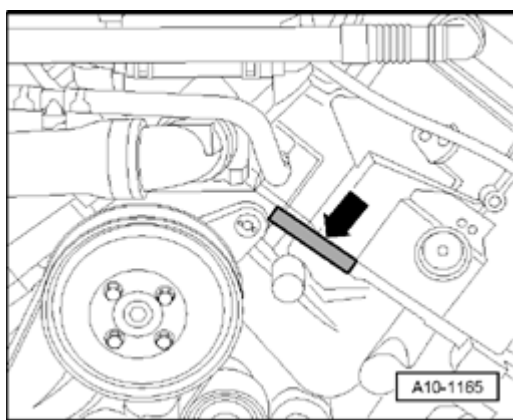


ENGINE**6.0 Liter 12-Cyl. 4V Engine Mechanical, Engine Code(s): BHT, BSB - A8****00 - GENERAL, TECHNICAL DATA****TECHNICAL DATA****Engine number and engine data****Engine number****Fig. 1: Engine Number Location**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

The engine number ("engine code" and "serial number") is located at the front on the cylinder block, below the left cylinder head.

In addition, a sticker with "engine code" and "serial number" is affixed to the right cylinder head cover.

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

Engine data

Code letters		BSB
Displacement	ltr.	5.998
Output	kW/RPM	331/6200
Torque	Nm/RPM	580/4000 - 4500
Bore	dia. mm	84
Stroke	mm	90.2
Compression ratio		10.75
RON	min.	98
Fuel injection and ignition system		Motronic
Ignition sequence		1-12-5-8-3-10-6-7-2-11-4-9

2009 Audi A8 Quattro

ENGINE 6.0 Liter 12-Cyl. 4V Engine Mechanical, Engine Code(s): BHT, BSB - A8

Exhaust gas recirculation	no
Charging	no
Knock control	yes
Variable valve timing	yes
Variable intake manifold	no
Secondary Air Injection (AIR) system	yes

*Super unleaded RON 95 is permitted, although with reduced power.

Cylinder Arrangement For W12 Engine

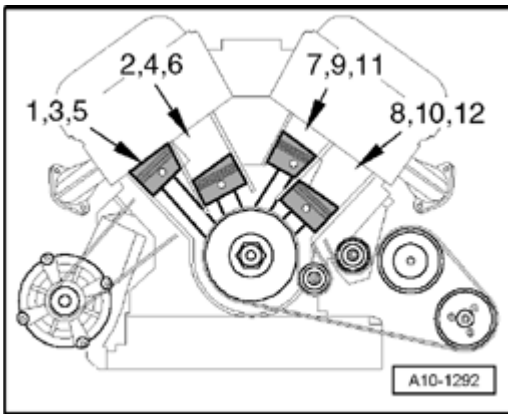


Fig. 2: Cylinder Arrangement For W12 Engine
Courtesy of VOLKSWAGEN UNITED STATES, INC.

GENERAL REPAIR INFORMATION

General Repair Information

--> Clean Working Conditions

--> Fuel Supply System, Checking for Leaks

Clean Working Conditions

Clean Working Conditions

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 the system is open: Do not work with compressed air. Do not move vehicle unless absolutely necessary.

Fuel Supply System, Checking for Leaks

Fuel Supply System, Checking for Leaks

- Let engine run a few minutes at average RPM.
- Switch off ignition.
- Check entire fuel supply system for leaks.
- If there are leaks in spite of correct tightening torque, corresponding component must be replaced.
- Afterward, perform test drive, fully depressing accelerator pedal at least once.
- Check high pressure areas for leaks again.

CONTACT CORROSION

Contact Corrosion

CAUTION:

- **Only use genuine Audi parts!**
- **Only use factory-approved accessories!**
- **Damage from contact corrosion is not covered by warranty!**

- Contact corrosion can occur if appropriate connecting elements (bolts, nuts, washers) are not used.
- For this reason, only install connecting elements that are treated with a special coating. These elements are distinguished by their greenish color.
- Furthermore, all rubber, plastic parts and adhesives are made of non-conductive material.
- If you have doubts about the reusability of parts, generally install new parts.

10 - ENGINE - ASSEMBLY

ENGINE, REMOVING AND INSTALLING

Engine, Removing and Installing

--> General Information

--> Engine, Removing

--> Engine and Transmission, Separating

--> Engine, Securing to Assembly Stand

2009 Audi A8 Quattro

ENGINE 6.0 Liter 12-Cyl. 4V Engine Mechanical, Engine Code(s): BHT, BSB - A8

--> **Engine, Installing**

--> **Engine Wiring, Routing on Engine**

General Information

General Information

NOTE:

- With the lock carrier installed, the engine is removed downward with the transmission and subframe.
- Before beginning work, make sure that the support element VAS 6131/10-12 for the scissor lift table VAS 6131 is also readily equipped with the support set VAS 6131/10.
- All cable ties opened or cut during engine removal must be reinstalled at the same locations during installation.
- Drained coolant must be stored in a clean container for disposal or reuse.

Special tools, testers and auxiliary items required

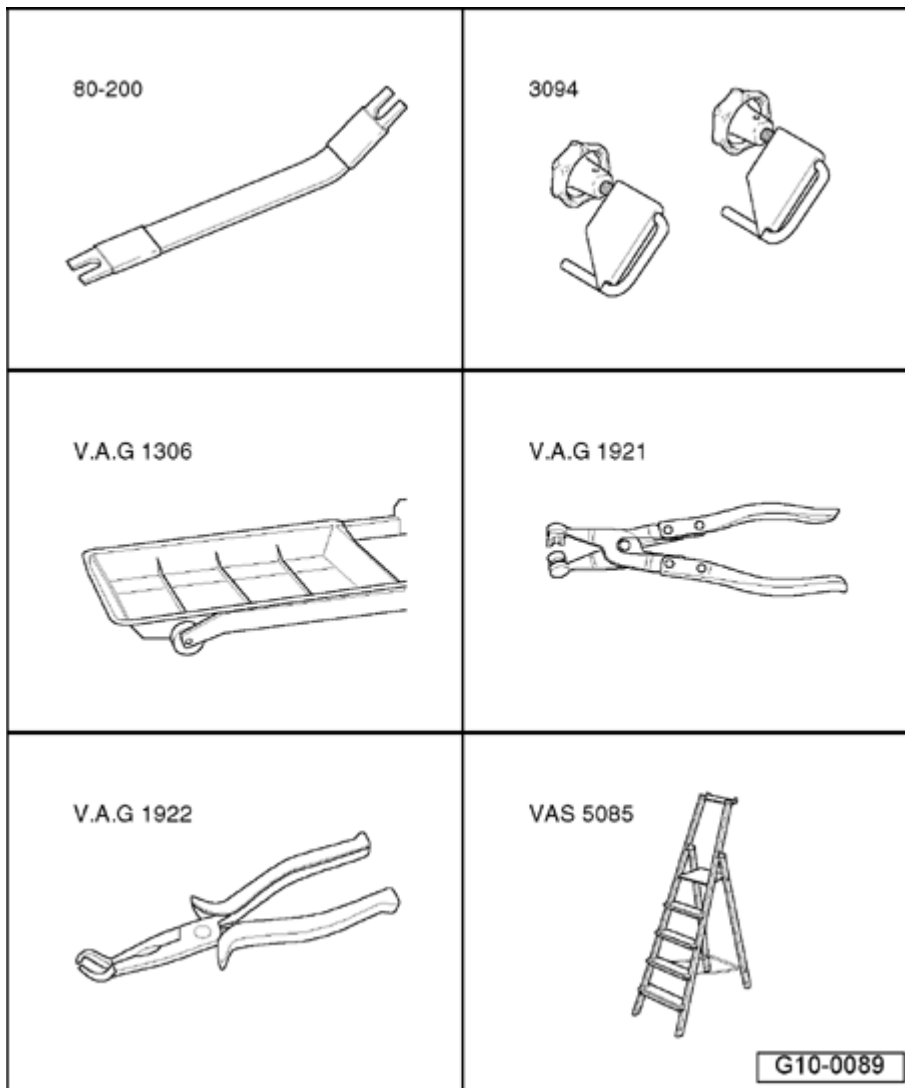


Fig. 3: Identifying Special Tools - General Information
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pry Lever - Rmv Outside Mirror 80-200
- Hose clamps up to 25 mm dia. 3094
- Drip tray V.A.G 1306 or Drip tray for workshop crane VAS 6208
- Hose clamp pliers V.A.G 1921
- Spark plug connector pliers V.A.G 1922
- Step ladder VAS 5085

Special tools, testers and auxiliary items required

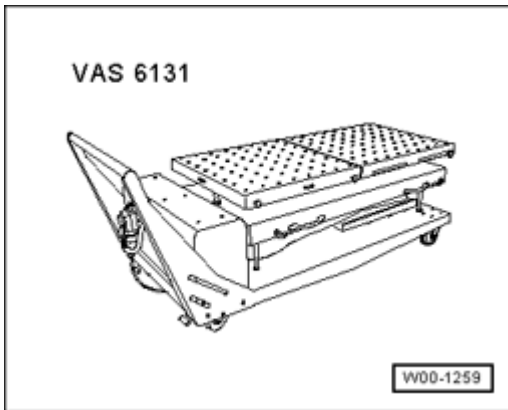


Fig. 4: Scissor Lift Table VAS 6131 With Support Set VAS 6131/10 And Added Support Element VAS 6131/10-12 As Well As Supplementary Set VAS 6131/11
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Scissor lift table VAS 6131 with Support set VAS 6131/10 and added Support element VAS 6131/10-12 as well as Supplementary set VAS 6131/11

Engine, Removing

Engine, Removing

- Discharge refrigerant circuit --> **87 - AIR CONDITIONING** .
- Activate vehicle lifting mode --> **43 - SELF LEVELING SUSPENSION** .

CAUTION: Observe procedures for disconnecting battery --> 27 - BATTERY, STARTER, GENERATOR, CRUISE CONTROL .

- Switch ignition off.

NOTE:

- So that the front wheels can still be turned with the battery disconnected, the battery must only be disconnected with the ignition key inserted.

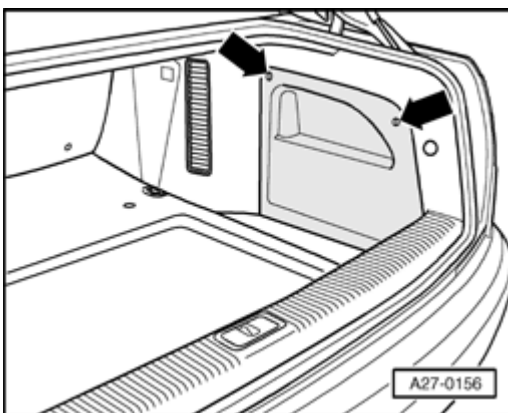


Fig. 5: Right Luggage Compartment Side Trim

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove cover of right luggage compartment side trim - **arrows** -.

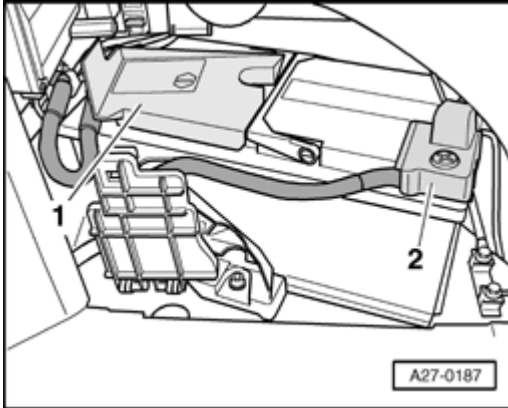


Fig. 6: Removing Cover Above Battery

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove cover - **1** - above battery.

NOTE:

- Ignore - **2** - in the illustration.

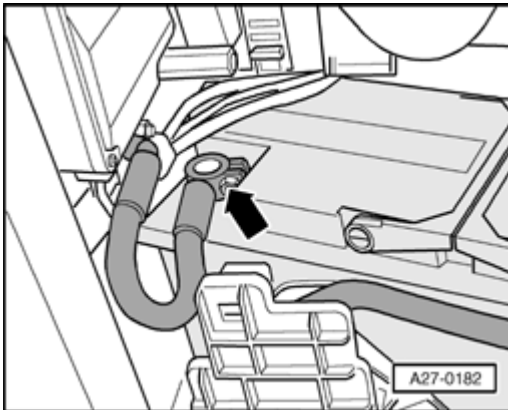


Fig. 7: Disconnecting Battery Ground (GND) Strap

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect Ground (GND) strap - **arrow** - at battery.

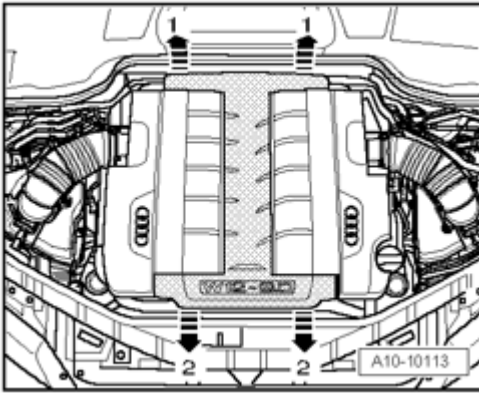


Fig. 8: Pulling Engine Cover At Rear And Middle Upward And Off & Pulling Engine Cover Forward And Off Of Intake Manifold

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Carefully pull engine cover at rear and middle upward and off - **arrows 1** -.
- Then, pull engine cover forward and off of intake manifold - **arrows 2** -.

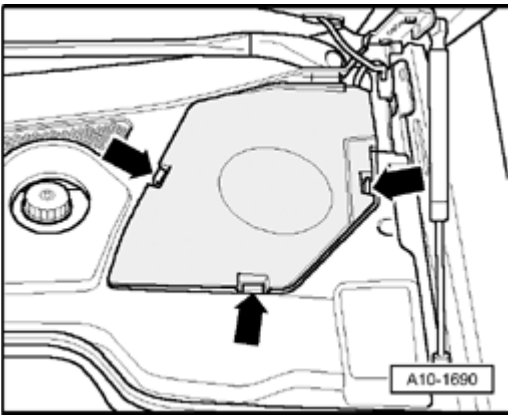


Fig. 9: Cover Above Coolant Reservoir

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove cover above coolant reservoir - **arrows** -.

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

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

NOTE:

- Secure the brake discs with wheel bolts.

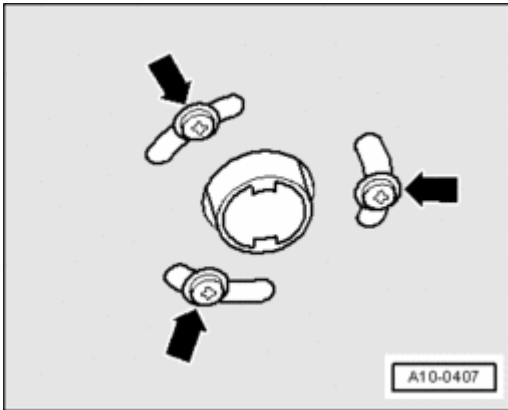


Fig. 10: Identifying Exhaust Pipe Fasteners

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

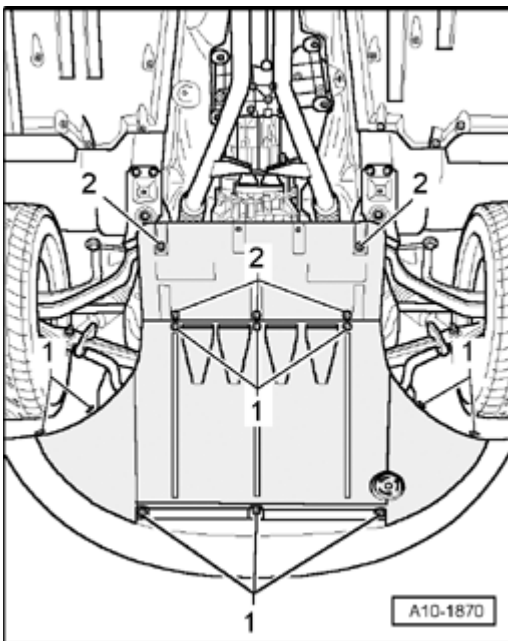


Fig. 11: Noise Insulation Quick-Release Fasteners

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen quick-release fasteners - **1** - and - **2** - and remove sound insulation.
- Remove front and rear parts of left and right front wheelhouse liners --> **66 - EXTERIOR EQUIPMENT** .
- Place drip tray V.A.G 1306 or drip tray for workshop crane VAS 6208 under engine.

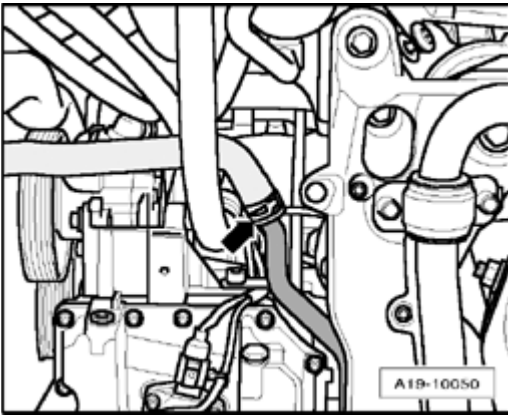


Fig. 12: Left Coolant Pipe Coolant Hose
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect coolant hose - **arrow** - from left coolant pipe and drain coolant.

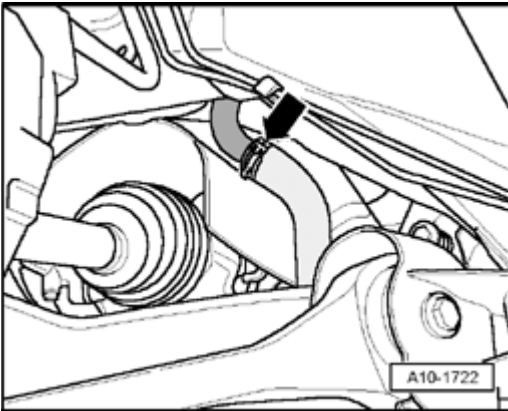


Fig. 13: Left Axle Shaft Coolant Pipe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect coolant hose next to left axle shaft from coolant pipe - **arrow** - and drain coolant.

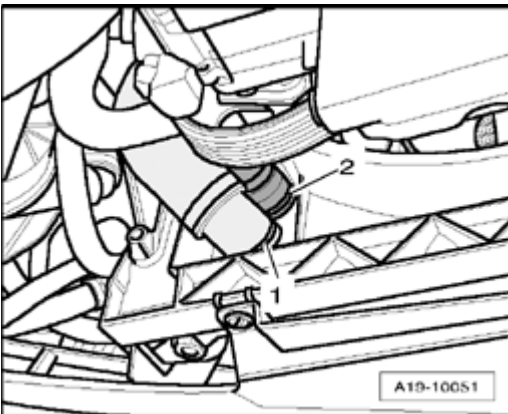


Fig. 14: Radiator Coolant Hoses
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect coolant hoses - **1** - and - **2** - at radiator and drain coolant.

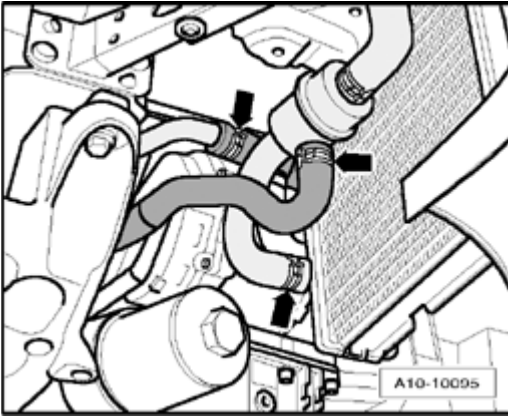


Fig. 15: Coolant Hoses

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect coolant hoses - **arrows** - and drain remaining coolant.

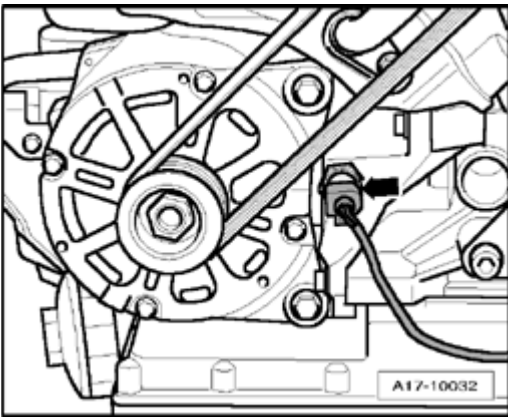


Fig. 16: Oil pressure switch F1 electrical connector

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **arrow** - at Oil pressure switch F1.

NOTE:

- **Illustration is shown with the lock carrier removed.**

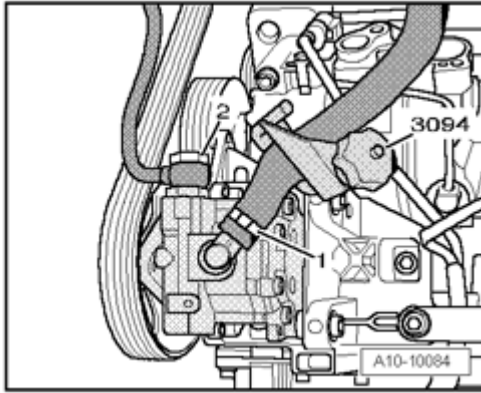


Fig. 17: Identifying Hydraulic Hose, Hydraulic Pressure Line & Hose Clamps 3094
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clamp off return hose for power steering pump with hose clamp 3094.
- Disconnect return hose - 1 - from power steering pump.

NOTE:

- Ignore - 2 - in the illustration.

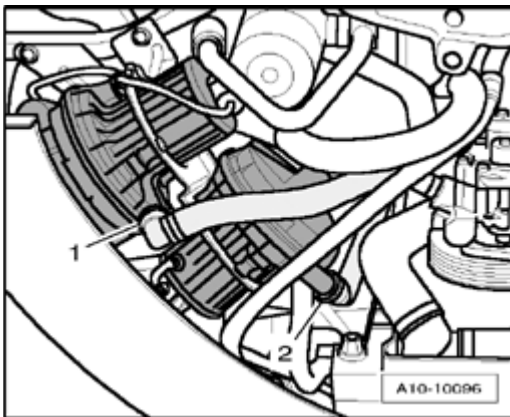
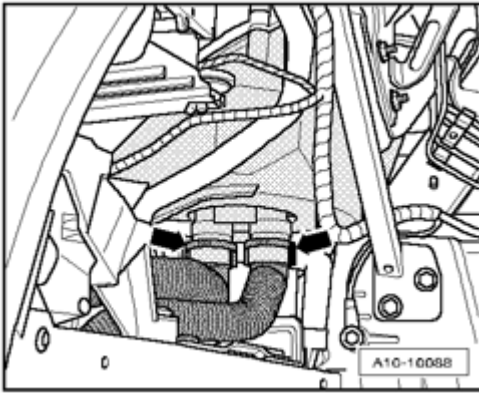


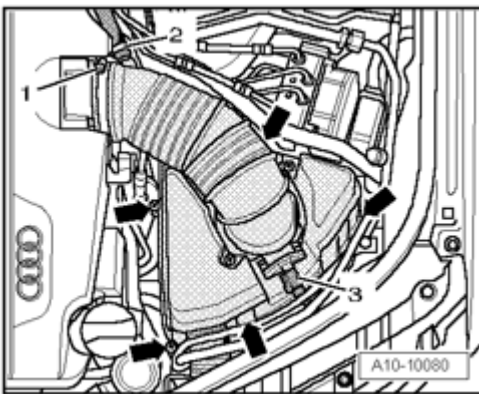
Fig. 18: Secondary Air Injection (AIR) Pump Air Duct Hoses
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect air duct hoses - 1 - and - 2 - at Secondary Air Injection (AIR) pump by pressing release buttons.

**Fig. 19: Air Duct Hoses**

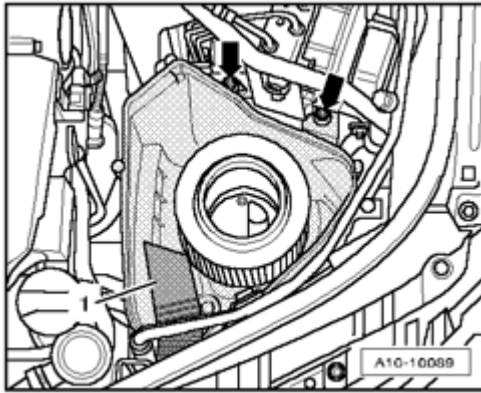
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull off both air duct hoses - **arrows** - at bottom of lower part of left air filter housing by pressing release buttons.

**Fig. 20: Mass Air Flow (MAF) Sensor 2 G246 Electrical Connector, Air Duct Hose, Intake Manifold Air Duct Hose & Bolts**

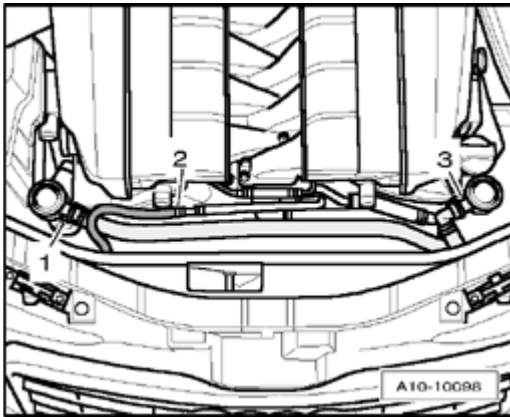
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Separate electrical connector - **3** - for Mass Air Flow (MAF) sensor 2 G246.
- Disconnect hose - **2** - from air duct hose.
- Disconnect air duct hose - **1** - at intake manifold.
- Remove bolts - **arrows** -.
- Remove upper part of left air filter housing.

**Fig. 21: Air Duct & Bolts**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove air duct- 1 -.
- Remove - **arrows** -.
- Remove lower part of left air filter housing.

**Fig. 22: Coolant Hose & Air Duct Hoses**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect coolant hose - 2 -.
- Disconnect air duct hoses - 1 - and - 3 - from combination valves.
- Pull air duct hoses upward and out of engine compartment.

NOTE:

- **Place a rag under hydraulic line to catch escaping hydraulic fluid.**

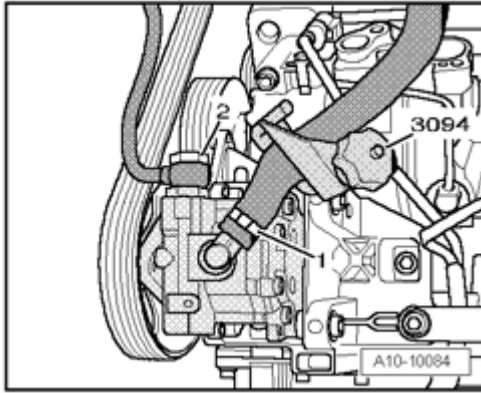


Fig. 23: Identifying Hydraulic Hose, Hydraulic Pressure Line & Hose Clamps 3094
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect hydraulic pressure line - 2 - at power steering pump and set it aside on top of longitudinal member.

NOTE:

- Ignore - 1 - in the illustration.
- To prevent damage to the A/C compressor and to the refrigerant lines/hoses, ensure that the lines and hoses are not stretched, kinked or bent.

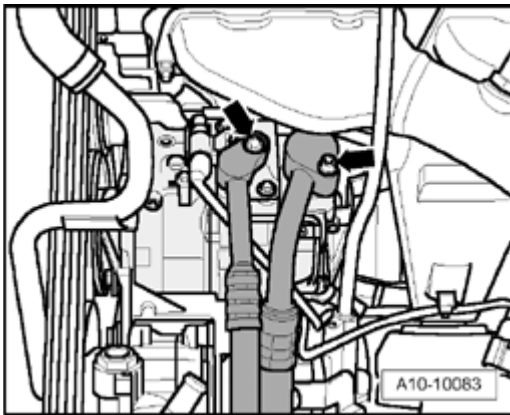
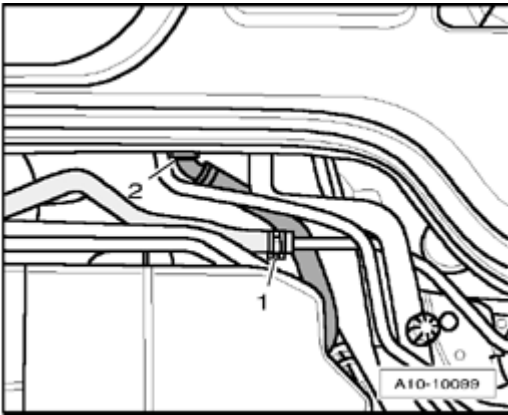


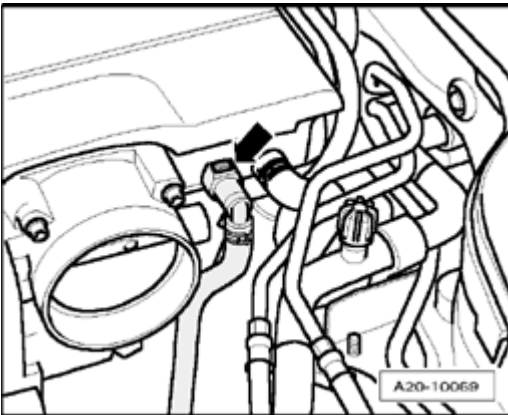
Fig. 24: Refrigerant Lines From A/C Compressor
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect refrigerant lines from A/C compressor - **arrows** -.
- Plug openings of A/C compressor.

**Fig. 25: Coolant Hose & Vacuum Hose**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect coolant hose - 1 -.
- Disconnect vacuum hose - 2 - to brake booster.

**Fig. 26: Leak Detection Pump (LDP) V144 Vacuum Hose**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect Leak Detection Pump (LDP) V144 - **arrow** - to Leak Detection Pump (LDP) V144 from intake manifold.

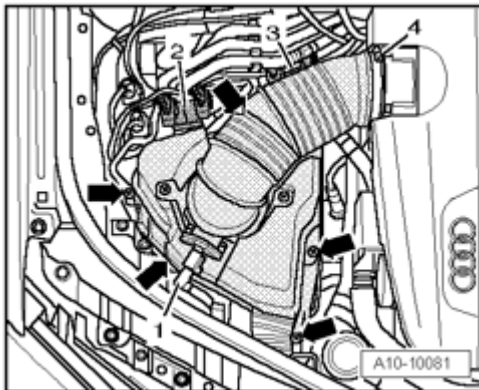


Fig. 27: Mass Air Flow (MAF) Sensor G70 Electrical Connector, Upper Part Of Air Filter Housing Connections, Intake Manifold Air Duct Hose & Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Separate electrical connector - **1** - for Mass Air Flow (MAF) sensor G70.
- Disconnect air duct hose - **4** - at intake manifold.
- Unhook retainer for connections - **2** - and - **3** - at upper part of air filter housing.
- Remove bolts - **arrows** -.
- Remove upper part of right air filter housing.

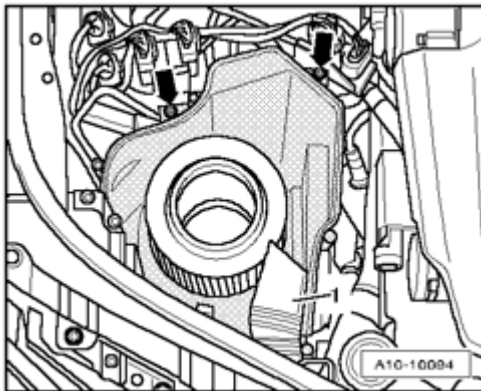


Fig. 28: Air Duct & Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove air duct - **1** -.
- Remove bolts - **arrows** -.
- Remove lower part of right air filter housing.

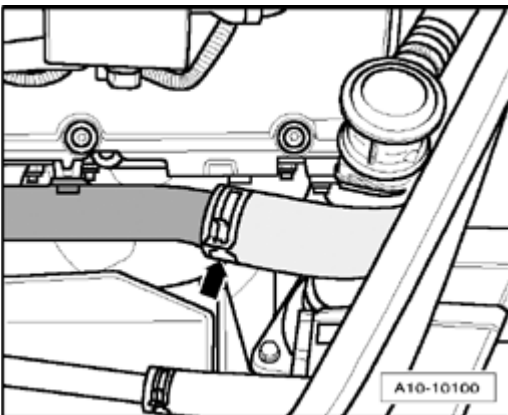


Fig. 29: Coolant Hose
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE: • Place a rag under separating point to catch escaping coolant.

- Disconnect coolant hose - **arrow** - at right on engine.

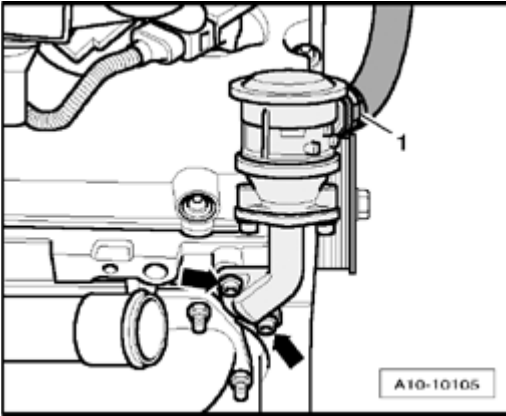


Fig. 30: Combination Valve Pressure Hose & Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and remove right combination valve for secondary air injection.

NOTE:

- Ignore - 1 - in the illustration.

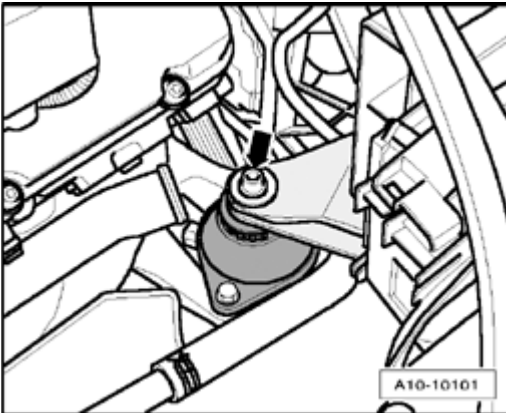


Fig. 31: Torque Support Mount Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - **arrow** - at torque support mount.

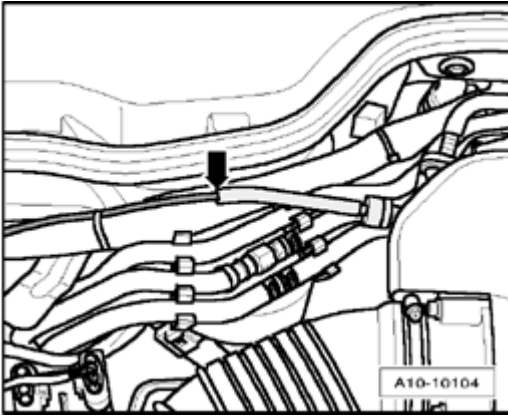


Fig. 32: Vacuum Line To Intake Manifold

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect vacuum line to intake manifold - arrow -.

CAUTION: Note the rules of cleanliness for working on the fuel injection system. -->
Clean Working Conditions

- CAUTION:**
- Fuel system is under pressure! Before opening system, place rags around the connection area. Then release pressure by carefully loosening the connection.

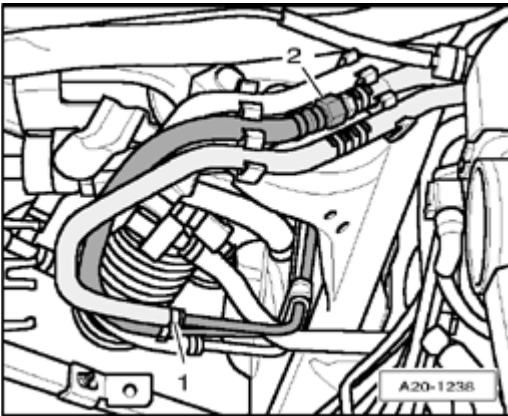


Fig. 33: Fuel Return Line & Fuel Supply Line

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Mark fuel return line - 1 - and fuel supply line - 2 -.

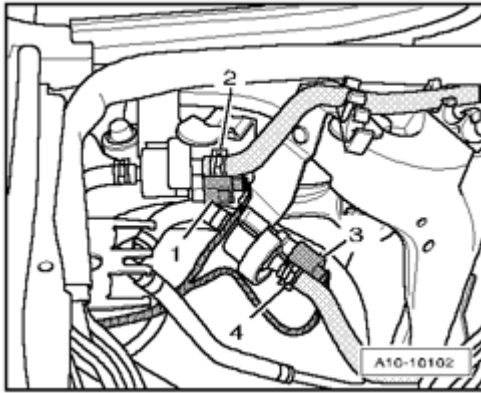


Fig. 34: Electrical Connectors & Vacuum Hoses
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Separate electrical connectors - 1 - and - 3 -.
- Move electrical wiring clear.
- Pull off vacuum hoses - 2 - and - 4 - at Evaporative Emission (EVAP) canister purge regulator valve N80 and at Evaporative Emission (EVAP) canister purge regulator valve 2 -N333-.
- Move vacuum hoses clear.

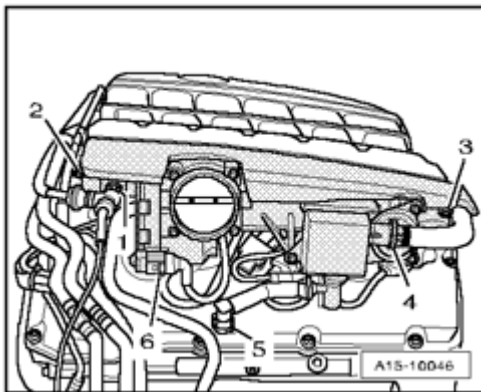


Fig. 35: Vacuum Hose, Bolts, Crankcase Breather Hoses & Throttle Valve Control Module J338 Electrical Connection
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connection - 6 - at Throttle valve control module J338.
- Disconnect vacuum hose - 1 -.
- Pull off hoses - 4 - and - 5 - for crankcase breather.
- Remove bolts - 2 - and - 3 -.
- Remove right intake manifold side part.

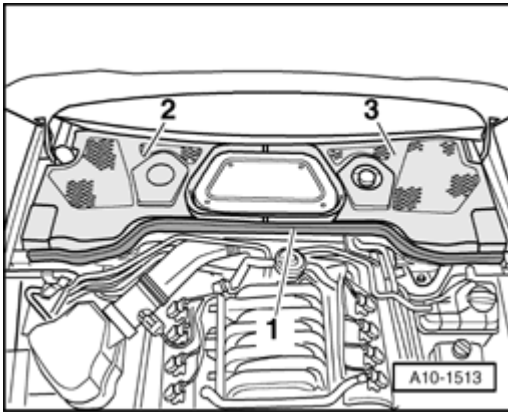


Fig. 36: Plenum Chamber Covers & Rubber Seal

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove rubber seal - 1 - for plenum chamber covers.
- Remove plenum chamber covers - 2 - and - 3 -.

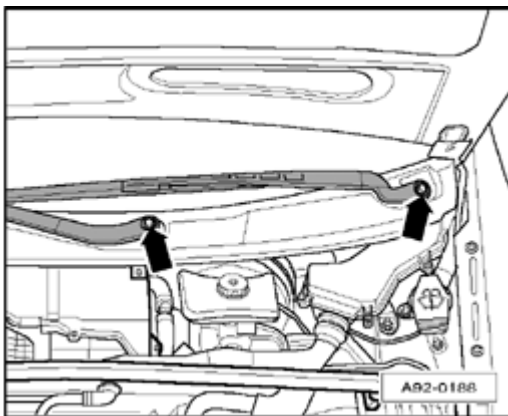


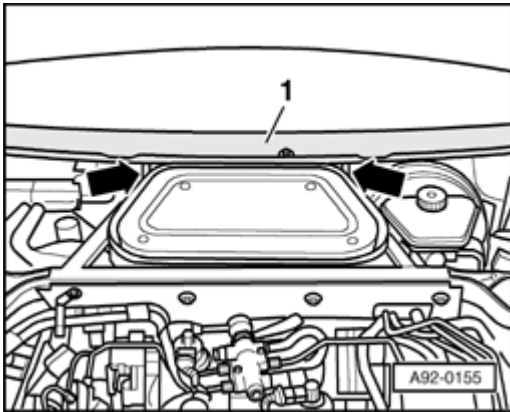
Fig. 37: Identifying Wiper Arm Nuts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pry off caps on wiper arms with a screwdriver.
- Loosen nuts - **arrows** - by several turns.
- Loosen wiper arms by gently rocking them. Remove nuts and remove wiper arms.
- Remove dust and pollen filter by opening 4 quick-release fasteners.

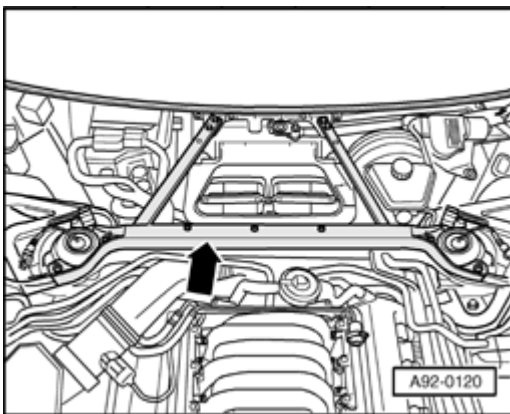
NOTE:

- **Cover the air duct at air conditioning housing with a clean rag so that nothing can fall in.**

**Fig. 38: Cowl Grille & Bolts**

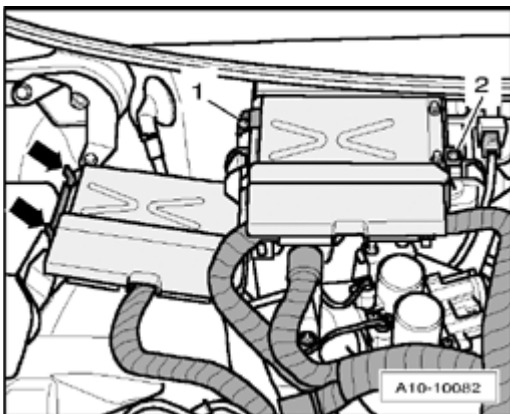
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - at left and right for cowl grille - **1** -.
- Carefully pull cowl grille off of retainers at windshield.

**Fig. 39: Strut Tower Brace**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unfasten strut tower brace - **arrow** -.

**Fig. 40: Retaining Bracket Bolts & Retaining Tabs**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **1** - and - **2** - and remove retaining bracket.
- Release retaining tabs - **arrows** - and remove both engine control modules.

NOTE:

- **The ECM electrical harnesses remain connected.**

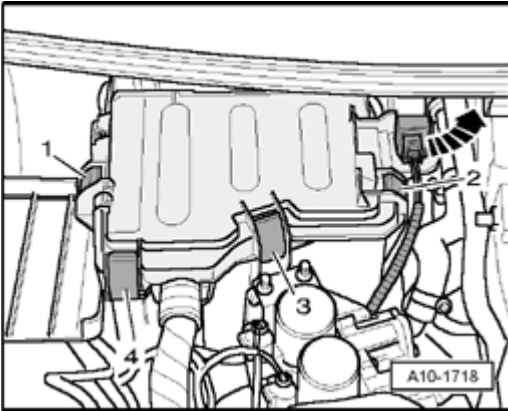


Fig. 41: Removing Air Quality Sensor G238 & Retaining Clips

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Turn Air quality sensor G238 approx. 90° counter-clockwise - **arrow** - and remove from retainer.
- Release retaining clips - **1 to 4** -.
- Fold cover for electronics box in plenum chamber open slightly and pull off toward front.

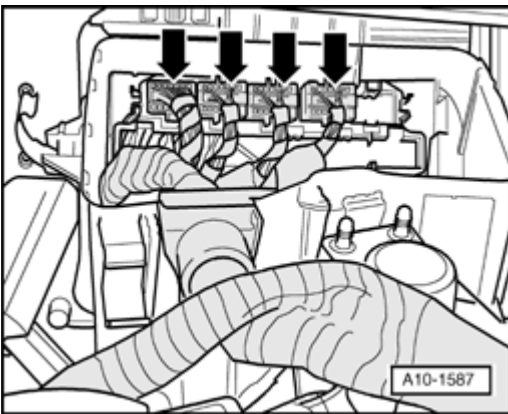


Fig. 42: Multi-Pin Harness Connectors

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect multi-pin harness connectors - **arrows** - using spark plug connector pliers V.A.G 1922.
- Disengage engine wiring harness at electronics box and at bulkhead.
- Place wiring harness aside on engine with engine control modules connected.

NOTE:

- **Protect the engine control modules from falling off.**

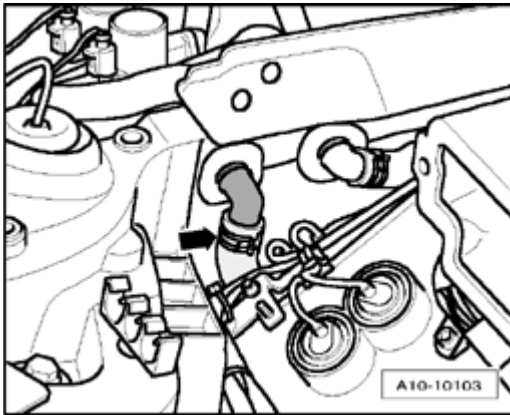


Fig. 43: Coolant Hose At Bulkhead

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect coolant hose at bulkhead - **arrow** -.

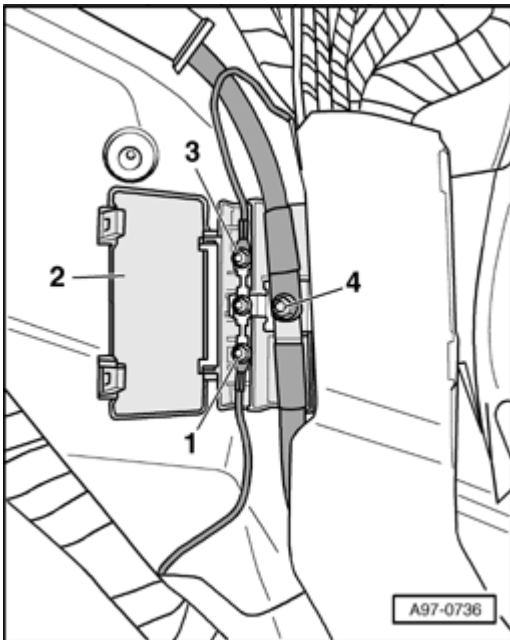


Fig. 44: Identifying Terminal 30 Wire To Starter Cap & Nut

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove right trim for A-pillar --> **70 - INTERIOR TRIM** .
- Fold floor covering back.
- Remove protective cover from above main fuse holder.
- Fold cover - **2** - aside.
- Remove nut - **4** -.
- Disconnect terminal 30 wiring to starter.

NOTE:

- Ignore - 1 - and - 3 - in the illustration.

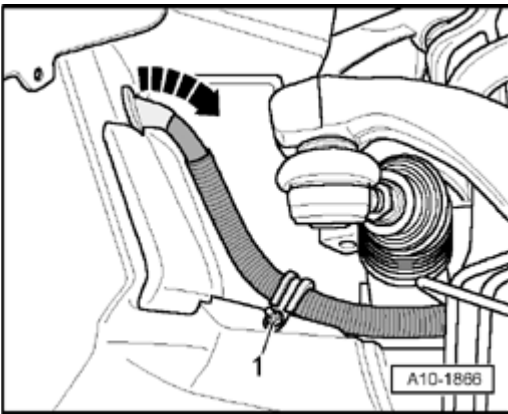


Fig. 45: Pulling Wiring Harness Out From Interior
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unfasten harness clamp - 1 - in right front wheelhousing.
- Pull wiring harness out from interior - **arrow** -.

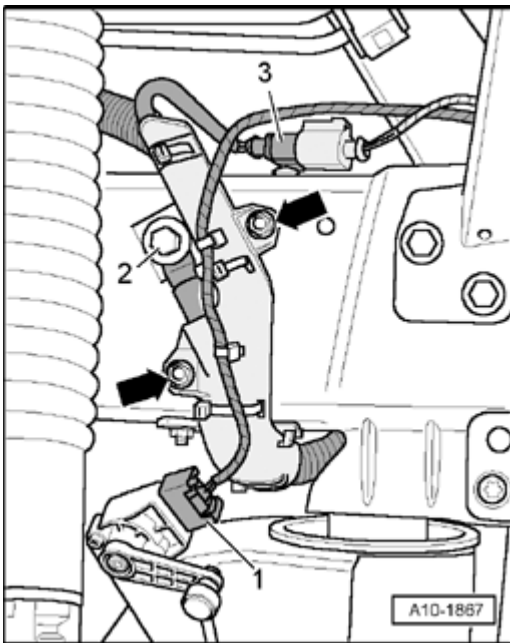
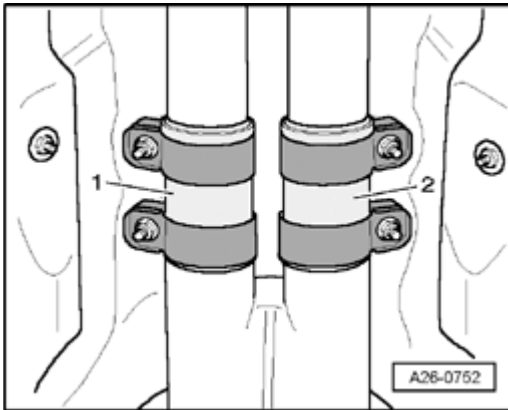


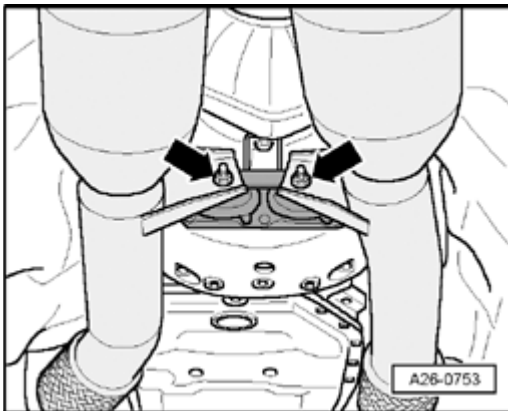
Fig. 46: Disconnecting Electrical Harness Connectors & Ground (GND) Wire On Long Member
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Separate electrical connectors - 1 - and - 3 -.
- Unscrew Ground wire - 2 - on longitudinal member.
- Unfasten bracket for wiring harness on longitudinal member - **arrows** - and place wiring harness aside.

**Fig. 47: Clamping Sleeves**

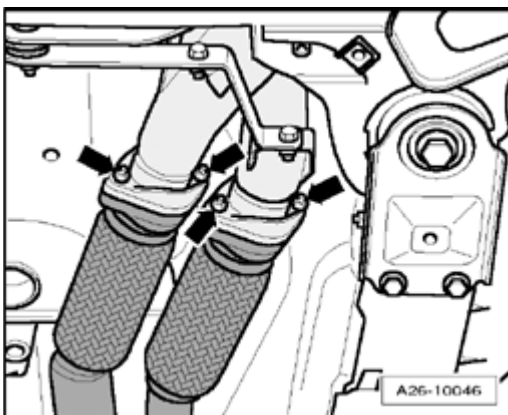
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen clamping sleeves - 1 - and - 2 -.

**Fig. 48: Front Muffler Retaining Straps Nuts**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - **arrows** - at retaining tabs for left and right front mufflers.

**Fig. 49: Left Front Muffler Decoupling Nuts**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- **Decoupling elements at front mufflers must not be bent more than 10 degrees to avoid danger of damage.**

- Remove nuts - **arrows** -.
- Remove left front muffler with decoupling elements.

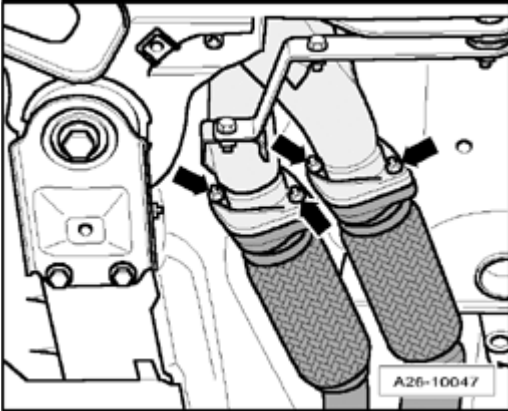


Fig. 50: Right Front Muffler Decoupling Nuts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - **arrows** -.
- Remove right front muffler with decoupling elements.

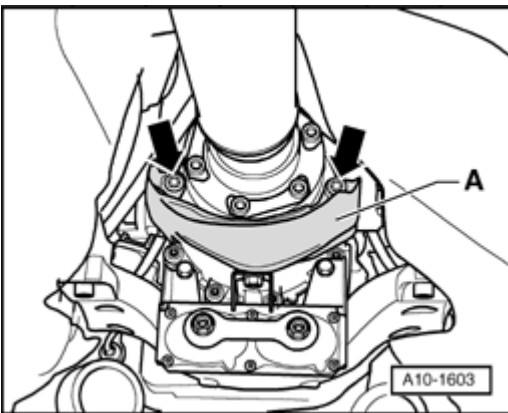


Fig. 51: Heat Shield For Driveshaft

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield for driveshaft - **A** - - **arrows** -.
- Remove bolts at transmission/driveshaft flange.
- Push driveshaft toward rear final drive. Constant velocity (CV) joints can move axially.
- Tie up driveshaft to body.

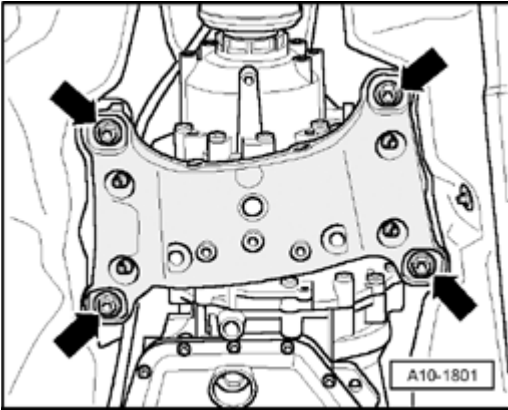


Fig. 52: Tunnel Crossmember Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - at tunnel crossmember.

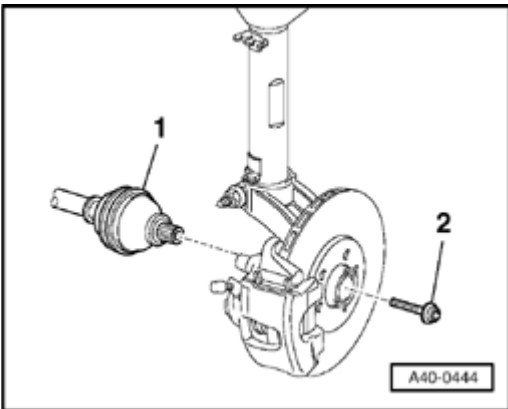


Fig. 53: Identifying Collar Bolt For Left/Right Drive Axle

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Have a second mechanic 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).

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

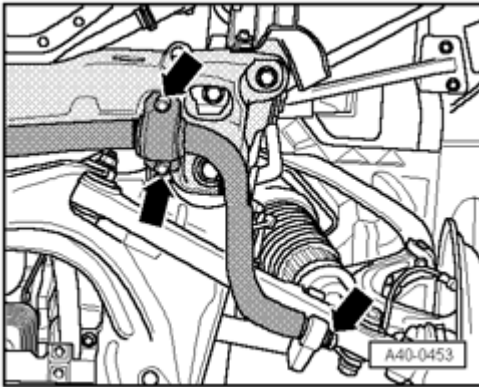


Fig. 54: Stabilizer & Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

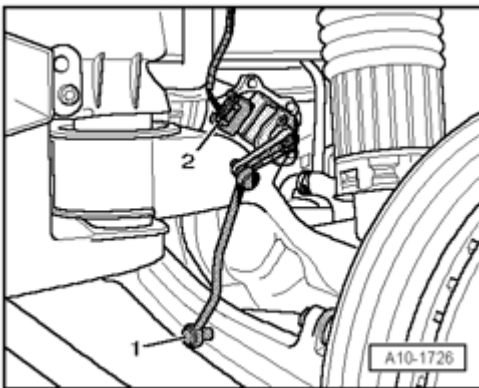


Fig. 55: Identifying Left Level Control System Sensor Electrical Harness Connector & Left/Right Control Arms Coupling Rod

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - **2** - at Level Control System sensor.
- Disconnect connecting link - **1** - at control arm.

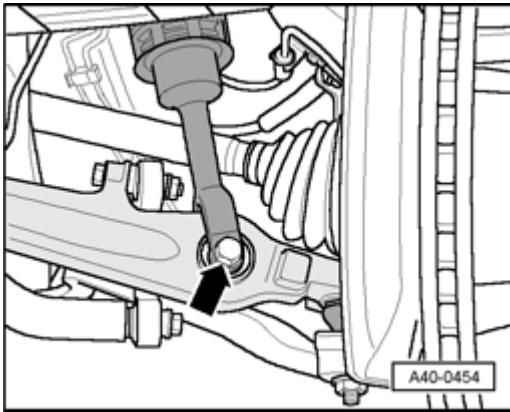


Fig. 56: Air Spring Damper At Control Arm Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt from air spring damper at control arm - **arrow** -.

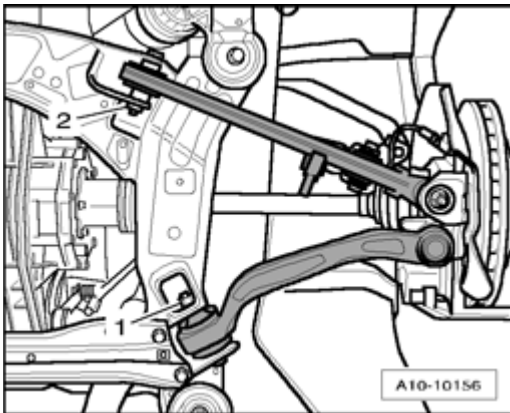


Fig. 57: Guide Control Arm & Control Arm
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unbolt guide control arm - **1** - and control arm - **2** - on subframe.

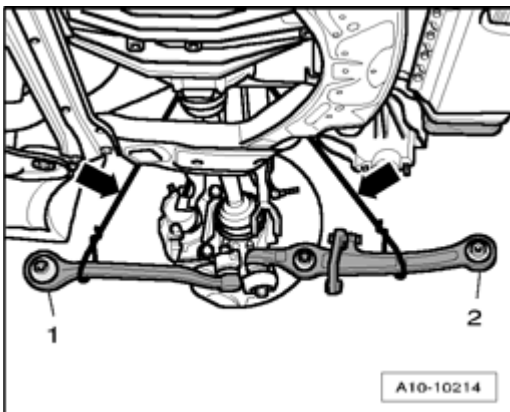


Fig. 58: Pivoting Guide Control Arm And Control Arm Outward
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pivot guide control arm - **1** - and control arm - **2** - outward.

CAUTION: The guide control arm and the control arm must not hang free. Tie up both control arms on the wheel bearing housing - arrows - as shown in illustration.

- Repeat work procedure on opposite side of vehicle.

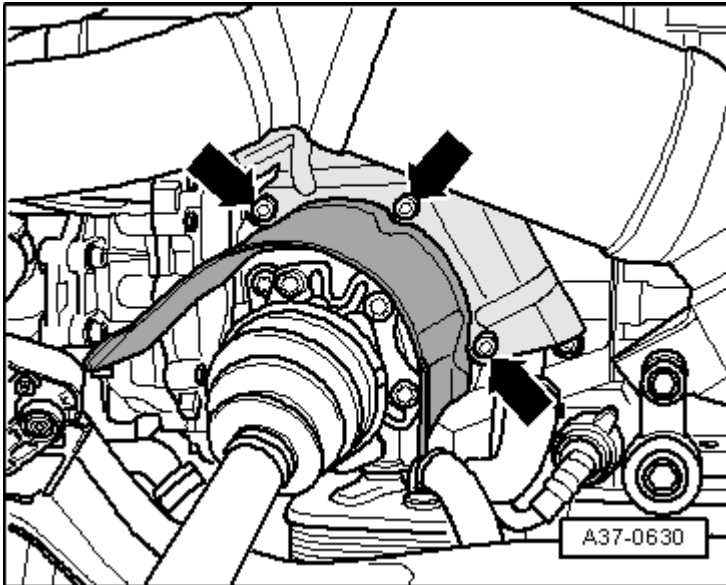


Fig. 59: Driveshaft Heat Shield

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield above driveshaft from transmission - **arrows** -.
- Unbolt driveshaft from transmission flange.

CAUTION: Do not damage brake hose!

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

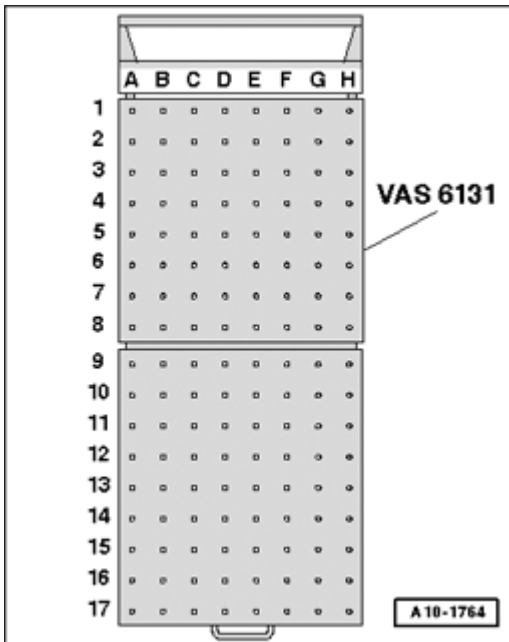


Fig. 60: Identifying Scissor Lift Platform VAS 6131
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Preparing scissor lift platform

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

Platform coordinates	Parts of support set VAS 6131/10 and VAS 6131/11			
C3	/10-1	/10-4	/10-5	/11-1
G3	/10-1	/10-4	/10-5	/11-1
B6	/10-1	/10-3	/10-5	/10-7
G6	/10-1	/10-3	/10-5	/10-7
B10	/10-1	/10-2	/10-5	/10-8
G10	/10-1	/10-2	/10-5	/10-8
D16	/10-1	/10-4	/10-5	/10-9
G15	/10-1	/10-4	/10-5	/10-12

*A washer must also be placed on the support element.

- Screw support elements first tightly by hand on scissor lift platform.
- 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.

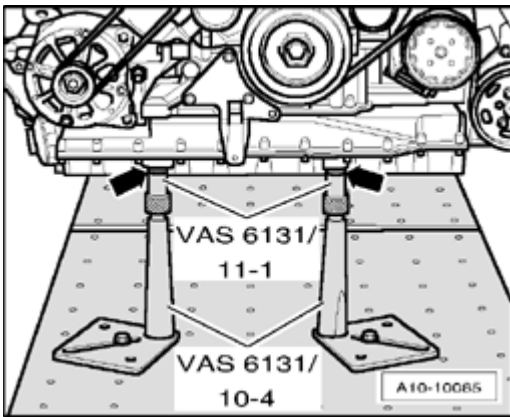


Fig. 61: Positioning Support Elements From VAS 6131/10 Or VAS 6131/11 On Front Of Engine
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position support elements from VAS 6131/10 or VAS 6131/11 on front of engine as shown in illustration.

NOTE:

- Place a washer - arrows - between the support elements VAS 6131/11-1 and the oil pan.

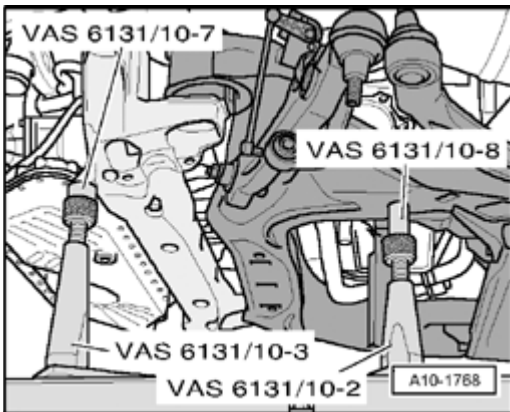


Fig. 62: Positioning Support Elements From VAS 6131/10 At Left/Right On Engine Carrier And Subframe

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

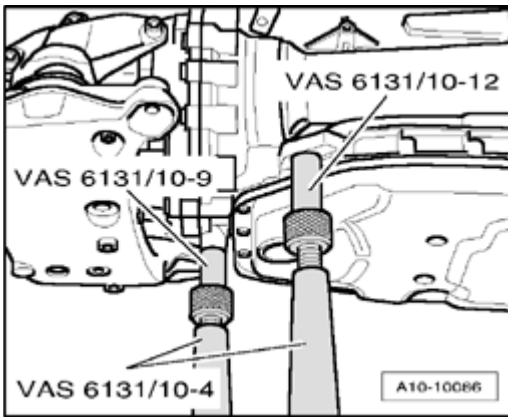


Fig. 63: Positioning Support Elements From VAS 6131/10 At Rear On Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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.

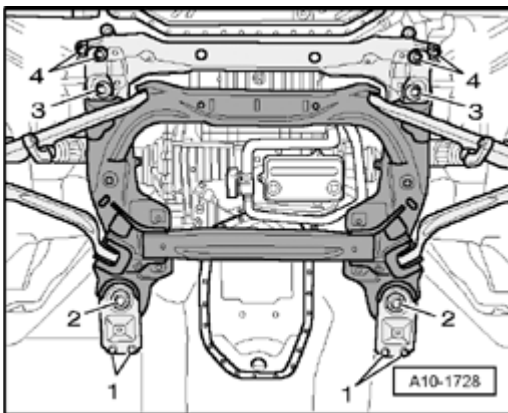


Fig. 64: Removing/Installing Long Member Subframe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Mark installation position of subframe and engine carrier to longitudinal members using a felt-tip marker.
- Remove bolts - 1 - and - 4 -.
- Remove bolts - 2 - and - 3 - in diagonal sequence and in stages.

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.**

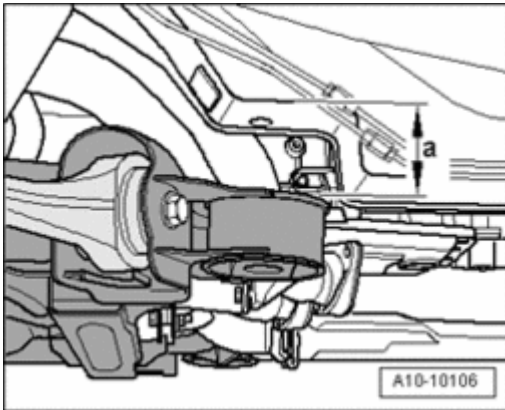


Fig. 65: Lowering/Lifting Engine/Transmission Assembly Using Scissor Lift Platform VAS 6131 Only Approx. By Dimension

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

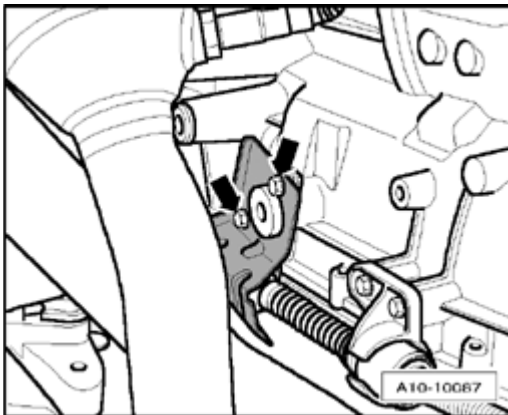


Fig. 66: Selector Lever Cable Heat Shield

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unbolt heat shield for selector lever cable on left of transmission - **arrows** -.

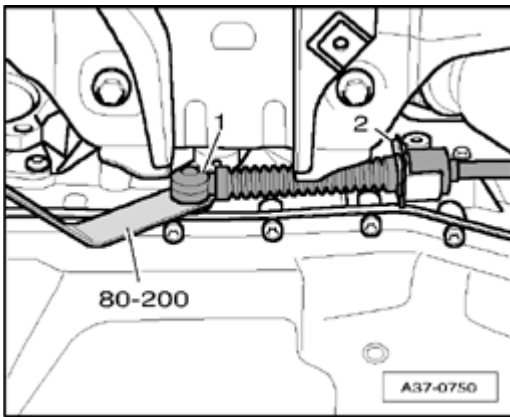


Fig. 67: Using Pry Lever - RMV Outside Mirror 80-200 To Pry Ball Socket On Selector Lever Cable Off Selector Shaft Lever

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press ball socket - 1 - of selector lever cable from selector shaft lever using pry lever 80-200.
- Unclip locking plate - 2 - from selector lever cable bracket.
- Move selector lever cable clear.

NOTE:

- **While lowering, carefully guide engine/transmission assembly with subframe out of engine compartment in order to prevent damage.**

- Slowly lower engine/transmission subassembly downward.
- Remove scissor lift table VAS 6131 from under vehicle.

Engine and Transmission, Separating

Engine and Transmission, Separating

- Engine/transmission unit removed and attached to scissor lift platform VAS 6131.

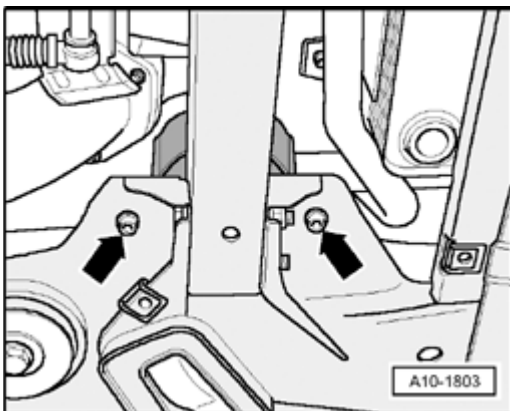


Fig. 68: Front Transmission Mount Left/Right Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - for front left and right transmission mounts.

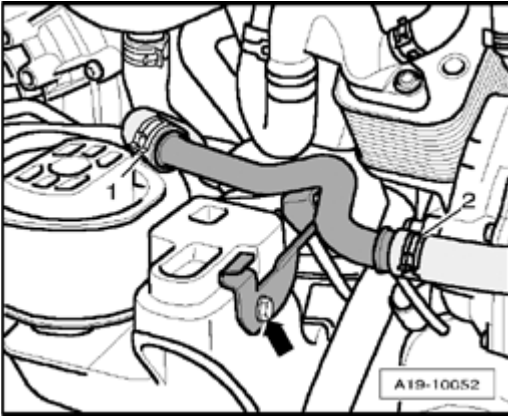


Fig. 69: Coolant Hose & Bolt

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - **arrow** -.
- Disconnect right bottom coolant pipe from coolant hose - **1** -.

NOTE: • **Ignore - 2 - in the illustration.**

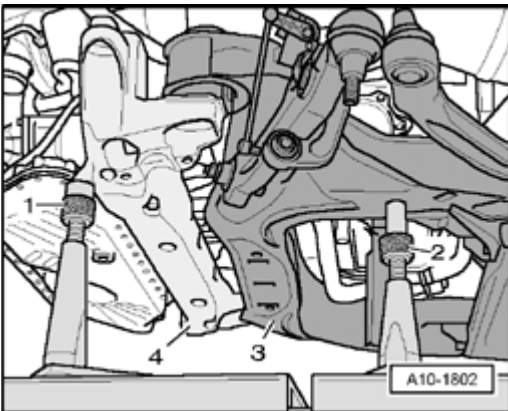


Fig. 70: Identifying Subframe, Left/Right Of Engine Carrier & Support Elements

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Rotate spindles of support elements - **2** - at left and right of subframe completely downward.
- Remove support pins from spindles.
- Remove subframe - **3** - to side.

NOTE: • **A second technician is required to remove subframe.**

- Rotate spindles of support elements - **1** - at left and right of engine carrier - **4** - completely downward.

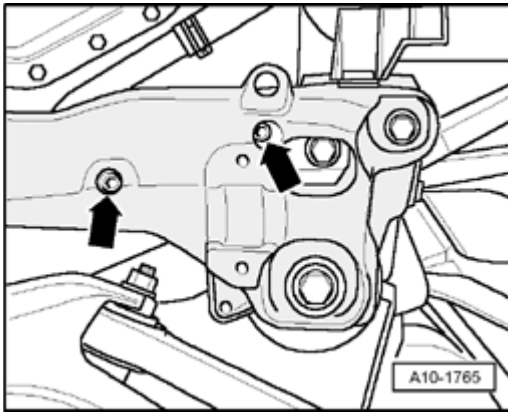


Fig. 71: Removing/Installing Bolts For Engine Mount At Left/Right
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - for engine mount at left and right.
- Remove engine carrier.
- Remove 4 base plates of support elements for engine carrier and subframe on scissor lift table VAS 6131.

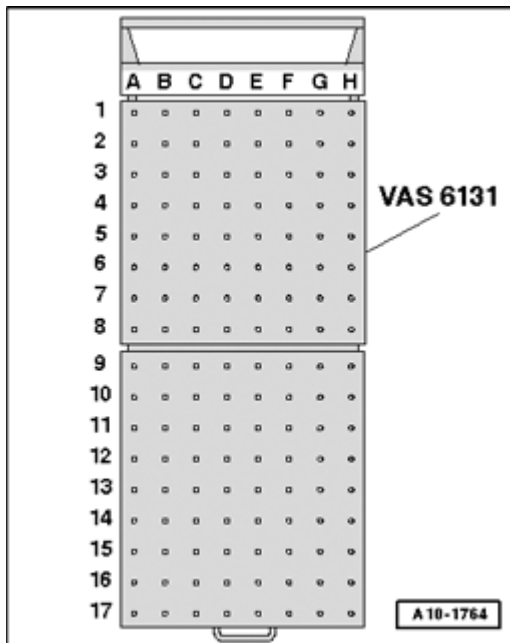


Fig. 72: Identifying Scissor Lift Platform VAS 6131
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

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

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

Platform	Parts of support set for Audi VAS 6131/10
----------	---

2009 Audi A8 Quattro

ENGINE 6.0 Liter 12-Cyl. 4V Engine Mechanical, Engine Code(s): BHT, BSB - A8

coordinates				
C3	/10-1	/10-4	/10-5	/11-1
G3	/10-1	/10-4	/10-5	/11-1
C7	/10-1	/10-4	/10-5	/10-11
F7	/10-1	/10-4	/10-5	/10-11
B11	/10-1	/10-4	/10-5	/10-12
G10	/10-1	/10-3	/10-5	/10-13
D16	/10-1	/10-4	/10-5	/10-9
G15	/10-1	/10-4	/10-5	/10-12

*Support elements remain unchanged.

*Two washers (3 mm thick) must also be placed on support element.

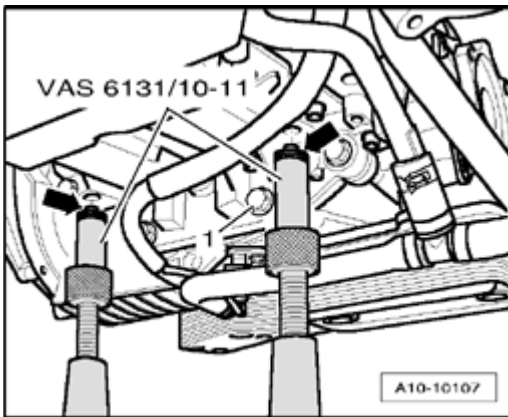


Fig. 73: Placing Two Washers On Mounting Pins Of Support Elements VAS 6131/10-11 At Rear Of Engine

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - 1 - from bottom left of engine/transmission flange.
- Place two washers - **arrows** - (3 mm total thickness) on mounting pins of support elements VAS 6131/10-11 at rear of engine.

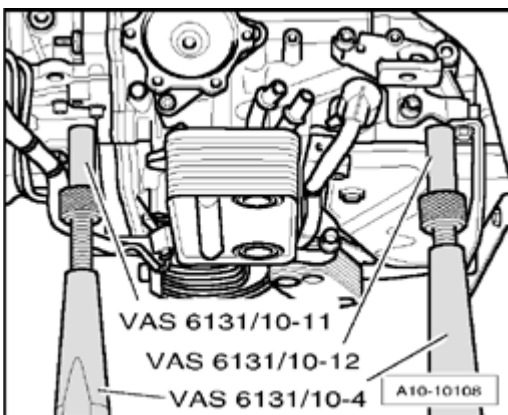


Fig. 74: Positioning Support Elements From VAS 6131/10 At Left On Engine/Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

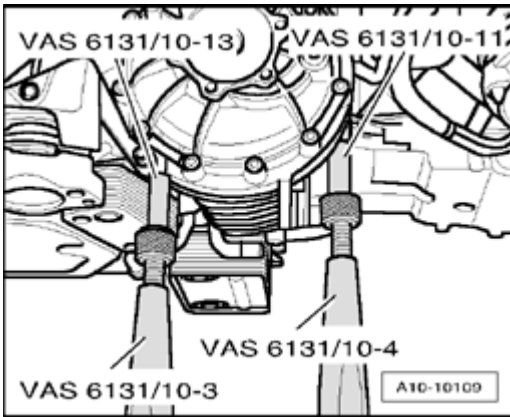


Fig. 75: Positioning Support Elements From VAS 6131/10 At Right On Engine/Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position support elements from VAS 6131/10 at right on engine/transmission as shown in illustration.
- Twist 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.

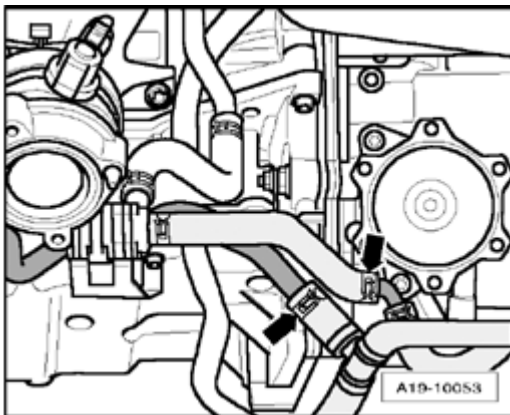


Fig. 76: Left Coolant Pipes Coolant Hoses
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE: • Place a rag under separating point to catch escaping coolant.

- Disconnect coolant hoses - **arrows** - from the left coolant pipes.

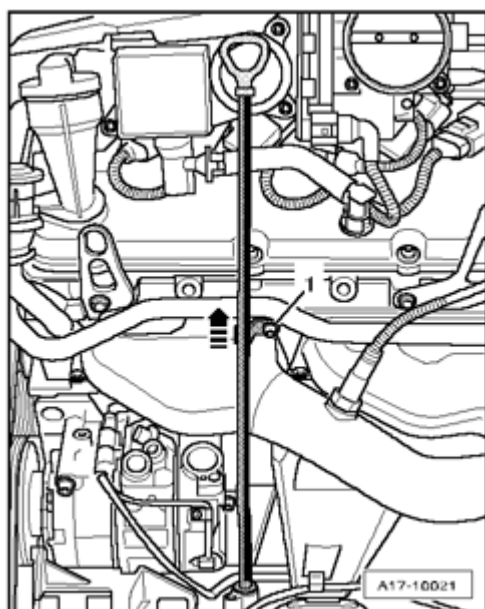


Fig. 77: Pulling Oil Dipstick Guide Tube Upward And Off
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **1** -.
- Pull the oil dipstick guide tube upward and off - **arrow** -.

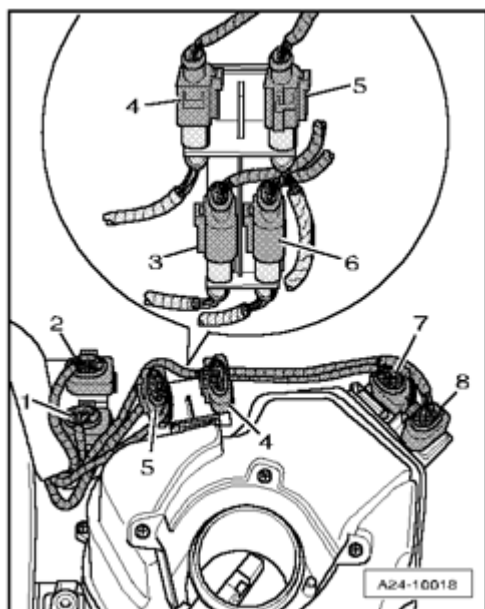
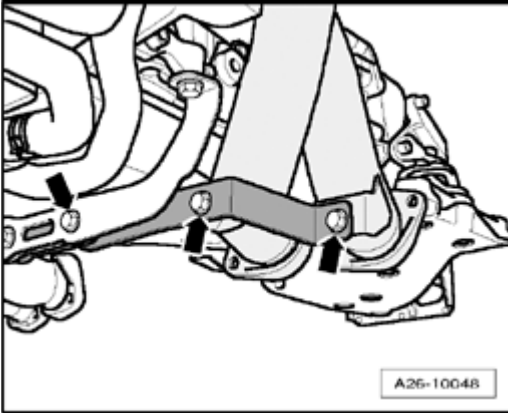


Fig. 78: Oxygen Sensors Electrical Harness Connectors
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connectors - **1 to 8** - for oxygen sensors.

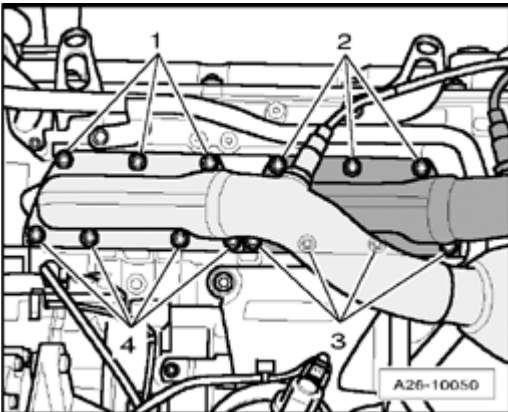
NOTE:

- To disconnect electrical connectors - 3 - and - 6 - , unclip bracket for connectors from air filter housing and turn over (shown in close-up).

**Fig. 79: Pivot Bracket Bolts**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and pivot bracket for left exhaust manifolds with catalytic converters downward.

**Fig. 80: Left Exhaust Manifolds Nuts**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - **1 to 4** - and remove both left exhaust manifolds with catalytic converters.

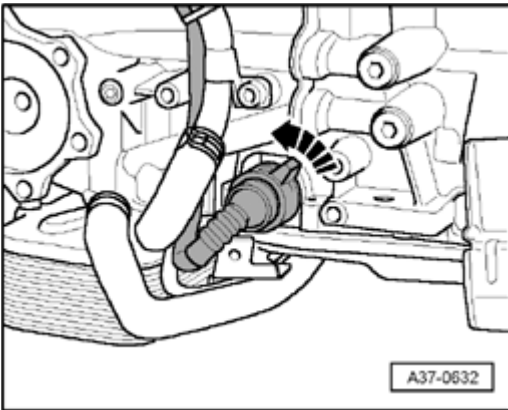


Fig. 81: Disconnecting Electrical Connector At Left On Transmission By Turning Twist Lock Counterclockwise

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector at left on transmission, by pivoting twist lock counterclockwise - **arrow** -.

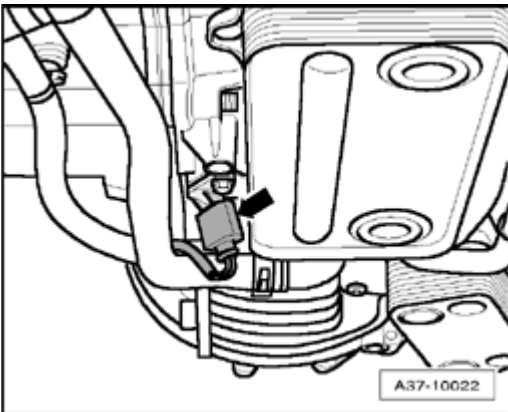


Fig. 82: Transmission RPM G182 Sensor Electrical Harness Connector

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - **arrow** - at Sensor for transmission RPM G182.

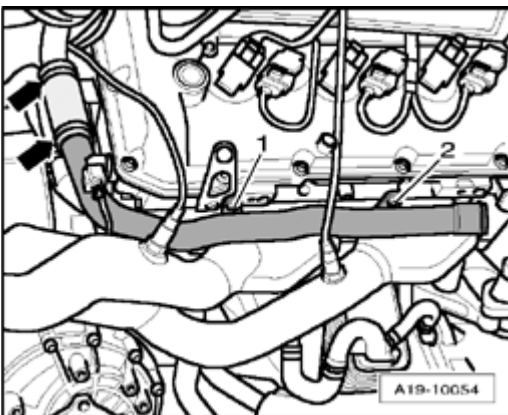


Fig. 83: Upper Right Coolant Pipe Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove both bolts - **1** - and - **2** - for upper right coolant pipe.

NOTE:

- Ignore - arrows - in the illustration.
- The coolant pipe remains in the installed position.

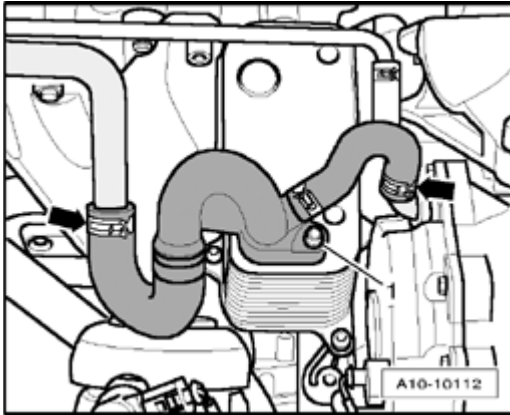


Fig. 84: Coolant Hoses & Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect coolant hoses - **arrows** -.
- Remove bolts - **1** -.
- Disconnect coolant connections at engine oil cooler.

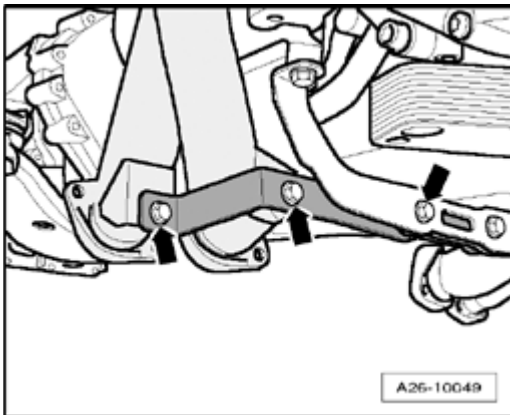


Fig. 85: Pivot Bracket Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and pivot the bracket for right exhaust manifolds with catalytic converters downward.

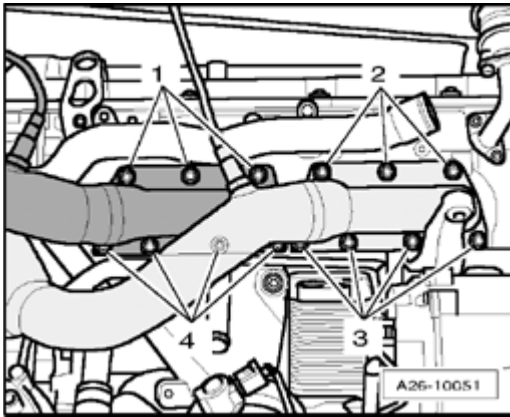


Fig. 86: Right Exhaust Manifold Nuts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - **1 to 4** - and remove both right exhaust manifolds with catalytic converters.

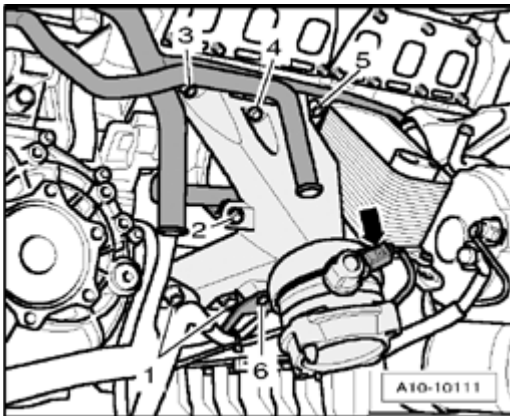


Fig. 87: Right Engine Mount Electrical Harness Connector & Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - **arrow** - at right engine mount.
- Remove bolts - **1 to 6** -.
- Remove engine support with engine mount.

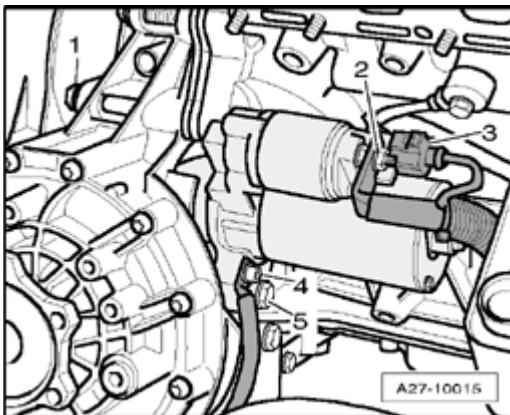


Fig. 88: Identifying Ground Wire, Electrical Wires, Bolts, And Starter
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove Ground wire - **4** - on starter.
- Disconnect electrical wires - **2** - and - **3** - on starter.
- Unscrew bolts - **1** - and - **5** - and remove starter.

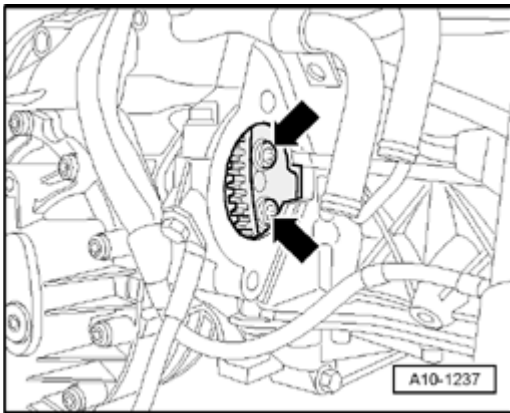


Fig. 89: Identifying Torque Converter Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unfasten 6 bolts - **arrows** - of torque converter in opening of removed starter (turn crankshaft $\frac{1}{3}$ rotation in each case).

NOTE:

- **To loosen the torque converter bolts, counterhold on the central bolt of the crankshaft.**

- Remove engine/transmission connecting bolts.

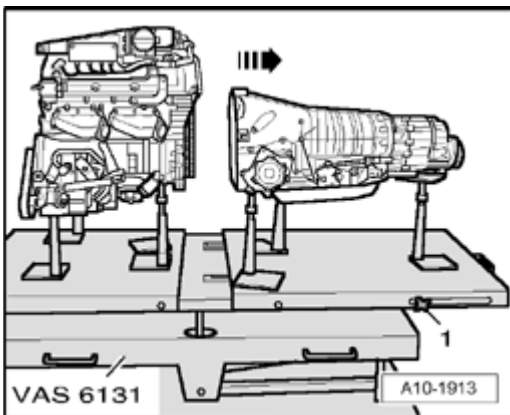


Fig. 90: Pulling Rear Platform Top With Transmission Toward Rear Simultaneously Pushing Torque Converter Through Opening Of Drive Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

2009 Audi A8 Quattro

ENGINE 6.0 Liter 12-Cyl. 4V Engine Mechanical, Engine Code(s): BHT, BSB - A8

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

NOTE:

- After removing the engine from the scissor lift table VAS 6131 , do not set it down on the oil pan.
- For performing work, lift engine using workshop crane VAS 6100 and secure to engine and transmission holder VAS 6095 --> Engine, Securing to Assembly Stand.

Engine, Securing to Assembly Stand

Engine, Securing to Assembly Stand

Special tools, testers and auxiliary items required

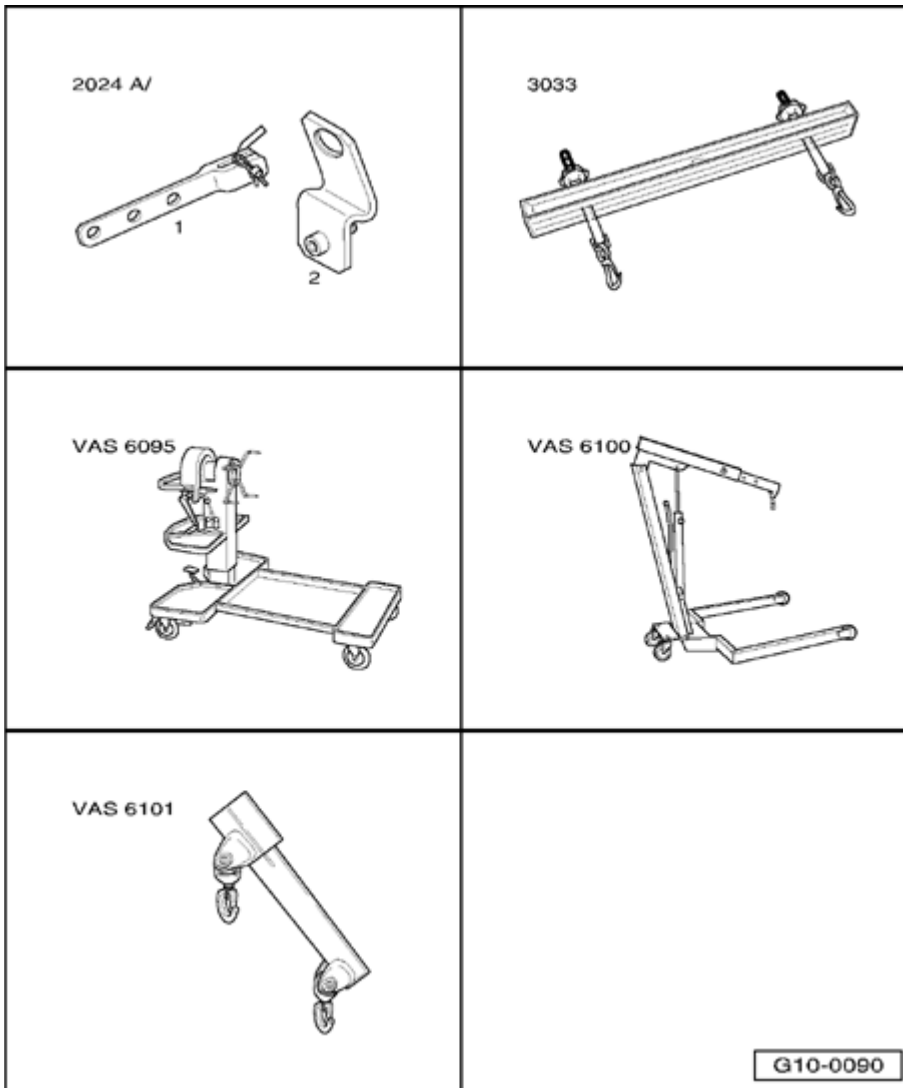


Fig. 91: Identifying Special Tools - Engine, Securing To Assembly Stand
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Engine sling 2024 A/2
- Lifting tackle 3033
- Engine and transmission holder VAS 6095 with adapter set VAS 6095/2
- Shop crane VAS 6100
- Lift arm extension for workshop crane VAS 6101
- Bolt M8x20

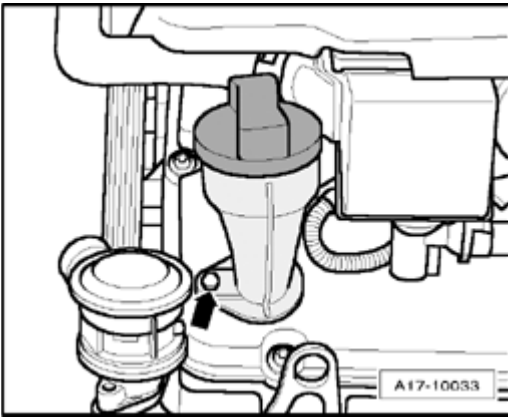


Fig. 92: Oil Filler Tube At Cylinder Head Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Work sequence

- Engine separated from transmission --> **Engine and Transmission, Separating.**
- Remove bolt - **arrow** -.
- Disconnect oil filler tube at cylinder head cover.

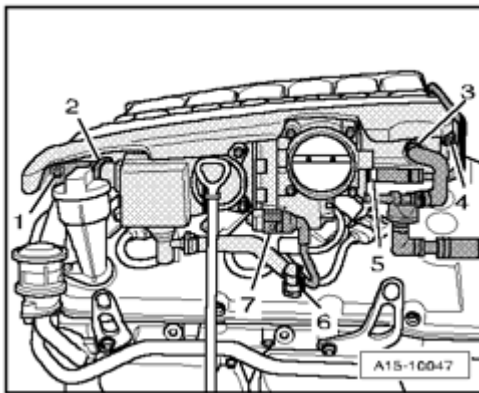
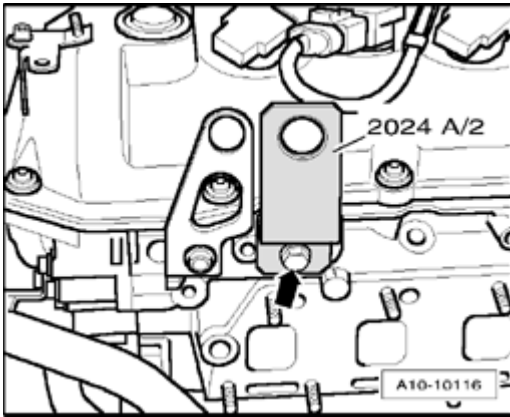


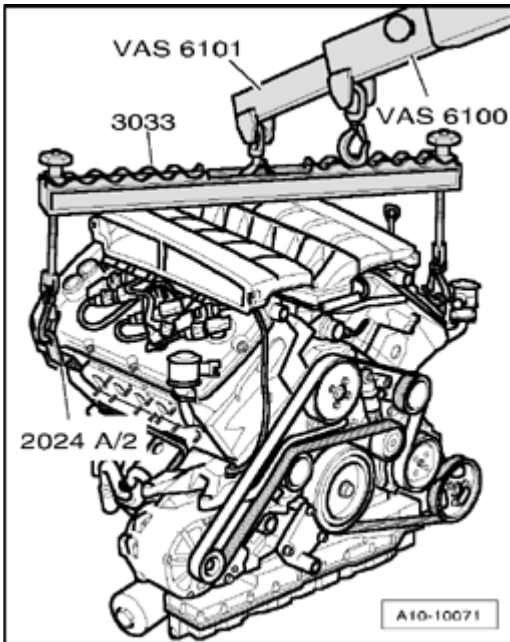
Fig. 93: Throttle Valve Control Module 2 J544 Electrical Connection, Vacuum Lines, Crankcase Breather Hoses & Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connection - **7** - at Throttle valve control module 2 J544.
- Separate vacuum lines - **3** - and - **5** -.
- Pull off hoses - **2** - and - **6** - for crankcase breather.
- Remove bolts - **1** - and - **4** -.
- Remove left intake manifold side part.

**Fig. 94: Strap 2024 A/2 With Bolt**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Fasten strap 2024 A/2 with bolt M8x20 - **arrow** - tightened to 20 Nm at right on engine.

**Fig. 95: Lifting Engine From Support Elements Of Scissor Lift Platform VAS 6131**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Attach lift arm extension VAS 6101 to workshop crane VAS 6100.
- Hook engine sling 3033 onto workshop crane VAS 6100 with lift arm extension for workshop crane VAS 6101 as shown in illustration.
- Lift engine from support elements of scissor lift platform VAS 6131.
- Remove left engine support from cylinder block.

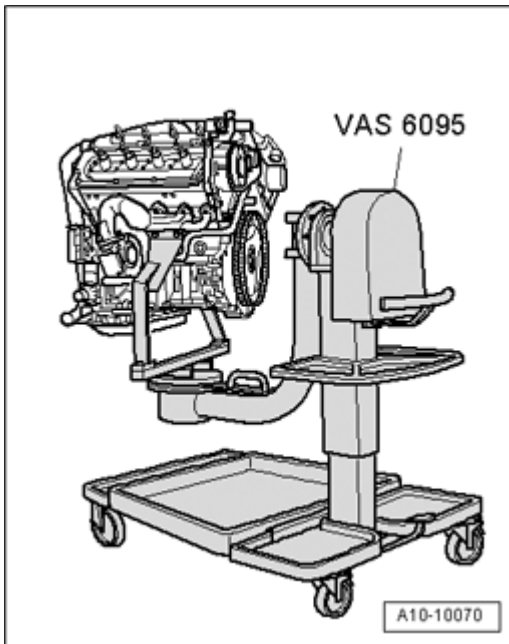


Fig. 96: Securing Engine On Engine/Transmission Holder VAS 6095 With Adapter Set VAS 6095/2 And Bracket VAS 6095/1-1

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure engine on engine/transmission holder VAS 6095 with adapter set VAS 6095/2 and bracket VAS 6095/1-1 as shown in illustration.

Engine, Installing

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 reinstalled at the same location.
- 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.

Installation dimension for torque converter, checking

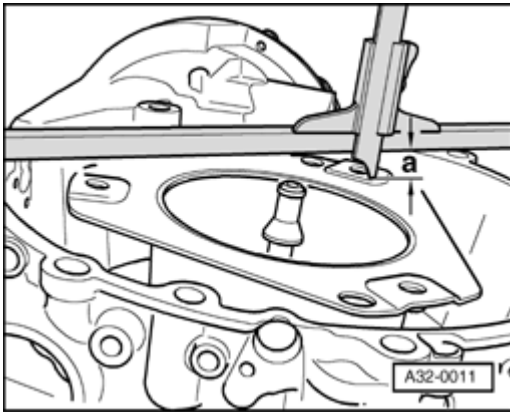


Fig. 97: Checking Installation Dimension For Torque Converter
Courtesy of VOLKSWAGEN UNITED STATES, INC.

When torque converter is installed correctly, the distance - **a** - between the contact surface of threaded holes at the torque converter and contact surface of the bell housing on Automatic Transmission 09E is at least 6 mm.

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

- Before guiding engine and transmission together, rotate torque converter and engine drive plate so that fastening locations are positioned at height of opening of removed starter.

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

- 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: 15%.

Engine/transmission, fastening

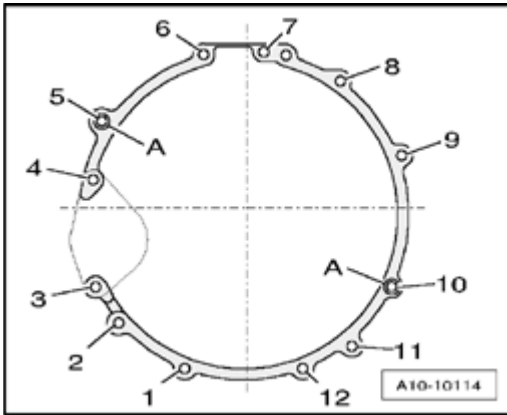


Fig. 98: Engine/Transmission, Fastening
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Pos.	Bolt	Nm
1, 8, 11, 12	M12x62	65
2	M12x105	65
3	M12x55	45
4	M10x150	65
5	M12x95	65
6, 7	M12x90	65
9	M12x67	65
10	M12x70	65
A	Alignment bushing for centering	

*Bolt class 10.9.

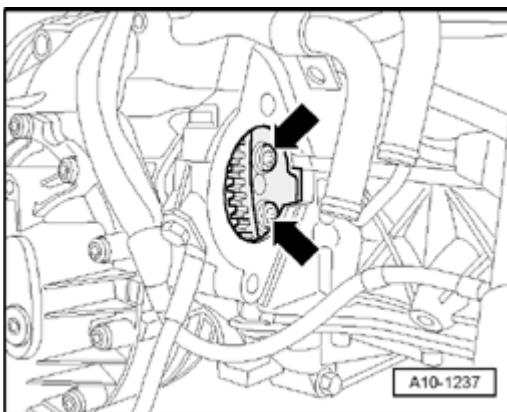


Fig. 99: Identifying Torque Converter Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Use new ribbed bolts to secure torque converter to drive plate.
- Hand-tighten 6 bolts - **arrows** - of torque converter in opening of removed starter (turn crankshaft $\frac{1}{3}$ rotation in each case).

- Then tighten bolts of torque converter to specified torque (Turn crankshaft $\frac{1}{3}$ rotation in each case).

Installation is in reverse order of removal. Note the following.

- Install exhaust manifolds with catalytic converters: Left --> **Installing**, right --> **Installing**.
- Check routing of wiring on engine --> **Engine Wiring, Routing on Engine**.
- Before installation, use a tap to clean threaded bores in transmission flanged shaft for crankshaft of locking fluid residue.

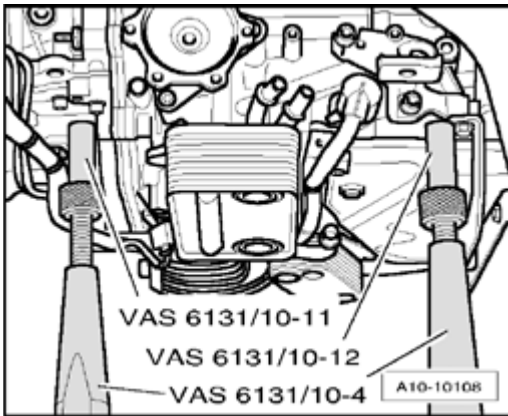


Fig. 100: Support Elements VAS 6131/10-11 And VAS 6131/10-12 Downward At Left Of Engine/Transmission Assembly

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Rotate spindles of support elements VAS 6131/10-11 and VAS 6131/10-12 downward at left of engine/transmission assembly.
- Unscrew both base plates for left support element on scissor lift platform VAS 6131.

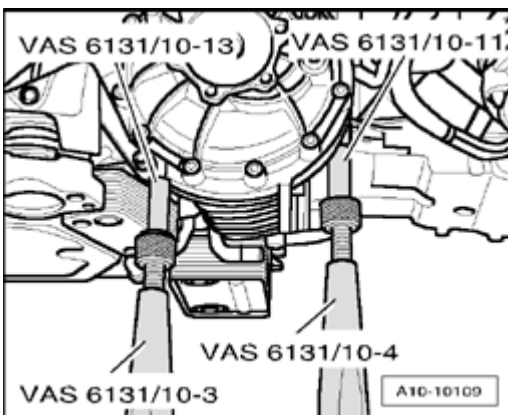


Fig. 101: Support Elements VAS 6131/10-11 And VAS 6131/10-13 Downward At Right Of Engine/Transmission Assembly

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Rotate spindles of support elements VAS 6131/10-11 and VAS 6131/10-13 downward at right of

engine/transmission assembly.

- Unscrew both base plates for right support element on scissor lift platform VAS 6131.

NOTE:

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

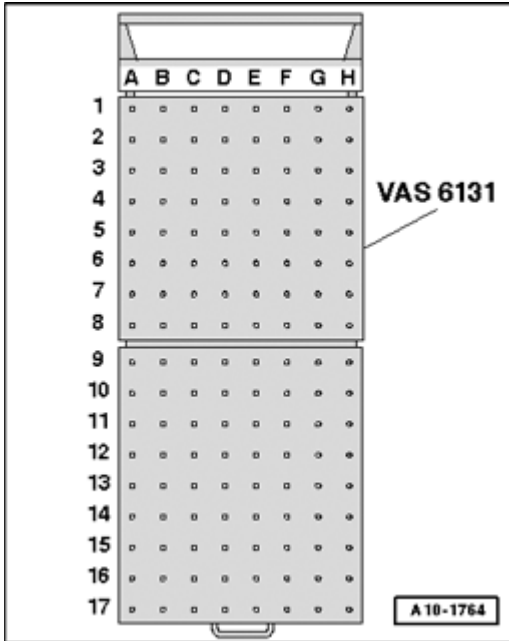


Fig. 102: Identifying Scissor Lift Platform VAS 6131
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Table coordinates	Parts of support set for Audi VAS 6131/10			
C3	/10-1	/10-4	/10-5	/11-1
G3	/10-1	/10-4	/10-5	/11-1
B6	/10-1	/10-3	/10-5	/10-7
G6	/10-1	/10-3	/10-5	/10-7
B10	/10-1	/10-2	/10-5	/10-8
G10	/10-1	/10-2	/10-5	/10-8
D16	/10-1	/10-4	/10-5	/10-9
G15	/10-1	/10-4	/10-5	/10-12

*Support elements remain unchanged.

*Only install support elements after installing subframe.

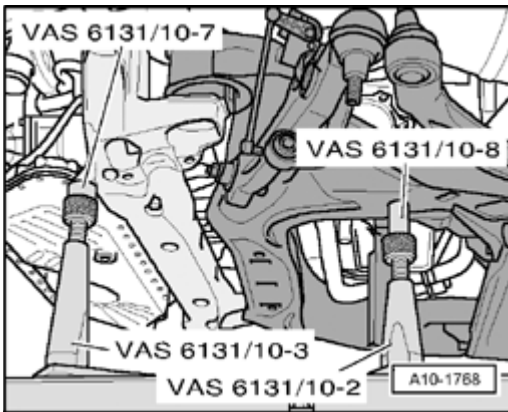


Fig. 103: Positioning Support Elements From VAS 6131/10 At Left/Right On Engine Carrier And Subframe

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position engine carrier on both support elements VAS 6131/10-7.
- Rotate spindles of the support elements VAS 6131/10-7 upward on both sides.
- Tighten base plates for support elements to 20 Nm on scissor lift platform VAS 6131.

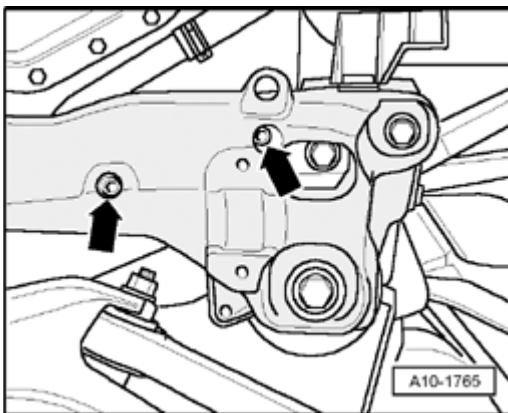


Fig. 104: Removing/Installing Bolts For Engine Mount At Left/Right

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Fasten bolts - **arrows** - for engine carrier on both sides.

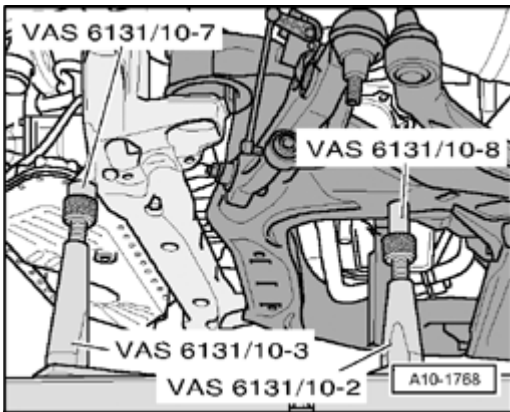


Fig. 105: Positioning Support Elements From VAS 6131/10 At Left/Right On Engine Carrier And Subframe

Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- A second technician is required to install the subframe onto the support elements.

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

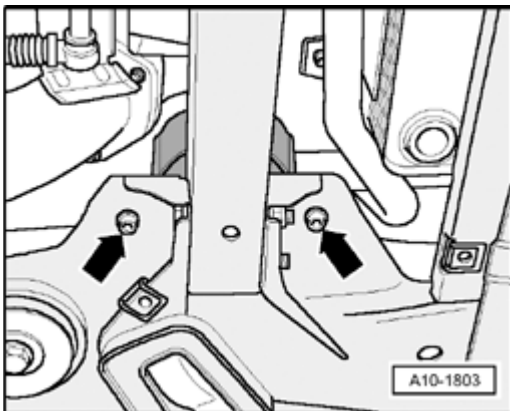


Fig. 106: Front Transmission Mount Left/Right Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Fasten bolts - **arrows** - of left and right transmission mounts.
- Using scissor lift platform VAS 6131 , slowly guide engine/transmission assembly with subframe and engine carrier into body from below.

CAUTION: Make sure that the selector lever cable is guided over the rear transmission mount so that it will not be pinched during installation.

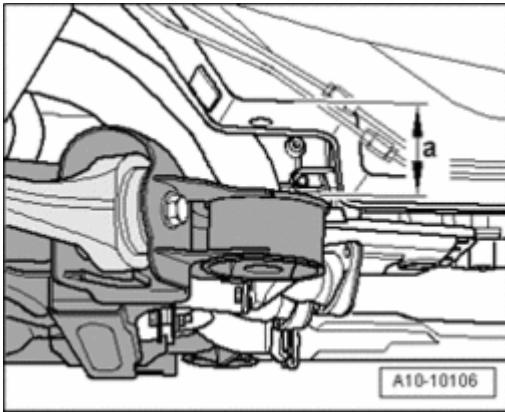


Fig. 107: Lowering/Lifting Engine/Transmission Assembly Using Scissor Lift Platform VAS 6131 Only Approx. By Dimension

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Raise engine/transmission slightly so that distance between subframe and body achieves dimension - **a** -.
- Dimension - **a** - = 80 mm
- Attach selector lever cable to transmission --> **37 - CONTROLS, HOUSING** for 6 SPD. AUTOMATIC TRANSMISSION 09E ALL WHEEL DRIVE or **37 - AUTOMATIC TRANSMISSION - CONTROLS, HOUSING** for 6 SPD. AUTOMATIC TRANSMISSION 09L ALL WHEEL DRIVE .

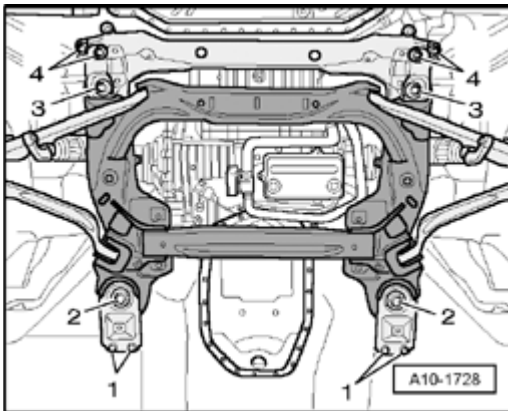


Fig. 108: Removing/Installing Long Member Subframe

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Align subframe according to markings on longitudinal members.
- Tighten bolts for subframe only to specified initial torque. Do not turn further (tighten bolts only after wheel alignment).

1. 50 Nm
2. 150 Nm
3. 150 Nm

CAUTION: Vehicle must not be driven in this condition.

- Fasten bolts - **4** - for engine carrier.

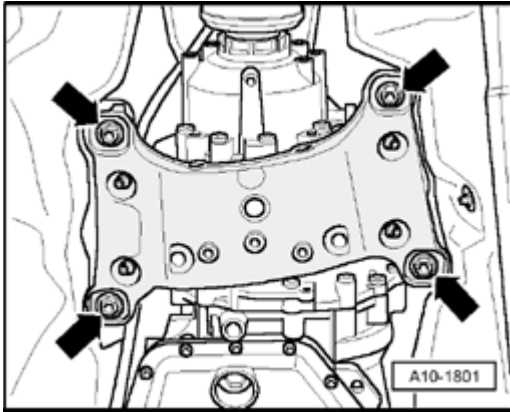


Fig. 109: Tunnel Crossmember Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Fasten bolts - **arrows** - at tunnel crossmember.
- Install driveshaft --> **39 - FINAL DRIVE, DIFFERENTIAL** .
- Align exhaust system free of tension --> **Exhaust system, installing free of tension** .
- Install guide links, control arms and stabilizer bar --> **40 - FRONT SUSPENSION** .
- Install drive axles --> **40 - FRONT SUSPENSION** .
- Install refrigerant lines --> **87 - AIR CONDITIONING** .
- Install intake manifold side part: --> **Intake Manifold Left Side, Removing and Installing** and --> **Intake Manifold Right Side, Removing and Installing**.
- Install strut tower brace --> **50 - BODY - FRONT** .

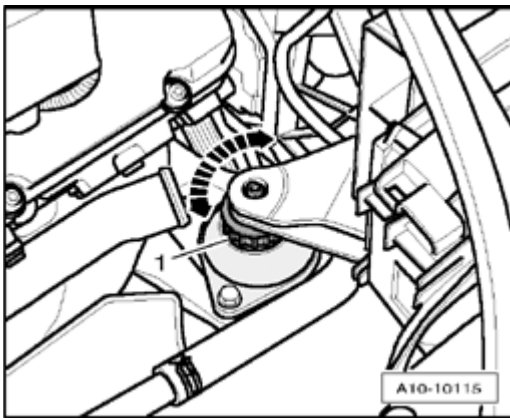


Fig. 110: Adjusting Torque Support Mount

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Adjust mount of torque support before fastening it. To adjust, rotate adjustment ring - **1** - until it rests

2009 Audi A8 Quattro

ENGINE 6.0 Liter 12-Cyl. 4V Engine Mechanical, Engine Code(s): BHT, BSB - A8

against bracket of torque support.

- Check harness connectors and routing: --> Electrical Wiring Diagrams, Troubleshooting 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.

- Check oil level --> **Engine Oil Level, Checking** .
- Fill with coolant. --> *Filling* under **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 with fluid for power steering system and bleed steering system --> **48 - STEERING** .
- Fill refrigerant circuit --> **87 - AIR CONDITIONING** .
- Install and adjust wiper arms --> **92 - WINDSHIELD WIPER AND WASHER SYSTEM** .
- Check adjustment of selector lever cable --> **37 - CONTROLS, HOUSING** for 6 SPD. AUTOMATIC TRANSMISSION 09E ALL WHEEL DRIVE or **37 - AUTOMATIC TRANSMISSION - CONTROLS, HOUSING** for 6 SPD. AUTOMATIC TRANSMISSION 09L ALL WHEEL DRIVE.
- Deactivate vehicle lifting mode --> **43 - SELF LEVELING SUSPENSION** .
- Perform wheel alignment --> **44 - WHEELS, TIRES AND WHEEL ALIGNMENT** .

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

- Inspect fuel system for leaks --> **Fuel Supply System, Checking for Leaks**.

Tightening torques

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 15%.

Component	Nm

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Bolts/nuts	M6	9
	M8	20
	M10	40
	M12	65
Exceptions:		
Drive plate to torque converter	M10x1	85
Engine mount to engine carrier		23
Transmission mount to subframe		23
Clamp B+ to starter		16
Ground (GND) wire to starter		20
Coolant pipe to engine carrier		10
Coolant connection to engine oil cooler		10
Engine support to engine		40
Engine carrier to longitudinal member		68
Heat shield for driveshaft to transmission		23
Tunnel crossmember to body		40
Ground (GND) cable to longitudinal member		20
Battery cable to fuse holder		20
Combination valve for Secondary Air Injection (AIR) system to cylinder head		10
Hydraulic pressure line to power steering pump		47
Bracket for torque support to mount for torque support		40
Hose clamps 9 mm wide		3
Hose clamps 13 mm wide		5.5

*Replace bolts.

Engine Wiring, Routing on Engine**Engine Wiring, Routing on Engine**

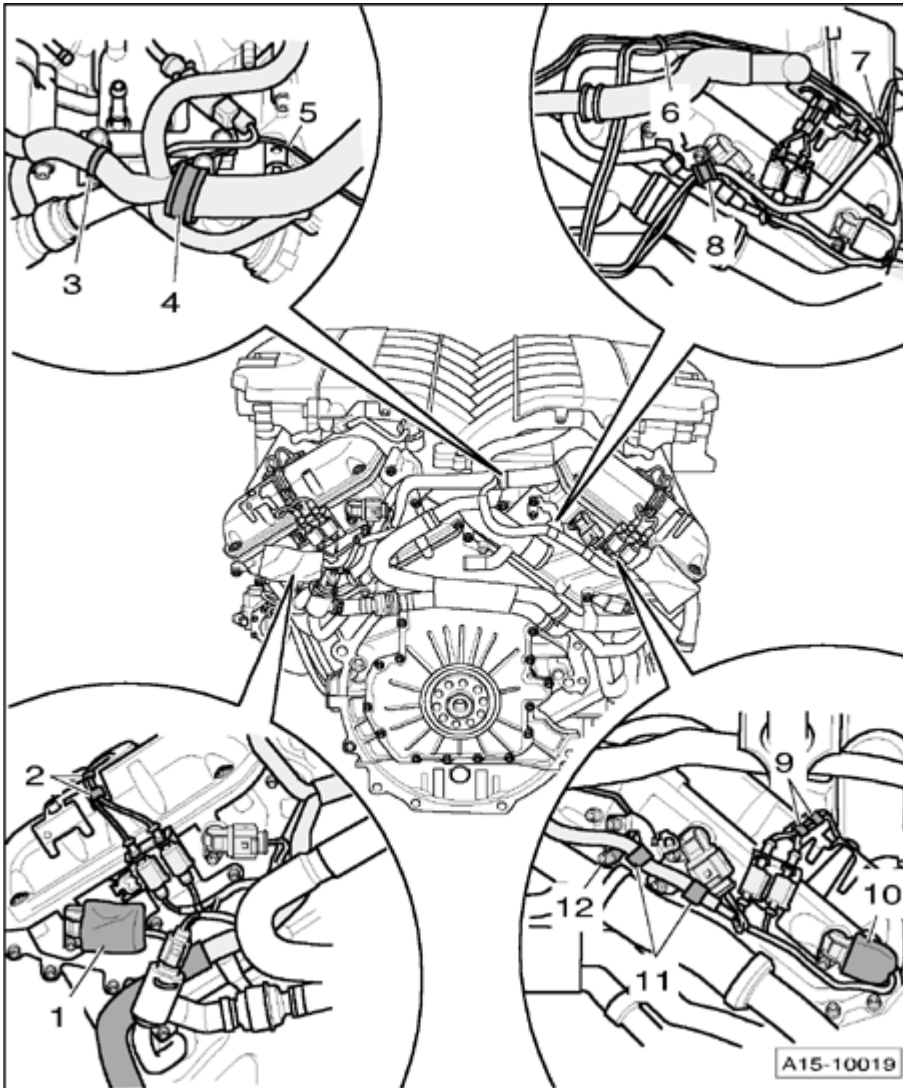


Fig. 111: Engine Wiring, Routing On Engine

Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Heat insulation sleeve

- Attach to Camshaft Position (CMP) sensor 4 G301

2 - Electrical harnesses for camshaft adjusters

- Clip into retainers

3 - Cable tie with clip

- Clip into hole of bracket

4 - Retaining clip

- Tighten to 9 Nm

5 - Ground (GND) wire

- Tighten to 9 Nm

6 - Cable tie for oxygen sensor harnesses

- Fasten to wiring to ignition coils cyl. 1 to 3 and cyl. 4 to 6

7 - Cable tie for oxygen sensor harnesses

- Clip into hole of bracket

8 - Retaining clip

- Tighten to 9 Nm

9 - Electrical harnesses for camshaft adjusters

- Clip into retainers

10 - Heat insulation sleeve

- Attach to Camshaft Position (CMP) sensor 3 G300

11 - Harness clip

- Clip into holes

12 - Ground (GND) wire

- Tighten to 9 Nm

13 - ENGINE - CRANKSHAFT, CYLINDER BLOCK

ENGINE, DISASSEMBLING AND ASSEMBLING

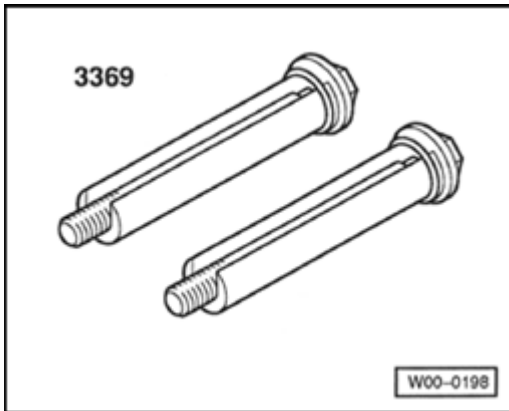
Engine, Disassembling and Assembling

--> **Lock Carrier, Moving into Service Position**

--> **Subframe, Lowering for Repair**

Lock Carrier, Moving into Service Position

Lock Carrier, Moving into Service Position

Special tools, testers and auxiliary items required**Fig. 112: Support Tool 3369****Courtesy of VOLKSWAGEN UNITED STATES, INC.**

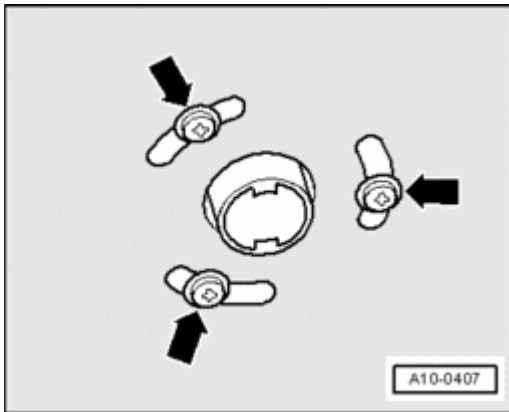
- Support tool 3369

Work sequence

- Activate vehicle lifting mode --> **43 - SELF LEVELING SUSPENSION** .
- Remove both front wheels.

NOTE:

- **Secure the brake discs with wheel bolts.**

**Fig. 113: Identifying Exhaust Pipe Fasteners****Courtesy of VOLKSWAGEN UNITED STATES, INC.**

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

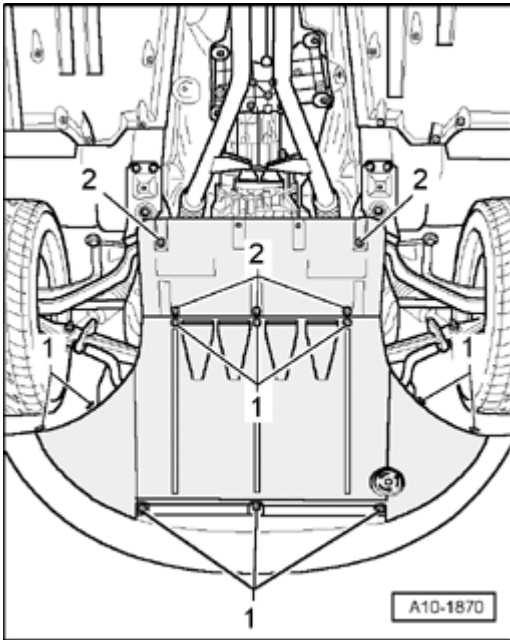


Fig. 114: Noise Insulation Quick-Release Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen quick-release fasteners - **1** - and remove front sound insulation.
- Remove front part of left and right front wheelhouse liners --> **66 - EXTERIOR EQUIPMENT** .
- Remove front bumper cover --> **63 - BUMPERS** .

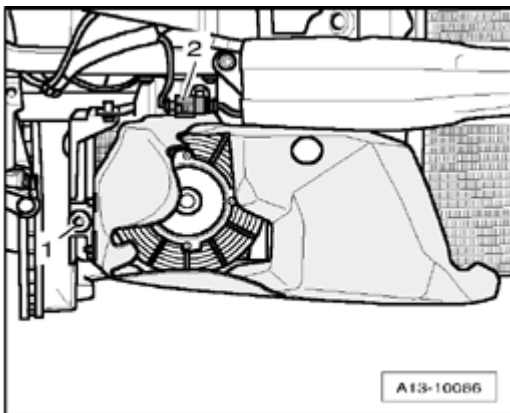


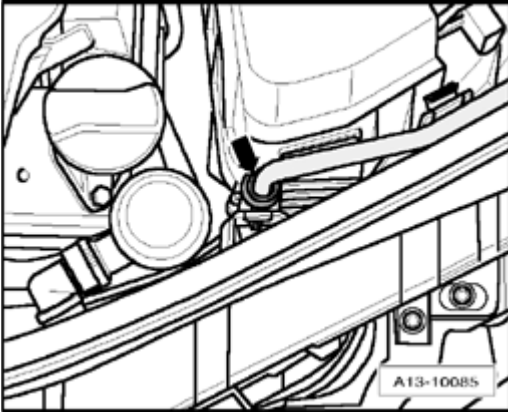
Fig. 115: Auxiliary Cooler Air Duct Bolt & Electrical Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect harness connector - **2** - and move wiring clear.
- Remove bolts - **1** -.
- Disconnect air ducting for auxiliary cooler.

CAUTION: The air conditioning refrigerant circuit must not be opened.

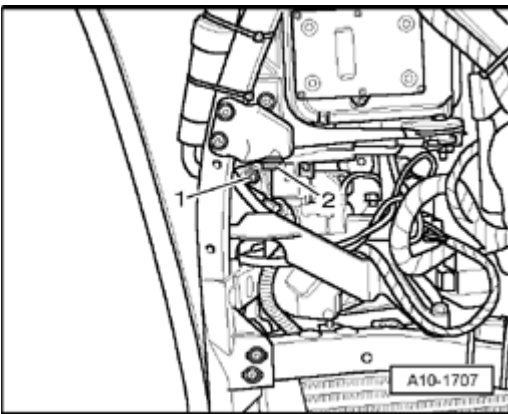
NOTE:

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

**Fig. 116: Refrigerant Line At Lock Carrier**

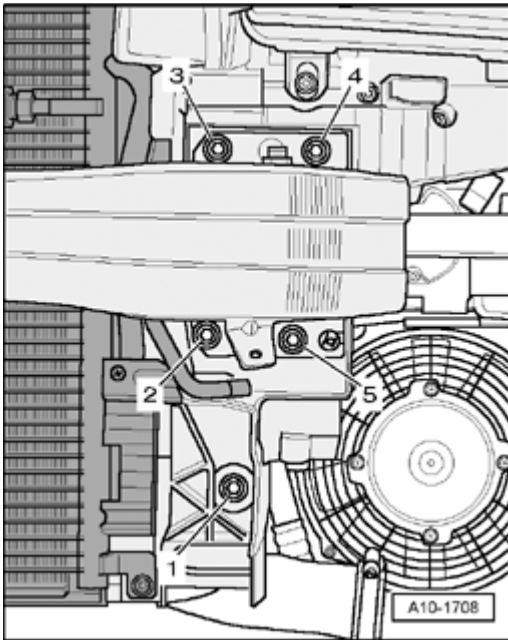
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unclip refrigerant line at lock carrier - **arrow** -.
- Free up hood release cable at left front of lock carrier.

**Fig. 117: Lock Carrier Bolt & Nut**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- In left and right wheelhousing, unfasten nut - **1** - and bolt - **2** - for lock carrier.

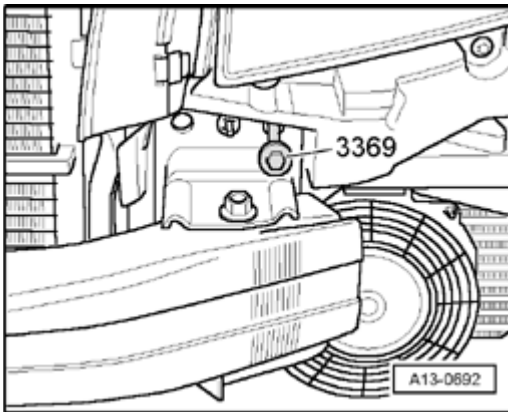
**Fig. 118: Lock Carrier Bolts**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- On both sides, remove bolts - 1 to 5 -.

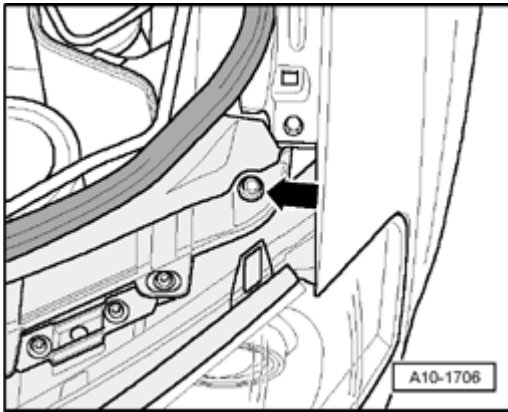
NOTE:

- First, remove one bolt from left and right sides and mark the installed position of the lock carrier in the bolt hole using a felt tip marker.

**Fig. 119: Support Tool 3369**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts from sleeves of special tool support tool 3369.
- Thread bolts from support tool 3369 at left and right into upper holes of impact absorber.
- Pull off hood seal on both fenders.

**Fig. 120: Lock Carrier Bolt**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove one bolt - **arrow** - at top of lock carrier on left and right.
- Carefully pull lock carrier toward front.

Installing

Installation is in reverse order of removal. Note the following:

- Install lock carrier with attachments --> **50 - BODY - FRONT** .
- Install front bumper cover --> **63 - BUMPERS** .
- Deactivate vehicle lifting mode --> **43 - SELF LEVELING SUSPENSION** .
- Check headlight adjustment --> **01 - MAINTENANCE** .

BELT PULLEY SIDE, SERVICING

Belt Pulley Side, Servicing

--> **Power Steering Pump Ribbed Belt Drive, Generator and Air Conditioning, Assembly Overview**

--> **Ribbed Belt, Removing and Installing**

--> **Power Steering Pump Belt Pulley and Air Conditioning Compressor Belt Pulley, Checking Alignment**

--> **Vibration Damper, Removing and Installing**

--> **Crankshaft Seal, Ribbed Belt Side, Replacing**

Power Steering Pump Ribbed Belt Drive, Generator and Air Conditioning, Assembly Overview

Power Steering Pump Ribbed Belt Drive, Generator and Air Conditioning, Assembly Overview

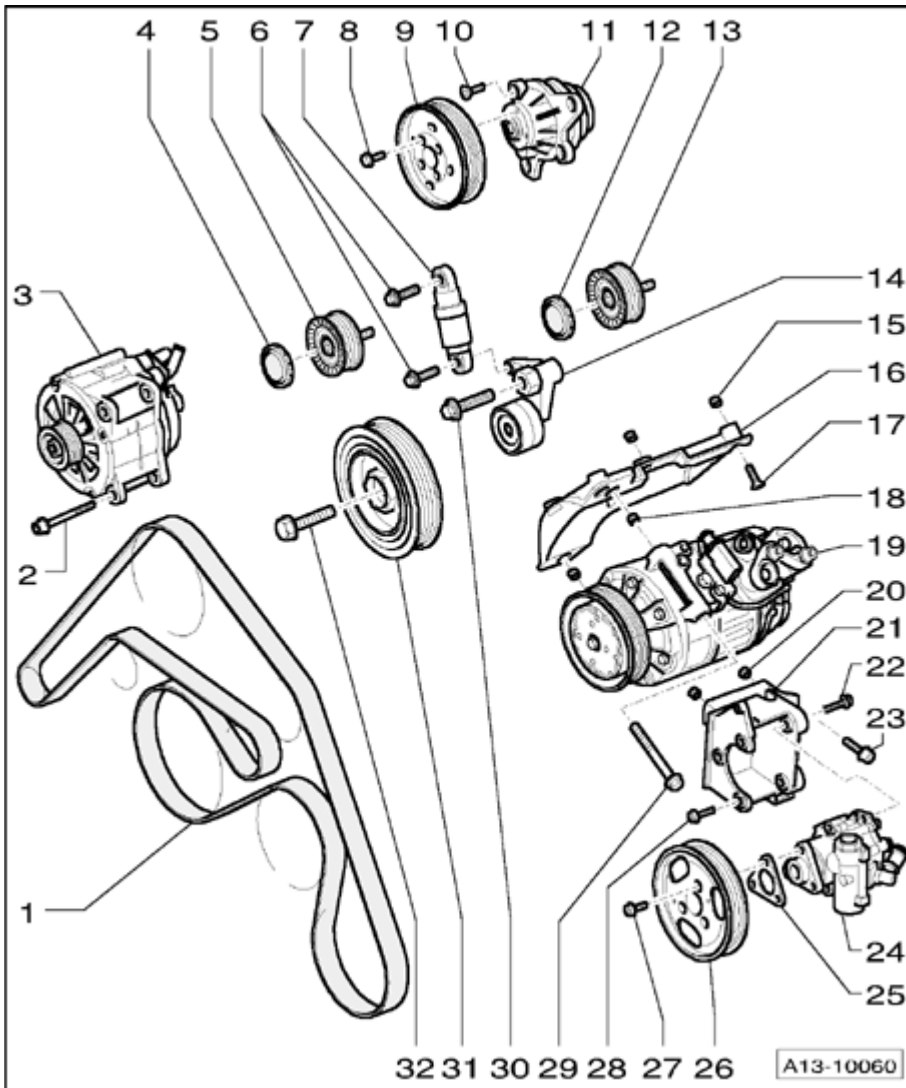


Fig. 121: Power Steering Pump Ribbed Belt Drive, Generator And Air Conditioning, Assembly Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Ribbed belt

- Before removing, mark direction of rotation using chalk or felt-tip marker. Reversing direction of rotation of a run-in belt can damage belt
- Removing and installing --> **Ribbed Belt, Removing and Installing**
- Check for wear

2 - 23 Nm

3 - Generator

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

4 - Cap for right idler roller

5 - Right idler roller for ribbed belt

- Tighten to 32 Nm

6 - 23 Nm

7 - Tensioning spring for tensioning roller

- With hydraulic damper
- Installed location: lettering "TOP" faces up

8 - 8 Nm

9 - Belt pulley for coolant pump

10 - 10 Nm

11 - Coolant pump

- Removing and installing --> **Coolant Pump, Removing and Installing**

12 - Cap for left idler roller

13 - Left idler roller for ribbed belt

- Tighten to 32 Nm

14 - Tensioning roller with relay lever

15 - Alignment bushing

- 2 pieces

16 - Bracket for air conditioning compressor

- After replacing, check alignment of power steering pump pulley and air conditioning compressor pulley -
-> **Power Steering Pump Belt Pulley and Air Conditioning Compressor Belt Pulley, Checking Alignment**

17 - 23 Nm

18 - Fitting sleeves

- 2 pieces

19 - Air conditioner compressor

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

20 - Alignment bushing

- 2 pieces

21 - Bracket for power steering pump

- After replacing, check alignment of power steering pump pulley and air conditioning compressor pulley -
-> **Power Steering Pump Belt Pulley and Air Conditioning Compressor Belt Pulley, Checking Alignment**

22 - 23 Nm

23 - 32 Nm

24 - Power steering pump

- Removing and installing --> **48 - STEERING**
- After replacing, check alignment of power steering pump pulley and air conditioning compressor pulley -
-> **Power Steering Pump Belt Pulley and Air Conditioning Compressor Belt Pulley, Checking Alignment**

25 - Shim

- Various thicknesses
- After changing power steering pump, air conditioning compressor, power steering pump bracket, air conditioning compressor bracket or upper part of oil pan, check alignment of power steering pump and air conditioning compressor pulleys --> **Power Steering Pump Belt Pulley and Air Conditioning Compressor Belt Pulley, Checking Alignment**

26 - Belt pulley for power steering pump

27 - 23 Nm

28 - 23 Nm

29 - 25 Nm

30 - 32 Nm plus $\frac{1}{4}$ turn (90)

- Replace

31 - Vibration damper

- With belt pulley for ribbed belt
- Removing and installing --> **Vibration Damper, Removing and Installing**

32 - 100 Nm plus $\frac{1}{4}$ turn (90)

- Replace
- Use counter-holder T10069 to loosen and tighten

Ribbed Belt, Removing and Installing

Ribbed Belt, Removing and Installing

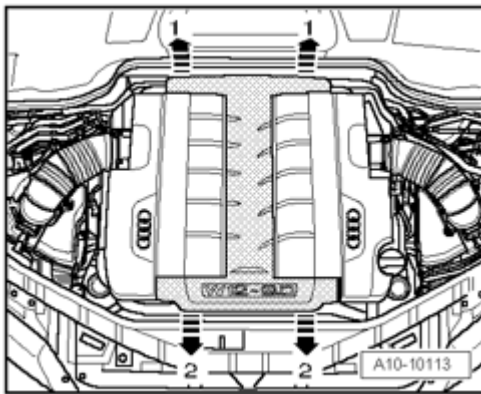


Fig. 122: Pulling Engine Cover At Rear And Middle Upward And Off & Pulling Engine Cover Forward And Off Of Intake Manifold

Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

- Bring lock carrier into service position --> **Lock Carrier, Moving into Service Position.**
- Carefully pull engine cover at rear and middle upward and off - **arrows 1 -**.
- Then, pull engine cover forward and off of intake manifold - **arrows 2 -**.

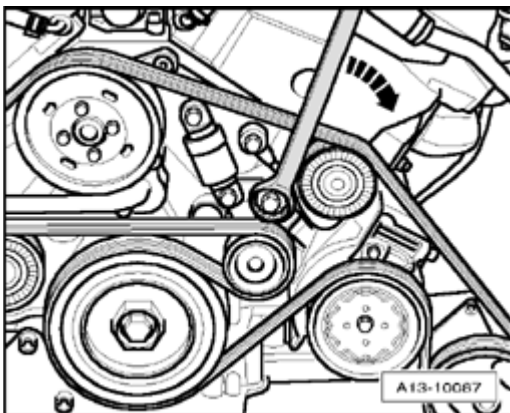


Fig. 123: Relieving Tension On Ribbed Belt

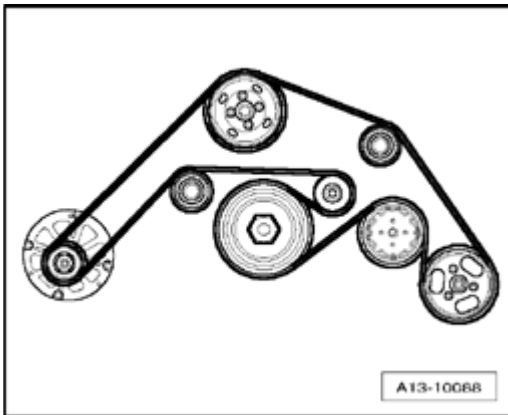
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- Before removing the ribbed belt, mark the turning direction of the belt with chalk or a felt tip pen. A reversed direction of rotation can cause damage to the belt under operating conditions.
- To relieve tension on ribbed belt, pivot tensioner in direction of - **arrow** - using a box-end 30 mm wrench.
- Remove ribbed belt and release tensioning device.

Installing

Installation is in reverse order of removal. Note the following:

**Fig. 124: Ribbed Belt Routing**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place ribbed belt onto vibration damper belt pulley, then onto remaining belt pulleys, and finally onto tensioning roller.

NOTE:

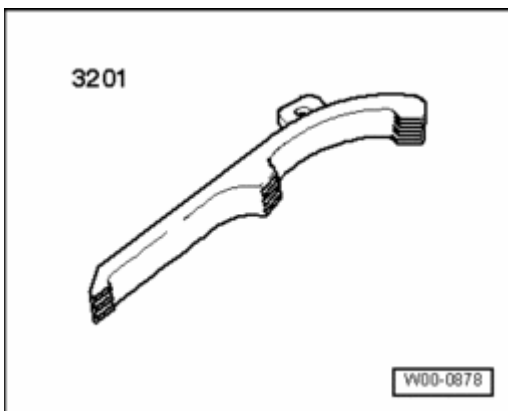
- When installing the ribbed belt, make sure it is seated correctly on the pulleys.
- Check alignment of power steering pump and air conditioning compressor belt pulleys after changing any of following components --> **Power Steering Pump Belt Pulley and Air Conditioning Compressor Belt Pulley, Checking Alignment** .
 - Power steering pump
 - Bracket for power steering pump
 - Air conditioner compressor
 - Bracket for air conditioning compressor

- Oil pan (upper section)
 - Install lock carrier with attachments --> **50 - BODY - FRONT** .
 - Install front bumper cover --> **63 - BUMPERS** .
 - Deactivate vehicle lifting mode --> **43 - SELF LEVELING SUSPENSION** .
 - Start engine and check belt running.
 - Check headlight adjustment --> **01 - MAINTENANCE** .

Power Steering Pump Belt Pulley and Air Conditioning Compressor Belt Pulley, Checking Alignment**Power Steering Pump Belt Pulley and Air Conditioning Compressor Belt Pulley, Checking Alignment****NOTE:**

- **To prevent damage to the ribbed belt, the alignment of the air conditioning compressor and power steering pump belt pulleys must be checked.**

- Check alignment of power steering pump and air conditioning compressor belt pulleys after changing any of following components:
 - Power-steering pump
 - Bracket for power steering pump
 - Air conditioner compressor
 - Bracket for air conditioning compressor
- Oil pan (upper section)

Special tools, testers and auxiliary items required**Fig. 125: Alignment Gauge 3201****Courtesy of VOLKSWAGEN UNITED STATES, INC.**

- Alignment gauge 3201

Requirement

- Ribbed belt removed.

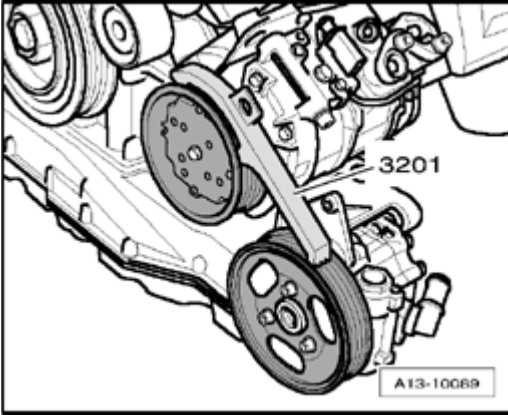
Work sequence

Fig. 126: Setting Alignment Gauge 3201 Onto Ribbed Belt Pulley Of Air Conditioning Compressor
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set alignment gauge 3201 onto ribbed belt pulley of air conditioning compressor.
- Determine center point of power steering pump shaft by axially moving pump shaft back and forth.
- Ribbed belt pulley for power steering pump must be aligned at center point with that of belt pulley for air conditioning compressor.

If both ribbed belt pulleys do not align:

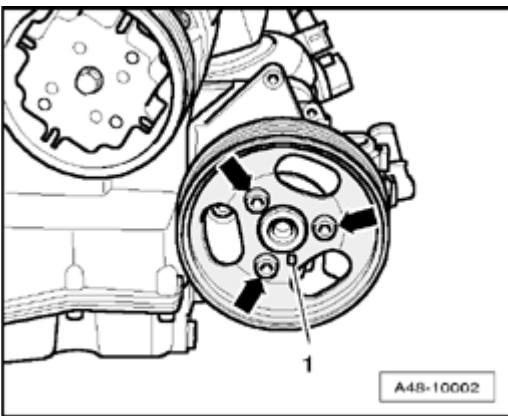


Fig. 127: Power Steering Pump Belt Pulley Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - for power steering pump belt pulley.
- Installed location: Protrusion - **1** - on ribbed belt pulley faces in direction of travel.

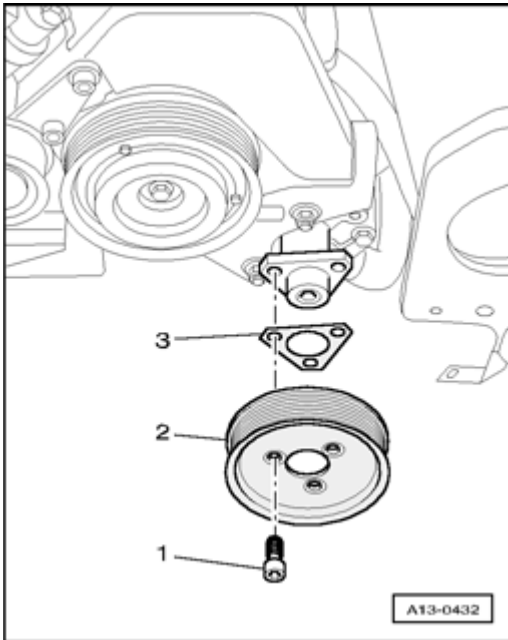


Fig. 128: Bolt, Power Steering Pump Belt Pulley & Air Conditioning Compressor Belt Pulley Shims
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Align offset of power steering pump belt pulley - 2 - to air conditioning compressor belt pulley using shims - 3 - of various thicknesses.
- Fasten bolt - 1 -.
- To finish, verify alignment of ribbed belt pulleys using alignment gauge 3201. If necessary, repeat adjustment.

Tightening torque

Component	Nm
Belt pulley to power steering pump	23

Vibration Damper, Removing and Installing

Vibration Damper, Removing and Installing

Special tools, testers and auxiliary items required

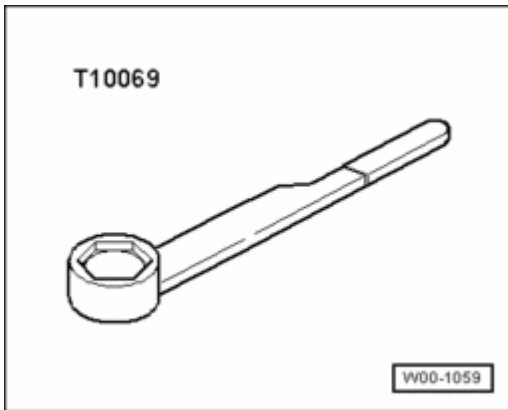


Fig. 129: Counter-Holder Tool T10069

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Counter-holder tool T10069

Removing

- Bring lock carrier into service position --> **Lock Carrier, Moving into Service Position.**

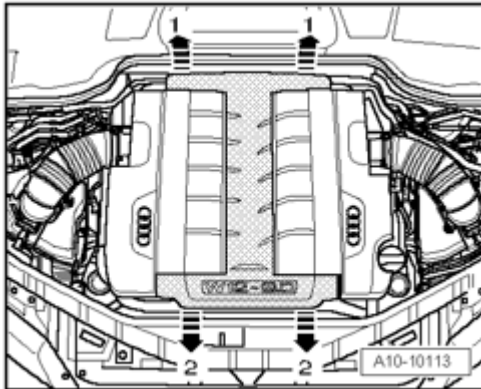


Fig. 130: Pulling Engine Cover At Rear And Middle Upward And Off & Pulling Engine Cover Forward And Off Of Intake Manifold

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Carefully pull engine cover at rear and middle upward and off - **arrows 1** -.
- Then, pull engine cover forward and off of intake manifold - **arrows 2** -.

NOTE:

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

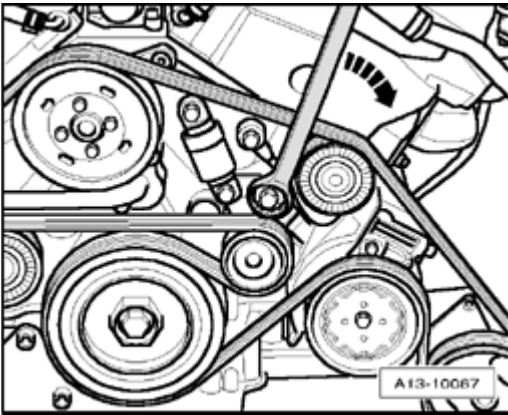


Fig. 131: Relieving Tension On Ribbed Belt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- To relieve tension on ribbed belt, pivot tensioner in direction of - **arrow** - , using a box-end 30 mm wrench.
- Remove ribbed belt and release tensioning device.

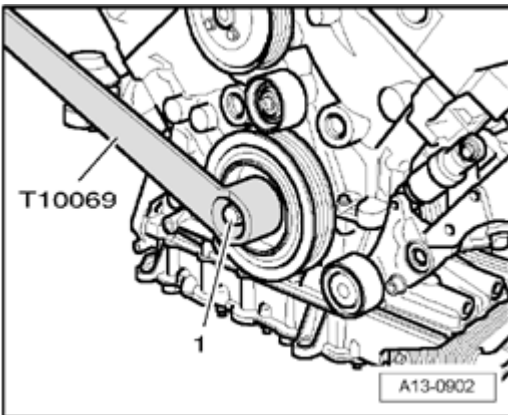


Fig. 132: Counter-Holding Crankshaft Using Counter-Holder T10069 Placed On Vibration Damper
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen center bolt - **1** - of vibration damper by holding vibration damper with counter-holder T10069.
- Remove vibration damper.

Installing

Installation is in reverse order of removal. Note the following:

NOTE:

- Always use a new center bolt to fasten the vibration damper.
- There must be no oil on the contact surfaces between the vibration damper and crankshaft.
- Also, do not oil the center bolt for the vibration damper.

2009 Audi A8 Quattro

ENGINE 6.0 Liter 12-Cyl. 4V Engine Mechanical, Engine Code(s): BHT, BSB - A8

- Install ribbed belt --> **Ribbed Belt, Removing and Installing** .
- Install lock carrier with attachments --> **50 - BODY - FRONT** .
- Install front bumper cover --> **63 - BUMPERS** .
- Deactivate vehicle lifting mode --> **43 - SELF LEVELING SUSPENSION** .
- Check headlight adjustment --> **01 - MAINTENANCE** .

Tightening torque

Component	Nm
Vibration damper to crankshaft	100 plus 90°

*Replace bolt.

* 90 corresponds to one quarter rotation.

TIMING CHAIN SIDE, SERVICING

Timing Chain Side, Servicing

--> **Drive Plate, Assembly Overview**

--> **Drive Plate, Removing and Installing**

--> **Timing Chain Covers, Assembly overview**

--> **Crankshaft Seal, Timing Chain Side, Replacing**

--> **Seals for Threaded Studs, Replacing**

--> **Timing Chain Covers, Removing and Installing**

--> **Timing Chains for Camshaft Drive, Removing and Installing**

--> **Timing Chains for Camshaft Drive, Assembly Overview**

--> **Camshaft Timing Chain, Removing and Installing**

--> **Drive Chain, Assembly Overview**

--> **Drive Chain, Removing and Installing**

Drive Plate, Assembly Overview

Drive Plate, Assembly Overview

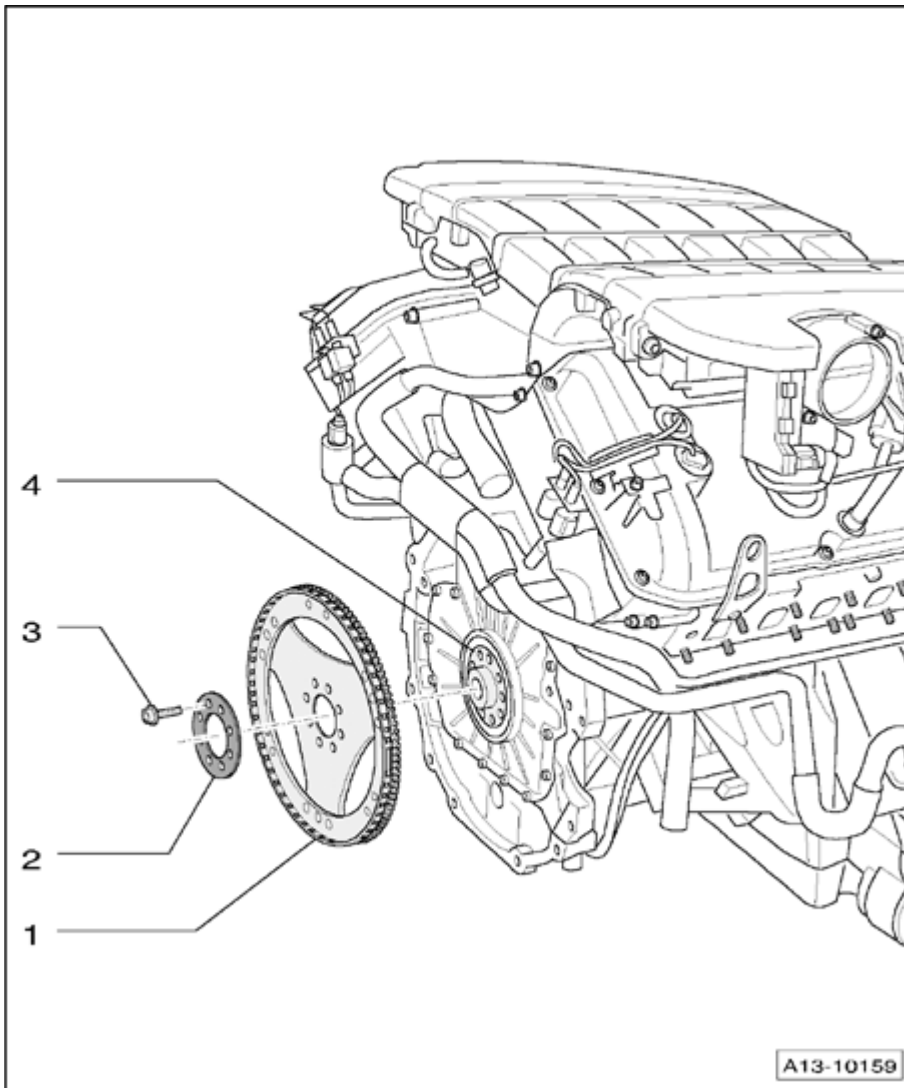


Fig. 133: Drive Plate, Assembly Overview

Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Drive plate

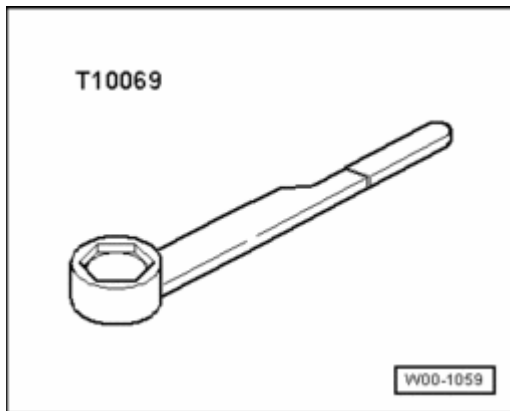
- Removing and installing --> **Drive Plate, Removing and Installing**
- Mark for reinstallation

2 - Washer

- Mark for reinstallation

3 - 60 Nm plus $\frac{1}{4}$ turn (90)

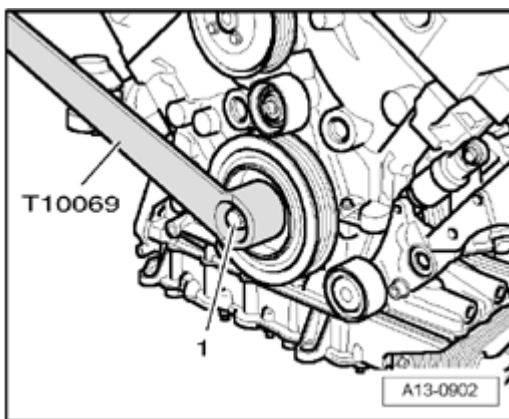
- Replace

4 - Crankshaft**Drive Plate, Removing and Installing****Drive Plate, Removing and Installing****Special tools, testers and auxiliary items required****Fig. 134: Counter-Holder Tool T10069****Courtesy of VOLKSWAGEN UNITED STATES, INC.**

- Counter-holder tool T10069

Removing

- Engine removed.
- Engine separated from transmission.

**Fig. 135: Counter-Holding Crankshaft Using Counter-Holder T10069 Placed On Vibration Damper****Courtesy of VOLKSWAGEN UNITED STATES, INC.**

- Counter-hold crankshaft using counter-holder T10069 placed on vibration damper.

NOTE:

- Ignore - 1 - in the illustration.

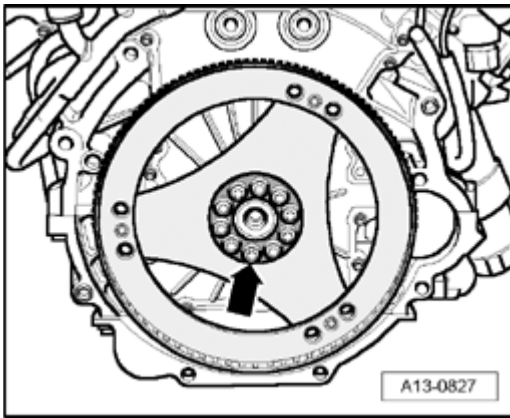


Fig. 136: Drive Plate Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Mark installation position on drive plate to crankshaft using a felt-tip marker.
- Unbolt drive plate - **arrow** -.

Installing

Installation is in reverse order of removal. Note the following:

Always use new bolts when securing the drive plate.

Tightening torque

Component	Nm
Drive plate to crankshaft	60 plus 90°

*Replace bolts.

* 90 corresponds to one quarter rotation.

Timing Chain Covers, Assembly overview

Timing Chain Covers, Assembly overview

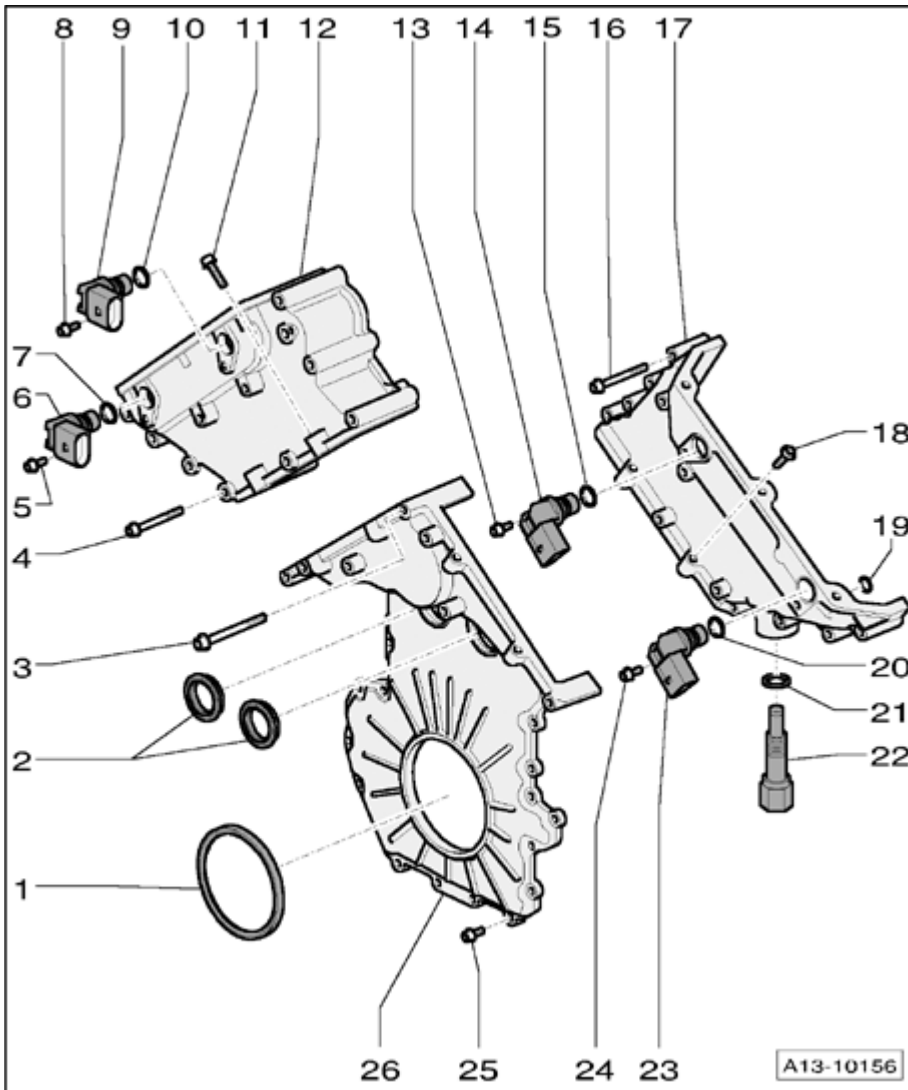


Fig. 137: Timing Chain Covers, Assembly Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Sealing ring for crankshaft - timing chain side

- Replace
- Removing and installing --> **Crankshaft Seal, Timing Chain Side, Replacing**

2 - Seals for threaded studs

- Replace
- Removing and installing --> **Seals for Threaded Studs, Replacing**

3 - 20 Nm

4 - 10 Nm

- Observe tightening sequence --> **Fig. 162**

5 - 9 Nm

- Insert using locking compound .

6 - Camshaft Position (CMP) sensor 4 G301

- For exhaust camshaft cylinder bank 2 (left)

7 - O-ring

- Replace

8 - 9 Nm

- Insert using locking compound .

9 - Camshaft Position (CMP) sensor 2 G163

- For intake camshaft cylinder bank 2 (left)

10 - O-ring

- Replace

11 - 10 Nm

- Observe tightening sequence --> **Fig. 162**

12 - Left cover for timing chain

- After removal, replace cover with threaded fitting using newer version without threaded fitting

13 - 9 Nm

- Insert using locking compound .

14 - Camshaft Position (CMP) sensor G40

- For intake camshaft cylinder bank 1 (right)

15 - O-ring

- Replace

16 - 10 Nm

- Observe tightening sequence --> **Fig. 163**

17 - Right cover for timing chain

18 - 10 Nm

- Observe tightening sequence --> **Fig. 163**

19 - O-ring

- Replace
- Insert into timing chain cover

20 - O-ring

- Replace

21 - Oil seal

22 - Chain tensioner for right timing chain

- Fasten to 60 Nm

23 - Camshaft Position (CMP) sensor 3 G300

- For exhaust camshaft cylinder bank 1 (right)

24 - 9 Nm

- Insert using locking compound .

25 - 10 Nm

26 - Lower timing chain cover

Crankshaft Seal, Timing Chain Side, Replacing

Crankshaft Seal, Timing Chain Side, Replacing

Special tools, testers and auxiliary items required

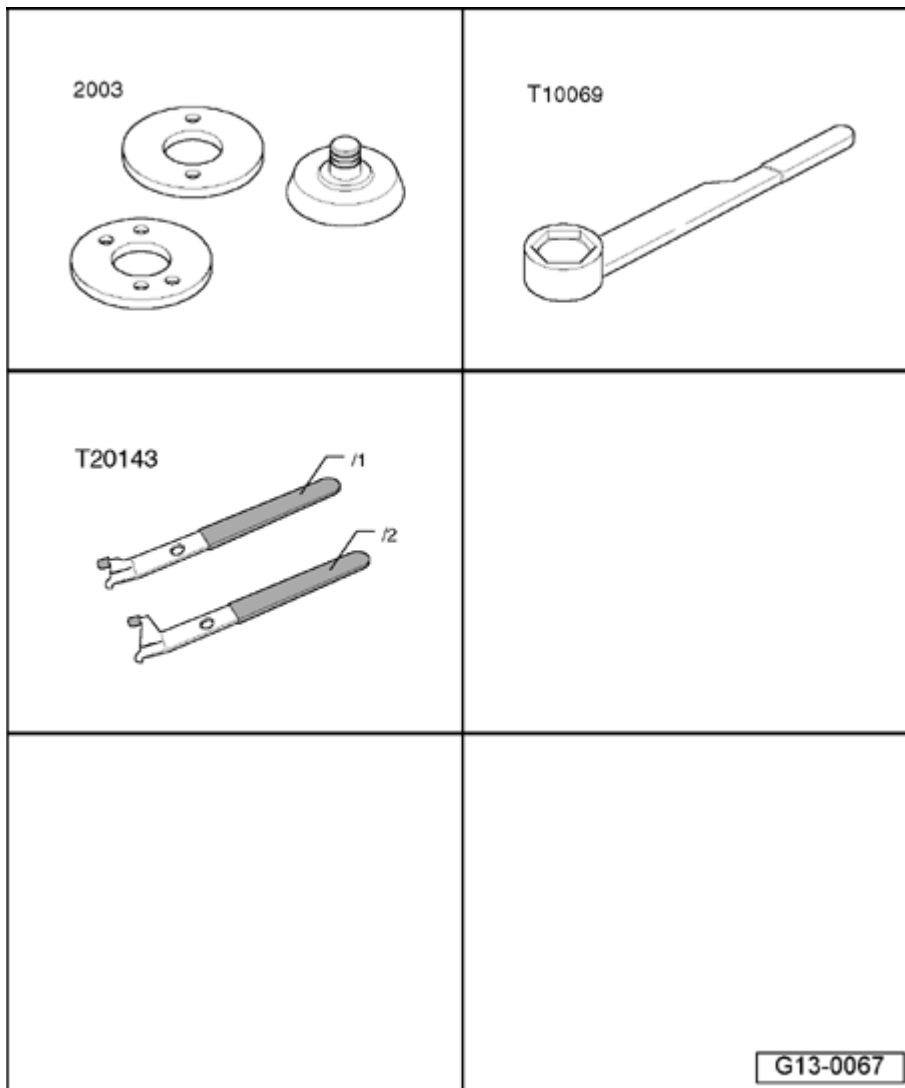


Fig. 138: Identifying Special Tools - Crankshaft Seal, Timing Chain Side, Replacing
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Seal installer 2003
- Counter-holder tool T10069
- Pulling hook T20143/2

Work sequence

- Engine removed
- Engine separated from transmission

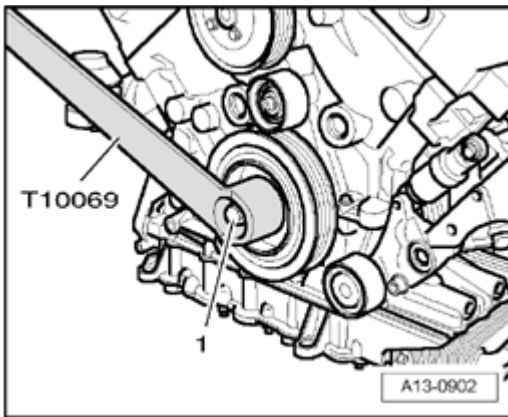


Fig. 139: Counter-Holding Crankshaft Using Counter-Holder T10069 Placed On Vibration Damper
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Counter-hold crankshaft using counter-holder T10069 placed on vibration damper.

NOTE:

- Ignore - 1 - in the illustration.

- Mark installation position on drive plate to crankshaft using a felt-tip marker.

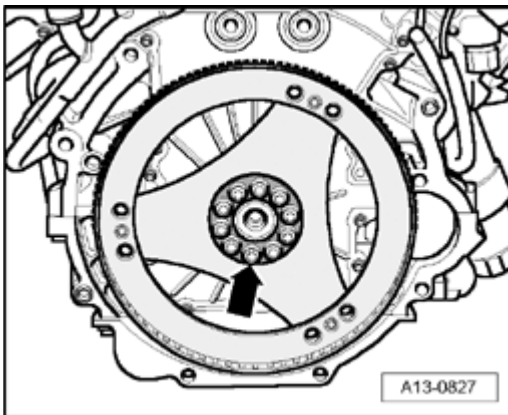


Fig. 140: Drive Plate Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts and drive plate - **arrow** -.

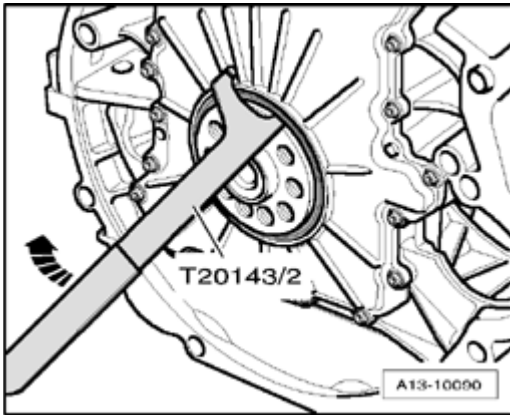


Fig. 141: Prying Out Seal Using Pulling Hook T20143/2
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pry out seal using pulling hook T20143/2 - **arrow** -.
- Clean operating and sealing surfaces.

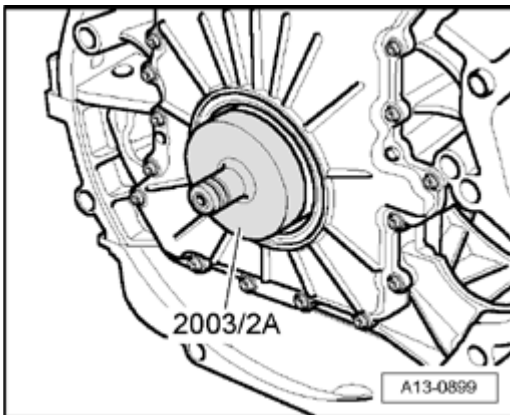


Fig. 142: Pushing New Seal Onto Crankshaft Using Press Sleeve 2003/2 A
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Push new seal onto crankshaft using press sleeve 2003/2 A.

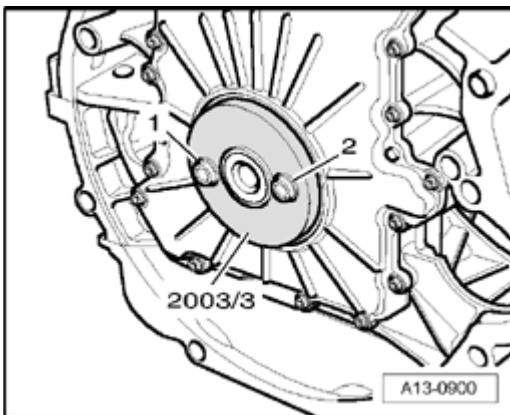


Fig. 143: Pressing New Seal Into Drive Plate Up To Stop Using Seal Installer 2003/3 And Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press new seal into drive plate up to stop using seal installer 2003/3 and bolts - 1 - and - 2 -.
- Install drive plate --> **Drive Plate, Removing and Installing.**

Seals for Threaded Studs, Replacing

Seals for Threaded Studs, Replacing

Work sequence

- Engine removed
- Engine separated from transmission

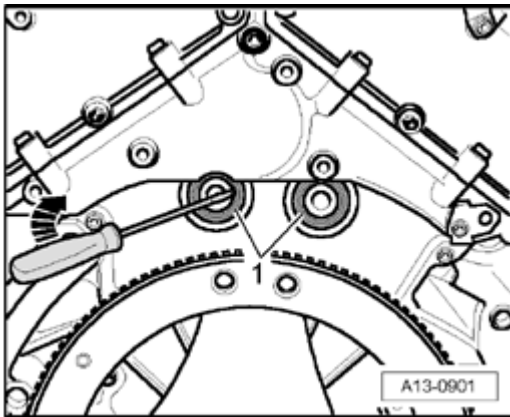


Fig. 144: Prying Out Seals Using Screwdriver

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pry out seals - 1 - using a screwdriver.
- Clean sealing surfaces to ensure they are free of grease.
- Carefully press in new seal up to stop using a 24 mm socket.

Timing Chain Covers, Removing and Installing

Timing Chain Covers, Removing and Installing

Special tools, testers and auxiliary items required

- Adhesive compound
- Hand drill with plastic brush attachment
- Protective glasses

CAUTION: When the upper right camshaft timing chain cover is removed, the engine must not be turned over. Only when the chain tensioner for the right camshaft timing chain and the upper right timing chain cover are installed

is the timing chain secured against jumping off.

Removing

- Engine removed
- Engine separated from transmission

NOTE:

- During installation, reinstall all heat insulation sleeves at the same locations.
 - All cable ties opened or cut during engine removal must be reinstalled at the same locations during installation.
- Remove drive plate --> Drive Plate, Removing and Installing.
 - Remove upper part of intake manifold: --> Intake Manifold Upper Section, Removing and Installing.
 - Remove intake manifold lower part: --> Intake Manifold Lower Section, Removing and Installing.
 - Remove cylinder head covers --> Cylinder Head Cover, Removing and Installing.

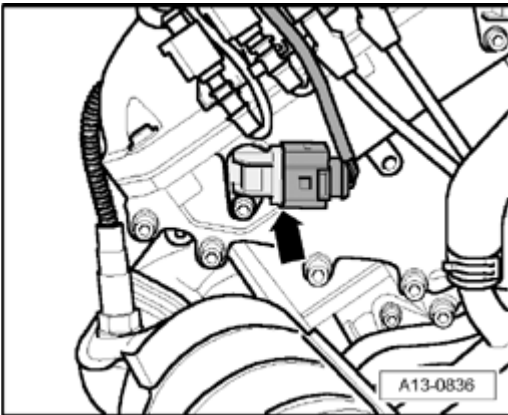


Fig. 145: Camshaft Position Sensors Electrical Connections
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Button heat insulation sleeve over camshaft position sensors for exhaust camshaft on both cylinder banks.
- Disconnect electrical connections on camshaft position sensors for exhaust camshaft - **arrow** - and intake camshaft on both cylinder banks.

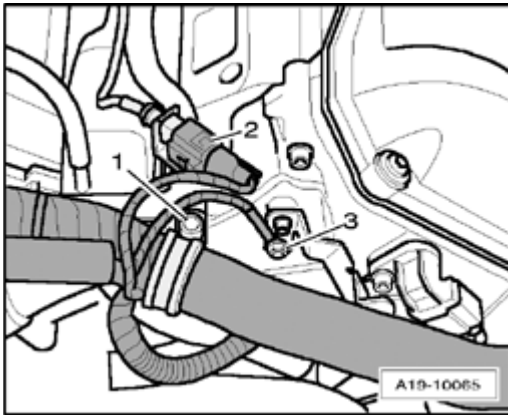


Fig. 146: Harness Clamp, Map Controlled Engine Cooling Thermostat F265 Electrical Connection & Ground Wire

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Separate electrical connection - 2 - at Map controlled engine cooling thermostat F265.
- Disconnect Ground wire - 3 - on cylinder head.
- Loosen harness clamp - 1 - and free harness from upper coolant pipe.

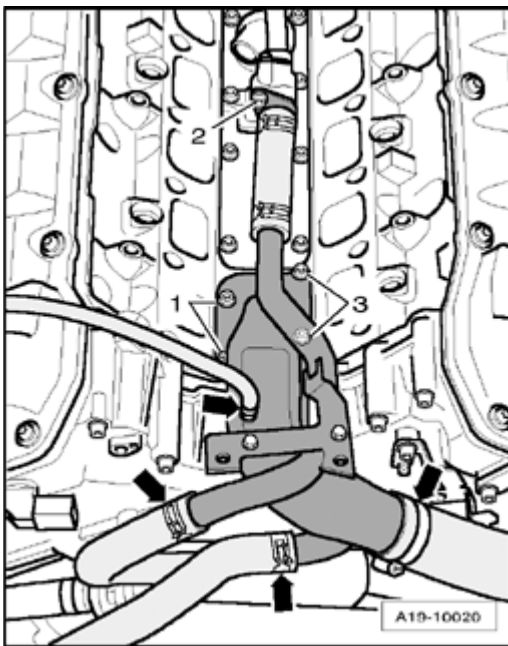


Fig. 147: Coolant Hoses At Upper Coolant Pipe & Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - 1 to 3 -.
- Disconnect coolant hoses at upper coolant pipe - **arrows** -.
- Remove upper coolant pipe.

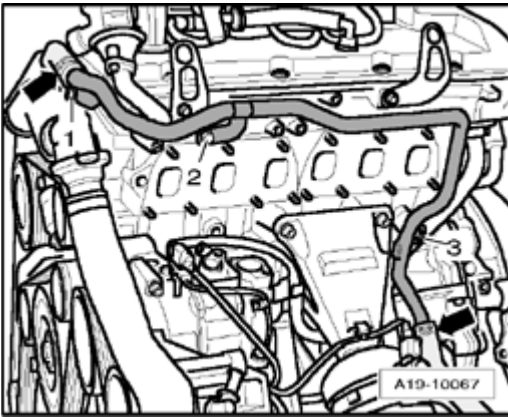


Fig. 148: Coolant Hoses At Upper Left Coolant Pipe & Bolts
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect coolant hoses - **arrows** - at upper left coolant pipe.
- Remove bolts - **1** - and - **2** - and nut - **3** -.
- Remove upper left coolant pipe.

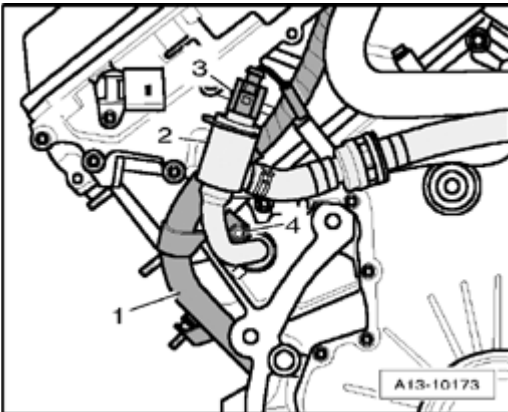


Fig. 149: Guide Tube, Pipe Connections, Engine Coolant Temperature (ECT) Sensor G62 Electrical Harness Connector & Bolts
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - **3** - at Engine Coolant Temperature (ECT) sensor G62.
- Remove bolt - **4** - and remove guide tube - **1** - for wiring harness from engine.
- Pull pipe connections - **2** - off of cylinder block.

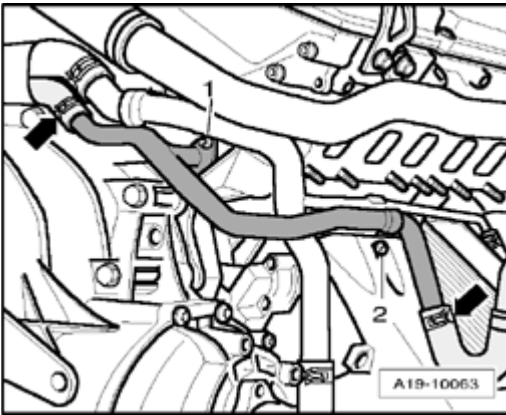


Fig. 150: Coolant Hoses At Lower Right Coolant Pipe & Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect coolant hoses - **arrows** - at lower right coolant pipe.
- Remove bolts - **1** - and - **2** -.
- Pull lower right coolant pipe rearward and off of cylinder head.

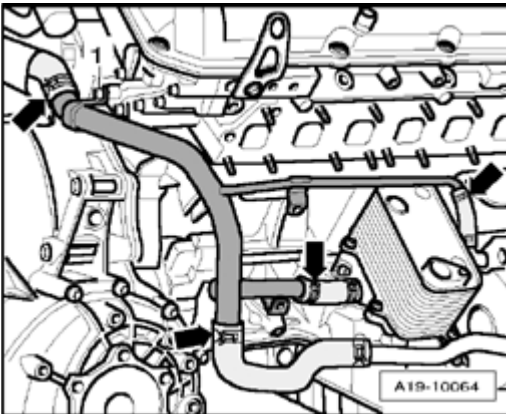


Fig. 151: Coolant Hoses & Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **1** -.
- Pull middle right coolant pipe off of coolant hoses at positions indicated by - **arrows** -.

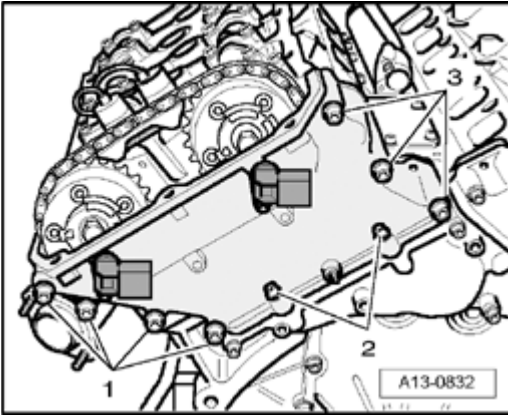


Fig. 152: Left Timing Chain Cover Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **1 to 3** - and remove left timing chain cover.

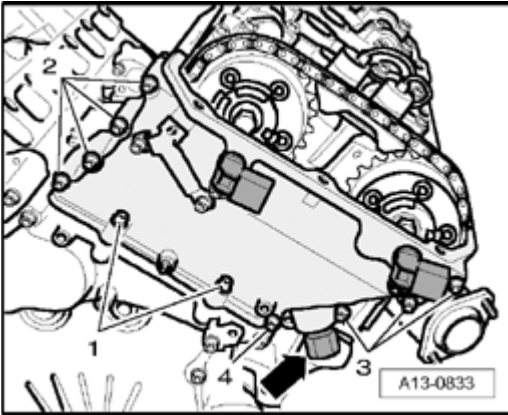


Fig. 153: Camshaft Timing Chain Tensioner & Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove chain tensioner for camshaft timing chain - **arrow** -.
- Remove bolts - **1 to 4** - and remove right timing chain cover.

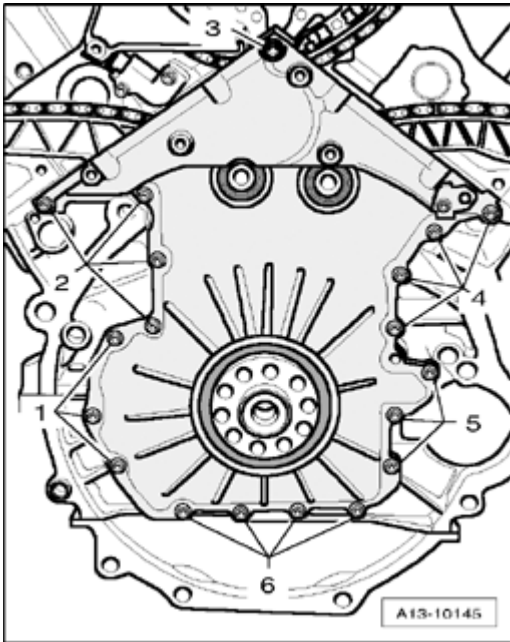


Fig. 154: Lower Timing Chain Cover & Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **1 to 6** - and remove lower timing chain cover.
- Press crankshaft seal - timing chain side - out of lower timing chain cover.

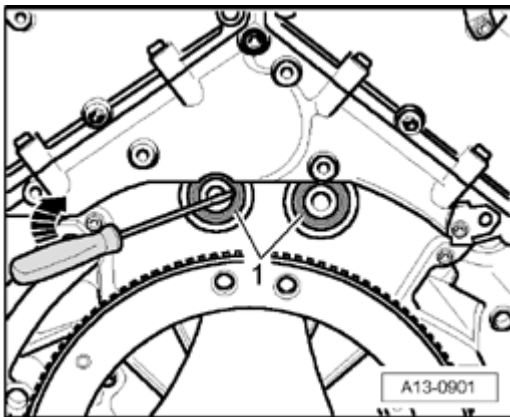


Fig. 155: Prying Out Seals Using Screwdriver

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pry out seals - **1** - for threaded studs using a screwdriver.

Installing

Installation is performed in reverse order of removal. Note the following:

NOTE:

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

- During installation, protective heat sleeves must be reinstalled at the same location.
- During installation, all cable ties must be reinstalled at the same location.

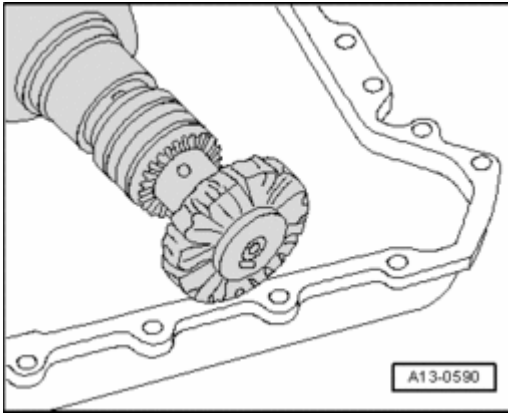


Fig. 156: Using Rotating Plastic Brush To Remove Sealant Residue On Timing Chain Covers And On Cylinder Block And Cylinder Head

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

CAUTION: Wear safety glasses.

- Clean sealing surfaces to ensure they are free of oil and grease.

NOTE:

- Timing chain covers must be installed within 15 minutes after applying sealant.

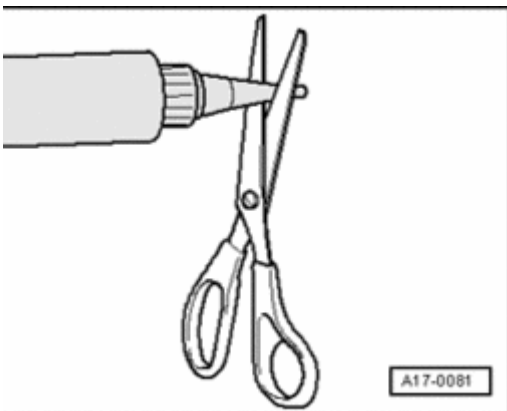


Fig. 157: Cutting Tube Nozzle At Front Marking

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Cut off nozzle on tube of sealant at front mark (diameter of nozzle: approx. 2 mm).

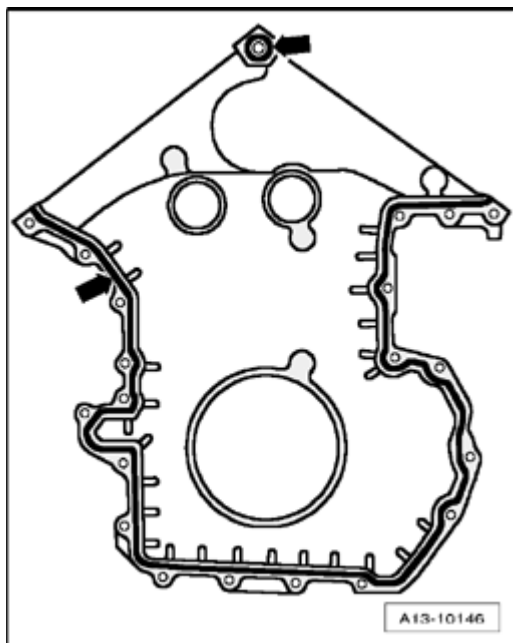


Fig. 158: Applying Sealant Beads On Clean Sealing Surfaces Of Lower Timing Chain Cover
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Apply sealant beads - **arrows** - on clean sealing surfaces of lower timing chain cover, as shown in illustration.
- Thickness of sealant bead: 1.5 to 2.0 mm

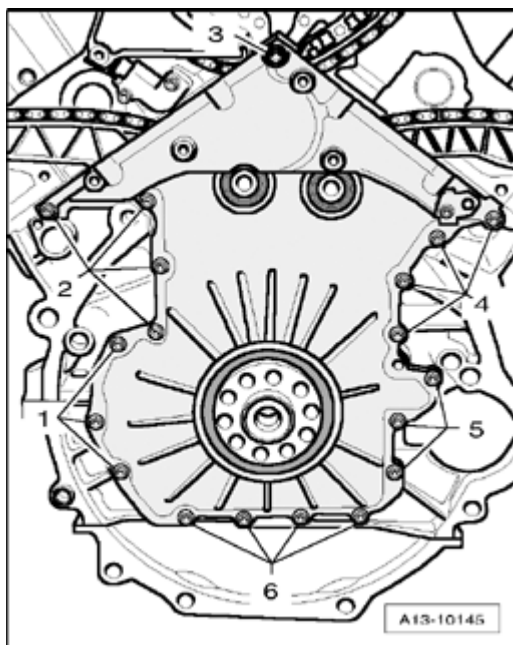


Fig. 159: Lower Timing Chain Cover & Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set lower timing chain cover in place and fasten bolts - **1 to 6** - in a diagonal sequence.

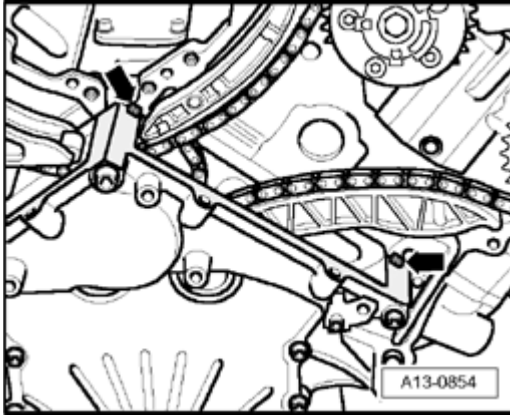


Fig. 160: Applying Thin Bead Of Sealant To Edges Between Lower Cover And Left/Right Covers For Timing Chain

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Apply a thin bead of sealant to edges between lower cover and left and right covers for timing chain - **arrows** -.

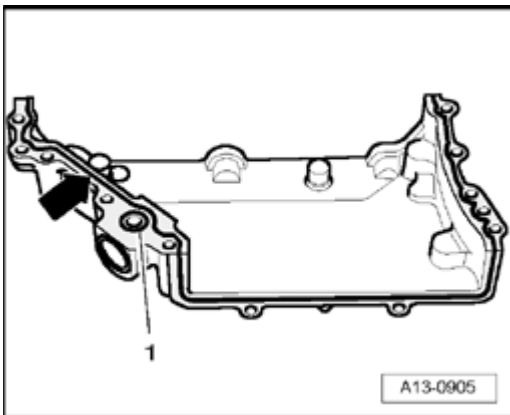


Fig. 161: Applying Sealant Bead On Clean Sealing Surfaces Of Lower Left/Right Timing Chain Covers

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Apply a sealant bead - **arrow** - on clean sealing surfaces of lower left and right timing chain covers, as shown in illustration.
- Thickness of sealant bead: 1.5 to 2.0 mm.
- Place O-ring - **1** - into right timing chain cover.

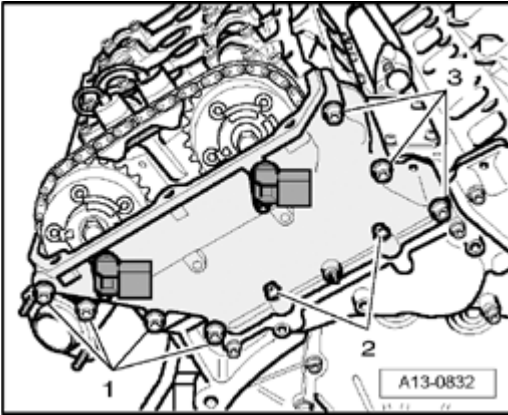


Fig. 162: Left Timing Chain Cover Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set left timing chain cover in place and fasten bolts as follows:
 1. Tighten bolts to 1 and 3 to 5 Nm.
 2. Tighten bolts 2 to 10 Nm.
 3. Tighten bolts to 1 and 3 to 10 Nm.

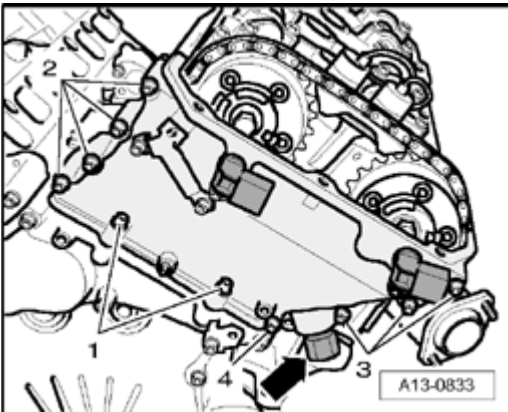


Fig. 163: Camshaft Timing Chain Tensioner & Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set right timing chain cover in place and fasten bolts as follows:
 1. Tighten bolts 2 , 3 and 4 to 5 Nm.
 2. Tighten bolts 1 to 10 Nm.
 3. Tighten bolts 2 , 3 and 4 to 10 Nm.
- Fasten chain tensioner for camshaft timing chain - **arrow** - with a new seal.
- Install crankshaft seal - timing belt side - --> **Crankshaft Seal, Timing Chain Side, Replacing.**
- Install seals for threaded studs --> **Seals for Threaded Studs, Replacing.**
- Install middle right coolant pipe. --> **Installing**
- Install lower right coolant pipe. --> **Installing**

2009 Audi A8 Quattro

ENGINE 6.0 Liter 12-Cyl. 4V Engine Mechanical, Engine Code(s): BHT, BSB - A8

- Install upper left coolant pipe --> **Upper left coolant pipe, removing and installing.**
- Install upper coolant pipe. --> **Installing**
- Install cylinder head covers. --> *Installing* under **Cylinder Head Cover, Removing and Installing**

CAUTION: Observe the correct routing of electrical harnesses on the engine --> Engine Wiring, Routing on Engine.

- Install intake manifold lower-part: --> **Intake Manifold Lower Section, Removing and Installing.**
- Install intake manifold upper-part: --> **Intake Manifold Upper Section, Removing and Installing.**
- Install drive plate --> **Drive Plate, Removing and Installing.**

Tightening torques

Component		Nm
Lower timing chain cover	M6	10
To cylinder block	M8	20
Left and right timing chain cover		10
Chain tensioner for camshaft timing chain		60

Timing Chains for Camshaft Drive, Removing and Installing

Timing Chains for Camshaft Drive, Removing and Installing

CAUTION: Crankshaft and camshafts may only be turned over with the engine completely assembled and may only be turned at the crankshaft. The timing chain covers and the chain tensioner for the right camshafts timing chain must be installed.

NOTE:

- The crankshaft holder 3242 serves exclusively to lock the crankshaft at TDC. To counterhold, the counter-holder tool T10069 must be used.
- The camshaft bar T10068 serves exclusively to lock the camshaft at TDC. To counterhold, an open-end 32 mm wrench must be set on the hex of the camshaft.

Timing Chains for Camshaft Drive, Assembly Overview

Timing Chains for Camshaft Drive, Assembly Overview

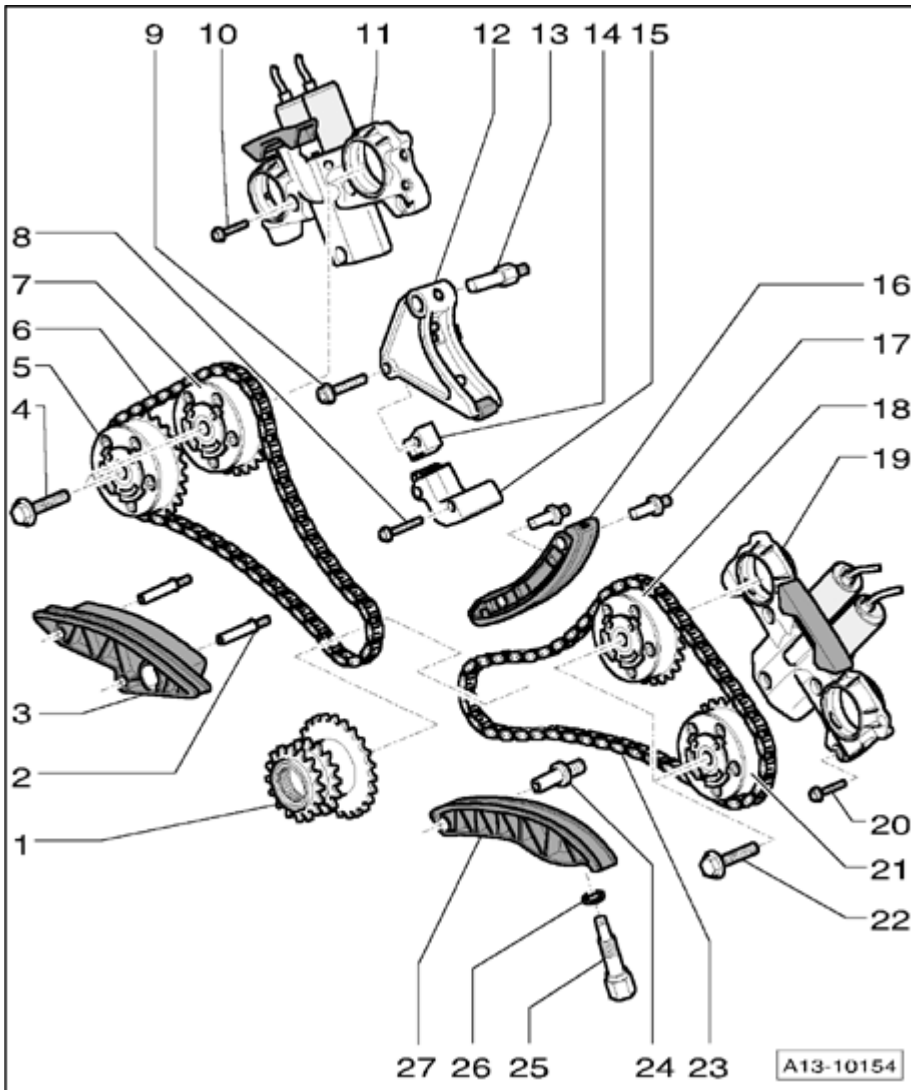


Fig. 164: Timing Chains For Camshaft Drive, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Chain sprocket for camshaft drive

- Removing and installing --> **Drive Chain, Removing and Installing**

2 - Pivot pin, 15 Nm

3 - Guide rail

4 - 60 Nm plus $\frac{1}{4}$ turn (90)

- Replace
- There must be no oil on contact surfaces between camshaft adjuster and camshaft or between bolt head and camshaft adjuster

- Counterhold camshaft using open-end 32 mm wrench when loosening and tightening

5 - Exhaust camshaft adjuster

- For cylinder bank 2 (left)
- Identification: B2/Front side made of plastic
- Removing and installing --> **Camshaft Timing Adjusters, Removing and Installing**

6 - Camshaft timing chain

- For cylinder bank 2 (left)

7 - Intake camshaft adjuster

- For cylinder bank 2 (left)
- Identification: B2/A2
- Removing and installing --> **Camshaft Timing Adjusters, Removing and Installing**

8 - 9 Nm

9 - 20 Nm

10 - 9 Nm

- Insert using locking compound .

11 - Housing for camshaft adjustment solenoid valves

- For cylinder bank 2 (left)
- Removing and installing --> **Camshaft Timing Adjusters, Removing and Installing**

12 - Tensioning rail

- For cylinder bank 2 (left)

13 - Pivot pin, 42 Nm

- With external hex
- Insert using locking compound .

14 - Guide piece**15 - Chain tensioner**

- Lock chain tensioner with drill (3.5 mm diameter)

16 - Guide rail

- With external hex

17 - Pivot pin, 15 Nm

18 - Intake camshaft adjuster

- For cylinder bank 1 (right)
- Identification: B1/A2
- Removing and installing --> **Camshaft Timing Adjusters, Removing and Installing**

19 - Housing for camshaft adjustment solenoid valves

- For cylinder bank 1 (right)
- Removing and installing --> **Camshaft Timing Adjusters, Removing and Installing**

20 - 9 Nm

- Insert using locking compound .

21 - Exhaust camshaft adjuster

- For cylinder bank 1 (right)
- Identification: B1/Front side made of plastic
- Removing and installing --> **Camshaft Timing Adjusters, Removing and Installing**

22 - 60 Nm plus $\frac{1}{4}$ turn (90)

- Replace
- There must be no oil on contact surfaces between camshaft adjuster and camshaft or between bolt head and camshaft adjuster
- Counterhold camshaft using open-end 32 mm wrench when loosening and tightening

23 - Camshaft timing chain

- For cylinder bank 1 (right)

24 - Pivot pin, 25 Nm

- With collar
- Insert using locking compound .

25 - Chain tensioner

- Fasten to 60 Nm

26 - Oil seal

- Replace

27 - Tensioning rail

Camshaft Timing Chain, Removing and Installing

Camshaft Timing Chain, Removing and Installing

CAUTION: Crankshaft and camshafts may only be turned over with the engine completely assembled and may only be turned at the crankshaft. The timing chain covers and the chain tensioner for the right camshafts timing chain must be installed.

NOTE:

- The camshaft bar T10068 serves exclusively to lock the camshaft at TDC. To counterhold, an open-end 32 mm wrench must be set on the hex of the camshaft.

Special tools, testers and auxiliary items required

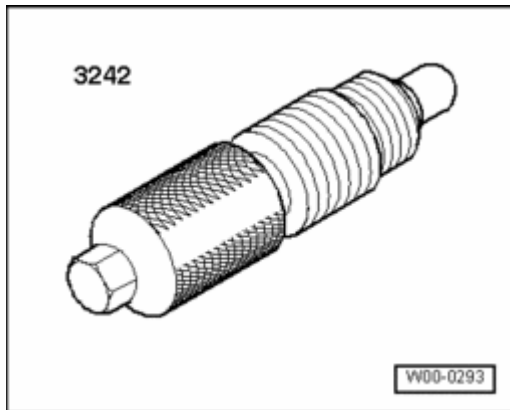


Fig. 165: Crankshaft Holder 3242

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Crankshaft holder 3242

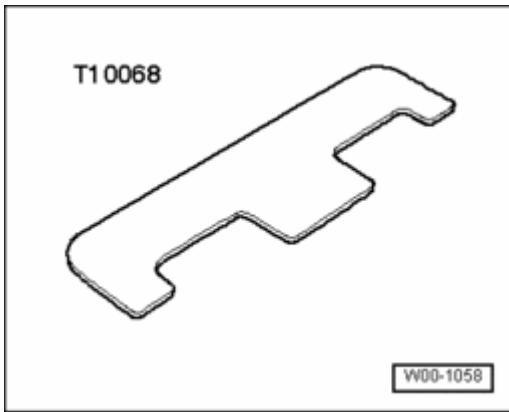


Fig. 166: Camshaft Bar T10068

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Camshaft bar T10068
- Drill bit, 3.5 mm diameter

Removing

- Engine removed
- Engine separated from transmission
- Remove drive plate --> **Drive Plate, Removing and Installing.**
- Remove upper part of intake manifold: --> **Intake Manifold Upper Section, Removing and Installing.**
- Remove intake manifold lower part: --> **Intake Manifold Lower Section, Removing and Installing.**
- Remove cylinder head covers --> **Cylinder Head Cover, Removing and Installing.**
- Rotate crankshaft at center bolt in direction of engine rotation to TDC of ignition timing.

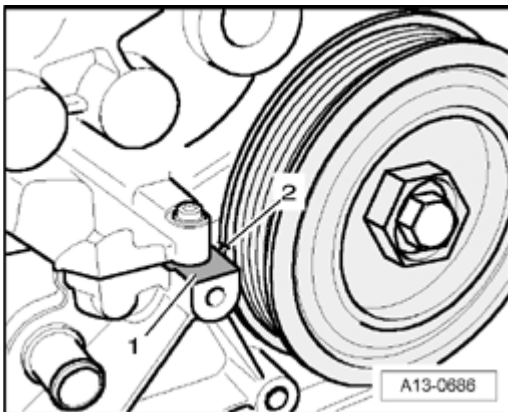


Fig. 167: Housing Separation Point & Marking

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Marking - 2 - on vibration damper must align with housing separation point - 1 -.

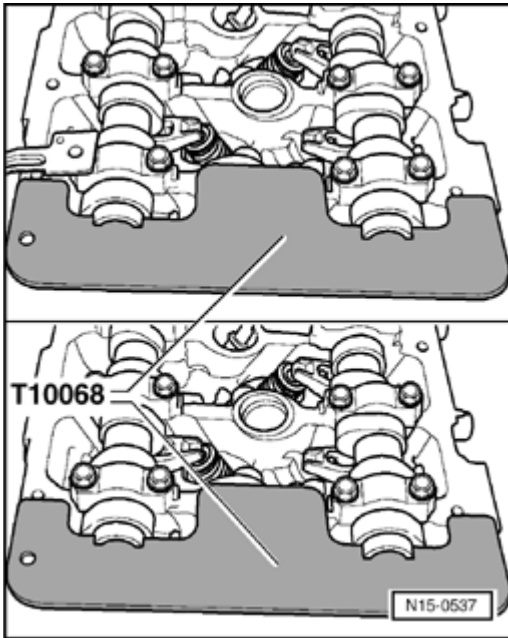


Fig. 168: Camshaft Bar T10068 Engaging In Both Shaft Grooves
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- At same time, camshaft bar T10068 must engage in both shaft grooves.
- If necessary, turn crankshaft one rotation further.

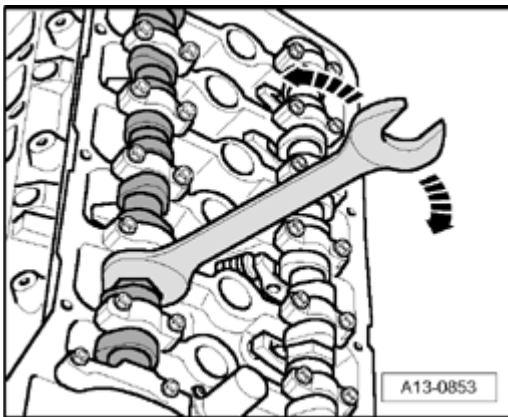
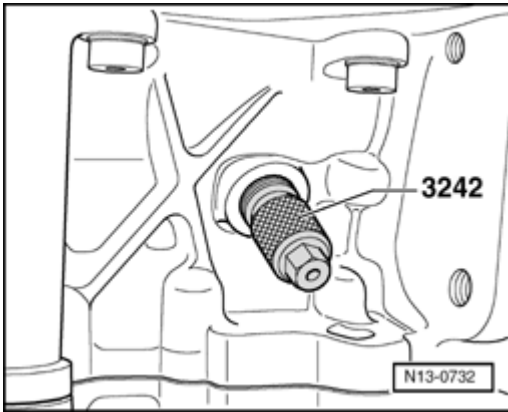


Fig. 169: Turning Camshafts Back And Forth Slightly Using An Open-End 32 Mm Wrench
Courtesy of VOLKSWAGEN UNITED STATES, INC.

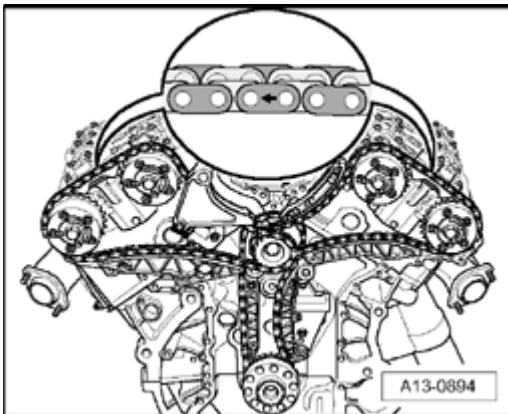
NOTE:

- If necessary, turn camshafts back and forth slightly using an open-end 32 mm wrench. Camshaft bar T10068 must not be installed during this process.

**Fig. 170: Thread Crankshaft Holder 3242**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove sealing plug from left side of cylinder block.
- Thread crankshaft holder 3242 into hole (20 Nm).

**Fig. 171: Timing Chains Paint Marking**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove all covers for timing chains --> **Timing Chain Covers, Removing and Installing.**
- If reusing current timing chains, mark direction of rotation and location of both left and right chains on chains with a paint marker.

CAUTION: Both camshaft timing chains must always be removed and installed together, otherwise the installation markings will not be able to be positioned properly.

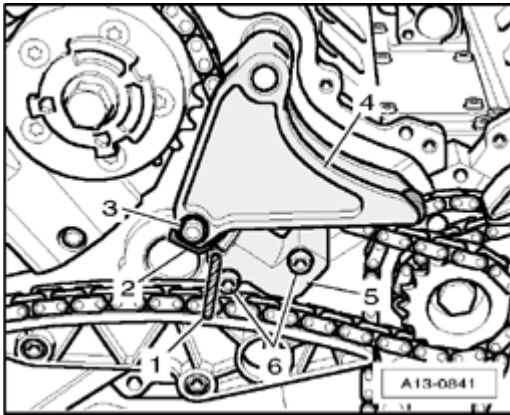


Fig. 172: Drill, Guide Piece, Bolts, Chain Tensioner & Tensioning Rail
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Push chain tensioner for camshaft timing chain on cylinder bank 2 (left) downward and lock in position with a 3.5 mm drill - **1** -.
- Remove bolts - **6** - and remove chain tensioner - **5** -.
- Remove bolt - **3** - and remove guide piece - **2** -.
- Pull tensioning rail - **4** - from pivot pins.

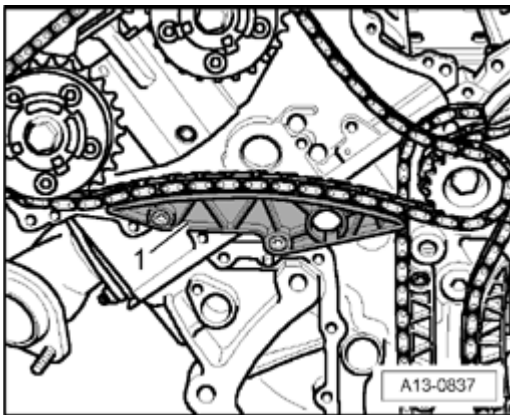


Fig. 173: Identifying Guide Rail
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull guide rail - **1** - from pivot pins.

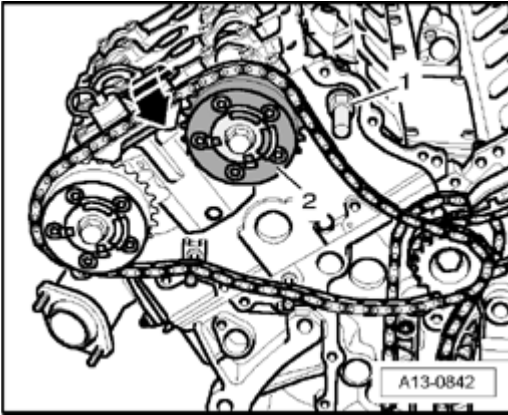


Fig. 174: Removing Pivot Pins & Timing Chain For Cylinder Bank 2 (Left), Beginning At Intake Camshaft Adjuster

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove pivot pins - 1 -.
- Remove timing chain for cylinder bank 2 (left), beginning at intake camshaft adjuster - 2 -.

NOTE:

- To ease the removal of the timing chain, rotate the camshaft adjuster back and forth slightly.

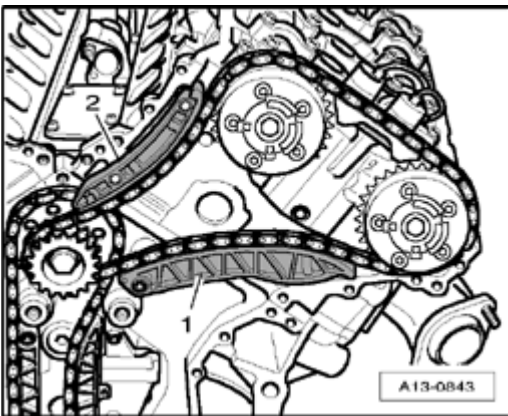


Fig. 175: Tensioning Rail & Guide Rail

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull tensioning rail - 1 - and guide rail - 2 - for cylinder bank 1 (right) from pivot pins.

NOTE:

- To ease the removal of the guide rail, rotate the intake camshaft slightly to the left at the hex.

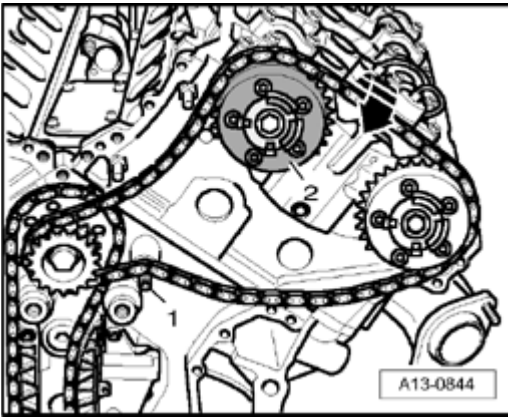


Fig. 176: Removing Pivot Pins & Timing Chain For Cylinder Bank 1 (Right), Beginning At Intake Camshaft Adjuster

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove pivot pins - 1 -.
- Remove timing chain for cylinder bank 1 (right), beginning at intake camshaft adjuster - 2 -.

NOTE:

- To ease the removal of the timing chain, rotate the camshaft adjuster back and forth slightly.

Installing

- Secure camshaft in TDC position using camshaft bar T10068.
- Secure crankshaft in TDC position using crankshaft holder 3242.
- Drive chain installed --> **Installing**.

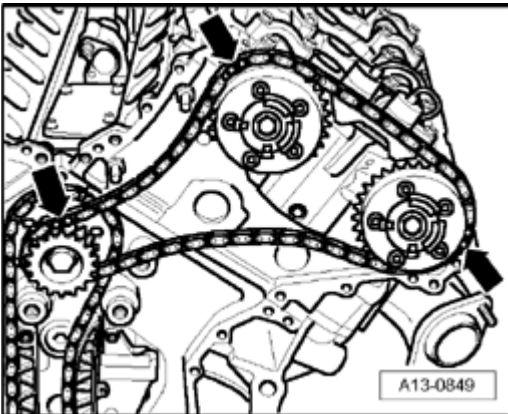


Fig. 177: Copper-Colored Chain Links

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place camshaft timing chain for cylinder bank 1 (right) onto chain sprocket for camshaft drive and onto camshaft adjuster.
- The copper-colored chain links face the transmission.

- The copper-colored chain links - **arrows** - must be positioned to the chain sprockets as shown in the illustration.
- The exact positions are shown in the following illustrations.

Chain sprocket for camshaft drive

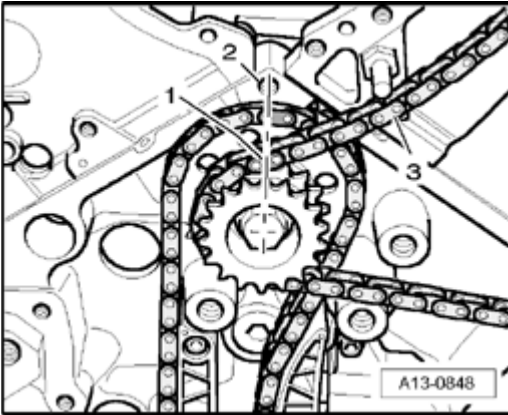


Fig. 178: Copper-Colored Chain Link, Threaded Hole & Camshaft Timing Chain
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- The copper-colored chain link - **1** - must be positioned centrally to threaded hole - **2** - when camshaft timing chain - **3** - is tensioned.

NOTE:

- The copper-colored chain link that is located behind on the drive chain is only positioned as shown the first time it is laid in place. If the drive chain was not removed, the placement of the copper-colored chain link is of no significance.

Camshaft adjuster for exhaust camshaft

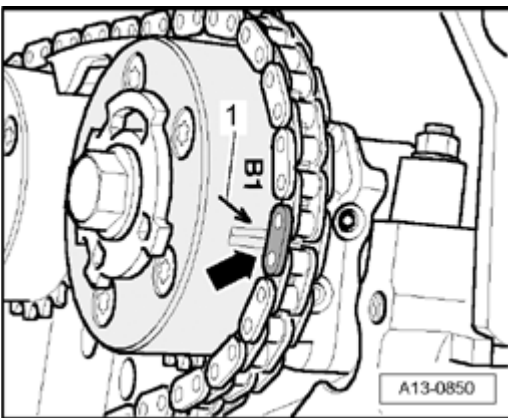


Fig. 179: Copper-Colored Chain Link & Marking (Exhaust Camshaft Adjuster)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- The copper-colored chain link - **arrow** - must align with marking - **1** - on the exhaust camshaft adjuster.

Camshaft adjuster for intake camshaft

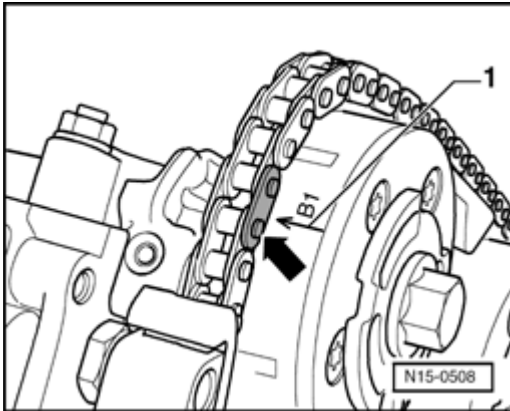


Fig. 180: Copper-Colored Chain Link & Marking (Intake Camshaft)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- The copper-colored chain link - **arrow** - must align with marking - **1** - on the intake camshaft adjuster.
- Install pivot pin using locking compound .

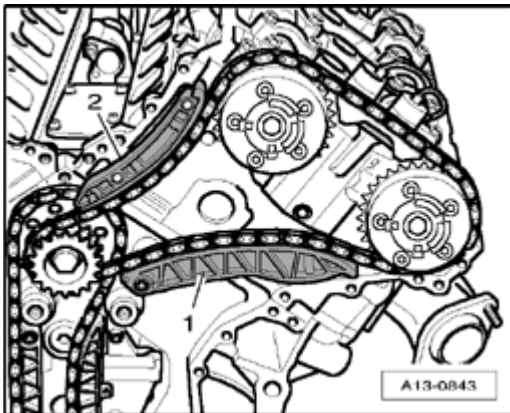


Fig. 181: Tensioning Rail & Guide Rail
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Push guide rail - **2** - onto pivot pins.
- Install tensioning rail - **1** -.

NOTE:

- **If the guide rail cannot be pressed on, rotate the intake camshaft slightly to the left.**
- Place camshaft timing chain for cylinder bank 2 (left) onto chain sprocket for camshaft drive and onto camshaft adjuster.
- The copper-colored chain link faces the engine.

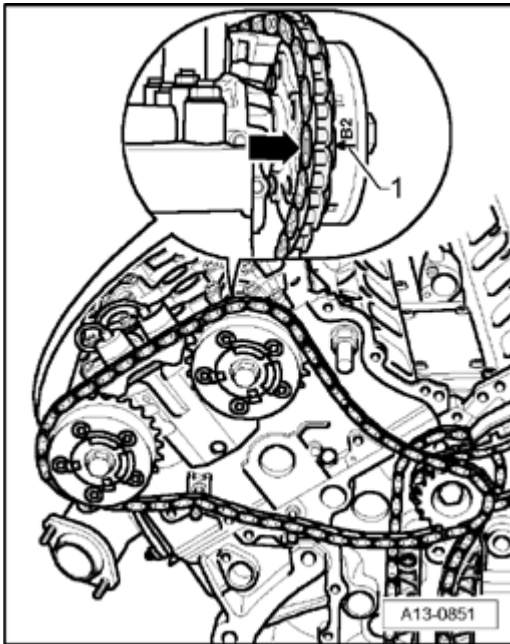


Fig. 182: Copper-Colored Chain Link Positioned To Chain Sprockets
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- The copper-colored chain link - **arrow** - must be positioned to the chain sprockets as shown in the illustration.
- The exact position is shown in the following illustrations.

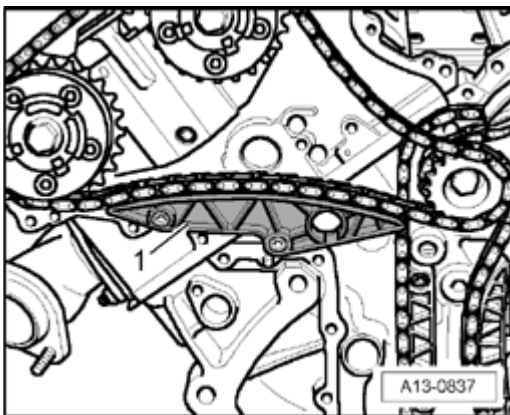


Fig. 183: Identifying Guide Rail
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install guide rail - **1** - before checking position of chain.

Chain sprocket for camshaft drive

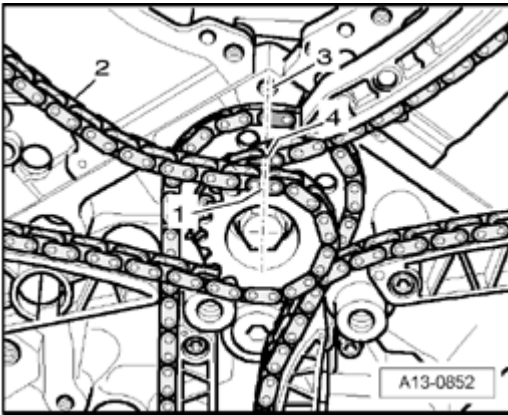


Fig. 184: Copper-Colored Chain Link, Threaded Hole & Camshaft Timing Chain
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- The copper-colored chain link - 1 - must be positioned centrally to the threaded hole - 3 - when the camshaft timing chain - 2 - is tensioned.

NOTE:

- In the illustration, the copper-colored chain link - 4 - faces toward the viewer for improved clarity. When installed correctly, it faces in direction of the engine.

Verification:

- The copper-colored chain links - 1 - and - 4 - of the camshaft timing chain for the left and right cylinder banks must be positioned directly behind one another and be centrally aligned to the threaded hole - 3 - when installed properly.

Camshaft adjuster for exhaust camshaft

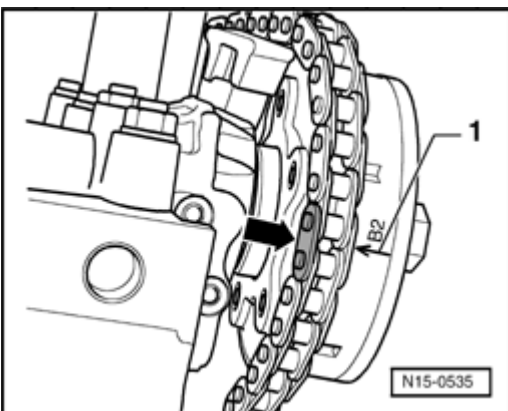


Fig. 185: Copper-Colored Chain Link Aligned With Marking On Exhaust Camshaft Adjuster
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- The copper-colored chain link - **arrow** - must align with marking - 1 - on exhaust camshaft adjuster.

Camshaft adjuster for intake camshaft

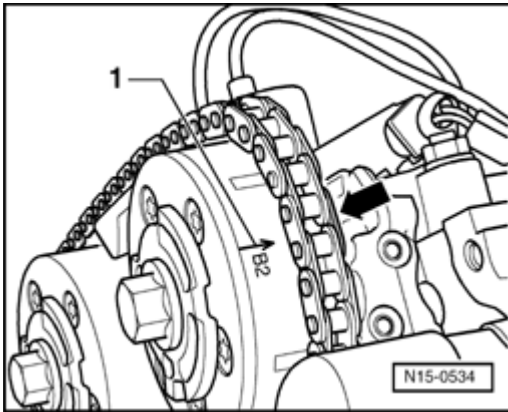


Fig. 186: Copper-Colored Chain Link Aligned With Marking On Intake Camshaft Adjuster
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- The copper-colored chain link - **arrow** - must align with marking - **1** - on intake camshaft adjuster.

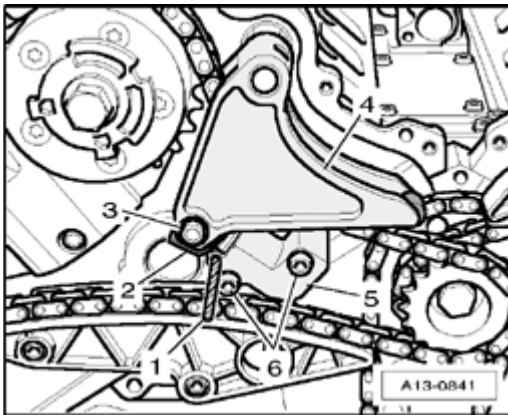


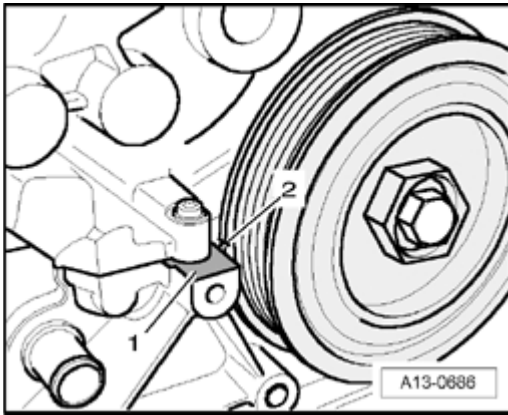
Fig. 187: Drill, Guide Piece, Bolts, Chain Tensioner & Tensioning Rail
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install pivot pins and tensioning rail - **4** -.
- Fasten guide piece - **2** - with bolt - **3** -.
- Fasten chain tensioner - **5** - with bolts - **6** -.
- Pull 3.5 mm drill - **1** - out of alignment hole, thereby releasing chain tensioner.

NOTE:

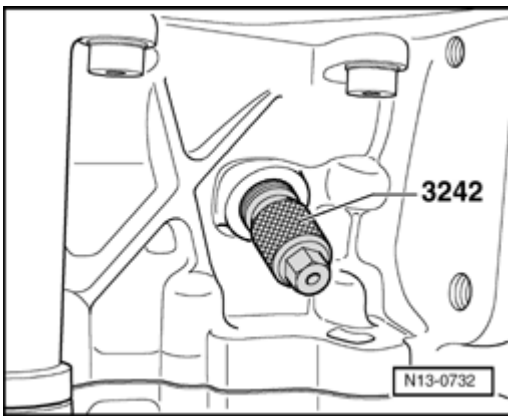
- **Before continuing the assembly, verify the correct positioning of the chain links to the markings.**

- Install timing chain covers --> **Timing Chain Covers, Removing and Installing.**
- Remove crankshaft holder 3242.

**Fig. 188: Housing Separation Point & Marking**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Turn crankshaft 2 rotations in engine direction of rotation, until marking - 2 - on vibration damper is aligned with housing separation point - 1 -.

**Fig. 189: Thread Crankshaft Holder 3242**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Thread crankshaft holder 3242 into the hole (20 Nm).

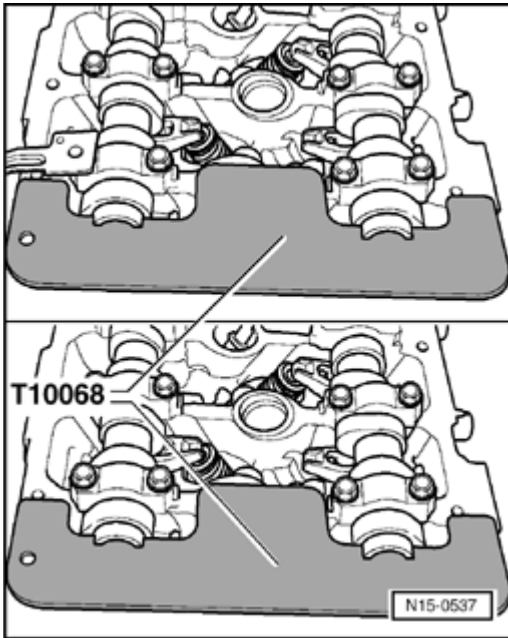


Fig. 190: Camshaft Bar T10068 Engaging In Both Shaft Grooves
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Camshaft bar T10068 must engage in both shaft grooves.

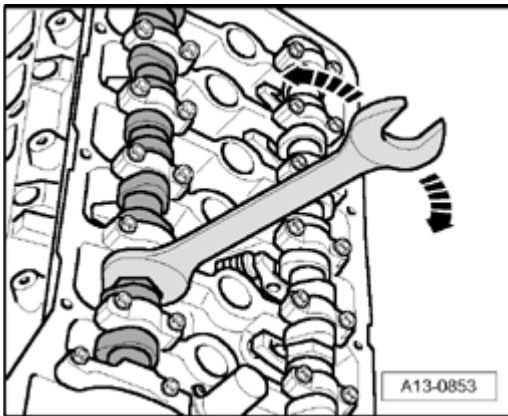


Fig. 191: Turning Camshafts Back And Forth Slightly Using An Open-End 32 Mm Wrench
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If necessary, turn camshafts back and forth slightly using open-end 32 mm wrench. Camshaft bar T10068 must not be installed during this process.
- Remove camshaft bar T10068.
- Remove crankshaft holder 3242.
- Screw sealing plug of TDC marking with new seal into bearing bracket.

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

- Install cylinder head covers. --> *Installing* under **Cylinder Head Cover, Removing and Installing**

2009 Audi A8 Quattro

ENGINE 6.0 Liter 12-Cyl. 4V Engine Mechanical, Engine Code(s): BHT, BSB - A8

- Install intake manifold lower-part: --> **Intake Manifold Lower Section, Removing and Installing.**
- Install intake manifold upper-part: --> **Intake Manifold Upper Section, Removing and Installing.**
- Install drive plate --> **Drive Plate, Removing and Installing.**

Tightening torques

Component	Nm
Mounting pin for tensioning rail cylinder bank 1 to cylinder block	25
Mounting pin for tensioning rail cylinder bank 2 to cylinder head	42
Guide piece to tensioning rail cylinder bank 2	20
Chain tensioner cylinder bank 2 to cylinder head	9
Sealing plug in bearing bracket	30

* Insert using locking compound .

Drive Chain, Assembly Overview

Drive Chain, Assembly Overview

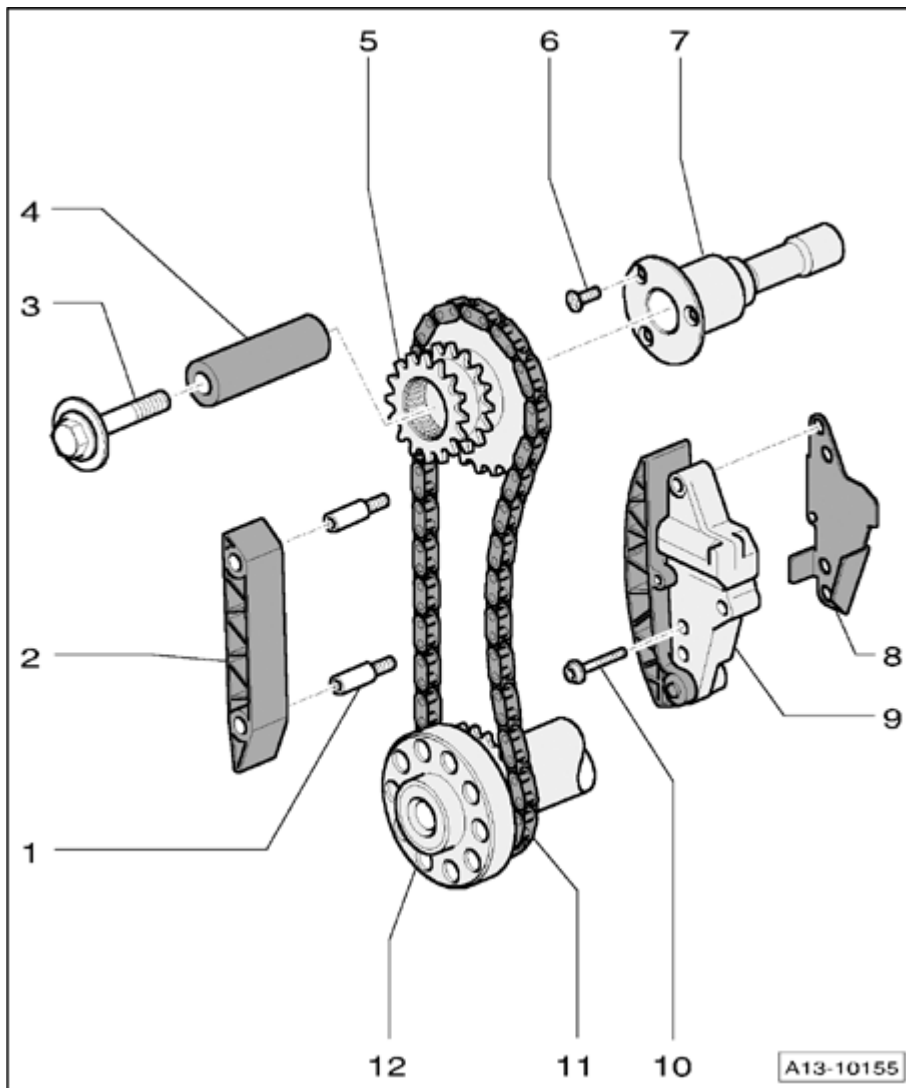


Fig. 192: Drive Chain, Assembly Overview

Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Pivot pin, 15 Nm

- Without collar

2 - Guide rail

3 - 60 Nm plus $\frac{1}{4}$ turn (90)

CAUTION: Bolt has left-hand thread!

- Replace

- Use counter-holder T10069 on vibration damper to loosen and tighten

4 - Mounting pin

5 - Chain sprocket for camshaft drive

- With needle bearings
- Replace chain sprocket if needle bearings are faulty
- Removing and installing --> **Drive Chain, Removing and Installing**

6 - Countersunk screw, 10 Nm

- Replace
- Insert using locking compound .

7 - Intermediate shaft

8 - Gasket

- Replace

9 - Chain tensioner with tensioning rail

- For drive chain
- Lock chain tensioner with drill (3.5 mm diameter)

10 - 9 Nm

11 - Timing chain

- Crankshaft/Intermediate shaft

12 - Drive gear

- Integral part of crankshaft

15 - ENGINE - CYLINDER HEAD, VALVETRAIN

CYLINDER HEAD, REMOVING AND INSTALLING

Cylinder Head, Removing and Installing

--> **Cylinder Head, Assembly Overview**

--> **Cylinder Head Cover, Removing and Installing**

--> Cylinder head, removing and installing

Cylinder Head, Assembly Overview

Cylinder Head, Assembly Overview

NOTE:

- Cylinder head bank 1 (right) is displayed in illustration.

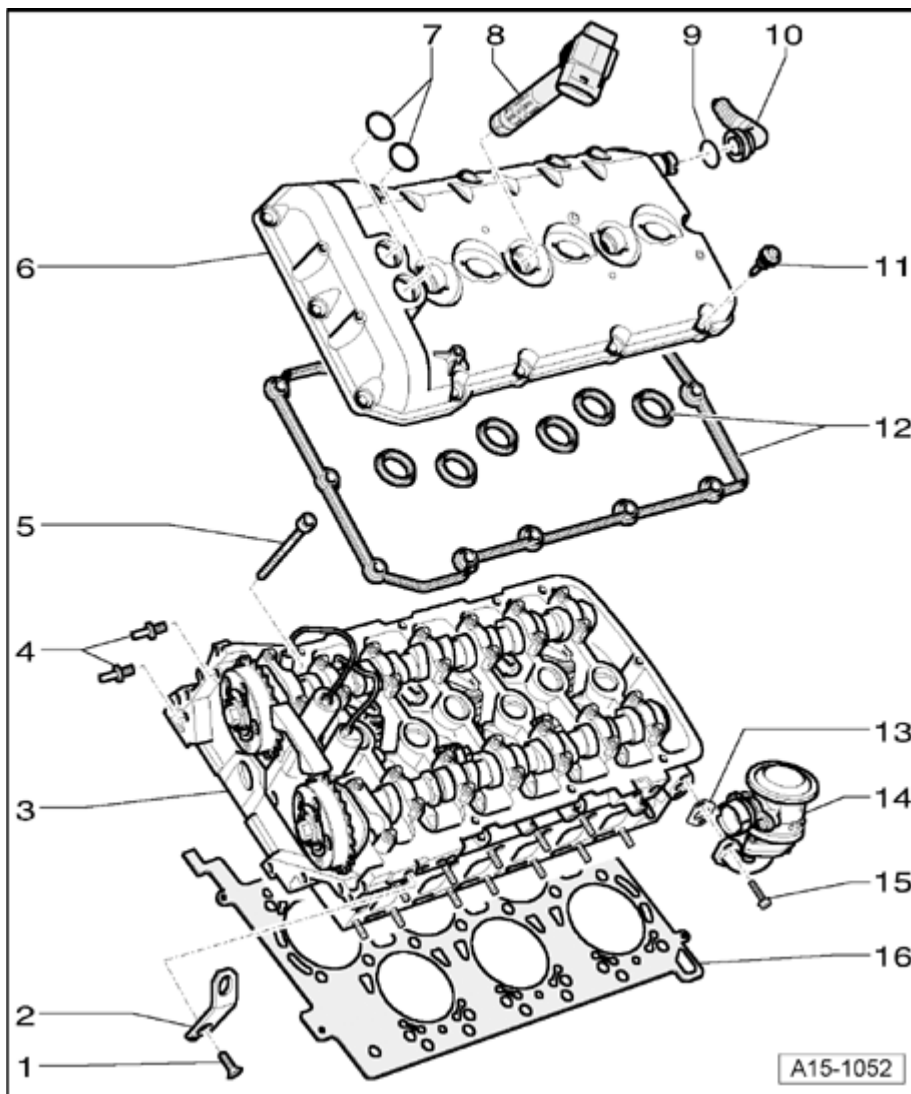


Fig. 193: Cylinder Head, Assembly Overview

Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - 23 Nm

2 - Lifting eye

3 - Cylinder head

- Removing --> **Cylinder head, removing and installing**
- Check for distortion --> **Checking cylinder head for distortion**
- Installing --> **Installing**
- Replace coolant after replacing cylinder head

4 - Pivot pin, 15 Nm

- For guide rail
- For right cylinder head

5 - Cylinder head bolt

- Different lengths; long bolts are installed on outside
- Replace
- Observe sequence for loosening: Right --> **Cylinder bank 1 (right):** , Left --> **Cylinder bank 2 (left):**
- Observe sequence for tightening: Right --> **Cylinder bank 1 (right):** , Left --> **Cylinder bank 2 (left):**

6 - Cylinder head cover

- Removing and installing --> **Cylinder Head Cover, Removing and Installing**

7 - Oil seals

- Replace if damaged or leaking

8 - Ignition coil

- Use ignition coil puller T10166 for removal --> **Removing ignition coils**

9 - O-ring

- Replace

10 - Crankcase ventilation pipe**11 - Special bolt, 8 Nm**

- Replace if damaged or leaking
- Observe sequence for tightening --> **Fig. 208.**

12 - Cylinder head cover gaskets

- Replace if damaged or leaking

13 - Gasket

- Replace

14 - Combination valve for Secondary Air Injection (AIR)

15 - 10 Nm

16 - Cylinder head gasket

- Different versions for cylinder bank 1 (right) and 2 (left)
- Replace --> **Cylinder head, removing and installing**
- Installed location: Part number facing cylinder head
- After replacing replace entire amount of coolant

Cylinder bank 1 (right):

Follow sequence - **1 to 20** - when loosening cylinder head bolts.

NOTE:

- **Arrow points in direction of travel.**

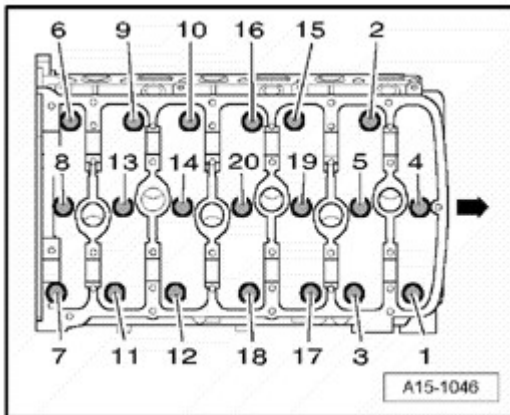


Fig. 194: Cylinder Head Bolts Loosing Sequence - Cylinder Bank 1 (Right)
Courtesy of AUDI OF AMERICA, INC.

Tightening sequence cylinder bank 1 (right):

NOTE:

- **Arrow points in direction of travel.**

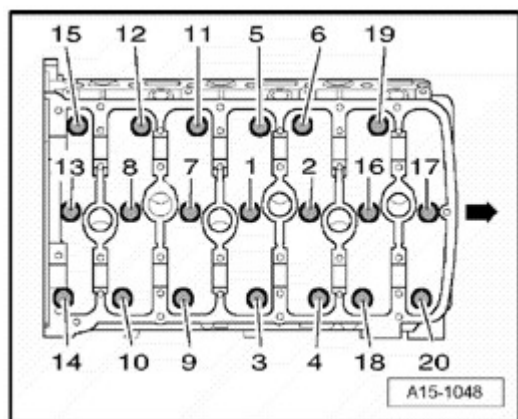


Fig. 195: Tightening Sequence Cylinder Bank 1 (Right)
Courtesy of AUDI OF AMERICA, INC.

Cylinder bank 2 (left):

Follow sequence - 1 to 21 - when loosening cylinder head bolts.

NOTE: • Arrow points in direction of travel.

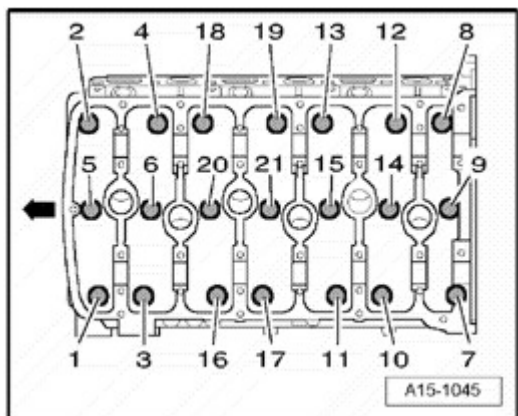


Fig. 196: Cylinder Head Bolts Loosing Sequence - Cylinder Bank 2 (Left)
Courtesy of AUDI OF AMERICA, INC.

Tightening sequence cylinder bank 2 (left):

NOTE: • Arrow points in direction of travel.

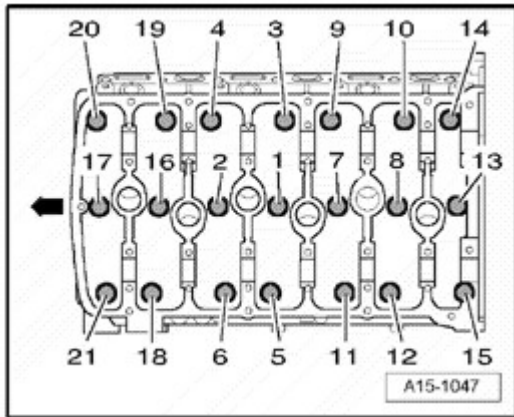


Fig. 197: Tightening Sequence Cylinder Bank 2 (Left)
Courtesy of AUDI OF AMERICA, INC.

Removing ignition coils

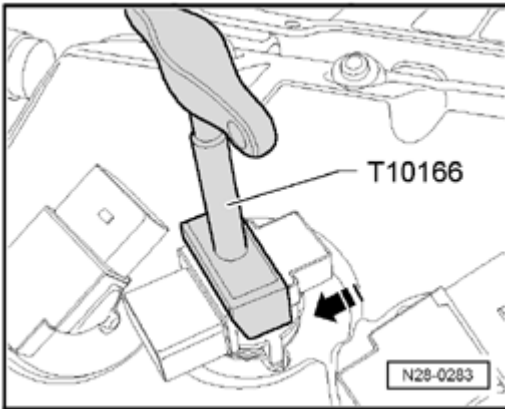


Fig. 198: Removing Ignition Coils From Spark Plugs Using Ignition Coil Puller T10166
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove ignition coils from spark plugs using ignition coil puller T10166.

Checking cylinder head for distortion

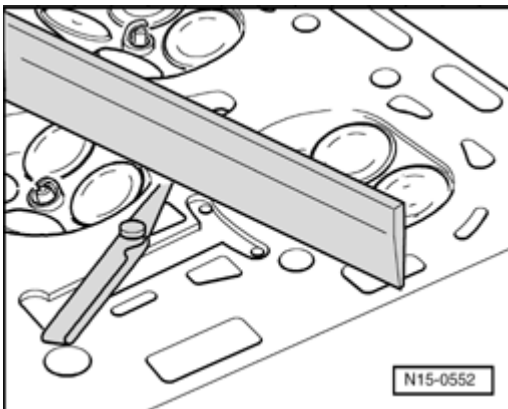
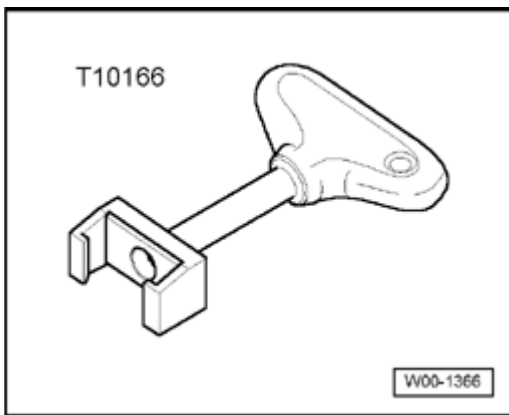


Fig. 199: Checking Cylinder Head For Distortion

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check cylinder head at multiple points for distortion. Use a straight edge and feeler gauges.
- Permissible distortion: max. 0.05 mm

Cylinder Head Cover, Removing and Installing**Cylinder Head Cover, Removing and Installing****Special tools, testers and auxiliary items required****Fig. 200: Ignition Coil Puller T10166**

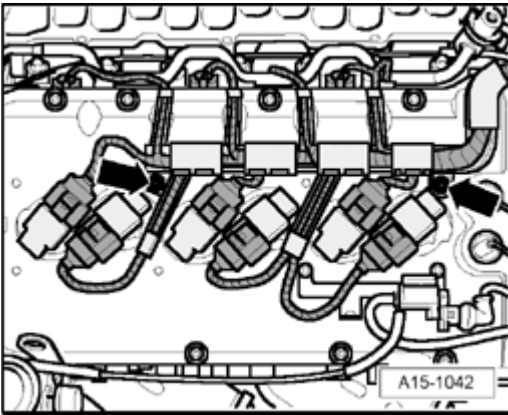
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Ignition coil puller T10166
- Sealant

Removing**NOTE:**

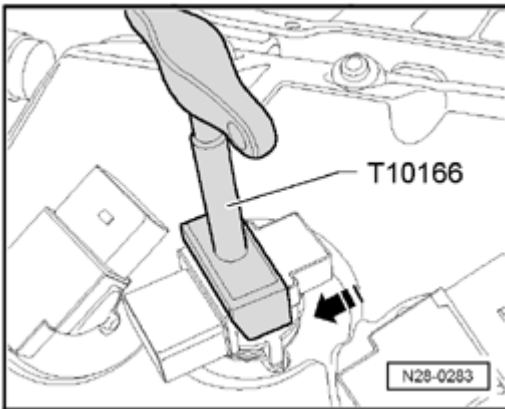
- The following repair is described for cylinder head bank 2 (left) with the engine removed.
- For cylinder head bank 1 (right) the procedure is the same.

- Remove upper part of intake manifold: --> **Intake Manifold Upper Section, Removing and Installing.**

**Fig. 201: Removing Bolts**

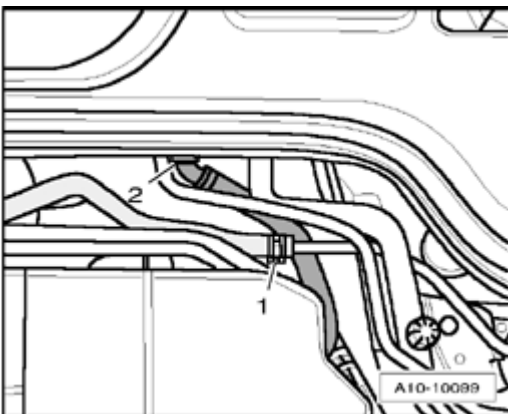
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.

**Fig. 202: Removing Ignition Coils From Spark Plugs Using Ignition Coil Puller T10166**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove ignition coils from spark plugs using ignition coil puller T10166.
- Set wiring harness with ignition coils aside.

**Fig. 203: Coolant Hose & Vacuum Hose**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect vacuum hose - 2 - to brake booster.

NOTE:

- Ignore - 1 - in the illustration.

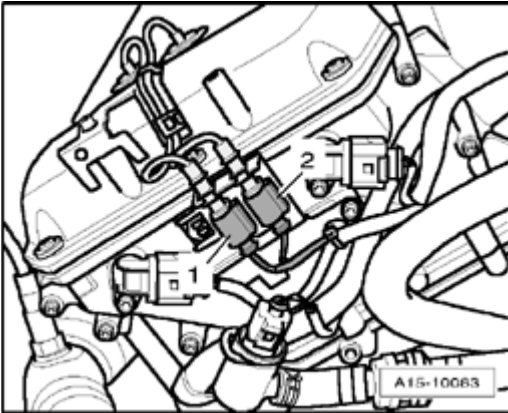


Fig. 204: Camshaft Adjustment Solenoid Valves Electrical Harness Connectors
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bracket for rear wiring harness at cylinder head cover.
- Remove electrical harness connectors - 1 - and - 2 - for camshaft adjustment solenoid valves from bracket and disconnect.

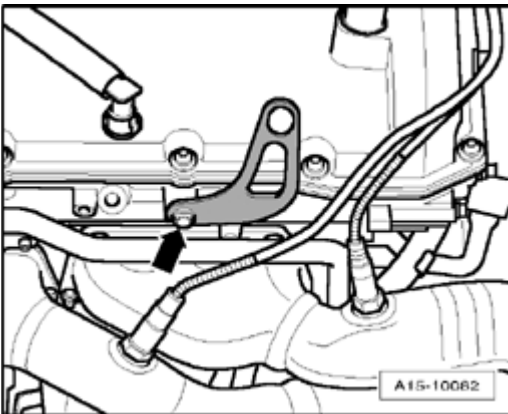


Fig. 205: Left Rear Engine Lifting Eye & Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen bolt - **arrow** - for left rear engine lifting eye by several turns.

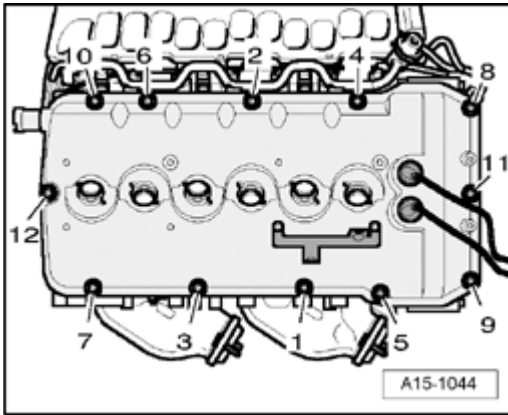


Fig. 206: Left Cylinder Head Cover Bolts Sequence
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts for left cylinder head cover in sequence - **1 to 12** -.
- 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 if damaged or sealing improperly.

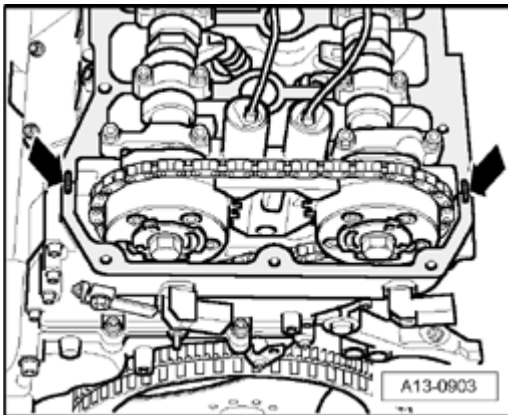


Fig. 207: Timing Chain Cover Transitions Coating Locations
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Coat transitions - **arrows** - between timing chain cover and cylinder head with a drop of sealant.

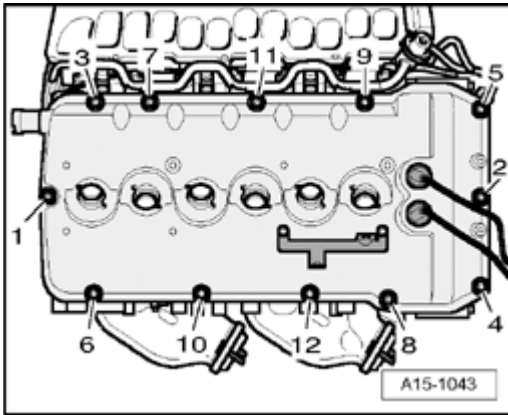


Fig. 208: Cylinder Head Cover Bolts Tightening Sequence
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten cylinder head cover in sequence - 1 to 12 -.
- Install intake manifold upper-part: --> **Intake Manifold Upper Section, Removing and Installing.**

Tightening torques

Component	Nm
Cylinder head cover to cylinder head	8
Engine lifting eyelet to cylinder head	23

INTAKE MANIFOLD, REMOVING AND INSTALLING

Intake Manifold, Removing and Installing

--> **Intake Manifold, Assembly Overview**

--> **Intake Manifold Left Side, Removing and Installing**

--> **Intake Manifold Right Side, Removing and Installing**

--> **Intake Manifold Upper Section, Removing and Installing**

--> **Intake Manifold Lower Section, Removing and Installing**

--> **Compression, Checking**

Intake Manifold, Assembly Overview

Intake Manifold, Assembly Overview

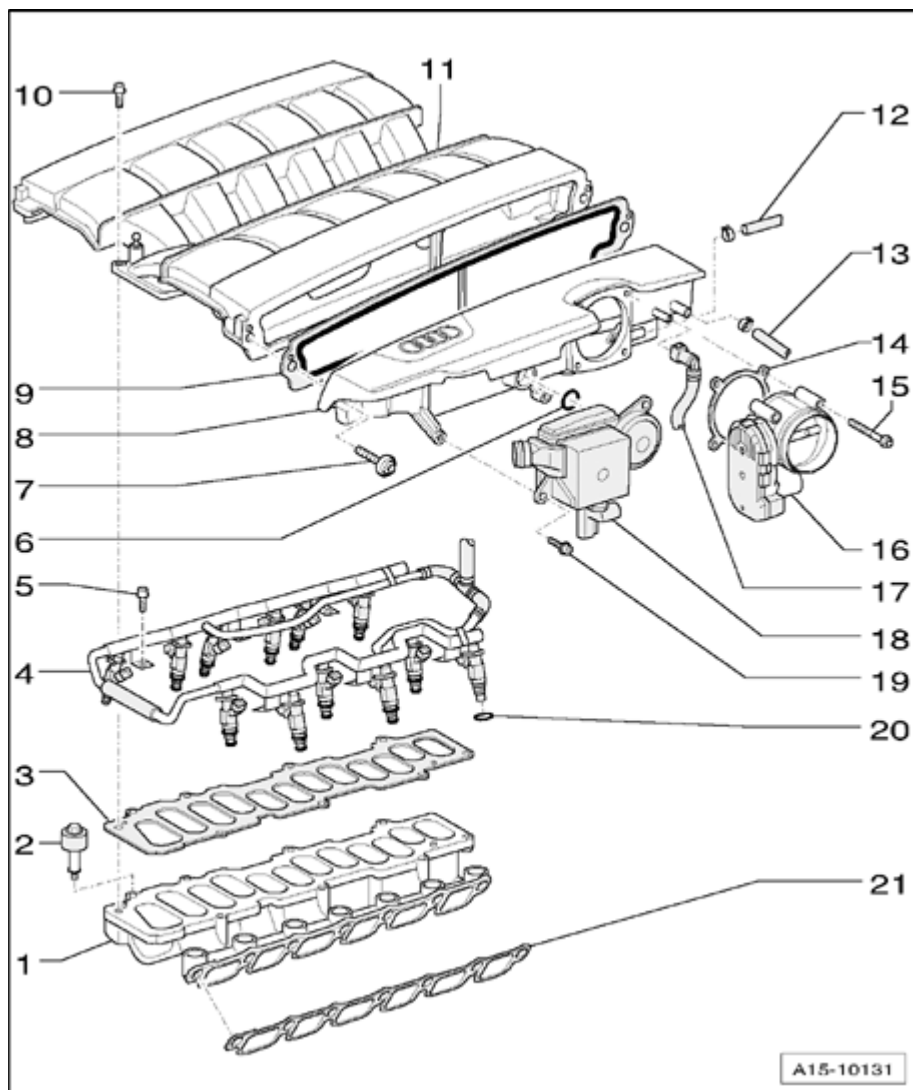


Fig. 209: Intake Manifold, Assembly Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Intake manifold lower part

- Removing and installing --> **Intake Manifold Lower Section, Removing and Installing**

2 - 9 Nm

3 - Gasket

- Replace

4 - Fuel rail

- Removing and installing --> **24 FUEL INJECTION SYSTEM**

5 - 9 Nm

6 - Oil seal

- Replace
- Must be coated with engine oil "0W/30" when installing

7 - 22 Nm

8 - Intake manifold side-part

- Left intake manifold side part, removing and installing --> **Intake Manifold Left Side, Removing and Installing**
- Right intake manifold side part, removing and installing --> **Intake Manifold Right Side, Removing and Installing**
- Minimal oil residue in intake manifold side part is acceptable

9 - Gasket

- Replace if damaged

10 - 7 Nm plus $1/2$ turn (180)

- Replace
- To install, coat with engine oil
- Starting from middle, tighten in stages and in diagonal sequence

11 - Intake manifold upper part

- Removing and installing --> **Intake Manifold Upper Section, Removing and Installing**

12 - Vacuum hose

- To Evaporative Emission (EVAP) canister purge regulator valve 2 N333

13 - Vacuum hose

- To suction jet pump for brake booster

14 - Gasket

- Replace

15 - 9 Nm

16 - Throttle valve control module

- Cylinder bank 1 (right): Throttle valve control module J338
- Cylinder bank 2 (left): Throttle valve control module 2 -544

17 - Vacuum hose

- To Leak Detection Pump (LDP) V144

18 - Pressure regulator valve for crankshaft housing ventilation

- With oil separator

19 - 9 Nm**20 - O-ring**

- Replace
- To install, moisten with fuel
- Do not use lubricants containing silicone

21 - Gasket

- Replace if damaged
- Press nubs of gasket into cylinder head

Intake Manifold Left Side, Removing and Installing**Intake Manifold Left Side, Removing and Installing****Special tools, testers and auxiliary items required**

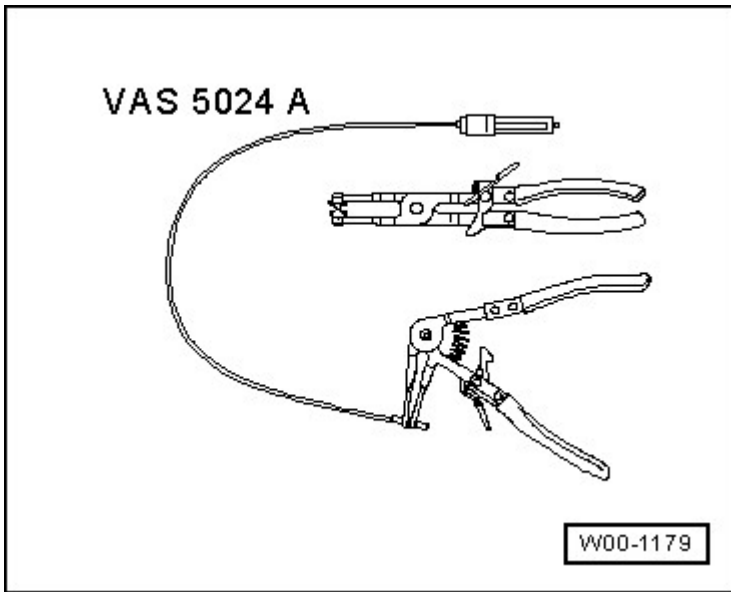


Fig. 210: Spring-Type Clip Pliers VAS 5024 A
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Spring-type clip pliers VAS 5024 A

Removing

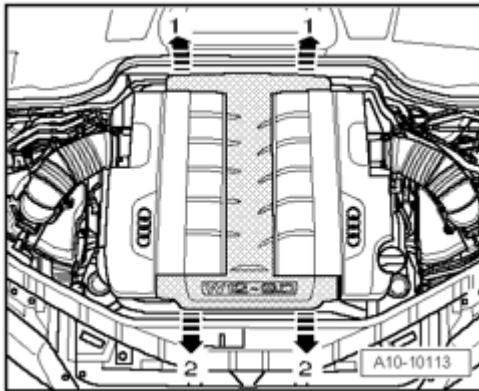
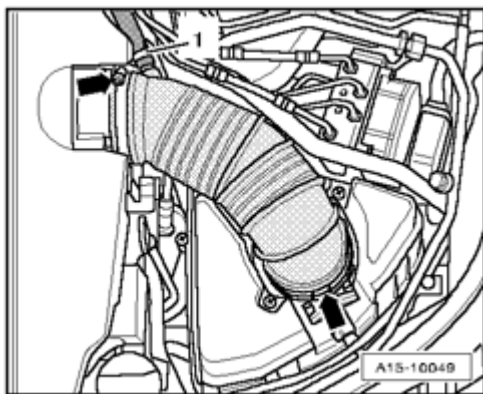


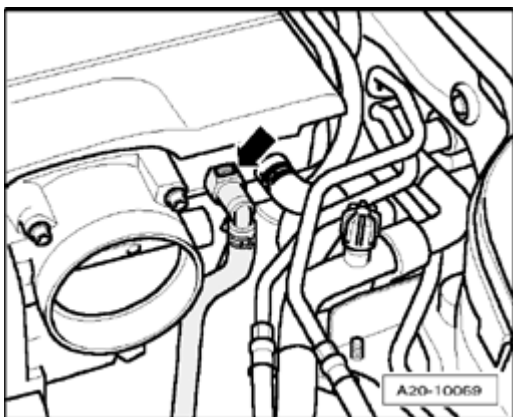
Fig. 211: Pulling Engine Cover At Rear And Middle Upward And Off & Pulling Engine Cover Forward And Off Of Intake Manifold
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Carefully pull engine cover at rear and middle upward and off - **arrows 1** -.
- Then, pull engine cover forward and off of intake manifold - **arrows 2** -.

**Fig. 212: Air Duct & Hose**

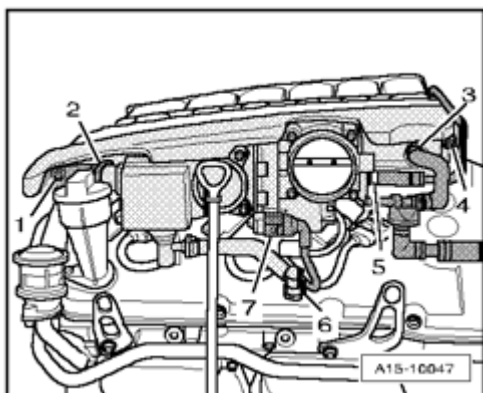
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect hose - **1** - from air duct.
- Remove left air duct - **arrows** -.

**Fig. 213: Leak Detection Pump (LDP) V144 Vacuum Hose**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect vacuum hose - **arrow** - to Leak Detection Pump (LDP) V144 from intake manifold.

**Fig. 214: Throttle Valve Control Module 2 J544 Electrical Connection, Vacuum Lines, Crankcase**

Breather Hoses & Bolts**Courtesy of VOLKSWAGEN UNITED STATES, INC.**

- Disconnect electrical connection - **7** - at Throttle valve control module 2 J544.
- Disconnect vacuum lines - **3** - and - **5** -.
- Pull off hoses - **2** - and - **6** - for crankcase breather.
- Remove bolts - **1** - and - **4** -.

- Remove left intake manifold side part.

NOTE:

- **Minimal oil residue in the intake manifold side part is acceptable**

Installing

Installation is in reverse order of removal. Note the following:

NOTE:

- **Replace O-rings.**
- **Replace gasket for intake manifold side part if damaged.**
- **Secure all hose connections using hose clamps appropriate for the model type .**

Tightening torque

Component	Nm
Intake manifold side part to intake manifold upper part	22

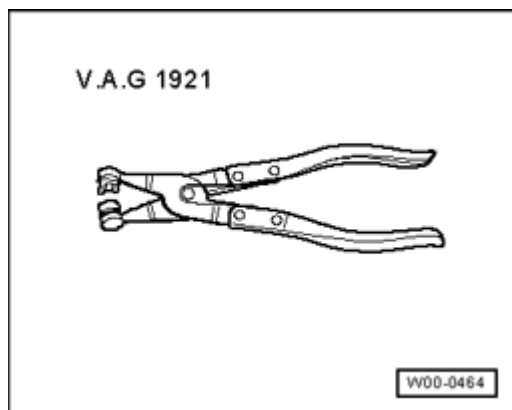
Intake Manifold Right Side, Removing and Installing**Intake Manifold Right Side, Removing and Installing****Special tools, testers and auxiliary items required**

Fig. 215: Hose Clamp Pliers V.A.G 1921

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hose clamp pliers V.A.G 1921

Removing

NOTE:

- During installation, reinstall all heat insulation sleeves at the same locations.

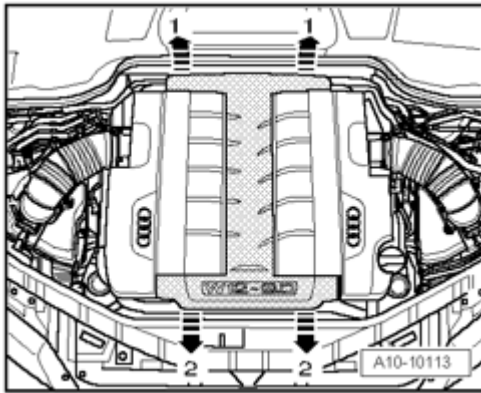


Fig. 216: Pulling Engine Cover At Rear And Middle Upward And Off & Pulling Engine Cover Forward And Off Of Intake Manifold

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Carefully pull engine cover at rear and middle upward and off - **arrows 1** -.
- Then, pull engine cover forward and off of intake manifold - **arrows 2** -.

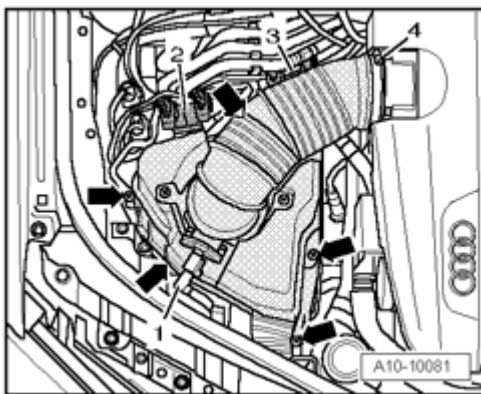


Fig. 217: Mass Air Flow (MAF) Sensor G70 Electrical Connector, Upper Part Of Air Filter Housing Connections, Intake Manifold Air Duct Hose & Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **1** - for Mass Air Flow (MAF) sensor G70.
- Disconnect air duct - **4** - at intake manifold.

- Unhook retainer for connections - 2 - and - 3 - at upper part of air filter housing.
- Remove bolts - **arrows** -.
- Remove upper part of right air filter housing.

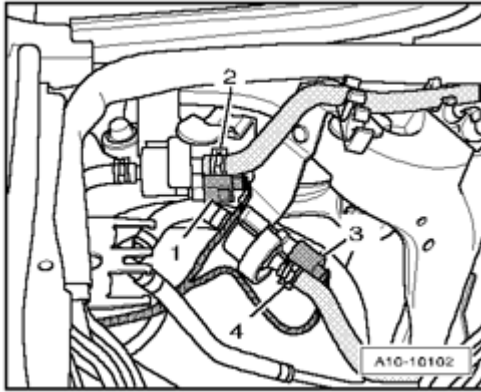


Fig. 218: Electrical Connectors & Vacuum Hoses
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull off vacuum hose - 4 - from Evaporative Emission (EVAP) canister purge regulator valve N80.

NOTE: • Ignore - 1 to 3 - in the illustration.

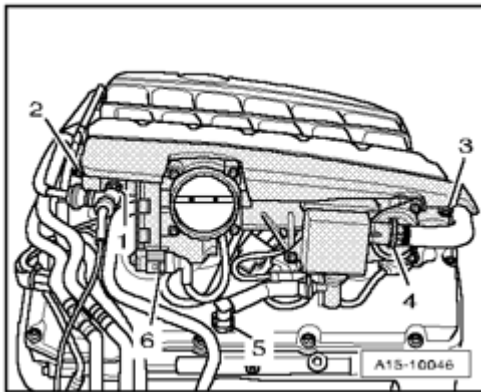


Fig. 219: Vacuum Hose, Bolts, Crankcase Breather Hoses & Throttle Valve Control Module J338
Electrical Connection
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connection - 6 - at Throttle valve control module J338.
- Disconnect vacuum hose - 1 -.
- Pull off hoses - 4 - and - 5 - for crankcase breather.
- Remove bolts - 2 - and - 3 -.
- Remove right intake manifold side part.

NOTE:

- Minimal oil residue in the intake manifold side part is acceptable

Installing

Installation is in reverse order of removal. Note the following:

NOTE:

- Replace O-rings.
- Replace gasket for intake manifold side part if damaged.
- During installation, protective heat sleeves must be re-installed at the same location.
- Secure all hose connections using hose clamps appropriate for the model type .

Tightening torque

Component	Nm
Intake manifold side part to intake manifold upper part	22

Intake Manifold Upper Section, Removing and Installing

Intake Manifold Upper Section, Removing and Installing

Special tools, testers and auxiliary items required

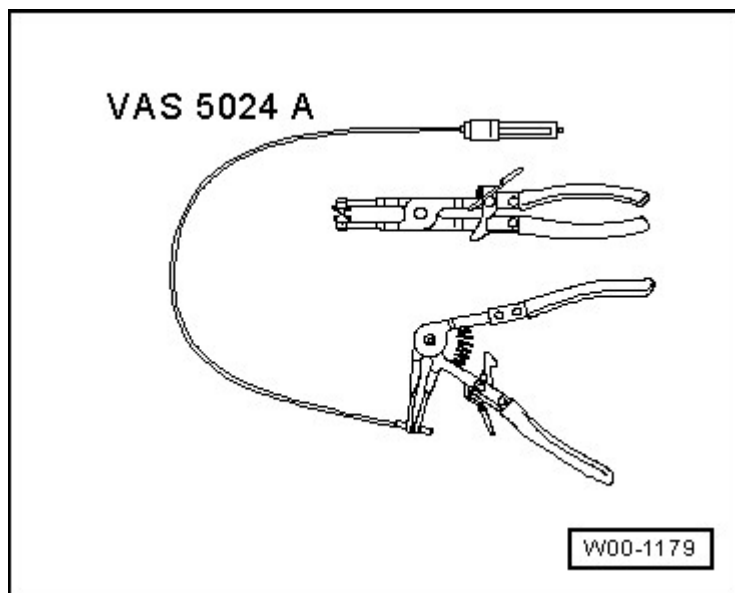


Fig. 220: Spring-Type Clip Pliers VAS 524 A
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Spring-type clip pliers VAS 5024 A

Removing**NOTE:**

- During installation, reinstall all heat insulation sleeves at the same locations.
- All cable ties opened or cut during engine removal must be reinstalled at the same locations during installation.

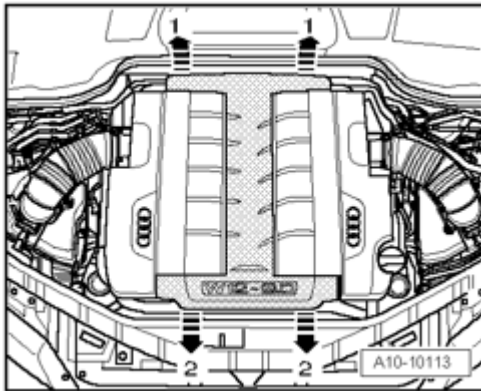


Fig. 221: Pulling Engine Cover At Rear And Middle Upward And Off & Pulling Engine Cover Forward And Off Of Intake Manifold

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Carefully pull engine cover at rear and middle upward and off - **arrows 1** -.
- Then, pull engine cover forward and off of intake manifold - **arrows 2** -.

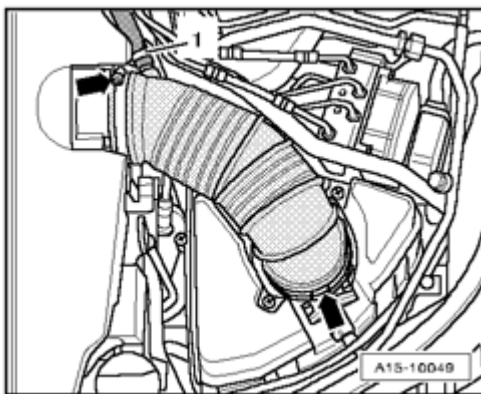


Fig. 222: Air Duct & Hose

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect hose - **1** - from air duct.
- Remove left air duct - **arrows 2** -.

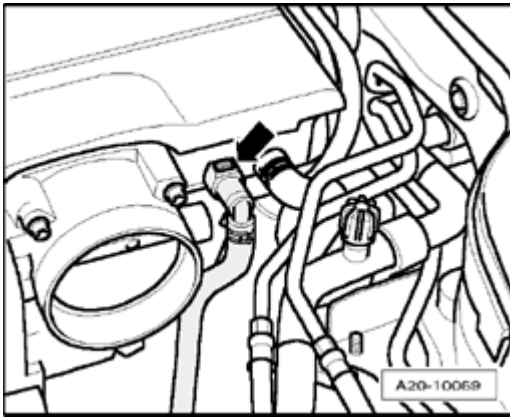


Fig. 223: Leak Detection Pump (LDP) V144 Vacuum Hose
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect vacuum hose - **arrow** - to Leak Detection Pump (LDP) V144 from intake manifold.

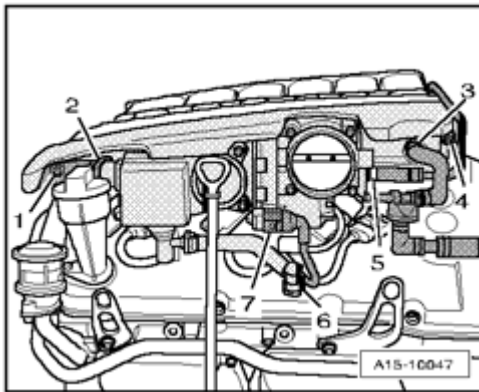


Fig. 224: Throttle Valve Control Module 2 J544 Electrical Connection, Vacuum Lines, Crankcase Breather Hoses & Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connection - **7** - at Throttle valve control module 2 J544.
- Disconnect vacuum lines - **3** - and - **5** -.
- Pull off hoses - **2** - and - **6** - for crankcase breather.

NOTE: • **Ignore - 1 - and - 4 - in the illustration.**

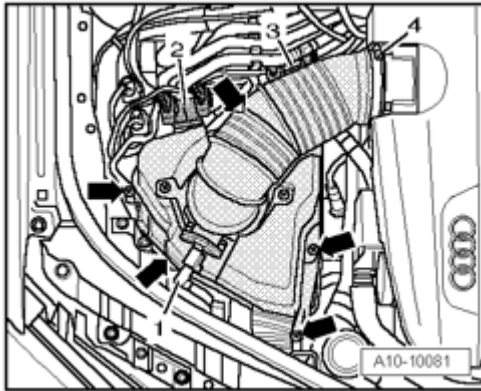


Fig. 225: Mass Air Flow (MAF) Sensor G70 Electrical Connector, Upper Part Of Air Filter Housing Connections, Intake Manifold Air Duct Hose & Bolts
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **1** - for Mass Air Flow (MAF) sensor G70.
- Disconnect air duct - **4** - at intake manifold.
- Unhook retainer for connections - **2** - and - **3** - at upper part of air filter housing.
- Remove bolts - **arrows** -.
- Remove upper part of right air filter housing.

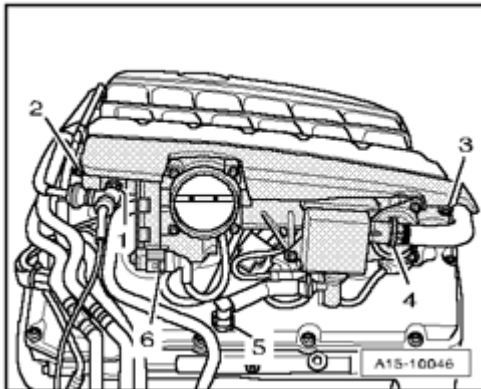


Fig. 226: Vacuum Hose, Bolts, Crankcase Breather Hoses & Throttle Valve Control Module J338 Electrical Connection

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connection - **6** - at Throttle valve control module J338.
- Disconnect vacuum hose - **1** -.
- Pull off hoses for crankcase breather - **4** - and - **5** -.

NOTE:

- **Ignore - 2 - and - 3 - in the illustration.**

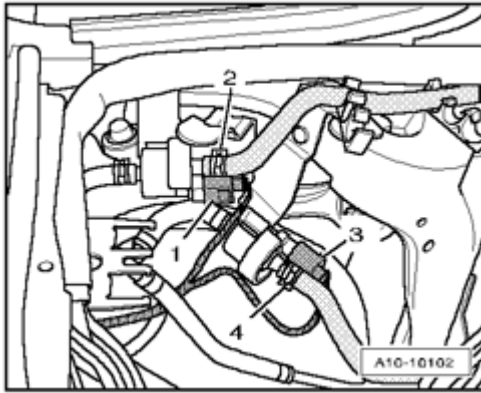


Fig. 227: Electrical Connectors & Vacuum Hoses
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull off vacuum hose - 4 - from Evaporative Emission (EVAP) canister purge regulator valve N80.

NOTE: • Ignore - 1 to 3 - in the illustration.

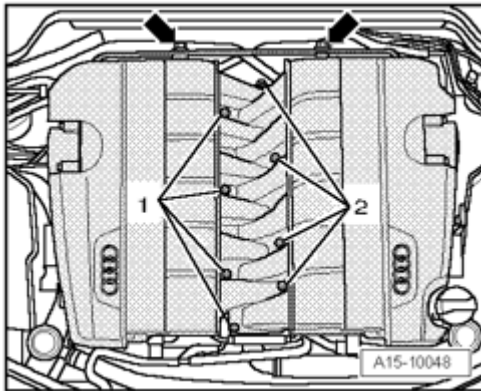


Fig. 228: Intake Manifold Upper Part & Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Remove bolts - **1** - and - **2** - and remove intake manifold upper part.

NOTE: • **Plug the intake ports of the cylinder head with clean rags.**

Installing

Installation is in reverse order of removal. Note the following:

NOTE: • **Replace gaskets and O-rings.**
 • **During installation, protective heat sleeves must be reinstalled at the same**

location.

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

Tightening torques

Component	Nm
Intake manifold upper part to intake manifold lower part	7 plus 180°
Line to intake manifold upper part	9
Intake manifold side part to intake manifold upper part	22

*Observe different bolt lengths.

*Replace bolts.

* 180 corresponds to one half turn.

Intake Manifold Lower Section, Removing and Installing

Intake Manifold Lower Section, Removing and Installing

Removing

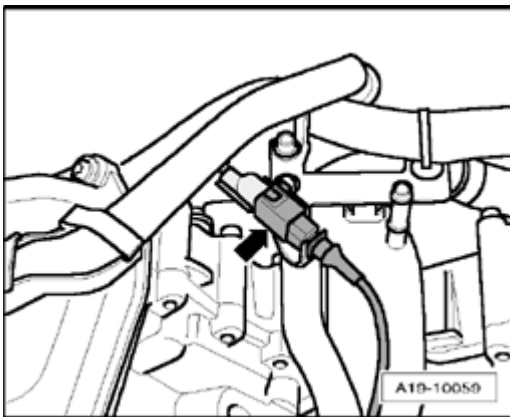


Fig. 229: Intake Manifold Lower Section Electrical Harness Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove upper part of intake manifold --> Intake Manifold Upper Section, Removing and Installing.
- Disconnect electrical harness connector - **arrow** -.

NOTE:

- Illustration shows intake manifold lower part removed.

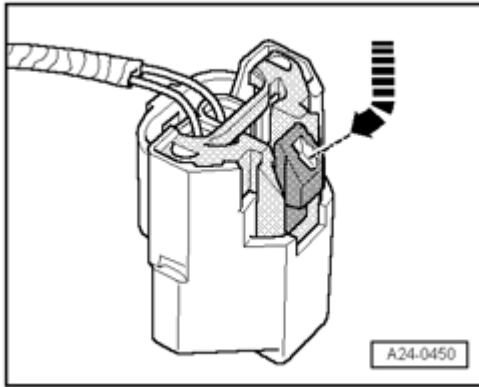


Fig. 230: Disconnecting Electrical Connectors For Fuel Injectors By Pressing Retaining Tab
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connections at fuel injectors by pressing release tabs down and then inward - **arrow** -.

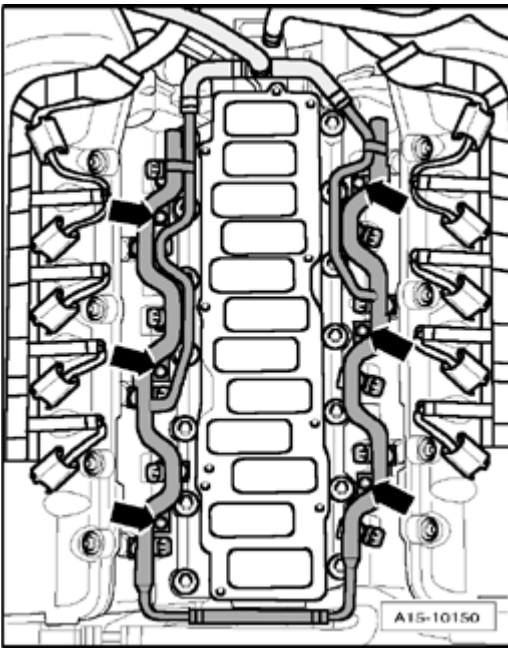


Fig. 231: Bolts For Fuel Rail
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts for fuel rail - **arrows** -.
- Pull fuel rail with fuel injectors upward and out.
- Place fuel rail with connected fuel hose onto a clean cloth.

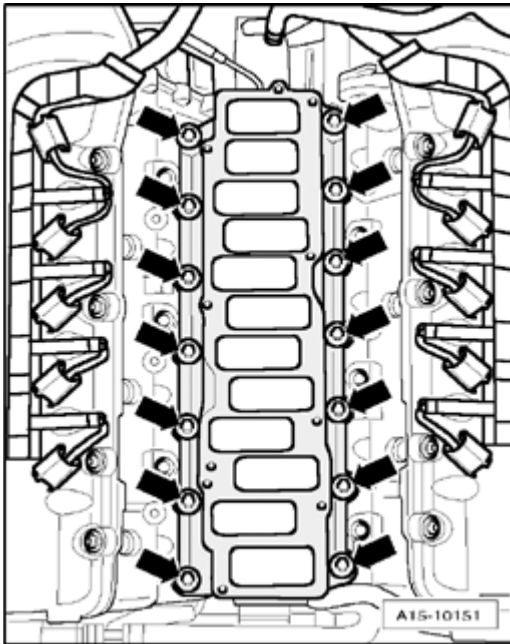


Fig. 232: Intake Manifold Lower Part Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Remove intake manifold lower part.

NOTE:

- **Plug the intake ports of the cylinder head with clean rags.**

Installing

Installation is in reverse order of removal. Note the following:

NOTE:

- **Replace O-rings.**
- **Replace gaskets for intake manifold lower-part if damaged.**

- Press nubs of gaskets for intake manifold lower part into holes on cylinder heads.
- Install intake manifold upper part --> **Intake Manifold Upper Section, Removing and Installing.**

Tightening torques

Component	Nm
Intake manifold lower part to cylinder heads	9
Fuel rail to cylinder heads	9

*Fasten diagonally in steps.

VALVE GEAR, SERVICING

Valve Gear, Servicing

--> **Camshafts, Assembly Overview**

--> **Camshaft Timing Adjusters, Removing and Installing**

--> **Control Housing for Camshaft Adjustment, Removing and Installing**

--> **Camshafts, Removing and Installing**

--> **Valve Stem Seals, Replacing**

--> **Camshafts, Checking Axial Clearance**

--> **Valve Guides, Checking**

--> **Valves, Checking**

--> **Valve Dimensions**

--> **Valve Seats, Reworking**

NOTE:

- Cylinder head bank 1 (right) is displayed in the following illustration.
- After installing the camshafts, the engine may not be started for approx. 30 minutes. The hydraulic lifter equalization elements must seat themselves (otherwise the valves will make contact with the pistons).
- After working on the valve gear 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.

CAUTION: When the right camshaft timing chain cover is removed, the engine must not be turned over. Only when the chain tensioner for the right camshaft timing chain and the right timing chain cover are installed, is the timing chain secured against jumping off.

Camshafts, Assembly Overview

Camshafts, Assembly Overview

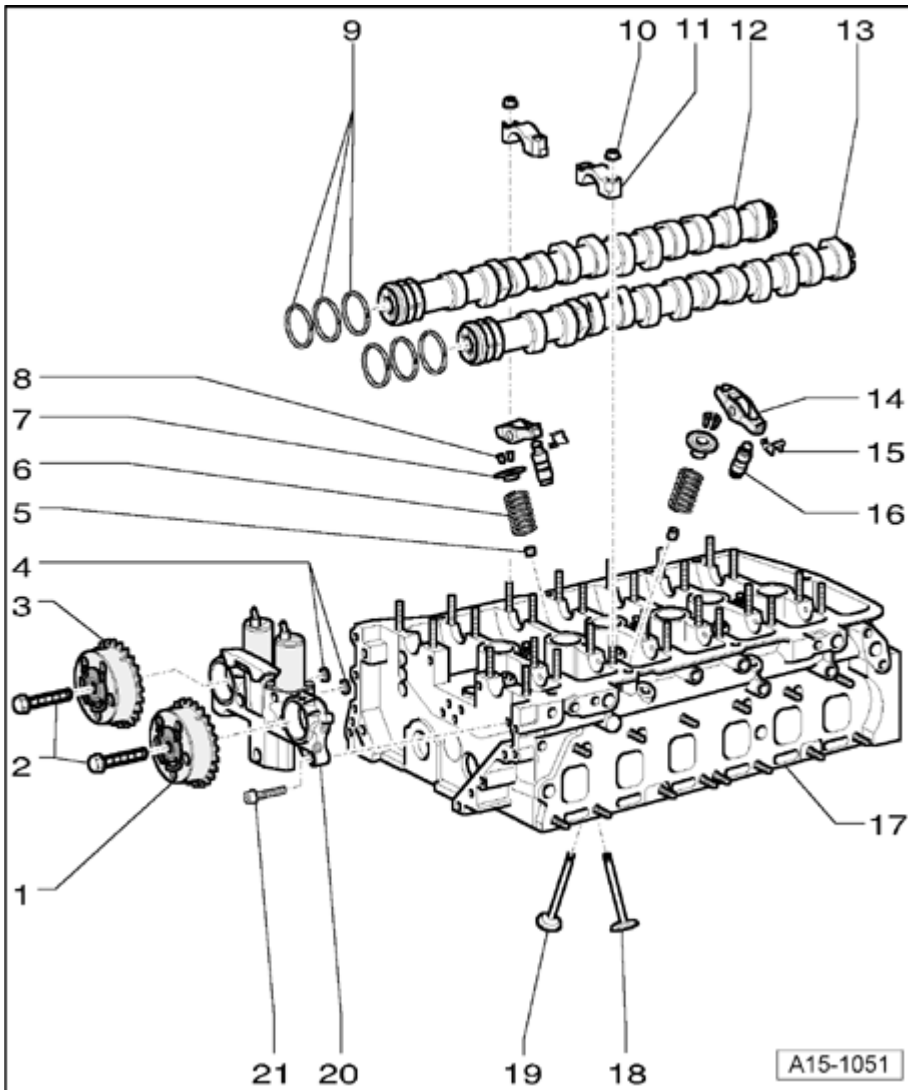


Fig. 233: Camshafts, Assembly Overview

Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Exhaust camshaft adjuster

- For cylinder bank 1 (right) Identification: B1/Front side made of plastic
- For cylinder bank 2 (left) Identification: B2/Front side made of plastic
- Removing and installing --> **Camshaft Timing Adjusters, Removing and Installing**

2 - 60 Nm plus $\frac{1}{4}$ turn (90)

- Replace
- There must be no oil on contact surfaces between camshaft adjuster and camshaft or between bolt head and camshaft adjuster
- Counterhold camshaft using open-end 32 mm wrench when loosening and tightening

3 - Intake camshaft adjuster

- For cylinder bank 1 (right) Identification: B1/A1
- For cylinder bank 2 (left) Identification: B2/A2
- Removing and installing --> **Camshaft Timing Adjusters, Removing and Installing**

4 - Strainer

- 2 pieces
- Clean

5 - Valve stem seal

- Replace --> **Valve Stem Seals, Replacing**

6 - Valve spring

- Installed location: Larger diameter faces cylinder head

7 - Valve spring plate**8 - Valve keys****9 - Piston rings for camshaft adjuster**

- Install with gaps offset by 120
- Oil contact surfaces
- When installing, only spread piston rings minimally

10 - 5 Nm plus $\frac{1}{8}$ turn (45)

- Observe tightening sequence: Right cylinder head --> **Cylinder bank 1 (right):** , Left cylinder head --> **Cylinder bank 2 (left):**

11 - Bearing cap

- Mark bearing caps 6 and 9
- Observe installed position and tightening sequence: Right cylinder head --> **Cylinder bank 1 (right):** , left cylinder head --> **Cylinder bank 2 (left):**
- On bearing caps for axial bearing, lightly coat face surface with adhesive lubricating paste before installing --> **Coating face surface of bearing cap for axial bearing with adhesive lubricating paste**

12 - Intake camshaft

- Checking axial play --> **Camshafts, Checking Axial Clearance**

- Check radial clearance using Plastigage (roller rocker lever removed)
- Radial clearance wear limit: 0.1 mm
- Run-out: max. 0.01 mm
- Removing and installing --> **Camshaft Timing Adjusters, Removing and Installing**
- Identification --> **Camshaft identification cylinder bank 1 (right)** and --> **Camshaft identification cylinder bank 2 (left)**

13 - Exhaust camshaft

- Checking axial play --> **Camshafts, Checking Axial Clearance**
- Check radial clearance using Plastigage (roller rocker lever removed)
- Radial clearance wear limit: 0.1 mm
- Run-out: max. 0.01 mm
- Removing and installing --> **Camshaft Timing Adjusters, Removing and Installing**
- Identification --> **Camshaft identification cylinder bank 1 (right)** and --> **Camshaft identification cylinder bank 2 (left)**

14 - Roller rocker lever

- Do not interchange
- Check roller for easy movement
- Lubricate contact surface

15 - Securing clip

- Check for secure seat

16 - Support element

- With hydraulic valve clearance compensation
- Do not interchange
- Lubricate contact surface

17 - Cylinder head

- Checking valve guides --> **Valve Guides, Checking**

18 - Exhaust valve

- Mark installed position
- Do not rework, only lapping is permitted
- Valve dimensions --> **Valve Dimensions**

- Checking valve guides --> **Valve Guides, Checking**
- Reworking valve seats --> **Valve Seats, Reworking**

19 - Intake valve

- Mark installed position
- Do not rework, only lapping is permitted
- Valve dimensions --> **Valve Dimensions**
- Checking valve guides --> **Valve Guides, Checking**
- Reworking valve seats --> **Valve Seats, Reworking**

20 - Control housing

- Removing and installing --> **Camshaft Timing Adjusters, Removing and Installing**
- Lightly lubricate contact surfaces of piston rings before installing

21 - 9 Nm

- Insert using locking compound .

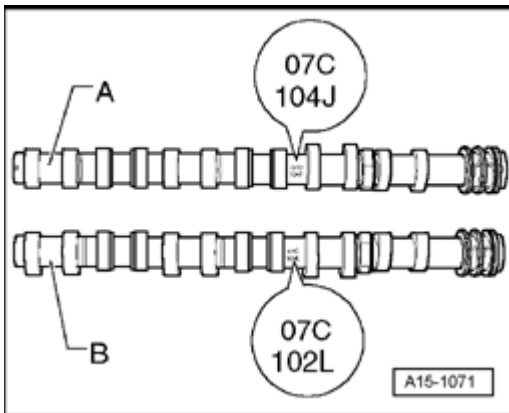
Camshaft identification cylinder bank 1 (right)

Fig. 234: Camshaft Identification Cylinder Bank 1 (Right)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Exhaust camshaft, Identification 07C - Index 104 J

B - Intake camshaft, Identification 07C - Index 102 L

Camshaft identification cylinder bank 2 (left)

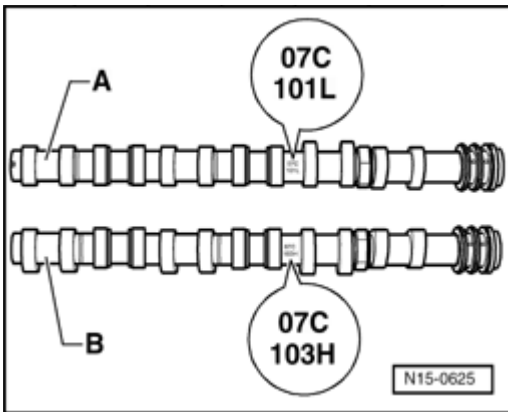


Fig. 235: Camshaft Identification Cylinder Bank 2 (Left)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Intake camshaft, Identification 07C - Index 101 L

B - Exhaust camshaft, Identification 07C - Index 103 H

Identification of camshaft adjusters

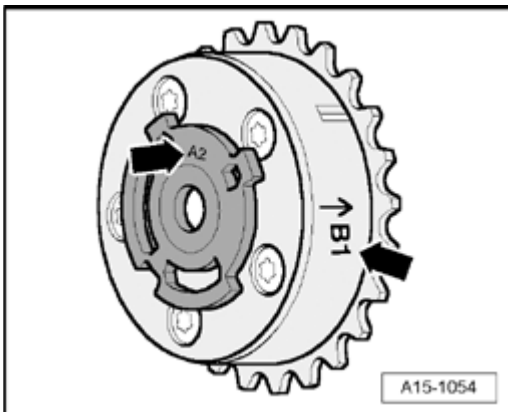


Fig. 236: Observing Identification Of Camshaft Adjuster
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Camshaft adjusters - **arrows** - are marked as follows:

- Intake camshaft timing adjuster for cylinder bank 1 (right): B1/A2
- Exhaust camshaft timing adjuster for cylinder bank 1 (right): B1/Front side made of plastic
- Intake camshaft timing adjuster for cylinder bank 2 (left): B2/A2
- Exhaust camshaft timing adjuster for cylinder bank 2 (left): B2/Front side made of plastic

Coating face surface of bearing cap for axial bearing with adhesive lubricating paste

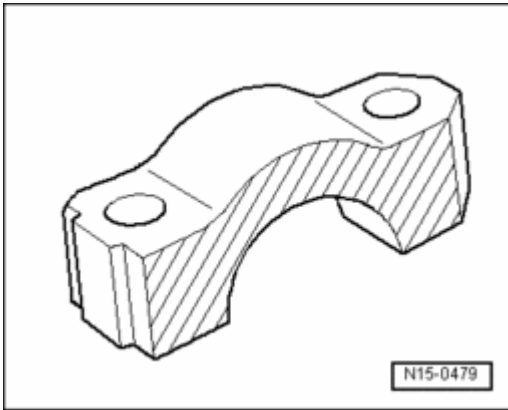


Fig. 237: Coating Face Surface Of Bearing Cap For Axial Bearing With Adhesive Lubricating Paste
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lightly coat face surface - **shown as shaded area** - of bearing caps 7, 8, 27 and 28 for axial bearing with *adhesive lubricating paste G 052 723 A2* .

Camshaft Timing Adjusters, Removing and Installing

Camshaft Timing Adjusters, Removing and Installing

Removing

NOTE:

- Camshafts and crankshaft must not be rotated when the timing drive is disassembled.
- The camshaft bar T10068 serves exclusively to lock the camshaft at TDC. To counterhold, an open-end 32 mm wrench must be set on the hex of the camshaft.
- Engine removed
- Engine separated from transmission

- Remove timing chains for camshafts --> Camshaft Timing Chain, Removing and Installing .

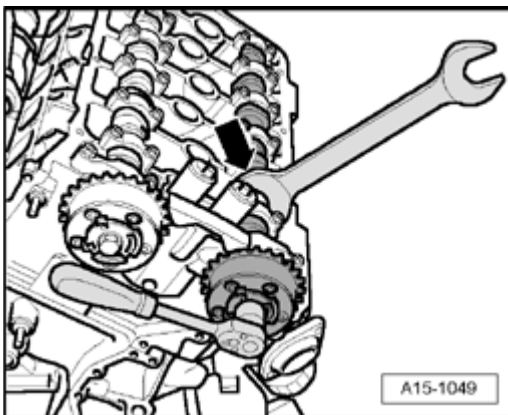


Fig. 238: Counterholding At Hex Of Camshaft

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen bolt for camshaft adjuster by counterholding at hex - **arrow** - of camshaft with an open-end 32 mm wrench.
- Remove camshaft adjuster.

Installing

NOTE:

- There must be no oil on the contact surfaces between the camshaft adjuster and camshaft or between the bolt head and camshaft adjusters.
- Observe alignment pin in camshaft adjuster.
- Use new bolts when securing the camshaft adjuster.

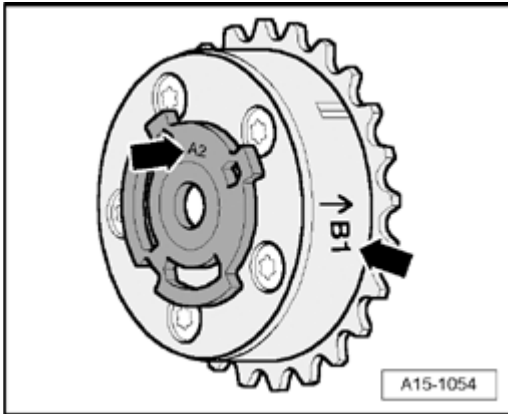


Fig. 239: Observing Identification Of Camshaft Adjuster
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- When installing, observe identification of camshaft adjuster - **arrows** -
- Intake camshaft timing adjuster for cylinder bank 1 (right): B1/A2
- Exhaust camshaft timing adjuster for cylinder bank 1 (right): B1/Front side made of plastic
- Intake camshaft timing adjuster for cylinder bank 2 (left): B2/A2
- Exhaust camshaft timing adjuster for cylinder bank 2 (left): B2/Front side made of plastic

NOTE:

- The camshaft bar T10068 serves exclusively to lock the camshaft at TDC. To counterhold, an open-end wrench 32 mm must be set on the hex of the camshaft.
- There must be no oil on the contact surfaces between the camshaft adjuster and camshaft or between the bolt head and camshaft adjuster

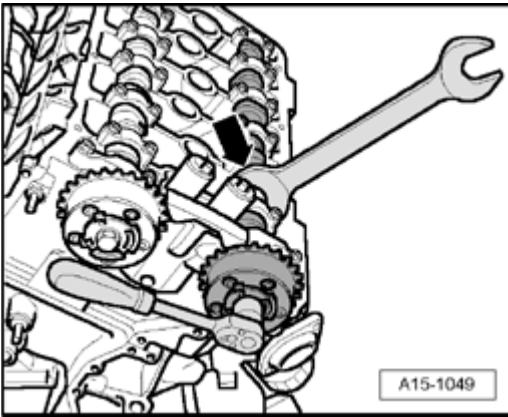


Fig. 240: Counterholding At Hex Of Camshaft

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Counter-hold at hex - **arrow** - of camshaft with an open-end 32 mm wrench and tighten camshaft adjuster.
- Install timing chains for camshafts --> **Camshaft Timing Chain, Removing and Installing** .

Tightening torque

Component	Nm
Camshaft timing adjuster to camshaft	60 plus 90°

* 90° corresponds to one quarter rotation.

*Replace bolts.

Control Housing for Camshaft Adjustment, Removing and Installing

Control Housing for Camshaft Adjustment, Removing and Installing

Removing

NOTE:

- Camshafts and crankshaft must not be rotated when the timing drive is disassembled.
- The camshaft bar T10068 serves exclusively to lock the camshaft at TDC. To counterhold, an open-end 32 mm wrench must be set on the hex of the camshaft.
- Engine removed
- Engine separated from transmission

- Remove timing chains for camshafts --> **Timing Chains for Camshaft Drive, Removing and Installing**.

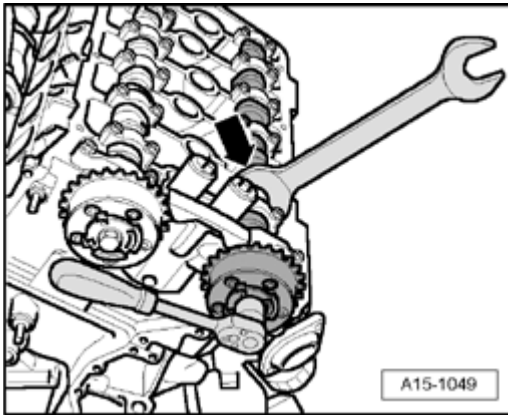


Fig. 241: Counterholding At Hex Of Camshaft

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen bolt for camshaft adjuster by counterholding at hex - **arrow** - of camshaft with an open-end 32 mm wrench.
- Remove camshaft adjuster.

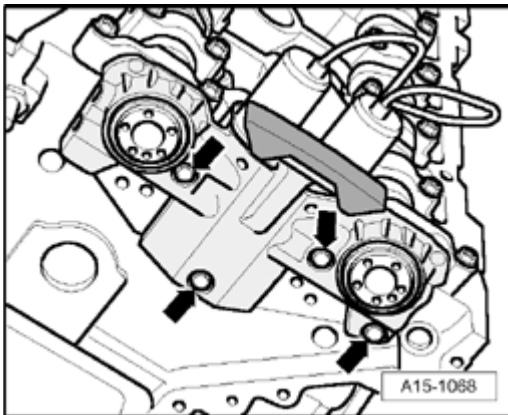


Fig. 242: Control Housing Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and remove control housing for camshaft adjustment.

Installing

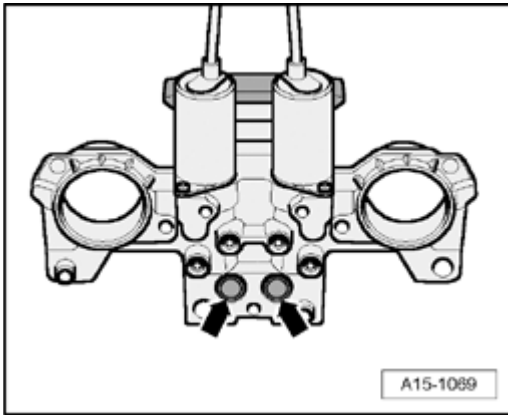


Fig. 243: Control Housing Strainer

Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installation is in reverse order of removal. Note the following.

- Clean strainer - **arrows** - on backside of control housing for camshaft adjustment.
- Lightly oil contact surface for piston rings in control housing for camshaft adjustment.

NOTE:

- When installing control housing for camshaft adjustment, make sure that the piston rings are not damaged on the camshafts.
- The piston ring gaps must be offset by 120°.

- Place control housing for camshaft adjustment onto camshaft.

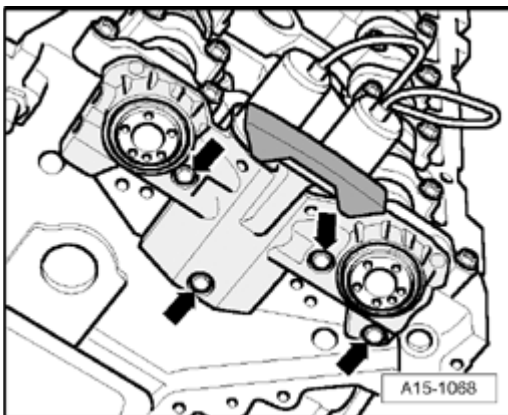


Fig. 244: Control Housing Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Fasten bolts - **arrows** - in a diagonal sequence.
- Install camshaft adjusters. --> *Installing* under **Camshaft Timing Adjusters, Removing and Installing**
- Install timing chains for camshafts --> **Timing Chains for Camshaft Drive, Removing and Installing**.

Tightening torque

Component	Nm
Control housing for camshaft adjustment to cylinder head	9

* Insert using locking compound .

Camshafts, Removing and Installing

Camshafts, Removing and Installing

Removing

NOTE:

- Camshafts and crankshaft must not be rotated when the timing drive is disassembled.
- The camshaft bar T10068 serves exclusively to lock the camshaft at TDC. To counterhold, an open-end 32 mm wrench must be set on the hex of the camshaft.
- Engine removed
- Engine separated from transmission

- Remove timing chains for camshafts --> Timing Chains for Camshaft Drive, Removing and Installing.

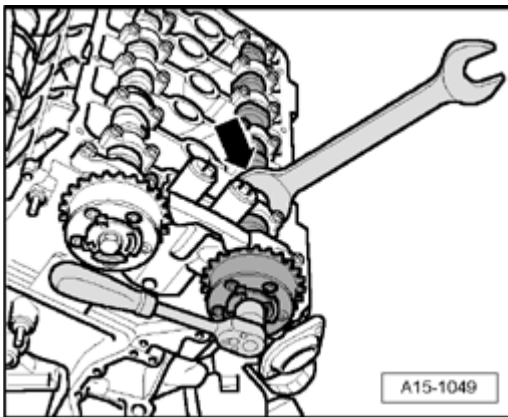


Fig. 245: Counterholding At Hex Of Camshaft

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen bolts for camshaft adjuster by counterholding at hex - **arrow** - of camshaft with an open-end 32 mm wrench.
- Remove camshaft adjuster.

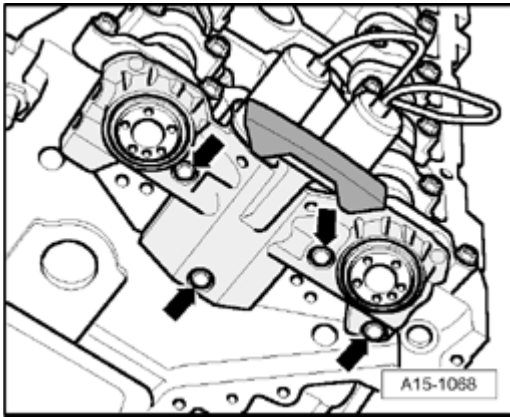


Fig. 246: Control Housing Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and remove control housing for camshaft adjustment.

Cylinder bank 1 (right)

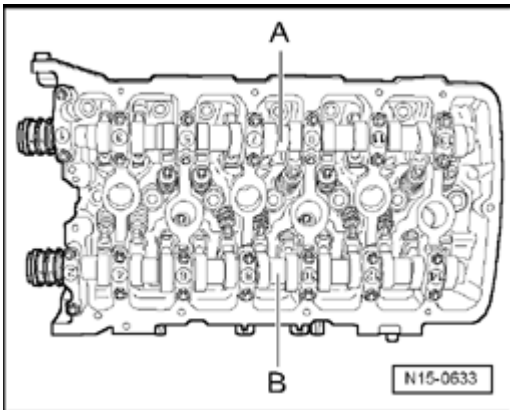


Fig. 247: Intake/Exhaust Camshaft - Cylinder Bank 1 (Right)

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove intake camshaft - **A** - as follows:
 1. Remove bearing caps 1 and 13.
 2. Remove bearing caps 5 and 9.
 3. Remove bearing cap 7.
 4. Loosen bearing caps 3 and 11 alternately and in diagonal sequence, and remove.
- Remove exhaust camshaft - **B** - as follows:
 1. Remove bearing caps 2 and 14.
 2. Remove bearing caps 6 and 10.
 3. Remove bearing cap 8.

4. Loosen bearing caps 4 and 12 alternately and in diagonal sequence, and remove.

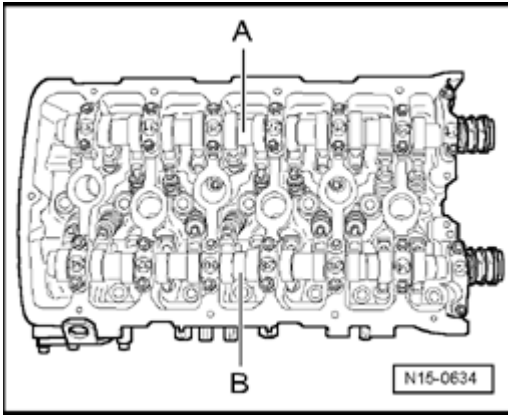
Cylinder bank 2 (left)

Fig. 248: Intake/Exhaust Camshaft - Cylinder Bank 2 (Left)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove intake camshaft - **A** - as follows:

1. Remove bearing caps 21 and 33.
2. Remove bearing caps 25 and 29.
3. Remove bearing cap 27.
4. Loosen bearing caps 23 and 31 alternately and in diagonal sequence, and remove.

- Remove exhaust camshaft - **B** - as follows:

1. Remove bearing caps 22 and 34.
2. Remove bearing caps 26 and 30.
3. Remove bearing cap 28.
4. Loosen bearing caps 24 and 32 alternately and in diagonal sequence, and remove.

Continuation for both cylinder banks

- Carefully remove camshafts and place on a clean surface.

NOTE:

- **Ensure that the roller rocker levers and the support elements are not interchanged. If necessary, remove roller rocker levers together with the support elements and place on a clean surface.**

Installing

- Secure crankshaft in TDC position using crankshaft holder 3242.

- Place support elements together with roller rocker levers into cylinder head.
- Install roller rocker levers so that they rest on ends of valve stems.
- Oil journal surfaces of camshafts.
- Place respective camshaft into camshaft bearings of cylinder head.

Camshaft identification cylinder bank 1 (right)

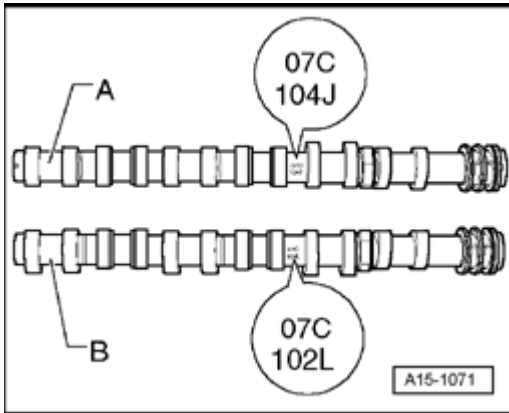


Fig. 249: Camshaft Identification Cylinder Bank 1 (Right)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Exhaust camshaft, Identification 07C - Index 104 J

B - Intake camshaft, Identification 07C - Index 102 L

Camshaft identification cylinder bank 2 (left)

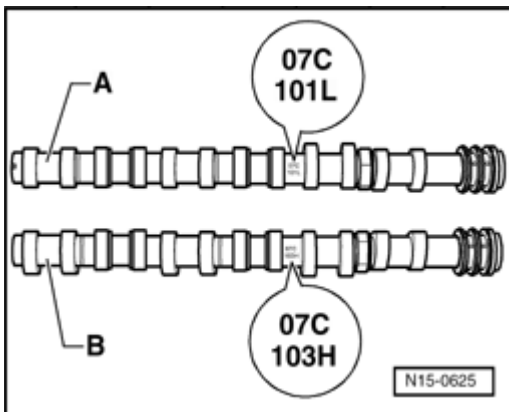


Fig. 250: Camshaft Identification Cylinder Bank 2 (Left)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Intake camshaft, Identification 07C - Index 101 L

B - Exhaust camshaft, Identification 07C - Index 103 H

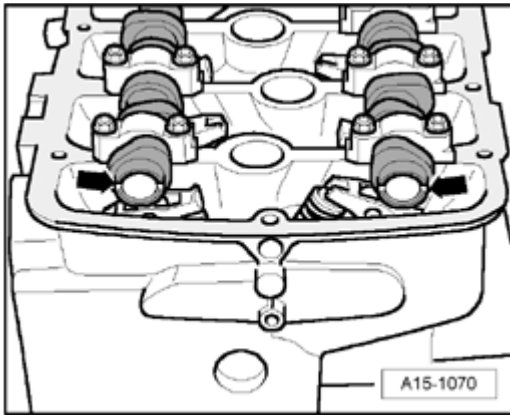


Fig. 251: Identifying Camshafts Slits

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert camshafts into cylinder head in such a way that they are set at TDC ignition timing.
- Slits - **arrows** - in camshafts at front must stand parallel at same height with upper edge of cylinder head.

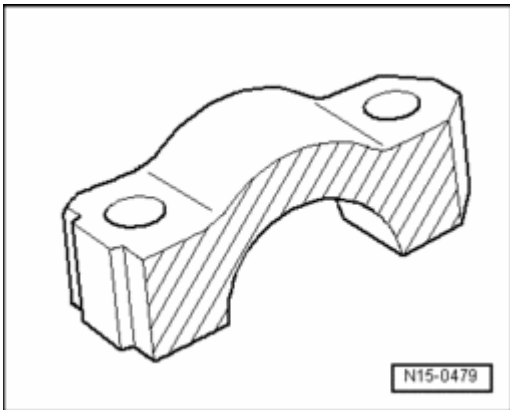


Fig. 252: Coating Face Surface Of Bearing Cap For Axial Bearing With Adhesive Lubricating Paste

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lightly coat face surface - **shown as shaded area** - of bearing cap with axial bearing (bearing caps 7, 8, 27, 28) with *adhesive lubricating paste G 052 723 A2* .

Cylinder bank 1 (right)

- Set camshaft bearing caps in place according to their number identification:

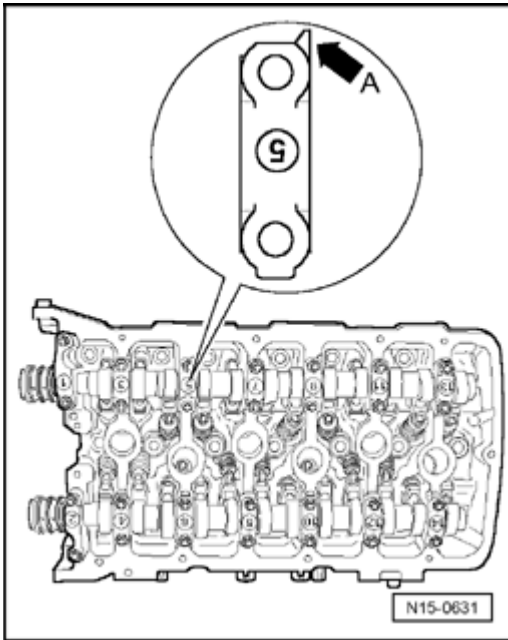


Fig. 253: Installation Position Camshaft Bearing Caps, Cylinder Bank 1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Points - **arrow A** - of intake and exhaust camshaft bearing caps face outward.
- Identification on bearing caps is legible when read from intake side.

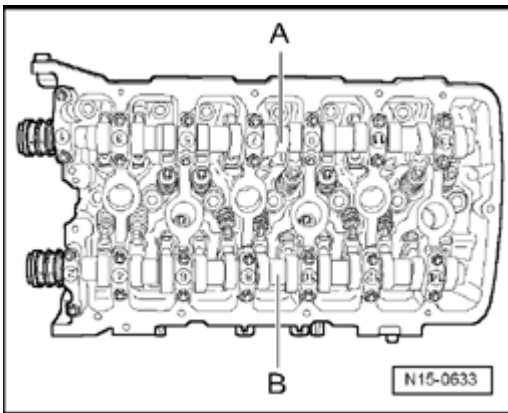


Fig. 254: Intake/Exhaust Camshaft - Cylinder Bank 1 (Right)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install intake camshaft - **A** - as follows:
 1. Fasten bearing caps 3 and 11 alternately and diagonally and then tighten to specified torque.
 2. Fasten bearing cap 7.
 3. Fasten bearing caps 5 and 9.
 4. Fasten bearing caps 1 and 13.
- Install exhaust camshaft - **B** - as follows:

1. Fasten bearing caps 4 and 12 alternately and diagonally and then tighten to specified torque.
2. Fasten bearing cap 8.
3. Fasten bearing caps 6 and 10.
4. Fasten bearing caps 2 and 14.

Cylinder bank 2 (left)

- Set camshaft bearing caps in place according to their number identification:

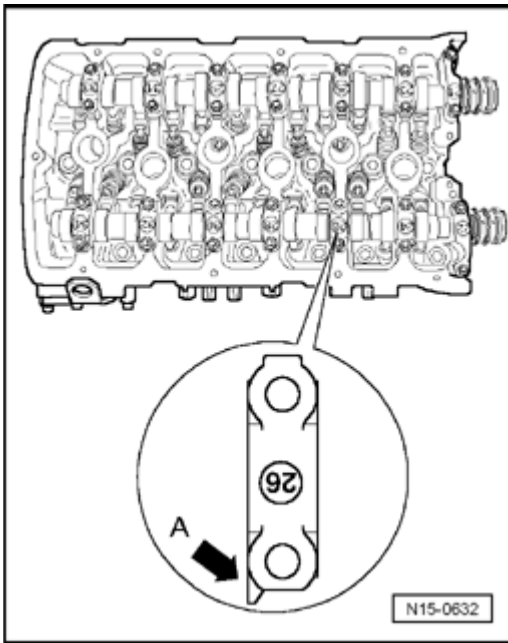


Fig. 255: Installation Position Camshaft Bearing Caps, Bank 2
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Points - **arrow A** - of intake and exhaust camshaft bearing caps face outward.
- Identification on bearing caps is legible when read from intake side.

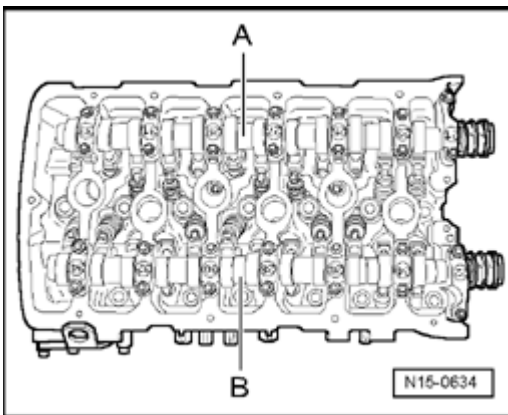


Fig. 256: Intake/Exhaust Camshaft - Cylinder Bank 2 (Left)

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install intake camshaft - **A** - as follows:

1. Fasten bearing caps 23 and 31 alternately and diagonally and then tighten to specified torque.
2. Fasten bearing cap 27.
3. Fasten bearing caps 25 and 29.
4. Fasten bearing caps 21 and 33.

- Install exhaust camshaft - **B** - as follows:

1. Fasten bearing caps 24 and 32 alternately and diagonally and then tighten to specified torque.
2. Fasten bearing cap 28.
3. Fasten bearing caps 26 and 30.
4. Fasten bearing caps 22 and 34.

- Install control housings for camshaft adjustment --> **Control Housing for Camshaft Adjustment, Removing and Installing.**
- Install camshaft adjusters --> *Installing* under **Camshaft Timing Adjusters, Removing and Installing .**

CAUTION: Camshaft and crankshaft must not be rotated when the timing drive is disassembled.

- Before continuing assembly, verify TDC position of camshafts.

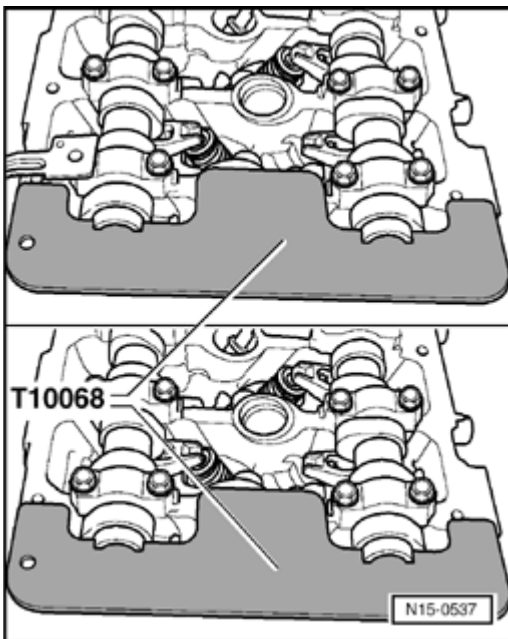


Fig. 257: Camshaft Bar T10068 Engaging In Both Shaft Grooves
Courtesy of VOLKSWAGEN UNITED STATES, INC.

2009 Audi A8 Quattro

ENGINE 6.0 Liter 12-Cyl. 4V Engine Mechanical, Engine Code(s): BHT, BSB - A8

- The camshaft bar T10068 must engage in both shaft grooves.
- Install timing chains for camshafts --> **Timing Chains for Camshaft Drive, Removing and Installing.**

Tightening torque

Component	Nm
Bearing cap to cylinder head	5 plus 45°

* 45 corresponds to one eighth rotation.

Valve Stem Seals, Replacing

Valve Stem Seals, Replacing

Special tools, testers and auxiliary items required

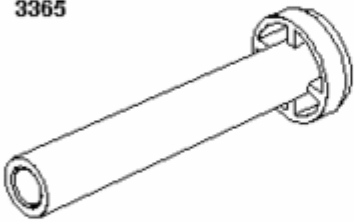
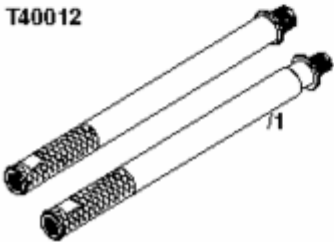
3122 B 	3364 
3365 	VAS 5161 
T40012 	G15-0058

Fig. 258: Identifying Special Tools - Valve Stem Seals, Replacing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Spark plug removal tool 3122 B
- Valve seal removal tool 3364
- Valve stem seal driver 3365
- Valve keeper disassembly and assembly device VAS 5161 with guide plate VAS 5161/25
- Adapter T40012

Work sequence

- Engine removed
 - Remove camshafts --> **Camshafts, Removing and Installing.**
 - Using spark plug removal tool 3122 B , remove spark plugs.

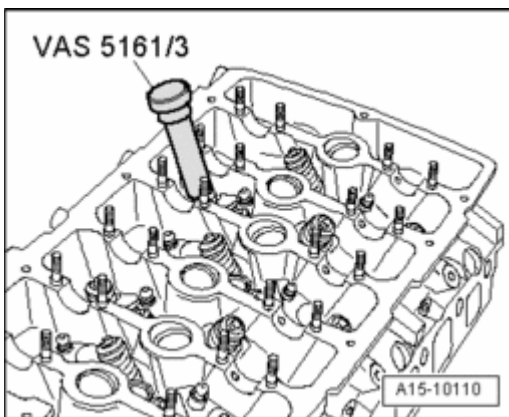


Fig. 259: Placing Drift VAS 5161/3 On Valve Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place drift VAS 5161/3 on valve plate and loosen stuck valve keepers using a plastic hammer.

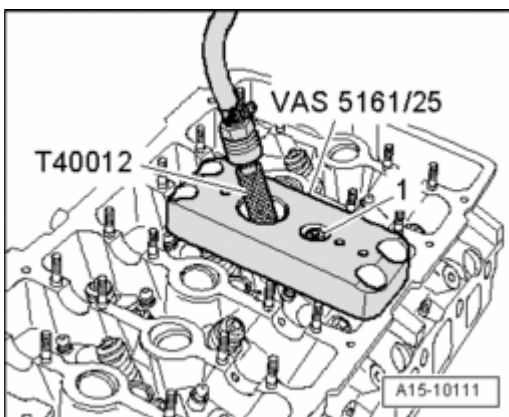
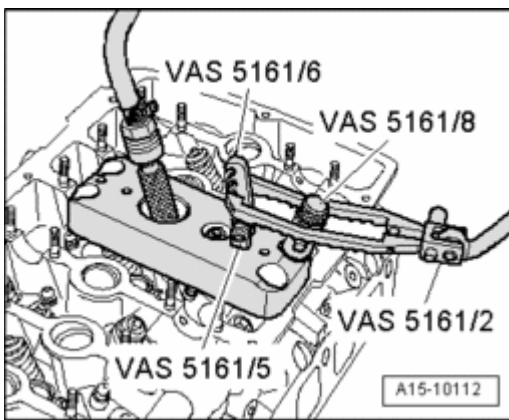


Fig. 260: Placing Guide Plate VAS 5161/25 From Valve Keeper Disassembly And Assembly Device VAS

5161 On Cylinder Head**Courtesy of VOLKSWAGEN UNITED STATES, INC.**

- Place guide plate VAS 5161/25 from valve keeper disassembly and assembly device VAS 5161 on cylinder head.
- Secure guide plate with a nut.
- Screw adapter T40012 with gasket by hand into respective spark plug thread and apply constant pressure.
- Minimum pressure: 6 bar positive pressure.

Procedure for outer rows of valves**Fig. 261: Procedure For Outer Rows Of Valves****Courtesy of VOLKSWAGEN UNITED STATES, INC.**

- Screw 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 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 installation cartridge.
- Release pressure fork.
- Take out installation cartridge.
- Unfasten guide plate and turn it aside.
- Pressurized air hose remains connected.
- Remove valve spring with valve plate.

Procedure for inner rows of valves

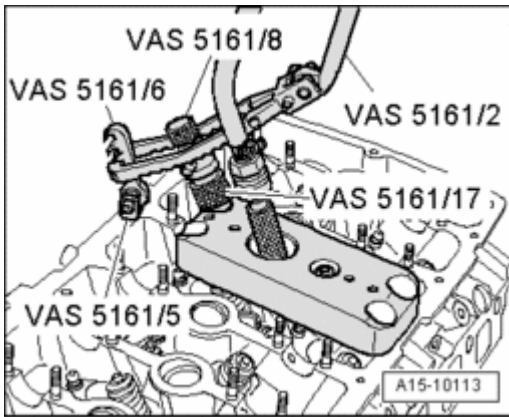


Fig. 262: Procedure For Inner Rows Of Valves

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Screw engaging device VAS 5161/6 with installation fork VAS 5161/5 onto cylinder head.
- Push the knurled spacer ring VAS 5161/17 onto installation cartridge VAS 5161/8.
- Push installation cartridge 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 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 installation cartridge.
- Release pressure fork.
- Take out installation cartridge.
- Unfasten guide plate and turn it aside.
- Pressurized air hose remains connected.
- Remove valve spring with valve plate.

Continued for all rows of valves

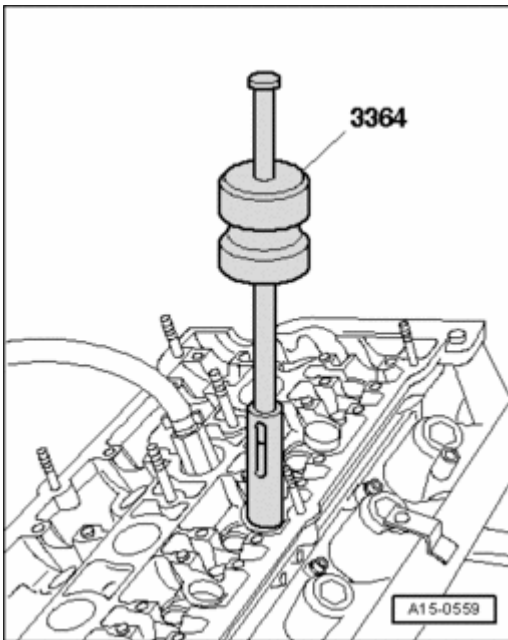


Fig. 263: Pulling Off Valve Stem Oil Seals Using Valve Seal Removal Tool 3364
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull off valve stem oil seals using valve seal removal tool 3364.

NOTE:

- For pressing on green-colored valve stem seals, the valve stem seal driver 3365 must be drilled to a diameter of 10.5 mm.
- Mark the drilled driver for later reuse.

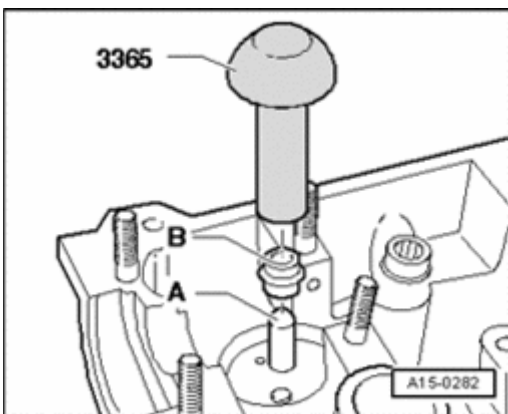


Fig. 264: Identifying Plastic Sleeve, Valve Stem Oil Seal & Valve Stem Seal Driver 3365
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- A plastic sleeve - **A** - is supplied with new valve stem 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.

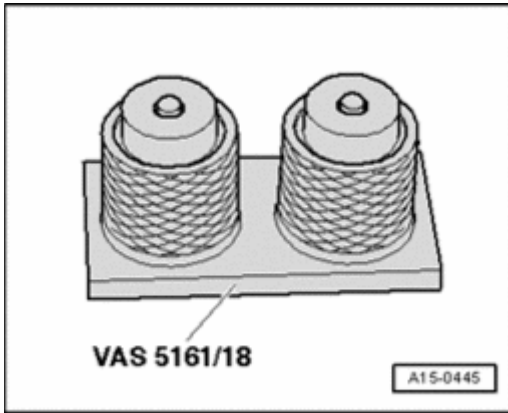


Fig. 265: Identifying Installation Cartridge VAS 5161/8
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

- Large diameter of valve keepers points upward.

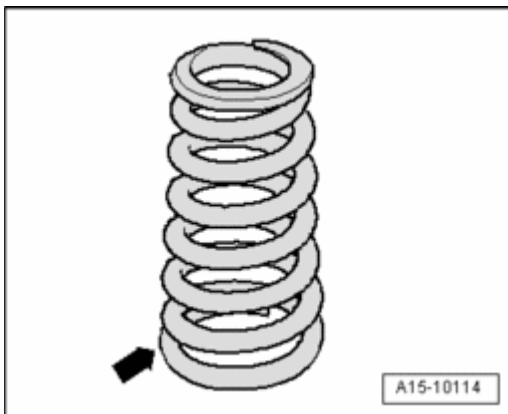


Fig. 266: Valve Spring And Valve Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install valve spring and valve plate.

Installed position of valve spring:

- Larger diameter - **arrow** - faces cylinder head.

Procedure for outer rows of valves

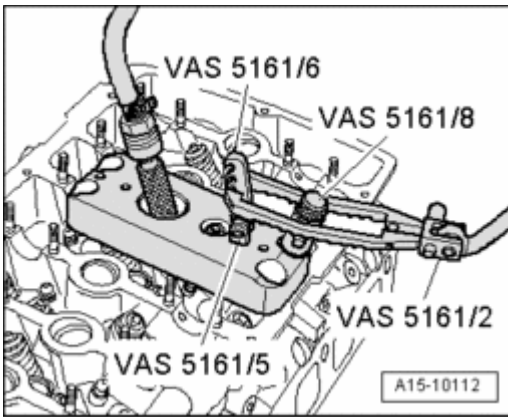


Fig. 267: Procedure For Outer Rows Of Valves
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Fasten guide plate to cylinder head again as shown in illustration.
- Insert installation cartridge into guide plate.
- Press down pressure fork and pull knurled bolt upward turning to left and right - valve keepers are inserted in this manner.
- Release pressure fork with knurled bolt still pulled.

Procedure for inner rows of valves

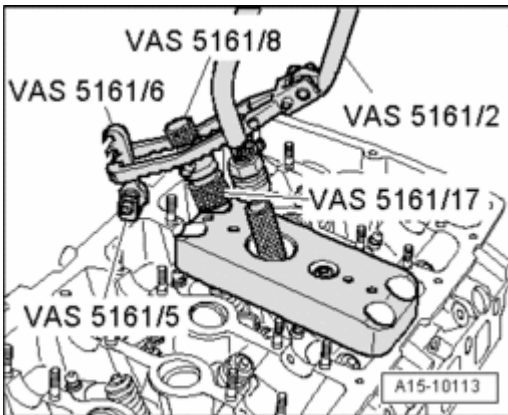


Fig. 268: Procedure For Inner Rows Of Valves
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert installation cartridge with knurled spacer wheel into guide plate.
- Press down pressure fork and pull knurled bolt upward turning to left and right - valve keepers are inserted in this manner.
- Release pressure fork with the knurled bolt still pulled.
- Install camshafts. --> *Installing* under **Camshafts, Removing and Installing**

NOTE:

- **After installing the camshafts, the engine may not be started for approx. 30 minutes. The hydraulic lifter equalization elements must seat themselves**

(otherwise the valves will make contact with the pistons).

- After working on the valve gear 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.

Tightening torque

Component	Nm
Spark plugs in cylinder head	30

Camshafts, Checking Axial Clearance

Camshafts, Checking Axial Clearance

Special tools, testers and auxiliary items required

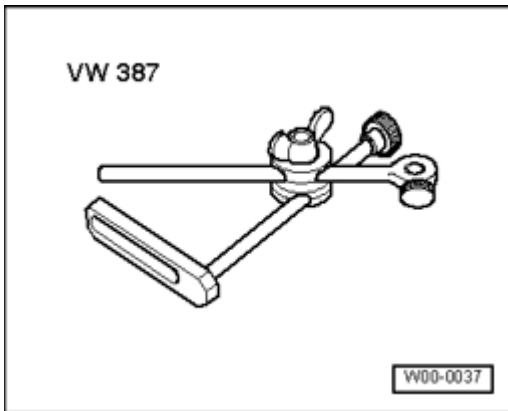


Fig. 269: Dial Gauge Holder VW 387
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Dial gauge holder VW 387

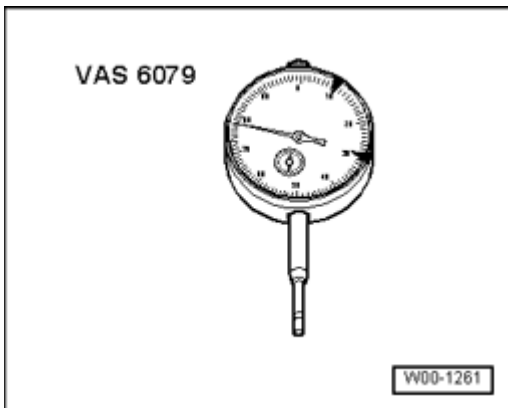


Fig. 270: Dial Gauge VAS 6079
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Dial gauge VAS 6079

Work sequence

Perform measurement with roller rocker levers and support elements removed. Bearing cap of axial bearing for respective camshaft remains installed.

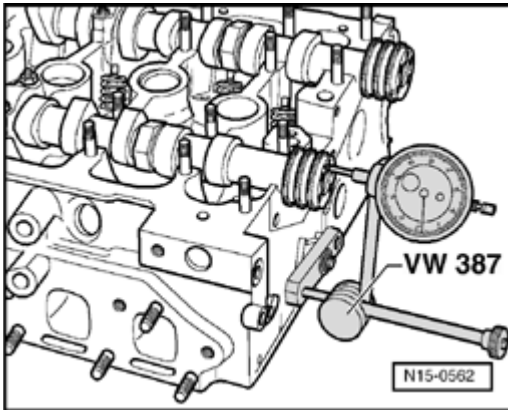


Fig. 271: Securing Dial Gauge Holder VW 387 To Dial Gauge VAS 6079 On Cylinder Head
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure dial gauge holder VW 387 to dial gauge VAS 6079 on cylinder head.
- Determine axial clearance.
- Axial play wear limit: 0.10 mm.

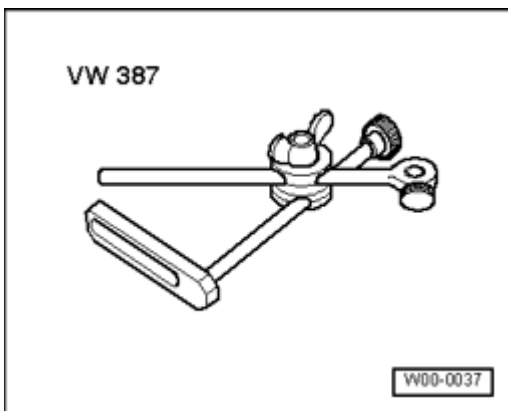
Valve Guides, Checking**Valve Guides, Checking****Special tools, testers and auxiliary items required**

Fig. 272: Dial Gauge Holder VW 387
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Dial gauge holder VW 387

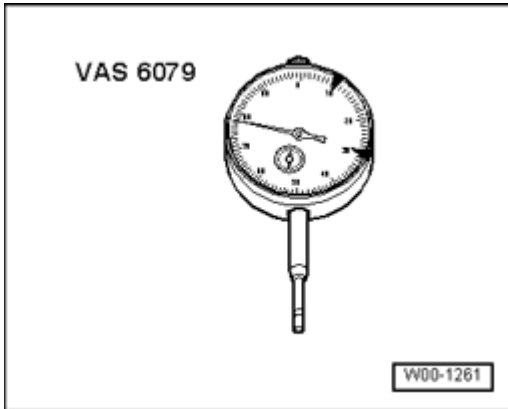


Fig. 273: Dial Gauge VAS 6079

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Dial gauge VAS 6079

Work sequence

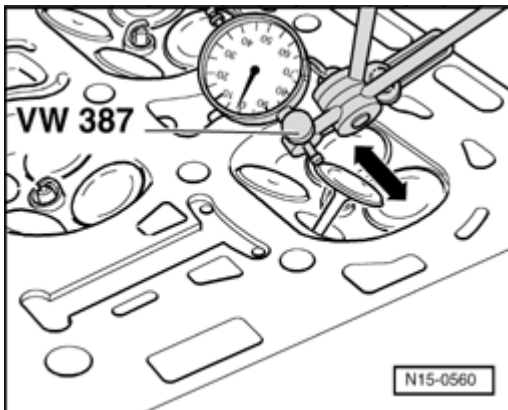


Fig. 274: Measuring Valve Tilt Clearance

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert valve into valve guide.
- Valve stem tip must seal with valve guide.

NOTE:

- Due to differences in valve stem diameter, make sure that only intake valves are used to check intake valve guides, and only exhaust valves are used to check exhaust valve guides.

- Determine tilt clearance.
- Tilt clearance wear limit: 0.8 mm.

NOTE:

- If wear limit is exceeded, re-measure using new valves.
- If wear limit is still exceeded, replace cylinder head. The valve guides cannot be replaced.
- If a valve is replaced during repair, use the new valve for measurement.

Valves, Checking

Valves, Checking

- Perform a visual check for signs of wear at stem and at seating surface.
- Replace valves with significant traces of wear.

Valve Dimensions

Valve Dimensions

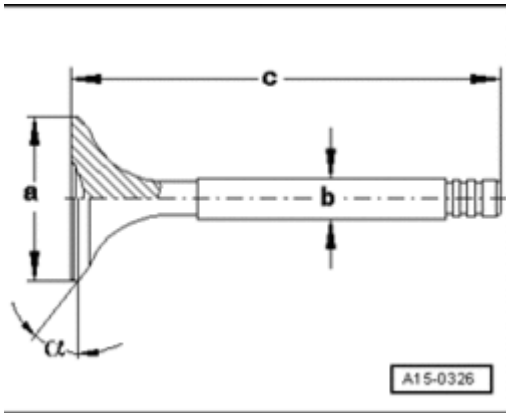


Fig. 275: Valve Dimensions

Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- Intake and exhaust valves must not be reworked by grinding. Only lapping is permitted.

Dimension		Short intake valve	Long intake valve	Short exhaust valve	Long exhaust valve
dia. a	mm	31.00	31.00	27.00	27.00
dia. b	mm	5.96	5.96	5.94	5.94
c	mm	102.20	136.10	102.50	136.40
a	Angle°	45	45	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 in half between the shaft center and the valve plate. While doing this, do not come into contact

with water. After cutting open valves, throw not more than 10 at a time into a bucket of water. Then, move quickly away, because a sudden chemical reaction will occur during which the sodium is burned away.

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

Valve Seats, Reworking

Valve Seats, Reworking

NOTE:

- If a perfect contact pattern is not achieved by lapping the valve seats, rework the valve seats.

Special tools, testers and auxiliary items required

- Depth gauge
- Valve seat refacing tool

NOTE:

- When repairing engines with leaking valves, it is not sufficient to rework or replace valve seats and valves. It is particularly important to check the valve guides for wear on engines with higher mileage --> Valve Guides, Checking
- Only rework valve seats until a perfect contact pattern is obtained.
- The maximum permissible reworking dimension must be calculated before work is performed.
- If the reworking dimension is exceeded, the function of the hydraulic lifters can no longer be guaranteed and therefore the cylinder head must be replaced.

Determining maximum allowable reworking dimension

- Insert valve and press it firmly against valve seat.

NOTE:

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

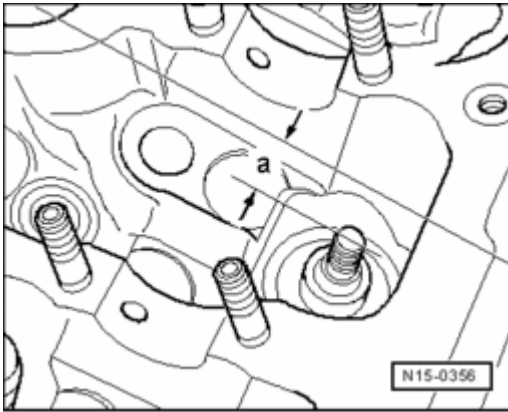


Fig. 276: Measuring Distance Between End Of Valve Stem And Upper Edge Of Cylinder Head
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Measure distance - **a** - between end of valve stem and upper cylinder head surface with a depth gauge.
- Calculate maximum allowable reworking dimension from measured distance and minimum dimension.

Minimum dimension			
Short intake valve	Long intake valve	Short exhaust valve	Long exhaust valve
32.2 mm	10.6 mm	32.2 mm	10.6 mm

Measured distance minus minimum dimension = max. permissible reworking dimension.

Example for long intake valve:		
	Measured distance	10.8 mm
	Minimum dimension	-10.4 mm
=	Max. permissible reworking dimension	= 0.4 mm

NOTE:

- If the maximum allowed reworking dimension is 0 mm or less than 0 mm, repeat the measurement using new valve. If the measurement result is still 0 mm or less than 0 mm, replace the cylinder head.

Reworking intake valve seat

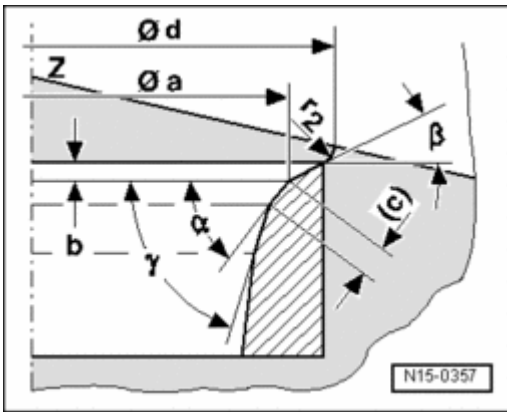


Fig. 277: Reworking Intake Valve Seat

Courtesy of VOLKSWAGEN UNITED STATES, INC.

a - diameter 32.6 mm

b - Max. permissible reworking dimension

c - 0.9 to 1.5 mm

d - max. diameter 35.0 mm

r2 - Radius 2.0 mm

Z - Cylinder head lower edge

a - 45 valve seat angle

β - 30 upper correction angle

gamma - 60 lower correction angle

NOTE:

- Calculating the maximum allowable reworking dimension, --> Determining maximum allowable reworking dimension .

Reworking exhaust valve seat

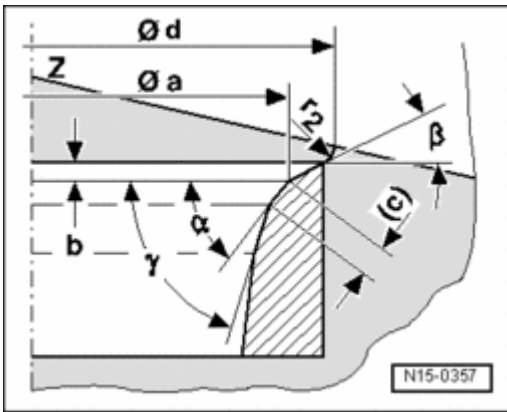


Fig. 278: Reworking Exhaust Valve Seat
Courtesy of VOLKSWAGEN UNITED STATES, INC.

a - diameter 26.7 mm

b - Max. permissible reworking dimension

c - 1.2 to 1.7 mm

d - max. diameter 29.0 mm

r2 - Radius 2.0 mm

Z - Cylinder head lower edge

a - 45 valve seat angle

β - 30 upper correction angle

gamma - 60 lower correction angle

NOTE: • Calculating the maximum allowable reworking dimension, --> Determining maximum allowable reworking dimension .

17 - ENGINE - LUBRICATION

LUBRICATION SYSTEM COMPONENTS, REMOVING AND INSTALLING

Lubrication System Components, Removing and Installing

--> Oil Pan, Assembly Overview

--> Oil Pan Lower Section, Removing and Installing

--> Oil Pump, Removing and Installing

--> **Oil Pan Upper Section, Removing and Installing**

--> **Oil Filter Bracket, Assembly Overview**

--> **Oil Filter Housing, Removing and Installing**

--> **Engine Oil Cooler, Removing and Installing**

--> **Oil Pressure and Oil Pressure Switch, Checking**

--> **Engine Oil**

--> **Engine Oil Level, Checking**

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 engine oil cooler must be replaced.
- The oil level must not be above the max. mark - danger of damage to catalytic converter!

Viscosity classes and oil specifications --> **01 - MAINTENANCE** .

Oil filling quantities --> Fluid Capacity Chart.

Oil Pan, Assembly Overview

Oil Pan, Assembly Overview

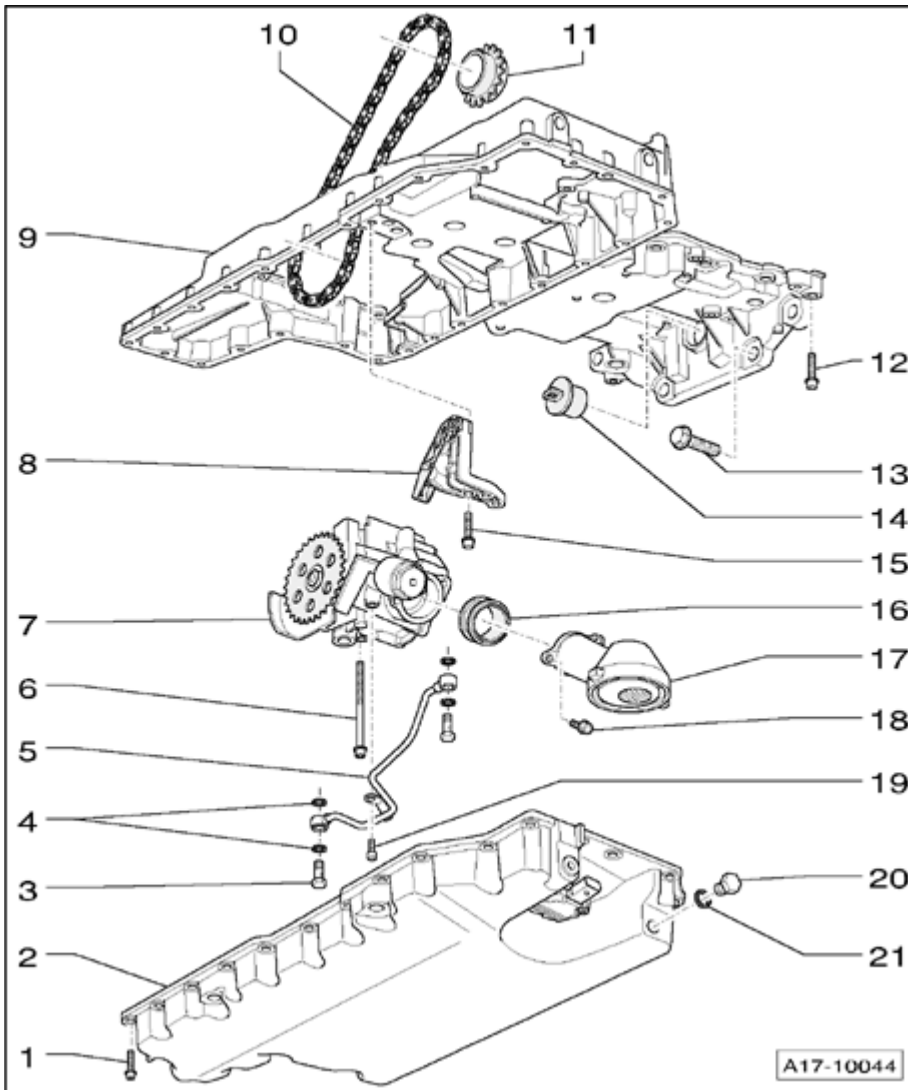


Fig. 279: Oil Pan, Assembly Overview

Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - 9 Nm

- Fasten in diagonal sequence in steps

2 - Oil pan lower part

- With Oil level thermal sensor G266 --> **Oil level thermal sensor G266**

3 - 20 Nm

4 - Oil seal

- Replace

5 - Oil line

6 - 20 Nm

7 - Oil pump

- Do not disassemble
- With relief valve
- Removing and installing --> **Oil Pump, Removing and Installing**

8 - Chain tensioner

- Before removing, secure with locking pin T40011
- Do not disassemble
- Removing and installing --> **Oil Pump, Removing and Installing**

9 - Oil pan upper part

- Removing and installing --> **Oil Pan Upper Section, Removing and Installing**

10 - Drive chain for oil pump

11 - Chain sprocket for oil pump

- Component of crankshaft

12 - Bolt

- Observe varying lengths
- Tightening sequence and torque specification --> **Fig. 311**

13 - 45 Nm

14 - Sealing plugs

15 - M6 = 9 Nm; M8 = 20 Nm

16 - Pulsation damper

17 - Suction line

- Clean strainer if soiled

18 - 9 Nm

19 - 9 Nm

20 - Oil drain plug, 30 Nm

21 - Oil seal

- Replace

Oil level thermal sensor G266

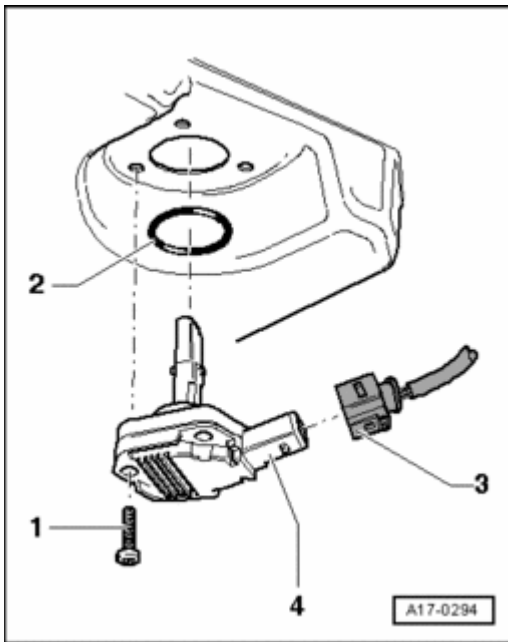


Fig. 280: Oil Level Thermal Sensor G266
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1. Insert bolt (10 Nm) using locking compound .
2. Sealing ring; replace
3. Electrical harness connector
4. Oil level thermal sensor G266

Oil Pan Lower Section, Removing and Installing

Oil Pan Lower Section, Removing and Installing

Special tools, testers and auxiliary items required

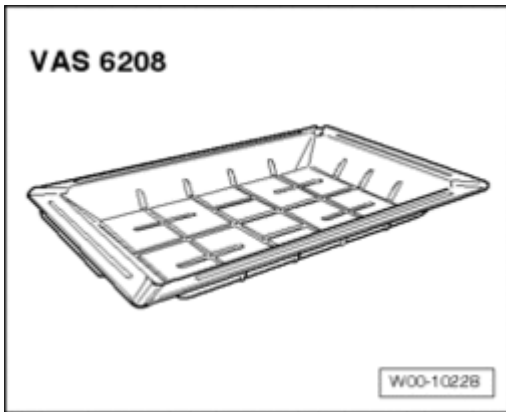


Fig. 281: Drip Tray For Workshop Crane VAS 6208 Or Drip Tray V.A.G 1306
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drip tray for workshop crane VAS 6208 or Drip tray V.A.G 1306
- Hand drill with plastic brush attachment
- Protective glasses
- Sealant

Removing

- Activate vehicle lifting mode --> **43 - SELF LEVELING SUSPENSION** .

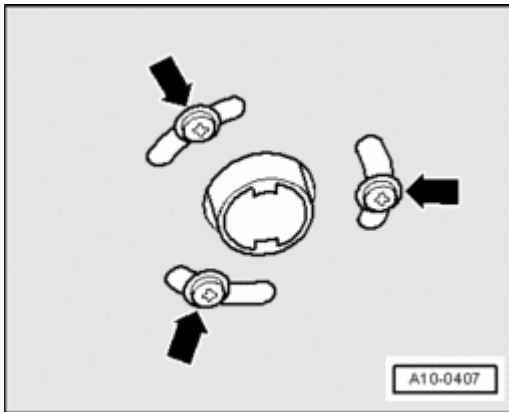


Fig. 282: Identifying Exhaust Pipe Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

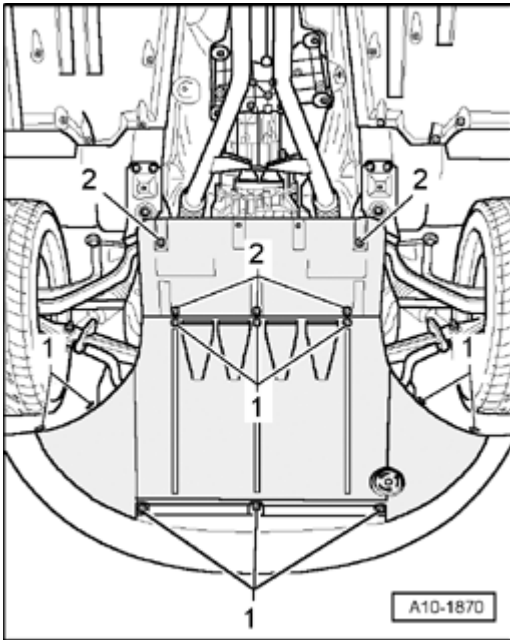


Fig. 283: Noise Insulation Quick-Release Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen quick-release fasteners - 1 - and remove front sound insulation.
- Place drip tray for workshop crane VAS 6208 or drip tray V.A.G 1306 under engine.
- Drain engine oil.

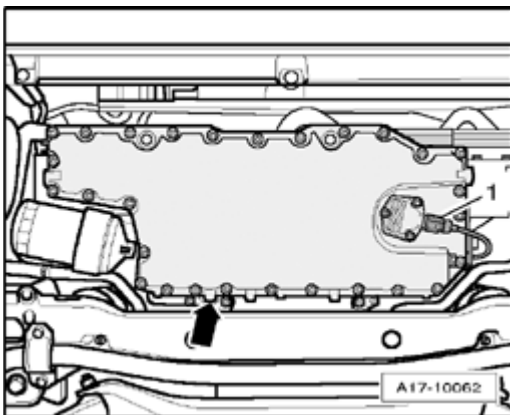


Fig. 284: Oil Level Thermal Sensor G266 Electrical Connector & Oil Pan Lower Part Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector from Oil Level Thermal Sensor G266 - 1 -.
- Unfasten oil pan lower part - **arrow** -.

Installing

Installation is in reverse order of removal. Note the following.

NOTE:

- **Replace seal.**

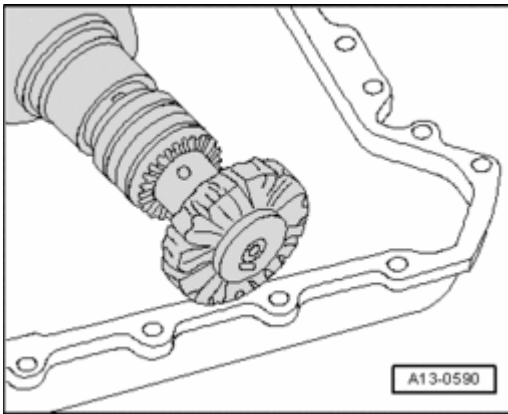


Fig. 285: Using Rotating Plastic Brush To Remove Sealant Residue On Timing Chain Covers And On Cylinder Block And Cylinder Head

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using rotating plastic brush, remove any remaining sealant from oil pan lower part and oil pan upper part.

CAUTION: Wear safety glasses.

- Clean sealing surfaces and ensure they are free of oil and grease.

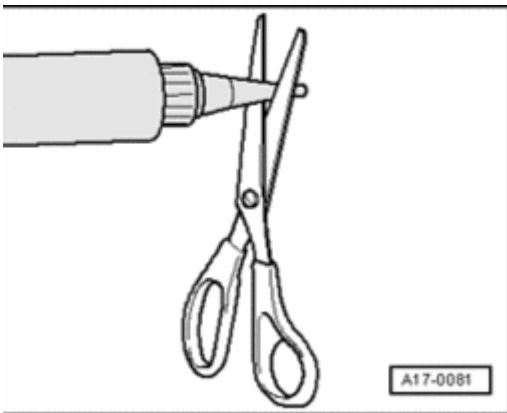


Fig. 286: Cutting Tube Nozzle At Front Marking

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Cut off nozzle on tube of sealant at front mark (diameter of nozzle approx. 2 mm).

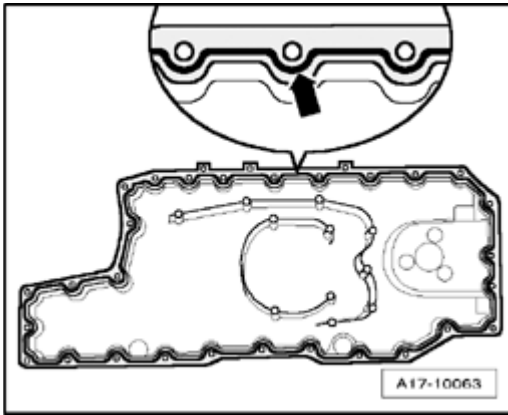


Fig. 287: Applying Sealant Bead On Clean Sealing Surface Of Oil Pan Lower Part
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Apply sealant bead - **arrow** - on clean sealing surface of oil pan lower part as shown in illustration.
- Thickness of sealant bead: 2 mm.

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 lower part must be installed within 5 minutes after application of sealant.

- Set oil pan lower part in place and fasten all bolts in diagonal sequence to 5 Nm.
- Fasten bolts for oil pan lower part in a diagonal sequence.
- Add engine oil and check oil level --> **Engine Oil Level, Checking** .
- Deactivate vehicle lifting mode --> **43 - SELF LEVELING SUSPENSION** .

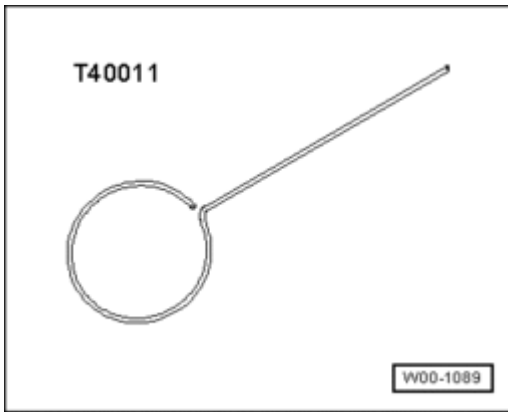
Tightening torques

Component	Nm
Oil pan lower part to oil pan upper part	9
Oil drain plug to oil pan	30

Oil Pump, Removing and Installing

Oil Pump, Removing and Installing

Special tools, testers and auxiliary items required

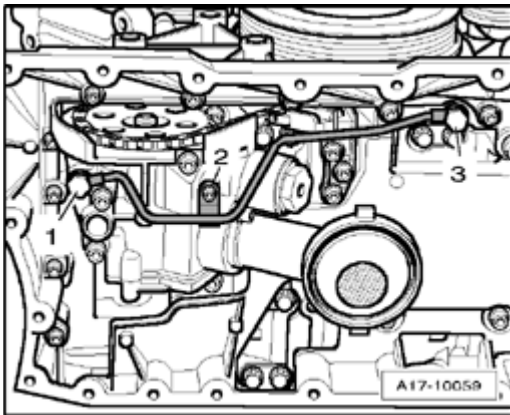
**Fig. 288: Securing Pin T40011**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Securing pin T40011

Removing

- Remove oil pan lower part --> **Oil Pan Lower Section, Removing and Installing.**

**Fig. 289: Oil Line Bolts**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **1 to 3** - and remove oil line.

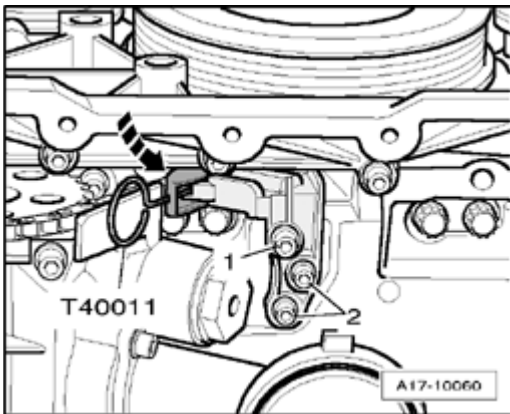


Fig. 290: Pressing Chain Tensioner And Securing With Locking Pin T40011
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press chain tensioner in direction of - **arrow** - and secure with locking pin T40011.
- Remove bolts - **1** - and - **2** -.
- Remove chain tensioner.

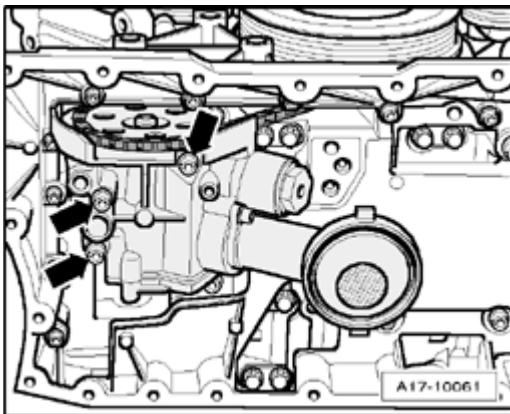


Fig. 291: Remove Oil Pump Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Remove oil pump and remove drive chain for oil pump from chain sprocket, pivoting the oil pump aside slightly.

Installing

Installation is in reverse order of removal. Note the following:

NOTE:

- **Replace seals.**

- Pay attention to alignment bushings during installation.
- Install oil pan lower part --> **Oil Pan Lower Section, Removing and Installing.**

2009 Audi A8 Quattro

ENGINE 6.0 Liter 12-Cyl. 4V Engine Mechanical, Engine Code(s): BHT, BSB - A8

- Add engine oil and check oil level --> **Engine Oil Level, Checking** .

Tightening torques

Component			Nm
Oil pump to cylinder block			20
Chain tensioner to	M6		9
Oil pan upper part	M8		20
Oil line	M6		9
	Banjo bolt		20

Oil Pan Upper Section, Removing and Installing

Oil Pan Upper Section, Removing and Installing

Special tools, testers and auxiliary items required

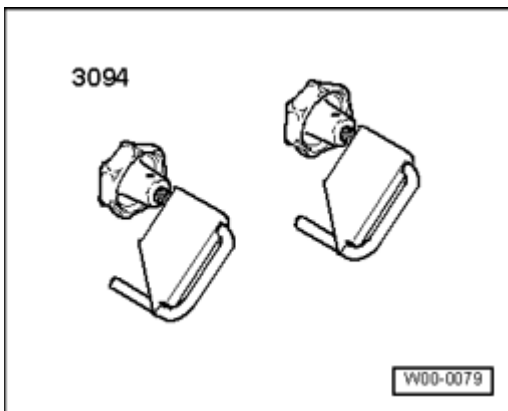


Fig. 292: 3094 Hose Clamps

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hose clamps up to 25 mm diameter 3094
- Hand drill with plastic brush attachment
- Protective glasses
- Sealant

Removing

- Remove both front wheels.

NOTE:

- **Secure the brake discs with wheel bolts.**

- Remove front part of left front wheelhouse liner --> **66 - EXTERIOR EQUIPMENT** .

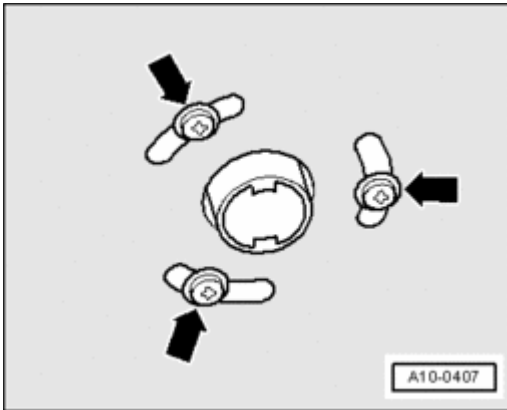


Fig. 293: Identifying Exhaust Pipe Fasteners

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

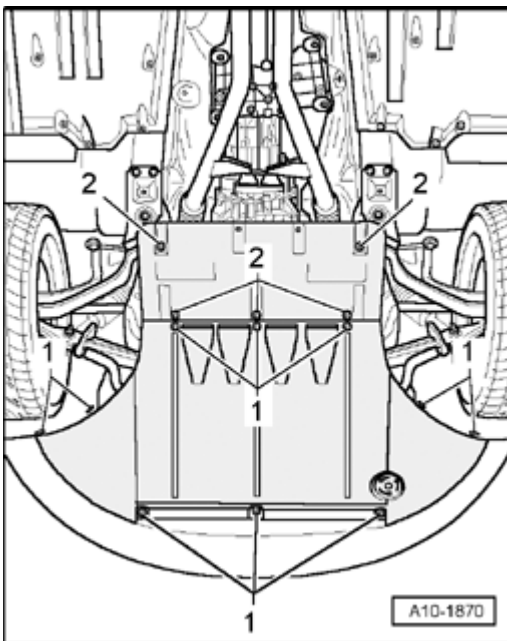


Fig. 294: Noise Insulation Quick-Release Fasteners

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen quick-release fasteners - **1** - and - **2** - and remove sound insulation.

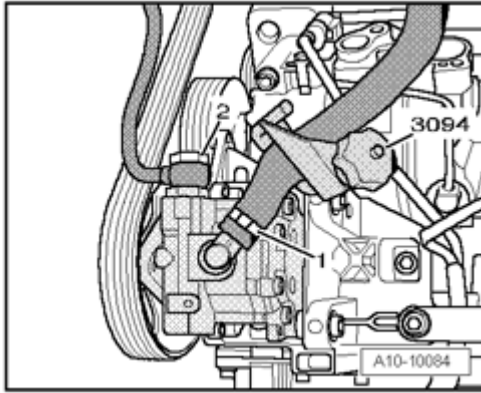


Fig. 295: Identifying Hydraulic Hose, Hydraulic Pressure Line & Hose Clamps 3094
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE: • Ignore - 2 - in the illustration.

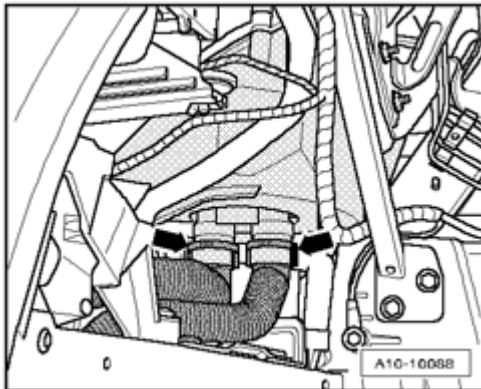


Fig. 296: Air Duct Hoses
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull off both air duct hoses - **arrows** - at bottom of lower part of left air filter housing by pressing release buttons.

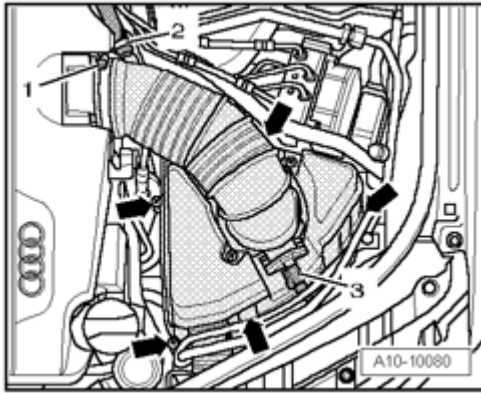


Fig. 297: Mass Air Flow (MAF) Sensor 2 G246 Electrical Connector, Air Duct Hose, Intake Manifold Air Duct Hose & Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Separate electrical connector - **3** - for Mass Air Flow (MAF) sensor 2 G246.
- Disconnect hose - **2** - from air duct.
- Disconnect air duct - **1** - at intake manifold.
- Remove bolts - **arrows** -.
- Remove upper part of left air filter housing.

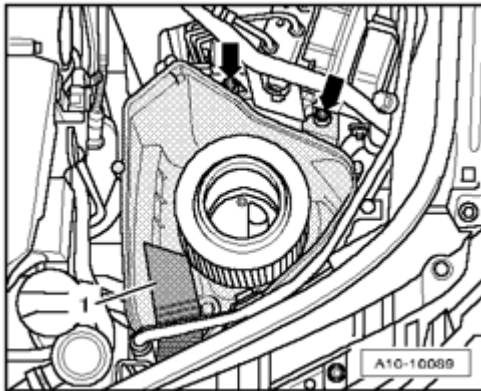


Fig. 298: Air Duct & Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove air duct - **1** -.
- Remove bolts - **arrows** -.
- Remove lower part of left air filter housing.

NOTE:

- Place a rag under the hydraulic line to catch escaping hydraulic fluid.

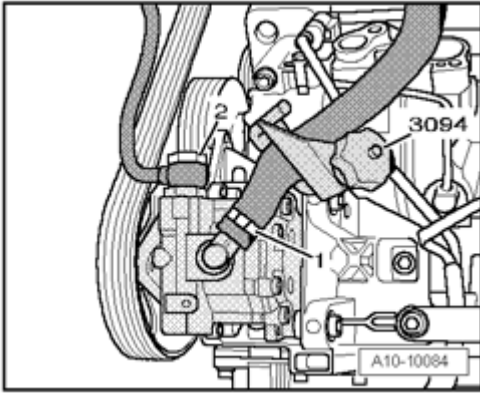


Fig. 299: Identifying Hydraulic Hose, Hydraulic Pressure Line & Hose Clamps 3094
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect hydraulic pressure line - 2 - at power steering pump and set it aside on top of longitudinal member.

NOTE: • Ignore - 1 - in the illustration.

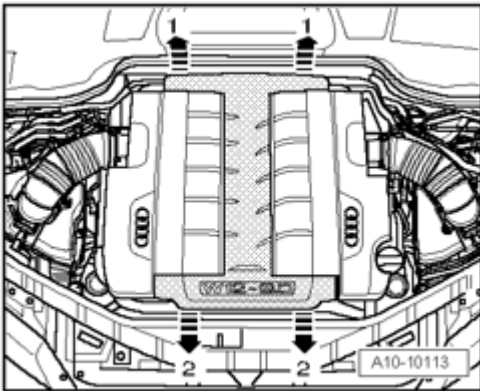
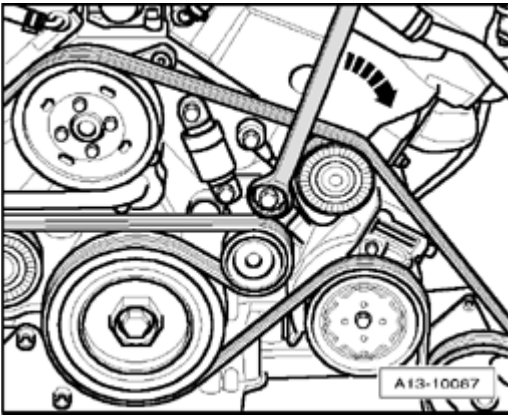


Fig. 300: Pulling Engine Cover At Rear And Middle Upward And Off & Pulling Engine Cover Forward And Off Of Intake Manifold
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Carefully pull engine cover at rear and middle upward and off - **arrows 1** -.
- Then, pull engine cover forward and off of intake manifold - **arrows 2** -.

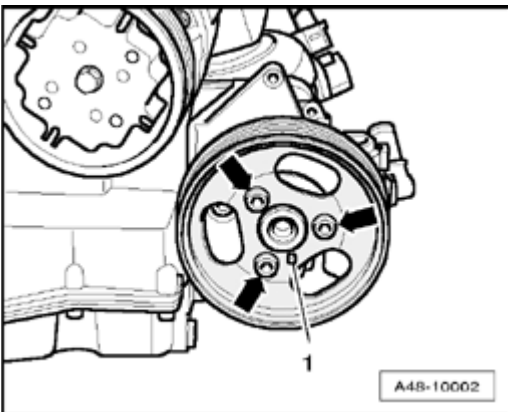
**Fig. 301: Relieving Tension On Ribbed Belt**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pivot tensioning device in direction of - **arrow** - to relieve tension on ribbed belt.
- Remove ribbed belt from power steering pump belt pulley and release tensioning device.

NOTE:

- **The ribbed belt stays in position on the remaining belt pulleys.**

**Fig. 302: Power Steering Pump Belt Pulley Bolts**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and remove belt pulley - **1** - from power steering pump.

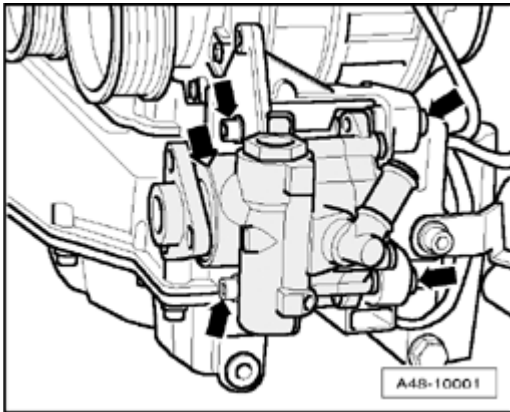


Fig. 303: Power Steering Pump Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and remove power steering pump.

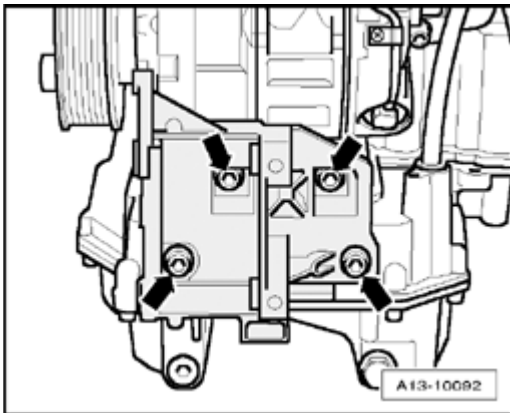
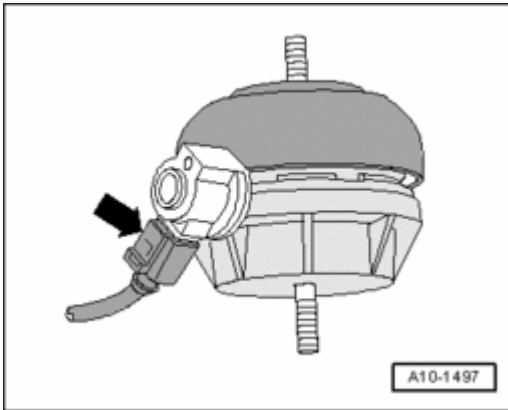


Fig. 304: Bracket For Power Steering Pump & Bolts

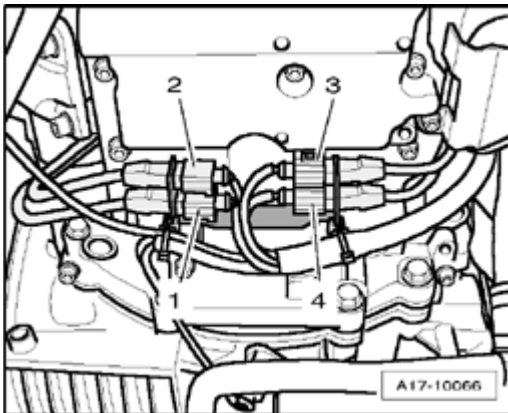
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and remove bracket for power steering pump.
- Lower subframe --> **Subframe, Lowering for Repair** .
- Remove oil pan lower part --> **Oil Pan Lower Section, Removing and Installing.**
- Remove oil pump --> **Oil Pump, Removing and Installing** .

**Fig. 305: Left Engine Mount Electrical Connector**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **arrow** - at left engine mount and move electrical wiring clear.

**Fig. 306: Oil Pan Upper Part Electrical Harness Connectors**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove retainer for connections - **1 to 4** - from oil pan upper part.
- Disconnect electrical harness connectors - **1 to 4** -.
- Remove engine/transmission bolts in area of oil pan upper part.
- Remove bolts for oil pan upper part.
- Remove oil pan upper part.

Installing

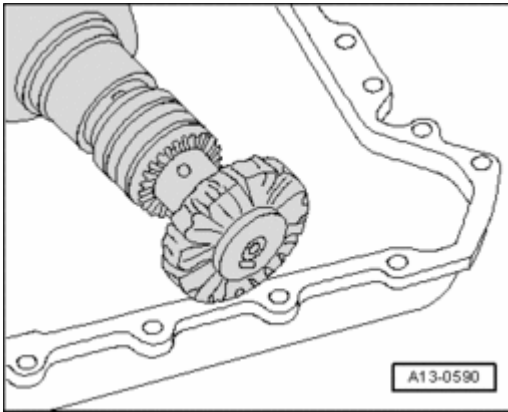


Fig. 307: Using Rotating Plastic Brush To Remove Sealant Residue On Timing Chain Covers And On Cylinder Block And Cylinder Head

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using rotating plastic brush, remove any remaining sealant from oil pan upper part and engine bearing bracket.

CAUTION: Wear safety glasses.

- Clean sealing surfaces and ensure they are free of oil and grease.

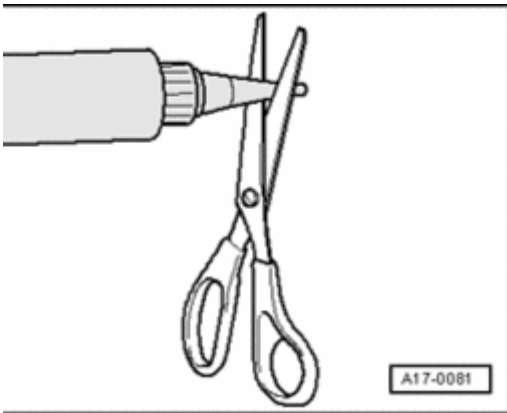


Fig. 308: Cutting Tube Nozzle At Front Marking

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Cut off nozzle on tube of sealant at front mark (diameter of nozzle approx. 2 mm).

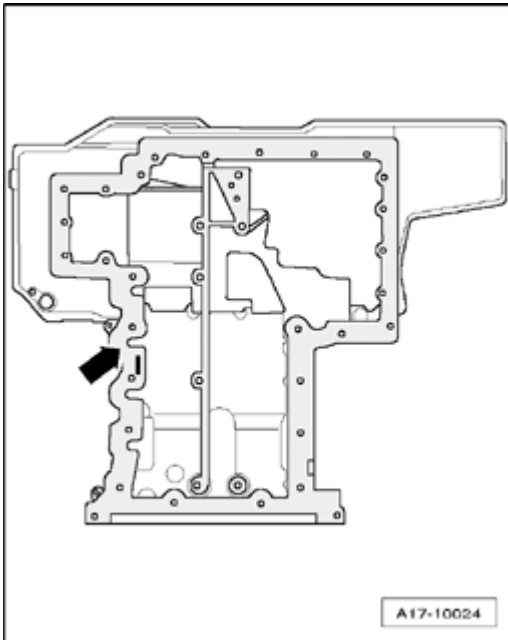


Fig. 309: Applying Sealant Bead On Clean Sealing Surface Of Oil Pan Upper Part
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Apply sealant bead - **arrow** - on clean sealing surface of oil pan upper part as shown in illustration.
- Thickness of sealant bead: 1.5 to 2 mm.

NOTE:

- Sealant bead must not be thicker than specified, otherwise sealant could get into oil pan and clog the oil pump strainer.

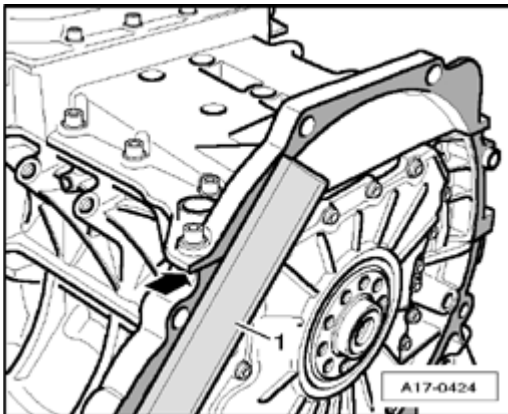


Fig. 310: Identifying Contact Surfaces Of Cylinder Block And Oil Pan Upper Part Are Aligned To Transmission

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- The oil pan upper part must be installed within 5 minutes after application of sealant.
- With the engine removed, make sure that the contact surfaces of the cylinder block and the oil pan upper part are aligned to the transmission - **arrow** -.

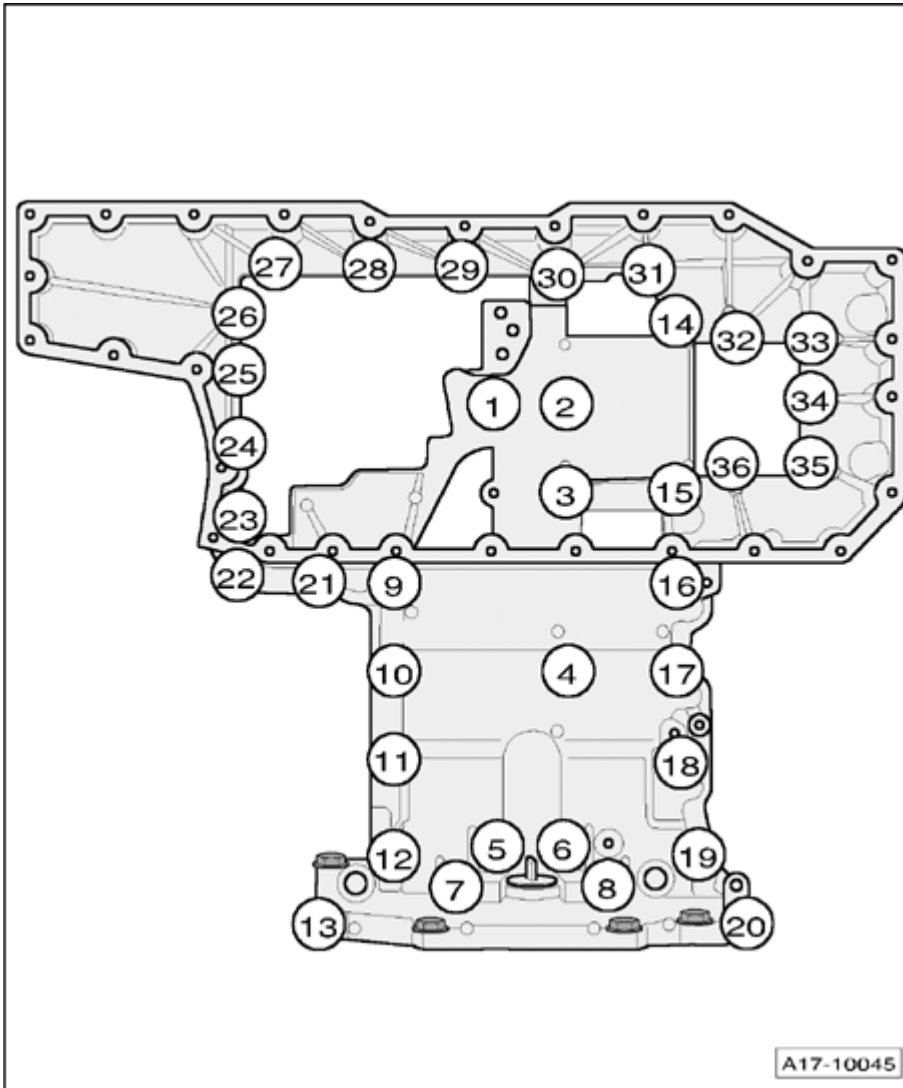


Fig. 311: Oil Pan Upper Section Bolts Tightening Sequence
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set oil pan upper part in place and pre-tighten all bolts to 5 Nm in sequence - **1 to 36** -.
- Tighten bolts for oil pan upper part/transmission - **dark shaded areas** - to 45 Nm.
- Tighten bolts - **1 to 36** - to 9 Nm.
- Tighten bolts M8 - **1 to 20** - to 20 Nm.

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

- Install oil pump --> **Oil Pump, Removing and Installing** .
- Install oil pan lower part --> **Oil Pan Lower Section, Removing and Installing**.
- Add engine oil and check oil level --> **Engine Oil Level, Checking** .
- Install subframe --> **40 - FRONT SUSPENSION** .

2009 Audi A8 Quattro

ENGINE 6.0 Liter 12-Cyl. 4V Engine Mechanical, Engine Code(s): BHT, BSB - A8

- Install power steering pump --> **48 - STEERING** .

NOTE:

- After replacing the oil pan upper part, check the alignment of the power steering pump and air conditioning compressor belt pulleys. --> **Power Steering Pump Belt Pulley and Air Conditioning Compressor Belt Pulley, Checking Alignment** .

- Install ribbed belt --> **Ribbed Belt, Removing and Installing** .

Tightening torques

Component		Nm
Oil pan upper part	M6	9
To cylinder block	M8	20
Bracket for power steering pump to engine		32

Oil Filter Bracket, Assembly Overview

Oil Filter Bracket, Assembly Overview

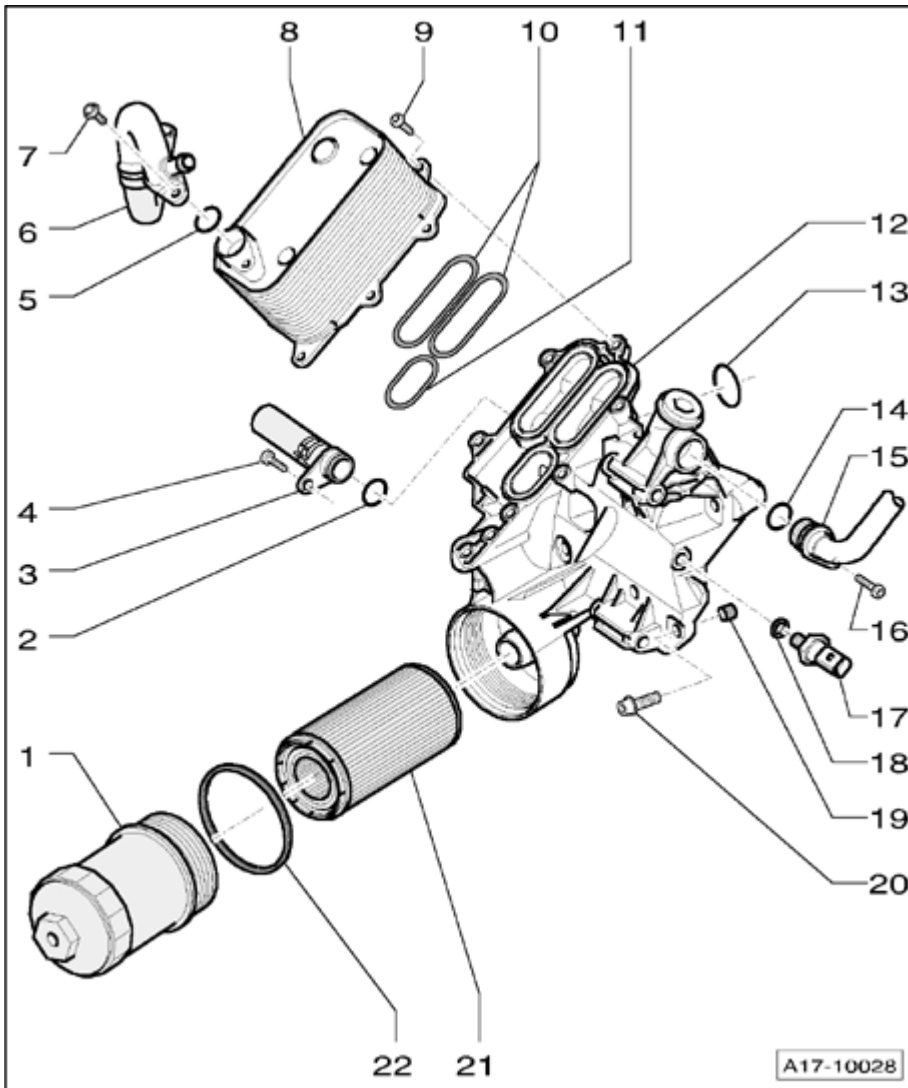


Fig. 312: Oil Filter Bracket, Assembly Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Oil filter housing

- To loosen and tighten, use 36 mm socket wrench
- Fasten to 25 Nm

2 - O-ring

- Replace

3 - Hose connections for coolant hose

- Fasten to 10 Nm

4 - 10 Nm

5 - O-ring

- Replace

6 - Hose connections for coolant hose

- Fasten to 10 Nm

7 - 10 Nm

8 - Engine oil cooler

- Integrated into oil filter housing
- With bypass valve
- Removing and installing --> **Engine Oil Cooler, Removing and Installing**
- Replace coolant after replacing oil cooler

9 - 10 Nm

10 - Oil seals

- Replace

11 - Oil filter bracket

- With filter bypass valve
- Removing and installing --> **Oil Filter Housing, Removing and Installing**

12 - Oil seal

- Replace

13 - O-ring

- Replace

14 - O-ring

- Replace

15 - Front coolant line

- Removing and installing --> **Front coolant pipe, removing and installing**

16 - 10 Nm

17 - Oil pressure switch F1 1.4 bar

- Fasten to 25 Nm
- Black insulation
- Checking, removing and installing --> **Oil Pressure and Oil Pressure Switch, Checking**

18 - Oil seal

- Replace

19 - Alignment bushing

- 2 pieces

20 - 22 Nm

21 - Oil filter element

- Observe change intervals --> Maintenance Service Circular

22 - O-ring

- Replace

Oil Filter Housing, Removing and Installing

Oil Filter Housing, Removing and Installing

Special tools, testers and auxiliary items required

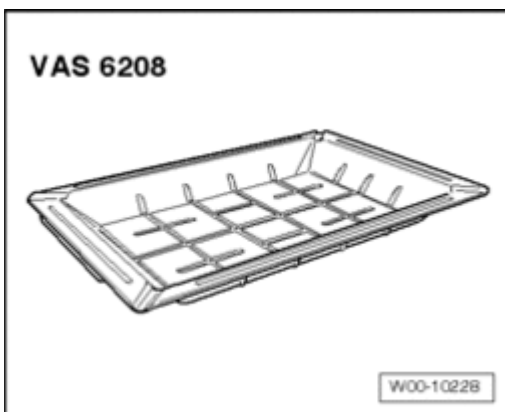


Fig. 313: Drip Tray For Workshop Crane VAS 6208 Or Drip Tray V.A.G 1306
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drip tray for workshop crane VAS 6208 or Drip tray V.A.G 1306

Removing

- Drain coolant --> Cooling System, Draining and Filling .
- Bring lock carrier into service position --> Lock Carrier, Moving into Service Position.

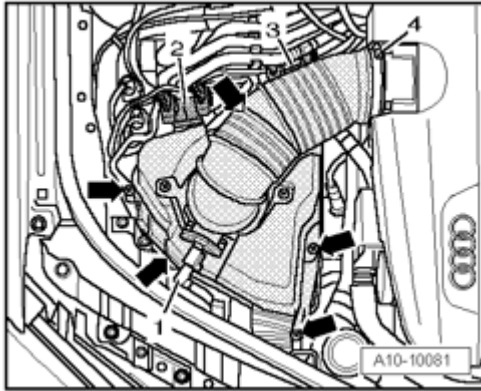


Fig. 314: Mass Air Flow (MAF) Sensor G70 Electrical Connector, Upper Part Of Air Filter Housing Connections, Intake Manifold Air Duct Hose & Bolts
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Separate electrical connector - **1** - for Mass Air Flow (MAF) sensor G70.
- Disconnect air duct - **4** - at intake manifold.
- Unhook retainer for connections - **2** - and - **3** - at upper part of air filter housing.
- Remove bolts - **arrows** -.
- Remove upper part of right air filter housing.

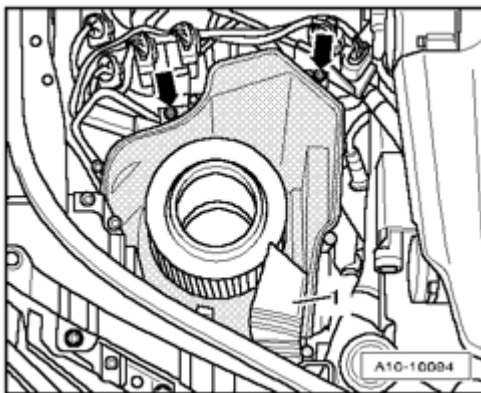
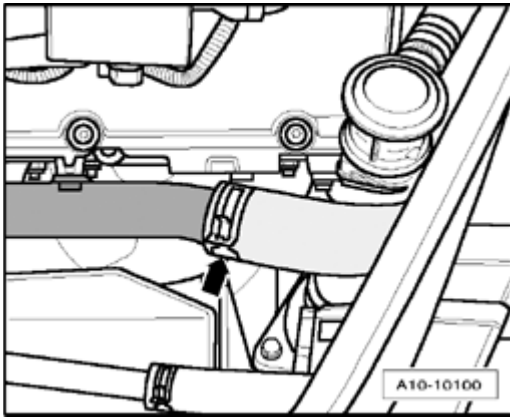


Fig. 315: Air Duct & Bolts
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

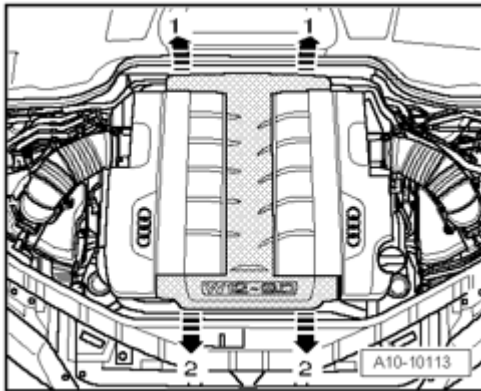
- Remove air duct - **1** -.
- Remove bolts - **arrows** -.
- Remove lower part of right air filter housing.

**Fig. 316: Coolant Hose**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- Place a rag under separating point to catch escaping coolant.
- Disconnect coolant hose - **arrow** - at right on engine.

**Fig. 317: Pulling Engine Cover At Rear And Middle Upward And Off & Pulling Engine Cover Forward And Off Of Intake Manifold**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Carefully pull engine cover at rear and middle upward and off - **arrows 1** -.
- Then, pull engine cover forward and off of intake manifold - **arrows 2** -.

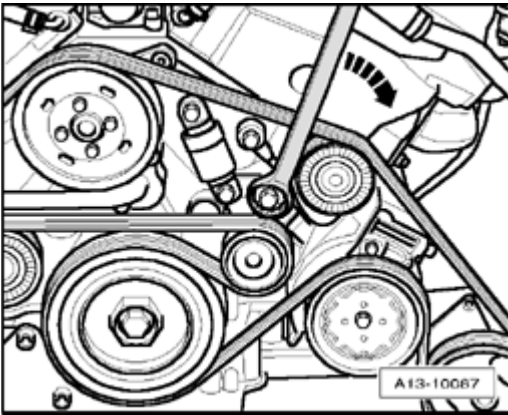


Fig. 318: Relieving Tension On Ribbed Belt

Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

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

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

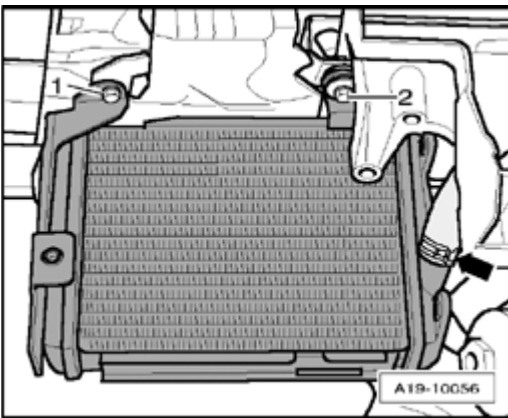


Fig. 319: Auxiliary Radiator Coolant Hose & Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front coolant hose from auxiliary radiator - **arrow** -.
- Remove bolts - **1** - and - **2** -.

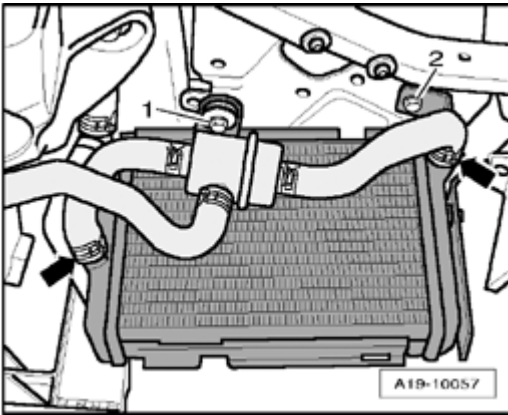


Fig. 320: Auxiliary Radiator, Coolant Hoses & Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect coolant hoses - **arrows** -.
- Remove bolts - **1** - and - **2** -.
- Remove auxiliary radiator.

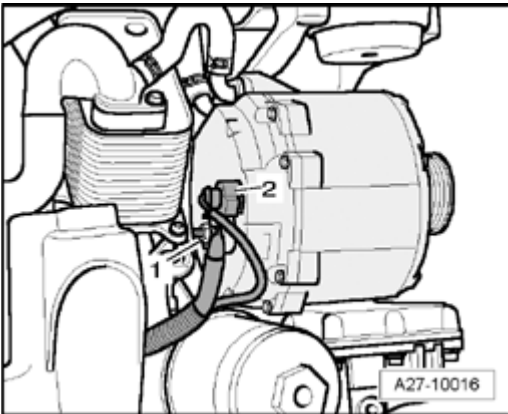


Fig. 321: Generator Electrical Wiring & Electrical Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical wiring - **1** - on Generator.
- Disconnect electrical connector - **2** -.

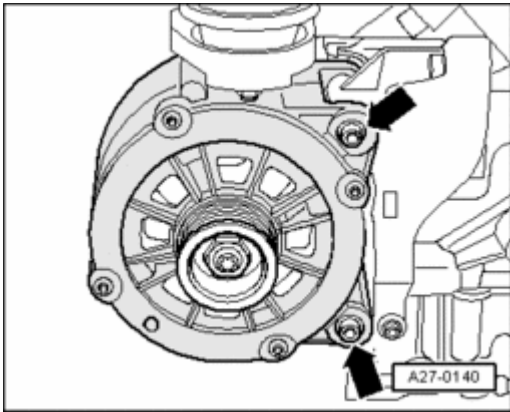


Fig. 322: Identifying Generator Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Pivot Generator downward and slightly toward left side.

NOTE:

- To continue disconnecting and removing the Generator, a second technician is necessary.

CAUTION: Some coolant will drip out.

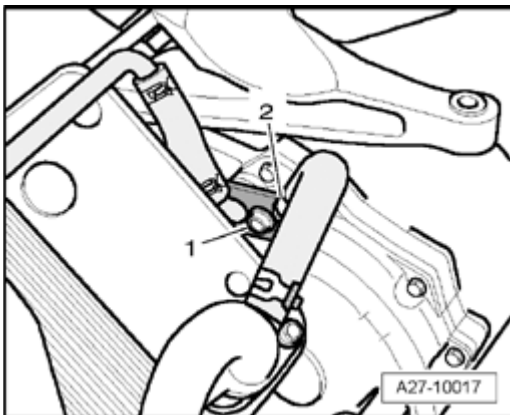


Fig. 323: Generator Bracket Bolt & Coolant Hose

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect coolant hose - **2** - from connection on Generator.
- Mark installed position of connection on Generator
- Unscrew bolt - **1** - and remove bracket.
- Remove both connections from Generator.
- Remove Generator.

- Lower subframe --> **Subframe, Lowering for Repair** .

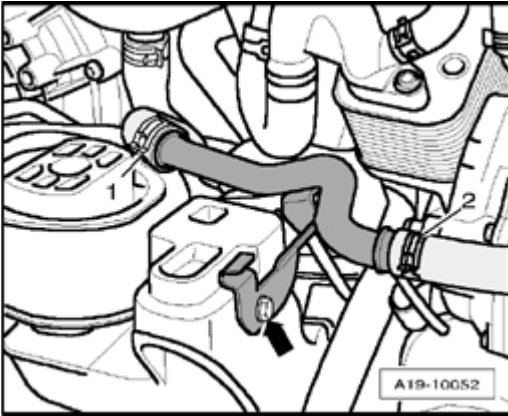


Fig. 324: Coolant Hose & Bolt

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect coolant hoses - **1** - and - **2** - at lower right coolant pipe.
- Remove front right coolant pipe.

NOTE:

- **Disregard - arrow - in the illustration.**

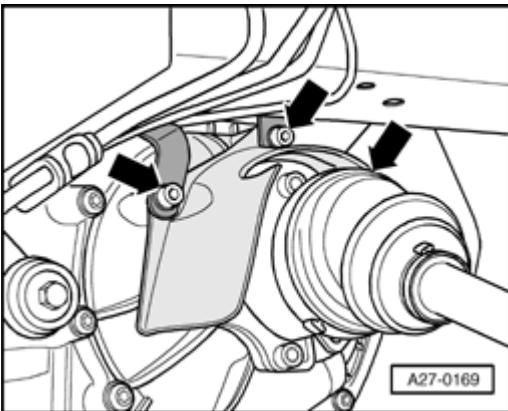


Fig. 325: Right Axle Shaft Heat Shield Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and remove heat shield above right axle shaft from transmission.

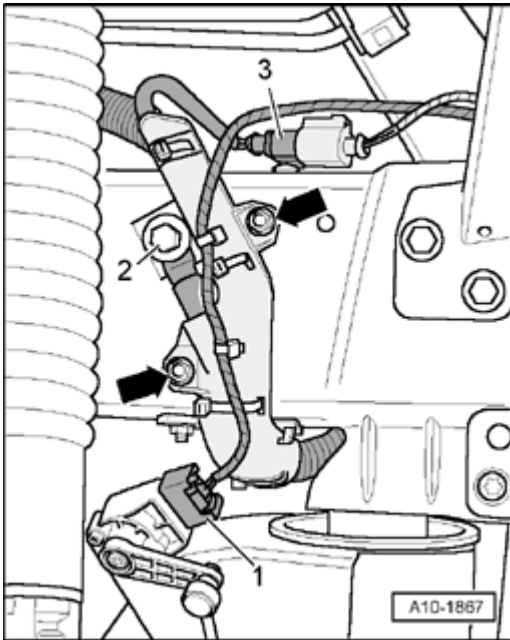


Fig. 326: Disconnecting Electrical Harness Connectors & Ground (GND) Wire On Long Member
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - 3 -.
- Disconnect Ground wire - 2 - on longmember.
- Unfasten bracket for wiring harness on longitudinal member - **arrows** - and lay wiring harness aside.

NOTE: • Ignore - 1 - in the illustration.

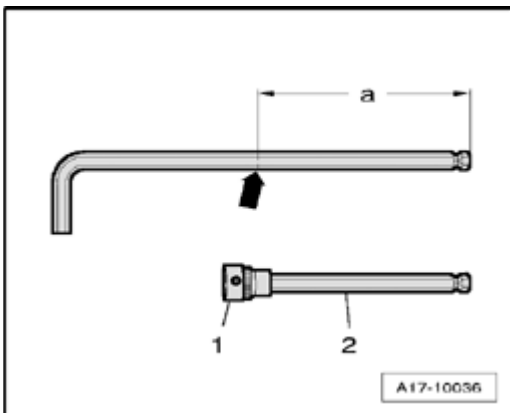


Fig. 327: Crafting Special Tool
Courtesy of VOLKSWAGEN UNITED STATES, INC.

To loosen the upper rear bolt at the engine support, a special tool must first be crafted as follows:

- Cut a long 8 mm Allen key with ball head at point indicated with - **arrow** -.
- Dimension - **a** - = 103 mm.

- Insert cut end - **2** - into an 8 mm socket - **1** -.

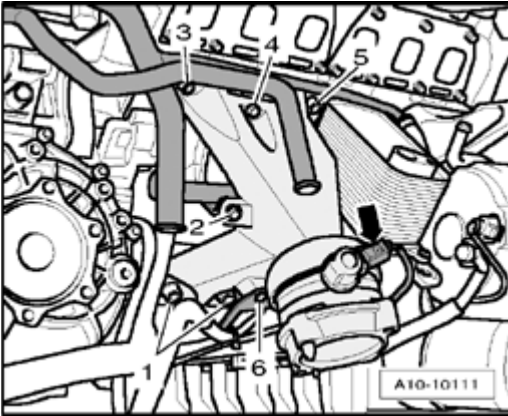


Fig. 328: Right Engine Mount Electrical Harness Connector & Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - **arrow** - at right engine mount.
- Remove bolts - **1 to 6** -.
- Remove engine support with engine mount.

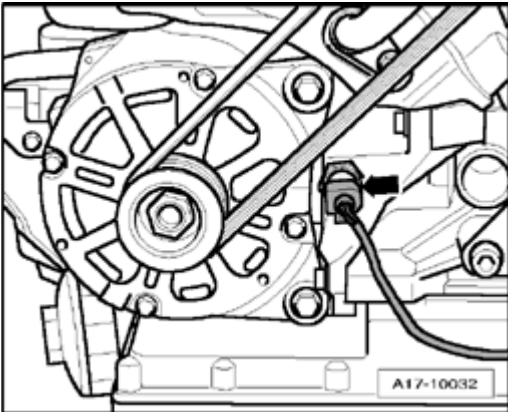


Fig. 329: Oil pressure switch F1 electrical connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **arrow** - at Oil pressure switch -F1-.

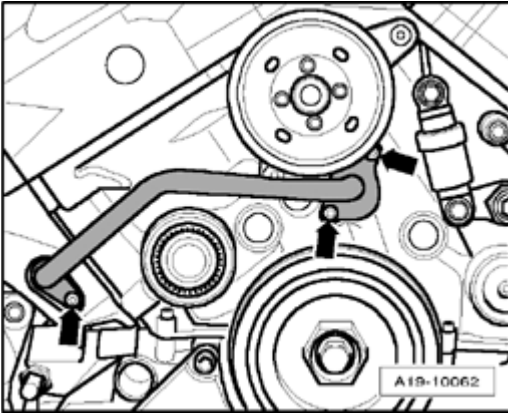


Fig. 330: Front Coolant Pipe Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Remove front coolant pipe.

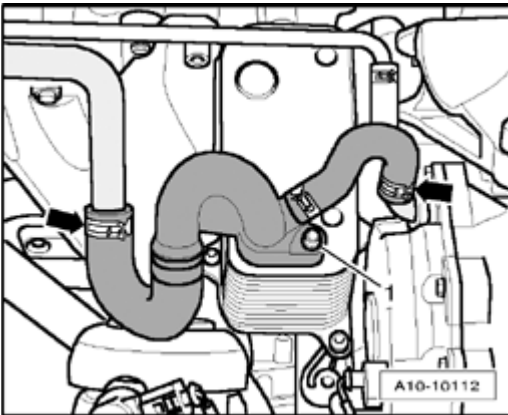


Fig. 331: Coolant Hoses & Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect coolant hose - **left arrow** -.

NOTE:

- **Ignore - right arrow - in the illustration.**

- Remove bolts - **1** -.
- Disconnect hose connection at engine oil cooler.

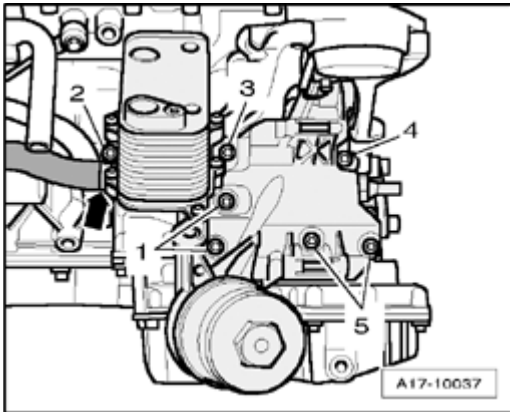


Fig. 332: Oil Filter Housing Coolant Hose & Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place drip tray V.A.G 1306 or drip tray for workshop crane VAS 6208 under engine.
- Disconnect coolant hose - **arrow** -.
- Remove bolts - **1 to 5** -.
- Remove oil filter housing.

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 .**

- Install front coolant pipe --> **Front coolant pipe, removing and installing.**

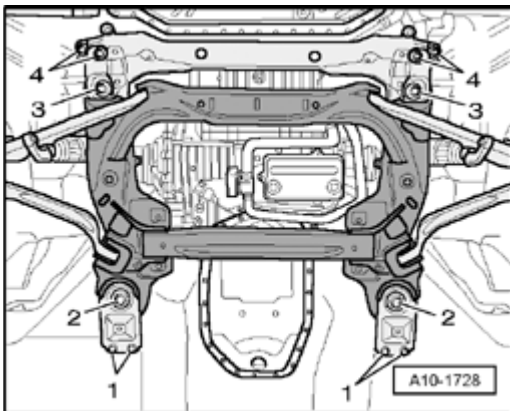


Fig. 333: Removing/Installing Long Member Subframe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Align subframe according to markings on longitudinal members.

2009 Audi A8 Quattro

ENGINE 6.0 Liter 12-Cyl. 4V Engine Mechanical, Engine Code(s): BHT, BSB - A8

- Tighten bolts for subframe only to initial specified torque. Do not tighten further (tighten bolts fully only after wheel alignment).

1. 50 Nm
2. 150 Nm
3. 150 Nm

CAUTION: Vehicle must not be driven in this condition.

- Install air spring dampers --> **40 - FRONT SUSPENSION** .
- Install stabilizer --> **40 - FRONT SUSPENSION** .
- Install Generator --> **27 - BATTERY, STARTER, GENERATOR, CRUISE CONTROL** .
- Install lock carrier with attachments --> **50 - BODY - FRONT** .
- Add engine oil and check oil level --> **Engine Oil Level, Checking** .
- Fill with coolant. --> *Filling* under **Cooling System, Draining and Filling**
- Perform wheel alignment --> **44 - WHEELS, TIRES AND WHEEL ALIGNMENT** .

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

- Check headlight adjustment --> **01 - MAINTENANCE** .

Tightening torques

Component	Nm
Engine carrier to longitudinal member	68
Oil filter housing to engine	22
Coolant connection to engine oil cooler	10
Engine support to engine	40
Coolant pipe to engine support	10
Ground cable to longitudinal member	20
Right heat shield for axle shaft to transmission	23

Engine Oil Cooler, Removing and Installing

Engine Oil Cooler, Removing and Installing

Removing

- Remove oil filter housing --> **Oil Filter Housing, Removing and Installing**.

NOTE:

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

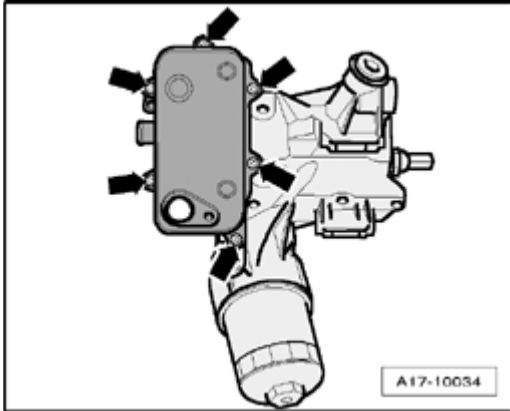


Fig. 334: Engine Oil Cooler Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Remove engine oil cooler.

Installing

Installation is in reverse order of removal. Note the following:

NOTE:

- **Replace seals.**

- Install oil filter housing. --> **Oil Filter Housing, Removing and Installing**

Tightening torque

Component	Nm
Engine oil cooler to oil filter bracket	10

Oil Pressure and Oil Pressure Switch, Checking

Oil Pressure and Oil Pressure Switch, Checking

Special tools, testers and auxiliary items required

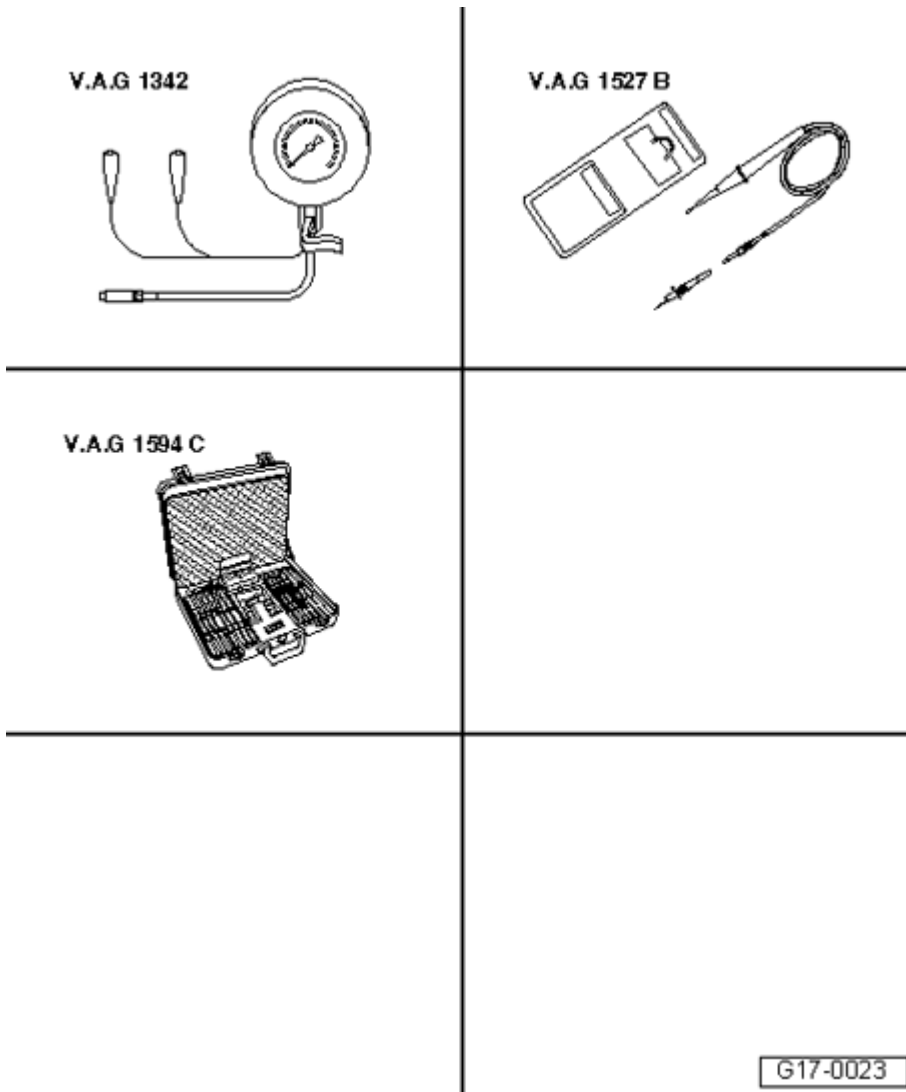


Fig. 335: Identifying Special Tools - Oil Pressure And Oil Pressure Switch, Checking
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Oil pressure gauge V.A.G 1342
- Voltage tester V.A.G 1527 B
- Connector test set V.A.G 1594 C

Conditions

- Oil level OK
- Engine oil temperature approx. 80 C

Work sequence

- Activate vehicle lifting mode --> **43 - SELF LEVELING SUSPENSION** .

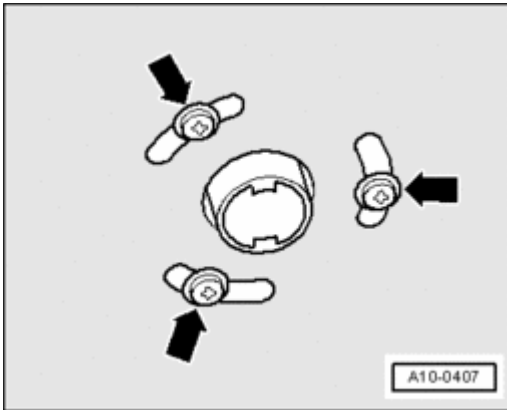


Fig. 336: Identifying Exhaust Pipe Fasteners

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

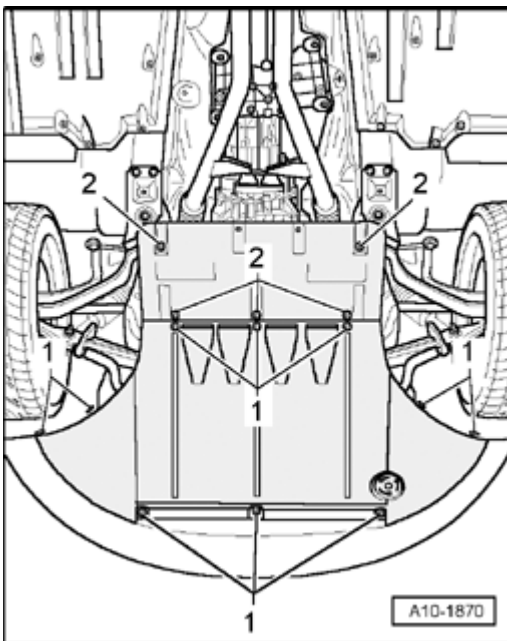


Fig. 337: Noise Insulation Quick-Release Fasteners

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen quick-release fasteners - **1** - and remove front sound insulation.

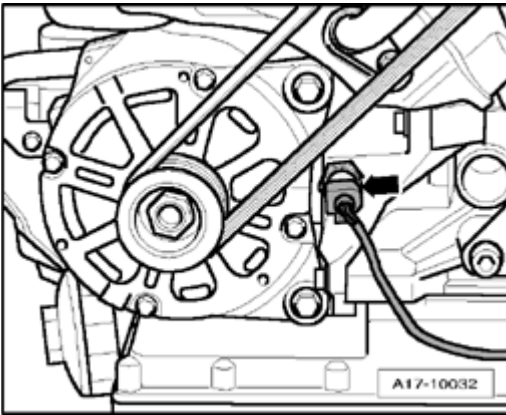


Fig. 338: Oil pressure switch F1 electrical connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **arrow** - at Oil pressure switch -F1-.
- Remove oil pressure switch.
- Thread adapter V.A.G 1342/14 into hole for oil pressure switch.

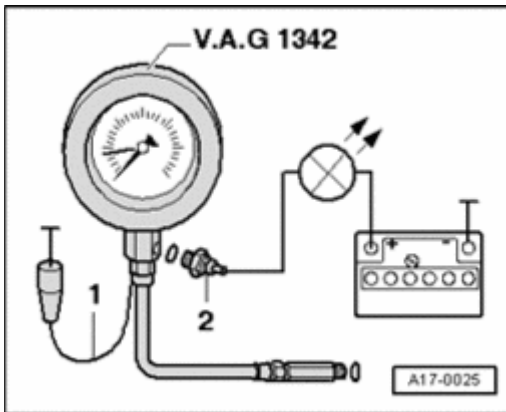


Fig. 339: Connecting Oil Pressure Gauge V.A.G 1342 To Adapter V.A.G 1342/14
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect oil pressure gauge V.A.G 1342 to adapter V.A.G 1342/14.
- Screw oil pressure switch - 2 - into oil pressure gauge V.A.G 1342.
- Place brown wire of oil pressure gauge to Ground (-).

Oil pressure switch, checking

- Connect voltage tester V.A.G 1527 B - 1 - with adapter cables from connector test kit V.A.G 1594 C to oil pressure switch and battery positive (+).
- LED must not light up.

If LED lights up:

2009 Audi A8 Quattro

ENGINE 6.0 Liter 12-Cyl. 4V Engine Mechanical, Engine Code(s): BHT, BSB - A8

- 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. 0.8 bar
- Oil pressure at 2000 RPM: min. 3.0 bar
- Oil pressure at increased engine speed: max. 7.0 bar

If specifications are not obtained the pressure relief valve or the oil pump is malfunctioning.

- Replace oil pump.

Assembling

Assembly is in reverse order of removal. Note the following:

- NOTE:**
- Replace seal.

- Deactivate vehicle lifting mode --> **43 - SELF LEVELING SUSPENSION** .

Tightening torque

Component	Nm
Oil pressure switch to engine	25

Engine Oil

Engine Oil

Viscosity classes and oil specifications

--> Fluid Capacity Chart.

Oil filling quantities --> Fluid Capacity Chart.

Engine Oil Level, Checking

Engine Oil Level, Checking

NOTE:

- Oil level must not exceed the max. marking danger of catalytic converter damage!

Conditions

- 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.

Work sequence

- Pull out oil dipstick, wipe off with a clean cloth and reinsert dipstick again up to stop.
- Withdraw dipstick again and read oil level.

Range of markings on dipstick:

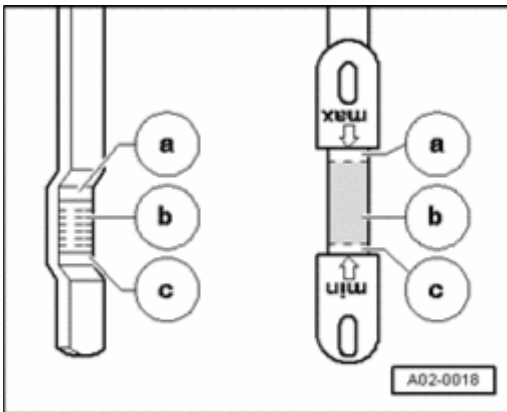


Fig. 340: Range Of Markings On Dipstick

Courtesy of VOLKSWAGEN UNITED STATES, INC.

a - Oil must not be added.

b - Oil may be topped up. After topping up, oil may be in range - a -.

c - Oil must be added. After topping up, it is sufficient if oil level is somewhere in range - b - (shaded area).

NOTE:

- Oil level must not exceed max. marking - a - and must not fall short of min. marking - c -.

19 - COOLING SYSTEM

COOLING SYSTEM COMPONENTS, REMOVING AND INSTALLING

Cooling System Components, Removing and Installing

--> **Cooling System, Component Overview**

--> **Cooling System, Draining and Filling**

--> **Coolant Pump, Removing and Installing**

--> **After-Run Coolant Pump, Removing and Installing**

--> **Coolant thermostat, checking**

--> **Coolant thermostat, removing and installing**

--> **Upper coolant pipe, removing and installing**

--> **Upper left coolant pipe, removing and installing**

--> **Lower left coolant pipe, removing and installing**

--> **Right front coolant pipe, removing and installing**

--> **Upper right coolant pipe, removing and installing**

--> **Middle right coolant pipe, removing and installing**

--> **Lower right coolant pipe, removing and installing**

--> **Front coolant pipe, removing and installing**

--> **Radiator and coolant fan, assembly overview**

--> **Radiator, removing and installing**

--> **Fan shroud, removing and installing**

--> **Coolant fan, removing and installing**

--> **Auxiliary cooler, removing and installing**

--> **Cooling System, Checking for Leaks**

Cooling System, Component Overview

Cooling System, Component Overview

Cooling system version for countries with cold climates without auxiliary heater - long wheelbase

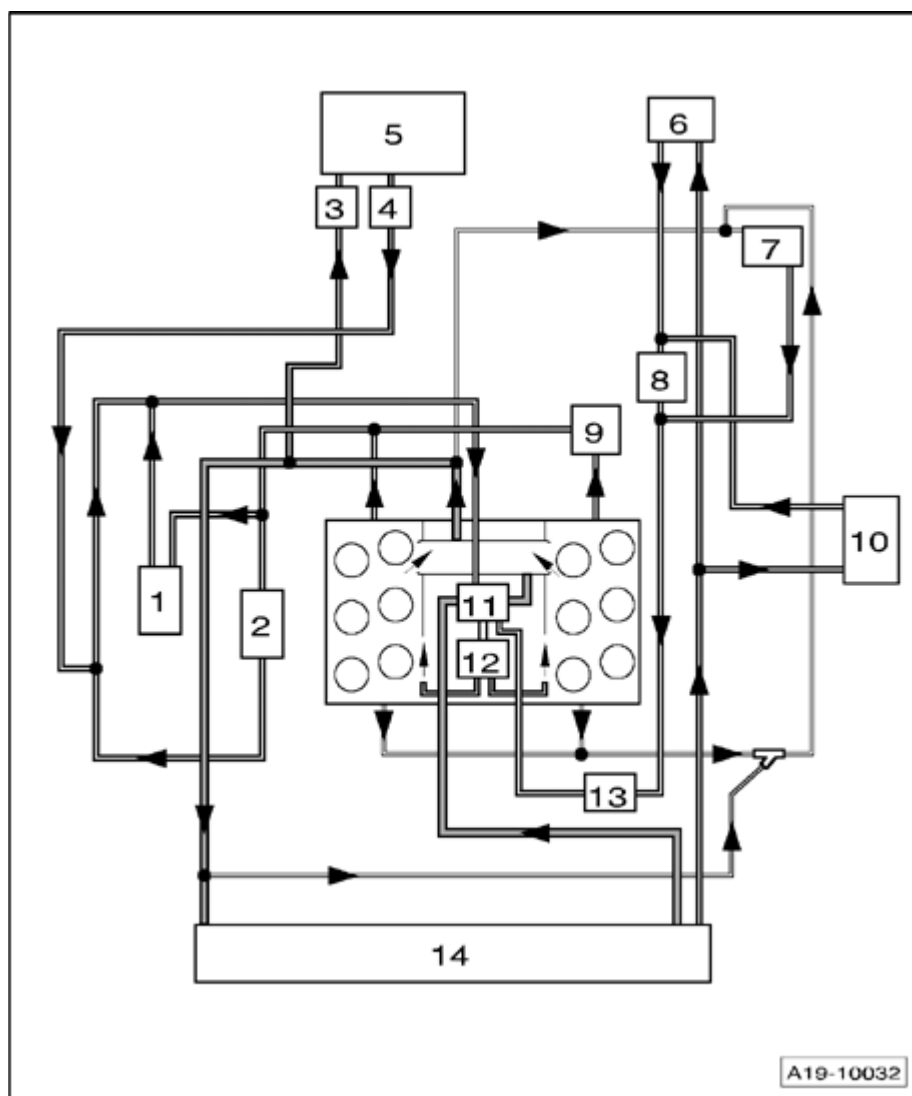


Fig. 341: Cooling System, Component Overview - Cooling System Version For Countries With Cold Climates Without Auxiliary Heater - Long Wheelbase
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Generator

2 - Engine oil cooler

- Removing and installing --> **Engine Oil Cooler, Removing and Installing**
- Replace coolant after replacing oil cooler

3 - Bleeder screw

4 - Bleeder screw

5 - Heater core

- Replace coolant after replacing

6 - ATF cooler

- Replace coolant after replacing ATF cooler

7 - Coolant expansion tank

- With cap
- Pressure relief valve in cap, checking --> **Checking pressure relief valve in cap**

8 - Coolant thermostat

- For ATF cooler and transfer gear oil cooler

9 - Engine Coolant Temperature (ECT) sensor G62

10 - Gear oil cooler for transfer gear

- Replace coolant after replacing gear oil cooler

11 - Coolant thermostat

- Checking --> **Coolant thermostat, checking**
- Removing and installing --> **Coolant thermostat, removing and installing**

12 - Coolant pump

- Removing and installing --> **Coolant Pump, Removing and Installing**

13 - After-run coolant pump V51

- Removing and installing --> **After-Run Coolant Pump, Removing and Installing**

14 - Radiator

- Removing and installing --> **Radiator, removing and installing**
- Replace coolant after replacing radiator

Cooling system version for countries with hot climates without auxiliary heater (including USA) - long wheelbase

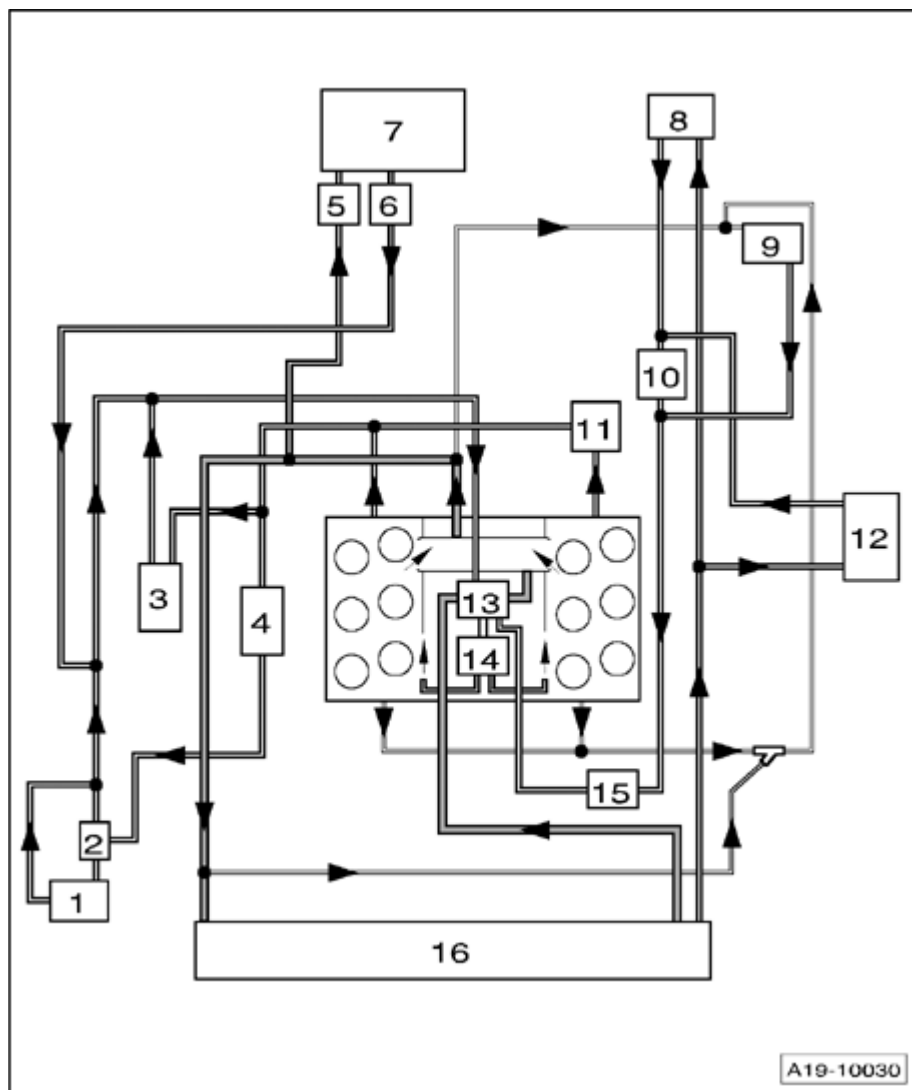


Fig. 342: Cooling System, Component Overview - Cooling System Version For Countries With Hot Climates Without Auxiliary Heater (Including USA) - Long Wheelbase
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Auxiliary cooler

- Removing and installing --> **Auxiliary cooler, removing and installing**
- Replace coolant after replacing auxiliary cooler

2 - Coolant thermostat for auxiliary cooler

3 - Generator

4 - Engine oil cooler

- Removing and installing --> **Engine Oil Cooler, Removing and Installing**

- Replace coolant after replacing engine oil cooler

5 - Bleeder screw

6 - Bleeder screw

7 - Heater core

- Replace coolant after replacing heater core

8 - ATF cooler

- Replace coolant after replacing ATF cooler

9 - Coolant expansion tank

- With pressure relief valve in cap, checking --> **Checking pressure relief valve in cap**

10 - Coolant thermostat

- For ATF cooler and gear oil cooler for transfer gear

11 - Engine Coolant Temperature (ECT) sensor G62

12 - Gear oil cooler for transfer gear

- Replace coolant after replacing gear oil cooler

13 - Coolant thermostat

- Checking --> **Coolant thermostat, checking**
- Removing and installing --> **Coolant thermostat, removing and installing**

14 - Coolant pump

- Removing and installing --> **Coolant Pump, Removing and Installing**

15 - After-run coolant pump V51

- Removing and installing --> **After-Run Coolant Pump, Removing and Installing**

16 - Radiator

- Removing and installing --> **Radiator, removing and installing**
- Replace coolant after replacing

Cooling system version for countries with very hot climates without auxiliary heater - normal wheelbase

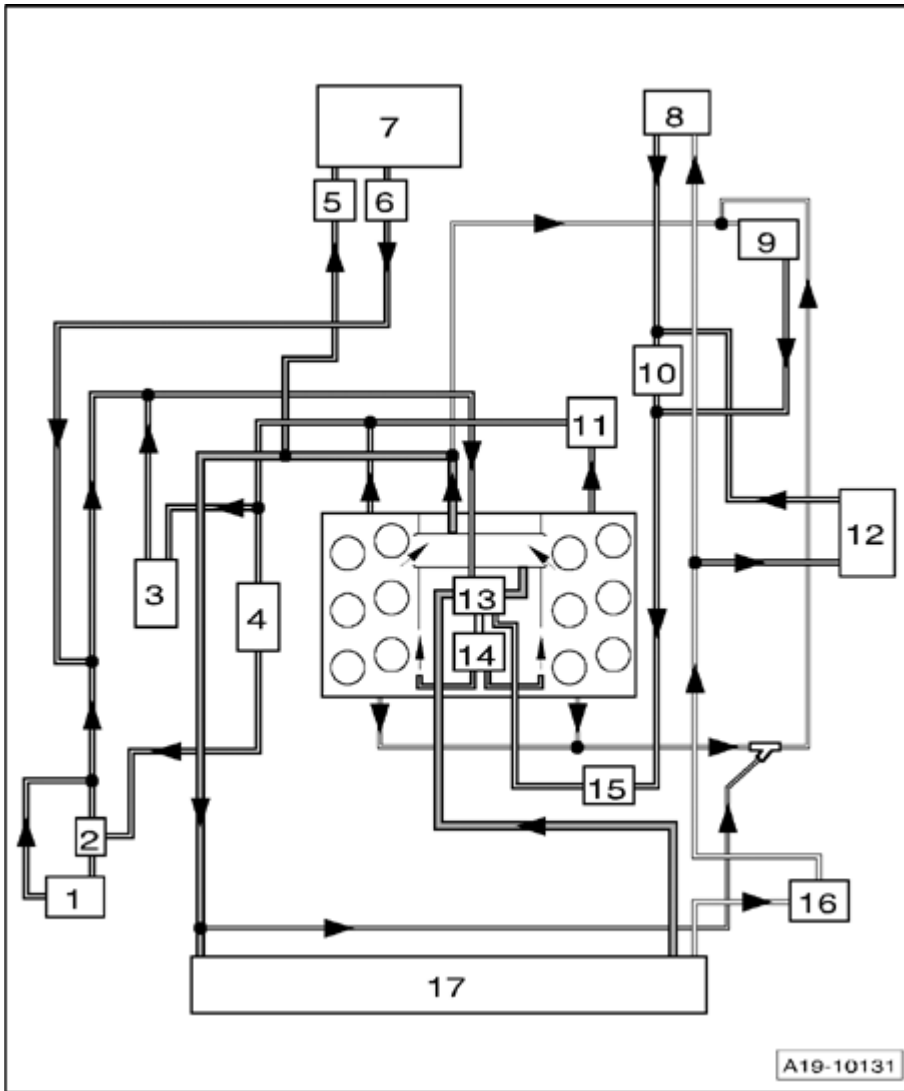


Fig. 343: Cooling System, Component Overview - Cooling System Version For Countries With Very Hot Climates Without Auxiliary Heater - Normal Wheelbase
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Auxiliary cooler

- Removing and installing --> **Auxiliary cooler, removing and installing**
- Replace coolant after replacing auxiliary cooler

2 - Coolant thermostat for auxiliary cooler

3 - Generator

4 - Engine oil cooler

- Removing and installing --> **Engine Oil Cooler, Removing and Installing**
- Replace coolant after replacing engine oil cooler

5 - Bleeder screw

6 - Bleeder screw

7 - Heater core

- Replace coolant after replacing heater core

8 - ATF cooler

- Replace coolant after replacing ATF cooler

9 - Coolant expansion tank

- With pressure relief valve in cap, checking --> **Checking pressure relief valve in cap**

10 - Coolant thermostat

- For ATF cooler and gear oil cooler for transfer gear

11 - Engine Coolant Temperature (ECT) sensor G62

12 - Gear oil cooler for transfer gear

- Replace coolant after replacing gear oil cooler

13 - Coolant thermostat

- Checking --> **Coolant thermostat, checking**
- Removing and installing --> **Coolant thermostat, removing and installing**

14 - Coolant pump

- Removing and installing --> **Coolant Pump, Removing and Installing**

15 - After-run coolant pump V51

- Removing and installing --> **After-Run Coolant Pump, Removing and Installing**

16 - Auxiliary cooler

- Removing and installing --> **Auxiliary cooler, removing and installing**
- Replace coolant after replacing auxiliary cooler

17 - Radiator

- Removing and installing --> **Radiator, removing and installing**
- Replace coolant after replacing radiator

Cooling system version for countries with cold and hot climates without auxiliary heater - normal wheelbase

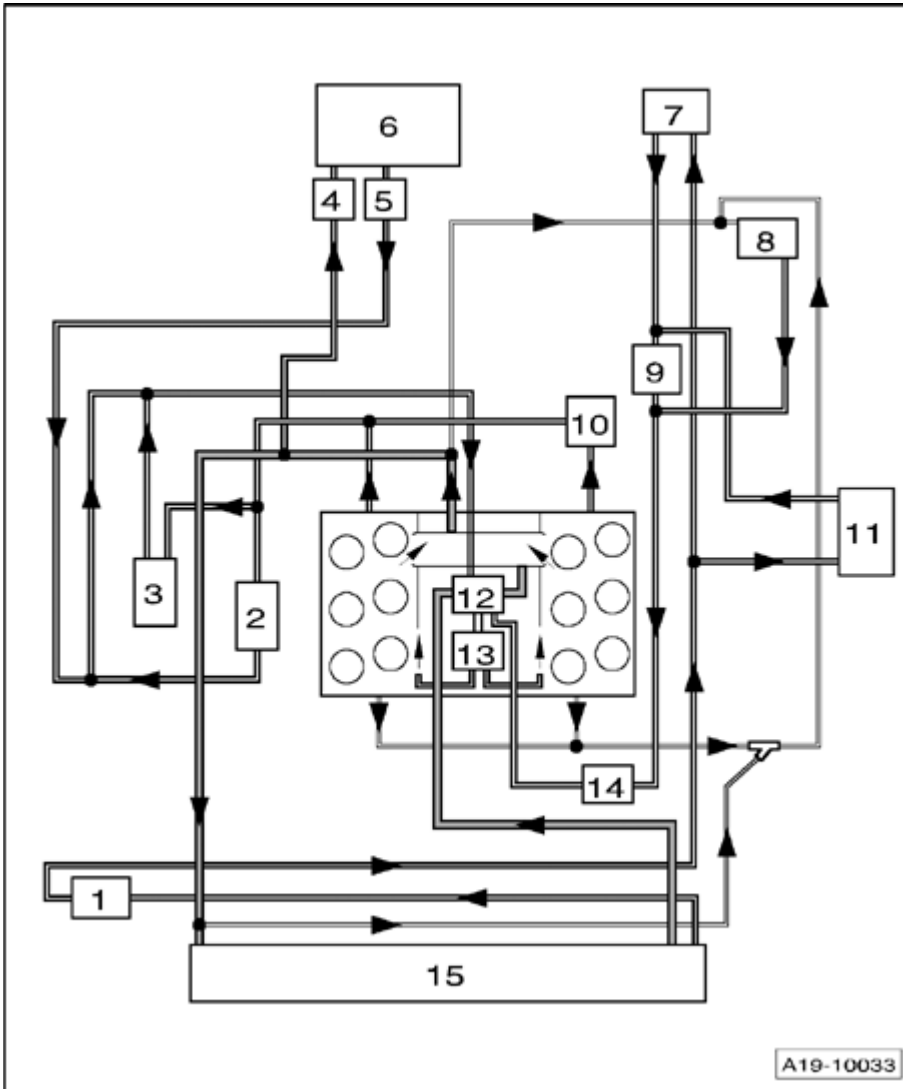


Fig. 344: Cooling System, Component Overview - Cooling System Version For Countries With Cold And Hot Climates Without Auxiliary Heater - Normal Wheelbase
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Auxiliary cooler

- Removing and installing --> **Auxiliary cooler, removing and installing**
- Replace coolant after replacing auxiliary cooler

2 - Engine oil cooler

- Removing and installing --> **Engine Oil Cooler, Removing and Installing**
- Replace coolant after replacing engine oil cooler

3 - Generator

4 - Bleeder screw

5 - Bleeder screw

6 - Heater core

- Replace coolant after replacing heater core

7 - ATF cooler

- Replace coolant after replacing ATF cooler

8 - Coolant expansion tank

- With pressure relief valve in cap, checking --> **Checking pressure relief valve in cap**

9 - Coolant thermostat

- For ATF cooler and gear oil cooler for transfer gear

10 - Engine Coolant Temperature (ECT) sensor G62

11 - Gear oil cooler for transfer gear

- Replace coolant after replacing gear oil cooler

12 - Coolant thermostat

- Checking --> **Coolant thermostat, checking**
- Removing and installing --> **Coolant thermostat, removing and installing**

13 - Coolant pump

- Removing and installing --> **Coolant Pump, Removing and Installing**

14 - After-run coolant pump V51

- Removing and installing --> **After-Run Coolant Pump, Removing and Installing**

15 - Radiator

- Removing and installing --> **Radiator, removing and installing**
- Replace coolant after replacing radiator

Cooling system version for countries with cold and hot climates with auxiliary heater and towing package - long wheelbase

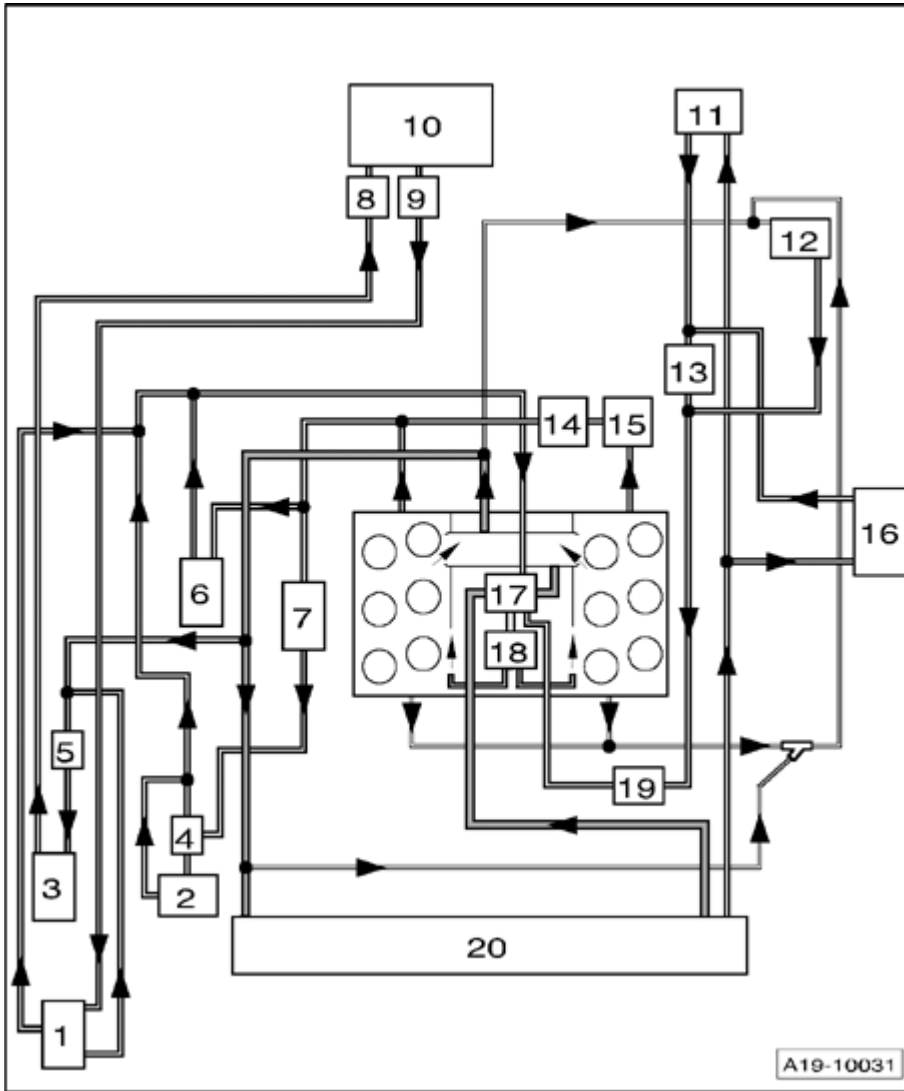


Fig. 345: Cooling System, Component Overview - Cooling System Version For Countries With Cold And Hot Climates With Auxiliary Heater And Towing Package - Long Wheelbase
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 1 - Engine Coolant (EC) switch-off valve (heater) N279
- 2 - Auxiliary cooler

- Removing and installing --> **Auxiliary cooler, removing and installing**
- Replace coolant after replacing auxiliary cooler

3 - Auxiliary heater

4 - Coolant thermostat for auxiliary cooler

5 - Recirculation Pump V55 for auxiliary heater

6 - Generator

7 - Engine oil cooler

- Removing and installing --> **Engine Oil Cooler, Removing and Installing**
- Replace coolant after replacing engine oil cooler

8 - Bleeder screw

9 - Bleeder screw

10 - Heater core

- Replace coolant after replacing heater core

11 - ATF cooler

- Replace coolant after replacing ATF cooler

12 - Coolant expansion tank

- With pressure relief valve in cap, checking --> **Checking pressure relief valve in cap**

13 - Coolant thermostat

- For ATF cooler and gear oil cooler for transfer gear

14 - Non-return valve

15 - Engine Coolant Temperature (ECT) sensor G62

16 - Gear oil cooler for transfer gear

- Replace coolant after replacing gear oil cooler

17 - Coolant thermostat

- Checking --> **Coolant thermostat, checking**
- Removing and installing --> **Coolant thermostat, removing and installing**

18 - Coolant pump

- Removing and installing --> **Coolant Pump, Removing and Installing**

19 - After-run coolant pump V51

- Removing and installing --> **After-Run Coolant Pump, Removing and Installing**

20 - Radiator

- Removing and installing --> **Radiator, removing and installing**
- Replace coolant after replacing radiator

Cooling System, Draining and Filling**Cooling System, Draining and Filling****Special tools, testers and auxiliary items required**

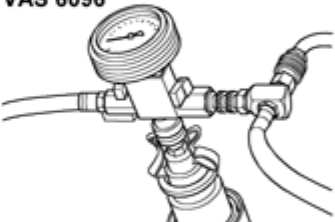
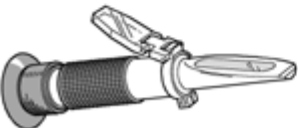
V.A.G 1274/8 	V.A.G 1306 
V.A.G 1921 	VAS 6096 
T10007 	G19-0016

Fig. 346: Identifying Special Tools - Cooling System, Draining And Filling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Adapter V.A.G 1274/8
- Drip tray V.A.G 1306 or drip tray VAS 6208
- Hose clamp pliers V.A.G 1921
- Cooling system charge unit VAS 6096
- Refractometer T10007

Draining

- Activate vehicle lifting mode --> **43 - SELF LEVELING SUSPENSION** .

NOTE:

- **Drained coolant must be stored in a clean container for disposal or reuse.**

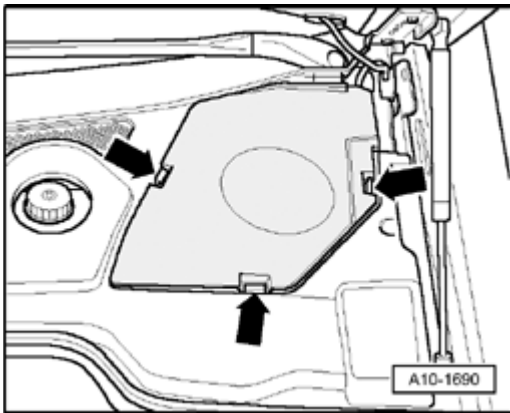


Fig. 347: Cover Above Coolant Reservoir
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove cover above coolant reservoir - **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.

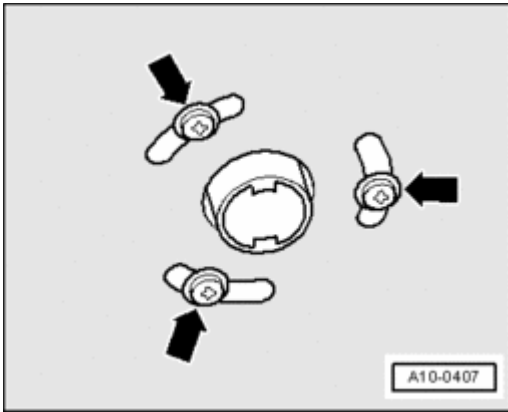


Fig. 348: Identifying Exhaust Pipe Fasteners

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

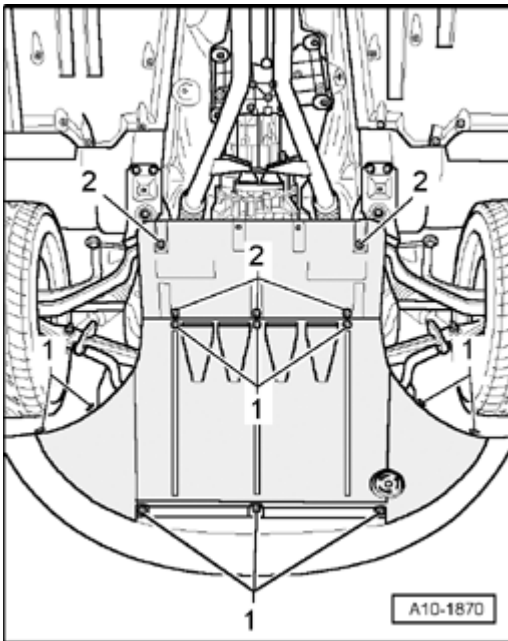


Fig. 349: Noise Insulation Quick-Release Fasteners

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen quick-release fasteners - **1** - and remove front sound insulation.

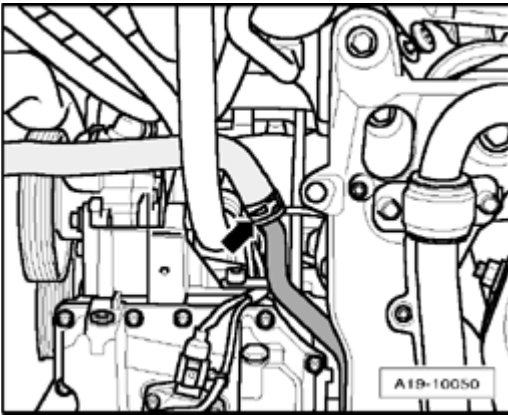


Fig. 350: Left Coolant Pipe Coolant Hose
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place drip tray V.A.G 1306 or drip tray VAS 6208 under engine.
- Disconnect coolant hose - **arrow** - from left coolant pipe and drain coolant.

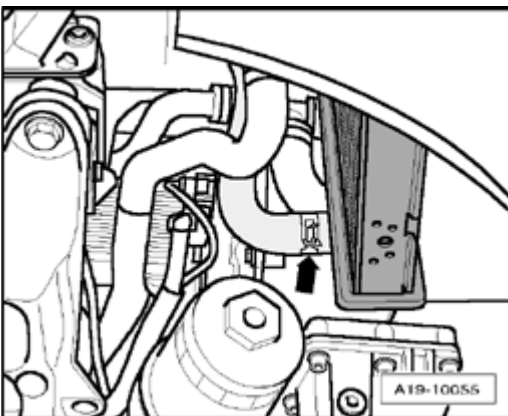


Fig. 351: Auxiliary Cooler Lower Right Coolant Hose
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove lower right coolant hose from auxiliary cooler - **arrow** - and allow remaining coolant to drain.

Filling

- CAUTION:**
- Refilling the cooling system must be performed exclusively using the cooling system charge unit VAS 6096. Otherwise, automatic transmission malfunctions could occur.

NOTE:

- The cooling system is filled all year round with a mixture of frost and corrosion protection additives and water.
- Only coolant additive Plus G 012 A8F A1 (short: G12+) "according to TL VW 774 F" may be used. Other coolant additives may 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 greater frost protection is required for climatic reasons, 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, cylinder block or any of the auxiliary coolers is replaced, completely replace the engine coolant.
- Dirty coolant must not be reused.
- For coolant G12+ , use refractometer T10007 to test frost protection in cooling system.

Conditions

- Ignition switched off.

Work sequence

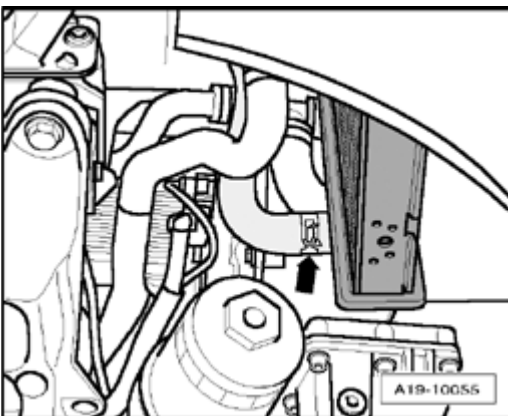


Fig. 352: Auxiliary Cooler Lower Right Coolant Hose
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect lower right coolant hose to auxiliary cooler - **arrow** -.

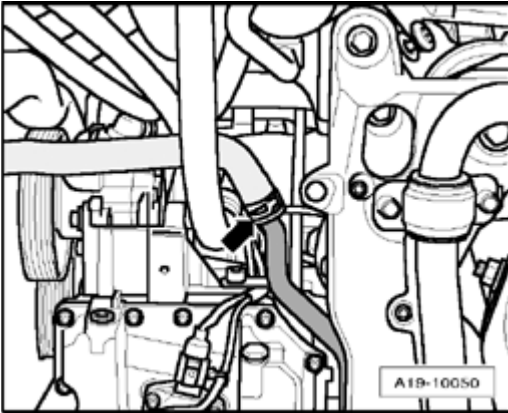


Fig. 353: Left Coolant Pipe Coolant Hose

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect lower coolant hose to coolant pipe - **arrow** -.

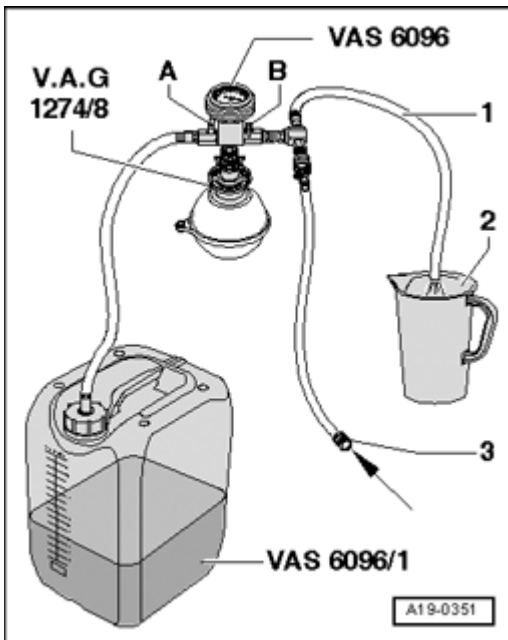


Fig. 354: Filling Replacement Reservoir VAS 6096/1 With Coolant Pre-Mixed To Correct Mixture Ratio

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Fill replacement reservoir VAS 6096/1 with at least 15 liters of coolant pre-mixed to correct mixture ratio:
 - G12+ (40%) and water (60%) for frost protection down to -25 C.
 - G12+ (50%) and water (50%) for frost protection down to -35 C.
 - G12+ (60%) and water (40%) for frost protection down to -40 C.

- Thread adapter V.A.G 1274/8 onto coolant expansion tank.
- Assemble cooling system charge unit VAS 6096 on adapter V.A.G 1274/8.
- Place air outlet hose - **1** - into a small container - **2** -. (A small amount of coolant will come out together with vented air. This drains into container.)
- 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.

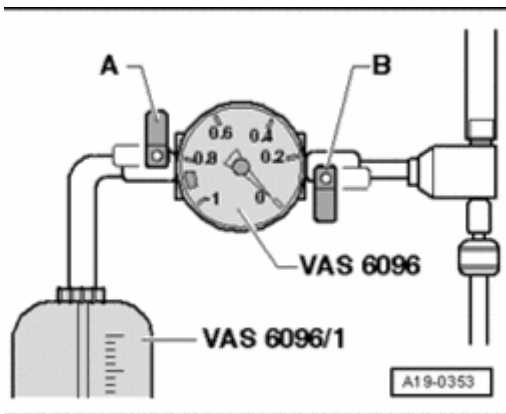


Fig. 355: Cooling System, Draining And Filling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Open valve - **B** - by turning lever in direction of flow.

A vacuum is created in the cooling system by the suction jet pump.

- Needle on instrument display must travel into green region.
- Also briefly open valve - **A** - by turning lever in direction of flow 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 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 upcoming filling.

If needle stands below the green region, repeat procedure.

If vacuum decreases, cooling system is leaking.

- Disconnect pressurized air hose.
- Open valve - A -.

Vacuum in cooling system has effect of extracting coolant from coolant reservoir VAS 6096/1 ; cooling system is filled.

- Disconnect cooling system charge unit VAS 6096 from coolant expansion tank.

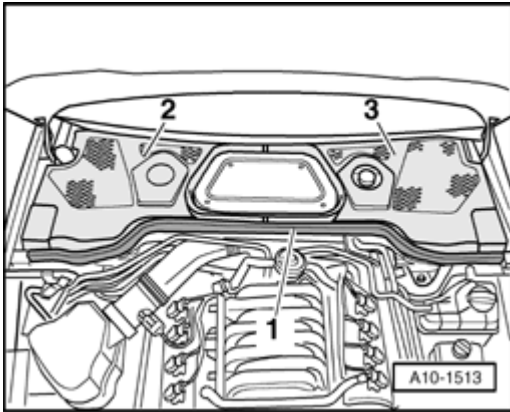


Fig. 356: Plenum Chamber Covers & Rubber Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE: • Ignore - 3 - in the illustration.

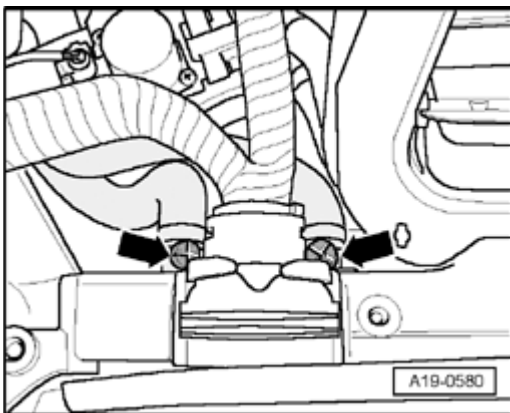


Fig. 357: Bleeder Screws
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Open bleeder screws - **arrows** -.
- Fill up coolant until it escapes from bleeder holes in coolant hoses.

- Close bleeder screws.
- Twist cap for expansion tank closed.
- Make sure that auxiliary heater is switched off.
- Start engine.
- Set heating air conditioning system to "HI" on both sides.
- Let engine run at 2000 RPM for 3 minutes.
- Let engine run at idle 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.

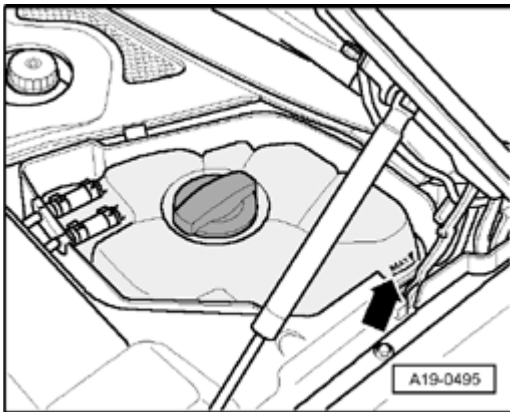


Fig. 358: Checking Coolant Level

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check coolant level.
- Coolant level must be at MAX. marking with engine cold.
- Coolant level may be above MAX. marking with engine at operating temperature.
- Deactivate vehicle lifting mode --> **43 - SELF LEVELING SUSPENSION** .

Coolant Pump, Removing and Installing

Coolant Pump, Removing and Installing

Removing

- Drain coolant --> **Cooling System, Draining and Filling** .
- Bring lock carrier into service position --> **Lock Carrier, Moving into Service Position.**

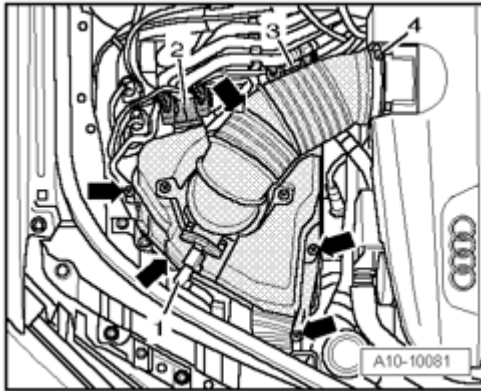


Fig. 359: Mass Air Flow (MAF) Sensor G70 Electrical Connector, Upper Part Of Air Filter Housing Connections, Intake Manifold Air Duct Hose & Bolts
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **1** - for Mass Air Flow (MAF) sensor G70.
- Disconnect air duct - **4** - at intake manifold.
- Unhook retainer for connections - **2** - and - **3** - at upper part of air filter housing.
- Remove bolts - **arrows** -.
- Remove upper part of right air filter housing.

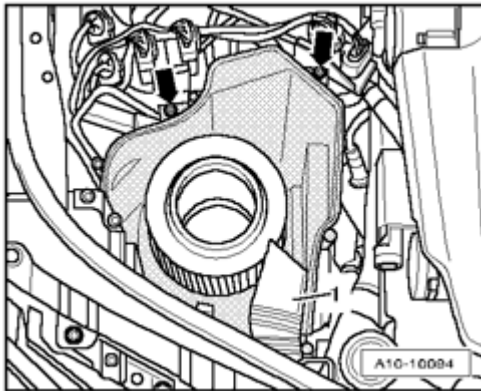
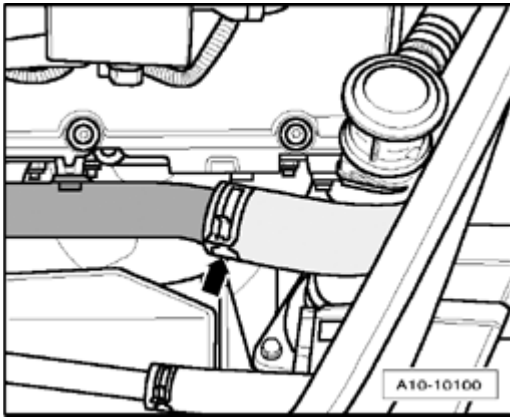


Fig. 360: Air Duct & Bolts
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

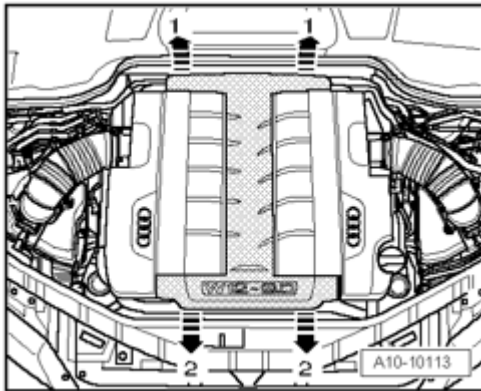
- Remove air duct - **1** -.
- Remove bolts - **arrows** -.
- Remove lower part of right air filter housing.

**Fig. 361: Coolant Hose**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- Place a rag under separating point to catch escaping coolant.
- Disconnect coolant hose - **arrow** - at right on engine.

**Fig. 362: Pulling Engine Cover At Rear And Middle Upward And Off & Pulling Engine Cover Forward And Off Of Intake Manifold**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Carefully pull engine cover at rear and middle upward and off - **arrows 1** -.
- Then, pull engine cover forward and off of intake manifold - **arrows 2** -.

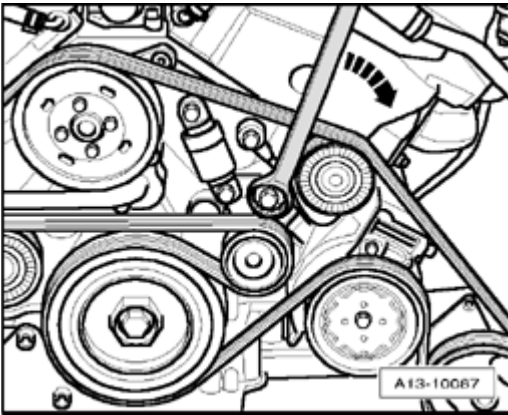


Fig. 363: Relieving Tension On Ribbed Belt

Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

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

- To relieve tension on ribbed belt, pivot tensioner in direction of - **arrow** - , using a box-end 30 mm wrench.
- Remove ribbed belt and release tensioning device.

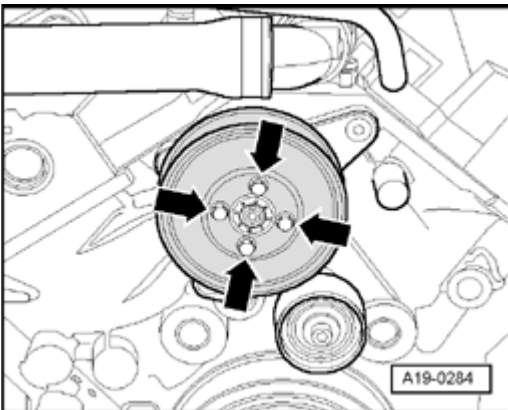
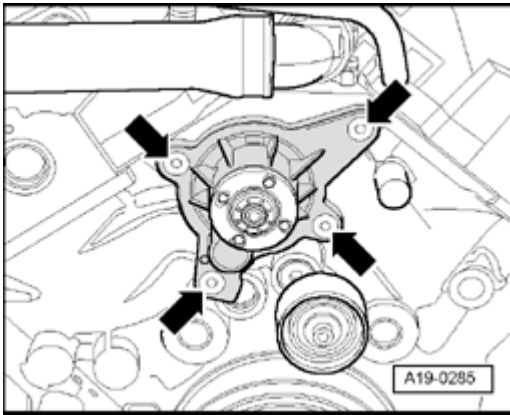


Fig. 364: Coolant Pump Belt Pulley Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and remove coolant pump belt pulley.

**Fig. 365: Coolant Pump Bolts**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and remove coolant pump.

Installing

Installation is performed in reverse order of removal, noting the following:

NOTE:

- **Replace seals.**
- **Secure all hose connections using hose clamps appropriate for the model type .**
- Install ribbed belt --> **Ribbed Belt, Removing and Installing** .
- Install lock carrier with attachments --> **50 - BODY - FRONT** .
- Install front bumper cover --> **63 - BUMPERS** .
- Deactivate vehicle lifting mode --> **43 - SELF LEVELING SUSPENSION** .
- Fill with coolant. --> *Filling* under **Cooling System, Draining and Filling**
- Check headlight adjustment --> **01 - MAINTENANCE** .

Tightening torques

Component	Nm
Coolant pump to cylinder block	10
Belt pulley to coolant pump	8

Coolant thermostat, checking

Special tools, testers and auxiliary items required

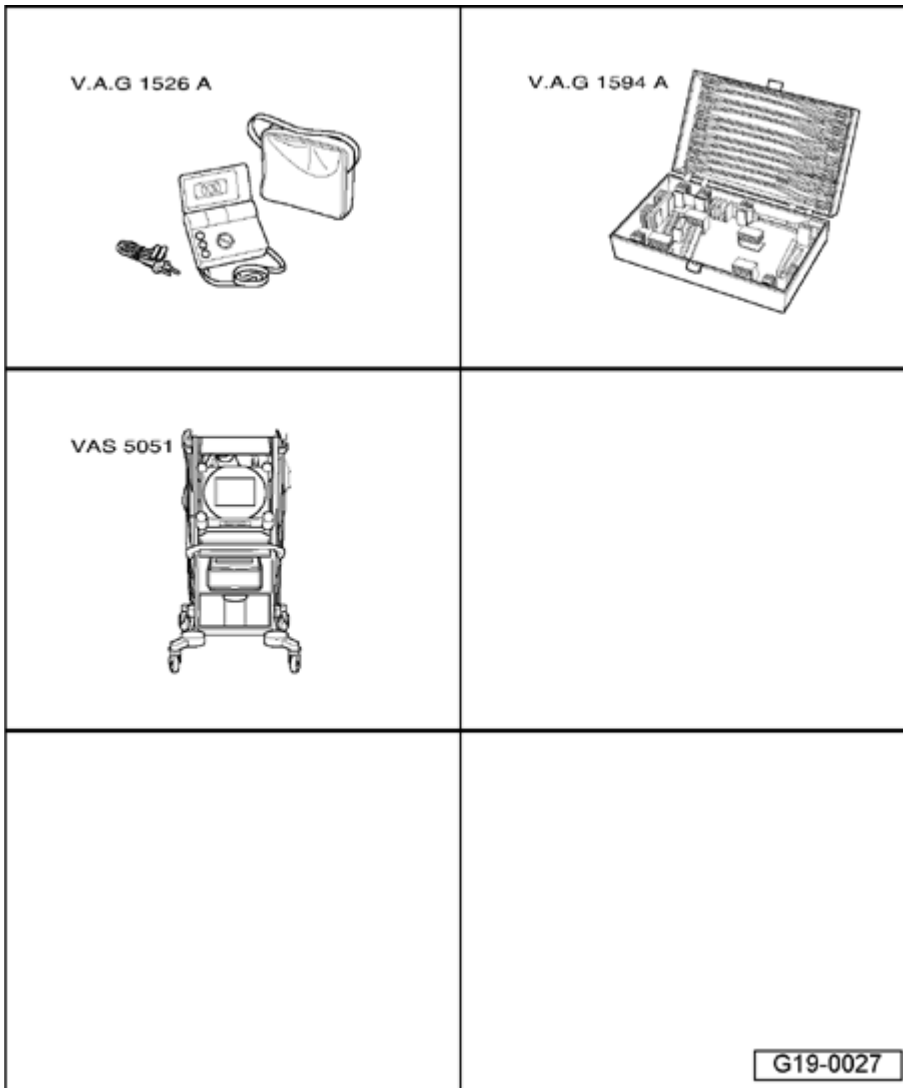


Fig. 366: Identifying Special Tools - Coolant Thermostat, Checking
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Portable multimeter V.A.G 1526 A
- Connector test set V.A.G 1594 A
- Vehicle Diagnostic, Testing and Information System VAS 5051 A with diagnostic cable VAS 5051/5A

Conditions

- Engine cold

Checking internal resistance of heating element

NOTE:

- The Map controlled engine cooling thermostat F265 and wiring connections are monitored by the Engine Control Module (ECM).

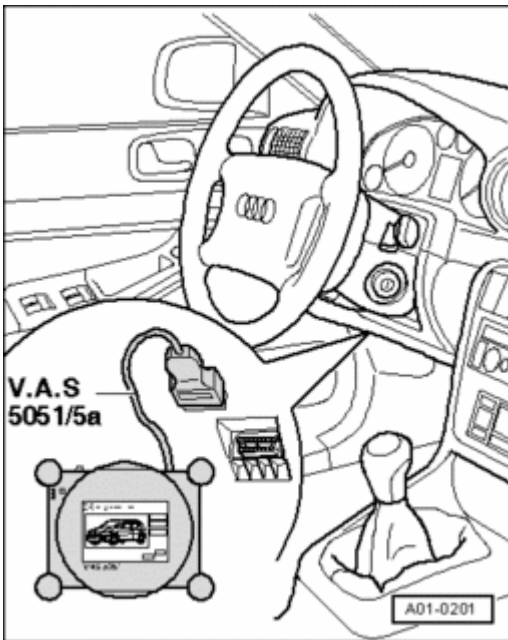


Fig. 367: Connecting Data Link Connector (DLC)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Vehicle Diagnostic, Testing and Information System VAS 5051 A with diagnostic cable VAS 5051/5A connected, On Board Diagnostic (OBD) and vehicle system "01 Engine electronics" selected. Switch ignition on.
 - Read Diagnostic Trouble Code (DTC) memory of engine control module.

If a fault related to Map controlled engine cooling thermostat F265 is displayed:

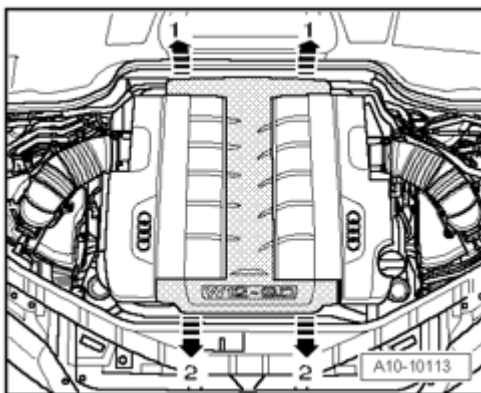


Fig. 368: Pulling Engine Cover At Rear And Middle Upward And Off & Pulling Engine Cover Forward And Off Of Intake Manifold
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Carefully pull engine cover at rear and middle upward and off - **arrows 1** -.
- Then, pull engine cover forward and off of intake manifold - **arrows 2** -.

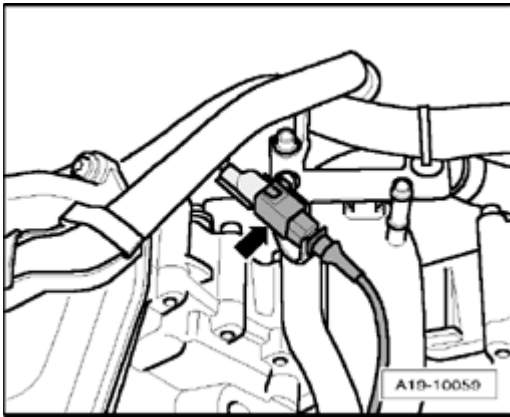


Fig. 369: Intake Manifold Lower Section Electrical Harness Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical 2-pin connector - **arrow** - at Map controlled engine cooling thermostat F265.

NOTE:

- To improve clarity, the electrical connector is shown with the intake manifold removed.

- Connect multimeter to thermostat for resistance measurement.
- Specification: 14 to 16 ohms at 25° C

If specification is not obtained:

- Replace Map controlled engine cooling thermostat F265 --> **Coolant thermostat, removing and installing.**

If specification is obtained:

- Check wiring connections according to wiring diagram.

Coolant thermostat, removing and installing

Removing

- Drain coolant --> **Cooling System, Draining and Filling** .

NOTE:

- All cable ties opened or cut during engine removal must be reinstalled at the same locations during installation.
- The coolant must be completely drained, otherwise there is a risk that coolant may leak into the intake channels.

- Remove intake manifold upper part: --> **Intake Manifold Upper Section, Removing and Installing** .
- Remove intake manifold lower part: --> **Intake Manifold Lower Section, Removing and Installing** .

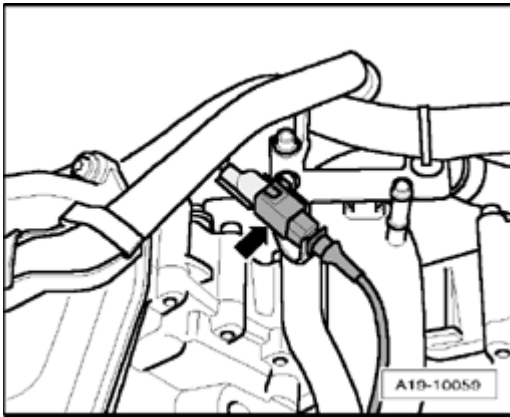


Fig. 370: Intake Manifold Lower Section Electrical Harness Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - **arrow** -.
- Move electrical wiring clear.

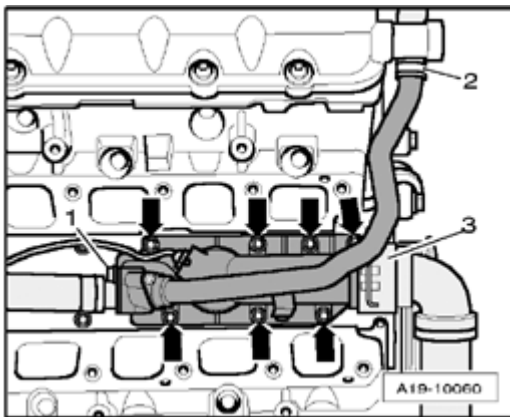


Fig. 371: Coolant Hoses, Thermostat Housing Bolts & Pipe Connection Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove coolant hoses - **2** - and - **3** -.
- Remove bolt - **1** - and disconnect pipe connection at housing.
- Remove bolts - **arrows** - and remove thermostat housing.

Installing

Installation is in reverse order of removal. Note the following:

NOTE:

- **Replace gaskets and O-rings.**
- **Secure all hose connections using hose clamps appropriate for the model type .**
- **During installation, all cable ties must be reinstalled at the same location.**

2009 Audi A8 Quattro

ENGINE 6.0 Liter 12-Cyl. 4V Engine Mechanical, Engine Code(s): BHT, BSB - A8

- Install intake manifold lower part: --> **Intake Manifold Lower Section, Removing and Installing** .
- Install intake manifold upper part: --> **Intake Manifold Upper Section, Removing and Installing** .
- Fill with coolant. --> *Filling* under **Cooling System, Draining and Filling**

Tightening torques

Component	Nm
Coolant thermostat housing to cylinder block	8
Coolant pipe to coolant thermostat housing	8

Upper coolant pipe, removing and installing

Special tools, testers and auxiliary items required

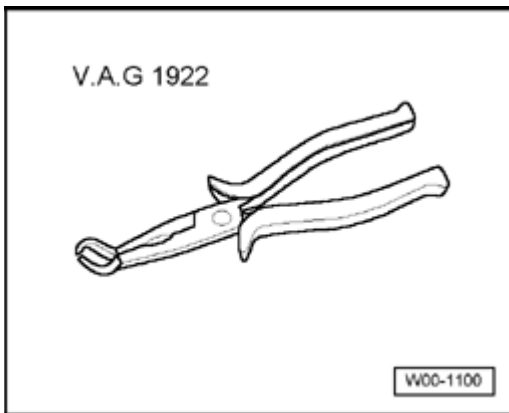


Fig. 372: Spark Plug Connector Pliers V.A.G 1922
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Spark plug connector pliers V.A.G 1922

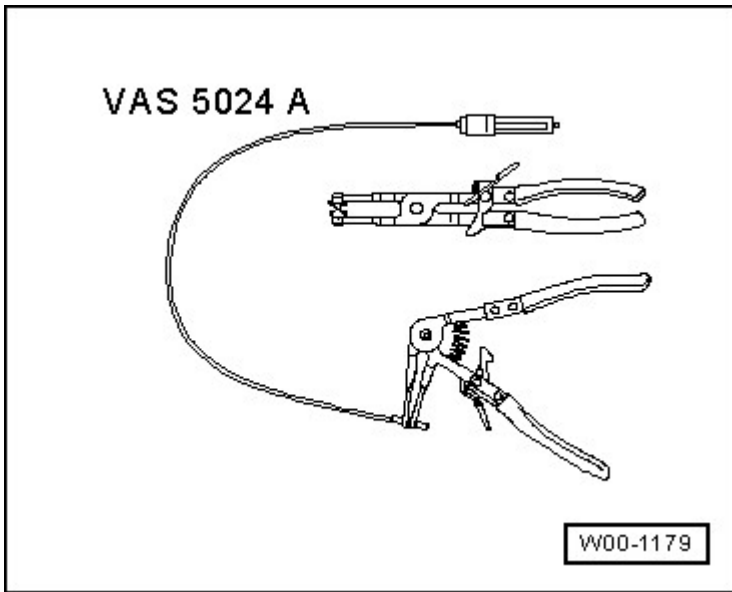


Fig. 373: Spring-Type Clip Pliers VAS 5024 A
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Spring-type clip pliers VAS 5024 A

Removing

NOTE:

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

- Drain coolant --> Cooling System, Draining and Filling .
- Remove intake manifold upper part: --> Intake Manifold Upper Section, Removing and Installing .
- Remove intake manifold lower part: --> Intake Manifold Lower Section, Removing and Installing .

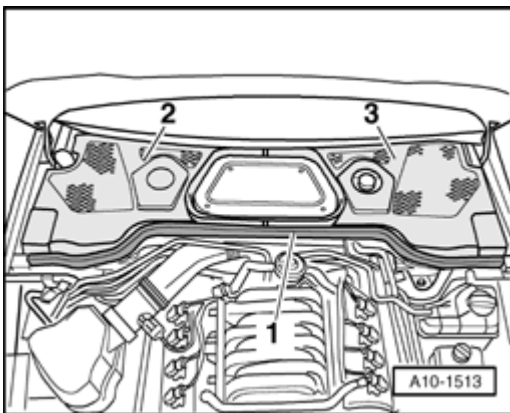


Fig. 374: Plenum Chamber Covers & Rubber Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove rubber seal - 1 - for plenum chamber covers.

- Remove plenum chamber covers - **2** - and - **3** -.

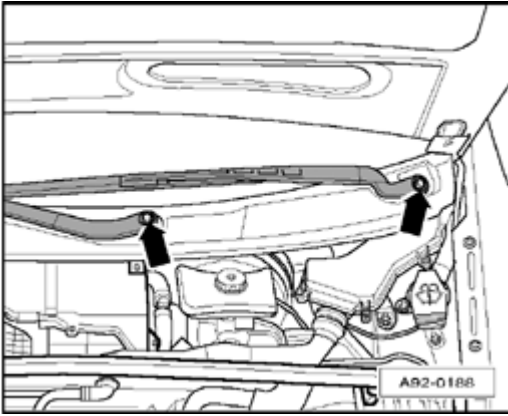


Fig. 375: Identifying Wiper Arm Nuts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pry off caps on wiper arms using a screwdriver.
- Loosen nuts - **arrows** - by several turns.
- Loosen wiper arms by gently rocking arm. Remove nuts and remove wiper arms.
- Remove dust and pollen filter by opening 4 quick-release fasteners.

NOTE:

- **Cover the air duct at air conditioning housing with a clean rag so that nothing can fall in.**

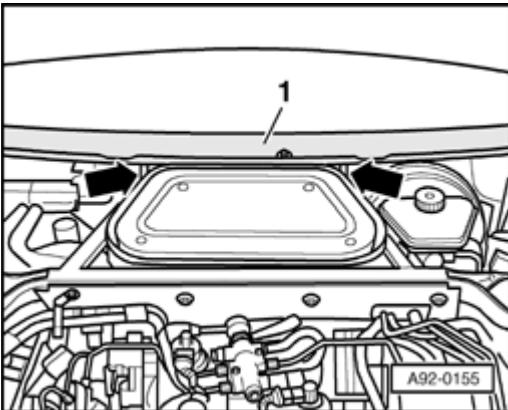


Fig. 376: Cowl Grille & Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - at left and right for cowl grille - **1** -.
- Carefully pull cowl grille off of retainers at windshield.

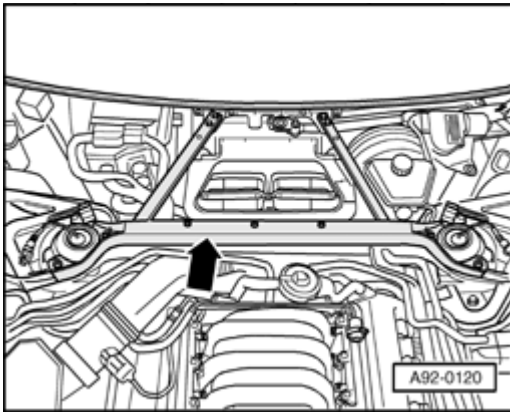


Fig. 377: Strut Tower Brace

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove strut tower brace - **arrow** -.

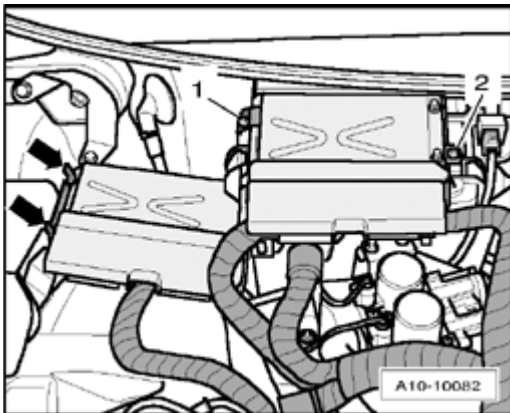


Fig. 378: Retaining Bracket Bolts & Retaining Tabs

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **1** - and - **2** - and remove retaining bracket.
- Release retaining tabs - **arrows** - and remove both engine control modules.

NOTE:

- **Electrical harnesses remains connected.**

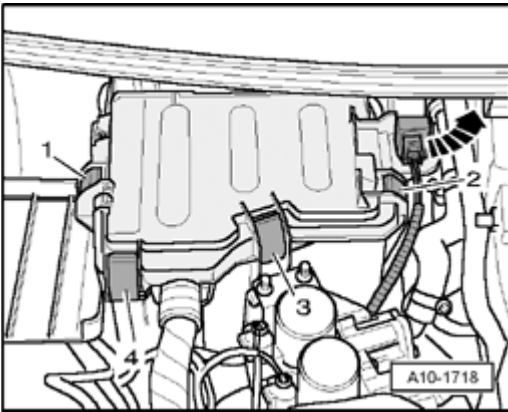


Fig. 379: Removing Air Quality Sensor G238 & Retaining Clips
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Turn Air quality sensor G238 approx. 90° counter-clockwise - **arrow** - and remove from retainer.
- Release retaining clips - **1 to 4** -.
- Fold cover for electronics box in plenum chamber open slightly and pull off toward front.

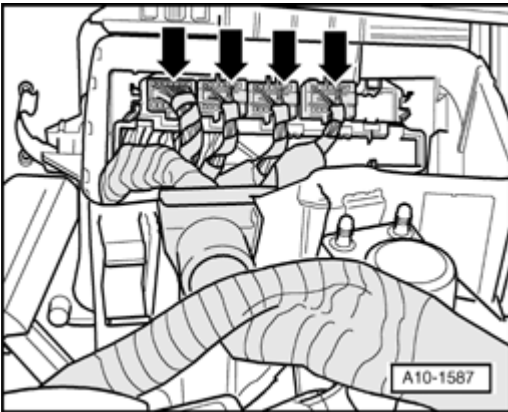


Fig. 380: Multi-Pin Harness Connectors
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect multi-pin harness connectors - **arrows** - using spark plug connector pliers V.A.G 1922.
- Disengage engine wiring harness at electronics box and at bulkhead.
- Lay wiring harness aside on engine with engine control modules connected.

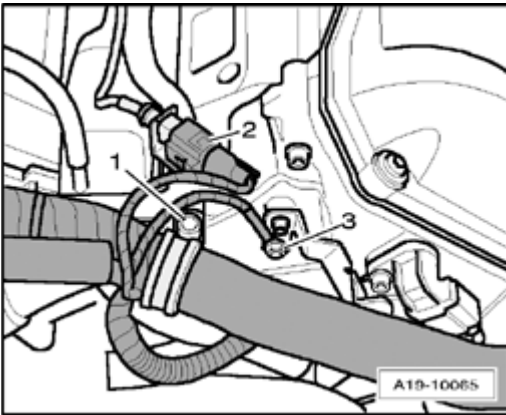


Fig. 381: Harness Clamp, Map Controlled Engine Cooling Thermostat F265 Electrical Connection & Ground Wire

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **2** - for Map controlled engine cooling thermostat F265.
- Move wiring clear.
- Disconnect ground wire - **3** - on cylinder head.
- Loosen harness clamp - **1** - and remove harness from coolant pipe.

NOTE:

- Shown from the rear to improve clarity.

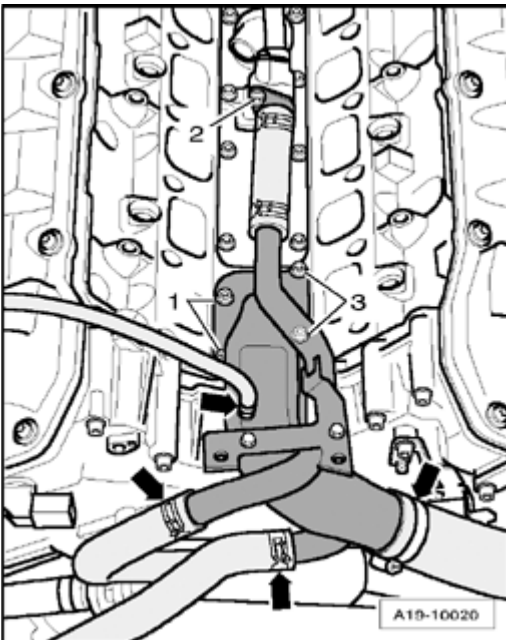


Fig. 382: Coolant Hoses At Upper Coolant Pipe & Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **1 to 3** -.
- Disconnect coolant hoses at coolant pipe - **arrows** -.

NOTE: • Shown from rear to improve clarity.

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

- Install strut tower brace --> **40 - FRONT SUSPENSION** .
- Install and adjust wiper arms --> **92 - WINDSHIELD WIPER AND WASHER SYSTEM** .
- Install intake manifold lower part: --> **Intake Manifold Lower Section, Removing and Installing** .
- Install intake manifold upper part: --> **Intake Manifold Upper Section, Removing and Installing** .
- Fill with coolant --> *Filling* under **Cooling System, Draining and Filling**

Tightening torques

Component	Nm
Coolant pipe to engine	10
Coolant pipe to coolant thermostat housing	10
Ground wire to cylinder head	10
Retaining clamp to coolant pipe	10

Upper left coolant pipe, removing and installing

Special tools, testers and auxiliary items required

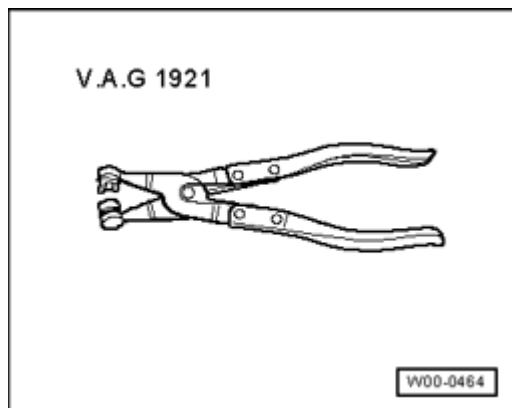


Fig. 383: Hose Clamp Pliers V.A.G 1921

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hose clamp pliers V.A.G 1921

Removing

- Engine/transmission unit removed and attached to scissor lift platform VAS 6131.

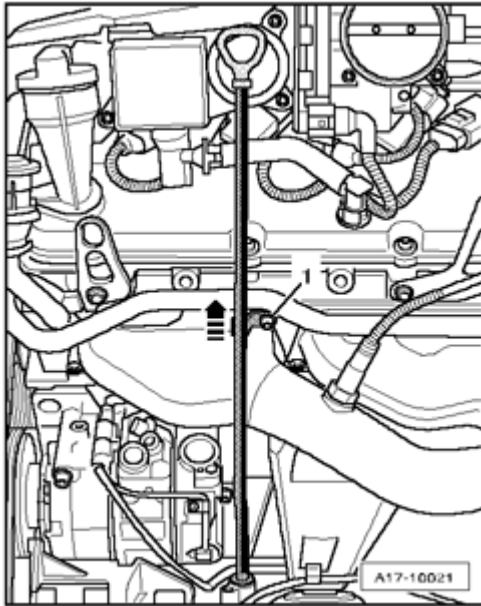


Fig. 384: Pulling Oil Dipstick Guide Tube Upward And Off
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - **1** -.
- Pull oil dipstick guide tube upward and off - **arrow** -.

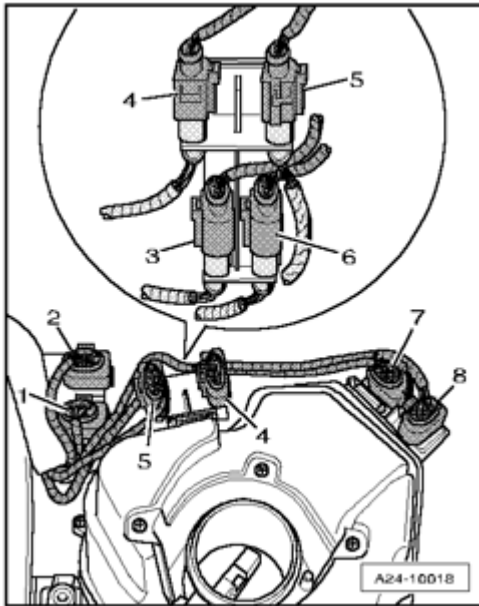


Fig. 385: Oxygen Sensors Electrical Harness Connectors
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - 2 - for Heated Oxygen Sensor (HO2S) 4 G286.

NOTE:

- Disregard the other items in the illustration.

- Move electrical wiring to oxygen sensor clear.

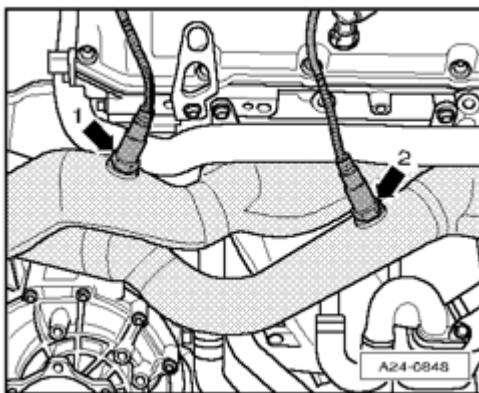


Fig. 386: Heated Oxygen Sensor (HO2S) 4 G286
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove Heated Oxygen Sensor (HO2S) 4 G286 - arrow 2 - using ring spanner set 3337.

NOTE:

- Ignore - arrow 1 - in the illustration.

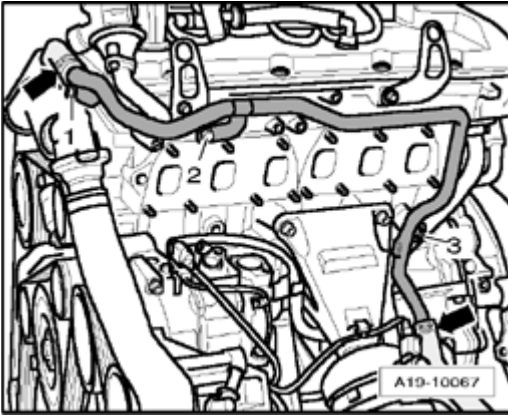


Fig. 387: Coolant Hoses At Upper Left Coolant Pipe & Bolts
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect coolant hoses - **arrows** - at upper left coolant pipe.
- Remove bolts - **1** - , - **2** - and nut - **3** -.
- Remove upper left coolant pipe upward.

NOTE:

- **To improve clarity, the exhaust manifold and catalytic converters are shown removed.**

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 Heated Oxygen Sensor (HO2S) 4 G286 --> **24 FUEL INJECTION SYSTEM**
- Install engine/transmission assembly --> **Engine, Installing.**

Tightening torques

Component		Nm
Coolant pipe	M6	10
To engine	M8	20
Oil dip stick guide tube to cylinder head		10

Lower left coolant pipe, removing and installing

Special tools, testers and auxiliary items required

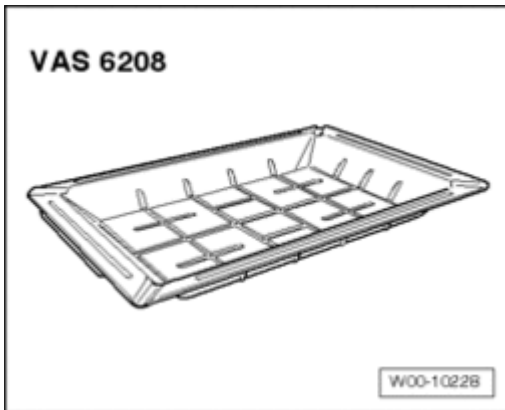


Fig. 388: Drip Tray For Workshop Crane VAS 6208 Or Drip Tray V.A.G 1306
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drip tray for workshop crane VAS 6208 or drip tray V.A.G 1306

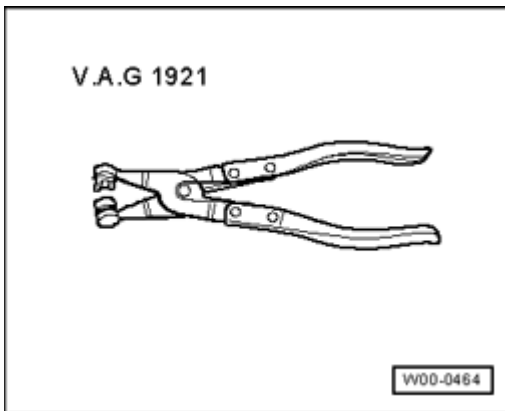
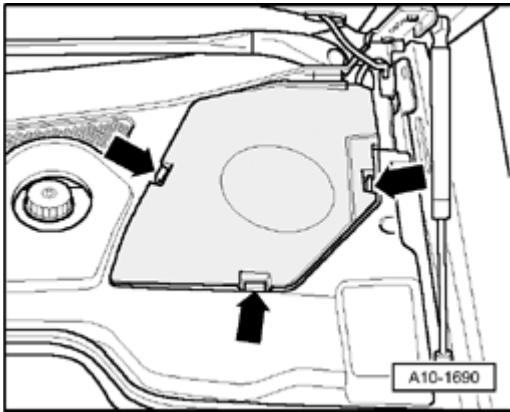


Fig. 389: Hose Clamp Pliers V.A.G 1921
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hose clamp pliers V.A.G 1921

Removing

- Activate vehicle lifting mode --> **43 - SELF LEVELING SUSPENSION** .

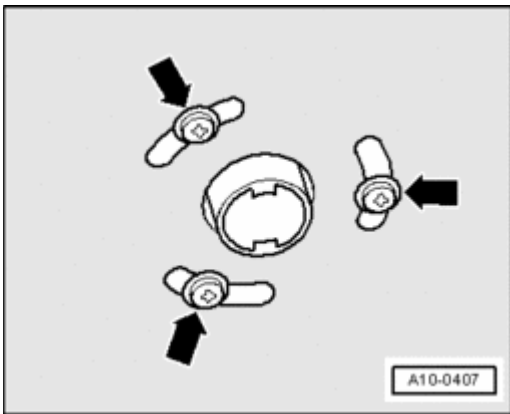
**Fig. 390: Cover Above Coolant Reservoir**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove cover above coolant reservoir - **arrows** -.

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

- Open cap of coolant expansion tank.

**Fig. 391: Identifying Exhaust Pipe Fasteners**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

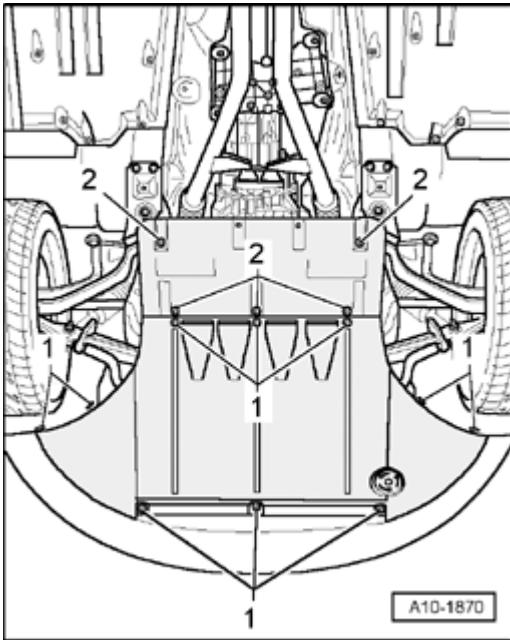


Fig. 392: Noise Insulation Quick-Release Fasteners
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen quick-release fasteners - 1 - and remove front sound insulation.

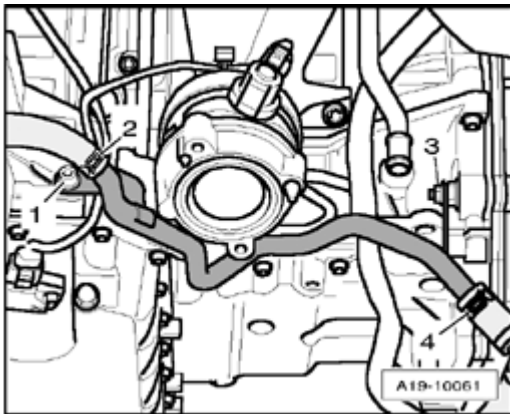


Fig. 393: Lower Left Coolant Pipe Coolant Hoses, Bolt & Nut
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place drip tray for workshop crane VAS 6208 or drip tray V.A.G 1306 under engine.
- Disconnect coolant hose - 2 - from lower left coolant pipe and drain coolant.
- Remove bolt - 1 - and nut - 3 -.
- Disconnect lower left coolant pipe from coolant hose - 4 -.

Installing

Installation is in reverse order of removal. Note the following:

2009 Audi A8 Quattro

ENGINE 6.0 Liter 12-Cyl. 4V Engine Mechanical, Engine Code(s): BHT, BSB - A8

NOTE:

- Secure all hose connections using hose clamps appropriate for the model type .

- Fill with coolant --> *Filling* under **Cooling System, Draining and Filling**
- Deactivate vehicle lifting mode --> **43 - SELF LEVELING SUSPENSION** .

Tightening torques

Component		Nm
Coolant pipe	M6	10
To engine	M8	20

Right front coolant pipe, removing and installing

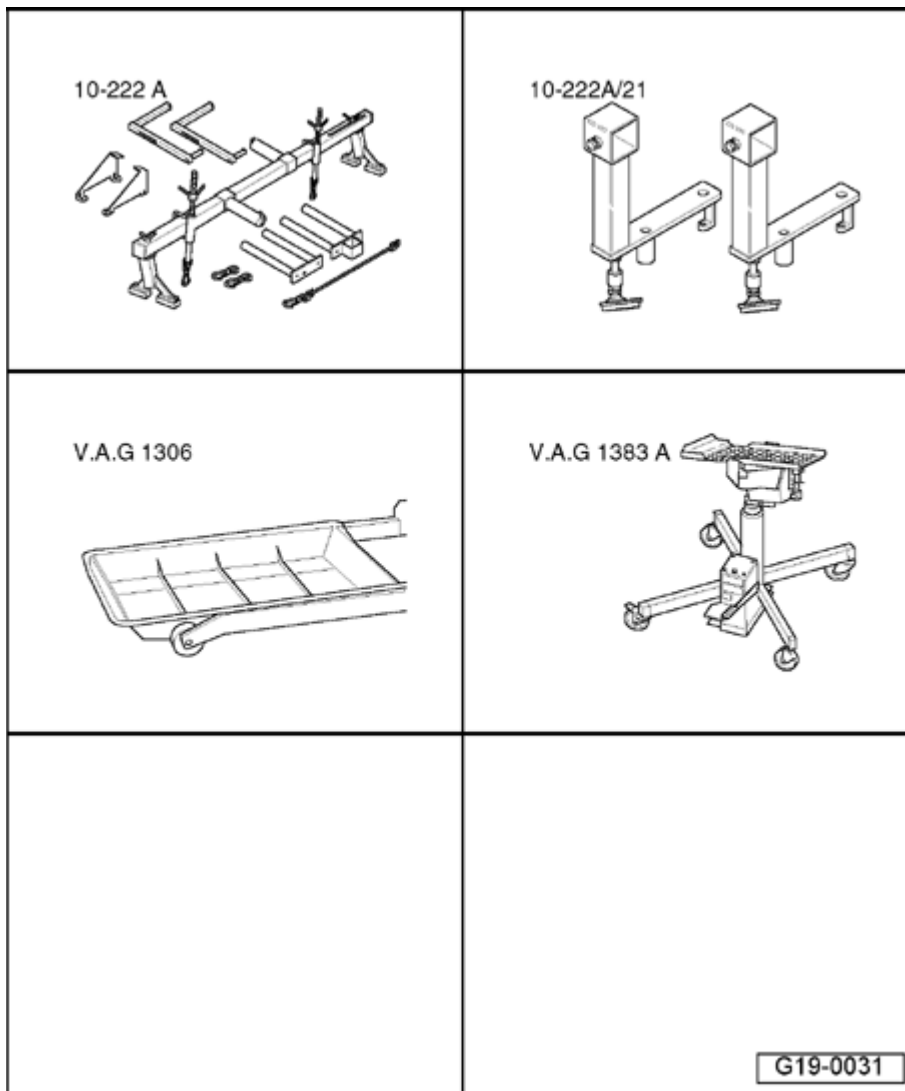
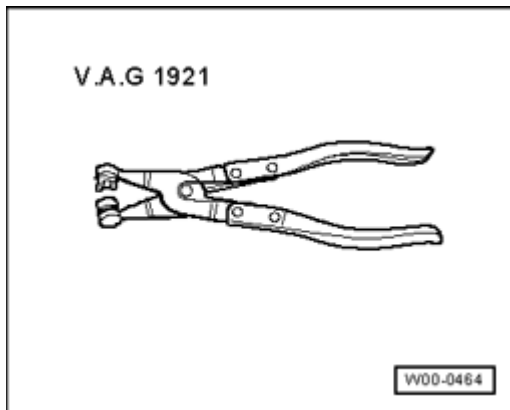


Fig. 394: Identifying Special Tools - Right Front Coolant Pipe, Removing And Installing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

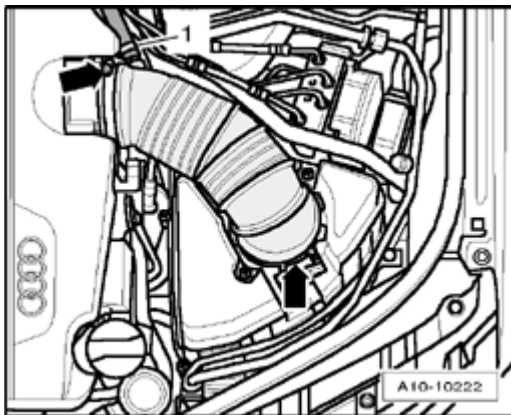
Special tools, testers and auxiliary items required

- Engine support bridge 10-222 A
- Brace 10-222 A/21
- Drip tray V.A.G 1306 or drip tray for workshop crane VAS 6208
- Engine/transmission jack V.A.G 1383 A

Special tools, testers and auxiliary items required**Fig. 395: Hose Clamp Pliers V.A.G 1921**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hose clamp pliers V.A.G 1921

Removing**Fig. 396: Left Air Duct & Hose**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect hose - **1** - from air duct.
- Remove left air duct - **arrows** -.

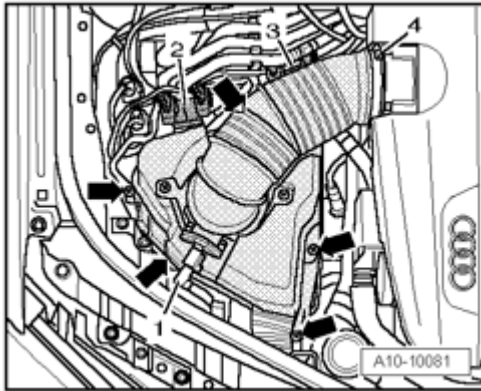


Fig. 397: Mass Air Flow (MAF) Sensor G70 Electrical Connector, Upper Part Of Air Filter Housing Connections, Intake Manifold Air Duct Hose & Bolts
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **1** - for right Mass Air Flow (MAF) sensor G70 on air filter housing.
- Disconnect air duct hose - **4** - at intake manifold.
- Unhook retainer for connections - **2** - and - **3** - at upper part of air filter housing.
- Remove bolts - **arrows** -.
- Remove upper part of right air filter housing.

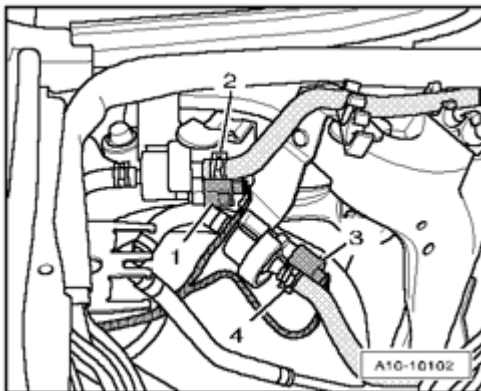


Fig. 398: Electrical Connectors & Vacuum Hoses
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect vacuum hose - **4** - from Evaporative Emission (EVAP) canister purge regulator valve N80.

NOTE: • **Ignore - 1 to 3 - in the illustration.**

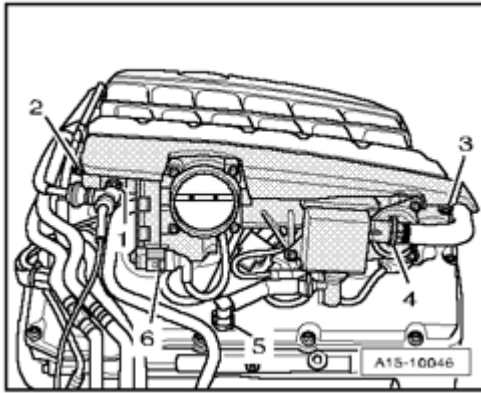


Fig. 399: Vacuum Hose, Bolts, Crankcase Breather Hoses & Throttle Valve Control Module J338

Electrical Connection

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connection - 6 - at Throttle valve control module J338.
- Disconnect vacuum hose - 1 -.
- Disconnect hoses - 4 - and - 5 - for crankcase breather.
- Remove bolts - 2 - and - 3 -.
- Remove right intake manifold side part.

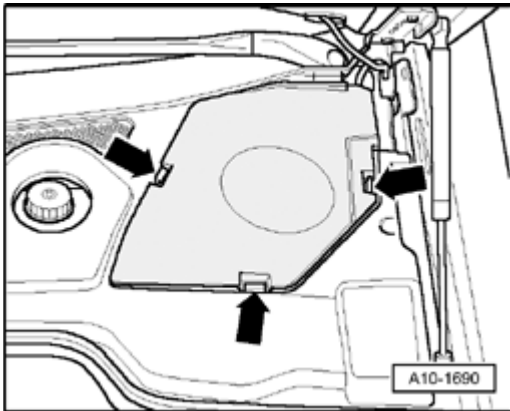


Fig. 400: Cover Above Coolant Reservoir

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove cover above coolant reservoir - **arrows** -.

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

- Open cap of coolant expansion tank.

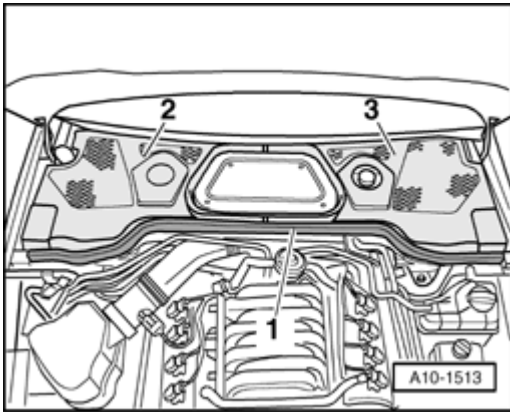


Fig. 401: Plenum Chamber Covers & Rubber Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove rubber seal - 1 - for plenum chamber covers.
- Remove plenum chamber covers - 2 - and - 3 -.

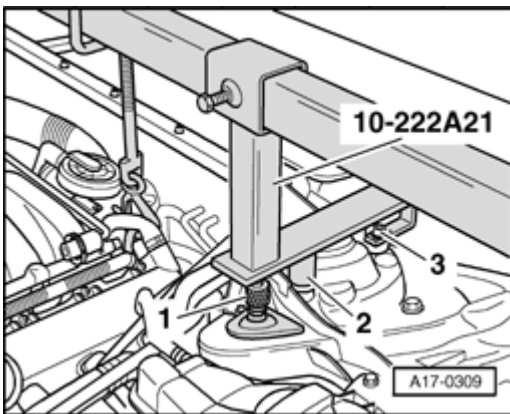


Fig. 402: Securing Engine Support Bridge 10 - 222 A With Adapters 10 - 222 A/21 At Suspension Strut Domes

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unclip fuel lines from retainer on strut tower.
- Remove rear bolts - 3 - for strut tower brace.
- Secure engine support bridge 10-222 A with supports 10-222 A/21 to strut towers.
- The supports are marked for left and right side of the vehicle.
- The middle contact point - 2 - of the support is placed on the front bolts for the strut tower brace.
- The supports 10-222 A/21 are secured with the rear bolts - 3 - for the strut tower brace.
- The knurled thumb screw - 1 - must be turned downward far enough so that the contact plate rests on the strut tower.

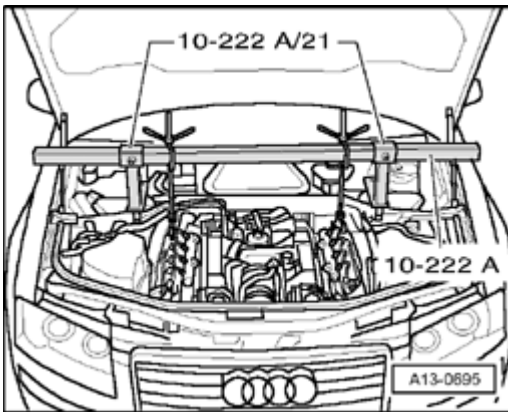


Fig. 403: Securing Spindles Of Engine Support Bridge 10 - 222 A At Rear Engine Lifting Eyes
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure spindles of engine support bridge 10-222 A at rear engine lifting eyes.
- Pre-tension engine slightly using engine support bridge spindles.
- Remove both front wheels.

NOTE:

- **Secure the brake discs with wheel bolts.**

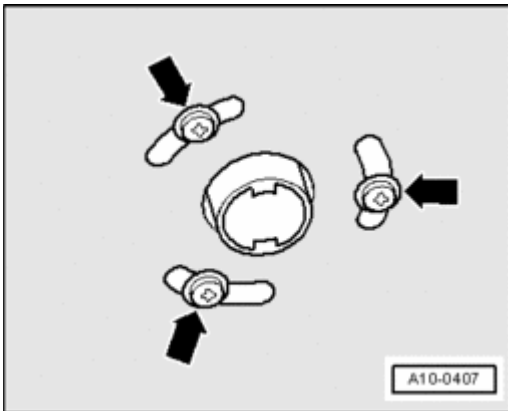


Fig. 404: Identifying Exhaust Pipe Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

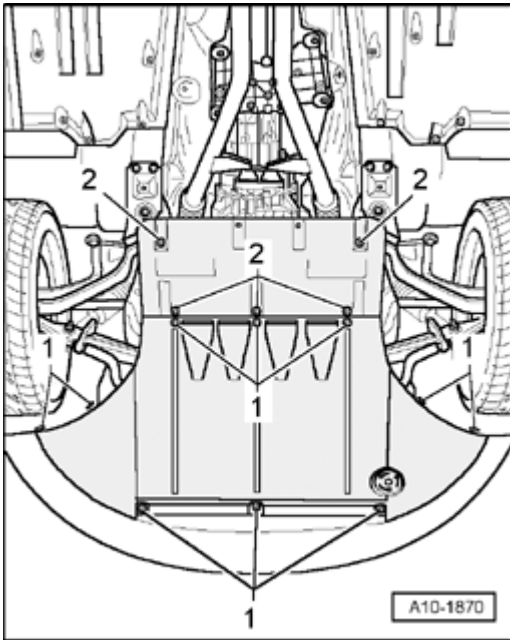


Fig. 405: Noise Insulation Quick-Release Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen quick-release fasteners - **1** - and - **2** - and remove sound insulation.

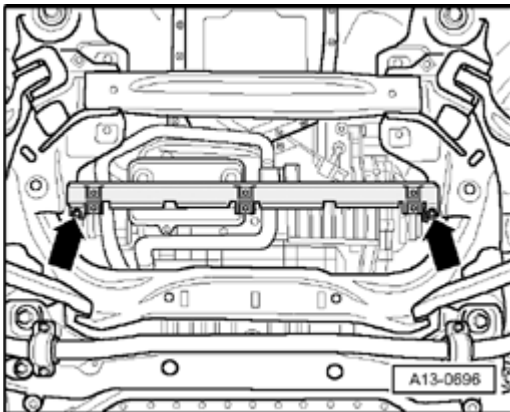


Fig. 406: Bracket For Sound Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bracket for sound insulation - **arrows** -.



Fig. 407: Right Front Coolant Pipe Lower Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - **arrow** - at bottom of right coolant pipe.

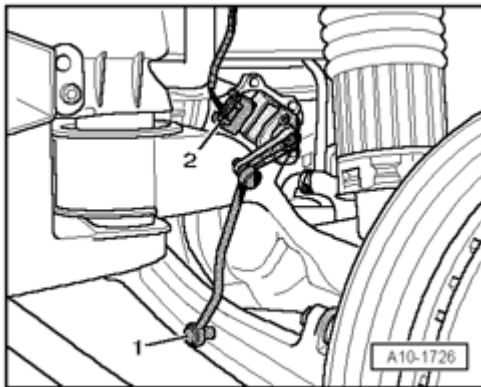


Fig. 408: Identifying Left Level Control System Sensor Electrical Harness Connector & Left/Right Control Arms Coupling Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - **2** - at left and right Level Control System sensors.

NOTE:

- **Ignore - 1 - in the illustration.**

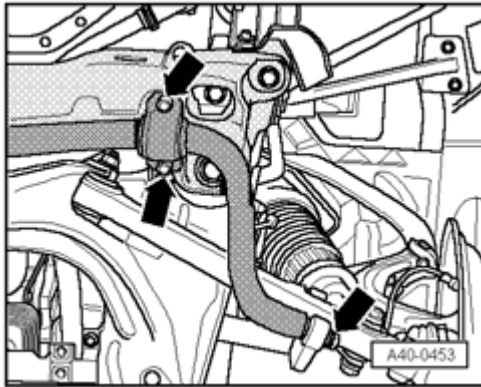


Fig. 409: Stabilizer & Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen and remove bolts - **arrows** - uniformly at left and right sides of vehicle.
- Remove stabilizer.

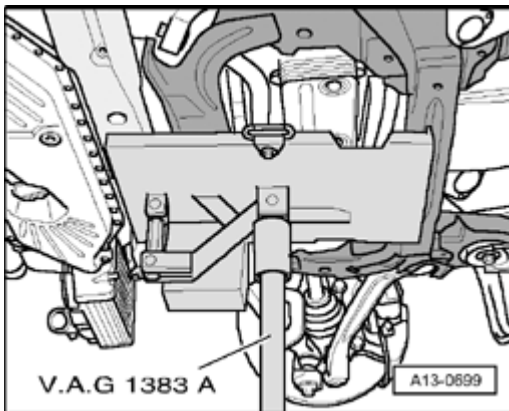


Fig. 410: Supporting Engine Carrier And Subframe Using Engine/Transmission Jack V.A.G 1383 A

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Support engine carrier and subframe using engine/transmission jack V.A.G 1383 A as shown in illustration.

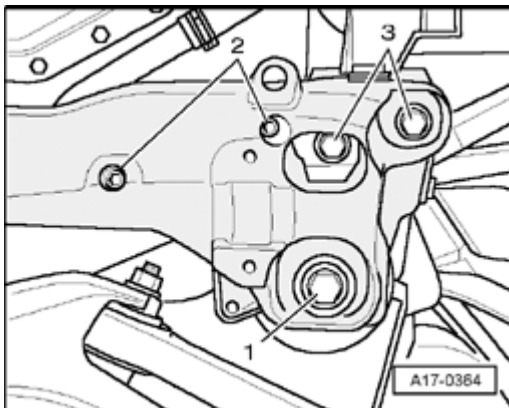
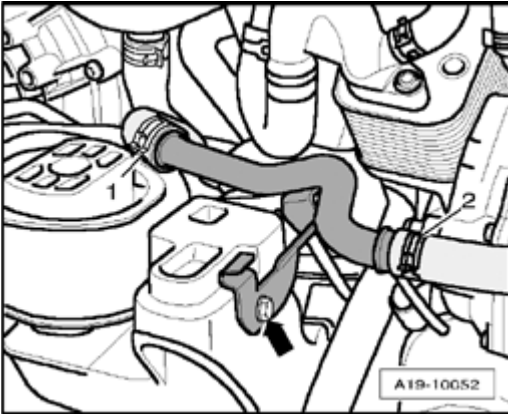


Fig. 411: Engine Carrier Left/Right Bolts**Courtesy of VOLKSWAGEN UNITED STATES, INC.**

- Remove bolts - **2** - and - **3** - on both sides of vehicle.
- Then, loosen and remove bolt - **1** - on left and right sides of vehicle uniformly (alternating between left and right sides of vehicle).
- Remove engine carrier.

**Fig. 412: Coolant Hose & Bolt****Courtesy of VOLKSWAGEN UNITED STATES, INC.**

- Place drip tray V.A.G 1306 or drip tray VAS 6208 under engine.
- Disconnect coolant hose - **2** - from coolant pipe and drain coolant.
- Disconnect coolant pipe from coolant hose - **1** -.

NOTE:

- **Disregard - arrow -.**

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 subframe --> **40 - FRONT SUSPENSION** .
- Install stabilizer --> **40 - FRONT SUSPENSION** .
- Install right intake manifold side part: --> **Intake Manifold Right Side, Removing and Installing** .
- Install strut tower brace --> **40 - FRONT SUSPENSION** .
- Fill with coolant --> *Filling* under **Cooling System, Draining and Filling**
- Deactivate vehicle lifting mode --> **43 - SELF LEVELING SUSPENSION** .

Tightening torques

Component	Nm
Engine mount to engine carrier	23
Engine carrier to longitudinal member	68
Lower coolant pipe to engine carrier	10
Bracket for sound insulation to subframe	10

Upper right coolant pipe, removing and installing

Removing

- Engine/transmission assembly removed and attached to scissor lift platform VAS 6131.

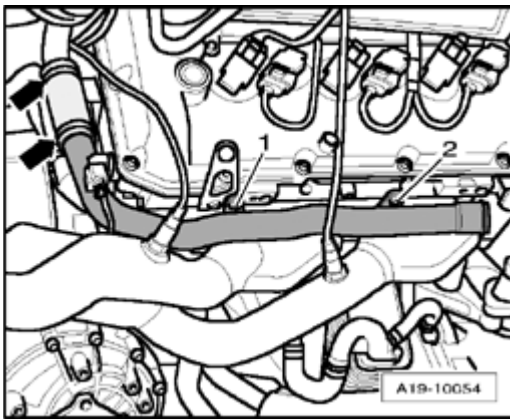


Fig. 413: Upper Right Coolant Pipe Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **1** - and - **2** - for upper right coolant pipe.
- Loosen hose clamps - **arrows** - and pivot coolant pipe upward and out.

Installing

Installation is in reverse order of removal. Note the following:

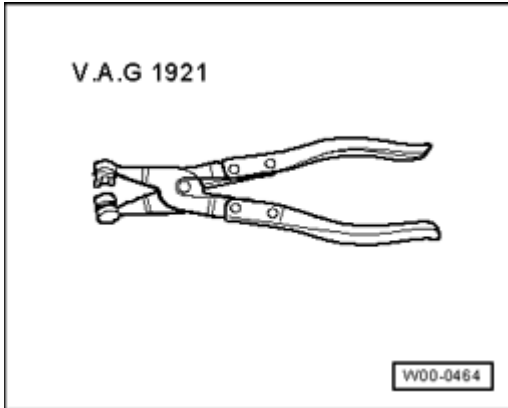
NOTE:

- Secure all hose connections using hose clamps appropriate for the model type .

- Install engine/transmission assembly --> Engine, Installing.

Tightening torque

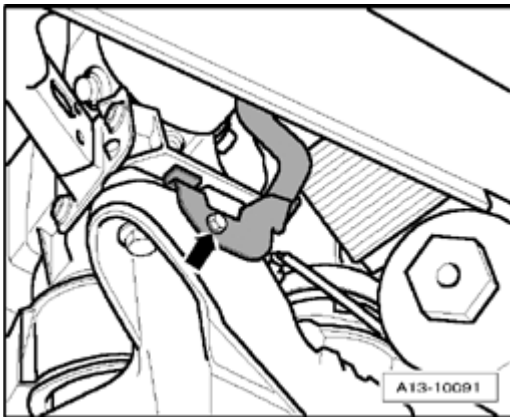
Component	Nm
Upper right coolant pipe to cylinder head	20

Middle right coolant pipe, removing and installing**Special tools, testers and auxiliary items required****Fig. 414: Hose Clamp Pliers V.A.G 1921****Courtesy of VOLKSWAGEN UNITED STATES, INC.**

- Hose clamp pliers V.A.G 1921

Removing

- Engine/transmission assembly removed and attached to scissor lift platform VAS 6131.
- Remove right exhaust manifolds with catalytic converters --> **Right exhaust manifold with catalytic converters, removing and installing.**

**Fig. 415: Right Front Coolant Pipe Lower Bolt****Courtesy of VOLKSWAGEN UNITED STATES, INC.**

- Remove lower bolt - **arrow** - at right front coolant pipe.



Fig. 416: Identifying Subframe, Left/Right Of Engine Carrier & Support Elements
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Rotate spindles of support elements - 1 - at left and right of engine carrier - 4 - completely downward.

NOTE:

- Ignore - 2 - and - 3 - in the illustration.

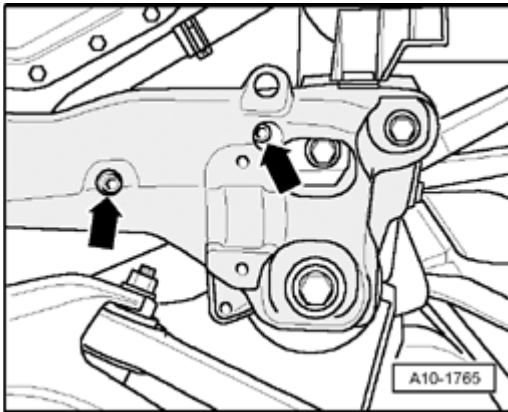


Fig. 417: Removing/Installing Bolts For Engine Mount At Left/Right
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - for engine mount at left and right.
- Remove engine carrier.

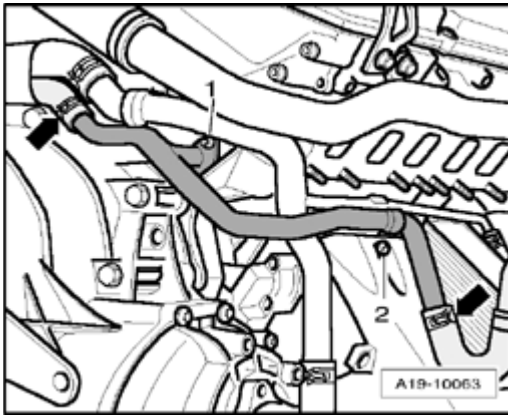


Fig. 418: Coolant Hoses At Lower Right Coolant Pipe & Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect coolant hoses - **arrows** - at lower right coolant pipe.
- Remove bolts - **1** - and - **2** -.
- Pull lower right coolant pipe rearward and off of cylinder head.

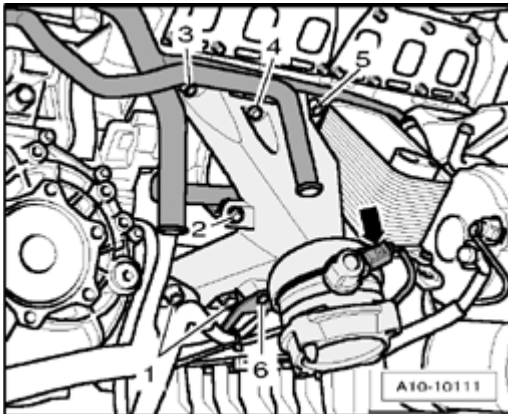
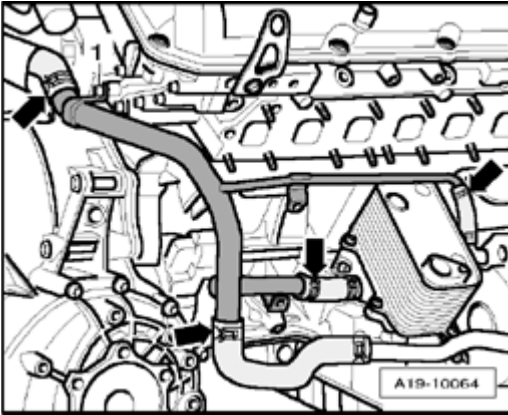


Fig. 419: Right Engine Mount Electrical Harness Connector & Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - **arrow** - at right engine mount.
- Remove bolts - **1 to 6** -.
- Remove engine support with engine mount.

**Fig. 420: Coolant Hoses & Bolts**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **1** -.
- Pull middle right coolant pipe off from coolant hoses at positions indicated by - **arrows** -.

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 lower right coolant pipe. **Installing**
- Install right exhaust manifolds with catalytic converters. **Installing**
- Install engine/transmission assembly --> **Engine, Installing.**

Tightening torque

Component	Nm
Middle right coolant pipe to cylinder head	10

Lower right coolant pipe, removing and installing

Special tools, testers and auxiliary items required

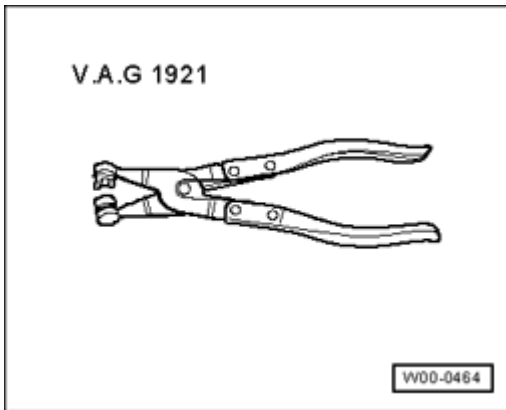


Fig. 421: Hose Clamp Pliers V.A.G 1921

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hose clamp pliers V.A.G 1921

Removing

- Engine/transmission unit removed and attached to scissor lift platform VAS 6131.
- Remove right exhaust manifolds with catalytic converters --> **Right exhaust manifold with catalytic converters, removing and installing.**

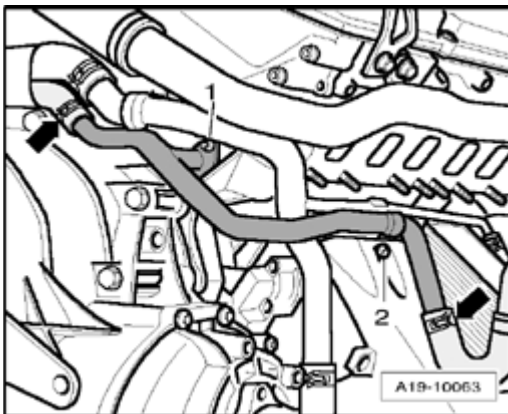


Fig. 422: Coolant Hoses At Lower Right Coolant Pipe & Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect coolant hoses - **arrows** - at coolant pipe.
- Remove bolts - **1** - and - **2** -.
- Pull coolant pipe rearward and off of cylinder head.

Installing

Installation is in reverse order of removal. Note the following:

NOTE:

2009 Audi A8 Quattro

ENGINE 6.0 Liter 12-Cyl. 4V Engine Mechanical, Engine Code(s): BHT, BSB - A8

- **Replace O-ring.**
- **Secure all hose connections using hose clamps appropriate for the model type .**

- Install right exhaust manifolds with catalytic converters. **Installing**
- Install engine/transmission assembly --> **Engine, Installing**

Tightening torques

Component	Nm
Lower right coolant pipe to cylinder head	10
Lower right coolant pipe to engine support	10

Front coolant pipe, removing and installing

Special tools, testers and auxiliary items required

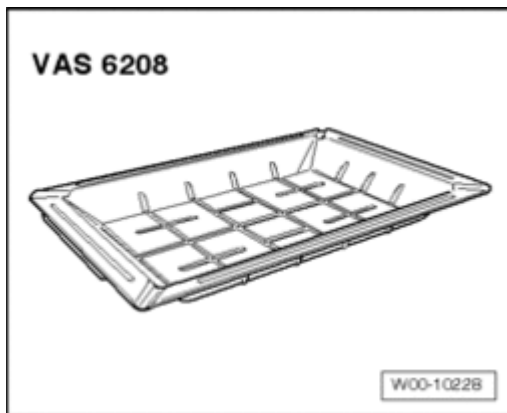
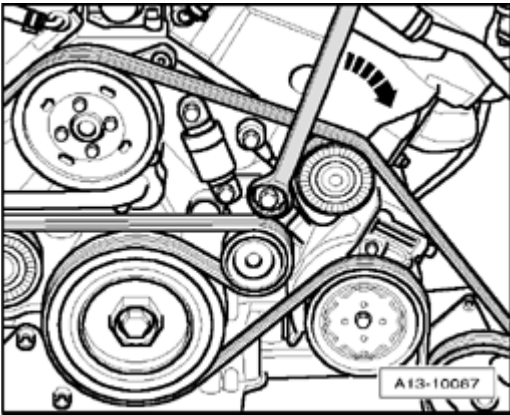


Fig. 423: Drip Tray For Workshop Crane VAS 6208 Or Drip Tray V.A.G 1306
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drip tray for workshop crane VAS 6208 or drip tray V.A.G 1306

Removing

- Drain coolant --> **Cooling System, Draining and Filling** .
- Bring lock carrier into service position --> **Lock Carrier, Moving into Service Position.**

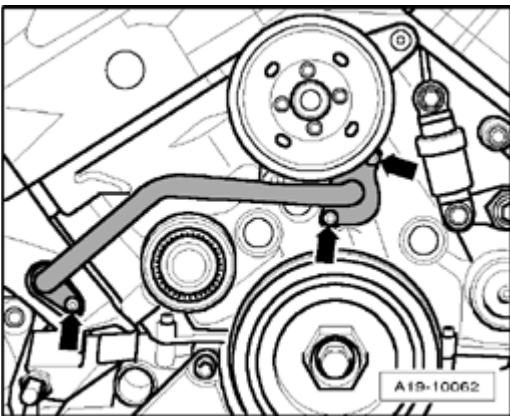
**Fig. 424: Relieving Tension On Ribbed Belt**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

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

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

**Fig. 425: Front Coolant Pipe Bolts**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place drip tray for workshop crane VAS 6208 or drip tray V.A.G 1306 under engine.
- Remove bolts - **arrows** -.
- Remove front coolant pipe.

Installing

Installation is in reverse order of removal. Note the following:

NOTE:

- Replace O-rings.

- Install ribbed belt --> **Ribbed Belt, Removing and Installing** .
- Install lock carrier with attachments --> **50 - BODY - FRONT** .
- Install front bumper cover --> **63 - BUMPERS** .
- Deactivate vehicle lifting mode --> **43 - SELF LEVELING SUSPENSION** .
- Fill with coolant --> *Filling* under **Cooling System, Draining and Filling**
- Check headlight adjustment ; Headlights, checking adjustment.

Radiator and coolant fan, assembly overview

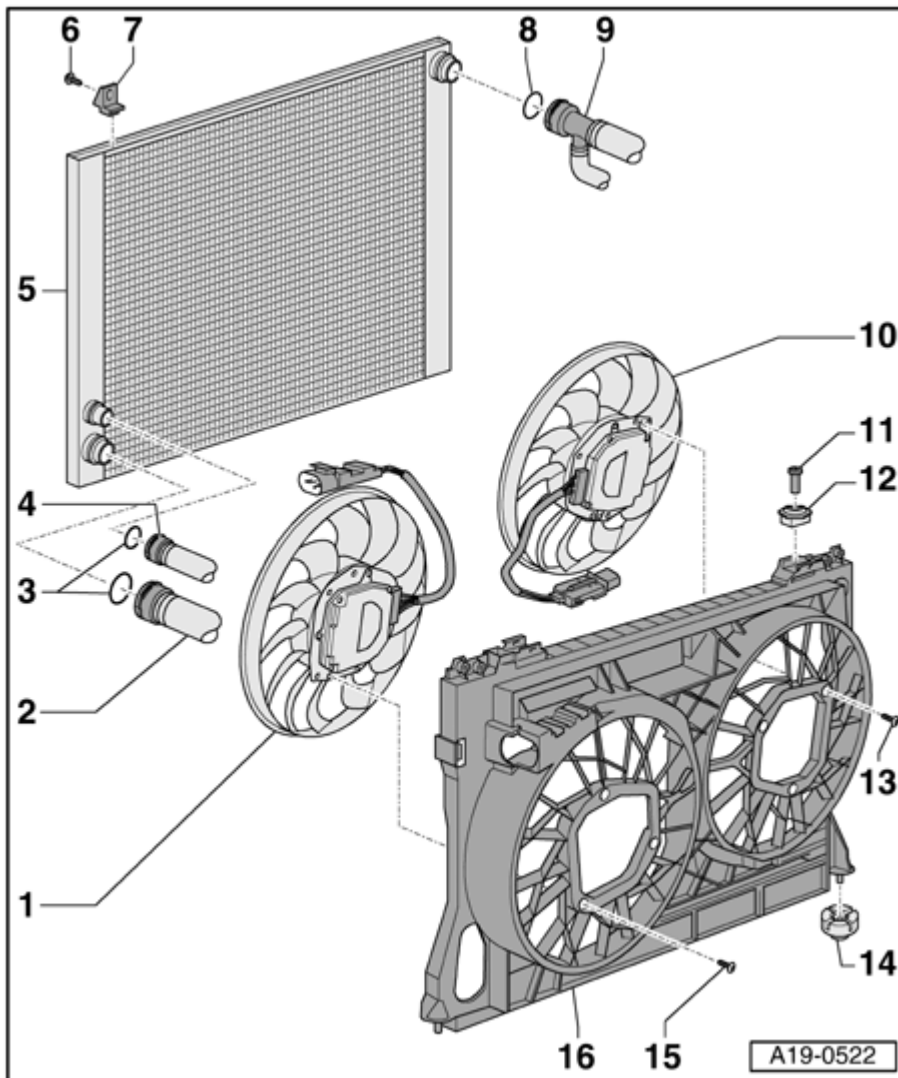


Fig. 426: Radiator And Coolant Fan, Assembly Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Coolant fan V7

- With Coolant Fan Control (FC) module J293

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

2 - Coolant hose

- Release retaining clip to disconnect

3 - O-ring

- Replace

4 - Coolant hose

- Release retaining clip to disconnect

5 - Radiator

- Removing and installing --> **Radiator, removing and installing**
- After replacing replace entire amount of coolant

6 - 6 Nm

7 - Bracket for radiator

8 - O-ring

- Replace

9 - Coolant hose

- Release retaining clip to disconnect

10 - Coolant Fan 2 V177

- With Coolant Fan Control (FC) module 2 J671
- Removing and installing --> **Coolant fan, removing and installing**

11 - Retaining pin

12 - Rubber buffer

- Release with screwdriver and remove

13 - 10 Nm

14 - Rubber bushing

15 - 10 Nm

- Replace

16 - Fan shroud

- Removing and installing --> **Fan shroud, removing and installing**

Radiator, removing and installing

Special tools, testers and auxiliary items required

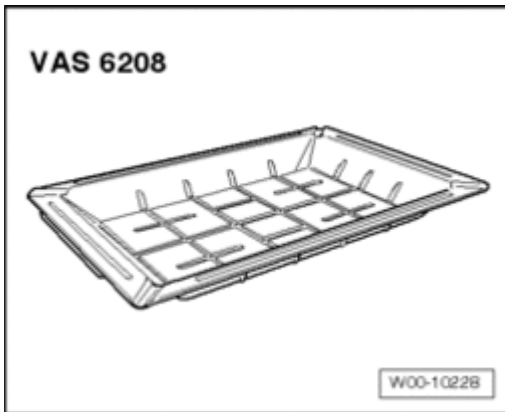


Fig. 427: Drip Tray For Workshop Crane VAS 6208 Or Drip Tray V.A.G 1306
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drip tray for workshop crane VAS 6208 or drip tray V.A.G 1306

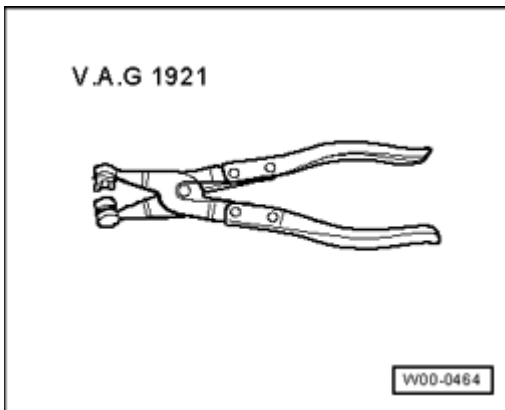


Fig. 428: Hose Clamp Pliers V.A.G 1921
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hose clamp pliers V.A.G 1921

Removing

NOTE:

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

- Activate vehicle lifting mode --> **43 - SELF LEVELING SUSPENSION**.

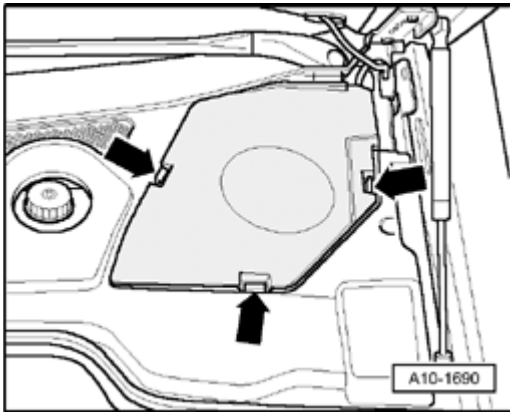


Fig. 429: Cover Above Coolant Reservoir

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove cover above coolant reservoir - **arrows** -.

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

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

NOTE:

- Secure the brake discs with wheel bolts.

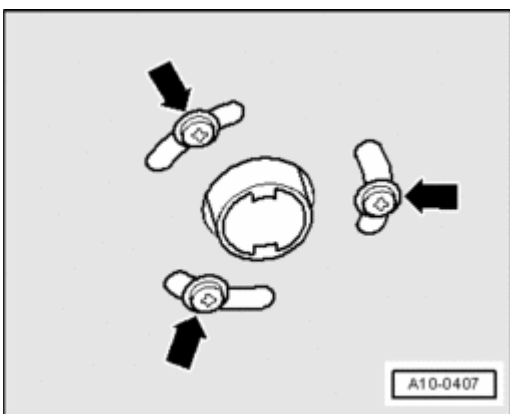


Fig. 430: Identifying Exhaust Pipe Fasteners

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- For vehicles with auxiliary heater, remove bolts - **arrows** - for exhaust pipe of auxiliary heater on sound

insulation.

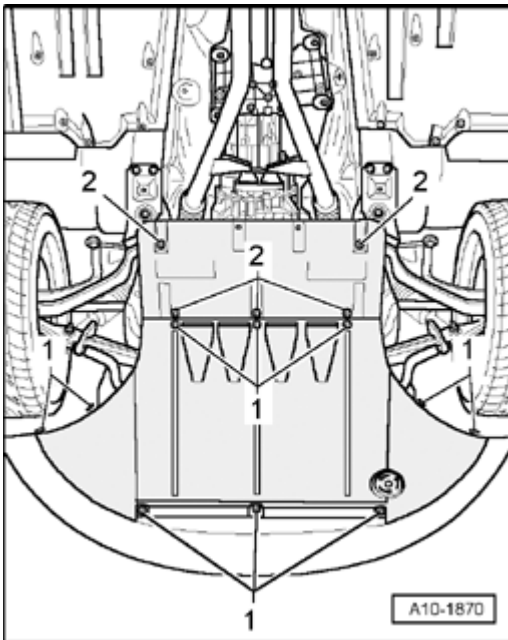


Fig. 431: Noise Insulation Quick-Release Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen quick-release fasteners - 1 - and remove front sound insulation.

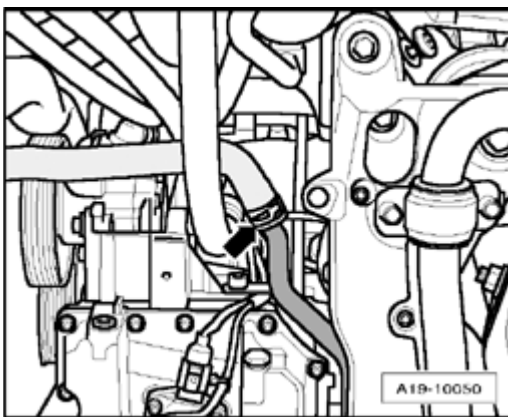


Fig. 432: Left Coolant Pipe Coolant Hose
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place drip tray for workshop crane VAS 6208 or drip tray V.A.G 1306 under engine.
- Disconnect coolant hose - **arrow** - from left coolant pipe and drain coolant.

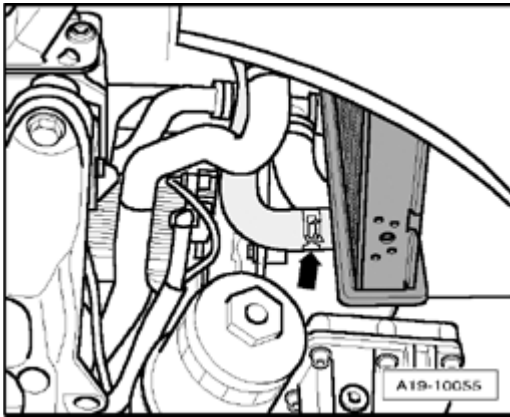


Fig. 433: Auxiliary Cooler Lower Right Coolant Hose
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect lower right coolant hose - **arrow** - from auxiliary cooler and drain remaining coolant.

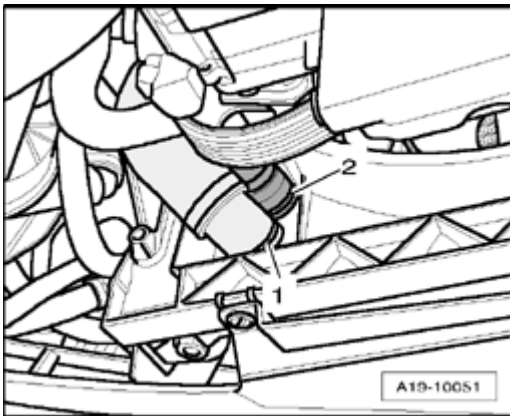


Fig. 434: Radiator Coolant Hoses
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove coolant hoses - **1** - and - **2** - at radiator by releasing retaining clips.
- Remove front part of left and right front wheelhouse liner --> **66 - EXTERIOR EQUIPMENT** .
- Remove front bumper cover --> **63 - BUMPERS** .

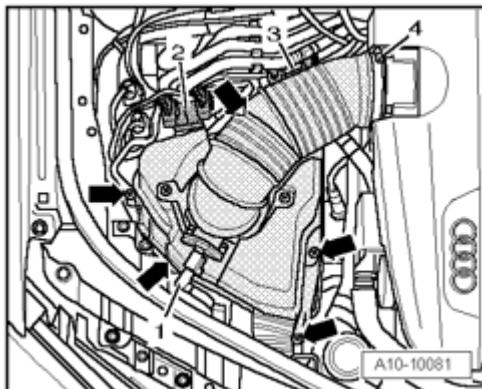


Fig. 435: Mass Air Flow (MAF) Sensor G70 Electrical Connector, Upper Part Of Air Filter Housing Connections, Intake Manifold Air Duct Hose & Bolts
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **1** - for Mass Air Flow (MAF) sensor G70.
- Disconnect air duct - **4** - at intake manifold.
- Unhook retainer for connections - **2** - and - **3** - at upper part of air filter housing.
- Remove bolts - **arrows** -.
- Remove upper part of right air filter housing.

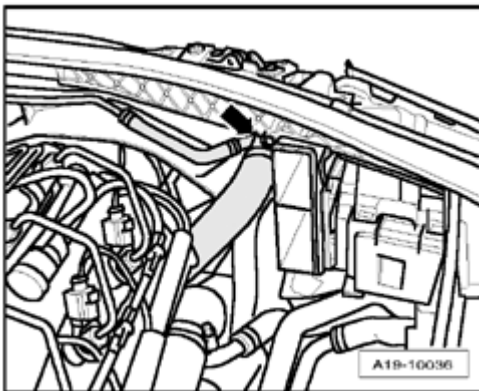


Fig. 436: Radiator Upper Coolant Hose
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect upper coolant hose - **arrow** - from radiator by releasing retaining clip.

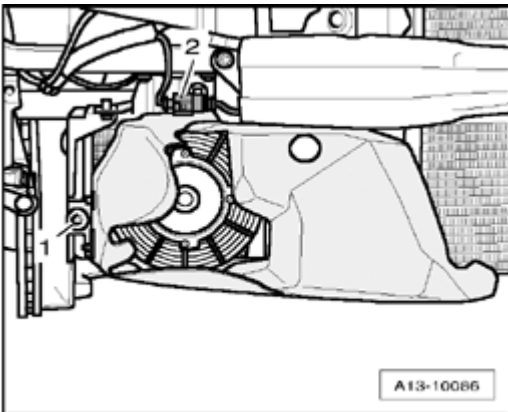


Fig. 437: Auxiliary Cooler Air Duct Bolt & Electrical Connector
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect harness connector - **2** - and move wiring clear.
- Remove bolts - **1** -.
- Remove air ducting for auxiliary cooler.

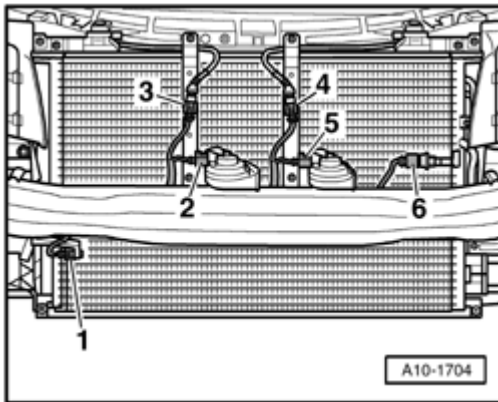


Fig. 438: Outside Air Temperature Sensor G17 Electrical Harness Connectors
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connectors - **1 to 6** - and move electrical wiring clear.
- Remove bracket for Outside air temperature sensor G17 by rotating bracket 90° clockwise and removing.

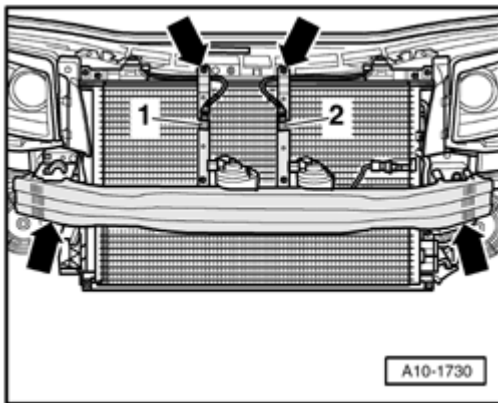
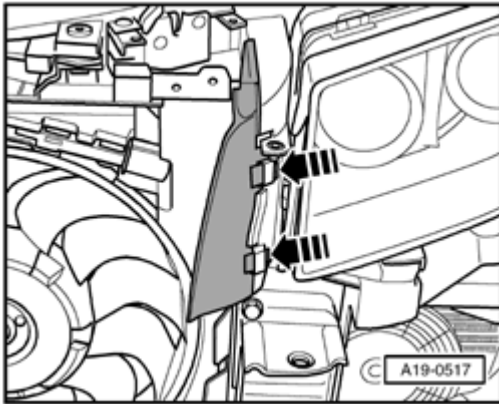


Fig. 439: Brace Electrical Connections & Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connections - **1** - and - **2** - from braces.
- Remove bolts - **arrows** -.
- Remove bumper with braces.

**Fig. 440: Air Guides**

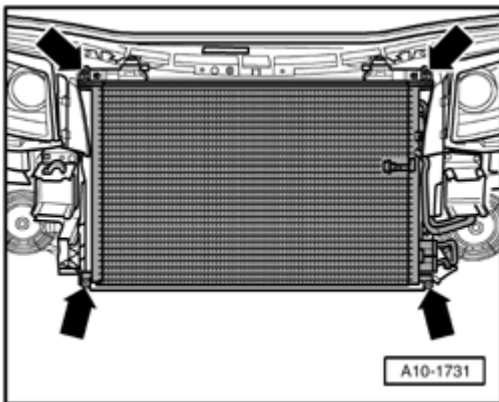
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove air guide at left and right - **arrows** -.

CAUTION: The air conditioning refrigerant circuit must not be opened.

NOTE:

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

**Fig. 441: Condenser Bolts**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Pivot condenser with power steering fluid cooler downward.
- Tie up condenser to vehicle.

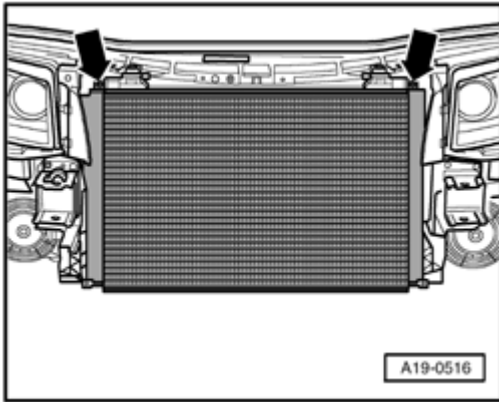


Fig. 442: Removing Brackets For Radiator
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove both brackets for radiator - **arrows** -.
- Pivot upper radiator forward slightly and lift it out of lock carrier.

Installing

Installation is performed in reverse order of removal, noting the following:

- NOTE:**
- **Secure all hose connections using hose clamps appropriate for the model type .**
 - **During installation, all cable ties must be reinstalled at the same location.**
- Install front bumper cover --> **63 - BUMPERS** .
 - Deactivate the vehicle lifting mode --> **43 - SELF LEVELING SUSPENSION** .
 - Fill with coolant --> *Filling* under **Cooling System, Draining and Filling**

Tightening torques

Component	Nm
Bracket for radiator to lock carrier	6
Condenser to lock carrier	6
Braces to lock carrier	9
Bumper to impact absorbers	23
Air guide to auxiliary cooler	10

Fan shroud, removing and installing

Removing

- Drain coolant --> **Cooling System, Draining and Filling** .
- Remove radiator --> **Radiator, removing and installing.**

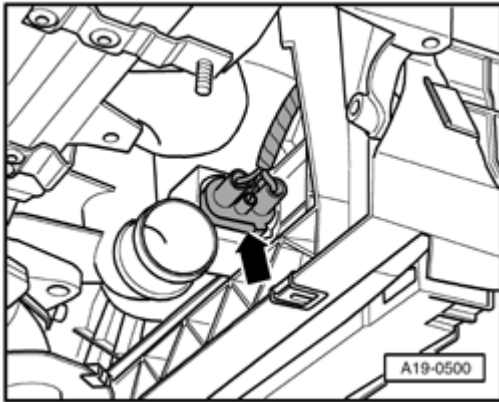


Fig. 443: Coolant Fans Electrical Harness Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - **arrow** - for coolant fans.
- Move wiring on back of lock carrier clear.

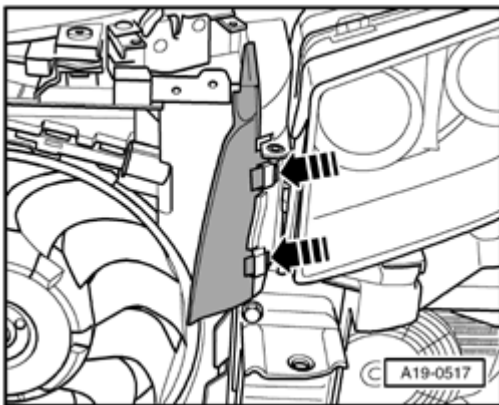


Fig. 444: Air Guides
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove air guide at left and right - **arrows** -.

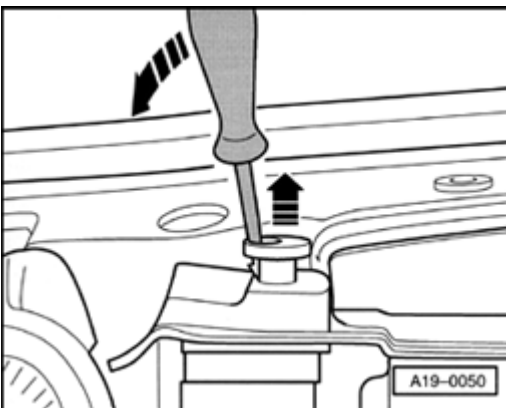


Fig. 445: Releasing Both Fan Shroud Retaining Pins And Removing By Pulling Upward

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Release both fan shroud retaining pins and remove by pulling upward - **arrows** -.
- Pivot fan shroud forward at upper edge.

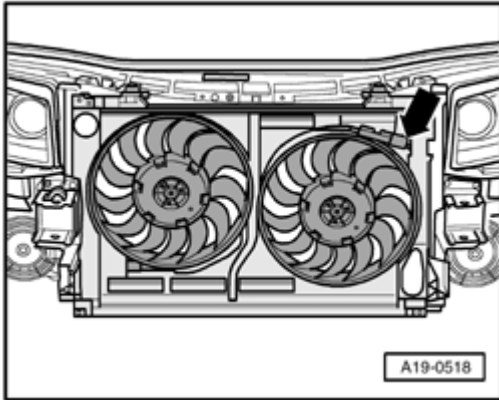


Fig. 446: Coolant Fan Electrical Connection

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connection - **arrow** - for coolant fan by reaching behind fan shroud.
- Remove fan shroud.

Installing

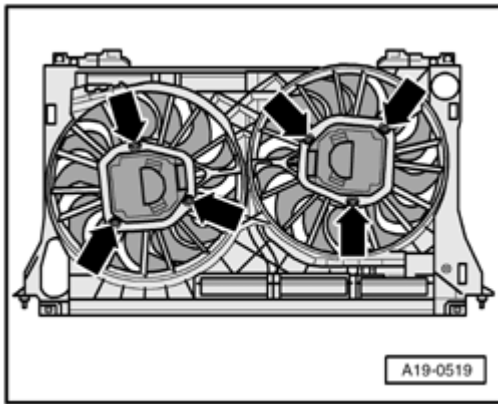
Installation is in reverse order of removal. Note the following:

- Install radiator. **Installing**
- Fill with coolant --> *Filling* under **Cooling System, Draining and Filling**

Coolant fan, removing and installing

Removing

- Drain coolant --> **Cooling System, Draining and Filling** .
- Remove radiator --> **Radiator, removing and installing.**
- Remove fan shroud --> **Fan shroud, removing and installing.**

**Fig. 447: Coolant Fan Bolts**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Unclip electrical harness connectors and move wiring clear.
- Remove coolant fan.

Installing

Installation is in reverse order of removal. Note the following:

- Install fan shroud. **Installing**
- Install radiator. **Installing**
- Fill with coolant --> *Filling* under **Cooling System, Draining and Filling**

Tightening torque

Component	Nm
Coolant fan to fan shroud	10 * See note

* Replace bolt.

Auxiliary cooler, removing and installing

Special tools, testers and auxiliary items required

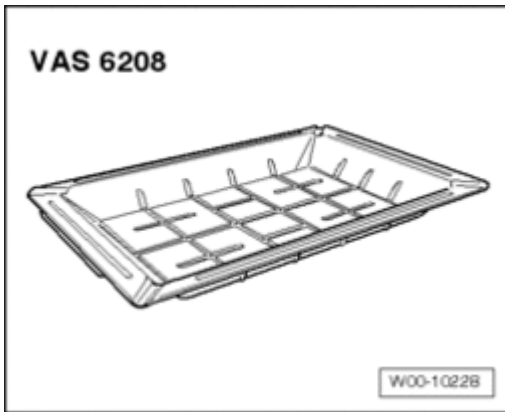


Fig. 448: Drip Tray For Workshop Crane VAS 6208 Or Drip Tray V.A.G 1306
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drip tray for workshop crane VAS 6208 or drip tray V.A.G 1306

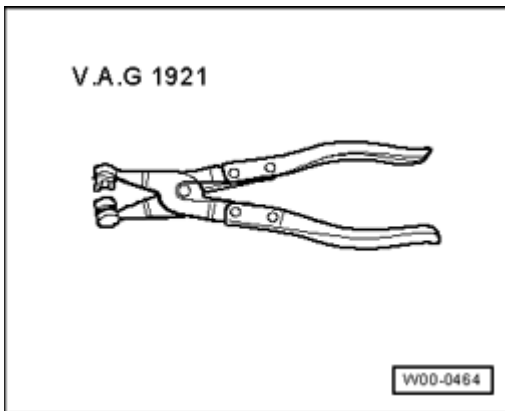


Fig. 449: Hose Clamp Pliers V.A.G 1921
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hose clamp pliers V.A.G 1921

Removing

NOTE:

- The following removal and installation procedure is for the right auxiliary cooler. The left auxiliary cooler is removed and installed in the same manner.
- Remove front bumper cover --> **63 - BUMPERS** .

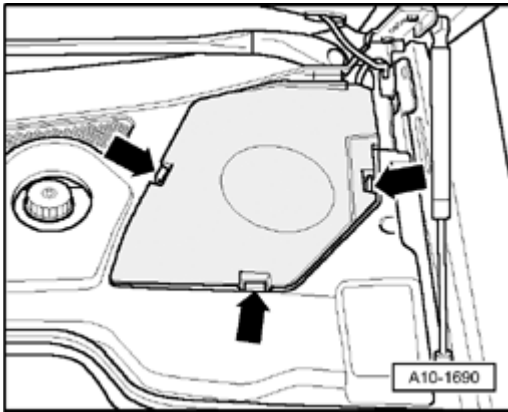


Fig. 450: Cover Above Coolant Reservoir

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove cover above coolant reservoir - **arrows** -.

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

- Open cap of coolant expansion tank.

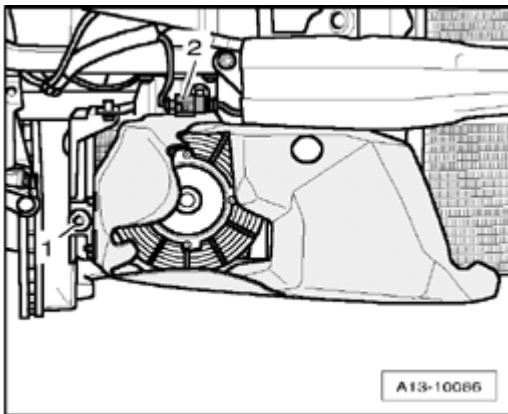


Fig. 451: Auxiliary Cooler Air Duct Bolt & Electrical Connector

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect harness connector - **2** - and move wiring clear.
- Remove bolts - **1** -.
- Remove air ducting for auxiliary cooler.

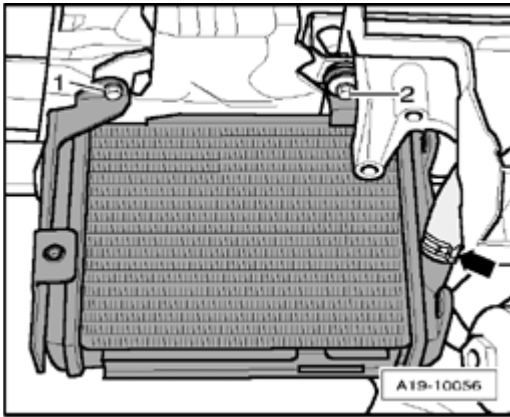


Fig. 452: Auxiliary Radiator Coolant Hose & Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place drip tray for workshop crane VAS 6208 or drip tray V.A.G 1306 under engine.
- Disconnect front coolant hose from auxiliary cooler - **arrow** - and drain coolant.
- Remove bolts - **1** - and - **2** -.

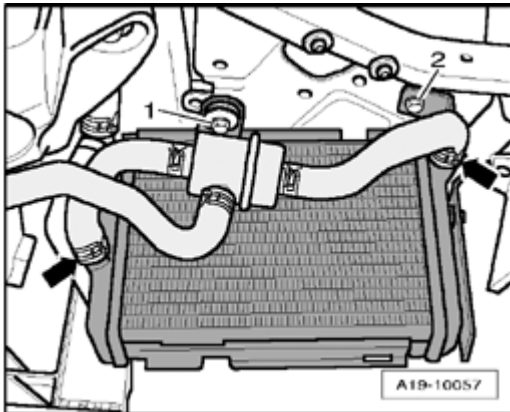


Fig. 453: Auxiliary Radiator, Coolant Hoses & Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect coolant hoses - **arrows** -.
- Remove bolts - **1** - and - **2** -.
- Remove auxiliary cooler.

Installing

Installation is in reverse order of removal. Note following:

NOTE:

- **Secure all hose connections using hose clamps appropriate for the model type .**

- Install front bumper cover --> **63 - BUMPERS** .

2009 Audi A8 Quattro

ENGINE 6.0 Liter 12-Cyl. 4V Engine Mechanical, Engine Code(s): BHT, BSB - A8

- Fill with coolant --> *Filling* under **Cooling System, Draining and Filling**

Torque specifications

Component	Nm
Air guide to auxiliary cooler	10
Auxiliary cooler to bracket	10

Cooling system, checking for proper seal

Special tools, testers and auxiliary items required

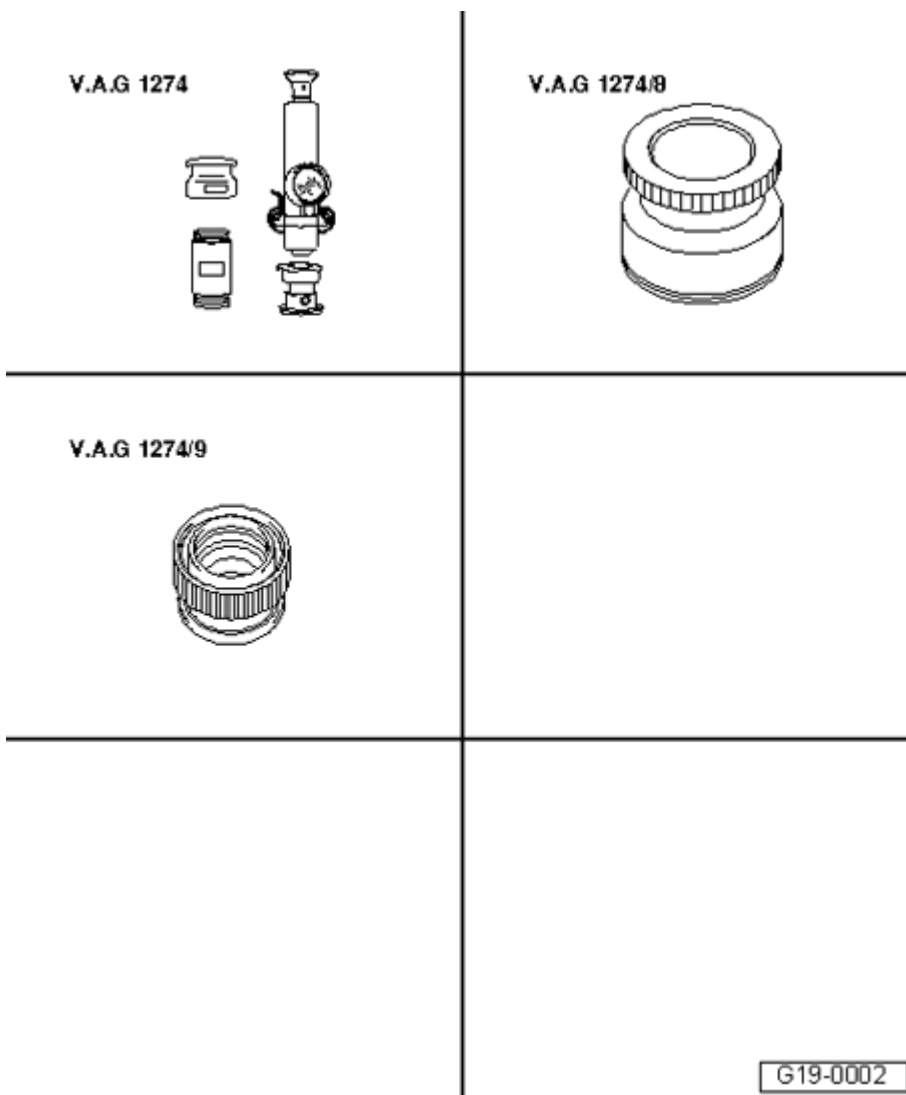


Fig. 454: Identifying Special Tools - Cooling System, Checking For Proper Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Cooling system tester V.A.G 1274

- Adapter V.A.G 1274/8
- Adapter V.A.G 1274/9

Conditions

- Engine at operating temperature.

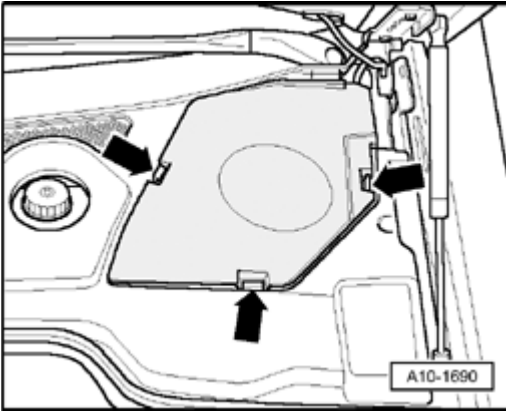
Work sequence

Fig. 455: Cover Above Coolant Reservoir

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove cover above coolant reservoir - **arrows** -.

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

- Open cap of coolant expansion tank.

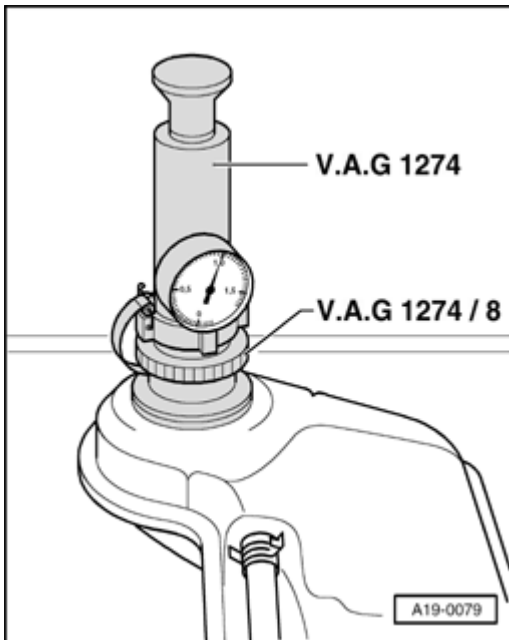


Fig. 456: Cooling System Tester V.A.G 1274 With Adapter V.A.G 1274/8 Onto Expansion Tank
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place cooling system tester V.A.G 1274 with adapter V.A.G 1274/8 onto expansion tank.
- Generate a positive pressure of approx. 1.0 bar using hand pump of cooling system tester.

If the pressure drops:

- Search for leaking areas and repair malfunction.

Checking pressure relief valve in cap

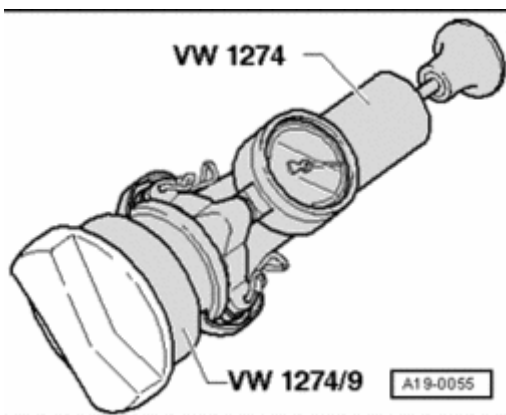


Fig. 457: Checking Pressure Relief Valve In Cap
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place cooling system tester V.A.G 1274 with adapter V.A.G 1274/8 onto 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 pressure relief 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 the exhaust system is not under stress and is far enough from the body. If necessary, loosen the clamping sleeves and align mufflers and exhaust pipes so that there is adequate distance to the vehicle body. Ensure the weight is evenly distributed among the exhaust hangers.
- Decoupling elements in the front muffler exhaust pipes must not be bent more than 10° danger of damage!
- In the illustration, the exhaust manifolds with catalytic converters and the front muffler are shown for the left cylinder bank.

Exhaust system, assembly overview

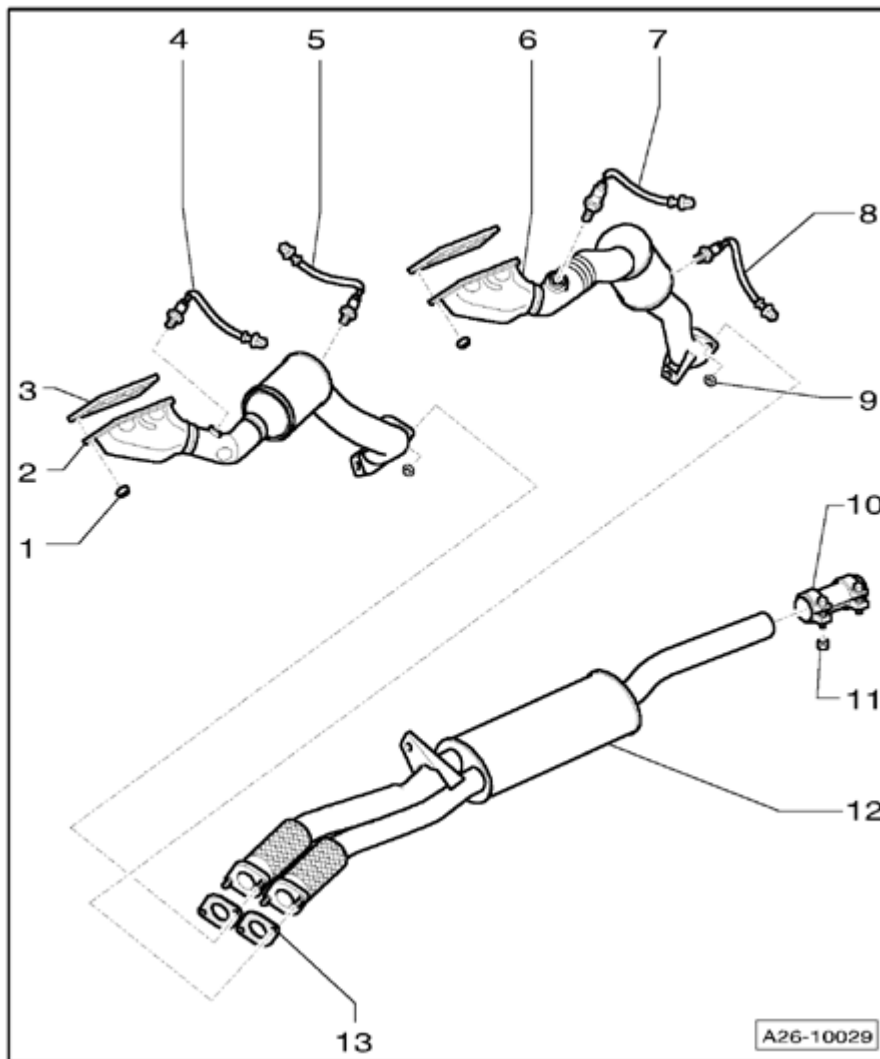


Fig. 458: Exhaust System, Assembly Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - 23 Nm

- Replace

2 - Exhaust manifold with catalytic converter

- Front left
- Removing and installing --> **Right exhaust manifold with catalytic converters, removing and installing**
- Protect from shocks and impact stress
- Individual components of suspension **Individual mounting components for exhaust manifold with catalytic converters**

3 - Gasket

- Replace

4 - Oxygen sensor before catalytic converter, 55 Nm

- Threads of new oxygen sensors are coated with assembly paste; paste must not get into slots of oxygen sensor body
- When re-using old oxygen sensor, grease threads with hot bolt paste; paste must not get into slots of oxygen sensor body
- Removing and installing --> **24 FUEL INJECTION SYSTEM**

5 - Oxygen sensor behind catalytic converter, 55 Nm

- Threads of new oxygen sensors are coated with assembly paste; paste must not get into slots of oxygen sensor body
- When re-using old oxygen sensor, grease threads with hot bolt paste; paste must not get into slots of oxygen sensor body.
- Removing and installing --> **24 FUEL INJECTION SYSTEM**

6 - Exhaust manifold with catalytic converters

- Rear left
- Removing and installing --> **Left exhaust manifold with catalytic converters, removing and installing**
- Protect from shocks and impact stress
- Individual components of suspension **Individual mounting components for exhaust manifold with catalytic converters**

7 - Oxygen sensor before catalytic converter, 55 Nm

- Threads of new oxygen sensors are coated with assembly paste; paste must not get into slots of oxygen sensor body
- When re-using the old oxygen sensor, grease threads with hot bolt paste; paste must not get into slots of oxygen sensor body.
- Removing and installing --> **24 FUEL INJECTION SYSTEM**

8 - Oxygen sensor behind catalytic converter, 55 Nm

- Threads of new oxygen sensors are coated with assembly paste; paste must not get into slots of oxygen sensor body
- When re-using old oxygen sensor, grease threads with hot bolt paste; paste must not get into slots of oxygen sensor body.
- Removing and installing --> **24 FUEL INJECTION SYSTEM**

9 - 25 Nm

- Replace

10 - Front clamping sleeve

- Before tightening, ensure exhaust system is tension-free --> **Exhaust system, installing free of tension**
- Installation position of bolt ends **Installed position of front double clamps**
- Fasten threaded fasteners uniformly, while pushing center muffler exhaust pipe upward slightly

11 - 23 Nm

12 - Front muffler

- With decoupling elements
- Decoupling elements must not be bent more than 10° risk of damage
- Left front muffler, removing, installing and aligning --> **Left front muffler, removing and installing**
- Right front muffler, removing, installing and aligning --> **Right front muffler, removing and installing**
- Individual components of suspension **Individual mounting components for exhaust manifold with catalytic converters**

13 - Gasket

- Replace

Individual mounting components for exhaust manifold with catalytic converters

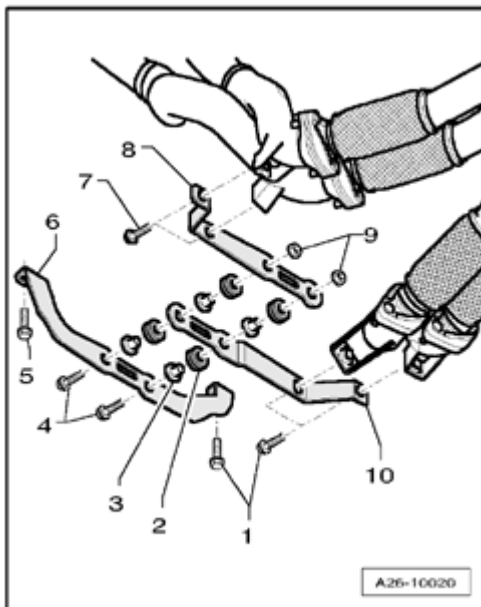


Fig. 459: Individual Mounting Components For Exhaust Manifold With Catalytic Converters
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1. Bolt, 25 Nm
2. Rubber grommet
3. Bushing
4. Bolt
5. Bolt, 25 Nm
6. Front bracket, installed location
7. Bolt, 25 Nm
8. Left bracket, installed location
9. Nut, 25 Nm
10. Right bracket, installed location

Installed location for front, left and right brackets

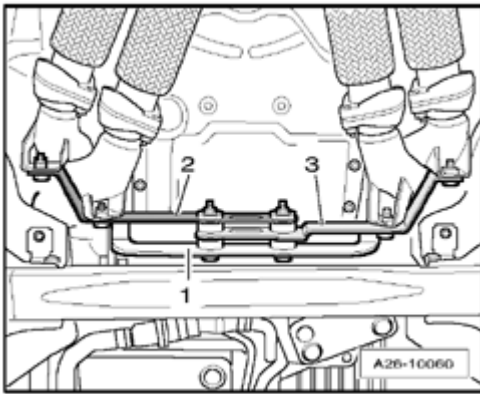


Fig. 460: Installed Location For Front, Left And Right Brackets
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Observe installed location for front, left and right brackets to prevent pre-tensioning of exhaust system.

1. Front bracket
2. Left bracket
3. Right bracket

Individual components of rear bracket

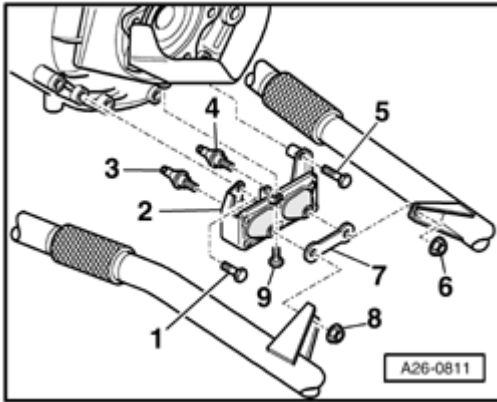


Fig. 461: Individual Components Of Rear Bracket
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1. Bolt, 22 Nm
2. Bracket
3. Threaded stud
4. Threaded stud
5. Bolt, 22 Nm
6. Nut, self-locking, 25 Nm
7. Tongue
8. Nut, self-locking, 25 Nm
9. Bolt, 22 Nm

Installed position of front double clamps

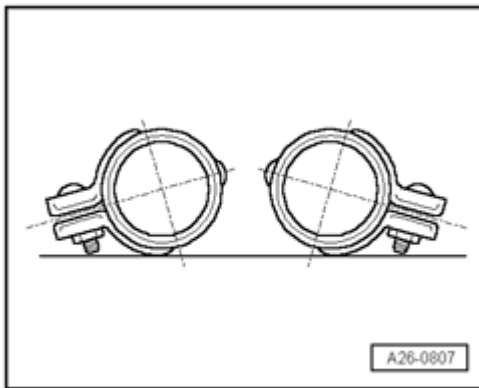


Fig. 462: Adjusting Front Double Clamps So Bolt Ends Do Not Project Over Lower Edges Of Double Clamps

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.

Left front muffler, removing and installing

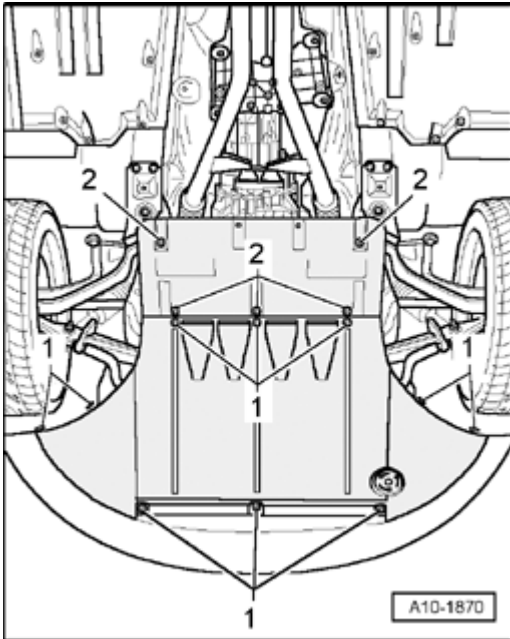


Fig. 463: Noise Insulation Quick-Release Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

- Activate vehicle lifting mode --> **43 - SELF LEVELING SUSPENSION** .
- Loosen quick-release fasteners - **2** - and remove rear sound insulation.

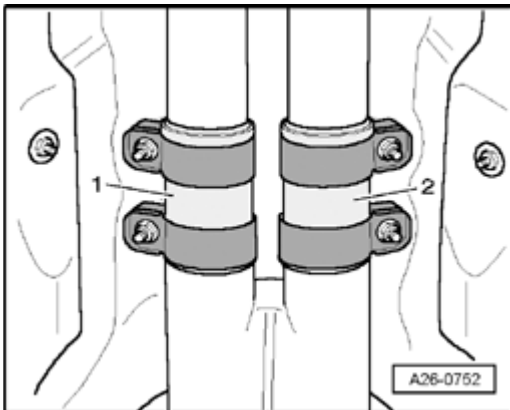


Fig. 464: Clamping Sleeves
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen left clamping sleeve - **1** -.

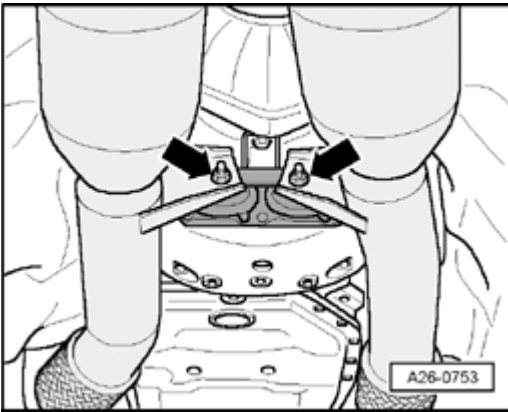


Fig. 465: Front Muffler Retaining Straps Nuts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - **left arrow** - at retaining strap for left front exhaust pipe.

NOTE:

- **Decoupling elements at front mufflers must not be bent more than 10° danger of damage!**

- Remove nuts - **arrows** -.

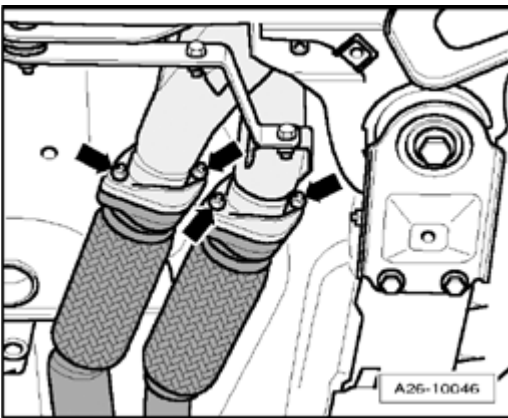


Fig. 466: Left Front Muffler Decoupling Nuts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove left front muffler with decoupling elements.

Installing

Installation is in reverse order of removal. Note the following:

NOTE:

- **Replace gaskets and self-locking nuts.**

- Align exhaust system free of tension --> **Exhaust system, installing free of tension.**
- Deactivate vehicle lifting mode --> **43 - SELF LEVELING SUSPENSION** .

Tightening torques

Component	Nm
Front muffler to exhaust manifold with catalytic converters	25 * See note
Front muffler to bracket	25 * See note

*Replace self-locking nuts

Right front muffler, removing and installing

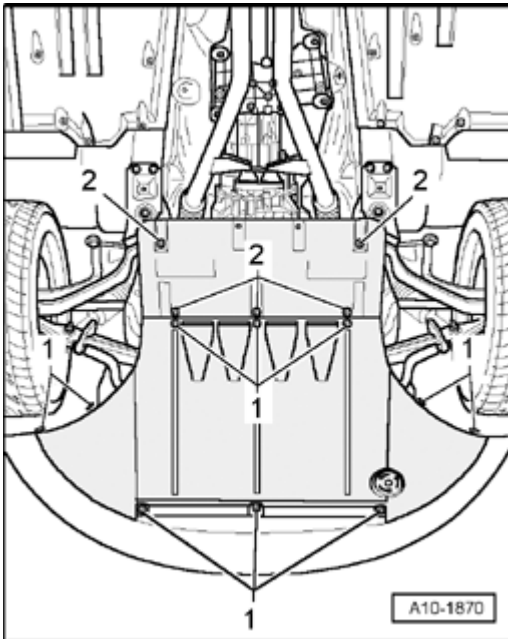
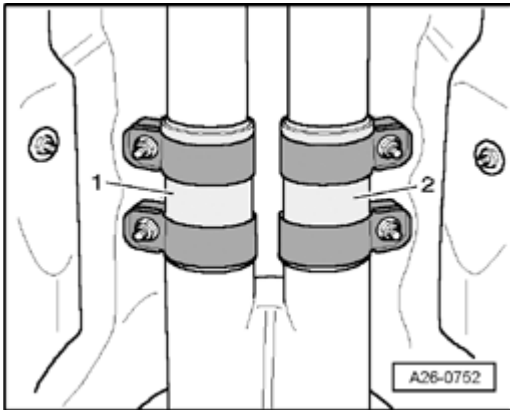


Fig. 467: Noise Insulation Quick-Release Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

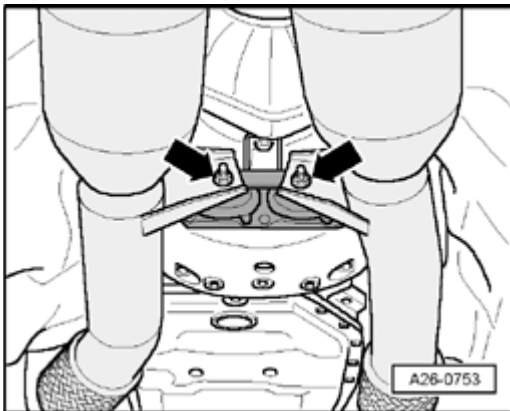
Removing

- Activate vehicle lifting mode --> **43 - SELF LEVELING SUSPENSION** .
- Loosen quick-release fasteners - **2** - and remove rear sound insulation.

**Fig. 468: Clamping Sleeves**

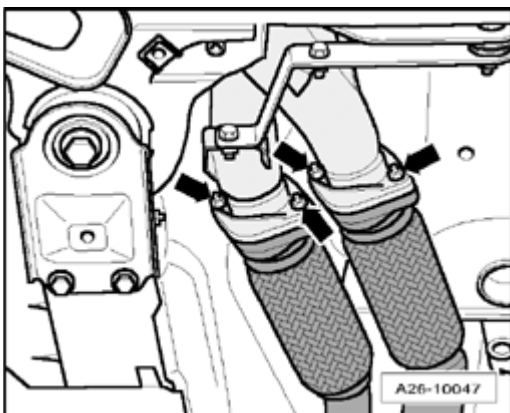
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen right clamping sleeve - 2 -.

**Fig. 469: Front Muffler Retaining Straps Nuts**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - **right arrow** - at retaining strap for right front exhaust pipe.

**Fig. 470: Right Front Muffler Decoupling Nuts**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

2009 Audi A8 Quattro

ENGINE 6.0 Liter 12-Cyl. 4V Engine Mechanical, Engine Code(s): BHT, BSB - A8

NOTE:

- **Decoupling elements at front mufflers must not be bent more than 10° danger of damage!**

- Remove nuts - **arrows** -.
- Remove right front muffler with decoupling elements.

Installing

Installation is in reverse order of removal. Note the following:

NOTE:

- **Replace gaskets and self-locking nuts.**
- Align exhaust system free of tension --> **Exhaust system, installing free of tension.**
- Deactivate vehicle lifting mode --> **43 - SELF LEVELING SUSPENSION** .

Tightening torques

Component	Nm
Front muffler to exhaust manifold with catalytic converters	25 * See note
Front muffler to bracket	25 * See note

*Replace self-locking nuts.

Left exhaust manifold with catalytic converters, removing and installing

Removing

- Engine/transmission unit removed and attached to scissor lift platform VAS 6131.

NOTE:

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

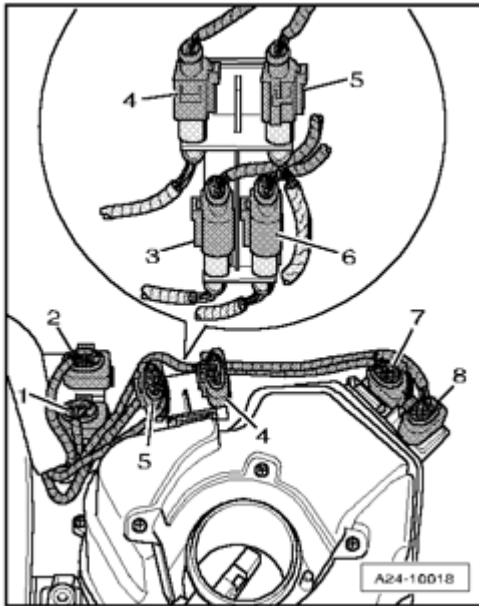


Fig. 471: Oxygen Sensors Electrical Harness Connectors
Courtesy of VOLKSWAGEN UNITED STATES, INC.

○ Separate following electrical connections for oxygen sensors:

- 1 - Heated Oxygen Sensor (HO2S) 3 G285 , (6-pin, black)
- 2 - Heated Oxygen Sensor (HO2S) 4 G286 , (6-pin, brown)
- 3 - Oxygen Sensor (O2S) 3 Behind Three Way Catalytic Converter (TWC) G287 , (4-pin, green)
- 6 - Oxygen Sensor (O2S) 4 Behind Three Way Catalytic Converter (TWC) G288 , (4-pin, gray)

NOTE:

- To disconnect electrical connectors - 3 - and - 6 - , unclip bracket for connectors from air filter housing and turn over (shown in close-up).
- Disregard the other items in the illustration.

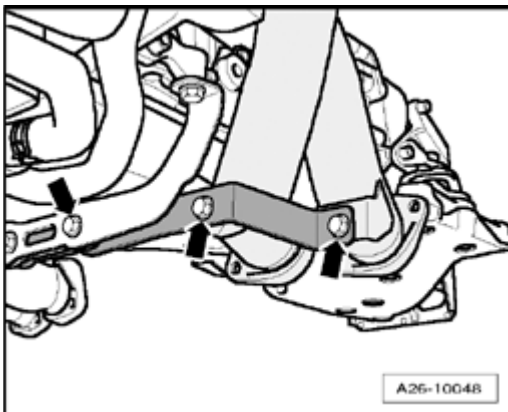


Fig. 472: Pivot Bracket Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and pivot bracket for left exhaust manifolds with catalytic converters downward.

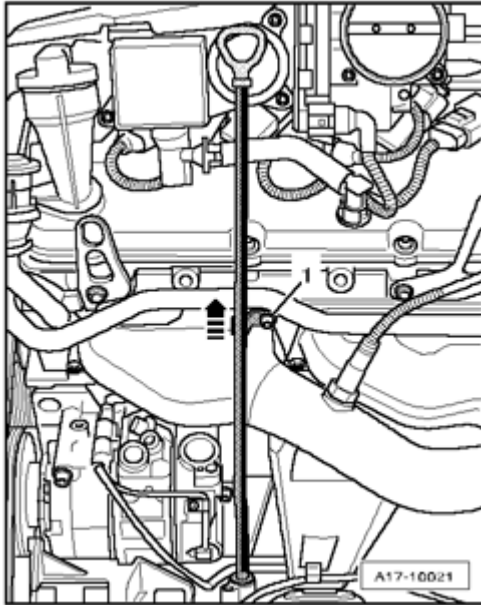


Fig. 473: Pulling Oil Dipstick Guide Tube Upward And Off

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - **1** -.
- Pull oil dipstick guide tube upward and off - **arrow** -.

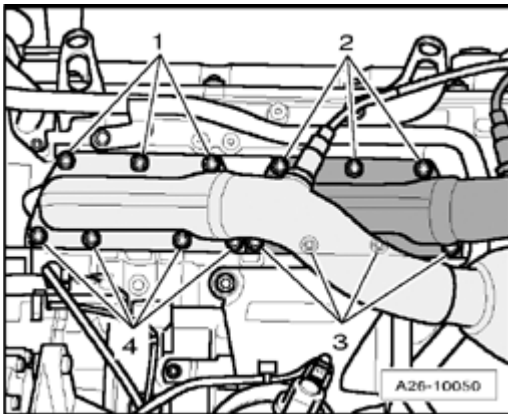


Fig. 474: Left Exhaust Manifolds Nuts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew nuts - **1 to 4** - and remove left exhaust manifold with catalytic converters.

Installing

Installation is in reverse order of removal. Note the following:

NOTE:

- Replace self-locking nuts.
- Replace gaskets and O-rings.
- During installation, all cable ties must be re-installed at the same location.

Tightening torques

Component	Nm
Exhaust manifold with catalytic converters to cylinder head	23 * See note
Exhaust manifold with catalytic converters to bracket	25
Oil dipstick guide tube to cylinder head	10

*Replace self-locking nuts.

Right exhaust manifold with catalytic converters, removing and installing

Removing

- Engine/transmission assembly removed and attached to scissor lift platform VAS 6131.

NOTE:

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

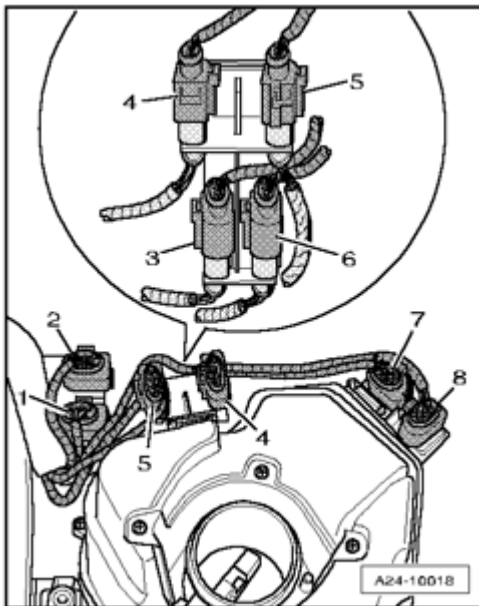


Fig. 475: Oxygen Sensors Electrical Harness Connectors

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect following oxygen sensor connections:

4 - Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130 , (4-pin, black)

5 - Oxygen Sensor (O2S) 2 Behind Three Way Catalytic Converter (TWC) G131 , (4-pin, brown)

7 - Heated Oxygen Sensor (HO2S) 2 G108 , (6-pin, brown)

8 - Heated Oxygen Sensor (HO2S) G39 , (6-pin, black)

NOTE:

- Disregard the other items in the illustration.

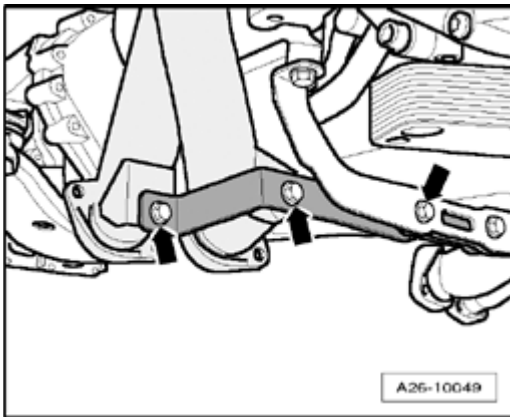


Fig. 476: Pivot Bracket Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and pivot bracket for right exhaust manifolds with catalytic converters downward.

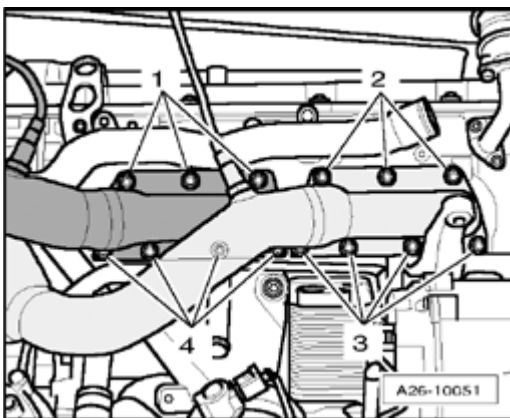


Fig. 477: Right Exhaust Manifold Nuts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

2009 Audi A8 Quattro

ENGINE 6.0 Liter 12-Cyl. 4V Engine Mechanical, Engine Code(s): BHT, BSB - A8

- Remove nuts - **1 to 4** - and remove right exhaust manifold with catalytic converters.

Installing

Installation is in reverse order of removal. Note the following:

NOTE:

- **Replace self-locking nuts.**
- **Replace seals.**
- **During installation, all cable ties must be re-installed at the same location.**

Tightening torques

Component	Nm
Exhaust manifold with catalytic converters to cylinder head	23 * See note
Exhaust manifold with catalytic converters to bracket	25

*Replace self-locking nuts.

Center muffler and rear muffler, removing and installing

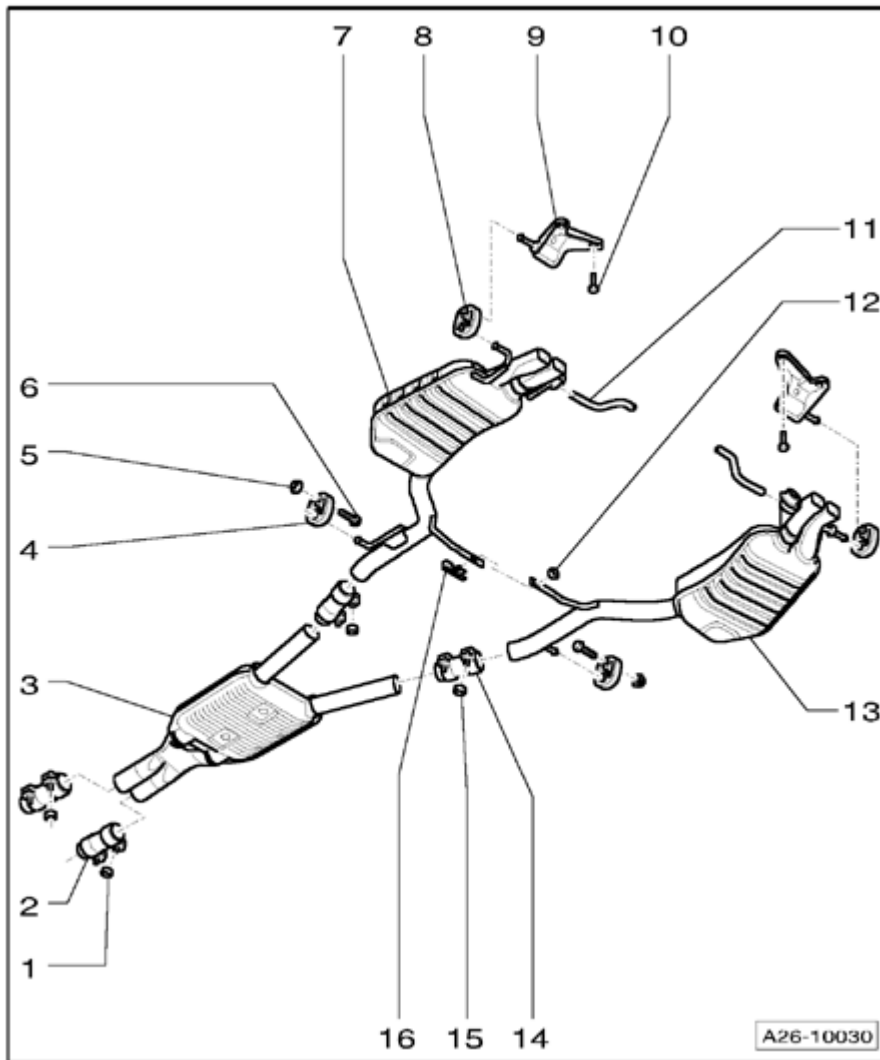


Fig. 478: Enter Muffler And Rear Muffler Remove/Install Components
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - 23 Nm

2 - Front clamping sleeve

- Before tightening, ensure exhaust system is tension-free --> **Exhaust system, installing free of tension**
- Installation position of bolt ends **Installed position of front double clamps**
- Fasten threaded fasteners uniformly, while pushing center muffler exhaust pipe upward slightly

3 - Center muffler

- Install exhaust system free of stress --> **Exhaust system, installing free of tension**

4 - Retaining loop

- Checking pretension, --> **Exhaust system, installing free of tension** ; Exhaust system, installing free of tension

5 - 23 Nm

6 - Bolt

7 - Rear muffler

- For left side of vehicle
- With exhaust flap
- Original equipment as one unit with center muffler. For repairs, replace each separately.
- Separating point **Fig. 482**
- With shield, depending on version
- When replacing a single rear muffler, remove shield from opposite rear muffler **Shield on rear muffler**
- Install exhaust system free of stress --> **Exhaust system, installing free of tension**
- Exhaust flap, checking --> **Exhaust flaps, checking**

8 - Retaining loop

- Check pretension --> **Exhaust system, installing free of tension**

9 - Suspended mount

10 - 22 Nm

11 - Vacuum hose

- For exhaust flap
- From exhaust flap valve

12 - 23 Nm

- Replace

13 - Rear muffler

- For right side of vehicle
- With exhaust flap
- Original equipment as one unit with center muffler. For repairs, replace each separately.
- Separating point **Fig. 482**
- With shield, depending on version

- When replacing a single rear muffler, remove shield from opposite rear muffler **Shield on rear muffler**
- Install exhaust system free of stress --> **Exhaust system, installing free of tension**
- Exhaust flap, checking --> **Exhaust flaps, checking**

14 - Rear clamping sleeve

- For individual replacement of center and rear mufflers
- Before tightening, ensure exhaust system is tension-free --> **Exhaust system, installing free of tension**
- Installed location **Installed position of rear double clamps**
- Tighten threaded connections evenly

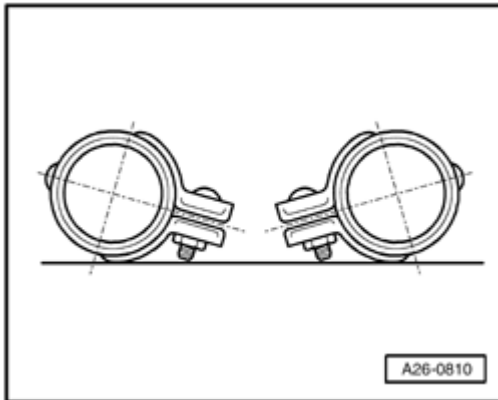
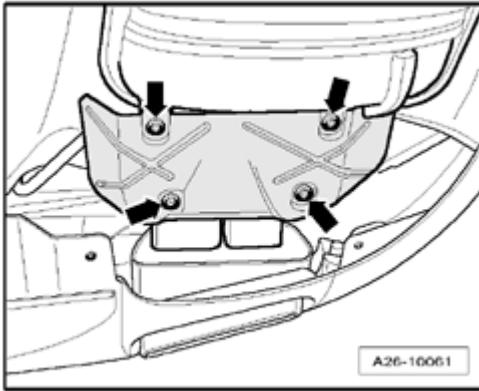
15 - 23 Nm**16 - Clamping piece****Installed position of rear double clamps**

Fig. 479: Adjusting Rear Double Clamps So That Bolt Ends Do Not Project Over Lower Edges Of Double Clamps

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install double clamps so that bolt ends do not project over lower edge of double clamp.
- Threaded connections face each other.

Shield on rear muffler

**Fig. 480: Shield On Rear Muffler**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

Depending on version, rear mufflers are equipped with shields.

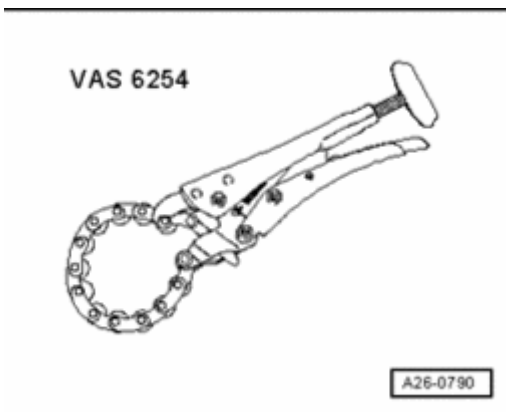
- When replacing a single rear muffler, remove shield from opposite rear muffler - **arrows** -.

Center muffler and rear muffler, separating

A separating point has been provided in the connecting pipe for individual replacement of the center or rear muffler

The separating point is marked by depressions around the circumference of the exhaust pipe.

Special tools, testers and auxiliary items required

**Fig. 481: Chain Pipe Cutter VAS 6254**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Chain pipe cutter VAS 6254

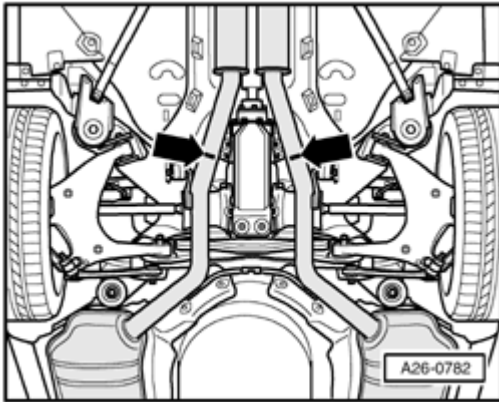


Fig. 482: Exhaust Pipes Separating Point
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Work sequence

- Activate vehicle lifting mode --> **43 - SELF LEVELING SUSPENSION** .
- Separate exhaust pipes at a right angle at separating point - **arrow** - using chain pipe cutter VAS 6254.

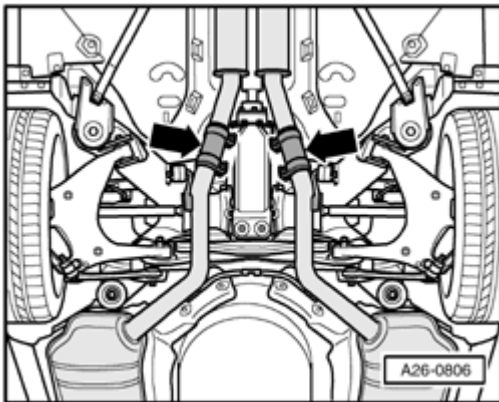


Fig. 483: Clamping Sleeves
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- When installing, position clamping sleeves - **arrows** - centrally on separation point.

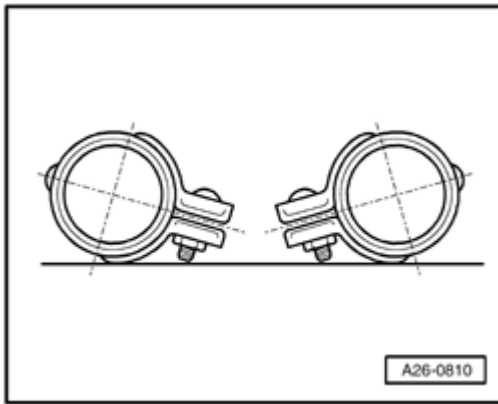


Fig. 484: Adjusting Rear Double Clamps So That Bolt Ends Do Not Project Over Lower Edges Of Double Clamps

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install double clamps so that bolt ends do not project over lower edge of double clamp.
- Threaded connections face each other.
- Align exhaust system free of tension --> **Exhaust system, installing free of tension.**
- Deactivate vehicle lifting mode --> **43 - SELF LEVELING SUSPENSION** .

Exhaust system, installing free of tension

NOTE:

- **Align exhaust system when cold.**

- Loosen threaded fasteners of all clamping sleeves on exhaust system.

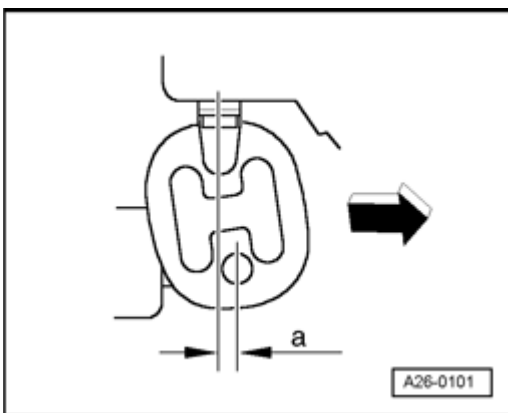


Fig. 485: Pushing Exhaust System Toward Front Of Vehicle

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Push rear muffler forward - **arrow** - until retaining loops are adjusted to following pretensions.
- Front retaining loops: - **a** - = 11 mm.

- Rear retaining loops: - **a** - = 14 mm.
- Align rear mufflers horizontally.

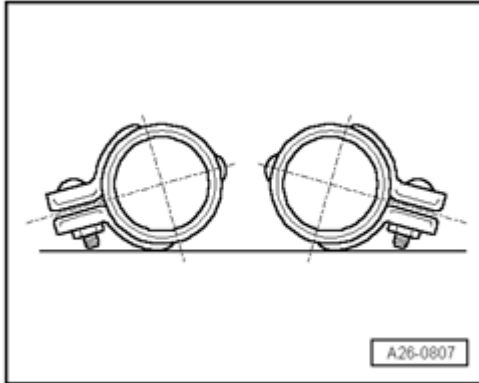


Fig. 486: Adjusting Front Double Clamps So Bolt Ends Do Not Project Over Lower Edges Of Double Clamps

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position clamping sleeves centrally on separation points.
- Align front clamping sleeve so that bolt ends do not project over lower edge of clamping sleeve.

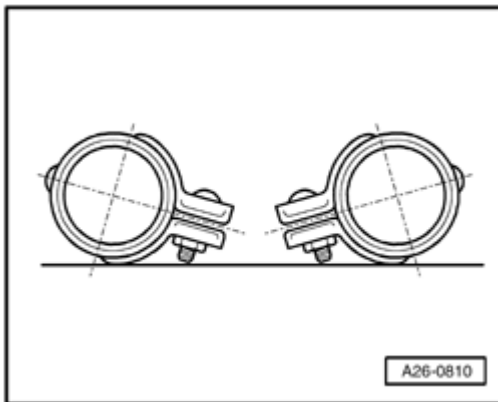


Fig. 487: Adjusting Rear Double Clamps So That Bolt Ends Do Not Project Over Lower Edges Of Double Clamps

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Align rear clamping sleeves so that bolt ends do not project over lower edge of clamping sleeves.
- Tighten threaded connections of clamping sleeves evenly to 23 Nm.

Aligning tailpipe trim

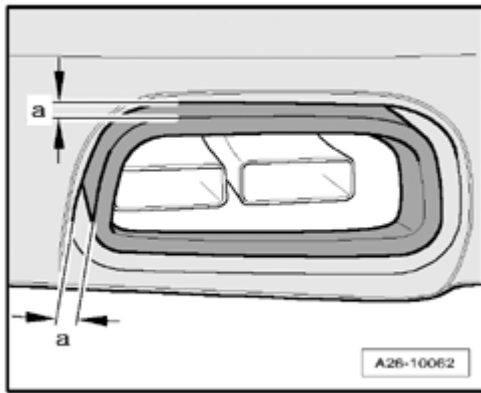


Fig. 488: Aligning Tailpipe Trim

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check if tailpipe trim has a uniform gap to bumper all around.
- Gap - a - = Gap - a - .
- If necessary, loosen nuts on backside of bumper and align tailpipe trim.

Exhaust system, checking for proper seal

- Start engine and let run at idle.
- Seal tailpipes with cloths or plug for duration of leak test.
- Listen for leaks at following connections: cylinder head/exhaust manifold with catalytic converters, exhaust manifold with catalytic converters/front muffler etc.
- Repair leaks detected.

SECONDARY AIR INJECTION (AIR), SERVICING

Secondary Air Injection (AIR), servicing

The secondary air injection system heats up the engine faster, and thereby the catalytic converter achieves operational readiness earlier after a cold start.

Principle and function

Principle

Due to the rich mixture during the cold start phase, the exhaust emissions contain an increased level of unburned hydrocarbons. The secondary air injection (AIR) system improves the secondary oxidation within the catalytic converter, thereby reducing harmful emissions. The heat released by secondary oxidation shortens the start-up time of the catalytic converter considerably, as well as significantly improves emissions quality during the cold-running phase.

Function

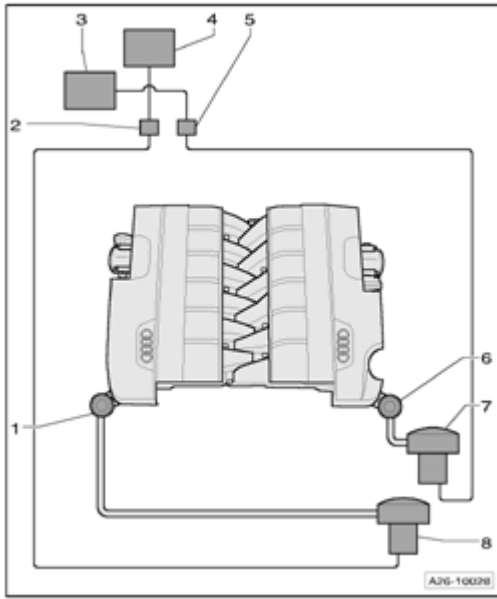


Fig. 489: Secondary Air Injection (Air), Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

In the cold-run phase, control modules - 3 - and - 4 - activate the secondary air injection pumps - 7 - and - 8 - via both secondary air injection pump relays - 2 - and - 5 -. The stream of air from the secondary air injection pump opens the combination valve and allows air to flow into the exhaust system before the catalytic converter.

Secondary Air Injection (AIR), assembly overview

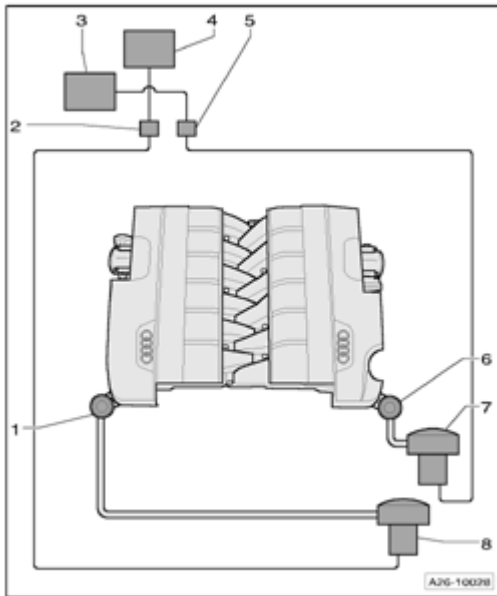


Fig. 490: Secondary Air Injection (Air), Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Right combination valve for Secondary Air Injection (AIR)

- Location: Right front on engine
- Checking --> **Combination valve for secondary air injection, checking function and for proper seal**
- Removing and installing --> **Right combination valve for secondary air injection, removing and installing**

2 - Secondary Air Injection (AIR) pump relay J299

- Location **Component locations for Secondary Air Injection (AIR) pump relays and fuses**

3 - Engine Control Module (ECM) 2 J624

- Location: Next to electronics box on right

4 - Engine Control Module (ECM) J623

- Location: Above electronics box on left

5 - Secondary Air Injection (AIR) pump relay 2 J545

- Location **Component locations for Secondary Air Injection (AIR) pump relays and fuses**

6 - Left combination valve for Secondary Air Injection (AIR)

- Location: Left front on engine
- Checking --> **Combination valve for secondary air injection, checking function and for proper seal**
- Removing and installing --> **Left combination valve for Secondary Air Injection (AIR), removing and installing**

7 - Secondary Air Injection (AIR) pump motor 2 V189

- For cylinder bank 2 (left)
- Location --> **Location of Secondary Air Injection (AIR) pump motor V101 and Secondary Air Injection (AIR) pump motor 2 V189**
- Removing and installing --> **Secondary Air Injection (AIR) pumps, removing and installing**

8 - Secondary Air Injection (AIR) pump motor V101

- For cylinder bank 1 (right)
- Location --> **Location of Secondary Air Injection (AIR) pump motor V101 and Secondary Air Injection (AIR) pump motor 2 V189**
- Removing and installing --> **Secondary Air Injection (AIR) pumps, removing and installing**

Component locations for Secondary Air Injection (AIR) pump relays and fuses

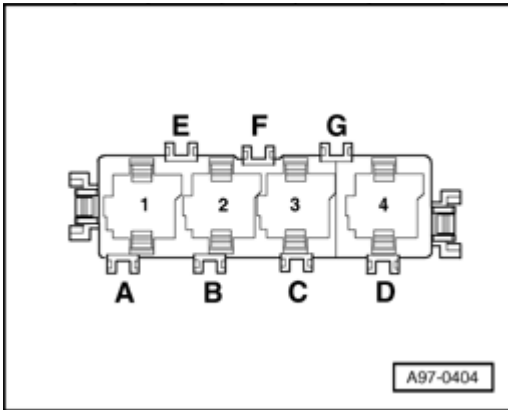


Fig. 491: Component Locations For Secondary Air Injection (AIR) Pump Relays And Fuses
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- In electronics box, plenum chamber.

1 - Secondary Air Injection (AIR) pump relay J299

2 - Secondary Air Injection (AIR) Pump Relay 2 J545

B - Secondary Air Injection (AIR) Pump Fuse S130 (50A)

C - Secondary Air (AIR) Pump Fuse 2 S284 (50A)

Location of Secondary Air Injection (AIR) pump motor V101 and Secondary Air Injection (AIR) pump motor 2 V189

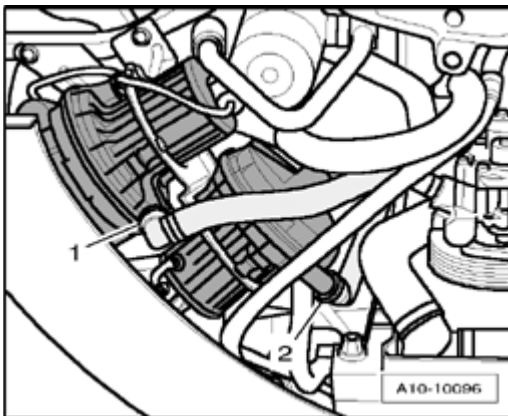


Fig. 492: Location Of Secondary Air Injection (AIR) Pump Motor V101 And Secondary Air Injection (AIR) Pump Motor 2 V189

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Front left behind bumper.

1. Secondary Air Injection (AIR) pump motor V101

2. Secondary Air Injection (AIR) pump motor 2 V189

Combination valve for secondary air injection, checking function and for proper seal

Work sequence

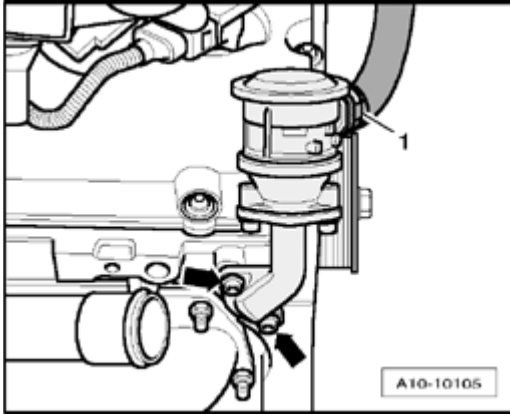


Fig. 493: Combination Valve Pressure Hose & Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect pressure hose - 1 - at combination valve for secondary air injection.

NOTE:

- **Ignore - arrows - in the illustration.**

- Connect an appropriate assisting hose to combination valve.
- Blow into assisting hose using light pressure (do not use compressed air).
- Combination valve must be closed, it must not be possible to blow through.
- Blow into assisting hose using higher pressure (do not use compressed air).
- Combination valve must open, it must be possible to blow through.

If the switching point is not recognized:

- Replace combination valve: Left --> **Left combination valve for Secondary Air Injection (AIR), removing and installing** , Right --> **Right combination valve for secondary air injection, removing and installing**.

Secondary Air Injection (AIR) pumps, removing and installing

Removing

- Activate vehicle lifting mode --> **43 - SELF LEVELING SUSPENSION** .
- Remove left front wheel.

NOTE:

- **Secure the brake disc with wheel bolts.**

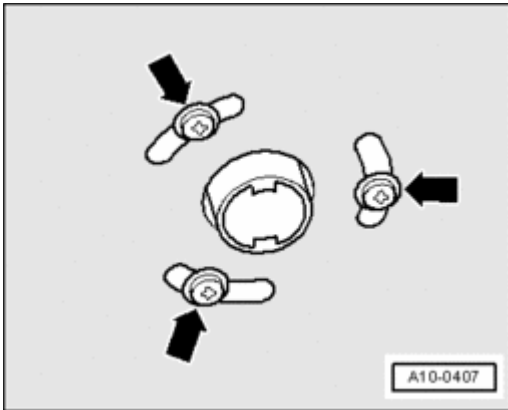


Fig. 494: Identifying Exhaust Pipe Fasteners

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

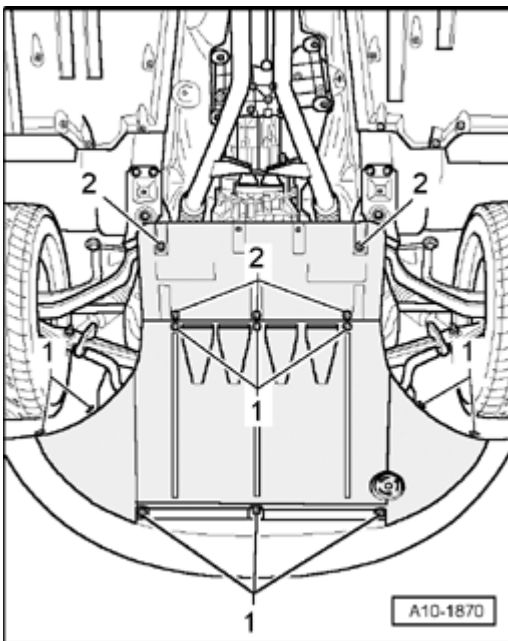
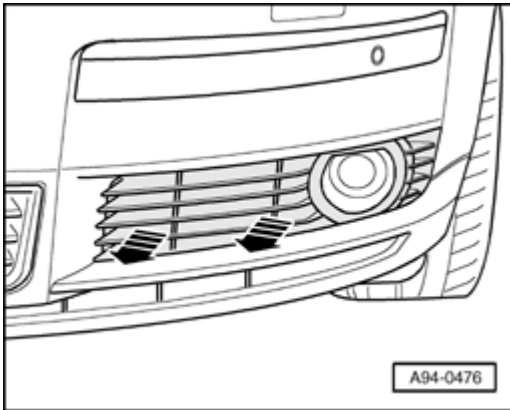


Fig. 495: Noise Insulation Quick-Release Fasteners

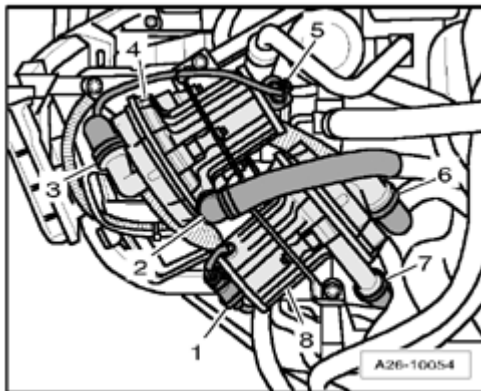
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen quick-release fasteners - **1** - and remove front sound insulation.
- Remove front part of left front wheelhouse liner --> **66 - EXTERIOR EQUIPMENT** .

**Fig. 496: Left Air Intake Grille**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull left air intake grille out of bumper - **arrows** -.

**Fig. 497: Secondary Air Injection Pump Electrical Connectors & Hoses**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Separate electrical connectors - **1** - and - **5** -.
- Disconnect hoses - **2** - , - **3** - , - **6** - and - **7** - at secondary air injection pumps - **4** - and - **8** - by pressing release buttons.
- Remove bolts and remove secondary air injection pumps from bracket.

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 .**

- Deactivate vehicle lifting mode --> **43 - SELF LEVELING SUSPENSION** .

Tightening torque

Component	Nm
Secondary Air Injection (AIR) pump to bracket	10

Left combination valve for Secondary Air Injection (AIR), removing and installing

Left combination valve for Secondary Air Injection (AIR), removing and installing

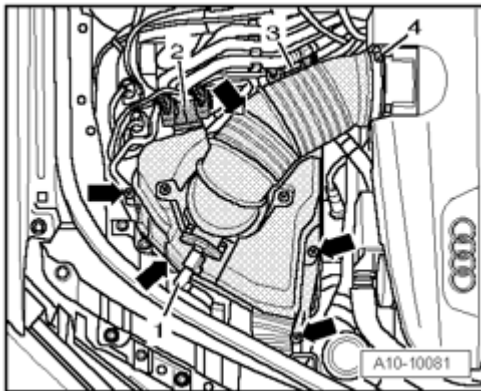
Removing

Fig. 498: Mass Air Flow (MAF) Sensor G70 Electrical Connector, Upper Part Of Air Filter Housing Connections, Intake Manifold Air Duct Hose & Bolts
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **1** - for Mass Air Flow (MAF) sensor G70.
- Disconnect air duct - **4** - at intake manifold.
- Unhook retainer for connections - **2** - and - **3** - at upper part of air filter housing.
- Remove bolts - **arrows** -.
- Remove upper part of right air filter housing.

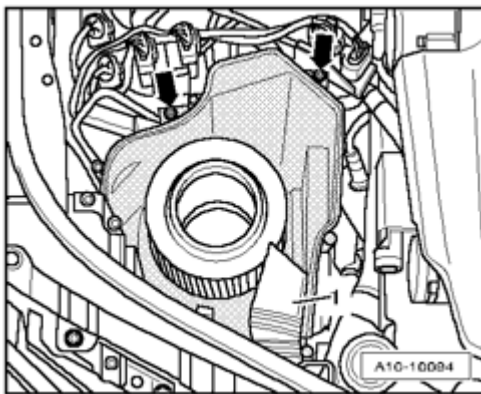


Fig. 499: Air Duct & Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove air duct - **1** -.
- Remove bolts - **arrows** -.
- Remove lower part of right air filter housing.

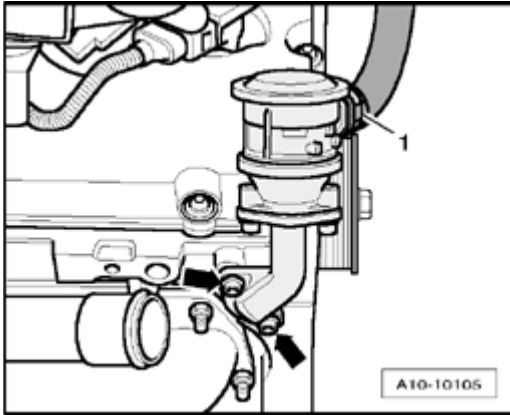


Fig. 500: Combination Valve Pressure Hose & Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull hose - **1** - off from right combination valve for secondary air injection.
- Remove bolts - **arrows** - and remove right combination valve for secondary air injection.

Installing

Installation is in reverse order of removal. Note the following:

NOTE:

- Replace gaskets and O-rings.
- Secure all hose connections using hose clamps appropriate for the model type .

Tightening torque

Component	Nm
Combination valve for Secondary Air Injection (AIR) system to cylinder head	10

Right combination valve for secondary air injection, removing and installing

Removing

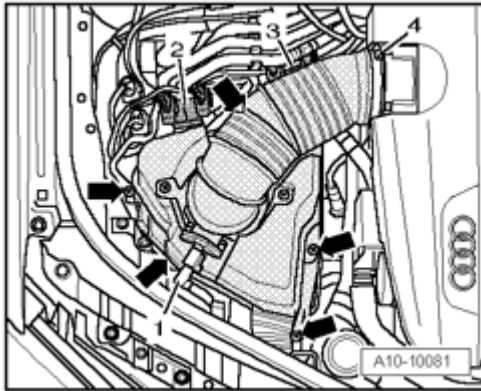


Fig. 501: Mass Air Flow (MAF) Sensor G70 Electrical Connector, Upper Part Of Air Filter Housing Connections, Intake Manifold Air Duct Hose & Bolts
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **1** - for Mass Air Flow (MAF) sensor G70.
- Disconnect air duct - **4** - at intake manifold.
- Unhook retainer for connections - **2** - and - **3** - at upper part of air filter housing.
- Remove bolts - **arrows** -.
- Remove upper part of right air filter housing.

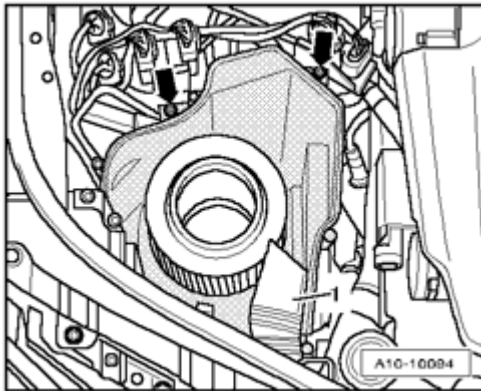


Fig. 502: Air Duct & Bolts
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove air duct - **1** -.
- Remove bolts - **arrows** -.
- Remove lower part of right air filter housing.

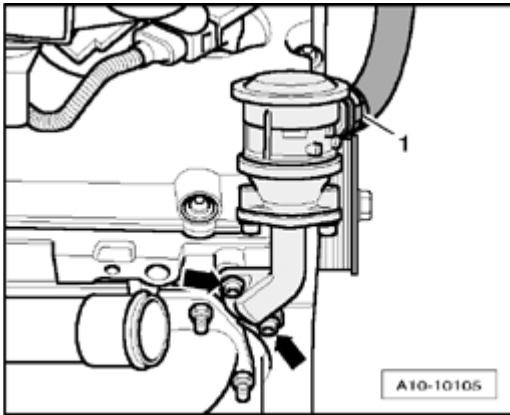


Fig. 503: Combination Valve Pressure Hose & Bolts
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull hose - **1** - off from right combination valve for secondary air injection.
- Remove bolts - **arrows** - and remove right combination valve for secondary air injection.

Installing

Installation is in reverse order of removal. Note the following:

NOTE:

- Replace gaskets and O-rings.
- Secure all hose connections using hose clamps appropriate for the model type .

Tightening torque

Component	Nm
Combination valve for Secondary Air Injection (AIR) system to cylinder head	10

EXHAUST FLAPS

Exhaust flaps, checking

Special tools, testers and auxiliary items required

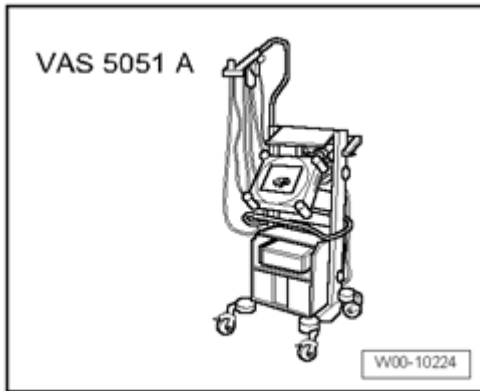


Fig. 504: Diagnostic Operation System VAS5051A
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Vehicle Diagnostic, Testing and Information System VAS 5051 A with diagnostic cable VAS 5051/5A

Work sequence

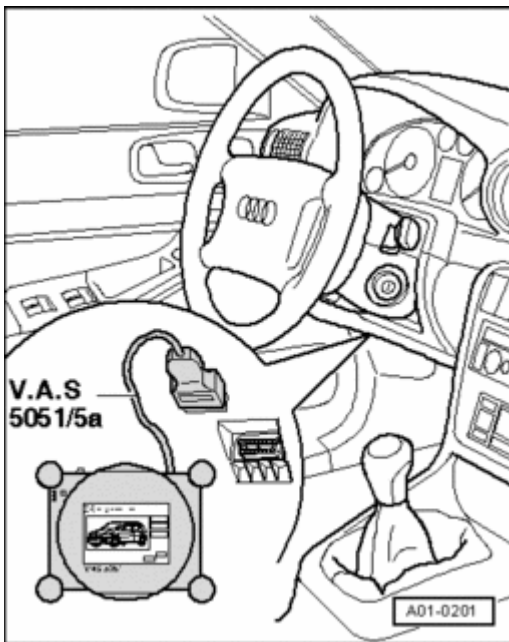


Fig. 505: Connecting Data Link Connector (DLC)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Vehicle Diagnostic, Testing and Information System VAS 5051 A with diagnostic cable VAS 5051/5A is connected.
 - Let engine run briefly so that required vacuum for test is present in vacuum reservoir.
 - Switch engine off and then switch ignition on.
 - Select vehicle On Board Diagnostics and vehicle system "01 - Engine electronics".

Display on VAS 5051 A :

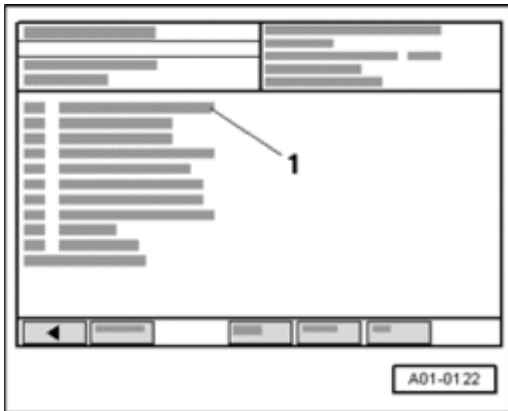


Fig. 506: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- In selection - 1 - , click on function "03 - output Diagnostic Test Mode (DTM)".

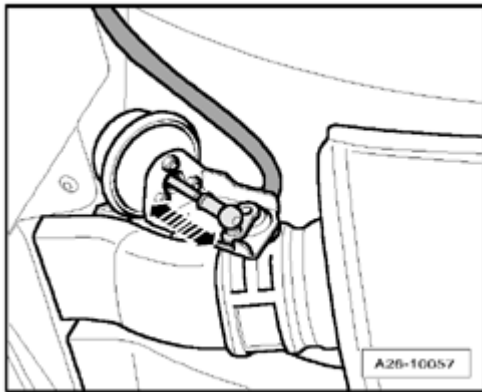
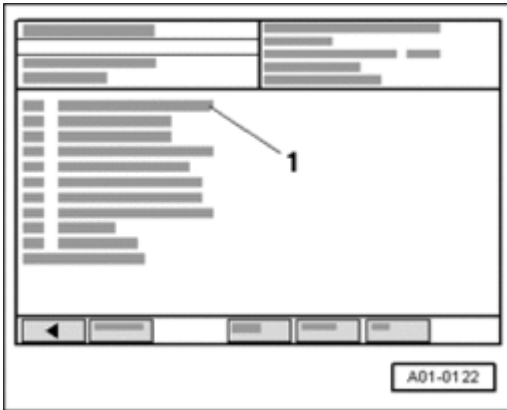


Fig. 507: Activating Exhaust Flap Valve 1 N321
Courtesy of VOLKSWAGEN UNITED STATES, INC.

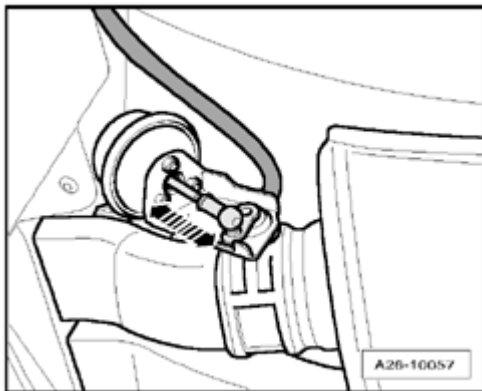
- Press --> button repeatedly until Exhaust Flap Valve 1 N321- is activated.
- Actuation rod of right exhaust flap must move back and forth.
- End function "03 - output Diagnostic Test Mode (DTM)" by pressing <-- button.
- Select "06 - End Output".
- Select vehicle system "11 - Engine electronics II".

Display on VAS 5051 A :

**Fig. 508: Diagnostic System VAS 5051: Display**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- In selection - 1 - , click on function "03 - output Diagnostic Test Mode (DTM)".

**Fig. 509: Activating Exhaust Flap Valve 2 N322**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press --> button repeatedly until Exhaust Flap Valve 2 N322- is activated.
- Actuation rod of left exhaust flap must move back and forth.
- End function "03 - output Diagnostic Test Mode (DTM)" by pressing <-- button.
- Select "06 - End Output".
- Switch off ignition.

If actuator rod does not move:

- Check exhaust flap vacuum reservoir --> **Exhaust flap vacuum reservoir, checking.**
- Check vacuum line from vacuum reservoir to corresponding exhaust flap valve at rear on vehicle floor.
- Check Exhaust Flap Valve 1 N321 and Exhaust Flap Valve 2 N322 using "Guided Fault Finding".

Exhaust flap vacuum reservoir, checking

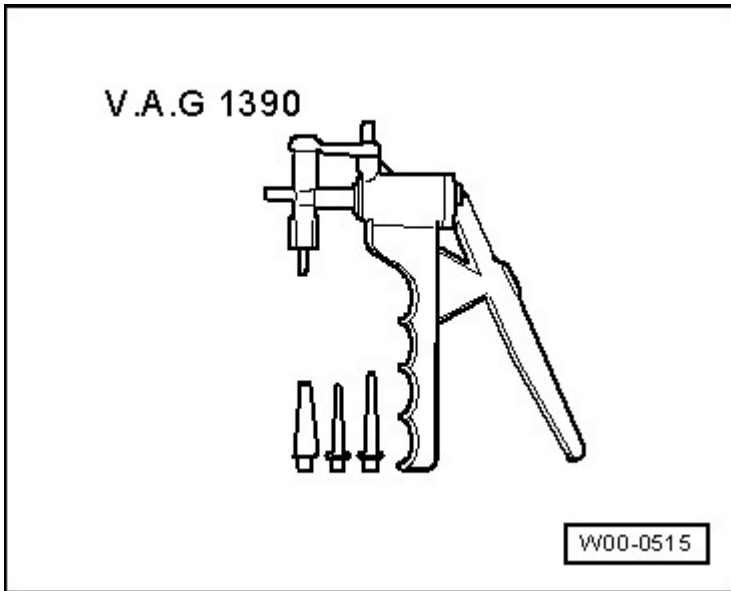
Special tools, testers and auxiliary items required

Fig. 510: Hand Vacuum Pump V.A.G 1390
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hand vacuum pump V.A.G 1390

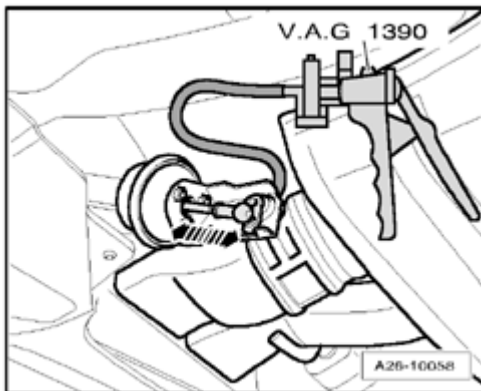


Fig. 511: Exhaust Flap Vacuum Reservoir, Checking
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Work sequence

- Disconnect hose on vacuum diaphragm for exhaust flap at rear muffler.
- Connect hand vacuum pump V.A.G 1390 to vacuum diaphragm.
- Generate vacuum using hand vacuum pump.
- Linkage must move upward.

2009 Audi A8 Quattro

ENGINE 6.0 Liter 12-Cyl. 4V Engine Mechanical, Engine Code(s): BHT, BSB - A8

- Vent hand vacuum pump.
- Linkage must move downward.

If linkage does not move:

- Check linkage for ease of movement and check vacuum diaphragm for leaks.