

ENGINE

5.2 Liter 10-Cyl. 4V Engine Mechanical, Engine Code(s): BSM - S8

00 - TECHNICAL DATA

SAFETY PRECAUTIONS

Safety Precautions

Note the following when working on the fuel system:

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

- **Before opening high pressure area of the fuel injection system, fuel pressure must be relieved to residual pressure.**
 - **To reduce remaining residual pressure, lay a clean cloth around the connector and carefully loosen connector.**
- Procedures before opening high pressure fuel injection system --> **Before Opening High Pressure Fuel Injection System.**

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

- The ignition must be switched off before connecting or disconnecting the injection and ignition system wiring or tester cables.
 - Only clean engine with ignition switched off.
 - If electrical connectors were disconnected, faults are saved in ECM:
- Connect Vehicle Diagnosis, Testing and Information System VAS 5051B.
- Start "Guided Functions" operating mode.
- Generate readiness code in ECM.

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

- **Observe measures when disconnecting battery.**
 - **Only disconnect battery with ignition switched off.**
- Disconnect battery --> **27 - BATTERY, STARTER, GENERATOR, CRUISE CONTROL .**

Note the following when working on the cooling system:

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

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

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

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

Risk of passenger airbag deploying in an accident.

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

Before Opening High Pressure Fuel Injection System

Before Opening High Pressure Fuel Injection System

- The fuel injection system is separated into a high-pressure section (max. approximately 120 bar) and a low-pressure section (approximately 6 bar).
- Before opening high pressure area, fuel pressure must be reduced to a residual pressure of approximately 6 bar. The procedure for this is as follows.

Special tools, testers and auxiliary items required

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

Procedure

Proceed as follows:

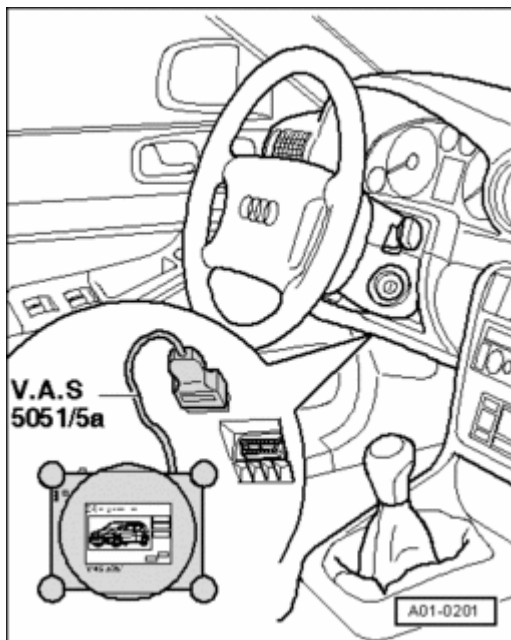


Fig. 1: Connecting Data Link Connector (DLC)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect vehicle diagnosis, testing and information system VAS 5051B while ignition is switched off.

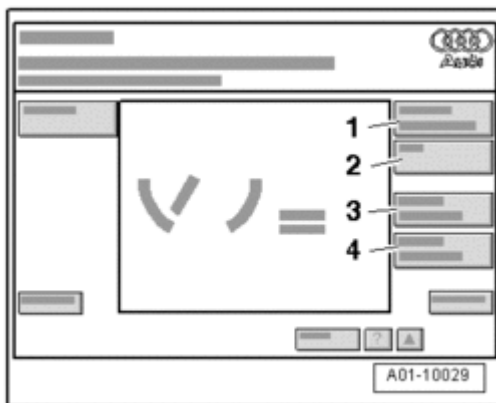


Fig. 2: Display On VAS 5051B - Vehicle Self-Diagnosis Button
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051B :

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

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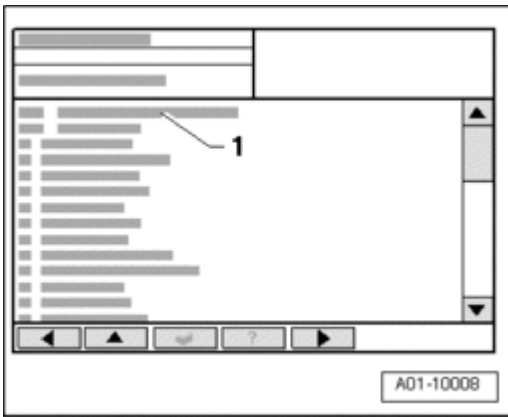


Fig. 3: Display On VAS 5051 - "01 - Engine Electronics"
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051B :

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

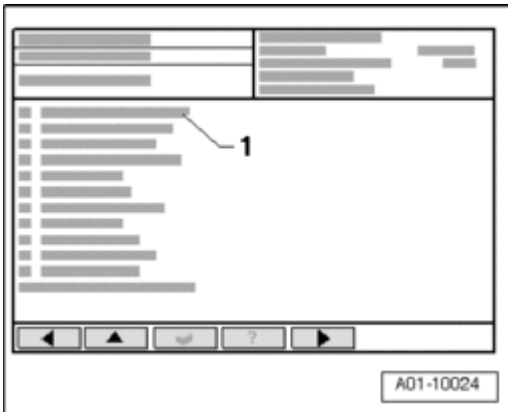


Fig. 4: Display On VAS 5051 - "006 - Basic Setting"
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051B :

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

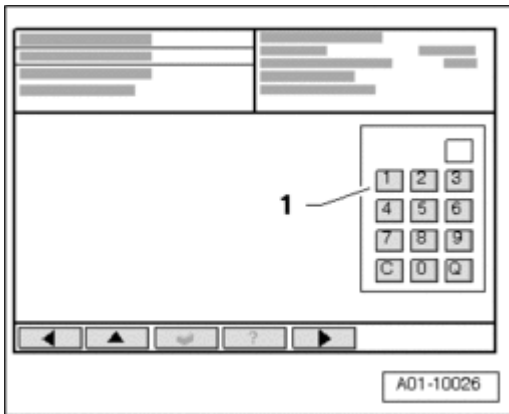


Fig. 5: Display On VAS 5051 - "Display Group 140"
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051B :

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



Fig. 6: Display On VAS 5051 - (Read-Out For Fuel Pressure In Fuel Rail)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051B :

- Check display for fuel pressure in fuel rail in display field - 3 -.

Example:

3 - 40.63 bar

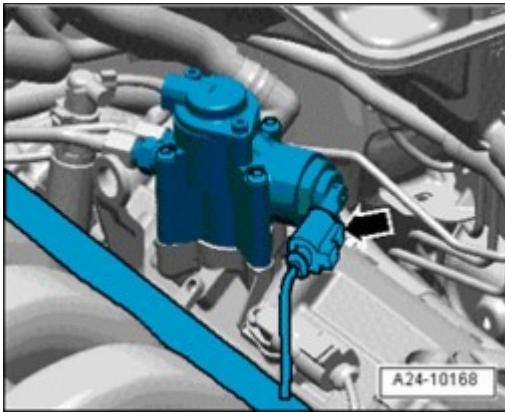


Fig. 7: Disconnecting Electrical Connector At Fuel Metering Valve 2 N402 On Left High Pressure Pump
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **arrow** - at Fuel Metering Valve 2 N402 on left high pressure pump.

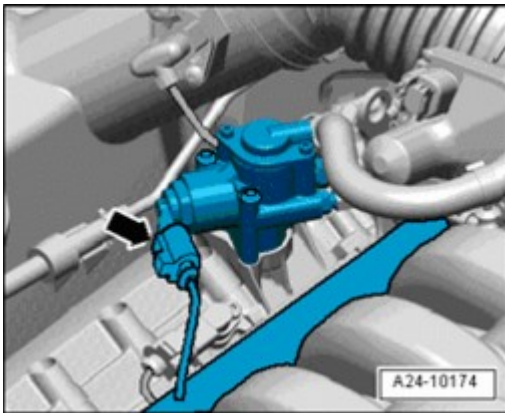


Fig. 8: Disconnecting Electrical Connector At Fuel Metering Valve 2 N290 On Right High Pressure Pump
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **arrow** - at Fuel Metering Valve 2 N290 on right high pressure pump.

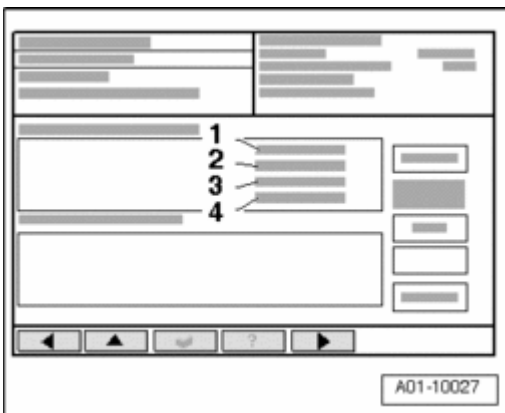


Fig. 9: Display On VAS 5051 - (Read-Out For Fuel Pressure In Fuel Rail)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051B :

- Check indication in display field - **3** - :
- Fuel pressure in fuel rail must sink to approximately 6 bar.
- Switch off ignition.

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

Now components or lines can be opened.

- Lay clean cloths around connectors and catch escaping fuel.

Final procedures

- Reconnect electrical harness connectors.
- Start "Guided Functions" operating mode.
- Generate readiness code in ECM.

GENERAL INFORMATION

General Information

--> **Clean Working Conditions**

--> **Contact Corrosion**

--> **Lines, Routing and Securing**

Clean Working Conditions

Clean Working Conditions

Even a little contamination can lead to faults. Pay careful attention to the following rules for clean working conditions when working on the fuel supply and injection system:

- Before loosening, connections and surrounding areas must be cleaned thoroughly with engine or brake cleaner, and then cleaned area must be dried completely.
- Plug open lines and connections immediately with appropriate protective caps.
- Place parts that have been removed on a clean surface and cover them. Use lint-free cloths.
- Only install clean components: Only unpack replacement parts immediately prior to installation. Do not use parts that have been stored unpacked (e.g. in tool boxes etc.).
- When the system is open: Do not work with compressed air. Do not move vehicle unless absolutely necessary.

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

Contact Corrosion

Contact Corrosion

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

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

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

NOTE:

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

Lines, Routing and Securing

Lines, Routing and Securing

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

ENGINE DATA

Engine Data

Code letters		BSM
Displacement	liter	5.204
Output	kW at RPM	331/7000
Torque	Nm at RPM	540/3500
Bore	Diameter mm	84.5
Stroke	mm	92.8
Compression ratio		12.5
RON		98 1)
Fuel injection and ignition system		Bosch Motronic
Ignition sequence		1-6-5-10-2-7-3-8-4-9
Exhaust Gas Recirculation		no
Turbocharger, G-Charger		no
Knock control		yes
Variable valve timing		yes
Variable intake manifold		yes
Secondary Air Injection System		yes

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Valve per cylinder

4

1) Super unleaded RON 95 is permissible, although with reduced power.

ENGINE NUMBER

Engine Number

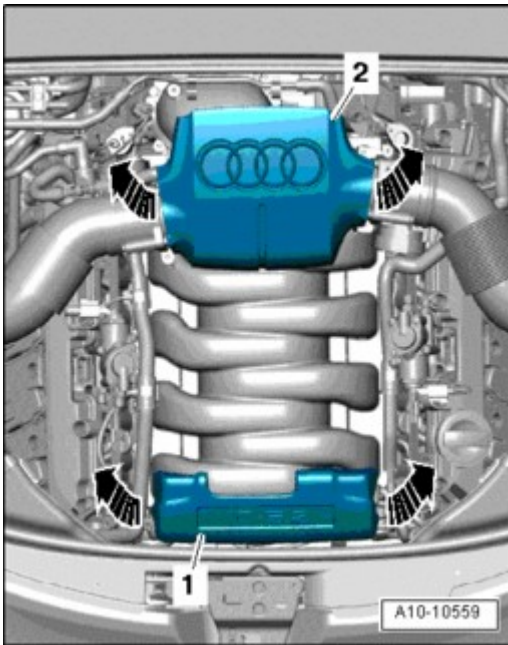


Fig. 10: Removing Front Engine Cover And Rear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front engine cover - 1 - - arrows -.

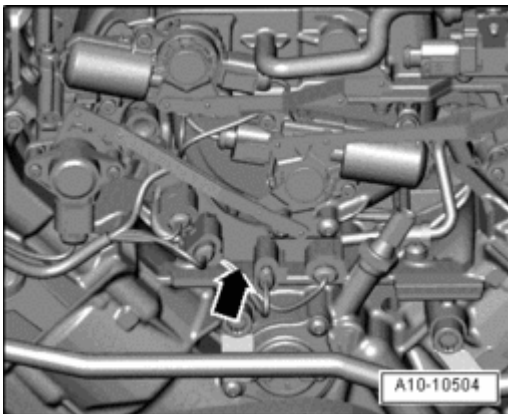


Fig. 11: Identifying Engine Number Stamped On Engine Block
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

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

10 - ENGINE, REMOVING AND INSTALLING

ENGINE, REMOVING

Engine, Removing

NOTE:

- With lock carrier installed, engine is removed downward with transmission and subframe.
- Drained coolant must be stored in a clean container for disposal or reuse.
- During installation, reinstall all heat insulation sleeves and heat shields at the same locations.
- All cable ties opened or cut during engine removal must be reinstalled at the same locations during installation.

Special tools, testers and auxiliary items required

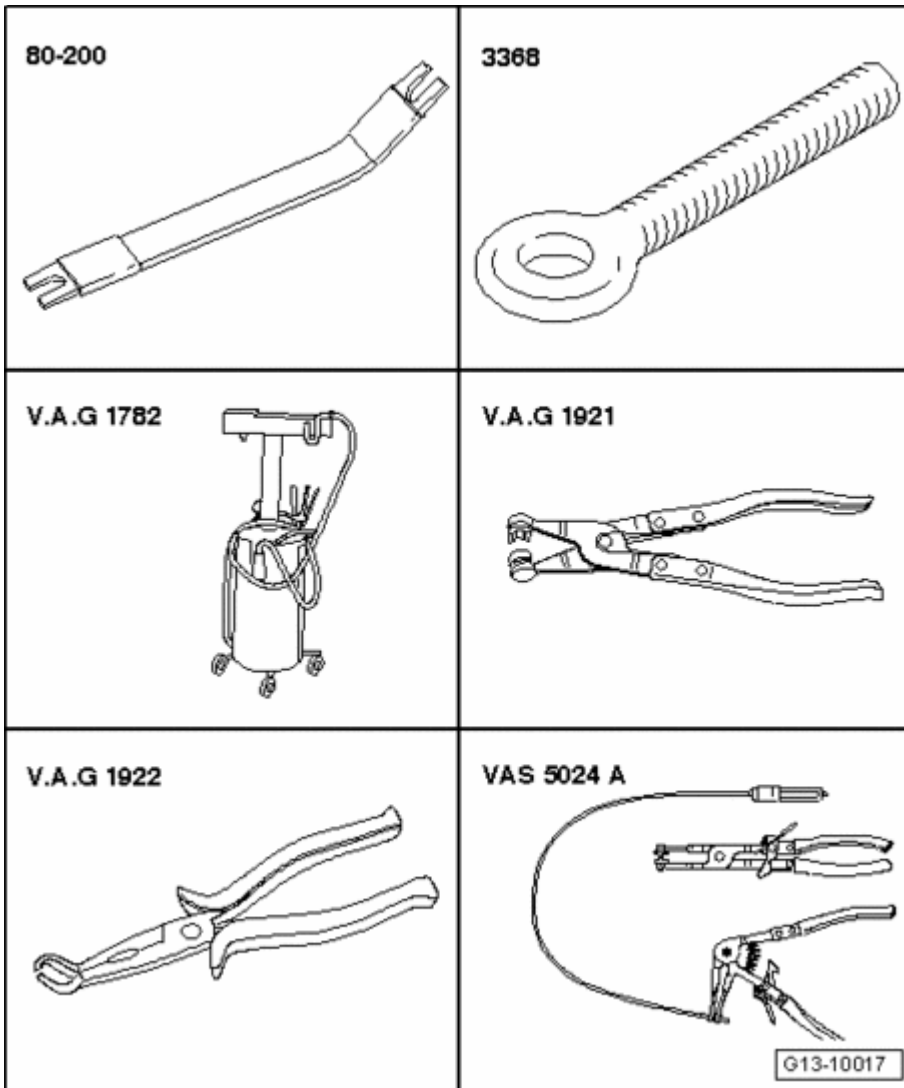


Fig. 12: Identifying Special Tools - Engine, Removing (1 Of 2)
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pry Lever - Rmv Outside Mirror 80 - 200
- Ring screw 3368
- Old oil collecting and extracting device V.A.G 1782
- Hose clamp pliers V.A.G 1921
- Spark plug connector pliers V.A.G 1922
- Hose clip pliers VAS 6340 (formerly: VAS 5024 A)

Special tools, testers and auxiliary items required

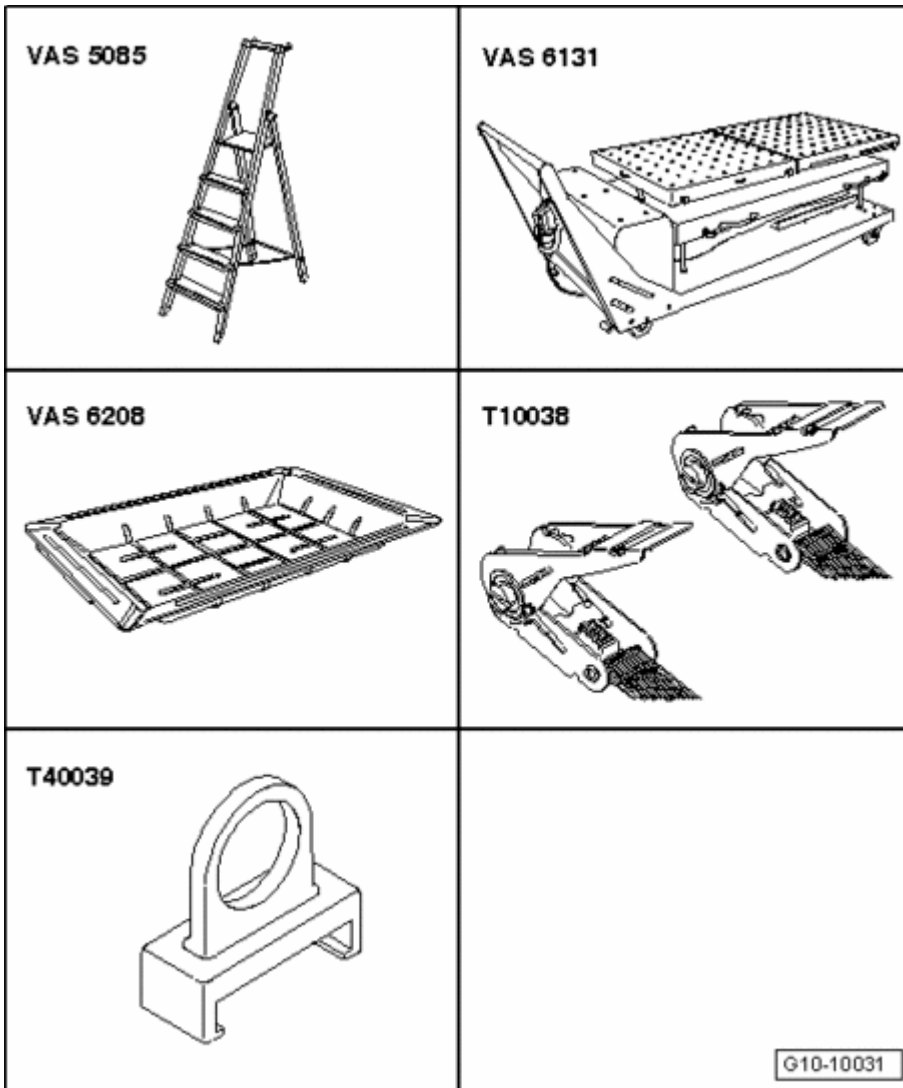


Fig. 13: Identifying Special Tools - Engine, Removing (2 Of 2)
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Step ladder VAS 5085
- Scissor lift platform VAS 6131 A with support set for Audi VAS 6131/10
- Drip tray for workshop crane VAS 6208
- Tensioning Strap T10038 qty. 2
- Ignition Coil Puller T40039

NOTE:

- If engine should be separated from transmission after removal, two additional adapter sets VAS 6131/10-12 are needed.

Procedure

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

NOTE:

- So that the front wheels can still be turned with the battery disconnected, the battery must only be disconnected with ignition key inserted.
- In order for the driveshaft to be able to rotate for removal, the electronic parking brake must be released before disconnecting battery.

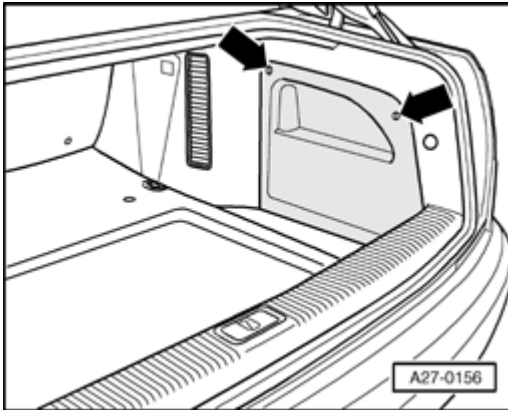


Fig. 14: Right Luggage Compartment Side Trim

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

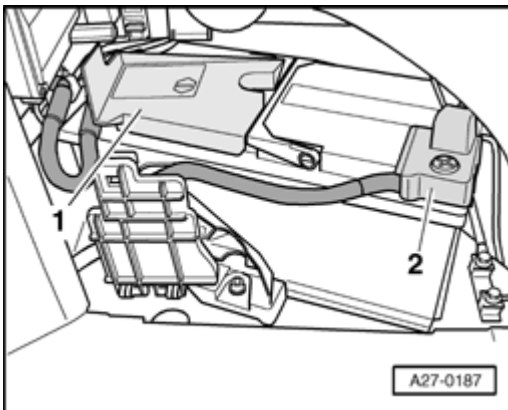


Fig. 15: Removing Cover Above Battery

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

- Ignore - **2** -.

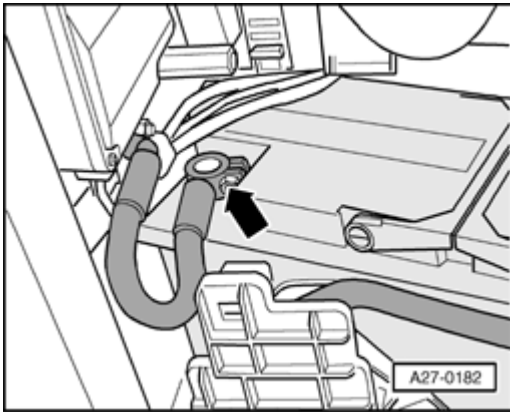


Fig. 16: Ground (GND) Battery Lead

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- With ignition switched off, disconnect Battery Ground (GND) strap - **arrow** -.
- Discharge refrigerant circuit --> **87 - AIR CONDITIONING** .

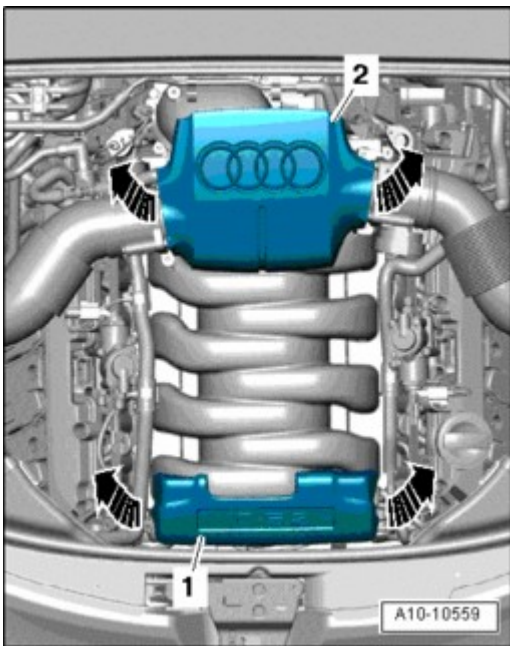


Fig. 17: Removing Front Engine Cover And Rear

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front engine cover - **1** - and rear - **2** - - **arrows** -.

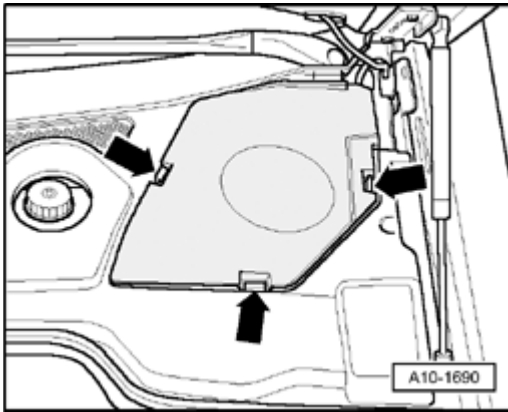


Fig. 18: Cover Above Coolant Reservoir

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

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

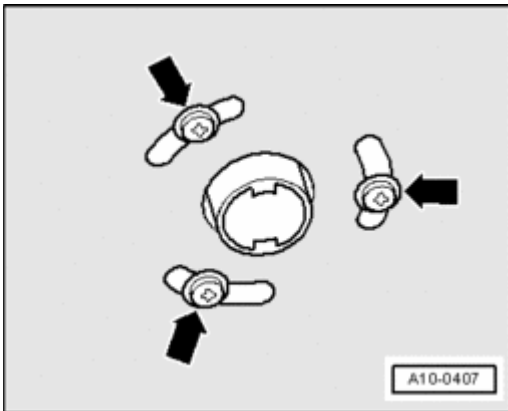


Fig. 19: Identifying Exhaust Pipe Fasteners

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

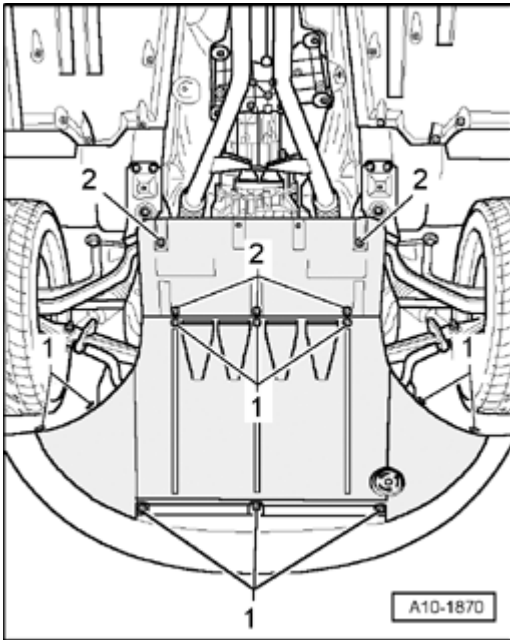


Fig. 20: Noise Insulation Quick-Release Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen quick-release fasteners - **1** - and - **2** - and remove noise insulation.
- Remove front and rear part of left and right front wheel housing liner --> **66 - EXTERIOR EQUIPMENT** .

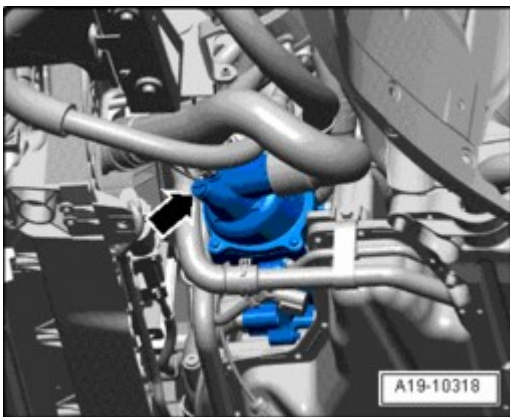


Fig. 21: Removing/Installing Drain Plug At Coolant Thermostat Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place drip tray for workshop crane VAS 6208 under engine.
- Remove drain plug - **arrow** - at coolant thermostat housing and drain coolant.

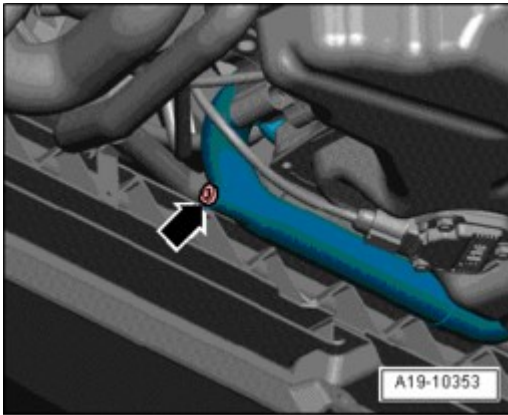


Fig. 22: Front Coolant Pipe Drain Plug

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove drain plug - **arrow** - at front coolant pipe and drain coolant.

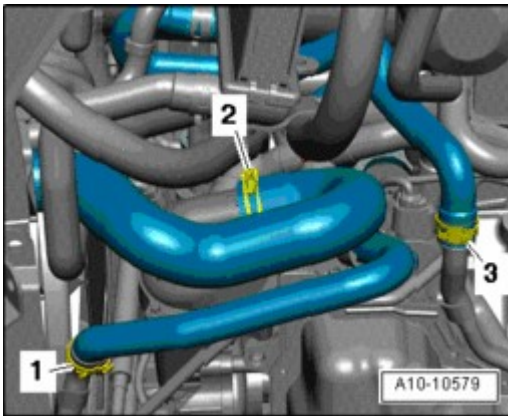


Fig. 23: Coolant Hoses

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove coolant hoses - **1 to 3** - and drain coolant.

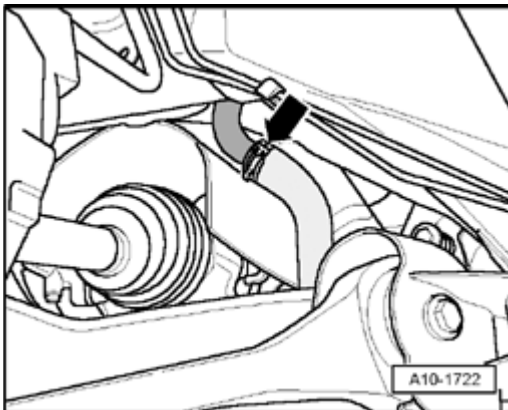


Fig. 24: Left Driveshaft Coolant Hose

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

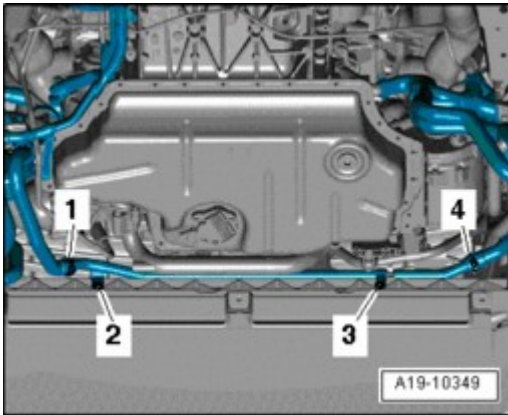


Fig. 25: Screws, Front Lower Coolant Pipe & Hoses
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove screws - 2 - and - 3 -.
- Remove front lower coolant pipe from hoses - 1 - and - 4 -.

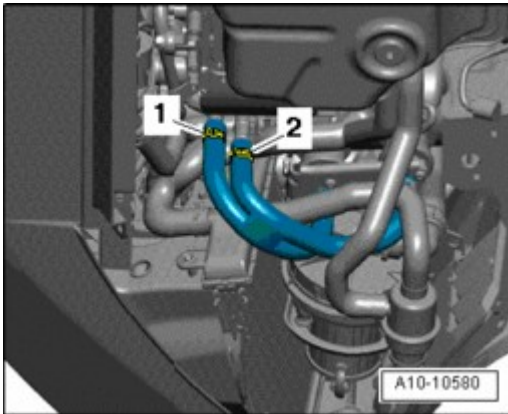


Fig. 26: Secondary Air Injection Connecting Pipes Hoses
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove hoses - 1 - and - 2 - from secondary air injection connecting pipes.

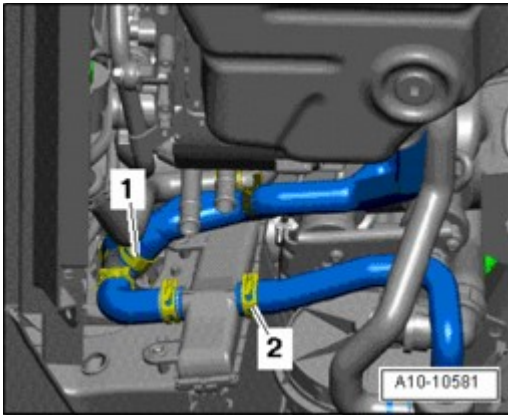


Fig. 27: Right Auxiliary Cooler Coolant Hoses
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove coolant hoses - 1 - and - 2 - from right auxiliary cooler and drain remaining coolant.

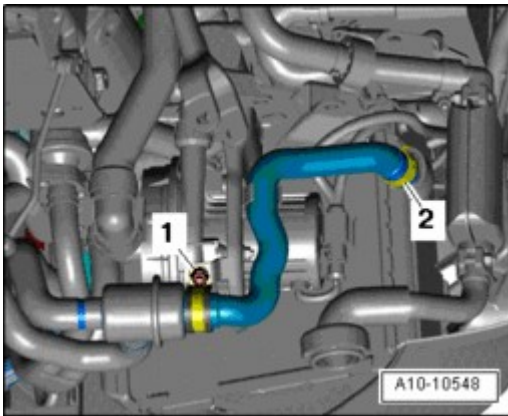


Fig. 28: Right Auxiliary Cooler Coolant Hose & Nut
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nut - 1 - and remove coolant hose - 2 - from right auxiliary cooler.

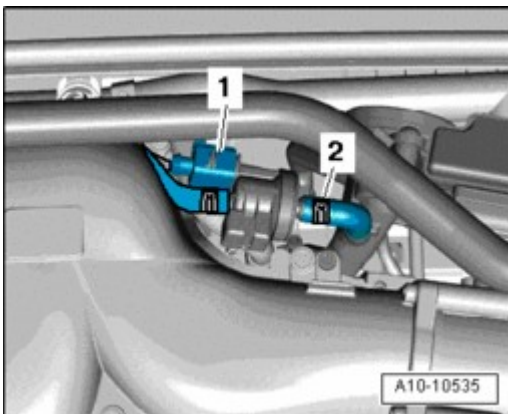


Fig. 29: Evaporative Emission (EVAP) Canister Purge Regulator Valve N80 Electrical Harness Connector

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **1** - on Evaporative Emission (EVAP) Canister Purge Regulator Valve N80 and remove vacuum hose - **2** -.
- Remove Evaporative Emission (EVAP) Canister Purge Regulator Valve N80 from bracket and lay aside with hose connected.

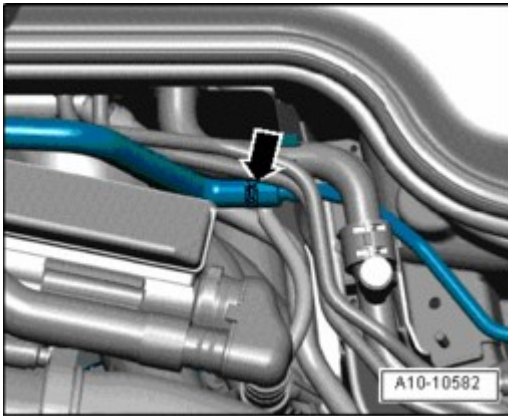


Fig. 30: Coolant Reservoir Coolant Hose

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove coolant hose - **arrow** - from coolant pipe to coolant reservoir.

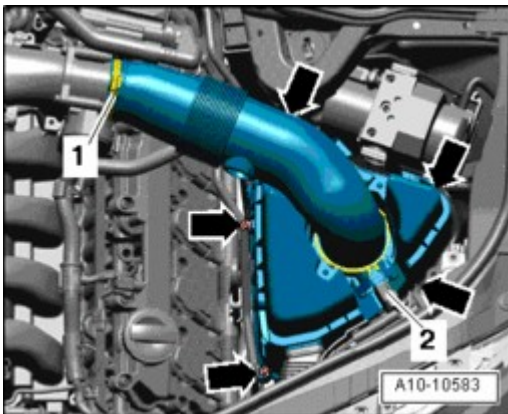


Fig. 31: Mass Air Flow (MAF) Sensor 2 G246 Electrical Connector, Intake Manifold Air Duct Hose & Air Filter Housing Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

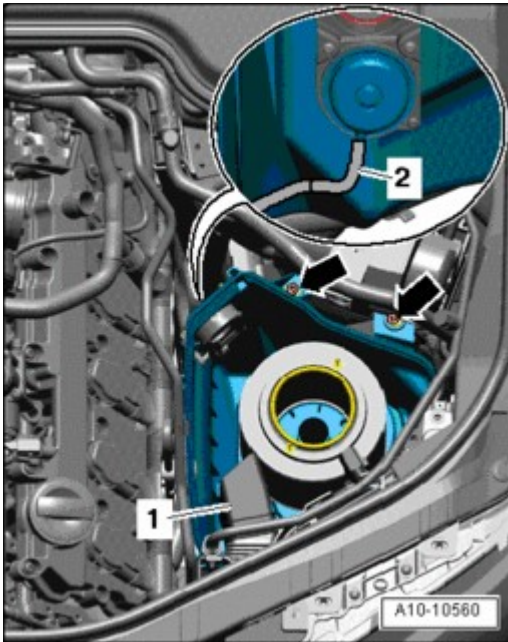


Fig. 32: Air Duct, Bolts, Air Filter Housing & Air Flap Vacuum Hose
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove air duct - 1 -.
- Remove bolts - **arrows** -.
- Tilt lower part of air filter housing and remove air flap vacuum hose.
- Remove lower part of left air filter housing.

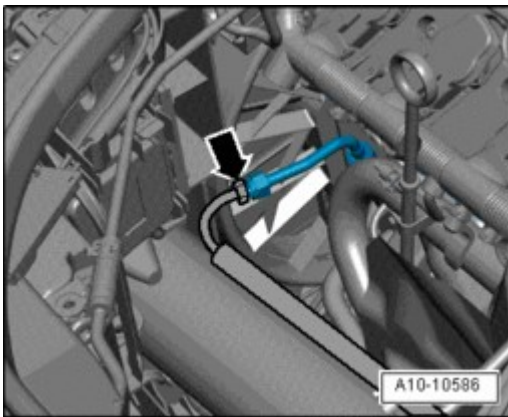


Fig. 33: Extracting Hydraulic Oil From Power Steering Reservoir Using Used Oil Collecting And Extracting Device V.A.G 1782

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Extract hydraulic oil from power steering reservoir using Used Oil Collecting and Extracting Device V.A.G 1782.

NOTE:

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

- Disconnect power steering hydraulic pressure line - **arrow** - at front left on engine.
- Remove hood seal from lock carrier and from fender edges.

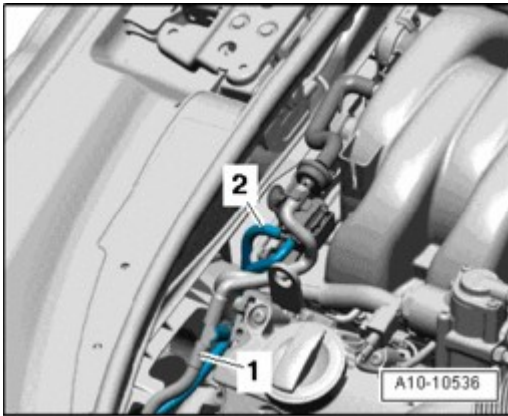


Fig. 34: Vacuum Hoses

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect vacuum hoses - **1** - and - **2** - and free them up.

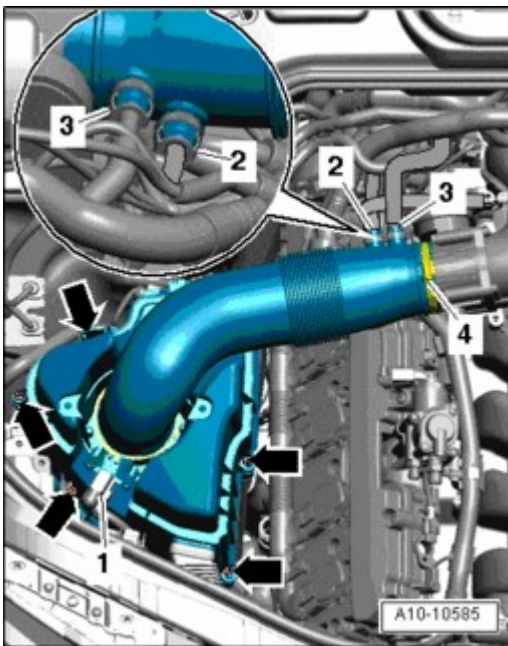


Fig. 35: Mass Air Flow (MAF) Sensor G70 Electrical Connector, Air Guide Hose Vacuum Hose, Air Guide Hose & Hose Clamps

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Separate electrical connector - **1** - for mass air flow (MAF) sensor G70.
- Disconnect vacuum hose - **2** - from air guide hose.
- Loosen hose clamps and lay aside air guide hose - **4** -.

CAUTION: Hose connectors - 3 - must not be opened.

- Remove bolts - **arrows** - and remove right upper part of air filter housing.

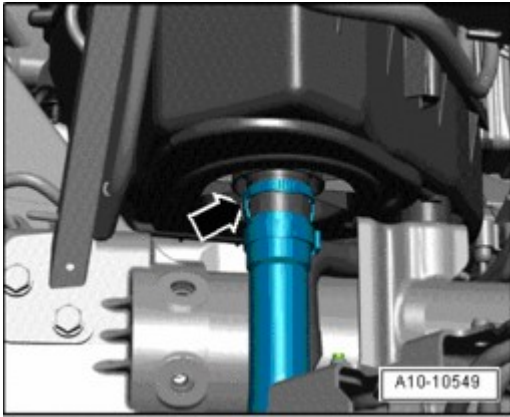


Fig. 36: Lower Air Guide Hose

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove lower air guide hose - **arrow** - from right upper part of air filter housing.

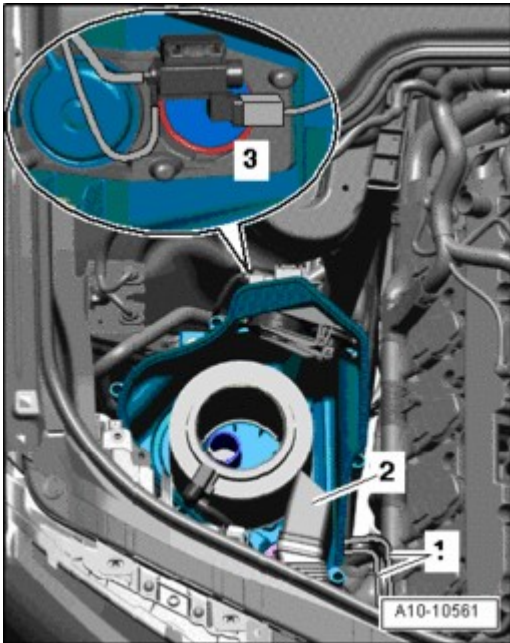


Fig. 37: Vacuum Hoses, Air Duct, Bolts & Intake Air Switch-Over Valve N335 Electrical Connector

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect both vacuum hoses - **1** -.
- Remove air duct - **2** -.
- Remove bolts - **arrows** -.
- Tilt lower part of air filter housing and disconnect electrical connector - **3** - on Intake Air Switch-Over

valve N335.

- Remove lower part of right air filter housing.

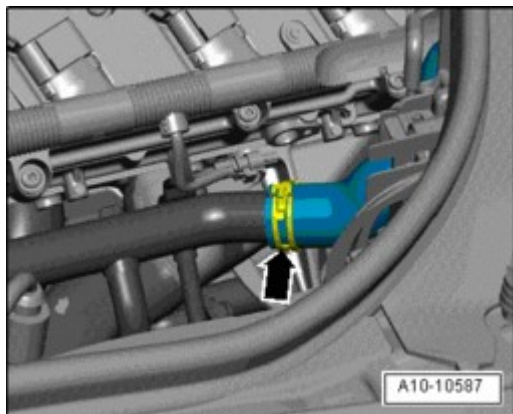


Fig. 38: Coolant Hose & Clamp

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

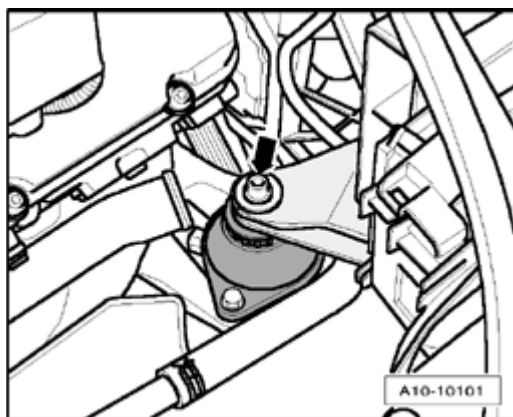


Fig. 39: Torque Support Mount Bolt

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

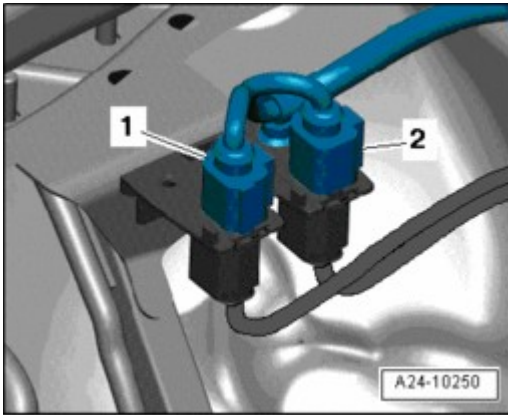


Fig. 40: Oxygen Sensor Electrical Connectors

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove oxygen sensor electrical connectors - 1 - and - 2 - from right bracket in engine compartment.

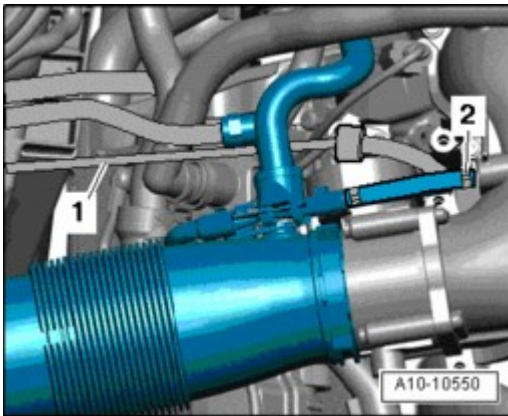
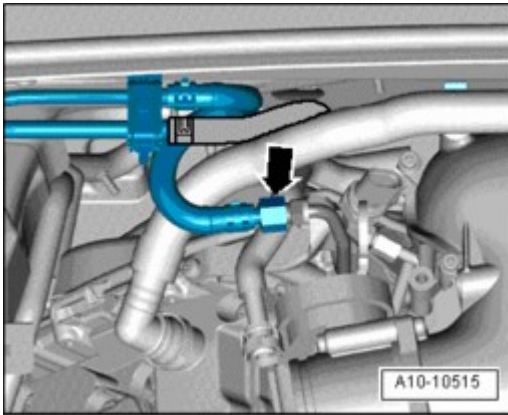


Fig. 41: Vacuum Hoses

Courtesy of VOLKSWAGEN UNITED STATES, INC.

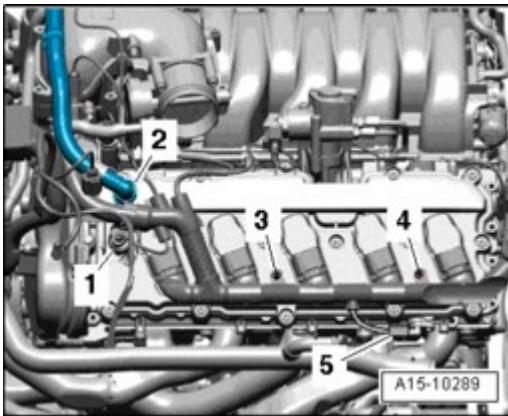
- Disconnect vacuum hoses - 1 - and - 2 - and free them up.

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

**Fig. 42: Fuel Supply Line**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect fuel supply line - **arrow** - on distribution piece.

**Fig. 43: Identifying Crankcase Ventilation Hose, Electrical Harness Connectors & Bolts**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect crankcase ventilation hose - **2** -.
- Disconnect electrical connectors - **1** - and - **5** -.
- Remove bolts - **3** - and - **4** -.
- Disconnect electrical connectors to ignition coils in cylinder bank 1 (right) and free up electrical wiring harness.

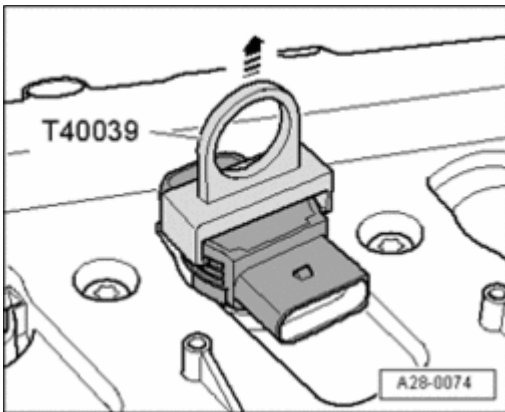


Fig. 44: Removing Ignition Coils Using Ignition Coil Puller T40039
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove ignition coils using Ignition Coil Puller T40039.

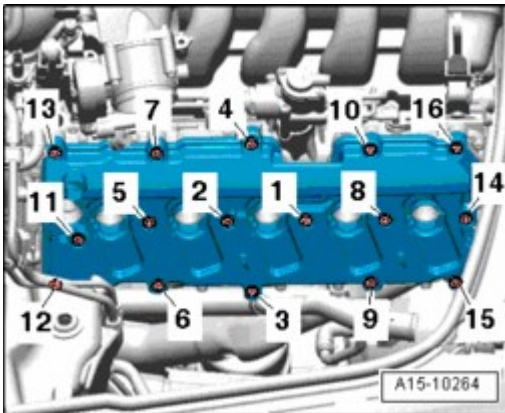


Fig. 45: Right Cylinder Head Cover Bolts Removal Sequence
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen bolts in sequence - 16 to 1 - and remove them.
- Remove right cylinder head cover.
- Cover open valvetrain with a clean cloth.

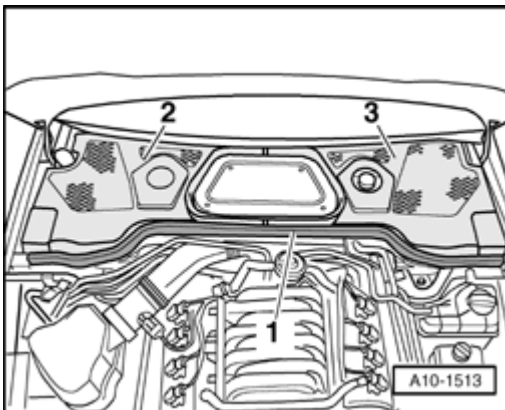


Fig. 46: Identifying Rubber Seal & Plenum Chamber Covers

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

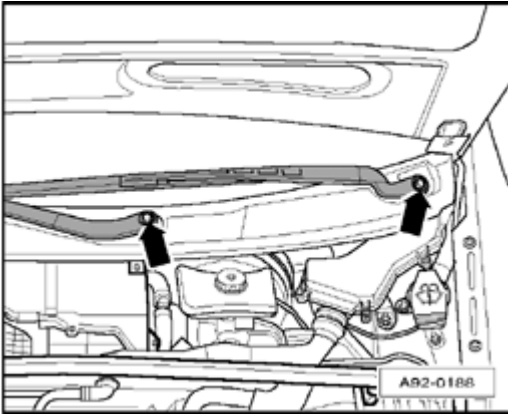


Fig. 47: Identifying Wiper Arm Nuts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pry out cover caps on windshield wiper arms with a screwdriver and loosen nuts - **arrows** - a few turns.
- Loosen wiper arms by tilting slightly from windshield wiper axle.
- Remove nuts completely and remove wiper arms.

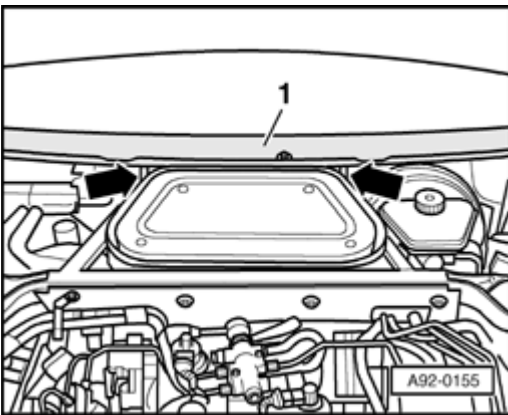


Fig. 48: Cowl Grille & Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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.**

- Remove bolts - **arrows** - at left and right for cowl grill - **1** -.
- Carefully pull the cowl grill off from the retainers at the windshield.

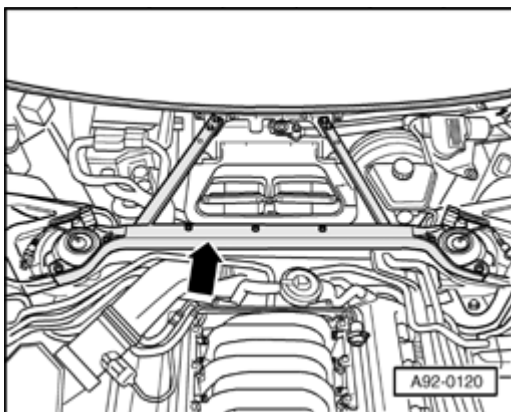


Fig. 49: Strut Tower Brace

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove suspension strut crossmember - **arrow** -.

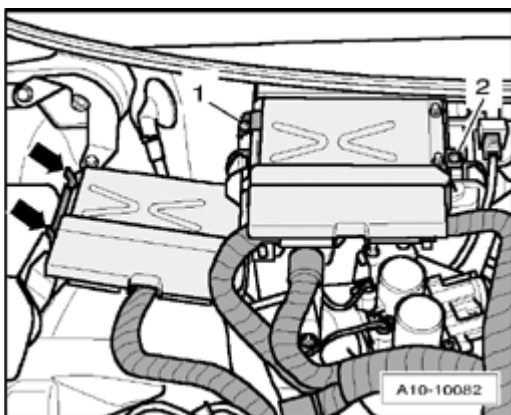


Fig. 50: Retaining Bracket Bolts & Engine Control Modules (ECM) Retaining Tabs

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 (ECM).

NOTE:

- **Electrical harnesses remains connected.**

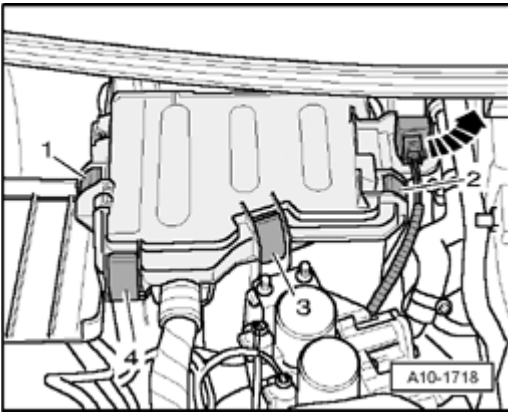


Fig. 51: Removing Air Quality Sensor G238 & Retaining Clips
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove Air Quality Sensor G238 by rotating approximately 90 counter-clockwise - **arrow** - and removing from bracket.
- Release retaining clips - **1 to 4** -.
- Fold cover for the E-box in plenum chamber open slightly and pull off toward the front.

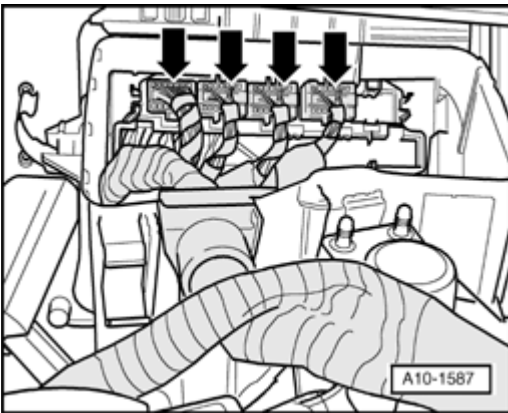


Fig. 52: Multi-Pin Harness Connectors
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect multi-pin harness connectors - **arrows** - using spark plug connector pliers V.A.G 1922.
- Disengage engine wiring harness at E-Box and bulkhead.
- Lay wiring harness aside on the engine with engine control modules (ECM) connected.

NOTE:

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

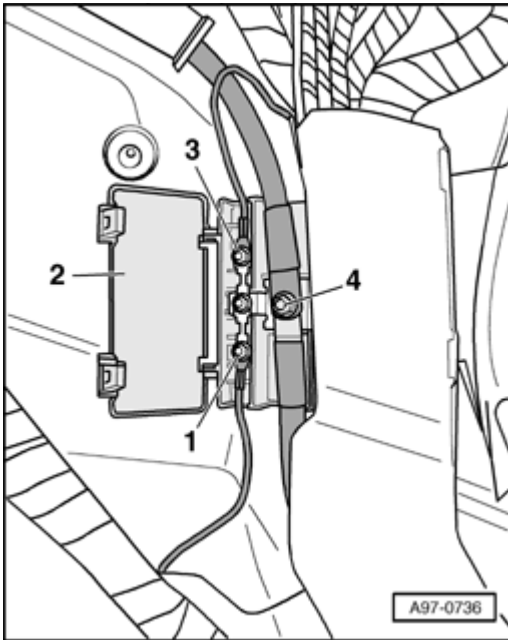


Fig. 53: Identifying Terminal 30 Wire To Starter Cap & Nut
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE: • Ignore - 1 - and - 3 - .

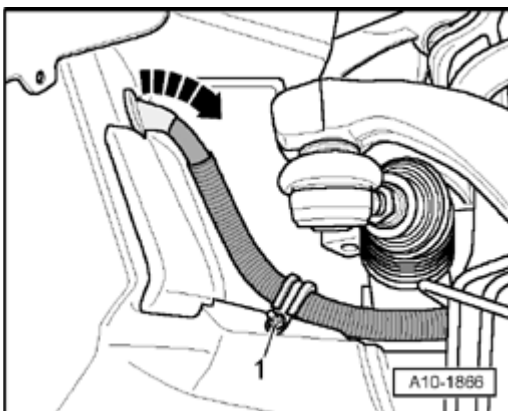


Fig. 54: Pulling Wiring Harness Out From Interior
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

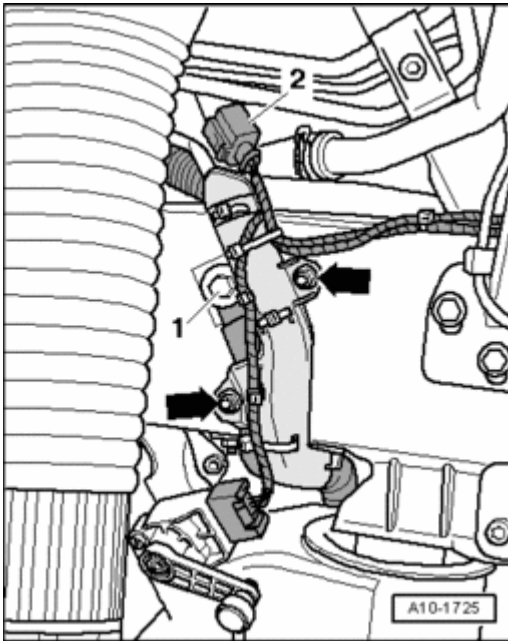


Fig. 55: Electrical Connector, Ground (GND) Wire & Wiring Harness Bracket From Longmember
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **2** -.
- Remove Ground (GND) wire - **1** - on longmember.
- Remove wiring harness bracket on longmember - **arrows** -.
- Free up wiring harness.

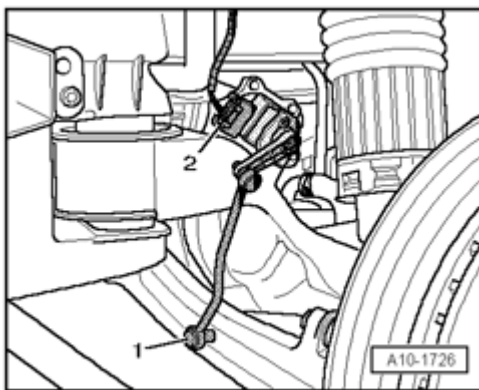


Fig. 56: Identifying Left Level Control System Sensor Electrical Harness Connector & Left/Right Control Arms Coupling Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - **2** - at Level Control System Sensor.

- Disconnect connecting link - **1** - from control arm.
- Repeat procedure on opposite side of the vehicle.

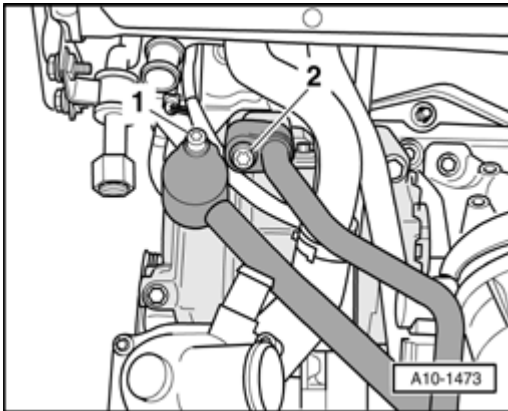


Fig. 57: Removing Bolts & Right Refrigerant Line From A/C Compressor
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

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

- Remove bolts - **1** - and - **2** -.
- Disconnect refrigerant lines from A/C compressor.

NOTE:

- Seal open lines and connections at A/C compressor with suitable sealing caps (to prevent dirt and moisture from entering).

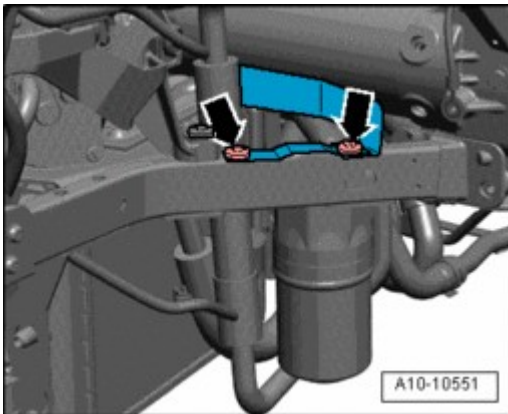


Fig. 58: Climate Control System Reservoir Bracket Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - on climate control system reservoir bracket.

NOTE:

- Climate control system reservoir remains in installation location.

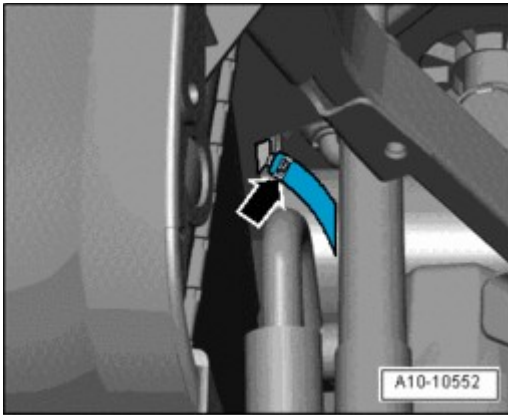


Fig. 59: Power Steering Fluid Reservoir Hydraulic Hose
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

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

- Remove hydraulic hose - **arrow** - from power steering fluid reservoir.

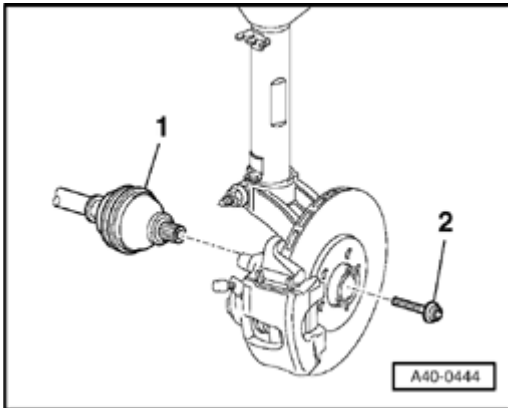


Fig. 60: Identifying Collar Bolt For Right Drive Axle
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Have a second technician press brake pedal.

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

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

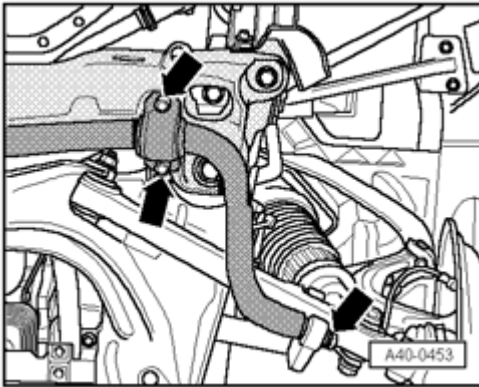


Fig. 61: Stabilizer & Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

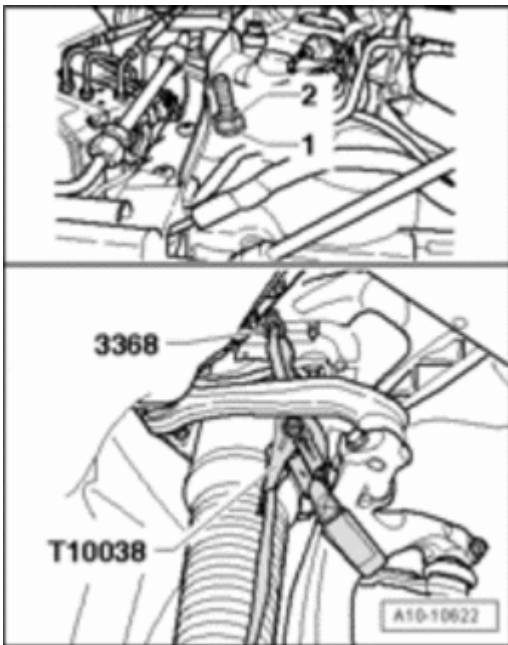


Fig. 62: Securing Lifting Eyebolt 3368 With Nut With Washer Over Several Threads & Tie Up Wheel Bearing Housing At Left/Right With Tensioning Strap T10038

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert left and right Lifting Eyebolt 3368 from below into hole in strut tower.
- Secure Lifting Eyebolt 3368 with a nut - **2** - with washer - **1** - over several threads (do not install nut all the way down on threads).
- Tie up wheel bearing housing at left and right with Tensioning Strap T10038 as shown in illustration.

CAUTION: To prevent upper control arm joints from being damaged, wheel bearing housing must be supported before loosening lower suspension strut

bolts.

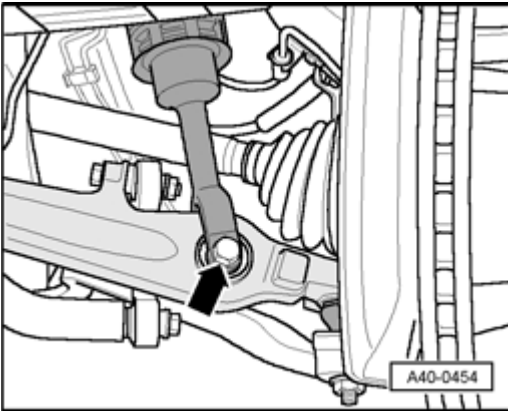


Fig. 63: Air Spring Damper At Control Arm Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

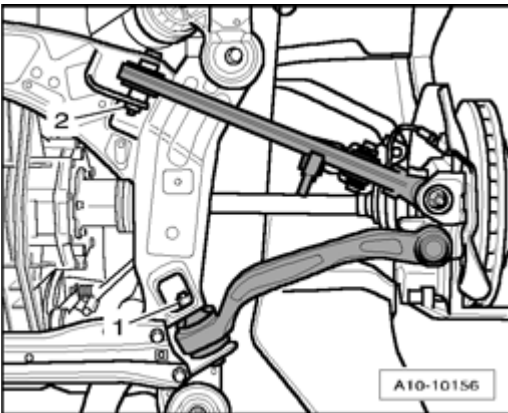


Fig. 64: Removing Guide Control Arm And Control Arm On Subframe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove guide control arm - **1** - and control arm - **2** - from subframe.

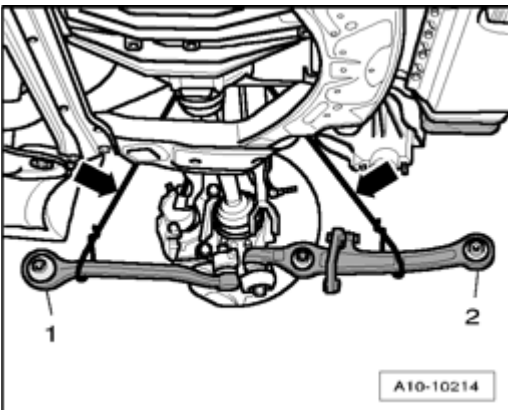


Fig. 65: Swinging Guide Control Arm And Control Arm Outward

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Swing guide control arm - 1 - and control arm - 2 - outward.

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

- Repeat work procedure on opposite side of the vehicle.
- Remove drive axle from transmission flanged shaft.

CAUTION: Do not damage brake hose!

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

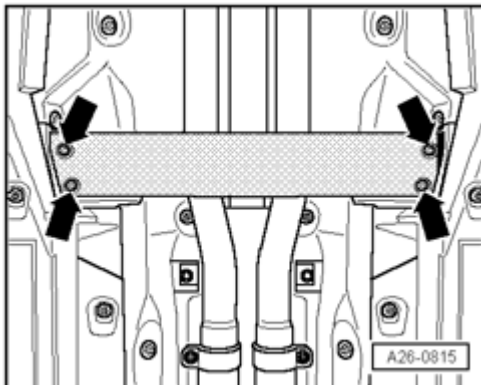


Fig. 66: Front Transverse Beam

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front transverse beam - arrows -.

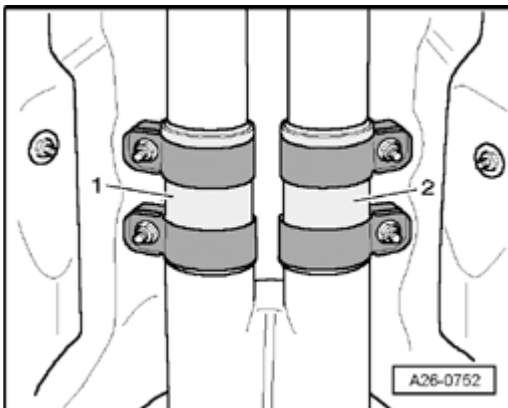


Fig. 67: Clamping Sleeves

Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- Do not bend the flex joint in front of the exhaust pipe more than 10 or it could be damaged.

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

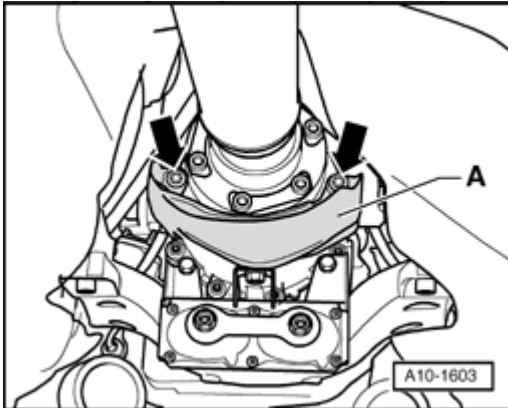


Fig. 68: Removing/Installing Heat Shield For Driveshaft

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield - A - for drive shaft - **arrows** -.
- Remove bolts on transmission/driveshaft connection.
- Slide driveshaft back to rear final drive; constant velocity joints can move axially.

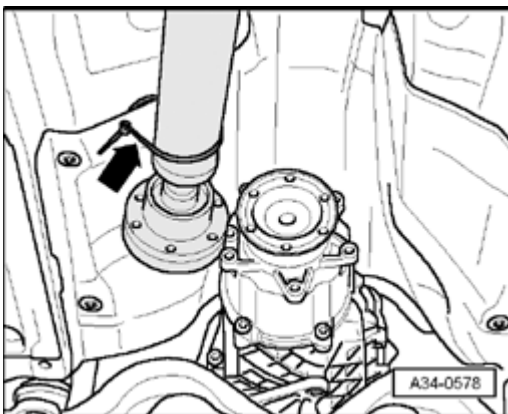


Fig. 69: Drive Shaft Tied To Side, Onto Heat Shield

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tie driveshaft up and to the side against heat shield - **arrow** -.

Prepare scissor lift platform:

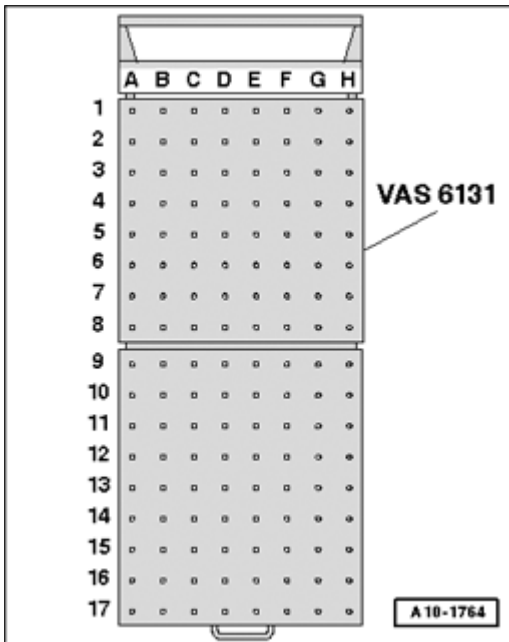


Fig. 70: Identifying Scissor Lift Platform VAS 6131
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Platform coordinates	Parts from Support Set VAS 6131/10			
B3	/10-1	/10-4	/10-5	/10-11
G3	/10-1	/10-4	/10-5	/10-11
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	/10-2	/10-5	/10-12

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

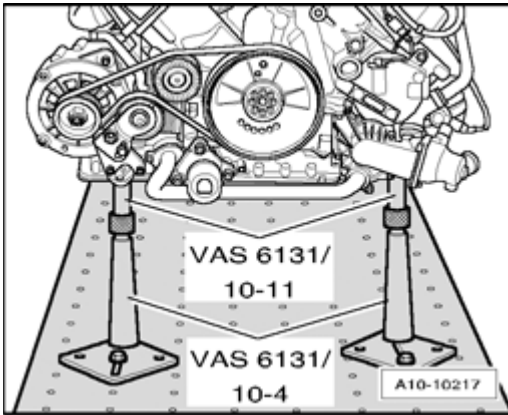


Fig. 71: Positioning Support Elements From VAS 6131/10 At Front On Engine
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

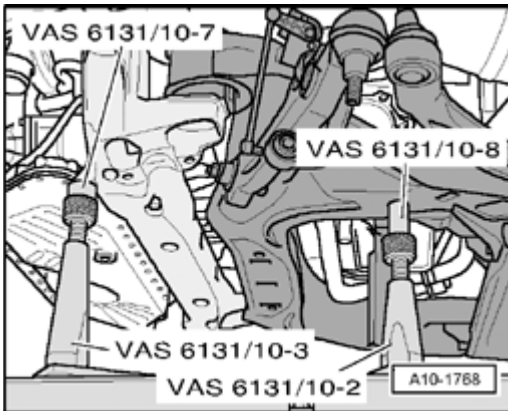


Fig. 72: Positioning Support Elements From VAS 6131/10 At Left/Right On Engine Carrier And Subframe
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

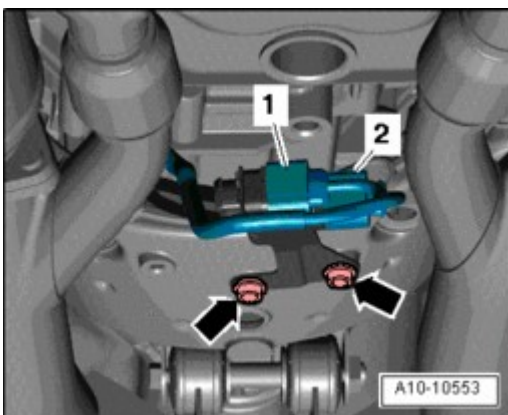


Fig. 73: Oxygen Sensor Electrical Connectors & Tunnel Cross Member Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bracket for oxygen sensor electrical connectors - **1** - and - **2** - from tunnel crossmember - **arrows** -.

NOTE:

- **Electrical connectors remain connected.**

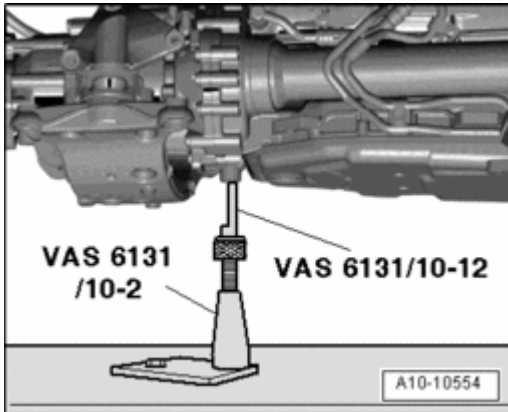


Fig. 74: Position Support Elements From VAS 6131/10 At Rear On Transmission

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.
- When all attachments are positioned, lift scissor lift table far enough until engine and transmission mount are free of tension.
- Tighten base plates for attachments to 20 Nm on the scissor lift table VAS 6131 A.

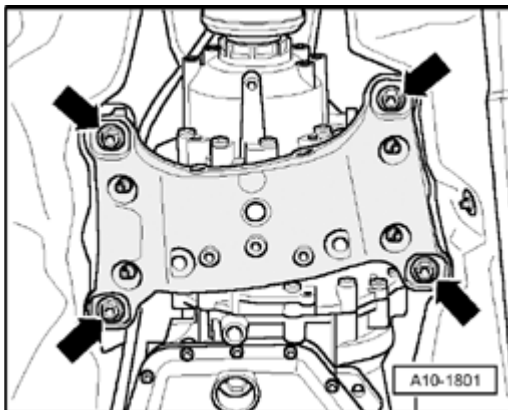


Fig. 75: Removing/Installing Bolts At Tunnel Cross Member

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - on tunnel cross member.

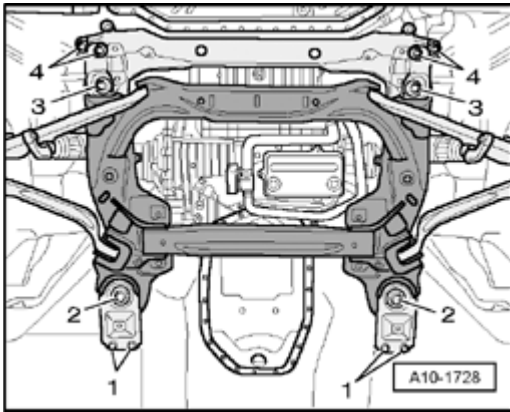


Fig. 76: Removing/Installing Long Member Subframe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Mark installation position of subframe on longmember using a felt tip pen.
- 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.

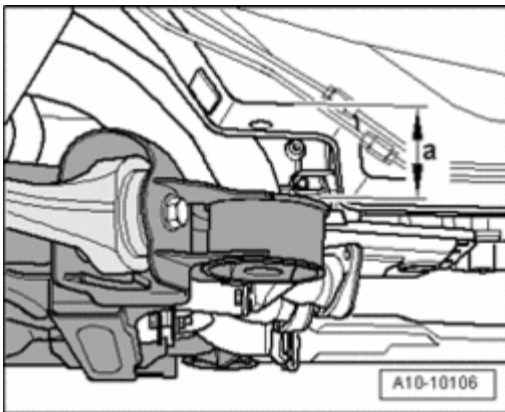


Fig. 77: Lowering/Lifting Engine/Transmission Assembly Using Scissor Lift Platform VAS 6131 Only
Approx. By Dimension
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- First lower engine/transmission assembly using scissor lift platform VAS 6131 A only approximately by dimension - a -.
- Dimension - a - = approximately 300 mm.

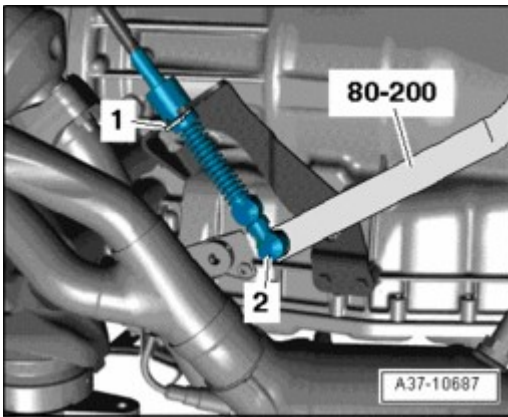


Fig. 78: Pressing Ball Socket Of Selector Lever Cable From Selector Shaft Lever Using Pry Lever - Rmv Outside Mirror 80 - 200 And Unclipping Locking Plate From Selector Lever Cable Bracket
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press ball socket - 2 - of selector lever cable from selector shaft lever using Pry Lever - Rmv Outside Mirror 80 - 200.
- Unclip locking plate - 1 - from selector lever cable bracket.
- Remove selector lever cable.
- Lower engine/transmission subassembly downward.
- Push scissor lift platform VAS 6131 A with engine/transmission subassembly under vehicle.

ENGINE AND TRANSMISSION, SEPARATING

Engine and Transmission, Separating

Engine and Transmission, Separating

Special tools, testers and auxiliary items required

- Adapter VAS 6131/10-12 qty. 2

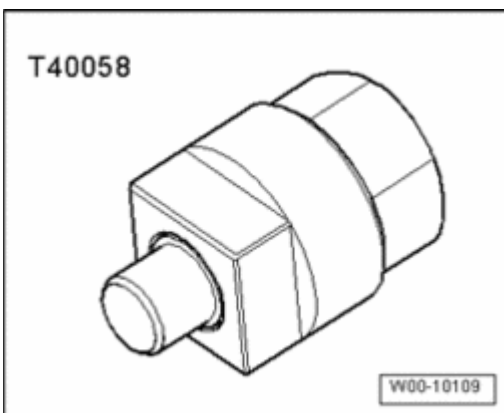


Fig. 79: Adapter T40058
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Adapter T40058

Procedure

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

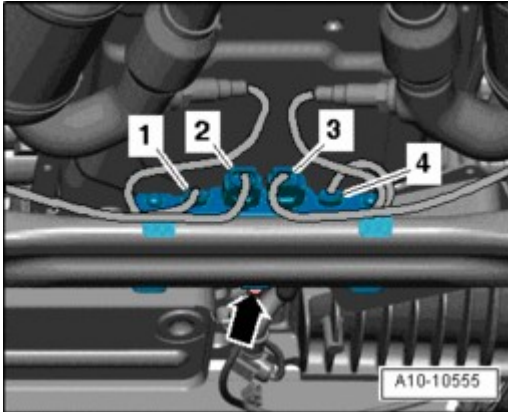


Fig. 80: Subframe Oxygen Sensor Electrical Connectors
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bracket for oxygen sensor electrical connectors - **1 to 4** - from subframe - **arrow** -.
- Remove electrical harness connectors from bracket and disconnect it.

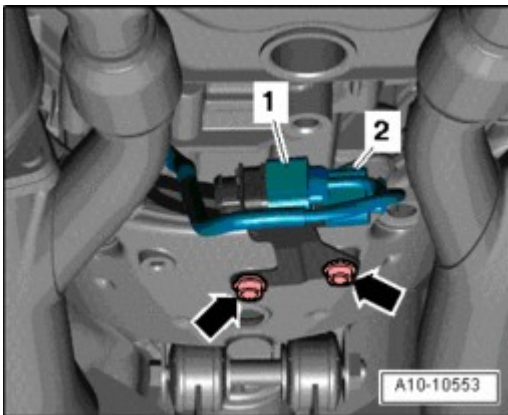


Fig. 81: Oxygen Sensor Electrical Connectors & Tunnel Cross Member Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove oxygen sensor electrical connectors - **1** - and - **2** - from bracket and disconnect them.

NOTE:

- Ignore - arrows -.

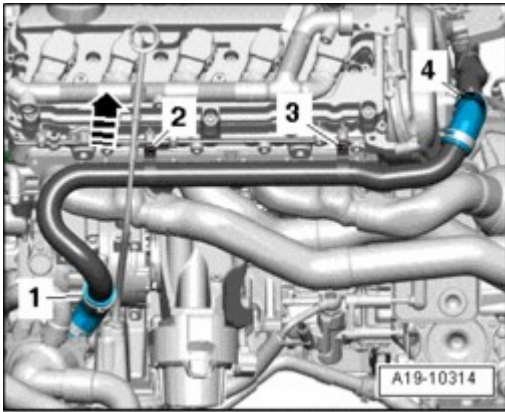


Fig. 82: Removing Bolts, Oil Dipstick Guide Tube Upward & Loosening Hose Clamps And Removing Left Coolant Pipe From Coolant Hoses

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - 2 - and - 3 -.
- Pull oil dipstick guide tube upward and off - **arrow** -.
- Loosen hose clamps - 1 - and - 4 - and remove left coolant pipe from coolant hoses.

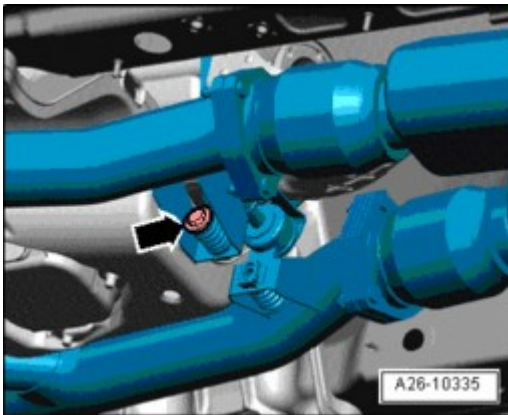


Fig. 83: Removing Bolt At Left Exhaust Tract Strap

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - **arrow** - at left exhaust tract strap.

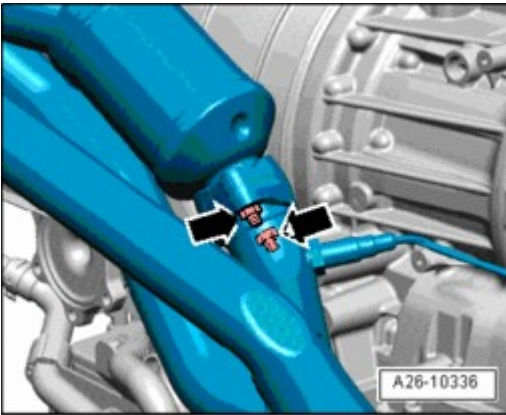


Fig. 84: Removing Nuts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - arrows -.

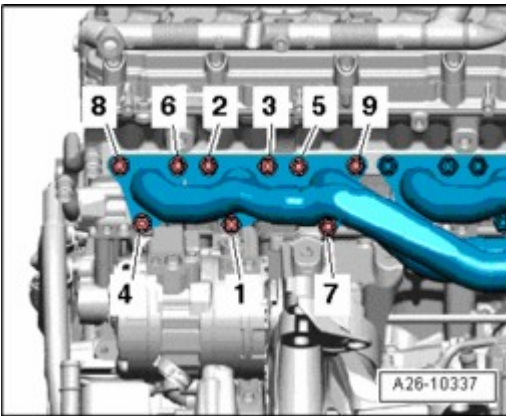


Fig. 85: Removing/Installing Nuts In Sequence And Left Front Exhaust Manifold With Catalytic Converter

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts in sequence - 9 to 1 - and remove left front exhaust manifold with catalytic converter.

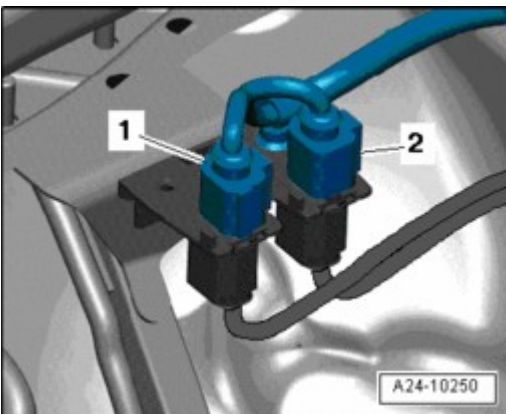


Fig. 86: Oxygen Sensor Electrical Connectors

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connectors - **1** - and - **2** - for oxygen sensors.

NOTE:

- Electrical connectors are shown in the installation position in the illustration.

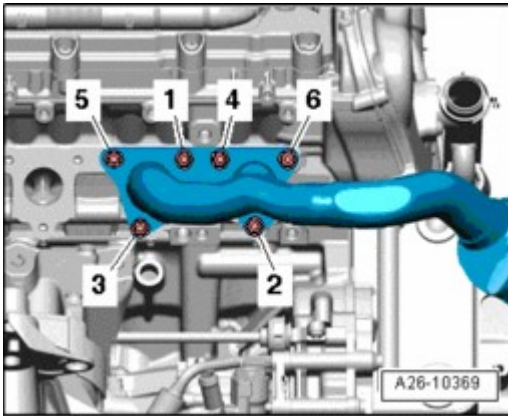


Fig. 87: Removing Nuts In Sequence And Left Rear Exhaust Manifold With Catalytic Converter
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts in sequence - **6 to 1** - and remove left rear exhaust manifold with catalytic converter.

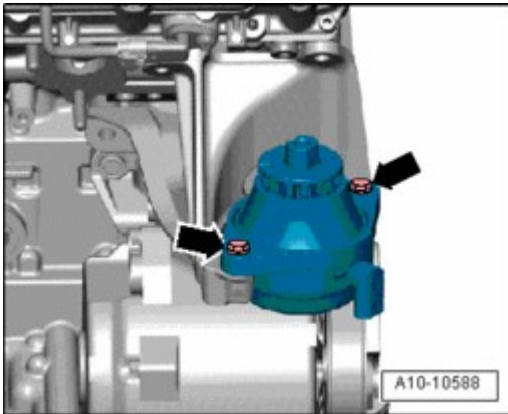
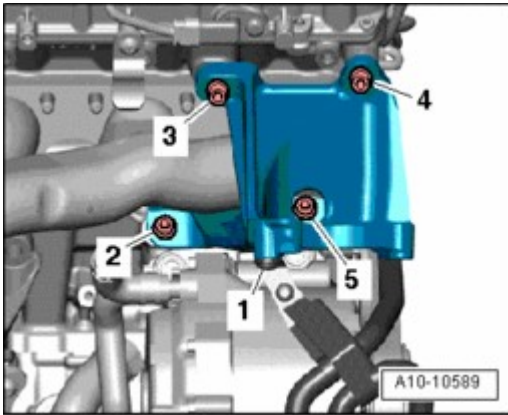


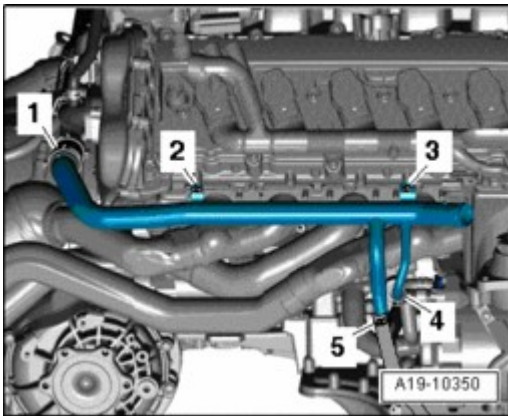
Fig. 88: Torque Support Mount Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and remove torque support mount.

**Fig. 89: Torque Support & Bolts**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **1 through 5** - and remove torque support bracket.

**Fig. 90: Bolts, Hose Clamps, Right Coolant Pipe From Coolant Hoses & Coolant Hoses**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **2** - and - **3** -.
- Loosen hose clamps - **1, 4, 5** - and remove right coolant pipe from coolant hoses.

**Fig. 91: Removing Bolt At Right Exhaust Tract Strap**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - **arrow** - at right exhaust tract strap.

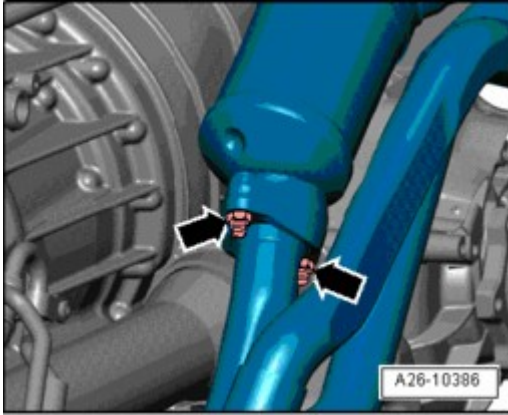


Fig. 92: Removing Nuts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - **arrows** -.

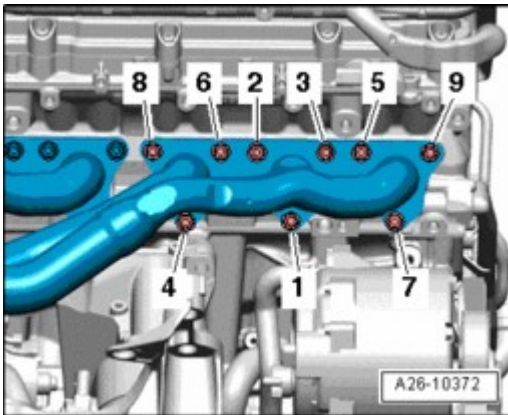


Fig. 93: Removing/Installing Nuts In Sequence And Right Front Exhaust Manifold With Catalytic Converter

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts in sequence - **9 to 1** - and remove right front exhaust manifold with catalytic converter.

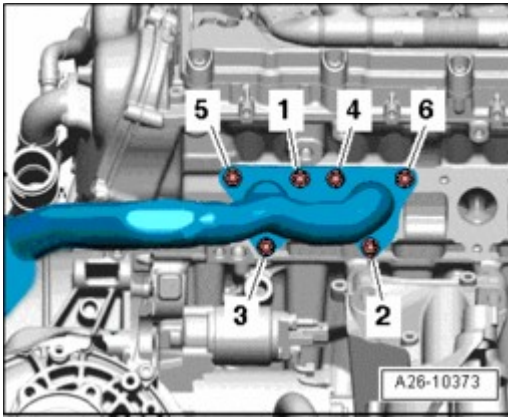


Fig. 94: Removing/Installing Nuts In Sequence And Right Rear Exhaust Manifold With Catalytic Converter

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts in sequence - 6 to 1 - and remove right rear exhaust manifold with catalytic converter.

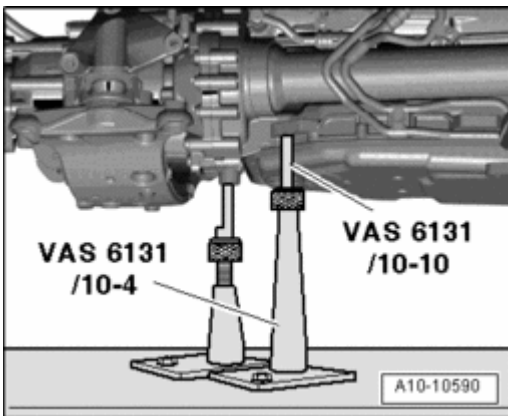


Fig. 95: Additional Support Element VAS 6131/10-10 With VAS 6131/10-4 On Right Rear Of Transmission

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Also place a support element from Support Set VAS 6131/10 at right rear of transmission as shown in illustration.
- Fastening point on scissor lift table VAS 6131 A : "G15".
- Rotate support element spindle upward until support pin comes into contact with support point.
- Tighten support element base plate to 20 Nm on the scissor lift table VAS 6131 A.

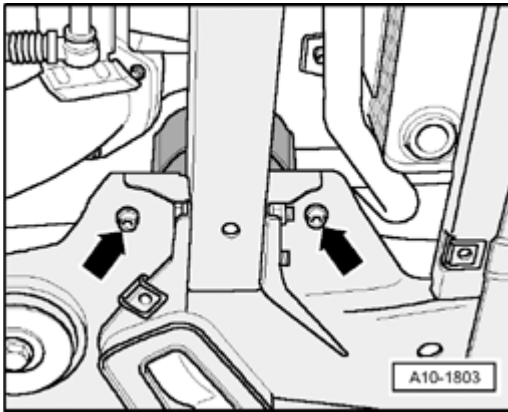


Fig. 96: Left/Right Front Transmission Mount Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

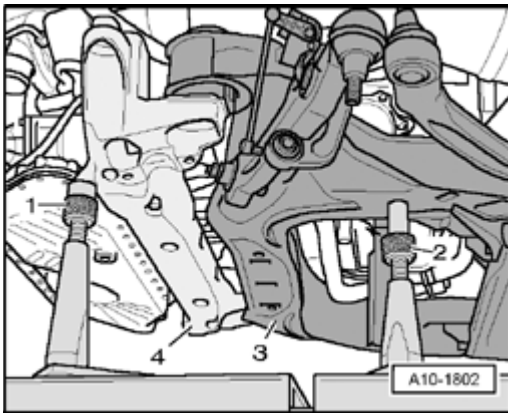


Fig. 97: Identifying Subframe, Left/Right Of Engine Carrier & Support Elements
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Rotate left and right support element spindles - **2** - on subframe completely down.
- Remove support pins from spindles.
- Remove both base plates of the subframe support elements from Scissor Lift Table VAS 6131 A.
- Remove subframe - **3** - to the side.
- Rotate left and right support element spindles - **1** - on engine carrier - **4** - completely down.

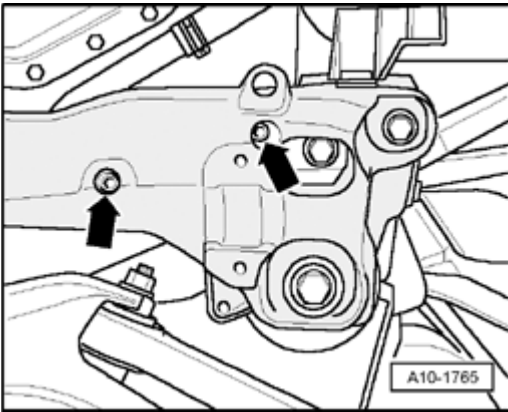


Fig. 98: Removing/Installing Bolts For Engine Mount At Left/Right
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove engine bracket bolts at left and right - **arrows** -.
- Remove engine carrier.
- Remove both base plates of the subframe support elements from Scissor Lift Table VAS 6131 A.

NOTE:

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

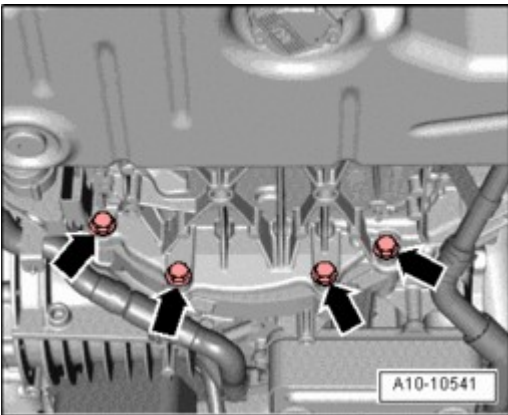


Fig. 99: Removing Bottom Engine/Transmission Connecting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bottom engine/transmission connecting bolts - **arrows** -.

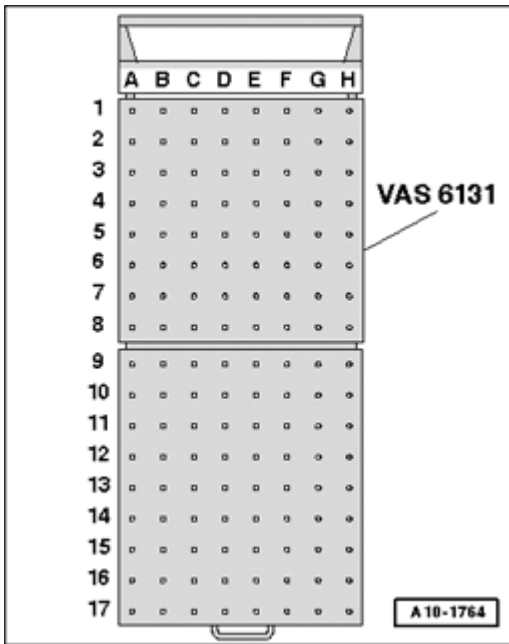


Fig. 100: Identifying Scissor Lift Platform VAS 6131
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Equip Scissor Lift Table VAS 6131 A with Support Set VAS 6131/10 as well as 3 Adapters VAS 6131/10-12 as follows:

Platform coordinates	Parts from Support Set VAS 6131/10			
B3 1)	/10-1	/10-4	/10-5	/10-11
G3 1)	/10-1	/10-4	/10-5	/10-11
C7	/10-1	/10-4	/10-5	/10-12
F7	/10-1	/10-4	/10-5	/10-12
B11	/10-1	/10-4	/10-5	/10-12
G11	/10-1	/10-3	/10-5	/10-13
G15 1)	/10-1	/10-4	/10-5	/10-10
D16 1)	/10-1	/10-2	/10-5	/10-12
1) The support elements remain unchanged.				

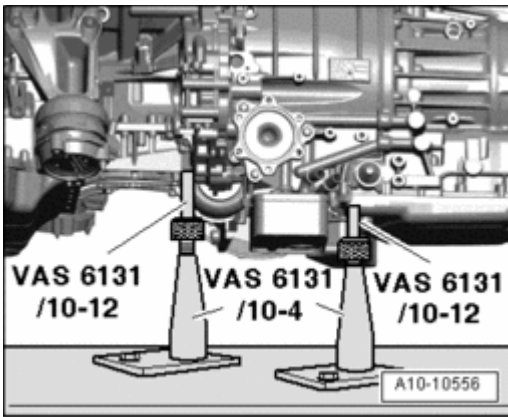


Fig. 101: Positioning Support Elements From VAS 6131/10 At Left On Engine/Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

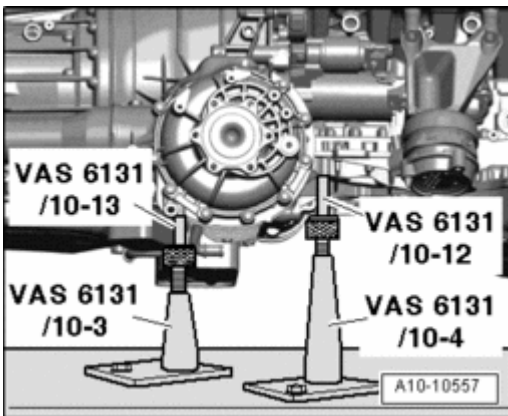


Fig. 102: Position Support Elements From VAS 6131/10 At Right On Engine/Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

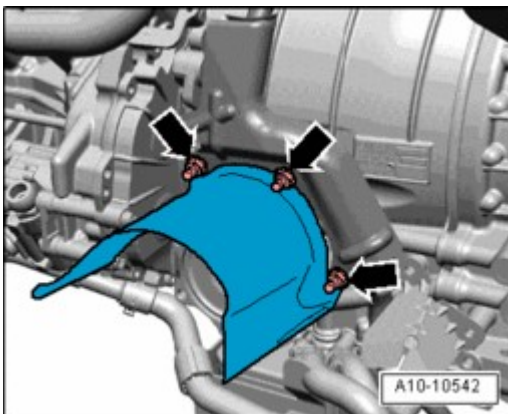


Fig. 103: Removing Left Drive Axle Heat Shield From Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove left driveshaft heat shield from transmission - **arrows** -.
- Remove coolant hoses - **arrows** -.
- Remove left transmission mount heat shield - **arrow** -.

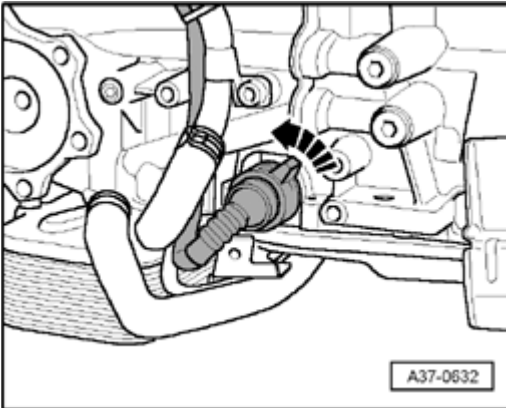


Fig. 104: Disconnecting Electrical Connector At Left On Transmission By Turning Twist Lock Counterclockwise

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector at left on transmission by turning the twist lock counterclockwise - **arrow** -.
- Free up wiring harness.

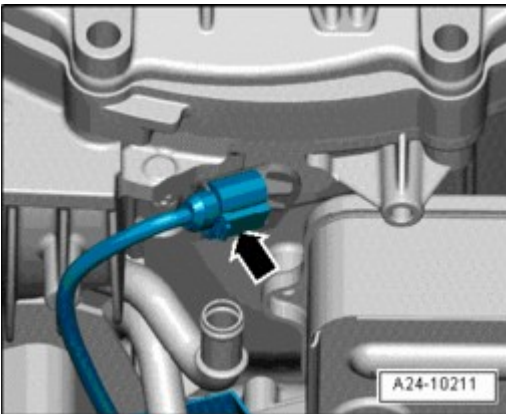


Fig. 105: Disconnecting Electrical Connector On Engine Speed (RPM) Sensor G28

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

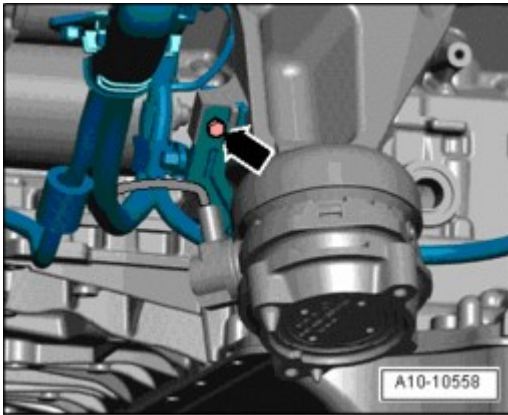


Fig. 106: Right Engine Support Electrical Wiring Bracket
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove electrical wiring bracket from right engine support - **arrow** -.

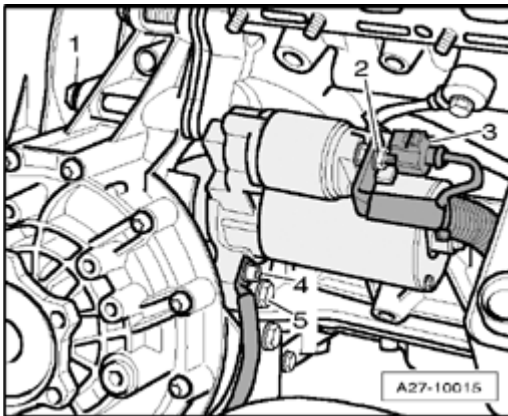


Fig. 107: Identifying Ground Wire, Electrical Wires, Bolts, And Starter
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove Ground (GND) wire - **4** - from starter.
- Remove the electrical wires - **2** - and - **3** - from the starter.
- Remove bolts - **1** - and - **5** - and remove starter.

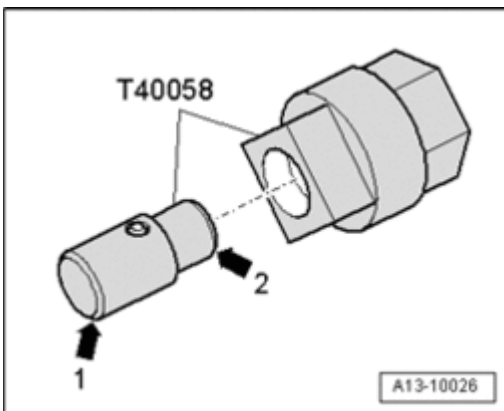


Fig. 108: Inserting Guide Pin Of Adapter T40058 So That Large Diameter Points To Engine
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert Socket T40058 adapter so that small diameter - **arrow 2** - points to engine. Large diameter - **arrow 1** - points to socket.

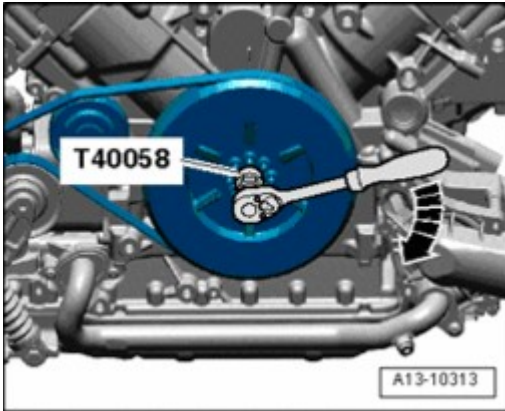


Fig. 109: Loosening/Tightening Torque Converter Bolts Using Adapter T40058 To Counterhold Crankshaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

- Disregard - arrow -.

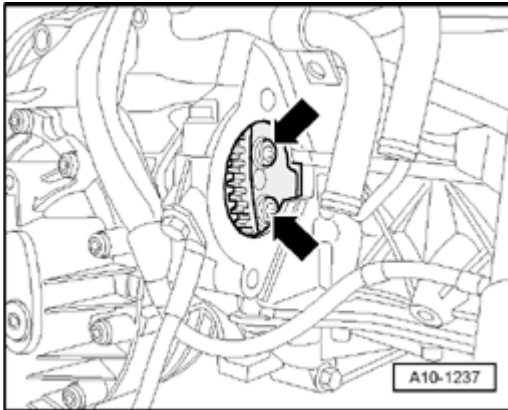


Fig. 110: Identifying Torque Converter Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

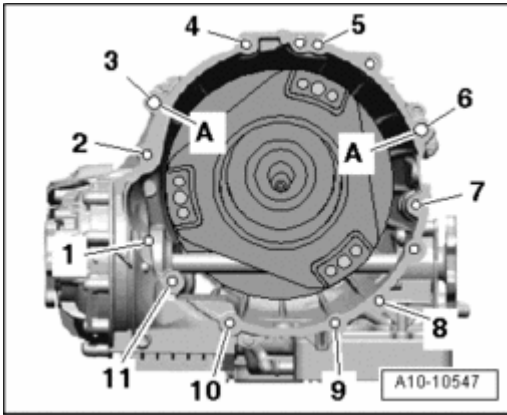


Fig. 111: Removing Engine/Transmission Connecting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove engine/transmission connecting bolts - 3 to 7 -.

NOTE:

- Ignore - A -.

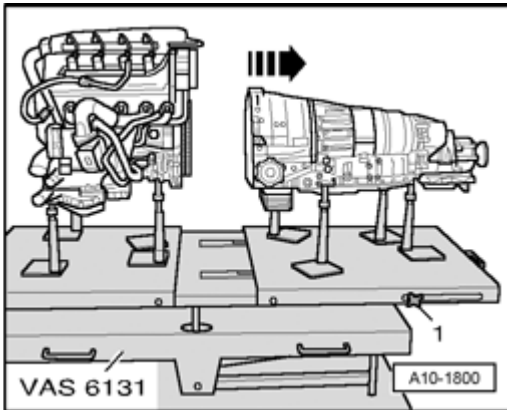


Fig. 112: Loosening Clamping Bolts On Side Of Scissor Lift Table VAS 6131 And Pulling Rear Table Section With Transmission Rearward
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen side clamping bolts - 1 - on scissor lift platform VAS 6131 A and pull rear platform top with transmission toward rear - **arrow** - , simultaneously push torque converter through opening of drive plate while doing this.

ENGINE, SECURING TO ENGINE AND TRANSMISSION HOLDER

Engine, Securing to Engine and Transmission Holder

Engine, Securing to Engine and Transmission Holder

Special tools, testers and auxiliary items required

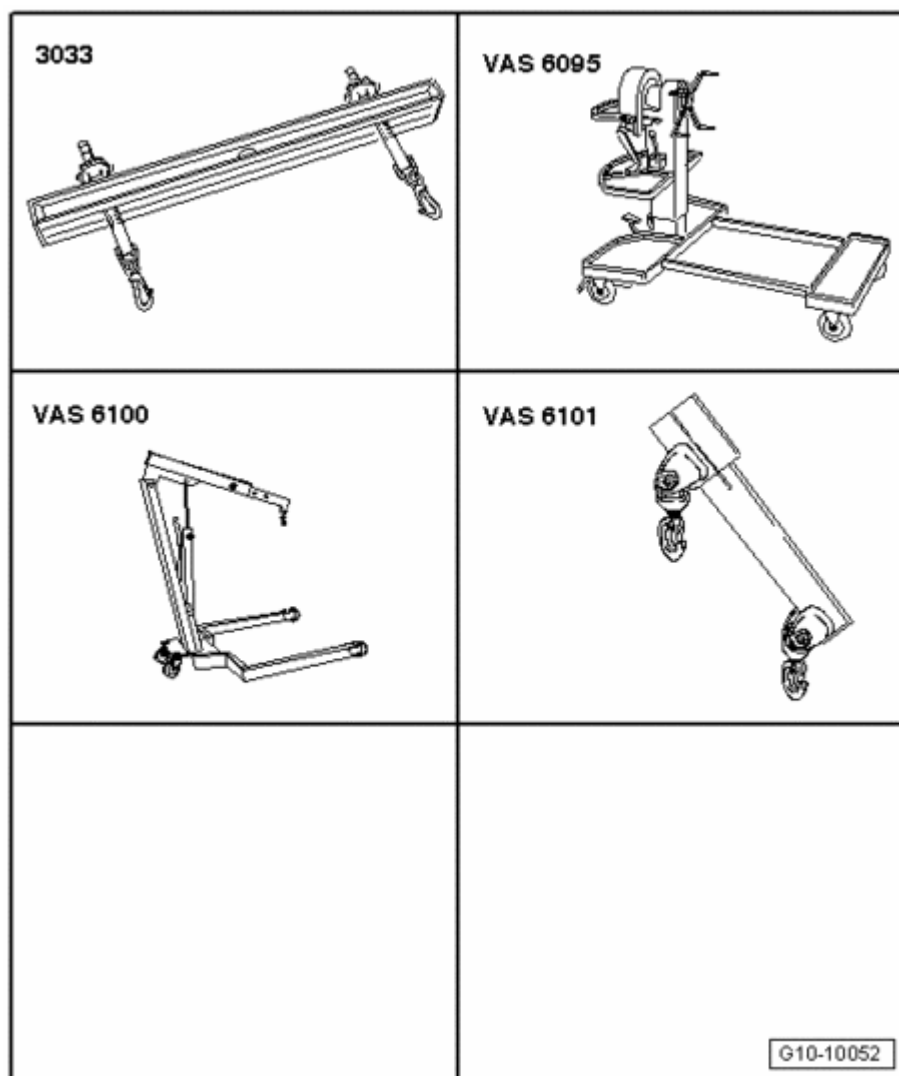


Fig. 113: Identifying Special Tools - Engine, Securing To Engine And Transmission Holder
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lifting tackle 3033
- Engine and transmission holder VAS 6095 with bracket VAS 6095/1-7
- Shop crane VAS 6100
- Lift arm extension for workshop crane VAS 6101

Procedure

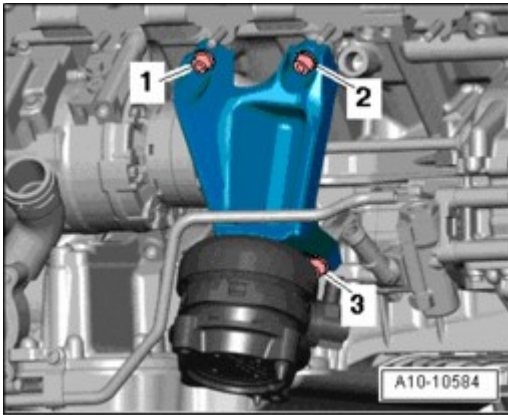


Fig. 114: Engine Support Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - **arrow** - at left engine mount.
- Remove bolts - **1 to 4** - and remove engine support from engine mount.
- Disconnect electrical harness connector - **arrow** - at right engine mount.

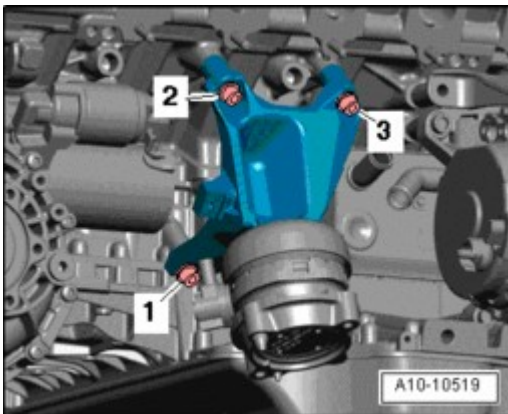


Fig. 115: Engine Support Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **1, 2, 3** - and remove engine support from engine mount.

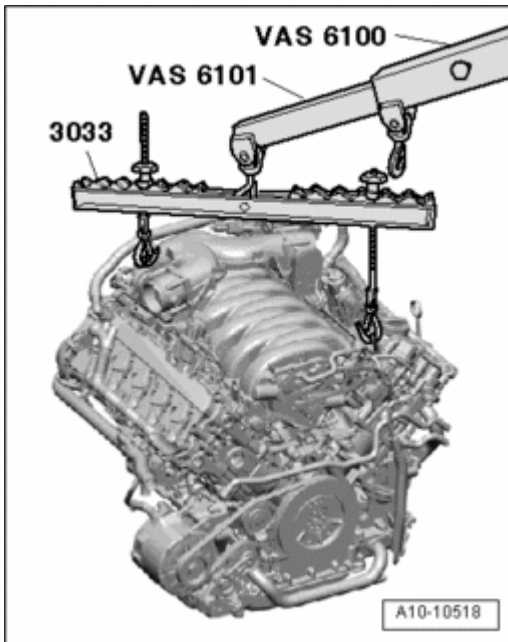


Fig. 116: Engaging Lifting Tackle 3033 On Engine Lifting Eyes And On Shop Crane VAS 6100 With Lift Arm Ext./Workshop Hoist VAS 6101

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Engage Lifting Tackle 3033 on engine lifting eyes and on Shop Crane VAS 6100 with Lift Arm Ext./Workshop Hoist VAS 6101 as shown in the illustration.
- Lift engine from support elements of Scissor Lift Table VAS 6131 A.

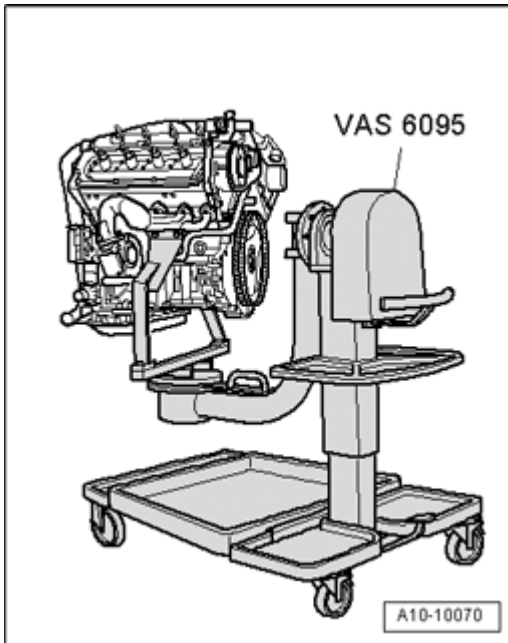


Fig. 117: Securing Engine To Engine And Transmission Holder VAS 6095/1-7 Using Holder VAS 6095

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure the engine to the engine and transmission holder VAS 6095/1-7 using Holder VAS 6095 , and tighten to 40 Nm as shown in the illustration.

ENGINE, INSTALLING

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 with hose clamps appropriate for the model .
 - During installation, reinstall all heat insulation sleeves and heat shields at the same locations.
 - During installation, all cable ties must be re-installed at the same location.
- Install left and right engine supports.
 - Make sure alignment sleeves for engine to transmission are installed in cylinder block. Install if necessary.

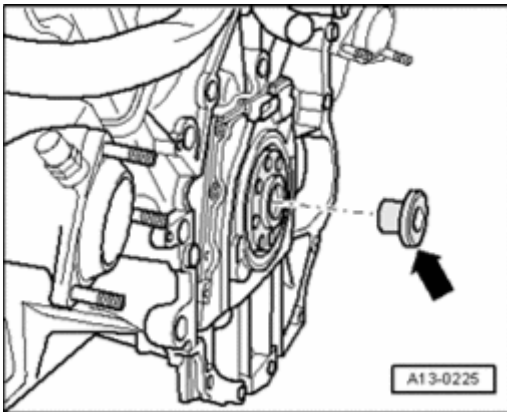


Fig. 118: Torque Converter Centering Bushing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

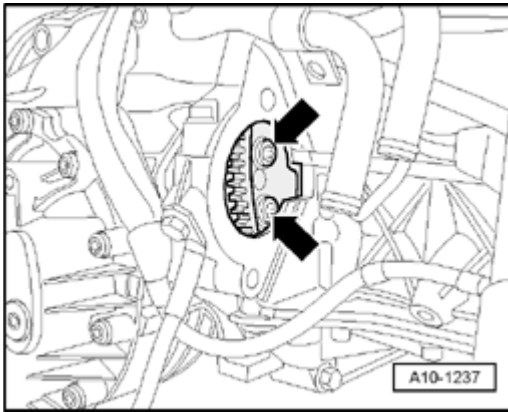


Fig. 119: Identifying Torque Converter Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Before guiding the engine and transmission together, rotate the torque converter and the engine drive plate so the holes and the threaded holes are at the same height as the opening on the removed starter - **arrows -**.
- Use new ribbed bolts to secure the torque converter to the drive plate .
- Bolt transmission to engine.

NOTE:

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

Engine/transmission, fastening

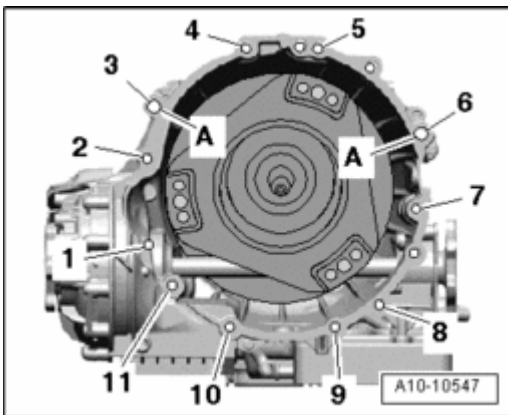


Fig. 120: Removing Engine/Transmission Connecting Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

Item	Bolt	Nm
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2009 Audi S8 Quattro

ENGINE 5.2 Liter 10-Cyl. 4V Engine Mechanical, Engine Code(s): BSM - S8

1	M10x40	45
2	M10x135 1)	65
3	M12x105	65
4, 5	M12x100	65
6, 8, 9, 10, 11	M12x75	65
7	M12x155	65
A	Alignment sleeves for centering	
1) bolt class 10.9.		

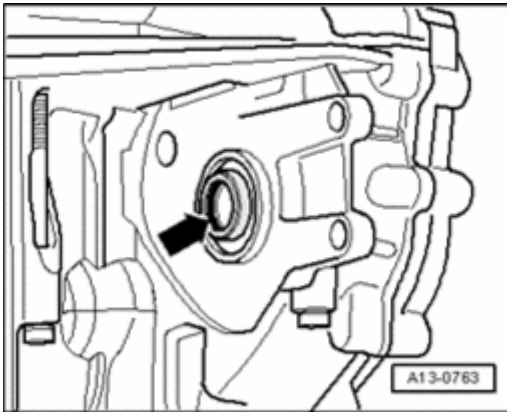


Fig. 121: Identifying Sealing Ring And O-Ring For Vane Pump
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Before installing an exchanged engine, check whether O-ring - **arrow** - is inserted in power steering pump input shaft.
- Install starter --> **27 - BATTERY, STARTER, GENERATOR, CRUISE CONTROL** .
- Always clean threaded driveshaft bores in transmission flanged shaft of locking fluid residue using a tap before installation.

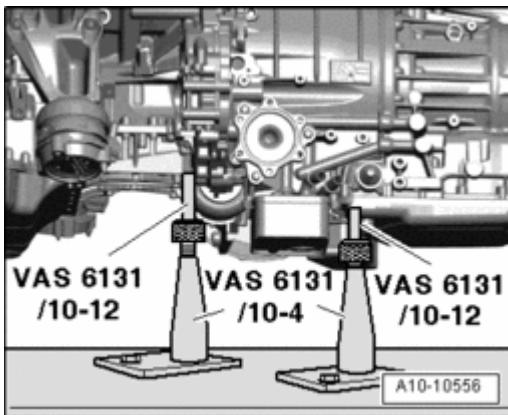


Fig. 122: Positioning Support Elements From VAS 6131/10 At Left On Engine/Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Rotate attachment spindles at left of engine/transmission assembly downward.

- Remove both left support element base plates from Scissor Lift Table VAS 6131 A.

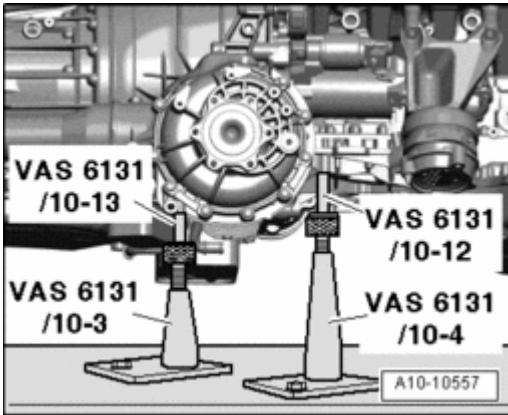


Fig. 123: Position Support Elements From VAS 6131/10 At Right On Engine/Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

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

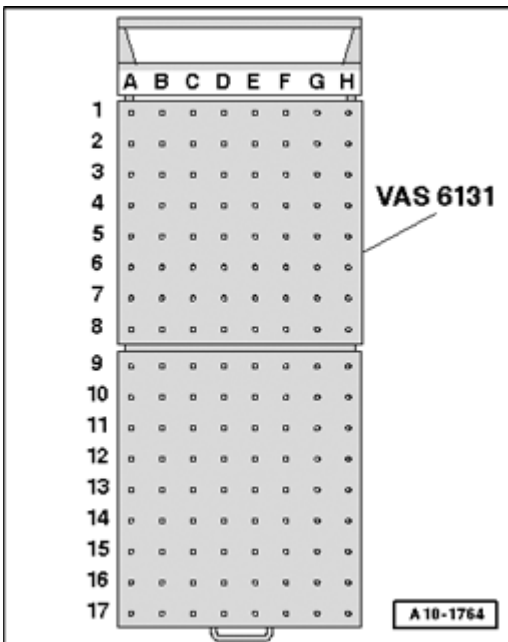


Fig. 124: Identifying Scissor Lift Platform VAS 6131
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

2009 Audi S8 Quattro

ENGINE 5.2 Liter 10-Cyl. 4V Engine Mechanical, Engine Code(s): BSM - S8

Platform coordinates	Parts from Support Set VAS 6131/10			
B3 1)	/10-1	/10-4	/10-5	/10-11
G3 1)	/10-1	/10-4	/10-5	/10-11
B6	/10-1	/10-3	/10-5	/10-7
C6	/10-1	/10-3	/10-5	/10-7
B10	/10-1	/10-2 2)	/10-5 2)	/10-8 2)
G10	/10-1	/10-2 2)	/10-5 2)	/10-8 2)
G15 1)	/10-1	/10-4	/10-5	/10-10
D16 1)	/10-1	/10-2	/10-5	/10-12

1) The support elements remain unchanged. 2) Only install support elements after installing subframe.

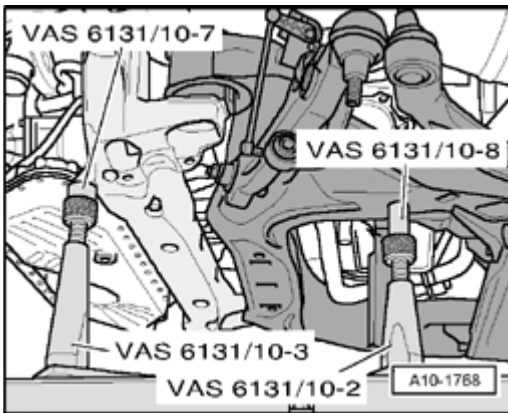


Fig. 125: Positioning Support Elements From VAS 6131/10 At Left/Right On Engine Carrier And Subframe

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

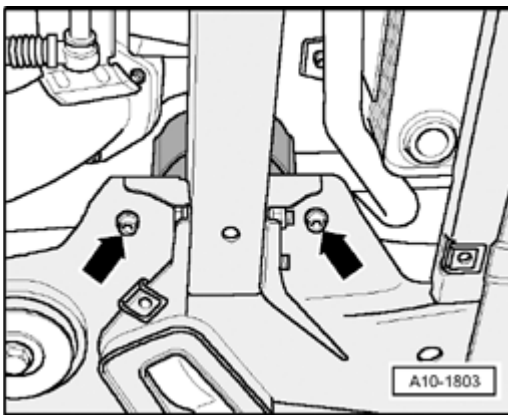


Fig. 126: Left/Right Front Transmission Mount Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten left and right transmission mount bolts - **arrows** -.

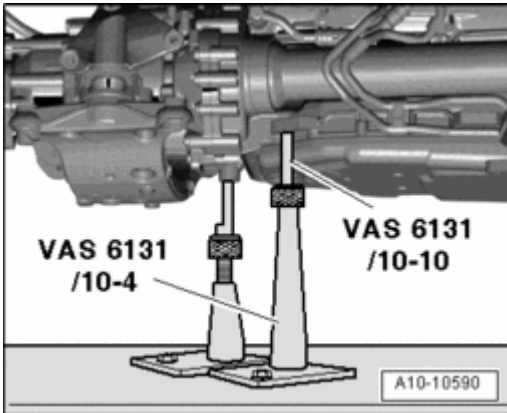


Fig. 127: Additional Support Element VAS 6131/10-10 With VAS 6131/10-4 On Right Rear Of Transmission

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove additional support element VAS 6131/10-10 with VAS 6131/10-4 on right rear of transmission.
- Install wiring harness and coolant hose system on engine/transmission assembly.
- Install left drive shaft heat shield.
- Install left exhaust system tract --> **Left Exhaust System Tract, Removing and Installing.**
- Install right exhaust system tract --> **Right Exhaust System Tract, Removing and Installing.**
- Install left coolant pipe --> **Left Coolant Pipe, Removing and Installing.**
- Install right coolant pipe --> **Right Coolant Pipe, Removing and Installing.**
- Using Scissor Lift Platform VAS 6131 A , slowly guide engine/transmission unit with subframe into body from below.

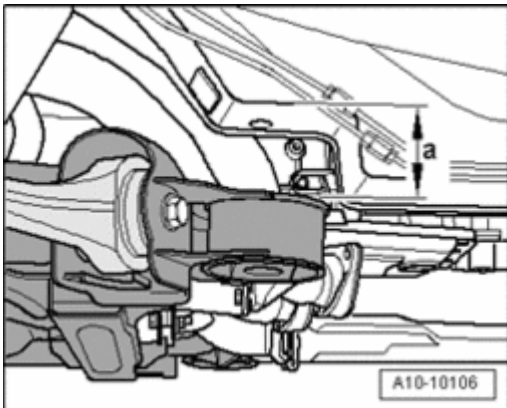


Fig. 128: Lowering/Lifting Engine/Transmission Assembly Using Scissor Lift Platform VAS 6131 Only Approx. By Dimension

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift engine/transmission subassembly using scissor lift platform VAS 6131 A until dimension - **a** - is

reached.

- Dimension - **a** - = max. 300 mm.
- Install selector lever cable and check adjustment if necessary --> **37 - CONTROLS, HOUSING** .

CAUTION: Ensure selector lever cable is not pinched in left rear transmission support during installation.

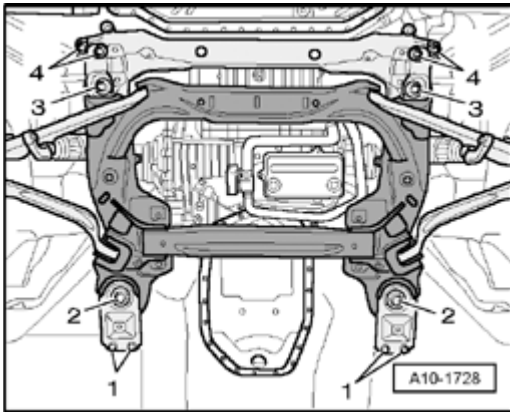


Fig. 129: Removing/Installing Long Member Subframe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

CAUTION: Vehicle must not be driven in this condition.

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

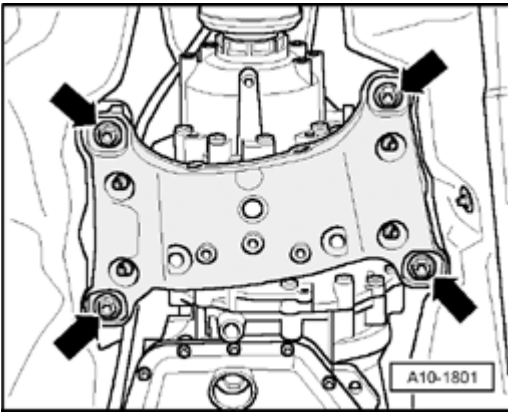


Fig. 130: Removing/Installing Bolts At Tunnel Cross Member
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten bolts - **arrows** - at tunnel cross member.

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

- Install driveshaft --> **39 - FINAL DRIVE, DIFFERENTIAL** .
- Align exhaust system --> **Exhaust System, Installing**.
- Install driveshafts --> **40 - FRONT SUSPENSION** .
- Install guide control arm, control arm and stabilizer --> **40 - FRONT SUSPENSION** .
- Install refrigerant lines --> **87 - AIR CONDITIONING** .
- Install right cylinder head cover --> **Right Cylinder Head Cover, Removing and Installing**.
- Install suspension strut crossmember --> **40 - FRONT SUSPENSION** .

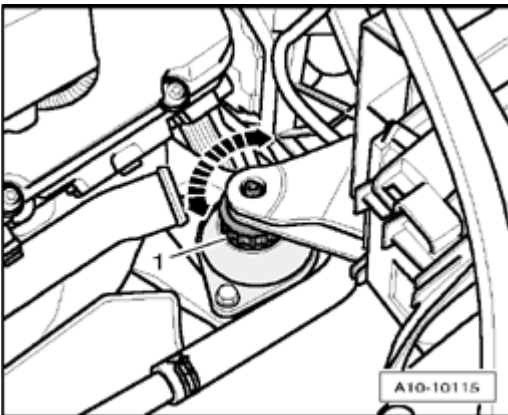


Fig. 131: Adjusting Torque Support Mount
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Before tightening specifications support, adjust torque support mount.
- Turn adjustment ring - **1** - counter-clockwise until it comes into contact with torque support bracket.
- Then, turn adjustment ring one rotation clockwise again.

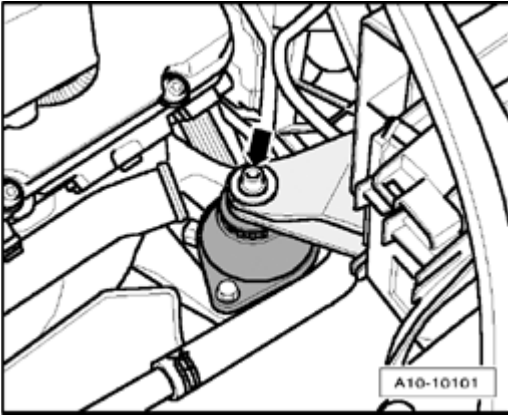


Fig. 132: Torque Support Mount Bolt

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten bolt - **arrow** - on torque support mount.
- Electrical connections and routing --> Electrical Wiring Diagrams, Troubleshooting and Component Locations.
- Observe safety precautions after connecting battery --> **27 - BATTERY, STARTER, GENERATOR, CRUISE CONTROL** .
- Install wiper arms and adjust --> **92 - WINDSHIELD WIPER AND WASHER SYSTEM** .

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

- Before starting engine for the first time, fill power steering vacuum reservoir with hydraulic oil.

NOTE:

- **Power-steering pump must not run dry.**

- Check oil level --> **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 refrigerant circuit --> **87 - AIR CONDITIONING** .
- Perform alignment --> **44 - WHEELS, TIRES AND WHEEL ALIGNMENT** .

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

Tightening Specifications

2009 Audi S8 Quattro

ENGINE 5.2 Liter 10-Cyl. 4V Engine Mechanical, Engine Code(s): BSM - S8

NOTE:

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

Component		Nm
Bolts/nuts	M6	9
	M8	20
	M10	40
	M12	65
Exceptions:		
Drive plate to torque converter		85 1)
Clamp B+ to starter		16
Engine support to cylinder block		40
Heat shield for drive shaft to transmission		23
Torque support bracket to cylinder block		40
Torque support mount to torque support bracket		23
Engine mount to engine carrier		23
Transmission mount to subframe		23
Engine carrier to chassis		68
Tunnel cross member to body		40
Fuel supply line to distribution piece		25
Torque support mount to torque support		40
1) Replace bolts.		

13 - ENGINE - CRANKSHAFT, CYLINDER BLOCK

SERVICING, BELT PULLEY SIDE

Servicing, Belt Pulley Side

--> **Ribbed Belt Drive, Component Overview**

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

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

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

Ribbed Belt Drive, Component Overview

[illegible]

- 1 - 22 Nm
 - 2 - 22 Nm
 - 3 - Tensioning device for ribbed belt
 - 4 - 22 Nm
 - 5 - Generator
- Removing and installing --> **27 - BATTERY, STARTER, GENERATOR, CRUISE CONTROL**

6 - M8 - 22 Nm; M10 - 46 Nm

7 - Alignment bushing

- For generator bracket
- 2 pieces

8 - Generator bracket

9 - 10 Nm

10 - Idler roller holder

11 - Vibration damper

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

12 - Bolt

- Replace
- Only use original equipment bolts, Bolt class 12.9
- Insert bolts that are not self-locking with locking compound; Locking compound .
- Tightening order --> **Vibration Damper, Removing and Installing**

13 - Idler roller for ribbed belt

14 - 22 Nm

15 - Cover cap

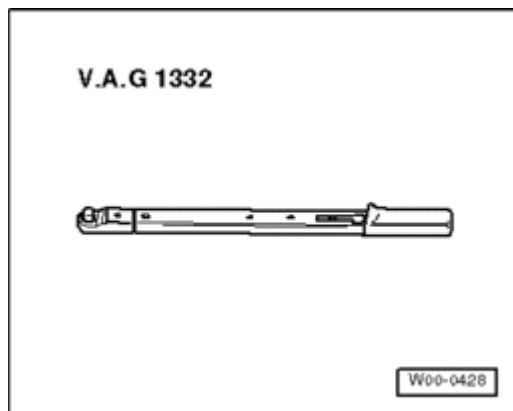
16 - Ribbed belt

- Check for wear
- Do not kink
- Before removing, mark direction of rotation using chalk or felt-tip marker. A reversed turning in direction can cause damage to the ribbed belt under operating conditions
- Removing and installing --> **Ribbed Belt, Removing and Installing**
- When installing the ribbed belt, make sure it is seated correctly on the pulleys

17 - Threaded bushing

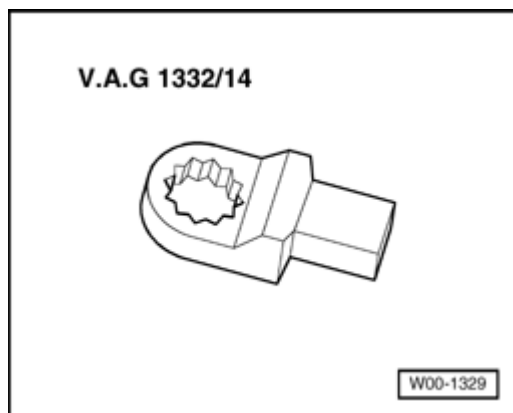
Ribbed Belt, Removing and Installing

Ribbed Belt, Removing and Installing

Special tools, testers and auxiliary items required**Fig. 134: Torque Wrench V.A.G 1332**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Torque Wrench V.A.G 1332

**Fig. 135: Socket AF 16 mm V.A.G 1332/14**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Socket AF 16 mm V.A.G 1332/14

Removing

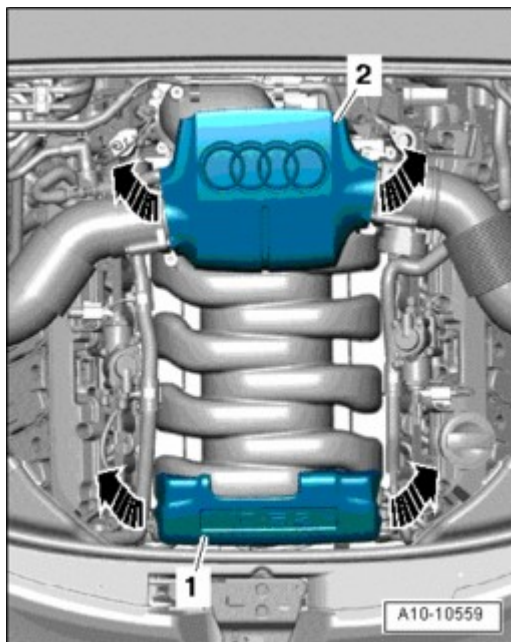


Fig. 136: Removing Front Engine Cover And Rear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front engine cover - **1** - - arrows -.

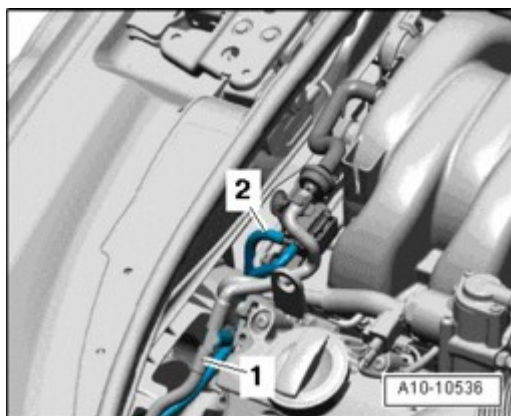


Fig. 137: Vacuum Hoses
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove hood seal from lock carrier and from fender edges.
- Disconnect vacuum hoses - **1** - and - **2** - and free them up.

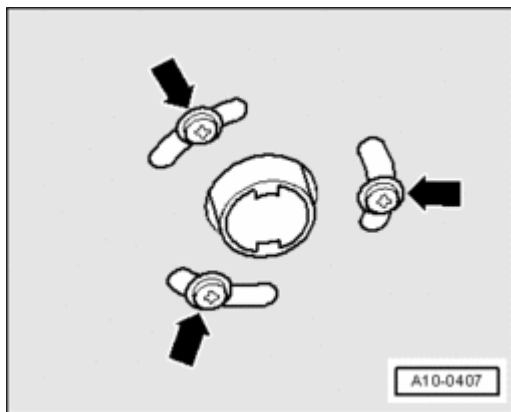


Fig. 138: Identifying Exhaust Pipe Fasteners

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

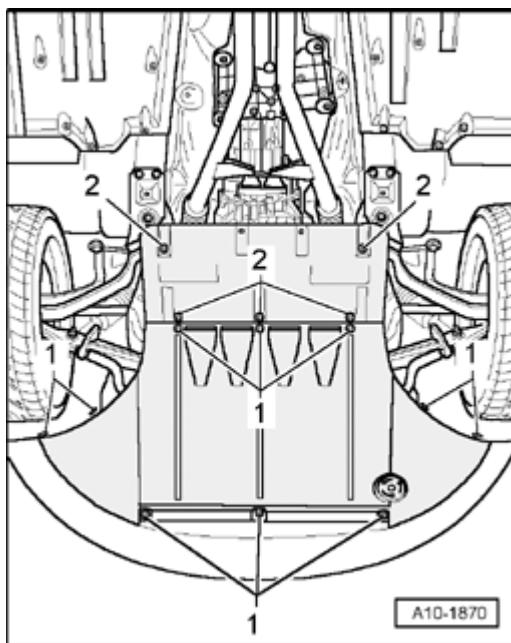
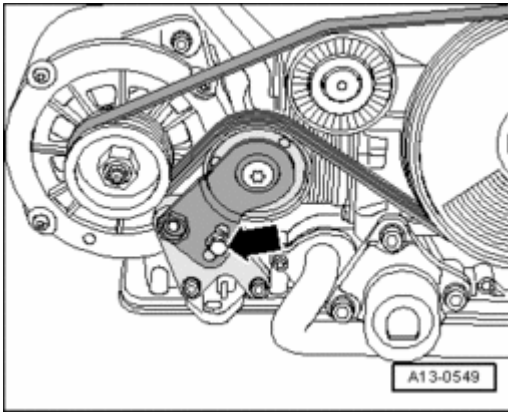


Fig. 139: Noise Insulation Quick-Release Fasteners

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen quick-release fasteners - **1** - and remove front noise insulation.

**Fig. 140: Ribbed Belt Tensioning Bolt**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

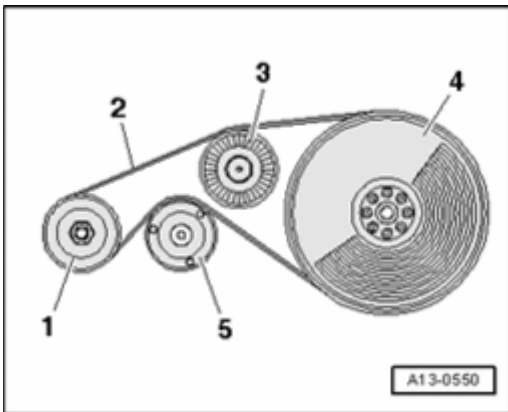
NOTE:

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

- Loosen tensioning bolt - **arrow** - and remove ribbed belt.

Installing

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

**Fig. 141: Placing Ribbed Belt Over Belt Pulley In Specified Sequence**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place ribbed belt - **2** - over belt pulley in the specified sequence.

1 - Generator

3 - Idler roller

4 - Vibration damper

5 - Tensioning roller

NOTE:

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

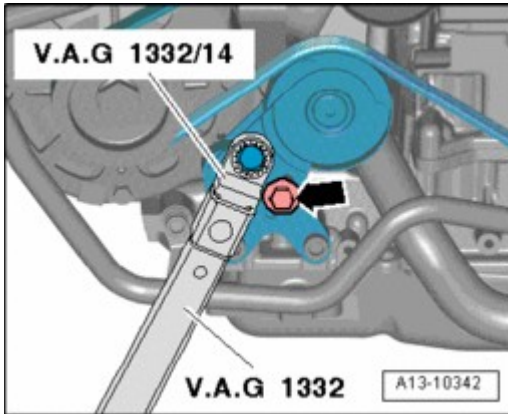


Fig. 142: Positioning Torque Wrench With Socket AF 16 mm V.A.G 1332/14 On Tensioning Roller Hex Head And Tension Ribbed Belt To 70 Nm

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position torque wrench with the 16 mm socket V.A.G 1332/14 on the tensioning roller hex head and tension the ribbed belt to 70 Nm.
- At the same time, tighten the tensioning bolt - **arrow** - to 25 Nm.
- Start engine and check running belt.

Vibration Damper, Removing and Installing

Vibration Damper, 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.**

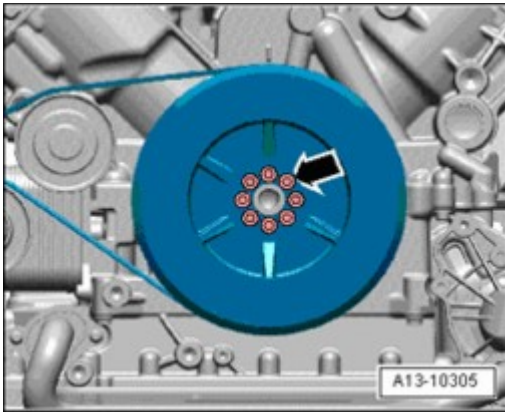


Fig. 143: Vibration Damper Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen 8 bolts - **arrow** - on vibration damper several turns by counterholding on generator belt pulley central nut with open end wrench.

NOTE:

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

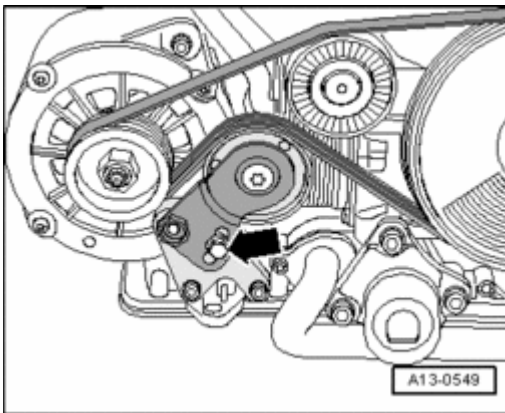


Fig. 144: Ribbed Belt Tensioning Bolt

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen tensioning bolt - **arrow** - and remove ribbed belt.
- Remove vibration damper.

Installing

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

NOTE:

- Replace the vibration damper bolts with new original bolts .
- Insert bolts that are not self-locking with locking compound; Locking

compound .

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

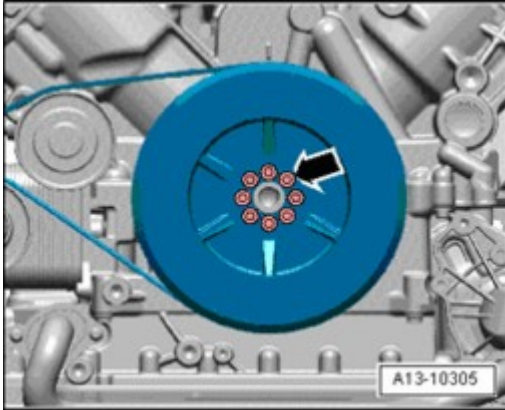


Fig. 145: Vibration Damper Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten vibration damper bolts - **arrow** - diagonally in 3 stages.
- Using torque wrench, tighten to 15 Nm.
- Using torque wrench, tighten to 22 Nm.
- With Torx key, 90 ($1/4$ turn) additional turn.
- Install ribbed belt --> **Ribbed Belt, Removing and Installing.**
- Install fan shroud --> **Fan Shroud, Removing and Installing.**
- Install radiator --> **Radiator, Removing and Installing.**
- Fill with coolant --> *Filling* under **Cooling System, Draining and Filling.**

Crankshaft Seal, Belt Pulley Side, Replacing

Crankshaft Seal, Belt Pulley Side, Replacing

Special tools, testers and auxiliary items required

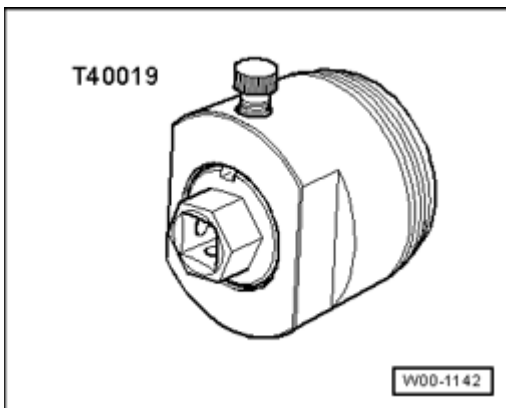
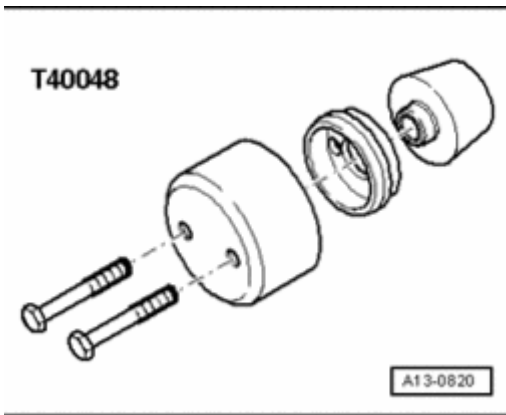


Fig. 146: Seal Remover T40019

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Seal remover T40019

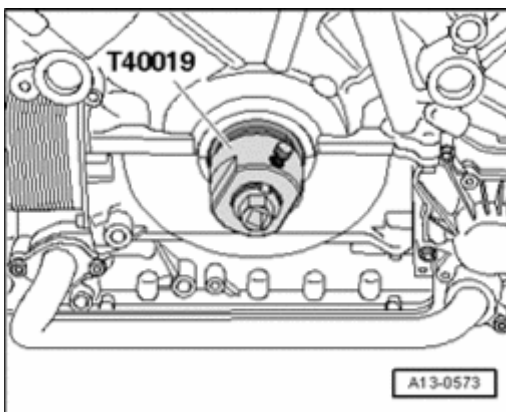
**Fig. 147: Assembly Tool T40048**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Assembly tool T40048

Procedure

- Drain coolant --> **Cooling System, Draining and Filling.**
- Remove radiator --> **Radiator, Removing and Installing.**
- Remove fan shroud --> **Fan Shroud, Removing and Installing.**
- Remove vibration damper --> **Vibration Damper, Removing and Installing.**

**Fig. 148: Installing Oil Seal Extractor T40019**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position inner part of Oil Seal Extractor T40019 flush with outer part and secure inner part with knurled thumb screw.
- Lubricate threaded head of the seal remover, place against seal, and with strong force screw into the seal

as far as possible.

- Loosen knurled screw and turn inner portion against crankshaft until oil seal is pulled out.
- Tension seal extractor in a vise at mounting points and remove seal with pliers.
- Clean operating and sealing surfaces.

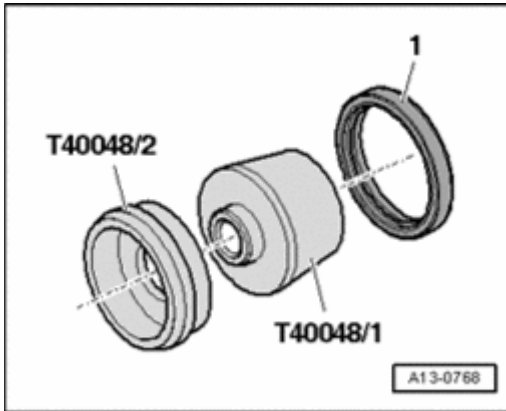


Fig. 149: Inserting Assembly Device T40048/1 Onto Pull Sleeve T40048/2 And Sliding Seal Onto Pull Sleeve

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position assembly device T40048/1 on pull sleeve T40048/2 and slide seal - A - onto pull sleeve.
- Remove assembly device.

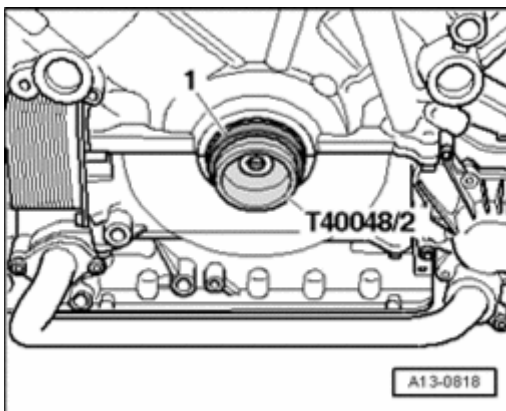


Fig. 150: Placing Pull Sleeve T40048/2 On Crankshaft And Sliding Seal Into Sealing Surface On Engine

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

- Pull sleeve remains on crankshaft for pressing in.

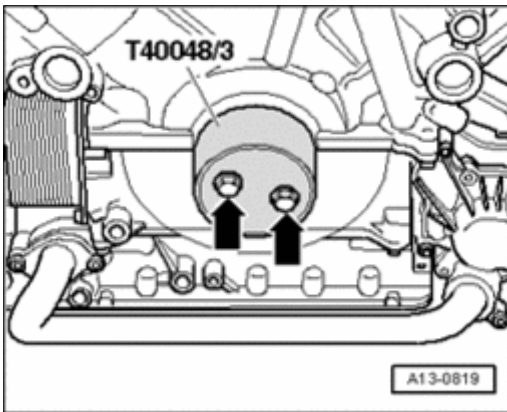


Fig. 151: Positioning Pressure Sleeve T40048/3 With Bolts On Crankshaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position pressure sleeve T40048/3 with 2 M8x55 mm bolts - **arrows** - on crankshaft.
- Then install bolts by hand.
- Tighten bolts each $\frac{1}{2}$ rotation by alternating sides to press in seal until it reaches stop.

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

- Install vibration damper --> **Vibration Damper, Removing and Installing.**
- Install ribbed belt --> **Ribbed Belt, Removing and Installing.**
- Install fan shroud --> **Fan Shroud, Removing and Installing.**
- Install radiator --> **Radiator, Removing and Installing.**
- Fill with coolant --> *Filling* under **Cooling System, Draining and Filling.**

SERVICING, TIMING CHAIN SIDE

Servicing, Timing Chain Side

--> **Drive Plate, Component Overview**

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

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

--> **Timing Chain Covers, Component Overview**

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

--> **Lower Timing Chain Cover, Removing and Installing**

--> **Camshaft Timing Chain, Component Overview**

2009 Audi S8 Quattro

ENGINE 5.2 Liter 10-Cyl. 4V Engine Mechanical, Engine Code(s): BSM - S8

- > **Camshaft Timing Chain, Removing from Camshaft**
- > **Camshaft Timing Chain, Removing and Installing**
- > **Timing Mechanism Drive Chain, Component Overview**
- > **Timing Mechanism Drive Chain, Removing and Installing**
- > **Power Take-Off, Oil Pump and Balancing Shaft Drive Chain, Component Overview**
- > **Power Take-Off, Oil Pump and Balancing Shaft Drive Chain, Removing and Installing**
- > **Power Take-Off, Component Overview**
- > **Power Take-Off Seals, Replacing**
- > **Spur Gear Unit, Removing and Installing**
- > **Balancing Shaft, Component Overview**
- > **Balancing Shaft, Removing and Installing**

Drive Plate, Component Overview

Drive Plate, Component Overview

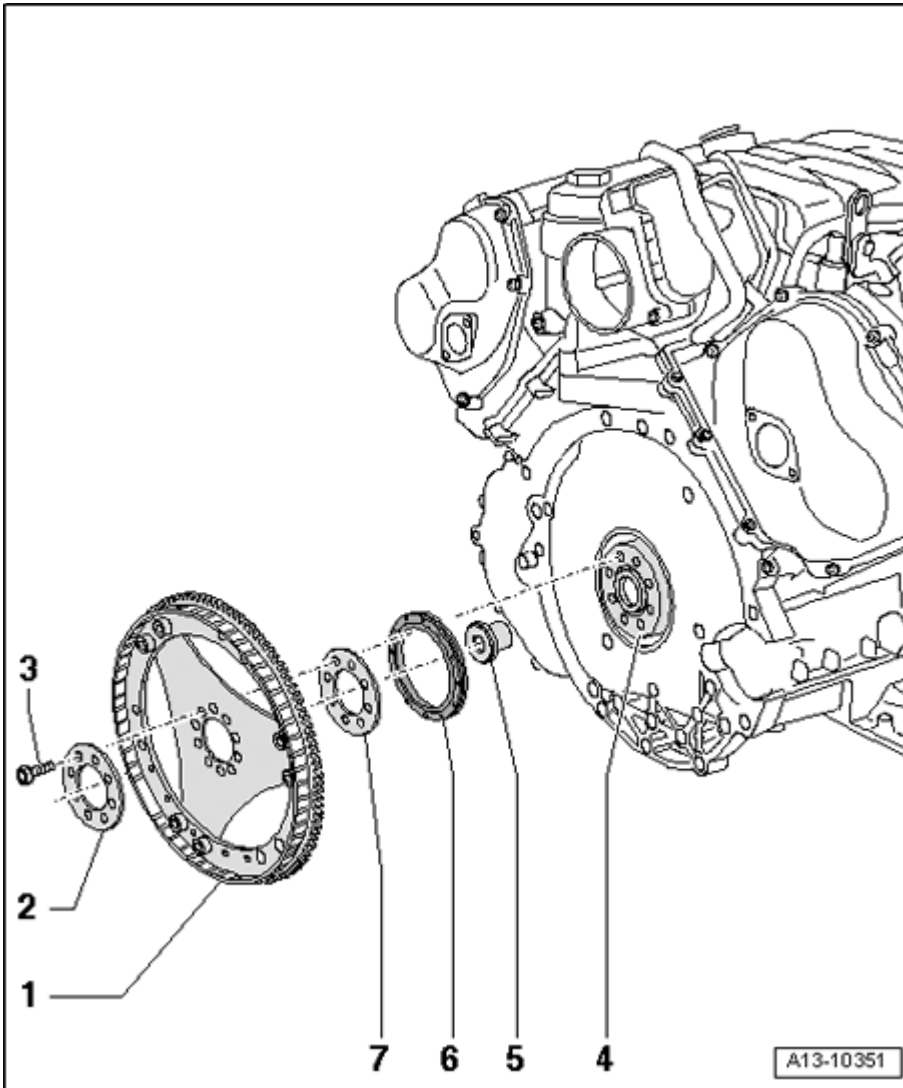


Fig. 152: Drive Plate, Component Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Drive plate

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

2 - Washer

- 3.4 mm thick
- Mark for re-installation

3 - 60 Nm plus additional 90 ($1/4$ turn)

- Replace

4 - Crankshaft

5 - Centering bushing

- For torque converter
- Check availability

6 - Crankshaft seal, timing chain side

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

7 - Spacer washer

- 1.5 mm thick
- Mark for re-installation

Drive Plate, Removing and Installing

Drive Plate, Removing and Installing

Special tools, testers and auxiliary items required

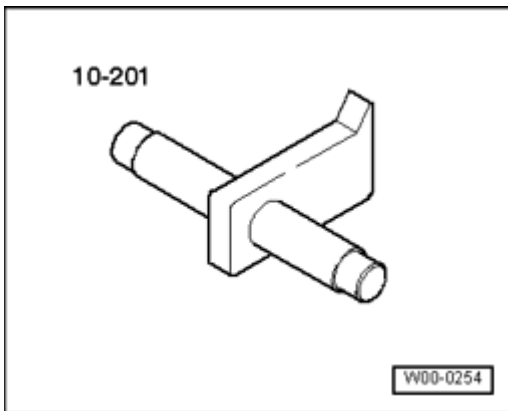


Fig. 153: Counter-Holder Tool 10 - 201

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Counter-holder tool 10 - 201

Removing

- Remove engine --> **Engine, Removing.**
- Separate engine and transmission --> **Engine and Transmission, Separating.**
- Leave engine on scissor lift table VAS 6131 A or secure engine to the engine and transmission holder --> **Engine, Securing to Engine and Transmission Holder.**

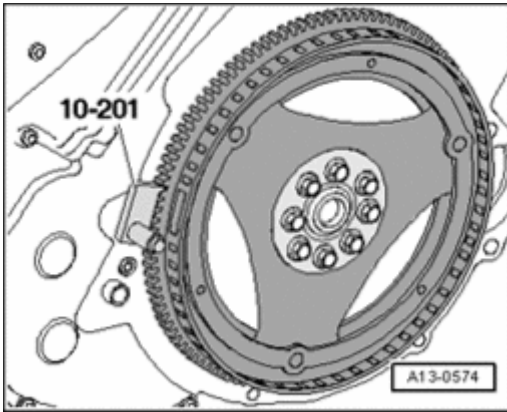


Fig. 154: Inserting Counter Hold Tool 10-201 To Loosen Bolts
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert counterhold tool 10 - 201 to loosen bolts.
- Mark installation position on drive plate to crankshaft using a felt-tip marker.
- Remove drive plate.
- Remove spacer washer behind.

Installing

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

- Install drive plate with spacer washer.
- Use new bolts when securing.
- Turn over counterhold tool 10 - 201 to tighten bolts.
- Install engine --> **Engine, Installing.**

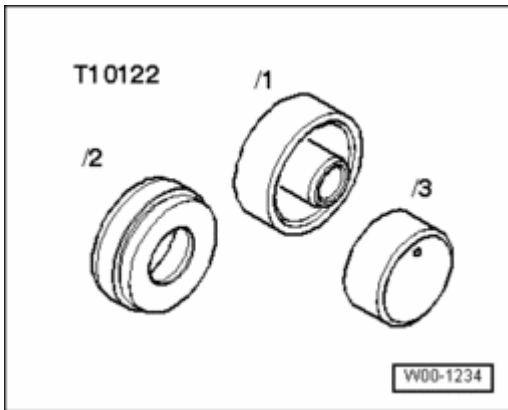
Tightening specifications

Component	Nm
Drive plate to crankshaft	60 plus 90° 1)2)
1) Replace bolts. 2) 90° corresponds to a quarter turn.	

Crankshaft Seal, Timing Chain Side, Replacing

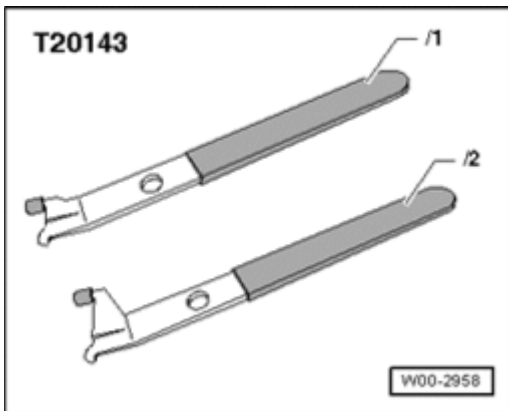
Crankshaft Seal, Timing Chain Side, Replacing

Special tools, testers and auxiliary items required

**Fig. 155: Pulling Fixture T10122**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pulling fixture T10122

**Fig. 156: Identifying Extractor Hook T20143**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Extractor hook T20143

Procedure

- Remove engine --> **Engine, Removing.**
- Separate engine and transmission --> **Engine and Transmission, Separating.**
- Leave engine on scissor lift table VAS 6131 A or secure engine to the engine and transmission holder --> **Engine, Securing to Engine and Transmission Holder.**
- Remove drive plate --> **Drive Plate, Removing and Installing.**

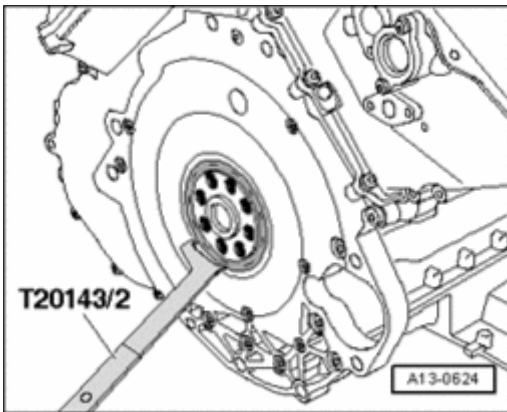


Fig. 157: Prying Out Sealing Ring Using Extractor Lever T20143/2
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pry out sealing ring using pulling hook T20143/2.
- Clean operating and sealing surfaces.

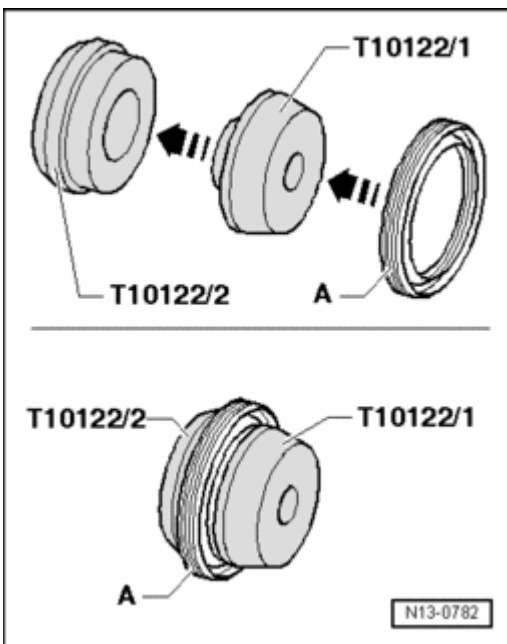


Fig. 158: Inserting Assembly Device T10122/1 Onto Pull Sleeve T10122/2 And Sliding Seal Onto Pull Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

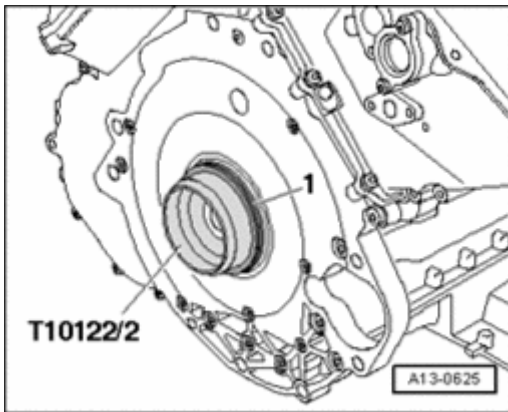


Fig. 159: Installing Pull Sleeve T10122/2 With Sealing Ring Onto Crankshaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install pull sleeve T10122/2 with seal - **1** - on crankshaft.

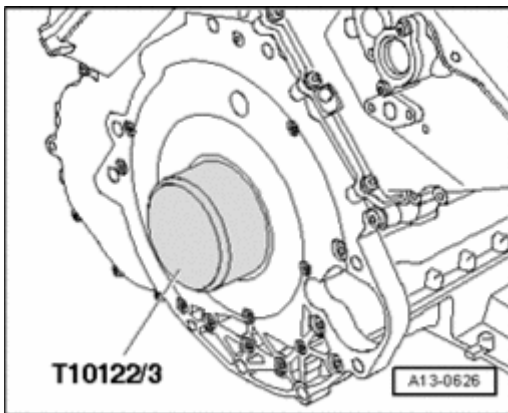


Fig. 160: Pressing Seal Evenly And Flush All Around With Thrust Piece T10122/3
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press seal evenly and flush all around with thrust piece T10122/3.

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

- Install drive plate --> **Drive Plate, Removing and Installing.**
- Install engine --> **Engine, Installing.**

Timing Chain Covers, Component Overview

Timing Chain Covers, Component Overview

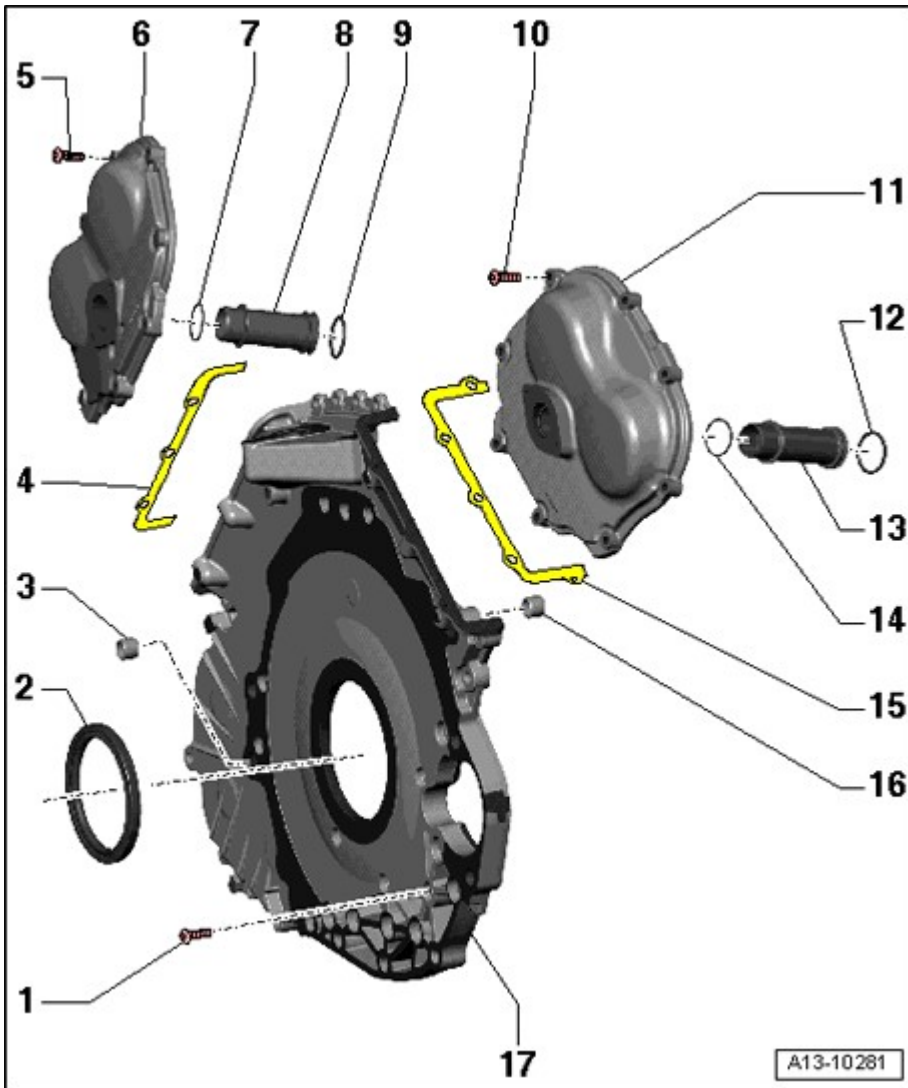


Fig. 161: Timing Chain Covers, Component Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Bolt

- M6 - 8 Nm plus an additional 90 ($1 \frac{1}{4}$ turn); replace
- M8 - 22 Nm
- Note tightening sequence --> **Fig. 185.**

2 - Crankshaft seal, timing chain side

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

3 - Alignment bushing

- 2 pieces

4 - Left cylinder head gasket

5 - 9 Nm

- Observe sequence when tightening: Left --> **Fig. 171** ; right --> **Fig. 173**.

6 - Left timing chain cover

- Removing and installing --> **Left and Right Timing Chain Covers, Removing and Installing**

7 - O-ring

- Replace

8 - Left coolant intermediate pipe

- Drive out with suitable drift

9 - O-ring

- Replace

10 - 9 Nm

- Note tightening sequence --> **Fig. 173**.

11 - Right timing chain cover

- Removing and installing --> **Left and Right Timing Chain Covers, Removing and Installing**

12 - O-ring

- Replace

13 - Right coolant intermediate pipe

- Drive out with suitable drift

14 - O-ring

- Replace

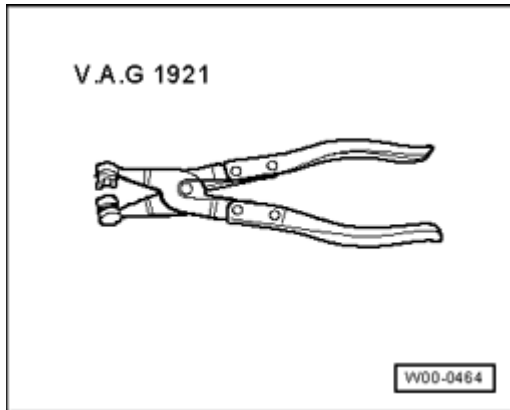
15 - Right cylinder head gasket

16 - Alignment bushing

- 2 pieces

17 - Lower timing chain cover

- Removing and installing --> **Lower Timing Chain Cover, Removing and Installing**

Left and Right Timing Chain Covers, Removing and Installing**Left and Right Timing Chain Covers, Removing and Installing****Special tools, testers and auxiliary items required****Fig. 162: Hose Clamp Pliers V.A.G 1921****Courtesy of VOLKSWAGEN UNITED STATES, INC.**

- Hose clamp pliers V.A.G 1921
- Hand drill with plastic brush attachment
- Protective glasses
- Sealant

Removing**NOTE:**

- During installation, reinstall all heat insulation sleeves and heat shields at the same locations.
 - All cable ties opened or cut during engine removal must be reinstalled at the same locations during installation.
-
- Remove engine --> **Engine, Removing**.
 - Leave engine with transmission installed on the scissor lift platform VAS 6131 A.

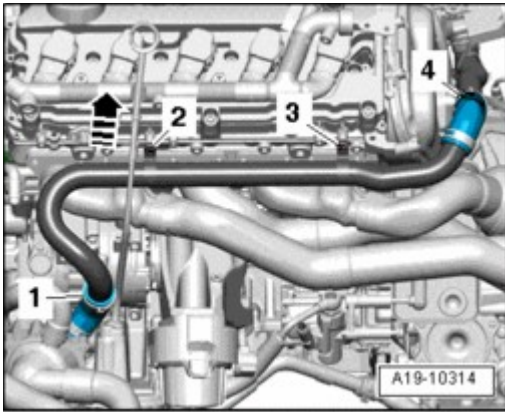


Fig. 163: Removing Bolts, Oil Dipstick Guide Tube Upward & Loosening Hose Clamps And Removing Left Coolant Pipe From Coolant Hoses

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - 2 - and - 3 -.
- Pull oil dipstick guide tube upward and off - **arrow** -.
- Loosen hose clamps - 1 - and - 4 - and remove left coolant pipe from coolant hoses.

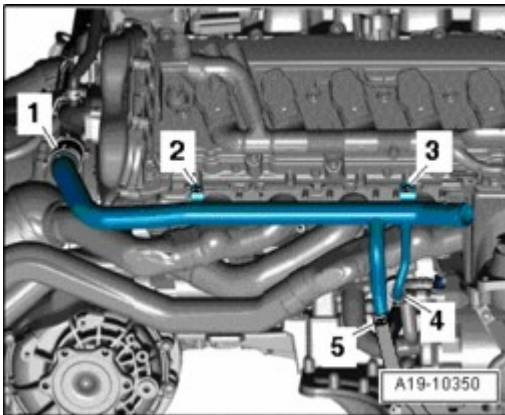


Fig. 164: Bolts, Hose Clamps, Right Coolant Pipe From Coolant Hoses & Coolant Hoses

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - 2 - and - 3 -.
- Loosen hose clamps - 1, 4, 5 - and remove right coolant pipe from coolant hoses.

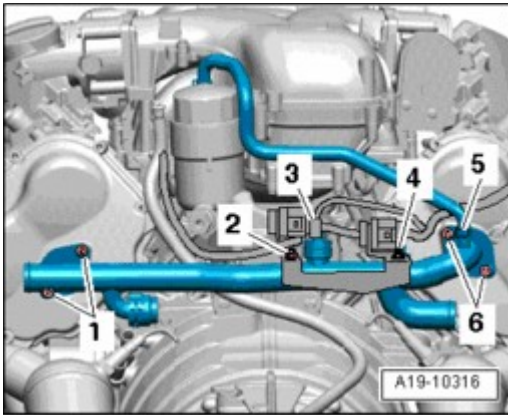


Fig. 165: Identifying Nuts, Bolts, Electrical Connector On Engine Coolant Temperature (ECT) Sensor G62 & Coolant Hose

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - 2 - and - 4 - and remove connector bracket from rear coolant pipe.
- Free up engine wiring harness on rear coolant pipe.
- Disconnect electrical connector - 3 - on Engine Coolant Temperature (ECT) Sensor G62.
- Disconnect coolant hose - 5 - from rear coolant pipe.
- Remove screws - 1 - and - 6 - and remove rear coolant pipe.

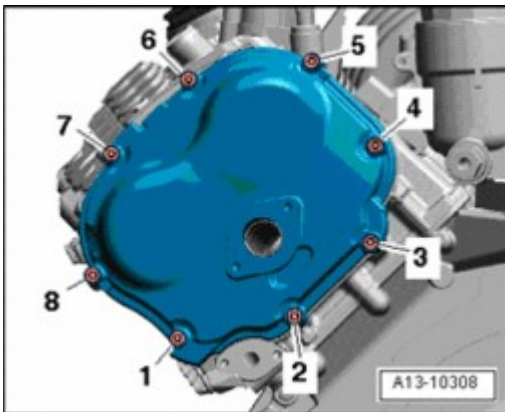


Fig. 166: Identifying Left Timing Chain Cover And Tighten/Removing Bolts Sequence

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

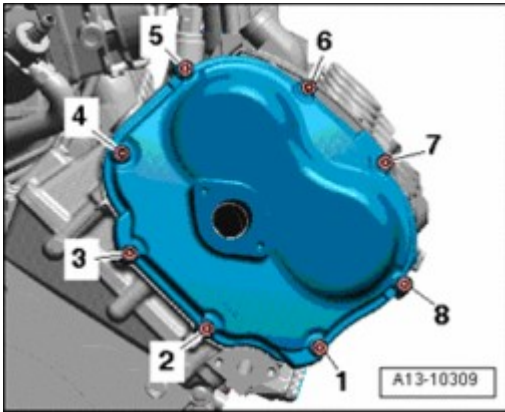


Fig. 167: Identifying Right Timing Chain Cover And Tighten/Removing Bolts Sequence
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Installing

NOTE:

- Replace O-rings.
- Secure all hose connections with hose clamps appropriate for the model .
- During installation, reinstall all heat insulation sleeves and heat shields at the same locations.
- During installation, all cable ties must be re-installed at the same location.

CAUTION: Wear safety glasses.

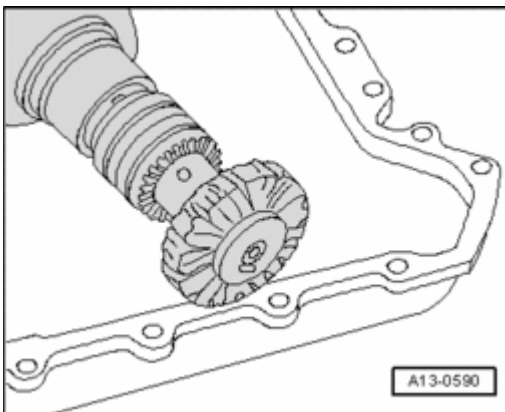


Fig. 168: Removing Sealant Residue On Timing Chain Covers And Cylinder Head With Rotating Plastic Brush

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

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

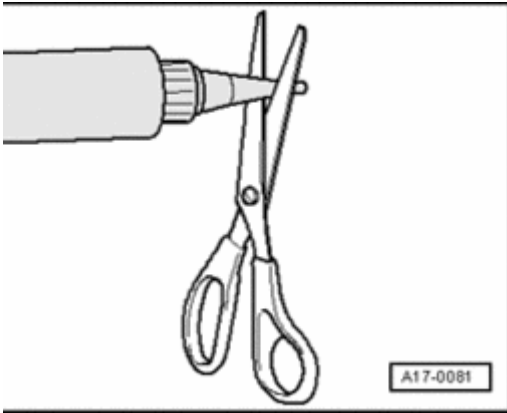


Fig. 169: Cutting Tube Nozzle At Front Marking
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

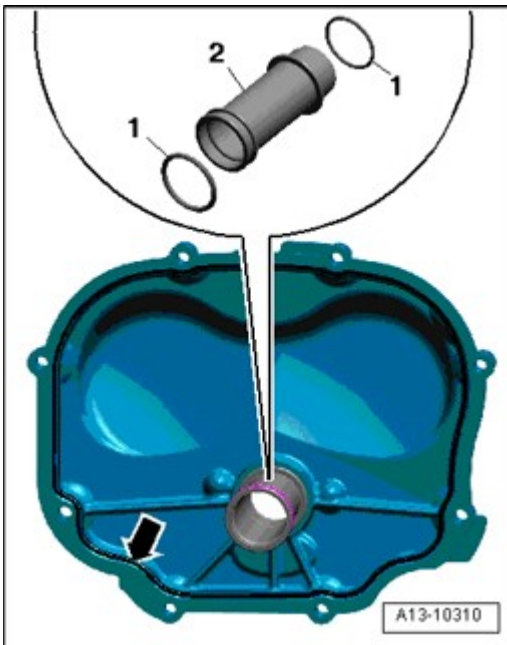


Fig. 170: Identifying Timing Chain Cover, Coolant Intermediate Pipe, O-Rings, And Sealant Bead
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive left coolant intermediate pipe - 2 - out of left timing chain cover with a suitable drift.
- Replace O-rings - 1 - at coolant intermediate pipe - 2 -.
- Insert coolant intermediate pipe in left timing chain cover.

- Apply sealant bead - **arrow** - on clean sealing surfaces of left timing chain cover, as shown in illustration.
- Thickness of sealant bead: 2.5 mm.

NOTE:

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

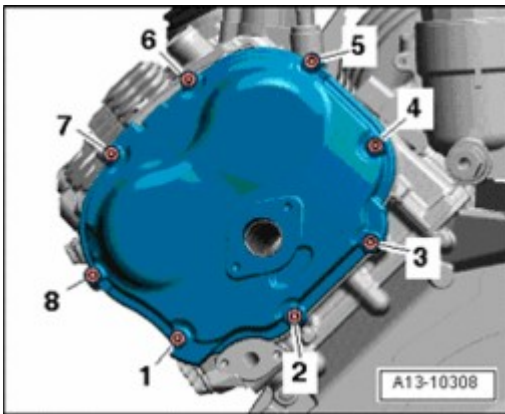


Fig. 171: Identifying Left Timing Chain Cover And Tighten/Removing Bolts Sequence
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

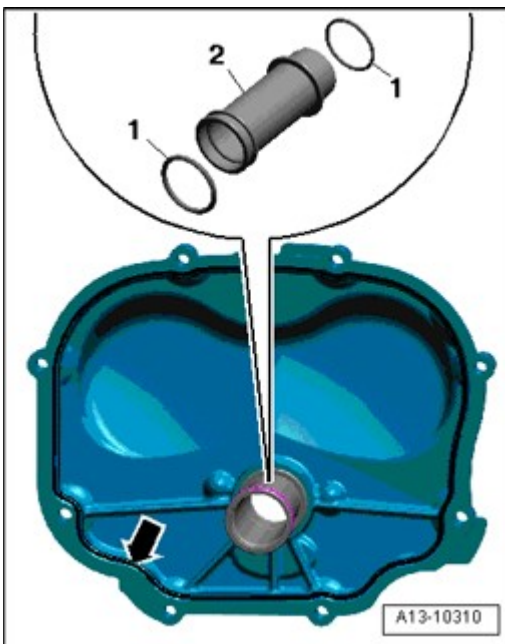


Fig. 172: Identifying Timing Chain Cover, Coolant Intermediate Pipe, O-Rings, And Sealant Bead
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive right coolant intermediate pipe - **2** - out of right timing chain cover with a suitable drift.
- Replace O-rings - **1** - at coolant intermediate pipe - **2** -.

- Insert coolant intermediate pipe in right timing chain cover.
- Apply sealant bead - **arrows** - on clean sealing surfaces of right timing chain cover, as shown in illustration.
- Thickness of sealant bead: 2.5 mm.

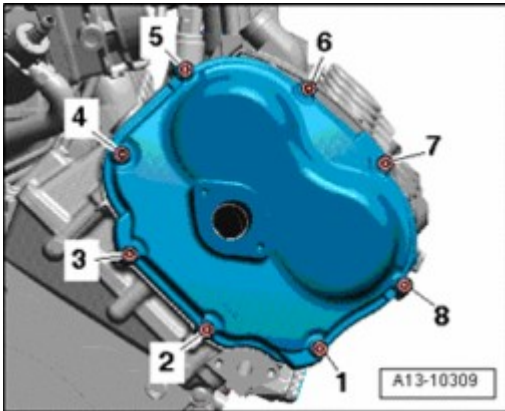


Fig. 173: Identifying Right Timing Chain Cover And Tighten/Removing Bolts Sequence
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

- Install rear coolant pipe --> **Rear Coolant Pipe, Removing and Installing.**
- Install left coolant pipe --> **Left Coolant Pipe, Removing and Installing.**
- Install right coolant pipe --> **Right Coolant Pipe, Removing and Installing.**
- Install engine --> **Engine, Installing.**

Tightening specifications

Component	Nm
Left and right timing chain covers on engine	9

Lower Timing Chain Cover, Removing and Installing

Lower Timing Chain Cover, Removing and Installing

Special tools, testers and auxiliary items required

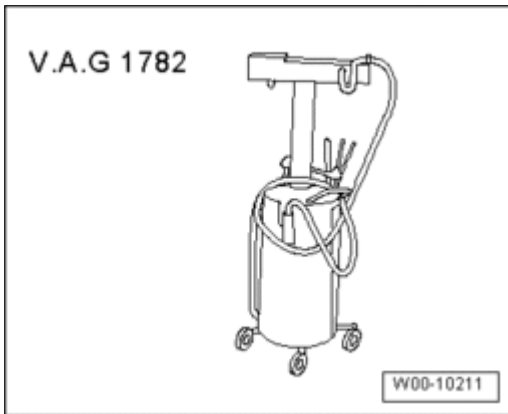


Fig. 174: Old Oil Collecting And Extracting Device V.A.G 1782
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Removing

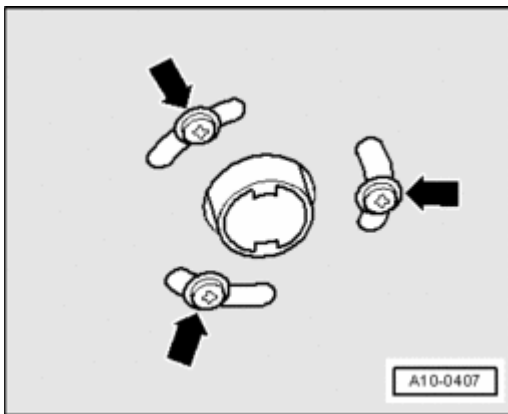


Fig. 175: Identifying Exhaust Pipe Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

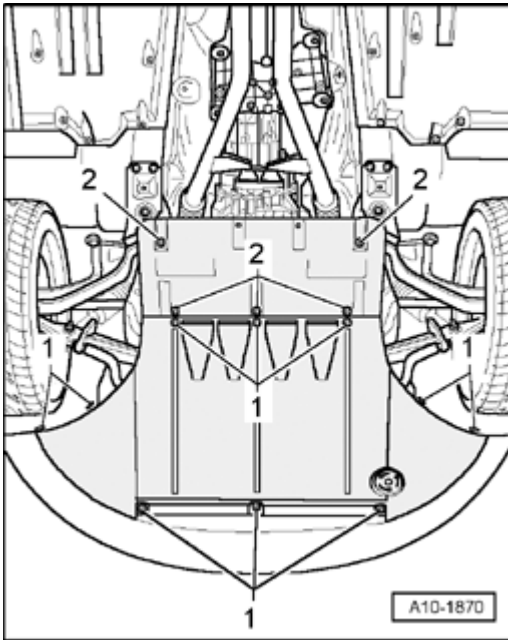


Fig. 176: Noise Insulation Quick-Release Fasteners
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen quick-release fasteners - 1 - and - 2 - and remove noise insulation.
- Place old oil collecting and extracting device V.A.G 1782 under engine and drain engine oil.
- Remove engine --> **Engine, Removing.**
- Separate engine and transmission --> **Engine and Transmission, Separating.**
- Leave engine on scissor lift table VAS 6131 A or secure engine to the engine and transmission holder --> **Engine, Securing to Engine and Transmission Holder.**
- Remove drive plate --> **Drive Plate, Removing and Installing.**
- Remove left and right timing chain covers --> **Left and Right Timing Chain Covers, Removing and Installing.**
- Remove intake manifold --> **24 - MULTIPOINT FUEL INJECTION (MPI) .**
- Remove oil filter housing --> **Oil Filter Housing, Removing and Installing.**

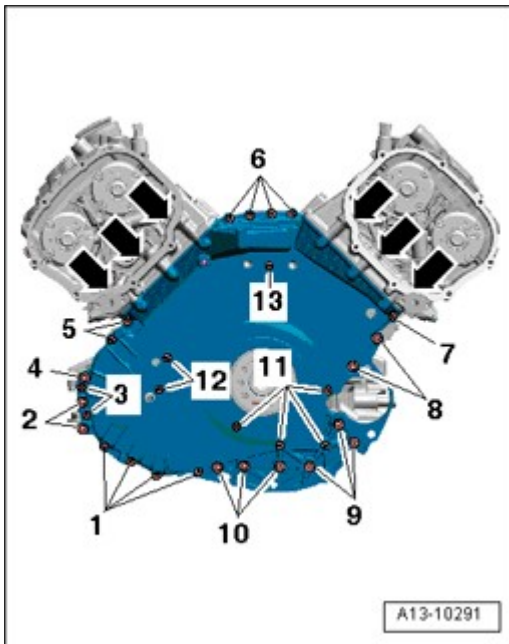


Fig. 177: Removing/Installing Bolts And Lower Timing Chain Cover
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Remove screws - **1 to 13** - and remove lower timing chain cover.
- Press crankshaft seal timing chain side out of lower timing chain cover.

Installing

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

- Pull alignment bushing out of top right of cylinder block.

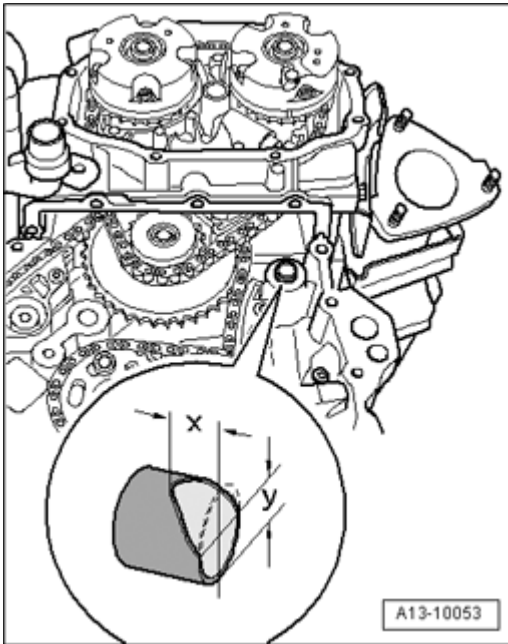


Fig. 178: Chamfering Alignment Bushing With A File
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

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

CAUTION: Wear safety glasses.

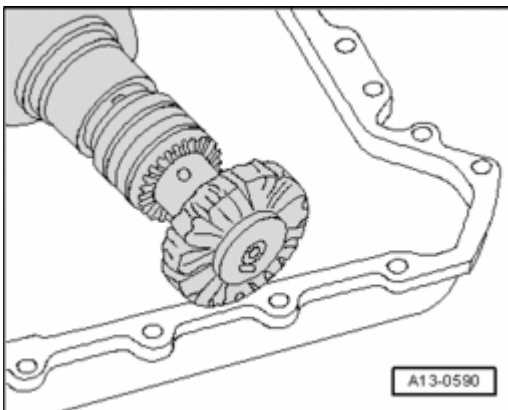


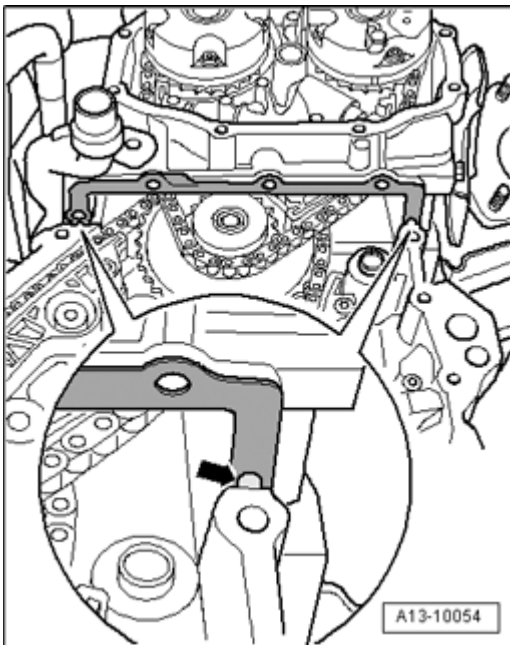
Fig. 179: Removing Sealant Residue On Timing Chain Covers And Cylinder Head With Rotating Plastic Brush

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

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

**Fig. 180: Cleaning Old Sealant From Holes In Cylinder Head Gaskets**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

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

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

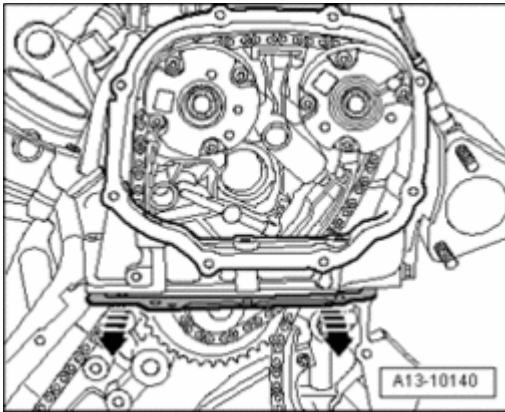


Fig. 181: Bending Ends Of Cylinder Head Gaskets Very Slightly Downward Until Upper Sealing Surface Of Gasket And Cylinder Head Can Be Cleaned

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

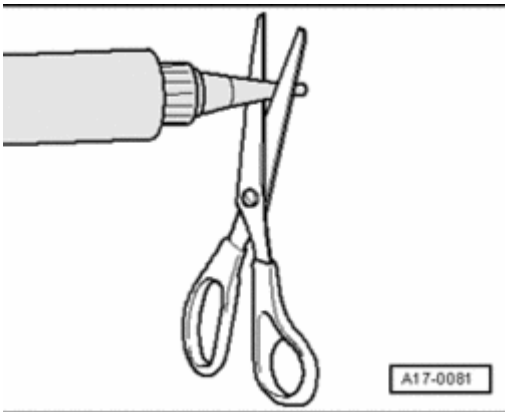


Fig. 182: Cutting Tube Nozzle At Front Marking

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

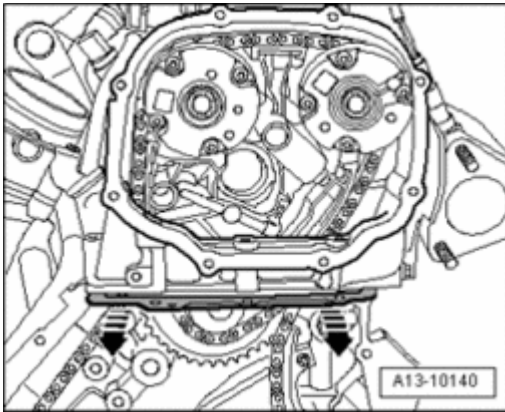


Fig. 183: Bending Ends Of Cylinder Head Gaskets Very Slightly Downward Until Upper Sealing Surface Of Gasket And Cylinder Head Can Be Cleaned

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

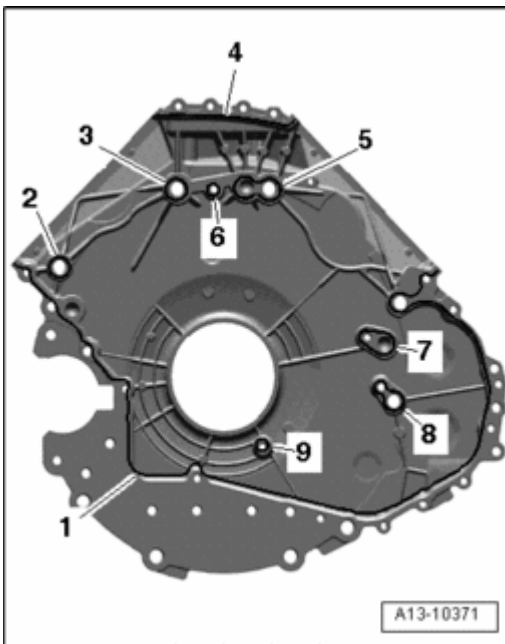


Fig. 184: Applying Sealant Beads On Clean Sealing Surfaces Of Lower Timing Chain Cover

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Apply sealant beads - **1 to 9** - on clean sealing surfaces of lower timing chain cover, as shown in illustration.
- Thickness of sealant beads: 2.5 mm.

NOTE:

- **Timing chain cover must be installed within 5 minutes of applying sealant.**

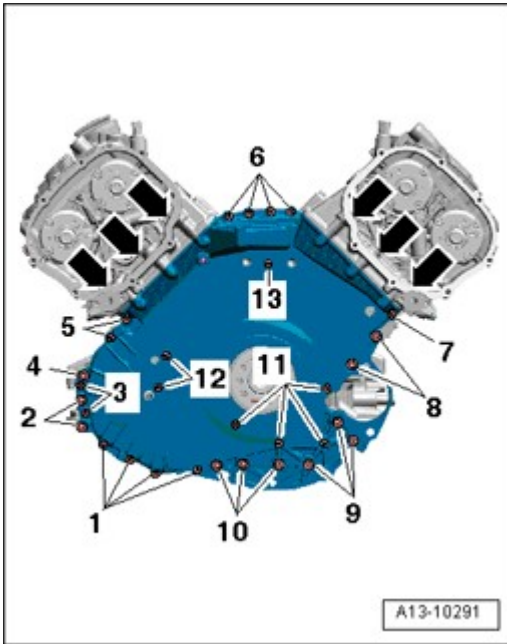


Fig. 185: Removing/Installing Bolts And Lower Timing Chain Cover
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

CAUTION: When installing, make sure that the cylinder head gaskets do not become damaged. A damaged cylinder head seal must be replaced.

- Tighten bolts in 6 stages as follows:
 - Tighten bolts - **arrows** - to 5 Nm using a torque wrench.
 - Tighten bolts - **1 to 13** - in a diagonal sequence to 8 Nm using a torque wrench.
 - Tighten bolts - **arrows** - to 8 Nm using a torque wrench.
- Tighten bolts - **2, 4, 8, 9, 10** - in a diagonal sequence to 22 Nm using a torque wrench.
- Tighten bolts - **1, 3, 5, 6, 7, 11, 12, 13** - an additional 90 ($1/4$ turn) in a diagonal sequence using a rigid wrench.
- Tighten bolts - **arrows** - 90 ($1/4$ additional turn) using a rigid wrench.

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

- Install crankshaft seal, timing chain side --> **Crankshaft Seal, Timing Chain Side, Replacing.**
- Install oil filter housing --> **Oil Filter Housing, Removing and Installing.**
- Install intake manifold --> **24 - MULTIPOINT FUEL INJECTION (MPI) .**
- Install left and right timing chain covers --> *Installing* under **Left and Right Timing Chain Covers,**

2009 Audi S8 Quattro

ENGINE 5.2 Liter 10-Cyl. 4V Engine Mechanical, Engine Code(s): BSM - S8

Removing and Installing .

- Install drive plate --> **Drive Plate, Removing and Installing.**
- Install engine --> **Engine, Installing.**
- Add engine oil and check oil level --> **Oil Level, Checking.**

Tightening Specifications

Component			Nm
Lower timing chain cover to	Cylinder Head		8 plus 90° 1)2)
Cylinder block	M6	8 plus 90° 1)2)	22
		M8	
2) Replace bolts. 3) 90° corresponds to a quarter turn.			

Camshaft Timing Chain, Component Overview

Camshaft Timing Chain, Component Overview

Left camshaft timing chain

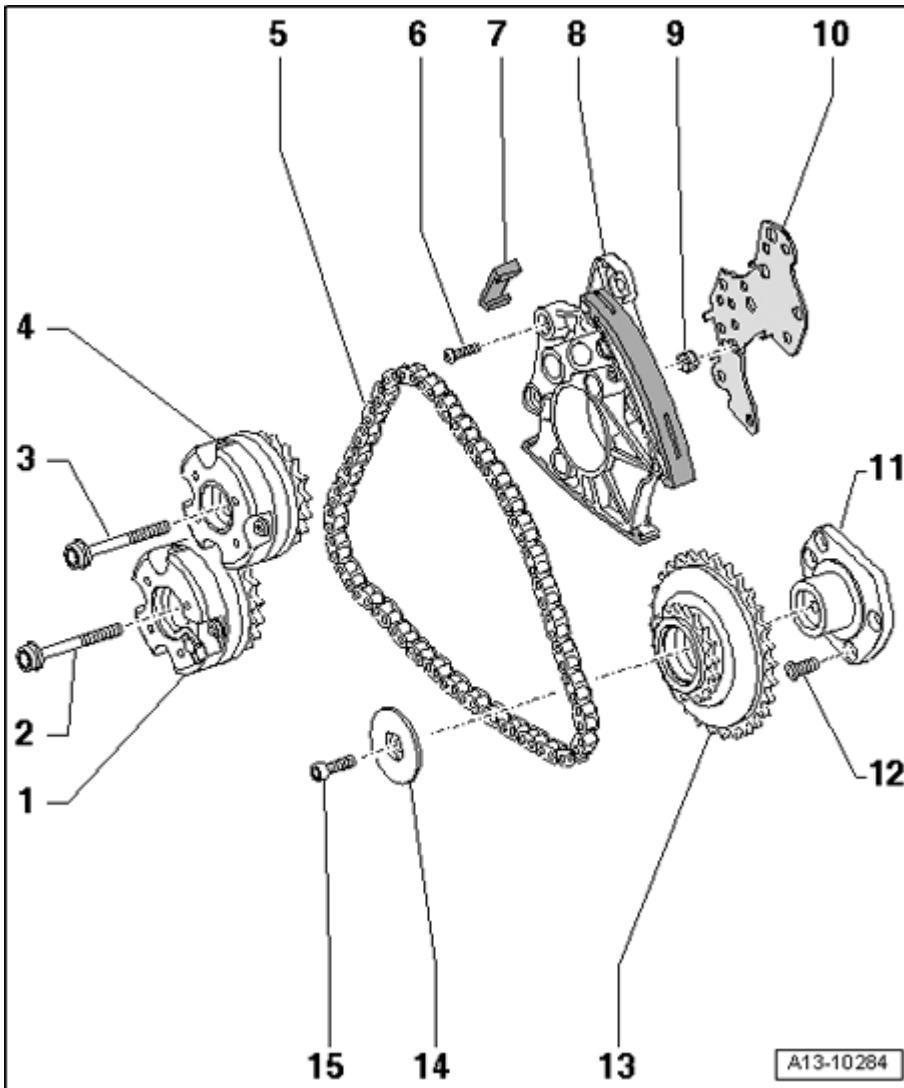


Fig. 186: Camshaft Timing Chain, Assembly Overview - Left Camshaft Timing Chain
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Camshaft adjuster for exhaust camshaft

- Identification "Exhaust"
- Removing and installing --> **Camshaft Timing Chain, Removing and Installing**

2 - Camshaft bolt

- Replace
- Initial tightening specifications: 60 Nm
- Final tightening specifications: 80 Nm plus an additional 90 ($1/4$ turn)

3 - Camshaft bolt

- Replace
- Initial tightening specifications: 60 Nm
- Final tightening specifications: 80 Nm plus an additional 90 ($1/4$ turn)

4 - Camshaft adjuster for intake camshaft

- Identification "Intake"
- Removing and installing --> **Camshaft Timing Chain, Removing and Installing**

5 - Left camshaft timing chain

- Before removing, mark direction of rotation with paint. Reversing the rotation direction of a used chain can destroy it
- Removing and installing --> **Camshaft Timing Chain, Removing and Installing**

6 - 5 Nm plus an additional 90 ($1/4$ turn)

- Replace

7 - Guide piece

8 - Chain tensioner for left camshaft timing chain

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

9 - Oil strainer

- Set into chain tensioner
- Observe locating tabs on circumference

10 - Gasket

- Replace
- Clipped onto chain tensioner

11 - Mounting bracket for drive sprocket

12 - 9 Nm

13 - Drive sprocket for left camshaft timing chain

14 - Thrust washer for drive sprocket

15 - 22 Nm

Right camshaft timing chain

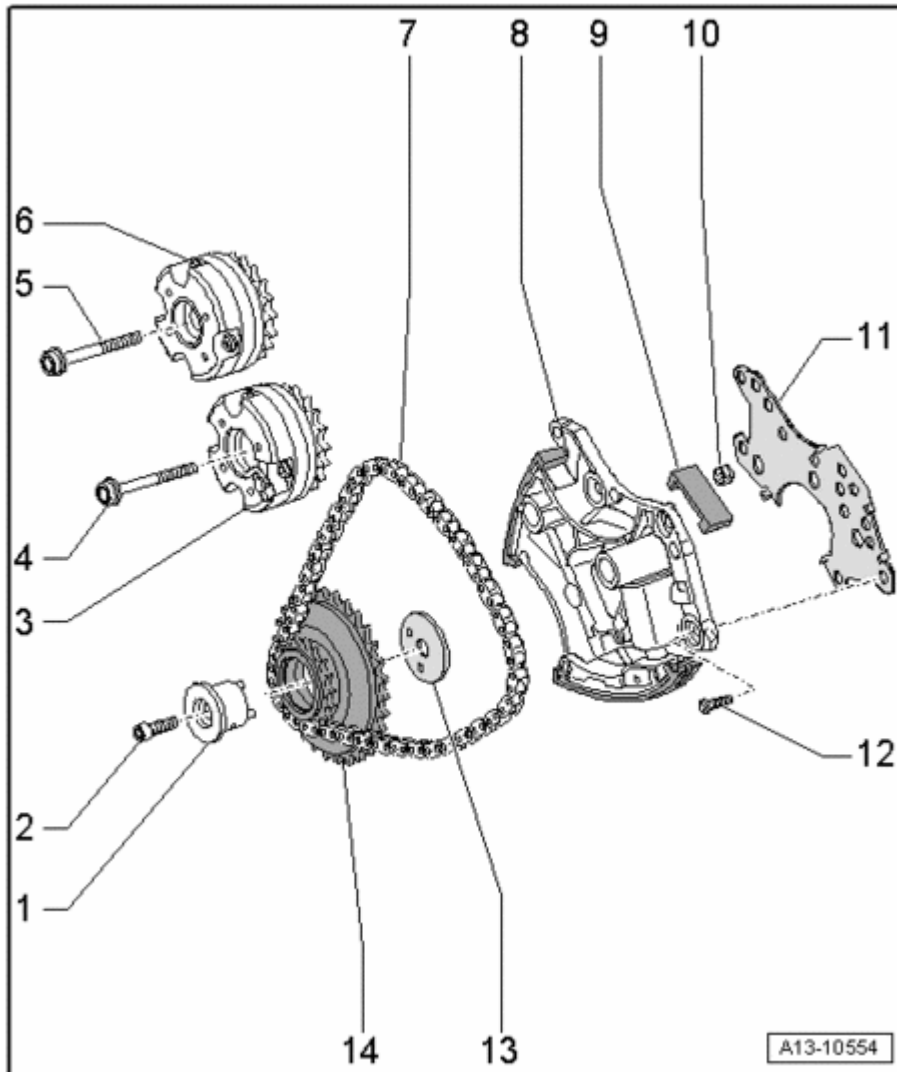


Fig. 187: Camshaft Timing Chain, Component Overview - Right Camshaft Timing Chain
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Pivot pin for drive sprocket

- For right camshaft timing chain
- Asymmetrical version
- Installed location --> Location of mounting pins for camshaft timing chain drive sprocket

2 - 42 Nm

3 - Camshaft adjuster for exhaust camshaft

- Identification "Exhaust"

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

4 - Camshaft bolt

- Replace
- Initial tightening specifications: 60 Nm
- Final tightening specifications: 80 Nm plus an additional 90 ($\frac{1}{4}$ turn)

5 - Camshaft bolt

- Replace
- Initial tightening specifications: 60 Nm
- Final tightening specifications: 80 Nm plus an additional 90 ($\frac{1}{4}$ turn)

6 - Camshaft adjuster for intake camshaft

- Identification "Intake"
- Removing and installing --> **Camshaft Timing Chain, Removing and Installing**

7 - Right camshaft timing chain

- Before removing, mark direction of rotation with paint. Reversing rotation direction of a used chain can destroy it
- Removing and installing --> **Camshaft Timing Chain, Removing and Installing**

8 - Chain tensioner for right camshaft timing chain

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

9 - Guide piece**10 - Oil strainer**

- Set into chain tensioner
- Installation position: Observe locating tabs on circumference

11 - Gasket

- Replace
- Clipped onto the chain tensioner

12 - 5 Nm plus an additional 90 ($\frac{1}{4}$ turn)

- Replace

13 - Thrust washer for drive sprocket

14 - Drive sprocket for right camshaft timing chain

Location of mounting pins for camshaft timing chain drive sprocket

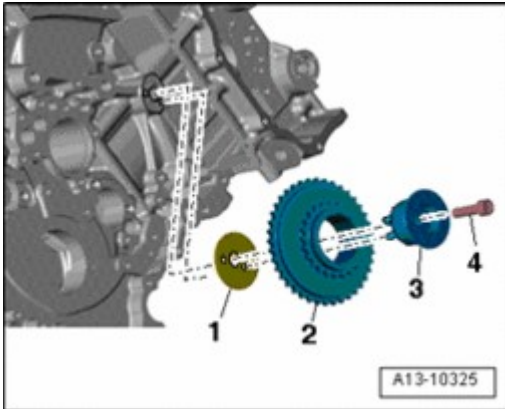


Fig. 188: Location Of Mounting Pins For Camshaft Timing Chain Drive Sprocket
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

2 - Drive sprocket for right camshaft timing chain

4 - Bolt - 42 Nm

Camshaft Timing Chain, Removing from Camshaft

Camshaft Timing Chain, Removing from Camshaft

Special tools, testers and auxiliary items required

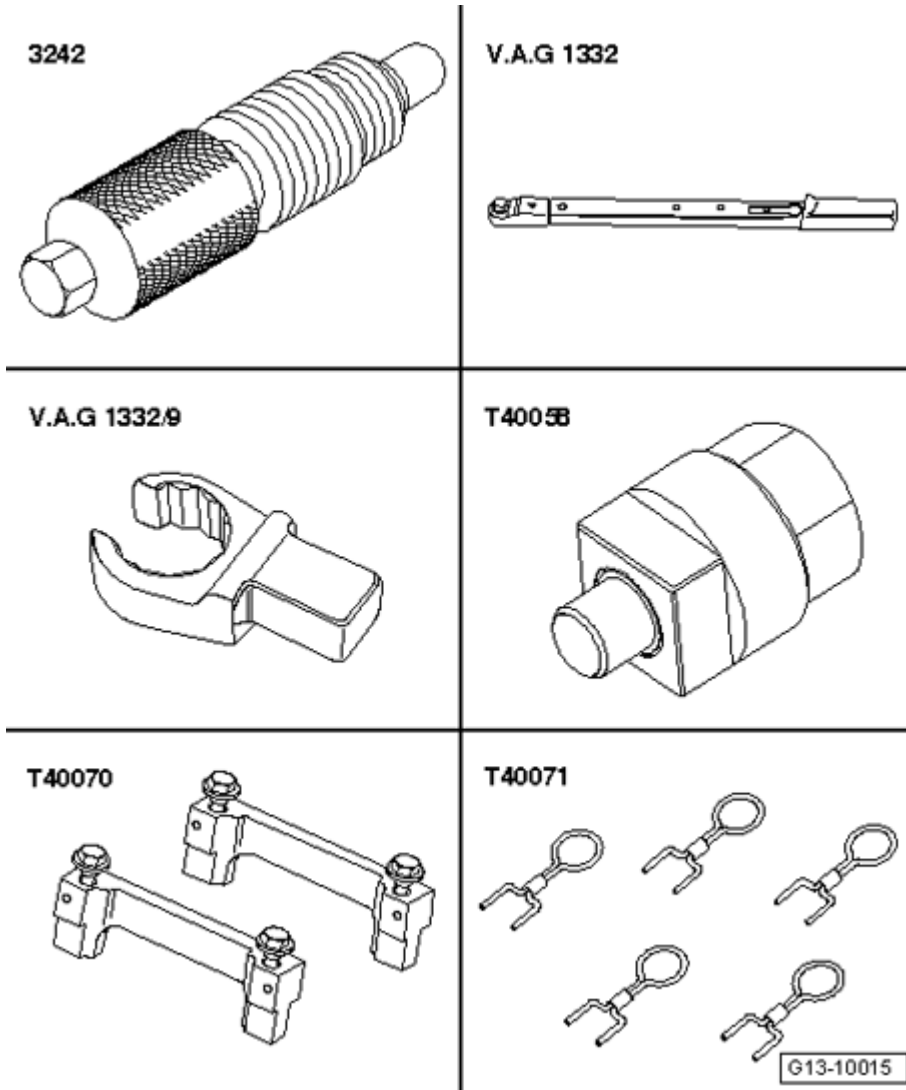


Fig. 189: Identifying Special Tools - Camshaft Timing Chain, Removing From Camshaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Locking pin 3242
- Torque Wrench V.A.G 1332
- Assembly tool V.A.G 1332/9
- Adapter T40058
- Camshaft locator T40070 (qty. 2)
- Securing pin T40071 (qty. 2)

Special tools, testers and auxiliary items required

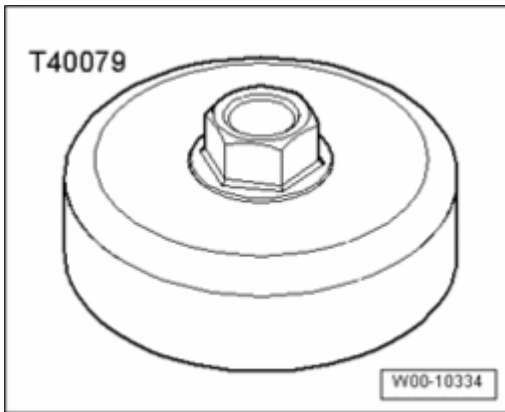


Fig. 190: Wrench T40079

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Wrench T40079

Removing

NOTE:

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

- Remove engine --> **Engine, Removing.**
- Leave engine with transmission installed on the scissor lift platform VAS 6131 A.
- Remove cylinder head cover: Left --> **Left Cylinder Head Cover, Removing and Installing** , right --> **Right Cylinder Head Cover, Removing and Installing.**
- Remove left and right timing chain covers --> **Left and Right Timing Chain Covers, Removing and Installing.**

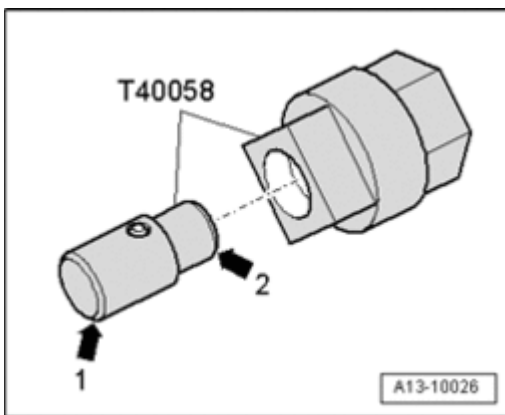


Fig. 191: Inserting Guide Pin Of Adapter T40058 So That Large Diameter Points To Engine

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert Socket T40058 adapter so that small diameter - **arrow 2** - points to engine. Large diameter - **arrow 1** - points to socket.

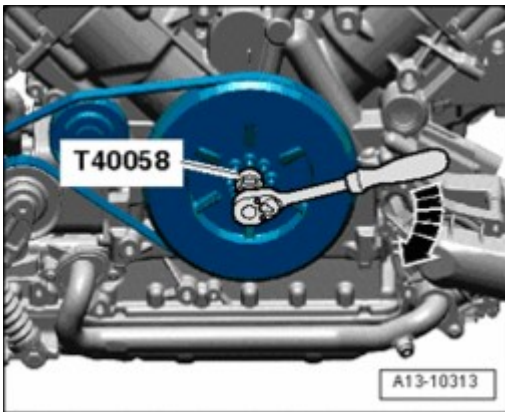


Fig. 192: Using Socket T40058 To Rotate Crankshaft To TDC
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

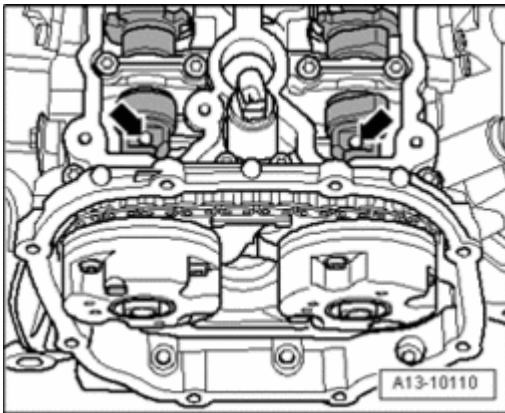


Fig. 193: Identifying Threaded Holes In Camshafts Must Face Upward
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

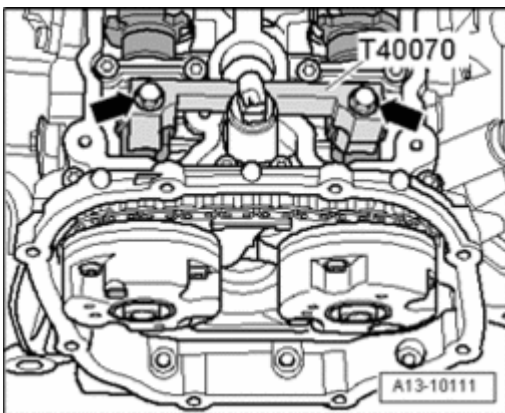


Fig. 194: Removing/Installing Camshaft Locators T40070 On Both Cylinder Heads
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Mount camshaft locating tool T40070 on both cylinder heads and tighten bolts - **arrows** - to 25 Nm.
- The camshaft locating tool T40070 is correctly positioned when the holes for the cylinder head bolts remain free.

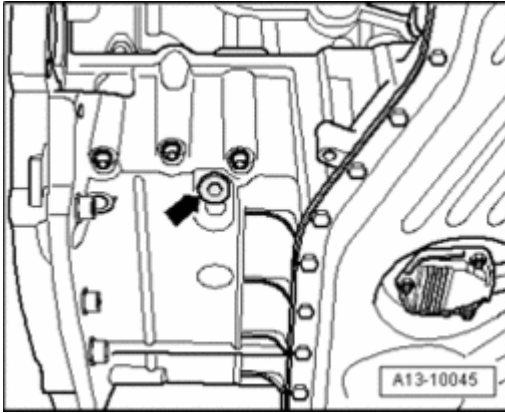


Fig. 195: Identifying Locking Bolt Of Upper Part Of Oil Pan
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove locking bolt - **arrow** - from upper part of oil pan.

CAUTION: Do not turn the crankshaft - 1 - while touching the "TDC" hole with your finger. You could be injured.

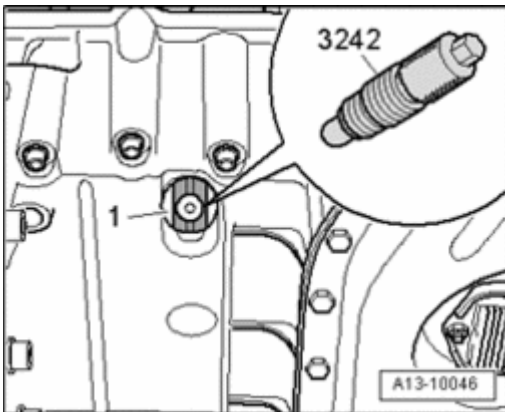


Fig. 196: Installing/Removing Crankshaft Holder 3242 In Bore
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install crankshaft holder 3242 in the hole and tighten to 20 Nm. If necessary, rotate the crankshaft back and forth slightly to completely center the holder.

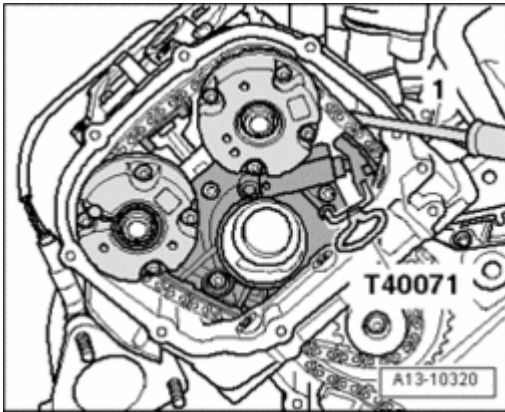


Fig. 197: Pressing Left Camshaft Timing Chain Tensioner Glide Track Inward With Screwdriver As Far As Stop And Securing Chain Tensioner With Locking Pin T40071

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

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

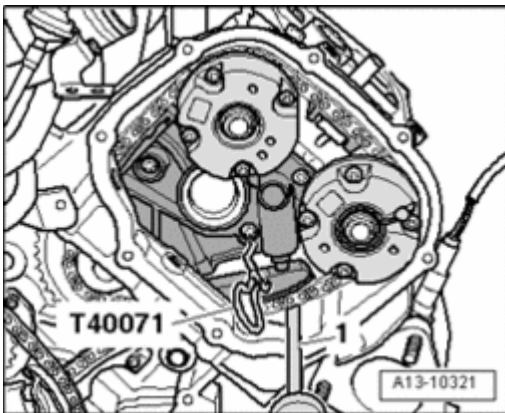


Fig. 198: Pressing Right Camshaft Timing Chain Tensioner Glide Track Inward With Screwdriver As Far As Stop And Securing Chain Tensioner With Locking Pin T40071

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

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

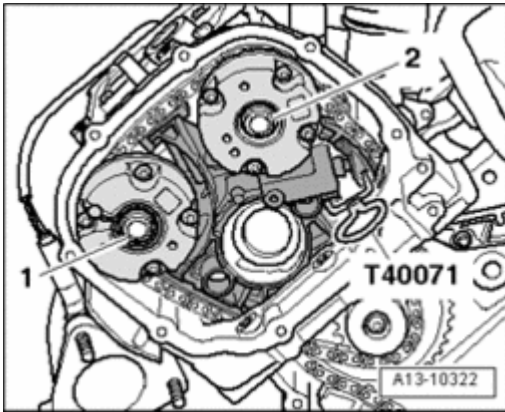


Fig. 199: Identifying Bolts On Left Cylinder Head And Removing Both Camshaft Adjusters
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- For re-installation, identify installation location of camshaft adjuster with paint.
- Remove bolts - 1 - and - 2 - on left cylinder head and remove both camshaft adjusters.

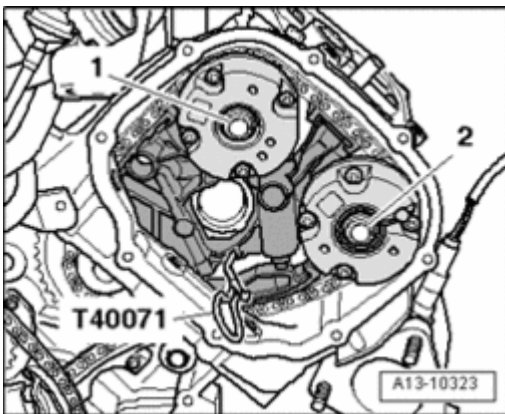


Fig. 200: Identifying Bolts On Right Cylinder Head And Removing Both Camshaft Adjusters
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- For re-installation, identify installation location of camshaft adjuster with paint.
- Remove bolts - 1 - and - 2 - on right cylinder head and remove both camshaft adjusters.

Installing

NOTE:

- Replace bolts which have been tightened to torque.

CAUTION: When turning camshaft crankshaft must not be at "TDC" for any cylinder.
Valves and/or pistons may be damaged.

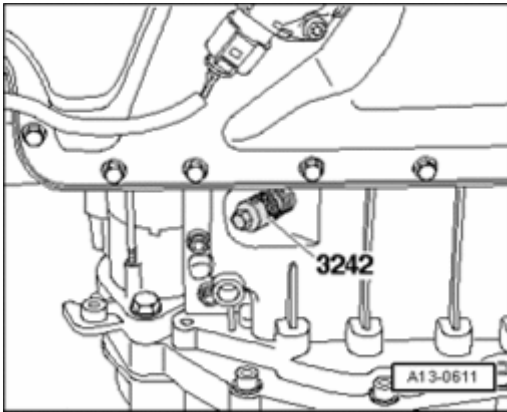


Fig. 201: Securing Crankshaft In TDC Position Using Crankshaft Holder 3242
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive chain for timing mechanism installed --> **Timing Mechanism Drive Chain, Removing and Installing.**
- Secure crankshaft in "TDC" position using Crankshaft Holder 3242.

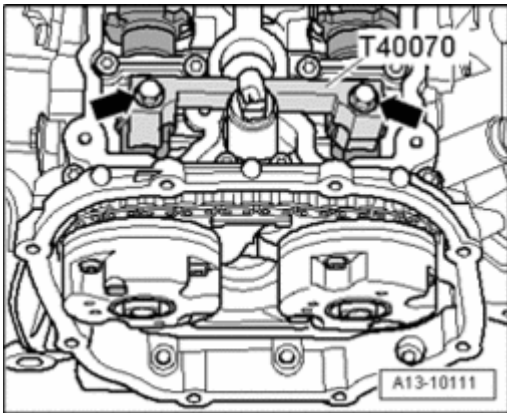


Fig. 202: Removing/Installing Camshaft Locators T40070 On Both Cylinder Heads
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Camshaft Clamp T40070 mounted on both cylinder heads and fastened to 25 Nm - **arrows** -.

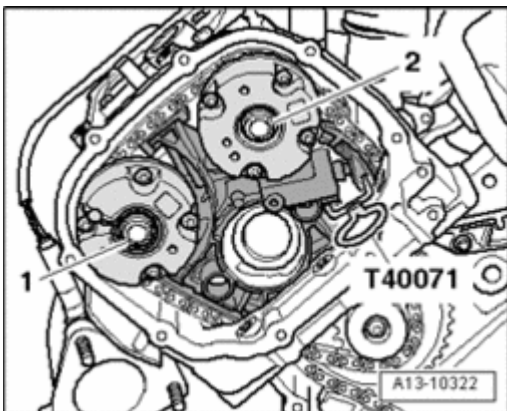


Fig. 203: Identifying Bolts On Left Cylinder Head And Removing Both Camshaft Adjusters
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- **Reinstall left camshaft adjuster according to the mark applied during removal.**
- Replace camshaft bolts.
- Place camshaft timing chain onto drive sprocket and onto camshaft adjusters and loosely thread in bolts - 1 - and - 2 -.
- Both camshaft adjusters must be able to still be rotated on camshaft and must not tip.
- Remove Locking Pin T40071.

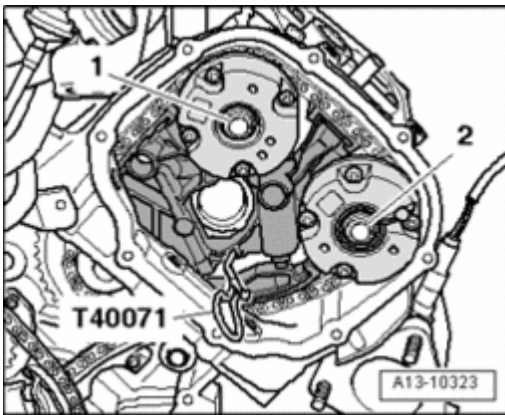


Fig. 204: Identifying Bolts On Right Cylinder Head And Removing Both Camshaft Adjusters
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- **Reinstall right camshaft adjuster according to the mark applied during removal.**
- Replace camshaft bolts.
- Place camshaft timing chain onto drive sprocket and onto camshaft adjusters and loosely thread in the bolts - 1 - and - 2 -.
- Both camshaft adjusters must be able to still be rotated on camshaft and must not tip.
- Remove Locking Pin T40071.

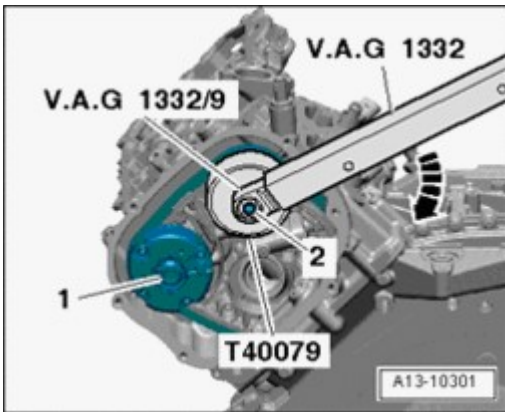


Fig. 205: Positioning Adapter T40079 On Intake Camshaft Adjuster At Left Cylinder Head
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- A 2nd technician is needed for further work.

- Position Key T40079 on intake camshaft adjuster at left cylinder head.
- Position Torque Wrench V.A.G 1332 with Open Ring Spanner Insert V.A.G 1332/9 on Key T40079.
- Pre-tension camshaft adjuster in direction of - **arrow** - to 40 Nm and maintain tension.
- Tighten bolts - **1** - on exhaust camshaft simultaneously to initial torque.
- Tightening Specifications 60 Nm.
- Continue holding pretension on exhaust camshaft and pre-torque bolt - **2** - on exhaust camshaft.
- Tightening Specifications: 60 Nm.

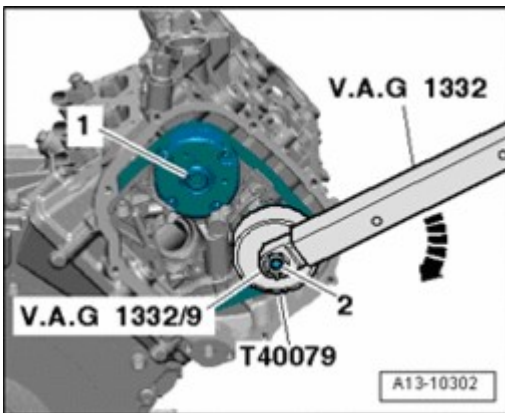


Fig. 206: Positioning Adapter T40079 On Exhaust Camshaft Adjuster At Right Cylinder Head
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position Key T40079 on exhaust camshaft adjuster at right cylinder head.
- Position Torque Wrench V.A.G 1332 with Open Ring Spanner Insert V.A.G 1332/9 on Key T40079.
- Pre-tension camshaft adjuster in direction of - **arrow** - to 40 Nm and maintain the tension.

- Tighten bolts - **1** - on intake camshaft simultaneously to initial torque.
- Tightening Specifications: 60 Nm.
- Continue holding pretension on exhaust camshaft and pre-torque bolt - **2** - on exhaust camshaft.
- Tightening Specifications: 60 Nm.

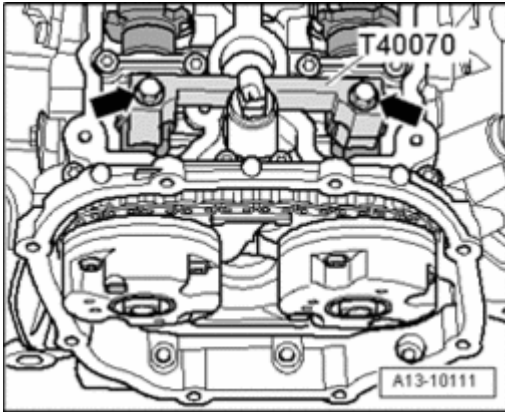


Fig. 207: Removing/Installing Camshaft Locators T40070 On Both Cylinder Heads
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove Key T40079.
- Remove Camshaft Clamps T40070 on both cylinder heads - **arrows** -.

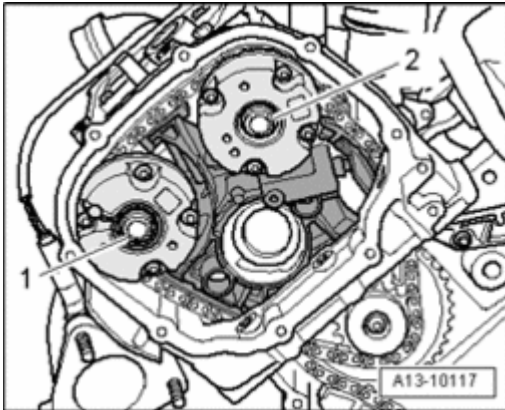


Fig. 208: Tightening Camshaft Bolts On Left Cylinder Head
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- First tighten camshaft bolt - **1** - and then camshaft bolt - **2** - on left cylinder head to final torque.
- Tightening Specifications: 80 Nm plus an additional 90 ($\frac{1}{4}$ turn).

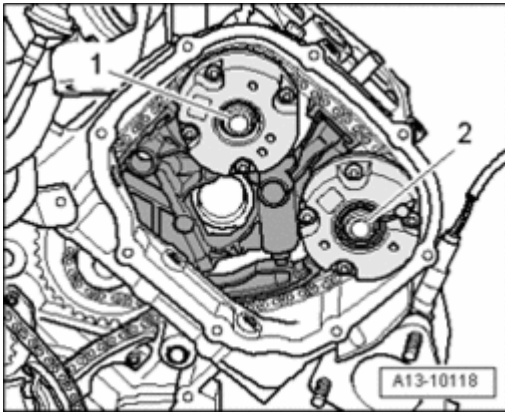


Fig. 209: Tightening Camshaft Bolts On Right Cylinder Head
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- First tighten camshaft bolt - 1 - and then camshaft bolt - 2 - on right cylinder head to final torque.
- Tightening Specifications 80 Nm plus an additional 90 ($1 \frac{1}{4}$ turn).

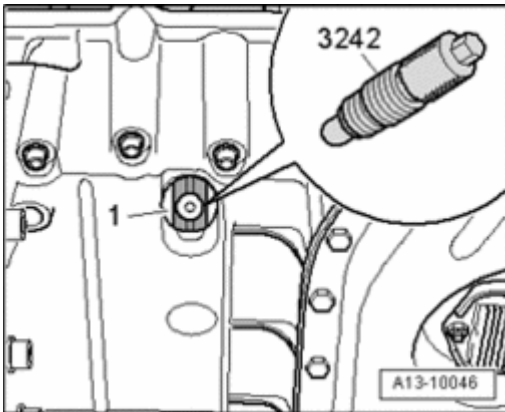


Fig. 210: Installing/Removing Crankshaft Holder 3242 In Bore
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove crankshaft holder 3242.

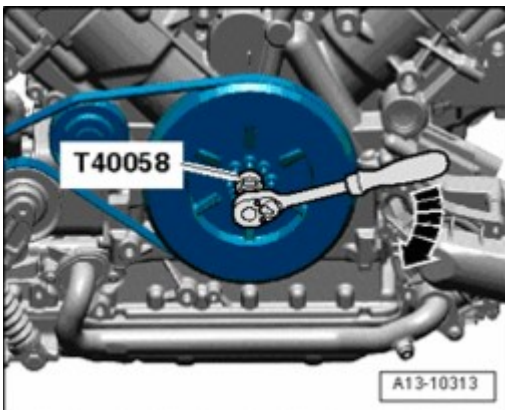


Fig. 211: Loosening/Tightening Torque Converter Bolts Using Adapter T40058 To Counterhold Crankshaft

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using Socket T40058 turn crankshaft two complete rotations in direction of engine rotation - **arrow** - until crankshaft stands at "TDC" again.

NOTE:

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

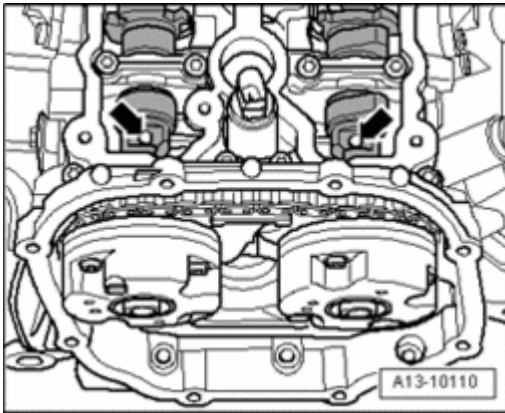


Fig. 212: Identifying Threaded Holes In Camshafts Must Face Upward

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

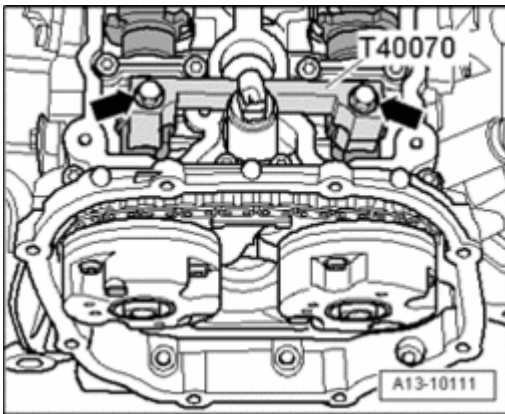


Fig. 213: Removing/Installing Camshaft Locators T40070 On Both Cylinder Heads

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Mount camshaft locating tool T40070 on both cylinder heads and tighten bolts - **arrows** - to 25 Nm.
- The camshaft locating tool T40070 is correctly positioned when the holes for the cylinder head bolts remain free.

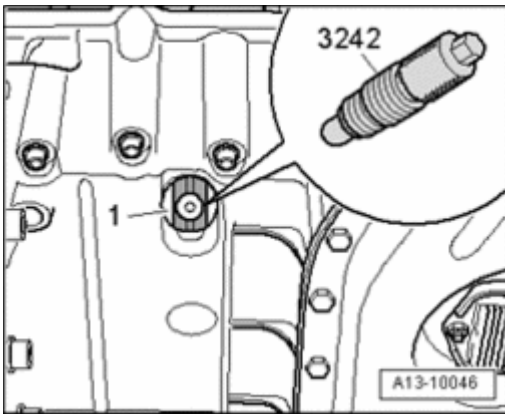


Fig. 214: Installing/Removing Crankshaft Holder 3242 In Bore
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install crankshaft holder 3242 in the bore or groove and tighten it to 20 Nm.
- The crankshaft holder 3242 must engage in the locating hole or groove on the crankshaft - 1 -. Repeat adjustment if it does not.
- Remove camshaft locating tools on both cylinder heads.
- Remove crankshaft holder 3242.
- Install "TDC" mark sealing plug with new seal in upper part of oil pan.

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

- Install left and right timing chain covers --> *Installing* under **Left and Right Timing Chain Covers, Removing and Installing** .
- Install cylinder head cover: Left --> **Left Cylinder Head Cover, Removing and Installing** , right --> **Right Cylinder Head Cover, Removing and Installing**.
- Install engine --> **Engine, Installing**.

Tightening Specifications

Component	Nm
Camshaft bolts	80 plus 90° 1)2)3)
Sealing plug in upper section of oil pan	35 4)
1) Replace bolts. 2) 90° corresponds to a quarter turn. 3) Tighten in 2 stages. 4) Install with new gasket.	

Camshaft Timing Chain, Removing and Installing

Camshaft Timing Chain, Removing and Installing

Special tools, testers and auxiliary items required

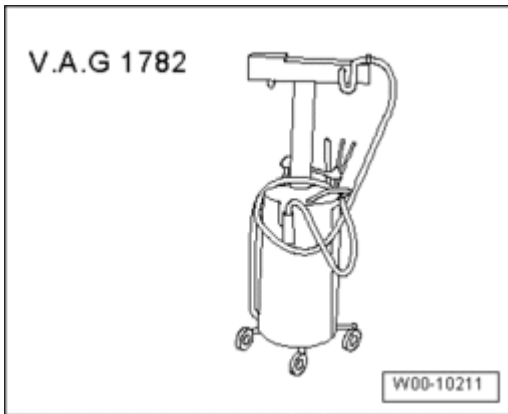


Fig. 215: Old Oil Collecting And Extracting Device V.A.G 1782
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Removing

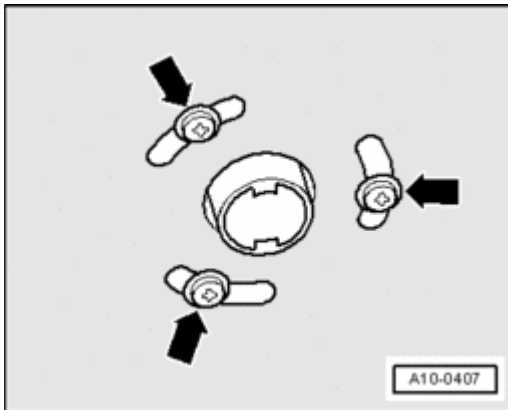


Fig. 216: Identifying Exhaust Pipe Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

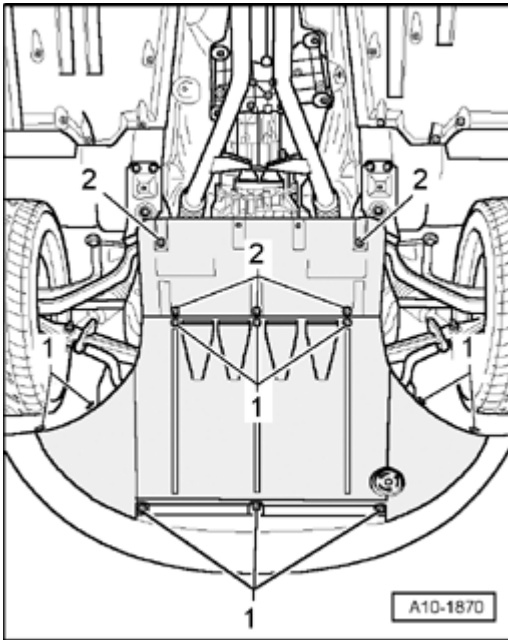


Fig. 217: Noise Insulation Quick-Release Fasteners
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen quick-release fasteners - 1 - and - 2 - and remove noise insulation.
- Place old oil collecting and extracting device V.A.G 1782 under engine and drain engine oil.
- Remove engine --> **Engine, Removing.**
- Separate engine and transmission --> **Engine and Transmission, Separating.**
- Leave engine on scissor lift table VAS 6131 A or secure engine to the engine and transmission holder --> **Engine, Securing to Engine and Transmission Holder.**
- Remove drive plate --> **Drive Plate, Removing and Installing.**
- Remove cylinder head cover: Left --> **Left Cylinder Head Cover, Removing and Installing** , right --> **Right Cylinder Head Cover, Removing and Installing.**
- Remove left and right timing chain covers --> **Left and Right Timing Chain Covers, Removing and Installing.**
- Remove intake manifold --> **24 - MULTIPOINT FUEL INJECTION (MPI) .**
- Remove oil filter housing --> **Oil Filter Housing, Removing and Installing.**
- Remove lower timing chain cover --> **Lower Timing Chain Cover, Removing and Installing.**
- Remove camshaft timing chains from camshafts --> **Camshaft Timing Chain, Removing from Camshaft.**

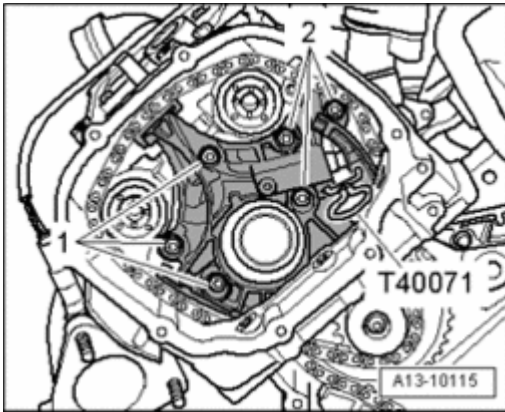


Fig. 218: Identifying Bolts For Left Chain Tensioner And Left Camshaft Timing Chain
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Mark running direction of left camshaft timing chain with paint.
- Remove bolts - 1 - and - 2 - and remove left chain tensioner and left camshaft timing chain.

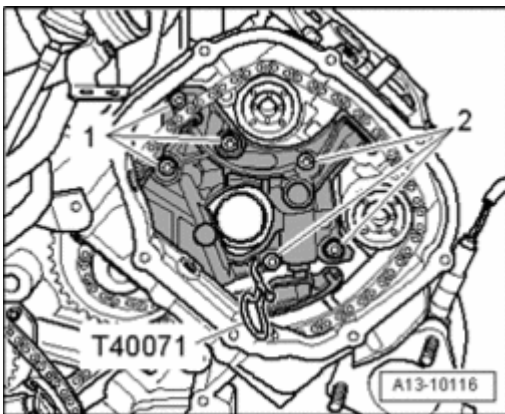


Fig. 219: Identifying Bolts For Right Chain Tensioner And Right Camshaft Timing Chain
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Mark running direction of right camshaft timing chain with paint.
- Remove bolts - 1 - and - 2 - and remove right chain tensioner and right camshaft timing chain.

Installing

NOTE:

- If the tensioning element is to be removed from the chain tensioner, observe the installed position: Hole in housing floor faces toward chain tensioner, piston faces toward tensioning rail.
- Replace bolts which have been tightened to torque.

CAUTION: When turning camshaft, crankshaft must not be at "TDC" for any cylinder. Valves and/or pistons may be damaged.

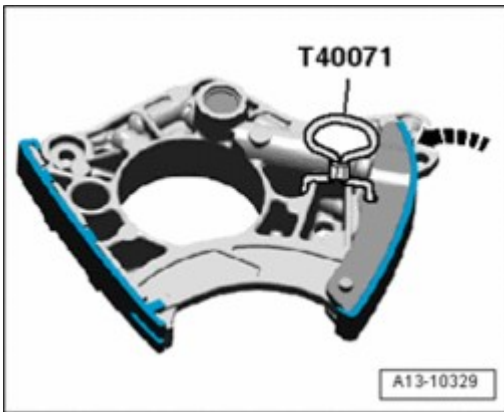


Fig. 220: Pressing Left/Right Camshaft Timing Chain Guide Rail Inward And Securing Chain Tensioner With Locking Pin T40071

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

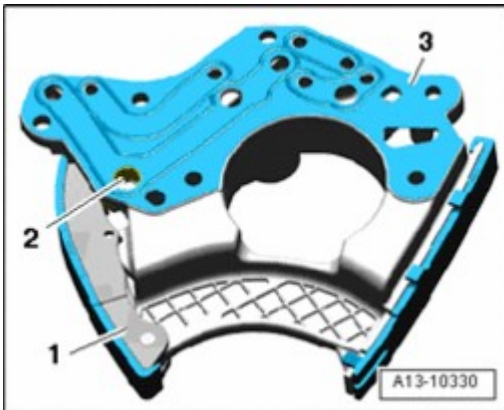


Fig. 221: Identifying Chain Tensioner Oil Screen, Gasket & Chain Tensioner

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clean oil strainer - 2 - in both chain tensioners if necessary.
- Place a new gasket - 3 - onto rear of the chain tensioner - 1 -.

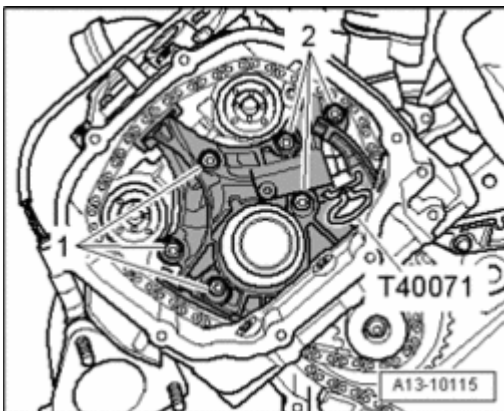


Fig. 222: Identifying Bolts For Left Chain Tensioner And Left Camshaft Timing Chain
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert chain tensioner in left cylinder head and position camshaft timing chain according to mark applied during removal, as shown in illustration.
- Tighten bolts - 1 - and - 2 -.

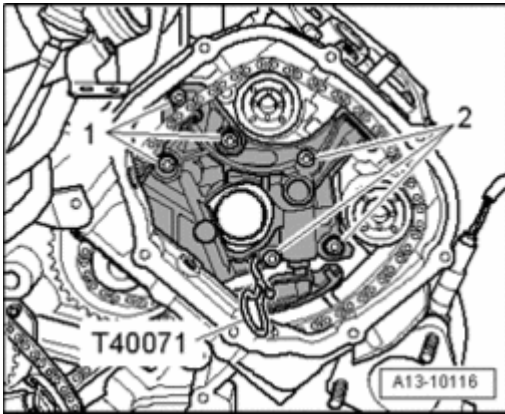


Fig. 223: Identifying Bolts For Right Chain Tensioner And Right Camshaft Timing Chain
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert chain tensioner in right cylinder head and position camshaft timing chain according to mark applied during removal, as shown in illustration.
- Tighten bolts - 1 - and - 2 -.

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

- Position camshaft timing chains on camshafts --> *Installing* under **Camshaft Timing Chain, Removing from Camshaft**.
- Install lower timing chain cover --> **Lower Timing Chain Cover, Removing and Installing**.
- Install crankshaft seal, timing chain side --> **Crankshaft Seal, Timing Chain Side, Replacing**.
- Install oil filter housing --> **Oil Filter Housing, Removing and Installing**.
- Install intake manifold --> **24 - MULTIPOINT FUEL INJECTION (MPI)**.
- Install left and right timing chain covers --> *Installing* under **Left and Right Timing Chain Covers, Removing and Installing**.
- Install cylinder head cover: Left --> **Left Cylinder Head Cover, Removing and Installing**, right --> **Right Cylinder Head Cover, Removing and Installing**.
- Install drive plate --> **Drive Plate, Removing and Installing**.
- Install engine --> **Engine, Installing**.
- Add engine oil and check oil level --> **Oil Level, Checking**.

Tightening specifications

2009 Audi S8 Quattro

ENGINE 5.2 Liter 10-Cyl. 4V Engine Mechanical, Engine Code(s): BSM - S8

Component	Nm
Chain tensioner to cylinder head	5 plus 90° 1)2)
1) Replace bolts. 2) 90° corresponds to a quarter turn.	

Timing Mechanism Drive Chain, Component Overview

Timing Mechanism Drive Chain, Component Overview

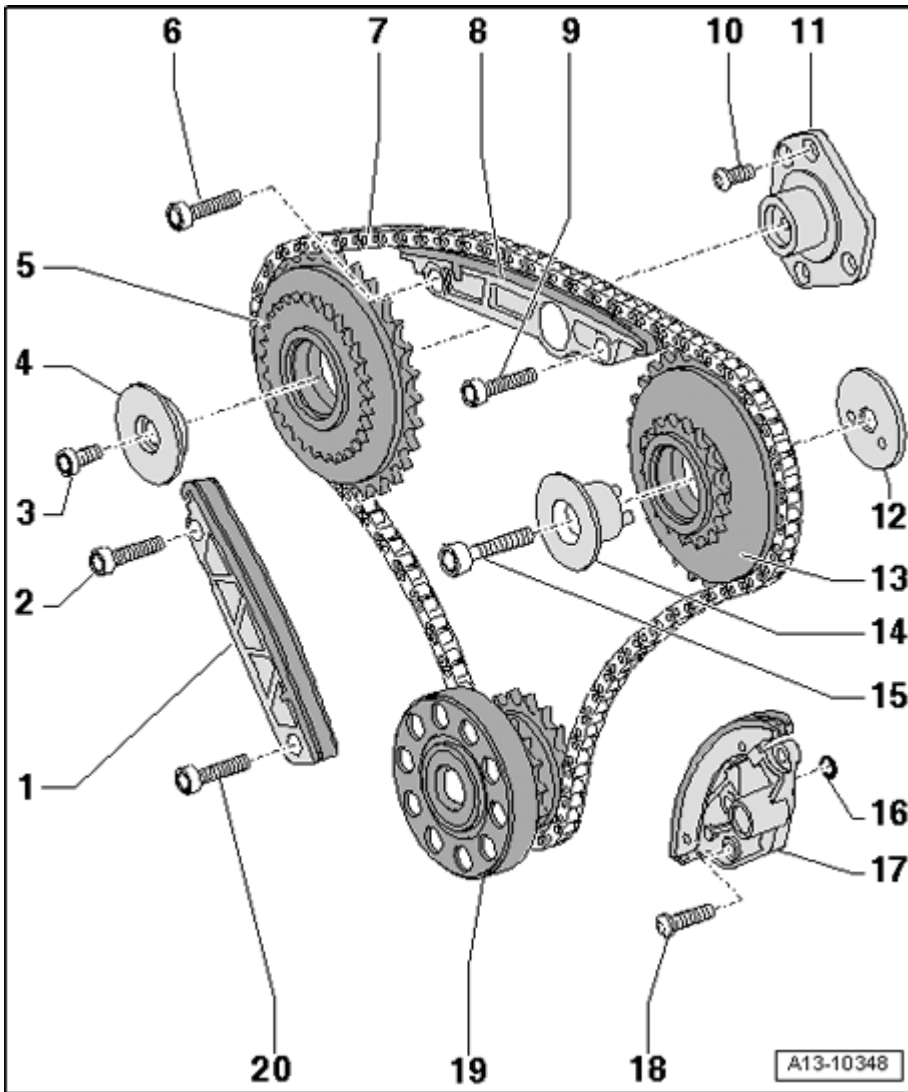


Fig. 224: Timing Mechanism Drive Chain, Component Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Guide rail

2 - 10 Nm plus an additional 90 ($\frac{1}{4}$ turn)

- Replace

3 - 22 Nm

4 - Thrust washer for drive sprocket

5 - Drive sprocket for left timing chain

6 - 10 Nm plus an additional 90 ($1/4$ turn)

- Replace

7 - Timing Mechanism Drive Chain

- Before removing, mark direction of rotation with paint. Reversing the rotation direction of a used chain can destroy it.
- Removing and installing --> **Timing Mechanism Drive Chain, Removing and Installing**

8 - Guide rail

9 - 10 Nm plus an additional 90 ($1/4$ turn)

- Replace

10 - 9 Nm

11 - Pivot pin for drive sprocket

- For right camshaft timing chain
- Asymmetrical version
- Installed location --> **Location of mounting pins for the camshaft timing chain drive sprocket**

12 - Thrust washer

13 - Drive sprocket for right timing chain

14 - Pivot pin for drive sprocket

15 - 42 Nm

16 - O-ring

- Replace

17 - Chain tensioner

18 - 5 Nm plus an additional 90 ($1/4$ turn)

- Replace

19 - Crankshaft

20 - 10 Nm plus an additional 90 ($1\frac{1}{4}$ turn)

- Replace

Location of mounting pins for the camshaft timing chain drive sprocket

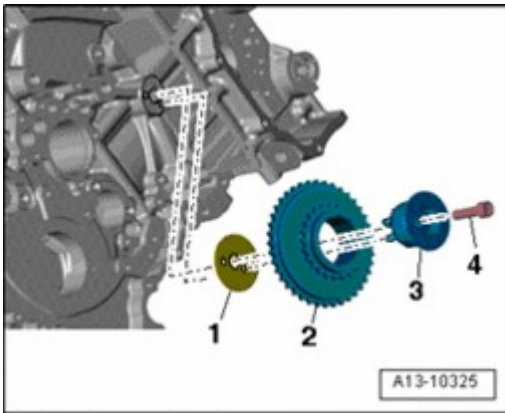


Fig. 225: Location Of Mounting Pins For Camshaft Timing Chain Drive Sprocket
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

2 - Drive sprocket for right camshaft timing chain

4 - Bolt - 42 Nm

Timing Mechanism Drive Chain, Removing and Installing

Timing Mechanism Drive Chain, Removing and Installing

Special tools, testers and auxiliary items required

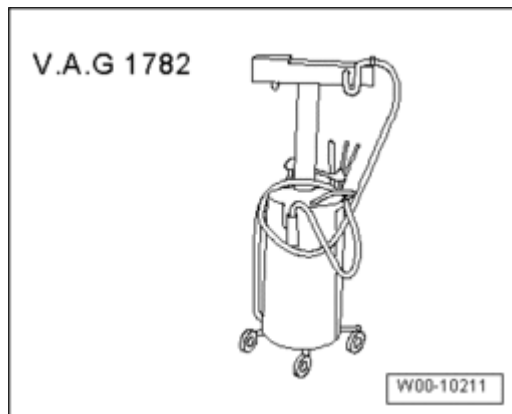


Fig. 226: Old Oil Collecting And Extracting Device V.A.G 1782
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

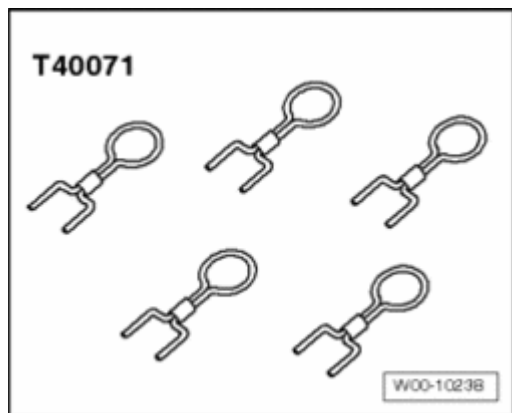


Fig. 227: Securing Pin T40071
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Securing pin T40071

Removing

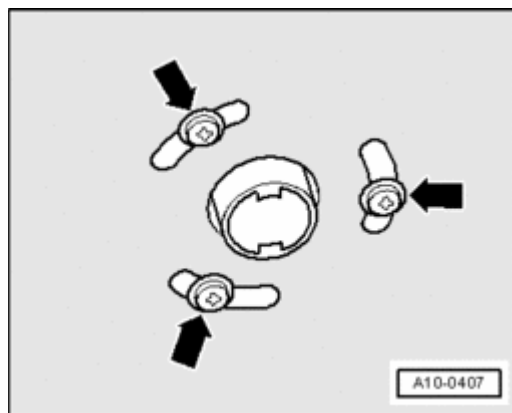


Fig. 228: Identifying Exhaust Pipe Fasteners

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

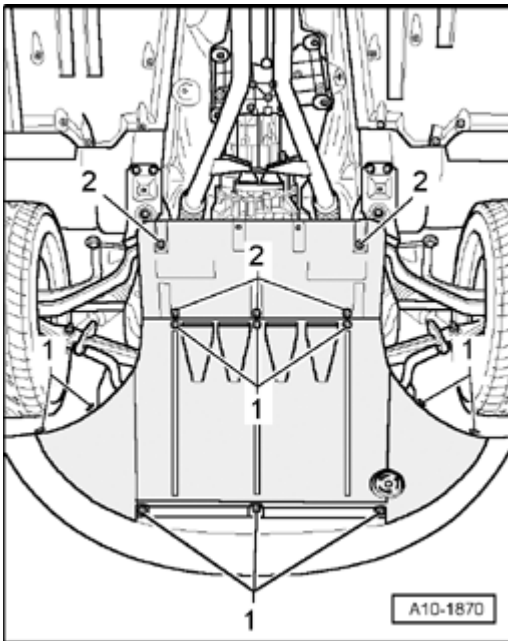


Fig. 229: Noise Insulation Quick-Release Fasteners

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen quick-release fasteners - **1** - and - **2** - and remove noise insulation.
- Place old oil collecting and extracting device V.A.G 1782 under engine and drain engine oil.
- Remove engine --> **Engine, Removing.**
- Separate engine and transmission --> **Engine and Transmission, Separating.**
- Leave engine on scissor lift table VAS 6131 A or secure engine to the engine and transmission holder --> **Engine, Securing to Engine and Transmission Holder.**
- Remove drive plate --> **Drive Plate, Removing and Installing.**
- Remove cylinder head cover: Left --> **Left Cylinder Head Cover, Removing and Installing** , right --> **Right Cylinder Head Cover, Removing and Installing.**
- Remove left and right timing chain covers --> **Left and Right Timing Chain Covers, Removing and Installing.**
- Remove intake manifold --> **24 - MULTIPOINT FUEL INJECTION (MPI) .**
- Remove oil filter housing --> **Oil Filter Housing, Removing and Installing.**
- Remove lower timing chain cover --> **Lower Timing Chain Cover, Removing and Installing.**
- Remove camshaft timing chains --> **Camshaft Timing Chain, Removing and Installing.**
- Remove oil pump drive chain and balance shaft --> **Power Take-Off, Oil Pump and Balancing Shaft**

Drive Chain, Removing and Installing.

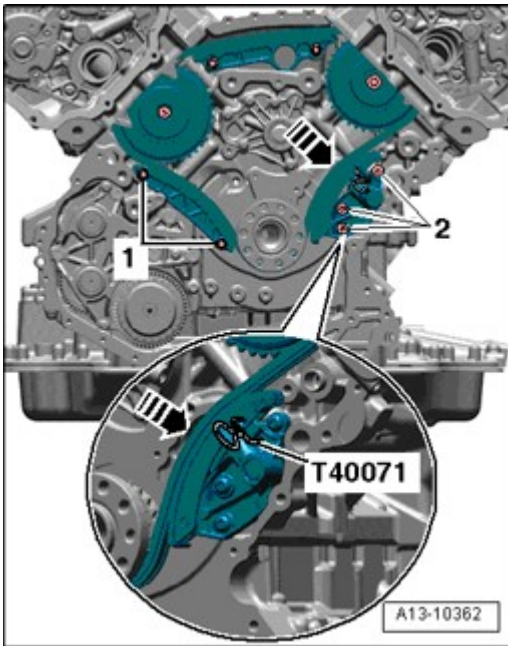


Fig. 230: Pushing Drive Chain Tensioner Guide Rail And Securing Chain Tensioner Using Locking Pin T40071

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Push drive chain tensioner guide rail in direction of - **arrow** - and secure chain tensioner using Locking Pin T40071.
- Mark drive chain running direction with paint.
- Remove bolts - **1** - and remove guide rail.
- Remove bolts - **2 to 4** - and remove chain tensioner.
- Remove timing mechanism drive chain.

Installing

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

NOTE:

- **Replace bolts which have been tightened to torque.**

- Route timing mechanism drive chain according to marks applied to drive chain sprockets during removal.
- Install guide rail and tighten bolts - **1** -.
- Install chain tensioner and tighten screws - **2** -.
- Press drive chain tensioner guide rail in direction of - **arrow** - and remove Locking Pin T40071 from chain tensioner.
- Install oil pump drive chain and balance shaft --> **Power Take-Off, Oil Pump and Balancing Shaft**

Drive Chain, Removing and Installing.

- Install camshaft timing chains --> *Installing* under **Camshaft Timing Chain, Removing and Installing** .
- Install lower timing chain cover --> **Lower Timing Chain Cover, Removing and Installing**.
- Install crankshaft seal, timing chain side --> **Crankshaft Seal, Timing Chain Side, Replacing**.

- Install oil filter housing --> **Oil Filter Housing, Removing and Installing**.
- Install intake manifold --> **24 - MULTIPOINT FUEL INJECTION (MPI)** .
- Install left and right timing chain covers --> *Installing* under **Left and Right Timing Chain Covers, Removing and Installing** .
- Install cylinder head cover: Left --> **Left Cylinder Head Cover, Removing and Installing** , right --> **Right Cylinder Head Cover, Removing and Installing**.

- Install drive plate --> **Drive Plate, Removing and Installing**.
- Install engine --> **Engine, Installing**.
- Add engine oil and check oil level --> **Oil Level, Checking**.

Tightening Specifications

Component	Nm
Guide track to cylinder block	10 Nm plus 90° 1)2)
Chain tensioner on cylinder block	5 Nm plus 90° 1)2)

1) Replace bolts. 2) 90° corresponds to a quarter turn.

Power Take-Off, Oil Pump and Balancing Shaft Drive Chain, Component Overview**Power Take-Off, Oil Pump and Balancing Shaft Drive Chain, Component Overview**

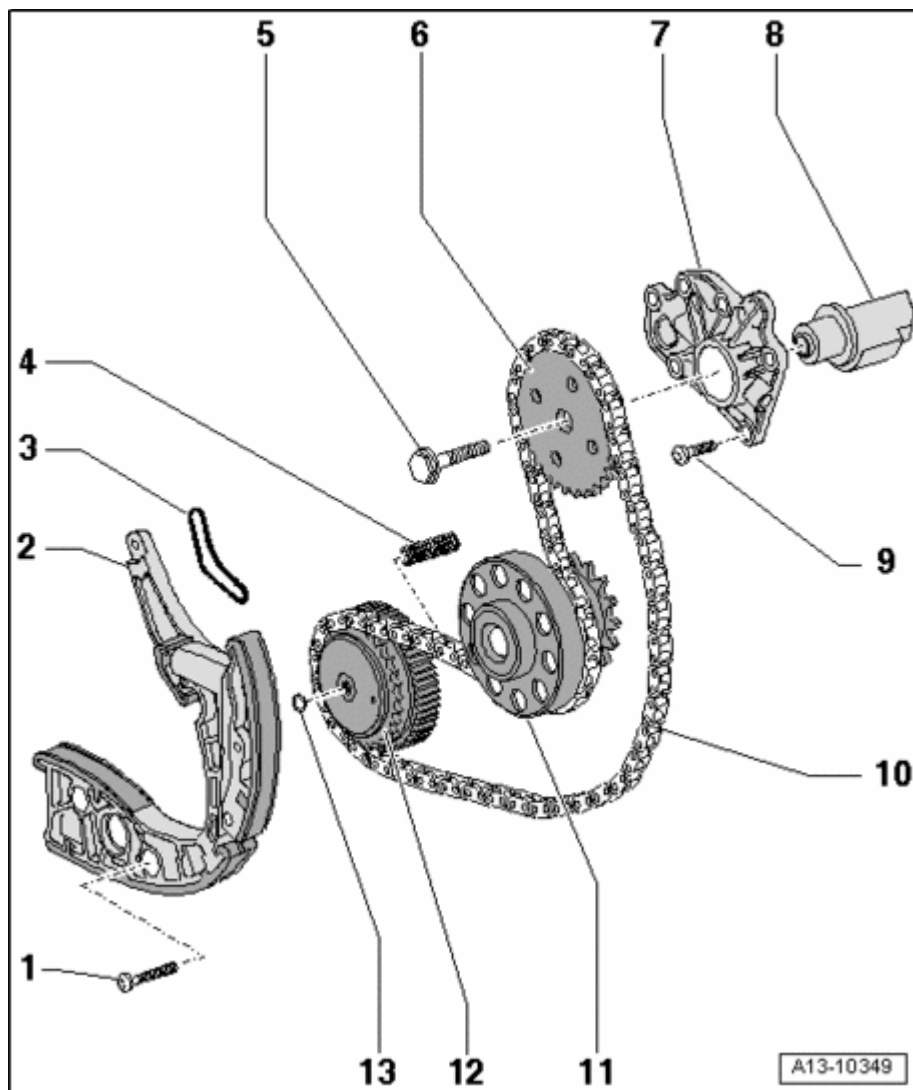


Fig. 231: Power Take-Off, Oil Pump And Balancing Shaft Drive Chain, Component Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - 9 Nm

2 - Chain tensioner

- With glide track

3 - Gasket

- Replace

4 - Spring

5 - 42 Nm

6 - Chain sprocket for balance shaft

7 - Bearing cap

8 - Differential shaft

- Removing and installing --> **Balancing Shaft, Removing and Installing**

9 - 9 Nm

10 - Drive chain for power take-off, oil pump and balance shaft

- Before removing, mark direction of rotation with paint. Reversing the rotation direction of a used chain can destroy it.
- Removing and installing --> **Power Take-Off, Oil Pump and Balancing Shaft Drive Chain, Removing and Installing**

11 - Crankshaft

12 - Drive chain for power take-off and oil pump

13 - Circlip

Power Take-Off, Oil Pump and Balancing Shaft Drive Chain, Removing and Installing

Power Take-Off, Oil Pump and Balancing Shaft Drive Chain, Removing and Installing

Special tools, testers and auxiliary items required

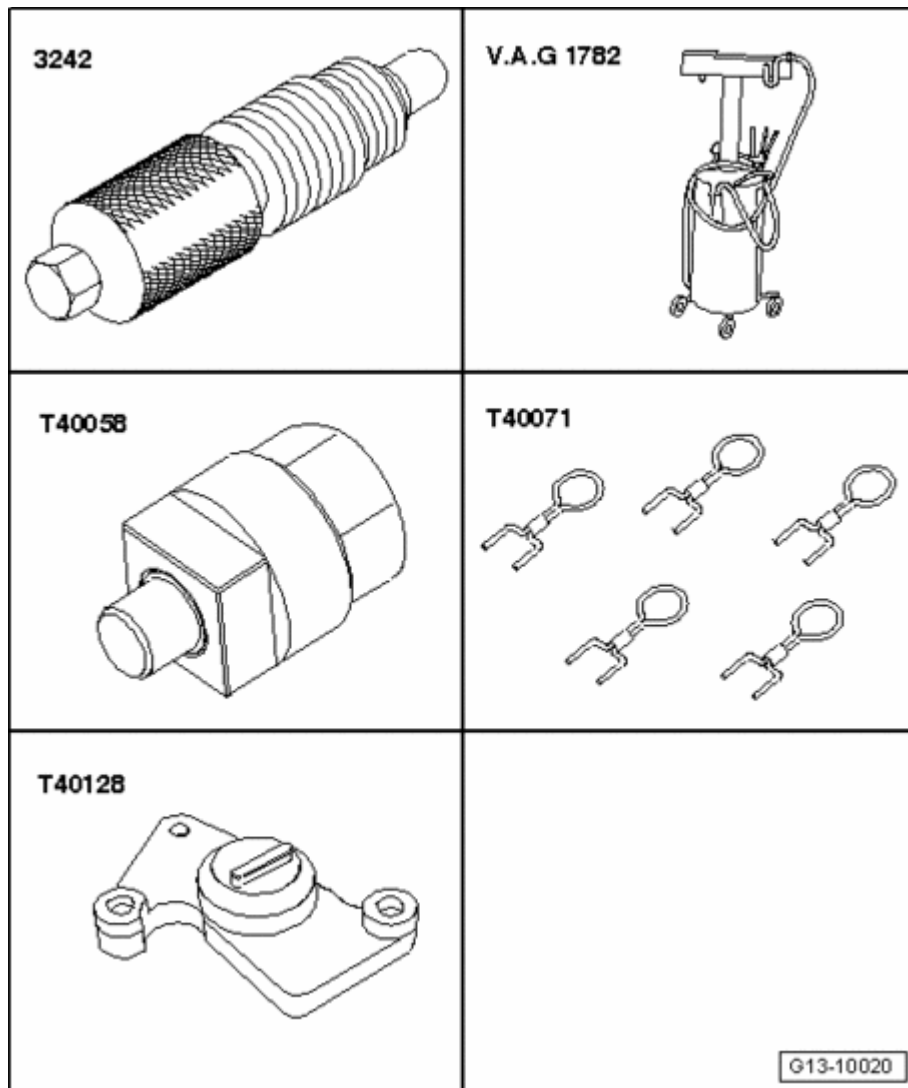


Fig. 232: Identifying Special Tools - Power Take-Off, Oil Pump And Balancing Shaft Drive Chain, Removing And Installing
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Locking pin 3242
- Old oil collecting and extracting device V.A.G 1782
- Adapter T40058
- Securing pin T40071
- Setting gauge T40128

Removing

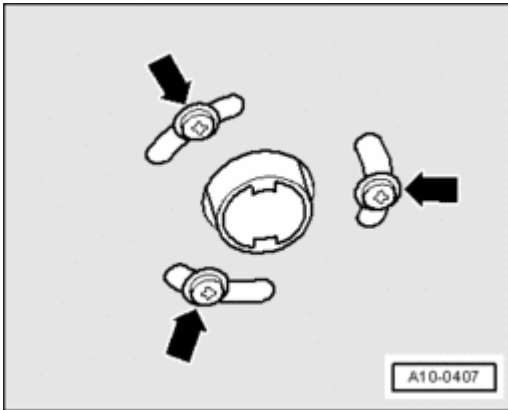


Fig. 233: Identifying Exhaust Pipe Fasteners

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

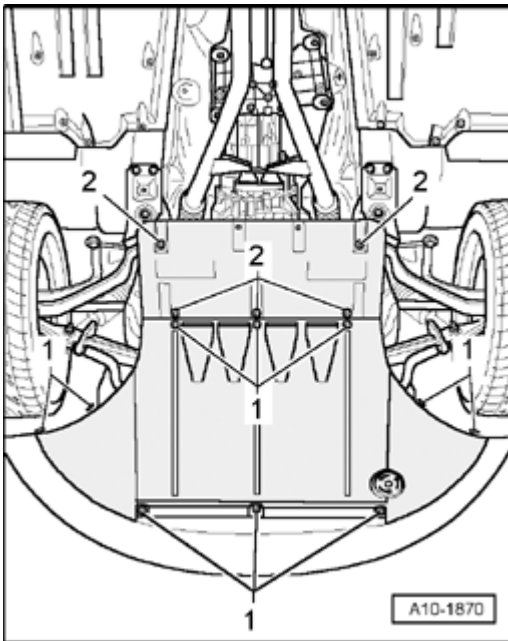


Fig. 234: Noise Insulation Quick-Release Fasteners

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen quick-release fasteners - **1** - and - **2** - and remove noise insulation.
- Place old oil collecting and extracting device V.A.G 1782 under engine and drain engine oil.
- Remove engine --> **Engine, Removing.**
- Separate engine and transmission --> **Engine and Transmission, Separating.**
- Leave engine on scissor lift table VAS 6131 A or secure engine to the engine and transmission holder --> **Engine, Securing to Engine and Transmission Holder.**

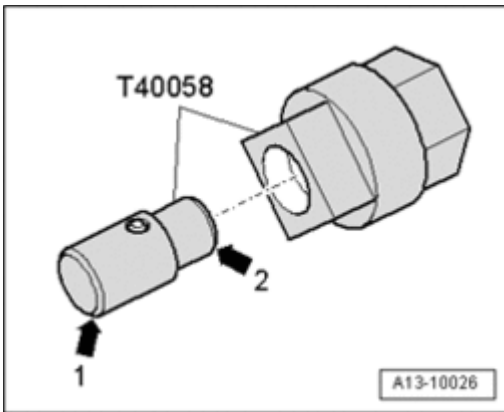


Fig. 235: Inserting Guide Pin Of Adapter T40058 So That Large Diameter Points To Engine
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert Socket T40058 adapter so that small diameter - **arrow 2** - points to engine. Large diameter - **arrow 1** - points to socket.

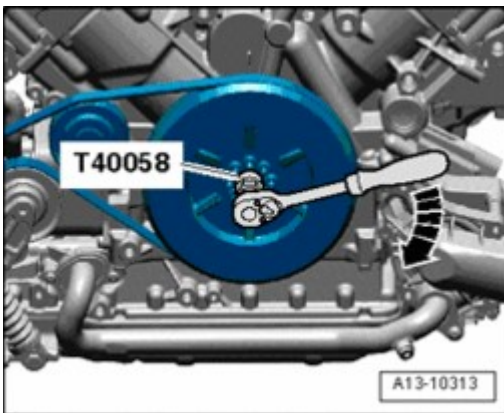


Fig. 236: Loosening/Tightening Torque Converter Bolts Using Adapter T40058 To Counterhold Crankshaft
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

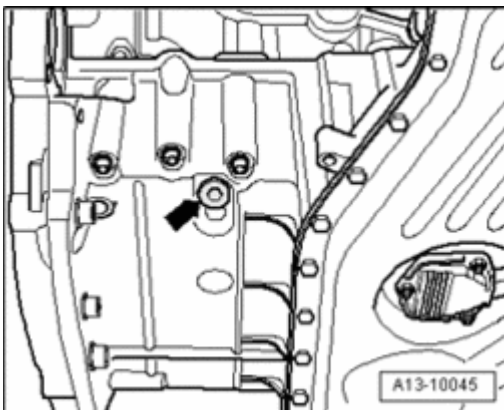


Fig. 237: Identifying Locking Bolt Of Upper Part Of Oil Pan

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove locking bolt - **arrow** - from upper part of oil pan.

CAUTION: Do not turn the crankshaft - 1 - while touching the "TDC" hole with your finger. You could be injured.

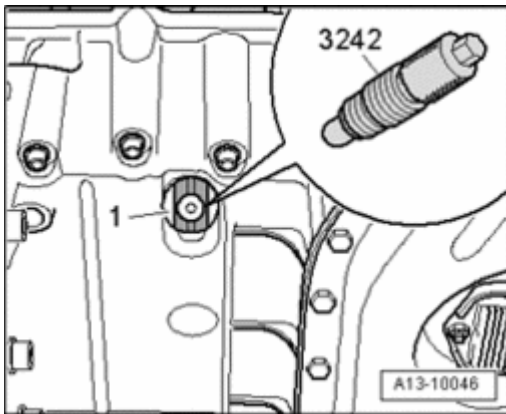


Fig. 238: Installing/Removing Crankshaft Holder 3242 In Bore
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install crankshaft holder 3242 in the hole and tighten to 20 Nm. If necessary, rotate crankshaft back and forth slightly to completely center the holder.
- Remove vibration damper --> **Vibration Damper, Removing and Installing.**
- Remove drive plate --> **Drive Plate, Removing and Installing.**
- Remove left and right timing chain covers --> **Left and Right Timing Chain Covers, Removing and Installing.**
- Remove intake manifold --> **24 - MULTIPORT FUEL INJECTION (MFI) .**
- Remove oil filter housing --> **Oil Filter Housing, Removing and Installing.**
- Remove lower timing chain cover --> **Lower Timing Chain Cover, Removing and Installing.**

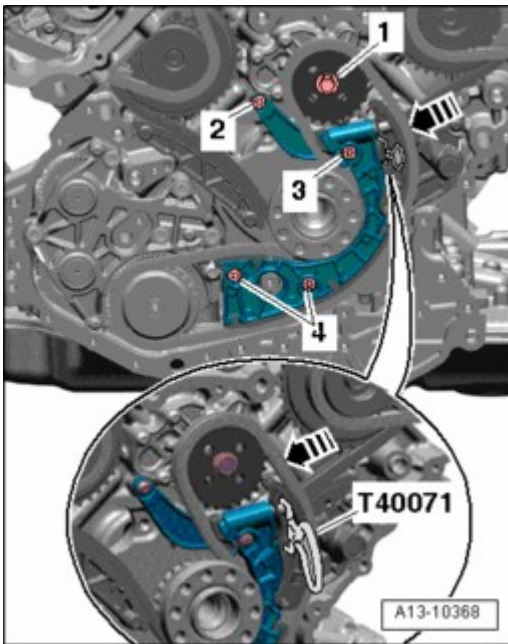


Fig. 239: Pressing Tensioning Rail, Securing Chain Tensioner With Locking Pin T40071, Removing Bolts, Balance Shaft Chain Sprocket & Chain Tensioner
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Mark running direction of power take-off chain with paint.
- Press tensioning rail in direction of - **arrow** - and secure chain tensioner with Locking Pin T40071.
- Remove bolt - **1** - and remove balance shaft chain sprocket.
- Remove bolts - **2, 3, 4** - and remove chain tensioner.
- Remove drive chain for power take-off, oil pump and balance shaft.

Installing

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

NOTE: • **Replace gaskets, seal and O-rings.**

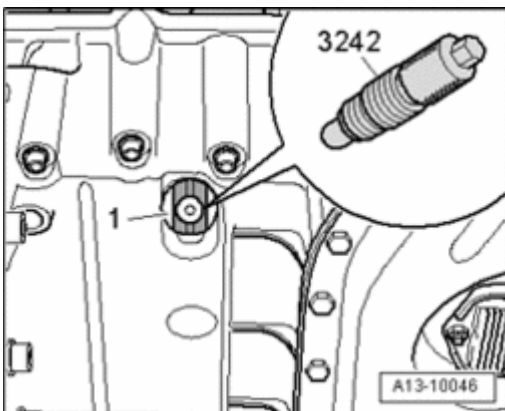


Fig. 240: Installing/Removing Crankshaft Holder 3242 In Bore
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure crankshaft - 1 - in "TDC" position using crankshaft holder 3242.

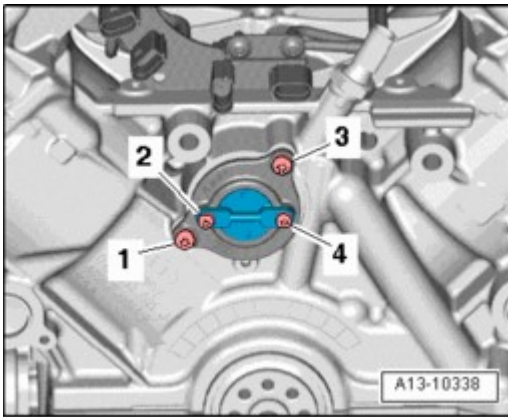


Fig. 241: Removing Bolts & Balance Shaft Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - 2 - and - 4 -.
- Remove balance shaft cover.
- Remove bolts - 1 - and - 3 -.

NOTE:

- Balance shaft front bearing cap remains installed.

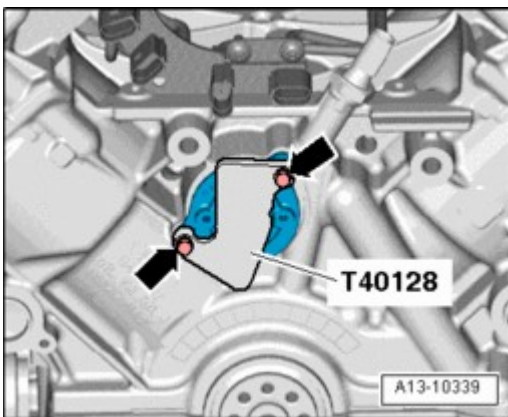


Fig. 242: Positioning Setting Gauge T40128 On Balance Shaft Front Bearing Cap
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position setting gauge T40128 on balance shaft front bearing cap.
- Rib on setting gauge T40128 must engage in groove on balance shaft.
- Fasten setting gauge T40128 to cylinder block with 2 M6x30 bolts - **arrows** -.

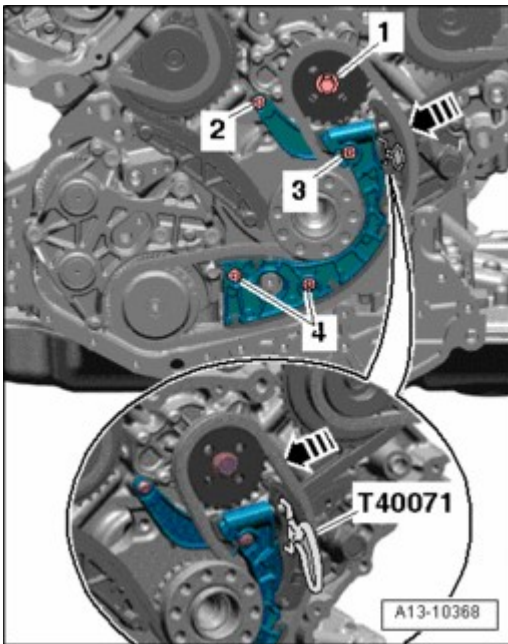


Fig. 243: Pressing Tensioning Rail, Securing Chain Tensioner With Locking Pin T40071, Removing Bolts, Balance Shaft Chain Sprocket & Chain Tensioner
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Route drive chain for power-take off, oil pump and balance shaft according to marks made during removal.
- Install chain tensioner and tighten bolts - 2, 3, 4 -.
- Place drive chain on balance shaft chain sprocket and tighten bolt - 1 -.

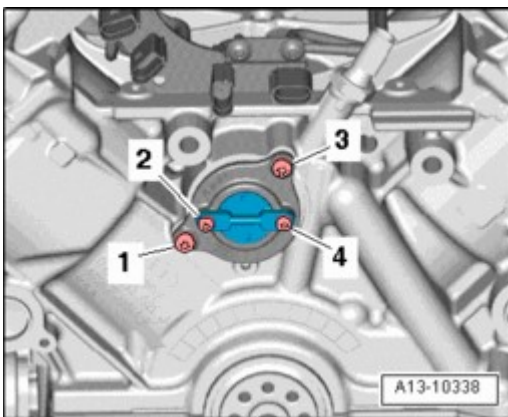


Fig. 244: Removing Bolts & Balance Shaft Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove setting gauge T40128.
- Tighten bolts - 1 - and - 3 -.
- Replace balance shaft cover O-ring.
- Tighten bolts - 2 - and - 4 - on balance shaft cover.

2009 Audi S8 Quattro

ENGINE 5.2 Liter 10-Cyl. 4V Engine Mechanical, Engine Code(s): BSM - S8

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

- Install lower timing chain cover --> **Lower Timing Chain Cover, Removing and Installing.**
- Install crankshaft seal, timing chain side --> **Crankshaft Seal, Timing Chain Side, Replacing.**
- Install oil filter housing --> **Oil Filter Housing, Removing and Installing.**
- Install intake manifold --> **24 - MULTIPORT FUEL INJECTION (MFI) .**
- Install left and right timing chain covers --> *Installing* under **Left and Right Timing Chain Covers, Removing and Installing .**
- Install drive plate --> **Drive Plate, Removing and Installing.**
- Install vibration damper --> **Vibration Damper, Removing and Installing.**
- Install engine --> **Engine, Installing.**
- Add engine oil and check oil level --> **Oil Level, Checking.**

Tightening Specifications

Component	Nm
Chain tensioner on cylinder block	9
Chain sprocket to balance shaft	42
Balance shaft front bearing cap to cylinder block	9
Balance shaft cover to balance shaft front bearing cap	5
Sealing plug in upper section of oil pan	35 1)
1) Replace seal.	

Power Take-Off, Component Overview

Power Take-Off, Component Overview

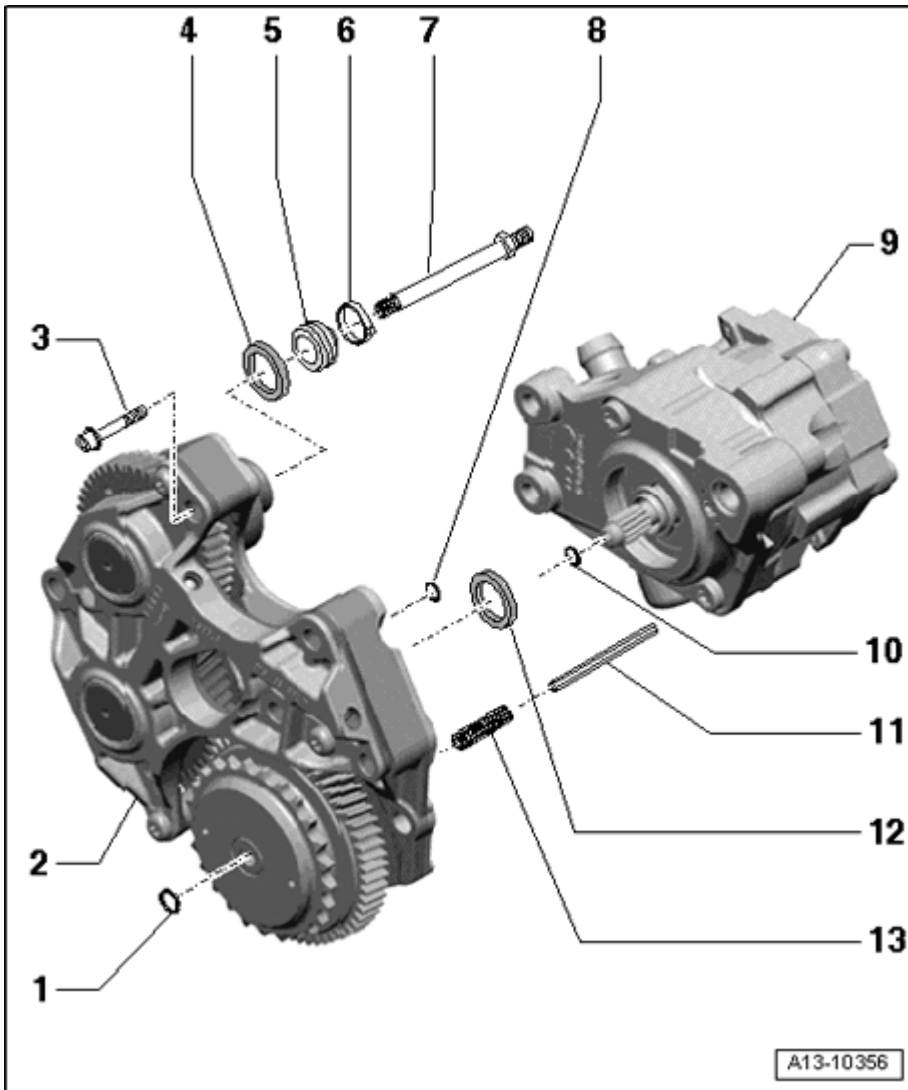


Fig. 245: Power Take-Off, Component Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Circlip

2 - Spur gear unit

- Removing and installing --> **Spur Gear Unit, Removing and Installing**

3 - 22 Nm

4 - Sealing ring for A/C compressor drive

- Replacing --> **Power Take-Off Seals, Replacing.**

5 - Dust seal cap for A/C compressor drive

6 - Clamp

7 - Drive shaft for A/C compressor

- Tighten to 60 Nm.

8 - O-ring

- Replace

9 - Power-steering pump

10 - O-ring

- Replace

11 - Drive shaft for oil pump

12 - Sealing ring for power-steering pump drive

- Replacing --> **Power Take-Off Seals, Replacing.**

13 - Spring

Power Take-Off Seals, Replacing

Power Take-Off Seals, Replacing

Special tools, testers and auxiliary items required

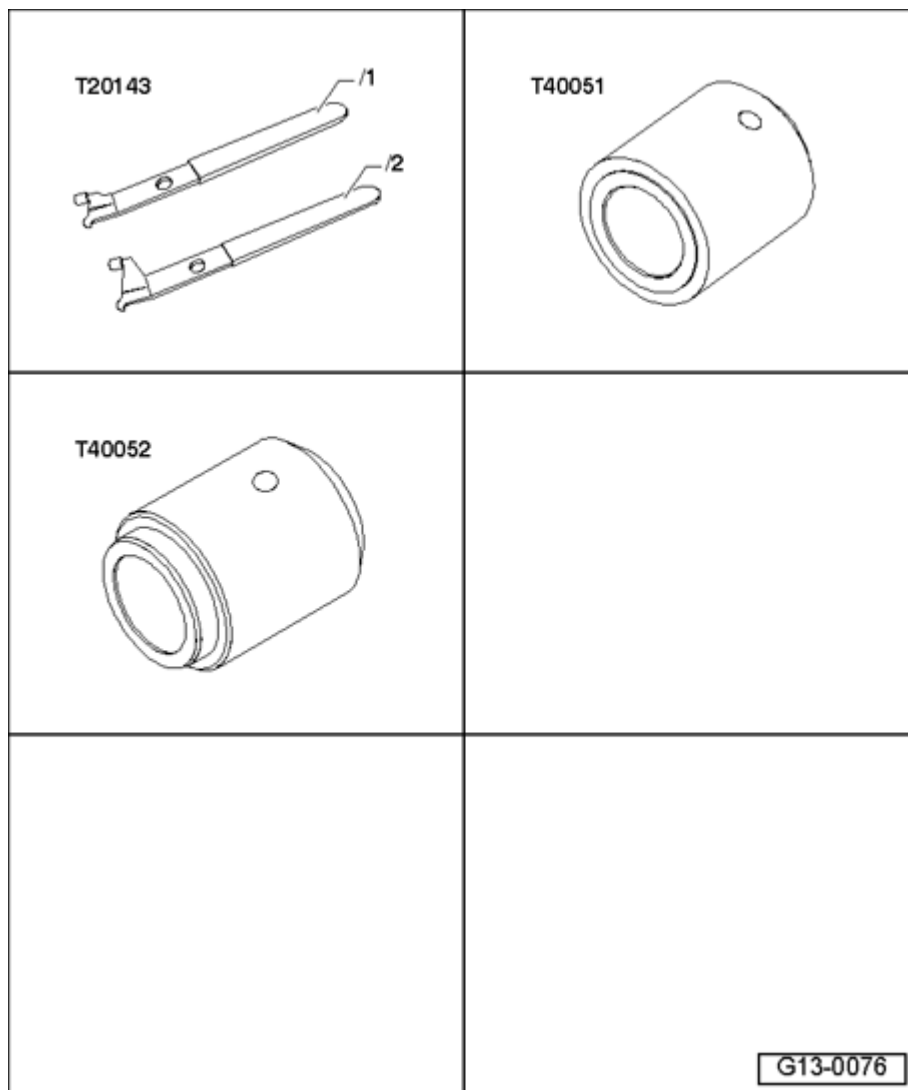


Fig. 246: Identifying Special Tools - Power Take-Off Seals, Replacing
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Extractor hook T20143
- Pressure piece T40051
- Pressure piece T40052

Procedure

- Remove engine --> **Engine, Removing.**
- Remove air conditioning compressor --> **87 - AIR CONDITIONING .**
- Remove power steering pump --> **48 - STEERING .**

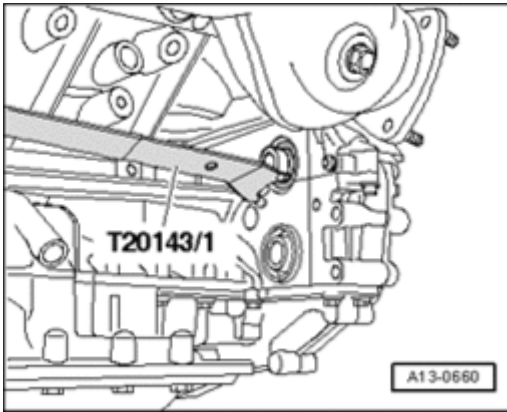


Fig. 247: Prying Out Sealing Ring For A/C Compressor Drive Using Pulling Hook T20143/1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pry out A/C compressor drive seal using pulling hook T20143/1.

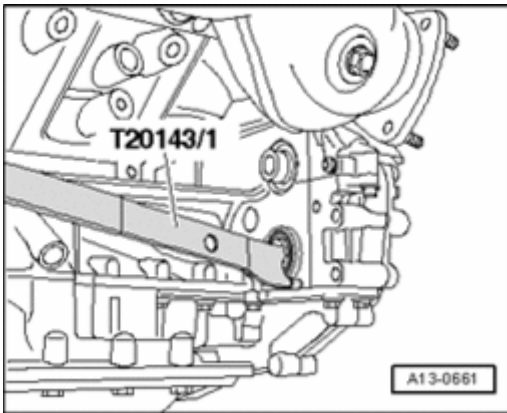


Fig. 248: Prying Out Power-Steering Pump Drive Seal Using Pulling Hook T20143/1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pry out power-steering pump drive seal using pulling hook T20143/1.

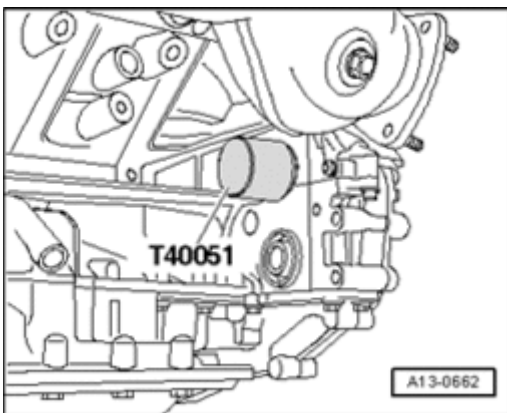


Fig. 249: Driving In Sealing Ring For A/C Compressor Drive Using Thrust Piece T40051
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive in sealing ring for A/C compressor drive using thrust piece T40051.

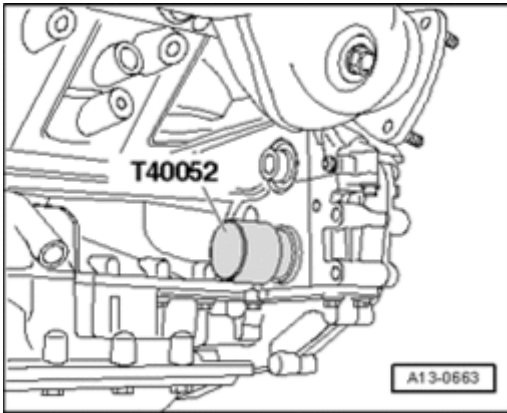


Fig. 250: Driving In Sealing Ring For Power-Steering Pump Drive Using Thrust Piece T40052
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive in sealing ring for power-steering pump drive using thrust piece T40052.

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

- Install power steering pump --> **48 - STEERING** .
- Install A/C compressor --> **87 - AIR CONDITIONING** .

Spur Gear Unit, Removing and Installing

Spur Gear Unit, Removing and Installing

Special tools, testers and auxiliary items required

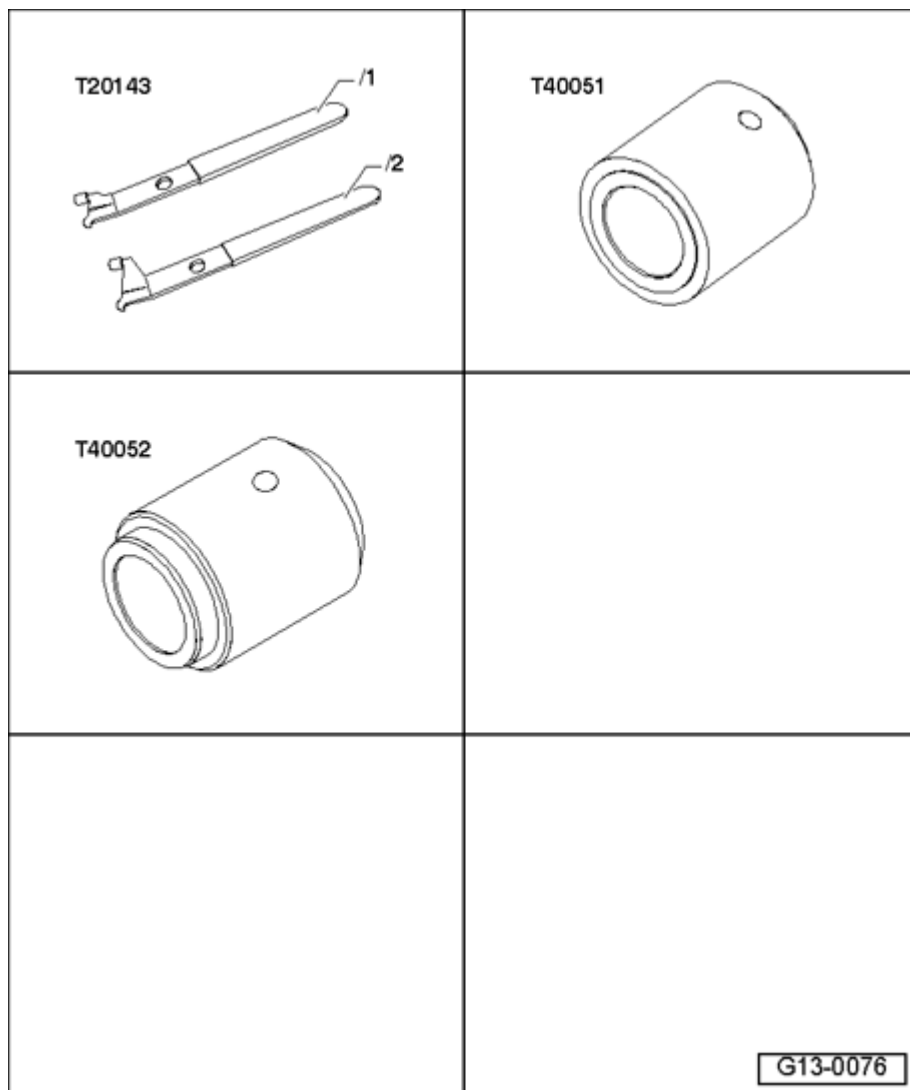


Fig. 251: Identifying Special Tools - Spur Gear Unit, Removing And Installing
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Extractor hook T20143
- Pressure piece T40051
- Pressure piece T40052

Special tools, testers and auxiliary items required

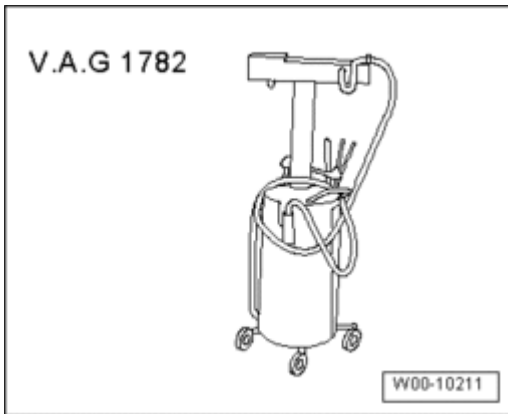


Fig. 252: Old Oil Collecting And Extracting Device V.A.G 1782
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Removing

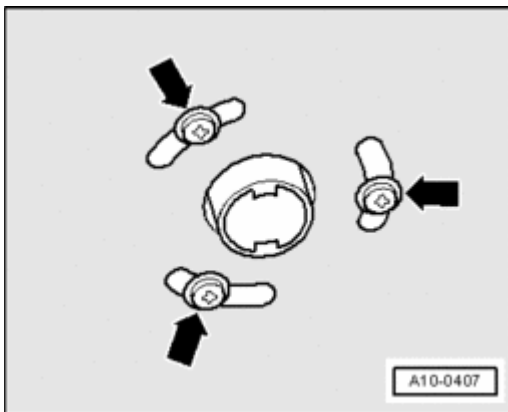


Fig. 253: Identifying Exhaust Pipe Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

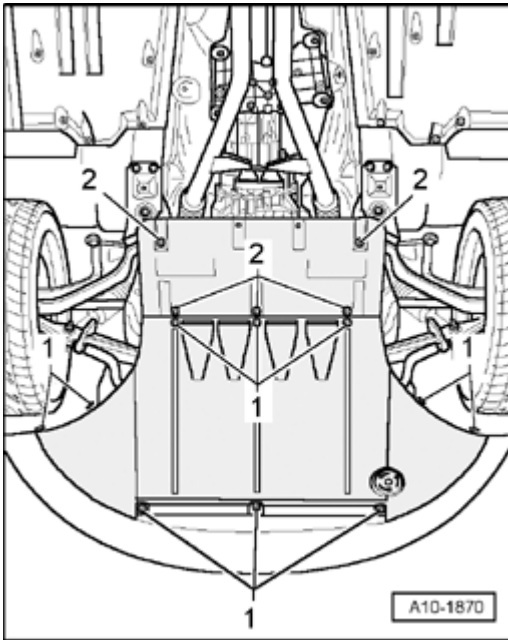


Fig. 254: Noise Insulation Quick-Release Fasteners
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen quick-release fasteners - 1 - and - 2 - and remove noise insulation.
- Place old oil collecting and extracting device V.A.G 1782 under engine and drain engine oil.
- Remove engine --> **Engine, Removing.**
- Separate engine and transmission --> **Engine and Transmission, Separating.**
- Leave engine on scissor lift table VAS 6131 A or secure engine to the engine and transmission holder --> **Engine, Securing to Engine and Transmission Holder.**
- Remove drive plate --> **Drive Plate, Removing and Installing.**
- Remove left and right timing chain covers --> **Left and Right Timing Chain Covers, Removing and Installing.**
- Remove intake manifold --> **24 - MULTIPOINT FUEL INJECTION (MPI) .**
- Remove oil filter housing --> **Oil Filter Housing, Removing and Installing.**
- Remove lower timing chain cover --> **Lower Timing Chain Cover, Removing and Installing.**
- Remove power-steering pump from cylinder block.

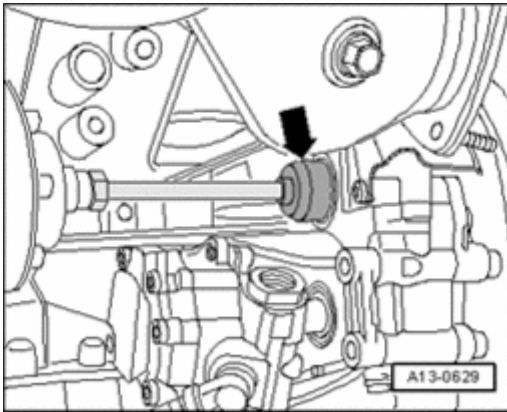


Fig. 255: Identifying Hose Clamp At Dust Cap

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove hose clamp at A/C compressor dust cap - **arrow** -.
- Remove power take-off drive chain --> **Power Take-Off, Oil Pump and Balancing Shaft Drive Chain, Removing and Installing.**

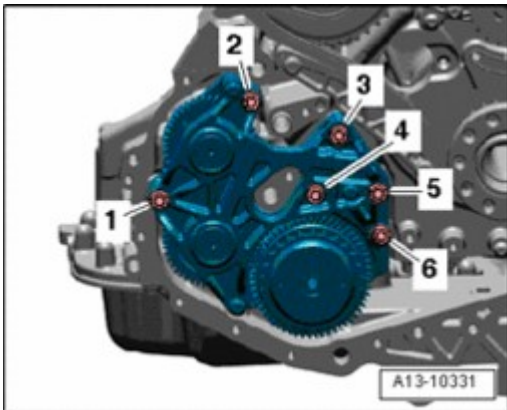


Fig. 256: Removing Bolts & Spur Gear Unit

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **1 through 6** - and remove spur gear unit.

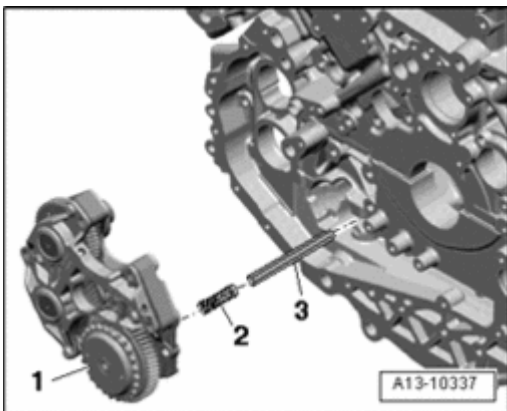


Fig. 257: Removing/Installing Compression Spring Between Spur Gear Unit And Oil Pump Input Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

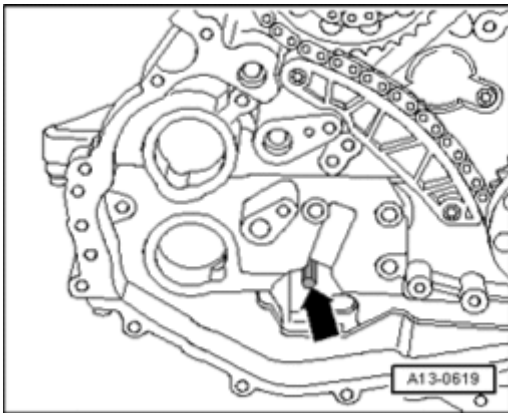


Fig. 258: Removing/Installing Drive Shaft For Oil Pump
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove drive shaft - **arrow** - for oil pump.

Installing

NOTE:

- Replace seals and O-rings.

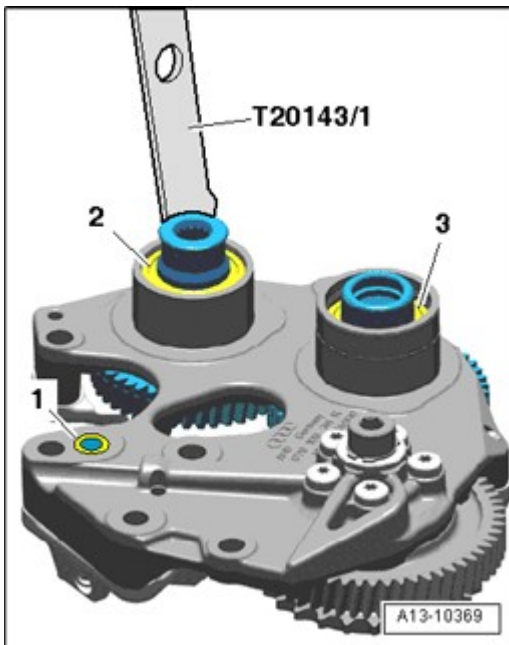


Fig. 259: Removing A/C Compressor Drive Seal And Power Steering Pump Drive Seal Using Pulling Hook T20143/1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove A/C compressor drive seal - **2** - and power steering pump drive seal - **3** - using pulling hook T20143/1.
- Remove O-ring - **1** -.
- Remove sealant residue on front bearing cap and on cylinder block.
- Clean sealing surfaces, they must be free of oil and grease.

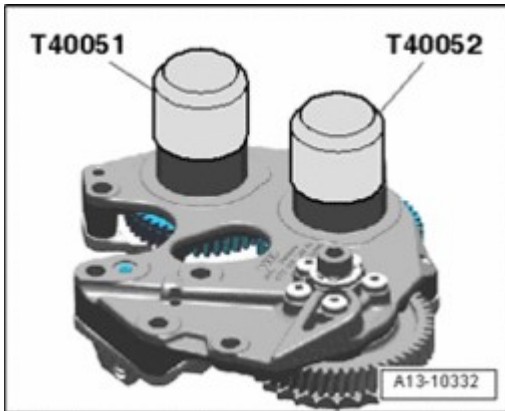


Fig. 260: Driving In Sealing Ring For A/C Compressor Drive Using Thrust Piece T40051 & Sealing Ring For Power-Steering Pump Drive Using Thrust Piece T40052
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive in sealing ring for A/C compressor drive using thrust piece T40051.
- Drive in sealing ring for power-steering pump drive using thrust piece T40052.

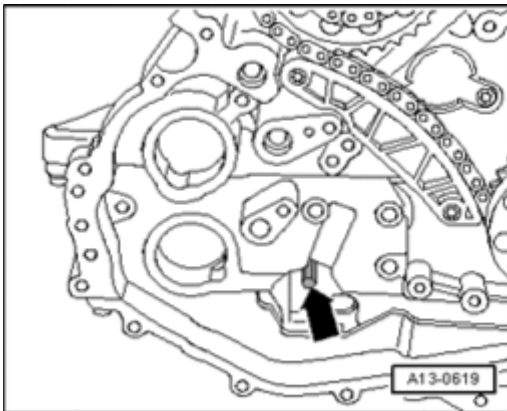


Fig. 261: Removing/Installing Drive Shaft For Oil Pump
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert drive shaft - **arrow** - for oil pump into guide on oil pump.

NOTE:

- To guarantee that the drive shaft engages correctly in oil pump, insert drive shaft only into oil pump, do not install together with spur gear unit.

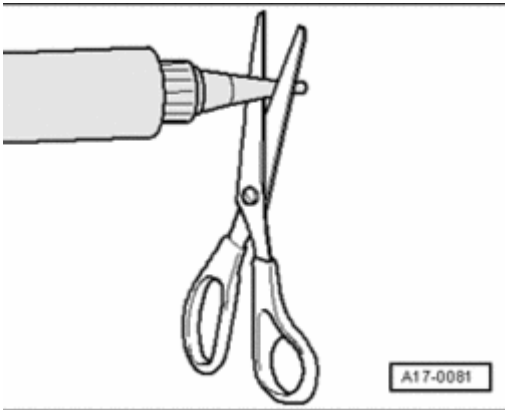


Fig. 262: Cutting Tube Nozzle At Front Marking
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Cut off nozzle on the tube of sealant at front mark (diameter of nozzle approximately 1.5 mm).

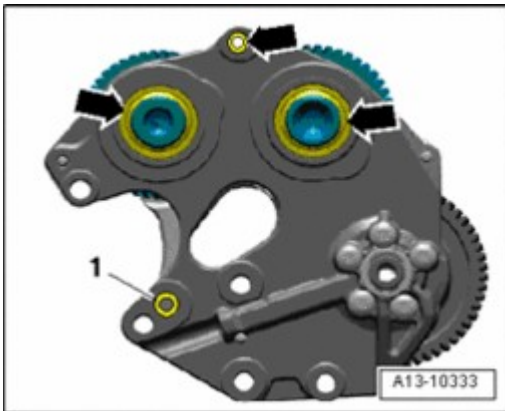


Fig. 263: Applying Sealant Beads To Clean Sealing Surfaces Of Spur Gear Unit
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Apply sealant beads - **arrows** - on clean sealing surfaces of front bearing cap as shown in illustration.
- Thickness of sealant beads: 2.0 mm.
- Position O-ring - **1** - and secure it with some grease.

NOTE:

- **The bearing cap must be installed within 5 minutes after application of sealant.**

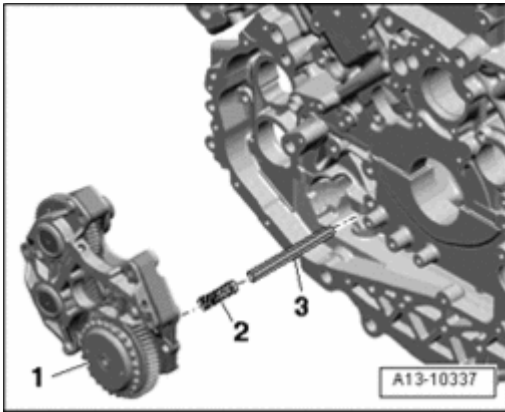


Fig. 264: Removing/Installing Compression Spring Between Spur Gear Unit And Oil Pump Input Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

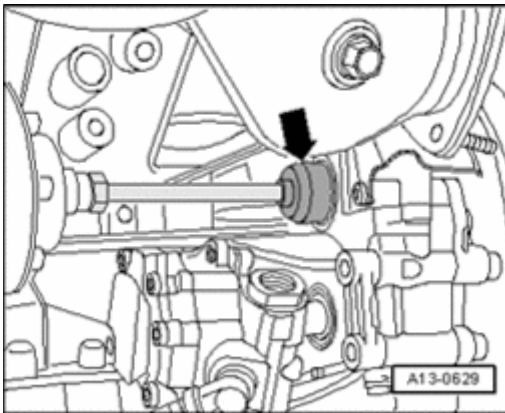


Fig. 265: Identifying Hose Clamp At Dust Cap
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

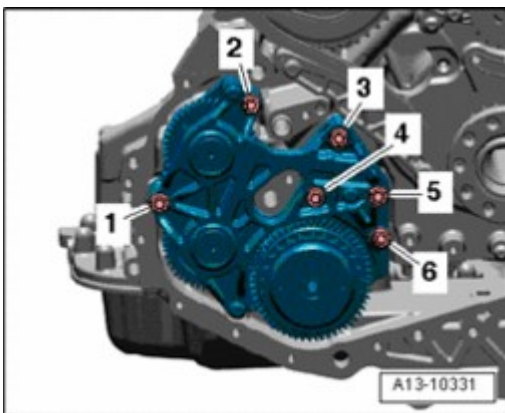


Fig. 266: Removing Bolts & Spur Gear Unit
Courtesy of VOLKSWAGEN UNITED STATES, INC.

2009 Audi S8 Quattro

ENGINE 5.2 Liter 10-Cyl. 4V Engine Mechanical, Engine Code(s): BSM - S8

- Position spur gear unit and tighten bolts - **1 to 6** - in a diagonal sequence in stages.
- Install oil pump drive chain and balance shaft --> **Power Take-Off, Oil Pump and Balancing Shaft Drive Chain, Removing and Installing.**
- Slide power steering pump with new O-ring onto spur gear for power-steering pump drive.

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

- Install lower timing chain cover --> **Lower Timing Chain Cover, Removing and Installing.**
- Install crankshaft seal, timing chain side --> **Crankshaft Seal, Timing Chain Side, Replacing.**
- Install oil filter housing --> **Oil Filter Housing, Removing and Installing.**
- Install intake manifold --> **24 - MULTIPOINT FUEL INJECTION (MPI) .**
- Install left and right timing chain covers --> *Installing* under **Left and Right Timing Chain Covers, Removing and Installing .**
- Install drive plate --> **Drive Plate, Removing and Installing.**
- Install engine --> **Engine, Installing.**
- Add engine oil and check oil level --> **Oil Level, Checking.**

Tightening specifications

Component	Nm
Spur gear unit to cylinder block	22

Balancing Shaft, Component Overview

Balancing Shaft, Component Overview

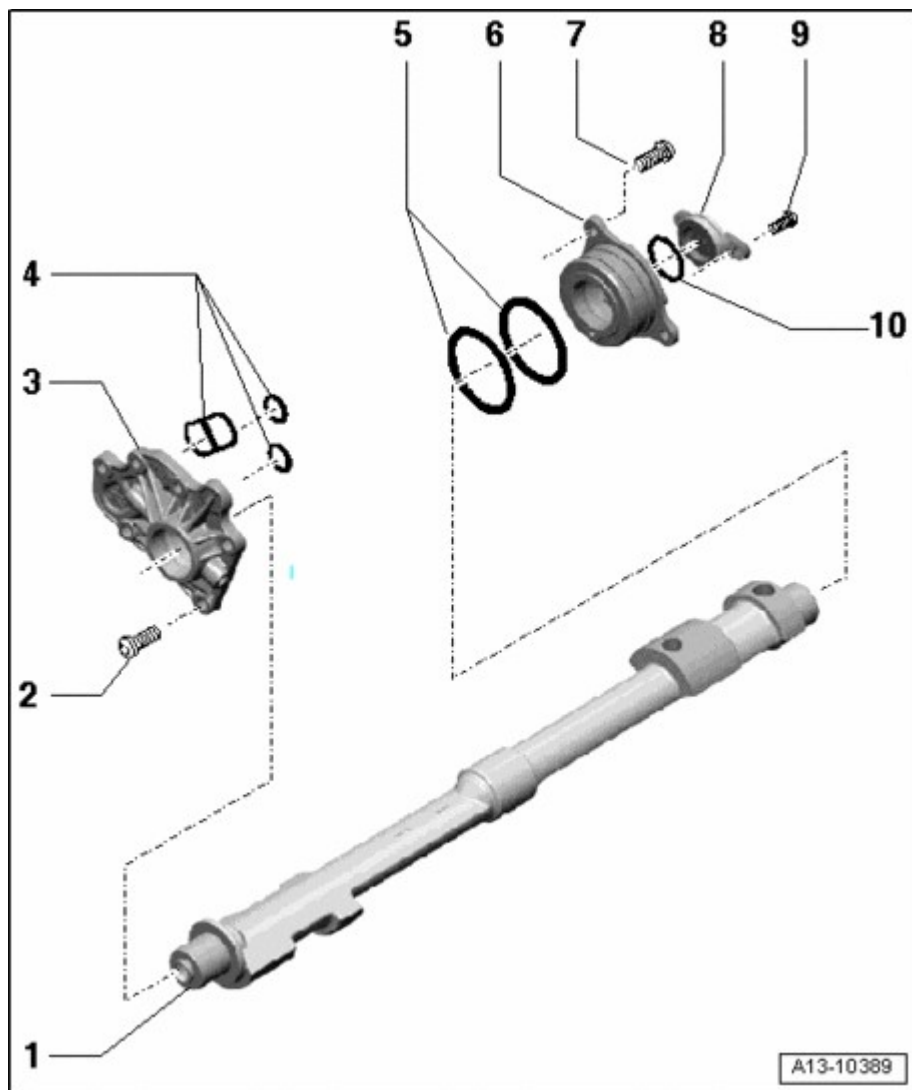


Fig. 267: Balancing Shaft, Component Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Differential shaft

- Removing and installing --> **Balancing Shaft, Removing and Installing**

2 - 9 Nm

3 - Rear bearing cap

- For balance shaft

4 - Seals

- For balance shaft rear bearing cap
- Replace

5 - O-rings

- Replace

6 - Front bearing cap

- For balance shaft

7 - 9 Nm

8 - Cover

- For balance shaft

9 - 5 Nm

10 - O-ring

- Replace

Balancing Shaft, Removing and Installing**Balancing Shaft, Removing and Installing****Removing**

- Remove oil pump drive chain and balance shaft --> **Power Take-Off, Oil Pump and Balancing Shaft Drive Chain, Removing and Installing.**

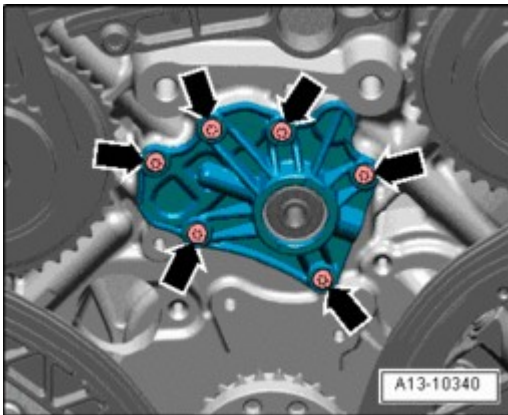


Fig. 268: Tightening Balance Shaft Rear Bearing Cap
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and remove balance shaft rear bearing cap.

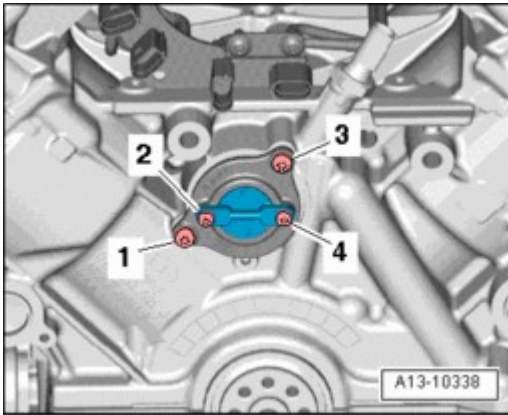


Fig. 269: Removing Bolts & Balance Shaft Cover

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - 2 - and - 4 - and remove balance shaft cover.
- Remove bolts - 1 - and - 3 - and remove balance shaft front bearing cap.

CAUTION: Ensure piston spray nozzles are not damaged when balance shaft is removed.

- Carefully remove balance shaft from cylinder block.

Installing

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

NOTE: • Replace gaskets and O-rings.

CAUTION: Ensure piston spray nozzles are not damaged when balance shaft is inserted.

- Carefully insert balance shaft in cylinder block.

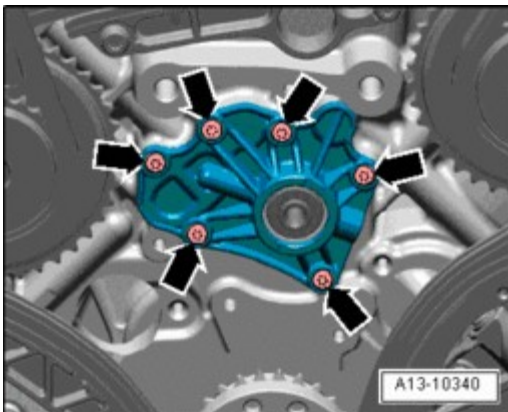
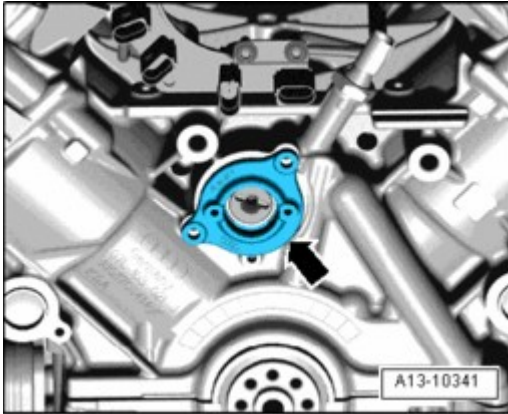


Fig. 270: Tightening Balance Shaft Rear Bearing Cap

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten balance shaft rear bearing cap - **arrows** -.
- Insert balance shaft in rear bearing cap.

**Fig. 271: Inserting Balance Shaft Front Bearing Cap**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert balance shaft front bearing cap - **arrow** -.

NOTE:

- The bolts for the balance shaft front bearing cap are installed later after the balance shaft is adjusted.
- Balance shaft, adjusting --> **Power Take-Off, Oil Pump and Balancing Shaft Drive Chain, Removing and Installing.**

- Install oil pump drive chain and balance shaft --> **Power Take-Off, Oil Pump and Balancing Shaft Drive Chain, Removing and Installing.**

Tightening specifications

Component	Nm
Balance shaft rear bearing cap to cylinder block	9

CRANKSHAFT, REMOVING AND INSTALLING**Crankshaft, Removing and Installing**--> **Crankshaft, Component Overview**--> **Main Bearing Shells, New Crankshafts, Allocating**--> **Main Bearing Shears, Used and Reworked Crankshafts, Allocating**

--> Crankshaft Dimensions

--> Axial Clearance, Measuring

--> Radial Clearance, Measuring

Crankshaft, Component Overview

Crankshaft, Component Overview

NOTE:

- For performing work, secure engine using bracket VAS 6095/1-7 on Engine and Transmission Holder VAS 6095 --> Engine, Securing to Engine and Transmission Holder.

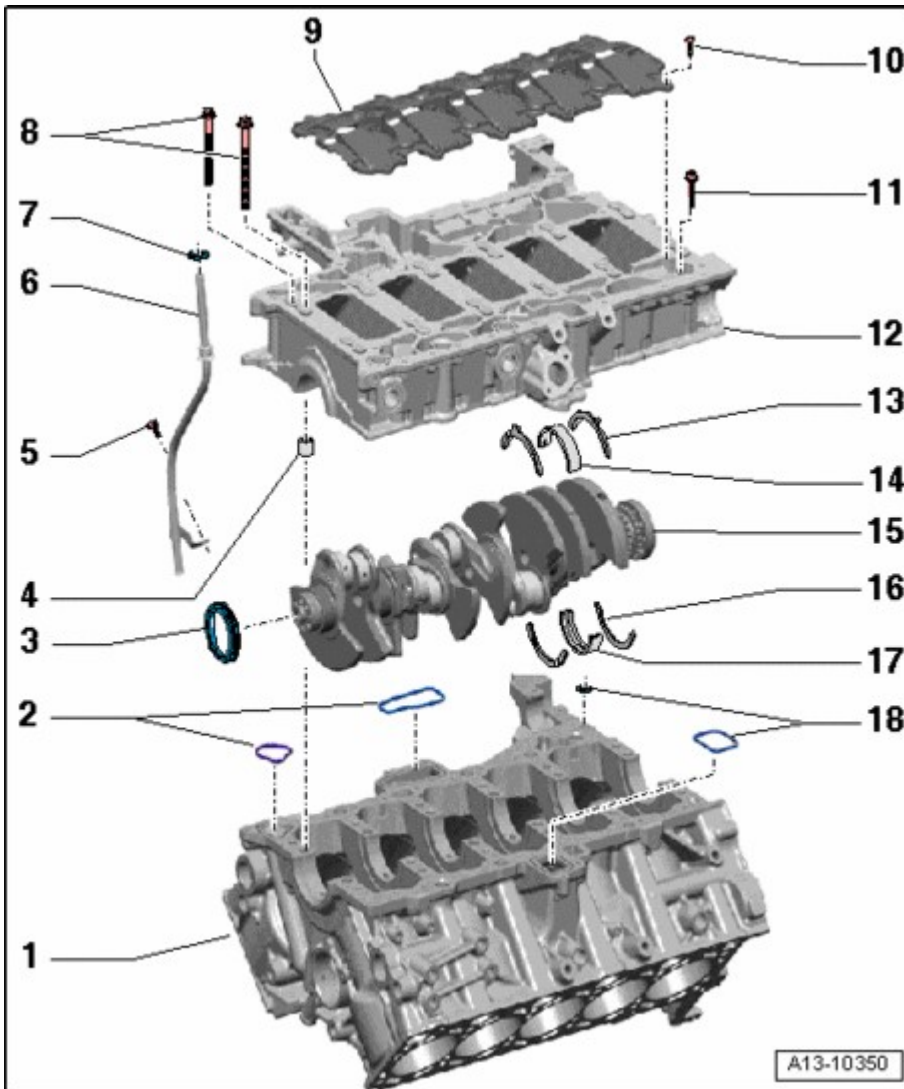


Fig. 272: Crankshaft, Component Overview

Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Cylinder block

- Paired to - **12** -
- Sealant applied on cylinder block (for guide frame) --> **Guide frame sealant application on cylinder block**

2 - Seals

- Replace

3 - Crankshaft seal, ribbed belt side

- Replacing --> **Crankshaft Seal, Belt Pulley Side, Replacing.**

4 - Alignment bushing

- 3 pieces
- Insert into guide frame
- Installed location --> **Installation position of alignment bushings**

5 - 9 Nm**6 - Guide tube for oil dipstick****7 - O-ring**

- Replace

8 - Bolts

- For guide frame
- Replace
- Various bolt sizes
- Tightening order --> **Installing guide frame**

9 - Baffle plate**10 - 9 Nm**

- Tightening order --> **Baffle plate tightening plate**

11 - Bolt

- For sealing surfaces of cylinder block/guide frame
- Different bolt lengths

- Tightening specifications and tightening sequence --> **Installing guide frame**

12 - Bearing bracket

- Paired to - 1 -
- Sealant applied on cylinder block (for guide frame) --> **Guide frame sealant application on cylinder block**
- Tightening order --> **Installing guide frame**

13 - Thrust washer

- Only at 4th crankshaft bearing
- Lubricating grooves face outward
- Note locating point in guide frame
- Measuring crankshaft axial clearance --> **Axial Clearance, Measuring**

14 - Bearing shell

- For guide frame without lubricating groove
- Do not interchange used bearing shells (mark)
- Insert new bearing shells for guide frame with proper color marking: With new crankshafts --> **Main Bearing Shells, New Crankshafts, Allocating** , with used and reworked crankshafts --> **Main Bearing Shells, Used and Reworked Crankshafts, Allocating**

15 - Crankshaft

- Measuring axial play --> **Axial Clearance, Measuring**
- Radial clearance, measuring --> **Radial Clearance, Measuring**
- Do not turn crankshaft when measuring radial play
- Crankshaft dimensions --> **Crankshaft Dimensions**

16 - Thrust washer

- Only at 4th crankshaft bearing
- Lubricating grooves face outward
- Measuring crankshaft axial clearance --> **Axial Clearance, Measuring**

17 - Bearing shell

- For cylinder block with oil groove
- Do not interchange used bearing shells (mark)
- Insert new bearing shells for cylinder block with proper color marking: With new crankshafts --> **Main Bearing Shells, New Crankshafts, Allocating** , with used and reworked crankshafts --> **Main Bearing Shells, Used and Reworked Crankshafts, Allocating**

Shears, Used and Reworked Crankshafts, Allocating

18 - Seals

- Replace

Baffle plate tightening plate

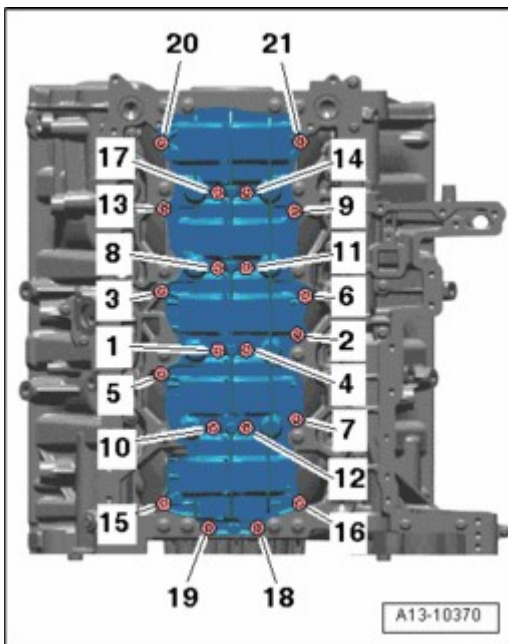


Fig. 273: Baffle Plate Bolts Tightening Sequence
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Then tighten bolts in sequence - 1 to 21 -.

Guide frame sealant application on cylinder block

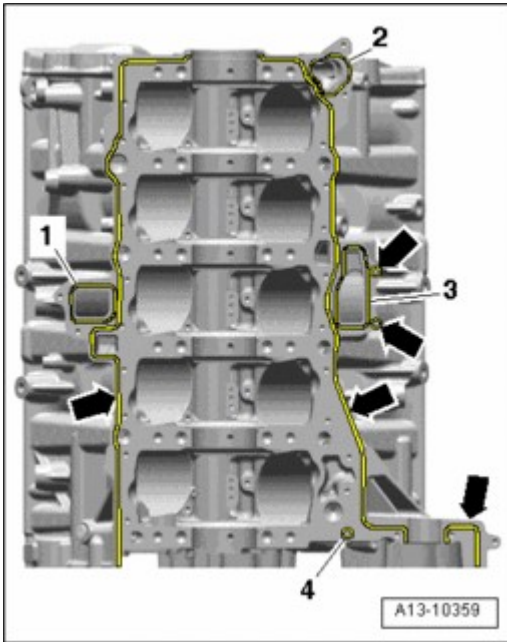


Fig. 274: Guide Frame Sealant Application On Cylinder Block
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Installation position of alignment bushings

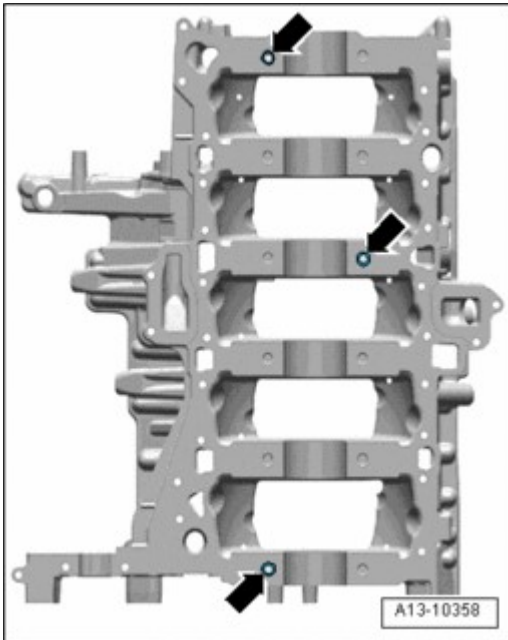


Fig. 275: Installation Position Of Alignment Bushings
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Installing guide frame

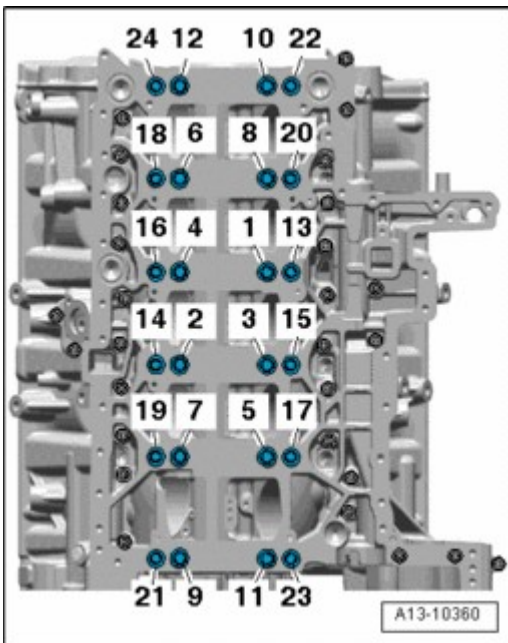


Fig. 276: Guide Frame Bolts Tightening Sequence
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Replace bolts - **1 to 24** -.

- Tighten bolts for guide frame as follows:
- Tighten bolts - **1 to 12** - to 30 Nm using a torque wrench.
- Tighten bolts - **13 to 24** - to 20 Nm using a torque wrench.
- Tighten bolts - **1 to 12** - to 50 Nm using a torque wrench.
- Tighten bolts - **13 to 24** - to 30 Nm using a torque wrench.
- Tighten bolts - **1 to 12** - 90 (1 / 4 turn) using a rigid wrench.
- Tighten bolts - **13 to 24** - 90 (1 / 4 turn) using a rigid wrench.
- Tighten cylinder block/guide frame bolts - **dark shaded** - in a diagonal sequence to 9 Nm.

Main Bearing Shells, New Crankshafts, Allocating

Main Bearing Shells, New Crankshafts, Allocating

Allocation of crankshaft bearing shells for cylinder block

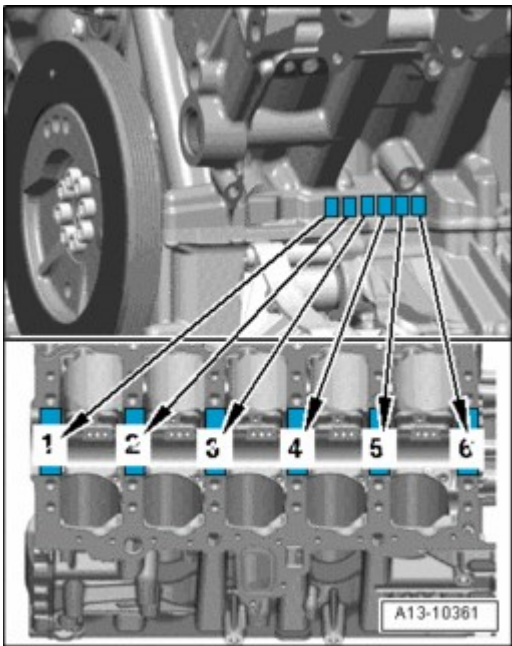


Fig. 277: Allocation Of Crankshaft Bearing Shells For Cylinder Block
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Letter on cylinder block	Color of bearing

2009 Audi S8 Quattro

ENGINE 5.2 Liter 10-Cyl. 4V Engine Mechanical, Engine Code(s): BSM - S8

R=	Red
G=	Yellow
B=	Blue

NOTE:

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

Allocation of crankshaft bearing shells for guide frame - Version I

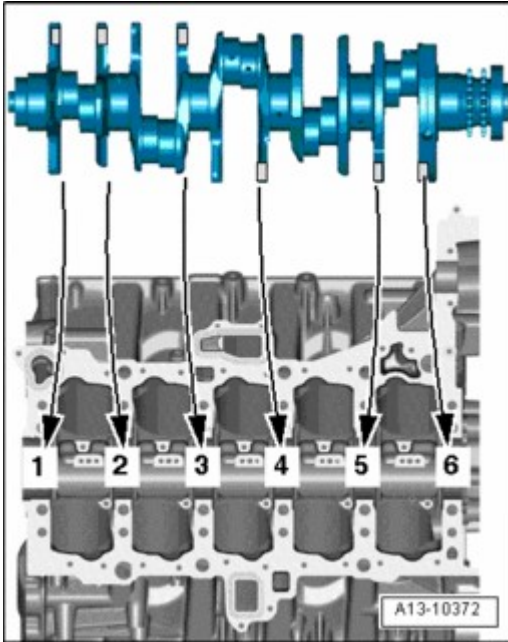


Fig. 278: Allocation Of Crankshaft Bearing Shells For Guide Frame - Version I
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

Allocation of crankshaft bearing shells for guide frame - Version II

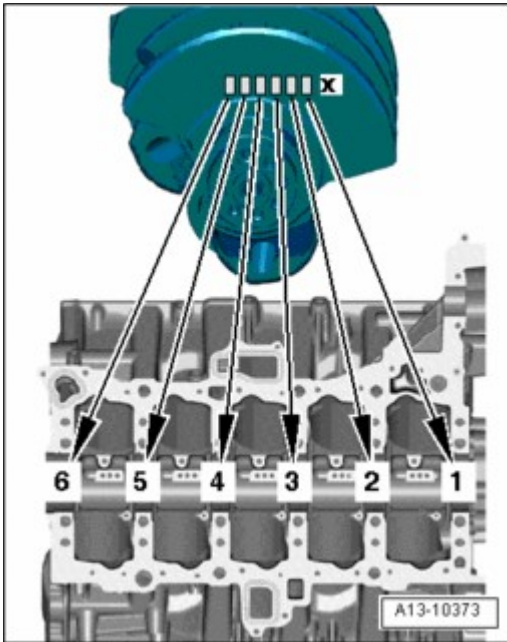


Fig. 279: Allocation Of Crankshaft Bearing Shells For Guide Frame - Version II
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Bearing shells with correct thickness are allocated to guide frame in the factory. Colored dots on sides of bearing shells serve for identifying bearing shell thickness.
- Allocation of bearing shells to guide frame is marked by one colored dot each on front crankshaft counterweight as shown in the illustration. The "X" marks the end of the letter series and stand next to color identification for bearing 1, belt pulley side.

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

Main Bearing Shears, Used and Reworked Crankshafts, Allocating

Main Bearing Shears, Used and Reworked Crankshafts, Allocating

Allocation of crankshaft bearing shells for cylinder block

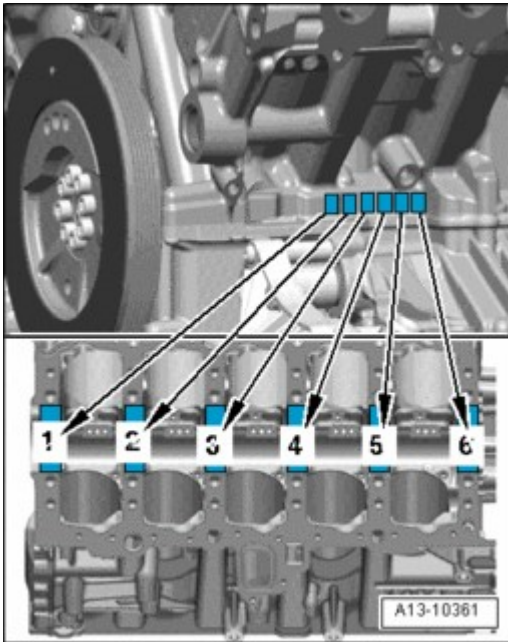


Fig. 280: Allocation Of Crankshaft Bearing Shells For Cylinder Block
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Bearing shells are allocated to cylinder block corresponding to color markings stamped into cylinder block.
- For used and reworked crankshafts, the main crankshaft journals must be measured in order to allocate the matching bearing shells.
- Basic dimension of main crankshaft journals = Diameter 65.00 mm.
- Repair stage of main crankshaft journals = Diameter 64.75 mm.
- Thicker, over-sized bearing shells are available for reworked crankshafts. These have the same color markings as the original-size bearing shells.

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

Allocation of crankshaft bearing shells for guide frame

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

Main crankshaft	Color identification of bearing shells for guide frame
-----------------	--

2009 Audi S8 Quattro

ENGINE 5.2 Liter 10-Cyl. 4V Engine Mechanical, Engine Code(s): BSM - S8

journals diameter			
Dimensions in mm	Red	Yellow	Blue
Basic dimension 65.000	64.978 to 64.972	64.972 to 64.965	64.965 to 64.958
Repair stage 64.750 1)	64.728 to 64.722	64.722 to 64.715	64.715 to 64.708
1) The same color marking is valid for the thicker over-sized bearing for reworked crankshafts as for new crankshafts despite the greater bearing thickness.			

Crankshaft Dimensions

Crankshaft Dimensions

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

Axial Clearance, Measuring

Axial Clearance, Measuring

Special tools, testers and auxiliary items required

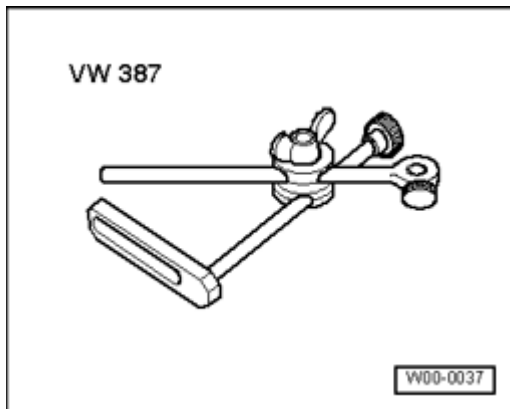
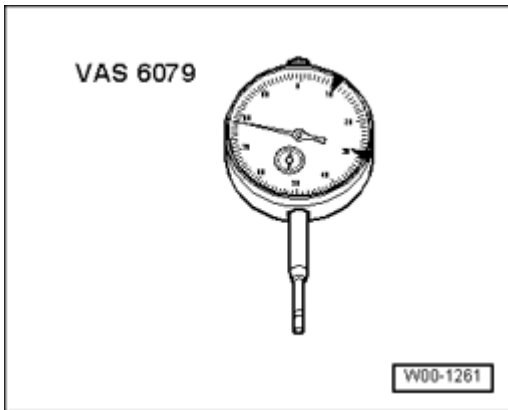


Fig. 281: Dial Gauge Holder VW 387

Courtesy of VOLKSWAGEN UNITED STATES, INC.

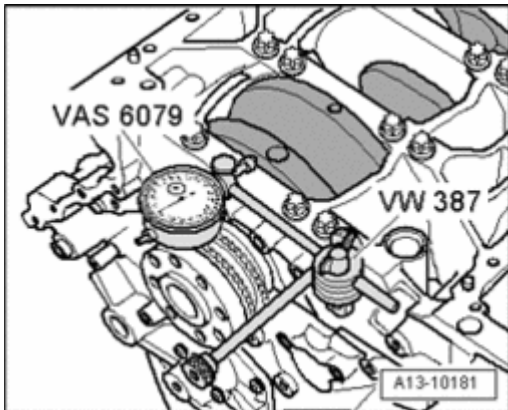
- Dial gauge holder VW 387

**Fig. 282: Dial Gauge VAS 6079**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Dial gauge VAS 6079

Procedure

**Fig. 283: Securing Dial Gauge VAS 6079 With Dial Gauge Holder VW 387 To Cylinder Block**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure Dial Gauge VAS 6079 with Dial Gauge Holder VW 387 to cylinder block as shown in illustration.
- Position dial gauge against crankshaft counterweight.
- Press crankshaft by hand against gauge and set gauge to "0".
- Press crankshaft off gauge and read value.
- Axial clearance: 0.090 to 0.158 mm.

Radial Clearance, Measuring

Radial Clearance, Measuring

Special tools, testers and auxiliary items required

- Plastigage

Procedure**NOTE:**

- **Do not interchange used bearings**
- **Bearing shells that are worn down to the nickel layer must be replaced.**
- Remove guide frame and clean journals.
- Place Plastigage over entire width of bearing journal or into bearing shells.
- Plastigage must rest in center of bearing shell.
- Install guide frame and tighten to 30 Nm. Do not turn crankshaft.
- Remove guide frame again.
- Compare width of Plastigage with measuring scale.

Radial clearance:

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

PISTON AND CONNECTING ROD, DISASSEMBLING AND ASSEMBLING**Piston and Connecting Rod, Disassembling and Assembling**

--> **Piston and Connecting Rod, Component Overview**

--> **Piston and Cylinder Dimensions**

--> **Connecting Rod, Measuring Radial Clearance**

Piston and Connecting Rod, Component Overview**Piston and Connecting Rod, Component Overview****NOTE:**

- **Oil injector jet for piston cooling --> Oil spray jet for piston cooling**

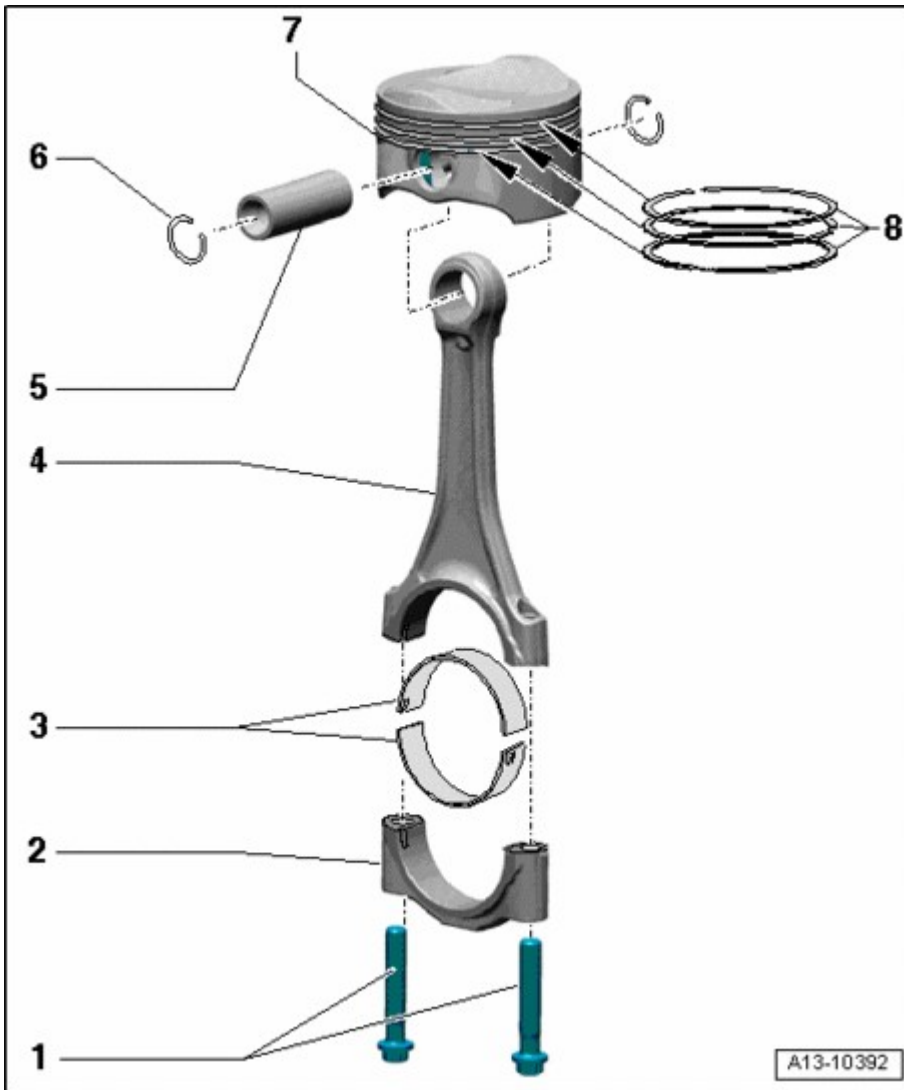


Fig. 284: Piston And Connecting Rod, Component Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Connecting rod bolt - 50 Nm plus an additional 90 ($\frac{1}{4}$ turn)

- Replace
- Lubricate threads and contact surface
- Tighten to 50 Nm to measure radial play, do not turn further

2 - Connecting rod bearing cap

- Do not interchange
- Mark affiliation to cylinder with paint --> **Mark connecting rod**
- Installation position of connecting rod pairs --> **Connecting rod, installed location**

3 - Bearing shells

- Check that retaining tabs are secured
- Do not interchange used bearing shells (mark, but not on the running surface)
- Radial clearance, measuring --> **Connecting Rod, Measuring Radial Clearance**
- To measure radial play, tighten bolts - **1** - to 60 Nm but no further
- Over-sized bearings are available for reworked crankshaft connecting rod journals

4 - Connecting rod

- Only replace as set
- Mark affiliation to cylinder with paint --> **Mark connecting rod**
- Installation position of connecting rod pairs --> **Connecting rod, installed location**
- Axial play for each new connecting rod pair: 0.20 to 0.38 mm
- Radial clearance, measuring --> **Connecting Rod, Measuring Radial Clearance**

5 - Piston pin

- If tight, heat piston to 60 C
- Removing and installing using a drift VW 222 A

6 - Circlip

7 - Piston

- Installation position of pistons --> **Piston installation position**
- Piston and cylinder dimension, piston allocation to cylinder bore --> **Piston and Cylinder Dimensions**
- Checking --> **Checking piston**
- Install with piston ring compressor
- Measuring cylinder bore --> **Measuring cylinder bore**

8 - Piston rings

- Offset gaps by 120
- Use piston ring pliers for removal and installation
- "TOP" marking or inscribed side must point to piston head
- Gap, measuring --> **Piston ring end gap, measuring**
- Measuring side clearance --> **Measuring piston ring side clearance**

Piston ring end gap, measuring

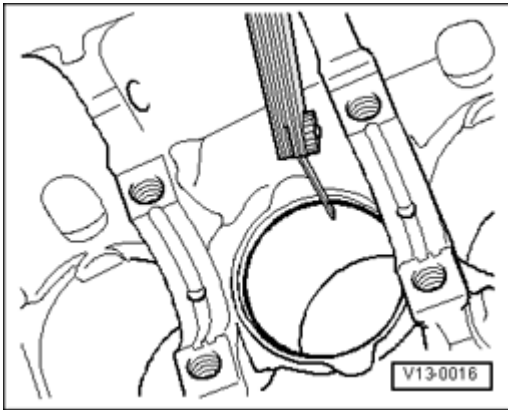


Fig. 285: Piston Ring End Gap, Measuring

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Slide piston ring down from above at a right angle to cylinder wall until it is approximately 15 mm from bottom edge of cylinder.
- When sliding in, use a piston without piston rings.

Piston ring dimensions in mm	New	Wear limit
1. Compression ring	0.20 to 0.35	0.80
2. Compression ring	0.20 to 0.40	0.80
Oil scraping ring	0.20 to 0.40	1)
1) Not determined yet.		

Measuring piston ring side clearance

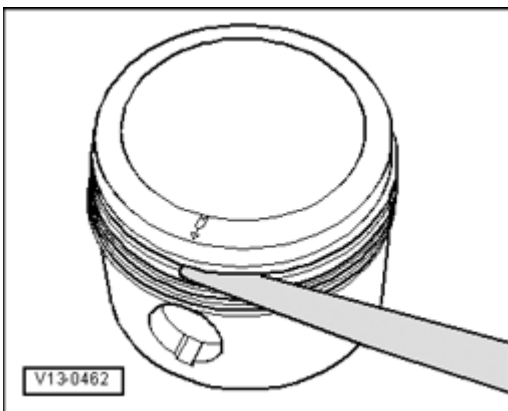


Fig. 286: Measuring Piston Ring Side Clearance

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clean ring groove of piston before checking.

Piston ring dimensions in mm	New	Wear limit
1. Compression ring	0.035 to 0.085	0.200
2. Compression ring	0.005 to 0.045	0.200

Oil scraping ring	0.01 to 0.05	0.15
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Checking piston

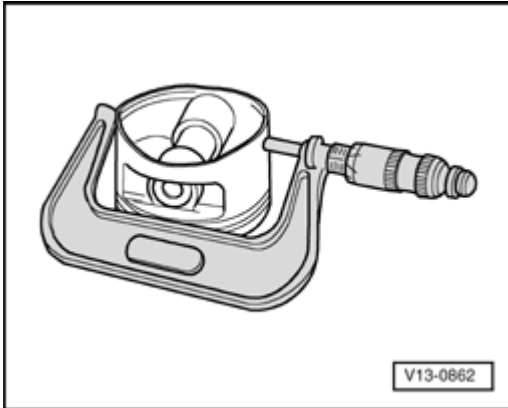


Fig. 287: Checking Piston

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Measure approximately 15 mm from lower edge, at a 90 angle to piston pin axis using an external micrometer 75 to 100 mm.
- Maximum deviation from nominal dimension: 0.03 mm.

Nominal dimension --> **Piston and Cylinder Dimensions.**

Measuring cylinder bore

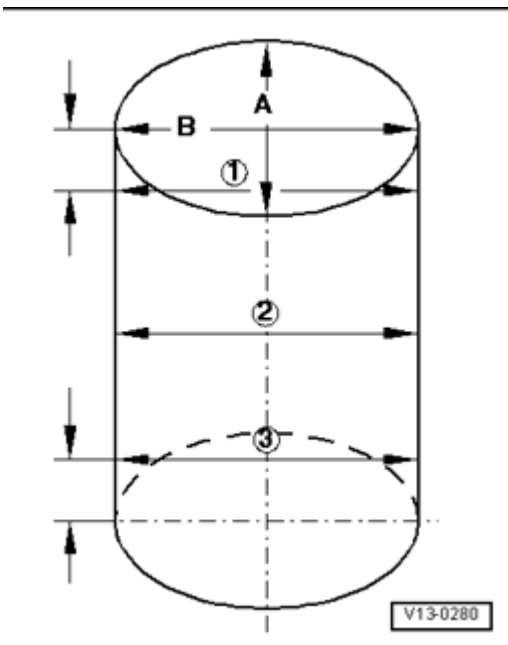


Fig. 288: Measuring Cylinder Bore

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using an internal dial gauge 50 to 100 mm, measure at 3 points in diagonal sequence horizontally - **A** - and vertically - **B** -.
- Maximum deviation from nominal dimension: 0.08 mm.

Nominal dimension --> **Piston and Cylinder Dimensions.**

Piston installation position

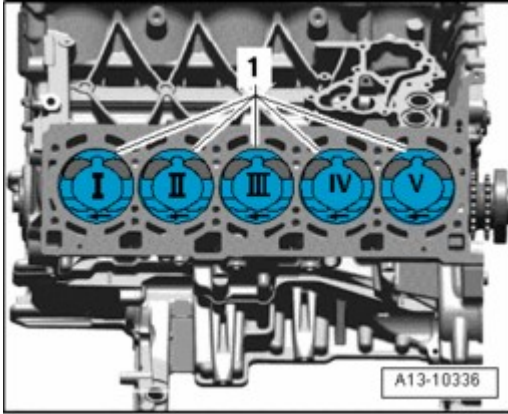


Fig. 289: Piston Installation Position

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Identify allocation to cylinder with paint on piston crown.

NOTE:

- **Do not use a center punch or scribe, since the piston head coating will be damaged.**

Installation position:

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

Mark connecting rod

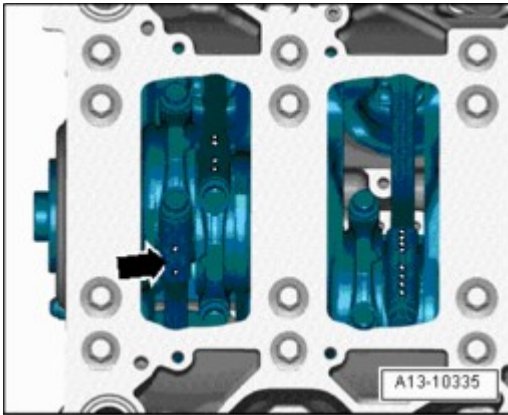


Fig. 290: Marking Connecting Rod

Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- Only replace connecting rod as a set.
- Do not interchange connecting rod bearings.

- Before removing, mark allocation of connecting rod and connecting rod bearing caps to each other and to cylinder with paint - **arrow** -.

Connecting rod, installed location

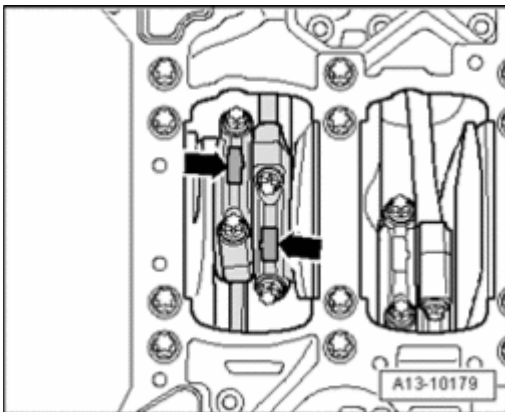
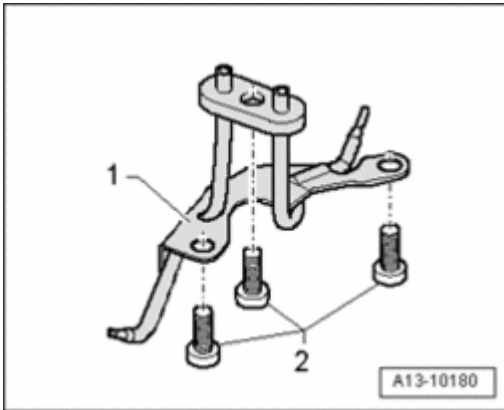


Fig. 291: Connecting Rod, Installed Location

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Molded tabs - **arrows** - at the beveled surfaces of the connecting rod pairs 1 and 2, 3 and 4, 5 and 6, 7 and 8 as well as 9 and 10 must point toward each other.

Oil spray jet for piston cooling

**Fig. 292: Oil Spray Jet For Piston Cooling**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

1. Oil spray jet
2. Bolts - 9 Nm. Insert with locking compound; Locking compound .

CAUTION:

- Do not bend piston spray nozzles.
- Bend piston spray nozzles must be replaced.

Piston and Cylinder Dimensions**Piston and Cylinder Dimensions**

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

Cylinder bore diameter mm	Piston diameter mm
84.510 ± 0.005	84.490 1)
84.610 ± 0.005	84.590 1)
1) Measurement with graphite coating (thickness = 0.01 mm). The graphite coating wears off.	

Connecting Rod, Measuring Radial Clearance**Connecting Rod, Measuring Radial Clearance****Special tools, testers and auxiliary items required**

- Plastigage

Procedure

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

- Remove connecting rod bearing caps again.
- Compare width of Plastigage with measuring scale.

Radial clearance:

- New: 0.020 to 0.069 mm.
- Wear limit: 0.120 mm.
- Replace bolts for connecting rod bearings.

15 - ENGINE - CYLINDER HEAD, VALVETRAIN

CYLINDER HEAD, REMOVING AND INSTALLING

Cylinder Head, Removing and Installing

--> **Cylinder Head, Component Overview**

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

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

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

--> **Compression, Checking**

Cylinder Head, Component Overview

Cylinder Head, Component Overview

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

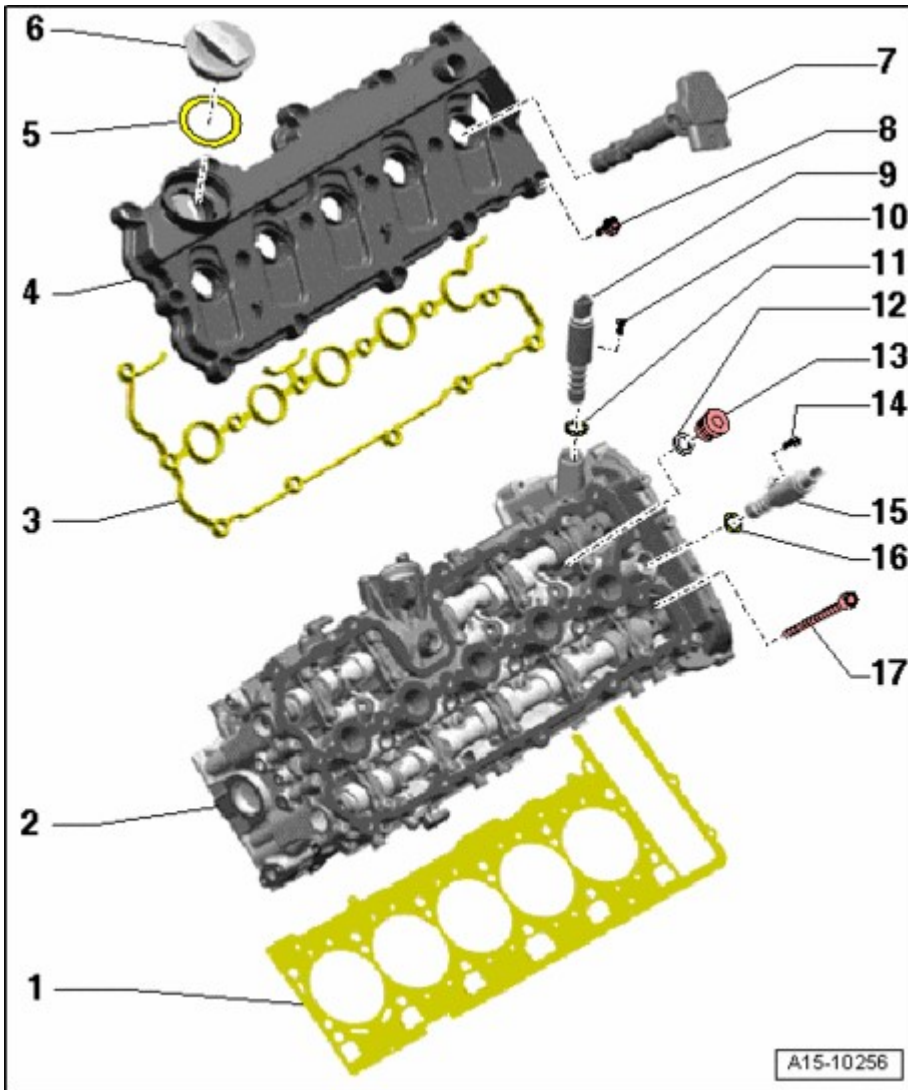


Fig. 293: Cylinder Head, Component Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Cylinder head gasket

- Replacing --> **Cylinder Head, Removing and Installing.**
- Installation position: Part Number, points to cylinder head
- After replacing, change coolant and engine oil

2 - Cylinder Head

- Removing and installing --> **Cylinder Head, Removing and Installing**
- Check for distortion --> **Checking cylinder head for distortion**
- Reworking dimension --> **Checking cylinder head for distortion**
- After replacing, change coolant and engine oil

3 - Cylinder head cover gasket

- Replace if damaged or leaking

4 - Cylinder head cover

- Removing and installing: Left --> **Left Cylinder Head Cover, Removing and Installing** , right --> **Right Cylinder Head Cover, Removing and Installing**

5 - Gasket

- For cap
- Replace if damaged or leaking

6 - Cap

7 - Ignition coil

- Remove with Ignition Coil Puller T40039

8 - Special bolt - 9 Nm

- Replace if seal is damaged
- Note tightening sequence --> **Fig. 302**

9 - Camshaft Adjustment Valve 2 N208

10 - 2.4 Nm

11 - O-ring

- Replace

12 - Seal

- Replace

13 - Locking bolt - 35 Nm

14 - 2.4 Nm

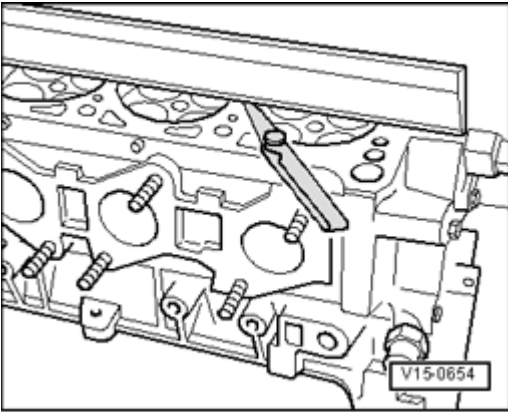
15 - Camshaft Adjustment Valve 2 (exhaust) N319

16 - O-ring

- Replace

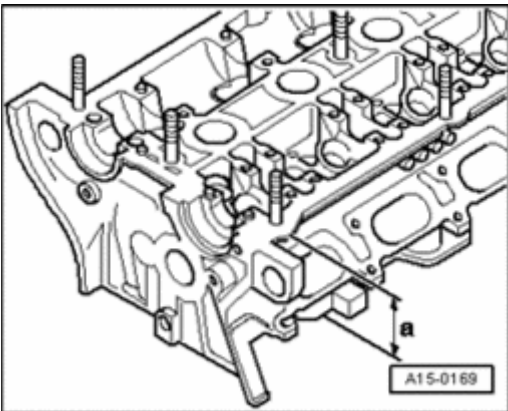
17 - Cylinder head bolt

- Replace
- Observe sequence for loosening --> **Fig. 316**
- Note tightening sequence --> **Fig. 320**

Checking cylinder head for distortion**Fig. 294: Checking Cylinder Head For Distortion**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check cylinder head at multiple points for distortion, using straight edge and feeler gauges.
- Max. permissible distortion: 0.1 mm.

Reworking dimension, cylinder head**Fig. 295: Reworking Dimension, Cylinder Head**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

- Minimum dimension: - **a** - = 139.5 mm.

Left Cylinder Head Cover, Removing and Installing

Left Cylinder Head Cover, Removing and Installing

Special tools, testers and auxiliary items required

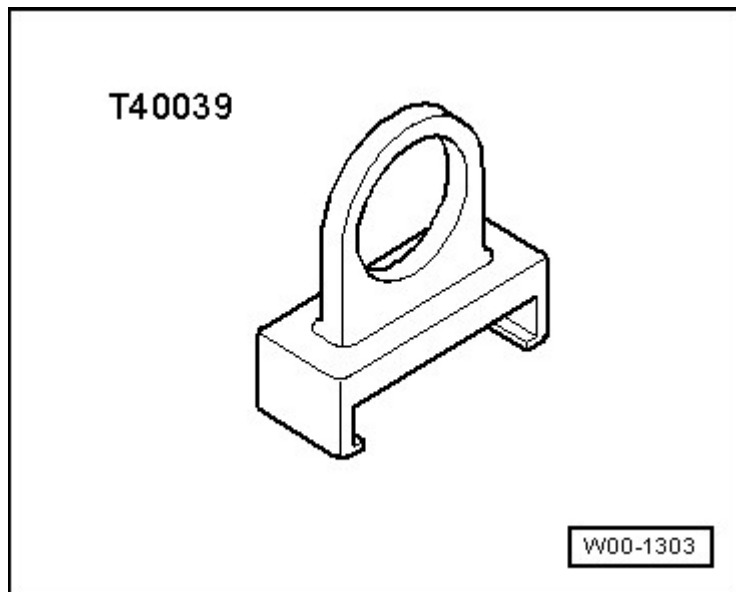


Fig. 296: Ignition Coil Puller T40039
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Ignition Coil Puller T40039

Removing

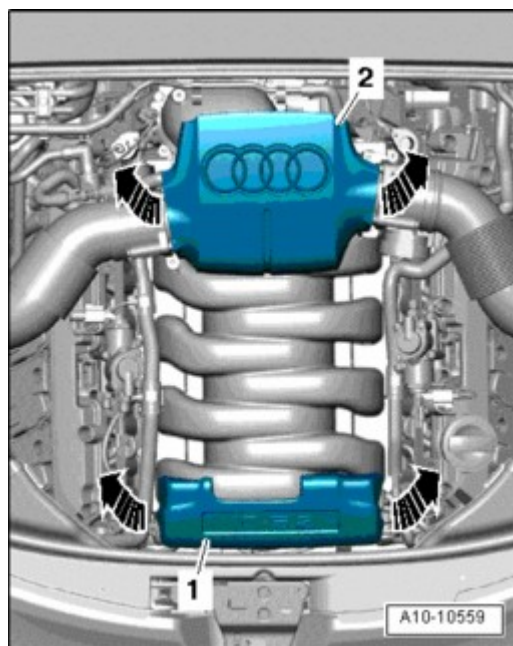


Fig. 297: Removing Front Engine Cover And Rear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front engine cover - **1** - and rear - **2** - - **arrows** -.

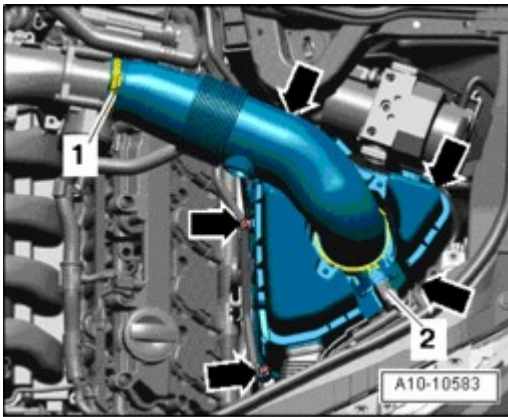


Fig. 298: Mass Air Flow (MAF) Sensor 2 G246 Electrical Connector, Intake Manifold Air Duct Hose & Air Filter Housing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

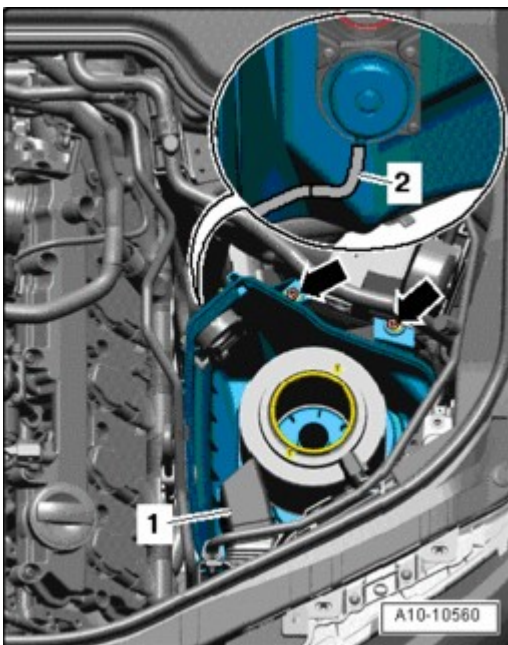


Fig. 299: Air Duct, Bolts, Air Filter Housing & Air Flap Vacuum Hose
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove air duct - **1** -.

- Remove bolts - **arrows** -.
- Tilt lower part of air filter housing and remove air flap vacuum hose.
- Remove lower part of left air filter housing.

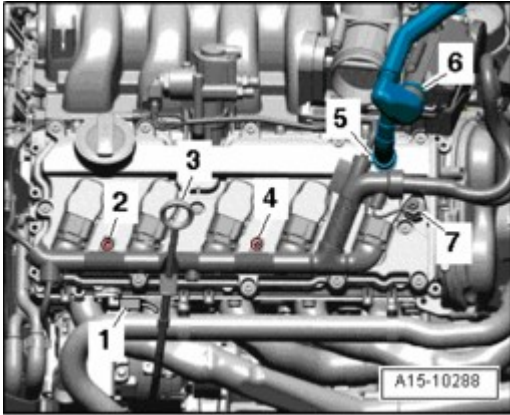


Fig. 300: Identifying Separator, Cylinder Head Cover, Oil Dipstick, Electrical Harness Connectors & Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove crankcase ventilation hose from oil separator - **6** - and from cylinder head cover - **5** -.
- Remove oil dipstick - **3** - from guide tube.
- Disconnect electrical connectors - **1** - and - **7** -.
- Remove bolts - **2** - and - **4** -.
- Disconnect electrical connectors to ignition coils.
- Free up electrical wiring harness by removing harness bracket.

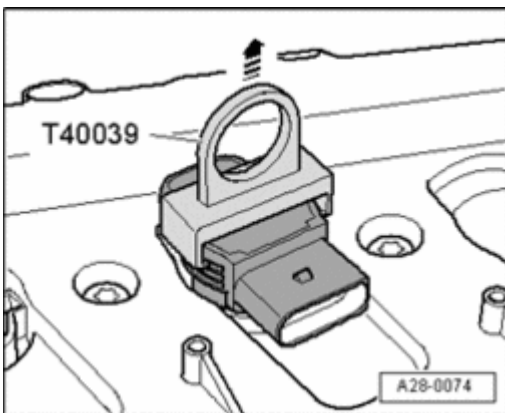


Fig. 301: Removing Ignition Coils Using Ignition Coil Puller T40039

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove ignition coils using Ignition Coil Puller T40039.

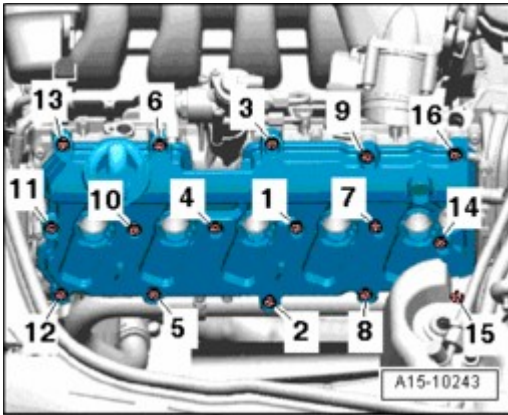


Fig. 302: Identifying Bolts Removal Sequence

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen bolts in sequence - **16 to 1** - and remove them.
- Remove left cylinder head cover.

Installing

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

NOTE:

- **Replace cylinder head cover if damaged or leaking.**
- **Replace bolts for cylinder head cover if gasket is damaged.**

- Clean sealing surfaces, they must be free of oil and grease.
- Tighten cylinder head cover in sequence - **1 to 16** -.
- Install left air filter housing --> **24 - MULTIPOINT FUEL INJECTION (MPI)** .

Tightening Specifications

Component	Nm
Cylinder head cover to cylinder head	9
Wiring for ignition coils at cylinder head cover	5

Right Cylinder Head Cover, Removing and Installing

Right Cylinder Head Cover, Removing and Installing

Special tools, testers and auxiliary items required

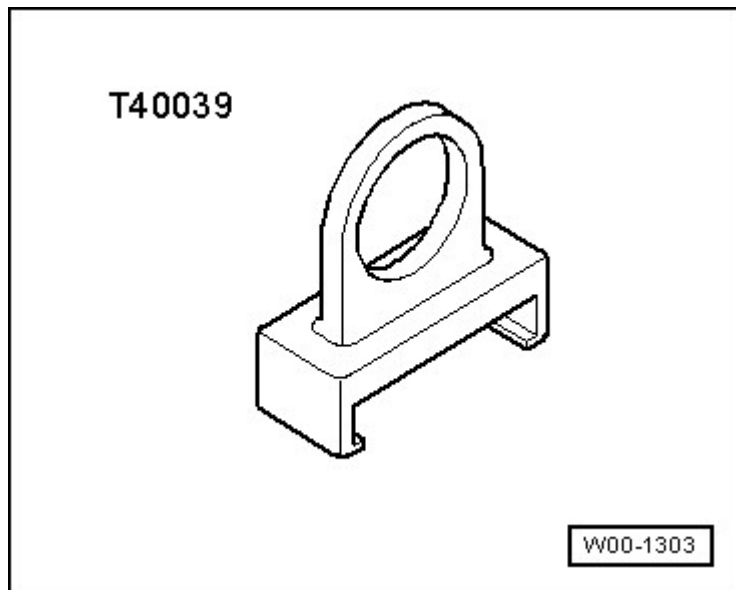


Fig. 303: Ignition Coil Puller T40039
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Ignition Coil Puller T40039

Removing

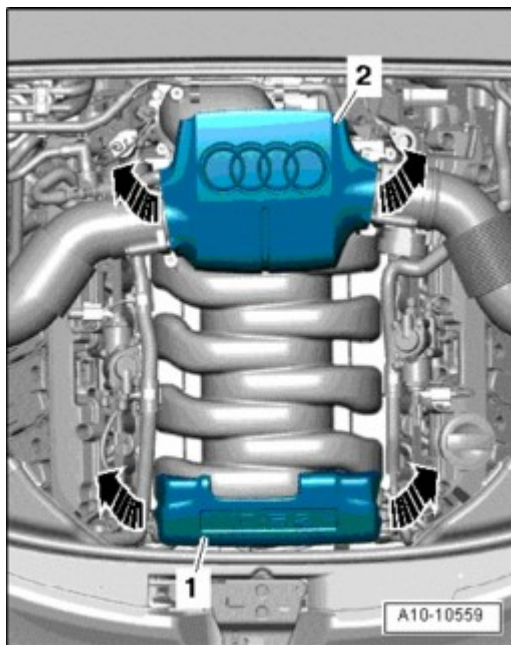


Fig. 304: Removing Front Engine Cover And Rear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front engine cover - **1** - and rear - **2** - - **arrows** -.

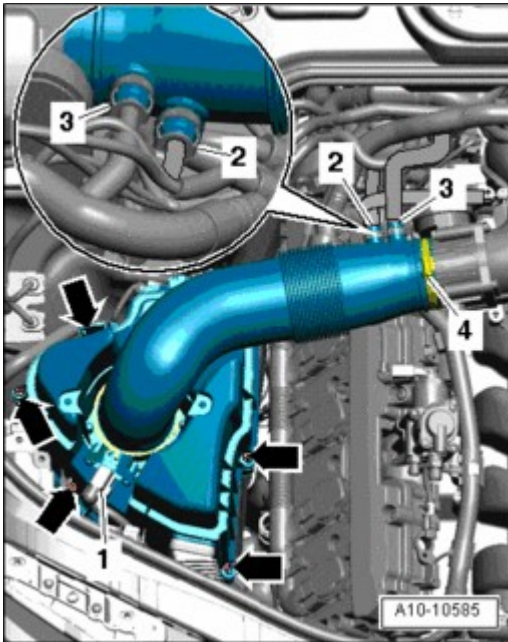


Fig. 305: Mass Air Flow (MAF) Sensor G70 Electrical Connector, Air Guide Hose Vacuum Hose, Air Guide Hose & Hose Clamps

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - 1 - for mass air flow (MAF) sensor G70.
- Disconnect vacuum hose - 2 - from air guide hose.
- Loosen hose clamps and lay aside air guide hose - 4 -.

CAUTION: Hose connectors - 3 - must not be opened.

- Remove bolts - **arrows** - and remove right upper part of air filter housing.
- Remove front part of right front wheel housing liner --> **66 - EXTERIOR EQUIPMENT** .

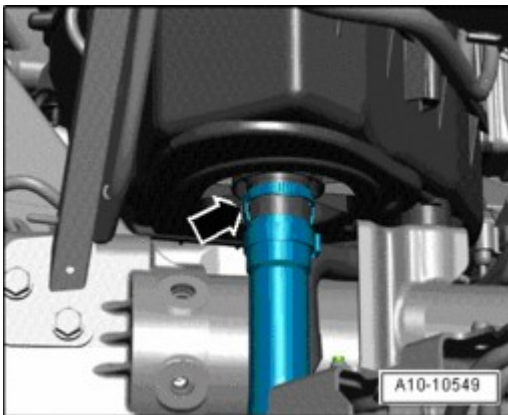


Fig. 306: Lower Air Guide Hose

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove lower air guide hose - **arrow** - from right upper part of air filter housing.

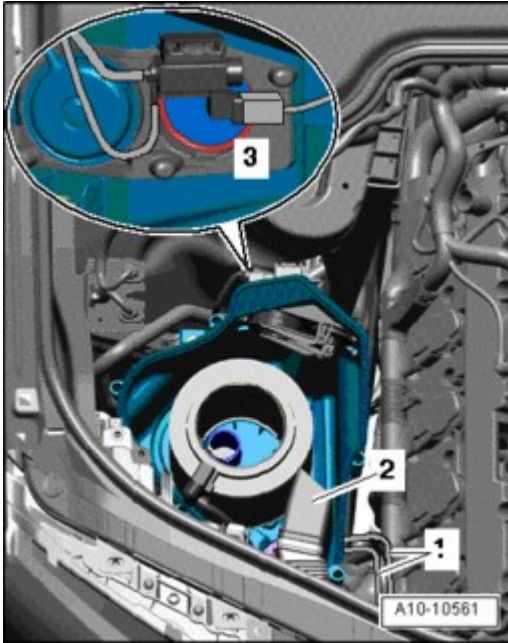


Fig. 307: Vacuum Hoses, Air Duct, Bolts & Intake Air Switch-Over Valve N335 Electrical Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect both vacuum hoses - **1** -.
- Remove air duct - **2** -.
- Remove bolts - **arrows** -.
- Tilt lower part of air filter housing and disconnect electrical connector - **3** - on Intake Air Switch-Over valve N335.
- Remove lower part of right air filter housing.

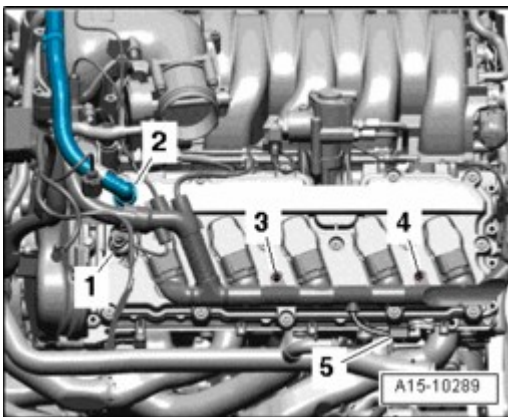


Fig. 308: Identifying Crankcase Ventilation Hose, Electrical Harness Connectors & Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect crankcase ventilation hose - **2** -.

- Disconnect electrical connectors - **1** - and - **5** -.
- Remove bolts - **3** - and - **4** -.
- Disconnect electrical connectors to ignition coils.
- Free up electrical wiring harness by removing harness bracket.

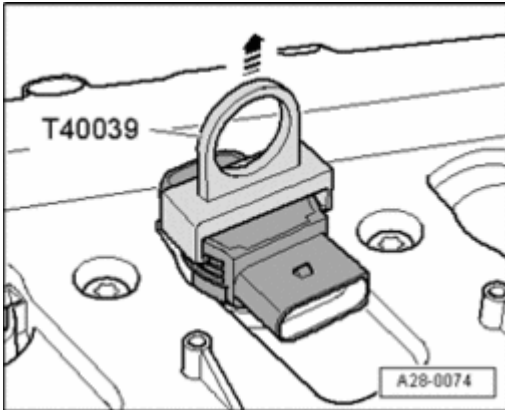


Fig. 309: Removing Ignition Coils Using Ignition Coil Puller T40039
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove ignition coils using Ignition Coil Puller T40039.

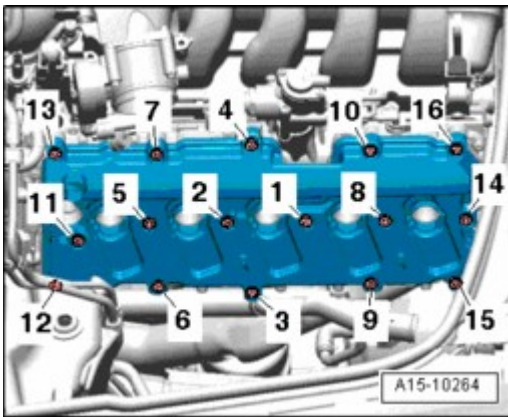


Fig. 310: Right Cylinder Head Cover Bolts Removal Sequence
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen bolts in - **16 to 1** - sequence and remove them.
- Remove cylinder head cover.

Installing

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

NOTE:

- **Replace cylinder head cover if damaged or leaking.**

2009 Audi S8 Quattro

ENGINE 5.2 Liter 10-Cyl. 4V Engine Mechanical, Engine Code(s): BSM - S8

- **Replace bolts for cylinder head cover if gasket is damaged.**

- Clean sealing surfaces, they must be free of oil and grease.
- Tighten cylinder head cover in sequence - **1 to 16** -.
- Install right air filter housing --> **24 - MULTIPOINT FUEL INJECTION (MPI)** .

Tightening Specifications

Component	Nm
Cylinder head cover to cylinder head	9
Wiring for ignition coils at cylinder head cover	5

Cylinder Head, Removing and Installing

Cylinder Head, Removing and Installing

Special tools, testers and auxiliary items required

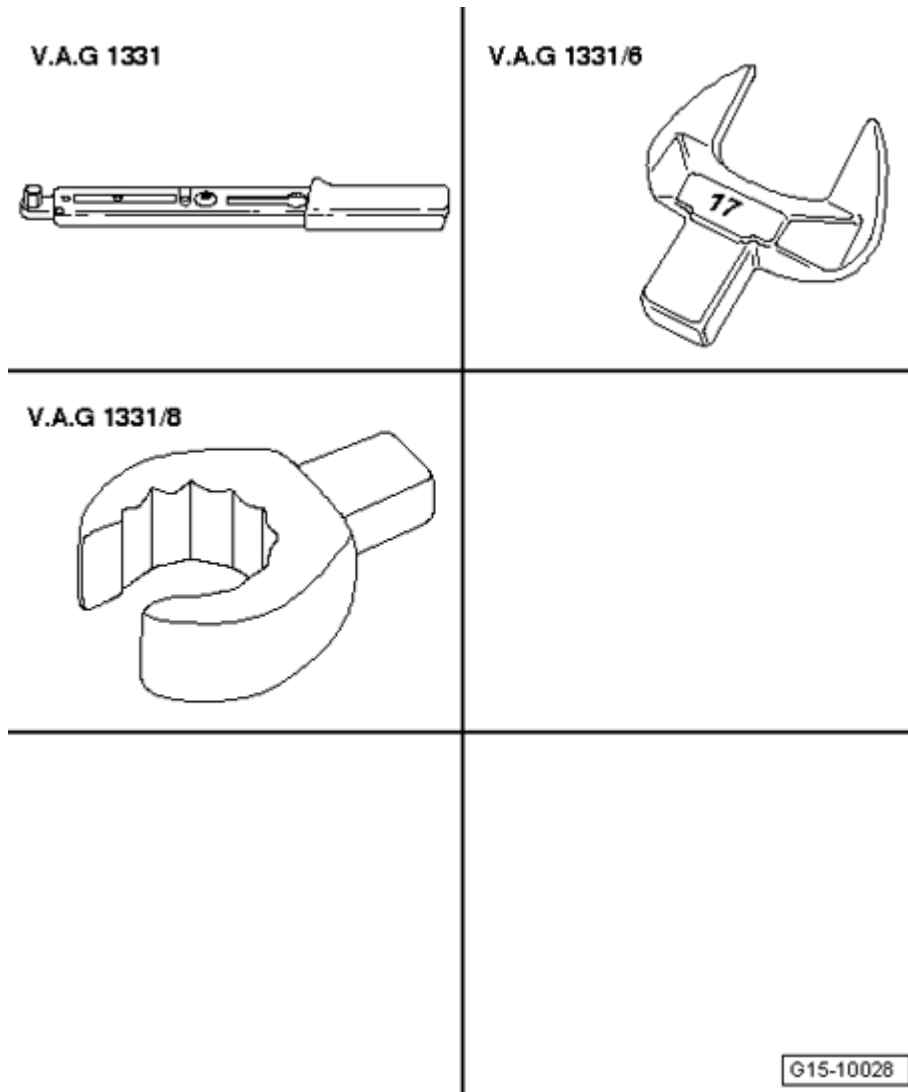


Fig. 311: Identifying Special Tools - Cylinder Head, Removing And Installing
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Torque Wrench V.A.G 1331
- SW 17 socket V.A.G 1331/6
- SW 14 socket, open ring V.A.G 1331/8

Removing

NOTE:

- All cable ties opened or cut during engine removal must be reinstalled at the same locations during installation.
- The following removal and installation procedure is for the left cylinder head. The procedure for the other side is identical.

- Remove engine --> **Engine, Removing.**

- Leave engine with transmission installed on scissor lift platform VAS 6131 A.
- Remove exhaust system tract: Left --> **Left Exhaust System Tract, Removing and Installing** , right --> **Right Exhaust System Tract, Removing and Installing**.

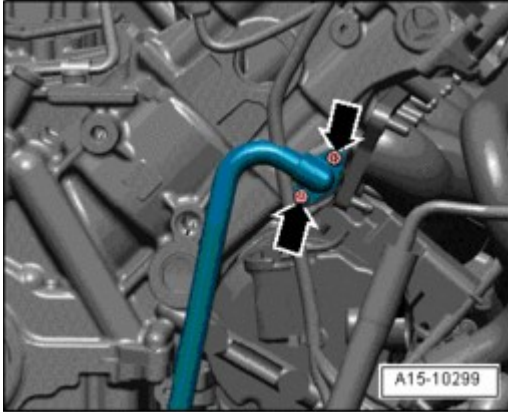


Fig. 312: Front Secondary Air Injection Connecting Piece From Cylinder Head
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front secondary air injection connecting piece from cylinder head - **arrows** -.
- Remove intake manifold --> **24 - MULTIPOINT FUEL INJECTION (MPI)** .

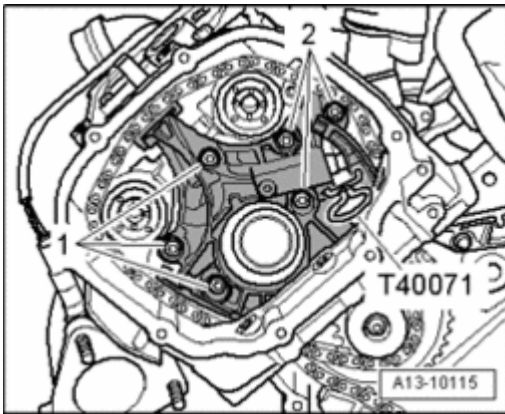


Fig. 313: Identifying Bolts For Left Chain Tensioner And Left Camshaft Timing Chain
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove camshaft timing chains from camshafts --> **Camshaft Timing Chain, Removing from Camshaft**.
- Remove bolts - **1** - and - **2** - and remove right chain tensioner.

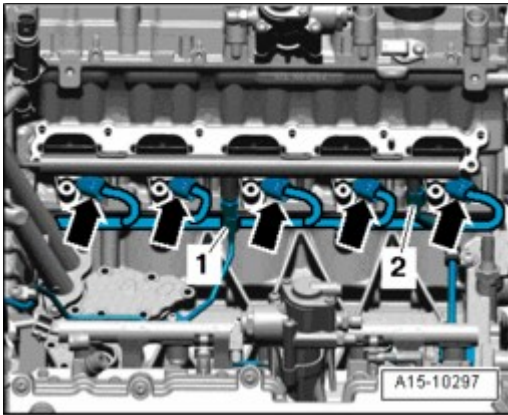


Fig. 314: Identifying Fuel Injectors Electrical Connectors & High Pressure Line
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connectors - **arrows** - at fuel injectors.
- Remove high pressure line - **2** - from connector on fuel rail.
- Remove high pressure line - **1** - from connector on fuel rail. To do this, counterhold at hex head with and open-end wrench and loosen the union nut.

NOTE:

- **Do not change bend shape of high pressure lines.**

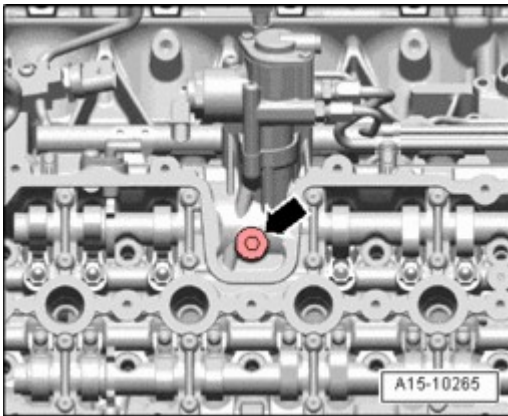


Fig. 315: Removing/Installing Locking Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove locking bolt - **arrow** -.

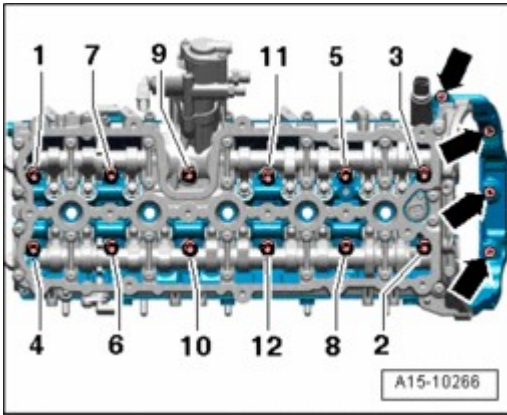


Fig. 316: Cylinder Head Bolts Removal Sequence

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Loosen cylinder head bolts in sequence - **1 to 12** - and remove them.
- Remove cylinder head and place it on a soft surface (foam).

Installing

NOTE:

- Replace cylinder head bolts.
- Replace self-locking nuts and bolts.
- Always replace bolts that are tightened to torque as well as O-rings and gaskets.
- Carefully remove sealant residue from cylinder head and cylinder block. Make sure that no long scrapes or scratches result.
- Carefully remove all grinding and sanding residue.
- There must be no oil or coolant in the blind holes for the cylinder head bolts in the cylinder block.
- Only unpack new cylinder head gasket immediately prior to installation.
- Handle gasket carefully. Damage in silicon layer and recessed area lead to leakage.
- Cylinder heads with cracks between the valve seats, or between the valve seat and the spark plug threads, can continue to be used without reducing the service life, as long as the cracks have a width of max. 0.3 mm, or only the first 4 threads of the spark plug threads are cracked.
- After installing a replacement cylinder head with camshafts installed, oil contact surfaces between roller rocker levers and cam lubricating surfaces after installing cylinder head.
- Do not remove plastic bases protecting free up valves until immediately before installing cylinder head.
- Secure all hose connections with hose clamps appropriate for the model .

- During installation, all cable ties must be re-installed at the same location.
- After working on the valvetrain and lifters, carefully rotate the crankshaft by hand at least 2 full revolutions before starting to be sure that valves do not strike the pistons.
- When replacing the cylinder head or cylinder head seal, all of the coolant and engine oil must be replaced.

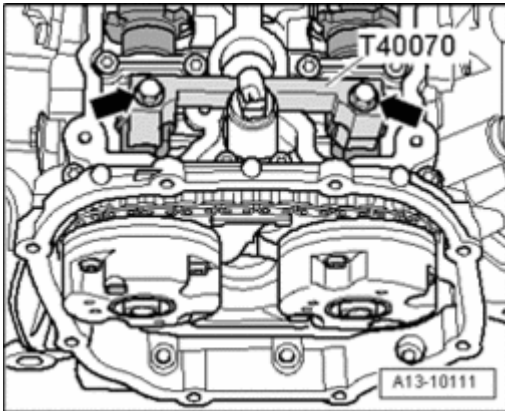


Fig. 317: Removing/Installing Camshaft Locators T40070 On Both Cylinder Heads
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check whether camshafts of both cylinder heads stand in "TDC" position.
- The camshaft clamp T40070 must be installed on both cylinder heads and tightened to 25 Nm - **arrows** -.

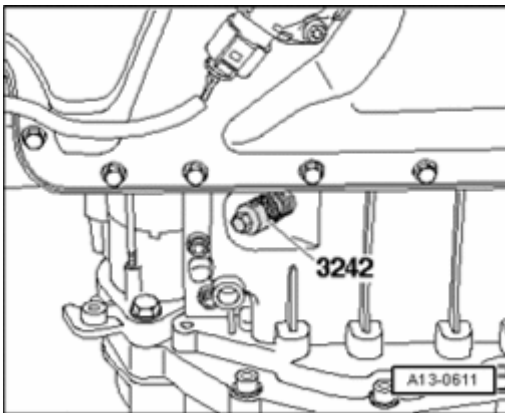


Fig. 318: Securing Crankshaft In TDC Position Using Crankshaft Holder 3242
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Crankshaft holder 3242 must be installed.

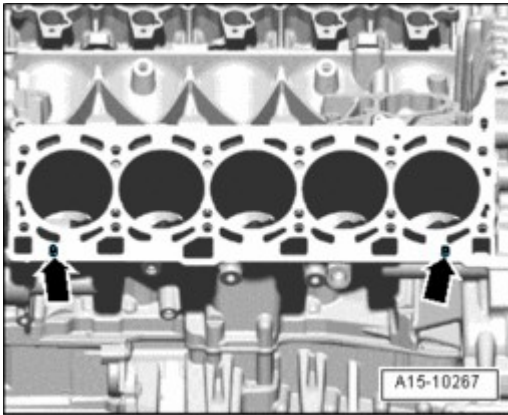


Fig. 319: Identifying Alignment Bushings In Cylinder Block
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position cylinder head gasket.
- Pay close attention to alignment bushings in cylinder block - **arrows** -.
- Pay attention to installation position of cylinder head gasket, marking "oben" (top) or part number must face toward cylinder head.
- Install cylinder head.
- Insert new cylinder head bolts and tighten by hand.

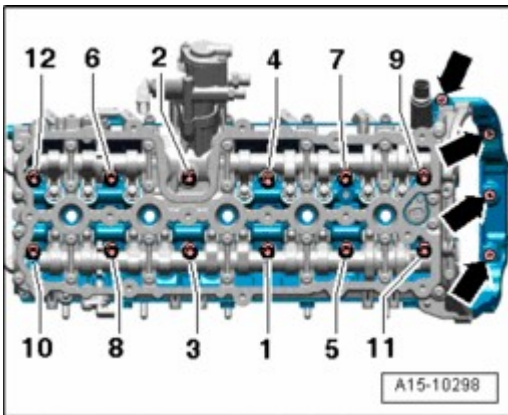


Fig. 320: Cylinder Head Bolts Tightening Sequence
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten cylinder head bolts in 4 stages in - **1 to 12** - sequence as follows:
- Using torque wrench, tighten to 30 Nm.
- Using torque wrench, tighten to 60 Nm.
- With Torx key, 90 ($\frac{1}{4}$ turn) additional turn.
- With Torx key, 90 ($\frac{1}{4}$ turn) additional turn.

NOTE:

- There is no requirement to retighten the cylinder head bolts after repairs.

- Insert bolts - **arrows** - with locking compound and tighten to 8 Nm .
- Tighten bolts - **arrows** - 90 ($1 \frac{1}{4}$ additional turn) using a rigid wrench.

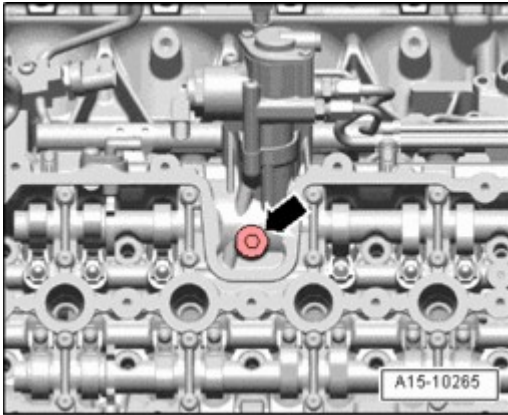


Fig. 321: Removing/Installing Locking Bolt

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten locking bolt - **arrow** -.

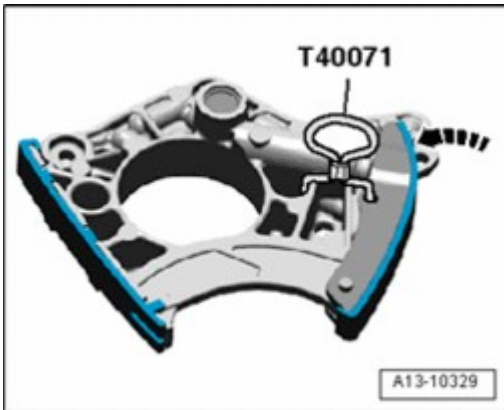


Fig. 322: Pressing Left/Right Camshaft Timing Chain Guide Rail Inward And Securing Chain Tensioner With Locking Pin T40071

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

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

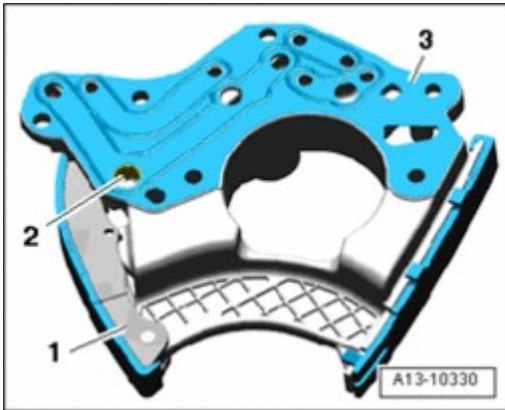


Fig. 323: Identifying Chain Tensioner Oil Screen, Gasket & Chain Tensioner
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clean chain tensioner oil screen - 2 - if necessary.
- Place a new gasket - 3 - onto rear of chain tensioner - 1 -.

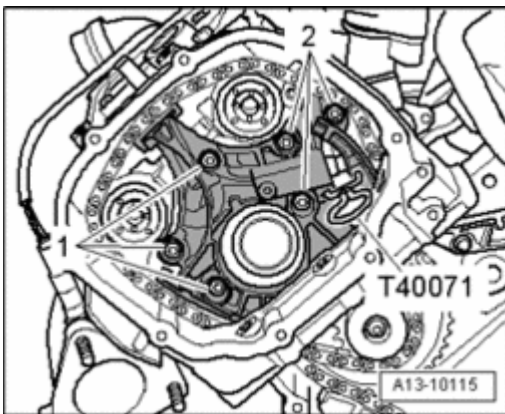


Fig. 324: Identifying Bolts For Left Chain Tensioner And Left Camshaft Timing Chain
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set chain tensioner in place and install camshaft timing chain, as shown in the illustration.
- Tighten bolts - 1 - and - 2 -.

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

- Install camshaft timing chains --> *Installing* under **Camshaft Timing Chain, Removing and Installing** .
- Install left and right timing chain covers --> *Installing* under **Left and Right Timing Chain Covers, Removing and Installing** .
- Install cylinder head cover: Left --> **Left Cylinder Head Cover, Removing and Installing** , right --> **Right Cylinder Head Cover, Removing and Installing**.

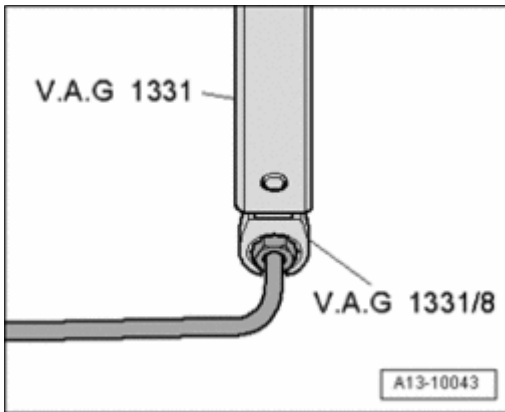


Fig. 325: Tightening Union Nut At Fuel Rail Using Torque Wrench V.A.G 1331 With 14 Mm Open End Wrench Socket V.A.G 1331/8

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- To tighten SW 14 union nut at fuel rail, use Torque Wrench V.A.G 1331 with Socket Insert AF 14, opening V.A.G 1331/8.

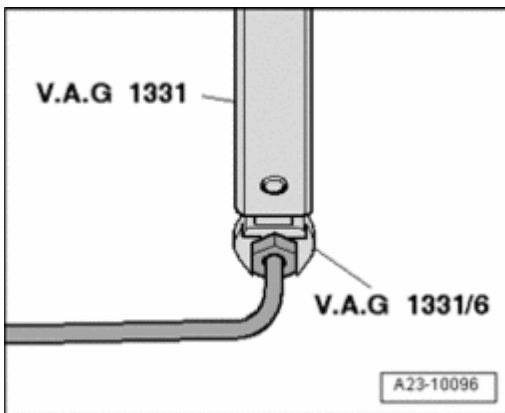


Fig. 326: Tightening SW 17 Union Nut At Fuel Rail Using Torque Wrench V.A.G 1331 With SW 17 Socket V.A.G 1331/6

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- To tighten SW 17 union nut at fuel rail, use torque wrench V.A.G 1331 with SW 17 socket V.A.G 1331/6.
- Install intake manifold --> **24 - MULTIPORT FUEL INJECTION (MFI)** .
- Install exhaust system tract: Left --> **Left Exhaust System Tract, Removing and Installing** , right --> **Right Exhaust System Tract, Removing and Installing**.
- Install engine --> **Engine, Installing**.
- Change engine oil --> **01 - MAINTENANCE** .
- Replace coolant --> **Cooling System, Draining and Filling**.

Tightening Specifications

2009 Audi S8 Quattro

ENGINE 5.2 Liter 10-Cyl. 4V Engine Mechanical, Engine Code(s): BSM - S8

Component	Nm
Locking bolt to guide frame	35
High pressure lines to fuel rail	25
Chain tensioner to cylinder head	5 plus 90° 1)2)
Secondary air injection connecting piece to cylinder head	9
1) Replace bolts. 2) 90° corresponds to a quarter turn.	

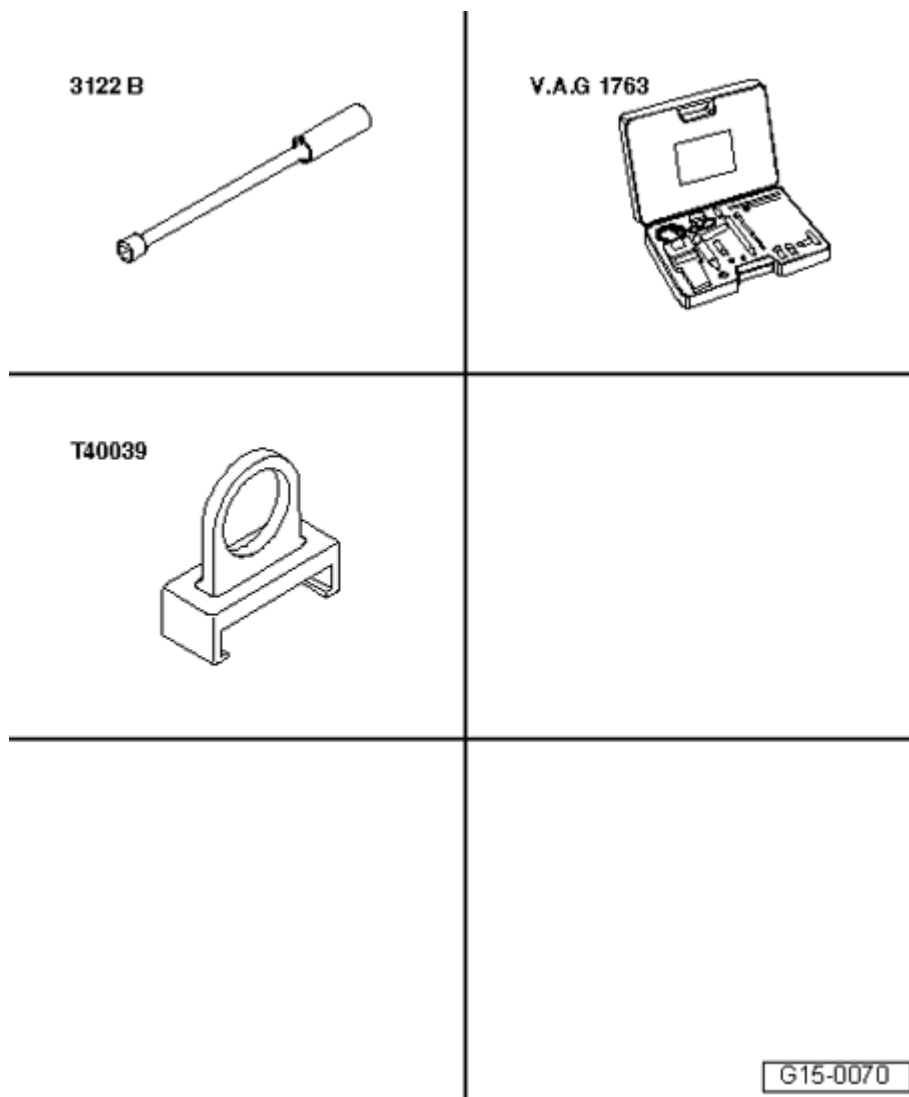
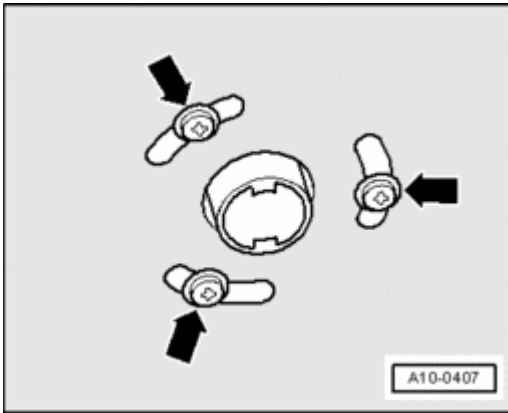
Compression, Checking**Compression, Checking****Special tools, testers and auxiliary items required**

Fig. 327: Identifying Special Tools - Compression, Checking
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Spark plug removal tool 3122 B
- Compression tester V.A.G 1763
- Ignition Coil Puller T40039

Procedure

- Engine oil temperature min. 30 C.
- Battery voltage min. 12.5 V.
- Switch off ignition.

**Fig. 328: Identifying Exhaust Pipe Fasteners**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

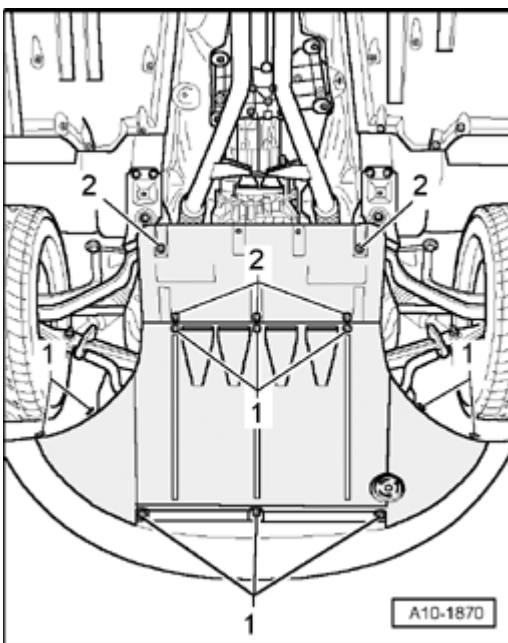
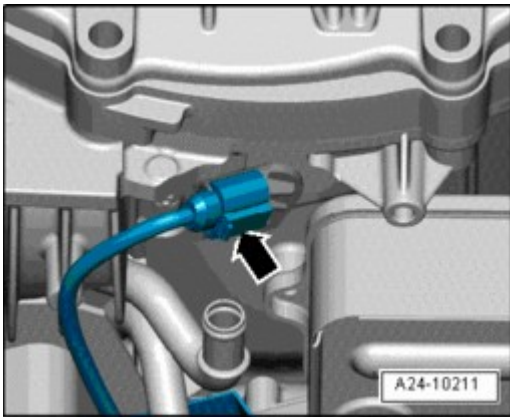


Fig. 329: Noise Insulation Quick-Release Fasteners

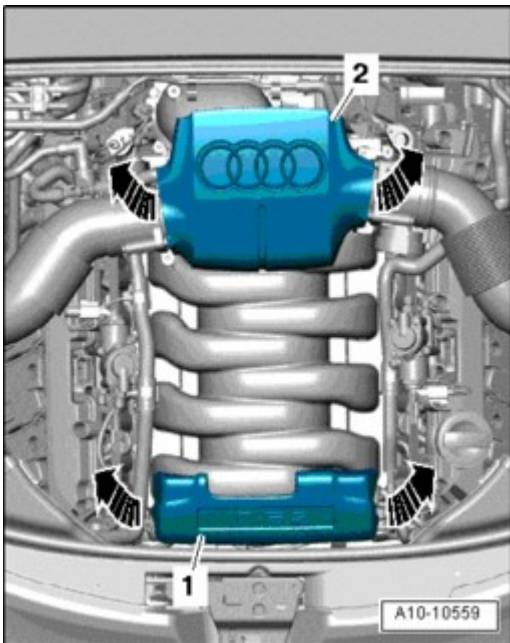
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen quick-release fasteners - **1** - and remove front noise insulation.

**Fig. 330: Disconnecting Electrical Connector On Engine Speed (RPM) Sensor G28**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector on Engine Speed (RPM) Sensor G28 - **arrow** - at bottom of transmission.

**Fig. 331: Removing Front Engine Cover And Rear**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front engine cover - **1** - and rear - **2** - - **arrows** -.

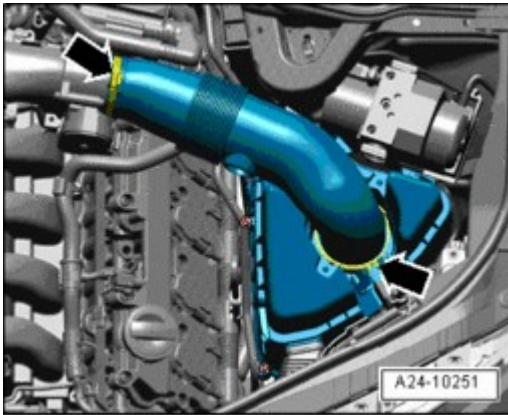


Fig. 332: Left Air Duct Hose, Hose Clamps & Air Guide Hose Vacuum Hose
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove left air duct hose - **arrows** -.

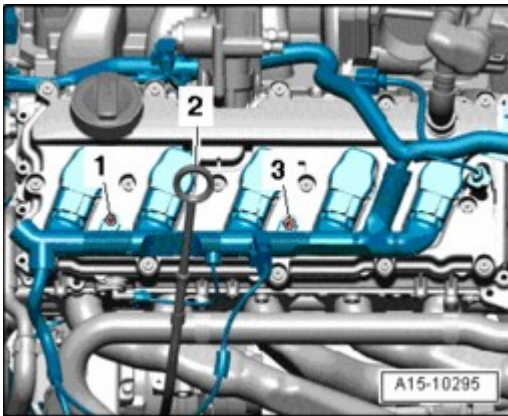


Fig. 333: Oil Dipstick, Bolts & Vacuum Hose
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove oil dipstick - **2** - from guide tube.
- Remove bolts - **1** - and - **3** -.
- Disconnect electrical connectors to ignition coils and press wiring harness to side.
- Disconnect vacuum hose - **2** - from air guide hose.
- Loosen hose clamps - **arrows** - and lay aside air guide hose.

CAUTION: Hose connectors - 1 - must not be opened.

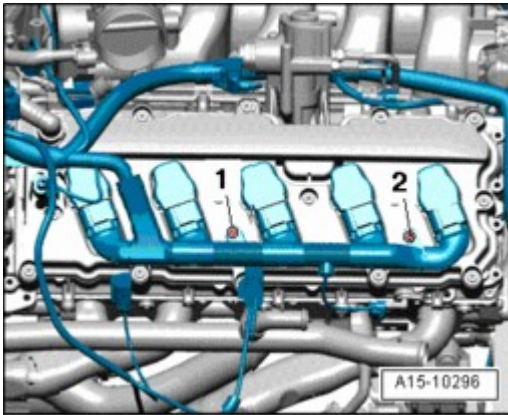


Fig. 334: Ignition Coil Electrical Harness Screws
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **1** - and - **2** -.
- Disconnect electrical connectors to ignition coils and press wiring harness to side.

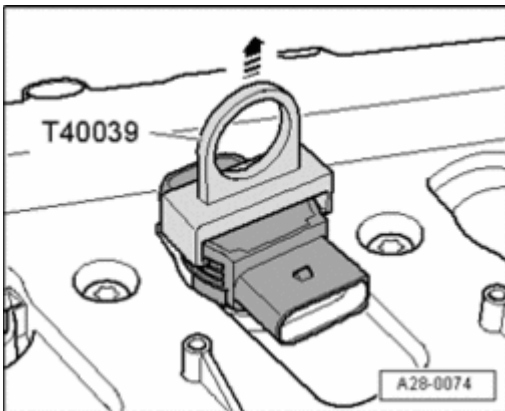


Fig. 335: Removing Ignition Coils Using Ignition Coil Puller T40039
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove all ignition coils using Ignition Coil Puller T40039.
- Using spark plug removal tool 3122 B , remove spark plugs.
- Check compression using compression tester V.A.G 1763.

NOTE:

- **Using tester --> operating instructions.**

- Have a second technician press accelerator pedal completely and at the same time operate starter long enough until pressure increase no longer appears on tester.

Compression pressure	Bar pressure
New	10.0 to 14.0
Wear limit	9.0
Difference between cylinders	max. 3.0

2009 Audi S8 Quattro

ENGINE 5.2 Liter 10-Cyl. 4V Engine Mechanical, Engine Code(s): BSM - S8

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

- Install spark plugs --> **28 - IGNITION/GLOW PLUG SYSTEM** .
- As a final step, check Engine Control Module (ECM) DTC memory and erase it, since malfunctions were stored by disconnecting electrical connectors

Tightening specifications

Component	Nm
Wiring for ignition coils at cylinder head cover	5

VALVETRAIN, SERVICING

Valvetrain, Servicing

- > **Valvetrain, Component Overview**
- > **Camshafts, Checking Axial Clearance**
- > **Camshafts, Removing and Installing**
- > **Valve Stem Seals, Cylinder Head Installed, Replacing**
- > **Valve Stem Seals, Cylinder Head Removed, Replacing**
- > **Hydraulic Adjusting Elements, Checking**
- > **Valve Dimensions**
- > **Valve Guides, Checking**
- > **Valves, Checking**

NOTE:

- Cylinder heads with cracks between the valve seats, or between the valve seat and the spark plug threads, can continue to be used without reducing the service life, as long as the cracks have a width of max. 0.3 mm, or only the first 4 threads of the spark plug threads are cracked.
- After installing the camshafts, the engine may not be started for approximately 30 minutes. The hydraulic adjusting elements must seat themselves (otherwise the valves will seat themselves on the pistons).
- After working on the valvetrain, carefully rotate engine by hand at least 2 full revolutions to ensure that valves do not strike the pistons when starting.

Valvetrain, Component Overview

Valvetrain, Component Overview

NOTE:

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

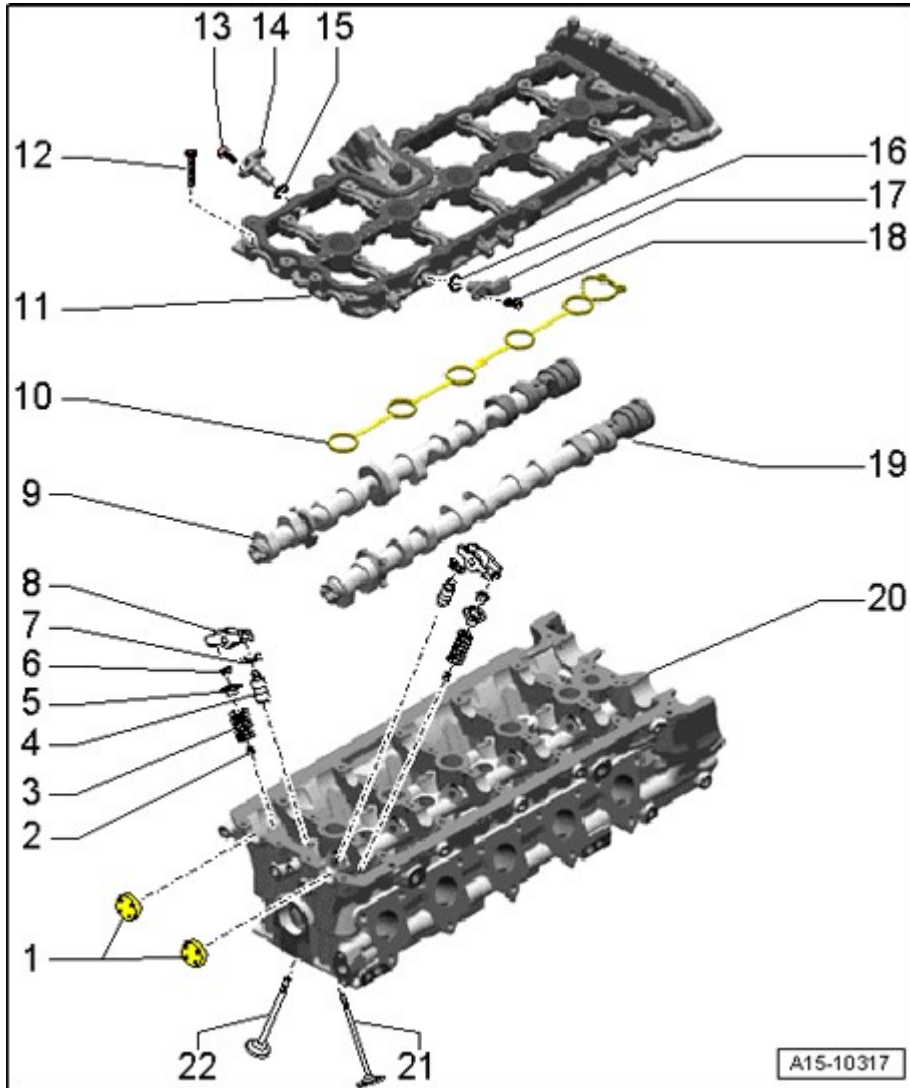


Fig. 336: Valvetrain, Component Overview

Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Sealing plug

- Insert with sealant

2 - Valve stem seal

- Replacing, Cylinder Head Installed --> **Valve Stem Seals, Cylinder Head Installed, Replacing**
- Replacing, Cylinder Head Removed --> **Valve Stem Seals, Cylinder Head Removed, Replacing**

3 - Valve spring

- Installed location --> **Installed position of valve spring**

4 - Hydraulic adjusting element

- Clipped into roller rocker lever - 8 -
- Checking --> **Hydraulic Adjusting Elements, Checking**
- Do not interchange
- Lubricate contact surface

5 - Valve spring plate

6 - Valve keys

7 - Securing clip

- Not available individually
- Check for secure seat

8 - Roller rocker lever

- Do not interchange
- Check roller for easy movement
- Lubricate contact surface
- To assemble, clip onto hydraulic adjusting element - 4 - using a circlip - 7 -

9 - Intake camshaft

- Removing and installing --> **Camshafts, Removing and Installing**
- Checking axial play --> **Camshafts, Checking Axial Clearance**
- Check radial clearance using Plastigage (roller rocker lever removed)
- Radial clearance at bearing-diameter 24 mm: 0.024 to 0.066 mm
- Radial clearance at bearing-diameter 36 mm: 0.100 to 0.325 mm
- Run-out: max. 0.04 mm

10 - Gasket

- Replace

11 - Bearing bracket

- With integrated camshaft bearings

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

12 - 8 Nm plus an additional 90 ($\frac{1}{4}$ turn)

- Replace
- Observe tightening sequence --> **Camshaft guide frame, tightening sequence**

13 - 9 Nm

14 - Camshaft position (CMP) sensor 2 G163

15 - O-ring

- Replace

16 - O-ring

- Replace

17 - Camshaft position (CMP) sensor 4 G301

18 - 9 Nm

19 - Exhaust camshaft

- Removing and installing --> **Camshafts, Removing and Installing**
- Checking axial play --> **Camshafts, Checking Axial Clearance**
- Check radial clearance using Plastigage (roller rocker lever removed)
- Radial clearance at bearing-diameter 24 mm: 0.024 to 0.066 mm
- Radial clearance at bearing-diameter 36 mm: 0.100 to 0.325 mm
- Run-out: max. 0.04 mm

20 - Cylinder Head

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

21 - Intake valve

- Do not rework, only lapping is permitted
- Mark installed position for re-installation
- Valve dimensions --> **Valve Dimensions**
- Check valve guides --> **Valve Guides, Checking**

22 - Exhaust valve

- Do not rework, only lapping is permitted
- Mark installed position for re-installation
- Valve dimensions --> **Valve Dimensions**
- Check valve guides --> **Valve Guides, Checking**

Installed position of valve spring

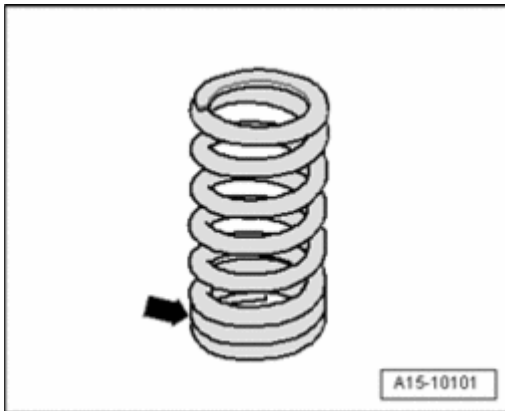


Fig. 337: Identifying Tight Spring Coils Face Toward Cylinder Head
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Camshaft Guide Frame, Tightening Sequence

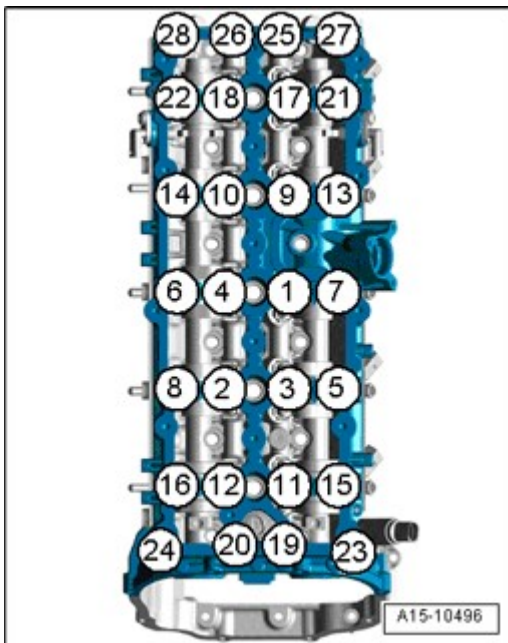


Fig. 338: Guide Frame Bolts Tightening/Loosening Sequence

Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE: • The Illustration Shows The Guide Frame For The Left Cylinder Head.

- Tighten Bolts In 3 Stages In Sequence - **1 To 28** - :
- Tighten Bolts By Hand.
- The Guide Frame Must Be In Contact With The Entire Contact Surface Of The Cylinder Head.
- Tighten Bolts To 8 Nm.
- Tighten Bolts An Additional 90.

Camshafts, Checking Axial Clearance

Camshafts, Checking Axial Clearance

Special tools, testers and auxiliary items required

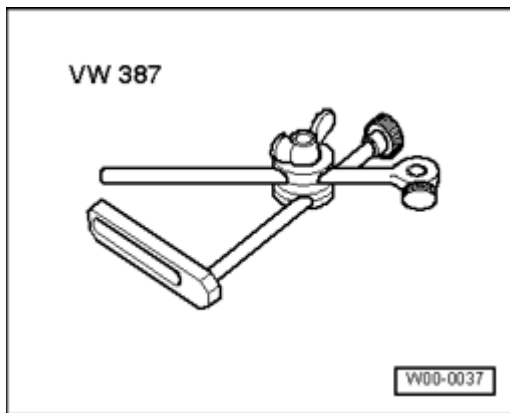


Fig. 339: Dial Gauge Holder VW 387

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Dial gauge holder VW 387

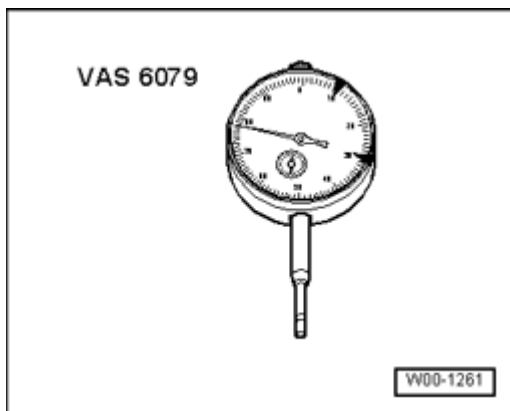
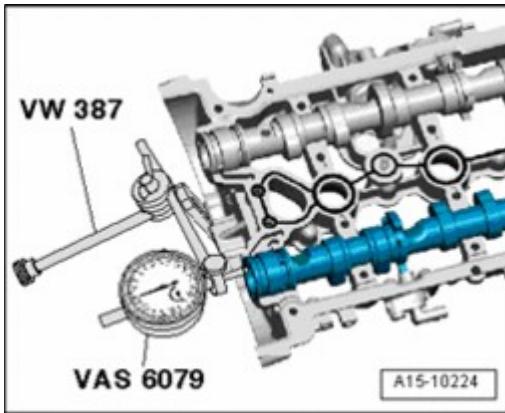


Fig. 340: Dial Gauge VAS 6079

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Dial gauge VAS 6079

**Fig. 341: Securing Dial Gauge Holder VW 387 To Dial Gauge VAS 6079 On Cylinder Head**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

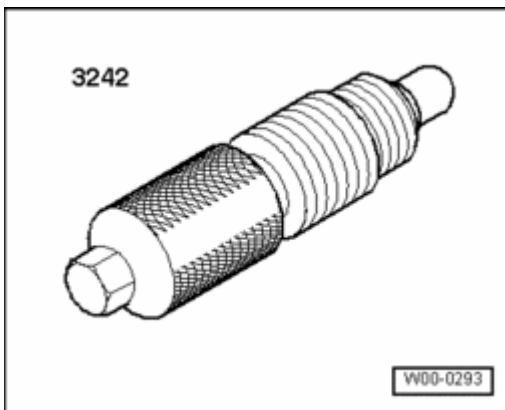
Test Sequence

- Perform measurement with guide frame removed.
 - Secure dial gauge holder VW 387 to dial gauge VAS 6079 on cylinder head.
 - Determine axial clearance.
- Axial clearance: 0.100 to 0.191 mm.

Camshafts, Removing and Installing

Camshafts, Removing and Installing

Special tools, testers and auxiliary items required

**Fig. 342: Locking Pin 3242**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Locking pin 3242

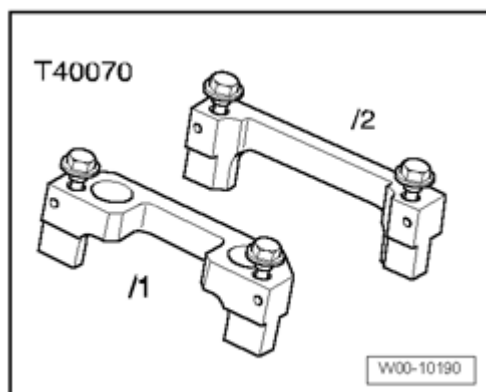


Fig. 343: Camshaft Clamp T40070

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Camshaft Clamp T40070 , qty. 2

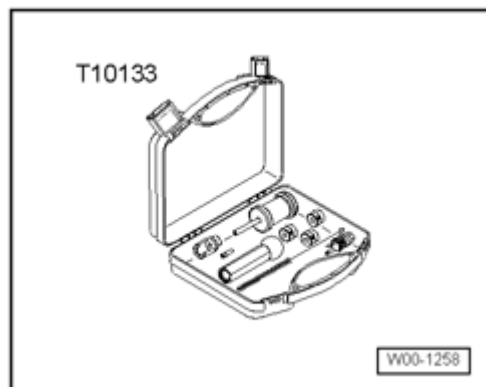


Fig. 344: Impact Puller T10133/3 From The Tool Set T10133

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Impact puller T10133/3 from tool set T10133

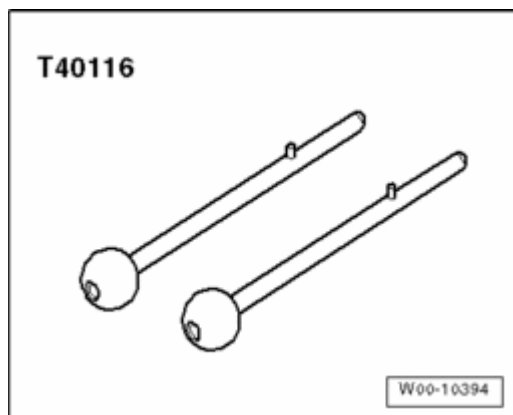


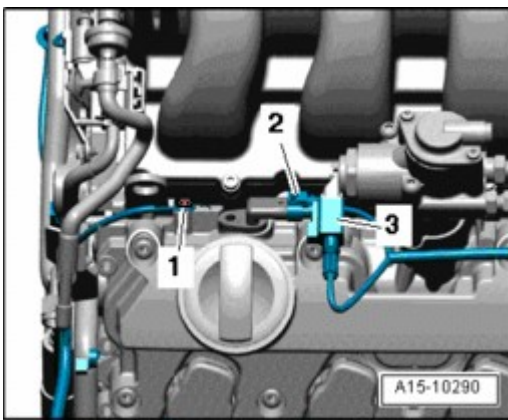
Fig. 345: Securing Pins

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Securing pins 1 set = qty. 2 T40116
- Hand drill with plastic brush attachment
- Protective glasses
- Sealant

NOTE:

- Here, removal and installation at left cylinder head is depicted in the following description.

**Fig. 346: Cylinder Head Ground Line & Electrical Connectors**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

- Remove engine --> **Engine, Removing**.
- Leave engine with transmission installed on scissor lift platform VAS 6131 A.
- Remove camshaft timing chains from camshafts --> **Camshaft Timing Chain, Removing from Camshaft**.
- Remove Ground (GND) wire - 1 - from guide frame.
- Disconnect electrical connectors - 2 - and - 3 -.
- Remove high-pressure pump --> **24 - MULTIPOINT FUEL INJECTION (MPI)** .

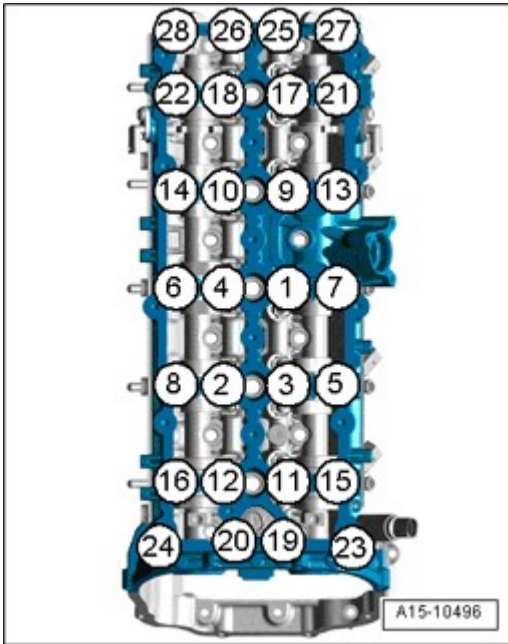


Fig. 347: Guide Frame Bolts Tightening/Loosening Sequence
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen guide frame bolts in sequence - 28 to 1 -.

NOTE:

- Proceed in the same way with right guide frame.

- Carefully remove guide frame and lay it on a soft surface on the workbench.

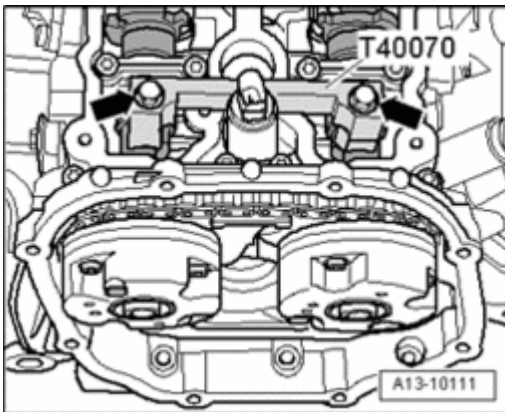


Fig. 348: Removing/Installing Camshaft Locators T40070 On Both Cylinder Heads
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove Camshaft Clamp T40070 at left cylinder head.

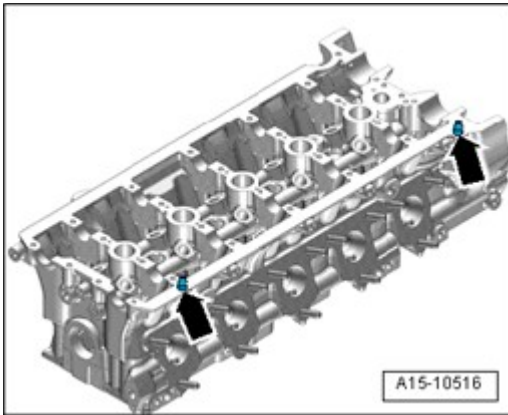


Fig. 349: Identifying Guide Frame Alignment Pins
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Mark camshafts and remove.

CAUTION: On engines equipped with guide frame alignment pins - arrows - , these must be driven out with a cotter pin driver.

Installing

- NOTE:**
- Always replace gaskets and seals.

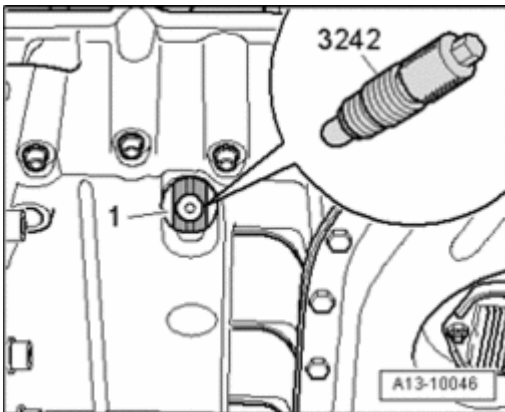


Fig. 350: Installing/Removing Crankshaft Holder 3242 In Bore
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure crankshaft - 1 - using crankshaft holder 3242.

CAUTION: Wear safety glasses.

CAUTION: Make sure that no sealant residue enters the cylinder head and bearings.

- Remove sealant residue on cylinder head and guide frame, e.g. with rotating plastic brush.
- Clean sealing surfaces, they must be free of oil and grease.
- Oil journal surfaces of camshafts.

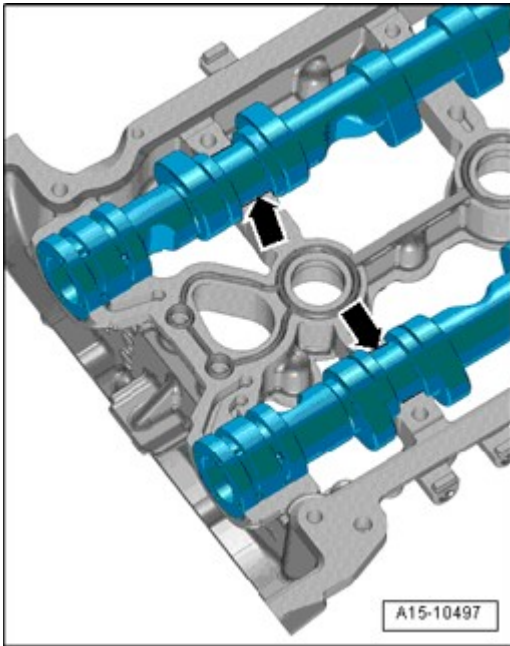


Fig. 351: Identifying Axial Bearings

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set camshafts into guide frame.
- The placement of the camshafts must be exactly within the axial bearings - **arrows** - of the guide frame.
- Rotate guide frame with camshafts installed while holding camshafts inside the frame.

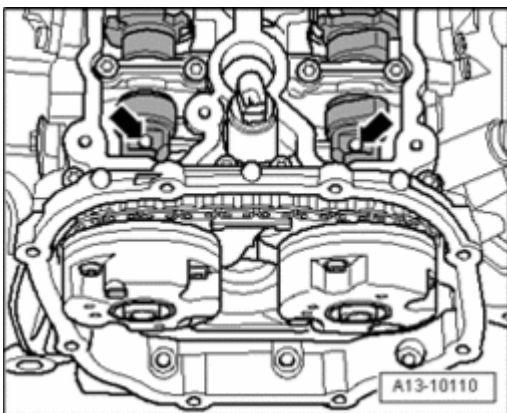


Fig. 352: Identifying Threaded Holes In Camshafts Must Face Upward

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Rotate camshafts until threaded holes - **arrows** - point upward.
- Check whether camshafts still lie exactly in axial bearings of guide frame.

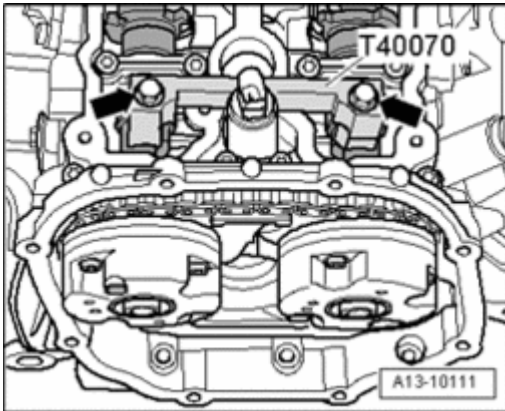


Fig. 353: Removing/Installing Camshaft Locators T40070 On Both Cylinder Heads
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install camshaft clamp T40070 at intake and exhaust camshafts as shown in the illustration and tighten the bolts to 25 Nm.

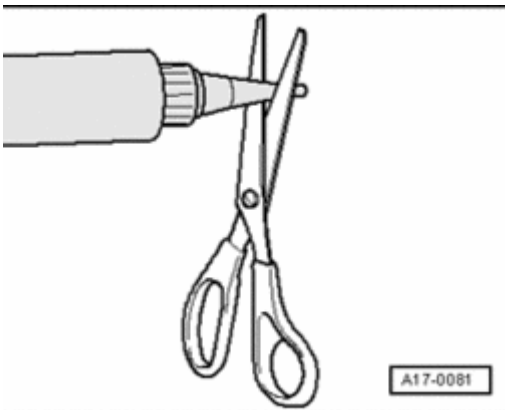


Fig. 354: Cutting Tube Nozzle At Front Marking
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

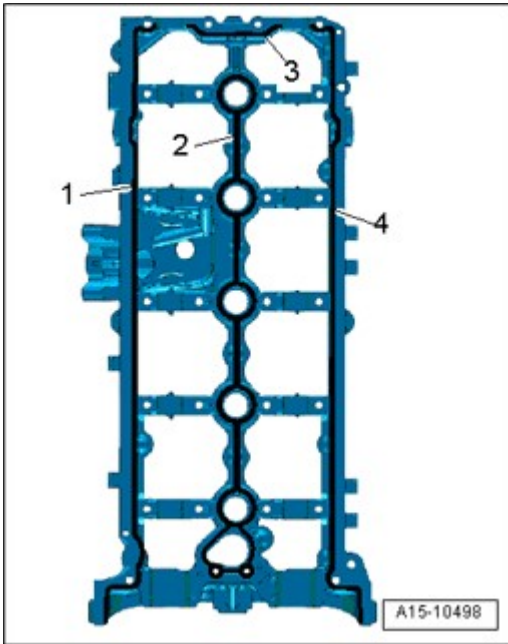


Fig. 355: Identifying Guide Seal & Sealant Beads
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Turn around guide frame again.
- Lay a new seal - 2 - in guide frame groove.

NOTE:

- **Sealant beads must not be thicker than specified, otherwise extra sealant can enter camshaft bearing.**

- Apply sealant beads - 1, 3, 4 - on clean guide frame sealing surfaces as shown in illustration.
- Thickness of sealant beads: 2.5 mm.

NOTE:

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

- Place guide frame on cylinder head.

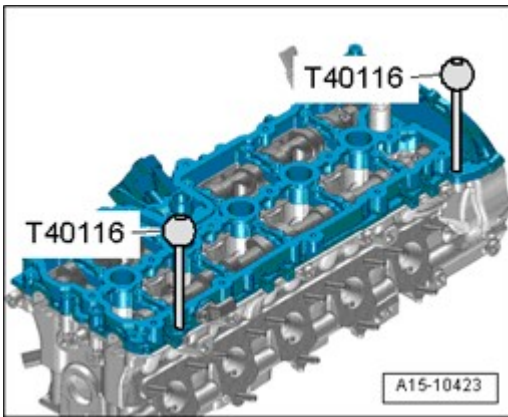


Fig. 356: Inserting Locating Pins T40116 In Guide Frame And Cylinder Head
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert locating pins T40116 in guide frame and cylinder head.

NOTE:

- After installing guide frame, sealant must dry for approximately 30 minutes.

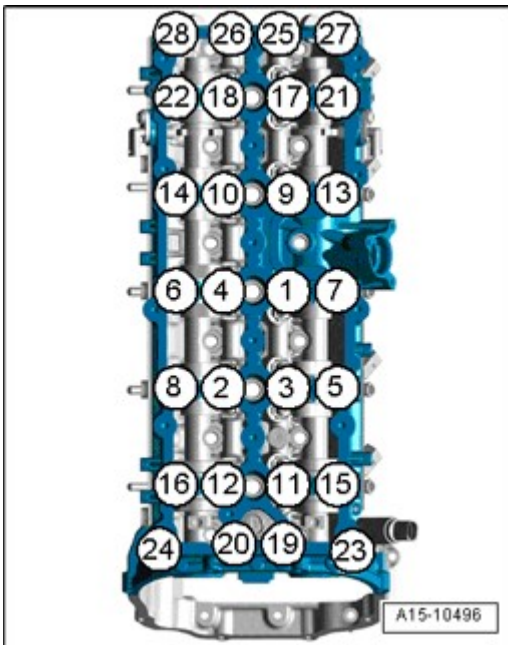


Fig. 357: Guide Frame Bolts Tightening/Loosening Sequence
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten guide frame bolts evenly by hand in sequence - **1 to 28** -.
- Fasten guide frame bolts in sequence - **28 to 1** - until they stop.
- Clean sealing plug hole in cylinder head. It must be free of oil and grease.

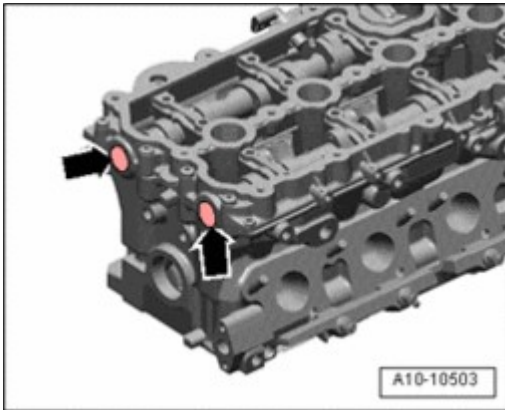


Fig. 358: Driving Sealing Plugs In Flush

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Coat outer circumference of sealing plugs - **arrows** - with sealant .
- Install sealing plugs so they are flush.

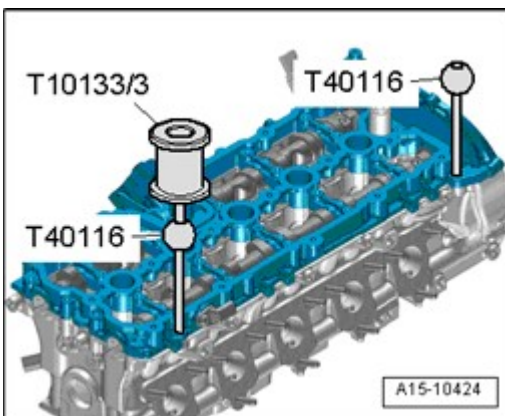


Fig. 359: Removing Locating Pins T40116 Using Impact Puller T10133/3

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove locating pins T40116 with impact puller T10133/3.

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

- Install high pressure pump --> **24 - MULTIPOINT FUEL INJECTION (MPI)** .
- Position camshaft timing chains on camshafts --> *Installing* under **Camshaft Timing Chain, Removing from Camshaft** .
- Install left and right timing chain covers --> *Installing* under **Left and Right Timing Chain Covers, Removing and Installing** .
- Install cylinder head cover: Left --> **Left Cylinder Head Cover, Removing and Installing** , right --> **Right Cylinder Head Cover, Removing and Installing** .
- Install engine --> **Engine, Installing** .

2009 Audi S8 Quattro

ENGINE 5.2 Liter 10-Cyl. 4V Engine Mechanical, Engine Code(s): BSM - S8

NOTE:

- After installing the camshafts, the engine may not be started for approximately 30 minutes. The hydraulic adjusting elements must seat themselves (otherwise the valves will seat themselves on the pistons).
- After working on the valvetrain, carefully rotate engine by hand at least 2 full revolutions to ensure that valves do not strike the pistons when starting.

Tightening specifications

Component	Nm
Bearing bracket to cylinder head	8 plus 90° 1)2)
1) Replace bolts. 2) 90° corresponds to a quarter turn.	

Valve Stem Seals, Cylinder Head Installed, Replacing

Valve Stem Seals, Cylinder Head Installed, Replacing

Special tools, testers and auxiliary items required

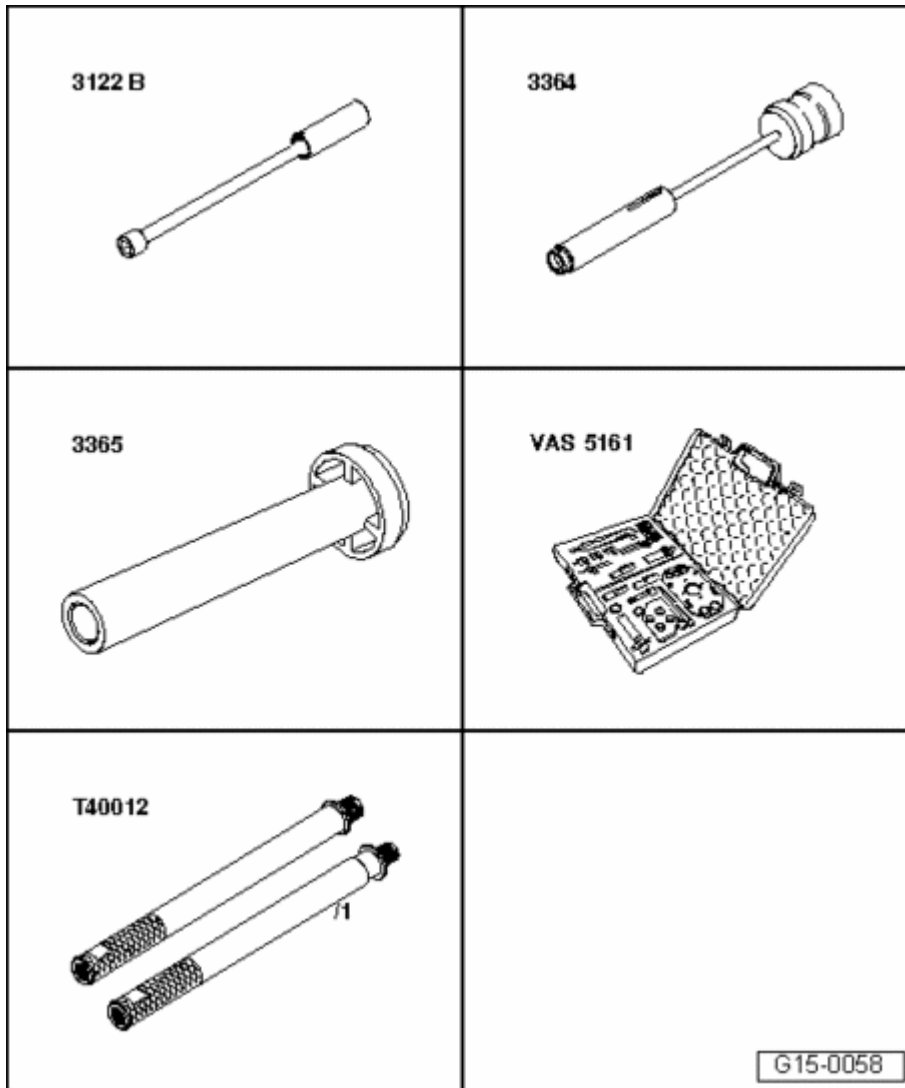


Fig. 360: Identifying Special Tools - Valve Stem Seals, Cylinder Head Installed, Replacing
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Spark plug removal tool 3122 B
- Valve seal removal tool 3364
- Valve stem seal driver 3365
- Valve cotter disassembly and assembly device VAS 5161
- Adapter T40012

Removing

- Remove engine --> **Engine, Removing.**
- Leave engine with transmission installed on scissor lift platform VAS 6131 A.
- Remove camshaft timing chains from camshafts --> **Camshaft Timing Chain, Removing from Camshaft.**

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

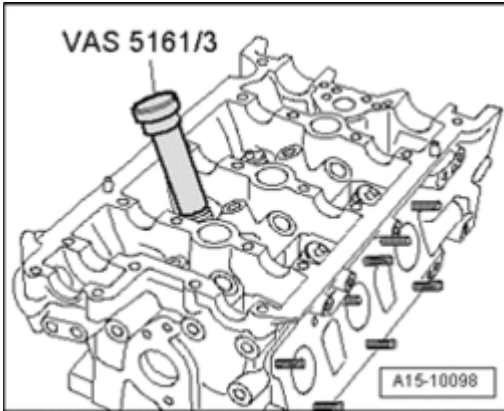


Fig. 361: Placing Drift VAS 5161/3 On Valve Spring Plate And Loosening Stuck Valve Keepers Using Plastic Hammer

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

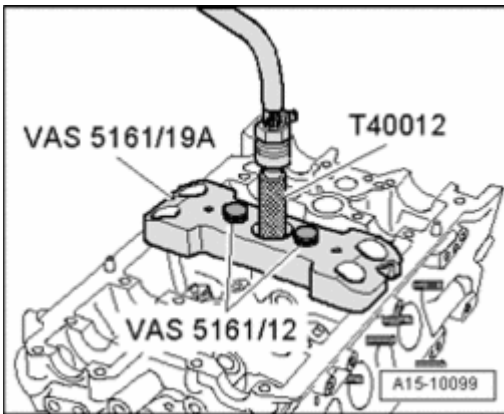


Fig. 362: Placing Guide Plate VAS 5161/19 A From Valve Cotter Disassembly And Assembly Device VAS 5161 On Cylinder Head

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place guide plate VAS 5161/19 A from valve cotter disassembly and assembly device VAS 5161 on cylinder head.
- Secure guide plate with knurled screws VAS 5161/12.
- Install adapter T40012 with gasket by hand into respective spark plug thread and apply constant pressure.
- Minimum pressure: 6 bar positive pressure.

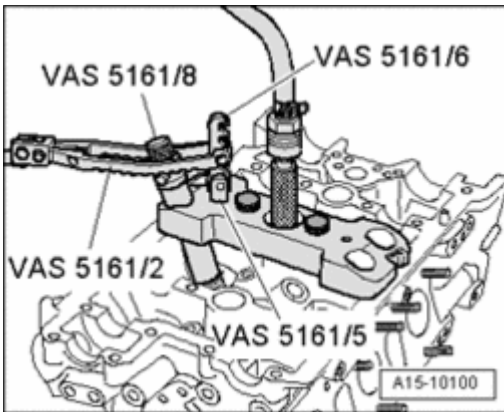


Fig. 363: Installing Engaging Device VAS 5161/6 With Installation Fork VAS 5161/5 Into Guide Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install engaging device VAS 5161/6 with installation fork VAS 5161/5 into guide plate.
- Push installation cartridge VAS 5161/8 into guide plate.
- Hook in pressure fork VAS 5161/2 at engaging device and press down installation cartridge.
- At the same time, turn knurled bolt of installation cartridge to the right, until points engage in the valve keepers.
- Lightly move knurled bolt back and forth, causing the valve keepers to be pressed apart and be captured in the installation cartridge.
- Release pressure fork.
- Take out installation cartridge.
- Unfasten guide plate and turn it aside.
- Pressurized air hose remains connected.
- Remove valve spring with valve spring plate.

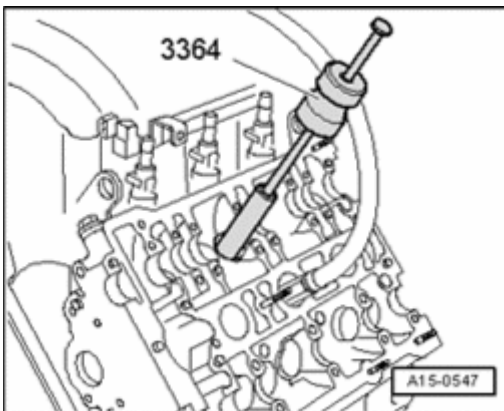


Fig. 364: Pulling Off Valve Stem Oil Seals Using Valve Seal Removal Tool 3364
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull off valve stem oil seals using Valve Seal Removal Tool 3364.

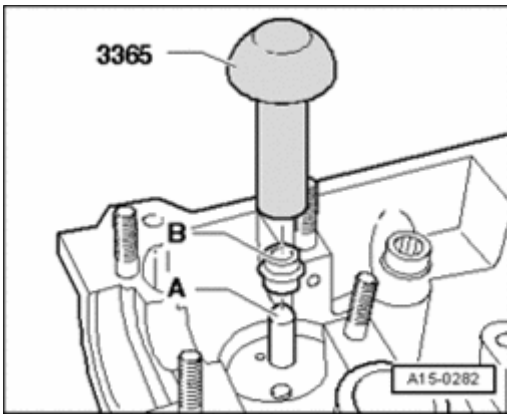


Fig. 365: Identifying Plastic Sleeve, Valve Stem Oil Seal & Valve Stem Seal Driver 3365
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- A plastic sleeve - A - is supplied with the new valve shaft seals.

- Place plastic sleeve - A - on valve stem to prevent damage to new valve stem seals - B -.
- Lightly coat sealing lips of valve stem seal with oil.
- Push valve stem seal onto plastic sleeve.
- Carefully press valve stem oil seal onto valve guide using Valve Stem Seal Driver 3365.
- Remove plastic sleeve again.

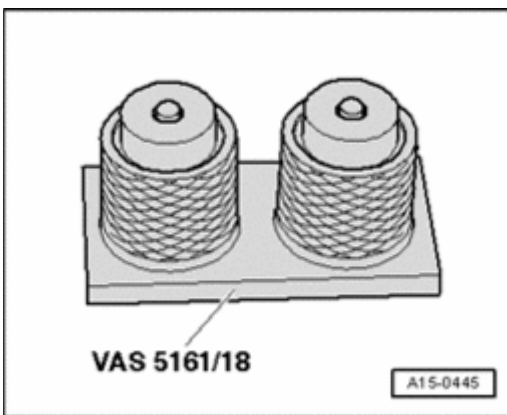


Fig. 366: Identifying Installation Cartridge VAS 5161/8
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

- The large diameter of the valve keepers point upward.

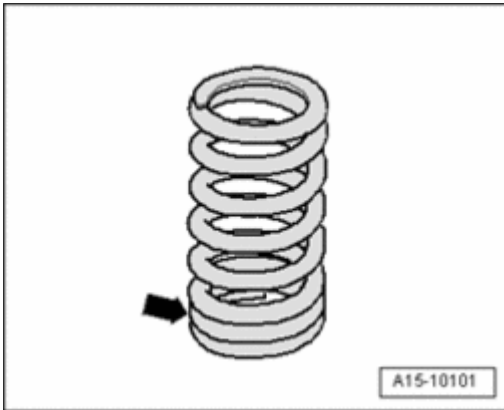


Fig. 367: Identifying Tight Spring Coils Face Toward Cylinder Head
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install valve spring and valve spring plate.
- The tight spring coils - **arrow** - face toward cylinder head.

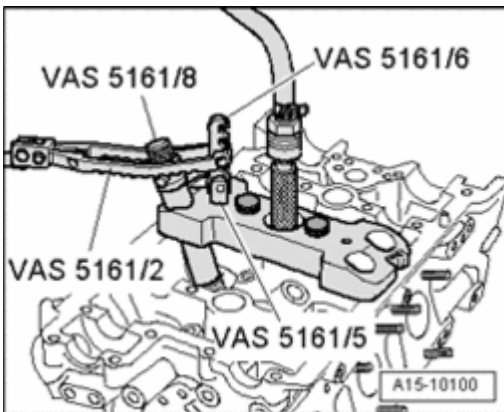


Fig. 368: Installing Engaging Device VAS 5161/6 With Installation Fork VAS 5161/5 Into Guide Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install guide plate onto cylinder head again.
- Insert installation cartridge into guide plate.
- Press pressure fork down and pull the knurled bolt upward while turning it left and right to insert the valve keepers.
- Release pressure fork with knurled bolt still pulled.
- Make sure all roller rocker levers seat properly on the valve stem ends and are clipped onto the respective hydraulic adjusting elements.
- Install camshafts --> **Camshafts, Removing and Installing.**
- Position camshaft timing chains on camshafts --> *Installing* under **Camshaft Timing Chain, Removing from Camshaft .**
- Install left and right timing chain covers --> *Installing* under **Left and Right Timing Chain Covers, Removing and Installing .**

- Install cylinder head cover: Left --> **Left Cylinder Head Cover, Removing and Installing** , right --> **Right Cylinder Head Cover, Removing and Installing**.
- Install engine --> **Engine, Installing**.

NOTE:

- After installing camshafts, do not crank engine for at least 30 minutes. The hydraulic adjusting elements must seat themselves (otherwise the valves will seat themselves on the pistons).
- After working on the valvetrain and lifters, carefully rotate the crankshaft by hand at least 2 full revolutions before starting to be sure that valves do not strike the pistons.

Valve Stem Seals, Cylinder Head Removed, Replacing

Valve Stem Seals, Cylinder Head Removed, Replacing

Special tools, testers and auxiliary items required

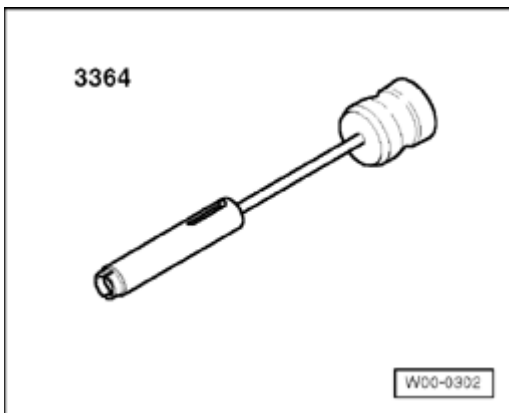


Fig. 369: Valve Seal Removal Tool 3364

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Valve seal removal tool 3364

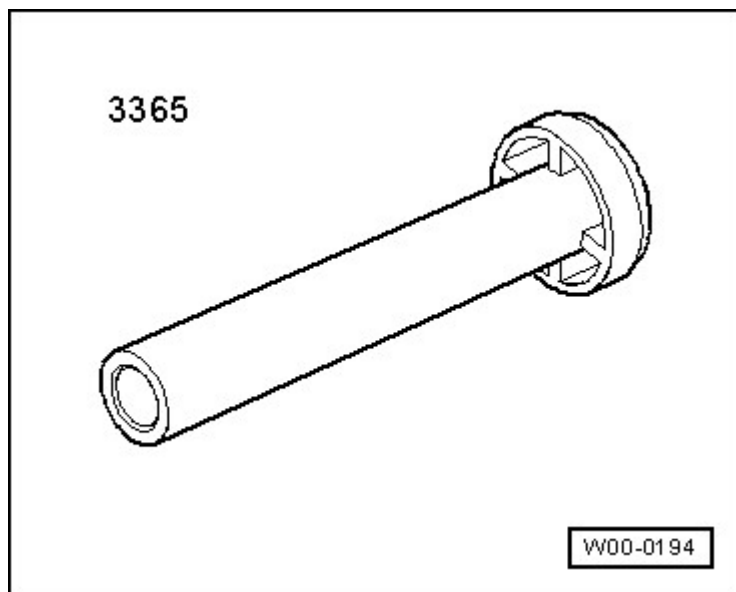


Fig. 370: Valve Stem Seal Driver 3365

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Valve stem seal driver 3365

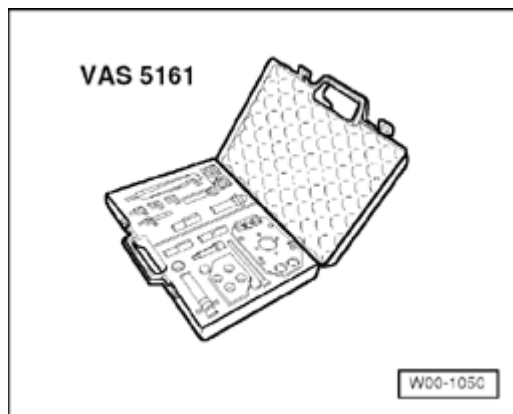


Fig. 371: Valve Cotter Disassembly/Assembly Device VAS 5161

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Valve cotter disassembly and assembly device VAS 5161

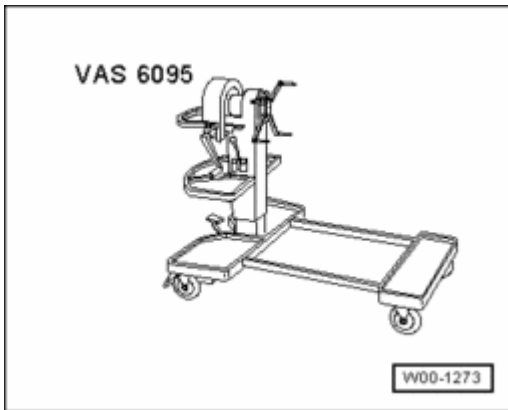


Fig. 372: Engine And Transmission Holder VAS 6095
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Engine and transmission holder VAS 6095
- Tensioning element VAS 6419

Procedure

- Remove camshafts --> **Camshafts, Removing and Installing.**

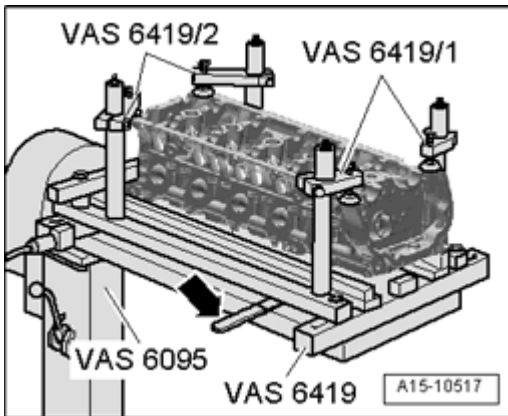


Fig. 373: Inserting Tensioning Element VAS 6419 In Engine And Transmission Holder VAS 6095
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert tensioning element VAS 6419 in engine and transmission holder VAS 6095.
- Tension cylinder head on tensioning element VAS 6419 as shown in the illustration.
- Connect tensioning element VAS 6419 to compressed air.
- Slide air cushion with lever - **arrow** - under cylinder onto valve stem seal that will be removed.
- Let enough compressed air flow into air cushion until it contacts the valve plate.

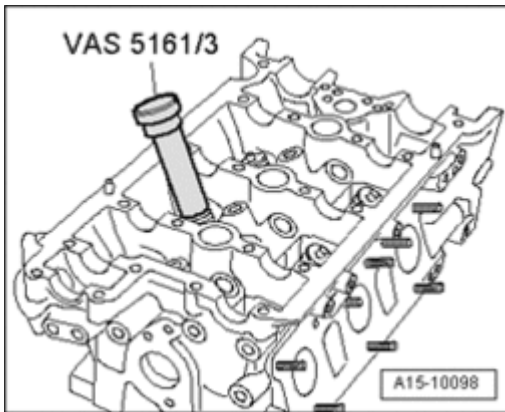


Fig. 374: Placing Drift VAS 5161/3 On Valve Spring Plate And Loosening Stuck Valve Keepers Using Plastic Hammer

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

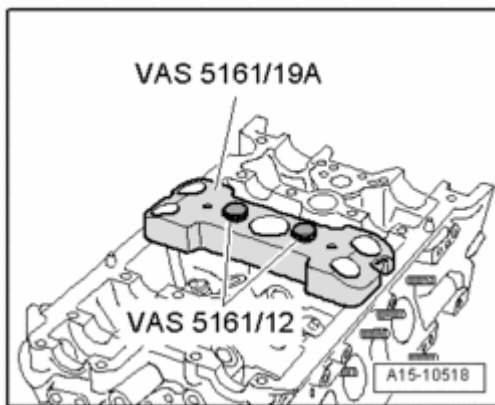


Fig. 375: Placing Guide Plate VAS 5161/19 A From Valve Cotter Disassembly/Assembly Device VAS 5161 On Cylinder Head

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place guide plate VAS 5161/19 A from valve cotter disassembly and assembly device VAS 5161 on cylinder head.
- Secure guide plate with knurled screws VAS 5161/12.

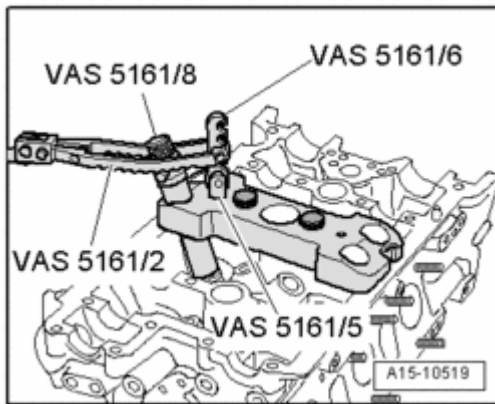


Fig. 376: Installing Engaging Device VAS 5161/6 With Installation Fork VAS 5161/5 Into Guide Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install engaging device VAS 5161/6 with installation fork VAS 5161/5 into guide plate.
- Push installation cartridge VAS 5161/8 into guide plate.
- Hook in pressure fork VAS 5161/2 at engaging device and press down installation cartridge.
- At the same time, turn knurled bolt of installation cartridge to the right, until the points engage in the valve keepers.
- Lightly move knurled bolt back and forth, causing the valve keepers to be pressed apart and be captured in the installation cartridge.
- Release pressure fork.
- Take out installation cartridge.
- Remove guide plate and turn it aside.
- Remove valve spring with valve spring plate.

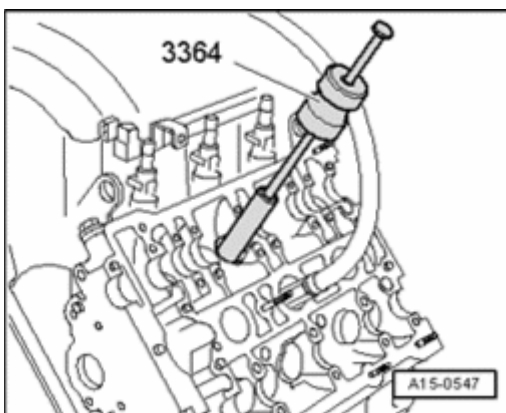


Fig. 377: Pulling Off Valve Stem Oil Seals Using Valve Seal Removal Tool 3364
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull off valve stem oil seals using Valve Seal Removal Tool 3364.

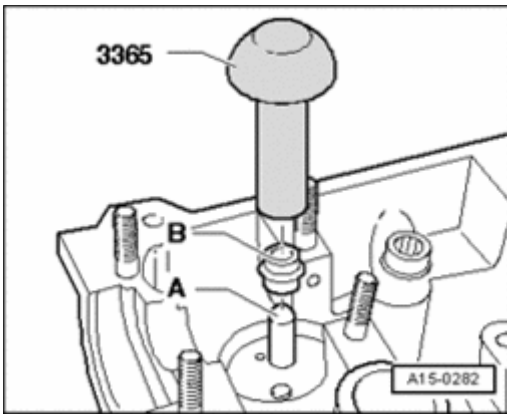


Fig. 378: Identifying Plastic Sleeve, Valve Stem Oil Seal & Valve Stem Seal Driver 3365
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- A plastic sleeve - A - is supplied with the new valve shaft seals.

- Place plastic sleeve - A - on valve stem to prevent damage to new valve stem seals - B -.
- Lightly coat sealing lips of valve stem seal with oil.
- Push valve stem seal onto plastic sleeve.
- Carefully press valve stem oil seal onto valve guide using Valve Stem Seal Driver 3365.
- Remove plastic sleeve again.

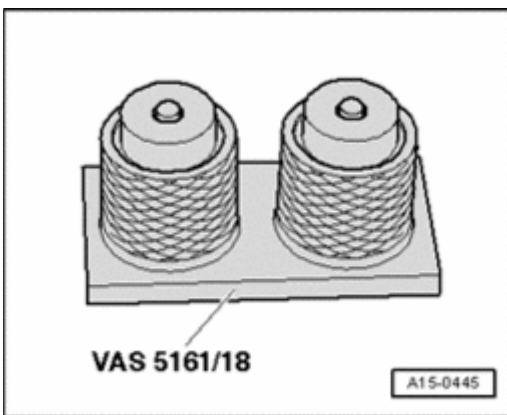


Fig. 379: Identifying Installation Cartridge VAS 5161/8
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

- The large diameter of the valve keepers point upward.

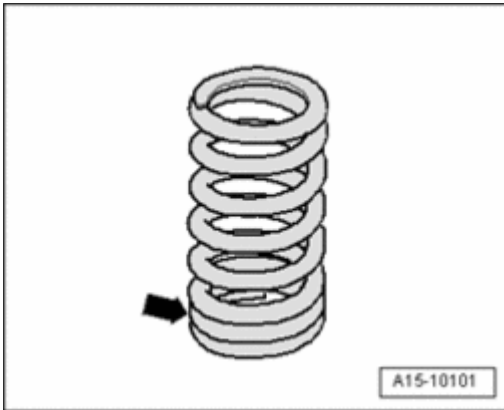


Fig. 380: Identifying Tight Spring Coils Face Toward Cylinder Head
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install valve spring and valve spring plate.
- The tight spring coils - **arrow** - face toward cylinder head.

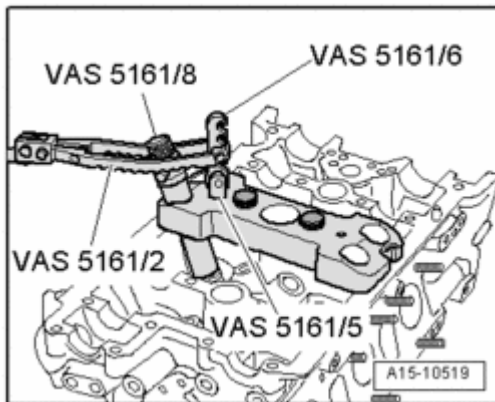
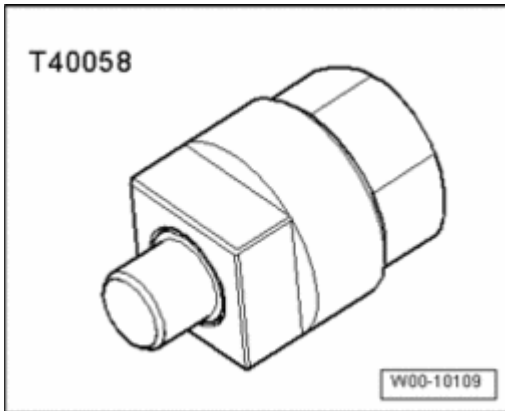


Fig. 381: Installing Engaging Device VAS 5161/6 With Installation Fork VAS 5161/5 Into Guide Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install guide plate onto cylinder head again.
- Insert installation cartridge into guide plate.
- Press pressure fork down and pull the knurled bolt upward while turning it left and right to insert the valve keepers.
- Release pressure fork with knurled bolt still pulled.
- Make sure all the roller rocker levers seat properly on the valve stem ends and are clipped onto the respective hydraulic adjusting elements.
- Install camshafts --> **Camshafts, Removing and Installing.**

Hydraulic Adjusting Elements, Checking

Hydraulic Adjusting Elements, Checking

Special tools, testers and auxiliary items required**Fig. 382: Adapter T40058**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Adapter T40058
- Feeler gauge

NOTE:

- The hydraulic adjusting elements cannot be repaired.
- Irregular valve noises are normal while starting the engine.

Procedure

- Start the engine and let it run until the radiator fan has switched on once.
- Increase engine speed for about 2 minutes to approximately 2500 RPM, perform road test if necessary.

NOTE:

- If irregular valve noises disappear but reappear during short drives, replace the oil check valve --> **Oil Check Valve and Spray Nozzle Valve, Removing and Installing.**

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

- Remove cylinder head cover: Left --> **Left Cylinder Head Cover, Removing and Installing** , right --> **Right Cylinder Head Cover, Removing and Installing.**
- Remove fan shroud --> **Fan Shroud, Removing and Installing.**

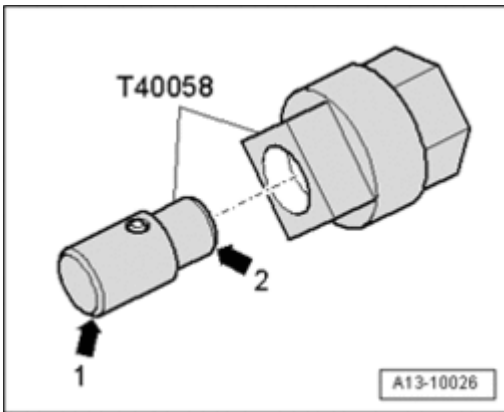


Fig. 383: Inserting Guide Pin Of Adapter T40058 So That Large Diameter Points To Engine
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert Socket T40058 adapter so that small diameter - **arrow 2** - points to engine. Large diameter - **arrow 1** - points to socket.

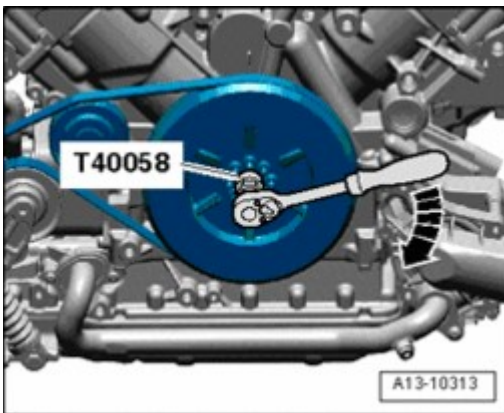


Fig. 384: Loosening/Tightening Torque Converter Bolts Using Adapter T40058 To Counterhold Crankshaft
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Rotate crankshaft in direction of engine rotation - **arrow** - using adapter T40058 until camshafts on the hydraulic adjuster that needs to be checked face upward.

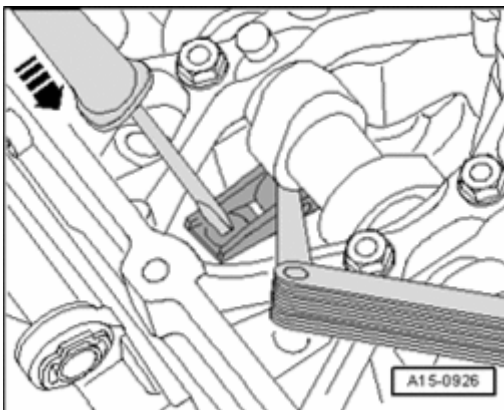


Fig. 385: Checking Play Between Cam Lobes And Roller Rocker Lever

Courtesy of VOLKSWAGEN UNITED STATES, INC.

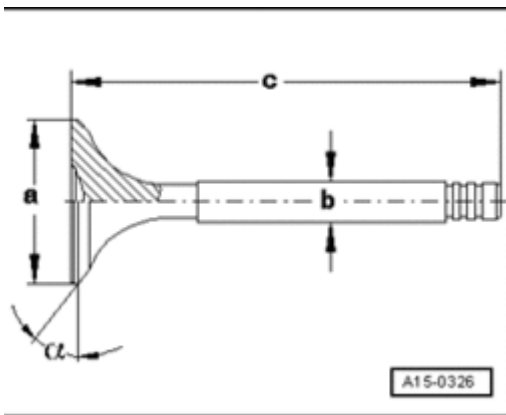
- Determine play between camshaft and roller rocker lever by pressing lever down using a screwdriver - **arrow -**.

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

- Replace hydraulic adjusting element --> **Camshafts, Removing and Installing.**

Final procedures

- Install fan shroud --> **Fan Shroud, Removing and Installing.**
- Install cylinder head cover: Left --> **Left Cylinder Head Cover, Removing and Installing** , right --> **Right Cylinder Head Cover, Removing and Installing.**

Valve Dimensions**Valve Dimensions****Fig. 386: Valve Dimensions**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

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

Dimension		Intake valve	Exhaust valve
Diameter a	mm	33.85 ± 0.10	28.0 ± 0.1
Diameter b	mm	5.980 ± 0.007	5.965 ± 0.007
c	mm	103.97 ± 0.20	101.87 ± 0.20
a	Angle°	45	45

CAUTION:

- Worn sodium-filled exhaust valves must not be scrapped without first being properly treated.

- Using a metal saw, the valves must be cut into two pieces between the shaft center and valve head. While doing this, do not come into contact with water. At the very most, throw 10 of the prepared valves into a bucket filled with water. Then, move quickly away, because a sudden chemical reaction will occur during which the sodium is burnt away.
- The treated parts may then be discarded through conventional disposal channels.

Valve Guides, Checking

Valve Guides, Checking

Special tools, testers and auxiliary items required

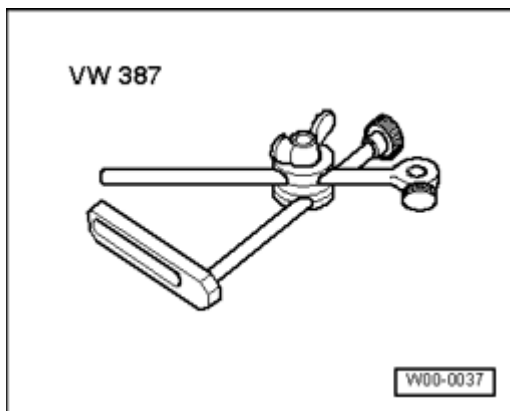


Fig. 387: Dial Gauge Holder VW 387

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Dial gauge holder VW 387

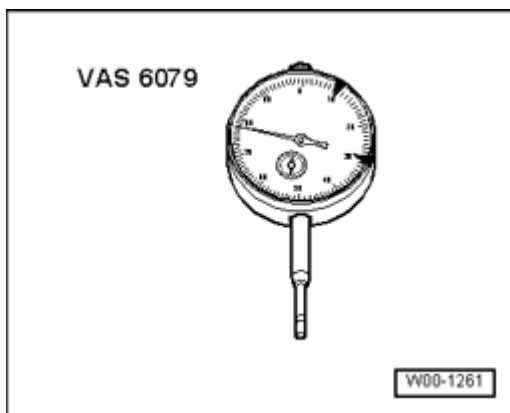


Fig. 388: Dial Gauge VAS 6079

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Dial gauge VAS 6079

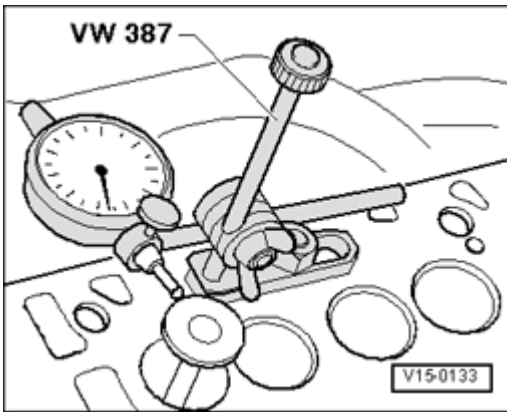


Fig. 389: Determining Valve Rock (Wear limit)
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

Test Sequence

- Insert valve into valve guide. Due to the slight difference in stem dimensions, ensure that only an intake valve is used in the intake guide and an exhaust valve in the exhaust guide.
- Valve stem tip must seal with valve guide.
- Determine tilt clearance.
- Wear limit: 0.8 mm.

NOTE:

- If the valve is to be replaced as part of a repair, use a new valve for the calculation.
- If wear limit is exceeded, re-measure using new valves. If wear limit is still exceeded, replace cylinder head.

Valves, Checking

Valves, Checking

- Perform a visual check for signs of wear at stem and at seating surface.

If significant wear is discovered:

- Replace the respective valve.

17 - ENGINE LUBRICATION

LUBRICATION SYSTEM COMPONENTS, REMOVING AND INSTALLING

Lubrication System Components, Removing and Installing

- > **Oil Pump and Oil Pan Lower Section, Component Overview**
- > **Oil Pan Lower Section, Removing and Installing**
- > **Oil Pump, Removing and Installing**
- > **Oil Pan Upper Section, Component Overview**
- > **Oil Pan Upper Section, Removing and Installing**
- > **Oil Check Valve and Spray Nozzle Valve, Component Overview**
- > **Oil Check Valve and Spray Nozzle Valve, Removing and Installing**
- > **Crankcase Ventilation Hose, Removing and Installing**
- > **Oil Filter Housing, Component Overview**
- > **Oil Filter Housing, Removing and Installing**
- > **Oil Cooler, Removing and Installing**
- > **Oil Pressure Switch, Removing and Installing**
- > **Oil Pressure and Oil Pressure Switch, Checking**
- > **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, lines and hoses must be carefully cleaned to prevent resulting damage and the oil cooler must be replaced.
- The oil level must not exceed the max. marking or the catalytic converter could be damaged.
- Oil quantities, oil specifications and viscosity classes --> Maintenance tables.

Oil Pump and Oil Pan Lower Section, Component Overview

Oil Pump and Oil Pan Lower Section, Component Overview

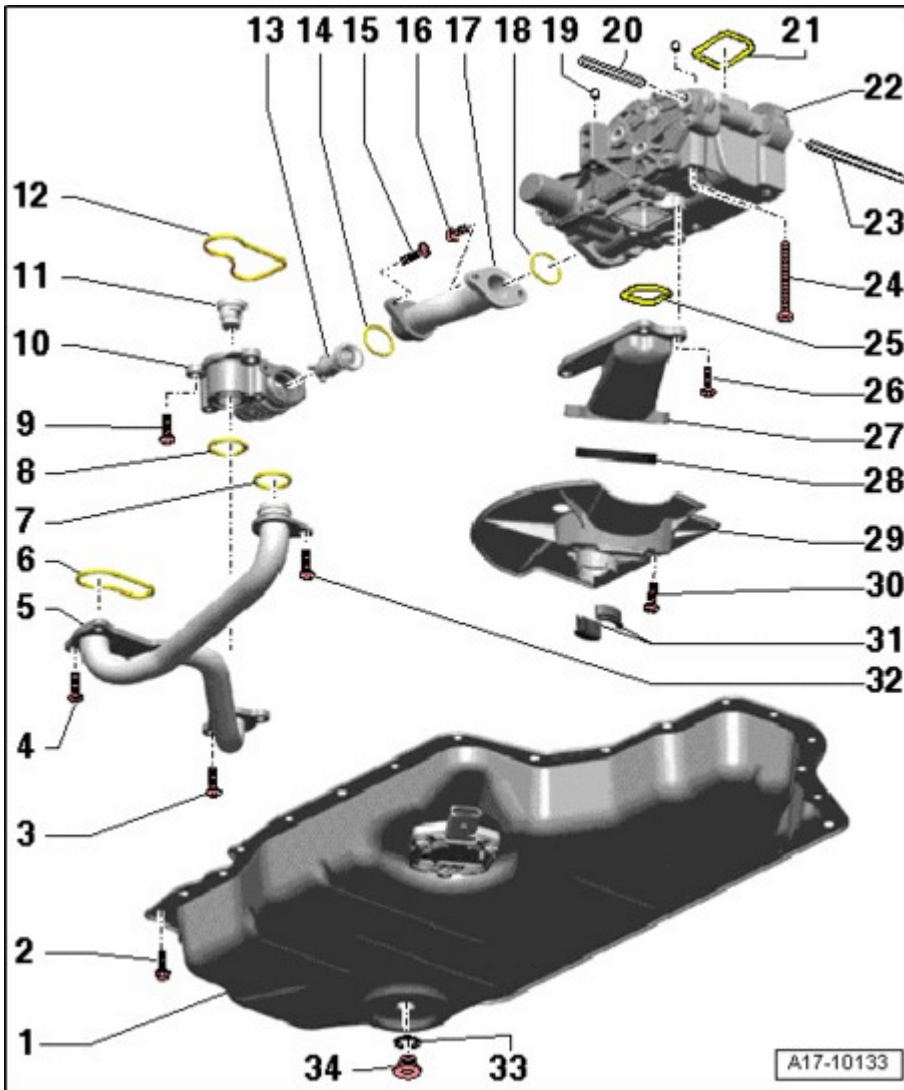


Fig. 390: Oil Pump And Oil Pan Lower Section, Component Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Oil pan (lower section)

- Removing and installing --> **Oil Pan Lower Section, Removing and Installing**
- With Oil Level Thermal Sensor G266
- Oil Level Thermal Sensor G266 , removing and installing --> **Oil Level Thermal Sensor G266, Removing and Installing**

2 - 9 Nm

- Tighten diagonally in 2 stages --> *Tighten bolts for lower part of oil pan in 2 stages as follows.* under **Installing**

3 - 9 Nm

2009 Audi S8 Quattro

ENGINE 5.2 Liter 10-Cyl. 4V Engine Mechanical, Engine Code(s): BSM - S8

4 - 9 Nm

5 - Oil pipe

6 - Gasket

- Replace

7 - O-ring

- Replace

8 - O-ring

- Replace

9 - 9 Nm

10 - Housing

- For oil cooler by-pass valve

11 - Oil cooler by-pass valve

12 - Gasket

- Replace

13 - Oil check valve

14 - O-ring

- Replace

15 - 9 Nm

16 - 9 Nm

17 - Oil pipe

18 - O-ring

- Replace

19 - Alignment bushing

- 2 pieces

20 - Drive shaft for coolant pump

21 - Gasket

- Replace

22 - Oil pump

- Do not disassemble
- With relief valve approximately 5.5 bar
- Removing and installing --> **Oil Pump, Removing and Installing**

23 - Drive shaft for oil pump

24 - 8 Nm plus an additional 90 ($1/4$ turn)

- Replace

25 - Gasket

- Replace

26 - 9 Nm

27 - Intake tube

- For oil pump

28 - Oil strainer

- Clean

29 - Oil baffle

30 - 5 Nm plus an additional 45 ($1/8$ turn)

- Replace

31 - Rubber buffer

32 - 9 Nm

33 - Seal

- Replace

34 - Oil drain plug - 25 Nm

Oil Level Thermal Sensor G266, Removing and Installing

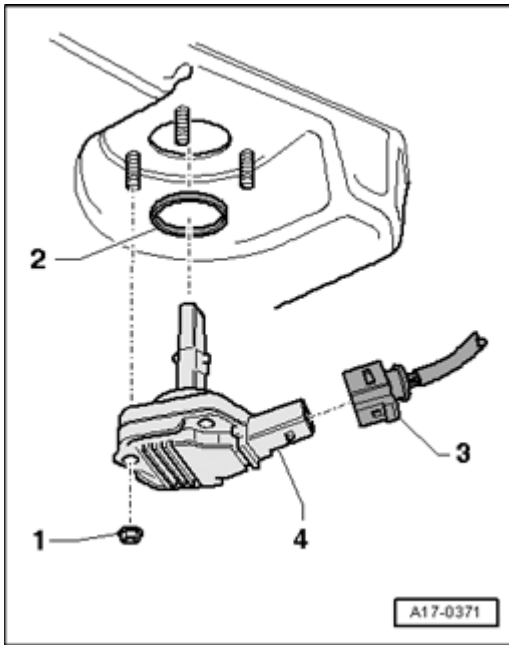


Fig. 391: Oil Level Thermal Sensor G266, Removing And Installing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1. Nut - 9 Nm
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

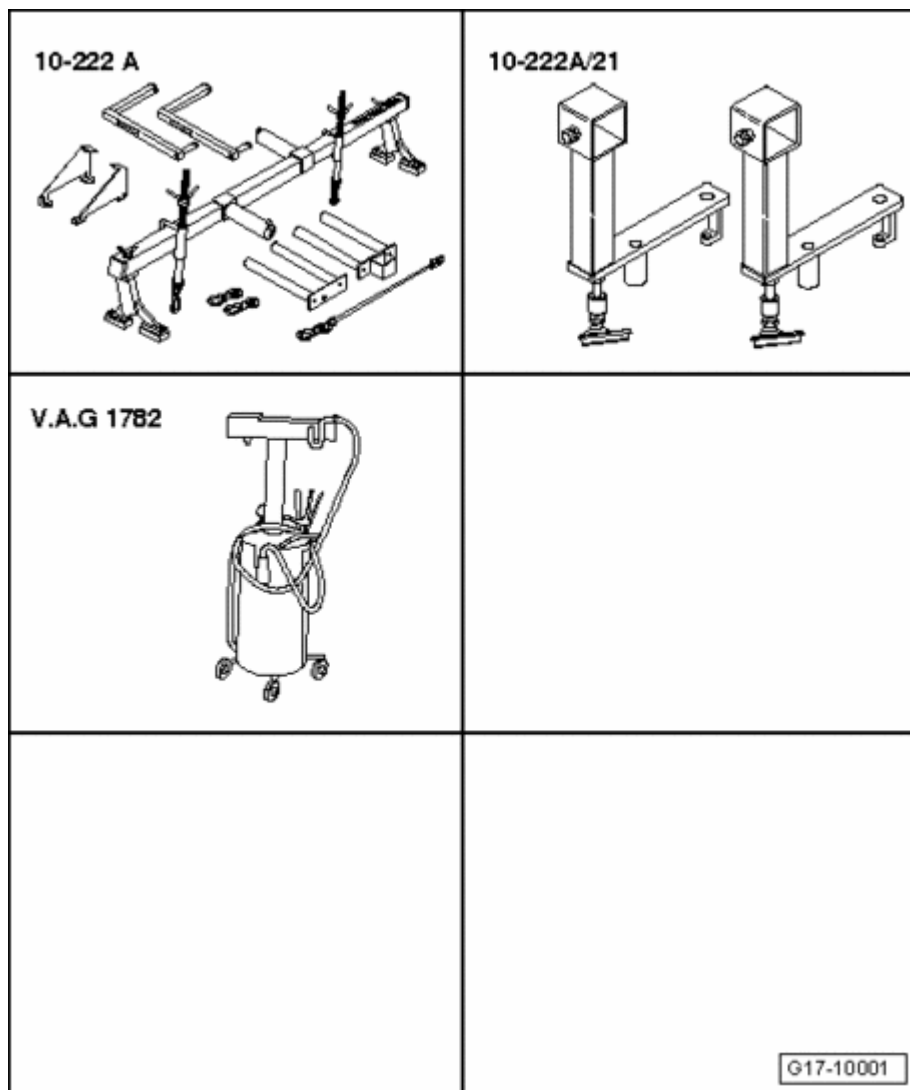


Fig. 392: Identifying Special Tools - Oil Pan Lower Section, Removing And Installing
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Engine support bridge 10 - 222 A
- Adapter 10 - 222 A/21
- Old oil collecting and extracting device V.A.G 1782
- Hand drill with plastic brush attachment
- Protective glasses
- Sealant

Removing

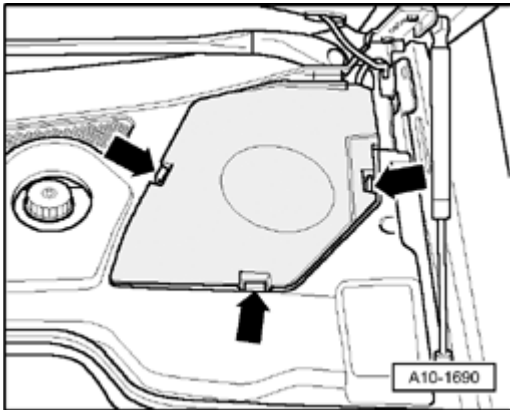


Fig. 393: Cover Above Coolant Reservoir

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

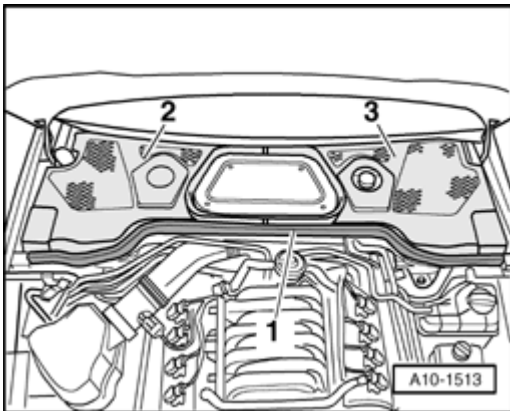


Fig. 394: Identifying Rubber Seal & Plenum Chamber Covers

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

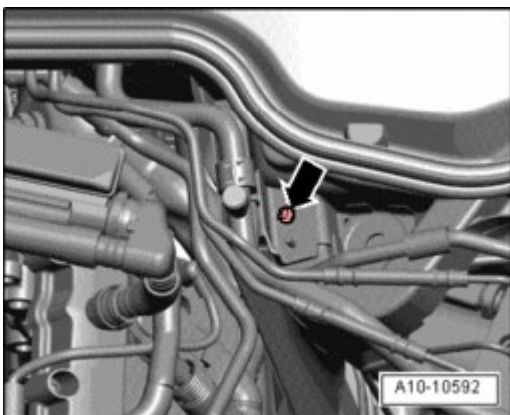


Fig. 395: Refrigerant Line Bracket At Left From Strut Tower

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove refrigerant line bracket at left from strut tower - **arrow** -.

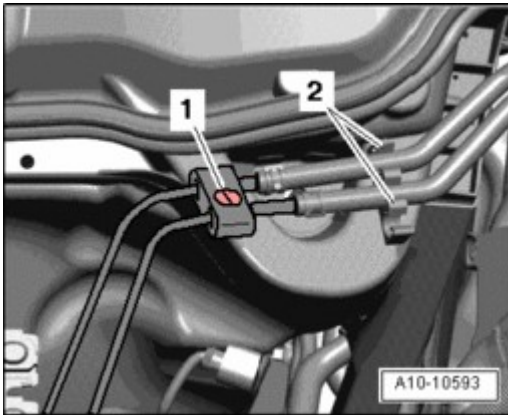


Fig. 396: Removing Clip Unclipping Fuel Line And Vacuum Pump From Bracket On Strut Tower
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove clip - **1** - at right.
- Unclip fuel line and vacuum pump from bracket - **2** - on strut tower.

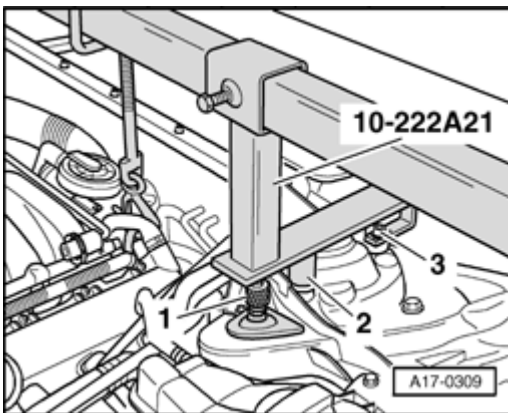


Fig. 397: Securing Engine Support Bridge 10 - 222 A With Adapters 10 - 222 A/21 At Suspension Strut Domes

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove suspension strut cross member rear bolts - **3** -.
- Secure Engine Support Bridge 10 - 222 A to strut towers with Adapter 10 - 222 A/21.
- The adapters are marked for the left and right side of the vehicle.
- The center contact point - **2** - on the adapter is placed on the suspension strut cross member front bolts.
- The adapters are tightened with the rear bolts - **3** - for suspension strut cross member.
- The knurled thumb screw - **1** - must be turned downward far enough so that the contact plate rests on the strut tower.

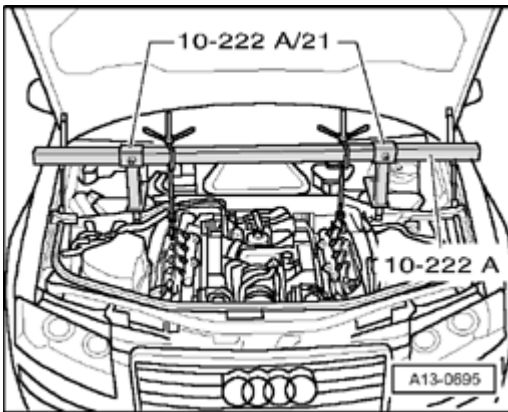


Fig. 398: Securing Spindles Of Engine Support Bridge 10 - 222 A At Rear Engine Lifting Eyes
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure spindles of Engine Support Bridge 10 - 222 A at the rear engine lifting eyes.
- Tension engine with spindles of the engine support bridge.

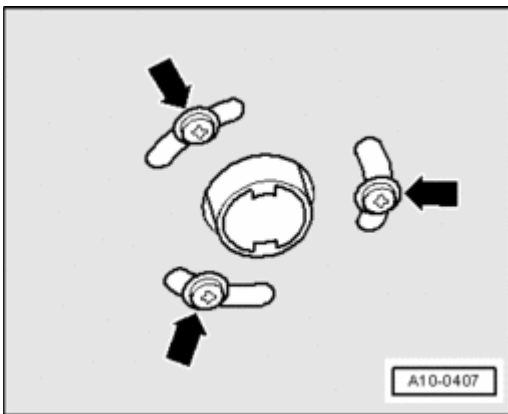


Fig. 399: Identifying Exhaust Pipe Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

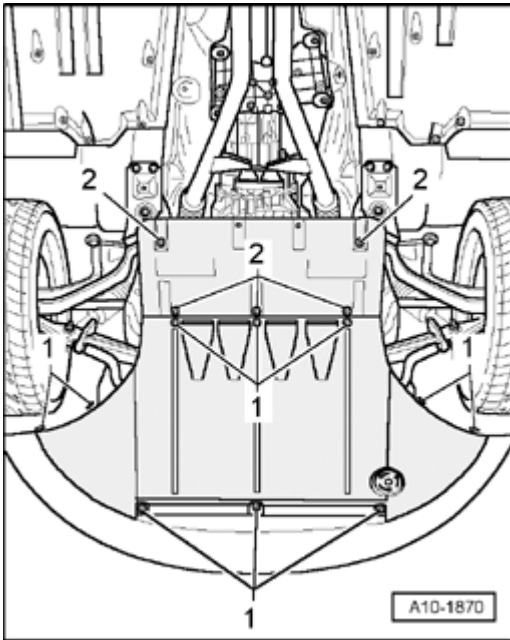


Fig. 400: Noise Insulation Quick-Release Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen quick-release fasteners - 1 - and - 2 - and remove noise insulation.

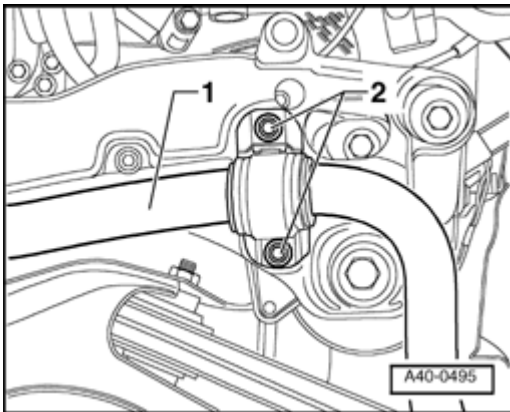
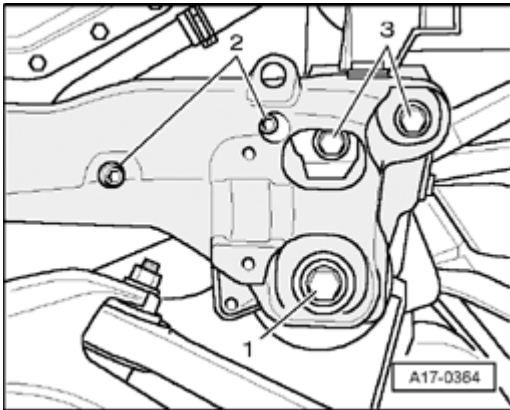


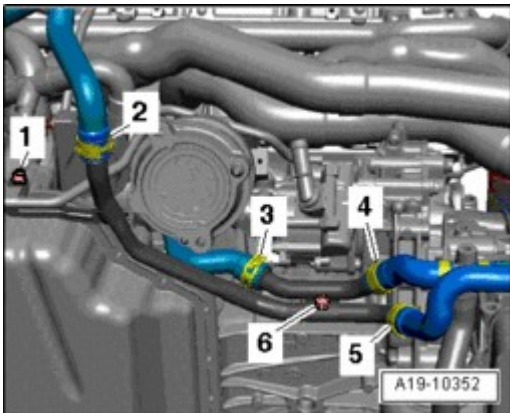
Fig. 401: Stabilizer Bar & Left/Right Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Evenly remove left and right bolts - 2 - on stabilizer bar retaining clamps and rotate stabilizer bar - 1 - downward.

**Fig. 402: Engine Carrier Left/Right Bolts**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove left and right bolts - 1, 2, 3 - and remove engine carrier.

**Fig. 403: Coolant Hoses, Nuts & Bolts**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nut - 1 - and bolt - 6 - on lower left coolant pipe.

NOTE:

- Ignore items - 2 to 5 -.

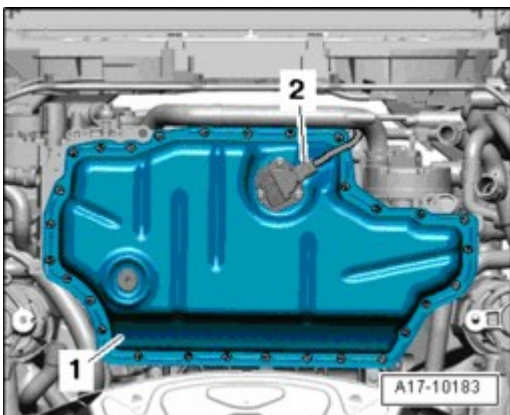


Fig. 404: Identifying Oil Level Thermal Sensor G266 Electrical Connector & Oil Pan (Lower Part)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - 2 - at Oil Level Thermal Sensor G266.
- Place old oil collecting and extracting device V.A.G 1782 under engine and drain engine oil.
- Remove oil pan (lower part) - 1 - and pry out carefully.

NOTE: • There is still a residual amount of oil in lower section of oil pan.

Installing

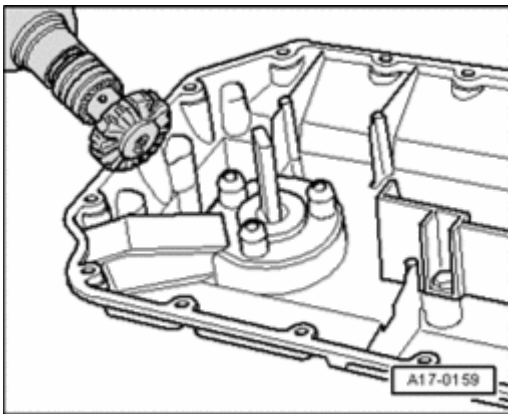


Fig. 405: Using Rotating Plastic Brush To Remove Any Remaining Sealant From Oil Pan (Lower Part) And At Upper Part
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE: • Replace seals.

CAUTION: Wear safety glasses.

- Remove sealant residue lower part and upper part of oil pan, e.g. with rotating plastic brush.
- Clean sealing surfaces, they must be free of oil and grease.

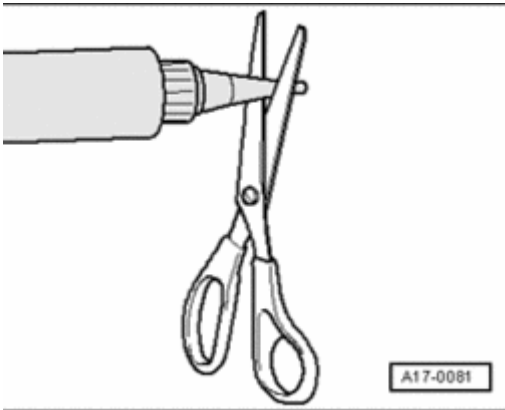


Fig. 406: Cutting Tube Nozzle At Front Marking
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

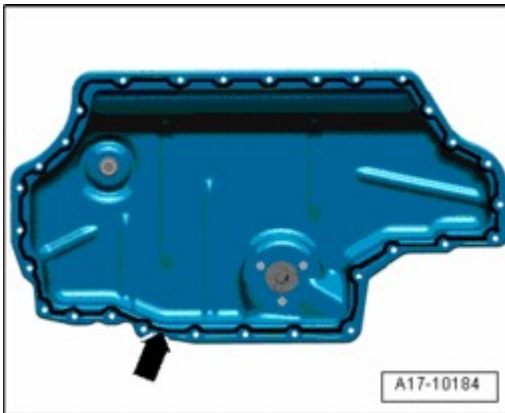


Fig. 407: Applying Sealant Bead On Clean Sealing Surface Of Lower Part Of Oil Pan
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Apply sealant bead - **arrow** - on clean sealing surface of lower part of oil pan as shown in illustration.
- Thickness of sealant bead: 2.5 mm.

NOTE:

- Sealant bead must not be thicker than specified, otherwise excess sealant may get into lower section of oil pan and clog strainer in intake tube.
- The oil pan (lower part) must be installed within 5 minutes after application of sealant.

- Position lower part of oil pan and hand tighten all bolts.
- Tighten bolts for lower part of oil pan in 2 stages as follows.
- Pre-tighten all bolts in a diagonal sequence to 5 Nm.
- Tighten all bolts in a diagonal sequence to 9 Nm.

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

- Install engine carrier --> **40 - FRONT SUSPENSION** .
- Install stabilizer bar --> **40 - FRONT SUSPENSION** .
- Add engine oil and check oil level --> **Oil Level, Checking**.

Tightening Specifications

Component	Nm
Lower section of oil pan to upper section of oil pan	9 1)
Oil drain plug	25
Lower left coolant pipe to upper section of oil pan	9
Engine mount to engine carrier	23
1) Tighten in 2 stages.	

Oil Pump, Removing and Installing

Oil Pump, Removing and Installing

Special tools, testers and auxiliary items required

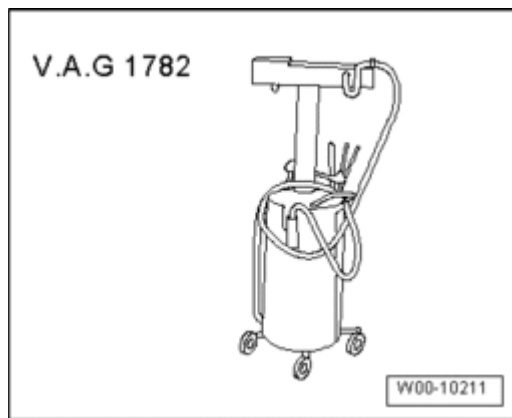


Fig. 408: Old Oil Collecting And Extracting Device V.A.G 1782
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Old oil collecting and extracting device V.A.G 1782
- Water pump pliers (standard)

Removing

- Remove coolant pump --> **Coolant Pump, Removing and Installing**.

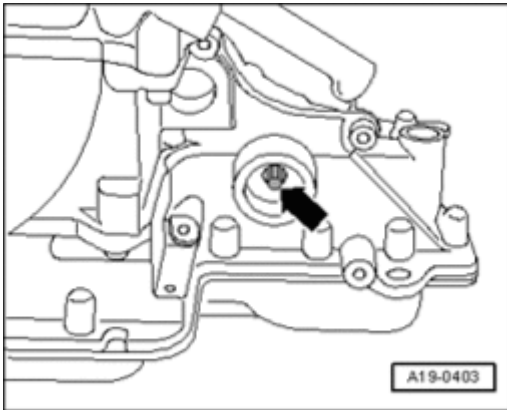


Fig. 409: Removing/Installing Drive Shaft For Coolant Pump From Oil Pump
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove drive shaft - **arrow** - for coolant pump from oil pump.
- Remove lower section of oil pan --> **Oil Pan Lower Section, Removing and Installing.**

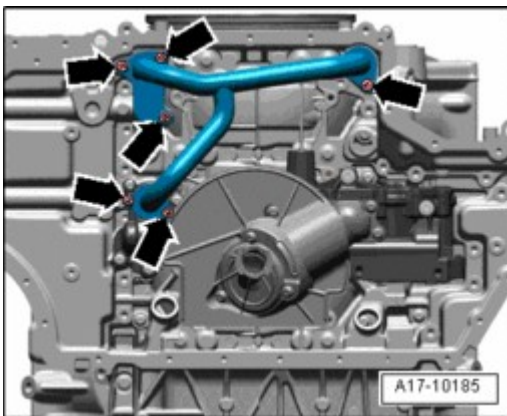


Fig. 410: Placing Old Oil Collecting, Extracting Device V.A.G 1782 Under Engine, Bolts & Oil Pipe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place old oil collecting and extracting device V.A.G 1782 under engine.
- Remove bolts - **arrows** - and remove oil pipe.

NOTE:

- **Oil escapes when removing oil lines.**

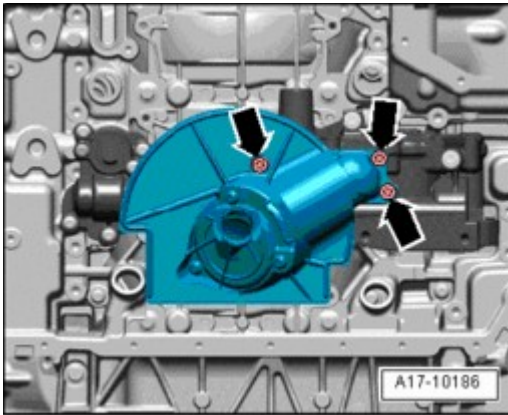


Fig. 411: Removing Bolts And Intake Tube With Oil Baffle
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and remove intake tube with oil baffle.

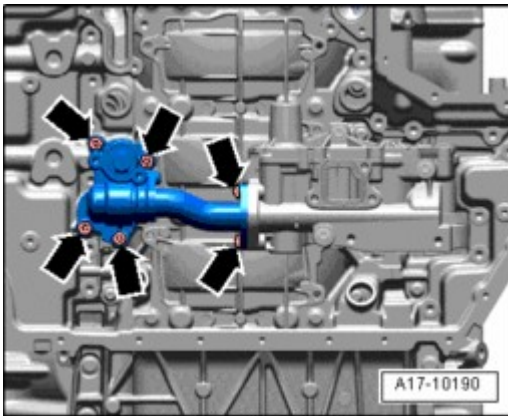


Fig. 412: Removing Bolts And Oil Pipe Together With Oil Cooler By-Pass Valve Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and remove oil line together with oil cooler by-pass valve housing.

NOTE:

- Oil escapes when removing oil lines.

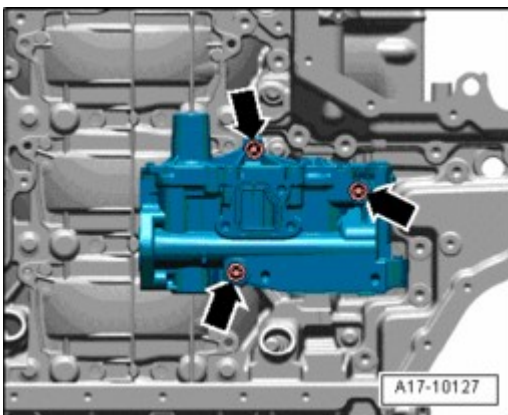


Fig. 413: Removing/Tightening Oil Pump Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and hold oil pump securely with hand.

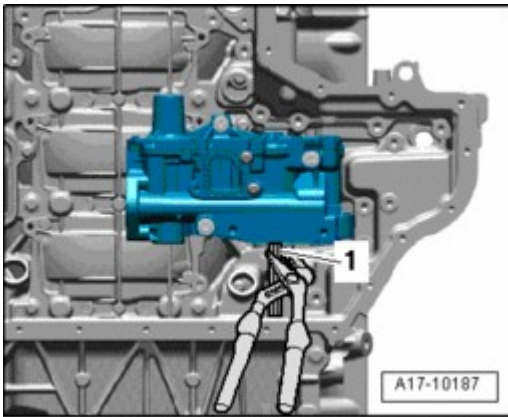


Fig. 414: Pulling Oil Pump Input Shaft Back Against Spring Force With Water Pump Pliers

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull oil pump input shaft - **1** - back against spring force with water pump pliers and remove oil pump.

Installing

NOTE:

- **Always replace bolts that are tightened to torque as well as sealing rings and O-rings.**

- Check whether 2 alignment bushings are present in cylinder block, install if necessary.
- Press oil pump input shaft - **1** - back with water pump pliers and place oil pump on cylinder block.
- Open water pump pliers and let input shaft - **1** - glide into oil pump.

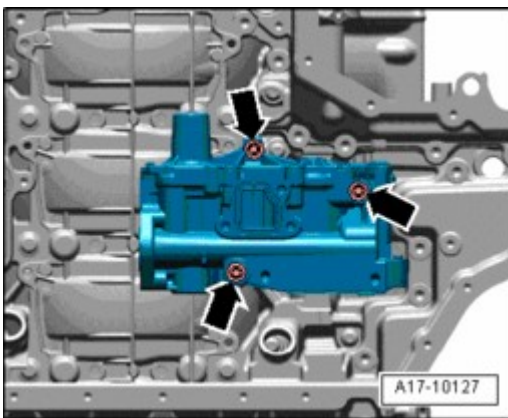


Fig. 415: Removing/Tightening Oil Pump Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten oil pump - **arrows** -.

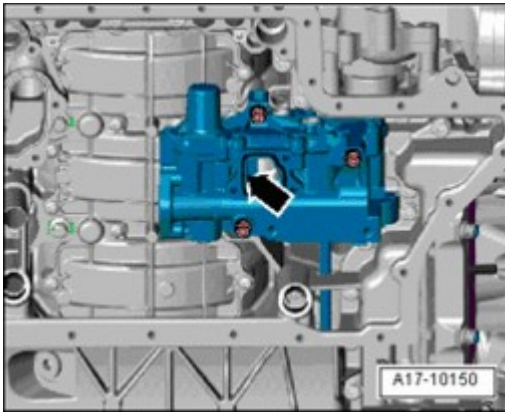


Fig. 416: Checking Whether Drive Shaft Is Friction Locked To Oil Pump
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check whether drive shaft is friction locked to oil pump. To do so, reach into intake opening - **arrow** - of oil pump and try to rotate oil pump gears.
- Toothed gears must not be able to be rotated.

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

- Install lower section of oil pan --> *Installing* under **Oil Pan Lower Section, Removing and Installing** .
- Install coolant pump --> **Coolant Pump, Removing and Installing**.
- Add engine oil and check oil level --> **Oil Level, Checking**.
- Fill with coolant --> *Filling* under **Cooling System, Draining and Filling**.

Tightening Specifications

Component	Nm
Oil pump to cylinder block	8 + 90° 1)2)
Housing for intake tube to oil pump	9
Oil lines to upper section of oil pan and oil pump	9
1) Replace bolts. 2) 90° corresponds to a quarter turn.	

Oil Pan Upper Section, Component Overview

Oil Pan Upper Section, Component Overview

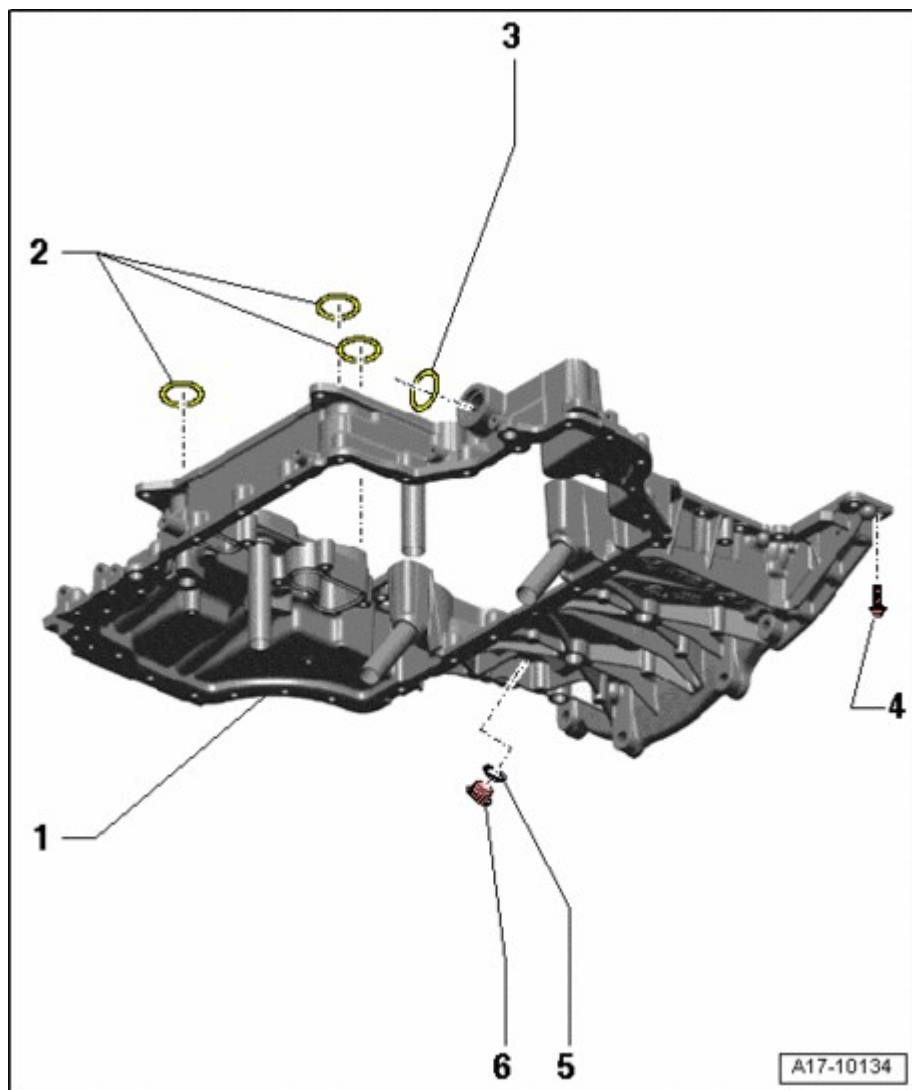


Fig. 417: Oil Pan Upper Section, Component Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Oil pan (upper section)

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

2 - Seals

- Replace

3 - O-ring

- Replace

4 - 14 Nm

5 - Seal

- Replace

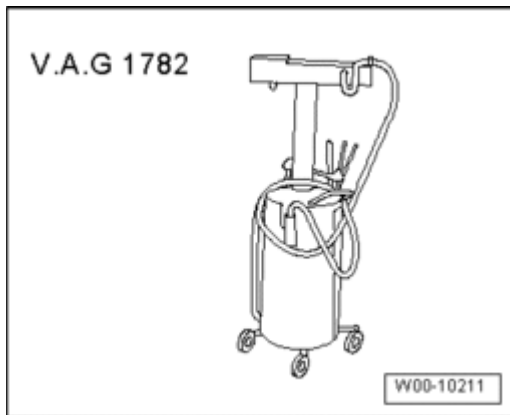
6 - Locking bolt - 35 Nm**Oil Pan Upper Section, Removing and Installing****Oil Pan Upper Section, Removing and Installing****Special tools, testers and auxiliary items required**

Fig. 418: Old Oil Collecting And Extracting Device V.A.G 1782
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

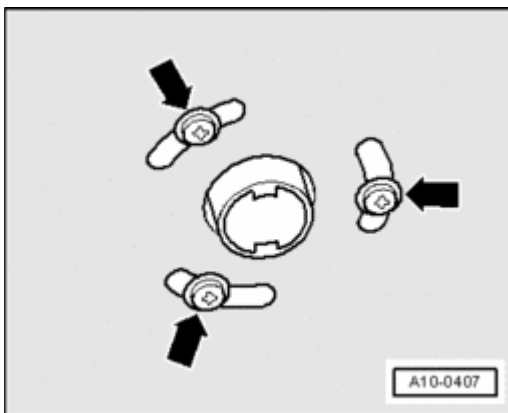
Removing

Fig. 419: Identifying Exhaust Pipe Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

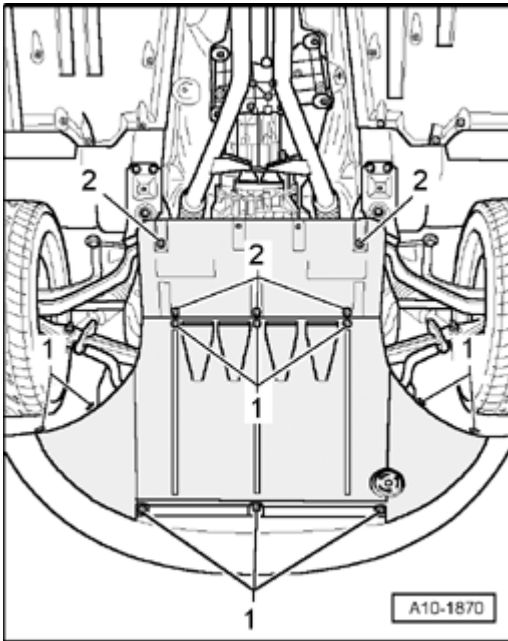


Fig. 420: Noise Insulation Quick-Release Fasteners
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen quick-release fasteners - **1** - and - **2** - and remove noise insulation.
- Place old oil collecting and extracting device V.A.G 1782 under engine and drain engine oil.
- Remove engine --> **Engine, Removing**.
- Separate engine and transmission --> **Engine and Transmission, Separating**.
- Secure engine on engine and transmission holder --> **Engine, Securing to Engine and Transmission Holder**.
- Remove drive plate --> **Drive Plate, Removing and Installing**.
- Remove left and right timing chain covers --> **Left and Right Timing Chain Covers, Removing and Installing**.
- Remove intake manifold --> **24 - MULTIPOINT FUEL INJECTION (MPI)** .
- Remove oil filter housing --> **Oil Filter Housing, Removing and Installing**.
- Remove lower timing chain cover --> **Lower Timing Chain Cover, Removing and Installing**.
- Remove generator --> **27 - BATTERY, STARTER, GENERATOR, CRUISE CONTROL** .
- Remove front coolant pipe --> **Front Coolant Line, Removing and Installing**.
- Remove coolant pump --> **Coolant Pump, Removing and Installing**.

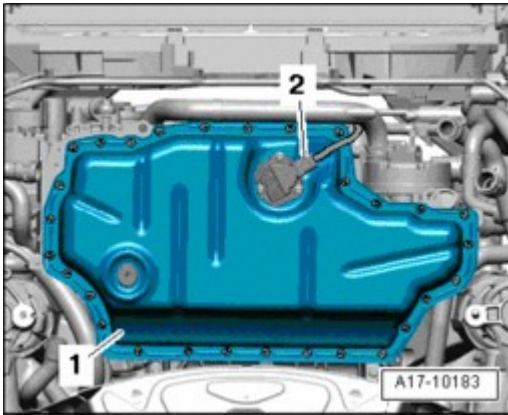


Fig. 421: Identifying Oil Level Thermal Sensor G266 Electrical Connector & Oil Pan (Lower Part)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - 2 - at Oil Level Thermal Sensor G266.
- Remove oil pan (lower part) - 1 - and pry out carefully.

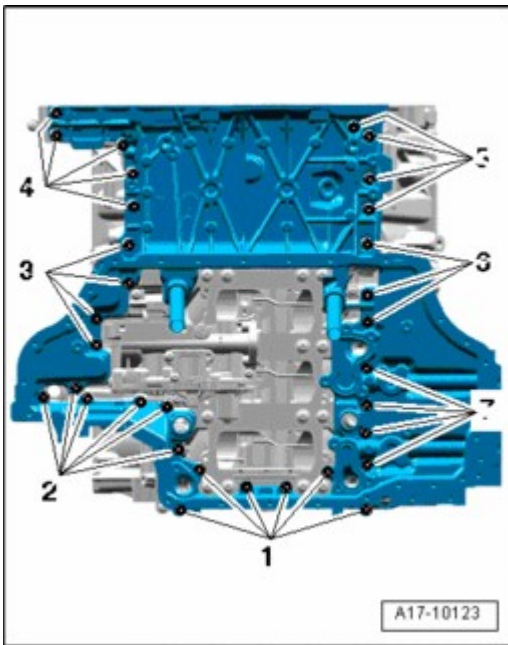


Fig. 422: Removing/Installing Oil Pump & Bolts For Upper Section Of Oil Pan
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove oil pump --> **Oil Pump, Removing and Installing.**
- Remove bolts - 1 to 7 - for upper section of oil pan.
- Press upper part of oil pan from alignment pins of cylinder block.

Installing

NOTE:

- Replace seals and O-rings.

CAUTION: Wear safety glasses.

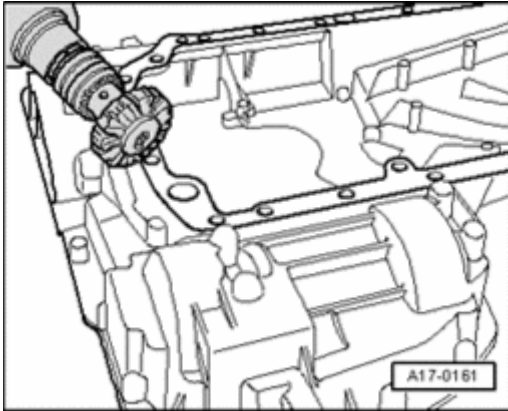


Fig. 423: Using Rotating Plastic Brush To Remove Remaining Sealant From Oil Pan (Upper Part) And At Cylinder Block

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using rotating plastic brush, remove any remaining sealant from oil pan (upper section) and at cylinder block.
- Clean sealing surfaces, they must be free of oil and grease.

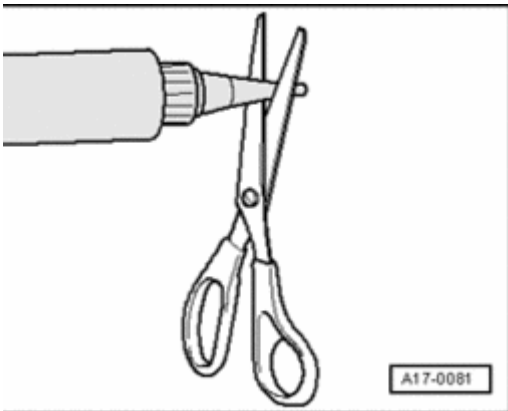


Fig. 424: Cutting Tube Nozzle At Front Marking

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

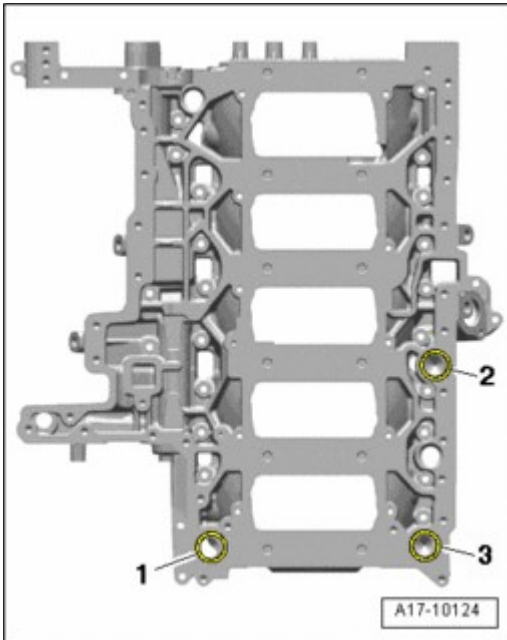


Fig. 425: Inserting New Seals Into Grooves On Cylinder Block
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert new seals - **1, 2, 3** - into grooves on cylinder block.

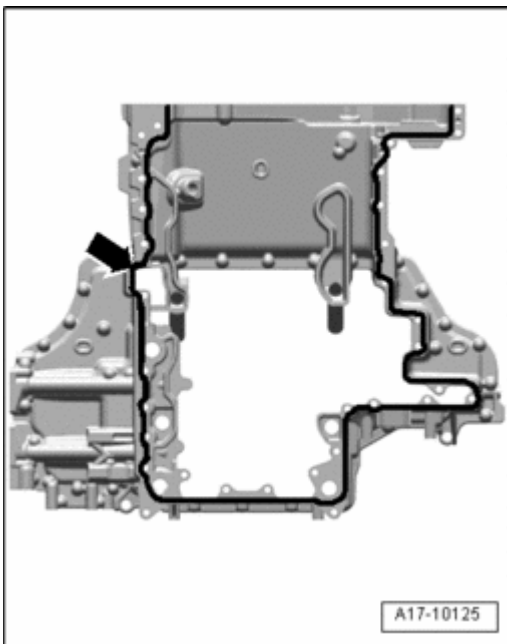


Fig. 426: Applying Sealant Bead On Clean Sealing Surface Of Upper Section Of Oil Pan
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Apply sealant bead - **arrow** - on clean sealing surface of upper section of oil pan as shown in illustration.
- Thickness of sealant beads: 2.5 mm.

NOTE:

- Sealant bead must not be thicker than specified, otherwise sealant could get into oil pan and clog the strainer on intake tube.
- The oil pan (upper section) must be installed within 5 minutes after application of sealant.

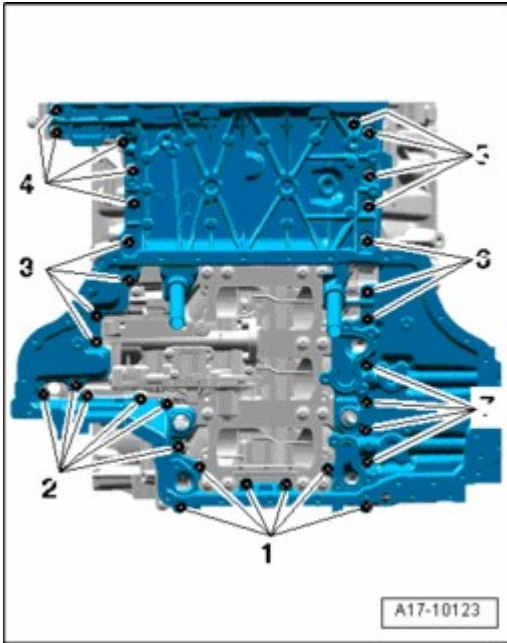


Fig. 427: Removing/Installing Oil Pump & Bolts For Upper Section Of Oil Pan
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position upper section of oil pan and hand tighten all bolts.
- Tighten bolts - **1 to 7** - in 2 stages as follows.
- Pre-tighten all the bolts in a diagonal sequence to 5 Nm.
- Tighten bolts in a diagonal sequence to 14 Nm.

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

- Install oil pump --> **Oil Pump, Removing and Installing.**
- Install lower section of oil pan --> *Installing* under **Oil Pan Lower Section, Removing and Installing .**
- Install coolant pump --> **Coolant Pump, Removing and Installing.**
- Install front coolant pipe --> **Front Coolant Line, Removing and Installing.**
- Install generator --> **27 - BATTERY, STARTER, GENERATOR, CRUISE CONTROL .**
- Install lower timing chain cover --> **Lower Timing Chain Cover, Removing and Installing.**
- Install crankshaft seal, timing chain side --> **Crankshaft Seal, Timing Chain Side, Replacing.**
- Install oil filter housing --> **Oil Filter Housing, Removing and Installing.**
- Install intake manifold --> **24 - MULTIPOINT FUEL INJECTION (MPI) .**

- Install left and right timing chain covers --> *Installing* under **Left and Right Timing Chain Covers, Removing and Installing** .
- Install drive plate --> **Drive Plate, Removing and Installing**.
- Install engine --> **Engine, Installing**.
- Add engine oil and check oil level --> **Oil Level, Checking**.

Tightening specifications

Component	Nm
Upper section of oil pan to cylinder block	14

Oil Check Valve and Spray Nozzle Valve, Component Overview

Oil Check Valve and Spray Nozzle Valve, Component Overview

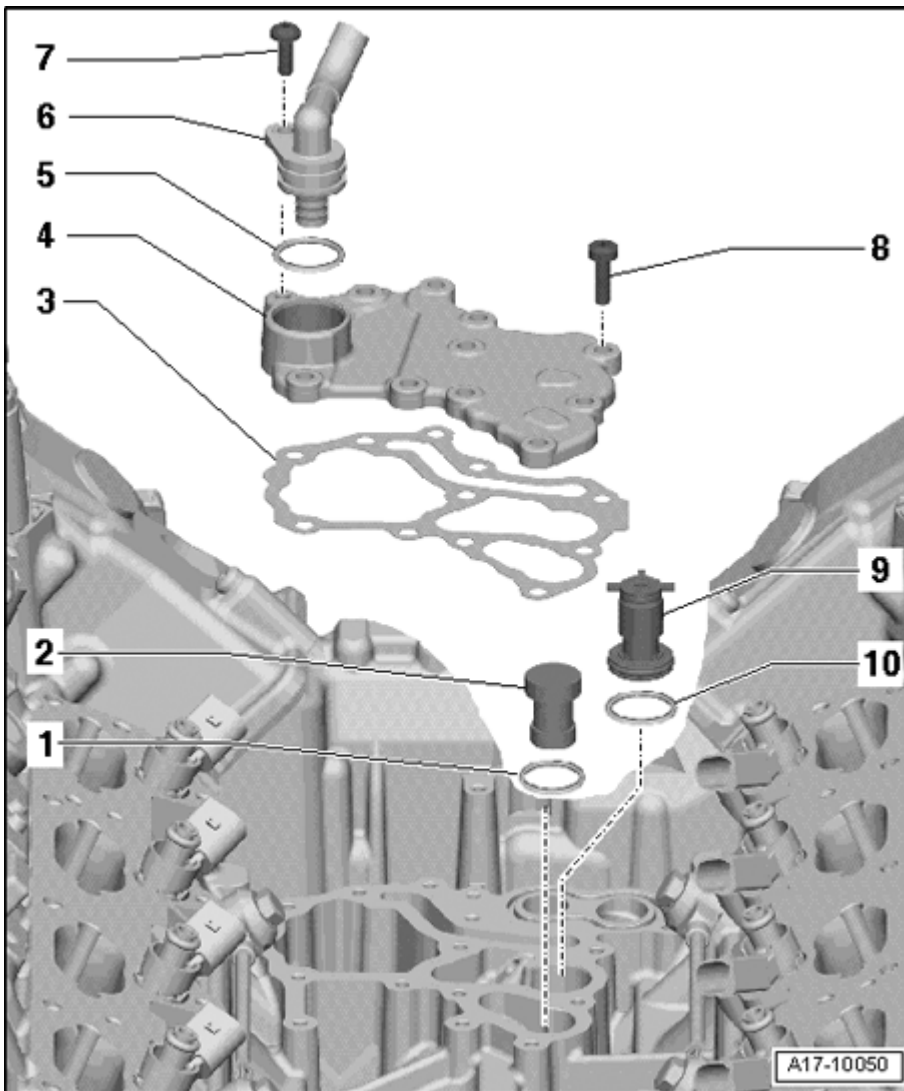


Fig. 428: Oil Check Valve And Spray Nozzle Valve, Component Overview**Courtesy of VOLKSWAGEN UNITED STATES, INC.**

1 - O-ring

- Replace

2 - Spray nozzle valve

- Removing and installing --> **Oil Check Valve and Spray Nozzle Valve, Removing and Installing**

3 - Gasket

- Replace

4 - Cover

5 - O-ring

- Replace

6 - Hose

- For crankcase ventilation

7 - 9 Nm

8 - 9 Nm

9 - Oil check valve

- Removing and installing --> **Oil Check Valve and Spray Nozzle Valve, Removing and Installing**

10 - O-ring

- Replace

Oil Check Valve and Spray Nozzle Valve, Removing and Installing**Oil Check Valve and Spray Nozzle Valve, Removing and Installing****NOTE:**

- If irregular valve noise occurs repeatedly during short journeys and disappears after extended driving, the oil check valve must be replaced.

Removing

- Remove intake manifold --> **24 - MULTIPOINT FUEL INJECTION (MPI)** .

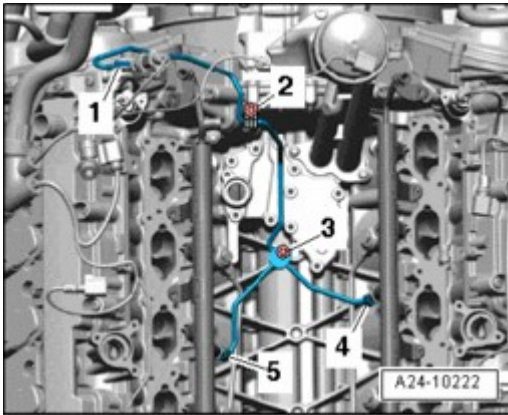


Fig. 429: Removing Bolts, High Pressure Line, Connections & Fuel Rail
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - 2 - and - 3 -.
- Remove high pressure line - 1 - from fuel rail.
- Remove high pressure line from connections - 4 - and - 5 - on fuel rail. To do this, counterhold at hex head with and open-end wrench and loosen union nut.
- Remove high pressure lines.

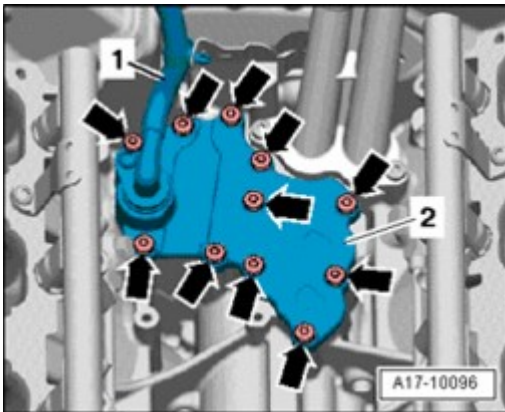


Fig. 430: Identifying Bolts & Cover With Crankcase Ventilation Hose
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Remove cover - 2 - with crankcase ventilation hose - 1 -.

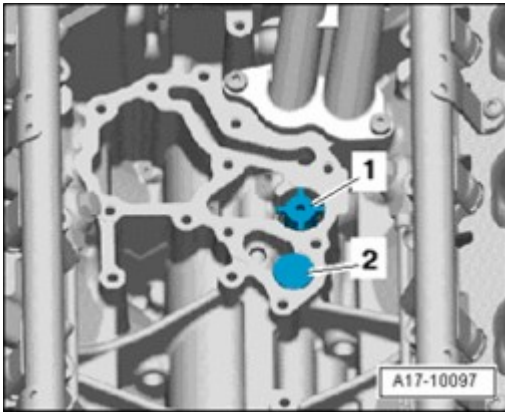


Fig. 431: Identifying Oil Check Valve And Spray Nozzle Valve
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove oil check valve - **1** - and spray nozzle valve - **2** -.

Installing

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

NOTE:

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

- Install high pressure lines --> **24 - MULTIPOINT FUEL INJECTION (MFI)** as described under "Fuel injectors, removing and installing".
- Install intake manifold --> **24 - MULTIPOINT FUEL INJECTION (MFI)** .

Tightening specifications

Component	Nm
Cover to cylinder block	9

Crankcase Ventilation Hose, Removing and Installing

Crankcase Ventilation Hose, Removing and Installing

Removing

- Remove intake manifold --> **24 - MULTIPOINT FUEL INJECTION (MFI)** .

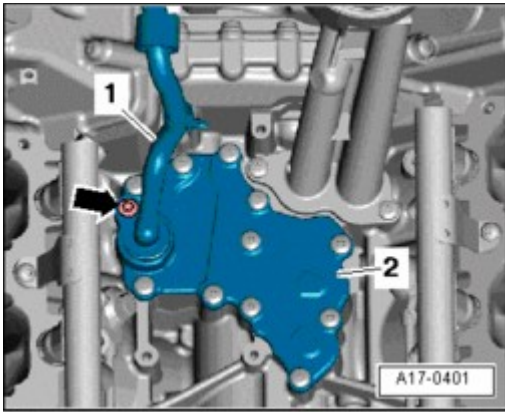


Fig. 432: Removing Bolt And Crankcase Ventilation Hose From Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - **arrow** - and remove crankcase ventilation hose - **1** - from cover - **2** -.

Installing

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

NOTE:

- **Replace O-ring.**

- Install intake manifold --> **24 - MULTIPOINT FUEL INJECTION (MPI)** .

Tightening specifications

Component	Nm
Crankcase ventilation hose to cover	9

Oil Filter Housing, Component Overview

Oil Filter Housing, Component Overview

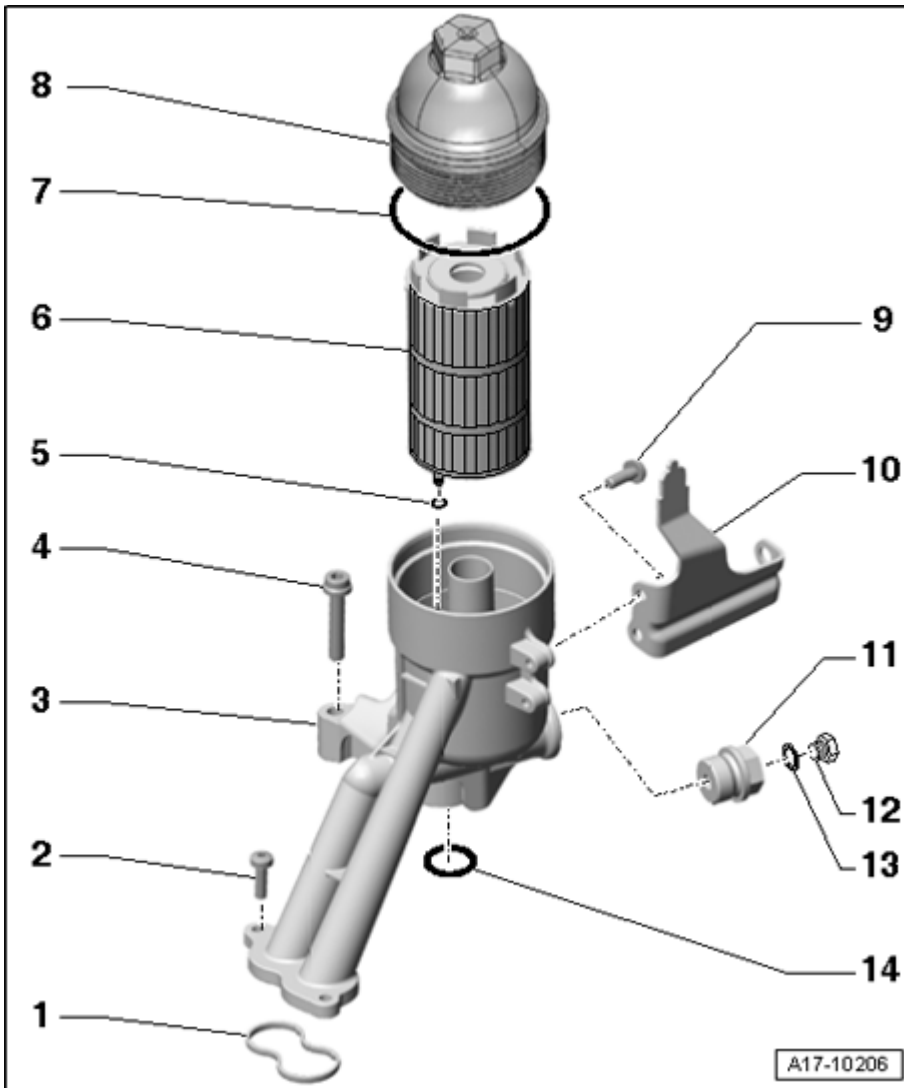


Fig. 433: Oil Filter Housing, Component Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Gasket

- Replace

2 - 9 Nm

3 - Oil filter housing

- With oil filter by-pass valve 1.3 bar

4 - 22 Nm

5 - O-ring

- Oil filter element component

6 - Oil filter element

- Removing and installing --> **01 - MAINTENANCE**

7 - O-ring

- Replace

8 - Cover - 25 Nm

9 - Not installed

10 - Not installed

11 - Locking bolt - 50 Nm

12 - Locking bolt - 9 Nm

13 - Seal

- Replace

14 - O-ring

- Replace

Oil Filter Housing, Removing and Installing

Oil Filter Housing, Removing and Installing

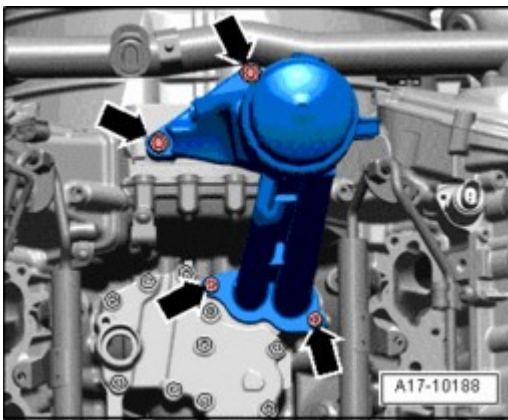


Fig. 434: Removing Bolts And Oil Filter Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

- Remove intake manifold --> **24 - MULTIPOINT FUEL INJECTION (MPI)** .

NOTE:

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

- Remove bolts - **arrows** - and remove oil filter housing.

Installing

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

NOTE:

- Replace seals and O-rings.

- Install intake manifold --> **24 - MULTIPOINT FUEL INJECTION (MPI)** .
- Check oil level --> **Oil Level, Checking**.

Tightening Specifications

Component		Nm
Oil filter housing to cylinder block	M8	9
	M10	22
Cap to oil filter housing		25

Oil Cooler, Removing and Installing

Oil Cooler, Removing and Installing

Special tools, testers and auxiliary items required

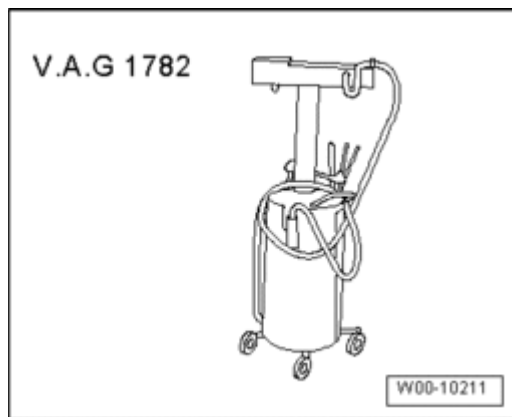


Fig. 435: Old Oil Collecting And Extracting Device V.A.G 1782
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Removing

- Drain coolant --> Cooling System, Draining and Filling.
- Remove generator --> 27 - BATTERY, STARTER, GENERATOR, CRUISE CONTROL .

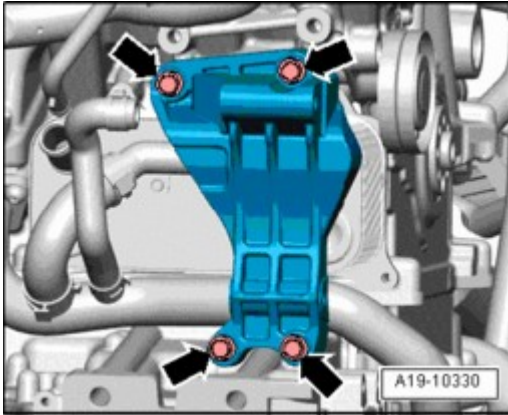


Fig. 436: Removing Bolts And Air Generator Bracket
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and remove air generator bracket.

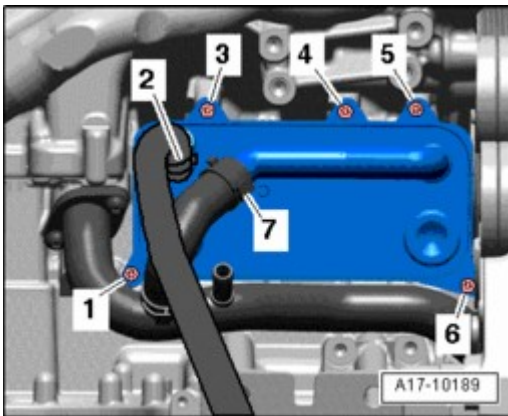


Fig. 437: Oil Cooler Coolant Hoses & Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove coolant hoses - **2** - and - **7** - from oil cooler.
- Place old oil collecting and extracting device V.A.G 1782 under engine.
- Remove bolts - **1, 3, 4, 5, 6** - and remove oil cooler.

Installing

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

- NOTE:**
- **Replace O-rings.**

2009 Audi S8 Quattro

ENGINE 5.2 Liter 10-Cyl. 4V Engine Mechanical, Engine Code(s): BSM - S8

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

- Install generator --> **27 - BATTERY, STARTER, GENERATOR, CRUISE CONTROL** .
- Check oil level --> **Oil Level, Checking.**
- Fill with coolant --> *Filling* under **Cooling System, Draining and Filling.**

Tightening Specifications

Component		Nm
Oil cooler to cylinder block		9
Alternator bracket to engine	M8	22
	M10	46

Oil Pressure Switch, Removing and Installing

Oil Pressure Switch, Removing and Installing

Removing

- Bring lock carrier into service position --> **50 - BODY - FRONT** .

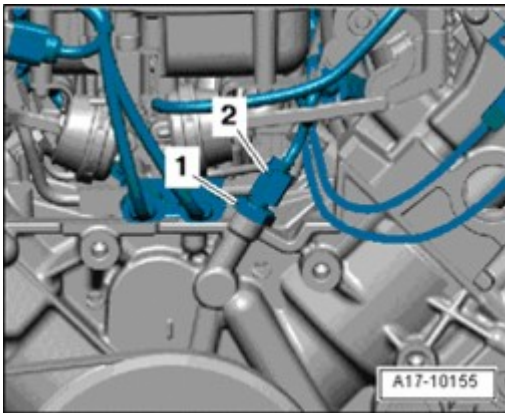


Fig. 438: Oil Pressure Switch F1 And Electrical Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **2** - on Oil Pressure Switch F1 - **1** - .
- Remove oil pressure switch.

Installing

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

- Install lock carrier with attachments --> **50 - BODY - FRONT** .

Tightening specifications

2009 Audi S8 Quattro

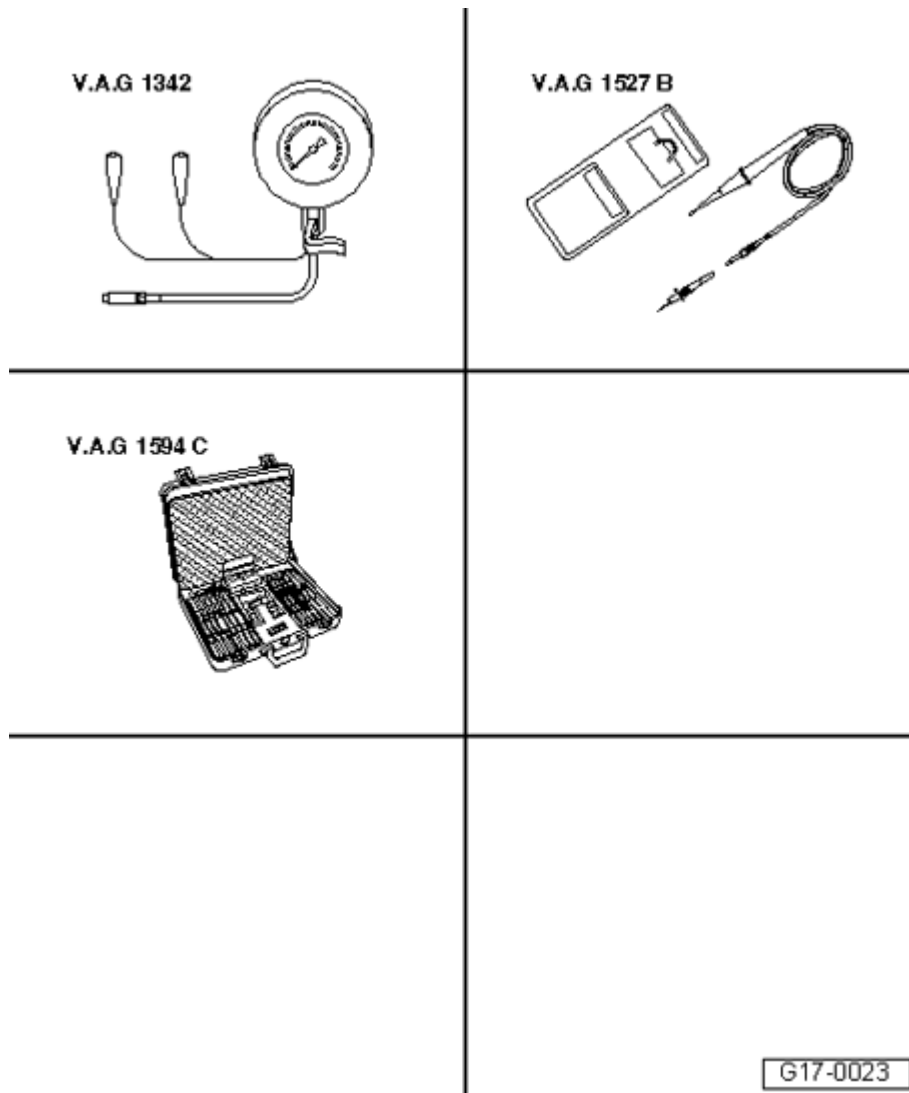
ENGINE 5.2 Liter 10-Cyl. 4V Engine Mechanical, Engine Code(s): BSM - S8

Component	Nm
Oil Pressure Switch F1 to cylinder block	20 1)
1) Replace seal.	

Oil Pressure and Oil Pressure Switch, Checking

Oil Pressure and Oil Pressure Switch, Checking

Special tools, testers and auxiliary items required



G17-0023

Fig. 439: Identifying Special Tools - Oil Pressure And Oil Pressure Switch, Checking
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Oil pressure gauge V.A.G 1342 with adapter V.A.G 1342/14
- Voltage tester V.A.G 1527B
- Connector test set V.A.G 1594C

Procedure

- Oil level OK
- Engine oil temperature approximately 80 C.
- Remove Oil Pressure Switch F1 --> **Oil Pressure Switch, Removing and Installing.**

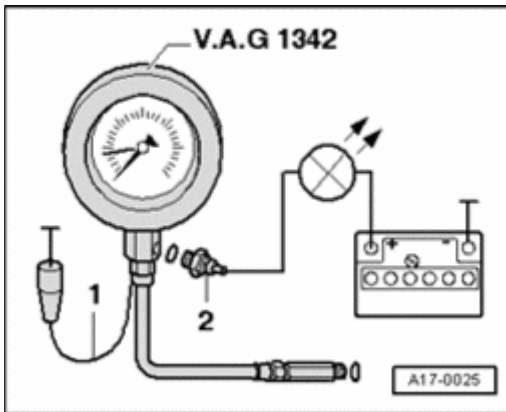


Fig. 440: Connecting Oil Pressure Gauge V.A.G 1342 With Adapter V.A.G 1342/14 To Hole For Oil Pressure Switch

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect oil pressure gauge V.A.G 1342 with adapter V.A.G 1342/14 to hole for oil pressure switch.
- Install oil pressure switch - 2 - into oil pressure gauge V.A.G 1342.
- Place brown wire of oil pressure gauge on Ground (GND).

Oil Pressure Switch, Checking

- Connect voltage tester V.A.G 1527B using adapter cables from connector test kit V.A.G 1594C to oil pressure switch and battery plus ("+").
- LED must not light up.

If LED lights up:

- Replace Oil Pressure Switch.
- Start engine.

NOTE:

- While starting engine, watch Pressure Tester and LED as oil pressure switch may open during start.
- At 1.2 to 1.6 bar pressure, the LED must light up.

If LED does not light up:

- Replace Oil Pressure Switch.

Oil Pressure, Checking

- Start engine.
- Oil pressure at idle: min. 1.5 bar.
- Oil pressure at 2000 RPM: min. 3.5 bar.

Assembling

- Install Oil Pressure Switch F1 --> **Oil Pressure Switch, Removing and Installing.**

Oil Level, Checking**Oil Level, Checking**

For oil quantities, oil specifications and viscosity classes refer to --> **01 - MAINTENANCE** .

Procedure

- Engine oil temperature min. 60 C.
- Vehicle in level position.
- After stopping engine, wait a few minutes to allow oil to flow back into oil pan.
- Pull out oil dipstick, wipe off with a clean cloth and re-insert dipstick again up to stop.
- Withdraw dipstick again and read oil level.

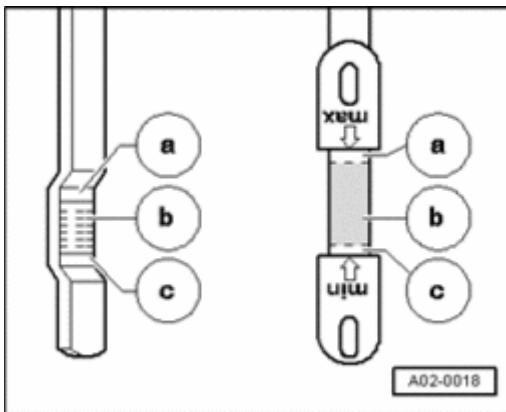
Range of markings on dipstick:

Fig. 441: Range Of Markings On Dipstick

Courtesy of VOLKSWAGEN UNITED STATES, INC.

a - Oil must not be added.

b - Oil may be topped off.

c - Oil must be added.

NOTE:

- Oil level must not exceed max. marking - a - and must not fall short of min. marking - c -.
- If the oil level exceeds the "max" marking, the catalytic converter could be damaged.

19 - ENGINE - COOLING SYSTEM

COOLING SYSTEM COMPONENTS, REMOVING AND INSTALLING

Cooling System Components, Removing and Installing

--> **Coolant Hose Connection Diagram, without Auxiliary Heater**

--> **Coolant Hose Connection Diagram, with Auxiliary Heater**

--> **Coolant Hose Connection Diagram, with Hot Climate Configuration without Parking Heater**

--> **Coolant Hose Connection Diagram, with Hot Climate Configuration with Parking Heater**

--> **Cooling System, Draining and Filling**

--> **Coolant Pump and Regulator, Component Overview**

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

--> **Thermostat Housing, Removing and Installing**

--> **Thermostat Opening Data**

--> **Engine Coolant Temperature Sensor, Removing and Installing**

--> **After-Run Coolant Pump, Removing and Installing**

--> **Coolant Pipes, Component Overview**

--> **Lower Front Coolant Line, Removing and Installing**

--> **Front Coolant Line, Removing and Installing**

--> **Left Coolant Pipe, Removing and Installing**

--> **Lower Left Coolant Pipe, Removing and Installing**

--> **Right Coolant Pipe, Removing and Installing**

- > **Rear Coolant Pipe, Removing and Installing**
- > **Radiator and Coolant Fan, Component Overview**
- > **Radiator, Removing and Installing**
- > **Left Auxiliary Cooler, Removing and Installing**
- > **Right Auxiliary Cooler, Removing and Installing**
- > **Cooling System, Checking for Leaks**
- > **Fan Shroud, Removing and Installing**
- > **Coolant Fan, Removing and Installing**

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

NOTE:

- When the engine is warm the cooling system is under pressure. If necessary release pressure before commencing repair work.
- Secure all hose connections with hose clamps appropriate for the model .
- Replace gaskets, seals and O-rings.
- Arrows on coolant pipes and coolant hoses must line up across from each other.
- During installation, reinstall all heat insulation sleeves and heat shields at the same locations.

Coolant Hose Connection Diagram, without Auxiliary Heater

Coolant Hose Connection Diagram, without Auxiliary Heater

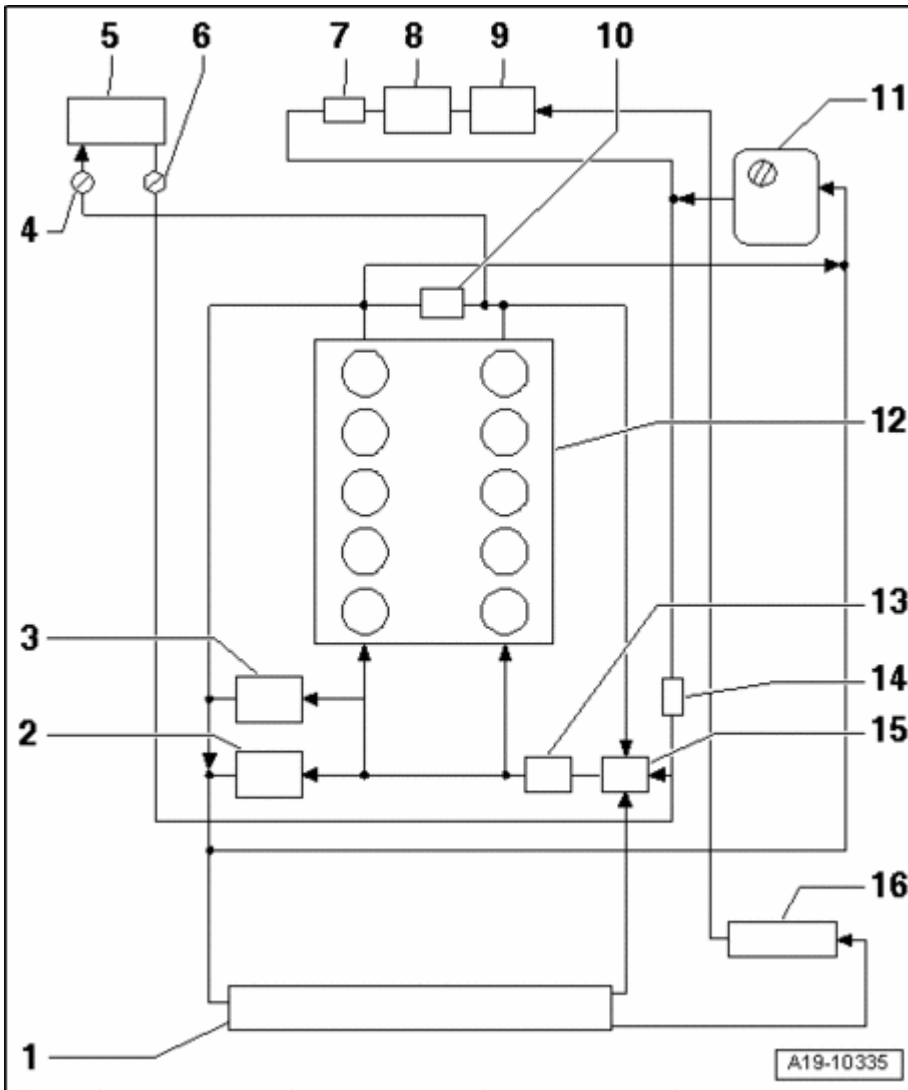


Fig. 442: Coolant Hose Connection Diagram, Without Auxiliary Heater
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Radiator

- Removing and installing --> **Radiator, Removing and Installing**
- Replace after replacing coolant

2 - Generator

3 - Oil cooler

- Removing and installing --> **Oil Cooler, Removing and Installing**
- Replace after replacing coolant

4 - Bleeder screw

5 - Heater core

- Replace after replacing coolant

6 - Bleeder screw

7 - Coolant thermostat

- For axle oil cooler and ATF cooler

8 - Axle oil cooler

9 - ATF cooler

10 - Engine Coolant Temperature (ECT) Sensor G62

11 - Coolant expansion tank

- Pressure relief valve in cap, checking --> **Pressure relief valve in cap, checking**

12 - Cylinder head/cylinder block

- Replace after replacing coolant

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 - Coolant thermostat

- Removing and installing --> **Thermostat Housing, Removing and Installing**

16 - Auxiliary cooler

- Removing and installing --> **Left Auxiliary Cooler, Removing and Installing**
- Replace after replacing coolant

Coolant Hose Connection Diagram, with Auxiliary Heater**Coolant Hose Connection Diagram, with Auxiliary Heater**

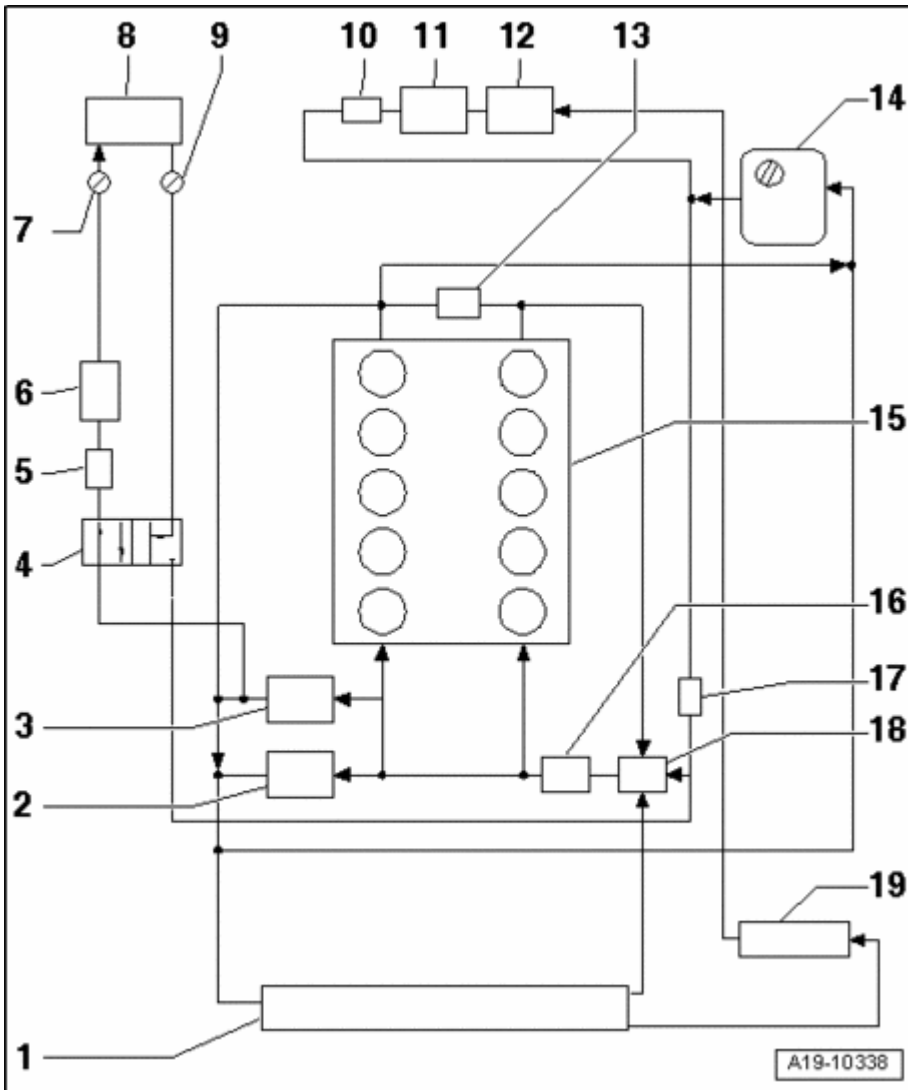


Fig. 443: Coolant Hose Connection Diagram, With Auxiliary Heater
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Radiator

- Removing and installing --> **Radiator, Removing and Installing**
- Replace after replacing coolant

2 - Generator

3 - Oil cooler

- Removing and installing --> **Oil Cooler, Removing and Installing**
- Replace after replacing coolant

4 - Engine Coolant (EC) Switch-Off Valve (heater) N279

5 - Recirculation Pump V55

6 - Auxiliary heater

7 - Bleeder screw

8 - Heater core

- Replace after replacing coolant

9 - Bleeder screw

10 - Coolant thermostat

- For axle oil cooler and ATF cooler

11 - Axle oil cooler

12 - ATF cooler

13 - Engine Coolant Temperature (ECT) Sensor G62

14 - Coolant expansion tank

- Pressure relief valve in cap, checking --> **Pressure relief valve in cap, checking**

15 - Cylinder head/cylinder block

- Replace after replacing coolant

16 - Coolant pump

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

17 - After-run coolant pump V51

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

18 - Coolant thermostat

- Removing and installing --> **Thermostat Housing, Removing and Installing**

19 - Auxiliary cooler

- Removing and installing --> **Left Auxiliary Cooler, Removing and Installing**
- Replace after replacing coolant

Coolant Hose Connection Diagram, with Hot Climate Configuration without Parking Heater

Coolant Hose Connection Diagram, with Hot Climate Configuration without Parking Heater

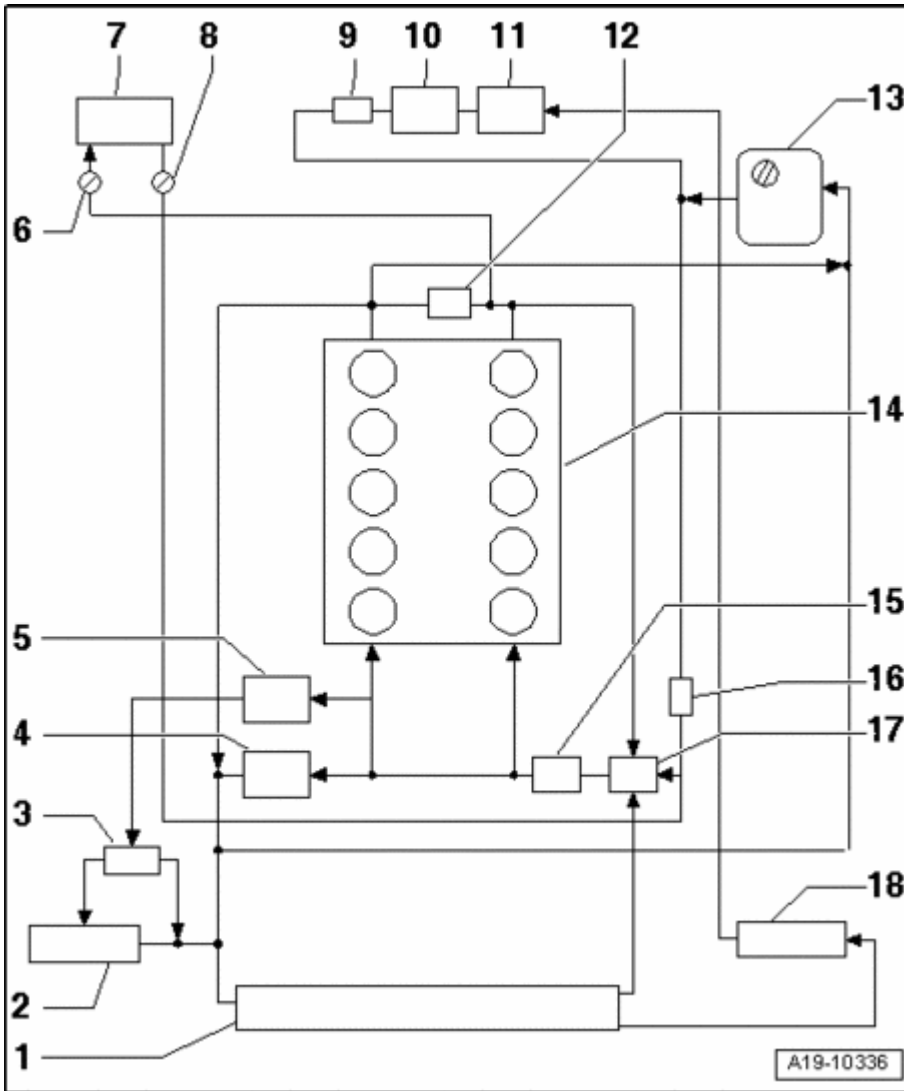


Fig. 444: Coolant Hose Connection Diagram, With Hot Climate Configuration Without Parking Heater
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Radiator

- Removing and installing --> **Radiator, Removing and Installing**
- Replace after replacing coolant

2 - Right auxiliary cooler

- Removing and installing --> **Right Auxiliary Cooler, Removing and Installing**
- Replace after replacing coolant

3 - Coolant regulator for auxiliary cooler

4 - Generator

5 - Oil cooler

- Removing and installing --> **Oil Cooler, Removing and Installing**
- Replace after replacing coolant

6 - Bleeder screw

7 - Heater core

- Replace after replacing coolant

8 - Bleeder screw

9 - Coolant thermostat

- For axle oil cooler and ATF cooler

10 - Axle oil cooler

11 - ATF cooler

12 - Engine Coolant Temperature (ECT) Sensor G62

13 - Coolant expansion tank

- Pressure relief valve in cap, checking --> **Pressure relief valve in cap, checking**

14 - Cylinder head/cylinder block

- Replace after replacing coolant

15 - Coolant pump

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

16 - After-run coolant pump V51

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

17 - Coolant thermostat

- Removing and installing --> **Thermostat Housing, Removing and Installing**

18 - Left auxiliary cooler

- Removing and installing --> **Left Auxiliary Cooler, Removing and Installing**
- Replace after replacing coolant

Coolant Hose Connection Diagram, with Hot Climate Configuration with Parking Heater

Coolant Hose Connection Diagram, with Hot Climate Configuration with Parking Heater

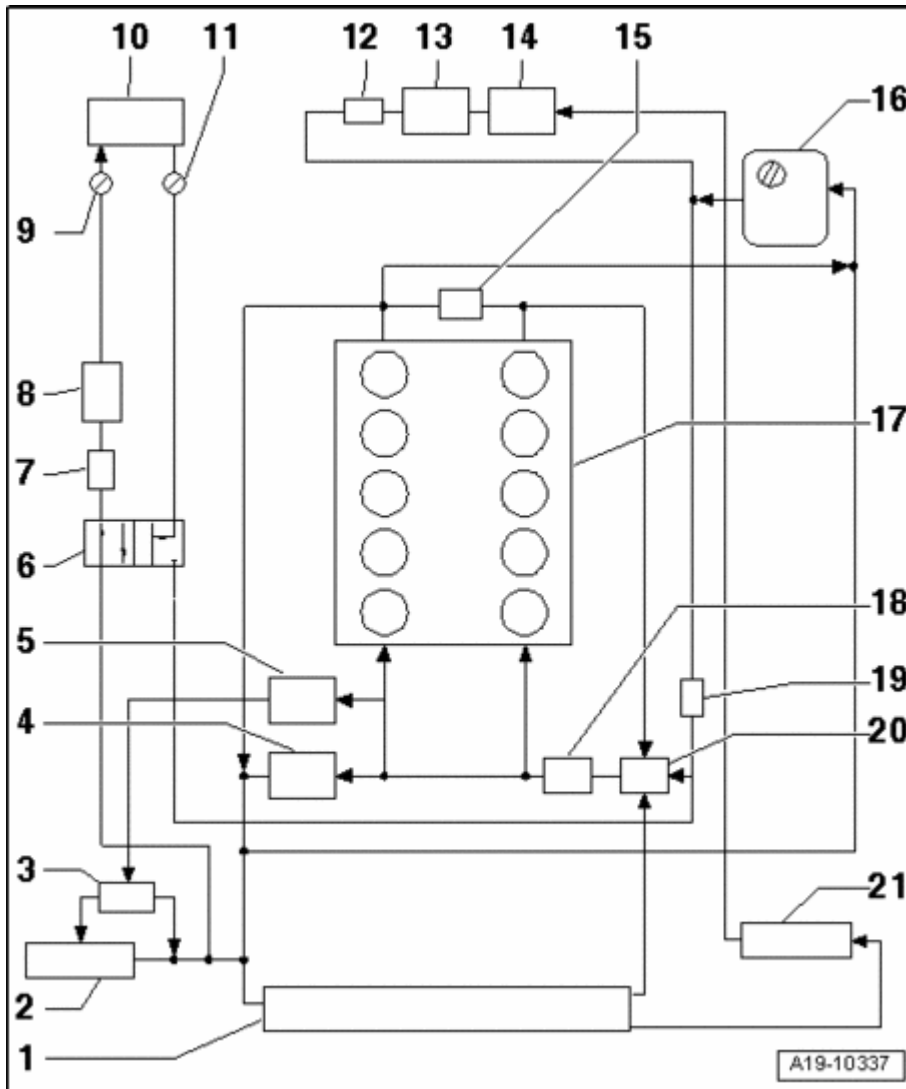


Fig. 445: Coolant Hose Connection Diagram, With Hot Climate Configuration With Parking Heater
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Radiator

- Removing and installing --> **Radiator, Removing and Installing**
- Replace after replacing coolant

2 - Right auxiliary cooler

- Removing and installing --> **Right Auxiliary Cooler, Removing and Installing**
- Replace after replacing coolant

3 - Coolant regulator for auxiliary cooler**4 - Generator****5 - Oil cooler**

- Removing and installing --> **Oil Cooler, Removing and Installing**
- Replace after replacing coolant

6 - Engine Coolant (EC) Switch-Off Valve (heater) N279**7 - Recirculation Pump V55****8 - Auxiliary heater****9 - Bleeder screw****10 - Heater core**

- Replace after replacing coolant

11 - Bleeder screw**12 - Coolant thermostat**

- For axle oil cooler and ATF cooler

13 - Axle oil cooler**14 - ATF cooler****15 - Engine Coolant Temperature (ECT) Sensor G62****16 - Coolant expansion tank**

- Pressure relief valve in cap, checking --> **Pressure relief valve in cap, checking**

17 - Cylinder head/cylinder block

- Replace after replacing coolant

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 - Coolant thermostat

- Removing and installing --> **Thermostat Housing, Removing and Installing**

21 - Left auxiliary cooler

- Removing and installing --> **Left Auxiliary Cooler, Removing and Installing**
- Replace after replacing coolant

Cooling System, Draining and Filling

Cooling System, Draining and Filling

Special tools, testers and auxiliary items required

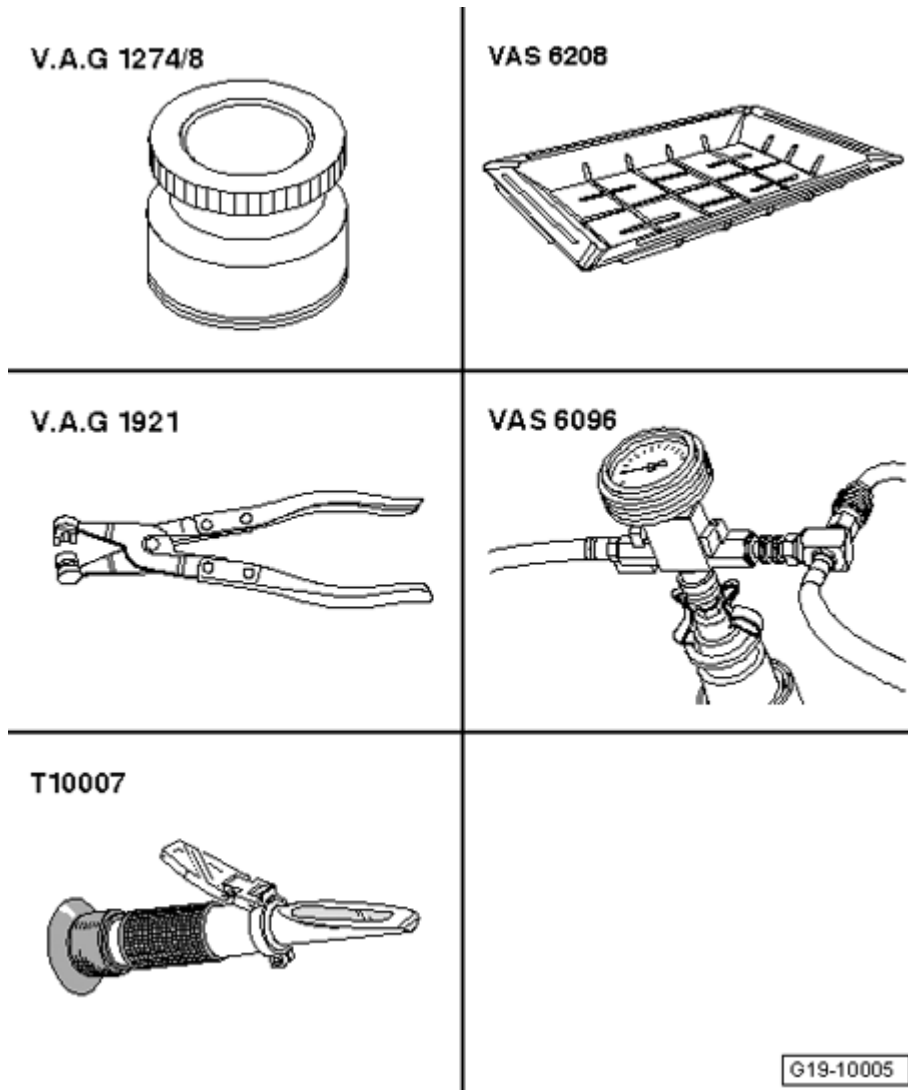


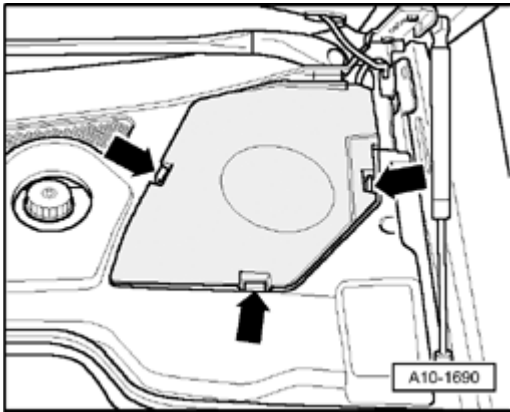
Fig. 446: Identifying Special Tools - Cooling System, Draining And Filling
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Adapter V.A.G 1274/8
- Drip tray for workshop crane VAS 6208
- Hose clamp pliers V.A.G 1921
- Cooling system charge unit VAS 6096
- Refractometer T10007

Draining

NOTE:

- Drained coolant must be stored in a clean container for disposal or reuse.

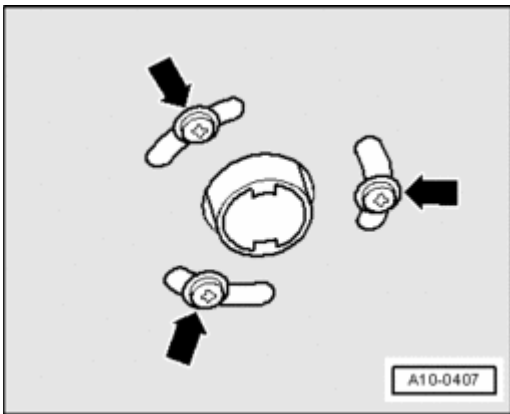
**Fig. 447: Cover Above Coolant Reservoir**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

- Open cap of coolant expansion tank.

**Fig. 448: Identifying Exhaust Pipe Fasteners**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

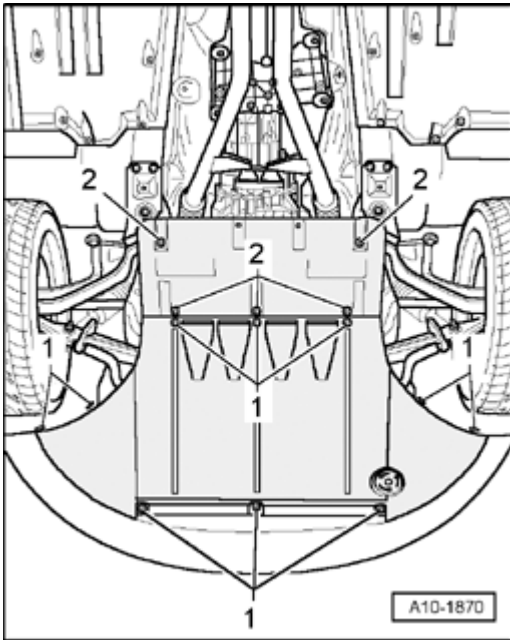


Fig. 449: Noise Insulation Quick-Release Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen quick-release fasteners - **1** - and remove front noise insulation.

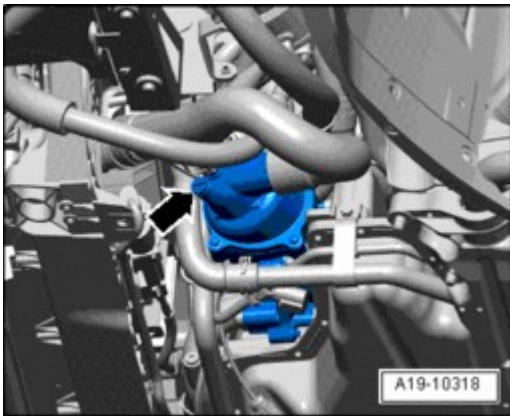


Fig. 450: Removing/Installing Drain Plug At Coolant Thermostat Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place drip tray for workshop crane VAS 6208 under engine.
- Remove drain plug - **arrow** - at coolant thermostat housing and drain coolant.

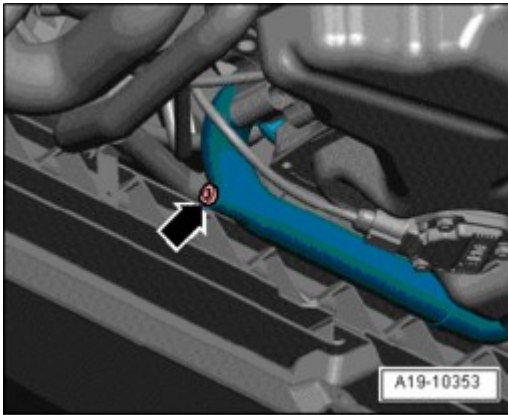


Fig. 451: Front Coolant Pipe Drain Plug
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove drain plug - **arrow** - at front coolant pipe and drain coolant.

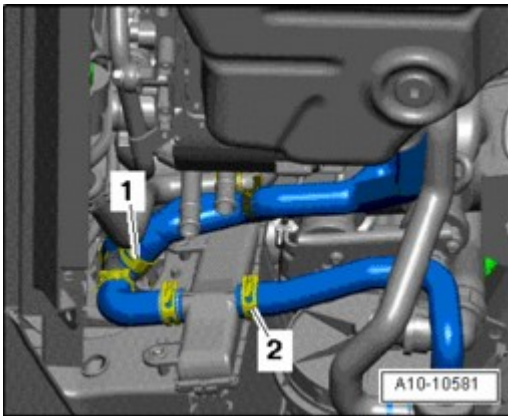


Fig. 452: Right Auxiliary Cooler Coolant Hoses
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove lower coolant hose - **2** - from right auxiliary cooler and drain remaining coolant.

NOTE:

- Ignore - **1** -.

Filling

- Ignition switched off.

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.

- Use only *coolant additive Plus G 012 A8F A1* (short: G12+) "according to TL VW 774 F". Other coolant additives may above all reduce the corrosion protection effect significantly. The damage resulting from this may lead to loss of coolant and consequently to severe engine damage.
- 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.
- Freeze protection must be guaranteed down to -25 C (in extremely cold countries to about -35 C).
- The coolant concentration must not be reduced by adding water even in warmer seasons and in warmer countries. The coolant additive portion must be at least 40%.
- If for climatic reasons greater frost protection is required, the amount of G12+ can be increased, but only up to 60% (frost protection to about -40 C), otherwise frost protection and cooling effectiveness will be reduced.
- Only clean drinking water may be used for mixing coolant.
- If the radiator, heater core, cylinder head and cylinder head gasket or cylinder block is replaced, completely replace the engine coolant.
- Dirty coolant must not be re-used.
- For coolant G12+ , use refractometer T10007 to test frost protection in cooling system.

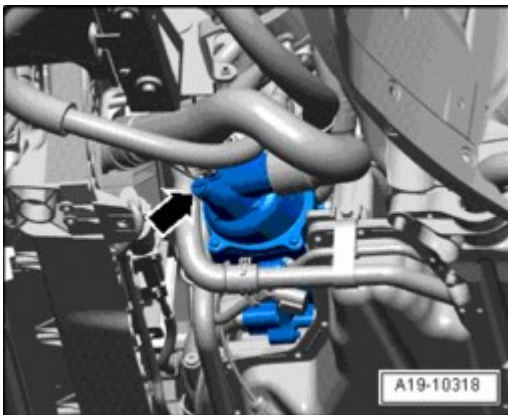


Fig. 453: Removing/Installing Drain Plug At Coolant Thermostat Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Reinstall drain plug - **arrow** - with new O-ring at coolant thermostat housing.

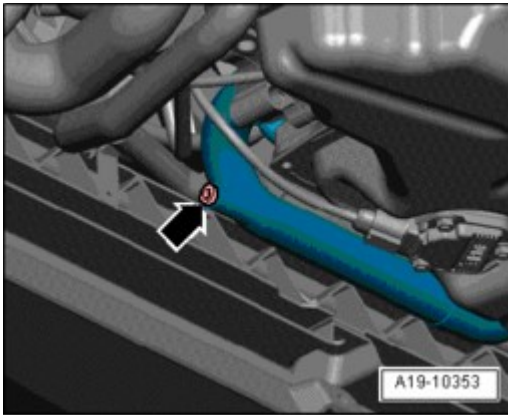


Fig. 454: Front Coolant Pipe Drain Plug
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Reinstall drain plug - **arrow** - with new gasket at front coolant pipe.

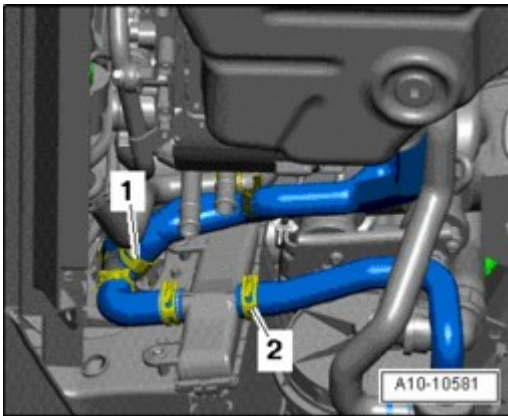


Fig. 455: Right Auxiliary Cooler Coolant Hoses
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install lower coolant hose - **2** - on right auxiliary cooler - **arrow** -.

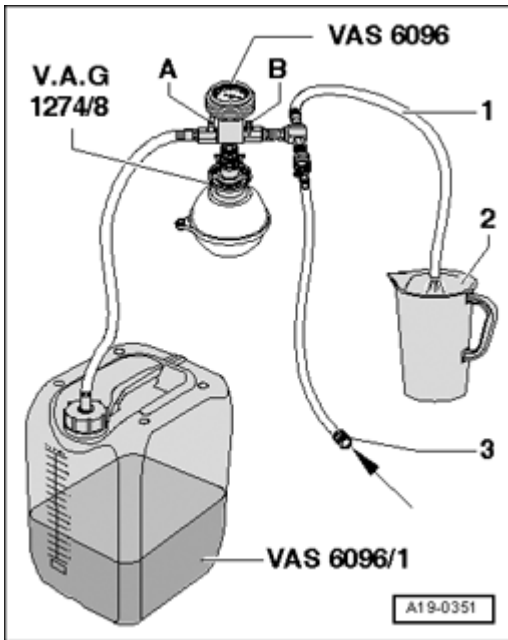


Fig. 456: Filling Coolant Reservoir Of Cooling System Charge Unit VAS 6096 With At Least 15 Liters Of Pre-Mixed Coolant

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Fill coolant reservoir of Cooling System Charge Unit VAS 6096 with at least 15 liters of pre-mixed coolant with correct mixture ratio:
 - G12+ (60%) and water (40%) for freeze protection down to -25 C
 - G12+ (50%) and water (50%) for freeze protection up to -35 C
 - G12+ (60%) and water (40%) for freeze protection down to -40 C
- Attach adapter V.A.G 1274/8 to coolant expansion tank.
- Install 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 is drawn off which should be reserved with the discharged air.)
- Close both valves - **A** - and - **B** - by turning lever perpendicular to direction of flow.
- Connect hose - **3** - to pressurized air.
- Pressure: 6 to 10 bar pressure.

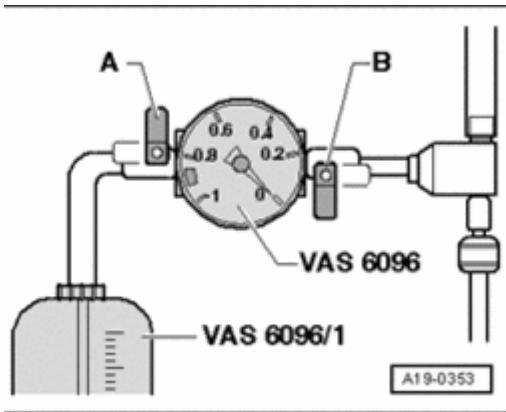


Fig. 457: Cooling System, Draining And Filling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Open valve - **B** -, turn lever in direction of flow to do this.

A vacuum is created in the cooling system by the suction jet pump.

- Needle on the instrument display must travel into the green region.
- Also briefly open valve - **A** - by turning lever in direction of flow so that Cooling System Charge Unit VAS 6096 coolant reservoir hose is filled with coolant.
- Close valve - **A** - again.
- Let valve - **B** - remain open another 2 minutes.
- A further vacuum is created in the cooling system by the suction jet pump.
- Needle on the instrument display must still remain in the green region.
- Close valve - **B** -.
- Needle in display must remain in green region, then vacuum in cooling system is sufficient for subsequent filling.

If needle stands below the green region, repeat procedure.

If the vacuum decreases, cooling system is leaking.

- Disconnect pressurized air hose.
- Open valve - **A** -.

The vacuum in the cooling system has the effect of extracting coolant from replacement reservoir; cooling system is filled.

- Detach Cooling System Charge Unit VAS 6096 from adapter V.A.G 1274/8 on coolant expansion tank.

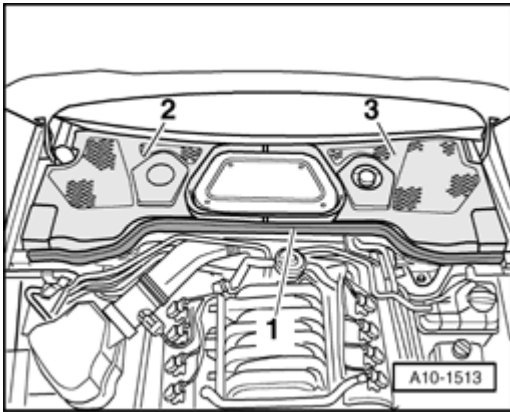


Fig. 458: Identifying Rubber Seal & Plenum Chamber Covers
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove rubber seal - 1 - and remove plenum chamber cover - 2 -.

NOTE:

- Ignore - 3 -.

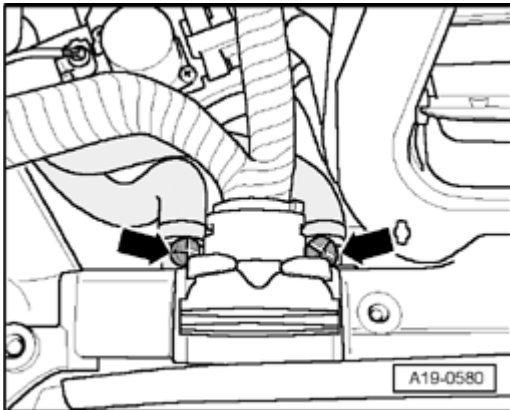


Fig. 459: Bleeder Screws
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Open bleeder screws - **arrows** -.
- Fill up coolant until it escapes from the bleeder holes in the coolant hoses.
- Close bleeder screws.
- Twist expansion tank cap closed.
- Make sure that the 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 long enough until both large coolant hoses on main cooler are warm.
- Let engine run at 2000 RPM for 1 minute.

- Turn off engine and allow it to cool off.

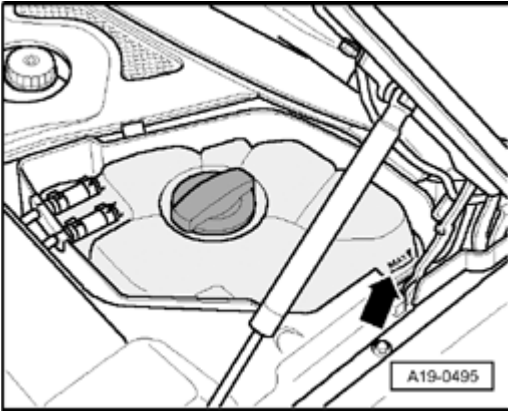


Fig. 460: Checking Coolant Level

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check coolant level.
- With cold engine, coolant level must be at MAX marking.
- Coolant level may be above MAX marking with engine at operating temperature.

Tightening Specifications

Component	Nm
Drain plug to coolant regulator housing	4
Drain plug to front coolant pipe	10

Coolant Pump and Regulator, Component Overview

Coolant Pump and Regulator, Component Overview

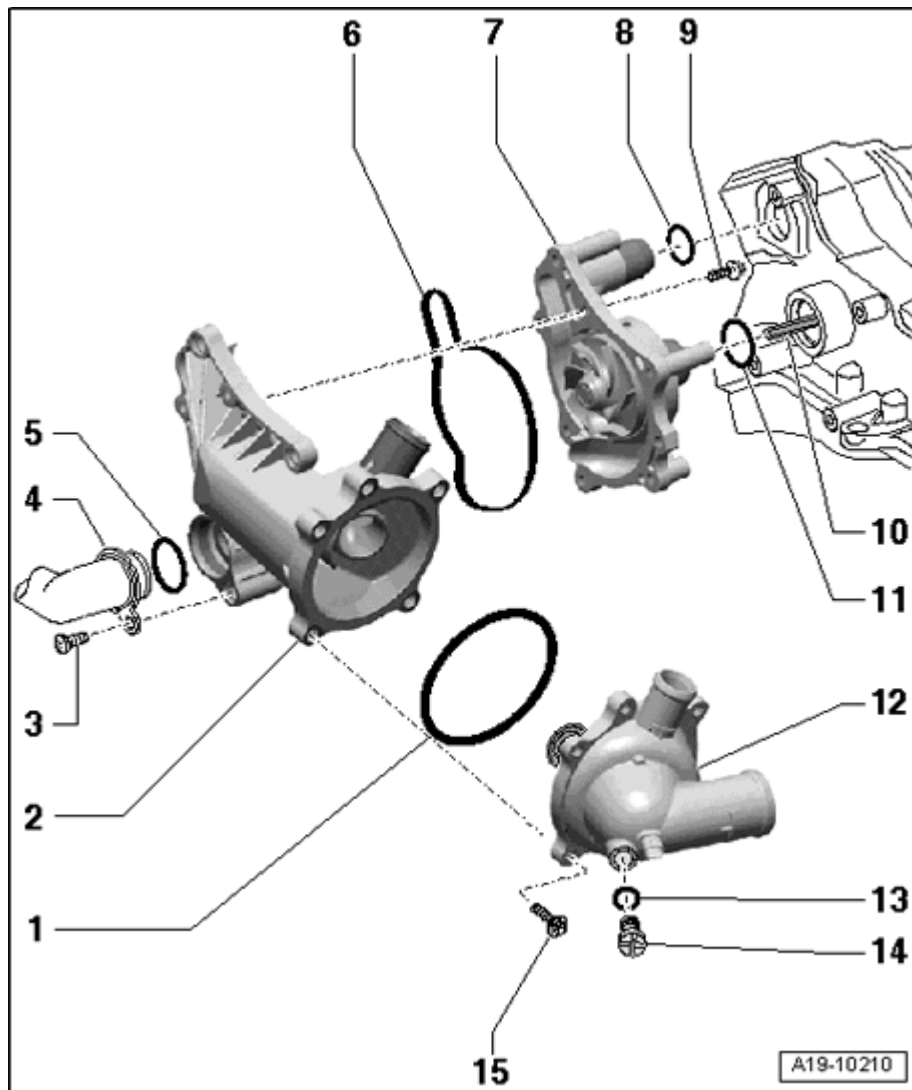


Fig. 461: Coolant Pump And Regulator, Component Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Seal

- Replace

2 - Coolant pump housing

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

3 - 8 Nm plus an additional 90 ($1/4$ turn)

- Replace

4 - Front coolant line

- Removing and installing --> **Front Coolant Line, Removing and Installing**

5 - O-ring

- Replace

6 - Seal

- Replace

7 - Coolant pump

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

8 - O-ring

- Replace

9 - 9 Nm

10 - Drive shaft for coolant pump

11 - O-ring

- Replace

12 - Thermostat housing

- Removing and installing --> **Thermostat Housing, Removing and Installing**
- Coolant thermostat opening data --> **Thermostat Opening Data**

13 - O-ring

- Replace

14 - Drain plug - 4 Nm

15 - 9 Nm

Coolant Pump, Removing and Installing

Coolant Pump, Removing and Installing

Removing

- Remove front coolant pipe --> **Front Coolant Line, Removing and Installing.**

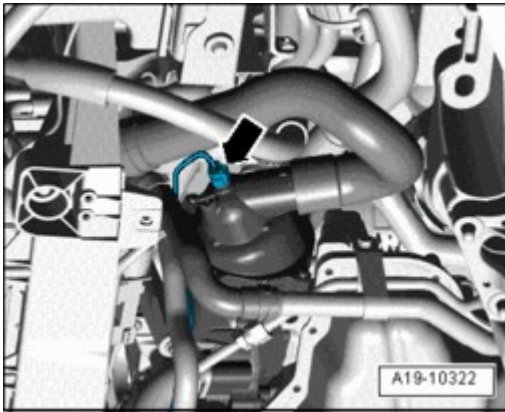


Fig. 462: Disconnecting Electrical Connector On Map Controlled Engine Cooling Thermostat F265
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **arrow** - at Engine Coolant Temperature (ECT) Sensor (on Radiator) G83.

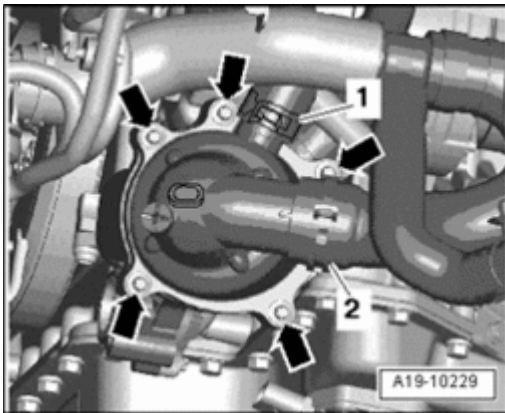


Fig. 463: Identifying Coolant Hose, Bolts & Coolant Thermostat Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove coolant hose - **2** - from bottom of coolant thermostat housing.
- Remove bolts - **arrows** -.
- Remove coolant thermostat housing and remove coolant hose - **1** - from top of coolant thermostat housing.

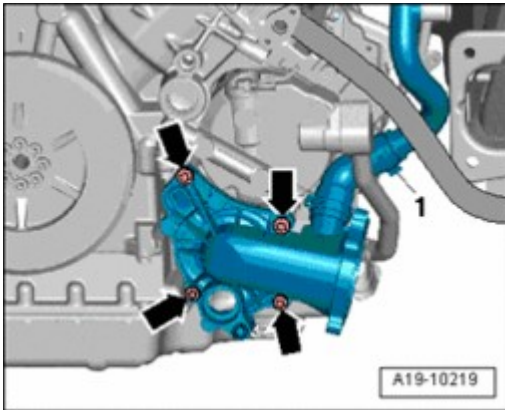


Fig. 464: Coolant Hose Clip & Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen hose clip - **1** - at coolant hose.
- Remove bolts - **arrows** -.
- Remove coolant pump housing toward front, pay attention to drive shaft for coolant pump while doing this.

NOTE:

- Coolant hose can only be removed with coolant pump removed.

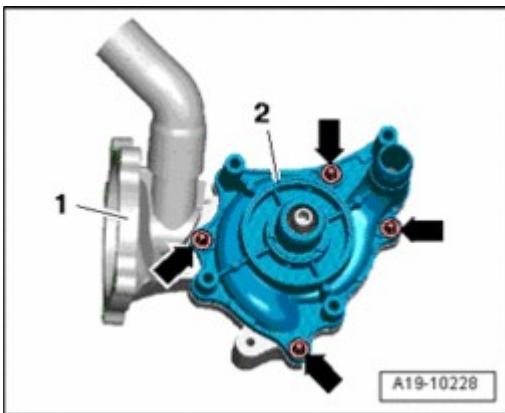


Fig. 465: Identifying Bolts, Coolant Pump, And Housing

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and remove coolant pump - **2** - from housing - **1** -.

Installing

NOTE:

- Replace seals and O-rings.
- Secure all hose connections with hose clamps appropriate for the model .

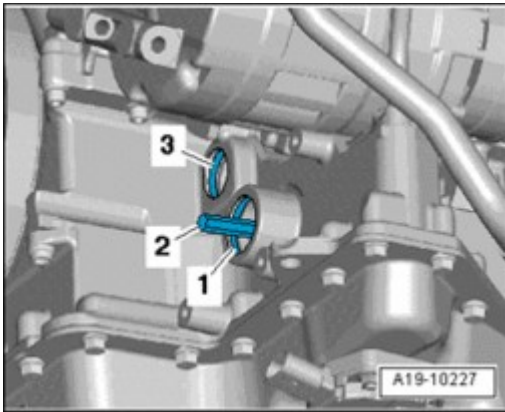


Fig. 466: Inserting New O-Rings & Coolant Pump Input Shaft In Oil Pump Mount
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert new O-rings - 1 - and - 3 -.
- Insert coolant pump input shaft - 2 - in oil pump mount as far as stop.
- Slide coolant pump into mounts in upper part of oil pan.

NOTE:

- To connect drive flange onto hex head of drive shaft, reach with the finger into the lower pipe connection of coolant pump and twist at impeller until coolant pump can be inserted completely.

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

- Install coolant thermostat housing --> **Thermostat Housing, Removing and Installing.**
- Install front coolant pipe --> **Front Coolant Line, Removing and Installing.**
- Fill with coolant --> *Filling* under **Cooling System, Draining and Filling.**

Tightening Specifications

Component	Nm
Coolant pump to housing	9
Coolant pump housing to upper section of oil pan	9

Thermostat Housing, Removing and Installing

Thermostat Housing, Removing and Installing

Removing

- Drain coolant --> **Cooling System, Draining and Filling.**

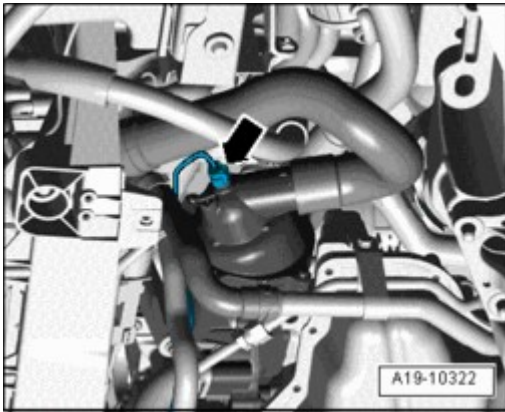


Fig. 467: Disconnecting Electrical Connector On Map Controlled Engine Cooling Thermostat F265
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **arrow** - at Engine Coolant Temperature (ECT) Sensor (on Radiator) G83.

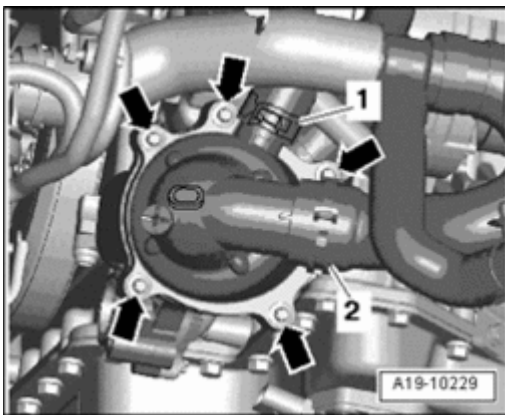


Fig. 468: Identifying Coolant Hose, Bolts & Coolant Thermostat Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove coolant hose - **2** - at bottom of coolant thermostat housing and drain remaining coolant.
- Remove bolts - **arrows** -.
- Remove coolant thermostat housing and remove coolant hose - **1** - from top of coolant thermostat housing.

Installing

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

NOTE:

- Replace seals and O-rings.
- Secure all hose connections with hose clamps appropriate for the model .

- Fill with coolant --> *Filling* under **Cooling System, Draining and Filling.**

2009 Audi S8 Quattro

ENGINE 5.2 Liter 10-Cyl. 4V Engine Mechanical, Engine Code(s): BSM - S8

Tightening specifications

Component	Nm
Coolant regulator housing to coolant pump housing	9

Thermostat Opening Data

Thermostat Opening Data

NOTE:

- Thermostat Opening Data cannot be tested with workshop equipment.

Opening begins	Opening ends	Opening lift	Voltage at thermostat
approximately 105° C	approximately 117° C	min. 8 mm	0 V
	approximately 105° C	min. 8 mm	14 V

Engine Coolant Temperature Sensor, Removing and Installing

Engine Coolant Temperature Sensor, Removing and Installing

Removing

- Engine cold

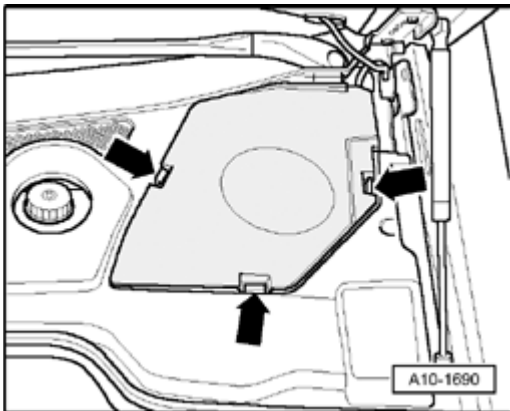


Fig. 469: Cover Above Coolant Reservoir

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove cover above coolant reservoir - **arrows** -.
- Briefly open coolant expansion tank cap to reduce residual pressure in the cooling system.

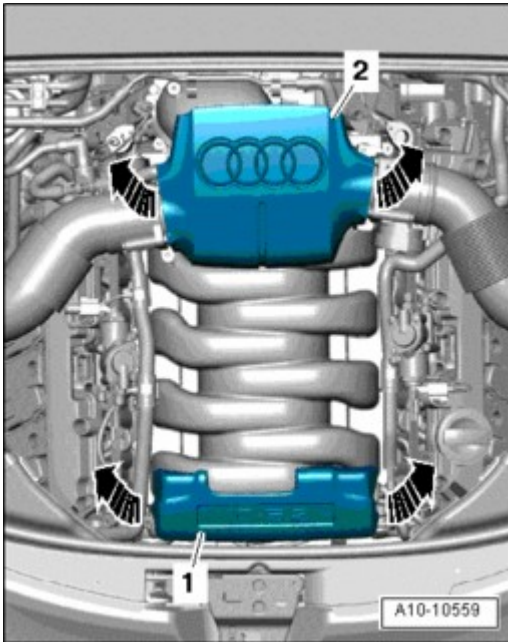


Fig. 470: Removing Front Engine Cover And Rear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove rear engine cover - **2** - - **arrows** -.

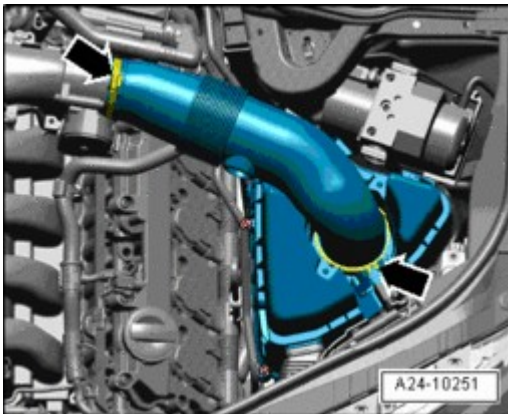


Fig. 471: Left Air Duct Hose, Hose Clamps & Air Guide Hose Vacuum Hose
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove left air duct hose - **arrows** -.
- Disconnect vacuum hose - **2** - from air guide hose.
- Loosen hose clamps - **arrows** - and lay aside air guide hose.

CAUTION: Hose connectors - 1 - must not be opened.

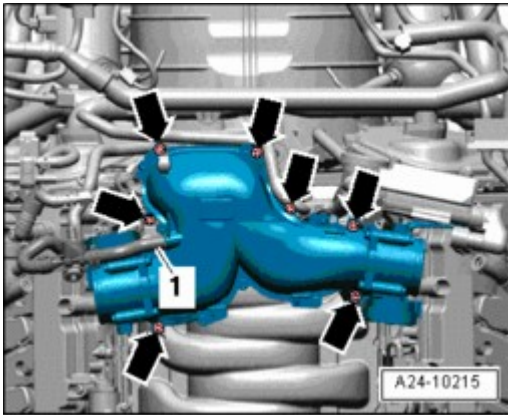


Fig. 472: Identifying Vacuum Hose And Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove vacuum hose - **1** - from intake manifold.
- Remove bolts - **arrows** - and remove air duct.

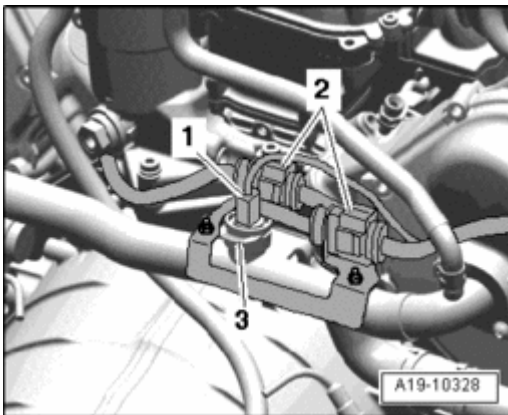


Fig. 473: Disconnecting Electrical Harness Connector At Engine Coolant Temperature (ECT) Sensor G62

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove electrical connectors - **2** - from bracket.
- Disconnect electrical connector - **1** - on Engine Coolant Temperature (ECT) Sensor G62.

NOTE:

- **Place a cloth under separation point to catch escaping coolant.**

- Remove retaining clip - **3** - and remove Engine Coolant Temperature (ECT) Sensor G62.

Installing

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

NOTE:

- **To avoid coolant loss, insert new Engine Coolant Temperature (ECT)**

2009 Audi S8 Quattro

ENGINE 5.2 Liter 10-Cyl. 4V Engine Mechanical, Engine Code(s): BSM - S8

Sensor G62 immediately and secure it with retaining clip.

- **Replace O-ring.**
- **Secure all hose connections with hose clamps appropriate for the model .**

○ Fill with coolant --> *Filling* under Cooling System, Draining and Filling.

Tightening Specifications

Component	Nm
Air duct to intake manifold	9

After-Run Coolant Pump, Removing and Installing

After-Run Coolant Pump, Removing and Installing

Special tools, testers and auxiliary items required

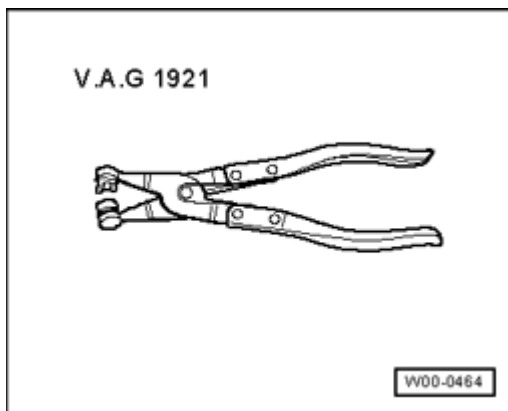


Fig. 474: Hose Clamp Pliers V.A.G 1921

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hose clamp pliers V.A.G 1921

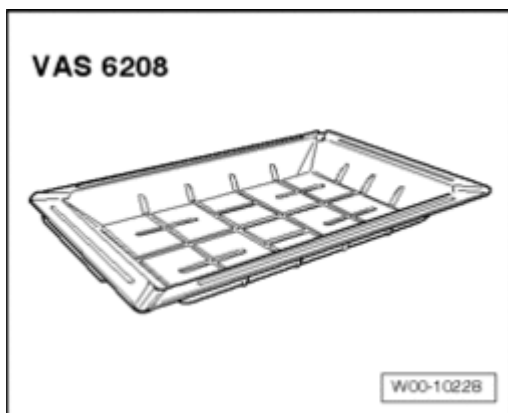


Fig. 475: Drip Tray For Workshop Crane VAS 6208

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drip tray for workshop crane VAS 6208

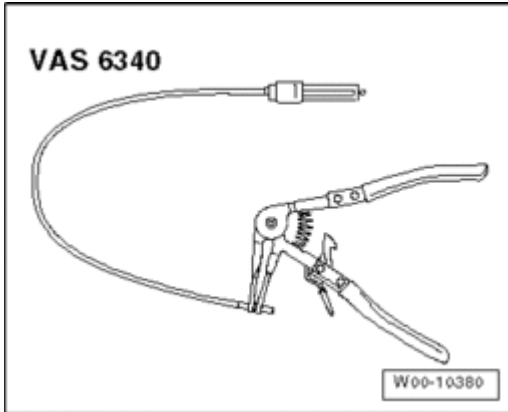


Fig. 476: Hose Clamp Pliers VAS 6340

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hose clamp pliers VAS 6340

Removing

- Drain coolant --> **Cooling System, Draining and Filling.**
- Place Drip Tray for VAS 6100 VAS 6208 below After-Run Coolant Pump V51.

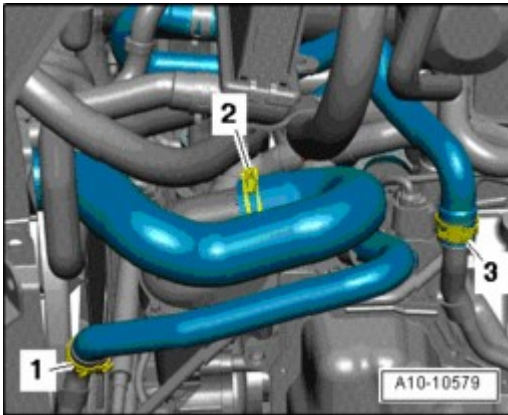


Fig. 477: Coolant Hoses

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove coolant hoses - **1, 2, 3** - and drain coolant.

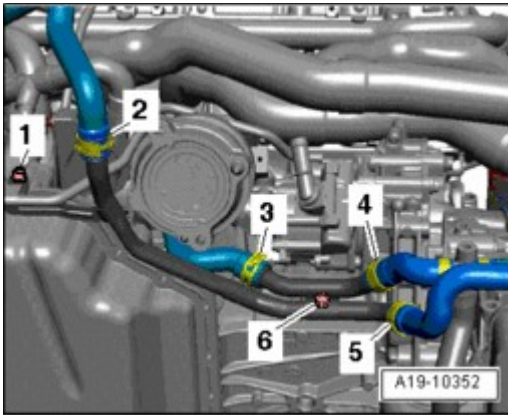


Fig. 478: Coolant Hoses, Nuts & Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nut - 1 - and bolt - 6 - on lower left coolant pipe.

NOTE:

- Ignore items - 2 to 5 -.

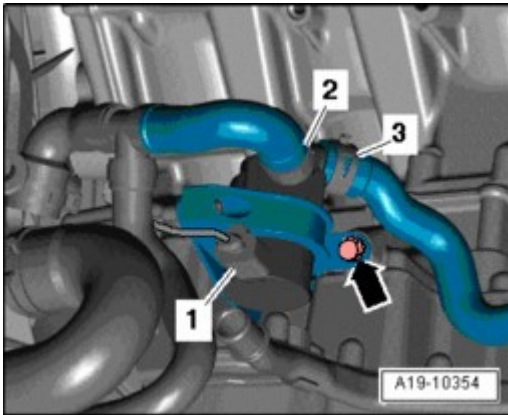


Fig. 479: Electrical Connector, Coolant Hose & Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Separate electrical connector - 1 -.
- Disconnect coolant hose - 2 -.
- Remove bolts - **arrows** -.
- Tilt After-Run Coolant Pump V51 and remove it from coolant hose - 3 -.

Installing

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

NOTE:

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

- Install left lower coolant pipe --> **Lower Left Coolant Pipe, Removing and Installing.**

2009 Audi S8 Quattro

ENGINE 5.2 Liter 10-Cyl. 4V Engine Mechanical, Engine Code(s): BSM - S8

- Fill with coolant --> *Filling* under **Cooling System, Draining and Filling.**

Tightening Specifications

Component	Nm
After-run coolant pump screw clip	9
After-Run Coolant Pump V51 bracket to cylinder block	9

Coolant Pipes, Component Overview

Coolant Pipes, Component Overview

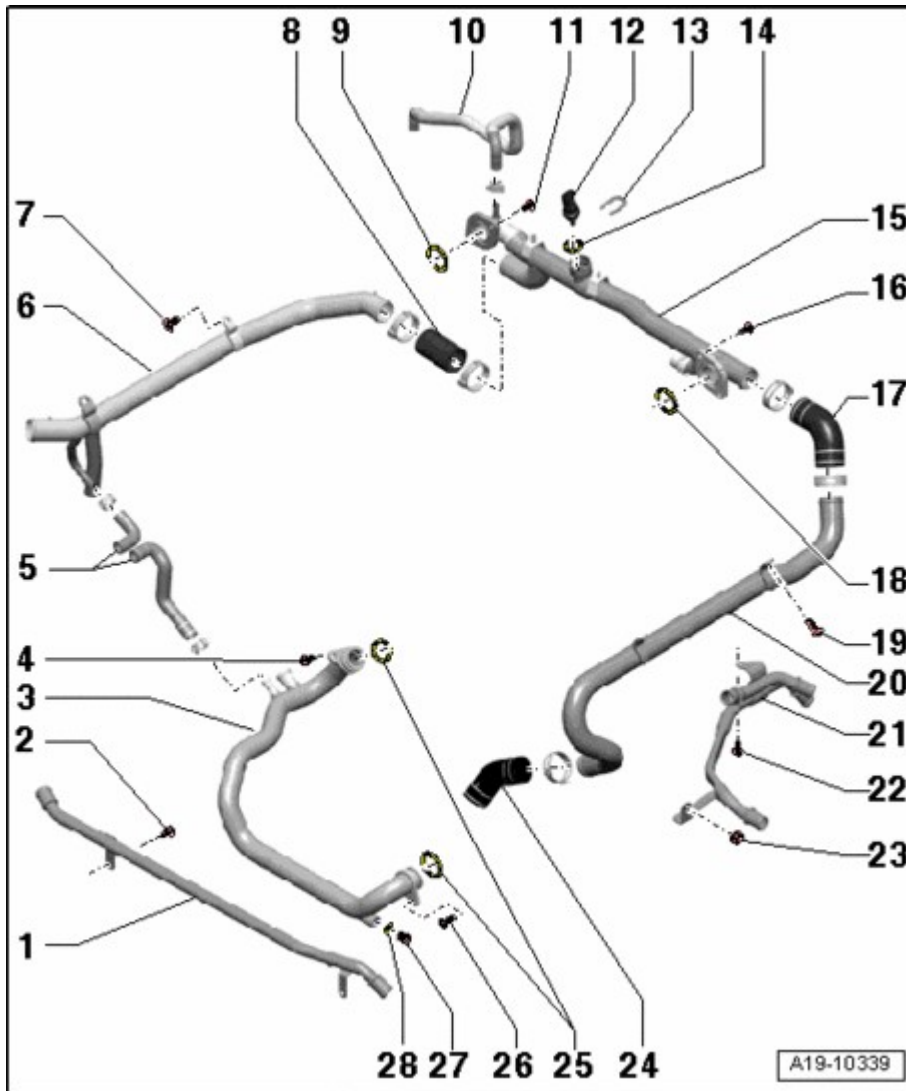


Fig. 480: Coolant Pipes, Component Overview

Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Lower front coolant pipe

- Removing and installing --> **Lower Front Coolant Line, Removing and Installing**

2 - 9 Nm

3 - Front coolant line

- Removing and installing --> **Front Coolant Line, Removing and Installing**

4 - 8 Nm plus an additional 90 (¹/₄ turn)

- Replace

5 - Coolant hoses

- To generator

6 - Right coolant line

- Removing and installing --> **Right Coolant Pipe, Removing and Installing**

7 - 9 Nm

8 - Coolant hose

9 - O-ring

- Replace

10 - Coolant hose

- To Intake manifold

11 - 9 Nm

12 - Engine Coolant Temperature (ECT) Sensor G62

- Removing and installing --> **Engine Coolant Temperature Sensor, Removing and Installing**

13 - Retaining clip

14 - O-ring

- Replace

15 - Rear coolant pipe

- Removing and installing --> **Rear Coolant Pipe, Removing and Installing**

16 - 9 Nm

17 - Coolant hose

18 - O-ring

- Replace

19 - 9 Nm

20 - Left coolant line

- Removing and installing --> **Left Coolant Pipe, Removing and Installing**

21 - Lower left coolant pipe

- Removing and installing --> **Lower Left Coolant Pipe, Removing and Installing**

22 - 9 Nm

23 - 9 Nm

24 - Coolant hose

- To coolant regulator housing

25 - O-rings

- Replace

26 - 8 Nm plus an additional 90 ($\frac{1}{4}$ turn)

- Replace

27 - Drain plug - 10 Nm

28 - Seal

- Replace

Lower Front Coolant Line, Removing and Installing

Lower Front Coolant Line, Removing and Installing

Special tools, testers and auxiliary items required

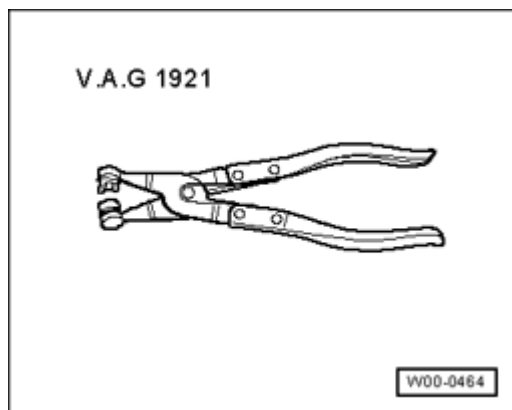


Fig. 481: Hose Clamp Pliers V.A.G 1921

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hose clamp pliers V.A.G 1921

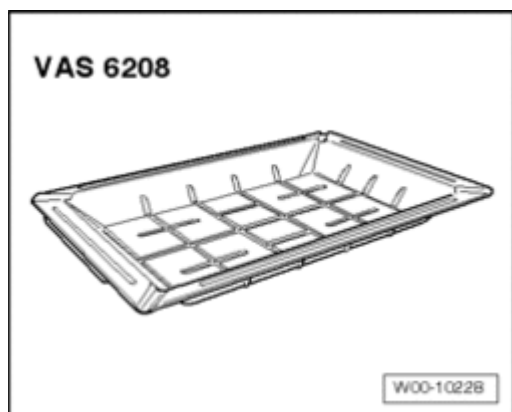


Fig. 482: Drip Tray For Workshop Crane VAS 6208

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drip tray for workshop crane VAS 6208

Removing

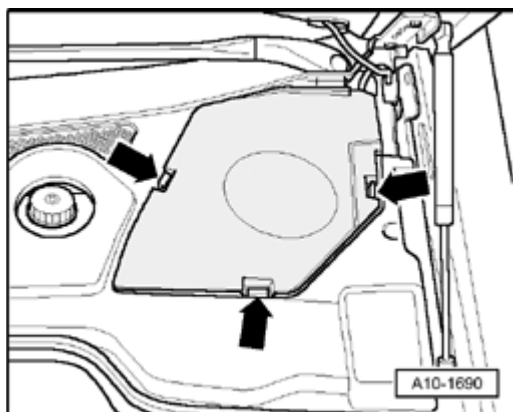


Fig. 483: Cover Above Coolant Reservoir

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

- Open cap of coolant expansion tank.

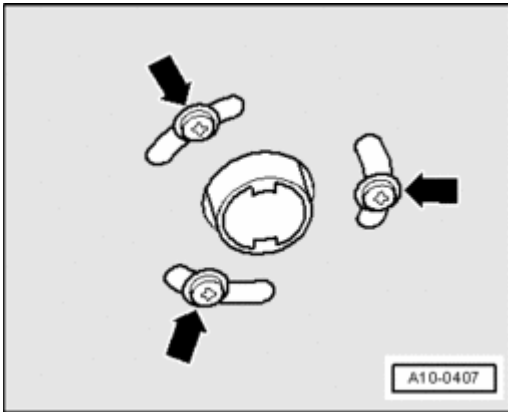


Fig. 484: Identifying Exhaust Pipe Fasteners

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

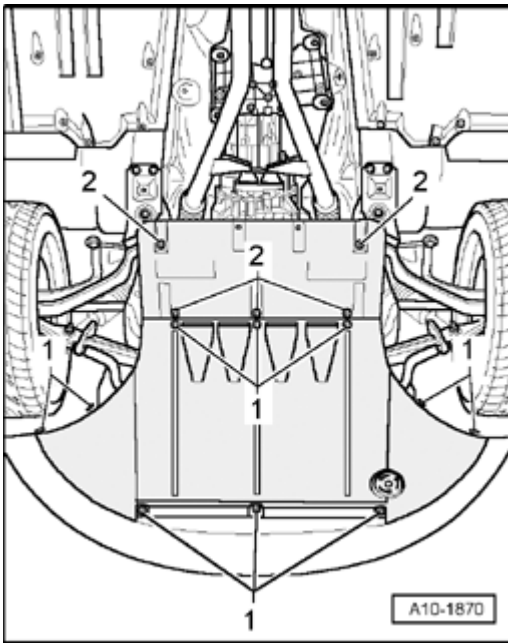


Fig. 485: Noise Insulation Quick-Release Fasteners

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen quick-release fasteners - 1 - and remove front noise insulation.
- Place Drip Tray for VAS 6100 VAS 6208 below front lower coolant pipe.

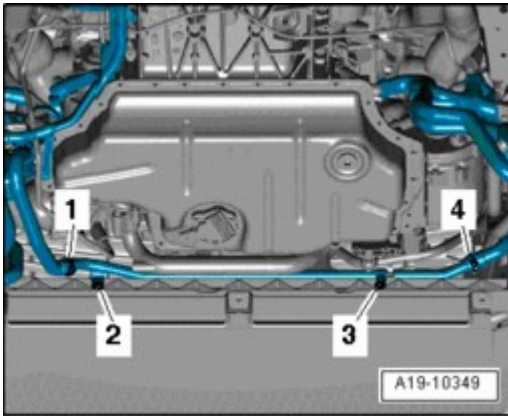


Fig. 486: Screws, Front Lower Coolant Pipe & Hoses
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - 2 - and - 3 - and remove front lower coolant pipe from coolant hoses - 1 - and - 4 -.

Installing

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

NOTE:

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

- Fill with coolant --> *Filling* under Cooling System, Draining and Filling.

Tightening specifications

Component	Nm
Front lower coolant pipe to lock carrier	9

Front Coolant Line, Removing and Installing

Front Coolant Line, Removing and Installing

Special tools, testers and auxiliary items required

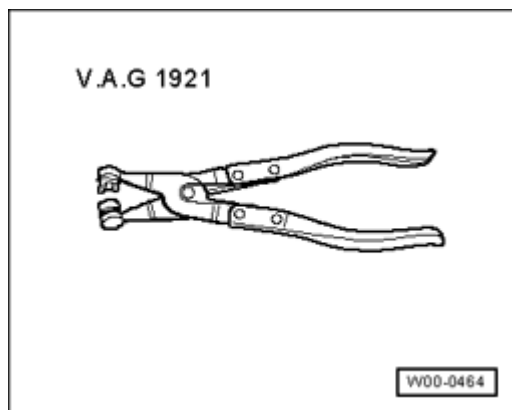


Fig. 487: Hose Clamp Pliers V.A.G 1921

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hose clamp pliers V.A.G 1921

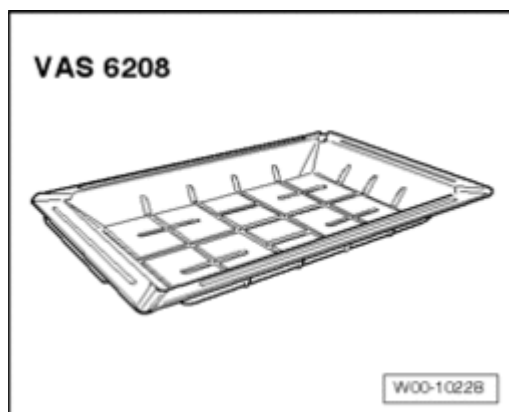


Fig. 488: Drip Tray For Workshop Crane VAS 6208

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drip tray for workshop crane VAS 6208

Removing

- Drain coolant --> **Cooling System, Draining and Filling.**
- Remove generator --> **27 - BATTERY, STARTER, GENERATOR, CRUISE CONTROL .**

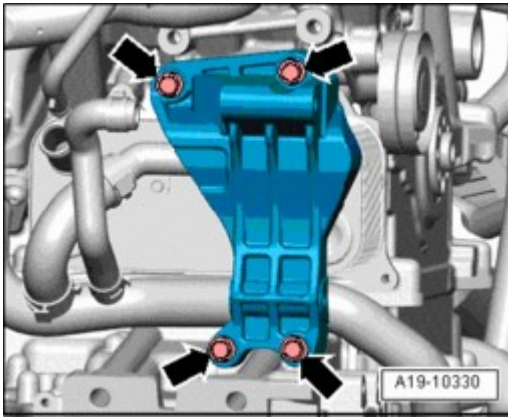


Fig. 489: Removing Bolts And Air Generator Bracket
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and remove air generator bracket.

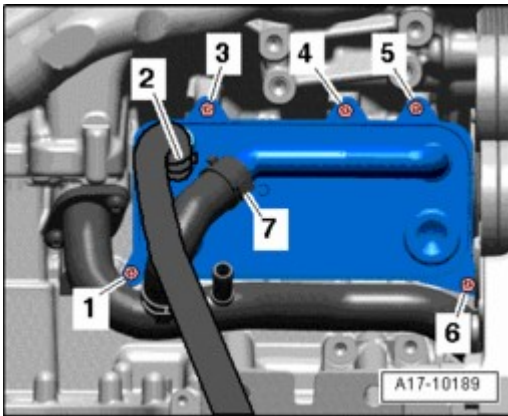


Fig. 490: Oil Cooler Coolant Hoses & Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- Place a rag under separating point to catch escaping oil.

- Remove coolant hoses - **2** - and - **7** -.
- Remove bolts - **1, 3, 4, 5, 6** - and remove oil cooler.

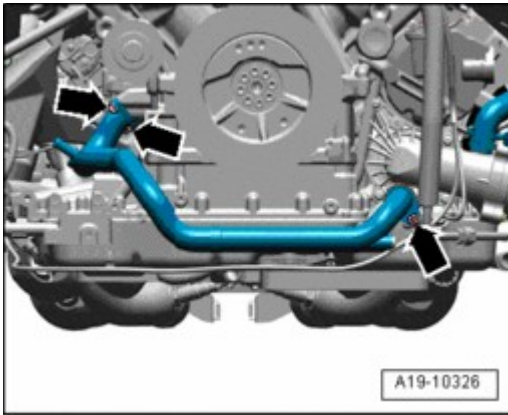


Fig. 491: Front Coolant Pipe & Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place drip tray for workshop crane VAS 6208 under engine.
- Remove bolts - **arrows** - and remove front coolant pipe.

Installing

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

NOTE:

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

- Install oil cooler --> **Oil Cooler, Removing and Installing.**
- Install generator --> **27 - BATTERY, STARTER, GENERATOR, CRUISE CONTROL .**
- Fill with coolant --> *Filling* under **Cooling System, Draining and Filling.**

Tightening Specifications

Component		Nm
Front coolant pipe to	Coolant pump	8 plus 90° 1)2)
	Oil pan (upper section)	8 plus 90° 1)2)
Alternator bracket to engine	M8	22
	M10	46
1) Replace bolts. 2) 90° corresponds to a quarter turn.		

Left Coolant Pipe, Removing and Installing

Left Coolant Pipe, Removing and Installing

Special tools, testers and auxiliary items required

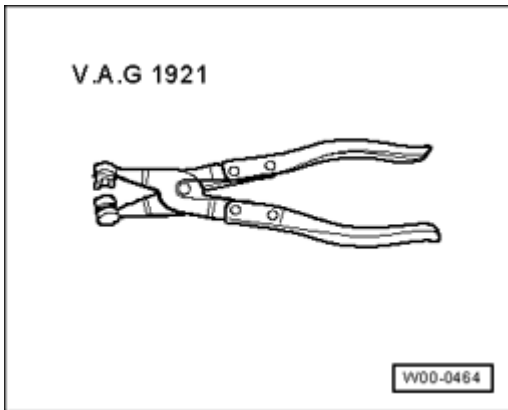


Fig. 492: Hose Clamp Pliers V.A.G 1921

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hose clamp pliers V.A.G 1921

Removing

- Remove engine --> **Engine, Removing.**
- Leave engine with transmission installed on scissor lift platform VAS 6131 A.

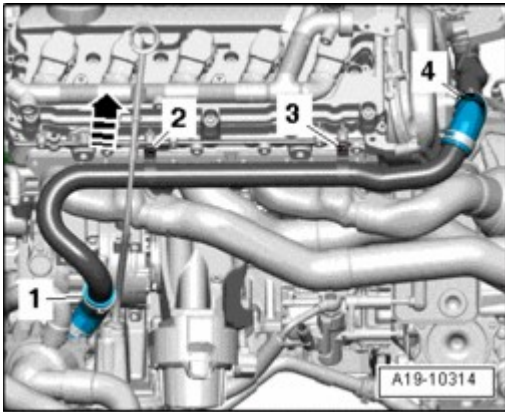


Fig. 493: Removing Bolts, Oil Dipstick Guide Tube Upward & Loosening Hose Clamps And Removing Left Coolant Pipe From Coolant Hoses

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **2** - and - **3** -.
- Pull oil dipstick guide tube upward and off - **arrow** -.
- Loosen hose clamps - **1** - and - **4** - and remove left coolant pipe from coolant hoses.

Installing

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

NOTE:

- **Replace O-ring.**

2009 Audi S8 Quattro

ENGINE 5.2 Liter 10-Cyl. 4V Engine Mechanical, Engine Code(s): BSM - S8

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

- Replace O-ring at guide tube for oil dipstick and insert guide tube into hole in oil pan (upper section).
- Install engine --> **Engine, Installing.**

Tightening specifications

Component	Nm
Left coolant pipe to cylinder head	9

Lower Left Coolant Pipe, Removing and Installing

Lower Left Coolant Pipe, Removing and Installing

Special tools, testers and auxiliary items required

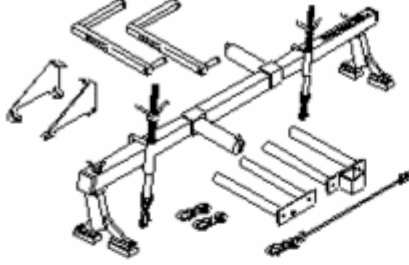
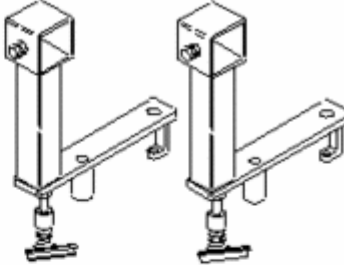

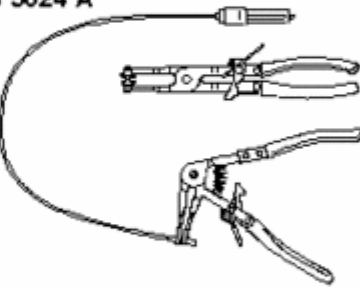
10-222 A 	10-222A/21 
V.A.G 1921 	VAS 5024 A 
	G19-10012

Fig. 494: Identifying Special Tools - Lower Left Coolant Pipe, Removing And Installing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Engine support bridge 10 - 222 A
- Adapter 10-222 A/21
- Hose clamp pliers V.A.G 1921
- Hose clip pliers VAS 6340 (formerly: VAS 5024 A)

Removing

- Drain coolant --> **Cooling System, Draining and Filling.**

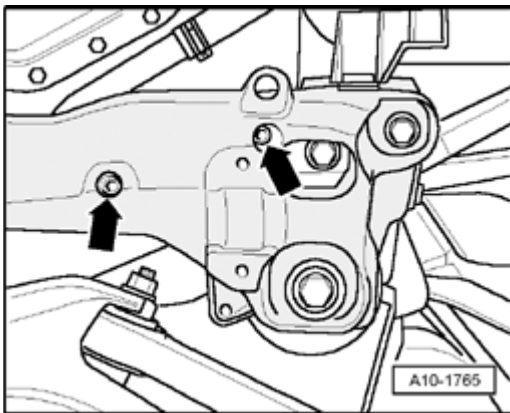


Fig. 495: Removing/Installing Bolts For Engine Mount At Left/Right
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

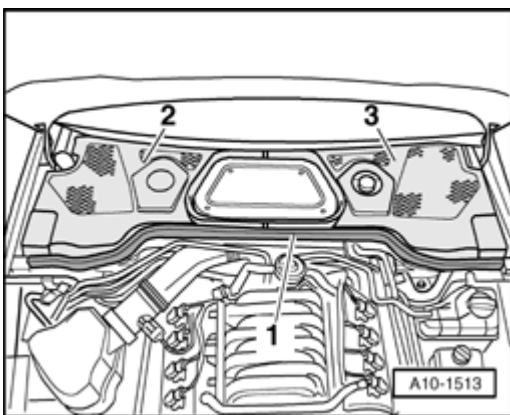


Fig. 496: Identifying Rubber Seal & Plenum Chamber Covers
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

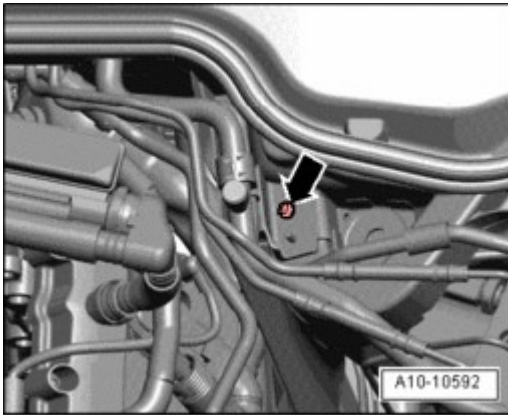


Fig. 497: Refrigerant Line Bracket At Left From Strut Tower
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove refrigerant line bracket at left from strut tower - **arrow** -.

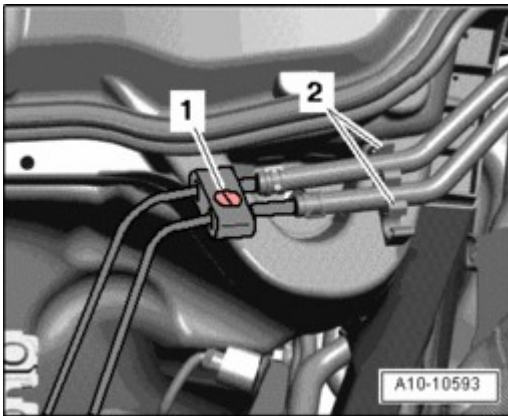


Fig. 498: Removing Clip Unclipping Fuel Line And Vacuum Pump From Bracket On Strut Tower
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove clip - **1** - at right.
- Unclip fuel line and vacuum pump from bracket - **2** - on strut tower.

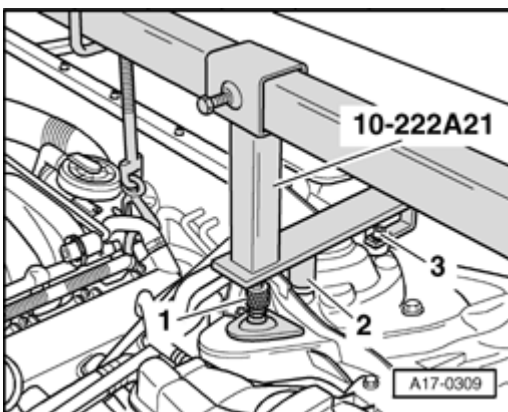


Fig. 499: Securing Engine Support Bridge 10 - 222 A With Adapters 10 - 222 A/21 At Suspension Strut

Domes

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove suspension strut cross member rear bolts - **3** -.
- Secure Engine Support Bridge 10 - 222 A to strut towers with Adapter 10-222 A/21.
- Support for left and right side of vehicle is marked.
- The center contact point - **2** - on the support is placed on the suspension strut cross member front bolts.
- The Adapters 10-222 A/21 are tightened with the rear bolts - **3** - for suspension strut cross member.
- The knurled thumb screw - **1** - must be turned downward far enough so that the contact plate rests on the strut tower.

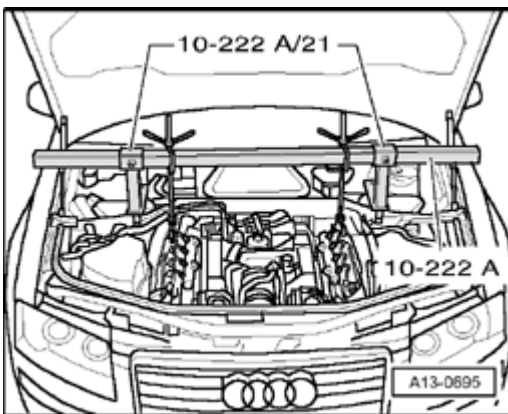


Fig. 500: Securing Spindles Of Engine Support Bridge 10 - 222 A At Rear Engine Lifting Eyes
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure spindles of the Engine Support Bridge 10 - 222 A at the rear engine lifting eyes.
- Tension engine with spindles of the engine support bridge.

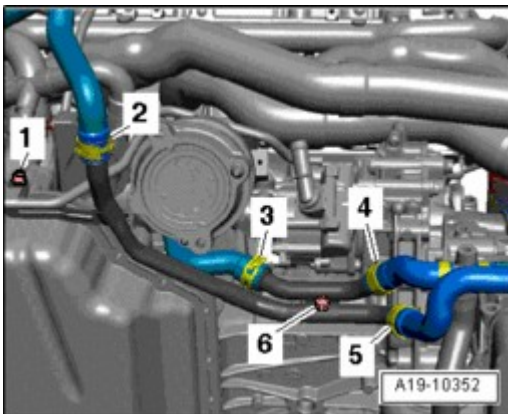


Fig. 501: Coolant Hoses, Nuts & Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nut - **1** - and bolt - **6** -.
- Remove lower left coolant pipe from coolant hoses - **2 to 5** -.

Installing

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

- NOTE:**
- **Secure all hose connections with hose clamps appropriate for the model .**
 - Fill with coolant --> *Filling* under **Cooling System, Draining and Filling.**

Tightening Specifications

Component	Nm
Engine mount to engine carrier	23
Lower left coolant pipe to upper part of oil pan	9

Right Coolant Pipe, Removing and Installing

Right Coolant Pipe, Removing and Installing

Special tools, testers and auxiliary items required

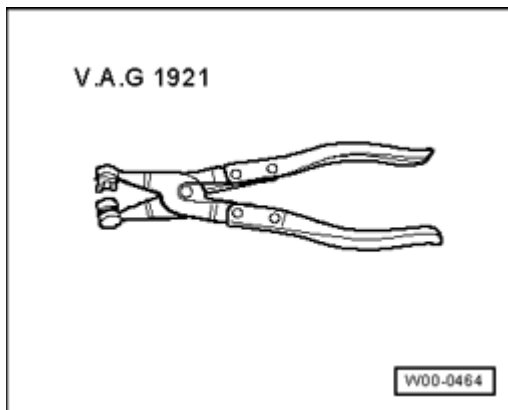


Fig. 502: Hose Clamp Pliers V.A.G 1921

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hose clamp pliers V.A.G 1921

Removing

- Remove engine --> **Engine, Removing.**
- Leave engine with transmission installed on scissor lift platform VAS 6131 A.

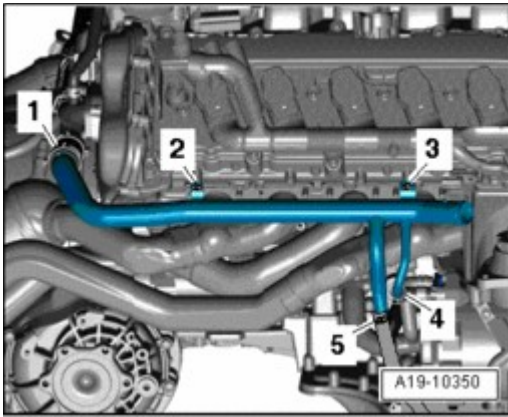


Fig. 503: Bolts, Hose Clamps, Right Coolant Pipe From Coolant Hoses & Coolant Hoses
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - 2 - and - 3 -.
- Loosen hose clamps - 1, 4, 5 - and remove right coolant pipe from coolant hoses.

Installing

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

NOTE: • **Secure all hose connections with hose clamps appropriate for the model .**

- Install engine --> **Engine, Installing.**

Tightening specifications

Component	Nm
Right coolant pipe to cylinder head	9

Rear Coolant Pipe, Removing and Installing

Rear Coolant Pipe, Removing and Installing

Special tools, testers and auxiliary items required

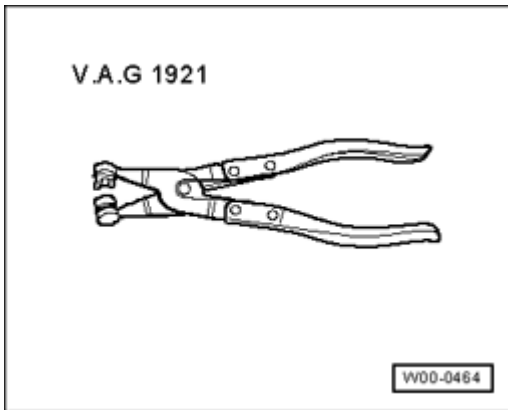


Fig. 504: Hose Clamp Pliers V.A.G 1921

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.

- Remove engine --> **Engine, Removing**.
- Leave engine with transmission installed on scissor lift platform VAS 6131 A.
- Remove left coolant pipe --> **Left Coolant Pipe, Removing and Installing**.
- Remove right coolant pipe --> **Right Coolant Pipe, Removing and Installing**.

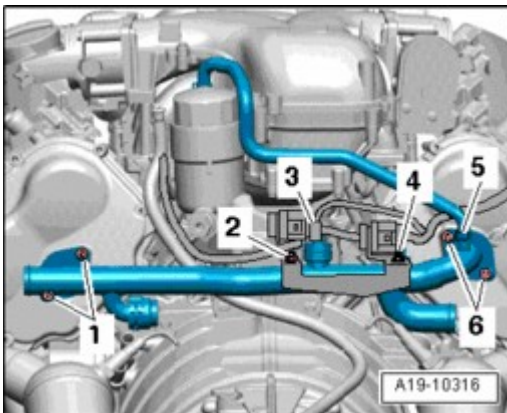


Fig. 505: Identifying Nuts, Bolts, Electrical Connector On Engine Coolant Temperature (ECT) Sensor G62 & Coolant Hose

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - 2 - and - 4 - and remove connector bracket from rear coolant pipe.
- Free up engine wiring harness on rear coolant pipe.
- Disconnect electrical connector - 3 - on Engine Coolant Temperature (ECT) Sensor G62.

2009 Audi S8 Quattro

ENGINE 5.2 Liter 10-Cyl. 4V Engine Mechanical, Engine Code(s): BSM - S8

- Disconnect coolant hose - **5** - from rear coolant pipe.
- Remove bolts - **1** - and - **6** - and remove rear coolant pipe.

Installing

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

NOTE:

- **Replace O-rings.**
 - **During installation, all cable ties must be re-installed at the same location.**
- Clean or smooth O-ring sealing surfaces.
 - Install left coolant pipe --> **Left Coolant Pipe, Removing and Installing.**
 - Install right coolant pipe --> **Right Coolant Pipe, Removing and Installing.**
 - Install engine --> **Engine, Installing.**

Tightening Specifications

Component	Nm
Rear coolant pipe to cylinder head	9
Connector bracket to rear coolant pipe	9

Radiator and Coolant Fan, Component Overview

Radiator and Coolant Fan, Component Overview

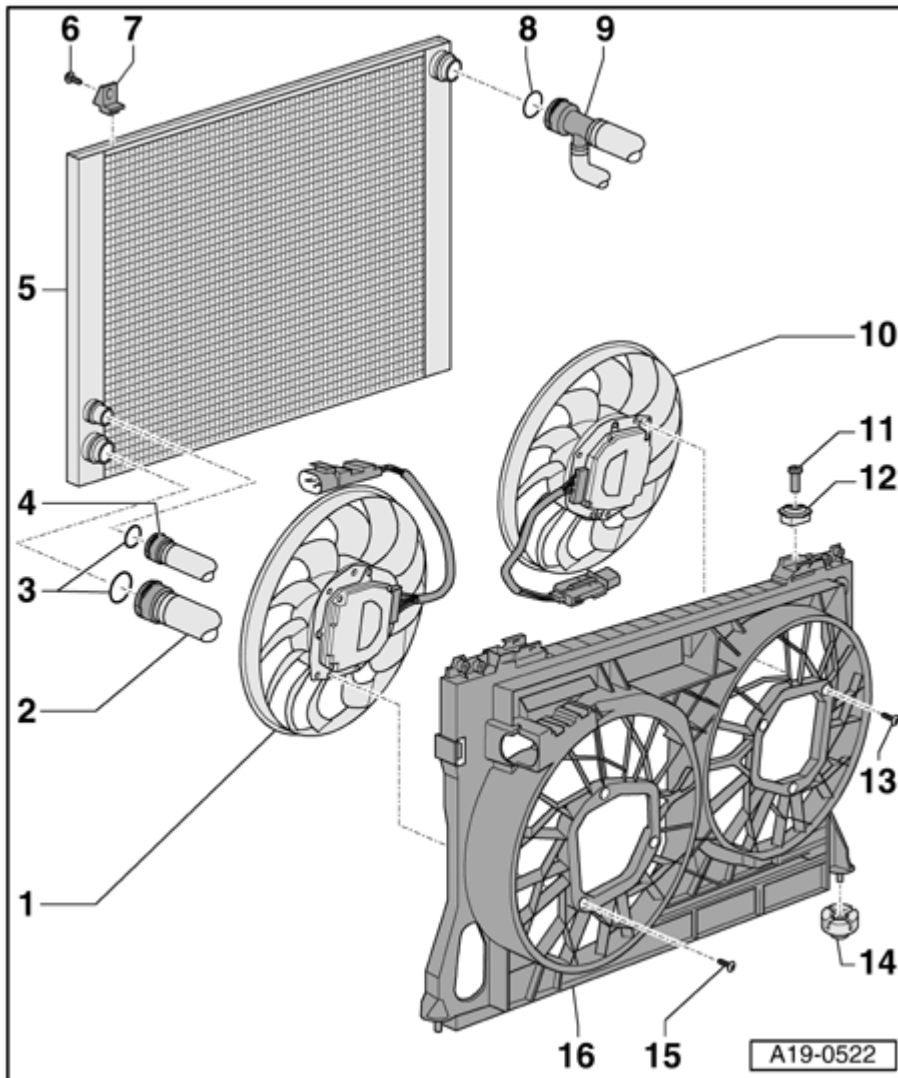


Fig. 506: Radiator And Coolant Fan, Component Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Coolant Fan V7

- With Coolant Fan Control (FC) Control Module J293
- Removing and installing --> **Coolant Fan, Removing and Installing**

2 - Coolant hose

- To pull off, disengage retaining clip

3 - O-ring

- Replace

4 - Coolant hose

- To pull off, disengage retaining clip

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

- To pull off, disengage retaining clip

10 - Coolant Fan 2 V177

- With Coolant Fan Control (FC) Control Module 2 J671
- Removing and installing --> **Coolant Fan, Removing and Installing**

11 - Retaining pin**12 - Rubber buffer**

- Disengage and remove using screwdriver

13 - 10 Nm**14 - Rubber bushing****15 - 10 Nm**

- Replace

16 - Fan rib

- Removing and installing --> **Fan Shroud, Removing and Installing**

Radiator, Removing and Installing**Radiator, Removing and Installing****Removing**

NOTE:

- When assembled correctly, radiator and condenser can show slight impressions on fins. This is not damage. Radiators or condensers should not be replaced because of slight impressions like these.

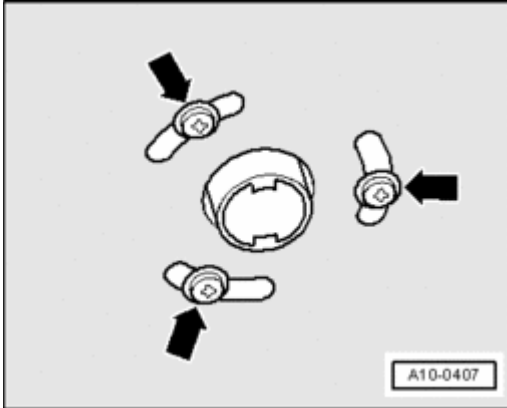


Fig. 507: Identifying Exhaust Pipe Fasteners

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

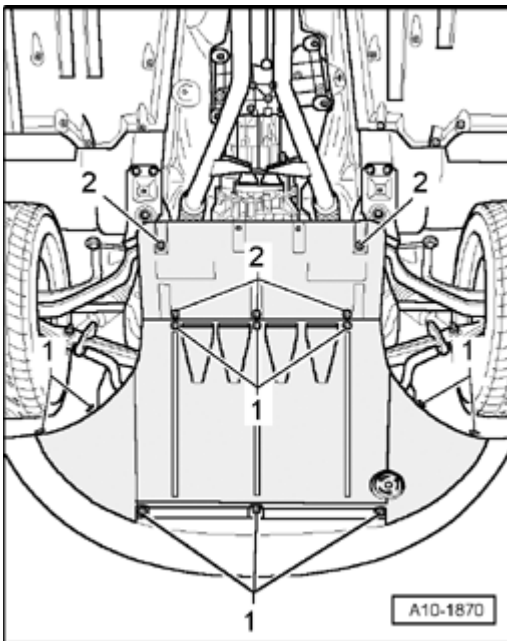


Fig. 508: Noise Insulation Quick-Release Fasteners

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen quick-release fasteners - **1** - and remove front noise insulation.
- Remove front bumper cover --> **63 - BUMPERS** .
- Drain coolant --> **Cooling System, Draining and Filling.**

- Remove front lower coolant pipe --> **Lower Front Coolant Line, Removing and Installing.**

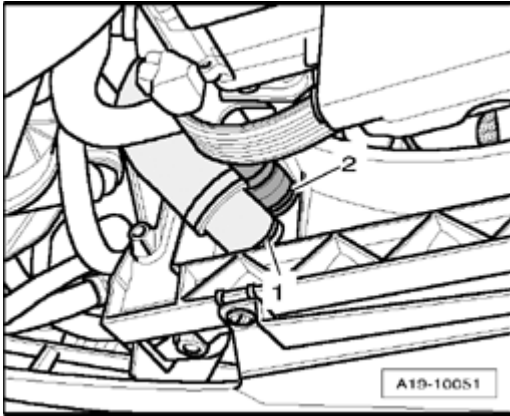


Fig. 509: Coolant Hoses

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove coolant hoses - 1 - and - 2 - from cooler.

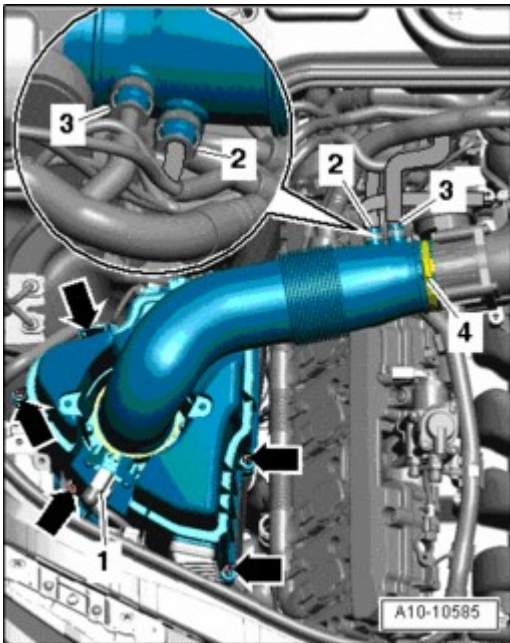


Fig. 510: Mass Air Flow (MAF) Sensor G70 Electrical Connector, Air Guide Hose Vacuum Hose, Air Guide Hose & Hose Clamps

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Separate electrical connector - 1 - for mass air flow (MAF) sensor G70.
- Remove vacuum lines - 2 - and - 3 - from air guide hose.
- Disconnect vacuum hose - 2 - from air guide hose.

CAUTION: Vacuum line - 3 - must not be opened.

- Disconnect air duct hose - **4** - from intake manifold.
- Remove bolts - **arrows** - and remove right upper part of air filter housing.

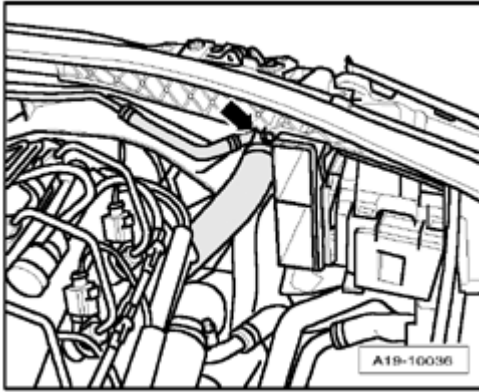


Fig. 511: Radiator Top Coolant Hose

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect top coolant hose - **arrow** - from radiator.

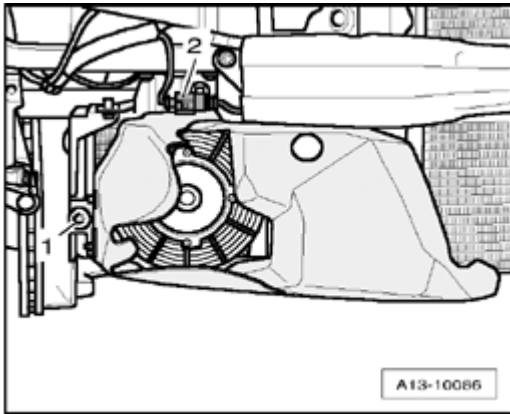


Fig. 512: Auxiliary Cooler Air Duct Bolt & Electrical Connector

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **2** - and free up electrical wiring.
- Remove bolt - **1** - and disengage auxiliary cooler air duct with auxiliary fan.

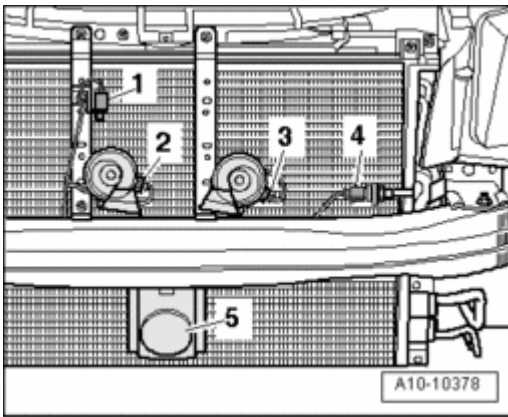


Fig. 513: Identifying Outside Air Temperature Sensor G17 & Electrical Connectors
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove Outside Air Temperature Sensor G17 - 4 -.
- Disconnect electrical connectors - 1, 2, 3 -.
- Free up wiring harness.

NOTE:

- Ignore - 5 -.

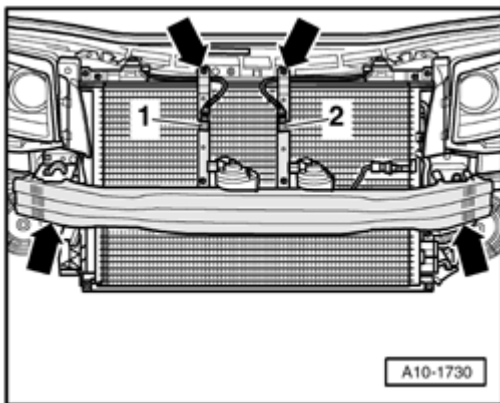


Fig. 514: Brace Electrical Connections & Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and remove bumper with braces.
- If present, disconnect electrical connector on Distance Regulation Control Module J428.

NOTE:

- Ignore - 1 - and - 2 -.

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

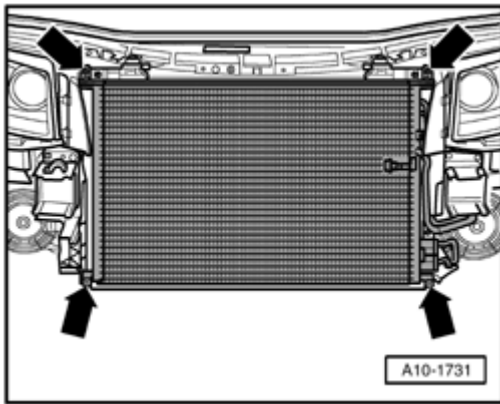


Fig. 515: Condenser Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

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

- Remove bolts - **arrows** -.
- Pivot condenser with power steering cooler downward.
- Tie up condenser to engine.

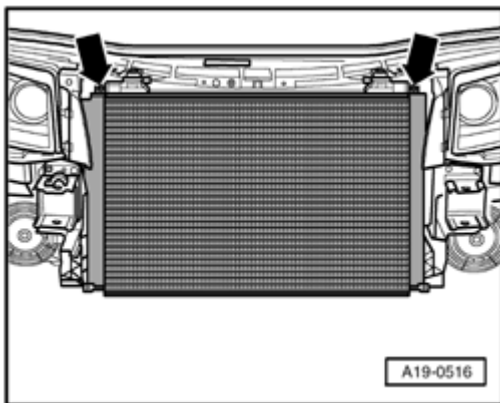


Fig. 516: Brackets For Radiator

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove both brackets for radiator - **arrows** -.
- Pivot upper radiator forward slightly and lift it out from lock carrier.

Installing

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

- Install front bumper cover --> **63 - BUMPERS** .
- Fill with coolant --> *Filling* under **Cooling System, Draining and Filling**.

2009 Audi S8 Quattro

ENGINE 5.2 Liter 10-Cyl. 4V Engine Mechanical, Engine Code(s): BSM - S8

NOTE:

- Complete coolant must be replaced if the radiator was replaced.

Tightening Specifications

Component	Nm
Radiator bracket 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

Left Auxiliary Cooler, Removing and Installing

Left Auxiliary Cooler, Removing and Installing

Removing

- Drain coolant --> **Cooling System, Draining and Filling.**
- Remove front part of left front wheel housing liner --> **66 - EXTERIOR EQUIPMENT** .

NOTE:

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

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

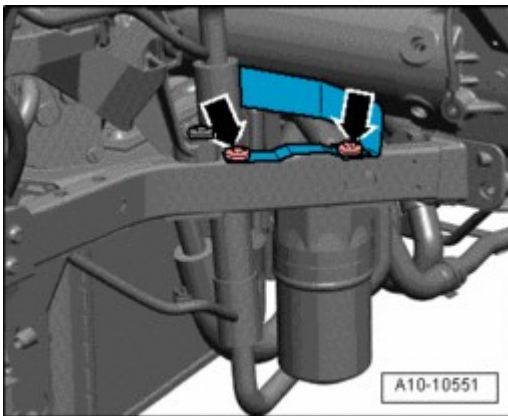


Fig. 517: Climate Control System Reservoir Bracket Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove climate control reservoir from carrier - **arrows** - and let it hang.

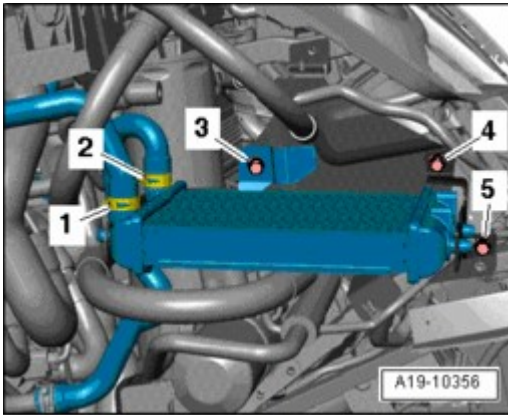


Fig. 518: Coolant Hoses & Auxiliary Cooler Bolts
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove coolant hoses - **1** - and - **2** -.
- Remove bolts - **3**, **4**, **5** - , disengage auxiliary cooler from bracket and remove it.

Installing

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

NOTE: • **Secure all hose connections with hose clamps appropriate for the model .**

- Install front part of left front wheel housing liner --> **66 - EXTERIOR EQUIPMENT** .
- Fill with coolant --> *Filling* under **Cooling System, Draining and Filling.**

NOTE: • **Complete coolant must be replaced if the radiator was replaced.**

Tightening Specifications

Component	Nm
Left auxiliary cooler to bracket	9
Climate control system reservoir to carrier	9

Right Auxiliary Cooler, Removing and Installing

Right Auxiliary Cooler, Removing and Installing

Special tools, testers and auxiliary items required

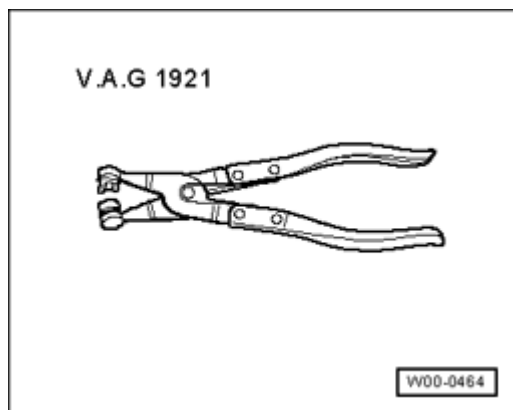


Fig. 519: Hose Clamp Pliers V.A.G 1921

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hose clamp pliers V.A.G 1921

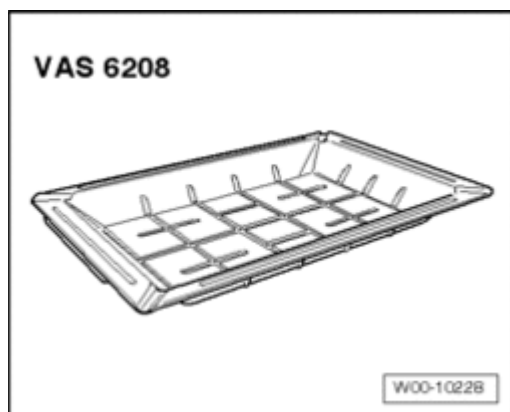


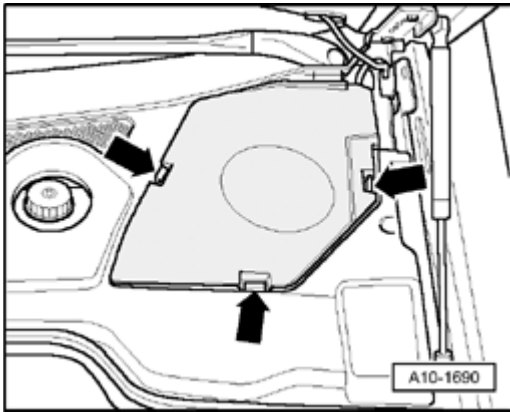
Fig. 520: Drip Tray For Workshop Crane VAS 6208

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drip tray for workshop crane VAS 6208

Removing

- Remove front bumper cover --> **63 - BUMPERS** .

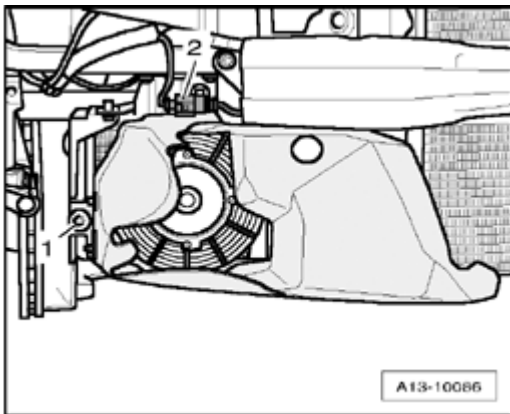
**Fig. 521: Cover Above Coolant Reservoir**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

- Open cap of coolant expansion tank.

**Fig. 522: Auxiliary Cooler Air Duct Bolt & Electrical Connector**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **2** - and free up electrical wiring.
- Remove bolt - **1** - and disengage auxiliary cooler air duct with auxiliary fan.
- Place drip tray for workshop crane VAS 6208 under engine.

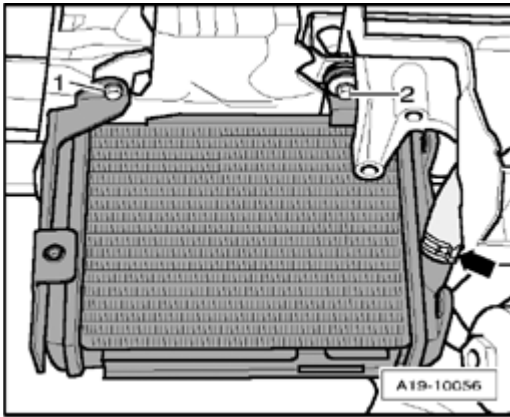


Fig. 523: Auxiliary Cooler Screws & Front Coolant Hose
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect front coolant hose from auxiliary cooler - **arrow** - and drain coolant.
- Remove screws - **1** - and - **2** -.

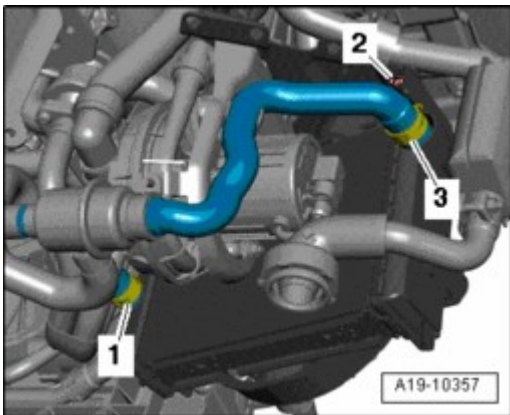


Fig. 524: Coolant Hoses & Auxiliary Cooler Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove coolant hoses - **1** - and - **3** -.
- Remove bolt - **2** - and remove auxiliary cooler.

Installing

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

NOTE: • **Secure all hose connections with hose clamps appropriate for the model .**

- Install front bumper cover --> **63 - BUMPERS .**
- Fill with coolant --> *Filling* under **Cooling System, Draining and Filling.**

NOTE: • **Complete coolant must be replaced if the radiator was replaced.**

2009 Audi S8 Quattro

ENGINE 5.2 Liter 10-Cyl. 4V Engine Mechanical, Engine Code(s): BSM - S8

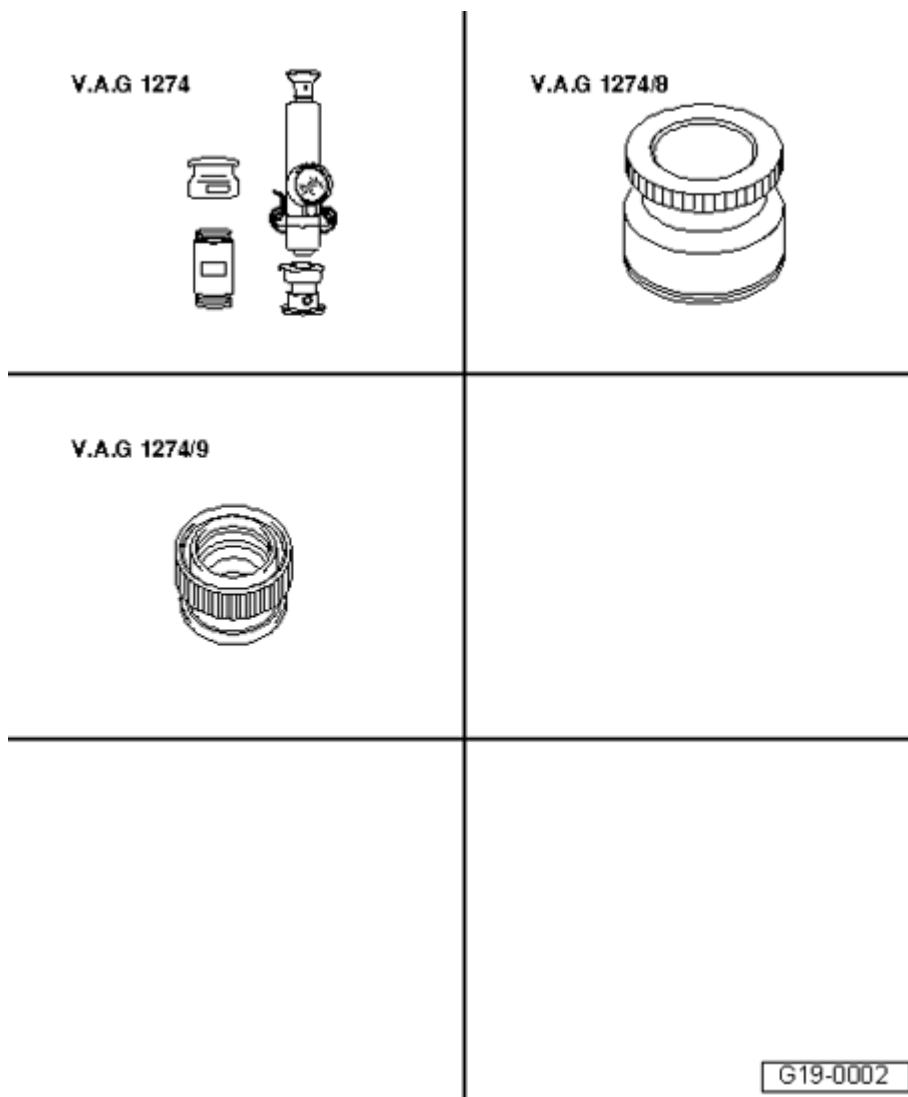
Tightening Specifications

Component	Nm
Air guide to auxiliary cooler	9
Right auxiliary cooler to bracket	9

Cooling System, Checking for Leaks

Cooling System, Checking for Leaks

Special tools, testers and auxiliary items required



G19-0002

Fig. 525: Identifying Special Tools - Cooling System, Checking For Leaks
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

Procedure

- Engine at operating temperature.

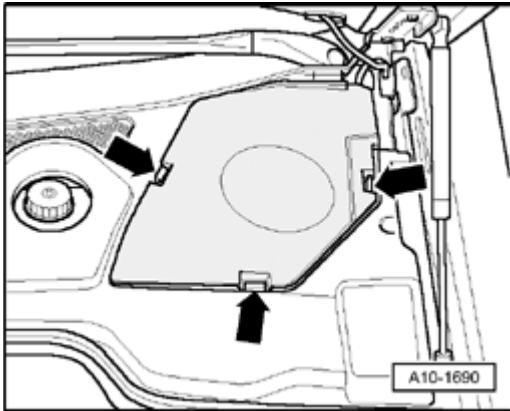


Fig. 526: Cover Above Coolant Reservoir
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

- Open cap of coolant expansion tank.

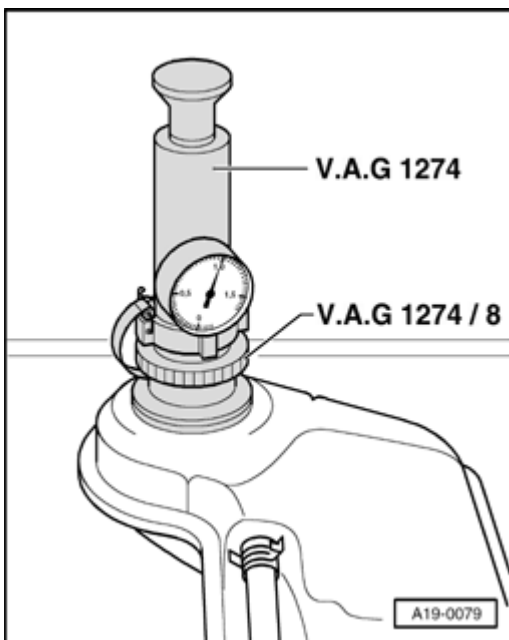
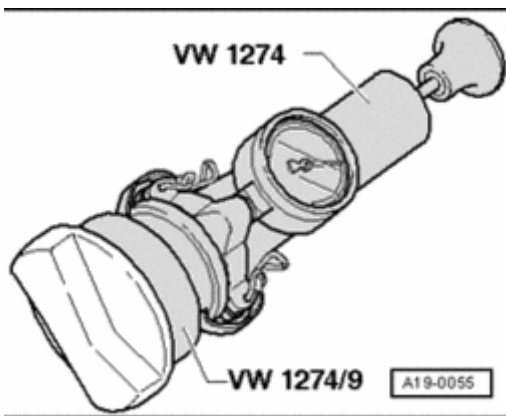


Fig. 527: Positioning Cooling System Tester V.A.G 1274 With Adapter V.A.G 1274/8 On Expansion Tank
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position Cooling System Tester V.A.G 1274 with adapter V.A.G 1274/8 on expansion tank.
- Generate a positive pressure of approximately 1.0 bar using hand pump of cooling system tester.

If pressure drops:

- Look for leaking places and fix them.

Pressure relief valve in cap, checking**Fig. 528: Pressure Relief Valve In Cap, Checking**
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Attach cooling system tester V.A.G 1274 with adapter V.A.G 1274/9 on sealing cap.
- Generate a positive pressure using hand pump of cooling system tester.
- The pressure release valve must open at 1.4 to 1.6 bar.

If check-valve does not open as indicated:

- Replace cap.

Fan Shroud, Removing and Installing**Fan Shroud, Removing and Installing****Removing**

- Drain coolant --> **Cooling System, Draining and Filling.**
- Remove radiator --> **Radiator, Removing and Installing.**

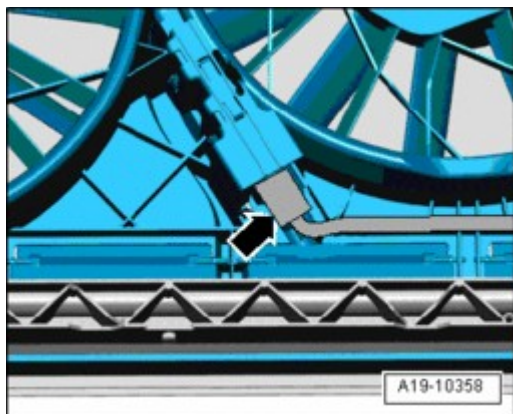


Fig. 529: Radiator Fan Electrical Harness Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - **arrow** - to radiator fan.

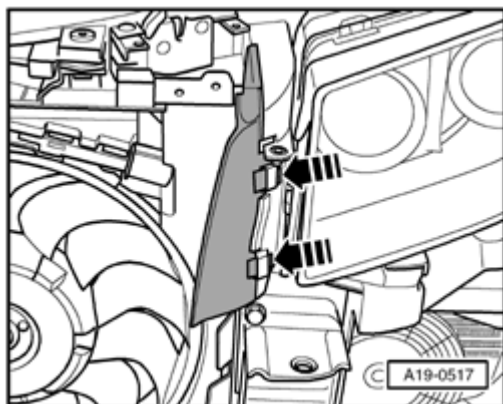


Fig. 530: Air Guides
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove air guide at left and right - **arrows** -.

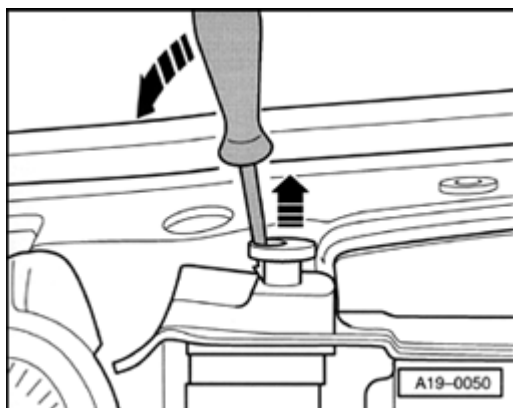


Fig. 531: Unlocking Both Retaining Bolts For Fan Shroud And Removing By Pulling Upward
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unlock both retaining bolts for fan shroud and remove by pulling upward - **arrows** -.
- Swing fan shroud toward front at upper edge.

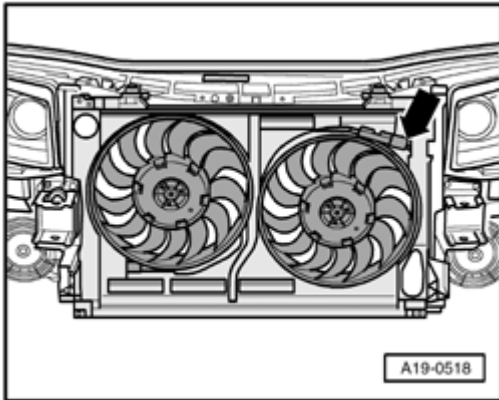


Fig. 532: Coolant Fan Electrical Connection
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Separate 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:

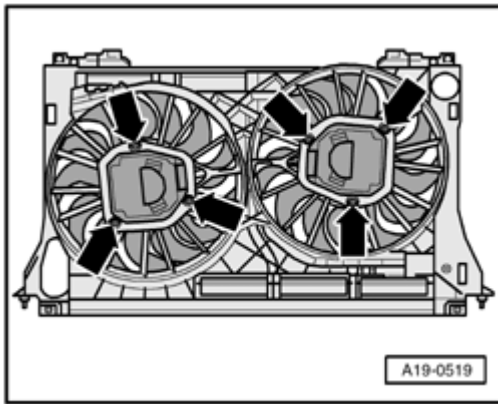
- Install radiator --> **Radiator, Removing and Installing.**
- Fill with coolant --> *Filling* under **Cooling System, Draining and Filling.**

Coolant Fan, Removing and Installing

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. 533: Coolant Fan Bolts**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Unclip electrical harness connectors and free up electrical wires.
- Remove coolant fan.

Installing

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

- Install fan shroud --> **Fan Shroud, Removing and Installing.**
- Install radiator --> **Radiator, Removing and Installing.**
- Fill with coolant --> *Filling* under **Cooling System, Draining and Filling.**

Tightening specifications

Component	Nm
Coolant fan to fan shroud	10 1)
1) Replace bolts.	

26 - EXHAUST SYSTEM, EMISSION CONTROLS

EXHAUST SYSTEM, REMOVING AND INSTALLING

Exhaust System, Removing and Installing

--> **Exhaust System, Component Overview**

--> **Center and Rear Mufflers, Separating**

--> **Left Exhaust System Tract, Removing and Installing**

--> **Right Exhaust System Tract, Removing and Installing**

--> **Left Y-Pipe, Removing and Installing**

--> **Right Y-Pipe, Removing and Installing**

--> **Left Front Muffler, Removing and Installing**

--> **Right Front Muffler, Removing and Installing**

--> **Exhaust System, Installing**

NOTE:

- After exhaust system repairs, make sure exhaust system is not under stress and is far enough from the body. If necessary, loosen clamping sleeves and align mufflers and exhaust pipes so that there is adequate distance to vehicle body, and weight is evenly distributed among the exhaust hangers.

Exhaust System, Component Overview

Exhaust System, Component Overview

Front exhaust system

NOTE:

- The front exhaust system for cylinder bank 1 (right) is shown in the illustration.

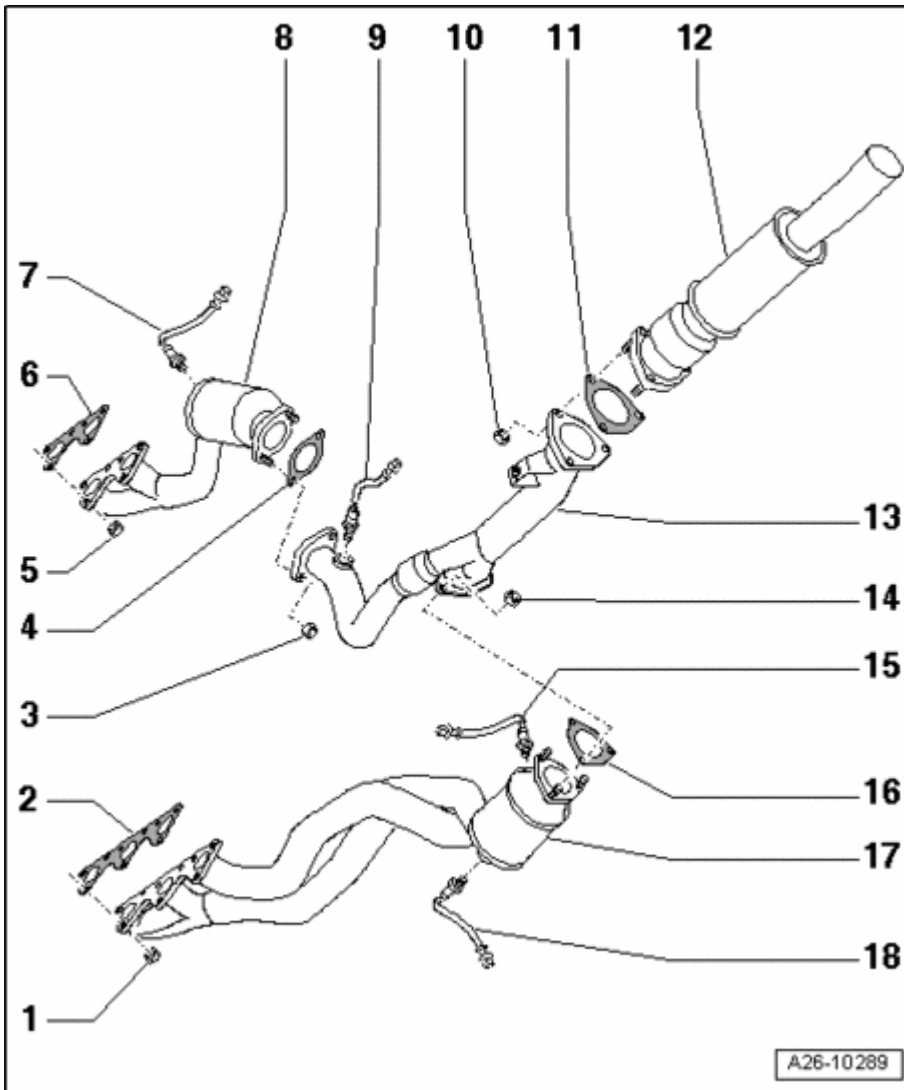


Fig. 534: Exhaust System, Component Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Nut

- Replace
- Tightening specification and sequence: Left --> **Right Front Muffler, Removing and Installing** , right --> **Right Front Muffler, Removing and Installing**

2 - Gasket

- Replace

3 - 23 Nm

- Replace

4 - Gasket

- Replace

5 - Nut

- Replace
- Tightening specification and sequence: Left --> **Right Front Muffler, Removing and Installing** , right --> **Right Front Muffler, Removing and Installing**

6 - Gasket

- Replace

7 - Heated Oxygen Sensor (HO2S) 2 G108 (in front of catalytic converter)

- For exhaust bank II (cylinder 4, 5)
- Threads of new oxygen sensors are coated with assembly paste
- When re-installing a used oxygen sensor, coat threads with hot bolt paste; hot bolt paste
- Assembly paste or hot bolt paste must not get onto slots of sensor body.
- Removing and installing --> **24 - MULTIPOINT FUEL INJECTION (MPI)**
- Tighten to 55 Nm.

8 - Rear exhaust manifold with catalytic converter

- For exhaust bank II (cylinder 4, 5)
- Protect from shocks and impact stress
- Removing and installing: Left --> **Left Exhaust System Tract, Removing and Installing** , right --> **Right Exhaust System Tract, Removing and Installing**.

9 - Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G131

- For exhaust bank II (cylinder 4, 5)
- Threads of new oxygen sensors are coated with assembly paste
- When re-installing a used oxygen sensor, coat threads with hot bolt paste; hot bolt paste
- Assembly paste or hot bolt paste must not get onto slots of sensor body.
- Removing and installing --> **24 - MULTIPOINT FUEL INJECTION (MPI)**
- Tighten to 55 Nm.

10 - 23 Nm

- Replace

11 - Gasket

- Replace

12 - Front muffler

- With flex joint
- Do not bend decoupling element more than 10 or it could be damaged.
- Removing and installing: Left --> **Left Front Muffler, Removing and Installing** , right --> **Right Front Muffler, Removing and Installing**
- Install exhaust system free of stress --> **Exhaust System, Installing**

13 - Y pipe

- With flex joint
- Do not bend decoupling element more than 10 or it could be damaged.
- Removing and installing: Left --> **Left Y-Pipe, Removing and Installing** , right --> **Right Y-Pipe, Removing and Installing**
- Install exhaust system free of stress --> **Exhaust System, Installing**

14 - 23 Nm

- Replace

15 - Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130

- For exhaust bank I (cylinder 1, 2, 3)
- Threads of new oxygen sensors are coated with assembly paste
- When re-installing a used oxygen sensor, coat threads with hot bolt paste; hot bolt paste
- Assembly paste or hot bolt paste must not get onto slots of sensor body.
- Removing and installing --> **24 - MULTIPOINT FUEL INJECTION (MPI)**
- Tighten to 55 Nm.

16 - Gasket

- Replace

17 - Front exhaust manifold with catalytic converter

- For exhaust bank I (cylinder 1, 2, 3)
- Protect from shocks and impact stress
- Removing and installing: Left --> **Left Exhaust System Tract, Removing and Installing** , right --> **Right Exhaust System Tract, Removing and Installing**.

18 - Heated Oxygen Sensor (HO2S) G39 (before catalytic converter)

- For exhaust bank I (cylinder 1, 2, 3)
- Threads of new oxygen sensors are coated with assembly paste
- When re-installing a used oxygen sensor, coat threads with hot bolt paste; hot bolt paste
- Assembly paste or hot bolt paste must not get onto slots of sensor body.
- Removing and installing --> **24 - MULTIPORT FUEL INJECTION (MFI)**
- Tighten to 55 Nm.

Exhaust system, rear

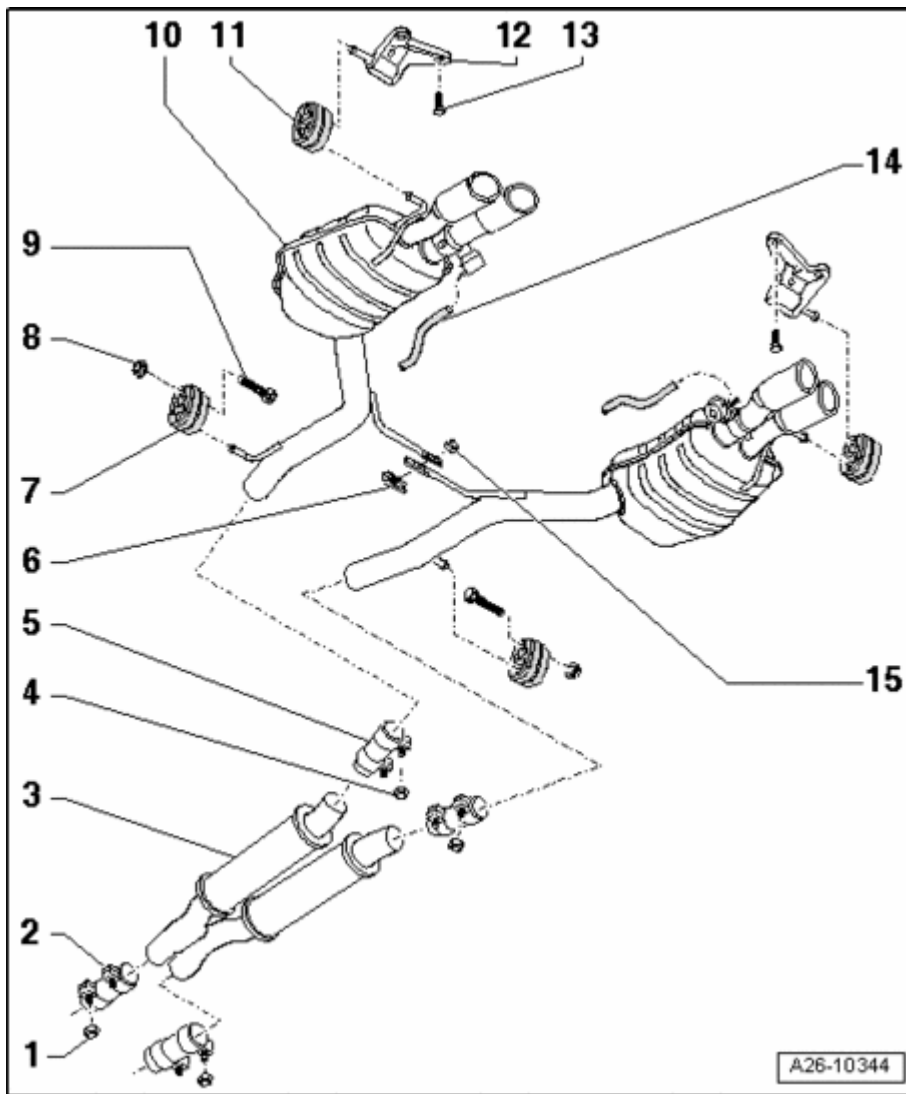


Fig. 535: Exhaust System, Component Overview - Exhaust System, Rear
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - 23 Nm

2 - Front clamping sleeve

- Installed location --> **Installed position of front double clamps**
- Before tightening, align exhaust system tension-free --> **Exhaust System, Installing**
- Tighten threaded connections evenly.

3 - Center muffler

- Original equipment as one unit with rear muffler. For repairs, replace each separately.
- Separation points --> **Center and Rear Mufflers, Separating**
- Install exhaust system free of stress --> **Exhaust System, Installing**

4 - 23 Nm**5 - Rear clamping sleeve**

- For individual replacement of center and rear mufflers
- Installed location --> **Installed position of rear double clamps**
- Before tightening, align exhaust system --> **Exhaust System, Installing**
- Tighten threaded connections evenly.

6 - Clamping piece**7 - Retaining loop**

- Replace if damaged

8 - 23 Nm**9 - Bolt****10 - Rear muffler**

- With exhaust flap
- Exhaust flap vacuum reservoir, checking --> **Exhaust Flap Vacuum Diaphragm, Checking**
- Original equipment as one unit with center muffler. For repairs, replace each separately.
- Separation points --> **Center and Rear Mufflers, Separating**
- Install exhaust system free of stress --> **Exhaust System, Installing**

11 - Retaining loop

- Replace if damaged

12 - Suspended mount

- Replace if damaged

13 - 22 Nm

14 - Exhaust flap vacuum hose

- From exhaust flap valve

15 - 23 Nm

- Replace

Individual components of mounting

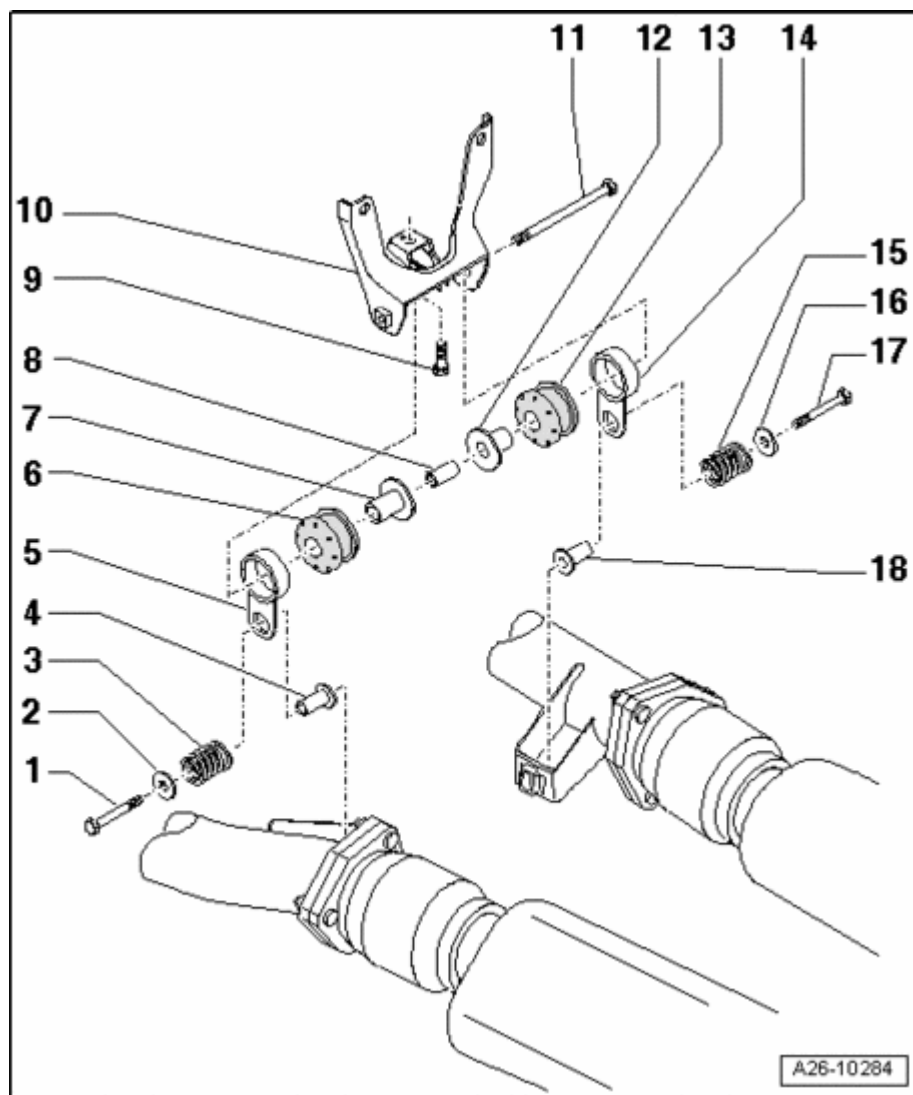


Fig. 536: Exhaust System, Component Overview - Individual Components Of Mounting
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

2009 Audi S8 Quattro

ENGINE 5.2 Liter 10-Cyl. 4V Engine Mechanical, Engine Code(s): BSM - S8

1 - 23 Nm

2 - Washer

3 - Spring

4 - Spacing sleeve

5 - Tab

6 - Buffer

7 - Spacing sleeve

8 - Sleeve

9 - 23 Nm

10 - Bracket

11 - 23 Nm

12 - Spacing sleeve

13 - Buffer

14 - Tab

15 - Spring

16 - Washer

17 - 23 Nm

18 - Spacing sleeve

Installed position of front double clamps

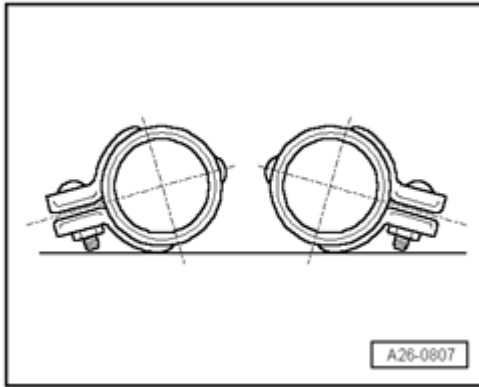


Fig. 537: Positioning Clamping Sleeves Centrally On Separation Points
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- When installing the double clamps, ensure that the bolt ends do not project beyond the lower edge of the double clamp.
- Threaded connections point outward.

Installed position of rear double clamps

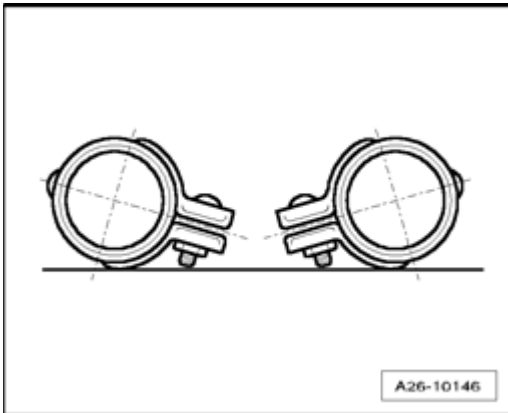


Fig. 538: Installed Position Of Front Double Clamps
Courtesy of VOLKSWAGEN UNITED STATES, INC.

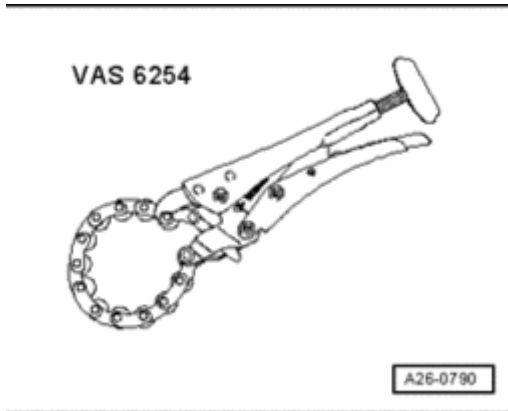
- When installing the double clamps, ensure that the bolt ends do not project beyond the lower edge of the double clamp.
- The threaded connections face each other.

Center and Rear Mufflers, Separating

Center and Rear Mufflers, Separating

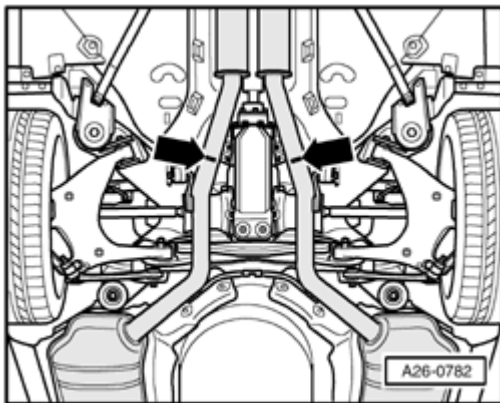
- A separating point has been provided in the connecting pipe for individual replacement of the center or rear muffler

- The separating point is marked by a depression around the circumference of the exhaust pipe.

Special tools, testers and auxiliary items required**Fig. 539: Chain Pipe Cutter VAS 6254**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Chain pipe cutter VAS 6254

Procedure**Fig. 540: Exhaust Pipes Separating Point**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Separate exhaust pipes at separating point - **arrows** - using chain pipe cutter VAS 6254 at a right angle.

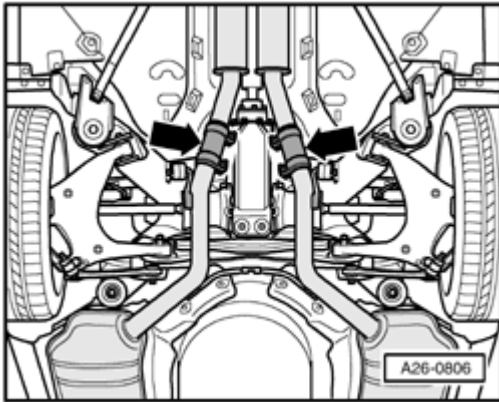


Fig. 541: Clamping Sleeves

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position clamping sleeves - **arrows** - at center of separating cut.

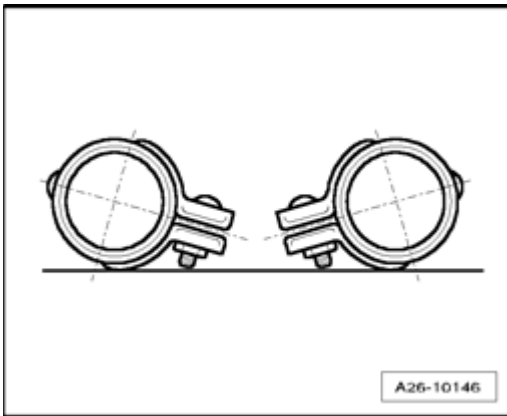


Fig. 542: Installed Position Of Front Double Clamps

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- When installing the double clamps, ensure that the bolt ends do not project beyond the lower edge of the double clamp.
- The threaded connections face each other.
- Align exhaust system --> **Exhaust System, Installing.**

Left Exhaust System Tract, Removing and Installing

Left Exhaust System Tract, Removing and Installing

Removing

NOTE:

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

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

- Remove engine --> **Engine, Removing.**
- Leave engine with transmission installed on the scissor lift platform VAS 6131 A.

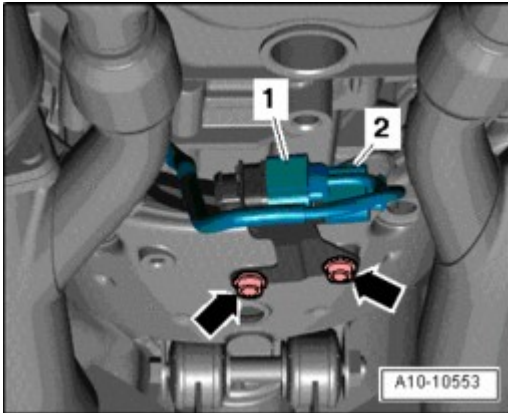


Fig. 543: Oxygen Sensor Electrical Connectors & Tunnel Cross Member Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove electrical connector - 1 - for Oxygen Sensor (O2S) 3 Behind Three Way Catalytic Converter (TWC) G287 from bracket and disconnect it.

NOTE:

- Ignore - 2 - and - arrows -.

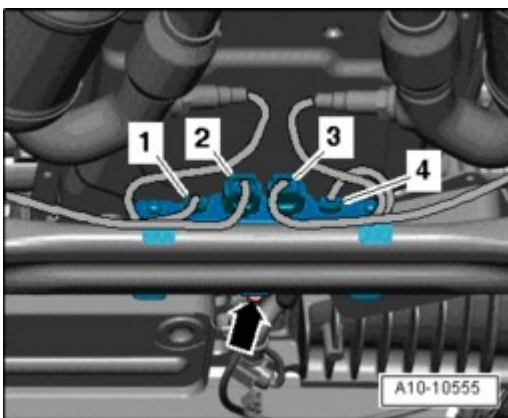


Fig. 544: Subframe Oxygen Sensor Electrical Connectors
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bracket for oxygen sensor electrical connectors - 1 to 4 - from subframe - **arrow** -.
- Remove electrical connectors - 1 - for Oxygen Sensor (O2S) 4 Behind Three Way Catalytic Converter (TWC) G288 and - 2 - for Heated Oxygen Sensor (HO2S) 3 G285 (in front of catalytic converter) from bracket on transmission and disconnect them.

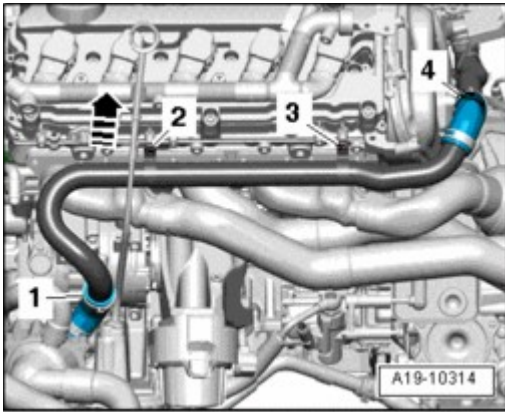


Fig. 545: Removing Bolts, Oil Dipstick Guide Tube Upward & Loosening Hose Clamps And Removing Left Coolant Pipe From Coolant Hoses

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - 2 - and - 3 -.
- Pull oil dipstick guide tube upward and off - **arrow** -.

NOTE:

- Ignore - 1 - and - 4 -.

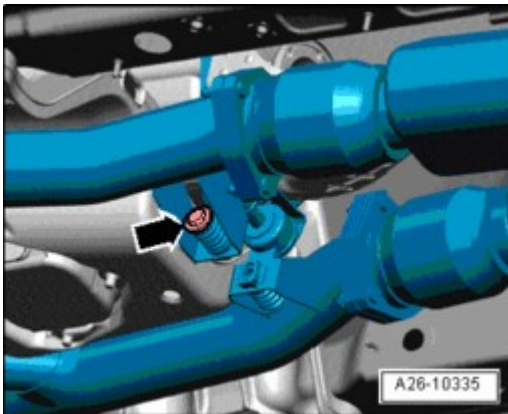


Fig. 546: Removing Bolt At Left Exhaust Tract Strap

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - **arrow** - at left exhaust tract strap.

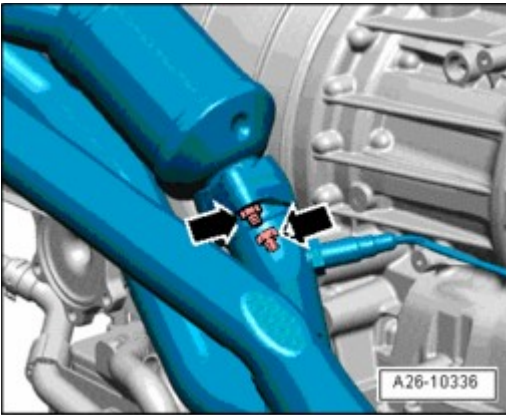


Fig. 547: Removing Nuts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - arrows -.

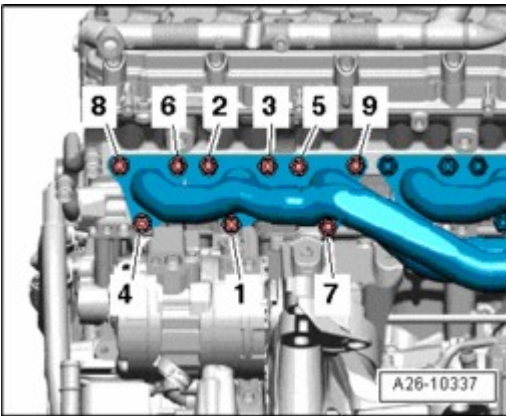


Fig. 548: Removing/Installing Nuts In Sequence And Left Front Exhaust Manifold With Catalytic Converter

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts in sequence - 9 to 1 - and remove left front exhaust manifold with catalytic converter.

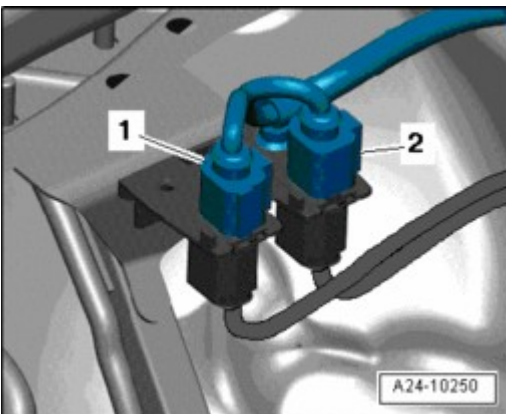


Fig. 549: Oxygen Sensor Electrical Connectors

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - 1 - for Heated Oxygen Sensor (HO2S) 4 G286 and free up oxygen sensor wiring.

NOTE:

- Ignore - 2 -.

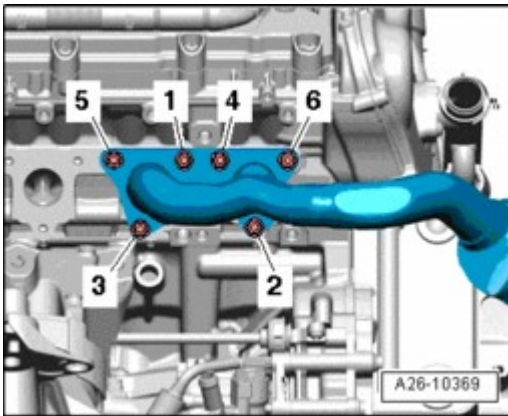


Fig. 550: Removing Nuts In Sequence And Left Rear Exhaust Manifold With Catalytic Converter
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts in sequence - 6 to 1 - and remove left rear exhaust manifold with catalytic converter.

Installing

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

NOTE:

- Replace gaskets, O-rings and self-locking nuts.
- Secure all hose connections with hose clamps appropriate for the model .
- During installation, reinstall all heat insulation sleeves and heat shields at the same locations.
- During installation, all cable ties must be re-installed at the same location.

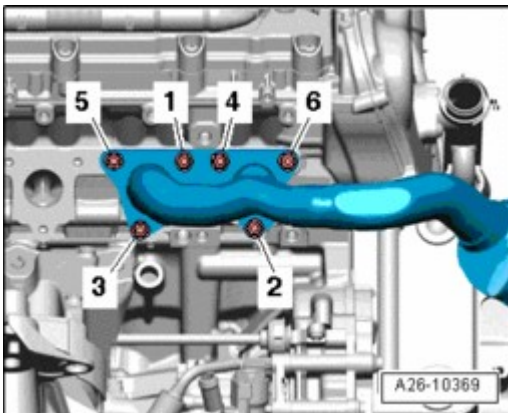


Fig. 551: Removing Nuts In Sequence And Left Rear Exhaust Manifold With Catalytic Converter
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position left rear exhaust manifold with catalytic converter on cylinder head and tighten nuts by hand.
- Tighten left rear exhaust manifold nuts in 2 stages as follows:

Pre-tighten nuts in sequence 1 to 6 to 10 Nm. Pre-tighten nuts in sequence 1 to 6 to 25 Nm.

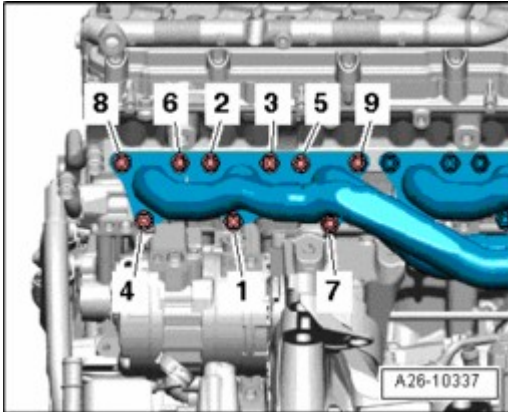


Fig. 552: Removing/Installing Nuts In Sequence And Left Front Exhaust Manifold With Catalytic Converter
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position left front exhaust manifold with catalytic converter on cylinder head and tighten nuts by hand.
- Tighten left front exhaust manifold nuts in 2 stages as follows:

Pre-tighten nuts in sequence 1 to 9 to 10 Nm. Pre-tighten nuts in sequence 1 to 9 to 25 Nm.

- Install engine --> **Engine, Installing.**
- Align exhaust system free of tension --> **Exhaust System, Installing.**

Tightening Specifications

Component		Nm
Front exhaust manifold with catalytic converter to cylinder head		25 1)2)3)
Rear exhaust manifold with catalytic converter to	Cylinder Head	25 1)2)3)
	Y pipe	23
Y pipe to strap		23
Coolant pipe to cylinder head		9
1) Replace nuts. 2) Grease with hot bolt paste; Hot bolt paste . 3) Tighten in 2 stages.		

Right Exhaust System Tract, Removing and Installing

Right Exhaust System Tract, Removing and Installing

Removing

NOTE:

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

- Remove engine --> **Engine, Removing.**
- Leave engine with transmission installed on the scissor lift platform VAS 6131 A.

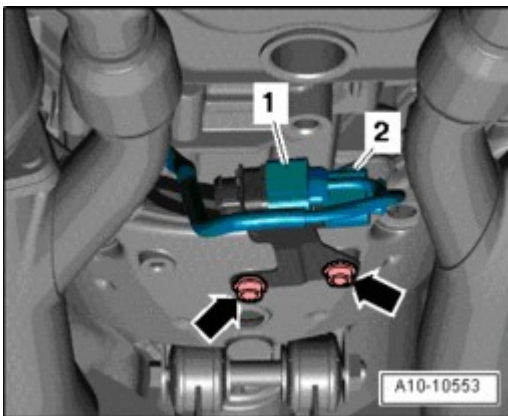


Fig. 553: Oxygen Sensor Electrical Connectors & Tunnel Cross Member Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove electrical connector - 2 - for Oxygen Sensor (O2S) 3 Behind Three Way Catalytic Converter (TWC) G130 from bracket and disconnect it.

NOTE:

- Ignore - 1 - and - arrows -.

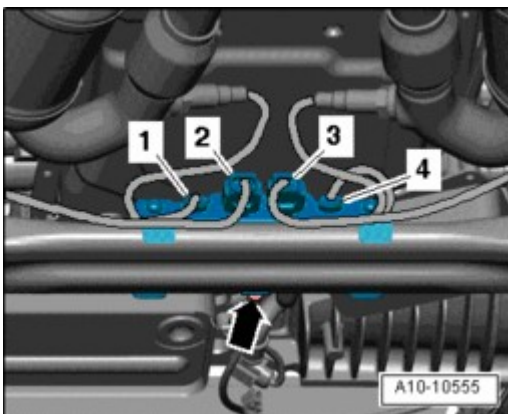


Fig. 554: Subframe Oxygen Sensor Electrical Connectors
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bracket for oxygen sensor electrical connectors - **1 to 4** - from subframe - **arrow** -.
- Remove electrical connectors - **3** - for Oxygen Sensor (O2S) 4 Behind Three Way Catalytic Converter (TWC) G131 and - **4** - for Heated Oxygen Sensor (HO2S) 3 G39 (in front of catalytic converter) from bracket on transmission and disconnect them.

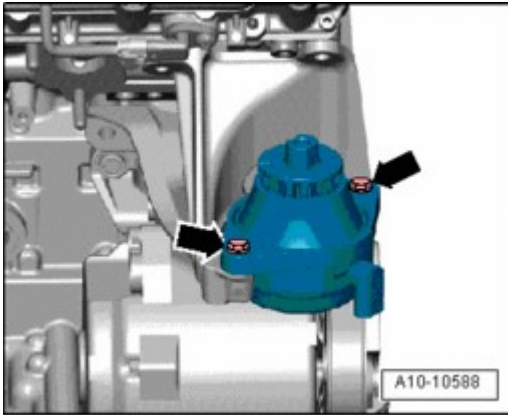


Fig. 555: Torque Support Mount Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and remove torque support mount.

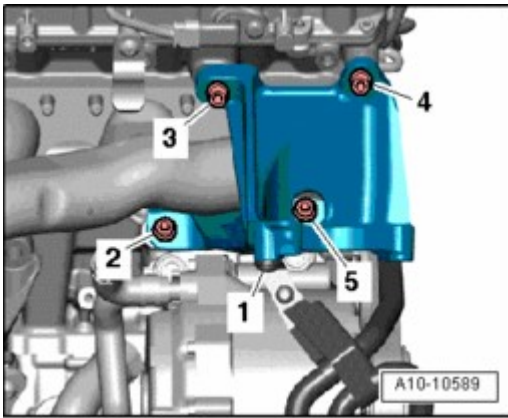


Fig. 556: Torque Support & Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **1 through 5** - and remove torque support bracket.

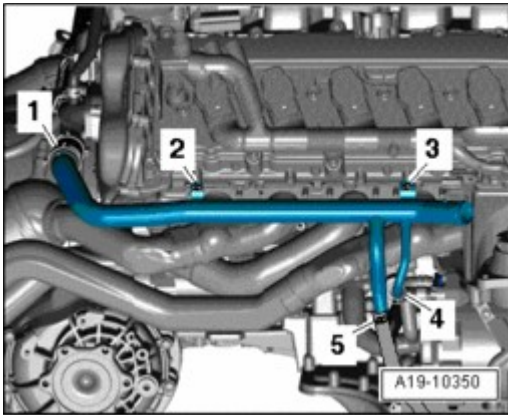


Fig. 557: Bolts, Hose Clamps, Right Coolant Pipe From Coolant Hoses & Coolant Hoses
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - 2 - and - 3 -.
- Loosen hose clamps - 1, 4, 5 - and remove right coolant pipe from coolant hoses.



Fig. 558: Removing Bolt At Right Exhaust Tract Strap
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - **arrow** - at right exhaust tract strap.

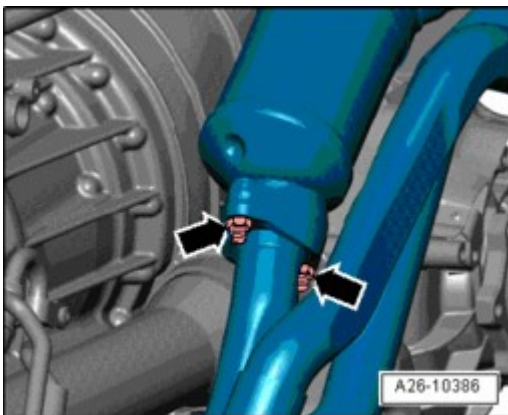


Fig. 559: Removing Nuts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - **arrows** -.

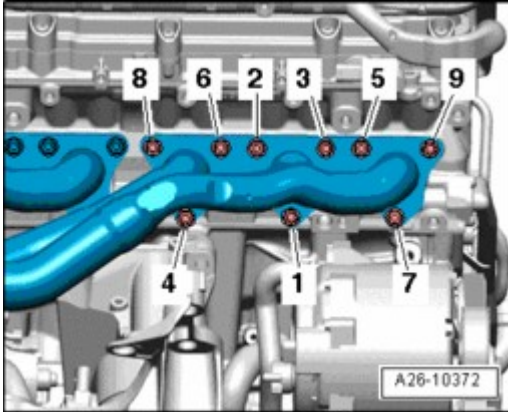


Fig. 560: Removing/Installing Nuts In Sequence And Right Front Exhaust Manifold With Catalytic Converter

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts in sequence - **9 to 1** - and remove right front exhaust manifold with catalytic converter.

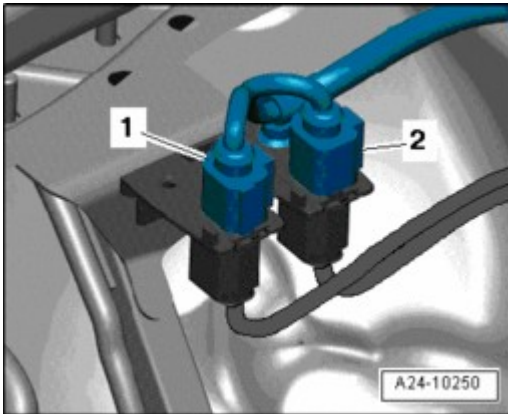


Fig. 561: Oxygen Sensor Electrical Connectors

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **2** - for Heated Oxygen Sensor (HO2S) 2 G108 and free up oxygen sensor wiring.

NOTE:

- Ignore - **1** -.

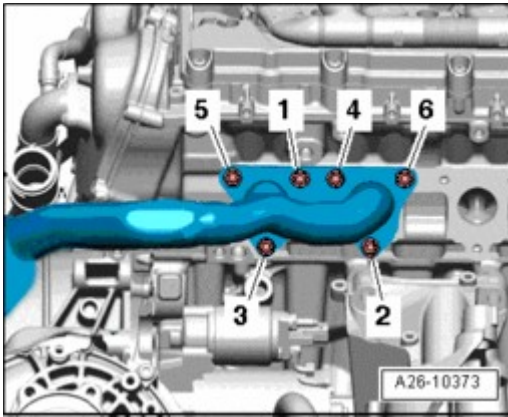


Fig. 562: Removing/Installing Nuts In Sequence And Right Rear Exhaust Manifold With Catalytic Converter

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts in sequence - 6 to 1 - and remove right rear exhaust manifold with catalytic converter.

Installing

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

NOTE:

- Replace gaskets and self-locking nuts.
- Secure all hose connections with hose clamps appropriate for the model .
- During installation, reinstall all heat insulation sleeves and heat shields at the same locations.
- During installation, all cable ties must be re-installed at the same location.

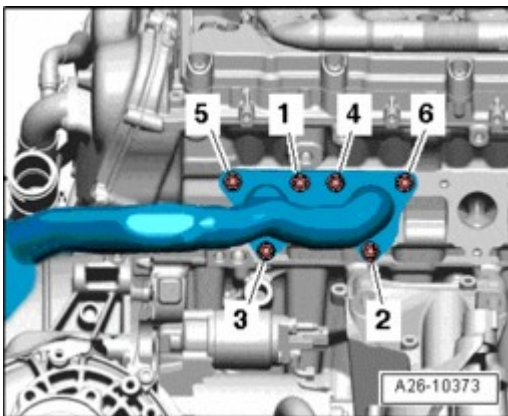


Fig. 563: Removing/Installing Nuts In Sequence And Right Rear Exhaust Manifold With Catalytic Converter

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position right rear exhaust manifold with catalytic converter on cylinder head and tighten nuts by hand.
- Tighten right rear exhaust manifold nuts in 2 stages as follows:

Pre-tighten nuts in sequence 1 to 6 to 10 Nm. Pre-tighten nuts in sequence 1 to 6 to 25 Nm.

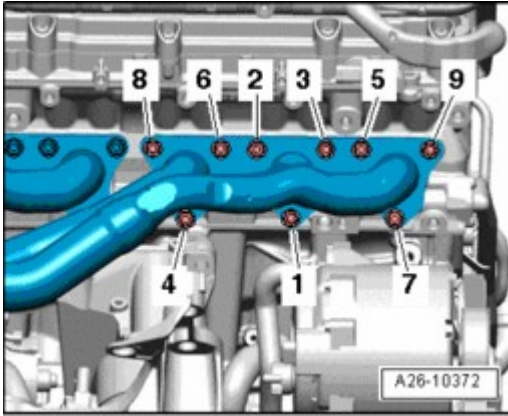


Fig. 564: Removing/Installing Nuts In Sequence And Right Front Exhaust Manifold With Catalytic Converter

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position right front exhaust manifold with catalytic converter on cylinder head and tighten nuts by hand.
- Tighten right front exhaust manifold nuts in 2 stages as follows:

Pre-tighten nuts in sequence 1 to 9 to 10 Nm. Pre-tighten nuts in sequence 1 to 9 to 25 Nm.

- Install engine --> **Engine, Installing.**
- Align exhaust system free of tension --> **Exhaust System, Installing.**

Tightening Specifications

Component		Nm
Front exhaust manifold with catalytic converter to cylinder head		25 1)2)3)
Rear exhaust manifold with catalytic converter to	Cylinder Head	25 1)2)3)
	Y pipe	23
Y pipe to strap		23
Coolant pipe to cylinder head		9
1) Replace nuts. 2) Grease with hot bolt paste; Hot bolt paste . 3) Tighten in 2 stages.		

Left Y-Pipe, Removing and Installing

Left Y-Pipe, Removing and Installing

Removing

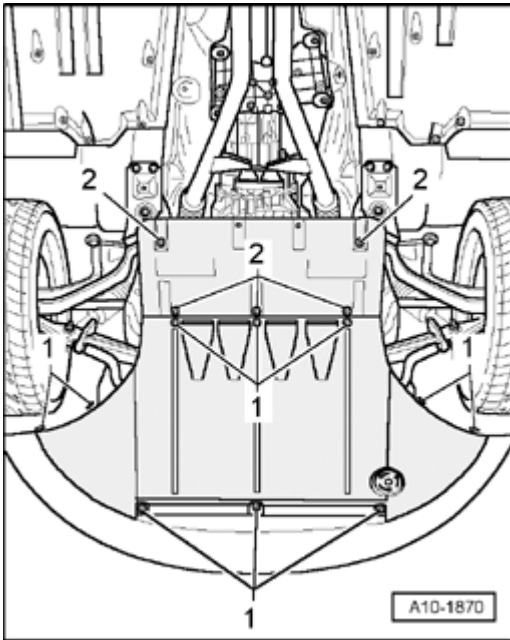


Fig. 565: Noise Insulation Quick-Release Fasteners
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen quick-release fasteners - 2 - and remove rear noise insulation.

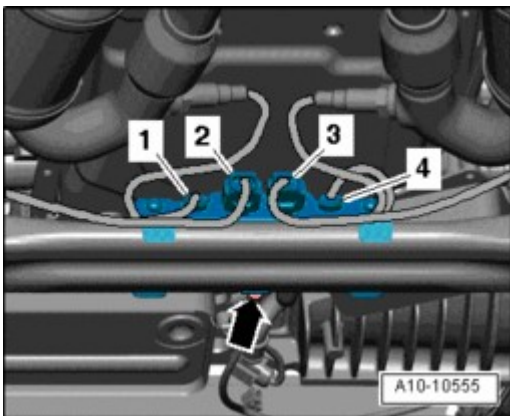


Fig. 566: Subframe Oxygen Sensor Electrical Connectors
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bracket for oxygen sensor electrical connectors - 1 to 4 - from subframe - **arrow** -.
- Remove electrical connector - 1 - for Oxygen Sensor (O2S) 4 Behind Three Way Catalytic Converter (TWC) G288 from bracket on transmission and disconnect it.

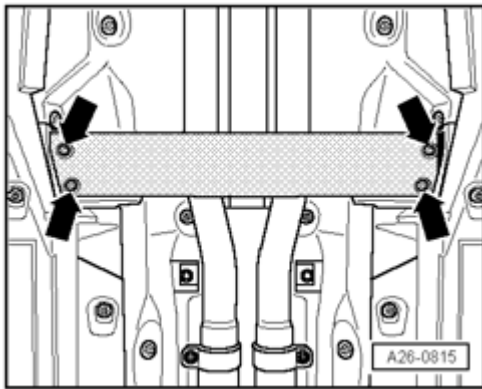


Fig. 567: Front Transverse Beam

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unbolt front transverse beam - **arrows** -.

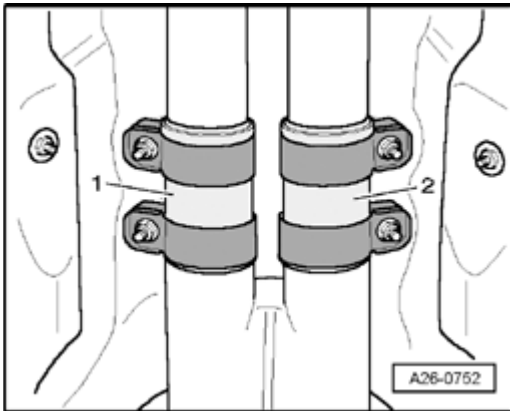


Fig. 568: Clamping Sleeves

Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- Do not bend the flex joint in the front muffler more than 10 or it could be damaged.

- Loosen clamping sleeve - **2** -.

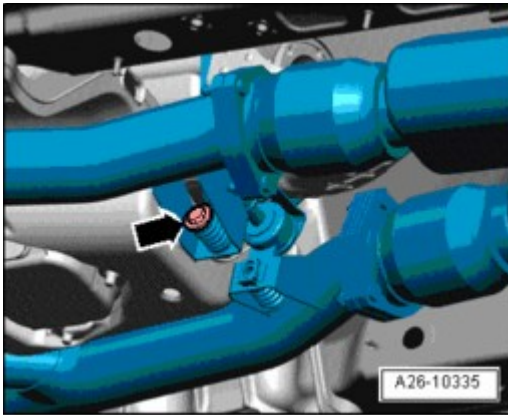


Fig. 569: Removing Bolt At Left Exhaust Tract Strap
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - **arrow** - at left exhaust tract strap.

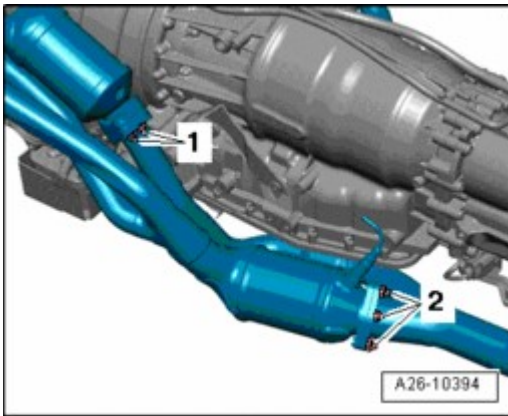


Fig. 570: Y-Pipe/front Muffler Nuts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - **1** - and - **2** - and remove Y-pipe together with front muffler.

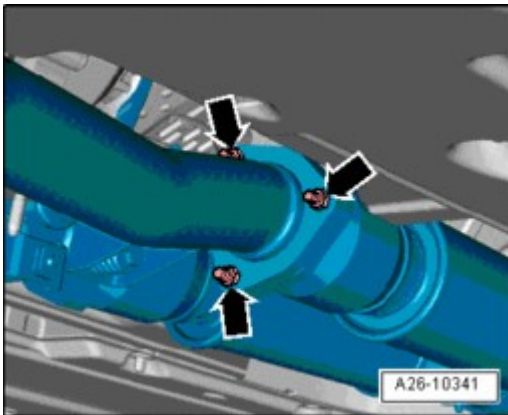


Fig. 571: Left Front Muffler Nuts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - **arrows** - and remove left front muffler from Y-pipe.

NOTE:

- Shown installed in illustration.

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.

Tightening specifications

Component		Nm
Front transverse beam to body		
Y-pipe to	Front muffler	23 1)
	Catalytic converter	23 1)
1) Replace nuts.		

Right Y-Pipe, Removing and Installing

Right Y-Pipe, Removing and Installing

Removing

- Remove engine --> Engine, Removing.
- Leave engine with transmission installed on scissor lift platform VAS 6131 A.
- Remove right exhaust system tract --> Right Exhaust System Tract, Removing and Installing.

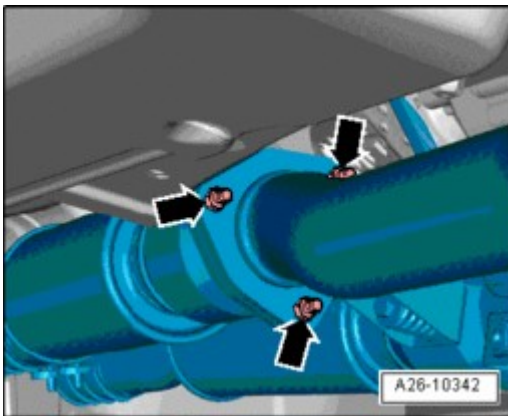


Fig. 572: Removing Nuts And Right Front Muffler From Y-Pipe
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - **arrows** - and remove right front muffler from Y-pipe.

NOTE:

- Shown installed in illustration.

Installing

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

NOTE:

- Replace gaskets and self-locking nuts.

- Install right exhaust system tract --> **Right Exhaust System Tract, Removing and Installing.**
- Install engine --> **Engine, Installing.**
- Align exhaust system free of tension --> **Exhaust System, Installing.**

Tightening specifications

Component		Nm
Y-pipe to	Front muffler	23 1)
Catalytic converter		23 1)
1) Replace nuts.		

Left Front Muffler, Removing and Installing

Left Front Muffler, Removing and Installing

Removing

NOTE:

- Do not bend the flex joint in the front muffler more than 10 or it could be damaged.

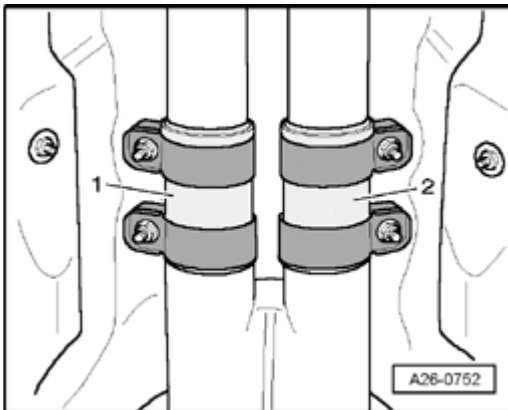


Fig. 573: Clamping Sleeves

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen left clamping sleeve - 2 -.

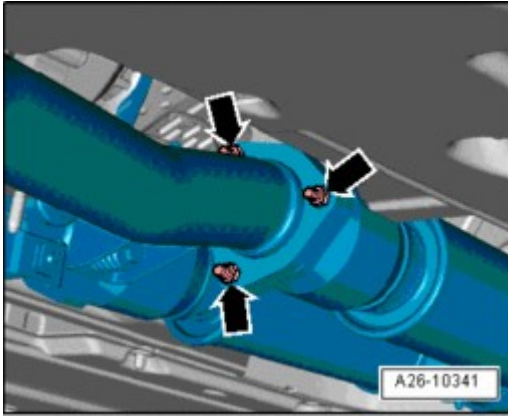


Fig. 574: Left Front Muffler Nuts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - **arrows** - and remove left front muffler from Y-pipe.

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.**

Tightening specifications

Component	Nm
Front muffler to Y pipe	23 1)
1) replace nuts.	

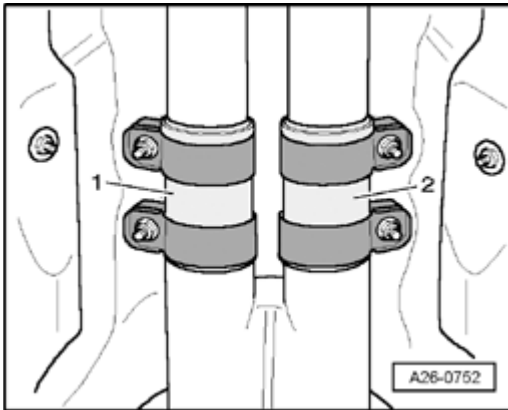
Right Front Muffler, Removing and Installing

Right Front Muffler, Removing and Installing

Removing

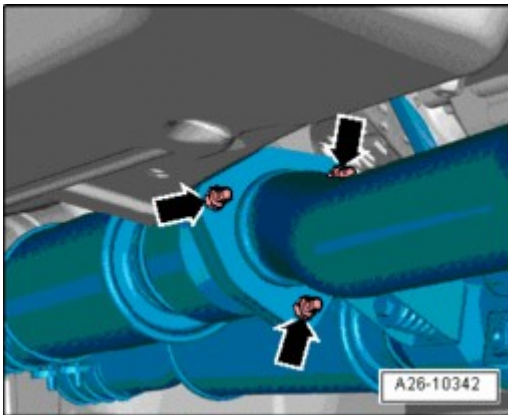
NOTE:

- **Do not bend the flex joint in the front muffler more than 10 or it could be damaged.**

**Fig. 575: Clamping Sleeves**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen right clamping sleeve - 1 -.

**Fig. 576: Removing Nuts And Right Front Muffler From Y-Pipe**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - **arrows** - and remove right front muffler from Y-pipe.

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.**

Tightening specifications

Component	Nm
Front muffler to Y pipe	23 1)
1) Replace nuts.	

Exhaust System, Installing

Exhaust System, Installing

- Align exhaust system when cold.
- Loosen threaded fasteners of all clamping sleeves on the exhaust system.

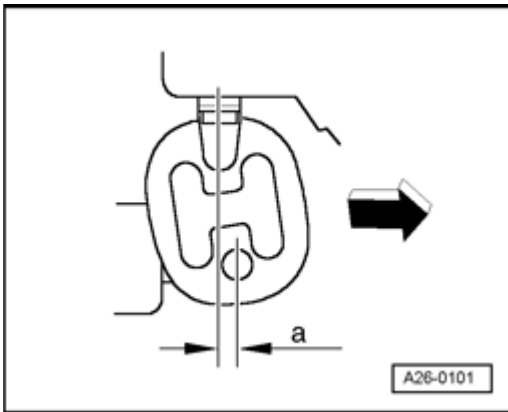


Fig. 577: Pressing Rear Muffler Toward Front
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press rear muffler toward front - **arrow** - until the following pre-loads on the retaining loops are achieved:
 - Front retaining loop: - **a** - = 11 mm.
 - Rear retaining loop: - **a** - = 14 mm.
- Align rear muffler horizontally.

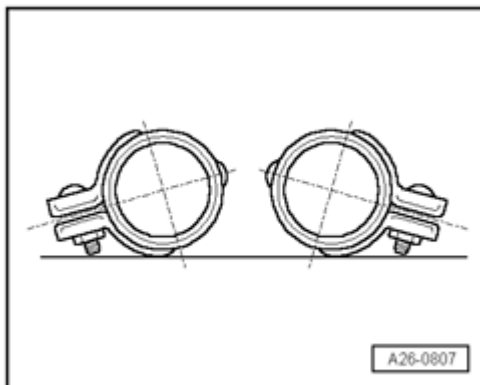


Fig. 578: Positioning Clamping Sleeves Centrally On Separation Points
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position clamping sleeves centrally on separation points.
- Align front clamping sleeves so that the bolt ends do not project over the lower edge of the clamping

sleeves.

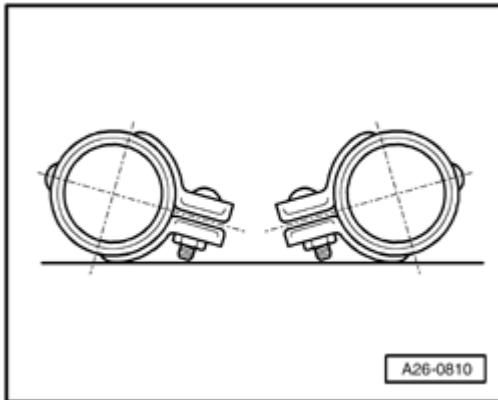


Fig. 579: Adjusting Rear Double Clamps So That Bolt Ends Do Not Project Over Lower Edges Of Double Clamps

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Align rear clamping sleeves so that the bolt ends do not project over the lower edge of the clamping sleeves.
- Tighten clamping sleeve threaded connections evenly to 23 Nm.
- Align end pipes.

Tail Pipes, Aligning

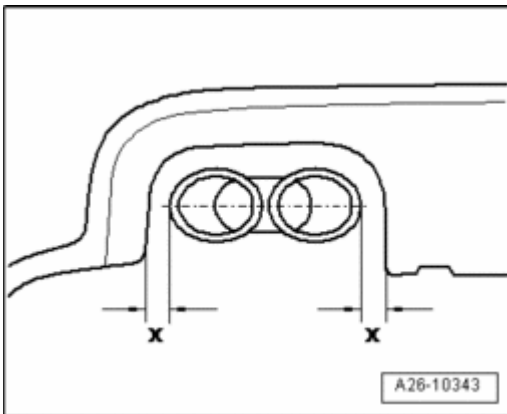


Fig. 580: Checking Distance Of End Pipes At Left/Right To Bumper Cover

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check distance of end pipes at left and right to bumper cover:
 - Dimension - x - left = dimension - x - right.

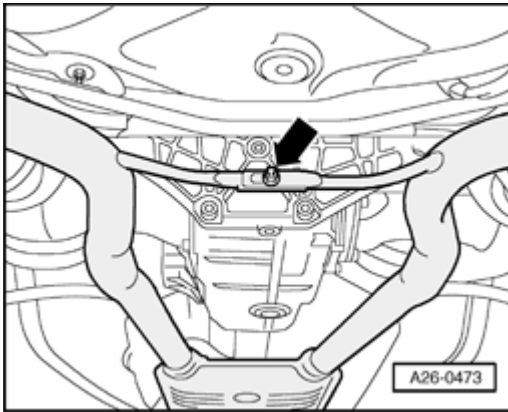


Fig. 581: Loosening Threaded Connections Of Brace Between Exhaust Pipes
Courtesy of VOLKSWAGEN UNITED STATES, INC.

If necessary, correct dimension "x" as follows:

- Loosen threaded connections - **arrow** - of brace between exhaust pipes.
- Adjust distance between rear mufflers.
- Tighten threaded fastener to 23 Nm.

SECONDARY AIR INJECTION, SERVICING

Secondary Air Injection, Servicing

--> **Secondary Air Injection, Component Overview**

--> **Secondary Air Injection Combination Valves, Checking**

--> **Secondary Air Injection Combination Valves, Removing and Installing**

--> **Secondary Air Injection Pump, Removing and Installing**

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.

- In the cold start phase, the engine control module controls the Secondary Air Injection (AIR) pump via the pump relay. Air reach secondary air injection combi-valves.
- The secondary air injection solenoid valve is activated in parallel which allows the vacuum to reach the secondary air injection combi-valves. The appropriate combination valve for Secondary Air Injection (AIR) thereby opens the path for secondary air to the exhaust channels of the cylinder head.

Secondary Air Injection, Component Overview

Secondary Air Injection, Component Overview

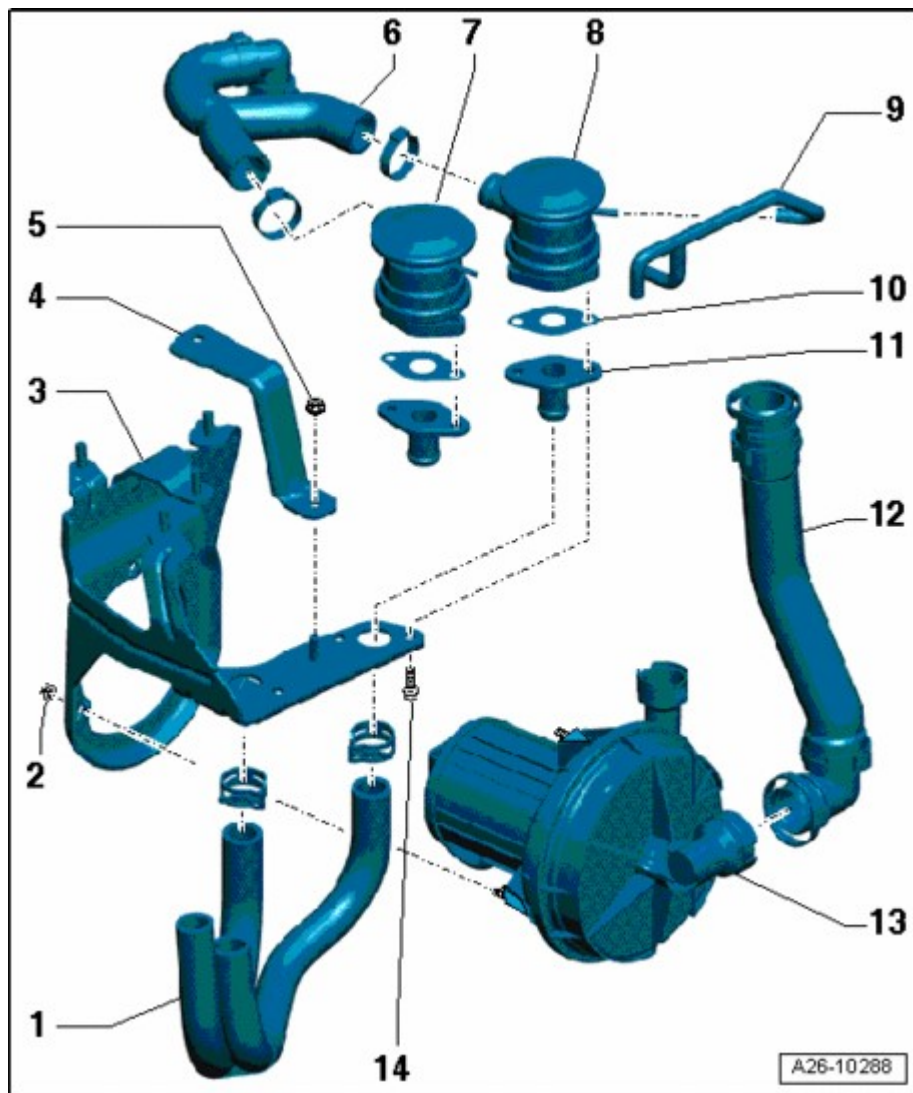


Fig. 582: Secondary Air Injection, Component Overview

Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Air guide hose

- To engine

2 - 9 Nm

3 - Bracket

4 - Angle bracket

5 - 9 Nm

6 - Air guide hose

- From Secondary Air Injection (AIR) Pump Motor V101 to secondary air injection combi-valves

7 - Secondary Air Injection (AIR) combi-valve

- Component location: Right front in engine compartment
- Checking --> **Secondary Air Injection Combination Valves, Checking**
- Removing and installing --> **Secondary Air Injection Combination Valves, Removing and Installing**

8 - Secondary Air Injection (AIR) combi-valve

- Component location: Right front in engine compartment
- Checking --> **Secondary Air Injection Combination Valves, Checking**
- Removing and installing --> **Secondary Air Injection Combination Valves, Removing and Installing**

9 - Vacuum hoses

10 - Gasket

- Replace

11 - Connecting piece

12 - Air guide hose

- From air filter

13 - Secondary Air Injection (AIR) Pump Motor V101

- Component location: At front right in engine compartment below the longitudinal member
- Removing and installing --> **Secondary Air Injection Pump, Removing and Installing**
- Check in "Guided Fault-Finding" operating mode

14 - 9 Nm

Secondary Air Injection (AIR) Pump Relay J299 and Secondary Air Injection (AIR) Pump Fuse S130 installation location

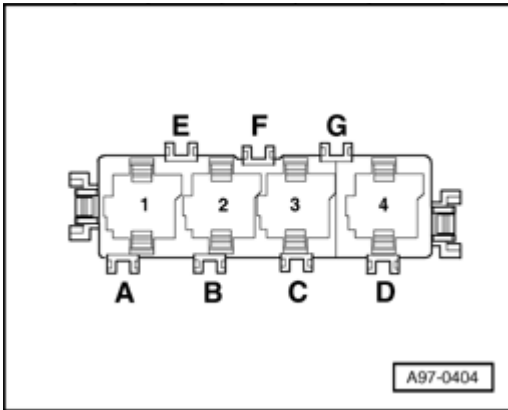


Fig. 583: Secondary Air Injection (AIR) Pump Relay J299 And Secondary Air Injection (AIR) Pump Fuse S130 Installation Location

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- In E-box, plenum chamber, passengers side.

1 - Secondary Air Injection (AIR) Pump Relay J299

B - Secondary Air Injection (AIR) Pump Fuse S130 (50 A)

Secondary Air Injection Combination Valves, Checking

Secondary Air Injection Combination Valves, Checking

Special tools, testers and auxiliary items required

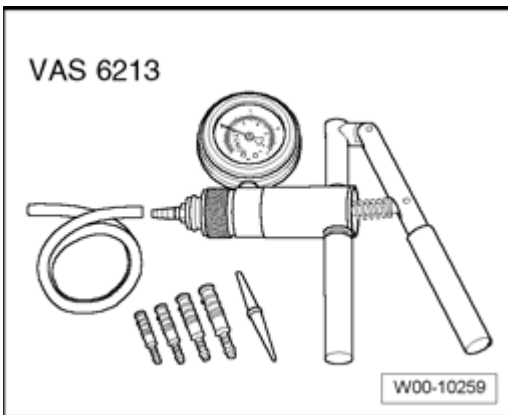


Fig. 584: Hand Vacuum Pump VAS 6213

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hand vacuum pump VAS 6213

Procedure

- Hose connections properly sealed.

- Remove affected secondary air injection combi-valve --> **Secondary Air Injection Combination Valves, Removing and Installing.**

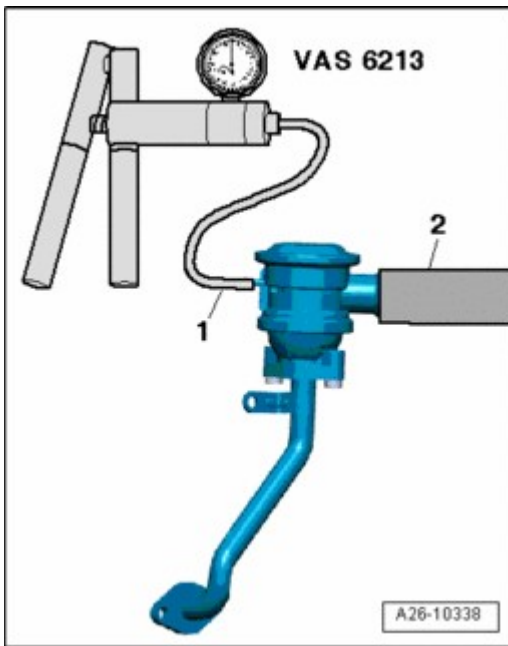


Fig. 585: Connecting Hand Vacuum Pump VAS 6213 To Vacuum Connection On Secondary Air Injection Combi-Valve

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect Hand Vacuum Pump VAS 6213 to vacuum connection - **1** - on secondary air injection combi-valve.
- Connect an appropriate assisting hose - **2** - to Secondary Air Injection (AIR) combi-valve.
- Blow into assisting hose - **2** - using light pressure (do not use pressurized air).
- Secondary Air Injection (AIR) combi-valve must be closed, it must not be possible to blow through.
- Operate hand vacuum pump.
- The Secondary Air Injection (AIR) combi-valve must open, it must be possible to blow through.

If secondary air injection combi-valve does not open:

- Replace affected Secondary Air Injection (AIR) combi-valve --> **Secondary Air Injection Combination Valves, Removing and Installing.**

Secondary Air Injection Combination Valves, Removing and Installing

Secondary Air Injection Combination Valves, Removing and Installing

Removing

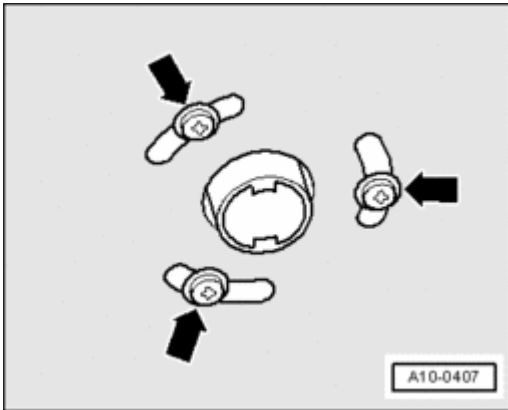


Fig. 586: Identifying Exhaust Pipe Fasteners

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

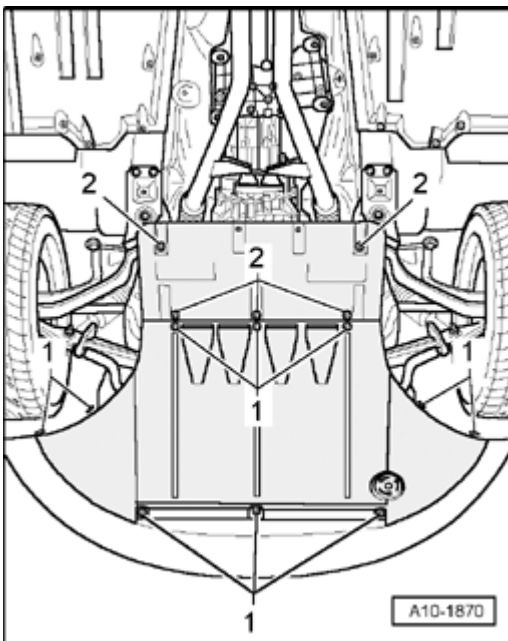


Fig. 587: Noise Insulation Quick-Release Fasteners

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen quick-release fasteners - **1** - and remove front noise insulation.

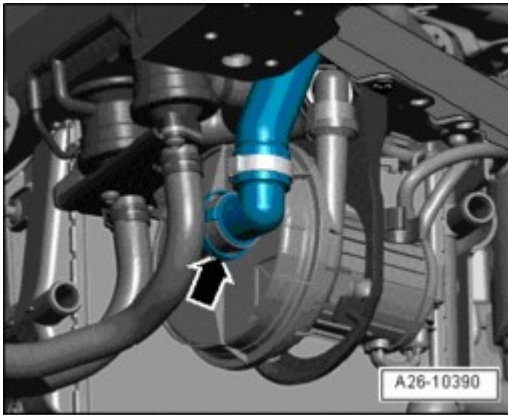


Fig. 588: Secondary Air Injection Pump Air Guide Hose
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove air guide hose from secondary air injection pump - **arrow** -.

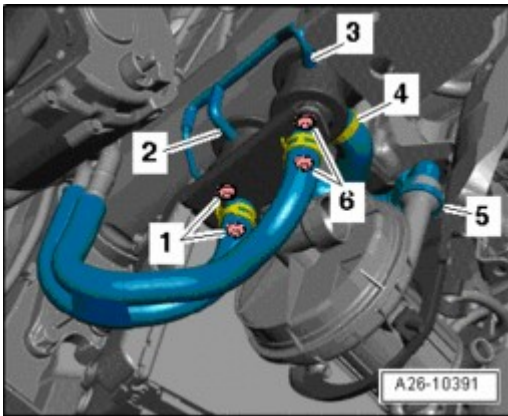


Fig. 589: Vacuum Hoses, Bolts, Air Guide Hoses & Secondary Air Injection (AIR) Combi-Valve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove vacuum hoses - **2** - and - **3** -.
- Remove bolts - **1** - and - **6** - and remove connecting piece.
- Remove air guide hoses - **4** - and - **5** -.
- Remove affected Secondary Air Injection (AIR) combi-valve.

Installing

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

NOTE: • **Replace seals.**

Tightening specifications

Component	Nm

Secondary air injection combi-valve from bracket

9

Secondary Air Injection Pump, Removing and Installing

Secondary Air Injection Pump, Removing and Installing

Removing

- Remove secondary air injection combi-valve --> **Secondary Air Injection Combination Valves, Removing and Installing.**

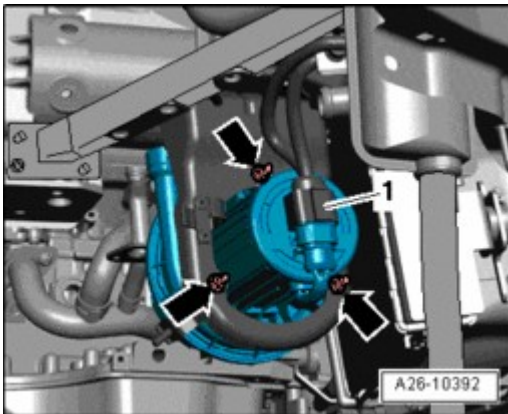


Fig. 590: Secondary Air Injection Pump Electrical Connector & Nuts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Separate electrical connector - **1** -.
- Remove nuts - **arrows** - and remove secondary air injection pump.

Installing

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

- Install secondary air injection combination valve --> **Secondary Air Injection Combination Valves, Removing and Installing.**

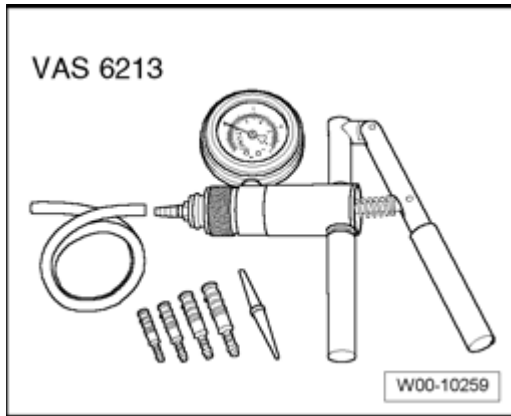
Tightening specifications

Component	Nm
Secondary Air Injection (AIR) pump to bracket	9

EXHAUST FLAPS

Exhaust Flaps

Exhaust Flap Vacuum Diaphragm, Checking

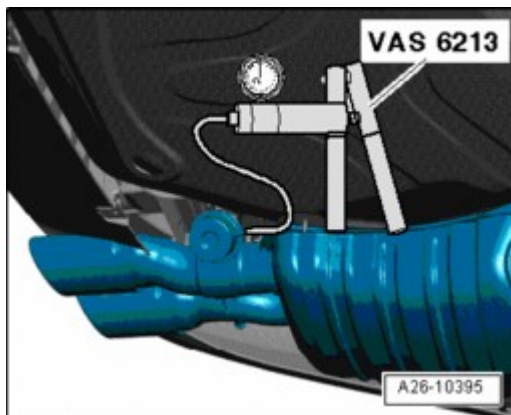
Special tools, testers and auxiliary items required**Fig. 591: Hand Vacuum Pump VAS 6213**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hand vacuum pump VAS 6213

Procedure

- Disconnect hose on vacuum diaphragm for exhaust flap at rear muffler.

**Fig. 592: Connecting Hand Vacuum Pump To Vacuum Diaphragm**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect hand vacuum pump to vacuum diaphragm.
- Generate vacuum using hand vacuum pump.
- Linkage must move upward.
- Vent hand vacuum pump.
- Linkage must move downward.

If linkage does not move:

2009 Audi S8 Quattro

ENGINE 5.2 Liter 10-Cyl. 4V Engine Mechanical, Engine Code(s): BSM - S8

- Check linkage for ease of movement and check vacuum diaphragm for leaks.