

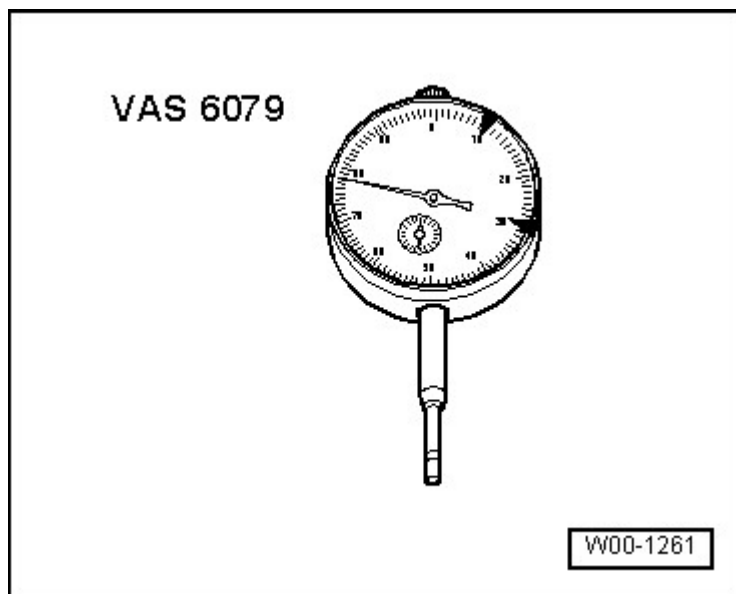
## ENGINE

### 3.2 V6 4V Engine Mechanical, Engine Code(s): BKH

## 00 - GENERAL, TECHNICAL DATA

### ENGINE NUMBER AND ENGINE DATA

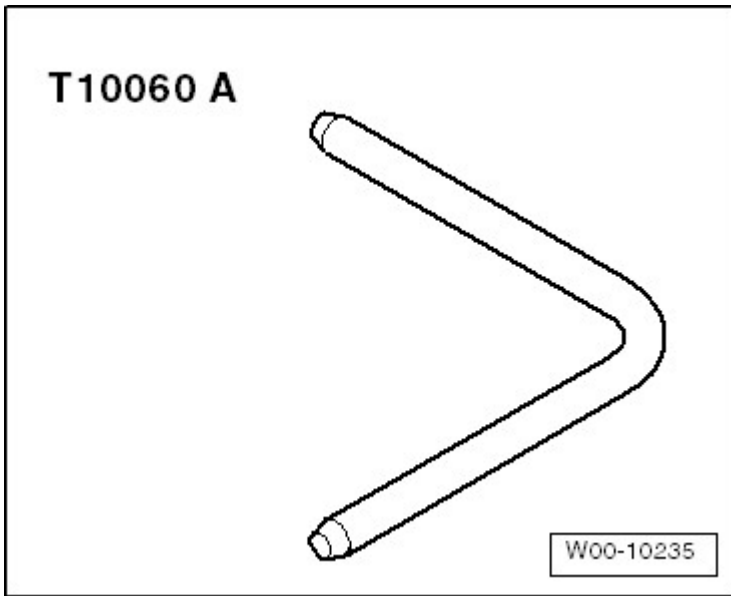
#### Engine number



**Fig. 1: Identifying Front Engine Cover**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front engine cover - **arrows** -.



**Fig. 2: Identifying "Engine Code" And "Serial Number"**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- The engine number ( "engine code" and "serial number" ) is located at front on cylinder block, below right cylinder head - **arrow 1** -.
- Additionally, a sticker - **arrow 2** - is affixed to front coolant line with "engine code" and "serial number".
- The engine code is also located on the vehicle data plate.

### Engine data

| Code letters                         |             | BKH              |
|--------------------------------------|-------------|------------------|
| Displacement                         | ltr.        | 3.123            |
| Output                               | kW at 1/rpm | 188/6500         |
| Torque                               | Nm at rpm   | 330/3250         |
| Bore                                 | Dia. mm     | 84.5             |
| Stroke                               | mm          | 92.8             |
| Compression ratio                    |             | 12.5             |
| RON                                  | min.        | 95 <sup>1)</sup> |
| Fuel injection and ignition system   |             | Simos            |
| Ignition sequence                    |             | 1-4-3-6-2-5      |
| Exhaust gas recirculation            |             | no               |
| Charging                             |             | no               |
| Knock control                        |             | yes              |
| Variable valve timing                |             | yes              |
| Variable intake manifold             |             | no               |
| Secondary air injection (AIR) system |             | no               |
| Valves per cylinder                  |             | 4                |

- 1) Super unleaded RON 91 is permissible, although with reduced power.

## GENERAL REPAIR NOTES

### Safety precautions

**CAUTION:** Fuel system is under high pressure! Before opening high pressure components of the fuel injection system, pressure must be relieved to residual pressure --> Procedure that must be performed before opening the high-pressure fuel injection system - Pay close attention!. Then wrap a clean rag around the connection and relieve residual pressure by carefully loosening the connection.

To reduce the risk of personal injury and/or damage to the fuel injection and ignition system, always observe the following:

- The ignition must be switched off before connecting or disconnecting injection and ignition system wiring or tester cables.
- It is possible that the control module will recognize a malfunction and store a DTC during some tests. Therefore, when all tests and repairs are completed, the DTC memory must be checked and, if necessary, erased. After DTC memory is erased, a readiness code must be generated for engine control module using operating mode "Guided Fault Finding".
- Clean engine only with ignition switched off.

**CAUTION:**

- The battery must only be disconnected and connected with the ignition switched off, since the Engine Control Module (ECM) can otherwise be damaged.
- Observe safety precautions when disconnecting the battery --> 27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL .

### Rules of cleanliness for performing work on fuel injection system

Even minor contaminations can lead to malfunctions in the fuel injection system. Therefore when working on the fuel supply/injection system, pay careful attention to the following rules of cleanliness:

- 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. Do not use fluffy cloths!
- Only install clean components: Only unpack replacement parts immediately prior to installation. Do not use parts that have been stored unpackaged (e.g. in tool boxes etc.).
- When system is open: Do not work with compressed air. Do not move vehicle unless absolutely necessary.

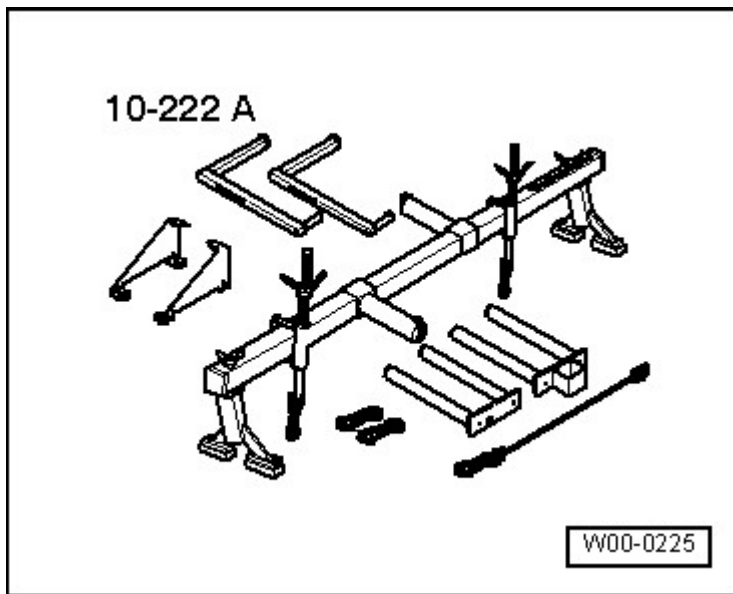
- Protect disconnected electrical connectors from dirt and moisture and only connect if dry.

**Procedure that must be performed before opening the high-pressure fuel injection system - Pay close attention!**

The fuel injection system is separated into a high-pressure section (max. approx. 110 bar) and a low-pressure section (approx. 6 bar).

Before opening the high-pressure section - e.g. removing the high-pressure pump, fuel rail, fuel injectors, the motor for intake manifold runner control valve or any other component or fuel line that is located in the high-pressure section of the fuel injection system - the fuel pressure in the high-pressure section must be relieved to a residual pressure of approx. 8 bar. The procedure for this is as follows.

- Start engine and run at idle speed.

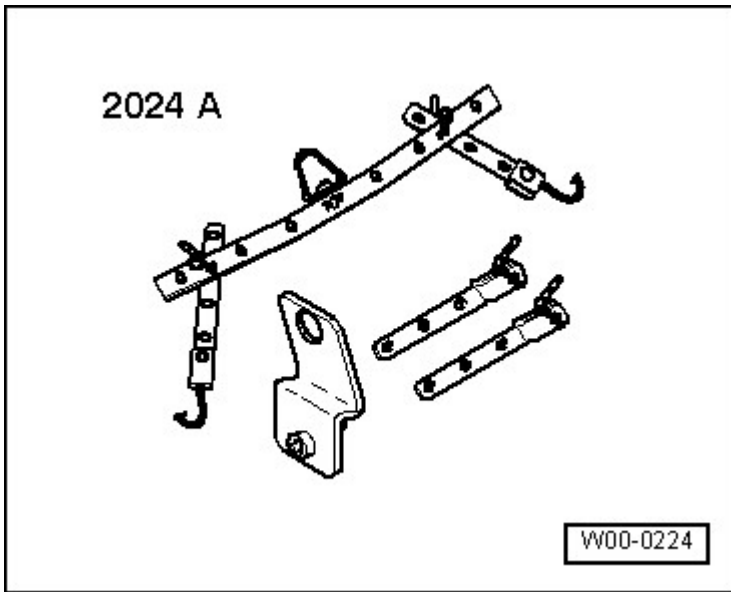


**Fig. 3: Connecting Vehicle Diagnosis, Testing And Information System VAS 5051 With Diagnostic Cable VAS 5051/5 A**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect Vehicle Diagnosis, Testing and Information System VAS 5051 with diagnostic cable VAS 5051/5 A.

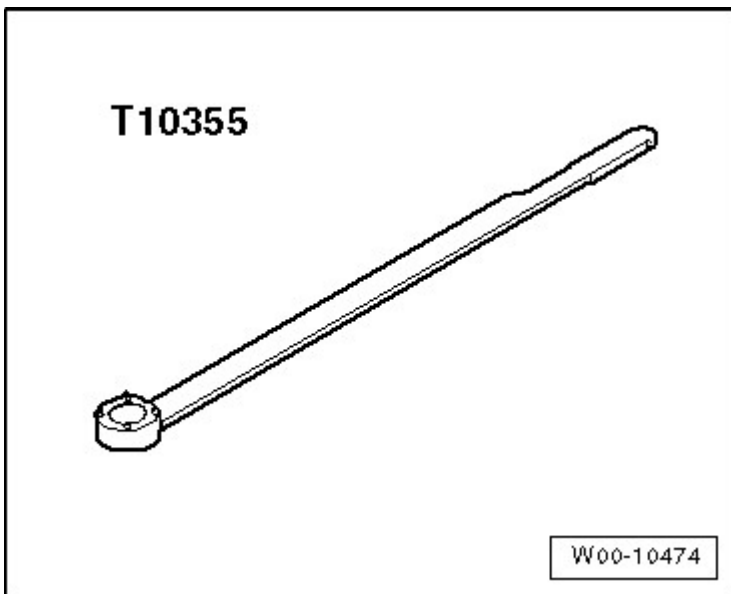




**Fig. 4: Display On VAS 5051 - "On Board Diagnostic (OBD)"**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051 :

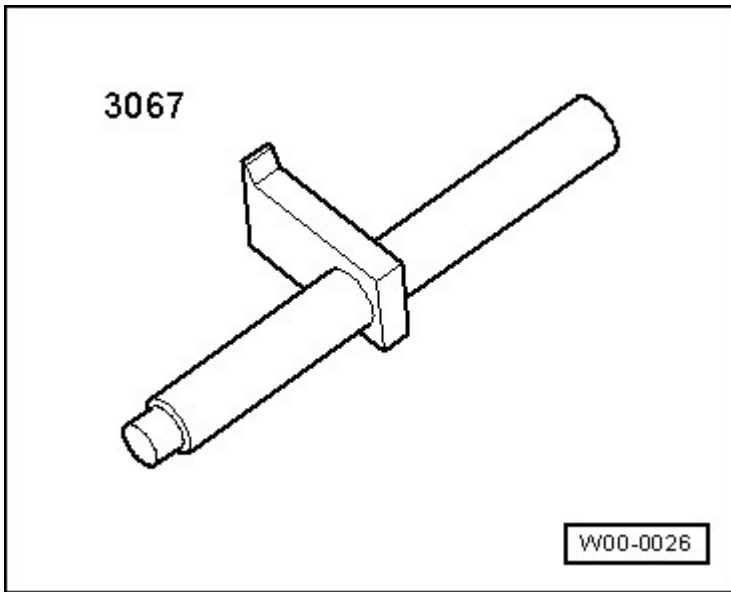
- In selection - 1 - , press "On Board Diagnostic (OBD)" system and activate by pressing --> button.



**Fig. 5: Display On VAS 5051 - "01 - Engine Electronics"**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051 :

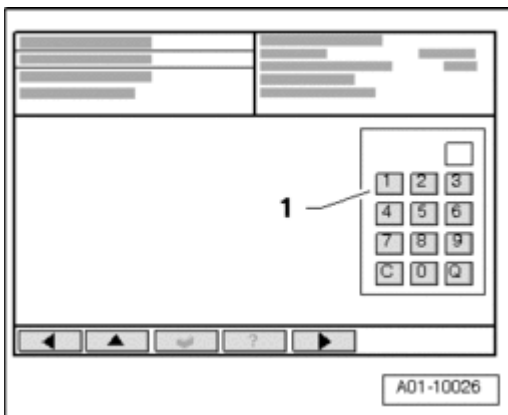
- In selection - 1 - , press "01 - Engine electronics" vehicle system and activate by pressing --> button.



**Fig. 6: Display On VAS 5051 - "006 - Basic Setting"**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051 :

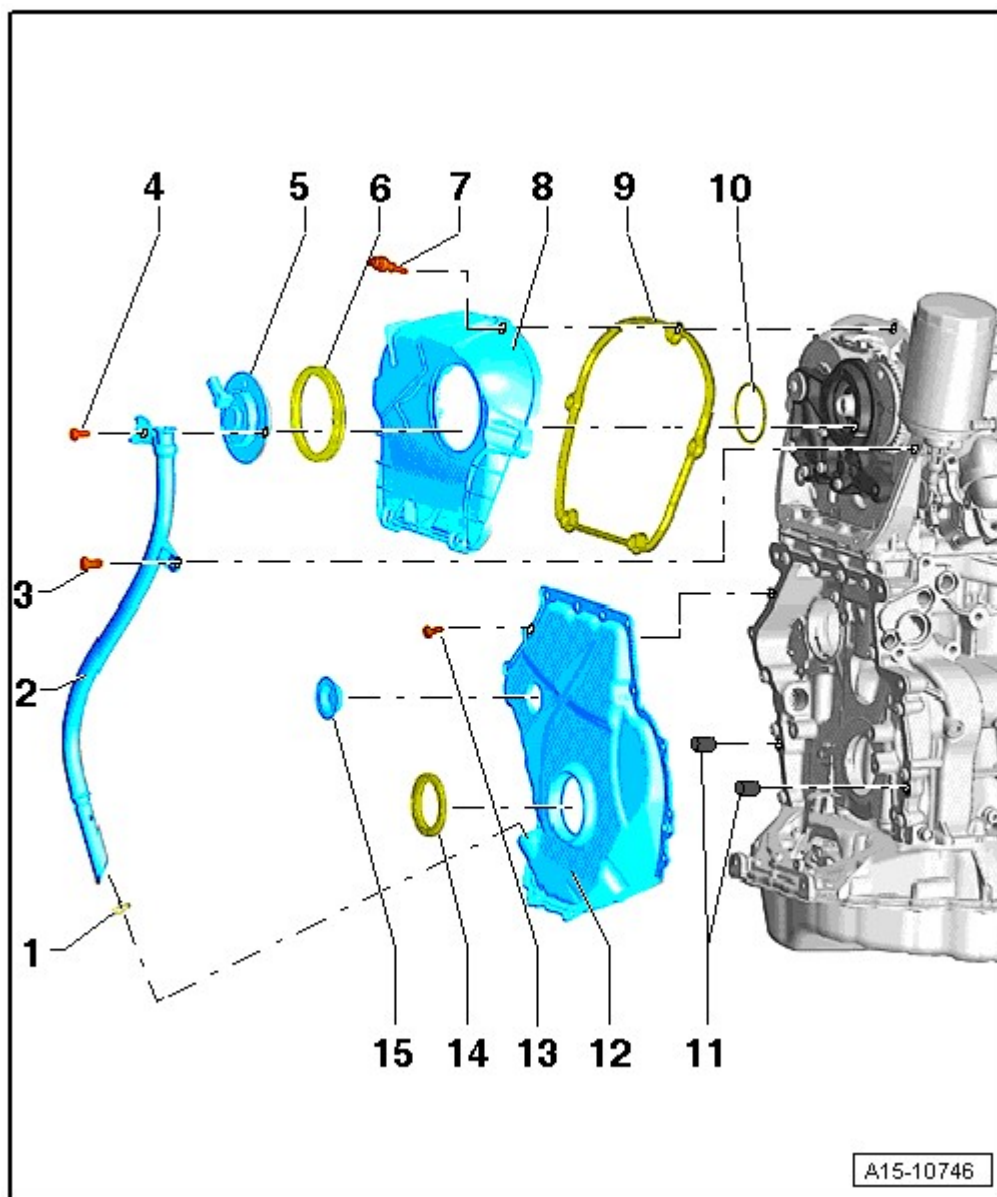
- In selection - 1 - , press diagnostic function "006 - Basic setting" and activate by pressing --> button.



**Fig. 7: Display On VAS 5051 - "Display Group 140"**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051 :

- In button field - 1 - , press buttons 1 4 0 for "Display group 140" and confirm entry by pressing Q button.

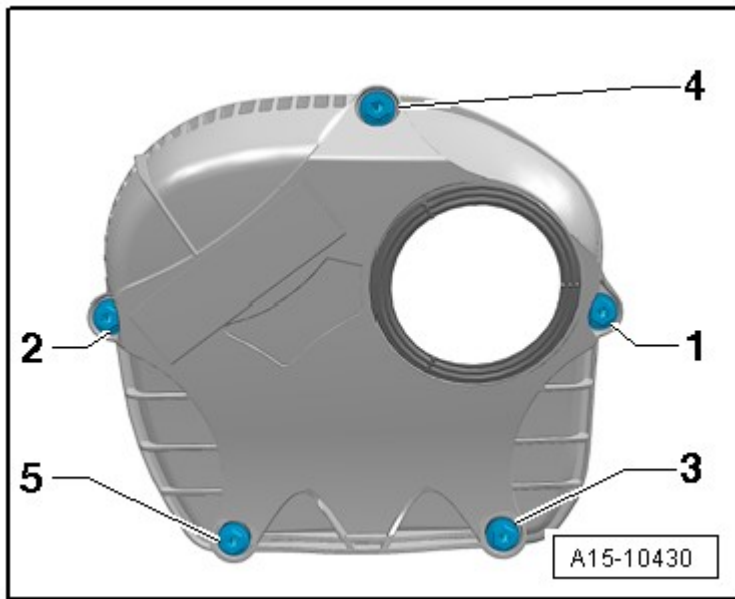


**Fig. 8: Display On VAS 5051 - (42%, 39.76 Bar, 40.63 Bar, Inactive)**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051 :

Example:

1. 42%
2. 39.76 bar
3. 40.63 bar
4. Inactive



**Fig. 9: Diagnostic System VAS 5051: Display - Display Fields**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Activate basic setting by pressing button A.

Display on VAS 5051 :

Example:

1. 0%
2. 0 bar
3. 5.46 bar
4. Lower

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

Now components or lines can be opened. A clean rag must be placed around connection points. Escaping fuel must be absorbed.

- In operating mode "Guided Fault Finding" , generate readiness code for engine control module (ECM).

#### **Contact corrosion!**

Contact corrosion can occur if appropriate connecting elements (bolts, nuts, washers, etc.) are not used.

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

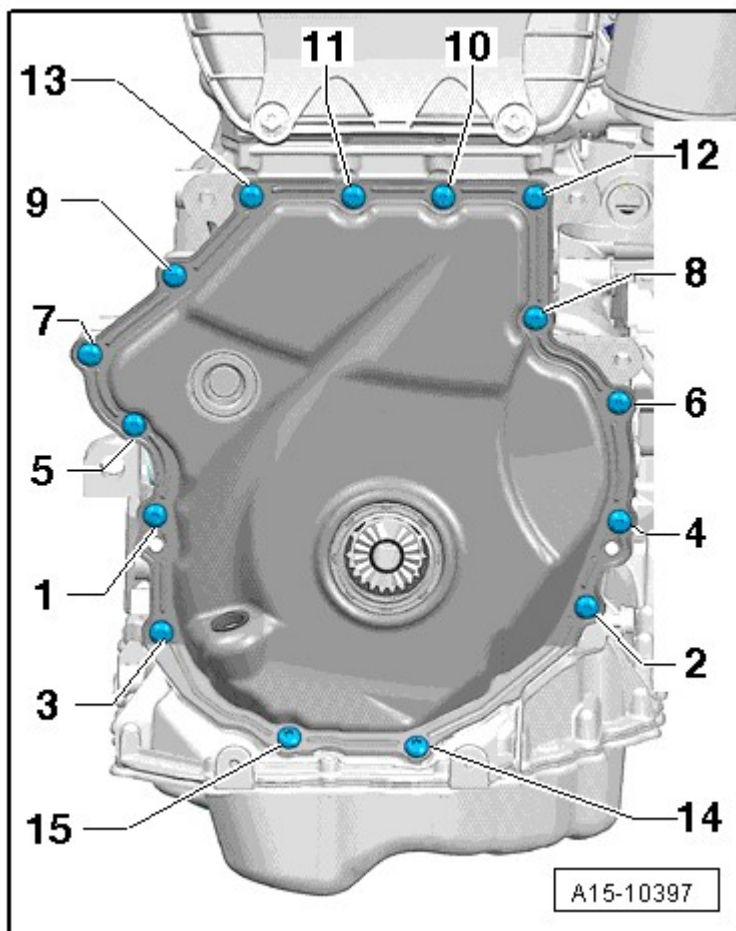
Also, rubber or plastic parts and adhesive consist of non-conductive materials.

**NOTE:**

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

**10 - ENGINE - ASSEMBLY****ENGINE (VEHICLES WITH MANUAL TRANSMISSION), REMOVING AND INSTALLING**

Engine, removing



**Fig. 10: Identifying Special Tools - Engine, Removing**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

**Special tools, testers and auxiliary items required**

- Pry lever 80-200
- Hose Clamps Up to 25 mm dia. 3094
- Drip tray for workshop crane VAS 6208 or V.A.G 1306

## 2007 Audi A6

ENGINE 3.2 V6 4V Engine Mechanical, Engine Code(s): BKH

- Hose clamp pliers V.A.G 1921
- Step ladder VAS 5085
- Scissor Lift Table VAS 6131 with Support Set VAS 6131/10 and VAS 6131/11

### NOTE:

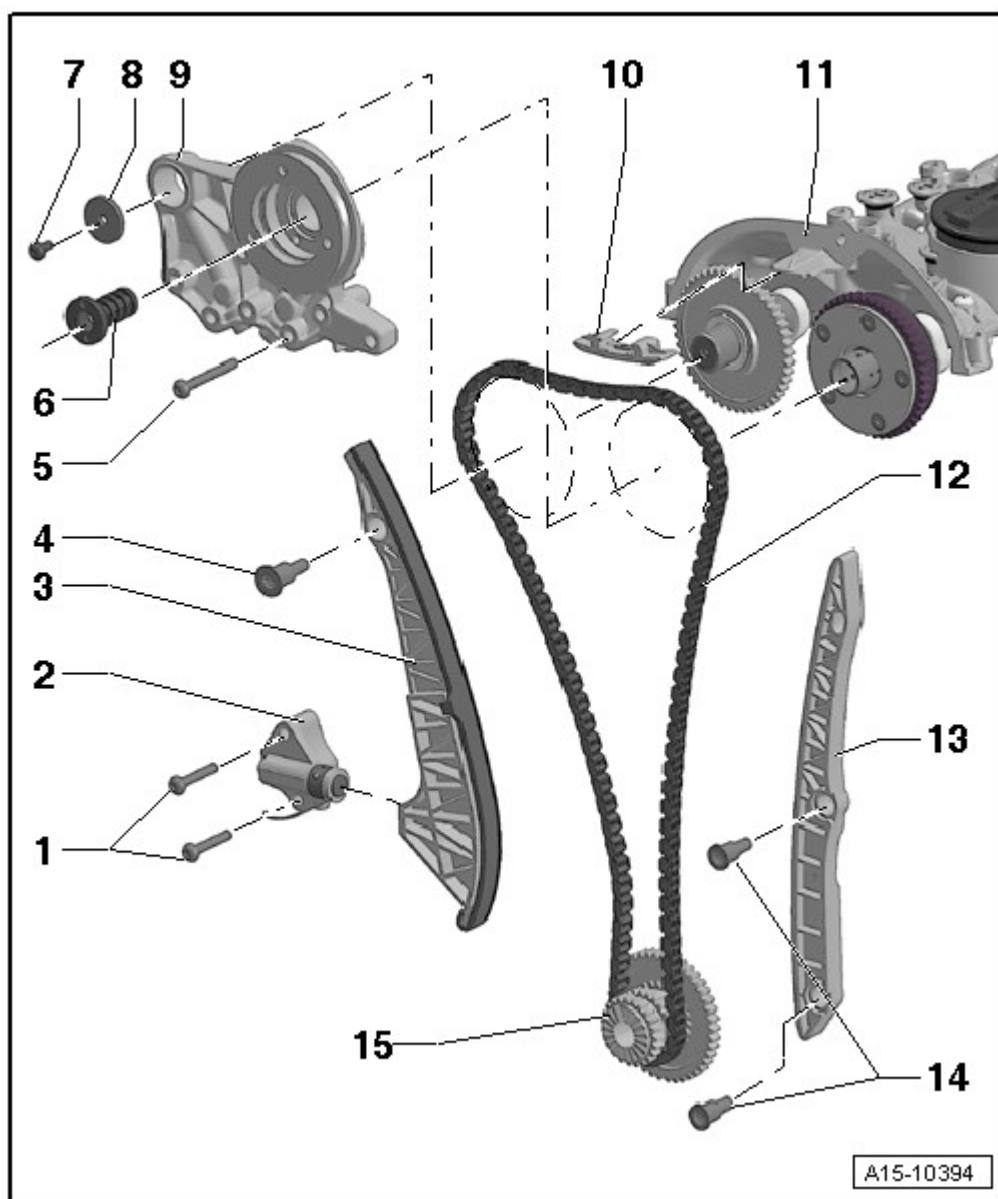
- If engine and transmission are to be separated after removal, the Supplementary Set Audi A6 (C6) VAS 6131/12 will also be required.

### Work procedure

### NOTE:

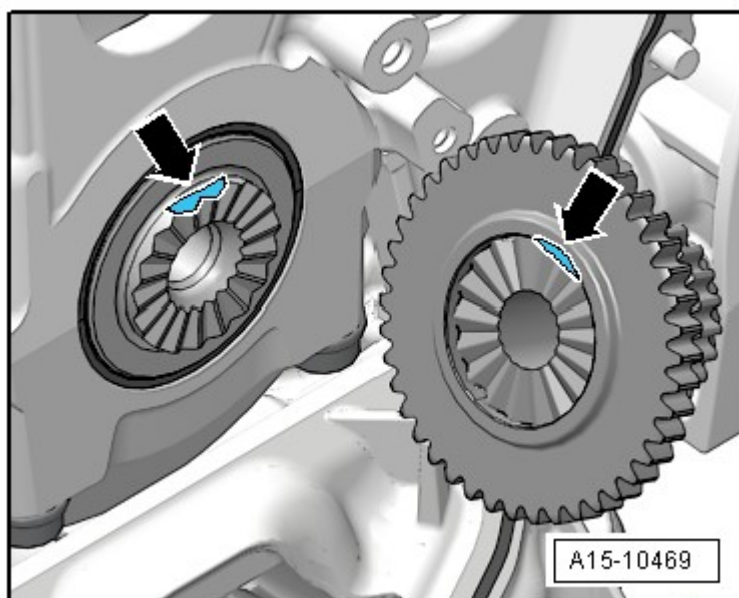
- With lock carrier installed, engine is removed downward with transmission and subframe.
  - All cable ties which are opened or cut open when removing engine, must be replaced in the same position when installing engine.
  - Drained coolant must be stored in a clean container for disposal or reuse.
- Discharge refrigerant circuit Refrigerant R134a - Servicing.

**CAUTION: Observe safety precautions when disconnecting the battery --> 27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL .**



**Fig. 11: Disconnecting Battery Ground (GND) Strap**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- With ignition switched off, disconnect Battery Ground (GND) strap - **arrow** -.

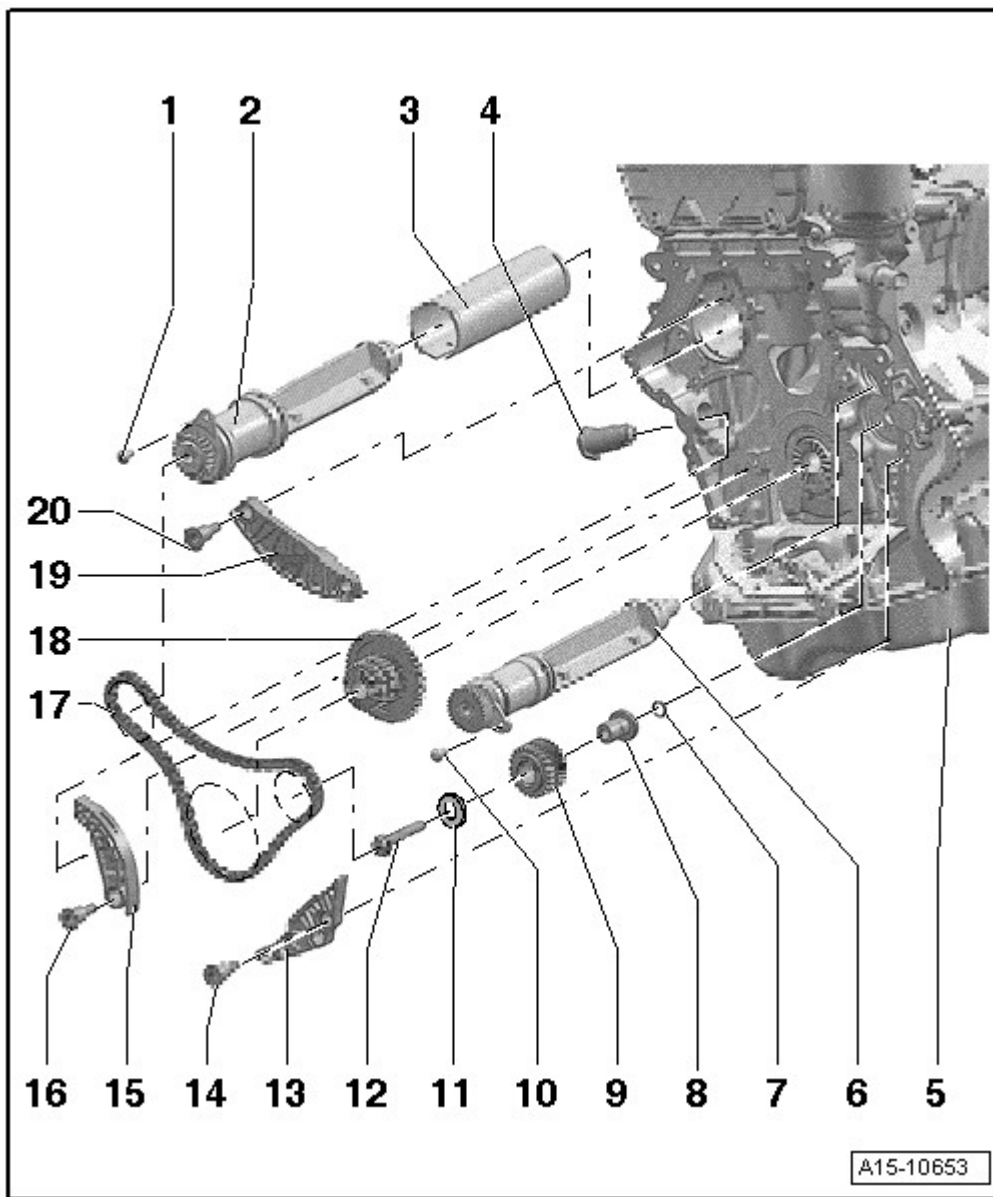


**Fig. 12: Removing Rear Engine Cover**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove rear engine cover - **arrows** -.





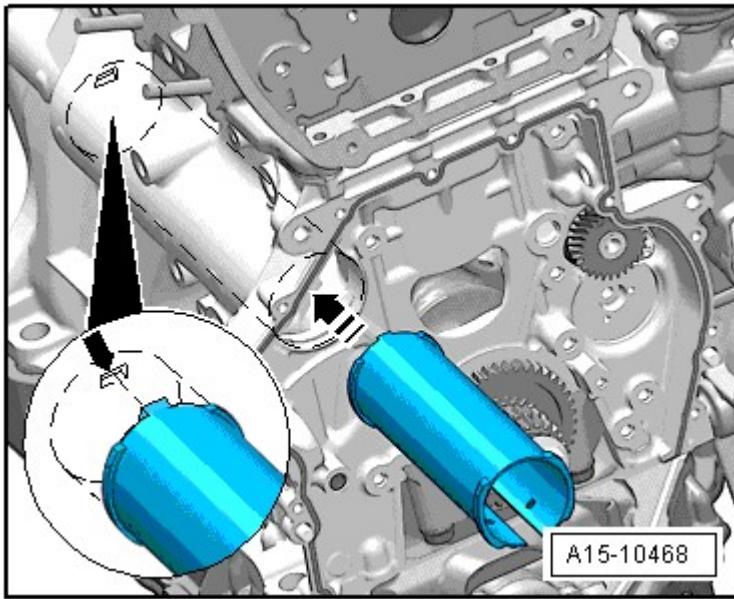
**Fig. 13: Identifying Front Engine Cover**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front engine cover - **arrows** -.

**CAUTION:** Cover cap of expansion tank with rag and open carefully, as hot steam i.e. hot coolant may escape when opening.

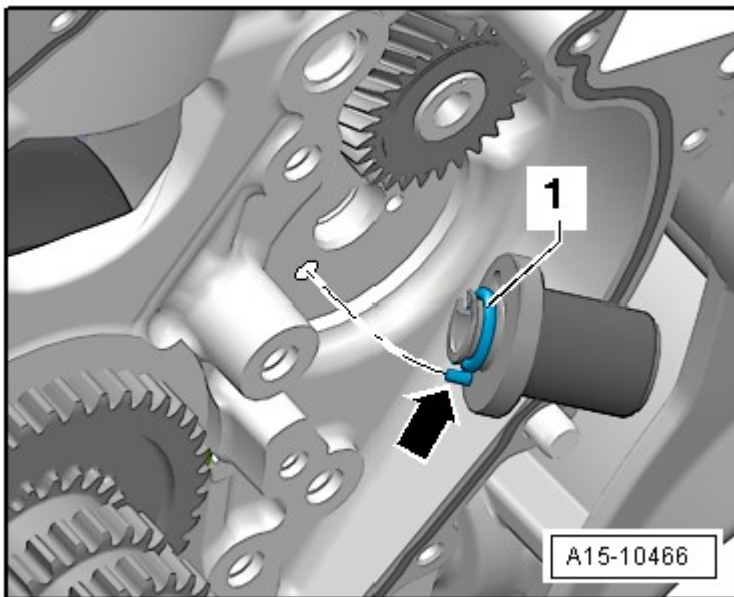
- Open cap of coolant expansion tank.
- Remove both front wheels.



**Fig. 14: Locating Fasteners Exhaust Pipe**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

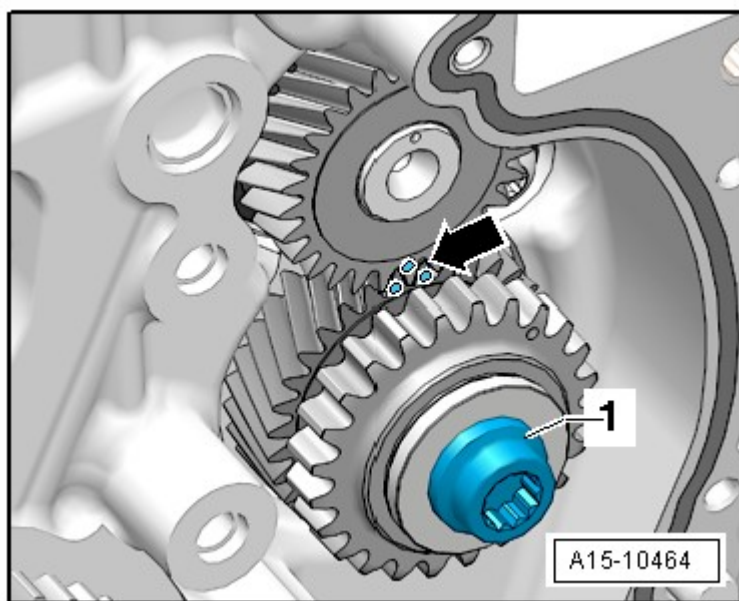
- For vehicles with auxiliary heater, remove bolts - **arrows** - for exhaust pipe of parking heater/auxiliary heater on noise insulation.



**Fig. 15: Identifying Quick-Release Fasteners And Noise Insulation**

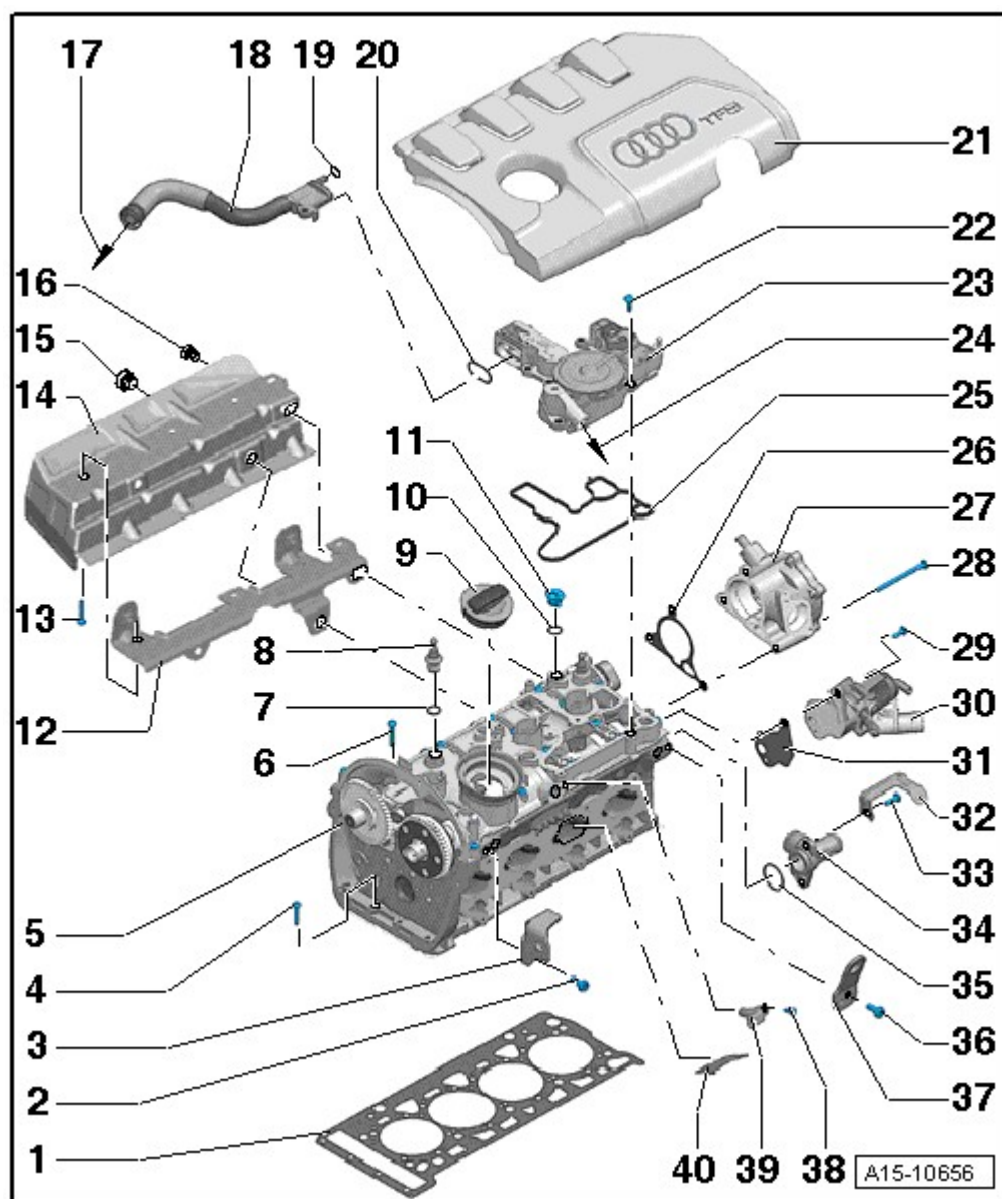
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen quick-release fasteners - **1 through 3** - and remove front and rear noise insulation.
- Place drip tray for workshop crane VAS 6208 under engine.



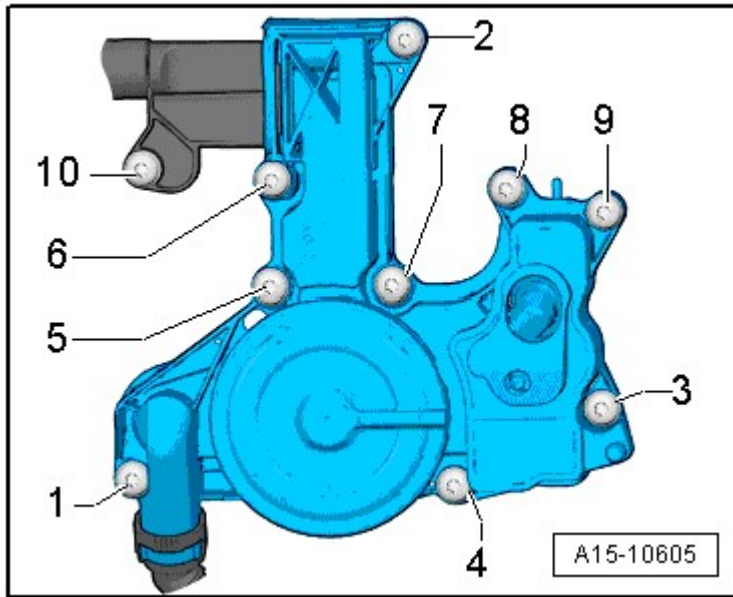
**Fig. 16: Disconnecting Coolant Hose From Oil Cooler**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect coolant hose - **arrow** - from oil cooler and drain coolant.



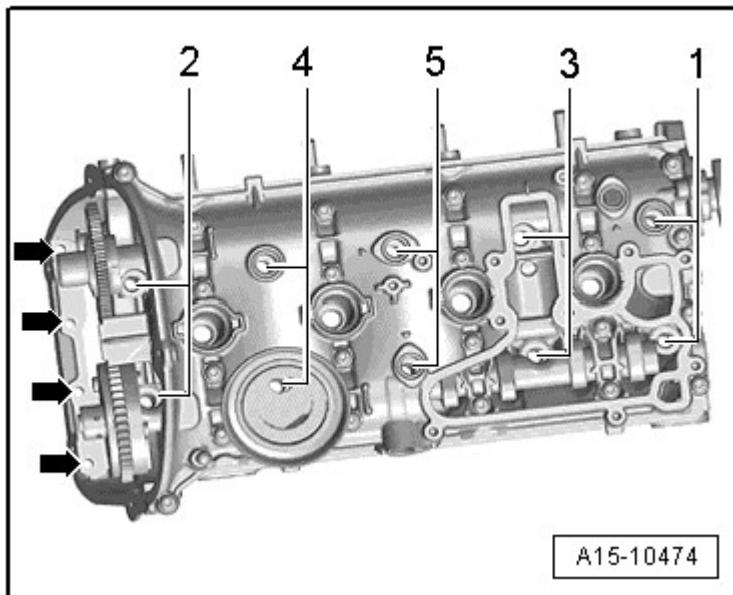
**Fig. 17: Disconnecting Lower Right Coolant Hose From Radiator**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect lower right coolant hose from radiator - **arrow** - and drain residual coolant.



**Fig. 18: Removing/Installing Bolts At Torque Support Stop**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - at torque support stop.

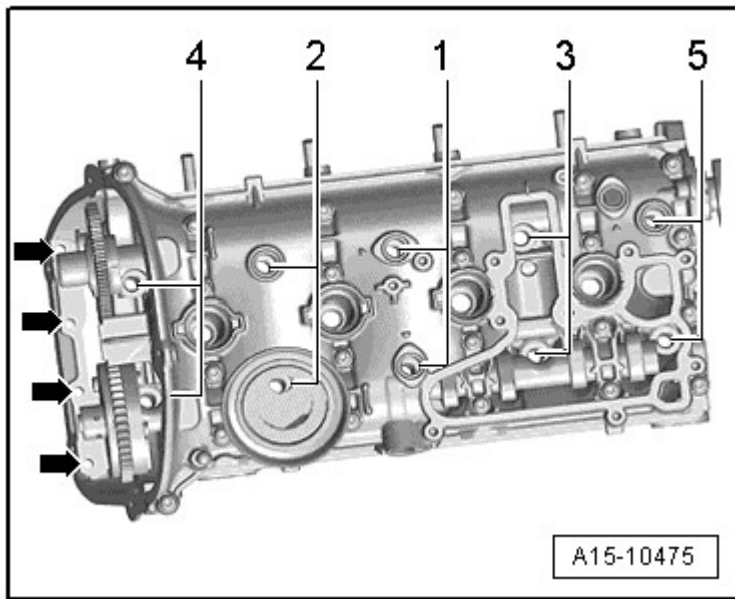


**Fig. 19: Removing/Installing Bolts For Torque Support**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - for torque support.

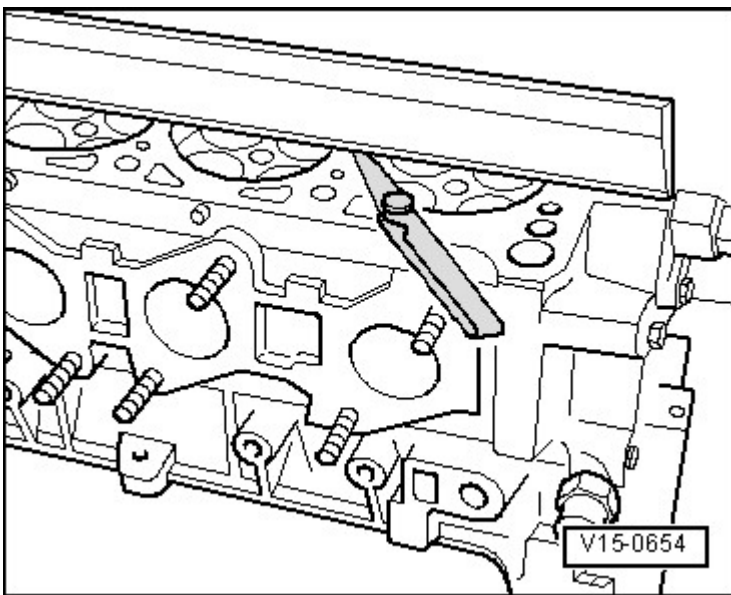
**NOTE:**

- The torque support and torque support stop will later be removed.



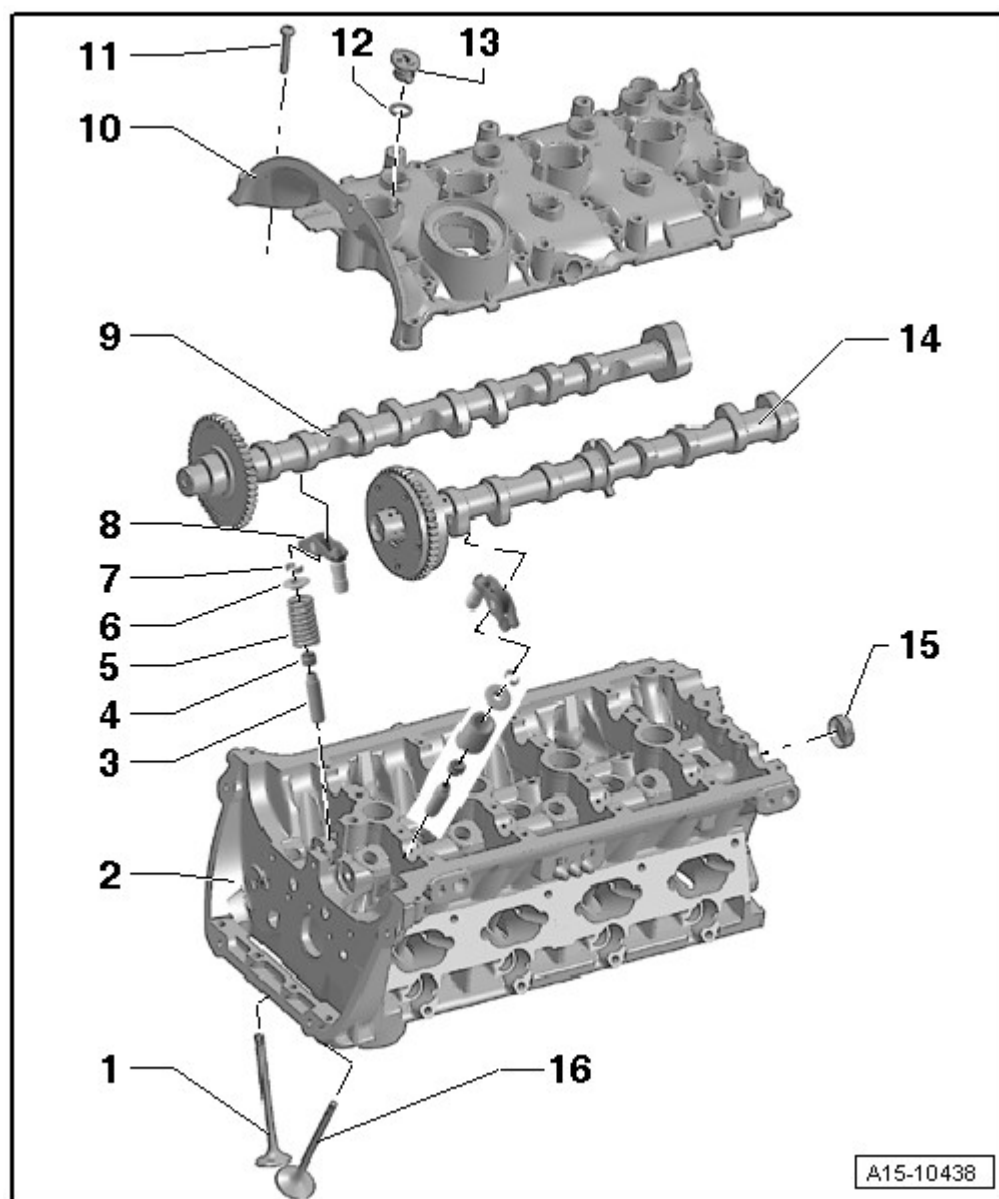
**Fig. 20: Removing Ground (GND) Strap From Right Longitudinal Member**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove Ground (GND) strap - **arrow** - from right longitudinal member.



**Fig. 21: Disconnecting Brake Booster Vacuum Hose From Grommet On Bulkhead**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

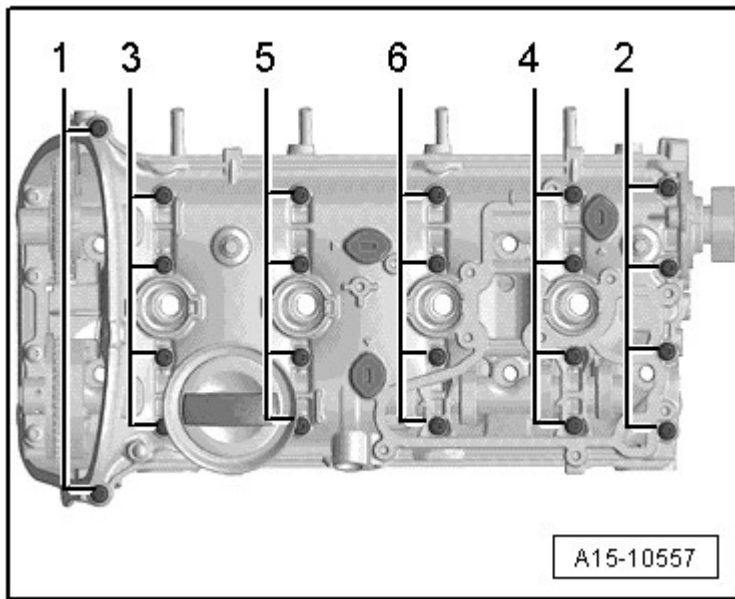
- Disconnect brake booster vacuum hose from grommet - **arrow** - on bulkhead.



**Fig. 22: Removing Ground (GND) Strap At Bulkhead**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

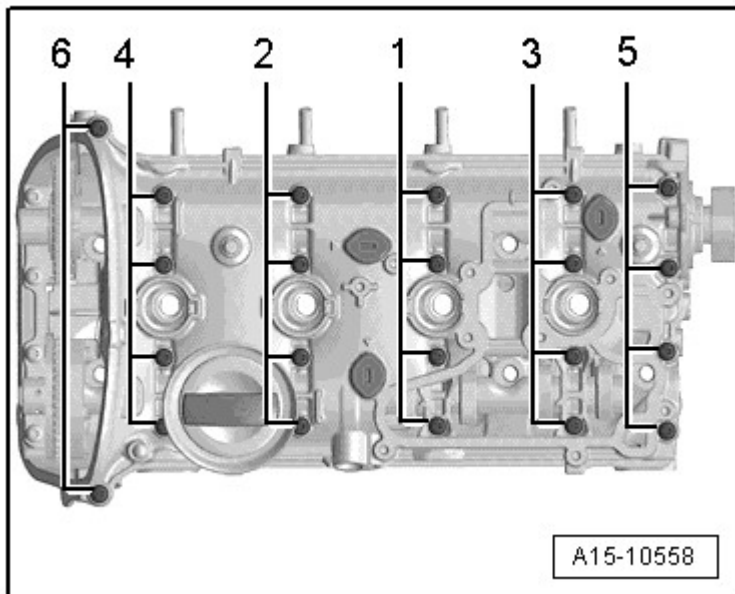
- Remove Ground (GND) strap - **arrow** - at bulkhead.





**Fig. 23: Removing Coolant Hoses At Coolant Expansion Tank**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

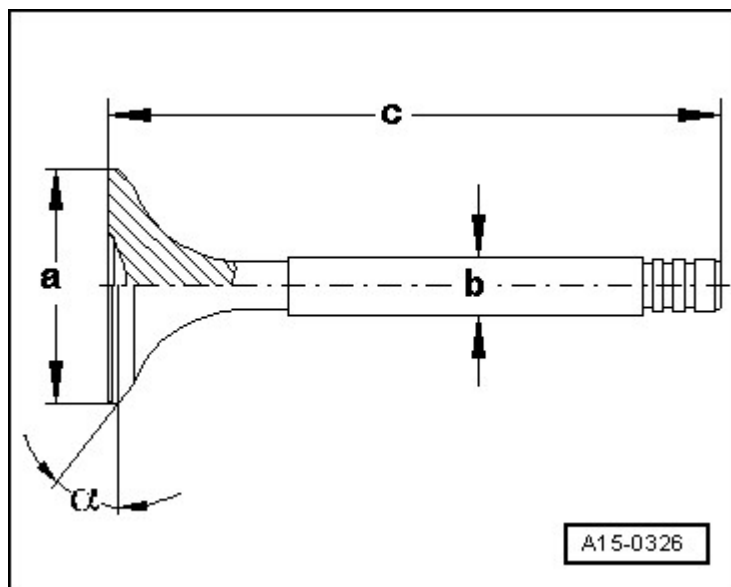
- Remove coolant hoses - **1** - and - **2** - at coolant expansion tank.
- Remove coolant expansion tank - **arrow** -.
- Disconnect electrical connection at Engine Coolant Level (ECL) Warning Switch F66 at bottom of coolant expansion tank.



**Fig. 24: Removing Coolant Hose From Front Coolant Line**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

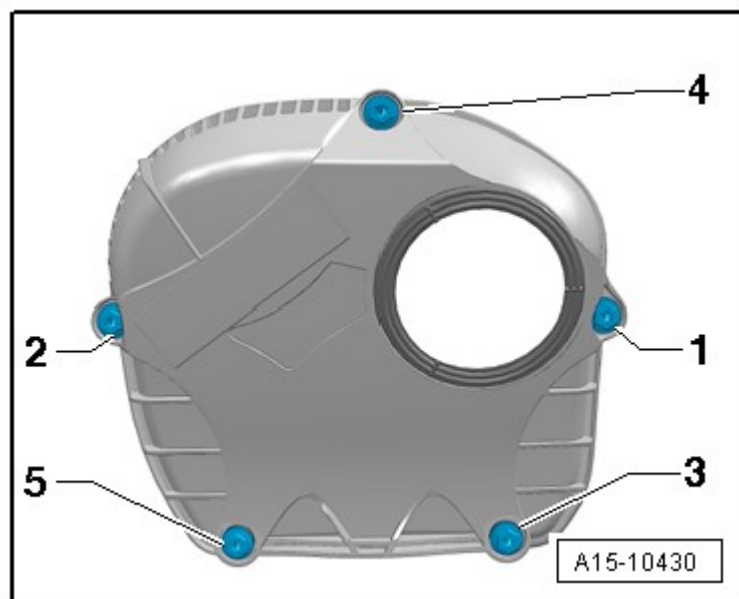
- Remove coolant hose - **arrow** - from front coolant line.





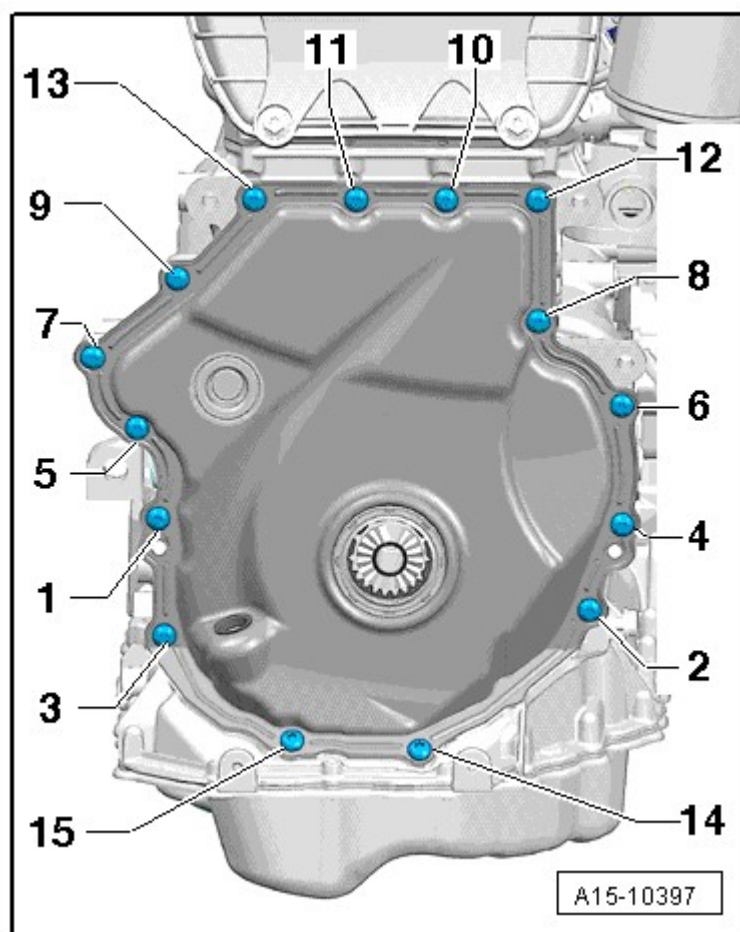
**Fig. 25: Disconnecting Top Coolant Hose From Radiator**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove left front coolant hose in engine compartment - **arrows** -.



**Fig. 26: Removing Coolant Hose From Front Coolant Line**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove coolant hose - **arrow** - from front coolant line.

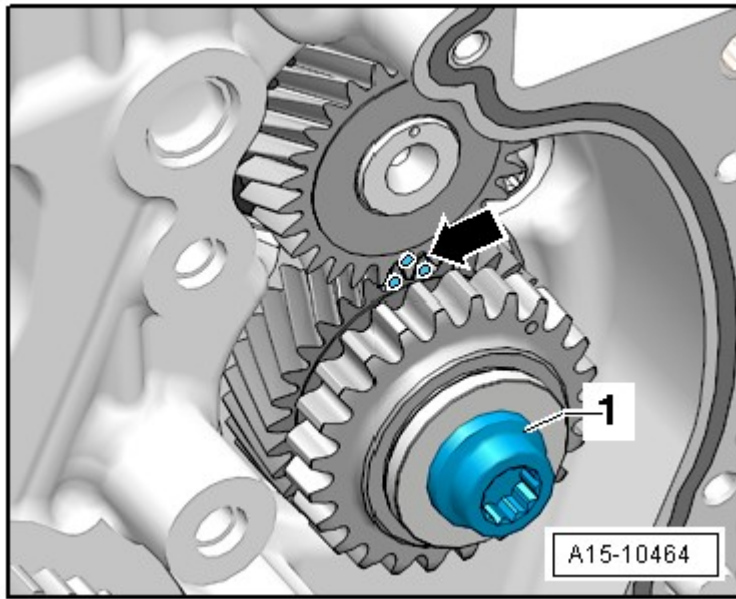


**Fig. 27: Disconnecting Vacuum Hose To Leak Detection Pump**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

**NOTE:**

- Place a rag under hydraulic lines to catch escaping hydraulic fluid.



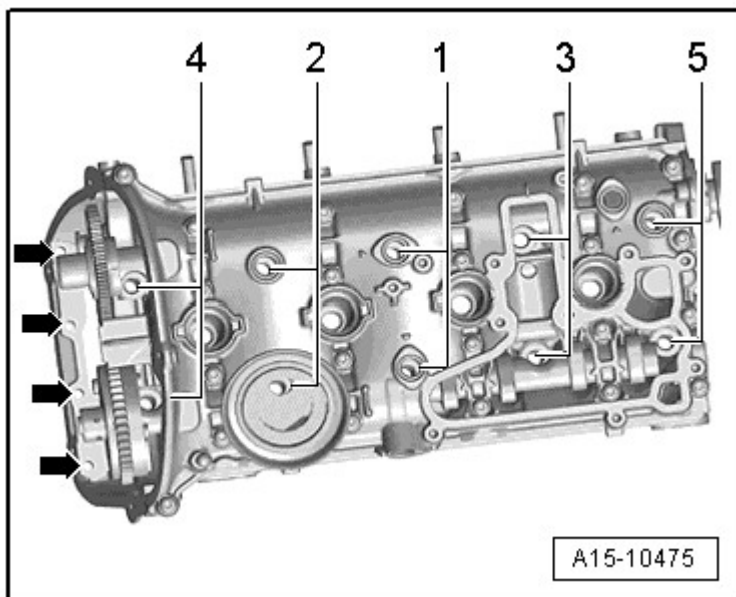
**Fig. 28: Removing Hydraulic Pressure Line At Power Steering Pump & Clamping Off Hydraulic Hose For Power Steering Pump With Hose Clamps**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove hydraulic pressure line - 2 - at power steering pump and set it aside on top of longitudinal member.
- Clamp off hydraulic hose - 1 - for power steering pump with a Hose Clamps Up to 25 mm dia. 3094.
- Remove hydraulic hose from power steering pump.

**NOTE:**

- To prevent damage to the refrigerant lines/hoses, ensure that the lines and hoses are not stretched, kinked or bent.



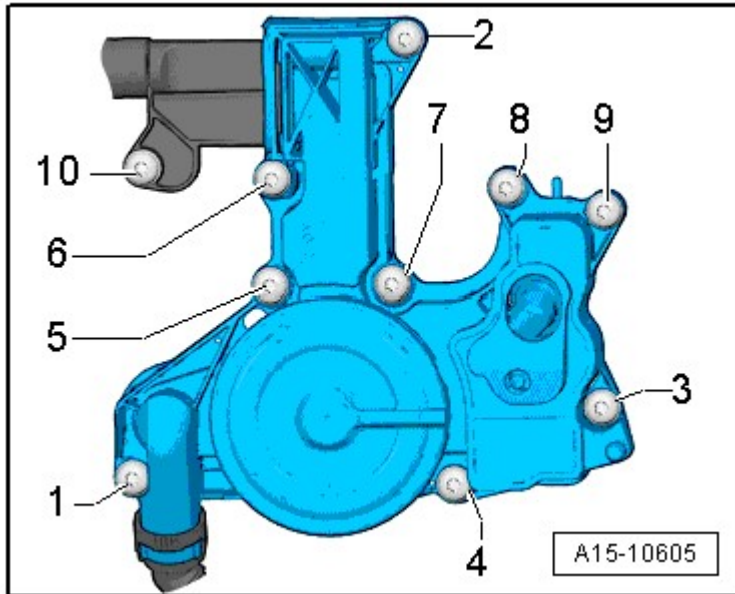
**Fig. 29: Removing Bolts**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - arrows -.

**NOTE:**

- The refrigerant lines will be removed from air conditioning compressor at a later point in time.

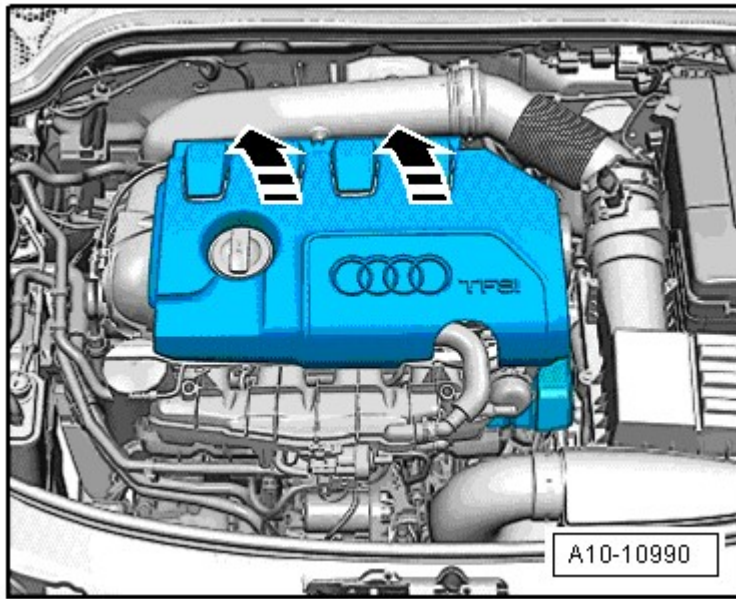
**Fig. 30: Identifying Bolts & Air Duct**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - arrows -.
- Remove air duct - 1 - and - 2 -.

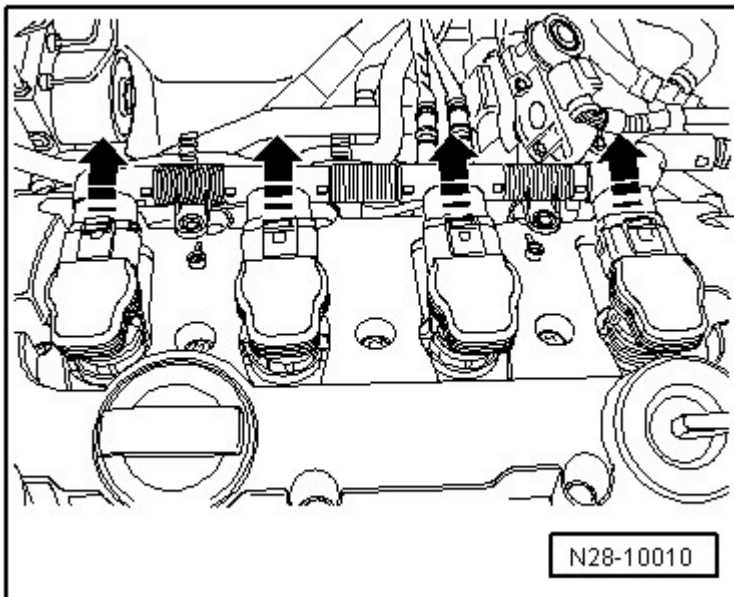
**CAUTION:** Note rules of cleanliness for working on the fuel injection system --> Rules of cleanliness for performing work on fuel injection system.

**CAUTION:** Fuel system is under pressure! Before opening the low pressure section of the fuel injection system, wrap a clean rag around the connection and relieve residual pressure by carefully loosening the connection.



**Fig. 31: Separating Fuel Line**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

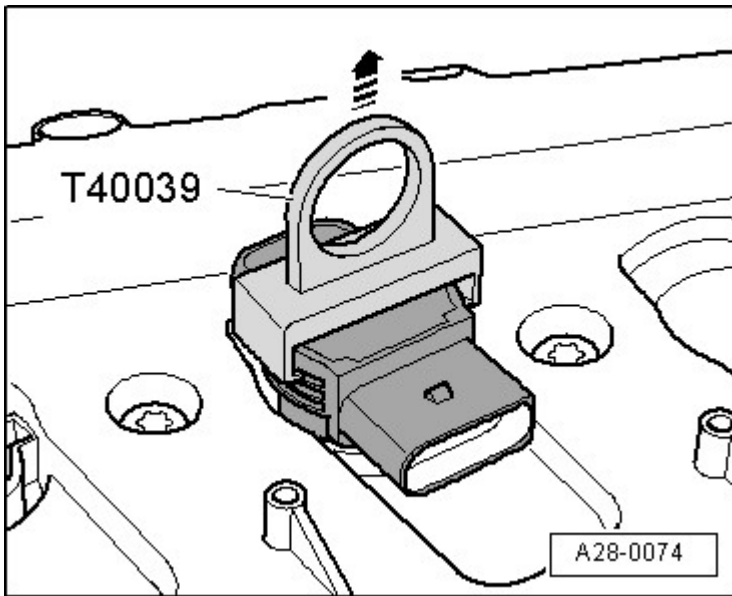
- Separate fuel line - **arrow** - and lay aside.



**Fig. 32: Disconnecting Check Valve From Connection At Air Duct Hose**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

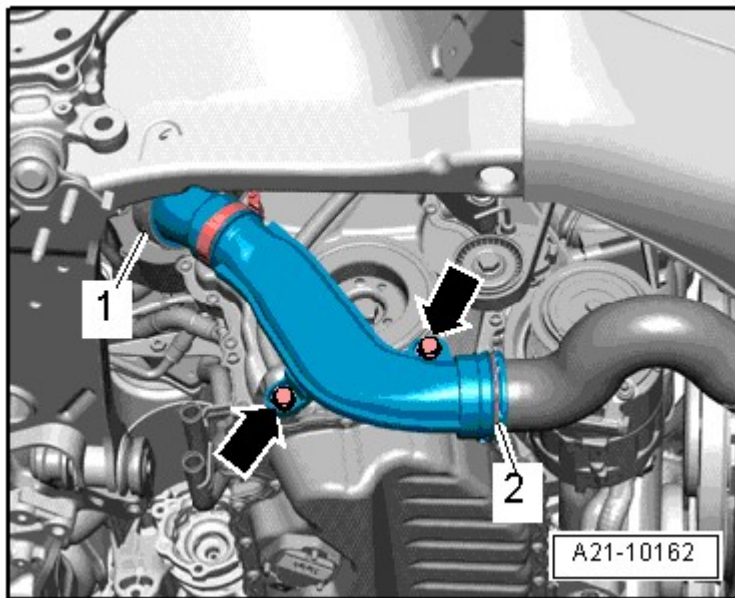
- Disconnect check valve - **1** - from connection at air duct hose.
- Remove air duct hose, thereby loosening hose clamp - **2** - and opening clips - **arrows** -.





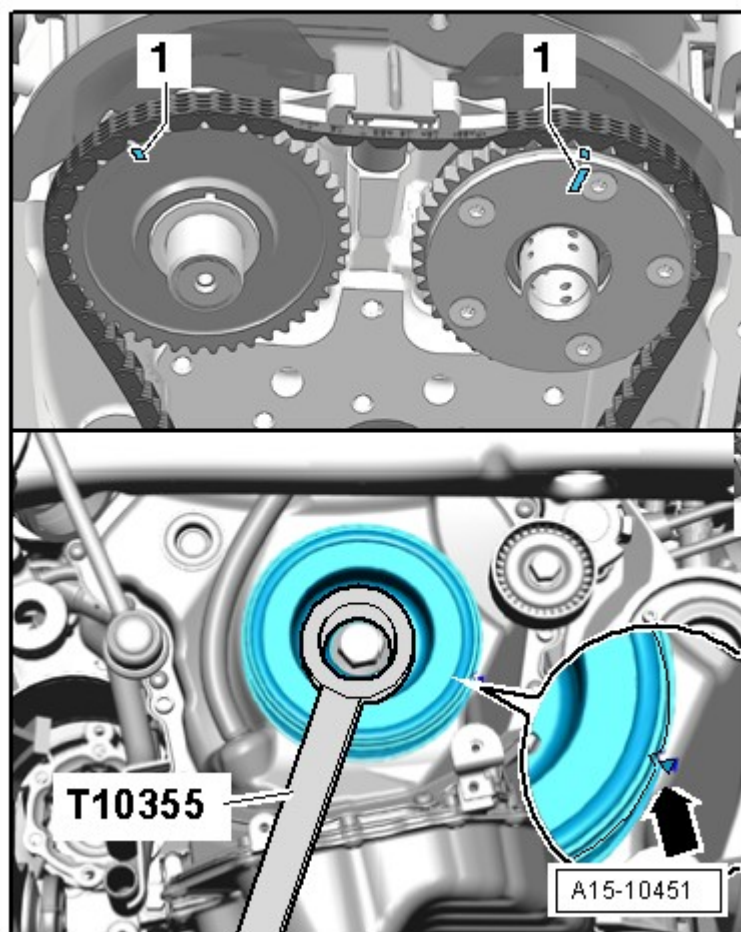
**Fig. 33: Removing Pin From Spreader Clips**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove pin from spreader clips - **arrow** -.
- Remove air filter housing.



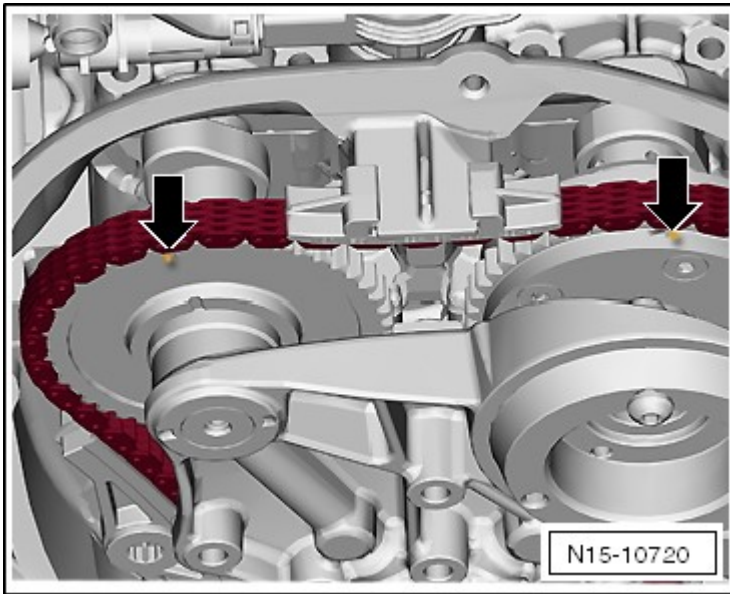
**Fig. 34: Removing Vacuum Hose To EVAP Canister At Evaporative Emission (EVAP) Canister Purge Regulator Valve N80**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove vacuum hose - **arrow** - to EVAP canister at Evaporative Emission (EVAP) Canister Purge Regulator Valve N80.



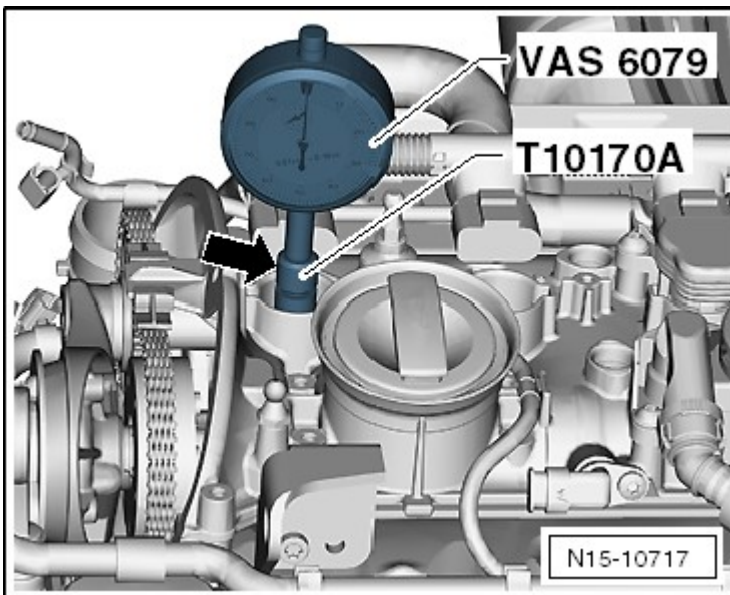
**Fig. 35: Removing Coolant Hose To Heater Core On Rear Of Engine**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove coolant hose - **arrow** - to heater core on rear of engine.



**Fig. 36: Disconnecting Electrical Harness Connector For Oxygen Sensor (O2S) 2 Behind Three Way Catalytic Converter (TWC) G131**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

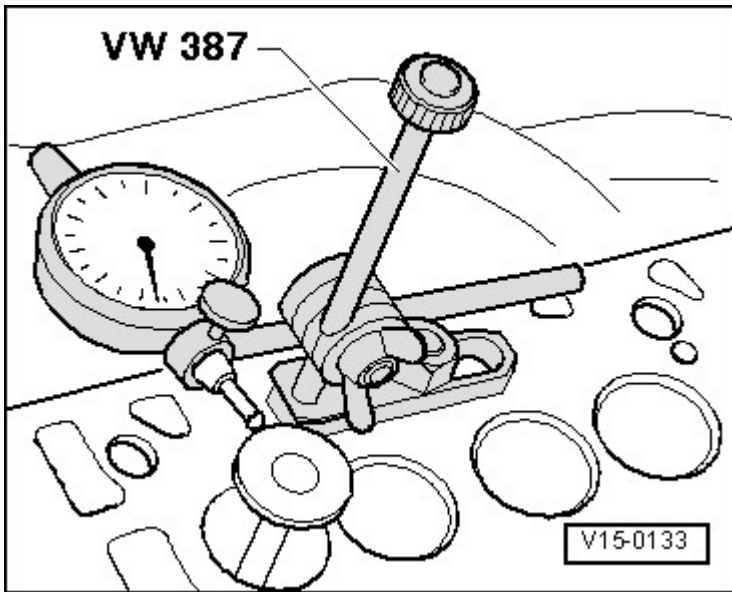
- Remove nuts and remove left bracket for harness connectors - 1 - and - 2 - from bulkhead.



**Fig. 37: Removing Rubber Seal & Plenum Chamber Cover**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove rubber seal - 2 - for plenum chamber cover.
- Remove plenum chamber cover - 1 -.



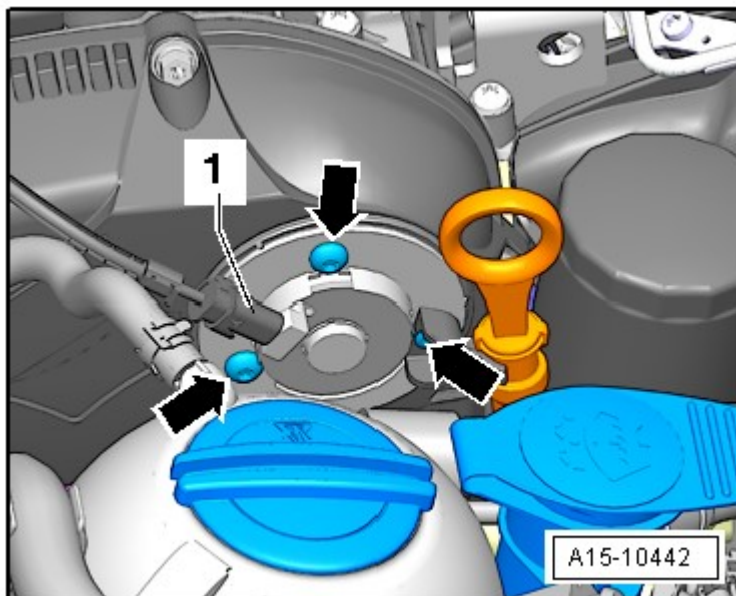


**Fig. 38: Removing Nut And Fuse Strip On Plus Wire Terminal Clamp**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nut - 1 - and remove fuse strip on plus wire terminal clamp.
- Disconnect positive wire - 2 - on battery positive terminal.
- Pull positive wire through bulkhead toward front.
- Free up wiring harness lay it aside on engine.

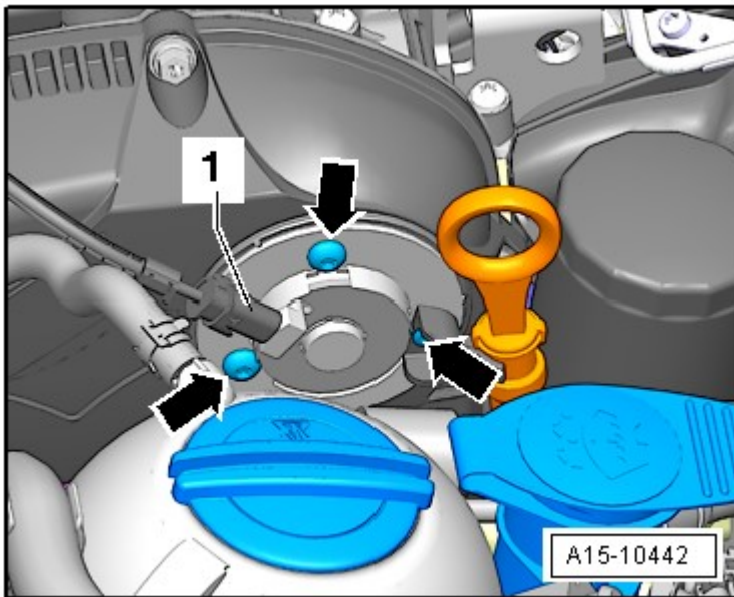
**NOTE:**

- Ignore - 3 -.



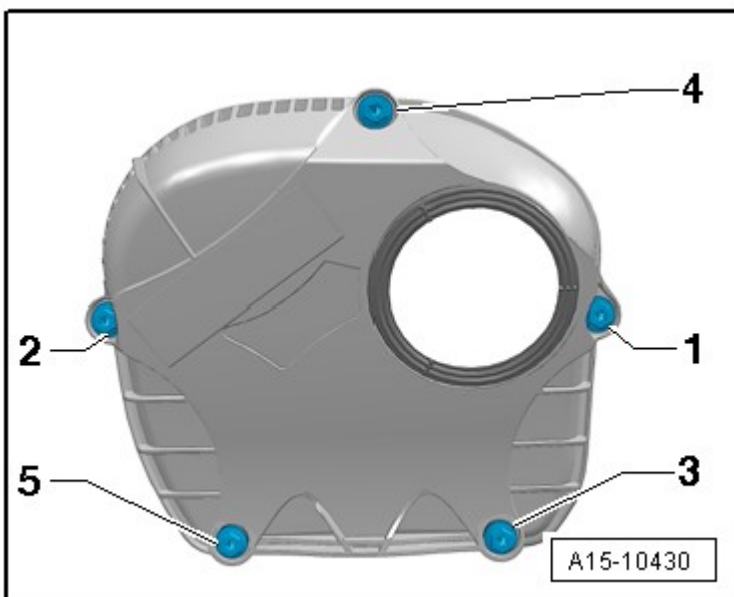
**Fig. 39: Identifying Covers, Hex-Nuts, Wiper Arm, Wiper Axle & Wiper Arms**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pry off both covers - **3** - using a screwdriver.
- Loosen hex-nuts - **4** - by several turns.
- Loosen wiper arm - **2** - from wiper axle by lightly tilting.
- Remove nuts completely and remove wiper arms.
- Disconnect securing clips - **1** - and remove cowl grille - **5** -.



**Fig. 40: Removing Cover From E-Box In Plenum Chamber**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove cover for E-Box in plenum chamber - **arrows** -.



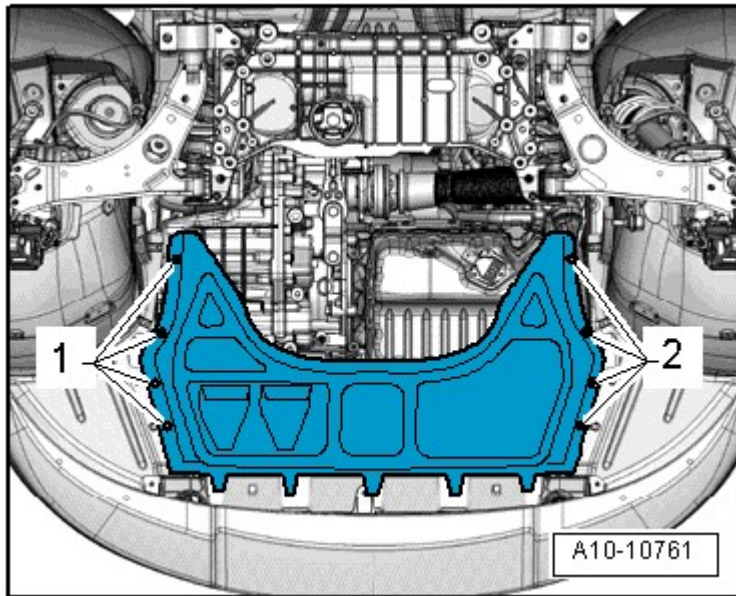
**Fig. 41: Using Screwdriver To Pry Off Mounting Bracket And Remove Engine Control Module (ECM) From E-Box**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using a screwdriver, carefully pry off mounting bracket - **arrow** - and remove Engine Control Module (ECM) from E-Box.

**NOTE:**

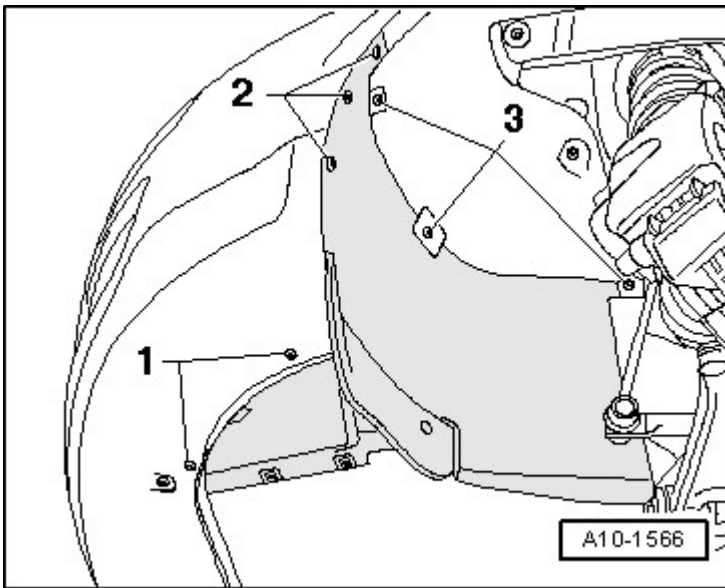
- Engine Control Module (ECM) remains connected at wiring harness.



**Fig. 42: Releasing Retaining Hooks Toward Outside And Removing Retaining Bracket**

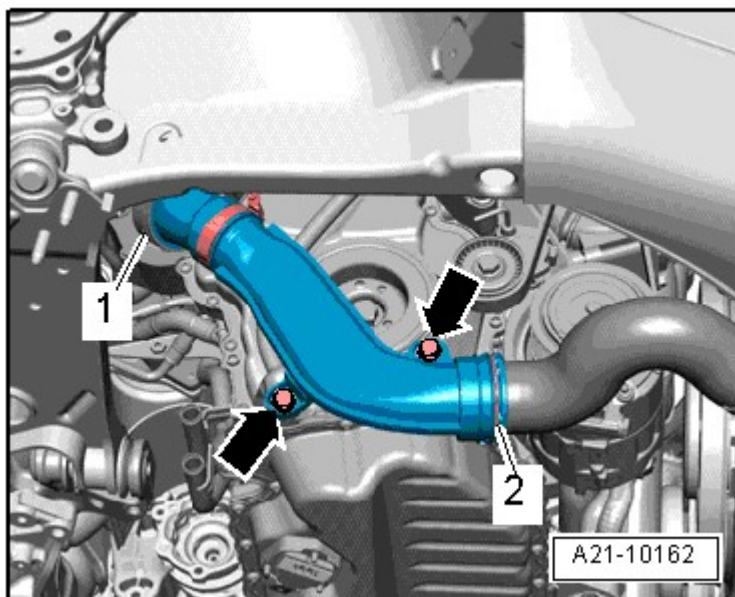
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Release retaining hooks - **arrows** - toward outside and remove retaining bracket.



**Fig. 43: Disconnecting Electrical Harness Connectors On Connector Station**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect all electrical harness connectors on connector station - **2** -.
- Remove electrical wire connection - **1** -.



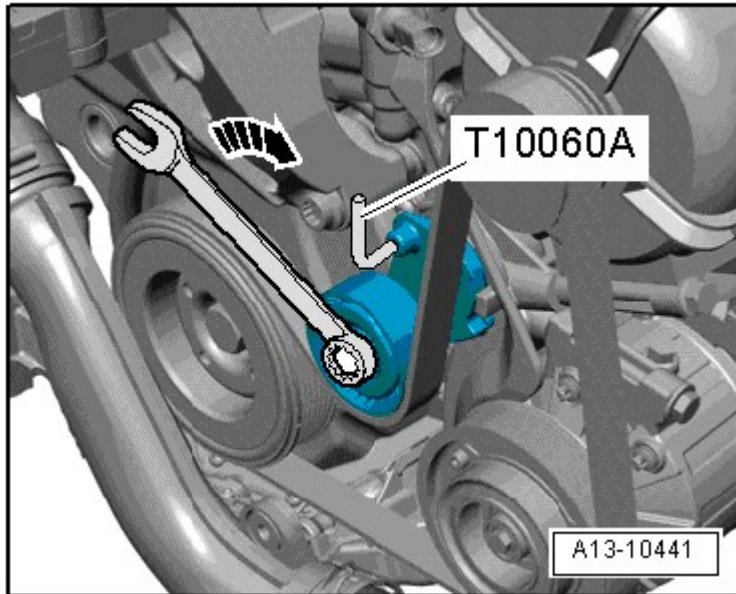
**Fig. 44: Disengaging Locking Mechanisms And Removing Secondary Relay Carrier In E-Box Toward Top**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disengage locking mechanisms - **arrows** - and remove secondary relay carrier in E-Box toward top.
- Disengage engine wiring harness at E-Box and bulkhead.
- Set wiring harness on engine and secure Engine Control Module (ECM) against falling down.



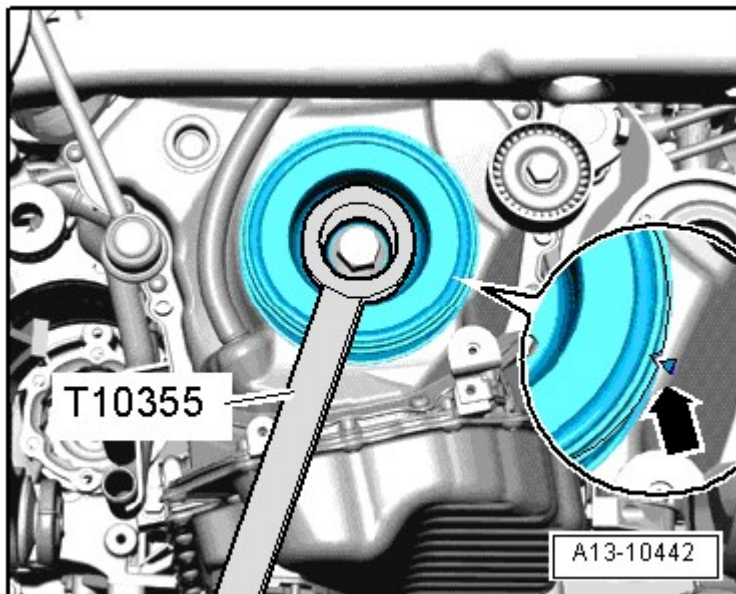
- Have a second technician press brake pedal.

**CAUTION:** To loosen collar bolt for drive axle, the wheel bearing must not be under load (vehicle must not be standing on its wheels).



**Fig. 45: Identifying Collar Bolt For Right Drive Axle**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove collar bolt - 2 - at left and right drive axles - 1 -.

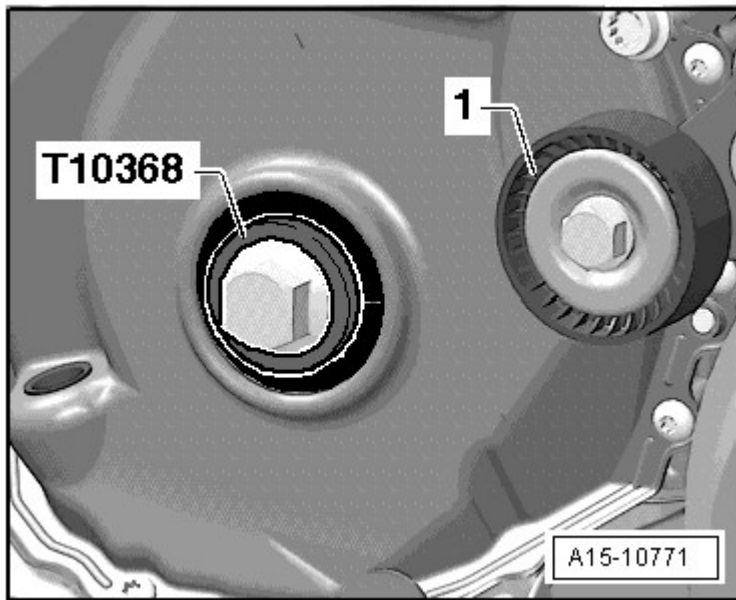


**Fig. 46: Removing Heat Shield For Left/Right Drive Axles**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield - **1** - for left and right drive axles.
- Remove left and right drive axles from flange shafts of transmission.

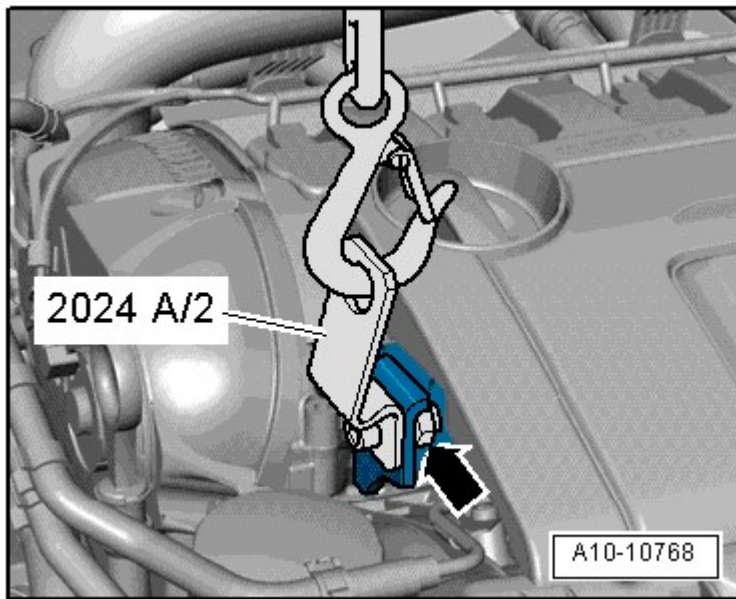
**NOTE:**                      • The drive axles will be removed at a later time.

**NOTE:**                      • To prevent damage to the refrigerant lines/hoses, ensure that the lines and hoses are not stretched, kinked or bent.



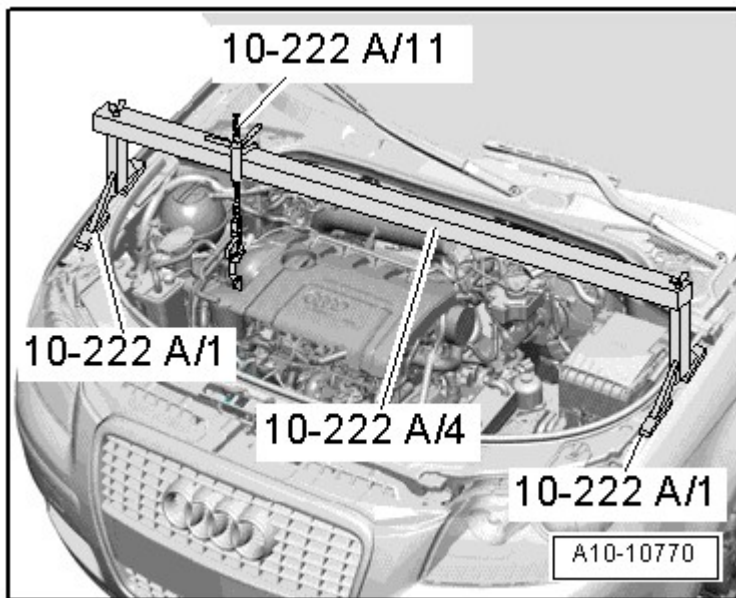
**Fig. 47: Removing Bracket For Refrigerant Lines At Right On Oil Pan**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bracket for refrigerant lines at right on oil pan - **arrow** -.
- Remove refrigerant lines at A/C compressor.
- Tie up refrigerant line, that runs to catch reservoir at right of vehicle, to body.
- Seal open connections on A/C compressor using clean plugs.



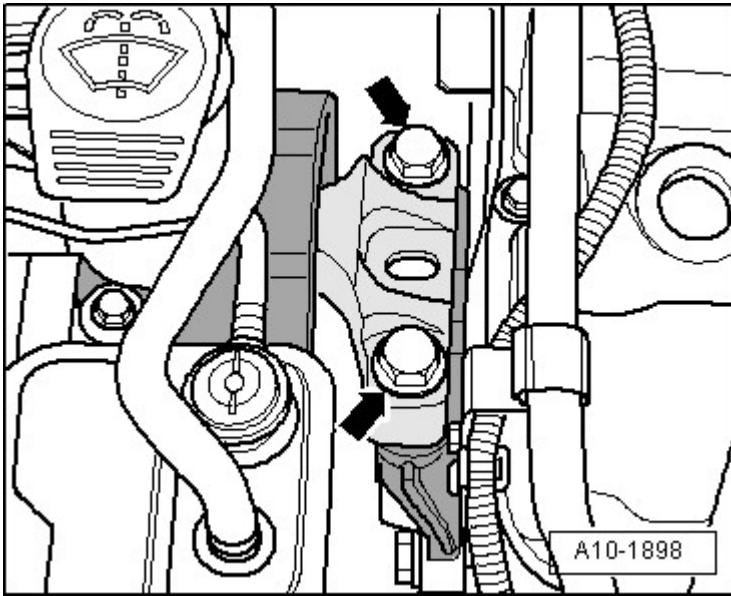
**Fig. 48: Removing Bolts And Nuts Uniformly At Left/Right**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts and nuts - **arrows** - uniformly at left and right.
- Remove stabilizer.



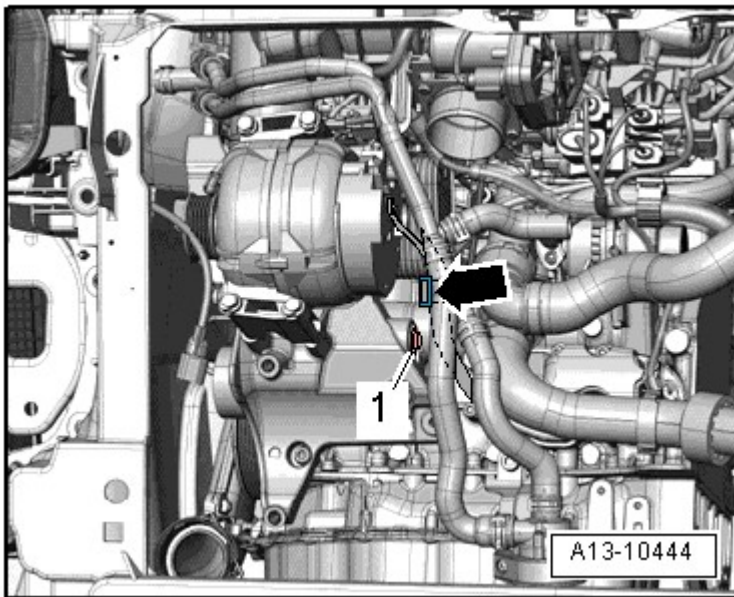
**Fig. 49: Unclipping Actuator Rod For Left Front Level Control System Sensor G78 At Bottom On Link**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If equipped, disconnect electrical harness connector at Left Front Level Control System Sensor G78.
- Unclip actuator rod for Left Front Level Control System Sensor G78 at bottom on link - **arrow** -.



**Fig. 50: Removing Suspension Strut From Link**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove suspension strut from link - **arrow** -.



**Fig. 51: Removing Nuts For Fastening Link And Guide Link**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

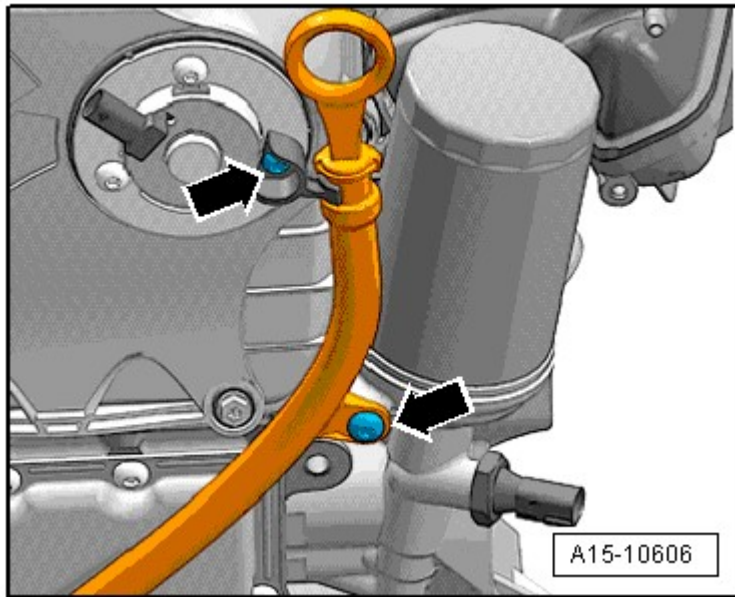
- Remove nuts - **1** - and - **2** - for fastening link and guide link.

**NOTE:**

- The bolts will be removed from the subframe at a later point in time.

- Repeat procedure on opposite side of vehicle.

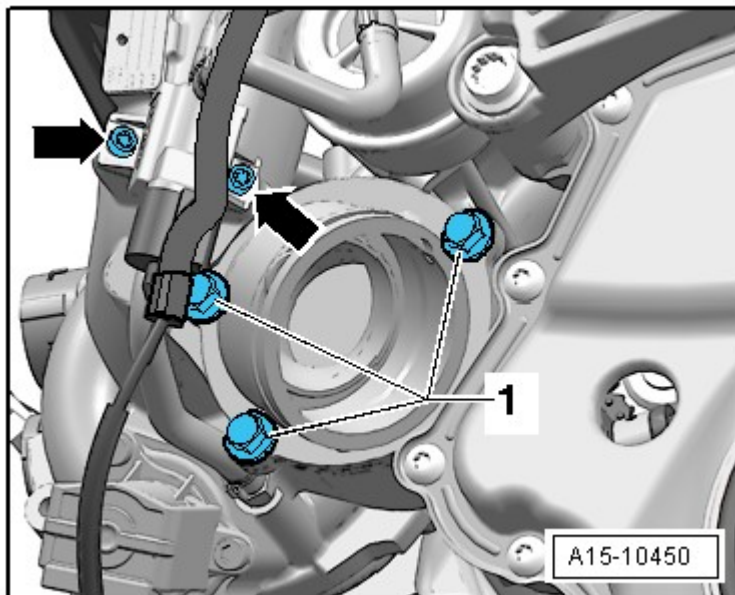




**Fig. 52: Loosening Clamping Sleeves**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

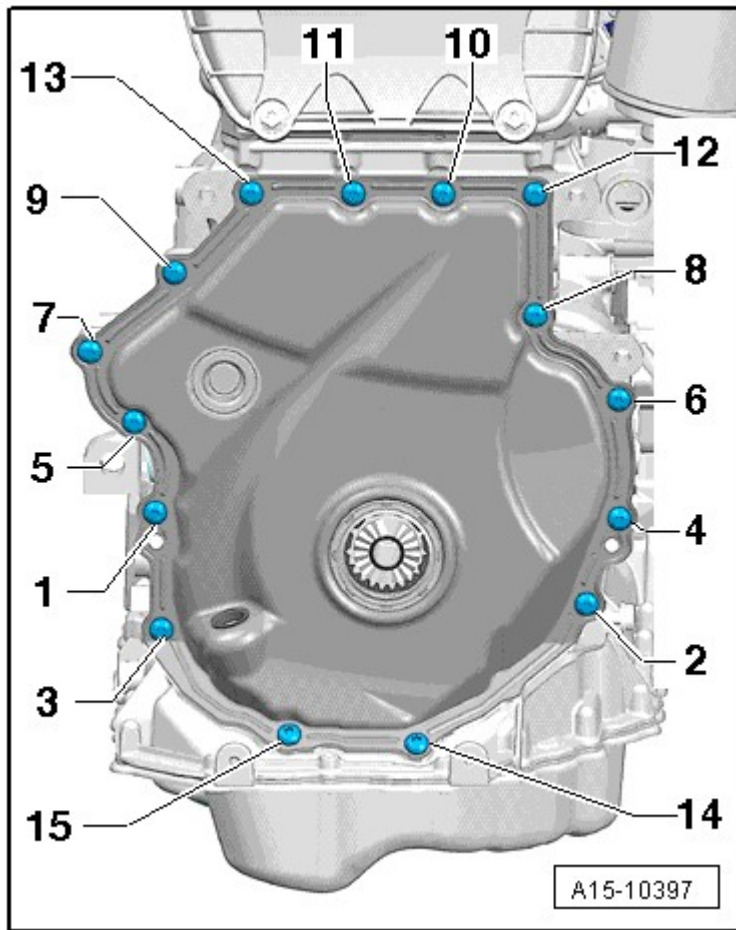
- Loosen clamping sleeves - **arrows** -.



**Fig. 53: Removing Heat Shield For Drive Shaft**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield - **A** - for drive shaft - **arrows** -.
- Remove bolts at transmission/drive shaft flange.
- Push drive shaft together with rear final drive. The constant velocity (CV) joints can move axially.
- Lay aside drive shaft on exhaust system.



**Fig. 54: Identifying Scissor Lift Platform VAS 6131**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

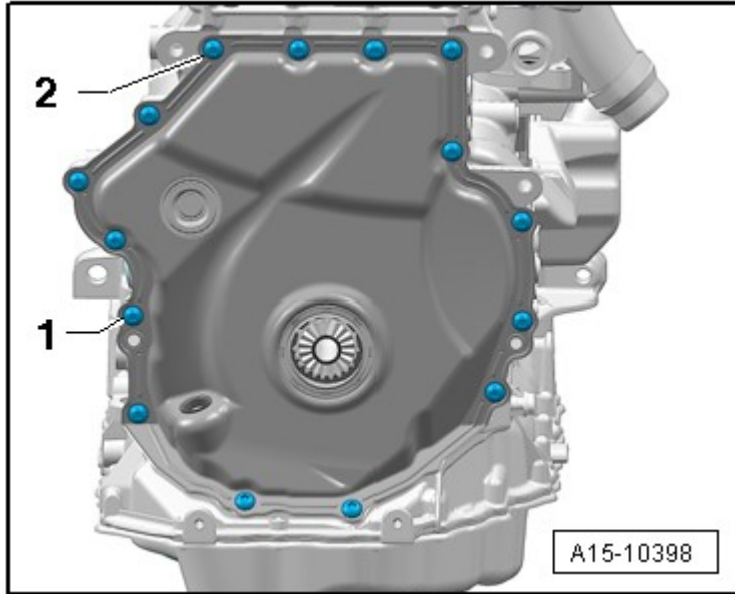
**Prepare scissor lift platform:**

- Equip scissor lift platform VAS 6131 with support set for Audi VAS 6131/10 and VAS 6131/11 as follows:

| Platform coordinates | Parts of support set for Audi VAS 6131/10 and VAS 6131/11 |       |       |        |
|----------------------|-----------------------------------------------------------|-------|-------|--------|
| B4                   | /10-1                                                     | /10-4 | /10-5 | /10-11 |
| G4                   | /10-1                                                     | /10-4 | /10-5 | /10-12 |
| B11                  | /10-1                                                     | /10-2 | /10-5 | /10-8  |
| G11                  | /10-1                                                     | /10-2 | /10-5 | /10-8  |
| C15                  | /10-1                                                     | /10-2 | /10-5 | /11-2  |
| F15                  | /10-1                                                     | /10-3 | /10-5 | /10-7  |

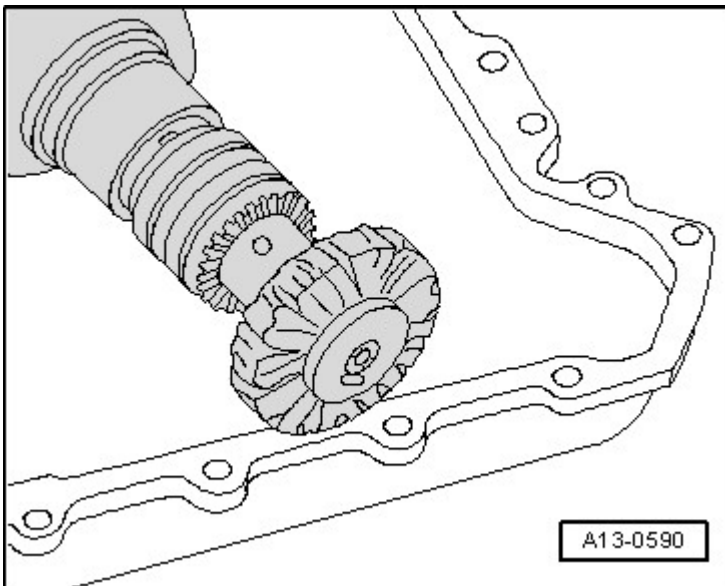
- Install attachments on scissor lift table by hand first.
- Place scissor lift platform VAS 6131 in horizontal position.

- Note bubble level (sight glass) on support platform.
- Drive scissor lift platform VAS 6131 under engine/transmission subassembly.



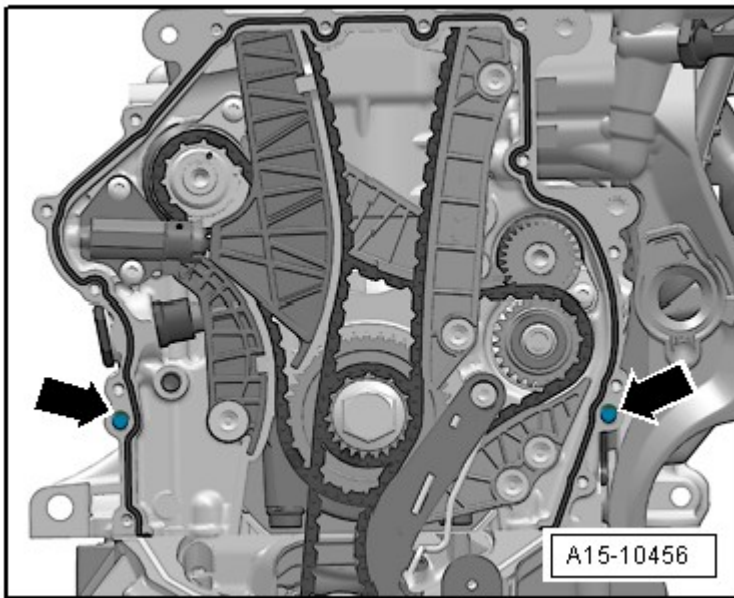
**Fig. 55: Positioning Support Elements From VAS 6131/10 At Front On Engine**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position support elements from VAS 6131/10 at front on engine as shown in illustration.
- Make sure that the threaded spindles are completely installed.



**Fig. 56: Positioning Support Elements From VAS 6131/10 At Left/Right On Subframe**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

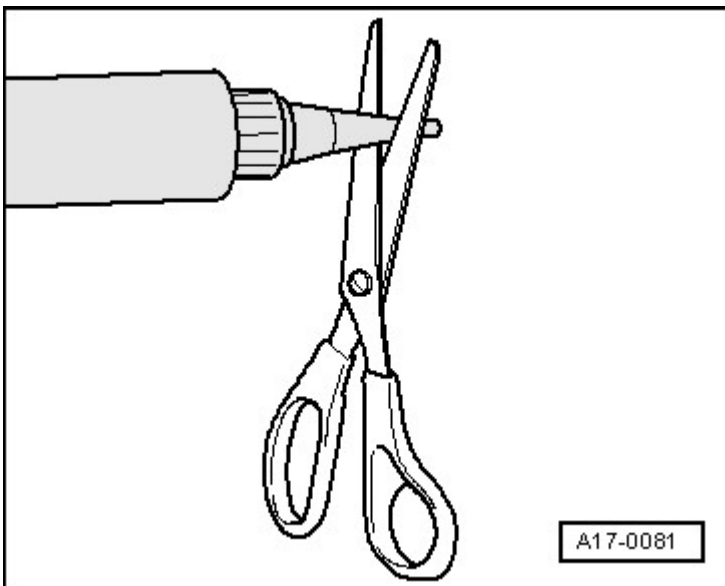
- Position support elements from VAS 6131/10 at left and right on subframe as shown in illustration.



**Fig. 57: Positioning Support Elements From VAS 6131/10 And VAS 6131/11 At Left/Right On Tunnel Cross Member**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

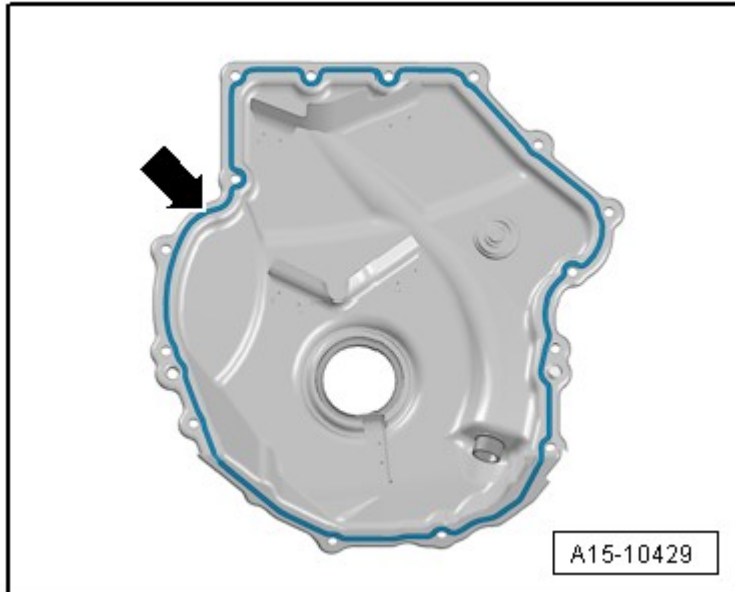
- Position support elements from VAS 6131/10 and VAS 6131/11 at left and right on tunnel cross member as shown in illustration.
- Twist all spindles of support elements upward far enough until all support pins make contact at support points.
- Tighten base plates for support elements to 20 Nm on scissor lift platform VAS 6131.



**Fig. 58: Removing Nuts At Bottom On Left/Right Engine Mounts**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

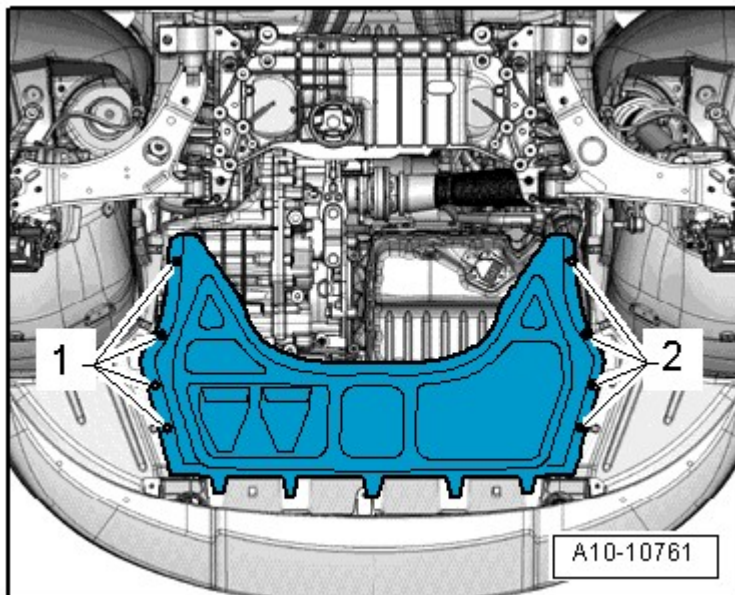
- Remove nuts - A - at bottom on left and right engine mounts.



**Fig. 59: Starter Wiring Bracket Cable Ties**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Cut through cable ties - **arrows** - , open starter harness retainer and take electrical harness out.



**Fig. 60: Removing/Installing Bolts In Diagonal Sequence And In Stages**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

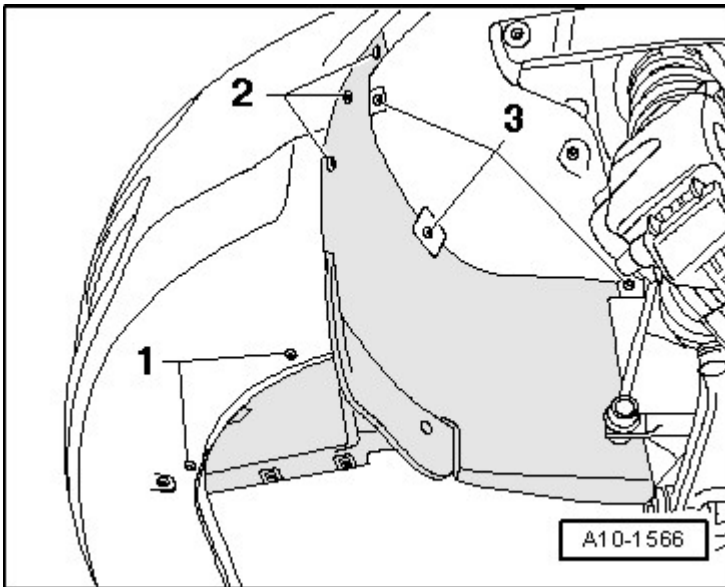
- Mark installation position of subframe and of both engine mount plates to long members using a felt-tip

marker.

- Remove bolts - **1 to 4** - in diagonal sequence and in stages.
- Remove left and right engine mount plate.

**NOTE:**

- **Verify that all hoses and lines between engine, transmission, subframe and body have been disconnected.**
- **While lowering, carefully guide engine/transmission subassembly with subframe out of engine compartment in order to prevent damage.**

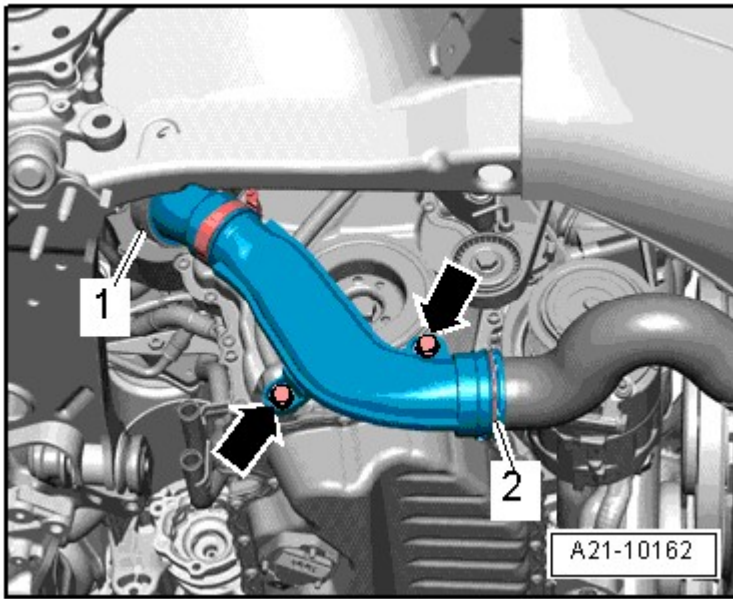


**Fig. 61: Lowering Engine/Transmission Assembly Using Scissor Lift Platform VAS 6131 Only Approx. By Dimension**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

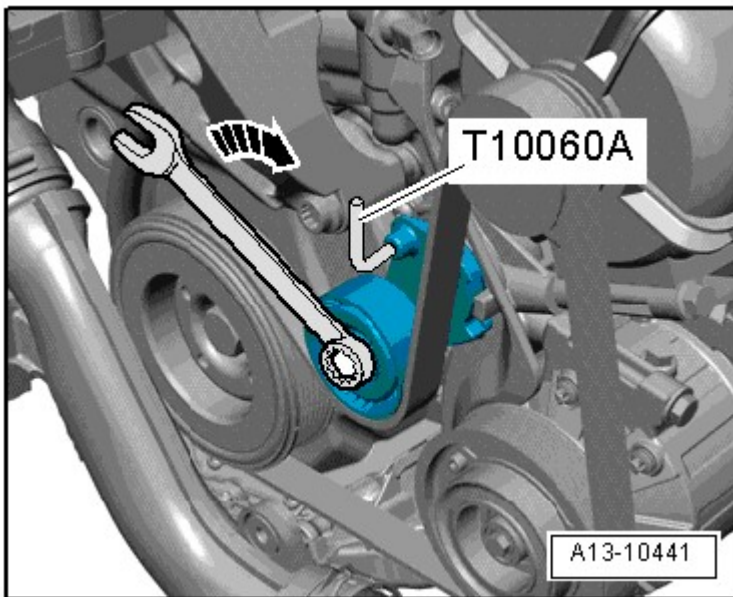
- First lower engine/transmission assembly using scissor lift platform VAS 6131 only approx. by dimension - **a** -.
- Dimension - **a** - = 80 mm.





**Fig. 62: Removing Nuts For Fastening Link And Guide Link**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts at guide link - 1 - and at link - 2 - from subframe.



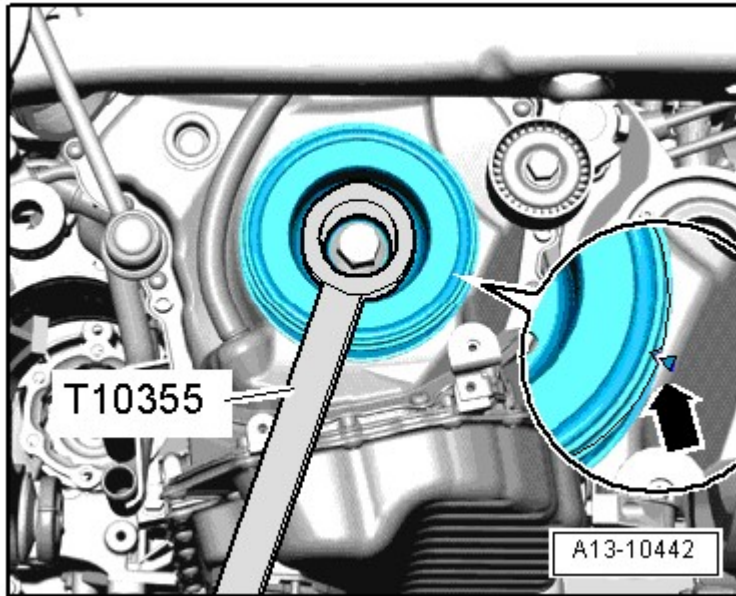
**Fig. 63: Pivoting Guide Link And Link Outward**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pivot guide link - 1 - and link - 2 - outward.

**CAUTION:** Guide link and link must not hang free. Tie up both links on wheel bearing housing - arrows - as shown in illustration.

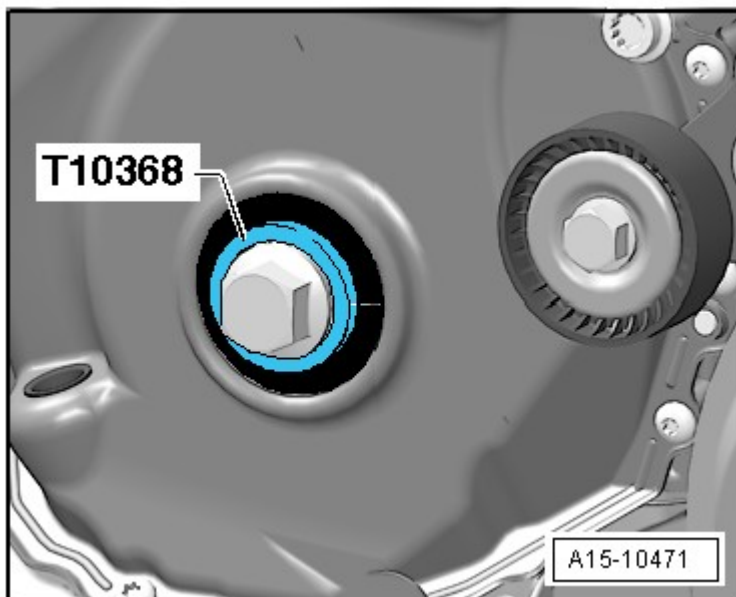


- Pivot wheel bearing housing outward and remove drive axle.
- Repeat work procedure on opposite side of the vehicle.



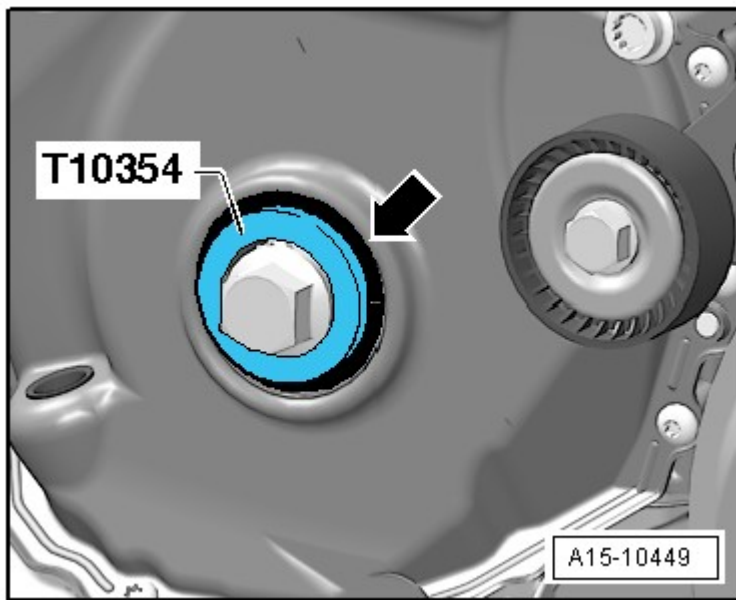
**Fig. 64: Identifying Push Rod And Connecting Rod For Selector Rod**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect connecting rod - 2 - of shift rod.
- Remove socket head bolt of pivot rod - 1 -.



**Fig. 65: Removing Nut And Lever From Selector Shaft**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nut - **arrow** - and remove lever from selector shaft.



**Fig. 66: Slave Cylinder Bracket And Fastener**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove clutch slave cylinder - **arrow** - , do not disconnect lines.
- Tie up clutch slave cylinder together with shift rods.
- Push scissor lift platform VAS 6131 approx. 20 mm back and remove torque support and torque support stop.
- Push scissor lift platform VAS 6131 back into removal position and lower scissor lift platform VAS 6131 completely.
- Push scissor lift platform VAS 6131 with engine/transmission subassembly under vehicle.

**Engine and manual transmission, separating**

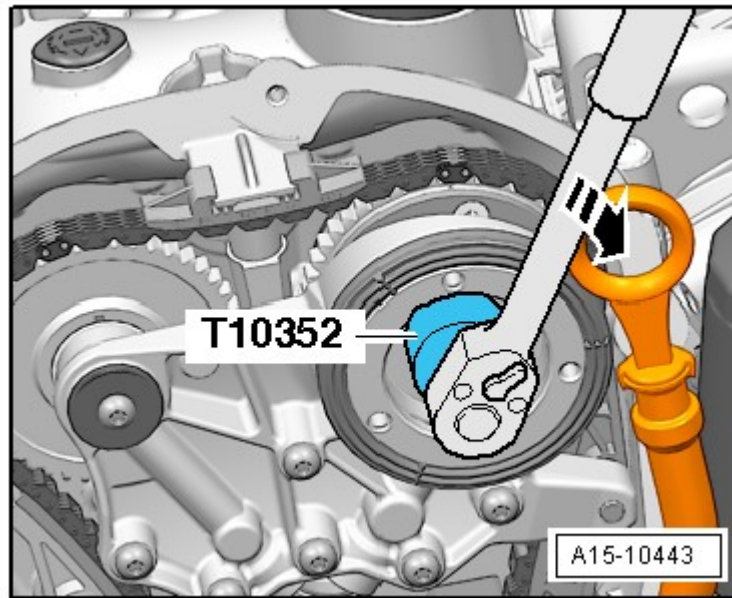
#### **Special tools, testers and auxiliary items required**

- Support set for Audi VAS 6131/10 , VAS 6131/11 and VAS 6131/12

#### **Work procedure**

##### **NOTE:**

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

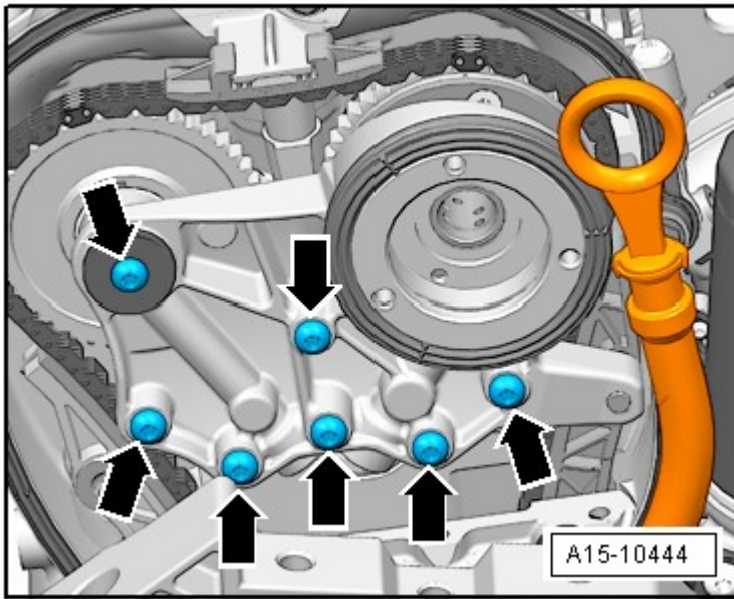


**Fig. 67: Positioning Support Elements From VAS 6131/10 At Left/Right On Subframe**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- **Engine/transmission assembly removed and placed on Scissor Lift Table VAS 6131.**
  - Twist spindles of support elements at left and right at subframe completely downward.
  - Remove support pins from spindles.
  - Remove subframe to side.
  - Remove both base plates of subframe support elements on scissor lift table VAS 6131.

**NOTE:**

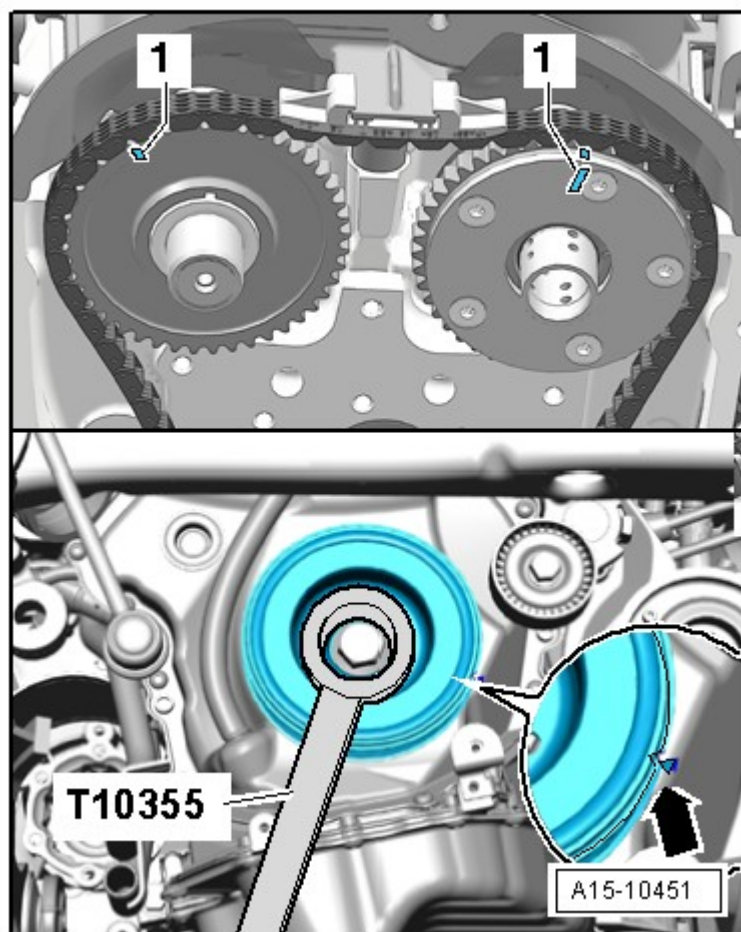
- **The support points for front of engine and tunnel cross member remain unchanged.**



**Fig. 68: Identifying Scissor Lift Platform VAS 6131**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Equip scissor lift platform VAS 6131 with support set for Audi VAS 6131/10 , VAS 6131/11 and VAS 6131/12 as follows:

| Platform coordinates                                                                                   | Parts of support set for Audi VAS 6131/10 , VAS 6131/11 and VAS 6131/12 |       |       |        |
|--------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|-------|-------|--------|
|                                                                                                        |                                                                         |       |       |        |
| B4 <sup>1)</sup>                                                                                       | /10-1                                                                   | /10-4 | /10-5 | /10-11 |
| G4 <sup>1)</sup>                                                                                       | /10-1                                                                   | /10-4 | /10-5 | /10-12 |
| B7                                                                                                     | /10-1                                                                   | /10-4 | /10-5 | /10-11 |
| G7                                                                                                     | /10-1                                                                   | /10-4 | /10-5 | /10-10 |
| C10                                                                                                    | /10-1                                                                   | /10-4 | /10-5 | /12-1  |
| F10                                                                                                    | /10-1                                                                   | /10-3 | /10-5 | /11-3  |
| C15 <sup>1)</sup>                                                                                      | /10-1                                                                   | /10-2 | /10-5 | /11-2  |
| F15 <sup>1)</sup>                                                                                      | /10-1                                                                   | /10-3 | /10-5 | /10-7  |
| <ul style="list-style-type: none"> <li><sup>1)</sup> The support elements remain unchanged.</li> </ul> |                                                                         |       |       |        |

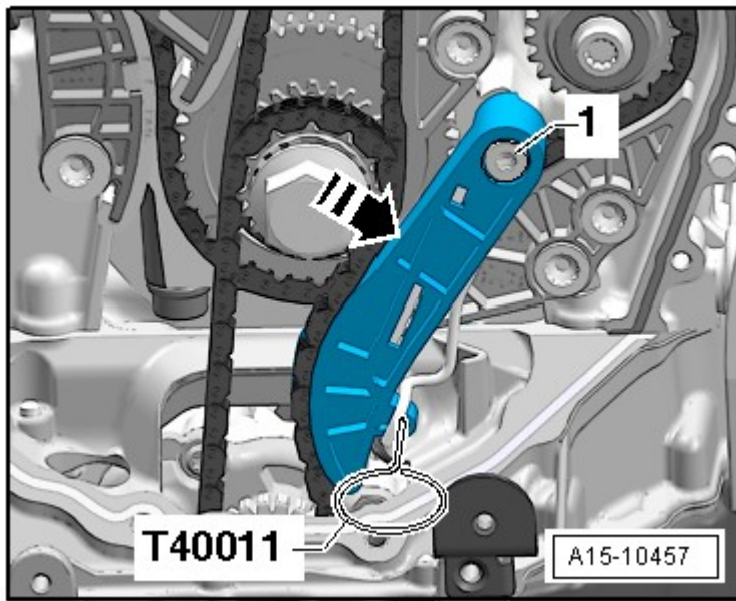


**Fig. 69: Positioning/Removing Support Elements From VAS 6131/10 And VAS 6131/12 At Left On Engine**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position support elements from VAS 6131/10 and VAS 6131/12 at left on engine as shown in illustration.

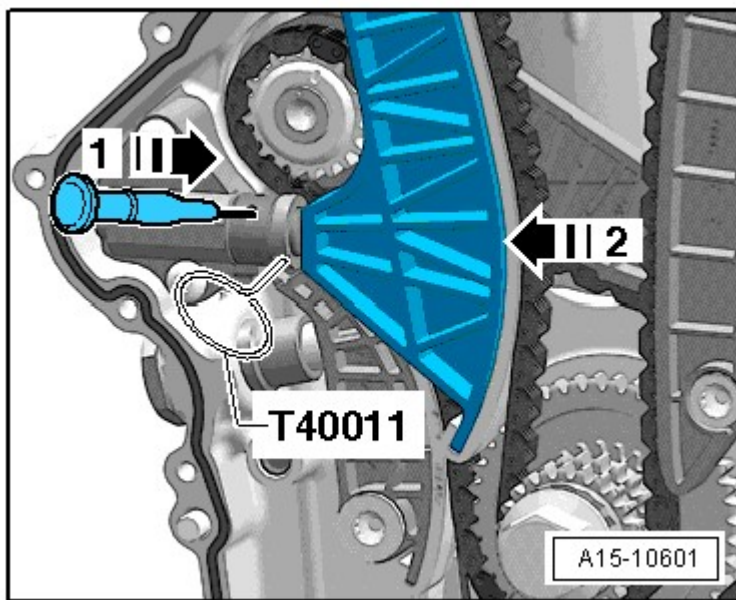




**Fig. 70: Positioning/Removing Support Elements From VAS 6131/10 And VAS 6131/11 At Right On Engine**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position support elements from VAS 6131/10 and VAS 6131/11 at right on engine as shown in illustration.
- Twist spindles of attachments upward far enough until all support pins make contact at support points.
- Tighten base plates for support elements to 20 Nm on scissor lift platform VAS 6131.



**Fig. 71: Disconnecting Electrical Harness Connector For Oxygen Sensor (O2S) 2 Behind Three Way Catalytic Converter (TWC) G131**

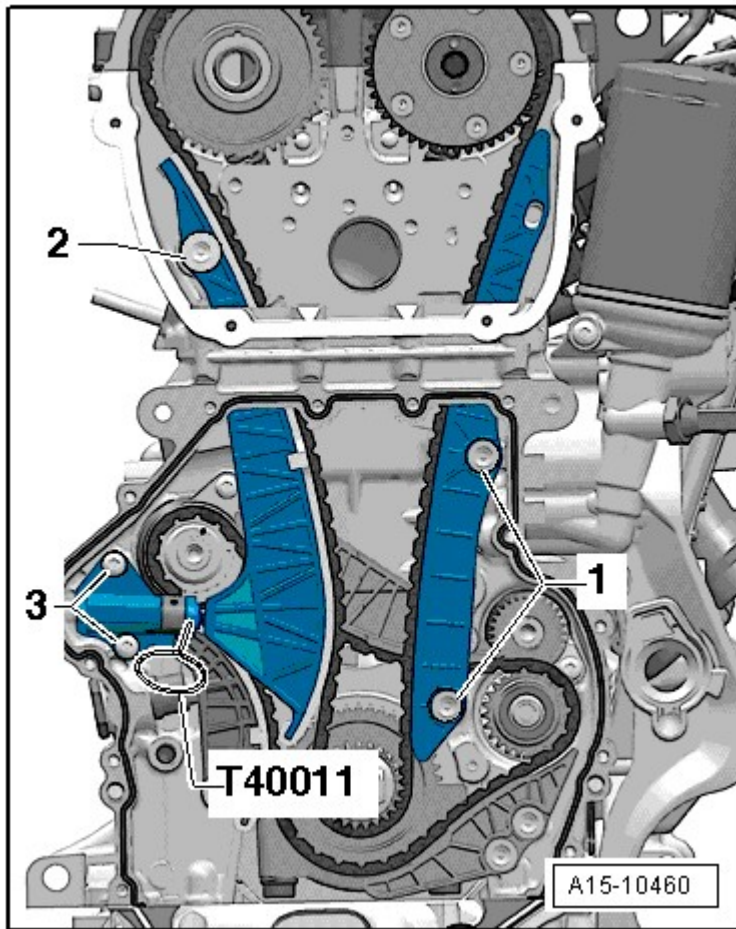
Courtesy of VOLKSWAGEN UNITED STATES, INC.



- Disconnect electrical harness connector - 1 - for Oxygen Sensor (O2S) 2 Behind Three Way Catalytic Converter (TWC) G131 and free up wire.

**NOTE:**

- In the illustration, the electrical harness connector is depicted as installed.
- Ignore - 2 -.

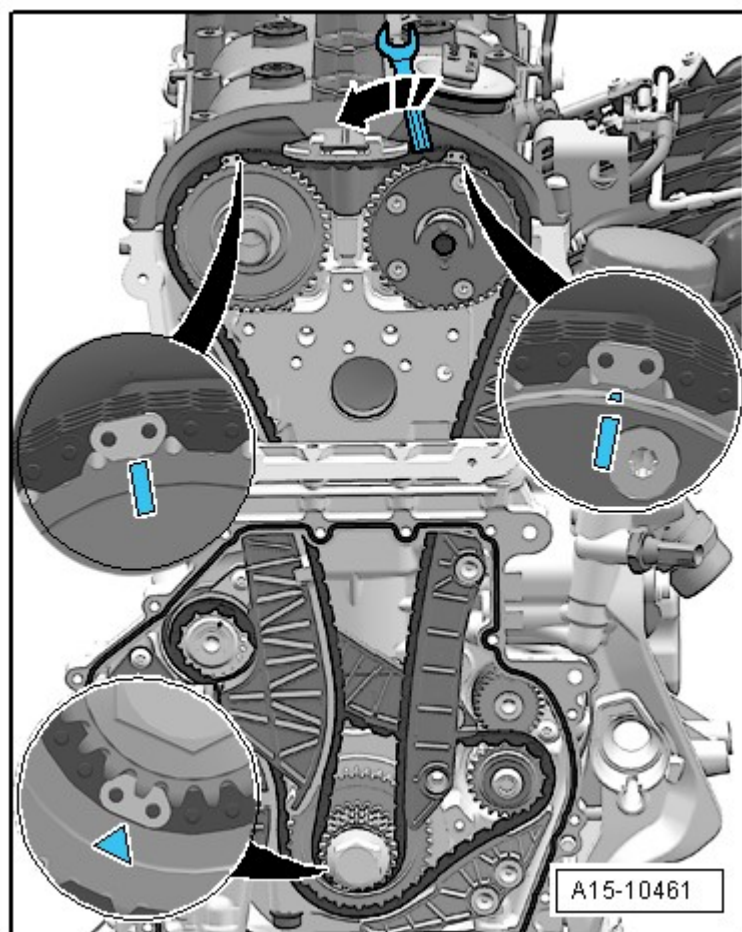


**Fig. 72: Removing Nut At Left Bracket For Front Exhaust Pipe**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nut - 2 - at left bracket for front exhaust pipe.

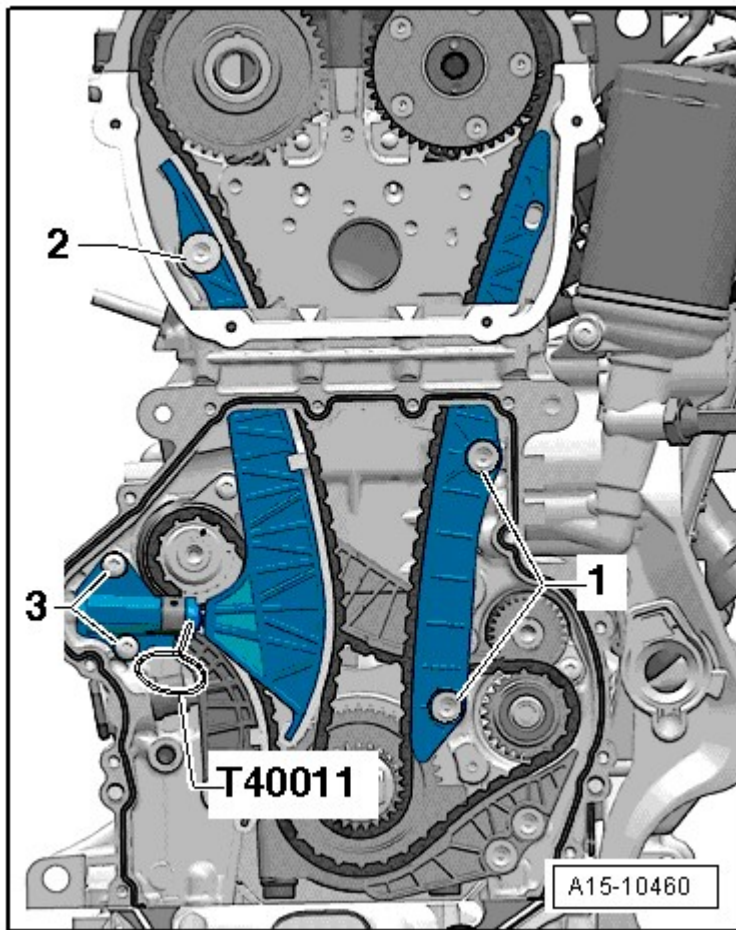
**NOTE:**

- Ignore - 1 -.



**Fig. 73: Removing Nuts & Left Front Exhaust Pipe With Catalytic Converter**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - 1 to 3 -.
- Remove left front exhaust pipe with catalytic converter.



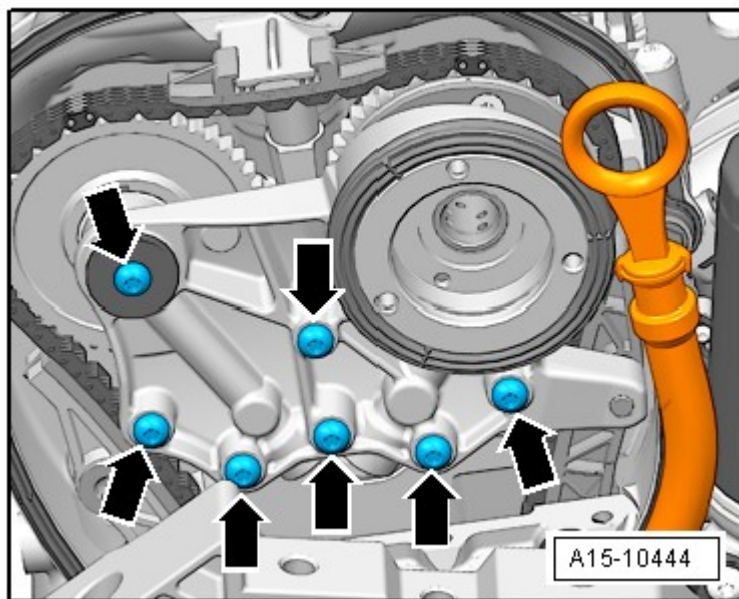
**Fig. 74: Disconnecting Electrical Harness Connector For Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - 2 - for Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130 and free up wire.

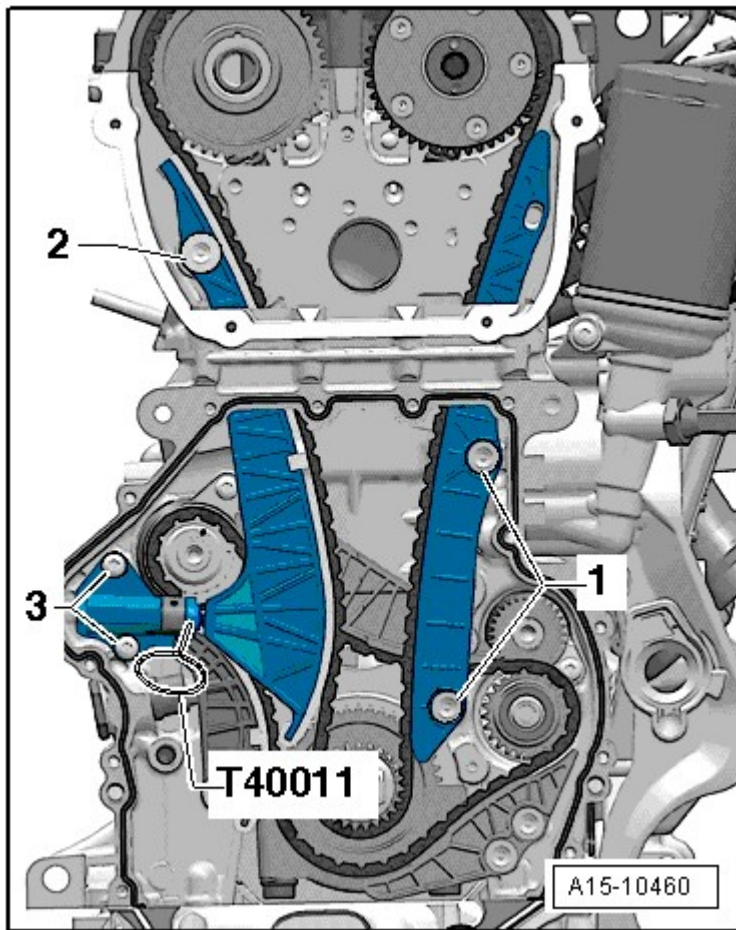
**NOTE:**

- In the illustration, the electrical harness connector is depicted as installed.
- Ignore - 1 -.



**Fig. 75: Disconnecting Electrical Harness Connector For Back-Up Light Switch F4**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - **arrow** - for Back-Up Light Switch F4 and free up electrical wire.



**Fig. 76: Disconnecting Electrical Harness Connector For Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130**

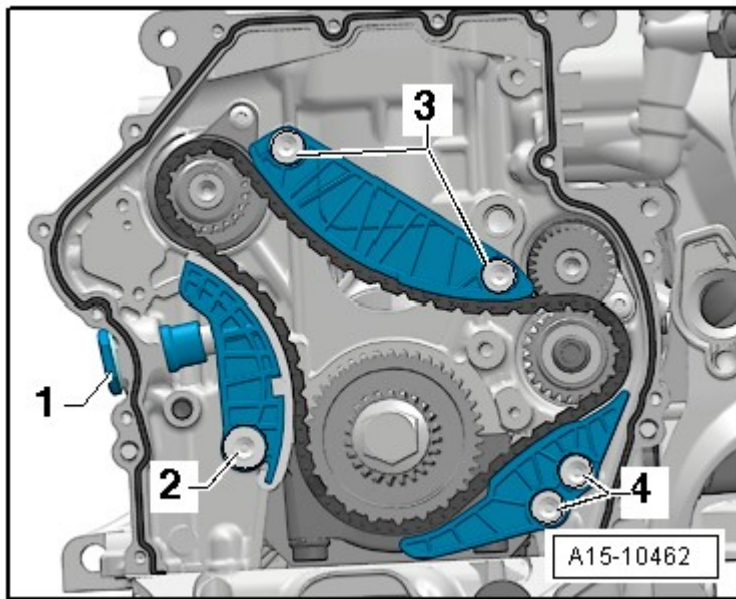
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - 2 - for Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130 and free up wire.

**NOTE:**

- In the illustration, the electrical harness connector is depicted as installed.
- Ignore - 1 -.



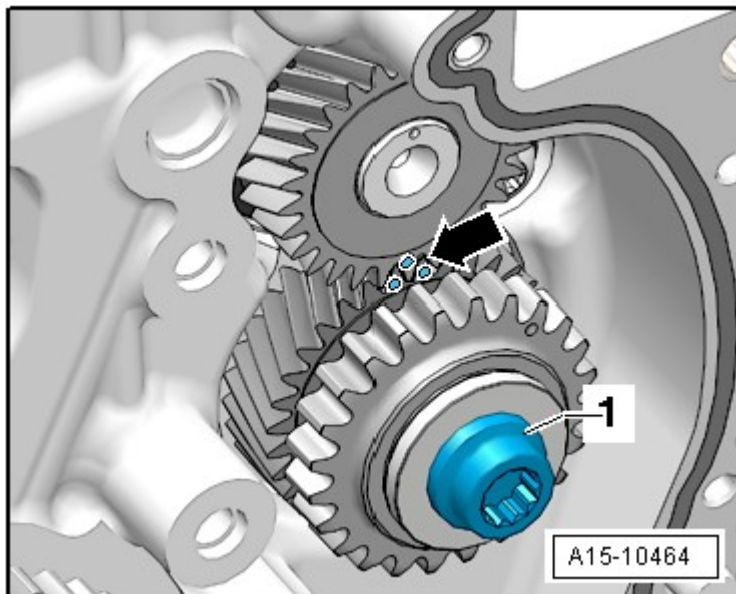


**Fig. 77: Removing Nut At Right Bracket For Front Exhaust Pipe**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nut - 2 - at right bracket for front exhaust pipe.

**NOTE:**

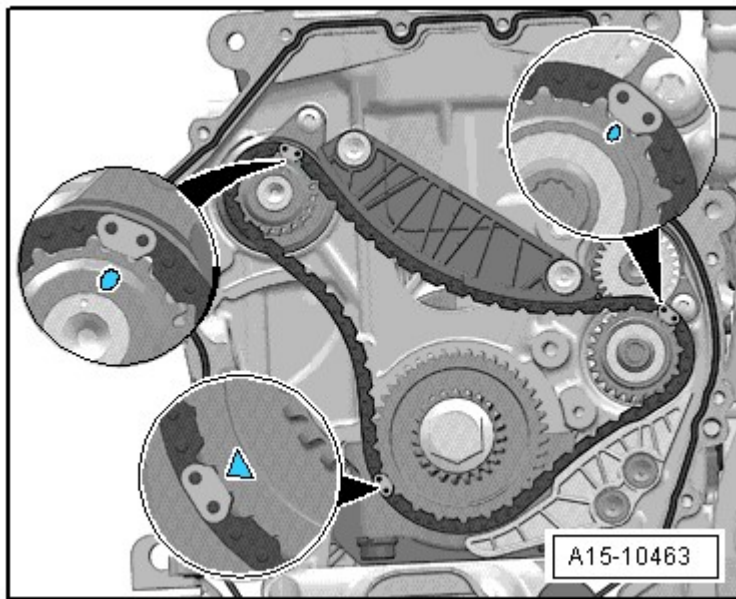
- Ignore - 1 -.



**Fig. 78: Removing Nuts & Right Front Exhaust Pipe With Catalytic Converter**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

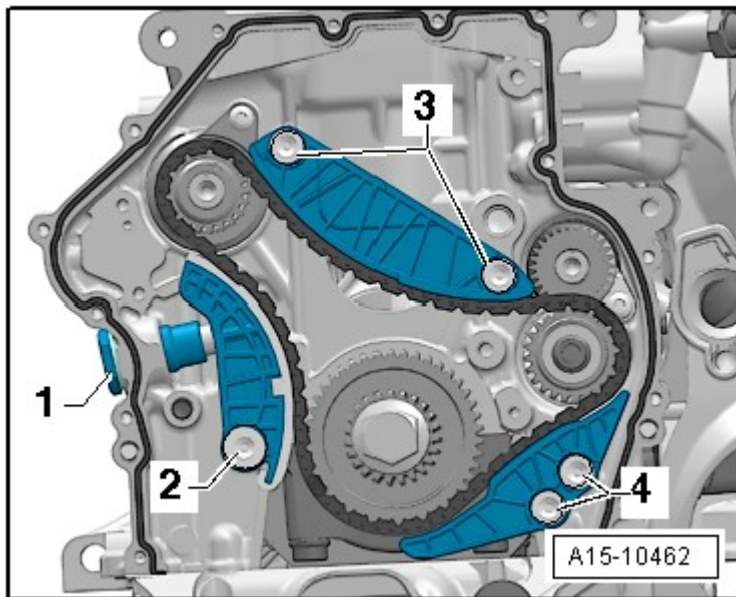
- Remove nuts - 1 to 3 -.
- Remove right front exhaust pipe with catalytic converter.





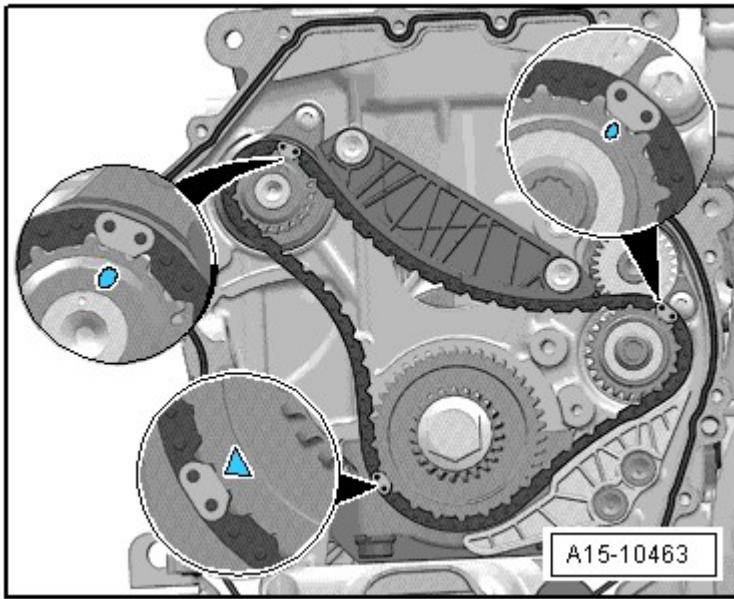
**Fig. 79: Disconnecting Electrical Connector On Engine Speed (RPM) Sensor G28**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **arrow** - on Engine Speed (RPM) Sensor G28.



**Fig. 80: Identifying Engine/Transmission Threaded Connections**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove engine/transmission threaded connections - **1 to 10** -.

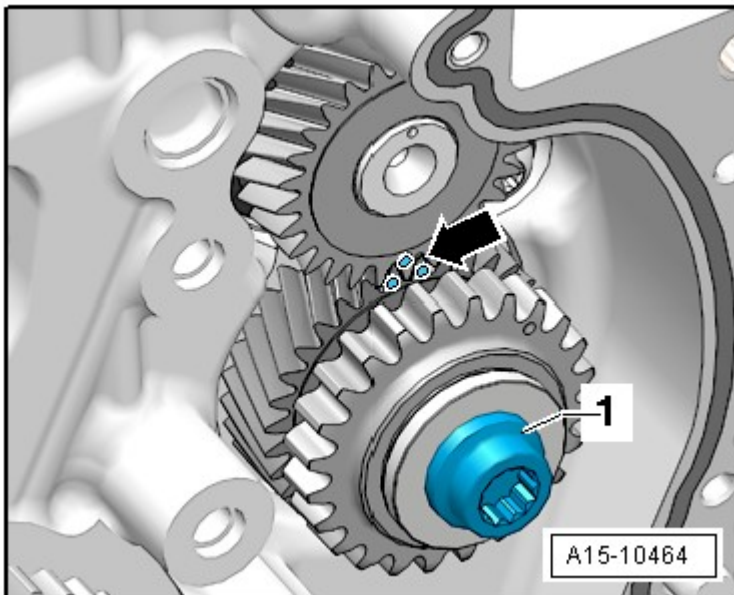


**Fig. 81: Loosening Clamping Bolts On Side Of Scissor Lift Table VAS 6131 And Pull Rear Table Section With Transmission Rearward**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen clamping bolts - **1** - on side of scissor lift table VAS 6131 and pull rear table section with transmission rearward - **arrow** -.

Engine, securing to assembly stand



**Fig. 82: Identifying Special Tools - Engine, Securing To Assembly Stand**

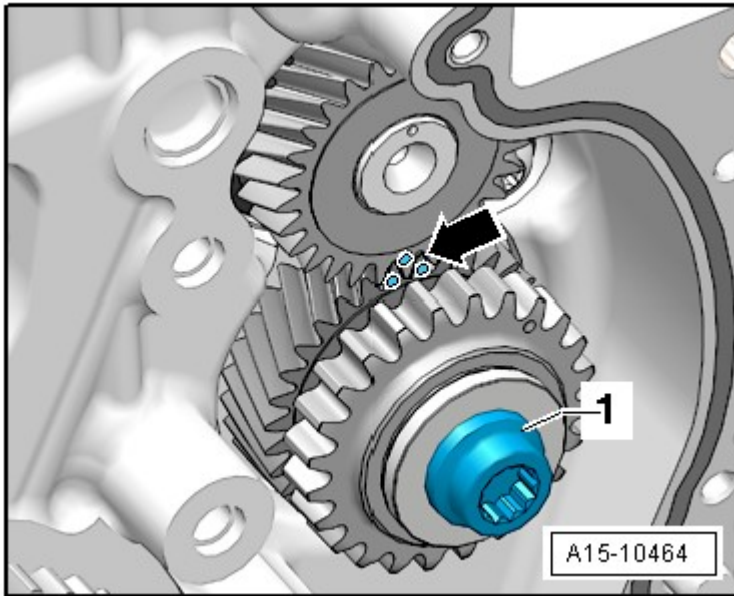
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

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

**Work procedure**

- Engine separated from transmission.



**Fig. 83: Hooking Engine Sling 2024 A Onto Engine And Onto Workshop Crane VAS 6100 With Lift Arm Extension For Workshop Crane VAS 6101**

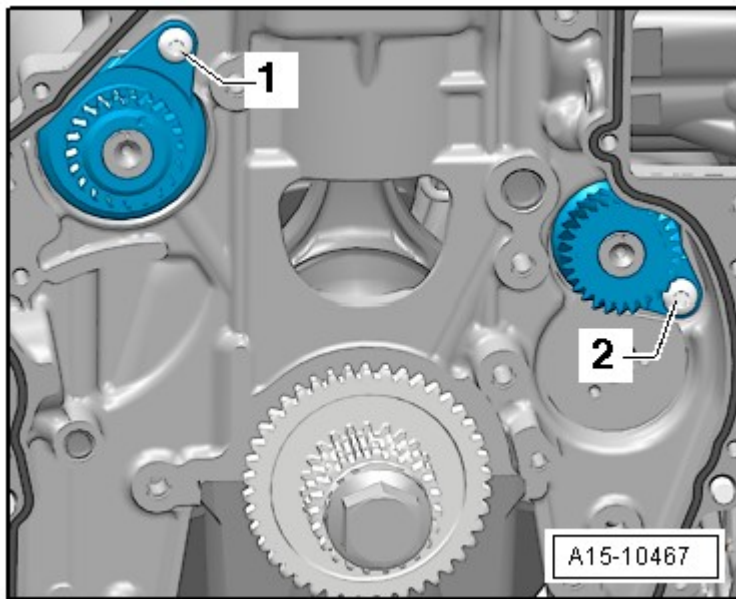
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hook engine sling 2024 A onto engine and onto workshop crane VAS 6100 with lift arm extension for workshop crane VAS 6101 as shown in the illustration.

**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.

**CAUTION:** Lifting hooks and alignment pins on the engine sling must be secured with securing pins - arrows -.

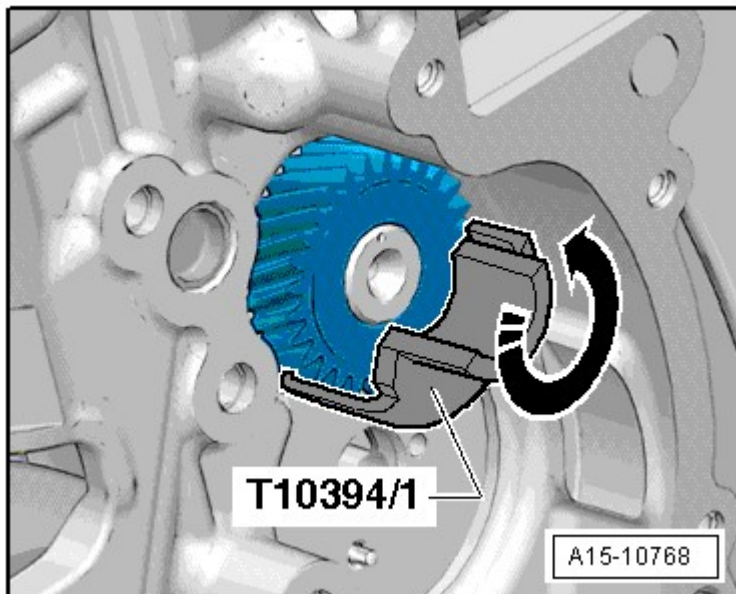


**Fig. 84: Removing Bolts And Left/Right Engine Support**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and remove left and right engine support.

**NOTE:**

- Ignore - 1 -.



**Fig. 85: Securing Engine On Engine And Transmission Holder VAS 6095 With Bracket For V6 FSI Engine VAS 6095/1-5**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure engine on Engine and Transmission Holder VAS 6095 with bracket for V6 FSI engine VAS

6095/1-5 as shown in illustration.

#### Engine, installing

**NOTE:**

- During assembly, replace self-locking nuts and bolts.
  - Always replace bolts that are tightened to torque as well as sealing rings, gaskets and O-rings.
  - Secure all hose connections using hose clamps appropriate for the model type .
  - During installation, all cable ties must be re-installed at the same location.
- When installing a new clutch disc in combination with a used SAC clutch pressure plate (self-adjusting pressure plate), the adjustment ring of the pressure plate must be turned back to stop. Otherwise pressure plate works with decreased contact pressure (clutch slips) -->
- **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
  - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
  - **30 CLUTCH** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
  - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE
  - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
  - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE

**NOTE:**

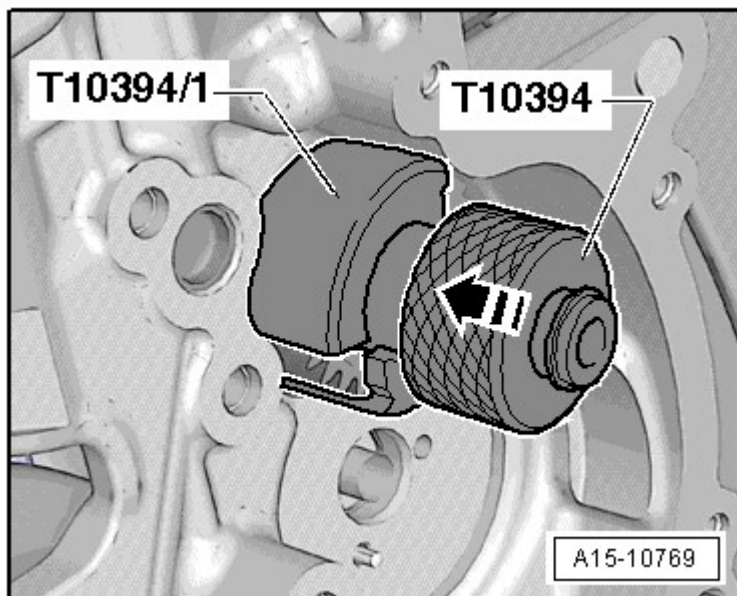
- If clutch disc is not being replaced, the adjustment ring must not be turned back.
  - New SAC-pressure plates are already pre-adjusted and must not be reset.
- Clean input shaft splines and (in case of used clutch plates) clean hub splines, remove corrosion and apply only a very thin coating of *lubricant G 000 100* on splines. Do not grease guide sleeve.
- If necessary, check centering of clutch drive plate.
- Check clutch release bearing for wear and replace if necessary.
- Check clutch release bearing for wear and loose plastic ring -->
- **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
  - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
  - **30 CLUTCH** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
  - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE
  - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
  - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE
- Make sure centering sleeves for engine to transmission are installed in cylinder block. Install if necessary.
- Install intermediate plate between engine and transmission onto alignment bushings.



- Bolt transmission to engine.

**NOTE:**

- Torque specifications only apply to lightly greased, oiled, phosphated or blackened nuts and bolts.
- Additional lubricants, such as engine or transmission oil are permissible, although lubricants containing graphite are not.
- Do not use any degreased parts.
- Tolerance for torque specifications  $\pm 15\%$ .



**Fig. 86: Identifying Engine/Transmission Threaded Connections**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

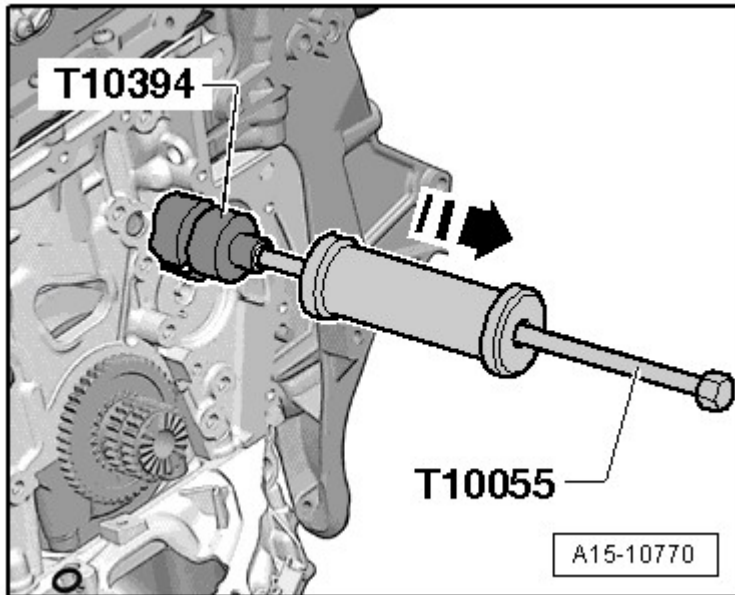
Engine/transmission, fastening

| Item                             | Bolt                            | Nm               |
|----------------------------------|---------------------------------|------------------|
| 1                                | M12x140                         | 65               |
| 2                                | M12x155                         | 65               |
| 3, 5                             | M12x110                         | 65               |
| 4                                | M12x115                         | 65               |
| 6                                | M12x125                         | 65               |
| 7                                | M10x160                         | 65 <sup>1)</sup> |
| 8, 9, 10                         | M10x80                          | 45               |
| A                                | Alignment sleeves for centering |                  |
| ● <sup>1)</sup> Bolt class 10.9. |                                 |                  |

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



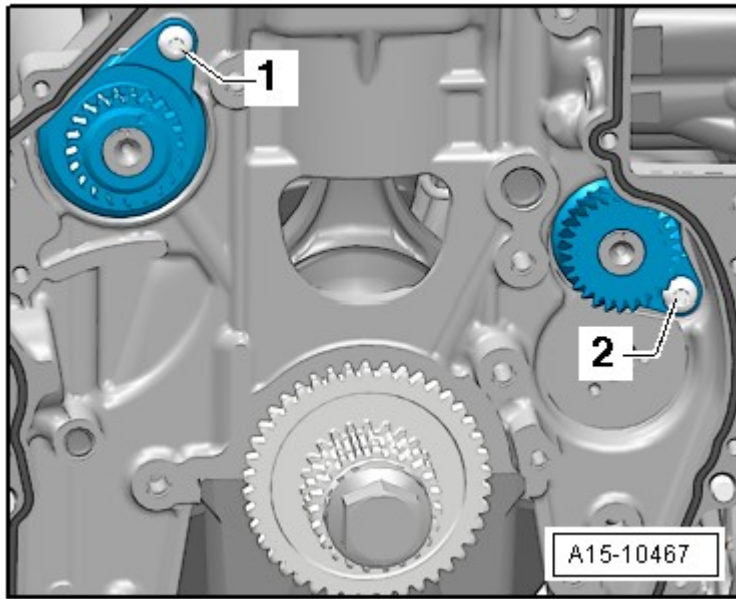
- Install front exhaust pipes: Left --> **Left front exhaust pipe with catalytic converter (vehicles with manual transmission), removing and installing** ; right --> **Right front exhaust pipe with catalytic converter (vehicles with manual transmission), removing and installing**.
- Always clean threaded drive shaft bores in transmission flanged shaft of locking fluid residue using a tap before installation.



**Fig. 87: Positioning/Removing Support Elements From VAS 6131/10 And VAS 6131/12 At Left On Engine**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Rotate attachment spindles at left of engine/transmission assembly downward.
- Remove both base plates for left support element on scissor lift platform VAS 6131.



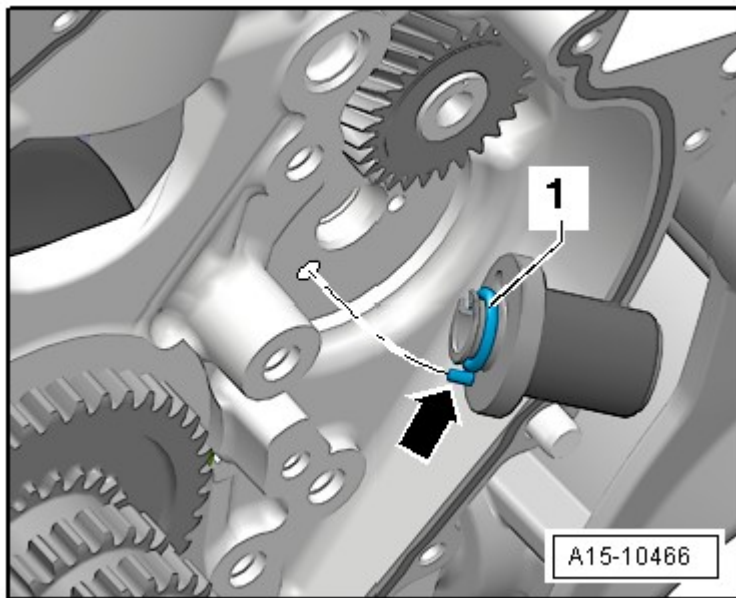
**Fig. 88: Positioning/Removing Support Elements From VAS 6131/10 And VAS 6131/11 At Right On Engine**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Rotate attachment spindles at right of engine/transmission assembly downward.
- Remove both base plates for right support element on Scissor Lift Table VAS 6131.

**NOTE:**

- The support points for front of engine and tunnel cross member remain unchanged.



**Fig. 89: Identifying Scissor Lift Platform VAS 6131**

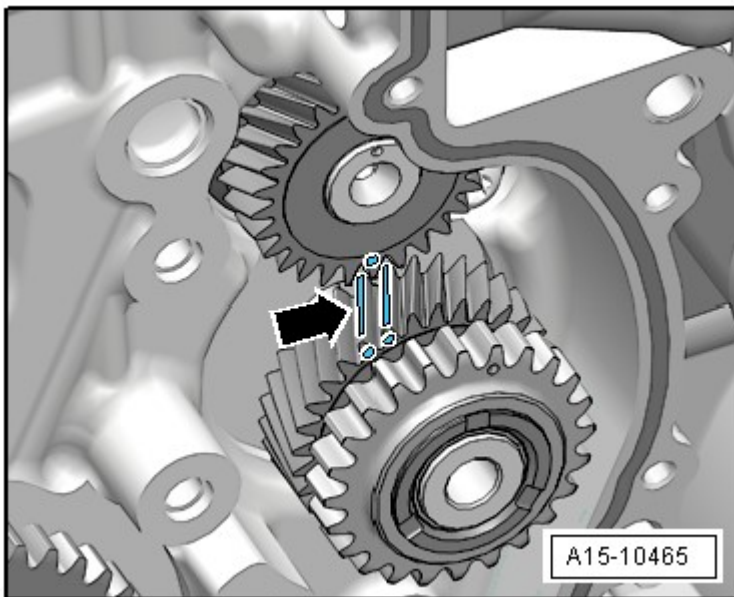
Courtesy of VOLKSWAGEN UNITED STATES, INC.

## 2007 Audi A6

ENGINE 3.2 V6 4V Engine Mechanical, Engine Code(s): BKH

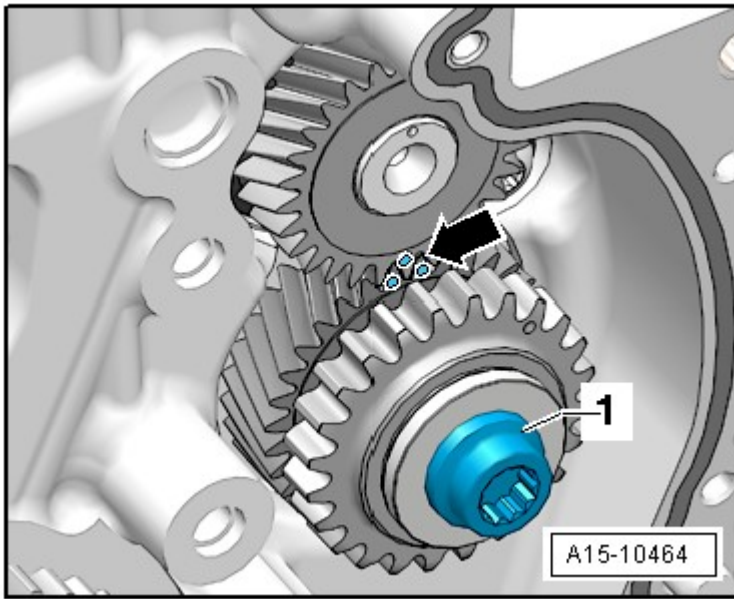
- Equip scissor lift platform VAS 6131 with support set for Audi VAS 6131/10 and VAS 6131/11 as follows:

| Platform coordinates                                                                                                                                                                | Parts of support set for Audi VAS 6131/10 and VAS 6131/11 |       |       |                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|-------|-------|---------------------|
| B4 <sup>1)</sup>                                                                                                                                                                    | /10-1                                                     | /10-4 | /10-5 | /10-11              |
| G4 <sup>1)</sup>                                                                                                                                                                    | /10-1                                                     | /10-4 | /10-5 | /10-12              |
| B10                                                                                                                                                                                 | /10-1                                                     | /10-2 | /10-5 | /10-8 <sup>2)</sup> |
| G10                                                                                                                                                                                 | /10-1                                                     | /10-2 | /10-5 | /10-8 <sup>2)</sup> |
| C15 <sup>1)</sup>                                                                                                                                                                   | /10-1                                                     | /10-2 | /10-5 | /11-2               |
| F15 <sup>1)</sup>                                                                                                                                                                   | /10-1                                                     | /10-3 | /10-5 | /10-7               |
| <ul style="list-style-type: none"><li><sup>1)</sup> The support elements remain unchanged.</li><li><sup>2)</sup> Only install support elements after installing subframe.</li></ul> |                                                           |       |       |                     |



**Fig. 90: Positioning Support Elements From VAS 6131/10 At Left/Right On Subframe**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

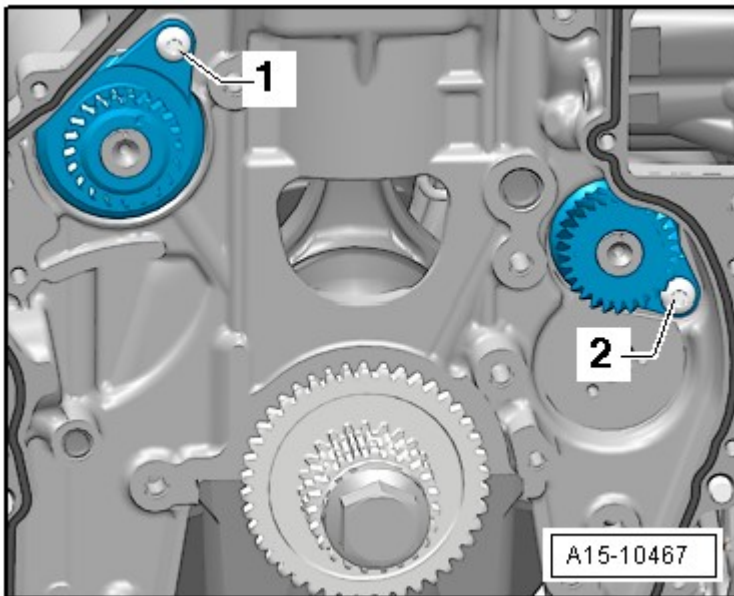
- Position subframe on both Attachments VAS 6131/10-8.
- Twist spindles of support elements upward on both sides.
- Tighten base plates for support elements to 20 Nm on scissor lift platform VAS 6131.



**Fig. 91: Lowering Engine/Transmission Assembly Using Scissor Lift Platform VAS 6131 Only Approx. By Dimension**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

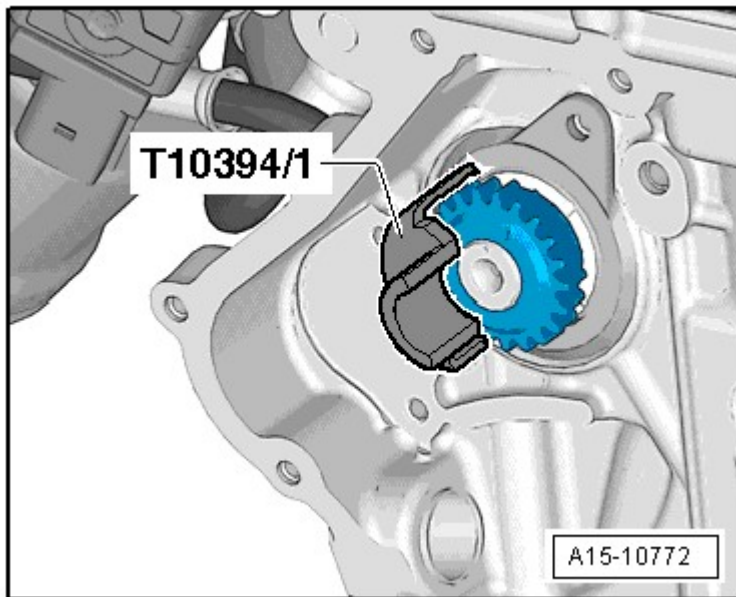
- Carefully guide engine/transmission assembly from below into body using Scissor Lift Table VAS 6131 far enough so distance between subframe and body is dimension - **a** -.
- Dimension - **a** - = 80 mm.
- Place torque support with torque support stop between lock carrier and engine.



**Fig. 92: Slave Cylinder Bracket And Fastener**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

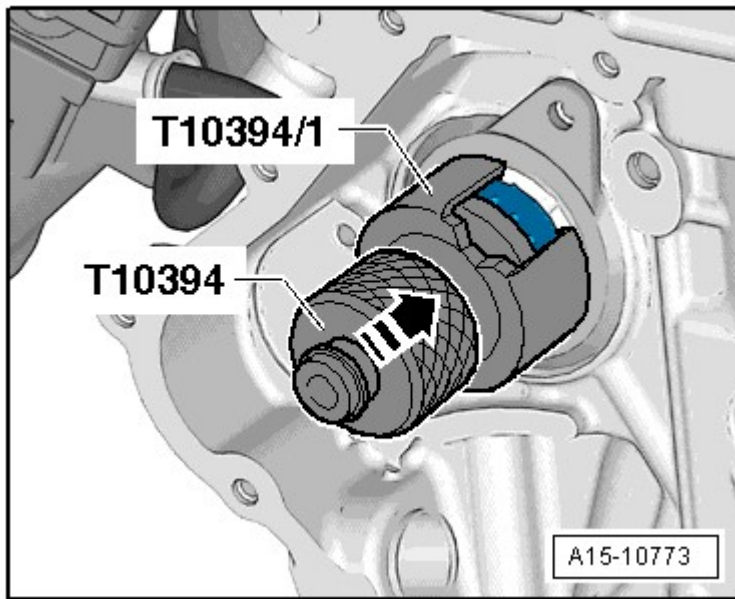
- Tighten clutch slave cylinder with new bolt - **arrow** - , procedure -->
  - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
  - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
  - **30 CLUTCH** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
  - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE
  - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
  - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE



**Fig. 93: Removing/Installing Nut And Lever From Selector Shaft**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

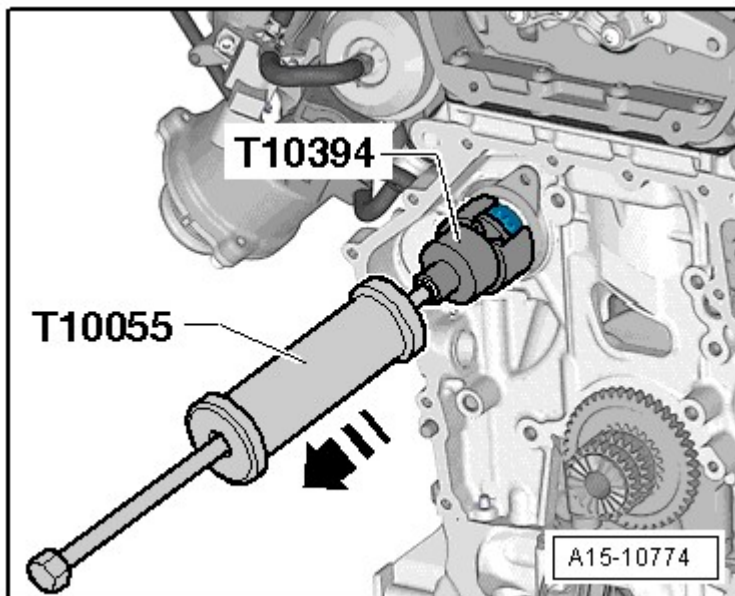
- Install lever for selector shaft - **arrow** -.





**Fig. 94: Identifying Push Rod And Connecting Rod For Selector Rod**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install connecting rod - 2 - of shift rod.
- Install socket head bolt of pivot rod - 1 -.



**Fig. 95: Removing Nuts For Fastening Link And Guide Link**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

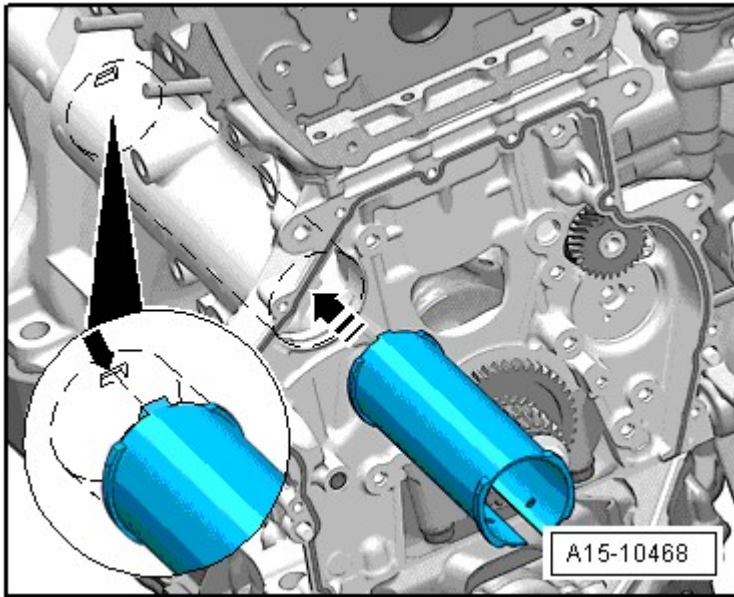
- Loosely bolt guide link - 1 - and link - 2 - to subframe.

**NOTE:**

- Bolts must first be tightened once the vehicle is sitting on its wheels on



the floor.



**Fig. 96: Removing/Installing Bolts In Diagonal Sequence And In Stages**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Align subframe, engine bearing plates and tunnel cross member according to markings applied on long members during removal.
- Tighten bolts for subframe, engine mount plates as well as tunnel cross member only to specified torque. Do not tighten further (tighten bolts only after axle alignment).

1. 65 Nm
2. 110 Nm
3. 110 Nm
4. 75 Nm

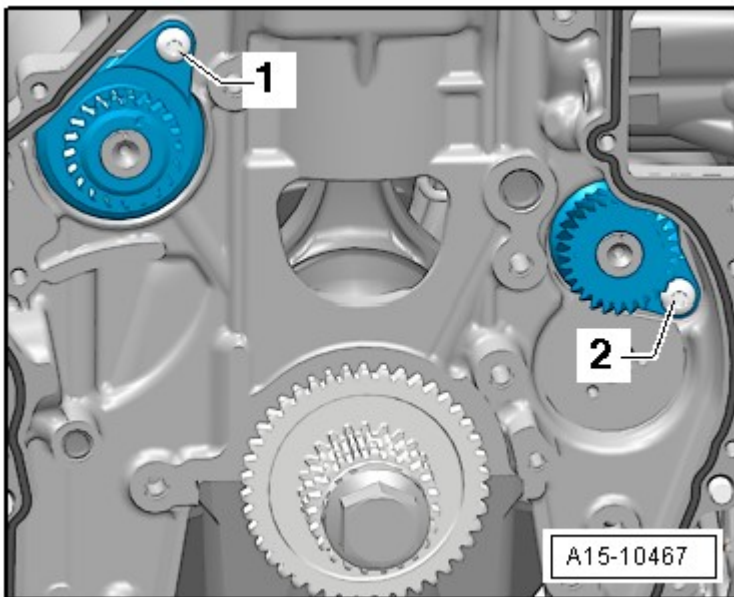
**CAUTION: Vehicle must not be driven in this condition.**

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

- Vehicles with all wheel drive: Install drive shaft -->
  - **39 - FINAL DRIVE, DIFFERENTIAL** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING
  - **39 FINAL DRIVE, DIFFERENTIAL** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
  - **39 FINAL DRIVE, DIFFERENTIAL** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE

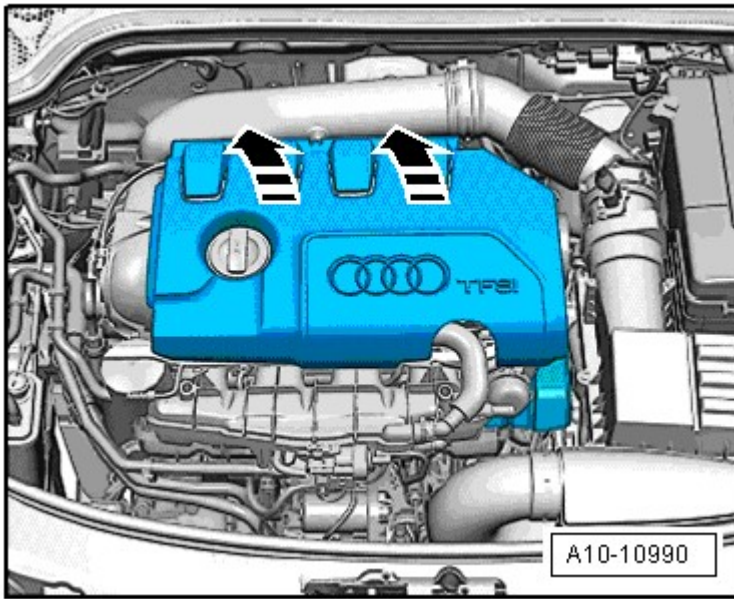
- **39F - FRONT FINAL DRIVE, DIFFERENTIAL** for 6 SPD. MANUAL TRANSMISSION 0A3 ALL WHEEL DRIVE, INTERNAL COMPONENT SERVICING
- **39 FINAL DRIVE, DIFFERENTIAL** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE

- Align exhaust system free of tension --> **Exhaust system, installing free of tension.**
- Install refrigerant lines --> **87 AIR CONDITIONING** .
- Install drive shafts --> **40 - FRONT SUSPENSION** .
- Install guide link, stabilizer bar and suspension strut --> **40 - FRONT SUSPENSION** .



**Fig. 97: Removing/Installing Bolts For Torque Support**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten bolts - **arrows** - for torque support.



**Fig. 98: Removing/Installing Bolts At Torque Support Stop**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place torque support on rubber buffer for torque support and tighten bolts - **arrows** -.
- Electrical connections and routing --> Electrical Wiring Diagrams, Troubleshooting and Component Locations.
- Observe safety precautions after connecting battery --> **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL** .

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

- Mount wiper arms and adjust --> **92 WINDSHIELD WIPER WASHER SYSTEM** .
- Check oil level --> **Oil level, checking.**
- Bleed fuel system --> **24 - FUEL INJECTION SYSTEM** .
- Fill with coolant --> **Cooling system, draining and filling.**

**NOTE:**

- Only reuse drained coolant if cylinder head or engine block was not replaced.
- Dirty coolant must not be re-used.

- Fill power-steering system oil and bleed steering system --> **48 - STEERING** .
- Align subframe and both engine mount plates --> **40 - FRONT SUSPENSION** .
- Perform axle alignment --> **44 - WHEELS, TIRES, VEHICLE ALIGNMENT** .

**CAUTION:** After axle alignment, tighten subframe bolts to final torque.

## 2007 Audi A6

ENGINE 3.2 V6 4V Engine Mechanical, Engine Code(s): BKH

- Fill refrigerant circuit Refrigerant R134a - Servicing.

### Torque specifications

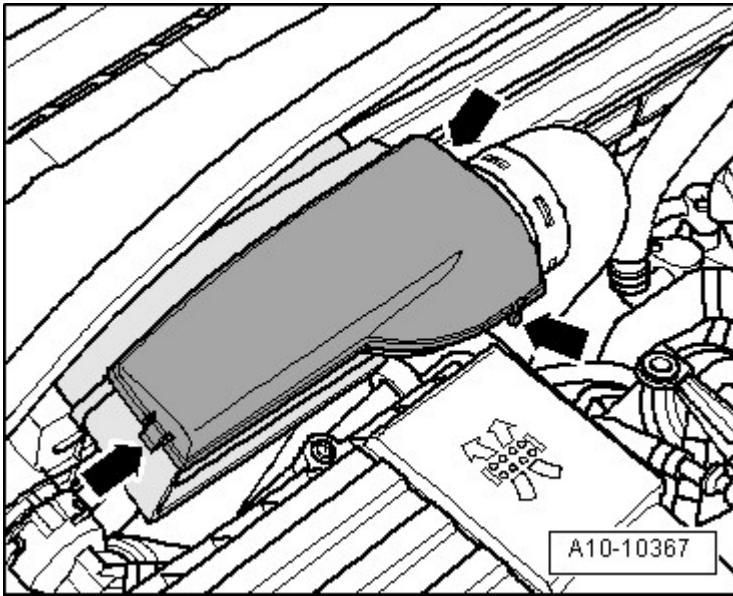
**NOTE:**

- Torque specifications only apply to lightly greased, oiled, phosphated or blackened nuts and bolts.
- Additional lubricants, such as engine or transmission oil are permissible, although lubricants containing graphite are not.
- Do not use any degreased parts.
- Tolerance for torque specifications  $\pm 15\%$ .

| Component                                      |     | Nm |
|------------------------------------------------|-----|----|
| Bolts/nuts                                     | M6  | 9  |
|                                                | M8  | 20 |
|                                                | M10 | 40 |
|                                                | M12 | 65 |
| Exceptions:                                    |     |    |
| Engine support to cylinder block               |     | 40 |
| Transmission mount to subframe                 |     | 23 |
| Engine mount plate to longitudinal member      |     | 75 |
| Engine mount to engine mount plate             |     | 23 |
| Heat shield for drive axle to transmission     |     | 23 |
| Torque bracket to engine                       |     | 40 |
| Torque support stop to lock carrier            |     | 28 |
| Hydraulic pressure line to power steering pump |     | 47 |
| Fuel hose to fuel line                         |     | 22 |
| Hose clamps 9 mm wide                          |     | 3  |

### ENGINE (VEHICLES WITH AUTOMATIC TRANSMISSION 09L), REMOVING AND INSTALLING

#### Engine, removing

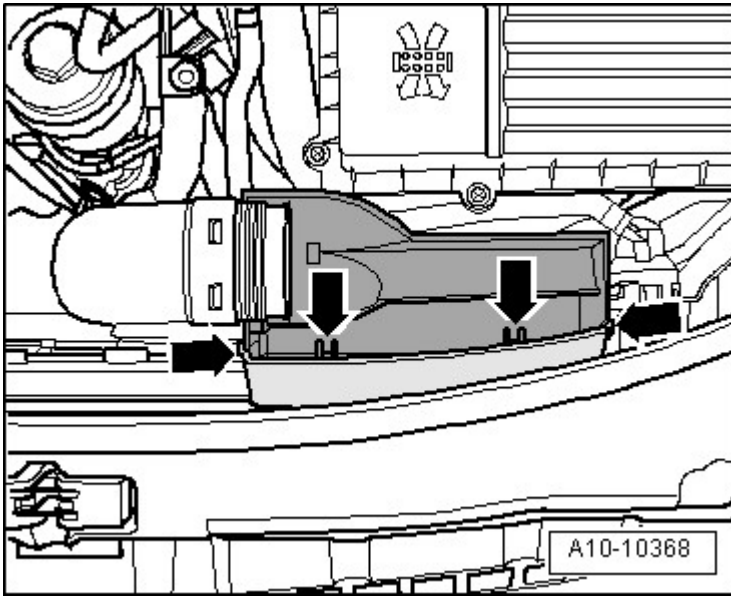


**Fig. 99: Identifying Special Tools - Engine, Removing**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

#### **Special tools, testers and auxiliary items required**

- Pry lever 80-200
- Hose Clamps Up to 25 mm dia. 3094
- Drip tray for workshop crane VAS 6208 or V.A.G 1306
- Hose clamp pliers V.A.G 1921
- Step ladder VAS 5085
- Scissor lift table VAS 6131 with support set VAS 6131/10 and adapters VAS 6131/10-12

#### **Special tools, testers and auxiliary items required**



**Fig. 100: Identifying Old Oil Collecting And Extracting Device V.A.G 1782**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Old oil collecting and extracting device V.A.G 1782

**NOTE:**

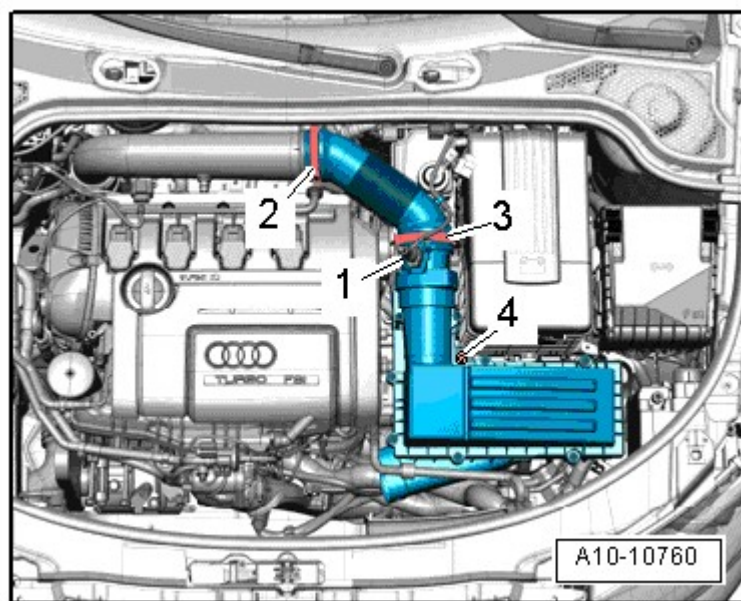
- If engine and transmission are to be separated after removal, the Supplementary Set Audi A8 (D3) VAS 6131/11 and VAS 6131/12 will also be required.

**Work procedure****NOTE:**

- With lock carrier installed, engine is removed downward with transmission and subframe.
  - All cable ties which are opened or cut open when removing engine, must be replaced in the same position when installing engine.
  - Drained coolant must be stored in a clean container for disposal or reuse.
- Shift selector lever to position "N".
  - Discharge refrigerant circuit Refrigerant R134a - Servicing.

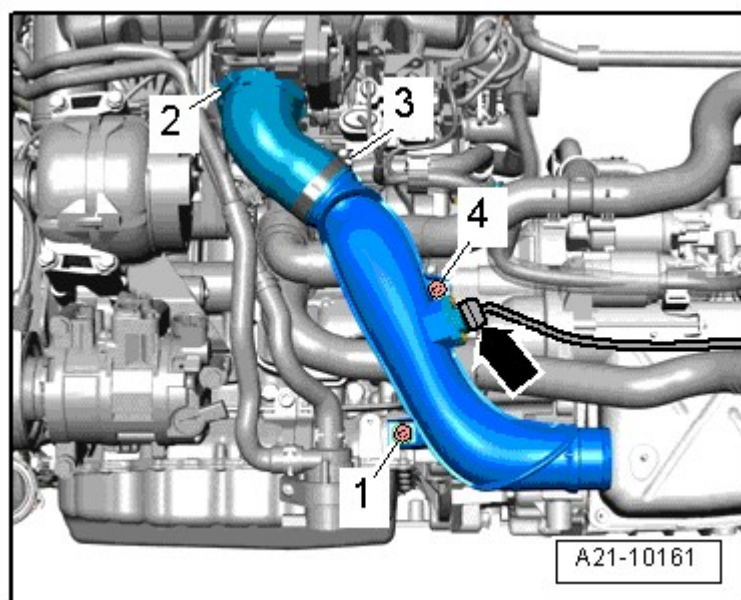
**CAUTION: Observe safety precautions when disconnecting the battery --> 27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL .**





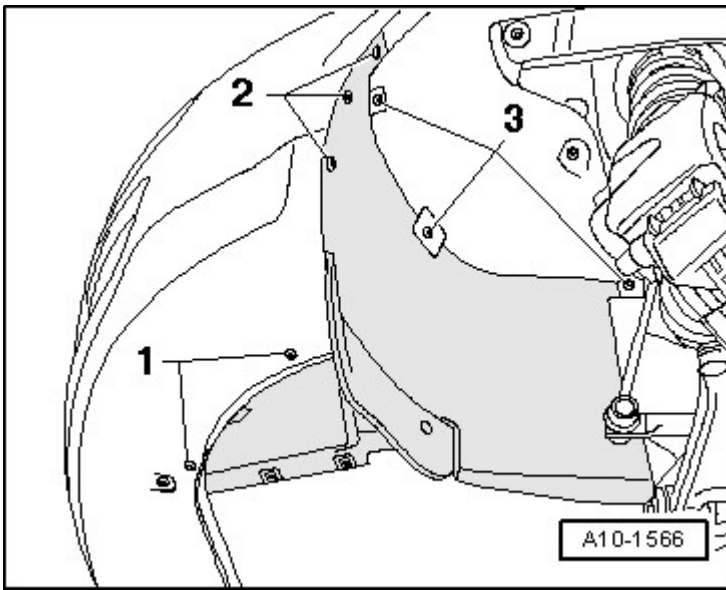
**Fig. 101: Disconnecting Battery Ground (GND) Strap**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- With ignition switched off, disconnect Battery Ground (GND) strap - **arrow** -.



**Fig. 102: Removing Rear Engine Cover**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove rear engine cover - **arrows** -.



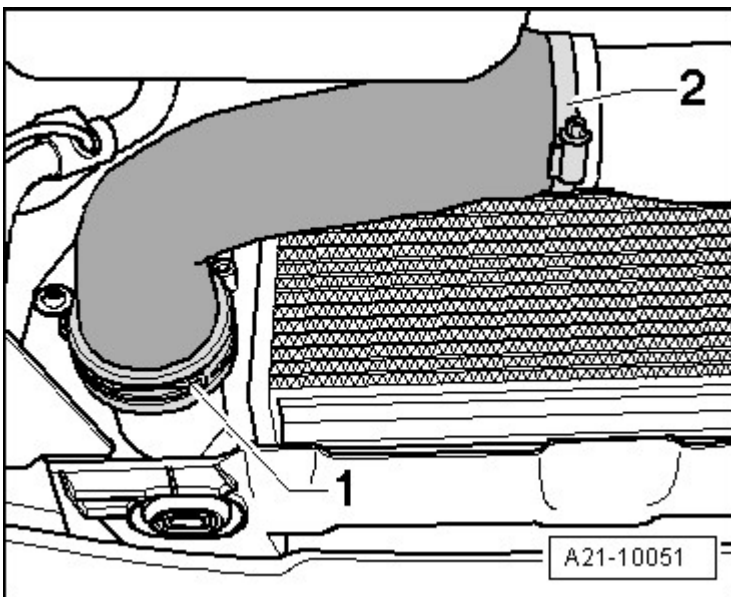
**Fig. 103: Identifying Front Engine Cover**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front engine cover - **arrows** -.

**CAUTION:** Cover cap of expansion tank with rag and open carefully, as hot steam i.e. hot coolant may escape when opening.

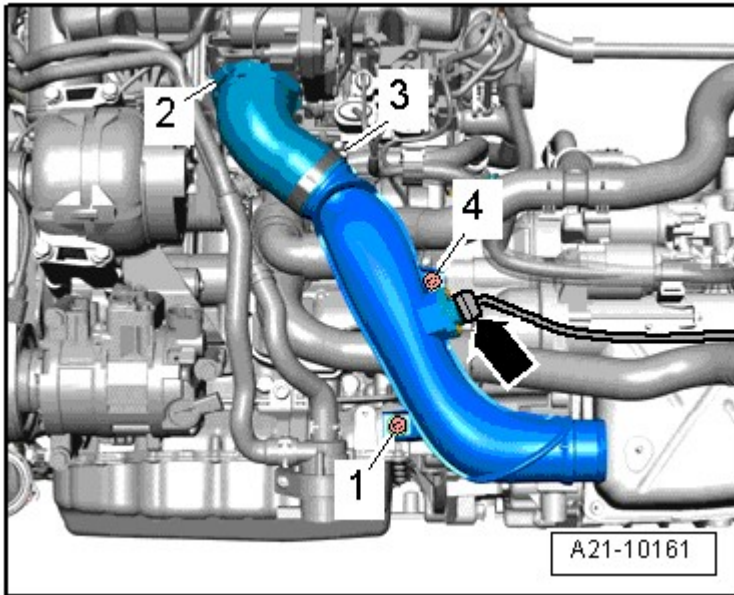
- Open cap of coolant expansion tank.
- Remove both front wheels.



**Fig. 104: Locating Fasteners Exhaust Pipe**

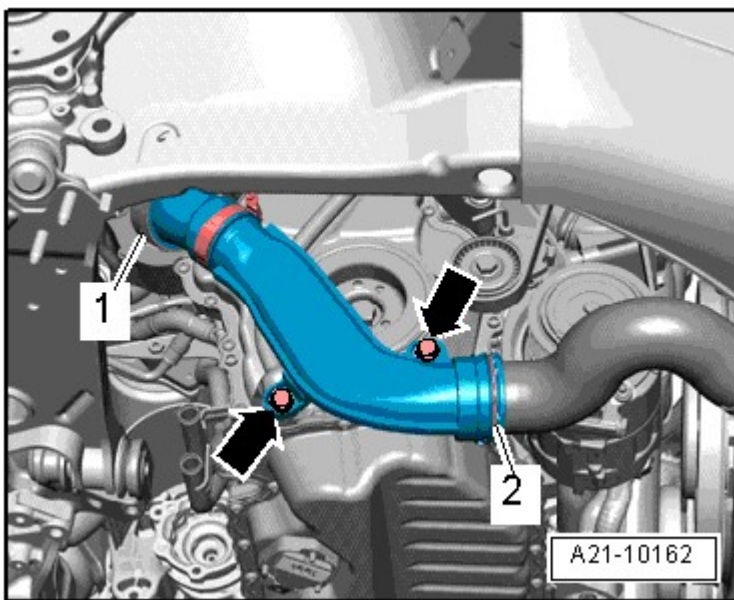
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- For vehicles with auxiliary heater, remove bolts - **arrows** - for exhaust pipe of parking heater/auxiliary heater on noise insulation.



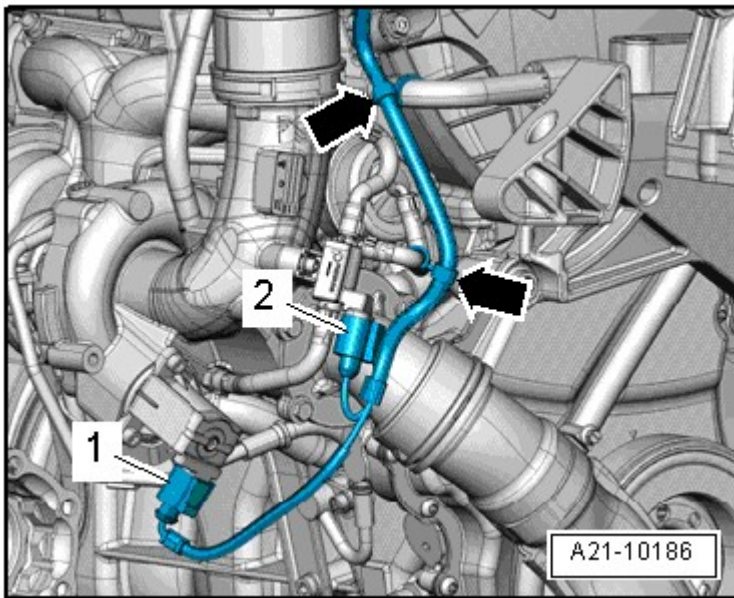
**Fig. 105: Identifying Quick-Release Fasteners And Noise Insulation**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen quick-release fasteners - **1 through 3** - and remove front and rear noise insulation.
- Place drip tray for workshop crane VAS 6208 under engine.



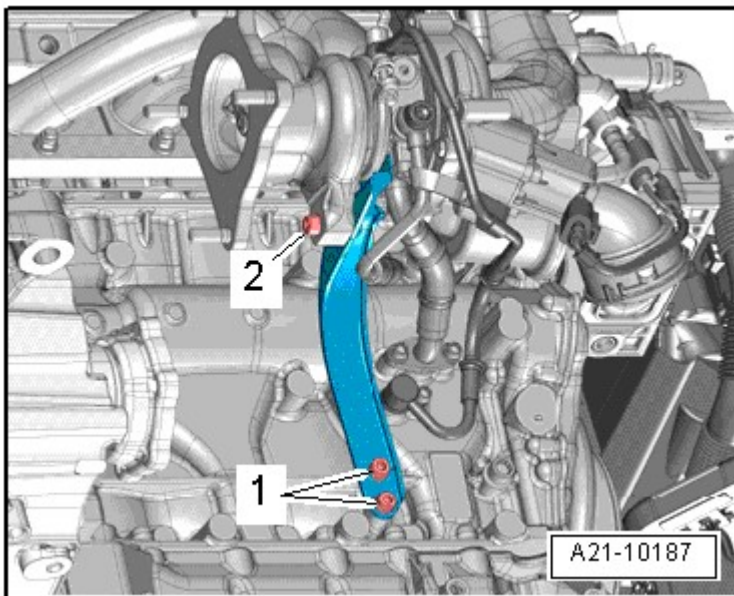
**Fig. 106: Disconnecting Coolant Hose From Oil Cooler**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect coolant hose - **arrow** - from oil cooler and drain coolant.



**Fig. 107: Disconnecting Lower Right Coolant Hose From Radiator**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

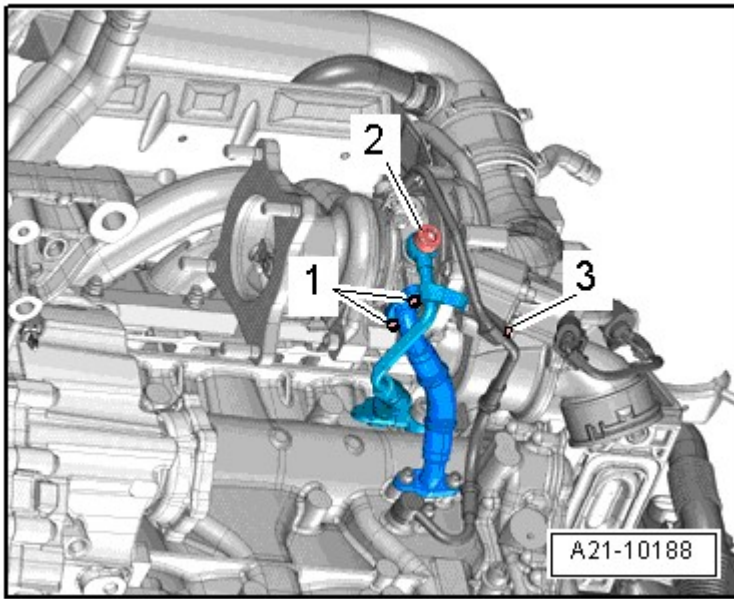
- Disconnect lower right coolant hose from radiator - **arrow** - and drain residual coolant.



**Fig. 108: Removing/Installing Bolts At Torque Support Stop**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - at torque support stop.



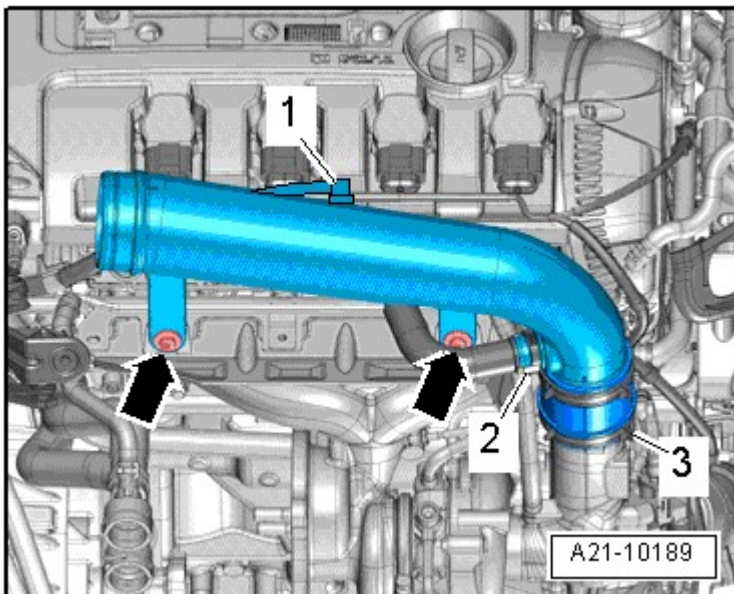


**Fig. 109: Removing/Installing Bolts For Torque Support**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - for torque support.

**NOTE:**

- The torque support and torque support stop will later be removed.



**Fig. 110: Removing Union Nuts And Disconnect ATF Lines**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

**NOTE:**

- Observe the rules of cleanliness for working on automatic transmissions --

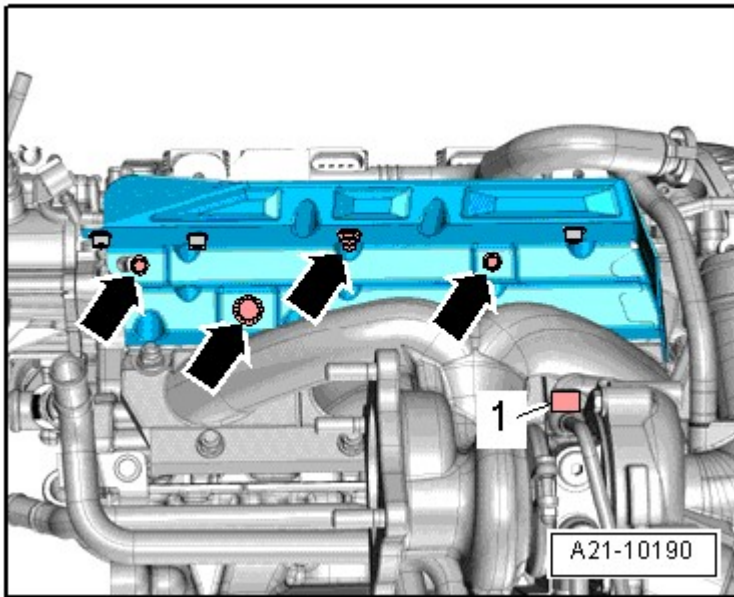
>

- **00 - GENERAL, TECHNICAL DATA for 5 SPD. AUTOMATIC TRANSMISSION 01V**
- **00 - GENERAL, TECHNICAL DATA for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING**
- **00 TECHNICAL DATA for AUTOMATIC TRANSMISSION 09L, FOUR-WHEEL DRIVE**

- Place old oil collecting and extracting device V.A.G 1782 under engine.
- Loosen union nuts - 3 - and disconnect ATF lines.

**NOTE:**

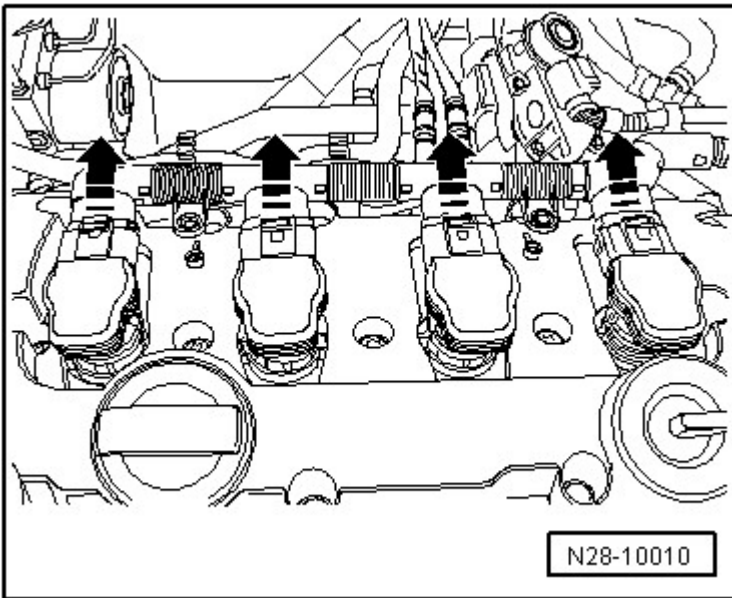
- Ignore - 1 - and - 2 -.



**Fig. 111: Removing Ground (GND) Strap From Right Longitudinal Member**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

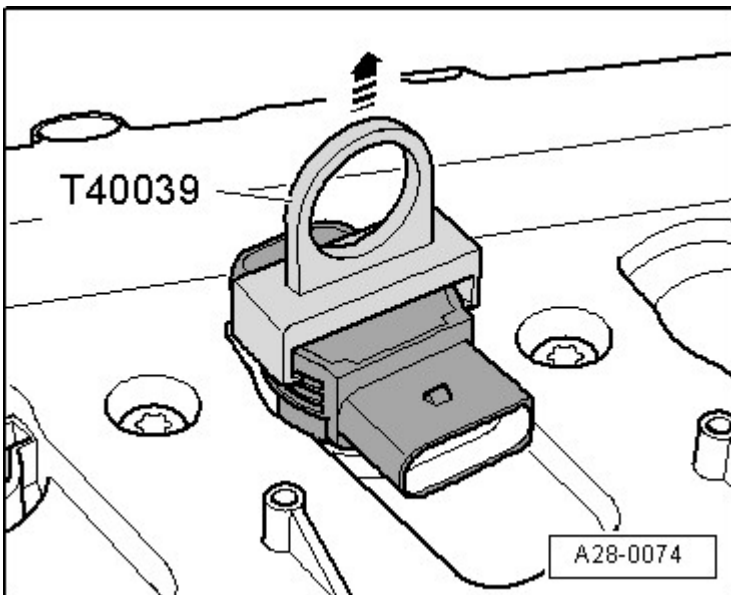
- Remove Ground (GND) strap - **arrow** - from right longitudinal member.





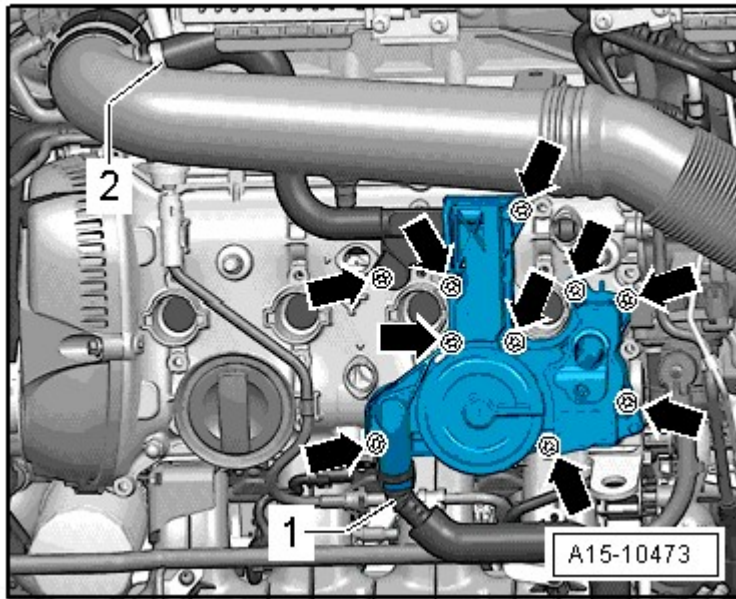
**Fig. 112: Disconnecting Brake Booster Vacuum Hose From Grommet On Bulkhead**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect brake booster vacuum hose from grommet - **arrow** - on bulkhead.



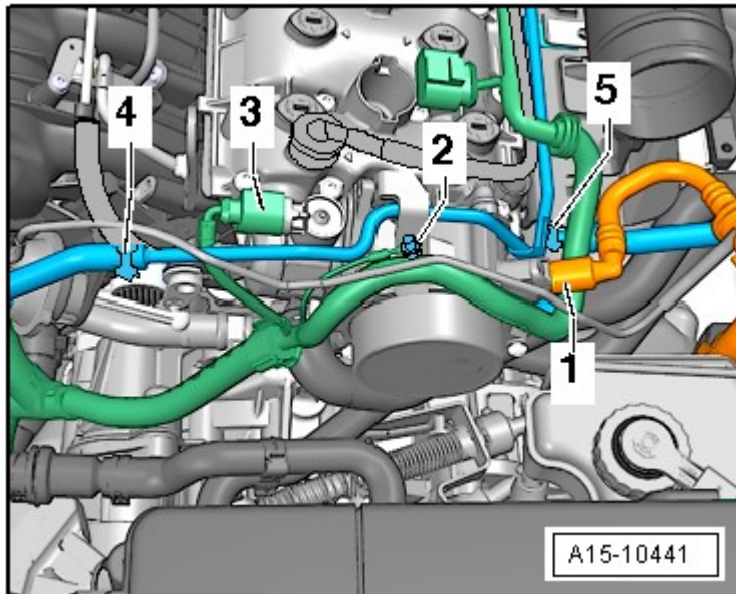
**Fig. 113: Removing Ground (GND) Strap At Bulkhead**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove Ground (GND) strap - **arrow** - at bulkhead.



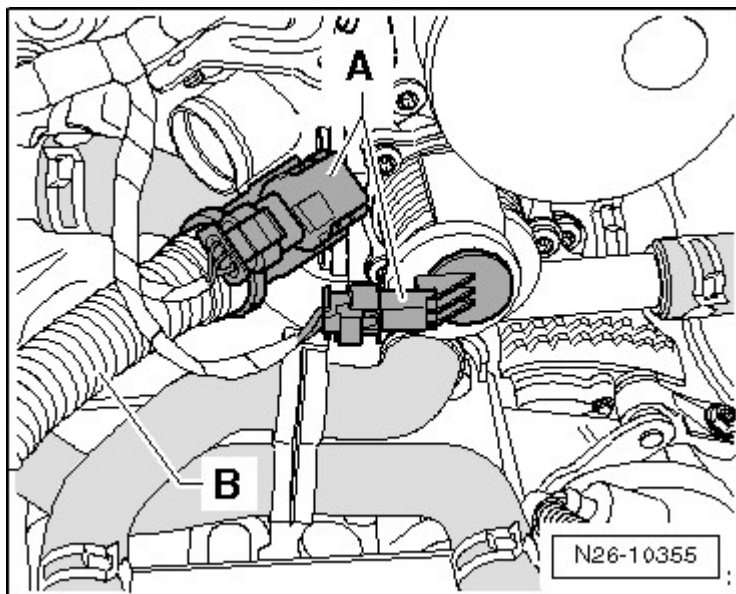
**Fig. 114: Removing Coolant Hoses At Coolant Expansion Tank**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove coolant hoses - 1 - and - 2 - at coolant expansion tank.
- Remove coolant expansion tank - **arrow** -.
- Disconnect electrical connection at Engine Coolant Level (ECL) Warning Switch F66 at bottom of coolant expansion tank.



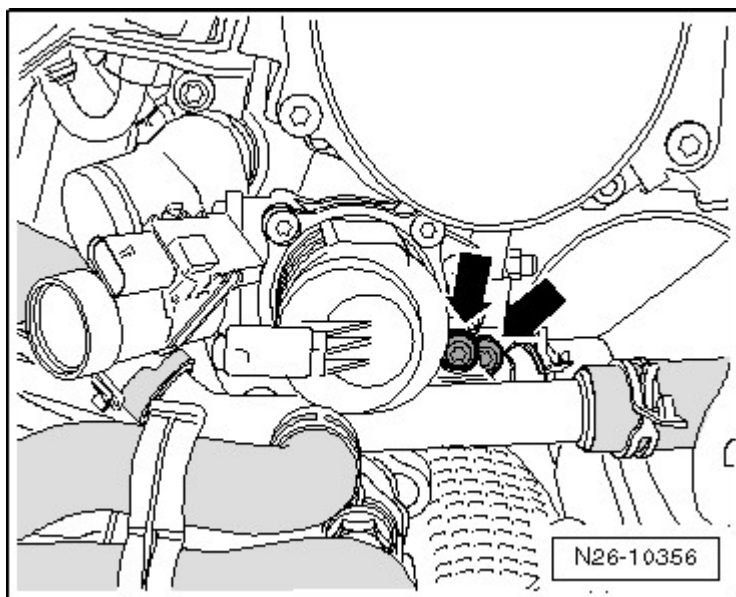
**Fig. 115: Removing Coolant Hose From Front Coolant Line**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove coolant hose - **arrow** - from front coolant line.



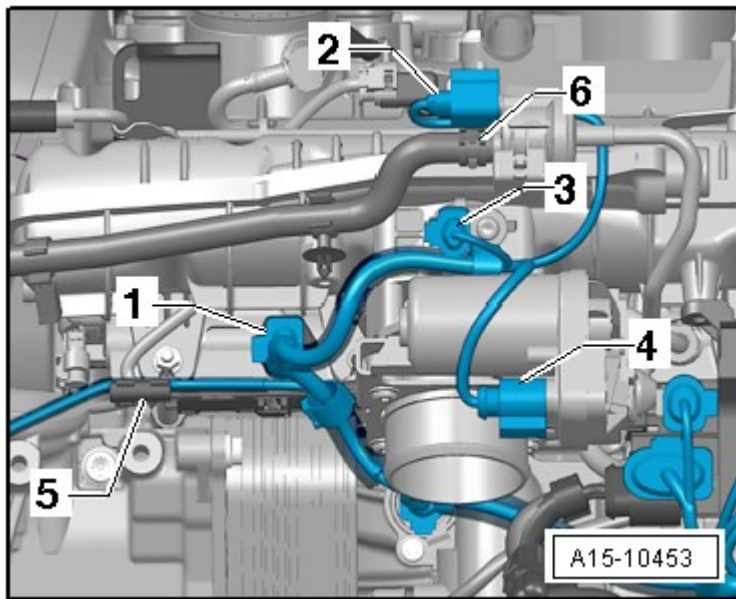
**Fig. 116: Disconnecting Top Coolant Hose From Radiator**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove left front coolant hose in engine compartment - **arrows** -.



**Fig. 117: Removing Coolant Hose From Front Coolant Line**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove coolant hose - **arrow** - from front coolant line.

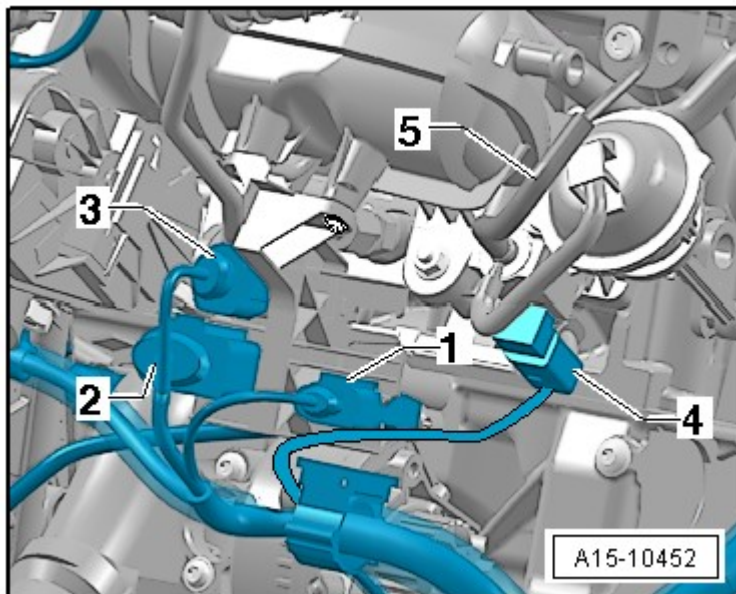


**Fig. 118: Disconnecting Vacuum Hose To Leak Detection Pump**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

**NOTE:**

- Place a rag under hydraulic lines to catch escaping hydraulic fluid.



**Fig. 119: Removing Hydraulic Pressure Line At Power Steering Pump & Clamping Off Hydraulic Hose For Power Steering Pump With Hose Clamps**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

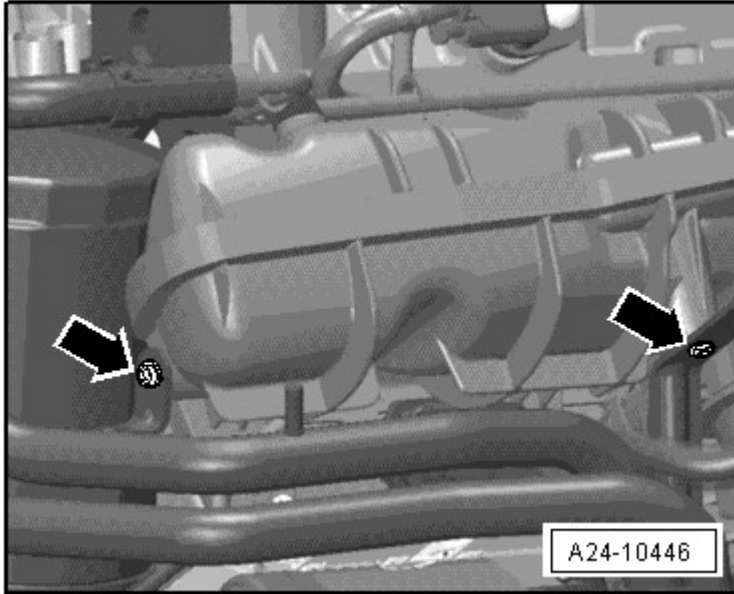
- Remove hydraulic pressure line - **2** - at power steering pump and set it aside on top of longitudinal

member.

- Clamp off hydraulic hose - 1 - for power steering pump with a Hose Clamps Up to 25 mm dia. 3094.
- Remove hydraulic hose from power steering pump.

**NOTE:**

- To prevent damage to the refrigerant lines/hoses, ensure that the lines and hoses are not stretched, kinked or bent.



**Fig. 120: Removing Bolts**

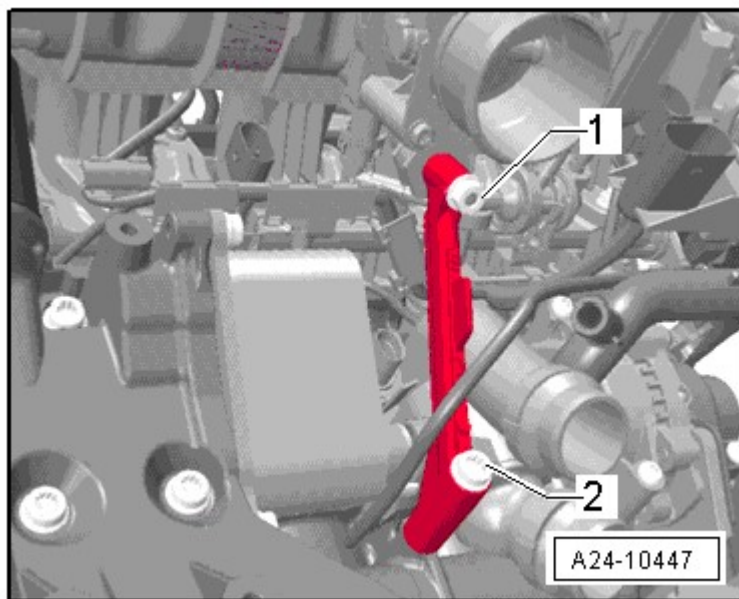
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - arrows -.

**NOTE:**

- The refrigerant lines will be removed from air conditioning compressor at a later time.

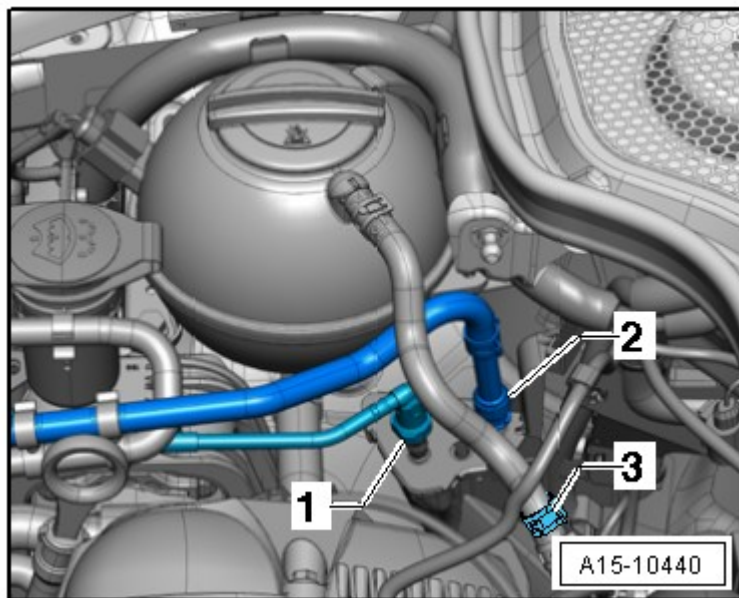




**Fig. 121: Identifying Bolts & Air Duct**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Remove air duct - **1** - and - **2** -.



**Fig. 122: Disconnecting Vacuum Hose At Vacuum Pump**

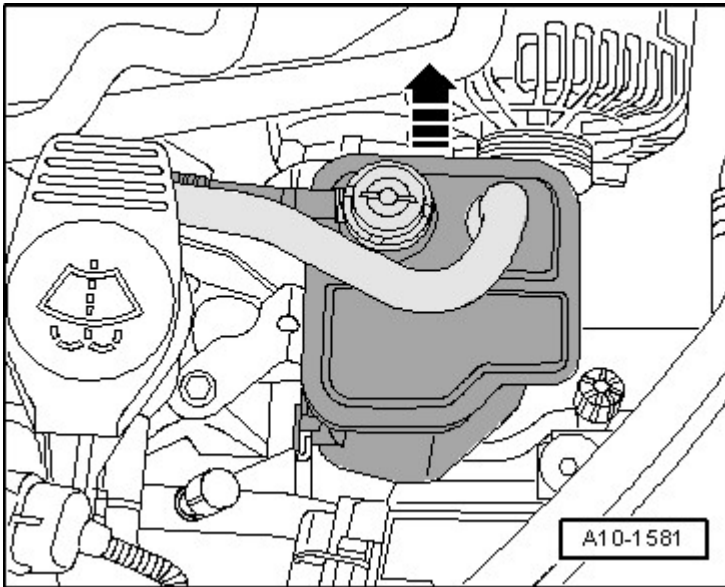
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect vacuum hose - **1** - at vacuum pump.
- Remove bolts - **arrows** - and remove vacuum pump.



**CAUTION:** Note rules of cleanliness for working on the fuel injection system --> Rules of cleanliness for performing work on fuel injection system.

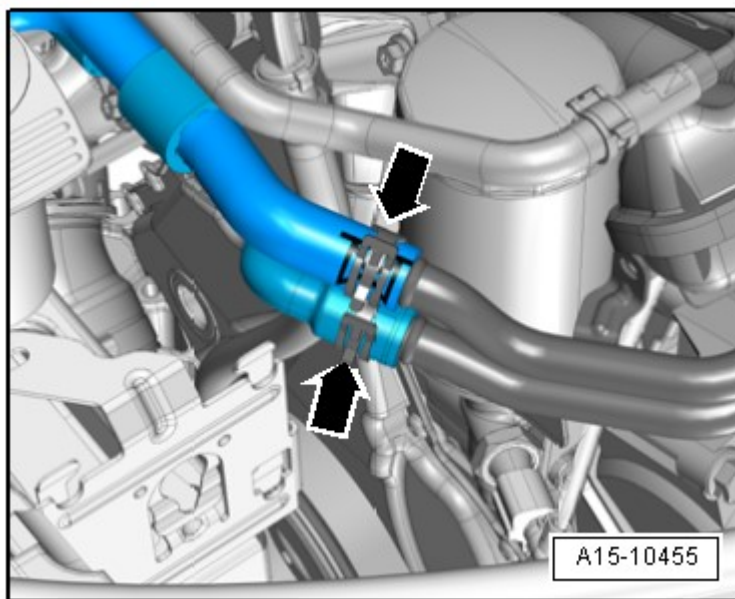
**CAUTION:** Fuel system is under pressure! Before opening the low pressure section of the fuel injection system, wrap a clean rag around the connection and relieve residual pressure by carefully loosening the connection.



**Fig. 123: Separating Fuel Line**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

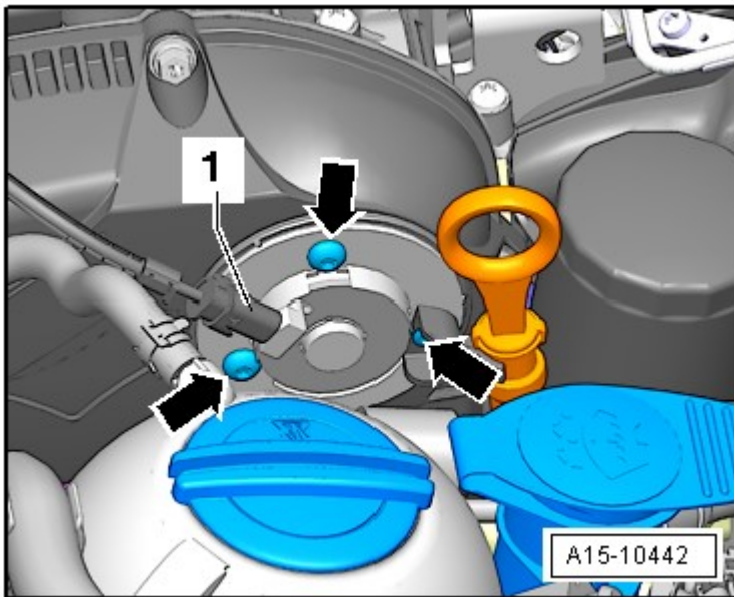
- Separate fuel line - **arrow** - and lay aside.



**Fig. 124: Disconnecting Check Valve From Connection At Air Duct Hose**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

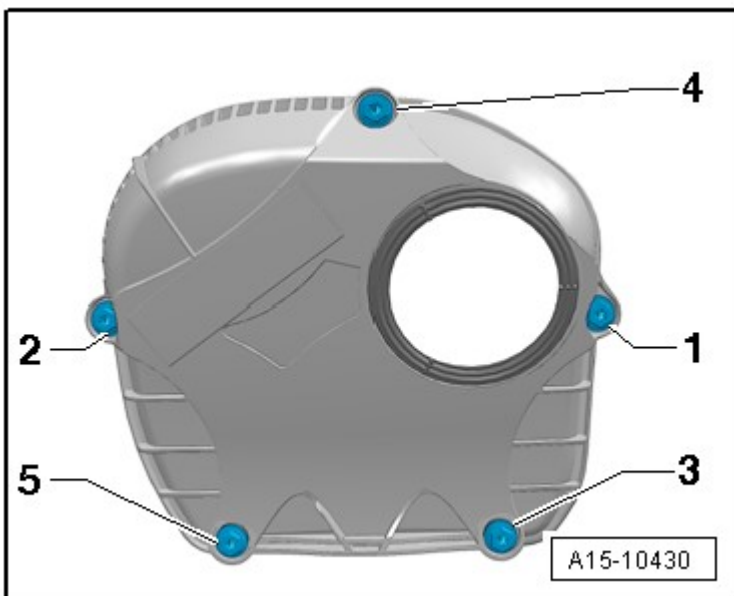
- Disconnect check valve - **1** - from connection at air duct hose.
- Remove air duct hose, thereby loosening hose clamp - **2** - and opening clips - **arrows** -.



**Fig. 125: Removing Pin From Spreader Clips**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove pin from spreader clips - **arrow** -.
- Remove air filter housing.

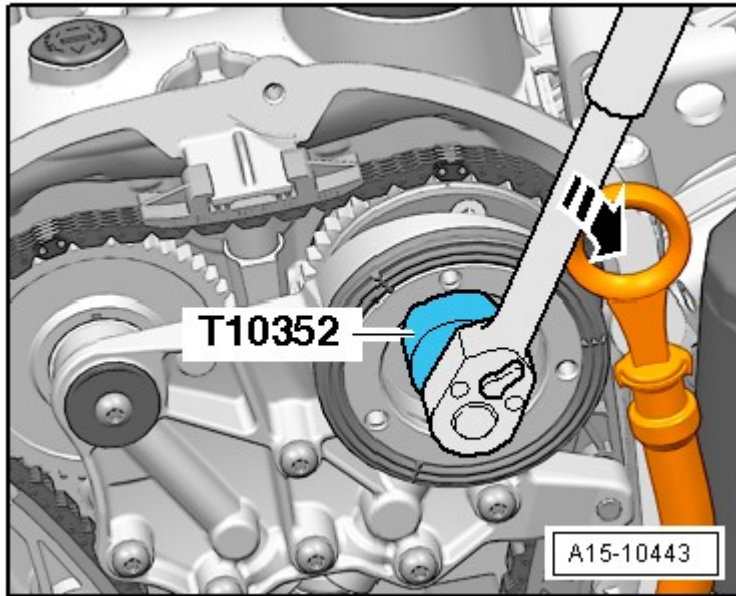


**Fig. 126: Removing Vacuum Hose To EVAP Canister At Evaporative Emission (EVAP) Canister Purge**

**Regulator Valve N80**

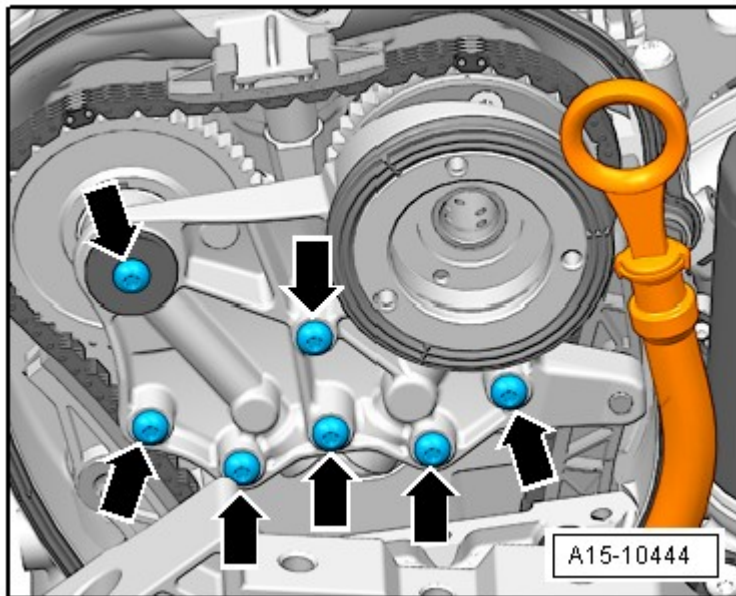
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove vacuum hose - **arrow** - to EVAP canister at Evaporative Emission (EVAP) Canister Purge Regulator Valve N80.

**Fig. 127: Removing Coolant Hose To Heater Core On Rear Of Engine**

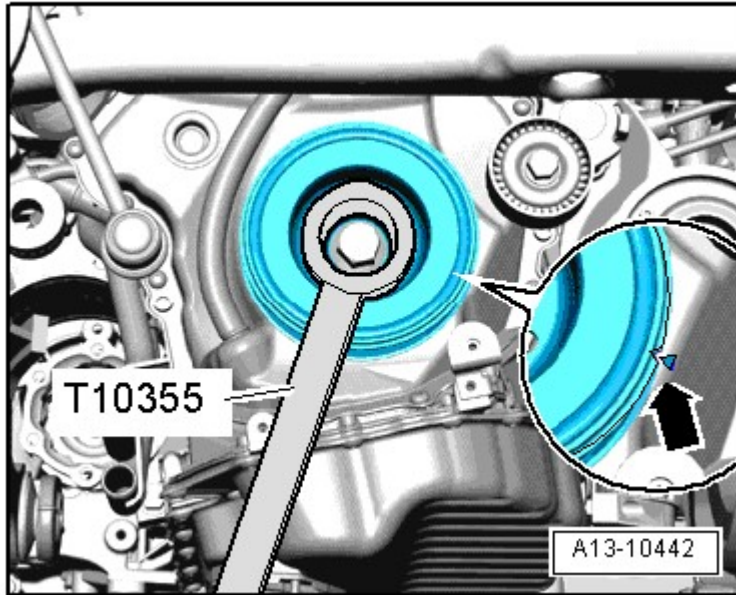
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove coolant hose - **arrow** - to heater core on rear of engine.

**Fig. 128: Disconnecting Electrical Harness Connector For Oxygen Sensor (O2S) 2 Behind Three Way Catalytic Converter (TWC) G131**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

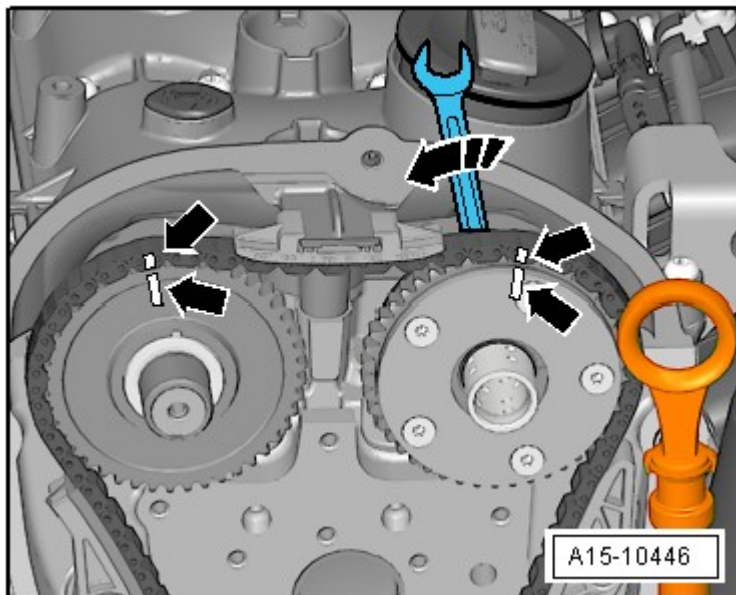
- Remove nuts and remove left bracket for harness connectors - 1 - and - 2 - from bulkhead.



**Fig. 129: Disconnecting Electrical Harness Connector For Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts and remove right bracket for harness connectors - 1 - and - 2 - from bulkhead.

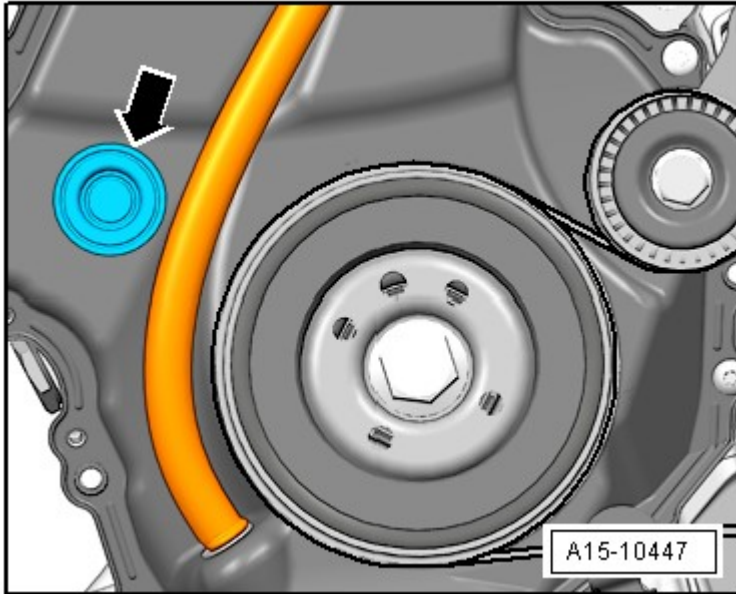


**Fig. 130: Removing Rubber Seal & Plenum Chamber Cover**

Courtesy of VOLKSWAGEN UNITED STATES, INC.



- Remove rubber seal - **2** - for plenum chamber cover.
- Remove plenum chamber cover - **1** -.



**Fig. 131: Removing Nut And Fuse Strip On Plus Wire Terminal Clamp**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nut - **1** - and remove fuse strip on plus wire terminal clamp.
- Disconnect plus wire - **2** - on battery positive terminal.
- Pull plus wire through bulkhead toward front.
- Free up wiring harness lay it aside on engine.

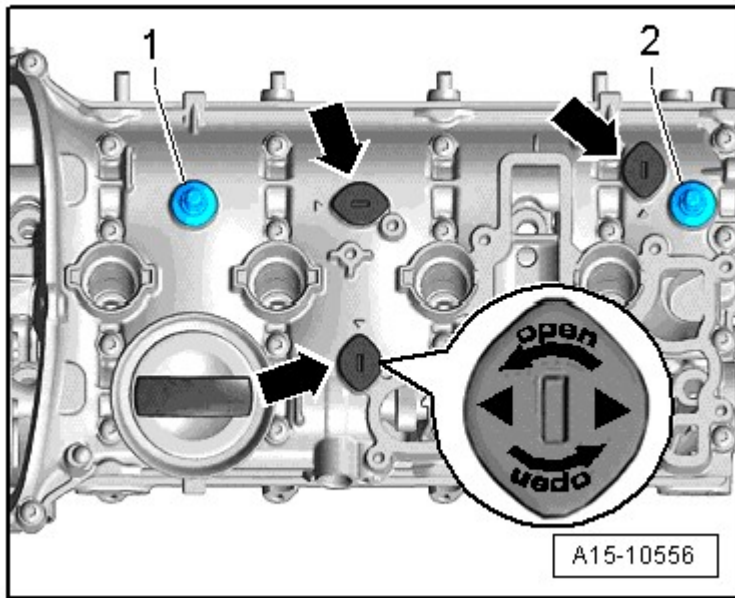
**NOTE:**                      • Ignore - **3** -.



- Fig. 133: Removing Screws And Cover From E-Box In Plenum Chamber**  
**Courtesy of VOLKSWAGEN UNITED STATES, INC.**



- Remove cover for E-Box in plenum chamber - **arrows** -.

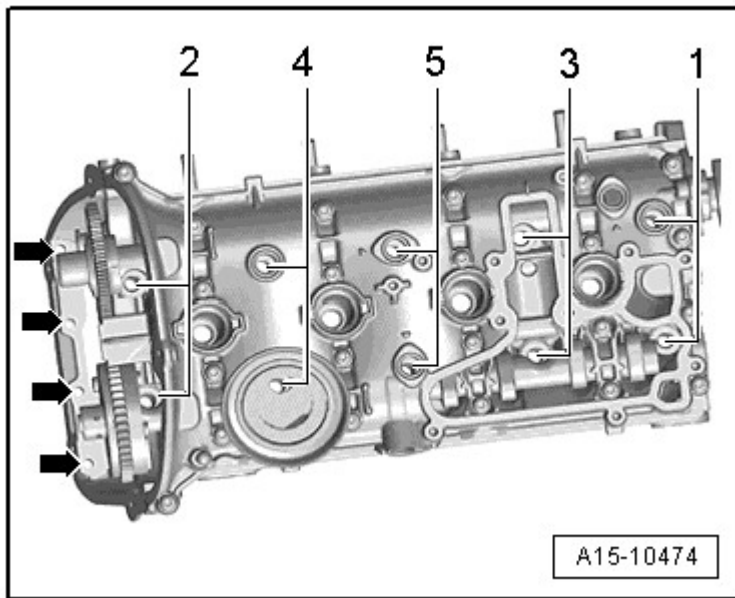


**Fig. 134: Using Screwdriver To Remove Retainer Bar And Engine Control Module (ECM) J623**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using a screwdriver, carefully pry off mounting bracket - **arrow** - and remove Engine Control Module (ECM) from E-Box.

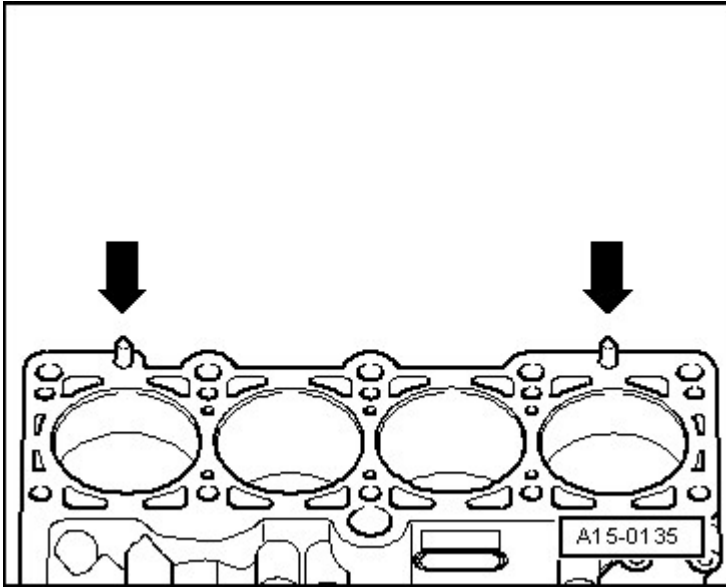
**NOTE:**

- Engine Control Module (ECM) remains connected at wiring harness.



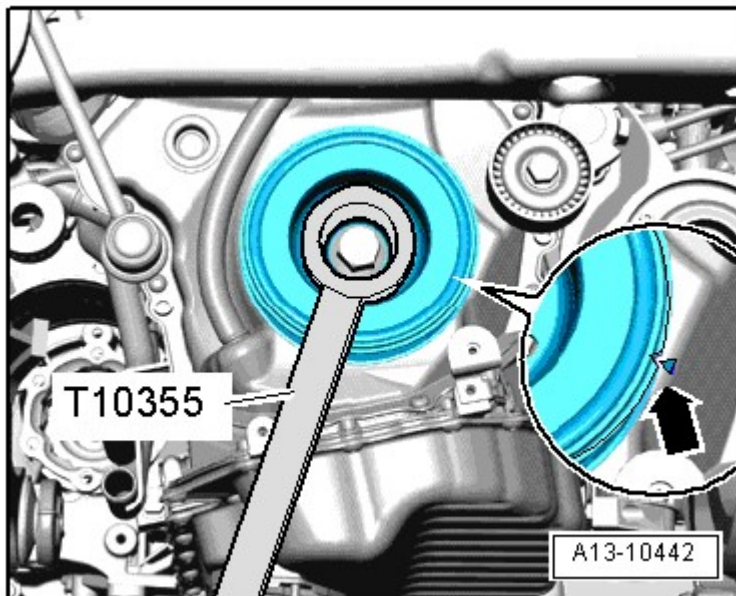
**Fig. 135: Releasing Retaining Hooks Toward Outside And Removing Retaining Bracket**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Release retaining hooks - **arrows** - toward outside and remove retaining bracket.



**Fig. 136: Disconnecting Electrical Harness Connectors On Connector Station**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect all electrical connectors on connector station - **2** -.
- Remove electrical wire connection - **1** -.

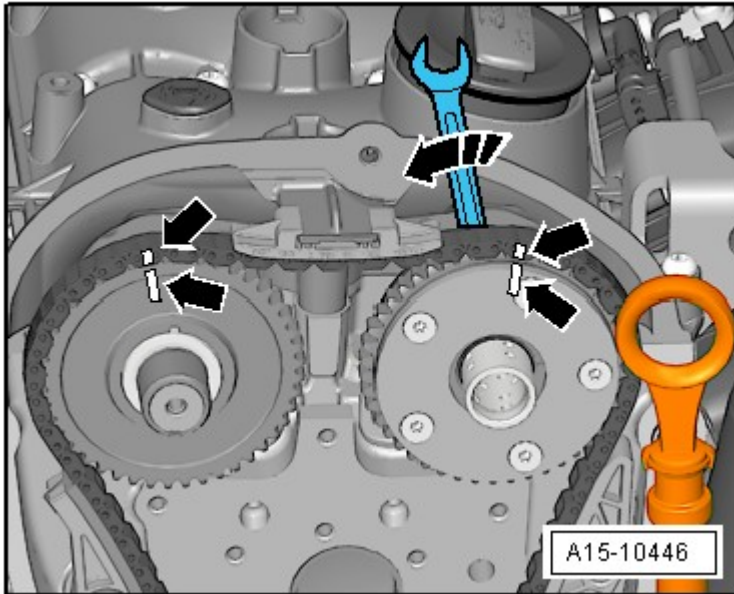


**Fig. 137: Disengaging Locking Mechanisms And Removing Secondary Relay Carrier In E-Box Toward Top**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disengage locking mechanisms - **arrows** - and remove secondary relay carrier in E-Box toward top.

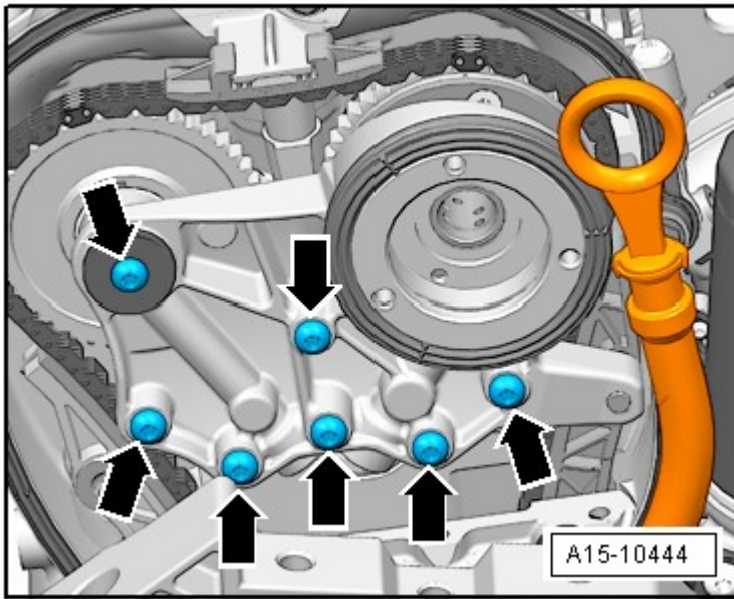
- Disengage engine wiring harness at E-Box and bulkhead.
- Set wiring harness on engine and secure Engine Control Module (ECM) against falling down.
- Have a second technician press brake pedal.

**CAUTION:** To loosen collar bolt for drive axle, the wheel bearing must not be under load (vehicle must not be standing on its wheels).



**Fig. 138: Identifying Collar Bolt For Right Drive Axle**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove collar bolt - 2 - at left and right drive axles - 1 -.

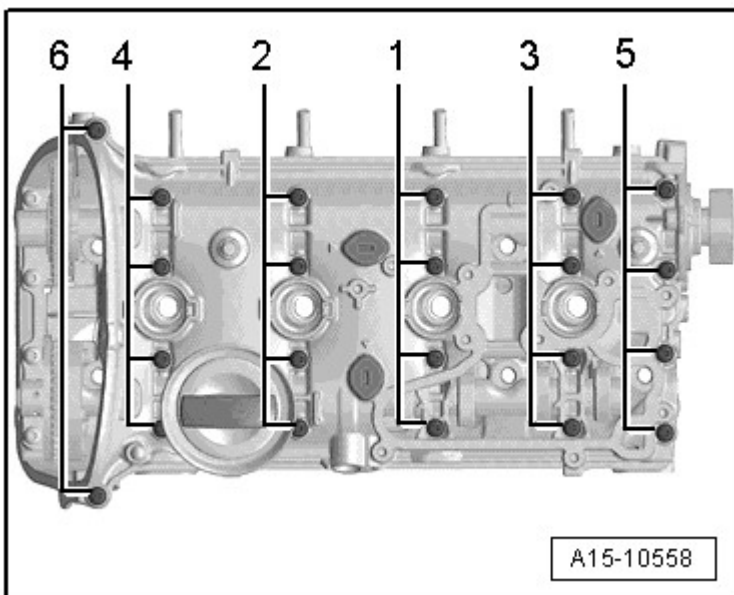


**Fig. 139: Removing Heat Shield For Left/Right Drive Axles**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield - 1 - for left and right drive axles.
- Remove left and right drive axles from flange shafts of transmission.

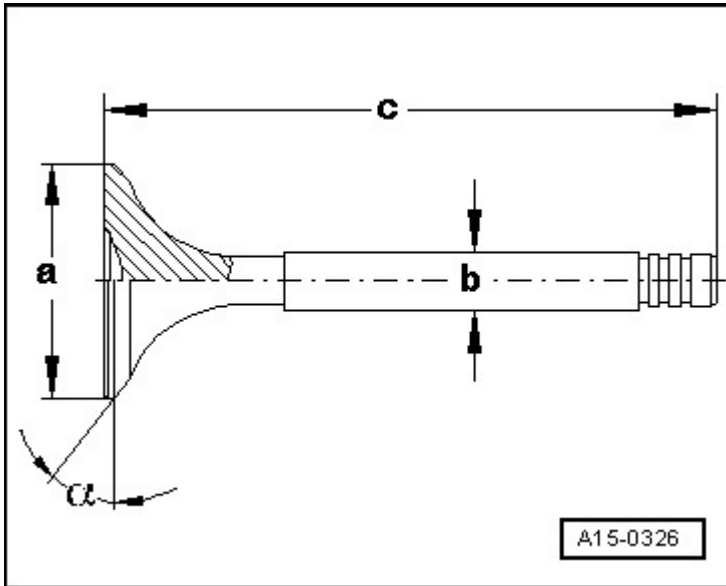
**NOTE:**                      • The drive axles will be removed at a later time.

**NOTE:**                      • To prevent damage to the refrigerant lines/hoses, ensure that the lines and hoses are not stretched, kinked or bent.



**Fig. 140: Removing Bracket For Refrigerant Lines At Right On Oil Pan**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

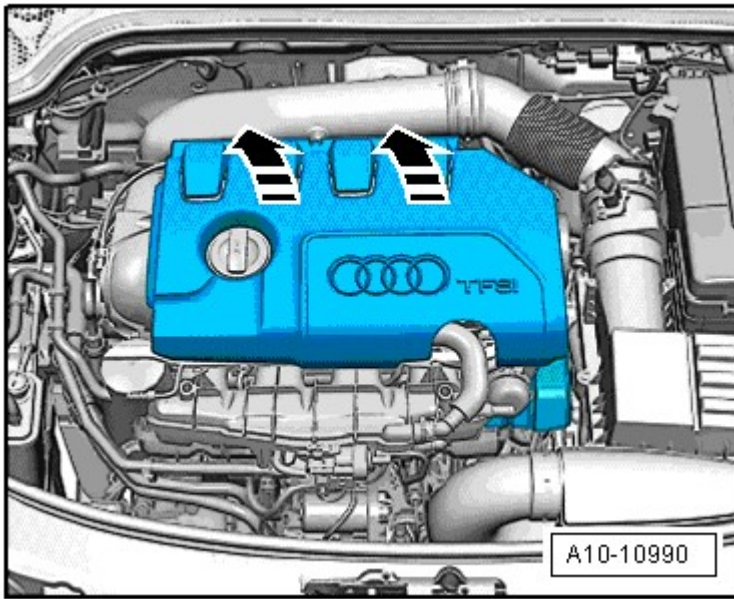
- Remove bracket for refrigerant lines at right on oil pan - **arrow** -.
- Remove refrigerant lines at A/C compressor.
- Tie up refrigerant line, that runs to catch reservoir at right of vehicle, to body.
- Seal open connections on A/C compressor using clean plugs.



**Fig. 141: Removing Bolts And Nuts Uniformly At Left/Right**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

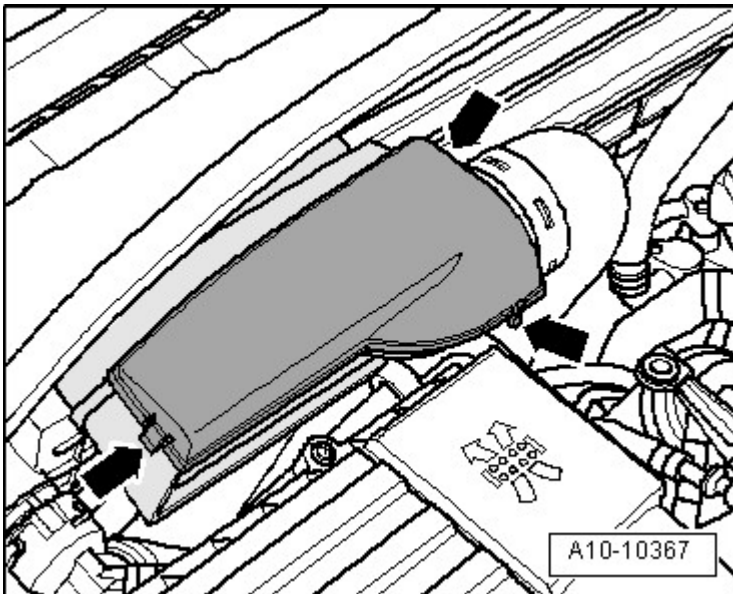
- Remove bolts and nuts - **arrows** - uniformly at left and right.
- Remove stabilizer.





**Fig. 142: Unclipping Actuator Rod For Left Front Level Control System Sensor G78 At Bottom On Link**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

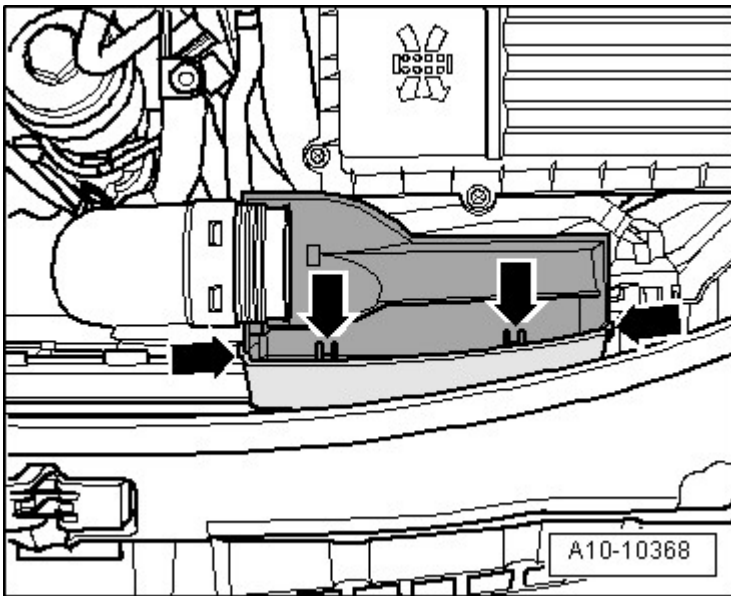
- If equipped, disconnect electrical harness connector at Left Front Level Control System Sensor G78.
- Unclip actuator rod for Left Front Level Control System Sensor G78 at bottom on link - **arrow** -.



**Fig. 143: Removing Suspension Strut From Link**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove suspension strut from link - **arrow** -.





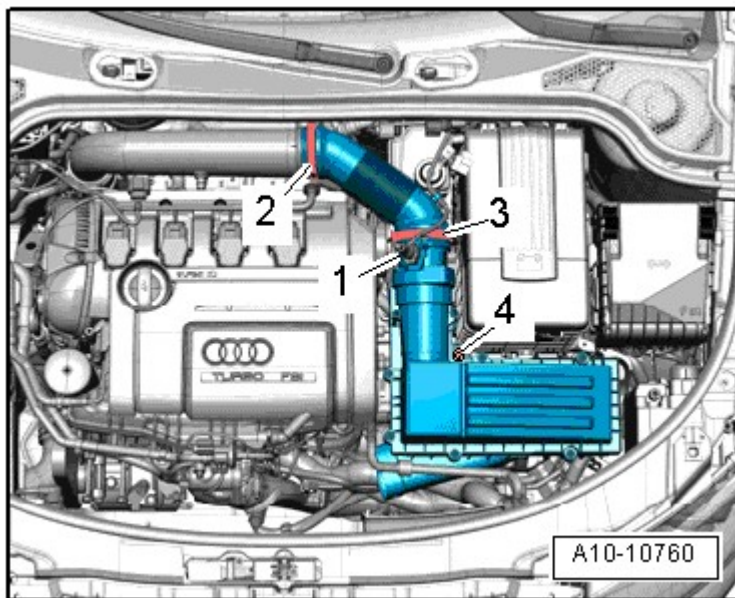
**Fig. 144: Removing Nuts For Fastening Link And Guide Link**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - 1 - and - 2 - for fastening link and guide link.

**NOTE:**

- The bolts will be removed from the subframe at a later point in time.

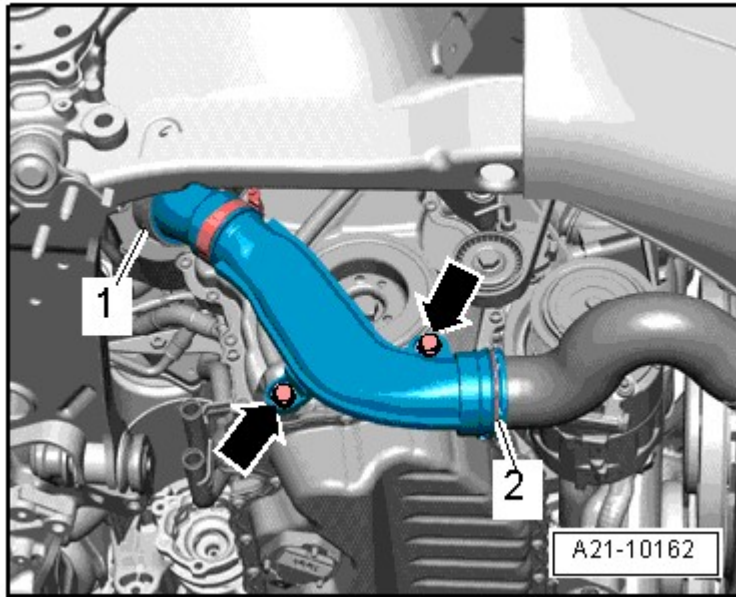
- Repeat procedure on opposite side of the vehicle.



**Fig. 145: Loosening Clamping Sleeves**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

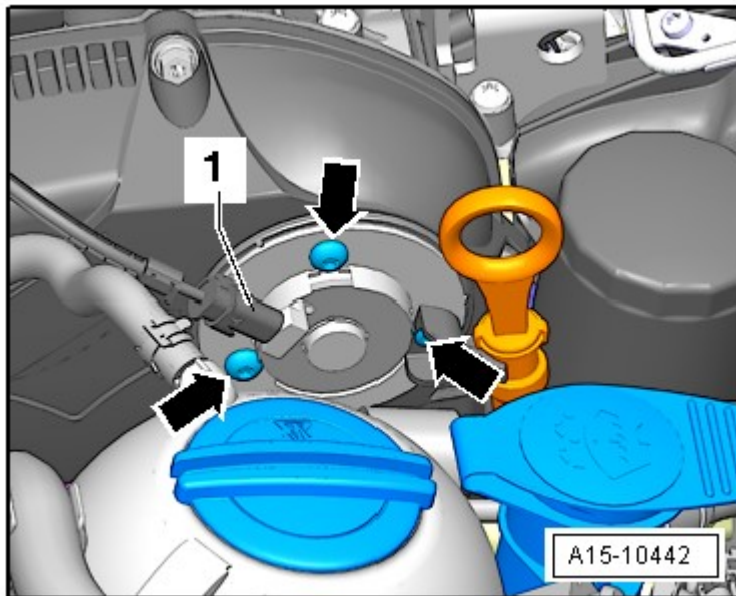
- Loosen clamping sleeves - **arrows** -.

Vehicles with all wheel drive:



**Fig. 146: Removing Heat Shield For Drive Shaft**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield - **A** - for drive shaft - **arrows** -.
- Remove bolts at transmission/drive shaft flange.
- Push drive shaft together with rear final drive. The constant velocity (CV) joints can move axially.
- Lay aside drive shaft on exhaust system.



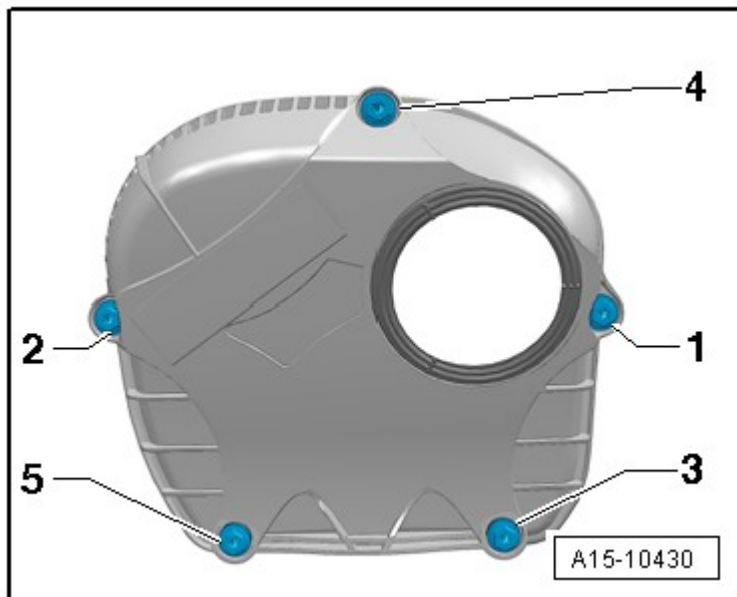
**Fig. 147: Identifying Scissor Lift Platform VAS 6131**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

**Prepare scissor lift platform:**

- Equip scissor lift platform VAS 6131 with support set for Audi VAS 6131/10 as follows:

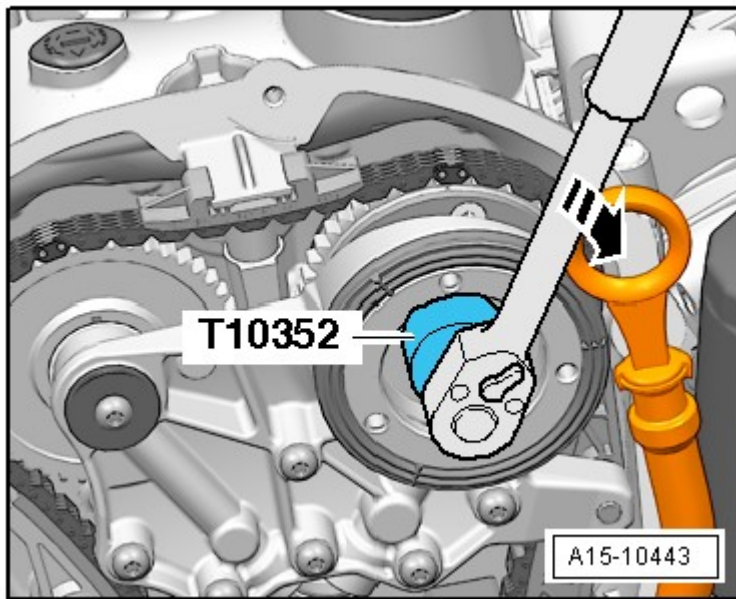
| Platform coordinates | Parts of support set for Audi VAS 6131/10 |       |       |        |
|----------------------|-------------------------------------------|-------|-------|--------|
| B4                   | /10-1                                     | /10-4 | /10-5 | /10-11 |
| G4                   | /10-1                                     | /10-4 | /10-5 | /10-12 |
| B11                  | /10-1                                     | /10-2 | /10-5 | /10-8  |
| G11                  | /10-1                                     | /10-2 | /10-5 | /10-8  |
| D15                  | /10-1                                     | /10-3 | /10-5 | /10-12 |
| F15                  | /10-1                                     | /10-3 | /10-5 | /10-12 |

- Install attachments on scissor lift table by hand first.
- Place scissor lift platform VAS 6131 in horizontal position.
- Note bubble level (sight glass) on support platform.
- Drive scissor lift platform VAS 6131 under engine/transmission subassembly.



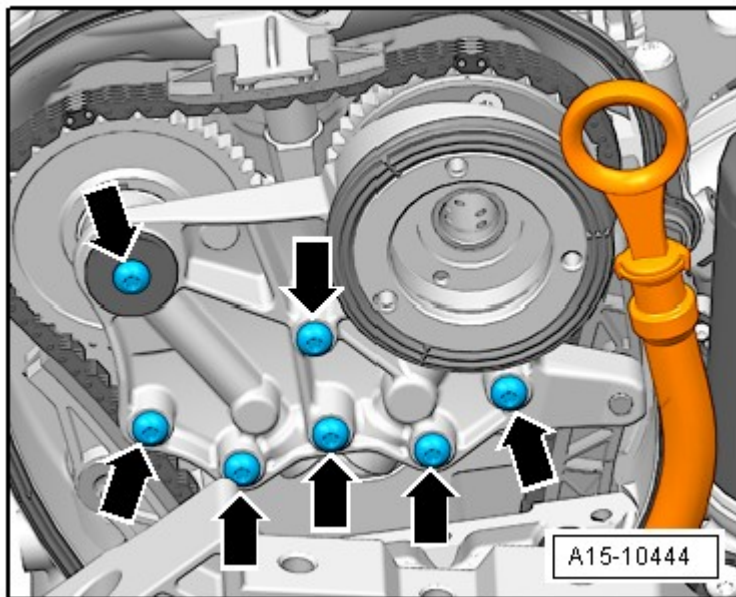
**Fig. 148: Positioning Support Elements From VAS 6131/10 At Front On Engine**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position support elements from VAS 6131/10 at front on engine as shown in illustration.
- Make sure that the threaded spindles are completely installed.



**Fig. 149: Positioning Support Elements From VAS 6131/10 At Left/Right On Subframe**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

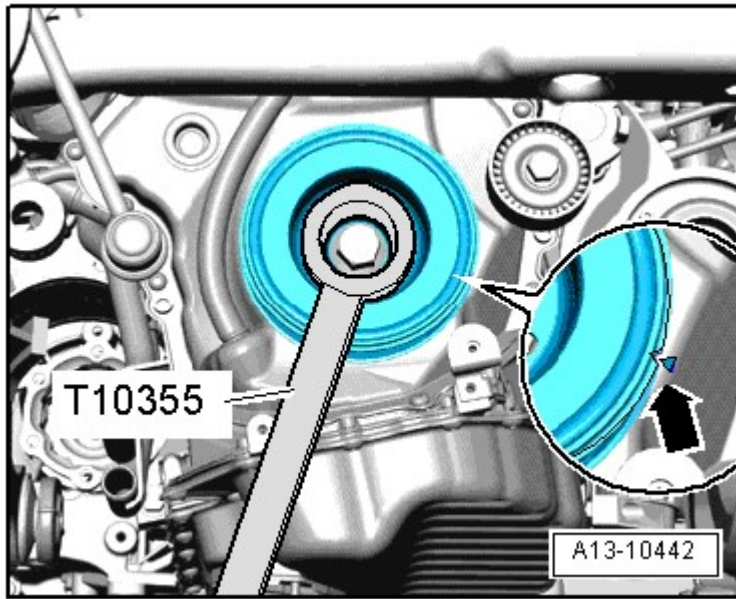
- Position support elements from VAS 6131/10 at left and right on subframe as shown in illustration.



**Fig. 150: Positioning Support Elements From VAS 6131/10 At Rear On Transmission**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

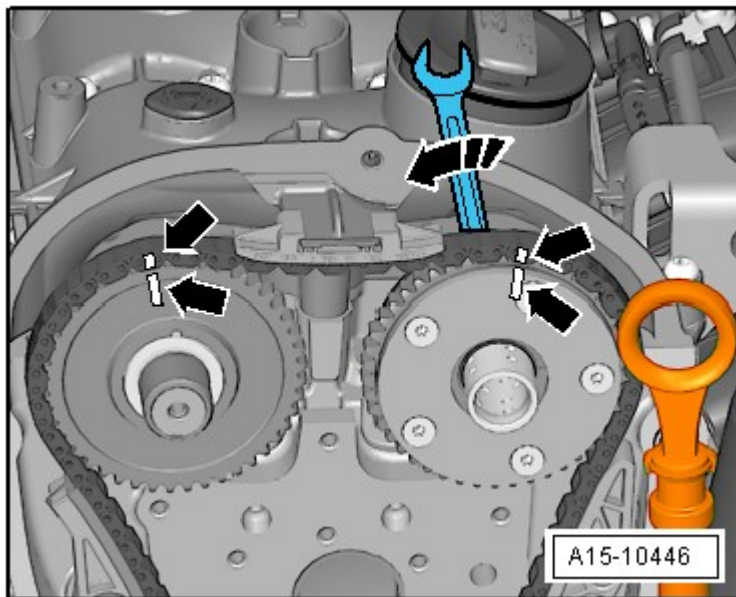
- Position support elements from VAS 6131/10 at rear on transmission as shown in illustration.
- Twist all spindles of support elements upward far enough until all support pins make contact at support points.
- Tighten base plates for support elements to 20 Nm on scissor lift platform VAS 6131.





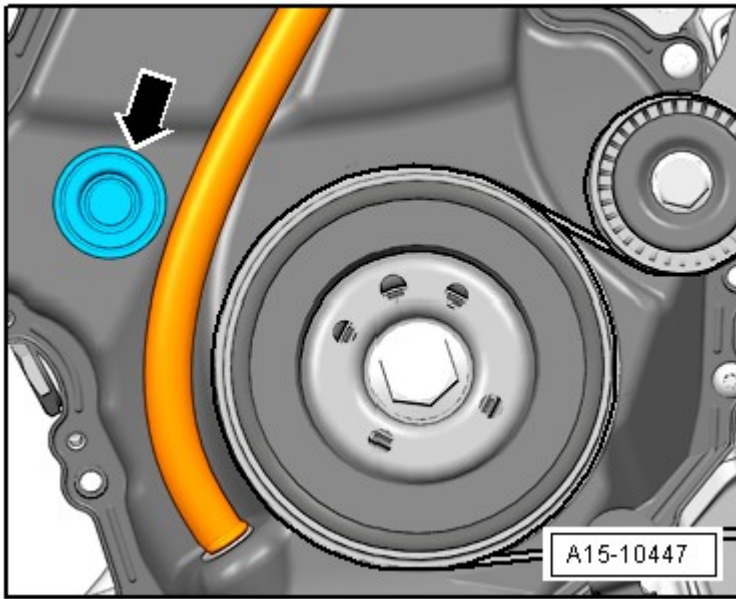
**Fig. 151: Removing Nuts At Bottom On Left/Right Engine Mounts**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - A - at bottom on left and right engine mounts.



**Fig. 152: Starter Wiring Bracket Cable Ties**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Cut through cable ties - **arrows** - , open starter harness retainer and take electrical harness out.



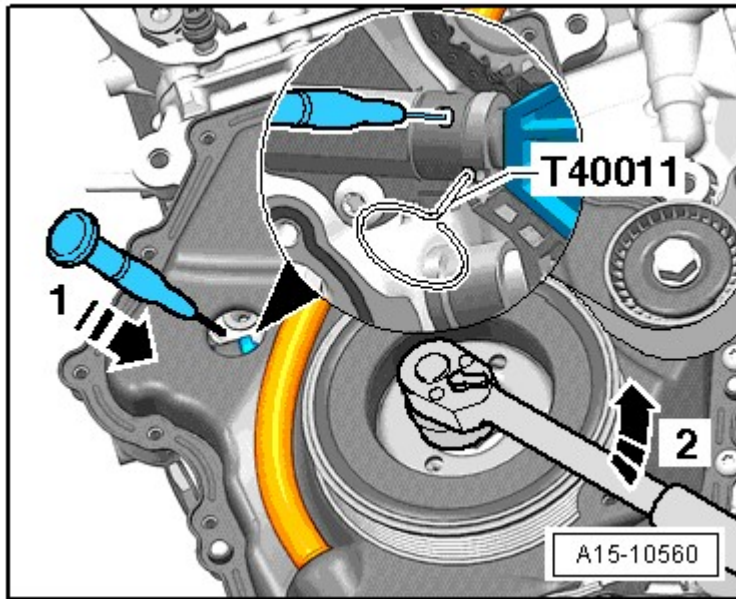
**Fig. 153: Removing/Installing Bolts In Diagonal Sequence And In Stages**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **1** -.
- Mark installation position of subframe and of both engine mount plates to long members using a felt-tip marker.
- Remove bolts - **2** - , - **3** - and - **4** - in diagonal sequence and in stages.
- Remove left and right engine mount plate.

**NOTE:**

- **Verify that all hoses and lines between engine, transmission, subframe and body have been disconnected.**
- **While lowering, carefully guide engine/transmission subassembly with subframe out of engine compartment in order to prevent damage.**

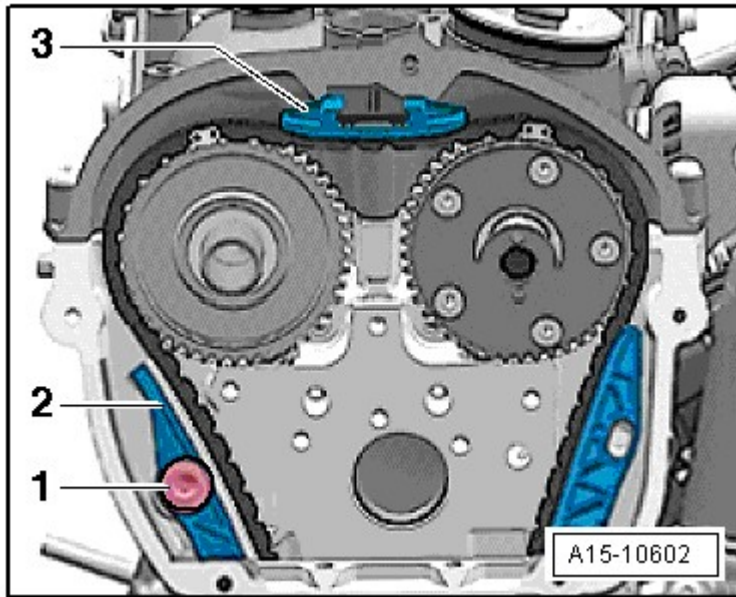




**Fig. 154: Lowering Engine/Transmission Assembly Using Scissor Lift Platform VAS 6131 Only Approx. By Dimension**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

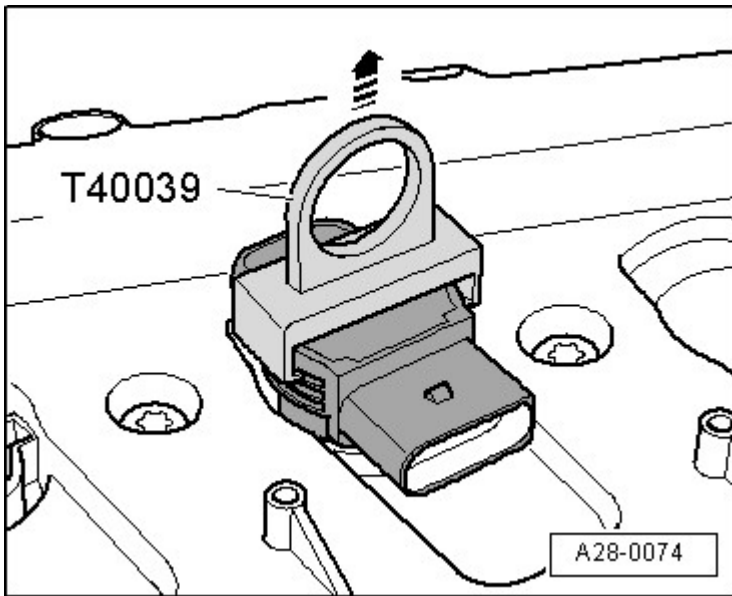
- First lower engine/transmission assembly using scissor lift platform VAS 6131 only approx. by dimension - **a** -.
- Dimension - **a** - = 80 mm.



**Fig. 155: Removing Nuts For Fastening Link And Guide Link**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts at guide link - **1** - and at link - **2** - from subframe.



**Fig. 156: Pivoting Guide Link And Link Outward**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

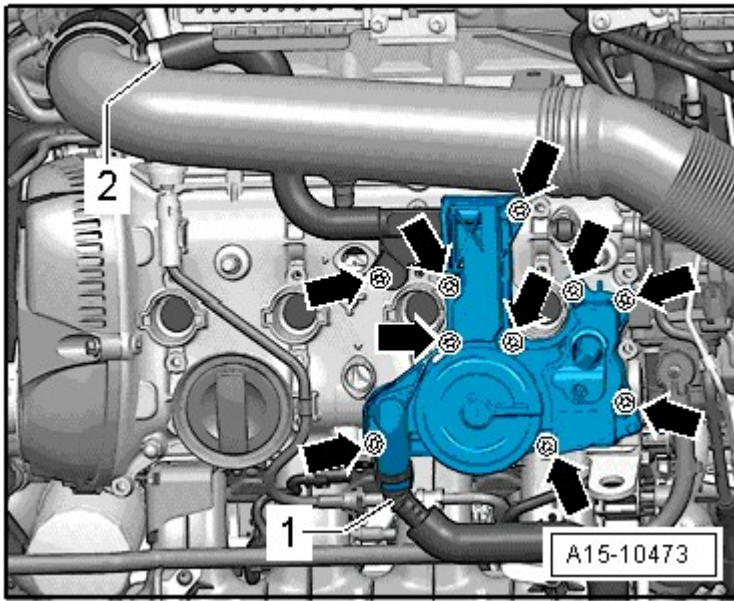
- Pivot guide link - 1 - and link - 2 - outward.

**CAUTION:** Guide link and link must not hang free. Tie up both links on wheel bearing housing - arrows - as shown in illustration.

- Pivot wheel bearing housing outward and remove drive axle.
- Repeat work procedure on opposite side of vehicle.

**NOTE:**

- Mark the installation position of bracket for selector lever cable using a felt-tip marker.



**Fig. 157: Pressing Ball Socket Of Selector Lever Cable From Selector Shaft Lever & Removing Bracket On Transmission**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press ball socket - 1 - of selector lever cable from selector shaft lever.
- Remove bracket on transmission - arrows -.
- Move selector lever cable clear.

**NOTE:**

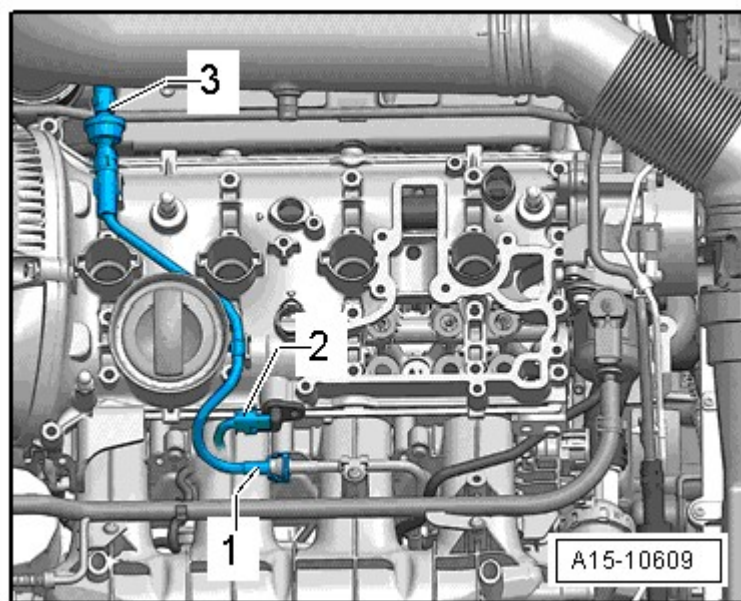
- **Do not bend or kink selector lever cable.**
- **To improve clarity, the transmission supports are shown removed in the illustration.**

- Push scissor lift platform VAS 6131 approx. 20 mm back and remove torque support and torque support stop.
- Push scissor lift platform VAS 6131 back into removal position and lower scissor lift platform VAS 6131 completely.
- Push scissor lift platform VAS 6131 with engine/transmission subassembly under vehicle.

**Engine and automatic transmission 09L, separating**

**Special tools, testers and auxiliary items required**

- Support set for Audi VAS 6131/10 , VAS 6131/11 and VAS 6131/12

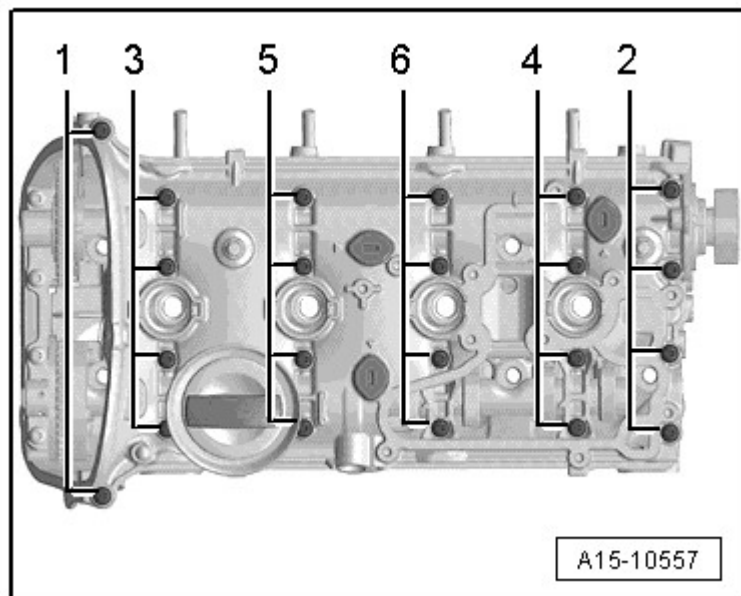
**Fig. 158: Adapter T40058**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Adapter T40058

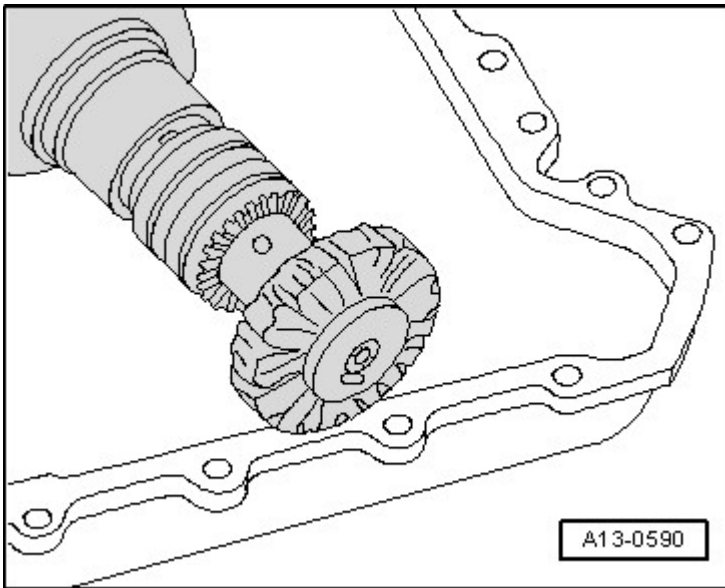
**Work procedure****NOTE:**

- All cable ties opened or cut during engine removal must be reinstalled at the same locations during installation.
- Engine/transmission assembly removed and placed on Scissor Lift Table VAS 6131.



**Fig. 159: Removing Bolts For Left/Right Transmission Mount**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - for left and right transmission mount.



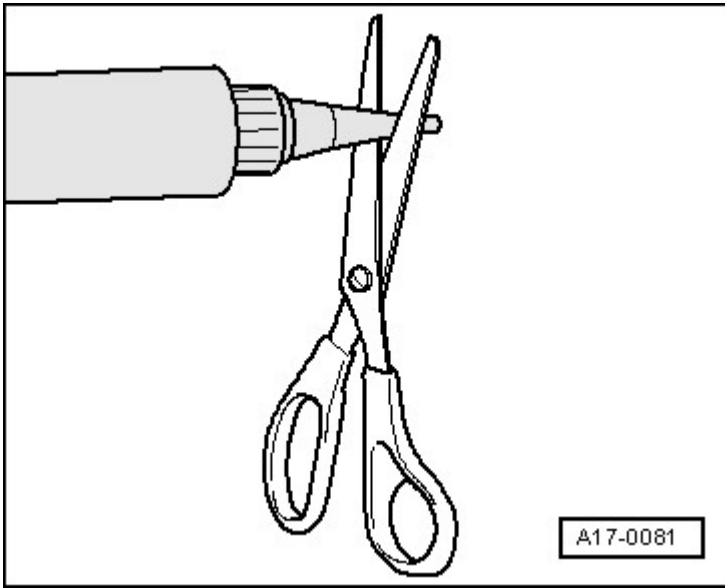
**Fig. 160: Positioning Support Elements From VAS 6131/10 At Left/Right On Subframe**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Twist spindles of support elements at left and right at subframe completely downward.
- Remove support pins from spindles.
- Remove subframe to side.
- Remove both base plates of subframe support elements on scissor lift table VAS 6131.

**NOTE:**

- The support points for front of engine and rear of transmission remain unchanged.



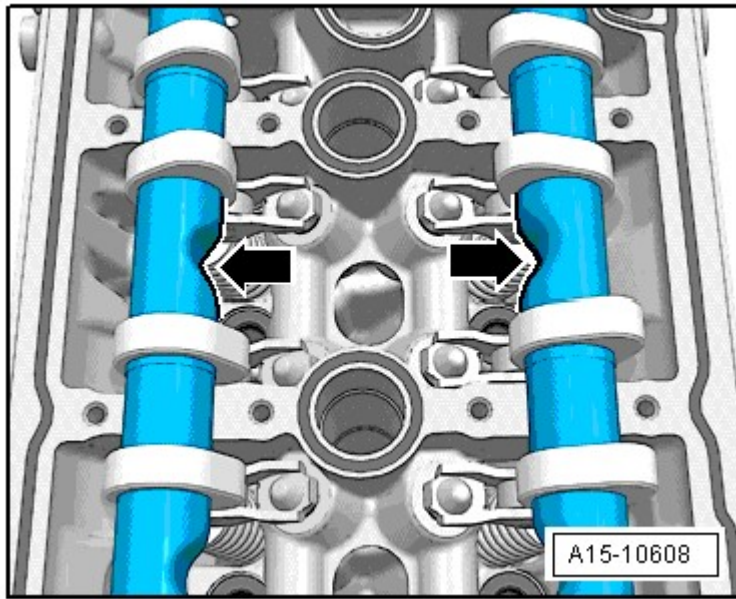


**Fig. 161: Identifying Scissor Lift Platform VAS 6131**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Equip scissor lift platform VAS 6131 with support set for Audi VAS 6131/10 , VAS 6131/11 and VAS 6131/12 as follows:

| Platform coordinates | Parts of support set for Audi VAS 6131/10 , VAS 6131/11 and VAS 6131/12 |       |       |        |
|----------------------|-------------------------------------------------------------------------|-------|-------|--------|
| B4 <sup>1)</sup>     | /10-1                                                                   | /10-4 | /10-5 | /10-11 |
| G4 <sup>1)</sup>     | /10-1                                                                   | /10-4 | /10-5 | /10-12 |
| B7                   | /10-1                                                                   | /10-4 | /10-5 | /10-11 |
| G7                   | /10-1                                                                   | /10-4 | /10-5 | /10-10 |
| B10                  | /10-1                                                                   | /10-2 | /10-5 | /12-1  |
| G10                  | /10-1                                                                   | /10-2 | /10-5 | /11-3  |
| D15 <sup>1)</sup>    | /10-1                                                                   | /10-3 | /10-5 | /10-12 |
| F15 <sup>1)</sup>    | /10-1                                                                   | /10-3 | /10-5 | /10-12 |

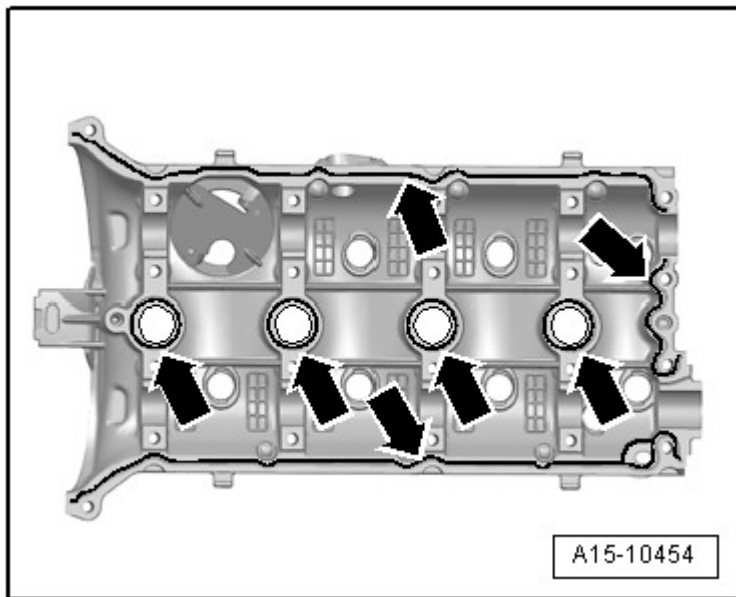
• <sup>1)</sup> The support elements remain unchanged.



**Fig. 162: Positioning/Removing Support Elements From VAS 6131/10 And VAS 6131/12 At Left On Engine**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position support elements from VAS 6131/10 and VAS 6131/12 at left on engine as shown in illustration.

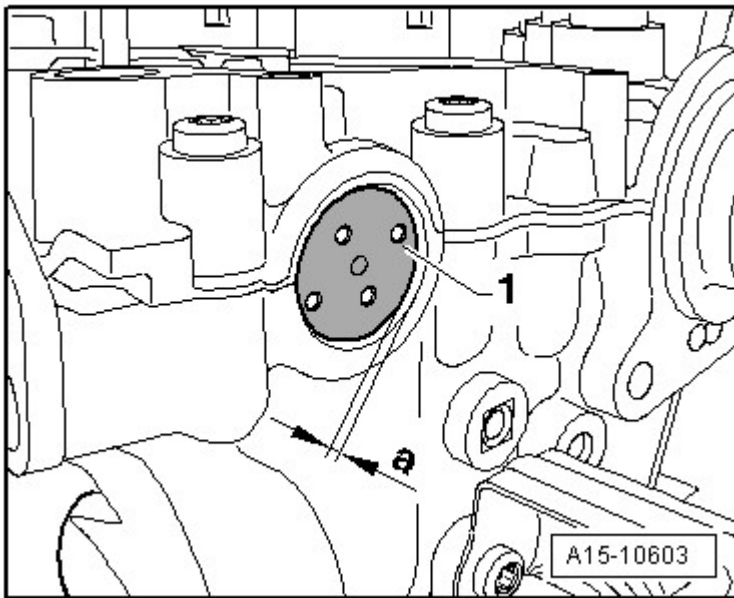


**Fig. 163: Removing Base Plate For Right Support Element On Scissor Lift Platform VAS 6131**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position support elements from VAS 6131/10 and VAS 6131/11 at right on engine as shown in illustration.
- Twist spindles of attachments upward far enough until all support pins make contact at support points.

- Tighten base plates for support elements to 20 Nm on scissor lift platform VAS 6131.



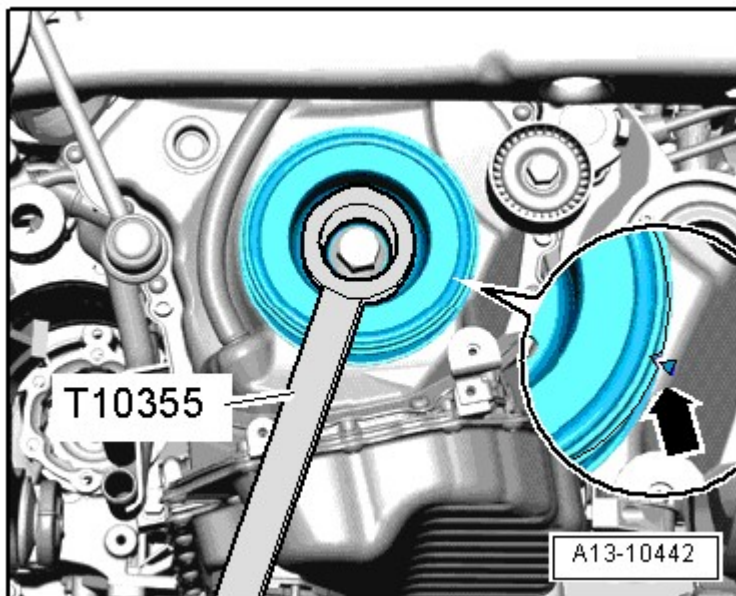
**Fig. 164: Disconnecting Electrical Harness Connector For Oxygen Sensor (O2S) 2 Behind Three Way Catalytic Converter (TWC) G131**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - 1 - for Oxygen Sensor (O2S) 2 Behind Three Way Catalytic Converter (TWC) G131 and free up wire.

**NOTE:**

- In the illustration, the electrical harness connector is depicted as installed.
- Ignore - 2 -.

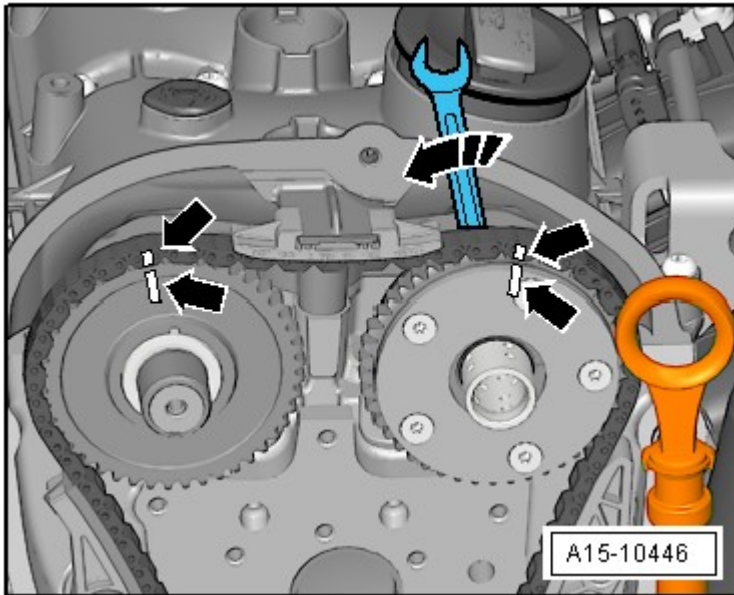


**Fig. 165: Removing Bolt At Left Bracket For Front Exhaust Pipe**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - 1 - at left bracket for front exhaust pipe.

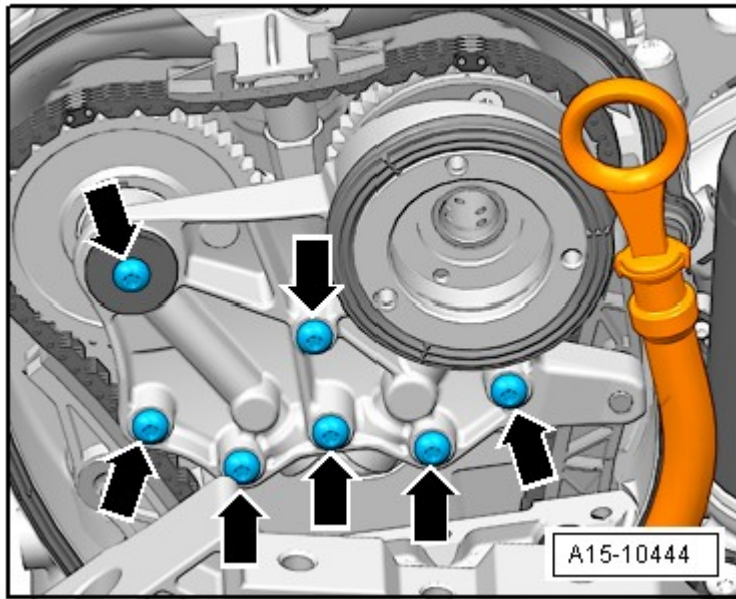
**NOTE:**

- Ignore - 2 -.



**Fig. 166: Removing Nuts & Left Front Exhaust Pipe With Catalytic Converter**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - 1 to 3 -.
- Remove left front exhaust pipe with catalytic converter.



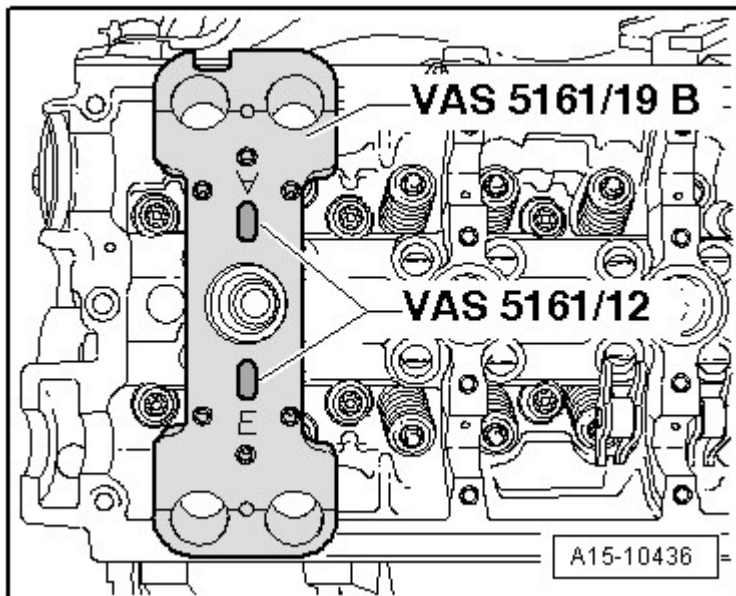
**Fig. 167: Disconnecting Electrical Harness Connector For Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - 2 - for Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130 and free up wire.

**NOTE:**

- In the illustration, the electrical harness connector is depicted as installed.
- Ignore - 1 -.



**Fig. 168: Removing Bolt At Right Bracket For Front Exhaust Pipe**

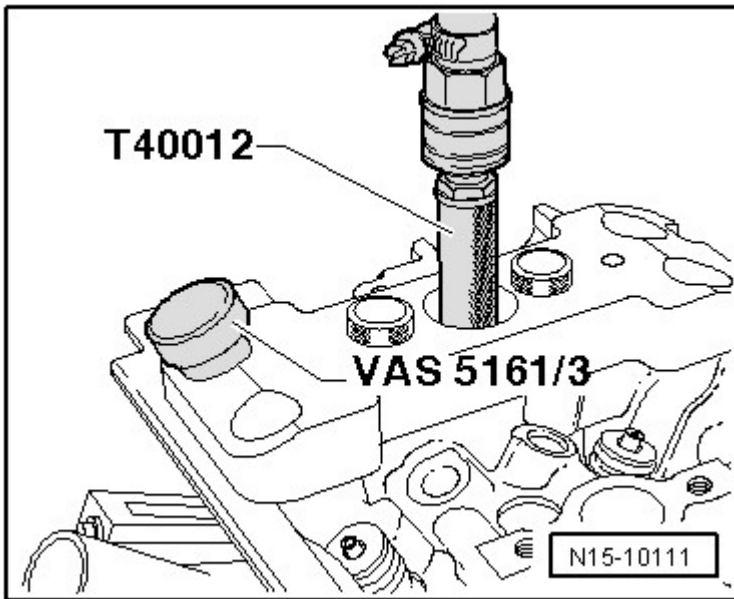
Courtesy of VOLKSWAGEN UNITED STATES, INC.



- Remove bolt - 1 - at right bracket for front exhaust pipe.

**NOTE:**

- Ignore - 2 -.

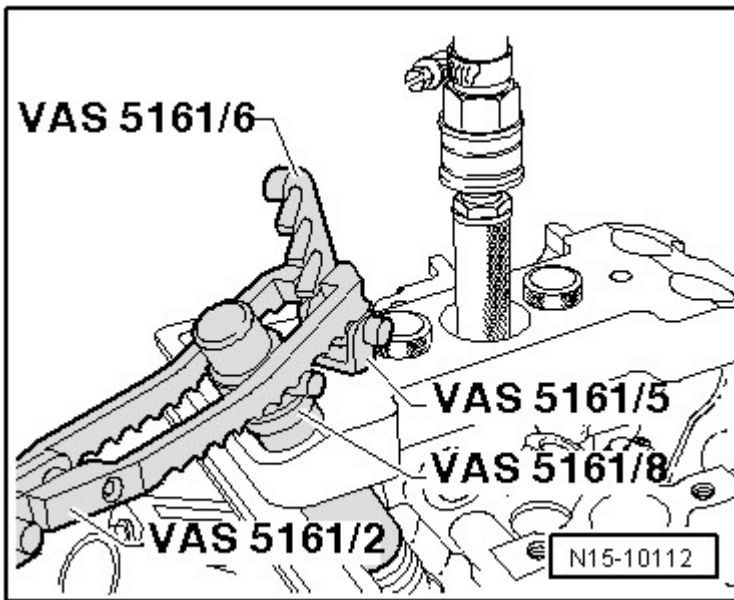


**Fig. 169: Removing Nuts & Right Front Exhaust Pipe With Catalytic Converter**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - 1 to 3 -.
- Remove right front exhaust pipe with catalytic converter.

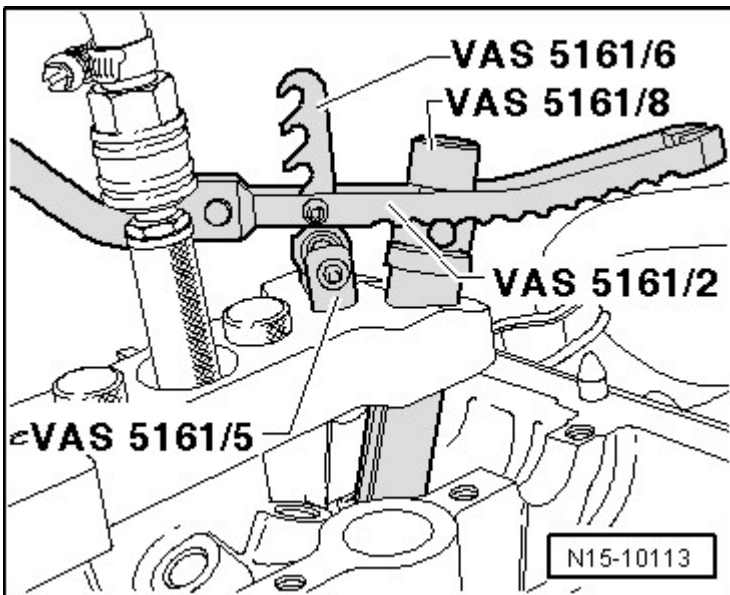
**NOTE:**

- Observe the rules of cleanliness for working on automatic transmissions --  
 >
  - 00 - GENERAL, TECHNICAL DATA for 5 SPD. AUTOMATIC TRANSMISSION 01V
  - 00 - GENERAL, TECHNICAL DATA for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING
  - 00 TECHNICAL DATA for AUTOMATIC TRANSMISSION 09L, FOUR-WHEEL DRIVE



**Fig. 170: Removing Bracket For ATF Lines On Oil Pan**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bracket - **arrow** - for ATF lines on oil pan.

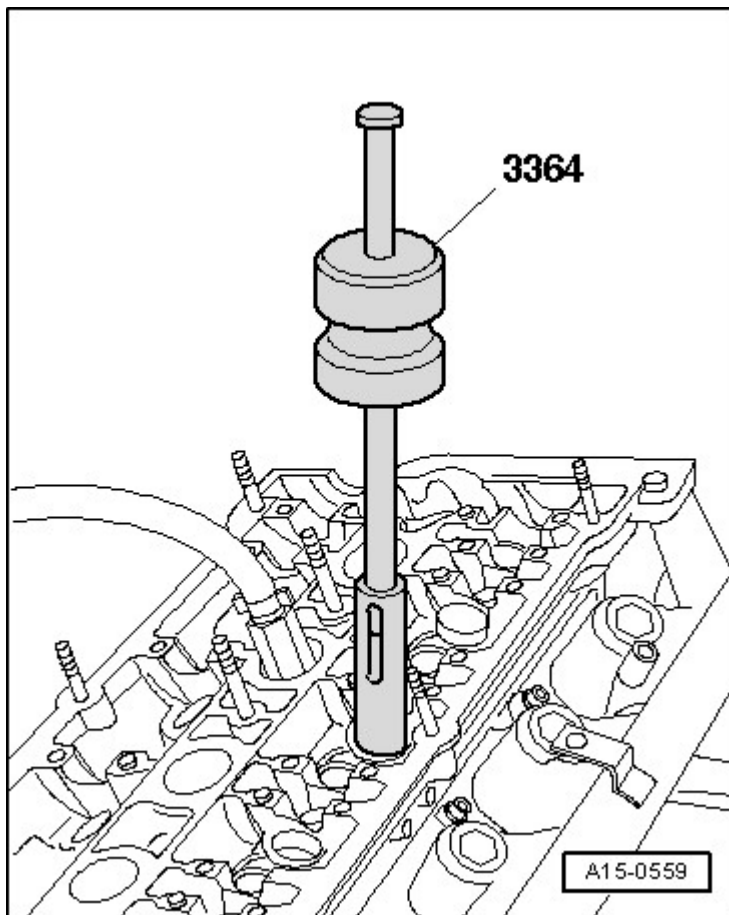


**Fig. 171: Removing Bracket For ATF Lines At Bottom On Transmission**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bracket - **arrow** - for ATF lines at bottom on transmission.

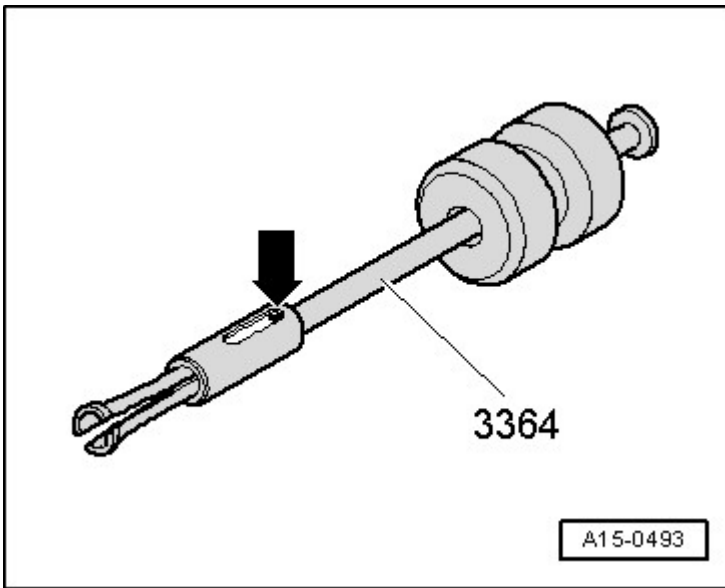
**NOTE:**

- Place a rag under the ATF lines to catch escaping ATF.



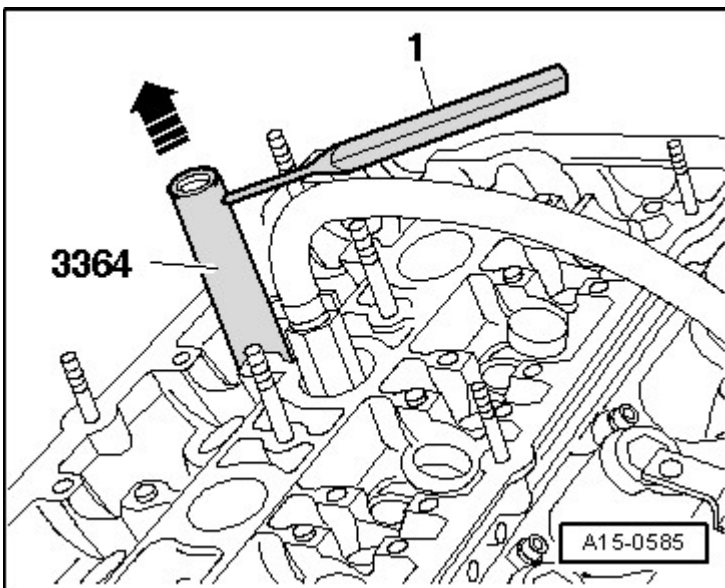
**Fig. 172: Removing Bolt & Disconnecting ATF Lines From Transmission**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - **arrow** -.
- Disconnect ATF lines from transmission.



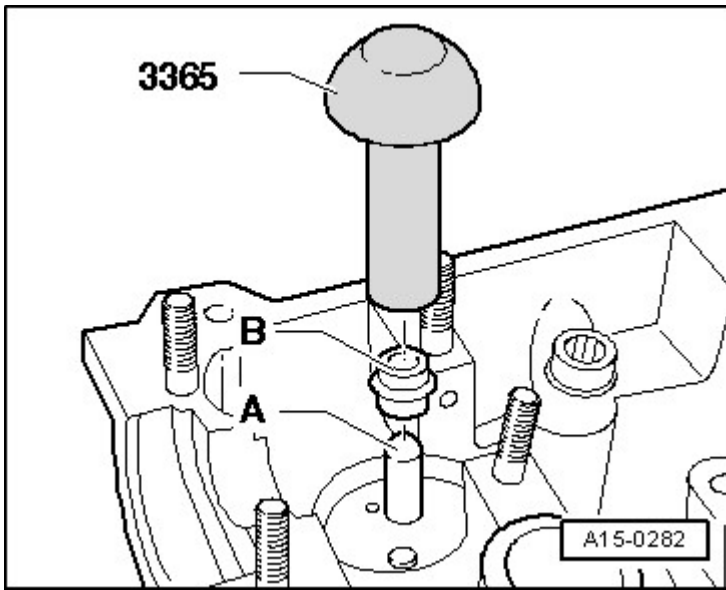
**Fig. 173: Disconnecting Electrical Connector On Engine Speed (RPM) Sensor G28**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **arrow** - on Engine Speed (RPM) Sensor G28.



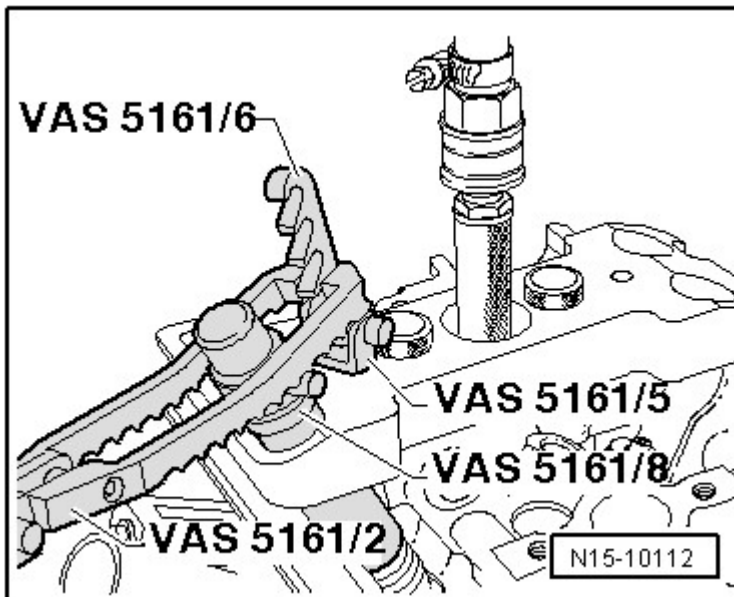
**Fig. 174: Disconnecting Electrical Harness Connector On Transmission**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector on transmission, to do this swing twist lock counterclockwise - **arrow** -.



**Fig. 175: Disconnecting Electrical Harness Connector At Right Engine Mount**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

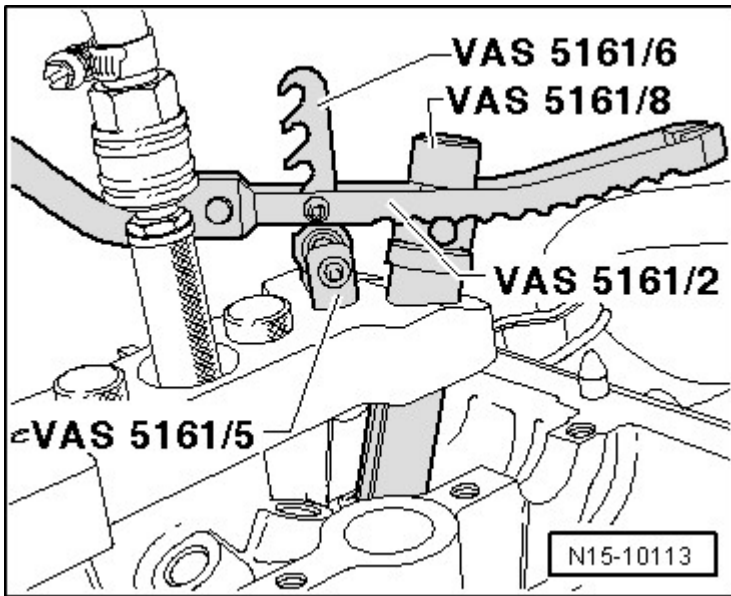
- Disconnect electrical harness connector - **1** - at right engine mount.
- Remove bolts - **arrows** - and remove right engine mount.



**Fig. 176: Disconnecting Electrical Wires On Starter, Removing Bolts & Starter**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

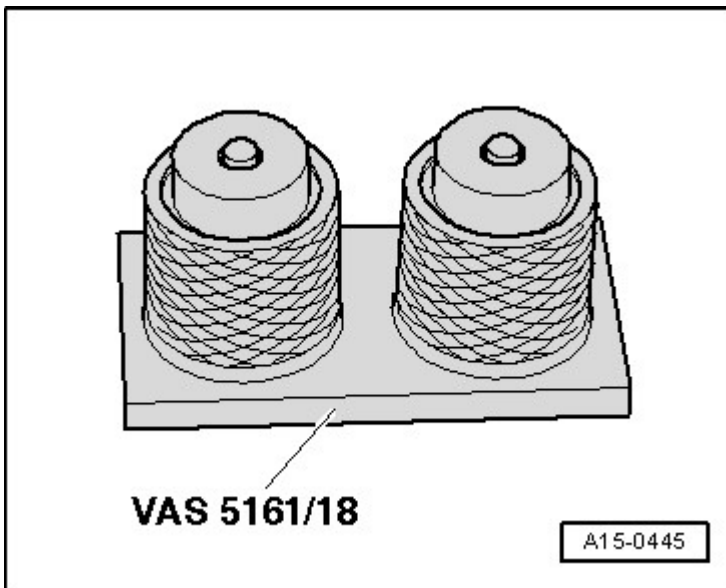
- Disconnect electrical wires - **2** - and - **3** - on starter.
- Remove bolts - **1** - and - **4** - and remove starter.





**Fig. 177: Inserting Guide Pin Of Adapter T40058 So That Large Diameter Points To Engine**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert guide pin of adapter T40058 so that large diameter - **arrow 1** - points to engine. Small diameter - **arrow 2** - points to adapter.

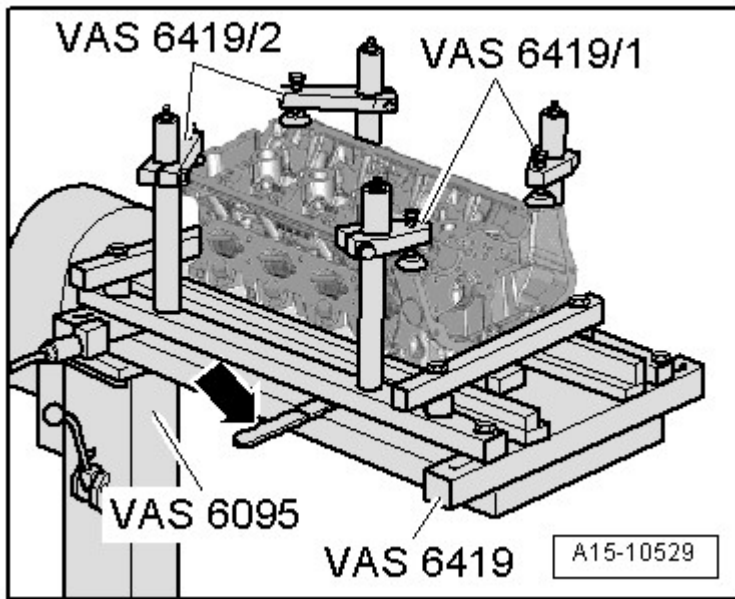


**Fig. 178: Loosening Torque Converter Bolts Using Adapter T40058**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- To loosen torque converter bolts, counter hold crankshaft using adapter T40058.

**NOTE:**

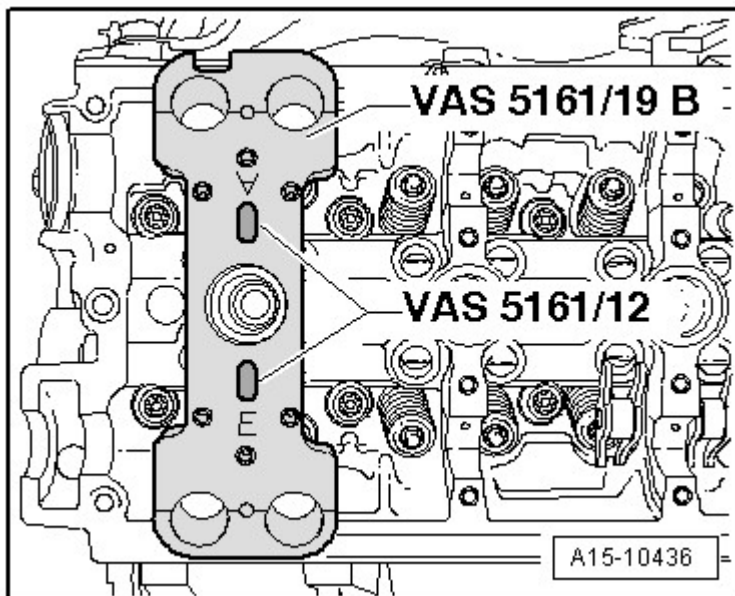
- Disregard - arrow -.



**Fig. 179: Torque Converter Bolts**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

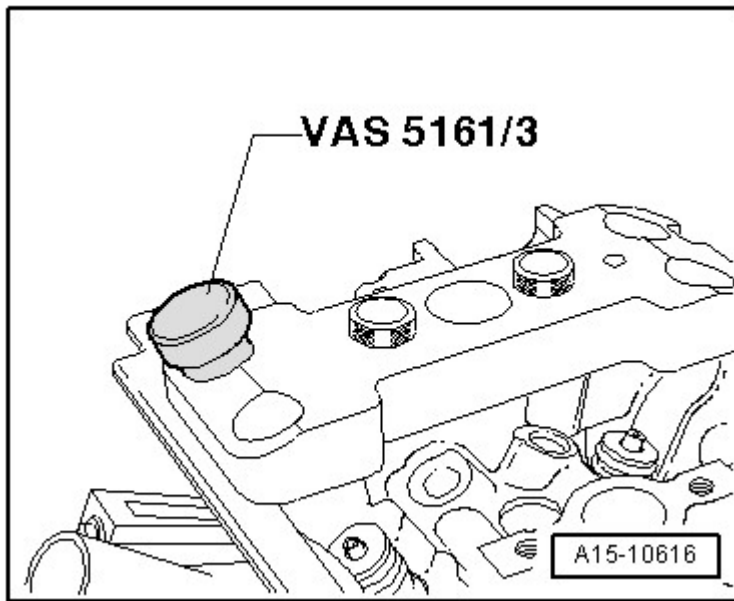
- Remove 3 bolts - **arrow** - of torque converter in opening of removed starter (turn crankshaft  $\frac{1}{3}$  rotation in each case).



**Fig. 180: Identifying Engine/Transmission Threaded Connections**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

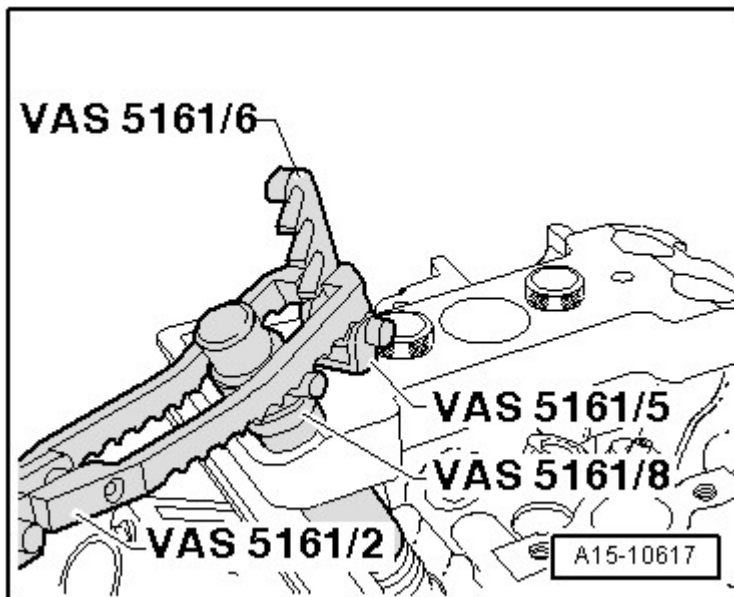
- Remove engine/transmission threaded connections - **3 to 10** -.



**Fig. 181: Loosening Clamping Bolts On Side Of Scissor Lift Table VAS 6131 And Pull Rear Table Section With Transmission Rearward**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen side clamping screws - **1** - on scissor lift platform VAS 6131 and pull rear platform top with transmission toward rear - **arrow** - , simultaneously push torque converter through opening of drive plate.
- Secure torque converter in transmission to prevent it from falling out.

Engine, securing to assembly stand



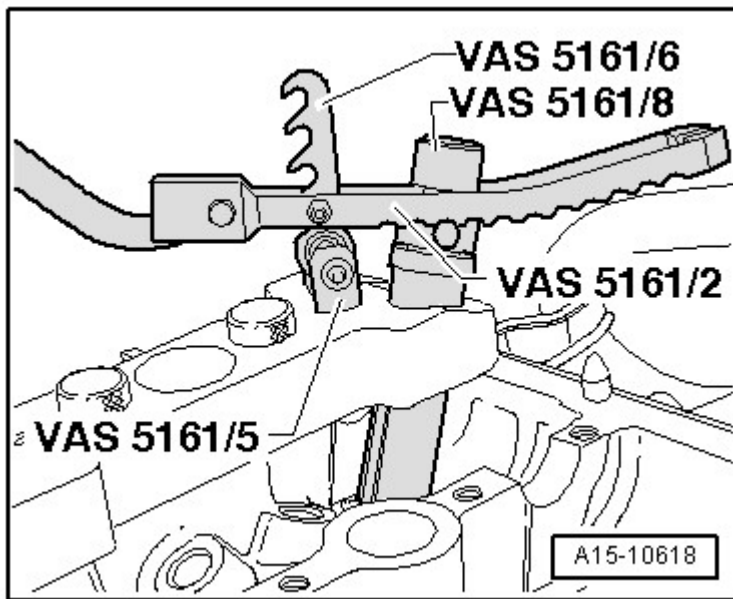
**Fig. 182: Identifying Special Tools - Engine, Securing To Assembly Stand**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

**Special tools, testers and auxiliary items required**

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

**Work procedure**

- Engine separated from transmission.



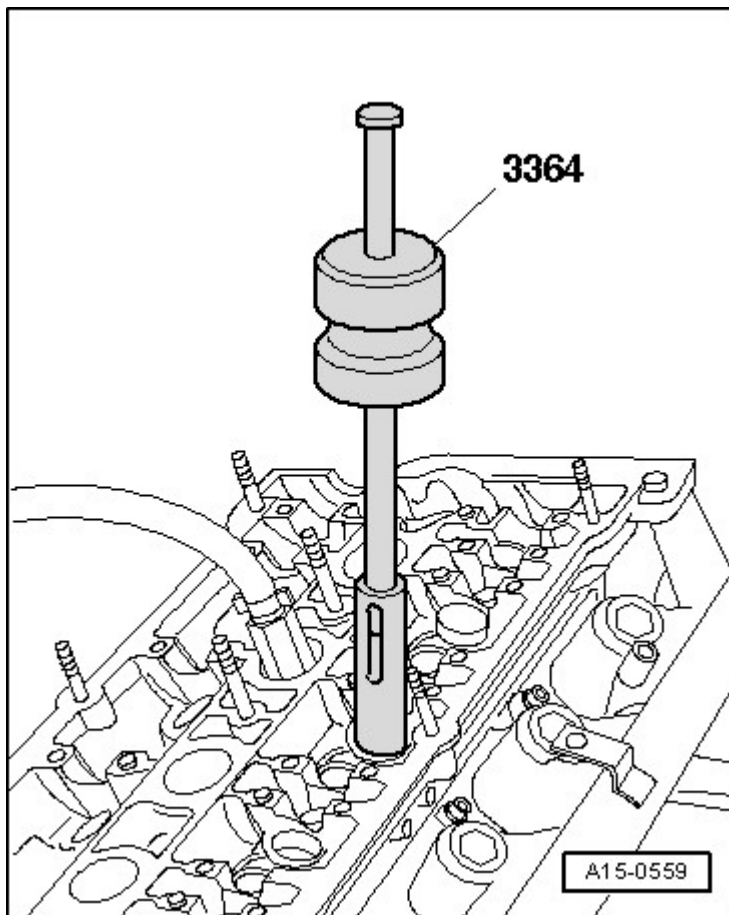
**Fig. 183: Hooking Engine Sling 2024 A Onto Engine And Onto Workshop Crane VAS 6100 With Lift Arm Extension For Workshop Crane VAS 6101**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hook engine sling 2024 A onto engine and onto workshop crane VAS 6100 with lift arm extension for workshop crane VAS 6101 as shown in the illustration.

**NOTE:**

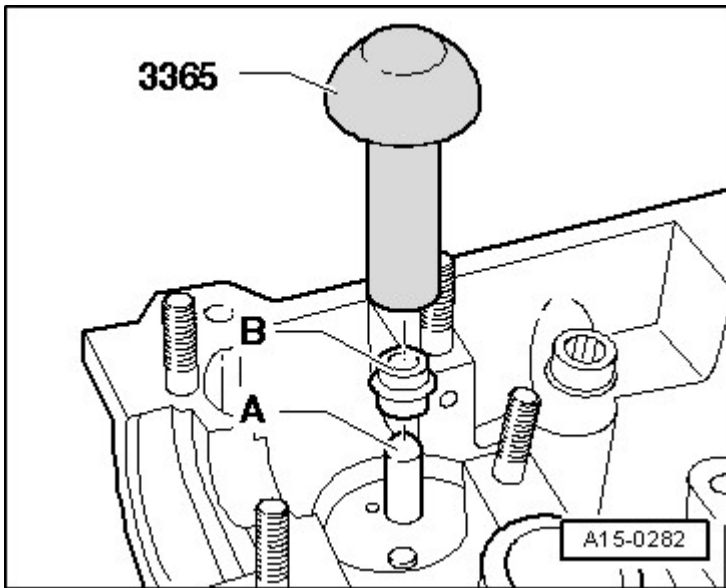
- To be aligned to the center of gravity of the engine assembly, the hole rails of the lifting hook must be inserted as shown in the illustration.

**CAUTION:** Lifting hooks and alignment pins on the engine sling must be secured with securing pins - arrows -.



**Fig. 184: Removing Bolts And Left/Right Engine Support**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - **1** - at left engine mount.
- Remove bolts - **arrows** - and remove left engine mount.



**Fig. 185: Securing Engine On Engine And Transmission Holder VAS 6095 With Bracket For V6 FSI Engine VAS 6095/1-5**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure engine on Engine and Transmission Holder VAS 6095 with bracket for V6 FSI engine VAS 6095/1-5 as shown in illustration.

Engine, installing

#### Special tools, testers and auxiliary items required

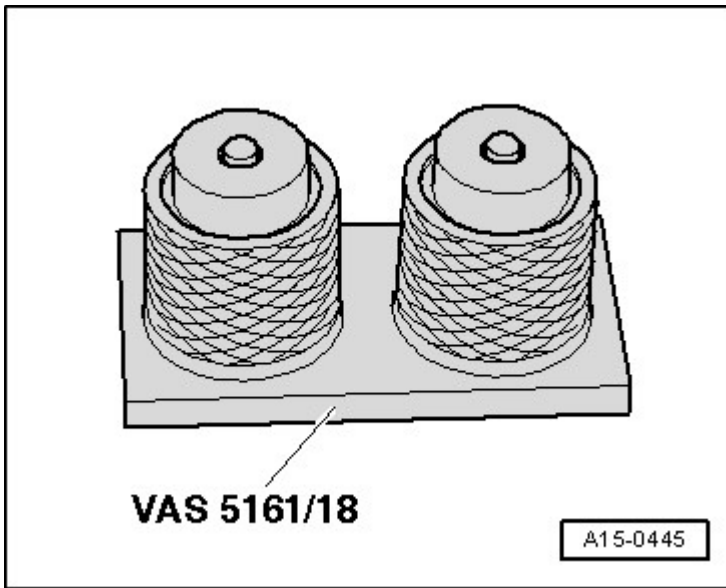
- Depth gauge

#### Work procedure

##### NOTE:

- During assembly, replace self-locking nuts and bolts.
- Always replace bolts that are tightened to torque as well as sealing rings, gaskets and O-rings.
- Secure all hose connections using hose clamps appropriate for the model type .
- During installation, all cable ties must be re-installed at the same location.



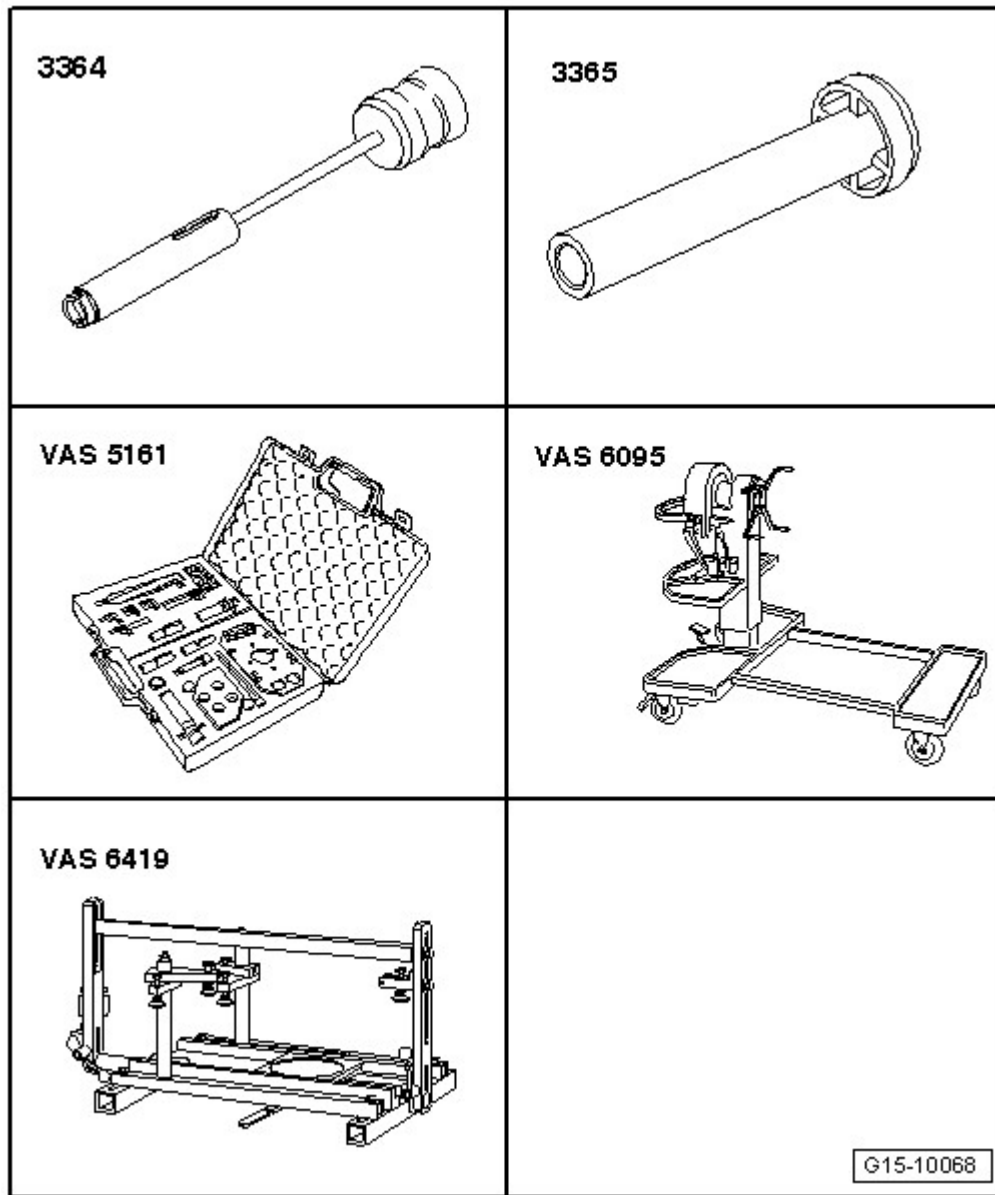


**Fig. 186: Checking Torque Converter Is Correctly Positioned**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installation dimension for torque converter, checking

When torque converter is installed correctly, distance between contact surface of threaded holes at torque converter and contact surface of converter housing on Automatic Transmission 09L is approx. 19 mm.

**CAUTION:** If torque converter is incorrectly installed, torque converter coupling and ATF pump could be damaged when transmission and engine are flanged together.

**Fig. 187: Torque Converter Bolts**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

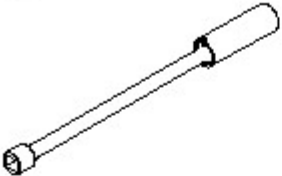
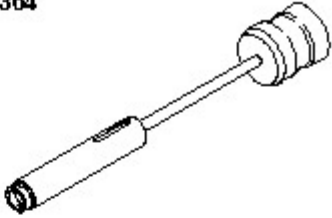
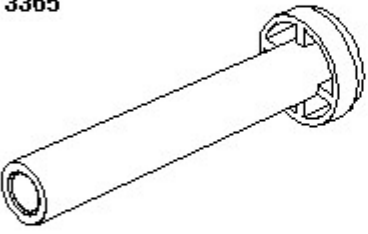
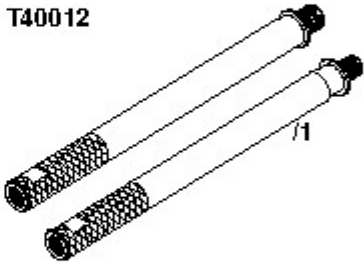
- Before connecting engine and transmission, rotate torque converter and engine drive plate so that one hole or one threaded hole stands at height of opening of removed starter - **arrow** -.
- To secure torque converter to drive plate, use new original ribbed bolts .
- Make sure centering sleeves for engine to transmission are installed in cylinder block. Install if necessary.
- Install intermediate plate between engine and transmission onto alignment bushings.
- Bolt transmission to engine.

**CAUTION:** Keep checking whether the torque converter behind the drive plate can be turned before and during tightening of the bolts at engine/transmission

flange. If the torque converter cannot be turned, it must be assumed that it has not been inserted properly and that the coupling plate of the ATF pump and therefore the transmission will be destroyed during final tightening of the bolts.

**NOTE:**

- Torque specifications only apply to lightly greased, oiled, phosphated or blackened nuts and bolts.
- Additional lubricants, such as engine or transmission oil are permissible, although lubricants containing graphite are not.
- Do not use any degreased parts.
- Tolerance for torque specifications  $\pm 15\%$ .

|                                                                                                       |                                                                                                                     |
|-------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| <p>3122 B</p>        | <p>3364</p>                      |
| <p>3365</p>        | <p>T40012</p>                   |
| <p>V.A.G 1331</p>  | <p>VAS 5161</p>  <p>W15-0189</p> |

**2007 Audi A6**

ENGINE 3.2 V6 4V Engine Mechanical, Engine Code(s): BKH

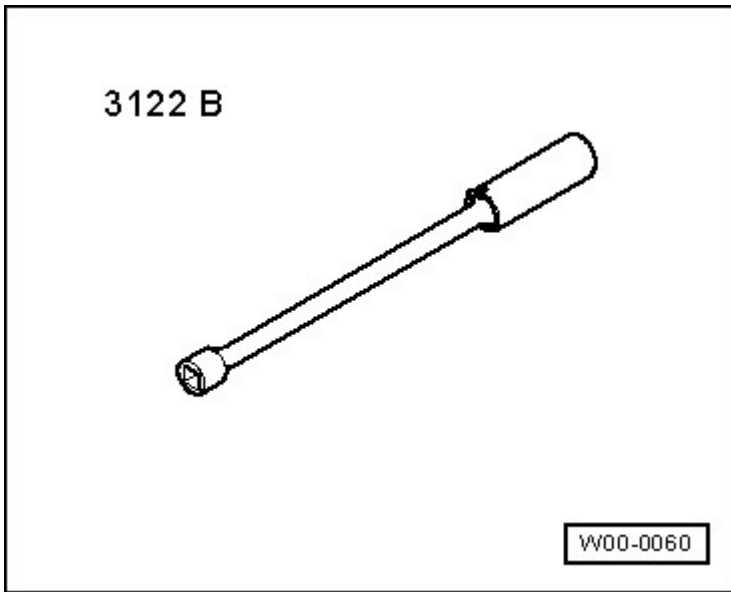
**Fig. 188: Identifying Engine/Transmission Threaded Connections**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

**Engine/transmission, fastening**

| Item                             | Bolt                            | Nm               |
|----------------------------------|---------------------------------|------------------|
| 1                                | M10x115                         | 65 <sup>1)</sup> |
| 2, 6                             | M12x125                         | 65               |
| 3, 5                             | M12x110                         | 65               |
| 4                                | M12x115                         | 65               |
| 7                                | M12x140                         | 65               |
| 8, 9, 10                         | M10x80                          | 45               |
| A                                | Alignment sleeves for centering |                  |
| • <sup>1)</sup> Bolt class 10.9. |                                 |                  |

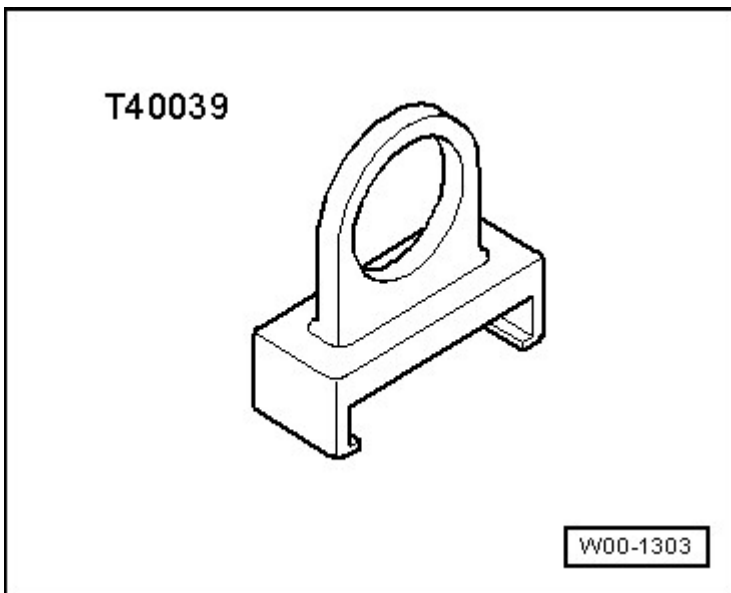
- Fasten ATF lines -->
  - **37 - AUTOMATIC TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. AUTOMATIC TRANSMISSION 01V
  - **37 - AUTOMATIC TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING
  - **37 CONTROLS, HOUSING** for AUTOMATIC TRANSMISSION 09L, FOUR-WHEEL DRIVE
- Install front exhaust pipes: Left --> **Left front exhaust pipe with catalytic converter (vehicles with automatic transmission 09L), removing and installing** ; right --> **Right front exhaust pipe with catalytic converter (vehicles with automatic transmission 09L), removing and installing**.
- Vehicles with all wheel drive: Always clean threaded drive shaft bores in transmission flanged shaft of locking fluid residue using a tap before installation.
- Rotate attachment spindles at left of engine/transmission assembly downward.



**Fig. 189: Positioning/Removing Support Elements From VAS 6131/10 And VAS 6131/12 At Left On Engine**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove base plate for left support element on scissor lift platform VAS 6131.



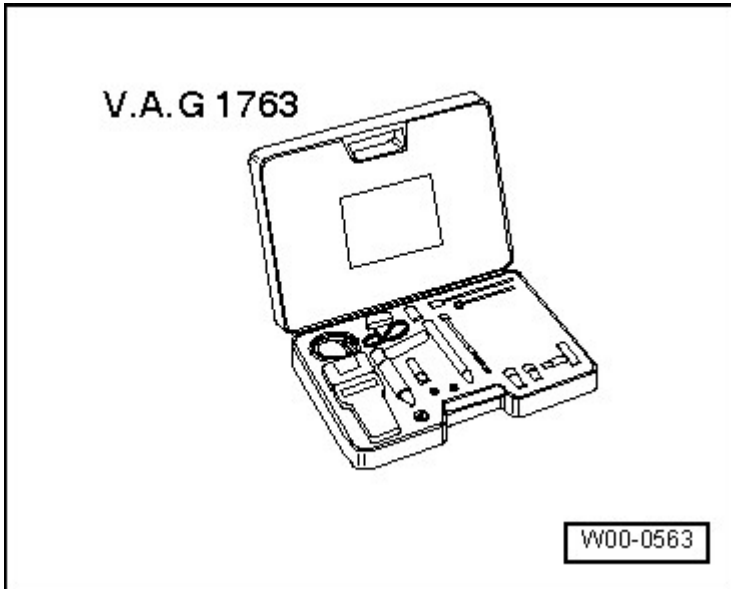
**Fig. 190: Removing Base Plate For Right Support Element On Scissor Lift Platform VAS 6131**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Rotate attachment spindles at right of engine/transmission assembly downward.
- Turn spindle of right support element on engine downward.
- Remove base plate for right support element on scissor lift platform VAS 6131.

**NOTE:**

- The support points for front of engine and rear of transmission remain unchanged.

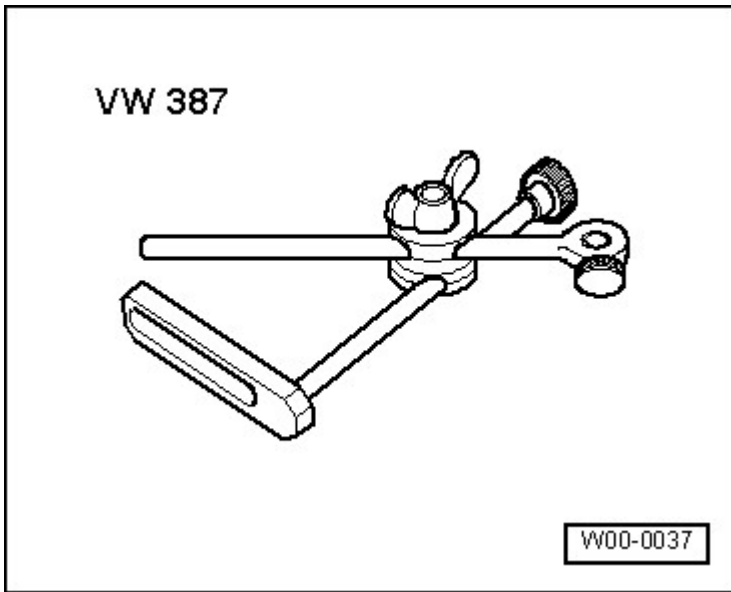


**Fig. 191: Identifying Scissor Lift Platform VAS 6131**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Equip scissor lift platform VAS 6131 with support set for Audi VAS 6131/10 as follows:

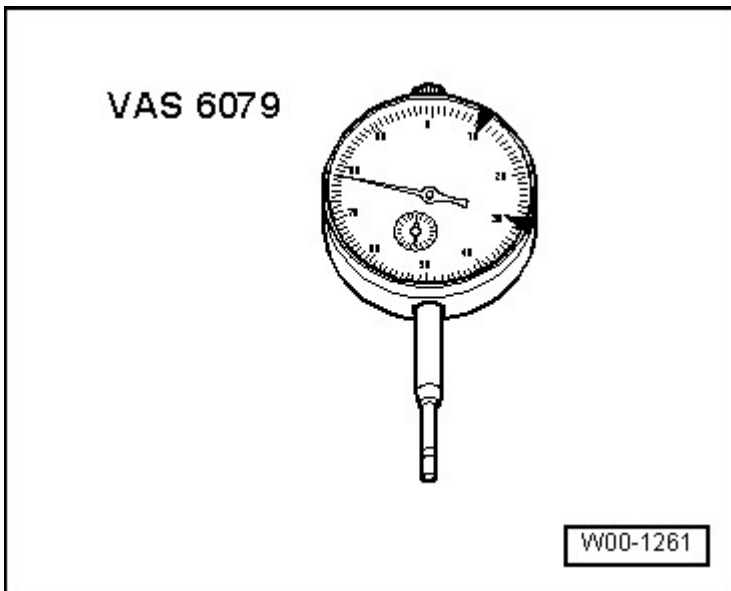
| Platform coordinates                                                                                                                                                                       | Parts of support set for Audi VAS 6131/10 |       |       |                     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|-------|-------|---------------------|
| B4 <sup>1)</sup>                                                                                                                                                                           | /10-1                                     | /10-4 | /10-5 | /10-11              |
| G4 <sup>1)</sup>                                                                                                                                                                           | /10-1                                     | /10-4 | /10-5 | /10-12              |
| B11                                                                                                                                                                                        | /10-1                                     | /10-2 | /10-5 | /10-8 <sup>2)</sup> |
| G11                                                                                                                                                                                        | /10-1                                     | /10-2 | /10-5 | /11-8 <sup>2)</sup> |
| D15 <sup>1)</sup>                                                                                                                                                                          | /10-1                                     | /10-3 | /10-5 | /10-12              |
| F15 <sup>1)</sup>                                                                                                                                                                          | /10-1                                     | /10-3 | /10-5 | /10-12              |
| <ul style="list-style-type: none"> <li>• <sup>1)</sup> The support elements remain unchanged.</li> <li>• <sup>2)</sup> Only install support elements after installing subframe.</li> </ul> |                                           |       |       |                     |





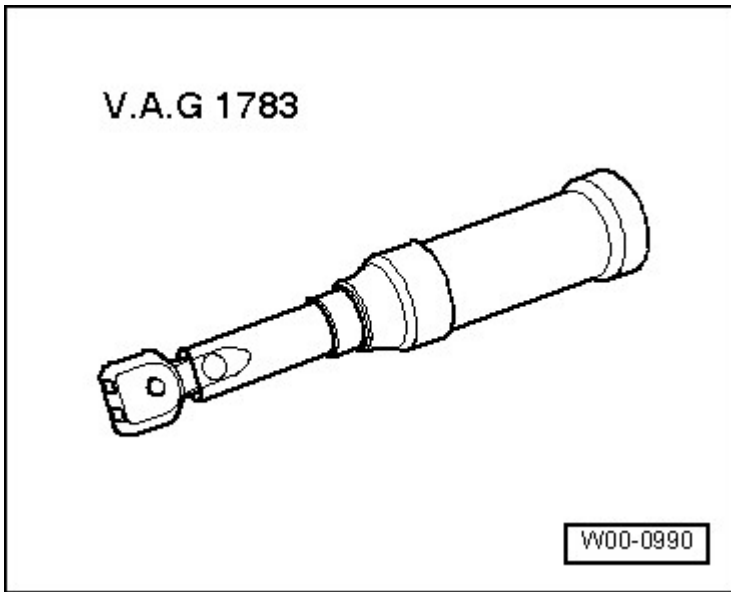
**Fig. 192: Positioning Support Elements From VAS 6131/10 At Left/Right On Subframe**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position subframe on both attachments VAS 6131/10-8.
- Twist spindles of support elements upward on both sides.



**Fig. 193: Removing Bolts For Left/Right Transmission Mount**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

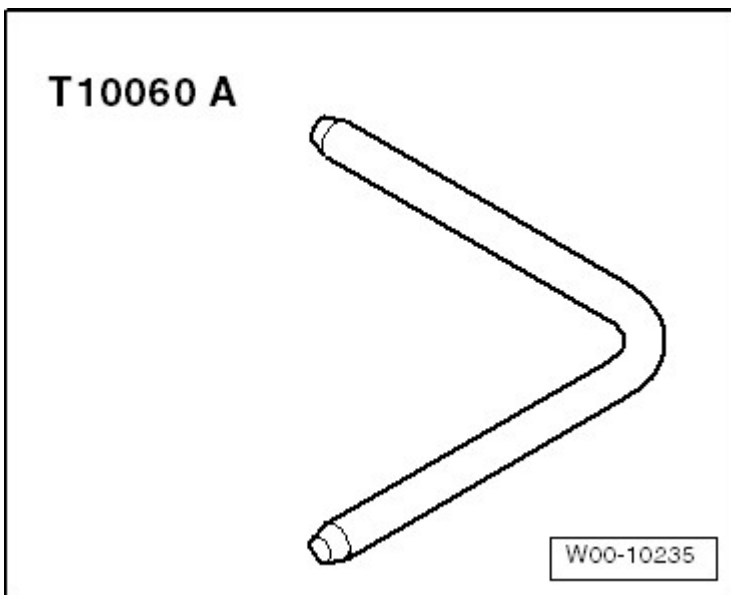
- Fasten transmission mount to subframe - **arrows** -.



**Fig. 194: Lowering Engine/Transmission Assembly Using Scissor Lift Platform VAS 6131 Only Approx. By Dimension**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

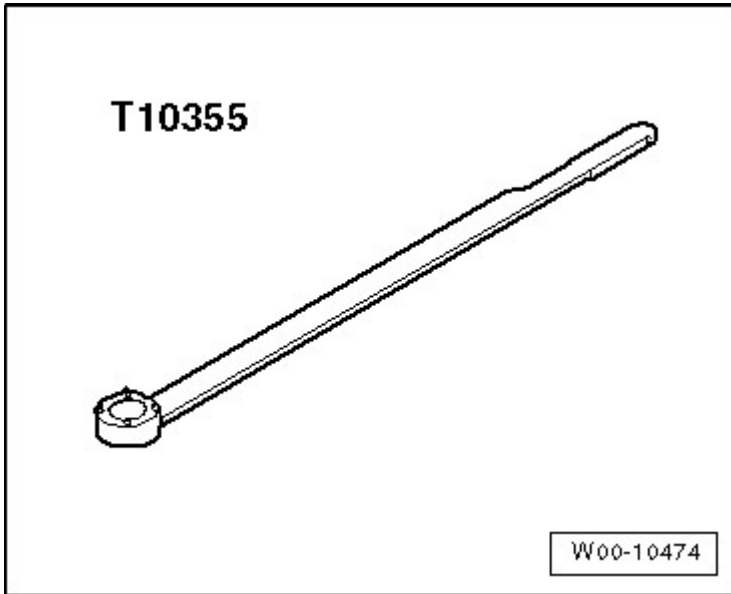
- Carefully guide engine/transmission assembly from below into body using Scissor Lift Table VAS 6131 far enough so distance between subframe and body is dimension - a -.
- Dimension - a - = 80 mm.
- Place torque support with torque support stop between lock carrier and engine.



**Fig. 195: Pressing Ball Socket Of Selector Lever Cable From Selector Shaft Lever & Removing Bracket On Transmission**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press ball socket - 1 - of selector lever cable onto selector shaft lever.
- Install mounting bracket according to marking on transmission - **arrows** -.
- Insert drive axles into spines of left and right wheel bearing housings.

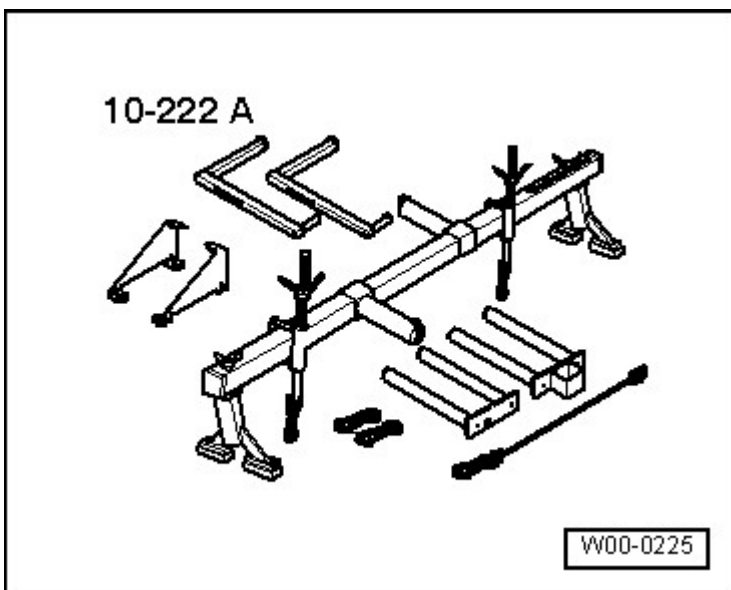


**Fig. 196: Removing Nuts For Fastening Link And Guide Link**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosely bolt guide link - 1 - and link - 2 - to subframe.

**NOTE:**

- Bolts must first be tightened once the vehicle is sitting on its wheels on the floor.



**Fig. 197: Removing/Installing Bolts In Diagonal Sequence And In Stages**

**Courtesy of VOLKSWAGEN UNITED STATES, INC.**

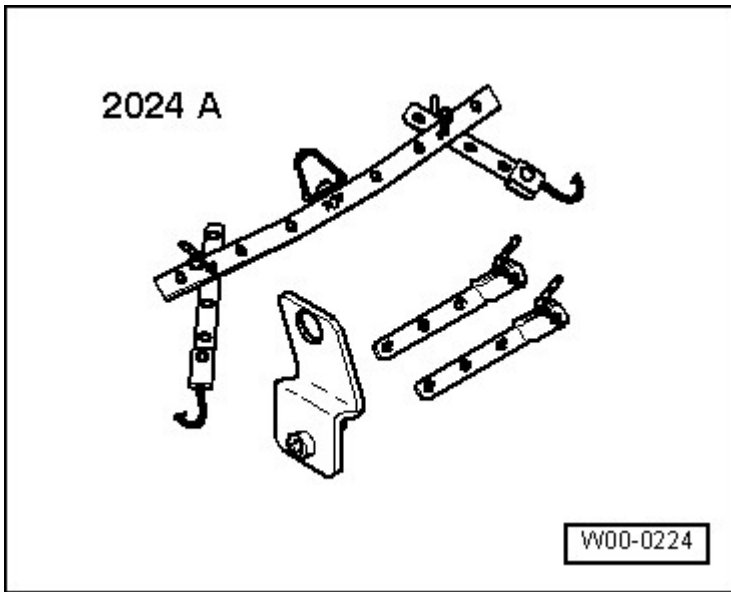
- Align subframe according to markings on longitudinal members made during removal.
- Tighten bolts for subframe and engine mount plates only to specified torque. Do not tighten further (tighten bolts only after axle alignment).

1. 65 Nm
2. 110 Nm
3. 110 Nm
4. 75 Nm

**CAUTION: Vehicle must not be driven in this condition.**

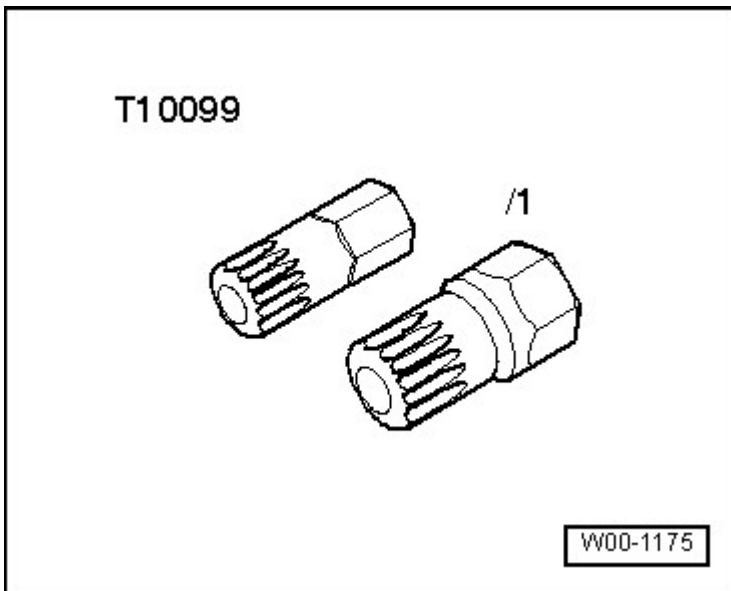
The rest of installation is in reverse order of removal, note the following:

- Install drive shaft -->
  - **39 - FINAL DRIVE, DIFFERENTIAL** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING
  - **39 FINAL DRIVE, DIFFERENTIAL** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
  - **39 FINAL DRIVE, DIFFERENTIAL** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
  - **39F - FRONT FINAL DRIVE, DIFFERENTIAL** for 6 SPD. MANUAL TRANSMISSION 0A3 ALL WHEEL DRIVE, INTERNAL COMPONENT SERVICING
  - **39 FINAL DRIVE, DIFFERENTIAL** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE
- Align exhaust system free of tension --> **Exhaust system, installing free of tension.**
- Install refrigerant lines --> **87 AIR CONDITIONING** .
- Install vacuum pump for brake booster --> **Vacuum pump for brake booster, removing and installing.**
- Install drive axles --> **40 - FRONT SUSPENSION** .
- Install guide link, stabilizer bar and suspension strut --> **40 - FRONT SUSPENSION** .



**Fig. 198: Removing/Installing Bolts For Torque Support**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten bolts - **arrows** - for torque support.



**Fig. 199: Removing/Installing Bolts At Torque Support Stop**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place torque support on rubber buffer for torque support and tighten bolts - **arrows** -.
- Electrical connections and routing --> Electrical Wiring Diagrams, Troubleshooting and Component Locations.
- Observe safety precautions after connecting battery --> **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL** .

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

- Mount wiper arms and adjust --> **92 WINDSHIELD WIPER WASHER SYSTEM** .
- Check selector lever cable adjustment -->
  - **37 - AUTOMATIC TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. AUTOMATIC TRANSMISSION 01V
  - **37 - AUTOMATIC TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING
  - **37 CONTROLS, HOUSING** for AUTOMATIC TRANSMISSION 09L, FOUR-WHEEL DRIVE
- Check oil level --> **Oil level, checking.**
- Bleed fuel system --> **24 - FUEL INJECTION SYSTEM** .
- Fill with coolant --> **Cooling system, draining and filling.**

**NOTE:**

- Only reuse drained coolant if cylinder head or engine block was not replaced.
- Dirty coolant must not be re-used.

- Fill power steering system oil and bleed steering system --> **48 - STEERING** .
- Check ATF level -->
  - **37 - AUTOMATIC TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. AUTOMATIC TRANSMISSION 01V
  - **37 - AUTOMATIC TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING
  - **37 CONTROLS, HOUSING** for AUTOMATIC TRANSMISSION 09L, FOUR-WHEEL DRIVE
- Align subframe and both engine mount plates --> **40 - FRONT SUSPENSION** .
- Perform axle alignment --> **44 - WHEELS, TIRES, VEHICLE ALIGNMENT** .

**CAUTION:** After axle alignment, tighten subframe bolts to final torque.

- Fill refrigerant circuit Refrigerant R134a - Servicing.

**Torque specifications**

**NOTE:**

- Torque specifications only apply to lightly greased, oiled, phosphated or



**2007 Audi A6**

ENGINE 3.2 V6 4V Engine Mechanical, Engine Code(s): BKH

blackened nuts and bolts.

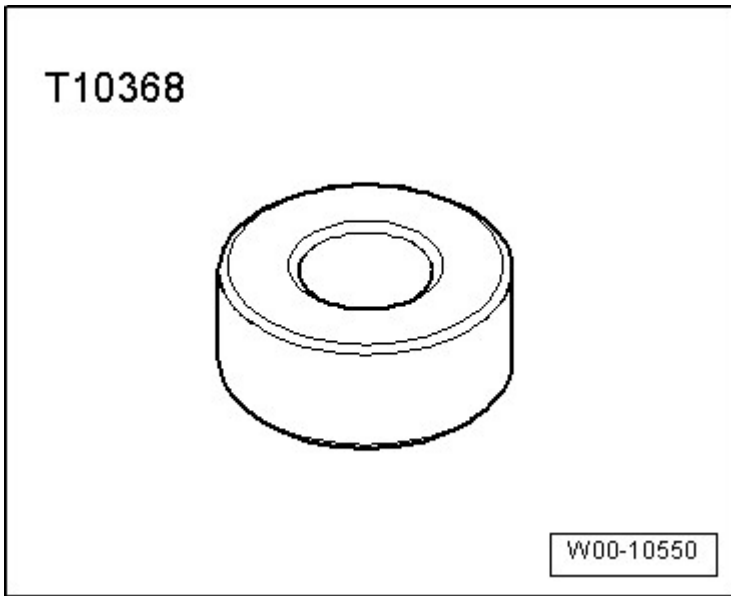
- Additional lubricants, such as engine or transmission oil are permissible, although lubricants containing graphite are not.
- Do not use any degreased parts.
- Tolerance for torque specifications  $\pm 15\%$ .

| Component                                      |     | Nm               |
|------------------------------------------------|-----|------------------|
| Bolts/nuts                                     | M6  | 9                |
|                                                | M8  | 20               |
|                                                | M10 | 40               |
|                                                | M12 | 65               |
| Exceptions:                                    |     |                  |
| Drive plate to torque converter                |     | 85 <sup>1)</sup> |
| Clamp B+ to starter                            |     | 16               |
| Engine support to cylinder block               |     | 40               |
| Transmission mount to subframe                 |     | 23               |
| Engine mount plate to longitudinal member      |     | 75               |
| Engine mount to engine mount plate             |     | 23               |
| Heat shield for drive axle to transmission     |     | 23               |
| Torque bracket to engine                       |     | 40               |
| Torque support stop to lock carrier            |     | 28               |
| Hydraulic pressure line to power steering pump |     | 47               |
| Fuel hose to fuel line                         |     | 22               |
| Hose clamps 9 mm wide                          |     | 3                |
| • <sup>1)</sup> Replace bolts.                 |     |                  |

## 13 - ENGINE - CRANKSHAFT, CYLINDER BLOCK

### BELT PULLEY SIDE, SERVICING

#### Ribbed belt drive, component overview



**Fig. 200: Ribbed Belt Drive, Component Overview**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Ribbed belt

- Check for wear
- Before removing, mark direction of rotation using chalk or felt-tip marker. Reversing direction of rotation of a run-in belt can destroy belt
- Removing and installing --> **Ribbed belt, removing and installing**
- When installing, make sure it is seated correctly on pulleys

2 - 30 Nm

3 - 22 Nm

4 - Generator

- Removing and installing --> **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL**

5 - Cap for idler pulley

6 - Idler roller for ribbed belt

- Tighten to 40 Nm

7 - 20 Nm

8 - Ribbed belt pulley for coolant pump

9 - 9 Nm

## 10 - Coolant pump

- Removing and installing --> **Coolant pump, removing and installing**

## 11 - Cap for tensioning element

## 12 - Tensioning element for ribbed belt

- Tighten to 40 Nm

## 13 - 20 Nm

## 14 - 20 Nm

## 15 - Bracket for power steering pump

## 16 - 20 Nm

## 17 - Power steering pump

- Removing and installing --> **48 - STEERING**

## 18 - 20 Nm

## 19 - Belt pulley for power steering pump

- Identification: "Vorne/Front"

## 20 - 20 Nm

## 21 - 25 Nm

## 22 - Air conditioner compressor

- Removing and installing --> **87 AIR CONDITIONING**

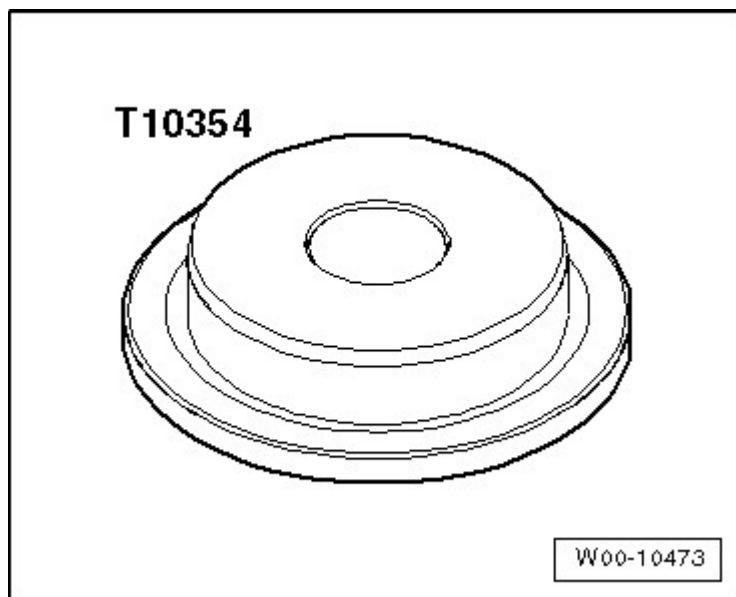
## 23 - Alignment bushing

- 2 pieces

## 24 - Bracket for air conditioning compressor

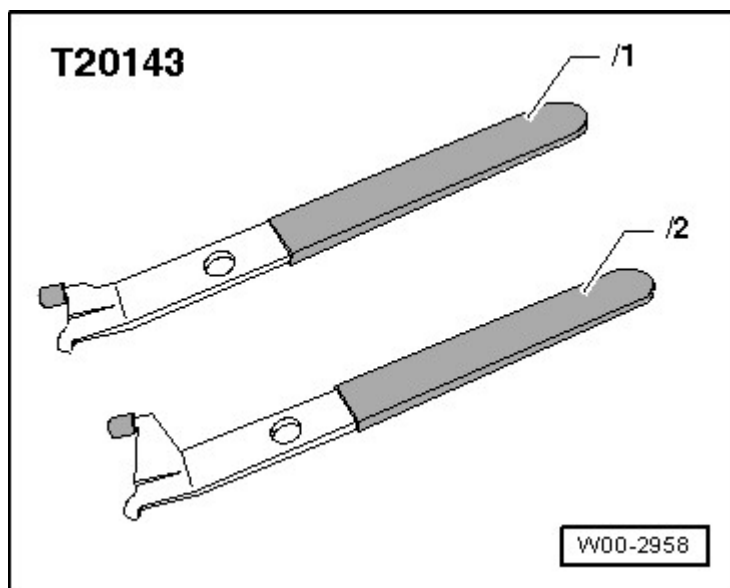
## 25 - Vibration damper

- With belt pulley for ribbed belt
- Removing and installing --> **Vibration damper, removing and installing**

**Ribbed belt, removing and installing****Removing**

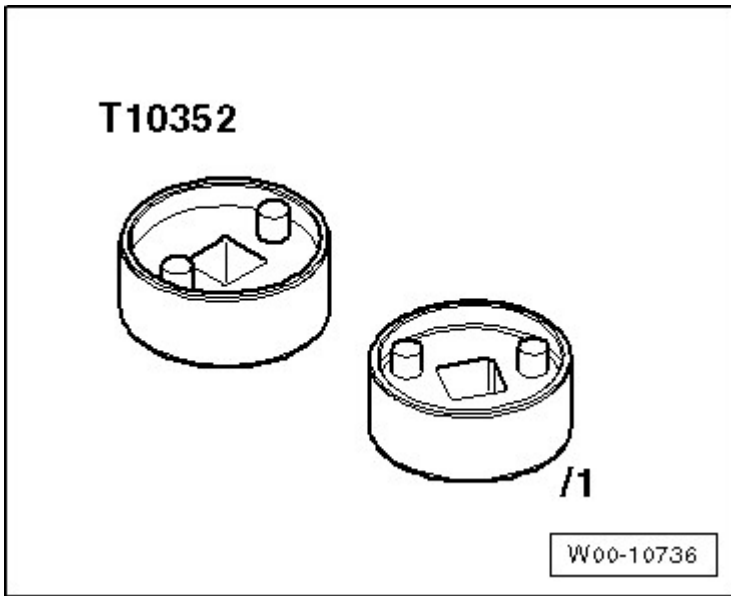
**Fig. 201: Identifying Front Engine Cover**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front engine cover - **arrows** -.



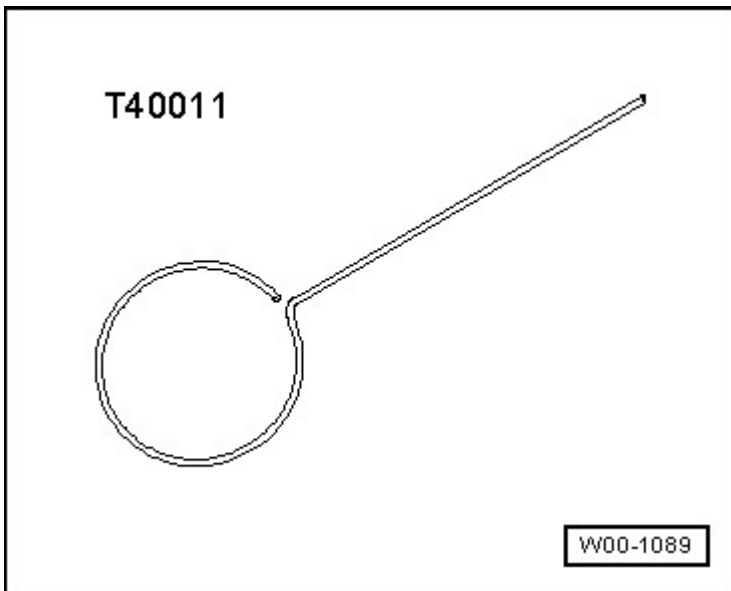
**Fig. 202: Identifying Bolts & Air Duct**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Remove air duct - **1** - and - **2** -.



**Fig. 203: Locating Fasteners Exhaust Pipe**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- For vehicles with auxiliary heater, remove bolts - **arrows** - for exhaust pipe of parking heater/auxiliary heater on noise insulation.



**Fig. 204: Identifying Quick-Release Fasteners And Noise Insulation**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen quick-release fasteners - **1** - and - **2** - and remove front noise insulation. Rear section of noise insulation remains installed.
- Remove front bumper cover -->
  - **63 BUMPER**

- **63 - BUMPERS** for BODY EXTERIOR - CABRIOLET

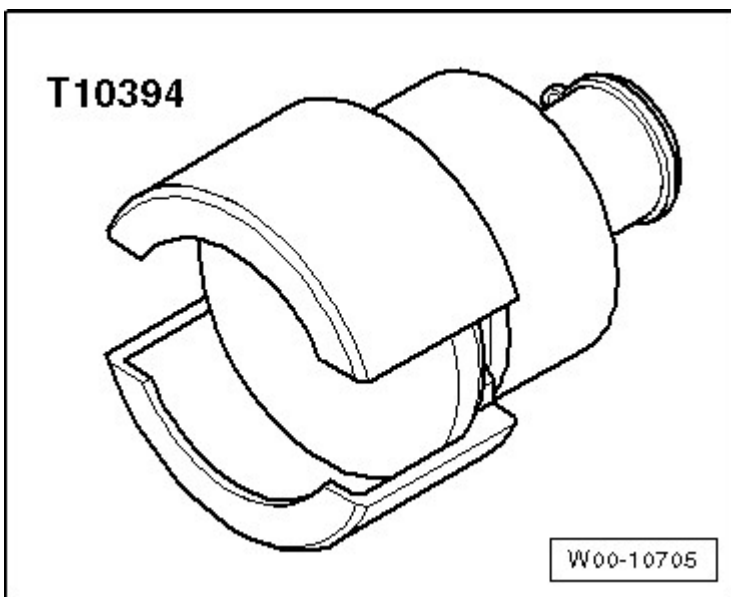
- Bring lock carrier into service position -->

- **50 BODY, FRONT**

- **50 - BODY - FRONT** for BODY EXTERIOR - CABRIOLET

**NOTE:**

- Before removing ribbed belt, mark the turning direction on it with chalk or a felt tip pen. A reversed turning direction can cause damage to the belt under operating conditions.



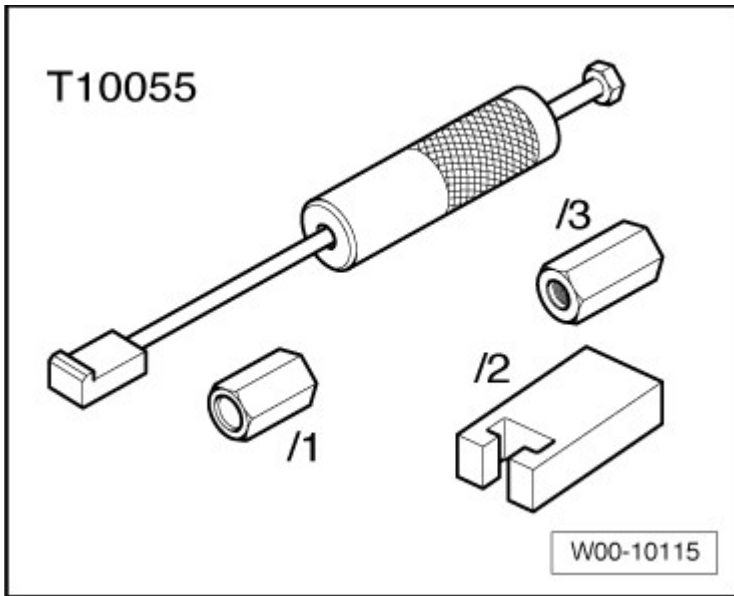
**Fig. 205: Pivoting Tensioning Device To Relieve Tension On Ribbed Belt**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pivot tensioning device in direction of - **arrow** - to relieve tension on ribbed belt.
- Remove ribbed belt and release tensioning device.

**Installing**

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





**Fig. 206: Placing Ribbed Belt Over Belt Pulley**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place ribbed belt over belt pulley as shown in the illustration.
- Generator
- Idler roller
- Coolant pump
- Power steering pump
- Air conditioner compressor
- Tensioning device for ribbed belt
- Crankshaft

**NOTE:**

- **When installing the ribbed belt, make sure it is seated correctly on the pulleys.**

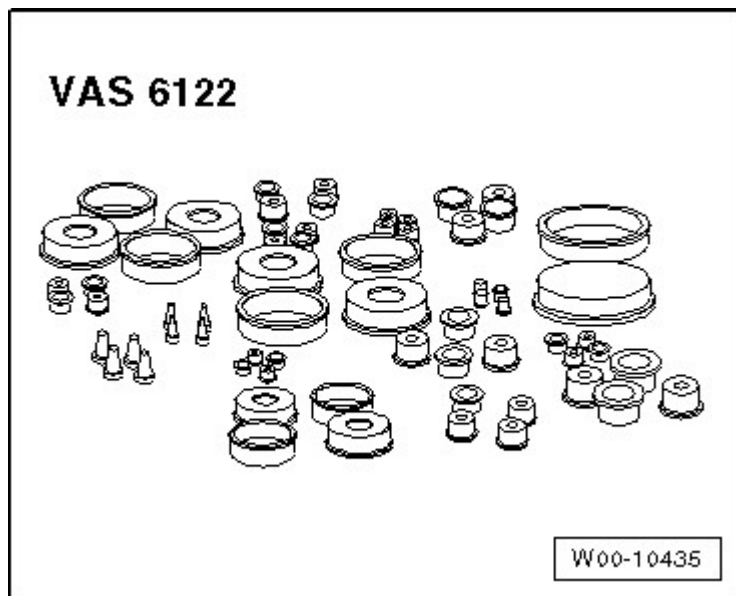
- Install lock carrier with attachments -->
  - **50 BODY, FRONT**
  - **50 - BODY - FRONT** for BODY EXTERIOR - CABRIOLET
- Start engine and check belt running.
- Install front bumper cover -->
  - **63 BUMPER**
  - **63 - BUMPERS** for BODY EXTERIOR - CABRIOLET

## Vibration damper, removing and installing

### NOTE:

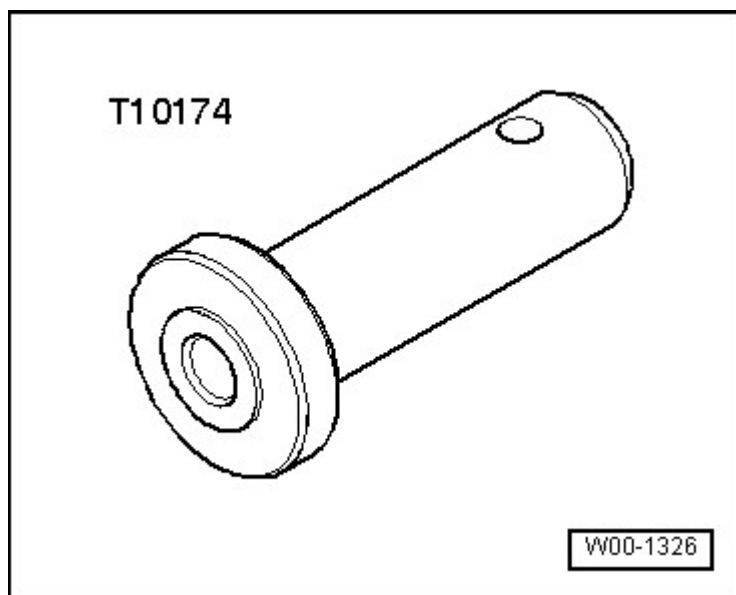
- Different vibration dampers are allocated to the various engine versions .

### Removing



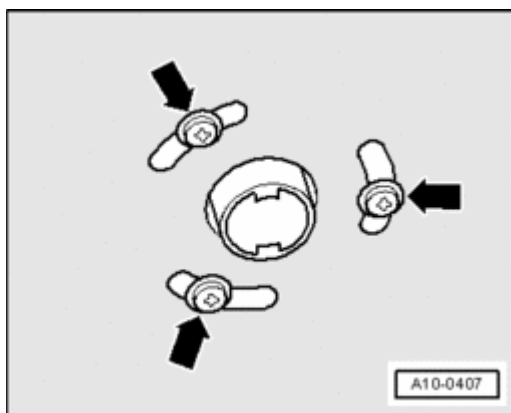
**Fig. 207: Identifying Front Engine Cover**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front engine cover - **arrows** -.



**Fig. 208: Identifying Bolts & Air Duct**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

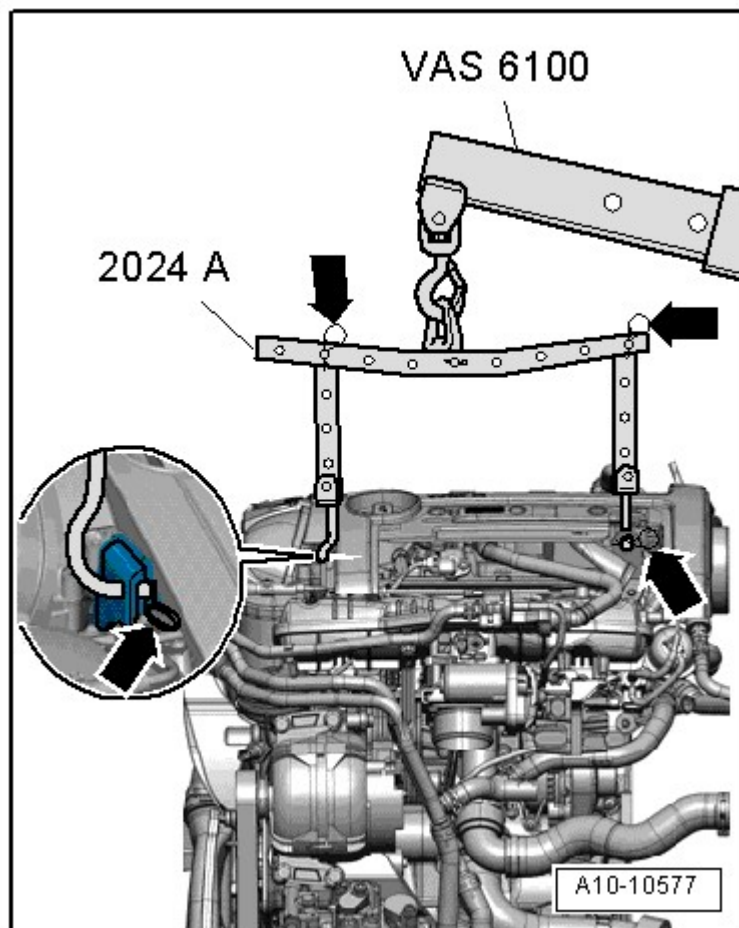
- Remove bolts - **arrows** -.
- Remove air duct - **1** - and - **2** -.



**Fig. 209: Locating Fasteners Exhaust Pipe**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- For vehicles with auxiliary heater, remove bolts - **arrows** - for exhaust pipe of parking heater/auxiliary heater on noise insulation.



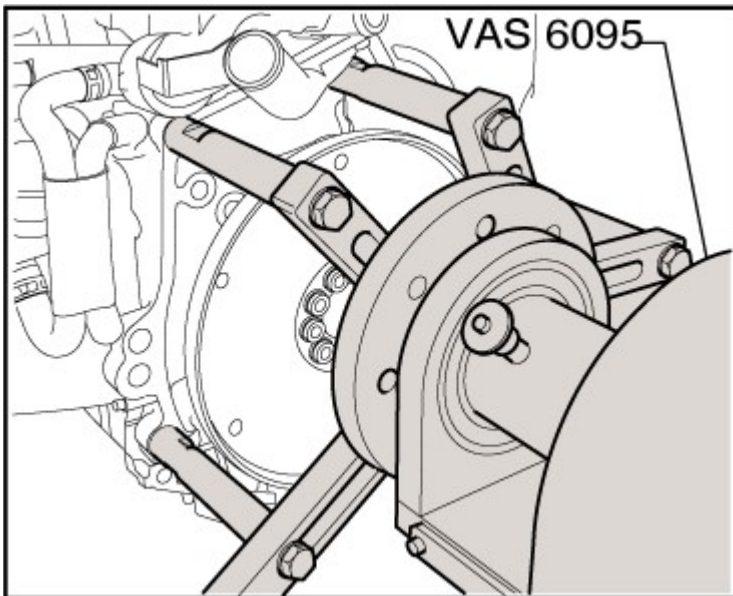
**Fig. 210: Identifying Quick-Release Fasteners And Noise Insulation**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen quick-release fasteners - **1** - and - **2** - and remove front noise insulation. Rear section of noise insulation remains installed.
- Remove front bumper cover -->
  - **63 BUMPER**
  - **63 - BUMPERS** for BODY EXTERIOR - CABRIOLET
- Bring lock carrier into service position -->
  - **50 BODY, FRONT**
  - **50 - BODY - FRONT** for BODY EXTERIOR - CABRIOLET

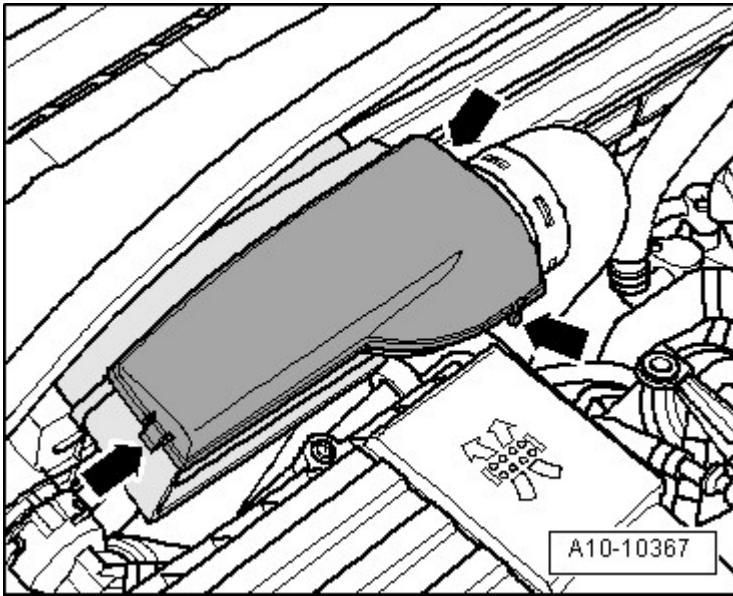
**NOTE:**

- Before removing ribbed belt, mark the turning direction on it with chalk or a felt tip pen. A reversed turning direction can cause damage to the belt under operating conditions.

**Fig. 211: Pivoting Tensioning Device To Relieve Tension On Ribbed Belt**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pivot tensioning device in direction of - **arrow** - to relieve tension on ribbed belt.
- Remove ribbed belt and release tensioning device.

**Fig. 212: Removing Vibration Damper**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Mark vibration damper for re-installation.
- Remove bolts - 1 -.
- Remove vibration damper.

**Installing**

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

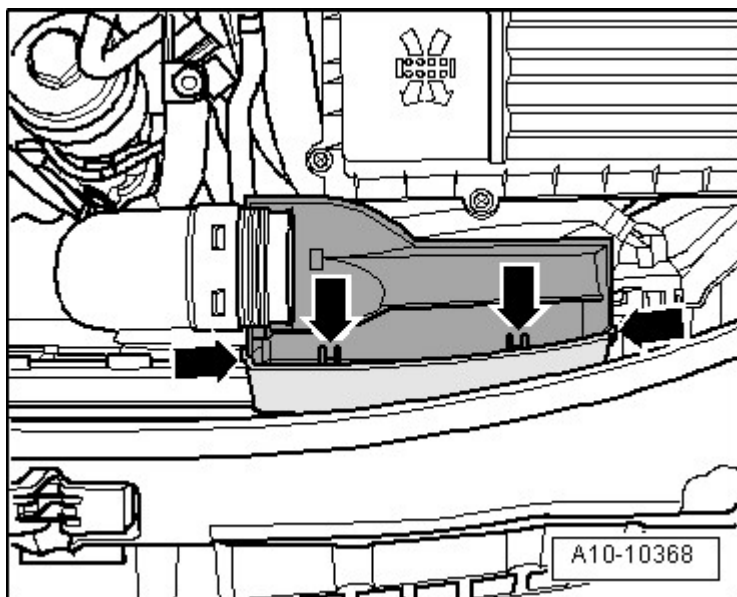
- Install ribbed belt **Installing**.
- Install lock carrier with attachments -->
  - **50 BODY, FRONT**
  - **50 - BODY - FRONT** for BODY EXTERIOR - CABRIOLET
- Install front bumper cover -->
  - **63 BUMPER**
  - **63 - BUMPERS** for BODY EXTERIOR - CABRIOLET

**Torque specifications**

| Component                      | Nm |
|--------------------------------|----|
| Vibration damper to crankshaft | 30 |

**Front sealing flange with crankshaft seal, removing and installing**

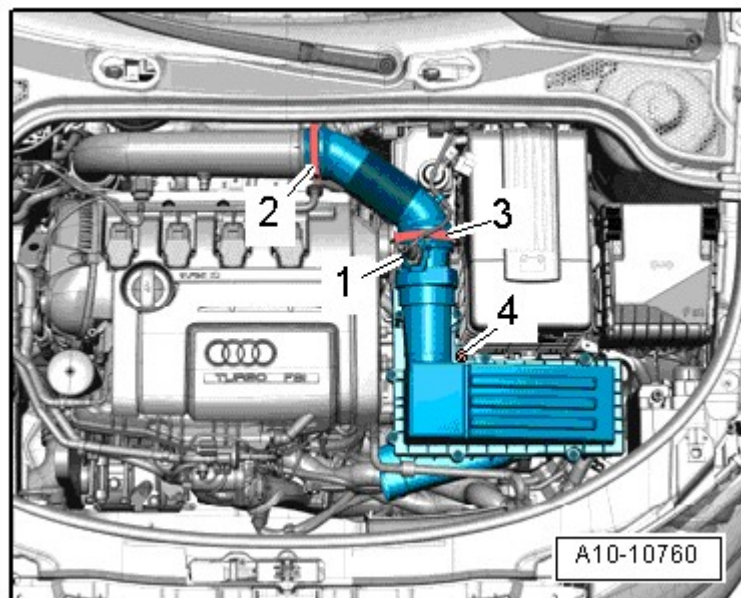
### Special tools, testers and auxiliary items required



**Fig. 213: Pin Wrench 3212**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pin wrench 3212



**Fig. 214: Assembly Tool T40048**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

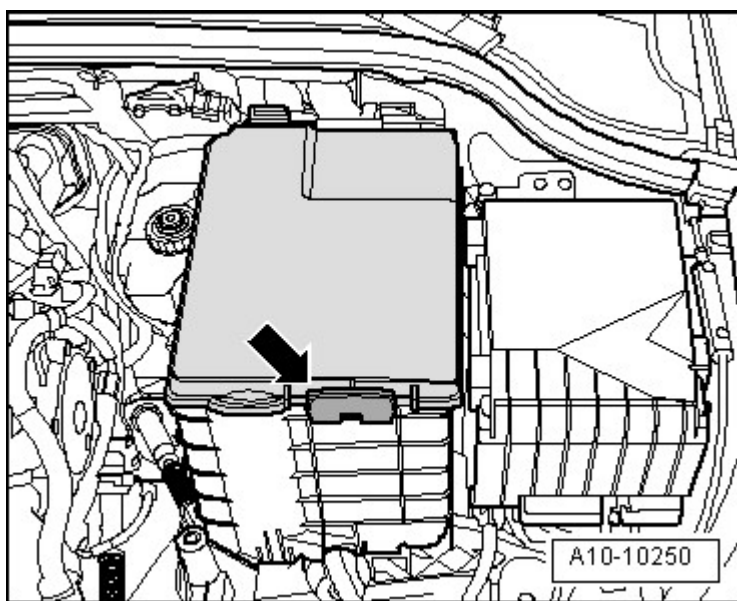
- Assembly tool T40048
- Hand drill with plastic brush attachment
- Protective glasses



- Sealant

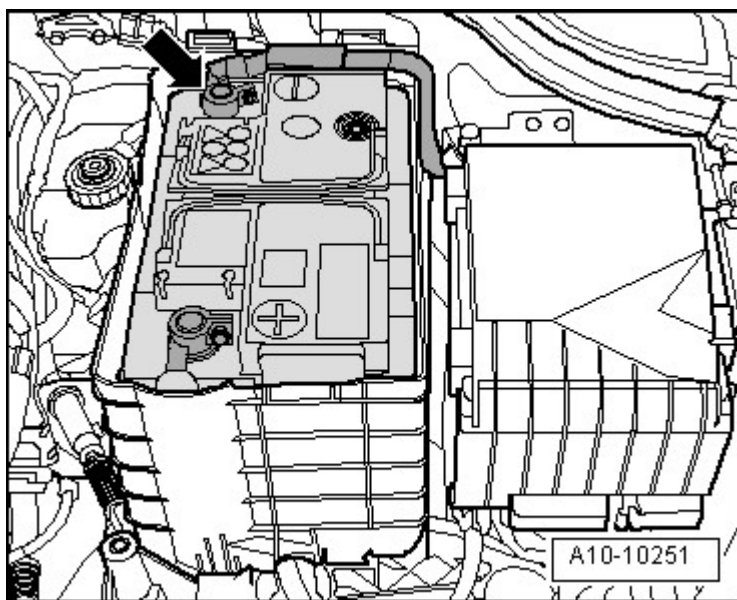
## Removing

- Remove vibration damper --> **Vibration damper, removing and installing.**
- Remove ribbed belt pulley from coolant pump.



**Fig. 215: Loosening Bolts Use Spanner Wrench 3212 To Counter-Hold**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- When loosening bolts use spanner wrench 3212 to counter-hold.



**Fig. 216: Removing Bolts & Front Sealing Flange**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

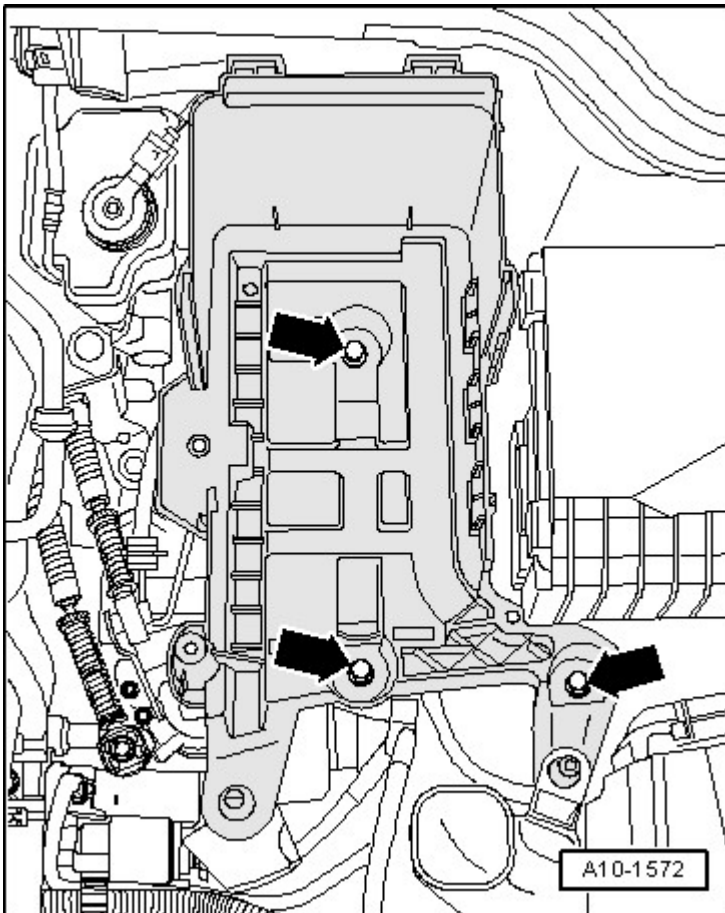
- Remove bolts - **arrows** -.
- Remove front sealing flange.

### Installing

- Remove sealant from sealing flange groove and from sealing surfaces.

**CAUTION: Make sure that no sealant residue enters the engine.**

**CAUTION: Wear safety glasses.**



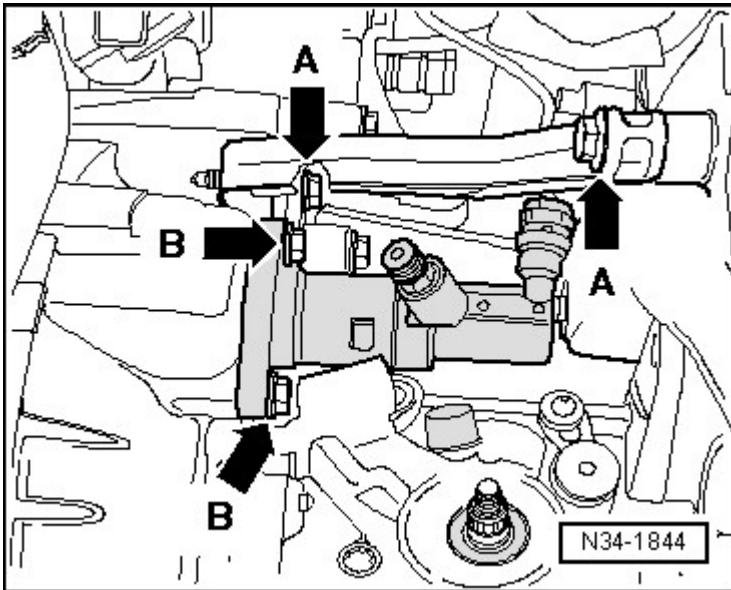
**Fig. 217: Using Rotating Plastic Brush To Remove Any Sealant Residue From Sealing Flange, Cylinder Block And Upper Part Of Oil Pan**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using rotating plastic brush, remove any sealant residue from sealing flange, cylinder block and upper

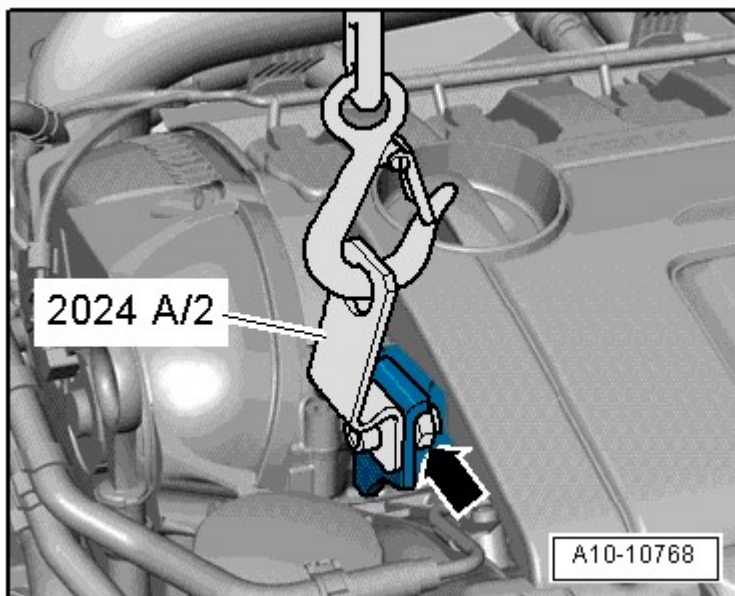
part of oil pan.

- Clean sealing surfaces so they are completely free of any oil or grease.



**Fig. 218: Cutting Tube Nozzle At Front Marking**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Cut tube nozzle at front marking (jet dia. approx. 2 mm).



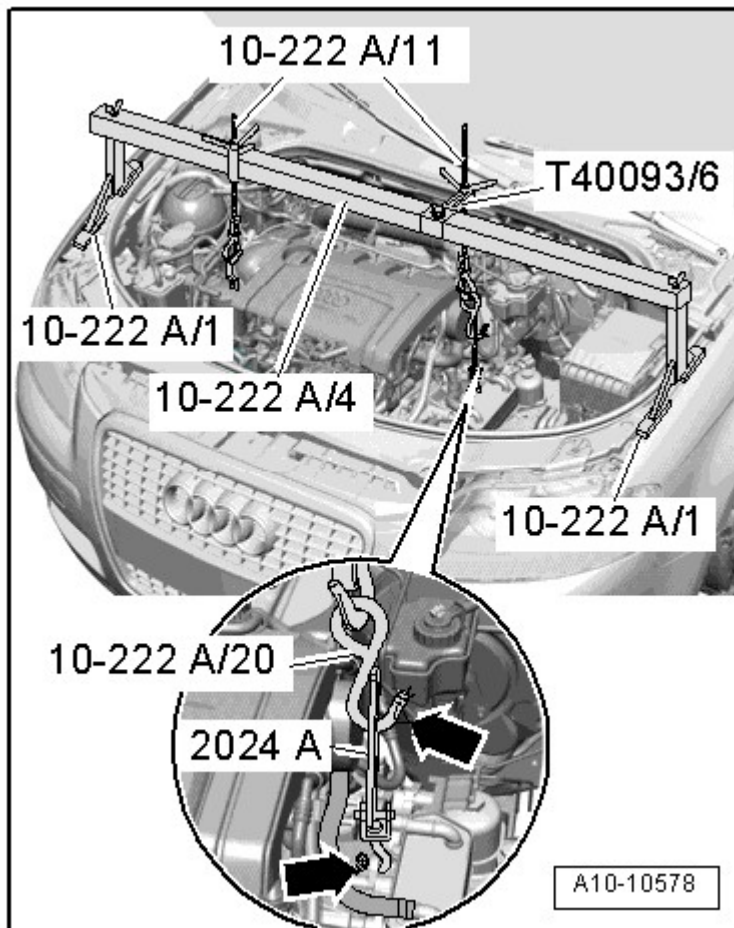
**Fig. 219: Applying Bead Of Sealant To Clean Sealing Surface Of Sealing Flange**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Apply bead of sealant as illustrated to clean sealing surface of sealing flange.

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

**NOTE:**

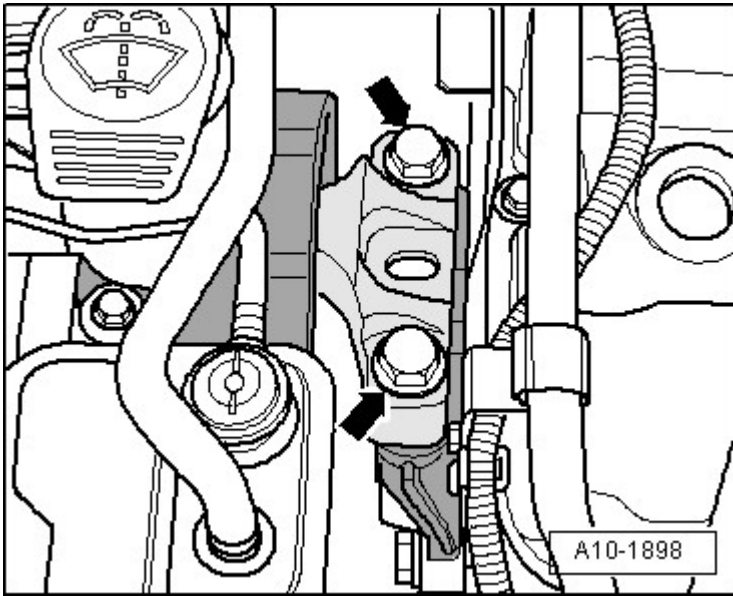
- Sealant bead must not be thicker than specified, otherwise sealant could get into oil pan and clog the oil pump strainer.
- The front sealing flange must be installed within 5 minutes of being applied with sealant.



**Fig. 220: Inserting Assembly Device T40048/1 Onto Pull Sleeve T40048/2 And Sliding Sealing Flange Onto Pull Sleeve**

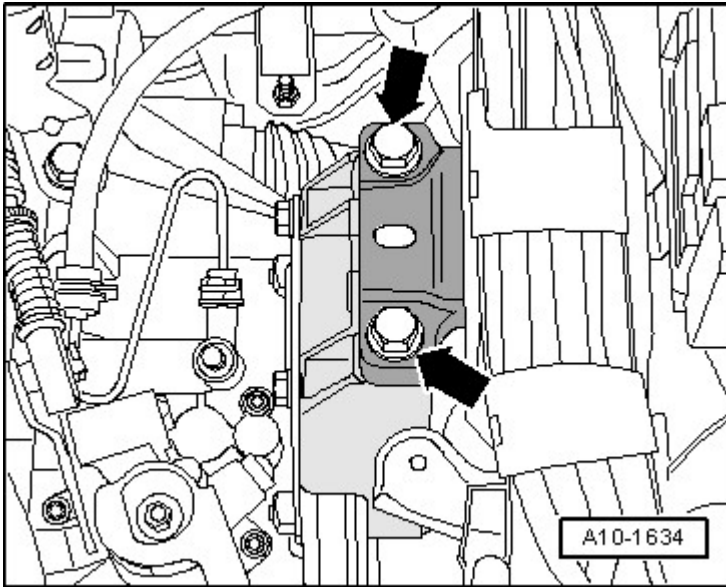
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert assembly device T40048/1 onto pull sleeve T40048/2 and slide sealing flange - **1** - onto pull sleeve.
- Remove assembly device.



**Fig. 221: Placing Sealing Flange With Inserted Pull Sleeve T40048/2 Onto Crankshaft**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place sealing flange - 1 - with inserted pull sleeve T40048/2 onto crankshaft.



**Fig. 222: Removing Bolts & Front Sealing Flange**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Fasten bolts - **arrows** - in a diagonal sequence and in steps.

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

- Install vibration damper **Installing**.
- Install ribbed belt **Installing**.

## 2007 Audi A6

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- Install lock carrier with attachments -->
  - **50 BODY, FRONT**
  - **50 - BODY - FRONT** for BODY EXTERIOR - CABRIOLET
- .
- Install front bumper cover -->
  - **63 BUMPER**
  - **63 - BUMPERS** for BODY EXTERIOR - CABRIOLET
- .

### Torque specifications

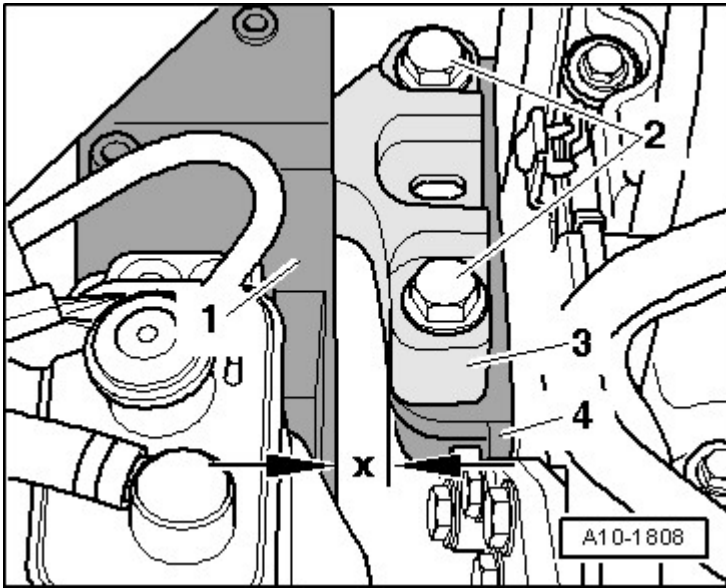
| Component                                     | Nm              |
|-----------------------------------------------|-----------------|
| Front sealing flange to cylinder block        | 9 <sup>1)</sup> |
| Ribbed belt pulley to coolant pump            | 20              |
| • <sup>1)</sup> Tighten diagonally in stages. |                 |

### TIMING CHAIN SIDE, SERVICING

Dual mass flywheel (vehicles with manual transmission), component overview

#### NOTE:

- Servicing clutch -->
  - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
  - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
  - **30 CLUTCH** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
  - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE
  - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
  - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE
- .



**Fig. 223: Dual Mass Flywheel (Vehicles With Manual Transmission), Component Overview**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Dual mass flywheel

- Removing and installing --> **Dual mass flywheel (vehicles with manual transmission), removing and installing**

2 - Special bolt

- Replace
- Tightening torque **Torque specifications**

3 - Needle bearing

- Only on vehicles with manual transmission
- Pulling out and driving in --> **Needle bearing on dual mass flywheel (vehicles with manual transmission), pulling out and driving in**

4 - Sealing ring for crankshaft (timing chain side)

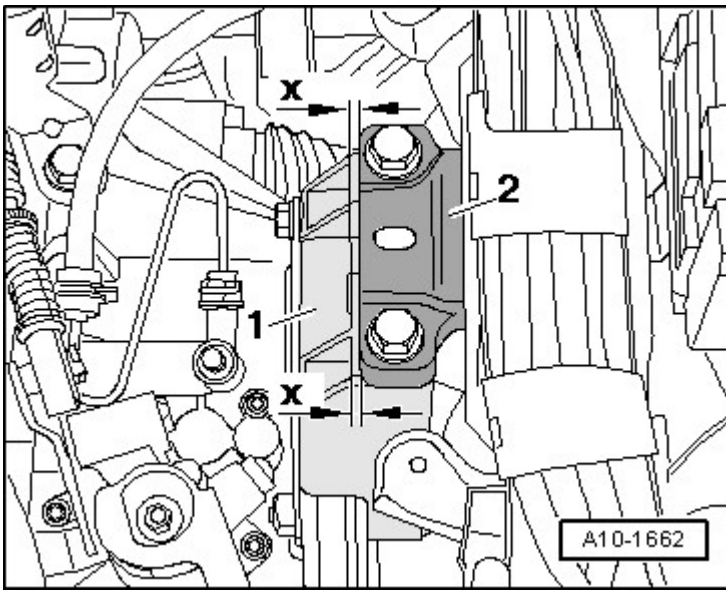
- Replacing --> **Crankshaft seal, timing chain side, replacing.**

5 - Crankshaft

**Dual mass flywheel (vehicles with manual transmission), removing and installing**

**Special tools, testers and auxiliary items required**





**Fig. 224: Counter-Holder Tool 10-201**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

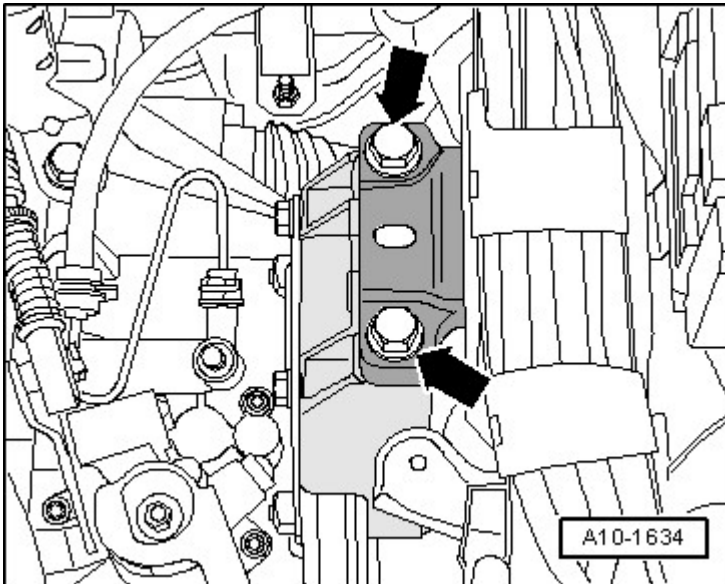
- Counter-holder tool 10-201

### Removing

- Remove transmission -->
  - **34 MANUAL TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
  - **34 MANUAL TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
  - **34 MANUAL TRANSMISSION - CONTROLS, HOUSING** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
  - **34 - CONTROLS, HOUSING** for 6 SPD. MANUAL TRANSMISSION 0A3 ALL WHEEL DRIVE, INTERNAL COMPONENT SERVICING
  - **34 CONTROLS, HOUSING** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE
  - **34 CONTROLS, HOUSING** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
  - **34 CONTROLS, HOUSING** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE
- Remove clutch pressure plate -->
  - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
  - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
  - **30 CLUTCH** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
  - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE

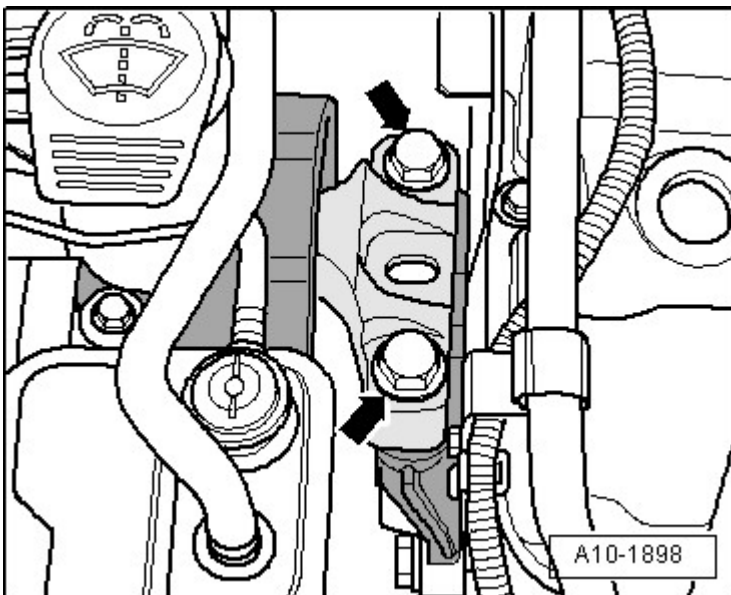
- **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
- **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE

- Mark dual-mass flywheel to engine.



**Fig. 225: Inserting Counter Hold Tool 10-201 To Loosen Bolts**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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



**Fig. 226: Identifying Dual-Mass Flywheel & Bolts**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

**NOTE:**

- **To prevent damage to dual-mass flywheel when removing, bolts - B - must not be removed using an air-powered or impact wrench. Only removing bolts by hand is permitted.**

- Rotate dual-mass flywheel - A - so that bolts stand centered to holes - **arrows** -.
- When removing bolts, make sure that no bolt head makes contact on dual-mass flywheel because it will otherwise be damaged when further removing the bolt.

**Installing**

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

**NOTE:**

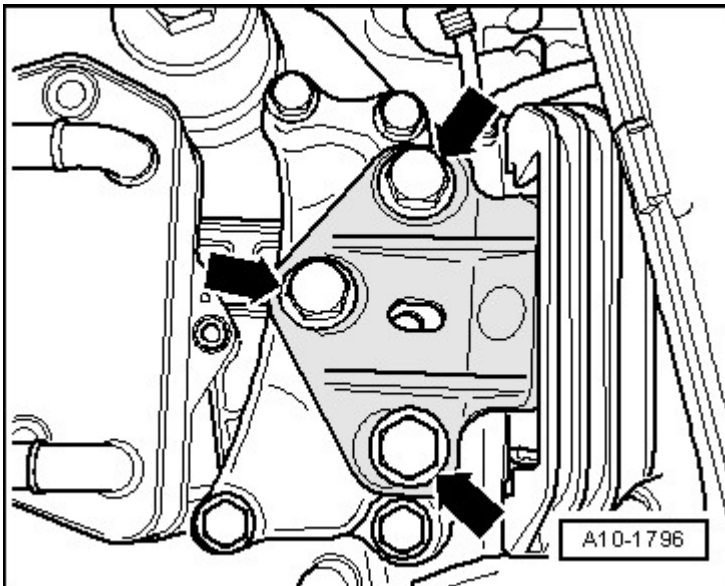
- **Needle bearing is located in the flywheel and must be driven in when flywheel is replaced --> Needle bearing on dual mass flywheel (vehicles with manual transmission), pulling out and driving in.**

- Use new bolts when securing.
- Re-position counter hold tool 10-201 to tighten bolts.
- Install clutch pressure plate -->
  - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
  - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
  - **30 CLUTCH** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
  - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE
  - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
  - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE
- Install transmission -->
  - **34 MANUAL TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
  - **34 MANUAL TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
  - **34 MANUAL TRANSMISSION - CONTROLS, HOUSING** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
  - **34 - CONTROLS, HOUSING** for 6 SPD. MANUAL TRANSMISSION 0A3 ALL WHEEL DRIVE, INTERNAL COMPONENT SERVICING
  - **34 CONTROLS, HOUSING** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE
  - **34 CONTROLS, HOUSING** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
  - **34 CONTROLS, HOUSING** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE

**Torque specifications**

| Component                                                                                                                                                               |                     | Nm              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-----------------|
| Flywheel to crankshaft                                                                                                                                                  | Bolt length 22.5 mm | 60 + 90 ° 1)2)  |
|                                                                                                                                                                         | Bolt length 35.0 mm | 60 + 180 ° 1)3) |
|                                                                                                                                                                         | Bolt length 43.0 mm | 60 + 180 ° 1)3) |
| <ul style="list-style-type: none"> <li>1) Replace bolts.</li> <li>2) 90 ° corresponds to a quarter turn.</li> <li>3) 180 ° corresponds to one half rotation.</li> </ul> |                     |                 |

Needle bearing on dual mass flywheel (vehicles with manual transmission), pulling out and driving in



**Fig. 227: Identifying Special Tools - Needle Bearing On Dual Mass Flywheel (Vehicles With Manual Transmission), Pulling Out And Driving In**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

**Special tools, testers and auxiliary items required**

- Centering mandrel 3176
- Bearing driver 3264
- Depth gauge VAS 6082
- 1 - Internal puller Kukko 21/2
- 4 - Counter-support Kukko 22/1

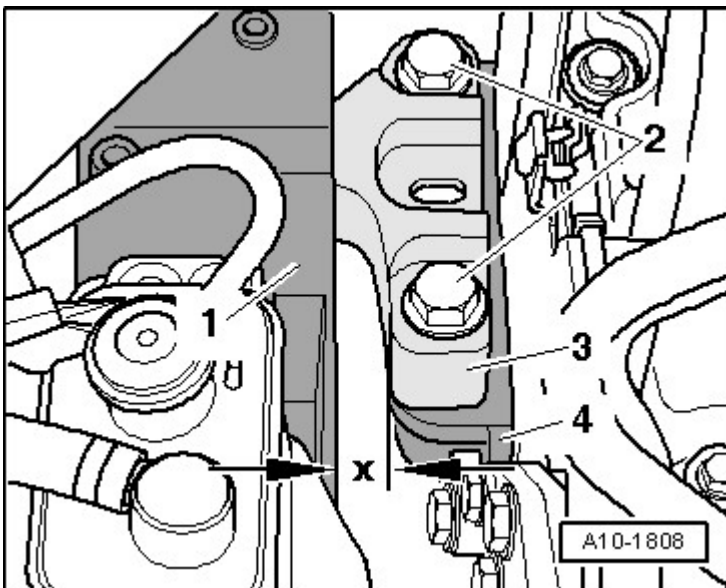
**Work procedure**

## ○ Remove transmission --&gt;

- **34 MANUAL TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
- **34 MANUAL TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
- **34 MANUAL TRANSMISSION - CONTROLS, HOUSING** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
- **34 - CONTROLS, HOUSING** for 6 SPD. MANUAL TRANSMISSION 0A3 ALL WHEEL DRIVE, INTERNAL COMPONENT SERVICING
- **34 CONTROLS, HOUSING** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE
- **34 CONTROLS, HOUSING** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
- **34 CONTROLS, HOUSING** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE

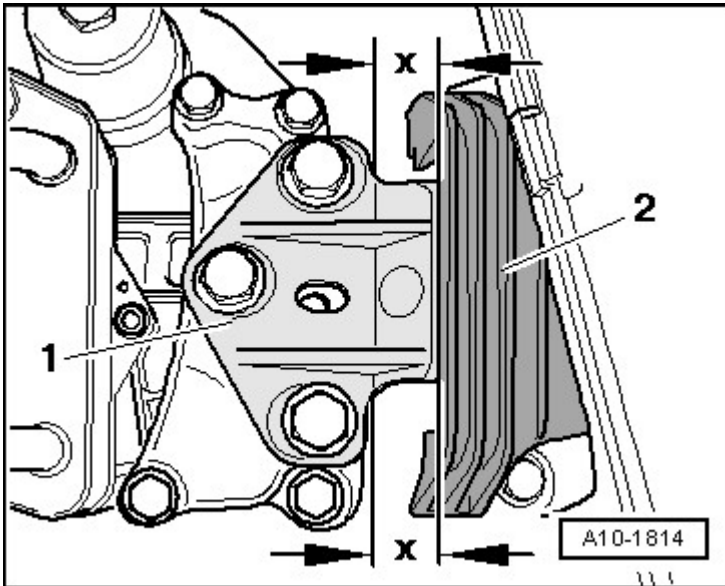
## ○ Remove clutch pressure plate --&gt;

- **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
- **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
- **30 CLUTCH** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
- **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE
- **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
- **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE



**Fig. 228: Measuring Depth That Needle Bearing Is Driven Into Dual-Mass Flywheel**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Measure depth - **dimension x** - that the needle bearing is driven into dual-mass flywheel and note this for later re-installation.



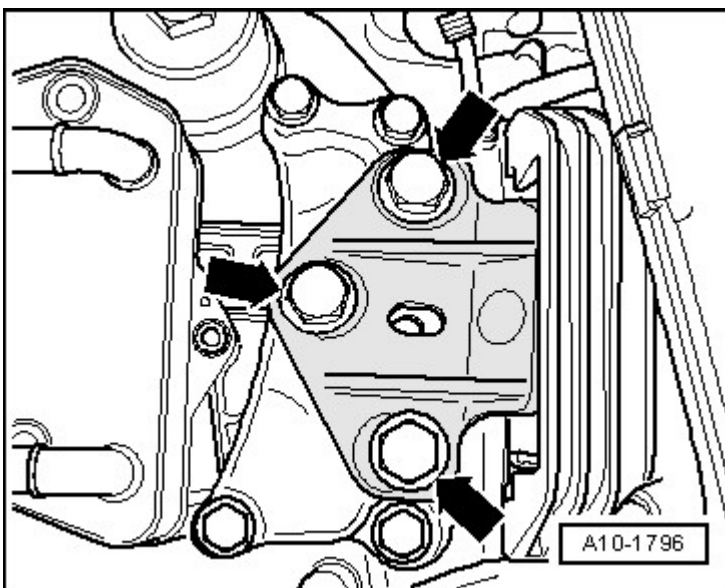
**Fig. 229: Pulling Out Needle Bearing Using Internal Puller Kukko 21/2 And Counter-Support Kukko 22/1**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull out needle bearing using internal puller Kukko 21/2 and counter-support Kukko 22/1.

**NOTE:**

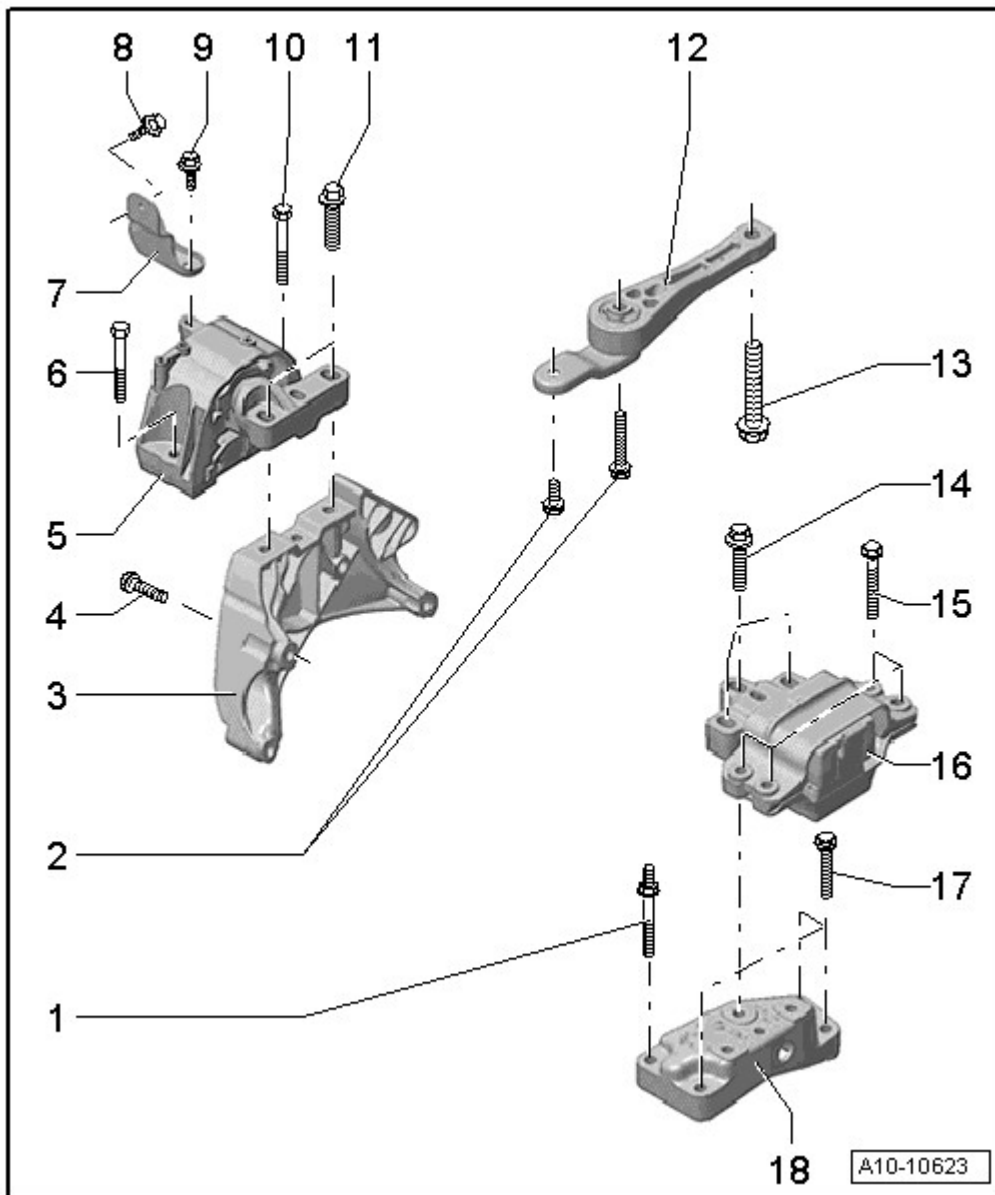
- The plastic ring in the dual-mass flywheel is affected by impacts. If plastic ring is damaged, the dual-mass flywheel must be replaced.



**Fig. 230: Driving Needle Bearing Into Flywheel Using 3264 Bearing Driver**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive needle bearing into dual-mass flywheel using bearing driver 3264.

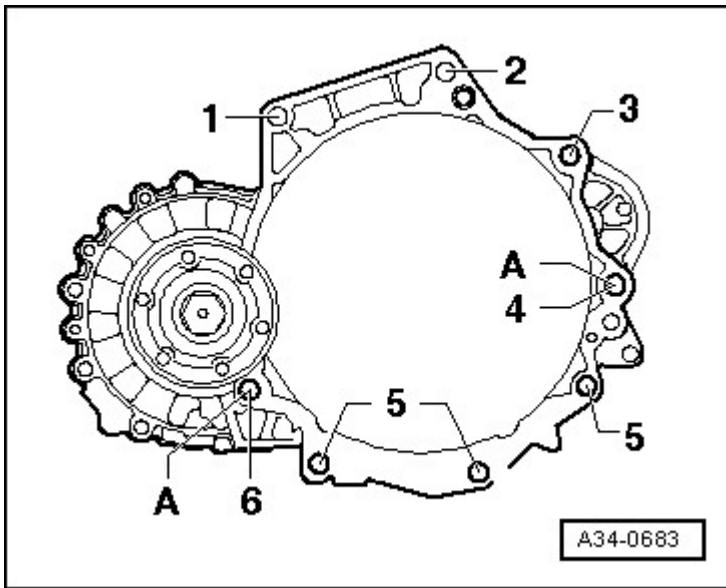


**Fig. 231: Using Backside Of Centering Mandrel 3176 To Press Needle Bearing Further In Until Previously Measured Depth Is Achieved**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using backside of centering mandrel 3176 , press needle bearing further in until previously measured depth is achieved.





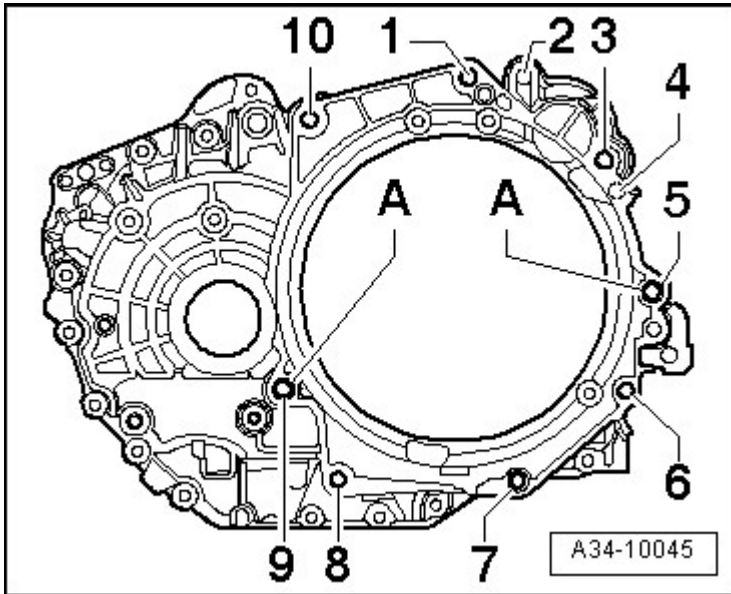
**Fig. 232: Measuring Depth That Needle Bearing Is Driven Into Dual-Mass Flywheel**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Afterwards, verify depth - **dimension x** - that the needle bearing is driven into dual-mass flywheel.
- Install clutch pressure plate -->
  - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
  - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
  - **30 CLUTCH** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
  - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE
  - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
  - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE
- Install transmission -->
  - **34 MANUAL TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
  - **34 MANUAL TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
  - **34 MANUAL TRANSMISSION - CONTROLS, HOUSING** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
  - **34 - CONTROLS, HOUSING** for 6 SPD. MANUAL TRANSMISSION 0A3 ALL WHEEL DRIVE, INTERNAL COMPONENT SERVICING
  - **34 CONTROLS, HOUSING** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE
  - **34 CONTROLS, HOUSING** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
  - **34 CONTROLS, HOUSING** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE

Drive plate (vehicles with automatic transmission), removing and installing

Special tools, testers and auxiliary items required



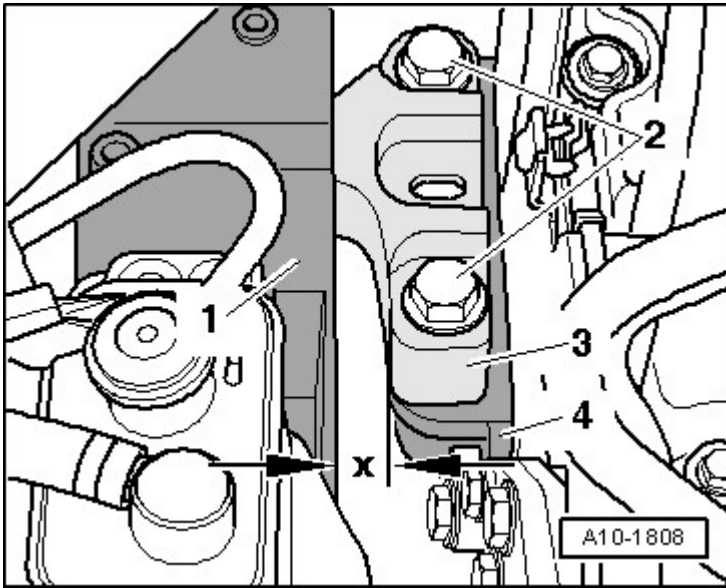
**Fig. 233: Counter-Holder Tool 10-201**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Counter-holder tool 10-201

### Removing

- Remove automatic transmission -->
  - **37 - AUTOMATIC TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. AUTOMATIC TRANSMISSION 01V
  - **37 - AUTOMATIC TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING
  - **37 CONTROLS, HOUSING** for AUTOMATIC TRANSMISSION 09L, FOUR-WHEEL DRIVE

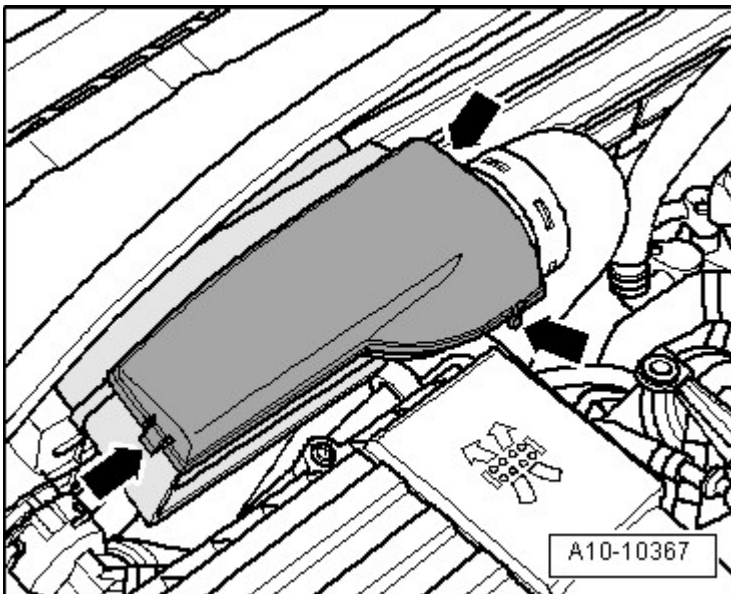


**Fig. 234: Inserting Counter Hold Tool 10-201 To Loosen Bolts**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert counter hold tool 10-201 to loosen bolts.
- Mark drive plate to engine.
- Remove drive plate.
- Remove centering washer from behind it.

### Installing

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



**Fig. 235: Installing Drive Plate With Centering Washer And Backing Plate**

## 2007 Audi A6

ENGINE 3.2 V6 4V Engine Mechanical, Engine Code(s): BKH

### Courtesy of VOLKSWAGEN UNITED STATES, INC.

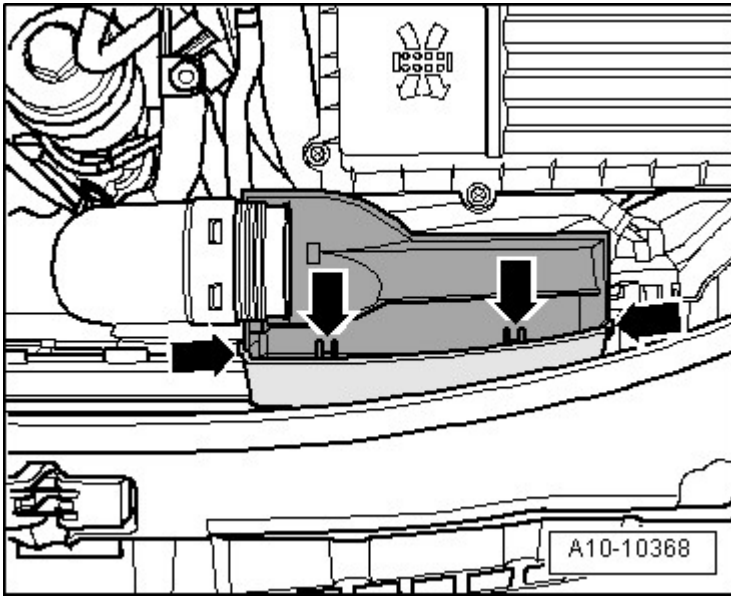
- Install drive plate with centering washer - **arrow** - and backing plate.
- Use new bolts when securing.
- Turn over counter hold tool 10-201 to tighten bolts.
- Install automatic transmission -->
  - **37 - AUTOMATIC TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. AUTOMATIC TRANSMISSION 01V
  - **37 - AUTOMATIC TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING
  - **37 CONTROLS, HOUSING** for AUTOMATIC TRANSMISSION 09L, FOUR-WHEEL DRIVE

### Torque specifications

| Component                                                                                                                                                                 |                     | Nm               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|------------------|
| Drive plate to crankshaft                                                                                                                                                 | Bolt length 22.5 mm | 60 + 90 ° 1) 2)  |
|                                                                                                                                                                           | Bolt length 35.0 mm | 60 + 180 ° 1) 3) |
|                                                                                                                                                                           | Bolt length 43.0 mm | 60 + 180 ° 1) 3) |
| <ul style="list-style-type: none"><li>● 1) Replace bolts.</li><li>● 2) 90 ° corresponds to a quarter turn.</li><li>● 3) 180 ° corresponds to one half rotation.</li></ul> |                     |                  |

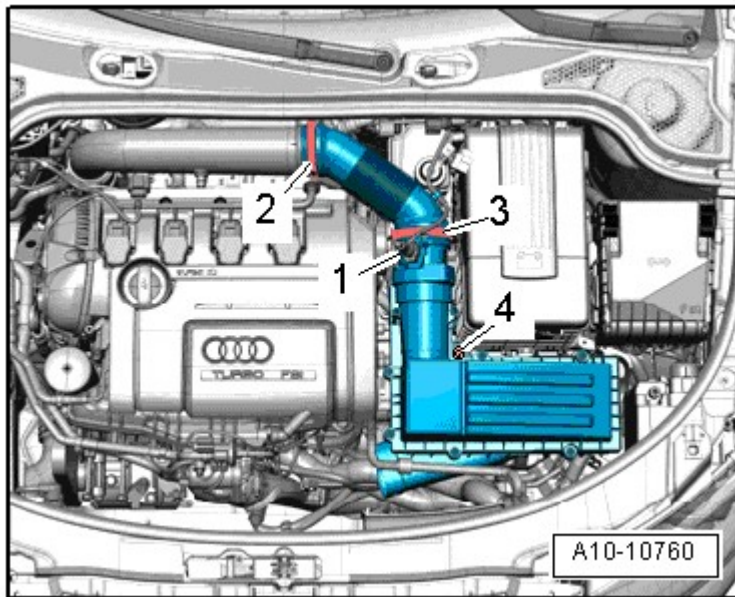
### Crankshaft seal, timing chain side, replacing

### Special tools, testers and auxiliary items required



**Fig. 236: Identifying Pulling Fixture T10122**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pulling fixture T10122



**Fig. 237: Identifying Extractor Hook T20143**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Extractor lever T20143/2

### Work procedure

- Remove transmission -->

- **34 MANUAL TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
- **34 MANUAL TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
- **34 MANUAL TRANSMISSION - CONTROLS, HOUSING** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
- **34 - CONTROLS, HOUSING** for 6 SPD. MANUAL TRANSMISSION 0A3 ALL WHEEL DRIVE, INTERNAL COMPONENT SERVICING
- **34 CONTROLS, HOUSING** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE
- **34 CONTROLS, HOUSING** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
- **34 CONTROLS, HOUSING** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE

or -->

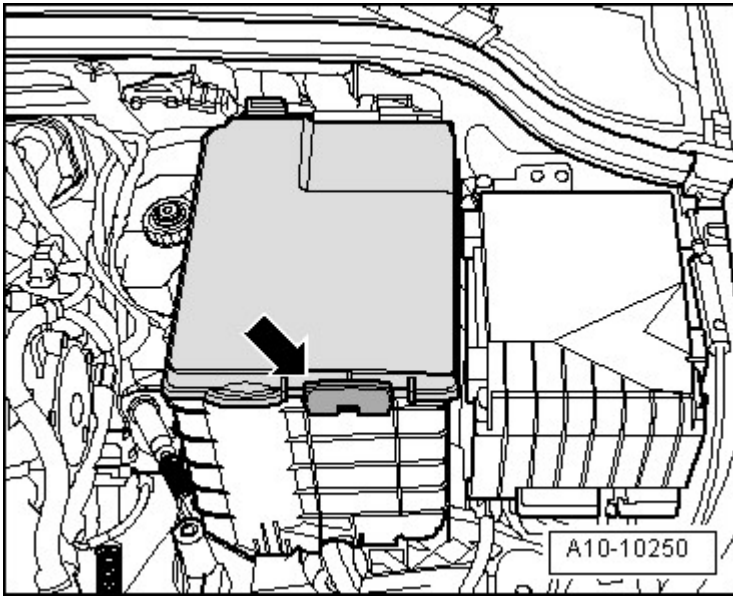
- **37 - AUTOMATIC TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. AUTOMATIC TRANSMISSION 01V
- **37 - AUTOMATIC TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING
- **37 CONTROLS, HOUSING** for AUTOMATIC TRANSMISSION 09L, FOUR-WHEEL DRIVE

○ Vehicles with manual transmission: Remove clutch pressure plate -->

- **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
- **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
- **30 CLUTCH** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
- **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE
- **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
- **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE

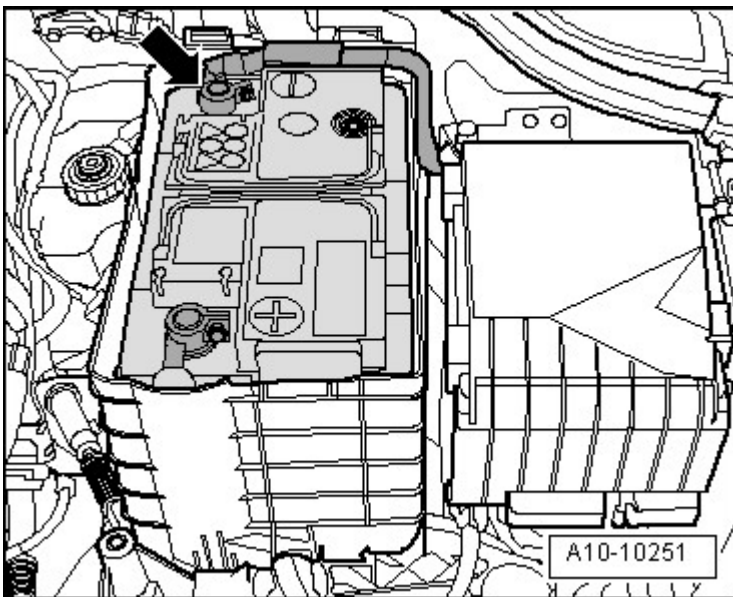
and dual mass flywheel --> **Dual mass flywheel (vehicles with manual transmission), removing and installing.**

○ Vehicles with automatic transmission: Remove drive plate --> **Dual mass flywheel (vehicles with manual transmission), removing and installing.**



**Fig. 238: Prying Out Sealing Ring Using Extractor Lever T20143/2**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

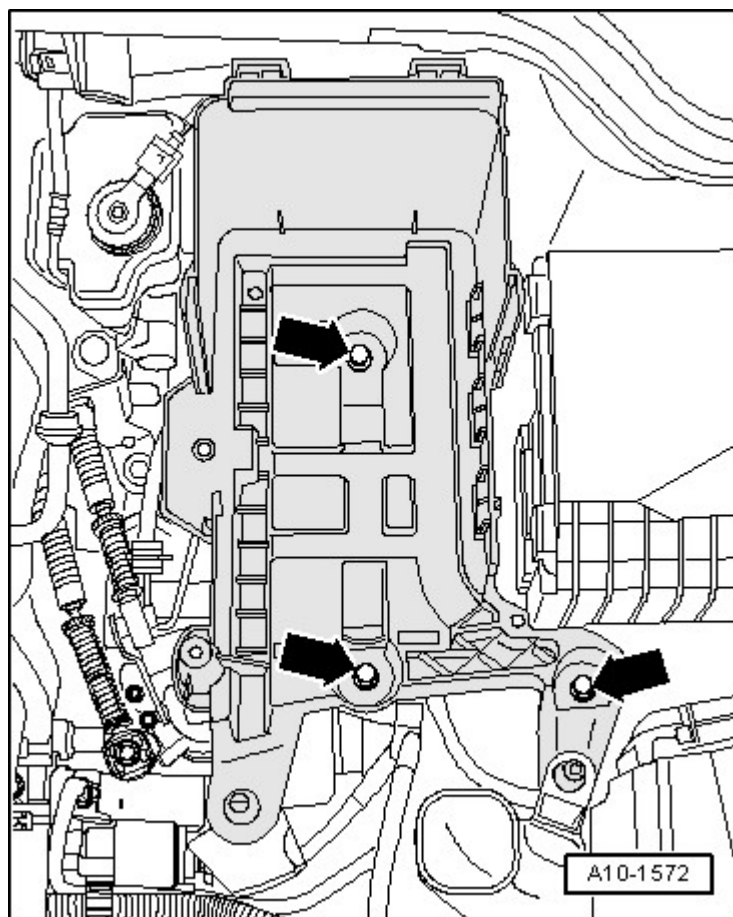
- Pry out sealing ring using extractor lever T20143/2.
- Clean operating and sealing surfaces.



**Fig. 239: Identifying Seal, Sleeve T10122/1 And Assembly Tool T10122/2**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

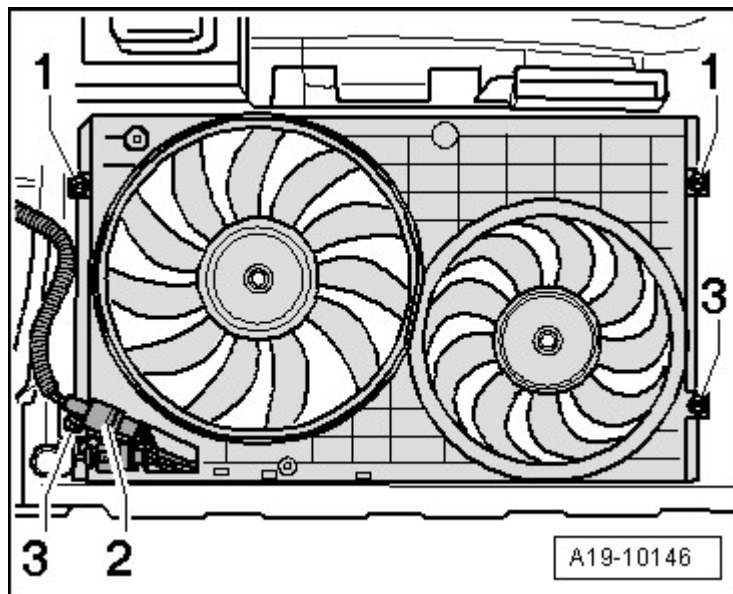
- Insert assembly device T10122/1 onto pull sleeve T10122/2 and slide seal - A - onto pull sleeve.
- Remove assembly device T10122/1.





**Fig. 240: Installing Pull Sleeve T10122/2 With Sealing Ring Onto Crankshaft**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install pull sleeve T10122/2 with sealing ring - 1 - onto crankshaft.



**Fig. 241: Pressing In Sealing Ring All Around Evenly And Flush Using Pressure Sleeve T10122/3**  
**Courtesy of VOLKSWAGEN UNITED STATES, INC.**

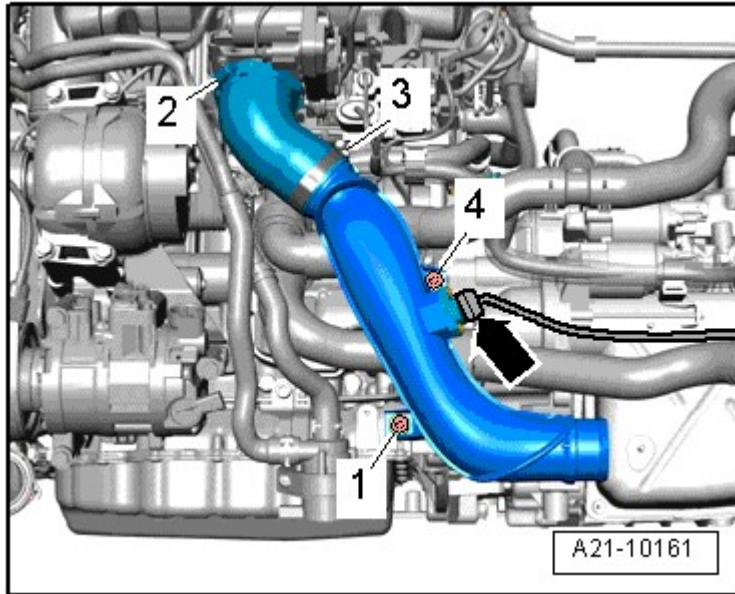
- Press in sealing ring all around evenly and flush using pressure sleeve T10122/3.

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

- Vehicles with manual transmission: Install dual mass flywheel --> **Dual mass flywheel (vehicles with manual transmission), removing and installing** and clutch pressure plate -->
  - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
  - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
  - **30 CLUTCH** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
  - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE
  - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
  - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE
- Vehicles with automatic transmission: Install drive plate --> **Drive plate (vehicles with automatic transmission), removing and installing**.
- Install transmission -->
  - **34 MANUAL TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
  - **34 MANUAL TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
  - **34 MANUAL TRANSMISSION - CONTROLS, HOUSING** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
  - **34 - CONTROLS, HOUSING** for 6 SPD. MANUAL TRANSMISSION 0A3 ALL WHEEL DRIVE, INTERNAL COMPONENT SERVICING
  - **34 CONTROLS, HOUSING** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE
  - **34 CONTROLS, HOUSING** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
  - **34 CONTROLS, HOUSING** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE
- or -->
  - **37 - AUTOMATIC TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. AUTOMATIC TRANSMISSION 01V
  - **37 - AUTOMATIC TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING
  - **37 CONTROLS, HOUSING** for AUTOMATIC TRANSMISSION 09L, FOUR-WHEEL DRIVE

## TIMING CHAIN COVERS

### Covers for timing chains, component overview



**Fig. 242: Covers For Timing Chains, Component Overview**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - M6, 9 Nm; M8, 20 Nm

- Observe sequence for tightening: Vehicles through 04.2005 *Set lower timing chain cover in place, guiding cover at an angle from below onto sealing surface of cylinder block and cylinder head.* under **Lower timing chain cover, removing and installing**, vehicles from 05.2005

2 - Sealing ring for crankshaft (timing chain side)

- Replacing --> **Crankshaft seal, timing chain side, replacing.**

3 - Alignment bushing

- 2 pieces

4 - Lower timing chain cover

- Removing and installing --> **Lower timing chain cover, removing and installing**

5 - Left cylinder head gasket

6 - 5 Nm plus an additional 90 ° (  $\frac{1}{4}$  turn)

- Replace
- Observe sequence for tightening: *Position left timing chain cover and tighten bolts in sequence* under **Installing** ; *Position right timing chain cover and tighten bolts in sequence* under **Installing**

**7 - Left timing chain cover**

- Removing and installing --> **Left and right timing chain covers, removing and installing**

**8 - 5 Nm plus an additional 90 ° (  $\frac{1}{4}$  turn)**

- Replace
- Observe sequence for tightening *Position right timing chain cover and tighten bolts in sequence* under **Installing**

**9 - Right timing chain cover**

- Removing and installing --> **Left and right timing chain covers, removing and installing**

**10 - Right cylinder head gasket****11 - Alignment bushing**

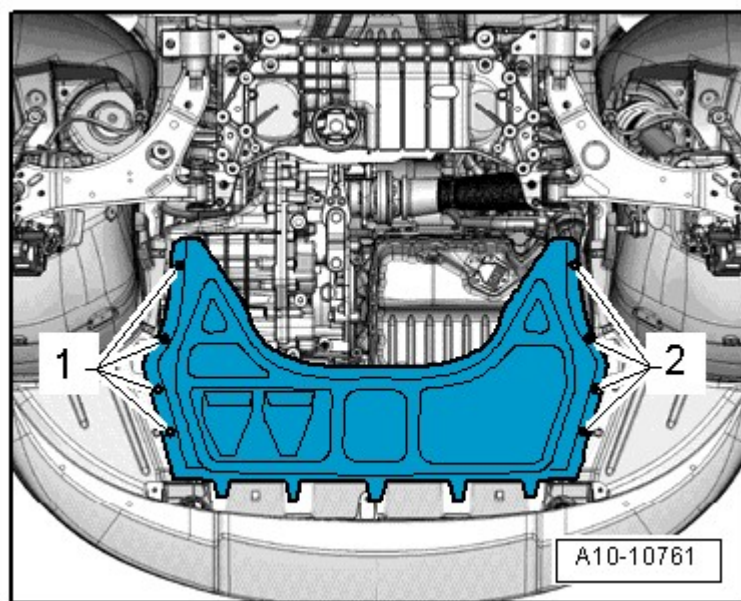
- 2 pieces

**Left and right timing chain covers, removing and installing****Special tools, testers and auxiliary items required**

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

**Removing****NOTE:**

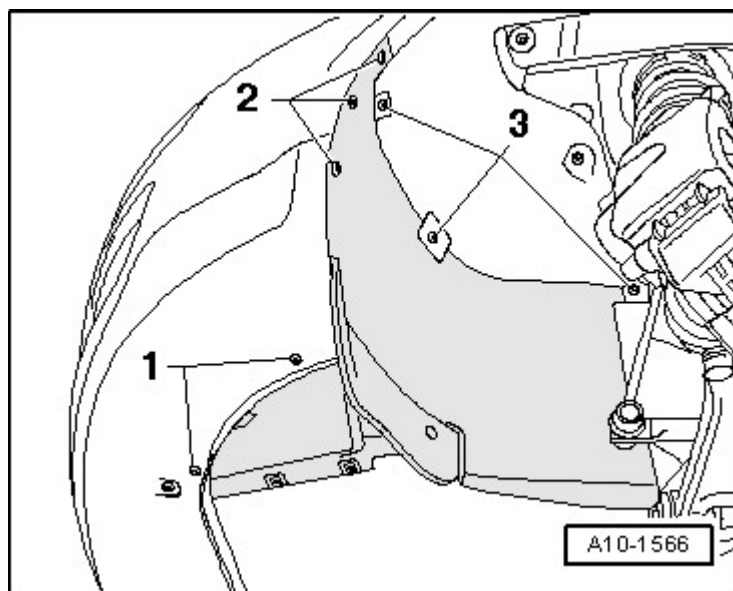
- All cable ties which are opened or cut open when removing, must be replaced in the same position when installing.



**Fig. 243: Removing Rear Engine Cover**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove rear engine cover - **arrows** -.

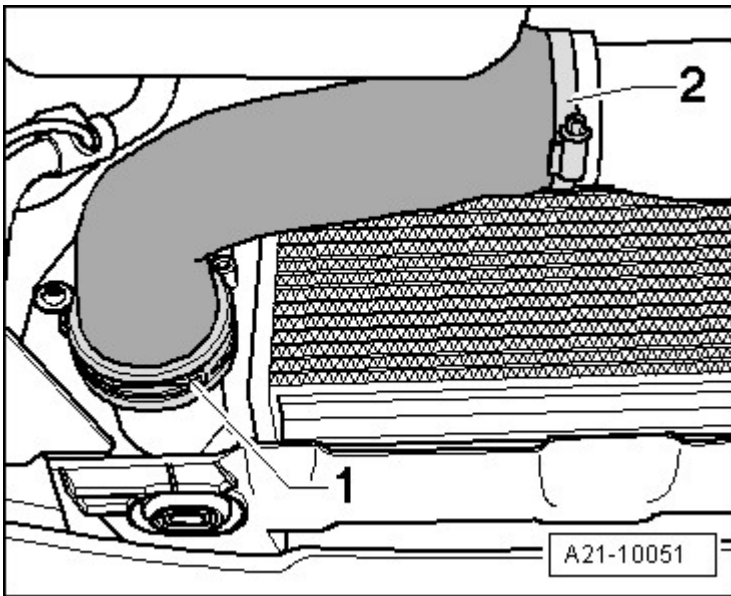


**Fig. 244: Identifying Front Engine Cover**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

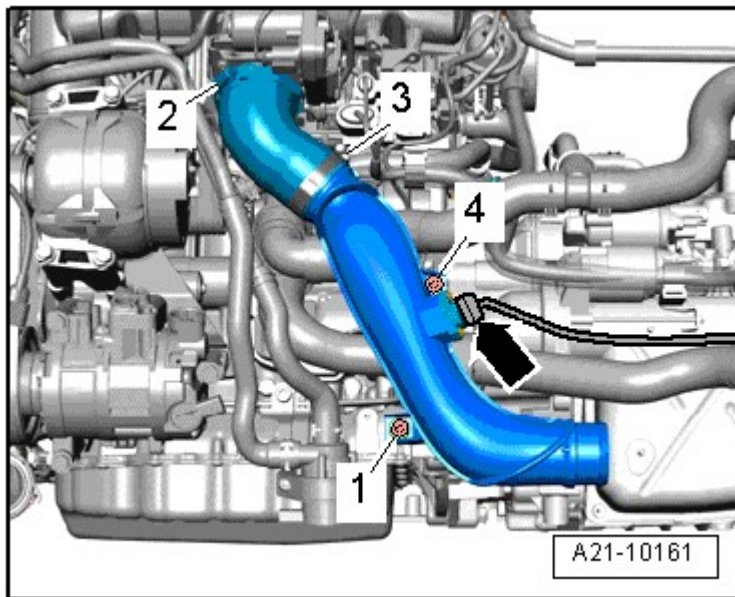
- Remove front engine cover - **arrows** -.

**Left timing chain cover:**



**Fig. 245: Removing Coolant Hoses At Coolant Expansion Tank**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove coolant expansion tank - **arrow** -.
- Disconnect electrical connection from Engine Coolant Level (ECL) Warning Switch F66 at bottom of coolant reservoir and set aside coolant reservoir with coolant hoses - **1** - and - **2** - connected.



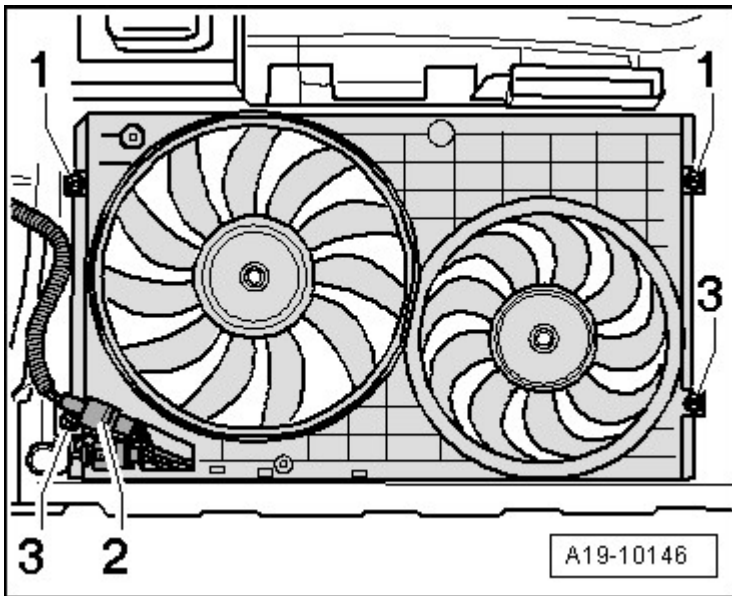
**Fig. 246: Disconnecting Electrical Harness Connector For Oxygen Sensor (O2S) 2 Behind Three Way Catalytic Converter (TWC) G131**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove electrical harness connectors - **1** - and - **2** - from bracket.
- Free up wiring harness.

- Remove nuts and remove left bracket for harness connectors from bulkhead.

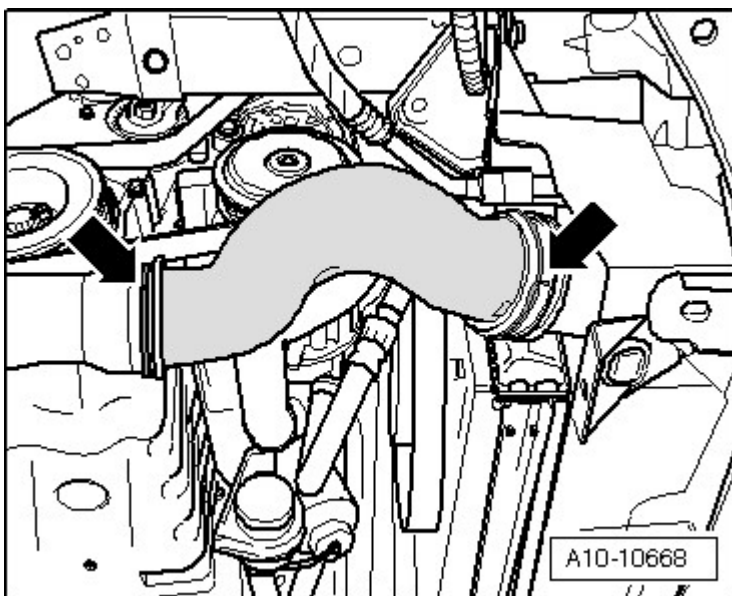
**NOTE:**

- Place a rag under oil filter housing to catch escaping engine oil.



**Fig. 247: Removing Cap For Oil Filter Housing**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove cap - **arrow** - for oil filter housing.
- Remove oil filter element.

**Rest-of-world vehicles**

**Fig. 248: Removing Crankcase Ventilation Hose At Left Cylinder Head Cover**



Courtesy of VOLKSWAGEN UNITED STATES, INC.

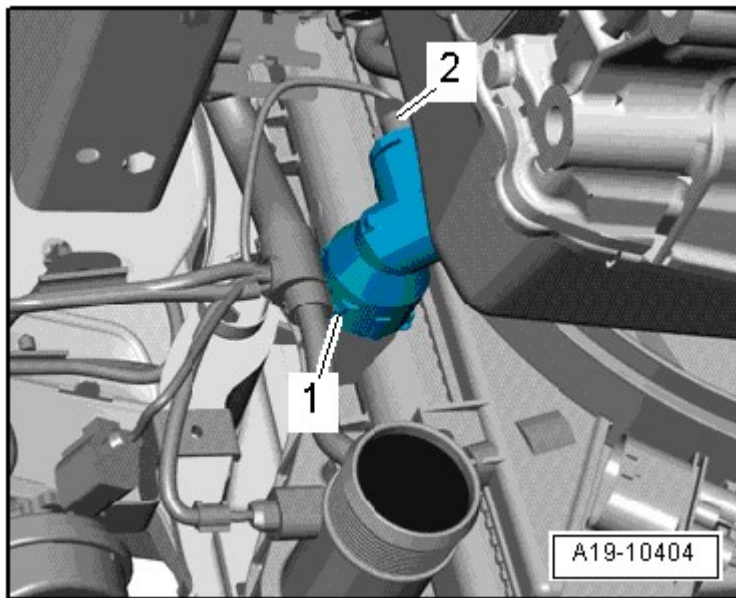
- Remove crankcase ventilation hose - **arrow** - at left cylinder head cover.

US./Can.-model vehicles:

**CAUTION: On US vehicles, crankcase ventilation must not be removed.**

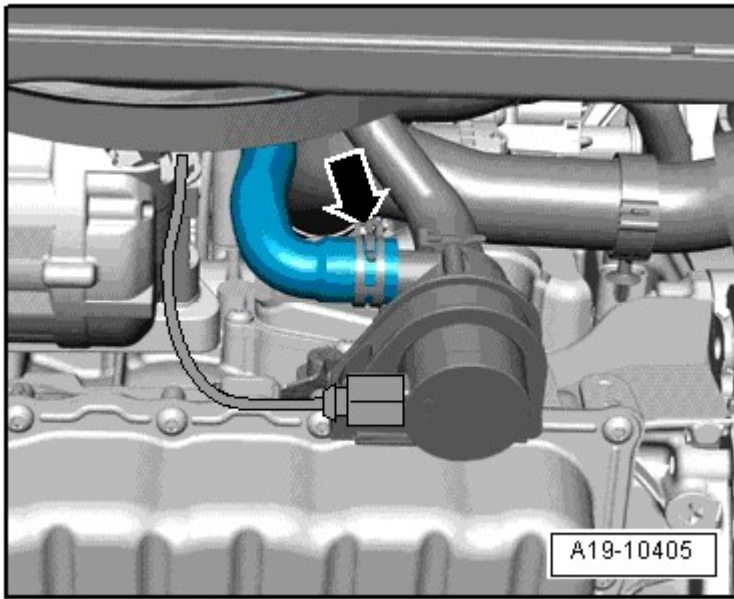
- Remove left cylinder head cover and lay aside with crankcase ventilation hose connected --> **Left cylinder head cover, US./Can. vehicles, removing and installing.**

All:



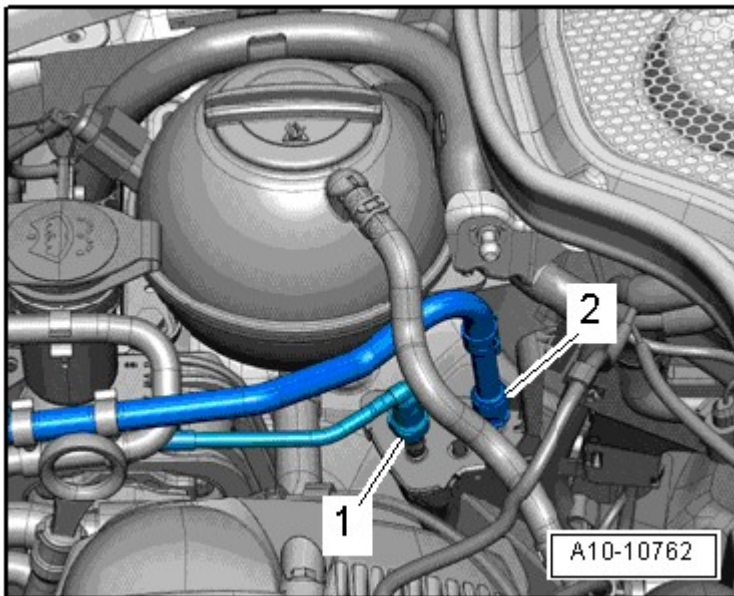
**Fig. 249: Disconnecting Electrical Harness Connectors**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connectors.
1. Camshaft position (CMP) sensor 2 G163
  2. Camshaft Adjustment Valve 2 N208
  3. Camshaft Adjustment Valve 2 (exhaust) N319
  4. Camshaft position (CMP) sensor 4 G301
- Remove bolts - **arrows** - and separate electrical connections at ignition coils.
  - Set electrical wiring harness aside.



**Fig. 250: Disconnecting Electrical Harness Connectors**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

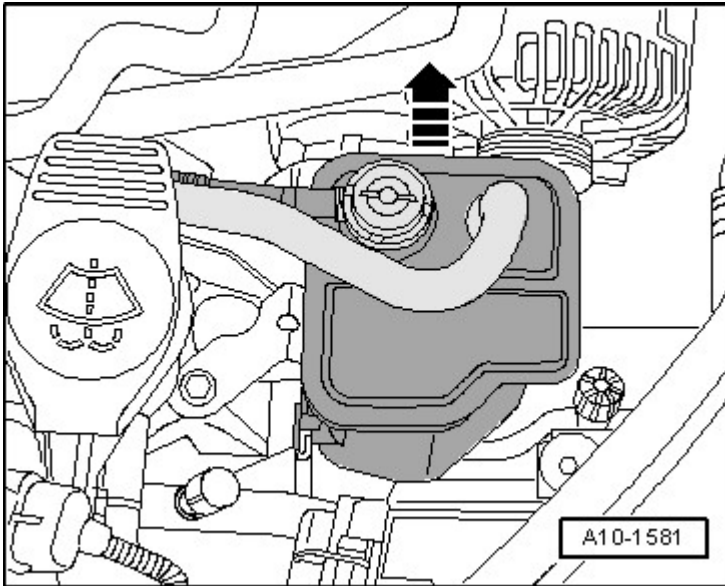
- Disconnect electrical harness connectors - **1 to 3** -.
- Remove nut - **arrow** -.
- Remove retainer for connection - **3** -.
- Remove double-bolt lying beneath.
- Remove retainer for connections - **1** - and - **2** -.



**Fig. 251: Removing/Tighten Bolts In Sequence For Left Timing Chain Cover**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

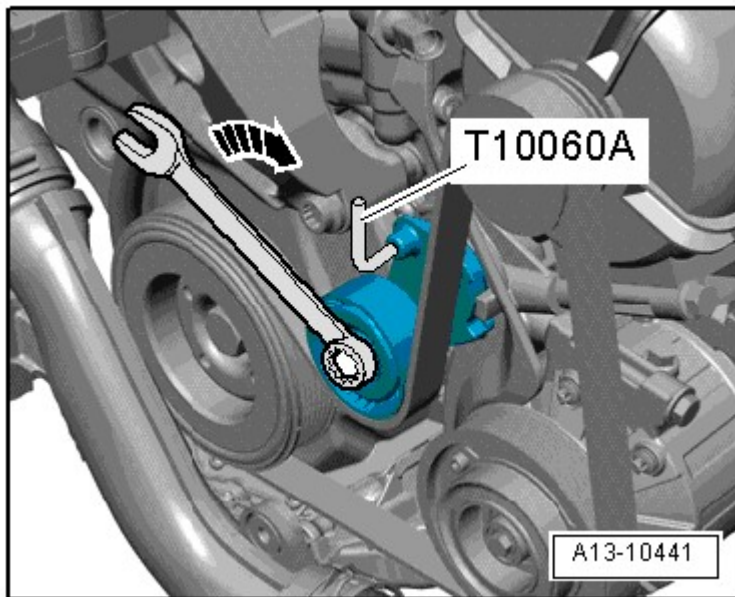
- Remove bolts - **1 to 8** - and remove left timing chain cover.

**Right timing chain cover:**



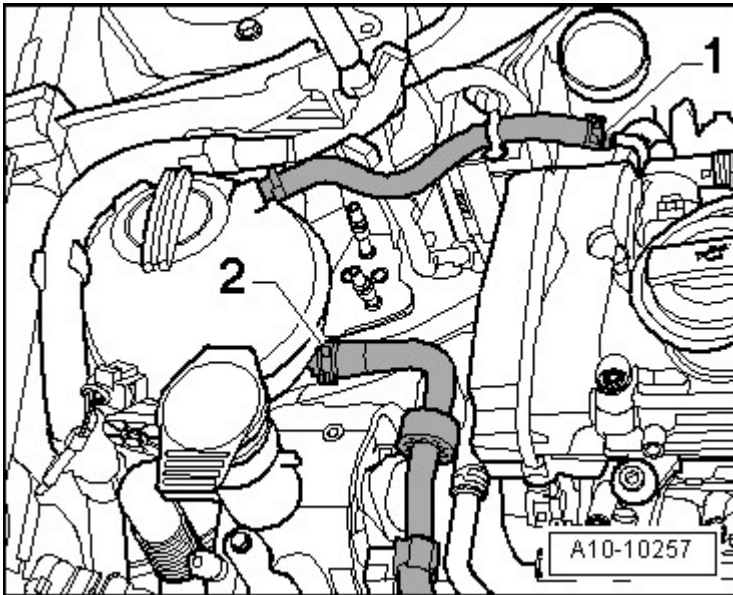
**Fig. 252: Disconnecting Check Valve From Connection At Air Duct Hose**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect check valve - **1** - from connection at air duct hose.
- Remove air duct hose, thereby loosening hose clamp - **2** - and opening clips - **arrows** -.



**Fig. 253: Removing Pin From Spreader Clips**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

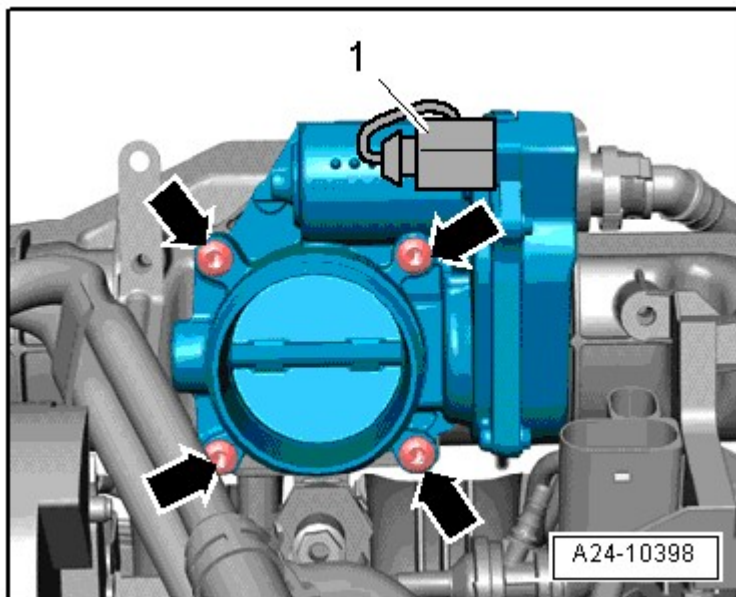
- Remove pin from spreader clips - **arrow** -.
- Remove air filter housing.



**Fig. 254: Disconnecting Electrical Harness Connector For Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts and remove right bracket for harness connectors - **1** - and - **2** - from bulkhead.

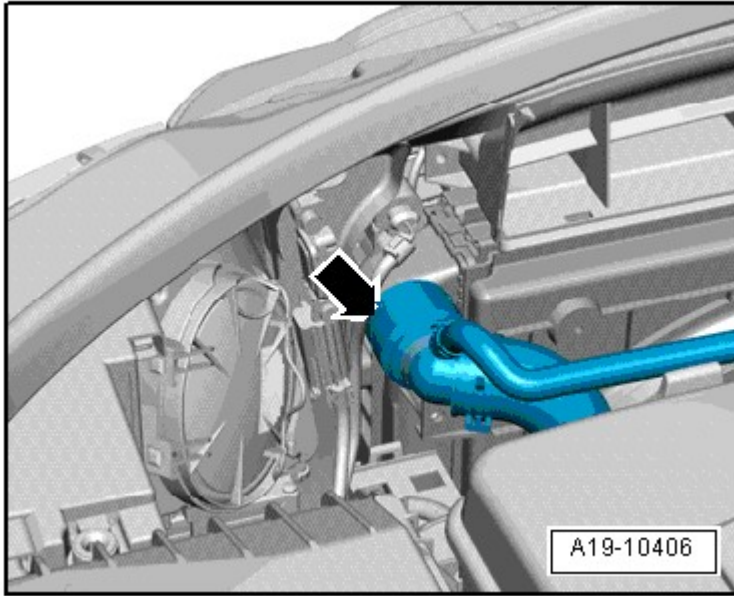


**Fig. 255: Disconnecting Electrical Harness Connectors**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connectors.

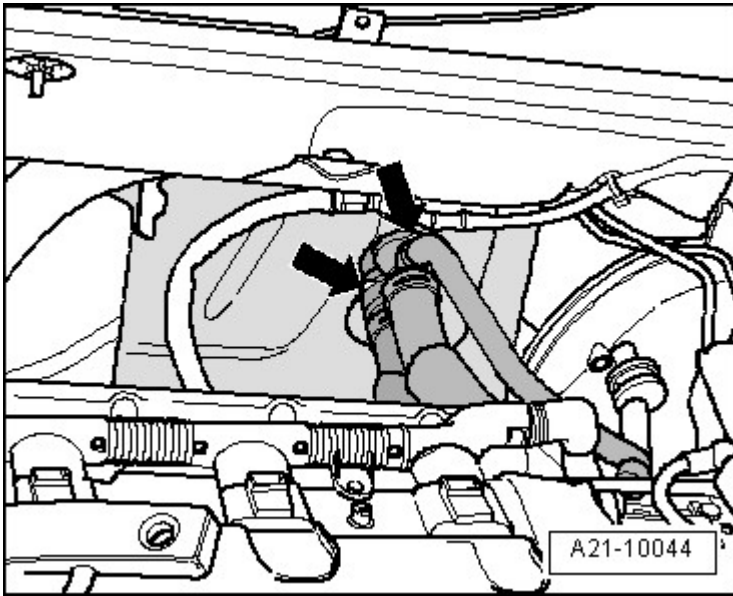
1. Camshaft Adjustment Valve 1 (exhaust) N318
  2. Camshaft Position (CMP) sensor G40
  3. Intake Manifold Runner Position Sensor G336
  4. Camshaft position (CMP) sensor 3 G300
- Remove bolts - **arrows** - and separate electrical connections at ignition coils.
  - Set electrical wiring harness aside.



**Fig. 256: Separating Electrical Connector, Removing Bolt And Retainer For Connection**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Separate electrical connector - **1** -.
- Remove bolt - **arrow** - and remove retainer for connection.





**Fig. 257: Removing/Tighten Bolts In Sequence For Right Timing Chain Cover**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

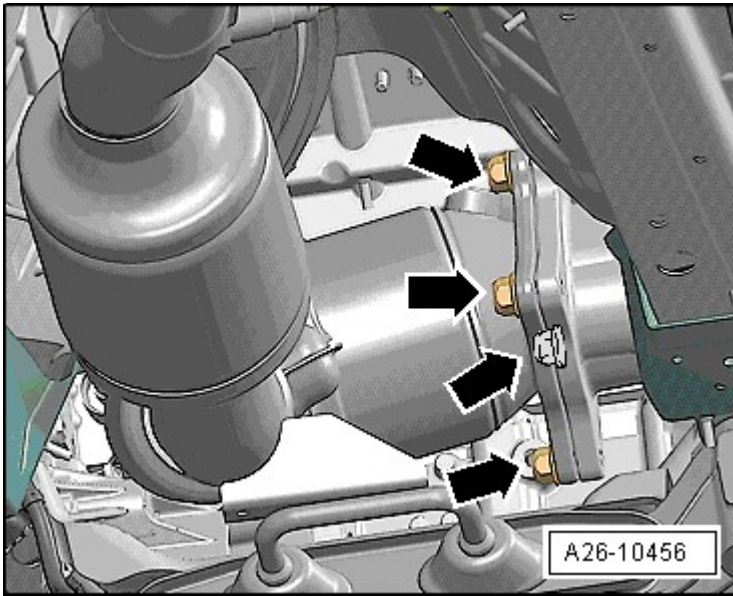
- Remove bolts - 1 to 8 - and remove right timing chain cover.

#### Installing

#### NOTE:

- During installation, all cable ties must be re-installed at the same location.
- Secure all hose connections using hose clamps appropriate for the model type .

**CAUTION:** Wear safety glasses.



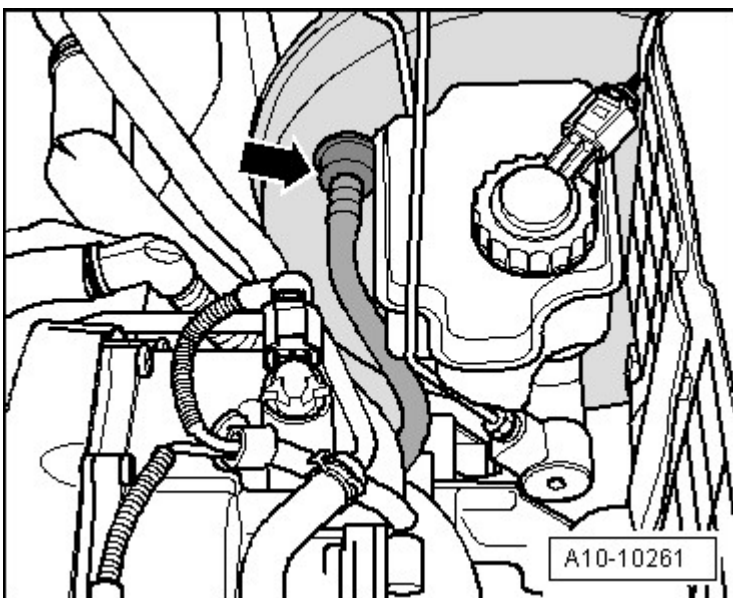
**Fig. 258: Using Rotating Plastic Brush To Remove Any Sealant Residue From Sealing Flange, Cylinder Block And Upper Part Of Oil Pan**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using e.g. a rotating plastic brush, remove sealant residue on covers for timing chain and on cylinder block and head.

**CAUTION: Make sure that no sealant residue enters the engine.**

- Clean sealing surfaces so they are completely free of any oil or grease.



**Fig. 259: Cutting Tube Nozzle At Front Marking**

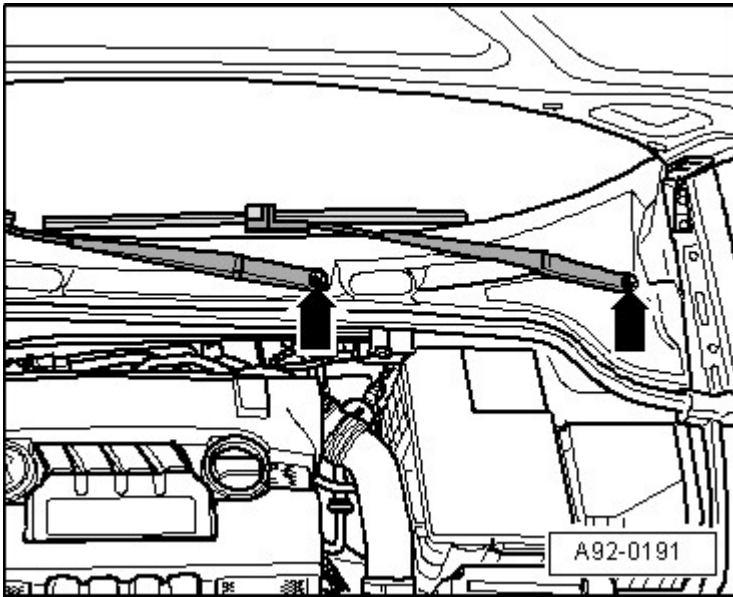


Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Cut tube nozzle at front marking (jet dia. approx. 1 mm).

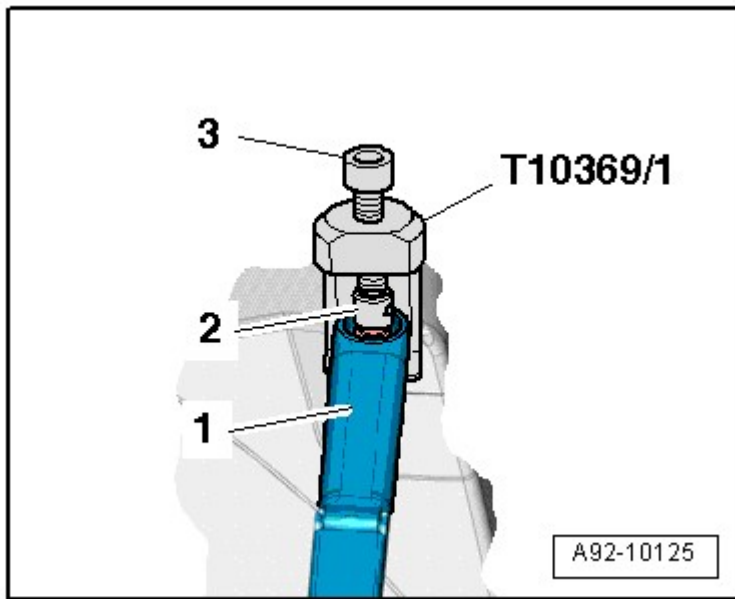
**NOTE:**

- **Covers for timing chain must be installed within 5 minutes after applying sealant.**



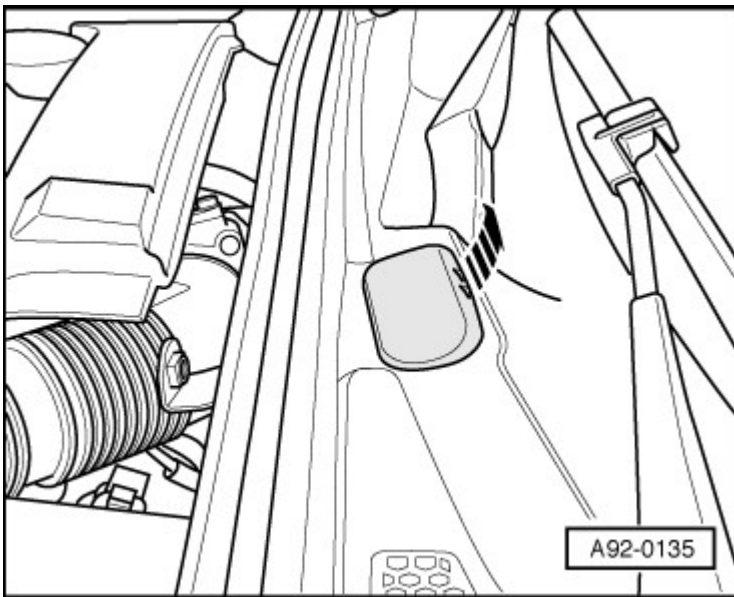
**Fig. 260: Applying Sealant Bead On Clean Sealing Surfaces Of Left Cover For Timing Chain**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Apply sealant bead - **arrow** - , as shown in illustration, on clean sealing surfaces of left cover for timing chain.
- The groove of sealing surface must be completely filled with sealant.
- Sealant bead must stand 1.5 to 2.0 mm above sealing surface.



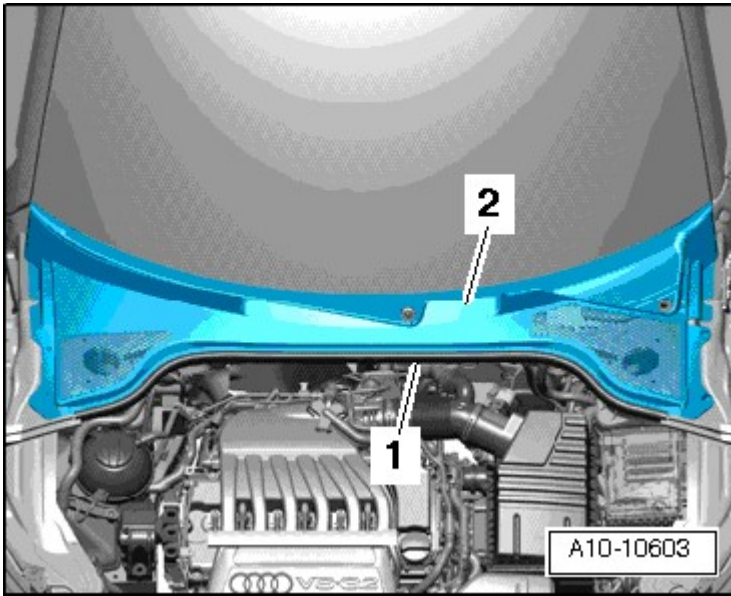
**Fig. 261: Removing/Tighten Bolts In Sequence For Left Timing Chain Cover**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position left timing chain cover and tighten bolts in sequence - **1 to 8** -.



**Fig. 262: Applying Sealant Bead On Clean Sealing Surfaces Of Right Cover For Timing Chain**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Apply sealant bead - **arrow** - , as shown in illustration, on clean sealing surfaces of right cover for timing chain.
- The groove of sealing surface must be completely filled with sealant.
- Sealant bead must stand 1.5 to 2.0 mm above sealing surface.



**Fig. 263: Removing/Tighten Bolts In Sequence For Right Timing Chain Cover**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position right timing chain cover and tighten bolts in sequence - **1 to 8** -.

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

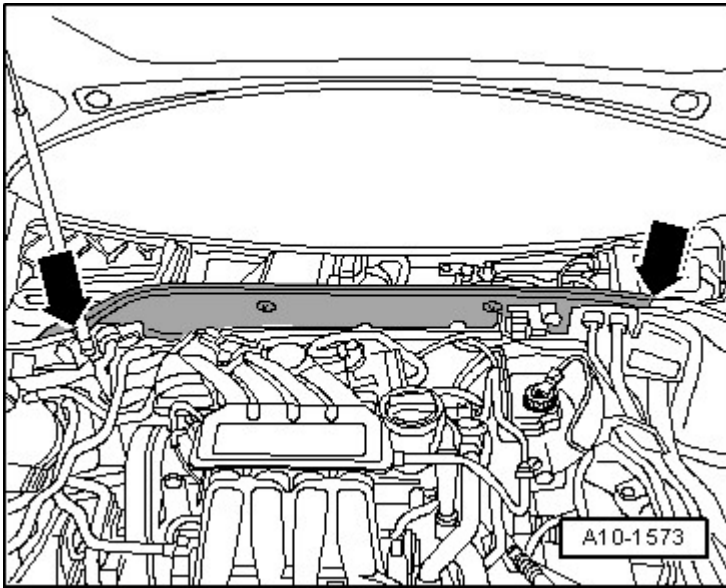
- Check oil level --> **Oil level, checking.**

#### Torque specifications

| Component                                                                                                               | Nm            |
|-------------------------------------------------------------------------------------------------------------------------|---------------|
| Left and right cover for timing chain on engine                                                                         | 5 + 90 ° 1)2) |
| Retainer for connections to cylinder head                                                                               | 9             |
| Cap for oil filter housing                                                                                              | 25            |
| Hose clamps 9 mm wide                                                                                                   | 3             |
| <ul style="list-style-type: none"> <li>• 1) Replace bolts.</li> <li>• 2) 90 ° corresponds to a quarter turn.</li> </ul> |               |

Lower timing chain cover, removing and installing

Special tools, testers and auxiliary items required



**Fig. 264: Identifying Old Oil Collecting And Extracting Device V.A.G 1782**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Old oil collecting and extracting device V.A.G 1782
- Hand drill with plastic brush attachment
- Protective glasses
- Sealant

### Removing

- Remove transmission -->
  - **34 MANUAL TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
  - **34 MANUAL TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
  - **34 MANUAL TRANSMISSION - CONTROLS, HOUSING** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
  - **34 - CONTROLS, HOUSING** for 6 SPD. MANUAL TRANSMISSION 0A3 ALL WHEEL DRIVE, INTERNAL COMPONENT SERVICING
  - **34 CONTROLS, HOUSING** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE
  - **34 CONTROLS, HOUSING** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
  - **34 CONTROLS, HOUSING** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE
- or -->
  - **37 - AUTOMATIC TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. AUTOMATIC TRANSMISSION 01V

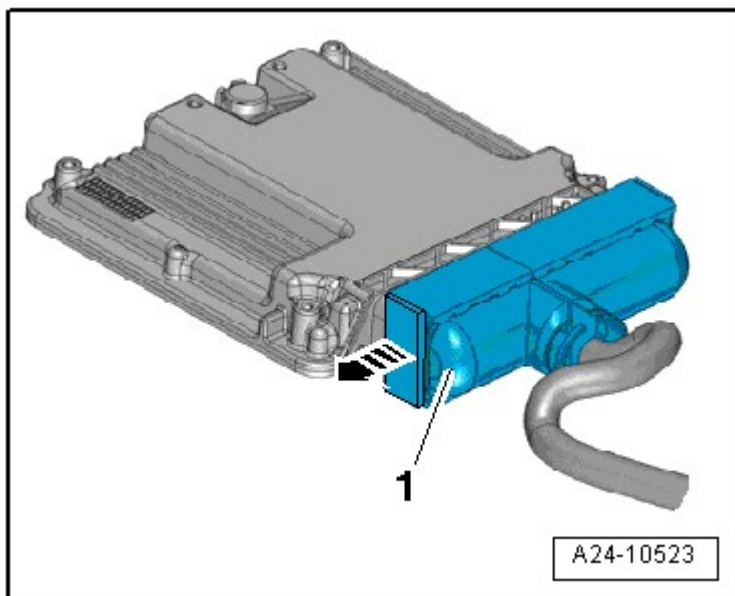
- **37 - AUTOMATIC TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING
  - **37 CONTROLS, HOUSING** for AUTOMATIC TRANSMISSION 09L, FOUR-WHEEL DRIVE
- Vehicles with manual transmission: Remove clutch pressure plate -->
- **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
  - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
  - **30 CLUTCH** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
  - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE
  - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
  - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE
- and dual mass flywheel --> **Dual mass flywheel (vehicles with manual transmission), removing and installing.**
- Vehicles with automatic transmission: Remove drive plate --> **Drive plate (vehicles with automatic transmission), removing and installing.**

**NOTE:**

- **After removing transmission, the engine is supported by engine support bridge 10-222 A and the torque support stop is loosened.**

**CAUTION:** For the further sequence of work, it must be made sure that the lock carrier is installed.

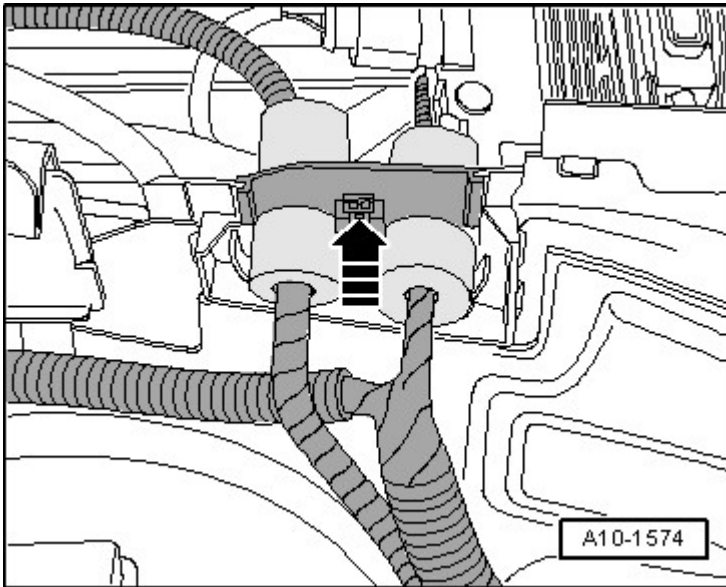
- To remove transmission, remove attached engine support bridge 10-222 A from engine.



**Fig. 265: Removing/Installing Bolts At Torque Support Stop**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

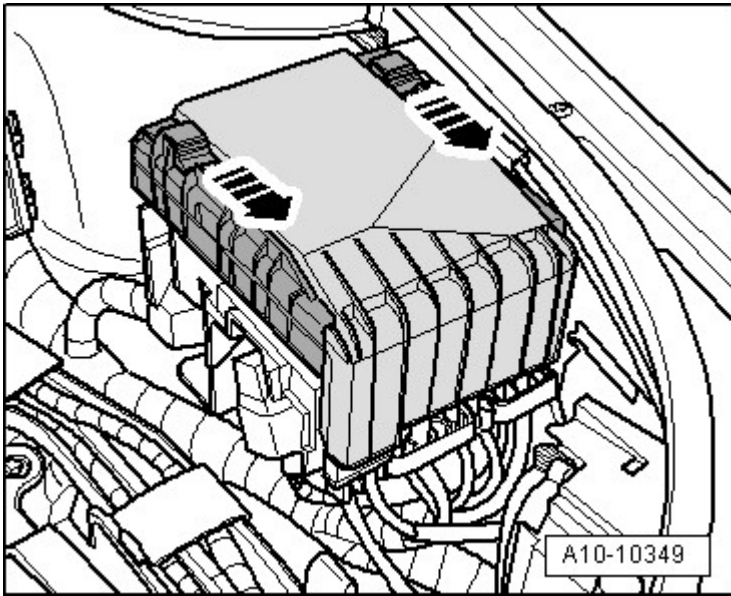
- Tighten torque support stop to 28 Nm - **arrows** -.
- Remove left and right timing chain covers --> **Left and right timing chain covers, removing and installing.**



**Fig. 266: Disconnecting Electrical Harness Connector From Oil Pressure Switch F1**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

**NOTE:**                      • Place a rag under oil filter housing to catch escaping engine oil.

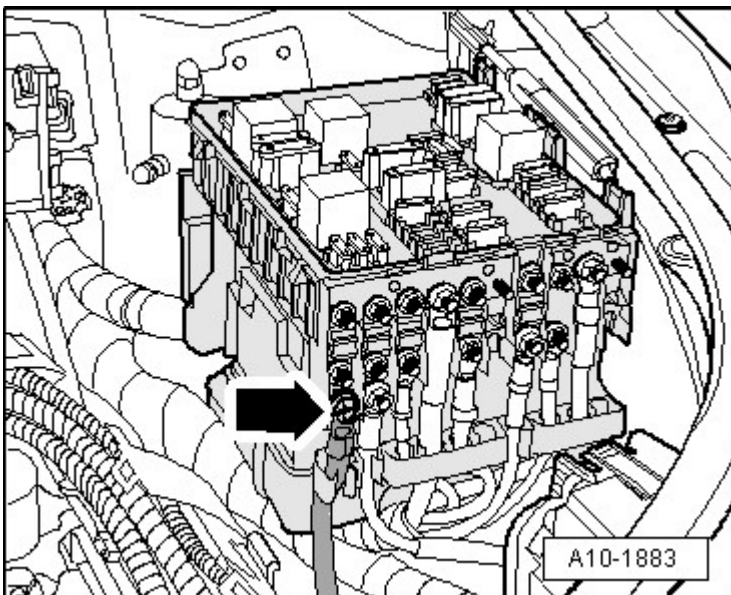
- Disconnect electrical harness connector from Oil Pressure Switch F1 - **arrow** -.
- Remove oil pressure switch.
- Extract engine oil using old oil collecting and extracting device V.A.G 1782 from oil filter housing.



**Fig. 267: Removing Oil Filter Housing Bolts**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Remove oil filter housing.
- Place old oil collecting and extracting device V.A.G 1782 under engine.
- Drain engine oil.



**Fig. 268: Removing/Installing Bolts And Lower Timing Chain Cover**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

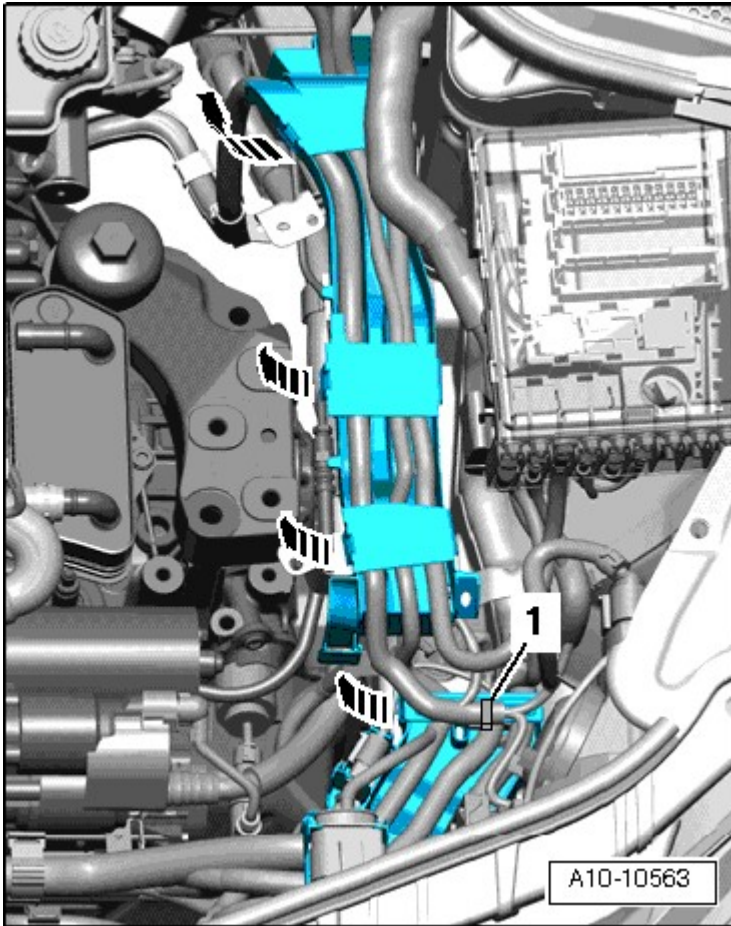
- Remove bolts - **arrows** -.
- Remove bolts - **1 to 8** - and remove lower timing chain cover.



- Press rear crankshaft seal out of lower timing chain cover.

## Installing

- NOTE:**
- Replace gaskets, seals and O-rings.

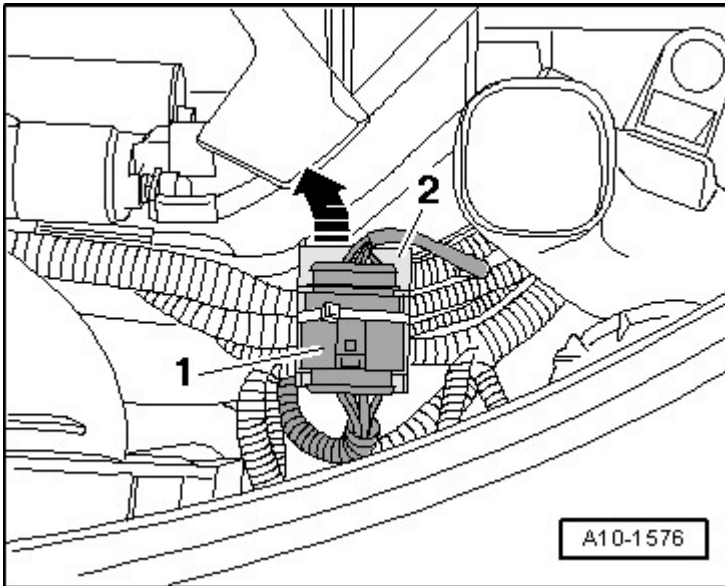


**Fig. 269: Pulling Alignment Bushing Out Of Top Right Of Cylinder Block**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull alignment bushing out of top right of cylinder block.
- Chamfer alignment bushing with a file, as shown in the illustration.
- Dimension - x - = 6.5 mm.
- Dimension - y - = 8 mm.
- Install alignment bushing into cylinder block so that the chamfered side faces upward.

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

**CAUTION: Wear safety glasses.**



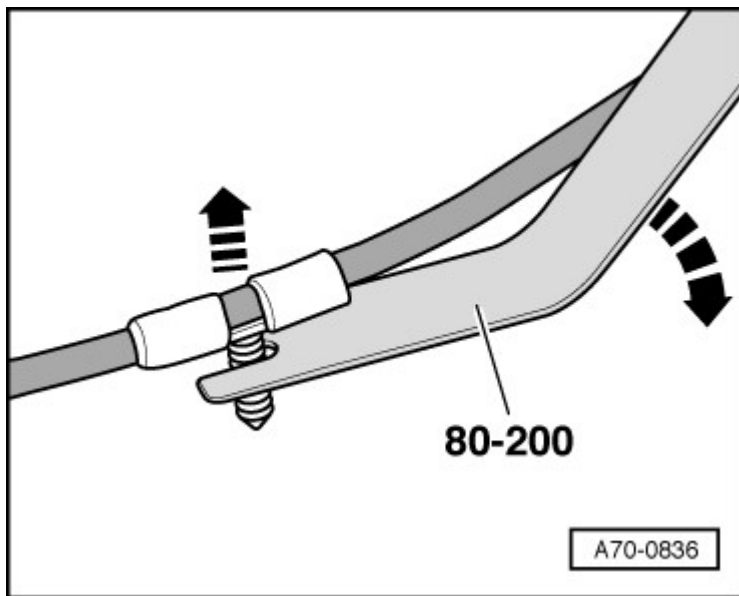
**Fig. 270: Using Rotating Plastic Brush To Remove Any Sealant Residue From Sealing Flange, Cylinder Block And Upper Part Of Oil Pan**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using e.g. a rotating plastic brush, remove sealant residue on timing chain cover, cylinder block and head.

**CAUTION: Make sure that no sealant residue enters the engine.**

- Clean sealing surfaces so they are completely free of any oil or grease.



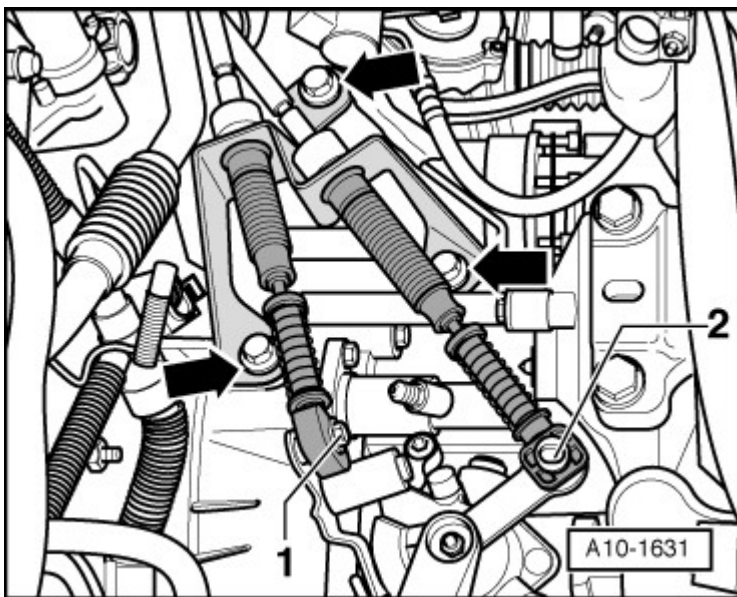
**Fig. 271: Cleaning Old Sealant From Holes In Cylinder Head Gaskets**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clean old sealant from holes - **arrow** - in cylinder head gaskets.

**NOTE:**

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

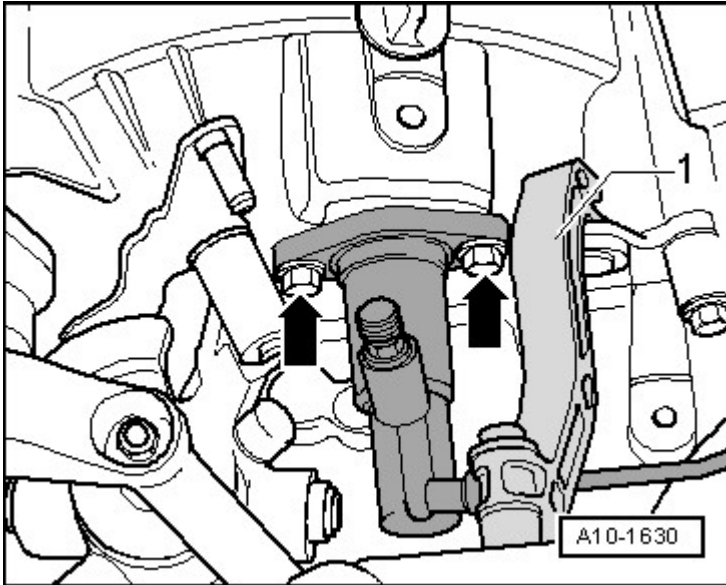
**CAUTION:** Cylinder head gasket must not be kinked. A kinked cylinder head gasket must be replaced.



**Fig. 272: Bending Ends Of Cylinder Head Gaskets Very Slightly Downward Until Upper Sealing Surface Of Gasket And Cylinder Head Can Be Cleaned**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Bend ends of cylinder head gaskets very slightly downward - **arrows** - until upper sealing surface of gasket and cylinder head can be cleaned.
- Clean both cylinder head gaskets, top and bottom, so they are completely free of any oil or grease.



**Fig. 273: Cutting Tube Nozzle At Front Marking**

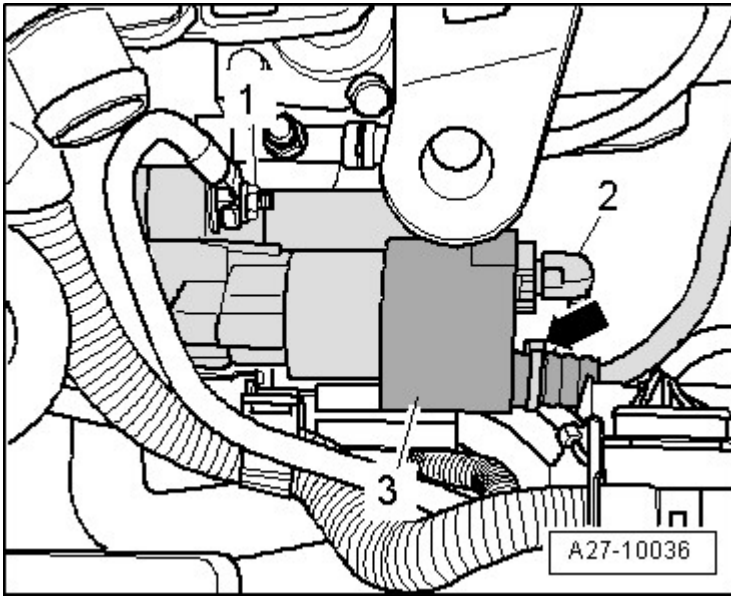
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Cut tube nozzle at front marking (jet dia. approx. 2 mm).

**NOTE:**

- The sealant must be applied to several places on the engine, as described in the following.
- The curing time for the sealant after application is only approx. 5 minutes.

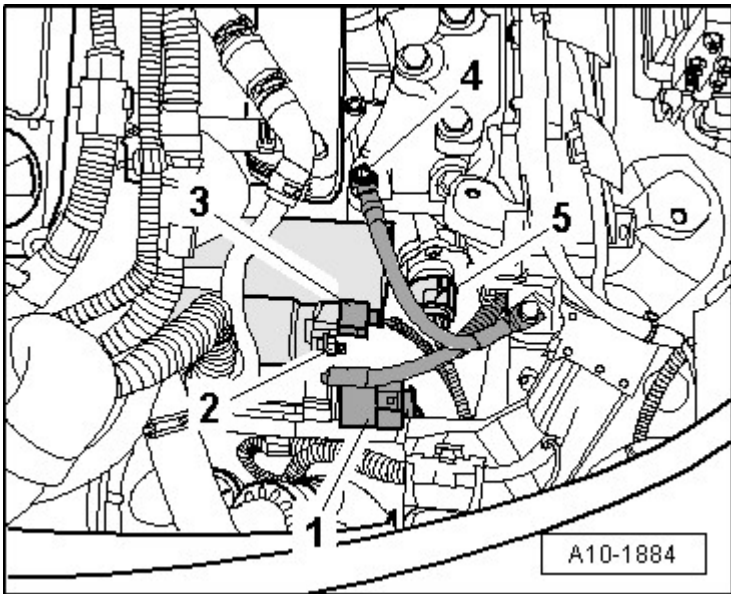
**CAUTION:** Cylinder head gasket must not be kinked. A kinked cylinder head gasket must be replaced.



**Fig. 274: Bending Ends Of Cylinder Head Gaskets Very Slightly Downward Until Upper Sealing Surface Of Gasket And Cylinder Head Can Be Cleaned**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Coat sealing surfaces of cylinder head gaskets, top and bottom, with a thin layer of sealant, slightly bending cylinder head gaskets downward again.
- To coat surface between cylinder head and gasket, use a flat object, e.g. a feeler gauge.

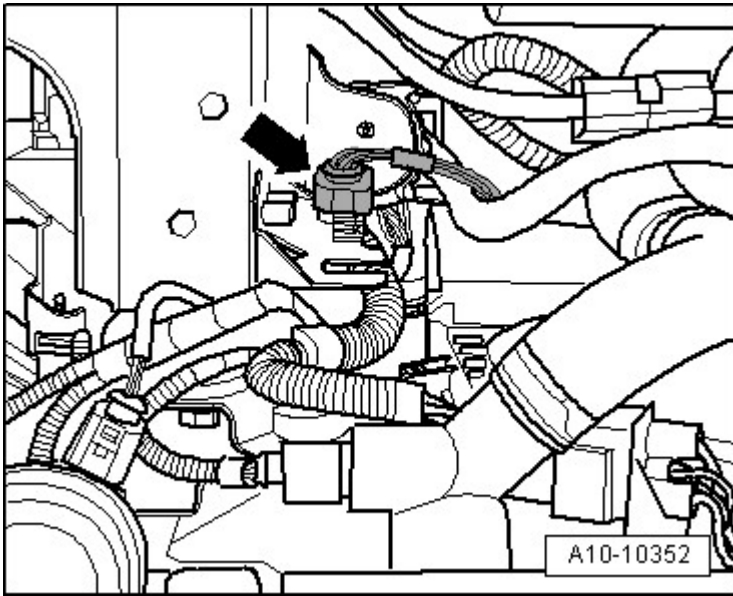


**Fig. 275: Cleaning Old Sealant From Holes In Cylinder Head Gaskets**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

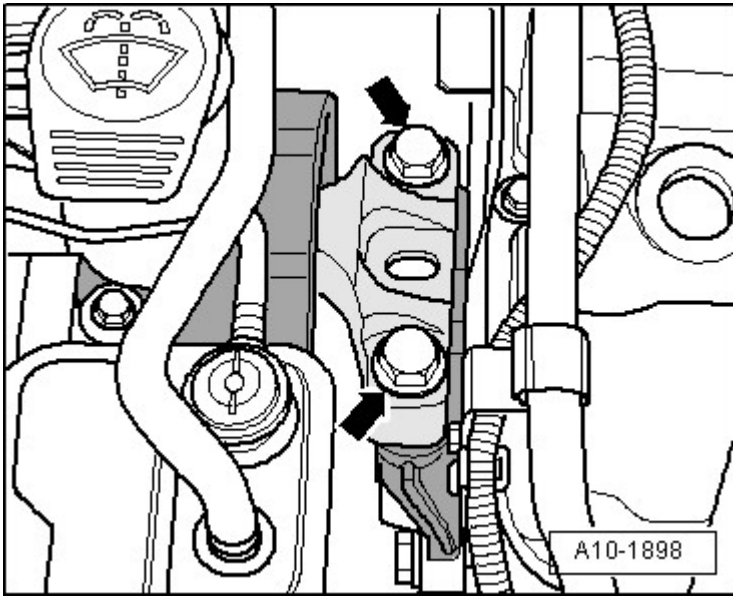
- Fill cleaned holes - **arrow** - in cylinder head seal with sealant.

**Vehicles through 04.2005:**



**Fig. 276: Applying Sealant Beads On Clean Sealing Surfaces Of Lower Timing Chain Cover**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Apply sealant beads - **1 to 6** - on clean sealing surfaces of lower timing chain cover, as shown in illustration.
- The groove of sealing surface must be completely filled with sealant.
- Sealant beads must stand 1.5 to 2.0 mm above sealing surface.
- The sealant bead - **3** - must be pulled through as shown in the illustration even though groove is intermittent.
- Lay O-ring - **arrow** - in lower timing chain cover groove.
- Secure O-ring with some sealant.

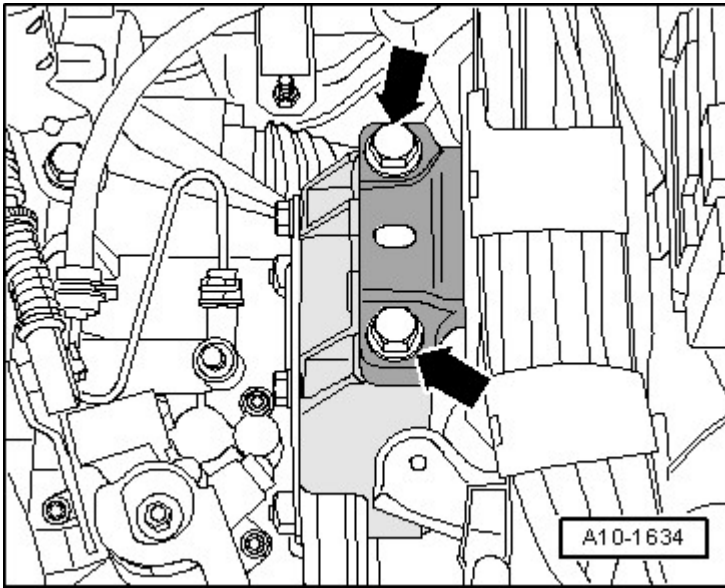


**Fig. 277: Removing/Installing Bolts And Lower Timing Chain Cover**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set lower timing chain cover in place, guiding cover at an angle from below onto sealing surface of cylinder block and cylinder head.
- When installing, make sure that the cylinder head gaskets do not become damaged. A damaged gasket must be replaced.
- Tighten bolts as follows:
  - Insert bolts - **arrows** - with locking compound and tighten to 5 Nm.
  - Tighten bolts - **1 to 8** - in diagonal sequence to 10 Nm.
  - Tighten bolts - **arrows** - to 10 Nm.
  - Tighten bolts - **6** - , - **7** - and - **8** - to 22 Nm.

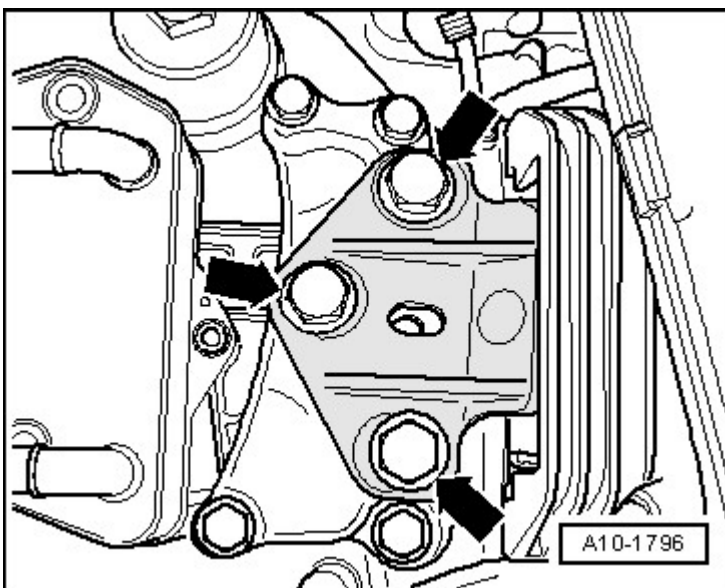
**Vehicles from 05.2005:**





**Fig. 278: Applying sealant beads on clean sealing surfaces of lower timing chain cover**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Apply sealant beads - **1 to 5** - on clean sealing surfaces of lower timing chain cover, as shown in illustration.
- The groove of sealing surface must be completely filled with sealant.
- Sealant beads must stand 1.5 to 2.0 mm above sealing surface.
- The sealant bead - **2** - must be pulled through as shown in the illustration even though groove is intermittent.
- Insert seals - **arrows** - in lower timing chain cover grooves.



**Fig. 279: Setting Lower Timing Chain Cover In Place, Guiding Cover At An Angle From Below Onto**

### **Sealing Surface Of Cylinder Block And Cylinder Head** **Courtesy of VOLKSWAGEN UNITED STATES, INC.**

- Set lower timing chain cover in place, guiding cover at an angle from below onto sealing surface of cylinder block and cylinder head.
- When installing, make sure that the cylinder head gaskets do not become damaged. A damaged gasket must be replaced.
- Tighten bolts as follows:

- Insert bolts - **arrows** - with locking compound and tighten to 5 Nm.
- Tighten bolts - **1 to 9** - in diagonal sequence to 10 Nm.
- Tighten bolts - **arrows** - to 10 Nm.
- Tighten bolts - **7** - , - **8** - and - **9** - to 22 Nm.
- Tighten stud bolt - **3** - to 16 Nm.

#### **All:**

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

- Install oil filter housing --> **Oil filter housing, removing and installing.**
- Install left and right timing chain covers **Installing.**
- Install crankshaft seal, timing chain side --> **Crankshaft seal, timing chain side, replacing.**
- Vehicles with manual transmission: Install dual mass flywheel --> **Dual mass flywheel (vehicles with manual transmission), removing and installing** and clutch pressure plate -->
  - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
  - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
  - **30 CLUTCH** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
  - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE
  - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
  - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE
- Vehicles with automatic transmission: Install drive plate --> **Drive plate (vehicles with automatic transmission), removing and installing.**
- Install transmission -->
  - **34 MANUAL TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
  - **34 MANUAL TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
  - **34 MANUAL TRANSMISSION - CONTROLS, HOUSING** for 6 SPD. MANUAL

TRANSMISSION 01E ALL WHEEL DRIVE

- **34 - CONTROLS, HOUSING** for 6 SPD. MANUAL TRANSMISSION 0A3 ALL WHEEL DRIVE, INTERNAL COMPONENT SERVICING
- **34 CONTROLS, HOUSING** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE
- **34 CONTROLS, HOUSING** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
- **34 CONTROLS, HOUSING** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE

or -->

- **37 - AUTOMATIC TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. AUTOMATIC TRANSMISSION 01V
- **37 - AUTOMATIC TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING
- **37 CONTROLS, HOUSING** for AUTOMATIC TRANSMISSION 09L, FOUR-WHEEL DRIVE

- Add engine oil and check oil level --> **Oil level, checking.**

**Torque specifications**

| Component                                                                                                                                                                                                                                                                                      |    | Nm                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|--------------------------|
| Lower timing chain cover to engine                                                                                                                                                                                                                                                             | M6 | 9 <sup>1)</sup>          |
| M7                                                                                                                                                                                                                                                                                             | 16 |                          |
| M8                                                                                                                                                                                                                                                                                             | 20 |                          |
| Left and right cover for timing chain on engine                                                                                                                                                                                                                                                |    | 5 + 90 ° <sup>2)3)</sup> |
| Retainer for connections to cylinder head                                                                                                                                                                                                                                                      |    | 9                        |
| <ul style="list-style-type: none"> <li>• <sup>1)</sup> Install threaded fasteners between cylinder head and lower timing chain cover with locking compound; Locking compound .</li> <li>• <sup>2)</sup> Replace bolts.</li> <li>• <sup>3)</sup> 90 ° corresponds to a quarter turn.</li> </ul> |    |                          |

**CAMSHAFT DRIVE**

**Camshaft drive**

**NOTE:**

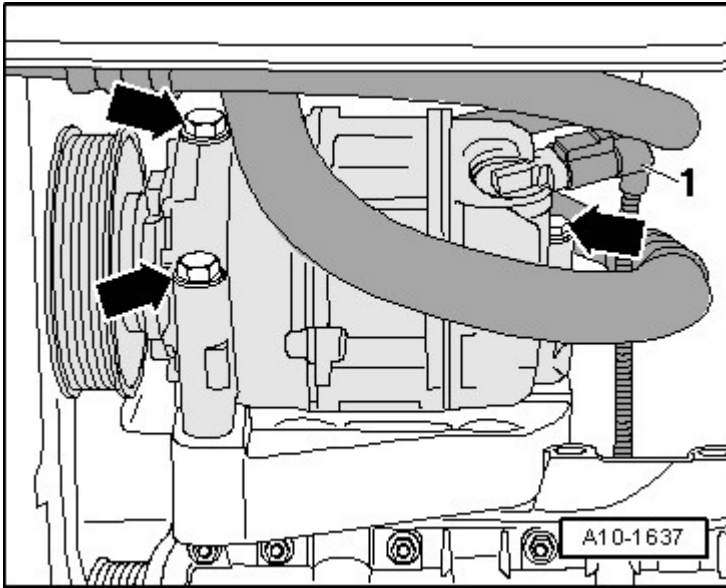
- **Crankshaft and camshafts must only be rotated when chain drive is installed completely. Otherwise the valves impact on the pistons danger of damage to valves/piston heads.**

## Camshaft timing chain, component overview

**NOTE:**

- Before removing camshaft timing chain, mark direction of travel with paint. Reversing the rotation direction of a used chain can destroy it.

## Left camshaft timing chain



**Fig. 280: Camshaft Timing Chain, Component Overview (Left Camshaft Timing Chain)**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

## 1 - Camshaft adjuster for exhaust camshaft

- Identification "Exhaust"
- Removing and installing --> **Detaching timing chains from camshaft, removing and installing chain tensioner**

## 2 - Camshaft bolt

- Replace
- Initial tightening torque: 40 Nm
- Final tightening torque: 80 Nm plus an additional 90 ° (  $\frac{1}{4}$  turn)

## 3 - Camshaft bolt

- Replace
- Initial tightening torque: 40 Nm
- Final tightening torque: 80 Nm plus an additional 90 ° (  $\frac{1}{4}$  turn)

**4 - Camshaft adjuster for intake camshaft**

- Identification "Intake"
- Removing and installing --> **Detaching timing chains from camshaft, removing and installing chain tensioner**

**5 - Left camshaft timing chain**

- Removing and installing --> **Detaching timing chains from camshaft, removing and installing chain tensioner**

**6 - 9 Nm****7 - Chain tensioner for left camshaft timing chain**

- Removing and installing --> **Detaching timing chains from camshaft, removing and installing chain tensioner**

**8 - Oil strainer**

- Set into chain tensioner
- Observe locating tabs on circumference

**9 - Gasket**

- Replace
- Clipped onto chain tensioner

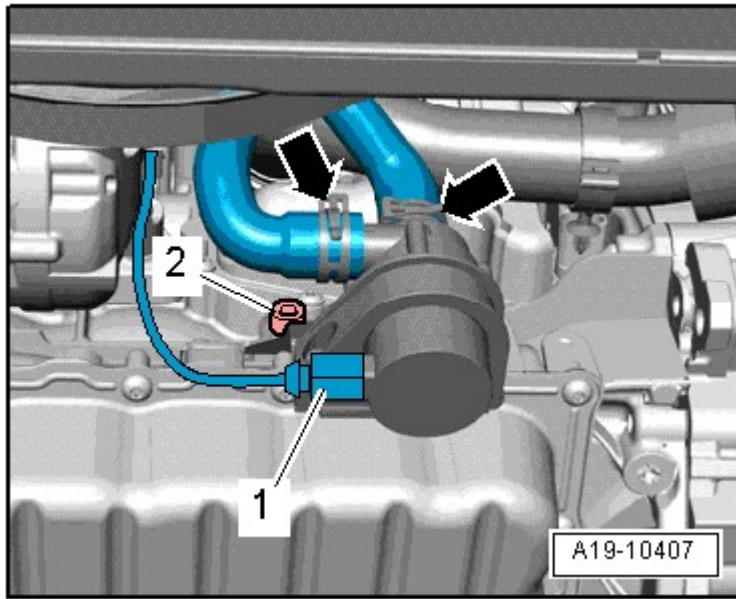
**10 - Mounting bracket for drive sprocket****11 - 8 Nm plus an additional 45 ° (  $\frac{1}{8}$  turn)**

- Replace
- To be oiled for installation

**12 - Drive sprocket for left camshaft timing chain****13 - Thrust washer for drive sprocket****14 - 6 Nm plus an additional 60 ° (  $\frac{1}{6}$  turn)**

- Replace

**Right camshaft timing chain**



**Fig. 281: Camshaft Timing Chain, Component Overview (Right Camshaft Timing Chain)**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Drive sprocket for right camshaft timing chain

2 - Mounting bracket for drive sprocket

3 - 30 Nm plus an additional 90 ° (  $\frac{1}{4}$  turn)

4 - Right camshaft timing chain

- Removing and installing --> **Detaching timing chains from camshaft, removing and installing chain tensioner**

5 - Camshaft bolt

- Replace
- Initial tightening torque: 40 Nm
- Final tightening torque: 80 Nm plus an additional 90 ° (  $\frac{1}{4}$  turn)

6 - Camshaft adjuster for intake camshaft

- Identification "Intake"
- Removing and installing --> **Detaching timing chains from camshaft, removing and installing chain tensioner**

7 - Chain tensioner for right camshaft timing chain

- Removing and installing --> **Detaching timing chains from camshaft, removing and installing chain tensioner**

8 - Oil strainer

- Set into chain tensioner
- Installed location: Locating tabs on circumference

9 - Gasket

- Replace
- Clipped onto chain tensioner

10 - 9 Nm

11 - Camshaft adjuster for exhaust camshaft

- Identification "Exhaust"
- Removing and installing --> **Detaching timing chains from camshaft, removing and installing chain tensioner**

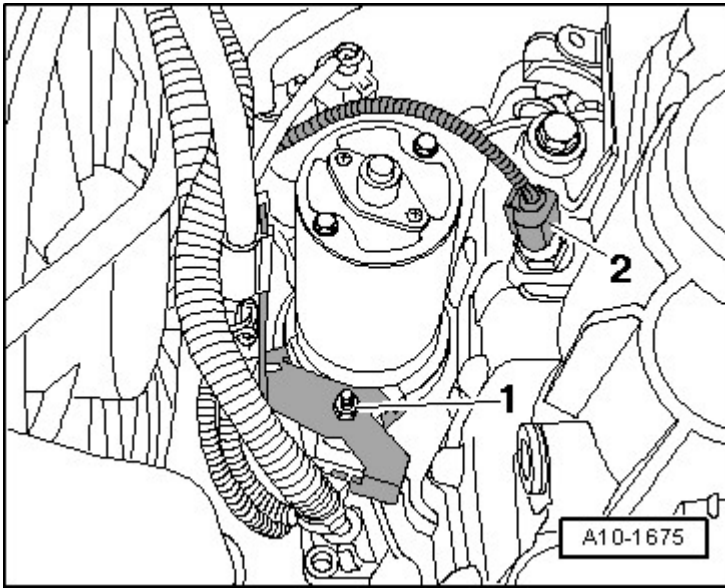
12 - Camshaft bolt

- Replace
- Initial tightening torque: 40 Nm
- Final tightening torque: 80 Nm plus an additional 90 ° (  $\frac{1}{4}$  turn)

13 - Thrust washer for drive sprocket

**Detaching timing chains from camshaft, removing and installing chain tensioner**





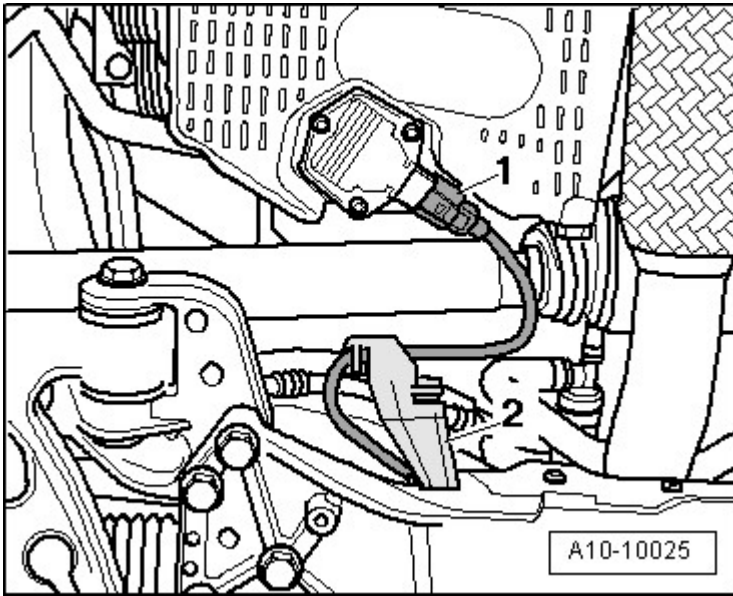
**Fig. 282: Identifying Special Tools - Detaching Timing Chains From Camshaft, Removing And Installing Chain Tensioner**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

**Special tools, testers and auxiliary items required**

- Counter-holder T10172 with pin T10172/2
- Adapter T40058
- Locking pin T40069
- Camshaft locator T40070 (qty. 2)
- Securing pin T40071 (qty. 2)

**Special tools, testers and auxiliary items required**



**Fig. 283: Socket And Key T10035**

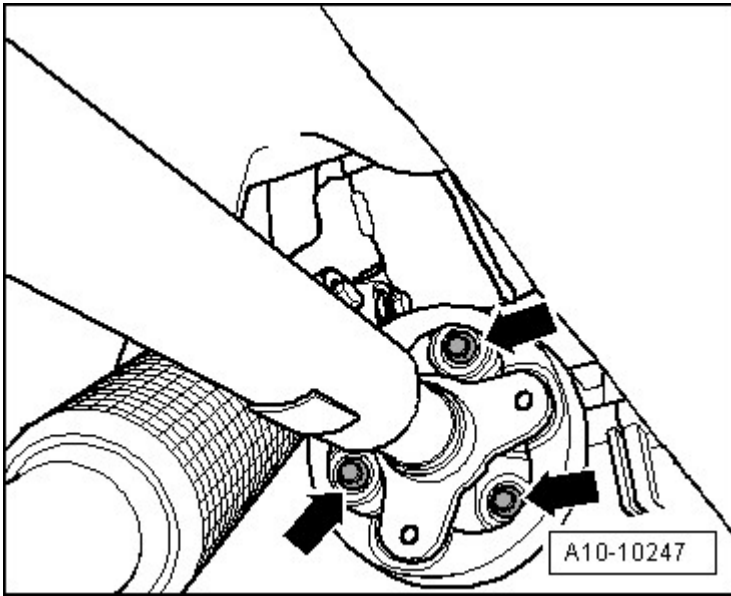
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Multi-point socket T10035

#### Removing

#### NOTE:

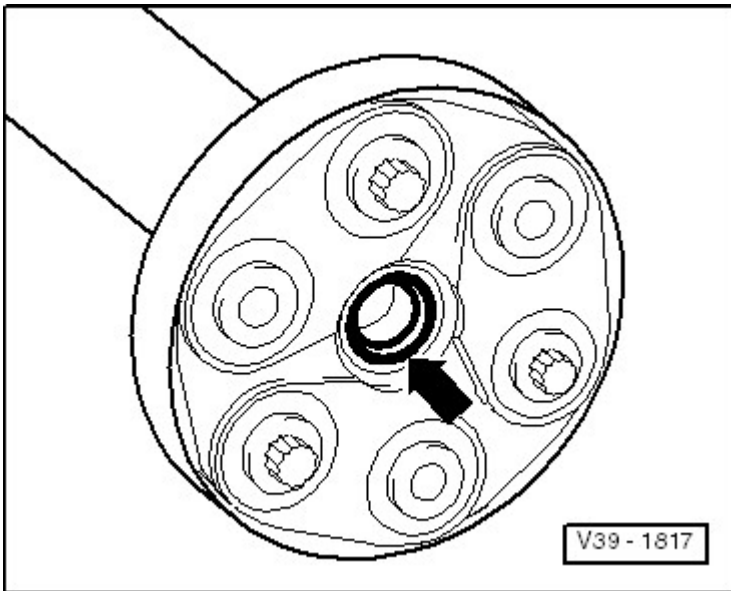
- According to the following description, the timing chains for camshafts remain on engine. If the timing chains for camshafts are to be completely removed, the lower timing chain cover must also be removed --> Lower timing chain cover, removing and installing.
- Remove cylinder head cover: Left --> Left cylinder head cover, removing and installing , right --> Right cylinder head cover, removing and installing.
- Remove left and right timing chain covers --> Left and right timing chain covers, removing and installing.



**Fig. 284: Locating Fasteners Exhaust Pipe**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

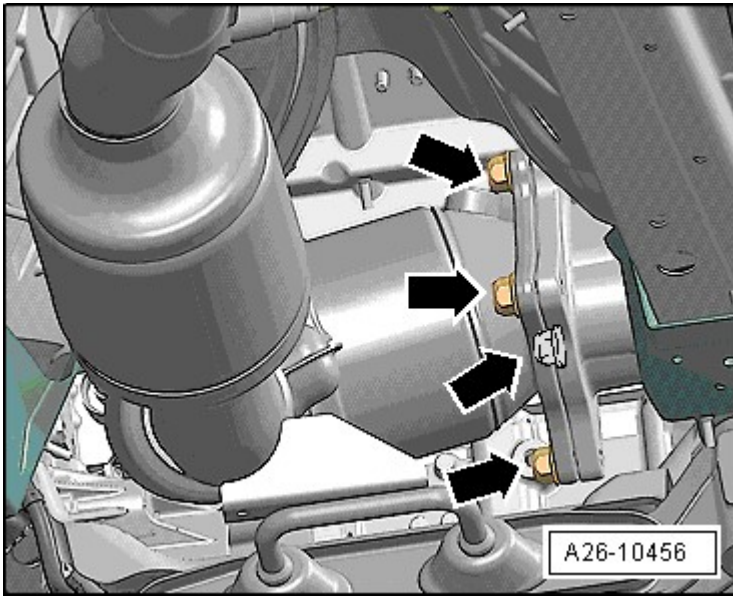
- For vehicles with auxiliary heater, remove bolts - **arrows** - for exhaust pipe of parking heater/auxiliary heater on noise insulation.



**Fig. 285: Identifying Quick-Release Fasteners And Noise Insulation**

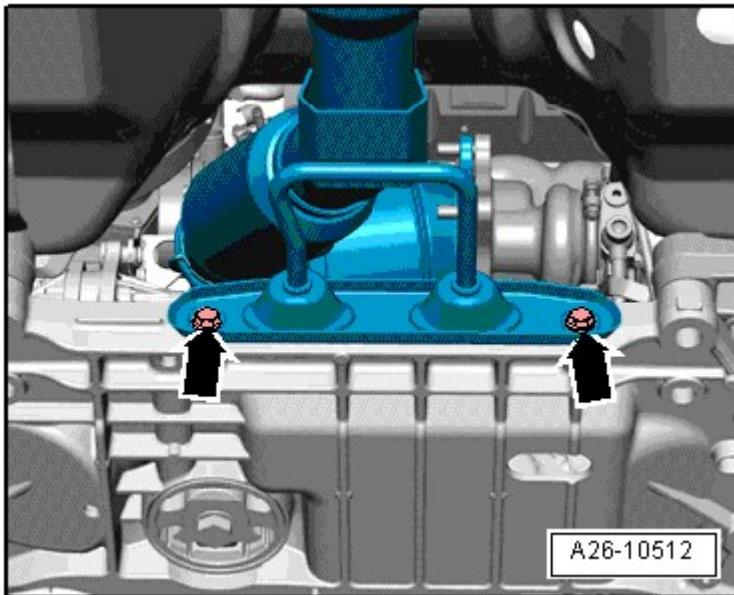
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen quick-release fasteners - **1** - and - **2** - and remove front noise insulation. Rear section of noise insulation remains installed.



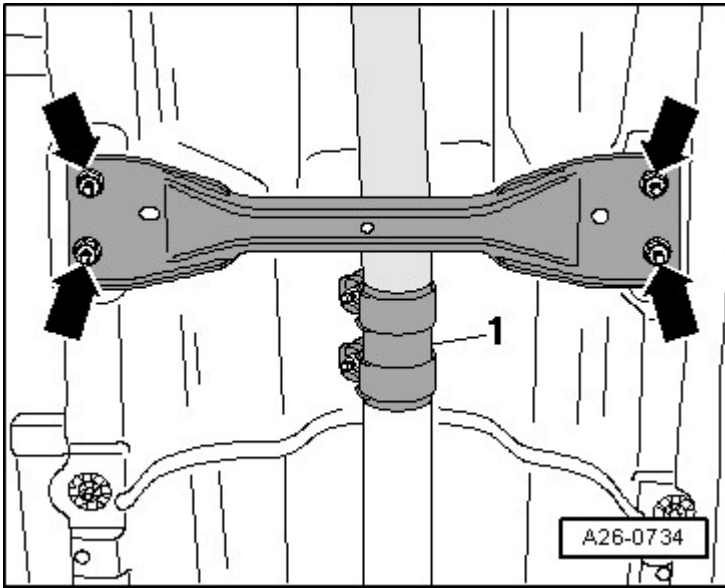
**Fig. 286: Inserting Guide Pin Of Adapter T40058 So That Large Diameter Points To Engine**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert guide pin of adapter T40058 so that large diameter - **arrow 1** - points to engine. Small diameter - **arrow 2** - points to adapter.



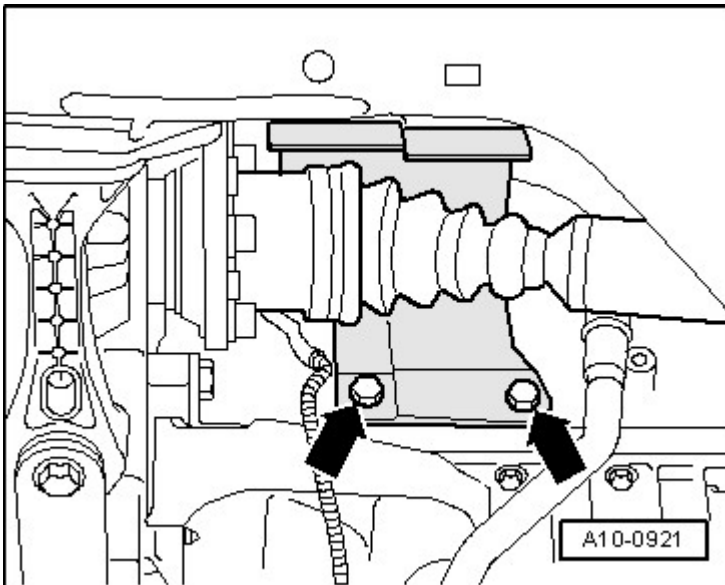
**Fig. 287: Loosening Torque Converter Bolts Using Adapter T40058**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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



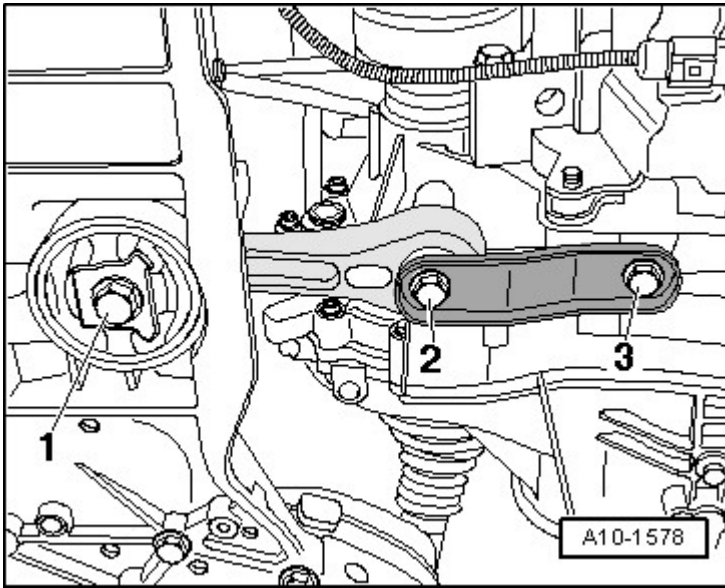
**Fig. 288: Identifying Threaded Holes In Camshafts Must Face Upward**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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



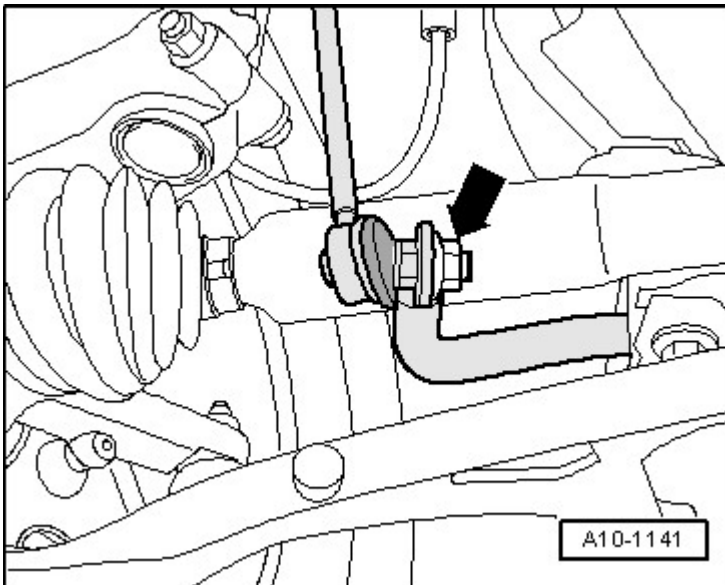
**Fig. 289: Mounting Camshaft Locating Tool T40070 To Both Cylinder Heads And Tightening Bolts**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Mount camshaft locating tool T40070 to both cylinder heads and tighten bolts - **arrows** - to 20 Nm.
- The camshaft locating tool T40070 is correctly positioned when holes for cylinder head bolts remain free.



**Fig. 290: Unfastening Left/Right Stabilizer Bar Mountings**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

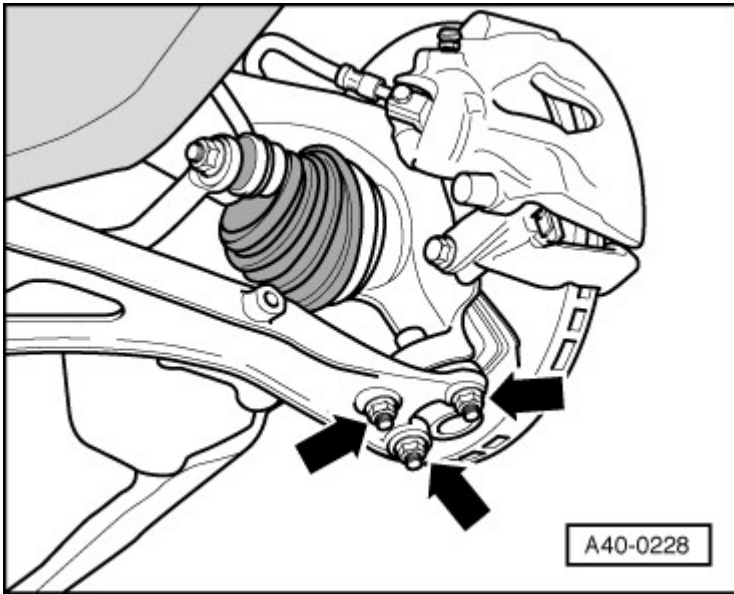
- Unfasten left and right stabilizer bar mountings - 1 - and - 2 -.



**Fig. 291: Removing/Installing Sealing Plug From Cylinder Block**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

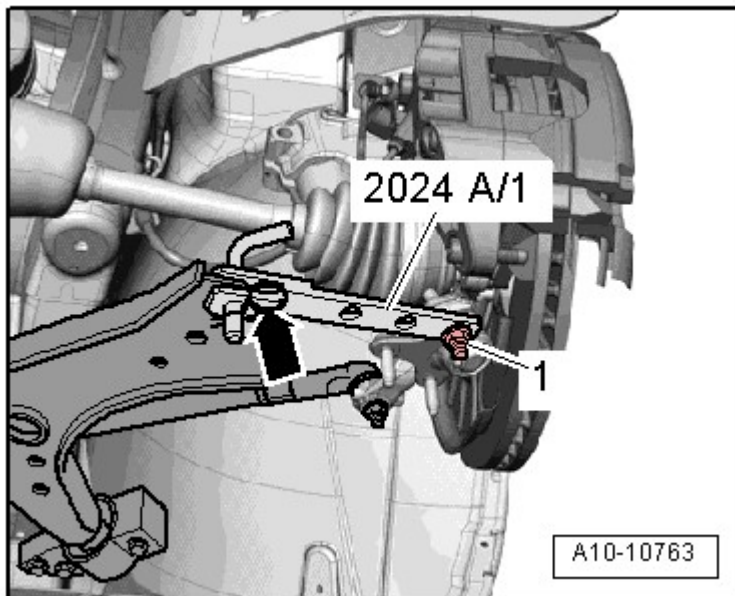
- Remove sealing plug - **arrow** - from cylinder block.

**CAUTION: Do not turn crankshaft while touching TDC hole with finger - Risk of injury.**



**Fig. 292: Installing Crankshaft Holder T40069 Into Hole**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

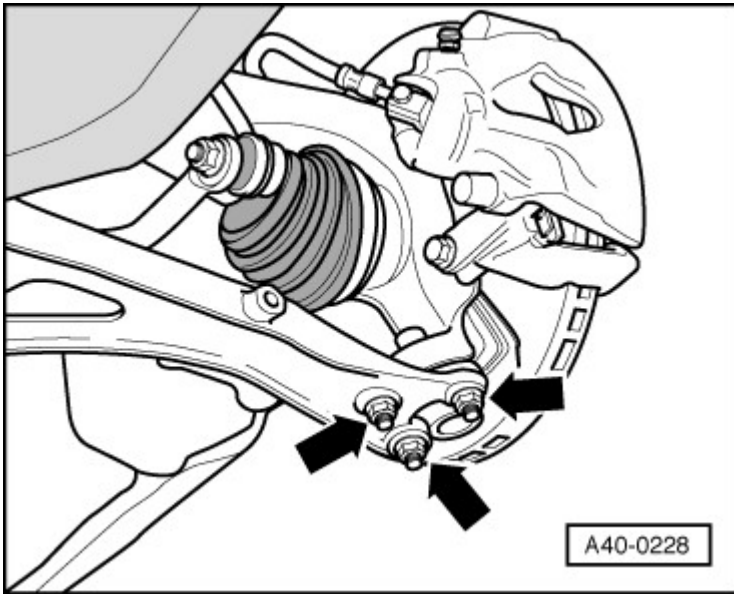
- Install crankshaft holder T40069 into hole - 1 - to 10 Nm, if necessary rotate crankshaft very slightly back and forth to completely center holder.
- Mark running direction of left camshaft timing chain with paint.



**Fig. 293: Tightening Camshaft Bolts On Left Cylinder Head**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

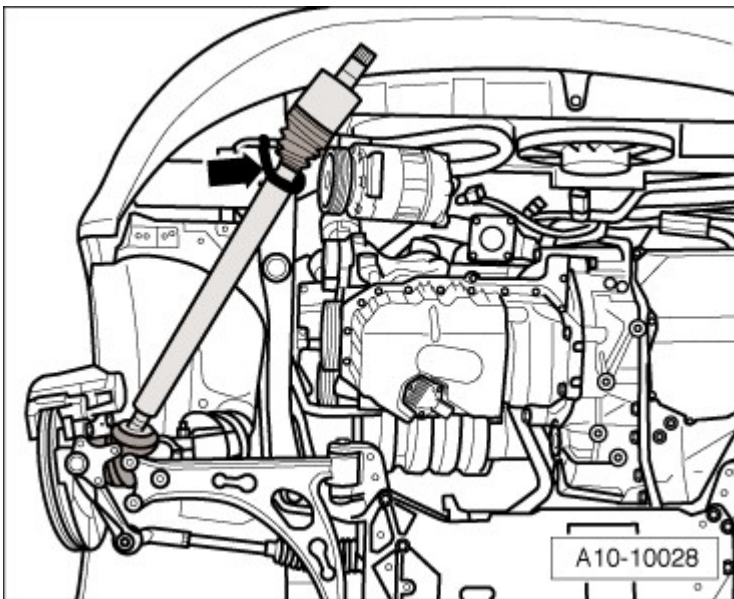
- Remove bolts - 1 - and - 2 - for camshaft adjuster using multipoint socket T10035.
- Remove both camshaft adjusters.





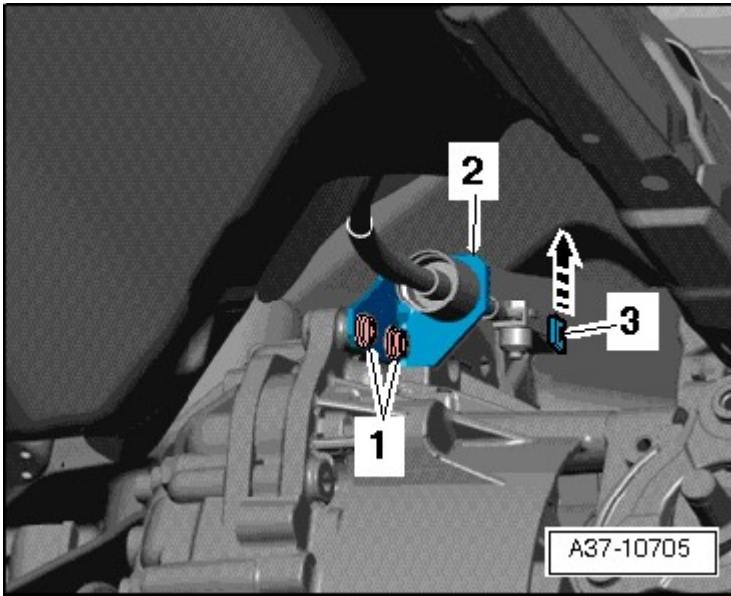
**Fig. 294: Removing Bolts And Chain Tensioner**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - 1 - and - 2 - and remove chain tensioner.
- Mark running direction of right camshaft timing chain with paint.



**Fig. 295: Removing Bolts For Camshaft Adjuster Using Multipoint Socket T10035**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - 1 - and - 2 - for camshaft adjuster using multipoint socket T10035.
- Remove both camshaft adjusters.



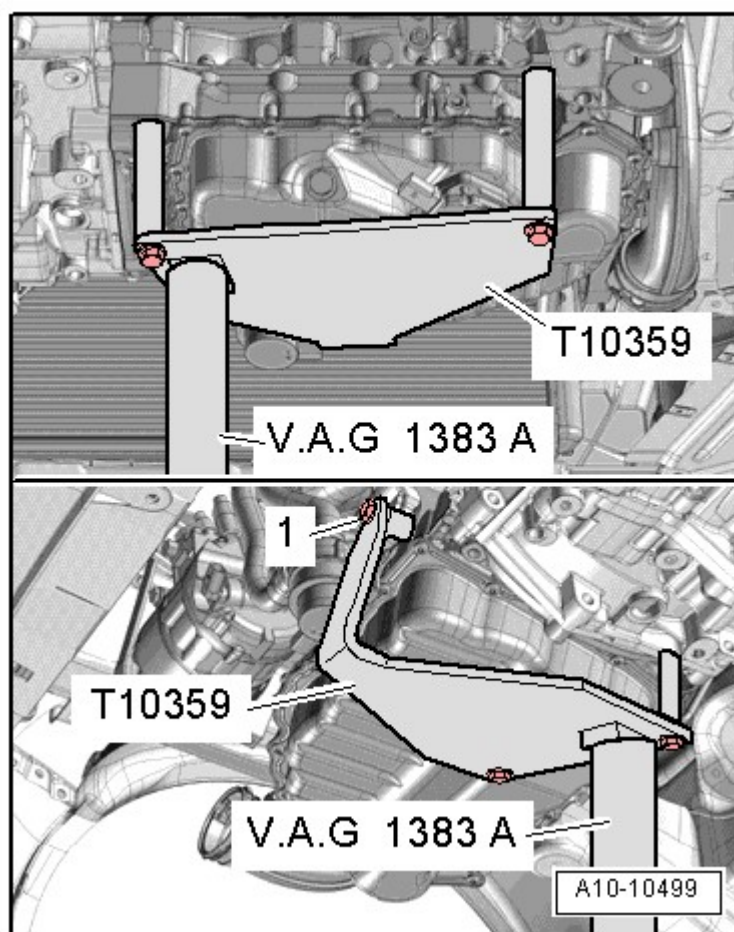
**Fig. 296: Removing Bolts And Chain Tensioner**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - 1 - and - 2 - and remove chain tensioner.

#### Installing

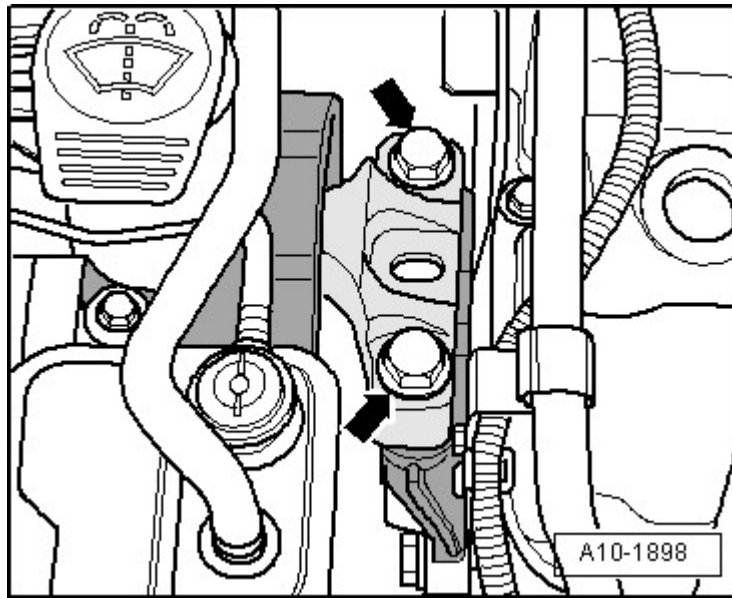
#### NOTE:

- Always replace bolts that are tightened to torque as well as O-rings and gaskets.
- When turning camshaft, crankshaft must not be at TDC for any cylinder. Valves and/or pistons may be damaged.
- Drive chain for timing mechanism installed --> Drive chain for timing mechanism, removing and installing.



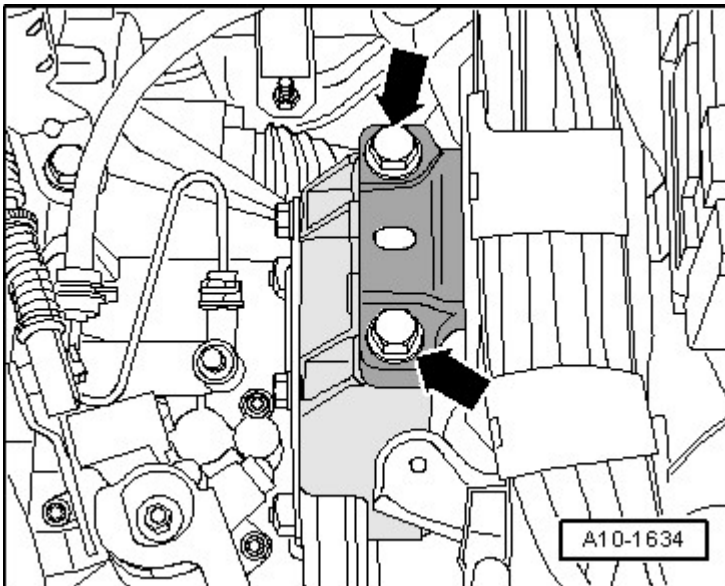
**Fig. 297: Installing Crankshaft Holder T40069 Into Hole**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure crankshaft in TDC position using crankshaft holder T40069.



**Fig. 298: Mounting Camshaft Locating Tool T40070 To Both Cylinder Heads And Tightening Bolts**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Camshaft locating tool T40070 mounted on both cylinder heads and tightened to 20 Nm.

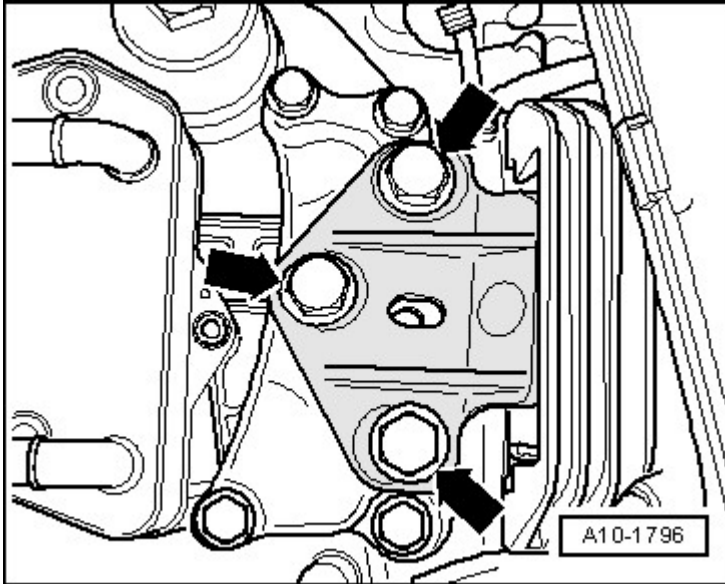


**Fig. 299: Fully Relieving Tension Of Guide Rail For Left/Right Camshaft Timing Chain Tensioner**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Fully relieve tension of guide rail for left and right camshaft timing chain tensioner - **arrow** -.
- The piston of tensioning element - **1** - must be driven out completely, thereby releasing retainer - for this chain tensioner must be removed.

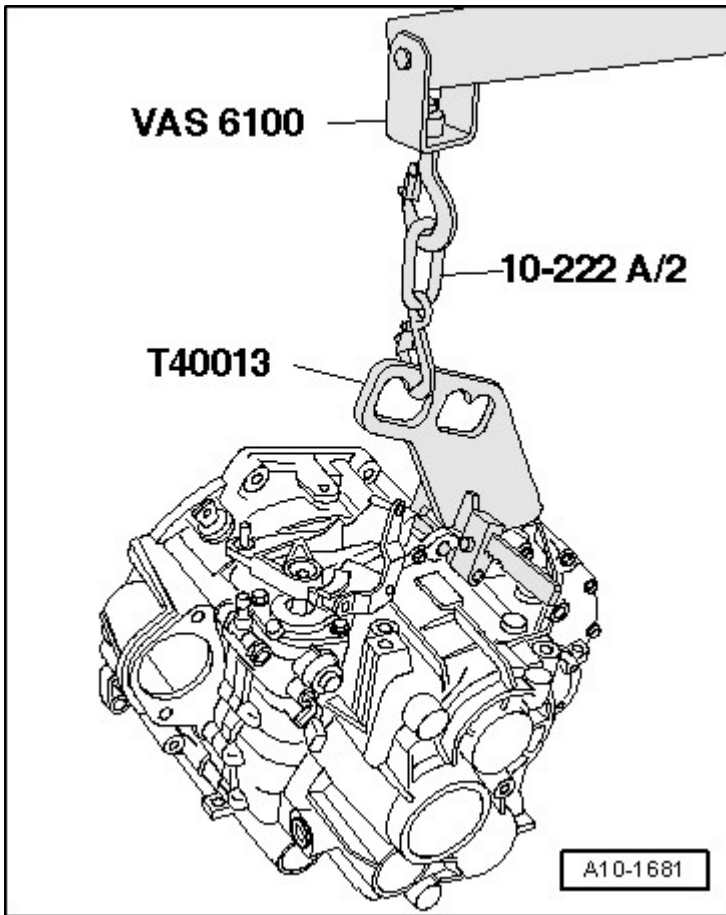
**NOTE:**

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



**Fig. 300: Pressing Guide Rail Of Left/Right Camshaft Timing Chain Inward Up To Stop And Secure Chain Tensioner With Securing Pin T40071**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

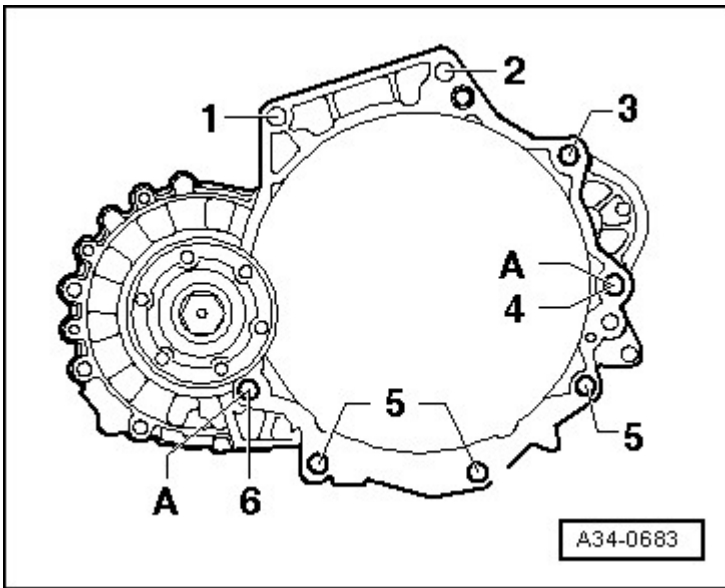
- Press guide rail of left and right camshaft timing chain inward - **arrow** - up to stop and secure chain tensioner with securing pin T40071.



**Fig. 301: Cleaning Oil Strainer In Both Chain Tensioners & Placing New Gasket Onto Rear Of Chain Tensioner**

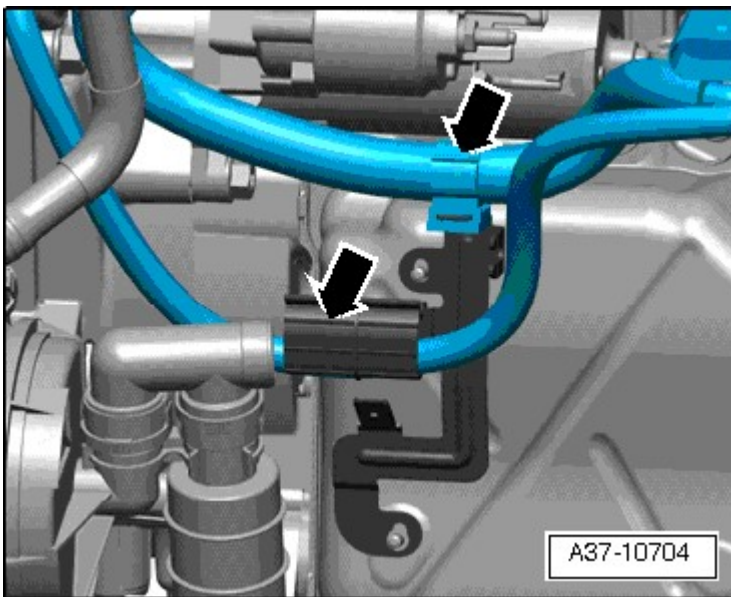
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clean oil strainer - 3 - in both chain tensioners, if necessary.
- Place a new gasket - 2 - onto rear of chain tensioner - 1 -.
- Set chain tensioner in place on left cylinder head and install camshaft timing chain, as shown in the illustration.



**Fig. 302: Tightening Bolts & Replacing Camshaft Bolts**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten bolts - 1 - and - 2 -.
- Replace camshaft bolts.

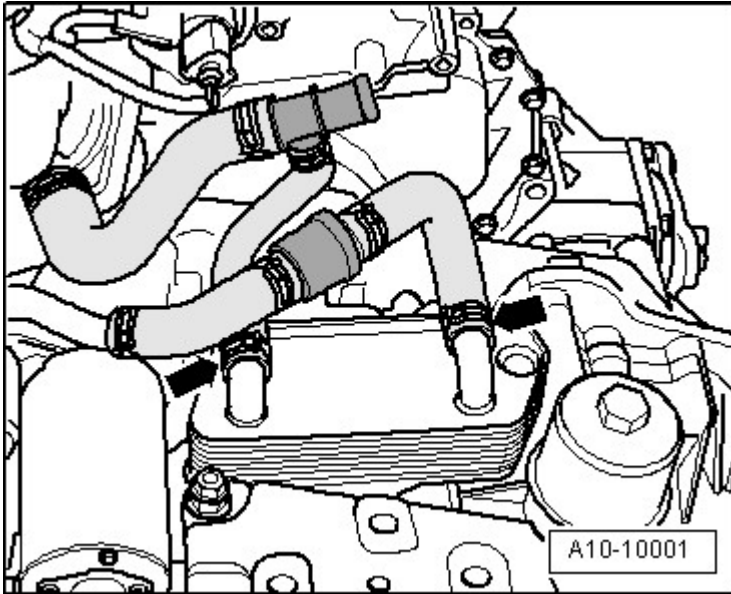


**Fig. 303: Tightening Camshaft Bolts On Left Cylinder Head**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place camshaft timing chain onto drive sprocket and onto camshaft adjusters and loosely thread in bolts - 1 - and - 2 -.
- Both camshaft adjusters must be able to still be rotated on camshaft and must not tip.

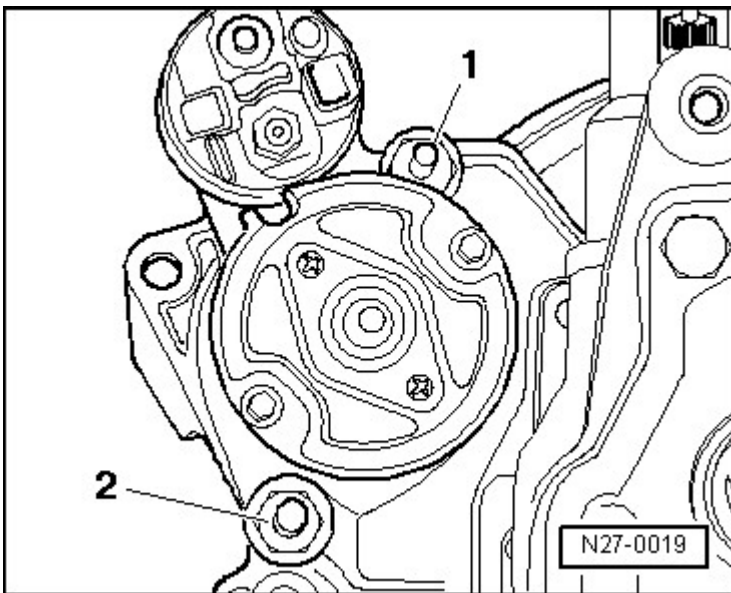


- Remove Locking Pin T40071.
- Set chain tensioner in place on right cylinder head and install camshaft timing chain, as shown in the illustration.



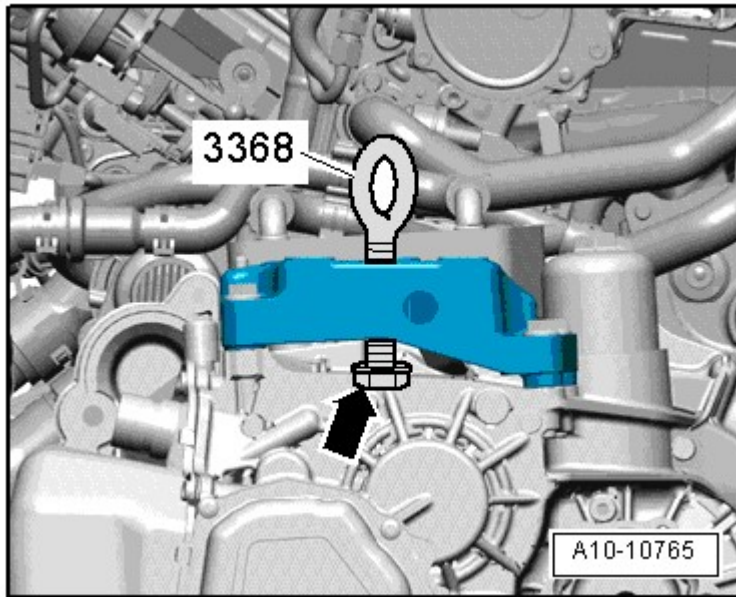
**Fig. 304: Tightening Bolts & Replacing Camshaft Bolts**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten bolts - 1 - and - 2 -.
- Replace camshaft bolts.



**Fig. 305: Removing Bolts For Camshaft Adjuster Using Multipoint Socket T10035**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

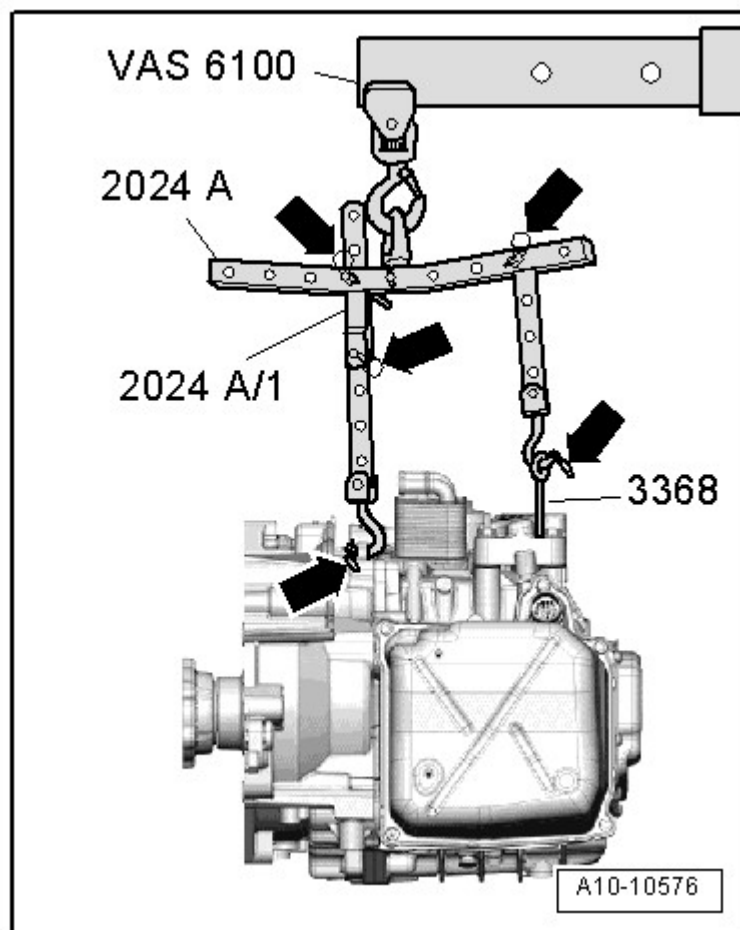
- Place camshaft timing chain onto drive sprocket and onto camshaft adjusters and loosely thread in bolts - **1** - and - **2** -.
- Both camshaft adjusters must be able to still be rotated on camshaft and must not tip.
- Remove Locking Pin T40071.



**Fig. 306: Setting Counter-Holder T10172 With Pin T10172/2 In Place On Camshaft Adjuster Of Left Intake Camshaft**

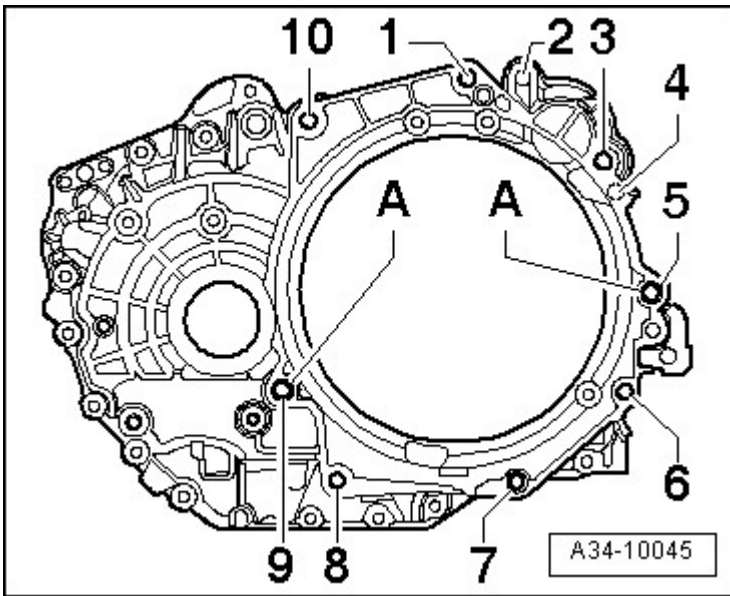
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set counter-holder T10172 with pin T10172/2 in place on camshaft adjuster of left intake camshaft.
- Hold camshaft timing chain pre-tensioned by pressing on counter-holder in direction of - **arrow** -.
- Simultaneously, pre-torque camshaft bolt using multipoint socket T10035 and torque wrench.
- Torque specification: 40 Nm.
- Continue holding pretension on intake camshaft and pre-torque bolt - **1** - on exhaust camshaft.
- Torque specification: 40 Nm.



**Fig. 307: Tightening Camshaft Bolts On Left Cylinder Head**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

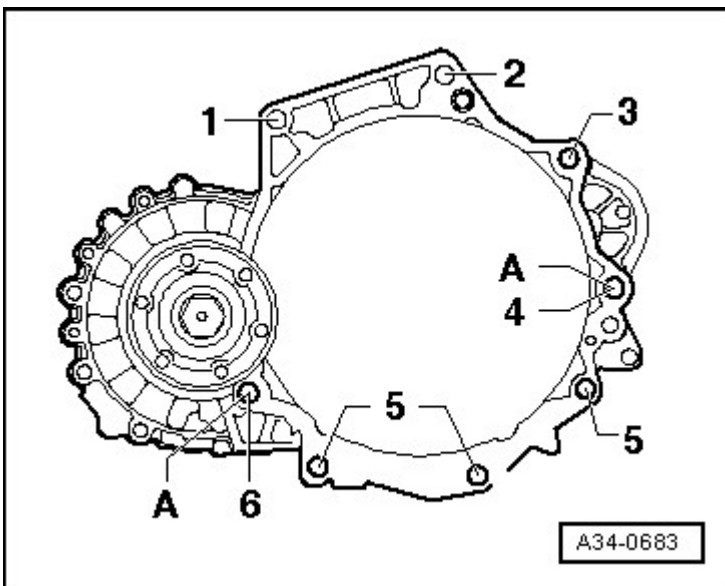
- Tighten camshaft bolts - 1 - and - 2 - on left cylinder head to final torque specification.
- Torque specification: 80 Nm plus an additional 90 ° (  $\frac{1}{4}$  turn).



**Fig. 308: Setting Counter-Holder T10172 With Pin T10172/2 In Place On Camshaft Adjuster Of Right Exhaust Camshaft**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

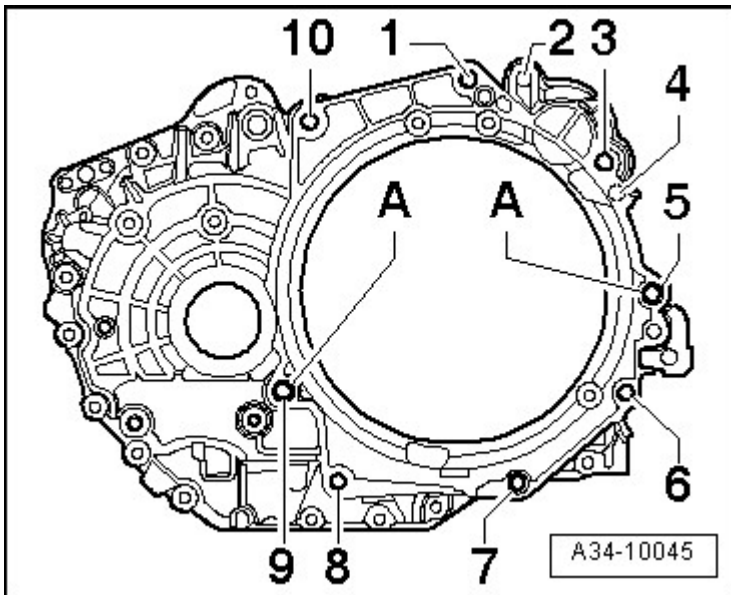
- Set counter-holder T10172 with pin T10172/2 in place on camshaft adjuster of right exhaust camshaft.
- Hold camshaft timing chain pre-tensioned by pressing on counter-holder in direction of - **arrow** -.
- Simultaneously, pre-torque camshaft bolt using multipoint socket T10035 and torque wrench.
- Torque specification: 40 Nm.
- Continue holding pretension on exhaust camshaft and pre-torque bolt - **1** - on intake camshaft.
- Torque specification: 40 Nm.



**Fig. 309: Tightening Camshaft Bolts On Right Cylinder Head**

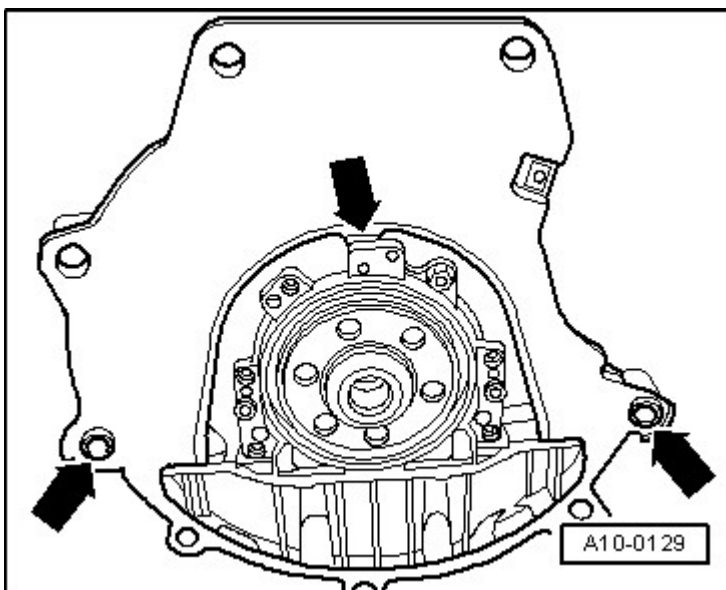
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten camshaft bolts - 1 - and - 2 - on right cylinder head to final torque specification.
- Torque specification: 80 Nm plus an additional 90 ° (  $\frac{1}{4}$  turn).

**Fig. 310: Mounting Camshaft Locating Tool T40070 To Both Cylinder Heads And Tightening Bolts**

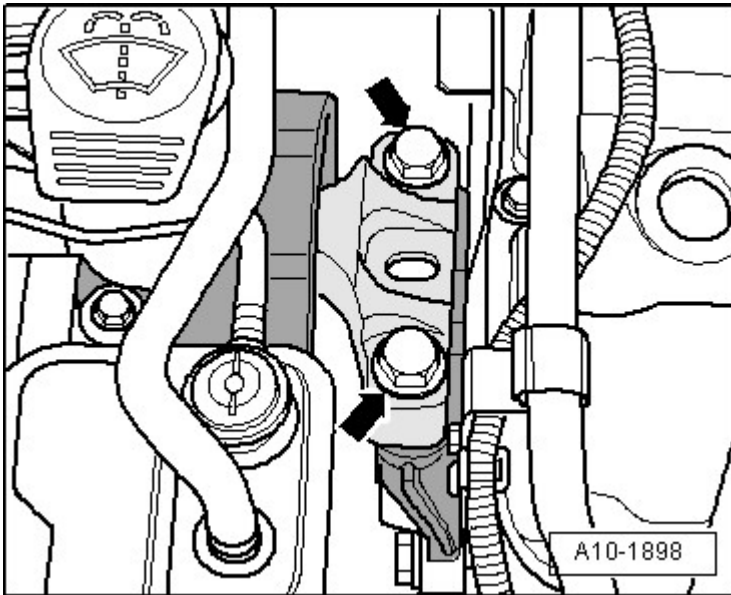
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove camshaft locators T40070 on both cylinder heads.

**Fig. 311: Removing/Installing Crankshaft Holder T40069**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove crankshaft holder T40069.



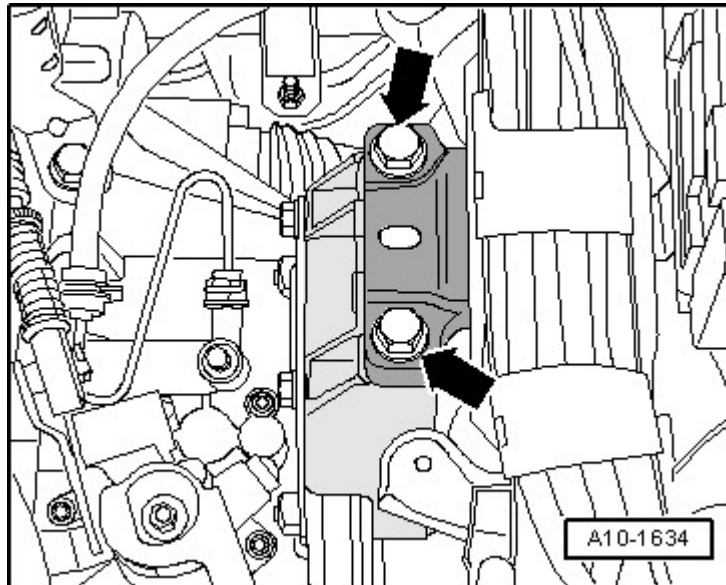
**Fig. 312: Loosening Torque Converter Bolts Using Adapter T40058**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using key T40058 turn crankshaft two complete rotations in direction of engine rotation - **arrow** - until crankshaft stands at TDC again.

**NOTE:**

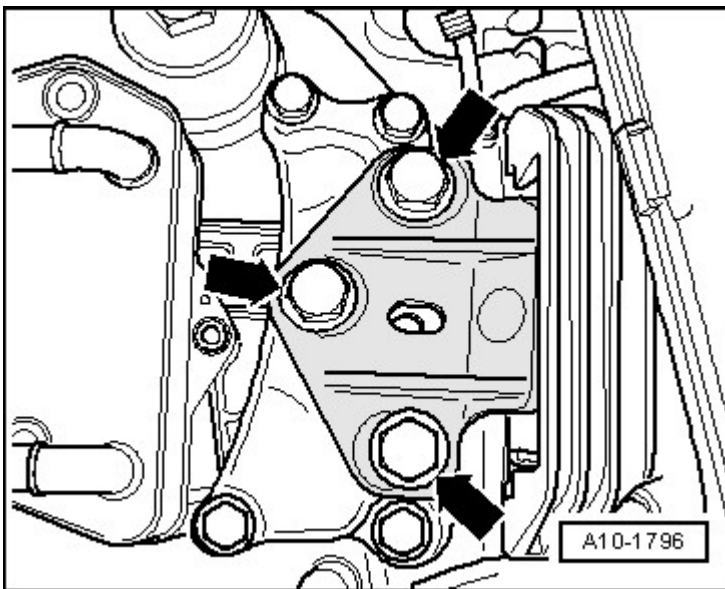
- If rotated unintentionally beyond TDC, turn back crankshaft again approx. 30 ° and set to TDC again.



**Fig. 313: Identifying Threaded Holes In Camshafts Must Face Upward**

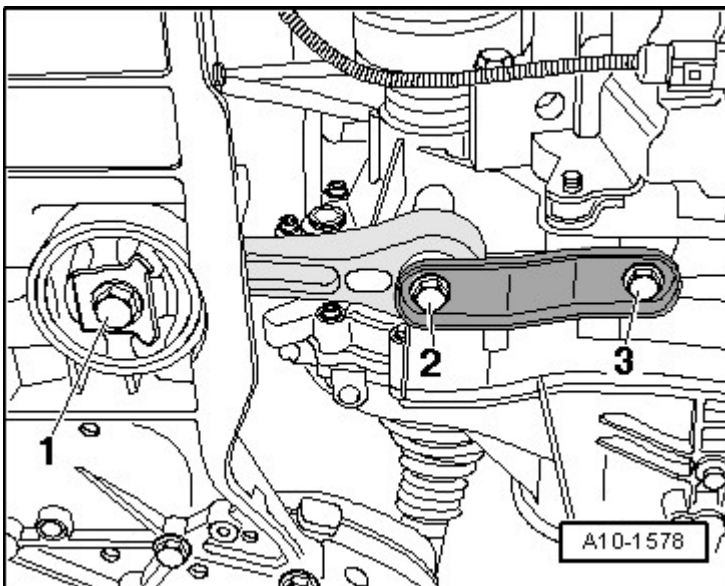
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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



**Fig. 314: Mounting Camshaft Locating Tool T40070 To Both Cylinder Heads And Tightening Bolts**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Mount camshaft locating tools T40070 to both cylinder heads and tighten bolts - **arrows** - to 20 Nm.
- The camshaft locating tool T40070 is correctly positioned when holes for cylinder head bolts remain free.

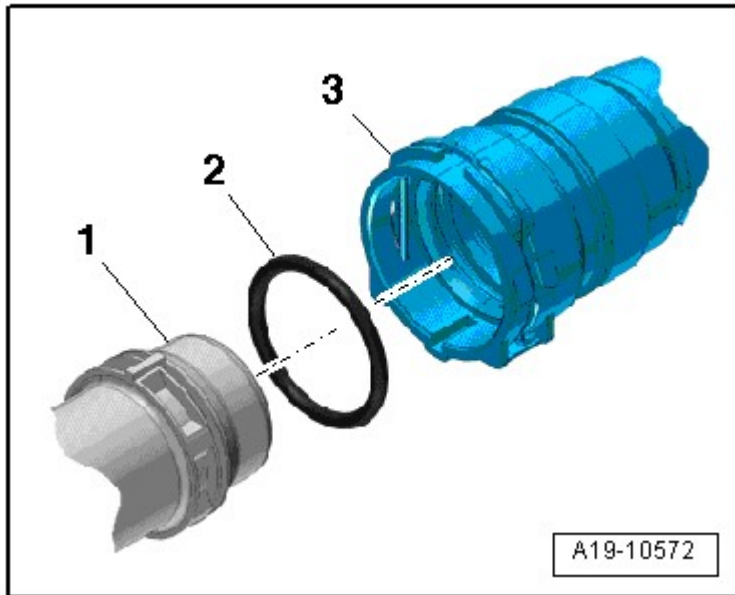


**Fig. 315: Installing Crankshaft Holder T40069 Into Hole**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install crankshaft holder T40069 directly into hole.



- The crankshaft holder T40069 must engage in locating hole of crankshaft - **1** - , otherwise repeat adjustment.
- Remove camshaft locating tools on both cylinder heads.
- Remove crankshaft holder.



**Fig. 316: Removing/Installing Sealing Plug From Cylinder Block**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install sealing plug - **arrow** - of TDC marking with new seal into cylinder block.

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

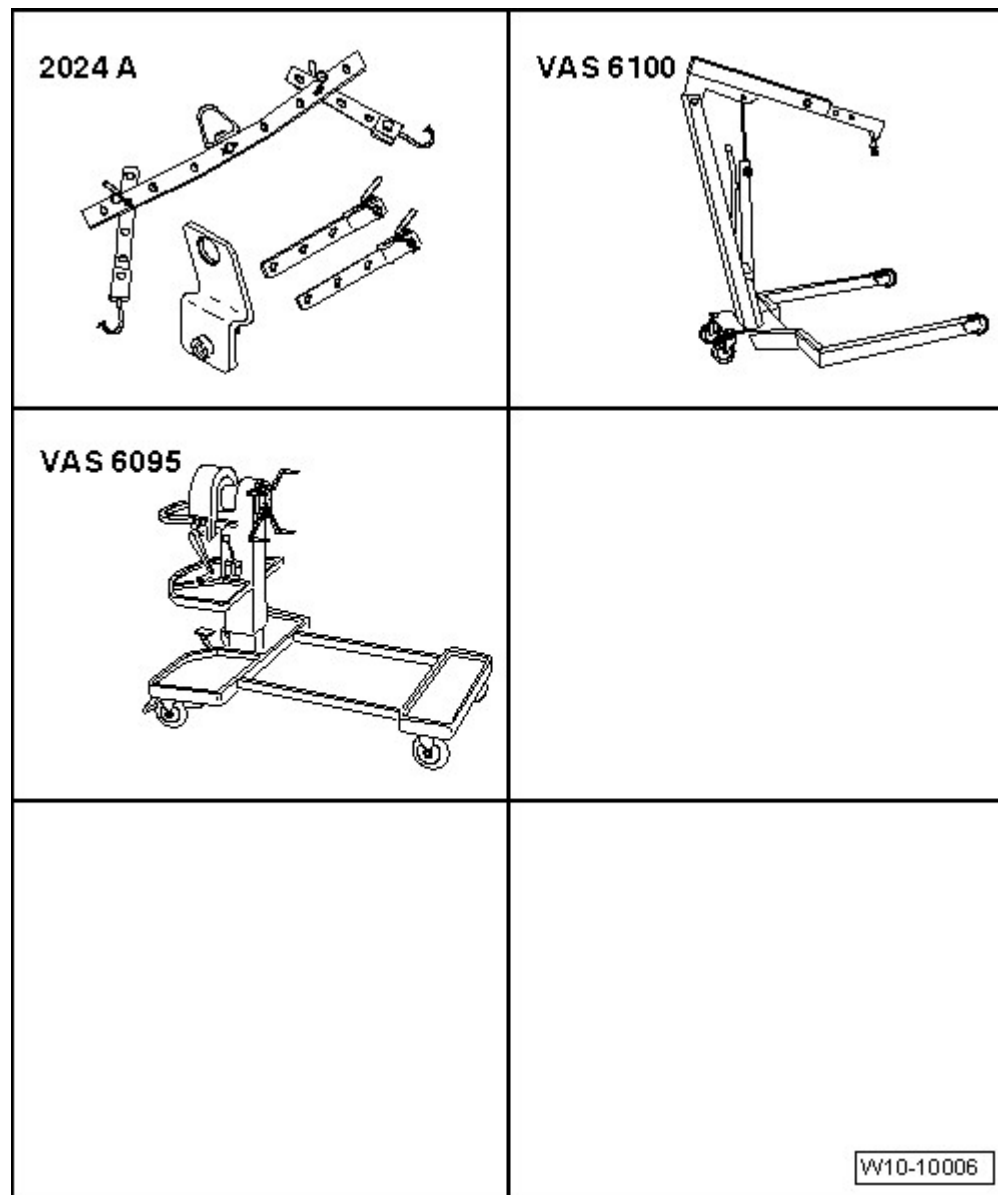
- Install stabilizer bar --> **40 - FRONT SUSPENSION** .
- Install left and right timing chain covers --> **Left and right timing chain covers, removing and installing.**
- Install cylinder head cover: Left --> **Left cylinder head cover, removing and installing** , right --> **Right cylinder head cover, removing and installing.**

#### Torque specifications

| Component                                                                                                               | Nm              |
|-------------------------------------------------------------------------------------------------------------------------|-----------------|
| Chain tensioner to cylinder head                                                                                        | 9               |
| Camshaft bolts                                                                                                          | 80 + 90 ° 1) 2) |
| Sealing plug in cylinder block                                                                                          | 14 3)           |
| <ul style="list-style-type: none"> <li>• 1) Replace bolts.</li> <li>• 2) 90 ° corresponds to a quarter turn.</li> </ul> |                 |

- <sup>3)</sup> Install with new gasket.

### Drive chain for timing mechanism, component overview



**Fig. 317: Drive Chain For Timing Mechanism, Component Overview**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Pivot pin for drive sprocket

2 - 30 Nm plus an additional 90 ° (  $\frac{1}{4}$  turn)

- Replace

3 - 10 Nm plus an additional  $90^\circ$  ( $1/4$  turn)

- Replace
- Insert using locking compound; locking compound .

4 - 6 Nm plus an additional  $60^\circ$  ( $1/6$  turn)

- Replace

5 - Thrust washer for drive sprocket

6 - Bushing with shoulder

7 - Drive sprocket for left camshaft timing chain

8 - 10 Nm plus an additional  $90^\circ$  ( $1/4$  turn)

- Replace
- Insert using locking compound; locking compound .

9 - Drive chain for timing mechanism

- Before removing, mark direction of rotation with paint

10 - Guide rail

11 - 10 Nm plus an additional  $90^\circ$  ( $1/4$  turn)

- Replace
- Insert using locking compound; locking compound .

12 - Bushing with shoulder

13 - 8 Nm plus an additional  $45^\circ$  ( $1/8$  turn)

- Replace
- To be oiled for installation

14 - Mounting bracket for drive sprocket

15 - Bushing with shoulder

16 - Thrust washer

17 - Drive sprocket for right camshaft timing chain

18 - Bushing with shoulder

19 - 10 Nm plus an additional 90 ° (  $\frac{1}{4}$  turn)

- Replace
- Insert using locking compound; locking compound .

20 - O-ring

- Replace

21 - Chain tensioner

22 - 10 Nm

23 - Glide track for chain tensioner

24 - Crankshaft

25 - Bushing with shoulder

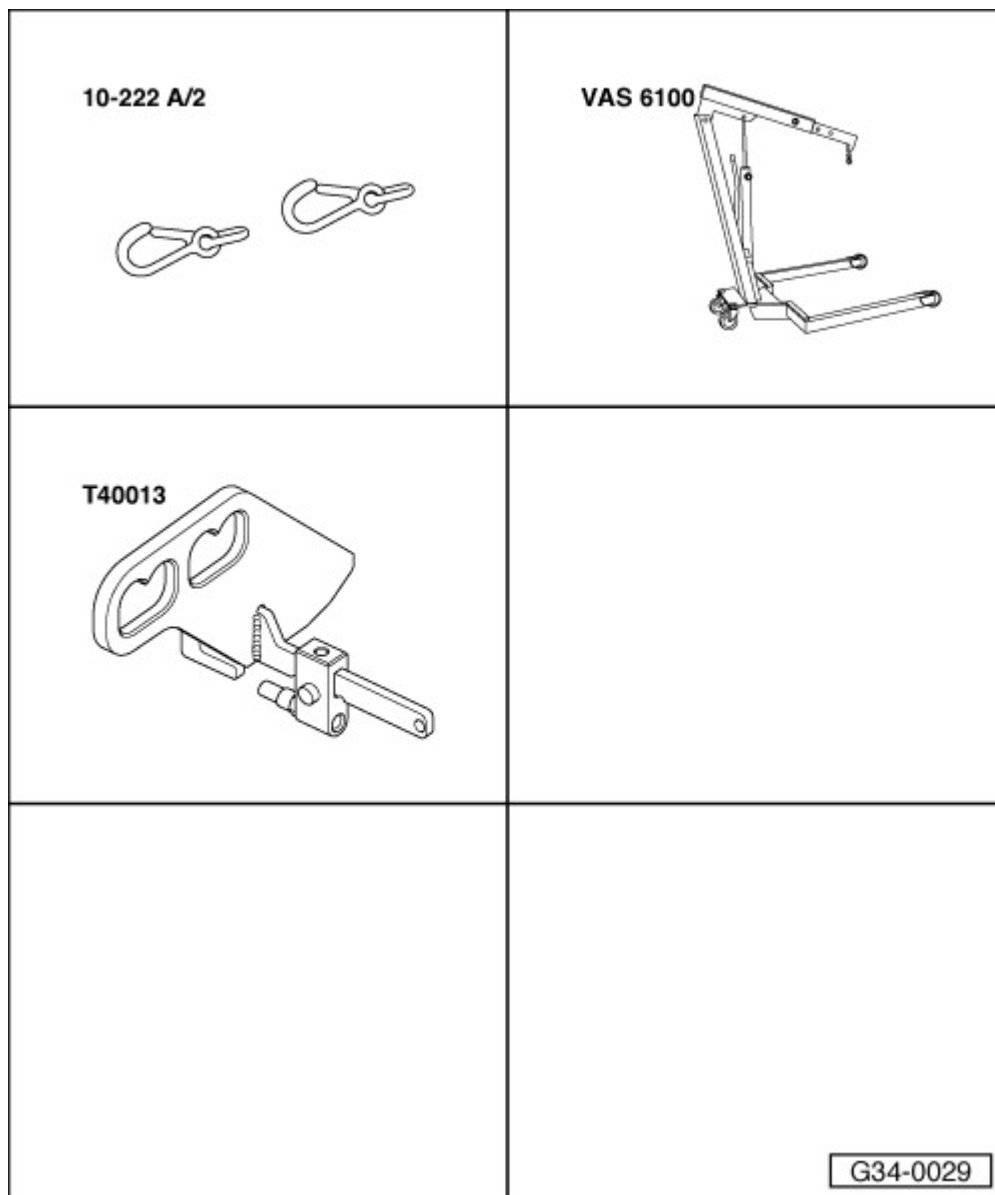
26 - Guide rail

- Note installation position

27 - 10 Nm plus an additional 90 ° (  $\frac{1}{4}$  turn)

- Replace
- Insert using locking compound; locking compound .

**Drive chain for timing mechanism, removing and installing**



**Fig. 318: Identifying Special Tools - Drive Chain For Timing Mechanism, Removing And Installing**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

#### Special tools, testers and auxiliary items required

- Old oil collecting and extracting device V.A.G 1782
- Locking pin T40069
- Securing pin T40071

#### Removing

- Remove transmission -->
  - **34 MANUAL TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. MANUAL

## TRANSMISSION 012/01W FRONT WHEEL DRIVE

- **34 MANUAL TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
- **34 MANUAL TRANSMISSION - CONTROLS, HOUSING** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
- **34 - CONTROLS, HOUSING** for 6 SPD. MANUAL TRANSMISSION 0A3 ALL WHEEL DRIVE, INTERNAL COMPONENT SERVICING
- **34 CONTROLS, HOUSING** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE
- **34 CONTROLS, HOUSING** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
- **34 CONTROLS, HOUSING** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE

or -->

- **37 - AUTOMATIC TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. AUTOMATIC TRANSMISSION 01V
- **37 - AUTOMATIC TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING
- **37 CONTROLS, HOUSING** for AUTOMATIC TRANSMISSION 09L, FOUR-WHEEL DRIVE

○ Vehicles with manual transmission: Remove clutch pressure plate -->

- **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
- **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
- **30 CLUTCH** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
- **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE
- **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
- **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE

and dual mass flywheel --> **Dual mass flywheel (vehicles with manual transmission), removing and installing.**

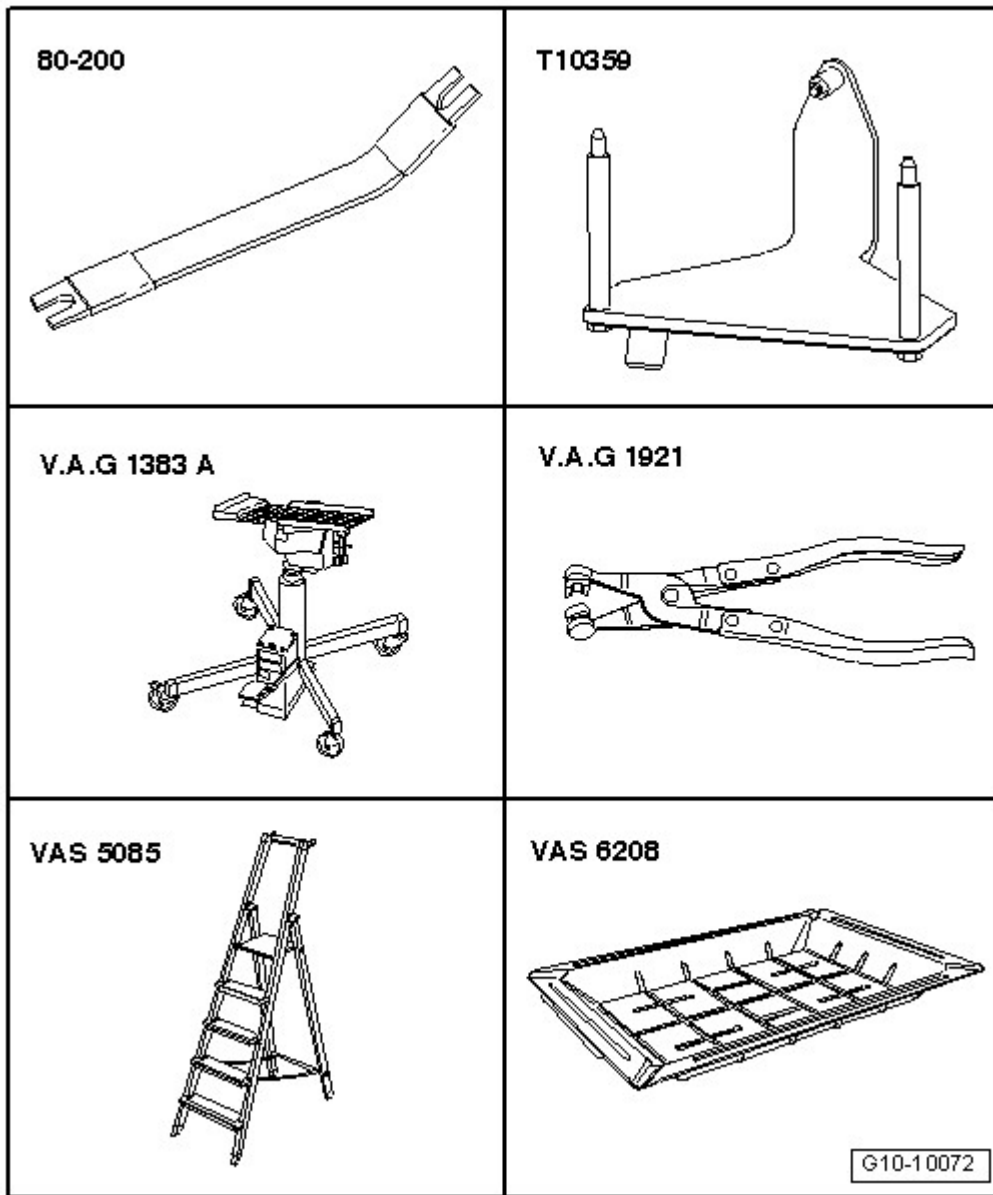
○ Vehicles with automatic transmission: Remove drive plate --> **Drive plate (vehicles with automatic transmission), removing and installing.**

**NOTE:**

- After removing transmission, the engine is supported by engine support bridge 10-222 A and the torque support stop is loosened.

**CAUTION:** For the further sequence of work, it must be made sure that the lock carrier is installed.

- To remove transmission, remove attached engine support bridge 10-222 A from engine.

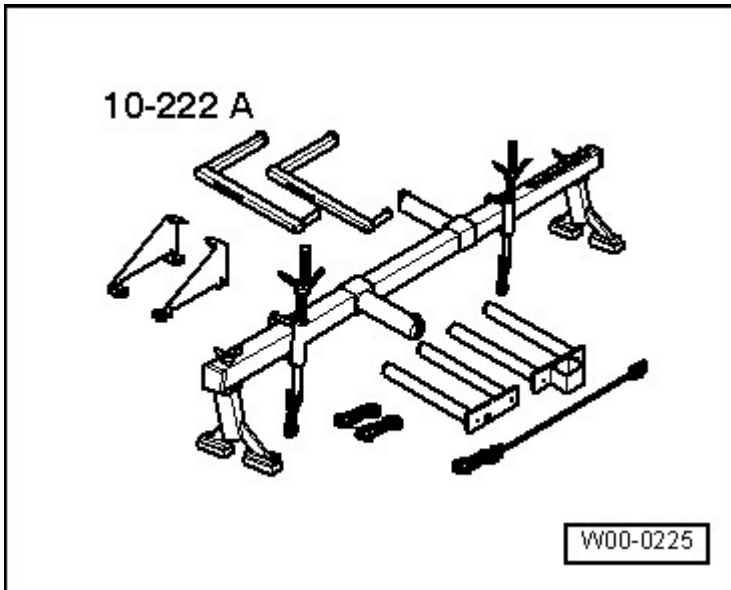


**Fig. 319: Removing/Installing Bolts At Torque Support Stop**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten torque support stop to 28 Nm - **arrows** -.
- Remove cylinder head cover: Left --> **Left cylinder head cover, removing and installing** , right --> **Right cylinder head cover, removing and installing**.
- Remove left and right timing chain covers --> **Left and right timing chain covers, removing and installing**.
- Place old oil collecting and extracting device V.A.G 1782 under engine.
- Drain engine oil.
- Remove lower timing chain cover --> **Lower timing chain cover, removing and installing**.



- Remove camshaft timing chains from camshafts --> **Detaching timing chains from camshaft, removing and installing chain tensioner.**
- Remove drive chain for oil pump and balance shaft --> **Drive chain for oil pump and balance shaft, removing and installing.**



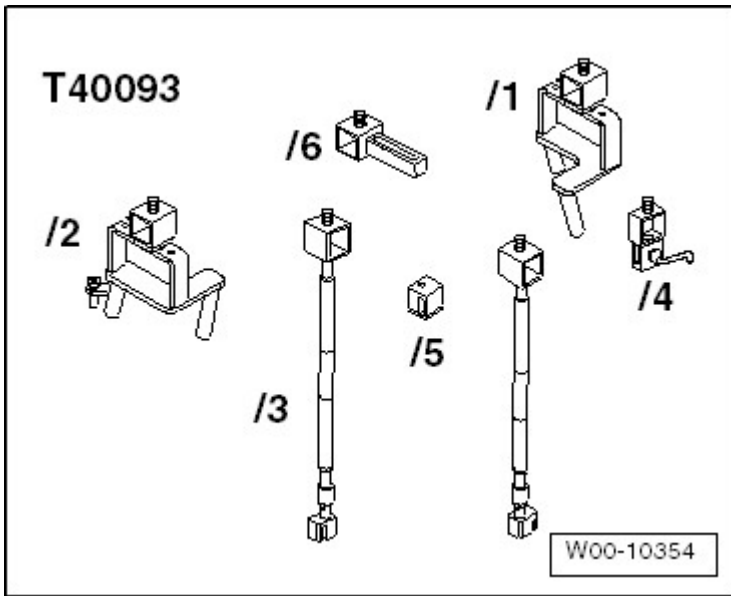
**Fig. 320: Pushing Drive Chain Tensioner Guide Rail And Securing Chain Tensioner Using Securing Pin T40071**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Push drive chain tensioner guide rail in direction of - **arrow** - and secure chain tensioner using securing pin T40071.
- Mark running direction of timing chain with paint.
- Remove bolts - **2** - and - **3** - and remove chain sprockets with drive chain and glide track - **1** -.

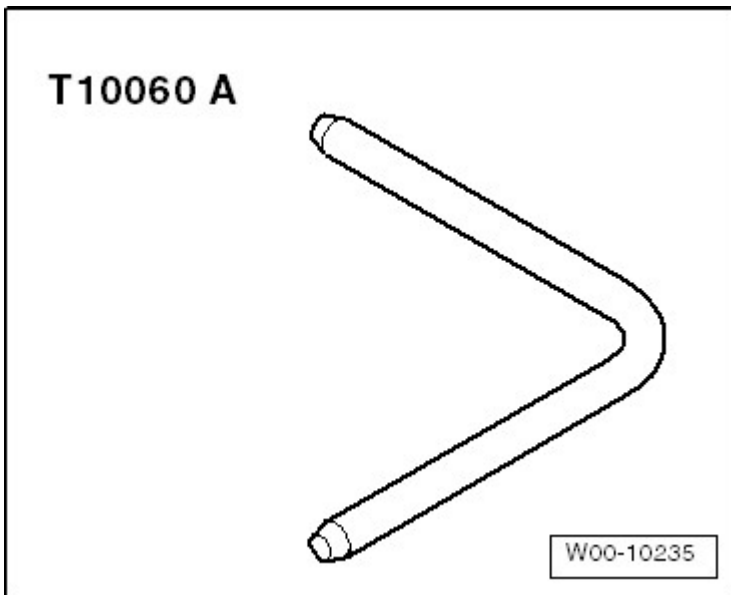
## Installing

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



**Fig. 321: Installing Crankshaft Holder T40069 Into Hole**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure crankshaft - 1 - in TDC position using crankshaft holder T40069.



**Fig. 322: Pushing Drive Chain Tensioner Guide Rail And Securing Chain Tensioner Using Securing Pin T40071**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- First, install left camshaft timing chain sprocket - 2 -.
- Install guide rail - 1 - with installed drive chain.
- Now install right camshaft timing chain sprocket - 3 -.
- Press drive chain tensioner guide rail in direction of - **arrow** - and pull securing pin T40071 out of chain

tensioner.

- Install oil pump drive chain and balance shaft --> **Drive chain for oil pump and balance shaft, removing and installing.**
  - Install camshaft timing chains **Installing.**
  - Install lower timing chain cover --> **Lower timing chain cover, removing and installing.**
  - Install crankshaft seal, timing chain side --> **Crankshaft seal, timing chain side, replacing.**
  - Install oil filter housing --> **Oil filter housing, removing and installing.**
  - Install left and right timing chain covers --> **Left and right timing chain covers, removing and installing.**
  - Install cylinder head cover: Left --> **Left cylinder head cover, removing and installing** , right --> **Right cylinder head cover, removing and installing.**
  - Vehicles with manual transmission: Install dual mass flywheel --> **Dual mass flywheel (vehicles with manual transmission), removing and installing** and clutch pressure plate -->
    - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
    - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
    - **30 CLUTCH** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
    - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE
    - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
    - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE
  - Vehicles with automatic transmission: Install drive plate --> **Drive plate (vehicles with automatic transmission), removing and installing.**
  - Install transmission -->
    - **34 MANUAL TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
    - **34 MANUAL TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
    - **34 MANUAL TRANSMISSION - CONTROLS, HOUSING** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
    - **34 - CONTROLS, HOUSING** for 6 SPD. MANUAL TRANSMISSION 0A3 ALL WHEEL DRIVE, INTERNAL COMPONENT SERVICING
    - **34 CONTROLS, HOUSING** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE
    - **34 CONTROLS, HOUSING** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
    - **34 CONTROLS, HOUSING** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE
- or -->
- **37 - AUTOMATIC TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. AUTOMATIC

## TRANSMISSION 01V

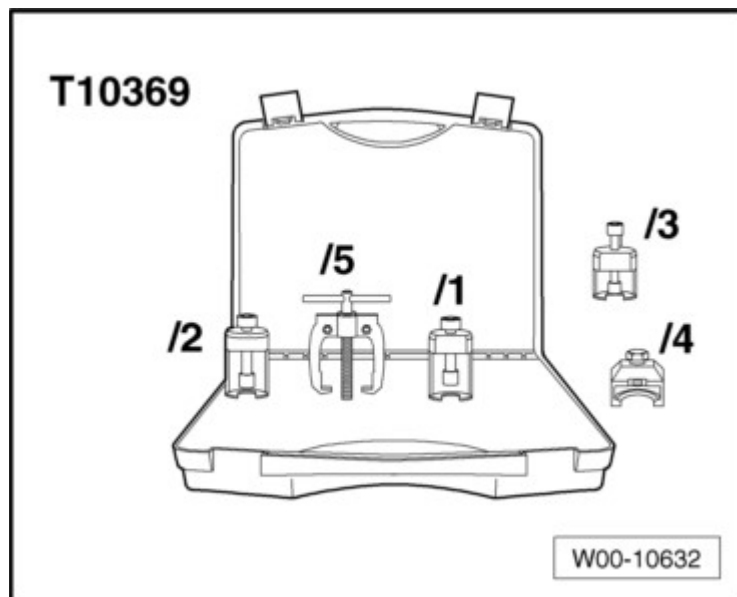
- **37 - AUTOMATIC TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING
- **37 CONTROLS, HOUSING** for AUTOMATIC TRANSMISSION 09L, FOUR-WHEEL DRIVE

- Add engine oil and check oil level --> **Oil level, checking.**

## Torque specifications

| Component                                                                                                                                                                                                    | Nm              |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Left drive sprocket to mounting bracket                                                                                                                                                                      | 6 + 60 ° 1) 2)  |
| Right drive sprocket to cylinder block                                                                                                                                                                       | 30 + 90 ° 1) 3) |
| Sealing plug in cylinder block                                                                                                                                                                               | 14 4)           |
| <ul style="list-style-type: none"> <li>• 1) Replace bolts.</li> <li>• 2) 60 ° corresponds to a 1/6 turn.</li> <li>• 3) 90 ° corresponds to a quarter turn.</li> <li>• 4) Install with new gasket.</li> </ul> |                 |

## Drive chain for oil pump and balance shaft, component overview



**Fig. 323: Drive Chain For Oil Pump And Balance Shaft, Component Overview**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Drive chain for oil pump and balance shaft

- Before removing, mark direction of rotation with paint
- Removing and installing --> **Drive chain for oil pump and balance shaft, removing and installing**

**2 - Drive sprocket for oil pump**

- Installed location: Labeled side faces engine

**3 - 30 Nm plus an additional 90 ° (  $\frac{1}{4}$  turn)**

- Replace

**4 - Spring****5 - Crankshaft****6 - 15 Nm plus an additional 90 ° (  $\frac{1}{4}$  turn)**

- Replace

**7 - Chain sprocket for balance shaft**

- Installed location: Labeled side faces transmission

**8 - 6 Nm plus an additional 45 ° (  $\frac{1}{8}$  turn)**

- Replace

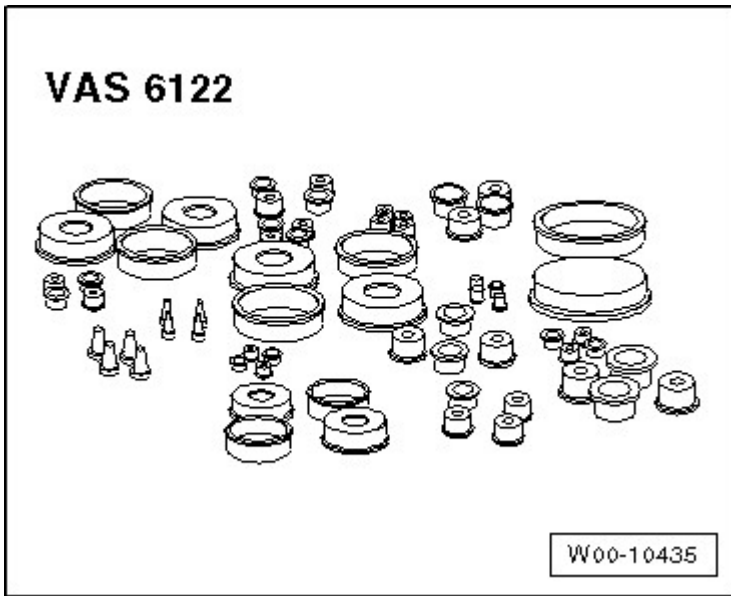
**9 - Chain tensioner**

- With glide track

**10 - Gasket**

- Replace

**Drive chain for oil pump and balance shaft, removing and installing**



**Fig. 324: Identifying Special Tools - Drive Chain For Oil Pump And Balance Shaft, Removing And Installing**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

#### Special tools, testers and auxiliary items required

- Old oil collecting and extracting device V.A.G 1782
- Adapter T40049
- Locking pin T40069
- Securing pin T40071
- Drill bit dia. 8 mm

#### Removing

- Remove transmission -->
  - **34 MANUAL TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
  - **34 MANUAL TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
  - **34 MANUAL TRANSMISSION - CONTROLS, HOUSING** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
  - **34 - CONTROLS, HOUSING** for 6 SPD. MANUAL TRANSMISSION 0A3 ALL WHEEL DRIVE, INTERNAL COMPONENT SERVICING
  - **34 CONTROLS, HOUSING** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE
  - **34 CONTROLS, HOUSING** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE

- **34 CONTROLS, HOUSING** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE

or -->

- **37 - AUTOMATIC TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. AUTOMATIC TRANSMISSION 01V
- **37 - AUTOMATIC TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING
- **37 CONTROLS, HOUSING** for AUTOMATIC TRANSMISSION 09L, FOUR-WHEEL DRIVE

- Vehicles with manual transmission: Remove clutch pressure plate -->

- **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
- **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
- **30 CLUTCH** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
- **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE
- **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
- **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE

and dual mass flywheel --> **Dual mass flywheel (vehicles with manual transmission), removing and installing.**

- Vehicles with automatic transmission: Remove drive plate --> **Drive plate (vehicles with automatic transmission), removing and installing.**

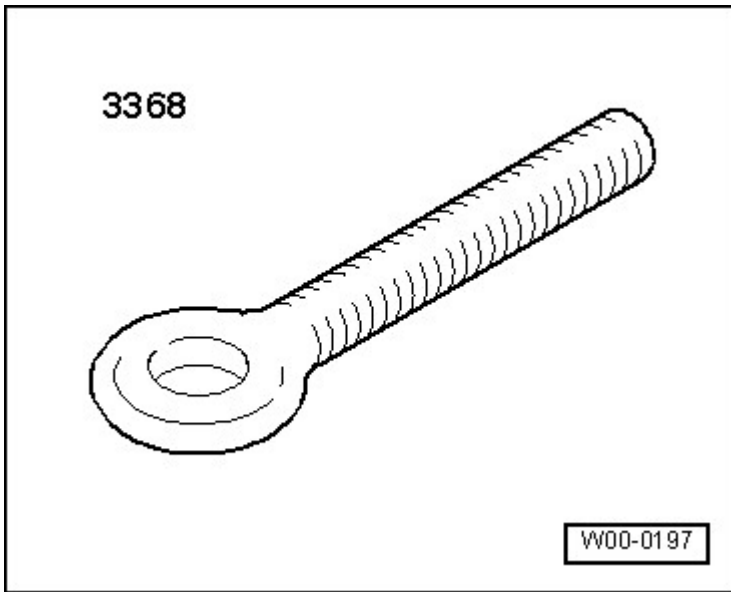
**NOTE:**

- After removing transmission, the engine is supported by engine support bridge 10-222 A and the torque support stop is loosened.

**CAUTION:** For the further sequence of work, it must be made sure that the lock carrier is installed.

- To remove transmission, remove attached engine support bridge 10-222 A from engine.

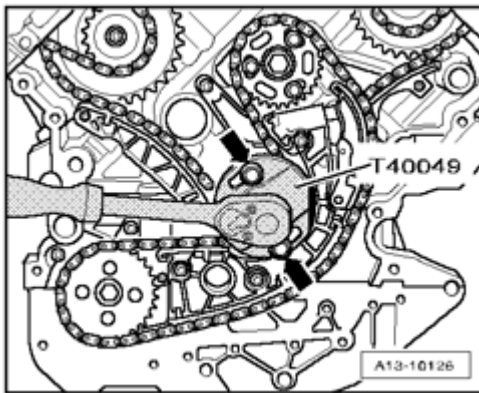




**Fig. 325: Removing/Installing Bolts At Torque Support Stop**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten torque support stop to 28 Nm - **arrows** -.
- Remove left and right timing chain covers --> **Left and right timing chain covers, removing and installing.**
- Place old oil collecting and extracting device V.A.G 1782 under engine.
- Drain engine oil.
- Remove lower timing chain cover --> **Lower timing chain cover, removing and installing.**

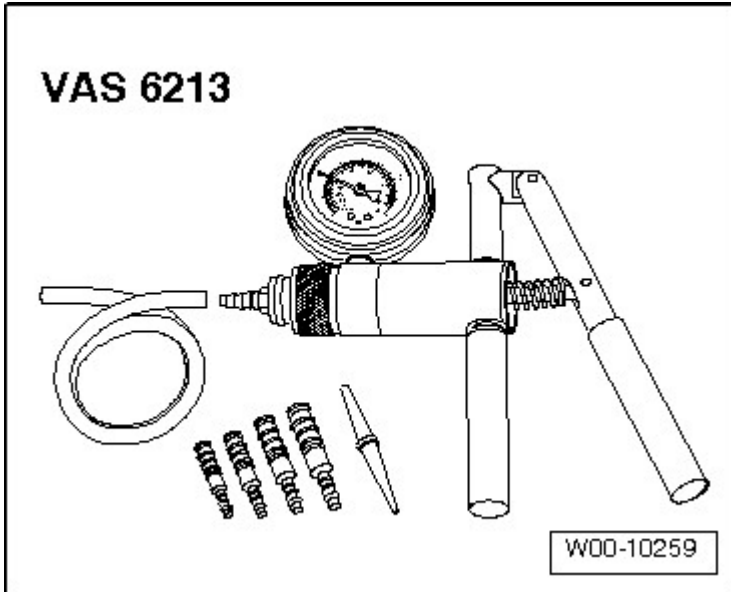
**CAUTION:** Place a washer under the bolt heads, to prevent the chain from being pinched by the bolts.



**Fig. 326: Installing Key T40049 At Rear On Crankshaft Using 2 Old Bolts For Dual-Mass Flywheel**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install key T40049 at rear on crankshaft using 2 old bolts - **arrows** - for dual-mass flywheel.

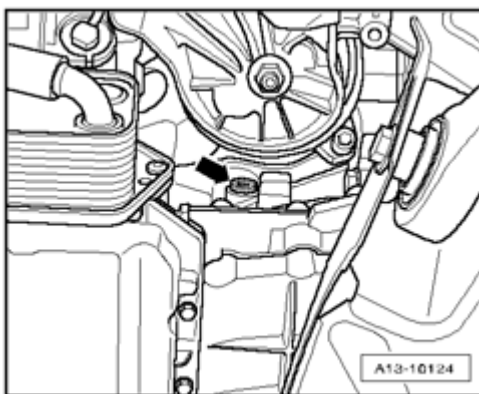
**Vehicles with manual transmission:**



**Fig. 327: Unfastening Left/Right Stabilizer Bar Mountings**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unfasten left and right stabilizer bar mountings - **1** - and - **2** -.
- Pivot stabilizer bar downward.

**All:**

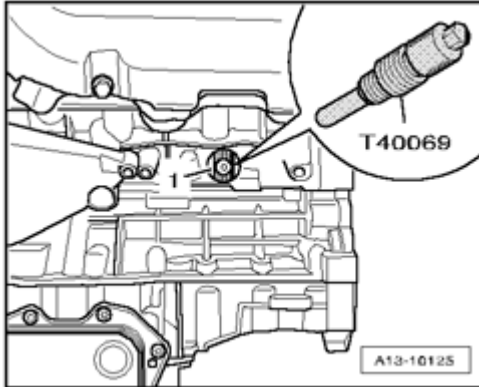


**Fig. 328: Removing/Installing Sealing Plug From Cylinder Block**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove sealing plug - **arrow** - from cylinder block.

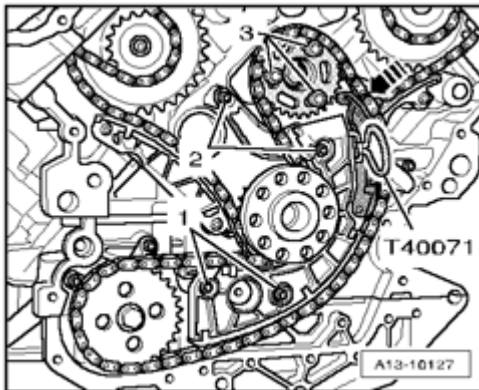
**CAUTION: Do not turn crankshaft while touching TDC hole with finger - Risk of injury.**

- Rotate crankshaft in direction of engine rotation to TDC of ignition timing.



**Fig. 329: Installing Crankshaft Holder T40069 Into Hole**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

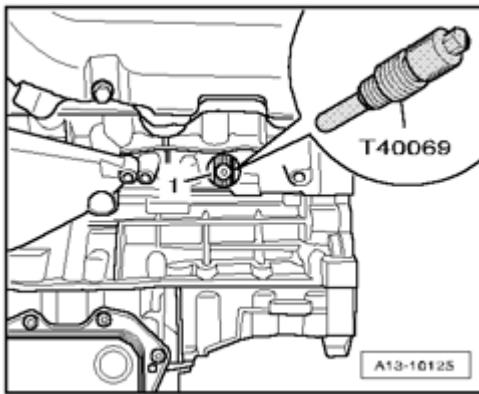
- Install crankshaft holder T40069 into hole to 20 Nm, if necessary rotate crankshaft very slightly back and forth to completely center holder.
- Mark running direction of drive chain for oil pump and balance shaft with paint.



**Fig. 330: Pressing Chain Tensioner Guide Rail And Securing Chain Tensioner With Securing Pin T40071**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

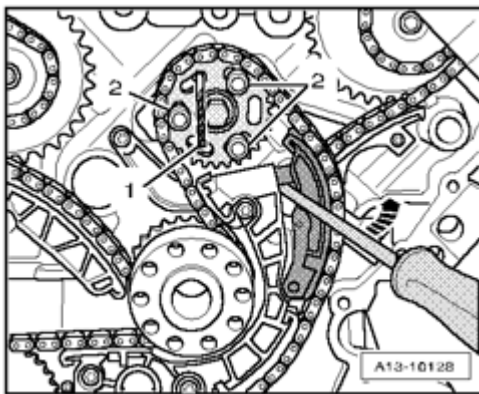
- Press chain tensioner guide rail in direction of - **arrow** - and secure chain tensioner with securing pin T40071.
- Remove bolts - **1 through 3** - and remove chain tensioner, balance shaft sprocket and chain.

## Installing



**Fig. 331: Installing Crankshaft Holder T40069 Into Hole**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure crankshaft - **1** - in TDC position using crankshaft holder T40069.



**Fig. 332: Mounting Chain Tensioner With Chain And Balance Shaft Sprocket**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Mount chain tensioner with chain and balance shaft sprocket.
- To protect against cuts, wrap point and cutting edges of with insulating tape.
- Secure balance shaft with 8 mm dia. drill bit - **1** - in TDC position.
- The slots in balance shaft sprocket must be at middle position in relation to threaded holes of balance shaft. If necessary, adjust chain by one tooth.
- Tighten chain tensioner bolts.
- Loosely install bolts - **2** - for sprocket.
- Chain sprocket must still be able to be rotated on balance shaft and must not tip.
- Pull out securing pin T40071 to release chain tensioner.
- Press against chain tensioner guide rail - **arrow** - with screwdriver and simultaneously fasten bolts - **2** - for sprocket.

- Pull drill - 1 - out of balance shaft.

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

- Install lower timing chain cover --> **Lower timing chain cover, removing and installing.**
  - Install oil filter housing --> **Oil filter housing, removing and installing.**
  - Install left and right timing chain covers --> **Left and right timing chain covers, removing and installing.**
  - Install crankshaft seal, timing chain side --> **Crankshaft seal, timing chain side, replacing.**
  - Vehicles with manual transmission: Install dual mass flywheel --> **Dual mass flywheel (vehicles with manual transmission), removing and installing** and clutch pressure plate -->
    - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
    - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
    - **30 CLUTCH** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
    - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE
    - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
    - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE
  - Vehicles with automatic transmission: Install drive plate --> **Drive plate (vehicles with automatic transmission), removing and installing.**
  - Install transmission -->
    - **34 MANUAL TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
    - **34 MANUAL TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
    - **34 MANUAL TRANSMISSION - CONTROLS, HOUSING** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
    - **34 - CONTROLS, HOUSING** for 6 SPD. MANUAL TRANSMISSION 0A3 ALL WHEEL DRIVE, INTERNAL COMPONENT SERVICING
    - **34 CONTROLS, HOUSING** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE
    - **34 CONTROLS, HOUSING** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
    - **34 CONTROLS, HOUSING** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE
- or -->
- **37 - AUTOMATIC TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. AUTOMATIC TRANSMISSION 01V
  - **37 - AUTOMATIC TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING

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ENGINE 3.2 V6 4V Engine Mechanical, Engine Code(s): BKH

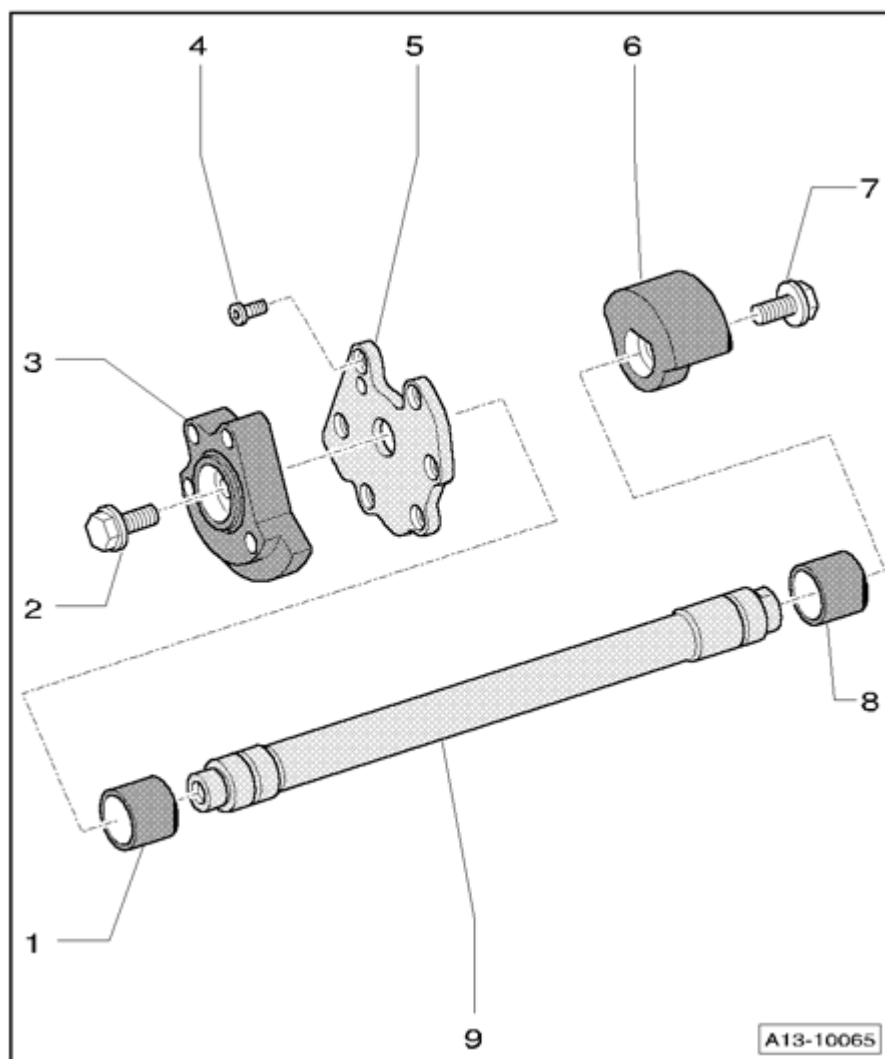
- **37 CONTROLS, HOUSING** for AUTOMATIC TRANSMISSION 09L, FOUR-WHEEL DRIVE

- Install stabilizer bar --> **40 - FRONT SUSPENSION** .
- Add engine oil and check oil level --> **Oil level, checking.**

### Torque specifications

| Component                                                                                                                                                                                                    | Nm              |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Chain tensioner on cylinder block                                                                                                                                                                            | 6 + 45 ° 1) 2)  |
| Balance shaft sprocket to balance weight                                                                                                                                                                     | 15 + 90 ° 1) 3) |
| Sealing plug in cylinder block                                                                                                                                                                               | 14 4)           |
| <ul style="list-style-type: none"><li>• 1) Replace bolts.</li><li>• 2) 45 ° corresponds to one eighth turn.</li><li>• 3) 90 ° corresponds to a quarter turn.</li><li>• 4) Install with new gasket.</li></ul> |                 |

### Balance shaft, component overview



**Fig. 333: Balance Shaft, Component Overview**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Friction bearing

2 - 60 Nm

- To loosen and fasten, use a 8 mm dia. drill bit as counter-holder

3 - Balance weight (timing chain side)

- Can only be positioned one way on balance shaft

4 - 9 Nm

5 - Bearing end bracket



**6 - Balance weight (belt pulley side)**

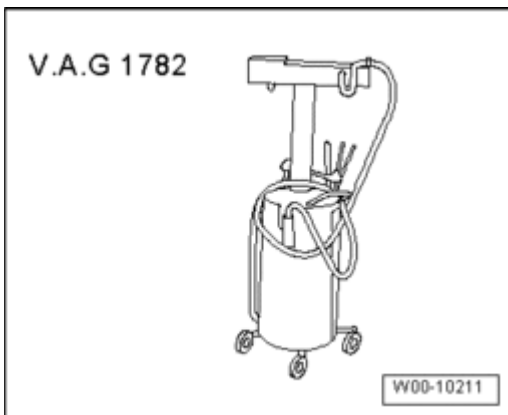
- Can only be positioned one way on balance shaft

**7 - 60 Nm**

- To loosen and fasten, use a 8 mm dia. drill bit as counter-holder

**8 - Friction bearing****9 - Differential shaft**

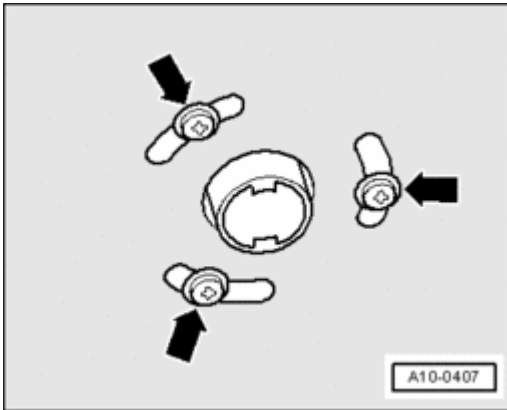
- Removing and installing --> **Balance shaft, removing and installing**

**Balance shaft, removing and installing****Special tools, testers and auxiliary items required**

**Fig. 334: Identifying Old Oil Collecting And Extracting Device V.A.G 1782**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Old oil collecting and extracting device V.A.G 1782
- 8 mm dia. drill bit

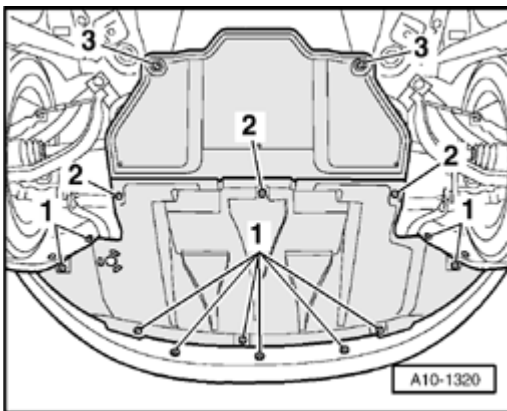
**Removing**



**Fig. 335: Locating Fasteners Exhaust Pipe**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- For vehicles with auxiliary heater, remove bolts - **arrows** - for exhaust pipe of parking heater/auxiliary heater on noise insulation.



**Fig. 336: Identifying Quick-Release Fasteners And Noise Insulation**

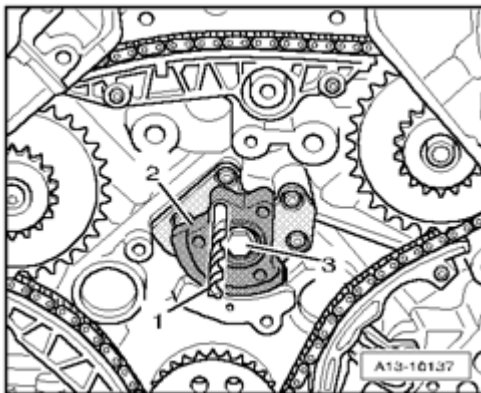
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen quick-release fasteners - **1 through 3** - and remove front and rear noise insulation.
- Place old oil collecting and extracting device V.A.G 1782 under engine.
- Drain engine oil.
- Remove engine: Vehicles with manual transmission --> **Engine, removing** , vehicles with automatic transmission --> **Engine, removing**.
- Separate engine/transmission assembly: Vehicles with manual transmission --> **Engine and manual transmission, separating** , vehicles with automatic transmission --> **Engine and automatic transmission 09L, separating**.
- Secure engine to assembly stand: Vehicles with manual transmission --> **Engine, securing to assembly stand** , Vehicles with automatic transmission --> **Engine, securing to assembly stand** or lower engine on scissor lift platform VAS 6131.
- Vehicles with manual transmission: Remove clutch pressure plate -->
  - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE

- **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
- **30 CLUTCH** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
- **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE
- **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
- **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE

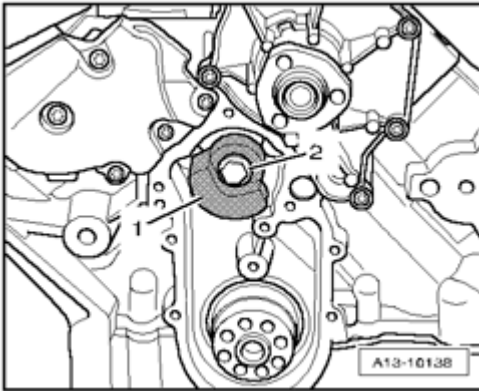
and dual mass flywheel --> **Dual mass flywheel (vehicles with manual transmission), removing and installing.**

- Vehicles with automatic transmission: Remove drive plate --> **Drive plate (vehicles with automatic transmission), removing and installing.**
- Remove front sealing flange --> **Front sealing flange with crankshaft seal, removing and installing.**
- Remove left and right timing chain covers --> **Left and right timing chain covers, removing and installing.**
- Remove lower timing chain cover --> **Lower timing chain cover, removing and installing.**
- Remove drive chain for oil pump and balance shaft --> **Drive chain for oil pump and balance shaft, removing and installing.**



**Fig. 337: Securing Balance Weight At Rear Of Engine With Drill Bit**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

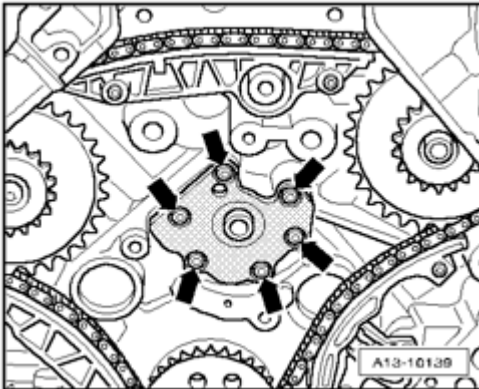
- To protect against cuts, wrap point and cutting edges of 8 mm dia. drill bit with insulating tape.
- Secure balance weight - **2** - at rear of engine with 8 mm dia. drill bit - **1** -.
- Remove bolt - **3** - and remove balance weight from balance shaft.



**Fig. 338: Removing Bolt, Counter-Holding Balance Weight With Drift And Removing Balance Weight From Balance Shaft At Front Of Engine**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - 2 - , thereby counter-hold balance weight with drift and remove balance weight - 1 - from balance shaft at front of engine.

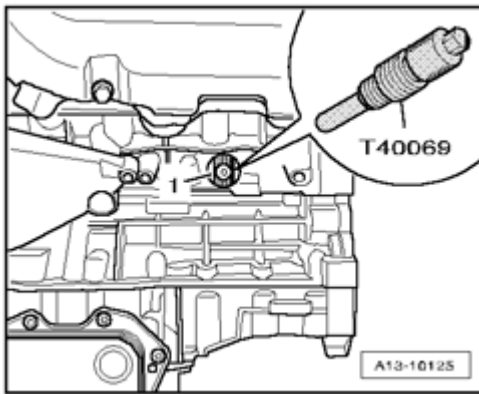


**Fig. 339: Removing Bolts And Bearing End Bracket From Balance Shaft At Rear Of Engine**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and remove bearing end bracket from balance shaft at rear of engine.
- Pull balance shaft rearward and out from cylinder block.

## Installing



**Fig. 340: Installing Crankshaft Holder T40069 Into Hole**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure crankshaft - 1 - in TDC position using crankshaft holder T40069.

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

**NOTE:**

- The balance weights can only be positioned one way on balance shaft.

- Install oil pump drive chain and balance shaft --> **Drive chain for oil pump and balance shaft, removing and installing.**
- Install lower timing chain cover --> **Lower timing chain cover, removing and installing.**
- Install oil filter housing --> **Oil filter housing, removing and installing.**
- Install left and right timing chain covers --> **Left and right timing chain covers, removing and installing.**
- Install crankshaft seal, timing chain side --> **Crankshaft seal, timing chain side, replacing.**
- Install front sealing flange --> **Front sealing flange with crankshaft seal, removing and installing.**
- Vehicles with manual transmission: Install dual mass flywheel --> **Dual mass flywheel (vehicles with manual transmission), removing and installing** and clutch pressure plate -->
  - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
  - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
  - **30 CLUTCH** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
  - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE
  - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
  - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE
- Vehicles with automatic transmission: Install drive plate --> **Drive plate (vehicles with automatic transmission), removing and installing.**
- Attach transmission to engine and install engine/transmission assembly: Vehicles with manual transmission --> **Engine, installing** , vehicles with automatic transmission --> **Engine, installing.**

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- Add engine oil and check oil level --> **Oil level, checking.**

### Torque specifications

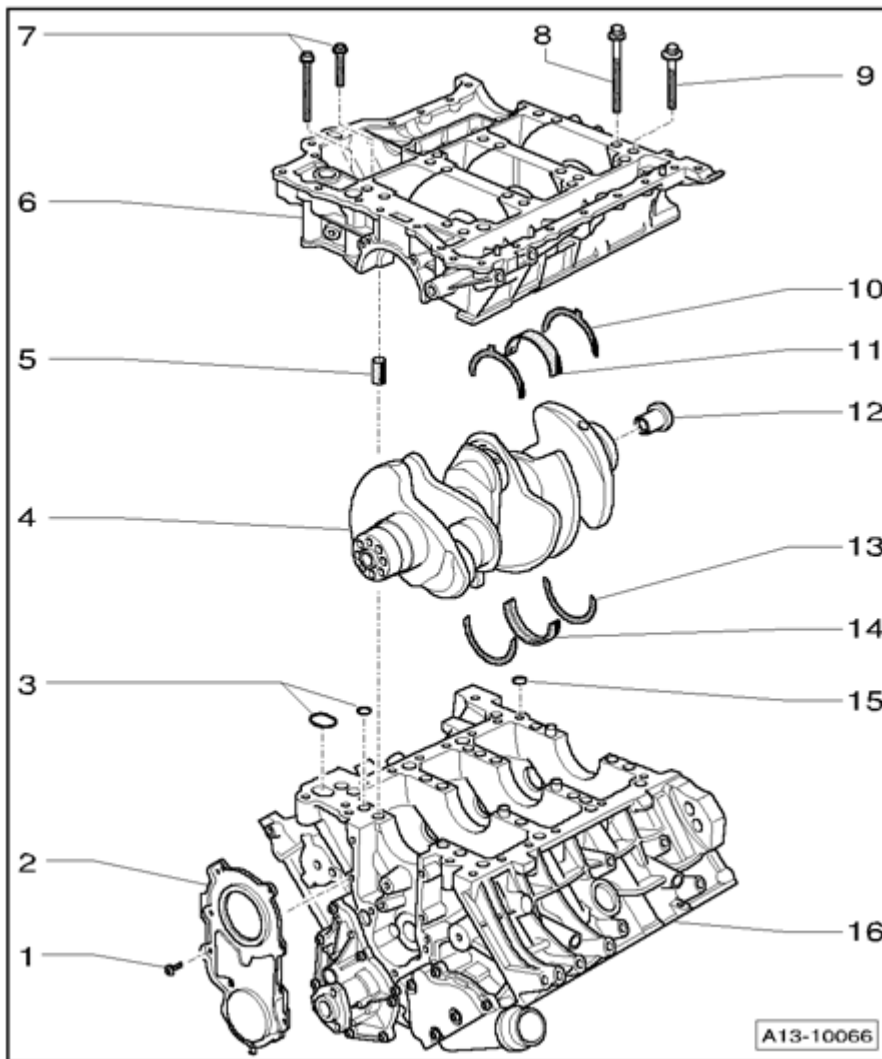
| Component                                                                                | Nm               |
|------------------------------------------------------------------------------------------|------------------|
| Bearing end bracket to cylinder block                                                    | 9                |
| Balance weight to balance shaft                                                          | 60               |
| Sealing plug in cylinder block                                                           | 14 <sup>1)</sup> |
| <ul style="list-style-type: none"><li>• <sup>1)</sup> Install with new gasket.</li></ul> |                  |

### CRANKSHAFT, REMOVING AND INSTALLING

#### Crankshaft, component overview

#### NOTE:

- Secure engine to engine and transmission holder VAS 6095 when working on engine. Vehicles with manual transmission --> **Engine, securing to assembly stand** or vehicles with automatic transmission --> **Engine, securing to assembly stand.**



**Fig. 341: Crankshaft, Component Overview**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - 9 Nm

- Fasten in diagonal sequence in steps

2 - Sealing flange, front

- Removing and installing --> **Front sealing flange with crankshaft seal, removing and installing**

3 - Seals

- Replace

4 - Crankshaft

- Measuring axial play --> **Axial clearance, measuring**
- Radial clearance, measuring --> **Radial clearance, measuring**
- Do not turn crankshaft when measuring radial play
- Crankshaft dimensions --> **Crankshaft dimensions**

#### 5 - Alignment bushing

- 4 pieces
- Insert into guide frame **Sealant application for guide frame, position of alignment bushings**

#### 6 - Bearing bracket

- Sealant application **Sealant application for guide frame, position of alignment bushings**
- Tightening sequence for manifold mounting bolts **Installing guide frame**

#### 7 - Bolt

- For sealing surfaces of cylinder block/guide frame
- Varying bolt lengths and bolt heads
- Tightening order **Installing guide frame**

#### 8 - Long bolt, large shoulder

- For inner row of guide frame
- Tightening order **Installing guide frame**

#### 9 - Short bolt, small shoulder

- For outer row of guide frame
- Tightening order **Installing guide frame**

#### 10 - Thrust washer

- Only on 3rd crankshaft bearing
- Lubricating grooves face outward
- Note locating point in guide frame
- Measuring crankshaft axial clearance --> **Axial clearance, measuring**

#### 11 - Bearing shell

- For guide frame without lubricating groove
- Do not interchange used bearing shells (mark)
- Note installation position



- Insert new bearing shells for guide frame with proper color marking **Allocation of crankshaft bearing shells for guide frame**

**12 - Centering washer**

- For vehicles with automatic transmission 09L **Centering washer for drive plate on automatic transmission 09L**

**13 - Thrust washer**

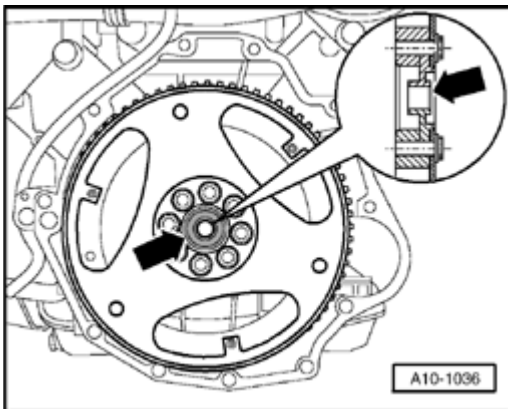
- Only on 3rd crankshaft bearing
- Lubricating grooves face outward
- Note locating point in guide frame
- Measuring crankshaft axial clearance --> **Axial clearance, measuring**

**14 - Bearing shell**

- For cylinder block with oil groove
- Do not interchange used bearing shells (mark)
- Note installation position
- Insert new bearing shells for cylinder block with proper color marking **Allocation of crankshaft bearing shells for cylinder block**

**15 - Seal**

- Replace

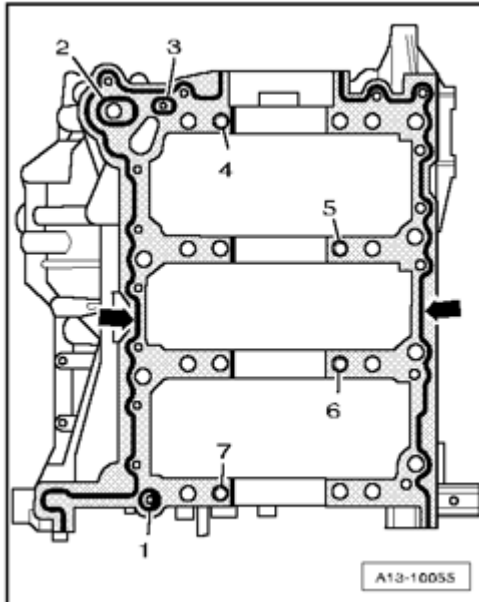
**16 - Cylinder block****Centering washer for drive plate on automatic transmission 09L**

**Fig. 342: Installing Drive Plate With Centering Washer And Backing Plate**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

**NOTE:**

- On vehicles with automatic transmission, the drive plate is bolted to the crankshaft with a centering washer - arrow -.

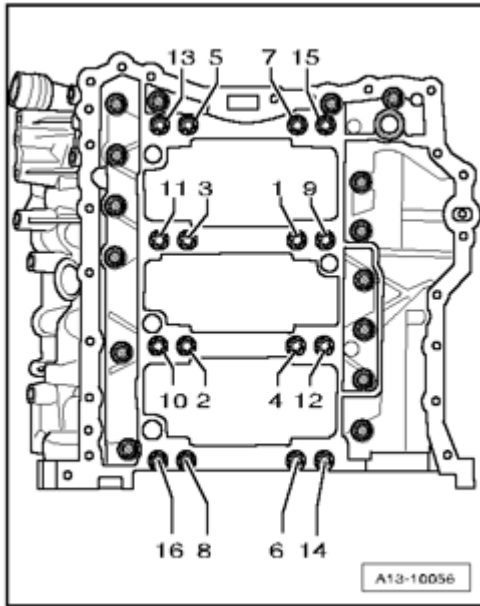
Sealant application for guide frame, position of alignment bushings



**Fig. 343: Sealant Application For Guide Frame, Position Of Alignment Bushings**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clean sealing surfaces, they must be free of oil and grease on top and bottom.
- Apply sealant beads - **arrows** - on clean sealing surfaces of guide frame as shown in illustration.
- The groove of sealing surface must be completely filled with sealant.
- Sealant beads must stand 1.5 to 2.0 mm above sealing surface.
- Install seals - **1 through 3** -.
- Check whether alignment bushings - **4 through 7** - are inserted at locations in guide frame as shown in the illustration.

**Installing guide frame**

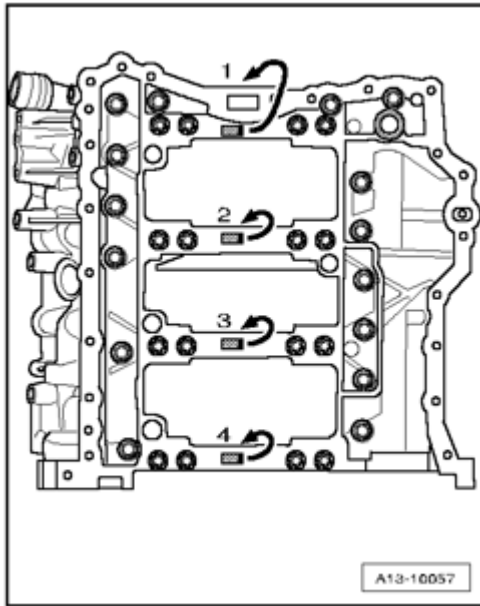


**Fig. 344: Installing Guide Frame**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Replace bolts - **1 to 16** -.
- Place long bolts into inner row of guide frame.
- Tighten bolts for guide frame as follows:
- Tighten bolts - **1 to 16** - to 50 Nm with torque wrench.
- Tighten bolts - **1 to 16** - 90 ° (  $\frac{1}{4}$  additional turn) using a rigid wrench.
- Tighten bolts for sealing surfaces of cylinder block/guide frame - **dark hatching in the illustration** - to 23 Nm in diagonal sequence.

**Allocation of crankshaft bearing shells for cylinder block**



**Fig. 345: Allocation Of Crankshaft Bearing Shells For Cylinder Block**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Bearing shells with correct thickness are allocated to 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

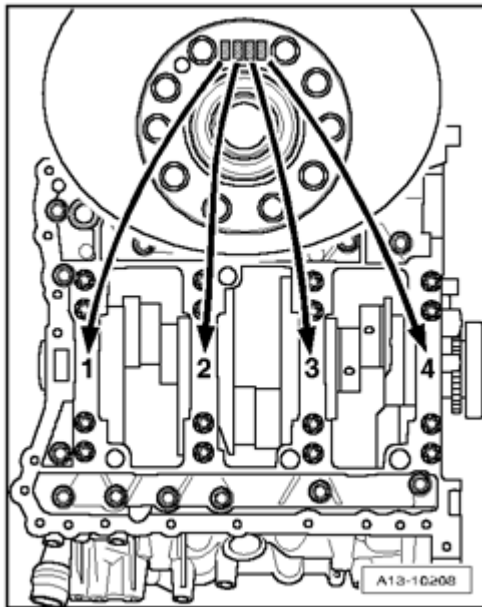
**Through engine no. BKH 033 000:**

On engines through no. BKH 033 000 another allocation of letters on guide frame to bearing shell color applies to bearing 1 (front).

| Bearing no. | Letter on guide frame | Color of bearing |
|-------------|-----------------------|------------------|
| 1           | G=                    | red              |
|             | B=                    | yellow           |
|             | S=                    | Blue             |
| 2 to 4      | G=                    | yellow           |
|             | B=                    | Blue             |
|             | S=                    | black            |

**From engine no. BKH 033 001:**

| Letter on guide frame | Color of bearing |
|-----------------------|------------------|
| R=                    | red              |
| G=                    | yellow           |
| B=                    | Blue             |
| S=                    | black            |

**Allocation of crankshaft bearing shells for guide frame**

**Fig. 346: Allocation Of Crankshaft Bearing Shells For Guide Frame**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Bearing shells with correct thickness are allocated to 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.

**Through engine no. BKH 033 000:**

On engines through no. BKH 033 000 another allocation of letters on crankshaft to bearing shell color applies to bearing 1 (front).

| Bearing no. | Letter on crankshaft | Color of bearing |
|-------------|----------------------|------------------|
| 1           | G=                   | red              |
|             | B=                   | yellow           |
|             | S=                   | Blue             |
| 2 4         | G=                   | yellow           |
|             | B=                   | Blue             |
|             | S=                   | black            |

**From engine no. BKH 033 001:**

| Letter on crankshaft | Color of bearing |
|----------------------|------------------|
| R=                   | red              |
| G=                   | yellow           |

## 2007 Audi A6

ENGINE 3.2 V6 4V Engine Mechanical, Engine Code(s): BKH

B=

Blue

S=

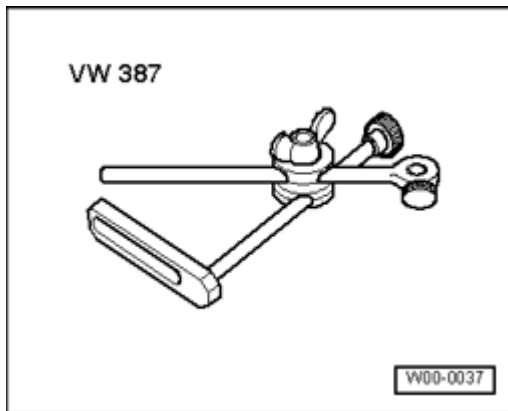
black

### Crankshaft dimensions

| Reconditioning dimension in mm | Crankshaft bearing journal diameter |             | Connecting rod journal diameter |             |
|--------------------------------|-------------------------------------|-------------|---------------------------------|-------------|
| Basic dimension                | 65.00                               | 0.022 0.042 | 56.00                           | 0.022 0.042 |

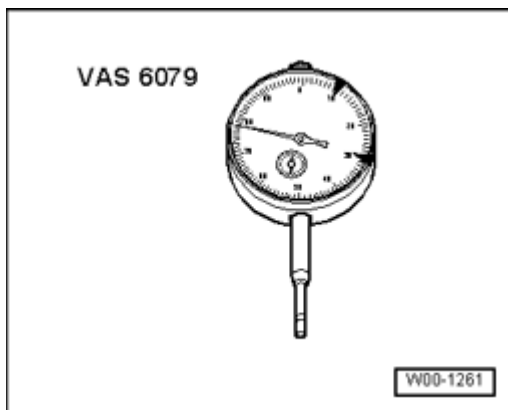
### Axial clearance, measuring

### Special tools, testers and auxiliary items required



**Fig. 347: Identifying Dial Gauge Holder VW 387**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

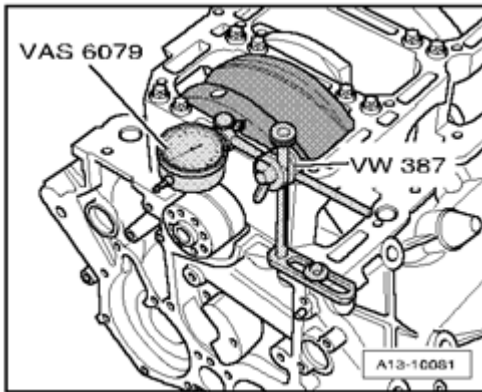
- Dial gauge holder VW 387



**Fig. 348: Identifying Dial Gauge VAS 6079**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Dial gauge VAS 6079

## Work procedure



**Fig. 349: Attaching Dial Indicator VAS 6079 Together With Dial Gauge Holder VW 387 To Cylinder Block And Setting Indicator Against Crankshaft Counterweight**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Attach dial indicator VAS 6079 together with dial gauge holder VW 387 to cylinder block and set indicator against crankshaft counterweight.
- Press crankshaft against dial indicator by hand, set indicator to - 0 -.
- Press crankshaft off dial indicator and read off value:
  - Axial clearance: 0.209 to 0.251 mm.

## Radial clearance, measuring

### Special tools, testers and auxiliary items required

- Plastigage

## Work procedure

### NOTE:

- Do not interchange used bearings
- Bearing shells that are worn down to the nickel layer must be replaced.

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

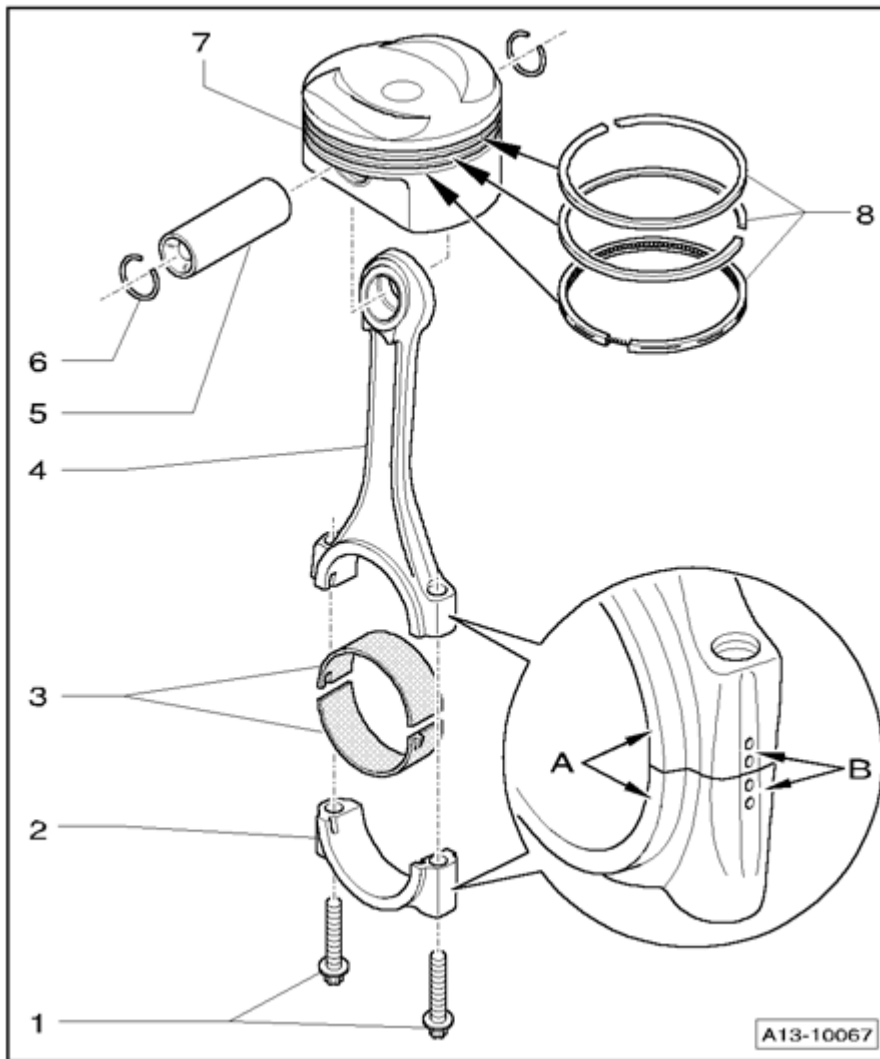
- Radial clearance, new: 0.010 to 0.039 mm.
- Radial clearance wear limit: 0.08 mm.

## PISTON AND CONNECTING ROD, DISASSEMBLING AND ASSEMBLING

### Piston and connecting rod, component overview

**NOTE:**

- Oil injector jet for piston cooling Oil spray jet for piston cooling



**Fig. 350: Piston And Connecting Rod, Component Overview**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Connecting rod bolt, 30 Nm plus an additional 90 ° (  $\frac{1}{4}$  turn)

- Replace



- Lubricate threads and contact surface
- Tighten to 30 Nm to measure radial play, do not turn further

## 2 - Connecting rod bearing cap

- Do not interchange
- Mark allocation to cylinder using a color marker - **B - Mark connecting rod**
- 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 **Connecting rod, installed location**

## 3 - Bearing shell

- Upper bearing shell (for connecting rod) made of wear-resistant material; identification: Bright color of bearing
- Lower bearing shell (for bearing cap) identification: Dark color of bearing
- Check that retaining tabs are secured
- Do not interchange used bearing shells (mark)
- Radial clearance, measuring --> **Radial clearance of connecting rod, checking**

## 4 - Connecting rod

- Only replace as set
- Mark allocation to cylinder with paint - **B - Mark connecting rod**
- 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 **Connecting rod, installed location**

## 5 - Piston pin

- If tight, heat piston to 60 ° C
- Removing and installing using a drift VW 222 A

## 6 - Circlip

## 7 - Piston

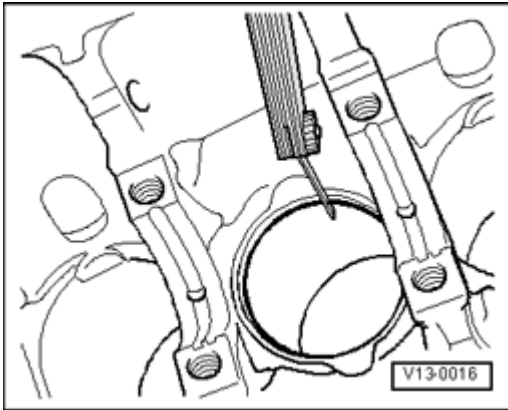
- Installed position and allocation, piston/cylinder **Installed position of piston and piston/cylinder allocation**
- Arrow on piston face points toward belt pulley side
- Checking **Checking piston**
- Install with piston ring compressor

- Piston and cylinder dimensions --> **Piston and cylinder dimensions**
- Cylinder bore, checking **Checking cylinder bores**

## 8 - Piston rings

- Offset gaps by 120 °
- Use piston ring pliers for removal and installation
- "TOP" marking or inscribed side must point to piston head
- Checking ring gap **Checking piston ring gap**
- Check piston ring groove clearance **Checking ring to groove clearance**

### Checking piston ring gap



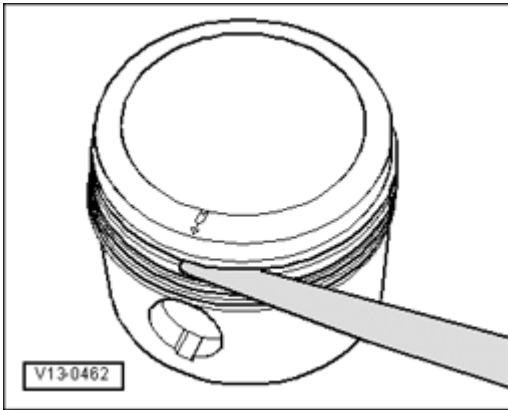
**Fig. 351: Checking Piston Ring Gap**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Push ring squarely from above down to approx. 15 mm from bottom end of cylinder. To do this use a piston without rings.

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

### Checking ring to groove clearance

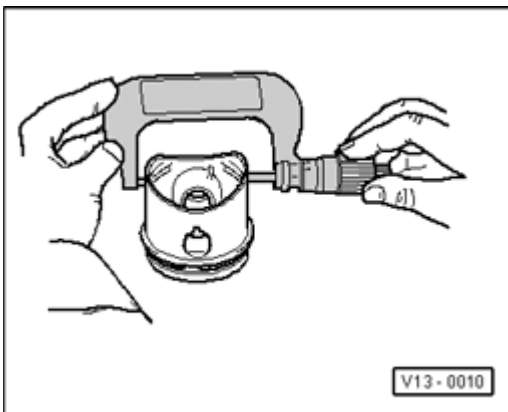


**Fig. 352: Checking Ring To Groove Clearance**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clean ring groove of piston 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       |

#### Checking piston

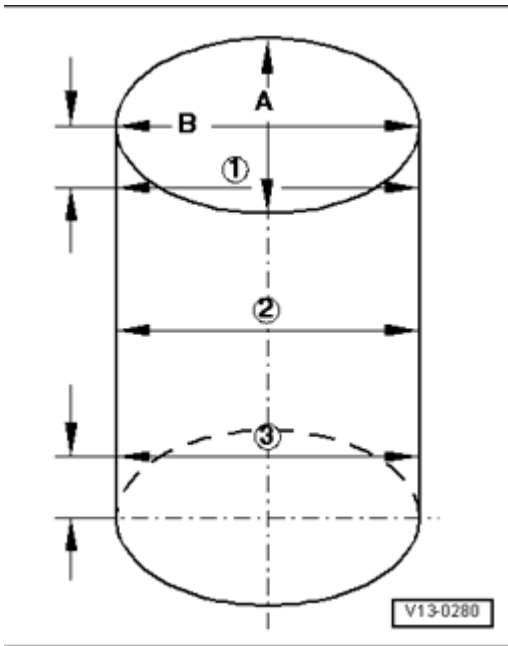


**Fig. 353: Checking Piston**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Measure approx. 10 mm from lower edge, at a 90 ° angle to piston pin axis using an external micrometer 75 to 100 mm.
- Maximum deviation from nominal dimension: 0.04 mm.

Nominal dimension --> **Piston and cylinder dimensions.**

#### Checking cylinder bores



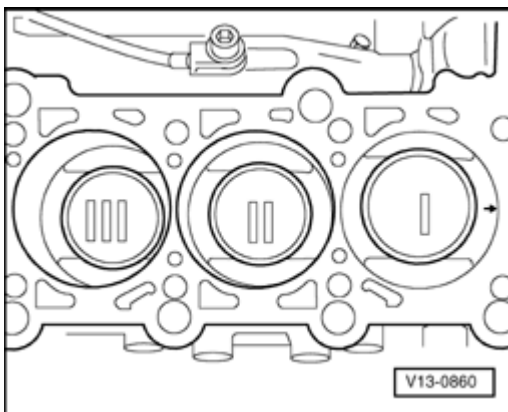
**Fig. 354: Checking Cylinder Bores**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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 --> **Piston and cylinder dimensions.**

**Installed position of piston and piston/cylinder allocation**



**Fig. 355: Installed Position Of Piston And Piston/Cylinder Allocation**

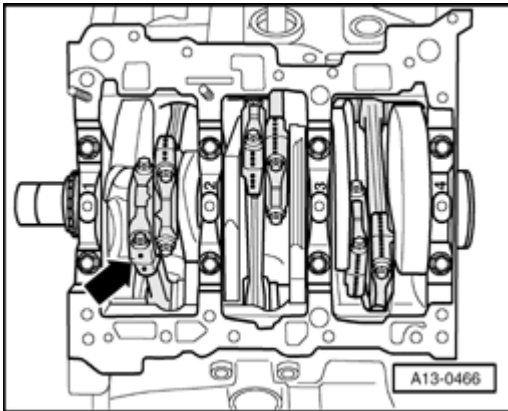
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Mark installed position and allocation to cylinder on piston head using chalk or waterproof felt pen.

**NOTE:**

- Do not use a center punch or scribe, since the piston head coating will be damaged.
- Installed location: Arrow on piston face points toward belt pulley side.

#### Mark connecting rod



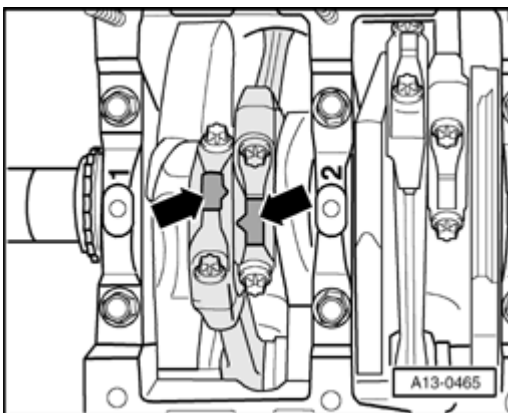
**Fig. 356: Mark Connecting Rod**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

#### NOTE:

- Only replace connecting rod as a set.
  - Do not interchange connecting rod bearings.
- Before removing, mark allocation of connecting rod and connecting rod bearing caps to each other and to cylinder with paint - **arrow** -.

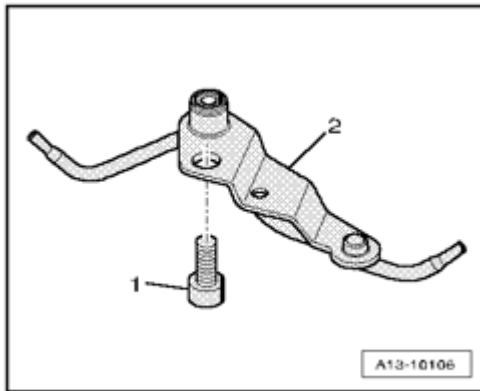
#### Connecting rod, installed location



**Fig. 357: Connecting Rod, Installed Location**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- The molded tabs - **arrows** - at beveled surfaces of connecting rod pairs 1 and 2, 3 and 4, and 5 and 6 must point toward each other.

**Oil spray jet for piston cooling**

**Fig. 358: Oil Spray Jet For Piston Cooling**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1. Insert bolt (9 Nm) using locking compound; locking compound
2. Oil spray jet with spray nozzle valve

**Piston and cylinder dimensions**

| Reconditioning dimension in mm                                                                                                           | Piston diameter     | Cylinder bore diameter |
|------------------------------------------------------------------------------------------------------------------------------------------|---------------------|------------------------|
| Basic dimension                                                                                                                          | 84.49 <sup>1)</sup> | 84.51                  |
| <ul style="list-style-type: none"> <li>• <sup>1)</sup> Measurement with coating (thickness = 0.02 mm). The coating wears off.</li> </ul> |                     |                        |

**Radial clearance of connecting rod, checking****Special tools, testers and auxiliary items required**

- Plastigage

**Work procedure**

- 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.
- Remove connecting rod bearing caps again.
- Compare width of Plastigage with measuring scale:
  - Radial clearance, new: 0.010 to 0.052 mm.
  - Radial clearance wear limit: 0.12 mm.

- Replace bolts for connecting rod bearings.

## 15 - ENGINE - CYLINDER HEAD, VALVETRAIN

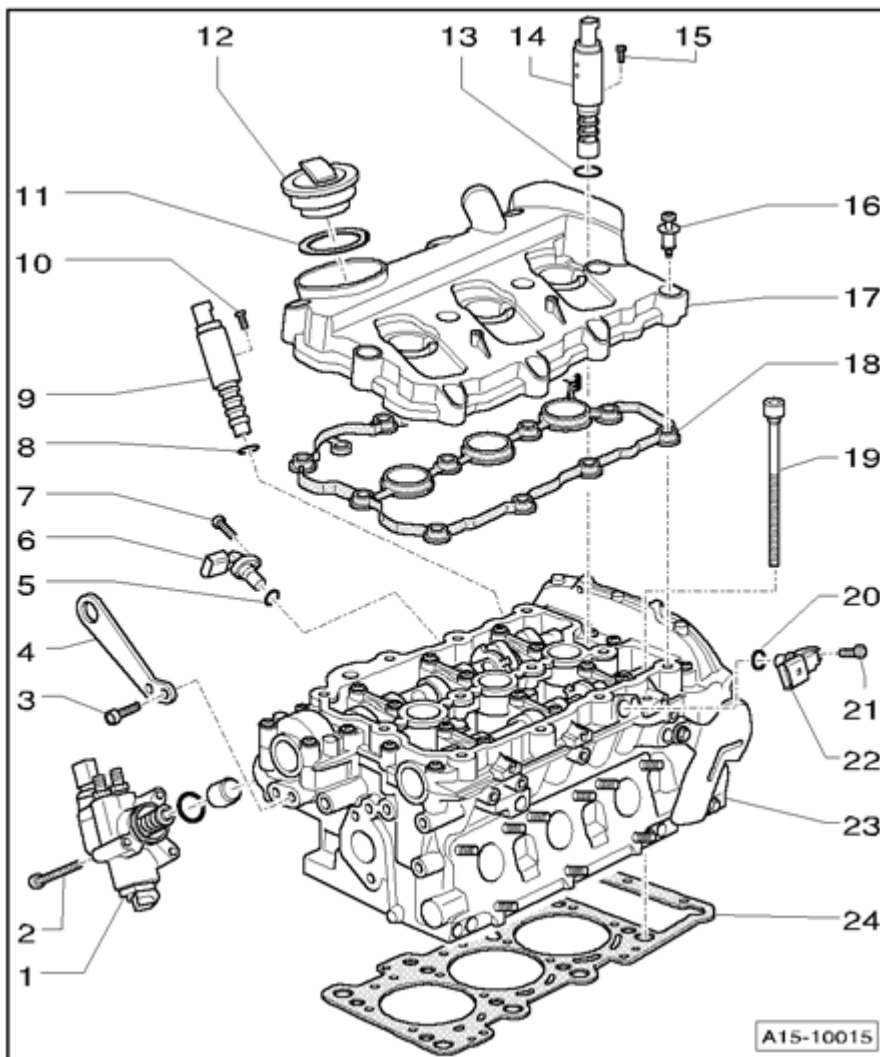
### CYLINDER HEAD, REMOVING AND INSTALLING

Cylinder head, component overview

**CAUTION:** This document contains Volkswagen World Wide content. Not all of the information applies to the US and Canadian Market.

**NOTE:**

- Illustration depicts left cylinder head.
- Both cylinder heads can be removed and installed when engine is installed in engine compartment.



**Fig. 359: Cylinder Head, Component Overview****Courtesy of VOLKSWAGEN UNITED STATES, INC.**

1 - High pressure pump

- Removing and installing --> **24 - FUEL INJECTION SYSTEM**

2 - 9 Nm

- Always apply Loctite 5910 on sealing surface when reinstalling.

3 - 20 Nm

4 - Lifting eye

5 - O-ring

- Replace

6 - Camshaft position sensor, intake camshaft

- Cylinder bank 1 (right) Camshaft Position (CMP) Sensor G40
- Cylinder bank 2 (left) Camshaft Position (CMP) Sensor 2 G163

7 - 9 Nm

8 - O-ring

- Replace

9 - 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

10 - 2.5 Nm

11 - Gasket

- Replace if damaged or leaking

12 - Cap

13 - O-ring

- Replace



## 14 - 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

## 15 - 2.5 Nm

## 16 - Special bolt, 9 Nm

- Replace if damaged or leaking
- Observe sequence for tightening *Tighten cylinder head cover in sequence* under **Left cylinder head cover, removing and installing**

## 17 - Cylinder head cover

- Removing and installing: Left --> **Left cylinder head cover, removing and installing** , right --> **Right cylinder head cover, removing and installing**

## 18 - Cylinder head cover gasket

- Replace if damaged or leaking

## 19 - Cylinder head bolt

- Replace
- Observe sequence for loosening --> **Left cylinder head cover, removing and installing**
- Observe sequence for tightening *Tighten cylinder head in sequence indicated, in 3 stages as follows:* under **Installing**

## 20 - O-ring

- Replace

## 21 - 9 Nm

## 22 - 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

## 23 - Cylinder head

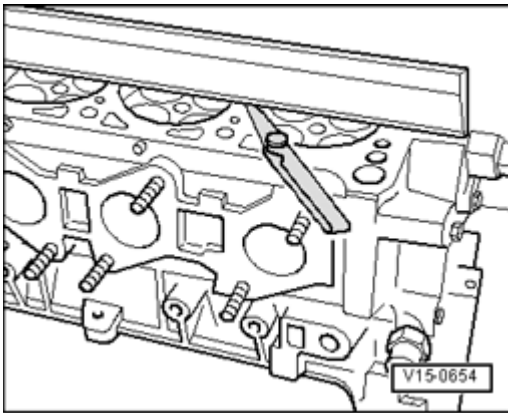
- Removing --> **Cylinder head, removing and installing**
- Check for distortion **Checking cylinder head for distortion**
- Reworking dimension **Reworking dimension, cylinder head**

- Installing **Installing**
- After replacing, change coolant and engine oil

#### 24 - Cylinder head gasket

- Replacing --> **Cylinder head, removing and installing.**
- Installed location: Part Number, points to cylinder head
- After replacing, change coolant and engine oil

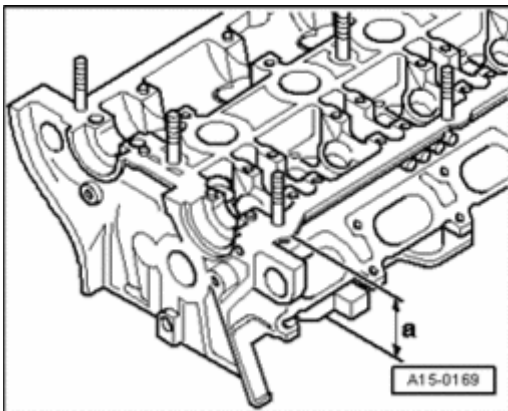
#### Checking cylinder head for distortion



**Fig. 360: Checking Cylinder Head For Distortion**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check cylinder head at multiple points for distortion, using straight edge and feeler gauges.
- Max. distortion: 0.05 mm.

#### Reworking dimension, cylinder head



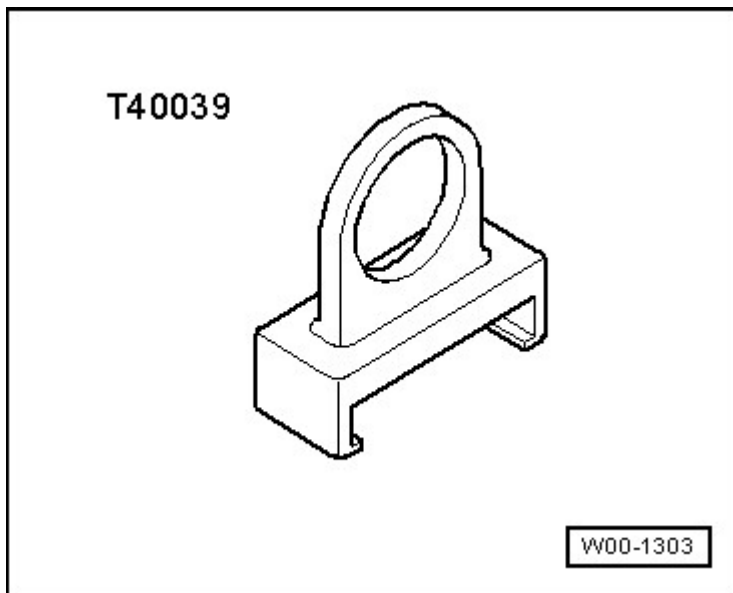
**Fig. 361: Reworking Dimension, Cylinder Head**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

- Minimum dimension - **a** - = 139.20 mm.

Left cylinder head cover, removing and installing

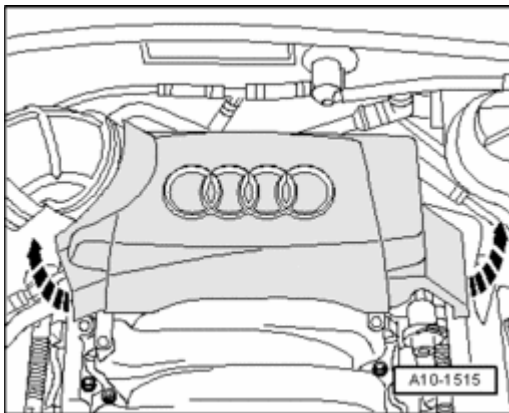
Special tools, testers and auxiliary items required



**Fig. 362: Identifying Ignition Coil Puller T40039**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

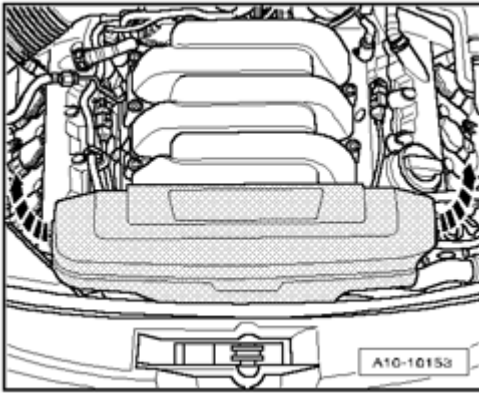
- Puller T40039

Removing



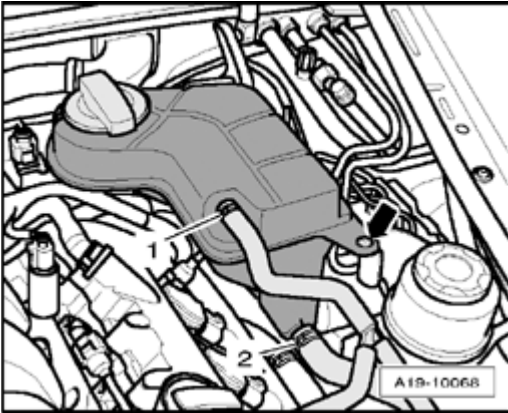
**Fig. 363: Removing Rear Engine Cover**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove rear engine cover - **arrows** -.



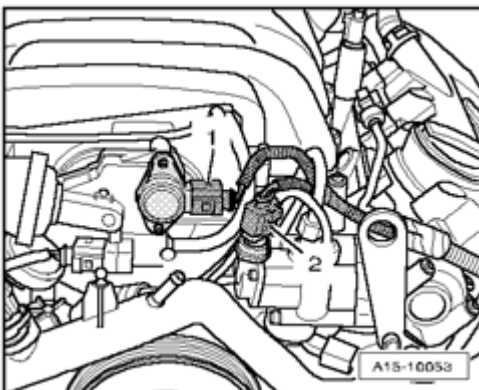
**Fig. 364: Identifying Front Engine Cover**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front engine cover - **arrows** -.



**Fig. 365: Removing Coolant Hoses At Coolant Expansion Tank**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

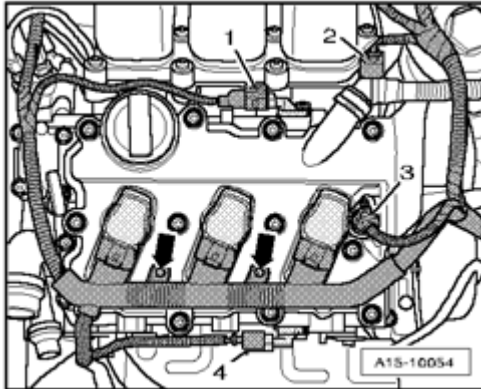
- Remove coolant expansion tank - **arrow** -.
- Disconnect electrical connection from Engine Coolant Level (ECL) Warning Switch F66 at bottom of coolant reservoir and set aside coolant reservoir with coolant hoses - **1** - and - **2** - connected.



**Fig. 366: Disconnecting Electrical Harness Connectors**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

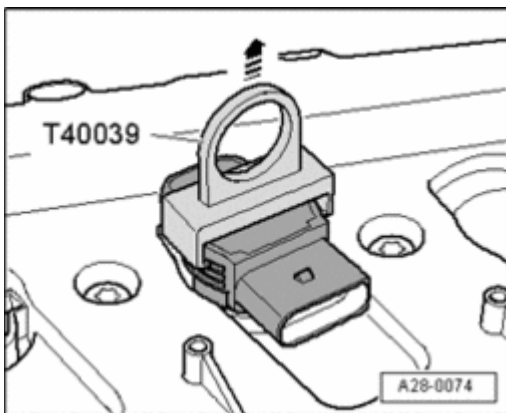
- Disconnect electrical harness connectors.
- 1. Change-over valve for intake manifold flap N239
- 2. Intake Manifold Tuning (IMT) Valve Position Sensor G513



**Fig. 367: Disconnecting Electrical Harness Connectors**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

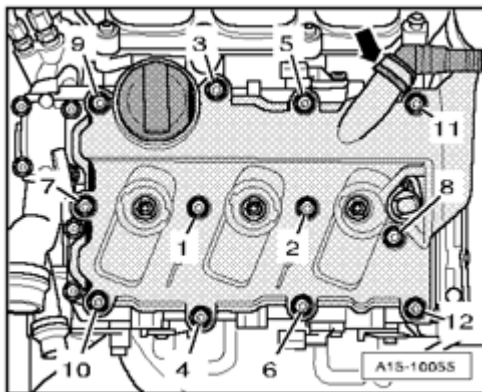
- Disconnect electrical harness connectors.
- 1. Camshaft position (CMP) sensor 2 G163
- 2. Camshaft Adjustment Valve 2 N208
- 3. Camshaft Adjustment Valve 2 (exhaust) N319
- 4. Camshaft position (CMP) sensor 4 G301
- Remove bolts - **arrows** - and separate electrical connections at ignition coils.
- Set electrical wiring harness aside.



**Fig. 368: Removing Ignition Coils Using Ignition Coil Puller T40039**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove ignition coils using ignition coil puller T40039.



**Fig. 369: Removing Crankshaft Housing Ventilation Hose & Left Cylinder Head Cover Bolts In Sequence**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove crankshaft housing ventilation hose - **arrow** -.
- Remove left cylinder head cover bolts in sequence - **12 to 1** -.
- Remove cylinder head cover.

### Installing

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

#### NOTE:

- **Replace cylinder head cover gaskets if damaged.**
- **Replace bolts for cylinder head cover if gasket is damaged.**

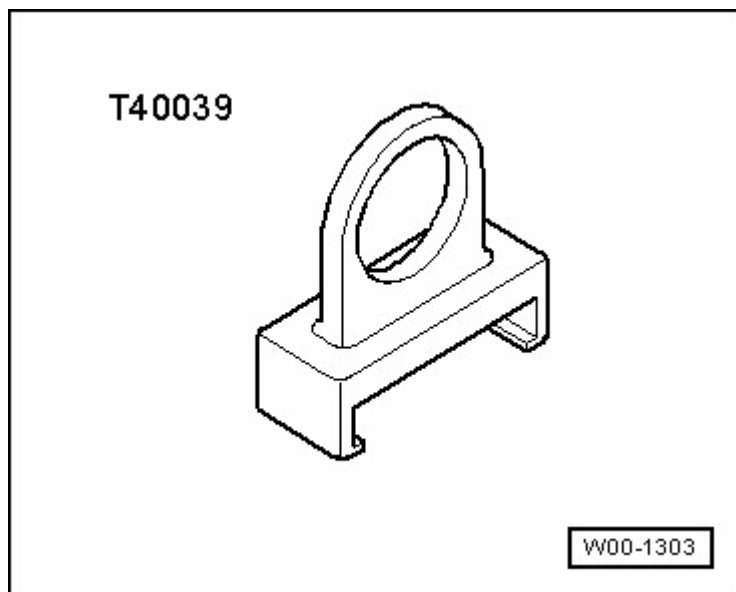
- Clean sealing surfaces so they are completely free of any oil or grease.
- Tighten cylinder head cover in sequence - **1 to 12** -.

### Torque specifications

| Component                            | Nm |
|--------------------------------------|----|
| Cylinder head cover to cylinder head | 9  |

Left cylinder head cover, US./Can. vehicles, removing and installing

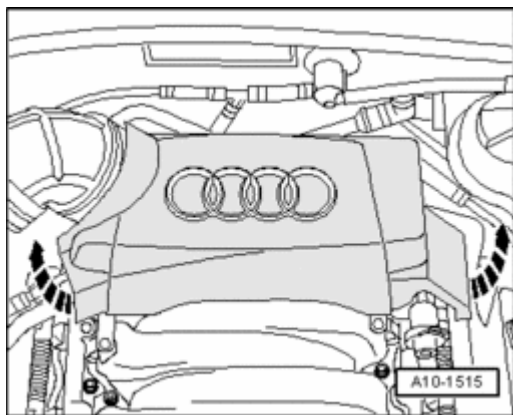
Special tools, testers and auxiliary items required



**Fig. 370: Identifying Ignition Coil Puller T40039**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

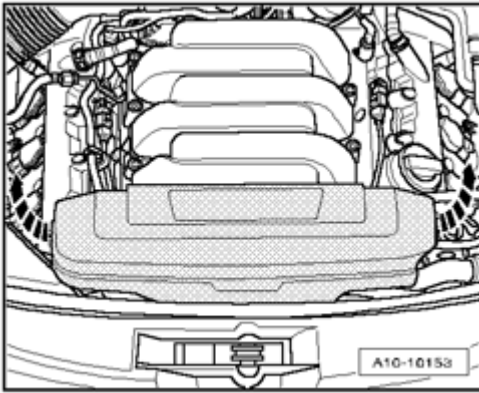
- Puller T40039

### Removing



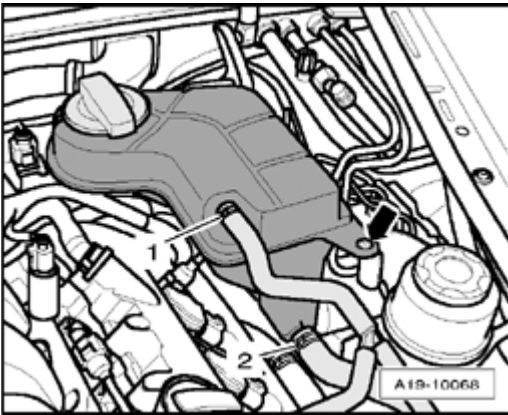
**Fig. 371: Removing Rear Engine Cover**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove rear engine cover - **arrows** -.



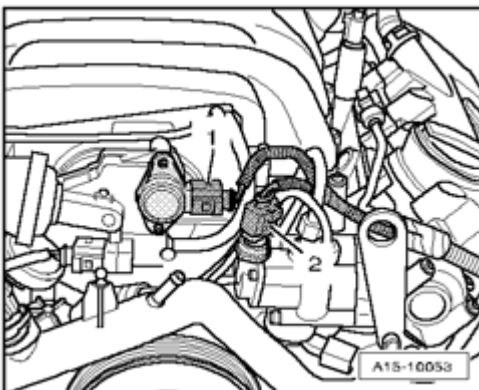
**Fig. 372: Identifying Front Engine Cover**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front engine cover - **arrows** -.



**Fig. 373: Removing Coolant Hoses At Coolant Expansion Tank**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove coolant expansion tank - **arrow** -.
- Disconnect electrical connection from Engine Coolant Level (ECL) Warning Switch F66 at bottom of coolant reservoir and set aside coolant reservoir with coolant hoses - **1** - and - **2** - connected.

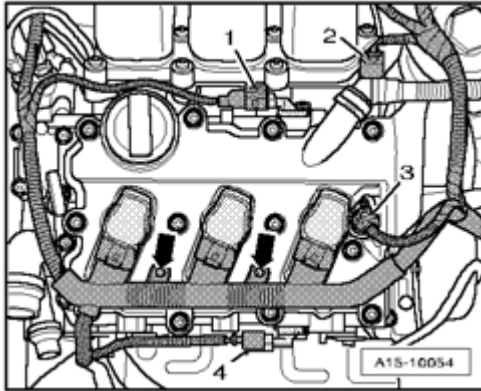




**Fig. 374: Disconnecting Electrical Harness Connectors**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

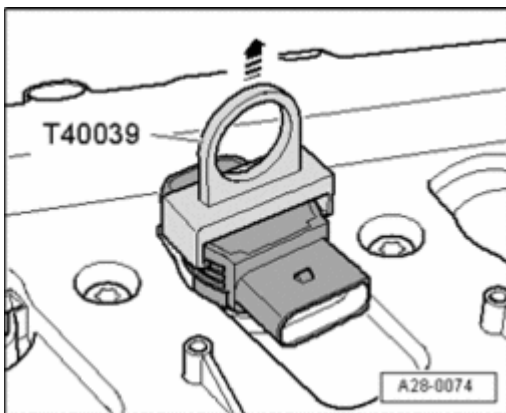
- Disconnect electrical harness connectors.
- 1. Change-over valve for intake manifold flap N239
- 2. Intake Manifold Tuning (IMT) Valve Position Sensor G513



**Fig. 375: Disconnecting Electrical Harness Connectors**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

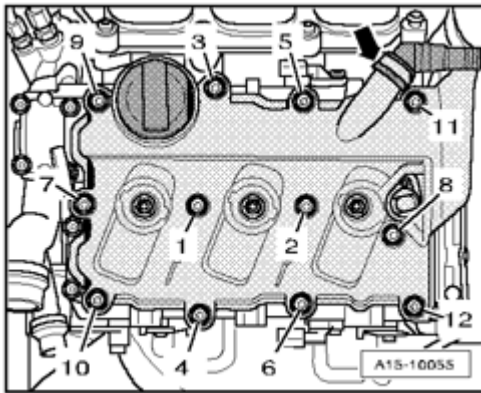
- Disconnect electrical harness connectors.
- 1. Camshaft position (CMP) sensor 2 G163
- 2. Camshaft Adjustment Valve 2 N208
- 3. Camshaft Adjustment Valve 2 (exhaust) N319
- 4. Camshaft position (CMP) sensor 4 G301
- Remove bolts - **arrows** - and separate electrical connections at ignition coils.
- Set electrical wiring harness aside.



**Fig. 376: Removing Ignition Coils Using Ignition Coil Puller T40039**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove ignition coils using ignition coil puller T40039.



**Fig. 377: Removing Crankshaft Housing Ventilation Hose & Left Cylinder Head Cover Bolts In Sequence**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove left cylinder head cover bolts in sequence - **12 to 1** -.

**CAUTION: On US vehicles, crankcase ventilation - arrow - must not be disconnected.**

- Lay aside removed cylinder head cover with connected crankcase ventilation hose.

### Installing

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

#### NOTE:

- Replace cylinder head cover gaskets if damaged.
- Replace bolts for cylinder head cover if gasket is damaged.

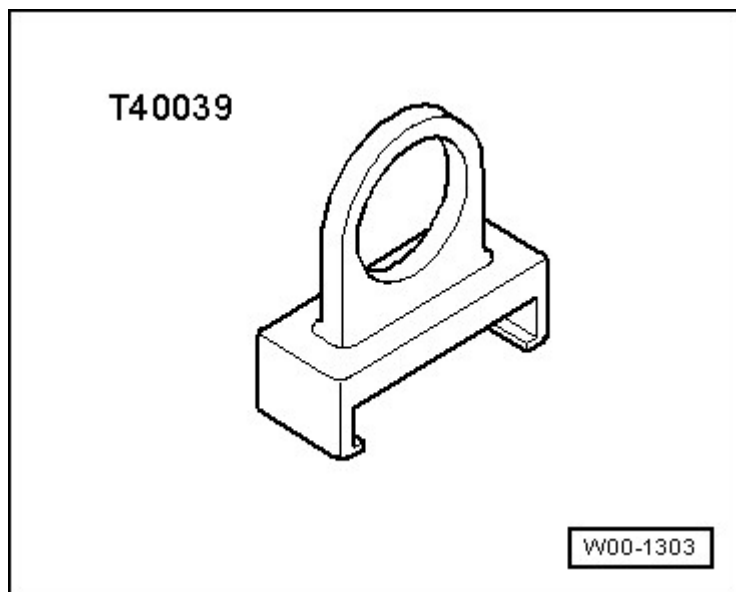
- Clean sealing surfaces so they are completely free of any oil or grease.
- Tighten cylinder head cover in sequence - **1 to 12** -.

### Torque specifications

| Component                            | Nm |
|--------------------------------------|----|
| Cylinder head cover to cylinder head | 9  |

Right cylinder head cover, removing and installing

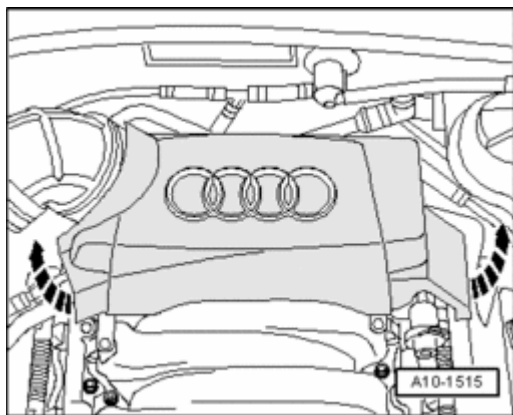
Special tools, testers and auxiliary items required



**Fig. 378: Identifying Ignition Coil Puller T40039**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

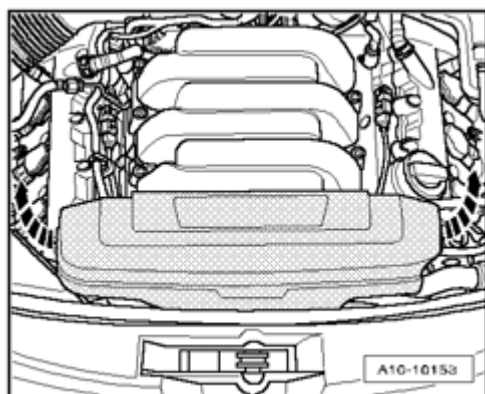
- Puller T40039

### Removing



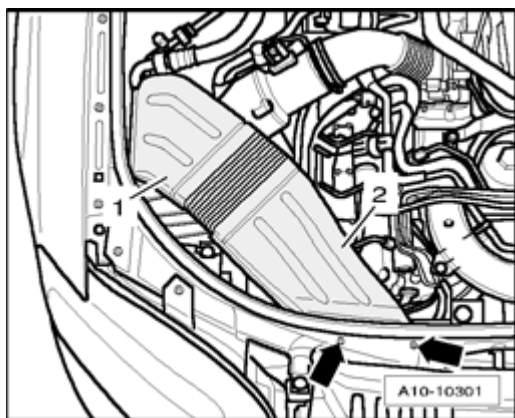
**Fig. 379: Removing Rear Engine Cover**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove rear engine cover - **arrows** -.



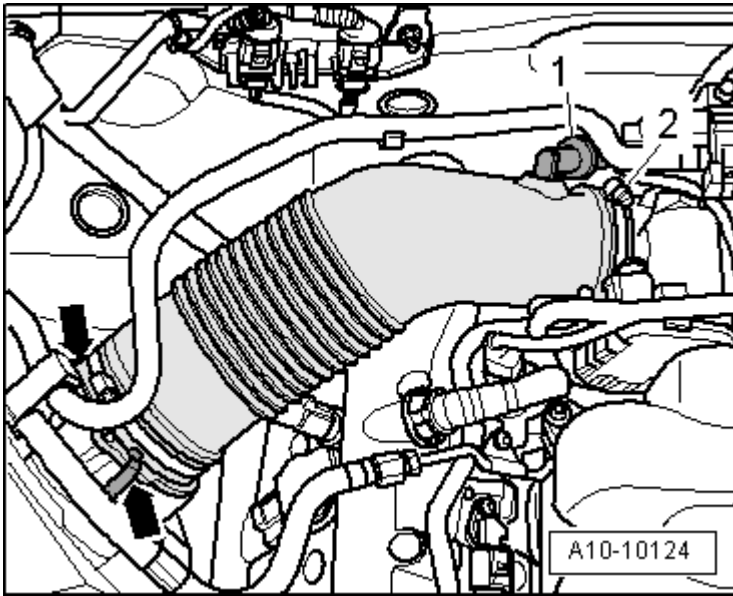
**Fig. 380: Identifying Front Engine Cover**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front engine cover - **arrows** -.



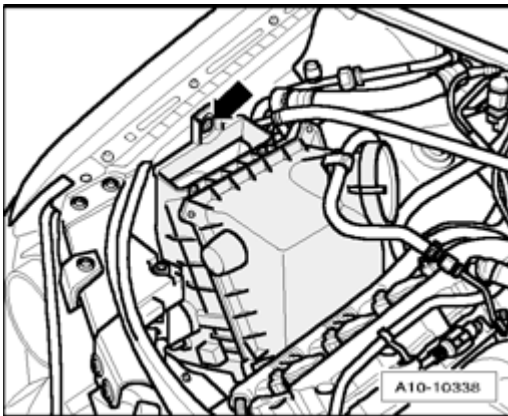
**Fig. 381: Identifying Bolts & Air Duct**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Remove air duct - **1** - and - **2** -.



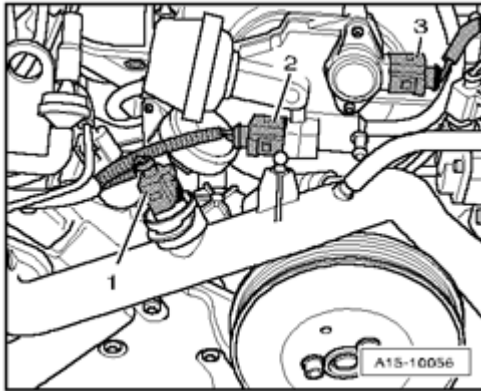
**Fig. 382: Disconnecting Check Valve From Connection At Air Duct Hose**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect check valve - **1** - from air duct hose.
- Remove air duct hose, thereby loosening hose clamp - **2** - and opening clips - **arrows** -.



**Fig. 383: Removing Pin From Spreader Clips**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove pin from spreader clips - **arrow** -.
- Remove air filter housing.

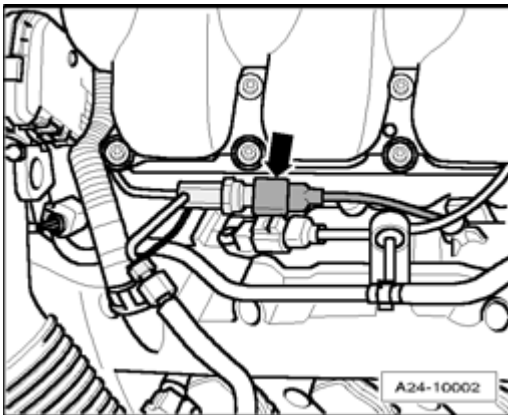


**Fig. 384: Disconnecting Electrical Harness Connectors**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connectors.
- 1. Engine Coolant Temperature (ECT) Sensor G62
- 2. Change-over valve for intake manifold flap N239

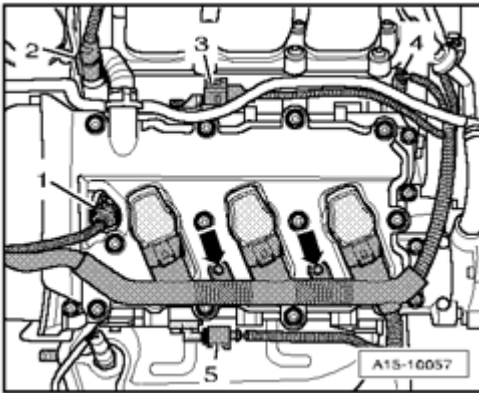
**NOTE:**

- Ignore - 3 -.



**Fig. 385: Disconnecting Electrical Connector At Low Fuel Pressure Sensor G410**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **arrow** - at Low Fuel Pressure Sensor G410.



**Fig. 386: Disconnecting Electrical Harness Connectors**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connectors.

1 - Camshaft Adjustment Valve 1 (exhaust) N318

3 - Camshaft Position (CMP) sensor G40

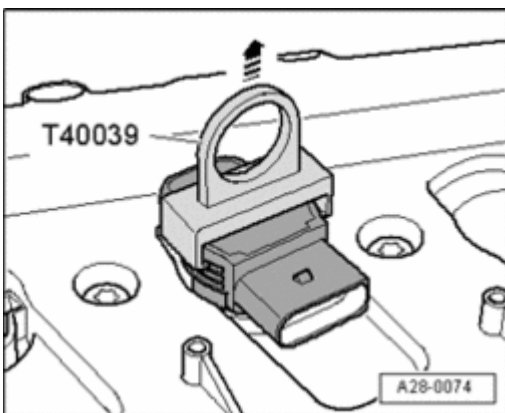
4 - Intake Manifold Runner Position Sensor G336

5 - Camshaft position (CMP) sensor 3 G300

**NOTE:**

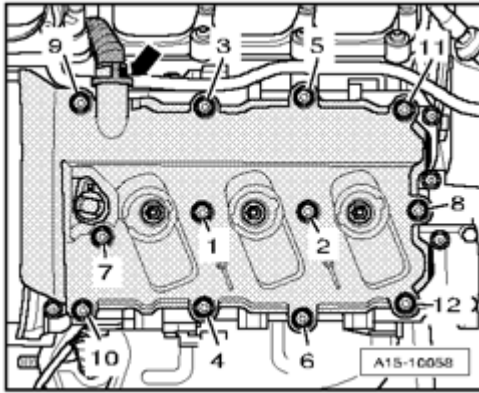
- Ignore - 2 -.

- Remove bolts - **arrows** - and separate electrical connections at ignition coils.
- Set electrical wiring harness aside.



**Fig. 387: Removing Ignition Coils Using Ignition Coil Puller T40039**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove ignition coils using ignition coil puller T40039.



**Fig. 388: Removing Crankshaft Housing Ventilation Hose & Right Cylinder Head Cover Bolts In Sequence**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove crankshaft housing ventilation hose - **arrow** -.
- Remove right cylinder head cover bolts in sequence - **12 to 1** -.
- Remove cylinder head cover.

### Installing

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

#### NOTE:

- **Replace cylinder head cover gaskets if damaged.**
- **Replace bolts for cylinder head cover if gasket is damaged.**

- Clean sealing surfaces so they are completely free of any oil or grease.
- Tighten cylinder head cover in sequence - **1 to 12** -.

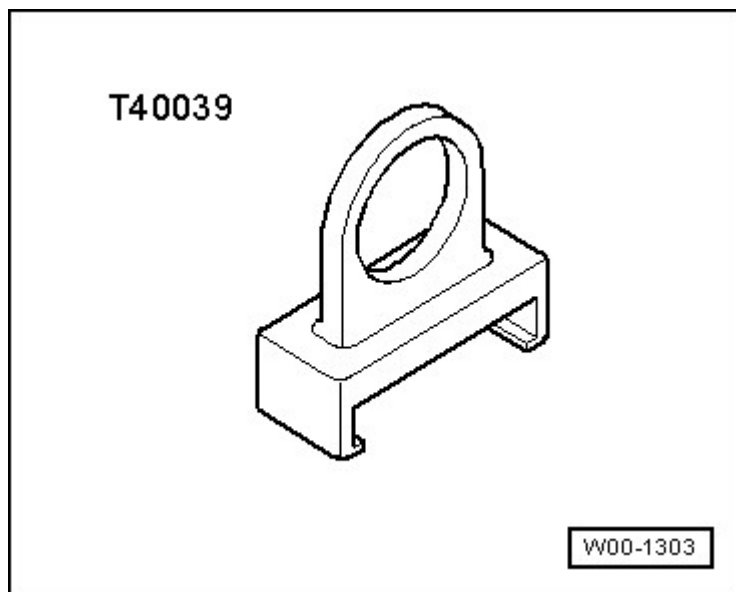
### Torque specifications

| Component                            | Nm |
|--------------------------------------|----|
| Cylinder head cover to cylinder head | 9  |
| Hose clamps 9 mm wide                | 3  |

Right cylinder head cover, US./Can. vehicles, removing and installing

Special tools, testers and auxiliary items required

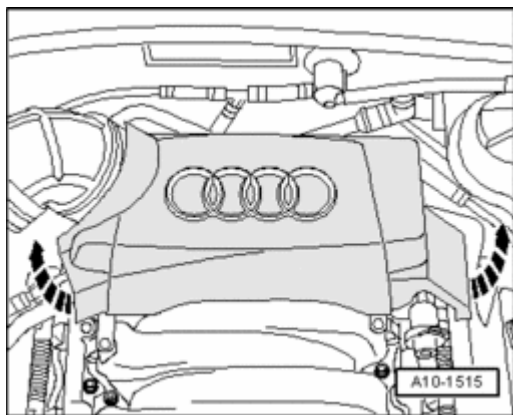




**Fig. 389: Identifying Ignition Coil Puller T40039**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

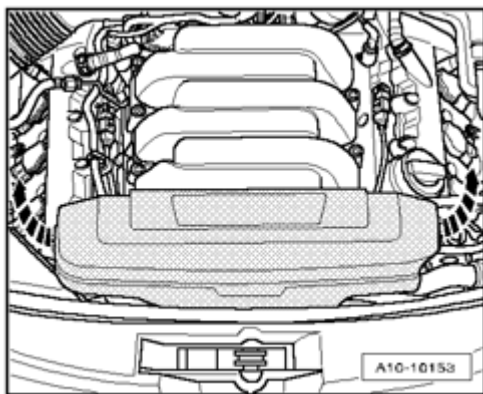
- Puller T40039

### Removing



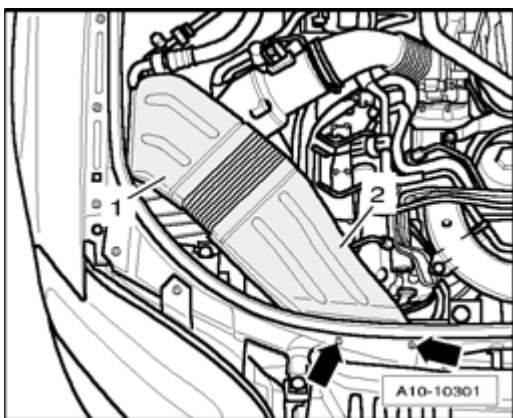
**Fig. 390: Removing Rear Engine Cover**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove rear engine cover - **arrows** -.



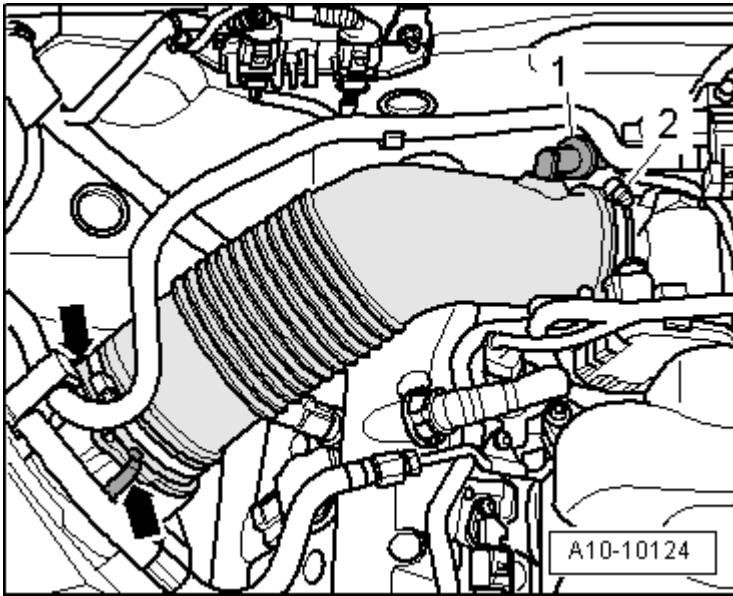
**Fig. 391: Identifying Front Engine Cover**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front engine cover - **arrows** -.



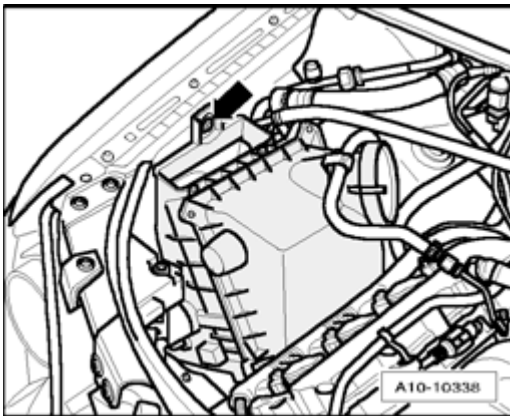
**Fig. 392: Identifying Bolts & Air Duct**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Remove air duct - **1** - and - **2** -.



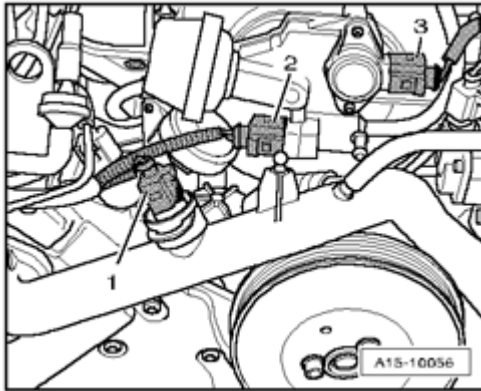
**Fig. 393: Disconnecting Check Valve From Connection At Air Duct Hose**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect check valve - **1** - from air duct hose.
- Remove air duct hose, thereby loosening hose clamp - **2** - and opening clips - **arrows** -.



**Fig. 394: Removing Pin From Spreader Clips**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove pin from spreader clips - **arrow** -.
- Remove air filter housing.



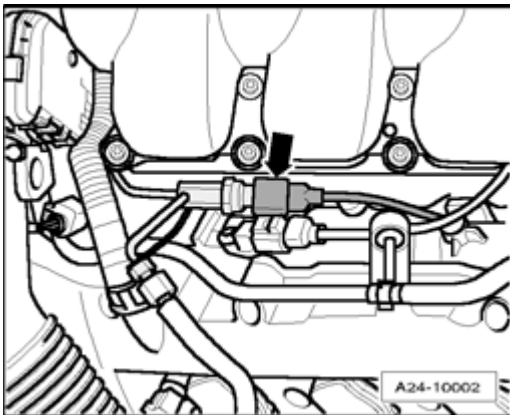
**Fig. 395: Disconnecting Electrical Harness Connectors**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connectors.

1. Engine Coolant Temperature (ECT) Sensor G62
2. Change-over valve for intake manifold flap N239

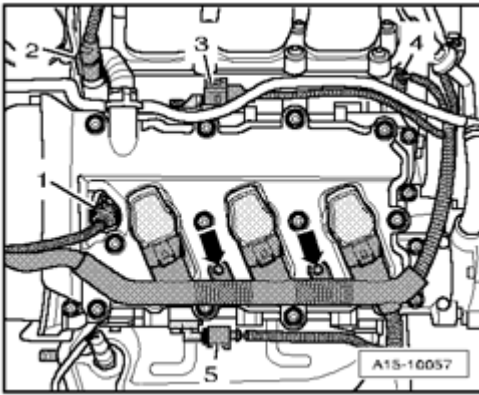
**NOTE:**

- Ignore - 3 -.



**Fig. 396: Disconnecting Electrical Connector At Low Fuel Pressure Sensor G410**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **arrow** - at Low Fuel Pressure Sensor G410.



**Fig. 397: Disconnecting Electrical Harness Connectors**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connectors.

1 - Camshaft Adjustment Valve 1 (exhaust) N318

3 - Camshaft Position (CMP) sensor G40

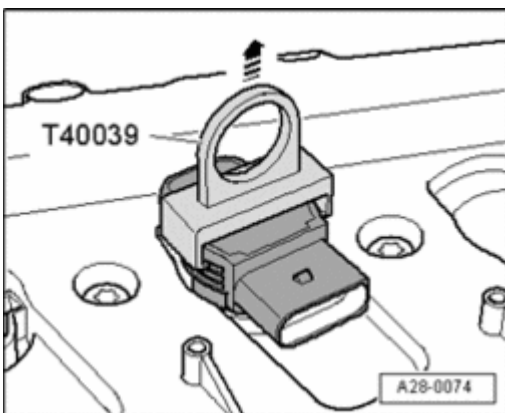
4 - Intake Manifold Runner Position Sensor G336

5 - Camshaft position (CMP) sensor 3 G300

**NOTE:**

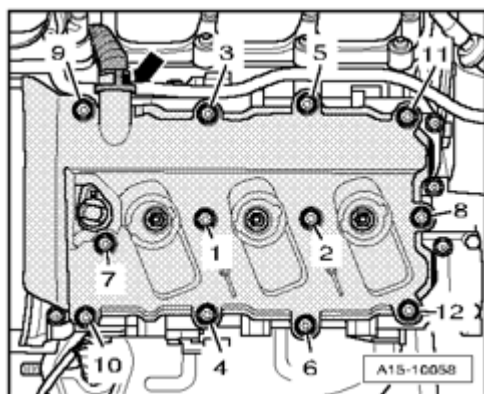
- Ignore - 2 -.

- Remove bolts - **arrows** - and separate electrical connections at ignition coils.
- Set electrical wiring harness aside.



**Fig. 398: Removing Ignition Coils Using Ignition Coil Puller T40039**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove ignition coils using ignition coil puller T40039.



**Fig. 399: Removing Crankshaft Housing Ventilation Hose & Right Cylinder Head Cover Bolts In Sequence**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove right cylinder head cover bolts in sequence - 12 to 1 -.

**CAUTION:** On US vehicles, crankcase ventilation - arrow - must not be disconnected.

- Lay aside removed cylinder head cover with connected crankcase ventilation hose.

### Installing

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

#### NOTE:

- Replace cylinder head cover gaskets if damaged.
- Replace bolts for cylinder head cover if gasket is damaged.

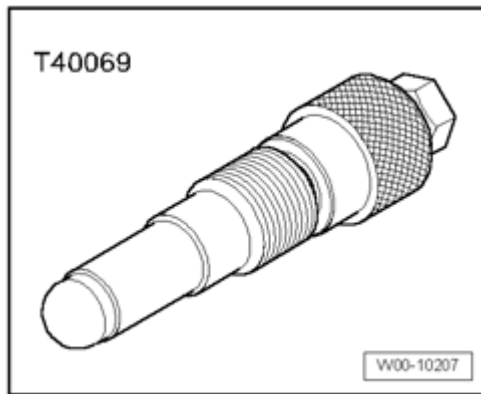
- Clean sealing surfaces so they are completely free of any oil or grease.
- Tighten cylinder head cover in sequence - 1 to 12 -.

### Torque specifications

| Component                            | Nm |
|--------------------------------------|----|
| Cylinder head cover to cylinder head | 9  |
| Hose clamps 9 mm wide                | 3  |

### Cylinder head, removing and installing

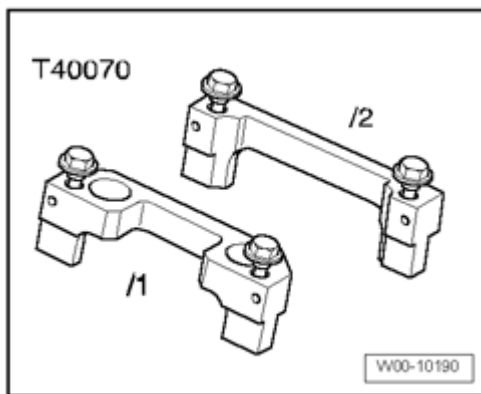
### Special tools, testers and auxiliary items required



**Fig. 400: Locking Pin T40069**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Locking pin T40069



**Fig. 401: Camshaft Locator T40070 (2X)**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

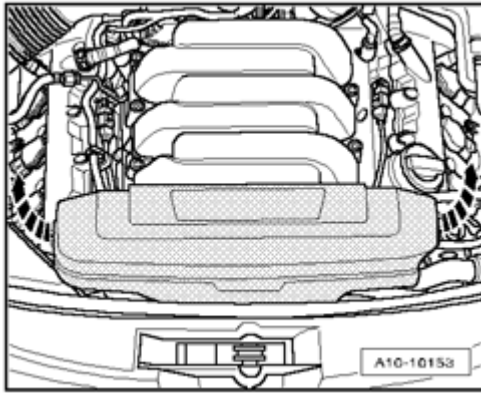
- Camshaft locator T40070

#### Removing

#### NOTE:

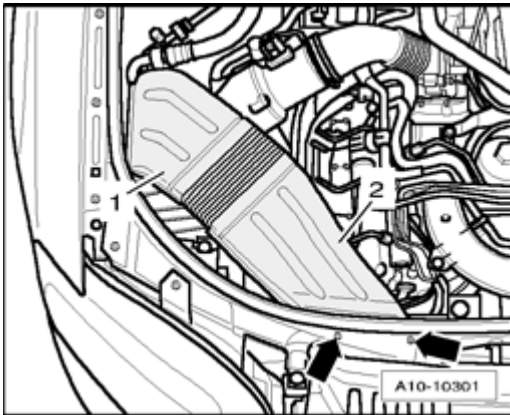
- The following removal and installation procedure is for the left cylinder head. The procedure for the other side is identical.

**CAUTION:** Fuel system is under high pressure! Before opening high pressure components of the fuel injection system, pressure must be relieved to residual pressure --> Procedure that must be performed before opening the high-pressure fuel injection system - Pay close attention!. Then wrap a clean rag around the connection and relieve residual pressure by carefully loosening the connection.



**Fig. 402: Identifying Front Engine Cover**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front engine cover - **arrows** -.



**Fig. 403: Identifying Bolts & Air Duct**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Remove air duct - **1** - and - **2** -.
- Drain coolant --> **Cooling system, draining and filling.**
- Remove both front wheels.

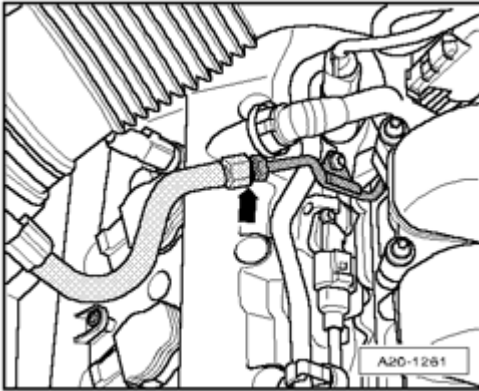
**NOTE:**                      • **Secure the brake disc with a wheel bolt.**

- Remove front bumper cover -->
  - **63 BUMPER**
  - **63 - BUMPERS** for BODY EXTERIOR - CABRIOLET
- Bring lock carrier into service position -->
  - **50 BODY, FRONT**



- **50 - BODY - FRONT** for BODY EXTERIOR - CABRIOLET

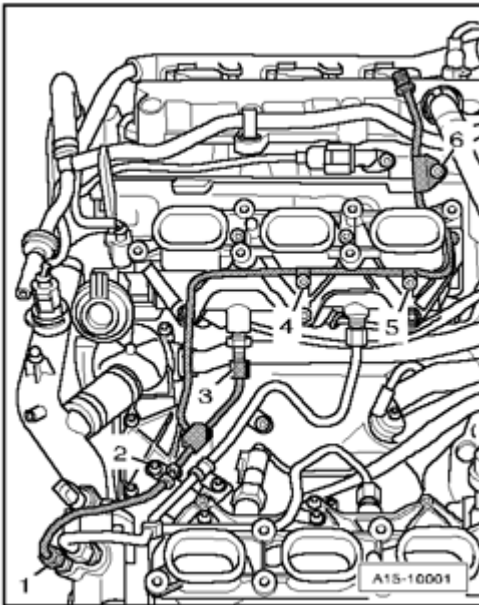
- Remove upper part of intake manifold --> **24 - FUEL INJECTION SYSTEM** .



**Fig. 404: Separating Fuel Line**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect fuel line - **arrow** -.



**Fig. 405: Removing Low Pressure Line, Thereby Removing Bolts And Union Nuts**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

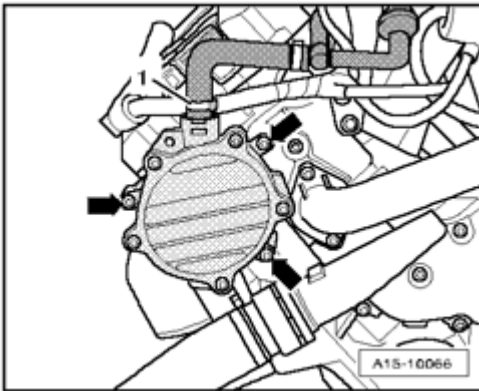
- Remove low pressure line, thereby removing bolts and union nuts - **1 through 6** -.
- Remove intake manifold lower part --> **24 - FUEL INJECTION SYSTEM** .
- Disconnect electrical harness connectors at fuel injectors.
- Remove ribbed belt --> **Ribbed belt, removing and installing**

- Remove front coolant pipe --> **Front coolant line, removing and installing.**

**Left cylinder head:**

- Remove power steering pump --> **48 - STEERING .**
- Remove oil filter housing --> **Oil filter housing, removing and installing.**

**Right cylinder head:**



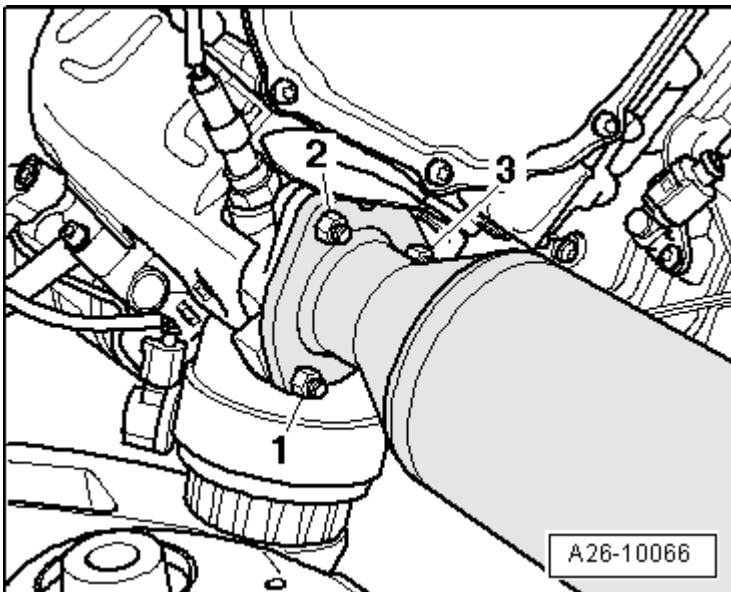
**Fig. 406: Disconnecting Vacuum Hose At Vacuum Pump**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect vacuum hose - **1** - at vacuum pump.

**NOTE:**

- Ignore - arrows -.

**Continued for both sides:**



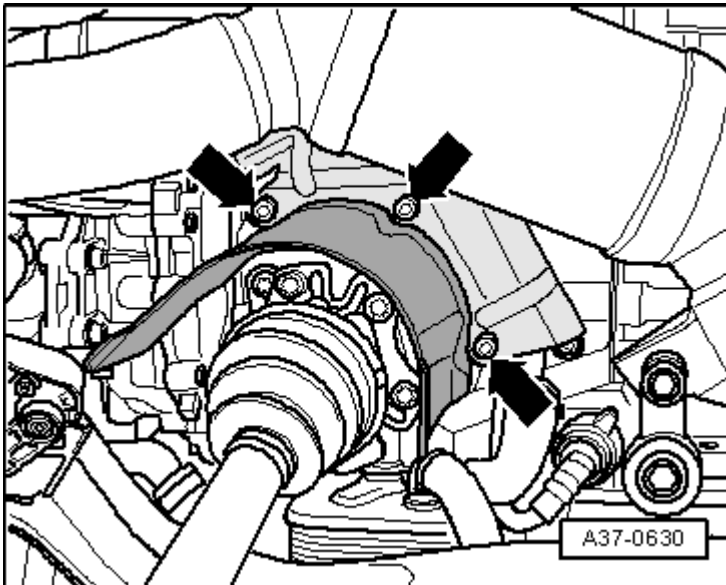
**Fig. 407: Removing Nuts & Left Front Exhaust Pipe With Catalytic Converter**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nut - 2 - of relevant threaded fastener for front exhaust pipe/exhaust manifold, which is accessible from top.

**NOTE:**

- To improve clarity, the removed engine is shown from the rear.

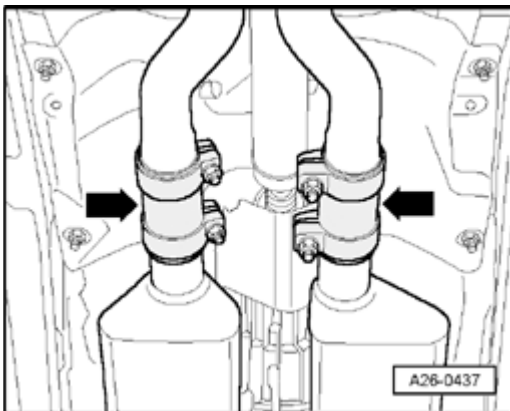
**Fig. 408: Removing Heat Shield For Left Drive Axle**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield - **arrows** - for left drive axle.

**Right cylinder head and vehicles with automatic transmission:**

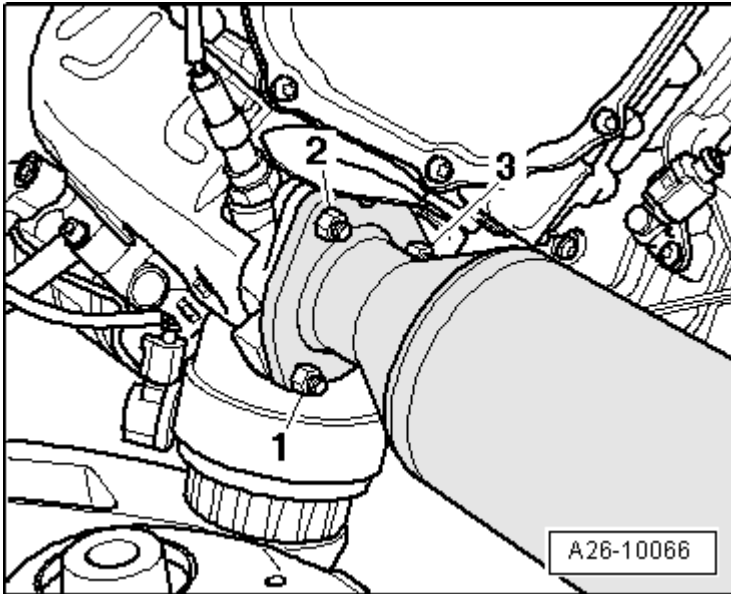
- Remove right drive axle from transmission flange shaft.

**Fig. 409: Loosening Clamping Sleeves**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

**Continued for both sides:**

- Separate exhaust system at relevant clamping sleeve - **arrows** - and push clamping sleeve toward rear.



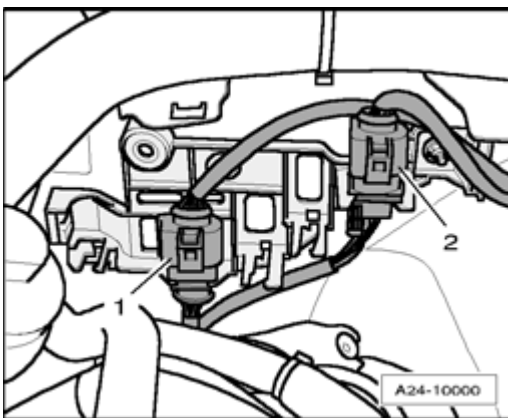
**Fig. 410: Removing Nuts & Left Front Exhaust Pipe With Catalytic Converter**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - 1 - and - 3 - of relevant threaded fastener for front exhaust pipe/exhaust manifold, which are accessible from bottom.

**NOTE:**

- To improve clarity, the removed engine is shown.

- Disconnect front exhaust pipe from exhaust manifold.

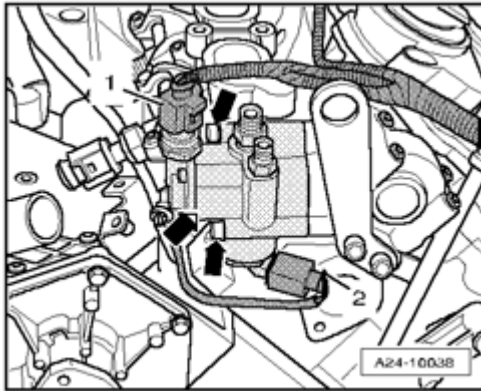


**Fig. 411: Disconnecting Electrical Harness Connector For Oxygen Sensor (O2S) 2 Behind Three Way Catalytic Converter (TWC) G131**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - 1 - for oxygen sensor before catalytic converter on relevant side and free up wiring.

**NOTE:**

- Ignore - 2 -.

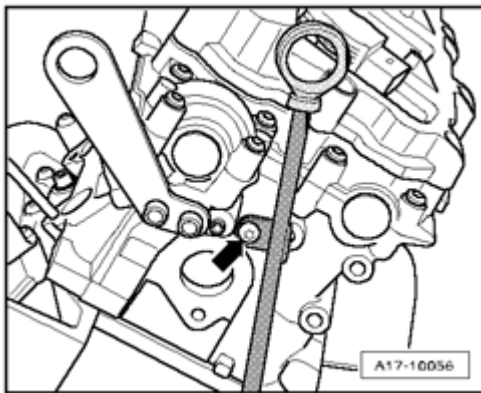
**Left cylinder head:****Fig. 412: Disconnecting Electrical Connector**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - 2 -.

**NOTE:**

- Ignore - 1 - and - arrows -.

**Fig. 413: Removing Bolt And Pulling Oil Dipstick Guide Tube Upward And Out**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

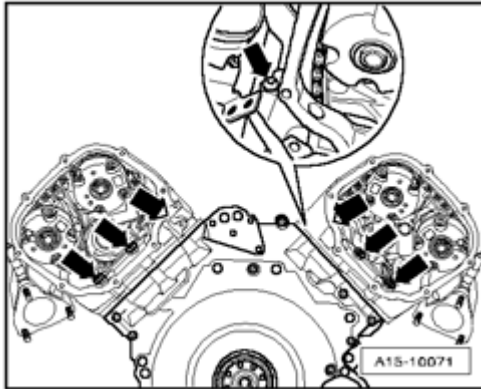
- Remove bolt - **arrow** - and pull oil dipstick guide tube upward and out.

**All:**

- Remove cylinder head cover: Left --> **Left cylinder head cover, removing and installing** , right -->

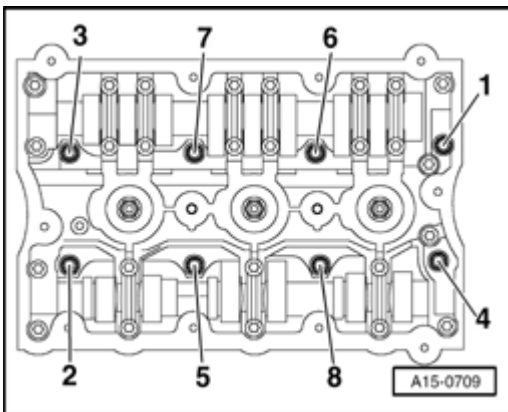
**Right cylinder head cover, removing and installing.**

- Remove left and right timing chain covers --> **Left and right timing chain covers, removing and installing.**
- Remove camshaft timing chains from camshafts --> **Detaching timing chains from camshaft, removing and installing chain tensioner.**



**Fig. 414: Removing Bolts At Rear Of Cylinder Head**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - at rear of cylinder head.
- Left cylinder head: 3 bolts.
- Right cylinder head: 4 bolts.



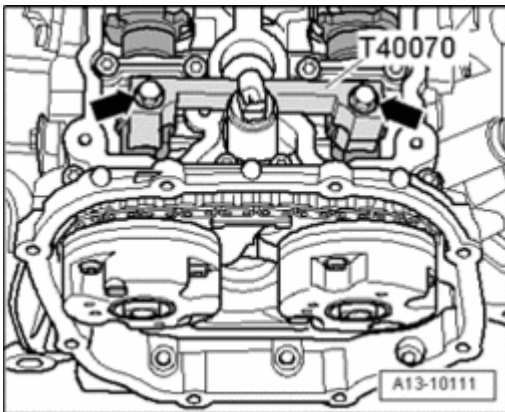
**Fig. 415: Identifying Cylinder Head Bolts Loosening Sequence**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Follow sequence - **1 to 8** - when loosening cylinder head bolts.
- Carefully remove cylinder head.

**Installing**

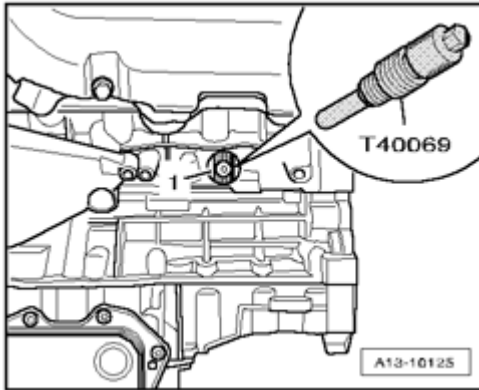
**NOTE:**                      • **Replace cylinder head bolts.**

- During assembly, replace self-locking nuts and bolts.
- Always replace bolts that are tightened to torque as well as sealing rings, gaskets and O-rings.
- Carefully remove residual sealant from cylinder head and cylinder block. Make sure that no long scrapes or scratches result.
- Carefully remove all grinding and sanding residue.
- There must be no oil or coolant in the blind holes for the cylinder head bolts in the cylinder block.
- Checking cylinder head for distortion Checking cylinder head for distortion
- Only unpack new cylinder head gasket immediately prior to installation.
- Handle gasket carefully. Damage in silicon layer and recessed area lead to leakage.
- Install cylinder head gasket onto guide sleeves. Marking "oben" (top) or part number must face toward cylinder head.
- After installing a replacement cylinder head with camshafts installed, oil contact surfaces between roller cam followers and cam lubricating surfaces after installing cylinder head.
- Do not remove plastic bases protecting exposed valves until immediately before installing cylinder head.
- When replacing cylinder head or cylinder head seal, coolant and engine oil must be changed.
- Secure all hose connections using hose clamps appropriate for the model type .
- During installation, all cable ties must be re-installed at the same location.
- After working on the valvetrain, carefully rotate engine by hand at least 2 full revolutions to ensure that valves do not strike the pistons when starting.



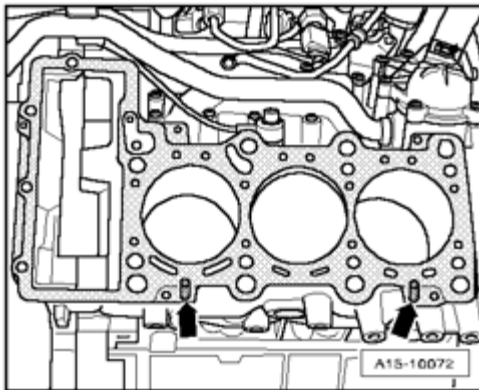
**Fig. 416: Mounting Camshaft Locating Tool T40070 To Both Cylinder Heads And Tightening Bolts**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Before installing cylinder head, set crankshaft and camshafts to TDC setting, mounting camshaft locating tool T40070 on both cylinder heads and tightening to 20 Nm.
- The camshaft locating tool T40070 is correctly positioned when the holes for the cylinder head bolts remain free.



**Fig. 417: Installing Crankshaft Holder T40069 Into Hole**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

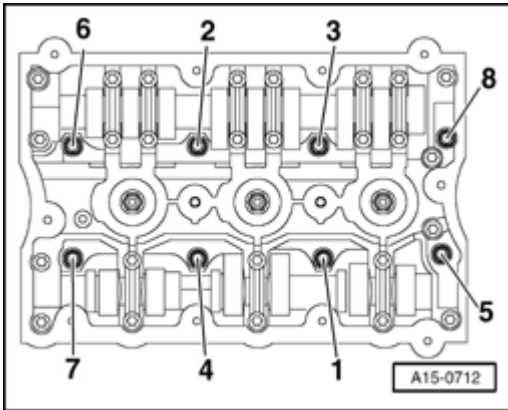
- Crankshaft holder T40069 must be installed into crankshaft - 1 -.
- Position cylinder head gasket.



**Fig. 418: Paying Close Attention To Centering Pins In Cylinder Block**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pay close attention to centering pins - **arrows** - in cylinder block.
- Pay attention to installation position of cylinder head gasket, marking "oben" (top) or part number must face toward cylinder head.
- Install cylinder head.



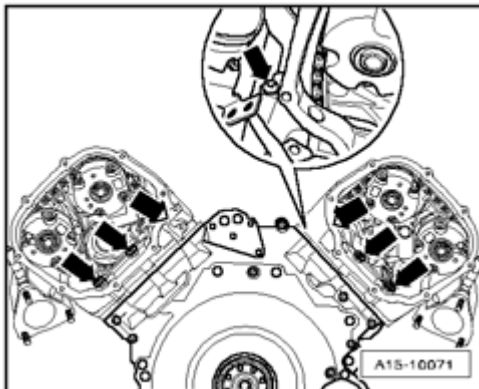


**Fig. 419: Tightening Cylinder Head Bolts In Sequence**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert new cylinder head bolts and tighten by hand.
- Tighten cylinder head in sequence indicated, in 3 stages as follows:
- Using torque wrench, tighten to 40 Nm.
- With Torx key, 90 ° (  $\frac{1}{4}$  turn) additional turn.
- With Torx key, 90 ° (  $\frac{1}{4}$  turn) additional turn.

**NOTE:**

- There is no requirement to retighten the cylinder head bolts.



**Fig. 420: Removing/Installing Bolts At Rear Of Cylinder Head**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten bolts - **arrows** - to 9 Nm.
- Left cylinder head: 3 bolts.
- Right cylinder head: 4 bolts.

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

- Install camshaft timing chains **Installing**.
- Install left and right timing chain covers --> **Left and right timing chain covers, removing and installing**.
- Install cylinder head cover: Left --> **Left cylinder head cover, removing and installing** , right --> **Right cylinder head cover, removing and installing**.
- Install front exhaust pipe with catalytic converter: Left, Vehicles with manual transmission --> **Left front exhaust pipe with catalytic converter (vehicles with manual transmission), removing and installing** , Vehicles with automatic transmission --> **Left front exhaust pipe with catalytic converter (vehicles with automatic transmission 09L), removing and installing** ; Right, Vehicles with manual transmission --> **Right front exhaust pipe with catalytic converter (vehicles with manual transmission), removing and installing** , Vehicles with automatic transmission --> **Right front exhaust pipe with catalytic converter (vehicles with automatic transmission 09L), removing and installing**.
- Align exhaust system free of tension --> **Exhaust system, installing free of tension**.
- Install right drive axle --> **40 - FRONT SUSPENSION** .
- Install oil filter housing --> **Oil filter housing, removing and installing**.
- Install power steering pump --> **48 - STEERING** .
- Install front coolant pipe --> **Front coolant line, removing and installing**.
- Install ribbed belt **Installing**.
- Install intake manifold lower-part with high and low-pressure lines --> **24 - FUEL INJECTION SYSTEM** .
- Install intake manifold upper-part --> **24 - FUEL INJECTION SYSTEM** .
- Install lock carrier with attachments -->
  - **50 BODY, FRONT**
  - **50 - BODY - FRONT** for BODY EXTERIOR - CABRIOLET
- Install front bumper cover -->
  - **63 BUMPER**
  - **63 - BUMPERS** for BODY EXTERIOR - CABRIOLET
- Change engine oil -->
  - **01 - MAINTENANCE**
  - **01 - MAINTENANCE** for MAINTENANCE PROCEDURES - CABRIOLET
- Replace coolant --> **Cooling system, draining and filling**.
- Fill power-steering system oil and bleed steering system --> **48 - STEERING** .

**Torque specifications**

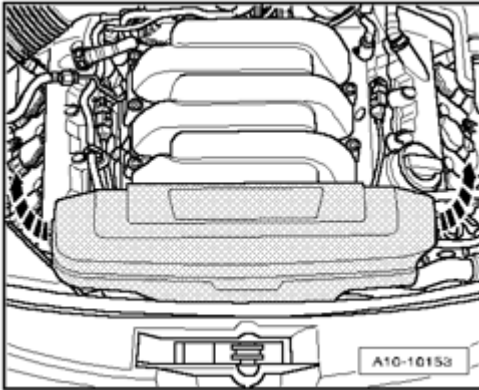
## 2007 Audi A6

ENGINE 3.2 V6 4V Engine Mechanical, Engine Code(s): BKH

| Component                                 | Nm |
|-------------------------------------------|----|
| Oil dip stick guide tube to cylinder head | 9  |
| Fuel hose to fuel line                    | 22 |

Vacuum pump for brake booster, removing and installing

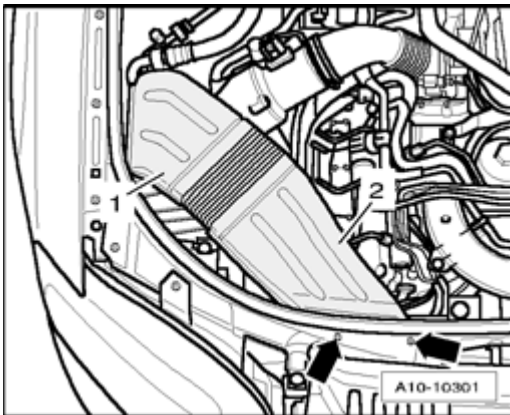
### Removing



**Fig. 421: Identifying Front Engine Cover**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

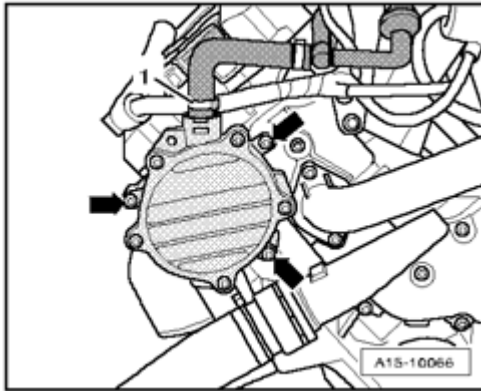
- Remove front engine cover - **arrows** -.



**Fig. 422: Identifying Bolts & Air Duct**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Remove air duct - **1** - and - **2** -.



**Fig. 423: Disconnecting Vacuum Hose At Vacuum Pump**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

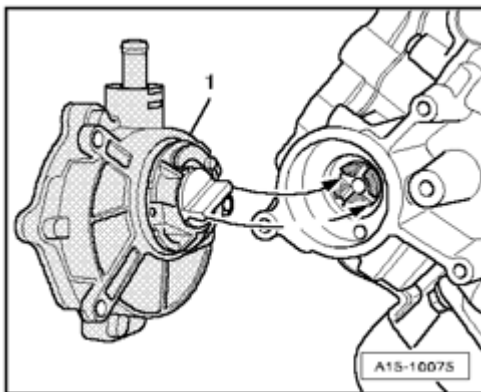
- Disconnect vacuum hose - **1** - at vacuum pump.
- Remove bolts - **arrows** - and remove vacuum pump.

### Installing

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

#### NOTE:

- Replace O-rings.
- Secure all hose connections using hose clamps appropriate for the model type .



**Fig. 424: Positioning Vacuum Pump Coupling So That It Engages Symmetrical Groove Of Camshaft When Installing Vacuum Pump**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position vacuum pump coupling - **1** - so that it engages symmetrical groove of camshaft - **arrows** - when installing vacuum pump.

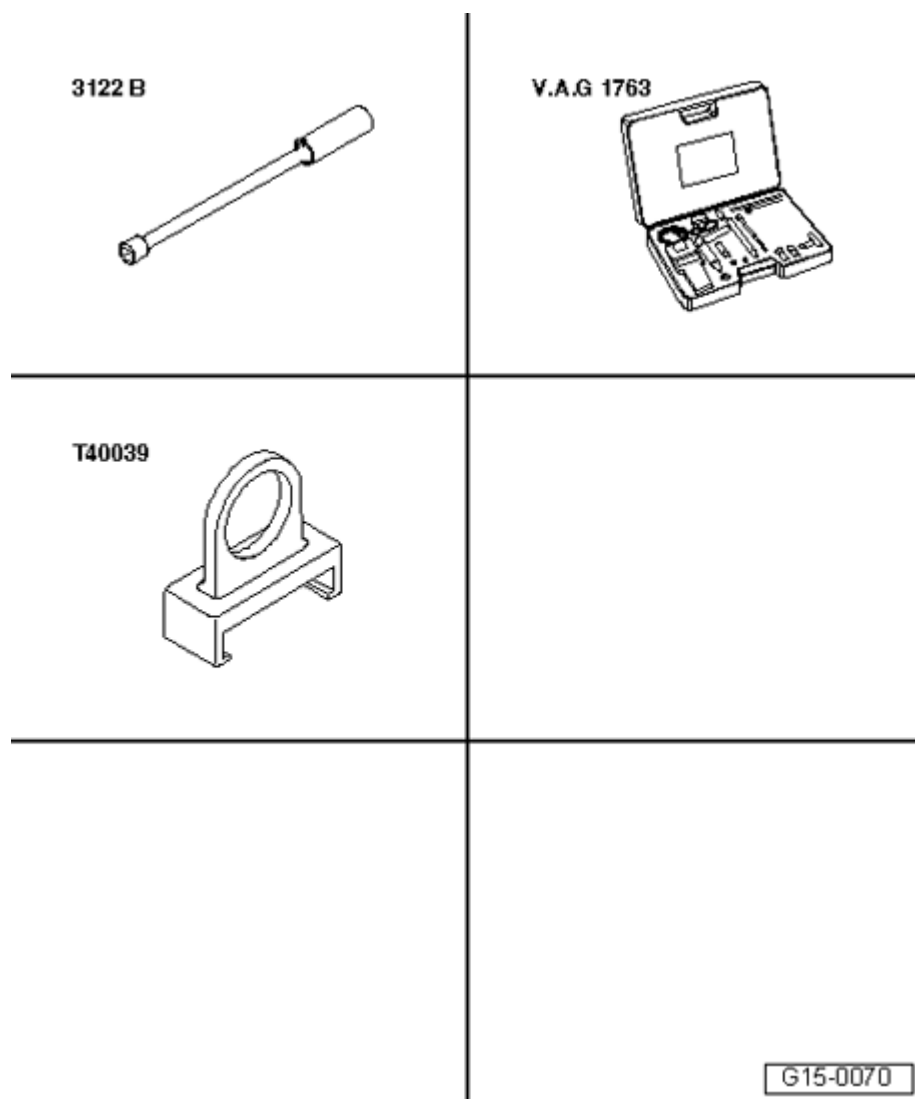
### Torque specifications

## 2007 Audi A6

ENGINE 3.2 V6 4V Engine Mechanical, Engine Code(s): BKH

| Component                    | Nm |
|------------------------------|----|
| Vacuum pump to cylinder head | 9  |

### Compression pressures, checking



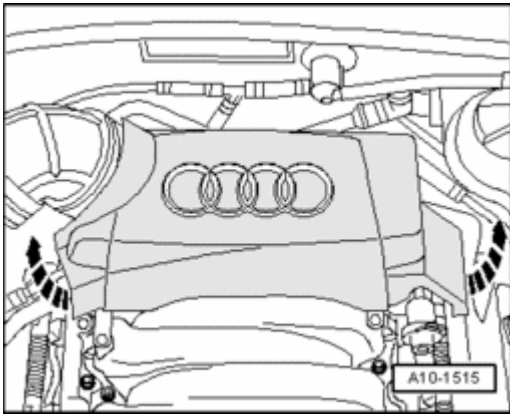
**Fig. 425: Identifying Special Tools - Compression Pressures, Checking**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

### Special tools, testers and auxiliary items required

- Spark plug removal tool 3122 B
- Compression tester V.A.G 1763
- Puller T40039

### Work procedure

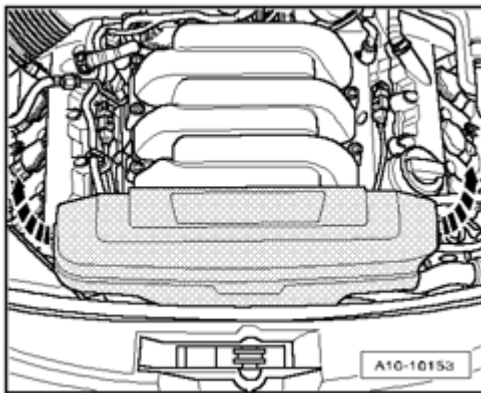
- Engine oil temperature min. 30 ° C.
- Battery voltage at least 12.5 V.
- Switch off ignition.



**Fig. 426: Removing Rear Engine Cover**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

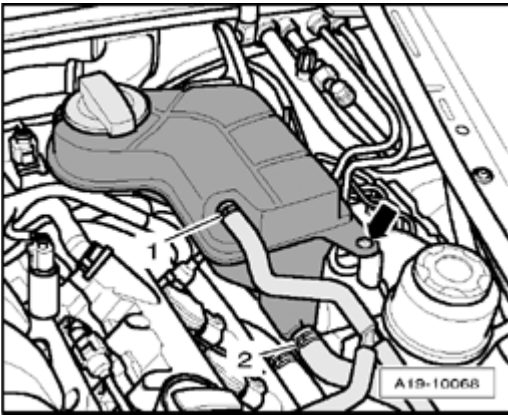
- Remove rear engine cover - **arrows** -.



**Fig. 427: Identifying Front Engine Cover**

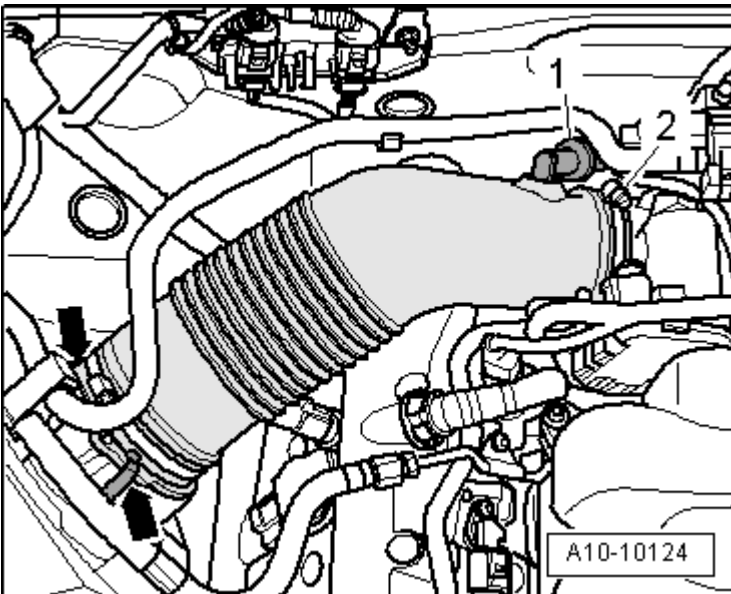
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front engine cover - **arrows** -.



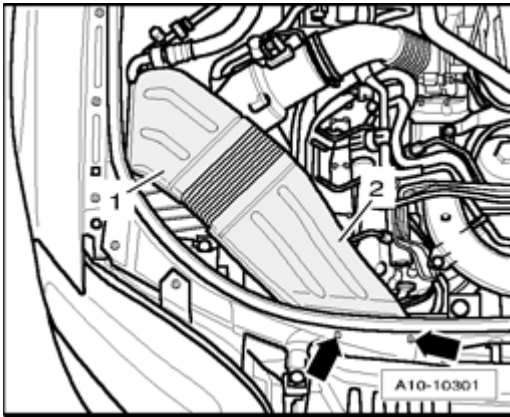
**Fig. 428: Removing Coolant Hoses At Coolant Expansion Tank**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove coolant expansion tank - **arrow** -.
- Disconnect electrical connection from Engine Coolant Level (ECL) Warning Switch F66 at bottom of coolant reservoir and set aside coolant reservoir with coolant hoses - **1** - and - **2** - connected.



**Fig. 429: Disconnecting Check Valve From Connection At Air Duct Hose**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

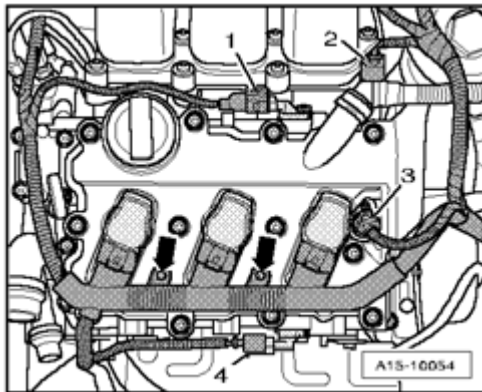
- Disconnect check valve - **1** - from connection at air duct hose.
- Remove air duct hose, thereby loosening hose clamp - **2** - and opening clips - **arrows** -.



**Fig. 430: Identifying Bolts & Air Duct**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Remove air duct - **1** - and - **2** -.



**Fig. 431: Disconnecting Electrical Harness Connectors**

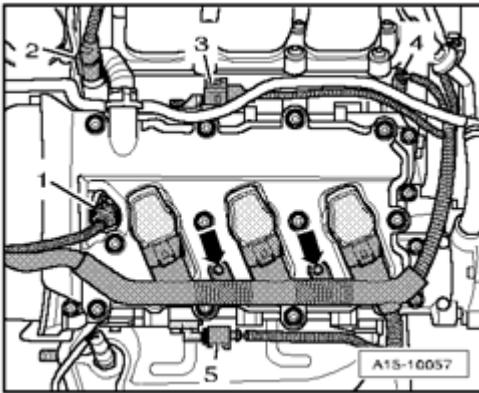
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and separate electrical connections at ignition coils of left cylinder head.

**NOTE:**

- Ignore items - **1 to 4** -.



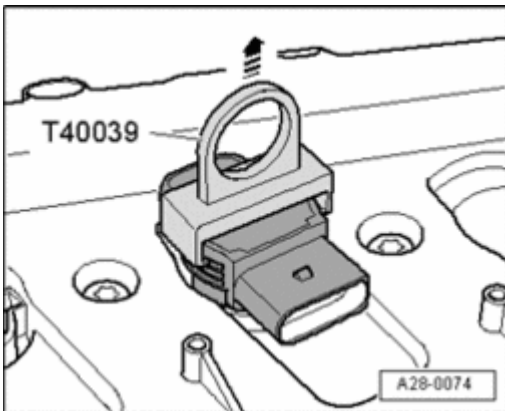


**Fig. 432: Disconnecting Electrical Harness Connectors**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and separate electrical connections at ignition coils of right cylinder head.

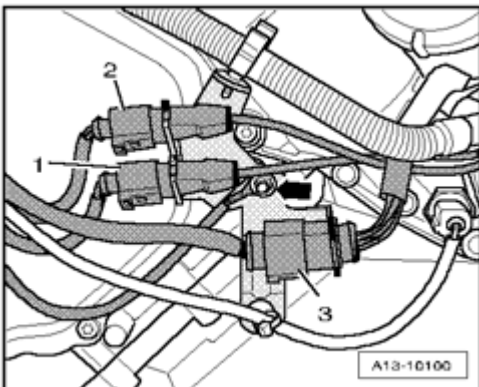
**NOTE:**

- Ignore items - 1 to 5 -.



**Fig. 433: Removing Ignition Coils Using Ignition Coil Puller T40039**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove ignition coils using ignition coil puller T40039.



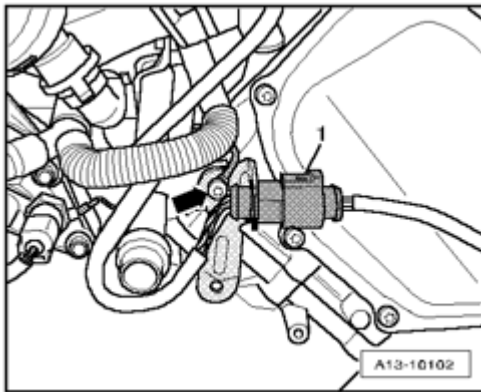
**Fig. 434: Disconnecting Electrical Harness Connectors**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- On rear of left cylinder head, disconnect electrical harness connector - **3** - for fuel injectors.

**NOTE:**

- Ignore - 1 -, - 2 - and - arrow -.

**Fig. 435: Separating Electrical Connector, Removing Bolt And Retainer For Connection**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- On rear of right cylinder head, disconnect electrical harness connector - **1** - for fuel injectors.

**NOTE:**

- Disregard - arrow -.

- Using spark plug removal tool 3122 B , remove spark plugs.
- Check compression using compression tester V.A.G 1763.

**NOTE:**

- Using tester operating instructions.

- Have a second technician press accelerator pedal completely and at the same time operate starter long enough until pressure increase no longer appears on tester.

| Compression pressure         | bar pressure |
|------------------------------|--------------|
| New                          | 11.0 to 14.0 |
| Wear limit                   | 10.0         |
| Difference between cylinders | max. 3.0     |

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

- Install spark plugs -->
  - **01 - MAINTENANCE**
  - **01 - MAINTENANCE** for MAINTENANCE PROCEDURES - CABRIOLET

## 2007 Audi A6

ENGINE 3.2 V6 4V Engine Mechanical, Engine Code(s): BKH

- Finally, check DTC memory and, if necessary, erase it. After DTC memory is erased, a readiness code must be generated for the engine control module using operating mode "Guided Fault Finding".

### Torque specifications

| Component             | Nm |
|-----------------------|----|
| Hose clamps 9 mm wide | 3  |

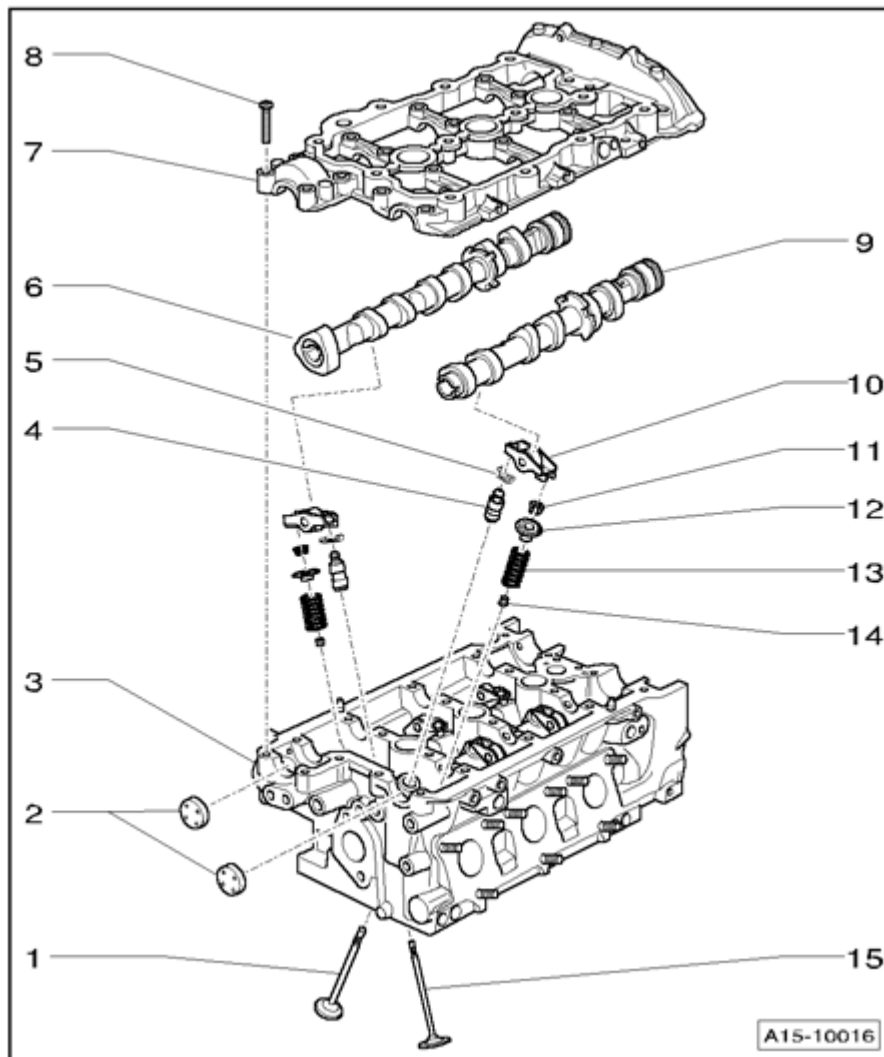
### VALVETRAIN, SERVICING

#### Valvetrain, servicing

##### 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.
- After installing the camshafts, the engine may not be started for approx. 30 minutes. The hydraulic equalization elements must seat themselves (otherwise the valves will crash into the pistons).
- After working on the valvetrain, carefully rotate engine by hand at least 2 full revolutions to ensure that valves do not strike the pistons when starting.
- Left cylinder head is shown in following illustration.

#### Valvetrain, component overview



**Fig. 436: Valvetrain, Component Overview**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Exhaust valve

- Do not rework, only lapping is permitted
- Mark installed position for re-installation
- Valve dimensions --> **Valve dimensions**
- Check valve guides --> **Valve guides, checking**

2 - Sealing plug

3 - Cylinder head

- Check valve guides --> **Valve guides, checking**

**4 - Support element**

- With hydraulic valve clearance compensation
- Checking --> **Support elements with hydraulic adjustment, checking**
- Do not interchange
- Lubricate contact surface

**5 - Securing clip**

- Check for secure seat

**6 - Intake camshaft**

- Removing and installing --> **Camshafts, removing and installing**
- Checking axial play --> **Camshafts, checking axial clearance**
- Check radial clearance using Plastigage (roller rocker lever removed)
- Radial clearance at bearing- 24 mm dia.: 0.024 to 0.066 mm
- Radial clearance at bearing- 36 mm dia.: 0.032 to 0.078 mm
- Run-out: max. 0.04 mm

**7 - Bearing bracket**

- With integrated camshaft bearings
- Removing and installing --> **Camshafts, removing and installing**

**8 - 9 Nm****9 - Exhaust camshaft**

- Removing and installing --> **Camshafts, removing and installing**
- Checking axial play --> **Camshafts, checking axial clearance**
- Check radial clearance using Plastigage (roller rocker lever removed)
- Radial clearance at bearing- 24 mm dia.: 0.024 to 0.066 mm
- Radial clearance at bearing- 36 mm dia.: 0.032 to 0.078 mm
- Run-out: max. 0.04 mm

**10 - Roller rocker lever**

- Do not interchange
- Check roller for easy movement
- Lubricate contact surface

- To assemble, clip onto support element - **4** - with securing clip - **5** -

11 - Valve keys

12 - Valve spring plate

13 - Valve spring

- Installed location: The tight spring coils face toward cylinder head

14 - Valve stem seal

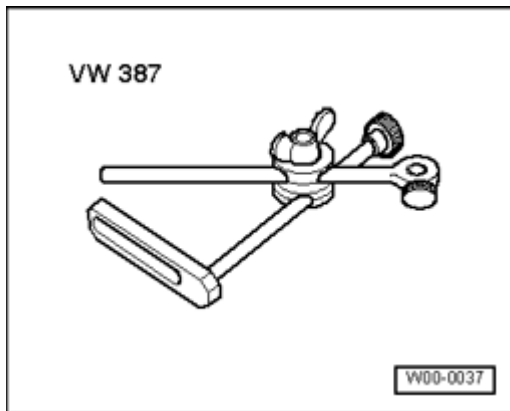
- Replacing --> **Valve stem seals, replacing.**

15 - Intake valve

- Do not rework, only lapping is permitted
- Mark installed position for re-installation
- Valve dimensions --> **Valve dimensions**
- Check valve guides --> **Valve guides, checking**

**Camshafts, checking axial clearance**

**Special tools, testers and auxiliary items required**

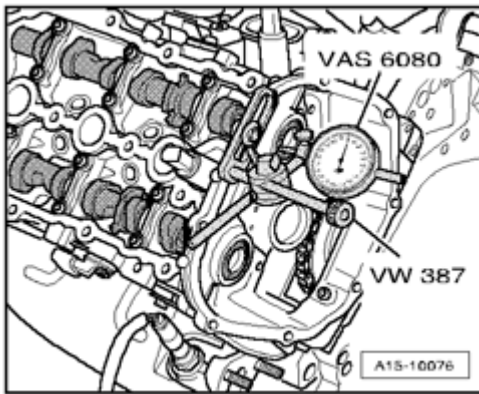


**Fig. 437: Identifying Dial Gauge Holder VW 387**  
**Courtesy of VOLKSWAGEN UNITED STATES, INC.**

- Dial gauge holder VW 387
- Dial gauge VAS 6080

### **Work procedure**

- Perform measurement with roller rocker levers and support elements removed.

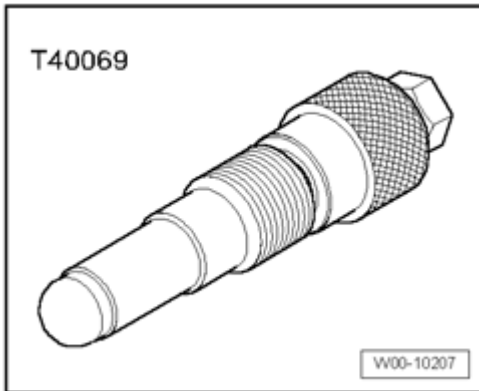


**Fig. 438: Securing Dial Gauge Holder VW 387 To Dial Gauge VAS 6080 On Cylinder Head**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure dial gauge holder VW 387 to dial gauge VAS 6080 on cylinder head.
- Determine axial clearance.
- Axial clearance: 0.100 to 0.191 mm.

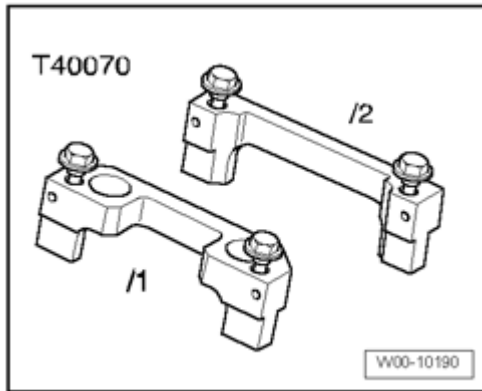
#### Camshafts, removing and installing

#### Special tools, testers and auxiliary items required



**Fig. 439: Locking Pin T40069**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Locking pin T40069



**Fig. 440: Camshaft Locator T40070 (2X)**

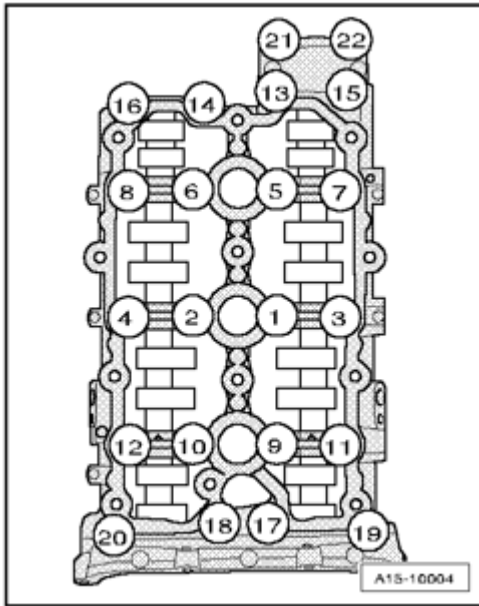
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Camshaft locator T40070 (2x)
- Hand drill with plastic brush attachment
- Protective glasses
- Sealant

### Removing

- Remove cylinder head cover: Left --> **Left cylinder head cover, removing and installing** , right --> **Right cylinder head cover, removing and installing**.
- Remove left and right timing chain covers --> **Left and right timing chain covers, removing and installing**.
- Remove camshaft timing chains from camshafts --> **Detaching timing chains from camshaft, removing and installing chain tensioner**.
- To remove right camshafts, the vacuum pump for brake booster must be removed --> **Vacuum pump for brake booster, removing and installing**.





**Fig. 441: Loosening/Tightening Guide Frame Bolts In Sequence**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen guide frame bolts in sequence - 22 to 1 -.

**NOTE:**

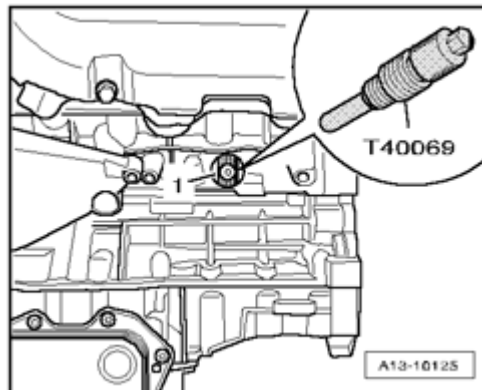
- Bearing bracket of left cylinder head is displayed in illustration.

- Carefully remove guide frame.
- Mark camshafts and remove.

**Installing**

**NOTE:**

- Always replace gaskets and seals.



**Fig. 442: Installing Crankshaft Holder T40069 Into Hole**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

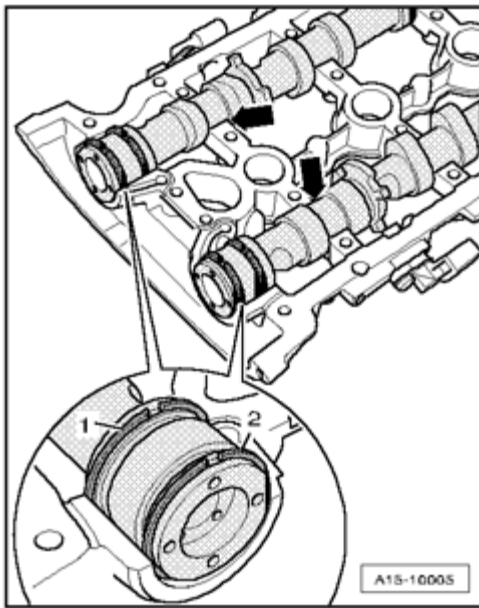
- **Secure crankshaft - 1 - using crankshaft holder T40069.**

**CAUTION: Wear safety glasses.**

- Using rotating plastic brush, remove any remaining sealant from cylinder head and guide frame.

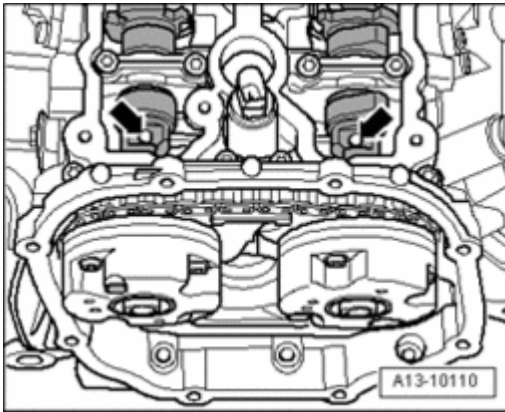
**CAUTION: Make sure that no sealant residue enters the cylinder head and bearings.**

- Clean sealing surfaces, they must be free of oil and grease.
- Oil journal surfaces of camshafts.
- Place guide frame onto a soft surface on workbench.



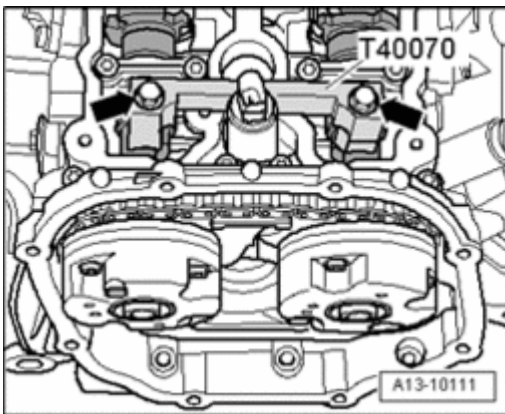
**Fig. 443: Setting Camshafts Into Guide Frame**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set camshafts into guide frame.
- The placement of camshafts must be exactly within axial bearings - **arrows** - of guide frame.
- The ends of the piston rings - **1** - and - **2** - must face upward or downward, and must never face sideways.
- Turn over guide frame with installed camshafts, thereby holding camshafts tight within guide frame.



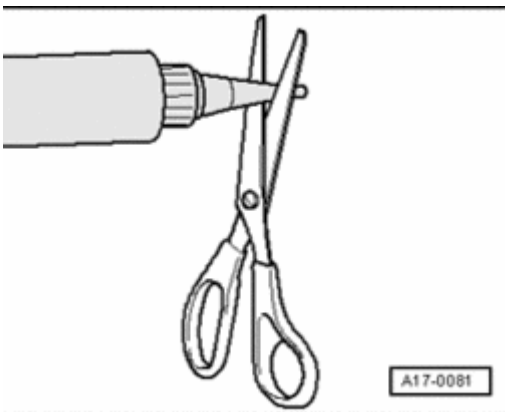
**Fig. 444: Identifying Threaded Holes In Camshafts Must Face Upward**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Rotate camshafts until threaded holes - **arrows** - point upward.
- Check whether camshafts still lie exactly in axial bearings of guide frame.



**Fig. 445: Mounting Camshaft Locating Tool T40070 To Both Cylinder Heads And Tightening Bolts**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

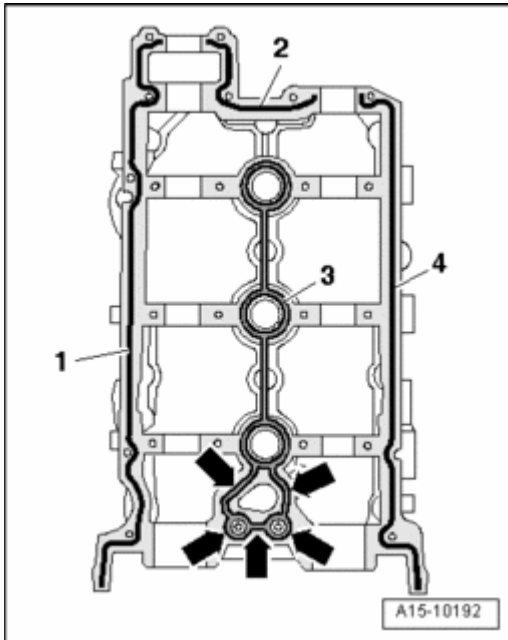
- Mount camshaft locating tool T40070 as shown in the illustration and tighten bolts - **arrows** - to 20 Nm.



**Fig. 446: Cutting Tube Nozzle At Front Marking**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Cut tube nozzle at front marking (jet dia. approx. 1 mm).
- Turn guide frame around again.



**Fig. 447: Applying Small Quantity Of Sealant In Seal Groove In Area Of Camshaft Adjuster Solenoid Valve Opening**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Apply a small quantity of sealant in seal groove - **3** - in area of camshaft adjuster solenoid valve opening - **arrows** -.
- Press seal into guide frame and wipe off escaping sealant on seal and guide frame.
- Apply sealant beads - **1** - , - **2** - and - **4** - on clean sealing surfaces of guide frame as shown in illustration.
- Thickness of sealant bead: 1.0 mm.

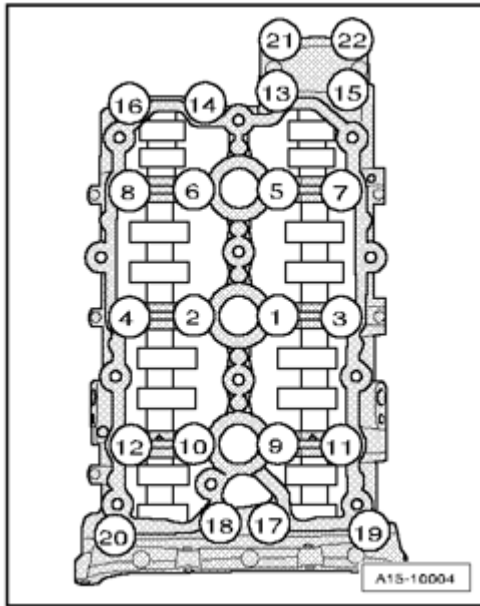
**NOTE:**

- **Sealant beads must be applied according to exact specifications, otherwise excess sealant could get into the camshaft bearings.**

- Attach guide frame on cylinder head immediately.

**NOTE:**

- **Placing guide frame in place and tightening it should occur without interruption, since the sealant begins to harden immediately.**
- **After installing guide frame, sealant must dry for approx. 30 minutes.**



**Fig. 448: Loosening/Tightening Guide Frame Bolts In Sequence**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hand-tighten guide frame bolts equally, in sequence - **1 to 22** -.
- The guide frame must be in contact with the entire contact surface of the cylinder head.
- Fasten guide frame bolts in sequence - **22 to 1** - until they stop.

**NOTE:** ● **Bearing bracket of left cylinder head is displayed in illustration.**

- Drive in sealing plugs flush.

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

**NOTE:**

- **After installing the camshafts, the engine may not be started for approx. 30 minutes. The hydraulic equalization elements must seat themselves (otherwise the valves will crash into the pistons).**
- **After working on the valvetrain, carefully rotate engine by hand at least 2 full revolutions to ensure that valves do not strike the pistons when starting.**

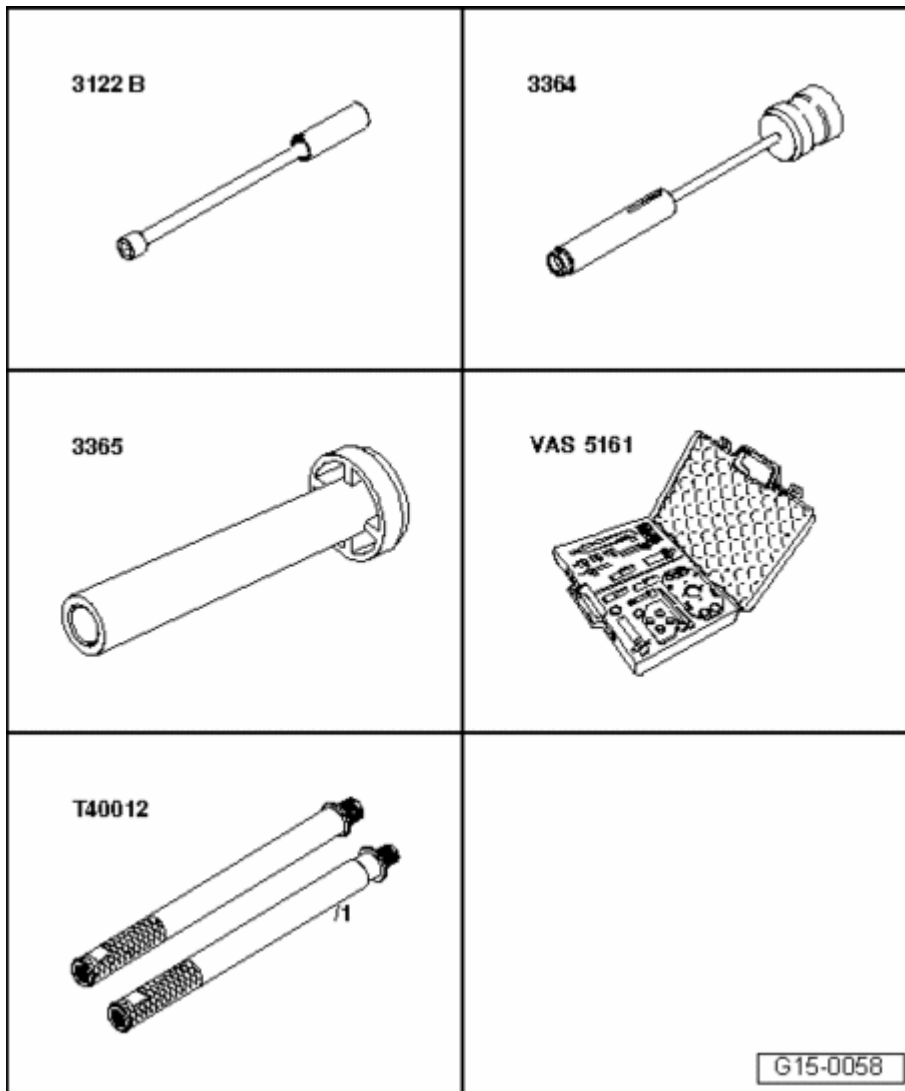
- Install vacuum pump for brake booster --> **Vacuum pump for brake booster, removing and installing.**
- Install camshaft timing chains onto camshafts --> **Detaching timing chains from camshaft, removing and installing chain tensioner.**
- Install left and right timing chain covers --> **Left and right timing chain covers, removing and installing.**

- Install cylinder head cover: Left --> **Left cylinder head cover, removing and installing** , right --> **Right cylinder head cover, removing and installing**.

### Torque specifications

| Component                        | Nm |
|----------------------------------|----|
| Bearing bracket to cylinder head | 9  |

### Valve stem seals, replacing



**Fig. 449: Identifying Special Tools - Valve Stem Seals, Replacing**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

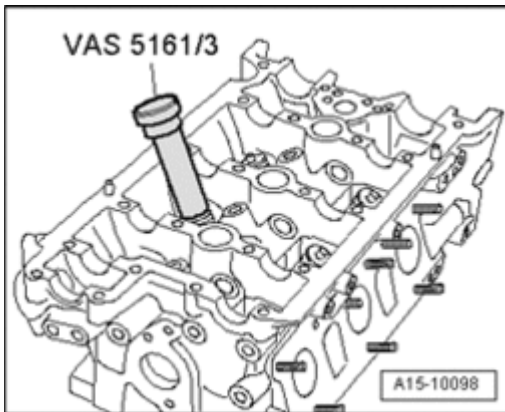
### Special tools, testers and auxiliary items required

- 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 5161/19 A
- Adapter T40012

**Work procedure**

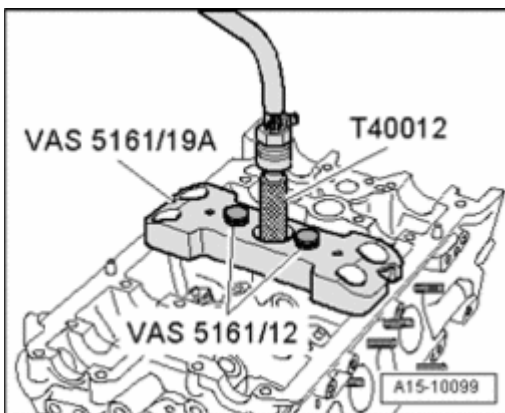
- Remove camshafts --> **Camshafts, removing and installing.**
- Mark positioning of roller rocker lever and support elements for re-installation.
- Remove roller rocker lever together with support elements and place on a clean surface.
- Using spark plug removal tool 3122 B , remove spark plugs.



**Fig. 450: Placing Drift VAS 5161/3 On Valve Spring Plate And Loosening Stuck Valve Keepers Using Plastic Hammer**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

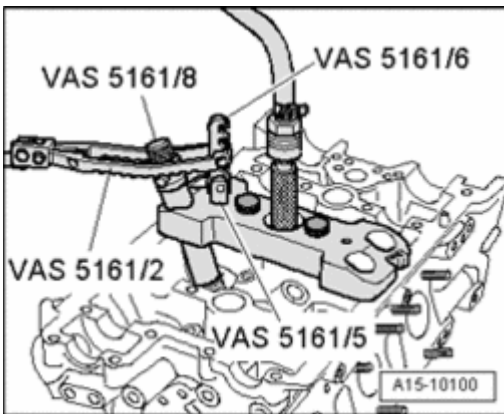
- Place drift VAS 5161/3 on valve spring plate and loosen stuck valve keepers using a plastic hammer.



**Fig. 451: Placing Guide Plate VAS 5161/19 A From Valve Cotter Disassembly And Assembly Device VAS 5161 On Cylinder Head**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

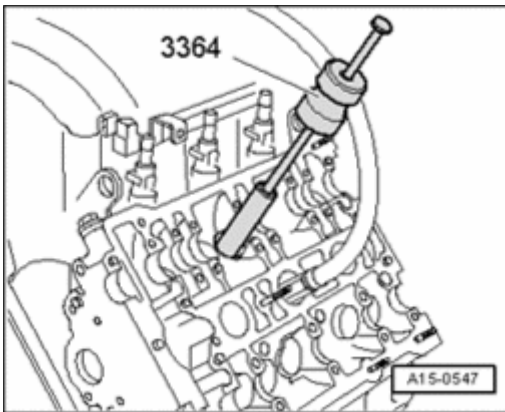
- Place guide plate VAS 5161/19 A from valve cotter disassembly and assembly device VAS 5161 on cylinder head.
- Secure guide plate with knurled screws VAS 5161/12.
- Install adapter T40012 with gasket by hand into respective spark plug thread and apply constant pressure.
- Minimum pressure: 6 bar positive pressure.



**Fig. 452: Installing Guide Plate Onto Cylinder Head**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

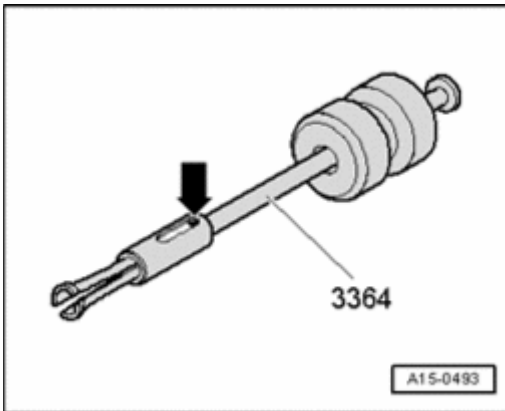
- Install engaging device VAS 5161/6 with installation fork VAS 5161/5 into guide plate.
- Push installation cartridge VAS 5161/8 into guide plate.
- Hook in pressure fork VAS 5161/2 at engaging device and press down installation cartridge.
- At same time, turn knurled bolt of installation cartridge to the right, until points engage in valve keepers.
- Lightly move knurled bolt back and forth, causing valve keepers to be pressed apart and be captured in the 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.





**Fig. 453: Removing Valve Stem Oil Seals Using Valve Seal Removal Tool 3364**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

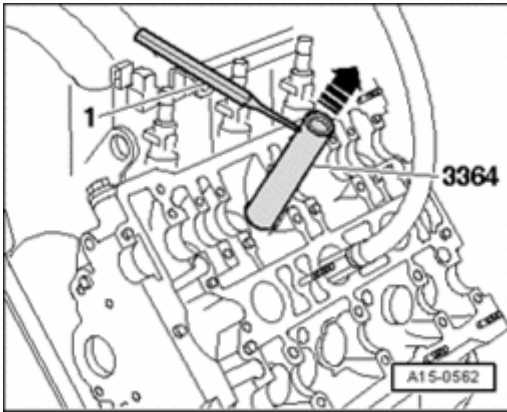
- Remove valve stem oil seals using Valve Seal Removal Tool 3364.



**Fig. 454: Identifying Valve Seal Removal Tool 3364**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

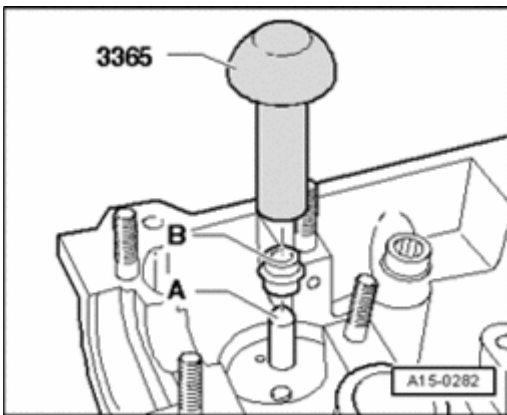
If Valve Seal Removal Tool 3364 cannot be used, on several valve stem seals due to restricted clearance, proceed as follows:

- Using a drift, drive out roll pin - **arrow** - at Valve Seal Removal Tool 3364 and remove impact puller attachment.



**Fig. 455: Securing Valve Seal Removal Tool 3364 With Drift Or Cotter Pin Driver**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

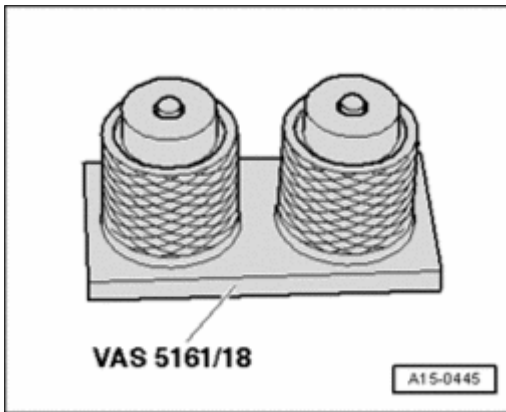
- Place lower part of Valve Seal Removal Tool 3364 on valve stem seal.
- Secure Valve Seal Removal Tool 3364 with a drift or cotter pin driver - **1** -, as shown in the illustration.
- Place valve lever on Valve Seal Removal Tool 3364 and pull off valve stem seal - **arrow** -.



**Fig. 456: Identifying Plastic Sleeve, Valve Stem Oil Seal & Valve Stem Seal Driver 3365**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

**NOTE:**                      • **A plastic sleeve - A - is supplied with the new valve shaft seals.**

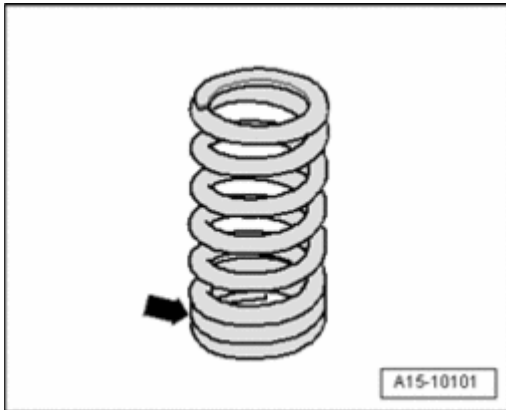
- Place plastic sleeve - **A** - on valve stem to prevent damage to new valve stem seals - **B** -.
- Lightly coat sealing lips of valve stem seal with oil.
- Push valve stem seal onto plastic sleeve.
- Carefully press valve stem oil seal onto valve guide using 3365.
- Remove plastic sleeve again.



**Fig. 457: Identifying Installation Cartridge VAS 5161/8**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

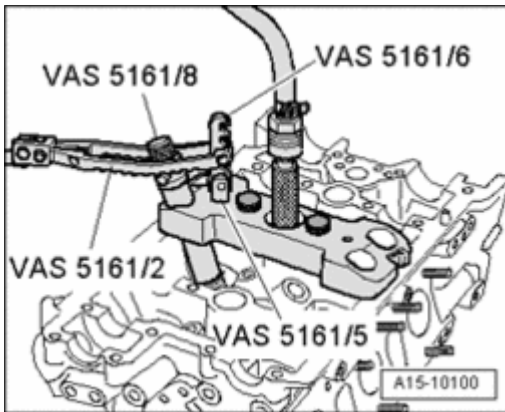
If valve keys were removed from installation cartridge, they must be inserted into insertion device VAS 5161/18 next.

- The large diameter of valve keepers point upward.
- Install valve spring and valve spring plate.



**Fig. 458: Identifying Tight Spring Coils Face Toward Cylinder Head**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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



**Fig. 459: Installing Guide Plate Onto Cylinder Head**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install guide plate onto cylinder head again.
- Insert installation cartridge into guide plate.
- Press down pressure fork and pull knurled bolt upward turning to left and right - the valve keepers are inserted in this manner.
- Release pressure fork with knurled bolt still pulled.
- Ensure that all roller rocker levers seat properly on valve stem ends and are clipped onto respective support elements.
- Install camshafts --> **Camshafts, removing and installing.**
- Install spark plugs -->
  - **01 - MAINTENANCE**
  - **01 - MAINTENANCE** for MAINTENANCE PROCEDURES - CABRIOLET

**NOTE:**

- **After installing the camshafts, the engine may not be started for approx. 30 minutes. The hydraulic equalization elements must seat themselves (otherwise the valves will crash into the pistons).**
- **After working on the valvetrain and lifters, carefully rotate the crankshaft by hand at least 2 full revolutions before starting to be sure that valves do not strike the pistons.**

Support elements with hydraulic adjustment, checking

Special tools, testers and auxiliary items required

- Feeler gauge

**NOTE:**

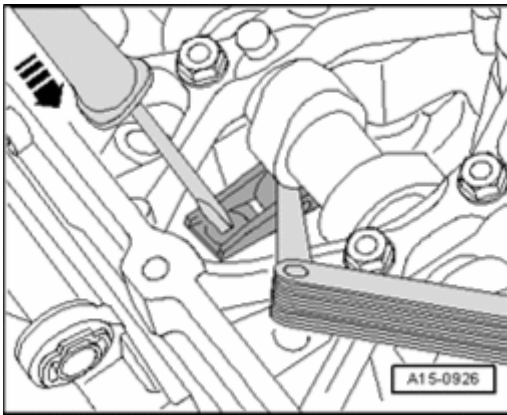
- **The support elements with hydraulic adjustment cannot be serviced.**
- **Irregular valve noises are normal while starting the engine.**

## Work procedure

- Start engine and let it run until radiator fan has switched on once.
- Increase engine speed for about 2 minutes to approx. 2500 RPM, perform road test if necessary.

If support elements with hydraulic adjustment are still loud, locate faulty support element as follows:

- Remove cylinder head cover: Left --> **Left cylinder head cover, removing and installing** , right --> **Right cylinder head cover, removing and installing**.
- Rotate crankshaft until lobes on support element to be checked face upward:
  - Vehicles with manual transmission: With 4th gear engaged an ignition switched off, slide forward.
  - Vehicles with multitronic: turn crankshaft clockwise at ribbed belt pulley center bolt.



**Fig. 460: Checking Play Between Cam Lobes And Roller Rocker Lever**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check play between cam lobes and roller rocker lever.
- Press roller rocker lever down with screwdriver - **arrow** -.

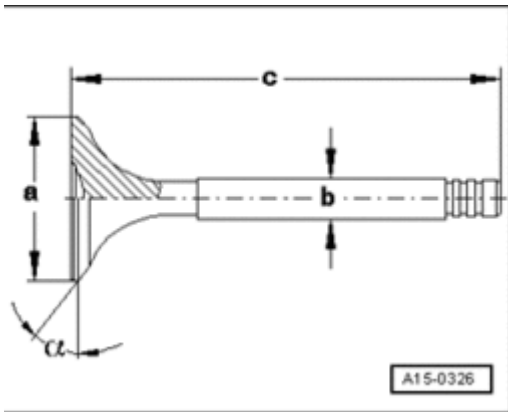
If a 0.20 mm feeler gauge can be inserted between camshaft and roller rocker lever:

- Replace support element --> **Camshafts, removing and installing**.

### NOTE:

- After installing the camshafts, the engine may not be started for approx. 30 minutes. The hydraulic equalization elements must seat themselves (otherwise the valves will crash into the pistons).
- After working on the valvetrain and lifters, carefully rotate the crankshaft by hand at least 2 full revolutions before starting to be sure that valves do not strike the pistons.

### Valve dimensions

**Fig. 461: Valve Dimensions**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

**NOTE:**

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

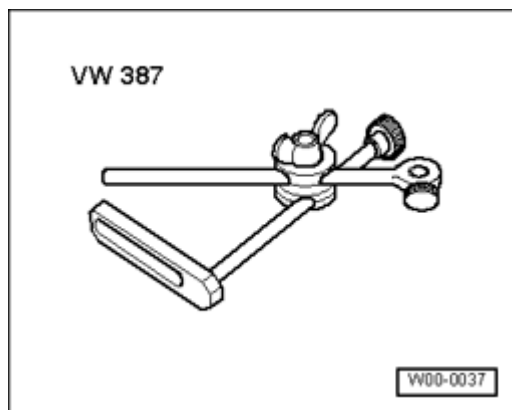
| Dimension  |         | Intake valve     | Exhaust valve   |
|------------|---------|------------------|-----------------|
| Diameter a | mm      | $33.85 \pm 0.10$ | $28.0 \pm 0.1$  |
| Diameter b | mm      | $5.98 \pm 0.01$  | $5.96 \pm 0.01$ |
| c          | mm      | $104.0 \pm 0.2$  | $101.9 \pm 0.2$ |
| a          | Angle ° | 45               | 45              |

**CAUTION:**

- Worn sodium-filled exhaust valves must not be scrapped without first being properly treated.
- Using a metal saw, the valves must be cut into two pieces between the shaft center and valve head. While doing this, do not come into contact with water. At the very most, throw 10 of the prepared valves into a bucket filled with water. Then, move quickly away, because a sudden chemical reaction will occur during which the sodium is burnt away.
- The treated parts may then be discarded through conventional disposal channels.

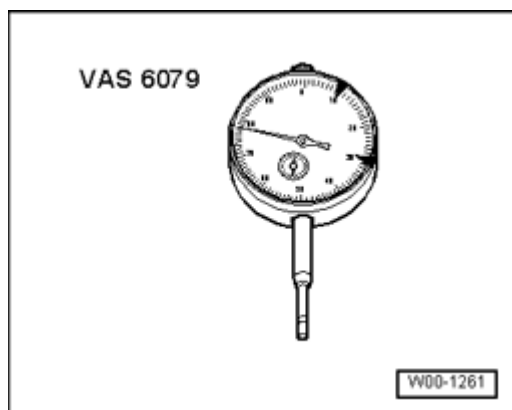
Valve guides, checking

Special tools, testers and auxiliary items required



**Fig. 462: Identifying Dial Gauge Holder VW 387**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

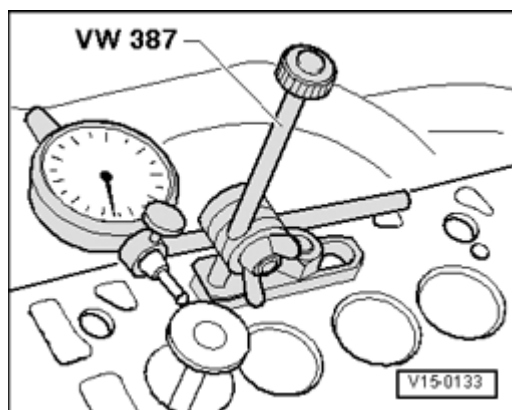
- Dial gauge holder VW 387



**Fig. 463: Identifying Dial Gauge VAS 6079**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Dial gauge VAS 6079

### Work procedure



**Fig. 464: Identifying Special Tool - VW 387 Installed**

**Courtesy of VOLKSWAGEN UNITED STATES, INC.**

- Insert valve into valve guide. Due to slight difference in stem dimensions, ensure that only an intake valve is used in the intake guide and an exhaust valve in the exhaust guide.
- Valve stem tip must seal with valve guide.
- Determine tilt clearance.
- Wear limit: 0.8 mm.

**NOTE:**

- If the valve is to be replaced as part of a repair, use a new valve for the calculation.
- If wear limit is exceeded, re-measure using new valves. If wear limit is still exceeded, replace cylinder head.

**Valves, checking**

- Perform a visual check for signs of wear at stem and at seating surface.

If significant wear is discovered:

- Replace respective valve.

**17 - ENGINE - LUBRICATION****LUBRICATION SYSTEM COMPONENTS, REMOVING AND INSTALLING****Lubrication system components, removing and installing**

**CAUTION:** This document contains Volkswagen World Wide content. Not all of the information applies to the US and Canadian Market.

**NOTE:**

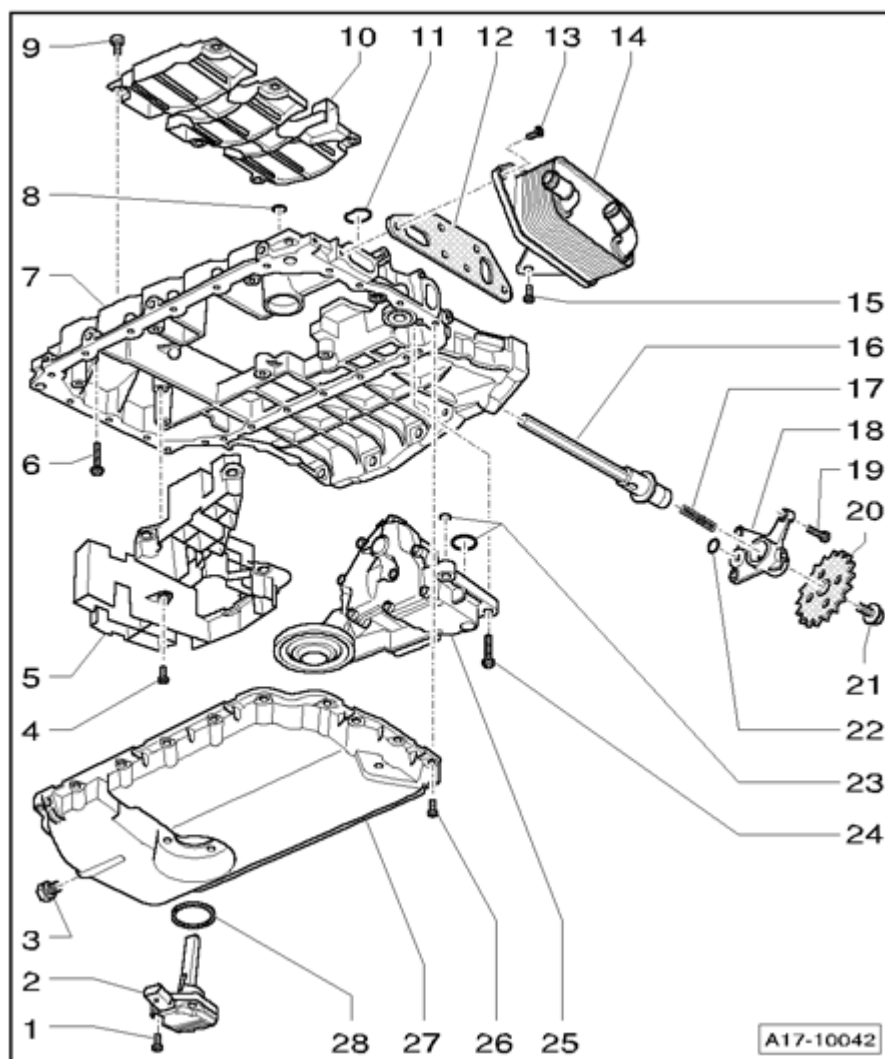
- If large quantities of metal shavings or abraded material are found in the engine oil while servicing the engine, the oil passages must be carefully cleaned to prevent resulting damage and the oil cooler must be replaced.
- The oil level must not be above the max. mark - danger of damage to catalytic converter!
- Viscosity classes, oil specifications, oil capacities Maintenance tables.

Oil pan (lower part), oil pan (upper part), oil pump, oil cooler, component overview

**NOTE:**

- Oil injector jet for piston cooling Oil spray jet for piston cooling





**Fig. 465: Oil Pan (Lower Part), Oil Pan (Upper Part), Oil Pump, Oil Cooler, Component Overview**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - 9 Nm

- Insert using locking compound; locking compound .

2 - Oil Level Thermal Sensor G266

3 - Oil drain plug, 30 Nm

4 - 9 Nm

5 - Lower oil baffle

6 - 16 Nm

- Fasten in diagonal sequence in steps

7 - Oil pan (upper section)

- Removing and installing --> **Upper part of oil pan, removing and installing**

8 - O-ring

- Replace

9 - 9 Nm

- Insert using locking compound; locking compound .

10 - Upper oil baffle

11 - O-ring

- Replace

12 - Gasket

- Replace

13 - 9 Nm

14 - Oil cooler

- See note
- Removing and installing --> **Oil cooler, removing and installing**
- With oil cooler by-pass valve

15 - 9 Nm

16 - Drive shaft for oil pump

17 - Spring

18 - Bracket

19 - 9 Nm

20 - Chain sprocket for oil pump

- Can only be placed onto drive shaft in one position

21 - 30 Nm plus an additional 90 ° (  $\frac{1}{4}$  turn)

- Replace
- To loosen, counter hold on sprocket with pin wrench 3212

22 - O-ring

- Replace

23 - O-rings

- Replace

24 - 20 Nm

25 - Oil pump

- Do not disassemble
- With cold pressure relief valve 11 bar and pressure regulator valve 4.3 bar
- Removing and installing --> **Oil pump, removing and installing**

26 - 9 Nm

- Fasten in diagonal sequence in steps

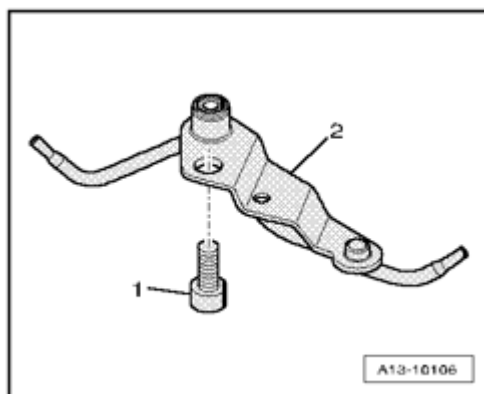
27 - Oil pan (lower section)

- Removing and installing --> **Lower part of oil pan, removing and installing**

28 - Seal

- Replace

**Oil spray jet for piston cooling**

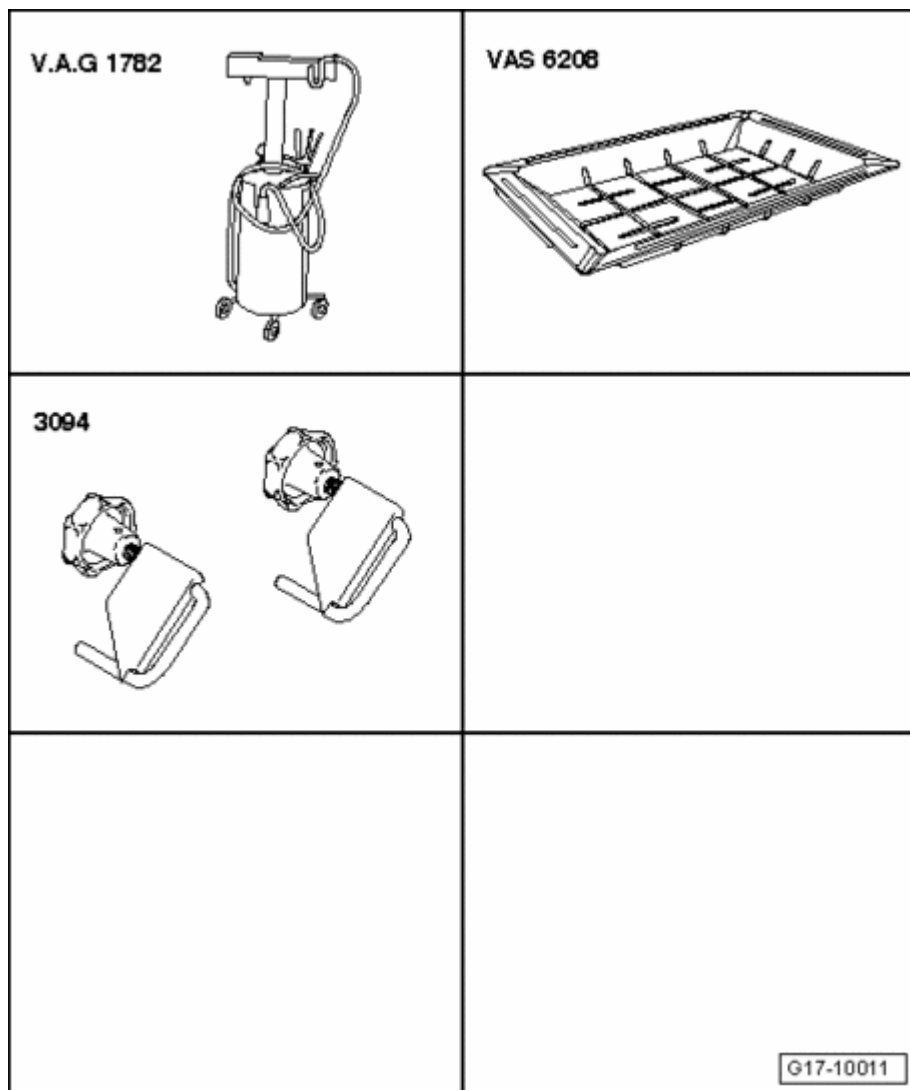


**Fig. 466: Oil Spray Jet For Piston Cooling**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

1. Insert bolt (9 Nm) using locking compound; locking compound
2. Oil spray jet with spray nozzle valve (opening pressure 2 to 2.4 bar positive pressure)

**Oil cooler, removing and installing**



**Fig. 467: Identifying Special Tools - Oil Cooler, Removing And Installing**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

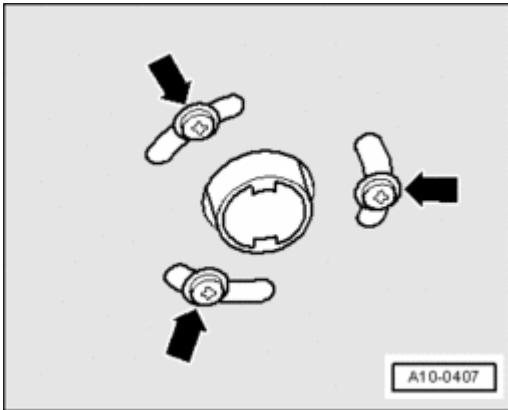
#### Special tools, testers and auxiliary items required

- Old oil collecting and extracting device V.A.G 1782
- Drip tray for workshop crane VAS 6208
- Hose Clamps Up to 25 mm dia. 3094

#### Removing

**CAUTION:** Cover cap of expansion tank with rag and open carefully, as hot steam i.e. hot coolant may escape when opening.

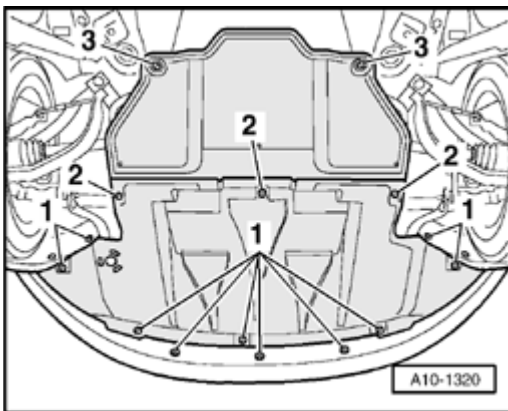
- Open cap of coolant expansion tank.



**Fig. 468: Locating Fasteners Exhaust Pipe**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

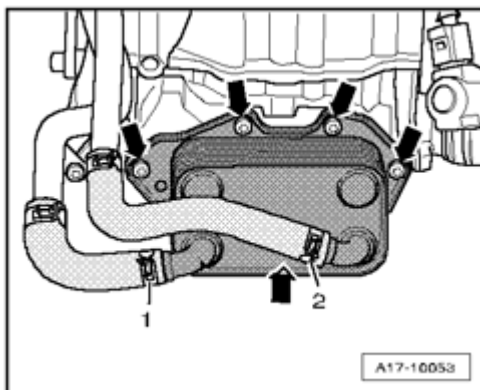
- For vehicles with auxiliary heater, remove bolts - **arrows** - for exhaust pipe of parking heater/auxiliary heater on noise insulation.



**Fig. 469: Identifying Quick-Release Fasteners And Noise Insulation**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen quick-release fasteners - **1** - and - **2** - and remove front noise insulation. Rear section of noise insulation remains installed.



**Fig. 470: Connecting/Removing Coolant Hoses With Hose Clamps**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place drip tray for workshop crane VAS 6208 under engine.
- Connection coolant hoses - **1** - and - **2** - with Hose Clamps Up to 25 mm dia. 3094.
- Remove coolant hoses on oil cooler and drain coolant.
- Place old oil collecting and extracting device V.A.G 1782 under engine.
- Remove bolts - **arrows** - and remove oil cooler.

### Installing

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

**NOTE:**

- **Always replace gaskets and seals.**
- **Secure all hose connections using hose clamps appropriate for the model type .**

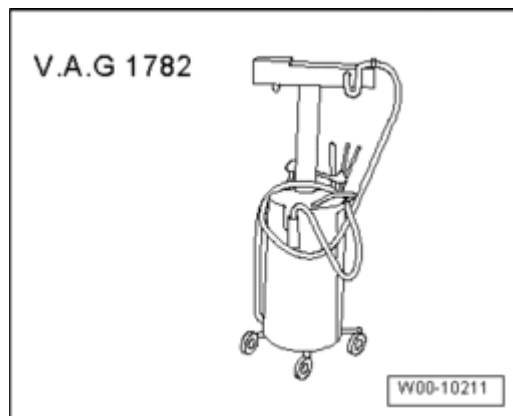
- Check oil level --> Oil level, checking.
- Fill with coolant --> Cooling system, draining and filling.

### Torque specifications

| Component                          | Nm |
|------------------------------------|----|
| Oil cooler to oil pan (upper part) | 9  |

Lower part of oil pan, removing and installing

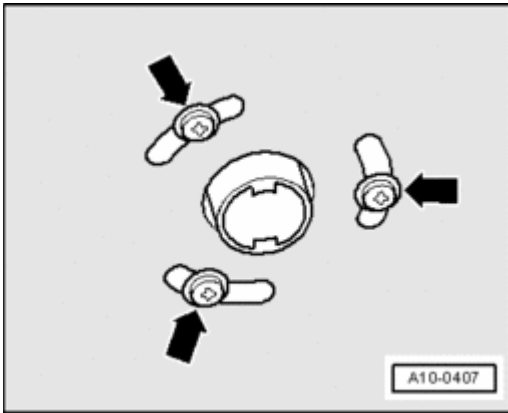
### Special tools, testers and auxiliary items required



**Fig. 471: Identifying Old Oil Collecting And Extracting Device V.A.G 1782**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Old oil collecting and extracting device V.A.G 1782
- Hand drill with plastic brush attachment
- Protective glasses
- Sealant

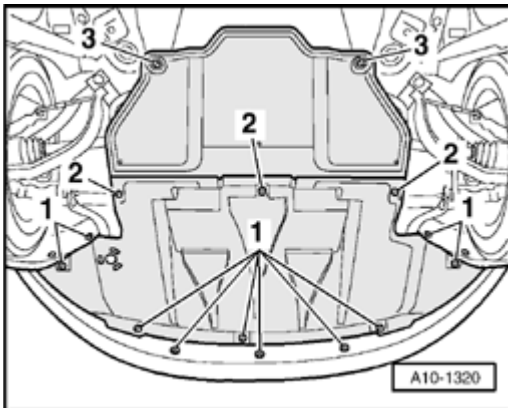
### Removing



**Fig. 472: Locating Fasteners Exhaust Pipe**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- For vehicles with auxiliary heater, remove bolts - **arrows** - for exhaust pipe of parking heater/auxiliary heater on noise insulation.

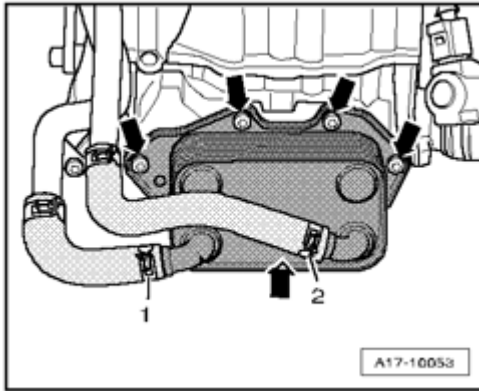


**Fig. 473: Identifying Quick-Release Fasteners And Noise Insulation**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen quick-release fasteners - **1** - and - **2** - and remove front noise insulation. Rear section of noise insulation remains installed.
- Place old oil collecting and extracting device V.A.G 1782 under engine.
- Drain engine oil.



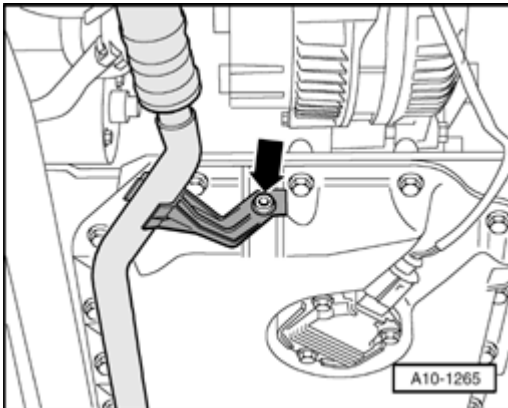


**Fig. 474: Connecting/Removing Coolant Hoses With Hose Clamps**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and remove oil cooler with coolant hoses - **1** - and - **2** - connected.

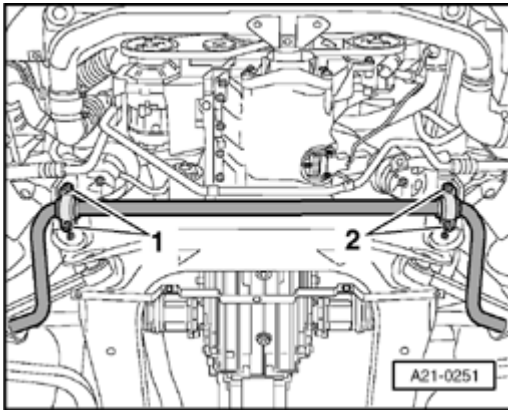
**NOTE:**

- To prevent damage to the refrigerant lines/hoses, ensure that the lines and hoses are not stretched, kinked or bent.



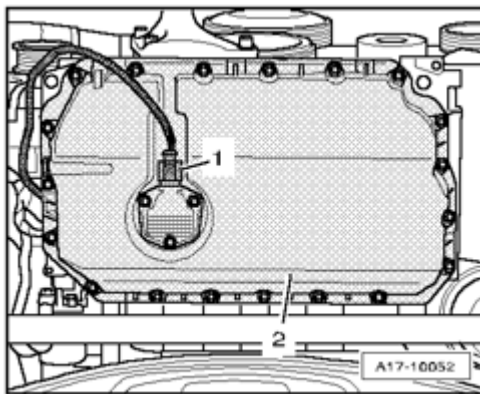
**Fig. 475: Removing Bracket For Refrigerant Lines At Right On Oil Pan**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bracket for refrigerant lines at right on oil pan - **arrow** -.



**Fig. 476: Unfastening Left/Right Stabilizer Bar Mountings**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove left and right stabilizer bar mountings - 1 - and - 2 -.
- Pivot stabilizer bar downward.



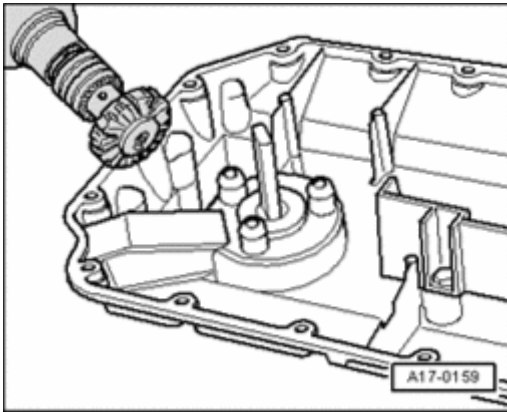
**Fig. 477: Disconnecting Electrical Connector To Oil Level Thermal Sensor G266 And Free Up Lines**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - 1 - to Oil Level Thermal Sensor G266 and free up lines.
- Remove lower part of oil pan - 2 - and carefully remove it.

## Installing

**NOTE:**                      • Always replace gaskets and seal.

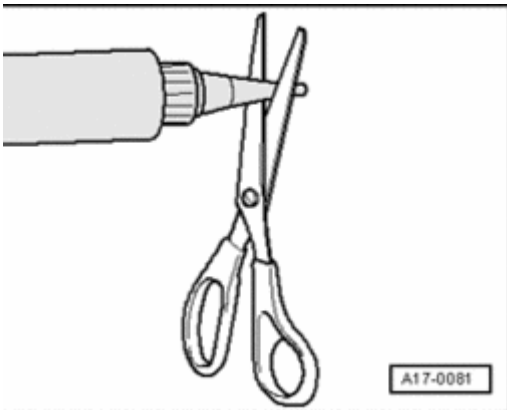
**CAUTION:** Wear safety glasses.



**Fig. 478: Using Rotating Plastic Brush To Remove Any Remaining Sealant From Oil Pan (Lower Part) And At Upper Part**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

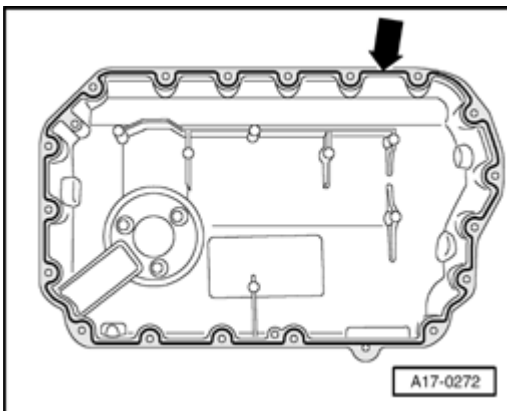
- Using rotating plastic brush, remove any remaining sealant from lower part of oil pan and upper part.
- Clean sealing surfaces so they are completely free of any oil or grease.



**Fig. 479: Cutting Tube Nozzle At Front Marking**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Cut tube nozzle at front marking (jet dia. approx. 1 mm).



**Fig. 480: Applying Sealant Bead To Clean Sealing Surfaces Of Oil Pan (Lower Part)**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Apply sealant bead - **arrow** - to clean sealing surfaces of oil pan (lower part) as shown in illustration.
- Thickness of sealant bead: approx. 1.5 mm.

**NOTE:**

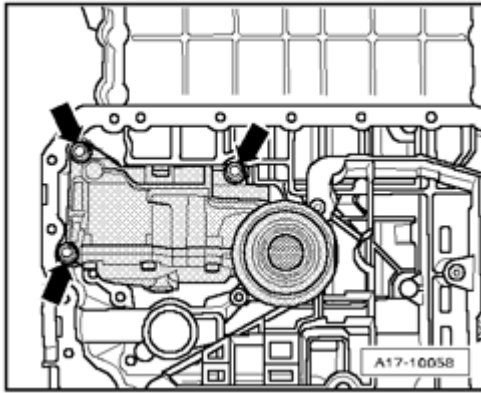
- **Sealant bead must not be thicker than specified, otherwise excess sealant may get into lower section of oil pan and clog strainer in intake tube.**
  - **The oil pan (lower part) must be installed within 5 minutes after application of sealant.**
- Set lower part of oil pan in place and fasten all bolts in diagonal sequence to 5 Nm.
  - Fasten bolts for lower part of oil pan in a diagonal sequence.
  - Install oil cooler --> **Oil cooler, removing and installing.**
  - Install stabilizer bar --> **40 - FRONT SUSPENSION** .
  - Add engine oil and check oil level --> **Oil level, checking.**

**Torque specifications**

| Component                                                                             | Nm              |
|---------------------------------------------------------------------------------------|-----------------|
| Oil cooler to oil pan (upper part)                                                    | 9               |
| Lower part of oil pan to upper part of oil pan                                        | 9 <sup>1)</sup> |
| Bracket to oil pan                                                                    | 9               |
| Oil drain plug                                                                        | 30              |
| <ul style="list-style-type: none"> <li>● <sup>1)</sup> Tighten diagonally.</li> </ul> |                 |

**Oil pump, removing and installing****Removing**

- Remove lower section of oil pan --> **Lower part of oil pan, removing and installing.**

**Fig. 481: Removing Oil Pump Bolts**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Pull oil pump forward and off from drive shaft.

### Installing

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

#### NOTE:

- **Replace O-rings.**

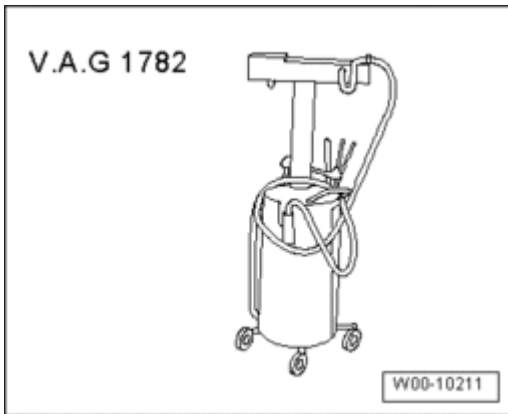
- Install oil pump onto drive shaft and fasten.
- Install lower section of oil pan --> **Lower part of oil pan, removing and installing.**
- Add engine oil and check oil level --> **Oil level, checking.**

### Torque specifications

| Component                         | Nm |
|-----------------------------------|----|
| Oil pump to upper part of oil pan | 20 |

Upper part of oil pan, removing and installing

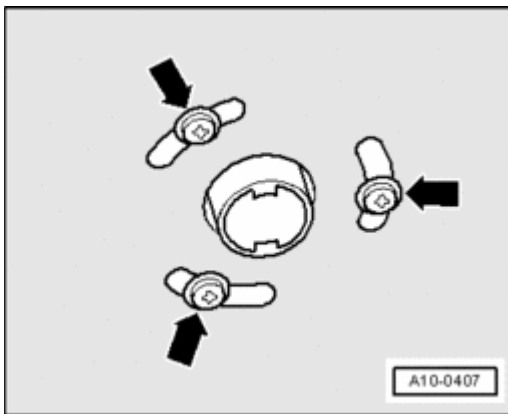
Special tools, testers and auxiliary items required



**Fig. 482: Identifying Old Oil Collecting And Extracting Device V.A.G 1782**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

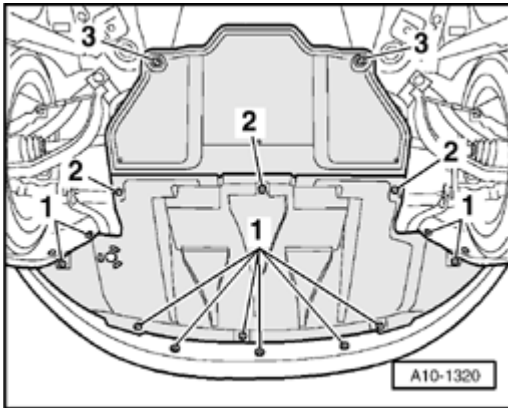
- Old oil collecting and extracting device V.A.G 1782
- Protective glasses
- Hand drill with plastic brush attachment
- Sealant

### Removing



**Fig. 483: Locating Fasteners Exhaust Pipe**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

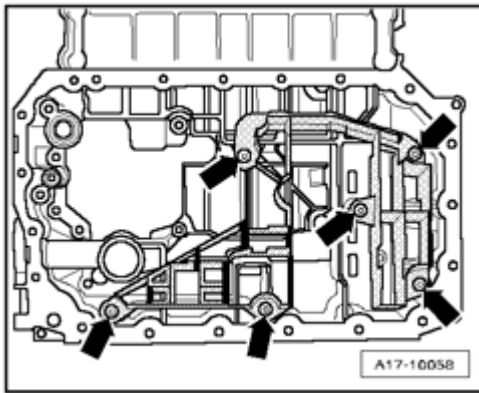
- For vehicles with auxiliary heater, remove bolts - **arrows** - for exhaust pipe of parking heater/auxiliary heater on noise insulation.



**Fig. 484: Identifying Quick-Release Fasteners And Noise Insulation**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

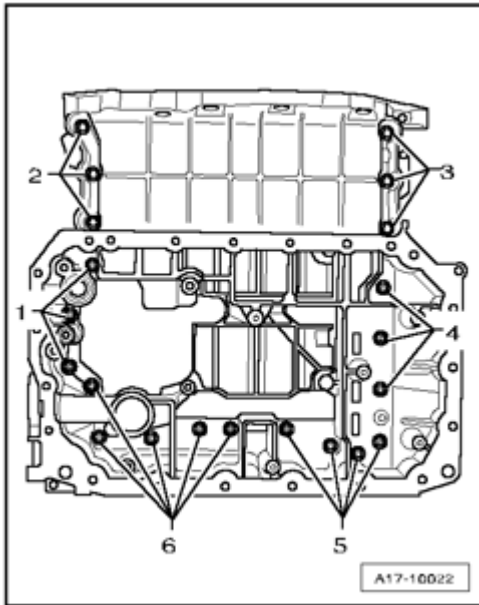
- Loosen quick-release fasteners - **1 through 3** - and remove front and rear noise insulation.
- Place old oil collecting and extracting device V.A.G 1782 under engine.
- Drain engine oil.
- Remove engine: Vehicles with manual transmission --> **Engine, removing** , vehicles with automatic transmission --> **Engine, removing**.
- Separate engine/transmission assembly: Vehicles with manual transmission --> **Engine and manual transmission, separating** , vehicles with automatic transmission --> **Engine and automatic transmission 09L, separating**.
- Secure engine to assembly stand: Vehicles with manual transmission --> **Engine, securing to assembly stand** , vehicles with automatic transmission --> **Engine, securing to assembly stand**.
- Vehicles with manual transmission: Remove clutch pressure plate -->
  - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
  - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
  - **30 CLUTCH** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
  - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE
  - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
  - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE
 and dual mass flywheel --> **Dual mass flywheel (vehicles with manual transmission), removing and installing.**
- Vehicles with automatic transmission: Remove drive plate --> **Drive plate (vehicles with automatic transmission), removing and installing.**
- Remove left and right timing chain covers --> **Left and right timing chain covers, removing and installing.**
- Remove lower timing chain cover --> **Lower timing chain cover, removing and installing.**
- Remove front sealing flange --> **Front sealing flange with crankshaft seal, removing and installing.**
- Remove lower section of oil pan --> **Lower part of oil pan, removing and installing.**

- Remove oil pump --> **Oil pump, removing and installing.**



**Fig. 485: Removing Bolts And Lower Oil Baffle**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and remove lower oil baffle.



**Fig. 486: Removing Bolts For Upper Section Of Oil Pan**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **1 to 6** - for upper section of oil pan.
- Press upper part of oil pan from alignment pins of cylinder block.

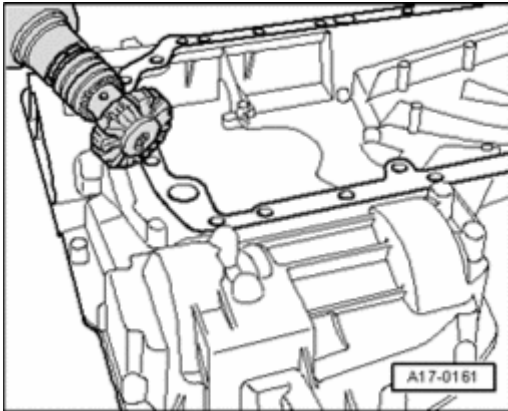
### Installing

**NOTE:**                      • **Replace gaskets, seals and O-rings.**



- Remove sealant from grooves of upper part of oil pan and from sealing surfaces.

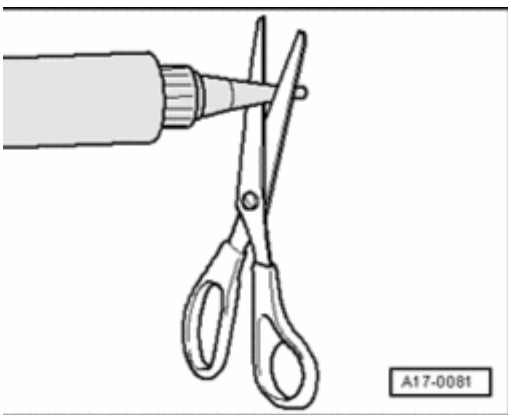
**CAUTION: Wear safety glasses.**



**Fig. 487: Using Rotating Plastic Brush To Remove Any Remaining Sealant From Upper Part Of Oil Pan And Cylinder Block**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

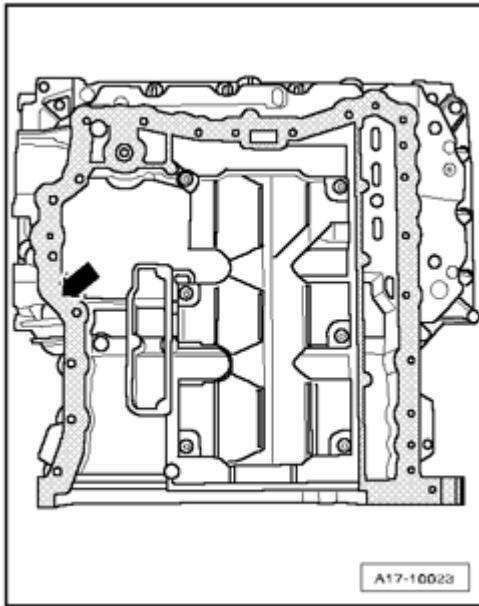
- Using rotating plastic brush, remove any remaining sealant from upper part of oil pan and cylinder block.
- Clean sealing surfaces so they are completely free of any oil or grease.



**Fig. 488: Cutting Tube Nozzle At Front Marking**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Cut tube nozzle at front marking (jet approx. 2 mm).

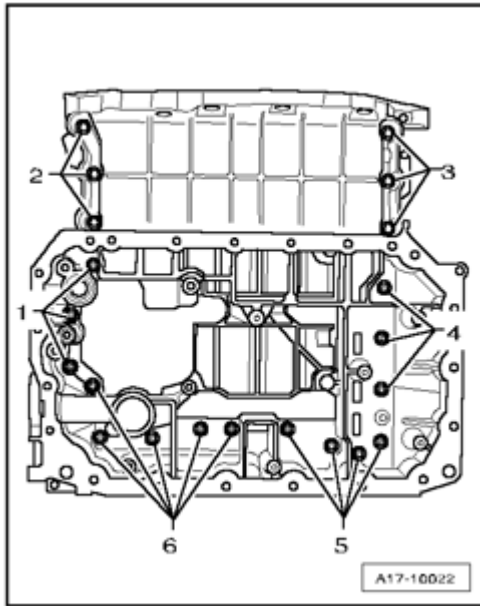


**Fig. 489: Applying Sealant Bead On Clean Sealing Surface Of Upper Section Of Oil Pan**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Apply sealant bead - **arrow** - on clean sealing surface of upper section of oil pan as shown in illustration.
- The groove of sealing surfaces must be completely filled with sealant.
- Sealant bead must stand 1.5 to 2.0 mm above sealing surface.

**NOTE:**

- Sealant bead must not be thicker than specified, otherwise sealant could get into oil pan and clog the oil pump strainer.
- The oil pan (upper part) must be installed within 5 minutes after application of sealant.



**Fig. 490: Removing Bolts For Upper Section Of Oil Pan**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position upper part of oil pan in place and tighten bolts - **1 through 6** - to 5 Nm in diagonal sequence.
- Tighten bolts - **1 to 6** - in a diagonal sequence.

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

- Install oil pump --> **Oil pump, removing and installing.**
- Install lower section of oil pan --> **Lower part of oil pan, removing and installing.**
- Install front sealing flange --> **Front sealing flange with crankshaft seal, removing and installing.**
- Install lower timing chain cover --> **Lower timing chain cover, removing and installing.**
- Install oil filter housing --> **Oil filter housing, removing and installing.**
- Install left and right timing chain covers **Installing.**
- Install crankshaft seal, timing chain side --> **Crankshaft seal, timing chain side, replacing.**
- Vehicles with manual transmission: Install dual mass flywheel --> **Dual mass flywheel (vehicles with manual transmission), removing and installing** and clutch pressure plate -->
  - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
  - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
  - **30 CLUTCH** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
  - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE
  - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
  - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE

## 2007 Audi A6

ENGINE 3.2 V6 4V Engine Mechanical, Engine Code(s): BKH

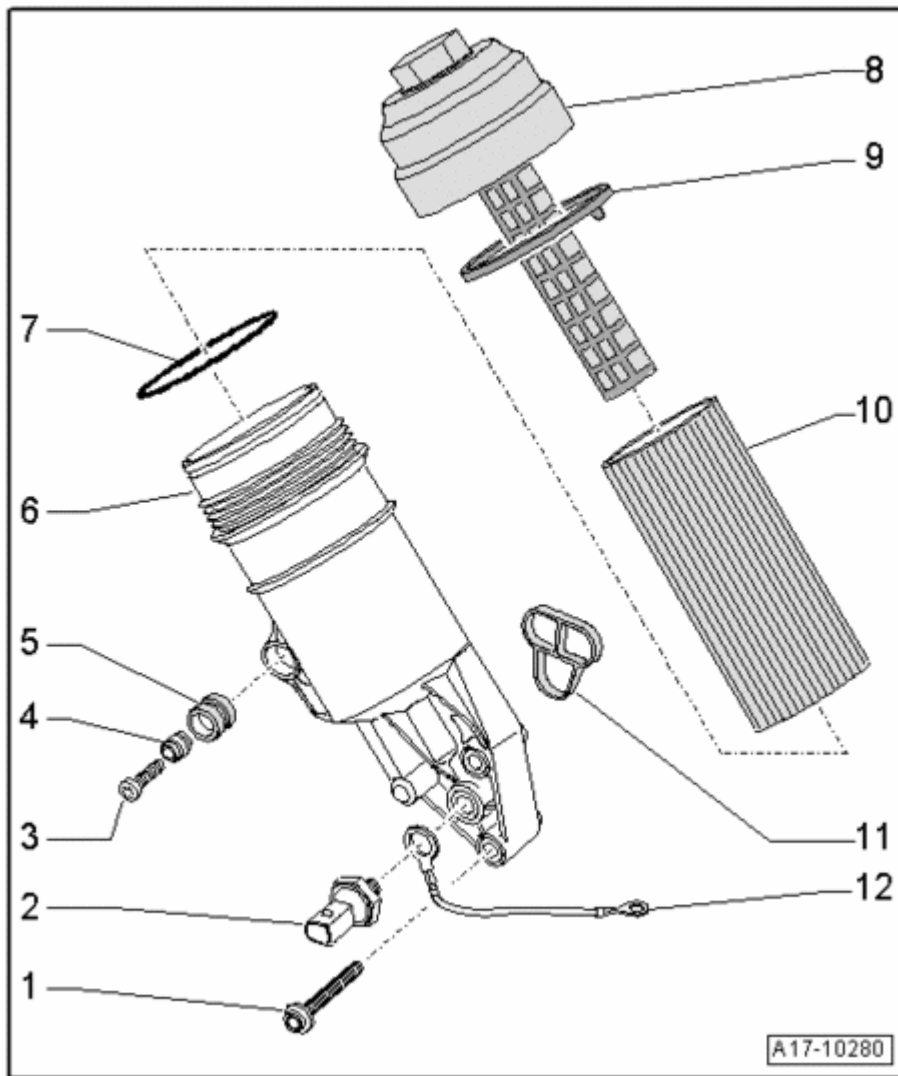
- Vehicles with automatic transmission: Install drive plate --> **Drive plate (vehicles with automatic transmission), removing and installing.**
- Attach transmission to engine and install engine/transmission assembly: Vehicles with manual transmission --> **Engine, installing** , vehicles with automatic transmission --> **Engine, installing.**
- Add engine oil and check oil level --> **Oil level, checking.**

### Torque specifications

| Component                                                                                                                                                    | Nm               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| Upper part of oil pan to cylinder block                                                                                                                      | 16 <sup>1)</sup> |
| Upper oil baffle to upper part of oil pan                                                                                                                    | 9 <sup>2)</sup>  |
| Lower oil baffle to upper part of oil pan                                                                                                                    | 9                |
| Oil drain plug                                                                                                                                               | 30               |
| <ul style="list-style-type: none"><li>• <sup>1)</sup> Tighten diagonally.</li><li>• <sup>2)</sup> Insert with locking compound; locking compound .</li></ul> |                  |

### Oil filter housing, component overview

### Vehicles through 04.2005



**Fig. 491: Oil Filter Housing, Component Overview (Vehicles Through 04.2005)**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - 13 Nm

2 - Oil pressure switch F1

- Black insulation
- Checking --> **Oil pressure, checking**
- Removing and installing --> **Oil Pressure Switch F1 , removing and installing**
- Tighten to 20 Nm

3 - 13 Nm

4 - Sleeve

5 - Rubber grommet

6 - Oil filter housing

- With filter by-pass valve 3.0 bar
- With oil check valve
- Oil check valve cannot be replaced
- Removing and installing --> **Oil filter housing, removing and installing**

7 - O-ring

- Replace
- Inserting **O-ring, inserting on oil filter housing**

8 - Cap, 25 Nm

9 - Seal

- Replace
- Removing and installing **Sealing ring on cap, replacing**

10 - Oil filter element

- Remove from cap - **8** -
- Replace O-ring - **7** - and sealing ring - **9** - when replacing filter
- Note installation position
- Change interval -->
  - **01 - MAINTENANCE**
  - **01 - MAINTENANCE** for MAINTENANCE PROCEDURES - CABRIOLET

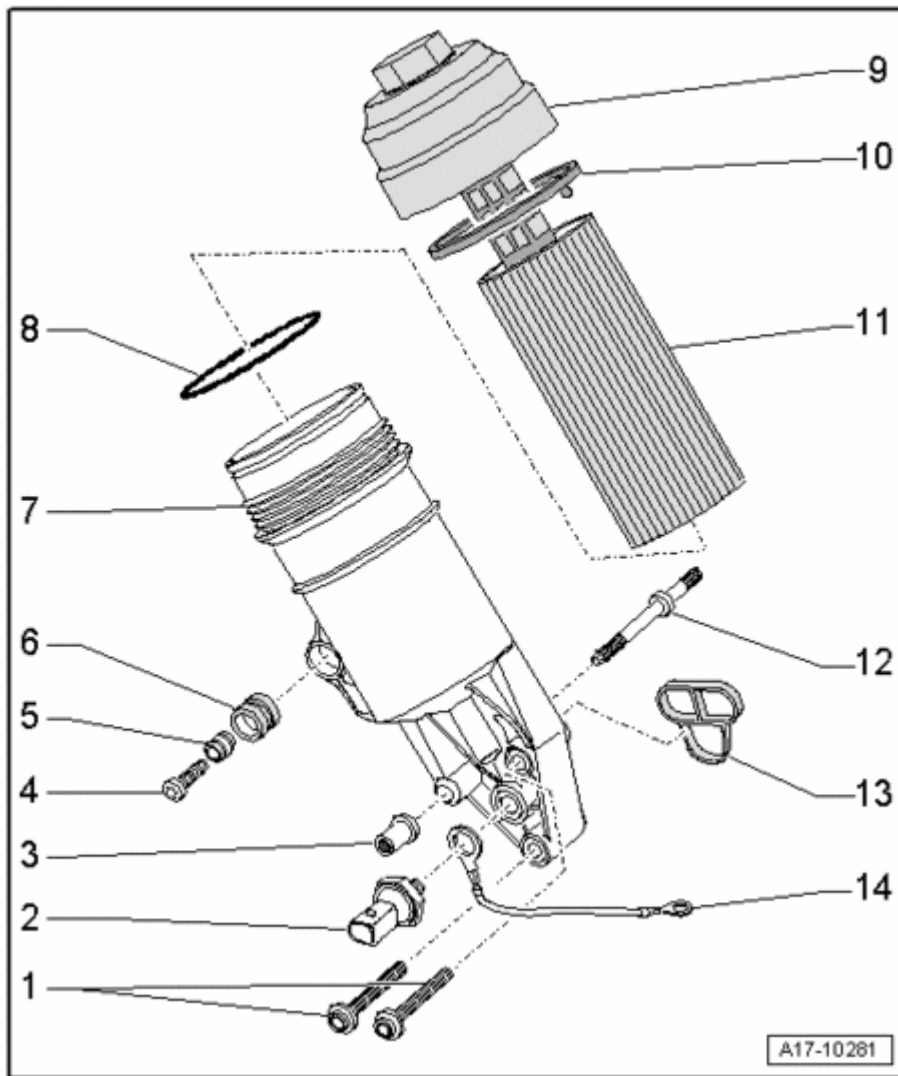
11 - Gasket

- Replace

12 - Seal with Ground (GND) wire

- Replace

**Vehicles from 05.2005**



**Fig. 492: Oil Filter Housing, Component Overview (Vehicles From 05.2005)**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - 13 Nm

2 - Oil pressure switch F1

- Tighten to 20 Nm
- Black insulation
- Removing and installing --> **Oil Pressure Switch F1 , removing and installing**
- Checking --> **Oil pressure, checking**

3 - Multi-point socket head union nut, 13 Nm

4 - 13 Nm

5 - Sleeve

6 - Rubber grommet

7 - Oil filter housing

- With filter by-pass valve 3.0 bar
- With oil check valve
- Oil check valve cannot be replaced

8 - O-ring

- Replace
- Inserting **Sealing ring on cap, replacing**

9 - Cap, 25 Nm

10 - Seal

- Replace
- Removing and installing **O-ring, inserting on oil filter housing**

11 - Oil filter element

- Remove from cap - **9** -
- Replace O-ring - **8** - and sealing ring - **10** - when replacing filter
- Note installation position
- Change interval -->
  - **01 - MAINTENANCE**
  - **01 - MAINTENANCE** for MAINTENANCE PROCEDURES - CABRIOLET

12 - Stud bolt, 16 Nm

13 - Gasket

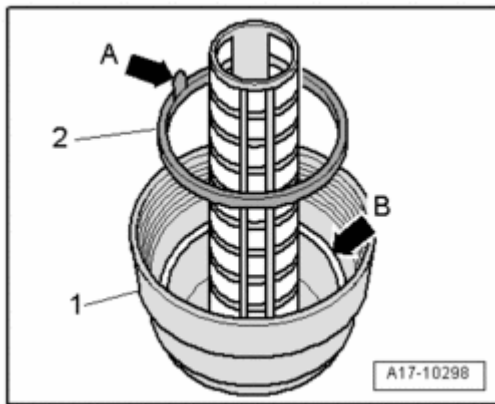
- Replace

14 - Seal with Ground (GND) wire

- Replace

**Sealing ring on cap, replacing**

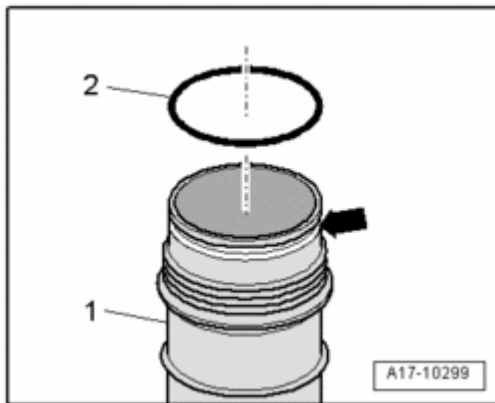




**Fig. 493: Sealing Ring On Cap, Replacing**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove sealing ring at pull tab - **arrow A** - from cap - **1** -.
- Insert new sealing ring - **2** - with semicircular profile in groove - **arrow B** - on cap.
- The pull tab - **arrow A** - must face up.

**O-ring, inserting on oil filter housing**

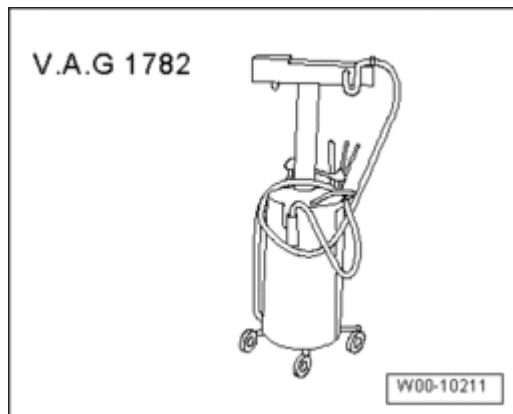


**Fig. 494: O-Ring, Inserting On Oil Filter Housing**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert O-ring - **2** - in groove - **arrow** - on oil filter housing - **1** -.

**Oil filter housing, removing and installing**

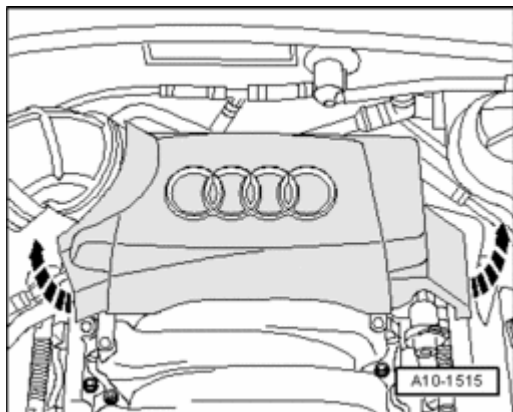
**Special tools, testers and auxiliary items required**



**Fig. 495: Identifying Old Oil Collecting And Extracting Device V.A.G 1782**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

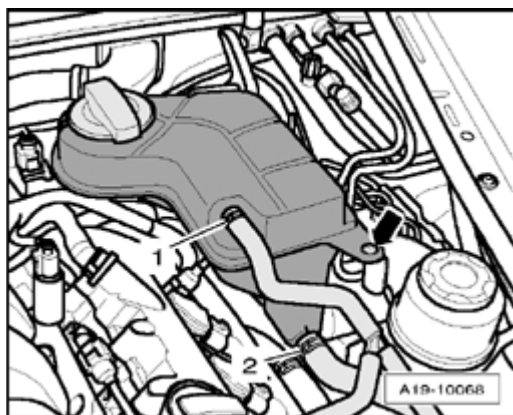
- Old oil collecting and extracting device V.A.G 1782

### Removing



**Fig. 496: Removing Rear Engine Cover**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

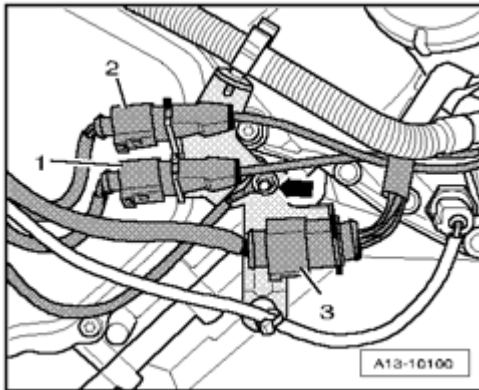
- Remove rear engine cover - **arrows** -.



**Fig. 497: Removing Coolant Hoses At Coolant Expansion Tank**

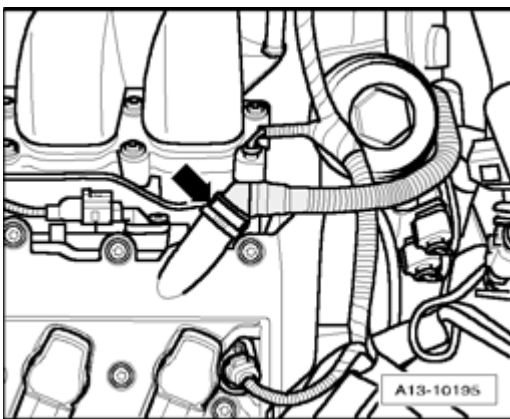
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove coolant expansion tank - **arrow** -.
- Disconnect electrical connection from Engine Coolant Level (ECL) Warning Switch F66 at bottom of coolant reservoir and set aside coolant reservoir with coolant hoses - **1** - and - **2** - connected.

**Fig. 498: Disconnecting Electrical Harness Connectors**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connectors - **1 to 3** -.
- Remove nut - **arrow** -.
- Remove retainer for connection - **3** -.
- Remove double-bolt lying beneath.
- Remove retainer for connections - **1** - and - **2** -.

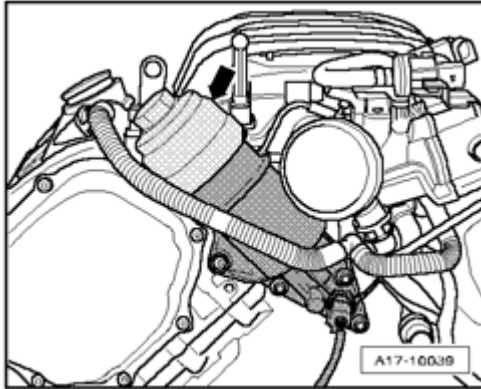
**Fig. 499: Removing Crankcase Ventilation Hose At Left Cylinder Head Cover**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove crankcase ventilation hose - **arrow** - at left cylinder head cover.

**NOTE:**

- To improve clarity, the work procedures in the following illustrations are shown with the engine removed and viewed from the rear.

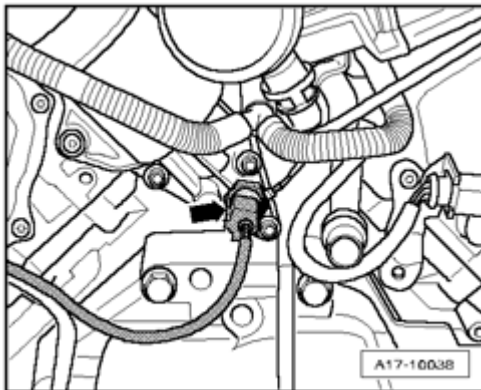


**Fig. 500: Removing Cap For Oil Filter Housing**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove cap - **arrow** - for oil filter housing.
- Remove oil filter element.
- Extract engine oil using old oil collecting and extracting device V.A.G 1782 from oil filter housing.

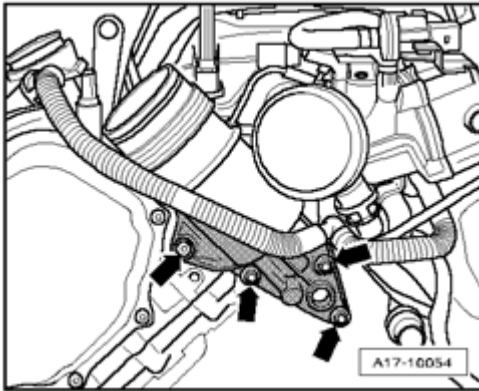
**NOTE:**

- Place a rag under oil filter housing to catch escaping engine oil.



**Fig. 501: Disconnecting Electrical Harness Connector From Oil Pressure Switch F1**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector from Oil Pressure Switch F1 - **arrow** -.
- Remove oil pressure switch.



**Fig. 502: Removing Oil Filter Housing Bolts**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- On engines from 05.2005, also remove multi-point socket head union nut.
- Remove oil filter housing.

### Installing

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

**NOTE:**                   ● **Replace gaskets, seals and O-rings.**

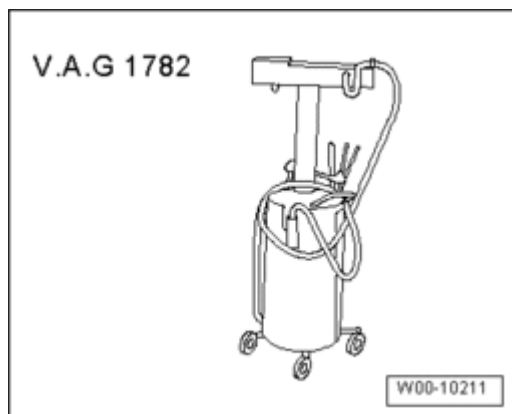
- Add engine oil and check oil level --> **Oil level, checking.**

### Torque specifications

| Component                                            | Nm |
|------------------------------------------------------|----|
| Oil filter housing to engine                         | 9  |
| Oil pressure switch to oil filter housing            | 20 |
| Cap to oil filter housing                            | 25 |
| Retainer for electrical connections to cylinder head | 9  |

Oil filter housing, US./Can. vehicles, removing and installing

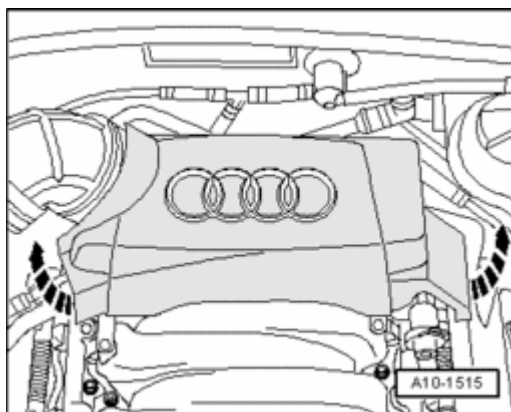
Special tools, testers and auxiliary items required



**Fig. 503: Identifying Old Oil Collecting And Extracting Device V.A.G 1782**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

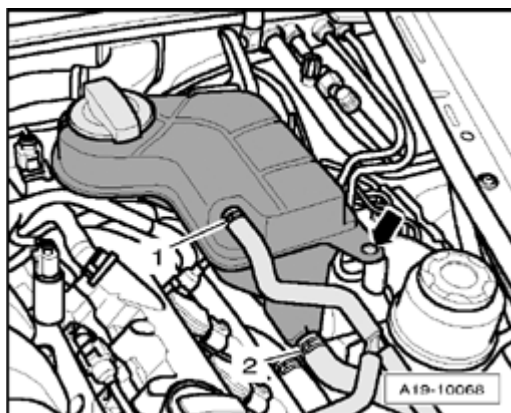
- Old oil collecting and extracting device V.A.G 1782

### Removing



**Fig. 504: Removing Rear Engine Cover**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

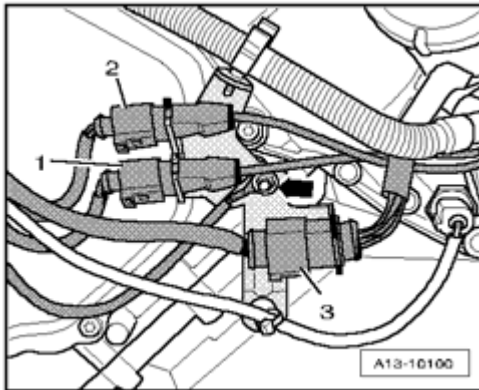
- Remove rear engine cover - **arrows** -.



**Fig. 505: Removing Coolant Hoses At Coolant Expansion Tank**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove coolant expansion tank - **arrow** -.
- Disconnect electrical connection from Engine Coolant Level (ECL) Warning Switch F66 at bottom of coolant reservoir and set aside coolant reservoir with coolant hoses - **1** - and - **2** - connected.

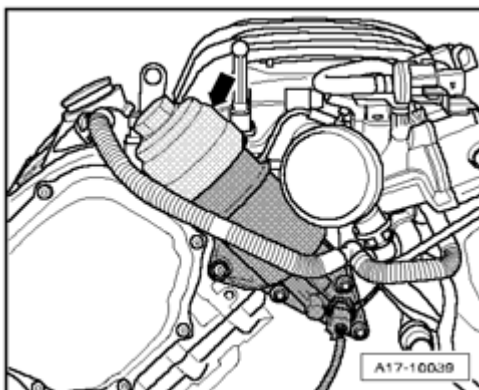
**Fig. 506: Disconnecting Electrical Harness Connectors**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connectors - **1 to 3** -.
- Remove nut - **arrow** -.
- Remove retainer for connection - **3** -.
- Remove double-bolt lying beneath.
- Remove retainer for connections - **1** - and - **2** -.
- Remove left cylinder head cover and lay aside with crankcase ventilation hose connected --> **Left cylinder head cover, US./Can. vehicles, removing and installing.**

**NOTE:**

- To improve clarity, the work procedures in the following illustrations are shown with the engine removed and viewed from the rear.



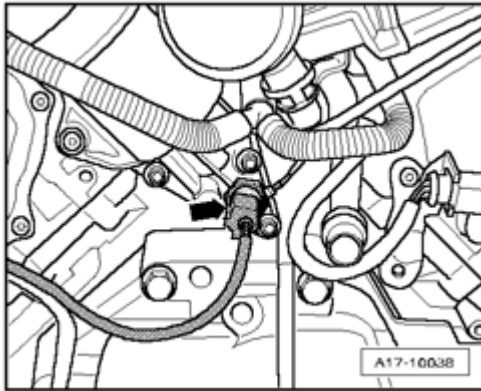
**Fig. 507: Removing Cap For Oil Filter Housing**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove cap - **arrow** - for oil filter housing.
- Remove oil filter element.
- Extract engine oil using old oil collecting and extracting device V.A.G 1782 from oil filter housing.

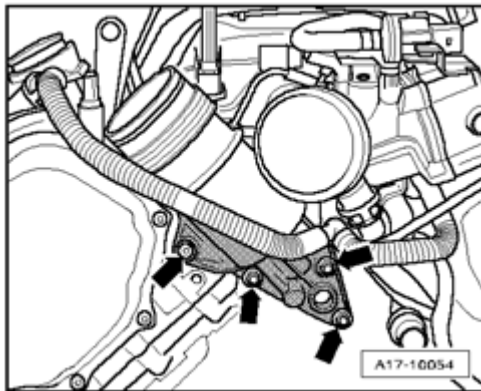
**NOTE:**

- Place a rag under oil filter housing to catch escaping engine oil.

**Fig. 508: Disconnecting Electrical Harness Connector From Oil Pressure Switch F1**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector from Oil Pressure Switch F1 - **arrow** -.
- Remove oil pressure switch.

**Fig. 509: Removing Oil Filter Housing Bolts**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- On engines from 05.2005, also remove multi-point socket head union nut.
- Remove oil filter housing.



## 2007 Audi A6

ENGINE 3.2 V6 4V Engine Mechanical, Engine Code(s): BKH

### Installing

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

#### NOTE:

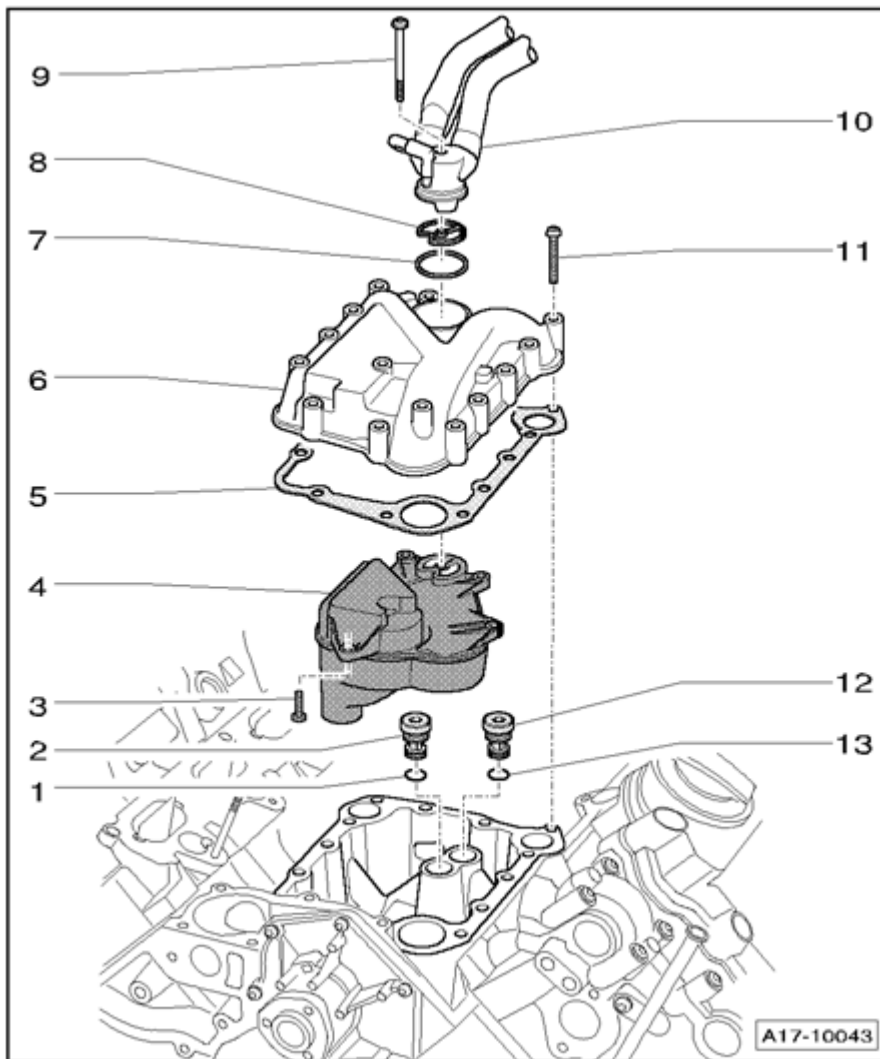
- **Replace gaskets, seals and O-rings.**

- Add engine oil and check oil level --> **Oil level, checking.**

### Torque specifications

| Component                                            | Nm |
|------------------------------------------------------|----|
| Oil filter housing to engine                         | 9  |
| Oil pressure switch to oil filter housing            | 20 |
| Cap to oil filter housing                            | 25 |
| Retainer for electrical connections to cylinder head | 9  |

Oil check valves, oil separator, component overview



**Fig. 510: Oil Check Valves, Oil Separator, Component Overview**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - O-ring

- Replace

2 - Oil check valve, 20 Nm

- For oil supply to right cylinder head

3 - 9 Nm

4 - Oil separator

5 - Gasket

- Replace

**6 - Cover**

- With connection for crankshaft housing ventilation
- To remove, remove upper part of intake manifold and left and right lower parts of intake manifold --> **24 - FUEL INJECTION SYSTEM**

**7 - O-ring**

- Replace

**8 - Gasket**

- Replace

**9 - 6 Nm****10 - Crankcase ventilation hoses**

- Removing and installing --> **Crankcase ventilation hoses, not for US vehicles, removing and installing**

**CAUTION: On US vehicles, crankcase ventilation must not be removed.**

**11 - 9 Nm****12 - Oil check valve, 20 Nm**

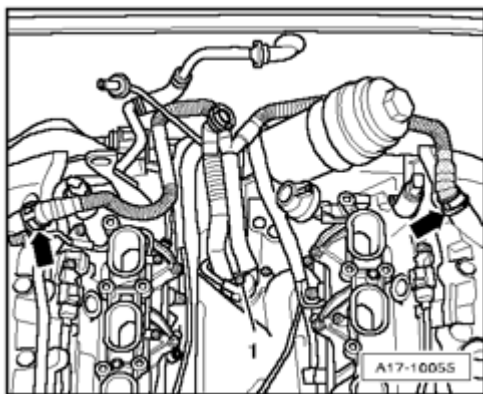
- For oil supply to left cylinder head

**13 - O-ring**

- Replace

**Crankcase ventilation hoses, not for US vehicles, removing and installing****Removing****NOTE:**

- **All cable ties which are opened or cut open when removing, must be replaced in the same position when installing.**
- Remove upper part of intake manifold --> **24 - FUEL INJECTION SYSTEM** .



**Fig. 511: Disconnecting Crankcase Ventilation Hoses At Cylinder Head Covers**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect crankcase ventilation hoses - **arrows** - at cylinder head covers.
- Free up crankcase ventilation hoses.
- Remove bolt - **1** - and remove connecting piece with crankcase ventilation hoses.

### Installing

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

#### NOTE:

- **Replace gaskets and O-rings.**
- **During installation, all cable ties must be re-installed at the same location.**

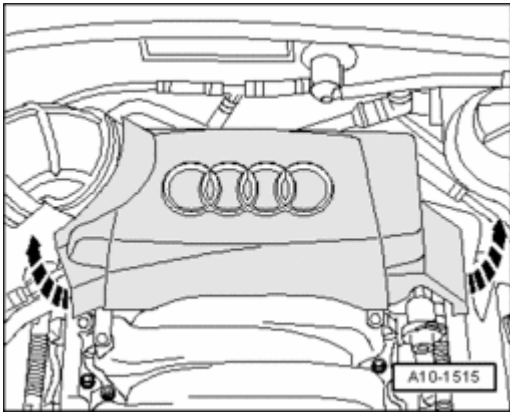
- Install intake manifold upper-part --> **24 - FUEL INJECTION SYSTEM** .

### Torque specifications

| Component                                                  | Nm |
|------------------------------------------------------------|----|
| Connecting pieces for crankcase ventilation hoses to cover | 6  |

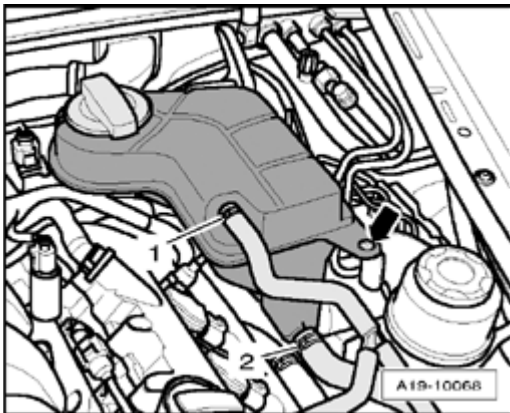
### Oil Pressure Switch F1 , removing and installing

#### Removing

**Fig. 512: Removing Rear Engine Cover**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove rear engine cover - **arrows** -.

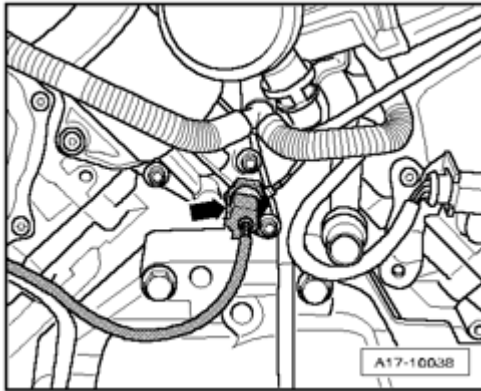
**Fig. 513: Removing Coolant Hoses At Coolant Expansion Tank**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove coolant expansion tank - **arrow** -.
- Disconnect electrical connection from Engine Coolant Level (ECL) Warning Switch F66 at bottom of coolant reservoir and set aside coolant reservoir with coolant hoses - **1** - and - **2** - connected.

**NOTE:**

- Place a rag under oil filter housing to catch escaping engine oil.



**Fig. 514: Disconnecting Electrical Harness Connector From Oil Pressure Switch F1**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector from Oil Pressure Switch F1 - **arrow** -.
- Remove oil pressure switch.

### Installing

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

#### NOTE:

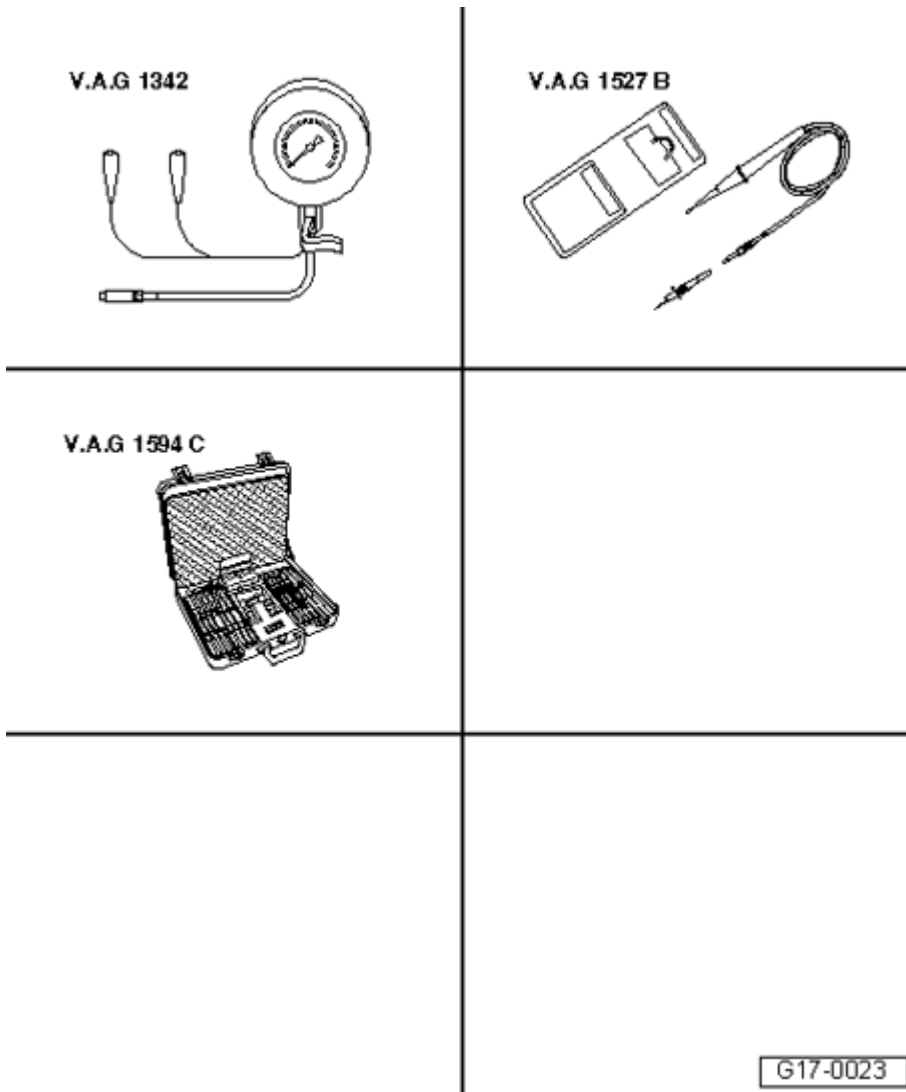
- **Replace seal.**

- Check oil level --> **Oil level, checking.**

### Torque specifications

| Component                                 | Nm |
|-------------------------------------------|----|
| Oil pressure switch to oil filter housing | 20 |

### Oil pressure, checking



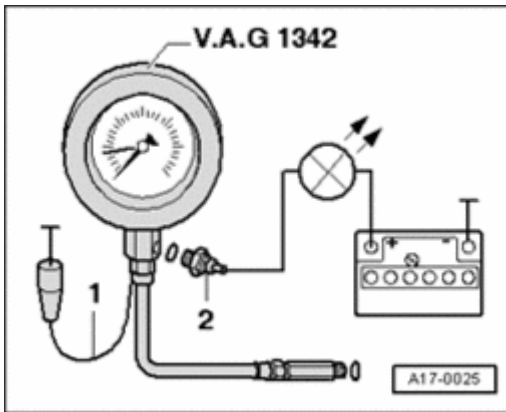
**Fig. 515: Identifying Special Tools - Oil Pressure, Checking**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

**Special tools, testers and auxiliary items required**

- Oil pressure gauge V.A.G 1342
- Voltage tester V.A.G 1527 B
- Connector test set V.A.G 1594 C

**Work procedure**

- Oil level OK
- Engine oil temperature approximately 80 ° C.
- Remove oil pressure switch --> **Oil Pressure Switch F1 , removing and installing.**



**Fig. 516: Connecting Oil Pressure Tester V.A.G 1342 To Hole For Oil Pressure Switch**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect oil pressure tester V.A.G 1342 to hole for oil pressure switch.
- Screw oil pressure switch - 2 - into oil pressure gauge V.A.G 1342.

#### Oil pressure switch, checking

- Connect brown wire - 1 - of oil pressure gauge to Ground (GND).
- Connect voltage tester V.A.G 1527 B using adapter cables from connector test kit V.A.G 1594 C to oil pressure switch and battery plus (+).
- LED must not light up.

If LED lights up:

- Replace Oil Pressure Switch.
- Start engine.

#### NOTE:

- While starting engine, watch Pressure Tester and LED as oil pressure switch may open during start.
- At 1.2 to 1.6 bar pressure, LED must light up.

If LED does not light up:

- Replace Oil Pressure Switch.

#### Oil pressure, checking

- Start engine.
- Oil pressure at idle: min. 1.2 bar positive pressure.
- Oil pressure at 2000 RPM: min. 3.4 bar positive pressure.



**Assembling**

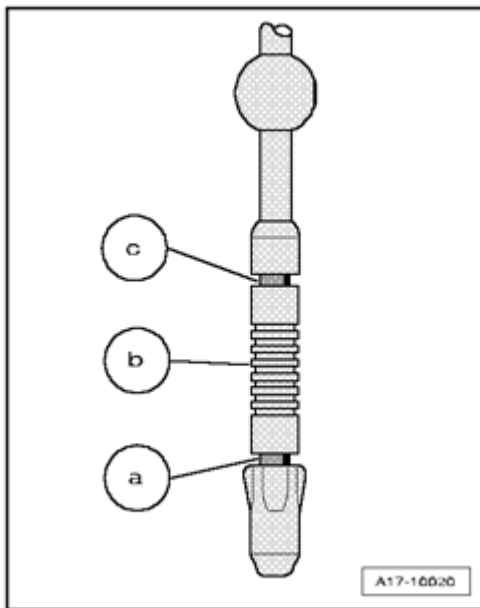
- Install oil pressure switch --> **Oil Pressure Switch F1 , removing and installing.**

**Engine oil**

Viscosity classes, oil specifications, oil capacities Maintenance tables.

**Oil level, checking****Work procedure**

- Engine oil temperature min. 60 ° C.
- Vehicle in level position.
- After stopping engine, wait a few minutes to allow oil to flow back into oil pan.
- Pull out oil dipstick, wipe off with a clean cloth and re-insert dipstick again up to stop.
- Withdraw dipstick again and read oil level.

**Range of markings on dipstick:**

**Fig. 517: Range Of Markings On Dipstick**  
**Courtesy of VOLKSWAGEN UNITED STATES, INC.**

- a - Oil must be added. After topping off, it is sufficient if oil level is somewhere in range - **b** - (shaded area).
- b - Oil may be topped off.
- c - Oil must not be added.

## **19 - ENGINE - COOLING SYSTEM**

### **COOLING SYSTEM COMPONENTS, REMOVING AND INSTALLING**

Cooling system components, removing and installing

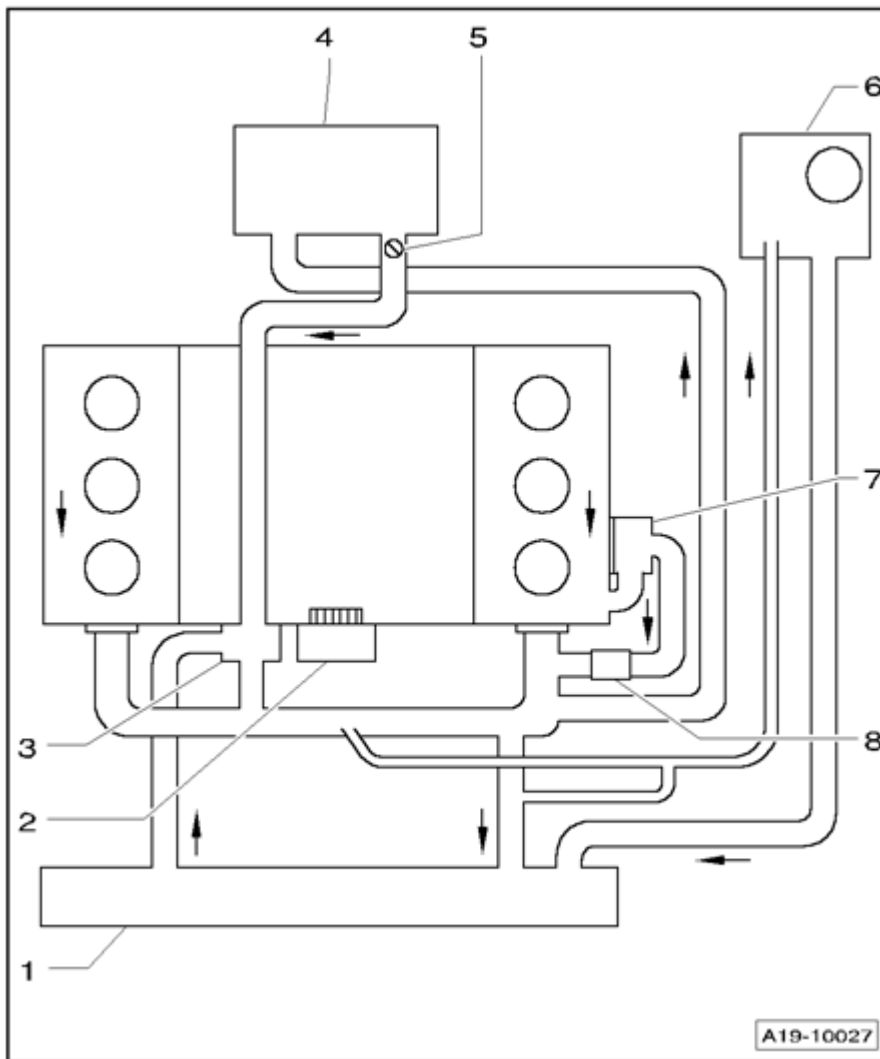
**CAUTION:** This document contains Volkswagen World Wide content. Not all of the information applies to the US and Canadian Market.

**CAUTION:** Steam can be released when the cap is removed from the expansion tank. Cover cap with a cloth and open carefully.

**NOTE:**

- When the engine is warm the cooling system is under pressure. If necessary release pressure before commencing repair work.
- Always replace gaskets and seals.
- Secure all hose connections using hose clamps appropriate for the model type .
- Arrows on coolant pipes and coolant hoses must line up across from each other.

Coolant hose connection diagram



A19-10027

**Fig. 518: Coolant Hose Connection Diagram**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

**1 - Radiator**

- Removing and installing --> **Radiator, removing and installing**
- Replace coolant after replacing

**2 - Coolant pump**

- Removing and installing --> **Coolant pump, removing and installing**

**3 - Coolant thermostat**

- Removing and installing --> **Coolant thermostat, removing and installing**
- Checking --> **Thermostat, checking**

**4 - Heater core**

- Replace coolant after replacing

**5 - Bleeder screw****6 - Expansion tank**

- With sealing cap
- Pressure relief valve in cap, checking

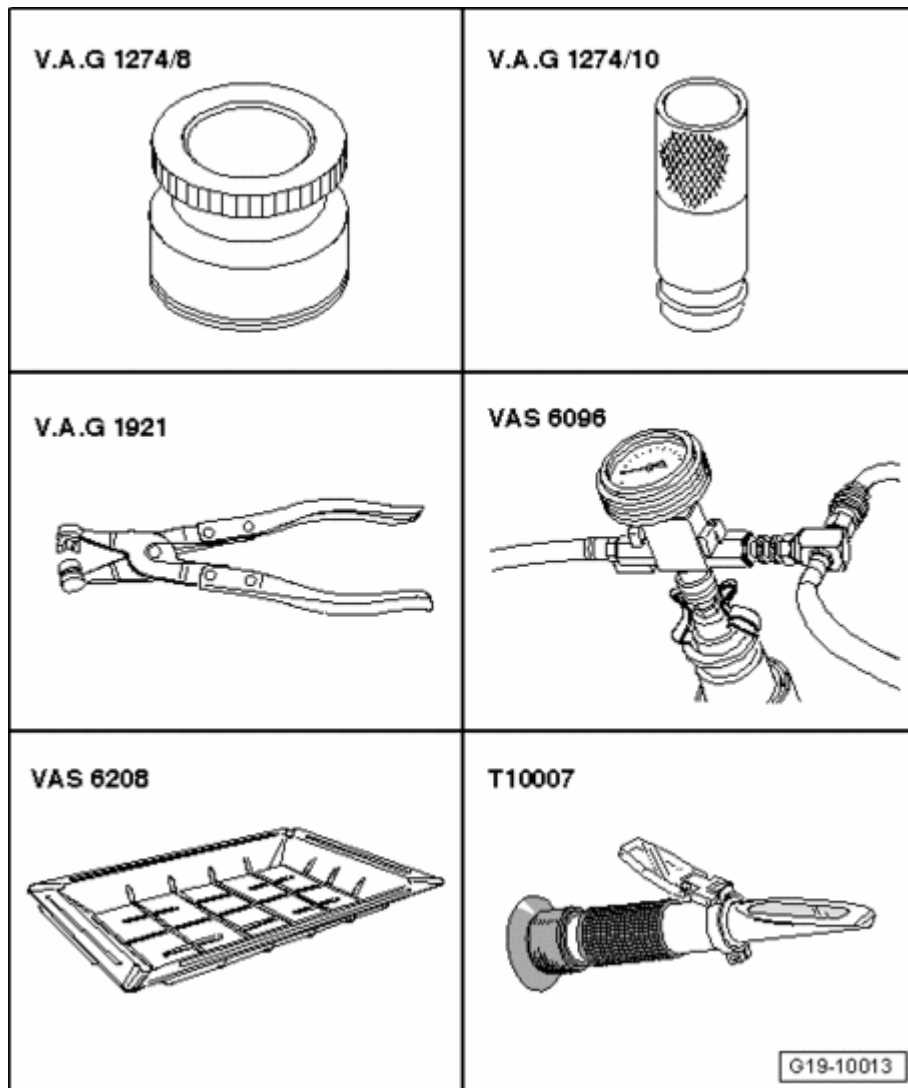
**7 - Oil cooler**

- Replace coolant after replacing
- Removing and installing --> **Oil cooler, removing and installing**

**8 - After-run coolant pump V51**

- Only for vehicles in countries with hot climates

**Cooling system, draining and filling**



**Fig. 519: Identifying Special Tools - Cooling System, Draining And Filling**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

#### Special tools, testers and auxiliary items required

- Adapter V.A.G 1274/8
- Adapter V.A.G 1274 tester V.A.G 1274/10
- Hose clamp pliers V.A.G 1921
- Cooling system charge unit VAS 6096
- Drip tray for workshop crane VAS 6208
- Refractometer T10007

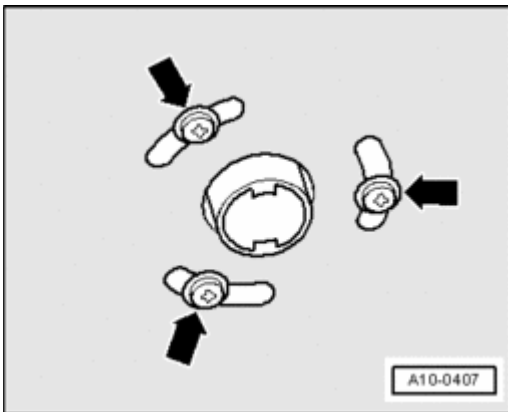
#### Draining

#### NOTE:

- Drained coolant must be stored in a clean container for disposal or reuse.

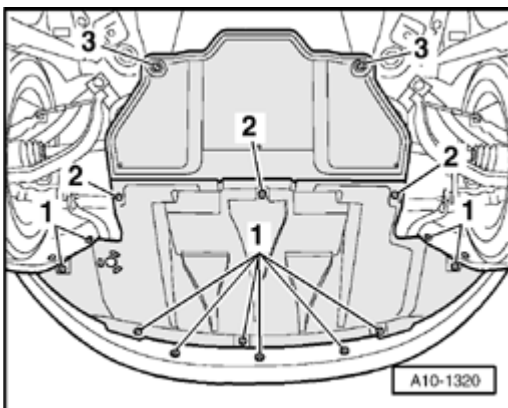
**CAUTION:** Cover cap of expansion tank with rag and open carefully, as hot steam i.e. hot coolant may escape when opening.

- Open cap of coolant expansion tank.



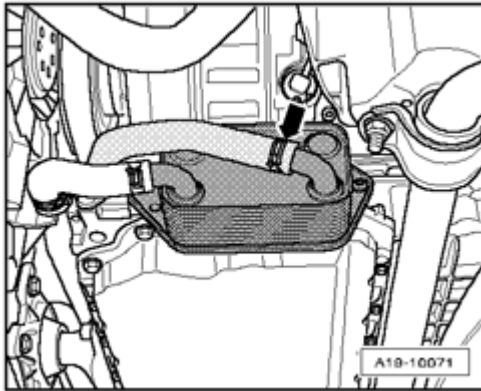
**Fig. 520: Locating Fasteners Exhaust Pipe**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- For vehicles with auxiliary heater, remove bolts - **arrows** - for exhaust pipe of parking heater/auxiliary heater on noise insulation.



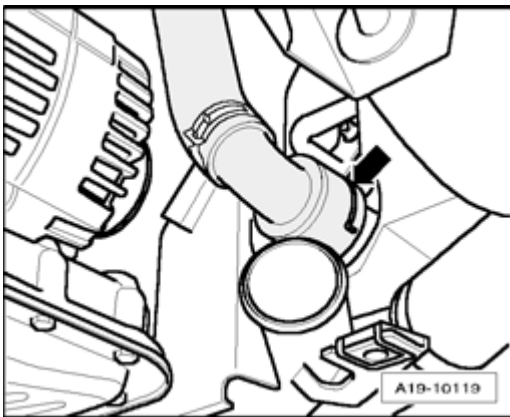
**Fig. 521: Identifying Quick-Release Fasteners And Noise Insulation**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen quick-release fasteners - **1 through 3** - and remove front and rear noise insulation.



**Fig. 522: Disconnecting Coolant Hose From Oil Cooler**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place drip tray for workshop crane VAS 6208 under engine.
- Disconnect coolant hose - **arrow** - from oil cooler and drain coolant.



**Fig. 523: Disconnecting Lower Right Coolant Hose From Radiator**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect lower right coolant hose from radiator - **arrow** - and drain residual coolant.

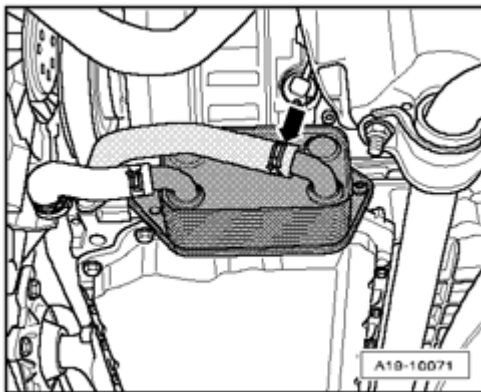
### Filling

- Ignition switched off.

### NOTE:

- The cooling system is filled all year round with a mixture of frost and corrosion protection additives and water.
- Use only *coolant additive Plus G 012 A8F A1* (short: G12+ ) "according to TL VW 774 F". Other coolant additives may above all reduce the corrosion protection effect significantly. The damage resulting from this may lead to loss of coolant and consequently to severe engine damage.
- Coolant additive G12+ can be combined with additives G11 and G12.

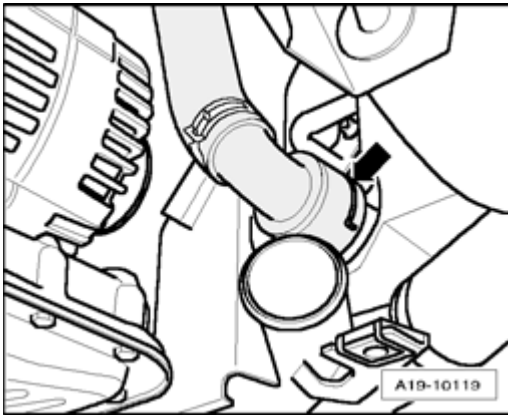
- G12+ and coolant additives with the designation "according to TL VW 774 F" reduce frost and corrosion damage as well as lime deposits. They also raise the boiling point. For this reason the system must be filled all year round with frost and corrosion protection additives.
- Because of its high boiling point, the coolant improves engine reliability under heavy loads, particularly in countries with tropical climates.
- Protection against frost must be assured to about -25 ° C (in arctic climatic countries to about -35 ° C).
- The coolant concentration must not be reduced by adding water even in warmer seasons and in warmer countries. The coolant additive portion must be at least 40%.
- If for climatic reasons greater frost protection is required, the amount of G12+ can be increased, but only up to 60% (frost protection to about -40 ° C), otherwise frost protection and cooling effectiveness will be reduced.
- Only clean drinking water may be used for mixing coolant.
- If the radiator, heater core, cylinder head and cylinder head gasket or cylinder block is replaced, completely replace the engine coolant.
- Dirty coolant must not be re-used.
- For coolant G12+ , use refractometer T10007 to test frost protection in cooling system.
- Secure all hose connections using hose clamps appropriate for the model type .
- Replace seal.



**Fig. 524: Disconnecting Coolant Hose From Oil Cooler**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

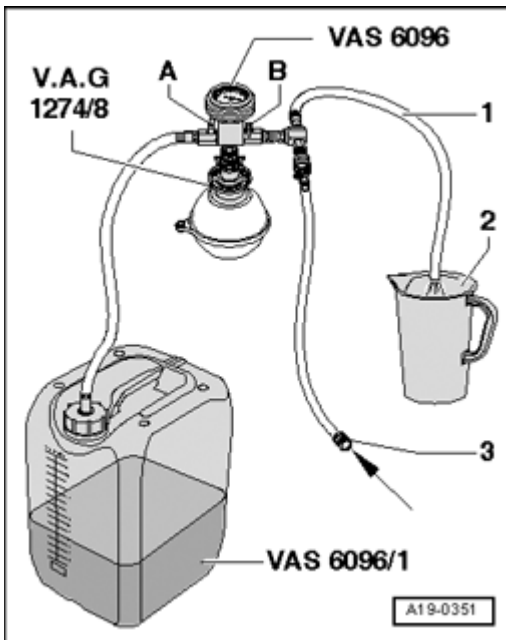
- Connect coolant hose to oil cooler - **arrow** -.





**Fig. 525: Pressing Coolant Hose Onto Lower Right Connection Of Radiator**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

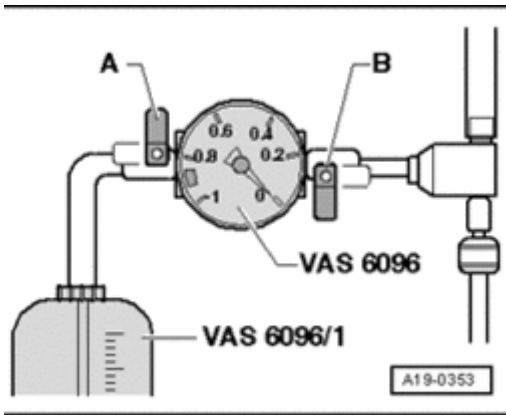
- Press coolant hose onto lower right connection of radiator - **arrow** -.



**Fig. 526: Filling Reservoir VAS 6096/1 With At Least 12 Liters Of Premixed Coolant**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Fill replacement reservoir VAS 6096/1 with at least 12 liters of pre-mixed coolant with correct mixture ratio:
  - G12+ (40%) and water (60%) for frost protection up to -25 ° C
  - G12+ (50%) and water (50%) for frost protection up to -35 ° C
  - G12+ (60%) and water (40%) for frost protection up to -40 ° C
- Place air outlet hose - **1** - into a small container - **2** -. (A small amount of coolant is drawn off which should be reserved with discharged air.)

- Close both valves - **A** - and - **B** - by turning lever perpendicular to direction of flow.
- Connect hose - **3** - to pressurized air.
- Pressure: 6 to 10 bar positive pressure.



**Fig. 527: Cooling System, Draining And Filling**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Open valve - **B** -, turn lever in direction of flow to do this.

A vacuum is created in cooling system by suction jet pump.

- Needle on instrument display must travel into green region.
- Also briefly open valve - **A** -, turn lever in direction of flow to do this, so that hose of replacement reservoir VAS 6096/1 is filled with coolant.
- Close valve - **A** - again.
- Let valve - **B** - remain open another 2 minutes.
- A further vacuum is created in the cooling system by suction jet pump.
- Needle on instrument display must still remain in green region.
- Close valve - **B** -.
- Needle in display instrument must remain in green region, then sufficient vacuum in cooling system is obtained for the upcoming filling.

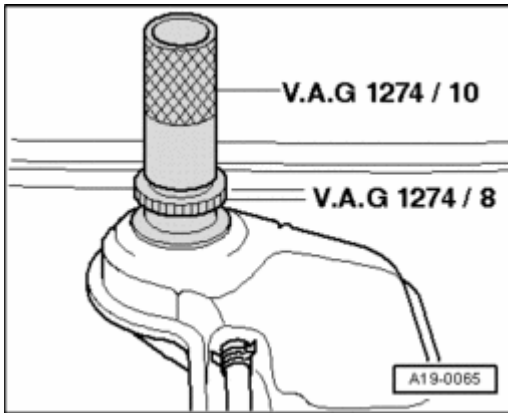
If needle stands below green region, repeat procedure.

If vacuum decreases, cooling system is leaking.

- Disconnect pressurized air hose.
- Open valve - **A** -.

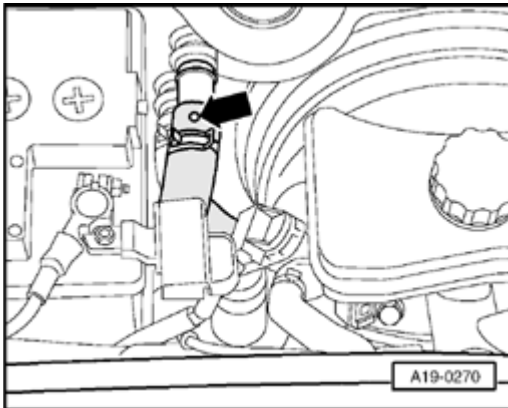
The vacuum in cooling system has the effect of extracting coolant from coolant reservoir VAS 6096/1 ; cooling system is filled.

- Detach cooling system filler unit VAS 6096 from coolant expansion tank.



**Fig. 528: Connecting Adapter For Cooling System Tester V.A.G 1274/10 To Adapter V.A.G 1274/8**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

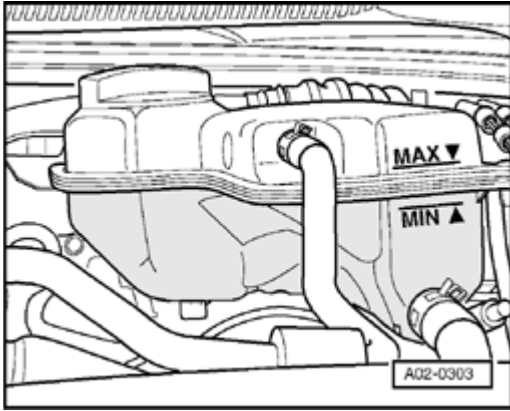
- Connect adapter for VAG1274 tester V.A.G 1274/10 to adapter V.A.G 1274/8.



**Fig. 529: Loosening Coolant Hose To Heater Core**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen coolant hose to heater core and pull back hose sufficiently so that the bleeder hole - **arrow** - in coolant hose is no longer sealed by the connection.
- Fill up coolant until it escapes from coolant hose bleeder hole.
- Push coolant hose onto connection and secure it with spring-type clamp.
- If present, switch on auxiliary heater for about 30 seconds.
- Twist cap for expansion tank closed.
- Start engine.
- Set heating air conditioning system to "HI".
- Let engine run at 2000 RPM for 3 minutes.

- Let engine run at idle long enough until both large coolant hoses on main cooler are warm.
- Let engine run at 2000 RPM for 1 minute.
- Turn off engine and allow it to cool off.

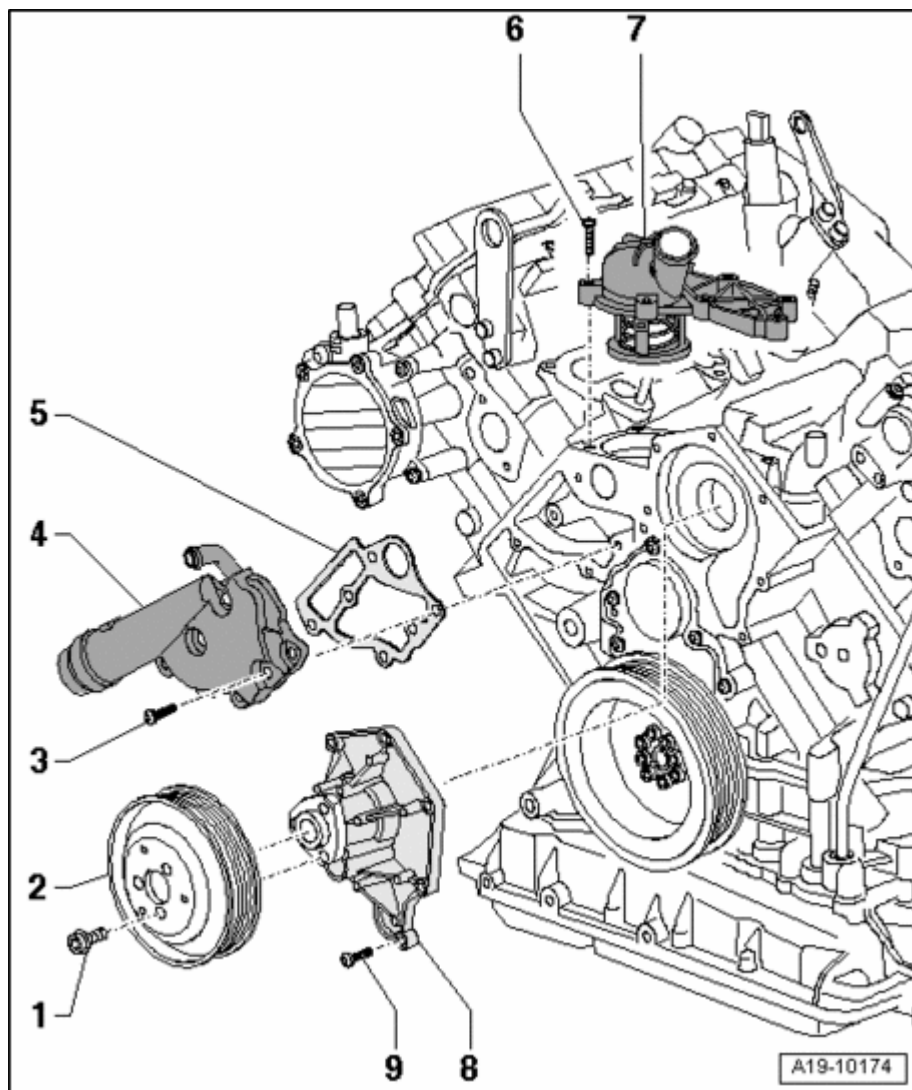


**Fig. 530: Checking Coolant Level**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check coolant level.
  - With cold engine, coolant level must be at MAX marking.
  - Coolant level may be above MAX marking with engine at operating temperature.

**Thermostat, coolant pump, connecting pieces, component overview**



**Fig. 531: Thermostat, Coolant Pump, Connecting Pieces, Component Overview**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - 20 Nm

2 - Ribbed belt pulley for coolant pump

3 - 9 Nm

4 - Connecting piece

- For coolant hose

5 - Gasket

- Replace

6 - 9 Nm

7 - Coolant thermostat

- Removing and installing --> **Coolant thermostat, removing and installing**
- Checking --> **Thermostat, checking**

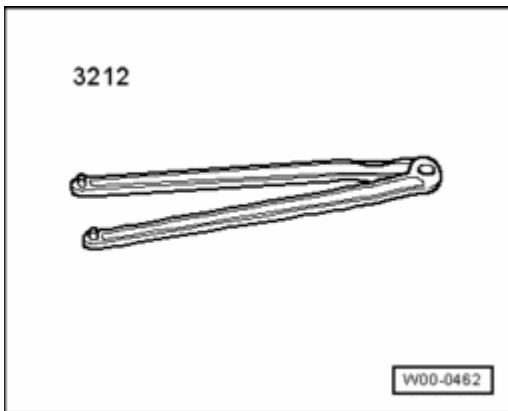
8 - Coolant pump

- With gasket
- Removing and installing --> **Coolant pump, removing and installing**

9 - 9 Nm

**Coolant pump, removing and installing**

**Special tools, testers and auxiliary items required**

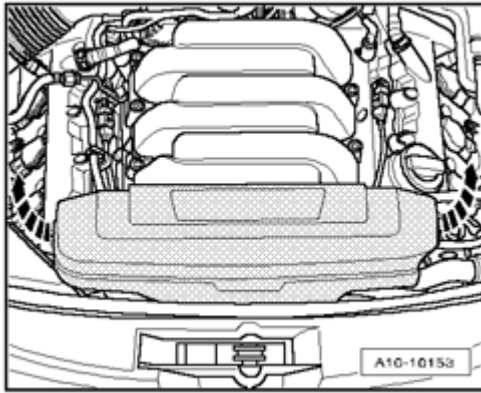


**Fig. 532: Pin Wrench 3212**

**Courtesy of VOLKSWAGEN UNITED STATES, INC.**

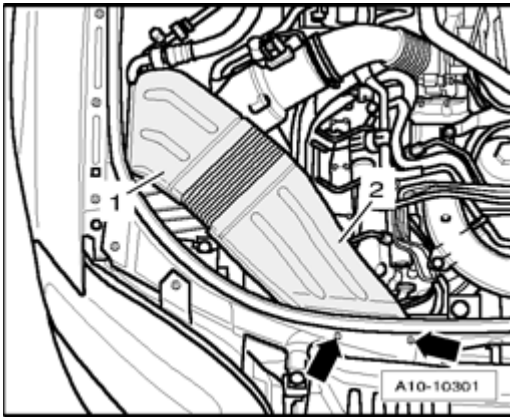
- Pin wrench 3212

**Removing**



**Fig. 533: Identifying Front Engine Cover**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front engine cover - **arrows** -.

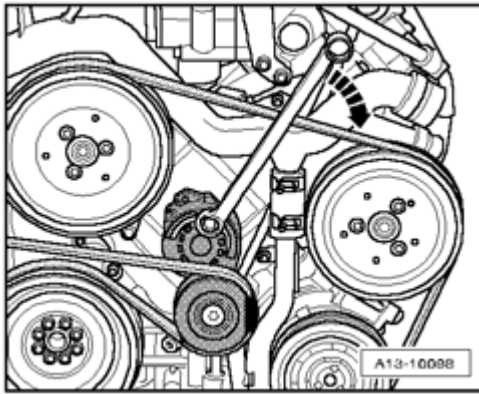


**Fig. 534: Identifying Bolts & Air Duct**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Remove air duct - **1** - and - **2** -.
- Drain coolant --> **Cooling system, draining and filling.**
- Remove front bumper cover -->
  - **63 BUMPER**
  - **63 - BUMPERS** for BODY EXTERIOR - CABRIOLET
- Bring lock carrier into service position -->
  - **50 BODY, FRONT**
  - **50 - BODY - FRONT** for BODY EXTERIOR - CABRIOLET

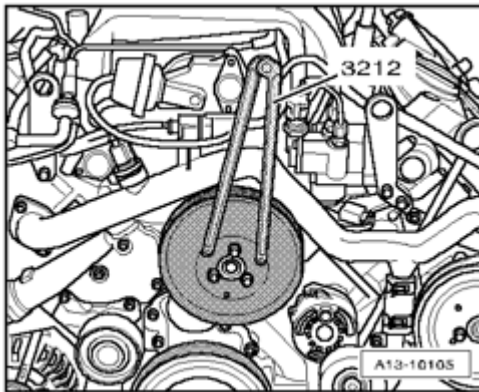
**NOTE:**

- Before removing ribbed belt, mark the turning direction on it with chalk or a felt tip pen. A reversed turning direction can cause damage to the belt under operating conditions.



**Fig. 535: Pivoting Tensioning Device To Relieve Tension On Ribbed Belt**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

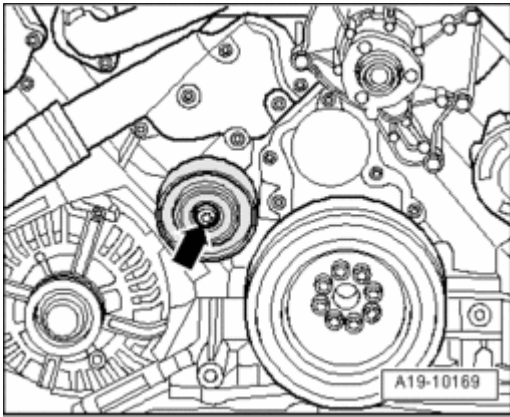
- Pivot tensioning device in direction of - **arrow** - to relieve tension on ribbed belt.
- Remove ribbed belt from coolant pump.
- Release tensioner unit



**Fig. 536: Loosening Bolts Use Spanner Wrench 3212 To Counter-Hold**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- When loosening bolts use Spanner Wrench 3212 to counter-hold.
- Remove ribbed belt pulley from coolant pump.
- Pry off cover cap.

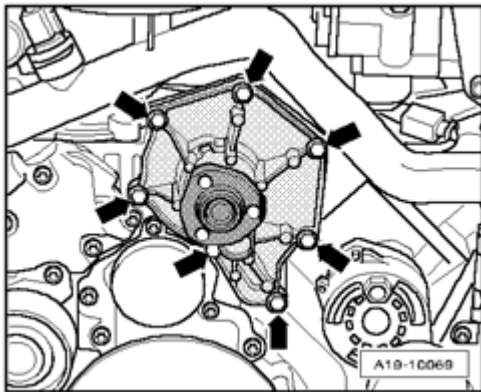




**Fig. 537: Disconnecting Idler Roller**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - **arrows** - and disconnect idler roller.



**Fig. 538: Removing Bolts For Coolant Pump And Coolant Pump**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - for coolant pump and remove coolant pump.

### Installing

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

- Clean sealing surfaces so they are completely free of any oil or grease.

### NOTE:

- If the previously used coolant pump is reinstalled, apply a 1.5 mm thick sealant bead to the cleaned sealing surface in addition to the seal that has been vulcanized on.

- Install ribbed belt **Installing**.
- Install lock carrier with attachments -->

### ● **50 BODY, FRONT**

- **50 - BODY - FRONT** for BODY EXTERIOR - CABRIOLET

- Install front bumper cover -->

- **63 BUMPER**

- **63 - BUMPERS** for BODY EXTERIOR - CABRIOLET

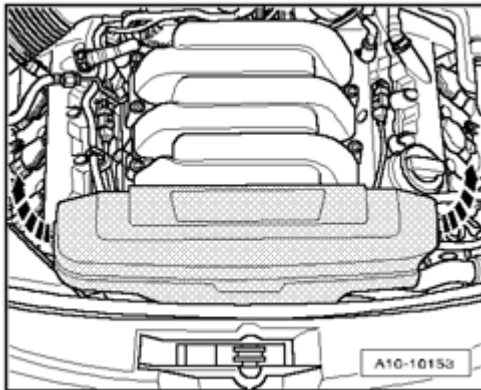
- Fill with coolant --> **Cooling system, draining and filling.**

### Torque specifications

| Component                          | Nm |
|------------------------------------|----|
| Coolant pump to cylinder block     | 9  |
| Ribbed belt pulley to coolant pump | 20 |
| Idler roller to cylinder block     | 40 |

### Coolant thermostat, removing and installing

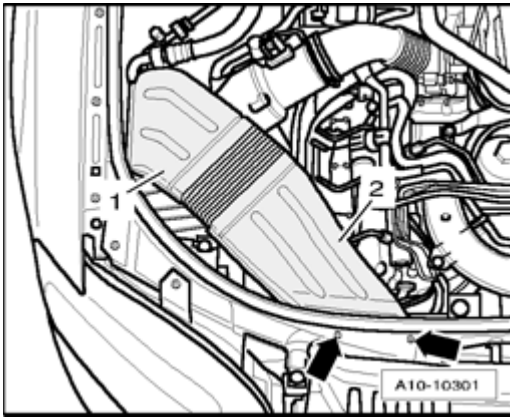
#### Removing



**Fig. 539: Identifying Front Engine Cover**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front engine cover - **arrows** -.



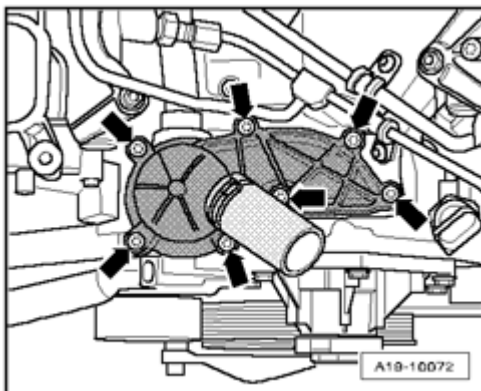
**Fig. 540: Identifying Bolts & Air Duct**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Remove air duct - **1** - and - **2** -.
- Drain coolant --> **Cooling system, draining and filling.**
- Remove front bumper cover -->
  - **63 BUMPER**
  - **63 - BUMPERS** for BODY EXTERIOR - CABRIOLET
- Bring lock carrier into service position -->
  - **50 BODY, FRONT**
  - **50 - BODY - FRONT** for BODY EXTERIOR - CABRIOLET
- Remove upper part of intake manifold --> **24 - FUEL INJECTION SYSTEM** .
- Remove front coolant pipe --> **Front coolant line, removing and installing.**

**NOTE:**

- **Place a rag beneath to catch escaping coolant.**



**Fig. 541: Remove Bolts & Thermostat**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Remove thermostat with connecting piece.

**Installing**

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

**NOTE:**

- **Replace seals.**

- Install front coolant pipe --> **Front coolant line, removing and installing.**
- Install intake manifold upper-part --> **24 - FUEL INJECTION SYSTEM**.
- Install lock carrier with attachments -->
  - **50 BODY, FRONT**
  - **50 - BODY - FRONT** for BODY EXTERIOR - CABRIOLET
- .
- Install front bumper cover -->
  - **63 BUMPER**
  - **63 - BUMPERS** for BODY EXTERIOR - CABRIOLET
- .
- Fill with coolant --> **Cooling system, draining and filling.**

**Torque specifications**

| Component                                          | Nm |
|----------------------------------------------------|----|
| Thermostat with connecting piece to cylinder block | 9  |

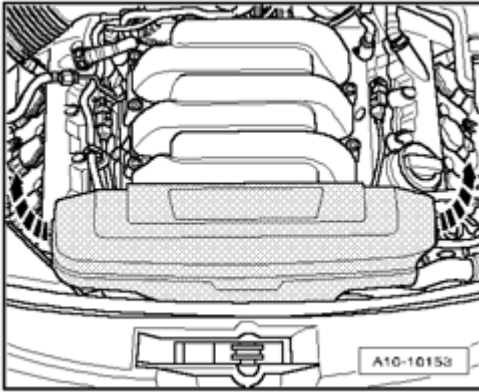
**Thermostat, checking**

- Heat up removed thermostat in water.

| Opening begins                                                                      | Opening ends                  | Opening lift |
|-------------------------------------------------------------------------------------|-------------------------------|--------------|
| approx. 87 ° C                                                                      | approx. 102 ° C <sup>1)</sup> | min. 8 mm    |
| <ul style="list-style-type: none"> <li>• <sup>1)</sup> Cannot be tested.</li> </ul> |                               |              |

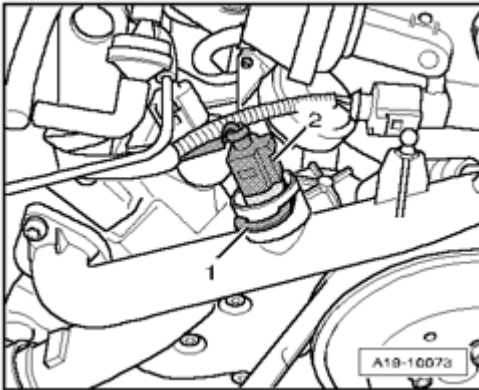
**Engine Coolant Temperature (ECT) Sensor G62 , removing and installing****Removing**

- Drain coolant --> Cooling system, draining and filling.



**Fig. 542: Identifying Front Engine Cover**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front engine cover - **arrows** -.



**Fig. 543: Disconnecting Electrical Connector, Retaining Clip And Engine Coolant Temperature (ECT) Sensor G62**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **2** - on Engine Coolant Temperature (ECT) Sensor G62.
- Remove retaining clip - **1** - and Engine Coolant Temperature (ECT) Sensor G62.

## Installing

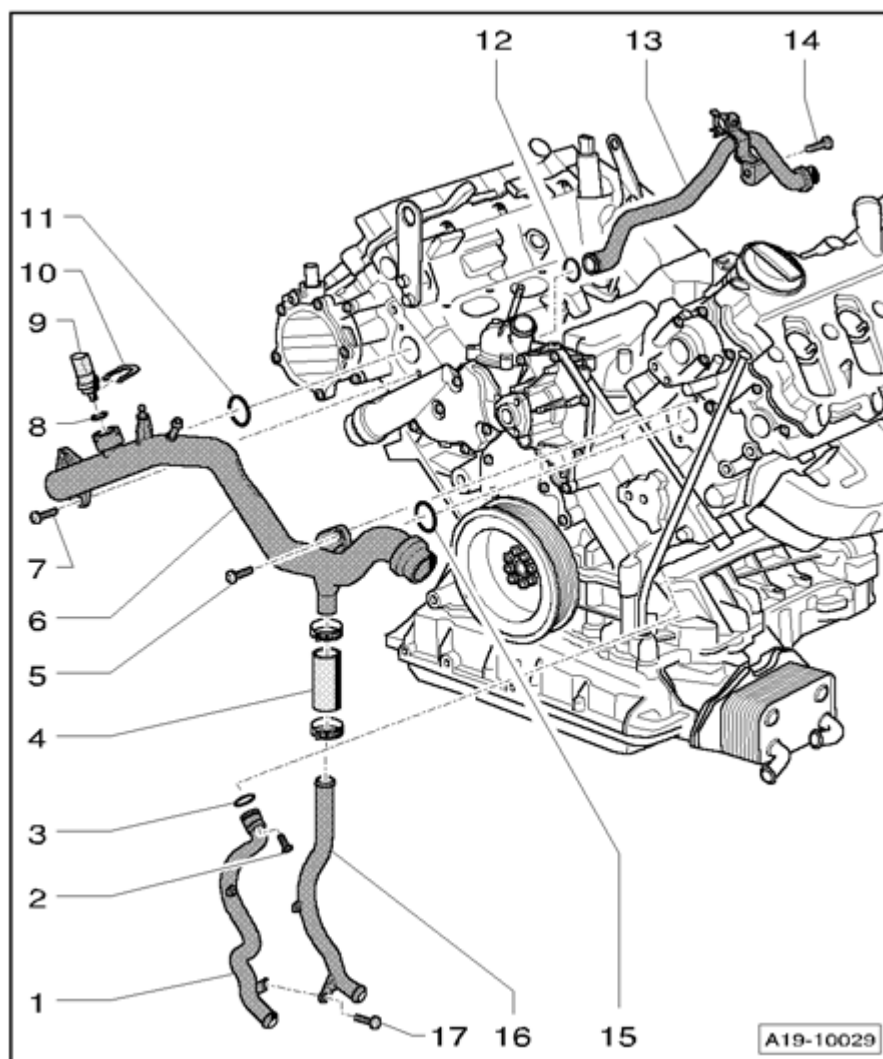
Installation is in reverse order of removal, note the following:

### NOTE:

- **Replace O-ring.**

- Fill with coolant --> Cooling system, draining and filling.

## Coolant pipes, component overview



**Fig. 544: Coolant Pipes, Component Overview**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 1 - Left coolant line
- 2 - 9 Nm
- 3 - O-ring
  - Replace
- 4 - Connecting hose
- 5 - 9 Nm
- 6 - Front coolant line

- Removing and installing --> **Front coolant line, removing and installing**

7 - 9 Nm

8 - O-ring

- Replace

9 - Engine Coolant Temperature (ECT) Sensor G62

10 - Retaining clip

11 - Seal

- Replace

12 - O-ring

- Replace

13 - Upper coolant line

- Removing and installing --> **Upper coolant pipe, not for US vehicles, removing and installing**

14 - 9 Nm

15 - Seal

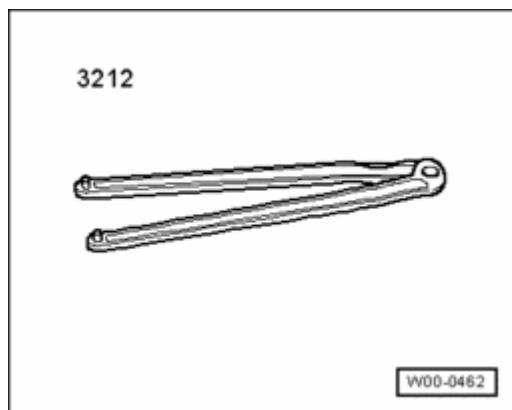
- Replace

16 - Left coolant line

17 - 9 Nm

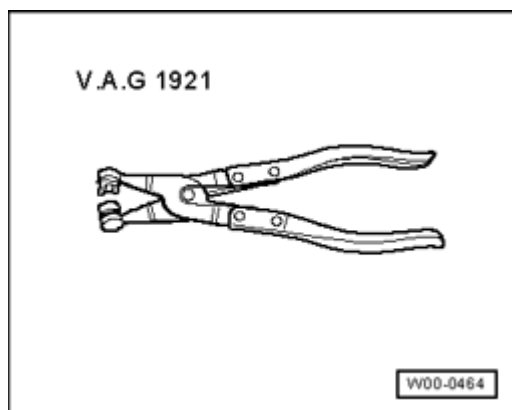
**Front coolant line, removing and installing**

**Special tools, testers and auxiliary items required**

**Fig. 545: Pin Wrench 3212**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

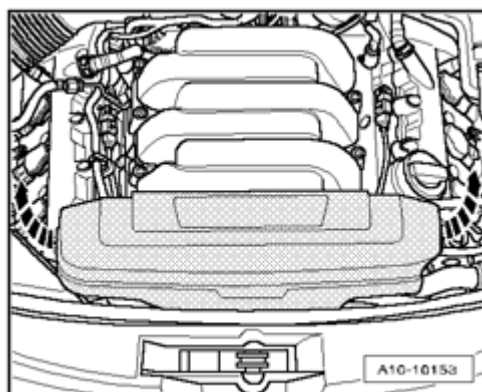
- Pin wrench 3212

**Fig. 546: Identifying Hose Clip Pliers Vag 1921**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hose clamp pliers V.A.G 1921

## Removing

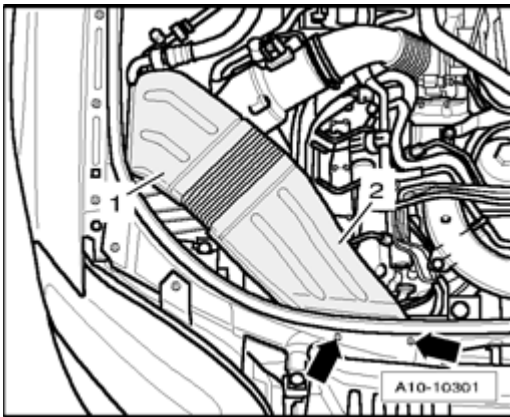




**Fig. 547: Identifying Front Engine Cover**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

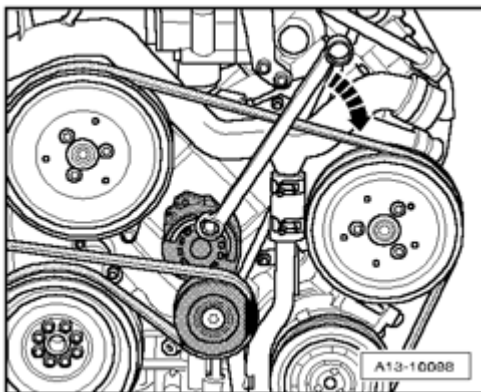
- Remove front engine cover - **arrows** -.



**Fig. 548: Identifying Bolts & Air Duct**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Remove air duct - **1** - and - **2** -.
- Drain coolant --> **Cooling system, draining and filling.**
- Remove front bumper cover -->
  - **63 BUMPER**
  - **63 - BUMPERS** for BODY EXTERIOR - CABRIOLET
- Bring lock carrier into service position -->
  - **50 BODY, FRONT**
  - **50 - BODY - FRONT** for BODY EXTERIOR - CABRIOLET

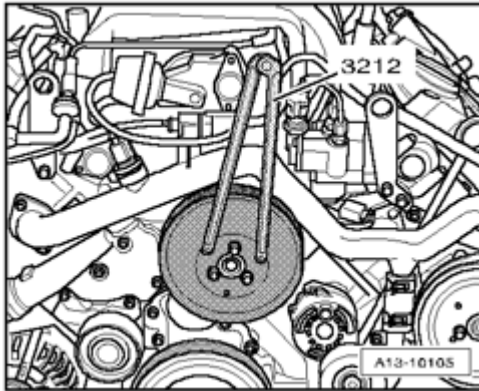


**Fig. 549: Pivoting Tensioning Device To Relieve Tension On Ribbed Belt**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

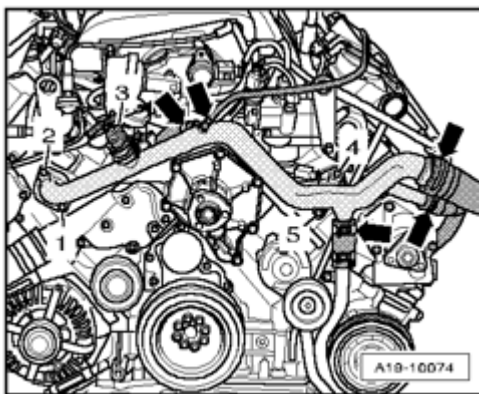
**NOTE:**

- Before removing ribbed belt, mark the turning direction on it with chalk or a felt tip pen. A reversed turning direction can cause damage to the belt under operating conditions.
- Pivot tensioning device in direction of - **arrow** - to relieve tension on ribbed belt.
- Remove ribbed belt from the coolant pump.
- Release tensioner unit



**Fig. 550: Loosening Bolts Use Spanner Wrench 3212 To Counter-Hold**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove ribbed belt pulley from coolant pump.
- When loosening bolts use spanner wrench 3212 to counter-hold.



**Fig. 551: Disconnecting Coolant Hoses From Front Coolant Pipe**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **3** -.
- Disconnect coolant hoses - **arrows** - from front coolant pipe.
- Remove bolts - **1** - , - **2** - , - **4** - and - **5** - and remove front coolant pipe.

## Installing

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

### NOTE:

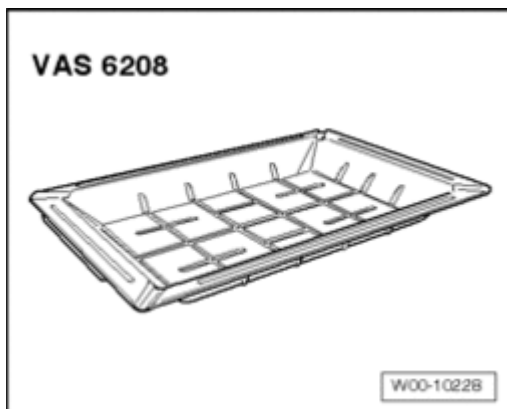
- **Replace seals and O-rings.**
- **Secure all hose connections using hose clamps appropriate for the model type .**
- Clean and/or smooth O-ring sealing surface before installing.
- Moisten new O-ring with G12+ and push onto coolant pipe.
- Install ribbed belt **Installing**.
- Install lock carrier with attachments -->
  - **50 BODY, FRONT**
  - **50 - BODY - FRONT** for BODY EXTERIOR - CABRIOLET
- Install front bumper cover -->
  - **63 BUMPER**
  - **63 - BUMPERS** for BODY EXTERIOR - CABRIOLET
- Fill with coolant --> **Cooling system, draining and filling.**

## Torque specifications

| Component                          | Nm |
|------------------------------------|----|
| Front coolant pipe to engine       | 9  |
| Ribbed belt pulley to coolant pump | 20 |

Left coolant pipes, removing and installing

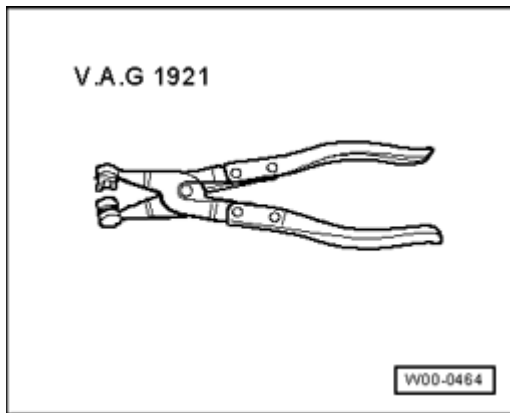
## Special tools, testers and auxiliary items required



**Fig. 552: Drip Tray For VAS 6100, VAS 6208**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

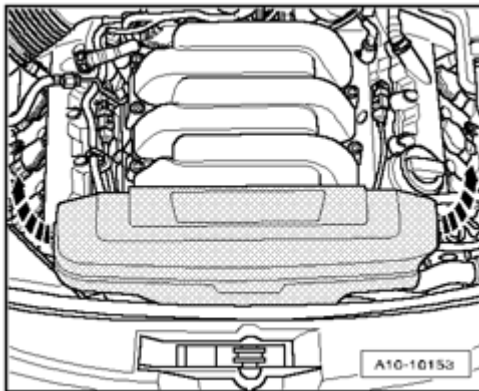
- Drip tray for workshop crane VAS 6208

**Fig. 553: Identifying Hose Clip Pliers Vag 1921**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

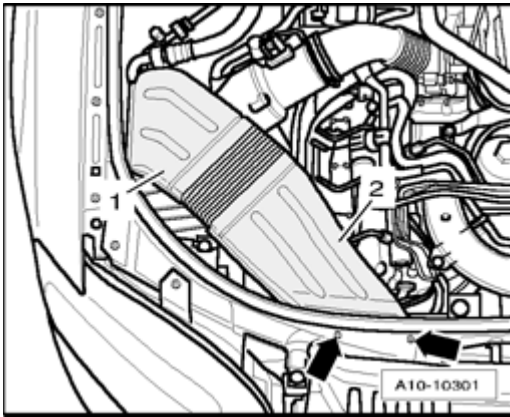
- Hose clamp pliers V.A.G 1921

### Removing

**Fig. 554: Identifying Front Engine Cover**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

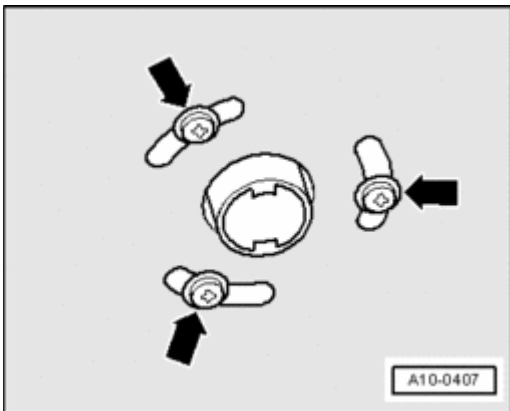
- Remove front engine cover - **arrows** -.



**Fig. 555: Identifying Bolts & Air Duct**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

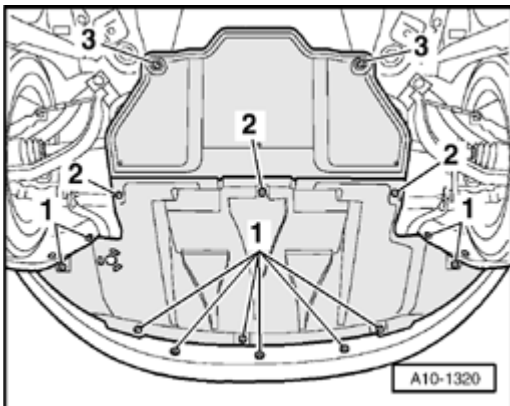
- Remove bolts - **arrows** -.
- Remove air duct - **1** - and - **2** -.



**Fig. 556: Locating Fasteners Exhaust Pipe**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- For vehicles with auxiliary heater, remove bolts - **arrows** - for exhaust pipe of parking heater/auxiliary heater on noise insulation.



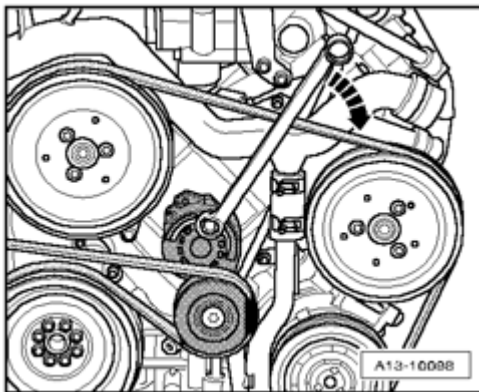
**Fig. 557: Identifying Quick-Release Fasteners And Noise Insulation**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen quick-release fasteners - **1** - and - **2** - and remove front noise insulation. Rear section of noise insulation remains installed.
- Remove front bumper cover -->
  - **63 BUMPER**
  - **63 - BUMPERS** for BODY EXTERIOR - CABRIOLET
- Bring lock carrier into service position -->
  - **50 BODY, FRONT**
  - **50 - BODY - FRONT** for BODY EXTERIOR - CABRIOLET
- Remove oil cooler --> **Oil cooler, removing and installing.**

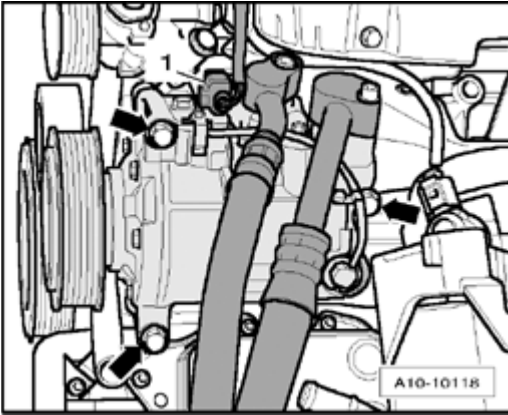
**NOTE:**

- Before removing ribbed belt, mark the turning direction on it with chalk or a felt tip pen. A reversed turning direction can cause damage to the belt under operating conditions.

**Fig. 558: Pivoting Tensioning Device To Relieve Tension On Ribbed Belt**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pivot tensioning device in direction of - **arrow** - to relieve tension on ribbed belt.
- Remove ribbed belt from the coolant pump.
- Release tensioner unit



**Fig. 559: Separating Connector For Wiring To Air Conditioning Compressor Clutch Solenoid**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Separate connector - 1 - for wiring to air conditioning compressor clutch solenoid.

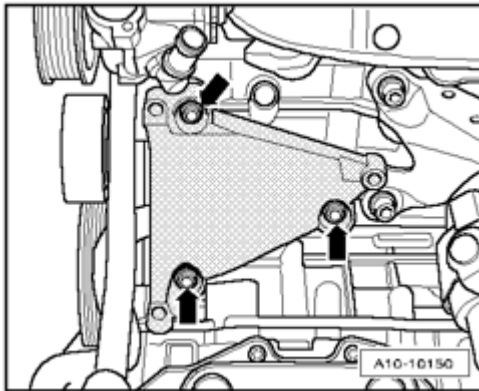
**CAUTION:** The air conditioning refrigerant circuit must not be opened.

- Remove air conditioning compressor from bracket - **arrows** -.

**NOTE:**

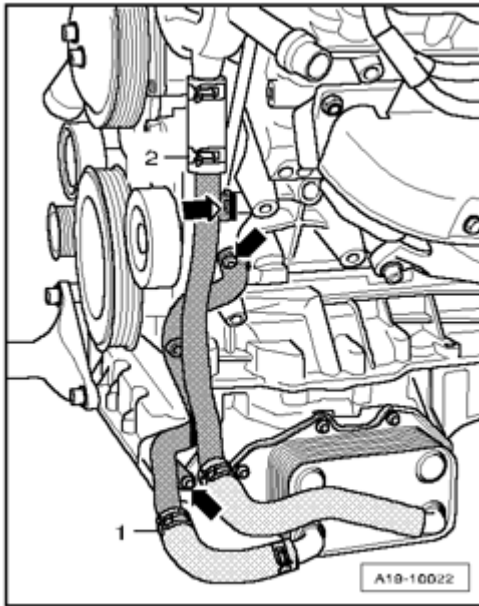
- To prevent damage to the refrigerant lines/hoses, ensure that the lines and hoses are not stretched, kinked or bent.

- Hang up air conditioning compressor with attached lines on left side of vehicle.



**Fig. 560: Removing Bolts And Air Conditioning Compressor Bracket**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and remove air conditioning compressor bracket.



**Fig. 561: Removing Bolts And Coolant Pipe From Engine**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and remove coolant pipe from engine - **2** -.

**NOTE:**

- Ignore - **1** -.

**Installing**

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

**NOTE:**

- **Replace O-rings.**
- **Secure all hose connections using hose clamps appropriate for the model type .**

- Clean and/or smooth O-ring sealing surface before installing.
- Moisten new O-ring with G12+ and push onto coolant pipe.
- Install A/C compressor --> **87 AIR CONDITIONING** .
- Install ribbed belt **Installing**.
- Install oil cooler --> **Oil cooler, removing and installing**.
- Install lock carrier with attachments -->
  - **50 BODY, FRONT**
  - **50 - BODY - FRONT** for BODY EXTERIOR - CABRIOLET
- Install front bumper cover -->



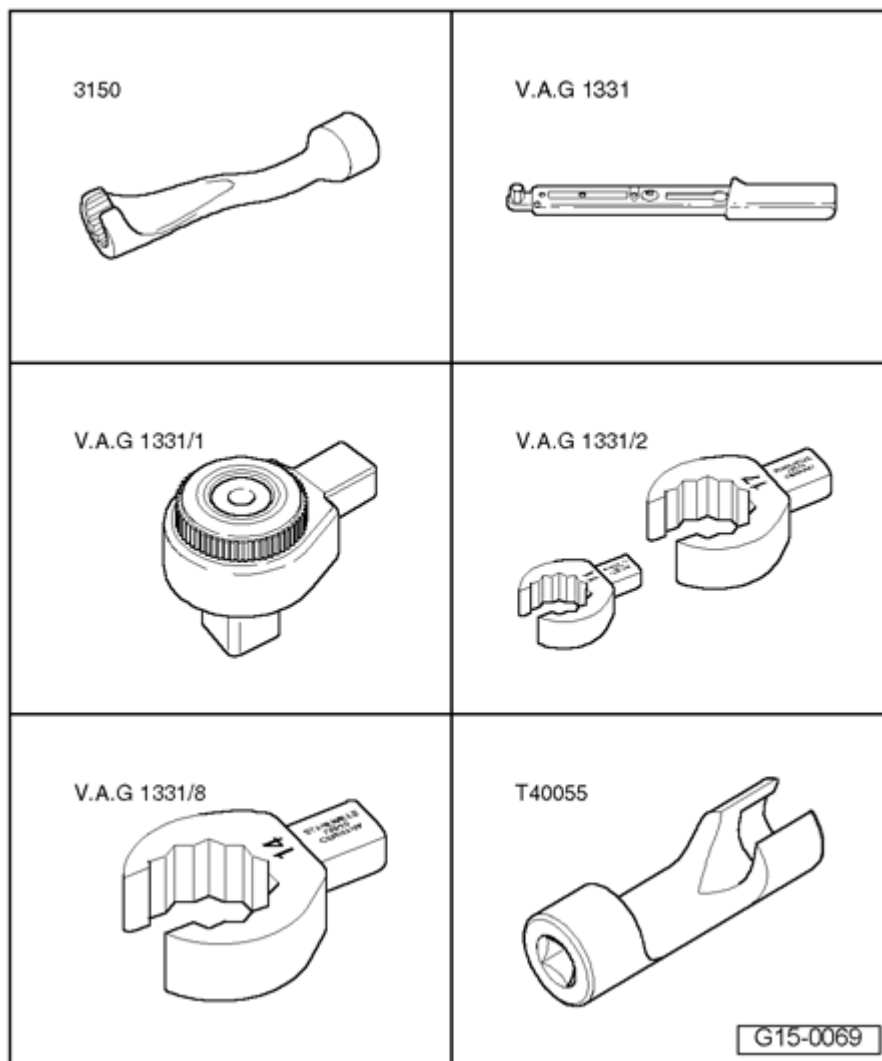
- **63 BUMPER**
- **63 - BUMPERS** for BODY EXTERIOR - CABRIOLET

- Fill with coolant --> **Cooling system, draining and filling.**

### Torque specifications

| Component                                    | Nm |
|----------------------------------------------|----|
| Coolant pipes to engine                      | 9  |
| Bracket for A/C compressor to cylinder block | 20 |

### Upper coolant pipe, not for US vehicles, removing and installing



**Fig. 562: Identifying Special Tools - Upper Coolant Pipe, Not For Us Vehicles, Removing And Installing**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

**Special tools, testers and auxiliary items required**

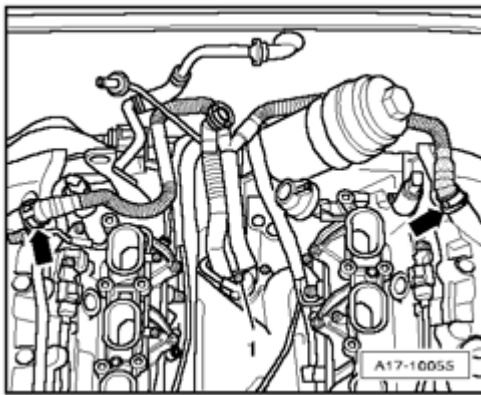
- Socket 14 mm 3150
- Torque wrench V.A.G 1331
- Ratchet V.A.G 1331/1
- Open end wrench socket 17 mm V.A.G 1331/2
- Open end wrench socket 17 mm V.A.G 1331/8
- Socket 14 mm T40055

**Removing****NOTE:**

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

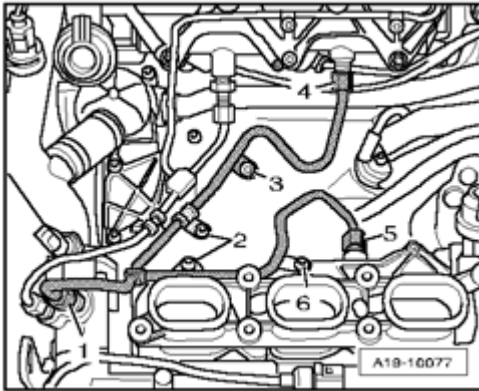
- Drain coolant --> Cooling system, draining and filling.
- Remove upper part of intake manifold --> 24 - FUEL INJECTION SYSTEM .

**CAUTION:** Fuel system is under high pressure! Before opening high pressure components of the fuel injection system, pressure must be relieved to residual pressure --> Procedure that must be performed before opening the high-pressure fuel injection system - Pay close attention!. Then wrap a clean rag around the connection and relieve residual pressure by carefully loosening the connection.



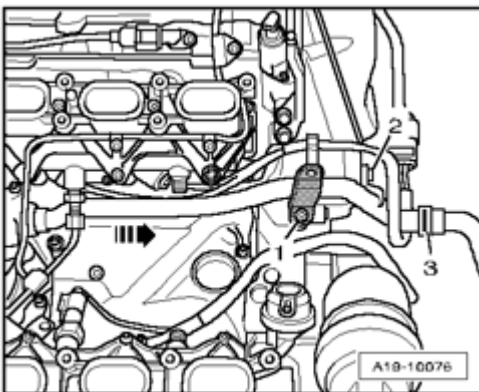
**Fig. 563: Disconnecting Crankcase Ventilation Hoses At Cylinder Head Covers**  
**Courtesy of VOLKSWAGEN UNITED STATES, INC.**

- Disconnect crankcase ventilation hoses - **arrows** - at cylinder head covers.
- Free up crankcase ventilation hoses.
- Remove bolt - **1** - and remove connecting piece with crankcase ventilation hoses.



**Fig. 564: Identifying Union Nuts & High-Pressure Lines**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove high-pressure line, thereby removing bolts and union nuts - **1 through 6** -.



**Fig. 565: Removing Bolts And Pulling Coolant Pipe Rearward And Out Of Cylinder Block**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place a rag under coolant pipe to catch escaping coolant.
- Disconnect coolant hose - **3** - from coolant pipe.
- Remove bolts - **1** - and - **2** - and pull coolant pipe rearward and out of the cylinder block - **arrow** -.

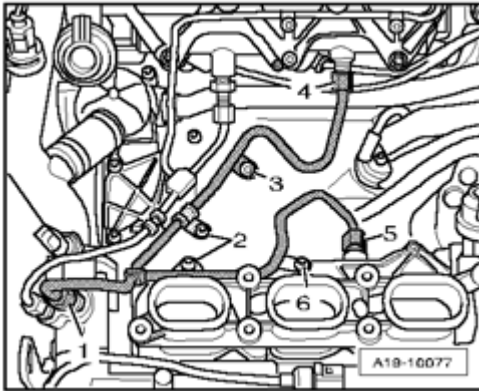
## Installing

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

### NOTE:

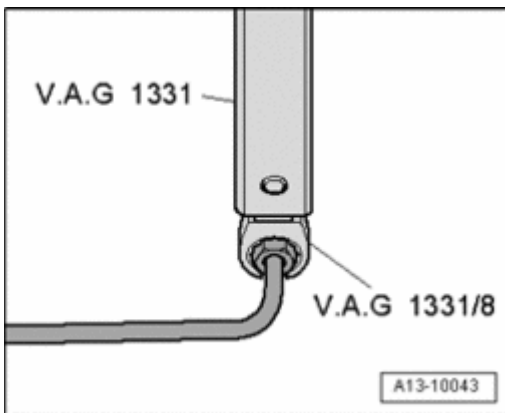
- **Replace O-ring.**
- **During installation, all cable ties must be re-installed at the same location.**

- Clean and/or smooth O-ring sealing surface before installing.
- Moisten new O-ring with G12+ and push onto coolant pipe.



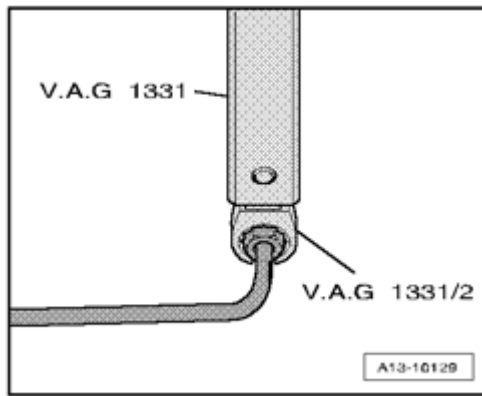
**Fig. 566: Identifying Union Nuts & High-Pressure Lines**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hand-tighten union nuts - 1 - , - 4 - and - 5 - of high-pressure lines, and then for lines - 2 - , - 3 - and - 6 -.
- Make sure high-pressure lines are seated free of stress.



**Fig. 567: Fastening High-Pressure Line At Fuel Rail Using Torque Wrench V.A.G 1331 With Open End Wrench Socket V.A.G 1331/8**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

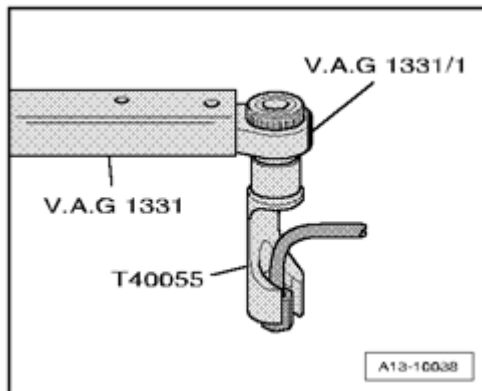
- To fasten high-pressure line (14 mm) at fuel rail use torque wrench V.A.G 1331 with 14 mm open end wrench socket V.A.G 1331/8.



**Fig. 568: Fastening High-Pressure Line At Fuel Rail Using Torque Wrench V.A.G 1331 With Open End Wrench Socket V.A.G 1331/2**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- To fasten high-pressure line (17 mm) at fuel rail use torque wrench V.A.G 1331 with 17 mm open end wrench socket V.A.G 1331/2.



**Fig. 569: Fastening High-Pressure Line At High Pressure Pump Using Torque Wrench V.A.G 1331 With Ratchet V.A.G 1331/1 And Socket 17 Mm T40055**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

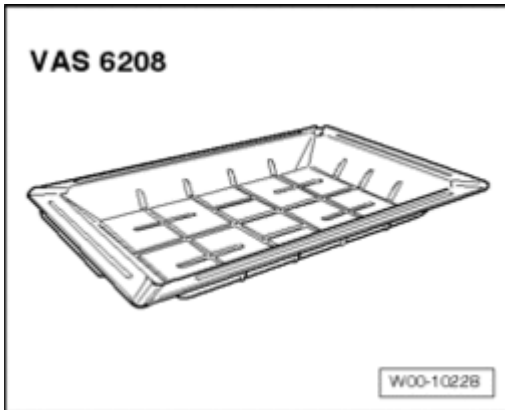
- To fasten high-pressure line (17 mm) at high pressure pump use torque wrench V.A.G 1331 with ratchet V.A.G 1331/1 and socket 17 mm T40055.
- Install intake manifold upper-part --> **24 - FUEL INJECTION SYSTEM** .
- Fill with coolant --> **Cooling system, draining and filling.**

### Torque specifications

| Component              |                    | Nm |
|------------------------|--------------------|----|
| Coolant pipe to engine |                    | 9  |
| High-pressure lines    | High pressure pump | 25 |
| to                     | Fuel rail          | 25 |

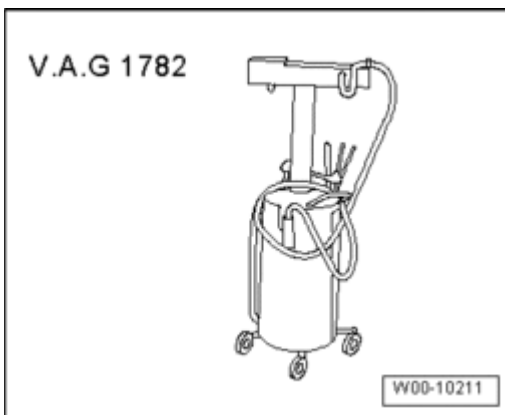
Connecting pieces for crankcase ventilation hoses to cover

6

**Radiator, removing and installing****Special tools, testers and auxiliary items required**

**Fig. 570: Drip Tray For VAS 6100, VAS 6208**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

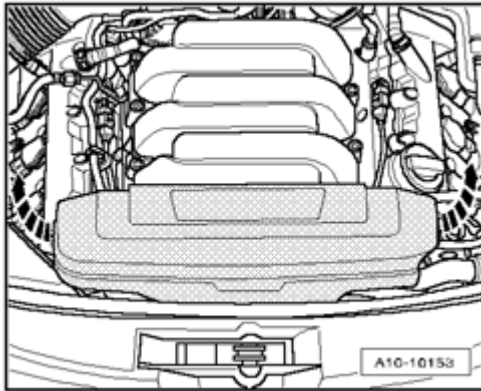
- Drip tray for workshop crane VAS 6208



**Fig. 571: Identifying Old Oil Collecting And Extracting Device V.A.G 1782**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Old oil collecting and extracting device V.A.G 1782

**Removing**

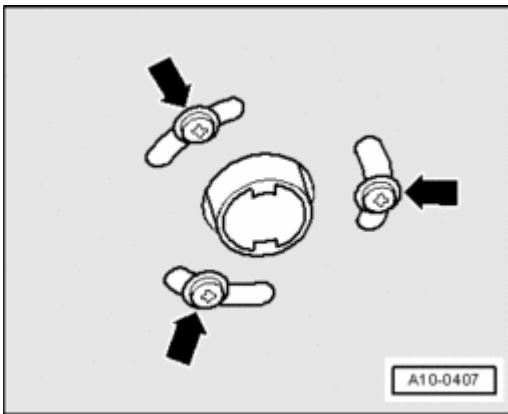


**Fig. 572: Identifying Front Engine Cover**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front engine cover - **arrows** -.

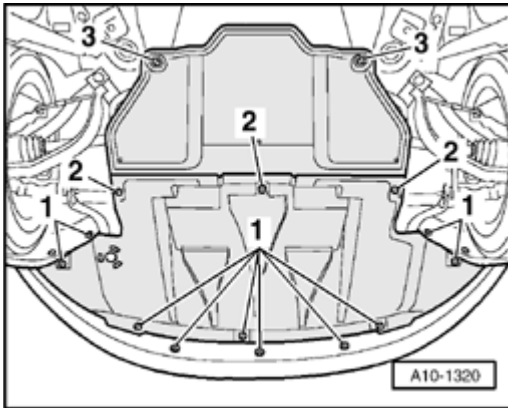
**CAUTION:** Cover cap of expansion tank with rag and open carefully, as hot steam i.e. hot coolant may escape when opening.

- Open cap of coolant expansion tank.



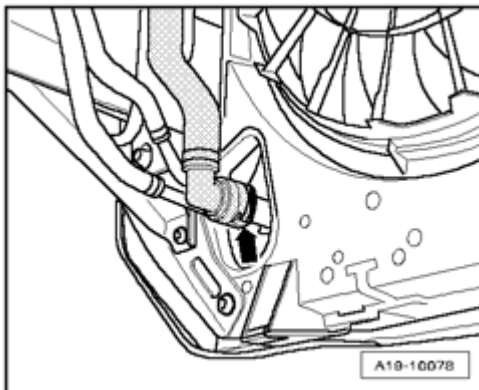
**Fig. 573: Locating Fasteners Exhaust Pipe**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- For vehicles with auxiliary heater, remove bolts - **arrows** - for exhaust pipe of parking heater/auxiliary heater on noise insulation.



**Fig. 574: Identifying Quick-Release Fasteners And Noise Insulation**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

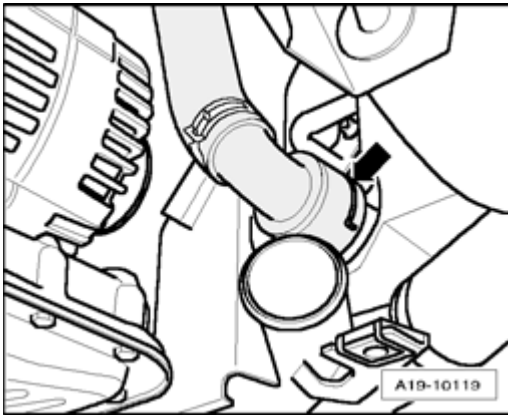
- Loosen quick-release fasteners - 1 - and - 2 - and remove front noise insulation. Rear section of noise insulation remains installed.
- Remove front bumper cover -->
  - **63 BUMPER**
  - **63 - BUMPERS** for BODY EXTERIOR - CABRIOLET
- Place drip tray for workshop crane VAS 6208 under engine.



**Fig. 575: Disconnecting Coolant Hose From Lower Left Of Radiator**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

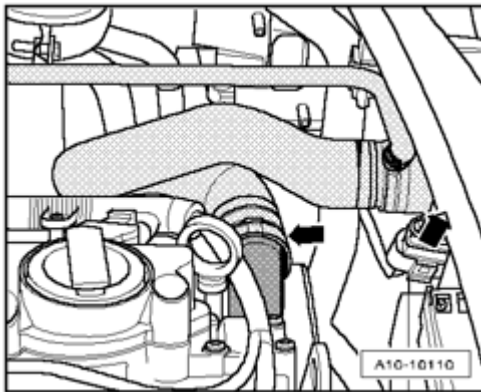
- Disconnect coolant hose - **arrow** - from lower left of radiator and drain coolant.





**Fig. 576: Disconnecting Lower Right Coolant Hose From Radiator**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect coolant hose from lower right of radiator - **arrow** -.



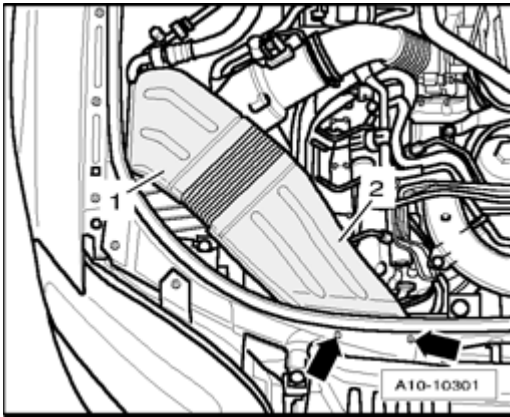
**Fig. 577: Disconnecting Top Coolant Hose From Radiator**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect top coolant hose - **right arrow** - from radiator.

**NOTE:**

- Ignore - left arrow -.

**Vehicles with automatic transmission:**



**Fig. 578: Identifying Bolts & Air Duct**

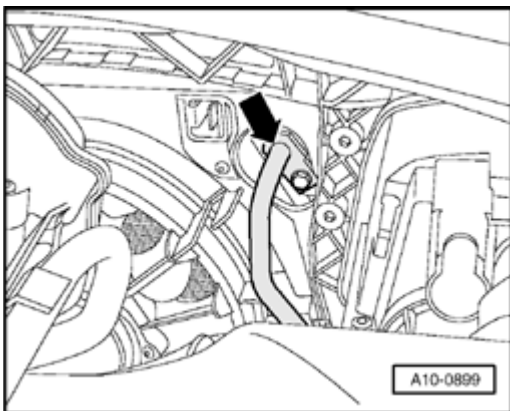
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Remove air duct - **1** - and - **2** -.

**NOTE:**

- **Observe the rules of cleanliness for working on automatic transmissions --**  
**>**
  - **00 - GENERAL, TECHNICAL DATA for 5 SPD. AUTOMATIC TRANSMISSION 01V**
  - **00 - GENERAL, TECHNICAL DATA for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING**
  - **00 TECHNICAL DATA for AUTOMATIC TRANSMISSION 09L, FOUR-WHEEL DRIVE**

- Place old oil collecting and extracting device V.A.G 1782 under engine.

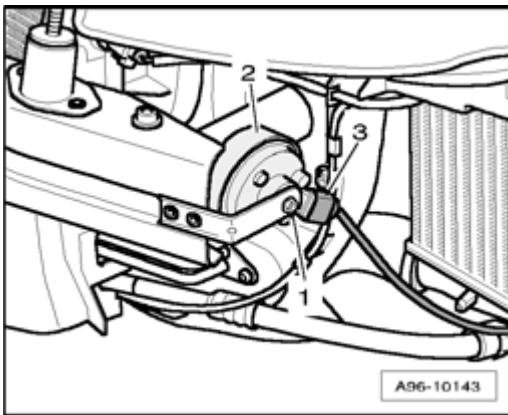


**Fig. 579: Disconnecting ATF-Lines At Top And Bottom Of Radiator**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove upper and lower ATF lines - **arrow** - on cooler -->
  - **37 - AUTOMATIC TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. AUTOMATIC TRANSMISSION 01V
  - **37 - AUTOMATIC TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING
  - **37 CONTROLS, HOUSING** for AUTOMATIC TRANSMISSION 09L, FOUR-WHEEL DRIVE
- Tie ATF lines up to longitudinal member to prevent fluid from escaping.

All:

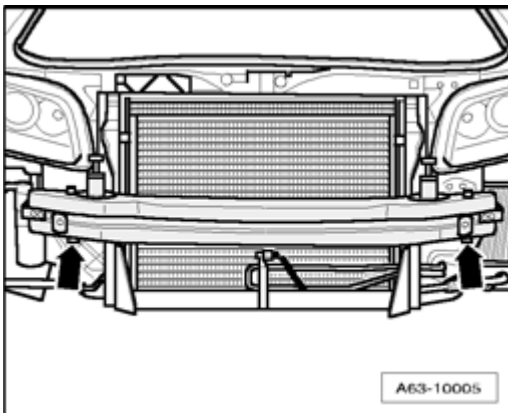


**Fig. 580: Disconnecting Left/Right Electrical Connectors Of Horns**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect left and right electrical connectors - 3 - of horns - 2 -.

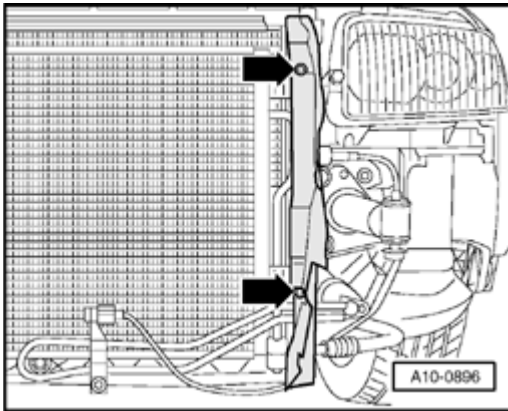
NOTE:

- Ignore - 1 -.



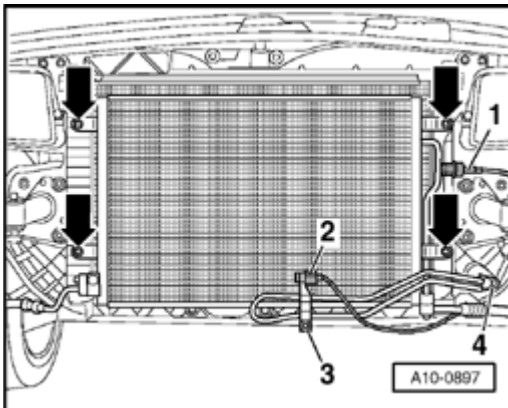
**Fig. 581: Removing Cross Member For Bumper**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove cross member for bumper - **arrows** -.



**Fig. 582: Removing Left/Right Air Guides At Radiator**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove left and right air guides at radiator - **arrows** -.



**Fig. 583: Identifying Outside Air Temperature Sensor G17, Bolts & High Pressure Sensor G65 Electrical Harness Connector**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unclip Outside Air Temperature Sensor G17 - **2** - from bracket.
- Remove power steering cooling coil bolts - **3** - and - **4** - hydraulic hoses remain connected.
- Disconnect electrical harness connector - **1** - at High Pressure Sensor G65.

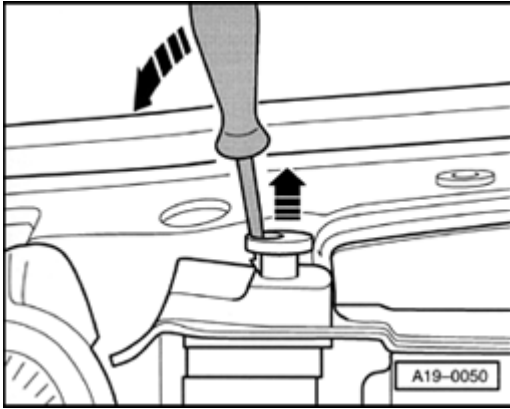
**CAUTION: The air conditioning refrigerant circuit must not be opened.**

- Remove bolts - **arrows** -.

**NOTE:**

- To prevent damage to the refrigerant lines/hoses, ensure that the lines and hoses are not stretched, kinked or bent.

- Pivot condenser downward with lines connected.



**Fig. 584: Releasing Both Radiator Retaining Pins And Removing By Pulling Upward**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Release both radiator retaining pins and remove by pulling upward - **arrows** -.
- Pivot radiator forward, pull up and remove.

### Installing

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

**NOTE:**                    • **Secure all hose connections using hose clamps appropriate for the model type .**

- Install ATF lines -->
  - **37 - AUTOMATIC TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. AUTOMATIC TRANSMISSION 01V
  - **37 - AUTOMATIC TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING
  - **37 CONTROLS, HOUSING** for AUTOMATIC TRANSMISSION 09L, FOUR-WHEEL DRIVE
- Install front bumper cross member -->
  - **63 BUMPER**
  - **63 - BUMPERS** for BODY EXTERIOR - CABRIOLET
- Install front bumper cover -->
  - **63 BUMPER**
  - **63 - BUMPERS** for BODY EXTERIOR - CABRIOLET

- Fill with coolant --> **Cooling system, draining and filling.**

**NOTE:**

- **Complete coolant must be replaced if radiator was replaced.**

- Check ATF level -->

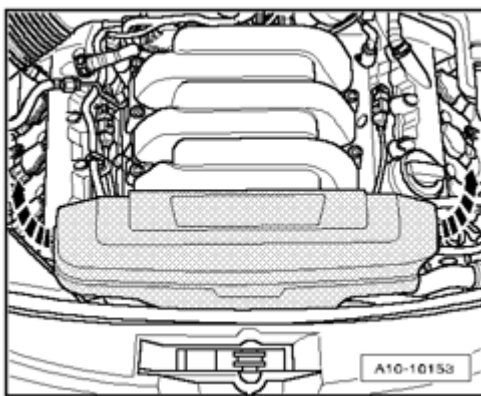
- **37 - AUTOMATIC TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. AUTOMATIC TRANSMISSION 01V
- **37 - AUTOMATIC TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING
- **37 CONTROLS, HOUSING** for AUTOMATIC TRANSMISSION 09L, FOUR-WHEEL DRIVE

**Torque specifications**

| Component                                    | Nm |
|----------------------------------------------|----|
| Condenser to lock carrier                    | 6  |
| Cooling coil for power steering to condenser | 9  |

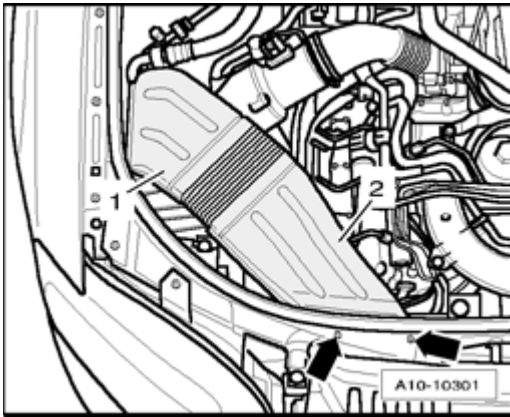
**Fan shroud, removing and installing****Removing****NOTE:**

- **All cable ties which are opened or cut open when removing, must be replaced in the same position when installing.**

**Fig. 585: Identifying Front Engine Cover**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

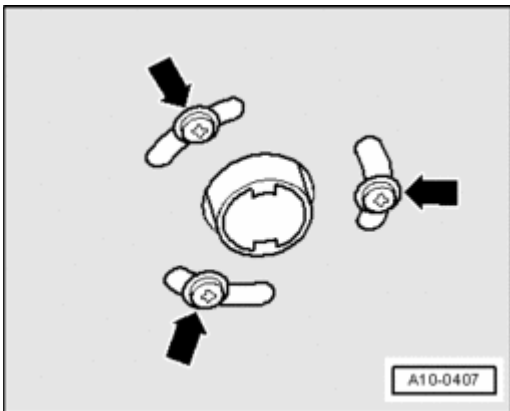
- Remove front engine cover - **arrows** -.



**Fig. 586: Identifying Bolts & Air Duct**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

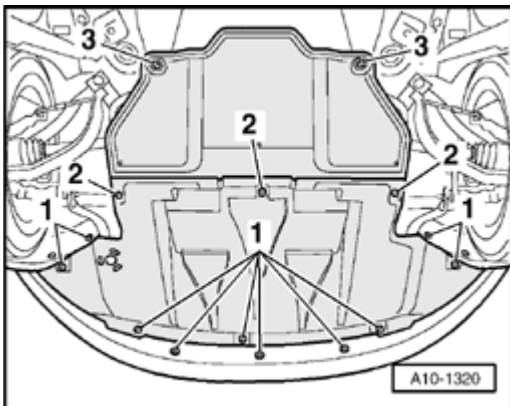
- Remove bolts - **arrows** -.
- Remove air duct - **1** - and - **2** -.



**Fig. 587: Locating Fasteners Exhaust Pipe**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

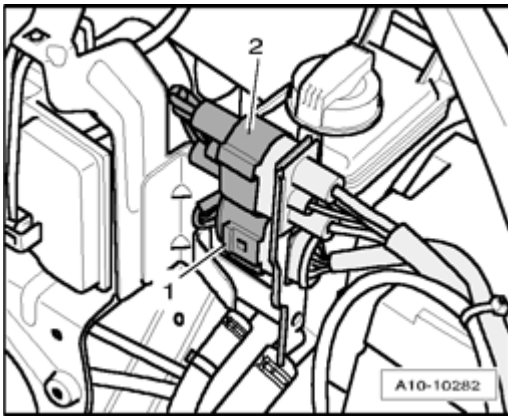
- For vehicles with auxiliary heater, remove bolts - **arrows** - for exhaust pipe of parking heater/auxiliary heater on noise insulation.



**Fig. 588: Identifying Quick-Release Fasteners And Noise Insulation**

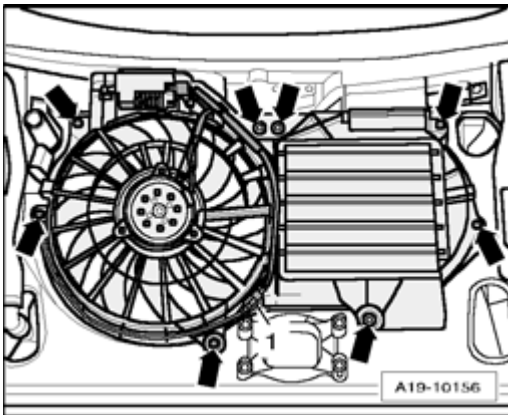
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen quick-release fasteners - **1 through 3** - and remove front and rear noise insulation.
- Remove front bumper cover -->
  - **63 BUMPER**
  - **63 - BUMPERS** for BODY EXTERIOR - CABRIOLET
- Bring lock carrier into service position -->
  - **50 BODY, FRONT**
  - **50 - BODY - FRONT** for BODY EXTERIOR - CABRIOLET

**Fig. 589: Removing Electrical Harness Connector From Bracket**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove electrical harness connector - **2** - from bracket and disconnect it.
- Free up electrical wiring.

**Fig. 590: Remove Fan Shroud Bolts**

Courtesy of VOLKSWAGEN UNITED STATES, INC.



## 2007 Audi A6

ENGINE 3.2 V6 4V Engine Mechanical, Engine Code(s): BKH

- Disconnect electrical harness connector - **1** - for hood lock and free up wiring.
- Remove bolts - **arrows** - and remove fan shroud upward and out.

### Installing

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

**NOTE:**               • **During installation, all cable ties must be re-installed at the same location.**

- Bring lock carrier into service position -->
  - **50 BODY, FRONT**
  - **50 - BODY - FRONT** for BODY EXTERIOR - CABRIOLET
- Remove front bumper cover -->
  - **63 BUMPER**
  - **63 - BUMPERS** for BODY EXTERIOR - CABRIOLET

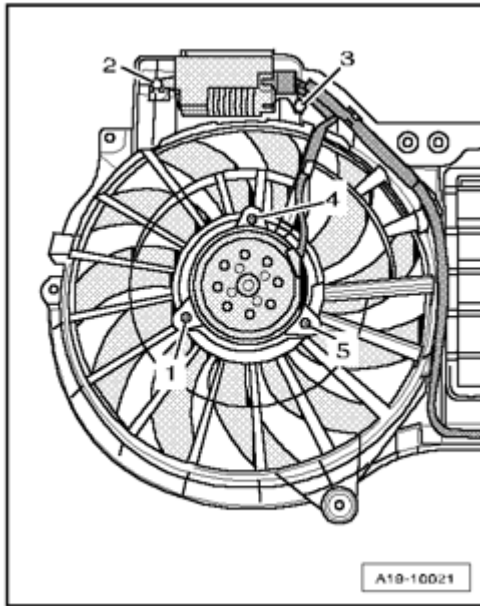
### Torque specifications

| Component                  |    | Nm  |
|----------------------------|----|-----|
| Fan shroud to lock carrier | M5 | 4.5 |

### Coolant fan, removing and installing

#### Removing

- Remove fan shroud --> **Fan shroud, removing and installing.**
- Free up electrical wiring.



**Fig. 591: Removing Coolant Fan Screws**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove screws - **1 to 5** -.
- Remove coolant fan with control module.

### Installing

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

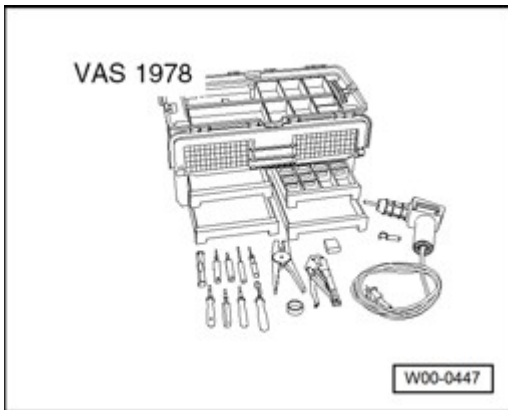
- Install fan shroud --> **Fan shroud, removing and installing.**

### Torque specifications

| Component     |    | Nm  |
|---------------|----|-----|
| Coolant fan   | M5 | 4.5 |
| To fan shroud | M6 | 9   |

Coolant fan motor, replacing

Special tools, testers and auxiliary items required



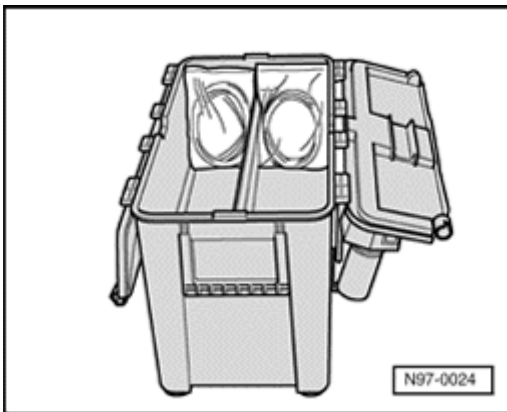
**Fig. 592: Wiring Harness Repair Kit V.A.S 1978**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Wiring harness repair kit VAS 1978

### Work procedure

#### NOTE:

- The coolant fan control module and coolant fan motor are available as a replacement part without connector.
- Wiring harness and connector repairs must only be performed using wiring harness repair kit VAS 1978.

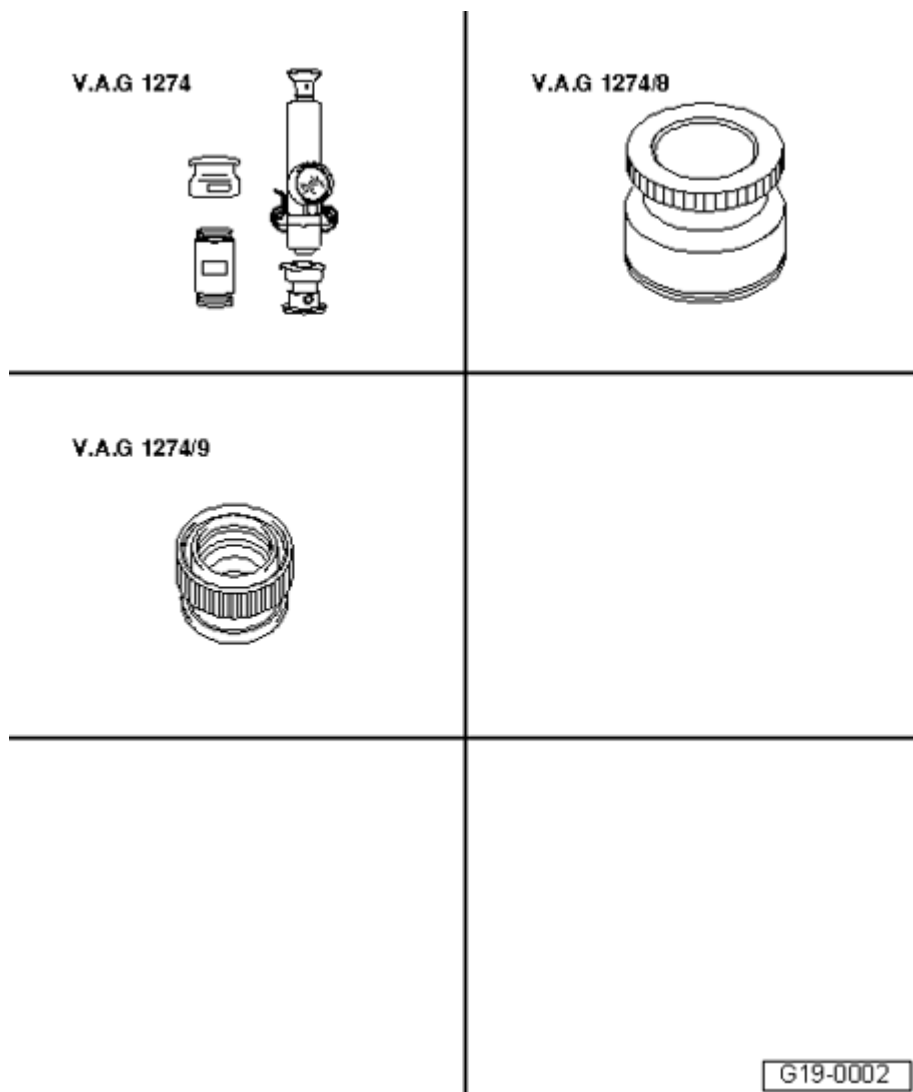


**Fig. 593: Opened Wiring Harness Repair Kit VAS 1978**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The description of wiring harness repair kit VAS 1978 is explained in detail in the included operating instructions.

For example, repairs of open circuits and faulty connectors are also explained.

### Cooling system, checking for leaks



**Fig. 594: Identifying Special Tools - Cooling System, Checking For Leaks**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

#### Special tools, testers and auxiliary items required

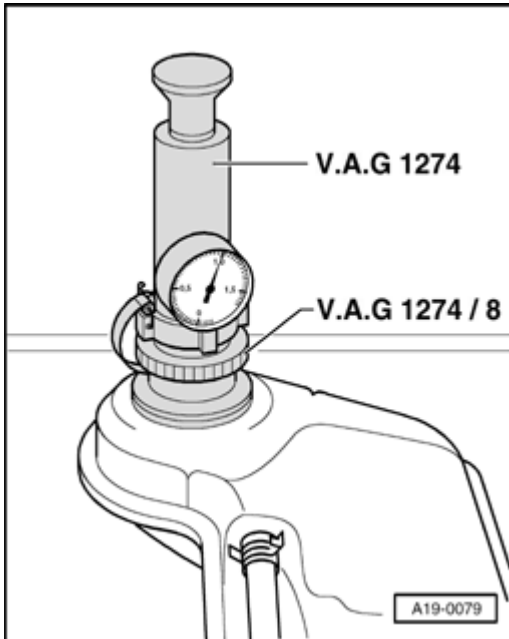
- Cooling system tester V.A.G 1274
- Adapter V.A.G 1274/8
- Adapter V.A.G 1274/9

#### Work procedure

- Engine at operating temperature.

**CAUTION:** Cover cap of expansion tank with rag and open carefully, as hot steam i.e. hot coolant may escape when opening.

- Open cap of coolant expansion tank.



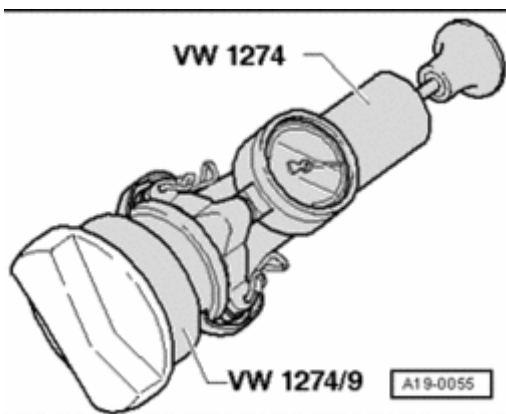
**Fig. 595: Positioning Cooling System Tester V.A.G 1274 With Adapter V.A.G 1274/8 On Expansion Tank**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position cooling system tester V.A.G 1274 with adapter V.A.G 1274/8 on expansion tank.
- Generate a positive pressure of approx. 1.0 bar using hand pump of cooling system tester.

If pressure drops:

- Search for leaking areas and repair malfunction.

#### Pressure relief valve in cap, checking



**Fig. 596: Checking Pressure Relief Valve In Filler Cap**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position cooling system tester V.A.G 1274 with adapter V.A.G 1274/9 on cap.
- Generate a positive pressure using hand pump of cooling system tester.
- Pressure release valve must open at a positive pressure of 1.4 to 1.6 bar.

If check-valve does not open as indicated:

- Replace cap.

## **26 - EXHAUST SYSTEM, EMISSION CONTROLS**

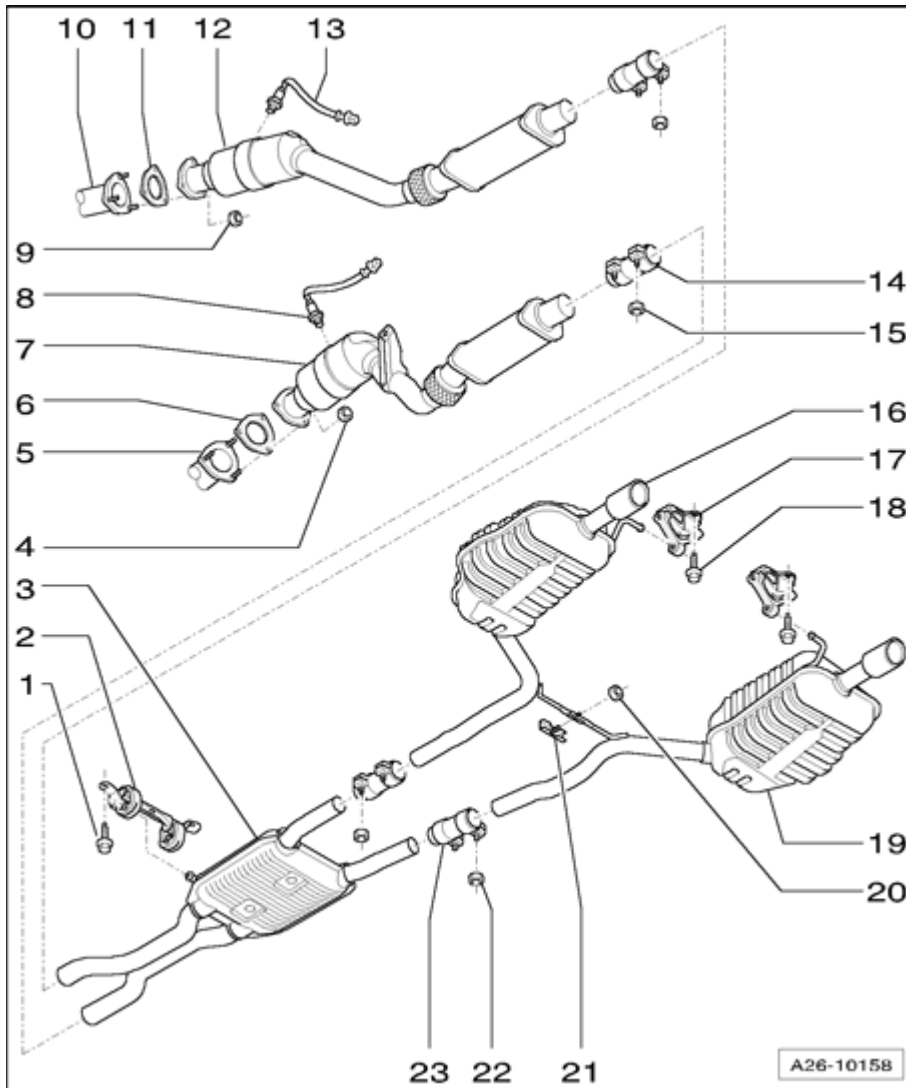
### **EXHAUST SYSTEM COMPONENTS, REMOVING AND INSTALLING**

Exhaust system components, removing and installing

**NOTE:**

- Replace gaskets and self-locking nuts.
- After exhaust system repairs, make sure exhaust system is not under stress and is far enough from the body. If necessary, loosen clamping sleeves and align mufflers and exhaust pipes so that there is adequate distance to vehicle body, and weight is evenly distributed among the exhaust hangers.
- Flex joint in front exhaust pipe must not be bent more than 10 ° , otherwise it may be damaged.

Exhaust system, component overview



**Fig. 597: Exhaust System, Component Overview**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - 23 Nm

2 - Suspended mount

- Replace if damaged

3 - Center muffler

- Original equipment as one unit with rear muffler. For repairs, replace each separately.
- Separating point *Separate exhaust pipes at a right angle at separating point* under **Center muffler and rear muffler, separating**
- Install exhaust system free of stress --> **Exhaust system, installing free of tension**

## 4 - 27 Nm

- Replace

## 5 - Exhaust manifold

- For cylinder bank 1 (right)
- Removing and installing --> **Right exhaust manifold, removing and installing**

## 6 - Gasket

- Replace

## 7 - Front exhaust pipe with catalytic converter and front muffler

- For cylinder bank 1 (right)
- With decoupling element; Decoupling element must not be bent more than 10 ° otherwise it may be damaged
- Protect from shocks and impact stress
- Removing and installing: Vehicles with manual transmission --> **Right front exhaust pipe with catalytic converter (vehicles with manual transmission), removing and installing**, vehicles with automatic transmission --> **Right front exhaust pipe with catalytic converter (vehicles with automatic transmission 09L), removing and installing**
- Individual components of mounting: Vehicles with manual transmission **Individual right mounting components - vehicles with manual transmission**, vehicles with automatic transmission **Individual right mounting components - vehicles with automatic transmission**
- Install exhaust system free of stress --> **Exhaust system, installing free of tension**

## 8 - Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130

- For cylinder bank 1 (right)
- The threads of new oxygen sensors are coated with assembly paste; the paste must not get into slots of oxygen sensor body
- When re-using old oxygen sensor, grease threads with hot bolt paste; the paste must not get into slots of oxygen sensor body; hot bolt paste
- Removing and installing --> **24 - FUEL INJECTION SYSTEM**
- Tighten to 55 Nm

## 9 - 27 Nm

- Replace

## 10 - Exhaust manifold



- For cylinder bank 2 (left)
- Removing and installing --> **Left exhaust manifold, removing and installing**

**11 - Gasket**

- Replace

**12 - Front exhaust pipe with catalytic converter and front muffler**

- For cylinder bank 2 (left)
- With decoupling element; Decoupling element must not be bent more than 10 ° otherwise it may be damaged
- Protect from shocks and impact stress
- Removing and installing: Vehicles with manual transmission --> **Left front exhaust pipe with catalytic converter (vehicles with manual transmission), removing and installing** , vehicles with automatic transmission --> **Left front exhaust pipe with catalytic converter (vehicles with automatic transmission 09L), removing and installing**
- Individual components of mounting: Vehicles with manual transmission **Individual left mounting components - vehicles with manual transmission** , vehicles with automatic transmission **Individual left mounting components - vehicles with automatic transmission**
- Install exhaust system free of stress --> **Exhaust system, installing free of tension**

**13 - Oxygen Sensor (O2S) 2 Behind Three Way Catalytic Converter (TWC) G131**

- For cylinder bank 2 (left)
- The threads of new oxygen sensors are coated with assembly paste; the paste must not get into slots of oxygen sensor body
- When re-using old oxygen sensor, grease threads with hot bolt paste; the paste must not get into slots of oxygen sensor body; hot bolt paste
- Removing and installing --> **24 - FUEL INJECTION SYSTEM**
- Tighten to 55 Nm

**14 - Front clamping sleeves**

- Installed location **Installed position of front double clamps**
- Before tightening, align exhaust system so that it is tension-free --> **Exhaust system, installing free of tension**
- Tighten threaded connections evenly.

**15 - 23 Nm****16 - Rear muffler**

- Left side of vehicle
- Original equipment as one unit with center muffler. For repairs, replace each separately.
- Separating point *Separate exhaust pipes at a right angle at separating point* under **Center muffler and rear muffler, separating**
- Install exhaust system free of stress --> **Exhaust system, installing free of tension**

## 17 - Suspended mount

- Replace if damaged

## 18 - 23 Nm

## 19 - Rear muffler

- Right side of vehicle
- Original equipment as one unit with center muffler. For repairs, replace each separately.
- Separating point *Separate exhaust pipes at a right angle at separating point* under **Center muffler and rear muffler, separating**
- Install exhaust system free of stress --> **Exhaust system, installing free of tension**

## 20 - 23 Nm

- Replace

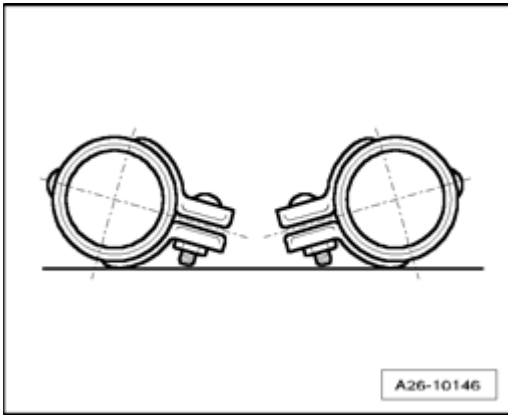
## 21 - Bracket

## 22 - 23 Nm

## 23 - Rear clamping sleeves

- For individual replacement of center and rear mufflers
- Position clamping sleeve centrally to separation point
- Installed location **Installed position of rear double clamps**
- Before tightening, align exhaust system so that it is tension-free --> **Exhaust system, installing free of tension**
- Tighten threaded connections evenly.

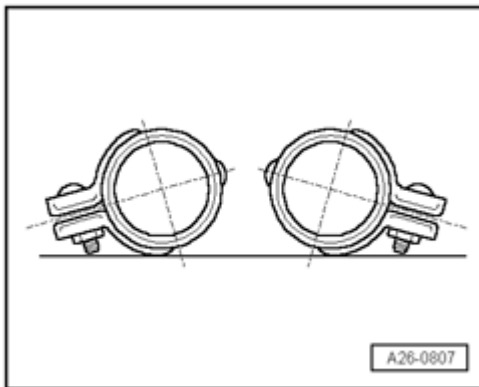
**Installed position of front double clamps**



**Fig. 598: Installed Position Of Front Double Clamps**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install double clamps so that the bolt ends do not project over lower edge of double clamp.
- Threaded connections face each other.

**Installed position of rear double clamps**

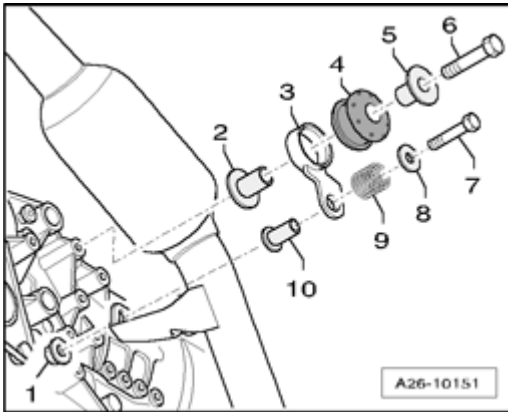


**Fig. 599: Installing Double Clamps So That Bolt Ends Do Not Project Over Lower Edge Of Double Clamp**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install double clamps so that the bolt ends do not project over lower edge of double clamp.
- Threaded connections point toward outside.

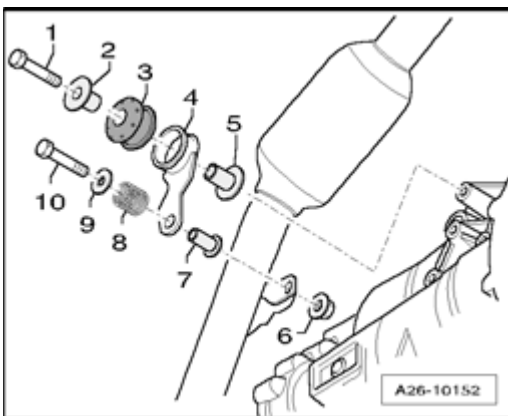
**Individual left mounting components - vehicles with manual transmission**



**Fig. 600: Individual Left Mounting Components - Vehicles With Manual Transmission**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1. Nut, 25 Nm
2. Spacing sleeve
3. Tab
4. Buffer
5. Spacing sleeve
6. Bolt, 25 Nm
7. Bolt
8. Washer
9. Spring
10. Spacing sleeve

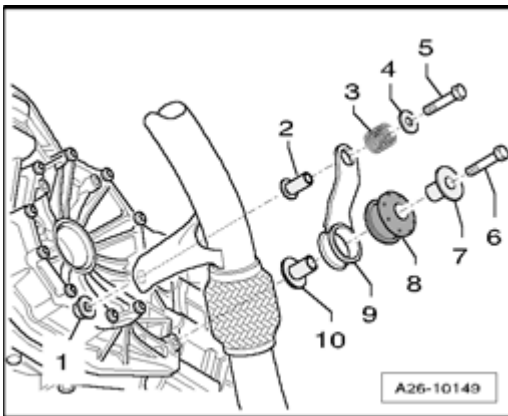
Individual right mounting components - vehicles with manual transmission



**Fig. 601: Individual Right Mounting Components - Vehicles With Manual Transmission**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1. Bolt, 25 Nm
2. Spacing sleeve

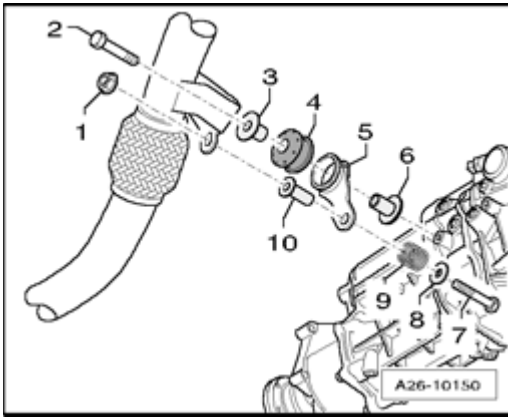
3. Buffer
4. Tab
5. Spacing sleeve
6. Nut, 25 Nm
7. Spacing sleeve
8. Spring
9. Washer
10. Bolt

**Individual left mounting components - vehicles with automatic transmission**

**Fig. 602: Individual Left Mounting Components - Vehicles With Automatic Transmission**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1. Nut, 25 Nm
2. Spacing sleeve
3. Spring
4. Washer
5. Bolt
6. Bolt, 25 Nm
7. Spacing sleeve
8. Buffer
9. Tab
10. Spacing sleeve

**Individual right mounting components - vehicles with automatic transmission**



**Fig. 603: Individual Right Mounting Components - Vehicles With Automatic Transmission**  
**Courtesy of VOLKSWAGEN UNITED STATES, INC.**

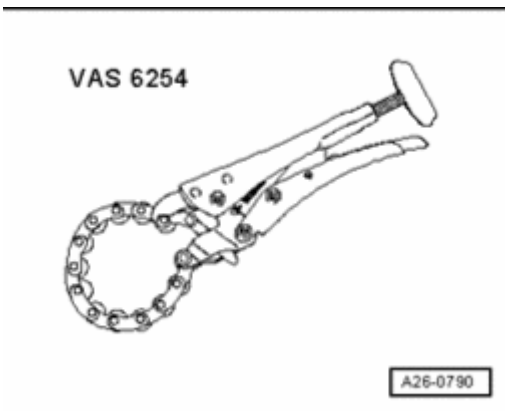
1. Nut, 25 Nm
2. Bolt, 25 Nm
3. Spacing sleeve
4. Buffer
5. Tab
6. Spacing sleeve
7. Bolt
8. Washer
9. Spring
10. Spacing sleeve

**Center muffler and rear muffler, separating**

A separating point has been provided in connecting pipe for individual replacement of center or rear muffler.

The separating point is marked by depressions around circumference of exhaust pipe.

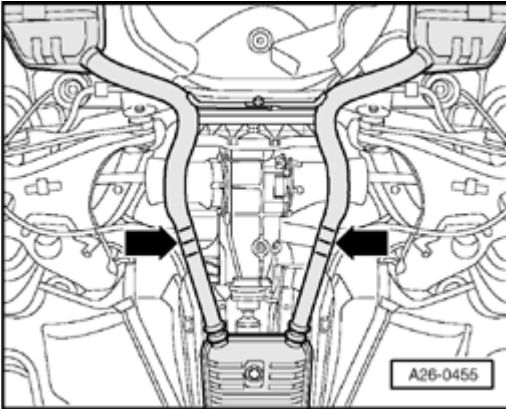
**Special tools, testers and auxiliary items required**



**Fig. 604: Chain Pipe Cutter VAS 6254**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Chain pipe cutter VAS 6254

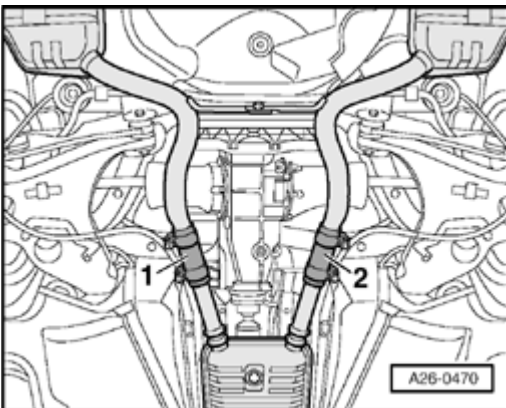
**Work procedure****Fig. 605: Separating Exhaust Pipes At Separating Point Using Chain Pipe Cutter VAS 6254 At A Right Angle**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Separate exhaust pipes at a right angle at separating point - **arrows** - using chain pipe cutter VAS 6254.

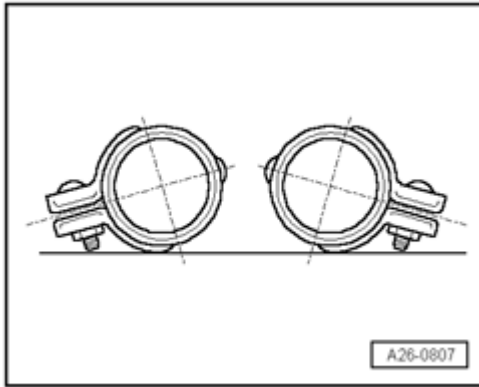
**NOTE:**

- The middle of the 3 impressions on the exhaust pipe is the separating point.

**Fig. 606: Positioning Clamping Sleeves At Center On Separating Cut**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- When installing, position clamping sleeves - **1** - and - **2** - centrally on separation point.



**Fig. 607: Installing Double Clamps So That Bolt Ends Do Not Project Over Lower Edge Of Double Clamp**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

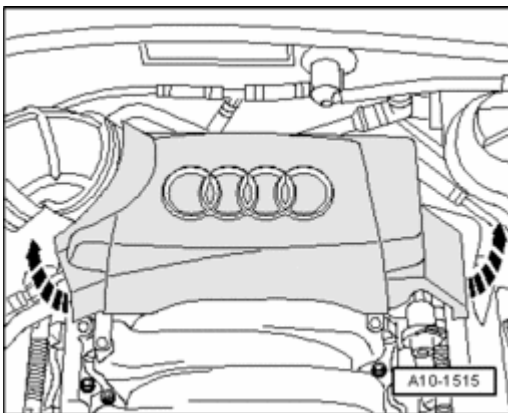
- Install double clamps so that bolt ends do not project over lower edge of double clamp.
- Threaded connections point toward outside.
- Align exhaust system free of tension --> **Exhaust system, installing free of tension.**
- Align rear muffler horizontally.

Left front exhaust pipe with catalytic converter (vehicles with manual transmission), removing and installing

### Removing

#### NOTE:

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

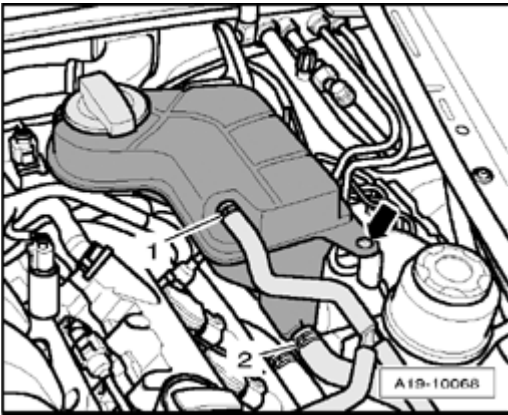


**Fig. 608: Removing Rear Engine Cover**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

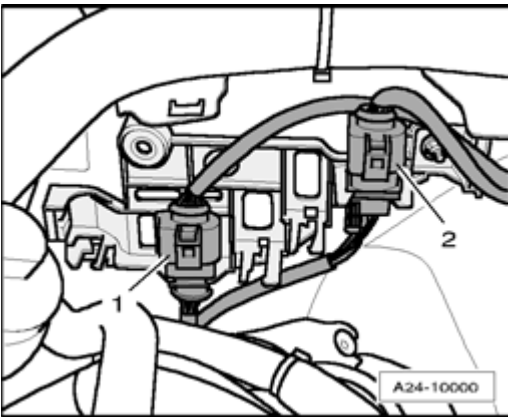
- Remove rear engine cover - **arrows** -.





**Fig. 609: Removing Coolant Hoses At Coolant Expansion Tank**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove coolant expansion tank - **arrow -**.
- Disconnect electrical connection from Engine Coolant Level (ECL) Warning Switch F66 at bottom of coolant reservoir and set aside coolant reservoir with coolant hoses - **1** - and - **2** - connected.

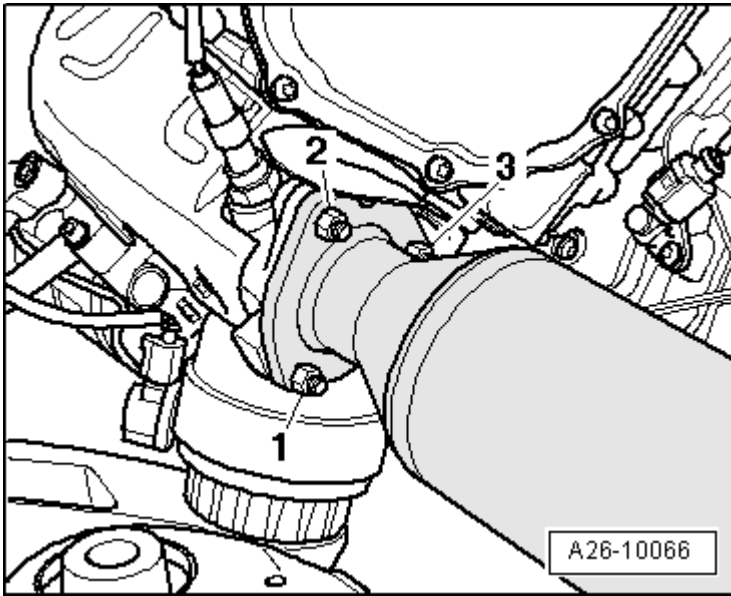


**Fig. 610: Disconnecting Electrical Harness Connector For Oxygen Sensor (O2S) 2 Behind Three Way Catalytic Converter (TWC) G131**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - **1** - for Oxygen Sensor (O2S) 2 Behind Three Way Catalytic Converter (TWC) G131 and free up wiring.

**NOTE:**

- **Ignore - 2 -.**



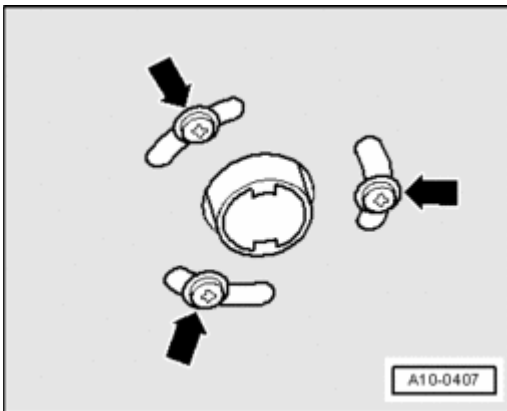
**Fig. 611: Removing Nuts & Left Front Exhaust Pipe With Catalytic Converter**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nut - 2 - which is accessible from top for front exhaust pipe/exhaust manifold.

**NOTE:**                      • To improve clarity, the removed engine is shown from the rear.

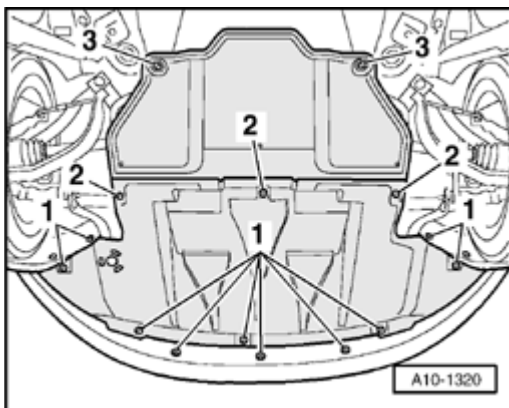
- Remove left front wheel.

**NOTE:**                      • Secure brake disc with a wheel bolt.



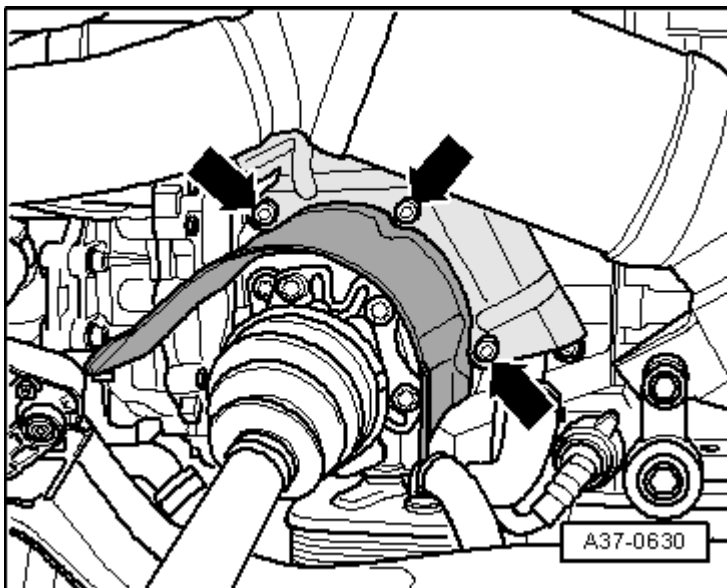
**Fig. 612: Locating Fasteners Exhaust Pipe**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- For vehicles with auxiliary heater, remove bolts - **arrows** - for exhaust pipe of parking heater/auxiliary heater on noise insulation.



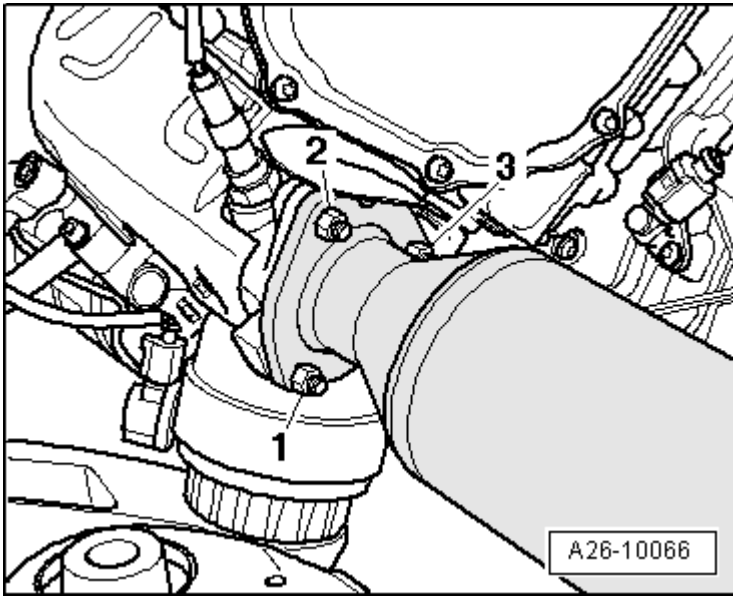
**Fig. 613: Identifying Quick-Release Fasteners And Noise Insulation**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen quick-release fasteners - **1 through 3** - and remove front and rear noise insulation.



**Fig. 614: Removing Heat Shield For Left Drive Axle**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield - **arrows** - for left drive axle.

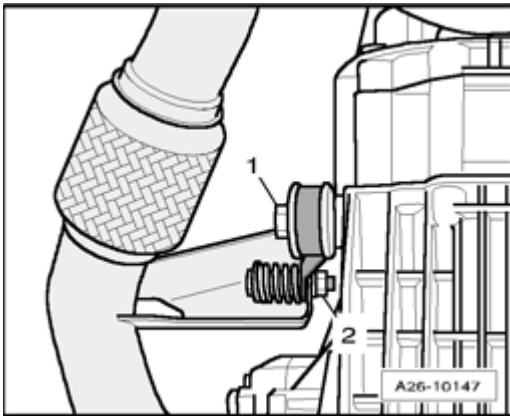


**Fig. 615: Removing Nuts & Left Front Exhaust Pipe With Catalytic Converter**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - 1 - and - 3 - which are accessible from bottom for front exhaust pipe/exhaust manifold.

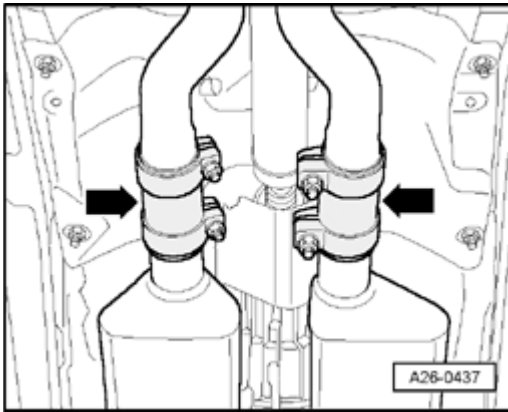
**NOTE:**

- To improve clarity, the removed engine is shown.



**Fig. 616: Removing Nut At Left Bracket For Front Exhaust Pipe**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - 1 - and nut - 2 -.
- Remove bracket for front exhaust pipe.

**Fig. 617: Loosening Clamping Sleeves**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect exhaust system at clamping sleeve - **left arrow** -.
- Remove front exhaust pipe with catalytic converter.

### Installing

Installation is in reverse order of removal, noting following:

#### NOTE:

- Replace gaskets and self-locking nuts.
- During installation, all cable ties must be re-installed at the same location.
- Electrical wire of oxygen sensor must always be secured in the same position when installing so that contact with the exhaust pipe is avoided.

- Align exhaust system free of tension --> Exhaust system, installing free of tension.

#### NOTE:

- Individual components of exhaust system mounting Individual left mounting components - vehicles with manual transmission

### Torque specifications

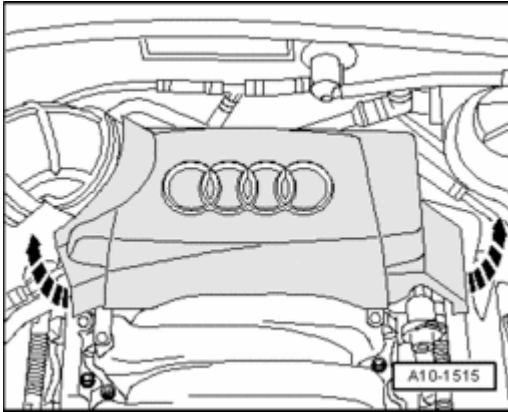
|                                                                                                                                                       |                    | Nm                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|--------------------|
| Front exhaust pipe with catalytic converter to exhaust manifold                                                                                       |                    | 27 <sup>1)2)</sup> |
| Mounting strap to                                                                                                                                     | Front exhaust pipe | 25                 |
|                                                                                                                                                       | Transmission       | 25                 |
| Heat shield for drive shaft to transmission                                                                                                           |                    | 23                 |
| <ul style="list-style-type: none"> <li>● <sup>1)</sup> Replace nuts.</li> <li>● <sup>2)</sup> Grease with hot bolt paste; hot bolt paste .</li> </ul> |                    |                    |

Right front exhaust pipe with catalytic converter (vehicles with manual transmission), removing and installing

## Removing

### NOTE:

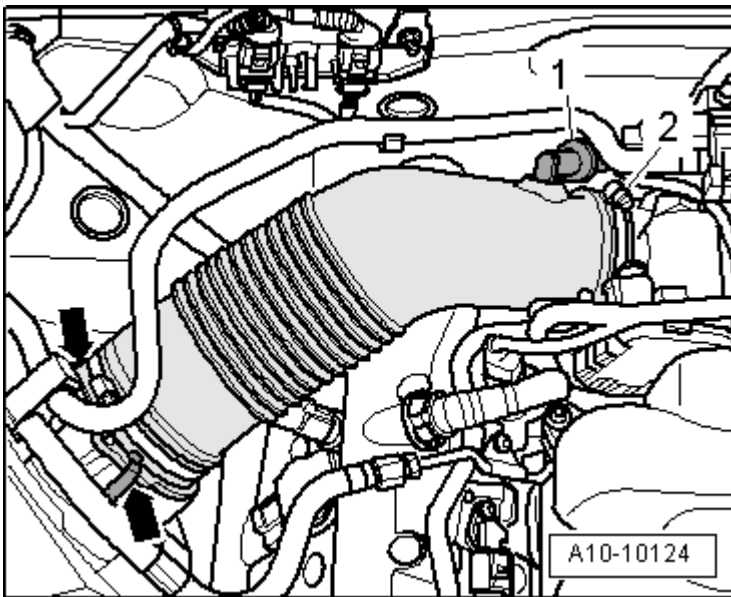
- All cable ties which are opened or cut open when removing, must be replaced in the same position when installing.



**Fig. 618: Removing Rear Engine Cover**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

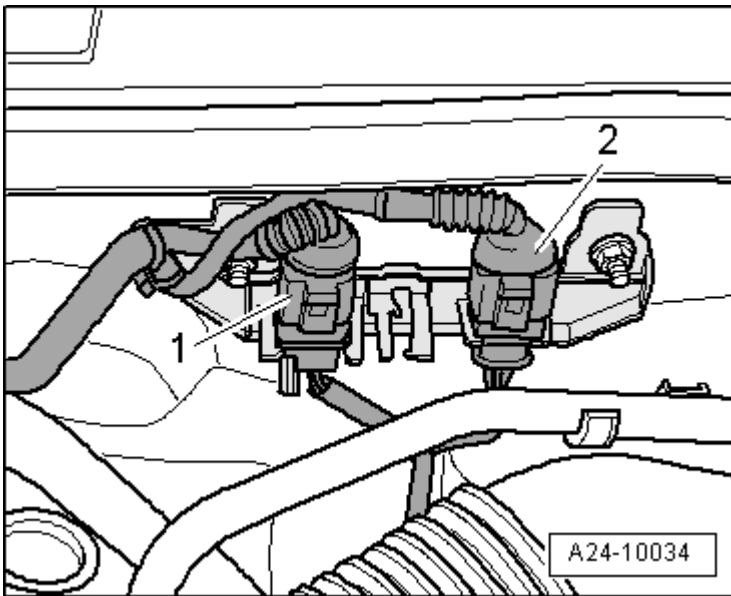
- Remove rear engine cover - **arrows** -.



**Fig. 619: Disconnecting Check Valve From Connection At Air Duct Hose**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect check valve - **1** - from connection at air duct hose.
- Remove air duct hose, thereby loosening hose clamp - **2** - and opening clips - **arrows** -.



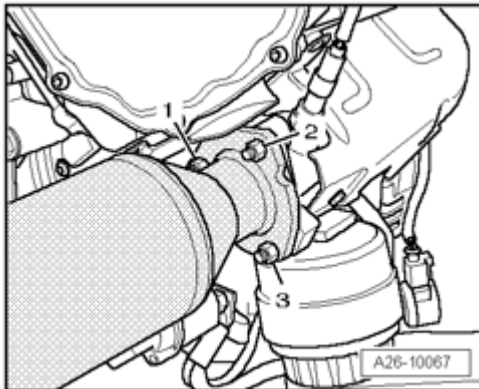
**Fig. 620: Disconnecting Electrical Harness Connector For Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - 2 - for Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130 and free up wiring.

**NOTE:**

- Ignore - 1 -.



**Fig. 621: Removing Nuts & Right Front Exhaust Pipe With Catalytic Converter**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nut - 2 - which is accessible from top for front exhaust pipe/exhaust manifold.

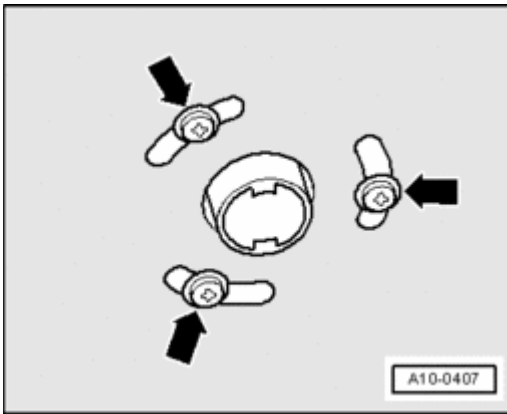
**NOTE:**

- To improve clarity, the removed engine is shown from the rear.

- Remove right front wheel.

**NOTE:**

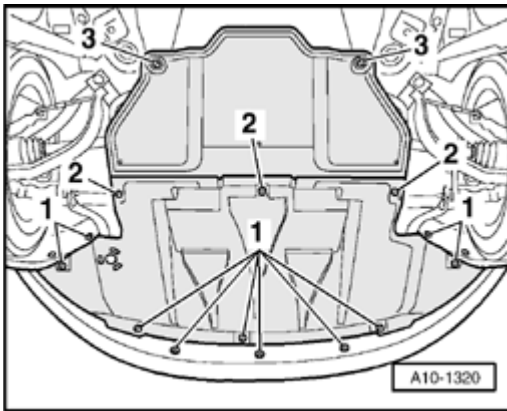
- Secure brake disc with a wheel bolt.



**Fig. 622: Locating Fasteners Exhaust Pipe**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- For vehicles with auxiliary heater, remove bolts - **arrows** - for exhaust pipe of parking heater/auxiliary heater on noise insulation.

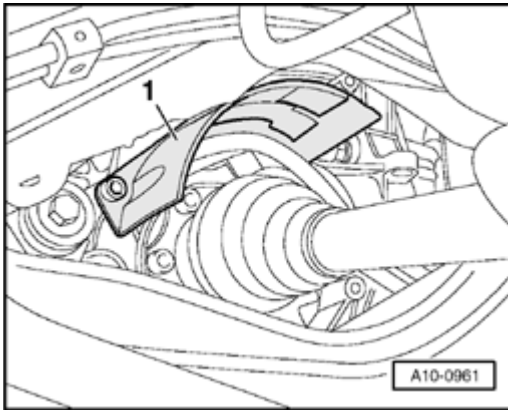


**Fig. 623: Identifying Quick-Release Fasteners And Noise Insulation**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

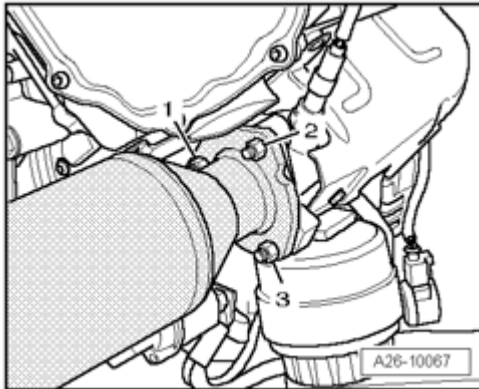
- Loosen quick-release fasteners - **1 through 3** - and remove front and rear noise insulation.





**Fig. 624: Removing Heat Shield For Left/Right Drive Axles**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield - 1 - for right drive axle.

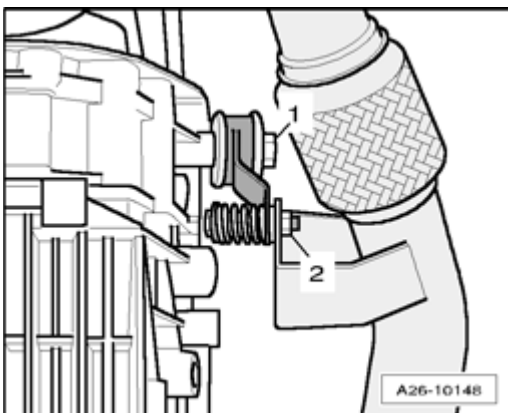


**Fig. 625: Removing Nuts & Right Front Exhaust Pipe With Catalytic Converter**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - 1 - and - 3 - which are accessible from bottom for front exhaust pipe/exhaust manifold.

**NOTE:**

- To improve clarity, the removed engine is shown.



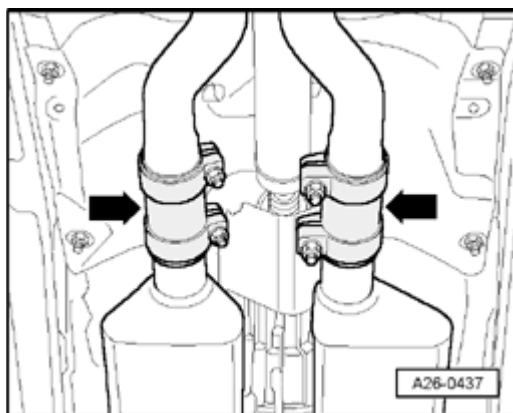
**Fig. 626: Removing Nut At Right Bracket For Front Exhaust Pipe**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nut - 2 - at right bracket for front exhaust pipe.

**NOTE:**

- Ignore - 1 -.

**Fig. 627: Loosening Clamping Sleeves**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Separate exhaust system at clamping sleeve - **right arrow** -.
- Remove front exhaust pipe with catalytic converter.

**Installing**

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

**NOTE:**

- Replace gaskets, O-rings and self-locking nuts.
- Secure all hose connections using hose clamps appropriate for the model type .
- During installation, all cable ties must be re-installed at the same location.
- Electrical wire of oxygen sensor must always be secured in the same position when installing so that contact with the exhaust pipe is avoided.

- Align exhaust system free of tension --> Exhaust system, installing free of tension.

**NOTE:**

- Individual components of exhaust system mounting Individual right mounting components - vehicles with manual transmission

**Torque specifications**

| Component | Nm |
|-----------|----|
|           |    |

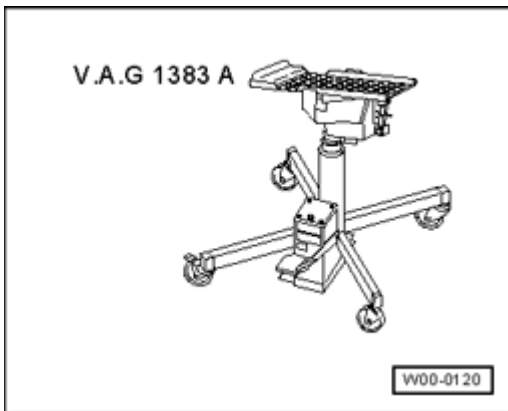
## 2007 Audi A6

ENGINE 3.2 V6 4V Engine Mechanical, Engine Code(s): BKH

|                                                                                                                                                    |                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Front exhaust pipe with catalytic converter to exhaust manifold                                                                                    | 27 <sup>1)2)</sup> |
| Mounting strap to front exhaust pipe                                                                                                               | 25                 |
| Heat shield for drive shaft to transmission                                                                                                        | 25                 |
| Hose clamps 9 mm wide                                                                                                                              | 3                  |
| <ul style="list-style-type: none"><li>• <sup>1)</sup> Replace nuts.</li><li>• <sup>2)</sup> Grease with hot bolt paste; hot bolt paste .</li></ul> |                    |

Left front exhaust pipe with catalytic converter (vehicles with automatic transmission 09L), removing and installing

### Special tools, testers and auxiliary items required



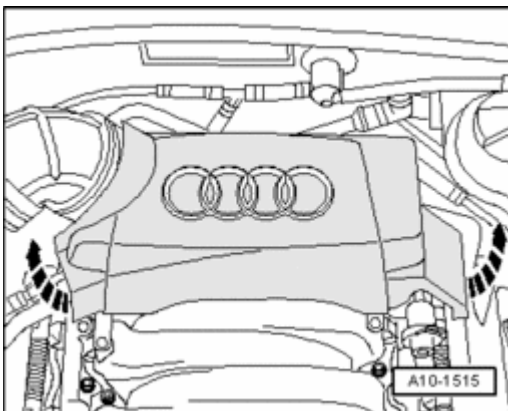
**Fig. 628: Identifying Engine/Transmission Jack V.A.G. 1383 A**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Engine/transmission jack V.A.G 1383 A

### Removing

#### NOTE:

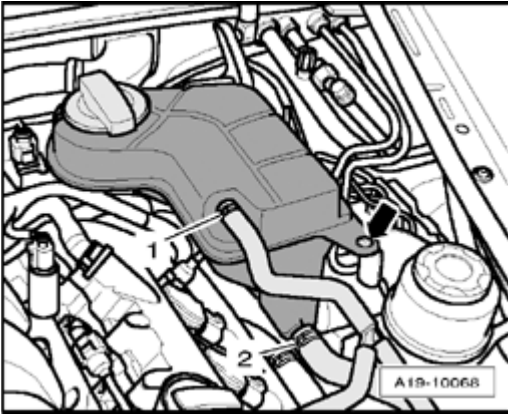
- All cable ties which are opened or cut open when removing, must be replaced in the same position when installing.



**Fig. 629: Removing Rear Engine Cover**

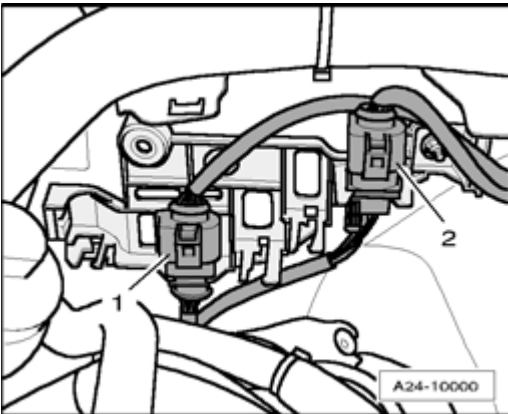
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove rear engine cover - **arrows** -.

**Fig. 630: Removing Coolant Hoses At Coolant Expansion Tank**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove coolant expansion tank - **arrow** -.
- Disconnect electrical connection from Engine Coolant Level (ECL) Warning Switch F66 at bottom of coolant reservoir and set aside coolant reservoir with coolant hoses - **1** - and - **2** - connected.

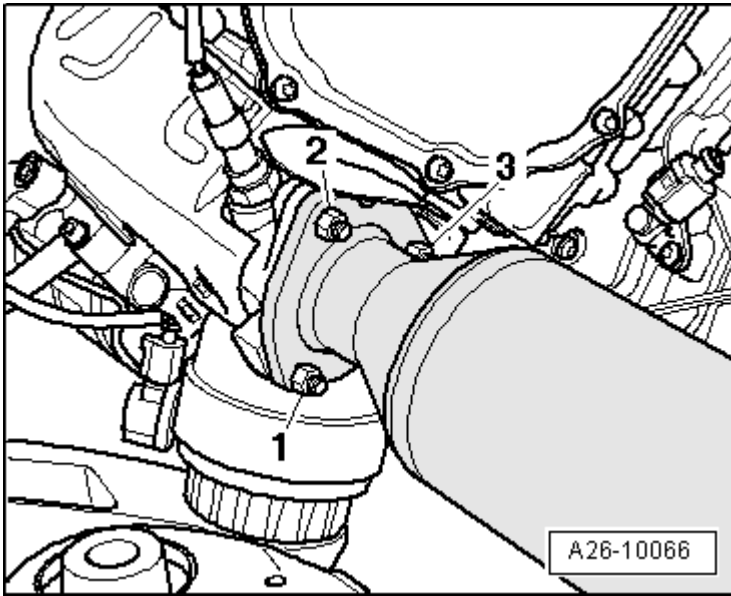
**Fig. 631: Disconnecting Electrical Harness Connector For Oxygen Sensor (O2S) 2 Behind Three Way Catalytic Converter (TWC) G131**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - **1** - for Oxygen Sensor (O2S) 2 Behind Three Way Catalytic Converter (TWC) G131 and free up the wiring.

**NOTE:**

- Ignore - **2** -.



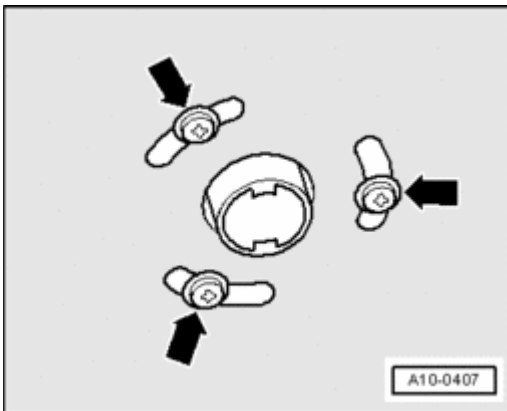
**Fig. 632: Removing Nuts & Left Front Exhaust Pipe With Catalytic Converter**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nut - 2 - which is accessible from top for front exhaust pipe/exhaust manifold.

**NOTE:**                      • To improve clarity, the removed engine is shown from the rear.

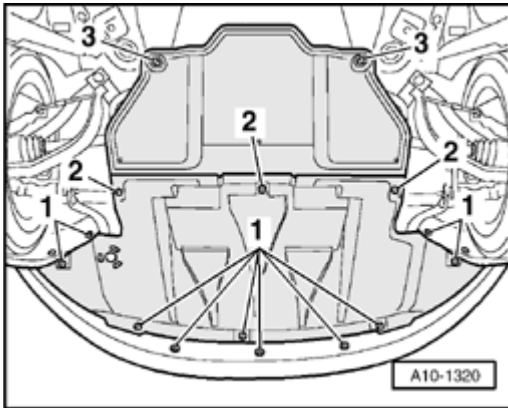
- Remove left front wheel.

**NOTE:**                      • Secure brake disc with a wheel bolt.



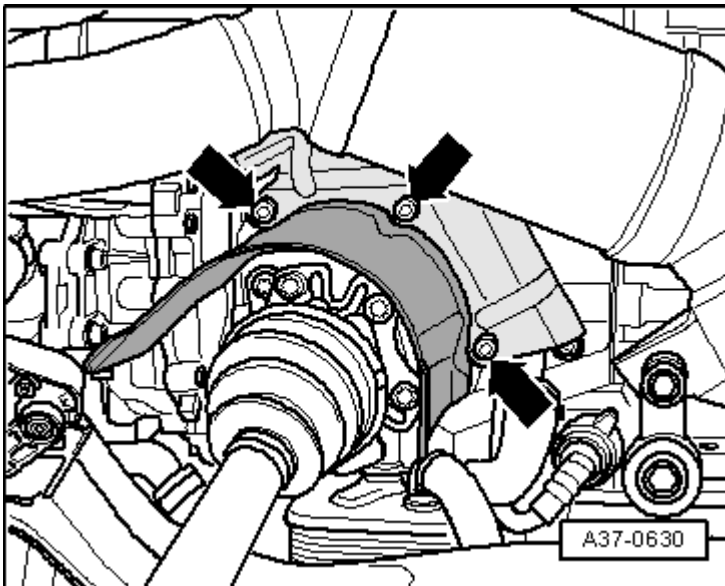
**Fig. 633: Locating Fasteners Exhaust Pipe**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- For vehicles with auxiliary heater, remove bolts - **arrows** - for exhaust pipe of parking heater/auxiliary heater on noise insulation.



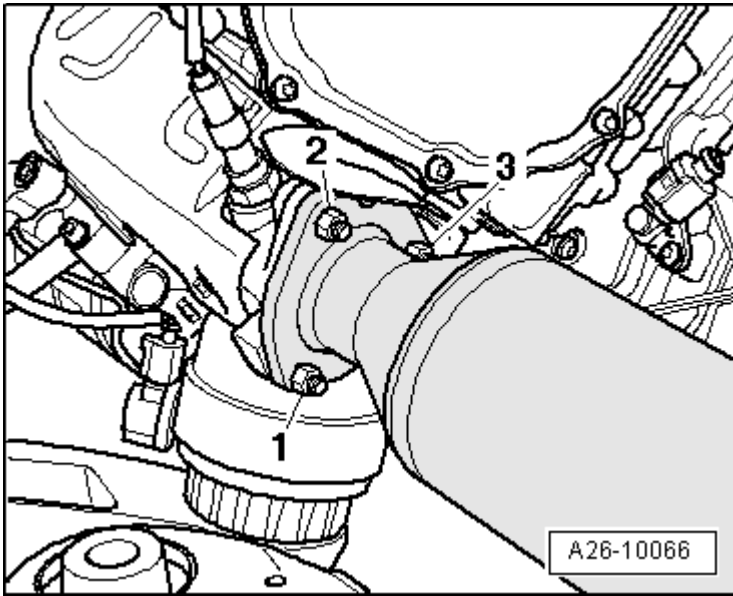
**Fig. 634: Identifying Quick-Release Fasteners And Noise Insulation**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen quick-release fasteners - **1 through 3** - and remove front and rear noise insulation.



**Fig. 635: Removing Heat Shield For Left Drive Axle**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield - **arrows** - for left drive axle.
- Remove left drive axle from transmission flange shaft.

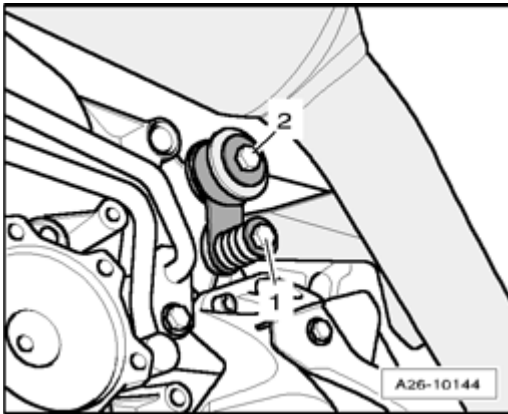


**Fig. 636: Removing Nuts & Left Front Exhaust Pipe With Catalytic Converter**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - 1 - and - 3 - which are accessible from bottom for front exhaust pipe/exhaust manifold.

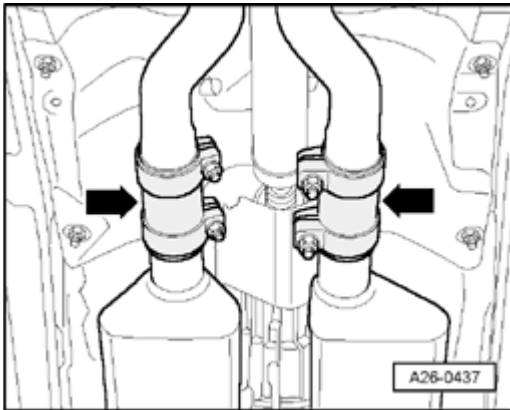
**NOTE:**

- To improve clarity, the removed engine is shown.



**Fig. 637: Removing Bolt At Left Bracket For Front Exhaust Pipe**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

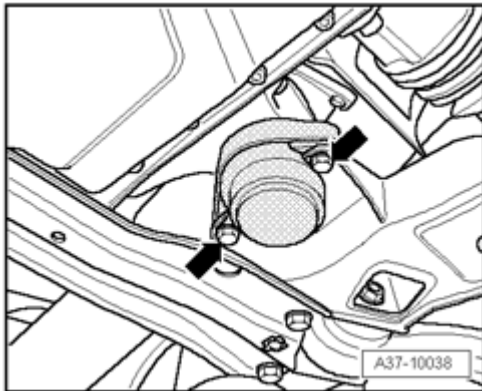
- Remove bolts - 1 - and - 2 -.
- Remove bracket for front exhaust pipe.



**Fig. 638: Loosening Clamping Sleeves**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

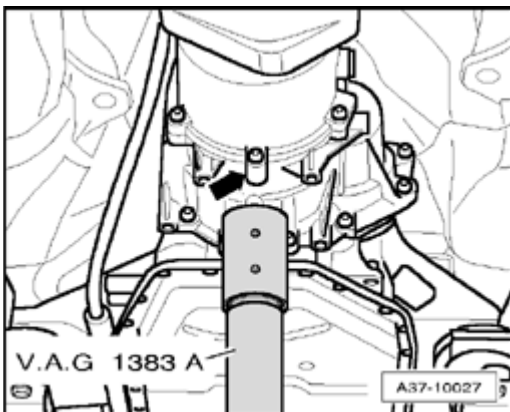
- Disconnect exhaust system at double clamps - **arrows** -.



**Fig. 639: Removing Bolts For Left/Right Transmission Mount**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - for left and right transmission mount.

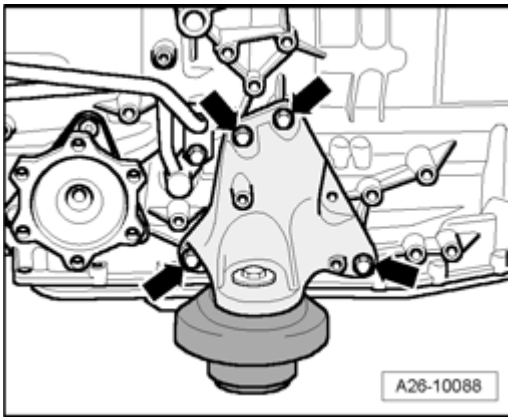


**Fig. 640: Placing Lifting Surface Of Engine/Transmission Jack V.A.G 1383 A Centrally On Lower Housing Base**



Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place lifting surface of Engine/Transmission Jack V.A.G 1383 A centrally on lower housing base - **arrow** - and lift transmission slightly.



**Fig. 641: Removing Heat Shield For Left Transmission Support**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield for left transmission support.
- Unfasten left transmission support with transmission mount - **arrows** -.
- Carefully push transmission upward using Engine/Transmission Jack V.A.G 1383 A , until transmission tunnel touches body.
- Guide front exhaust pipe downward and out between transmission and subframe using twisting motions.

### Installing

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

#### NOTE:

- Replace gaskets and self-locking nuts.
- During installation, all cable ties must be re-installed at the same location.
- Electrical wire of oxygen sensor must always be secured in the same position when installing so that contact with the exhaust pipe is avoided.

- Install transmission support and transmission mount -->
  - **37 - AUTOMATIC TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. AUTOMATIC TRANSMISSION 01V
  - **37 - AUTOMATIC TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING
  - **37 CONTROLS, HOUSING** for AUTOMATIC TRANSMISSION 09L, FOUR-WHEEL DRIVE
- Install drive axle --> **40 - FRONT SUSPENSION** .

- Align exhaust system free of tension --> **Exhaust system, installing free of tension.**

**NOTE:**

- **Individual components of exhaust system mounting Individual left mounting components - vehicles with automatic transmission.**

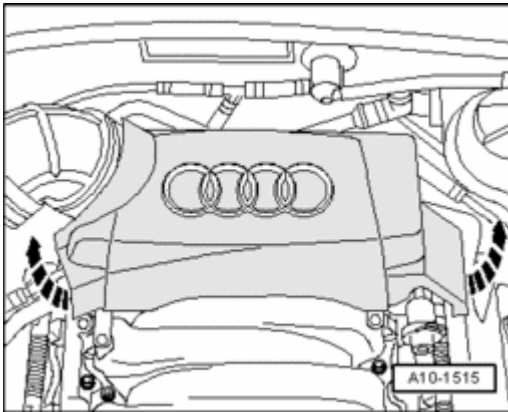
**Torque specifications**

|                                                                                                                                                       |                    | Nm                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|--------------------|
| Front exhaust pipe with catalytic converter to exhaust manifold                                                                                       |                    | 27 <sup>1)2)</sup> |
| Mounting strap to                                                                                                                                     | Front exhaust pipe | 23                 |
|                                                                                                                                                       | Transmission       | 25                 |
| Heat shield for drive axle to transmission                                                                                                            |                    | 25                 |
| <ul style="list-style-type: none"> <li>● <sup>1)</sup> Replace nuts.</li> <li>● <sup>2)</sup> Grease with hot bolt paste; hot bolt paste .</li> </ul> |                    |                    |

**Right front exhaust pipe with catalytic converter (vehicles with automatic transmission 09L), removing and installing**

**Removing****NOTE:**

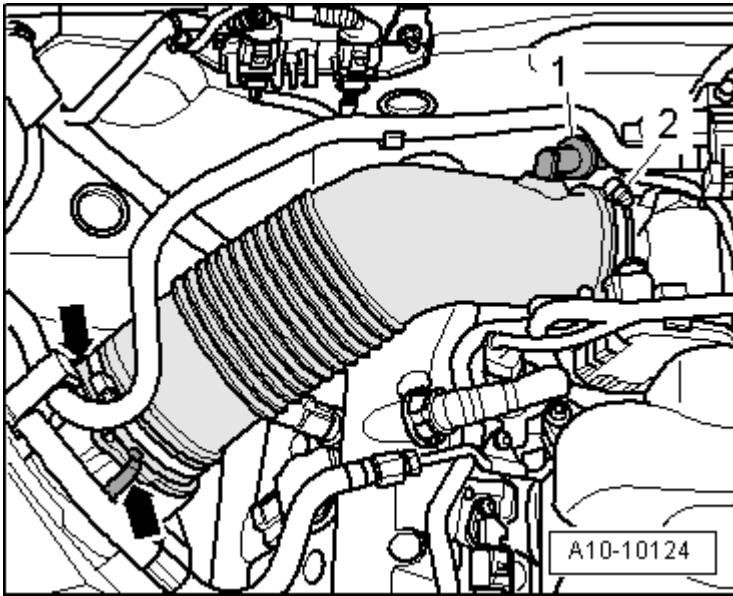
- **All cable ties which are opened or cut open when removing, must be replaced in the same position when installing.**



**Fig. 642: Removing Rear Engine Cover**

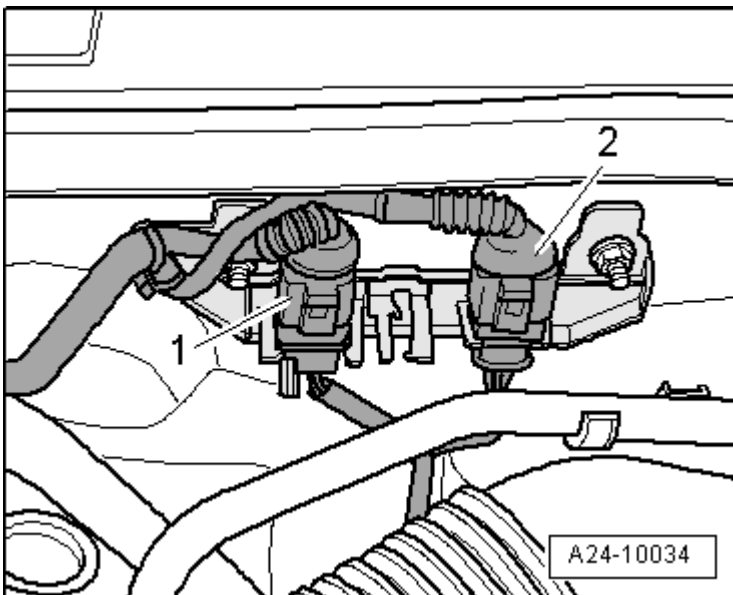
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove rear engine cover - **arrows** -.



**Fig. 643: Disconnecting Check Valve From Connection At Air Duct Hose**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect check valve - 1 - from connection at air duct hose.
- Remove air duct hose, thereby loosening hose clamp - 2 - and opening clips - arrows -.

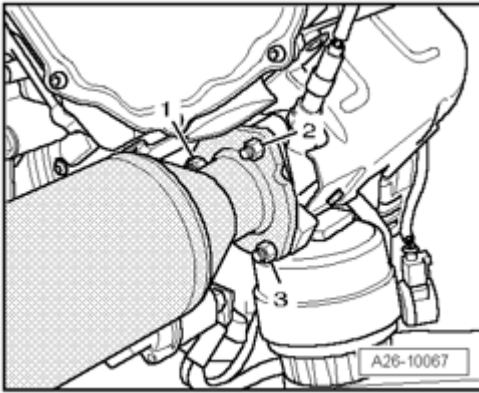


**Fig. 644: Disconnecting Electrical Harness Connector For Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - 2 - for Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130 and free up wiring.

**NOTE:**

- Ignore - 1 -.



**Fig. 645: Removing Nuts & Right Front Exhaust Pipe With Catalytic Converter**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nut - 2 - which is accessible from top for front exhaust pipe/exhaust manifold.

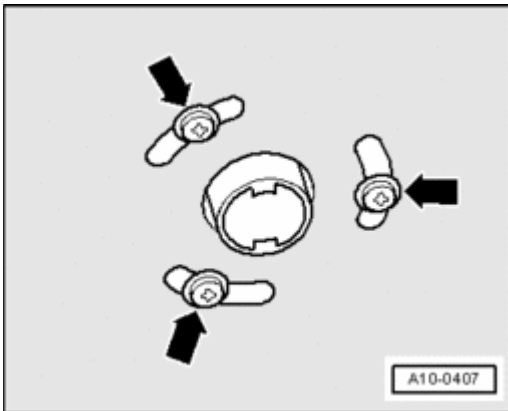
**NOTE:**

- To improve clarity, the removed engine is shown from the rear.

- Remove right front wheel.

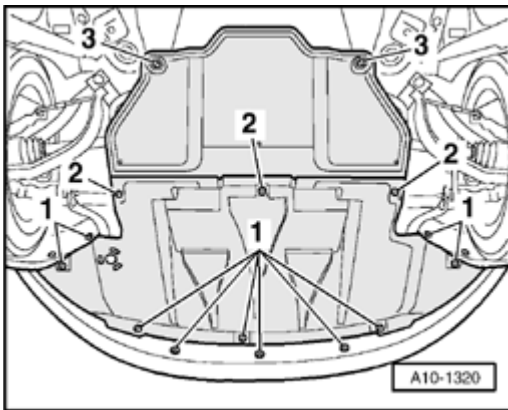
**NOTE:**

- Secure brake disc with a wheel bolt.



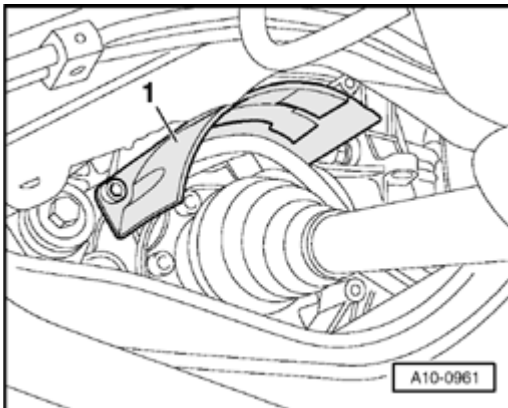
**Fig. 646: Locating Fasteners Exhaust Pipe**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- For vehicles with auxiliary heater, remove bolts - **arrows** - for exhaust pipe of parking heater/auxiliary heater on noise insulation.



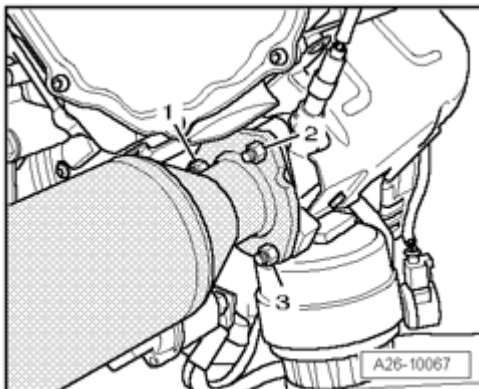
**Fig. 647: Identifying Quick-Release Fasteners And Noise Insulation**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen quick-release fasteners - **1 through 3** - and remove front and rear noise insulation.



**Fig. 648: Removing Heat Shield For Left/Right Drive Axles**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield - **1** - for right drive axle.

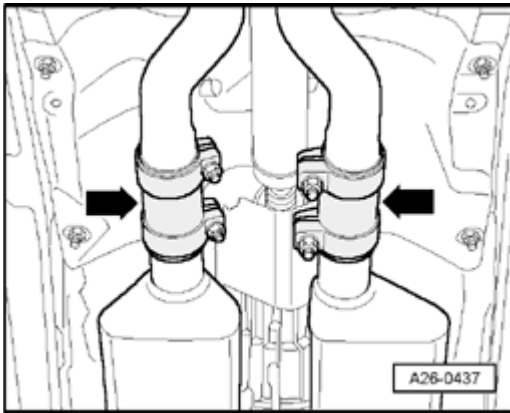


**Fig. 649: Removing Nuts & Right Front Exhaust Pipe With Catalytic Converter**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - **1** - and - **3** - which are accessible from bottom for front exhaust pipe/exhaust manifold.

**NOTE:**

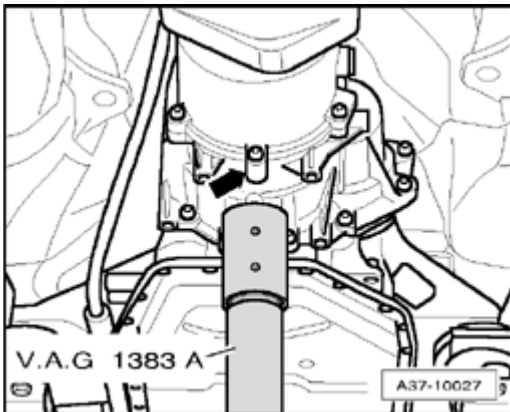
- To improve clarity, the removed engine is shown.



**Fig. 650: Loosening Clamping Sleeves**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

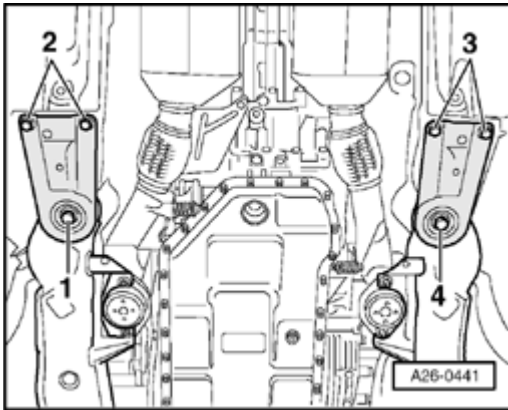
- Disconnect exhaust system at double clamps - **arrows** -.



**Fig. 651: Placing Lifting Surface Of Engine/Transmission Jack V.A.G 1383 A Centrally On Lower Housing Base**

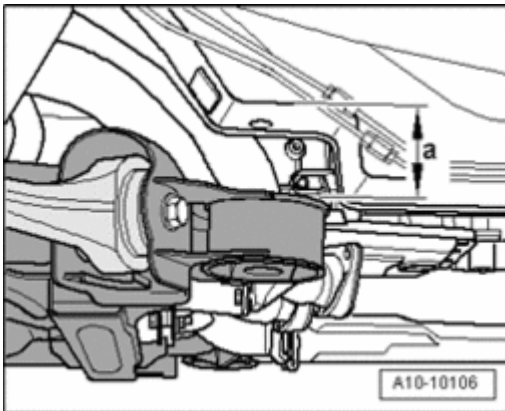
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place lifting surface of Engine/Transmission Jack V.A.G 1383 A centrally on lower housing base - **arrow** - and support transmission from below.



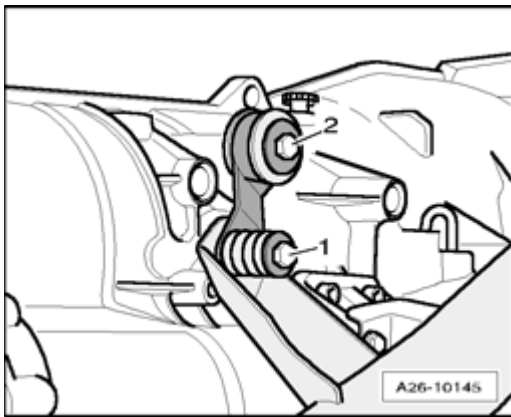
**Fig. 652: Removing Bolts And Mounting Bolts Of Subframe**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- First remove bolts - 2 - and - 3 - and then mounting bolts - 1 - and - 4 - of subframe.



**Fig. 653: Lowering Engine/Transmission Assembly Using Scissor Lift Platform VAS 6131 Only Approx. By Dimension**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Slowly lower transmission and subframe to dimension - a - using Engine/Transmission Jack V.A.G 1383 A.
- Dimension - a - = 50 mm



**Fig. 654: Removing Bolt At Right Bracket For Front Exhaust Pipe**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - 1 - at right bracket for front exhaust pipe.

**NOTE:**

- Ignore - 2 -.

- Remove front exhaust pipe with catalytic converter.

**Installing**

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

**NOTE:**

- Replace gaskets, O-rings and self-locking nuts.
- Secure all hose connections using hose clamps appropriate for the model type .
- During installation, all cable ties must be re-installed at the same location.
- Electrical wire of oxygen sensor must always be secured in the same position when installing so that contact with the exhaust pipe is avoided.

- Install subframe --> **40 - FRONT SUSPENSION** .
- Align exhaust system free of tension --> **Exhaust system, installing free of tension.**

**NOTE:**

- Individual components of exhaust system mounting **Individual right mounting components - vehicles with automatic transmission.**

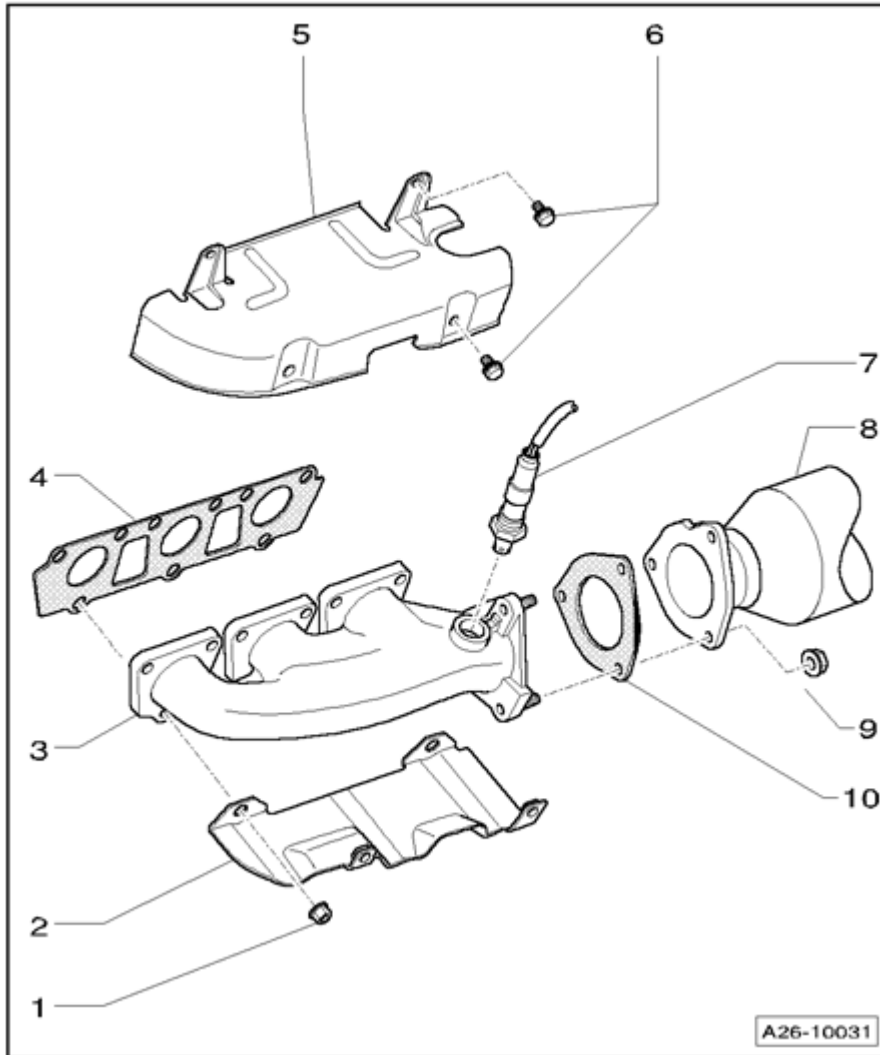
**Torque specifications**

| Component                                                       | Nm                 |
|-----------------------------------------------------------------|--------------------|
| Front exhaust pipe with catalytic converter to exhaust manifold | 27 <sup>1)2)</sup> |
| Mounting strap to front exhaust pipe                            | 25                 |



|                                                                                                                             |    |
|-----------------------------------------------------------------------------------------------------------------------------|----|
| Heat shield for drive shaft to transmission                                                                                 | 25 |
| Hose clamps 9 mm wide                                                                                                       | 3  |
| <ul style="list-style-type: none"> <li>1) Replace nuts.</li> <li>2) Grease with hot bolt paste; hot bolt paste .</li> </ul> |    |

#### Exhaust manifold, component overview



**Fig. 655: Exhaust Manifold, Component Overview**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - 25 Nm

- Replace
- Lubricate with hot bolt paste; Hot bolt paste
- Observe tightening sequence: *Fasten exhaust manifold together with heat shield bracket in 2 steps*

*according to the indicated tightening sequence, as follows. under **Left exhaust manifold, removing and installing** , Fasten exhaust manifold together with heat shield bracket in 2 steps according to indicated tightening sequence, as follows. under **Right exhaust manifold, removing and installing***

2 - Bracket for heat shield

3 - Exhaust manifold

- Removing and installing: Left --> **Left exhaust manifold, removing and installing** , right --> **Right exhaust manifold, removing and installing**

4 - Gasket

- Replace

5 - Heat shield

6 - 10 Nm

7 - Oxygen sensor, 55 Nm

- Before catalytic converter
- The threads of new oxygen sensors are coated with assembly paste; the paste must not get into slots of oxygen sensor body
- When re-using old oxygen sensor, grease threads with hot bolt paste; the paste must not get into slots of oxygen sensor body. Hot bolt paste

8 - Front exhaust pipe

- With decoupling element; Decoupling element must not be bent more than 10 ° otherwise it may be damaged
- Protect from shocks and impact stress
- Removing and installing: Left, Vehicles with manual transmission --> **Left front exhaust pipe with catalytic converter (vehicles with manual transmission), removing and installing** , Vehicles with automatic transmission --> **Left front exhaust pipe with catalytic converter (vehicles with automatic transmission 09L), removing and installing** , Right, Vehicles with manual transmission --> **Right front exhaust pipe with catalytic converter (vehicles with manual transmission), removing and installing** , Vehicles with automatic transmission --> **Right front exhaust pipe with catalytic converter (vehicles with automatic transmission 09L), removing and installing**
- Individual components of mounting: Left, Vehicles with manual transmission **Individual left mounting components - vehicles with manual transmission** , Vehicles with automatic transmission **Individual left mounting components - vehicles with automatic transmission** ; Right, Vehicles with manual transmission **Individual right mounting components - vehicles with manual transmission** , Vehicles with automatic transmission **Individual right mounting components - vehicles with automatic transmission**

- Install exhaust system free of stress --> **Exhaust system, installing free of tension**

9 - 27 Nm

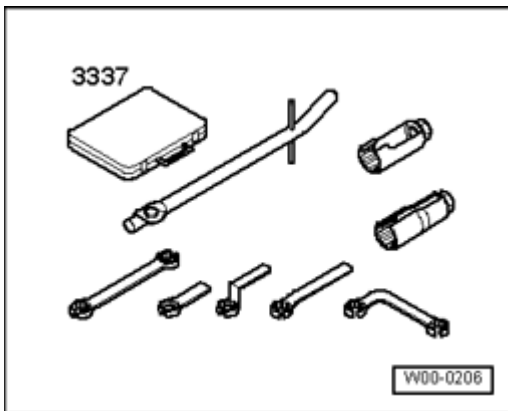
- Replace
- Lubricate with hot bolt paste; Hot bolt paste

10 - Gasket

- Replace

**Left exhaust manifold, removing and installing**

**Special tools, testers and auxiliary items required**



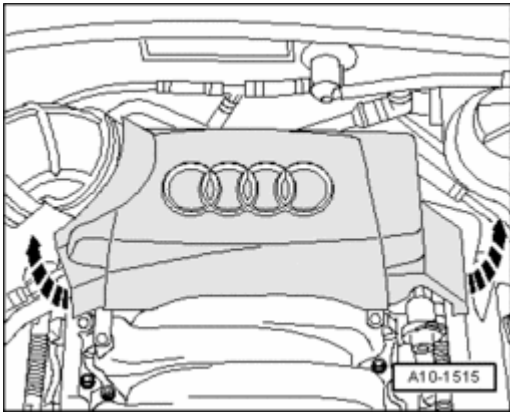
**Fig. 656: Identifying Ring Spanner 7-Piece Set 3337**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Ring spanner 7-piece set for oxygen sensor 3337

**Removing**

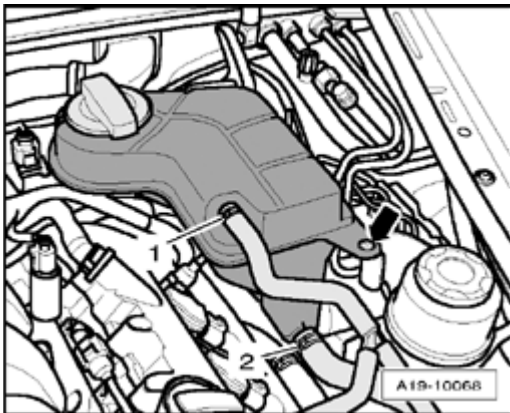
**NOTE:**

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

**Fig. 657: Removing Rear Engine Cover**

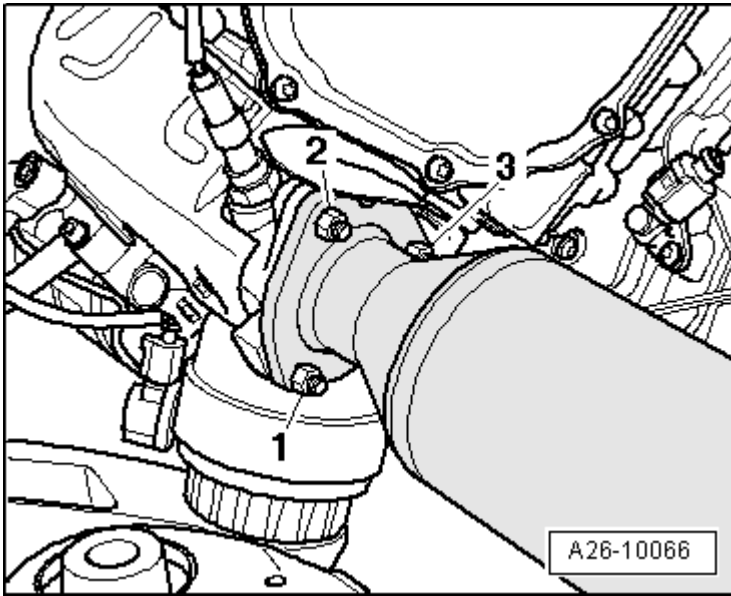
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove rear engine cover - **arrows** -.

**Fig. 658: Removing Coolant Hoses At Coolant Expansion Tank**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove coolant expansion tank - **arrow** -.
- Disconnect electrical connection from Engine Coolant Level (ECL) Warning Switch F66 at bottom of coolant reservoir and set aside coolant reservoir with coolant hoses - **1** - and - **2** - connected.



**Fig. 659: Removing Nuts & Left Front Exhaust Pipe With Catalytic Converter**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nut - 2 - of relevant threaded fastener for front exhaust pipe/exhaust manifold, which is accessible from top.

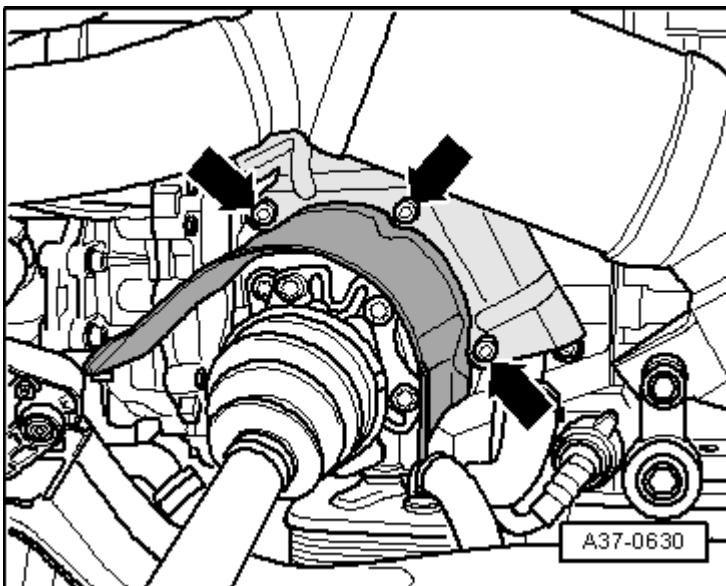
**NOTE:**

- To improve clarity, the removed engine is shown from the rear.

- Drain coolant --> Cooling system, draining and filling.
- Remove left front wheel.

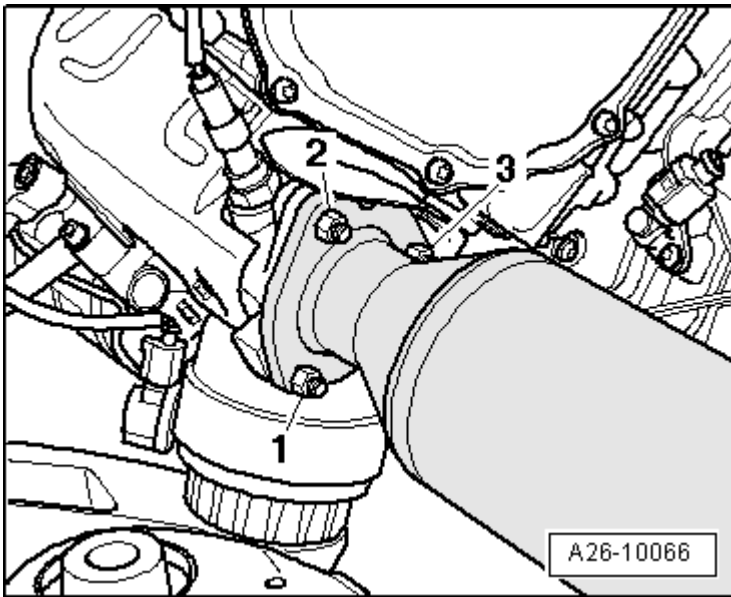
**NOTE:**

- Secure brake disc with a wheel bolt.



**Fig. 660: Removing Heat Shield For Left Drive Axle**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield - **arrows** - for left drive axle.

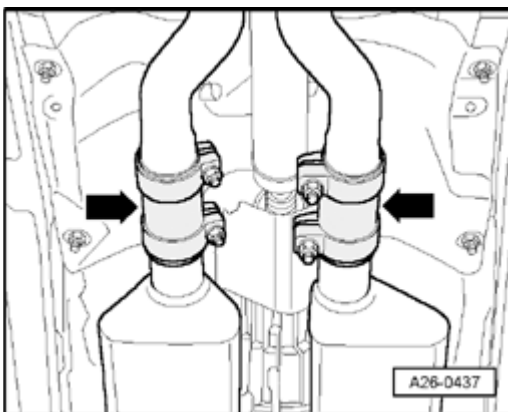


**Fig. 661: Removing Nuts & Left Front Exhaust Pipe With Catalytic Converter**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - **1** - and - **3** - which are accessible from bottom for front exhaust pipe/exhaust manifold.

**NOTE:**

- To improve clarity, the removed engine is shown.



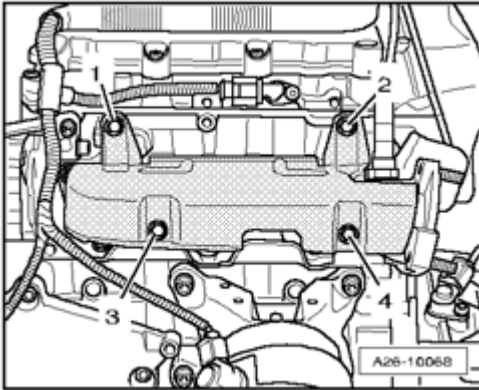
**Fig. 662: Loosening Clamping Sleeves**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

**NOTE:**

- Flex joint in front exhaust pipe must not be bent more than 10 ° , otherwise it may be damaged.

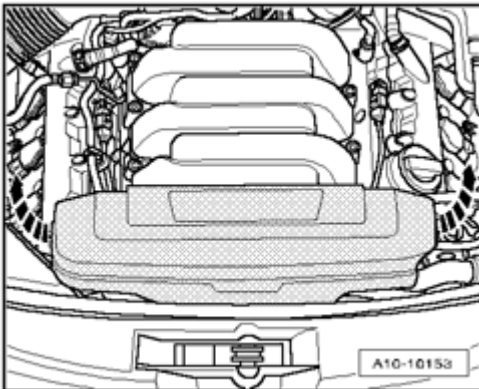
- Disconnect exhaust system at clamping sleeve - **left arrow** -.
- Push the clamping sleeve back and pull the front exhaust pipe off from the exhaust manifold.

**NOTE:**                      • **The front exhaust pipe remains on vehicle.**



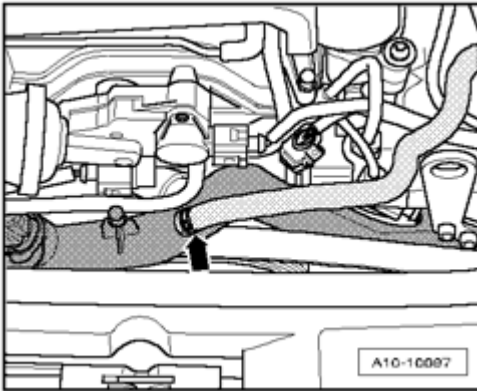
**Fig. 663: Removing Bolts For Heat Shield**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **3** - and - **4** - for heat shield, which are accessible from bottom.



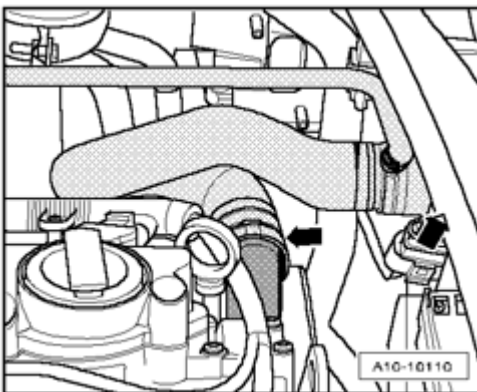
**Fig. 664: Identifying Front Engine Cover**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front engine cover - **arrows** -.



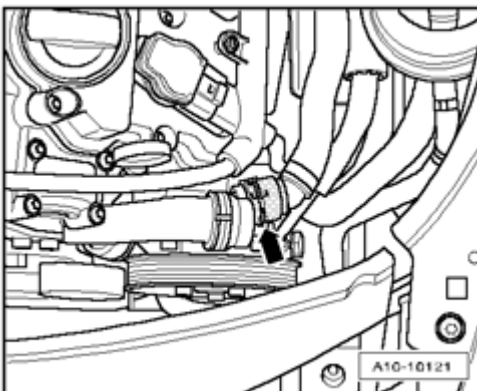
**Fig. 665: Removing Coolant Hose From Front Coolant Line**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove coolant hose - **arrow** - from front coolant line.



**Fig. 666: Removing Left Front Coolant Hose In Engine Compartment**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove left front coolant hose in engine compartment - **arrows** -.



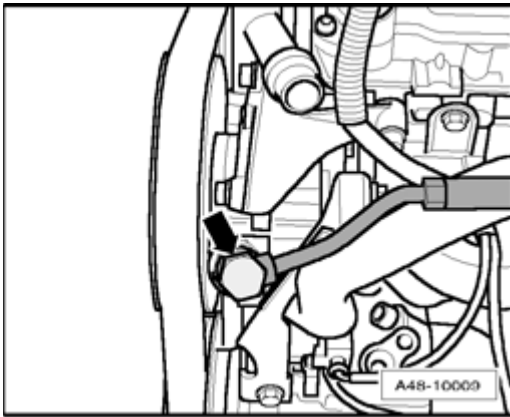
**Fig. 667: Removing Coolant Hose From Front Coolant Line**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.



- Remove coolant hose - **arrow** - from front coolant line.

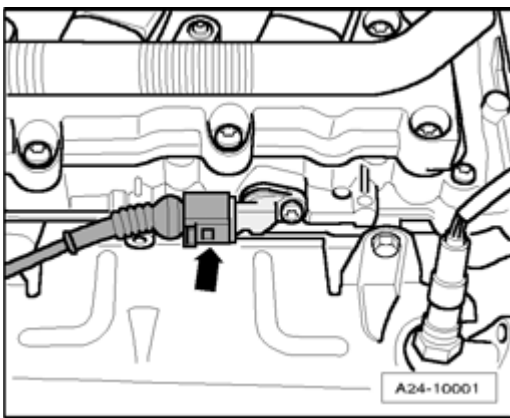
**NOTE:**

- Place a rag under hydraulic line to catch escaping hydraulic fluid.



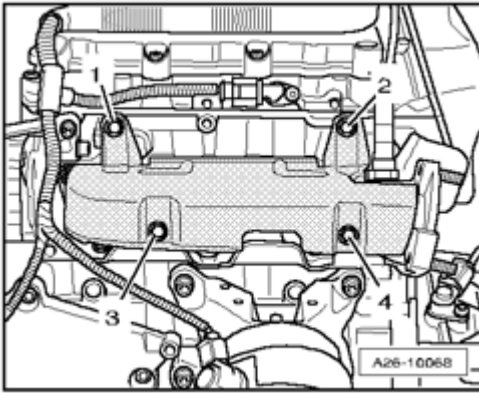
**Fig. 668: Removing Hydraulic Pressure Line At Power Steering Pump**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove hydraulic pressure line - **arrow** - at power steering pump and set it aside on top of longitudinal member.



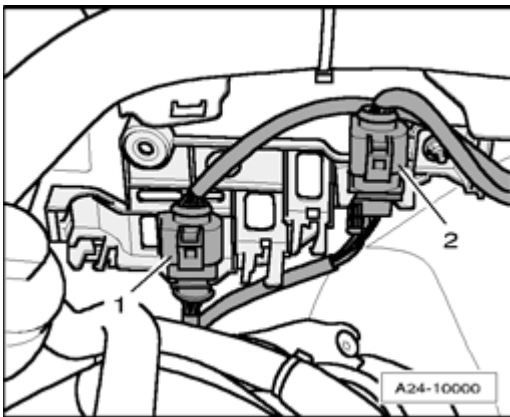
**Fig. 669: Disconnecting Electrical Harness Connector At Camshaft Position (CMP) Sensor 4 G301**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - **arrow** - at Camshaft Position (CMP) Sensor 4 G301.
- Free up electrical wiring.

**Fig. 670: Removing Bolts For Heat Shield**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - 1 - and - 2 - for heat shield, which are accessible from top.
- Remove heat shield.

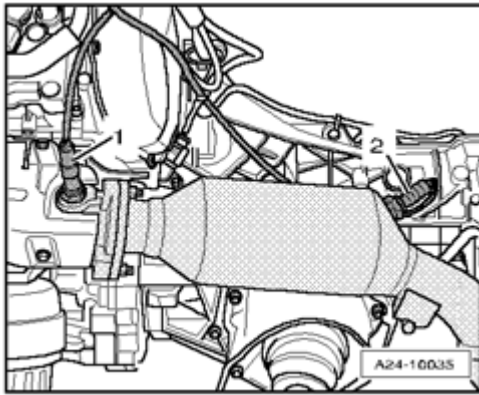
**Fig. 671: Disconnecting Electrical Harness Connector For Oxygen Sensor (O2S) 2 Behind Three Way Catalytic Converter (TWC) G131**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - 2 - for Heated Oxygen Sensor (HO2S) 2 G108 and free up wire.

**NOTE:**

- Ignore - 1 -.

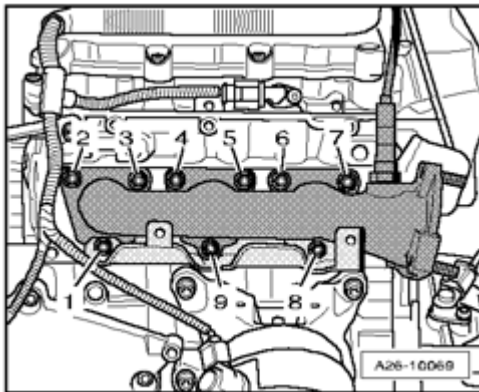


**Fig. 672: Removing Oxygen Sensor Using Ring Spanner Set 3337**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove oxygen sensor - 1 - using ring spanner set 3337.

**NOTE:**

- To improve clarity, the engine is shown removed.
- Ignore - 2 -.



**Fig. 673: Removing Nuts, Bracket For Heat Shield & Exhaust Manifold**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - 1 - and - 8 - and remove bracket for heat shield.
- Remove nuts - 2 through 7 - and - 9 - and remove exhaust manifold.

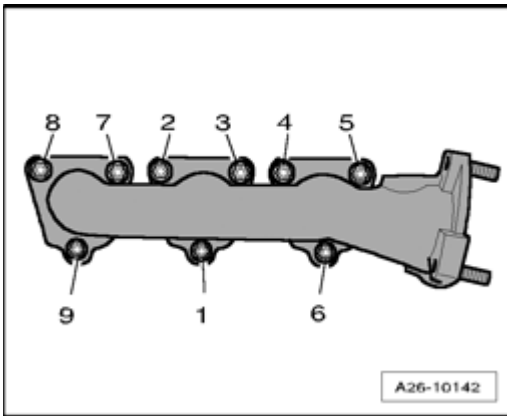
**Installing**

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

**NOTE:**

- Replace gaskets, seals and self-locking nuts.
- Secure all hose connections using hose clamps appropriate for the model type .

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



**Fig. 674: Exhaust Manifold Tightening Sequence**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Fasten exhaust manifold together with heat shield bracket in 2 steps according to the indicated tightening sequence, as follows.
  1. Pre-tighten to 15 Nm.
  2. Tighten to 25 Nm.
- Install oxygen sensor --> **24 - FUEL INJECTION SYSTEM** .
- Install left front exhaust pipe with catalytic converter: Vehicles with manual transmission --> **Left front exhaust pipe with catalytic converter (vehicles with manual transmission), removing and installing** , vehicles with automatic transmission --> **Left front exhaust pipe with catalytic converter (vehicles with automatic transmission 09L), removing and installing**.
- Align exhaust system free of tension --> **Exhaust system, installing free of tension**.
- Fill with coolant --> **Cooling system, draining and filling**.
- Check power steering oil level and top off if necessary --> **48 - STEERING** .

### Torque specifications

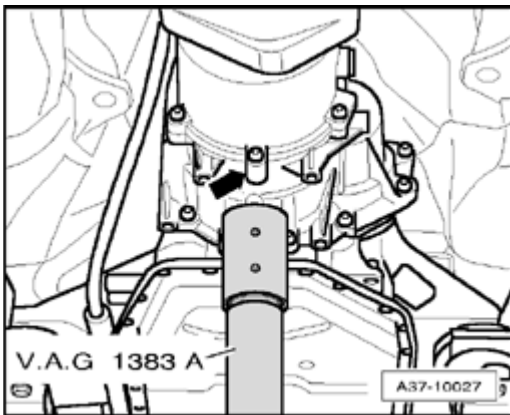
| Component                                                                                                                                             | Nm                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Exhaust manifold to cylinder head                                                                                                                     | 25 <sup>1)2)</sup> |
| Heat shield to heat shield bracket                                                                                                                    | 10                 |
| Hydraulic pressure line to power steering pump                                                                                                        | 47                 |
| Heat shield for drive shaft to transmission                                                                                                           | 23                 |
| <ul style="list-style-type: none"> <li>• <sup>1)</sup> Replace nuts.</li> <li>• <sup>2)</sup> Grease with hot bolt paste; hot bolt paste .</li> </ul> |                    |

### Right exhaust manifold, removing and installing

## Removing

### NOTE:

- All cable ties which are opened or cut open when removing, must be replaced in the same position when installing.
- Remove right front exhaust pipe with catalytic converter: Vehicles with manual transmission --> **Right front exhaust pipe with catalytic converter (vehicles with manual transmission), removing and installing**, vehicles with automatic transmission --> **Right front exhaust pipe with catalytic converter (vehicles with automatic transmission 09L), removing and installing**.



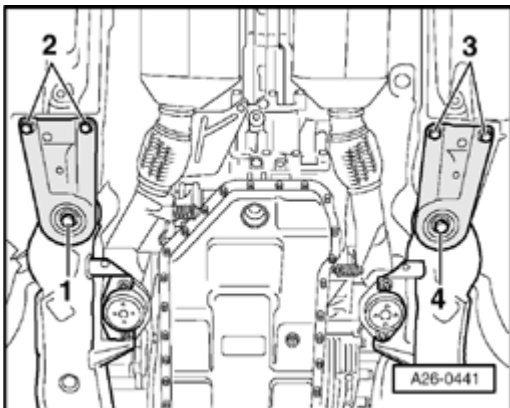
**Fig. 675: Placing Lifting Surface Of Engine/Transmission Jack V.A.G 1383 A Centrally On Lower Housing Base**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

### Vehicles with automatic transmission:

### NOTE:

- After removing right front exhaust pipe, the rear of the subframe is loosened.
- The transmission is supported by the Engine/Transmission Jack V.A.G 1383 A centrally on lower housing base - arrow -.
- Lift transmission slightly using Engine/Transmission Jack V.A.G 1383 A.



**Fig. 676: Removing Bolts And Mounting Bolts Of Subframe**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

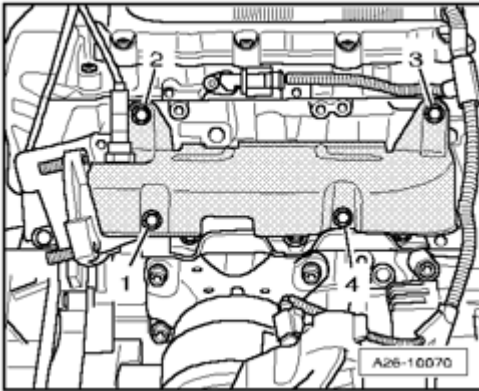
- Install bolts - 1 - and - 4 - to hand-tight.

**NOTE:**

- Ignore - 2 - and - 3 -.

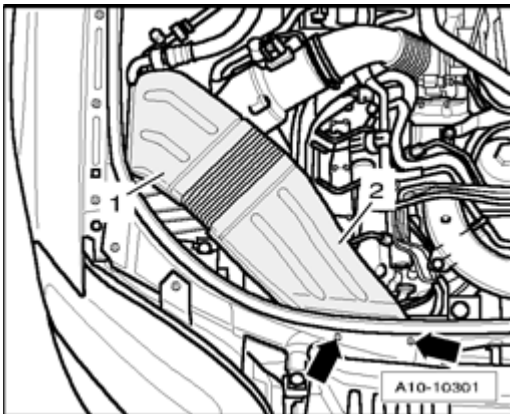
- Lower transmission and pull Engine/Transmission Jack V.A.G 1383 A out from under vehicle.

**All:**



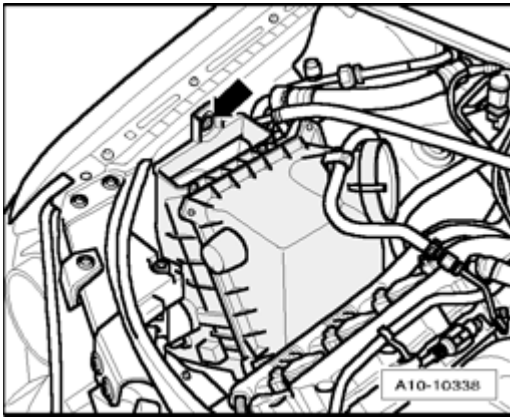
**Fig. 677: Removing Bolts For Heat Shield**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - 1 - and - 4 - for heat shield, which are accessible from bottom.



**Fig. 678: Identifying Bolts & Air Duct**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

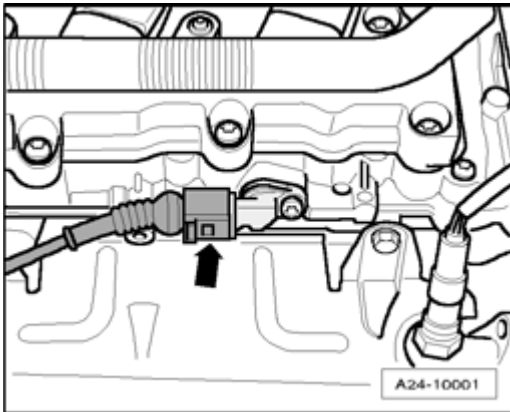
- Remove bolts - **arrows** -.
- Remove air duct - 1 - and - 2 -.



**Fig. 679: Removing Pin From Spreader Clips**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

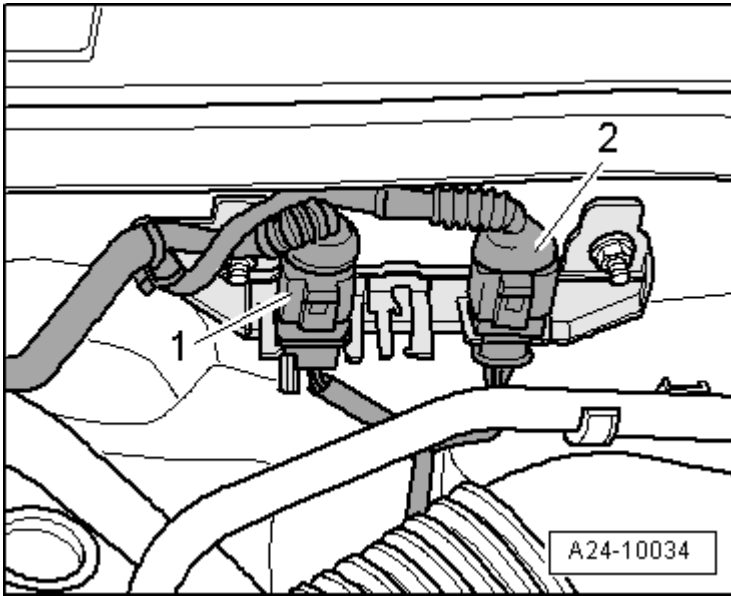
- Remove pin from spreader clips - **arrow** -.
- Remove air filter housing.
- Free up electrical wiring harness for generator and starter at longitudinal member.



**Fig. 680: Disconnecting Electrical Harness Connector At Camshaft Position (CMP) Sensor 3 G300**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - **arrow** - at Camshaft Position (CMP) Sensor 3 G300.
- Free up electrical wiring.



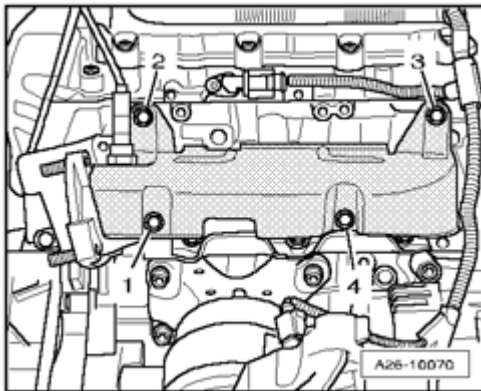
**Fig. 681: Disconnecting Electrical Harness Connector For Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - 1 - for Heated Oxygen Sensor (HO2S) G39 and free up wire.

**NOTE:**

- Ignore - 2 -.

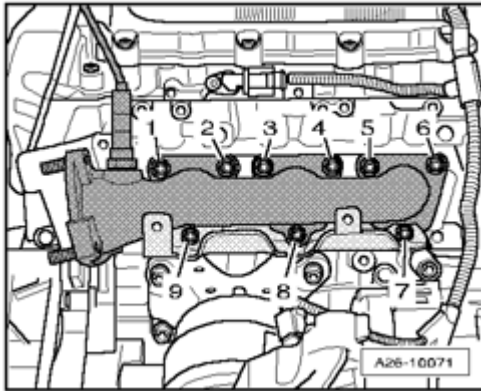


**Fig. 682: Removing Bolts For Heat Shield**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - 2 - and - 3 - , which are accessible from above, and remove heat shield.





**Fig. 683: Removing Nuts, Bracket For Heat Shield & Exhaust Manifold**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

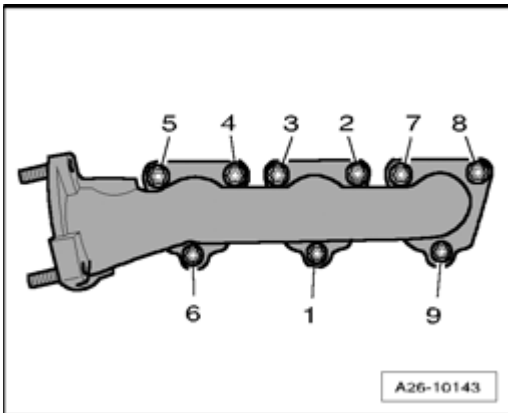
- Remove nuts - 7 - and - 9 - and remove bracket for heat shield.
- Remove nuts - 1 through 6 - and - 8 - and remove exhaust manifold.

### Installing

Installation is in reverse order of removal, noting following:

#### NOTE:

- Replace gaskets and self-locking nuts.
- During installation, all cable ties must be re-installed at the same location.



**Fig. 684: Exhaust Manifold Tightening Sequence**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Fasten exhaust manifold together with heat shield bracket in 2 steps according to indicated tightening sequence, as follows.
  1. Pre-tighten to 15 Nm.
  2. Tighten to 25 Nm.

- Install right front exhaust pipe with catalytic converter: Vehicles with manual transmission --> **Right front exhaust pipe with catalytic converter (vehicles with manual transmission), removing and installing** , vehicles with automatic transmission --> **Right front exhaust pipe with catalytic converter (vehicles with automatic transmission 09L), removing and installing**.
- Align exhaust system free of tension --> **Exhaust system, installing free of tension**.

### Torque specifications

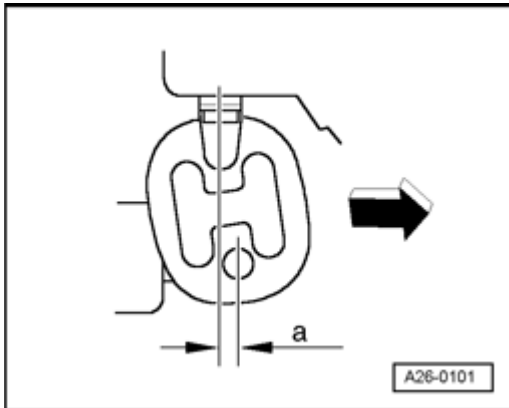
| Component                                                                                                                                             | Nm                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Exhaust manifold to cylinder head                                                                                                                     | 25 <sup>1)2)</sup> |
| Heat shield to heat shield bracket                                                                                                                    | 10                 |
| Hose clamps 9 mm wide                                                                                                                                 | 3                  |
| <ul style="list-style-type: none"> <li>• <sup>1)</sup> Replace nuts.</li> <li>• <sup>2)</sup> Grease with hot bolt paste; hot bolt paste .</li> </ul> |                    |

### Exhaust system, installing free of tension

**NOTE:**                      • **Align exhaust system when cold.**

### Vehicles without double clamps between center and rear muffler

- Loosen bolts of clamping sleeves.



**Fig. 685: Pushing Exhaust System Toward Front Of Vehicle**  
**Courtesy of VOLKSWAGEN UNITED STATES, INC.**

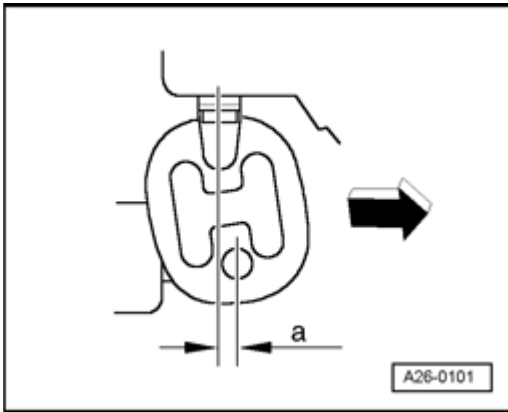
- Push exhaust system far enough forward - **arrow** - until pre-load on retaining loops at center muffler is - **a** - = 5 to 9 mm.
- Tighten clamping sleeve connections evenly to 23 Nm.
- Align end pipes **Tailpipes, aligning**.

### Vehicles with double clamps between center and rear muffler

**NOTE:**

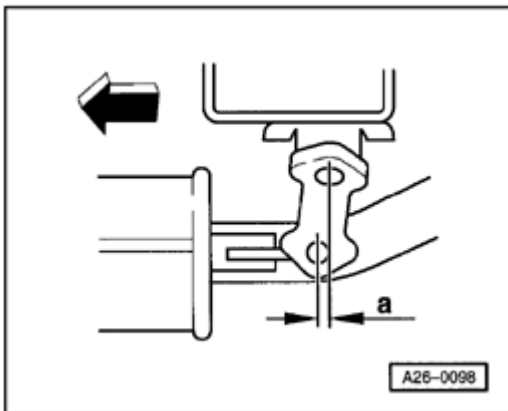
- Only for vehicles with clamping sleeves between center and rear mufflers, the center muffler must also be aligned.

- Loosen bolts of clamping sleeves and.



**Fig. 686: Pushing Exhaust System Toward Front Of Vehicle**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

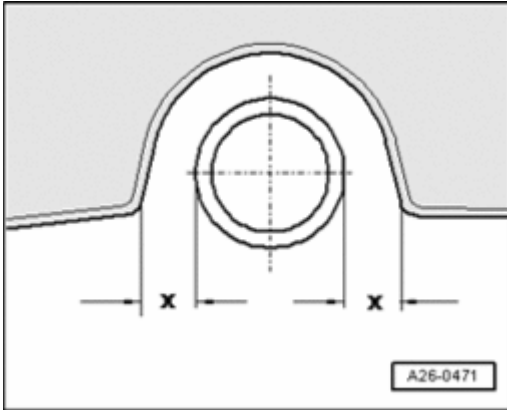
- Slide front section of exhaust system far enough forward - **arrow** - until pre-load on retaining loops at center muffler - **a** - = 5 to 9 mm.
- Tighten from clamping sleeve connections evenly to 23 Nm.
- Slide rear section of exhaust system far enough forward - **arrow** - until pre-load on retaining loops at center muffler - **a** - = 5 to 9 mm.



**Fig. 687: Pushing Rear Part Of Exhaust System Far Enough Forward Until Pre-Load On Retaining Loops At Rear On Rear Muffler**  
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Push rear part of exhaust system far enough forward - **arrow** - until pre-load on retaining loops at rear on rear muffler - **a** - = 7 to 11 mm.
- Align rear muffler horizontally.
- Tighten bolts for rear clamping sleeve uniformly to 23 Nm.

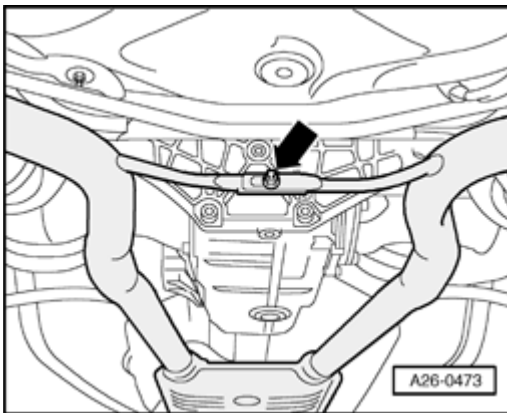
- Align end pipes **Tailpipes, aligning.**

**Tailpipes, aligning**

**Fig. 688: Checking Distance Of End Pipes At Left/Right To Bumper**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

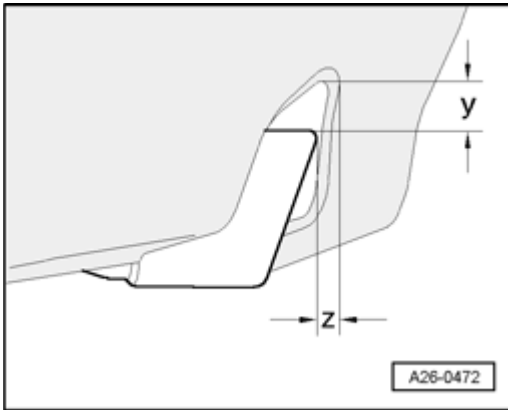
- Check distance of end pipes at left and right to bumper:
  - Dimension - x - left = dimension - x - right.

If necessary, correct dimension "x" as follows:



**Fig. 689: Loosening Nut Of Brace Between Exhaust Pipes**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen threaded connections - **arrow** - of brace between exhaust pipes.
- Adjust distance between rear mufflers.
- Tighten threaded fastener to 23 Nm.



**Fig. 690: Checking Distances Of End Pipes To Bumper**  
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check distances - y - and - z - of end pipes to bumper:
  - Dimension - y - = approx. 20 mm.
  - Dimension - z - = 20 to 26 mm.
- If necessary, check whether exhaust system is aligned tension-free --> **Exhaust system, installing free of tension.**

#### **Exhaust system, checking for leaks**

- Start engine and let run at idle.
- Seal tailpipes with cloths or plug for duration of leak test.
- Check for leaks by listening at connection areas of cylinder head/exhaust manifold, exhaust manifold/front exhaust pipe etc.
- Repair leaks detected.