

ENGINE

4.2 Liter V8 4V Engine Mechanical, Engine Code(s): BNS

00 - GENERAL, TECHNICAL DATA

TECHNICAL DATA

Engine number

The imprinted engine number is only visible after a work step.

- Bring lock carrier into service position -->
 - **50 BODY, FRONT**
 - **50 - BODY - FRONT** for BODY EXTERIOR - CABRIOLET

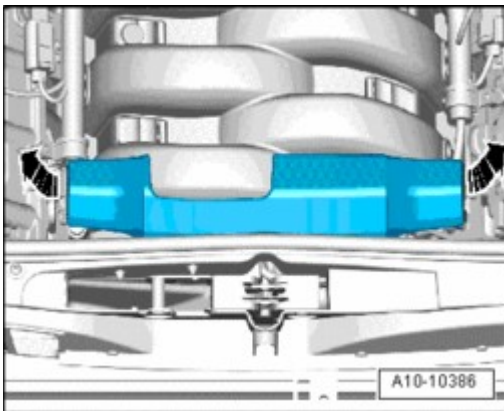


Fig. 1: Pulling Front Engine Cover Off

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull front engine cover - **arrows** - off.

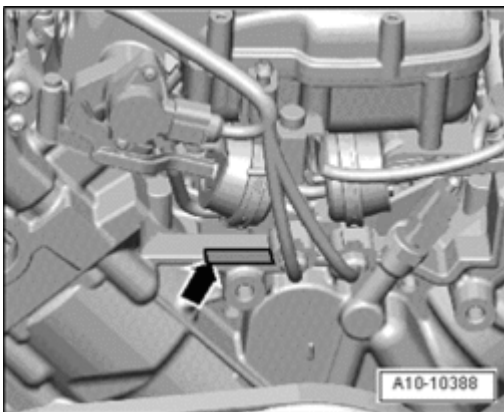


Fig. 2: Locating Engine Number

2008 Audi RS 4

ENGINE 4.2 Liter V8 4V Engine Mechanical, Engine Code(s): BNS

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.

Engine data

Code letters		BNS
Displacement	ltr.	4,163
Output	kW at 1/rpm	309/7800
Torque	Nm at rpm	430/5500
Bore	Dia. mm	84.5
Stroke	mm	92.8
Compression ratio		12.2
RON		98 ¹⁾
Fuel injection and ignition system		Bosch Motronic
Ignition sequence		1-5-4-8-6-3-7-2
Exhaust gas recirculation		no
Charging		no
Knock control		yes
Variable valve timing		yes
Variable intake manifold		yes
Secondary air injection (AIR) system		yes
• ¹⁾ Super unleaded RON 95 is permissible, although with reduced power.		

GENERAL REPAIR NOTES

Safety precautions

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

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

- The ignition must be switched off before connecting or disconnecting injection and ignition system wiring or tester cables.
- It is possible that the engine control module will recognize a malfunction and store a DTC during some

tests. Therefore, when all tests and repairs are completed, the DTC memory must be checked and, if necessary, erased. After DTC memory is erased, a readiness code must be generated for the engine control module using operating mode "Guided Functions".

- Clean engine only with ignition switched off.

CAUTION:

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

Rules of cleanliness for performing work on fuel injection system

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

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

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

- The fuel injection system is separated into a high-pressure section (max. approx. 120 bar) and a low-pressure section (approx. 6 bar).
- Before opening the high pressure section (e.g. to remove high pressure pump, fuel rail, fuel injectors or any other component or fuel line located in high pressure area of fuel injection system), fuel pressure in high pressure area must be dissipated in a defined manner to a residual pressure of approx. 6 bar. The procedure for this is as follows.

Special tools, testers and auxiliary items required

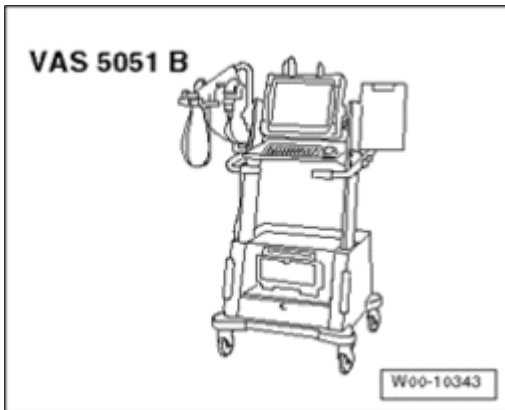


Fig. 3: Identifying Vehicle Diagnosis, Testing And Information System VAS 5051B
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Vehicle diagnostic, testing, and information system VAS 5051B (VAS 5051 B version shown as example only)

Work procedure

- Start engine and run at idle speed.

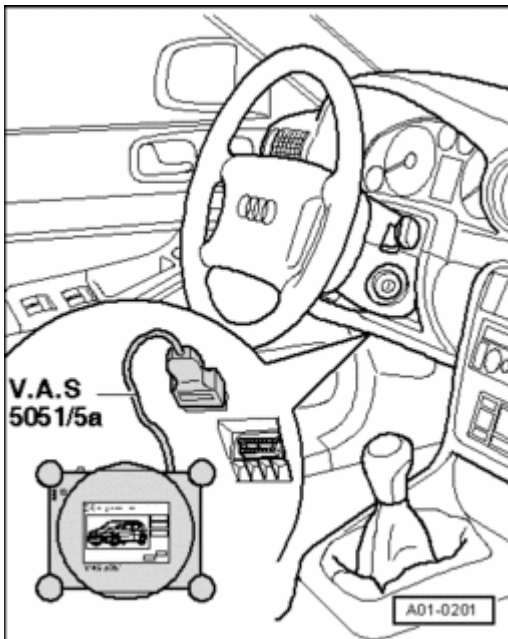


Fig. 4: Connecting Vehicle Diagnosis, Testing Info. System VAS 5051B
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect Vehicle Diagnosis, testing info. system VAS 5051B.

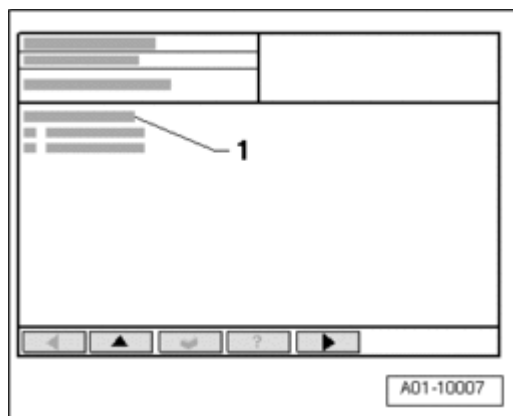


Fig. 5: Display On VAS 5051 - "On Board Diagnostic (OBD)"
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051B :

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



Fig. 6: 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 activate by pressing --> button.

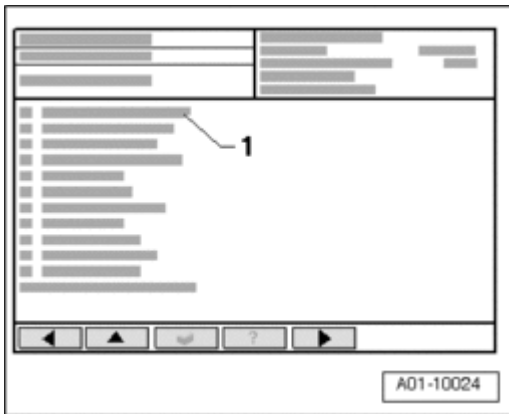


Fig. 7: Display On VAS 5051 - "006 - Basic Setting"
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051B :

- In selection - 1 - , press "011 - Measured values" and activate by pressing --> button.

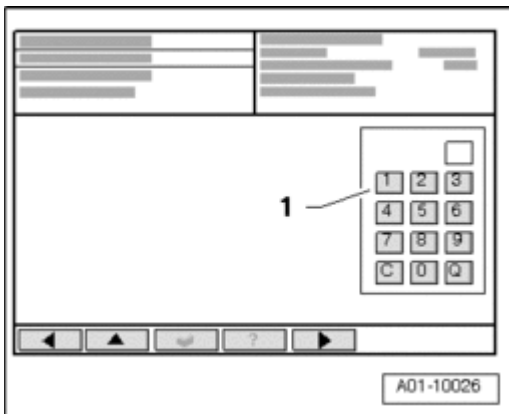


Fig. 8: Display On VAS 5051 - "Display Group 140"
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051B :

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

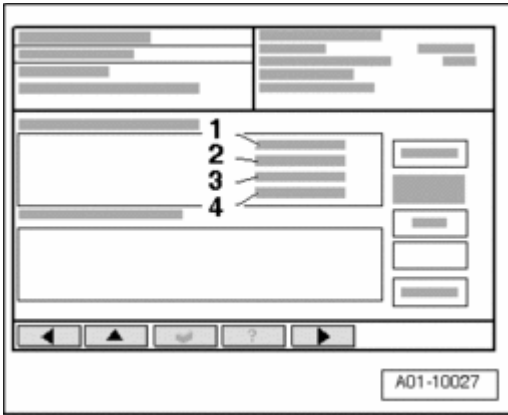


Fig. 9: Display On VAS 5051 - (Read-Out For Fuel Pressure In Fuel Rail)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051B :

- Check read-out for fuel pressure in fuel rail in display field - **3** -.

Example:

3 - 40.63 bar

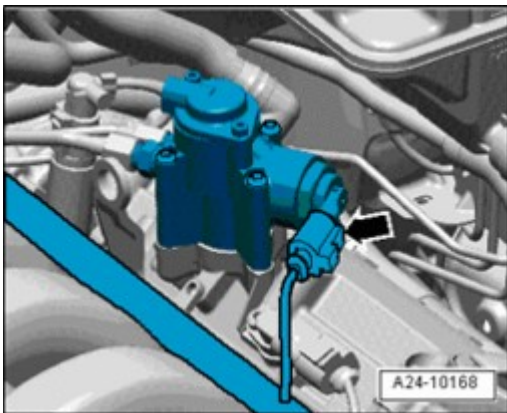


Fig. 10: Disconnecting Electrical Connector At Fuel Metering Valve 2 N402 On Left High Pressure Pump
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

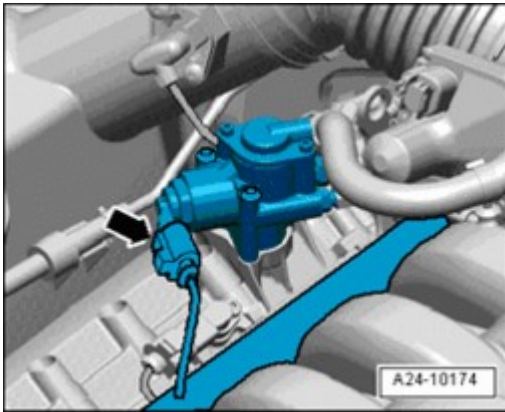


Fig. 11: Disconnecting Electrical Connector At Fuel Metering Valve 2 N290 On Right High Pressure Pump

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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



Fig. 12: Display On VAS 5051 - (Read-Out For Fuel Pressure In Fuel Rail)

Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051B :

- Check read-out in display field - **3** - :
 - Fuel pressure in fuel rail must sink to approx. 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 a clean cloth around connection points and collect escaping fuel.

Final procedures

- Reconnect electrical harness connectors.

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

CONTACT CORROSION!

Contact corrosion!

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

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

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

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

NOTE:

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

10 - ENGINE - ASSEMBLY

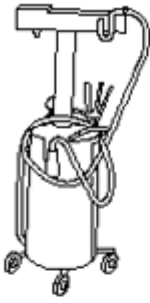
ENGINE, REMOVING AND INSTALLING

Engine, removing

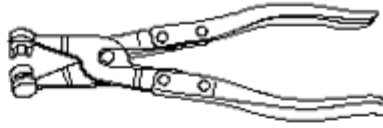
NOTE:

- **With lock carrier removed, engine is removed downward with transmission and subframe.**
- **Drained coolant must be stored in a clean container for disposal or reuse.**
- **During installation, re-install 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.**

V.A.G 1782



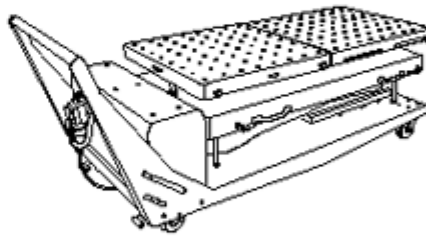
V.A.G 1921



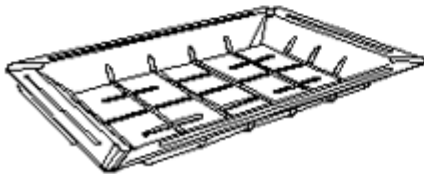
VAS 5085



VAS 6131



VAS 6208



G10-10012

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

Special tools, testers and auxiliary items required

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

NOTE:

- If engine and transmission are to be separated after removal, the supplementary set VAS 6131/11 and adapter VAS 6131/10-12 (qty. 2) will be additionally required.

Work procedure

- Raise luggage compartment floor covering and secure.

CAUTION: Observe safety precautions when disconnecting the battery -->

- 27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL
- 27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL for ELECTRICAL EQUIPMENT, CABRIOLET

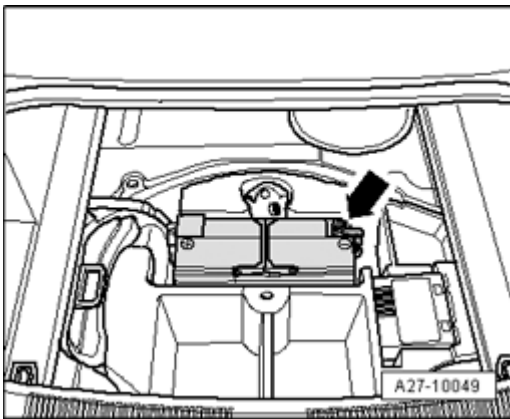


Fig. 14: Disconnecting Battery Ground (GND) Strap
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- With ignition switched off, disconnect Battery Ground (GND) strap - **arrow** -.
- Discharge refrigerant circuit Refrigerant R134a - Servicing.
- Extract hydraulic oil for power-steering from reservoir using old oil collecting and extracting device V.A.G 1782.

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.

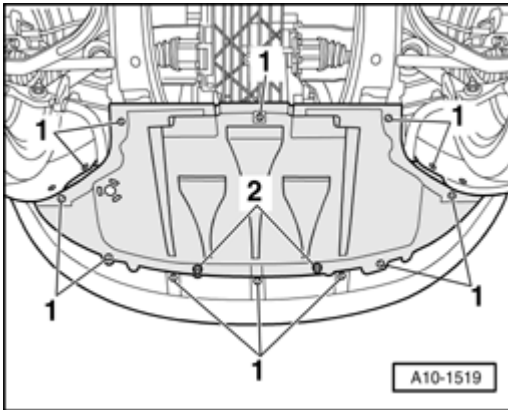


Fig. 15: Removing Quick-Release Fasteners, Screws And Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove quick-release fasteners - 1 - , remove screws - 2 - and remove noise insulation.

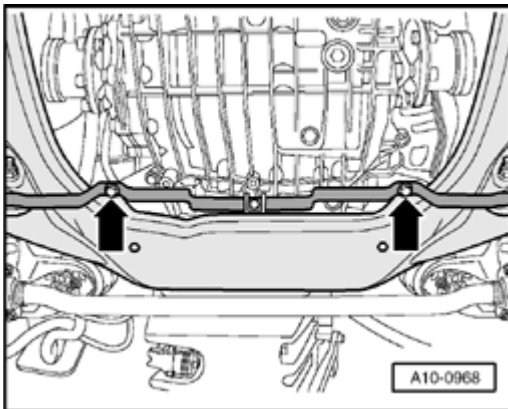


Fig. 16: Removing Bracket For Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bracket for noise insulation - **arrows** -.
- Remove left and right front wheel housing liners -->
 - **66 EXTERIOR EQUIPMENT**
 - **66 - EXTERIOR EQUIPMENT** for BODY EXTERIOR - CABRIOLET
- Remove front bumper cover -->
 - **63 BUMPER**
 - **63 - BUMPERS** for BODY EXTERIOR - CABRIOLET

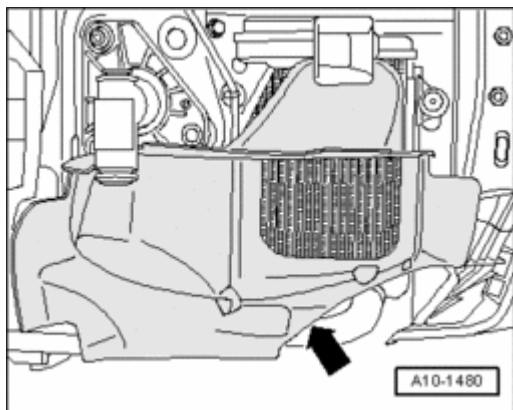


Fig. 17: Removing Left Air Guide In Front Of Auxiliary Cooler
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove left air guide - **arrow** - in front of auxiliary cooler.

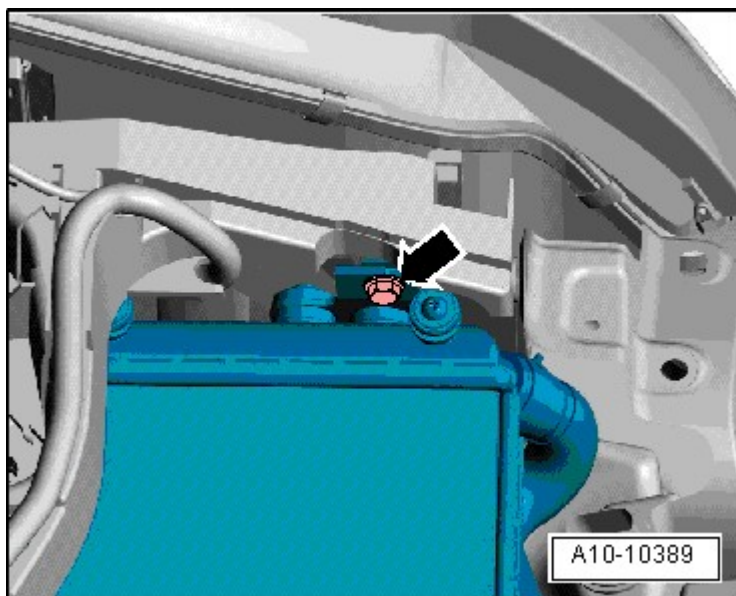


Fig. 18: Removing Bolt On Auxiliary Cooler Upper Bracket, At Left Of Lock Carrier
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - **arrow** - on auxiliary cooler upper bracket, at left of lock carrier.

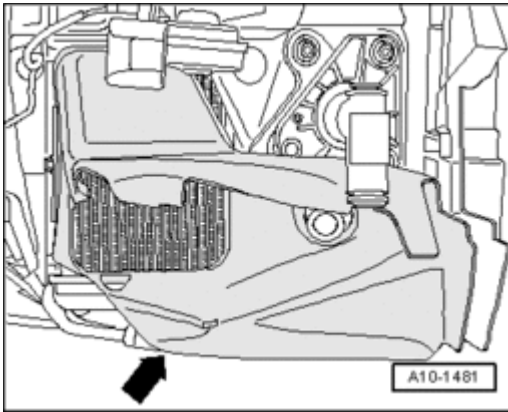


Fig. 19: Removing Right Air Guide In Front Of Auxiliary Cooler
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove right air guide - **arrow** - in front of auxiliary cooler.
- Place old oil collecting and extracting device V.A.G 1782 under engine.
- Drain engine oil.

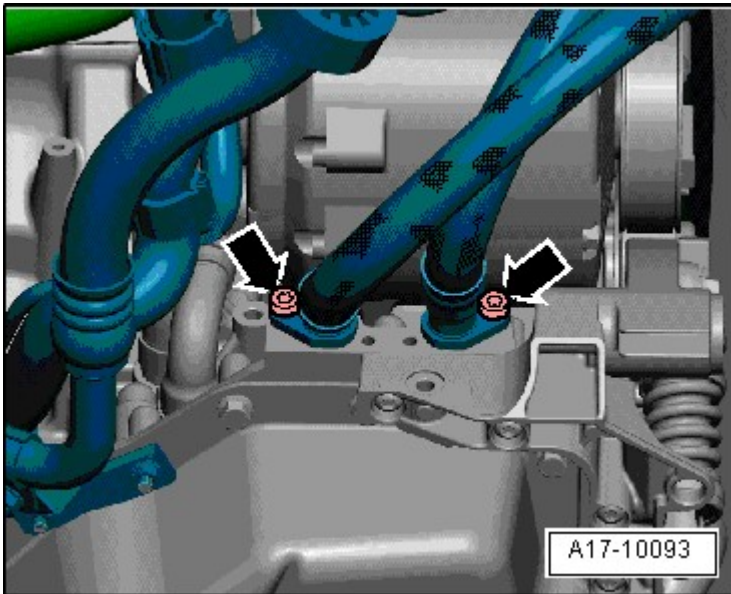


Fig. 20: Removing Bolts On Oil Cooler Lines At Upper Part Of Oil Pan
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - on oil cooler lines at upper part of oil pan.
- Remove oil lines from upper part of oil pan.

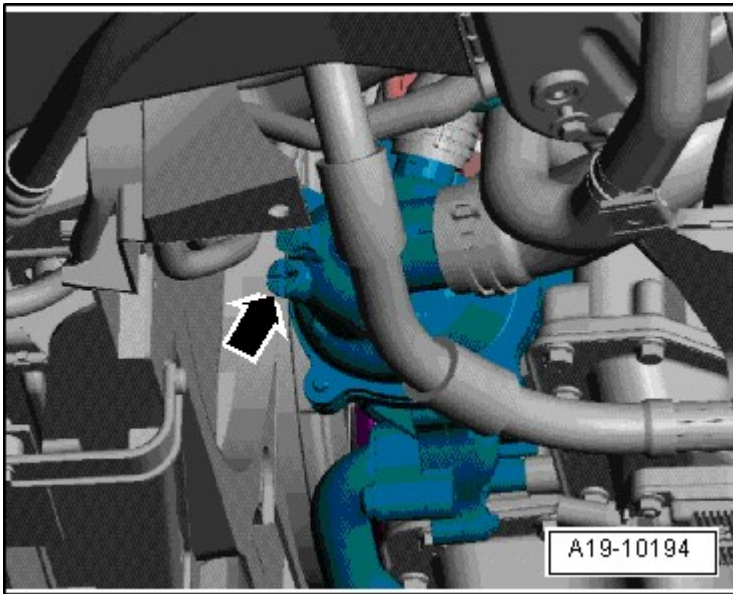


Fig. 21: Removing Drain Plug On Coolant Thermostat Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

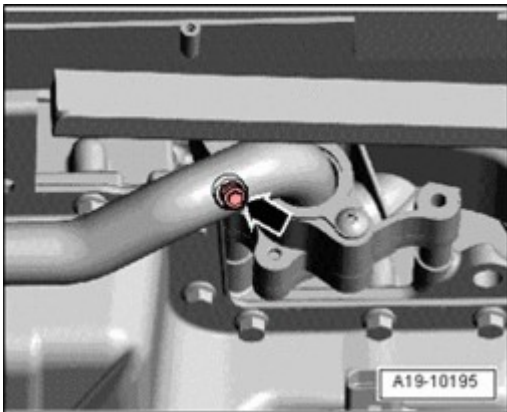


Fig. 22: Removing Drain Plug On Front Coolant Pipe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- In addition, remove drain plug - **arrow** - on front coolant pipe and allow rest of coolant to drain.

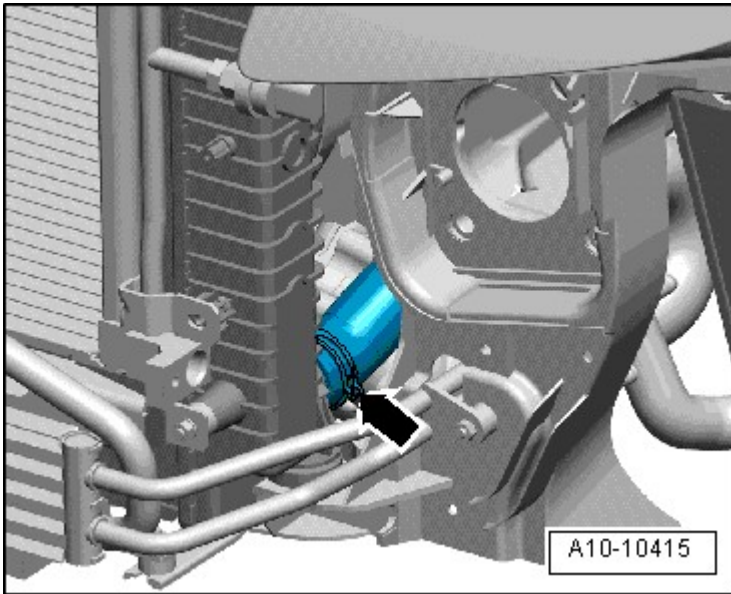


Fig. 23: Removing Coolant Hose Downward From Cooler
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen hose clamps - **arrow** - and remove coolant hose downward from cooler.
- Place old oil collecting and extracting device V.A.G 1782 under engine.

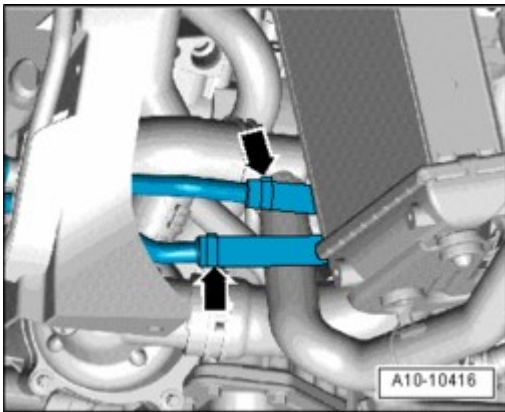


Fig. 24: Disconnecting Hydraulic Lines To Cooling Coil At Left Rear Of Bumper
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect hydraulic lines to cooling coil at left rear of bumper - **arrows** -.

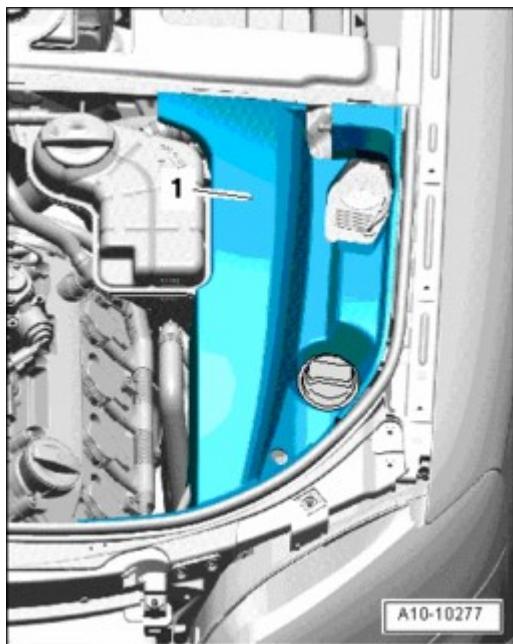


Fig. 25: Removing Cover In Engine Compartment (Left Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove cover - 1 - in engine compartment (left side).

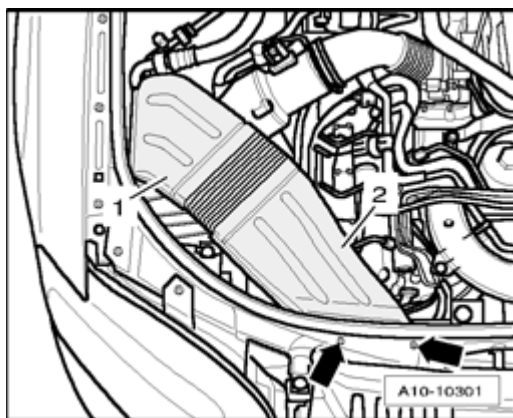


Fig. 26: Removing Bolts & Air Ducts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

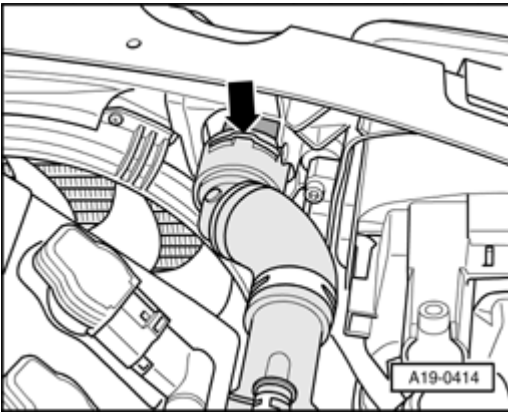


Fig. 27: Disconnecting Top Coolant Hose From Radiator
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect top coolant hose - **arrow** - from radiator.

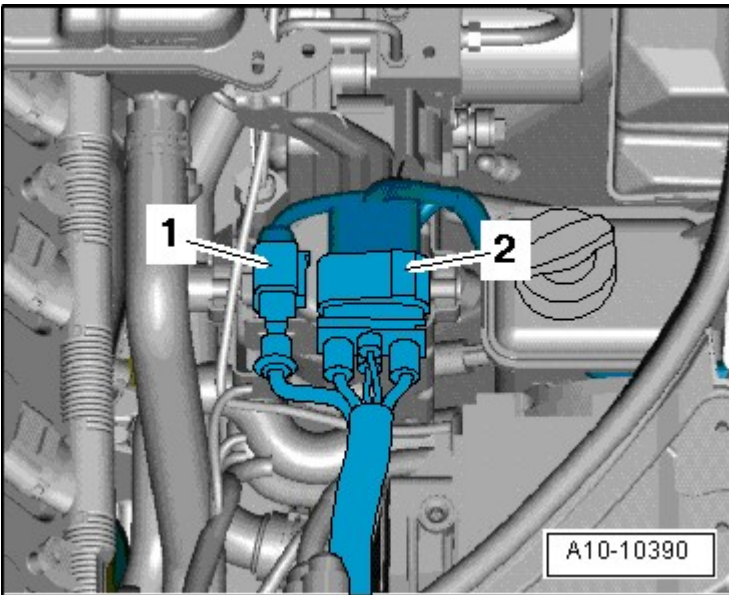


Fig. 28: Removing Electrical Harness Connectors From Bracket
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove electrical harness connectors - **1** - and - **2** - from bracket and disconnect them.
- Free up electrical wires to lock carrier.

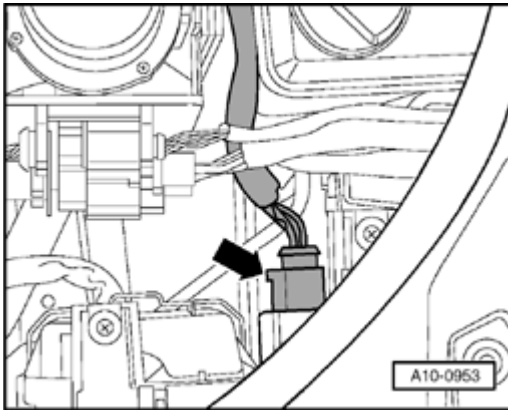


Fig. 29: Disconnecting Electrical Harness Connector For Headlights At Both Sides Of Vehicle
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - **arrow** - for headlights at both sides of vehicle.
- Free up electrical wiring.

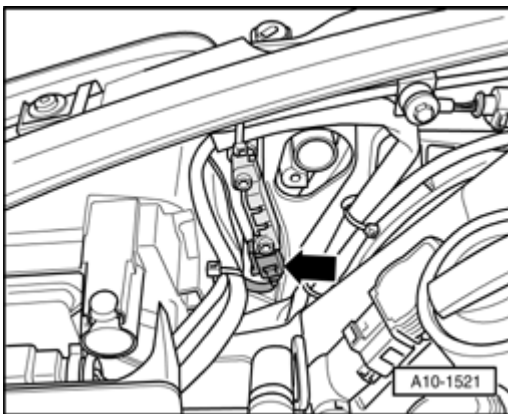


Fig. 30: Disconnecting Electrical Harness Connector For Left/Right Airbag Sensors On Lock Carrier
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - **arrow** - for left and right airbag sensors on lock carrier.
- Free up electrical wiring.
- Remove hood cable at lock carrier -->
 - **55 HOOD, LIDS**
 - **55 - HOOD, LIDS** for BODY EXTERIOR - CABRIOLET

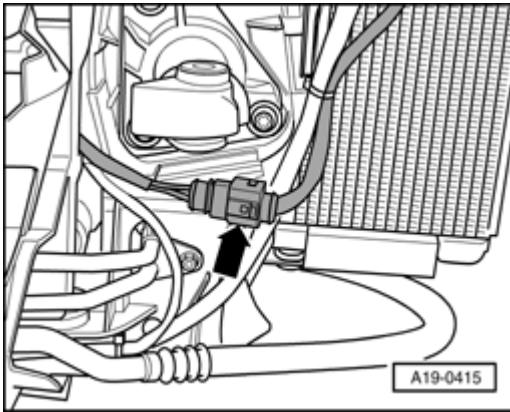


Fig. 31: Disconnecting Electrical Harness Connector For Right Fan
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect right radiator fan electrical connector - **arrow** -.

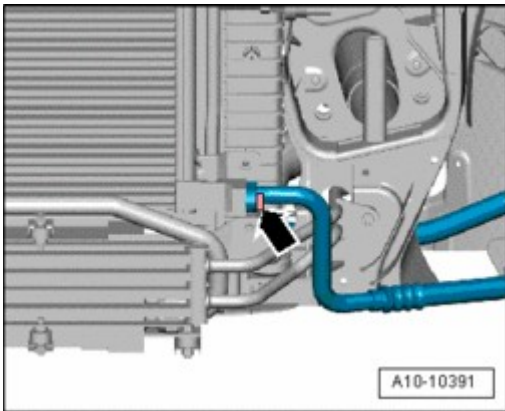


Fig. 32: Removing Bolt And Disconnecting Refrigerant Line To A/C Compressor
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

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

- Remove bolt - **arrow** - and disconnect refrigerant line to A/C compressor.

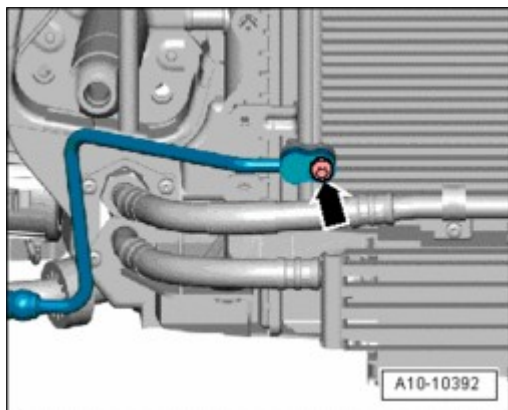


Fig. 33: Removing Bolt And Disconnecting Refrigerant Line To A/C Evaporator
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - **arrow** - and disconnect refrigerant line to A/C evaporator.

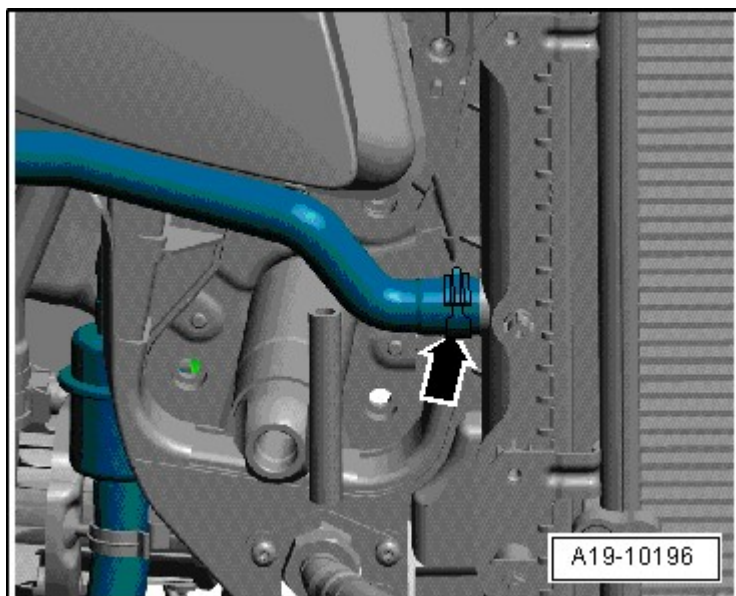


Fig. 34: Removing Right Coolant Hose
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove right coolant hose - **arrow** -.

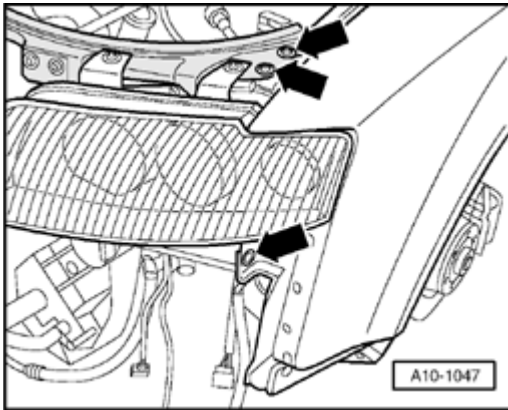


Fig. 35: Removing Bolts At Left/Right Side Of Bumper
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - at left and right side of bumper.
- Pull off hood seal from lock carrier and fender edges.

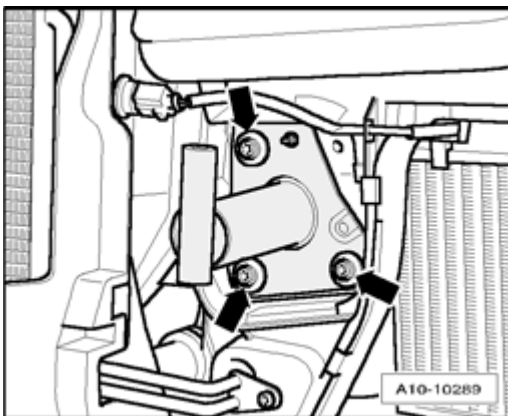


Fig. 36: Removing Bolts At Impact Absorbers At Left/Right
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts at impact absorbers - **arrows** - at left and right.

NOTE:

- **A second technician is required to remove the lock carrier.**

- Remove lock carrier and set aside so it cannot topple.



Fig. 37: Pulling Rear Engine Cover Off

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull rear engine cover off - **arrows** -.

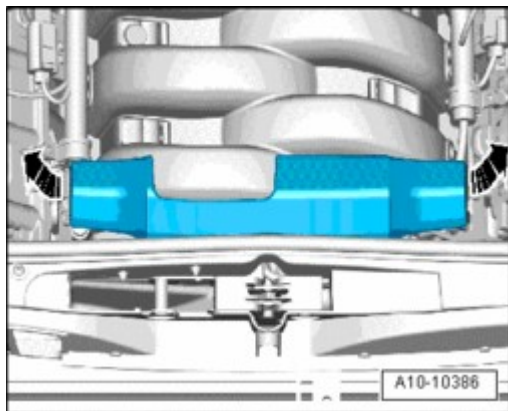


Fig. 38: Pulling Front Engine Cover Off

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull front engine cover off - **arrows** -.

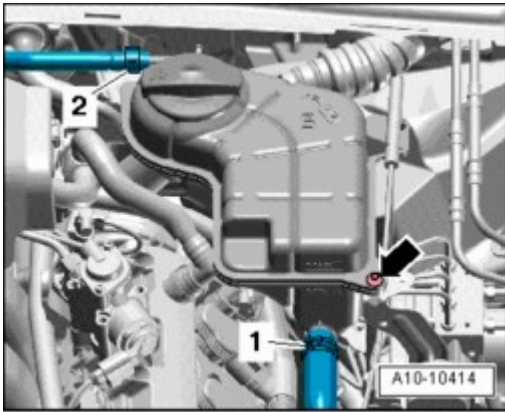


Fig. 39: Removing Coolant Hoses & Coolant Expansion Tank
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

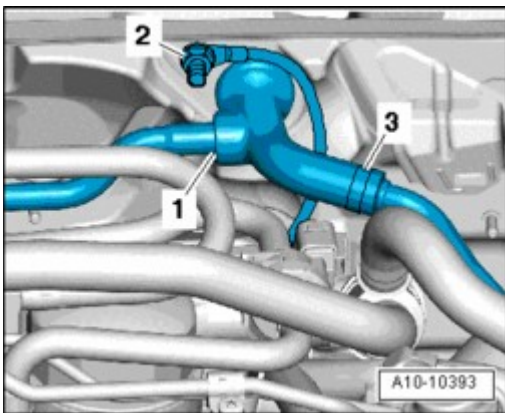


Fig. 40: Removing Ground (GND) Connection & Vacuum Lines To Brake Booster From Distribution Piece
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove Ground (GND) connection - **2** -.
- Remove vacuum lines - **1** - and - **3** - to brake booster from distribution piece.

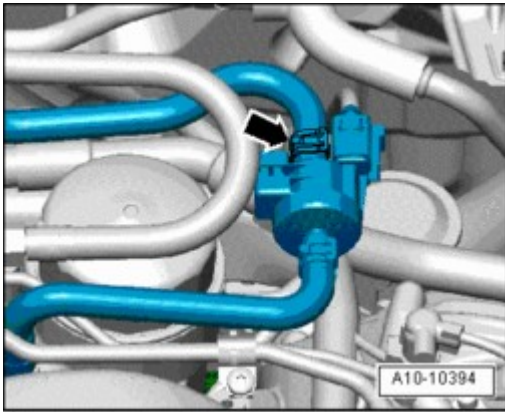


Fig. 41: Removing Hose At Evaporative Emission (EVAP) Canister Purge Regulator Valve N80
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove hose at Evaporative Emission (EVAP) Canister Purge Regulator Valve N80 - **arrow** -.
- Free up hose.

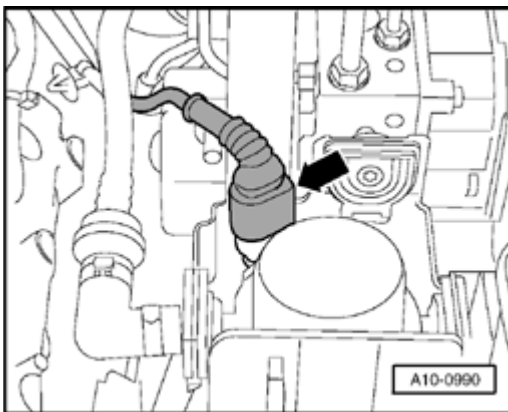


Fig. 42: Disconnecting Electrical Harness Connector On Brake System Vacuum Pump V192
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - **arrow** - on Brake System Vacuum Pump V192.

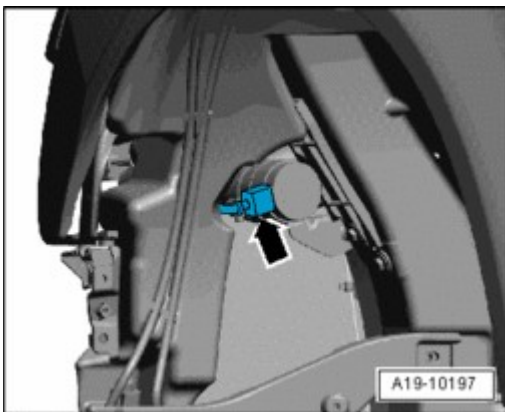


Fig. 43: Disconnecting Electrical Harness Connector For After-Run Coolant Pump V51 (Behind

Auxiliary Cooler At Left)

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - **arrow** - for After-Run Coolant Pump V51 (behind auxiliary cooler at left) and free up electrical wire.

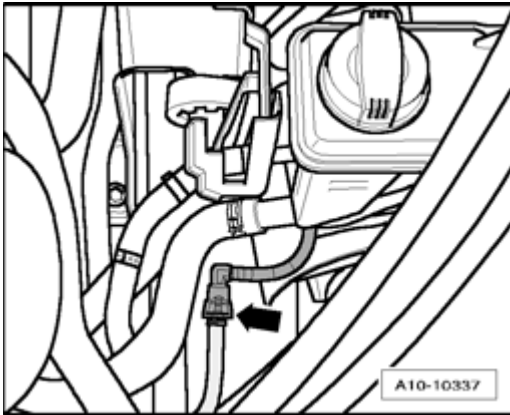


Fig. 44: Disconnecting Vacuum Hose

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect vacuum hose - **arrow** -.

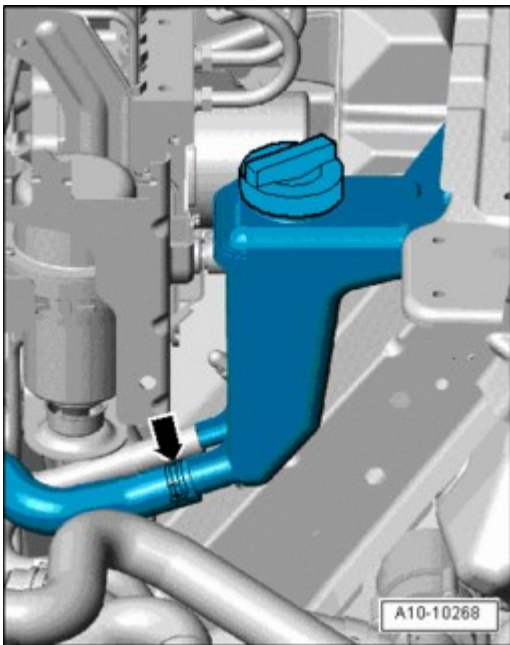


Fig. 45: Removing Hose At Power Steering Fluid Reservoir

Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

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

- Remove hose - **arrow** - at power steering fluid reservoir.

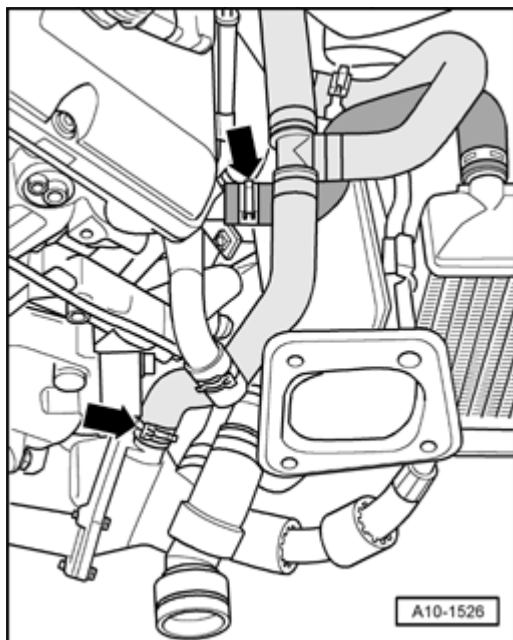


Fig. 46: Disconnecting Coolant Hoses

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect coolant hoses at positions indicated by - **arrows** -.

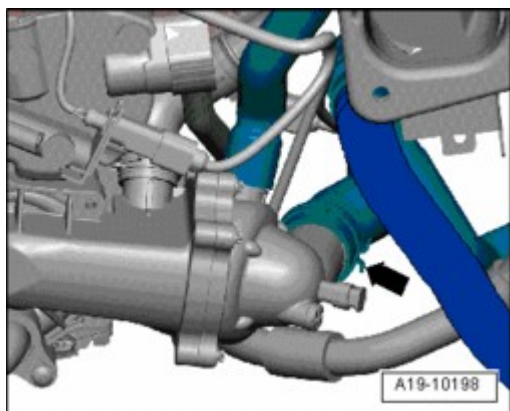


Fig. 47: Removing Coolant Hose From Thermostat Housing

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove coolant hose from thermostat housing - **arrow** -.

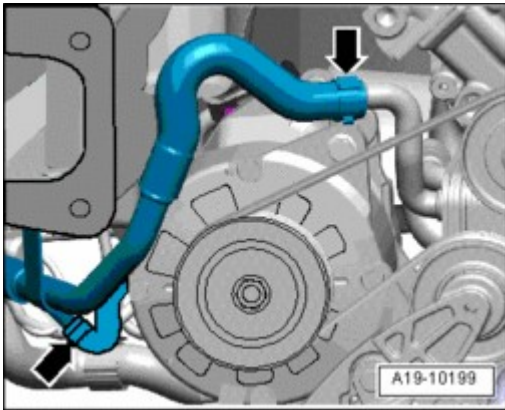


Fig. 48: Removing Coolant Hoses To Oil Cooler At Engine And To Generator
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove coolant hoses to oil cooler at engine and to generator - **arrows** -.

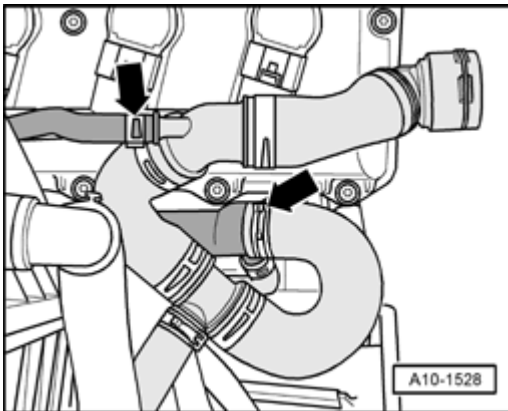


Fig. 49: Disconnecting Coolant Hoses
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect coolant hoses at positions indicated by - **arrows** -.

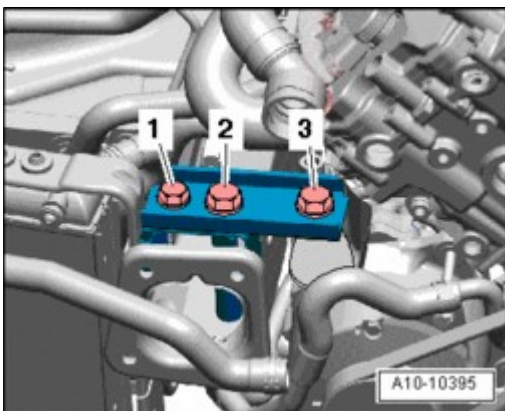


Fig. 50: Removing Bolts & Bracket For Front Torque Support
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - 1 to 3 -.
- Remove bracket for front torque support.

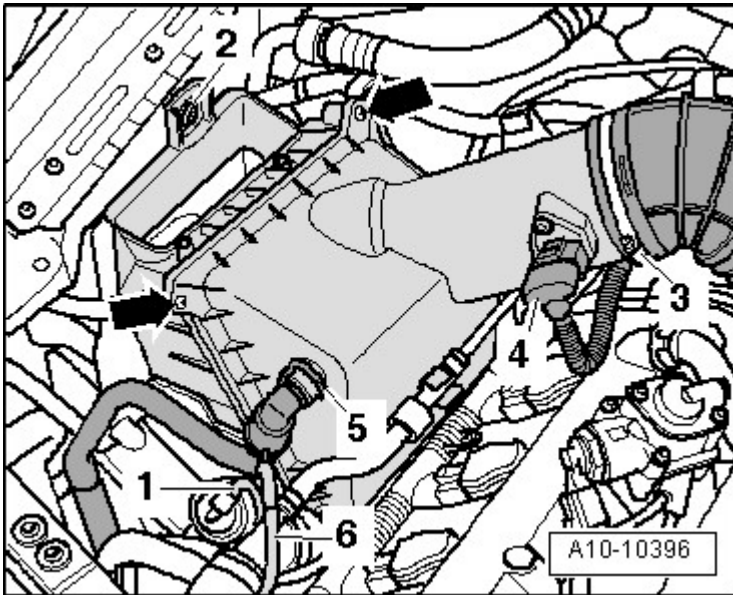


Fig. 51: Identifying Mass Air Flow (MAF) Sensor G70 Electrical Harness Connector, Secondary Air Injection (AIR) Pump Hose, Vacuum Lines & Air Guide Hose
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - 4 - at Mass Air Flow (MAF) Sensor G70.
- Disconnect hose - 5 - to Secondary Air Injection (AIR) pump.
- Pull off vacuum lines - 1 - and - 6 -.
- Disconnect air guide hose - 3 - at Mass Air Flow (MAF) sensor.
- Free up electrical wiring harness at air filter housing.
- Remove clip - 2 - and remove air filter housing with Mass Air Flow (MAF) sensor.

NOTE:

- Ignore - arrows -.

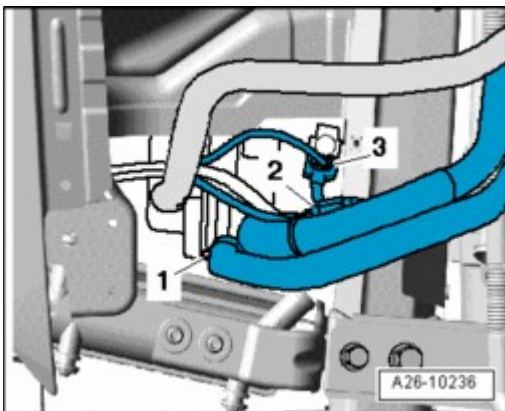


Fig. 52: Removing Hose At Secondary Air Injection Pump By Pressing Release Buttons & Disconnecting Electrical Harness Connectors

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove hose - 1 - at secondary air injection pump by pressing release buttons.
- Disconnect electrical harness connectors - 2 - and - 3 -.
- Free up electrical wiring.
- Disconnect vacuum hose - 2 - from air guide hose.
- Remove hose clamps - 1 - and - 3 - and lay air guide hose aside.

CAUTION: Hose connectors must not be opened.

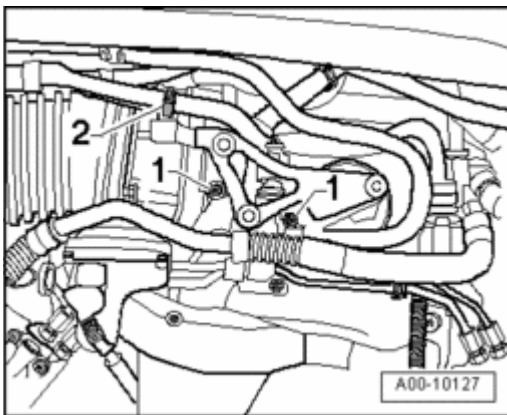


Fig. 53: Removing Bolts & Disengaging Retaining Clip & Removing Rear Engine Cover Bracket

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - 1 -.
- Disengage retaining clip - 2 - and remove rear engine cover bracket.

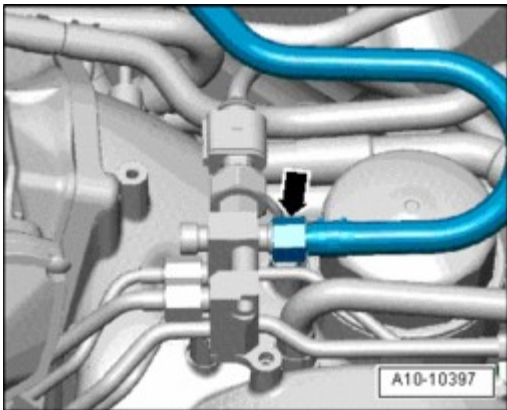


Fig. 54: Disconnect fuel supply line - arrow - at fuel rail

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

- Disconnect fuel supply line - **arrow** - at fuel rail.

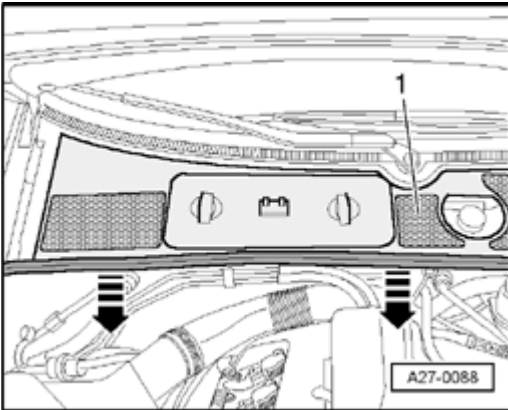


Fig. 55: Identifying Plenum Chamber Cover & Rubber Seal
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove rubber seal and plenum chamber cover - **1** - forward - **arrows** -.

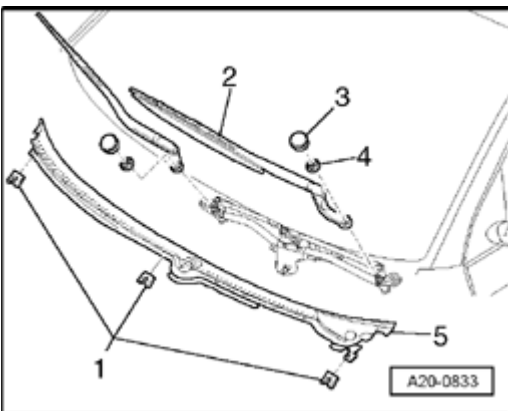


Fig. 56: Removing Securing Clips And Cowl
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pry off cover caps - **3** - from wiper arms with a screwdriver.
- Loosen nuts - **4** - several turns.
- Loosen wiper arms - **2** - one after another by tilting wiper axles slightly.
- Remove nuts completely and remove wiper arms.

NOTE:

- If wiper arm cannot be removed in this way, use a standard puller.

- Disconnect securing clips - **1** - and remove cowl grille - **5** -.

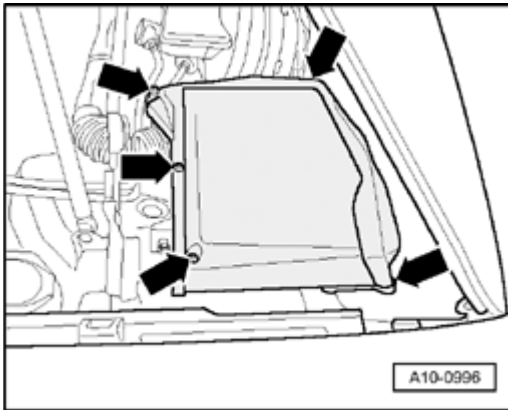


Fig. 57: Removing Screws And Cover From E-Box In Plenum Chamber
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

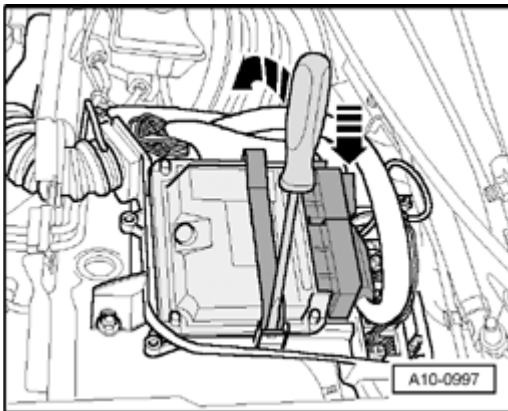


Fig. 58: Using Screwdriver To Remove Retainer Bar And Engine Control Module (ECM) J623
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

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

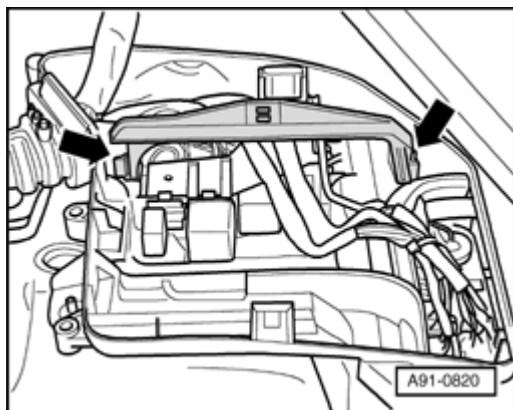


Fig. 59: Releasing Retaining Hooks Toward Outside And Removing Retaining Bracket
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

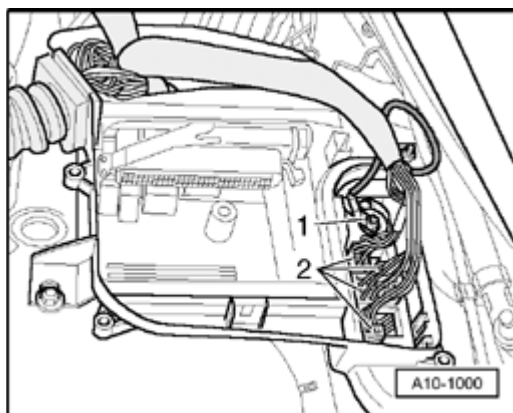


Fig. 60: Disconnecting All Electrical Harness Connectors On Connector Station & Electrical Wire Connection
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

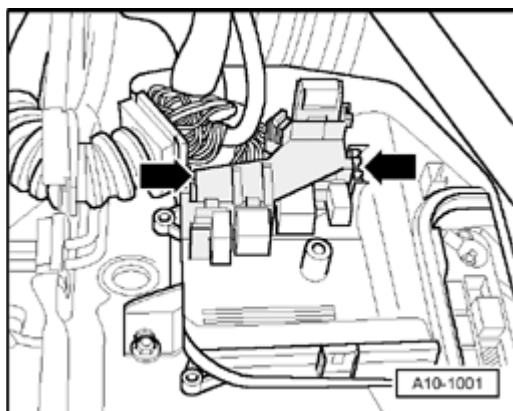


Fig. 61: Disengaging Locking Mechanisms And Removing Secondary Relay Carrier In E-Box Toward Top

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disengage locking mechanisms - **arrows** - and remove secondary relay carrier in E-Box toward top.
- Disengage engine wiring harness at E-Box and bulkhead.

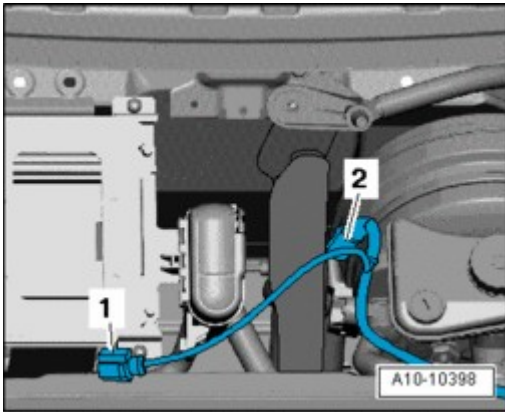


Fig. 62: Disconnecting Electrical Connectors

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connectors - **1** - and - **2** -.
- Free up wiring harness.
- Set electrical wiring harness on engine and secure Engine Control Module (ECM) against falling down.

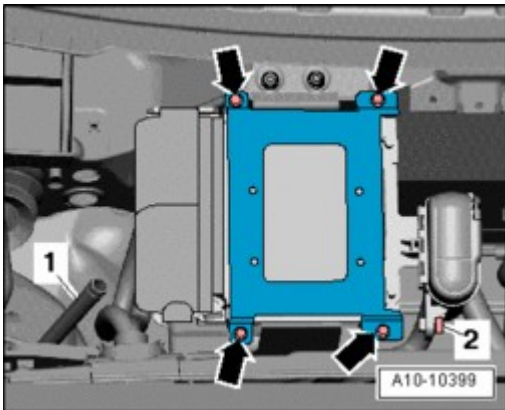


Fig. 63: Removing Bolts, Ground (GND) Pins & Ground (GND) Line Underneath

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Remove engine control module (ECM) 2 bracket.
- Place ECM 2 on engine and secure it against falling down.
- Remove Ground (GND) pins - **1** - and remove Ground (GND) line underneath.
- Remove bolt - **2** - and disengage positive terminal pick-off at mount.

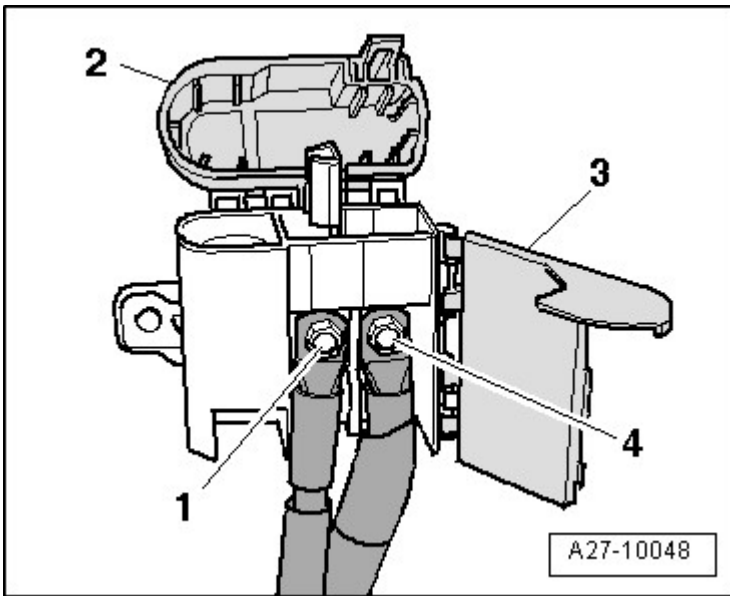


Fig. 64: Releasing Retaining Clip And Open Cover Over Positive Terminal Pick-Off, Cover Over Electrical Lines & Removing Nut On Positive Line
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Release retaining clip and open cover - **2** - over positive terminal pick-off.
- Release cover - **3** - over electrical lines.
- Remove nut - **1** - on positive line.
- Pull plus wire through bulkhead toward front.
- Free up the wiring harness.

NOTE:

- Ignore - **4** -.

- Remove heat insulation sleeve over coolant hoses to heat exchanger.

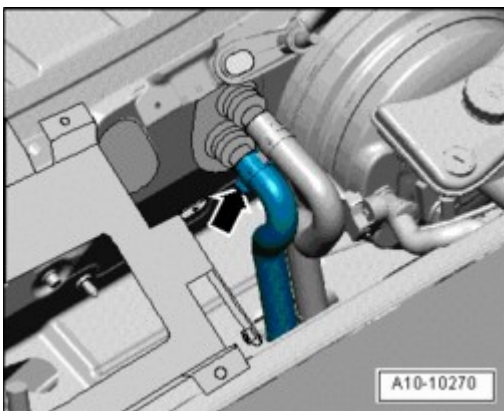


Fig. 65: Removing Lower Coolant Hose At Heat Exchanger
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove lower coolant hose - **arrow** - at heat exchanger.
- Slide coolant hose back down slightly through rubber sleeve.

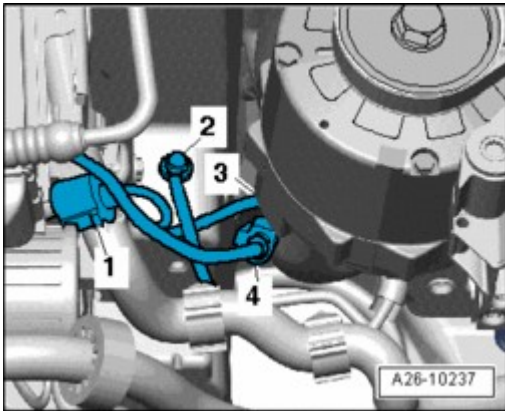


Fig. 66: Identifying Secondary Air Injection (AIR) Pump Motor V101 Electrical Harness Connector, Long Member Ground (GND) Wire & Right Engine Bracket Electrical Connectors
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - **1** - at Secondary Air Injection (AIR) Pump Motor V101.
- Remove Ground (GND) wire - **2** - on long member.
- Disconnect - **3** - and - **4** - at right engine bracket and at Generator (D+).
- Free up wiring harness upward.
- Place old oil collecting and extracting device V.A.G 1782 under engine.

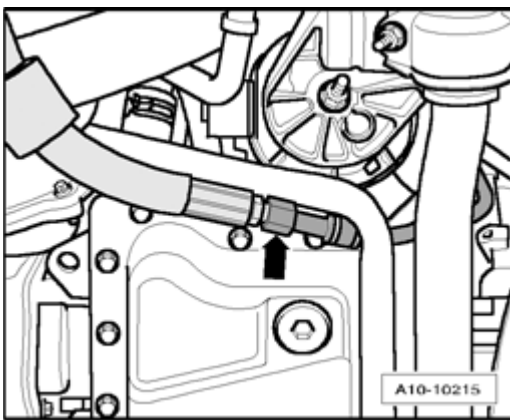


Fig. 67: Disconnecting Hydraulic Pressure Line For Power-Steering At Left Next To Oil Pan
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect hydraulic pressure line - **arrow** - for power-steering at left next to oil pan.

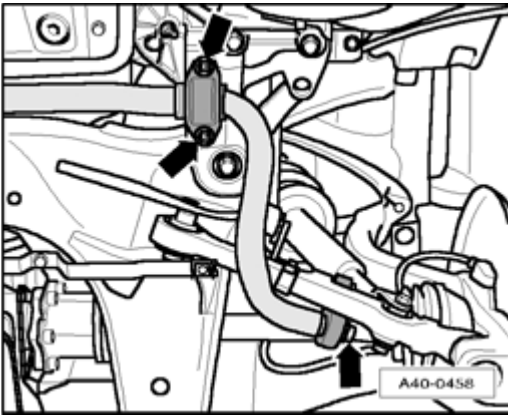


Fig. 68: Removing Bolts And Nuts Uniformly At Left/Right
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

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

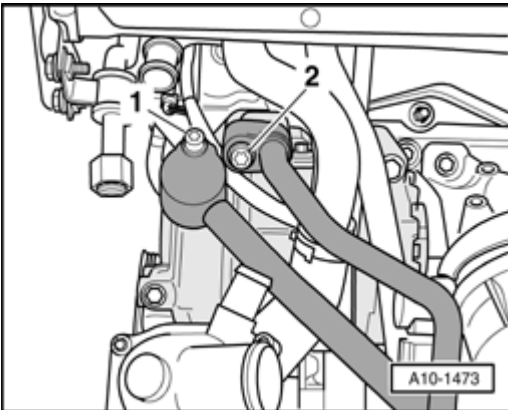


Fig. 69: Removing Bolts & Right Refrigerant Line From A/C Compressor
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **1** - and - **2** -.
- Remove right refrigerant line from A/C compressor.

NOTE:

- The left refrigerant line will be removed at a later point in time.

- Seal open connections on A/C compressor using clean plugs.

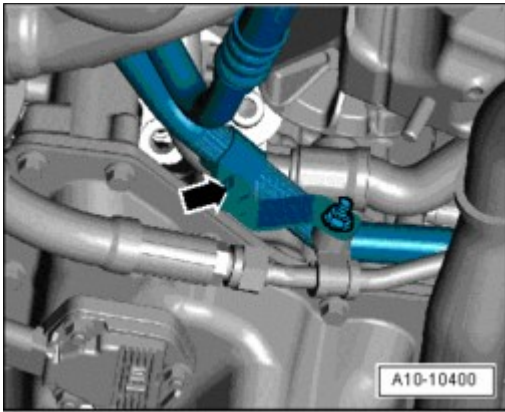


Fig. 70: Removing Bracket For Refrigerant Lines At Left Front On Oil Pan
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bracket for refrigerant lines at left front on oil pan - **arrow** -.

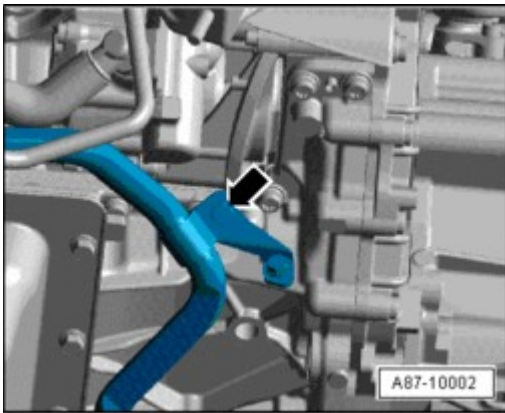


Fig. 71: Removing Bracket For Refrigerant Lines At Left Rear On Oil Pan
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bracket for refrigerant lines at left rear on oil pan - **arrow** -.

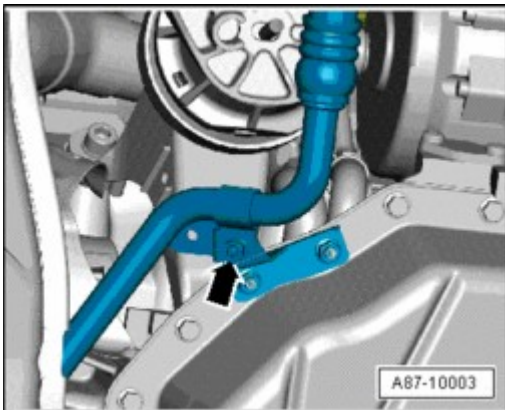


Fig. 72: Removing Bracket For Refrigerant Lines At Right On Oil Pan
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bracket for refrigerant lines at right on oil pan - **arrow** -.

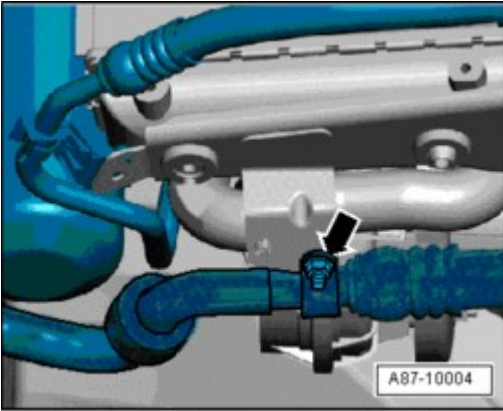


Fig. 73: Removing Coolant Line Retaining Clamp At Right Of Auxiliary Cooler
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove coolant line retaining clamp at right of auxiliary cooler - **arrow** -.



Fig. 74: Removing Bolt And Disconnecting Refrigerant Line To A/C Compressor
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - **arrow** - and disconnect refrigerant line to A/C compressor.
- Have a second technician press foot brake.

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

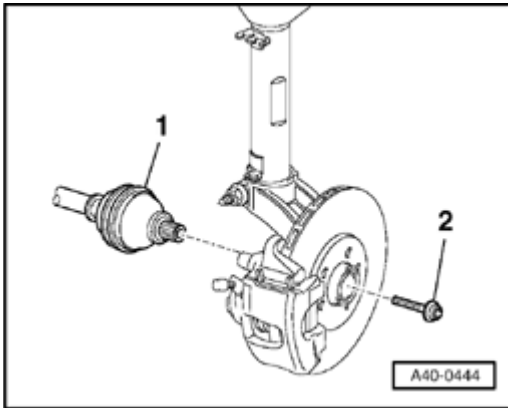


Fig. 75: Identifying Collar Bolt For Right Drive Axle
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

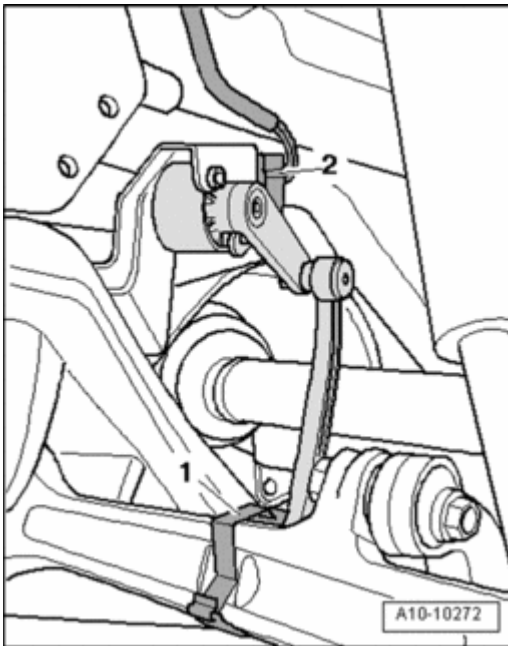


Fig. 76: Disconnecting Electrical Harness Connector At Left Front Level Control System Sensor G78
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - 2 - at Left Front Level Control System Sensor G78.
- Unclip securing clip - 1 - at Left Front Level Control System Sensor G78 actuating rod at bottom of control arm.

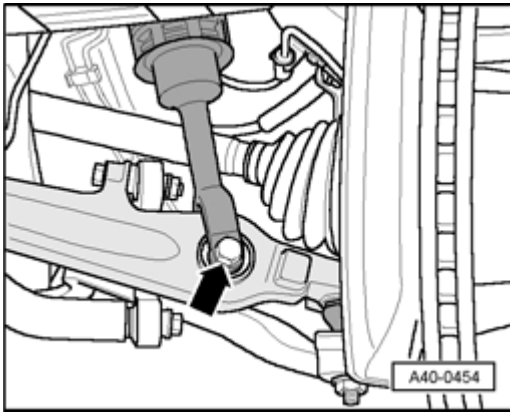


Fig. 77: Removing Suspension Strut From Link
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

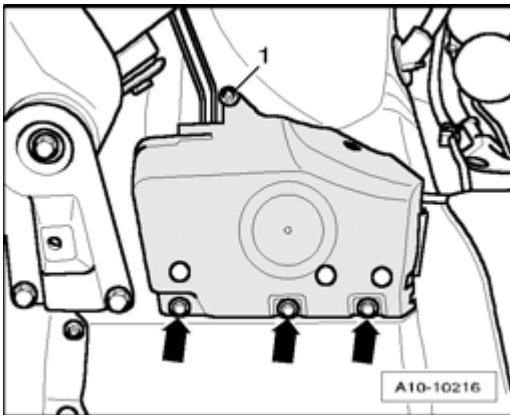


Fig. 78: Removing Expanding Clips, Nut And Cover Behind Wheel Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove expanding clips - **arrows** -.
- Remove nut - **1** - and remove cover behind wheel housing.

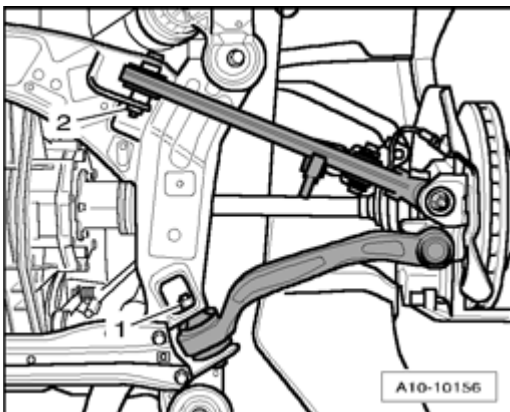


Fig. 79: Removing Guide Link And Link On Subframe

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove guide link - 1 - and link - 2 - on subframe.

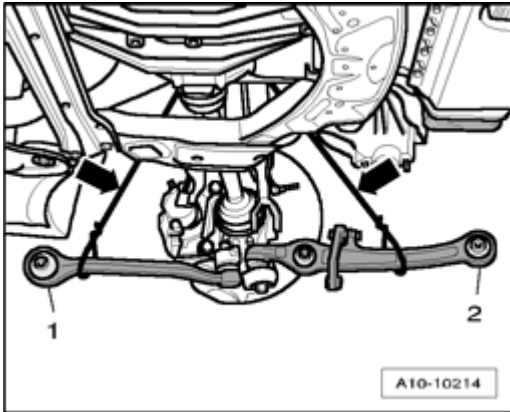


Fig. 80: Pivoting Guide Link And Link Outward

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

- Repeat work procedure on opposite side of vehicle.

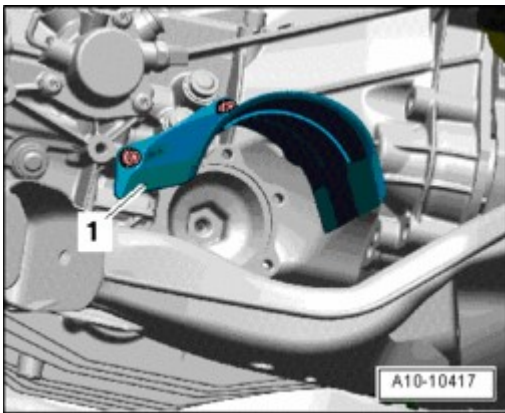


Fig. 81: Removing Heat Shield For Left Drive Axle

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield - 1 - for left drive axle.
- Remove drive axle from transmission flanged shaft.
- Swing left wheel bearing housing outward and remove drive axle.
- Repeat work procedure on opposite side of vehicle.

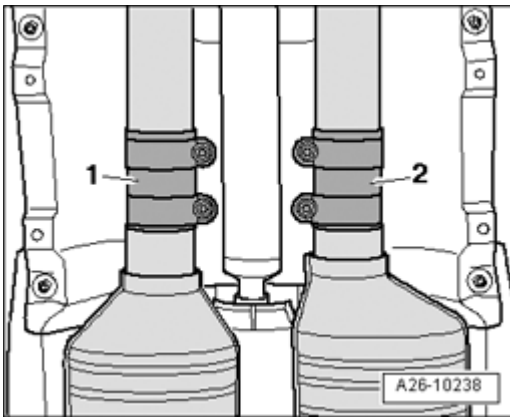


Fig. 82: Disconnecting Exhaust System At Clamping Sleeves
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- Flex joint in front exhaust pipe must not be bent more than 10 ° , otherwise it may be damaged.

- Disconnect exhaust system at clamping sleeves - 1 - and - 2 -.

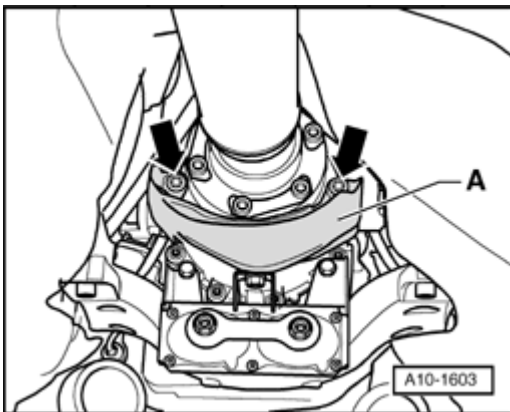


Fig. 83: Removing Heat Shield For Drive Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield - A - for drive shaft - **arrows** -.
- Remove bolts at transmission/drive shaft flange.
- Push drive shaft together with rear final drive. The constant velocity (CV) joints can move axially.
- Tie up drive shaft to body.

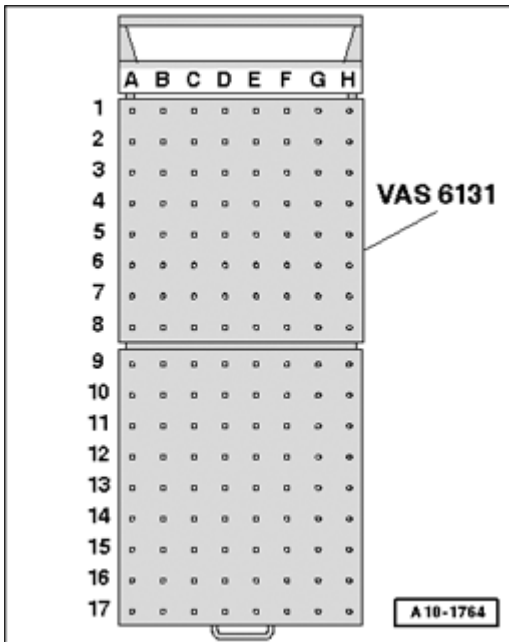


Fig. 84: Identifying Scissor Lift Platform VAS 6131
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Prepare scissor lift platform:

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

Platform coordinates	Parts from Support Set VAS 6131/10			
B4	/10-1	/10-4	/10-5	/10-12
G3	/10-1	/10-4	/10-5	/10-6
B10	/10-1	/10-2	/10-5	/10-8
G10	/10-1	/10-2	/10-5	/10-8
C14	/10-1	/10-3	/10-5	/10-7
E14	/10-1	/10-3	/10-5	/10-7

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

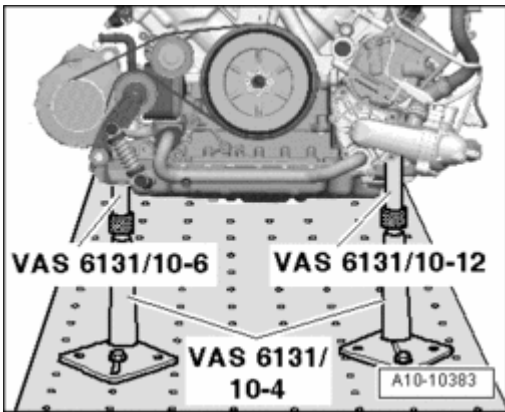


Fig. 85: Positioning Support Elements From VAS 6131/10 At Front On Engine
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

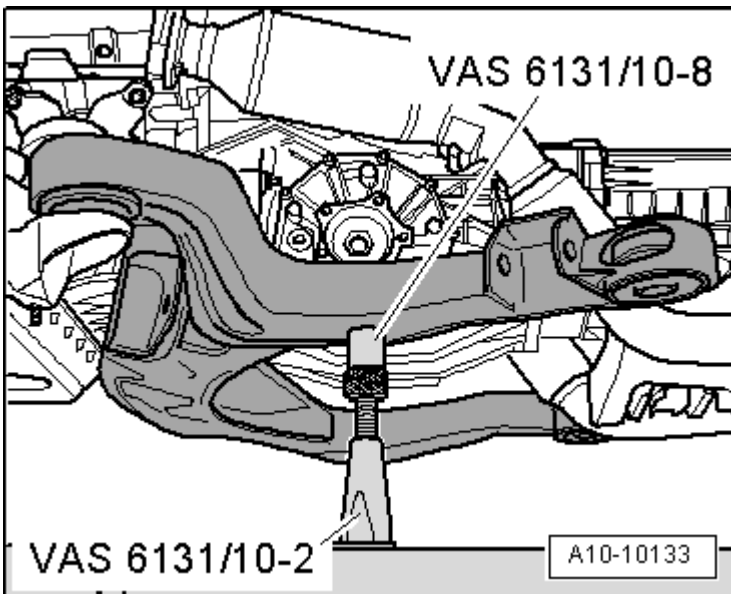


Fig. 86: Positioning Support Elements From VAS 6131/10 At Left/Right On Subframe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

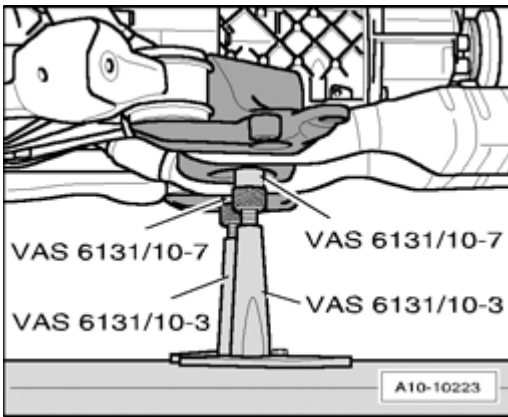


Fig. 87: Positioning Support Elements From VAS 6131/10 At Left/Right On Tunnel Cross Member
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

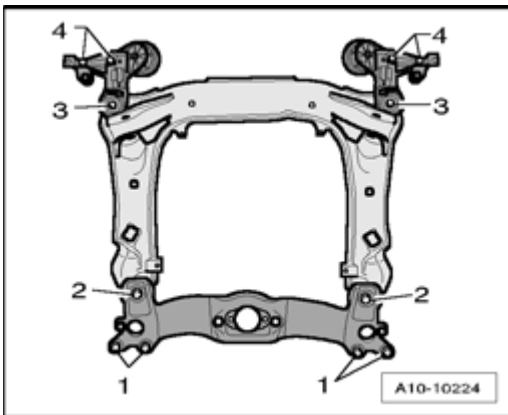


Fig. 88: Removing/Installing Bolts In Diagonal Sequence And In Stages
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

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

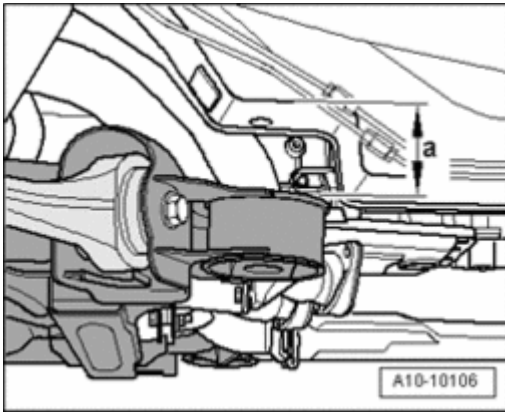


Fig. 89: Lowering/Lifting Engine/Transmission Assembly Using Scissor Lift Platform VAS 6131 Only Approx. By Dimension

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- First lower engine/transmission assembly using scissor lift platform VAS 6131 only approx. by dimension - **a** -.
- Dimension - **a** - = max. 100 mm.

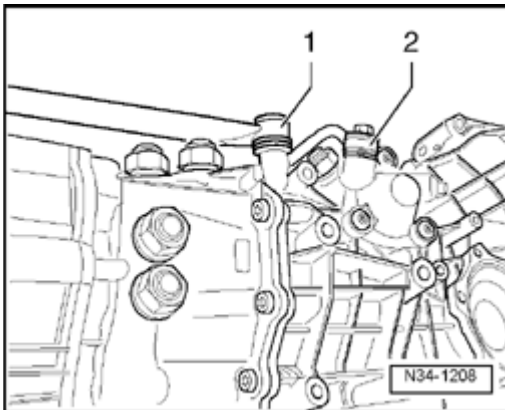


Fig. 90: Identifying Push Rod And Connecting Rod For Selector Rod

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

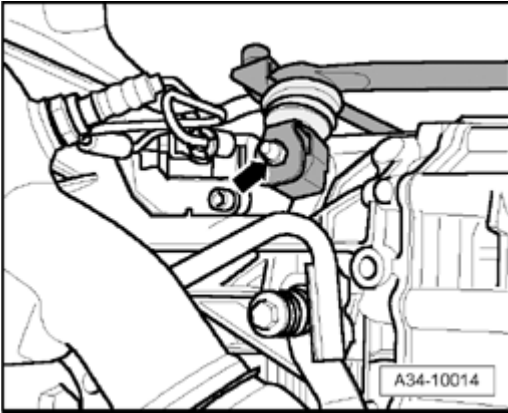


Fig. 91: Removing/Installing Nut And Lever From/To Selector Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

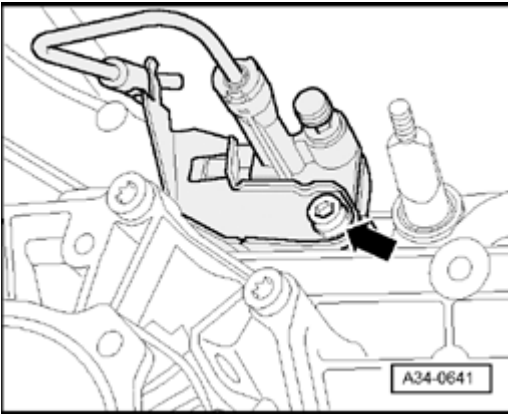


Fig. 92: Slave Cylinder Bracket And Fastener
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove clutch slave cylinder - **arrow** - , do not disconnect lines.
- Tie up clutch slave cylinder together with shift rods.

CAUTION: Do not operate the clutch pedal anymore after slave cylinder has been removed. At a pedal pressure of approx. 300 N, the clutch slave cylinder is destroyed.

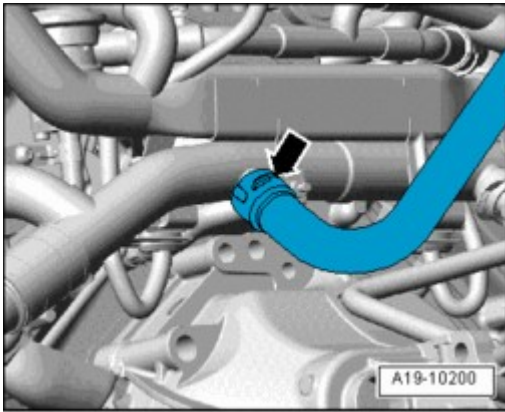


Fig. 93: Removing/Installing Coolant Hose To Heater Core On Rear Coolant Pipe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove coolant hose - **arrow** - to heater core on rear coolant pipe.
- Lower engine/transmission subassembly downward.
- Push scissor lift platform VAS 6131 with engine/transmission subassembly under vehicle.

Engine and transmission, separating

Special tools, testers and auxiliary items required

- Support Set for Audi VAS 6131/10 and VAS 6131/11 with additional support elements VAS 6131/10-12

Work procedure

- Engine/transmission assembly removed and placed on Scissor Lift Table VAS 6131.

NOTE:

- **All heat insulation sleeves and heat shields removed during engine removal must be reinstalled at the same locations during installation.**
- **All cable ties opened or cut during engine removal must be reinstalled at the same locations during installation.**

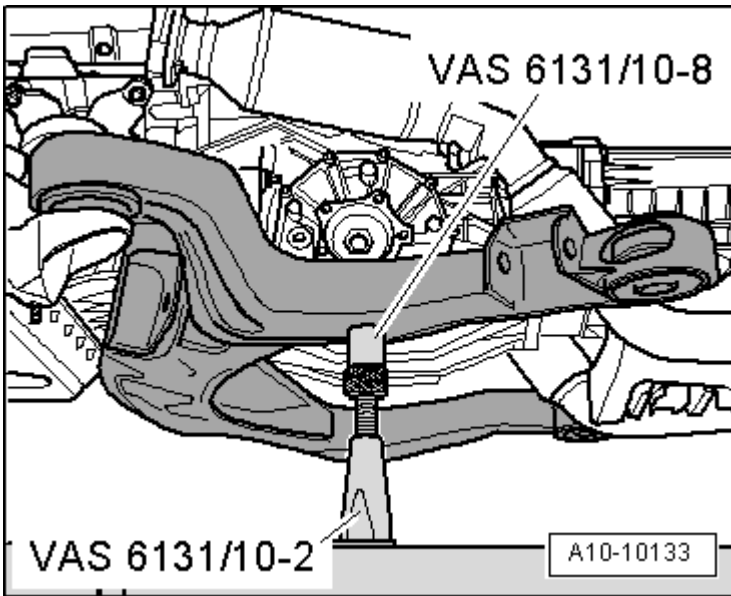


Fig. 94: Removing Support Pins From Spindles
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Twist spindles of support elements at left and right at subframe completely downward.
- Remove support pins from spindles.
- Remove subframe to side.

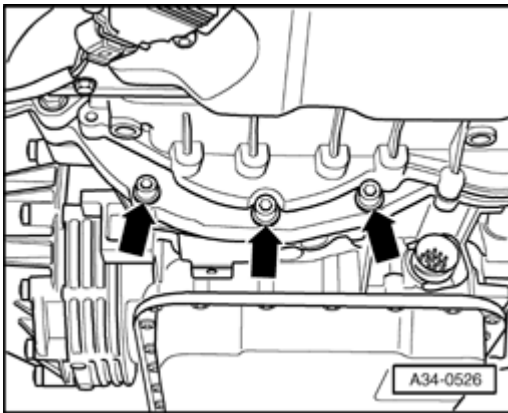


Fig. 95: Removing Bottom Engine/Transmission Connecting Bolts
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

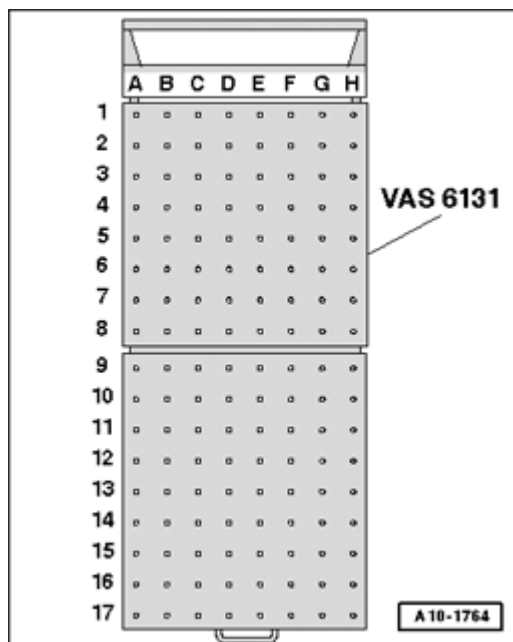


Fig. 96: Identifying Scissor Lift Platform VAS 6131
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Platform coordinates	Parts from Support Set VAS 6131/10 and VAS 6131/11			
B4 ¹⁾	/10-1	/10-4	/10-5	/10-12
G3 ¹⁾	/10-1	/10-4	/10-5	/10-6
C7	/10-1	/10-4	/10-5	/10-12
G7	/10-1	/10-4	/10-5	/10-12
F10	/10-1	/10-4	/10-5	/11-3
D12	/10-1	/10-2	/10-5	/11-2
C14 ¹⁾	/10-1	/10-3	/10-5	/10-7
E14 ¹⁾	/10-1	/10-3	/10-5	/10-7
¹⁾ The support elements remain unchanged.				

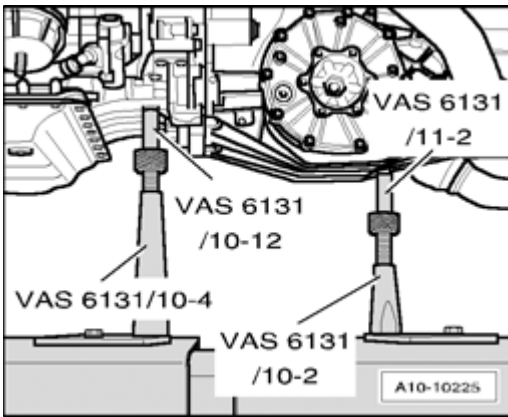


Fig. 97: Positioning Support Elements From VAS 6131/10 And VAS 6131/11 At Left On Engine/Transmission

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position support elements from VAS 6131/10 and VAS 6131/11 at left on engine/transmission as shown in illustration.

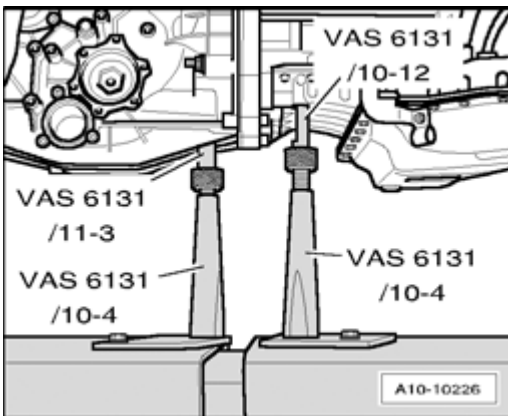


Fig. 98: Positioning Support Elements From VAS 6131/10 And VAS 6131/11 At Right On Engine/Transmission

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

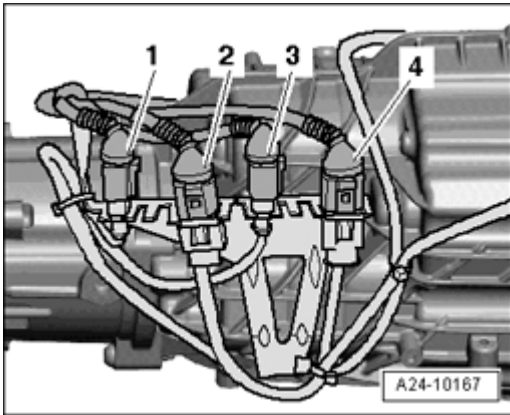


Fig. 99: Identifying Electrical Connectors On Transmission Bracket
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove electrical connectors - **1 to 4** - from bracket on transmission.
- Disconnect electrical harness connectors.
- Remove heat insulation sleeve on wiring harness and free up individual electrical wires.

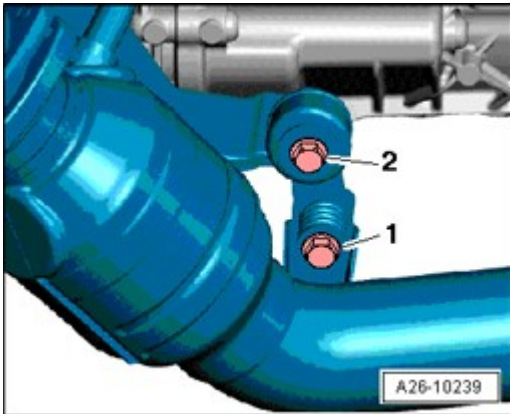


Fig. 100: Removing Bolt At Left Front Exhaust Pipe Strap
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - **1** - at left front exhaust pipe strap.

NOTE:

- Ignore - **2** -.

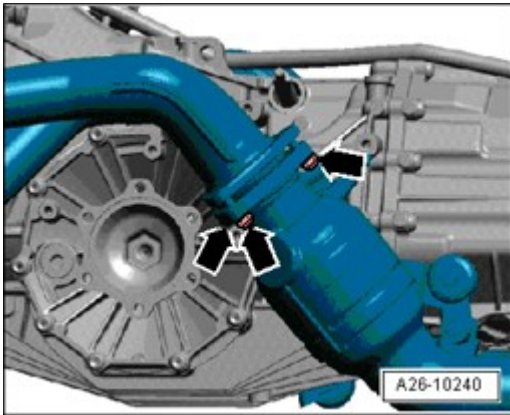


Fig. 101: Identifying Nuts & Front Exhaust Pipe With Pre- And Main Catalytic Converters
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - **arrows** -.
- Remove front exhaust pipe with pre- and main catalytic converters.

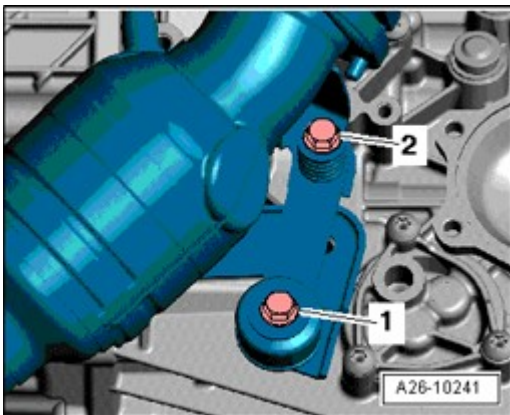


Fig. 102: Removing Bolt At Right Front Exhaust Pipe Strap
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - **1** - at right front exhaust pipe strap.

NOTE:

- Ignore - **2** -.

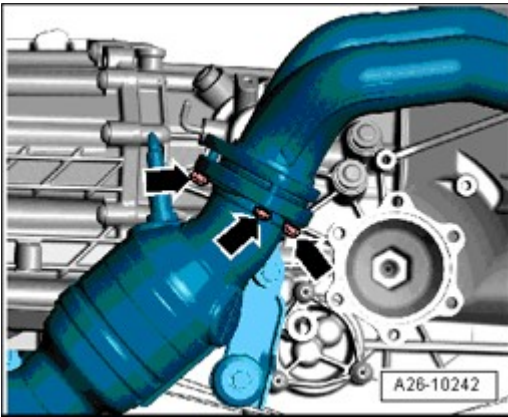


Fig. 103: Removing/Installing Nuts & Left Front Exhaust Pipe With Pre- And Main Catalytic Converters
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - **arrows** -.
- Remove left front exhaust pipe with pre- and main catalytic converters.

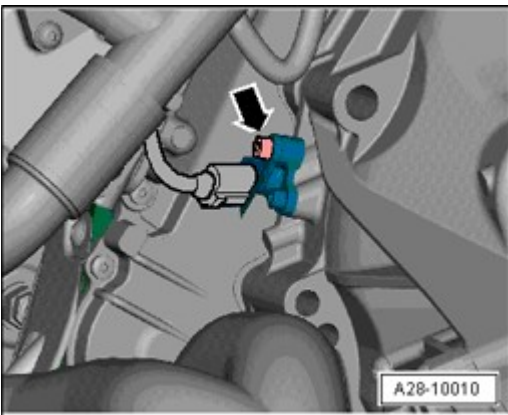


Fig. 104: Removing On Engine Speed (RPM) Sensor G28 At Left Of Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Bend heat shield slightly to side.
- Remove - **arrow** - on Engine Speed (RPM) Sensor G28 at left of transmission.
- Remove Engine Speed (RPM) Sensor G28 with heat shield.
- Disconnect electrical harness connector.

CAUTION: With Engine Speed (RPM) Sensor G28 removed, transmission must not be detached from engine. Otherwise, sensor will be destroyed.

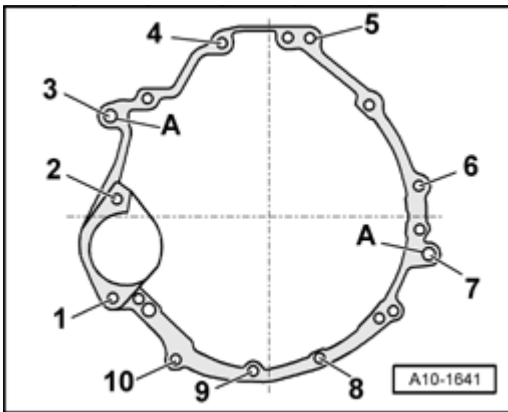


Fig. 105: Identifying Engine/Transmission Threaded Connections
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove engine/transmission connecting bolts - **1 to 7** -.

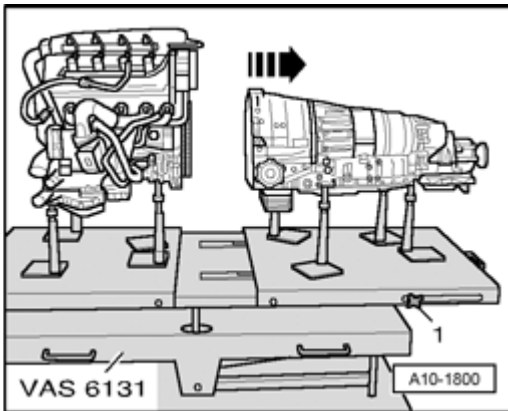


Fig. 106: Loosening Clamping Bolts On Side Of Scissor Lift Table VAS 6131 And Pull Rear Table Section With Transmission Rearward
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen clamping bolts - **1** - on sides of scissor lift table VAS 6131 and then pull rear table section with transmission back slightly.
- Raise transmission slightly and remove rear table section with transmission from engine - **arrow** - (second technician necessary).

Engine, securing to assembly stand

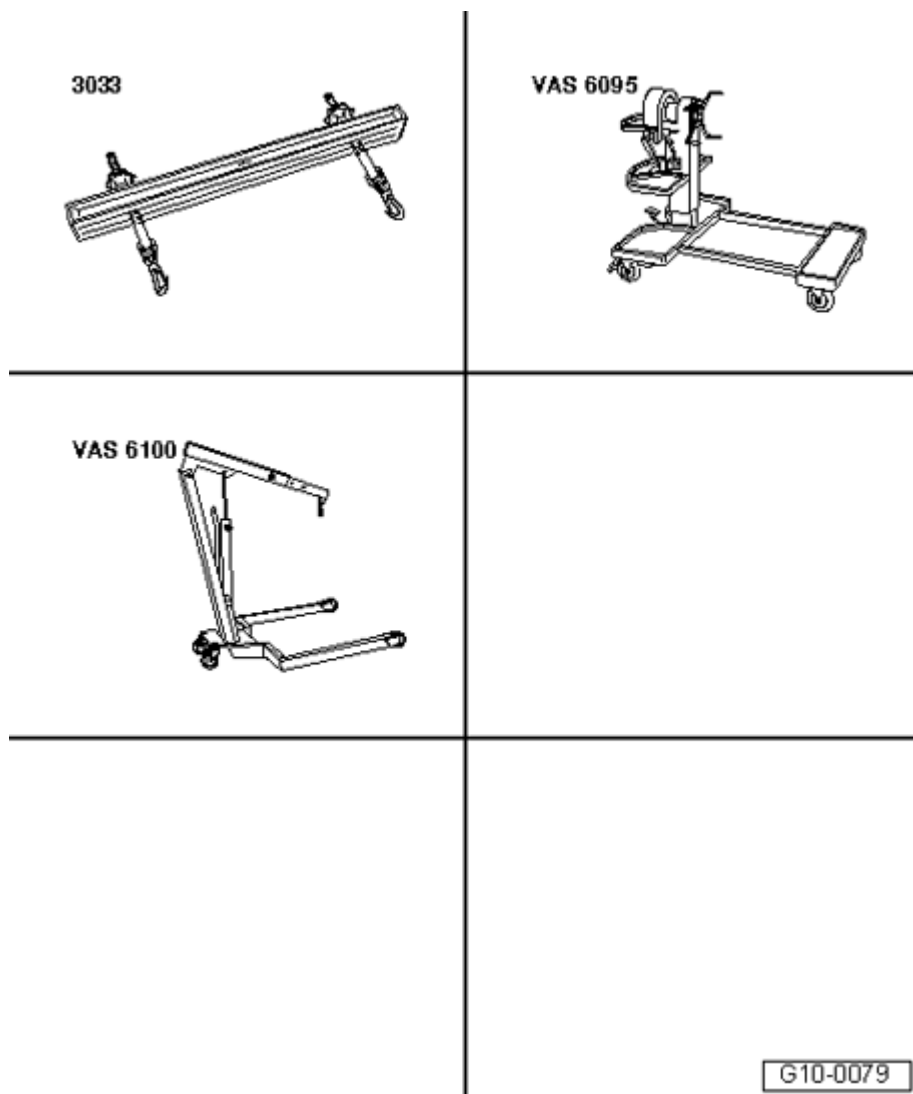


Fig. 107: Identifying Special Tools - Engine, Securing To Assembly Stand
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Lifting tackle 3033
- Engine and transmission holder VAS 6095 with adapter set VAS 6095/1-6A
- Shop crane VAS 6100

Special tools, testers and auxiliary items required

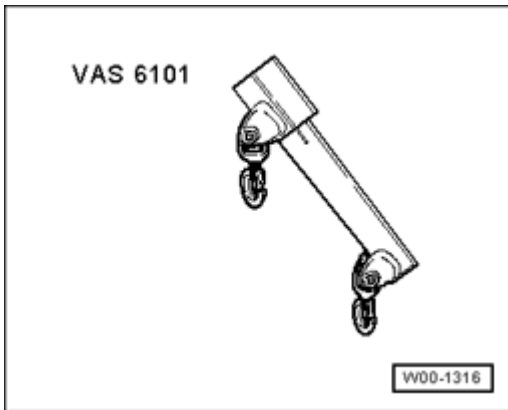


Fig. 108: Lift Arm Extension For Workshop Crane VAS 6101
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift arm extension for workshop crane VAS 6101

Work procedure

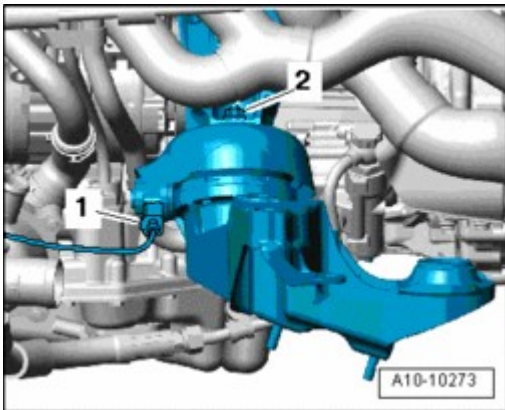


Fig. 109: Disconnecting Electrical Harness Connector At Left Engine Mount & Removing Engine Bracket Nut On Left Engine Support
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector at left engine mount - **1** -.
- Remove engine bracket nut - **2** - on left engine support.
- Remove engine bracket with left engine mount plate.
- Remove power-steering pump hydraulic line bolt - **1** - at engine support.

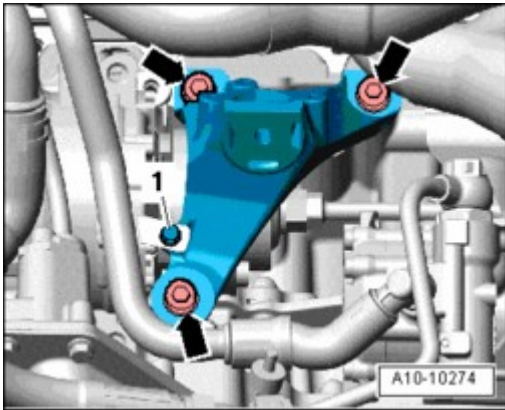


Fig. 110: Removing Bolts And Engine Support
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

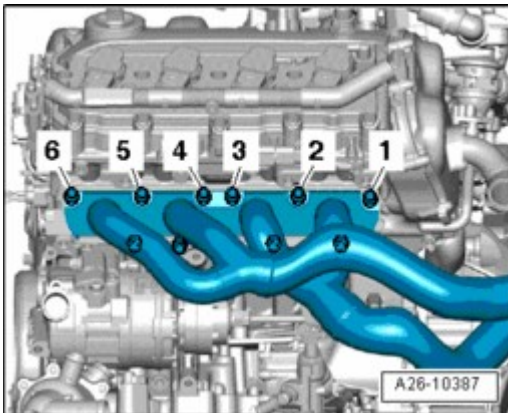


Fig. 111: Removing/Installing Nuts And Left Exhaust Manifold
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - **1 to 6** - and remove left exhaust manifold.

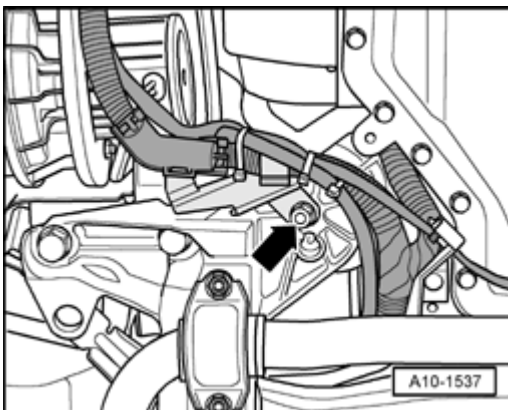


Fig. 112: Removing Wiring Harness Bracket At Right Engine Mount Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove wiring harness bracket at right engine mount plate - **arrows** -.

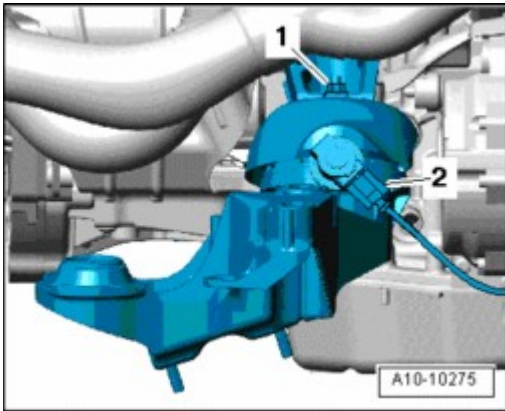


Fig. 113: Removing Engine Bracket Nut On Right Engine Support
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove engine bracket nut - **1** - on right engine support.
- Remove engine bracket with right engine mount plate.

NOTE:

- Ignore - **2** -.

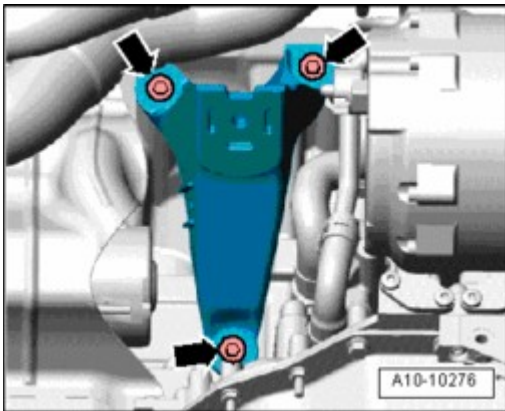


Fig. 114: Removing Bolts And Right Engine Mount
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and remove right engine mount.

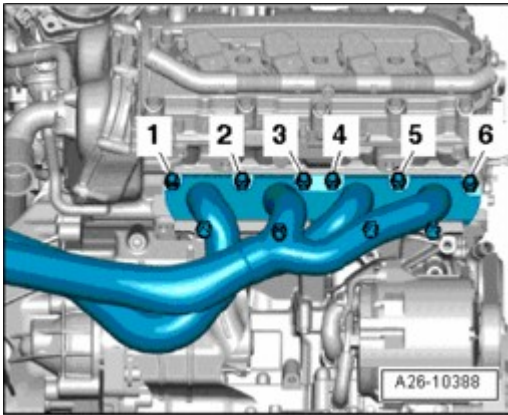


Fig. 115: Removing/Installing Nuts And Right Exhaust Manifold
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - 1 to 6 - and remove right exhaust manifold.

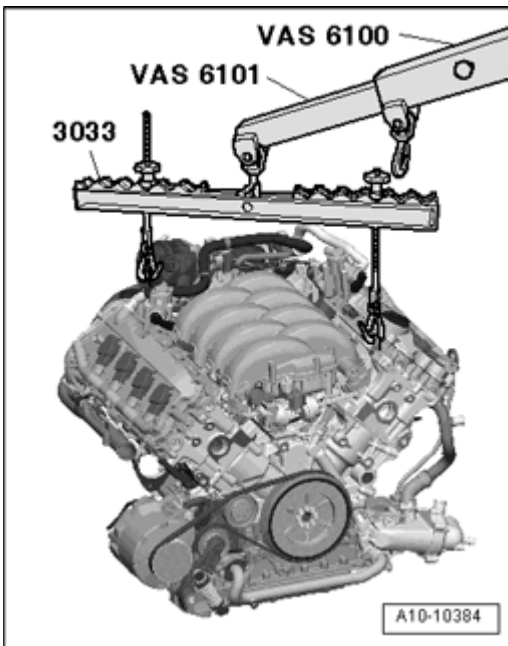


Fig. 116: Engaging Lifting Tackle 3033 On Engine Lifting Eyes And On Shop Crane VAS 6100 With Lift Arm Ext./Workshop Hoist VAS 6101
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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 platform VAS 6131.

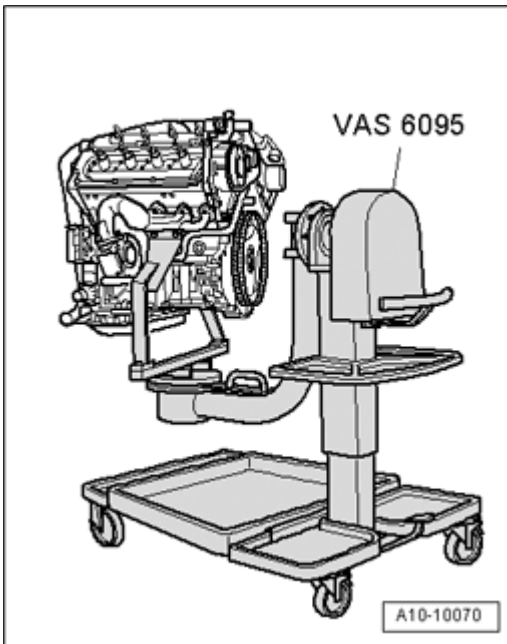


Fig. 117: Securing Engine With Transmission Holder VAS 6095
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure engine using Bracket VAS 6095/1-6A to Engine and Transmission Holder VAS 6095 as shown in illustration.

Engine, installing

NOTE:

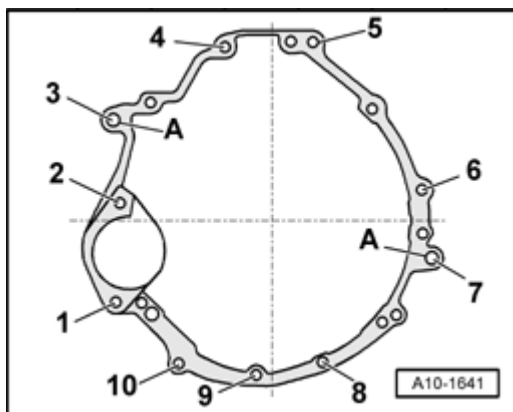
- During assembly, replace self-locking nuts and bolts.
 - Always replace bolts that are tightened to torque as well as sealing rings, gaskets and O-rings.
 - Secure all hose connections using hose clamps appropriate for the model type .
 - During installation, re-install all heat insulation sleeves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

NOTE:

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

NOTE:

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

**Fig. 118: Identifying Engine/Transmission Threaded Connections**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

Engine/transmission, fastening

Pos.	Bolt	Nm
1, 2	M12x120	65
3	M12x110	65
4, 5	M12x105	65
6	M12x130	65
7	M12x170	65
8, 9, 10	M10x60	45
A	Alignment sleeves for centering	

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

- Install exhaust manifold: Left --> **Left exhaust manifold, removing and installing** , right --> **Right exhaust manifold, removing and installing**.
- Install front exhaust pipe with pre- and main catalytic converter: Left --> **Left front exhaust pipe with primary and main catalytic converter, removing and installing** , right --> **Right front exhaust pipe with primary and main catalytic converter, removing and installing**.
- Always clean threaded drive shaft bores in transmission flanged shaft of locking fluid residue using a tap before installation.
- Rotate attachment spindles at left of engine/transmission assembly downward.

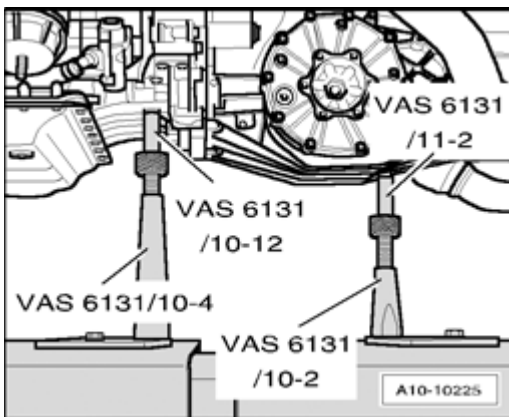


Fig. 119: Removing Both Base Plates For Left Support Element On Scissor Lift Platform VAS 6131
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

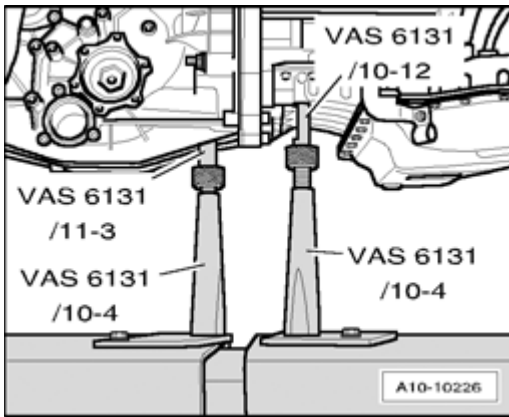


Fig. 120: Removing Both Base Plates For Right Support Element On Scissor Lift Table VAS 6131
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove both base plates for right support element on Scissor Lift Table VAS 6131.

NOTE:

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

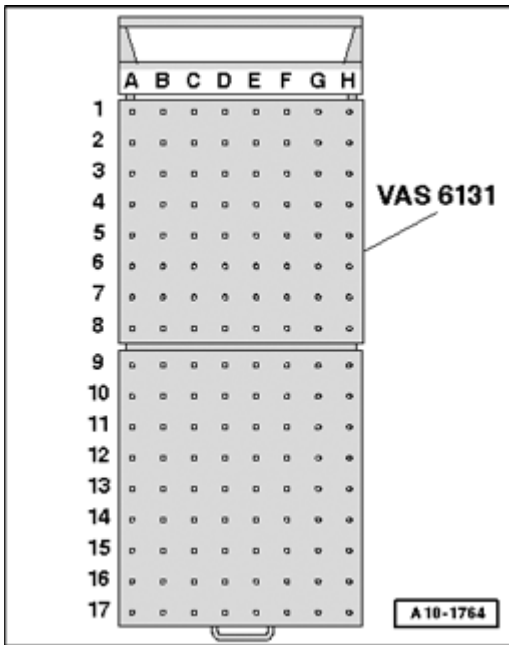


Fig. 121: Identifying Scissor Lift Platform VAS 6131
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Platform coordinates	Parts from Support Set VAS 6131/10			
B4 ¹⁾	/10-1	/10-4	/10-5	/10-12

2008 Audi RS 4

ENGINE 4.2 Liter V8 4V Engine Mechanical, Engine Code(s): BNS

G3 ¹⁾	/10-1	/10-4	/10-5	/10-6
B10	/10-1	/10-2	/10-5	/10-8 ²⁾
G10	/10-1	/10-2	/10-5	/10-8 ²⁾
C14 ¹⁾	/10-1	/10-3	/10-5	/10-7
E14 ¹⁾	/10-1	/10-3	/10-5	/10-7

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

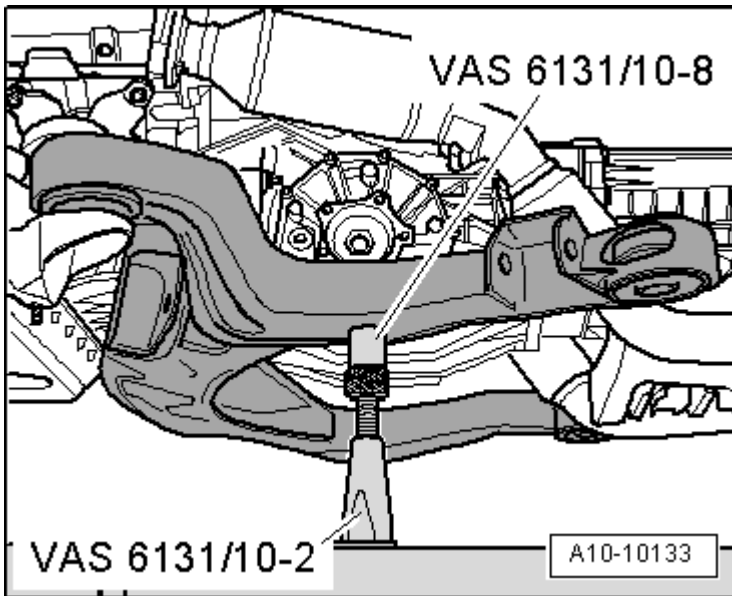


Fig. 122: Positioning Support Elements From VAS 6131/10 At Left/Right On Subframe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position subframe on both attachments VAS 6131/10-8.
- Twist spindles of support elements upward on both sides.
- Tighten base plates for support elements to 20 Nm on scissor lift platform VAS 6131.
- Using Scissor Lift Platform VAS 6131 , slowly guide engine/transmission unit with subframe into body from below.

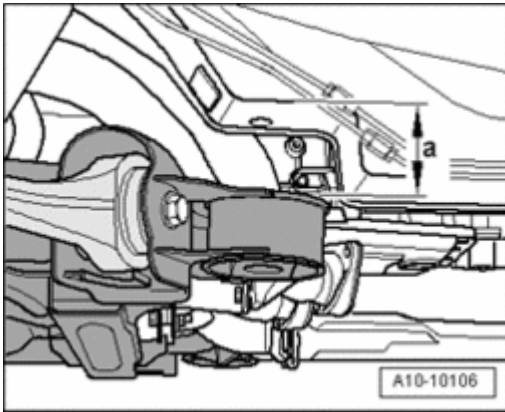


Fig. 123: Lowering/Lifting Engine/Transmission Assembly Using Scissor Lift Platform VAS 6131 Only Approx. By Dimension

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift engine/transmission subassembly using scissor lift platform VAS 6131 until dimension - **a** - is reached.
- Dimension - **a** - = max. 100 mm.

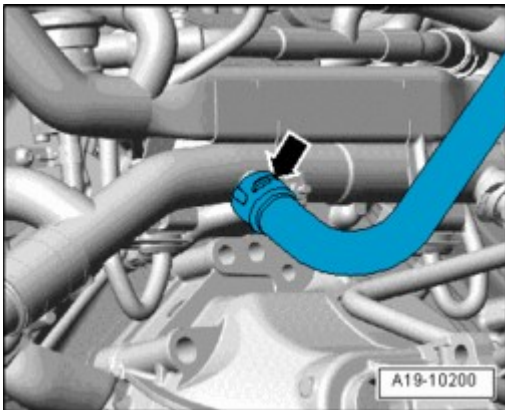


Fig. 124: Removing/Installing Coolant Hose To Heater Core On Rear Coolant Pipe

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure coolant hose - **arrow** - to heat exchanger on rear coolant pipe.

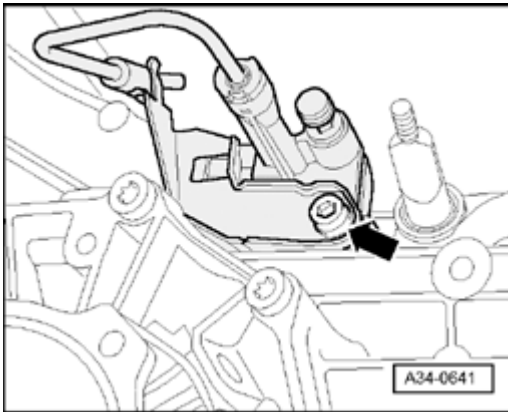


Fig. 125: Slave Cylinder Bracket And Fastener
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

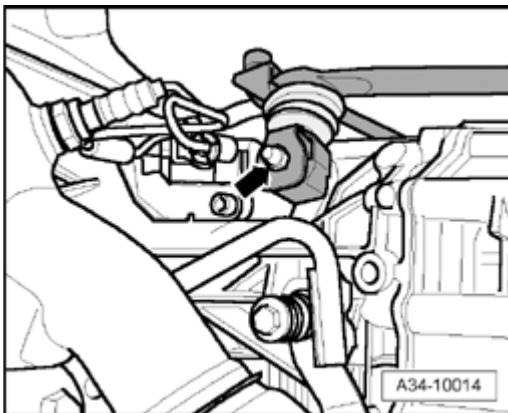


Fig. 126: Removing/Installing Nut And Lever From/To Selector Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

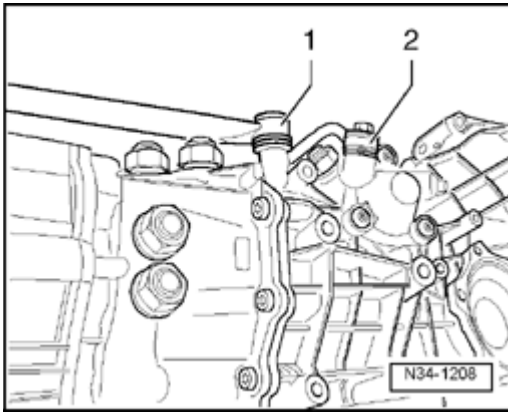


Fig. 127: Identifying Push Rod And Connecting Rod For Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

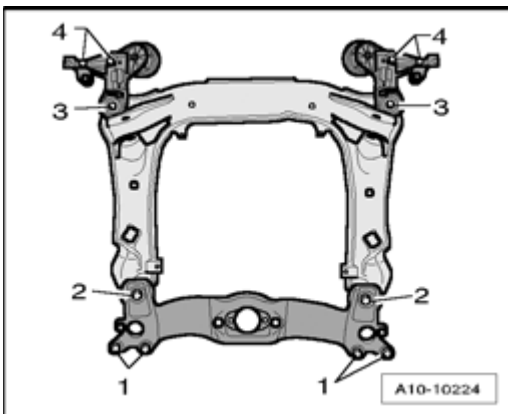


Fig. 128: Removing/Installing Bolts In Diagonal Sequence And In Stages
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Bring subframe into contact with body using Scissor Lift Table VAS 6131.
- Align subframe, engine bearing plates and tunnel cross member according to markings applied on long members during removal.
- Tighten bolts for subframe, engine mount consoles as well as tunnel cross member only to specified torque. Do not tighten further (tighten bolts only after axle alignment).

1. 65 Nm
2. 115 Nm
3. 115 Nm
4. 75 Nm

CAUTION: Vehicle must not be driven in this condition.

- Install drive axles --> **40 - FRONT SUSPENSION** .
- Install guide link, link and suspension strut --> **40 - FRONT SUSPENSION** .
- Install drive shaft -->
 - **39 FINAL DRIVE, DIFFERENTIAL**
 - **39 - FINAL DRIVE, DIFFERENTIAL** for REAR FINAL DRIVE 0AR
- Align exhaust system free of tension --> **Exhaust system, installing free of tension.**
- Install refrigerant lines --> **87 AIR CONDITIONING** .
- Install stabilizer bar --> **40 - FRONT SUSPENSION** .
- Install torque support.

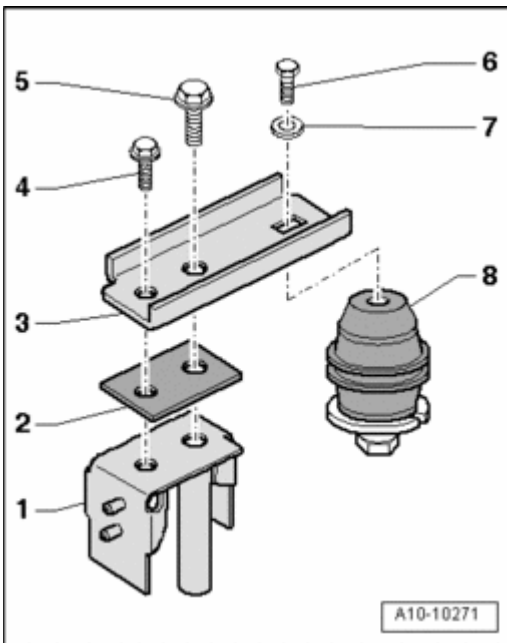


Fig. 129: Identifying Torque Support Bracket, Long Member & Correcting Shims
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Even up the gap between torque support bracket - 3 - and long member - 1 - using correcting shims - 2 - in an appropriate strength .

NOTE:

- **2 shims may also be used.**

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

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

- Electrical connections and routing --> Electrical Wiring Diagrams, Troubleshooting and Component Locations.
- Observe safety precautions after connecting battery -->
 - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL**
 - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL** for ELECTRICAL EQUIPMENT, CABRIOLET

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

- Mount wiper arms and adjust -->
 - **92 WINDSHIELD WIPER WASHER SYSTEM**
 - **92 WINDSHIELD WIPER & WASHER SYSTEM** for ELECTRICAL EQUIPMENT, CABRIOLET
- Add engine oil and check oil level --> **Oil level, checking.**
- Before starting engine for the first time, fill power steering vacuum reservoir with hydraulic oil --> **48 - STEERING** .

NOTE: • **Power-steering pump must not run dry.**

- Fill with coolant **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 Refrigerant R134a - Servicing.
- Align subframe and both engine bearing plates --> **40 - FRONT SUSPENSION** .
- Perform axle alignment --> **44 - WHEELS, TIRES, VEHICLE ALIGNMENT** .

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

- Check headlight adjustment 803 or 805.

Torque specifications

NOTE:

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

Component		Nm
Bolts/nuts	M6	9
	M8	20
	M10	40
	M12	65
Exceptions:		
Engine support to engine		42 ¹⁾
Engine mount to engine mount plate		23
Clutch slave cylinder to transmission		23 ²⁾
Selector shaft lever to transmission		23
Pivot rod on transmission		40
Shift rod connecting rod on transmission		23
Heat shield for drive axle to transmission		23
Hydraulic pressure line		40
Fuel supply line to fuel rail		25
Torque support bracket to	Bearing	40
Long member	M8	30
	M10	50 + 90 ° ²⁾³⁾
Oil cooler oil lines to upper part of oil pan		8
• ¹⁾ Insert with locking compound; locking compound . • ²⁾ Replace bolt. • ³⁾ 90 ° corresponds to a quarter turn.		

13 - ENGINE - CRANKSHAFT, CYLINDER BLOCK**BELT PULLEY SIDE, SERVICING OPERATIONS**

Ribbed belt drive for generator, component overview

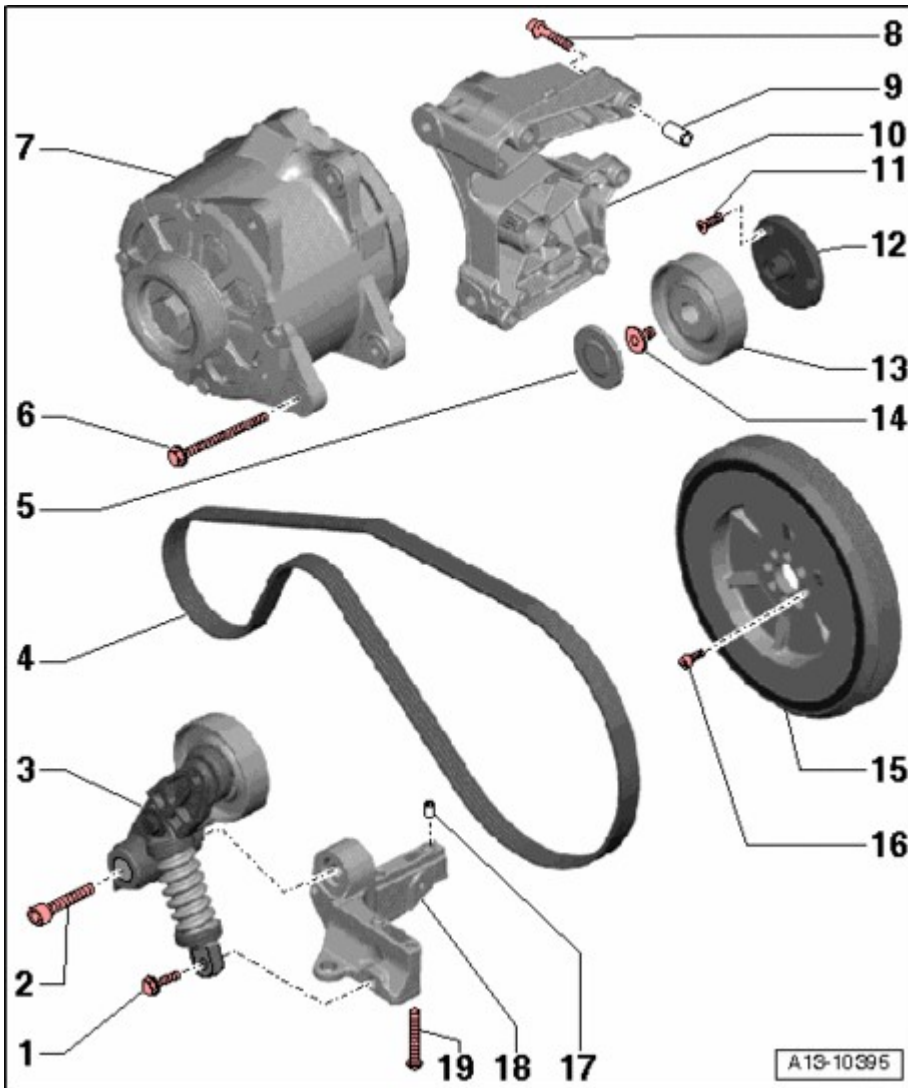


Fig. 130: Ribbed Belt Drive For Generator, Component Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - 22 Nm

2 - 55 Nm

3 - Tensioning device for ribbed belt

4 - Ribbed belt

- Check for wear
- Do not kink
- Before removing, mark direction of rotation using chalk or felt-tip marker. A reversed turning direction can cause damage to ribbed belt under operating conditions.
- Removing and installing --> **Ribbed belt, removing and installing**

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

5 - Cover cap

6 - 22 Nm

7 - Generator

- Removing and installing -->
 - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL**
 - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL** for ELECTRICAL EQUIPMENT, CABRIOLET

8 - M8, 22 Nm; M10, 46 Nm

9 - Alignment bushing

- For generator bracket
- 2 pieces

10 - Generator bracket

11 - 9 Nm

12 - Bracket

- For idler pulley

13 - Idler roller for ribbed belt

14 - 22 Nm

15 - Vibration damper

- Removing and installing --> **Vibration damper, removing and installing**

16 - Bolt

- Replace
- Tightening order

17 - Alignment bushing

- 2 pieces

18 - Bracket

- For ribbed belt tensioner

19 - 9 Nm

- Different lengths

Ribbed belt, removing and installing

Removing

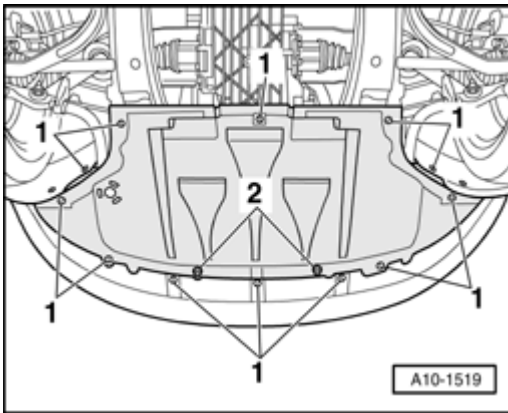


Fig. 131: Removing Quick-Release Fasteners, Screws And Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove quick-release fasteners - 1 - , remove screws - 2 - and remove noise insulation.

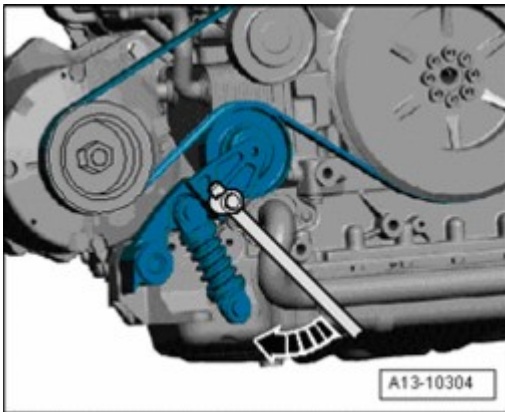


Fig. 132: Releasing Ribbed Belt Tension
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- Before removing ribbed belt, mark 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.

- To release ribbed belt tension, swing tensioner in direction of - **arrow** -. Use a lever with $\frac{3}{8}$ " drive for

this.

NOTE:

- Ensure lever axle is long enough so that it can be inserted completely in the tensioner.
- A suitable lever is, e.g., "Stahlwille 425QR".

- Remove ribbed belt.
- Release tensioner unit

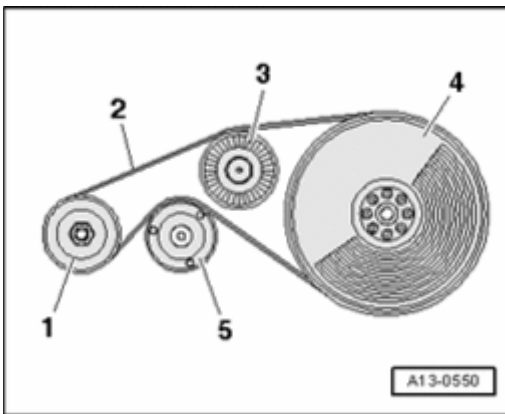
Installing

Fig. 133: Placing Ribbed Belt Over Belt Pulley In Specified Sequence
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place ribbed belt over belt pulley in specified sequence.

1. Generator
2. Ribbed belt
3. Idler roller
4. Vibration damper
5. Tensioning roller

NOTE:

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

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

- Start engine and check belt running.

Vibration damper, removing and installing**Removing**

- Bring lock carrier into service position -->
 - **50 BODY, FRONT**
 - **50 - BODY - FRONT** for BODY EXTERIOR - CABRIOLET

NOTE:

- To loosen and tighten harmonic balancer, counter hold on central nut of Generator belt pulley using ring wrench.

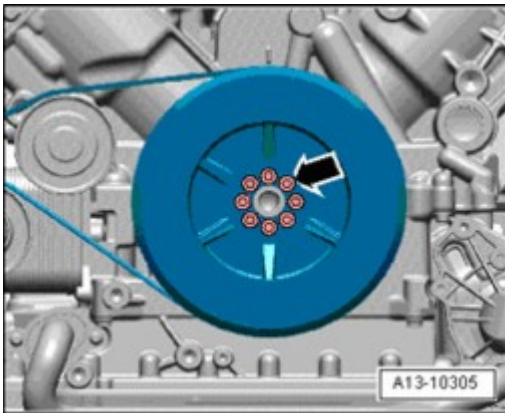


Fig. 134: Loosening Mounting Bolts On Vibration Damper
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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.

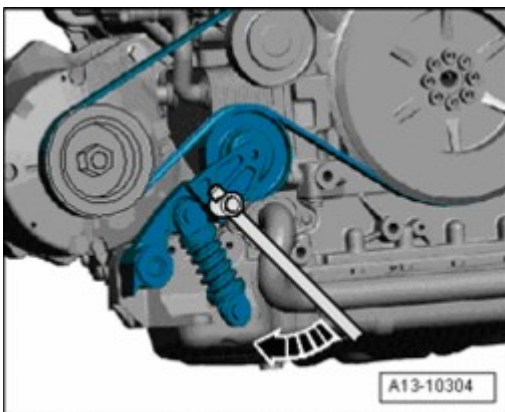


Fig. 135: Releasing Ribbed Belt Tension
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- To release ribbed belt tension, swing tensioner in direction of - **arrow** -. Use a lever with $\frac{3}{8}$ " drive for

this.

NOTE:

- Ensure lever axle is long enough so that it can be inserted completely in the tensioner.
- A suitable lever is, e.g., "Stahlwille 425QR".

- Remove ribbed belt.
- Release tensioner unit
- Remove vibration damper.

Installing

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

NOTE:

- Replace bolts which have been tightened to torque.

- Install vibration damper using only original equipment bolts .
- Installation of harmonic balancer is only possible in one position - note alignment bushing.

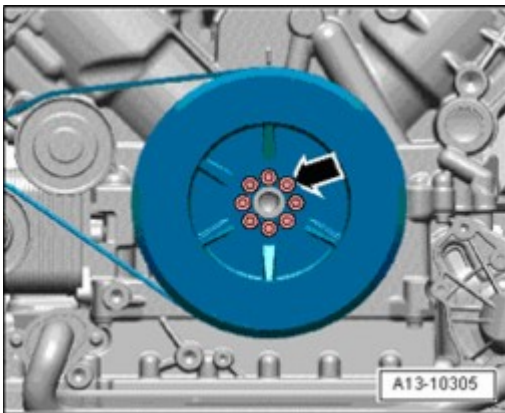


Fig. 136: Loosening Mounting Bolts On Vibration Damper
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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 ° ($\frac{1}{4}$ turn) additional turn.
- Install ribbed belt **Installing**.
- Install lock carrier with attachments -->
 - **50 BODY, FRONT**
 - **50 - BODY - FRONT** for BODY EXTERIOR - CABRIOLET

- Install front bumper cover -->
 - **63 BUMPER**
 - **63 - BUMPERS** for BODY EXTERIOR - CABRIOLET

Crankshaft seal (ribbed belt side), replacing

Special tools, testers and auxiliary items required

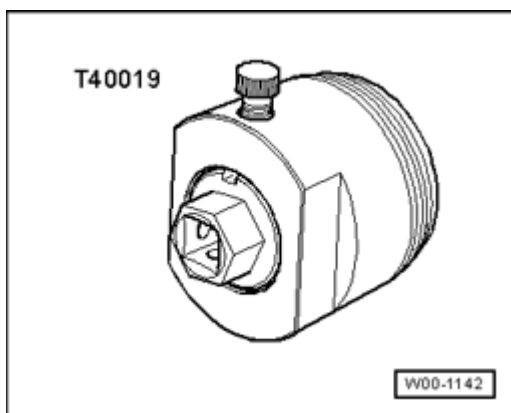


Fig. 137: Seal Remover T40019

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Seal remover T40019

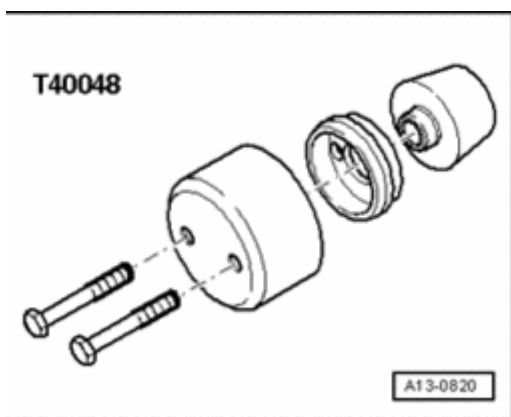


Fig. 138: Assembly Tool T40048

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Assembly tool T40048

Removing

- Bring lock carrier into service position -->

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

- Remove vibration damper --> **Vibration damper, removing and installing.**

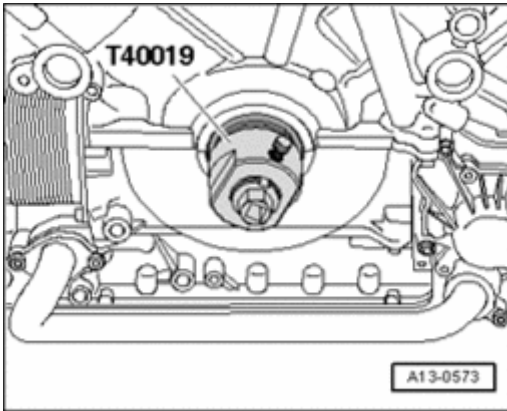


Fig. 139: Installing Oil Seal Extractor T40019

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place inner part of oil seal extractor T40019 flush with outer part and secure using knurled-head screw.
- Lubricate threaded head of seal remover, place against seal, and with strong force screw into seal as far as possible.
- Loosen knurled thumb screw and turn inner portion against crankshaft until seal is pulled out.
- Clamp seal extractor at mounting points in a vise.
- Remove seal using pliers.

Installing

- Clean operating and sealing surfaces.

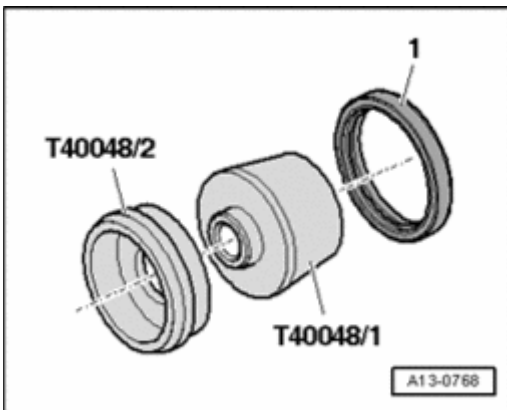


Fig. 140: Inserting Assembly Device T40048/1 Onto Pull Sleeve T40048/2 And Sliding Seal Onto Pull Sleeve

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert assembly device T40048/1 onto pull sleeve T40048/2 and slide seal - 1 - onto pull sleeve.
- Remove assembly device.

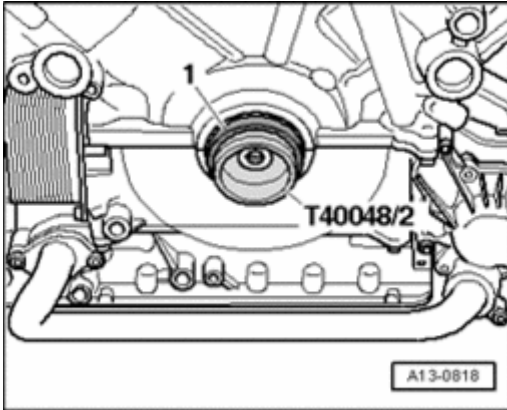


Fig. 141: Placing Pull Sleeve T40048/2 On Crankshaft And Sliding Seal Into Sealing Surface On Engine
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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.

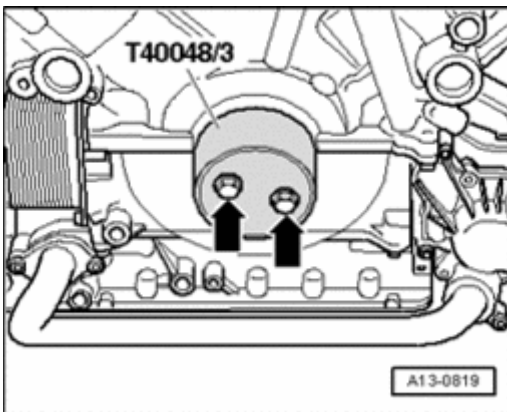


Fig. 142: Positioning Pressure Sleeve T40048/3 With Bolts On Crankshaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position pressure sleeve T40048/3 with bolts M8x55 mm - **arrows** - on crankshaft.
- 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 lock carrier with attachments -->
 - **50 BODY, FRONT**
 - **50 - BODY - FRONT** for BODY EXTERIOR - CABRIOLET
- Install front bumper cover -->
 - **63 BUMPER**
 - **63 - BUMPERS** for BODY EXTERIOR - CABRIOLET

TIMING CHAIN SIDE, SERVICING OPERATIONS

Dual-mass flywheel, component overview

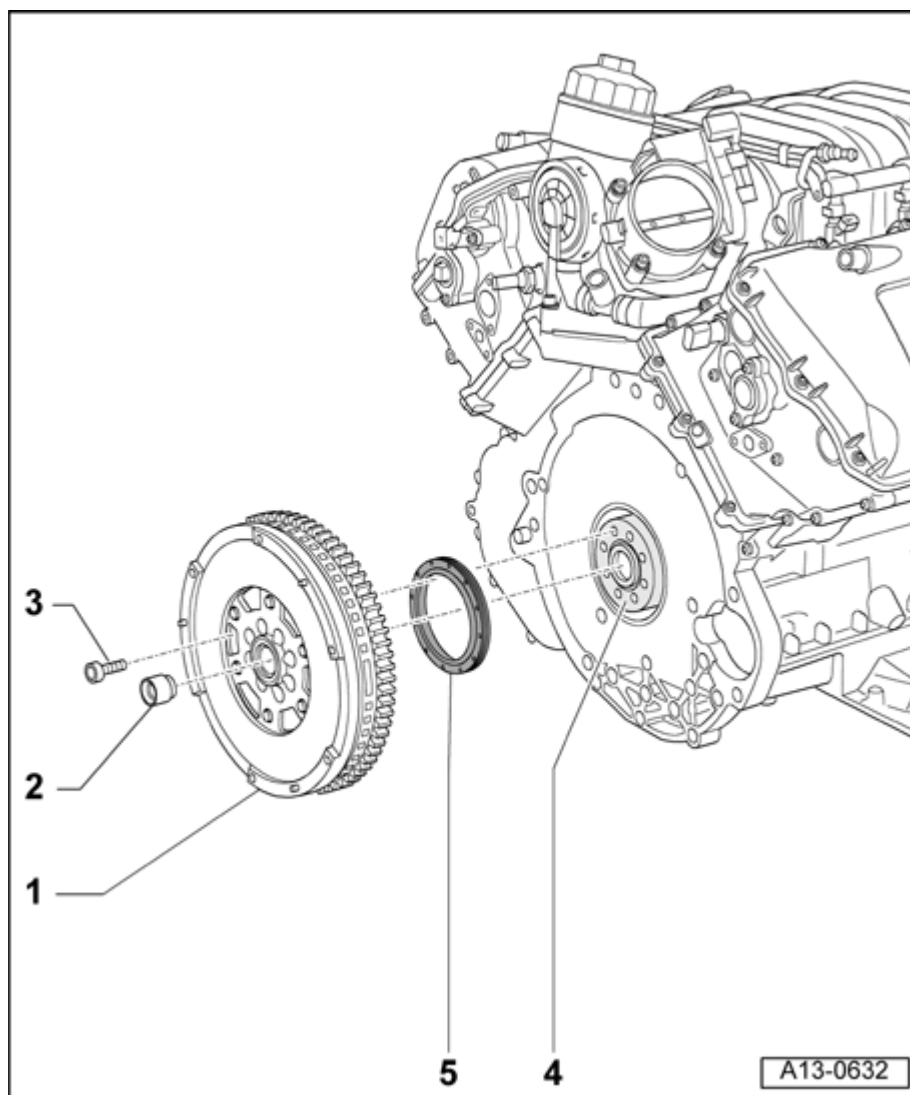


Fig. 143: Dual-Mass Flywheel, Component Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Dual mass flywheel

- Removing and installing --> **Dual-mass flywheel, removing and installing**

2 - Needle bearing

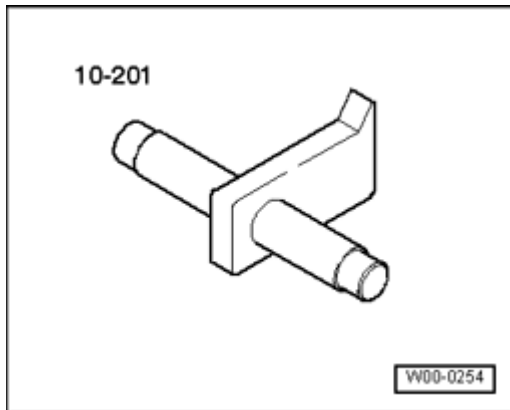
- Pulling out and driving in --> **Needle bearing on dual mass flywheel, pulling out and driving in**

3 - Special bolt

- Replace
- Loosening and tightening **Torque specification**

4 - Crankshaft**5 - Crankshaft seal, timing chain side**

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

Dual-mass flywheel, removing and installing**Special tools, testers and auxiliary items required****Fig. 144: Counter-Holder Tool 10-201****Courtesy of VOLKSWAGEN UNITED STATES, INC.**

- Counter-holder tool 10-201

Removing

- Transmission removed.
- Remove clutch pressure plate -->
 - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
 - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE

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

- Mark dual mass flywheel to crankcase.

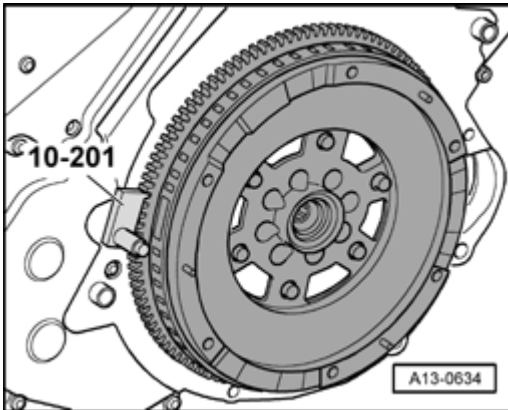


Fig. 145: Inserting Counter Hold Tool 10-201 To Loosen Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

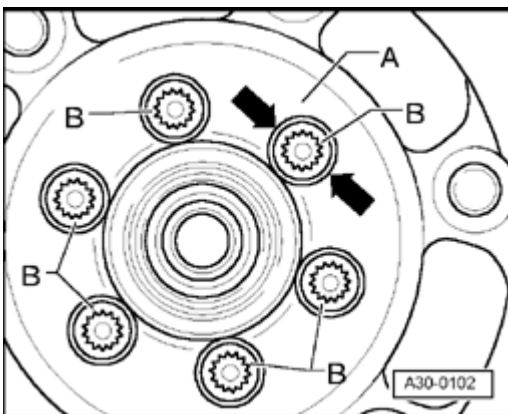


Fig. 146: Identifying Dual-Mass Flywheel & Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

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

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

Installing

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

NOTE:

- **In the dual mass flywheel, a needle bearing must be installed; when replacing flywheel, drive in needle bearing --> Needle bearing on dual mass flywheel, pulling out and driving in.**

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

Torque specification

Component	Nm
Dual-mass flywheel to crankshaft	
Bolt length 22.3 mm	60 + 90 ° 1)2)
• 1) Replace bolts. • 2) 90 ° corresponds to a quarter turn.	

Needle bearing on dual mass flywheel, pulling out and driving in

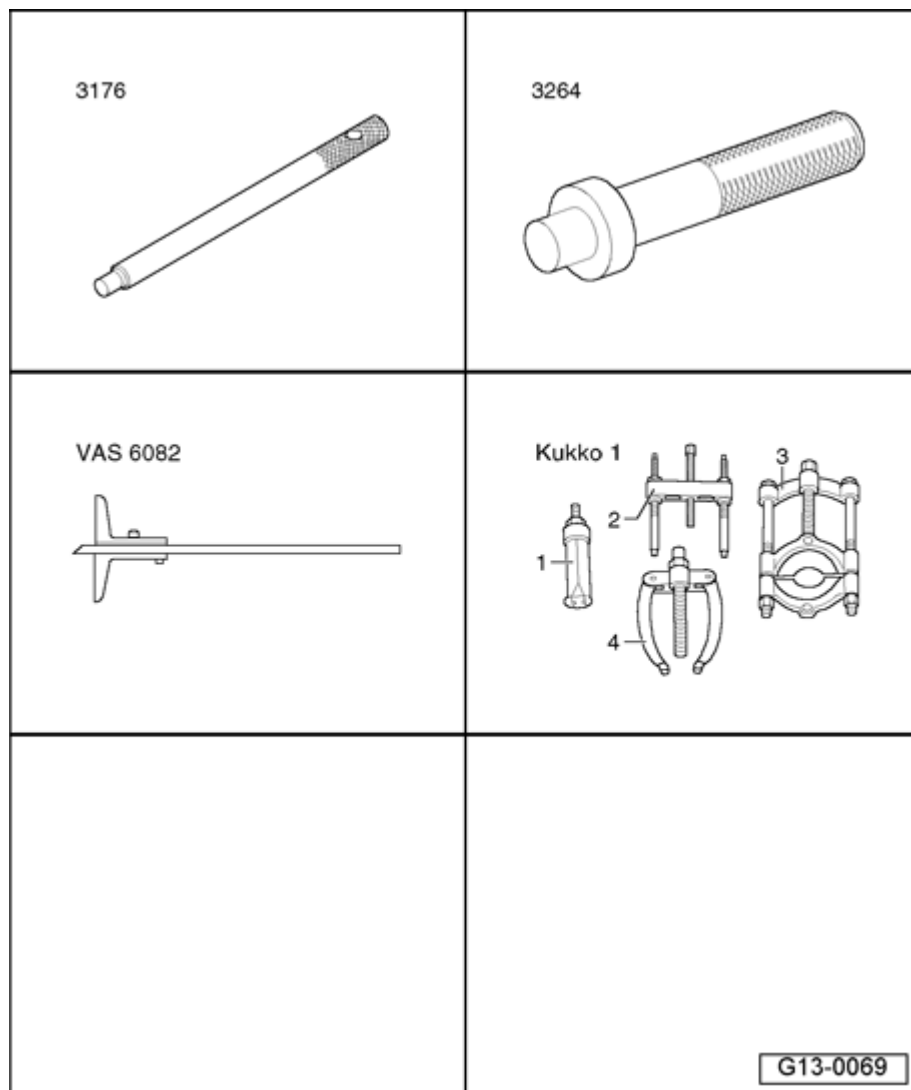


Fig. 147: Identifying Special Tools - Needle Bearing On Dual Mass Flywheel, Pulling Out And Driving In
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

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

Work procedure

- Remove transmission -->
 - **34 MANUAL TRANSMISSION - CONTROLS, HOUSING** for 5 SPD. MANUAL

TRANSMISSION 012/01W FRONT WHEEL DRIVE

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

- Remove clutch pressure plate -->

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

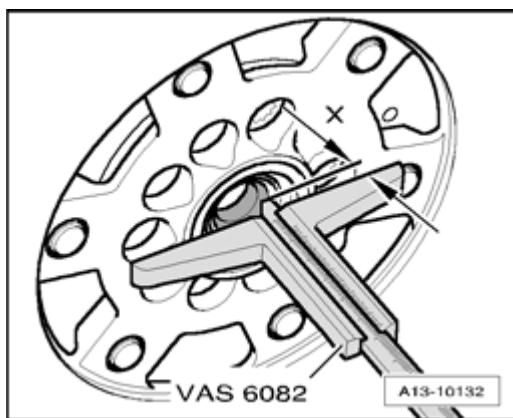


Fig. 148: Measuring Depth That Needle Bearing Is Driven Into Dual-Mass Flywheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

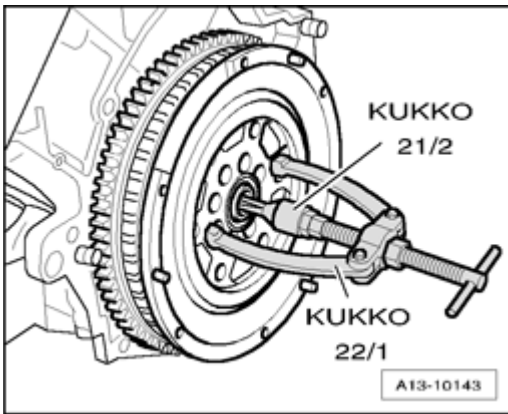


Fig. 149: Pulling Out Needle Bearing Using Internal Puller Kukko 21/2 And Counter-Support Kukko 22/1

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

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

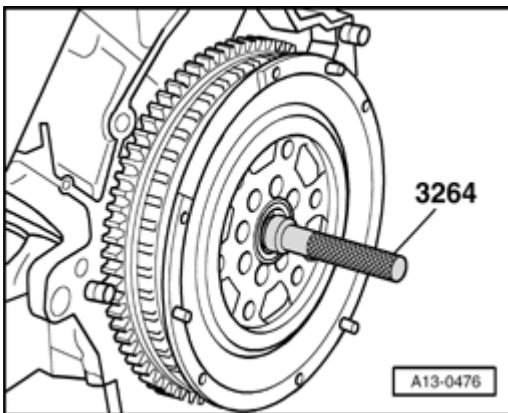


Fig. 150: Driving Needle Bearing Into Dual-Mass Flywheel Using Bearing Driver 3264

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

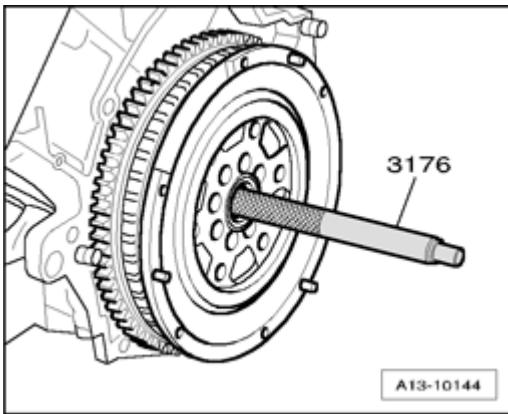


Fig. 151: Using Backside Of Centering Mandrel 3176 To Press Needle Bearing Further In Until Previously Measured Depth Is Achieved

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

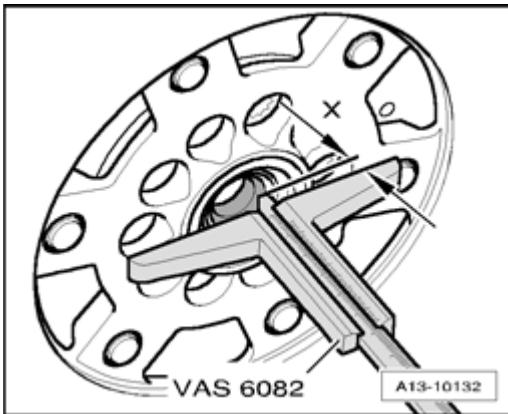


Fig. 152: Measuring Depth That Needle Bearing Is Driven Into Dual-Mass Flywheel

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

Crankshaft seal (timing chain side), replacing

Special tools, testers and auxiliary items required

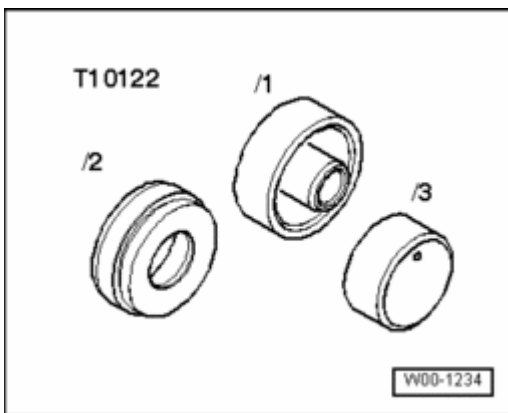


Fig. 153: Identifying Pulling Fixture T10122
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pulling fixture T10122

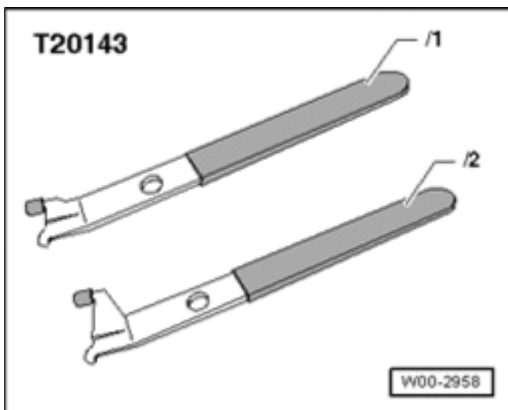


Fig. 154: Identifying Extractor Hook T20143

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Extractor hook T20143

Work procedure

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

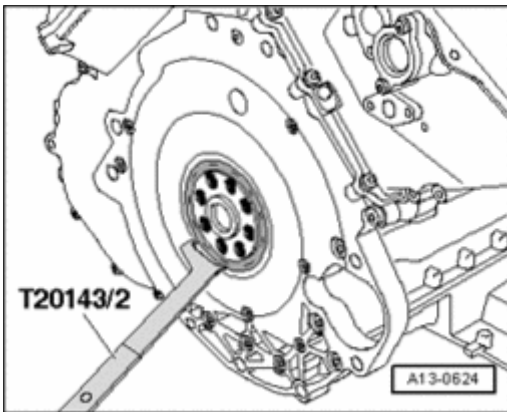


Fig. 155: Prying Out Sealing Ring Using Pulling Hook T20143/2
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pry out sealing ring using Pulling Hook T20143/2.
- Clean operating and sealing surfaces.

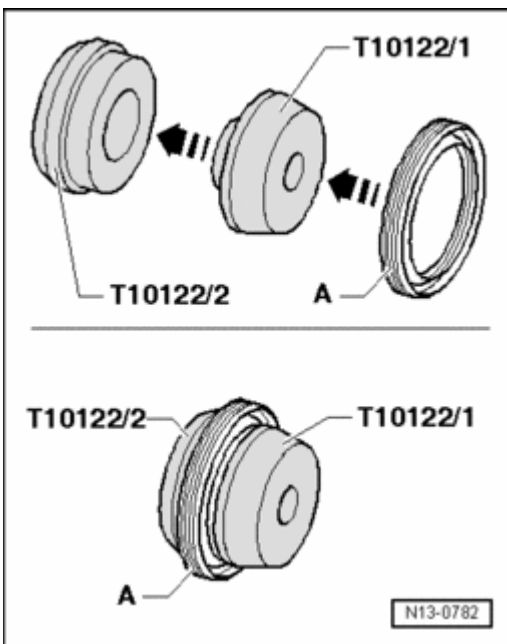


Fig. 156: Identifying Seal, Sleeve T10122/1 And Assembly Tool T10122/2
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

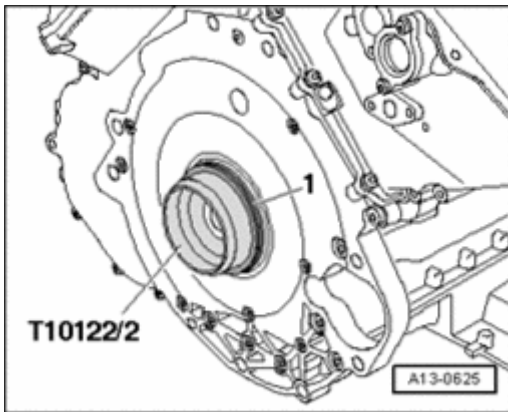


Fig. 157: Installing Pull Sleeve T10122/2 With Sealing Ring Onto Crankshaft
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

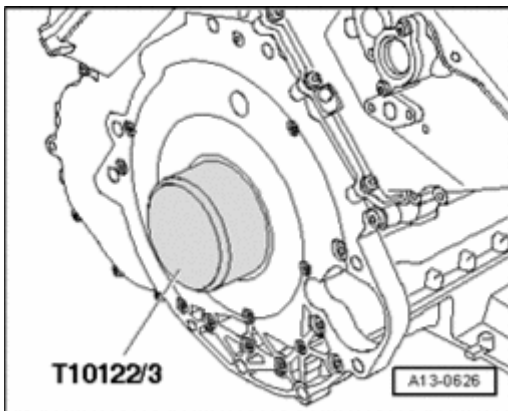


Fig. 158: Pressing Seal Evenly All Around Until It Reaches Stop Using T10122/3
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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 dual-mass flywheel --> **Dual-mass flywheel, removing and installing.**
- Install clutch pressure plate -->
 - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
 - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
 - **30 CLUTCH** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
 - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE
 - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
 - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE
- Install transmission -->

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

Timing chain covers, component overview

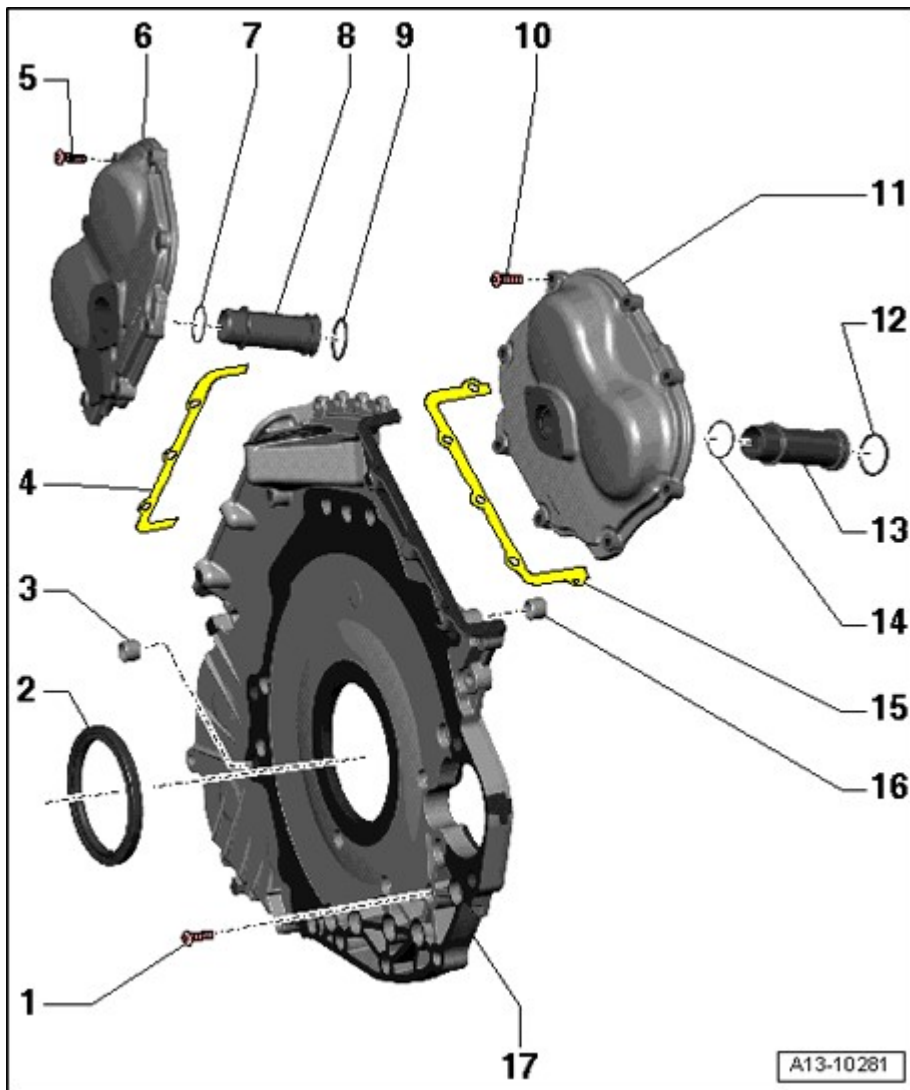


Fig. 159: Timing Chain Covers, Component Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Bolt

- M6, 8 Nm plus an additional 90 ° ($\frac{1}{4}$ turn)
- M8, 22 Nm
- Note tightening sequence --> **Fig. 183**

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. 170** ; right --> **Fig. 172**

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. 172**

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

Special tools, testers and auxiliary items required

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

Removing

NOTE:

- During installation, re-install 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 scissor lift platform VAS 6131.

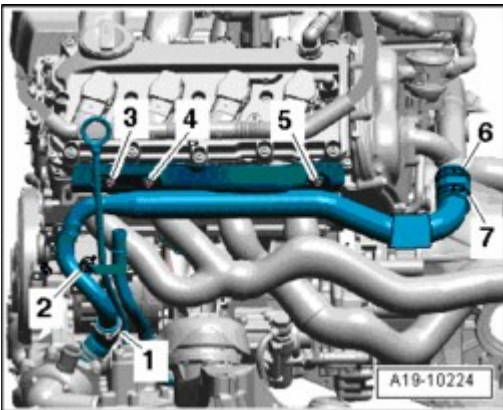


Fig. 160: Removing Bolts, Oil Dipstick Guide Tube Upward, Bolts & Hose Clips
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - 2 - and - 3 - and remove oil dipstick guide tube upward.
- Remove bolts - 4 - and - 5 -.
- Slide heat insulation sleeve over left coolant connection hose to side.
- Loosen hose clips - 1 - and - 7 -.
- Remove left coolant pipe from coolant hoses.

NOTE:

- Ignore - 6 -.

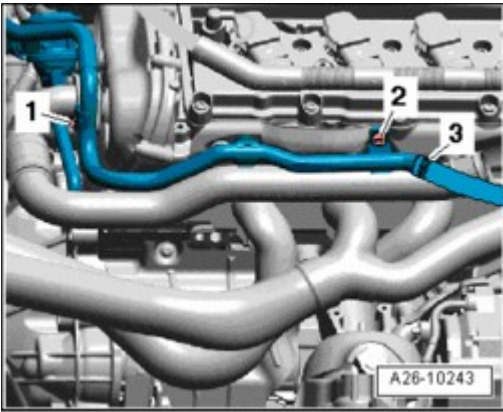


Fig. 161: Identifying Secondary Air Injection Combination Valves Air Guide Hose & Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - 1 - and - 2 -.
- Lay aside air guide pipe to secondary air injection combination valves.

NOTE:

- Ignore - 3 -.

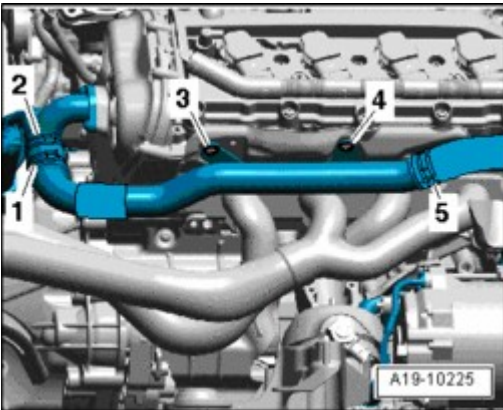


Fig. 162: Removing Bolts & Hose Clip
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - 3 - and - 4 -.
- Slide heat insulation sleeve over right coolant connection hose to side.
- Loosen hose clip - 1 -.
- Remove right coolant pipe from coolant connection hose.

NOTE:

- Ignore - 2 - and - 5 -.

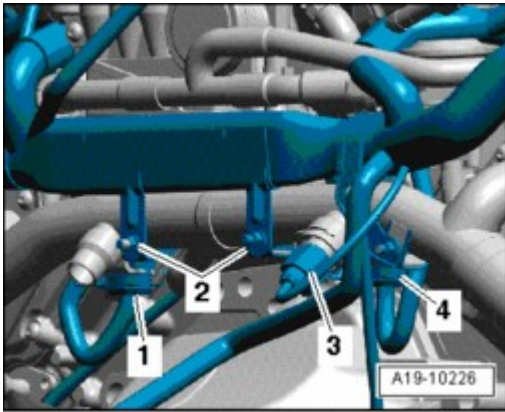


Fig. 163: Identifying Nuts, Wiring Harness Bracket From Rear Coolant Pipe, Engine Coolant Temperature (ECT) Sensor G62 Electrical Connector & Rear Coolant Pipe Bracket Electrical Connectors

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - 2 - and remove wiring harness bracket from rear coolant pipe.
- Disconnect electrical connector - 3 - on Engine Coolant Temperature (ECT) Sensor G62.
- Remove electrical connectors - 1 - and - 4 - from bracket at rear coolant pipe.

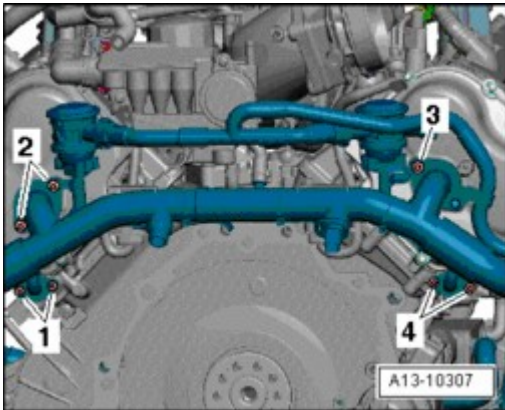


Fig. 164: Removing Bolts, Rear Coolant Pipe & Secondary Air Injection Combination Valves
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - 1 to 4 -.
- Remove rear coolant pipe and secondary air injection combination valves.

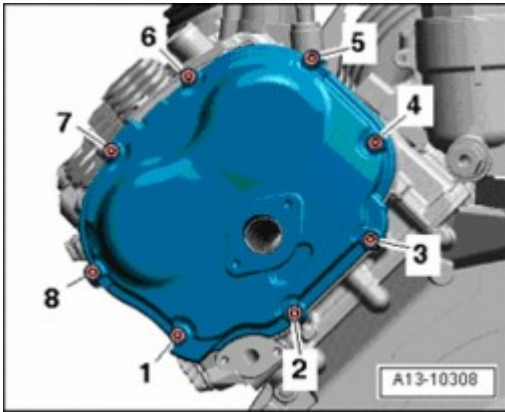


Fig. 165: Identifying Left Timing Chain Cover And Tighten/Removing Bolts Sequence
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

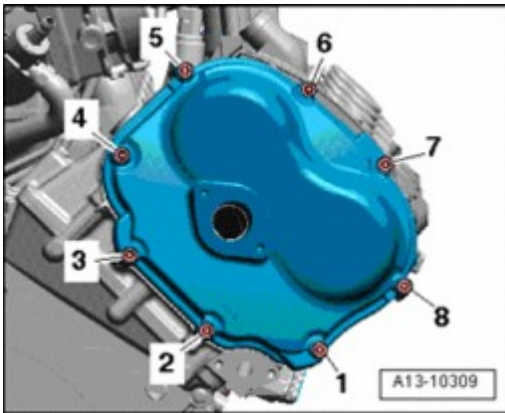


Fig. 166: Removing Bolts And Right Timing Chain Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Installing

NOTE:

- Replace O-rings.
- Secure all hose connections using hose clamps appropriate for the model type .
- During installation, re-install 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.

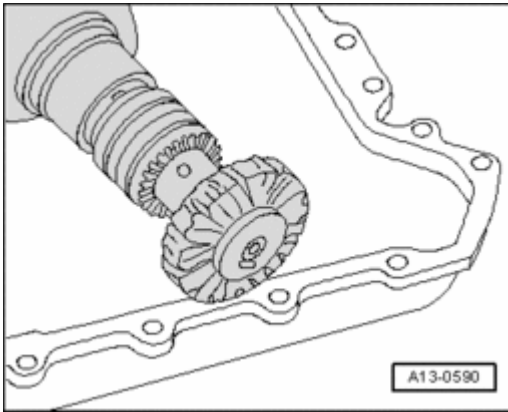


Fig. 167: Using Rotating Plastic Brush To Remove Any Sealant Residue From Sealing Flange, Cylinder Block And Upper Part Of Oil Pan

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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.

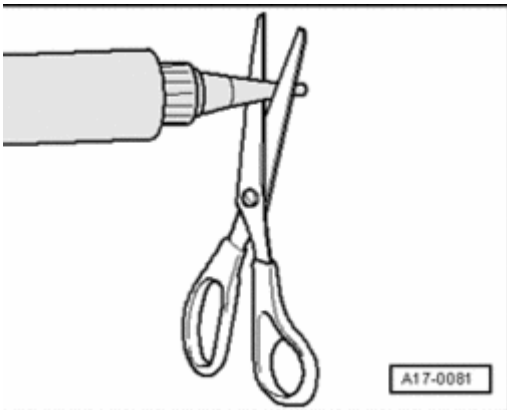


Fig. 168: Cutting Tube Nozzle At Front Marking

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

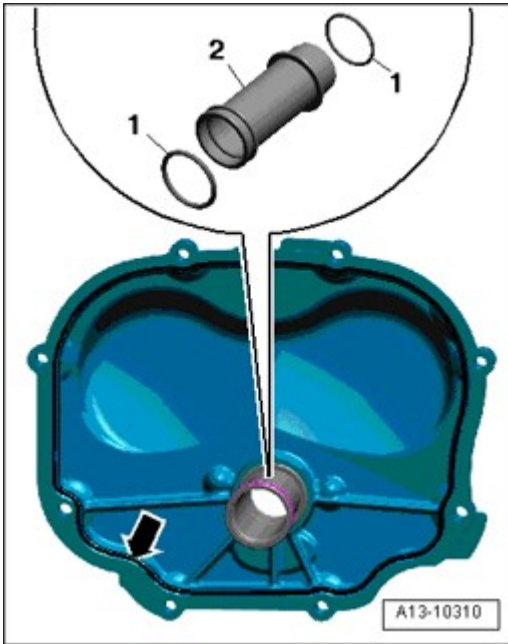


Fig. 169: Driving Left Coolant Intermediate Pipe Out Of Left Timing Chain Cover With Suitable Drift
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

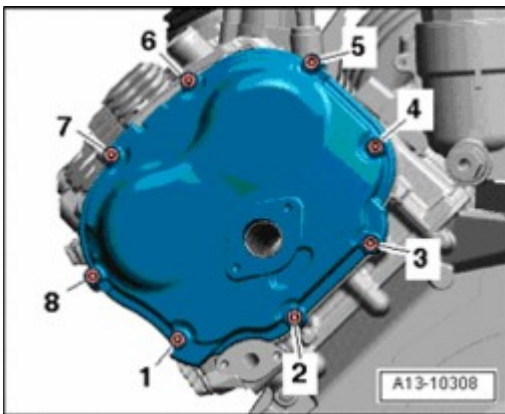


Fig. 170: Identifying Left Timing Chain Cover And Tighten/Removing Bolts Sequence
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

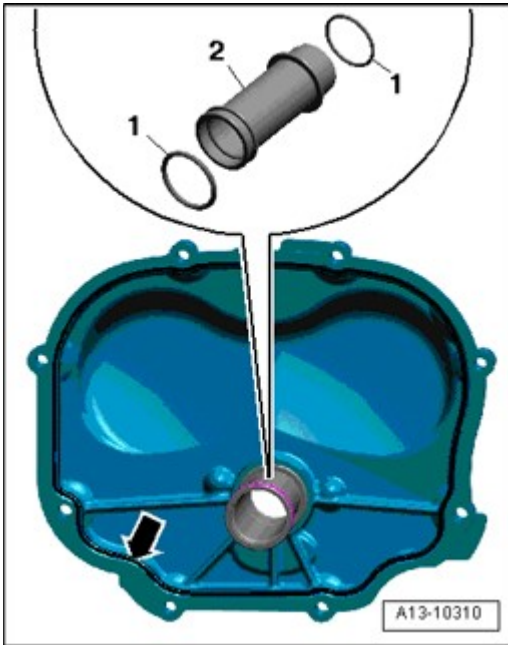


Fig. 171: Driving Left Coolant Intermediate Pipe Out Of Left Timing Chain Cover With Suitable Drift
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

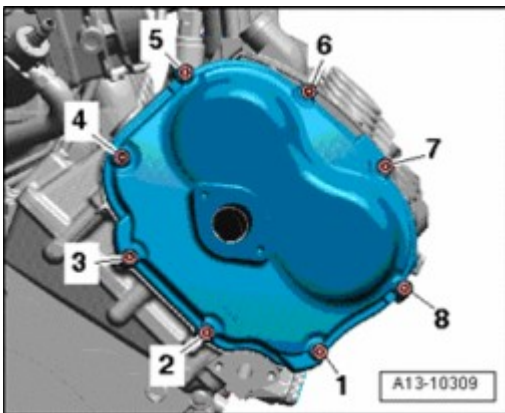


Fig. 172: Identifying Right Timing Chain Cover And Tighten/Removing Bolts Sequence
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

- Install combination valve for Secondary Air Injection (AIR) system: Left --> **Left combination valve for secondary air injection (AIR), removing and installing** , right --> **Right combination valve for secondary air injection, removing and installing**.
- Install rear coolant pipe --> **Rear coolant line, 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**.

Torque specifications

Component	Nm
Left and right timing chain covers to engine	9

Lower timing chain cover, removing and installing

Special tools, testers and auxiliary items required

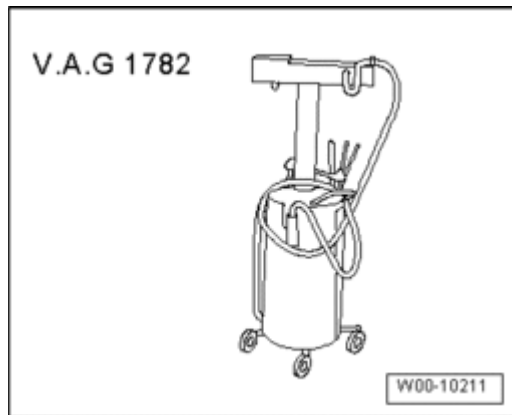


Fig. 173: Identifying Old Oil Collecting And Extracting Device V.A.G 1782

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Removing

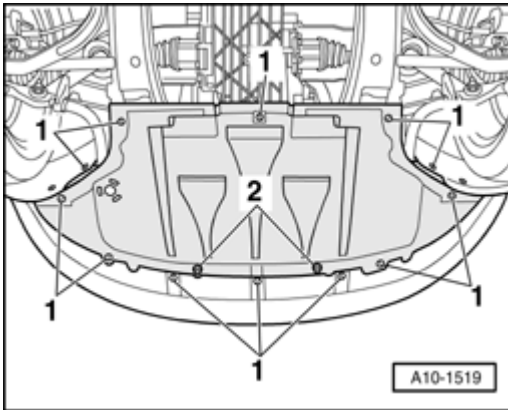


Fig. 174: Removing Quick-Release Fasteners, Screws And Noise Insulation
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove quick-release fasteners - **1** - , remove screws - **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 or secure engine to assembly stand --> **Engine, securing to assembly stand.**
- Remove clutch pressure plate -->
 - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
 - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
 - **30 CLUTCH** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
 - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE
 - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
 - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE
- Remove dual-mass flywheel --> **Dual-mass flywheel, 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.**

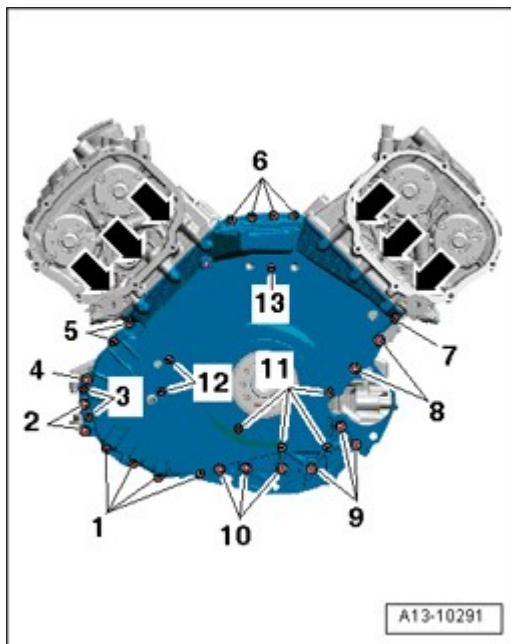


Fig. 175: Removing Bolts And Lower Timing Chain Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Remove bolts - **1 to 13** - and remove lower timing chain cover.
- Press rear crankshaft seal 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.

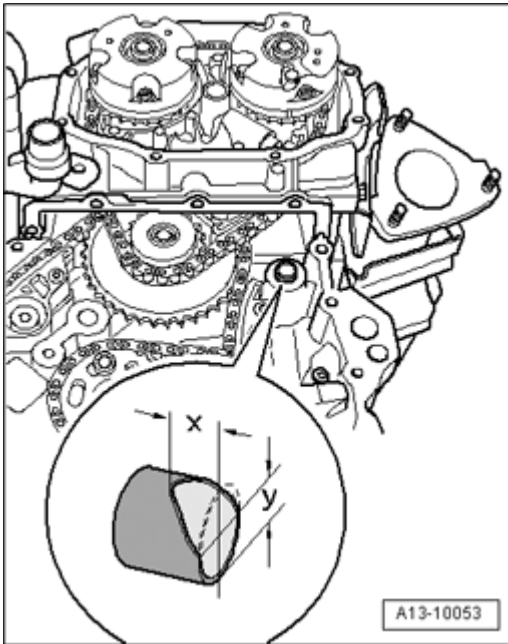


Fig. 176: Chamfer Alignment Bushing With File
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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.

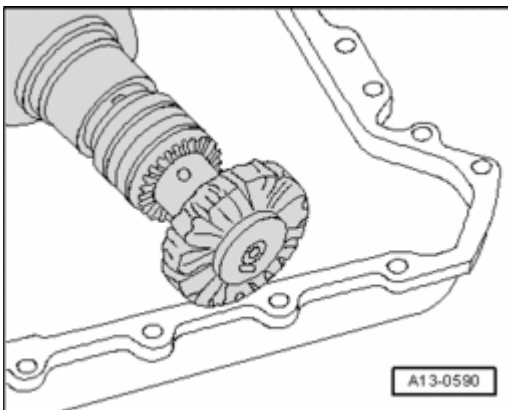


Fig. 177: Using Rotating Plastic Brush To Remove Any Sealant Residue From Sealing Flange, Cylinder Block And Upper Part Of Oil Pan

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

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

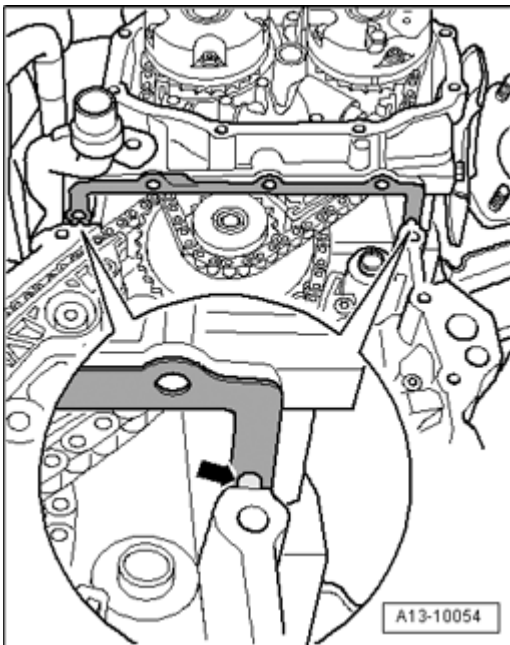


Fig. 178: Cleaning Old Sealant From Holes In Cylinder Head Gaskets

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

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

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

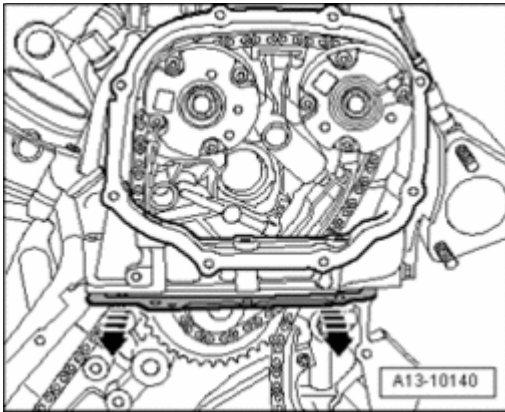


Fig. 179: Bending Ends Of Cylinder Head Gaskets Very Slightly Downward Until Upper Sealing Surface Of Gasket And Cylinder Head Can Be Cleaned

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

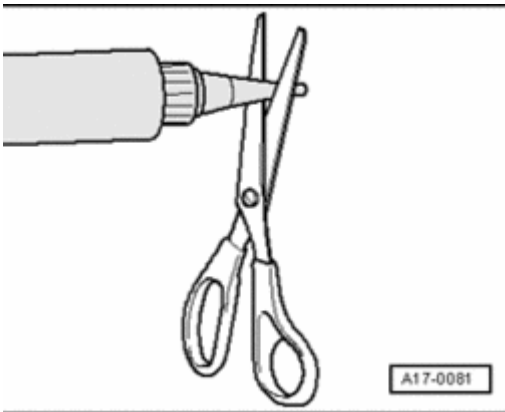


Fig. 180: Cutting Tube Nozzle At Front Marking

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

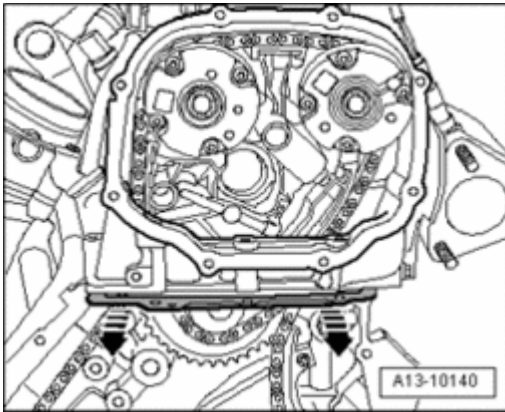


Fig. 181: Bending Ends Of Cylinder Head Gaskets Very Slightly Downward Until Upper Sealing Surface Of Gasket And Cylinder Head Can Be Cleaned

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

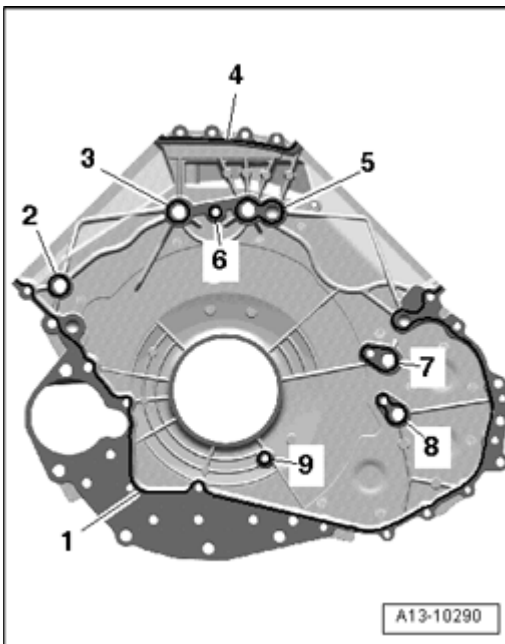


Fig. 182: Applying Sealant Beads On Clean Sealing Surfaces Of Lower Timing Chain Cover

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:

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

sealant.

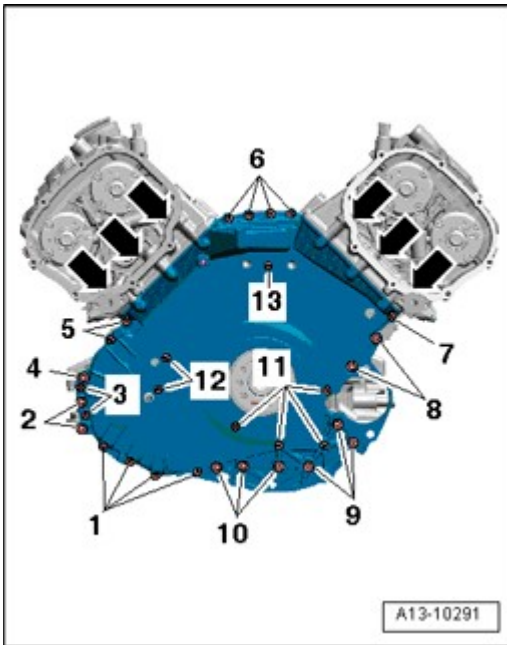


Fig. 183: Removing/Installing Bolts And Lower Timing Chain Cover
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set lower timing chain cover in place, guiding cover at an angle from below onto cylinder block sealing surface and cylinder head.
- When installing, make sure that the cylinder head gaskets do not become damaged. A damaged gasket must be replaced.
- Tighten bolts as follows:
 - Insert bolts - **arrows** - with locking compound and tighten to 5 Nm with torque wrench.
 - Tighten bolts - **1 to 13** - in diagonal sequence to 8 Nm with torque wrench.
 - Tighten bolts - **arrows** - to 8 Nm with torque wrench.
 - Tighten bolts - **2, 4, 8, 9, 10** - to 22 Nm with torque wrench.
 - Tighten bolts - **1, 3, 5, 6, 7, 11, 12, 13** - an additional 90 ° ($\frac{1}{4}$ turn) in a diagonal sequence using a rigid wrench.
 - Tighten bolts - **arrows** - 90 ° ($\frac{1}{4}$ 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**.
- Install dual-mass flywheel --> **Dual-mass flywheel, removing and installing**.
- Install clutch pressure plate -->
 - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
 - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
 - **30 CLUTCH** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
 - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE
 - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
 - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE
- Install engine --> **Engine, installing**.
- Add engine oil and check oil level --> **Oil level, checking**.

Torque specifications

Component			Nm
Lower timing chain cover to	Cylinder head		8 + 90 ° 1)2)3)
Cylinder block	M6	8 + 90 ° 2)3)	
		M8	22
• 1) Insert with locking compound; locking compound . • 2) Replace bolts. • 3) 90 ° corresponds to a quarter turn.			

Camshaft timing chain, component overview

Left camshaft timing chain

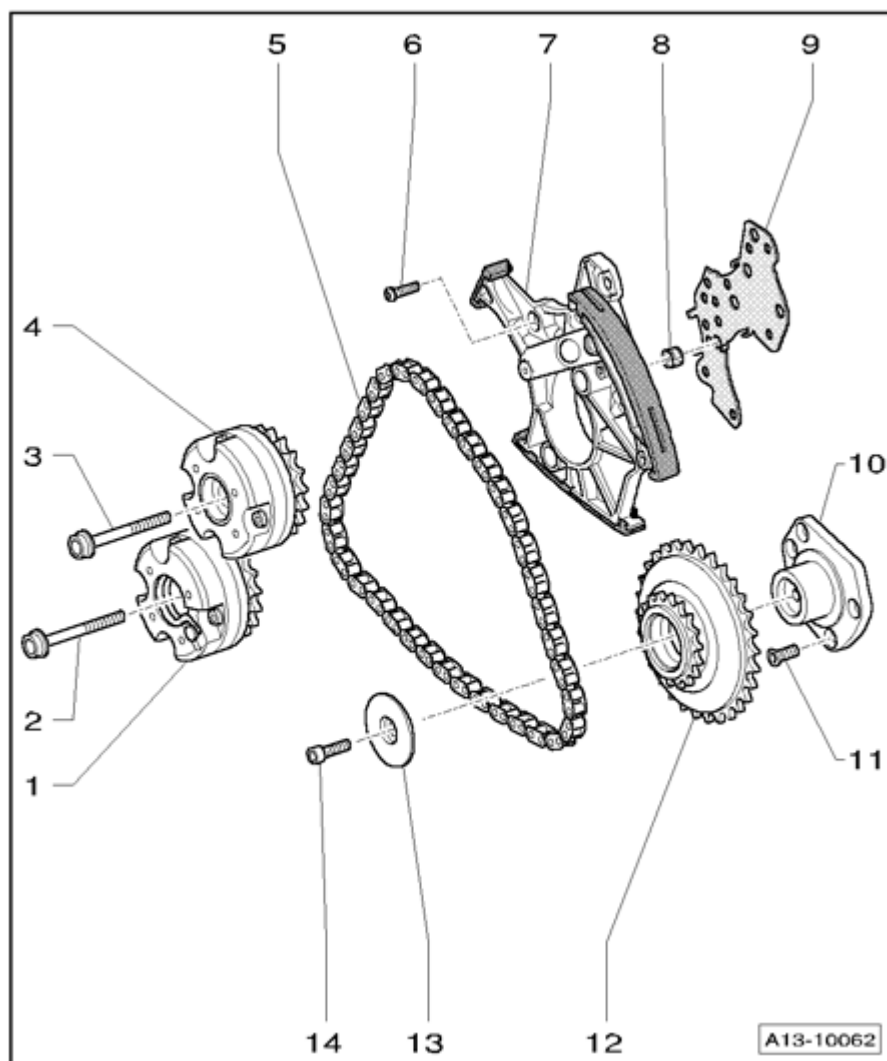


Fig. 184: Left Camshaft Timing Chain

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 torque: 60 Nm
- Final tightening torque: 80 Nm plus an additional 90 ° (1 / 4 turn)

3 - Camshaft bolt

- Replace
- Initial tightening torque: 60 Nm
- Final tightening torque: 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 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 - Chain tensioner for left camshaft timing chain

- Removing and installing --> **Camshaft timing chain, removing and installing**

8 - Oil strainer

- Set into chain tensioner
- Observe locating tabs on circumference

9 - Gasket

- Replace
- Clipped onto chain tensioner

10 - Mounting bracket for drive sprocket

11 - 5 Nm plus an additional 90° ($1/4$ turn)

- Replace

12 - Drive sprocket for left camshaft timing chain

13 - Thrust washer for drive sprocket

14 - 5 Nm plus an additional 60 ° ($\frac{1}{6}$ turn)

- Replace

Right camshaft timing chain

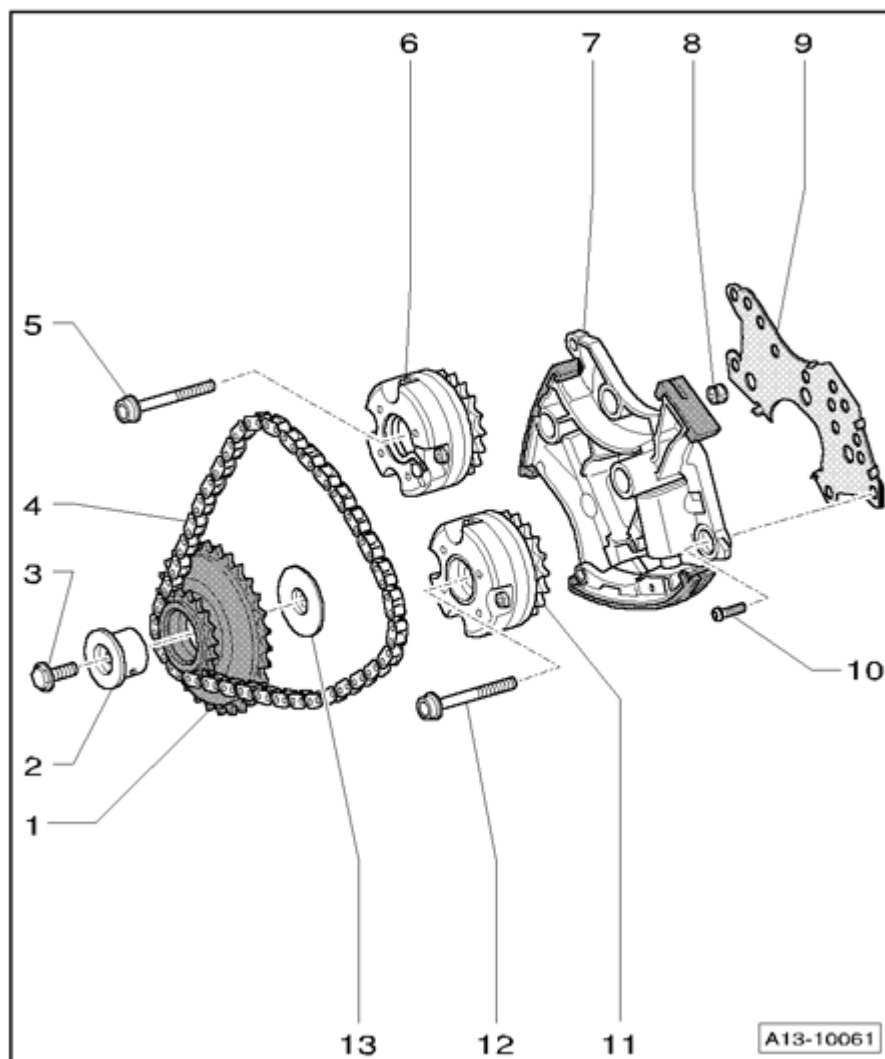


Fig. 185: Right Camshaft Timing Chain

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 1 - Drive sprocket for right camshaft timing chain
- 2 - Mounting bracket for drive sprocket
- 3 - 42 Nm
- 4 - 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**

5 - Camshaft bolt

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

6 - Camshaft adjuster for intake camshaft

- Identification "Intake"
- Removing and installing --> **Camshaft timing chain, removing and installing**

7 - Chain tensioner for right camshaft timing chain

- Removing and installing --> **Camshaft timing chain, removing and installing**

8 - Oil strainer

- Set into chain tensioner
- Installed location: Locating tabs on circumference

9 - Gasket

- Replace
- Clipped onto chain tensioner

10 - 5 Nm plus an additional 90° ($1/4$ turn)

- Replace

11 - Camshaft adjuster for exhaust camshaft

- Identification "Exhaust"
- Removing and installing --> **Camshaft timing chain, removing and installing**

12 - Camshaft bolt

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

13 - Thrust washer for drive sprocket

Camshaft timing chains, removing from camshafts

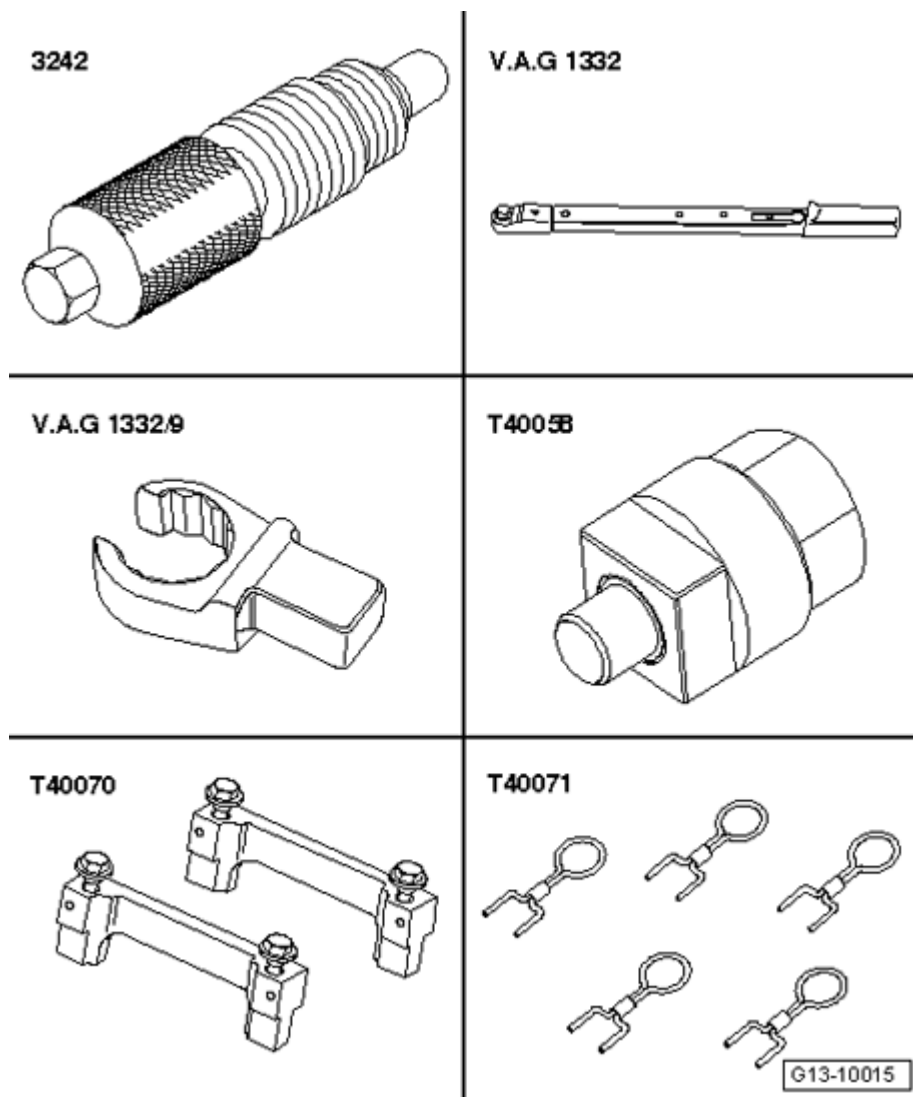
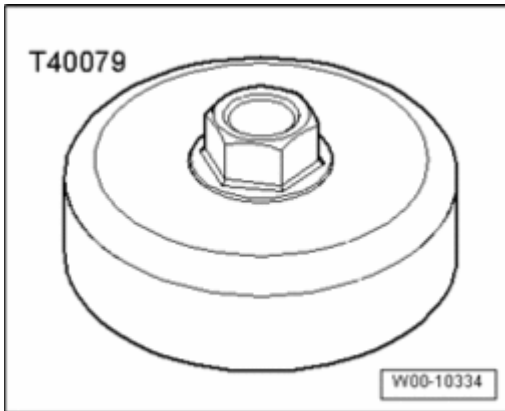


Fig. 186: Identifying Special Tools - Camshaft Timing Chains, Removing From Camshafts
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

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

Special tools, testers and auxiliary items required

**Fig. 187: Adapter T40079**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

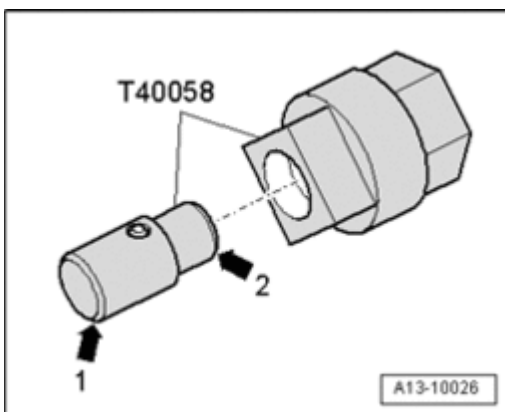
- Adapter T40079

Removing

NOTE:

- According to the following description, the timing chains for camshafts remain on engine.
- Even if work is performed only on one of the cylinder heads, the procedure described must be followed, since then the valve timing at both cylinder heads must be adjusted.

- Remove engine --> **Engine, removing.**
- Leave engine with transmission installed on scissor lift platform VAS 6131.
- Remove left and right timing chain covers --> **Left and right timing chain covers, removing and installing.**
- Remove cylinder head cover: Left --> **Left cylinder head cover, removing and installing** , right --> **Right cylinder head cover, removing and installing.**

**Fig. 188: Inserting Guide Pin Of Adapter T40058**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

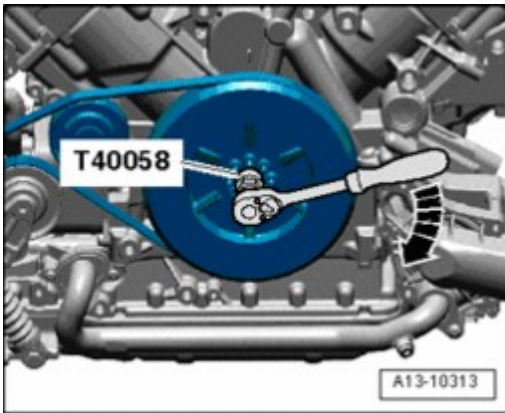


Fig. 189: Using Socket T40058 To Rotate Crankshaft To TDC
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

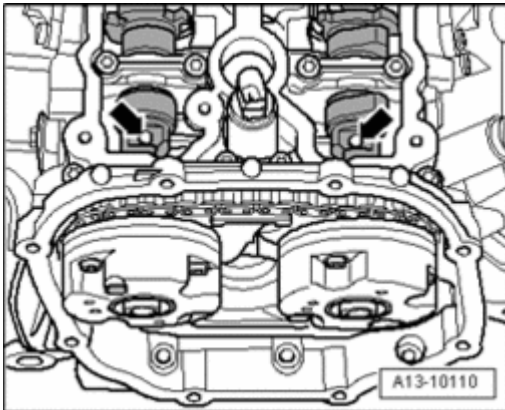


Fig. 190: Identifying Threaded Holes In Camshafts Must Face Upward
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

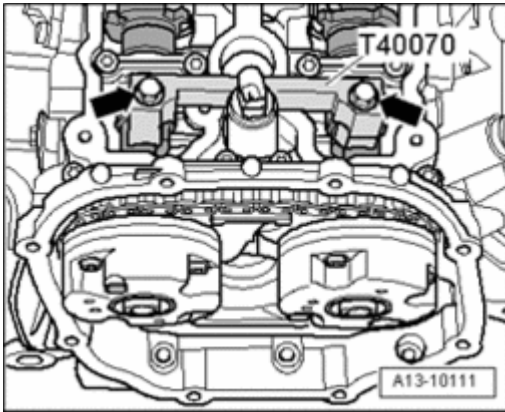


Fig. 191: Removing/Installing Camshaft Locators T40070 On Both Cylinder Heads
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

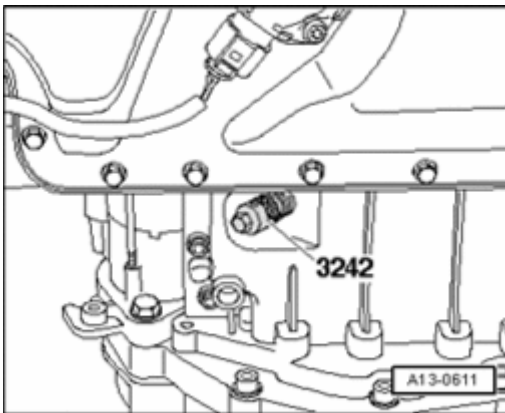


Fig. 192: Removing/Installing Drain Plug From Upper Section Of Oil Pan
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove drain plug from upper section of oil pan.

CAUTION: Do not turn crankshaft while touching TDC hole with finger - Risk of injury.

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

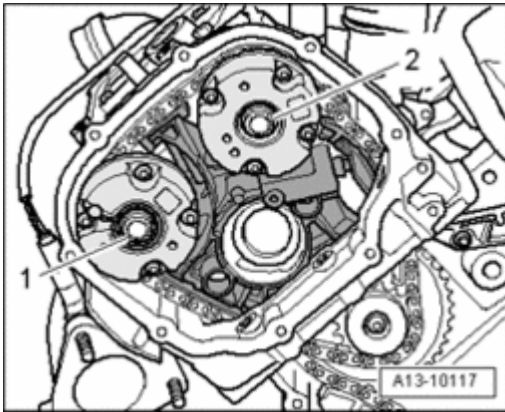


Fig. 193: Removing/Installing Camshaft Adjuster Screws On Left Cylinder Head
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Identify installation position of camshaft adjuster with paint to make reinstallation easier.
- Remove camshaft adjuster screws - 1 - and - 2 - on left cylinder head.
- Remove both camshaft adjusters.

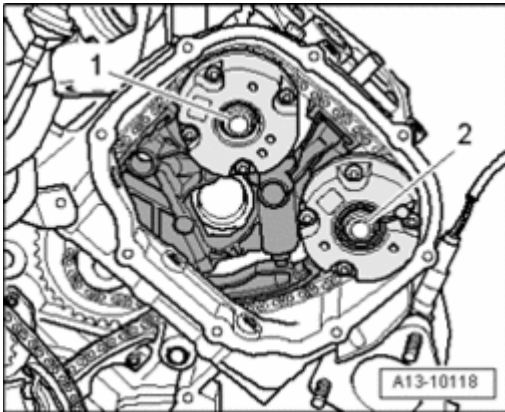


Fig. 194: Removing/Installing Camshaft Adjuster Screws On Right Cylinder Head
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Identify installation position of camshaft adjuster with paint to make reinstallation easier.
- Remove camshaft adjuster screws - 1 - and - 2 - on right cylinder head.
- 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.

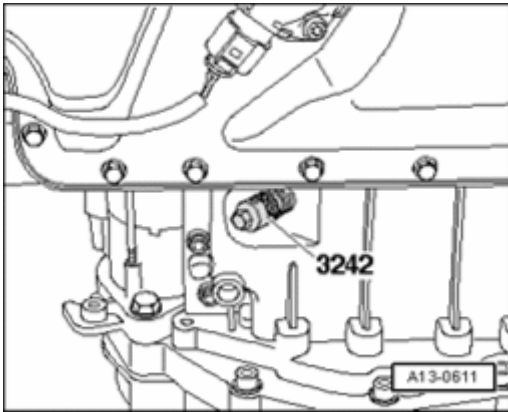


Fig. 195: Removing/Installing Drain Plug From Upper Section Of Oil Pan
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive chain for timing mechanism installed --> **Drive chain for timing mechanism, removing and installing.**
- Secure crankshaft in TDC position using crankshaft holder 3242.

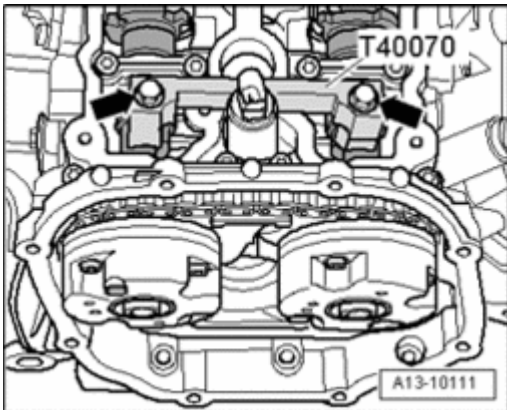


Fig. 196: Removing/Installing Camshaft Locators T40070 On Both Cylinder Heads
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Camshaft locating tool T40070 mounted on both cylinder heads and tightened to 25 Nm.

NOTE:

- The chain tensioner is removed in the following illustration.

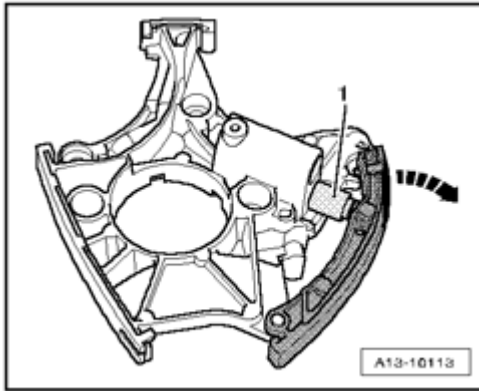


Fig. 197: Releasing Chain Tensioner Glide Track For Camshaft Timing Chain
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Completely release chain tensioner glide track for camshaft timing chain - **arrow** - by laying timing chain slightly to side.
- The chain tensioner piston - **1** - must be driven out completely, thereby releasing the retainer.

NOTE:

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

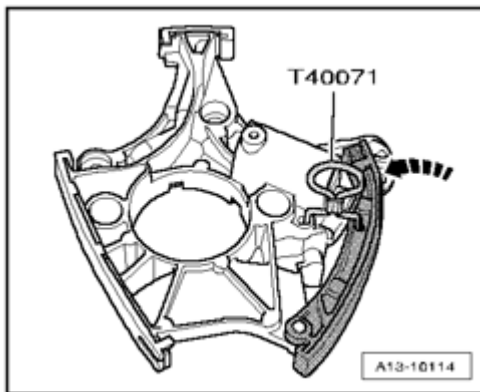


Fig. 198: Pressing Guide Rail Of Left/Right Camshaft Timing Chain Inward Up To Stop And Secure Chain Tensioner With Securing Pin T40071
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press guide rail of the left and right camshaft timing chain inward - **arrow** - up to stop and secure chain tensioner with securing pin T40071.

NOTE:

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

- Replace camshaft bolts.

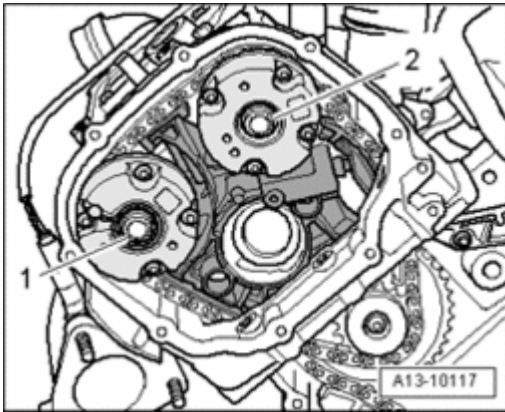


Fig. 199: Removing/Installing Camshaft Adjuster Screws On Left Cylinder Head
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place camshaft timing chain onto drive sprocket and onto camshaft adjusters and loosely thread in bolts - 1 - and - 2 -.
- Both camshaft adjusters must be able to still be rotated on camshaft and must not tip.
- Remove Locking Pin T40071.

NOTE:

- **Reinstall right camshaft adjuster according to mark applied during removal.**

- Replace camshaft bolts.

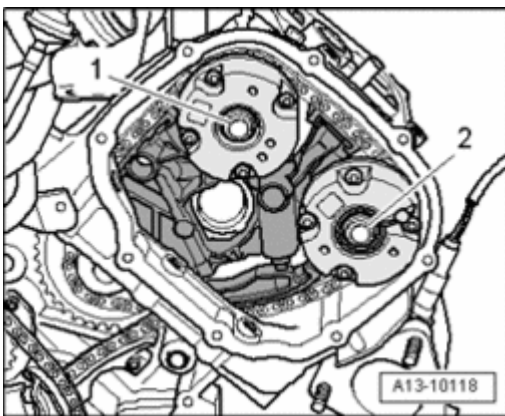


Fig. 200: Removing/Installing Camshaft Adjuster Screws On Right Cylinder Head
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place camshaft timing chain onto drive sprocket and onto camshaft adjusters and loosely thread in bolts - 1 - and - 2 -.
- Both camshaft adjusters must be able to still be rotated on camshaft and must not tip.
- Remove Locking Pin T40071.

NOTE:

- A 2nd technician is needed for further work.

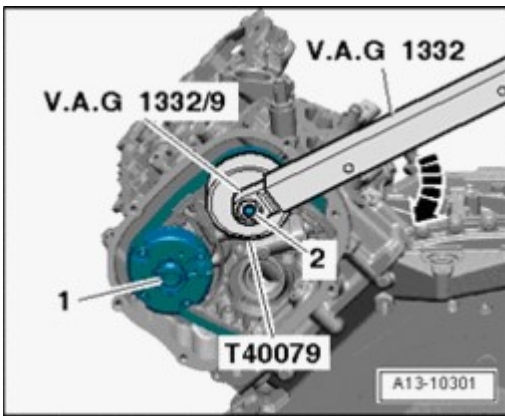


Fig. 201: Positioning Adapter T40079 On Intake Camshaft Adjuster At Left Cylinder Head
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position Adapter 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 Adapter T40079.
- Pre-tension camshaft adjuster to 40 Nm in direction of - **arrow** - and hold tension.
- Tighten bolts - 1 - on exhaust camshaft simultaneously to initial torque.
- Torque specification: 60 Nm.
- Continue holding pretension on exhaust camshaft and pre-torque bolt - 2 - on exhaust camshaft.
- Torque specification: 60 Nm.

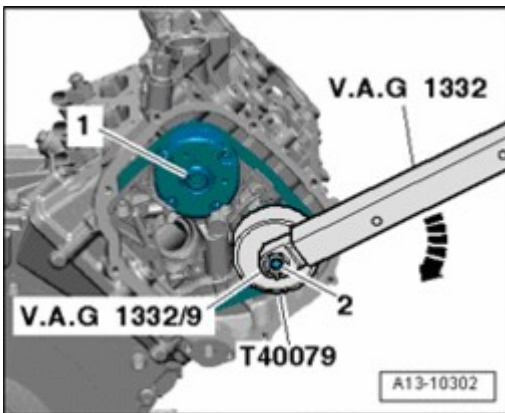


Fig. 202: Positioning Adapter T40079 On Exhaust Camshaft Adjuster At Right Cylinder Head
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position Adapter 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 Adapter T40079.
- Pretension camshaft adjuster to 40 Nm in direction of - **arrow** - and hold tension.

- Tighten bolt - **1** - on intake camshaft simultaneously to initial torque.
- Torque specification: 60 Nm.
- Continue holding pretension on exhaust camshaft and pre-torque bolt - **2** - on exhaust camshaft.
- Torque specification: 60 Nm.
- Remove Adapter T40079.

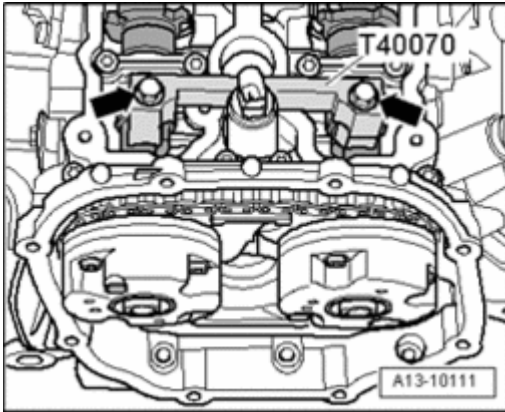


Fig. 203: Removing/Installing Camshaft Locators T40070 On Both Cylinder Heads
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove camshaft locators T40070 on both cylinder heads.

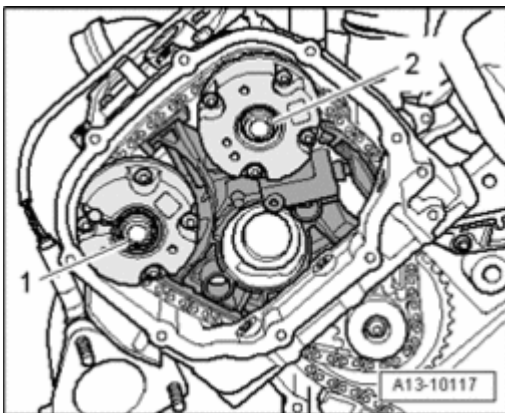


Fig. 204: Removing/Installing Camshaft Adjuster Screws On Left Cylinder Head
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

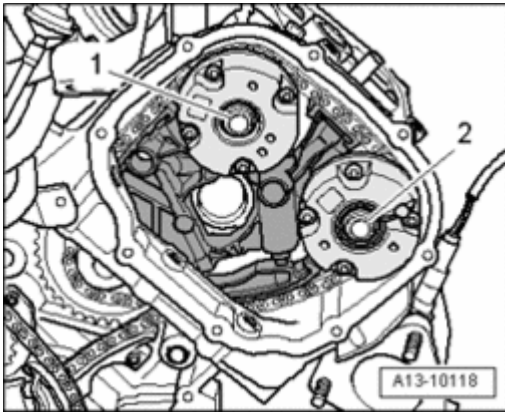


Fig. 205: Removing/Installing Camshaft Adjuster Screws On Right Cylinder Head
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

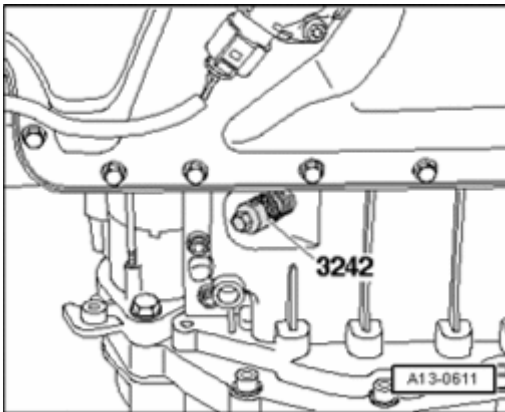


Fig. 206: Removing/Installing Drain Plug From Upper Section Of Oil Pan
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove crankshaft holder 3242.

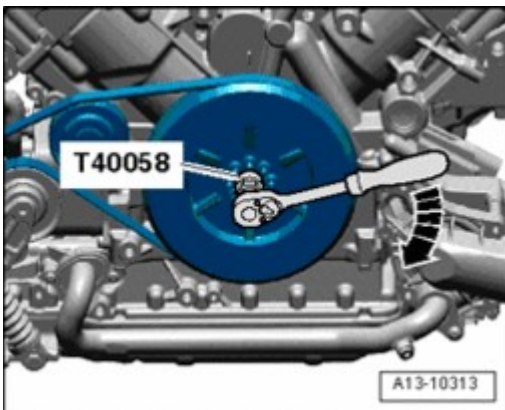


Fig. 207: Using Socket T40058 To Rotate Crankshaft To TDC
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

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

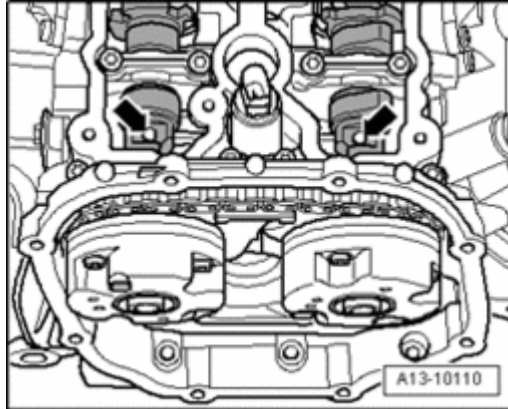


Fig. 208: Identifying Threaded Holes In Camshafts Must Face Upward
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

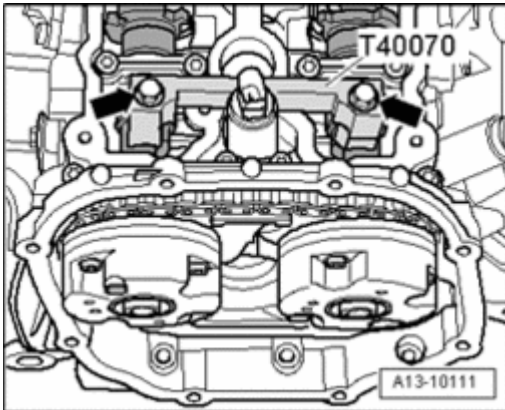


Fig. 209: Removing/Installing Camshaft Locators T40070 On Both Cylinder Heads
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Mount camshaft locating tools T40070 to 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.

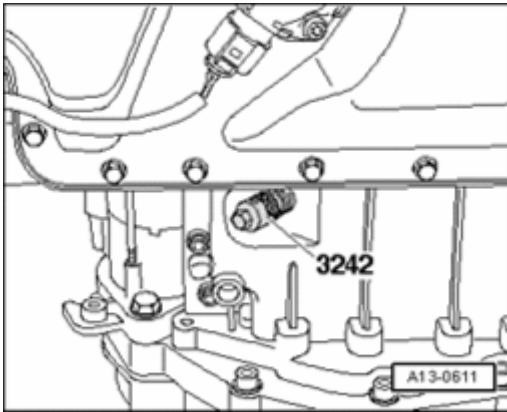


Fig. 210: Removing/Installing Drain Plug From Upper Section Of Oil Pan
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install Crankshaft Holder 3242 in bore and tighten to 20 Nm.
- The Crankshaft Holder 3242 must engage in locating hole of crankshaft, otherwise repeat adjustment.
- Remove camshaft locating tools on both cylinder heads.
- Remove crankshaft holder 3242.
- Install sealing plug of TDC-marking with new sealing ring into upper section of oil pan.

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

- Install left and right timing chain covers --> **Left and right timing chain covers, 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.**

Torque specifications

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

Camshaft timing chain, removing and installing

Special tools, testers and auxiliary items required

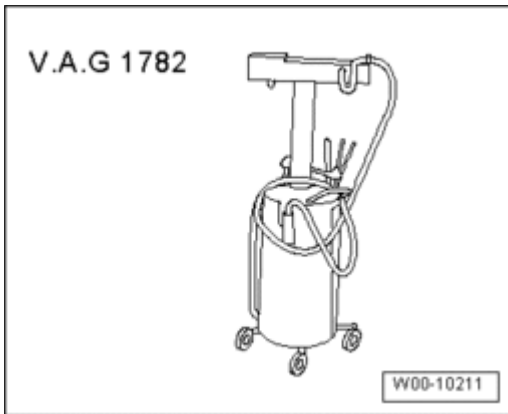


Fig. 211: Identifying Old Oil Collecting And Extracting Device V.A.G 1782
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Removing

NOTE:

- Even if work is performed only on one of the cylinder heads, the procedure described must be followed, since then the valve timing at both cylinder heads must be adjusted.

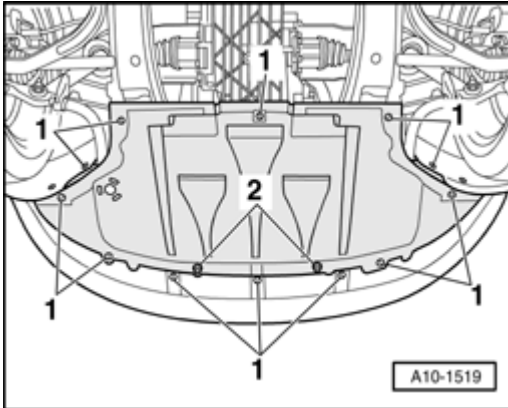


Fig. 212: Removing Quick-Release Fasteners, Screws And Noise Insulation
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove quick-release fasteners - 1 - , remove screws - 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 or secure engine to assembly stand --> **Engine, securing to assembly stand.**
- Remove clutch pressure plate -->

- **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
 - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
 - **30 CLUTCH** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
 - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE
 - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
 - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE
- .
- Remove dual-mass flywheel --> **Dual-mass flywheel, 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 - 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.**
 - Remove camshaft timing chains from camshafts --> **Camshaft timing chains, removing from camshafts.**
 - Mark running direction of left camshaft timing chain with paint.

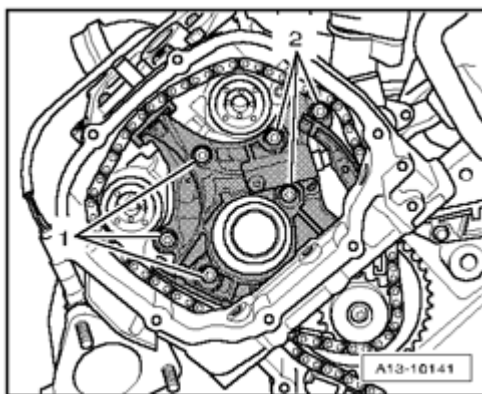


Fig. 213: Removing Bolts, Left Chain Tensioner And Left Camshaft Timing Chain
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

- **Ensure tensioning piston does not slip out of chain tensioner and fall to ground.**

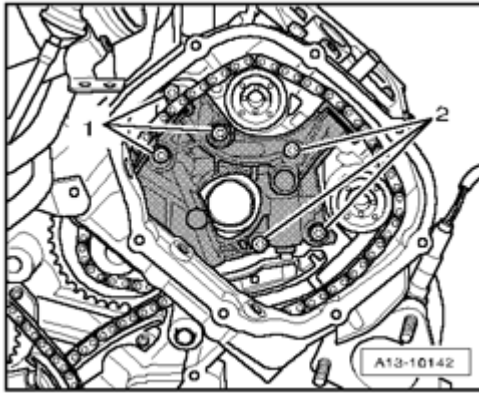


Fig. 214: Removing Bolts, Right Chain Tensioner And Right Camshaft Timing Chain
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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.

NOTE:

- **Ensure tensioning piston does not slip out of chain tensioner and fall to the ground.**

Installing

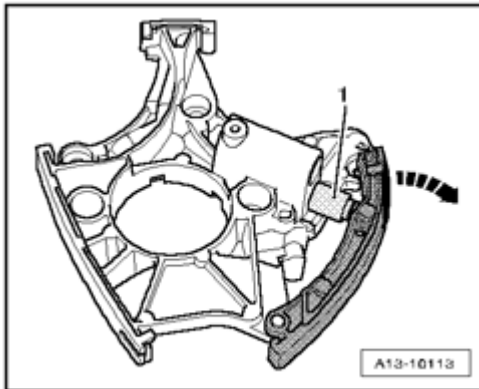


Fig. 215: Releasing Chain Tensioner Glide Track For Camshaft Timing Chain
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Completely release glide track at left and right removed chain tensioner for camshaft timing chain - arrow -.
- The chain tensioner piston - 1 - must be driven out completely, thereby releasing the retainer.

NOTE:

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

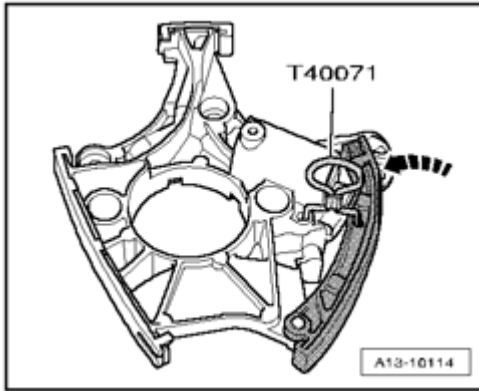


Fig. 216: Pressing Guide Rail Of Left/Right Camshaft Timing Chain Inward Up To Stop And Secure Chain Tensioner With Securing Pin T40071

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press guide rail of left and right camshaft timing chain inward - **arrow** - up to stop and secure chain tensioner with securing pin T40071.

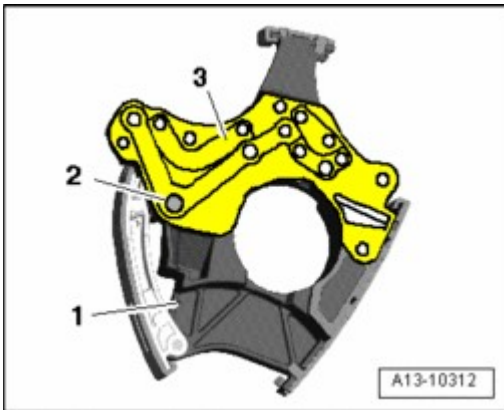


Fig. 217: Placing New Gasket Onto Rear Of Chain Tensioner

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

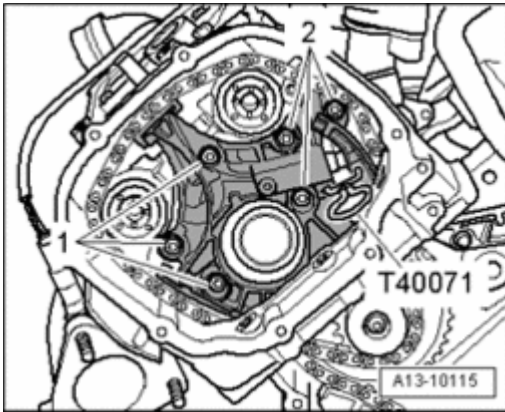


Fig. 218: Tightening Bolts & Replacing Camshaft Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set chain tensioner in place on left cylinder head and install camshaft timing chain, as shown in illustration.
- Tighten bolts - 1 - and - 2 -.

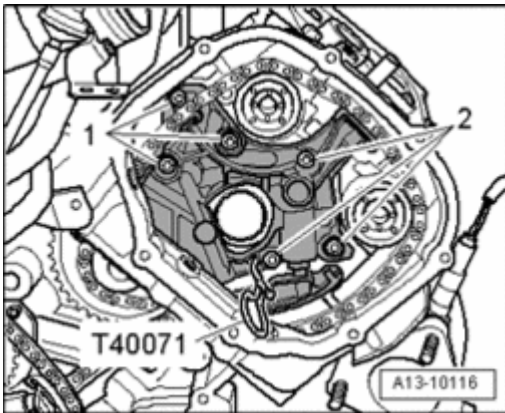


Fig. 219: Tightening Bolts & Replacing Camshaft Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set chain tensioner in place on right cylinder head and install camshaft timing chain, as shown in the illustration.
- Tighten bolts - 1 - and - 2 -.

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

- Position camshaft timing chains on camshafts **Installing**.
- Install lower timing chain cover --> **Lower timing chain cover, removing and installing**.
- 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**.
- Install cylinder head cover: Left --> **Left cylinder head cover, removing and installing**, right --> **Right**

cylinder head cover, removing and installing.

- Install dual-mass flywheel --> **Dual-mass flywheel, removing and installing.**
- Install clutch pressure plate -->
 - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
 - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
 - **30 CLUTCH** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
 - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE
 - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
 - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE
- Install engine --> **Engine, installing.**
- Add engine oil and check oil level --> **Oil level, checking.**

Torque specifications

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

Drive chain for timing mechanism, component overview

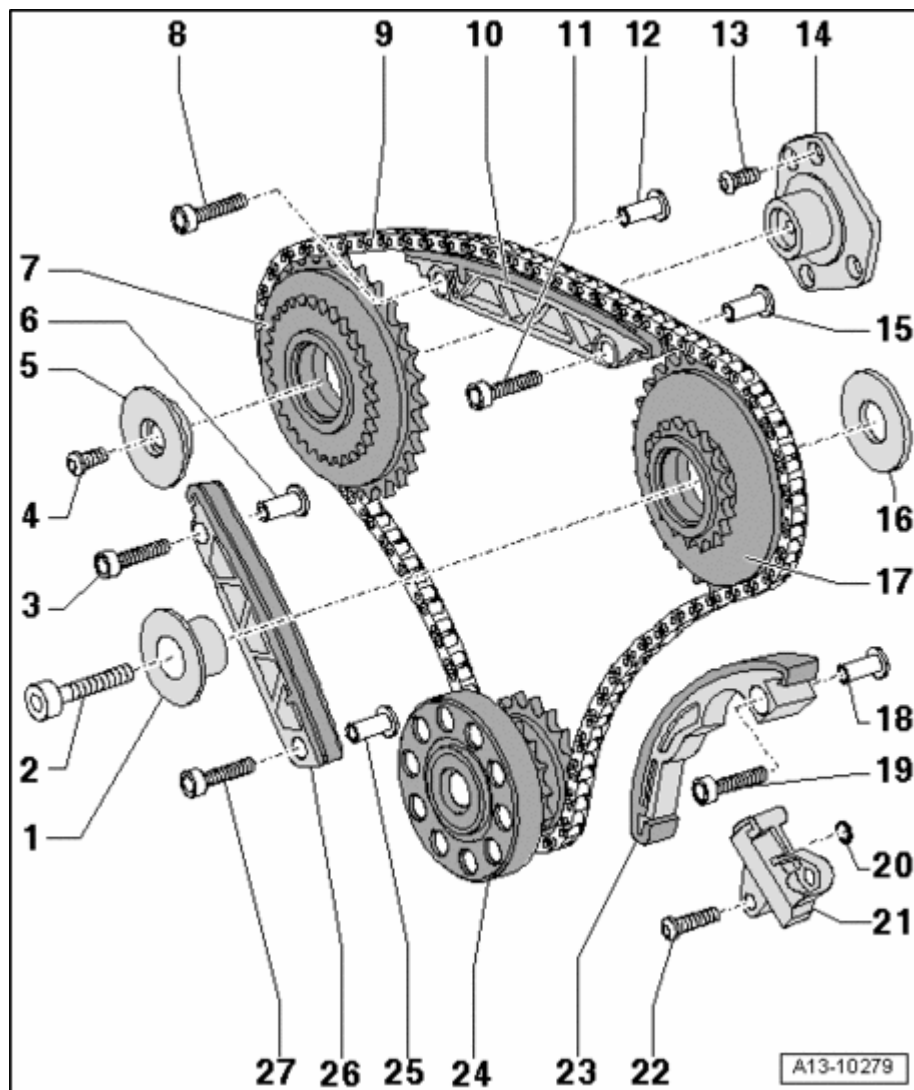


Fig. 220: Drive Chain For Timing Mechanism, Component Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Pivot pin for drive sprocket

2 - 42 Nm

3 - 10 Nm plus an additional 90° ($1\frac{1}{4}$ turn)

- Replace

4 - 5 Nm plus an additional 60° ($1\frac{1}{6}$ turn)

- Replace

5 - Thrust washer for drive sprocket

6 - Mounting pin

7 - Drive sprocket for left timing chain

8 - 10 Nm plus an additional 90 ° ($\frac{1}{4}$ turn)

- Replace

9 - Drive chain for timing mechanism

- Before removing, mark direction of rotation with paint. Reversing rotation direction of a used chain can destroy it
- Removing and installing --> **Drive chain for timing mechanism, removing and installing**

10 - Guide rail

11 - 10 Nm plus an additional 90 ° ($\frac{1}{4}$ turn)

- Replace

12 - Mounting pin

13 - 5 Nm plus an additional 90 ° ($\frac{1}{4}$ turn)

- Replace

14 - Mounting bracket for drive sprocket

15 - Mounting pin

16 - Thrust washer

17 - Drive sprocket for right timing chain

18 - Mounting pin

19 - 10 Nm plus an additional 90 ° ($\frac{1}{4}$ turn)

- Replace

20 - O-ring

- Replace

21 - Chain tensioner

22 - 5 Nm plus an additional 90 ° ($\frac{1}{4}$ turn)

- Replace

23 - Glide track for chain tensioner

24 - Crankshaft

25 - Mounting pin

26 - Guide rail

27 - 10 Nm plus an additional 90 ° ($\frac{1}{4}$ turn)

- Replace

Drive chain for timing mechanism, removing and installing

Special tools, testers and auxiliary items required

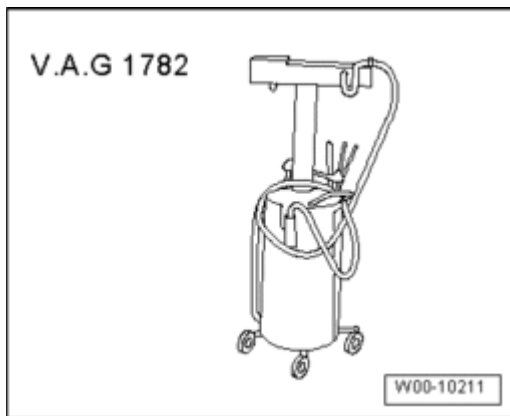


Fig. 221: Identifying Old Oil Collecting And Extracting Device V.A.G 1782
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

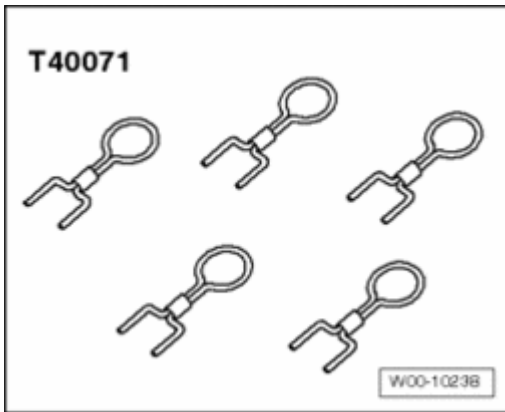


Fig. 222: Securing Pin T40071

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Securing pin T40071

Removing

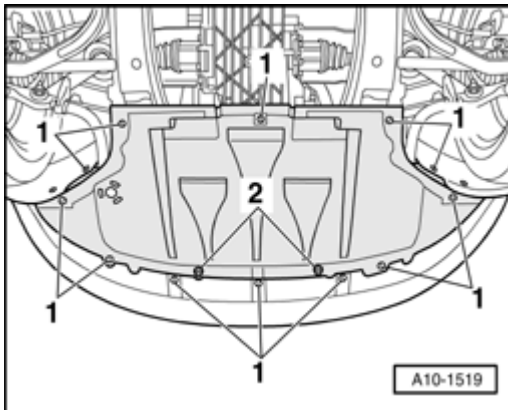


Fig. 223: Removing Quick-Release Fasteners, Screws And Noise Insulation

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove quick-release fasteners - **1** - , remove screws - **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 or secure engine to assembly stand --> **Engine, securing to assembly stand.**
- Remove clutch pressure plate -->
 - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
 - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
 - **30 CLUTCH** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
 - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE

- **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
 - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE
- .
- Remove dual-mass flywheel --> **Dual-mass flywheel, 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 chain for power take-off --> **Power take-off drive chain, removing and installing.**

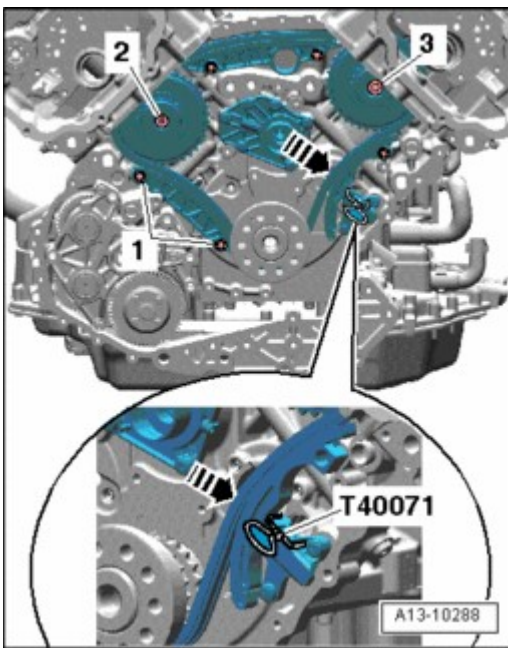


Fig. 224: Pushing Drive Chain Tensioner Guide Rail In And Securing Chain Tensioner Using Locking Pin T40071

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 running direction of timing chain with paint.
- Remove bolts - **1** - and remove guide rail.
- Remove bolts - **2** - and - **3** - and remove sprocket with drive chain.

Installing

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

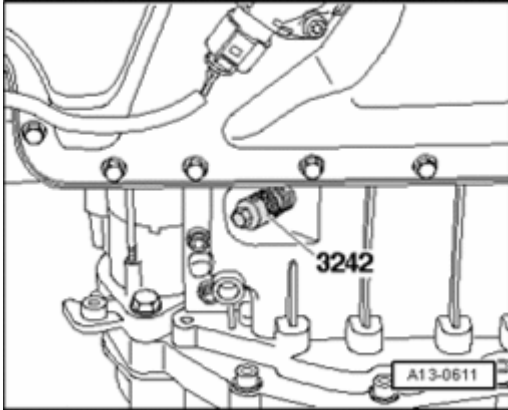


Fig. 225: Securing Crankshaft In TDC Position Using Crankshaft Holder 3242
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure crankshaft in TDC position using crankshaft holder 3242.

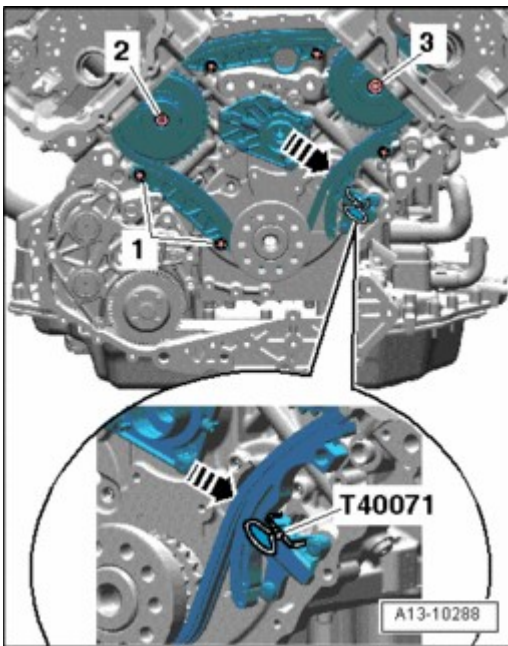


Fig. 226: Pushing Drive Chain Tensioner Guide Rail In And Securing Chain Tensioner Using Locking Pin T40071

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- First, install left camshaft timing chain sprocket - **2** -.
- Install guide rail - **1** - with installed drive chain.
- Now install right camshaft timing chain sprocket - **3** -.
- Press drive chain tensioner guide rail in direction of - **arrow** - and pull securing pin T40071 out of the

chain tensioner.

- Install chain for power take-off --> **Power take-off drive chain, removing and installing.**
- Install camshaft timing chains **Installing.**
- Install lower timing chain cover --> **Lower timing chain cover, removing and installing.**
- Install crankshaft seal, timing chain side --> **Crankshaft seal (timing chain side), replacing.**
- Install oil filter housing --> **Oil filter housing, removing and installing.**
- Install intake manifold --> **24 - MULTIPOINT FUEL INJECTION (MPI) .**
- Install left and right timing chain covers --> **Left and right timing chain covers, removing and installing.**
- Install cylinder head cover: Left --> **Left cylinder head cover, removing and installing** , right --> **Right cylinder head cover, removing and installing.**
- Install dual-mass flywheel --> **Dual-mass flywheel, removing and installing.**
- Install clutch pressure plate -->
 - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
 - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
 - **30 CLUTCH** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
 - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE
 - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
 - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE
- Install engine --> **Engine, installing.**
- Add engine oil and check oil level --> **Oil level, checking.**

Torque specifications

Component	Nm
Left drive sprocket to mounting bracket	5 + 60 ° 1)2)
Right drive sprocket to cylinder block	42
● 1) Replace bolts. ● 2) 60 ° corresponds to a 1/6 turn.	

Power take-off drive chain, component overview

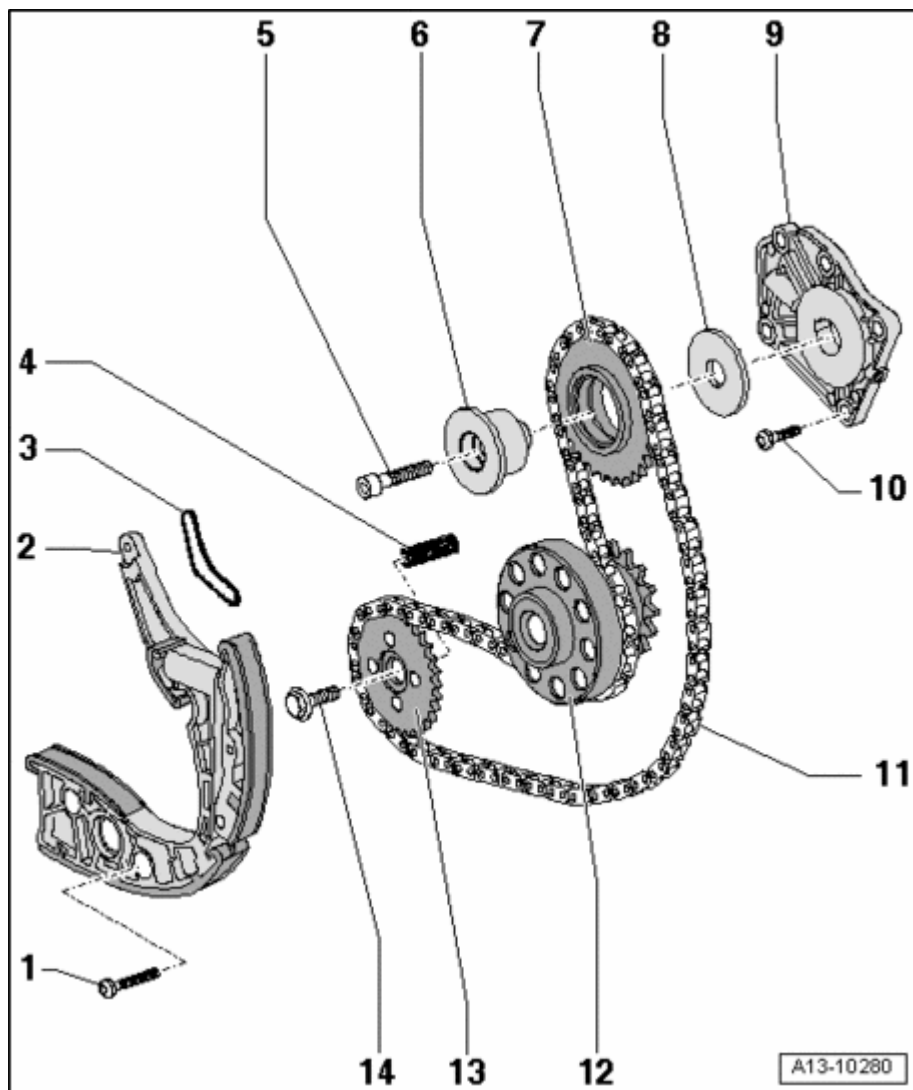


Fig. 227: Power Take-Off Drive Chain, Component Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - 9 Nm

2 - Chain tensioner

- With glide track

3 - Gasket

- Replace

4 - Spring

5 - 42 Nm

6 - Pivot pin for idler sprocket

7 - Idler sprocket for chain for power take-off

8 - Thrust washer

- Depending on version

9 - Mounting bracket for idler chain sprocket

10 - 9 Nm

11 - Power take-off drive chain

- Before removing, mark direction of rotation with paint. Reversing rotation direction of a used chain can destroy it.
- Removing and installing --> **Power take-off drive chain, removing and installing**

12 - Crankshaft

13 - Drive sprocket for power take-off

14 - 64 Nm

Power take-off drive chain, removing and installing

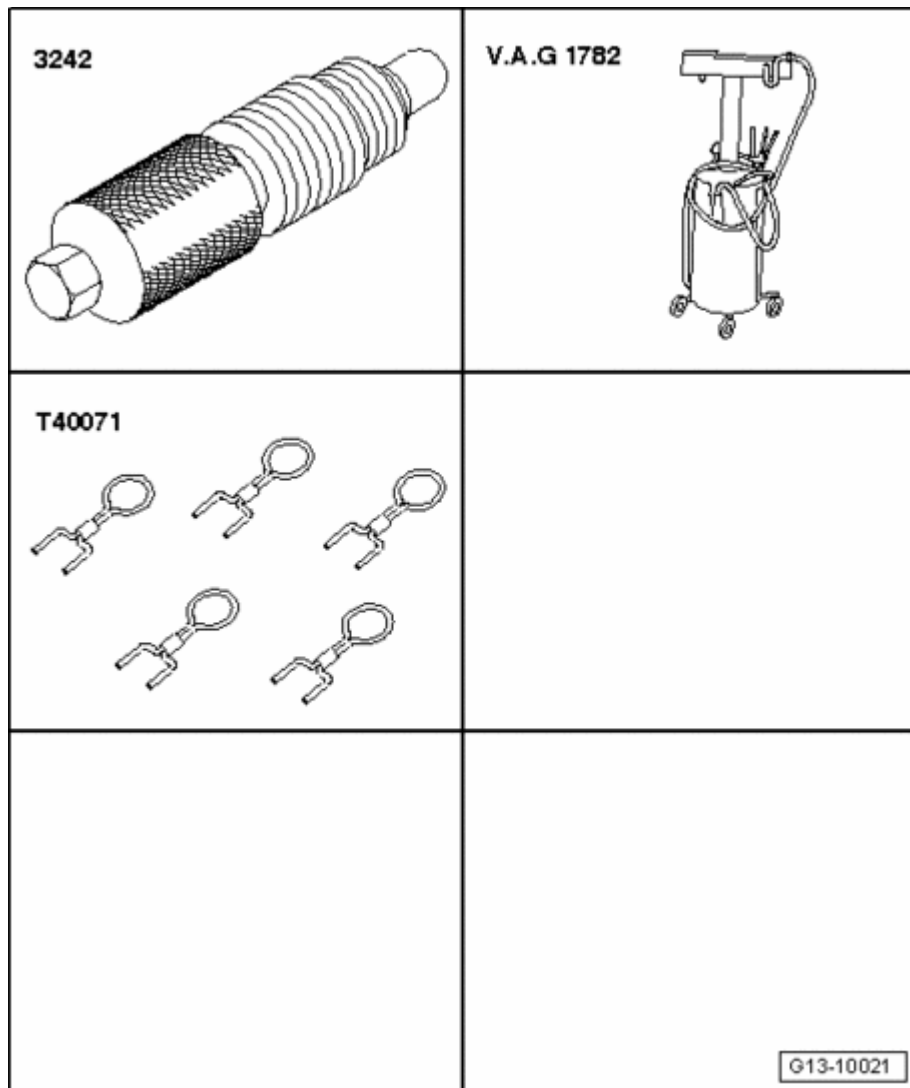


Fig. 228: Identifying Special Tools - Power Take-Off Drive Chain, Removing And Installing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Locking pin 3242
- Old oil collecting and extracting device V.A.G 1782
- Securing pin T40071

Removing

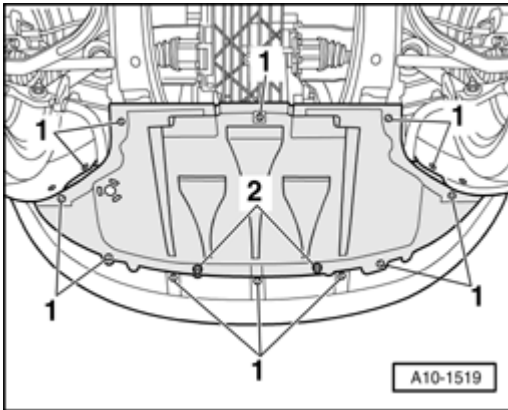


Fig. 229: Removing Quick-Release Fasteners, Screws And Noise Insulation
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove quick-release fasteners - **1** - , remove screws - **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 or secure engine to assembly stand --> **Engine, securing to assembly stand.**
- Remove clutch pressure plate -->
 - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
 - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
 - **30 CLUTCH** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
 - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE
 - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
 - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE
- Remove dual-mass flywheel --> **Dual-mass flywheel, 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.**
- Mark running direction of power take-off chain with paint.

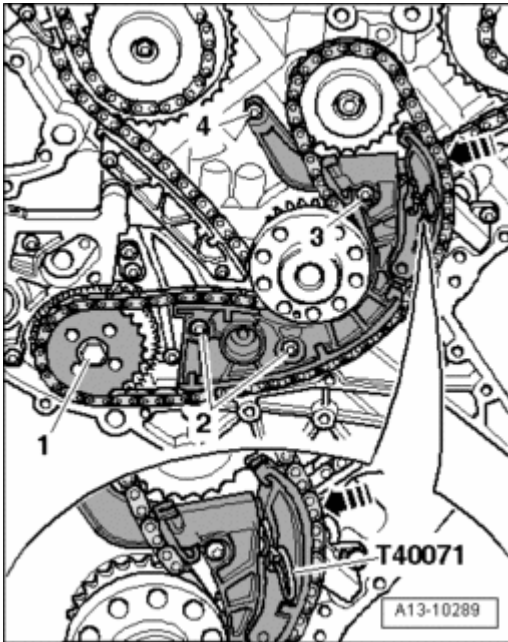


Fig. 230: Pressing Tensioning Rail In And Disconnect Chain Tensioner With Locking Pin T40071
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press tensioning rail in direction of - **arrow** - and disconnect chain tensioner with Locking Pin T40071.
- Remove bolt - **1** - and remove power take-off drive sprocket.

NOTE:

- **When removing, be careful of spring in drive spur gear shaft.**

- Remove bolts - **2 to 4** - and remove chain tensioner.
- Remove power take-off drive chain.

Installing

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

NOTE:

- **Replace gaskets.**

- 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 --> **Left and right timing chain covers, removing and installing.**
- Install dual-mass flywheel --> **Dual-mass flywheel, removing and installing.**
- Install clutch pressure plate -->

2008 Audi RS 4

ENGINE 4.2 Liter V8 4V Engine Mechanical, Engine Code(s): BNS

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

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

Torque specifications

Component	Nm
Chain tensioner on cylinder block	9
Power take-off drive sprocket to input shaft	64

Power take-off, assembly overview

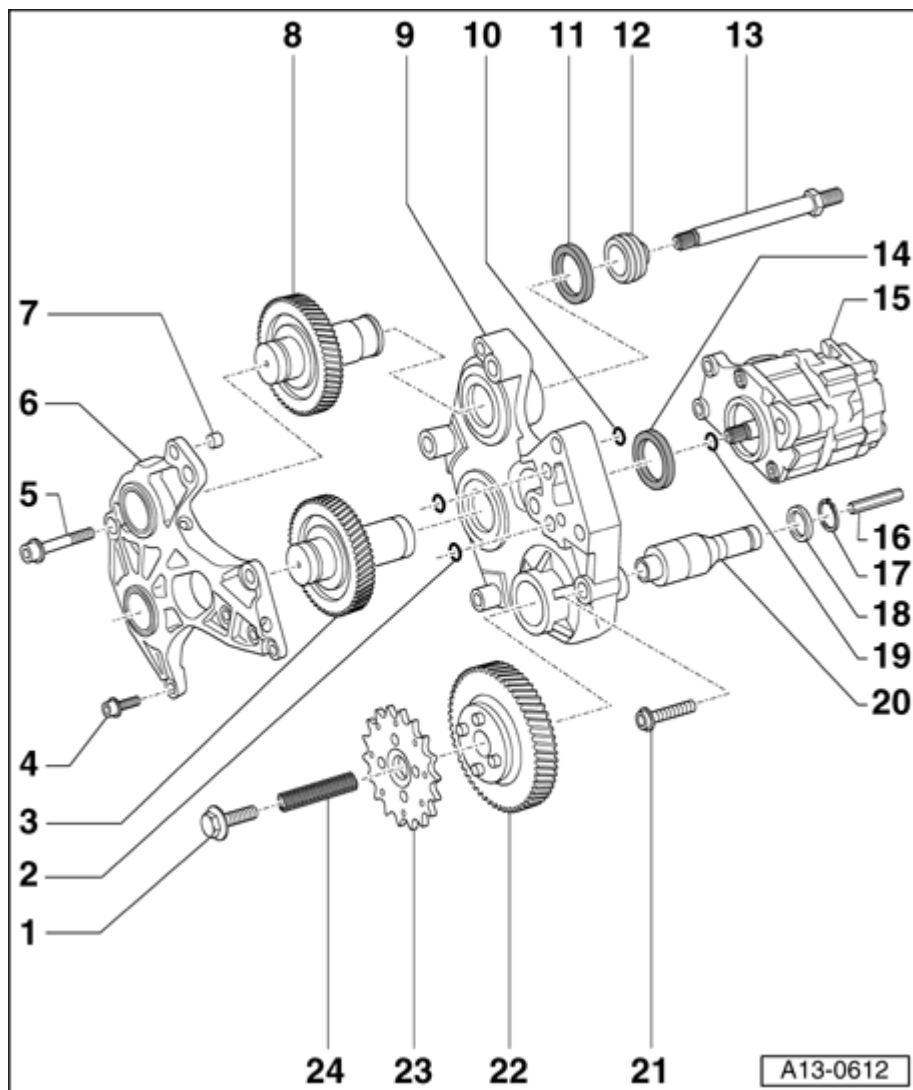


Fig. 231: Power Take-Off, Assembly Overview

Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - 64 Nm

2 - O-ring

- Replace

3 - Spur gear

- For power steering pump drive
- Cannot be replaced separately

4 - 9 Nm

5 - 22 Nm

6 - Rear bearing cap for spur gear unit

7 - Alignment bushing

- 2 pieces

8 - Spur gear

- For A/C compressor drive
- Cannot be replaced separately

9 - Front bearing cap for spur gear unit

10 - O-ring

- Replace

11 - Sealing ring for A/C compressor drive

- Replacing --> **Seals for power take-off, replacing.**

12 - Dust seal cap for A/C compressor drive

13 - Drive shaft for A/C compressor

- Tighten to 60 Nm

14 - Sealing ring for power-steering pump drive

- Replacing --> **Seals for power take-off, replacing.**

15 - Power-steering pump

16 - Drive shaft for oil pump

17 - Circlip

18 - Thrust washer

19 - O-ring

- Replace

20 - Shaft for drive spur gear

21 - 22 Nm

22 - Drive spur gear

- For power take-off
- Cannot be replaced separately

23 - Drive sprocket

- For power take-off

24 - Spring

Seals for power take-off, replacing

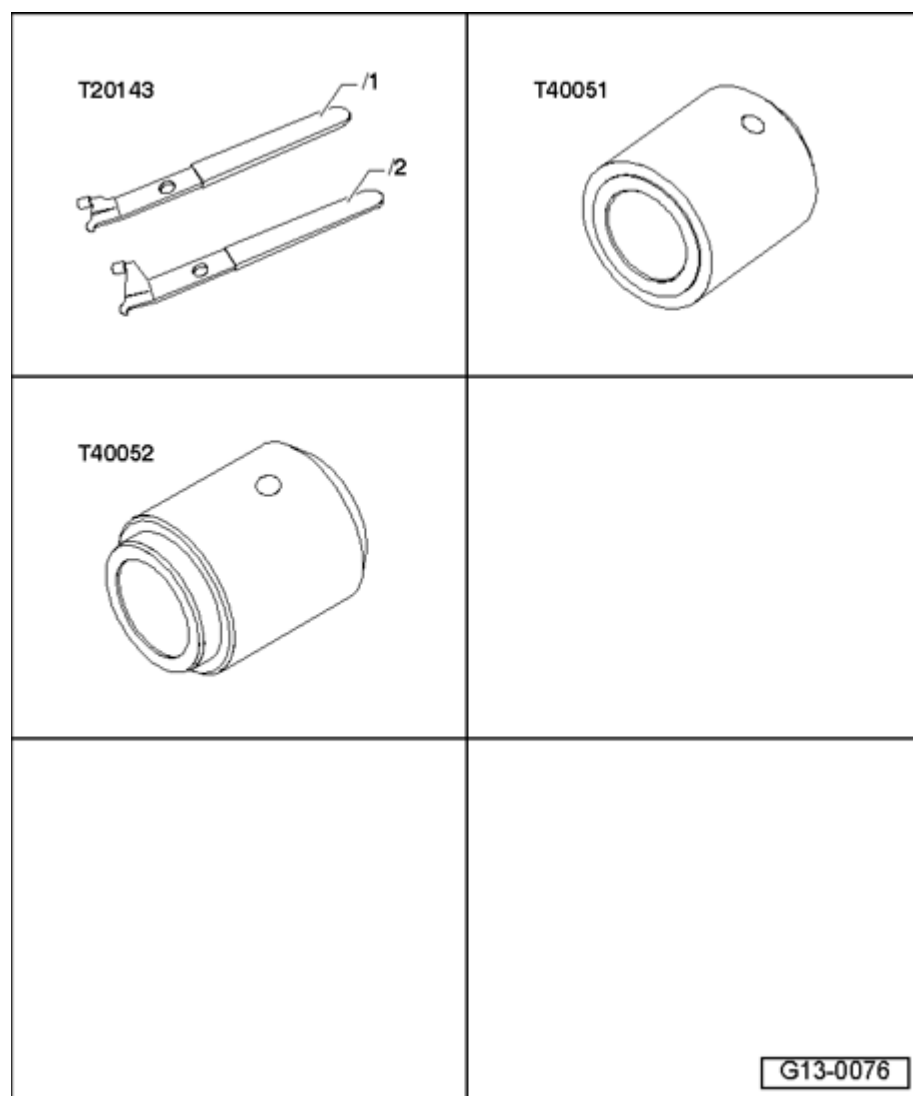


Fig. 232: Identifying Special Tools - Seals For Power Take-Off, Replacing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

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

Work procedure

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

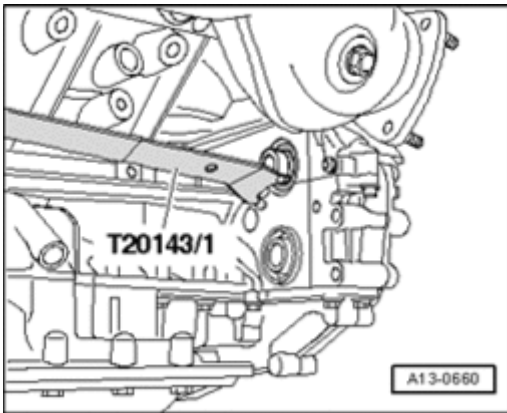


Fig. 233: Prying Out Sealing Ring For A/C Compressor Drive Using Pulling Hook T20143/1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pry out sealing ring for A/C compressor drive using pulling hook T20143/1.

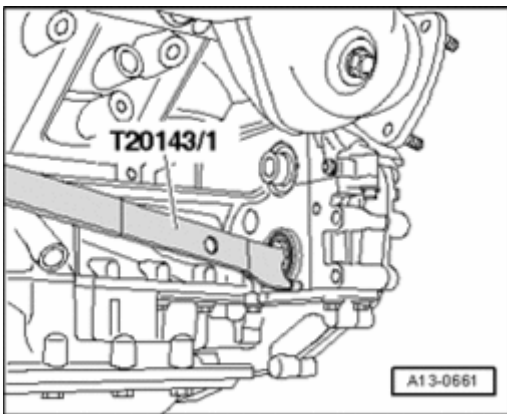


Fig. 234: Prying Out Power-Steering Pump Drive Seal Using Pulling Hook T20143/1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

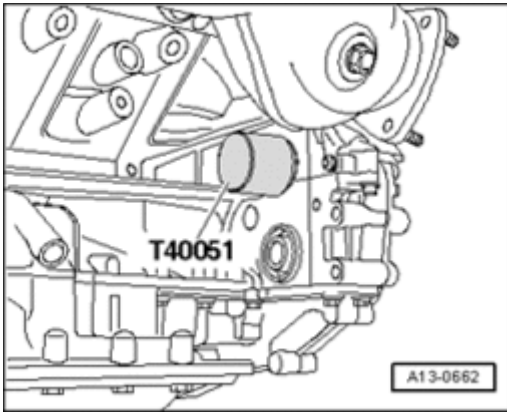


Fig. 235: Driving In Sealing Ring For A/C Compressor Drive Using Thrust Piece T40051
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

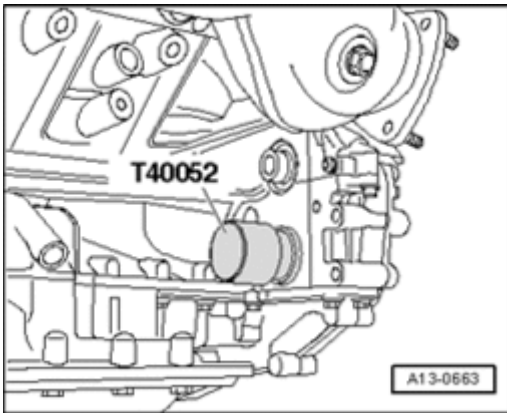


Fig. 236: Driving In Sealing Ring For Power-Steering Pump Drive Using Thrust Piece T40052
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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

Special tools, testers and auxiliary items required

- Sealant

Removing

- Remove engine --> **Engine, removing**.

- Separate engine and transmission --> **Engine and transmission, separating.**
- Leave engine on Scissor Lift Table VAS 6131 or secure engine to assembly stand --> **Engine, securing to assembly stand.**
- Remove clutch pressure plate -->
 - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
 - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
 - **30 CLUTCH** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
 - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE
 - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
 - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE
- Remove dual-mass flywheel --> **Dual-mass flywheel, 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 (MFI) .**
- 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.
- Remove power take-off drive chain --> **Power take-off drive chain, removing and installing.**

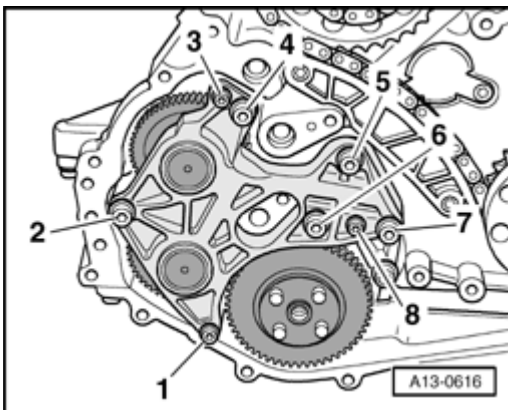


Fig. 237: Removing Bolts & Spur Gear Unit Rear Bearing Cap
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **1 to 8** -.
- Remove spur gear unit rear bearing cap.

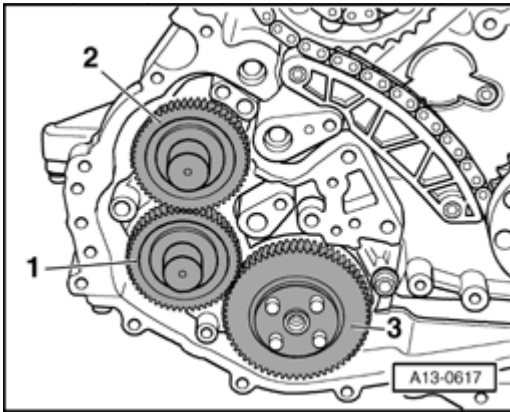


Fig. 238: Removing Spur Gears In Sequence
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove spur gears in sequence - 1 to 3 -.

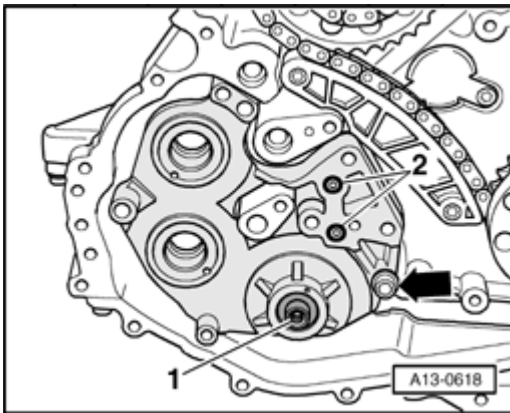


Fig. 239: Removing/Installing Compression Spring From/To Shaft For Drive Spur Gear, O-Rings, Bolts & Front Bearing Cap From Cylinder Block
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove compression spring - 1 - from shaft for drive spur gear.
- Remove O-rings - 2 -.
- Remove bolt - **arrow** -.
- Remove front bearing cap from cylinder block.

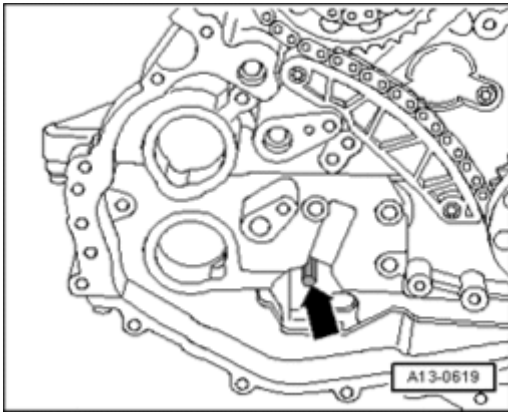


Fig. 240: Removing Drive Shaft For Oil Pump
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Installing

NOTE: • **Replace seals and O-rings.**

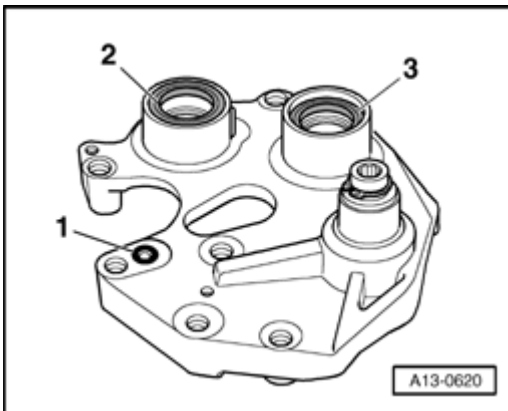


Fig. 241: Driving Out Sealing Rings (For A/C Compressor Drive) And (For Power-Steering Pump Drive) Using Drift
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive out sealing rings - **2** - (for A/C compressor drive) and - **3** - (for power-steering pump drive) using a drift.
- 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.
- Drive in sealing ring for power-steering pump drive and A/C compressor drive --> **Seals for power take-off, replacing.**

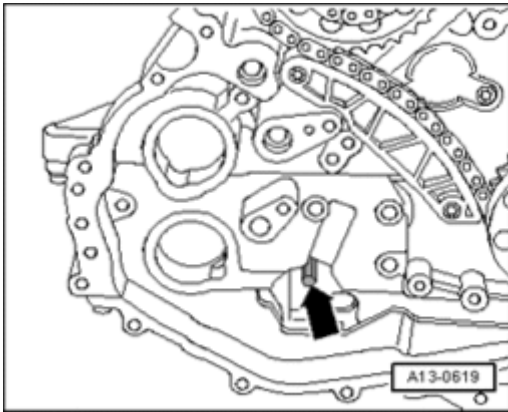


Fig. 242: Removing Drive Shaft For Oil Pump

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 front bearing cap.

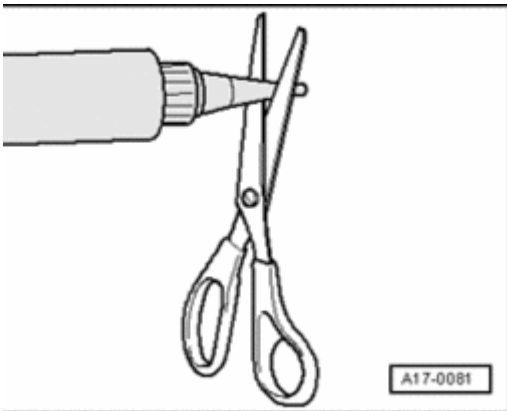


Fig. 243: Cutting Tube Nozzle At Front Marking

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Cut off nozzle on tube of sealant at front mark (dia. of nozzle approx. 1 mm).

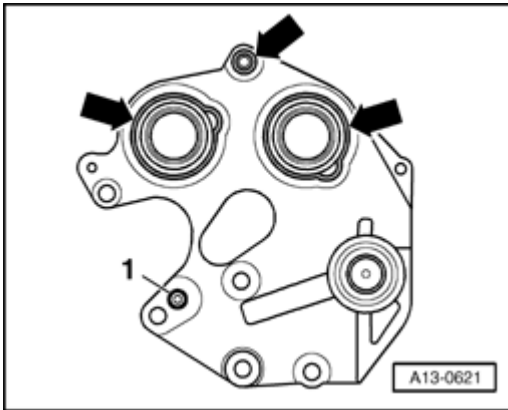


Fig. 244: Applying Sealant Beads On Clean Sealing Surfaces Of Front Bearing Cap
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Apply sealant beads - **arrows** - on clean sealing surfaces of front bearing cap as shown in illustration.
- Thickness of sealant beads: 1.5 to 2.0 mm.
- Install O-ring - **1** - and secure using some grease.

NOTE:

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

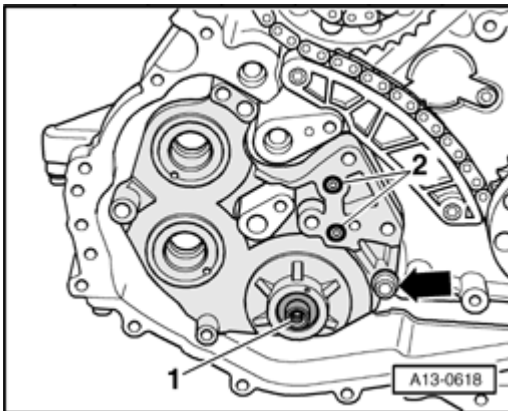


Fig. 245: Removing/Installing Compression Spring From/To Shaft For Drive Spur Gear, O-Rings, Bolts & Front Bearing Cap From Cylinder Block
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install front bearing cap and tighten bolt - **arrow** - hand-tight.
- Insert compression spring - **1** -.
- Install O-rings - **2** - and secure using some grease.

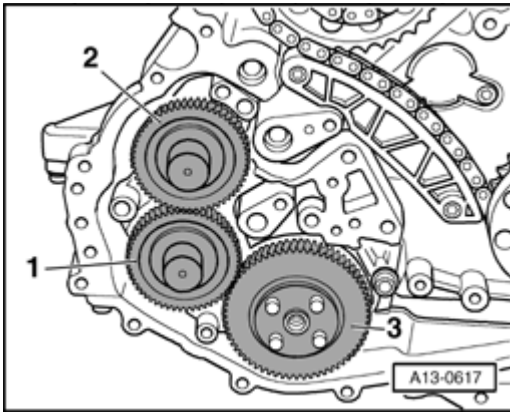


Fig. 246: Removing/Installing Spur Gears In Sequence
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert spur gears - 1 to 3 -.

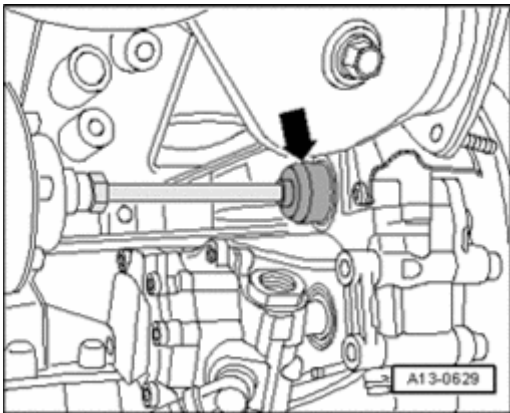


Fig. 247: Sliding Dust Seal Cap Onto Shaft End Of A/C Compressor Drive Spur Gear
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Slide dust seal cap - **arrow** - onto shaft end of A/C compressor drive spur gear.
- Check whether 2 alignment bushings are present in rear bearing cap, install if necessary.

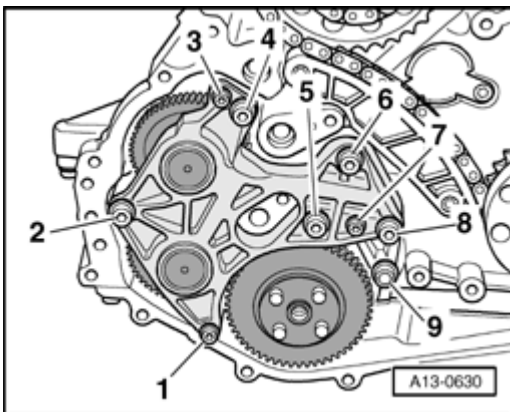


Fig. 248: Rear Bearing Cap Bolts Tighten Sequence

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install rear bearing cap and tighten bolts as follows.
 1. Tighten bolts 1, 3, 7 to 10 Nm.
 2. Tighten bolts 2, 4, 5, 6, 8, 9 in stages in a diagonal sequence
- Fasten drive sprocket for power take-off hand-tight.
- Install power take-off drive chain --> **Power take-off 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 --> **Left and right timing chain covers, removing and installing.**
- Install dual-mass flywheel --> **Dual-mass flywheel, removing and installing.**
- Install clutch pressure plate -->
 - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
 - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
 - **30 CLUTCH** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
 - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE
 - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
 - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE
- Install engine --> **Engine, installing.**

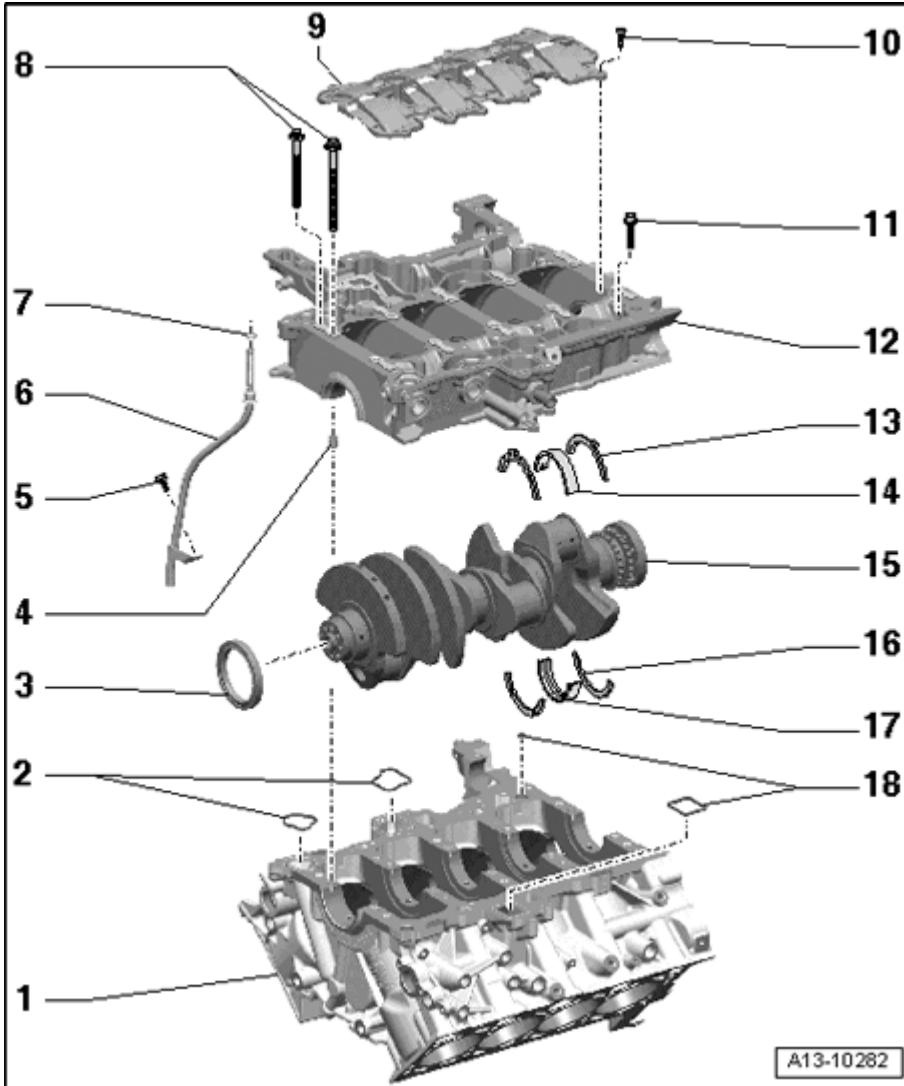
Torque specifications

Component		Nm
Front bearing cap to cylinder block		22
Bearing cap	Front bearing cap	9
at rear on	Cylinder block	22
Drive sprocket for power take-off to shaft		64

CRANKSHAFT, REMOVING AND INSTALLING**Crankshaft, component overview**

NOTE:

- For performing work, secure engine using Bracket VAS 6095/1-6A to Engine and Transmission Holder VAS 6095 --> Engine, securing to assembly stand.

**Fig. 249: Crankshaft, Component Overview**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Cylinder block

- Paired to - 12 -
- Sealant applied on cylinder block (for guide frame) Sealant applied on cylinder block (for guide frame)

2 - Seals

- Replace

3 - Crankshaft seal, ribbed belt side

- Replacing --> **Crankshaft seal (ribbed belt side), replacing.**

4 - Alignment bushing

- 2 pieces
- Insert into guide frame
- Installed location **Sealant applied on cylinder block (for guide frame)**

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 order **Installing guide frame**

12 - Bearing bracket

- Paired to - 1 -
- Sealant applied on cylinder block (for guide frame) **Sealant applied on cylinder block (for guide frame)**
- Tightening sequence for manifold mounting bolts **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 bearings (mark)
- Insert new bearing shells for guide frame with proper color marking
- New crankshafts --> **Allocation of main bearing shells for new crankshafts**
- Used and reworked crankshafts --> **Allocation of main bearing shells for used and reworked crankshafts**

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 bearings (mark)
- Insert new bearing shells for cylinder block with proper color marking
- New crankshafts --> **Allocation of main bearing shells for new crankshafts**
- Used and reworked crankshafts --> **Allocation of main bearing shells for used and reworked crankshafts**

18 - Seals

- Replace

Baffle plate tightening plate

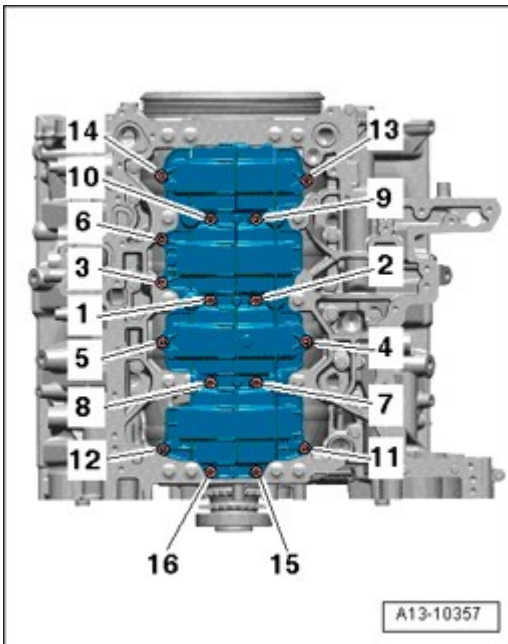


Fig. 250: Baffle Plate Tightening Plate Bolts Tightening Sequence
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Then tighten bolts in sequence - 1 to 16 -.

Sealant applied on cylinder block (for guide frame)

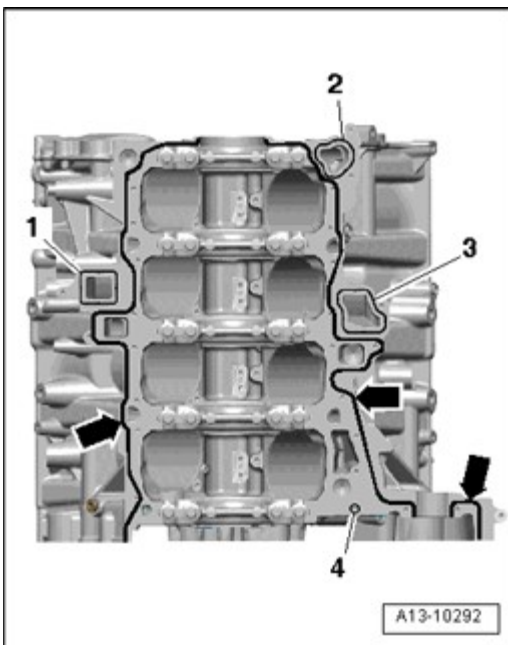


Fig. 251: Sealant Applied On Cylinder Block (For Guide Frame)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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** -.

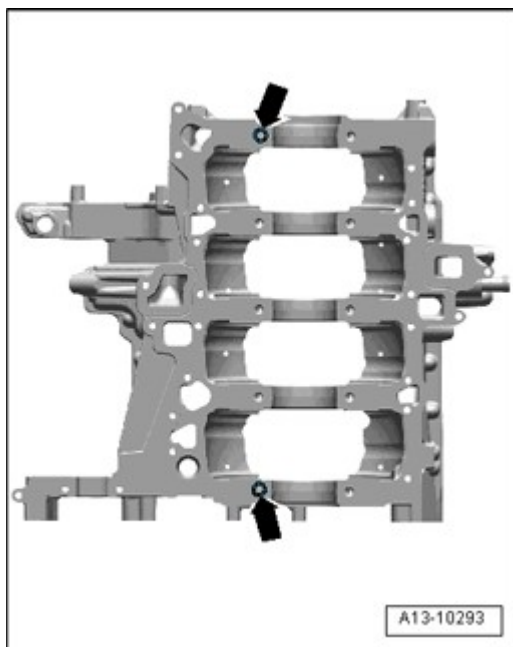
Installation position of alignment bushings

Fig. 252: 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

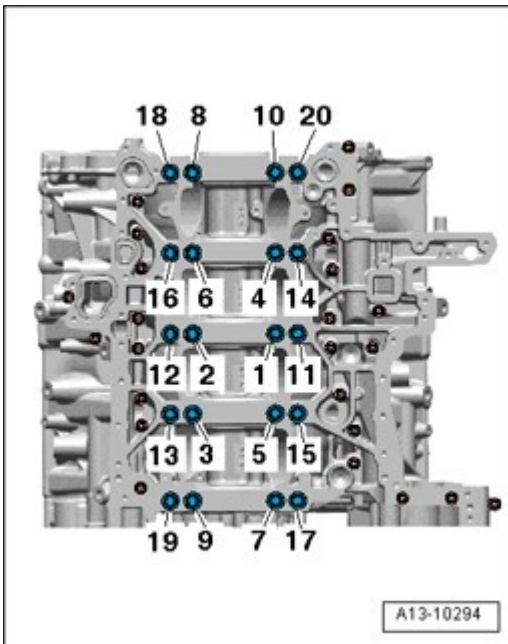


Fig. 253: Guide Frame Bolts Tightening Sequence
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Replace bolts - **1 to 20** -.
- Tighten bolts for guide frame as follows:
- Tighten bolts - **1 to 10** - to 30 Nm with torque wrench.
- Tighten bolts - **11 to 20** - to 20 Nm with torque wrench.
- Tighten bolts - **1 to 10** - to 50 Nm with torque wrench.
- Tighten bolts - **11 to 20** - to 30 Nm with torque wrench.
- Tighten bolts - **1 to 10** - 90 ° ($\frac{1}{4}$ additional turn) using a rigid wrench.
- Tighten bolts - **11 to 20** - 90 ° ($\frac{1}{4}$ additional turn) using a rigid wrench.
- Tighten cylinder block/guide frame sealing surface bolts, - **highlighted in illustration but not numbered** -, in a diagonal sequence to 9 Nm.

Allocation of main bearing shells for new crankshafts

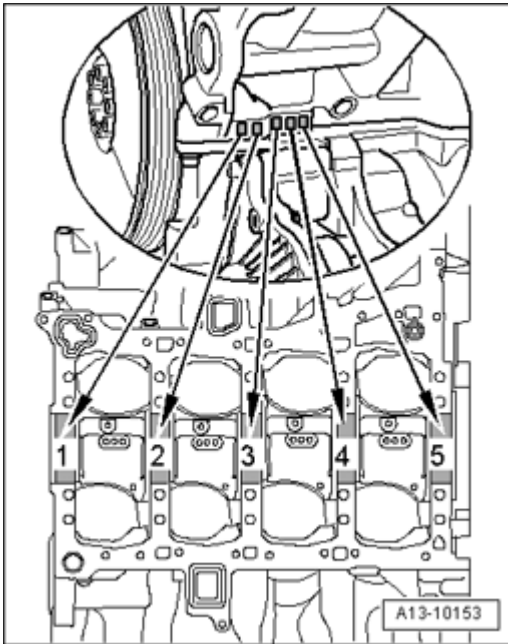


Fig. 254: Allocation Of Crankshaft Bearing Shells For Cylinder Block
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

Allocation of crankshaft bearing shells for cylinder block

- Bearing shells with correct thickness are allocated to the cylinder block in the factory. Colored dots on sides of bearing shells serve for identifying bearing shell thickness.
- Allocation of bearing shells to cylinder block is marked by 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
R=	red
G=	yellow
B=	Blue

NOTE:

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

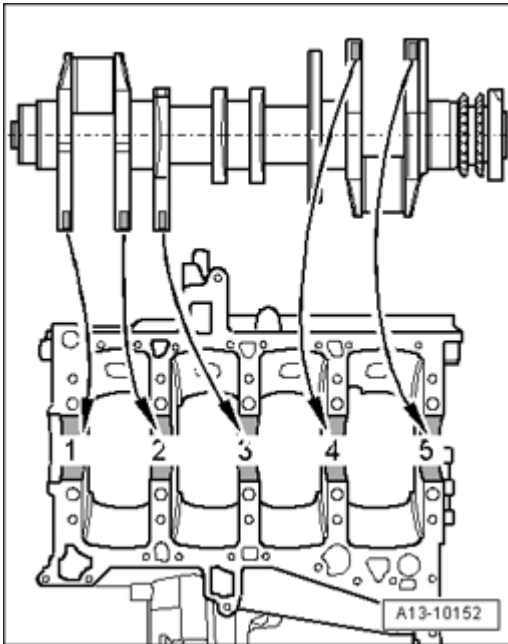


Fig. 255: Allocation Of Crankshaft Bearing Shells For Guide Frame - Version I
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

Allocation of crankshaft bearing shells for guide frame - Version I

- 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

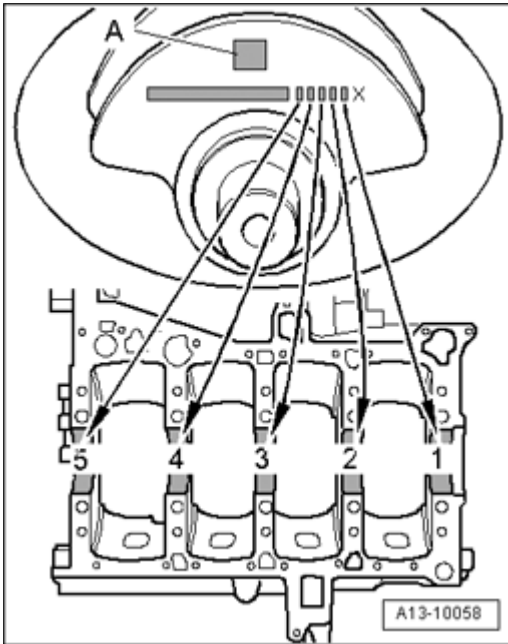


Fig. 256: Allocation Of Crankshaft Bearing Shells For Guide Frame - Version II
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

Allocation of crankshaft bearing shells for guide frame - Version II

- 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 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.

NOTE:

- Ignore - A -.

Letter on crankshaft	Color of bearing
R=	red
G=	yellow
B=	Blue

Allocation of main bearing shells for used and reworked crankshafts

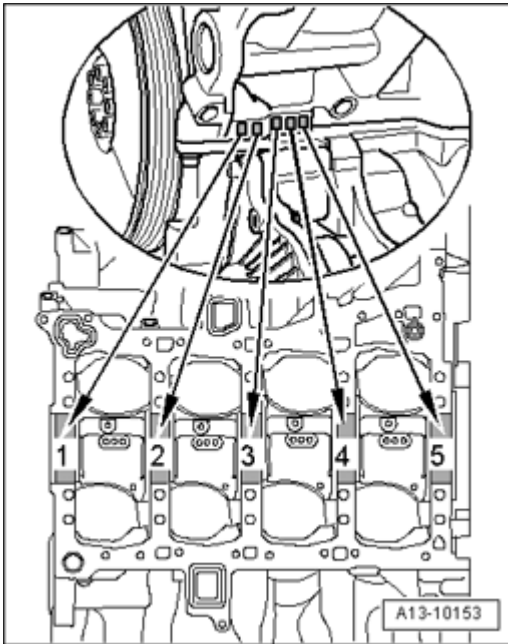


Fig. 257: Allocation Of Crankshaft Bearing Shells For Cylinder Block
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

Allocation of crankshaft bearing shells for cylinder block

- 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 = dia. 65.00 mm.
- Repair stage of main crankshaft journals = dia. 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 the determined diameter of main crankshaft journals according to the following table.

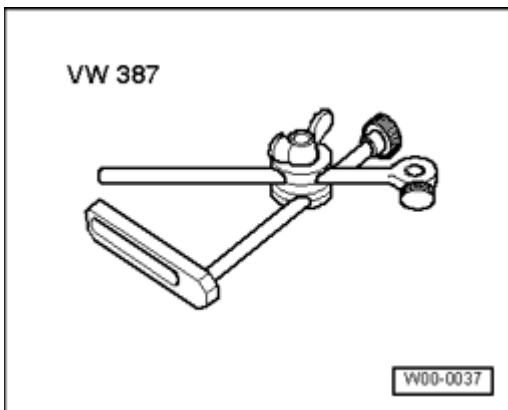
2008 Audi RS 4

ENGINE 4.2 Liter V8 4V Engine Mechanical, Engine Code(s): BNS

Main crankshaft journals diameter	Color identification of bearing shells for guide frame		
	red	yellow	Blue
Dimensions in mm			
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 greater bearing thickness.			

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**Special tools, testers and auxiliary items required****Fig. 258: Identifying Dial Gauge Holder VW 387**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Dial gauge holder VW 387

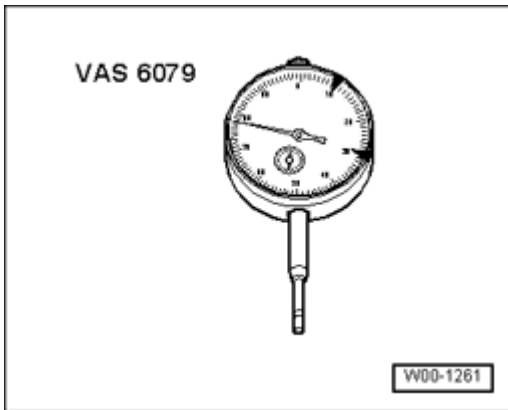


Fig. 259: Identifying Dial Gauge VAS 6079

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Dial gauge VAS 6079

Work procedure

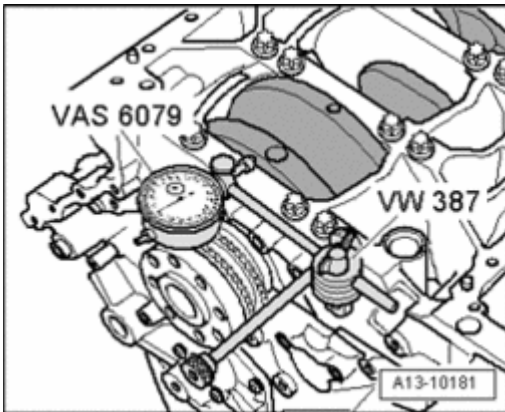


Fig. 260: Securing Dial Gauge VAS 6079 With Dial Gauge Holder VW 387 To Cylinder Block

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 0.251 mm.

Radial clearance, measuring

Special tools, testers and auxiliary items required

- Plastigage

Work procedure**NOTE:**

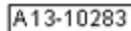
- **Do not interchange used bearings**
- **Bearing shells that are worn down to the nickel layer must be replaced.**
- Remove guide frame and clean journals.
- Place Plastigage over entire width of bearing journal or into bearing shells.
- Plastigage must rest in center of bearing shell.
- Install guide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

Radial clearance:

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

PISTON AND CONNECTING ROD, DISASSEMBLING AND ASSEMBLING**Piston and connecting rod, assembly overview****NOTE:**

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



- 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 running surface)
- Radial clearance, measuring --> **Radial clearance of connecting rod, measuring**
- To measure radial play, tighten bolt - 1 - to 40 Nm but no further
- Over-sized bearings are available for reworked crankshaft connecting rod journals
- Insert bearing shells with correct color marking --> **Connecting rod, allocating with connecting rod bearing shells to crankshaft**

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 0.27 mm
- Axial play wear limit: 0.30 mm
- Radial clearance, measuring --> **Radial clearance of connecting rod, measuring**
- Insert connecting rod with correct identification letter --> **Connecting rod, allocating with connecting rod bearing shells to crankshaft**

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

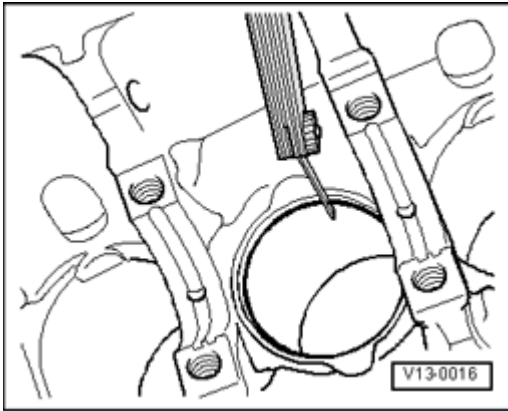


Fig. 262: Checking Piston Ring Gap

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Slide piston ring down from above at a right angle to cylinder wall until it is approx. 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	0.80

Measuring piston ring side clearance

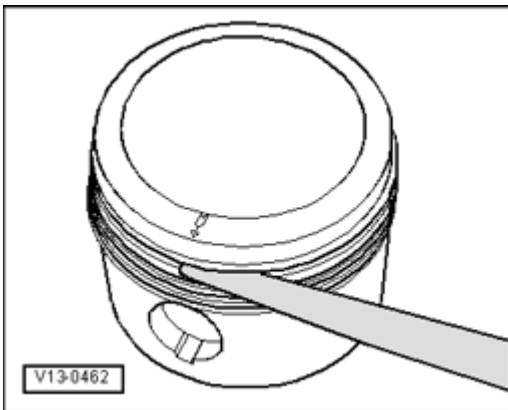


Fig. 263: Measuring Piston Ring Side Clearance

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clean ring groove of piston before checking.

Piston ring dimensions in mm	New	Wear limit
1. Compression ring	0.04 to 0.09	0.20
2. Compression ring	0.020 to 0.045	0.200
Oil scraping ring	0.03 to 0.05	0.15

Checking piston

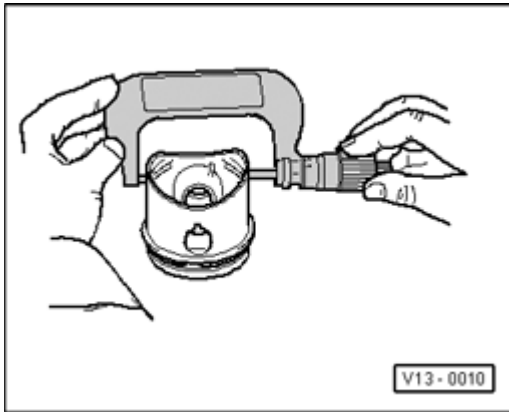


Fig. 264: Checking Piston

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Measure approx. 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

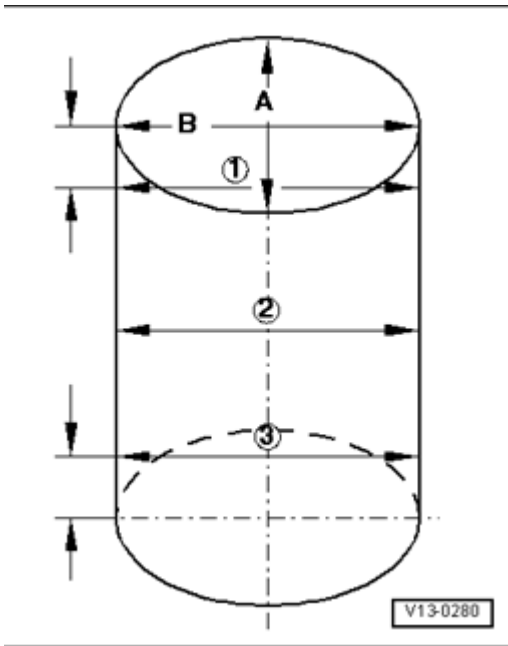


Fig. 265: Checking Cylinder Bores

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Nominal dimension --> **Piston and cylinder dimensions.**

Piston installation position

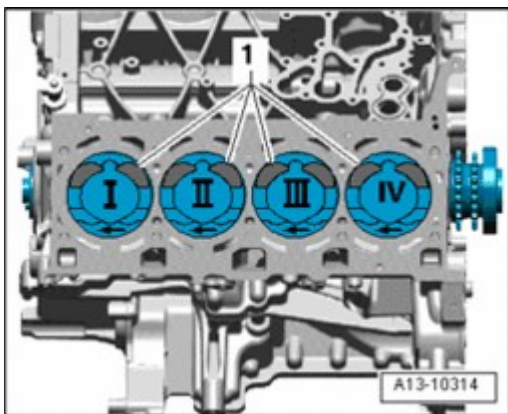


Fig. 266: Piston Installation Position

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.

Installed location:

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

Mark connecting rod

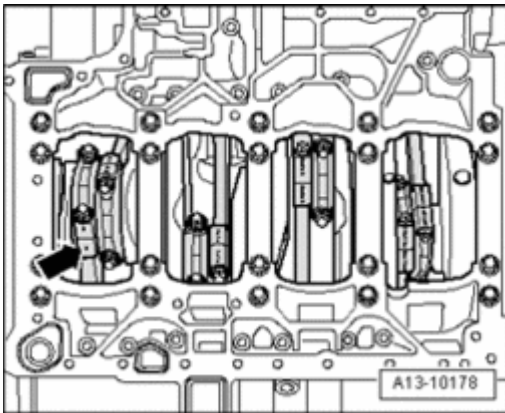


Fig. 267: Mark Connecting Rod

Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- Only replace connecting rod as a set.
 - Do not interchange connecting rod bearings.
- Before removing, mark allocation of connecting rod and connecting rod bearing caps to each other and to cylinder with paint - **arrow** -.

Connecting rod, installed location

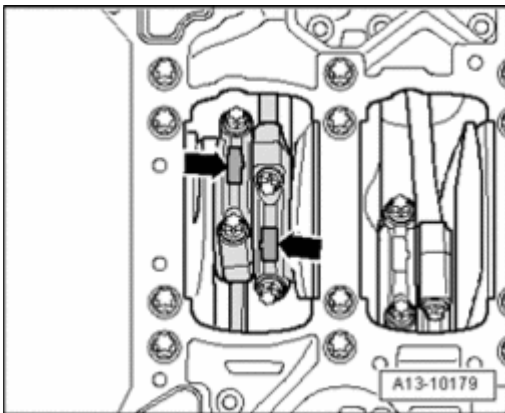


Fig. 268: Connecting Rod, Installed Location

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Oil spray jet for piston cooling

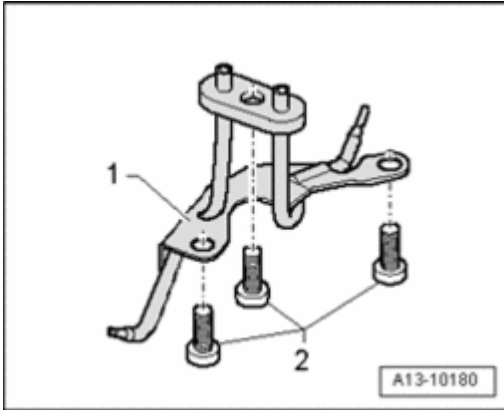


Fig. 269: Oil Spray Jet For Piston Cooling

Courtesy of VOLKSWAGEN UNITED STATES, INC.

1. Oil spray jet
2. Bolts, 9 Nm. Insert using locking compound; locking compound

CAUTION:

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

Connecting rod, allocating with connecting rod bearing shells to crankshaft

Allocating connecting rod (width of connecting rod base) to crankshaft

- The crankshaft is allocated to a connecting rod of the proper width at the factory. Stamped letters on the narrow side of the base identify the width of the base.

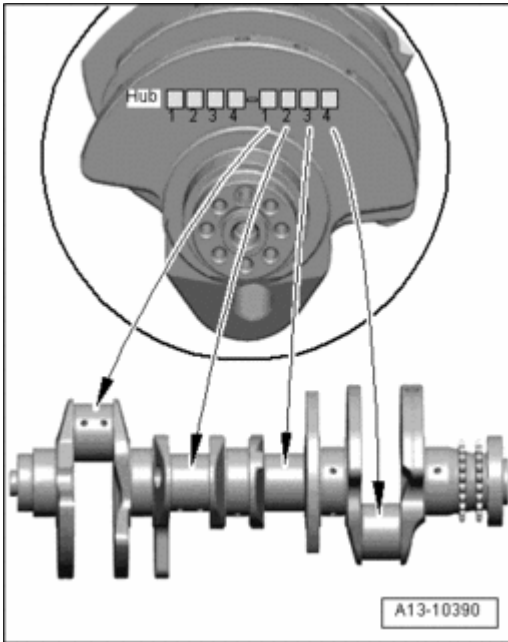


Fig. 270: Allocation Of Connecting Rod To Crankshaft Is Identified By Letter On Front Crankshaft Counterweight

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- The allocation of the connecting rod to the crankshaft is identified by a letter on the front crankshaft counterweight, as shown in the illustration.

NOTE:

- The numbers under the sequence of letters indicate the allocation of the crank pins from front to rear.

Letter on crankshaft	Connecting rod base width
X=	narrow (18.650 to 18.669 mm)
Y=	width (18.670 to 18.690 mm)

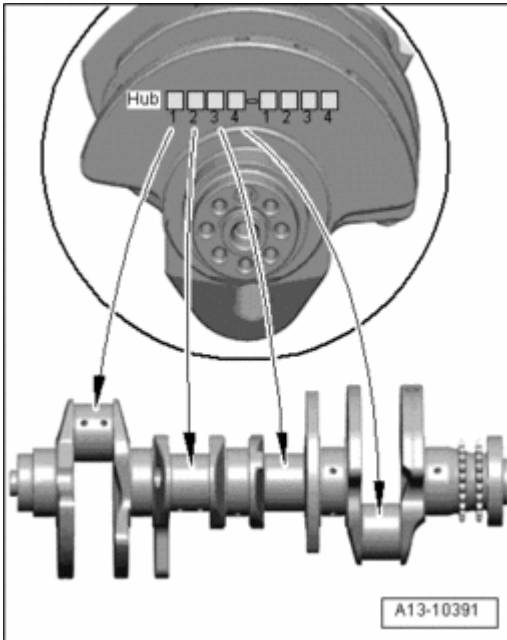


Fig. 271: Allocation Of Connecting Rod Bearing Shell Thickness To Crankshaft
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

Allocation of connecting rod bearing shell thickness to crankshaft

- The crankshaft is allocated to connecting rod bearing shells of the proper thickness at the factory. Colored dots on sides of bearing shells serve for identifying bearing shell thickness.
- The allocation of bearing shells to crankshaft is identified by a letter on the front crankshaft counterweight, as shown in the illustration.

NOTE:

- The numbers under the sequence of letters indicate the allocation of the crank pins from front to rear.

Letter on crankshaft	Bearing color combination (Connecting rod/cover alternatively)
R=	red/yellow
G=	yellow/blue
B=	blue/blue

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.

Radial clearance of connecting rod, measuring

Special tools, testers and auxiliary items required

- Plastigage

Work 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 40 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, component overview

NOTE:

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

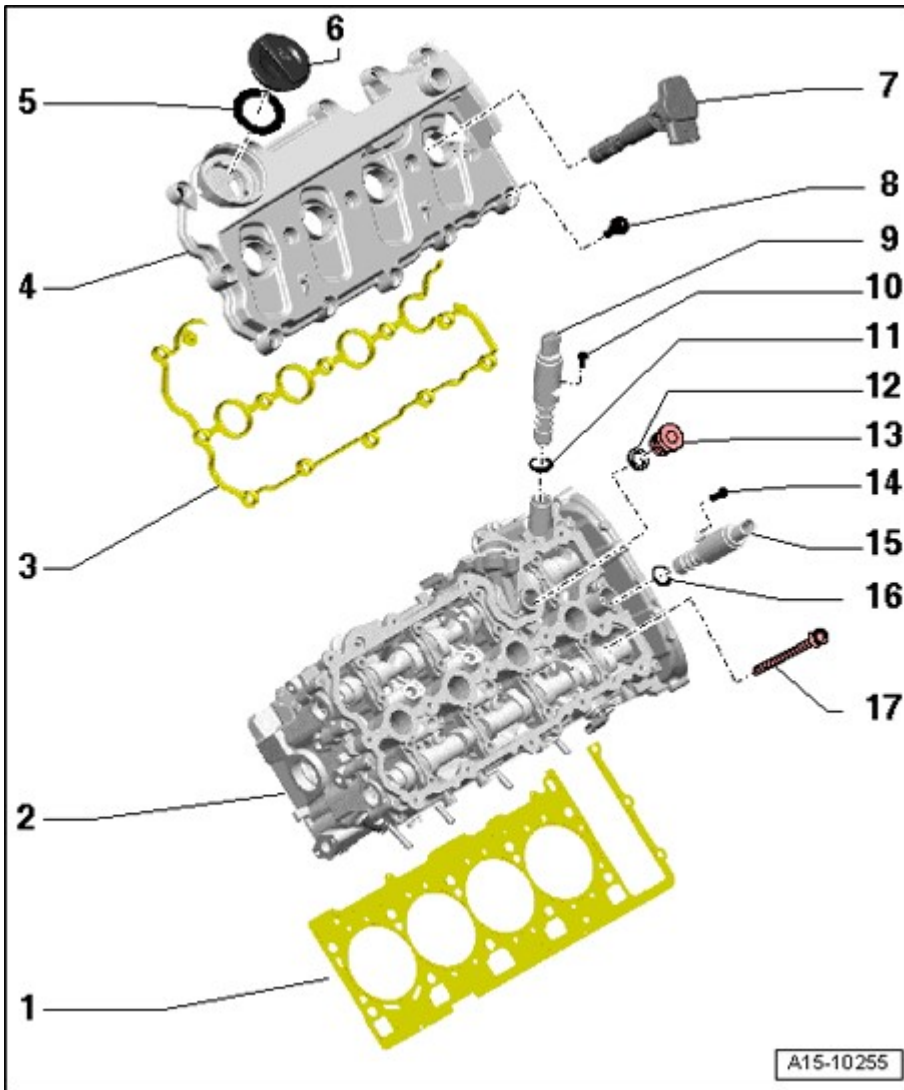


Fig. 272: Cylinder Head, Component Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Cylinder head gasket

- Replacing --> **Cylinder head, removing and installing.**
- Installed location: 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 **Reworking dimension, cylinder head**
- 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 Puller T40039

8 - Special bolt, 9 Nm

- Replace if seal is damaged
- Note tightening sequence --> **Fig. 281**

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

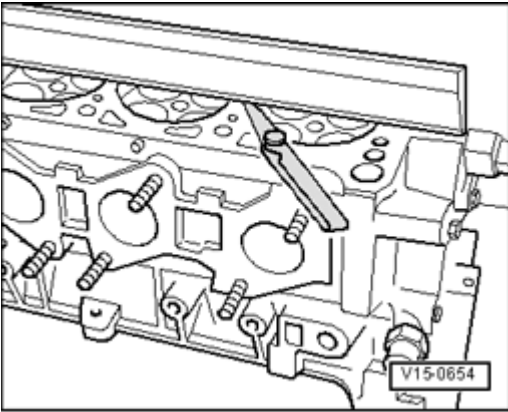
16 - O-ring

- Replace

17 - Cylinder head bolt

- Replace
- Observe sequence for loosening --> **Fig. 296**
- Note tightening sequence --> **Fig. 300**

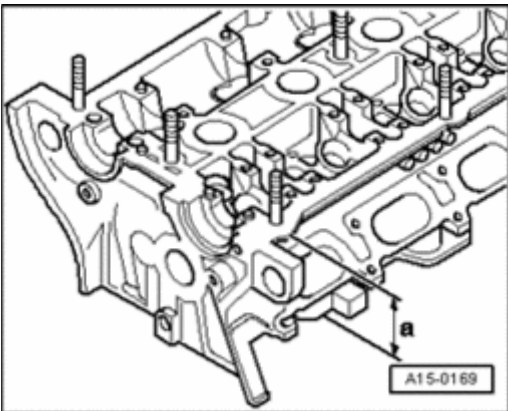
Checking cylinder head for distortion

**Fig. 273: 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. 274: 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

Special tools, testers and auxiliary items required

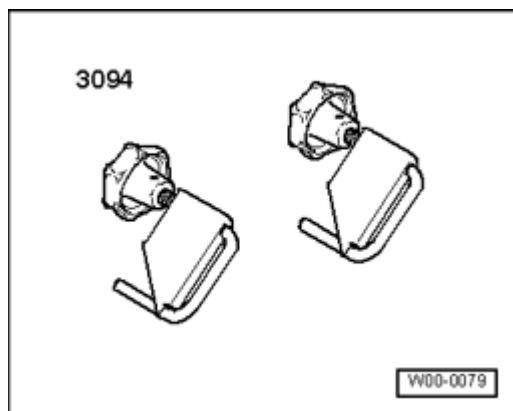


Fig. 275: Identifying Hose Clamps 3094

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hose clamps up to 25 mm dia. 3094

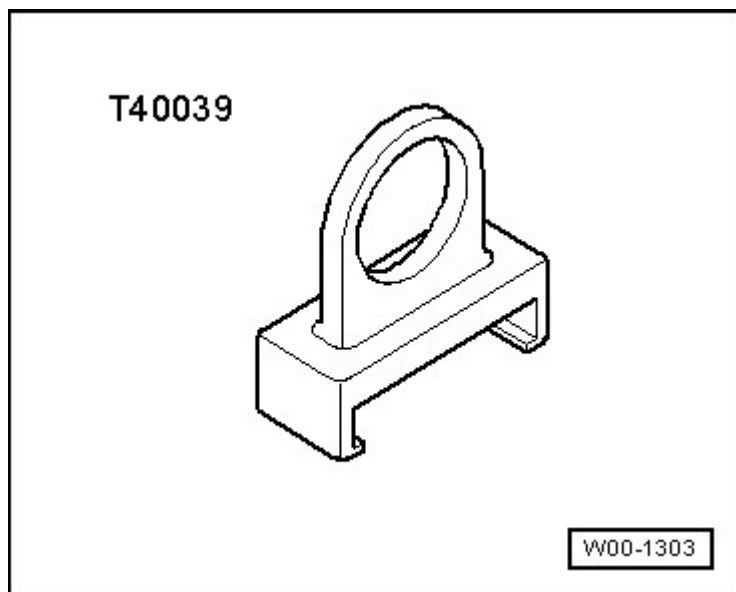


Fig. 276: Identifying Ignition Coil Puller T40039

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Puller T40039

Removing

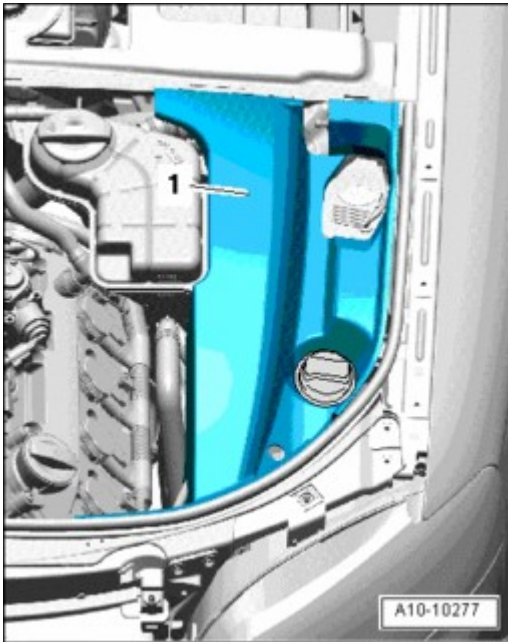


Fig. 277: Removing Cover In Engine Compartment (Left Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove cover - 1 - in engine compartment (left side).

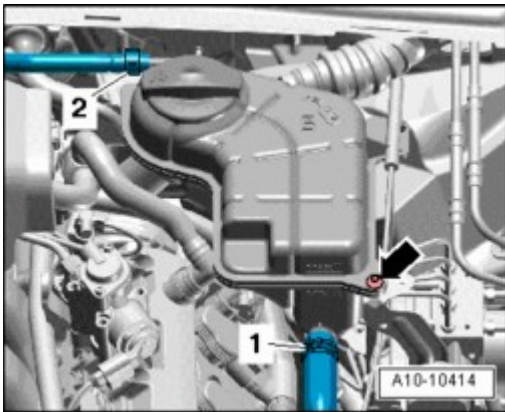


Fig. 278: Removing Coolant Hoses & Coolant Expansion Tank
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clamp off coolant hose - 2 - using hose clamp 3094 and disconnect from coolant expansion tank.
- Seal connection using a plug that fits.
- Remove coolant expansion tank - **arrow** -.
- Disconnect electrical wire from Engine Coolant Level (ECL) Warning Switch F66 at bottom on coolant reservoir and set aside coolant reservoir with coolant hose - 1 - connected.

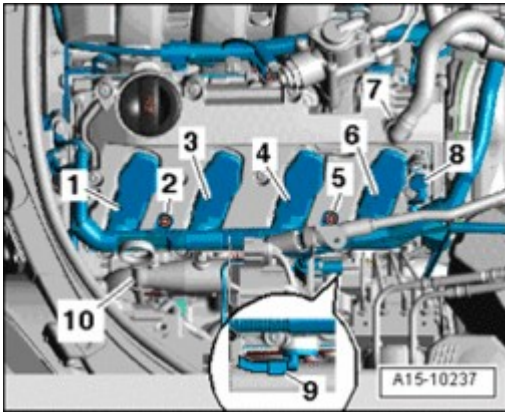


Fig. 279: Removing Oil Dipstick From Guide Tube, Bolts Electrical Connectors & Crankcase Ventilation Hose

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove oil dipstick - **10** - from guide tube.
- Remove bolts - **2** - and - **5** -.
- Disconnect electrical connectors - **1, 3, 4, 6, 8, 9** - and free up wiring harness.
- Remove crankcase ventilation hose - **7** - by pressing release buttons.

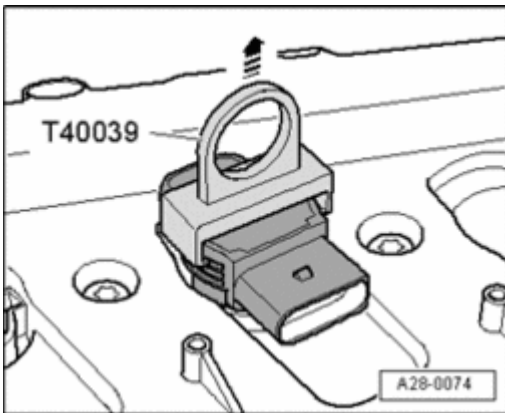


Fig. 280: Removing Ignition Coils Using Ignition Coil Puller T40039

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove ignition coils using ignition coil puller T40039.

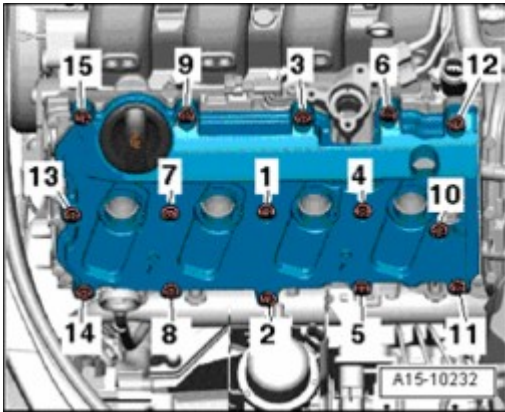


Fig. 281: Left Cylinder Head Cover Bolts Removal Sequence
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Installing

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

NOTE:

- **Replace cylinder head cover gaskets if damaged.**
- **Replace bolts for cylinder head cover if gasket is damaged.**

- Clean sealing surfaces, they must be free of oil and grease.
- Tighten cylinder head cover in sequence - **1 to 15** -.

Torque 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

Special tools, testers and auxiliary items required

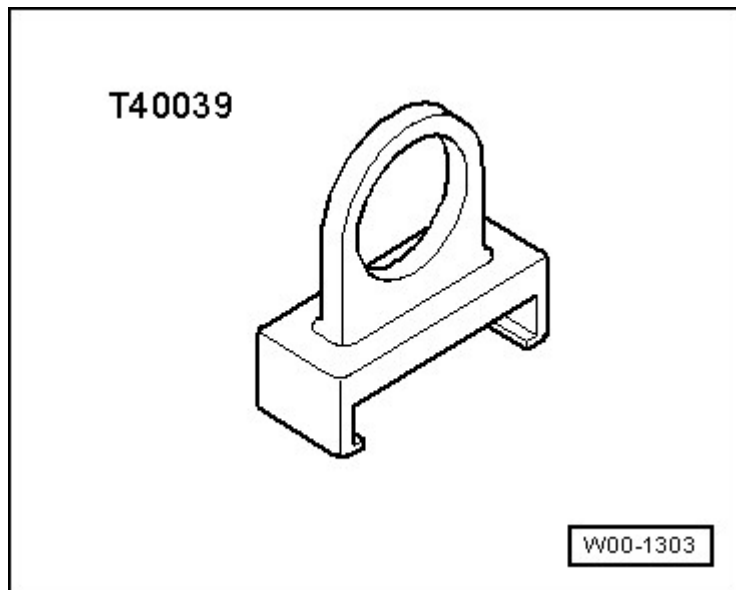


Fig. 282: Identifying Ignition Coil Puller T40039
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Puller T40039

Removing



Fig. 283: Pulling Rear Engine Cover Off
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull rear engine cover off - **arrows** -.

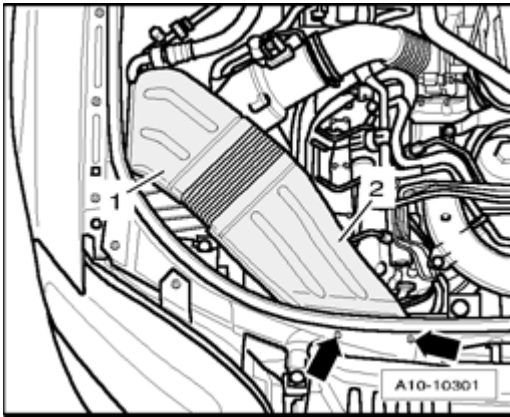


Fig. 284: Removing Bolts & Air Ducts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Remove air duct - **1** - and - **2** -.
- Disconnect vacuum hose - **2** - from air guide hose.
- Remove hose clamps - **1** - and - **3** - and lay air guide hose aside.

CAUTION: Hose connectors - 4 - must not be opened.

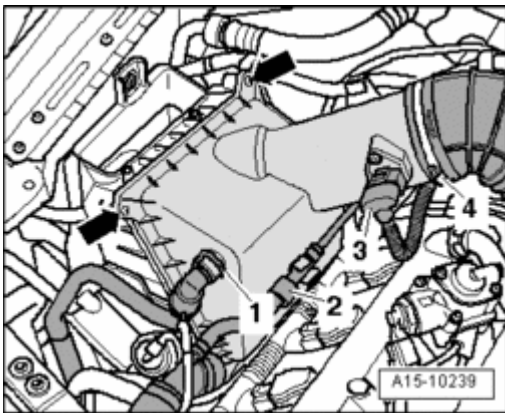


Fig. 285: Disconnecting Mass Air Flow (Maf) Sensor G70 Electrical Harness Connector, Removing Bolts And Upper Part Of Air Filter Housing

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - **3** - at Mass Air Flow (MAF) Sensor G70.
- Remove hose - **1** - to Secondary Air Injection (AIR) pump by pressing release buttons.
- Disconnect air guide hose - **4** - at Mass Air Flow (MAF) sensor.
- Free up wiring harness - **2** - at air filter housing.
- Remove bolts - **arrows** - and remove upper part of air filter housing.

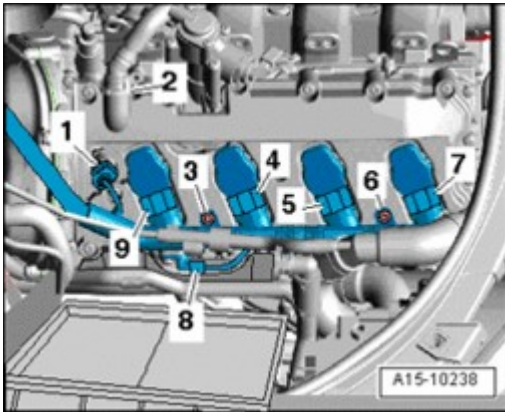


Fig. 286: Removing Bolts On Right Cylinder Head & Disconnecting Electrical Connectors
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - 3 - and - 6 - on right cylinder head.
- Disconnect electrical connectors - 1, 4, 5, 7, 8, 9 -.
- Remove crankcase ventilation hose - 2 - by pressing release buttons.

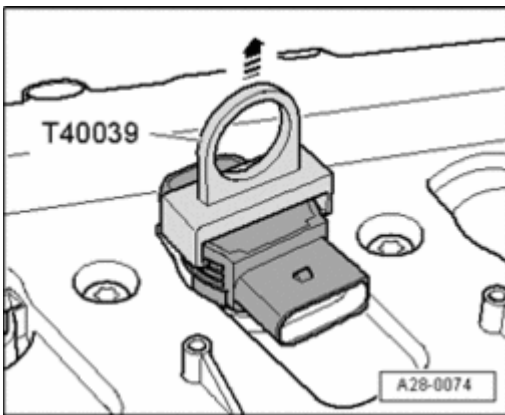


Fig. 287: Removing Ignition Coils Using Ignition Coil Puller T40039
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove ignition coils using ignition coil puller T40039.

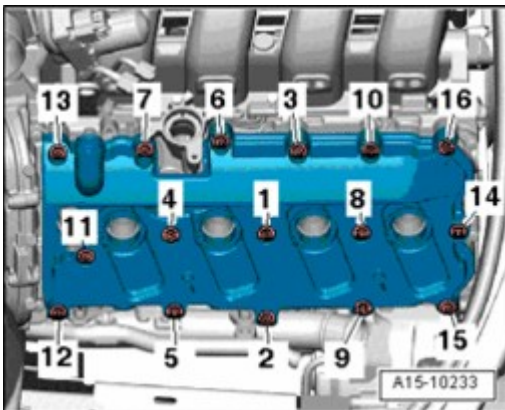


Fig. 288: Right Cylinder Head Cover Bolts Removal Sequence**Courtesy of VOLKSWAGEN UNITED STATES, INC.**

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

Installing

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

NOTE:

- **Replace cylinder head cover gaskets if damaged.**
 - **Replace bolts for cylinder head cover if gasket is damaged.**
 - **Secure all hose connections using hose clamps appropriate for the model type .**
- Clean sealing surfaces, they must be free of oil and grease.
 - Tighten cylinder head cover in sequence - **1 to 16** -.

Torque specifications

Component	Nm
Cylinder head cover to cylinder head	9
Wiring for ignition coils at cylinder head cover	5

Cylinder head, removing and installing

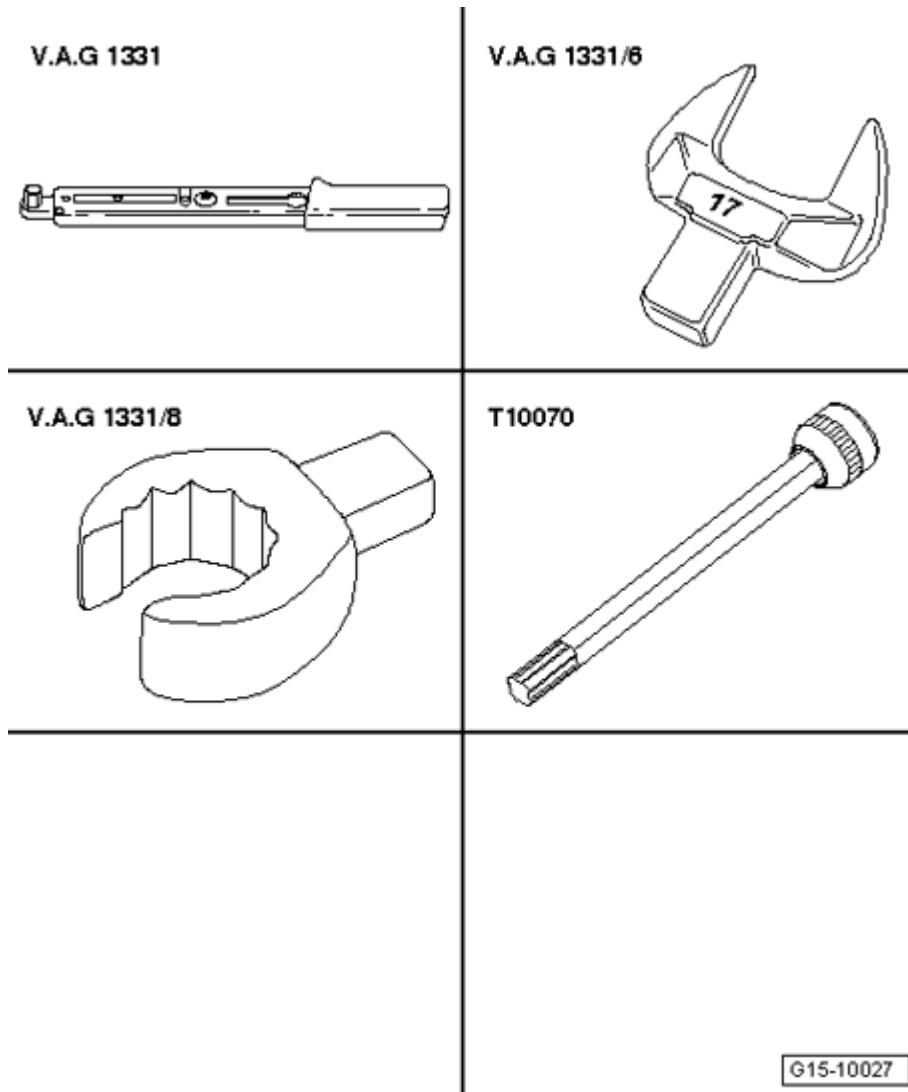


Fig. 289: Identifying Special Tools - Cylinder Head, Removing And Installing
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Torque wrench V.A.G 1331
- SW 17 socket V.A.G 1331/6
- SW 14 socket, open ring V.A.G 1331/8
- Multi-point socket T10070

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.

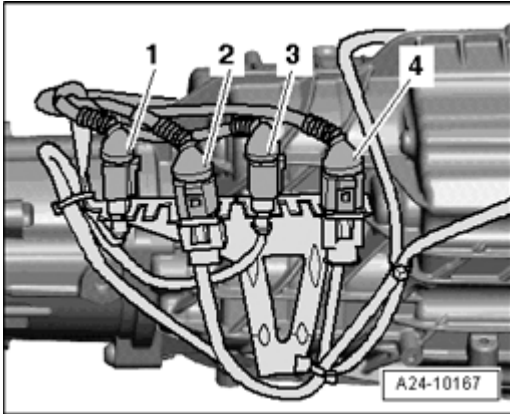


Fig. 290: Identifying Electrical Connectors On Transmission Bracket
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove electrical harness connectors - 1 - and - 4 - from bracket at transmission.
- Disconnect electrical harness connectors.
- Remove heat insulation sleeve on wiring harness and free up individual electrical wires.

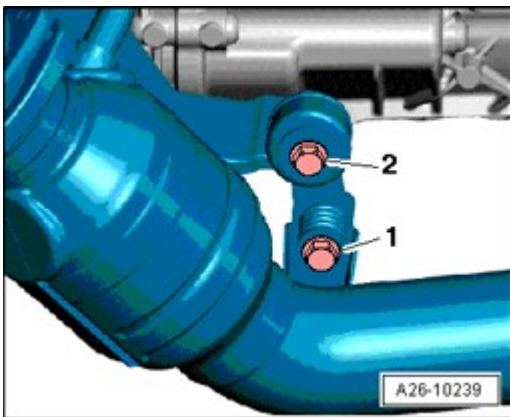


Fig. 291: Removing Bolt At Left Front Exhaust Pipe Strap
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - 1 - at left front exhaust pipe strap.

NOTE:

- Ignore - 2 -.

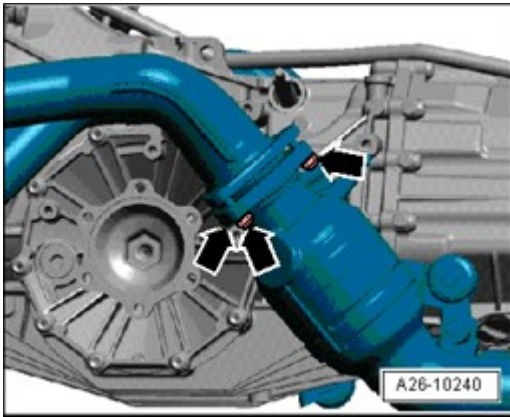


Fig. 292: Identifying Nuts & Front Exhaust Pipe With Pre- And Main Catalytic Converters
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - **arrows** -.
- Remove front exhaust pipe with pre- and main catalytic converters.
- Remove intake manifold --> **24 - MULTIPOINT FUEL INJECTION (MPI)** .
- Remove camshaft timing chains from camshafts --> **Camshaft timing chains, removing from camshafts.**

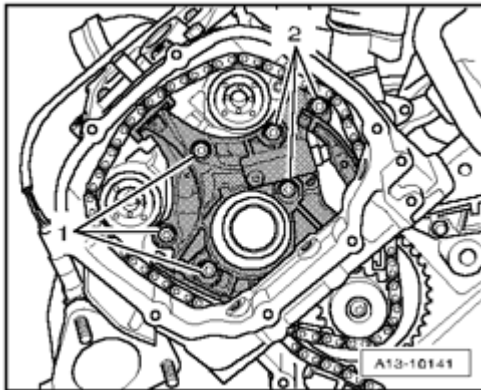


Fig. 293: Removing Bolts, Left Chain Tensioner And Left Camshaft Timing Chain
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **1** - and - **2** - and remove right chain tensioner.

NOTE:

- **Ensure tensioning piston does not slip out of chain tensioner and fall to ground.**

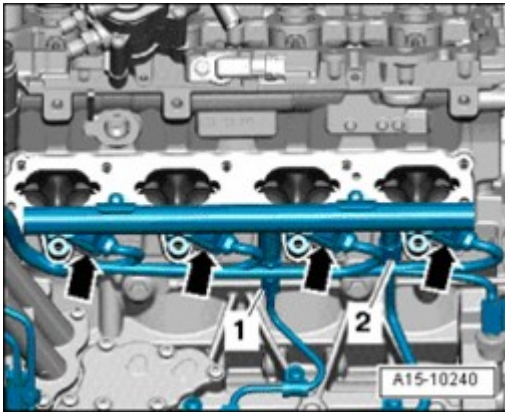


Fig. 294: Disconnecting Electrical Connectors At Fuel Injectors & Removing High Pressure Lines From Connector On Fuel Rail

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, counter hold at hex head with and open-end wrench and loosen union nut.

NOTE:

- **Do not change bend shape of high pressure lines.**

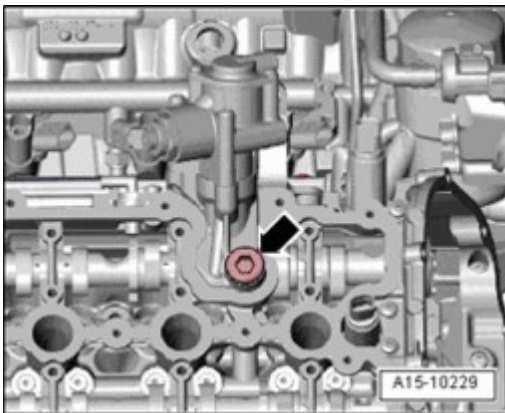


Fig. 295: Removing/Installing Locking Bolt

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove locking bolt - **arrow** -.

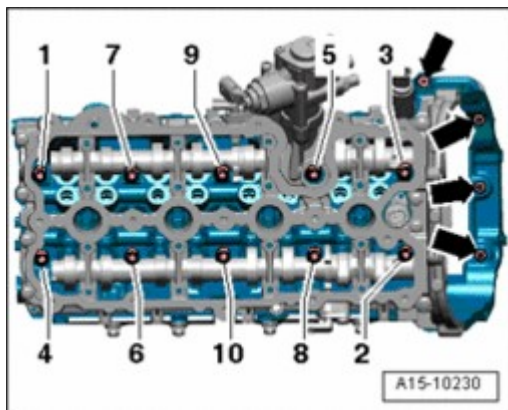


Fig. 296: Cylinder Head Bolts Loosening Sequence

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Loosen cylinder head bolts in sequence - **1 to 10** - using Socket Insert T10070.
- 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. Damages to the silicone layer and in areas of recesses may result in leaks.
- 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 exposed valves until immediately before installing cylinder head.
- Secure all hose connections using hose clamps appropriate for the model type .

- During installation, all cable ties must be re-installed at the same location.
- After working on the valvetrain 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.
- After replacing cylinder head or cylinder head seal, coolant and engine oil must be changed.

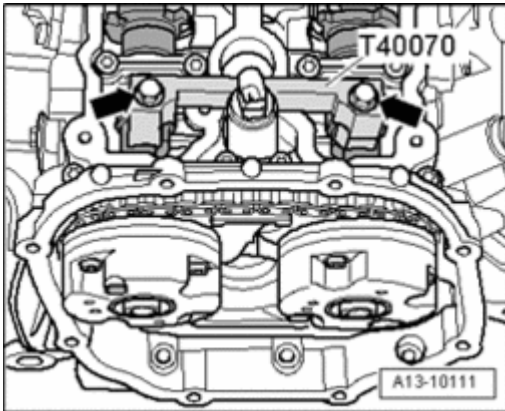


Fig. 297: Removing/Installing Camshaft Locators T40070 On Both Cylinder Heads
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check whether camshafts of both cylinder heads stand in TDC position.
- Camshaft Clamp T40070 must be installed on both cylinder heads and tightened to 25 Nm.

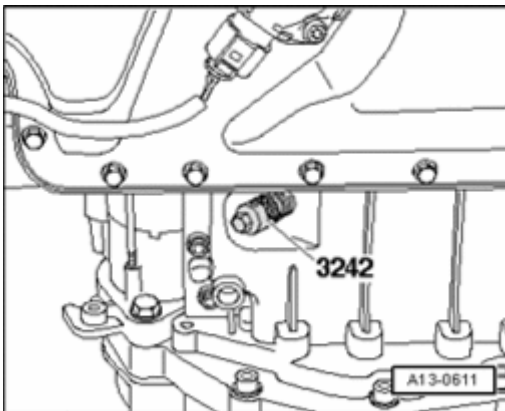


Fig. 298: Removing/Installing Drain Plug From Upper Section Of Oil Pan
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Crankshaft holder 3242 must be installed.

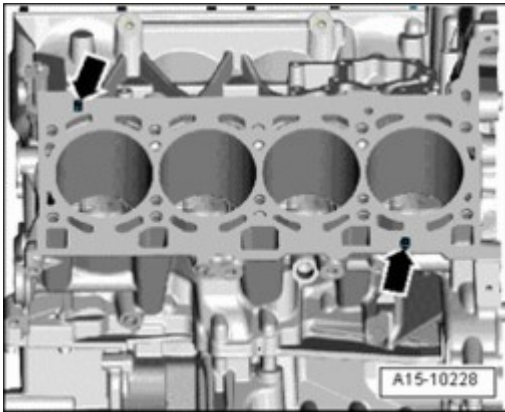


Fig. 299: Identifying Alignment Bushings In Cylinder Block
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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.

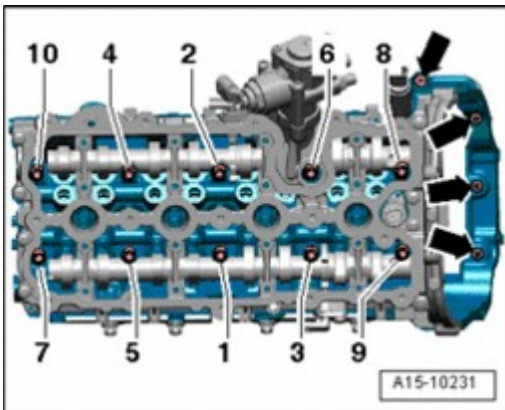


Fig. 300: Tightening Cylinder Head Bolts In Stages In Tightening Sequence
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten cylinder head bolts in 4 stages in tightening sequence - **1 to 10** - 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; Locking compound .
- Tighten bolts - **arrows** - 90 ° ($\frac{1}{4}$ additional turn) using a rigid wrench.

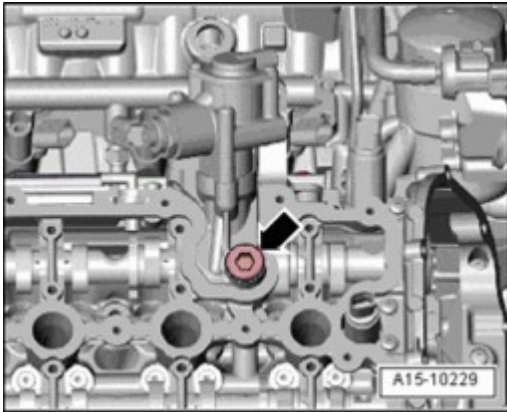


Fig. 301: Removing/Installing Locking Bolt

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten locking bolt - **arrow** -.

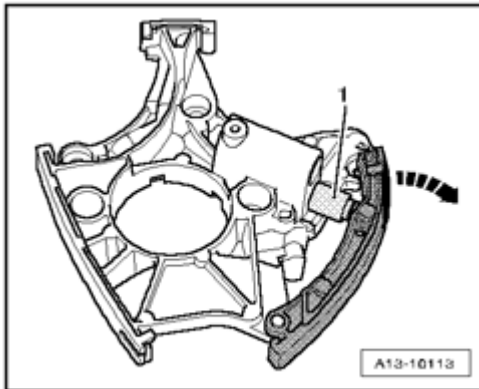


Fig. 302: Releasing Chain Tensioner Glide Track For Camshaft Timing Chain

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Completely release guide rail on removed camshaft timing chain tensioner - **arrow** -.
- The chain tensioner piston - **1** - must be driven out completely, thereby releasing retainer.

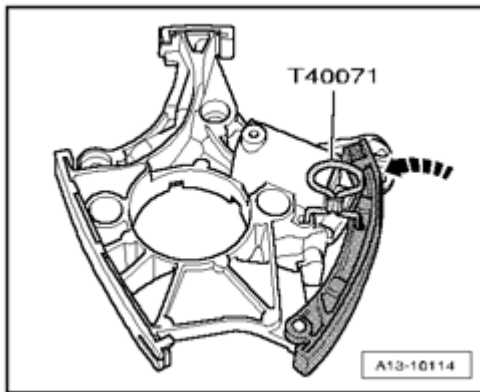


Fig. 303: Pressing Guide Rail Of Left/Right Camshaft Timing Chain Inward Up To Stop And Secure Chain Tensioner With Securing Pin T40071

Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

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

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

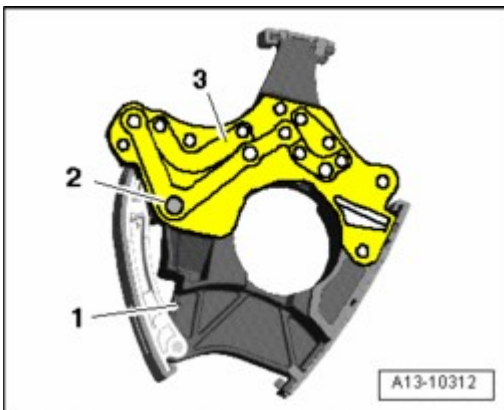


Fig. 304: Placing New Gasket Onto Rear Of Chain Tensioner

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 -.

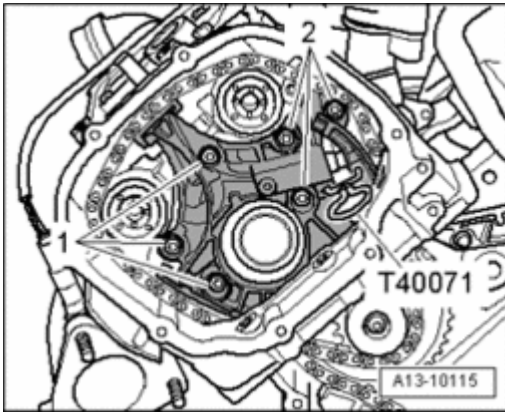


Fig. 305: Tightening Bolts & Replacing Camshaft Bolts
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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**.
- Install left and right timing chain covers **Installing**.
- Install cylinder head cover: Left --> **Left cylinder head cover, removing and installing**, right --> **Right cylinder head cover, removing and installing**.

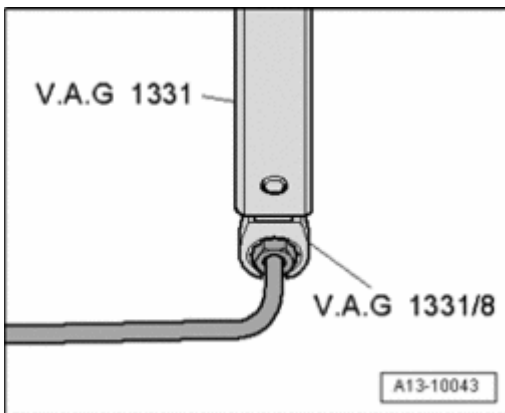


Fig. 306: Fastening High-Pressure Line At Fuel Rail Using Torque Wrench V.A.G 1331 With Open End Wrench Socket V.A.G 1331/8
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- To tighten union nut (14 mm) at fuel rail use torque wrench V.A.G 1331 with 14 mm open end wrench socket V.A.G 1331/8.

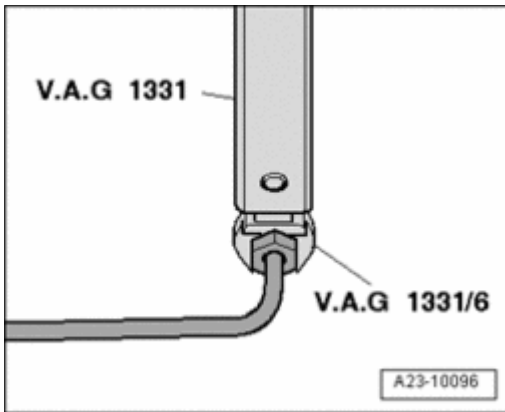


Fig. 307: Tightening SW 17 Union Nut At Fuel Rail Using Torque Wrench V.A.G 1331 With SW 17 Socket V.A.G 1331/6

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 front exhaust pipe with pre- and main catalytic converters: Left --> **Left front exhaust pipe with primary and main catalytic converter, removing and installing** ; right --> **Right front exhaust pipe with primary and main catalytic converter, removing and installing**.
- Install engine --> **Engine, installing**.
- Change engine oil 803 or 805.
- Replace coolant --> **Cooling system, draining and filling**.

Torque specifications

Component	Nm
Locking bolt to guide frame	35 ¹⁾
High pressure lines to fuel rail	25
Chain tensioner to cylinder head	9
● ¹⁾ Replace seal.	

Compression pressures, checking

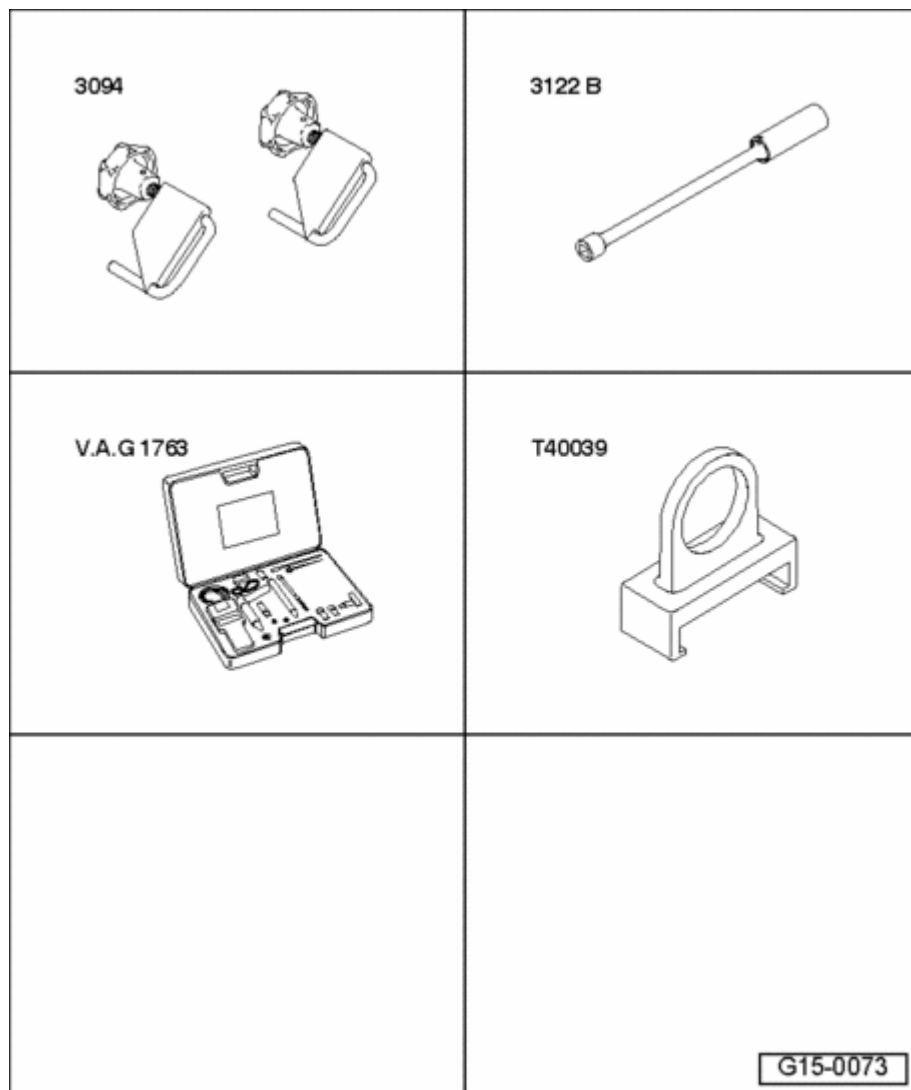


Fig. 308: Identifying Special Tools - Compression Pressures, Checking
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Hose clamps up to 25 mm dia. 3094
- Spark plug removal tool 3122 B
- Compression tester V.A.G 1763
- Puller T40039

Work procedure

- Engine oil temperature min. 30 ° C.
- Battery voltage min. 12.5 V.
- Switch off ignition.

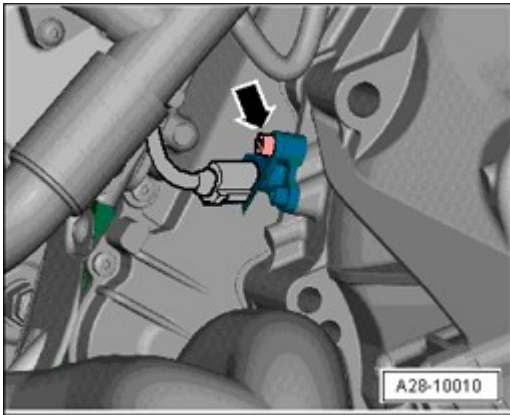


Fig. 309: Removing On Engine Speed (RPM) Sensor G28 At Left Of Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector at Engine Speed (RPM) Sensor G28 - **arrow** - at left of transmission by bending heat shield to side slightly.

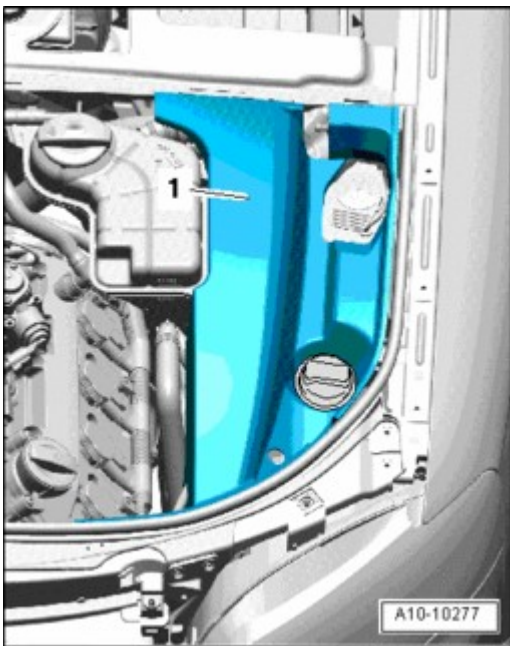


Fig. 310: Removing Cover In Engine Compartment (Left Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove cover - **1** - in engine compartment (left side).

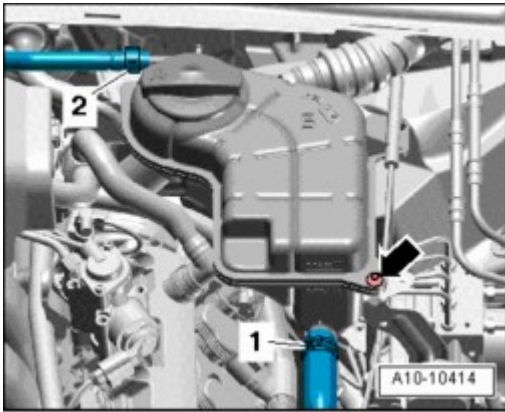


Fig. 311: Removing Coolant Hoses & Coolant Expansion Tank
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clamp off coolant hose - **2** - using hose clamp 3094 and disconnect from coolant expansion tank.
- Seal connection using a plug that fits.
- Remove coolant expansion tank - **arrow** -.
- Disconnect electrical wire from engine coolant level (ECL) warning switch F66 at bottom on coolant reservoir and set aside coolant reservoir with coolant hose - **1** - connected.

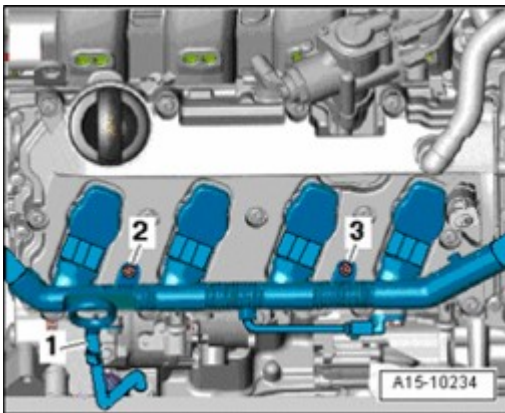
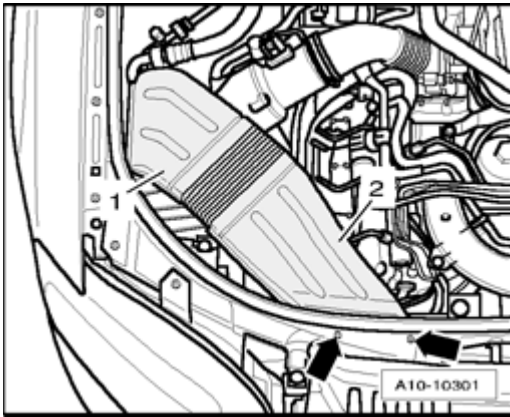


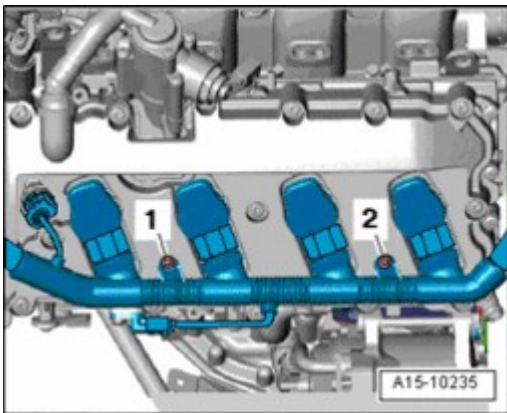
Fig. 312: Identifying Oil Dipstick, Bolts & Ignition Coils Electrical Harness Connectors
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove oil dipstick - **1** - from guide tube.
- Remove bolts - **2** - and - **3** -.
- Disconnect electrical harness connectors at ignition coils.
- Press electrical wiring harness to side.

**Fig. 313: Removing Bolts & Air Ducts**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

**Fig. 314: Identifying Bolts & Ignition Coils Electrical Harness Connectors**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

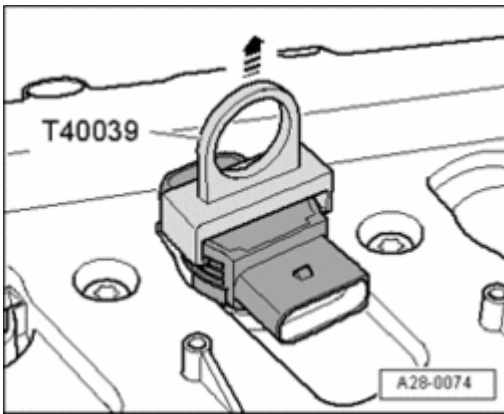


Fig. 315: Removing Ignition Coils Using Ignition Coil Puller T40039
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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

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

Torque specifications

Component	Nm
Wiring for ignition coils at cylinder head cover	5

VALVETRAIN, SERVICING

Valvetrain, servicing

NOTE:

- **Cylinder heads with cracks between the valve seats, or between the valve**

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

- After installing the camshafts, the engine may not be started for approx. 30 minutes. The hydraulic equalization elements must seat themselves (otherwise the valves will crash into the pistons).
- After working on the valvetrain, carefully rotate engine by hand at least 2 full revolutions to ensure that valves do not strike the pistons when starting.

Valvetrain, component overview

NOTE:

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

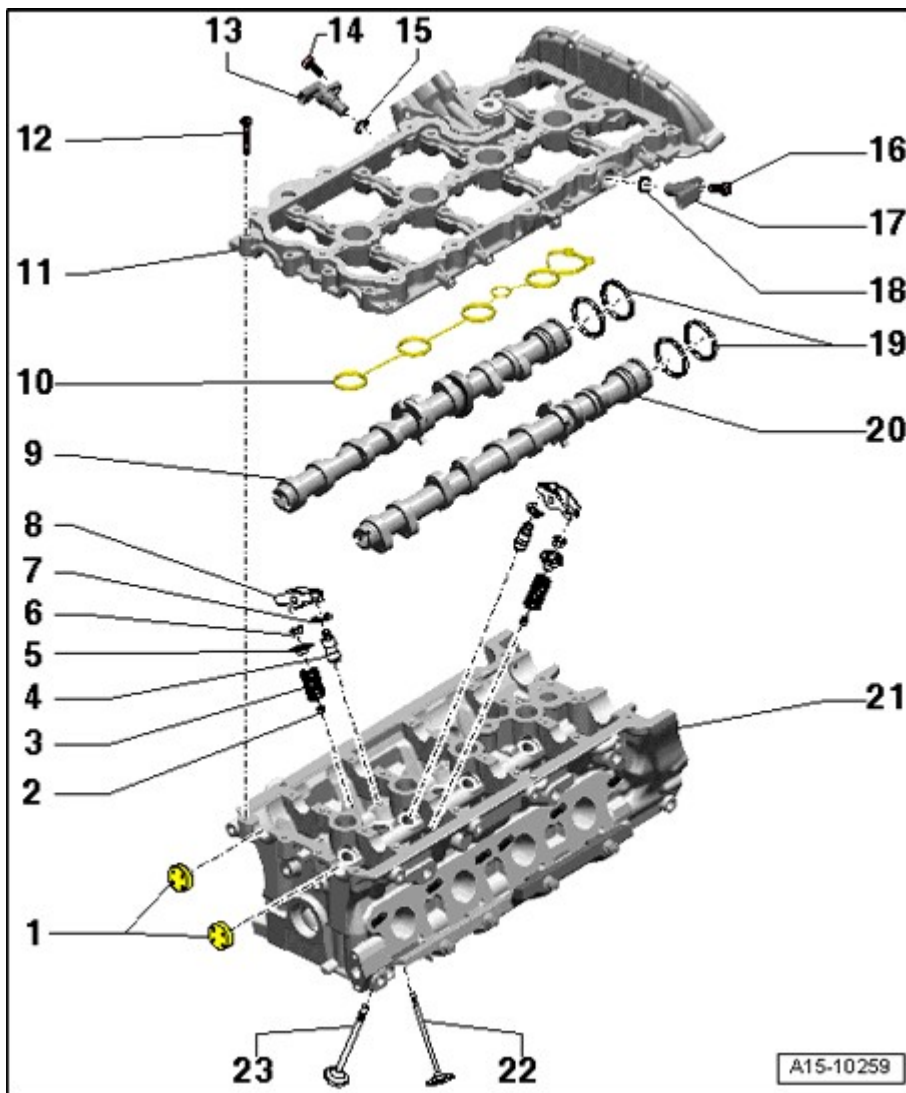


Fig. 316: Valvetrain, Component Overview

Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Sealing plug

2 - Valve stem seal

- Replacing --> **Valve stem seals, replacing.**

3 - Valve spring

- Installed location **Installed position of valve spring**

4 - Support element

- With hydraulic valve clearance compensation
- Clipped into roller rocker lever - **8** -
- Checking --> **Support elements with hydraulic adjustment, checking**
- Do not interchange
- Lubricate contact surface

5 - Valve spring plate

6 - Valve keepers

7 - Securing clip

- Check for secure seat

8 - Roller rocker lever

- Do not interchange
- Check roller for easy movement
- Lubricate contact surface
- To assemble, clip onto support element - **4** - with securing clip - **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-dia. 24 mm: 0.024 to 0.066 mm
- Radial clearance at bearing-dia. 36 mm: 0.032 to 0.078 mm
- Run-out: max. 0.04 mm

10 - Gasket

- Replace

11 - Bearing bracket

- With integrated camshaft bearings
- Removing and installing --> **Camshafts, removing and installing**

12 - 8 Nm

- Observe tightening sequence --> **Camshafts, removing and installing**

13 - Camshaft position (CMP) sensor 2 G163**14 - 9 Nm****15 - O-ring**

- Replace

16 - 9 Nm**17 - Camshaft position (CMP) sensor 4 G301****18 - O-ring**

- Replace

19 - Compression ring

- For camshaft adjuster

20 - 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-dia. 24 mm: 0.024 to 0.066 mm
- Radial clearance at bearing-dia. 36 mm: 0.032 to 0.078 mm
- Run-out: max. 0.04 mm

21 - Cylinder head

- Check valve guides --> **Valve guides, checking**

22 - 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**

23 - 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

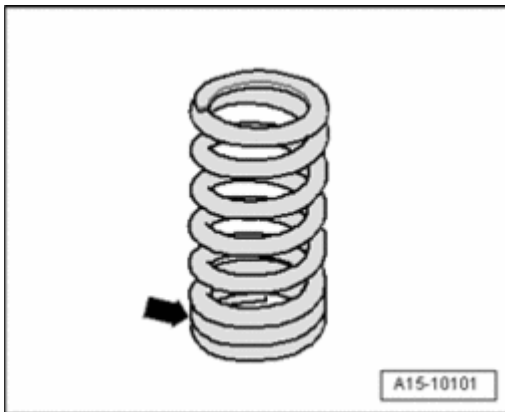


Fig. 317: Identifying Tight Spring Coils Face Toward Cylinder Head
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Camshafts, checking axial clearance

Special tools, testers and auxiliary items required

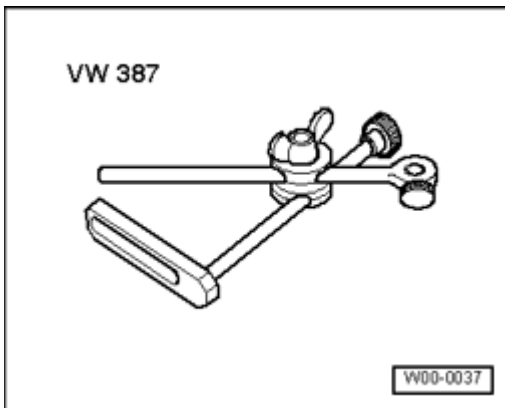
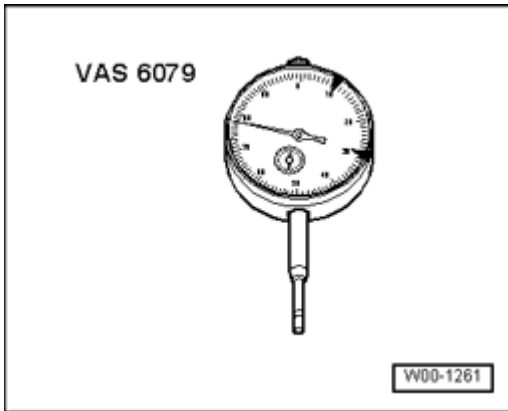


Fig. 318: Identifying Dial Gauge Holder VW 387

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Dial gauge holder VW 387

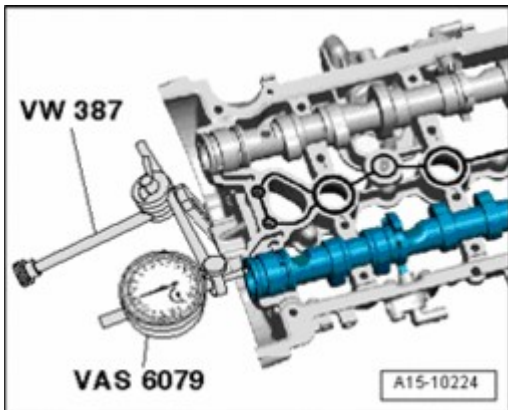
**Fig. 319: Identifying Dial Gauge VAS 6079**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Dial gauge VAS 6079

Work procedure

- Perform measurement with guide frame removed.

**Fig. 320: Securing Dial Gauge Holder VW 387 To Dial Gauge VAS 6079 On Cylinder Head**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure dial gauge holder VW 387 to dial gauge VAS 6079 on cylinder head.
- Determine axial clearance.
- Axial clearance: 0.100 to 0.191 mm.

Camshafts, removing and installing

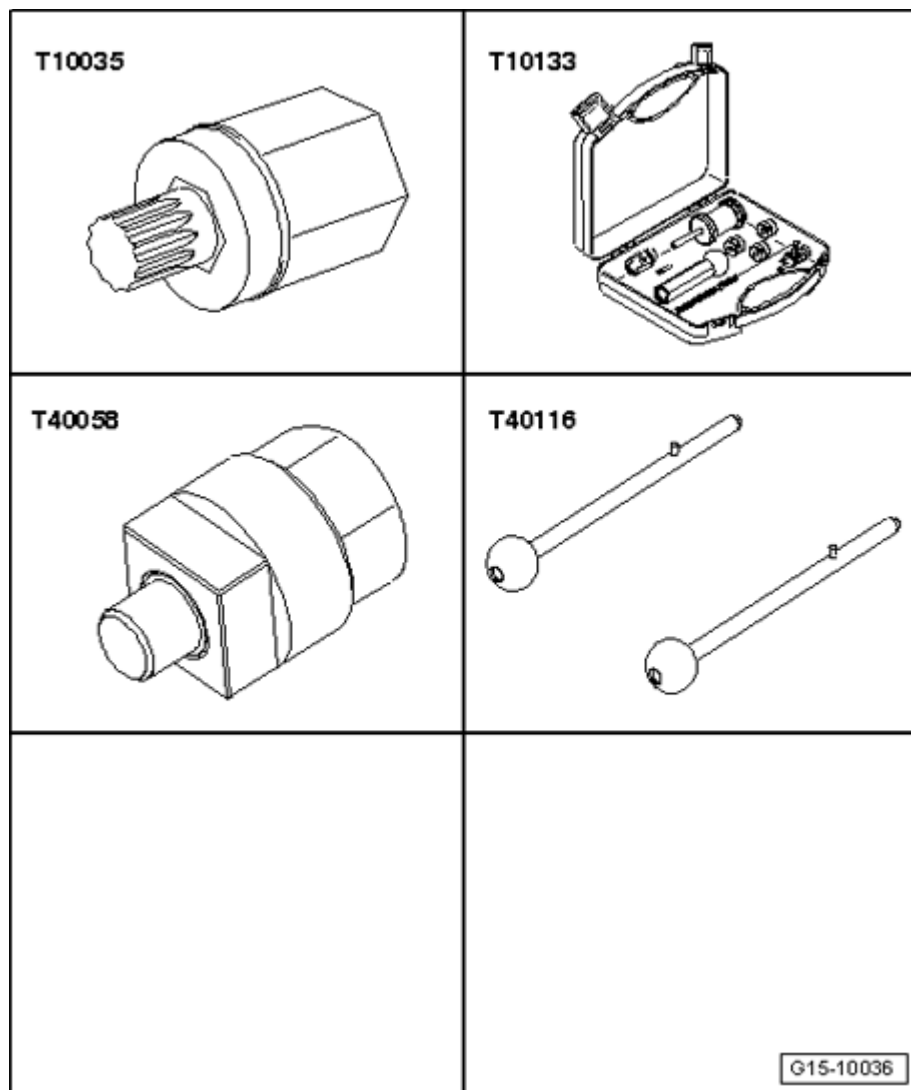


Fig. 321: Identifying Special Tools - Camshafts, Removing And Installing
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Multi-point socket T10035
- Impact Puller T10133/3
- Adapter T40058
- Guide frame securing pins 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.

Removing

- Remove engine --> **Engine, removing.**
- Leave engine with transmission installed on scissor lift platform VAS 6131.
- Remove camshaft timing chains from camshafts --> **Camshaft timing chains, removing from camshafts.**

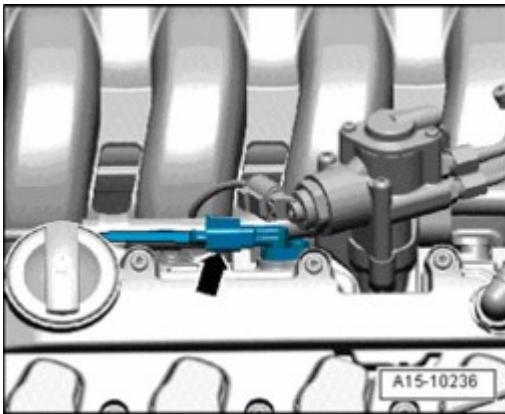


Fig. 322: Disconnecting Electrical Connector At Intake Camshaft Position Sensor
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector at intake camshaft position sensor - **arrow** -.
- Remove high-pressure pump --> **24 - MULTIPOINT FUEL INJECTION (MPI)** .

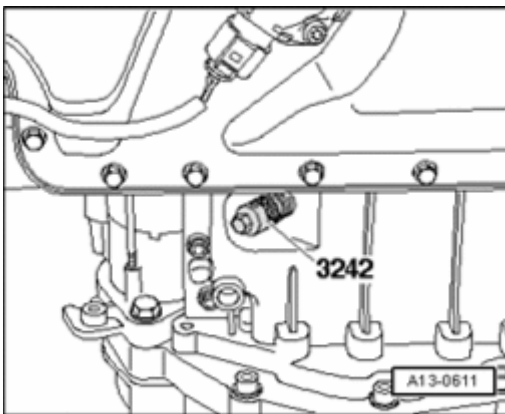


Fig. 323: Removing/Installing Drain Plug From Upper Section Of Oil Pan
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove Crankshaft Holder 3242 from upper part of oil pan.

CAUTION: To prevent valves from contacting pistons during the following steps, crankshaft must be turned so that no pistons are in "TDC" position.

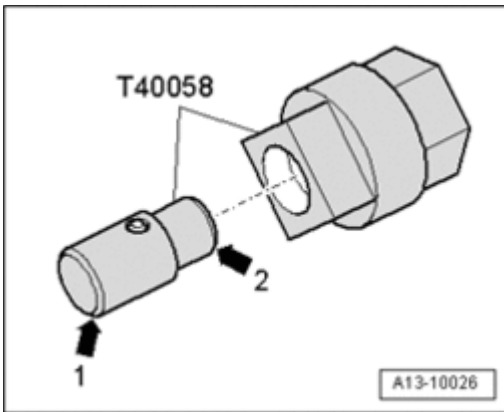


Fig. 324: Inserting Guide Pin Of Adapter T40058

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

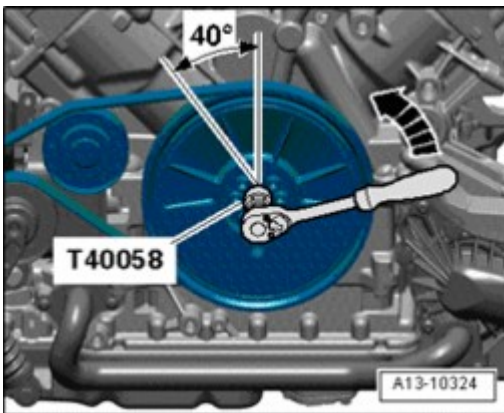


Fig. 325: Rotating Crankshaft With Socket T40058 Opposite Engine Rotation Direction 40 ° Out Of "TDC" Position

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

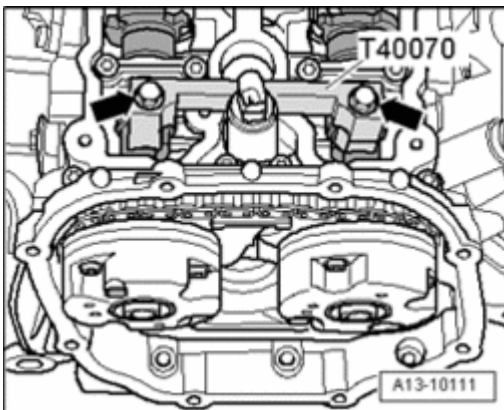


Fig. 326: Removing/Installing Camshaft Locators T40070 On Both Cylinder Heads
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove Camshaft Clamp T40070 at left cylinder head.

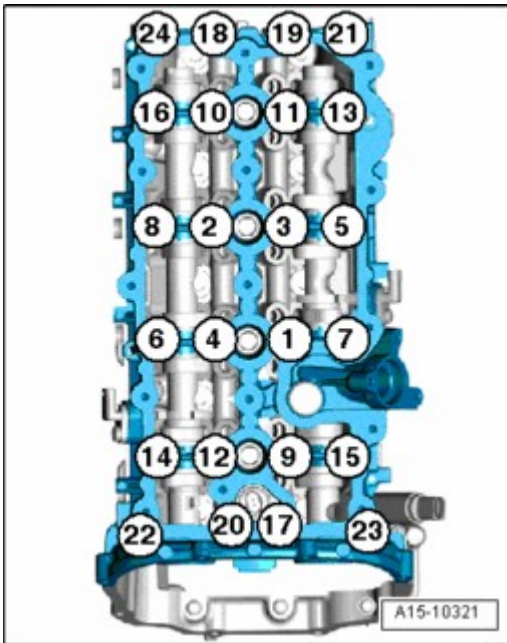


Fig. 327: Guide Frame Bolts Loosening Sequence
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

- Proceed in the same way with right guide frame.

- Carefully remove guide frame.
- Mark camshafts and remove them.

CAUTION: On engines equipped with guide frame alignment pins - arrows - , these must be driven out with a cotter pin driver.

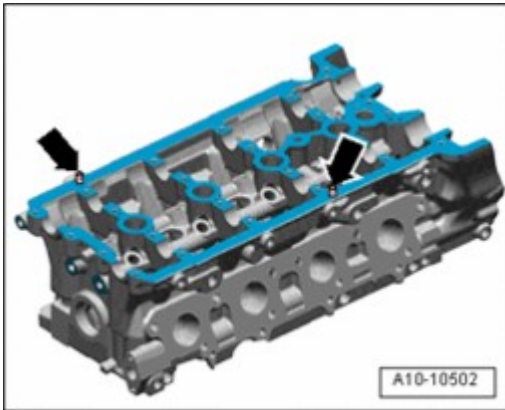


Fig. 328: Identifying Guide Frame Alignment Pins
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installing

NOTE:

- Always replace gaskets and seals.

CAUTION: Wear safety glasses.

- Remove sealant residue on cylinder head and guide frame, e.g. with rotating plastic brush.

CAUTION: Make sure that no sealant residue enters the cylinder head and bearings.

- Clean sealing surfaces, they must be free of oil and grease.
- Oil journal surfaces of camshafts.
- Place camshafts in cylinder head, note position of camshafts so that guide frame can be installed without tension.

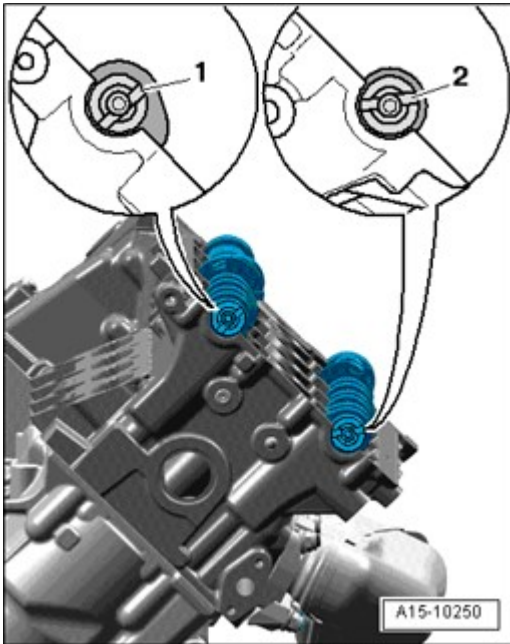


Fig. 329: Identifying Intake Camshaft & Exhaust Camshaft (Left Cylinder Head)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Left cylinder head:

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

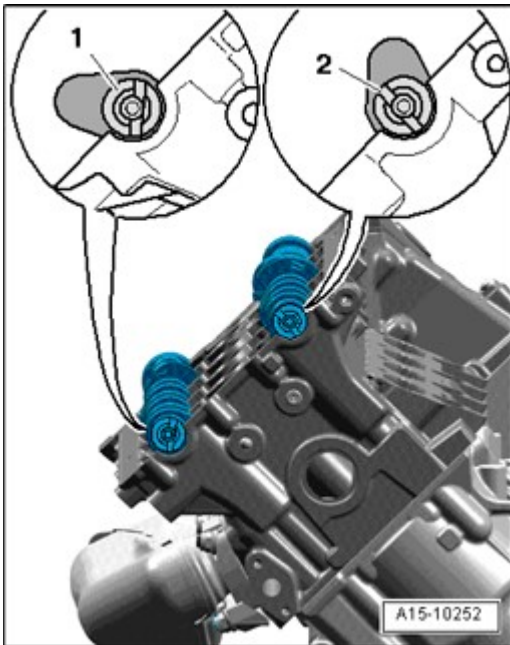


Fig. 330: Identifying Intake Camshaft & Exhaust Camshaft (Right Cylinder Head)

Courtesy of VOLKSWAGEN UNITED STATES, INC.

Right cylinder head:

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

Continued for both sides:

- Check location of compression ring ends.

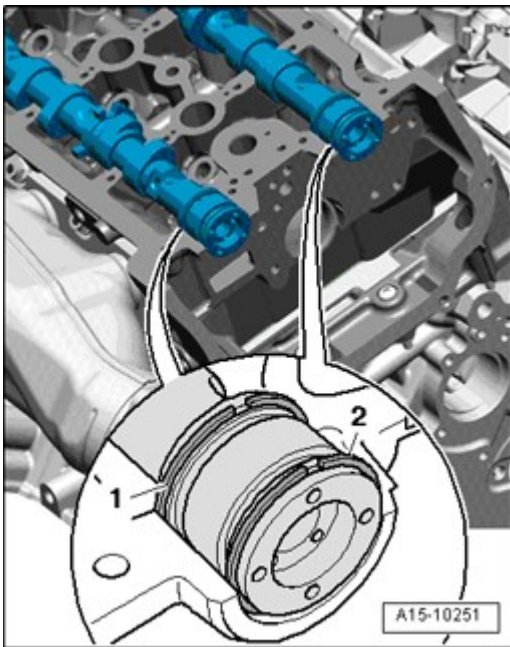


Fig. 331: Identifying Compression Ring Ends Face Upward Or Downward
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

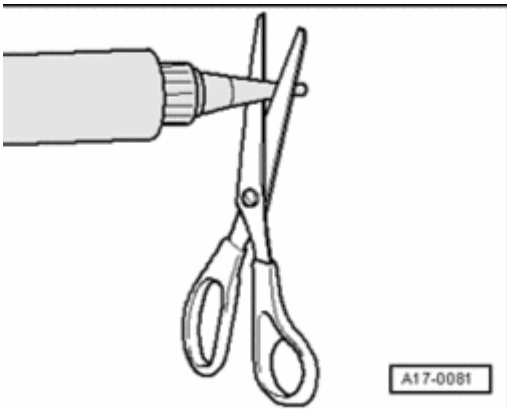
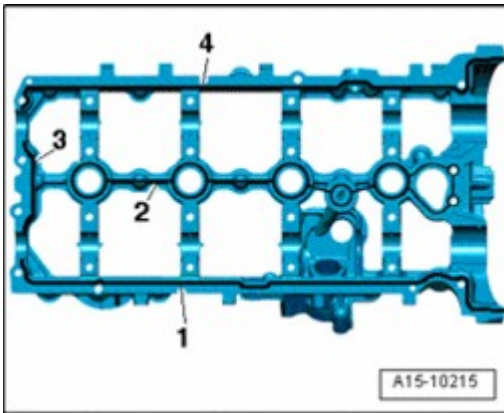


Fig. 332: Cutting Tube Nozzle At Front Marking

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

**Fig. 333: Laying New Seal In Guide Frame Groove & Applying Sealant Beads On Clean Guide Frame Sealing Surfaces**

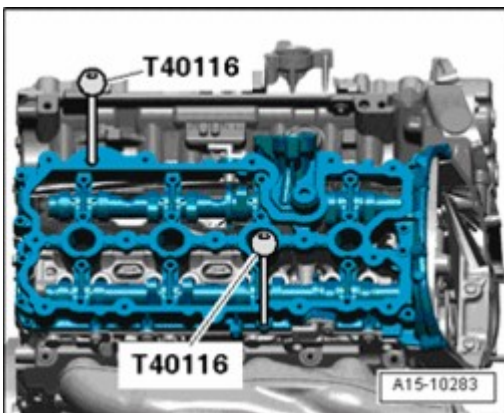
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lay a new seal - 2 - in guide frame groove.
- Apply sealant beads - 1, 3, 4 - on clean guide frame sealing surfaces as shown in illustration.
- Thickness of sealant beads: 2.5 mm.

NOTE:

- Sealant beads must not be thicker than specified, otherwise extra sealant can enter camshaft bearing.

- Immediately place guide frame on cylinder head.

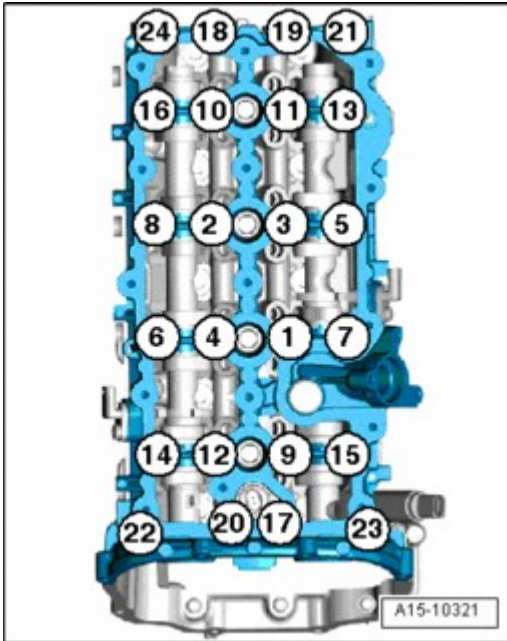
**Fig. 334: Inserting Guide Frame Securing Pins T40116 In Guide Frame And Cylinder Head**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert Guide Frame Securing Pins T40116 in guide frame and cylinder head.

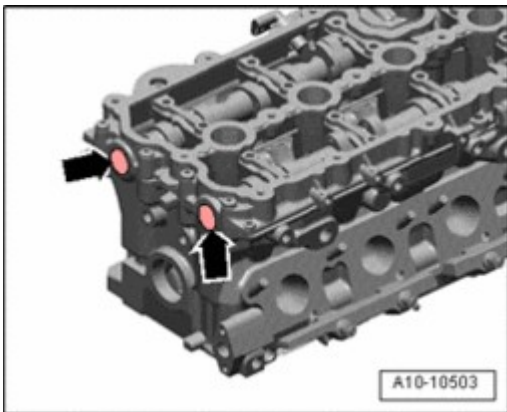
NOTE:

- Placing the guide frame in place and tightening it should occur without interruption, since the sealant begins to harden immediately.
- After installing guide frame, sealant must dry for approx. 30 minutes.

**Fig. 335: Guide Frame Bolts Loosening Sequence**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hand-tighten guide frame bolts equally, in sequence - **1 to 24** -.
- Fasten guide frame bolts in sequence - **24 to 1** - until they stop.

**Fig. 336: Driving Sealing Plugs In Flush**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive sealing plugs - **arrows** - in flush.

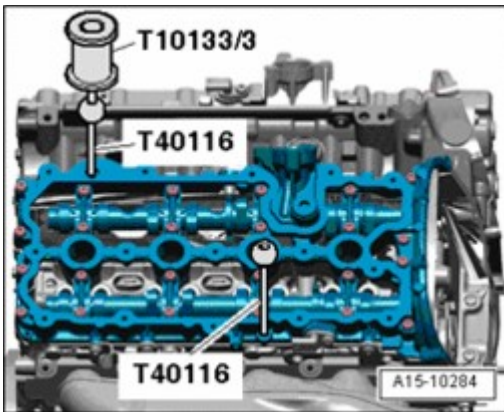


Fig. 337: Removing Guide Frame Securing Pins T40116 With Impact Puller T10133/3
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove Guide Frame Securing Pins T40116 with Impact Puller T10133/3.

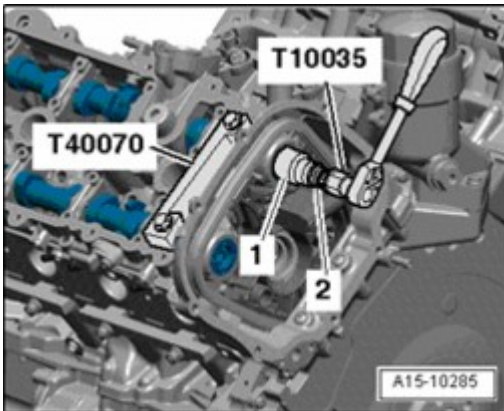


Fig. 338: Rotating Intake Camshaft To "TDC" And Tightening Camshaft Adjuster Screw On Camshaft With A Socket SW 24 Inserted Between
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

- To tighten bolt, counter hold socket with pliers if necessary.

- Position a lever or ratchet with Socket T10035 on bolt and rotate camshaft until threaded holes for Camshaft Clamp T40070 face up.
- Next, loosely fasten Camshaft Clamp T40070 to intake camshaft.
- The camshaft locating tool T40070 is correctly positioned when holes for cylinder head bolts remain free.

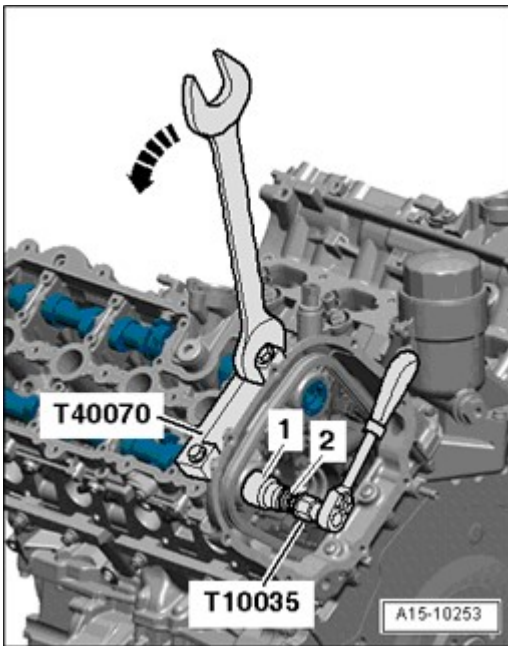


Fig. 339: Adapting Camshaft Adjuster Screw And Socket 24 To Exhaust Camshaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Adapt camshaft adjuster screw - 2 - and socket 24 - 1 - to exhaust camshaft.
- Rotate exhaust camshaft until threaded hole for Camshaft Clamp T40070 faces up.
- At the same time, position a counter-hole SW 24 on Camshaft Clamp T40070 and swing Camshaft Clamp T40070 against exhaust camshaft to install - **arrow** -.
- Tighten Camshaft Clamp T40070 by hand onto exhaust camshaft to avoid damaging threads (2nd technician needed).

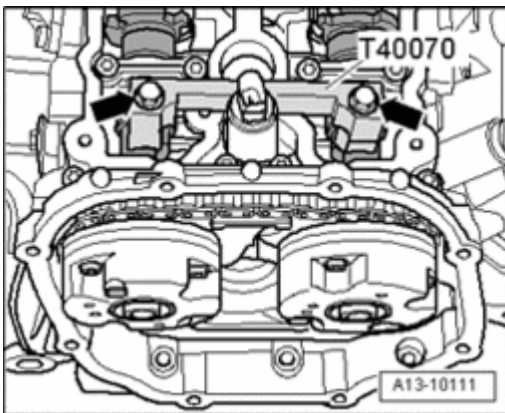


Fig. 340: Removing/Installing Camshaft Locators T40070 On Both Cylinder Heads
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten Camshaft Clamp T40070 bolts to 25 Nm.

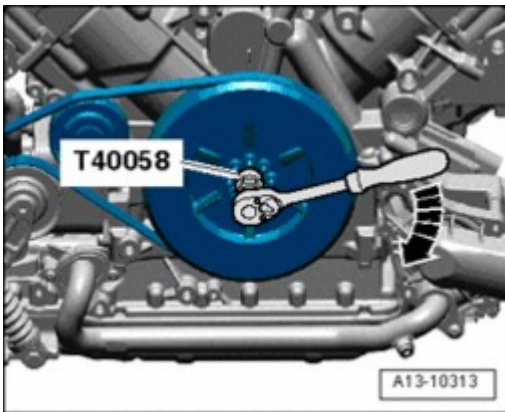


Fig. 341: Using Socket T40058 To Rotate Crankshaft To TDC
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

CAUTION: Do not turn crankshaft while touching "TDC" hole with finger - Risk of injury.

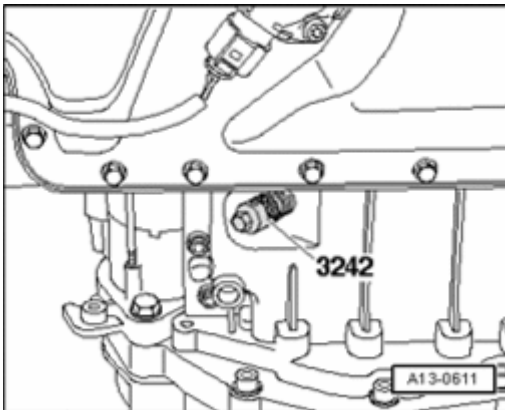


Fig. 342: Removing/Installing Drain Plug From Upper Section Of Oil Pan
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

NOTE:

- After installing camshafts, do not crank engine for at least 30 minutes. The hydraulic equalization elements must seat themselves (otherwise the valves will crash into the pistons).
- After working on the valvetrain, carefully rotate engine by hand at least 2 full revolutions to ensure that valves do not strike the pistons when starting.

- Position camshaft timing chains on camshafts **Installing**.
- Install left and right timing chain covers **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**.

Torque specifications

Component	Nm
Bearing bracket to cylinder head	8

Valve stem seals, replacing

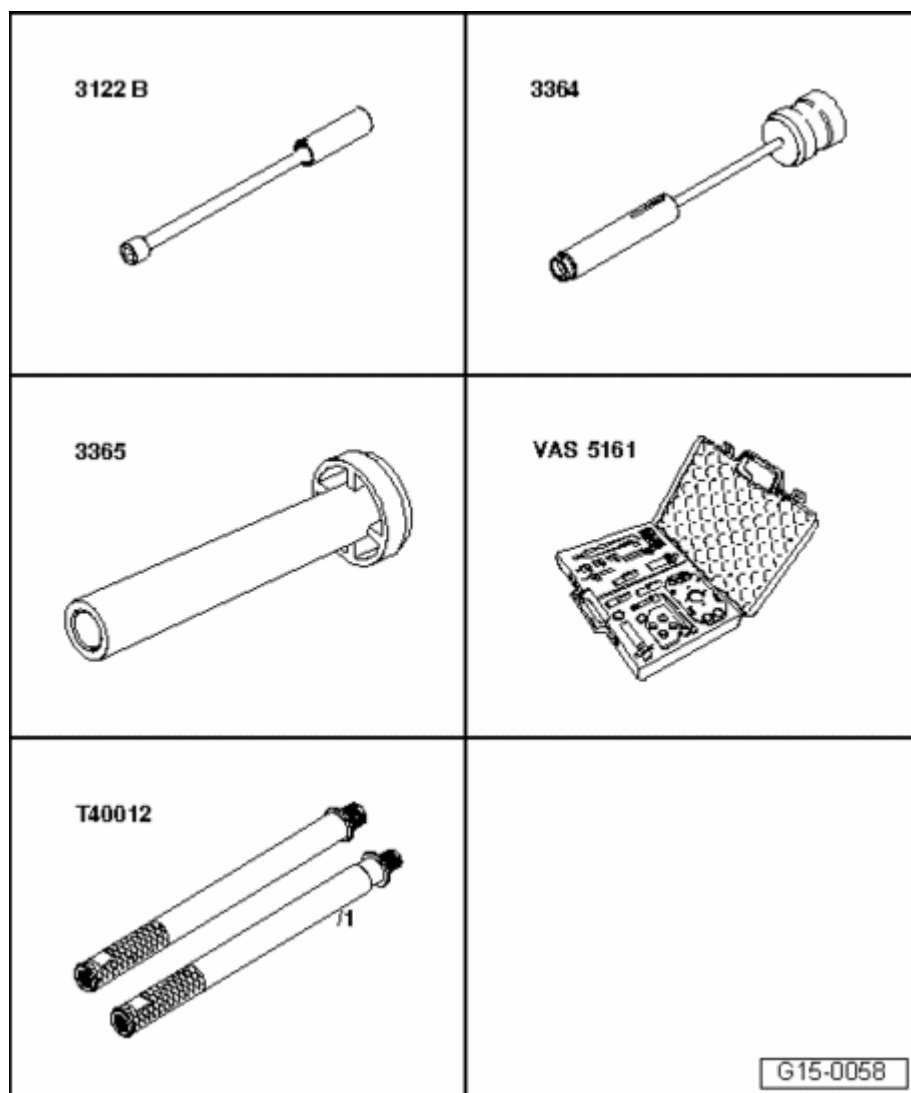


Fig. 343: Identifying Special Tools - Valve Stem Seals, Replacing
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Spark plug removal tool 3122 B
- Valve seal removal tool 3364
- Valve stem seal driver 3365
- Valve cotter disassembly and assembly device VAS 5161
- Adapter T40012

Removing

- Remove engine --> **Engine, removing.**
- Leave engine with transmission installed on scissor lift platform VAS 6131.
- Remove camshaft timing chains from camshafts --> **Camshaft timing chains, removing from camshafts.**
- Remove camshafts --> **Camshafts, removing and installing.**
- Using spark plug removal tool 3122 B , remove spark plugs.

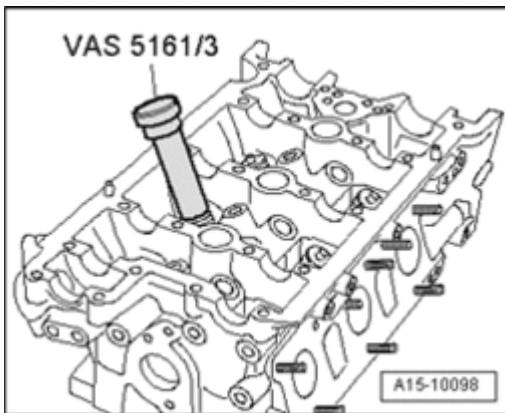


Fig. 344: Placing Drift VAS 5161/3 On Valve Spring Plate And Loosening Stuck Valve Keepers Using Plastic Hammer

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

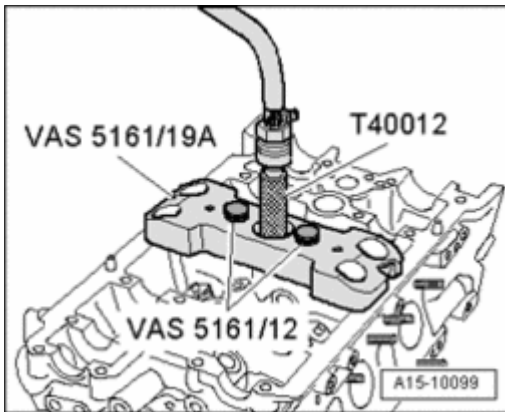


Fig. 345: Placing Guide Plate VAS 5161/19 A From Valve Cotter Disassembly And Assembly Device VAS 5161 On Cylinder Head

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.

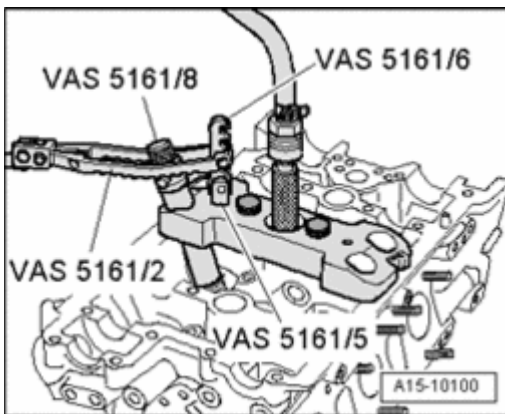


Fig. 346: Installing Engaging Device VAS 5161/6 With Installation Fork VAS 5161/5 Into Guide Plate

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 valve keepers.
- Lightly move knurled bolt back and forth, causing valve keepers to be pressed apart and be captured in the installation cartridge.
- Release pressure fork.

- Remove installation cartridge.
- Unfasten guide plate and turn it aside.
- Pressurized air hose remains connected.
- Remove valve spring with valve spring plate.

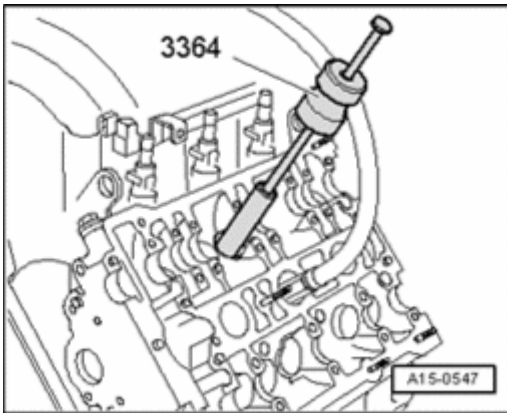


Fig. 347: Pulling Off Valve Stem Oil Seals Using Valve Seal Removal Tool 3364
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull off valve stem oil seals using Valve Seal Removal Tool 3364.

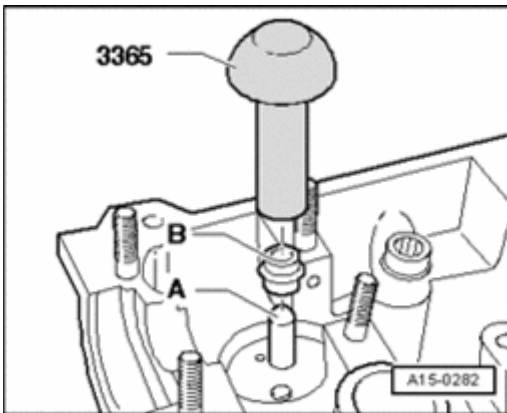


Fig. 348: Identifying Plastic Sleeve, Valve Stem Oil Seal & Valve Stem Seal Driver 3365
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

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.

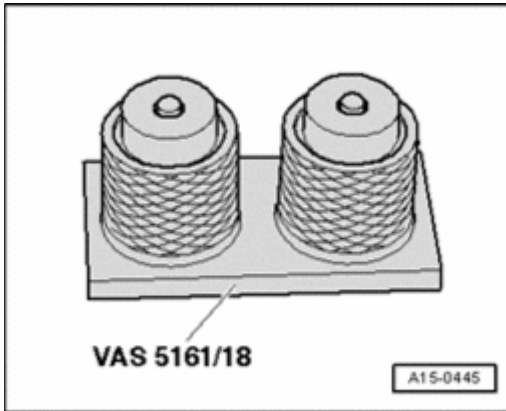


Fig. 349: Identifying Installation Cartridge VAS 5161/8
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

- The large diameter of valve keepers point upward.
- Install valve spring and valve spring plate.

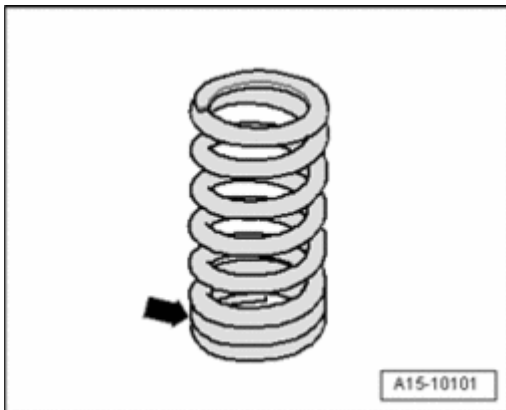


Fig. 350: Identifying Tight Spring Coils Face Toward Cylinder Head
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

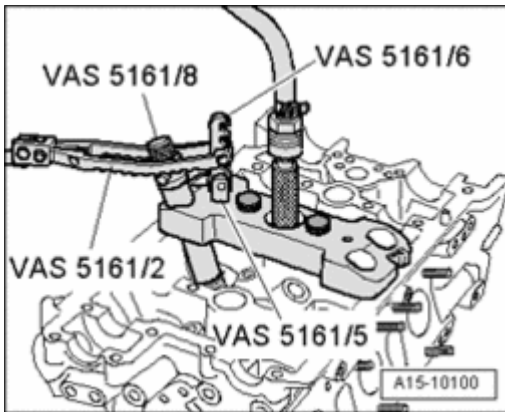


Fig. 351: Installing Guide Plate Onto Cylinder Head
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install guide plate onto cylinder head again.
- Insert installation cartridge into guide plate.
- Press down pressure fork and pull knurled bolt upward turning to left and right - the valve keepers are inserted in this manner.
- Release pressure fork with knurled bolt still pulled.
- Ensure that all roller rocker levers seat properly on valve stem ends and are clipped onto respective support elements.
- Install sparks plugs --> **28 - IGNITION/GLOW PLUG SYSTEM** .
- Install camshafts --> **Camshafts, removing and installing**.
- Position camshaft timing chains on camshafts **Installing**.
- Install left and right timing chain covers **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 equalization elements must seat themselves (otherwise the valves will crash into the pistons).**
- **After working on the valvetrain and lifters, carefully rotate the crankshaft by hand at least 2 full revolutions before starting to be sure that valves do not strike the pistons.**

Support elements with hydraulic adjustment, checking

Special tools, testers and auxiliary items required

- Feeler gauge

NOTE:

- The support elements with hydraulic adjustment cannot be serviced.
- Irregular valve noises are normal while starting the engine.

Work procedure

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

NOTE:

- If irregular valve noises disappear but reappear during short drives, oil check valve should be replaced. Oil check valve location --> Oil check valve and spray nozzle valve, component overview.

If support elements with hydraulic adjustment are still loud, locate faulty support element as follows:

- Remove cylinder head cover: Left --> Left cylinder head cover, removing and installing , right --> Right cylinder head cover, removing and installing.
- Rotate crankshaft until cam lobes on support element that will be checked face upward. To do this, move vehicle forward with 4th gear engaged and ignition switched off.

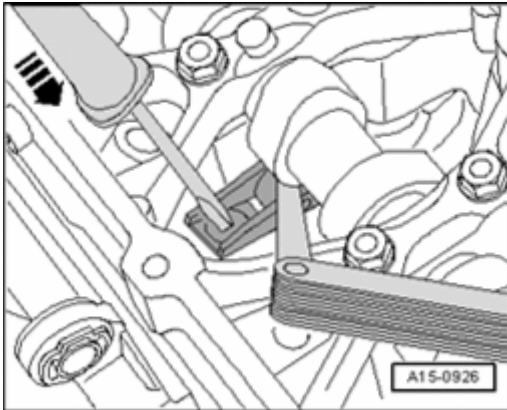


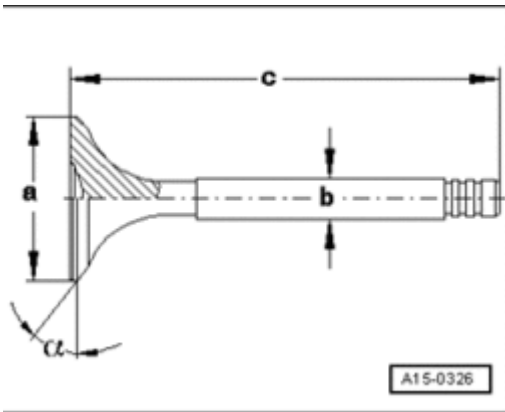
Fig. 352: Checking Play Between Cam Lobes And Roller Rocker Lever
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check play between cam lobes and roller rocker lever.
- Press roller rocker lever down with screwdriver - **arrow** -.

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

- Replace support element --> Camshafts, removing and installing.

Valve dimensions

**Fig. 353: 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
Dia. a	mm	33.85 ± 0.10	28.0 ± 0.1
Dia. b	mm	5.98 ± 0.01	5.96 ± 0.01
c	mm	103.97 ± 0.20	101.9 ± 0.2
a	Angle °	45	45

CAUTION:

- Worn sodium-filled exhaust valves must not be scrapped without first being properly treated.
- Using a metal saw, the valves must be cut into two pieces between the shaft center and valve head. While doing this, do not come into contact with water. At the very most, throw 10 of the prepared valves into a bucket filled with water. Then, move quickly away, because a sudden chemical reaction will occur during which the sodium is burnt away.
- The treated parts may then be discarded through conventional disposal channels.

Valve guides, checking

Special tools, testers and auxiliary items required

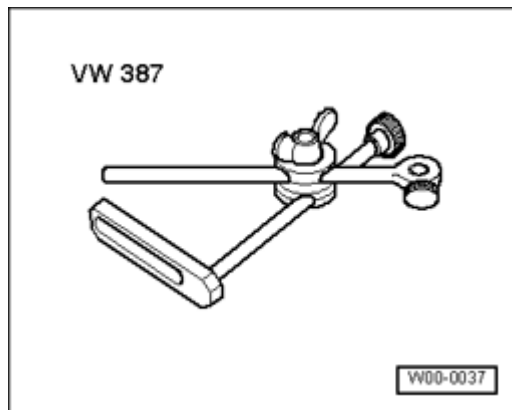


Fig. 354: Identifying Dial Gauge Holder VW 387
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Dial gauge holder VW 387

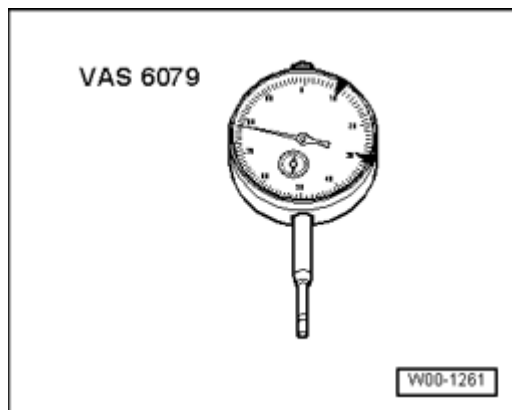


Fig. 355: Identifying Dial Gauge VAS 6079
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Dial gauge VAS 6079

Work procedure

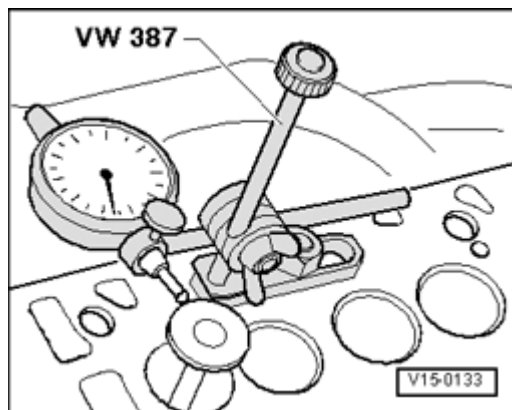


Fig. 356: Identifying Special Tool - VW 387 Installed

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert valve into valve guide. Due to slight difference in stem dimensions, ensure that only an intake valve is used in intake guide and an exhaust valve in exhaust guide.
- Valve stem tip must seal with valve guide.
- Determine tilt clearance.
- Wear limit: 0.8 mm.

NOTE:

- If the valve is to be replaced as part of a repair, use a new valve for the calculation.
- If wear limit is exceeded, re-measure using new valves. If wear limit is still exceeded, replace cylinder head.

Valves, checking

- Perform a visual check for signs of wear at stem and at seating surface.

If significant wear is discovered:

- Replace respective valve.

17 - ENGINE - LUBRICATION**LUBRICATION SYSTEM COMPONENTS, REMOVING AND INSTALLING****Lubrication system components, removing and installing****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 both oil coolers must be replaced.
- Oil level must not exceed max. marking danger of catalytic converter damage!
- Oil quantities, viscosity classes and oil specifications Maintenance tables.

Oil pump, lower section of oil pan, component overview

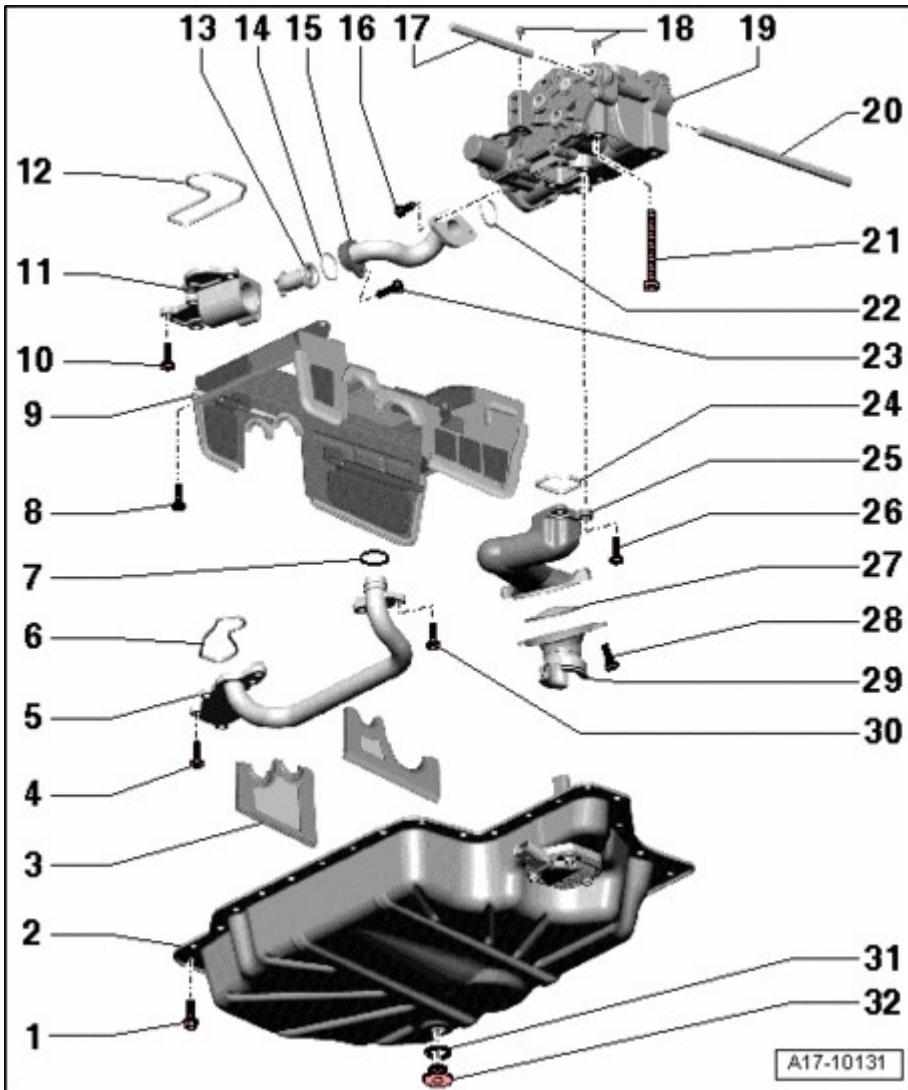


Fig. 357: Oil Pump, Lower Section Of Oil Pan, Component Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - 9 Nm

2 - Oil pan (lower section)

- Removing and installing --> **Lower part of oil pan, 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**

3 - Side panel

- For baffle box

4 - 9 Nm

5 - Oil pipe

6 - Gasket

- Replace

7 - O-ring

- Replace

8 - 9 Nm

9 - Baffle box

10 - 9 Nm

11 - Housing

- For oil check valve

12 - Gasket

- Replace

13 - Oil check valve

14 - O-ring

- Replace

15 - Oil pipe

16 - 9 Nm

17 - Drive shaft for coolant pump

18 - Fitting sleeves

- 2 pieces

19 - Oil pump

- Do not disassemble
- With relief valve approx. 5.5 bar
- Removing and installing --> **Oil pump, removing and installing**

20 - Drive shaft for oil pump

21 - 8 Nm plus an additional 90 ° ($\frac{1}{4}$ turn)

- Replace

22 - O-ring

- Replace

23 - 9 Nm

24 - Gasket

- Replace

25 - Housing for intake tube

26 - 9 Nm

27 - Oil strainer

- Clean

28 - 9 Nm

29 - Intake tube

- For oil pump

30 - 9 Nm

31 - Seal

- Replace

32 - Oil drain plug, 25 Nm

Oil Level Thermal Sensor G266 , removing and installing

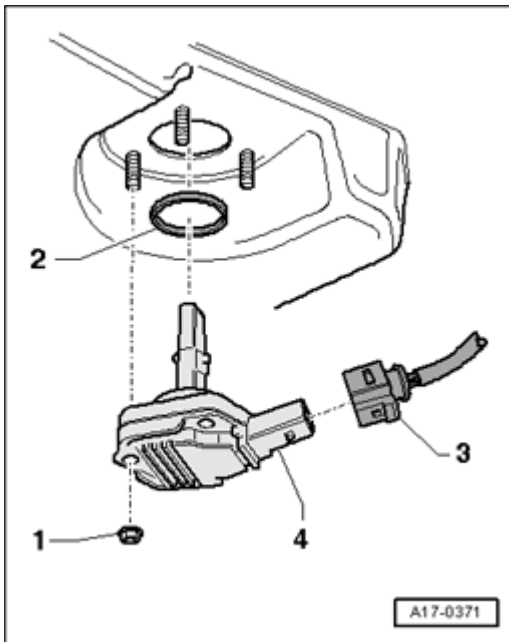


Fig. 358: Oil Level Thermal Sensor G266 , Removing And Installing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1. Nut, 9 Nm
2. Sealing ring; replace
3. Electrical harness connector
4. Oil Level Thermal Sensor G266

Lower part of oil pan, removing and installing

Special tools, testers and auxiliary items required

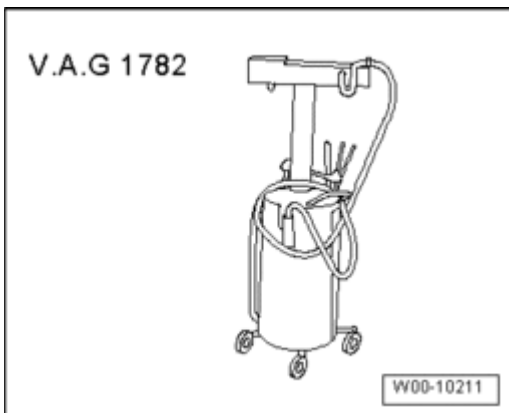


Fig. 359: Identifying Old Oil Collecting And Extracting Device V.A.G 1782
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

- Protective glasses
- Sealant

Removing

- Drain coolant --> **Cooling system, draining and filling.**

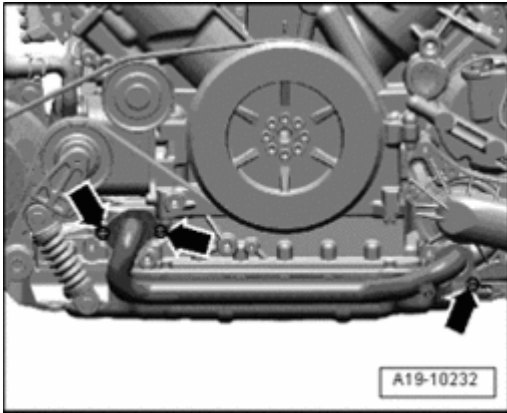


Fig. 360: Removing Bolts, Front Coolant Pipe At Engine And At Coolant Pump
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Remove front coolant pipe at engine and at coolant pump.

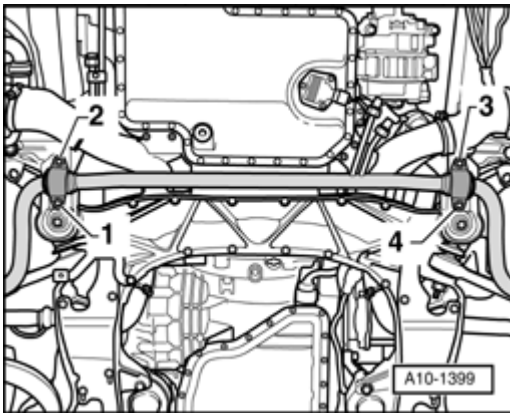


Fig. 361: Removing Nuts For Left/Right Stabilizer Mounts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - **1 to 4** - for left and right stabilizer mounts.

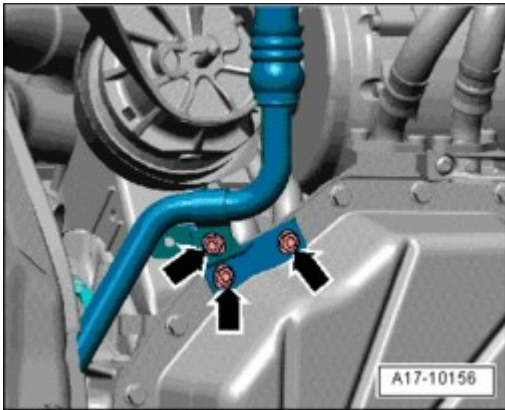


Fig. 362: Removing Refrigerant Line Bracket At Right On Oil Pan
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove refrigerant line bracket at right on oil pan - **arrows** -.

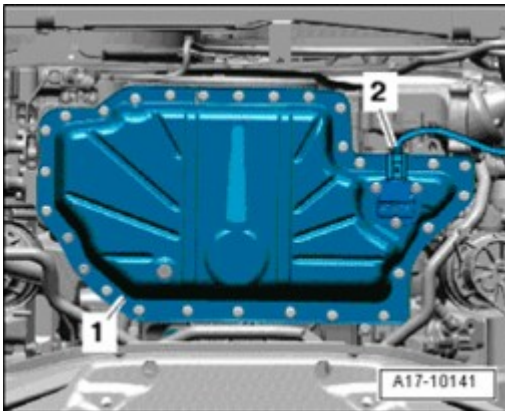


Fig. 363: Disconnecting Electrical Connector At Oil Level Thermal Sensor G266
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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

NOTE: • **Replace seals.**

CAUTION: Wear safety glasses.

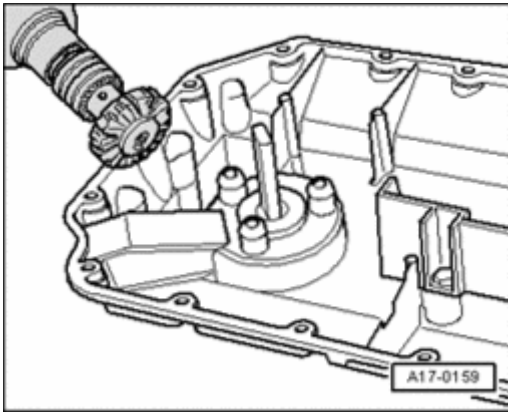


Fig. 364: Using Rotating Plastic Brush To Remove Any Remaining Sealant From Oil Pan (Lower Part) And At Upper Part

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using rotating plastic brush, remove any remaining sealant from oil pan (lower part) and at upper part.
- Clean sealing surfaces, they must be free of oil and grease.

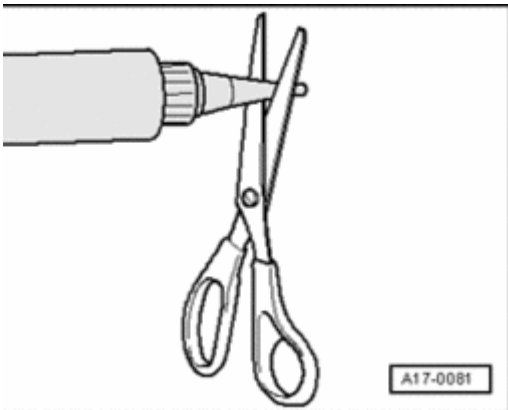


Fig. 365: Cutting Tube Nozzle At Front Marking

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

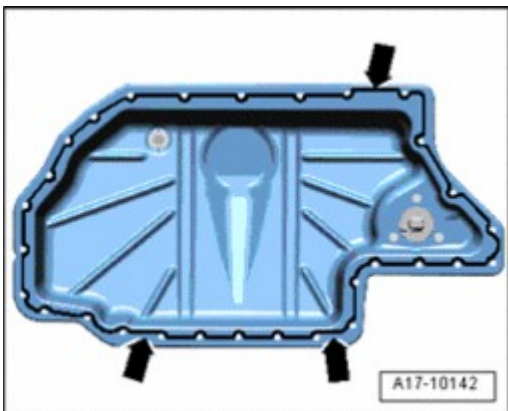


Fig. 366: Applying Sealant Bead On Clean Sealing Surface Of Lower Section Of Oil Pan
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Apply sealant bead - **arrows** - on clean sealing surface of lower section of oil pan as shown in illustration.
- Thickness of sealant bead: 2.5 mm.

NOTE:

- **Observe the position of the sealant bead at areas indicated with - arrows -.**
 - **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 stabilizer bar --> **40 - FRONT SUSPENSION** .
- Install front coolant pipe --> **Front coolant line, removing and installing**.
- Add engine oil and check oil level --> **Oil level, checking**.
- Fill with coolant **Filling**.

Torque specifications

Component	Nm
Lower part of oil pan to upper part of oil pan	9 ¹⁾
Oil drain plug	25
Bracket for refrigerant line to upper section of oil pan	9
Clamp to bracket for refrigerant line	9
● ¹⁾ Tighten in 2 stages.	

Oil pump, removing and installing

Special tools, testers and auxiliary items required

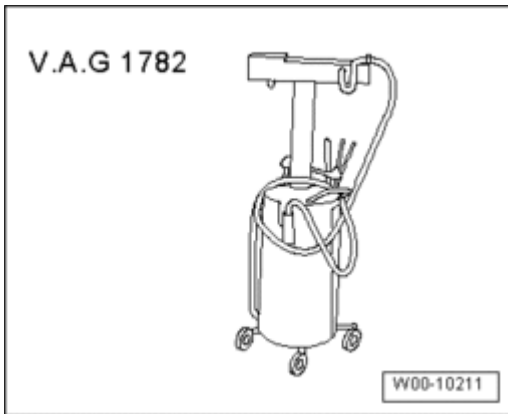


Fig. 367: Identifying Old Oil Collecting And Extracting Device V.A.G 1782
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

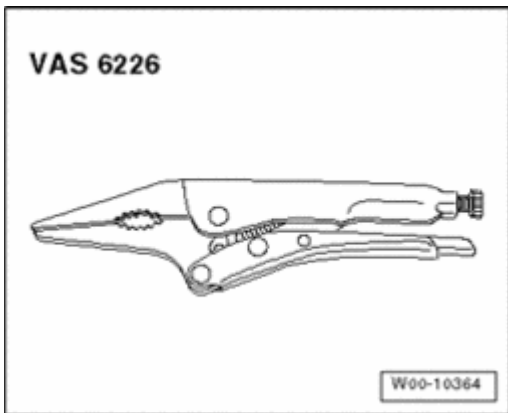


Fig. 368: Long-Nose Gripping Pliers VAS 6226
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Long-nose gripping pliers VAS 6226

Removing

- Remove lower section of oil pan --> **Lower part of oil pan, removing and installing.**

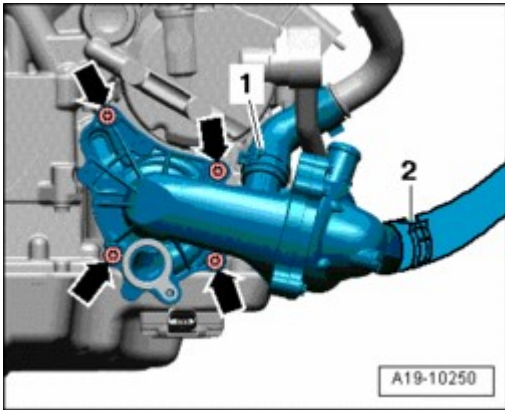


Fig. 369: Removing Coolant Hoses & Coolant Pump
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove coolant hoses - **1** - and - **2** -.
- Remove coolant pump - **arrows** -.

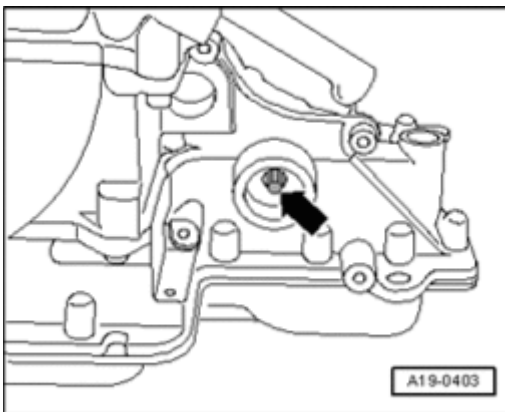


Fig. 370: Removing/Installing Drive Shaft For Coolant Pump From Oil Pump
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

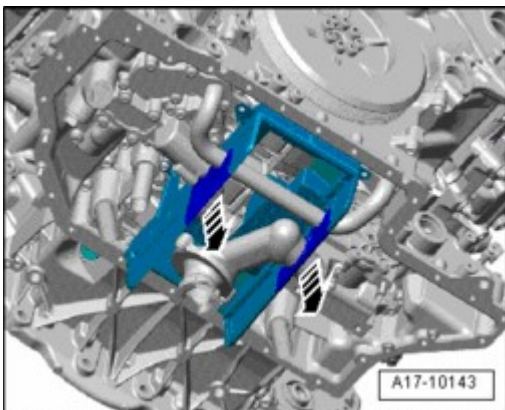


Fig. 371: Removing Both Side Panels From Baffle Box

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove both side panels from baffle box - **arrows** -.

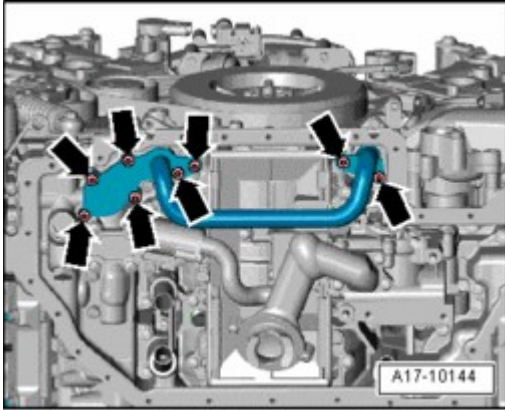


Fig. 372: Removing Bolts And Oil Pipe

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 pipes.

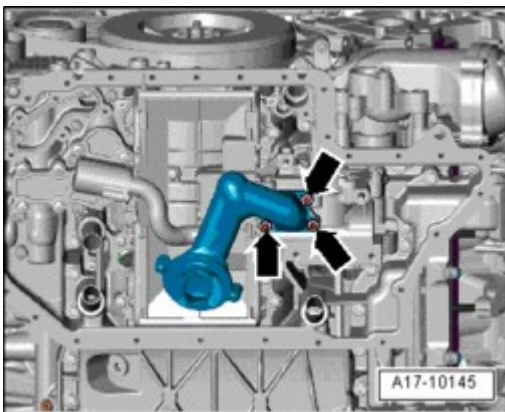


Fig. 373: Removing Bolts And Intake Tube With Housing

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and remove intake tube with housing.

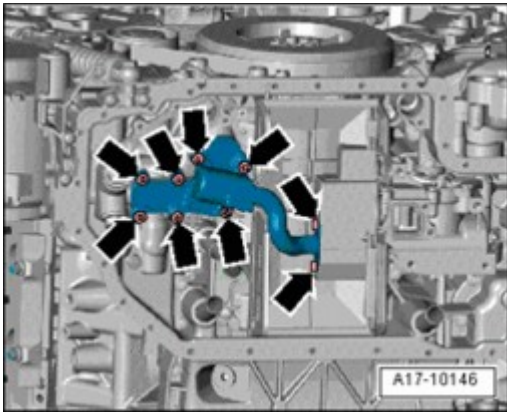


Fig. 374: Removing Oil Pipe Together With Oil Check Valve Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove oil pipe together with oil check valve housing.

NOTE:

- Oil escapes when removing oil pipes.

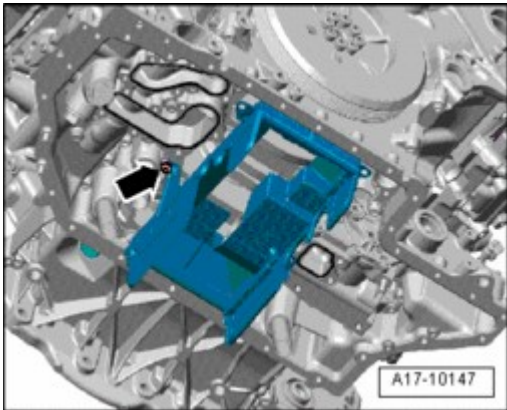


Fig. 375: Removing Bolt And Baffle Box
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - **arrow** - and remove baffle box.

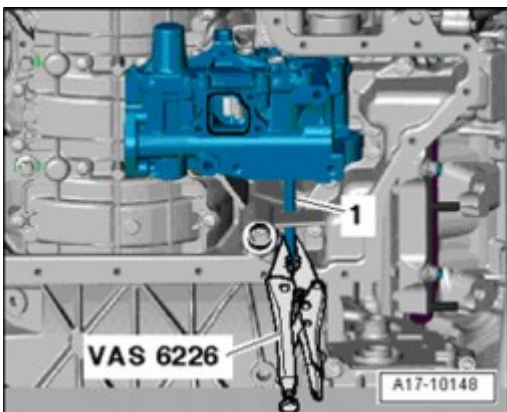


Fig. 376: Unlocking Long-Nose Gripping Pliers VAS 6226 And Letting Drive Shaft Glide Into Oil Pump
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press back drive shaft - **1** - for oil pump against spring force and clamp tightly using Long-nose gripping pliers VAS 6226.

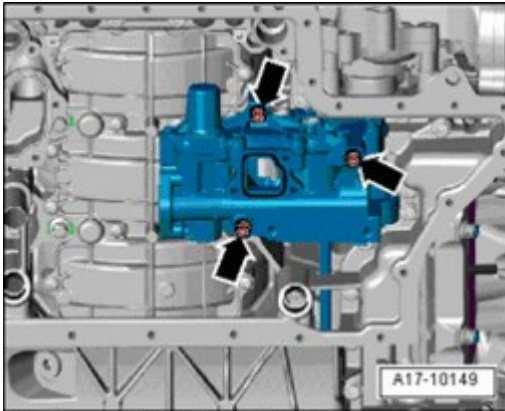


Fig. 377: Removing Bolts And Oil Pump
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and remove oil pump.

Installing

NOTE:

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

- Check whether 2 alignment bushings are present in cylinder block, install if necessary.
- Tighten oil pump - **arrows** -.

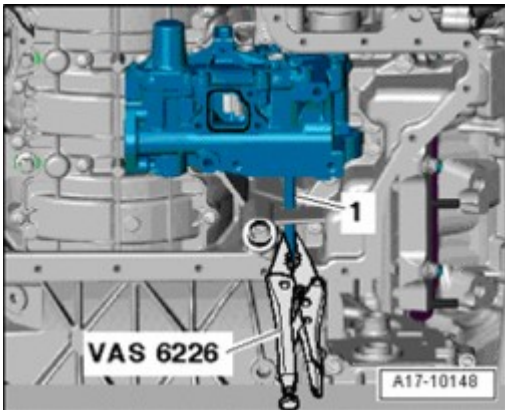


Fig. 378: Unlocking Long-Nose Gripping Pliers VAS 6226 And Letting Drive Shaft Glide Into Oil Pump
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unlock Long-nose gripping pliers VAS 6226 and let drive shaft - **1** - glide into oil pump.

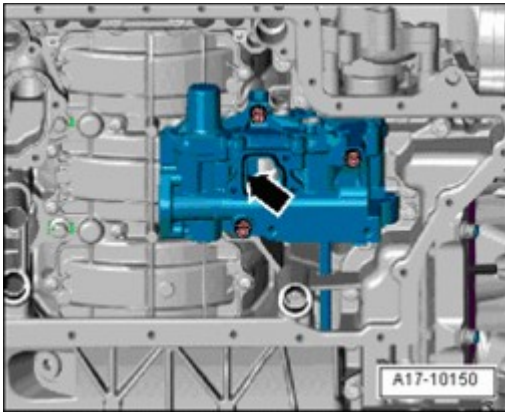


Fig. 379: Checking Whether Drive Shaft Is Friction Locked To Oil Pump
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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 coolant pump --> **Coolant pump, removing and installing.**
- Install lower section of oil pan **Installing.**
- Add engine oil and check oil level --> **Oil level, checking.**
- Fill with coolant **Filling.**

Torque specifications

Component	Nm
Oil pump to cylinder block	8 + 90 ° 1)2)
Baffle box to upper part of oil pan	9
Housing for intake tube to oil pump	9
Oil pipes to upper section of oil pan and oil pump	9
● 1) Replace bolts. ● 2) 90 ° corresponds to a quarter turn.	

Upper section of oil pan, component overview

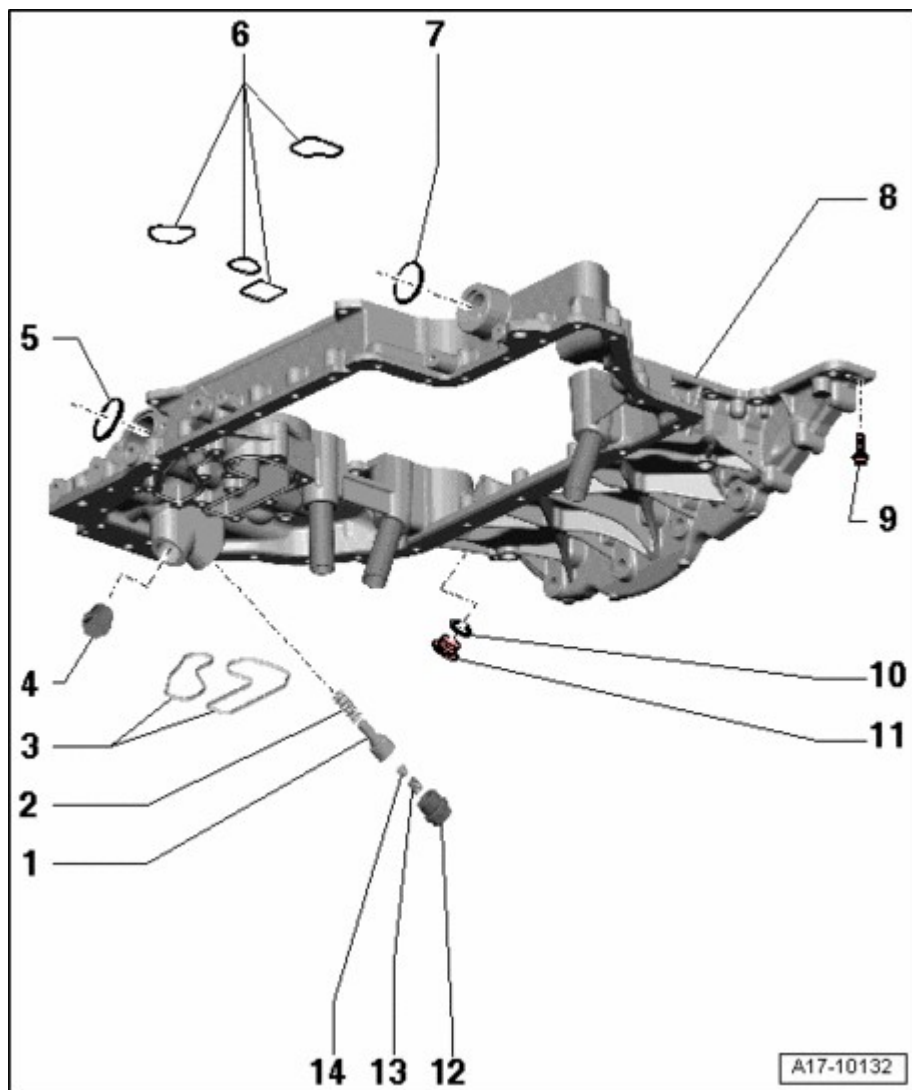


Fig. 380: Upper Section Of Oil Pan, Component Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Thermostat

- For oil cooler
- Opening temperature 120 ° C

2 - Spring

3 - Seals

- Replace

4 - Locking bolt, 35 Nm

5 - Gasket

- Replace

6 - Seals

- Replace

7 - O-ring

- Replace

8 - Oil pan (upper section)

- Removing and installing --> **Upper part of oil pan, removing and installing**

9 - 14 Nm

10 - Seal

- Replace

11 - Locking bolt, 35 Nm

12 - Locking bolt, 35 Nm

13 - Spring

14 - Pressure piece

Upper part of oil pan, removing and installing

Special tools, testers and auxiliary items required

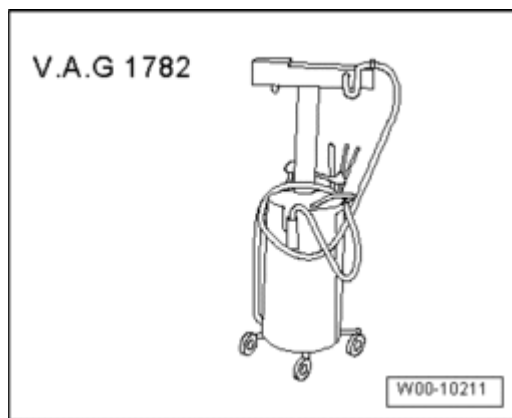


Fig. 381: Identifying Old Oil Collecting And Extracting Device V.A.G 1782
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Removing

- Remove engine --> **Engine, removing.**
- Separate engine and transmission --> **Engine and transmission, separating.**
- Secure engine to assembly stand --> **Engine, securing to assembly stand.**
- Remove clutch pressure plate -->
 - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE
 - **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE
 - **30 CLUTCH** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE
 - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 01X, FRONT-WHEEL DRIVE
 - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 02X, FOUR-WHEEL DRIVE
 - **30 CLUTCH** for 6-SPEED MANUAL TRANSMISSION 0A3, ALL WHEEL DRIVE
- Remove dual-mass flywheel --> **Dual-mass flywheel, 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.**

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.

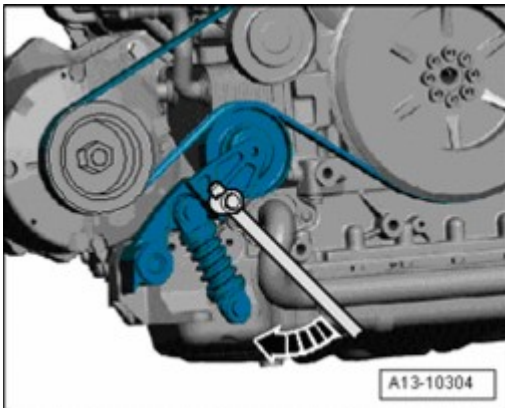


Fig. 382: Releasing Ribbed Belt Tension

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- To release ribbed belt tension, swing tensioner in direction of - **arrow** -. Use a lever with $\frac{3}{8}$ " drive for this.

NOTE:

- Ensure lever axle is long enough so that it can be inserted completely in the tensioner.
- A suitable lever is, e.g., "Stahlwille 425QR".

- Remove ribbed belt.
- Release tensioner unit

**Fig. 383: Removing Bolts & Ribbed Belt Tensioner At Upper Part Of Oil Pan**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Remove ribbed belt tensioner at upper part of oil pan.

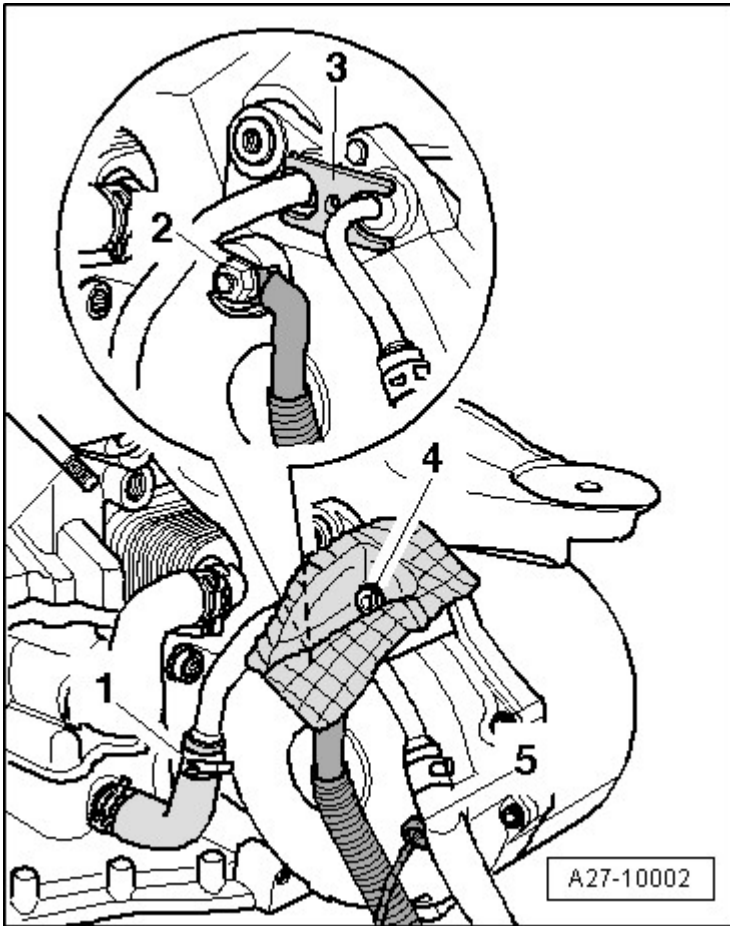


Fig. 384: Identifying Coolant Hose, Electrical Connector, Bolt & Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove coolant hose - 1 - from generator.
- Disconnect electrical connector - 5 -.
- Remove bolt - 4 - and remove heat shield.

NOTE:

- **Ensure coolant pipes do not slip out because O-rings on removed coolant pipes must be replaced. Reinstall bracket - 3 - after removing heat shield, if necessary.**

- Remove electrical wire - 2 - from generator.

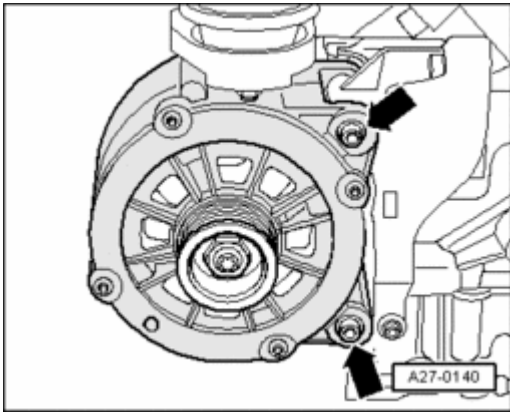


Fig. 385: Removing Generator Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.

NOTE:

- If generator is stuck in its bracket, install mounting bolt again up to 2 rotations.
- Carefully strike on bolt heads using flat side of hammer - doing this loosens threaded sleeves of generator mount.

- Remove generator.

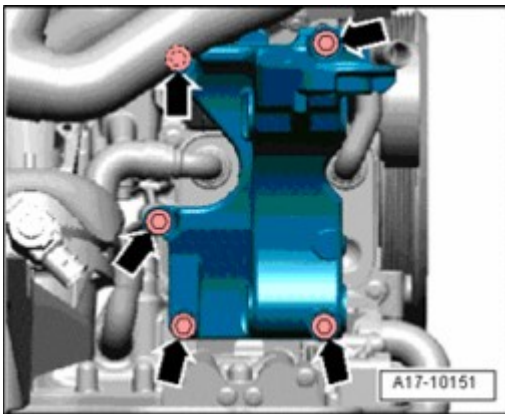


Fig. 386: Removing Bolts & Bracket For Generator

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Remove bracket for generator.

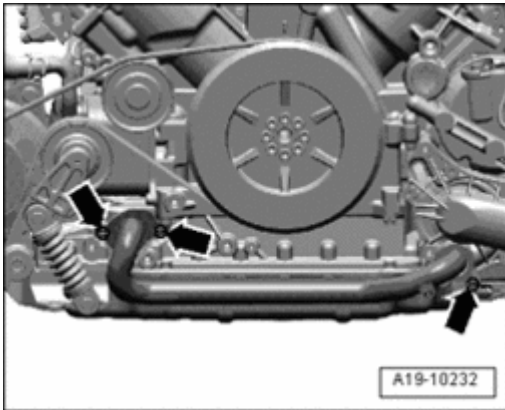


Fig. 387: Removing Bolts, Front Coolant Pipe At Engine And At Coolant Pump
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Remove front coolant pipe at engine and at coolant pump.

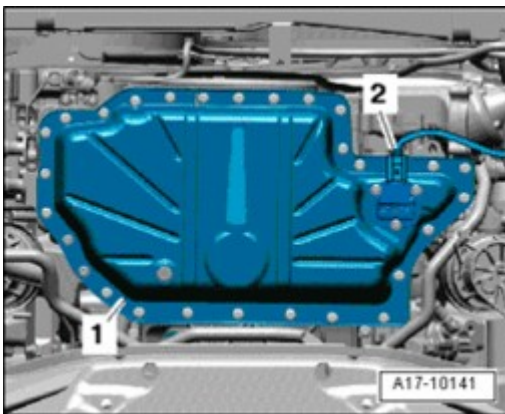


Fig. 388: Disconnecting Electrical Connector At Oil Level Thermal Sensor G266
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **2** - at Oil Level Thermal Sensor G266.
- Remove oil pan (lower part) - **1** - and pry out carefully.
- Remove oil pump --> **Oil pump, removing and installing.**

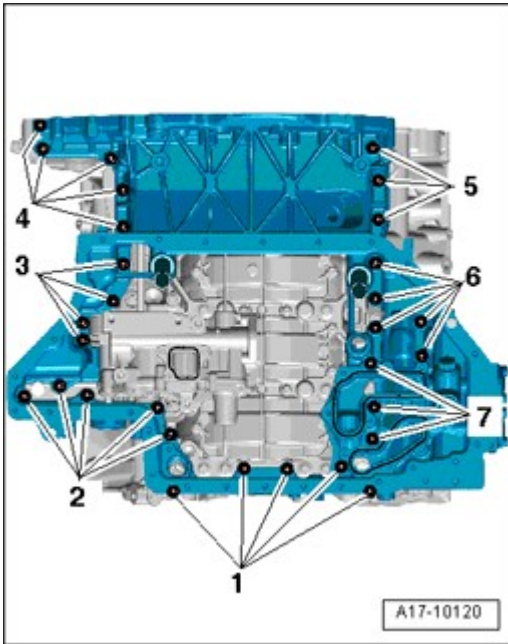


Fig. 389: Removing Bolts For Upper Section Of Oil Pan
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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.

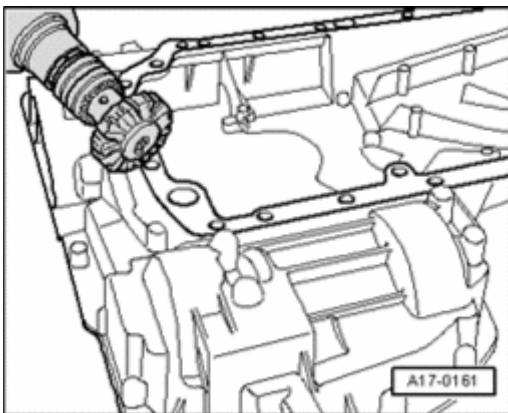


Fig. 390: Using Rotating Plastic Brush To Remove Remaining Sealant From Oil Pan (Upper Part) And At Cylinder Block
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using rotating plastic brush, remove any remaining sealant from oil pan (upper part) and at cylinder block.
- Clean sealing surfaces, they must be free of oil and grease.

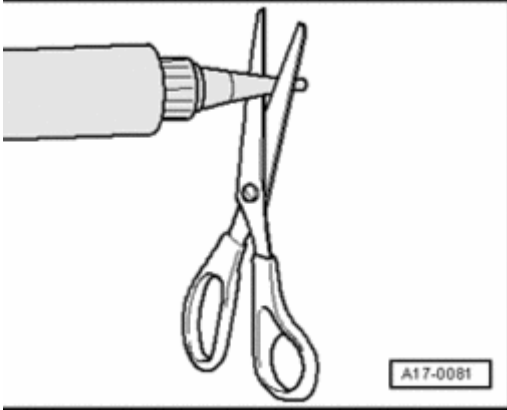


Fig. 391: Cutting Tube Nozzle At Front Marking
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

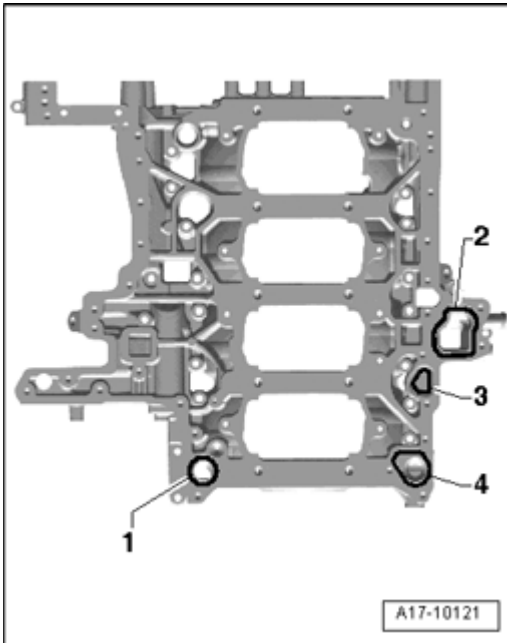


Fig. 392: Inserting New Seals Into Grooves On Cylinder Block
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert new seals - 1 to 4 - into grooves on cylinder block.

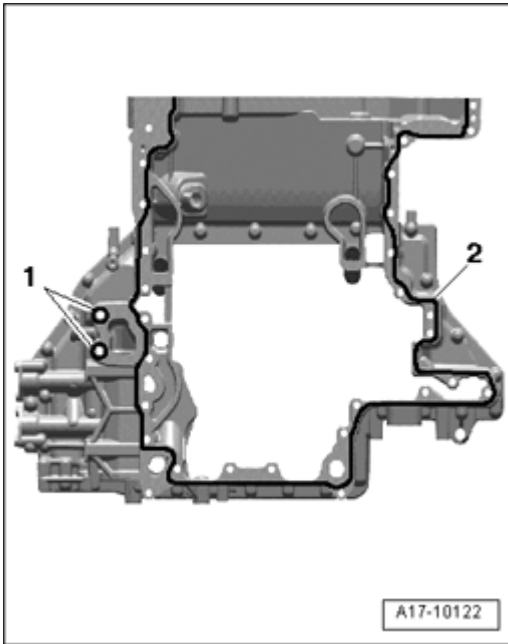


Fig. 393: Applying Sealant Beads On Clean Sealing Surfaces Of Upper Part Of Oil Pan
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Apply sealant beads - 1 - and - 2 - on clean sealing surfaces of upper part 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 part) must be installed within 5 minutes after application of sealant.

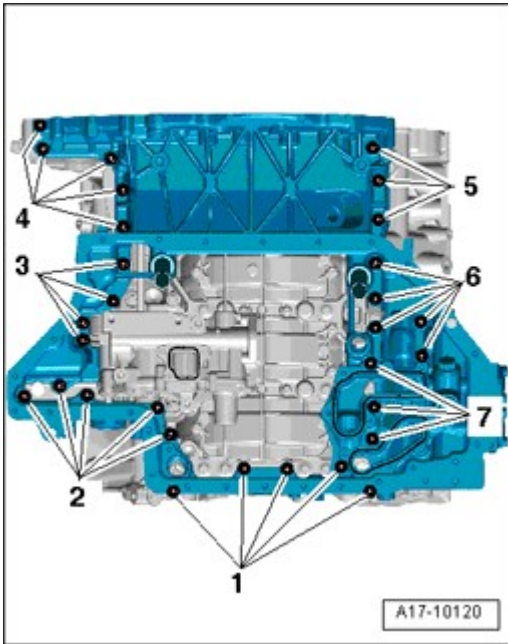


Fig. 394: Removing/Installing Bolts For/To Upper Section Of Oil Pan
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position upper part of oil pan and pre-tighten bolts - **1 to 7** - diagonally to 5 Nm.
- Tighten bolts - **1 to 7** - in a diagonal sequence.

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

- Install oil pump --> **Oil pump, removing and installing.**
- Install coolant pump --> **Coolant pump, removing and installing.**
- Install lower section of oil pan **Installing.**
- Install front coolant pipe --> **Front coolant line, removing and installing.**
- Install generator -->
 - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL**
 - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL** for ELECTRICAL EQUIPMENT, CABRIOLET
- 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 --> **Left and right timing chain covers, removing and installing.**
- Install dual-mass flywheel --> **Dual-mass flywheel, removing and installing.**

2008 Audi RS 4

ENGINE 4.2 Liter V8 4V Engine Mechanical, Engine Code(s): BNS

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

- Install engine --> **Engine, installing.**

Torque specifications

Component	Nm
Upper part of oil pan to cylinder block	14
Generator bracket to cylinder bock	22
Tensioner to upper part of oil pan	9

Oil check valve and spray nozzle valve, component overview

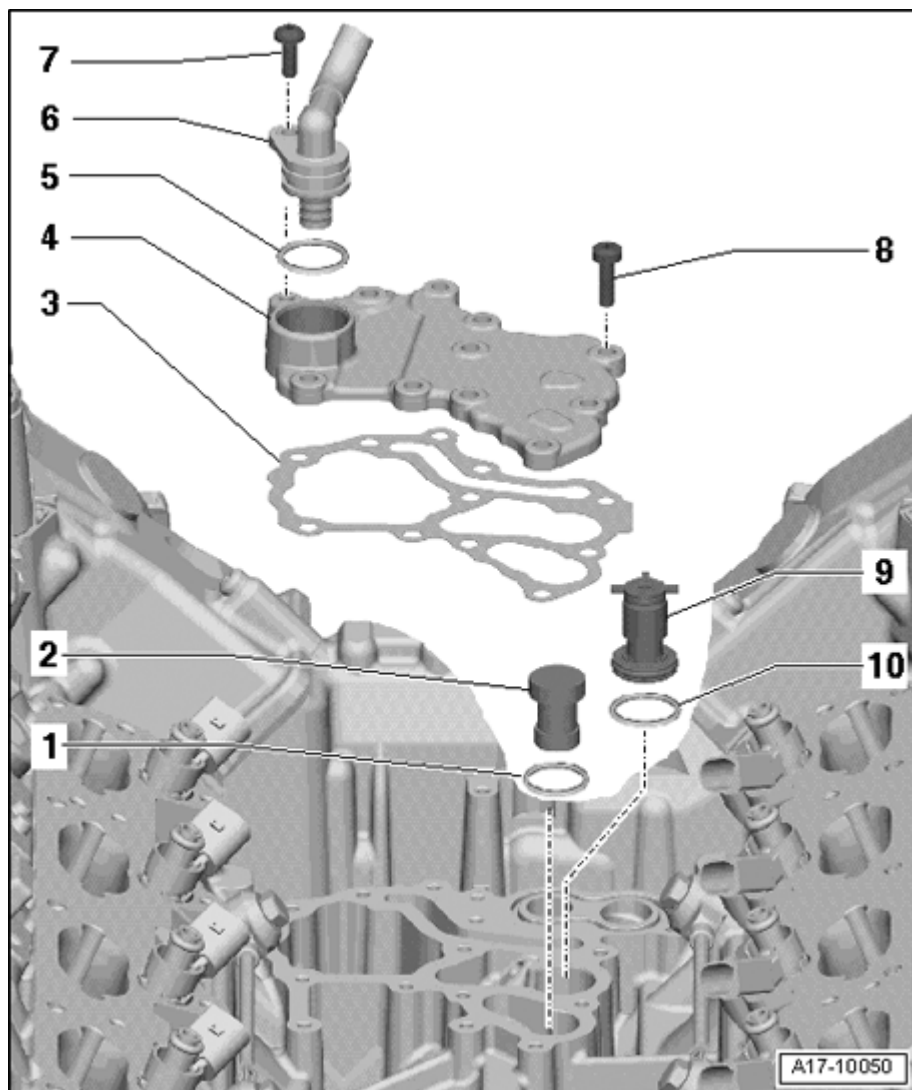


Fig. 395: Oil Check Valve And Spray Nozzle Valve, Component Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

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 - 7 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

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)** .

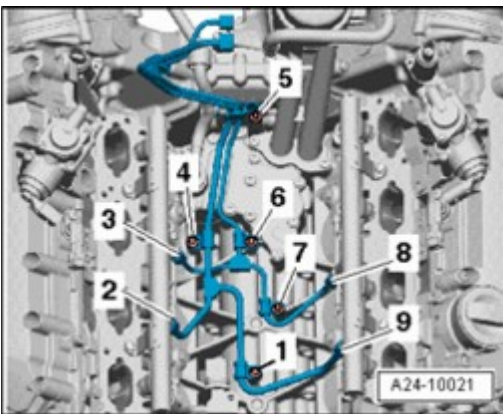


Fig. 396: Identifying Bolts On High Pressure Line Retaining Clamps, Fuel Injectors Electrical Harness Connectors & High Pressure Lines

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - 1, 4, 5, 6, 7 - on high pressure line retaining clamps.
- Disconnect electrical harness connectors at fuel injectors.

- Remove high pressure lines - 2 - and - 9 - from connections on fuel rail.
- Remove high pressure lines - 3 - and - 8 - from connections on fuel rail. To do this, counter hold at hex head with and open-end wrench and loosen the union nut.
- Remove high pressure lines.

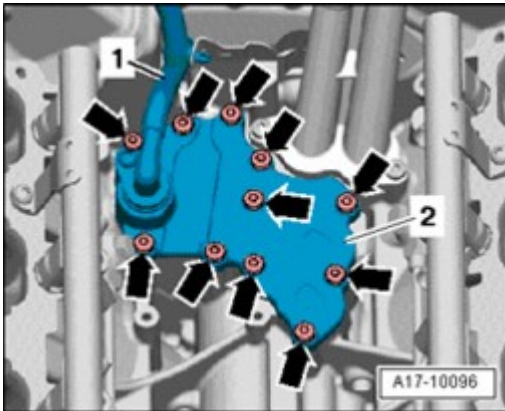


Fig. 397: Removing Bolts & Cover With Crankcase Ventilation Hose
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Remove cover - **2** - with crankcase ventilation hose - **1** -.
- Remove seal.

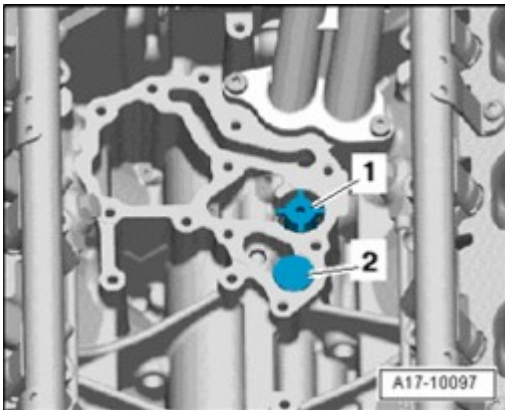


Fig. 398: Removing Oil Check Valve And Spraying Nozzle Valve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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)** .

Torque specifications

Component	Nm
Cover to cylinder block	9

Crankcase ventilation hose, removing and installing

Removing

- Remove intake manifold --> **24 - MULTIPOINT FUEL INJECTION (MFI)** .

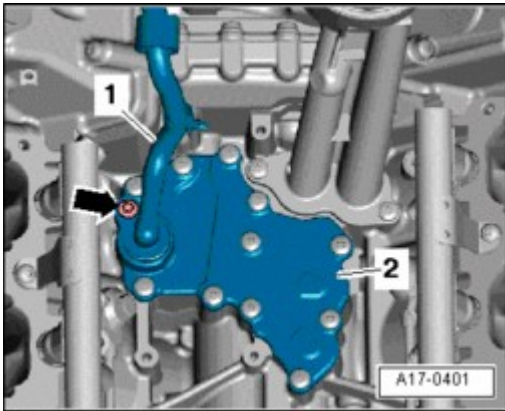


Fig. 399: Removing Bolt And Crankcase Ventilation Hose From Cover
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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 (MFI)** .

Torque specifications

Component	Nm

Crankcase ventilation hose to cover

9

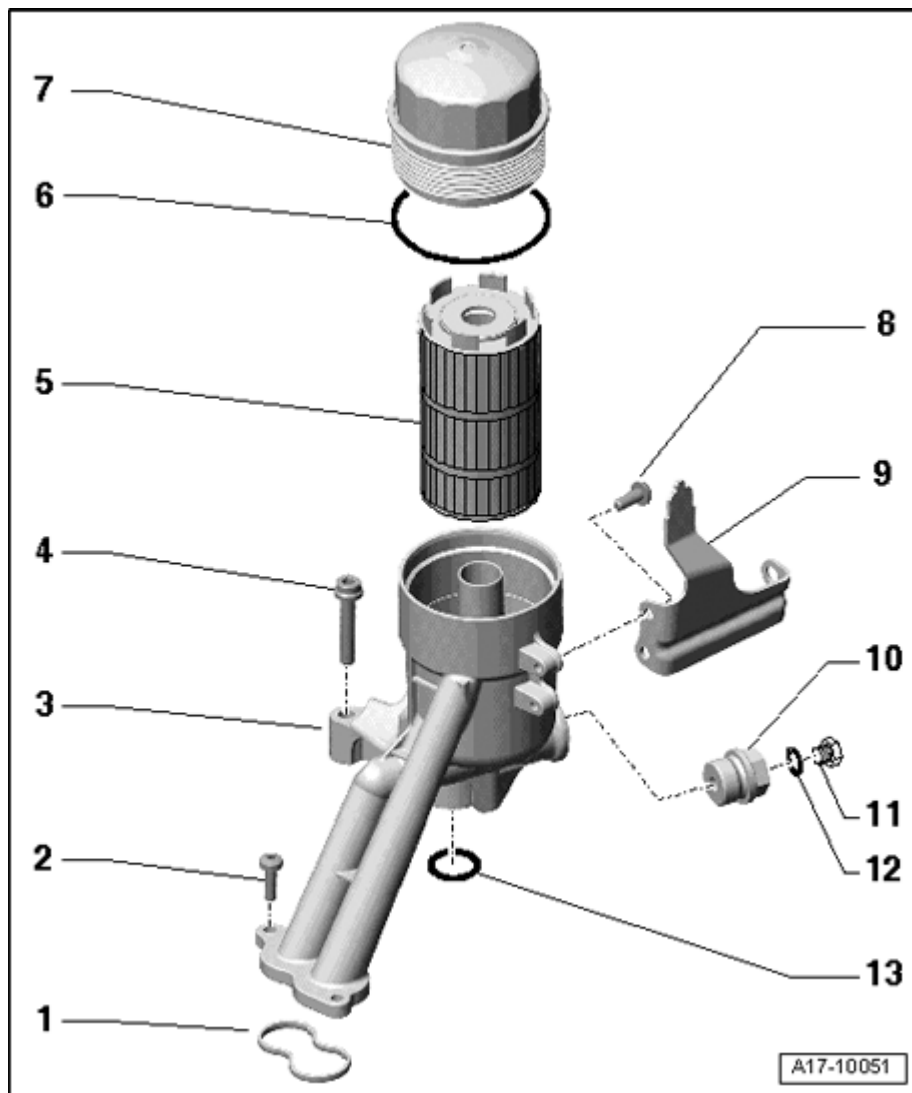
Oil filter housing, component overview

Fig. 400: Oil Filter Housing, Component Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Gasket

- Replace

2 - 9 Nm

3 - Oil filter housing

- With oil filter bypass valve 1.3 bar

4 - 22 Nm

5 - Oil filter element

- Replace O-ring - **6** - when filter is changed
- Observe change intervals 803 or 805

6 - O-ring

- Replace

7 - Cap, 25 Nm

- Loosen and tighten using socket wrench 32 mm

8 - 9 Nm

9 - Bracket

- For evaporative emission (EVAP) canister purge regulator valve N80

10 - Locking bolt, 50 Nm

11 - Locking bolt, 9 Nm

12 - Seal

- Replace

13 - O-ring

- Replace

Oil filter housing, removing and installing

Removing

- Remove intake manifold --> **24 - MULTIPOINT FUEL INJECTION (MPI)** .

NOTE:

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

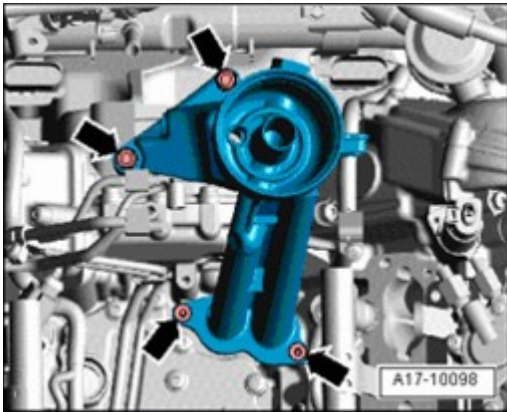


Fig. 401: Removing Bolts And Oil Filter Housing
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Torque specifications

Component		Nm
Oil filter housing to cylinder block	M8	9
	M10	22
Cap to oil filter housing		25

Oil cooler at engine, removing and installing

Special tools, testers and auxiliary items required

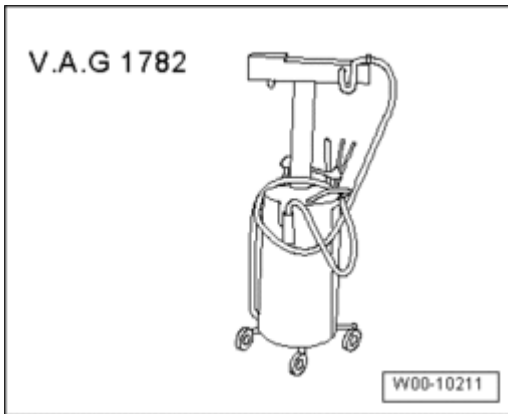


Fig. 402: Identifying Old Oil Collecting And Extracting Device V.A.G 1782
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Removing

- Remove the generator -->
 - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL**
 - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL** for ELECTRICAL EQUIPMENT, CABRIOLET

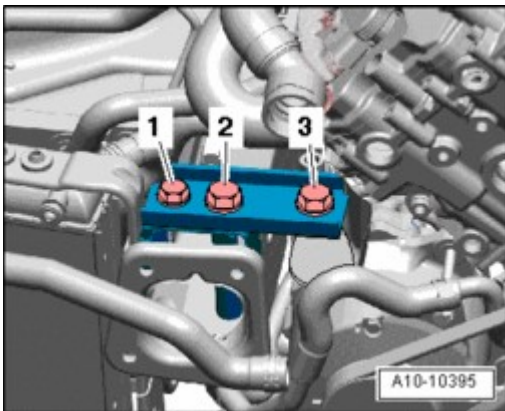


Fig. 403: Removing Bolts & Bracket For Front Torque Support
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - 1, 2 and 3 - and remove torque support bracket.

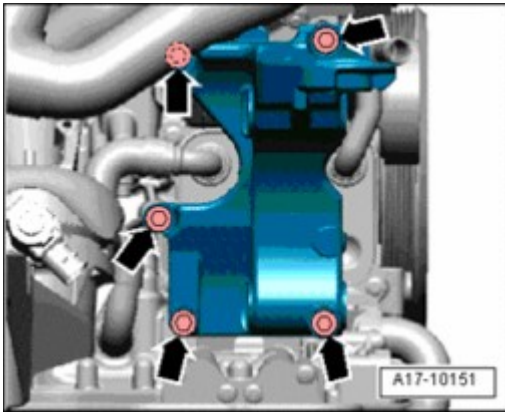


Fig. 404: Removing Bolts & Bracket For Generator
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Remove bracket for generator.

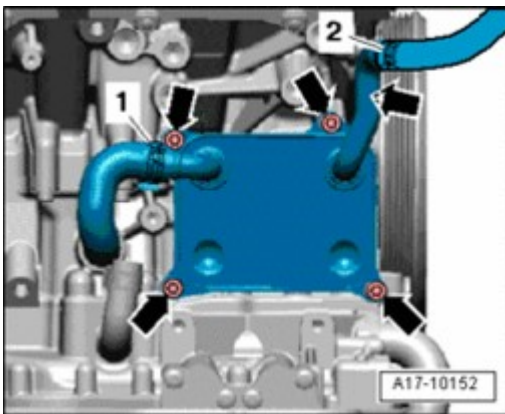


Fig. 405: Removing Coolant Hoses At Oil Cooler
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove coolant hoses - **1** - and - **2** - at oil cooler.
- Place old oil collecting and extracting device V.A.G 1782 under engine.
- Remove bolts - **arrows** - and remove oil cooler.

Installing

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

NOTE:

- Replace O-rings.
- Secure all hose connections using hose clamps appropriate for the model type .

- Install generator -->

- **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL**
- **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL** for ELECTRICAL EQUIPMENT, CABRIOLET

Torque specifications

Component			Nm
Engine oil cooler to cylinder block			9
Generator bracket to engine			22
Torque support bracket to	Long member	M8	30
	M10	50 + 90 ° 1)2)	40
	Torque support bearing		
• 1) Replace bolt. • 2) 90 ° corresponds to a quarter turn.			

Oil cooler at lock carrier, removing and installing

Special tools, testers and auxiliary items required

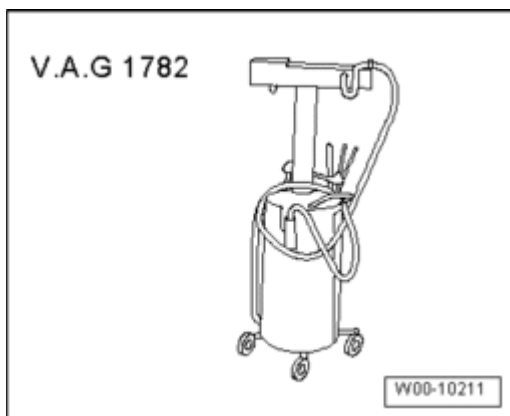


Fig. 406: Identifying Old Oil Collecting And Extracting Device V.A.G 1782
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Removing

- Remove front bumper cover -->
 - **63 BUMPER**
 - **63 - BUMPERS** for BODY EXTERIOR - CABRIOLET

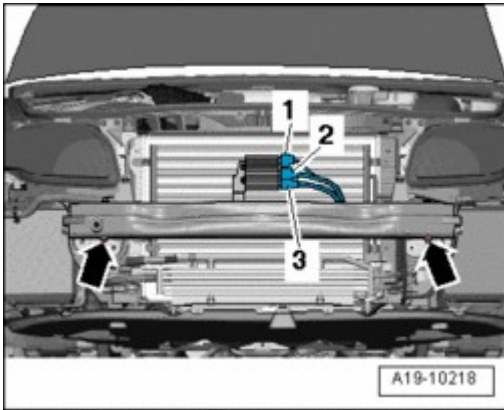


Fig. 407: Disconnecting Electrical Harness Connectors & Removing Bolts At Bumper Impact Absorber
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connectors - **1 to 3** -.
- Remove bolts - **arrows** - at bumper impact absorber.
- Remove impact absorber.

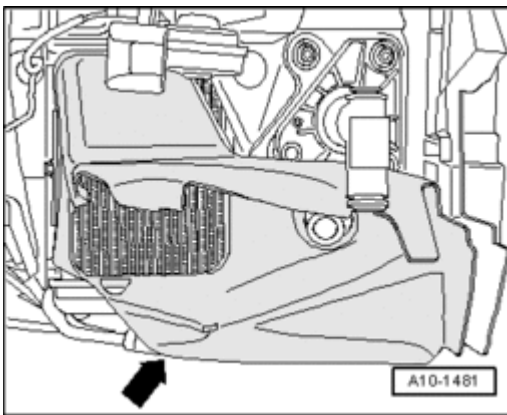


Fig. 408: Removing Right Air Guide In Front Of Auxiliary Cooler
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove right air guide - **arrow** - in front of auxiliary cooler.

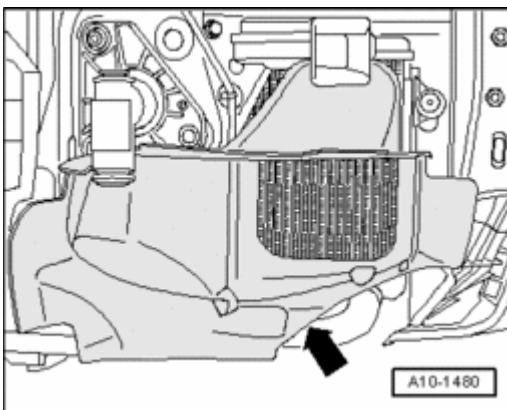


Fig. 409: Removing Left Air Guide In Front Of Auxiliary Cooler
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove left air guide - **arrow** - in front of auxiliary cooler.

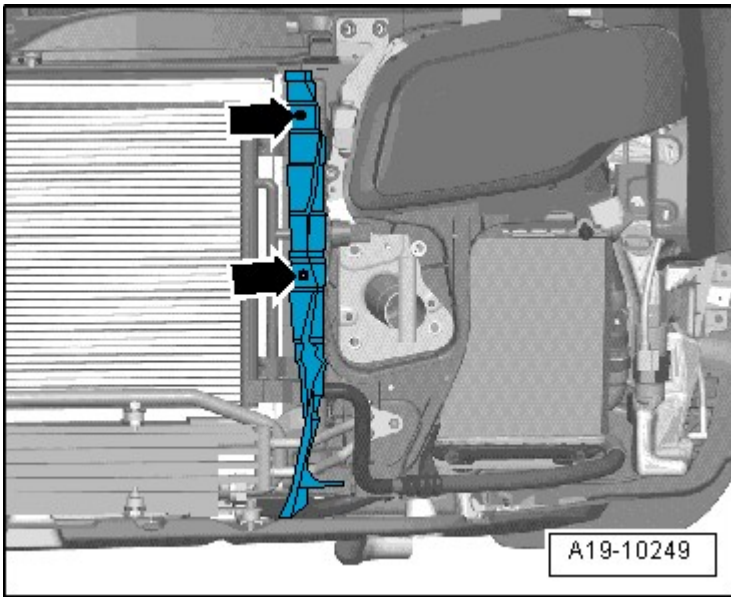


Fig. 410: Removing Bolts On Left/Right Air Guides At Cooler
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - on left and right air guides at cooler.

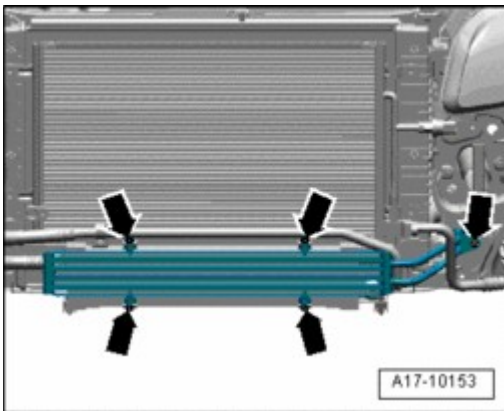


Fig. 411: Removing Nuts At Oil Cooler And At Lock Carrier
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - **arrows** - at oil cooler and at lock carrier.
- Swing power steering hydraulic oil cooler with hoses connected downward.

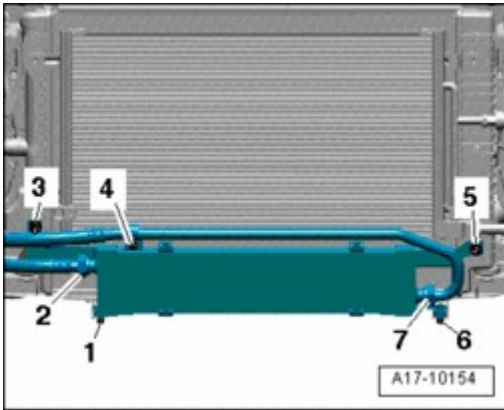


Fig. 412: Placing Old Oil Collecting And Extracting Device V.A.G 1782 Under Oil Cooler
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place old oil collecting and extracting device V.A.G 1782 under oil cooler.
- Remove screw clip - 4 - on oil cooler.
- Remove union nuts - 2 - and - 7 - at oil cooler.
- Remove nuts - 1, 3, 5, 6 -.
- Remove oil cooler.

Installing

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

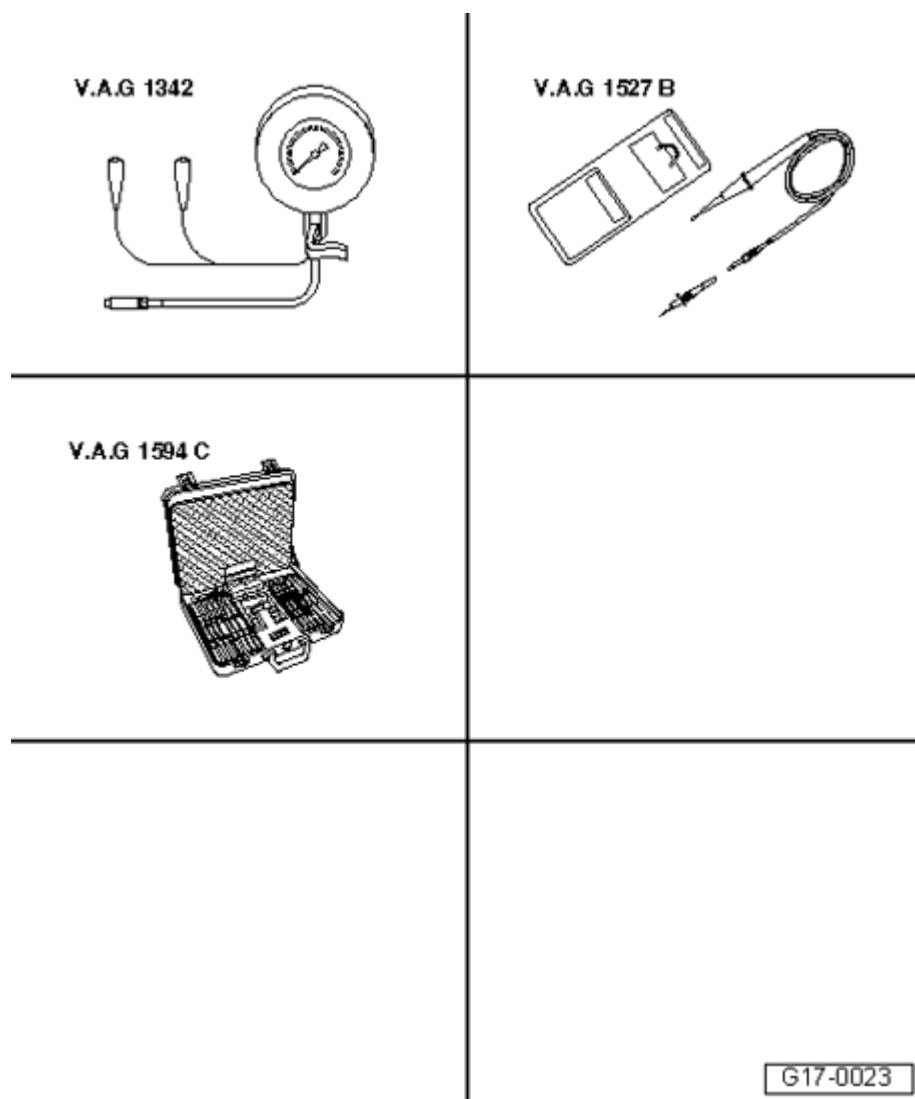
- Install bumper impact absorber -->
 - **63 BUMPER**
 - **63 - BUMPERS** for BODY EXTERIOR - CABRIOLET
- Install the front bumper cover -->
 - **63 BUMPER**
 - **63 - BUMPERS** for BODY EXTERIOR - CABRIOLET
- Check oil level --> **Oil level, checking.**

Torque specifications

Component		Nm
Oil cooler to	Lock carrier	9
	Radiator	9
Spring clip to oil cooler		9
Union nut to oil cooler		40
Power steering hydraulic oil	Oil cooler	9

cooler to		
Lock carrier		9

Oil pressure and oil pressure switch, checking



G17-0023

Fig. 413: Identifying Special Tools - Oil Pressure And Oil Pressure Switch, Checking
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Oil pressure gauge V.A.G 1342 with adapter V.A.G 1342/14
- Voltage tester V.A.G 1527 B
- Connector test set V.A.G 1594 C

Work procedure

- Oil level OK
- Engine oil temperature approximately 80 ° C.
- Bring lock carrier into service position -->
 - **50 BODY, FRONT**
 - **50 - BODY - FRONT** for BODY EXTERIOR - CABRIOLET

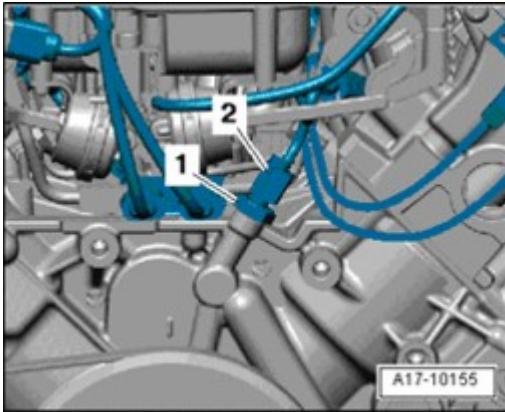


Fig. 414: Disconnecting Electrical Harness Connector From Oil Pressure Switch F1 & Oil Pressure Switch

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector from Oil Pressure Switch F1 - 2 -.
- Remove oil pressure switch - 1 -.

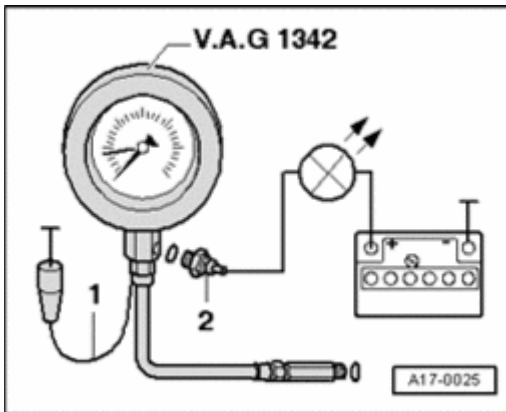


Fig. 415: Connecting Oil Pressure Gauge V.A.G 1342 With Adapter V.A.G 1342/14 To Hole For Oil Pressure Switch

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 1527 B using adapter cables from connector test kit V.A.G 1594 C to oil pressure switch and battery plus ("+").
- LED must not light up.

If LED lights up:

- Replace Oil Pressure Switch.
- Start engine.

NOTE:

- While starting engine, watch Pressure Tester and LED as oil pressure switch may open during start.
- At 1.2 to 1.6 bar pressure, LED must light up.

If LED does not light up:

- Replace Oil Pressure Switch.

Oil pressure, checking

- Start engine.
- Oil pressure at idle: min. 1.5 bar.
- Oil pressure at 2000 RPM: min. 3.5 bar.

Assembling

Assembly is in reverse order.

Torque specifications

Component	Nm
Oil pressure switch to oil filter housing	20 ¹⁾
● ¹⁾ Replace seal.	

Engine oil

Oil quantities, viscosity classes and oil specifications Maintenance tables.

Oil level, checking**NOTE:**

- Oil level must not exceed max. marking danger of catalytic converter

damage!

Work procedure

- Engine oil temperature min. 60 ° C.
- Vehicle in level position.
- After stopping engine, wait a few minutes to allow oil to flow back into oil pan.
- Pull out oil dipstick, wipe off with a clean cloth and re-insert dipstick again up to stop.
- Withdraw dipstick again and read oil level.

Range of markings on dipstick:

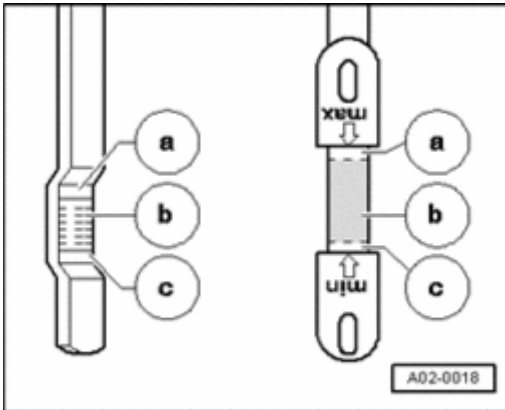


Fig. 416: Range Of Markings On Dipstick

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 -.

19 - ENGINE - COOLING SYSTEM

COOLING SYSTEM COMPONENTS, REMOVING AND INSTALLING

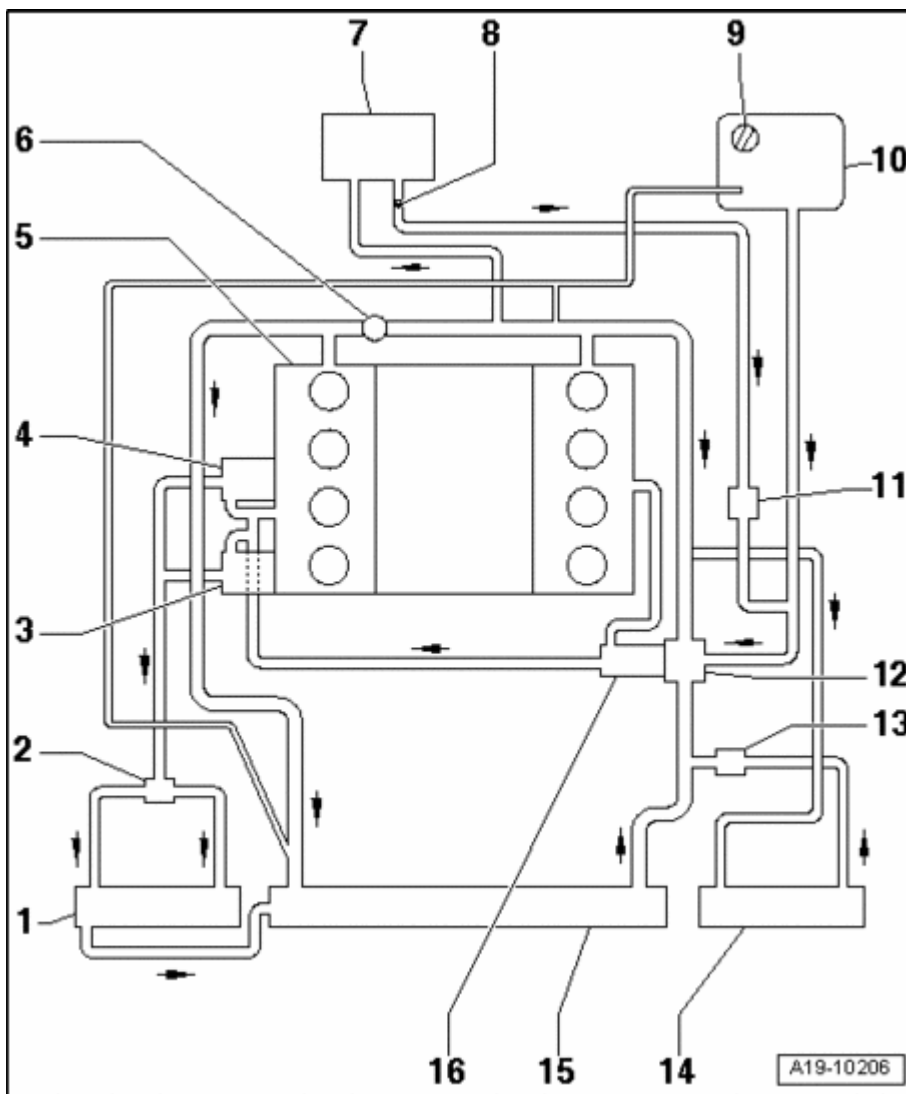
Cooling system components, removing and installing

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 using hose clamps appropriate for the model type .
- Replace gaskets, seals and O-rings.
- Arrows on coolant pipes and coolant hoses must line up across from each other.

- During installation, re-install all heat insulation sleeves and heat shields at the same locations.

Coolant hose connection diagram**Fig. 417: Coolant Hose Connection Diagram**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Right auxiliary cooler

- Removing and installing --> **Right auxiliary cooler, removing and installing**
- Replace coolant after replacing

2 - Coolant regulator for auxiliary cooler

3 - Generator

4 - Oil cooler

- Removing and installing --> **Oil cooler at engine, removing and installing**
- Replace coolant after replacing

5 - Cylinder head/cylinder block

- Replace coolant after replacing

6 - Engine Coolant Temperature (ECT) Sensor G62

7 - Heater core

- Replace coolant after replacing

8 - Bleeder hole

- At coolant hose to heater core

9 - Cap

- Pressure relief valve in cap, checking **Pressure relief valve in cap, checking**

10 - Coolant expansion tank

11 - After-run coolant pump V51

- Removing and installing --> **After-Run Coolant Pump V51 , removing and installing**

12 - Coolant thermostat

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

13 - Non-return valve

14 - Left auxiliary cooler

- Removing and installing --> **Left auxiliary cooler, removing and installing**
- Replace coolant after replacing

15 - Radiator

- Removing and installing --> **Radiator, removing and installing**
- Replace coolant after replacing

16 - Coolant pump

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

Cooling system, draining and filling

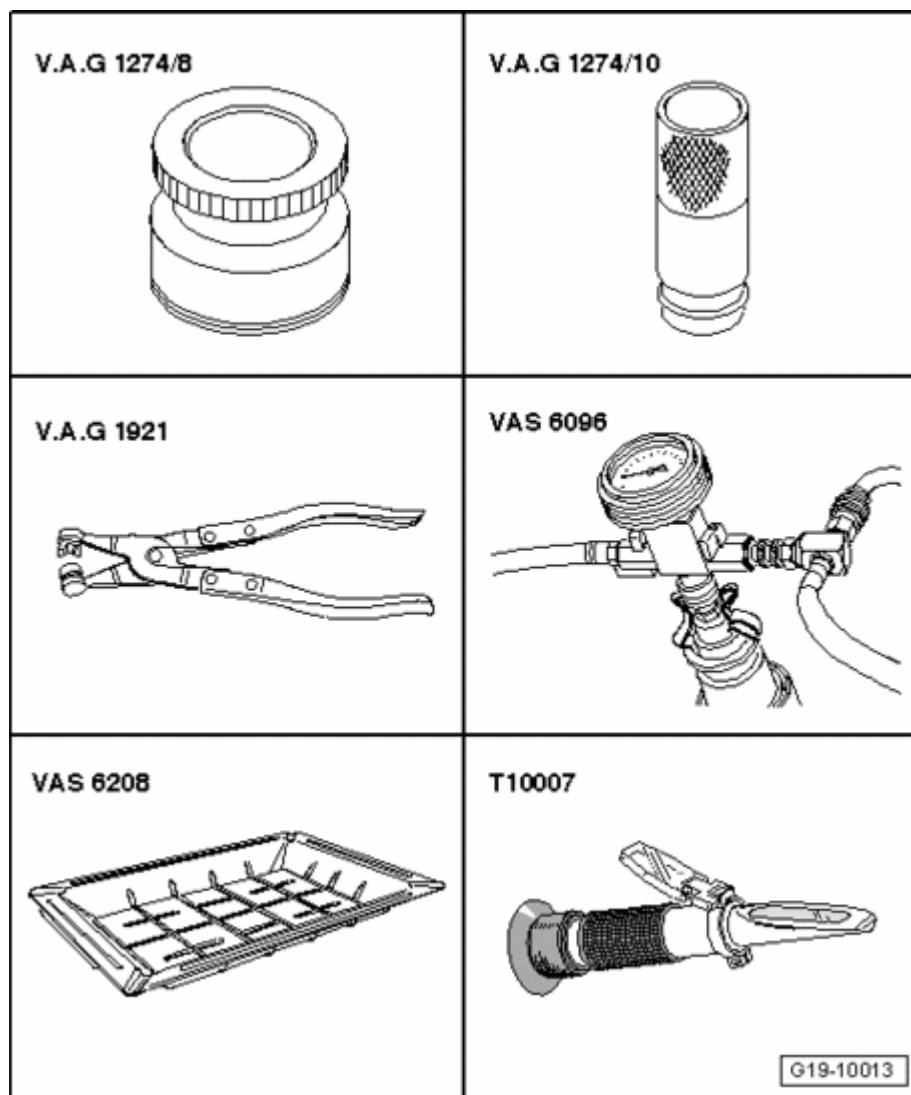


Fig. 418: Identifying Special Tools - Cooling System, Draining And Filling
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Adapter V.A.G 1274/8

- Adapter V.A.G 1274 tester V.A.G 1274/10
- Hose clamp pliers V.A.G 1921
- Cooling system charge unit VAS 6096
- Drip tray for workshop crane VAS 6208
- Refractometer T10007

Draining

NOTE: • Drained coolant must be stored in a clean container for disposal or reuse.

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

- Open cap of coolant expansion tank.

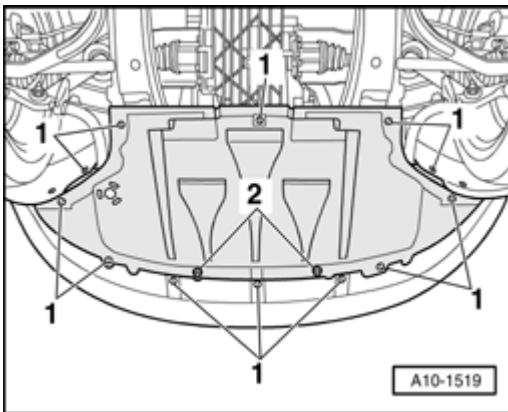


Fig. 419: Removing Quick-Release Fasteners, Screws And Noise Insulation
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove quick-release fasteners - 1 - , remove screws - 2 - and remove noise insulation.

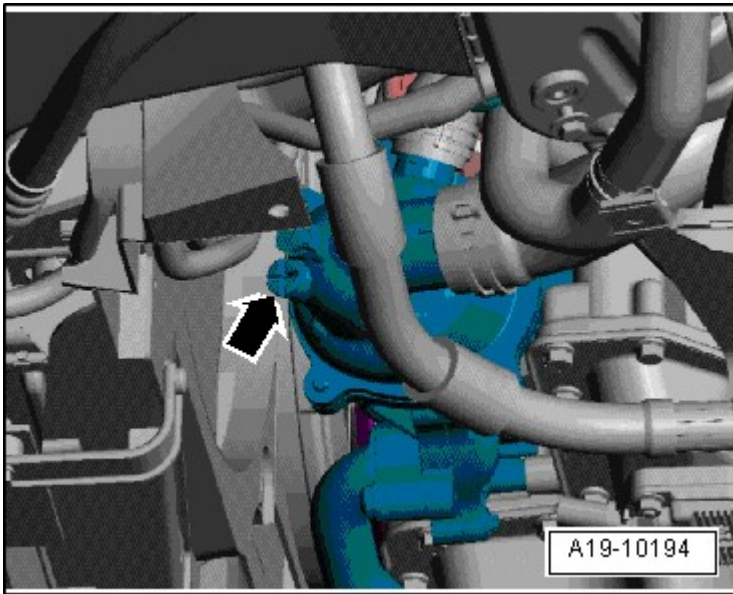


Fig. 420: Removing Drain Plug On Coolant Thermostat Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

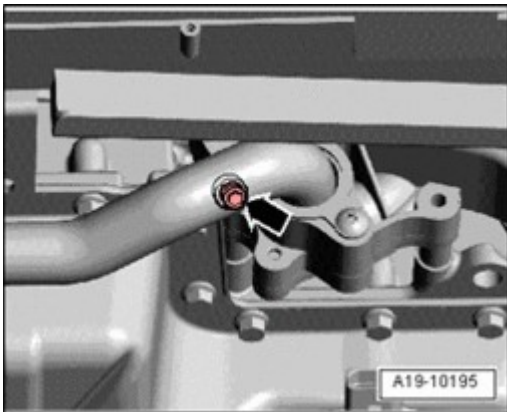


Fig. 421: Removing Drain Plug On Front Coolant Pipe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- In addition, remove drain plug - **arrow** - on front coolant pipe and allow rest of coolant to drain.

Filling

NOTE:

- The cooling system is filled all year round with a mixture of frost and corrosion protection additives and water.
- Use only *coolant additive Plus G 012 A8F A1* (short: G12+) "according to TL VW 774 F". Other coolant additives may above all reduce the corrosion protection effect significantly. The damage resulting from this may lead to

loss of coolant and consequently to severe engine damage.

- Coolant additive G12+ can be combined with additives G11 and G12.
- G12+ and coolant additives with the designation "according to TL VW 774 F" reduce frost and corrosion damage as well as lime deposits. They also raise the boiling point. For this reason the system must be filled all year round with frost and corrosion protection additives.
- Because of its high boiling point, the coolant improves engine reliability under heavy loads, particularly in countries with tropical climates.
- Protection against frost must be assured to about -25 ° C (in arctic climatic countries to about -35 ° C).
- The coolant concentration must not be reduced by adding water even in warmer seasons and in warmer countries. The coolant additive portion must be at least 40%.
- If for climatic reasons greater frost protection is required, the amount of G12+ can be increased, but only up to 60% (frost protection to about -40 ° C), otherwise frost protection and cooling effectiveness will be reduced.
- Only clean drinking water may be used for mixing coolant.
- If the radiator, heater core, cylinder head and cylinder head gasket or cylinder block is replaced, completely replace the engine coolant.
- Dirty coolant must not be re-used.
- For coolant G12+ , use refractometer T10007 to test frost protection in cooling system.

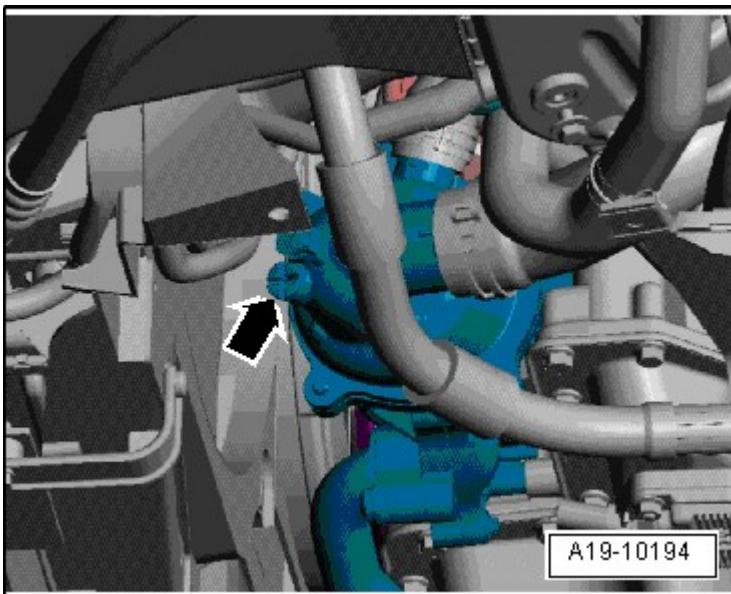


Fig. 422: Removing Drain Plug On Coolant Thermostat Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Reinstall drain plug - **arrow** - with new O-ring at coolant thermostat housing.

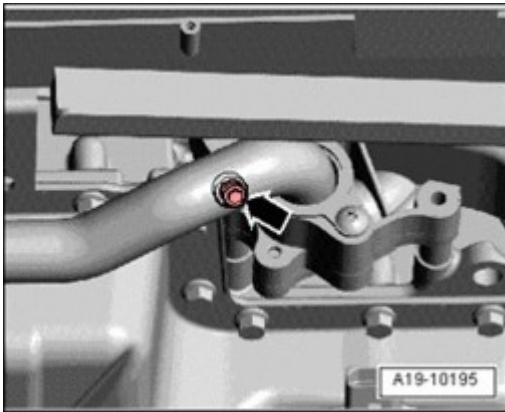


Fig. 423: Removing Drain Plug On Front Coolant Pipe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Reinstall drain plug - **arrow** - with new gasket at front coolant pipe.

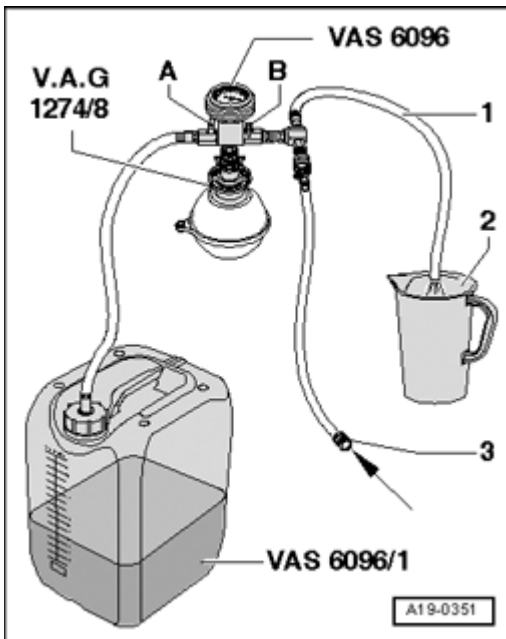


Fig. 424: Filling Reservoir VAS 6096/1 With At Least 12 Liters Of Premixed Coolant
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Fill coolant reservoir of Cooling System Charge Unit VAS 6096 with at least 12 liters of premixed coolant with correct mixture ratio:
 - G12+ (40%) and water (60%) for frost protection up to -25 ° C
 - G12+ (50%) and water (50%) for frost protection up to -35 ° C
 - G12+ (60%) and water (40%) for frost protection up to -40 ° C
- Install adapter V.A.G 1274/8 onto expansion tank.
- Assemble Cooling System Charge Unit VAS 6096 on adapter V.A.G 1274/8.

- Place air outlet hose - **1** - into a small container - **2** -. (A small amount of coolant is drawn off which should be reserved with discharged air.)
- Close both valves - **A** - and - **B** - by turning lever perpendicular to direction of flow.
- Connect hose - **3** - to pressurized air.
- Pressure: 6 to 10 bar positive pressure.

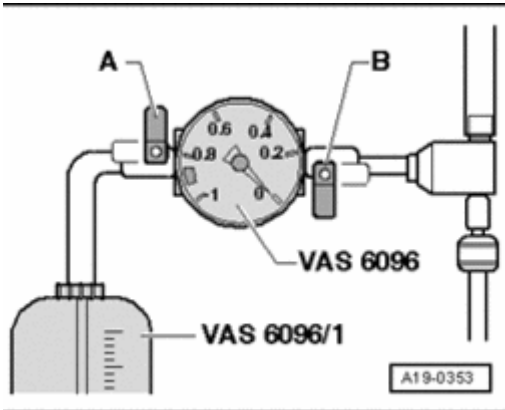


Fig. 425: Cooling System, Draining And Filling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Open valve - **B** -, turn lever in direction of flow to do this.

A vacuum is created in cooling system by the suction jet pump.

- Needle on instrument display must travel into green region.
- Also briefly open valve - **A** -, turn lever in direction of flow to do this, so that coolant reservoir hose of cooling system filler unit VAS 6096 is filled with coolant.
- Close valve - **A** - again.
- Let valve - **B** - remain open another 2 minutes.
- A further vacuum is created in cooling system by suction jet pump.
- Needle on instrument display must still remain in green region.
- Close valve - **B** -.
- Needle in display instrument must remain in green region, then sufficient vacuum in the cooling system is obtained for upcoming filling.

If needle stands below green region, repeat procedure.

If vacuum decreases, cooling system is leaking.

- Disconnect pressurized air hose.
- Open valve - A -.

The vacuum in cooling system has the effect of extracting coolant from coolant reservoir VAS 6096/1 ; cooling system is filled.

- Detach cooling system filler unit VAS 6096 from adapter V.A.G 1274/8 on coolant expansion tank.

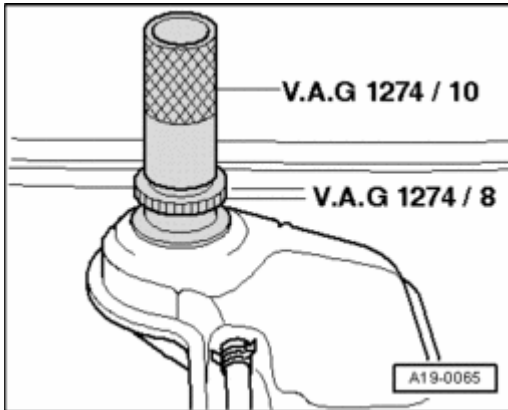


Fig. 426: Connecting Adapter For Cooling System Tester V.A.G 1274/10 To Adapter V.A.G 1274/8
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect pipe for cooling system tester V.A.G 1274/10 to adapter.

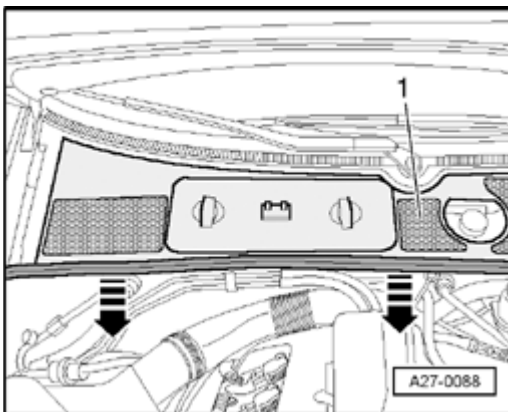


Fig. 427: Identifying Plenum Chamber Cover & Rubber Seal
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove rubber seal and remove plenum chamber cover - 1 - forward - **arrows** -.

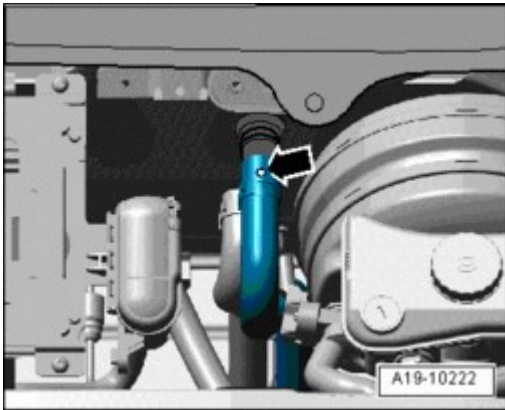


Fig. 428: Sliding Back Boot For Coolant Hoses At Connection Of Heater Core
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Slide back boot for coolant hoses at connection of heater core.
- Loosen coolant hose to heater core and pull back hose sufficiently so that the bleeder hole - **arrow** - is no longer sealed by connection.
- Fill up coolant until it escapes from coolant hose bleeder hole without bubbles.
- Push coolant hose back onto connection and secure it with hose clamp.
- Twist expansion tank cap closed.
- Start engine.
- Set heating air conditioning system to "HI".
- Let engine run at 2000 RPM for 3 minutes.
- Let engine run at idle long enough until both large coolant hoses on main cooler are warm.
- Let engine run at 2000 RPM for 1 minute.
- Turn off engine and allow it to cool off.

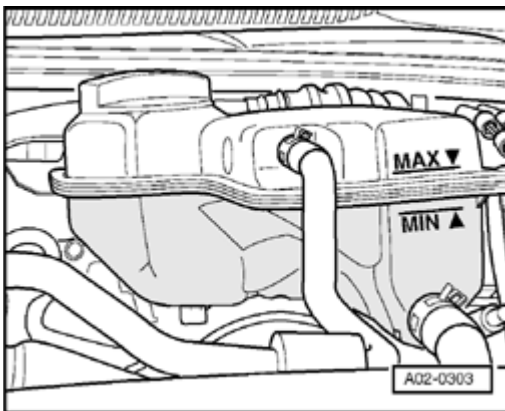


Fig. 429: Checking Coolant Level
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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.

Torque specifications

Component	Nm
Drain plug to coolant regulator housing	4
Drain plug to front coolant pipe	10

Coolant pump and coolant regulator, component overview

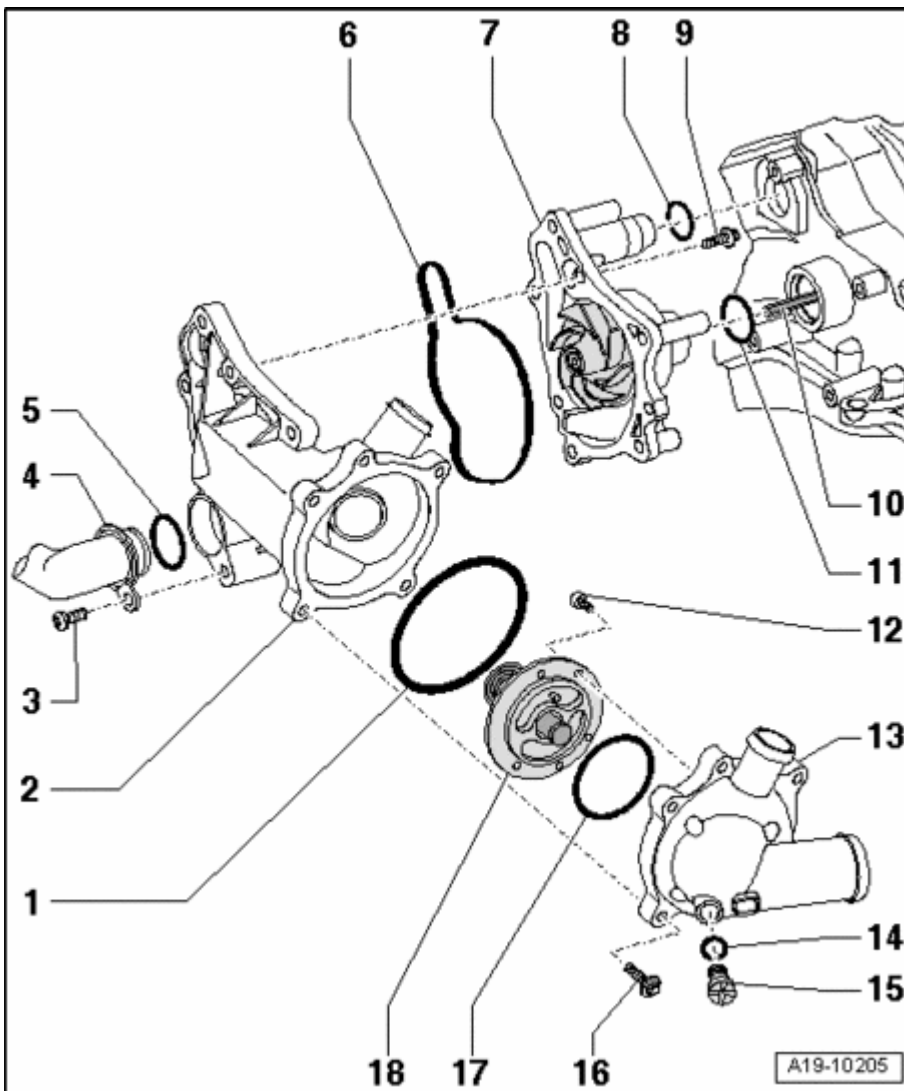


Fig. 430: Coolant Pump And Coolant Regulator, Component Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Seal

- Replace

2 - Coolant pump housing

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

3 - 8 Nm plus an additional 90 ° ($\frac{1}{4}$ 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 - 4.5 Nm

13 - Thermostat housing

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

14 - O-ring

- Replace

15 - Drain plug, 4 Nm

16 - 9 Nm

17 - Seal

- Replace

18 - Coolant thermostat

- Removing and installing --> **Coolant thermostat, removing and installing**
- Checking --> **Thermostat, checking**

Coolant pump, removing and installing

Removing

- Remove front coolant pipe --> **Front coolant line, removing and installing.**

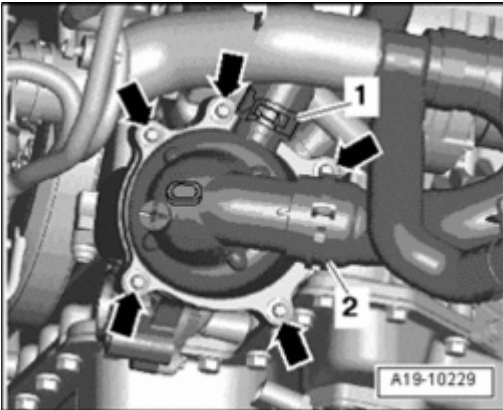


Fig. 431: Identifying Coolant Hose, Bolts & Coolant Thermostat Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove coolant hose - **2** - on bottom of coolant thermostat housing.
- Remove bolts - **arrows** -.
- Remove coolant thermostat housing and remove coolant hose - **1** - at top of coolant thermostat housing.

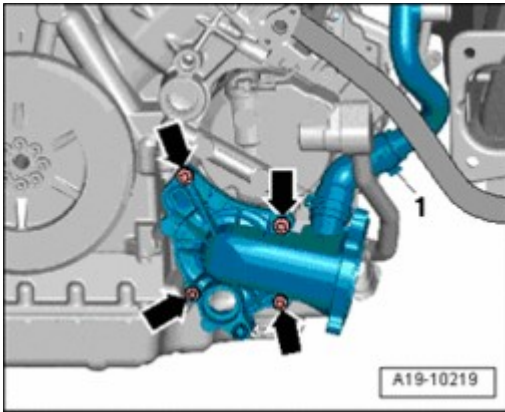


Fig. 432: Loosening Hose Clip At Coolant Hose
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen hose clip - **1** - at coolant hose.
- Remove bolts - **arrows** -.
- Remove coolant pump housing toward front, while doing this pay attention to drive shaft for coolant pump.

NOTE:

- Coolant hose can only be removed with coolant pump removed.

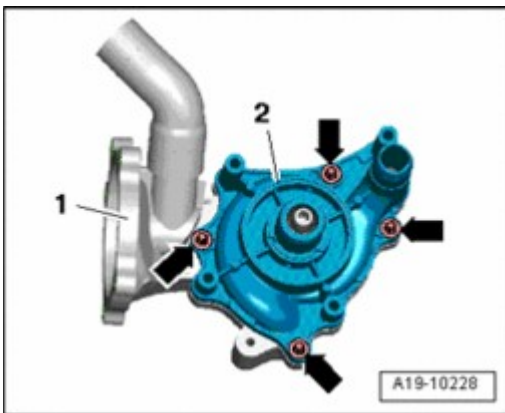


Fig. 433: Removing Bolts & Coolant Pump From Housing
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Remove coolant pump - **2** - from housing - **1** -.

Installing

NOTE:

- Replace seals and O-rings.
- Secure all hose connections using hose clamps appropriate for the model type .

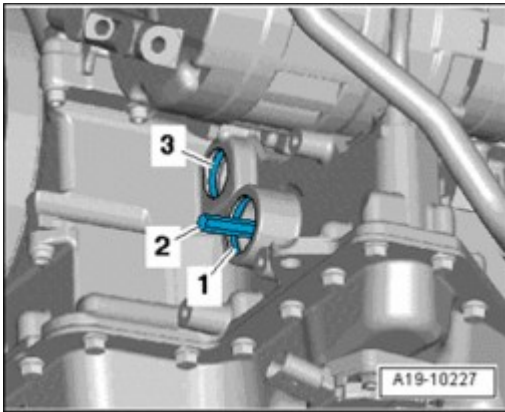


Fig. 434: Inserting New O-Rings & Coolant Pump Input Shaft In Oil Pump Mount
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert new O-rings - **1** - and - **3** -.
- Insert coolant pump input shaft - **2** - in oil pump mount as far as stop at engine.
- 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 --> **Coolant thermostat, removing and installing.**
- Install front coolant pipe --> **Front coolant line, removing and installing.**
- Fill with coolant **Filling.**

Torque specifications

Component	Nm
Coolant pump to housing	9
Coolant pump housing to upper section of oil pan	9

Coolant thermostat, removing and installing

Removing

- Drain coolant --> **Cooling system, draining and filling.**

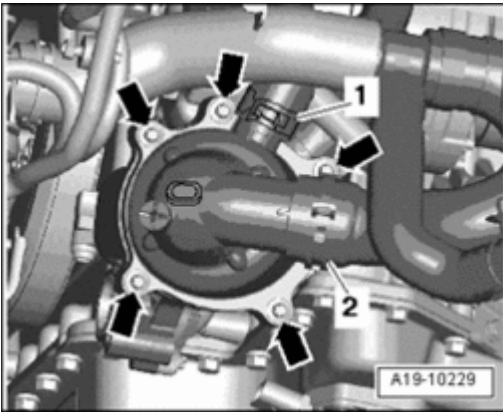


Fig. 435: Identifying Coolant Hose, Bolts & Coolant Thermostat Housing
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove coolant hose - 2 - at bottom of coolant thermostat housing and let rest of coolant drain.
- Remove bolts - **arrows** -.
- Remove coolant thermostat housing and remove coolant hose - 1 - at top of coolant thermostat housing.

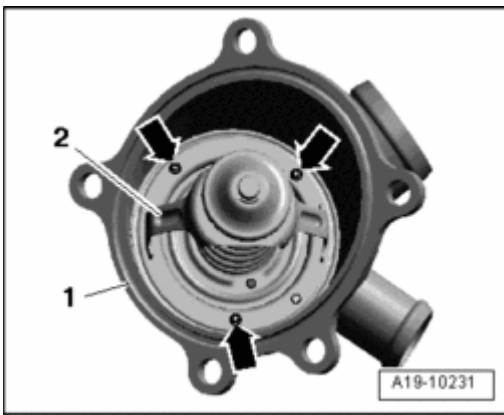


Fig. 436: Identifying Bolts, Coolant Thermostat & Housing
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Remove coolant thermostat - 2 - from housing - 1 -.

Installing

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

NOTE:

- **Replace seals and O-rings.**
- **Secure all hose connections using hose clamps appropriate for the model type .**

- Fill with coolant **Filling**.

Torque specifications

Component	Nm
Coolant thermostat to thermostat housing	4.5
Coolant regulator housing to coolant pump housing	9

Thermostat, checking

- Heat up removed thermostat in water.

Opening begins	Opening ends	Opening lift
approx. 87 ° C	approx. 102 ° C ¹⁾	min. 8 mm
• ¹⁾ Cannot be tested.		

After-Run Coolant Pump V51 , removing and installing

Special tools, testers and auxiliary items required

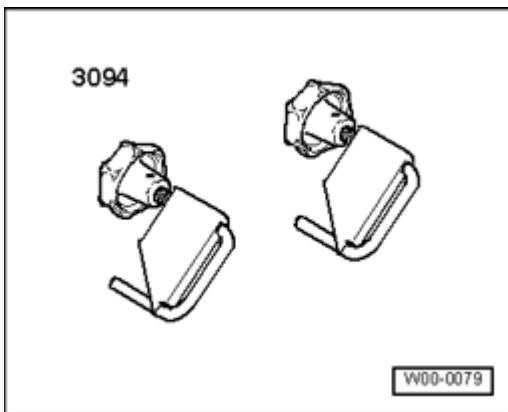


Fig. 437: Identifying Hose Clamps 3094

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hose Clamps Up to 25 mm dia. 3094

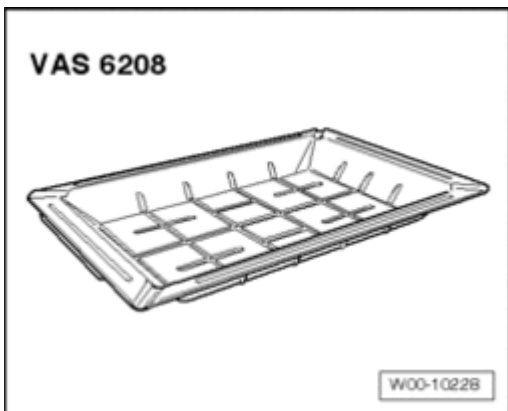


Fig. 438: Drip Tray For VAS 6100, VAS 6208

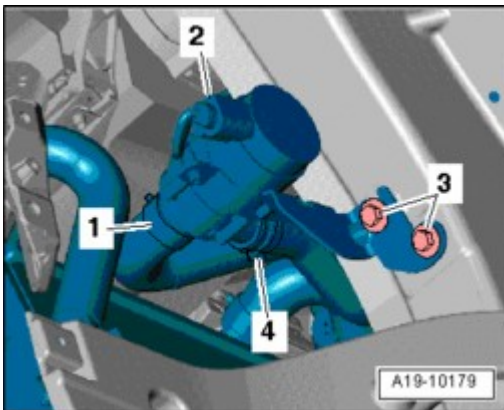
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drip tray for workshop crane VAS 6208

Removing

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 upper and lower part of washer fluid reservoir -->
 - **92 WINDSHIELD WIPER WASHER SYSTEM**
 - **92 WINDSHIELD WIPER & WASHER SYSTEM** for ELECTRICAL EQUIPMENT, CABRIOLET

**Fig. 439: Identifying Electrical Connector, Bolts & Coolant Hoses**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - 2 -.
- Remove bolts - 3 -.
- Clamp off coolant hoses - 1 - and - 4 - with Hose Clamps 3094.
- Place Drip Tray for VAS 6100 VAS 6208 below After-Run Coolant Pump V51.
- Remove coolant hoses at After-Run Coolant Pump V51.

Installing

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

- NOTE:**
- **Secure all hose connections using hose clamps appropriate for the model type .**

- Install upper and lower part of washer fluid reservoir -->
 - **92 WINDSHIELD WIPER WASHER SYSTEM**
 - **92 WINDSHIELD WIPER & WASHER SYSTEM** for ELECTRICAL EQUIPMENT, CABRIOLET
- Fill with coolant **Filling**.

Torque specifications

Component	Nm
After-run coolant pump screw clip	5
After-run coolant pump bracket to body	9

Coolant pipes, component overview

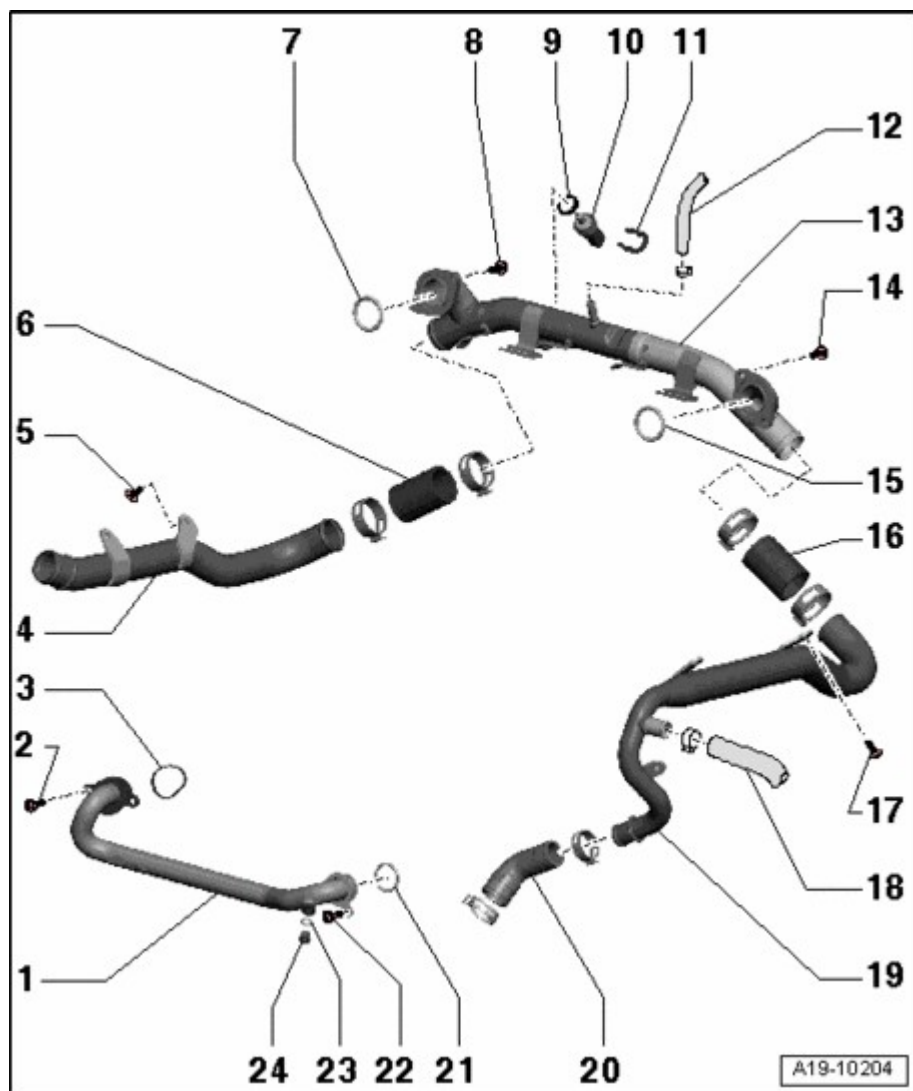


Fig. 440: Coolant Pipes, Component Overview**Courtesy of VOLKSWAGEN UNITED STATES, INC.**

1 - Front coolant line

- Removing and installing --> **Front coolant line, removing and installing**

2 - 8 Nm plus an additional 90 ° ($\frac{1}{4}$ turn)

- Replace

3 - Gasket

- Replace

4 - Right coolant line

- Removing and installing --> **Right coolant pipe, removing and installing**

5 - 9 Nm

6 - Coolant hose

7 - O-ring

- Replace

8 - 9 Nm

9 - O-ring

- Replace

10 - Engine Coolant Temperature (ECT) Sensor G62

11 - Retaining clip

12 - Coolant hose

- To Intake manifold

13 - Rear coolant pipe

- Removing and installing --> **Rear coolant line, removing and installing**

14 - 9 Nm

15 - O-ring

- Replace

16 - Coolant hose

17 - 9 Nm

18 - Coolant hose

- To left auxiliary cooler

19 - Left coolant line

- Removing and installing --> **Left coolant pipe, removing and installing**

20 - Coolant hose

- To coolant regulator housing

21 - O-ring

- Replace

22 - 8 Nm plus an additional 90 ° ($\frac{1}{4}$ turn)

- Replace

23 - O-ring

- Replace

24 - Drain plug, 10 Nm

Front coolant line, removing and installing

Special tools, testers and auxiliary items required

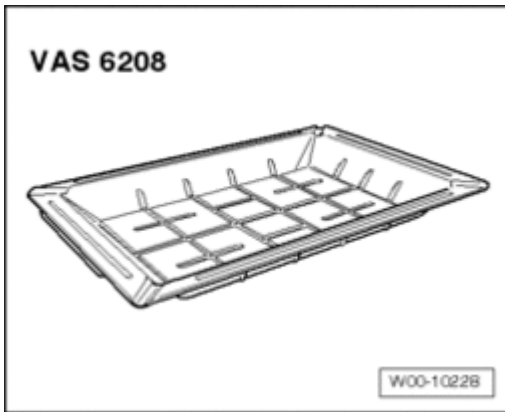


Fig. 441: Drip Tray For VAS 6100, VAS 6208

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drip tray for workshop crane VAS 6208

Removing

- Drain coolant --> **Cooling system, draining and filling.**
- Place drip tray for workshop crane VAS 6208 under engine.

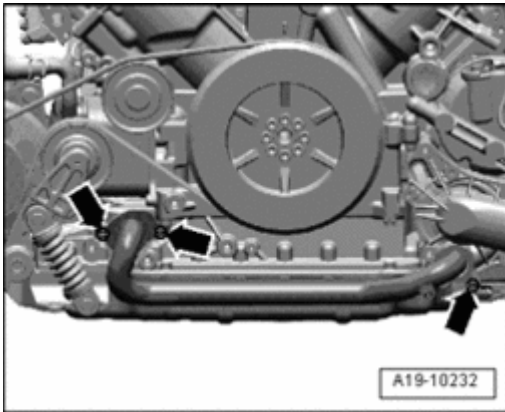


Fig. 442: Removing Bolts, Front Coolant Pipe At Engine And At Coolant Pump

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Remove front coolant pipe at engine and at coolant pump.

Installing

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

NOTE:

- **Replace seals and O-rings.**
- Fill with coolant **Filling.**

Torque specifications

Component		Nm
Front coolant pipe to	Coolant pump	8 + 90 ° 1)2)
	Oil pan (upper section)	8 + 90 ° 1)2)
1) Replace bolts. 2) 90 ° corresponds to a quarter turn.		

Rear coolant line, removing and installing

Special tools, testers and auxiliary items required

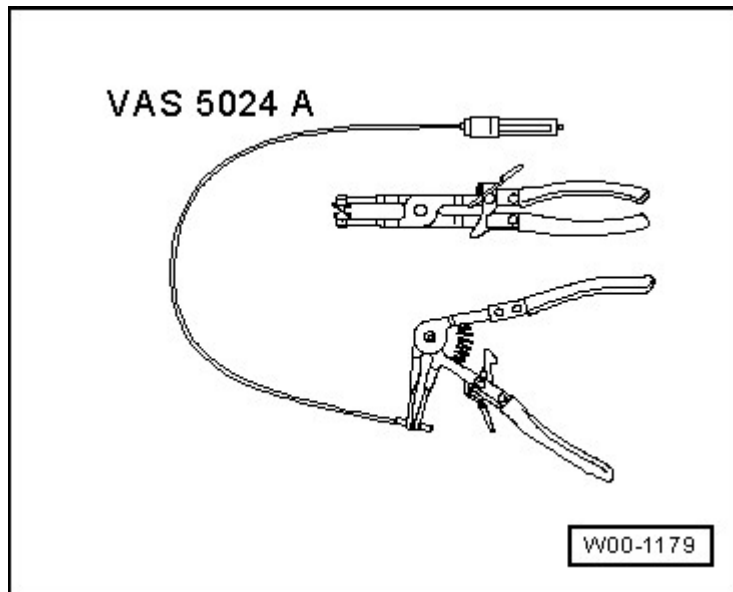


Fig. 443: Identifying Spring-Type Clip Pliers VAS 5024 A
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Spring-type clip pliers VAS 5024 A

Removing

NOTE:

- During installation, re-install 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.

- Drain coolant --> Cooling system, draining and filling.

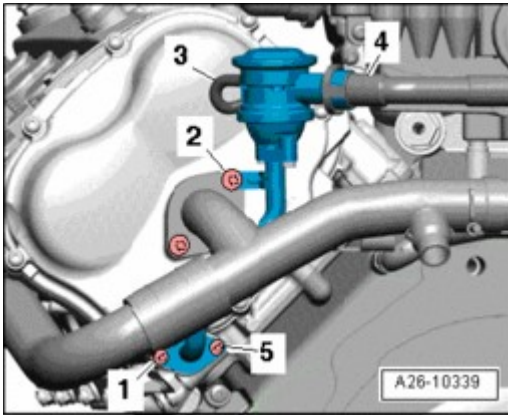


Fig. 444: Removing Bolts At Bottom Of Left Secondary Air Injection Combination Valve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - 1 - and - 5 - at bottom of left secondary air injection combination valve.

NOTE:

- The illustration depicts the engine removed from behind.
- Ignore items - 2 to 4 -.

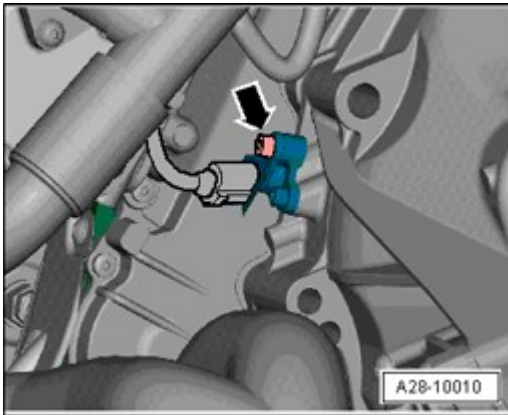


Fig. 445: Removing On Engine Speed (RPM) Sensor G28 At Left Of Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Bend heat shield slightly to side.
- Disconnect electrical connector on Engine Speed (RPM) Sensor G28 - **arrow** -.

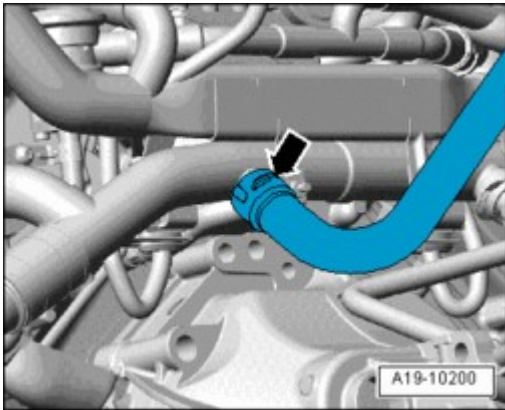


Fig. 446: Removing/Installing Coolant Hose To Heater Core On Rear Coolant Pipe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

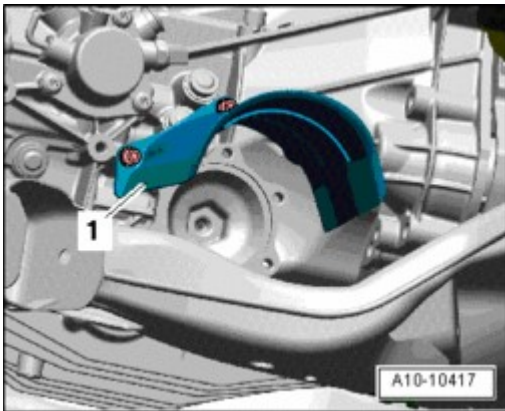


Fig. 447: Removing Heat Shield For Left Drive Axle
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield - **1** - for right drive axle.
- Remove drive axle from transmission flanged shaft.

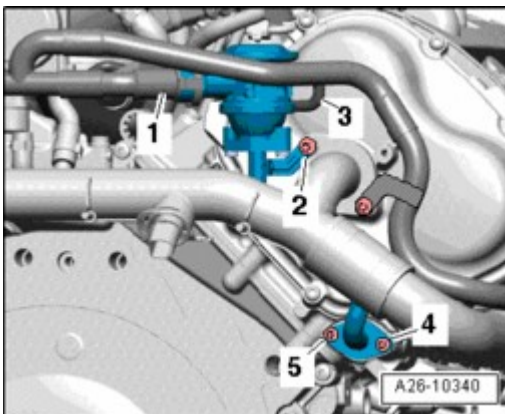


Fig. 448: Removing Bolts At Bottom Of Right Secondary Air Injection Combination Valve

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - 4 - and - 5 - at bottom of right secondary air injection combination valve.

NOTE:

- The illustration depicts the engine removed from behind.
- Ignore items - 1 to 3 -.

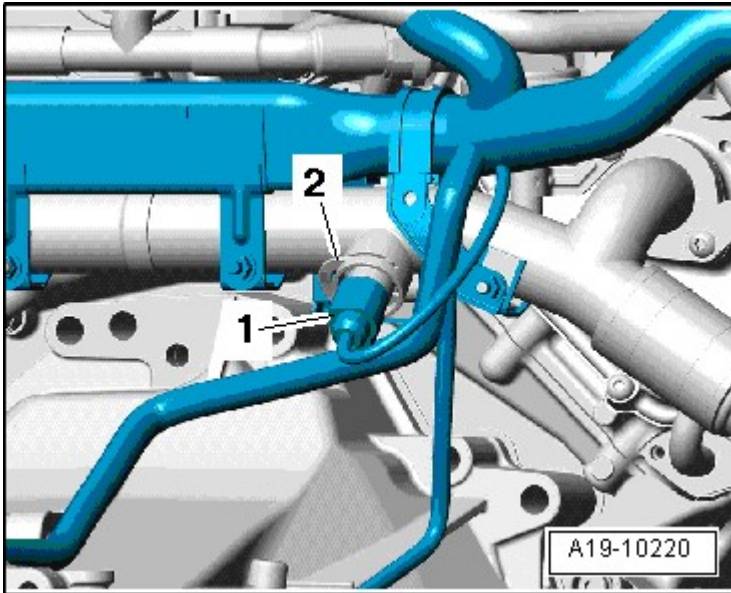


Fig. 449: Disconnecting Electrical Connector On Engine Coolant Temperature (ECT) Sensor G62
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - 1 - on Engine Coolant Temperature (ECT) Sensor G62 - 2 -.
- Remove intake manifold --> **24 - MULTIPOINT FUEL INJECTION (MPI)** .
- Remove left secondary air injection combination valve and lay it aside with vacuum line connected.

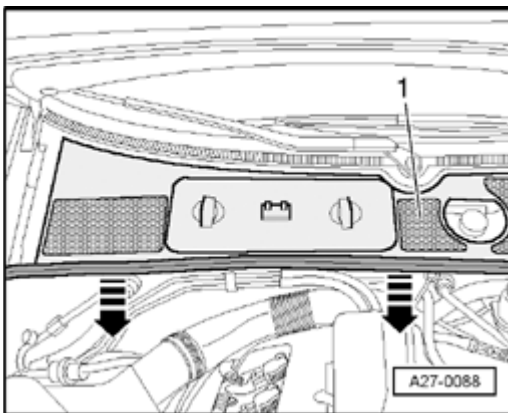


Fig. 450: Identifying Plenum Chamber Cover & Rubber Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove rubber seal and remove plenum chamber cover - 1 - forward - **arrows** -.

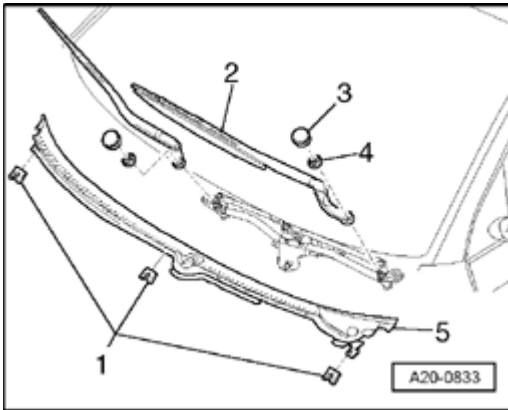


Fig. 451: Removing Securing Clips And Cowl

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pry off cover caps - 3 - from wiper arms with a screwdriver.
- Loosen nuts - 4 - several turns.
- Loosen wiper arms - 2 - one after another by tilting wiper axles slightly.
- Remove nuts completely and remove wiper arms.

NOTE:

- If wiper arm cannot be removed in this way, use a standard puller.

- Disconnect securing clips - 1 - and remove cowl grille - 5 -.

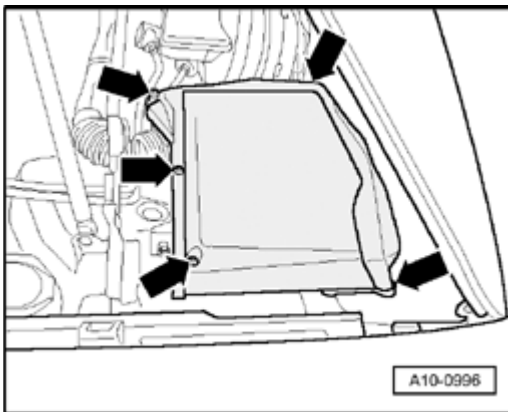


Fig. 452: Removing Screws And Cover From E-Box In Plenum Chamber

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

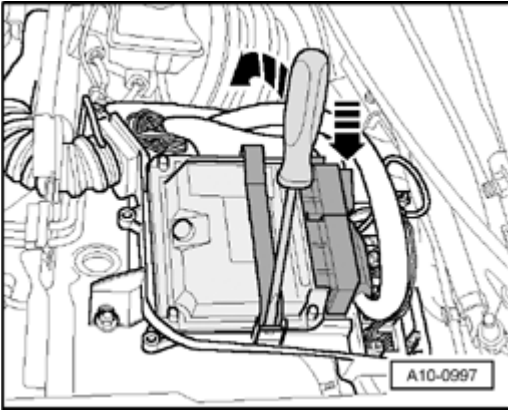


Fig. 453: Using Screwdriver To Remove Retainer Bar And Engine Control Module (ECM) J623
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

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

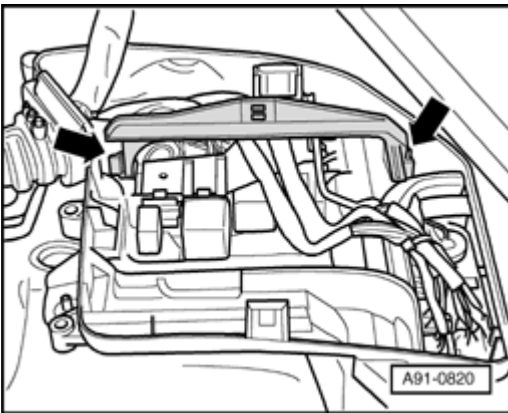


Fig. 454: Releasing Retaining Hooks Toward Outside And Removing Retaining Bracket
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

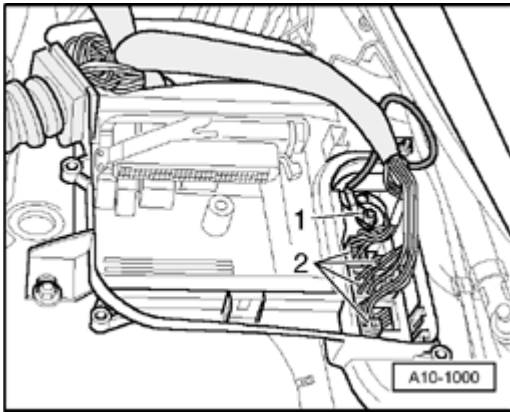


Fig. 455: Disconnecting All Electrical Harness Connectors On Connector Station & Electrical Wire Connection

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

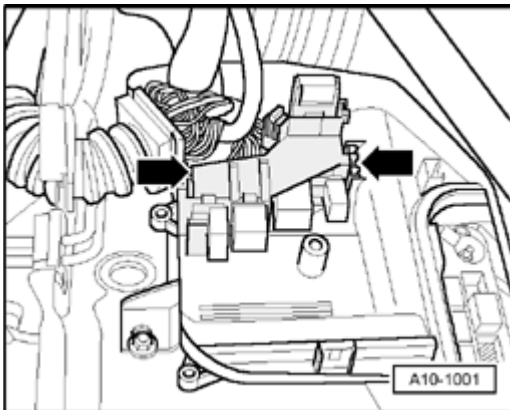


Fig. 456: Disengaging Locking Mechanisms And Removing Secondary Relay Carrier In E-Box Toward Top

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disengage locking mechanisms - **arrows** - and remove secondary relay carrier in E-Box toward top.
- Disengage engine wiring harness at E-Box and bulkhead.

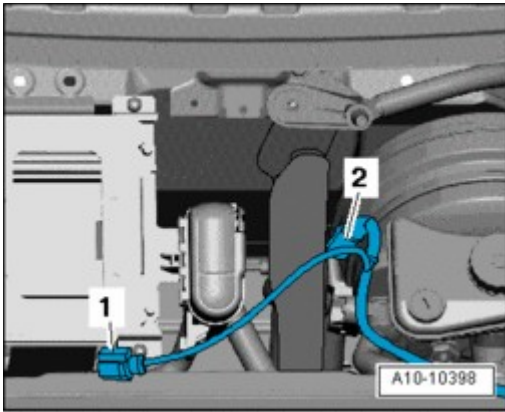


Fig. 457: Disconnecting Electrical Connectors

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connectors - 1 - and - 2 -.
- Free up wiring harness.
- Set electrical wiring harness on engine and secure Engine Control Module (ECM) against falling down.

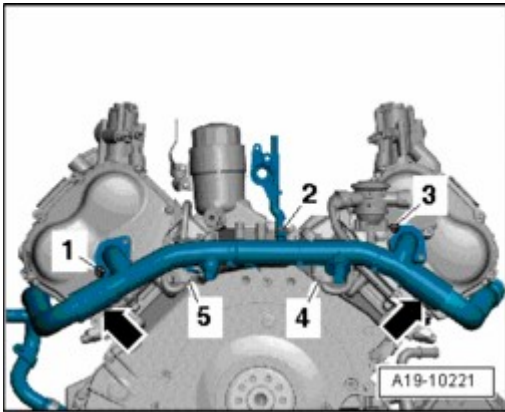


Fig. 458: Identifying Bolts, Coolant Hose, Electrical Connectors & Heat Insulation Sleeves

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - 1 - and - 3 -.
- Remove coolant hose - 2 - to coolant connections.
- Slide heat insulation sleeves - **arrows** - over left and right coolant connection hoses at rear coolant pipe to side.
- Loosen hose clips with Spring Type Clip Pliers VAS 5024 A and slide coolant connection hoses to side.
- Remove electrical connectors - 4 - and - 5 - from bracket at rear coolant pipe.
- Remove rear coolant pipe to left.

Installing

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

NOTE:

- **Replace O-rings.**
 - **Secure all hose connections using hose clamps appropriate for the model type .**
 - **During installation, re-install all heat insulation sleeves and heat shields at the same locations.**
 - **During installation, all cable ties must be re-installed at the same location.**
- Clean and/or smooth O-rings sealing surface before installing.
 - Coat new O-rings with non-corrosive lubricant (Vaseline), install rear coolant pipe and tighten.
 - Install secondary air injection combination valve: Left --> **Left combination valve for secondary air injection (AIR), removing and installing** , right --> **Right combination valve for secondary air injection, removing and installing**.
 - Install intake manifold --> **24 - MULTIPORT FUEL INJECTION (MFI)** .
 - Mount wiper arms and adjust -->
 - **92 WINDSHIELD WIPER WASHER SYSTEM**
 - **92 WINDSHIELD WIPER & WASHER SYSTEM** for ELECTRICAL EQUIPMENT, CABRIOLET
 - Fill with coolant **Filling**.

Torque specifications

Component	Nm
Rear coolant pipe to cylinder head	9
Heat shield for drive axle to transmission	23

Left coolant pipe, removing and installing**Removing****NOTE:**

- **During installation, re-install all heat insulation sleeves and heat shields at the same locations.**
- Remove engine --> **Engine, removing**.

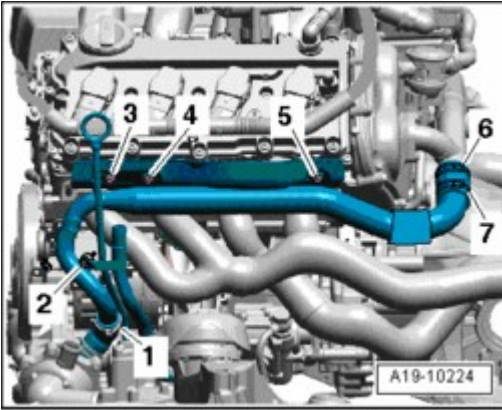


Fig. 459: Removing Bolts, Oil Dipstick Guide Tube Upward, Bolts & Hose Clips
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - 2 - and - 3 - and remove oil dipstick guide tube upward.
- Remove bolts - 4 - and - 5 -.
- Slide heat insulation sleeve over left coolant connection hose to side.
- Loosen hose clips - 1 - and - 7 -.
- Remove left coolant pipe from coolant hoses.

NOTE: • Ignore - 6 -.

Installing

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

- NOTE:**
- Replace O-ring.
 - Secure all hose connections using hose clamps appropriate for the model type .
 - During installation, re-install all heat insulation sleeves and heat shields at the same locations.

- Replace O-ring at guide tube for oil dipstick and insert guide tube into hole in oil pan (upper part).
- Install engine --> **Engine, installing.**

Torque specifications

Component	Nm
Left coolant pipe to cylinder head	9
Oil dip stick guide tube to cylinder head	9
Power steering return line to coolant pipe	9

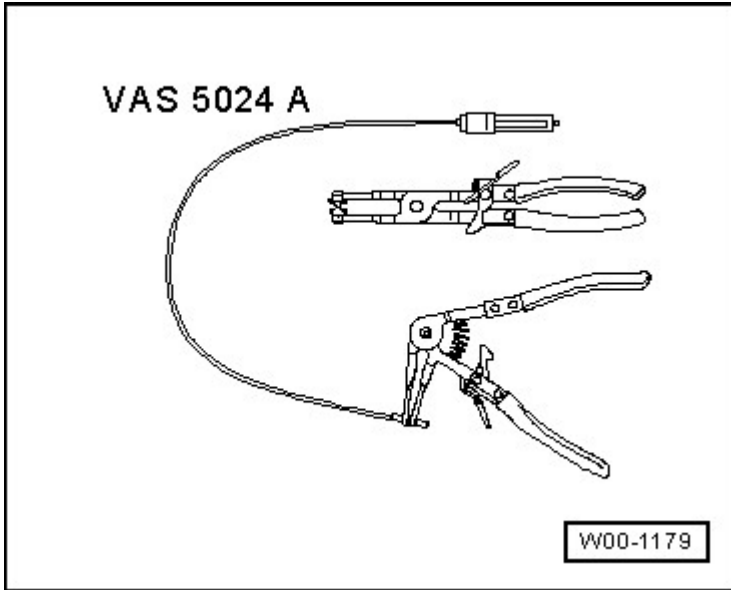
Right coolant pipe, removing and installing**Special tools, testers and auxiliary items required**

Fig. 460: Identifying Spring-Type Clip Pliers VAS 5024 A
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Spring-type clip pliers VAS 5024 A

Removing**NOTE:**

- During installation, re-install 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.
- Drain coolant --> Cooling system, draining and filling.



Fig. 461: Pulling Rear Engine Cover Off
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull rear engine cover off - **arrows** -.

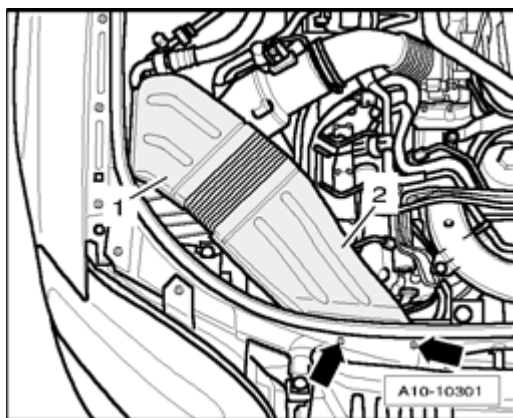


Fig. 462: Removing Bolts & Air Ducts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Remove air duct - **1** - and - **2** -.
- Disconnect vacuum hose - **2** - from air guide hose.
- Remove hose clamps - **1** - and - **3** - and lay air guide hose aside.

CAUTION: Hose connectors - 4 - must not be opened.

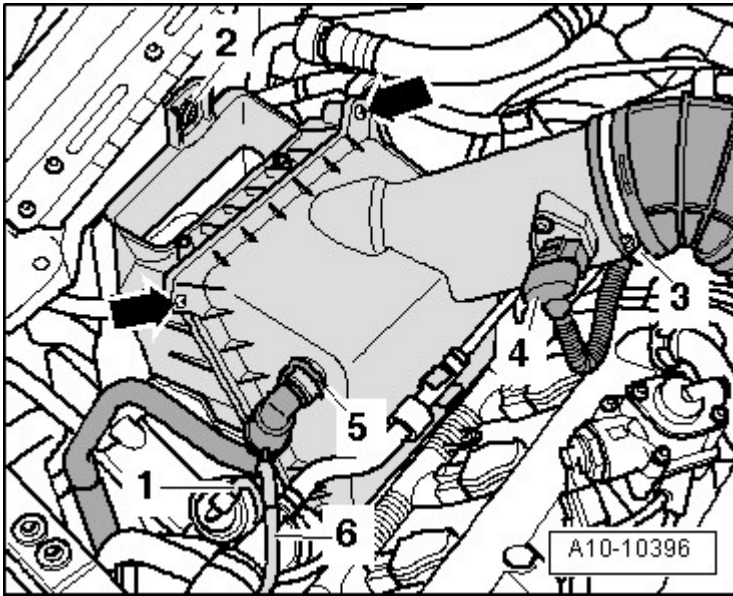


Fig. 463: Identifying Mass Air Flow (MAF) Sensor G70 Electrical Harness Connector, Secondary Air Injection (AIR) Pump Hose, Vacuum Lines & Air Guide Hose
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - 4 - at Mass Air Flow (MAF) Sensor G70.
- Disconnect hose - 5 - to Secondary Air Injection (AIR) pump.
- Pull off vacuum lines - 1 - and - 6 -.
- Disconnect air guide hose - 3 - at Mass Air Flow (MAF) sensor.
- Move wiring harness clear at air filter housing.
- Remove bolts - **arrows** - and remove upper part of air filter housing.
- Remove clip - 2 - and remove lower part of air filter housing.

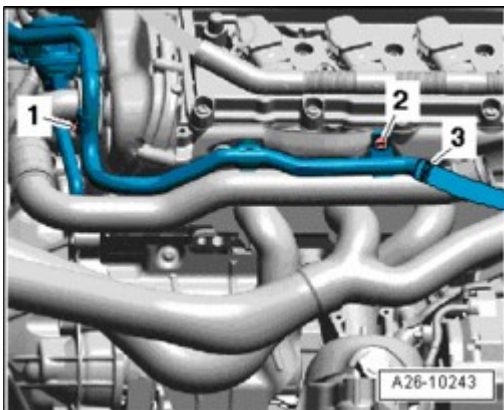


Fig. 464: Identifying Secondary Air Injection Combination Valves Air Guide Hose & Bolts
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove air guide hose - 3 - to secondary air injection combination valves.
- Remove bolts - 1 - and - 2 -.

- Lay aside air guide pipe to secondary air injection combination valves.

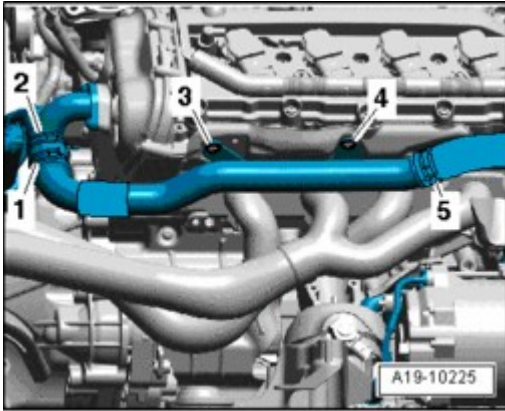


Fig. 465: Removing Bolts & Hose Clip

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Slide heat insulation sleeve over right coolant connection hose at rear coolant pipe to side.
- Loosen hose clips - 1 - and - 2 - with Spring Type Clip Pliers VAS 5024 A and slide coolant connection hose to side.
- Loosen hose clamp - 5 - and remove right coolant pipe from coolant hoses.
- Remove bolts - 3 - and - 4 -.
- Remove front right coolant pipe.

Installing

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

NOTE:

- During installation, re-install all heat insulation sleeves and heat shields at the same locations.
- Secure all hose connections using hose clamps appropriate for the model type .
- During installation, all cable ties must be re-installed at the same location.

- Fill with coolant **Filling**.

Torque specifications

Component		Nm
Right coolant pipe to cylinder head		9
Line to secondary air injection combination valves to	Cylinder head	9
	Bracket	9

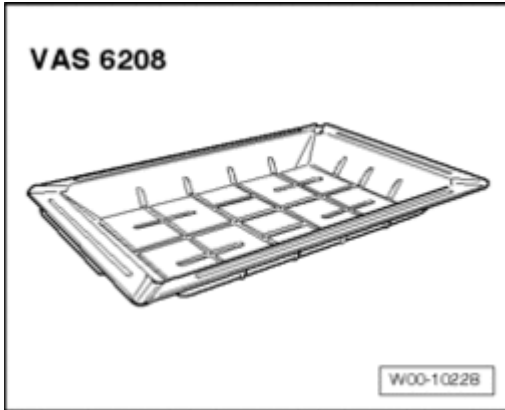
Radiator, removing and installing**Special tools, testers and auxiliary items required**

Fig. 466: Drip Tray For VAS 6100, VAS 6208
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drip tray for workshop crane VAS 6208

Removing**NOTE:**

- Drained coolant must be stored in a clean container for disposal or reuse.

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.

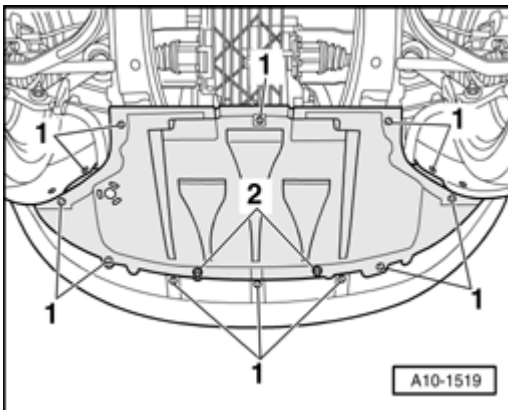


Fig. 467: Removing Quick-Release Fasteners, Screws And Noise Insulation
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove quick-release fasteners - 1 - , remove screws - 2 - and remove noise insulation.
- Remove front bumper cover -->

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

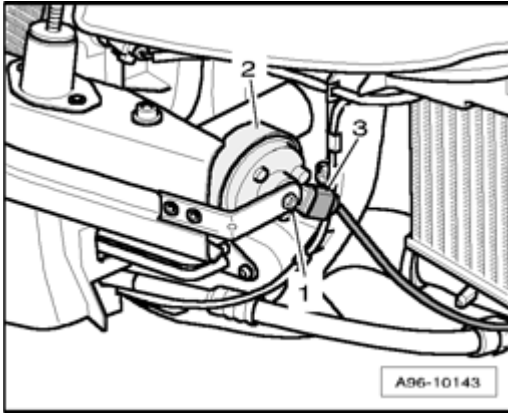


Fig. 468: Disconnecting Left/Right Electrical Connectors Of Horns
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - 3 -.

NOTE:

- Ignore - 1 - and - 2 -.

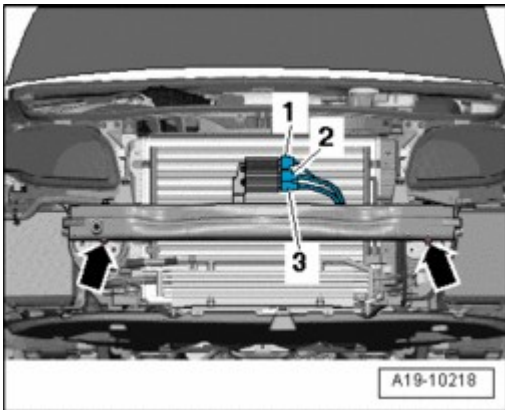


Fig. 469: Disconnecting Electrical Harness Connectors & Removing Bolts At Bumper Impact Absorber
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connectors - 1 to 3 -.
- Remove bolts - **arrows** - at bumper impact absorber.
- Remove impact absorber.

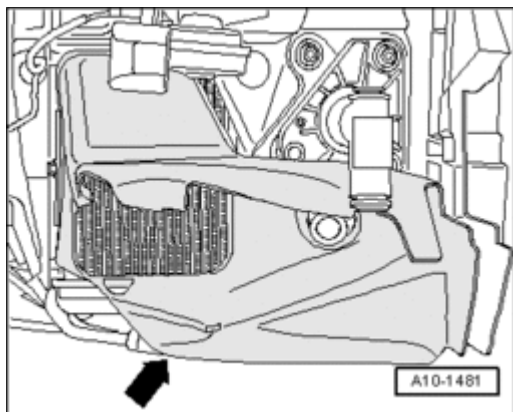


Fig. 470: Removing Right Air Guide In Front Of Auxiliary Cooler
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove right air guide - **arrow** - in front of auxiliary cooler.

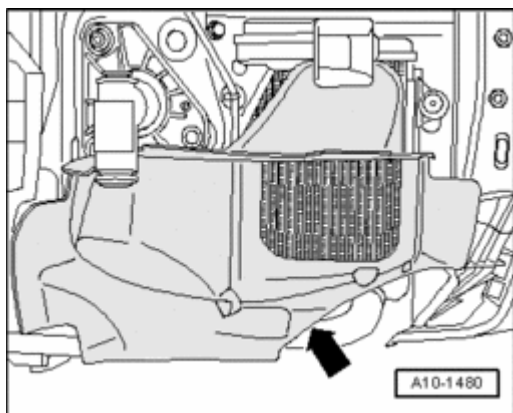


Fig. 471: Removing Left Air Guide In Front Of Auxiliary Cooler
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove left air guide - **arrow** - in front of auxiliary cooler.

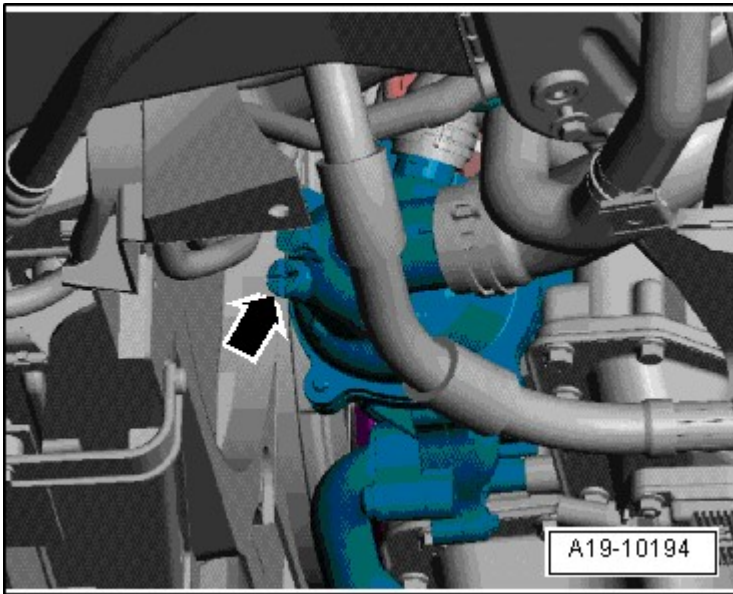


Fig. 472: Removing Drain Plug On Coolant Thermostat Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

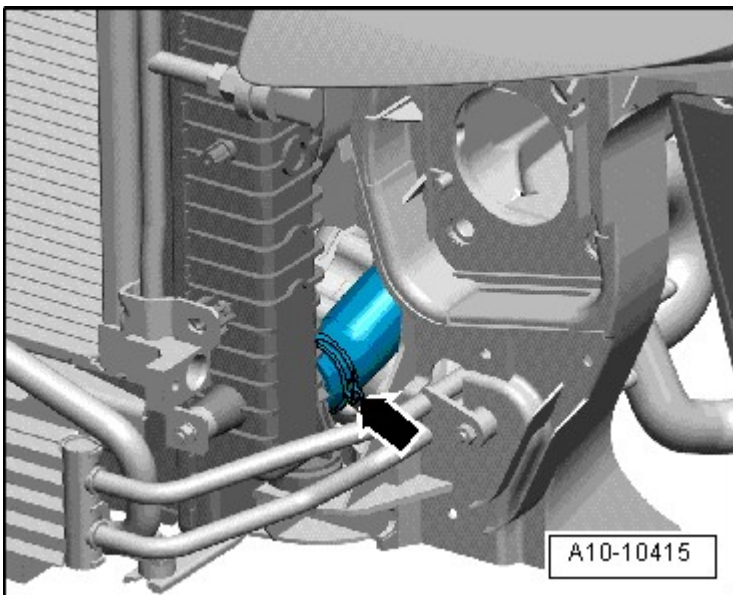


Fig. 473: Removing Coolant Hose Downward From Cooler
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

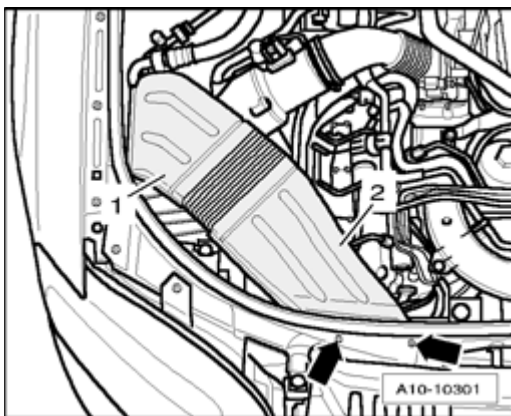


Fig. 474: Removing Bolts & Air Ducts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

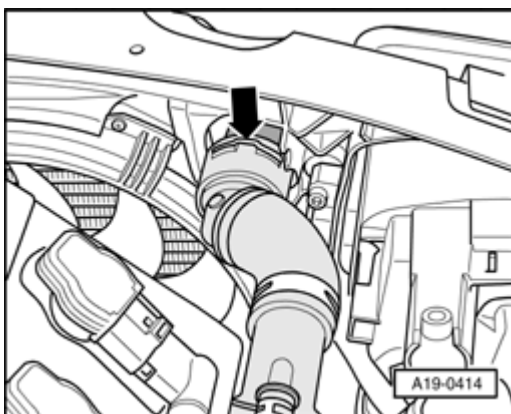


Fig. 475: Disconnecting Top Coolant Hose From Radiator

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect top coolant hose - **arrow** - from radiator.

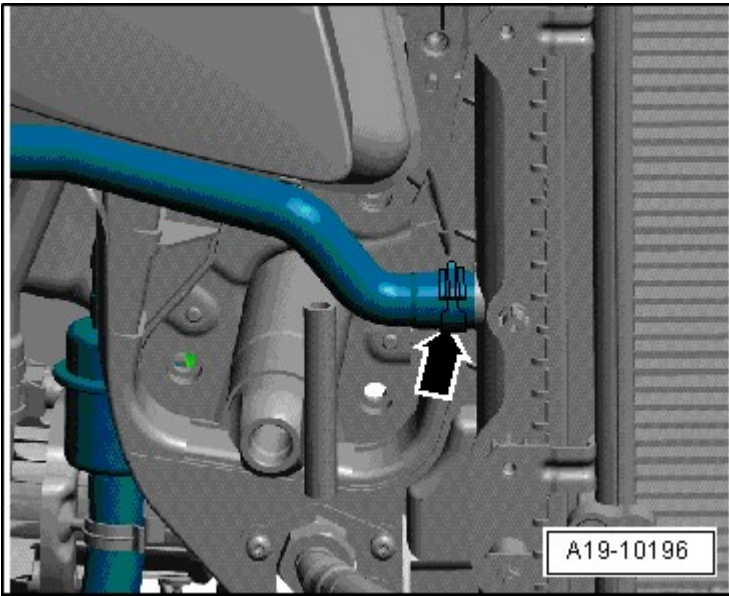


Fig. 476: Removing Right Coolant Hose
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove right auxiliary cooler coolant hose - **arrow** - at cooler.

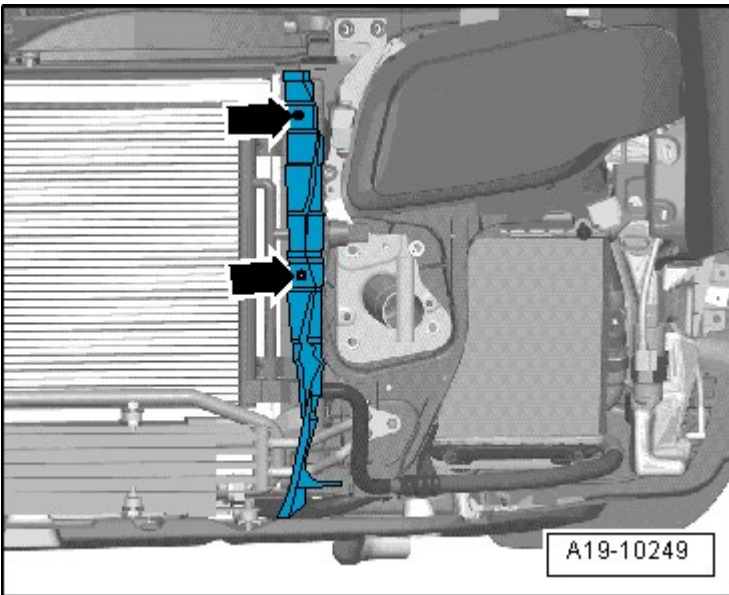


Fig. 477: Removing Bolts On Left/Right Air Guides At Cooler
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - on left and right air guides at cooler.

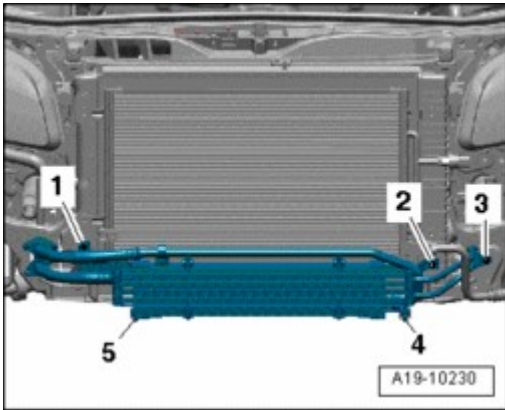


Fig. 478: Removing Oil Cooler Nuts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - **1 to 5** -.
- Lay oil cooler with power steering cooler with connected lines forward.

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

NOTE:

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

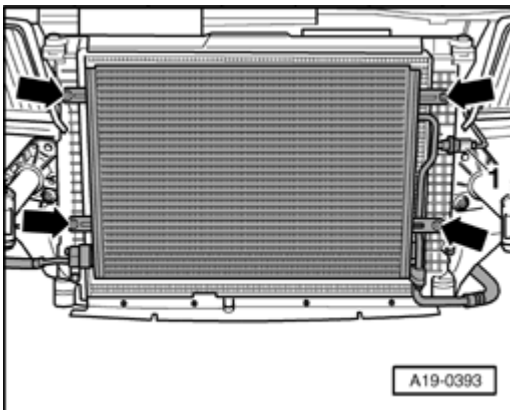


Fig. 479: Disconnecting Electrical Harness Connector At High Pressure Sensor G65

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - **1** - at High Pressure Sensor G65.
- Remove bolts - **arrows** -.
- Remove condenser and lay forward with connected lines.

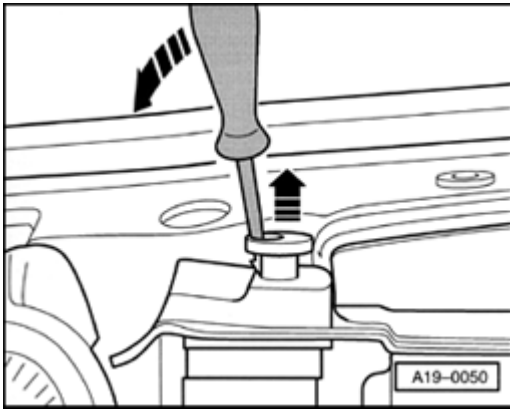


Fig. 480: Releasing Both Radiator Retaining Pins And Removing By Pulling Upward
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Release both radiator retaining pins and remove by pulling upward - **arrows** -.
- Tilt radiator at upper edge forward, pull up and remove.

Installing

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

- Install bumper impact absorber -->
 - **63 BUMPER**
 - **63 - BUMPERS** for BODY EXTERIOR - CABRIOLET
- Install front bumper cover -->
 - **63 BUMPER**
 - **63 - BUMPERS** for BODY EXTERIOR - CABRIOLET
- Fill with coolant **Filling**.

NOTE: • **Complete coolant must be replaced if the radiator was replaced.**

Torque specifications

Component	Nm
Condenser to radiator	9
Oil cooler to lock carrier	9
Power steering cooler to lock carrier	9

Left auxiliary cooler, removing and installing

Special tools, testers and auxiliary items required

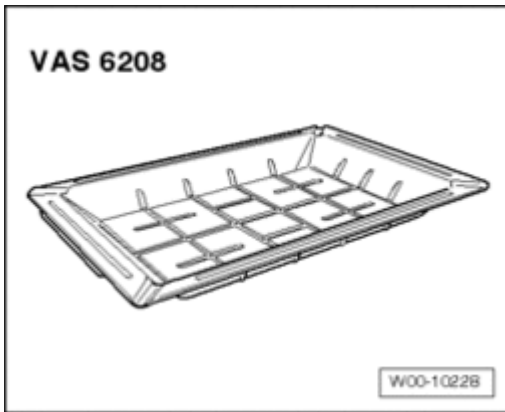


Fig. 481: Drip Tray For VAS 6100, VAS 6208

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drip tray for workshop crane VAS 6208

Removing

- Drain coolant --> **Cooling system, draining and filling.**
- Remove front bumper cover -->
 - **63 BUMPER**
 - **63 - BUMPERS** for BODY EXTERIOR - CABRIOLET

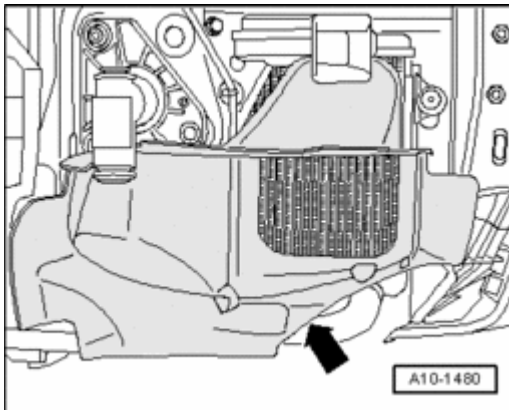


Fig. 482: Removing Left Air Guide In Front Of Auxiliary Cooler

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove left air guide - **arrow** - in front of auxiliary cooler.

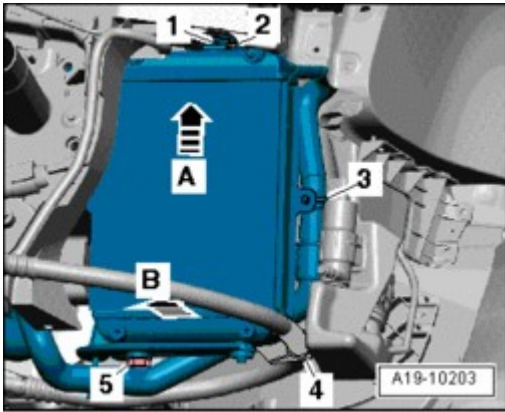


Fig. 483: Removing Upper Lock Carrier Bolt, Lower Mount Bolt, Coolant Line And Refrigerant Line From Brackets & Disengaging Bracket
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - 2 - on upper lock carrier.
- Remove bolt - 5 - at lower mount.
- Remove coolant line and refrigerant line from brackets - 3 - and - 4 -.
- Disengage bracket - 1 - upward.
- Remove left auxiliary cooler from lower mount - **arrow A** -.
- Remove left auxiliary cooler forward from lower mount - **arrow B** -.

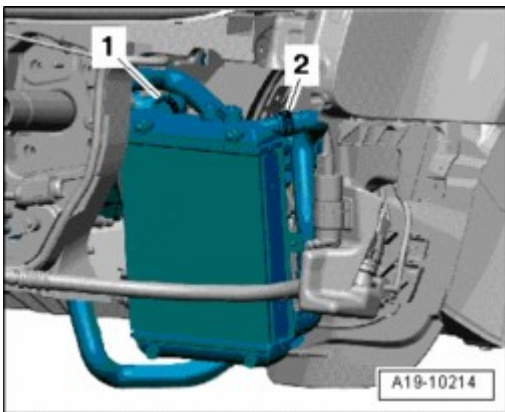


Fig. 484: Removing Coolant Hoses From Left Auxiliary Cooler
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove coolant hoses - 1 - and - 2 - from left auxiliary cooler.
- Remove left auxiliary cooler.

Installing

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

NOTE:

- **Secure all hose connections using hose clamps appropriate for the model type .**

○ Install front bumper cover -->

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

○ Fill with coolant **Filling**.

NOTE: • **Complete coolant must be replaced if the radiator was replaced.**

Torque specifications

Component	Nm
Left auxiliary cooler to lower mount	9
Left auxiliary cooler upper bracket to lock carrier	9

Right auxiliary cooler, removing and installing

Special tools, testers and auxiliary items required

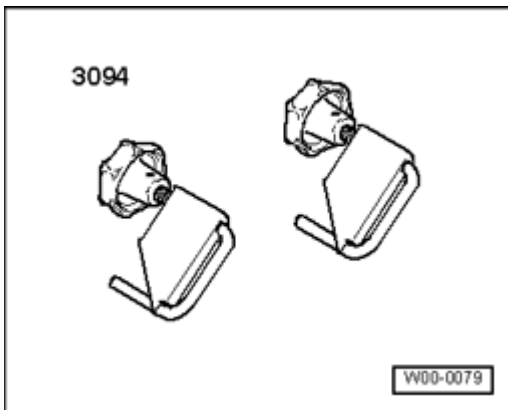


Fig. 485: Identifying Hose Clamps 3094

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hose clamps up to 25 mm dia. 3094

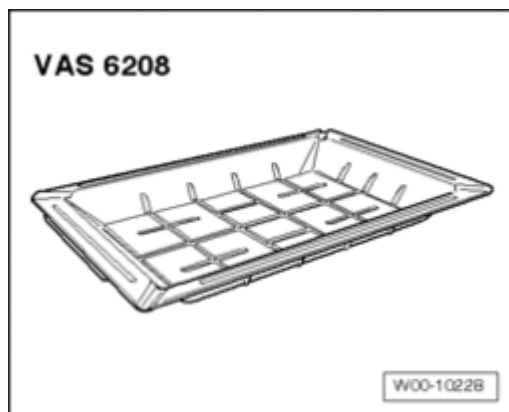


Fig. 486: Drip Tray For VAS 6100, VAS 6208

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drip tray for workshop crane VAS 6208

Removing

- Remove front bumper cover -->
 - **63 BUMPER**
 - **63 - BUMPERS** for BODY EXTERIOR - CABRIOLET

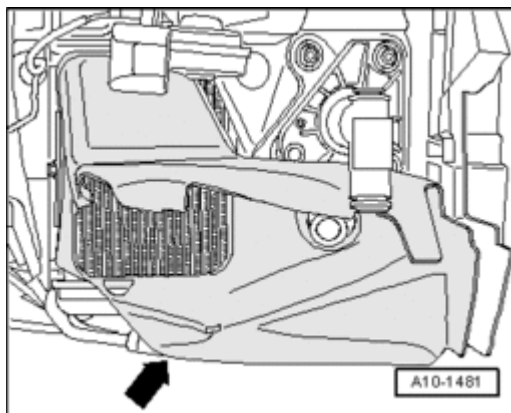


Fig. 487: Removing Right Air Guide In Front Of Auxiliary Cooler

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove right air guide - **arrow** - in front of auxiliary cooler.

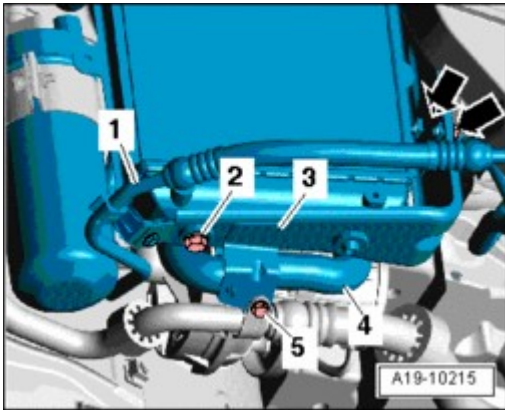


Fig. 488: Removing Lower Mount Bolt, Refrigerant Line Retaining Clip At Right Auxiliary Cooler Mount & Disengaging Refrigerant Line And Coolant Line From Brackets
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - **2** - at lower mount.
- Remove refrigerant line retaining clip - **5** - at right auxiliary cooler mount.
- Disengage refrigerant line - **1** - and coolant line - **4** - from brackets.
- Remove bolts - **arrows** -.
- Remove right auxiliary cooler mount - **3** -.

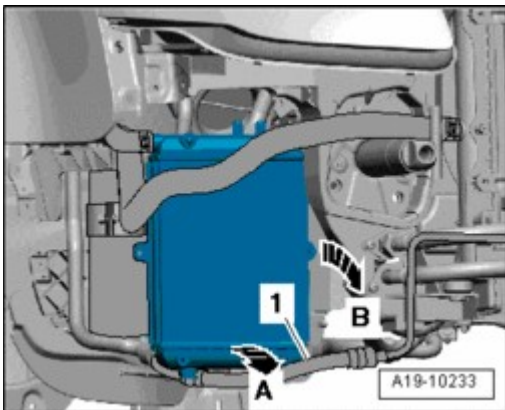


Fig. 489: Tipping Right Auxiliary Cooler Down Over Refrigerant Line And Forward
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tip right auxiliary cooler down over refrigerant line - **1** - and forward - **arrow A** -.
- Swing auxiliary cooler to right and then forward and out - **arrow B** -.

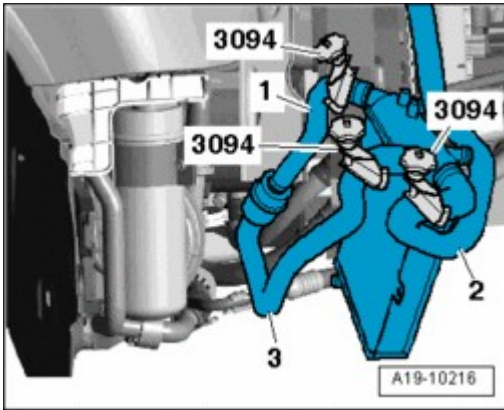


Fig. 490: Clamping Off Coolant Hoses With Hose Clamps & Removing From Right Auxiliary Cooler
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clamp off coolant hoses - **1 to 3** - with Hose Clamps Up To 25 mm Dia. 3094 and remove from right auxiliary cooler.
- Remove right auxiliary cooler.

Installing

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

NOTE:

- **Secure all hose connections using hose clamps appropriate for the model type .**

- Install front bumper cover -->
 - **63 BUMPER**
 - **63 - BUMPERS** for BODY EXTERIOR - CABRIOLET
- Fill with coolant **Filling**.

NOTE:

- **Complete coolant must be replaced if the radiator was replaced.**

Torque specifications

Component	Nm
Lower mount to long member	9
Auxiliary cooler to lower mount	9

Cooling system, checking for leaks

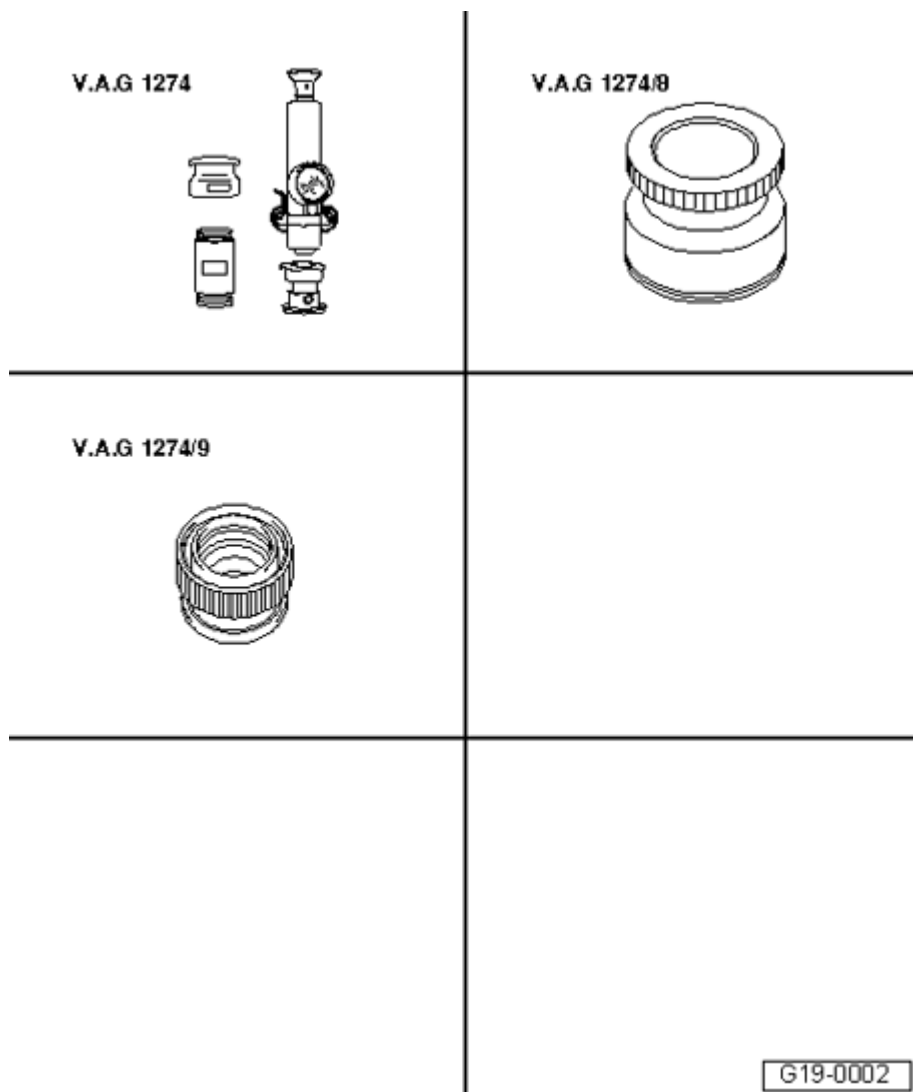


Fig. 491: Identifying Special Tools - Cooling System, Checking For Leaks
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Cooling system tester V.A.G 1274
- Adapter V.A.G 1274/8
- Adapter V.A.G 1274/9

Work procedure

- Engine at operating temperature.

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

- Open cap of coolant expansion tank.

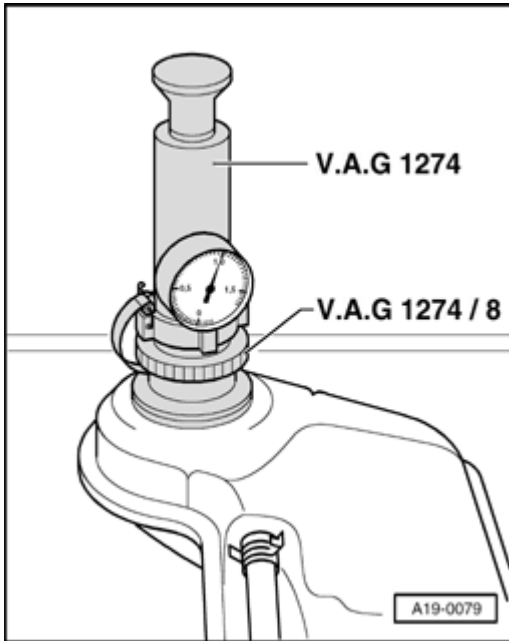


Fig. 492: Positioning Cooling System Tester V.A.G 1274 With Adapter V.A.G 1274/8 On Expansion Tank
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position cooling system tester V.A.G 1274 with adapter V.A.G 1274/8 on coolant expansion tank.
- Generate a positive pressure of approx. 1.0 bar using hand pump of cooling system tester.

If pressure drops:

- Search for leaking areas and repair malfunction.

Pressure relief valve in cap, checking

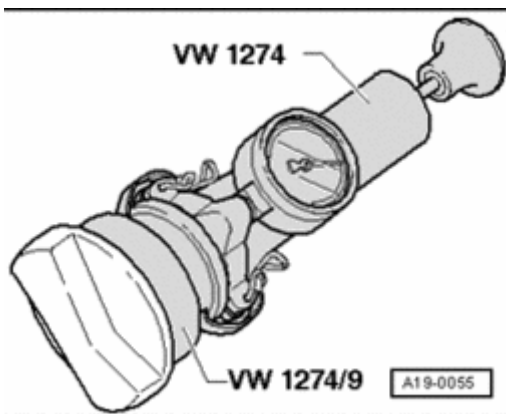


Fig. 493: Checking Pressure Relief Valve In Filler Cap
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position cooling system tester V.A.G 1274 with adapter V.A.G 1274/9 on cap.
- Generate a positive pressure using hand pump of cooling system tester.
- Pressure release valve must open at a positive pressure of 1.4 to 1.6 bar.

If check-valve does not open as indicated:

- Replace cap.

Coolant Fan Control (FC) Control Module J293 , removing and installing

Removing

- Remove front bumper cover -->
 - **63 BUMPER**
 - **63 - BUMPERS** for BODY EXTERIOR - CABRIOLET

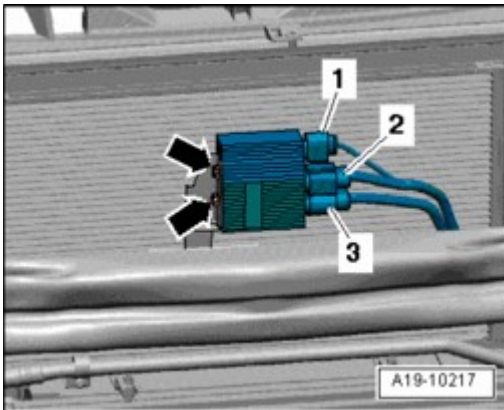


Fig. 494: Disconnecting Electrical Harness Connectors, Removing Nuts & Coolant Fan Control (FC) Control Module J293

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connectors - **1 to 3** -.
- Remove nuts - **arrows** -.
- Remove Coolant Fan Control (FC) Control Module J293.

Installing

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

- Install front bumper cover -->
 - **63 BUMPER**
 - **63 - BUMPERS** for BODY EXTERIOR - CABRIOLET

Torque specifications

Component	Nm
Coolant Fan Control (FC) Control Module J293 to bracket	9

Coolant Fan V7 (left), removing and installing

Removing

NOTE:

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

- Bring lock carrier into service position -->
 - **50 BODY, FRONT**
 - **50 - BODY - FRONT** for BODY EXTERIOR - CABRIOLET

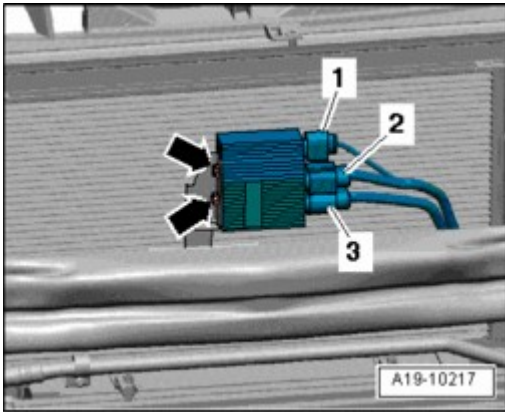


Fig. 495: Disconnecting Electrical Harness Connectors, Removing Nuts & Coolant Fan Control (FC) Control Module J293

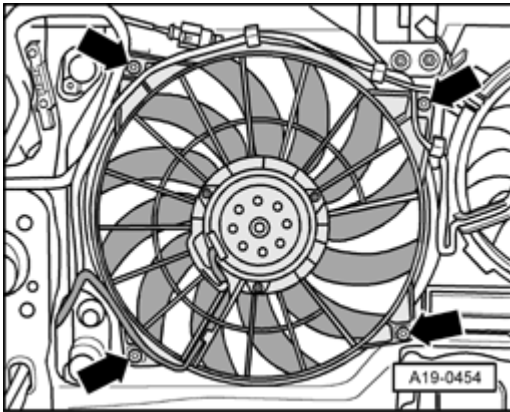
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - 3 -.

NOTE:

- Disregard the other items.

- Free up wiring harness to coolant fans.
- Disconnect hood lock electrical connector.

**Fig. 496: Removing Bolts And Fan**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and remove coolant fan.

Installing

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

NOTE:

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

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

Torque specifications

Component	Nm
Coolant fan to lock carrier	9

Coolant Fan 2 V177 (right), removing and installing**Removing****NOTE:**

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

- Bring lock carrier into service position -->
 - **50 BODY, FRONT**
 - **50 - BODY - FRONT** for BODY EXTERIOR - CABRIOLET

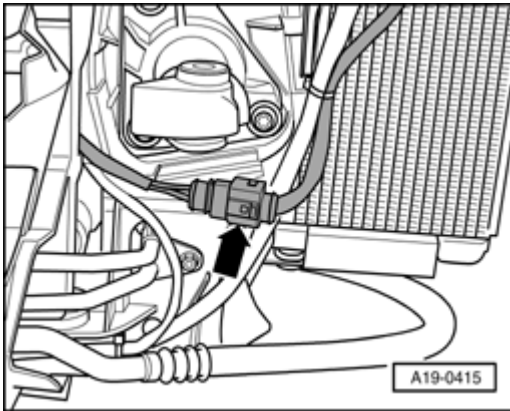


Fig. 497: Disconnecting Electrical Harness Connector For Right Fan
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - **arrow** -.
- Free up wiring harness to coolant fans.

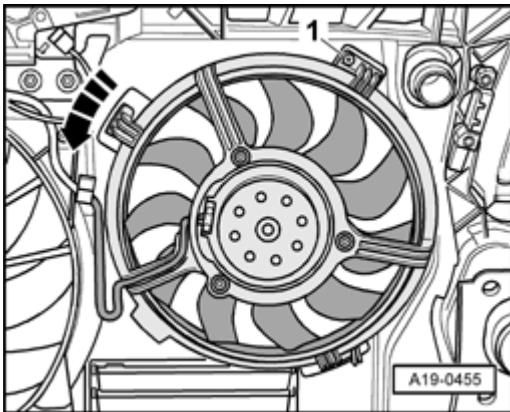


Fig. 498: Removing Coolant Fan
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **1** -.
- Rotate coolant fan in direction of - **arrow** - and remove it.

Installing

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

NOTE: ● **During installation, all cable ties must be re-installed at the same location.**

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

Torque specifications

Component	Nm
Coolant fan to lock carrier	9

26 - EXHAUST SYSTEM, EMISSION CONTROLS**EXHAUST SYSTEM COMPONENTS, REMOVING AND INSTALLING****Exhaust system components, removing and 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

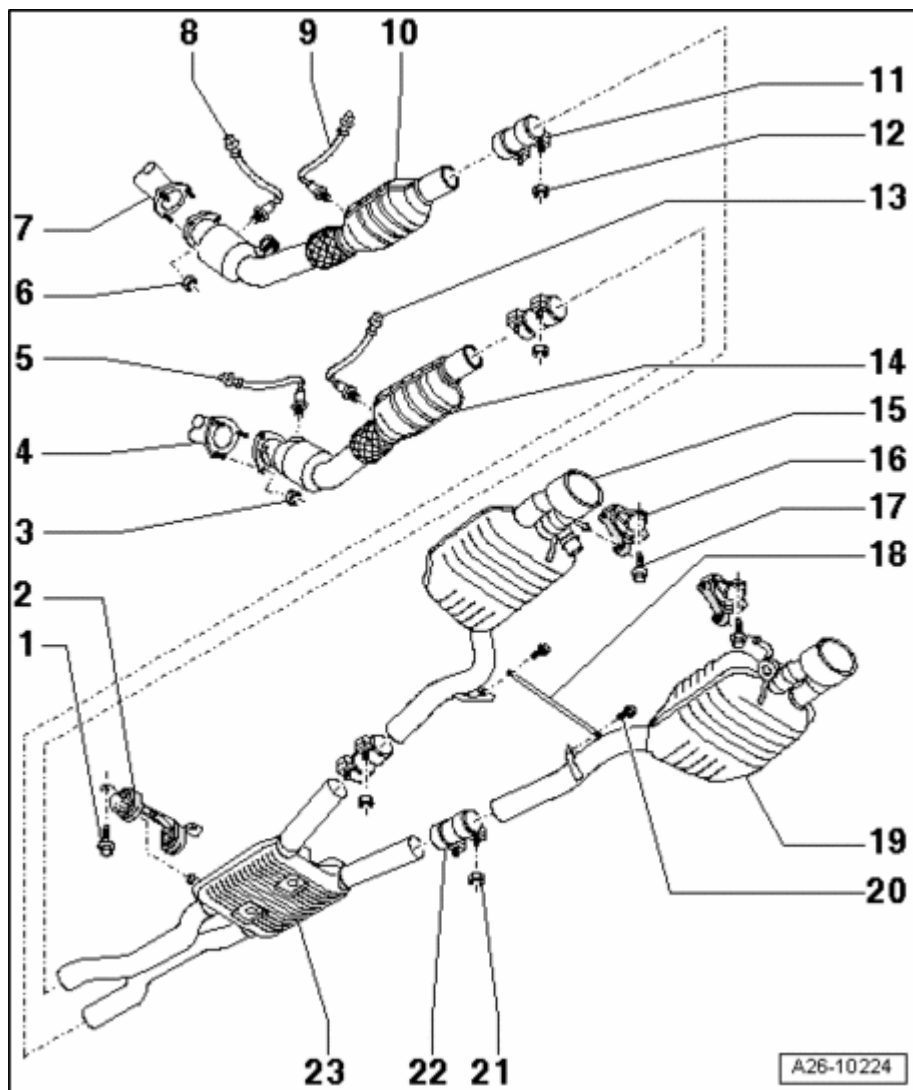


Fig. 499: Exhaust System, Component Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - 23 Nm

2 - Suspended mount

- Replace if damaged

3 - 25 Nm

- Replace
- Tighten evenly in several stages

4 - Exhaust manifold

- For cylinder bank 1 (right)

- Removing and installing --> **Right exhaust manifold, removing and installing**

5 - Heated Oxygen Sensor (HO2S) G39 (before catalytic converter)

- For cylinder bank 1 (right)
- The threads of new oxygen sensors are coated with assembly paste; the paste must not get into slots of oxygen sensor body
- When re-using the previous oxygen sensor, grease threads with hot bolt paste; the paste must not get into slots of oxygen sensor body. Hot bolt paste
- Removing and installing --> **24 - MULTIPOINT FUEL INJECTION (MPI)**
- Tighten to 55 Nm

6 - 25 Nm

- Replace
- Tighten evenly in several stages

7 - Exhaust manifold

- Cylinder bank 2 (left)
- Removing and installing --> **Left exhaust manifold, removing and installing**

8 - Heated Oxygen Sensor (HO2S) 2 G108 (in front of catalytic converter)

- For cylinder bank 2 (left)
- The threads of new oxygen sensors are coated with assembly paste; the paste must not get into slots of oxygen sensor body
- When re-using the previous oxygen sensor, grease the threads with hot bolt paste; the paste must not get into slots of oxygen sensor body. Hot bolt paste
- Removing and installing --> **24 - MULTIPOINT FUEL INJECTION (MPI)**
- Tighten to 55 Nm

9 - Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G131

- For cylinder bank 2 (left)
- The threads of new oxygen sensors are coated with assembly paste; the paste must not get into slots of oxygen sensor body
- When re-using previous oxygen sensor, grease threads with hot bolt paste; the paste must not get into slots of oxygen sensor body. Hot bolt paste
- Removing and installing --> **24 - MULTIPOINT FUEL INJECTION (MPI)**
- Tighten to 55 Nm

10 - Front exhaust pipe with pre- and main catalytic converters

- For left side of vehicle
- With flex joint
- Decoupling element must not be bent more than 10 ° otherwise it may be damaged
- Protect from shocks and impact stress
- Removing and installing --> **Left front exhaust pipe with primary and main catalytic converter, removing and installing**
- Individual components of suspension **Individual suspension components, left side**
- Install exhaust system free of stress --> **Exhaust system, installing free of tension**

11 - Front clamping sleeve

- Installed location **Installed position of front double clamps**
- Before tightening, align exhaust system tension-free --> **Exhaust system, installing free of tension**
- Tighten threaded connections evenly.

12 - 23 Nm**13 - Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130**

- For cylinder bank 1 (right)
- The threads of new oxygen sensors are coated with assembly paste; the paste must not get into slots of oxygen sensor body
- When re-using the previous oxygen sensor, grease the threads with hot bolt paste; the paste must not get into slots of oxygen sensor body. Hot bolt paste
- Removing and installing --> **24 - MULTIPOINT FUEL INJECTION (MPI)**
- Tighten to 55 Nm

14 - Front exhaust pipe with pre- and main catalytic converters

- For right side of vehicle
- With flex joint
- Decoupling element must not be bent more than 10 ° otherwise it may be damaged
- Protect from shocks and impact stress
- Removing and installing --> **Right front exhaust pipe with primary and main catalytic converter, removing and installing**
- Individual components of suspension **Individual components of suspension, right side**
- Install exhaust system free of stress --> **Exhaust system, installing free of tension**

15 - Rear muffler

- For left side of vehicle
- Original equipment as one unit with center muffler. For repairs, replace each separately.
- Separating point --> **Fig. 505**
- With exhaust flap - checking exhaust flap --> **Exhaust flap, checking**
- Install exhaust system free of stress --> **Exhaust system, installing free of tension**

16 - Suspended mount

- Replace if damaged

17 - 23 Nm**18 - Brace****19 - Rear muffler**

- For right side of vehicle
- Original equipment as one unit with center muffler. For repairs, replace each separately.
- Separating point --> **Fig. 505**
- With exhaust flap - checking exhaust flap --> **Exhaust flap, checking**
- Install exhaust system free of stress --> **Exhaust system, installing free of tension**

20 - 23 Nm**21 - 23 Nm****22 - Rear clamping sleeve**

- For individual replacement of center and rear mufflers
- Installed location **Installed position of rear double clamps**
- Before tightening, align exhaust system tension-free --> **Exhaust system, installing free of tension**
- Tighten threaded connections evenly.

23 - Center muffler

- Original equipment as one unit with rear muffler. For repairs, replace each separately.
- Separating point --> **Fig. 505**
- Install exhaust system free of stress --> **Exhaust system, installing free of tension**

Installed position of front double clamps

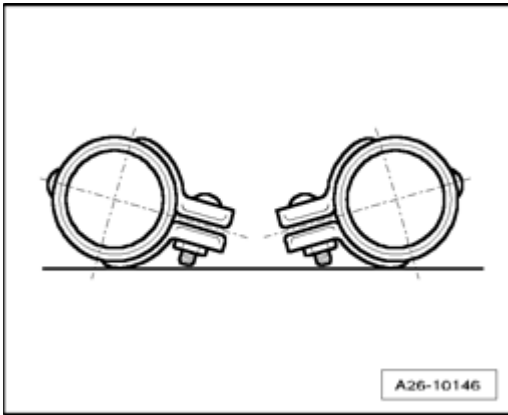


Fig. 500: Installed Position Of Front Double Clamps
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install double clamps so that the bolt ends do not project over lower edge of double clamp.
- Threaded connections face each other.

Installed position of rear double clamps

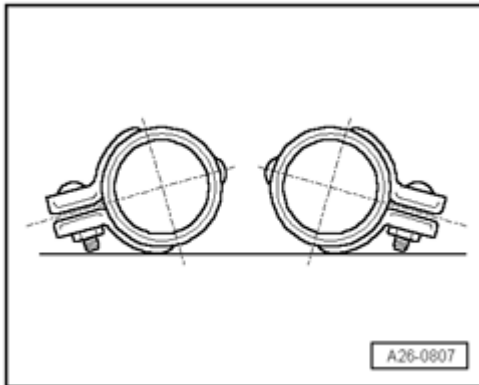


Fig. 501: Installing Double Clamps So That Bolt Ends Do Not Project Over Lower Edge Of Double Clamp

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install double clamps so that the bolt ends do not project over lower edge of double clamp.
- Threaded connections point toward outside.

Individual suspension components, left side

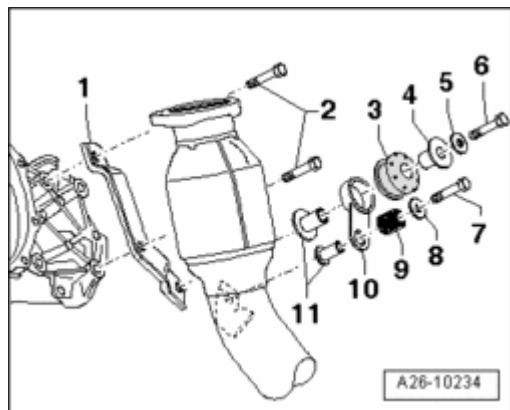


Fig. 502: Individual Suspension Components, Left Side
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1. Bracket
2. Bolts, 25 Nm
3. Buffer
4. Spacing sleeve
5. Washer
6. Bolt, 40 Nm
7. Bolt, 25 Nm
8. Washer
9. Spring
10. Tongue
11. Spacer sleeves

Individual components of suspension, right side

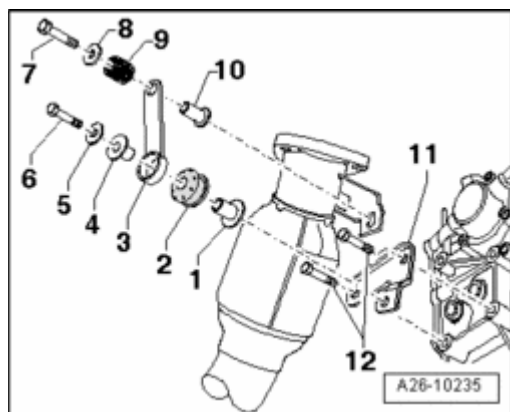


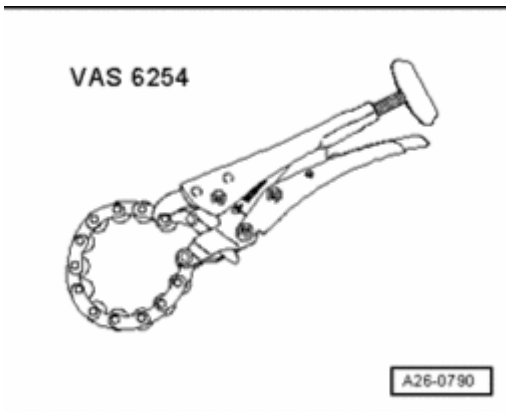
Fig. 503: Individual Components Of Suspension, Right Side
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1. Spacing sleeve
2. Buffer

3. Tongue
4. Spacing sleeve
5. Washer
6. Bolt, 40 Nm
7. Bolt, 25 Nm
8. Washer
9. Spring
10. Spacing sleeve
11. Bracket
12. Bolt, 25 Nm

Center muffler and rear muffler, separating

- A separating point has been provided in the connecting pipe for individual replacement of the center or rear muffler
- The separating point is marked by depressions around the circumference of the exhaust pipe.

Special tools, testers and auxiliary items required**Fig. 504: Chain Pipe Cutter VAS 6254**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Chain pipe cutter VAS 6254

Work procedure

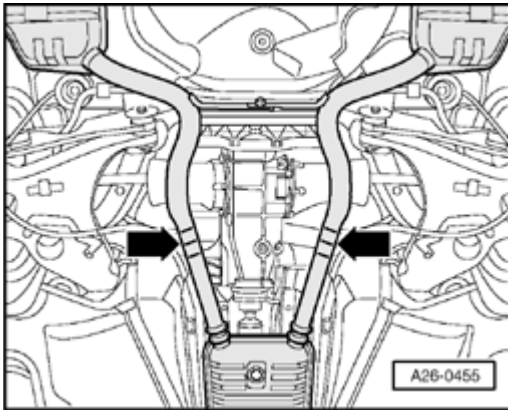


Fig. 505: Separating Exhaust Pipes At Separating Point Using Chain Pipe Cutter VAS 6254 At A Right Angle

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Separate exhaust pipe at separating point - **arrow** - using Chain Pipe Cutter VAS 6254 at a right angle.

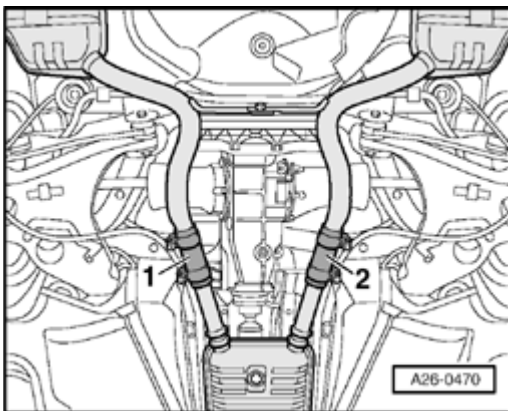


Fig. 506: Positioning Clamping Sleeves At Center On Separating Cut

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- When installing, position clamping sleeves - **1** - and - **2** - at center on separating cut.

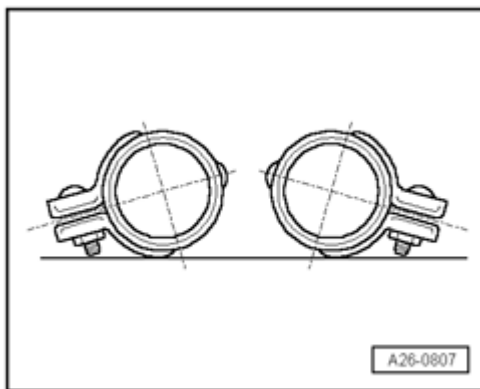


Fig. 507: Installing Double Clamps So That Bolt Ends Do Not Project Over Lower Edge Of Double Clamp

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install double clamps so that the bolt ends do not project over lower edge of double clamp.
- Threaded connections point toward outside.
- Align exhaust system free of tension --> **Exhaust system, installing free of tension.**

Left front exhaust pipe with primary and main catalytic converter, removing and installing

Special tools, testers and auxiliary items required

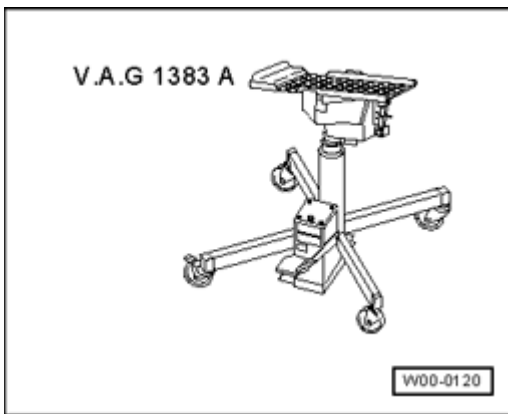


Fig. 508: Identifying Engine/Transmission Jack V.A.G. 1383 A
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Engine/transmission jack V.A.G 1383 A

Removing

NOTE:

- During installation, re-install 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.

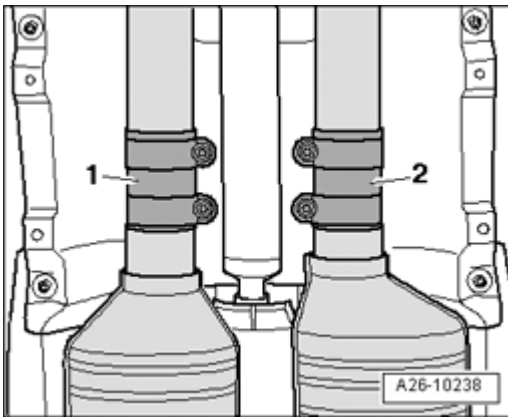


Fig. 509: Disconnecting Exhaust System At Clamping Sleeves
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- Flex joint in front exhaust pipe must not be bent more than 10 ° , otherwise it may be damaged.

- Disconnect exhaust system at clamping sleeves - 1 - and - 2 -.

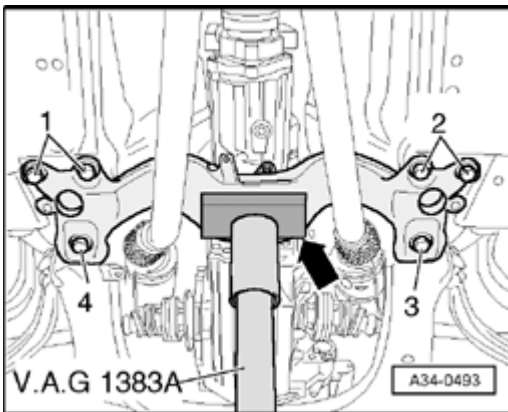


Fig. 510: Supporting Tunnel Cross Member Using VAG1383A Engine/Transmission Lift And A Piece Of Wood

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place plunger of Engine/transmission jack V.A.G 1383 A with a block of wood inserted in between - **arrow** - beneath rear cross member.
- First remove bolts - 1 - and - 2 - , then bolts - 3 - and - 4 -.

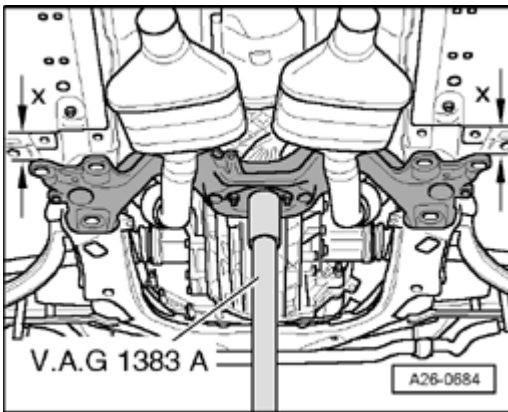


Fig. 511: Identifying Distance Between Cross Member And Body Reaches Dimension
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Slowly lower rear cross member using engine/transmission jack V.A.G 1383 A until distance between rear cross member/chassis acquires dimension - x -.
- Dimension - x - = max. 60 mm.

NOTE:

- Dimension - x - must not be exceeded, otherwise drive shaft joint and lines on bulkhead can be damaged.

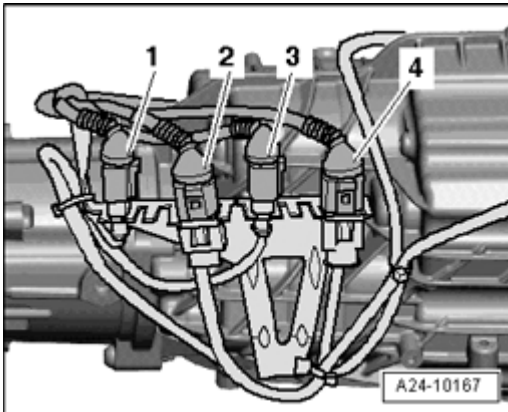


Fig. 512: Identifying Electrical Connectors On Transmission Bracket
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove electrical harness connectors - 3 - and - 4 - from bracket at transmission.
- Disconnect electrical harness connectors.
- Remove heat insulation sleeve on wiring harness and free up individual electrical wires.

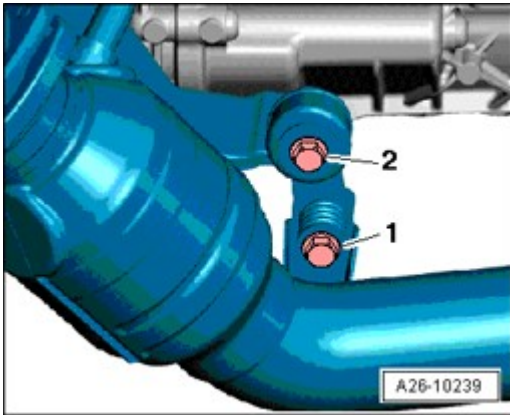


Fig. 513: Removing Bolt At Left Front Exhaust Pipe Strap
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - 1 - at left front exhaust pipe strap.

NOTE:

- Ignore - 2 -.

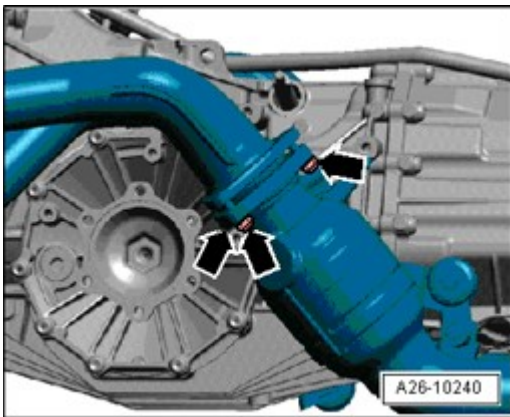


Fig. 514: Identifying Nuts & Front Exhaust Pipe With Pre- And Main Catalytic Converters
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove left front exhaust pipe/exhaust manifold nuts - **arrows** -.
- Remove front exhaust pipe with pre- and main catalytic converters.

Installing

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

NOTE:

- Replace self-locking nuts.
- During installation, re-install all heat insulation sleeves and heat shields at the same locations.
- During installation, all cable ties must be re-installed at the same location.

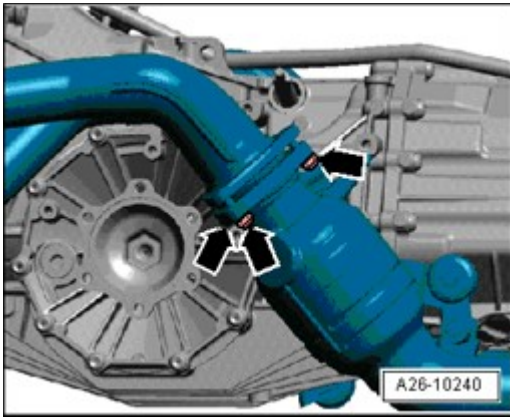


Fig. 515: Identifying Nuts & Front Exhaust Pipe With Pre- And Main Catalytic Converters
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten front exhaust pipe/exhaust manifold threaded connection nuts - **arrows** - evenly in stages while aligning main catalytic converter horizontally.
- Install subframe with cross member --> **40 - FRONT SUSPENSION** .

NOTE:

- **Individual mounting components of exhaust system on transmission**
Individual components of suspension, right side

- Align exhaust system free of tension --> **Exhaust system, installing free of tension.**

Torque specifications

Component		Nm
Front exhaust pipe with pre- and main catalytic converters to	Exhaust manifold	25 ¹⁾
Mounting strap		25
● ¹⁾ Replace nuts.		

Right front exhaust pipe with primary and main catalytic converter, removing and installing

Special tools, testers and auxiliary items required

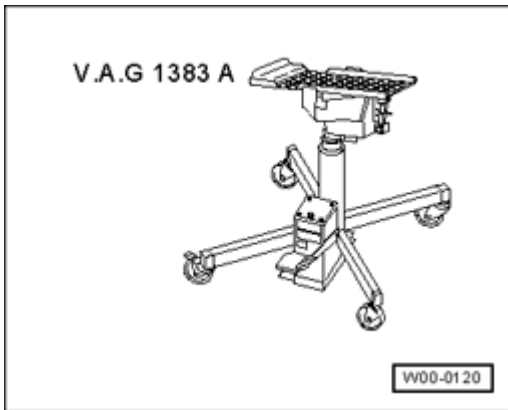


Fig. 516: Identifying Engine/Transmission Jack V.A.G. 1383 A
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Engine/transmission jack V.A.G 1383 A

Removing

NOTE:

- During installation, re-install 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.

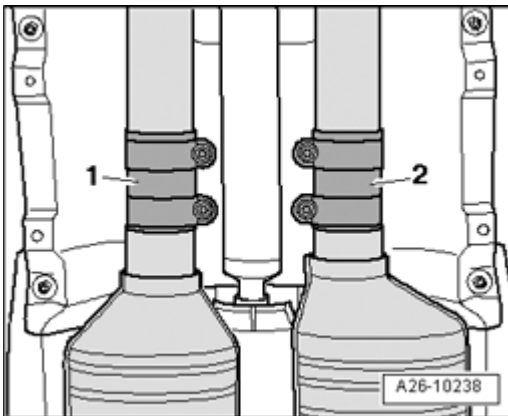


Fig. 517: Disconnecting Exhaust System At Clamping Sleeves
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- Flex joint in exhaust pipe must not be bent more than 10 ° , otherwise it may be damaged.
- Disconnect exhaust system at clamping sleeves - 1 - and - 2 -.

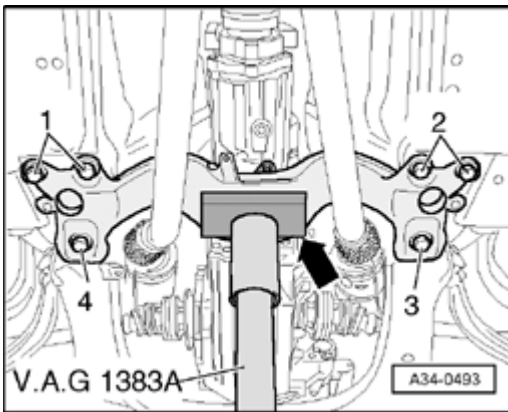


Fig. 518: Supporting Tunnel Cross Member Using VAG1383A Engine/Transmission Lift And A Piece Of Wood

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place plunger of engine/transmission jack V.A.G 1383 A with a block of wood inserted in between - **arrow** - beneath rear cross member.
- First remove bolts - 1 - and - 2 - , then bolts - 3 - and - 4 - .

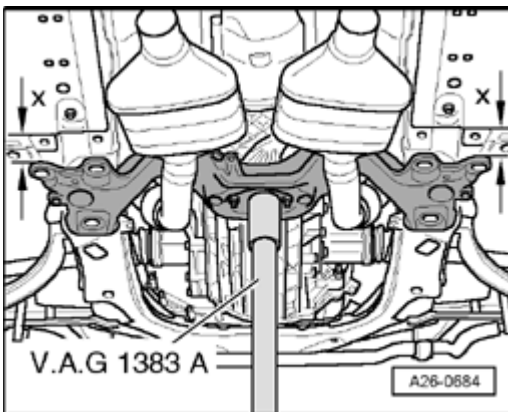


Fig. 519: Identifying Distance Between Cross Member And Body Reaches Dimension

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Slowly lower rear cross member using engine/transmission jack V.A.G 1383 A until distance between rear cross member/chassis acquires dimension - **x** - .
- Dimension - **x** - = max. 60 mm

NOTE:

- **Dimension - x - must not be exceeded, otherwise drive shaft joint and lines on bulkhead can be damaged.**

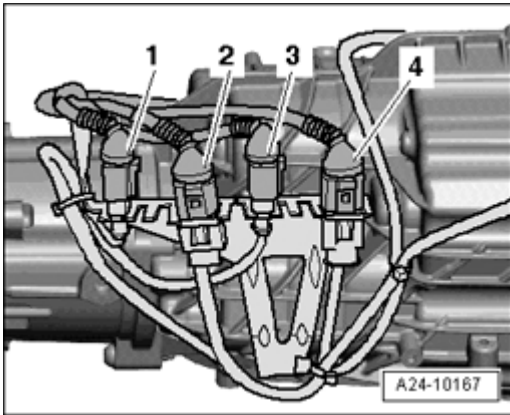


Fig. 520: Identifying Electrical Connectors On Transmission Bracket
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove electrical harness connectors - **1** - and - **2** - from bracket at transmission.
- Disconnect electrical harness connectors.
- Remove heat insulation sleeve on wiring harness and free up individual electrical wires.

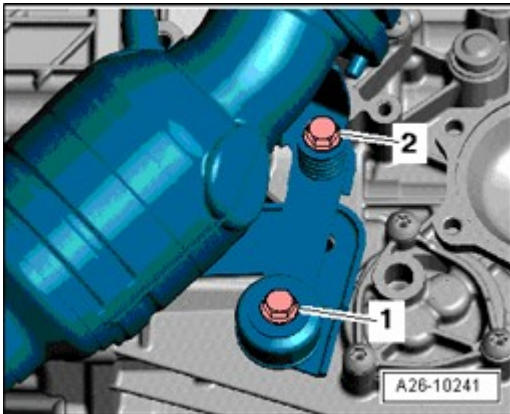


Fig. 521: Removing Bolt At Right Front Exhaust Pipe Strap
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **1** - and - **2** -.
- Remove right front exhaust pipe strap.

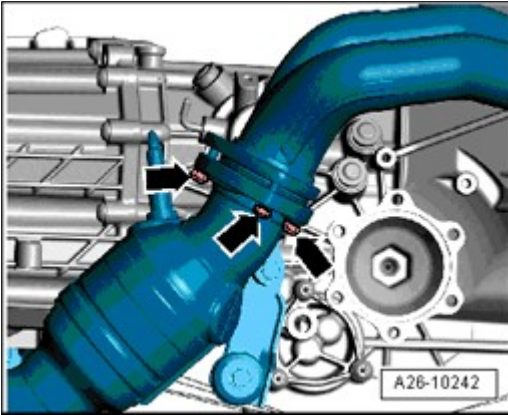


Fig. 522: Removing/Installing Nuts & Left Front Exhaust Pipe With Pre- And Main Catalytic Converters
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove right front exhaust pipe/exhaust manifold nuts - **arrows** -.
- Remove front exhaust pipe with pre- and main catalytic converters.

Installing

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

NOTE:

- Replace self-locking nuts.
- During installation, re-install all heat insulation sleeves and heat shields at the same locations.
- During installation, all cable ties must be re-installed at the same location.

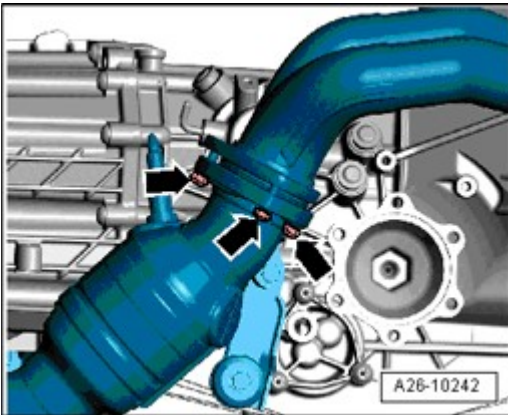


Fig. 523: Removing/Installing Nuts & Left Front Exhaust Pipe With Pre- And Main Catalytic Converters
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten front exhaust pipe/exhaust manifold threaded connection nuts - **arrows** - evenly in stages while aligning main catalytic converter horizontally.
- Install subframe with cross member --> **40 - FRONT SUSPENSION** .

2008 Audi RS 4

ENGINE 4.2 Liter V8 4V Engine Mechanical, Engine Code(s): BNS

NOTE:

- **Individual mounting components of exhaust system on transmission**
Individual components of suspension, right side

- Align exhaust system free of tension --> **Exhaust system, installing free of tension.**

Torque specifications

Component		Nm
Front exhaust pipe with pre- and main catalytic converters to	Exhaust manifold	25 ¹⁾
Mounting strap		25
Mounting strap to bracket		40
• ¹⁾ Replace nuts.		

Exhaust manifold, component overview

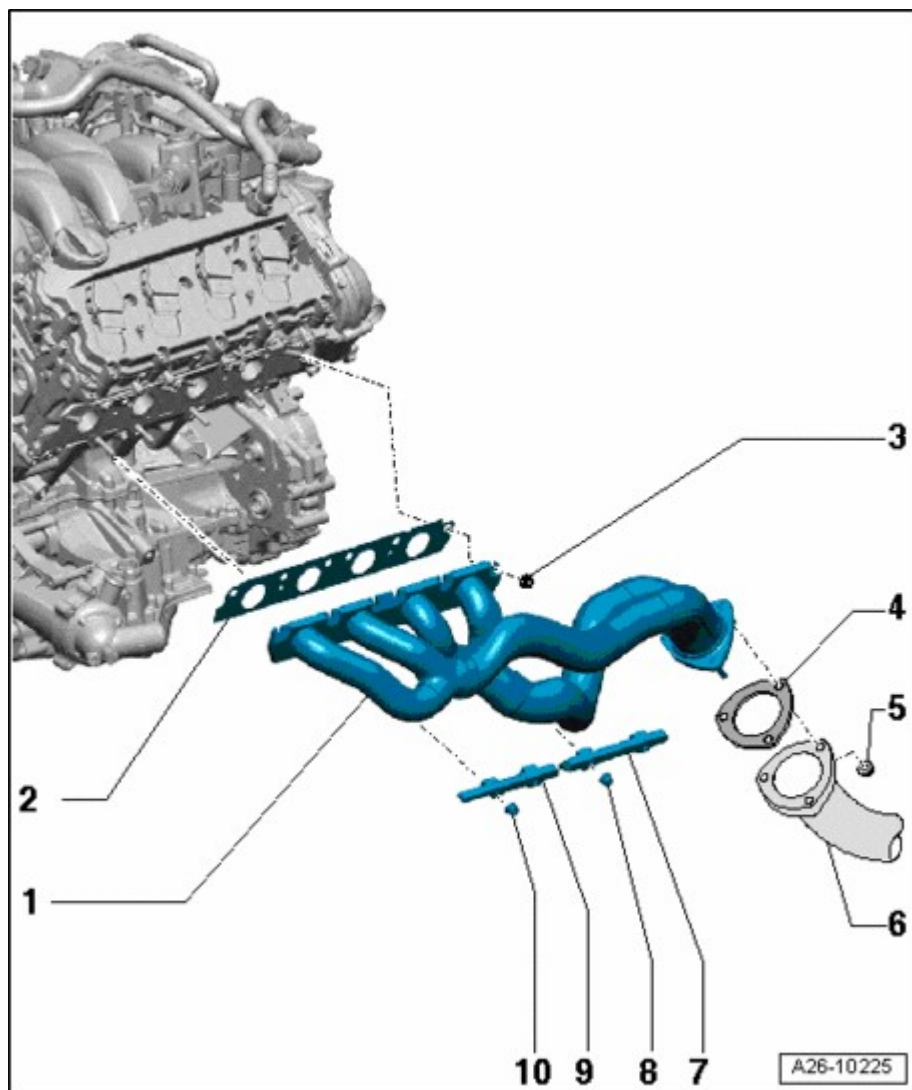


Fig. 524: Exhaust Manifold, Component Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Exhaust manifold

- Removing and installing: Left --> **Left exhaust manifold, removing and installing** , right --> **Right exhaust manifold, removing and installing**

2 - Gasket

- Replace

3 - 25 Nm

- Replace
- Lubricate with hot bolt paste; Hot bolt paste

- Observe tightening sequence: Left --> **Fig. 529** , right --> **Fig. 534**

4 - Gasket

- Replace

5 - 25 Nm

- Replace
- Tighten evenly in several stages

6 - Front exhaust pipe with pre- and main catalytic converters

- With decoupling element; Decoupling element must not be bent more than 10 ° otherwise it may be damaged
- Protect from shocks and impact stress
- Removing and installing: Left --> **Left front exhaust pipe with primary and main catalytic converter, removing and installing** ; right --> **Right front exhaust pipe with primary and main catalytic converter, removing and installing**
- Individual components of mounting: Left **Individual suspension components, left side** , right **Individual components of suspension, right side**
- Install exhaust system free of stress --> **Exhaust system, installing free of tension**

7 - Securing strip**8 - 25 Nm**

- Replace

9 - Securing strip**10 - 25 Nm**

- Replace

Left exhaust manifold, removing and installing**Removing****NOTE:**

- During installation, re-install 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.**

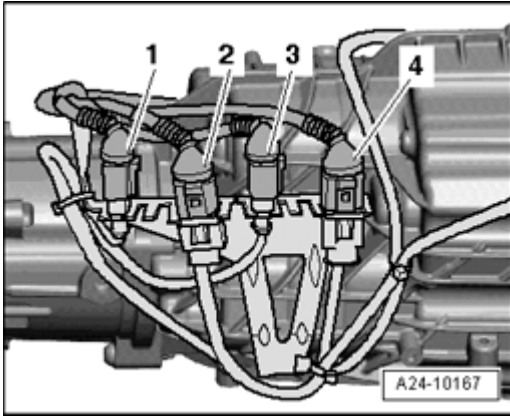


Fig. 525: Identifying Electrical Connectors On Transmission Bracket
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove electrical harness connectors - **3** - and - **4** - from bracket at transmission.
- Disconnect electrical harness connectors.
- Remove heat insulation sleeve on wiring harness and free up individual electrical wires.

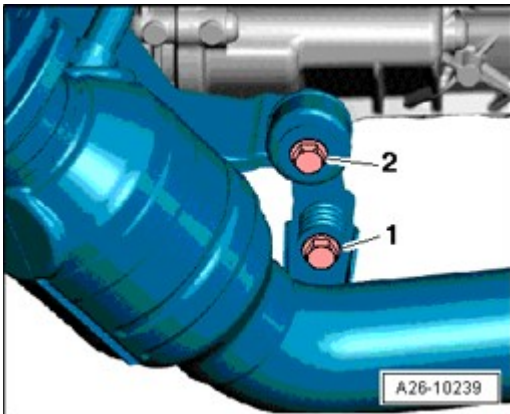


Fig. 526: Removing Bolt At Left Front Exhaust Pipe Strap
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - **1** - at left front exhaust pipe strap.

NOTE:

- Ignore - **2** -.

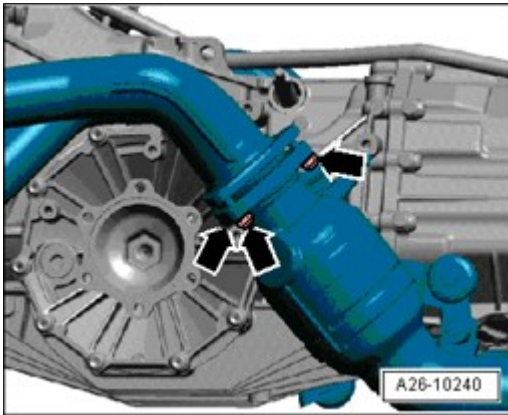


Fig. 527: Identifying Nuts & Front Exhaust Pipe With Pre- And Main Catalytic Converters
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove left front exhaust pipe/exhaust manifold nuts - **arrows** -.
- Remove front exhaust pipe with pre- and main catalytic converters.

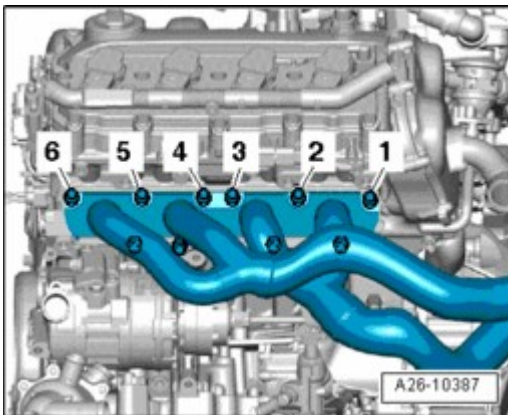


Fig. 528: Removing/Installing Nuts And Left Exhaust Manifold
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - **1 to 6** - and remove left exhaust manifold.

Installing

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

NOTE:

- **Replace self-locking nuts and seal.**
- **During installation, re-install 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.**

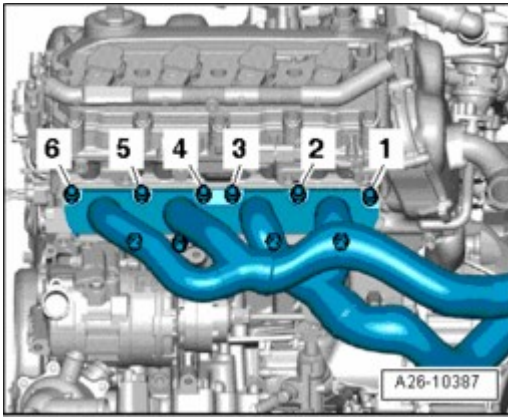


Fig. 529: Removing/Installing Nuts And Left Exhaust Manifold
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place gasket onto stud bolts.
- Insert exhaust manifold in securing strips and hand tighten nuts.
- Tighten exhaust manifold nuts in 2 stages as follows:
- Pre-tighten nuts in - **1 to 6** - sequence to 20 Nm.
- Pre-tighten nuts in - **1 to 6** - sequence to 30 Nm.
- Install left front exhaust pipe --> **Left front exhaust pipe with primary and main catalytic converter, removing and installing.**
- Install engine --> **Engine, installing.**

Torque specifications

Component	Nm
Exhaust manifold to cylinder head	30 ¹⁾²⁾³⁾
● ¹⁾ Replace nuts. ● ²⁾ Grease with hot bolt paste; hot bolt paste . ● ³⁾ Tighten in 2 stages.	

Right exhaust manifold, removing and installing

Removing

NOTE:

- During installation, re-install 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.**

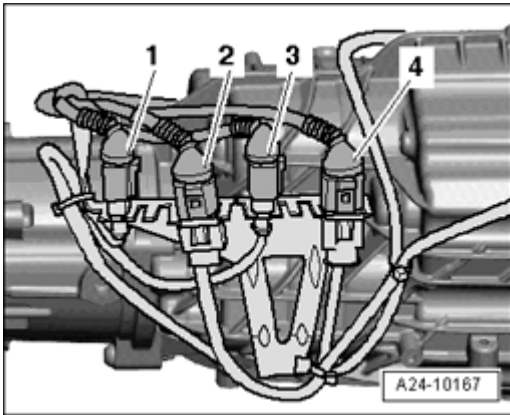


Fig. 530: Identifying Electrical Connectors On Transmission Bracket
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove electrical harness connectors - **1** - and - **2** - from bracket at transmission.
- Disconnect electrical harness connectors.
- Remove heat insulation sleeve on wiring harness and free up individual electrical wires.

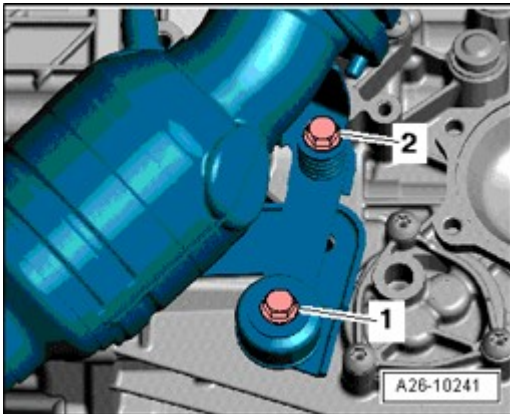


Fig. 531: Removing Bolt At Right Front Exhaust Pipe Strap
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - **2** - at right front exhaust pipe strap.

NOTE:

- Ignore - **1** -.

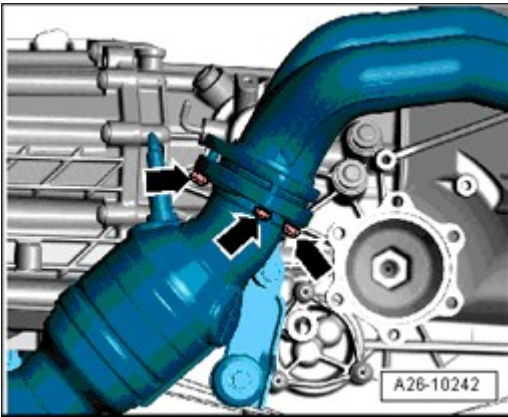


Fig. 532: Removing/Installing Nuts & Left Front Exhaust Pipe With Pre- And Main Catalytic Converters
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove right front exhaust pipe/exhaust manifold nuts - **arrows** -.
- Remove front exhaust pipe with pre- and main catalytic converters.

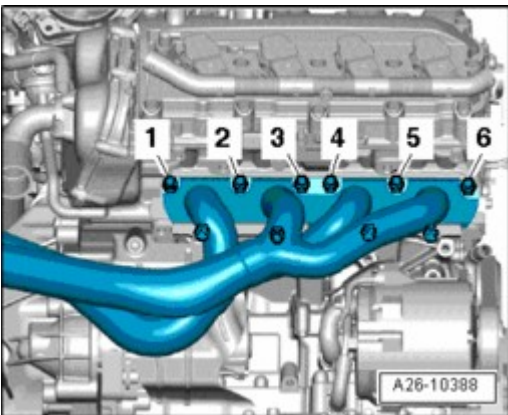


Fig. 533: Removing/Installing Nuts And Right Exhaust Manifold
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - **1 to 6** - and remove right exhaust manifold.

Installing

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

NOTE:

- **Replace self-locking nuts and seal.**
- **During installation, re-install 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.**

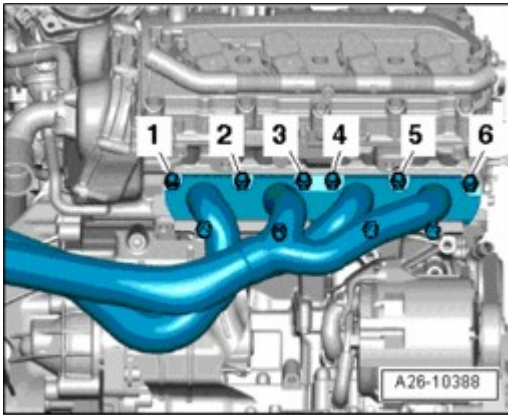


Fig. 534: Removing/Installing Nuts And Right Exhaust Manifold
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place gasket onto stud bolts.
- Insert exhaust manifold in securing strips and hand tighten nuts.
- Tighten exhaust manifold nuts in 2 stages as follows:
- Pre-tighten nuts in - **1 to 6** - sequence to 20 Nm.
- Pre-tighten nuts in - **1 to 6** - sequence to 30 Nm.
- Install right front exhaust pipe --> **Right front exhaust pipe with primary and main catalytic converter, removing and installing.**
- Install engine --> **Engine, installing.**

Torque specifications

Component	Nm
Exhaust manifold to cylinder head	30 ¹⁾²⁾³⁾
● ¹⁾ Replace nuts. ● ²⁾ Grease with hot bolt paste; hot bolt paste Electronic . ● ³⁾ Tighten in 2 stages.	

Exhaust system, installing free of tension

- Align exhaust system when cold.

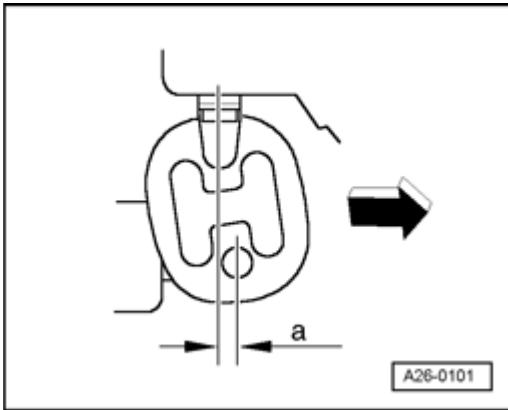


Fig. 535: Pushing Exhaust System Toward Front Of Vehicle
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

Vehicles without double clamps between center and rear muffler

- Loosen clamping sleeves bolts.
- Push exhaust system far enough forward - **arrow** - until pre-load on retaining loops at right on center muffler - **a** - = 5 to 9 mm.
- Tighten of clamping sleeve threaded connections evenly to 23 Nm.
- Align end pipes **Tailpipes, aligning.**

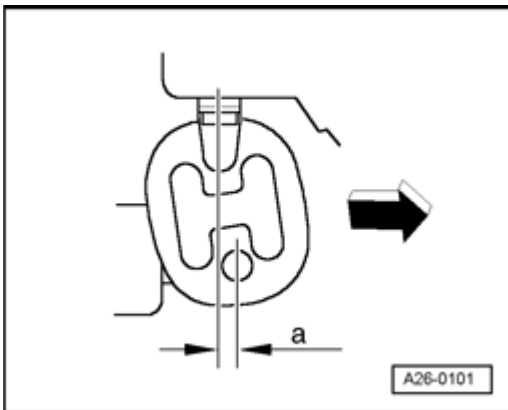


Fig. 536: Pushing Exhaust System Toward Front Of Vehicle
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

Vehicles with double clamps between center and rear muffler

NOTE:

- **Only for vehicles with double clamps between center and rear mufflers, the center muffler must also be aligned.**

- Loosen bolts of double clamps and.
- Push forward part of exhaust system far enough forward - **arrow** - until pre-load on retaining loops on center muffler - **a** - = 5 to 9 mm.

- Tighten front clamping sleeve bolts evenly to 23 Nm.

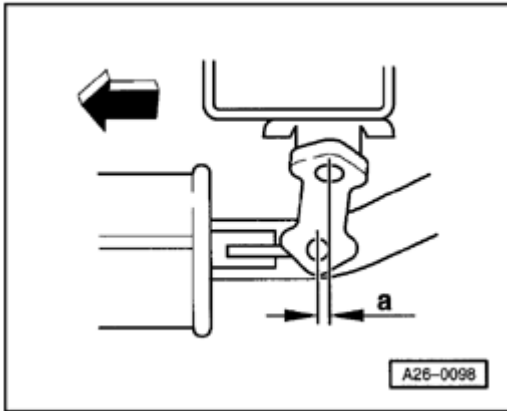


Fig. 537: Pushing Rear Part Of Exhaust System Far Enough Forward Until Pre-Load On Retaining Loops At Rear On Rear Muffler

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Push rear part of exhaust system far enough forward - **arrow** - until pre-load on retaining loops at rear on rear muffler - **a** - = 7 to 11 mm.
- Align rear muffler horizontally.
- Tighten rear clamping sleeve screws evenly to 23 Nm.
- Align end pipes.

Tailpipes, aligning

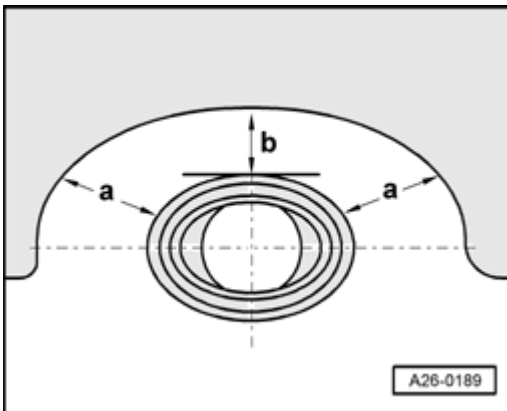


Fig. 538: Checking Distance Of End Pipes At Left/Right To Bumper

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check distance of end pipes at left and right to bumper:
 - Left dimension - **a** - = right dimension - **a** -.
 - Ignore dimension - **b** -.

If necessary, correct dimension "a" as follows:

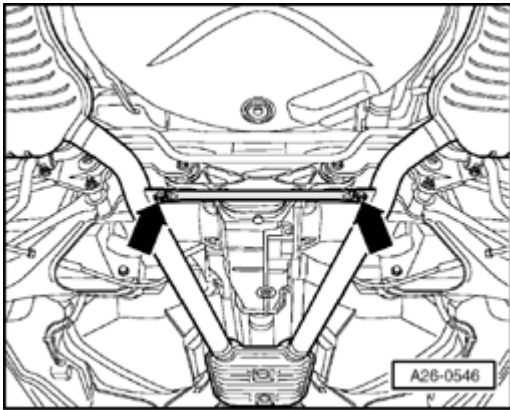


Fig. 539: Loosening Brace Bolts Between Exhaust Pipes
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen brace bolts - **arrows** - between exhaust pipes.
- Adjust distance between rear mufflers.
- Tighten bolts to 23 Nm.

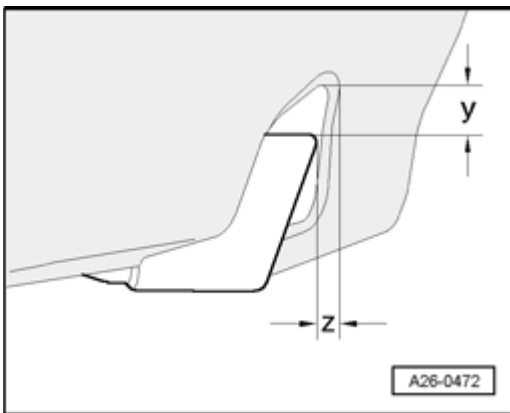


Fig. 540: Checking Distances Of End Pipes To Bumper
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check distances - **y** - and - **z** - of end pipes to bumper:
 - Dimension - **y** - = 15 mm.
 - Dimension - **z** - = 20 to 26 mm.
- If necessary, check whether exhaust system is aligned tension-free --> **Exhaust system, installing free of tension.**

Exhaust system, checking for leaks

- Start engine and let run at idle.
- Seal tailpipes with cloths or plug for duration of leak test.
- Check for leaks by listening at connection areas of cylinder head/exhaust manifold, exhaust

manifold/front exhaust pipe etc.

- Repair leaks detected.

SECONDARY AIR INJECTION (AIR), SERVICING

Secondary Air Injection (AIR), servicing

The Secondary Air Injection (AIR) system heats up the engine faster, and thereby the catalytic converter achieves operation readiness earlier after a cold start.

Principle and function

Principle

Due to the rich mixture during the cold start phase, the exhaust emissions contain an increased level of unburned hydrocarbons. The Secondary Air Injection (AIR) system improves the secondary oxidation within the catalytic converter, thereby reducing harmful emissions. The heat released by secondary oxidation shortens the start-up time of the catalytic converter considerably, as well as significantly improves emissions quality during the cold-running phase.

Function

In the cold start phase, the engine control module controls the Secondary Air Injection (AIR) pump via the pump relay. The stream of air from the Secondary Air Injection (AIR) pump opens the combination valves and allows air to flow into the exhaust system before the catalytic converter.

Secondary Air Injection (AIR), component overview

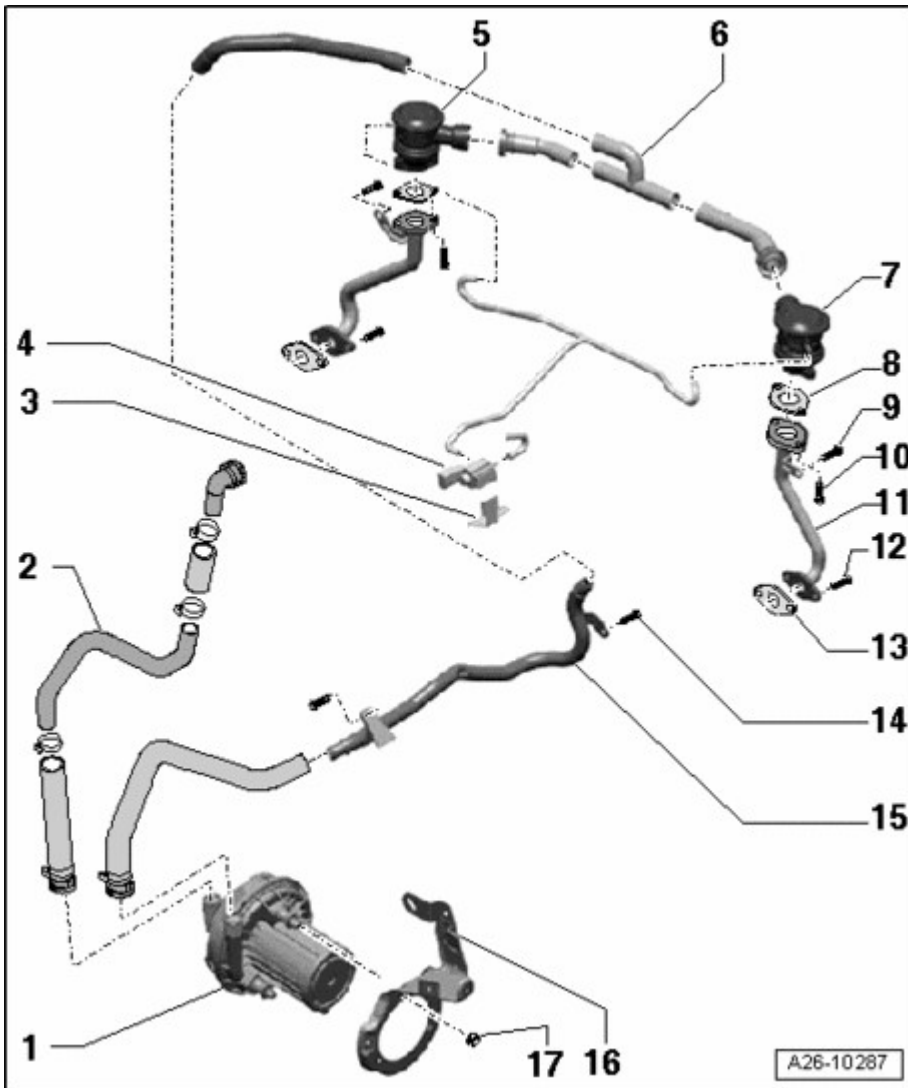


Fig. 541: Secondary Air Injection (AIR), Component Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Secondary Air Injection (AIR) Pump Motor V101

- At right front in engine compartment below long member
- Removing and installing --> **Secondary Air Injection (AIR) pump, removing and installing**

2 - Air guide pipe

- To air filter housing

3 - Bracket

- For Secondary Air Injection (AIR) Solenoid Valve N112

4 - Secondary air injection (AIR) solenoid valve N112

- Component location --> **Installation location of Secondary Air Injection (AIR) Solenoid Valve N112**

5 - Right combination valve for Secondary Air Injection (AIR)

- Component location: Back of right cylinder head
- Checking --> **Combination valve for secondary air injection (AIR), checking function and for leaks**
- Removing and installing --> **Right combination valve for secondary air injection, removing and installing**

6 - Air guide hose

- From Secondary Air Injection (AIR) Pump Motor V101 to combination valves

7 - Left combination valve for Secondary Air Injection (AIR)

- Component location: Back of left cylinder head
- Checking --> **Combination valve for secondary air injection (AIR), checking function and for leaks**
- Removing and installing --> **Left combination valve for secondary air injection (AIR), removing and installing**

8 - Gasket

- Replace

9 - 9 Nm**10 - 9 Nm****11 - Connecting pipe**

- To cylinder head

12 - 9 Nm**13 - Gasket**

- Replace

14 - 9 Nm**15 - Air guide pipe**

- To combination valves

16 - Bracket

- For Secondary Air Injection (AIR) pump motor V101

17 - 9 Nm

Component location for Secondary Air Injection (AIR) Pump Relay J299

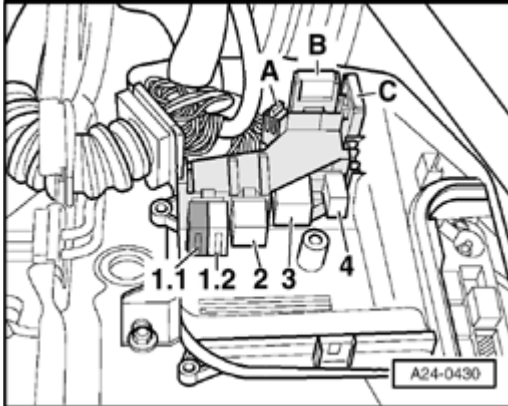


Fig. 542: Component Location For Secondary Air Injection (AIR) Pump Relay J299
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- In E-box, plenum chamber.

4 - Secondary Air Injection (AIR) Pump Relay J299

NOTE:

- The Secondary Air Injection (AIR) Pump Fuse S130 is located on a separate bracket.

Installation location of Secondary Air Injection (AIR) Solenoid Valve N112

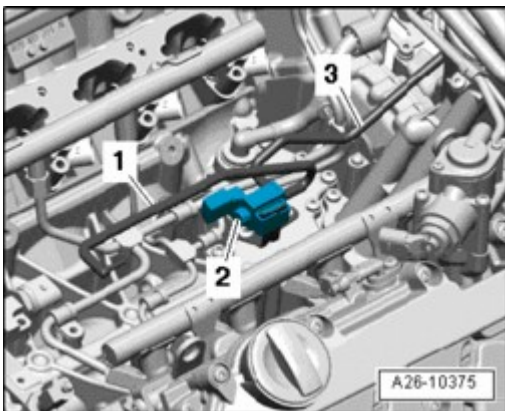


Fig. 543: Installation Location Of Secondary Air Injection (AIR) Solenoid Valve N112
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Under intake manifold

1. Vacuum line from intake manifold

2. Secondary air injection (AIR) solenoid valve N112
3. Vacuum line to Secondary Air Injection (AIR) combi-valves

Secondary Air Injection (AIR) pump, removing and installing**Removing**

Fig. 544: Pulling Rear Engine Cover Off
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull rear engine cover off - **arrows** -.

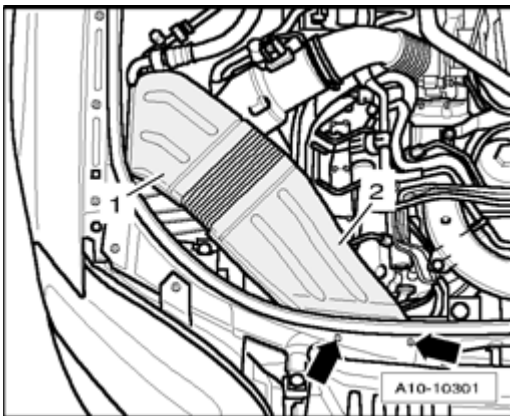


Fig. 545: Removing Bolts & Air Ducts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Remove air duct - **1** - and - **2** -.
- Disconnect vacuum hose - **2** - from air guide hose.

- Remove hose clamps - 1 - and - 3 - and lay air guide hose aside.

CAUTION: Hose connectors - 4 - must not be opened.

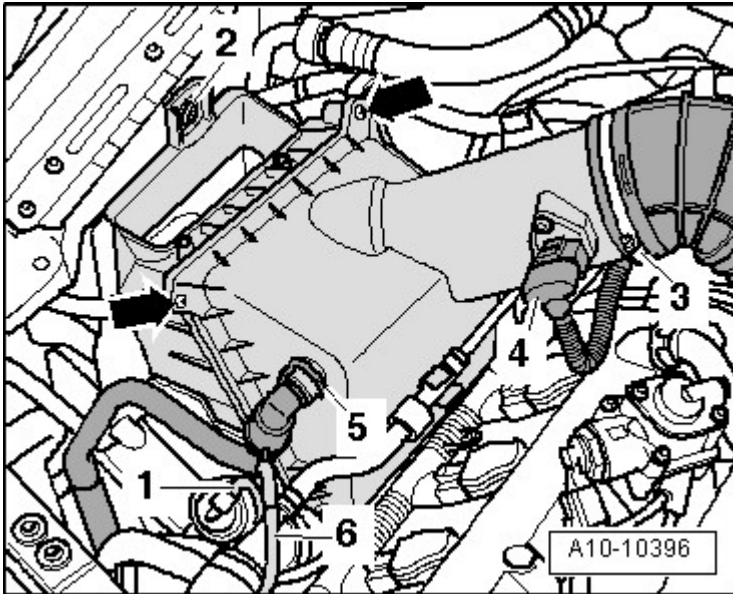


Fig. 546: Identifying Mass Air Flow (MAF) Sensor G70 Electrical Harness Connector, Secondary Air Injection (Air) Pump Hose, Vacuum Lines & Air Guide Hose
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - 4 - at Mass Air Flow (MAF) Sensor G70.
- Disconnect hose - 5 - to Secondary Air Injection (AIR) pump.
- Pull off vacuum lines - 1 - and - 6 -.
- Disconnect air guide hose - 3 - at Mass Air Flow (MAF) sensor.
- Move wiring harness clear at air filter housing.
- Remove bolts - **arrows** - and remove upper part of air filter housing.
- Remove clip - 2 - and remove lower part of air filter housing.

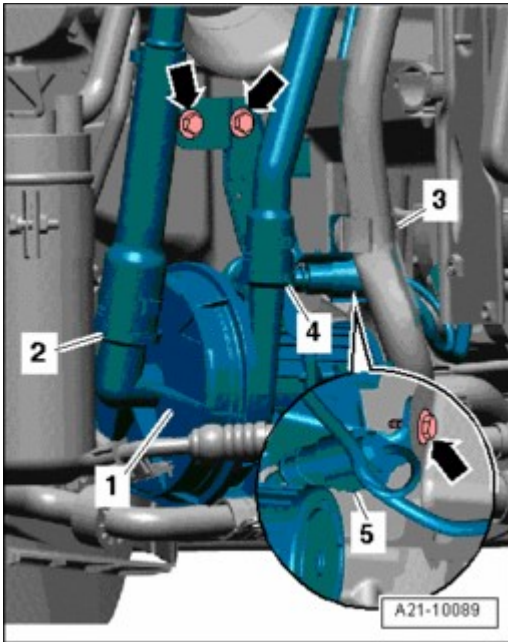


Fig. 547: Disconnecting Electrical Connector & Removing Secondary Air Injection Pump Downward
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove hose - 4 - to combination valves on secondary air injection pump by pressing release buttons
- Remove bolts - **arrows** - at secondary air injection pump bracket with Intake Air Switch-Over valve N335 bracket.
- Remove right wheel housing liner in forward area -->
 - **66 EXTERIOR EQUIPMENT**
 - **66 - EXTERIOR EQUIPMENT** for BODY EXTERIOR - CABRIOLET
- Remove hose - 2 - to upper part of air filter housing at secondary air injection pump - 1 - by pressing release buttons.
- Release electrical wiring harness bracket - 3 -.

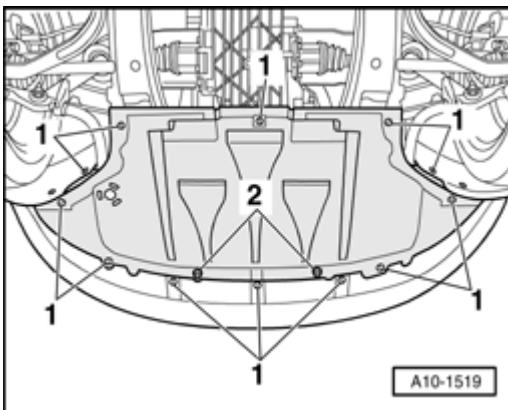


Fig. 548: Removing Quick-Release Fasteners, Screws And Noise Insulation

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove quick-release fasteners - 1 - , remove screws - 2 - and remove noise insulation.

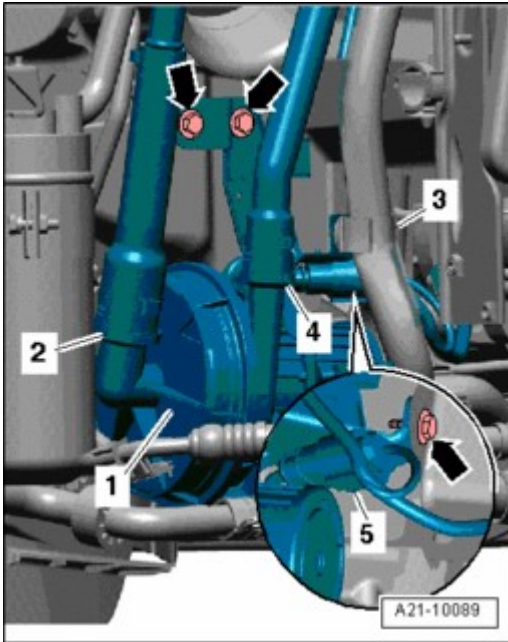


Fig. 549: Disconnecting Electrical Connector & Removing Secondary Air Injection Pump Downward
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - 5 -.
- Remove secondary air injection pump downward.

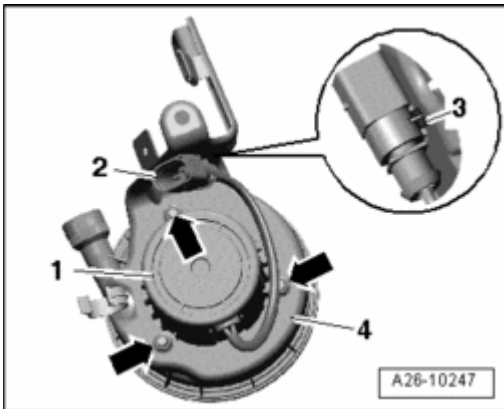


Fig. 550: Releasing Fastener And Removing Electrical Connector From Bracket, Nuts & Secondary Air Injection Pump From Bracket
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Release fastener - 3 - and remove electrical connector - 2 - from bracket.
- Remove nuts - **arrows** - and remove secondary air injection pump - 1 - from bracket - 4 -.

Installing

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

- Install right wheel housing liner -->
 - **66 EXTERIOR EQUIPMENT**
 - **66 - EXTERIOR EQUIPMENT** for BODY EXTERIOR - CABRIOLET

Torque specifications

Component	Nm
Secondary Air Injection (AIR) pump to bracket	9
Secondary Air Injection (AIR) pump bracket to body	9

Combination valve for secondary air injection (AIR), checking function and for leaks

Special tools, testers and auxiliary items required

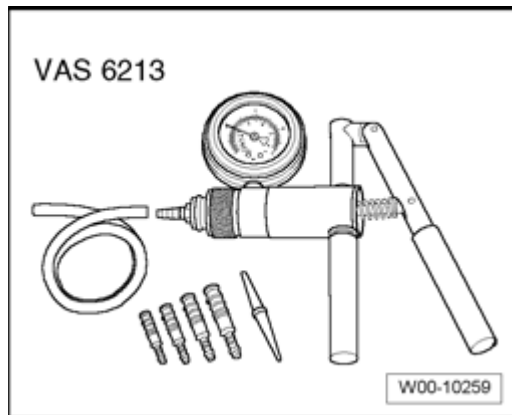


Fig. 551: Identifying Hand Vacuum Pump VAS 6213
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hand vacuum pump VAS 6213

Work procedure

- Hose connections properly sealed.
- Remove Secondary Air Injection (AIR) system combi-valve: Left --> **Left combination valve for secondary air injection (AIR), removing and installing** , right --> **Right combination valve for secondary air injection, removing and installing.**

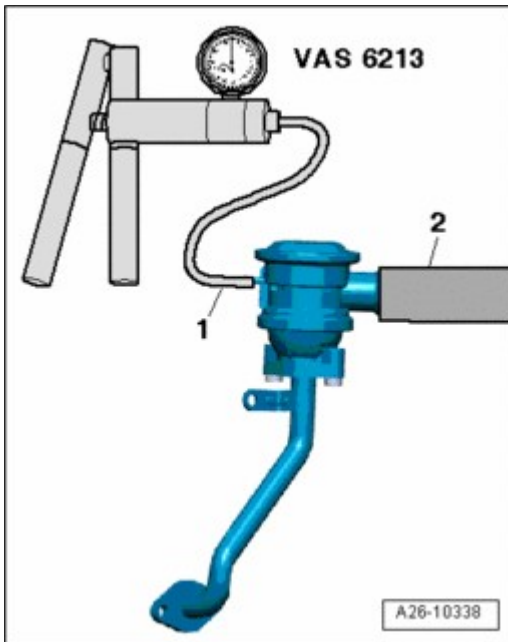


Fig. 552: Connecting Hand Vacuum Pump VAS 6213 To Vacuum Connection On Secondary Air Injection Combi-Valve

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 Secondary Air Injection (AIR) combi-valve: Left --> **Left combination valve for secondary air injection (AIR), removing and installing** , right --> **Right combination valve for secondary air injection, removing and installing**.

Left combination valve for secondary air injection (AIR), removing and installing

Special tools, testers and auxiliary items required

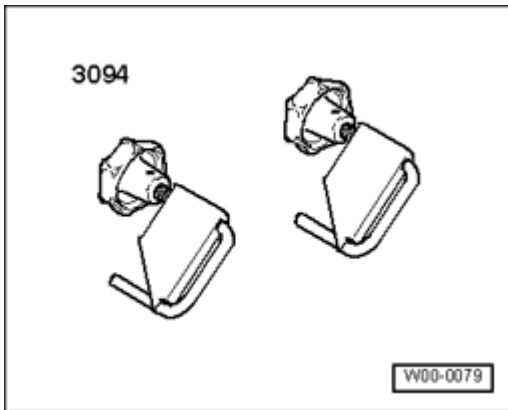


Fig. 553: Identifying Hose Clamps 3094

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hose clamps up to 25 mm dia. 3094

Removing

NOTE:

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

- Remove left front wheel.

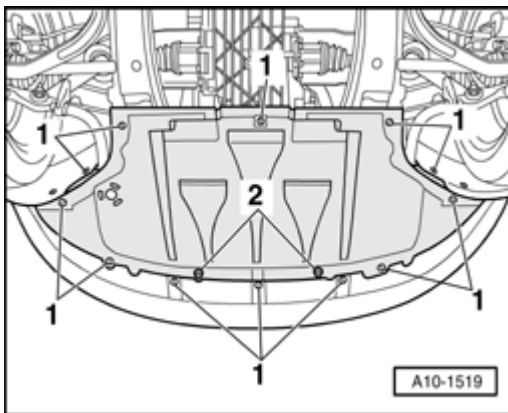


Fig. 554: Removing Quick-Release Fasteners, Screws And Noise Insulation

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove quick-release fasteners - 1 - , remove screws - 2 - and remove noise insulation.

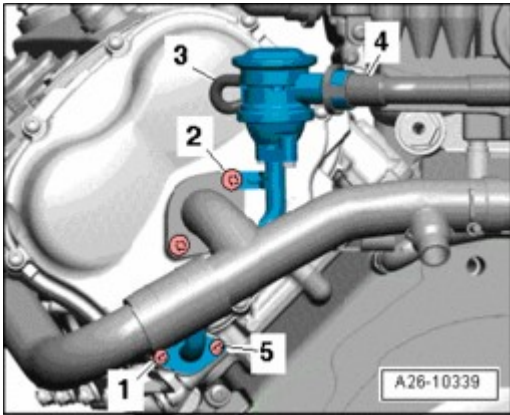


Fig. 555: Removing Bolts At Bottom Of Left Secondary Air Injection Combination Valve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - 1 - and - 5 - at bottom of left secondary air injection combination valve.

NOTE:

- The illustration depicts the engine removed from behind.
- Ignore items - 2 to 4 -.



Fig. 556: Pulling Rear Engine Cover Off
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull rear engine cover off - **arrows** -.

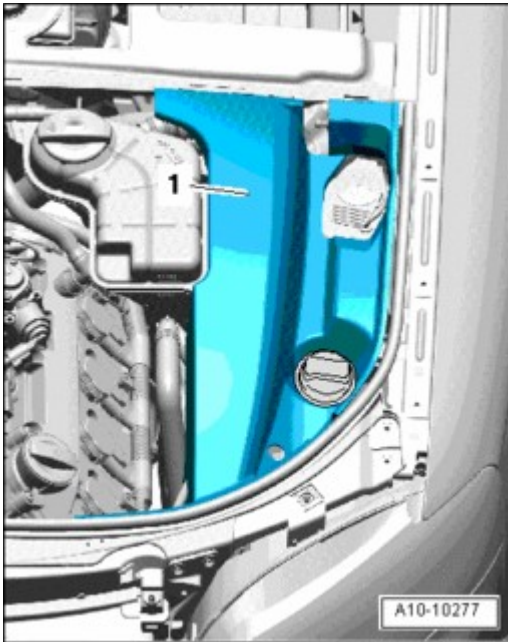


Fig. 557: Removing Cover In Engine Compartment (Left Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove cover - 1 - in engine compartment (left side).

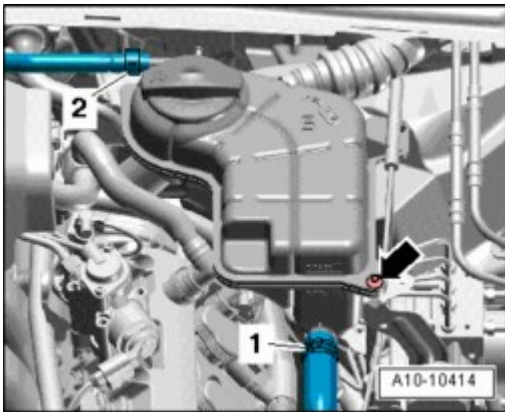


Fig. 558: Removing Coolant Hoses & Coolant Expansion Tank
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clamp off coolant hose - 2 - using hose clamp 3094 and disconnect from coolant expansion tank.
- Seal connection using a plug that fits.
- Remove coolant expansion tank - **arrow** -.
- Disconnect electrical wire from engine coolant level (ECL) warning switch F66 at bottom on coolant reservoir and set aside coolant reservoir with coolant hose - 1 - connected.

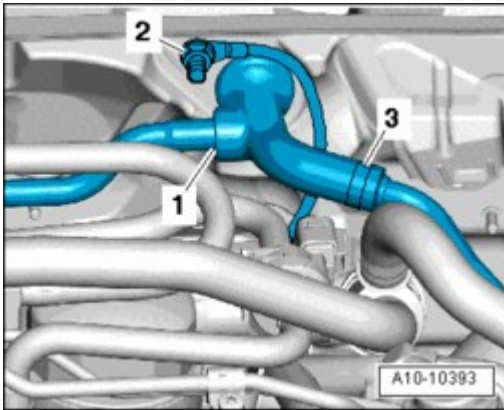


Fig. 559: Removing Ground (GND) Connection & Vacuum Lines To Brake Booster From Distribution Piece

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove vacuum hoses - 1 - and - 3 - to brake booster at bulkhead.

NOTE:

- Ignore - 1 -.

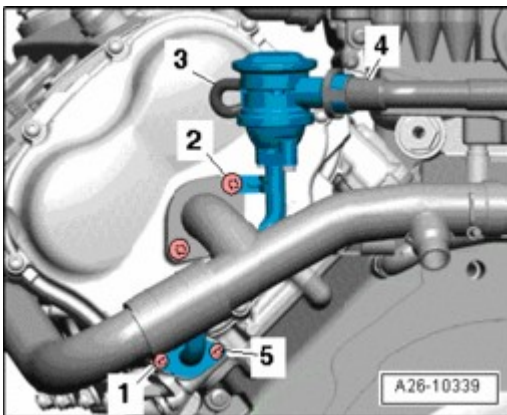


Fig. 560: Removing Bolts At Bottom Of Left Secondary Air Injection Combination Valve

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - 2 -.
- Remove vacuum hose - 3 - and air guide hose - 4 - from secondary air injection combination valve by pressing release buttons.
- Remove secondary air injection combination valve with connecting pipe.

NOTE:

- The illustration depicts the engine removed from behind.
- Ignore - 1 - and - 5 -.

Installing

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

NOTE:

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

- Check coolant level **Filling**.

Torque specifications

Component		Nm
Connecting pipe at	Cylinder head	9
Secondary Air Injection (AIR) combi-valve		9

Right combination valve for secondary air injection, removing and installing

Removing**NOTE:**

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

- Remove right front wheel.

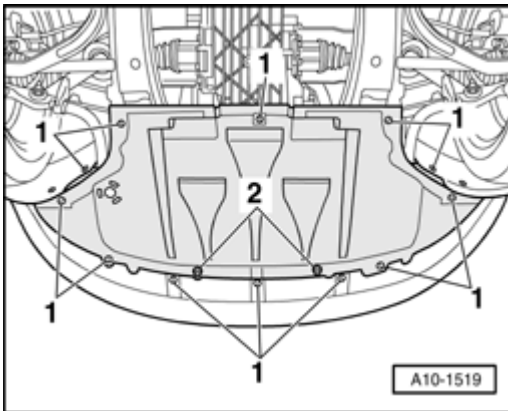


Fig. 561: Removing Quick-Release Fasteners, Screws And Noise Insulation

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove quick-release fasteners - 1 - , remove screws - 2 - and remove noise insulation.

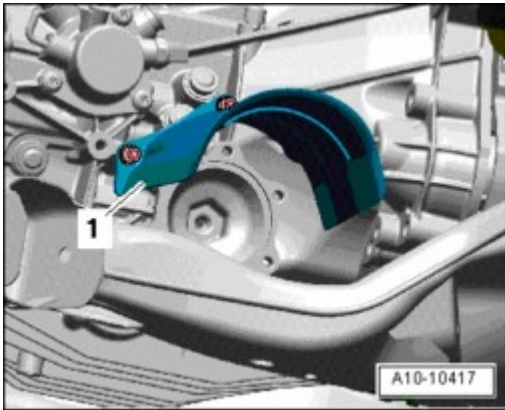


Fig. 562: Removing Heat Shield For Left Drive Axle
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield - 1 - for right drive axle.
- Remove drive axle from transmission flanged shaft.

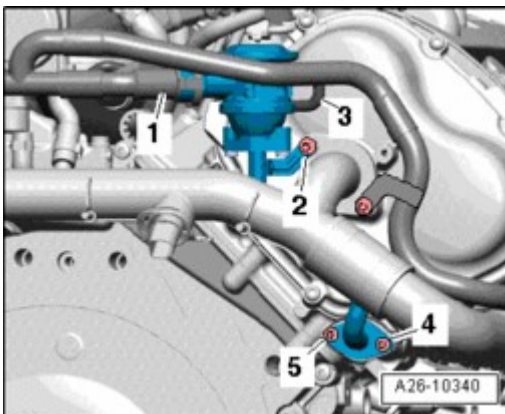


Fig. 563: Removing Bolts At Bottom Of Right Secondary Air Injection Combination Valve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - 4 - and - 5 - at bottom of right secondary air injection combination valve.

NOTE:

- The illustration depicts the engine removed from behind.
- Ignore items - 1 to 3 -.



Fig. 564: Pulling Rear Engine Cover Off
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull rear engine cover off - **arrows** -.
- Disconnect vacuum hose - **2** - from air guide hose.
- Remove hose clamps - **1** - and - **3** - and lay air guide hose aside.

CAUTION: Hose connectors - 4 - must not be opened.

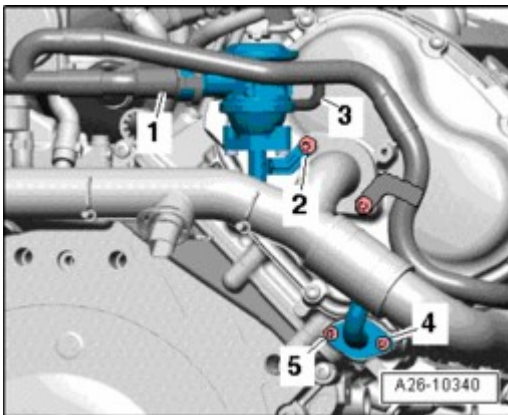


Fig. 565: Removing Bolts At Bottom Of Right Secondary Air Injection Combination Valve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **2** -.
- Remove vacuum hose - **3** - and air guide hose - **1** - from right secondary air injection combination valve by pressing release buttons.
- Remove secondary air injection combination valve with connecting pipe.

2008 Audi RS 4

ENGINE 4.2 Liter V8 4V Engine Mechanical, Engine Code(s): BNS

NOTE:

- The illustration depicts the engine removed from behind.
- Ignore - 4 - and - 5 -.

Installing

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

NOTE:

- Replace gaskets and O-rings.
 - Secure all hose connections using hose clamps appropriate for the model type .
 - During installation, all cable ties must be re-installed at the same location.
- Check coolant level **Filling**.

Torque specifications

Component	Nm
Connecting tube to cylinder head	9
Connecting pipe to Secondary Air Injection (AIR) combi-valve	9

EXHAUST FLAP, SERVICING

Exhaust flap, checking

Special tools, testers and auxiliary items required

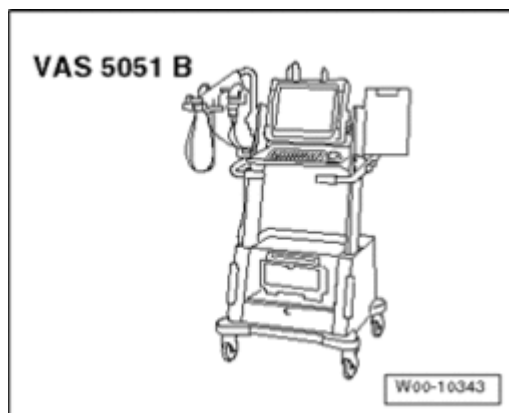


Fig. 566: Identifying Vehicle Diagnosis, Testing And Information System VAS 5051B
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Vehicle diagnostic, testing, and information system VAS 5051

Work procedure

- Let engine run briefly so that the required vacuum for the test is present in vacuum reservoir.
- Switch off engine and connect Vehicle Diagnostic, Testing and Information System VAS 5051 and select vehicle system "01 - engine electronics". Thereby, the ignition must be switched on.

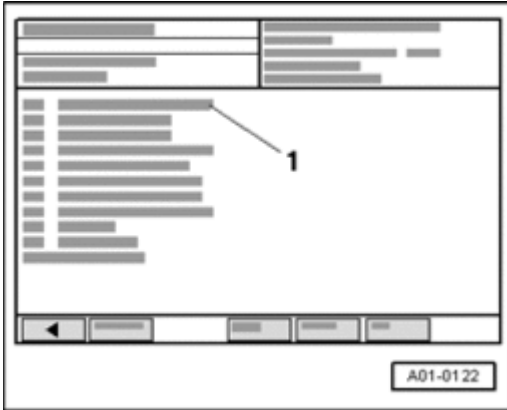


Fig. 567: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051 :

- In selection - 1 - , click on function "03 - output Diagnostic Test Mode (DTM)".

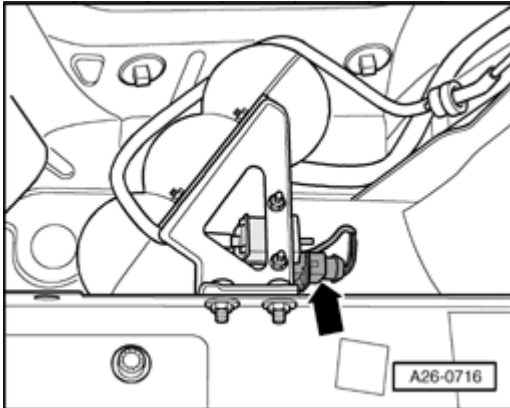


Fig. 568: Identifying Left Front/Right Rear Electronic Differential Lock Intake Valve N321
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tap --> button until Left Front/Right Rear Electronic Differential Lock Intake Valve N321 - **arrow** - at left in luggage compartment is activated.

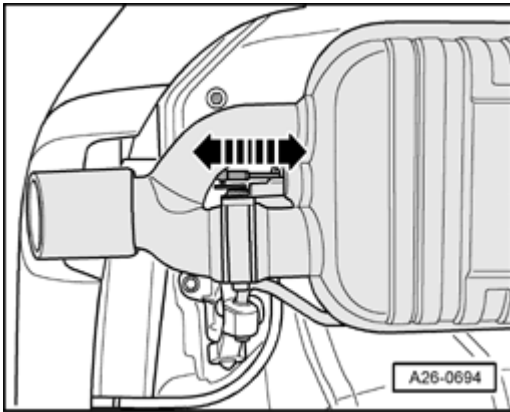


Fig. 569: Operating Rod For Exhaust Flap Must Move Back And Forth At Both Rear Mufflers
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Operating rod - **arrow** - for exhaust flap must move back and forth at both rear mufflers.

If actuator rod does not move:

- Check exhaust flap vacuum reservoir --> **Exhaust flap vacuum reservoir, checking.**
- Check vacuum line to vacuum reservoir and to Exhaust Flap Valve 1 N321 under left side trim in luggage compartment.
- Check Left Front/Right Rear Electronic Differential Lock Intake Valve N321 and using "Guided Fault Finding".
- End function "03 - output Diagnostic Test Mode (DTM)" by pressing <-- button.
- Select "06 - End Output".
- Switch off ignition.

Exhaust flap vacuum reservoir, checking

Special tools, testers and auxiliary items required

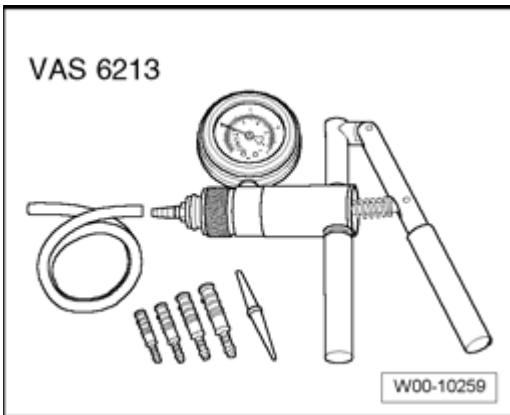


Fig. 570: Identifying Hand Vacuum Pump VAS 6213
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hand vacuum pump VAS 6213 or hand vacuum pump V.A.G 1390

Work procedure

- Disconnect hose on vacuum diaphragm for exhaust flap at rear muffler.

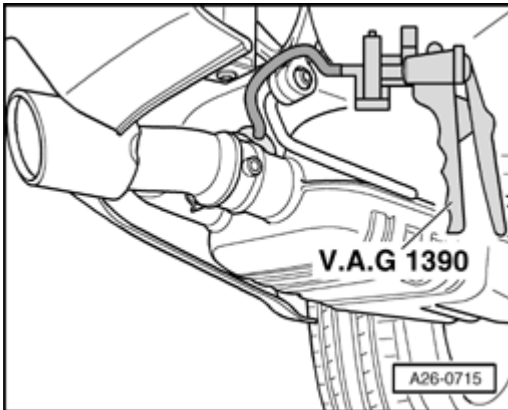


Fig. 571: Connecting Hand Vacuum Pump V.A.G 1390 To Vacuum Diaphragm
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect Hand Vacuum Pump V.A.G 1390 or VAS 6213 to vacuum diaphragm.

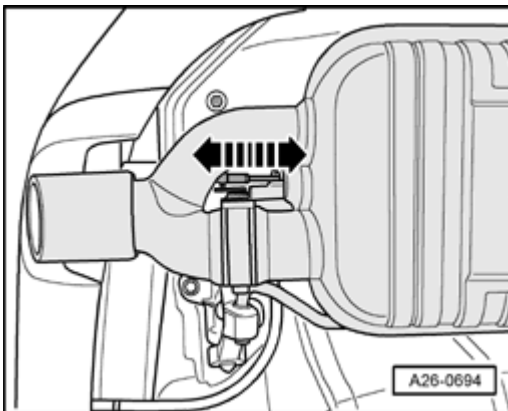


Fig. 572: Operating Rod For Exhaust Flap Must Move Back And Forth At Both Rear Mufflers
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Generate vacuum using hand vacuum pump.
- Linkage must move toward front.
- Vent hand vacuum pump.
- Linkage must move toward rear.

If linkage does not move:

2008 Audi RS 4

ENGINE 4.2 Liter V8 4V Engine Mechanical, Engine Code(s): BNS

- Check linkage for ease of movement and check vacuum diaphragm for leaks.