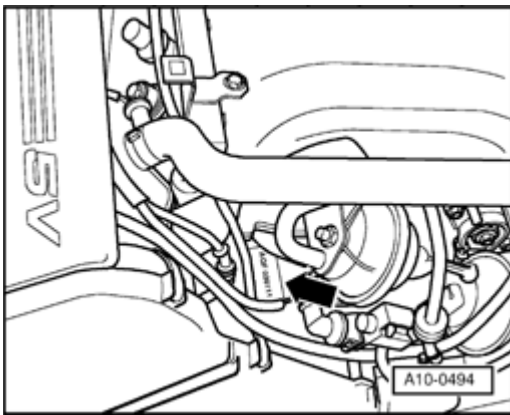


ENGINE**4.2 Liter V8 5V Engine Mechanical, Engine Code(s): BFM, BGK - A8****00 - GENERAL, TECHNICAL DATA****TECHNICAL DATA****Engine number****Fig. 1: Identifying Engine Number**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

The engine number ("engine code" and "serial number") are stamped on left side of cylinder block.

In addition, a sticker with "engine code" and "serial number" is affixed to timing belt cover.

The engine code is also included on vehicle data plate.

Engine data

Code letters		BFM	BGK
Displacement	ltr.	4.172	4.172
Output	kW at RPM	246/6000	246/6000
Torque	Nm at RPM	430/3500	430/3500
Bore	dia. mm	84.5	84.5
Stroke	mm	93.0	93.0
Compression ratio		11.0	11.0
RON		98 unleaded * See note	98 unleaded * See note
Fuel injection and ignition system		Motronic	Motronic
Ignition sequence		1-5-4-8-6-3-7-2	1-5-4-8-6-3-7-2
Catalytic converter		yes	yes
Exhaust gas recirculation		no	no
Charging		no	no

2006 Audi A8 Quattro

ENGINE 4.2 Liter V8 5V Engine Mechanical, Engine Code(s): BFM, BGK - A8

Variable valve timing	yes	yes
Variable intake manifold	yes	yes
Secondary air injection (AIR)	yes	yes
Timing at 1 mm valve lift and 0 mm valve lash:		
Intake valve opens after TDC	25°	25°
Intake valve closes after BDC	45°	45°
Exhaust valve opens before BDC	38°	38°
Exhaust valve closes before TDC	8°	8°

*In exceptional circumstances 95 RON, however with reduced performance

10 - ENGINE - ASSEMBLY

ENGINE, REMOVING AND INSTALLING

Engine, removing and installing

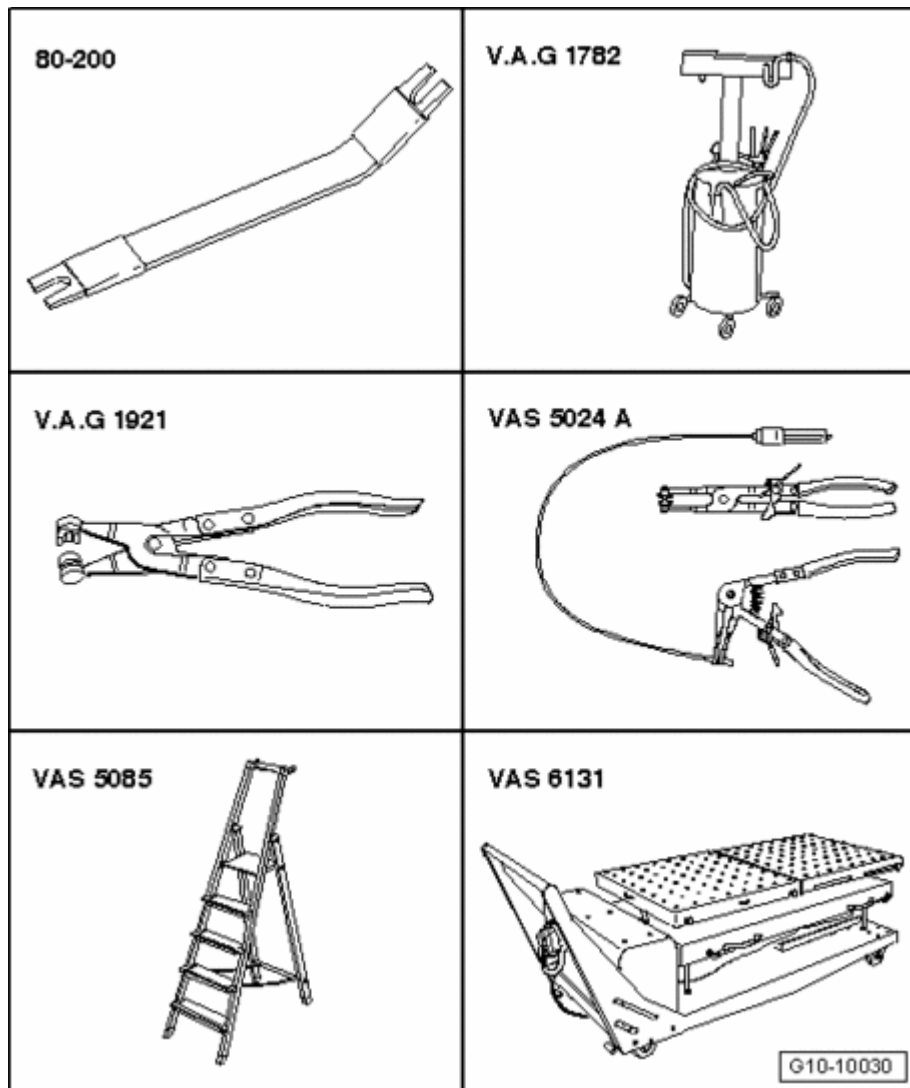


Fig. 2: Identifying Special Tools - Engine, Removing And Installing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Pry Lever - Rmv Outside Mirror 80-200
- Old oil collecting and extracting device V.A.G 1782
- Hose clamp pliers V.A.G 1921
- Spring-type clip pliers V.A.S 5024 A
- Step ladder VAS 5085
- Scissor lift table VAS 6131

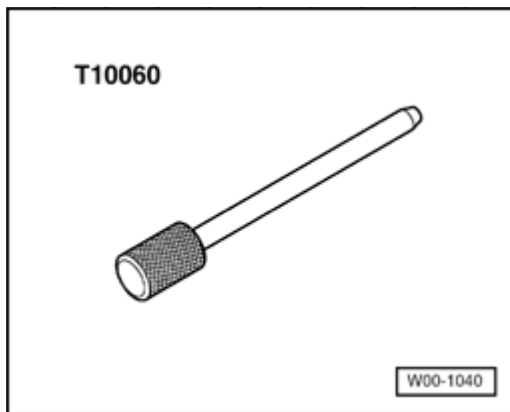


Fig. 3: Locking Pin T10060 A

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Locking Pin T10060 A

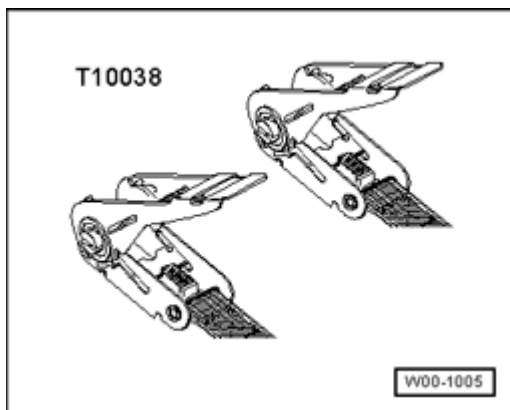


Fig. 4: Tensioning Strap T10038

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tensioning Strap T10038 qty. 2

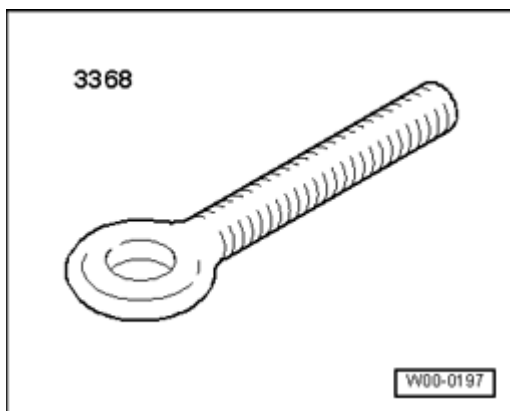


Fig. 5: Lifting Eyebolt 3368

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lifting Eyebolt 3368 qty. 2

Removing**NOTE:**

- Engine is removed downward with transmission and subframe.
- Obtain radio anti-theft code.
- All cable ties which are opened or cut open when removing engine, must be replaced in the same position when installing engine.
- Battery is located at right in luggage compartment.
- Drained coolant must be stored in a clean container for disposal or reuse.

NOTE:

- Before raising the vehicle on a hoist (wheels off the ground), first activate the vehicle jack mode --> 43 - SELF LEVELING SUSPENSION .

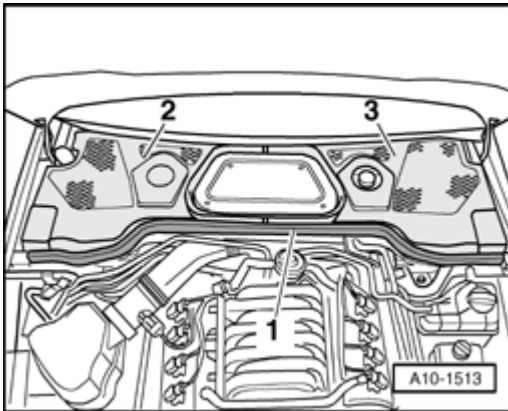


Fig. 6: Identifying Rubber Seal & Plenum Chamber Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove rubber seal for plenum chamber cover - **1** -.
- Remove plenum chamber cover - **2** - and - **3** -.
- Switch ignition on.
- Carry out flick wipe function and let wiper motor run to rest position.
- Turn ignition and remove ignition key.

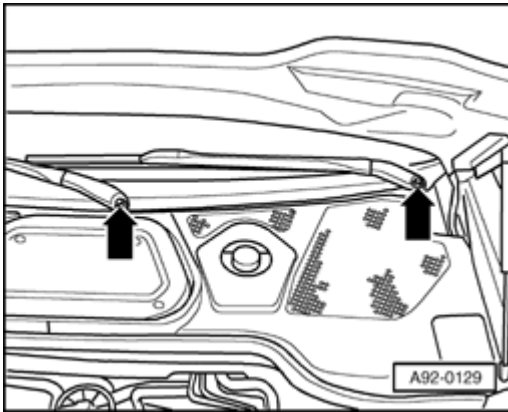


Fig. 7: Prying Off Cover Cap At Wiper Arms Using Screwdriver And Hex Nut
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pry off cover cap at wiper arms using a screwdriver - **arrows** - and remove hex nut.
- Pull off wiper arms from wiper axles.

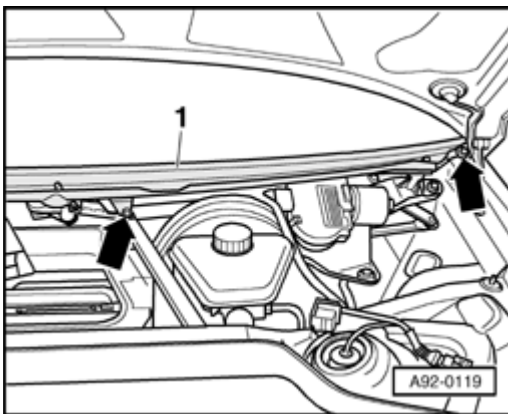


Fig. 8: Removing Wind Deflector By Removing Bolts On Left/Right
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove wind deflector - **1** - by removing bolts on left and right - **arrows** - if present.

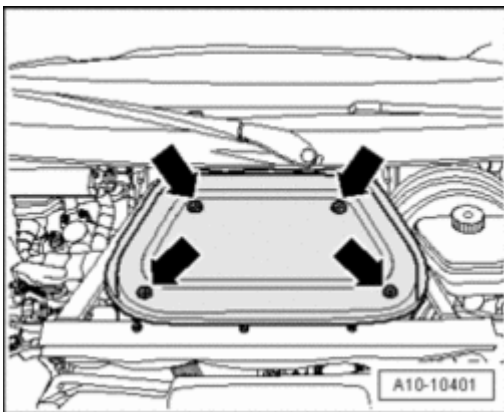


Fig. 9: Removing Dust And Pollen Filter

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove dust and pollen filter, to do so open quick-release screws - **arrows** -.

CAUTION: For vehicles with Telematic, activate service mode of Telematic Control Module before disconnecting the battery.

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

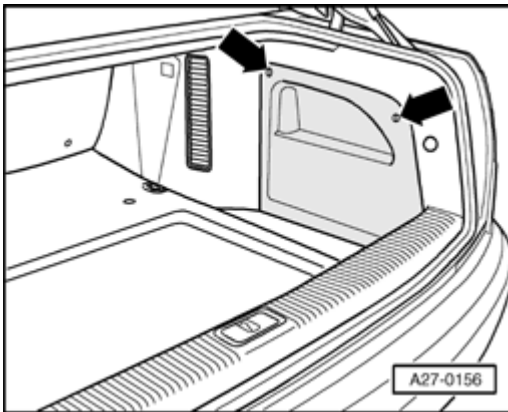


Fig. 10: Removing Cover Of Right Luggage Compartment Side Trim
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove right luggage compartment side trim cover.

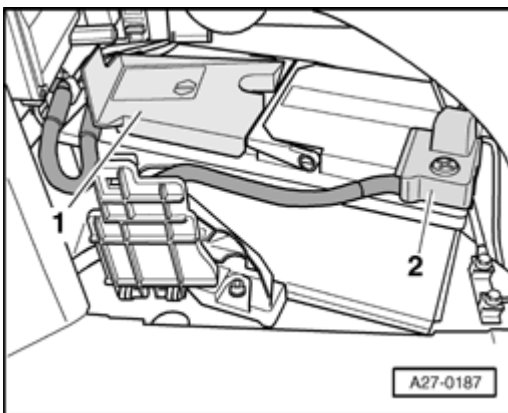


Fig. 11: Removing Cover Above Battery
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

- Disregard - **2** -.

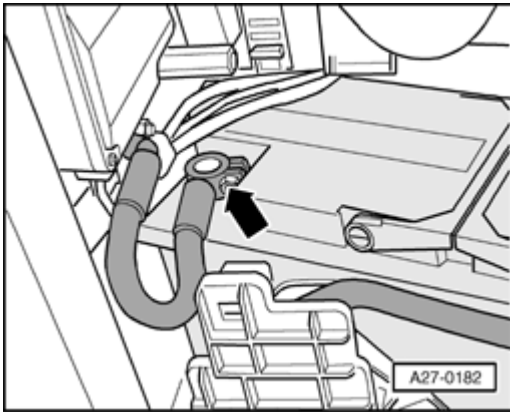


Fig. 12: Disconnecting Battery Ground (GND) Strap
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

For vehicles with auxiliary heater

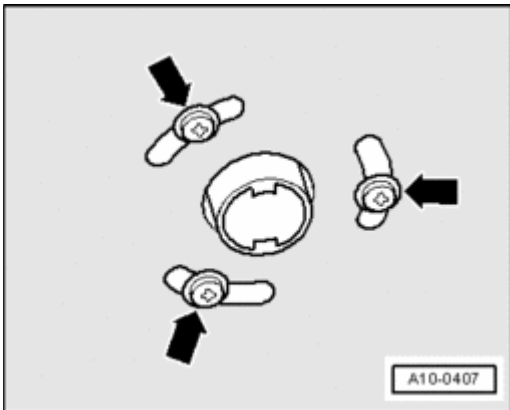


Fig. 13: Removing Bolts For Exhaust Pipe Of Parking Heater/Auxiliary Heater On Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - for exhaust pipe of parking heater/auxiliary heater on noise insulation.

All

- Remove left and right front wheels.

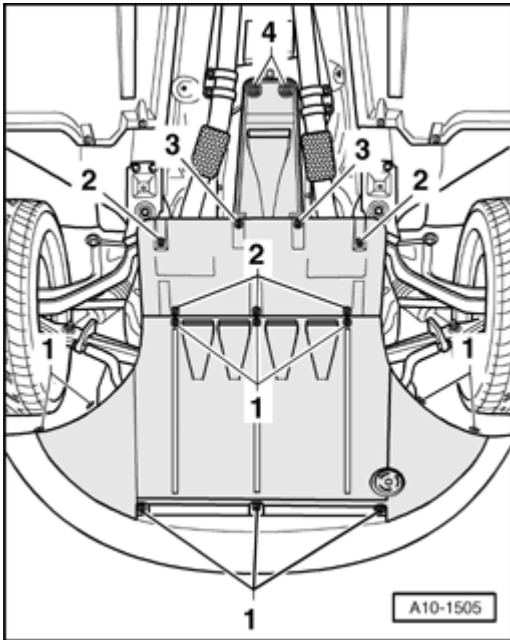


Fig. 14: Loosening Mounting Parts And Removing Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove noise insulation, items - **1 through 4** -.
- Remove front and rear parts of wheel housing liner at right front --> **66 - EXTERIOR EQUIPMENT** .
- Remove front part of left front wheelhouse liner --> **66 - EXTERIOR EQUIPMENT** .
- Remove front bumper --> **63 - BUMPERS** .

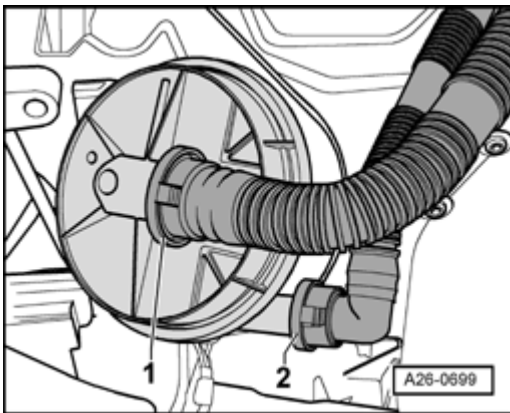
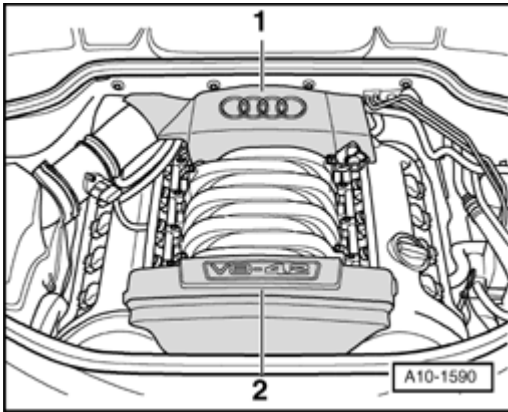


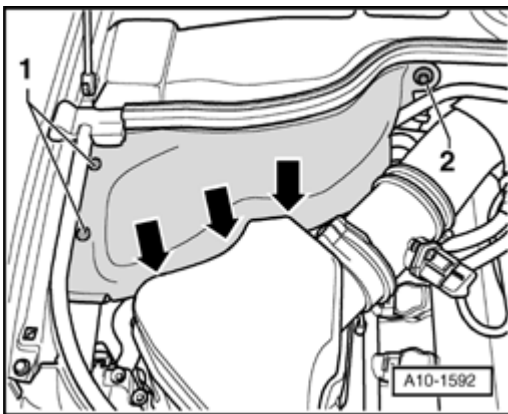
Fig. 15: Disconnecting Intake Air Duct At Secondary Air Injection (AIR) Pump Motor V101
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect intake air duct - **1** - at Secondary Air Injection (AIR) Pump Motor V101.

**Fig. 16: Removing Engine Cover**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove engine cover - 1 - and - 2 - upward.
- Carefully open cap on coolant expansion tank (release pressure), then close again.

**Fig. 17: Identifying Clips & Bolt**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove clips - 1 - using Pry Lever - Rmv Outside Mirror 80 - 200.
- Remove bolt - 2 - and remove cover.

NOTE:

- Note clips when installing - arrows -.

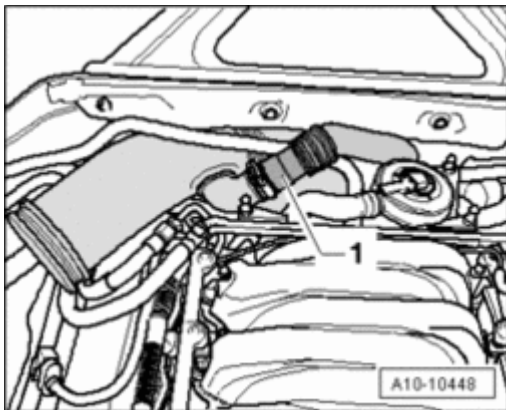


Fig. 18: Removing Hose

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove hose - 1 -.

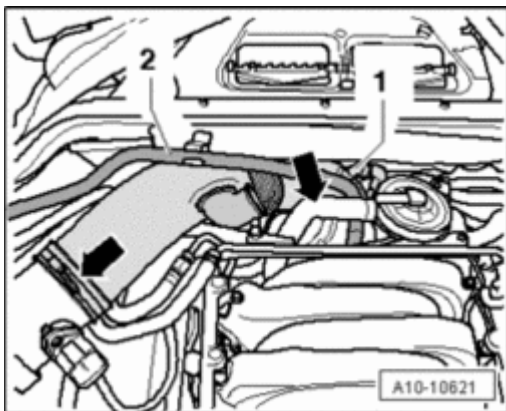


Fig. 19: Identifying Hose & Air Intake Tube

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect hose - 1 -.
- Unclip hose - 2 -.
- Remove air intake tube - arrows -.

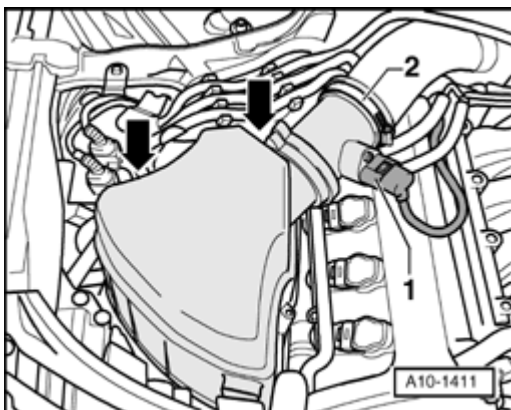


Fig. 20: Identifying Mass Air Flow (MAF) Sensor Electrical Connector & Air Filter Box
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **1** - from mass air flow (MAF) sensor.
- Remove air filter box - **arrows** -.
- Remove right headlight --> **94 - LIGHTS, SWITCHES - EXTERIOR** .

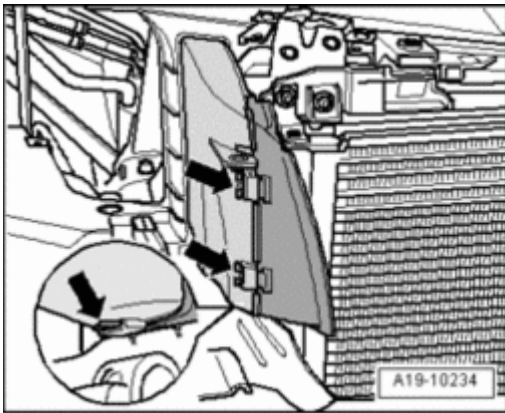


Fig. 21: Depressing Locking Mechanisms And Removing Air Guide At Right Front From Lock Carrier
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Depress locking mechanisms - **arrows** - and remove air guide at right front from lock carrier.

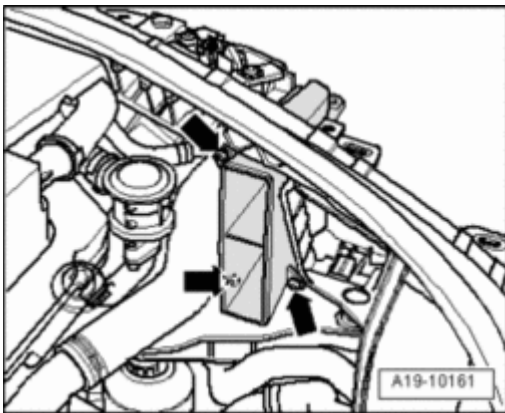


Fig. 22: Removing Bolts And Air Guide
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and remove air guide.
- Pull lock carrier toward front --> **50 - BODY - FRONT**

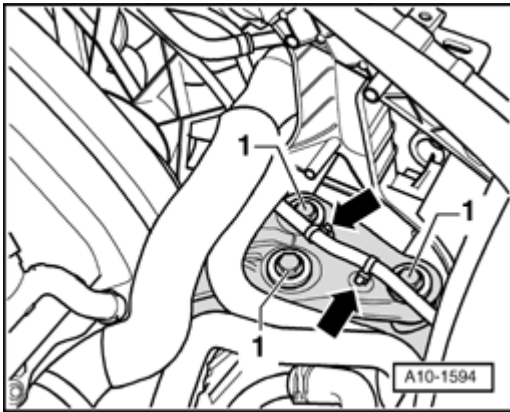


Fig. 23: Identifying Cable & Torque Support Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unclip cable - **arrows** -.
- Remove bolts - **1** - for torque support.

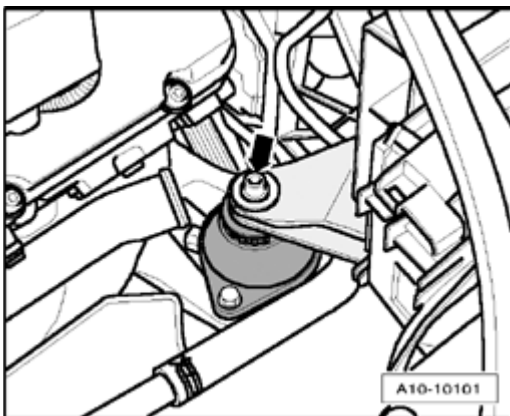


Fig. 24: Tightening Bolt On Torque Support Valve N382
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Separate torque support - **arrow** - from torque support valve N382 and remove.

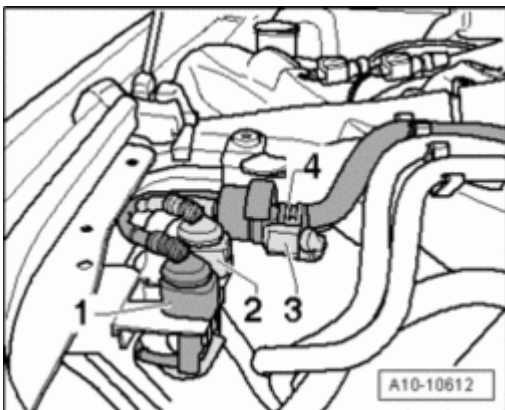
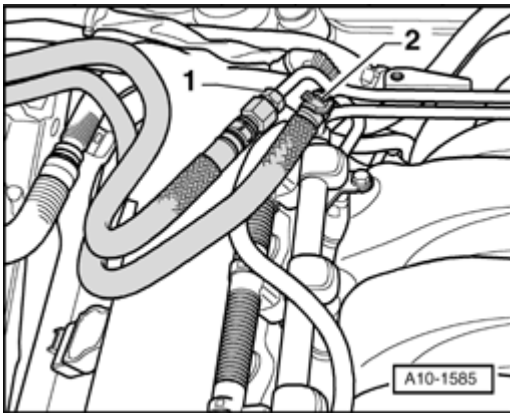


Fig. 25: Identifying Heated Oxygen Sensor Before Catalytic Converter, Oxygen Sensor Behind Catalytic

Converter & Solenoid Valve Connector**Courtesy of VOLKSWAGEN UNITED STATES, INC.**

- Disconnect connector - **1** - of heated oxygen sensor before catalytic converter (black).
- Disconnect connector - **2** - of oxygen sensor behind catalytic converter (brown).
- Disconnect connector - **3** - from solenoid valve and lay wiring harness to engine aside.
- Disconnect hose - **4** - from solenoid valve and lay hose aside.

- free up electrical wires of oxygen sensors.

**Fig. 26: Identifying Fuel Supply Lines****Courtesy of VOLKSWAGEN UNITED STATES, INC.**

- Disconnect fuel supply line - **1** -.
- Disconnect fuel return line - **2** -.
- Remove right trim for A-pillar --> **70 - INTERIOR TRIM** .
- Fold floor covering back.

- Remove protective cover from above main fuse holder.

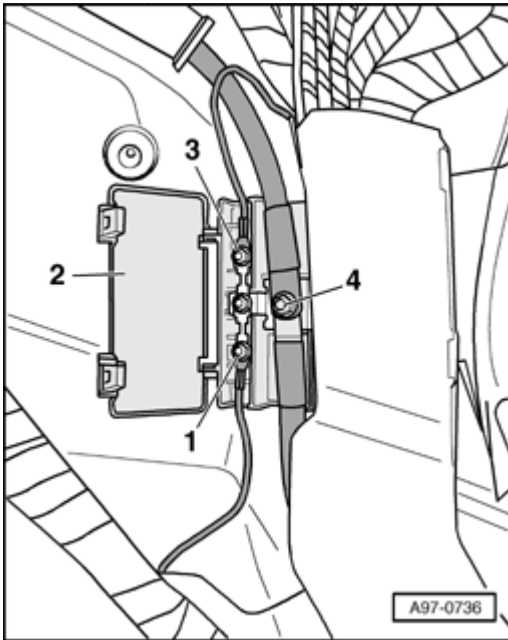


Fig. 27: Identifying Cap & Nut

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Fold cap - 2 - aside.
- Remove nut - 4 -.
- Remove terminal 30 wire to starter.

NOTE:

- Ignore - 1 - and - 3 -.

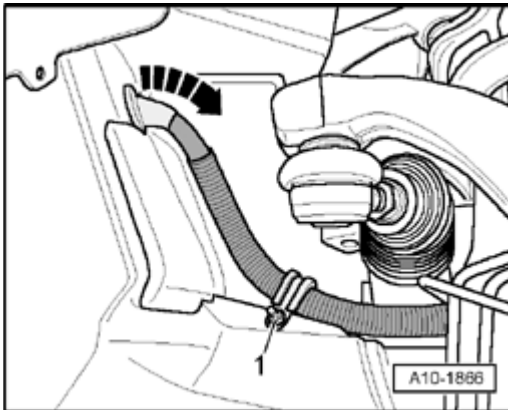


Fig. 28: Pulling Wiring Harness Out From Interior

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

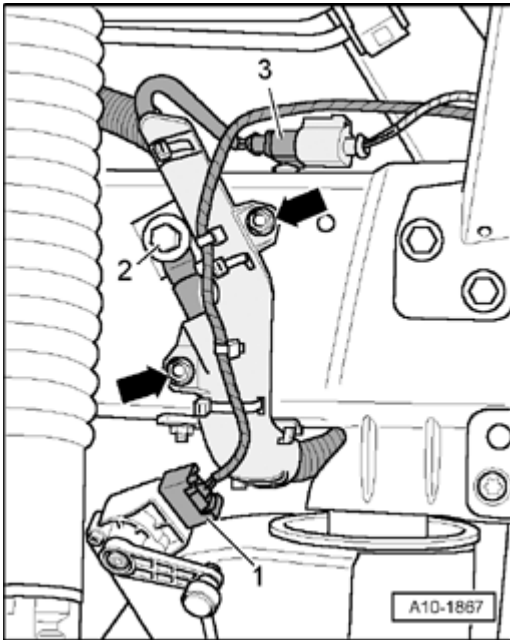


Fig. 29: Disconnecting Electrical Harness Connectors & Ground (GND) Wire On Long Member
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connectors - **1** - and - **3** -.
- Remove Ground (GND) wire - **2** - on long member.
- Remove bracket for wiring harness on longitudinal member - **arrows** - and lay wiring harness aside.
- Place drip tray for workshop crane VAS 6208 under engine.

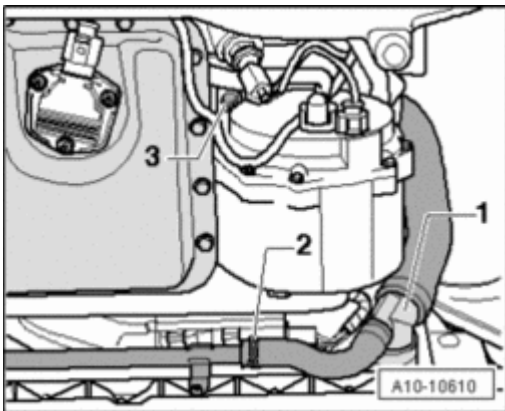


Fig. 30: Identifying Coolant Hoses & Drain Plug
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect coolant hose - **1** - to drain coolant.
- Disconnect coolant hose - **2** -.
- Open drain plug - **3** - and drain coolant from oil filter bracket.

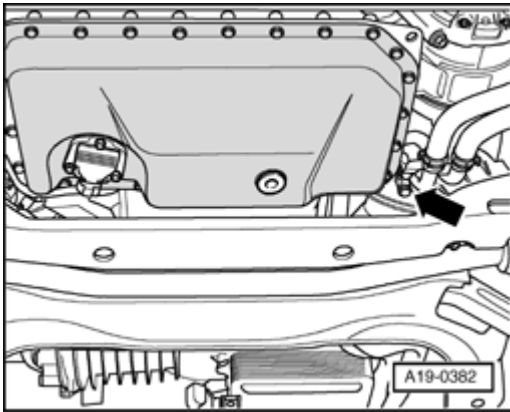


Fig. 31: Installing Drain Plug At Oil Filter Bracket With New Gasket In Engine At Left
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Open drain plug - **arrow** - and drain coolant from engine.

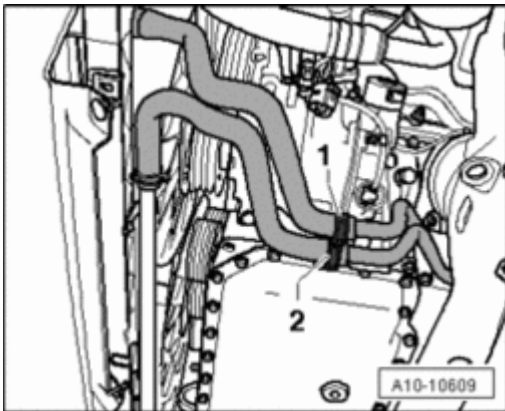
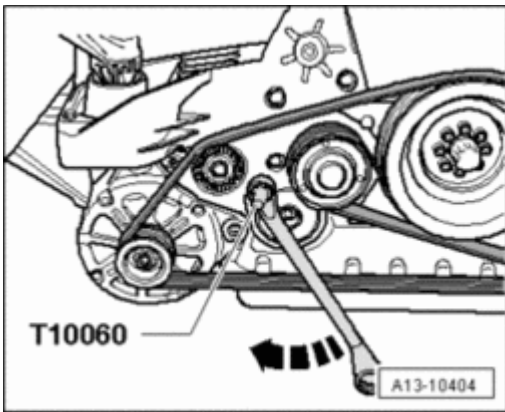


Fig. 32: Disconnecting Coolant Hoses
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect coolant hoses - **1 and 2** -.

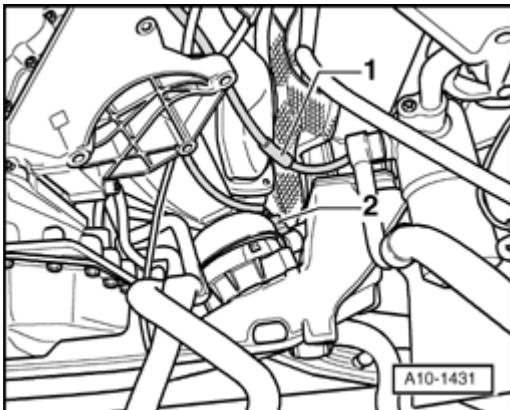
NOTE:

- Before removing toothed belt, mark running direction with chalk or felt tip marker. A reversed turning direction can cause damage to the belt under operating conditions.
- Note previously marked direction of belt rotation and be sure that it is seated correctly on pulley.

**Fig. 33: Tightening Ribbed Belt**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- To loosen ribbed belt, turn tensioner clockwise in direction of - **arrow** - using box wrench until two holes are aligned; counter hold in position using locking pin T10060 A.
- Remove ribbed belt.

**Fig. 34: Disconnecting Vacuum Hose To Variable-Tract Intake Manifold**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect vacuum hose - **1** - to variable-tract intake manifold.

NOTE:

- For the sake of illustration, compressor is removed.

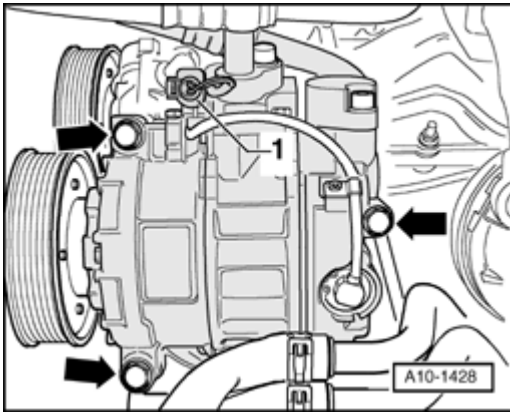


Fig. 35: Disconnecting Electrical Connector From A/C Compressor And Free Up Electrical Wire
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **1** - from A/C compressor and free up electrical wire.
- Remove A/C compressor - **arrows** - and hang at side.

NOTE:

- Lines remain connected.
- Lines must not be bent.
- Pay attention to centering sleeves for guiding A/C compressor at retainer.

- Place drip tray VAS 6208 underneath vehicle to collect hydraulic fluid.

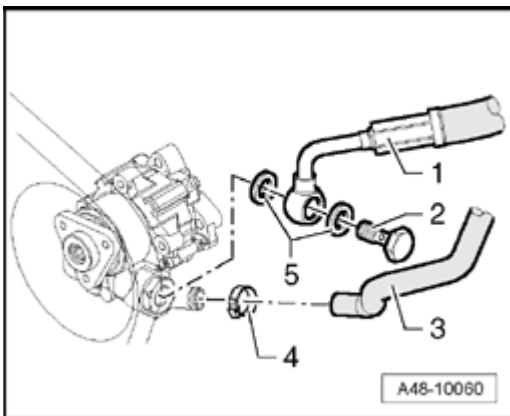


Fig. 36: Identifying Banjo Bolt, Pressure Hose, And Seals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen clamp - **4** - , pull off intake line - **3** - and lay aside.
- Remove banjo fitting - **2** - for expansion hose - **1** - and lay expansion hose aside.
- Seal connections of power steering pump using sealing plugs.

For vehicles without auxiliary/additional heater

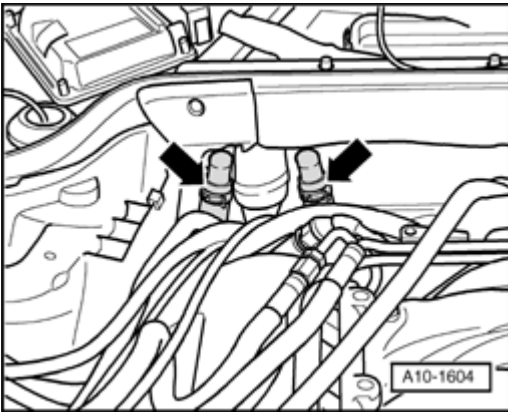


Fig. 37: Disconnecting Supply And Return Line To Heater Core
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect supply and return line to heater core - **arrows** -.

For vehicles with auxiliary/additional heater

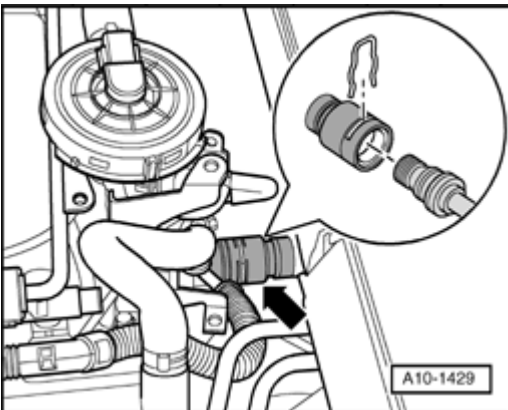


Fig. 38: Disconnecting Coolant Hose From Coolant Pipe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect coolant hose - **arrow** - from coolant pipe.

All

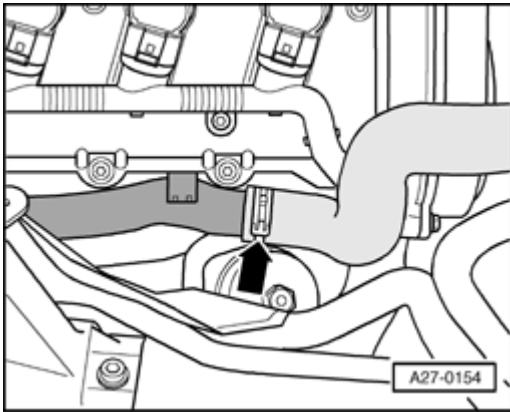


Fig. 39: Disconnecting Hose From Coolant Pipe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect hose - **arrow** - from coolant pipe.

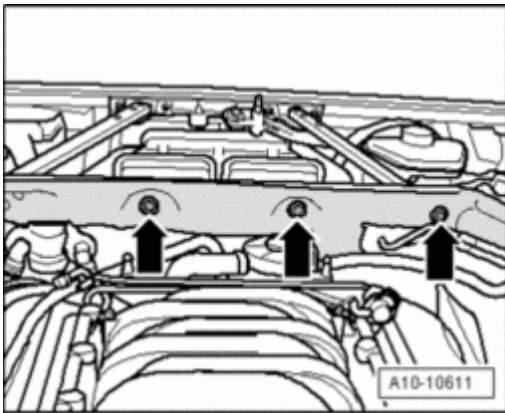


Fig. 40: Removing Insulation Mat From Dome Brace
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove insulation mat from dome brace - **arrows** -.

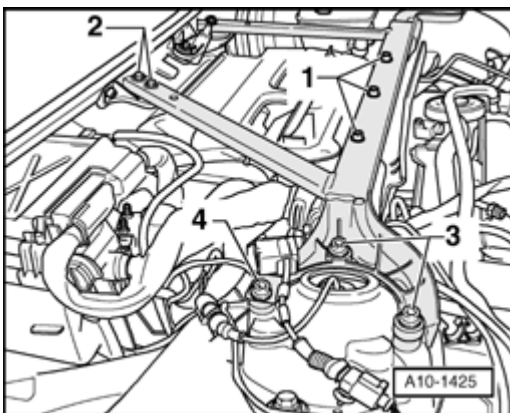
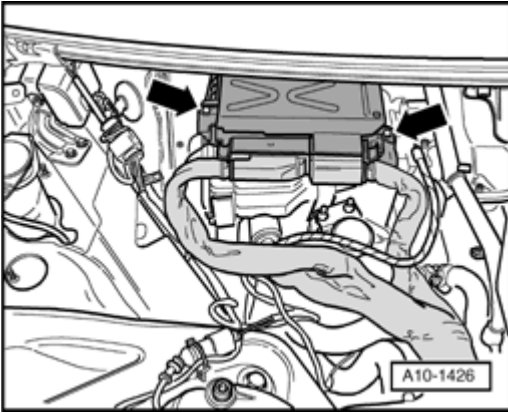


Fig. 41: Removing Dome Brace Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove dome brace bolts - **1** through **4** -.

NOTE:

- Note spacer sleeves for - **2** -.

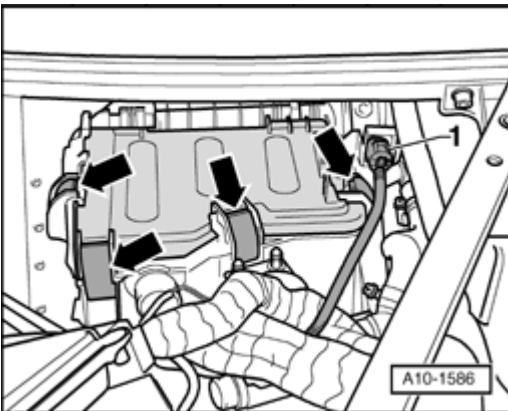
**Fig. 42: Removing Engine Control Module**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove engine control module - **arrows** - and lay aside.

NOTE:

- The anti-theft device is not removed, the control module remains attached.

**Fig. 43: Disconnecting Electrical Connector & Removing E-Box Cover**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **1** -.
- Remove E-Box cover - **arrows** -.

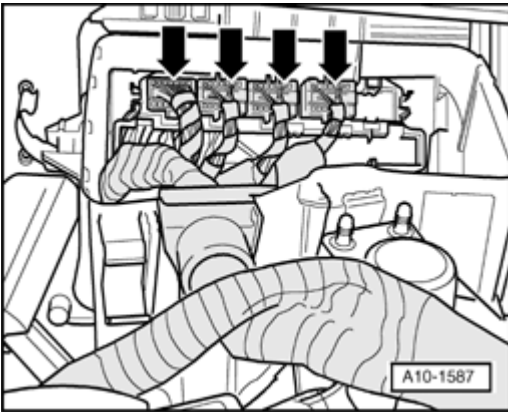


Fig. 44: Disconnecting Electrical Connectors And Exposing Wiring Harness With Control Module Up To Engine

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connectors - **arrows** - and expose wiring harness with control module up to engine.

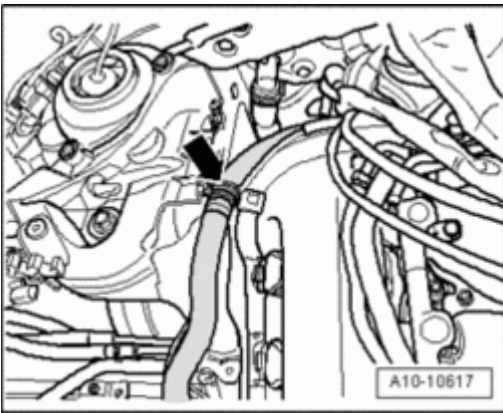


Fig. 45: Disconnecting Hose For Secondary Air Injection

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect hose - **arrow** - for secondary air injection.

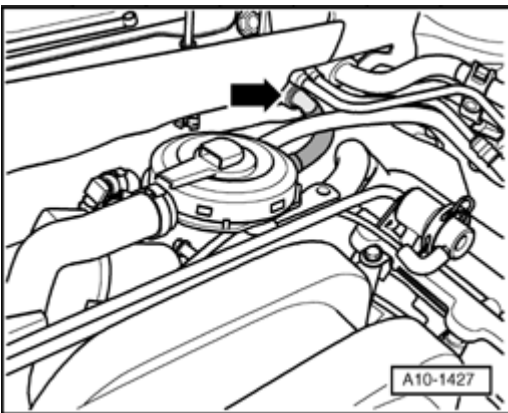


Fig. 46: Disconnecting Hose To Brake Booster

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect hose - **arrow** - to brake booster.

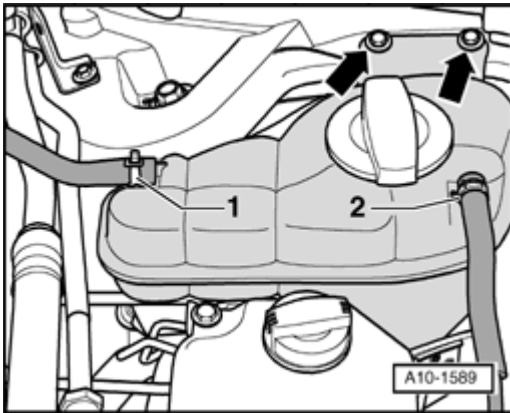


Fig. 47: Identifying Permanent Ventilation Hoses & Coolant Reservoir
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect hose - **1** - for permanent ventilation from coolant expansion tank.
- Disconnect hose - **2** - for permanent ventilation from coolant expansion tank.
- Remove coolant reservoir - **arrows** -.
- Disconnect electrical connector for coolant level indicator.
- Remove coolant hose beneath coolant reservoir.

NOTE: • **Wheel bearing housing must be supported to prevent upper control arm joints from being damaged.**

NOTE: • **Ensure Lifting Eyebolt 3368 thread does not protrude too far toward top.**

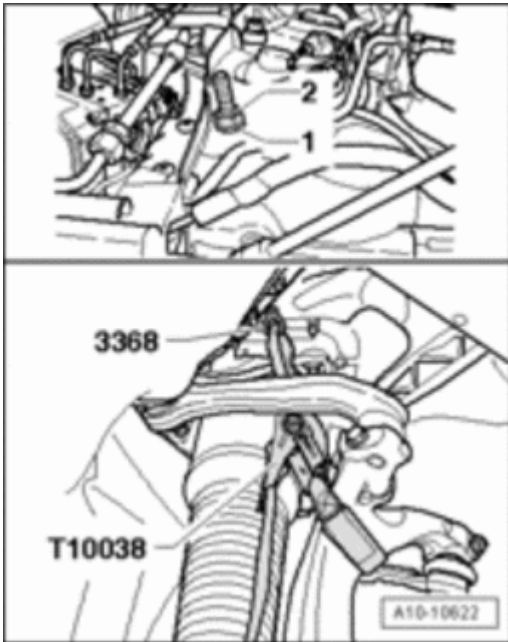


Fig. 48: Positioning Lifting Eyebolt 3368 Into Hole At Suspension Strut Dome And Securing With Washer And Nut

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position Lifting Eyebolt 3368 into hole at suspension strut dome and secure with washer - 1 - and nut - 2 -
- Tie up wheel bearing housing using tensioning strap T10038 as shown in illustration.

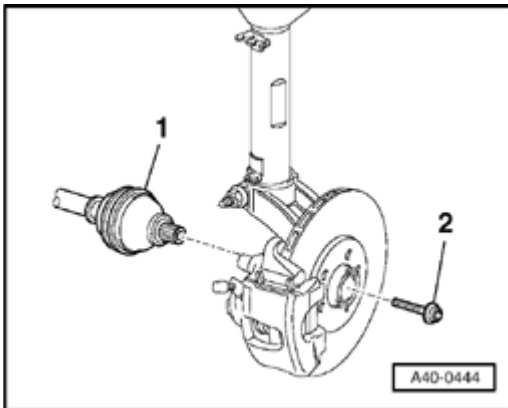


Fig. 49: Removing Collar Bolt At Left/Right Drive Axles

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Have a second technician press brake pedal.

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

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

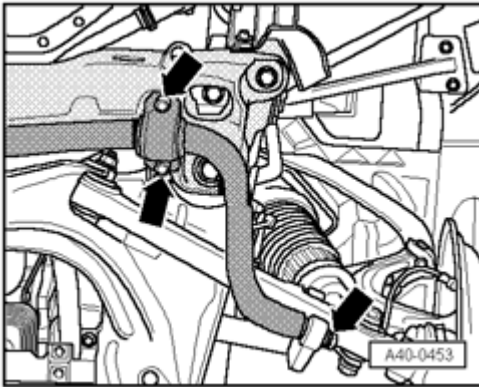


Fig. 50: Removing Bolts Uniformly At Left/Right
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

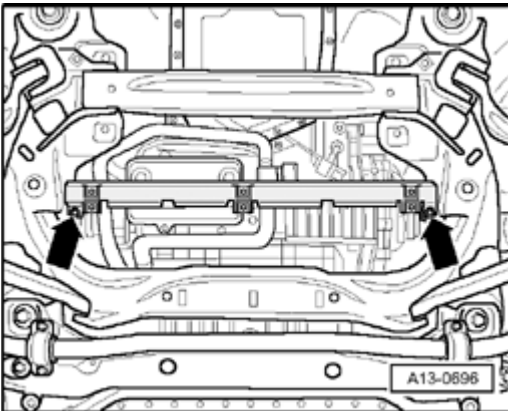


Fig. 51: Removing Cross Member For Noise Insulation At Subframe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove cross member - **arrows** - for noise insulation at subframe.

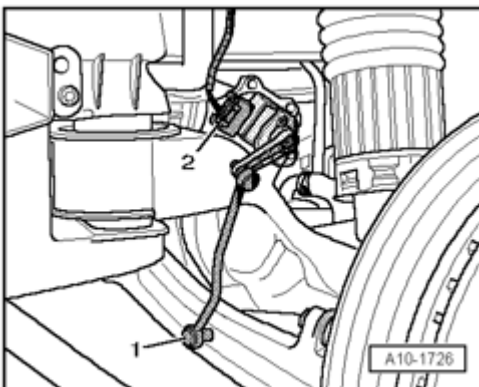
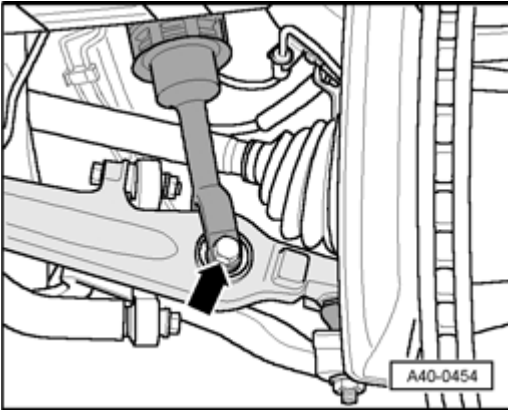


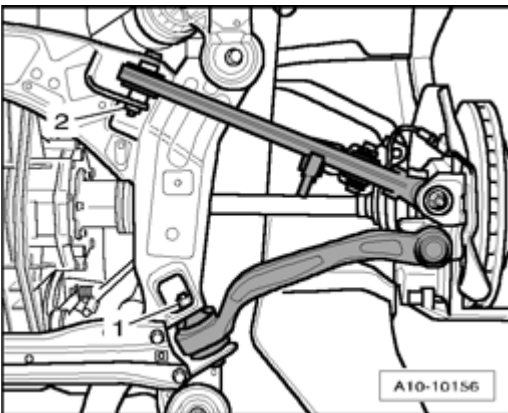
Fig. 52: Identifying Left Level Control System Sensor Electrical Harness Connector & Left/Right

Control Arms Coupling Rod**Courtesy of VOLKSWAGEN UNITED STATES, INC.**

- Disconnect electrical harness connector - **2** - at left level control system sensor.
- Remove coupling rod - **1** - at left and right control arms.

**Fig. 53: Removing Air Spring Damper From Control Arm****Courtesy of VOLKSWAGEN UNITED STATES, INC.**

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

**Fig. 54: Removing Guide Control Link And Control Link On Subframe****Courtesy of VOLKSWAGEN UNITED STATES, INC.**

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

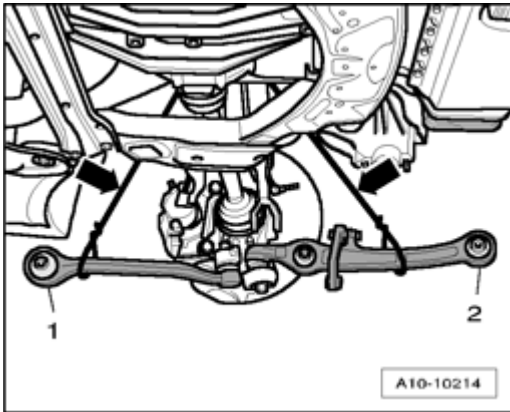


Fig. 55: Pivoting Guide Control Link And Control Link Outward
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

- Repeat work procedure on opposite side of vehicle.

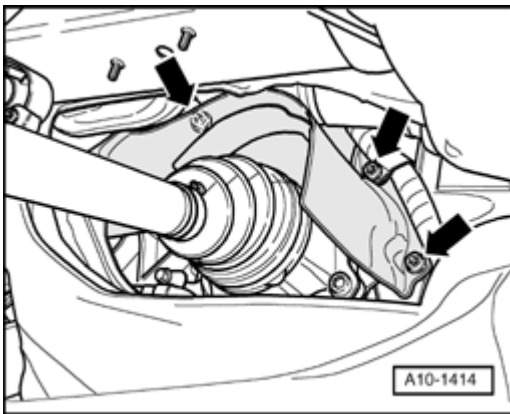


Fig. 56: Removing Shielding Plate Of Drive Axles
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove shielding plate - **arrows** - of drive axles.

NOTE: • The left shielding plate consists of 2 parts.

- Remove drive shaft from transmission flange.

CAUTION: Do not damage brake hose!

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

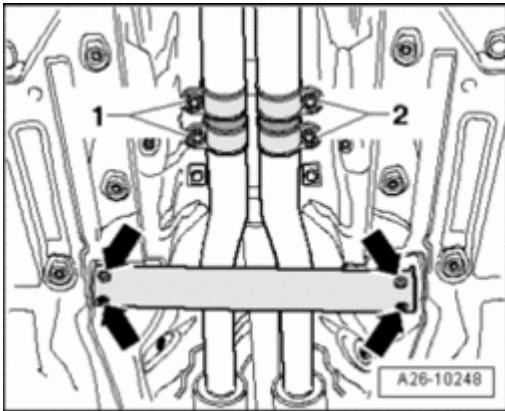


Fig. 57: Loosening Double Clamps And Sliding Toward Front
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen double clamps - **1** - and - **2** - and slide toward front.
- Remove front cross member - **arrows** -.

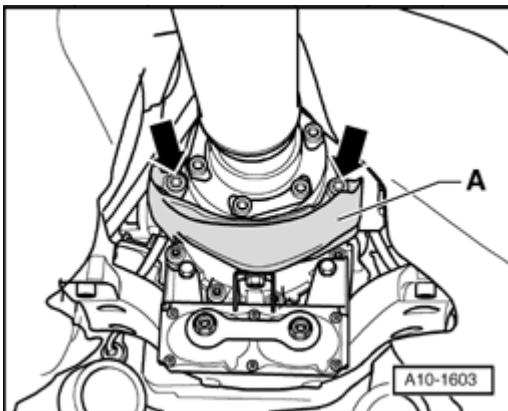


Fig. 58: Removing Drive Shaft Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove drive shaft heat shield - **A** - - **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 side at body.

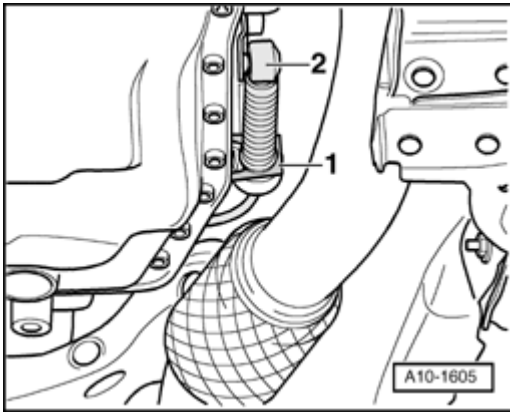


Fig. 59: Identifying Selector Lever Cable & Bracket
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pry off selector lever cable - 2 - from ball head using Pry Lever - Rmv Outside Mirror 80 - 200.
- Remove securing device from bracket - 1 - and expose selector lever cable.

Prepare scissor lift platform:

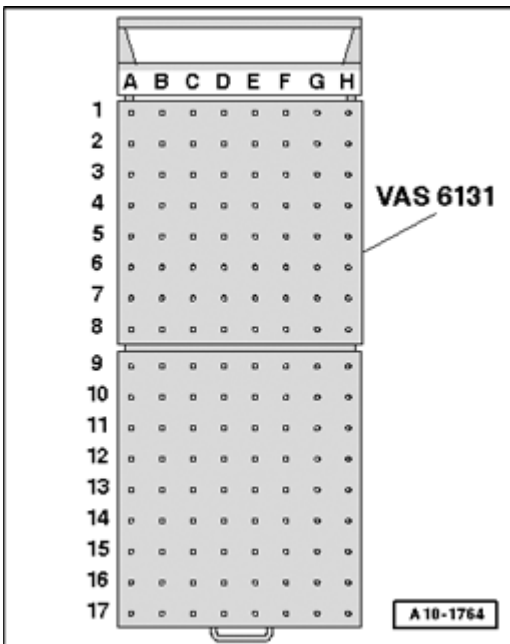


Fig. 60: Identifying Scissor Lift Platform VAS 6131
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Equip scissor lift table VAS 6131 with support set VAS 6131/10 and supplementary set, Audi A8 VAS 6131/11 as follows:

Platform coordinates	Support set components from VAS 6131/10 and supplementary set VAS 6131/11			
B3	/10-1	/10-4	/10-5	/10-11

2006 Audi A8 Quattro

ENGINE 4.2 Liter V8 5V Engine Mechanical, Engine Code(s): BFM, BGK - A8

G3	/10-1	/10-4	/10-5	/11-4
B5	/10-1	/10-3	/10-5	/10-7
G5	/10-1	/10-3	/10-5	/10-7
B9	/10-1	/10-2	/10-5	/10-8
G9	/10-1	/10-2	/10-5	/10-8
C16	/10-1	/10-2	/10-5	/11-5
F16	/10-1	/10-2	/10-5	/11-5

- 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.

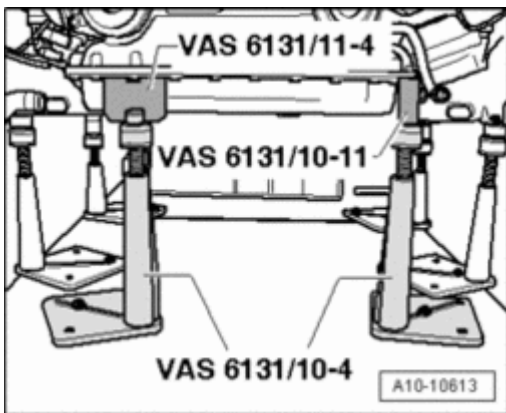


Fig. 61: Placing Support Set VAS 6131/10 And Supplementary Set, Audi A8 VAS 6131/11 Attachments On Front Of Engine

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place Support Set VAS 6131/10 and Supplementary Set, Audi A8 VAS 6131/11 attachments on front of engine as shown in illustration.
- Make sure threaded spindles are installed completely.

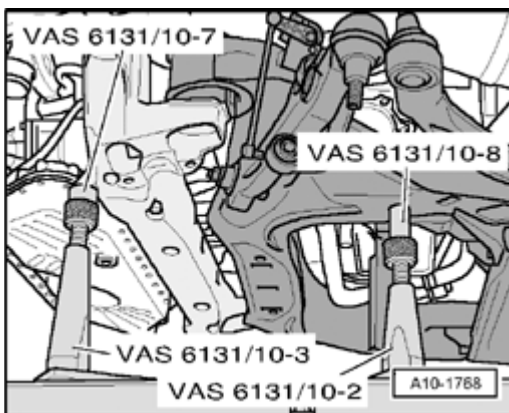


Fig. 62: Positioning Attachments Of Support Set VAS 6131/10 At Left And Right On Engine Carrier And

Subframe

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position attachments of support set VAS 6131/10 at left and right on engine carrier and subframe, as shown in illustration.

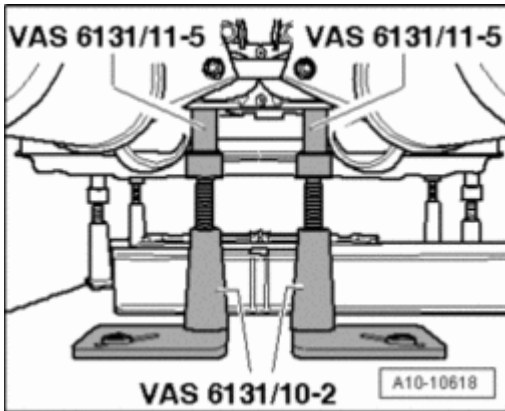


Fig. 63: Placing Support Set VAS 6131/10 And Supplementary Set, Audi A8 VAS 6131/11 Attachments On Rear Of Transmission

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place Support Set VAS 6131/10 and Supplementary Set, Audi A8 VAS 6131/11 attachments on rear of transmission as shown in illustration.
- Twist all spindles of support elements upward far enough until all support pins make contact at support points.
- When all attachments are positioned, lift scissor lift table far enough until engine and transmission mount are free of tension.
- Tighten base plates for attachments to 20 Nm onto scissor lift table VAS 6131.

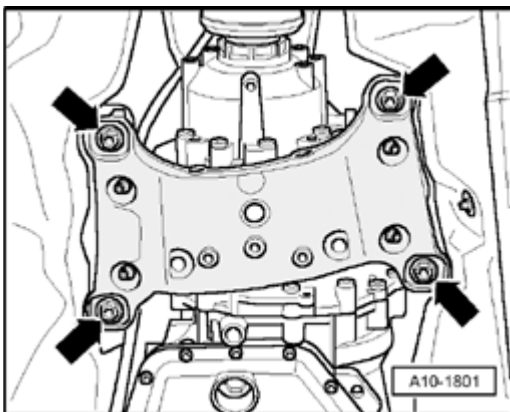


Fig. 64: Removing/Installing Bolts At Tunnel Cross Member

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

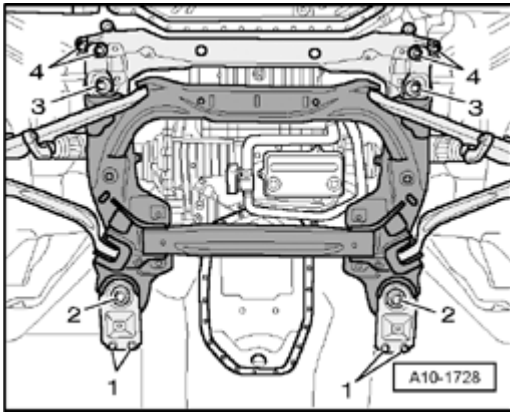


Fig. 65: Removing/Installing Long Member Subframe

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Mark installation position of subframe on long member using a felt tip pen.
- Remove bolts - 1 - and - 4 -.
- Remove bolts - 2 - and - 3 - in diagonal sequence and in stages.

NOTE:

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

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

Engine and transmission, separating

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

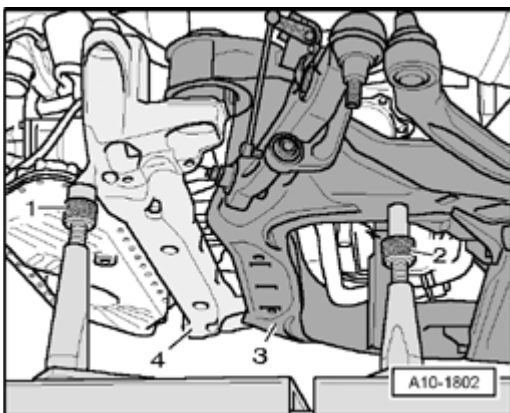


Fig. 66: Identifying Subframe, Left/Right Of Engine Carrier & Support Elements

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Rotate spindles of support elements - 2 - at left and right of subframe completely downward.

- Remove support pins from spindles.
- Remove subframe - **3** - to side.

NOTE:

- **A second technician is required to remove subframe.**

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

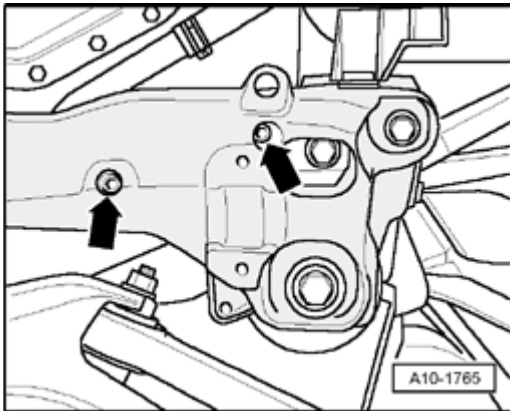
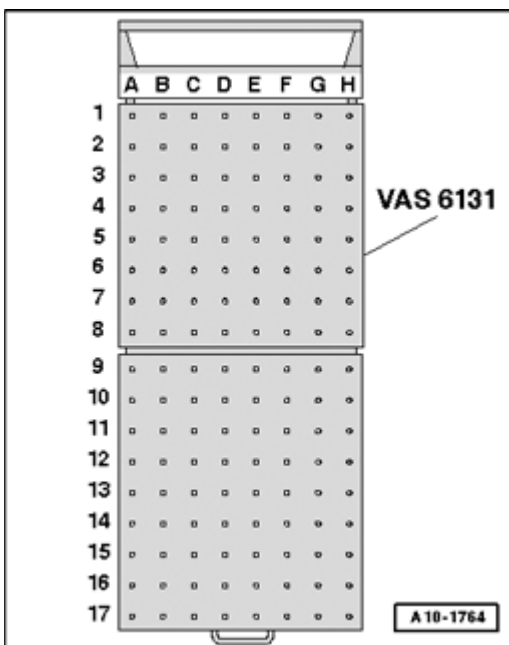


Fig. 67: Removing/Installing Bolts For Engine Mount At Left/Right
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - for engine mount at left and right.
- Remove engine carrier.
- Remove four base plates of attachments for engine carrier and subframe from scissor lift table VAS 6131.
- Equip scissor lift table VAS 6131 with support set VAS 6131/10 and supplementary set, Audi A8 VAS 6131/11 as follows:



2006 Audi A8 Quattro

ENGINE 4.2 Liter V8 5V Engine Mechanical, Engine Code(s): BFM, BGK - A8

Fig. 68: Identifying Scissor Lift Platform VAS 6131

Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- The other attachments remain unchanged.

Platform coordinates	Components of unit support set from support set VAS 6131/10 and supplementary set VAS 6131/11			
C6	/10-1	/10-4	/10-5	/11-2
F7	/10-1	/10-4	/10-5	/10-11
B10	/10-1	/10-3	/10-5	/10-12
G10	/10-1	/10-3	/10-5	/10-13

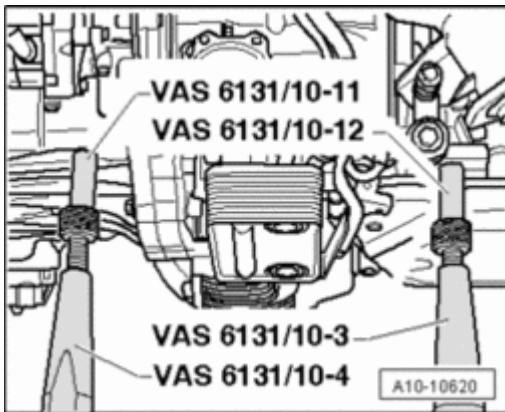


Fig. 69: Placing Support Set VAS 6131/10 And Supplementary Set, Audi A8 VAS 6131/11 Attachments On Left Of Engine/Transmission

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place Support Set VAS 6131/10 and Supplementary Set, Audi A8 VAS 6131/11 attachments on left of engine/transmission as shown in illustration.

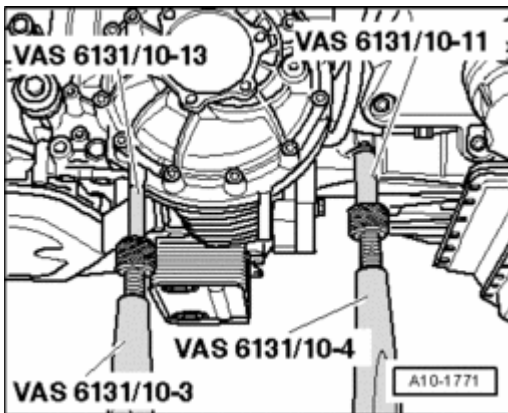


Fig. 70: Positioning Attachments From Support Set VAS 6131/10 At Right On Engine/Transmission

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position attachments from Support Set VAS 6131/10 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 attachments to 20 Nm onto scissor lift table VAS 6131.
- Free up Heated Oxygen Sensor (HO2S) 2 G108 electrical wire.

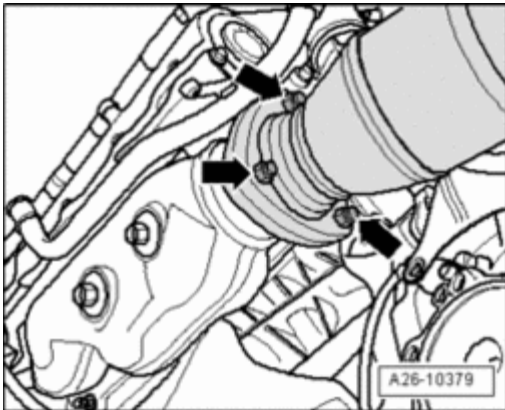


Fig. 71: Removing Catalytic Converter With Front Muffler From Exhaust Manifold
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove catalytic converter with front muffler from exhaust manifold - **arrows** -.

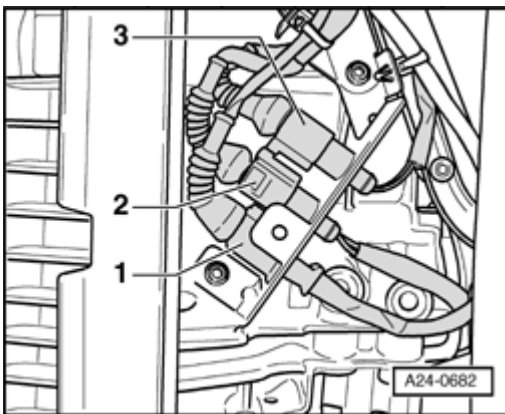


Fig. 72: Disconnecting Electrical Connector (Brown) Of Oxygen Sensor (O2S) 2 Behind Three Way Catalytic Converter (TWC) G131 And Free Up Electrical Wire
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **3** - (brown) of Oxygen Sensor (O2S) 2 Behind Three Way Catalytic Converter (TWC) G131 and free up electrical wire.

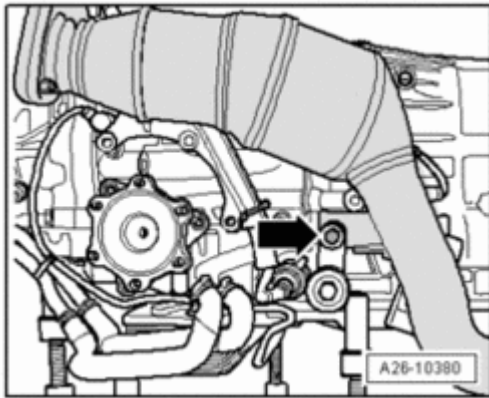


Fig. 73: Removing Bolt On Bracket For Exhaust Pipe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - **arrow** - on bracket for exhaust pipe.

NOTE:

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

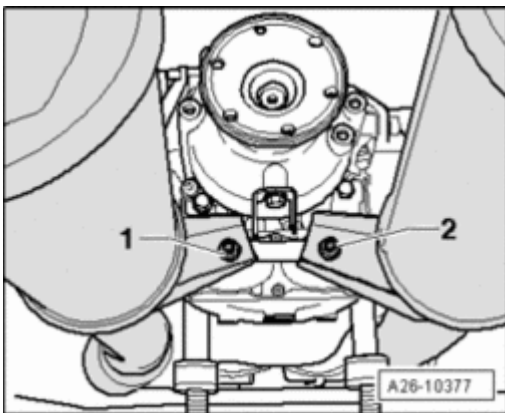
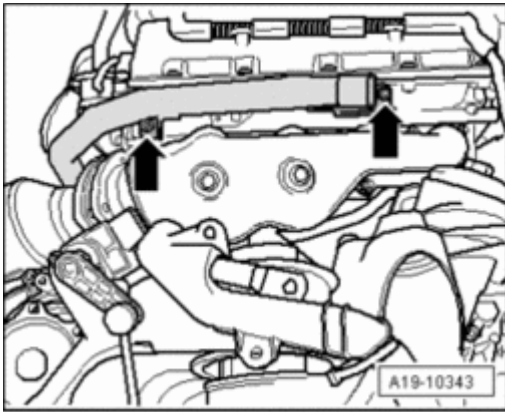


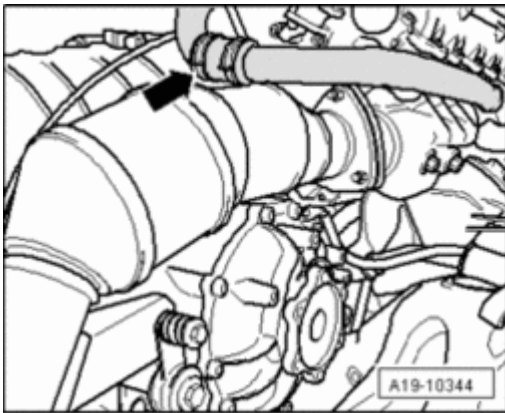
Fig. 74: Removing Bolt On Bracket For Exhaust System And Catalytic Converter With Front Muffler
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - **1** - on bracket for exhaust system and remove catalytic converter with front muffler.

**Fig. 75: Removing Water Pipe At Right**

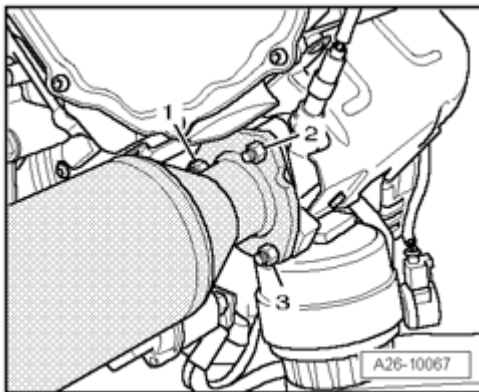
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove water pipe at right - **arrows** -.

**Fig. 76: Disconnecting Water Pipe**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect water pipe - **arrow** - and remove.
- Free up Heated Oxygen Sensor (HO2S) G39 electrical wire.

**Fig. 77: Removing Catalytic Converter With Front Muffler From Exhaust Manifold**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove catalytic converter with front muffler from exhaust manifold - **arrows** -.

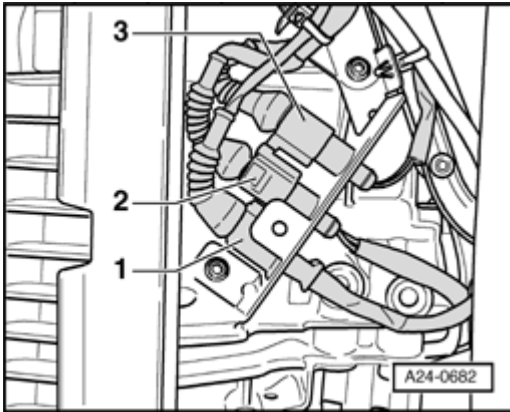


Fig. 78: Disconnecting Electrical Connector (BLACK) Of Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - 2 - (black) of Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130.

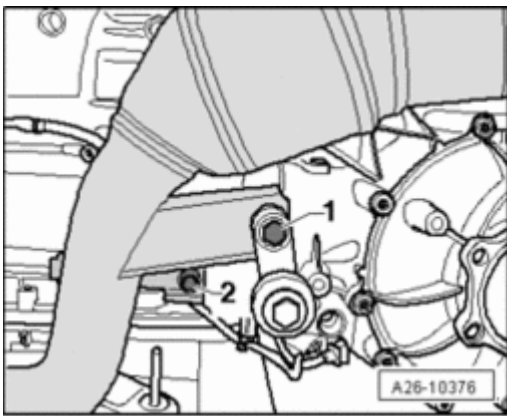


Fig. 79: Removing Bolt On Bracket For Exhaust Pipe & Heat Shield

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - 1 - on bracket for exhaust pipe.
- Remove heat shield - 2 -.
- Free up Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130 electrical wire.

NOTE:

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

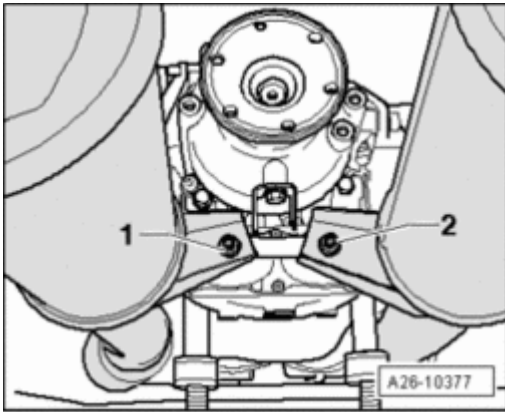


Fig. 80: Removing Bolt On Bracket For Exhaust System And Catalytic Converter With Front Muffler
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - 2 - on bracket for exhaust system and remove catalytic converter with front muffler.

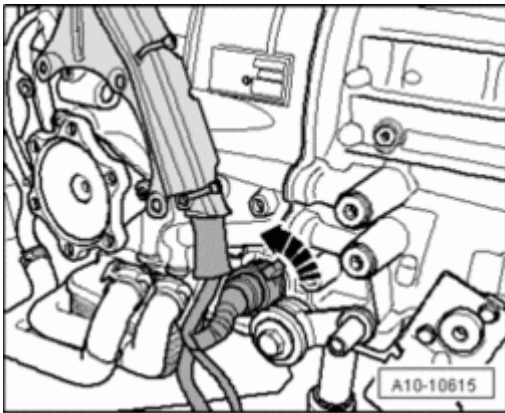


Fig. 81: Disconnecting Electrical Harness Connector On Transmission, To Do This Swing Twist Lock Counterclockwise
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

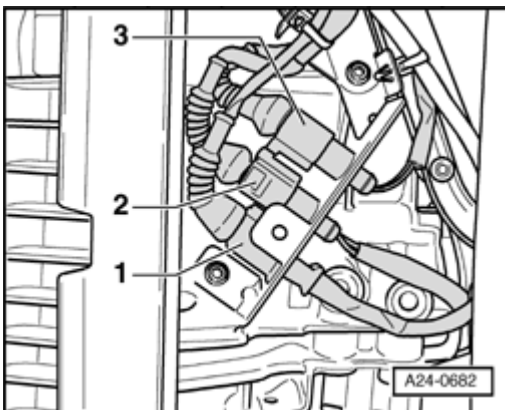
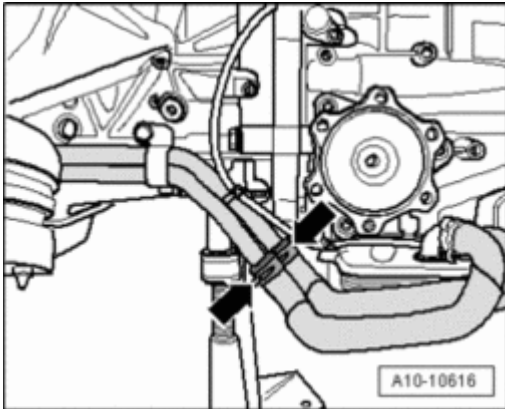


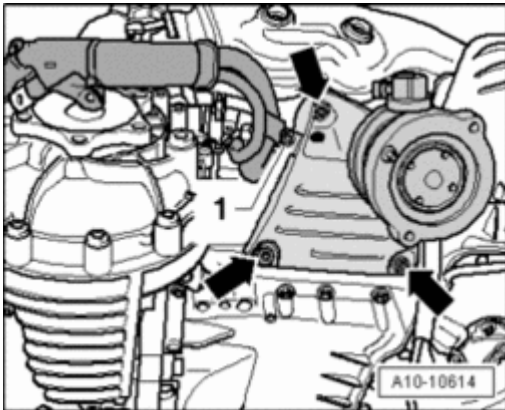
Fig. 82: Disconnecting Electrical Connector (Brown) Of Oxygen Sensor (O2S) 2 Behind Three Way

Catalytic Converter (TWC) G131 And Free Up Electrical Wire**Courtesy of VOLKSWAGEN UNITED STATES, INC.**

- Disconnect electrical connector - **1** - (gray) for Engine Speed (RPM) Sensor G28 and free up electrical wire with heat shield.

**Fig. 83: Disconnecting Coolant Hoses & Connector From Engine Mount****Courtesy of VOLKSWAGEN UNITED STATES, INC.**

- Disconnect coolant hoses - **arrows** -.
- Disconnect connector from engine mount.

**Fig. 84: Removing Wiring Harness From Engine Mount & Engine Mount****Courtesy of VOLKSWAGEN UNITED STATES, INC.**

- Remove wiring harness from engine mount - **1** -.
- Remove engine mount - **arrows** -.

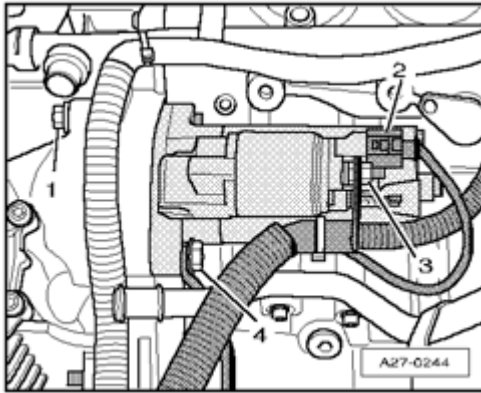


Fig. 85: Removing Starter With Connected Wiring Harness
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove starter with connected wiring harness - **1 and 4** -
- When disassembled, rotate engine to Top Dead Center (TDC) and align marking on transmission housing with marking on converter.

NOTE:

- **Before removing converter from drive plate, mark position of both components toward each other.**

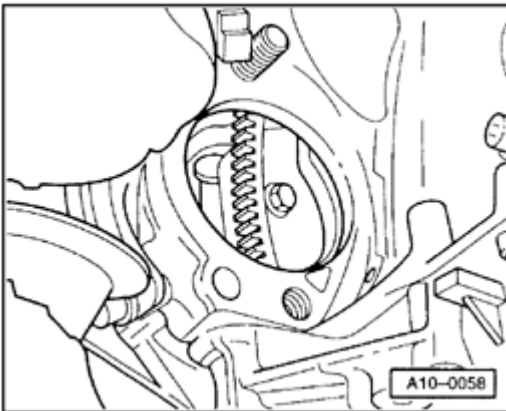


Fig. 86: Removing Torque Converter From Drive Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove torque converter from drive plate, 3 bolts.

NOTE:

- **To loosen the torque converter bolts counter hold main bolt of crankshaft.**
- Remove engine/transmission connecting bolts.

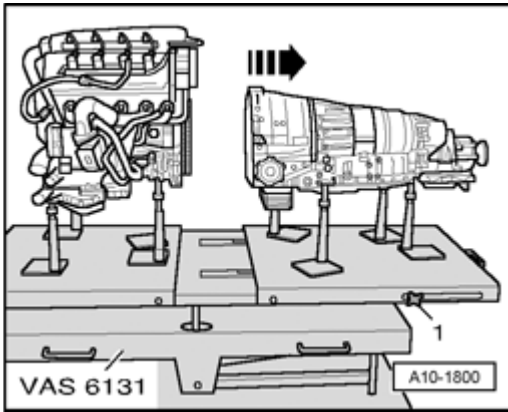


Fig. 87: Loosening Side Clamping Screws On Scissor Lift Platform VAS 6131 And Pulling Rear Platform Top With Transmission Toward Rear

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen side clamping screws - **1** - on scissor lift platform VAS 6131 and pull rear platform top with transmission toward rear - **arrow** - , simultaneously push torque converter through opening of drive plate while doing this.
- Secure torque converter in transmission so that it cannot fall out.

Engine, attaching to engine stand

2006 Audi A8 Quattro

ENGINE 4.2 Liter V8 5V Engine Mechanical, Engine Code(s): BFM, BGK - A8

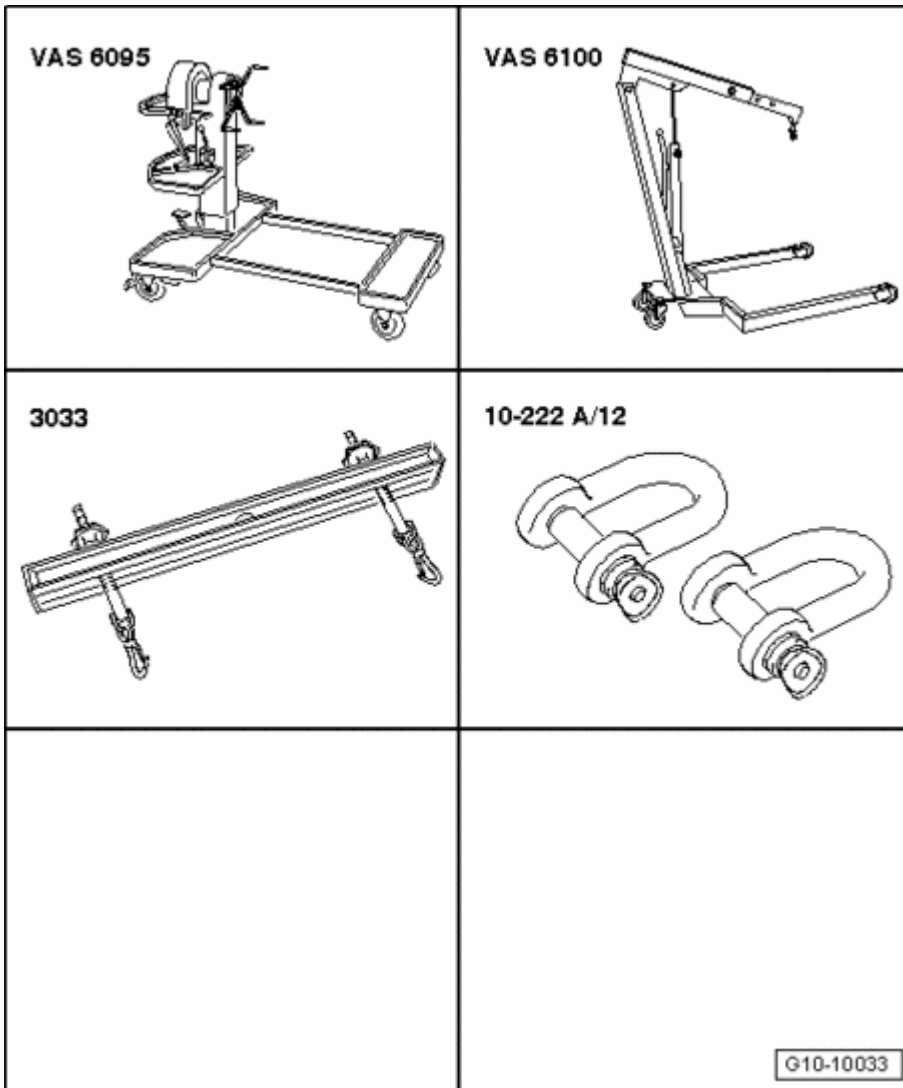


Fig. 88: Identifying Special Tools - Engine, Attaching To Engine Stand
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Adapter set for engine and transmission support VW 540/1 B
- Engine and transmission holder VAS 6095
- Shop crane VAS 6100
- Lifting tackle 3033
- Shackle 10 - 222 A/12

Work procedure

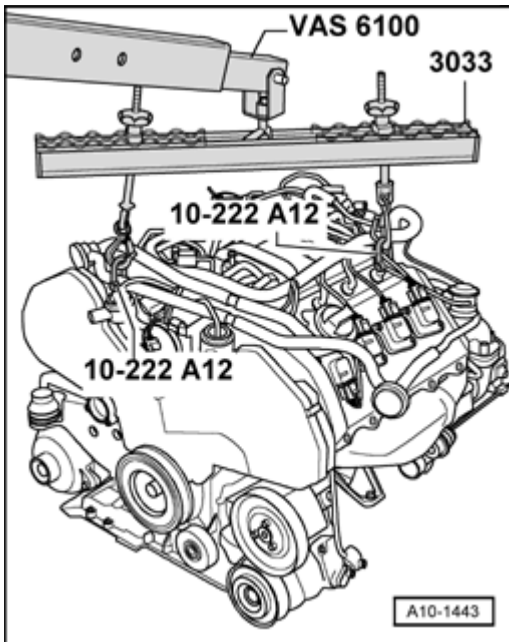


Fig. 89: Hooking In Lifting Tackle 3033 At Shackles 10 - 222 A/12 And At Workshop Crane VAS 6100
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Engage shackle 10 - 222 A/12 at right front and left rear engine lifting eye.
- Hook in lifting tackle 3033 at shackles 10 - 222 A/12 and at workshop crane VAS 6100 , as depicted in illustration.

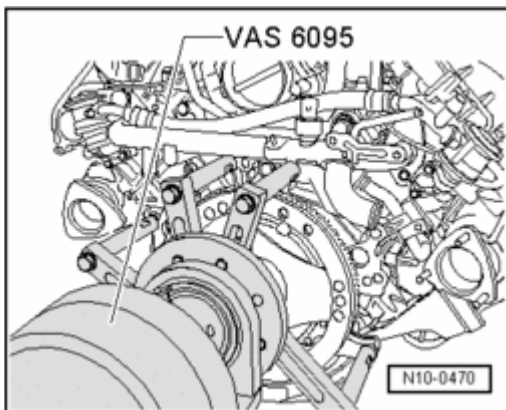


Fig. 90: Lifting Engine By Shop Crane VAS 6100 Far Enough So That Flywheel Center Is At Height Of Mounting Plate Of Engine And Transmission Holder VAS 6095
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift engine by shop crane VAS 6100 far enough so that flywheel center is at height of mounting plate of engine and transmission holder VAS 6095. Then, install with four universal mounting components at cylinder block as depicted.

Installing

NOTE:

- During assembly, replace self-locking nuts and bolts.
- Always replace bolts that are tightened to torque as well as O-rings and gaskets.
- 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.
- During installation, re-install all heat insulation sleeves and heat shields at the same locations.

○ Install torque converter -->

- **32 - TORQUE CONVERTER** for 6 SPD. AUTOMATIC TRANSMISSION 09E ALL WHEEL DRIVE
- **32 - TORQUE CONVERTER** for 6 SPD. AUTOMATIC TRANSMISSION 09L ALL WHEEL DRIVE

- Make sure alignment sleeves for engine to transmission are installed in cylinder block. Install if necessary.
- No needle bearing is installed in crankshaft on vehicles with automatic transmission.
- Before connecting engine and transmission, rotate torque converter and engine drive plate so that holes or threaded holes stands at height of opening of removed starter.
- To secure torque converter to drive plate, use new original ribbed bolts .

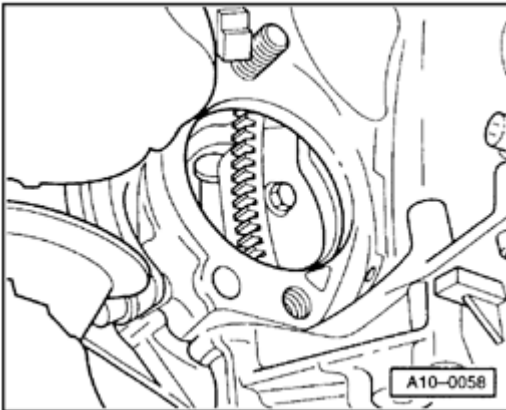


Fig. 91: Removing Torque Converter From Drive Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Attach torque converter to drive plate, 3 bolts.

NOTE:

- To tighten torque converter bolts, counter hold main bolt of crankshaft.

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 $\pm 15\%$.

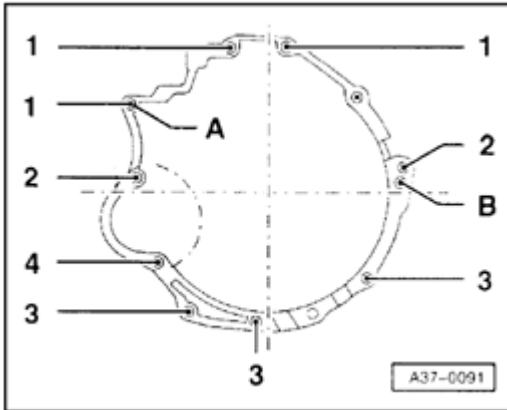


Fig. 92: Securing Engine/Transmission (Flange View Of Transmission)

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Securing engine/transmission (flange view of transmission)

Item	Bolt	Qty.	Nm
1	M 12x75	3	65
2	M 12x90	2	65
3	M 10x45	3	45
4	M 10x80	1	65

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

CAUTION: To avoid contact corrosion, use only approved bolts, nuts, washers, etc. These elements have a special surface coating and can be recognized by their green color.

- Always clean threaded drive shaft bores in transmission flanged shaft of locking fluid residue using a tap before installation.

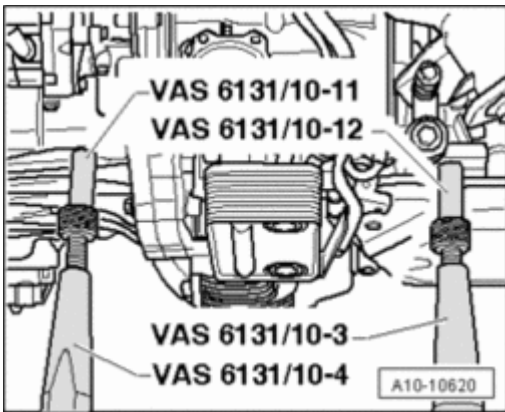


Fig. 93: Twisting Spindles Of Attachments From Support Set VAS 6131/10 And Supplementary Set, Audi A8 VAS 6131/11 Downward At Left On Engine/Transmission
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Twist spindles of attachments from support set VAS 6131/10 and supplementary set, Audi A8 VAS 6131/11 downward at left on engine/transmission.

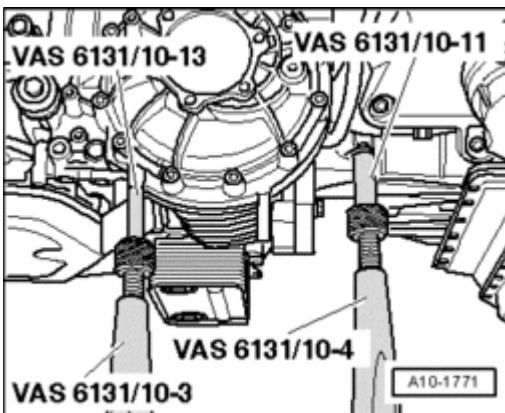


Fig. 94: Twisting Spindles Of Support Elements Support Set VAS 6131/10 Downward At Right On Engine/Transmission
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Twist spindles of support elements support set VAS 6131/10 downward at right on engine/transmission.
- Remove four base plates of attachments for engine carrier and subframe from scissor lift table VAS 6131.

NOTE:

- **The other attachments remain unchanged.**

- Equip scissor lift table VAS 6131 with support set VAS 6131/10 and supplementary set, Audi A8 VAS 6131/11 as follows:

Platform coordinates	Support set components from VAS 6131/10 and supplementary set VAS 6131/11			
B3	/10-1	/10-4	/10-5	/10-11
G3	/10-1	/10-4	/10-5	/11-4

2006 Audi A8 Quattro

ENGINE 4.2 Liter V8 5V Engine Mechanical, Engine Code(s): BFM, BGK - A8

B5	/10-1	/10-3	/10-5	/10-7
G5	/10-1	/10-3	/10-5	/10-7
B9	/10-1	/10-2	/10-5	/10-8
G9	/10-1	/10-2	/10-5	/10-8
C16	/10-1	/10-2	/10-5	/11-5
F16	/10-1	/10-2	/10-5	/11-5

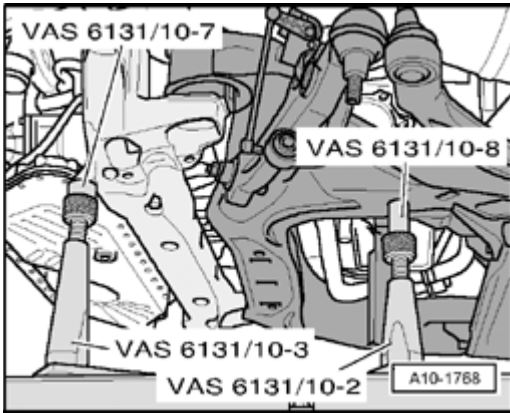


Fig. 95: Positioning Attachments Of Support Set VAS 6131/10 At Left And Right On Engine Carrier And Subframe

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position engine carrier on both attachments VAS 6131/10-7.
- Twist left and right spindle of support elements VAS 6131/10-7 upward.
- Tighten base plates for attachments to 20 Nm onto scissor lift table VAS 6131.

NOTE:

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

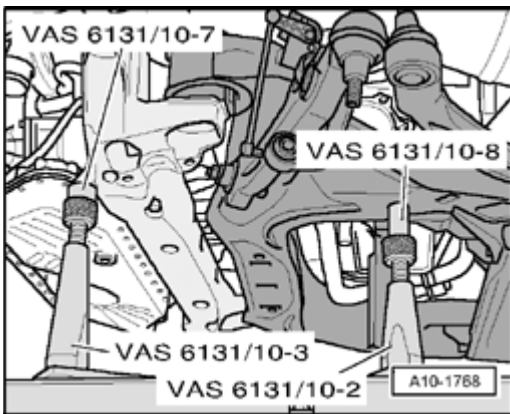


Fig. 96: Positioning Attachments Of Support Set VAS 6131/10 At Left And Right On Engine Carrier And Subframe

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position subframe on both attachments VAS 6131/10-8.
- Twist left and right spindle of support elements VAS 6131/10-8 upward.
- Tighten base plates for attachments to 20 Nm onto scissor lift table VAS 6131.

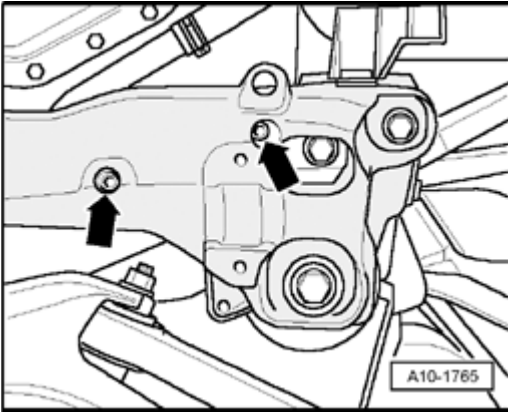


Fig. 97: Removing/Installing Bolts For Engine Mount At Left/Right
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten left and right bolts - **arrows** - for engine mount.
- Guide engine/transmission unit with subframe and engine carrier into body from below using scissor lift table VAS 6131.

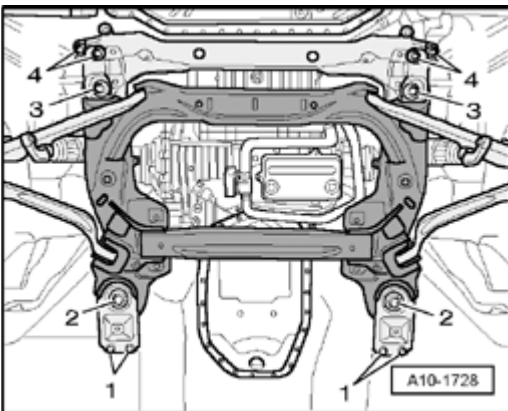


Fig. 98: Removing/Installing Long Member Subframe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install subframe --> **40 - FRONT SUSPENSION** .
- Tighten bolts for subframe only to tightening torque, do not tighten further (tighten bolts only after axle alignment) --> **40 - FRONT SUSPENSION** .

CAUTION: Vehicle must not be driven in this condition.

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

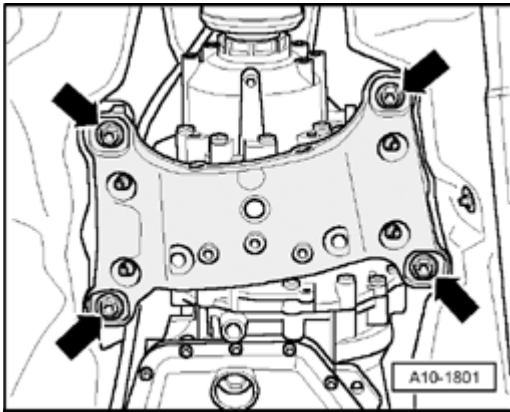


Fig. 99: Removing/Installing Bolts At Tunnel Cross Member
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten bolts - **arrows** - at tunnel cross member.
- Install drive shaft --> **39 - FINAL DRIVE, DIFFERENTIAL** .
- Install selector lever cable, adjust if necessary -->
 - **37 - CONTROLS, HOUSING** for 6 SPD. AUTOMATIC TRANSMISSION 09E ALL WHEEL DRIVE
 - **37 - AUTOMATIC TRANSMISSION - CONTROLS, HOUSING** for 6 SPD. AUTOMATIC TRANSMISSION 09L ALL WHEEL DRIVE
- Install exhaust system free of stress --> **Exhaust system, installing free of tension**
- Install guide control link, control link and stabilizer --> **40 - FRONT SUSPENSION** .
- Install drive axles --> **40 - FRONT SUSPENSION** .
- Fill with coolant.
- Install torque support --> **Torque support (with torque support valve N382), assembly overview.**
- Install dome brace --> **47 - BRAKES - HYDRAULIC COMPONENTS** .
- Mount wiper arms and adjust --> **92 - WINDSHIELD WIPER AND WASHER SYSTEM** .
- Before first engine start, fill hydraulic oil into power steering system refill tank; power steering pump must not run dry.
- Connect battery --> **27 - BATTERY, STARTER, GENERATOR, CRUISE CONTROL** .
- Install lock carrier with attachments --> **50 - BODY - FRONT** .
- Install front bumper --> **63 - BUMPERS** .
- Fill up power steering oil and bleed steering system --> **48 - STEERING** .
- Adjust headlights --> **94 - LIGHTS, SWITCHES - EXTERIOR** .
- Check engine oil level before starting engine --> **Oil level, checking.**
- Check engine oil level of automatic transmission.

2006 Audi A8 Quattro

ENGINE 4.2 Liter V8 5V Engine Mechanical, Engine Code(s): BFM, BGK - A8

- Perform axle alignment --> **44 - WHEELS, TIRES AND WHEEL ALIGNMENT** .

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

- Raise windows with electric window regulators up to stop.
- Activate all power window switches "up" again for at least one second to activate automatic window raising/lowering.
- Set clock.

Torque specifications

NOTE:

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

Alignment sleeves (- A - and - B -).

Bolted connections		Torque specifications
Engine mount to torque support valve N382		40 Nm
Generator to engine	M10	40 Nm
	M 8	25 Nm
Exhaust manifold to cylinder head		25 Nm
A/C compressor to bracket		25 Nm
Bracket for central hydraulic pump and A/C compressor to engine		25 Nm
Drive axles to flange shafts	M 10	77 Nm
Exhaust pipe to exhaust manifold		40 Nm
Transmission mount to subframe		40 Nm
Wheel bolt to wheel hub		120 Nm
Engine carrier to engine mount		23
Engine carrier to chassis		68

ENGINE MOUNT, REMOVING AND INSTALLING

Left and right engine mounts, removing and installing

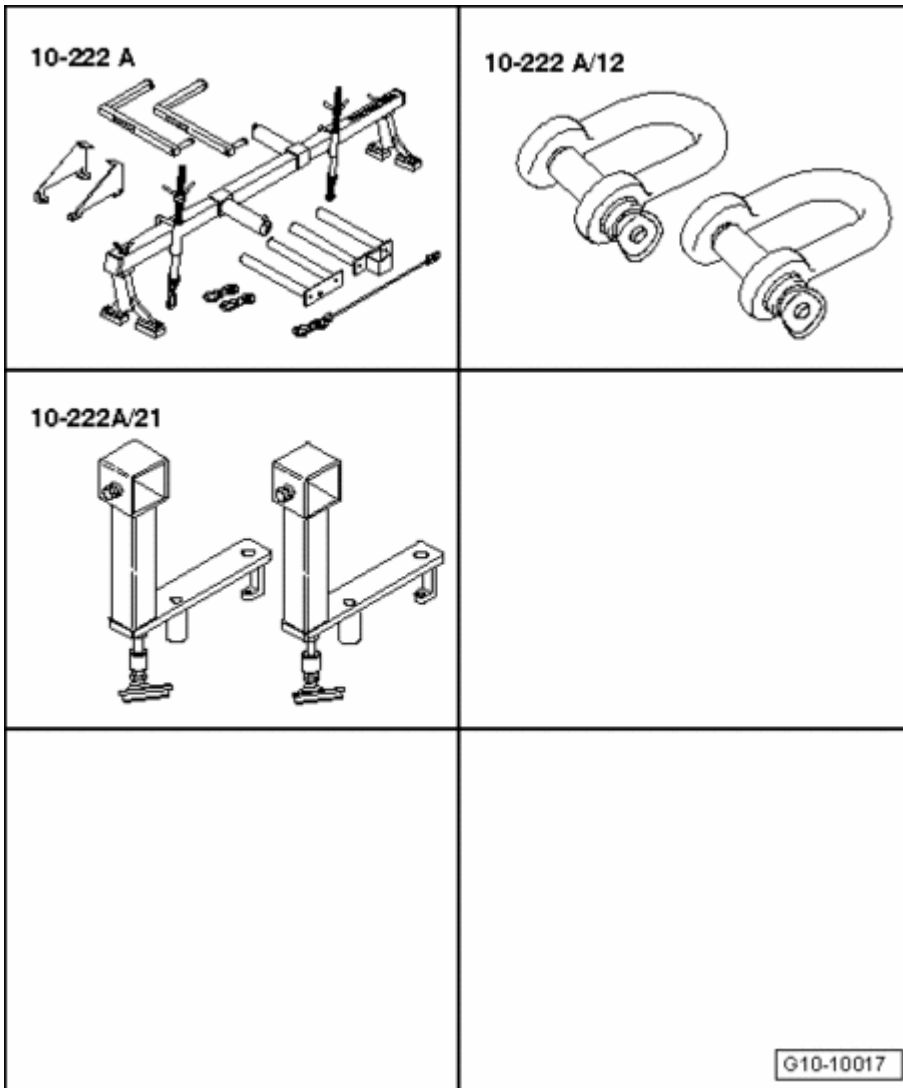


Fig. 100: Identifying Special Tools - Left And Right Engine Mounts, Removing And Installing
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Engine support bridge 10 - 222 A
- Shackle 10 - 222 A/12
- Adapter 10-222 A/21

Removing

NOTE:

- Before raising the vehicle on a hoist (wheels off the ground), first activate the vehicle jack mode --> **43 - SELF LEVELING SUSPENSION** .

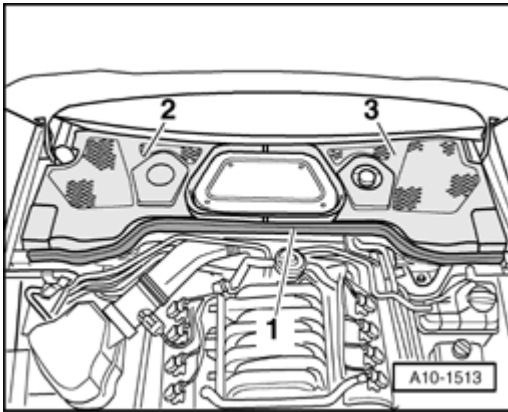


Fig. 101: Identifying Rubber Seal & Plenum Chamber Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

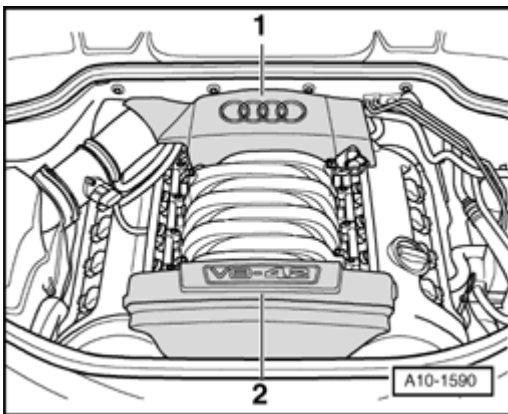


Fig. 102: Removing Engine Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove engine cover - 1 - upward.

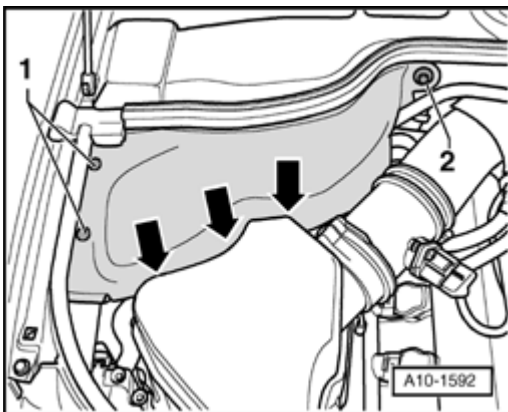


Fig. 103: Identifying Clips & Bolt

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove clips - 1 -.
- Remove bolt - 2 - and remove cover.

NOTE: • Note clips when installing - arrows -.

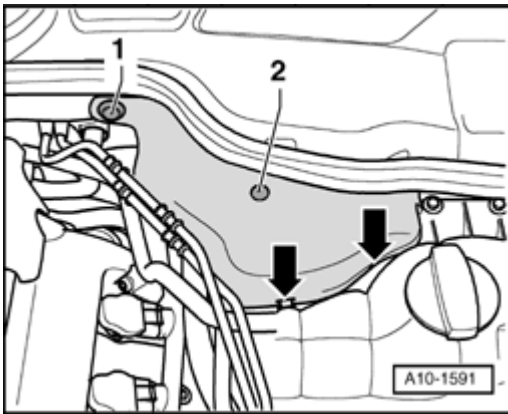


Fig. 104: Removing Left Cover By Removing Bolt And Expanding Rivet
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove left cover by removing bolt - 1 - and removing expanding rivet - 2 -.

NOTE: • Note clips when installing - arrows -.

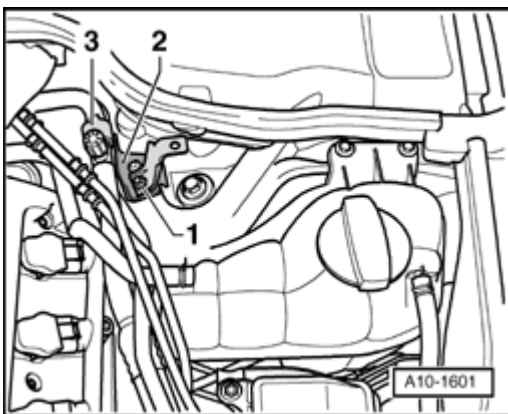


Fig. 105: Identifying Cover Bracket, Bracket For A/C Line & Bracket For A/C Line
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove cover bracket - 1 -.
- Remove bracket for A/C line - 2 -.
- Unclip bracket for A/C line - 3 -.

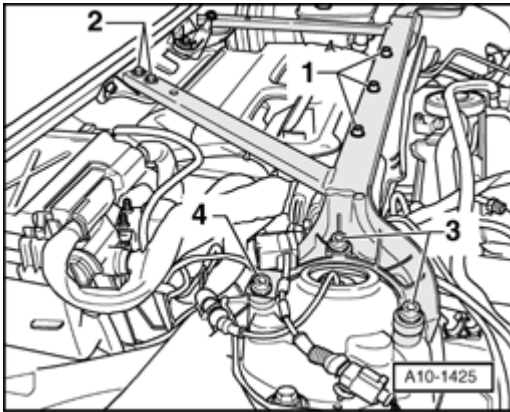


Fig. 106: Removing Dome Brace Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - 4 - on left and right.

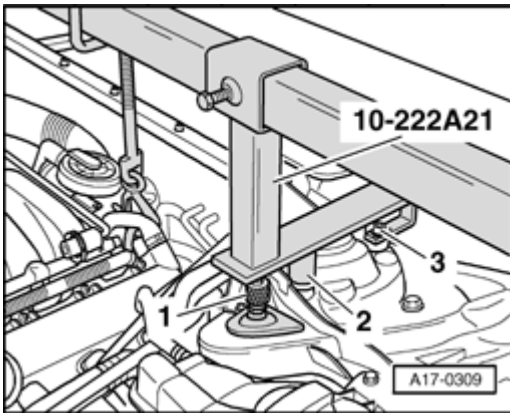


Fig. 107: Securing Engine Support Bridge 10 - 222 A With Adapters 10 - 222 A/21 At Suspension Strut Domes

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure engine support bridge 10 - 222 A with adapters 10 - 222 A/21 at suspension strut domes.
- Install adapters 10 - 222 A/21 to dome brace - 3 - at left and right.
- Support for left and right side of vehicle is marked.
- The center support point is secured on front bolts for dome brace.
- Knurled-head bolt - 1 - must be turned downward far enough so that supporting plate makes contact on suspension strut dome.

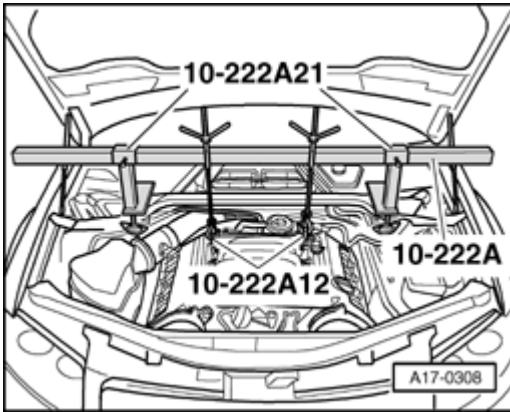


Fig. 108: Securing Shackles 10 - 222 A/12 To Right Rear Engine Lifting Eyelets
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure shackles 10 - 222 A/12 to right rear engine lifting eyelets.
- Hook shackles 10 - 222 A/12 into spindles of engine support bridge 10 - 222 A.
- Slightly pre-tension engine using engine support bridge spindles.

For vehicles with parking/auxiliary heater:

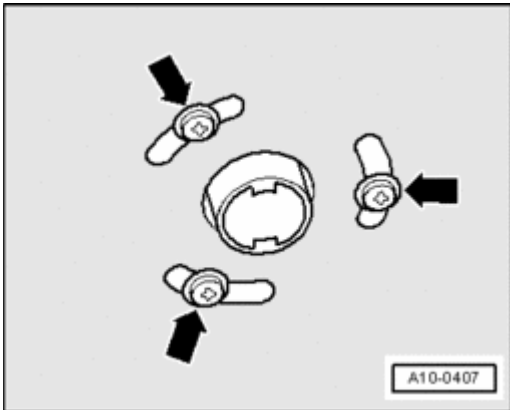


Fig. 109: Removing Bolts For Exhaust Pipe Of Parking Heater/Auxiliary Heater On Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - for exhaust pipe of parking heater/auxiliary heater on noise insulation.

All

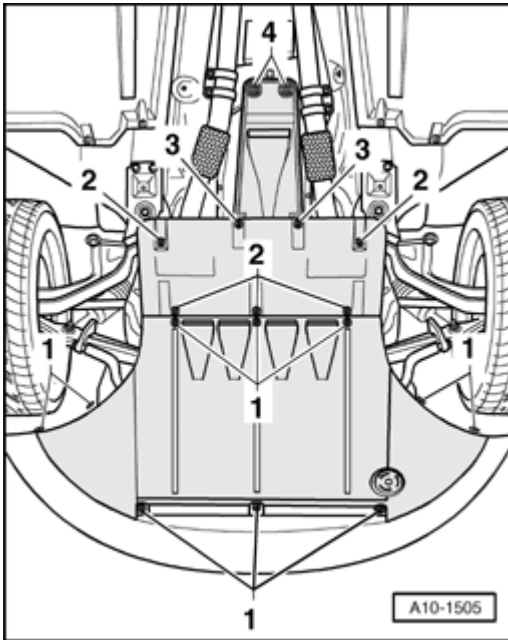


Fig. 110: Loosening Mounting Parts And Removing Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front noise insulation - 1 -.

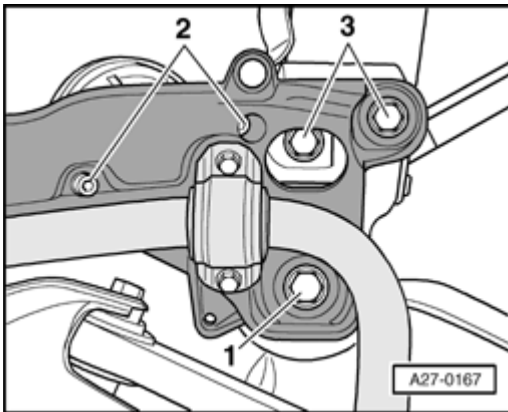


Fig. 111: Removing Bolts On Left/Right
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - 1 through 3 - on left and right.
- Lower engine carrier.

Engine mount, right

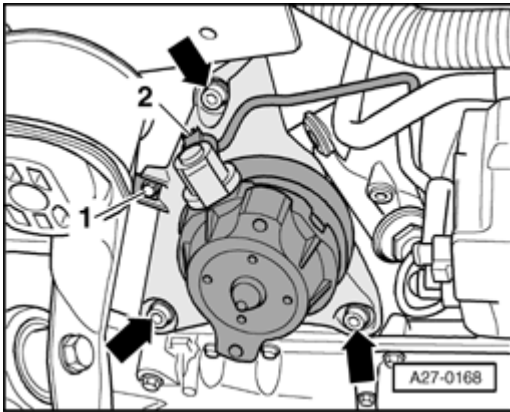


Fig. 112: Disconnecting Electrical Connector On Engine Mount & Removing Cable Clip From Engine Support

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **2** - on engine mount.
- Remove cable clip - **1** - from engine support.
- Remove engine mount - **arrows** -.
- Disconnect engine mount from engine support.

Engine mount, left

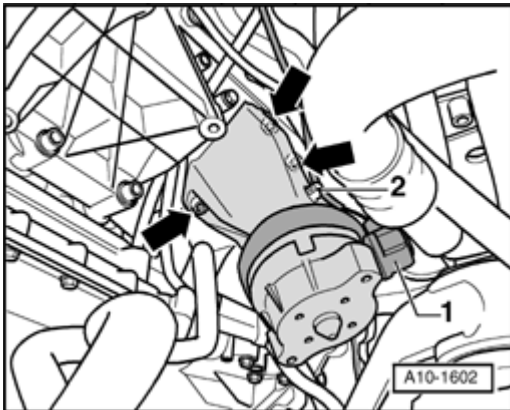


Fig. 113: Identifying Engine Mount Electrical Connector, Electrical Wire & Engine Mount

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **1** - on engine mount.
- Unclip electrical wire - **2** -.
- Remove engine mount - **arrows** -.
- Disconnect engine mount from engine support.

Installing

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

NOTE:

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

Torque specifications

Component	Nm
Engine support to engine	40
Engine carrier to engine mount	23
Engine carrier to chassis	68
Engine mount to engine support	40

Torque support (with torque support valve N382), assembly overview

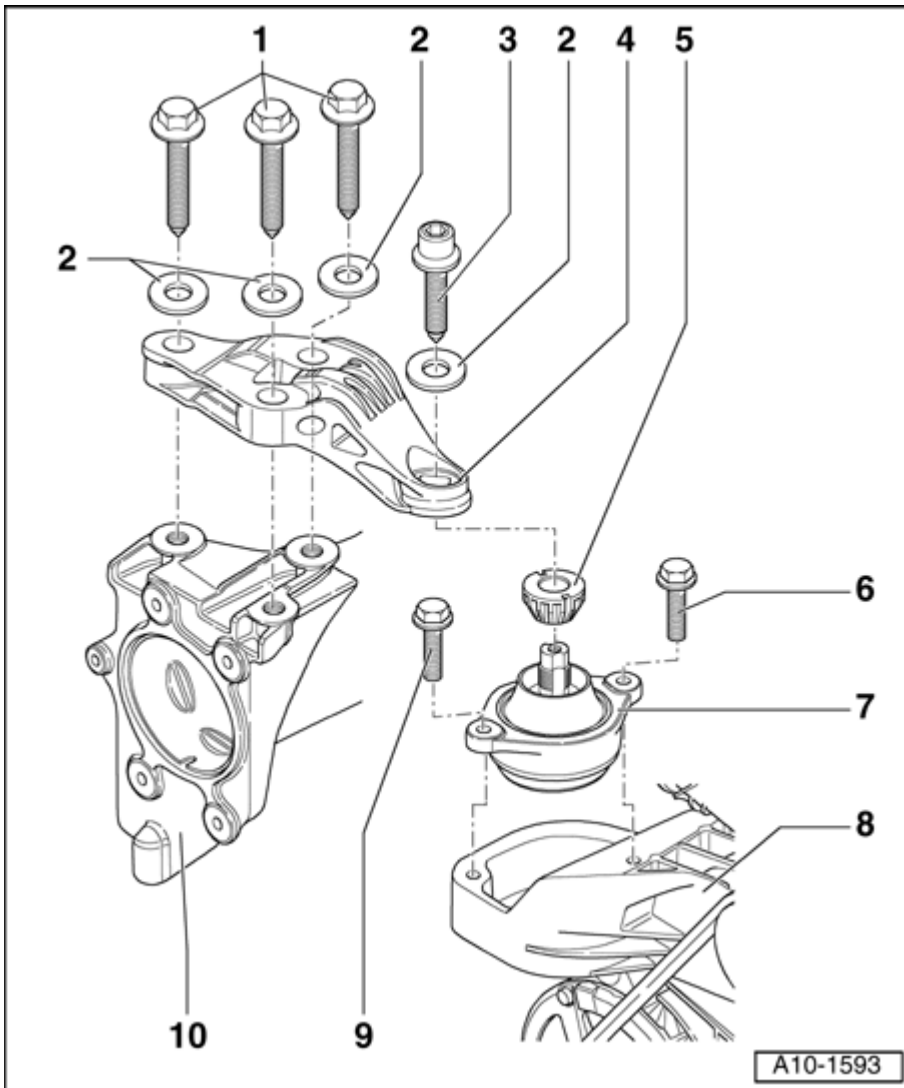


Fig. 114: Torque Support (With Torque Support Valve N382), Assembly Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

2006 Audi A8 Quattro

ENGINE 4.2 Liter V8 5V Engine Mechanical, Engine Code(s): BFM, BGK - A8

1 - 40 Nm

2 - Washer

3 - 40 Nm

4 - Torque bracket

5 - Knurled nut

- For height compensation

6 - 23 Nm

7 - Torque support valve N382

8 - Bracket for torque support valve N382

9 - 23 Nm

10 - Long member

Removing

Special tools, testers and auxiliary items required

- Drill
- Stepped quick-helix drill (dia. 24 mm)

NOTE:

- Before raising the vehicle on a hoist (wheels off the ground), first activate the vehicle jack mode --> 43 - SELF LEVELING SUSPENSION .

- Turn ignition and remove ignition key.
- Turn light switch to "0" position.

For vehicles with parking/auxiliary heater:

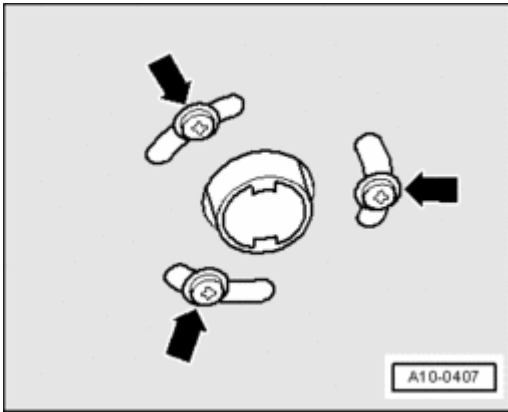


Fig. 115: Removing Bolts For Exhaust Pipe Of Parking Heater/Auxiliary Heater On Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - for exhaust pipe of parking heater/auxiliary heater on noise insulation.

All

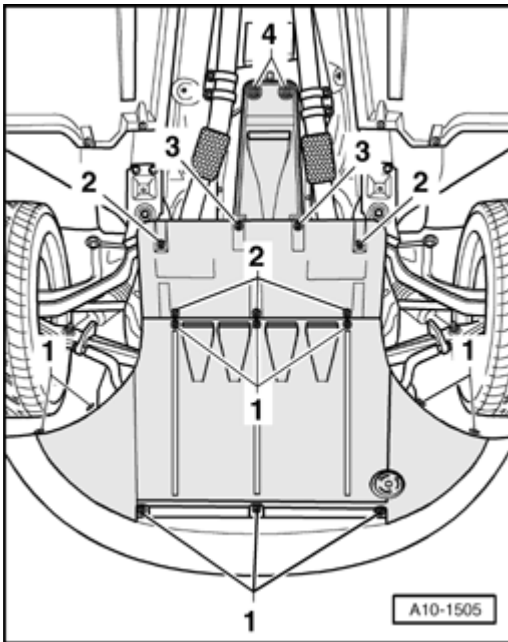


Fig. 116: Loosening Mounting Parts And Removing Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front noise insulation - **1** -.
- Remove front part of wheel housing liner at left and right front --> **66 - EXTERIOR EQUIPMENT** .
- Remove front bumper cover --> **63 - BUMPERS** .

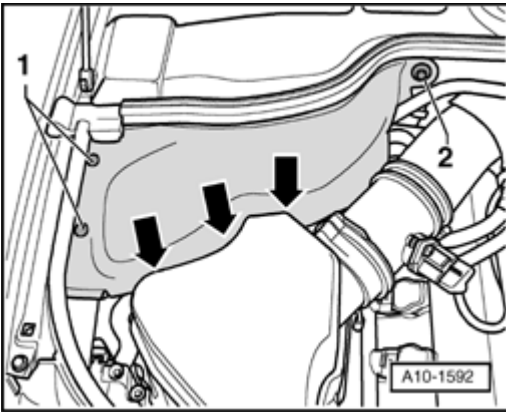


Fig. 117: Identifying Clips & Bolt

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove clips - 1 -.
- Remove bolt - 2 - and remove cover.

NOTE:

- Note clips when installing - arrows -.

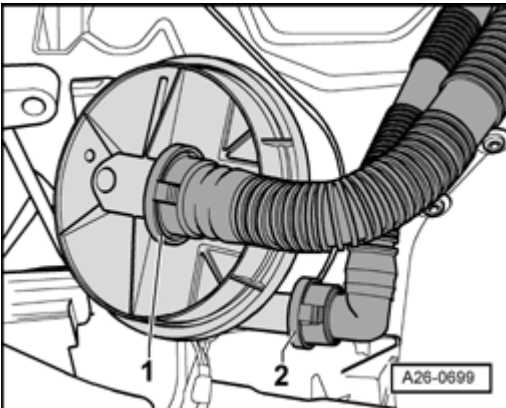
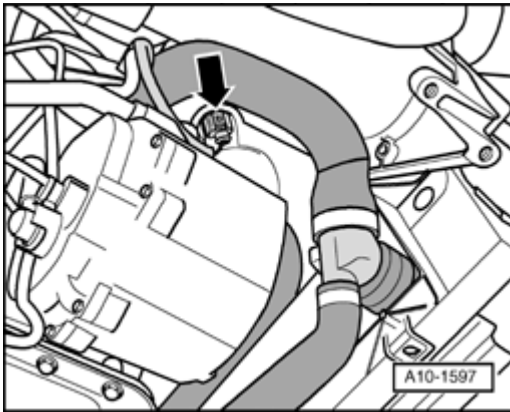


Fig. 118: Disconnecting Intake Air Duct At Secondary Air Injection (AIR) Pump Motor V101

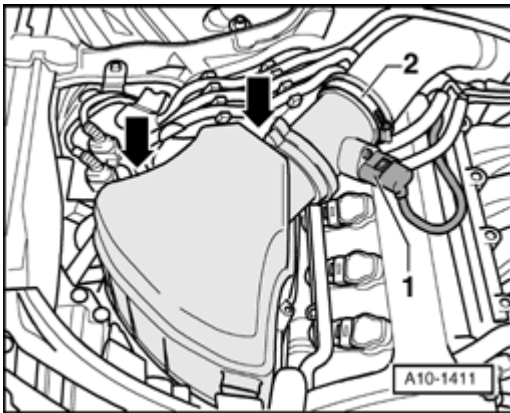
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect intake air duct - 1 - from secondary air injection pump.

**Fig. 119: Disconnecting Electrical Connector**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **arrow** -.

**Fig. 120: Identifying Mass Air Flow (MAF) Sensor Electrical Connector & Air Filter Box**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **1** - from mass air flow (MAF) sensor.
- Disconnect mass air flow sensor from intake air duct - **2** -.
- Remove air filter box - **arrows** -.
- Remove right headlight --> **94 - LIGHTS, SWITCHES - EXTERIOR** .

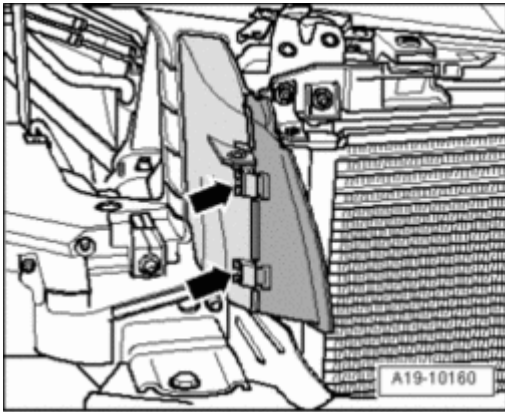


Fig. 121: Depressing Locking Mechanisms And Removing Air Guide At Right Front From Lock Carrier
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Depress locking mechanisms - **arrows** - and remove air guide at right front from lock carrier.

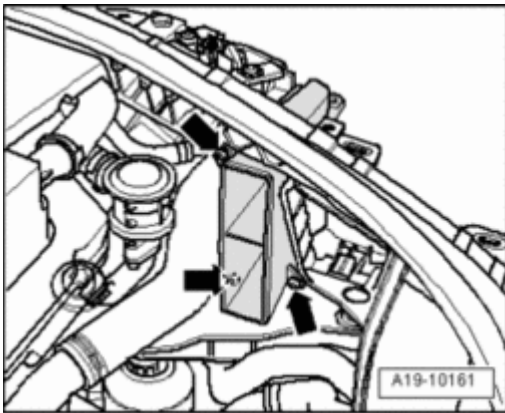


Fig. 122: Removing Bolts And Air Guide
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Remove air guide at right rear from lock carrier.

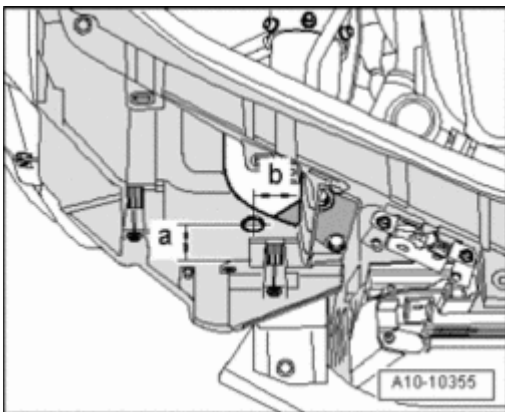


Fig. 123: Marking Holes According To Dimensions At Lock Carrier

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Mark holes according to dimensions - **a** - and - **b** - at lock carrier as shown.
- Dimension - **a** - = 40 mm.
- Dimension - **b** - = 55 mm
- Make a bore dia. 24 mm.

NOTE:

- The bore must be pre-bored and then drilled to dia. 24 mm using stepped quick-helix drill.

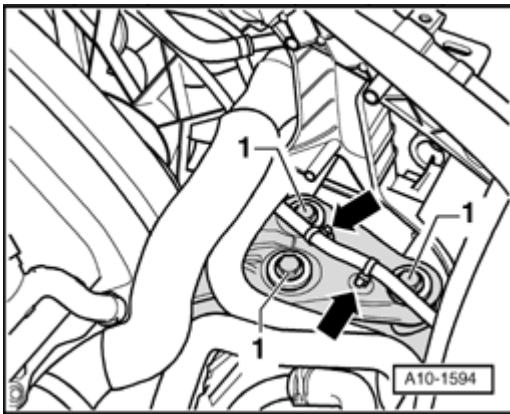


Fig. 124: Identifying Cable & Torque Support Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unclip cable - **arrows** -.

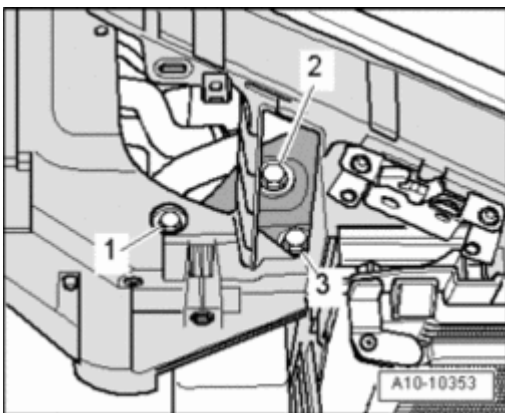


Fig. 125: Tightening Bolts For Torque Support
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **1** - and - **2** - for torque support.
- Loosen bolt - **3** - several turns.

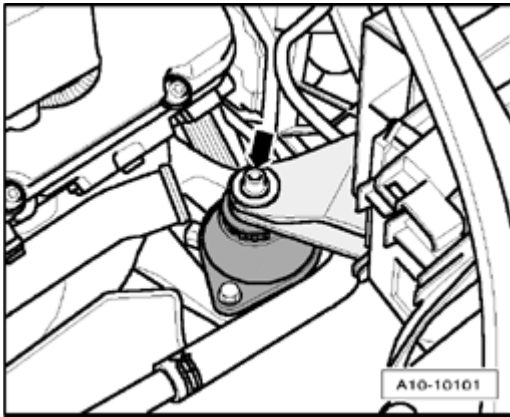


Fig. 126: Tightening Bolt On Torque Support Valve N382
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Separate torque support - **arrow** - from torque support valve N382.

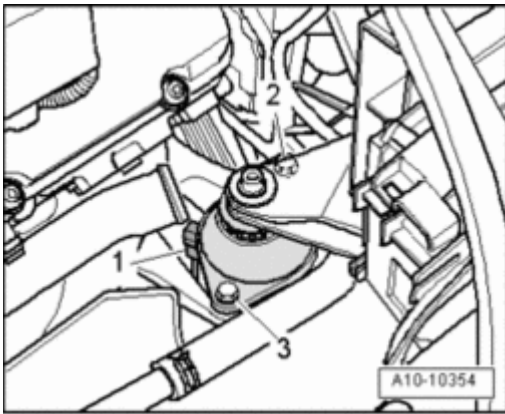


Fig. 127: Removing/Installing Bolts & Disconnect Torque Support Electrical Harness Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **2** - and - **3** -.
- Swivel torque support aside and disconnect electrical harness connector - **1** -.
- Remove torque support valve N382.

Installing

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

NOTE:

- All cable ties which are opened or cut open when removing engine, must be replaced in the same position when installing engine.
- Secure all hose connections using hose clamps appropriate for the model type .

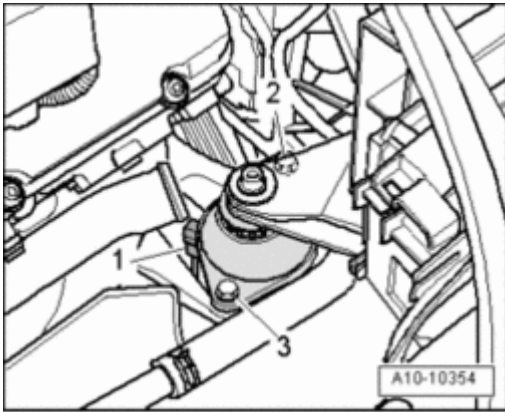


Fig. 128: Removing/Installing Bolts & Disconnect Torque Support Electrical Harness Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect electrical harness connector - 1 - to torque support valve N382.
- Insert torque support valve N382 and tighten bolts - 2 - and - 3 -.

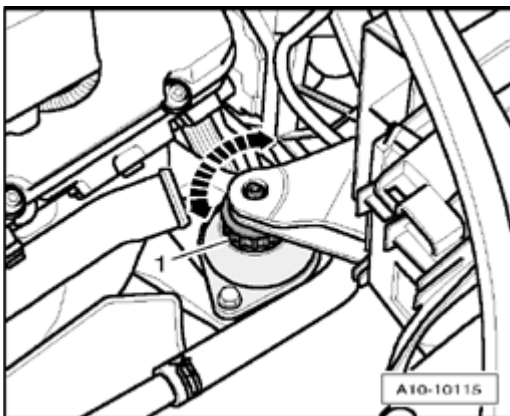


Fig. 129: Turning Adjustment Ring On Torque Support Valve N382 Clockwise Until Stop
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Turn adjustment ring - 1 - on torque support valve N382 clockwise until stop.

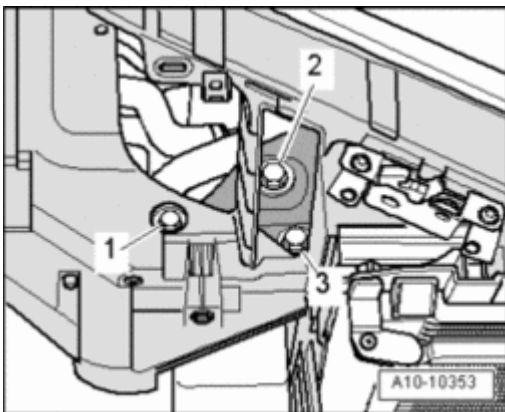


Fig. 130: Tightening Bolts For Torque Support

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten bolts - **1** - and - **3** - for torque support.

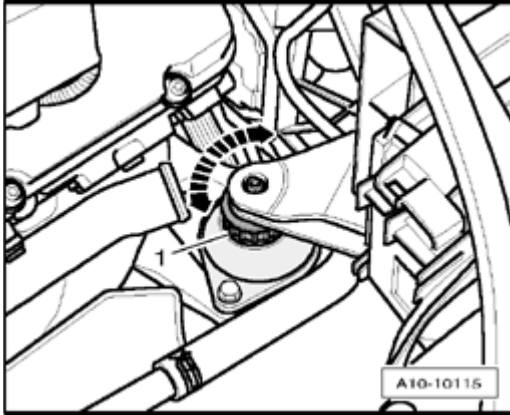


Fig. 131: Turning Adjustment Ring On Torque Support Valve N382 Clockwise Until Stop
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Turn adjustment ring - **1** - by hand counterclockwise until it makes contact at torque support valve N382.
- Then, turn adjustment ring one rotation clockwise again.

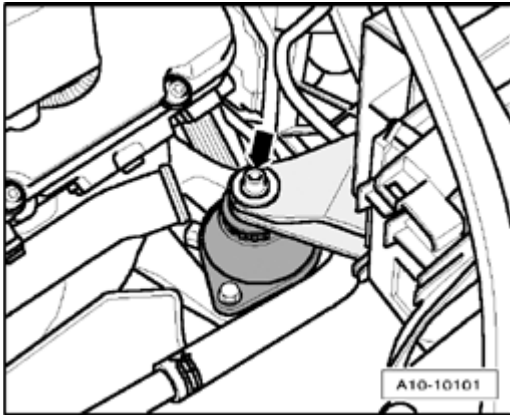


Fig. 132: Tightening Bolt On Torque Support Valve N382
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten bolt - **arrow** - on torque support valve N382.

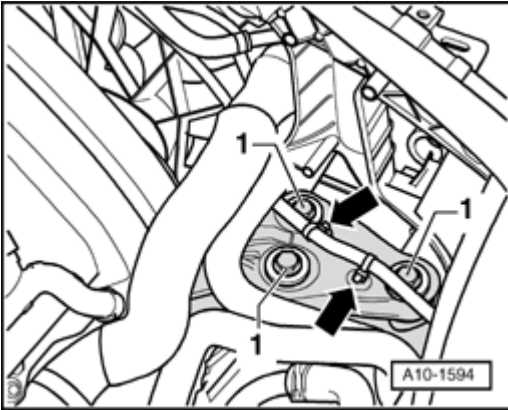


Fig. 133: Identifying Cable & Torque Support Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clip in cable - **arrows** -.
- Install headlamps --> **94 - LIGHTS, SWITCHES - EXTERIOR** .
- Install front bumper cover --> **63 - BUMPERS** .
- Check headlight adjustment --> **01 - MAINTENANCE** .

Torque specifications

Tightening torques --> **Torque support (with torque support valve N382), assembly overview**

13 - ENGINE - CRANKSHAFT, CYLINDER BLOCK

ENGINE, DISASSEMBLING AND ASSEMBLING

Lock carrier, pulling toward front

Special tools, testers and auxiliary items required

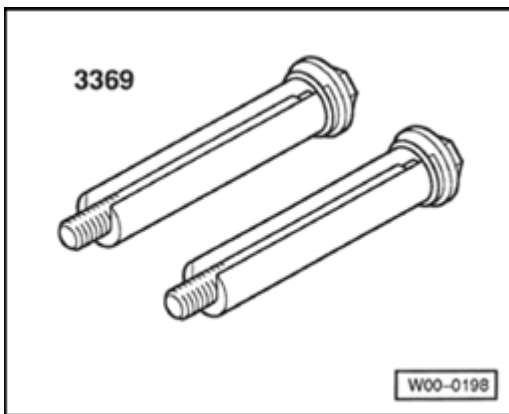


Fig. 134: Support Tool 3369
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Support tool 3369

NOTE:

- Before raising the vehicle on a hoist (wheels off the ground), first activate the vehicle jack mode --> 43 - SELF LEVELING SUSPENSION .

Work procedure

For vehicles with auxiliary heater

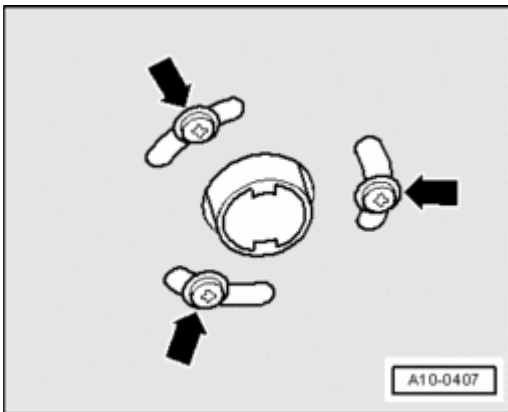


Fig. 135: Removing Bolts For Exhaust Pipe Of Parking Heater/Auxiliary Heater On Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - for exhaust pipe of parking heater/auxiliary heater on noise insulation.

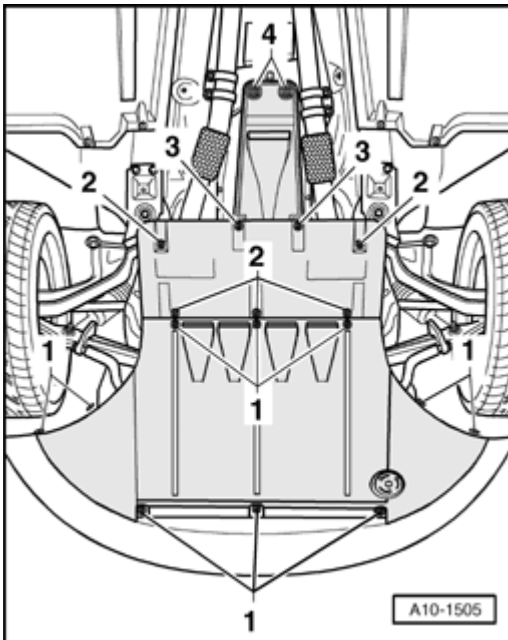
All

Fig. 136: Loosening Mounting Parts And Removing Noise Insulation

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front noise insulation - **1** -.
- Remove front bumper --> **63 - BUMPERS** .

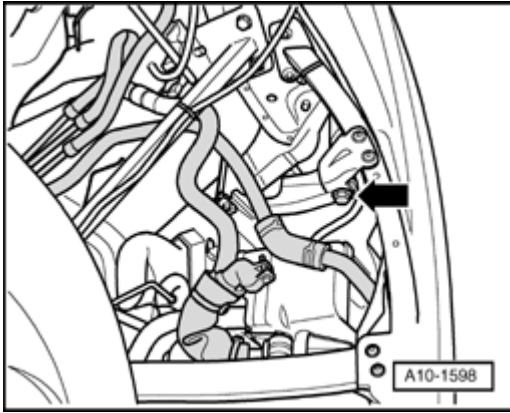


Fig. 137: Removing Bolt On Left/Right

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - **arrow** - on left and right.

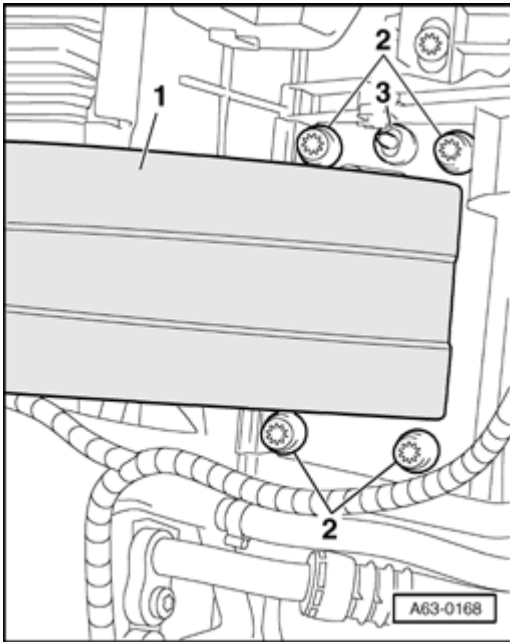


Fig. 138: Removing Bolts On Left/Right

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **2** - on left and right.

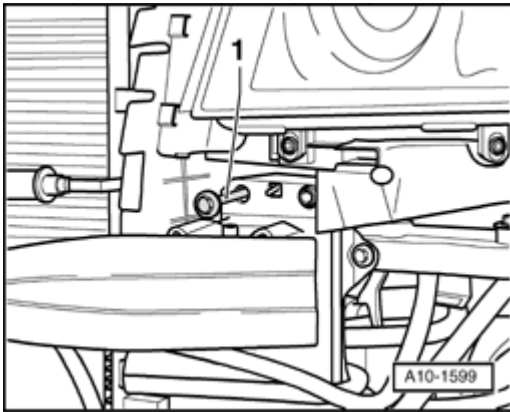


Fig. 139: Installing Bolt From Support Tool 3369 On Left/Right
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install M8x90 bolt - **1** - , e.g. from support tool 3369 on left and right.

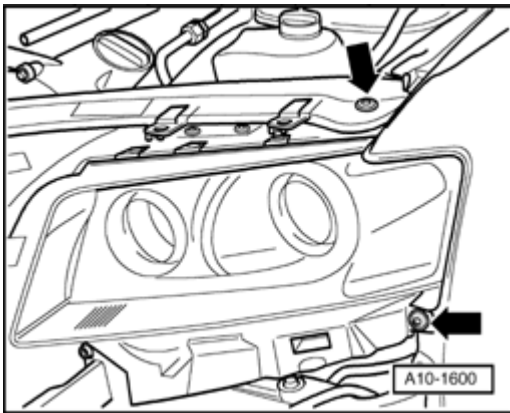


Fig. 140: Removing Bolts And Pulling Lock Carrier Toward Front
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and pull lock carrier toward front.

Installing

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

NOTE:

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

- Install lock carrier with attachments --> **50 - BODY - FRONT** .
- Install front bumper --> **63 - BUMPERS** .
- Adjust headlights --> **94 - LIGHTS, SWITCHES - EXTERIOR** .

Ribbed belt drive, assembly overview

NOTE:

- Before removing toothed belt, mark the running direction with chalk or felt tip marker. A reversed turning direction can cause damage to the belt under operating conditions.
- When installing the ribbed belt, make sure it is seated correctly on the pulleys

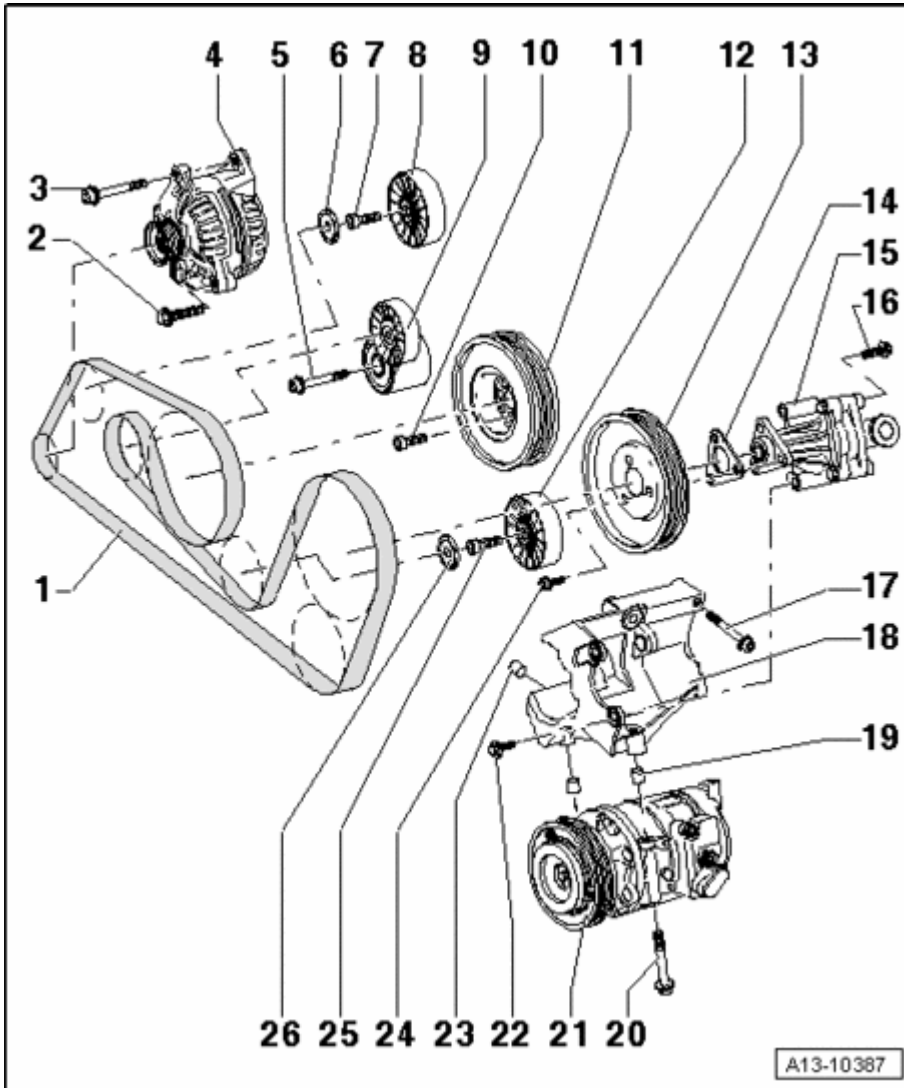


Fig. 141: Ribbed Belt Drive, Assembly Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Ribbed belt

- Removing and installing --> Ribbed belt, removing and installing

2 - 22 Nm

3 - 45 Nm

4 - Generator

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

5 - 43 Nm**6 - Cover**

- For idler pulley

7 - 45 Nm**8 - Upper idler pulley**

- For ribbed belt

9 - Tensioning device for ribbed belt

- To release tension on ribbed belt, swing using box wrench --> **Ribbed belt, removing and installing**

10 - 22 Nm**11 - Vibration damper**

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

12 - Lower idler pulley

- For ribbed belt

13 - Pulley

- For power steering pump
- Removing and installing --> **Removing and installing belt pulley for power steering pump**

14 - Shim

- Different thicknesses
- After replacing power steering vane pump, A/C compressor or bracket for vane pump and A/C compressor, determine thickness --> check alignment of ribbed belt --> **Ribbed belt alignment, checking**

15 - Power steering pump

- For power steering

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

16 - 22 Nm

17 - 40 Nm

18 - Bracket

- For A/C compressor and vane pump

19 - Alignment bushing

- 2 pieces
- Ensure they are seated correctly in bracket

20 - 22 Nm

21 - Air conditioner compressor

22 - 22 Nm

23 - Alignment bushing

- 2 pieces
- Check for proper seating

24 - 22 Nm

25 - 23 Nm

26 - Cover

- For idler pulley

Removing and installing belt pulley for power steering pump

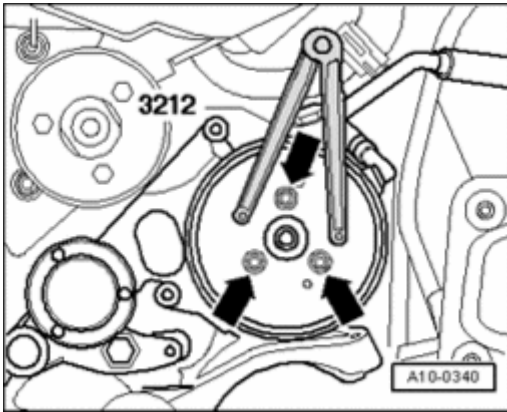


Fig. 142: Removing/Installing Belt Pulley For Power Steering Pump
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lock carrier pulled toward front --> **Lock carrier, pulling toward front.**
- Ribbed belt removed --> **Ribbed belt, removing and installing.**
 - For removing and installing bolts - **arrows** - , use Spanner Wrench 3212 to counter hold.
- Installed location: Writing "front" indicates direction of travel
- Check alignment of ribbed belt --> **Ribbed belt alignment, checking**

Ribbed belt, removing and installing

Special tools, testers and auxiliary items required

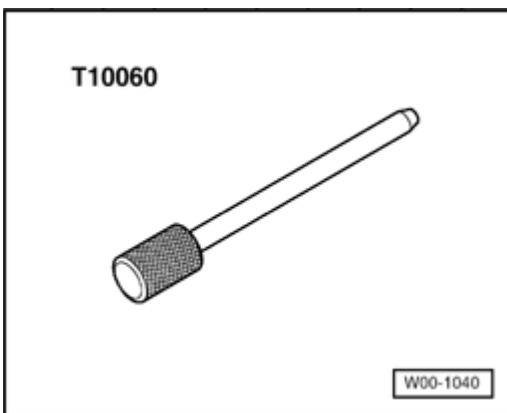


Fig. 143: Locking Pin T10060 A
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Locking Pin T10060 A

Removing

NOTE:

- **Before raising the vehicle on a hoist (wheels off the ground), first activate**

the vehicle jack mode --> 43 - SELF LEVELING SUSPENSION .

For vehicles with parking/auxiliary heater:

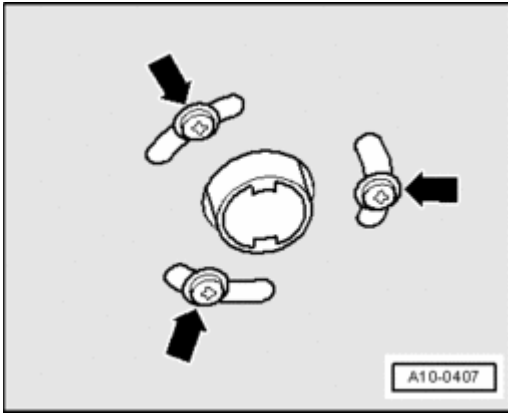


Fig. 144: Removing Bolts For Exhaust Pipe Of Parking Heater/Auxiliary Heater On Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - for exhaust pipe of parking heater/auxiliary heater on noise insulation.

All

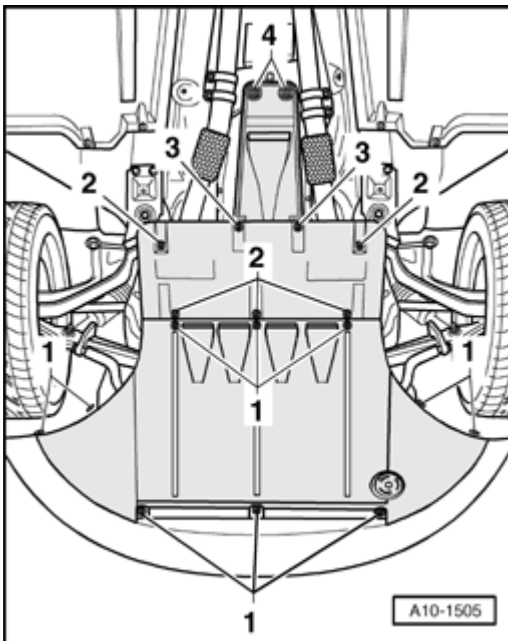


Fig. 145: Loosening Mounting Parts And Removing Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen mounting parts - **1** - and remove noise insulation.

NOTE:

- Before removing toothed belt, mark the running direction with chalk or felt

tip marker. A reversed turning direction can cause damage to the belt under operating conditions.

- Note previously marked direction of belt rotation and be sure that it is seated correctly on pulley.

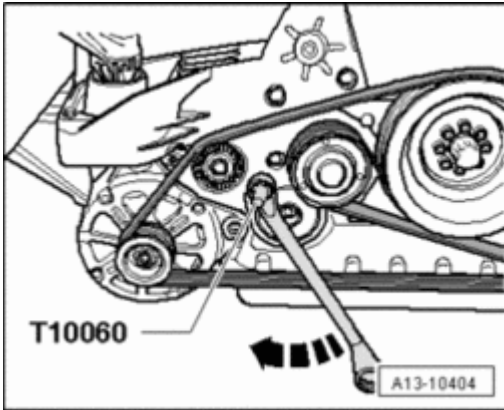


Fig. 146: Tightening Ribbed Belt

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- To loosen ribbed belt, turn tensioner clockwise in direction of - **arrow** - using 19 mm box wrench until two holes are aligned; counter hold in position using drift T10060.
- Remove ribbed belt.

Installing

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

NOTE:

- Check alignment of ribbed belt after replacing the following components --
> Ribbed belt alignment, checking :
- Power steering pump
- Air conditioner compressor
- Bracket for power steering pump and A/C compressor

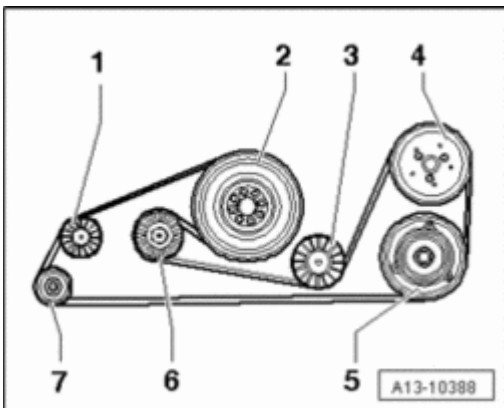
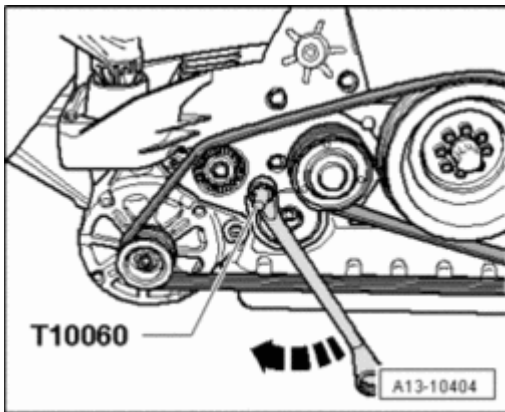


Fig. 147: Ribbed Belt Routing Sequence

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place ribbed belt over belt pulley in specified sequence.

1. Upper idler pulley
2. Crankshaft
3. Lower idler pulley
4. Power steering pump
5. Air conditioner compressor
6. Tensioning device for ribbed belt
7. Generator

**Fig. 148: Tightening Ribbed Belt**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Move ribbed belt tensioner in direction of - **arrow** -.
- Remove mandrel T10060.
- Ensure ribbed belt is seated and routed correctly.
- Start engine and check belt running.

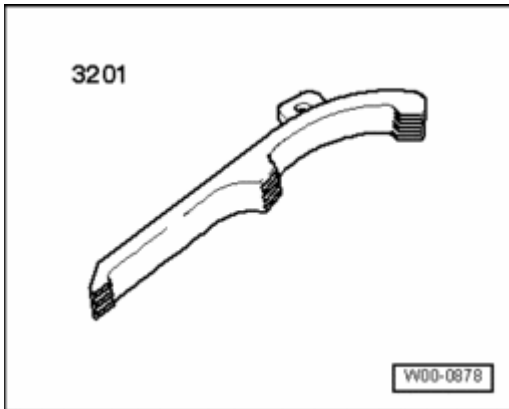
Ribbed belt alignment, checking

Check alignment of ribbed belt after replacing the following components:

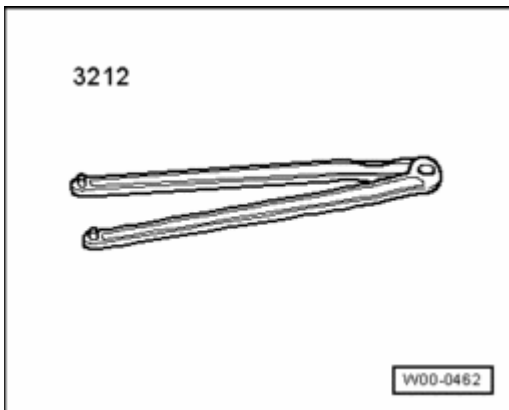
- Power steering pump
- Air conditioner compressor
- Bracket for power steering pump and A/C compressor

NOTE:

- **To prevent damage to the ribbed belt, check alignment of ribbed belt between A/C compressor and power steering vane pump.**

Special tools, testers and auxiliary items required**Fig. 149: Alignment Gauge 3201****Courtesy of VOLKSWAGEN UNITED STATES, INC.**

- Alignment gauge 3201

**Fig. 150: Spanner Wrench 3212****Courtesy of VOLKSWAGEN UNITED STATES, INC.**

- Spanner Wrench 3212

Test sequence

- Lock carrier pulled toward front --> **Lock carrier, pulling toward front.**
- Ribbed belt removed --> **Ribbed belt, removing and installing.**

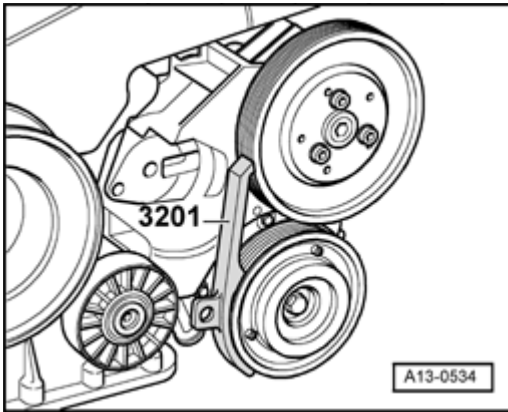


Fig. 151: Placing Alignment Gauge 3201 On Ribbed Belt Pulley Of A/C Compressor
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place alignment gauge 3201 on ribbed belt pulley of A/C compressor.
- Ribbed belt pulley of vane pump and ribbed belt pulley of A/C compressor must align.

If ribbed belt pulleys do not align:

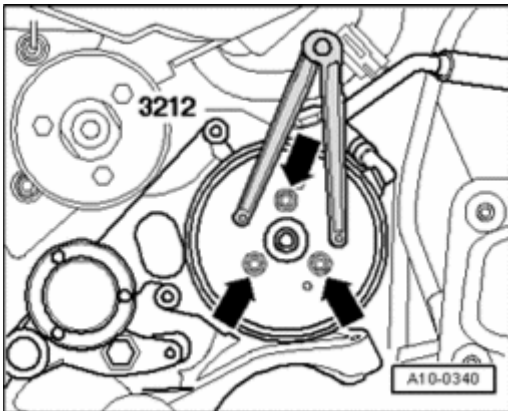


Fig. 152: Removing/Installing Belt Pulley For Power Steering Pump
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - of ribbed belt pulley for vane pump.

NOTE:

- For removing and installing bolts use spanner wrench 3212 to counter hold.
- Installed location: Writing "front" on ribbed belt pulley indicates direction of travel.

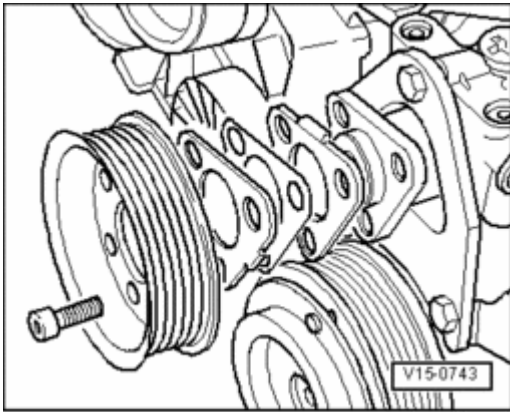


Fig. 153: Adjusting Distance Between Ribbed Belt Pulley Of Vane Pump To Ribbed Belt Pulley Of A/C Compressor Using Spacer Discs

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Adjust distance between ribbed belt pulley of vane pump to ribbed belt pulley of A/C compressor using spacer discs of 0.5, 1.0 and 1.5 mm, part number .
- Check alignment of ribbed belt pulleys using alignment gauge 3201. Readjust if necessary.

NOTE:

- **Secure all hose connections using hose clamps appropriate for the model type .**

Torque specifications

Component	Nm
Pulley to power steering vane pump	22

Vibration damper, removing and installing

Removing

- Lock carrier pulled toward front --> **Lock carrier, pulling toward front.**
- Ribbed belt removed --> **Ribbed belt, removing and installing.**

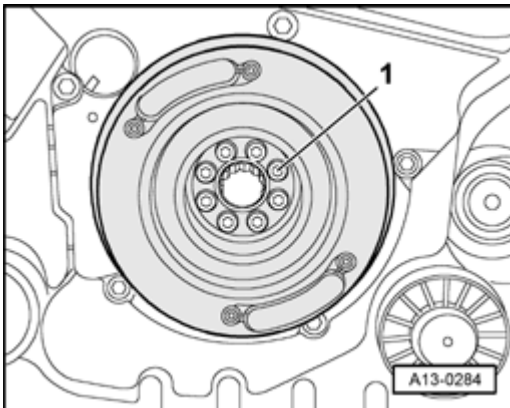


Fig. 154: Removing Vibration Damper Of Crankshaft After Removing 8 Attachment Bolts
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove vibration damper of crankshaft after removing 8 attachment bolts - 1 -.

Installing

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

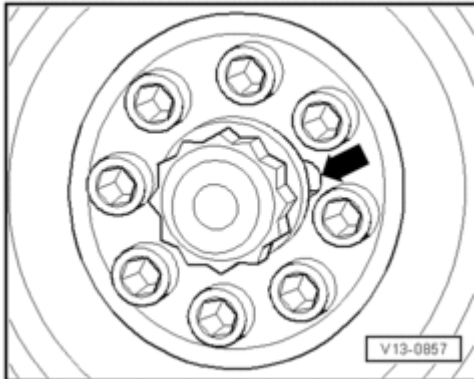


Fig. 155: Making Sure That Notch In Vibration Damper Aligns With Locating Lug On Toothed Belt Gear
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- When installing, make sure that notch - **arrow** - in vibration damper aligns with locating lug on toothed belt gear.

Torque specifications

Component	Nm
Vibration damper to crankshaft gear	22

Toothed belt guards, assembly overview

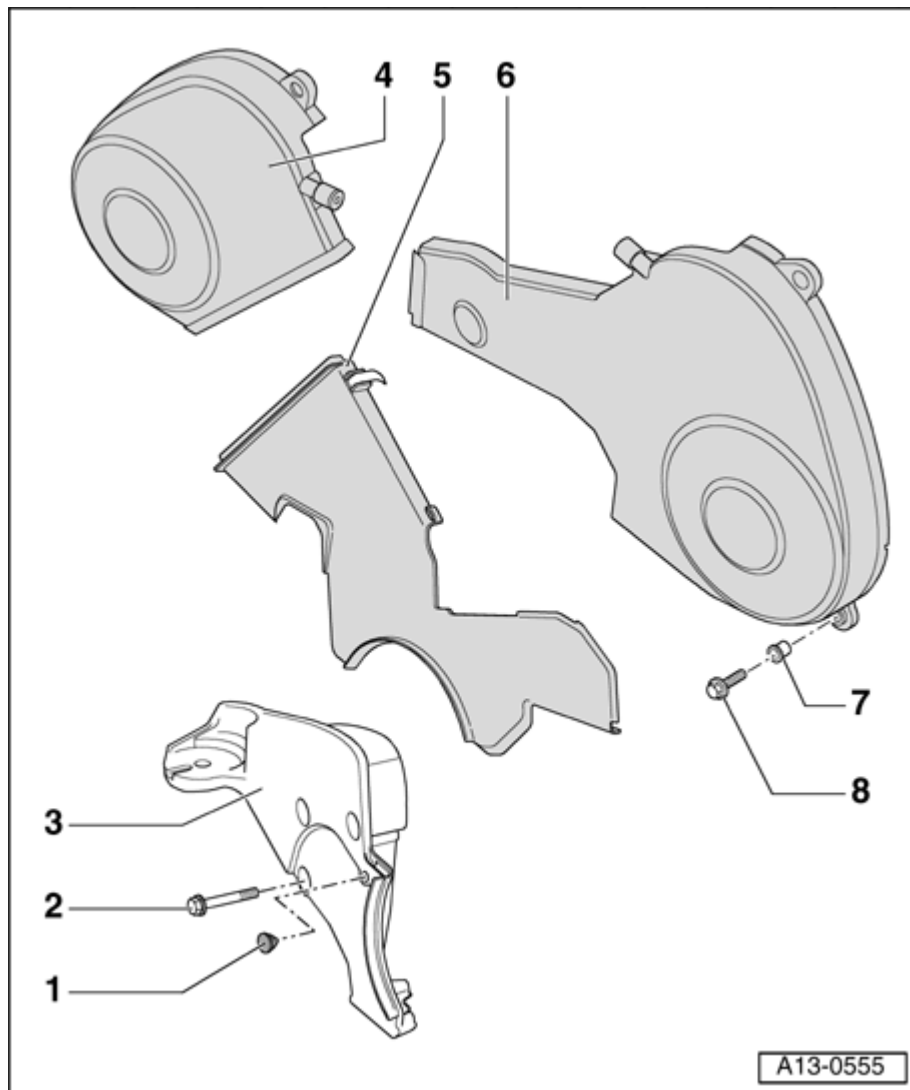


Fig. 156: Toothed Belt Guards, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Plugs

2 - 43 Nm

3 - Bracket

- For Torque Support Valve N382

4 - Toothed belt guard, right

5 - Toothed belt guard, center

6 - Toothed belt guard, left

7 - Sleeve

8 - 10 Nm

Toothed belt drive, assembly overview

NOTE:

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

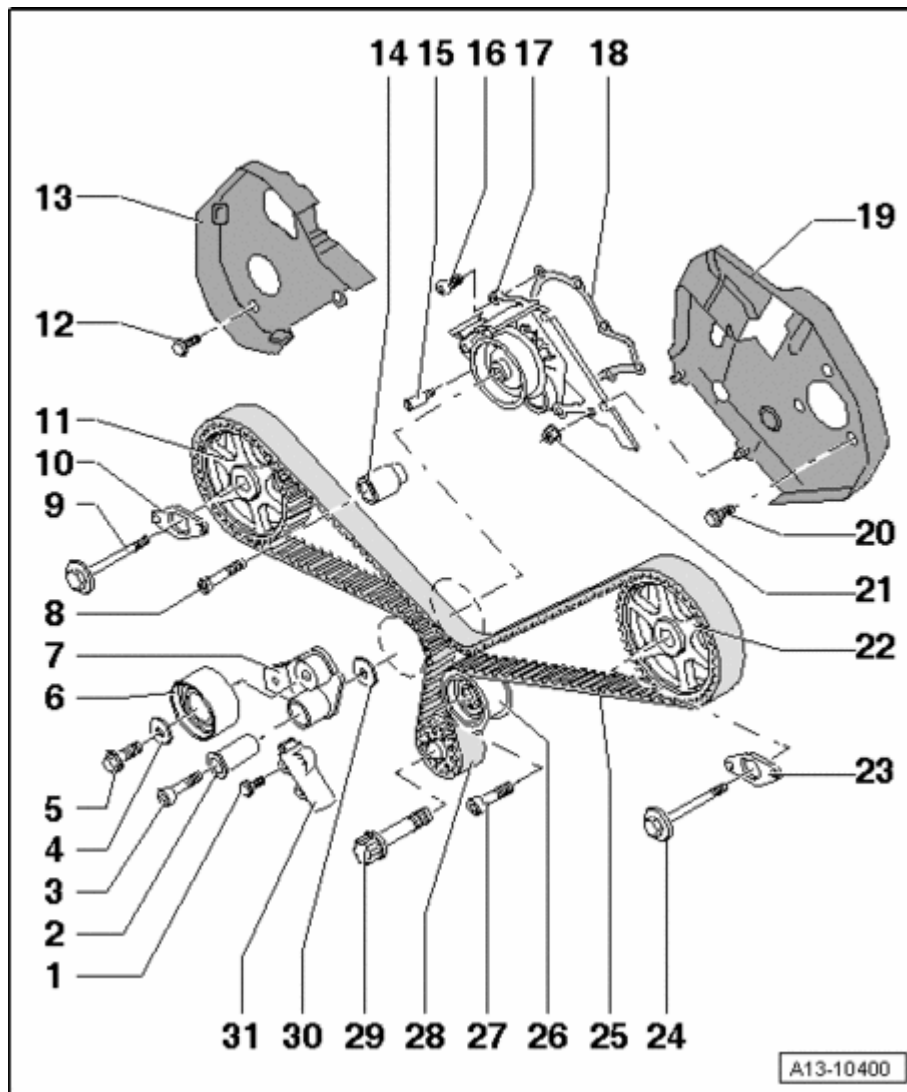


Fig. 157: Toothed Belt Drive, Assembly Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - 10 Nm

2 - Mounting pin

3 - 20 Nm plus an additional 90° ($\frac{1}{4}$ turn)

- Replace

4 - Washer

- For tensioning roller

5 - 40 Nm

6 - Tensioning roller

7 - Tensioning lever

8 - 22 Nm

9 - 55 Nm

- Replace
- Grease thread and head seating surface

10 - Securing plate

- Replace
- Side with writing "rear hinten" points toward rear

11 - Right camshaft gear

- When removing and installing, remove toothed belt --> **Toothed belt, removing and installing**
- Pull off using puller T40001 and claws T40001/2

12 - 10 Nm

- Insert with locking fluid
- Locking fluid

13 - Right rear toothed belt guard

14 - Idler roller

15 - Pin bolt, 9 Nm

16 - 14 Nm

- Bolt class 10.9

17 - Coolant pump

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

18 - Gasket

- Replace

19 - Left rear toothed belt guard

20 - 10 Nm

- Insert with locking fluid
- Locking fluid

21 - 10 Nm

22 - Left camshaft gear

- When removing and installing, remove toothed belt --> **Toothed belt, removing and installing**
- Pull off using puller T40001 and claws T40001/2

23 - Securing plate

- Replace
- Side with writing "rear hinten" points toward rear

24 - 55 Nm

- Replace
- Grease thread and head seating surface

25 - Toothed belt

- Before removing, mark direction of rotation using chalk or felt-tip marker
- Check for wear
- Removing --> **Toothed belt, removing and installing**
- Installing (adjusting valve timing) --> **Toothed belt, removing and installing**

26 - Eccentric roller

27 - 45 Nm

28 - Crankshaft toothed belt sprocket

- There must be no oil on contact surface between toothed belt sprocket and crankshaft
- Only possible to install in one position

29 - 200 Nm plus an additional $1/2$ turn (180°)

- Replace
- Do not oil lubricate additionally
- Use crankshaft holder 3242 for loosening and tightening
- Install crankshaft holder 3242 --> **Fig. 167**

30 - Washer

- For tension lever

31 - Tensioning element

Toothed belt, removing and installing

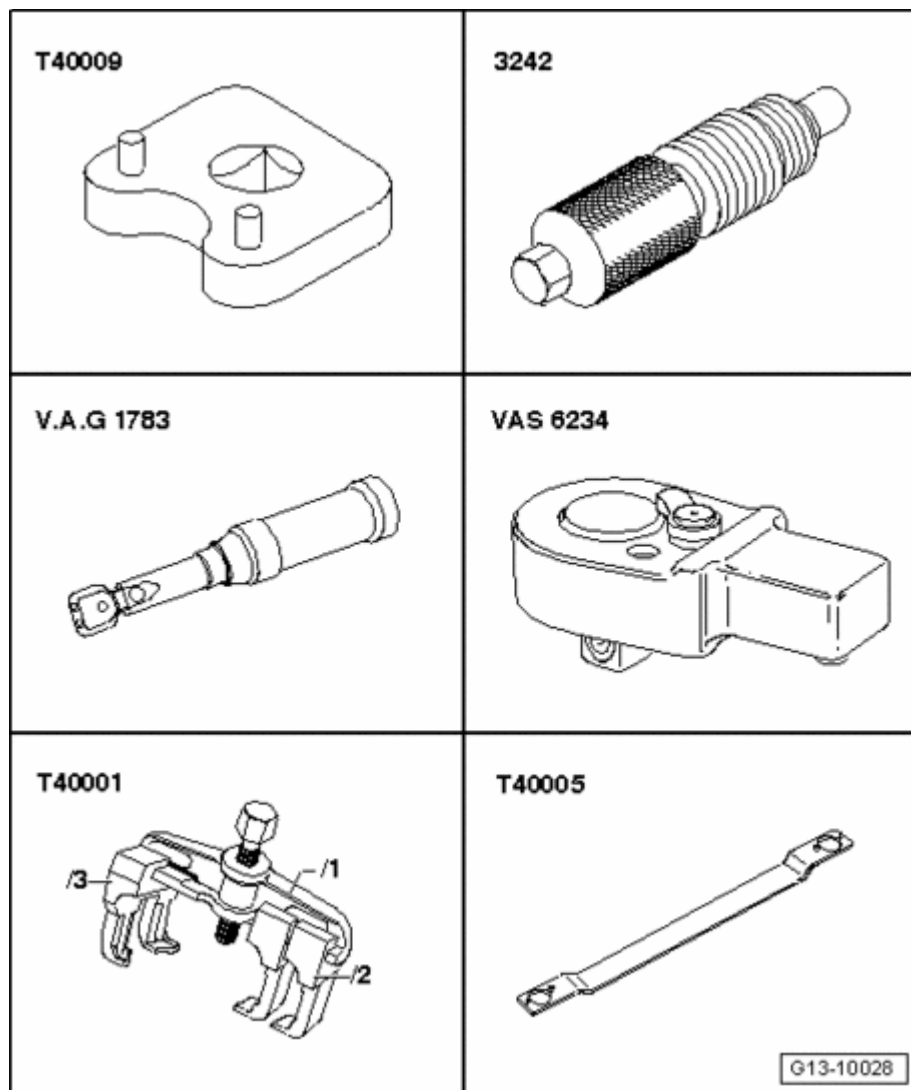
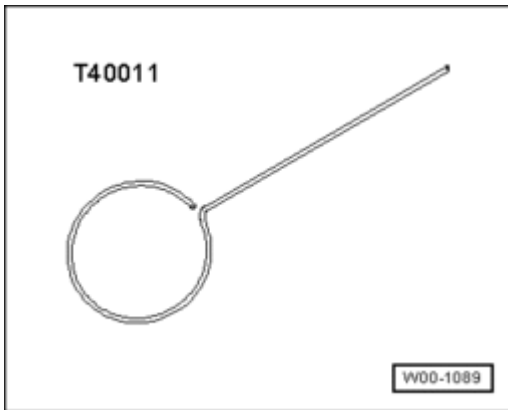


Fig. 158: Identifying Special Tools - Toothed Belt, Removing And Installing
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

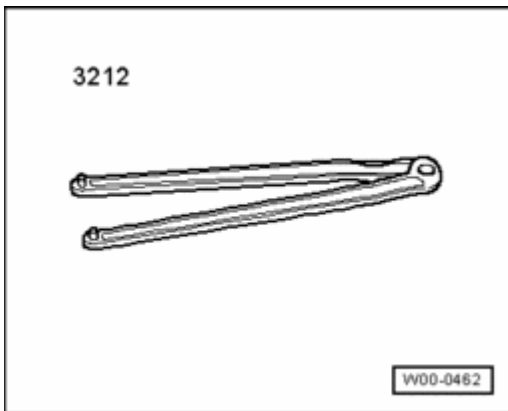
Special tools, testers and auxiliary items required

- Tightener pulley wrench T40009
- Crankshaft Holder 3242
- Torque wrench V.A.G 1783
- Ratchet 1/4" VAS 6234
- Puller T40001 with claws T40001/2
- Camshaft locator T40005

**Fig. 159: Securing Pin T40011**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Securing pin T40011

**Fig. 160: Spanner Wrench 3212**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Spanner Wrench 3212

Toothed belt, removing

NOTE:

- Before raising the vehicle on a hoist (wheels off the ground), first activate the vehicle jack mode --> **43 - SELF LEVELING SUSPENSION** .
- Remove front bumper --> **63 - BUMPERS** .
- Remove lock carrier --> **50 - BODY - FRONT** .
- Remove ribbed belt --> **Ribbed belt, removing and installing**

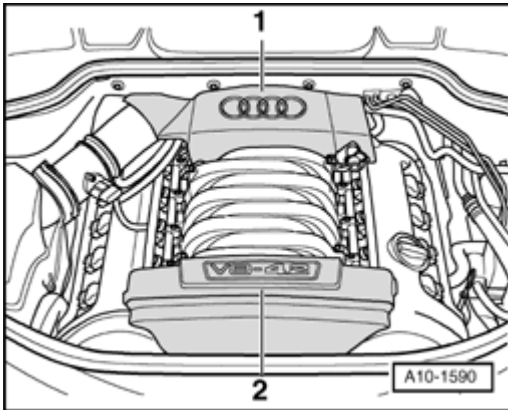


Fig. 161: Removing Engine Cover

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove engine cover - 2 - upward.
- Remove upper toothed belt guard at left and right.

CAUTION: Only turn over the engine at the crankshaft in direction of engine rotation (clockwise).

- Turn crankshaft at center bolt of toothed belt gear in direction of engine rotation to TDC Cyl. 5 5 marking.

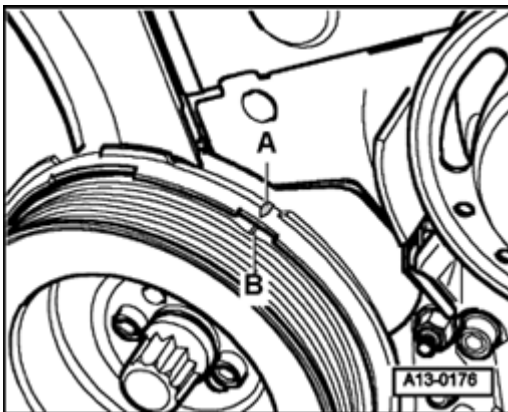


Fig. 162: Identifying Notch Aligns With Marking

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Notch - B - aligns with marking - A -

NOTE:

- Turning over engine is performed at the center bolt of the crankshaft.

- Check position of camshafts:

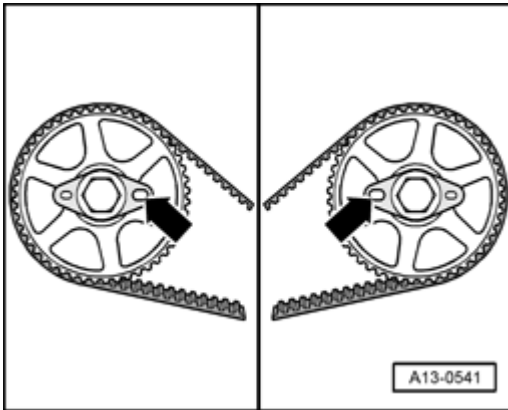


Fig. 163: Identifying Large Holes On Securing Plates At Camshaft Gears Aligns On Inside
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- The large holes - **arrows** - on securing plates at camshaft gears must align on inside.
- In case they do not align, turn one more rotation.

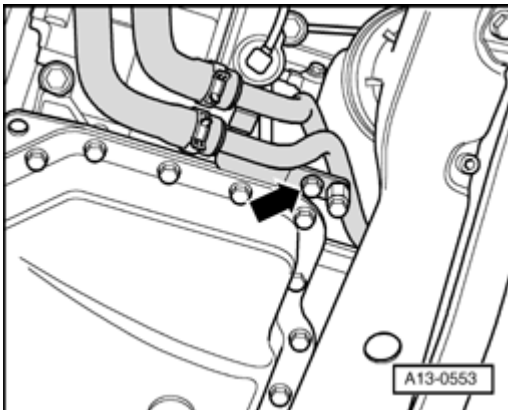


Fig. 164: Disconnecting Water Pipe From Oil Pan
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect water pipe - **arrow** - from oil pan.

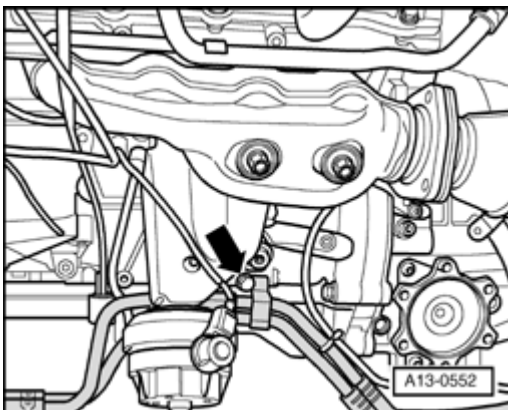


Fig. 165: Disconnecting Water Pipe From Engine Block

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect water pipe from engine block - **arrow** -.

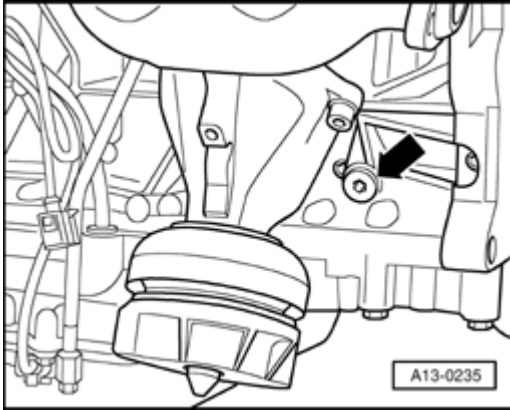


Fig. 166: Removing Locking Bolt Of TDC Marking At Upper Part Of Oil Pan
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove locking bolt - **arrow** - of TDC marking at upper part of oil pan.

NOTE:

- In the crankshaft, a TDC bore is located exactly behind the locking bolt (can be felt by touch).

CAUTION: Do not rotate crankshaft while touching TDC mark with finger - danger of injury.

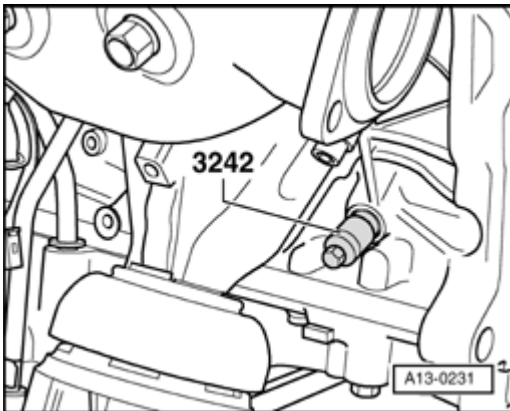


Fig. 167: Installing Crankshaft Holder 3242 In Hole For Removed Locking Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install crankshaft holder 3242 in hole for removed locking bolt.

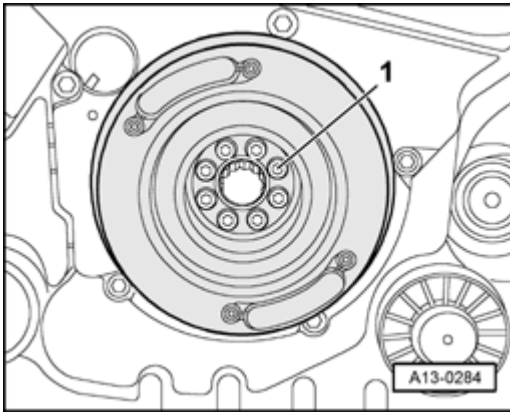


Fig. 168: Removing Vibration Damper Of Crankshaft After Removing 8 Attachment Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove vibration damper of crankshaft after removing 8 attachment bolts - 1 -.
- Remove center toothed belt cover.

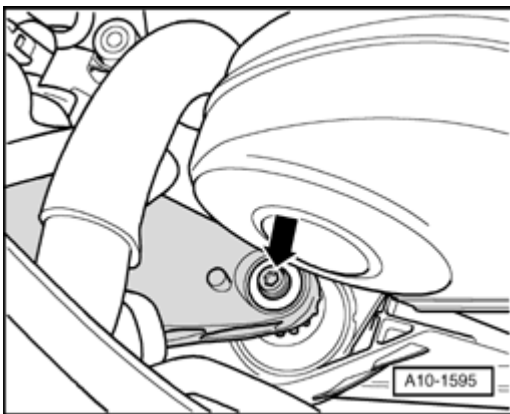


Fig. 169: Separating Torque Support From Torque Support Valve N382
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Separate torque support - **arrow** - from torque support valve N382.

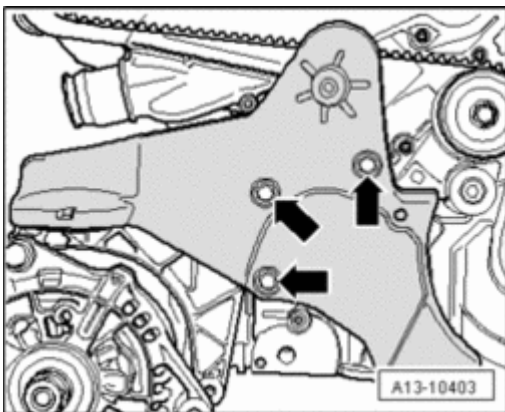


Fig. 170: Removing Bracket For Torque Support Valve N382

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bracket for torque support valve N382 - **arrows** -.

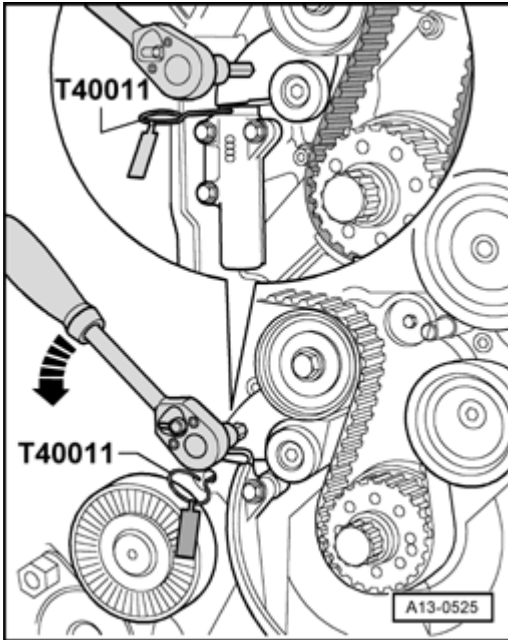


Fig. 171: Using Hex Socket Wrench To Turn Toothed Belt Tensioner
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using an 8 mm hex socket wrench, turn toothed belt tensioner in direction of - **arrow** - until tensioning lever pushes tensioner together far enough so that locking pin T40011 can be inserted into bores of pistons and housing.

NOTE:

- When inserting, bracket for torque support valve N382 remains installed. The locking pin can be guided through a hole in the bracket to be inserted into the holes in the tensioner.
- The toothed belt tensioner is oil-dampened. Compress it by slowly applying constant pressure.
- Mark direction of rotation of toothed belt. Reversed running direction can cause damage.

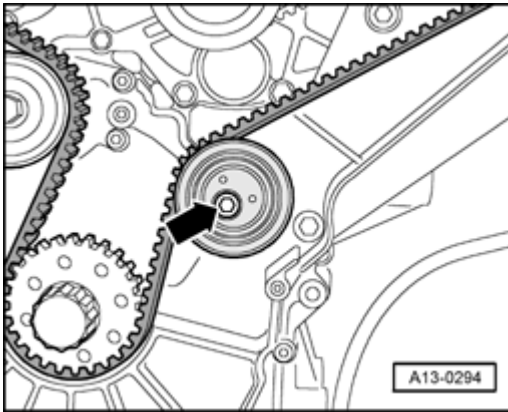


Fig. 172: Loosening Bolt Of Eccentric Pulley
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen bolt - **arrow** - of eccentric pulley.

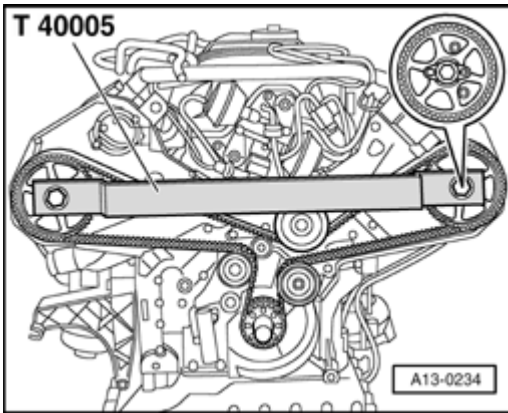


Fig. 173: Installing Camshaft Adjustment T40005 In Locking Plates Of Camshafts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install camshaft adjustment T40005 in locking plates of camshafts.
- Loosen both camshaft gear bolts approx. 5 turns.

NOTE: • **The camshaft adjustment T40005 serves as a retainer.**

- Remove camshaft adjustment T40005.

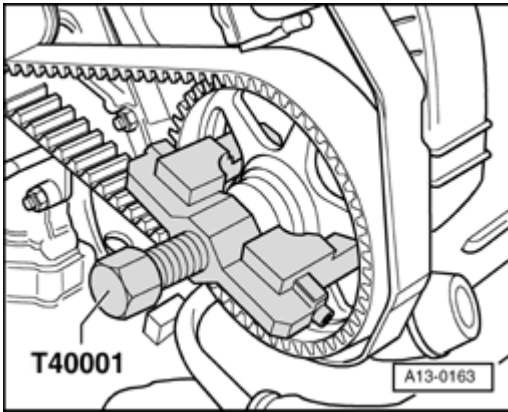


Fig. 174: Removing Left/Right Camshaft Gears From Cone Using Puller T40001 With Claw T40001/2
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove left and right camshaft gears from cone using Puller T40001 with Claw T40001/2.
- Remove toothed belt.

CAUTION: Check gears after removing. If dents are visible, replace camshaft gears.

Installing (Adjusting valve timing)

NOTE:

- When turning camshaft, crankshaft must not be at TDC. Valves and/or pistons may be damaged.

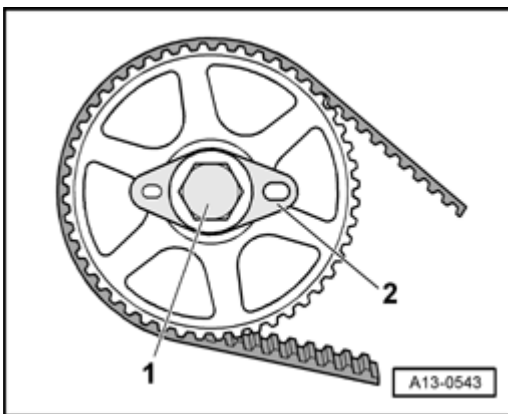


Fig. 175: Replacing Bolts For Camshaft Gears And Securing Plates
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Replace bolts - 1 - for camshaft gears and securing plates - 2 -.
- Grease threads and head seating surfaces of bolts for camshaft gears.
- Install bolts far enough so that they can still just be turned and do not cant.
- Observe proper seating of securing plates on camshafts.

Before installing toothed belt, make sure crankshaft and camshafts are set to TDC cylinder 5:

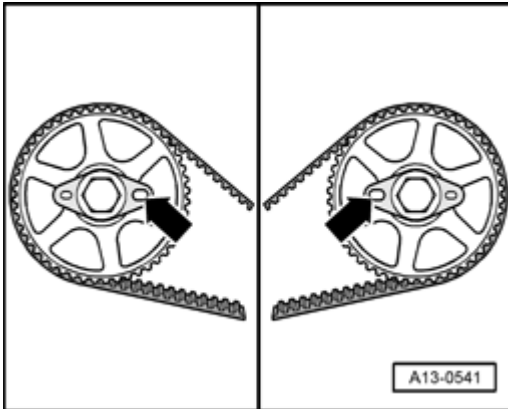


Fig. 176: Identifying Large Holes On Securing Plates At Camshaft Gears Aligns On Inside
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- The large holes - **arrows** - on securing plates at camshaft gears must align on inside.

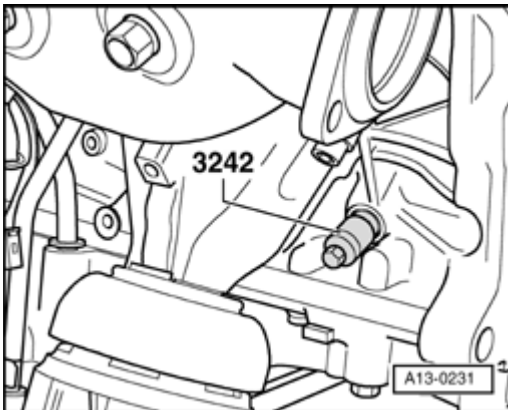


Fig. 177: Installing Crankshaft Holder 3242 In Hole For Removed Locking Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Crankshaft holder 3242 must be installed.

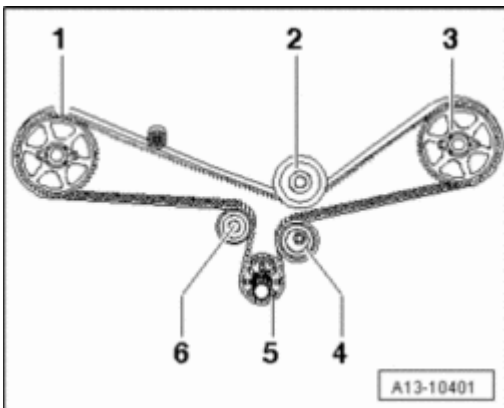


Fig. 178: Routing Toothed Belt In Following Sequence

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Route toothed belt in the following sequence: Toothed belt gear crankshaft - **5** - , eccentric pulley - **4** - , tensioner - **6** - , toothed belt gear left camshaft - **3** - , coolant pump - **2** - .
- At last, place toothed belt on toothed belt gear of right camshaft - **1** - .

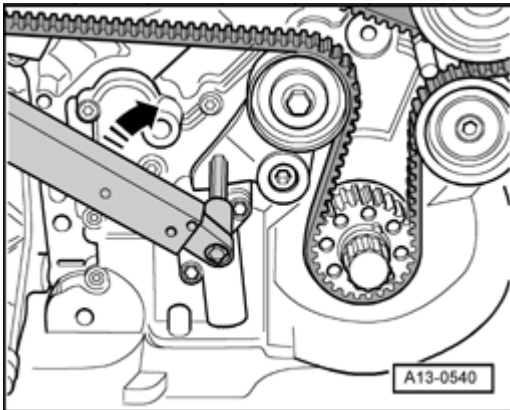


Fig. 179: Turning Tensioning Lever Twice In Direction Of To Pretension Toothed Belt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Turn tensioning lever twice at 40 Nm in direction of - **arrow** - to pretension toothed belt.

NOTE:

- In the next two illustrations, depicted with torque support bracket removed, for the sake of illustration.

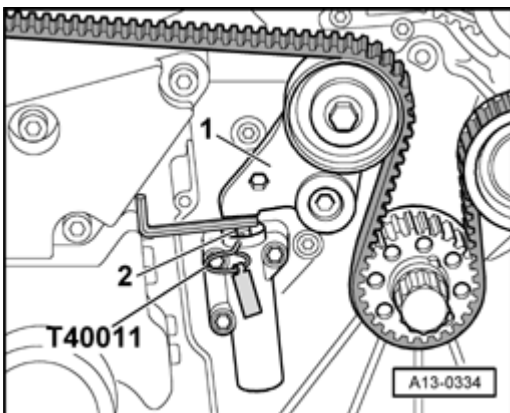


Fig. 180: Inserting Hex Socket Wrench Flat Between Tensioning Lever And Piston Of Tensioner
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert a 5 mm hex socket wrench flat between tensioning lever - **1** - and piston - **2** - of tensioner.

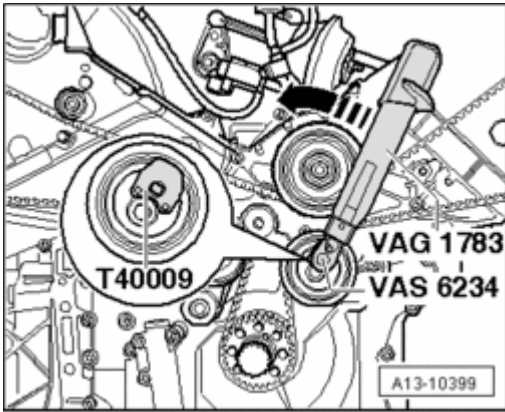


Fig. 181: Tightening Toothed Belt By Turning Eccentric Pulley Using Tightener Pulley Wrench T40009 And Turning Torque Wrench V.A.G 1783 Using Ratchet VAS 6234

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten toothed belt by turning eccentric pulley using tightener pulley wrench T40009 and turn torque wrench V.A.G 1783 using ratchet VAS 6234 in direction of - **arrow** - and hold.
- Protection torque 6 Nm
- Tighten eccentric pulley.

NOTE:

- **Make sure that position does not change while tightening.**

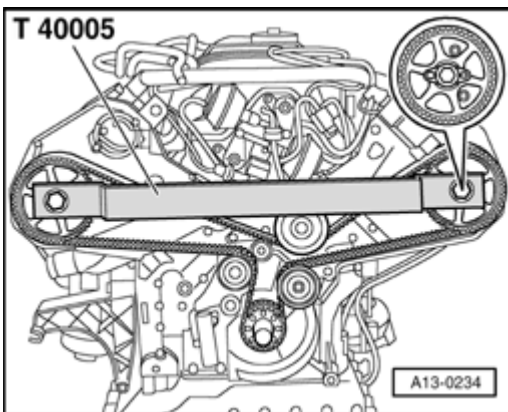


Fig. 182: Installing Camshaft Adjustment T40005 In Locking Plates Of Camshafts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert camshaft adjustment T40005 into securing plates of both camshafts.
- Press in camshaft adjustment as far as possible.
- Tighten camshaft gears.

NOTE:

- **The camshaft adjustment T40005 serves as a retainer.**

- Remove camshaft adjustment T40005.
- Remove 5 mm hex socket wrench.

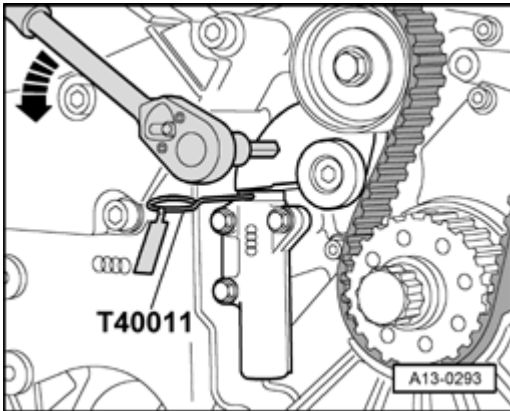


Fig. 183: Turning Tensioning Lever Using Hex Socket Wrench Until Locking Pin T40011 Can Be Pulled Out

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Turn tensioning lever using 8 mm hex socket wrench in direction of - **arrow** - until Locking Pin T40011 can be pulled out.
- Remove crankshaft holder 3242.
- Turn crankshaft two complete rotations in direction of engine rotation until crankshaft stands at TDC cyl. 5 again.

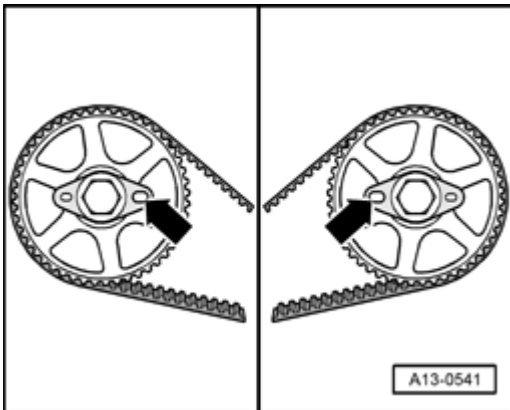


Fig. 184: Identifying Large Holes On Securing Plates At Camshaft Gears Aligns On Inside

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- The large holes - **arrows** - on securing plates at camshaft gears must align on inside.

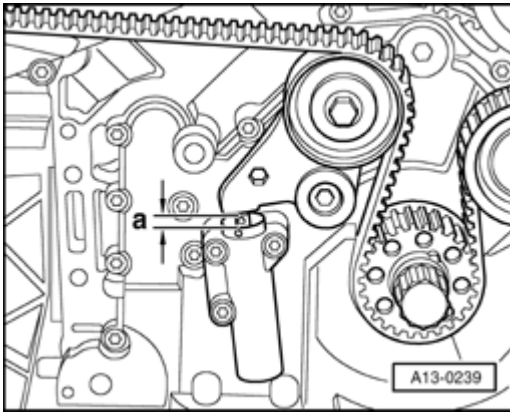


Fig. 185: Checking Dimension Between Tensioning Lever And Tensioner Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check dimension - **a** - between tensioning lever and tensioner housing.
- Dimension - **a** - = 5.0 ± 1.0 mm

NOTE:

- If dimension - **a** - is not obtained, repeat adjustment.

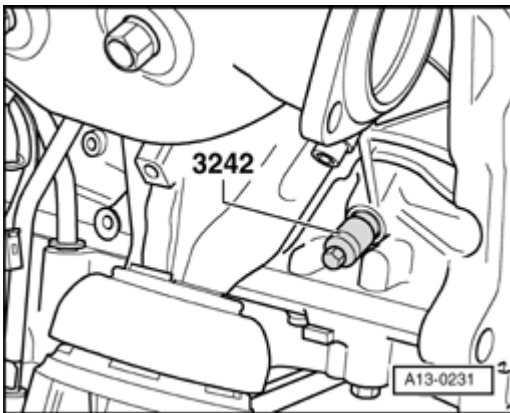


Fig. 186: Installing Crankshaft Holder 3242 In Hole For Removed Locking Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- To check timing, bolt crankshaft holder 3242 in bore at upper part of oil pan again.

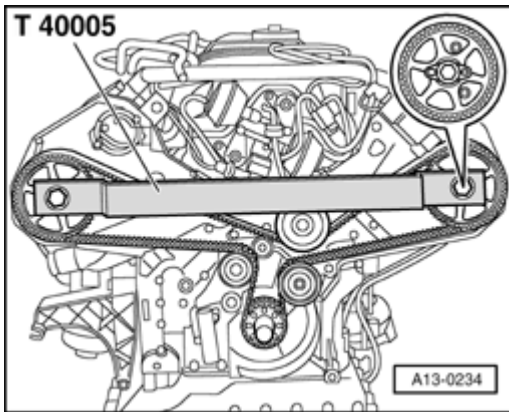


Fig. 187: Installing Camshaft Adjustment T40005 In Locking Plates Of Camshafts
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check camshaft positions using camshaft adjustment T40005.

NOTE:

- If camshaft locator cannot be inserted, repeat adjustment.

- Remove camshaft adjustment T40005 from both cylinder heads.
- Remove crankshaft holder 3242.
- Bolt locking bolt of TDC marking into upper part of oil pan using new sealing ring.

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

NOTE:

- Replace gaskets, seals and O-rings.
- Secure all hose connections using hose clamps appropriate for the model type .

- Install ribbed belt --> **Ribbed belt, removing and installing.**
- Install lock carrier with attachments --> **50 - BODY - FRONT** .
- Fill with coolant.
- Install torque support --> **Torque support (with torque support valve N382), assembly overview.**

NOTE:

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

Torque specifications

Component	Nm
Eccentric pulley to cylinder block	45
Camshaft sprocket to camshaft	55

2006 Audi A8 Quattro

ENGINE 4.2 Liter V8 5V Engine Mechanical, Engine Code(s): BFM, BGK - A8

Sealing plug in upper section of oil pan	35
Vibration damper to crankshaft gear	22
Tension roller for ribbed belt	43

SEALING FLANGE AND DRIVE PLATE, ASSEMBLY OVERVIEW

Sealing flange and drive plate, assembly overview

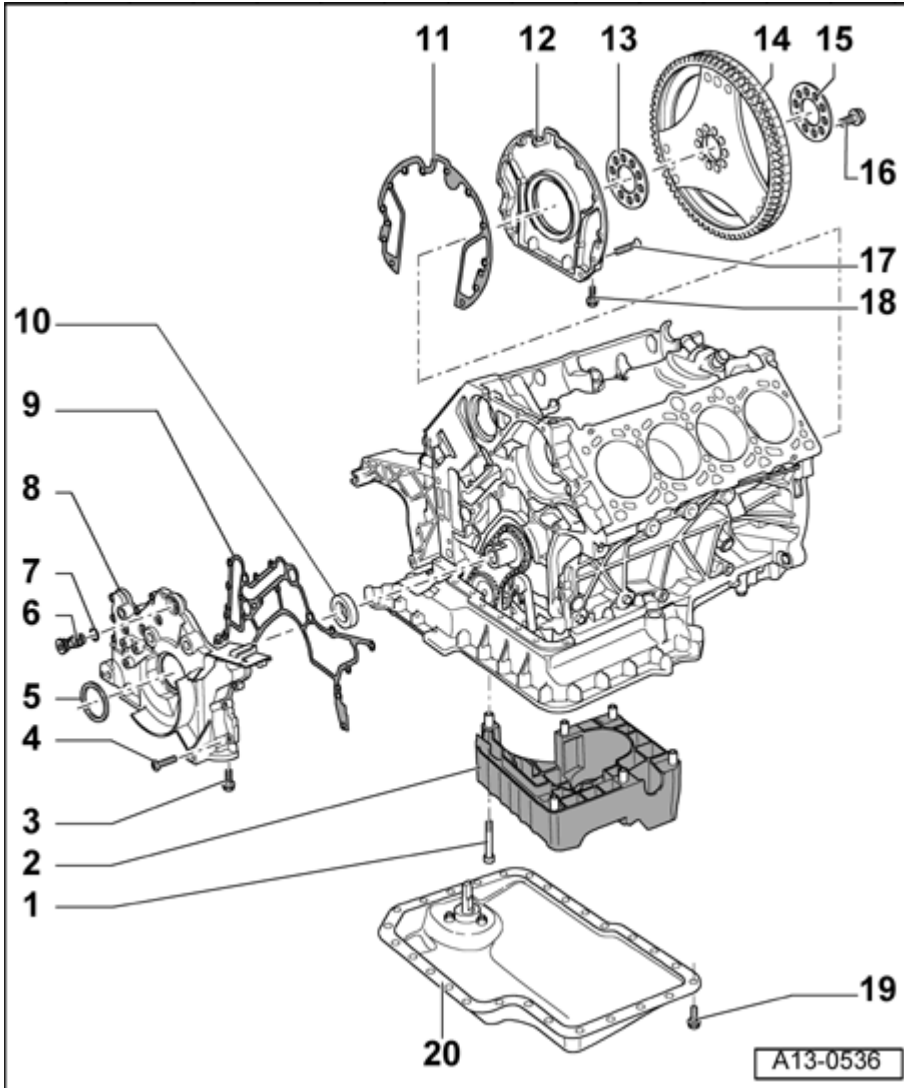


Fig. 188: Sealing Flange And Drive Plate, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - 10 Nm

2 - Oil baffle

3 - 14 Nm

2006 Audi A8 Quattro

ENGINE 4.2 Liter V8 5V Engine Mechanical, Engine Code(s): BFM, BGK - A8

4 - 14 Nm

- Bolt class 10.9

5 - Seal

- For crankshaft
- Removing and installing --> **Seal for crankshaft (ribbed belt side), replacing**

6 - Spray nozzle valve, 35 Nm

7 - O-ring

- Replace

8 - Sealing flange, front

- Removing and installing --> **Front sealing flange, removing and installing**

9 - Gasket

- Replace

10 - Thrust collar

- In case of signs of wear, pull off and turn, or replace --> **Seal for crankshaft (ribbed belt side), replacing**

11 - Gasket

- Replace

12 - Rear sealing flange with sealing ring

- Removing and installing --> **Rear sealing flange, removing and installing**

13 - Shim

- 3.4 mm thick

14 - Drive plate

- Removing and installing --> **Drive plate, removing and installing**

15 - Washer

- 1.5 mm thick

16 - 30 Nm plus an additional 90° ($\frac{1}{4}$ turn)

17 - 10 Nm

18 - 14 Nm

19 - 10 Nm

- Fasten diagonally in steps

20 - Oil pan (lower section)

- Removing and installing --> **Lower part of oil pan, removing and installing**

Seal for crankshaft (ribbed belt side), replacing

Special tools, testers and auxiliary items required

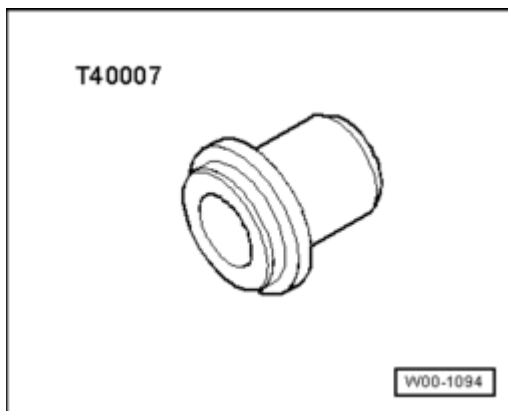


Fig. 189: Thrust Piece T40007

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Thrust Piece T40007

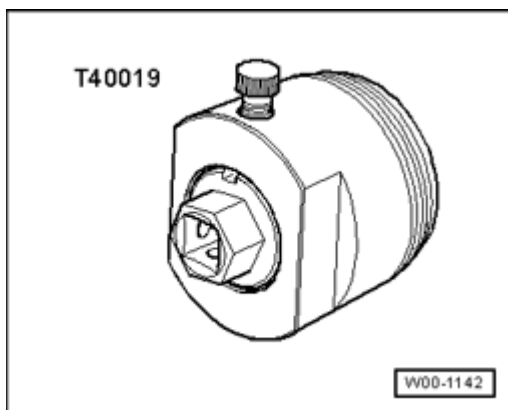


Fig. 190: Seal Remover T40019

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Seal remover T40019

Removing

- Remove front bumper --> **63 - BUMPERS** .
- Remove lock carrier --> **50 - BODY - FRONT** .
- Toothed belt, removing --> **Toothed belt, removing and installing.**

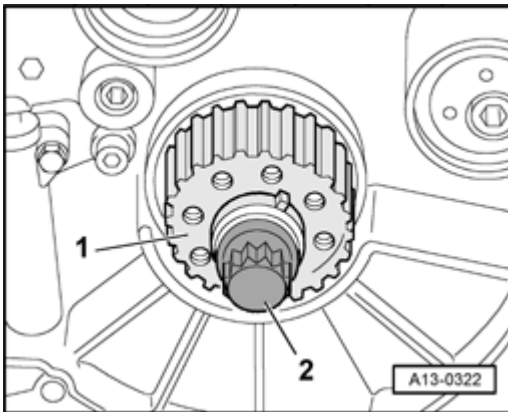


Fig. 191: Removing/Installing Center Bolt For Crankshaft Toothed Belt Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove center bolt - 2 - for crankshaft toothed belt gear - 1 - .
- Remove toothed belt gear.
- Place inner part of oil seal extractor T40019 flush with outer part and secure using knurled-head screw.

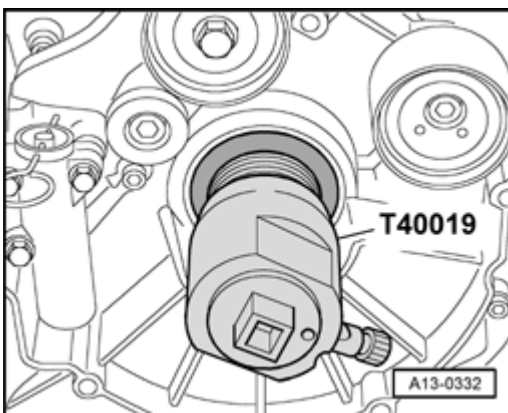


Fig. 192: Positioning And With Forced Pressure Bolt Into Oil Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lubricate threaded head of seal extractor, position and with forced pressure bolt into oil seal as far as possible.
- Loosen knurled screw and turn inner portion against crankshaft until oil seal is pulled out.

- Secure seal remover in a vise at the flat spots. Remove seal using pliers

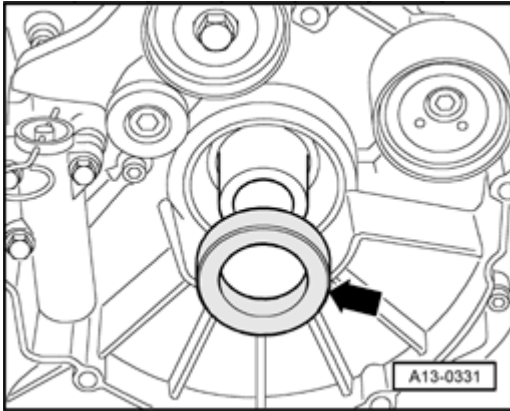


Fig. 193: Removing/Installing Thrust Washer From Crankshaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Mark front surface of thrust washer - **arrow** - using a waterproof felt pen.
- Remove thrust washer from crankshaft.

Installing

- Clean running and sealing surface.
- Do not oil sealing lip and outer edge of seal before pressing in.

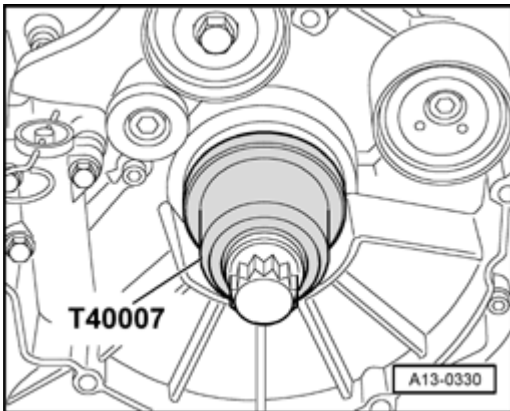


Fig. 194: Pressing In Sealing Ring Using Thrust Piece T40007 And Center Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press in sealing ring using thrust piece T40007 and center bolt.

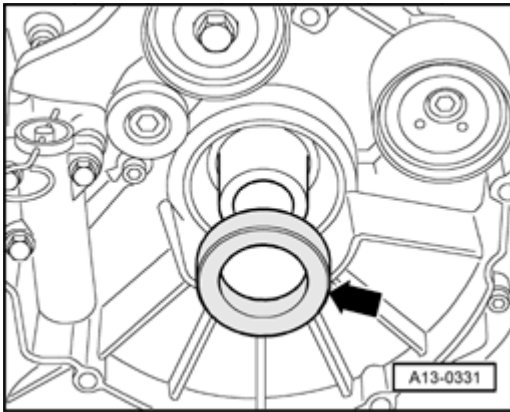


Fig. 195: Removing/Installing Thrust Washer From Crankshaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Rotate thrust washer and install on crankshaft.

NOTE:

- The thrust washer is rotated so that the new sealing ring runs on new sealing path.
- Marked front surface of thrust washer must now point toward engine.

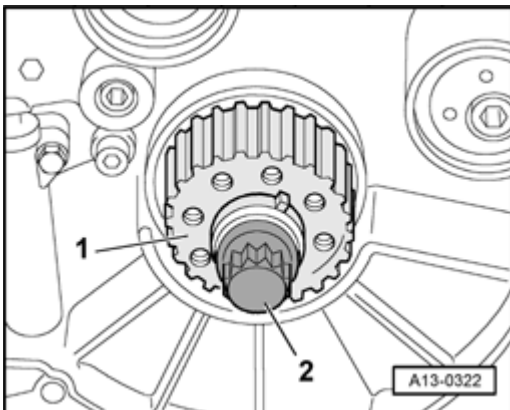


Fig. 196: Removing/Installing Center Bolt For Crankshaft Toothed Belt Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install toothed belt gear of crankshaft - 1 - with new center bolt - 2 -.

NOTE:

- There must be no oil on the contact surface between the toothed belt sprocket and crankshaft.
- Do not oil the bolt for crankshaft toothed belt sprocket.

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

- Install toothed belt (adjust timing) --> **Toothed belt, removing and installing.**
- Install lock carrier with attachments --> **50 - BODY - FRONT** .

2006 Audi A8 Quattro

ENGINE 4.2 Liter V8 5V Engine Mechanical, Engine Code(s): BFM, BGK - A8

- Install torque support --> **Torque support (with torque support valve N382), assembly overview.**

Torque specifications

Component	Nm
Toothed belt sprocket to crankshaft	200 + 180° ¹⁾²⁾

- ¹⁾ Replace bolt
- ²⁾ 180° Corresponds to one half rotation.

Front sealing flange, removing and installing

Special tools, testers and auxiliary items required

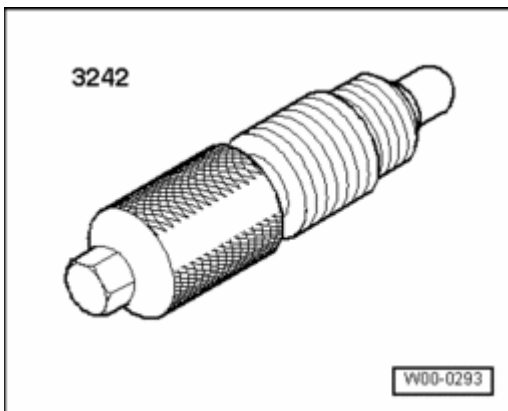


Fig. 197: Crankshaft Holder 3242

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Crankshaft Holder 3242

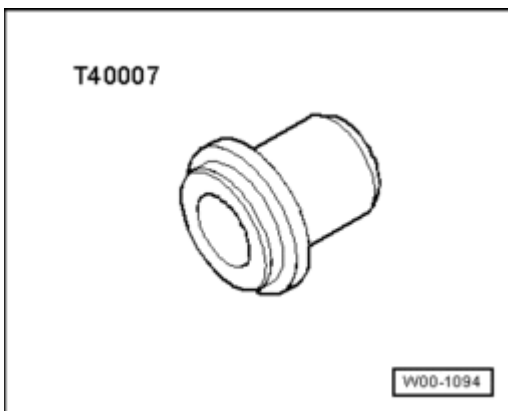


Fig. 198: Thrust Piece T40007

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Thrust Piece T40007

- Hand drill with plastic brush attachment
- Protective glasses
- Silicone sealant

Removing

- Remove front bumper --> **63 - BUMPERS** .
- Remove lock carrier --> **50 - BODY - FRONT** .
- Remove ribbed belt --> **Ribbed belt, removing and installing**

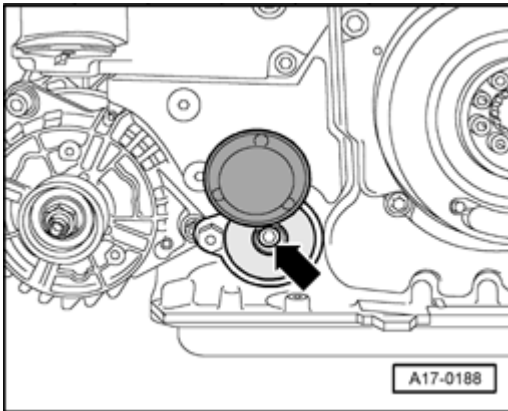


Fig. 199: Removing Tension Roller For Ribbed Belt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove tension roller for ribbed belt - **arrow** -.
- Remove cover for lower idler pulley.

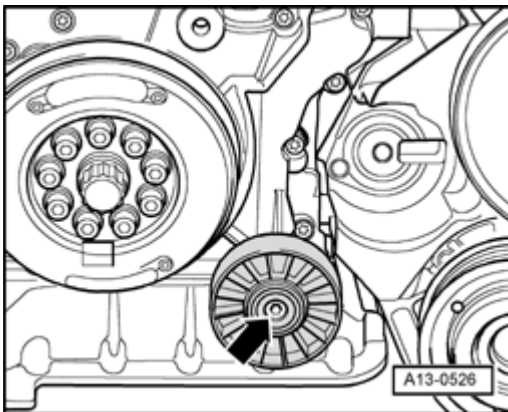


Fig. 200: Removing Lower Idler Pulley For Ribbed Belt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove lower idler pulley for ribbed belt - **arrow** -.
- Remove upper toothed belt guard at left and right.

CAUTION: Only turn over the engine at the crankshaft in direction of engine rotation (clockwise).

- Turn crankshaft at center bolt of toothed belt gear in direction of engine rotation to TDC Cyl. 5 5 marking.

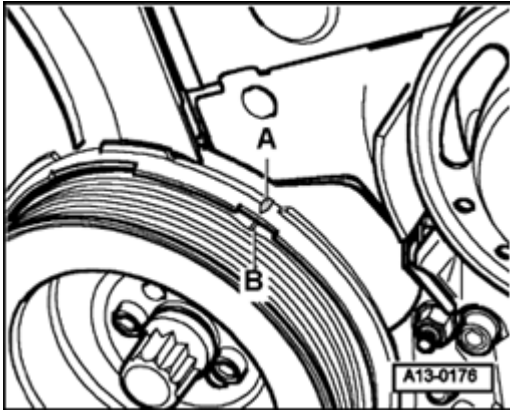


Fig. 201: Identifying Notch Aligns With Marking
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Notch - **B** - aligns with marking - **A** -.

NOTE: • Turning over the engine is performed at the center bolt of the crankshaft.

- Check position of camshafts:

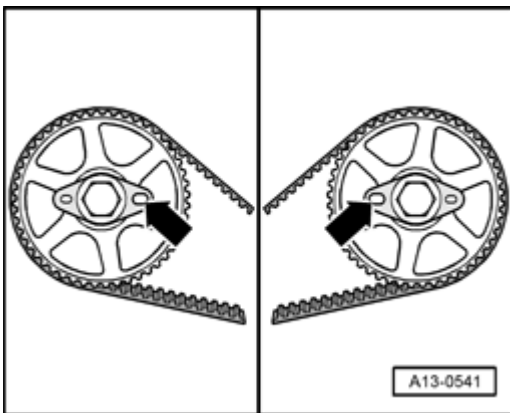


Fig. 202: Identifying Large Holes On Securing Plates At Camshaft Gears Aligns On Inside
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- The large holes - **arrows** - on securing plates at camshaft gears must align on inside.
- In case they do not align, turn one more rotation.

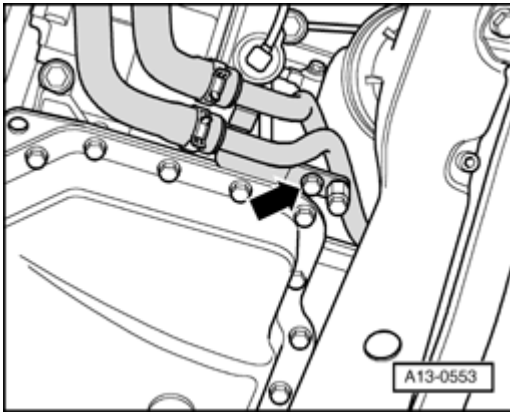


Fig. 203: Disconnecting Water Pipe From Oil Pan
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect water pipe - **arrow** - from oil pan.

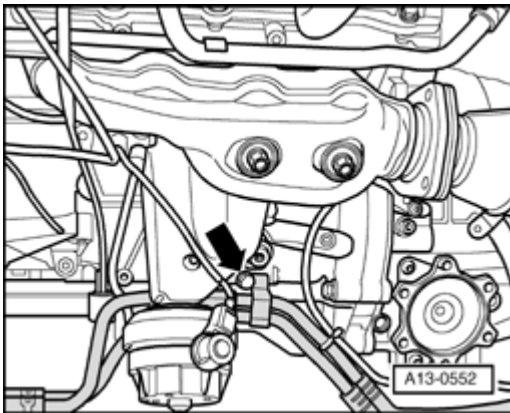


Fig. 204: Disconnecting Water Pipe From Engine Block
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect water pipe from engine block - **arrow** -.

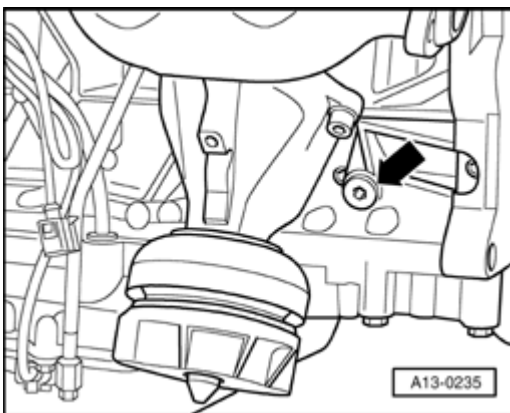


Fig. 205: Removing Locking Bolt Of TDC Marking At Upper Part Of Oil Pan
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove locking bolt - **arrow** - of TDC marking at upper part of oil pan.

NOTE:

- In the crankshaft, a TDC bore is located exactly behind locking bolt (can be felt by touch).

CAUTION: Do not rotate crankshaft while touching TDC mark with finger - danger of injury.

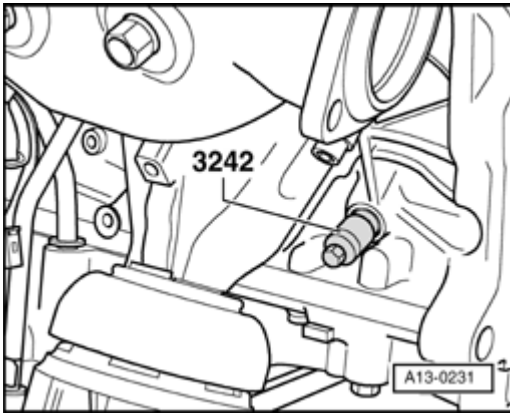


Fig. 206: Installing Crankshaft Holder 3242 In Hole For Removed Locking Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install crankshaft holder 3242 in hole for removed locking bolt.

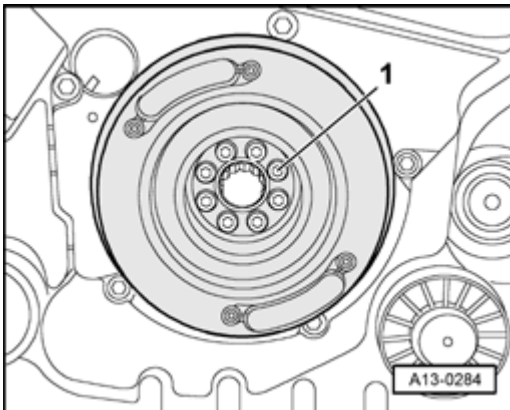


Fig. 207: Removing Vibration Damper Of Crankshaft After Removing 8 Attachment Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove vibration damper of crankshaft after removing 8 attachment bolts - **1** -.
- Remove center toothed belt cover.

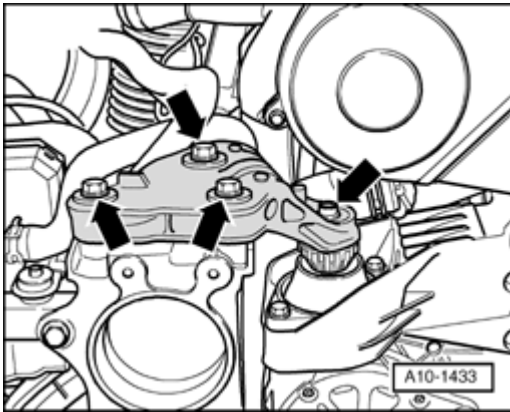


Fig. 208: Removing Mounting Bolts And Torque Support
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

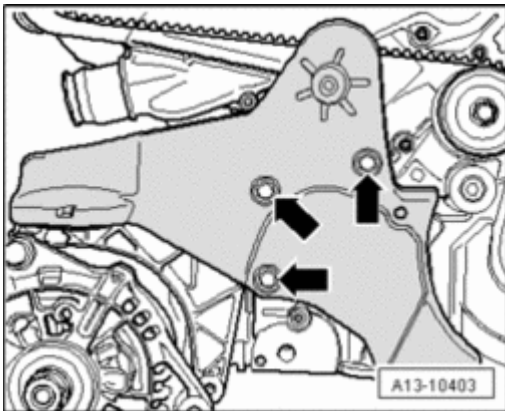


Fig. 209: Removing Bracket For Torque Support Valve N382
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bracket for torque support valve N382 - **arrows** -.
- Toothed belt, removing --> **Toothed belt, removing and installing.**

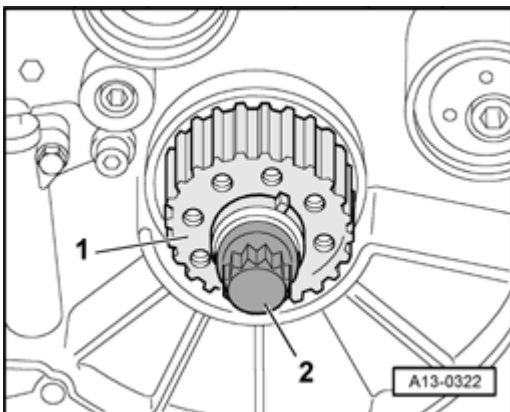


Fig. 210: Removing/Installing Center Bolt For Crankshaft Toothed Belt Gear

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove center bolt - 2 - for crankshaft toothed belt gear - 1 -.
- Remove toothed belt gear.

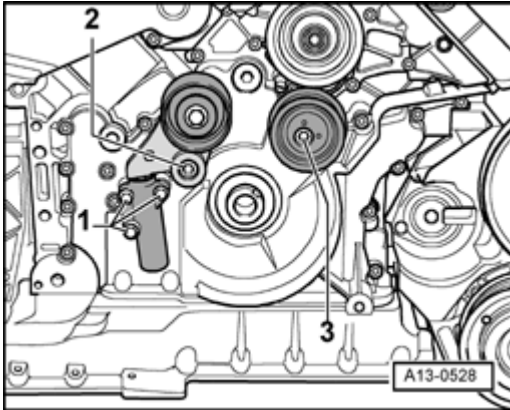


Fig. 211: Removing Eccentric Roller & Tensioning Lever With Tensioning Roller And Tensioner
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove eccentric roller - 3 -, tensioning lever with tensioning roller - 2 - and tensioner - 1 -.

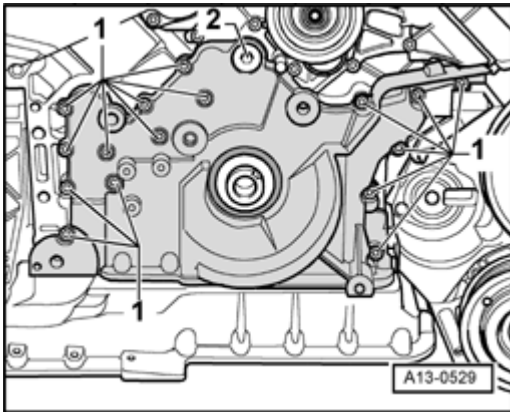


Fig. 212: Removing/Installing Spray Jet Valve & Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove spray jet valve - 2 -.
- Remove bolts - 1 -.
- Remove lower section of oil pan --> **Oil Level Thermal Sensor G266 , removing and installing.**

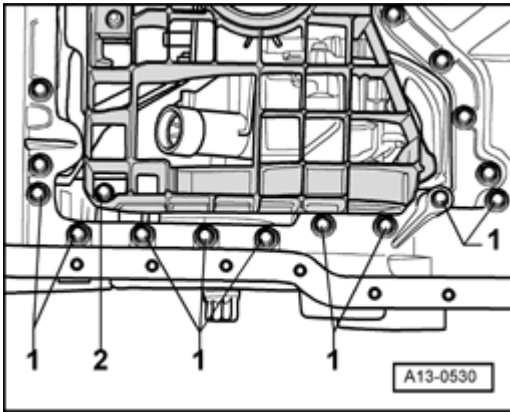


Fig. 213: Removing/Installing Sealing Flange Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **1** - and - **2** -.
- Remove front sealing flange.
- Drive out seal from removed flange.

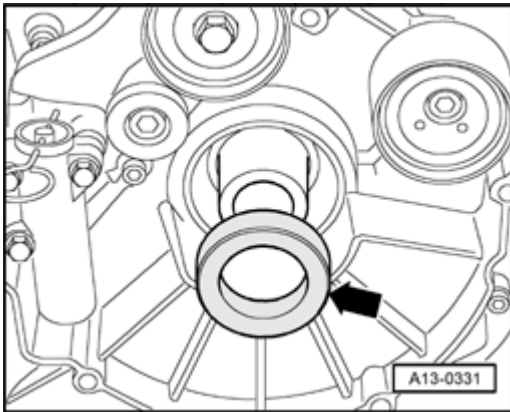


Fig. 214: Removing/Installing Thrust Washer From Crankshaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Mark front surface of thrust washer - **arrow** - using a waterproof felt pen.
- Remove thrust washer from crankshaft.

NOTE: • **Illustration is shown with sealing flange installed.**

Installing

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

- Place a rag over open part of oil pan.
- Carefully remove remaining sealant at upper part of oil pan.

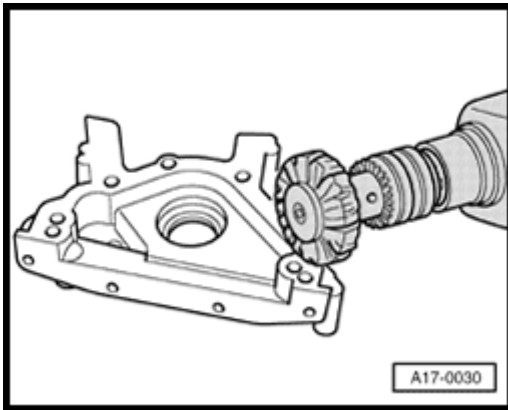


Fig. 215: Removing Sealant Remains On Sealing Flange With Rotating Plastic Brush
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove remaining sealant on sealing flange using e.g. a rotating plastic brush.

CAUTION: Wear safety glasses.

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

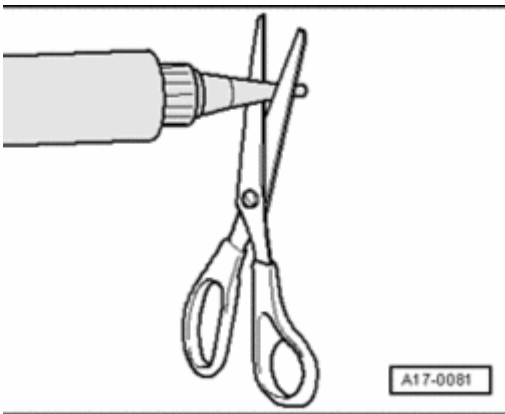


Fig. 216: Cutting Tube Nozzle At Front Marking
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

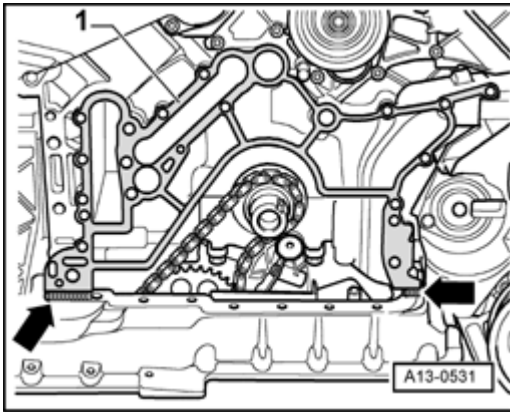


Fig. 217: Placing New Sealing Ring Onto Cylinder Block & Applying Thin Silicone Sealing Bead Each Between Cylinder Block And Upper Part Of Oil Pan

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place new sealing ring - **1** - onto cylinder block.
- Apply thin silicone sealing bead - **arrows** - each between cylinder block and upper part of oil pan.

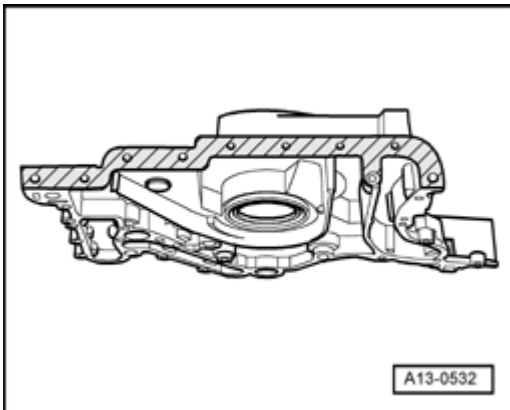


Fig. 218: Thinly Coating Lower Sealing Surface At Sealing Flange With Silicone Sealant

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Thinly coat lower sealing surface at sealing flange with silicone sealant (hatched area).

NOTE:

- **The sealing flange must be installed within 5 minutes after application of silicon sealant.**

- Carefully slide sealing flange onto reamed bolt at cylinder block.

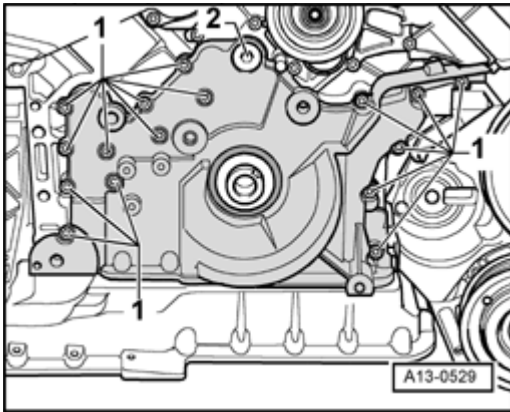


Fig. 219: Removing/Installing Spray Jet Valve & Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten bolts - 1 - and spray jet valve - 2 -.

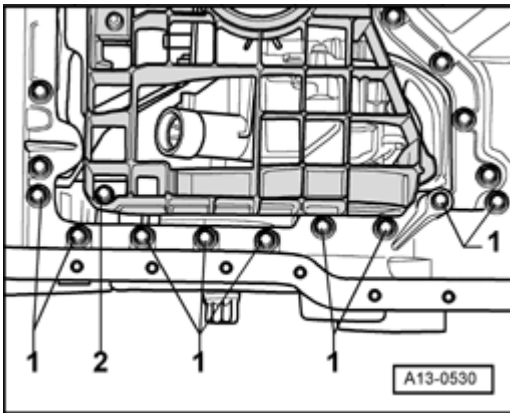


Fig. 220: Removing/Installing Sealing Flange Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten bolts - 1 - and - 2 -.
- Install oil pan (lower part) --> **Oil Level Thermal Sensor G266 , removing and installing.**
- Do not oil sealing lip and outer edge of seal before pressing in.

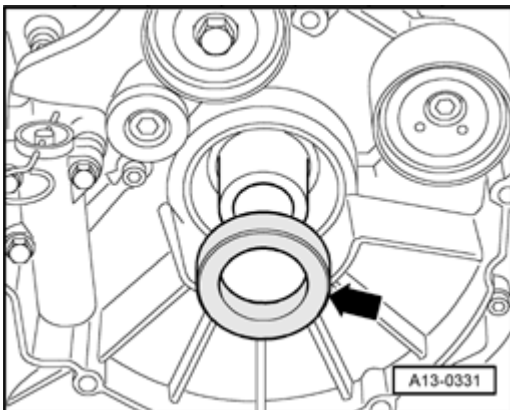


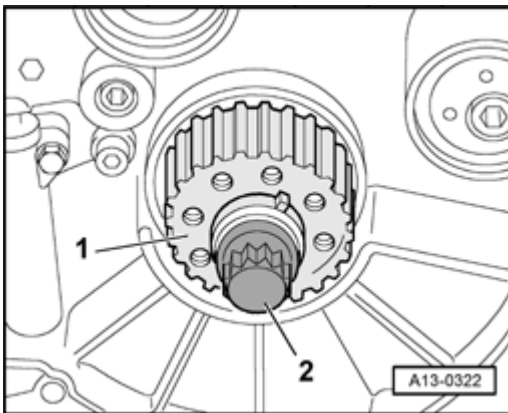
Fig. 221: Removing/Installing Thrust Washer From Crankshaft

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press in sealing ring using thrust piece T40007 and center bolt. Rotate thrust washer and install on crankshaft.

NOTE:

- The thrust washer is rotated so that the new sealing ring runs on new sealing path.
- Marked front surface of thrust washer must now point toward engine.

**Fig. 222: Removing/Installing Center Bolt For Crankshaft Toothed Belt Gear**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install toothed belt gear of crankshaft - 1 - with new center bolt - 2 -.

NOTE:

- There must be no oil on the contact surface between the toothed belt sprocket and crankshaft.
- Do not oil the bolt for crankshaft toothed belt sprocket.
- Note washer below tensioning lever.

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

NOTE:

- Secure all hose connections using hose clamps appropriate for the model type .

- Install toothed belt (adjust timing) --> **Toothed belt, removing and installing.**
- Install lock carrier with attachments --> **50 - BODY - FRONT** .
- Install torque support --> **Torque support (with torque support valve N382), assembly overview.**

Torque specifications

Component	Nm

2006 Audi A8 Quattro

ENGINE 4.2 Liter V8 5V Engine Mechanical, Engine Code(s): BFM, BGK - A8

Front sealing flange to cylinder block	14 ¹⁾
Spray jet valve to cylinder block	35
Front sealing flange to upper part of oil pan	14
Baffle plate to front sealing flange	10
Tensioner to front sealing flange	10
Tensioning lever to front sealing flange	20 + 90° ¹⁾²⁾
Eccentric roller to front sealing flange	45
Toothed belt sprocket to crankshaft	200 + 180° ¹⁾³⁾
Torque support bracket to cylinder block	43
Upper idler pulley for ribbed belt to torque support bracket	10
Lower idler pulley for ribbed belt to front sealing flange	23
Tension roller for ribbed belt to upper part of oil pan	43

- ¹⁾ Replace bolt
- ²⁾ 90° Corresponds to a quarter turn.
- ³⁾ 180° Corresponds to one half rotation.

Rear sealing flange, removing and installing

Special tools, testers and auxiliary items required

- Hand drill with plastic brush attachment
- Protective glasses
- Silicone sealant

Removing

- Remove engine --> **Engine, removing and installing.**
- Disconnect engine and transmission --> **Engine and transmission, separating.**
- Remove drive plate --> **Drive plate, removing and installing.**

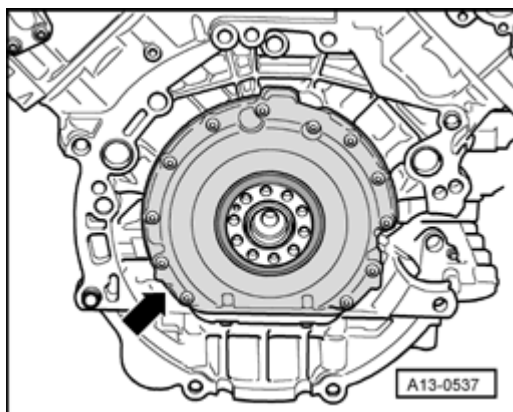


Fig. 223: Removing Rear Sealing Flange

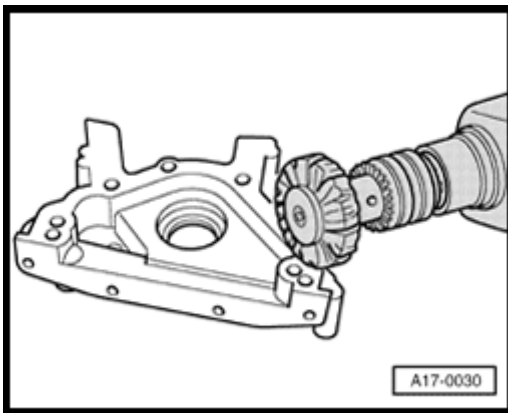
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove rear sealing flange - **arrow** -.

Installing**NOTE:**

- **Replace seals.**

- Place a rag over open part of oil pan.
- Carefully remove remaining sealant at upper part of oil pan.

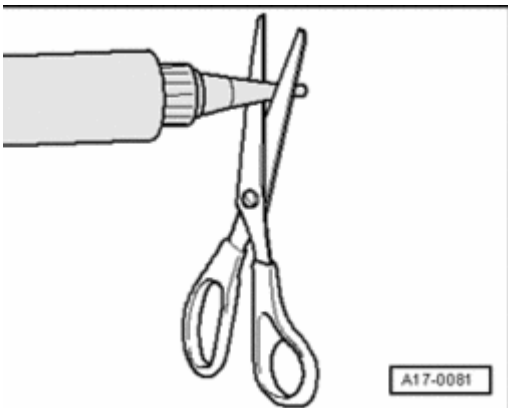
**Fig. 224: Removing Sealant Remains On Sealing Flange With Rotating Plastic Brush**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove remaining sealant on sealing flange using e.g. a rotating plastic brush.

CAUTION: Wear safety glasses.

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

**Fig. 225: Cutting Tube Nozzle At Front Marking**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

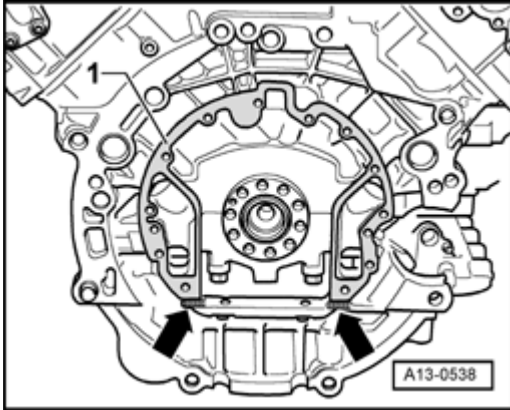


Fig. 226: Placing New Sealing Ring Onto Cylinder Block & Applying Thin Silicone Sealing Bead
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place new sealing ring - **1** - onto cylinder block.
- Apply thin silicone sealing bead - **arrows** - each between cylinder block and upper part of oil pan.

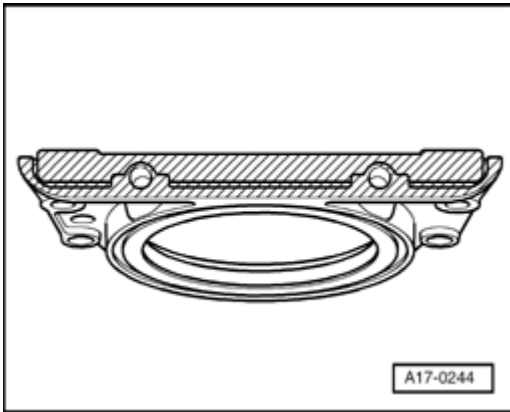


Fig. 227: Thinly Coating Lower Sealing Surface At Sealing Flange With Silicone Sealant
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Thinly coat lower sealing surface at sealing flange with silicone sealant (hatched area).

NOTE:

- **The sealing flange must be installed within 5 minutes after application of silicon sealant.**

- To install, slide guide sleeve from replacement kit onto crankshaft.
- Carefully slide sealing flange onto reamed bolt at cylinder block.
- Tighten rear sealing flange.
- Install drive plate --> **Drive plate, removing and installing.**

2006 Audi A8 Quattro

ENGINE 4.2 Liter V8 5V Engine Mechanical, Engine Code(s): BFM, BGK - A8

- Install engine --> **Installing.**

Torque specifications

Component		Nm
Rear sealing flange to	Cylinder block	10
	Oil pan (upper section)	14

Drive plate, removing and installing

Special tools, testers and auxiliary items required

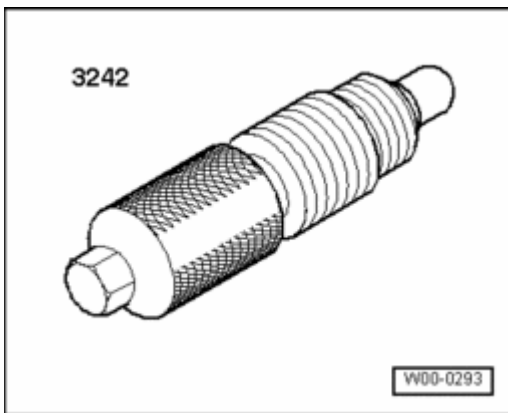


Fig. 228: Crankshaft Holder 3242

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Crankshaft Holder 3242

Removing

- Engine removed --> **Engine, removing and installing.**
- Engine separated from transmission --> **Engine and transmission, separating.**

CAUTION: Only turn over the engine at the crankshaft in direction of engine rotation (clockwise).

- Turn crankshaft at center bolt of toothed belt gear in direction of engine rotation to TDC Cyl. 5 marking.

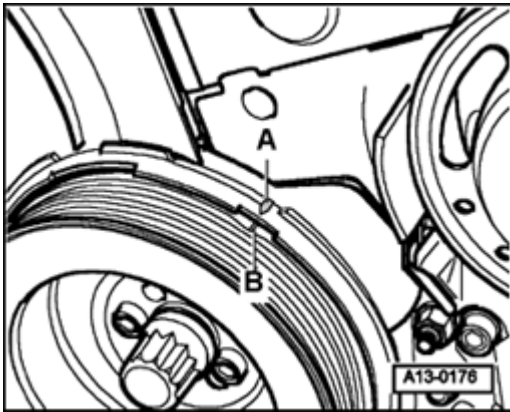


Fig. 229: Identifying Notch Aligns With Marking
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Notch - **B** - aligns with marking - **A** -.

NOTE:

- Turning over the engine is performed at the center bolt of the crankshaft.

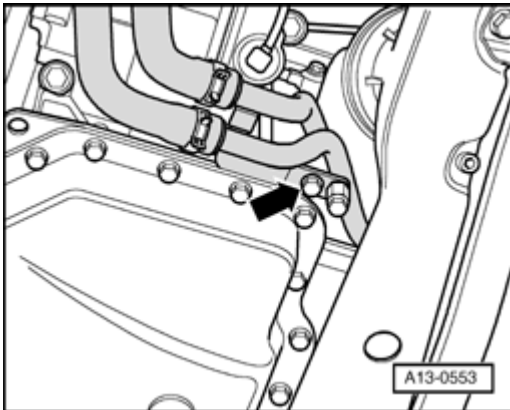


Fig. 230: Disconnecting Water Pipe From Oil Pan
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect water pipe - **arrow** - from oil pan.

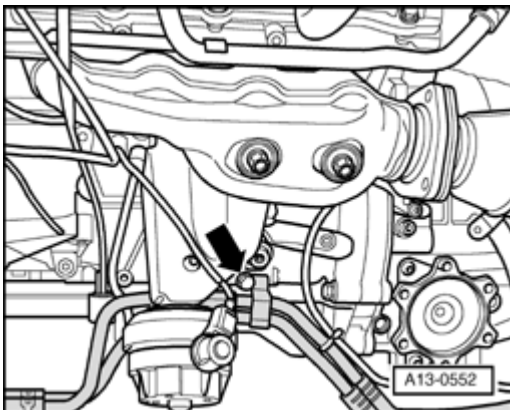


Fig. 231: Disconnecting Water Pipe From Engine Block
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect water pipe from engine block - **arrow** -.

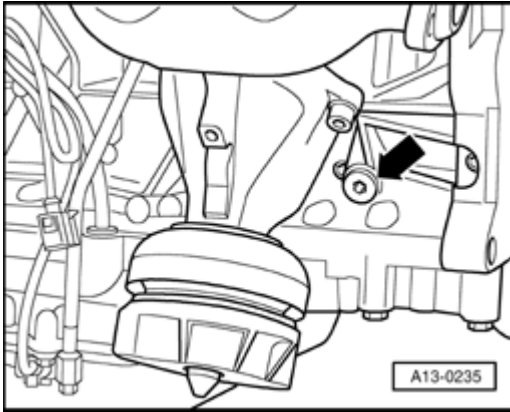


Fig. 232: Removing Locking Bolt Of TDC Marking At Upper Part Of Oil Pan
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove locking bolt - **arrow** - of TDC marking at upper part of oil pan.

NOTE:

- In the crankshaft, a TDC bore is located exactly behind the locking bolt (can be felt by touch).

CAUTION: Do not rotate crankshaft while touching TDC mark with finger - danger of injury.

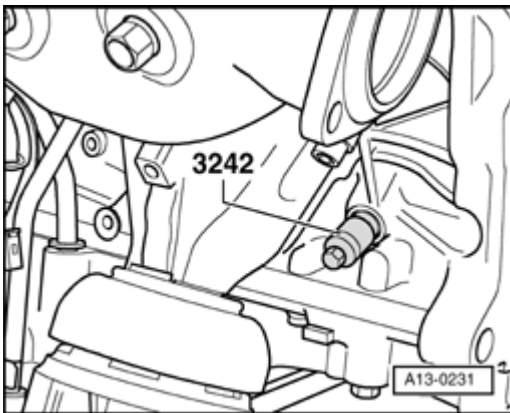


Fig. 233: Installing Crankshaft Holder 3242 In Hole For Removed Locking Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install crankshaft holder 3242 in hole for removed locking bolt.

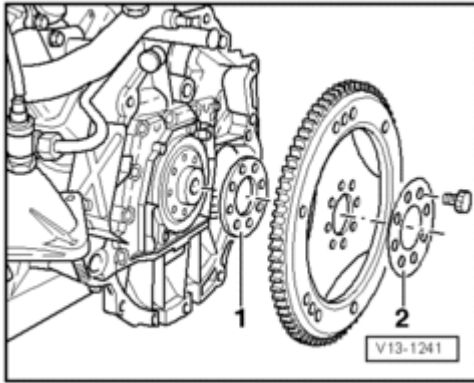


Fig. 234: Marking Drive Plate, Shim And Washer To Engine & Removing Drive Plate
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Mark drive plate, shim - 1 - and washer - 2 - to engine.
- Remove drive plate.

Installing

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

NOTE: • **Replace seals.**

- Install drive plate with the following shims:

1 - Shim: Thickness 3.4 mm

2 - Washer: Thickness 1.50 mm

- Replace bolts and tighten.

Torque specifications

Component	Nm
Drive plate to crankshaft	30 + 90° ¹⁾²⁾
Sealing plug in upper section of oil pan	35

- ¹⁾ Replace bolt
- ²⁾ 90° Corresponds to a quarter turn.

CRANKSHAFT, ASSEMBLY OVERVIEW

Crankshaft, assembly overview

NOTE:

- Secure engine to assembly stand using engine and transmission holder VAS 6095 when performing repair work --> Engine, attaching to engine stand.

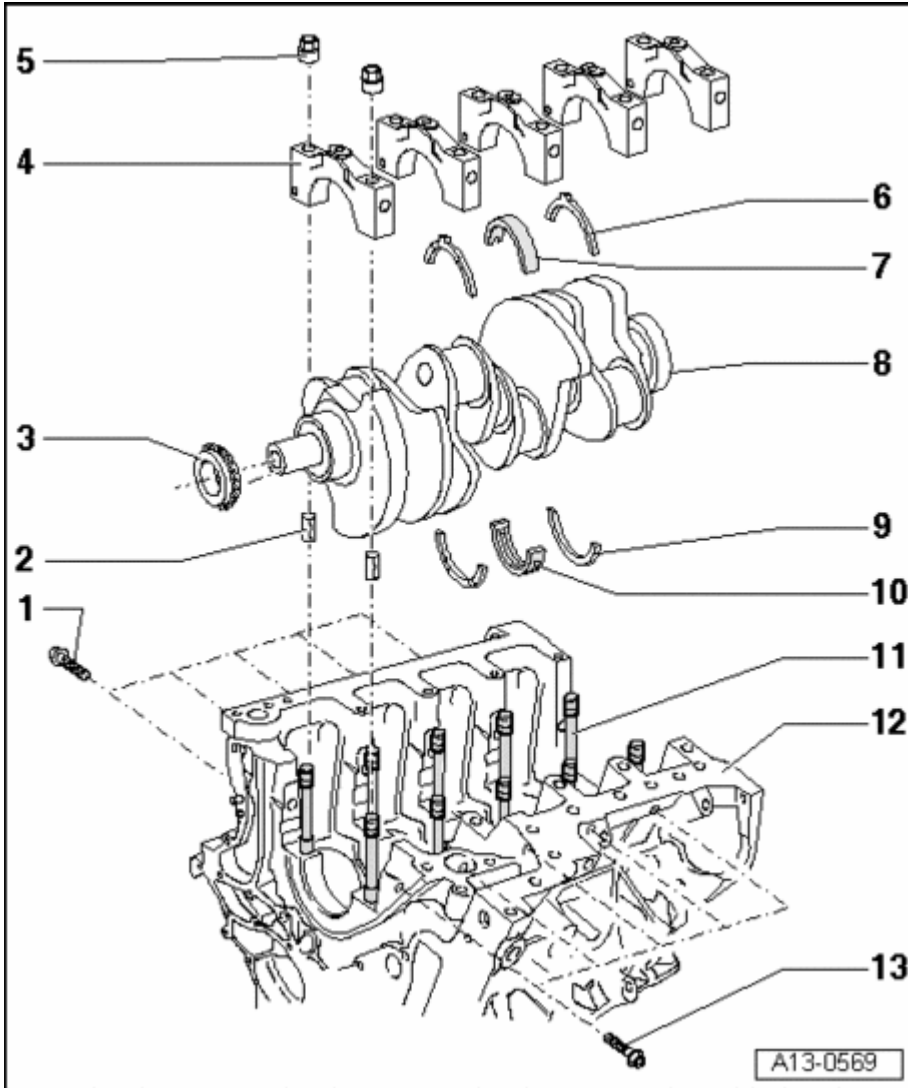


Fig. 235: Crankshaft, Assembly Overview

Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Bolt, 22 Nm

- For bearing cap
- Replace
- Tightening order --> Crankshaft bearing cap, installing

2 - Alignment bushing

- Insert in cylinder block

3 - Drive sprocket for oil pump

- Removing and installing --> **Oil pump drive sprocket, removing and installing**

4 - Bearing cap

- Observe identification --> **Crankshaft bearing cap identification**
- Removing --> **Crankshaft bearing cap, removing**
- Installing --> **Crankshaft bearing cap, installing**

5 - Nut, 35 Nm plus an additional 90°

- For bearing cap
- Replace
- Tightening order --> **Crankshaft bearing cap, installing**

6 - Thrust washer

- Only on 3rd crankshaft bearing
- Lubricating grooves face outward
- Observe locating point
- Measuring crankshaft axial clearance --> **Axial clearance, measuring**

7 - Bearing shell

- For bearing cap without oil groove
- Do not interchange used bearing shells (mark)
- Insert new bearing shells for cylinder block with proper color marking --> **Allocation of crankshaft bearing shells for bearing cap**

8 - 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**

9 - Thrust washer

- Only on 3rd crankshaft bearing
- Lubricating grooves face outward
- Measuring crankshaft axial clearance --> **Axial clearance, measuring**

10 - Bearing shell

- For cylinder block with oil groove
- Do not interchange used bearing shells (mark)
- Insert new bearing shells for cylinder block with proper color marking --> **Allocation of crankshaft bearing shells for cylinder block**

11 - Studs

12 - Cylinder block

13 - Bolt, 22 Nm

- For bearing cap
- Replace
- Tightening order --> **Crankshaft bearing cap, installing**

Crankshaft bearing cap identification

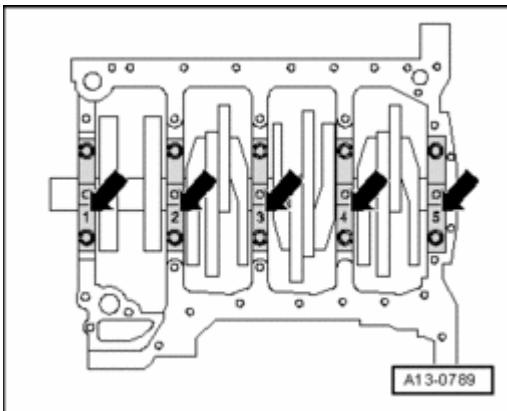


Fig. 236: Crankshaft Bearing Cap Identification
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Bearing 1 is located on belt pulley side.

Crankshaft bearing cap, removing

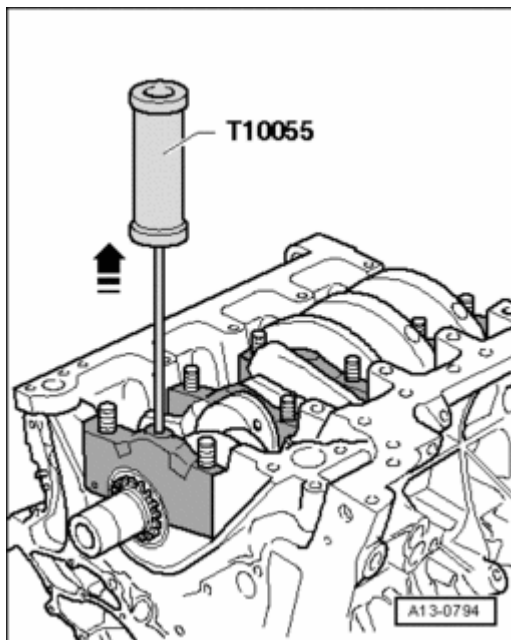


Fig. 237: Crankshaft Bearing Cap, Removing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove crankshaft bearing cap bolts or nuts.
- Remove crankshaft bearing caps from cylinder block using puller T10055.

Allocation of crankshaft bearing shells for cylinder block

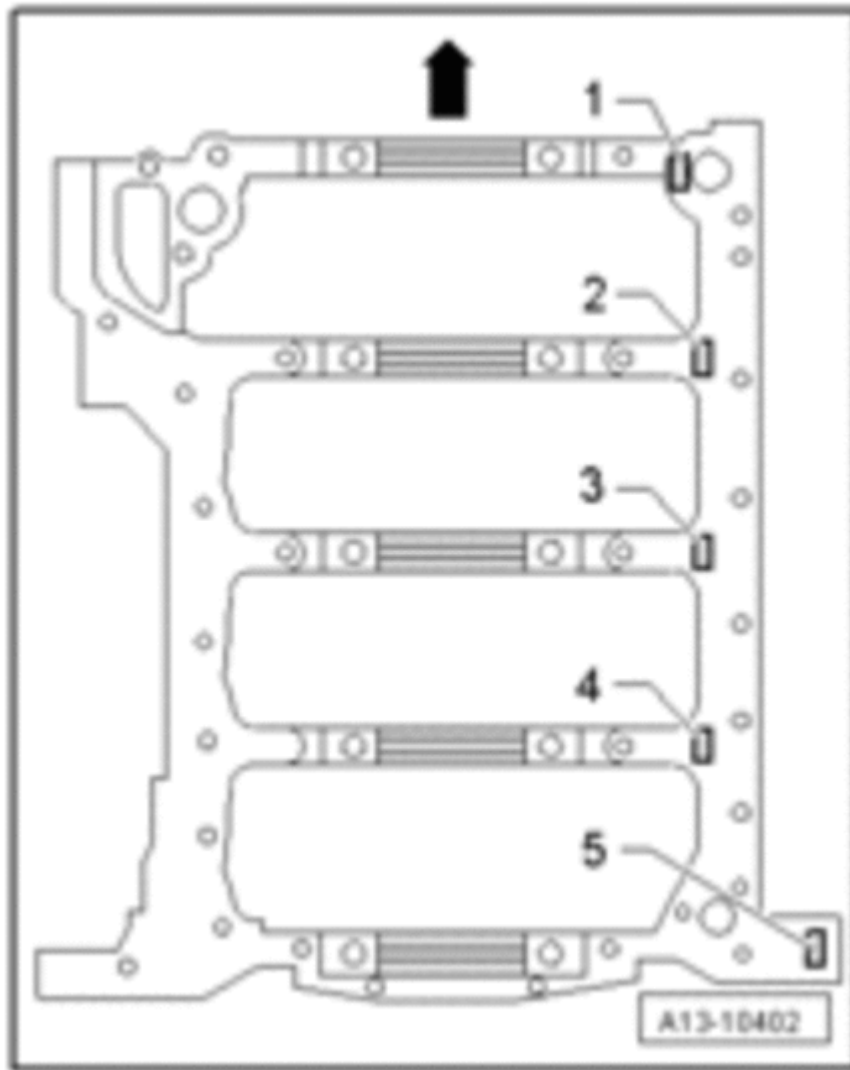


Fig. 238: Allocation Of Crankshaft Bearing Shells For Cylinder Block
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

Bearing shells with correct thickness are allocated to cylinder block in the factory. Colored dots on bearing shells serve for identifying bearing shell thickness.

NOTE: • - Arrow - points to belt pulley side.

Allocation of bearing shells to cylinder block is identified with a letter by each bearing.

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

Allocation of crankshaft bearing shells for bearing cap

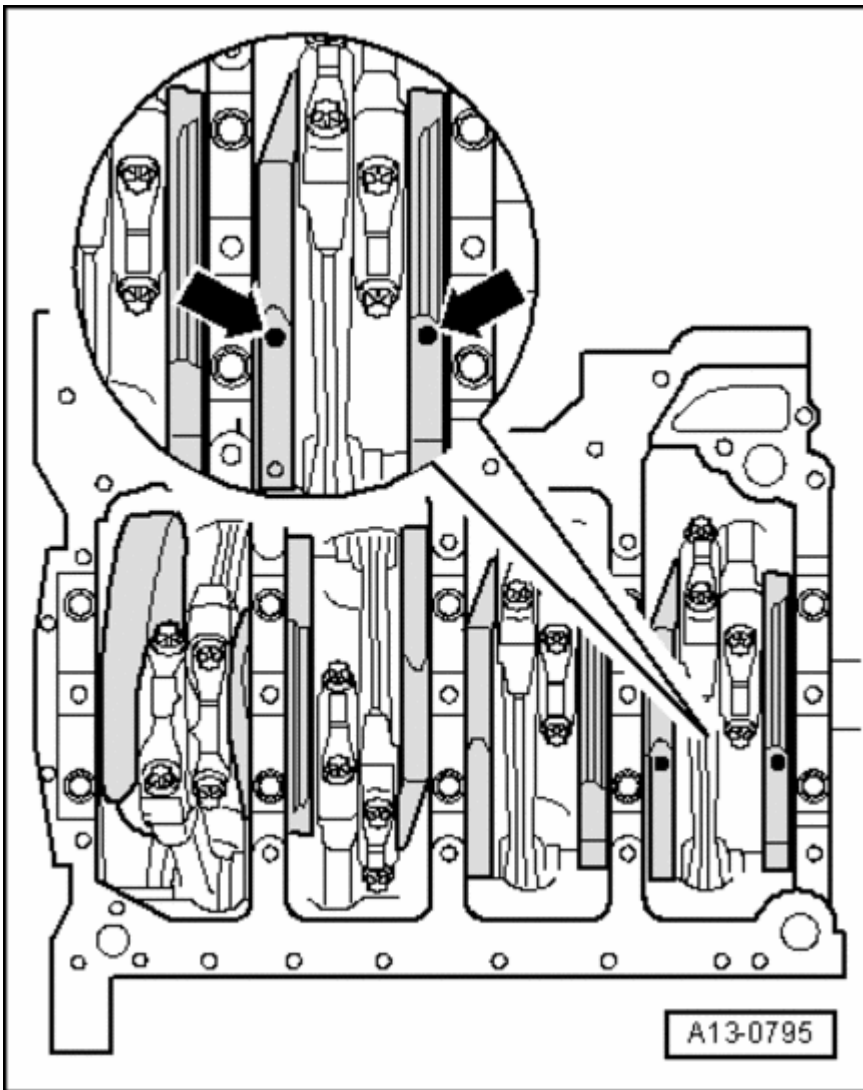


Fig. 239: Allocation Of Crankshaft Bearing Shells For Bearing Cap
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Bearing shells with correct thickness are allocated to bearing cap at factory. Colored dots on the bearing shells serve for identifying bearing shell thickness - **arrows** -.

Allocation of bearing shells to crankshaft is marked at crankshaft counterweight by colored dots.

Crankshaft bearing cap, installing

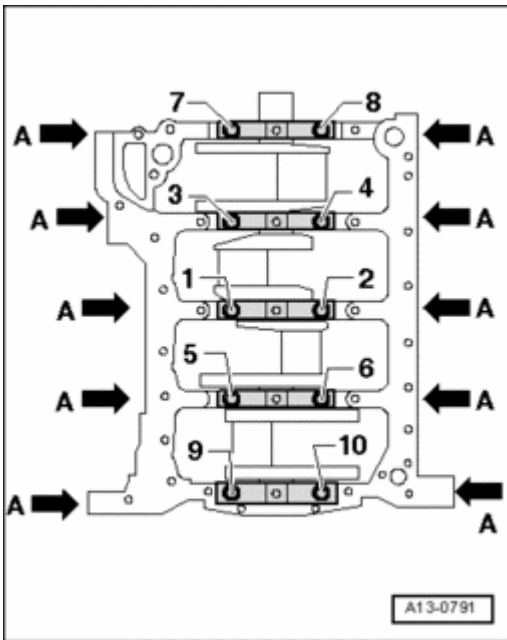


Fig. 240: Crankshaft Bearing Cap, Installing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Replace bolts - A - and nuts - 1 through 10 -.
- Inserting alignment bushings into cylinder block.
- Tighten bearing cap nuts or bolts in the following sequence:
 1. Hand-tighten bolts A.
 2. Tighten nuts 1 through 10 to 35 Nm.
 3. Tighten nuts 1 through 10 90° (1/4 additional turn) using a rigid wrench.
 4. Tighten bolts A to 22 Nm.
 5. Tighten bolts A 90 (1/4 turn) further using rigid wrench.

Crankshaft dimensions

(Dimensions in mm)

Reconditioning dimension, dimensions in mm	Crankshaft bearing pins-diameter		Connecting rod pins-diameter	
		-0.022		-0.022
Basic dimension	65.000		54.000	
		-0.042		-0.042
		-0.022		-0.022
1st undersize	64.750		53.750	
		-0.042		-0.042
		-0.022		-0.022

2006 Audi A8 Quattro

ENGINE 4.2 Liter V8 5V Engine Mechanical, Engine Code(s): BFM, BGK - A8

2nd undersize	64.500		53.500	
		-0.042		-0.042
		-0.022		-0.022
3rd undersize	64.250		53.250	
		-0.042		-0.042

Axial clearance, measuring

Special tools, testers and auxiliary items required

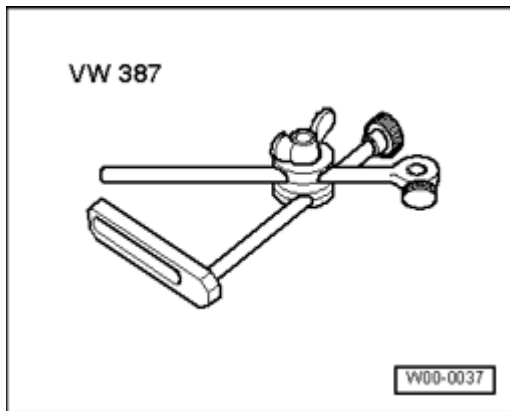


Fig. 241: Dial Gauge Holder VW 387
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Dial gauge holder VW 387
- Dial gauge

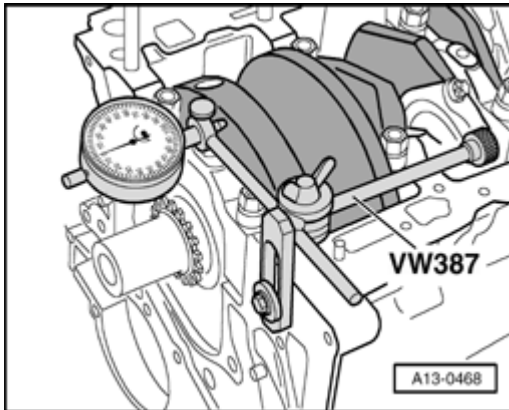


Fig. 242: Attaching Dial Indicator Together With VW387 Dial Gauge Holder To Cylinder Block And Set Indicator Against Crankshaft Counterweight
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Attach dial gauge with dial gauge holder VW 387 to cylinder block and set against crankshaft counterweight.
- Press crankshaft against dial indicator by hand, set indicator to - 0 -.

2006 Audi A8 Quattro

ENGINE 4.2 Liter V8 5V Engine Mechanical, Engine Code(s): BFM, BGK - A8

- Press crankshaft away from dial gauge.
- Read value:

New clearance	Wear limit
0.07 to 0.23 mm	0.25 mm

Radial clearance, measuring

Special tools, testers and auxiliary items required

- Plastigage

NOTE:

- Do not interchange used bearings
- Bearing shells that are worn down to the nickel layer must be replaced.

- Remove main bearing cap. Clean bearing cap and journal.
- Place Plastigage over entire width of bearing journal or into bearing shells.
- Plastigage must rest in center of bearing shell.
- Install main bearing cap and tighten to 30 Nm. Do not turn crankshaft.
- Remove main bearing cap again.
- Compare width of Plastigage with calibrated scale.
- Read value:

New clearance	Wear limit
0.018 to 0.045 mm	0.08 mm

Oil pump drive sprocket, removing and installing

Special tools, testers and auxiliary items required

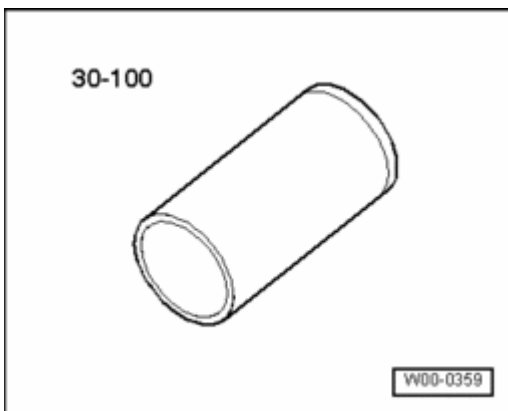
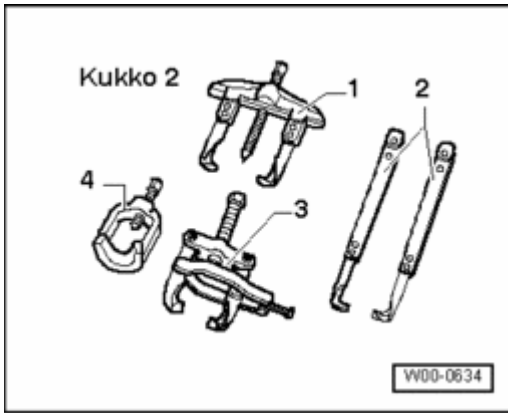


Fig. 243: Press Tube 30 - 100

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press tube 30 - 100

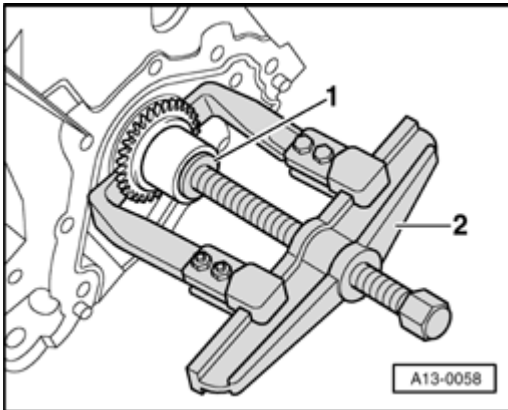
**Fig. 244: Identifying Special Tools - Kukko 20/10 Puller Set**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 1 two-arm puller Kukko 20/10

Removing

- Remove front sealing flange --> **Front sealing flange, removing and installing.**

**Fig. 245: Using Standard Claw Remover To Remove Crankshaft Chain Sprocket While Protecting Crankshaft End With Appropriate Washer**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using standard claw remover - 2 -, remove crankshaft chain sprocket while protecting crankshaft end with appropriate washer - 1 -.

Installing

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

- Heat up chain sprocket in an oven for approx. 15 minutes at 220°C.

CAUTION: Wear protective gloves!

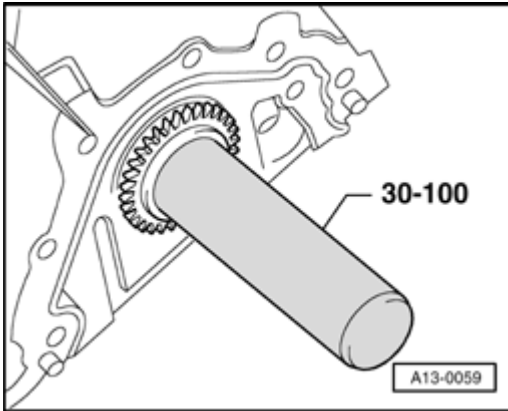


Fig. 246: Installing Chain Sprocket Onto Crankshaft Up To Limit Stop Using Press Tube 30-100
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using pliers, install chain sprocket on crankshaft end and slide onto crankshaft to stop using press tube 30 - 100.

PISTONS AND CONNECTING RODS, ASSEMBLY OVERVIEW

Pistons and connecting rods, assembly overview

NOTE:

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

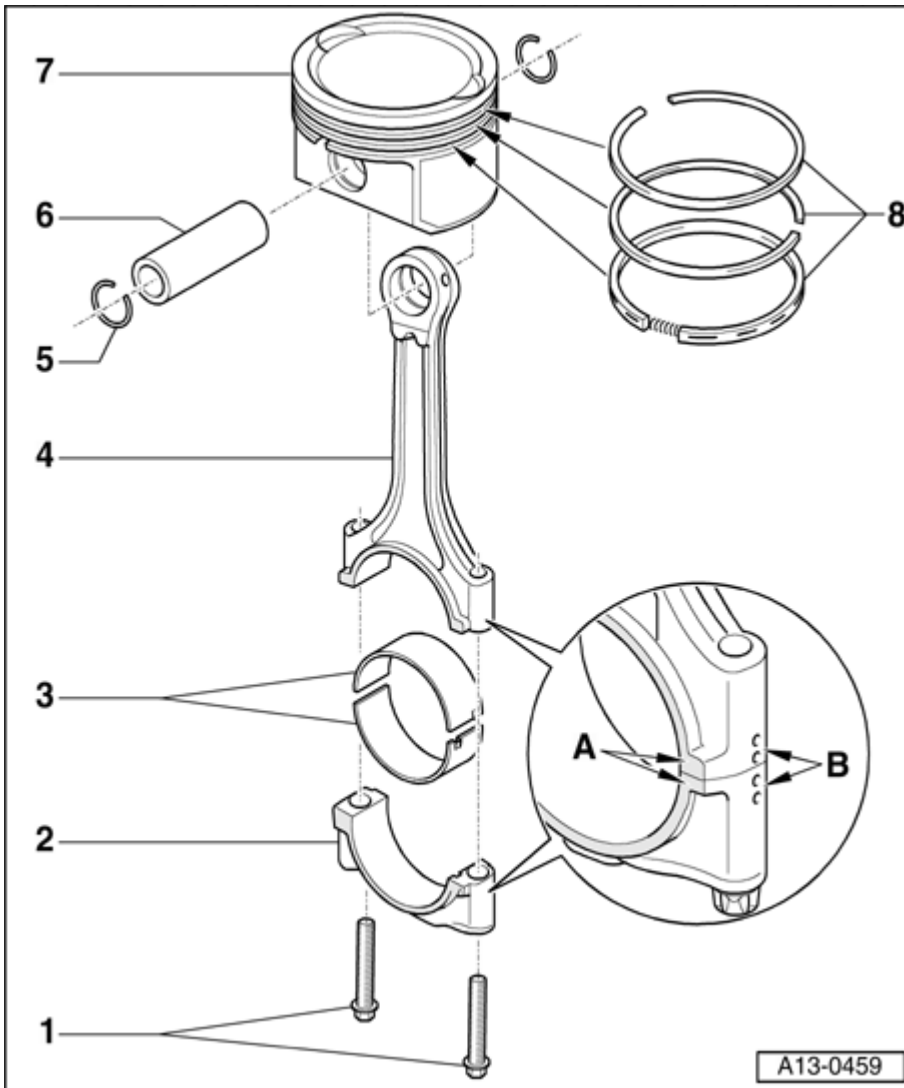


Fig. 247: Pistons And Connecting Rods, Assembly Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Connecting rod bolt - 30 Nm plus an additional 90° ($\frac{1}{4}$ turn)

- Replace
- Lubricate threads and contact surface
- Tighten to 30 Nm to measure radial play, do not turn further

2 - Connecting rod bearing cap

- Do not interchange
- Mark allocation to cylinder using a color marker - **B** - --> **Mark connecting rod**
- When installing bearing cap, observe: Tabs on contact surfaces on front side of connecting rod must align - **A** -

- Installation position of connecting rod pairs --> **Connecting rod, installed location**

3 - Bearing shell

- Note installation position
- Do not interchange used bearing shells (mark)
- Radial clearance, measuring --> **Radial clearance of connecting rod, checking**

4 - Connecting rod

- Only replace as set
- Mark allocation to cylinder using a color marker - B - --> **Mark connecting rod**
- When installing bearing cap, observe: Tabs on contact surfaces on front side of connecting rod must align - A -
- Installation position of connecting rod pairs --> **Connecting rod, installed location**

5 - Circlip

6 - Piston pin

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

7 - Piston

- Installed position and allocation, piston/cylinder --> **Installed position of piston and piston/cylinder allocation**
- Arrow on piston face points toward belt pulley side
- Checking --> **Checking piston**
- Install with piston ring compressor
- Piston and cylinder dimensions --> **Piston and cylinder dimensions**
- Cylinder bore, checking --> **Checking cylinder bores**

8 - Piston rings

- Offset gaps by 120°
- Use piston ring pliers for removal and installation
- Marking or identification "TOP" i.e. marked side must face toward piston head
- Checking ring gap --> **Checking piston ring gap**
- Check piston ring groove clearance --> **Checking ring to groove clearance**

Checking piston ring gap

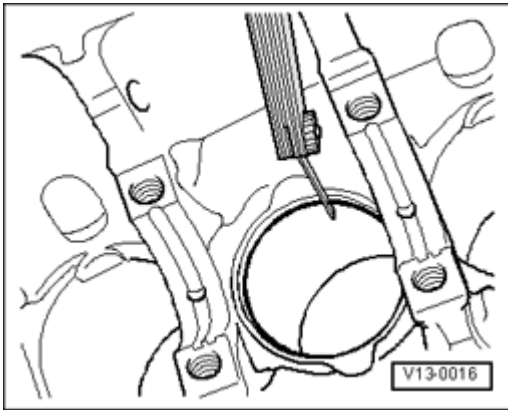


Fig. 248: Checking Piston Ring Gap

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Push ring squarely from above down to approx. 15 mm from bottom end of cylinder. To do this use a piston without rings.

Piston ring dimensions in mm	New	Wear limit
1st Compression ring	0.15 to 0.35	0.8
2nd Compression ring	0.20 to 0.40	0.8
Oil scraping ring	0.20 to 0.40	0.8

Checking ring to groove clearance

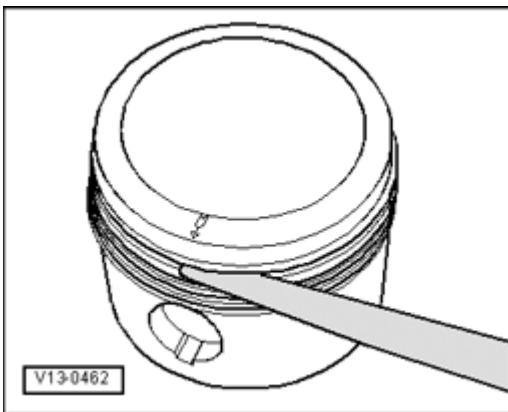
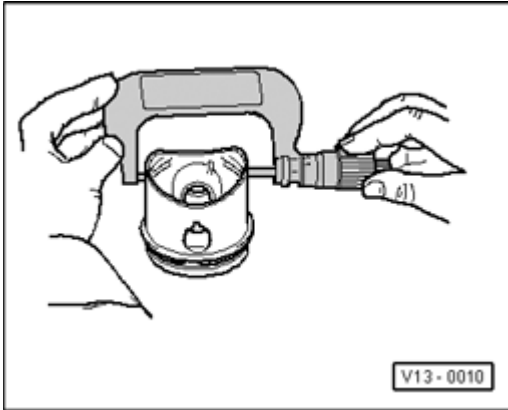


Fig. 249: Checking Ring To Groove Clearance

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clean ring groove of piston before checking.

Piston ring dimensions in mm	New	Wear limit
1st Compression ring	0.040 to 0.070	0.20
2nd Compression ring	0.010 to 0.045	0.15
Oil scraping ring	0.012 to 0.032	0.15

Checking piston**Special tools, testers and auxiliary items required****Fig. 250: Checking Piston****Courtesy of VOLKSWAGEN UNITED STATES, INC.**

- External micrometer 75 to 100 mm
 - Measure pistons approx. 10 mm from bottom edge and at points offset by 90° to piston pin axis.
- Deviation from nominal size maximum 0.04 mm

Nominal size --> Piston and cylinder dimensions.**Checking cylinder bores****Special tools, testers and auxiliary items required**

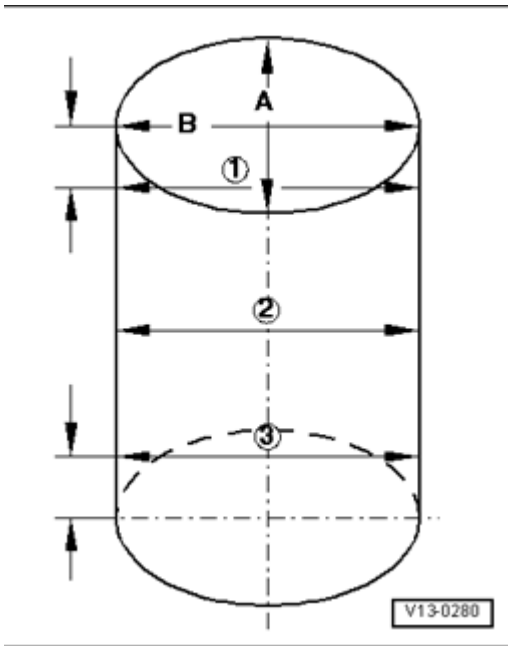


Fig. 251: Checking Cylinder Bores

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Inner bore gauge 50 to 100 mm
- Measure diagonally at 3 positions transversely - **A** - and longitudinally - **B** -.
- Deviation from nominal size maximum 0.08 mm

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

Installed position of piston and piston/cylinder allocation

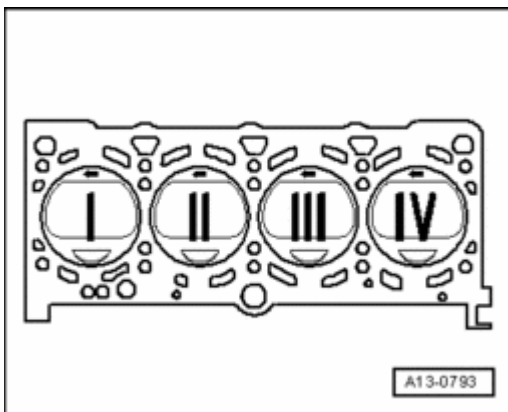


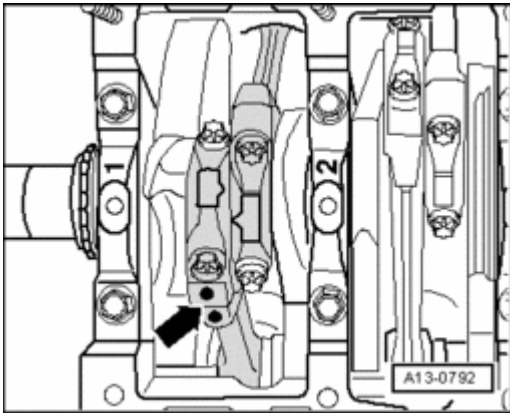
Fig. 252: Installed Position Of Piston And Piston/Cylinder Allocation

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Mark installed position and allocation to cylinder on piston head using chalk or waterproof felt pen.

NOTE:

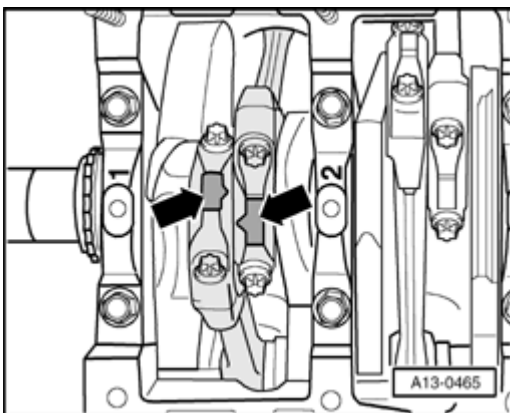
- Do not use a center punch or scribe, since the piston head coating will be damaged.
- Installed location: Arrow on piston face points toward belt pulley side

Mark connecting rod**Fig. 253: 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 - **arrow** - using a color marker.

Connecting rod, installed location**Fig. 254: Connecting Rod, Installed Location**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Oil spray jet for piston cooling

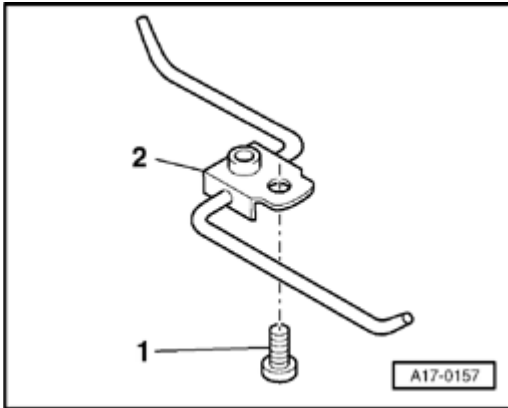


Fig. 255: Oil Spray Jet For Piston Cooling

Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Bolt, 10 Nm

2 - Oil spray jet for piston cooling

Piston and cylinder dimensions

Honing dimension		Piston diameter	Cylinder bore diameter
Basic dimension	mm	84.490 ¹⁾	84.510
Repair stage	mm	84.590 ¹⁾	84.610

- ¹⁾ Measurements without graphite coating (thickness = 0.02 mm). Graphite coating wears away

Radial clearance of connecting rod, checking

Special tools, testers and auxiliary items required

- Plastigage

Test sequence

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

New clearance	Wear limit
0.015 to 0.062 mm	0.12 mm

- Always replace connecting rod bolts.

15 - ENGINE - CYLINDER HEAD, VALVETRAIN

CYLINDER HEAD, ASSEMBLY OVERVIEW

Cylinder head, assembly overview

NOTE:

- Illustration depicts cylinder head of cylinder bank 2 (left).

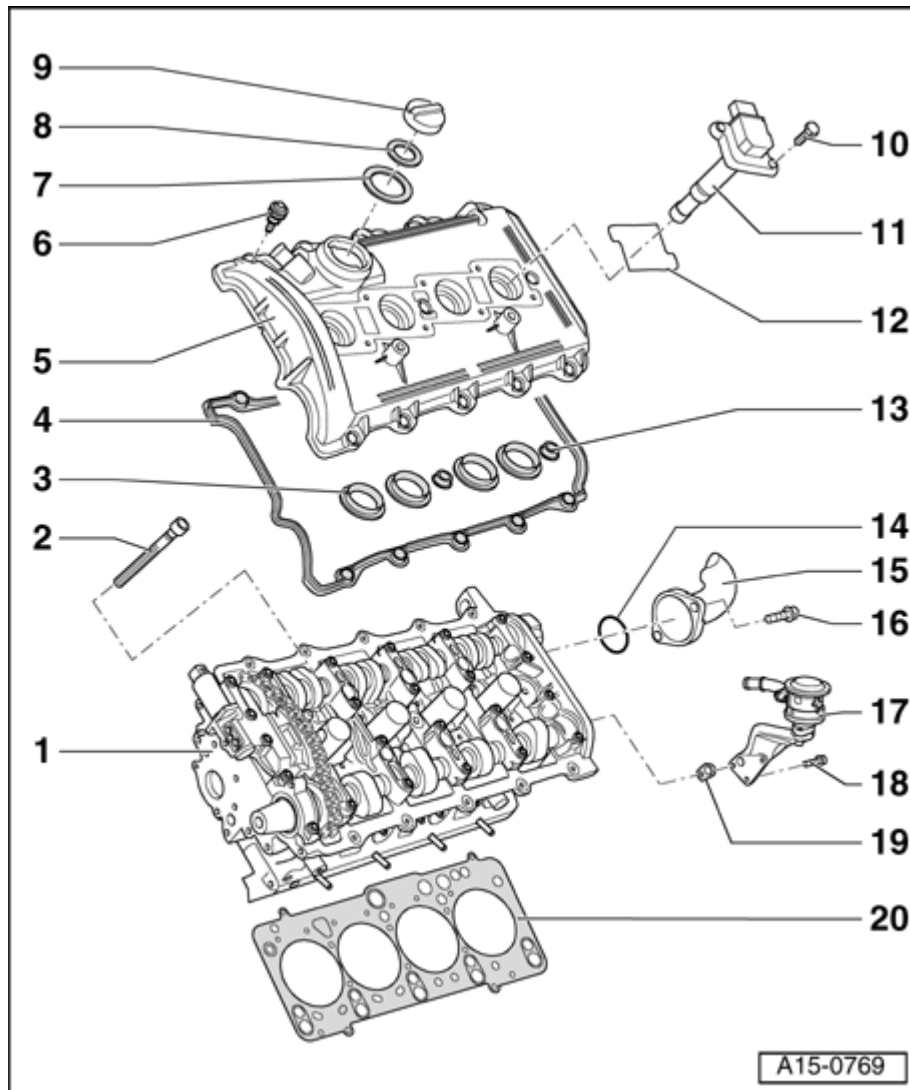


Fig. 256: Cylinder Head, Assembly Overview

Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Cylinder head

- Remove left cylinder head --> **Left cylinder head, removing**

- Remove right cylinder head --> **Right cylinder head, removing**
- Check for distortion --> **Checking cylinder head for distortion**
- Resurfacing is not permissible
- Installing --> **Cylinder head, installing**
- Renew coolant after replacing

2 - Cylinder head bolt

- Replace
- Note loosening sequence:
- Left cylinder head --> **Fig. 278**
- Right cylinder head --> **Fig. 287**
- Observe sequence for tightening --> **Fig. 293**

3 - Cylinder head cover gaskets and ignition coils

- Replace if damaged or leaking

4 - Cylinder head cover gasket

- Replace if damaged or leaking
- Seal contact surfaces with sealant before installing --> **Seal contact surfaces of bearing cap/cylinder head**
- Sealant

5 - Cylinder head cover

- Removing and installing left cylinder head cover --> **Left cylinder head cover, removing and installing**
- Removing and installing right cylinder head cover --> **Right cylinder head cover, removing and installing**

6 - Special bolt, 10 Nm

- Replace if damaged or leaking

7 - Gasket

- Replace if damaged or leaking

8 - Gasket

- For cap

- Replace if damaged or leaking

9 - Cap

10 - 10 Nm

11 - Ignition coil

- Removing --> **01 - MAINTENANCE**

12 - Gasket

- Replace if damaged

13 - Cylinder head cover gasket

- Replace if damaged or leaking

14 - O-ring

- Replace

15 - Rear coolant pipe

16 - 10 Nm

17 - Combination valve for Secondary Air Injection (AIR)

18 - 10 Nm

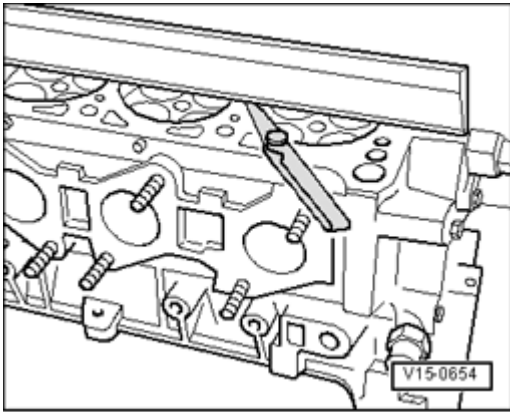
19 - Gasket

- Replace

20 - Cylinder head gasket

- Replacing --> Cylinder head, removing --> **Left cylinder head, removing**
- Installed location: Part number facing cylinder head
- Replace coolant after replacing

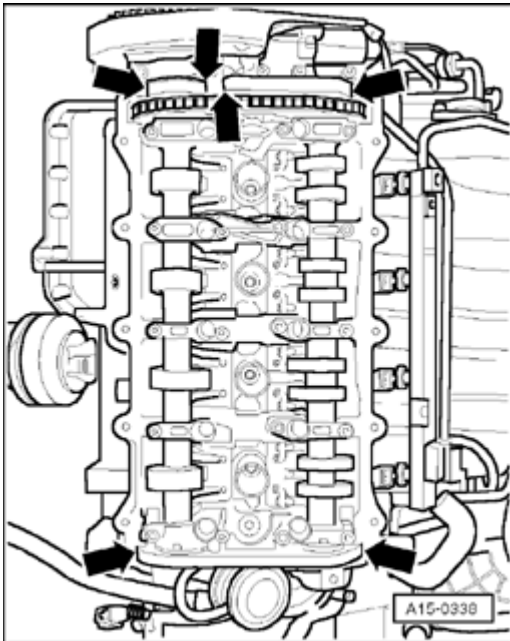
Checking cylinder head for distortion

**Fig. 257: 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.
- Maximum permissible warpage: 0.1 mm

Seal contact surfaces of bearing cap/cylinder head

**Fig. 258: Applying Thin Layer Of Sealant To Edges Of Sealing Surfaces Between Bearing Cap And Cylinder Head**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Apply thin layer of sealant (dia. approx. 5 mm) - **arrows** - to edges of sealing surfaces between bearing cap and cylinder head.
- Sealant

Left cylinder head cover, removing and installing

Removing

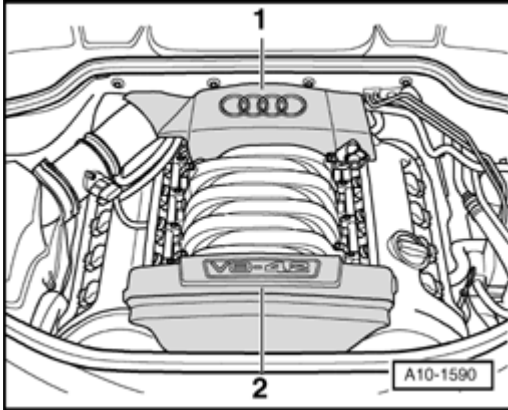


Fig. 259: Removing Engine Cover

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove engine cover - 1 - and - 2 - upward.
- Remove ignition coils --> **28 IGNITION/GLOW PLUG SYSTEM** .
- Disconnect crankcase ventilation hose from cylinder head cover.
- Remove toothed belt guard.

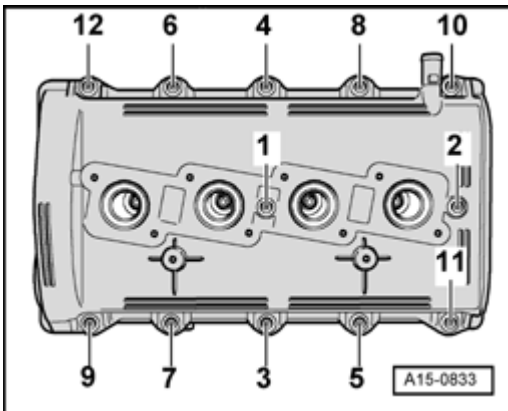


Fig. 260: Cylinder Head Cove Bolt Loosening/Tightening Sequence

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove left cylinder head cover bolts in sequence - 12 to 1 -.
- Remove cylinder head cover.

Installing

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

NOTE:

- **Replace cylinder head cover gaskets and ignition coils if damaged.**

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

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

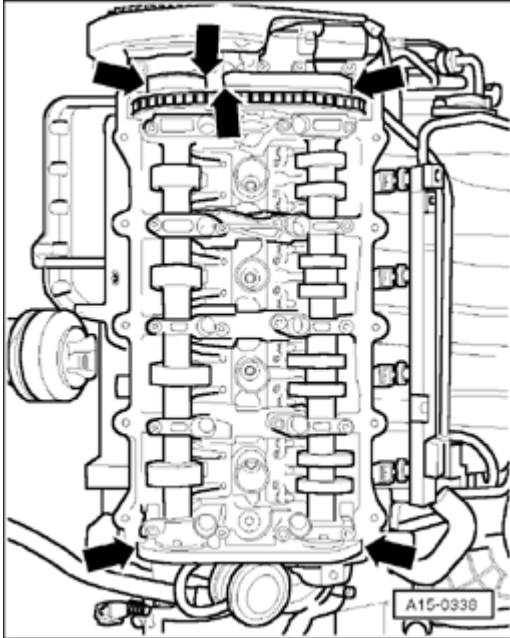


Fig. 261: Applying Thin Layer Of Sealant To Edges Of Sealing Surfaces Between Bearing Cap And Cylinder Head

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Apply thin layer of sealant (dia. approx. 5 mm) - **arrows** - to edges of sealing surfaces between bearing cap and cylinder head.
- Sealant

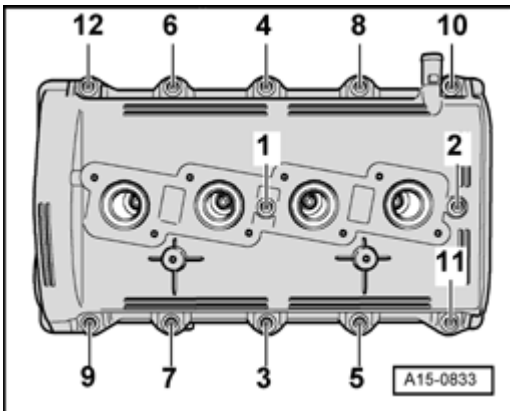


Fig. 262: Cylinder Head Cove Bolt Loosening/Tightening Sequence

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten cylinder head cover in sequence - **1 to 12** -.

Torque specifications

Component	Nm
Cylinder head cover to cylinder head	10
Toothed belt guard to cylinder head cover	10

Right cylinder head cover, removing and installing

Removing

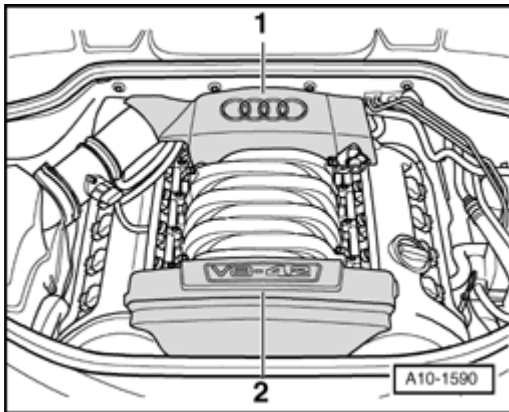


Fig. 263: Removing Engine Cover

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove engine cover -1 and 2- upward.

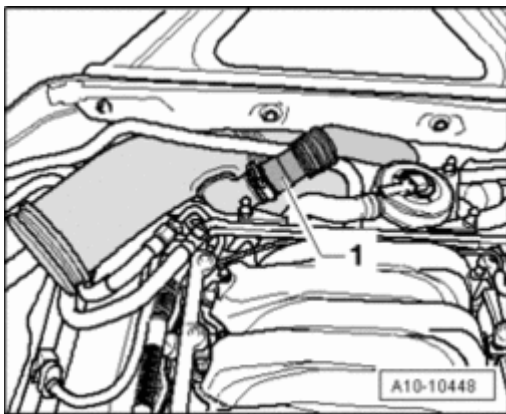


Fig. 264: Removing Hose

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove hose - 1 -.

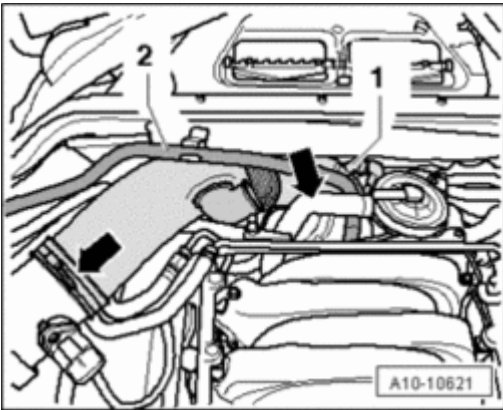


Fig. 265: Identifying Hose & Air Intake Tube

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect hose - 1 -.
- Unclip hose - 2 -.
- Remove air intake tube - **arrows** -.

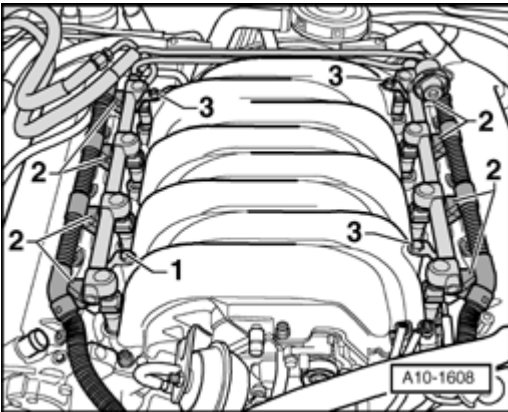


Fig. 266: Identifying Hose, Fuel Injectors Connectors & Fuel Distributor

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect hose - 1 -.
- Disconnect connectors of fuel injectors - 2 -.
- Remove fuel distributor - 3 - and lay aside.

NOTE:

- **Do not open fuel supply and return line.**

- Remove ignition coils --> **28 IGNITION/GLOW PLUG SYSTEM** .
- Disconnect crankcase ventilation hose from cylinder head cover.
- Remove toothed belt cover.

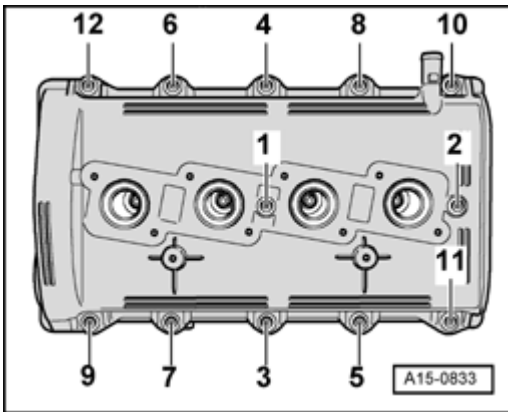


Fig. 267: Cylinder Head Cove Bolt Loosening/Tightening Sequence
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove left cylinder head cover bolts in sequence - 12 to 1 -.
- Remove cylinder head cover.

Installing

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

NOTE:

- Replace cylinder head cover gaskets and ignition coils if damaged.
- Replace bolts for cylinder head cover if gasket is damaged.

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

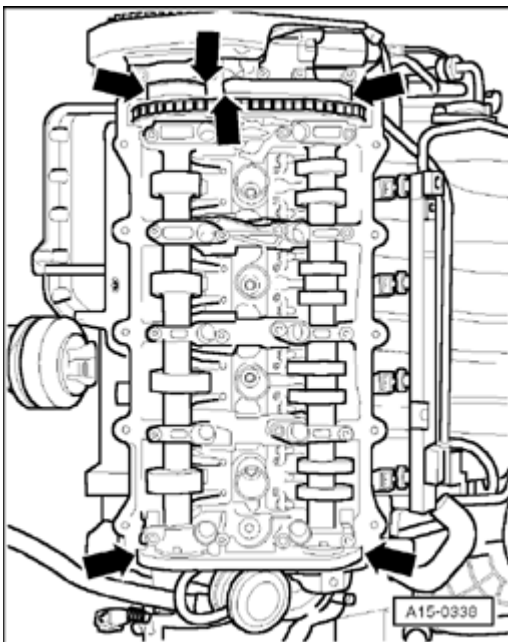


Fig. 268: Applying Thin Layer Of Sealant To Edges Of Sealing Surfaces Between Bearing Cap And Cylinder Head

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Apply thin layer of sealant (dia. approx. 5 mm) - **arrows** - to edges of sealing surfaces between bearing cap and cylinder head.
- Sealant

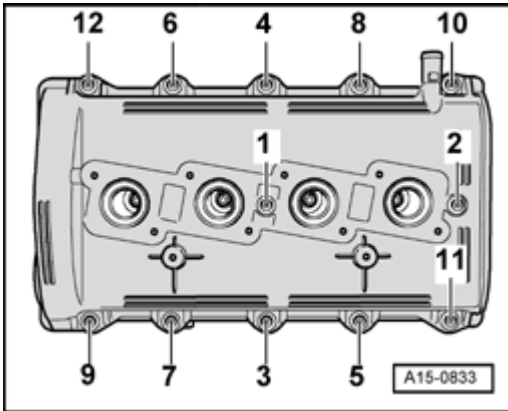


Fig. 269: Cylinder Head Cove Bolt Loosening/Tightening Sequence
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten cylinder head cover in sequence - **12 to 1** -.

Torque specifications

Component	Nm
Cylinder head cover to cylinder head	10
Fuel distributor to intake manifold	10
Toothed belt guard to cylinder head cover	10

Left cylinder head, removing

Special tools, testers and auxiliary items required

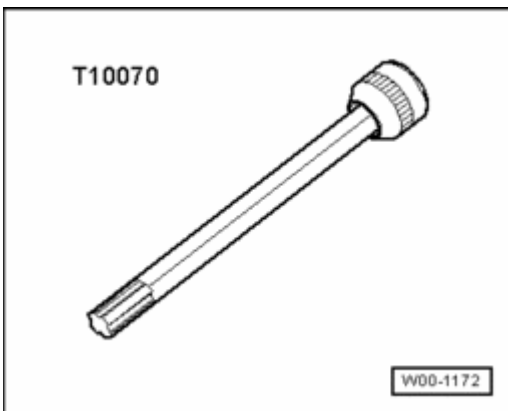
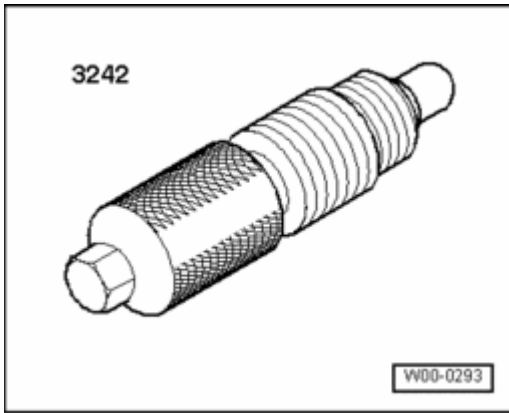


Fig. 270: Socket T10070

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Polydrive Bit and Drive Socket T10070

**Fig. 271: Crankshaft Holder 3242**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Crankshaft Holder 3242

Removing**NOTE:**

- Before raising the vehicle on a hoist (wheels off the ground), first activate the vehicle jack mode --> **43 - SELF LEVELING SUSPENSION** .

NOTE:

- Secure all hose connections using hose clamps appropriate for the model type .
- All cable ties which are opened or cut open when removing, must be replaced in the same position when installing.
- Replace cylinder head bolts.
- Always replace self-locking nuts, bolts which have been tightened to tightening torque as well as gaskets and O-rings.
- When replacing the cylinder head or cylinder head gasket, coolant must be completely replaced.

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

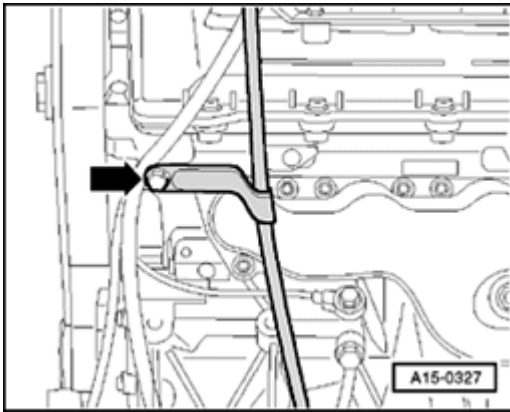


Fig. 272: Removing Guide Pipe For Oil Dipstick From Cylinder Head
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove guide pipe for oil dipstick from cylinder head.
- Toothed belt, removing --> **Toothed belt, removing and installing.**
- Remove camshaft gear from cylinder bank 5 to 8.

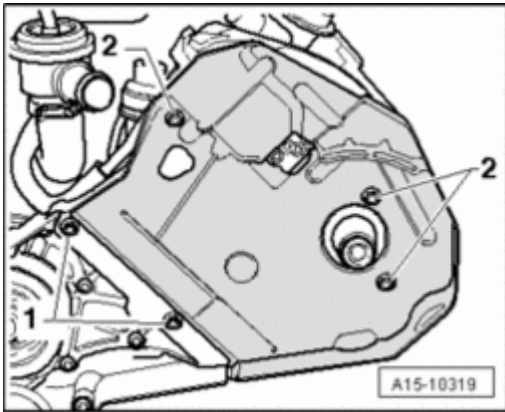


Fig. 273: Removing Bolts And Toothed Belt Guard At Rear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **2** - and remove toothed belt guard at rear.
- Loosen nuts - **1** -.

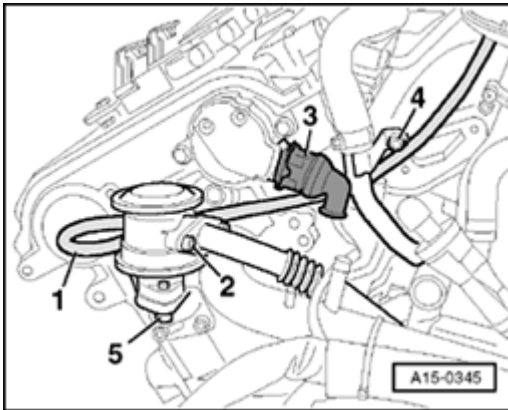


Fig. 274: Identifying Hose, Bolts & Connector

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect hose - **1** -.
- Remove bolts - **2** -.
- Disconnect connector - **3** -.
- Remove bolt - **4** - and pull out oil line.
- Remove bolts - **5** - and remove combination valve.

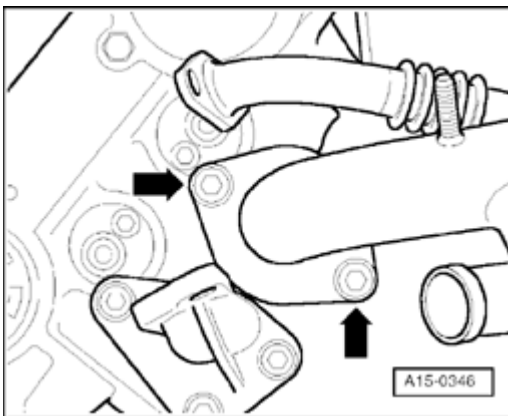


Fig. 275: Removing Water Pipe At Left/Right

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove water pipe - **arrows** - at left and right.
- Remove intake manifold --> **24 MULTIPOINT FUEL INJECTION (MPI)** .

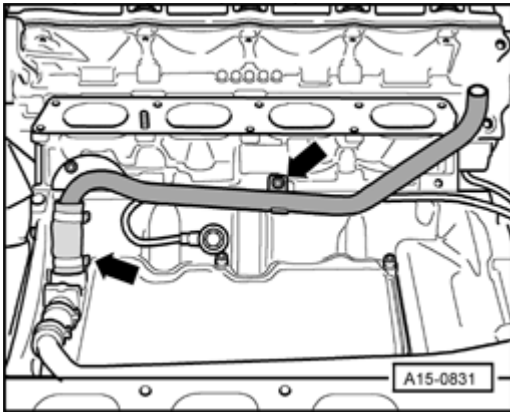


Fig. 276: Removing Pipe Of Crankshaft Housing Ventilation
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove pipe of crankshaft housing ventilation - **arrows** -.
- Remove left front exhaust pipe with catalytic converter.
- Remove ignition coils --> **28 IGNITION/GLOW PLUG SYSTEM** .

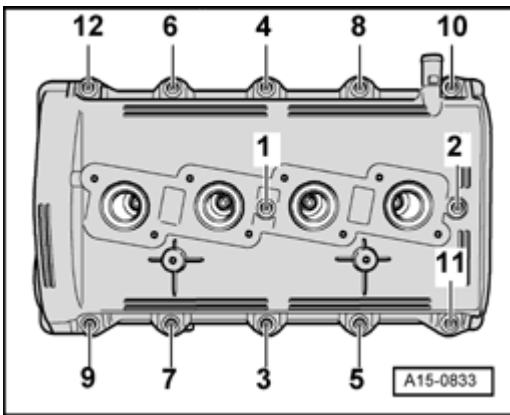


Fig. 277: Cylinder Head Cove Bolt Loosening/Tightening Sequence
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove left cylinder head cover bolts in sequence - **12 to 1** -.
- Remove cylinder head cover.

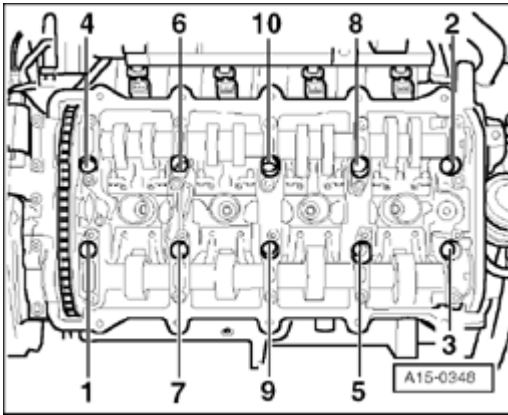


Fig. 278: Cylinder Head Bolts Loosening Sequence
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Follow sequence - **1 to 10** - when loosening cylinder head bolts.
- Remove cylinder head and place it on a soft surface (foam).

Right cylinder head, removing

Special tools, testers and auxiliary items required

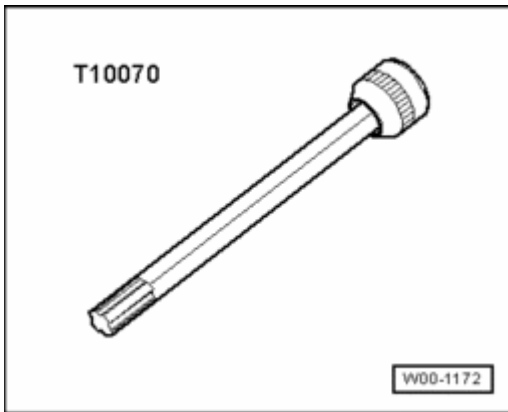


Fig. 279: Socket T10070
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Polydrive Bit and Drive Socket T10070

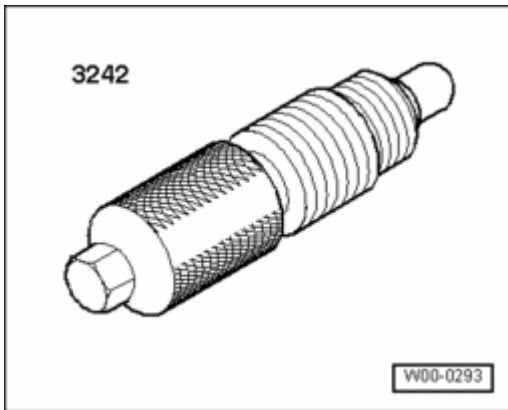


Fig. 280: Crankshaft Holder 3242

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Crankshaft Holder 3242

Removing

NOTE:

- Before raising the vehicle on a hoist (wheels off the ground), first activate the vehicle jack mode --> 43 - SELF LEVELING SUSPENSION .

NOTE:

- Secure all hose connections using hose clamps appropriate for the model type .
- All cable ties which are opened or cut open when removing, must be replaced in the same position when installing.
- Replace cylinder head bolts.
- Always replace self-locking nuts, bolts which have been tightened to tightening torque as well as gaskets and O-rings.
- When replacing the cylinder head or cylinder head gasket, coolant must be completely replaced.

- Remove engine --> Engine, removing and installing.
- Remove toothed belt cover.

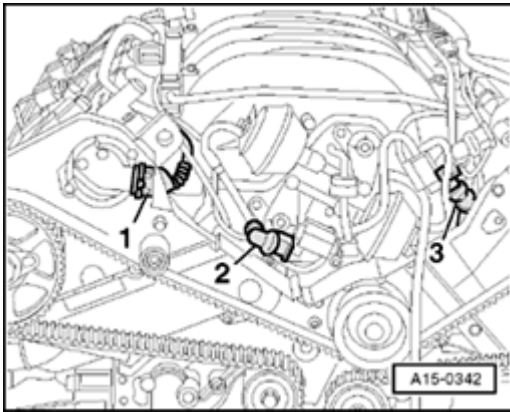


Fig. 281: Disconnecting Connector From Camshaft Position (CMP) Sensor
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect connector - 1 - from Camshaft Position (CMP) sensor.
- Toothed belt, removing --> **Toothed belt, removing and installing.**
- Remove camshaft gear.

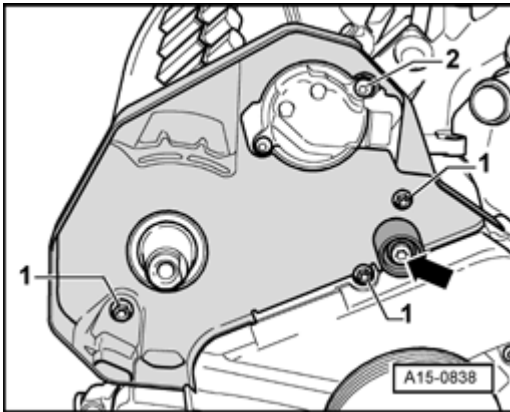


Fig. 282: Removing Idler Pulley & Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove idler pulley - **arrow** -.
- Remove bolts - 1 - and - 2 - and remove bolts .
- Remove intake manifold --> **24 MULTIPOINT FUEL INJECTION (MFI)** .

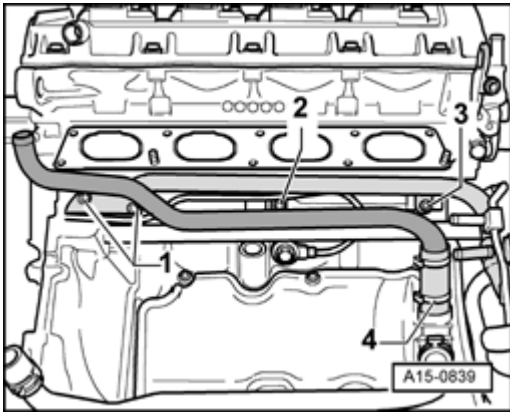


Fig. 283: Removing Crankshaft Housing Ventilation Pipe, Bolt And Loosening Hose Clamp
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove crankshaft housing ventilation pipe, remove bolt - 2 - and loosen hose clamp - 4 - to do so.
- Remove coolant pipe from cylinder head (bolts - 1 - and - 3 -).
- Remove ignition coils --> **28 IGNITION/GLOW PLUG SYSTEM** .

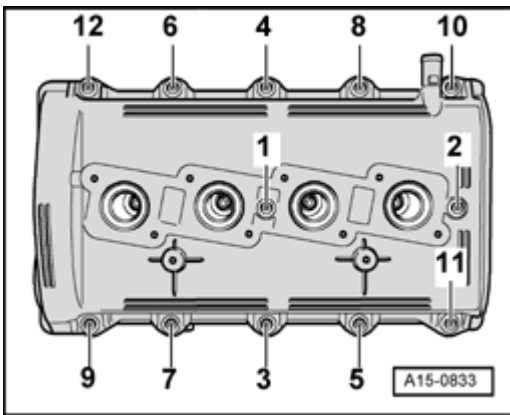


Fig. 284: Cylinder Head Cove Bolt Loosening/Tightening Sequence
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove left cylinder head cover bolts in sequence - 12 to 1 -.
- Remove cylinder head cover.

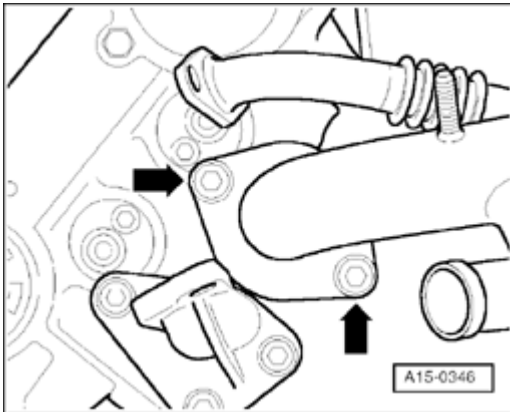


Fig. 285: Removing Water Pipe At Left/Right
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove water pipe - **arrows** -.

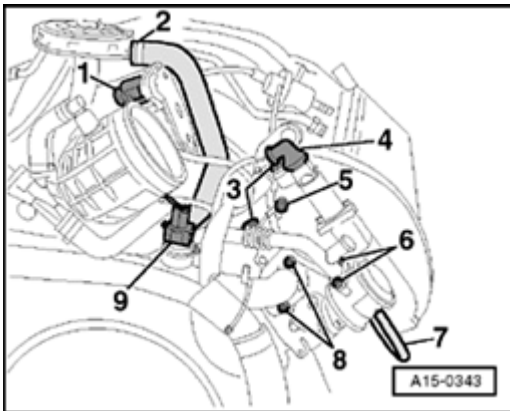


Fig. 286: Identifying Connector, Hoses, Bracket , Connectors, Ground (GND) Cable & Bolts
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect connector - **1** -.
- Disconnect hose - **2** -.
- Remove bracket - **3** -.
- Disconnect connector - **4** -.
- Remove Ground (GND) cable - **5** - from cylinder head.
- Remove bolts - **6** -.
- Disconnect hose - **7** - from combination valve.
- Remove bolts - **8** -.
- Disconnect connector - **9** -.
- Remove water pipe.
- Remove right front exhaust pipe with catalytic converter.

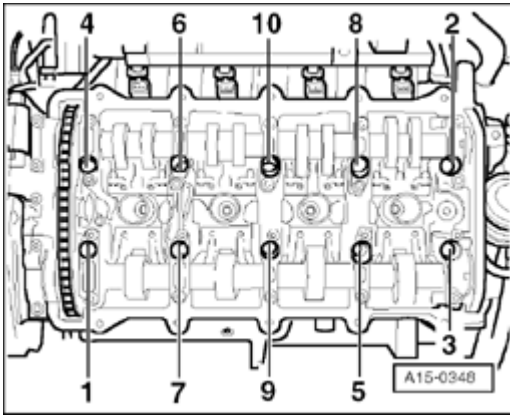


Fig. 287: Cylinder Head Bolts Loosening Sequence
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Follow sequence - **1 to 10** - when loosening cylinder head bolts.
- Remove cylinder head and place it on a soft surface (foam).

Cylinder head, installing

Special tools, testers and auxiliary items required

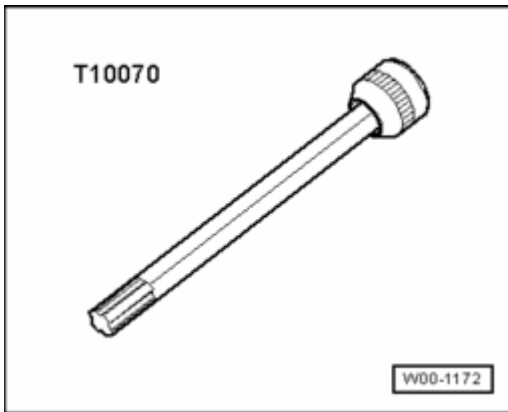


Fig. 288: Socket T10070
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Polydrive Bit and Drive Socket T10070

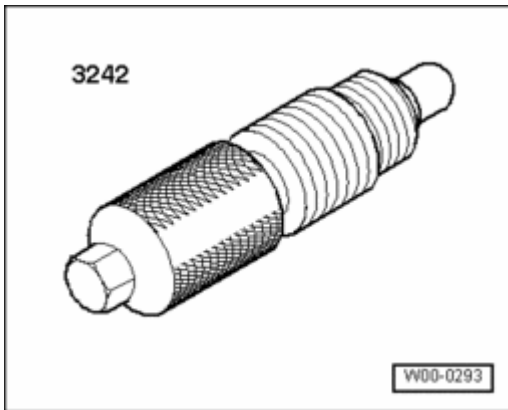


Fig. 289: Crankshaft Holder 3242

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Crankshaft Holder 3242

Installing

NOTE:

- Replace cylinder head bolts.
- During assembly, replace self-locking nuts and bolts.
- Always replace bolts that are tightened to torque as well as O-rings and gaskets.
- Carefully remove residual sealant from cylinder head and cylinder block. Make sure that no long scrapes or scratches result.
- Carefully remove all grinding and sanding residue.
- There must be no oil or coolant in the blind holes for the cylinder head bolts in the cylinder block.
- After installing a replacement cylinder head with camshafts installed, oil contact surfaces between valve lifters, cam followers and cam lubricating surfaces after installing cylinder head.
- Do not remove plastic bases protecting exposed valves until immediately before installing cylinder head.
- When replacing the cylinder head or cylinder head gasket, coolant must be completely replaced.
- Reworking the cylinder heads is not permissible.
- Cylinder heads with cracks between valve seats or between valve seat and spark plug thread can still be used without loss of service life if the cracks are minute (max. 0.3 mm width) or only the first four threads of a spark plug thread are cracked.
- 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.
- Install cylinder head gasket onto guide sleeves. Marking "oben" (top) or

part number must face toward cylinder head.

- Secure all hose connections using hose clamps appropriate for the model type .
- 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.
- All cable ties which are opened or cut open when removing, must be replaced in the same position when installing.

○ Before positioning cylinder head, set crankshaft and camshafts on DTC cylinder 5:

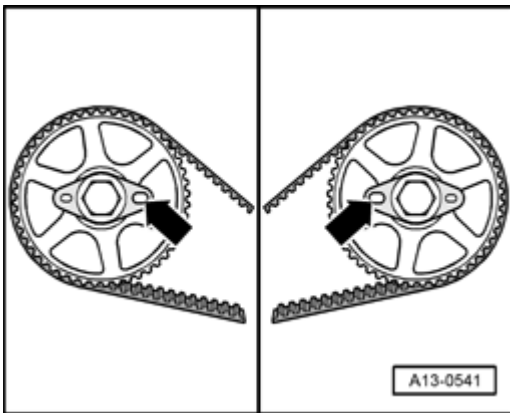


Fig. 290: Identifying Large Holes On Securing Plates At Camshaft Gears Aligns On Inside
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- The large holes - **arrows** - on securing plates at camshaft gears must align on inside.

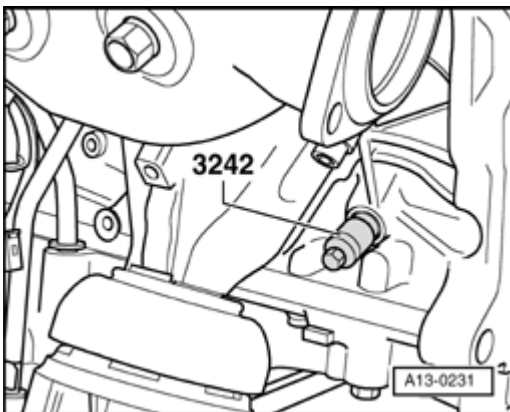


Fig. 291: Installing Crankshaft Holder 3242 In Hole For Removed Locking Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Crankshaft holder 3242 must be installed.

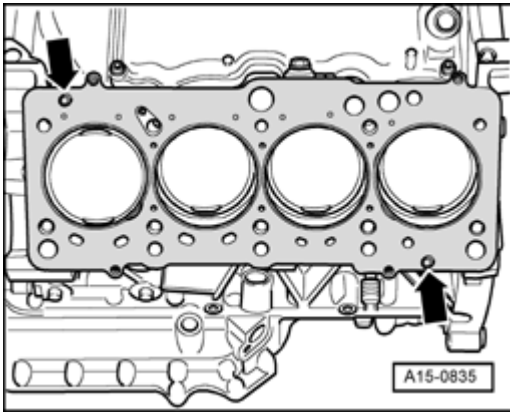


Fig. 292: Cylinder Head Gasket Alignment Bushings
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set cylinder head gasket in place.
- 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.
- Set cylinder head in place.
- Insert new cylinder head bolts and tighten by hand.

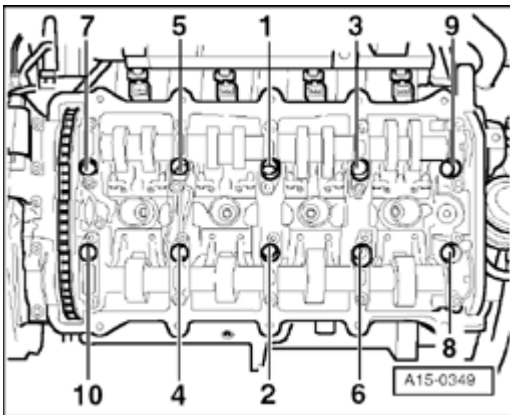


Fig. 293: Cylinder Head Tightening Sequence
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten cylinder head in sequence indicated, in four stages as follows:
- Tighten with torque wrench:
 - 1. Step: 30 Nm
 - 2. Step: 60 Nm
- Tighten using a solid wrench:

2006 Audi A8 Quattro

ENGINE 4.2 Liter V8 5V Engine Mechanical, Engine Code(s): BFM, BGK - A8

- 3. Step: 90° (¹ /₄ turn) further
- 4. Step: 90° (¹ /₄ turn) further

NOTE:

- **There is no requirement to retighten the cylinder head bolts after repairs.**

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

- Install cylinder head cover on left --> **Left cylinder head cover, removing and installing** or right --> **Right cylinder head cover, removing and installing**.
- Install right combination valve for secondary air injection system --> **Secondary Air Injection (AIR) (right combination valve), removing and installing**.
- Install front exhaust pipe.
- Install intake manifold --> **24 MULTIPOINT FUEL INJECTION (MFI)** .
- Install toothed belt (adjust timing) --> **Toothed belt, removing and installing**.

NOTE:

- **After working on the valvetrain, carefully rotate engine by hand at least 2 full revolutions to ensure that valves do not strike the pistons when starting.**

- Install engine --> **Installing**.
- Replace coolant.
- Install torque support --> **Torque support (with torque support valve N382), assembly overview**.

Torque specifications

Component		Nm
Rear toothed belt cover to	Cylinder head	10 ¹⁾
	Coolant pump	10
Idler roller to cylinder head		22
Oil dip stick guide tube to cylinder head		10
Coolant pipe to cylinder head		10

- Insert ¹⁾ bolts using locking compound; locking compound

COMPRESSION PRESSURES, CHECKING

Compression pressures, checking

Special tools, testers and auxiliary items required

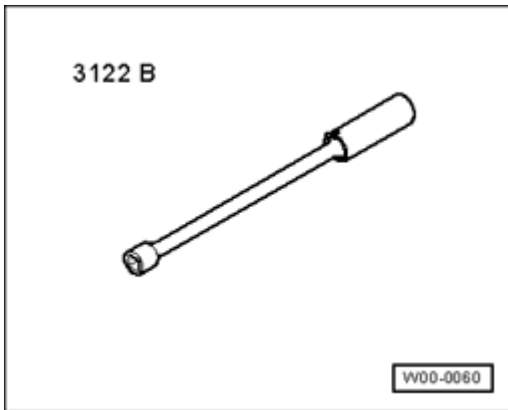


Fig. 294: Spark Plug Removal Tool 3122 B
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Spark plug removal tool 3122 B



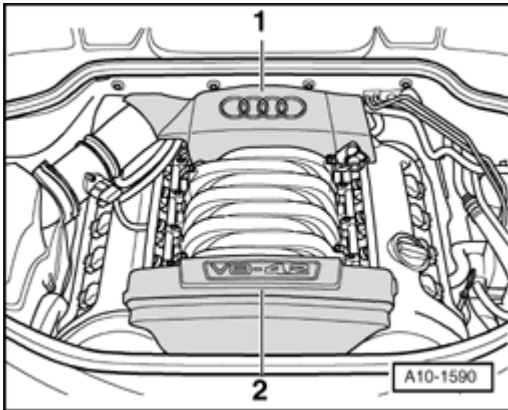
Fig. 295: Compression Tester V.A.G 1763
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Compression tester V.A.G 1763

Test conditions

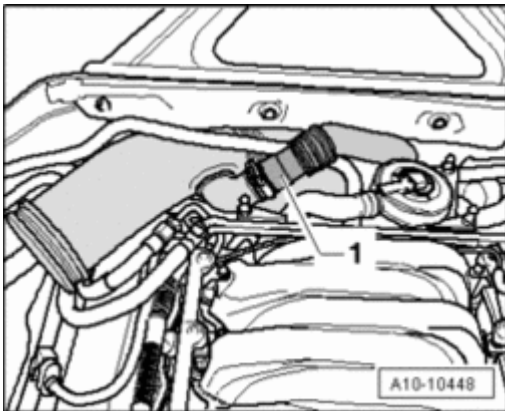
- Engine oil temperature at least 30°C
- Battery voltage at least 12.7 V

Test sequence

**Fig. 296: Removing Engine Cover**

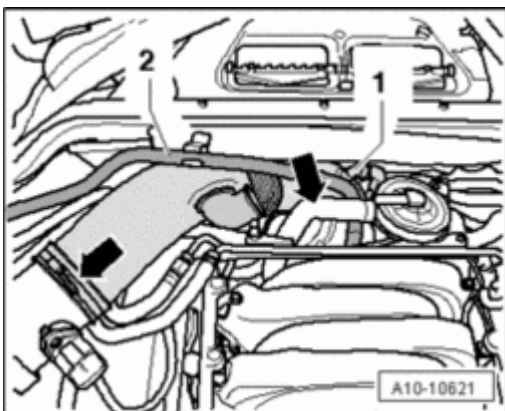
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove engine cover - 1 - and - 2 - upward.

**Fig. 297: Removing Hose**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove hose - 1 -.

**Fig. 298: Identifying Hose & Air Intake Tube**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect hose - **1** -.
- Unclip hose - **2** -.
- Remove air intake tube - **arrows** -.

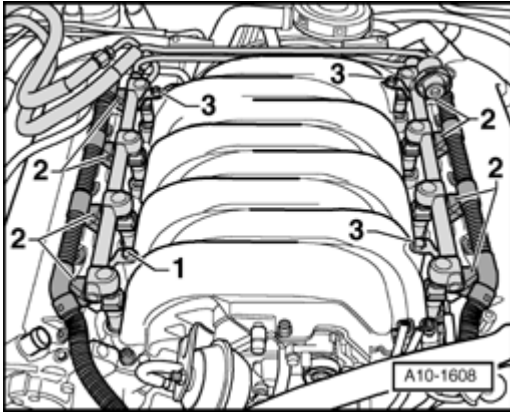


Fig. 299: Identifying Hose, Fuel Injectors Connectors & Fuel Distributor
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect connectors of fuel injectors - **2** -.
- Remove ignition coils --> **28 IGNITION/GLOW PLUG SYSTEM** .
- Using spark plug removal tool 3122 B , remove spark plugs.
- Open throttle valve completely.
- Check compression pressure using the compression tester V.A.G 1763.

NOTE: • **Using tester operating instructions.**

- Operate starter until tester shows no further pressure increase.

Compression pressure:

New bar positive pressure	Wear limit bar positive pressure	Difference between cylinders bar positive pressure
10.0 to 13.0	7.0	Maximum 3.0

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

The following work step must be performed after engine compression test.

- Query fault memory and erase, if necessary.

Use Vehicle Diagnosis, Testing and Information System VAS 5051 to do so.

Torque specifications

2006 Audi A8 Quattro

ENGINE 4.2 Liter V8 5V Engine Mechanical, Engine Code(s): BFM, BGK - A8

Component	Nm
Spark plugs in cylinder head	30

VALVETRAIN, ASSEMBLY OVERVIEW

Valvetrain, assembly overview

NOTE:

- Cylinder heads with cracks between valve seats or between valve seat and spark plug thread can still be used without loss of service life if the cracks are minute (max. 0.3 mm width) or only the first four threads of a spark plug thread 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.
- Always replace seals, sealing rings and O-rings.

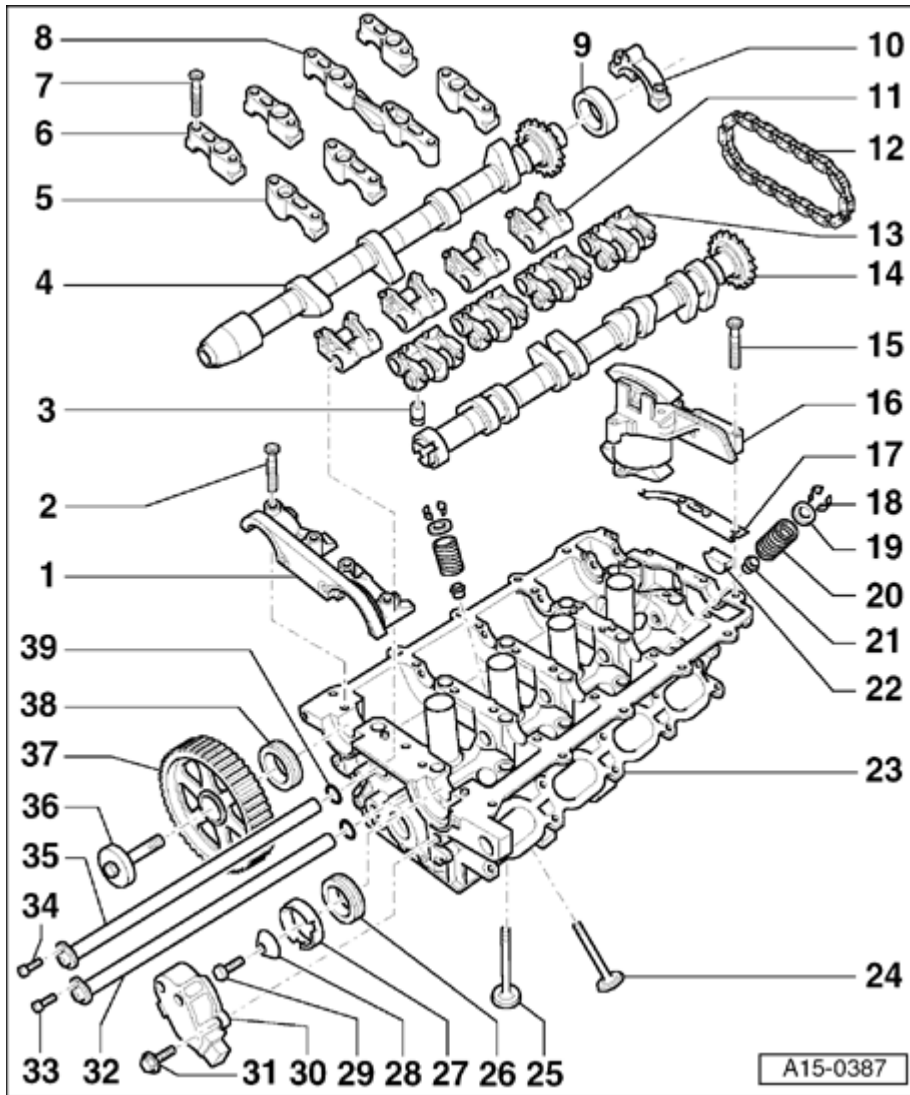


Fig. 300: Valvetrain, Assembly Overview

Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Double bearing cap

- Before installing, coat contact surfaces of front and rear bearing caps lightly with sealant --> **Coat bearing cap with sealant**
- Sealant

2 - 5 Nm plus an additional 90° ($\frac{1}{4}$ turn)

- Replace

3 - Hydraulic plunger

- Pressed into roller rocker lever

4 - Exhaust camshaft

- Checking axial play --> **Camshafts, checking axial clearance**
- Removing and installing --> **Camshafts and camshaft adjusters (right cylinder head), removing and installing**
- Check radial play using Plastigage (cam follower removed), wear limit 0.1 mm, run-out max. 0.01 mm

5 - Bearing cap for intake camshaft

- Note installation position and allocation --> **Fig. 330**
- Observe alignment bushings if present

6 - Bearing cap for exhaust camshaft

- Note installation position and allocation --> **Fig. 330**
- Observe alignment bushings if present

7 - 5 Nm plus an additional 90° ($\frac{1}{4}$ turn)

- Replace

8 - Double bearing cap**9 - Cap**

- Replace
- To remove, push through using screwdriver and pry out
- To install, drive in using retractors 3202 or suitable lever

10 - Bearing cap

- Before installing, coat contact surfaces of front and rear bearing caps lightly with sealant --> **Coat bearing cap with sealant**
- Sealant

11 - Roller rocker lever

- For exhaust camshaft
- Removing and installing --> **Roller rocker lever, removing and installing**

12 - Drive chain

- **Installing:**
- Left cylinder head --> **Camshafts and camshaft adjusters (left cylinder head), removing and**

installing

- Right cylinder head --> **Camshafts and camshaft adjusters (right cylinder head), removing and installing**

13 - Roller rocker lever

- For intake camshaft
- Removing and installing --> **Roller rocker lever, removing and installing**

14 - Intake camshaft

- Checking axial play --> **Camshafts, checking axial clearance**
- Removing and installing --> **Camshafts and camshaft adjusters (right cylinder head), removing and installing**
- Check radial play using Plastigage (cam follower removed) wear limit 0.1 mm, run-out max. 0.01 mm

15 - 5 Nm plus an additional 90° ($\frac{1}{4}$ turn)

- Replace

16 - Mechanical camshaft adjuster

- With Camshaft Adjustment Valve 1 N205
- Before removing, secure using Bracket For Chain Adjustment 3366 --> **Camshafts and camshaft adjusters (right cylinder head), removing and installing**

17 - Rubber/metal seal

- Replace

18 - Valve keepers

19 - Valve spring plate

20 - Valve spring

21 - Valve stem seal

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

22 - Gasket

- Replace

23 - Cylinder head

- See note --> **Valvetrain, assembly overview**
- Check valve guides, grind valve seats --> **Valve guides, checking**
- Rework valve seats --> **Valve seats, reworking**

24 - Exhaust valve

- Do not rework, only lapping is permitted
- Valve dimensions --> **Valve dimensions**
- Check valve guides, grind valve seats --> **Valve guides, checking**

25 - Intake valve

- Do not rework, only lapping is permitted
- Valve dimensions --> **Valve dimensions**
- Check valve guides, grind valve seats --> **Valve guides, checking**

26 - Seal

- For Camshaft Position (CMP) Sensor
- Replacing --> **Camshaft Position (CMP) Sensor seals, replacing.**

27 - Cover for Camshaft Position (CMP) Sensor

- Note installation location, notch in camshaft

28 - Washer

- Conical

29 - 23 Nm**30 - Camshaft Position (CMP) sensor****31 - 10 Nm****32 - Shaft for roller rocker lever, intake side**

- Removing and installing --> **Roller rocker lever, removing and installing**

33 - 10 Nm**34 - 10 Nm****35 - Shaft for roller rocker lever, exhaust side**

- Removing and installing --> **Roller rocker lever, removing and installing**

36 - 55 Nm

37 - Camshaft sprocket

38 - Seal

- For camshaft
- Replacing --> **Camshaft seals, replacing.**

39 - O-ring

- For roller rocker lever shaft
- Replace

Valve dimensions

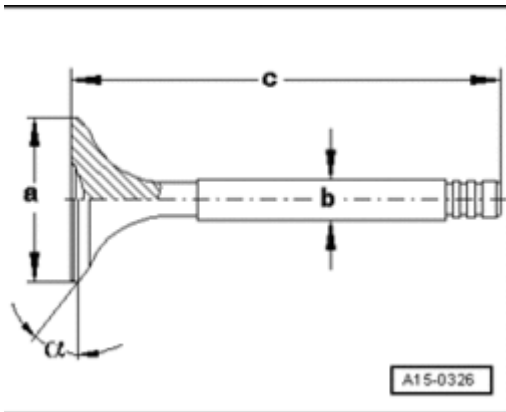


Fig. 301: Valve Dimensions

Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- Valves must not be reworked. Only lapping is permitted.

Dimension	Intake valve	Exhaust valve
- a - = dia. mm	26.8 to 27.0	26.8 to 27.0
- b - = dia. mm	5.94 to 5.95	5.94 to 5.95
- c - = mm	96.4 to 96.6	95.3 to 95.5
- 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.

Coat bearing cap with sealant

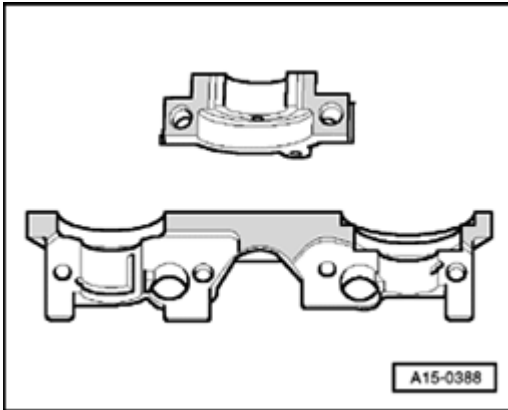


Fig. 302: Coating Hatched Surface Of Double Bearing Cap As Well As Outer Bearing Cap Next To Camshaft Adjuster With Sealant

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lightly coat hatched surface of double bearing cap as well as outer bearing cap next to camshaft adjuster with sealant and install bearing cap (observe alignment bushings).

- Sealant

Camshafts, checking axial clearance

Special tools, testers and auxiliary items required

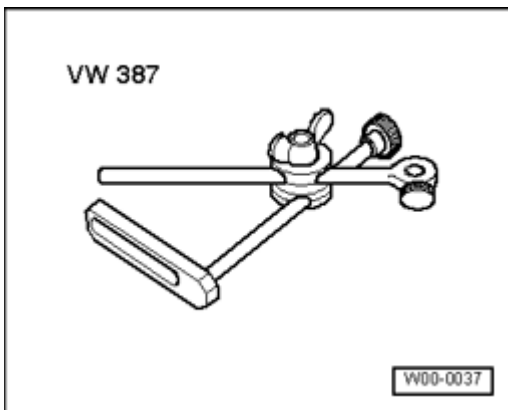


Fig. 303: Dial Gauge Holder VW 387

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Dial gauge holder VW 387
- Dial gauge

Test sequence

- Camshafts, removing --> **Camshafts and camshaft adjusters (right cylinder head), removing and installing.**
- Removing cam follower --> **Roller rocker lever, removing and installing.**

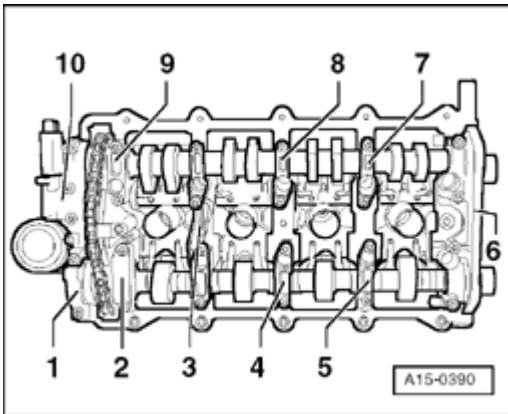


Fig. 304: Installing Camshafts Without Chain Into Cylinder Head And Tightening With Bearing Caps
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install camshafts without chain into cylinder head and tighten with bearing caps 3, 5 and 7.

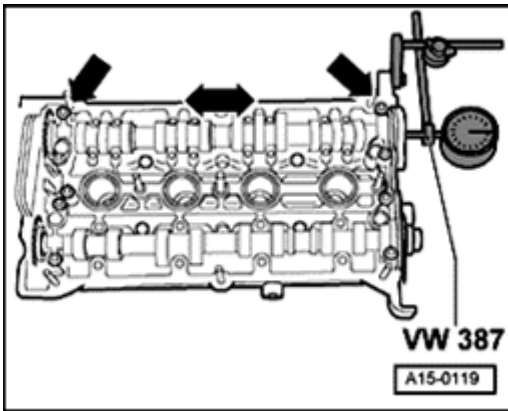


Fig. 305: Securing Dial Gauge Holder VW 387 To Dial Gauge On Cylinder Head
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure dial gauge holder VW 387 to dial gauge on cylinder head:

Intake camshaft

Exhaust camshaft

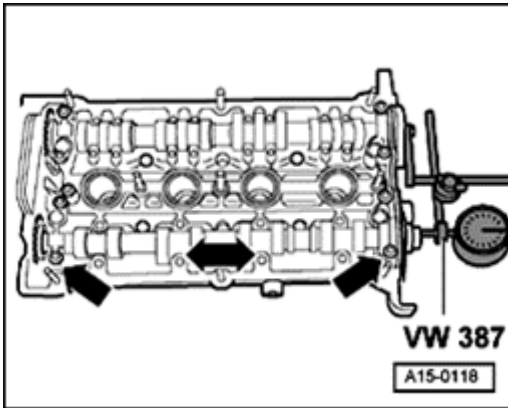


Fig. 306: Camshaft Axial Clearance, Checking - Exhaust Camshaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Wear limit for intake and exhaust camshaft

- Axial clearance: maximum 0.20 mm

Camshaft seals, replacing

Special tools, testers and auxiliary items required

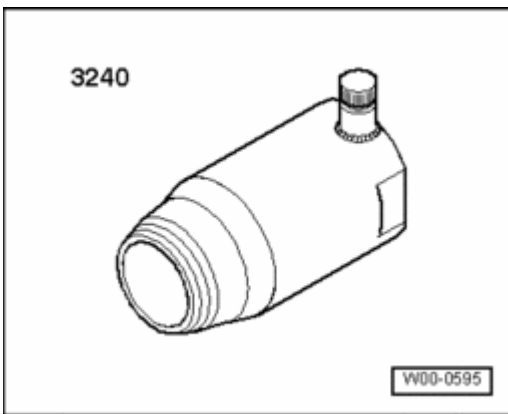
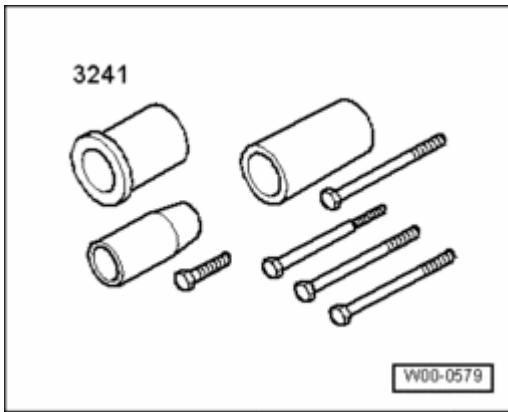


Fig. 307: Seal Remover 3240
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Seal remover 3240

**Fig. 308: Seal Installer 3241**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Seal installer 3241

Removing

- Toothed belt, removing --> **Toothed belt, removing and installing.**
- Remove camshaft gears.

NOTE:

- **If shaft seal leaks, replace seals on both cylinder heads.**

- Align inner part of seal extractor 3240 flush with outer part.

Left cylinder head:

- Remove inner part of seal extractor 2 rotations and lock using knurled-head screw.

Right cylinder head:

- Remove inner part of seal extractor 7 rotations and lock using knurled-head screw.

Continued for both sides:

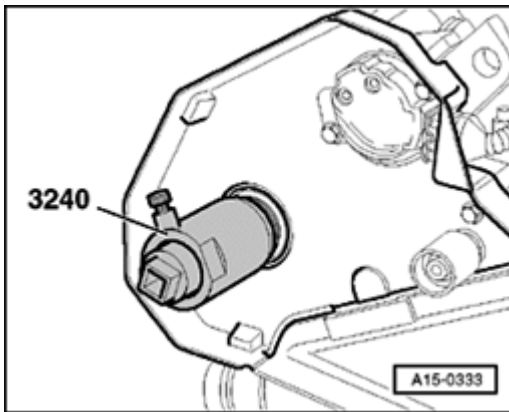


Fig. 309: Identifying Seal Extractor 3240 Installed

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lubricate threaded head of seal extractor 3240 , position and forcefully screw into oil seal as far as possible.
- Loosen knurled bolt and turn inner part against camshaft until seal is removed.
- Secure seal remover in a vise at flat spots. Remove seal using pliers
- Clean running and sealing surface.

Installing

- Slide oil seal onto cone of camshaft.

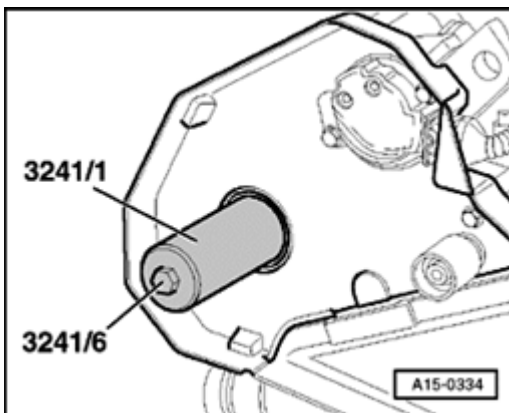


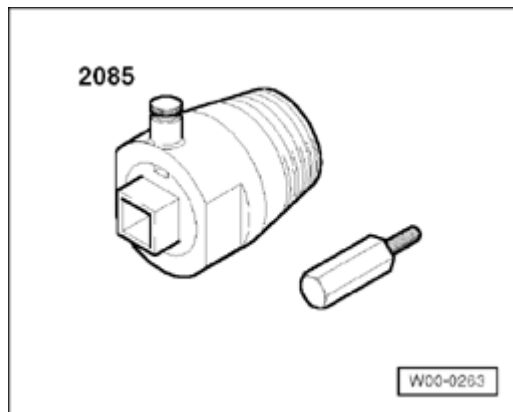
Fig. 310: Pressing In Seal Until Stop Using Thrust Sleeve 3241/1 And Bolt 3241/6

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press in seal until stop using thrust sleeve 3241/1 and bolt 3241/6.
- Install toothed belt (adjust timing) --> **Toothed belt, removing and installing.**

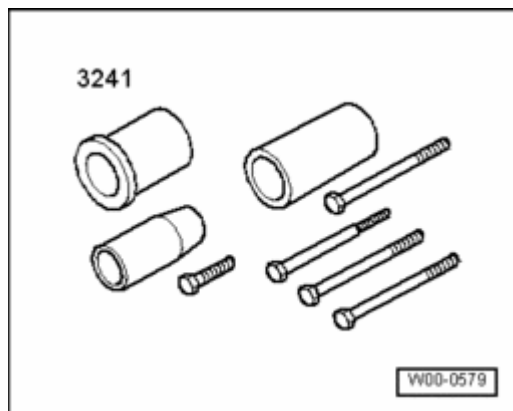
Camshaft Position (CMP) Sensor seals, replacing

Special tools, testers and auxiliary items required

**Fig. 311: Seal Remover 2085**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Seal remover 2085

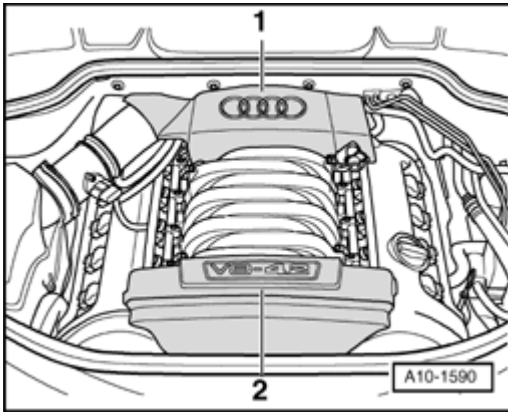
**Fig. 312: Seal Installer 3241**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Seal installer 3241

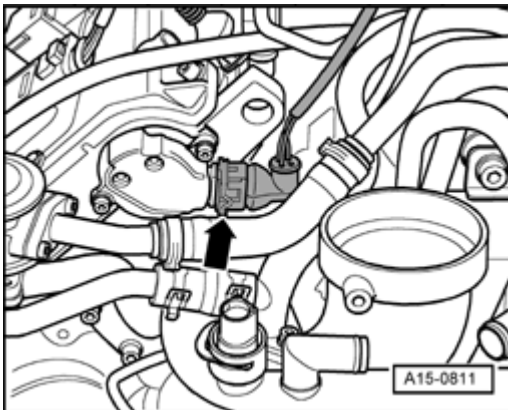
Work procedure

Left cylinder head:

**Fig. 313: Removing Engine Cover**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove engine cover - **1** - upward.
- Remove left combination valve for secondary air injection system --> **Secondary Air Injection (AIR) (left combination valve), removing and installing.**

**Fig. 314: Disconnecting Electrical Harness Connector At Camshaft Position (CMP) Sensor 2 G163**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - **arrow** - at Camshaft Position (CMP) Sensor 2 G163.
- Remove housing for Hall sensor.
- Remove washer and cover for Hall sensor.

Right cylinder head:

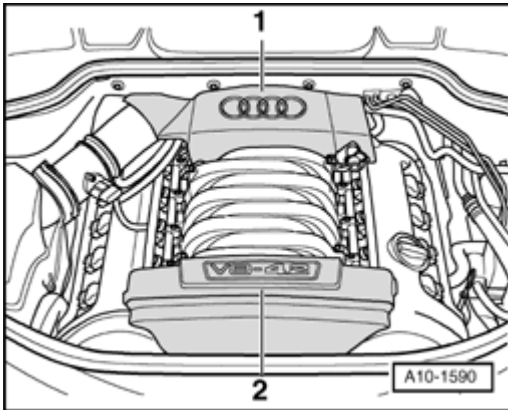


Fig. 315: Removing Engine Cover

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove engine cover - 2 - upward.
- Pull lock carrier toward front --> **Lock carrier, pulling toward front.**

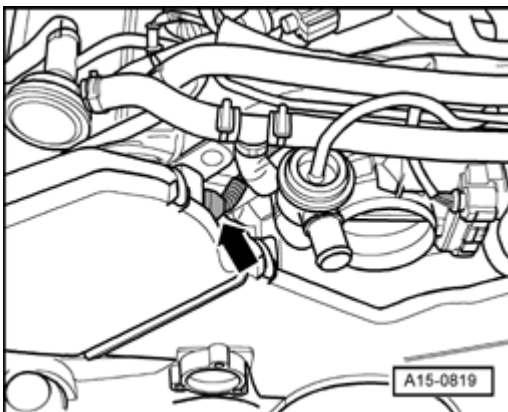


Fig. 316: Disconnecting Electrical Harness Connector At Camshaft Position (CMP) Sensor G40

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - **arrow** - at Camshaft Position (CMP) Sensor G40.
- Remove right toothed belt cover.

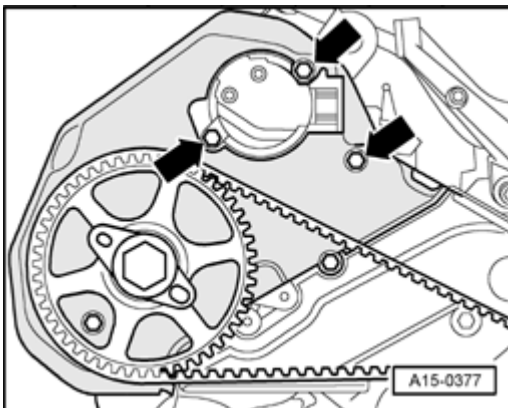


Fig. 317: Identifying Hall Sensor & Bolts

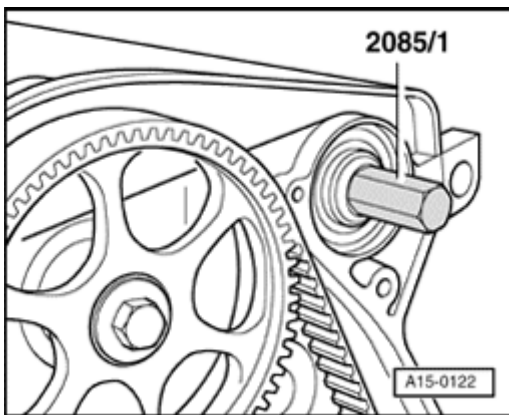
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Pull toothed belt guard slightly toward front and remove camshaft position sensor.
- Remove washer and cover for Hall sensor.

Continued for both sides:

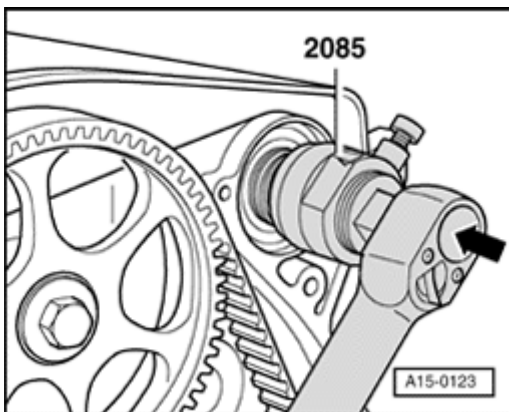
NOTE:

- In the following illustrations, the right cylinder head is depicted.

**Fig. 318: Adapter 2085/1 Threaded In Camshaft**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- To guide seal puller, thread adapter 2085/1 in camshaft by hand until stop.
- Remove inner portion of seal extractor 2085 two rotations from outer portion and secure with knurled-head bolt.

**Fig. 319: Screwing Threaded Head Of Seal Extractor With Forced Pressure Into Oil Seal**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Grease threaded head of seal puller 2085 , position and install oil seal as far as possible with forced pressure.

- Loosen knurled bolt and turn inner part against camshaft until seal is removed.

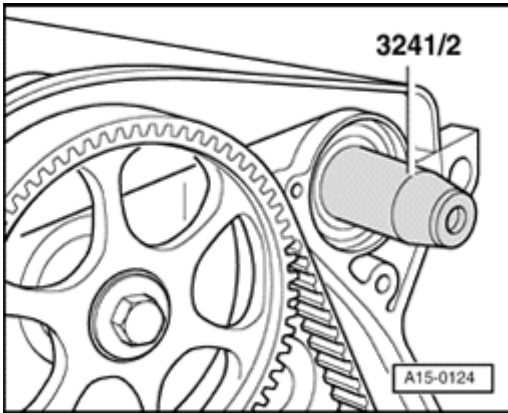


Fig. 320: Placing Guide Sleeve 3241/2 On Camshaft Pin
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place guide sleeve 3241/2 on camshaft pin.
- Push seal over guide sleeve.

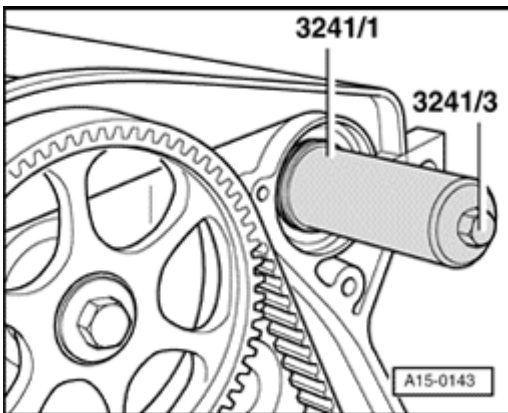


Fig. 321: Pressing In Seal Up To Stop Using Thrust Sleeve 3241/1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press in seal up to stop using Thrust Sleeve 3241/1. To do so, use bolt 3241/3.

Further 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 .**
- **Hose connections and charge air system hoses must be free of oil and grease before installing. Do not use lubricant under any circumstances.**

Left cylinder head:

2006 Audi A8 Quattro

ENGINE 4.2 Liter V8 5V Engine Mechanical, Engine Code(s): BFM, BGK - A8

- Install left combination valve for secondary air injection system --> **Secondary Air Injection (AIR) (left combination valve), removing and installing.**

Right cylinder head:

- Install lock carrier with attachments --> **50 - BODY - FRONT** .

Torque specifications

Component	Nm
Camshaft position sensor trim to camshaft	25
Camshaft position sensor housing to cylinder head	10
Rear toothed belt cover to cylinder head	10 ¹⁾

- Insert ¹⁾ using locking compound; locking compound

Camshafts and camshaft adjusters (left cylinder head), removing and installing

NOTE:

- Installation of camshaft drive chain to left and right cylinder heads differ basically. Note different procedures!

Special tools, testers and auxiliary items required

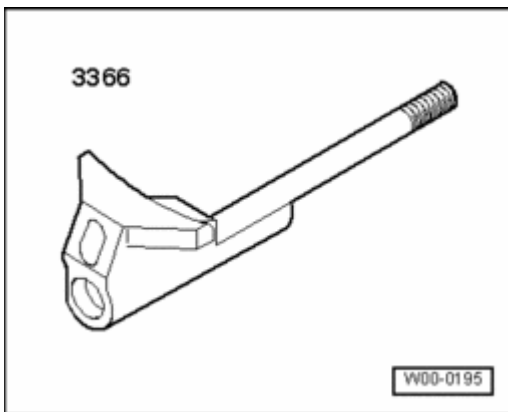


Fig. 322: Bracket For Chain Adjustment 3366

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Bracket For Chain Adjustment 3366

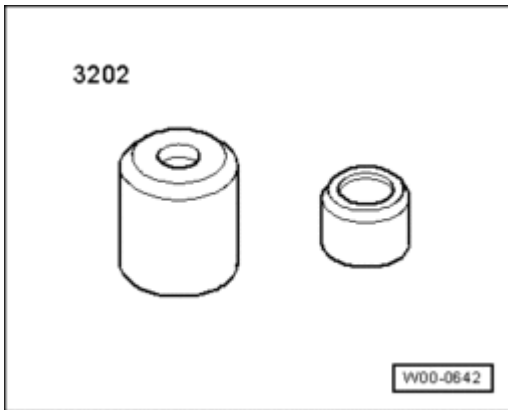


Fig. 323: 3202/1 Pull Sleeve

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Seal installer 3202
- Sealant

Removing

- Engine installed.
 - Toothed belt, removing --> **Toothed belt, removing and installing.**
 - Remove camshaft gear.

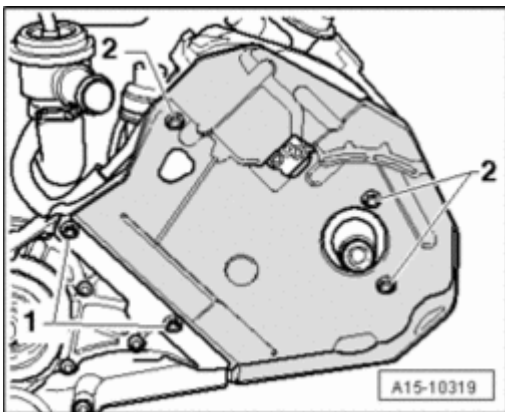


Fig. 324: Removing Bolts And Toothed Belt Guard At Rear

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen nuts - 1 -.
- Remove bolts - 2 - and remove toothed belt guard at rear.

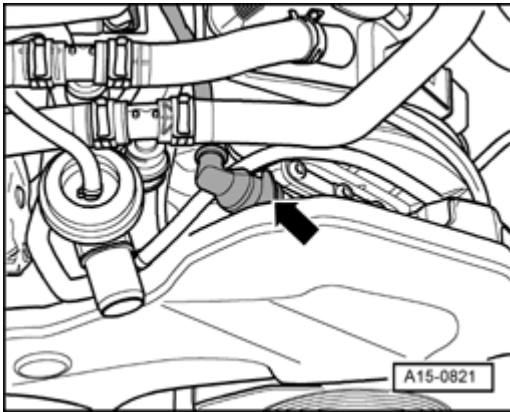


Fig. 325: Disconnecting Electrical Harness Connector From Camshaft Adjustment Valve 2 N208
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - **arrow** - from Camshaft Adjustment Valve 2 N208.
- Remove left cylinder head cover --> **Left cylinder head cover, removing and installing.**

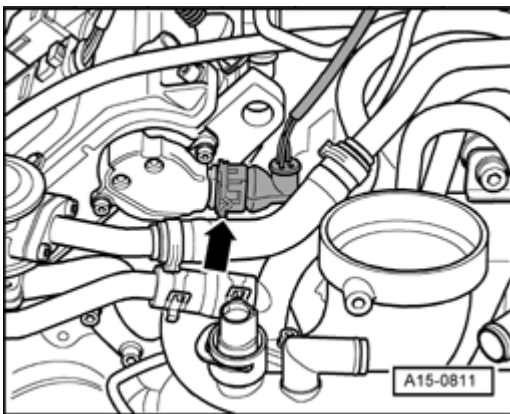


Fig. 326: Disconnecting Electrical Harness Connector At Camshaft Position (CMP) Sensor 2 G163
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - **arrow** - at Camshaft Position (CMP) Sensor 2 G163.
- Remove housing for Hall sensor.
- Remove washer and cover for Hall sensor.
- Rotate crankshaft at mounting bolt for toothed belt sprocket counterclockwise approx. 45° so that no pistons stand at TDC.

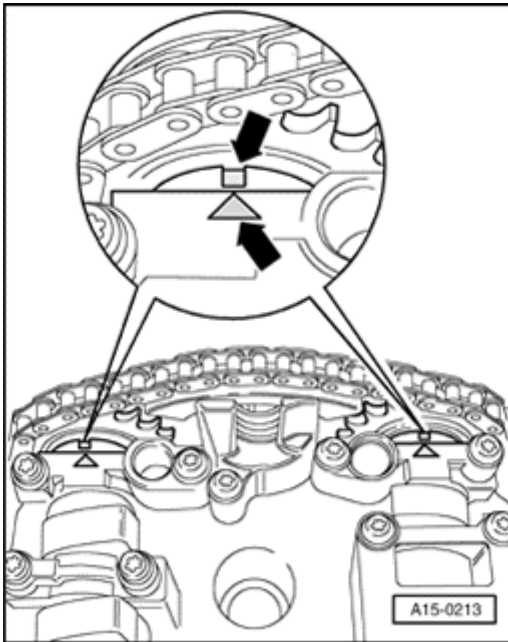


Fig. 327: Identifying Camshaft TDC

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Verify camshaft TDC position again:
- The two camshaft markings must align with both arrows on bearing caps.

When reusing the old drive chain:

- Clean drive chain and camshaft chain sprockets across from both arrows on bearing caps and mark installed position with a color marking.

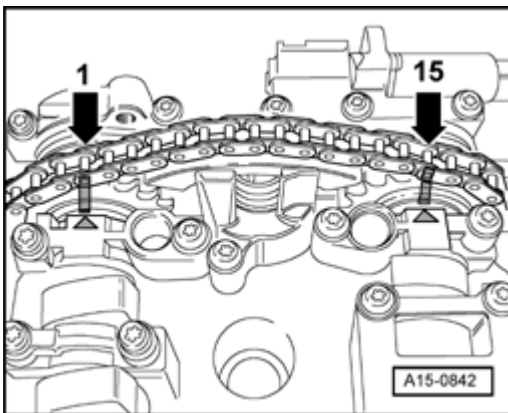


Fig. 328: Identifying Distance Between Both Arrows Or Colored Markings Consists Of 15 Rollers Of Drive Chain

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- The distance between both arrows or colored markings consists of 15 rollers of the drive chain.

NOTE: • Do not mark chain using a center punch or similar means!

Continued:

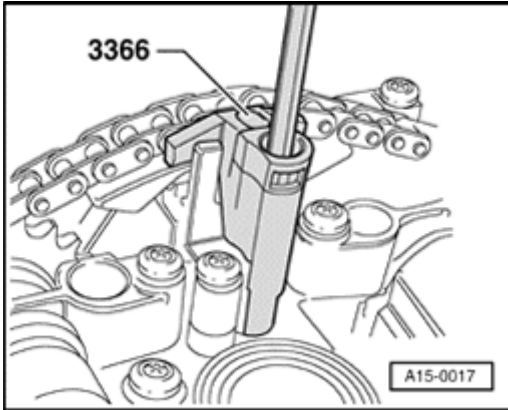


Fig. 329: Securing Camshaft Adjuster Or Chain Tensioner Using Bracket For Chain Adjustment 3366
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure camshaft adjuster using Bracket For Chain Adjustment 3366.

NOTE: • If chain tensioner retainer is fastened too tightly, the camshaft adjuster can be damaged.

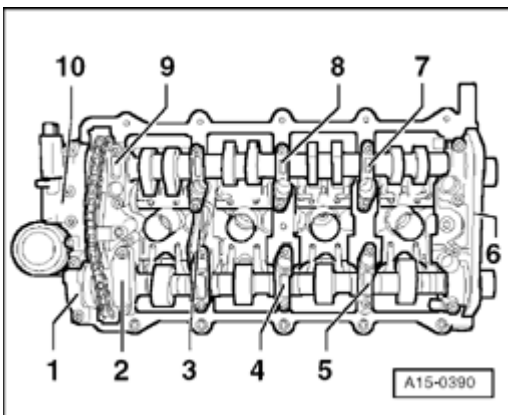


Fig. 330: Installing Camshafts Without Chain Into Cylinder Head And Tightening With Bearing Caps
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Independent of the existing markings on the bearing caps, mark sequence and installation position on all bearing caps, as shown in the illustration.
- For marking, clean bearing cap and use waterproof felt pen.
- Remove mounting bolts of camshaft adjuster - **10** -.
- Remove bearing cap 1.
- Remove bearing caps 2, 4, 6, 8 and 9 and lay on a clean surface in corresponding sequence.

- Alternating in diagonal sequence, loosen bearing caps 3, 5 and 7 of intake and exhaust camshafts and remove.
- Raise both camshafts with camshaft adjuster.

Installing

- Replace bolts for camshaft bearing and camshaft adjuster.
- Replace half-round sealing plugs.
- Remove sealant residue from cylinder head and bearing caps.

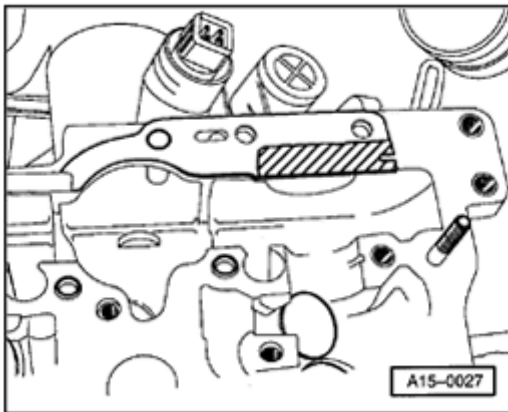


Fig. 331: Replacing Rubber/Metal Camshaft Adjuster Gasket And Spreading Thin Layer Of Sealant On Hatched Surface

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Replace rubber/metal camshaft adjuster gasket and spread thin layer of sealant on hatched surface.
- Sealant
- Place drive chain onto camshaft chain sprockets as follows:

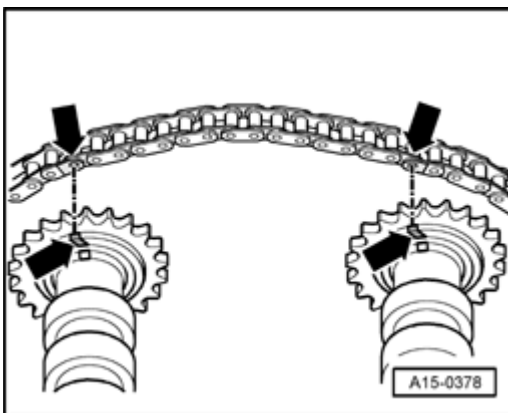
When using old drive chain:

Fig. 332: Aligning Color Markings

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Align color markings - **arrows** -.

When using a new drive chain:

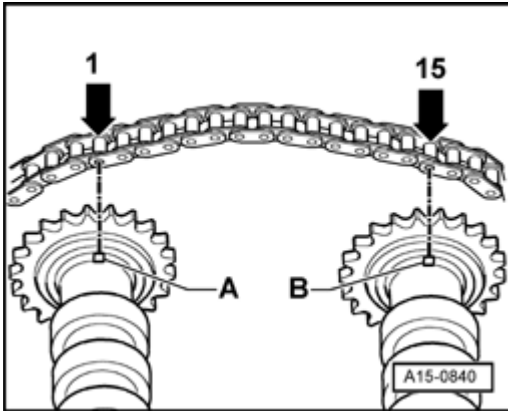


Fig. 333: Distance Between Notches At Camshafts Must Be Distance Of 15 Rollers At Drive Chain
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Distance between notches - **A** - and - **B** - at camshafts must be distance of 15 rollers at drive chain. Illustration shows where first and fifteenth drive chain rollers must be installed on chain gears.

Continued:

- Slide camshaft adjuster between drive chain (2nd technician needed).
- Install camshafts with drive chain and camshaft adjuster in cylinder head.
- Oil running surfaces of both camshafts.

NOTE:

- **Alignment bushings for bearing caps and camshaft adjuster must be installed in cylinder head.**

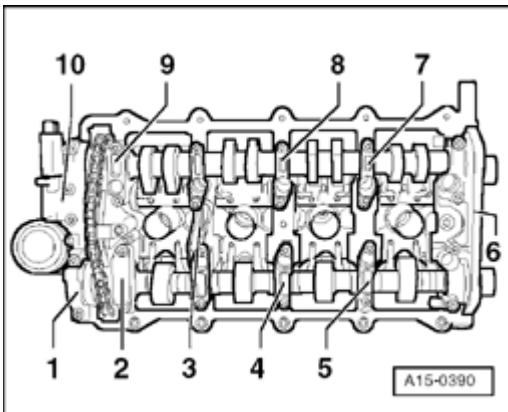


Fig. 334: Installing Camshafts Without Chain Into Cylinder Head And Tightening With Bearing Caps
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install bearing caps 3, 5, and 7 according to marking.
- Tighten bearing caps 3, 5 and 7 of intake and exhaust camshafts in alternating diagonal sequence.
- Tighten camshaft adjuster - **10** -.
- Remove Bracket For Chain Adjustment 3366.
- Check whether camshafts are correctly adjusted:

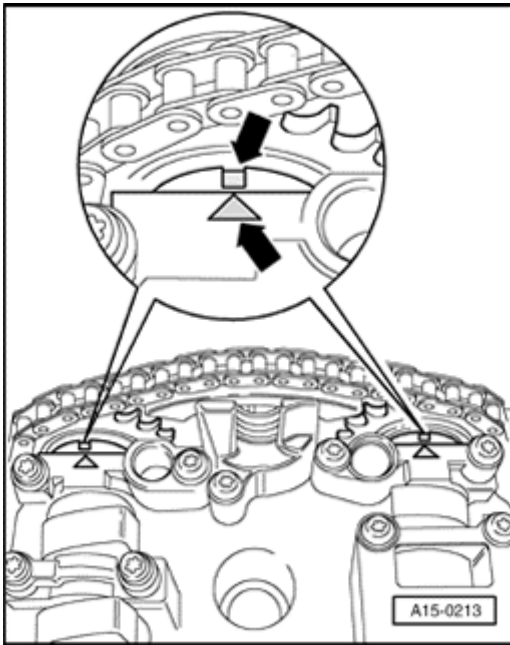


Fig. 335: Verifying Camshaft TDC

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- The two camshaft markings must align with both arrows on bearing caps - **arrows** -.

NOTE:

- So that both markings line up, turn camshaft slightly back or forth if necessary.

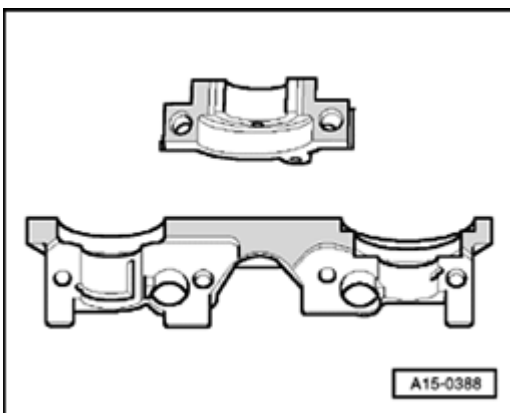


Fig. 336: Coating Hatched Surface Of Double Bearing Cap As Well As Outer Bearing Cap Next To

Camshaft Adjuster With Sealant

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lightly coat hatched surface of double bearing cap as well as outer bearing cap next to camshaft adjuster with sealant and install bearing cap.
- Sealant
- Install remaining bearing caps.
- Replacing and installing oil seals for intake and exhaust camshaft --> **Camshaft seals, replacing** for camshafts or --> **Camshaft Position (CMP) Sensor seals, replacing** for camshaft position sensor.
- Carefully drive in cap using retractors 3202.
- Rotate crankshaft at mounting bolt for toothed belt sprocket clockwise approx. 45° to TDC again and secure crankshaft using locking pin.

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

- Install toothed belt (adjust timing) --> **Toothed belt, removing and installing.**
- Install cylinder head cover --> **Right cylinder head cover, removing and installing.**
- Install torque support --> **Torque support (with torque support valve N382), assembly overview.**

NOTE:

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

Torque specifications

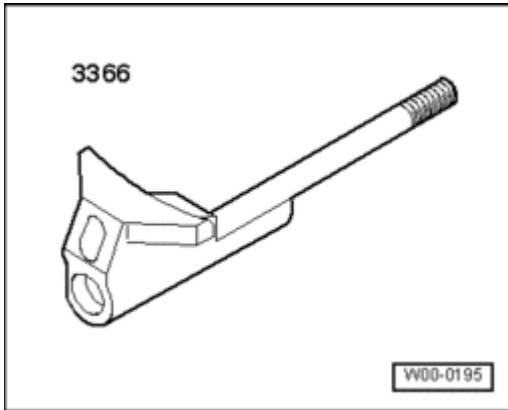
Component		Nm
Bearing cap to cylinder head		5 + 90° 1)2)
Camshaft adjuster to cylinder head		5 + 90° 1)2)
Toothed belt guard	Cylinder head	10 3)
at rear on	Coolant pump	10
Idler roller to cylinder head		22

- 1) Replace bolt
- 2) 90° Corresponds to a quarter turn.
- Insert 3) using locking compound; locking compound

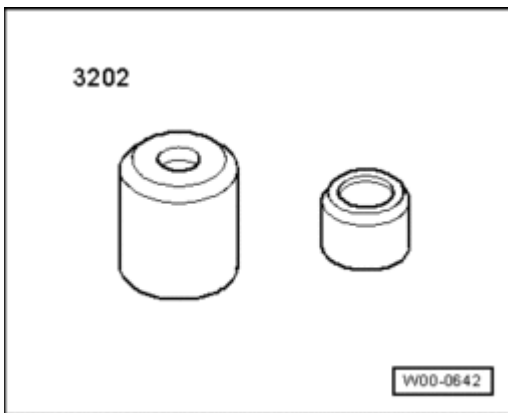
Camshafts and camshaft adjusters (right cylinder head), removing and installing

NOTE:

- Installation of camshaft drive chain to left and right cylinder heads differ basically. Note different procedures!

Special tools, testers and auxiliary items required**Fig. 337: Bracket For Chain Adjustment 3366****Courtesy of VOLKSWAGEN UNITED STATES, INC.**

- Bracket For Chain Adjustment 3366

**Fig. 338: 3202/1 Pull Sleeve****Courtesy of VOLKSWAGEN UNITED STATES, INC.**

- Seal installer 3202

Sealant**Removing**

- Remove engine --> **Engine, removing and installing.**
- Toothed belt, removing --> **Toothed belt, removing and installing.**
- Remove camshaft gear.

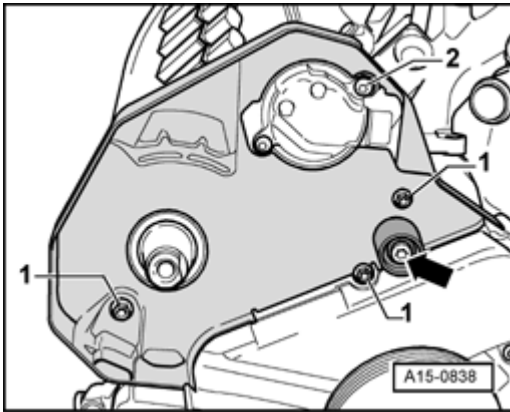


Fig. 339: Removing Idler Pulley & Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove idler pulley - **arrow** -.
- Remove bolts - **1** - and - **2** - and remove toothed belt guard at rear.

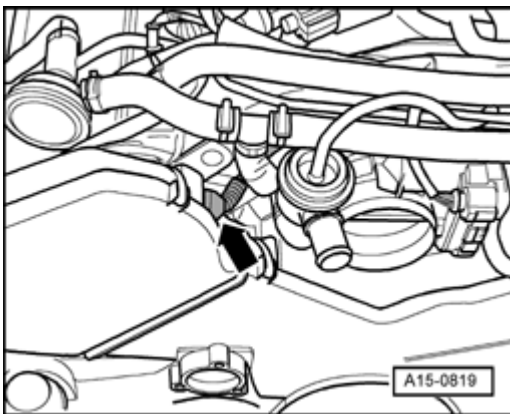


Fig. 340: Disconnecting Electrical Harness Connector At Camshaft Position (CMP) Sensor G40

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - **arrow** - at Camshaft Position (CMP) Sensor G40.
- Remove housing for Hall sensor.
- Remove washer and cover for Hall sensor.
- Disconnect electrical harness connector at camshaft adjustment solenoid valve.
- Remove right cylinder head cover --> **Right cylinder head cover, removing and installing.**
- Rotate crankshaft at mounting bolt for toothed belt sprocket counterclockwise approx. 45° so that no pistons stand at TDC.

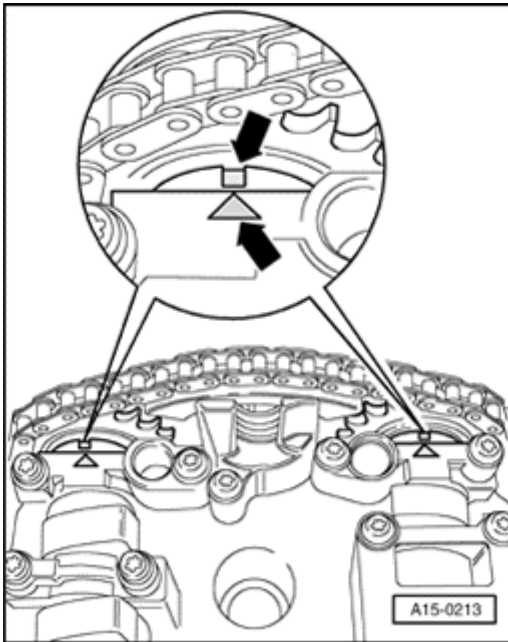


Fig. 341: Verifying Camshaft TDC

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Verify camshaft TDC position again:
- The two camshaft markings must align with both arrows on bearing caps.

When reusing old drive chain:

- Clean drive chain and camshaft chain sprockets across from both arrows on bearing caps and mark installed position with a color marking.

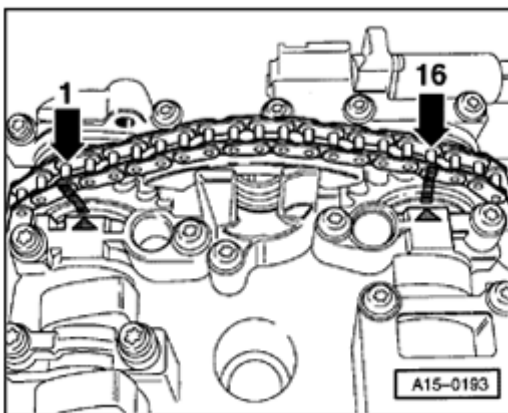


Fig. 342: Identifying Distance Between Both Arrows Or Colored Markings Consists Of 16 Rollers Of Drive Chain

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- The distance between both arrows or colored markings consists of 16 rollers of drive chain.

- The notch on intake camshaft is slightly offset inward toward drive chain roller - **16** -.

NOTE:

- **Do not mark chain using a center punch or similar means!**

Continued:

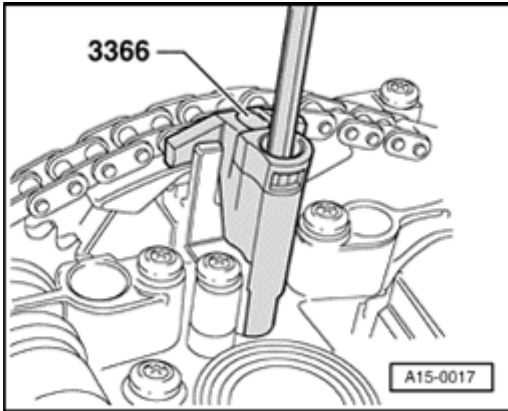


Fig. 343: Securing Camshaft Adjuster Or Chain Tensioner Using Bracket For Chain Adjustment 3366
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure camshaft adjuster using Bracket For Chain Adjustment 3366.

NOTE:

- **If the chain tensioner retainer is fastened too tightly, the camshaft adjuster can be damaged.**

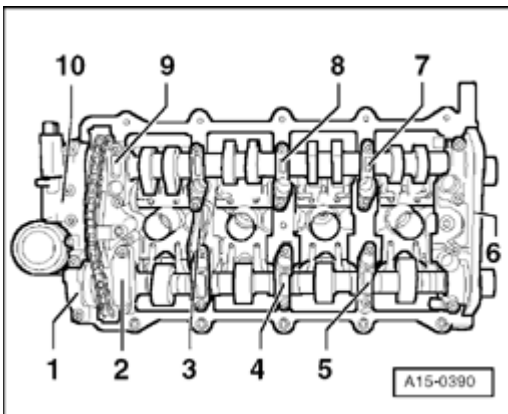


Fig. 344: Installing Camshafts Without Chain Into Cylinder Head And Tightening With Bearing Caps
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Independent of existing markings on bearing caps, mark sequence and installation position on all bearing caps, as shown in the illustration.
- For marking, clean bearing cap and use waterproof felt pen.
- Remove mounting bolts of camshaft adjuster - **10** -.
- Remove bearing cap 1.

- Remove bearing caps 2, 4, 6, 8 and 9 and lay on a clean surface in the corresponding sequence.
- Alternating in diagonal sequence, loosen bearing caps 3, 5 and 7 of intake and exhaust camshafts and remove.
- Raise both camshafts with camshaft adjuster.

Installing

- Replace bolts for camshaft bearing and camshaft adjuster.
- Replace half-round sealing plugs.
- Remove sealant residue from cylinder head and bearing caps.

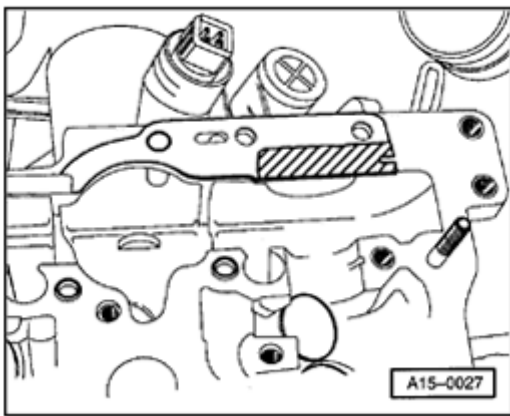


Fig. 345: Replacing Rubber/Metal Camshaft Adjuster Gasket And Spreading Thin Layer Of Sealant On Hatched Surface

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Replace rubber/metal camshaft adjuster gasket and spread thin layer of sealant on hatched surface.
- Sealant
- Place drive chain onto camshaft chain sprockets as follows:

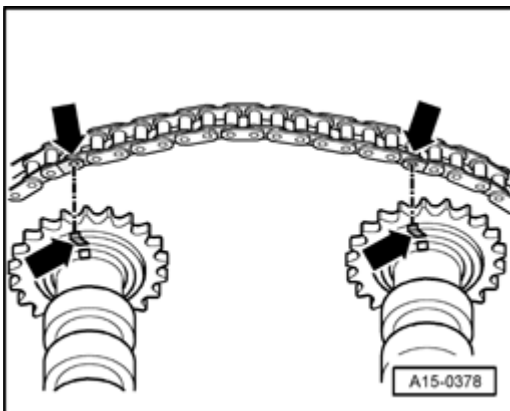
When using old drive chain:

Fig. 346: Aligning Color Markings

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Align color markings - **arrows** -.

When using a new drive chain:

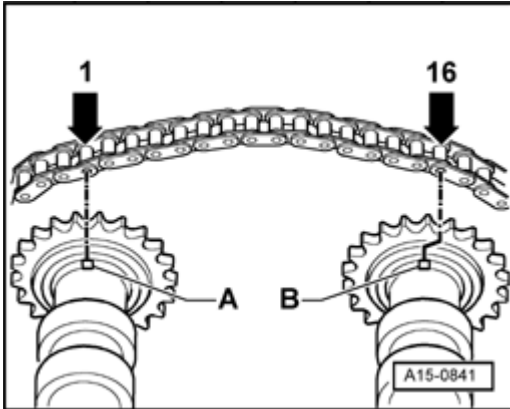


Fig. 347: Identifying Distance Between Notches At Camshafts Must Be Distance Of 16 Rollers At Drive Chain

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Distance between notches - **A** - and - **B** - at camshafts must be distance of 16 rollers at drive chain. Illustration shows where first and sixteenth drive chain rollers must be installed on chain gears.
- Notch - **B** - is slightly offset inward toward chain roller - **16** -

Continued:

- Slide camshaft adjuster between drive chain (2nd technician needed).
- Install camshafts with drive chain and camshaft adjuster in cylinder head.
- Oil running surfaces of both camshafts.

NOTE:

- **Alignment bushings for bearing caps and camshaft adjuster must be installed in cylinder head.**

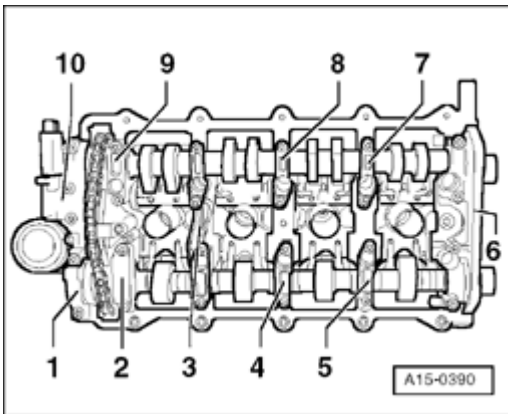


Fig. 348: Installing Camshafts Without Chain Into Cylinder Head And Tightening With Bearing Caps
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install bearing caps 3, 5, and 7 according to marking.
- Tighten bearing caps 3, 5 and 7 of intake and exhaust camshafts in alternating diagonal sequence.
- Tighten camshaft adjuster - 10 -.
- Remove Bracket For Chain Adjustment 3366.
- Check whether camshafts are correctly adjusted:

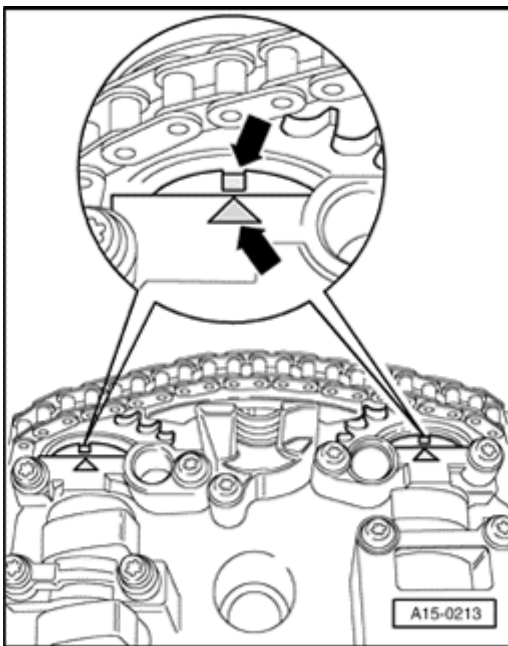


Fig. 349: Verifying Camshaft TDC
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- The two camshaft markings must align with both arrows on bearing caps - **arrows** -.

NOTE:

- So that both markings line up, turn camshaft slightly back or forth if

necessary.

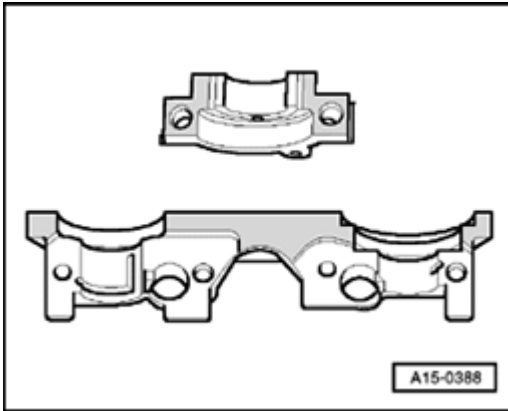


Fig. 350: Coating Hatched Surface Of Double Bearing Cap As Well As Outer Bearing Cap Next To Camshaft Adjuster With Sealant

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lightly coat hatched surface of double bearing cap as well as outer bearing cap next to camshaft adjuster with sealant and install bearing cap.
- Sealant
- Install remaining bearing caps.
- Replacing and installing oil seals for intake and exhaust camshaft --> **Camshaft seals, replacing** for camshaft or --> **Camshaft Position (CMP) Sensor seals, replacing** for camshaft position sensor.
- Carefully drive in cap using retractors 3202.
- Rotate crankshaft at mounting bolt for toothed belt sprocket clockwise approx. 45° to TDC again and secure crankshaft using locking pin.

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

- Install toothed belt (adjust timing) --> **Toothed belt, removing and installing.**
- Install cylinder head cover --> **Right cylinder head cover, removing and installing.**
- Install engine --> **Installing.**
- Install torque support --> **Torque support (with torque support valve N382), assembly overview.**

NOTE:

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

Torque specifications

2006 Audi A8 Quattro

ENGINE 4.2 Liter V8 5V Engine Mechanical, Engine Code(s): BFM, BGK - A8

Component		Nm
Bearing cap to cylinder head		5 + 90° ¹⁾²⁾
Camshaft adjuster to cylinder head		5 + 90° ¹⁾²⁾
Rear toothed belt cover to	Cylinder head	10 ³⁾
	Coolant pump	10
Idler roller to cylinder head		22

- ¹⁾ Replace bolt
- ²⁾ 90° Corresponds to a quarter turn.
- Insert ³⁾ using locking compound; locking compound

Roller rocker lever, removing and installing

Removing

- Engine removed --> **Engine, removing and installing.**
- Remove camshafts and camshaft adjusters for right cylinder head --> **Camshafts and camshaft adjusters (left cylinder head), removing and installing** and left cylinder head --> **Camshafts and camshaft adjusters (right cylinder head), removing and installing.**
- Mark allocation of roller rocker lever and shafts for roller cam follower for re-installation.

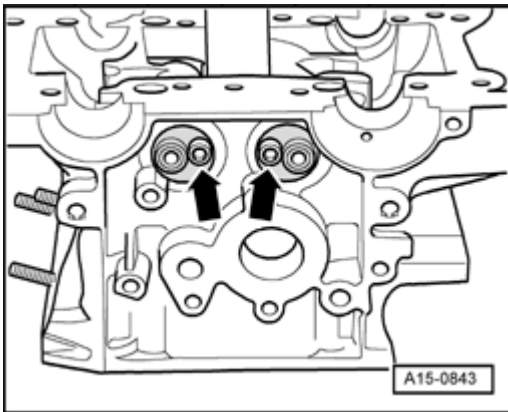


Fig. 351: Removing Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Thread a M6-bolt into hole in shaft for roller rocker lever.
- Remove shaft from cylinder head and remove roller rocker lever.

Installing

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

2006 Audi A8 Quattro

ENGINE 4.2 Liter V8 5V Engine Mechanical, Engine Code(s): BFM, BGK - A8

NOTE:

- **Replace O-rings.**

- Before installing, oil bearing areas for roller rocker lever.
- Install camshafts and camshaft adjusters --> Camshafts and camshaft adjusters (right cylinder head), removing and installing for left cylinder head and --> Camshafts and camshaft adjusters (left cylinder head), removing and installing for right cylinder head.

Torque specifications

Component	Nm
Shaft for roller rocker lever to cylinder head	10

Valve stem seals, replacing

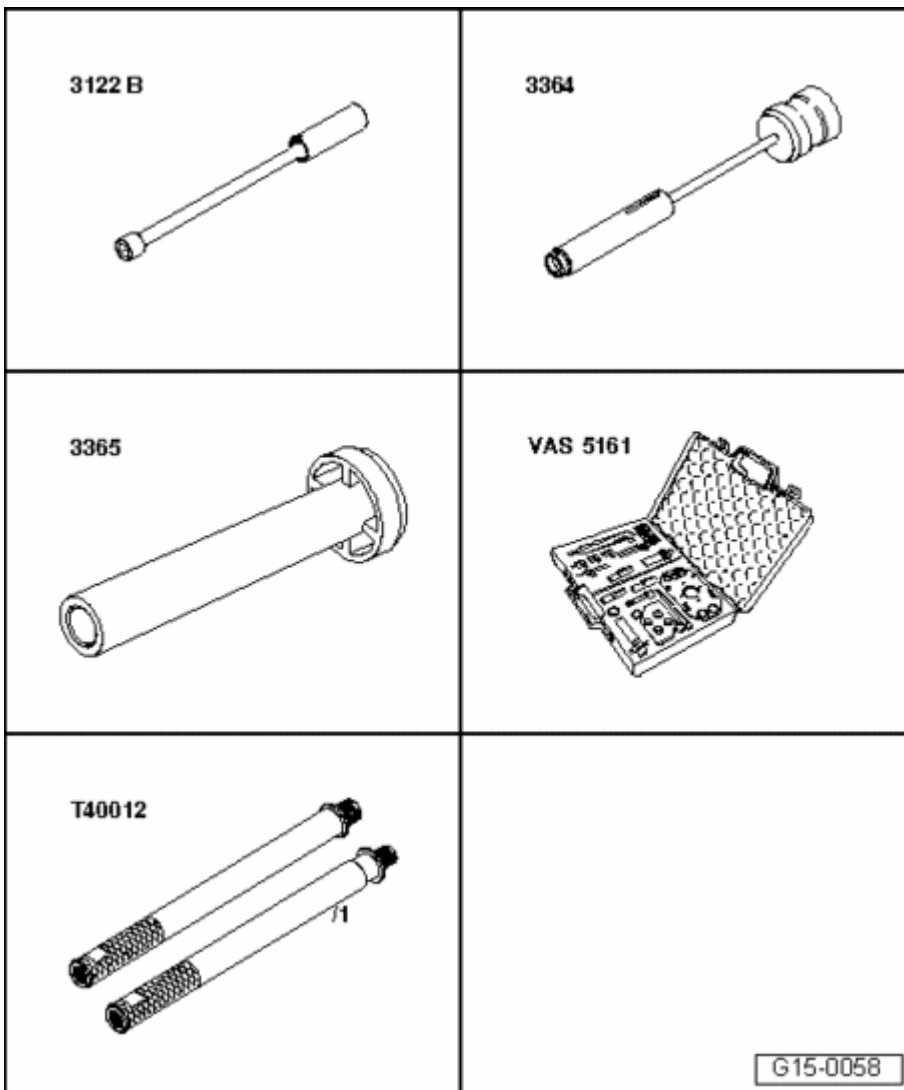


Fig. 352: Identifying Special Tools - Valve Stem Seals, Replacing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

- Engine removed --> **Engine, removing and installing.**
- Remove camshafts and camshaft adjusters for right cylinder head --> **Camshafts and camshaft adjusters (left cylinder head), removing and installing** and left cylinder head --> **Camshafts and camshaft adjusters (right cylinder head), removing and installing.**
- Using spark plug removal tool 3122 B , remove spark plugs.

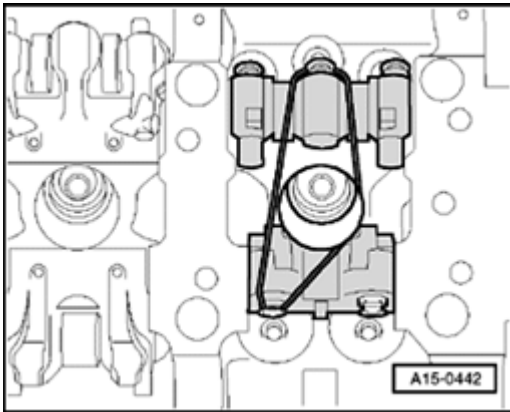


Fig. 353: Turning Roller Rocker Lever Upward And Securing It With Rubber Band
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Turn roller rocker lever upward and secure it with a rubber band.

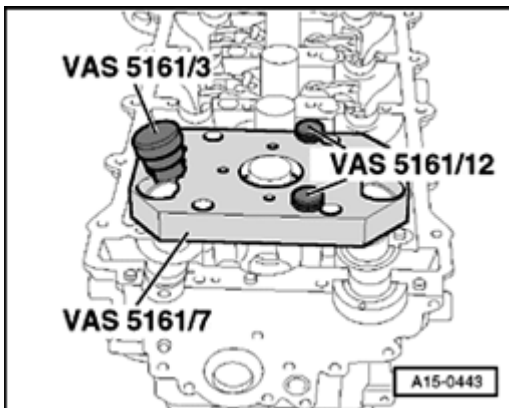
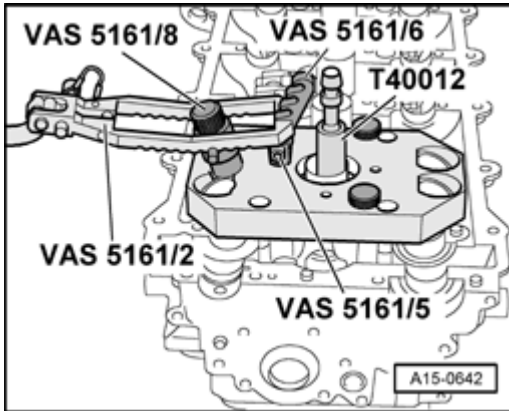


Fig. 354: Placing Guide Plate VAS 5161/7 From Valve Cotter Disassembly And Assembly Device VAS 5161 On Cylinder Head**Courtesy of VOLKSWAGEN UNITED STATES, INC.**

- Place Guide Plate VAS 5161/7 from Valve Cotter Disassembly and Assembly Device VAS 5161 on cylinder head.
- Secure guide plate VAS 5161/7 with knurled screws VAS 5161/12.
- Insert drift VAS 5161/3 into guide plate and loosen stuck valve keepers using a plastic hammer.

**Fig. 355: Installing Engaging Device VAS 5161/6 With VAS 5161/5 Into Guide Plate VAS 5161/7****Courtesy of VOLKSWAGEN UNITED STATES, INC.**

- Install engaging device VAS 5161/6 with VAS 5161/5 into guide plate VAS 5161/7.
- Guide installation cartridge VAS 5161/8 into guide plate VAS 5161/7.
- Install adapter T40012 with gasket by hand into respective spark plug thread and apply constant pressure.
- Minimum pressure: 6 bar pressure
- Engage pressure fork VAS 5161/2 at engaging device VAS 5161/6 and press down installation cartridge.
- At the same time, turn knurled bolt of installation cartridge to right, until points engage in valve keepers.
- Lightly move knurled bolt back and forth, causing valve keepers to be pressed apart and be captured in installation cartridge.
- Release pressure fork.
- Remove installation cartridge.
- Remove guide plate.
- Pressurized air hose remains connected.

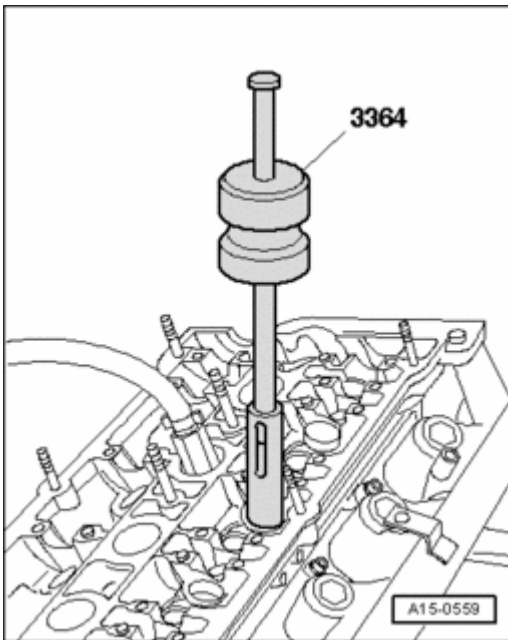


Fig. 356: Removing Valve Stem Seals Using Valve Seal Removal Tool 3364
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove valve stem seals using Valve Seal Removal Tool 3364.

Installing

NOTE:

- For pressing on valve stem seals from delivery program, the Valve Stem Seal Driver 3365 must be drilled to 6.5 mm dia.

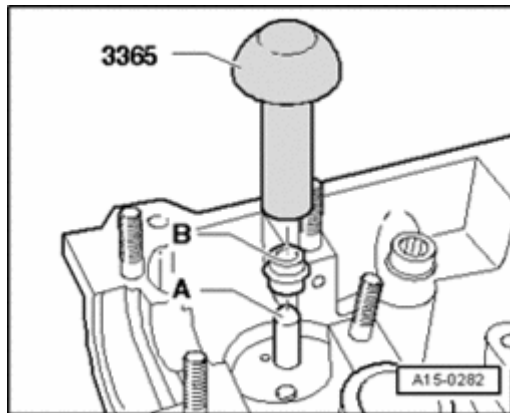


Fig. 357: Identifying Plastic Sleeve, Valve Stem Oil Seal & Valve Stem Seal Driver 3365
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- A plastic sleeve - A - is supplied with the new valve shaft seals.
 - Place plastic sleeve - A - on valve stem to prevent damage to new valve stem oil seals - B -.

- Lightly oil valve stem seal.
- 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.

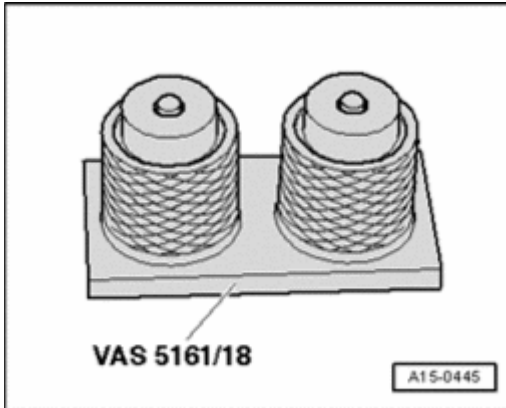


Fig. 358: Identifying Installation Cartridge VAS 5161/8
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

- The large diameter of the valve keepers point upward.

- Insert valve spring and valve spring plate.
- Install Guide Plate VAS 5161/7 onto cylinder head again.

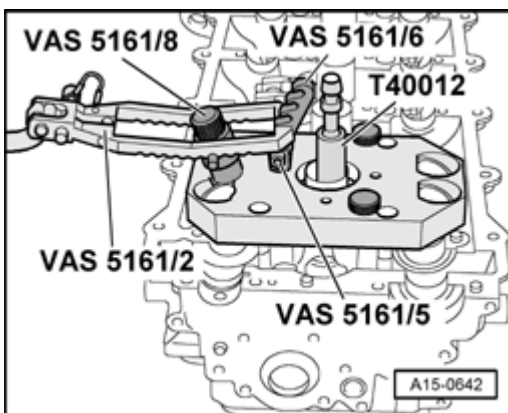


Fig. 359: Installing Engaging Device VAS 5161/6 With VAS 5161/5 Into Guide Plate VAS 5161/7
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert installation cartridge VAS 5161/8 into guide plate.
- Press down pressure fork and pull knurled-head bolt upward - thereby valve keepers are inserted.

- Release pressure fork with knurled bolt still pulled.
- Install camshafts and camshaft adjusters --> **Camshafts and camshaft adjusters (right cylinder head), removing and installing** for left cylinder head and --> **Camshafts and camshaft adjusters (left cylinder head), removing and installing** for right cylinder head.

NOTE:

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

Valve guides, checking

Special tools, testers and auxiliary items required

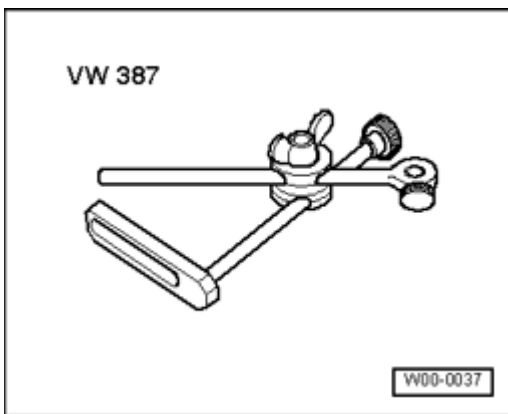


Fig. 360: Dial Gauge Holder VW 387

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Dial gauge holder VW 387
- Dial gauge

Test sequence

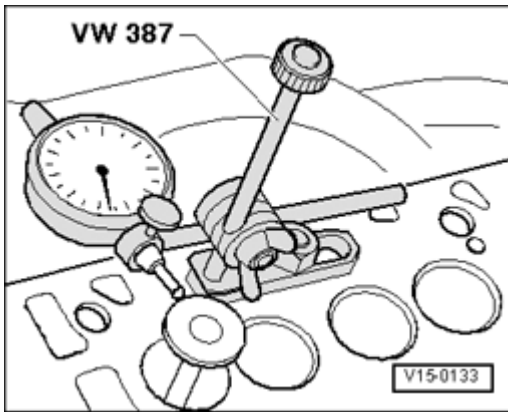


Fig. 361: Identifying Special Tool - VW 387 Installed

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert valve into guide. The end of the valve stem must be flush with the guide. Due to the slight difference in stem dimensions, ensure that only an intake valve is used in the intake guide and an exhaust valve in exhaust guide.
- Determine tip clearance.

Wear limit

Intake valve guide	Exhaust valve guide
0.80 mm	0.80 mm

NOTE:

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

Valves, checking

- Visually check for signs of wear on stem and on seating surface. Replace valve if it shows significant signs of wear.

Valve seats, reworking

NOTE:

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

Special tools, testers and auxiliary items required

- Depth gauge
- Valve seat refacing tool

NOTE:

- When repairing engines with leaking valves, it is not sufficient to rework or replace valve seats and valves. It is particularly important to check valve guides for wear on engines with higher mileage performance --> Valve guides, checking.
- Only reface valve seats enough until a perfect contact pattern is obtained.
- Before refacing, determine maximum refacing dimension.
- If the reworking dimension is exceeded, the function of the hydraulic lifters can no longer be guaranteed and therefore the cylinder head should be replaced.

Determining maximum allowable refacing dimension

- Insert valve and press it firmly against the valve seat.

NOTE:

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

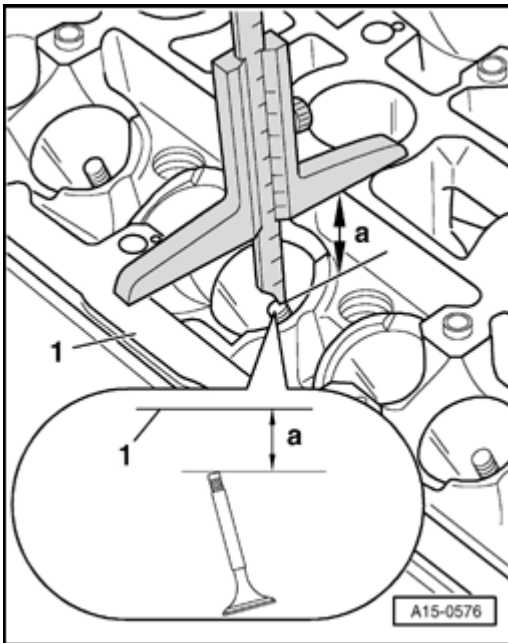


Fig. 362: Measuring Distance Between End Of Valve Stem And Camshaft Center Axle (Camshaft Center Axle Is Located At The Level Of Cylinder Head Upper Edge)

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Measure distance - **a** - between end of valve stem and camshaft center axle (camshaft center axle is located at the level of cylinder head upper edge).
- Determine maximum allowable refacing dimension using distance measured and minimum dimension.

Minimum dimensions		
Outer intake valves	Center intake valves	Exhaust valves

2006 Audi A8 Quattro

ENGINE 4.2 Liter V8 5V Engine Mechanical, Engine Code(s): BFM, BGK - A8

39.3 mm

41.0 mm

40.6 mm

Measured distance minus minimum dimension = maximum permissible refaced dimension.

Example for outer intake valve:

	Measured distance	39.7 mm
-	Minimum dimension	39.3 mm
=	Maximum permissible refacing dimension	0.4 mm

NOTE:

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

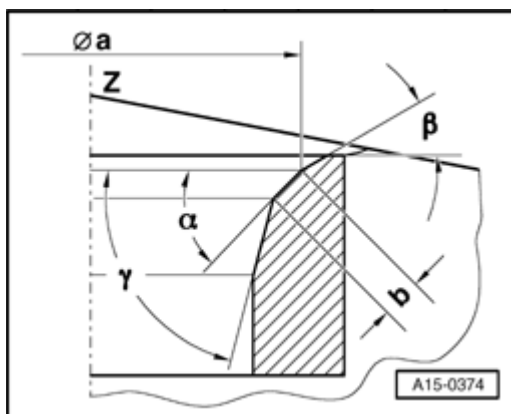


Fig. 363: Refacing Valve Seats

Courtesy of VOLKSWAGEN UNITED STATES, INC.

Valve seats, reworking

Intake valve seat		
a	=	Dia. 26.6 mm
b	=	Approx. 1.0 mm
Z	=	Cylinder head lower edge
a	=	45° valve seat angle
β	=	30° upper correction angle
g	=	60° lower correction angle

Exhaust valve seat		
a	=	Dia. 26.0 mm
b	=	Approx. 1.0 mm
Z	=	Cylinder head lower edge
a	=	45° valve seat angle
β	=	30° upper correction angle

g	=	60° lower correction angle
---	---	----------------------------

CAMSHAFT ADJUSTMENT, CHECKING

Camshaft adjustment, checking

The adjustment of intake camshaft is load and RPM dependent. Oil pressure is switched to respective camshaft adjuster (mechanical adjustment devices) via solenoid valve for camshaft adjustment.

NOTE:

- **Camshaft adjustment is active only 25 seconds after engine start.**

Perform system test

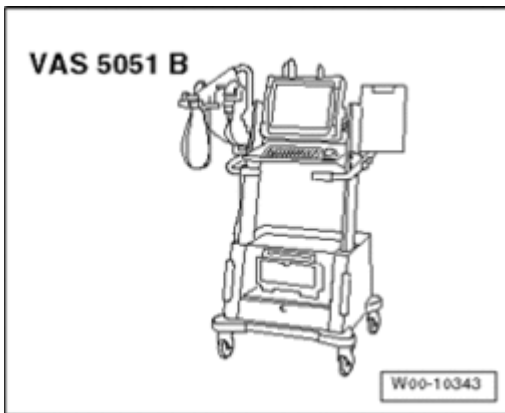


Fig. 364: Identifying Vehicle Diagnosis, Testing And Information System VAS 5051B
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Vehicle Diagnosis, Testing and Information System VAS 5051 with VAS 5051/1 (VAS 5051 B version shown as example only)

Test conditions

- Coolant temperature at least 80°C.
- Vehicles with automatic transmission: Selector lever in position P or N.

Test sequence

- Connect Vehicle Diagnostic, Testing and Information System VAS 5051 and select vehicle system "01 - engine electronics". Engine must run at idle for this.

CAUTION:

- **Test and measuring equipment must always be secured to the rear seat and be operated from there by a second person.**
- **If test and measuring instruments are operated from the front passengers seat and the vehicle is involved in an accident, there is a possibility that the person sitting in this seat may receive serious**

injuries when the airbag is triggered.

Display on VAS 5051 :

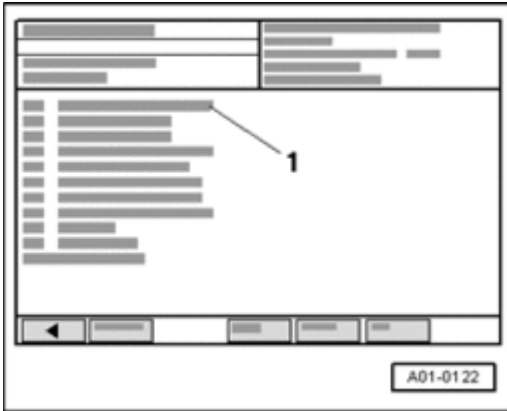


Fig. 365: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- In selection - 1 - , press diagnostic function "04- Basic Setting".

Display on VAS 5051 :

1 - Enter display group



Fig. 366: Diagnostic System VAS 5051: Display - Display Group And Key Pad
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Select function "094" in button field - 2 - for "display group number 094" and press Q to confirm input.

Display on VAS 5051 :

2006 Audi A8 Quattro

ENGINE 4.2 Liter V8 5V Engine Mechanical, Engine Code(s): BFM, BGK - A8



Fig. 367: Diagnostic System VAS 5051: Display - Display Fields
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Activate basic setting by pressing button A.
- Increase engine speed to approx. 2000 RPM for about 10 seconds.
- Check specified values in display fields - 3 - and - 4 -.

	Display field			
	1	2	3	4
Display group 94: Camshaft adjustment bank 1 (right cyl. bank) and bank 2 (left cyl. bank)				
Display	xxxx/min	---	---	---
Indicated	Engine RPM	Variable valve timing	Camshaft adjustment, Bank 1	Camshaft adjustment, Bank 2
Operating range		Cs-CM ON Cs-CM OFF	Test OFF Test ON Syst. OK Syst. nOK	Test OFF Test ON Syst. OK Syst. nOK
Specified value	Greater than 2000/min		System OK	System OK

If specified value "Syst. OK" is not obtained:

- Click on button twice.

Display on VAS 5051 :

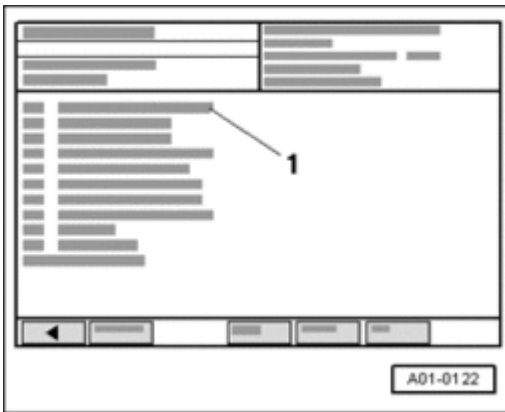


Fig. 368: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- In selection - 1 - , click on diagnostic function "08 - Read measuring value block".

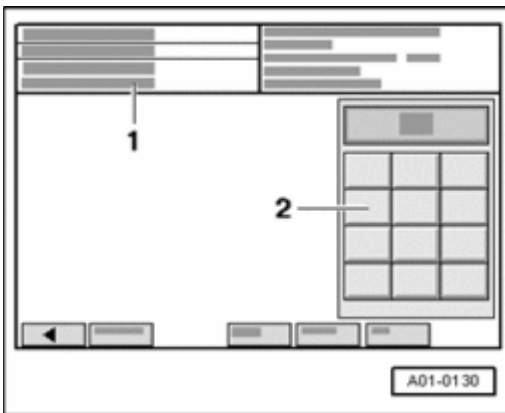


Fig. 369: Diagnostic System VAS 5051: Display - Display Group And Key Pad
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051 :

1 - Enter display group

- Select function "090" in button field - 2 - for "display group number 090" and press Q to confirm input.

2006 Audi A8 Quattro

ENGINE 4.2 Liter V8 5V Engine Mechanical, Engine Code(s): BFM, BGK - A8

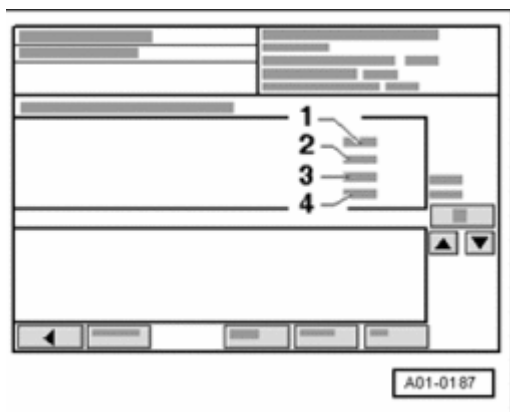


Fig. 370: Diagnostic System VAS 5051: Display

Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051 :

Test conditions

- Engine running at idle.
- Check specified values in display fields - 3 - and - 4 -.

	Display field			
	1	2	3	4
Display group 090: Camshaft adjustment in idle position				
Display	xxx/min	---	° KW	° KW
Indicated	Engine RPM	Adjustment	Adjustment bank 1 (right cylinder bank)	Adjustment bank 2 (left cylinder bank)
Specified value	xxxx/min	Cs-CM. OFF	-3 to 6° KW	-3 to 6° KW

- Perform test drive.
- Check specified values in display fields - 3 - and - 4 -.

	Display field			
	1	2	3	4
Display group 090: Camshaft adjustment while driving				
Display	xxxx/min	---	° KW	° KW
Indicated	Engine RPM	Adjustment	Adjustment bank 1 (right cylinder bank)	Adjustment bank 2 (left cylinder bank)
Specified value	xxxx/min	Cs-CM. ON	16 to 25° KW	16 to 25° KW

- Press button to end function "08 - Read measuring value block".

If specifications are not obtained:

- Check solenoid valves for camshaft adjustment Guided Fault Finding.

NOTE:

- If display field indicates a value between 6.0° Crankshaft and 16.0° Crankshaft during a road test, the electrical valve for camshaft adjustment is correctly switching the oil pressure to mechanical camshaft adjuster but the mechanical camshaft adjuster cannot reach its end position (e.g. due to difficulty of movement).

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 must be carefully cleaned to prevent resulting damage and the oil cooler must be replaced.
- The oil level must not be above the max. mark - danger of damage to catalytic converter!

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

Oil system capacity: Fluid Capacity Chart

Oil pump, lower section of oil pan, assembly overview

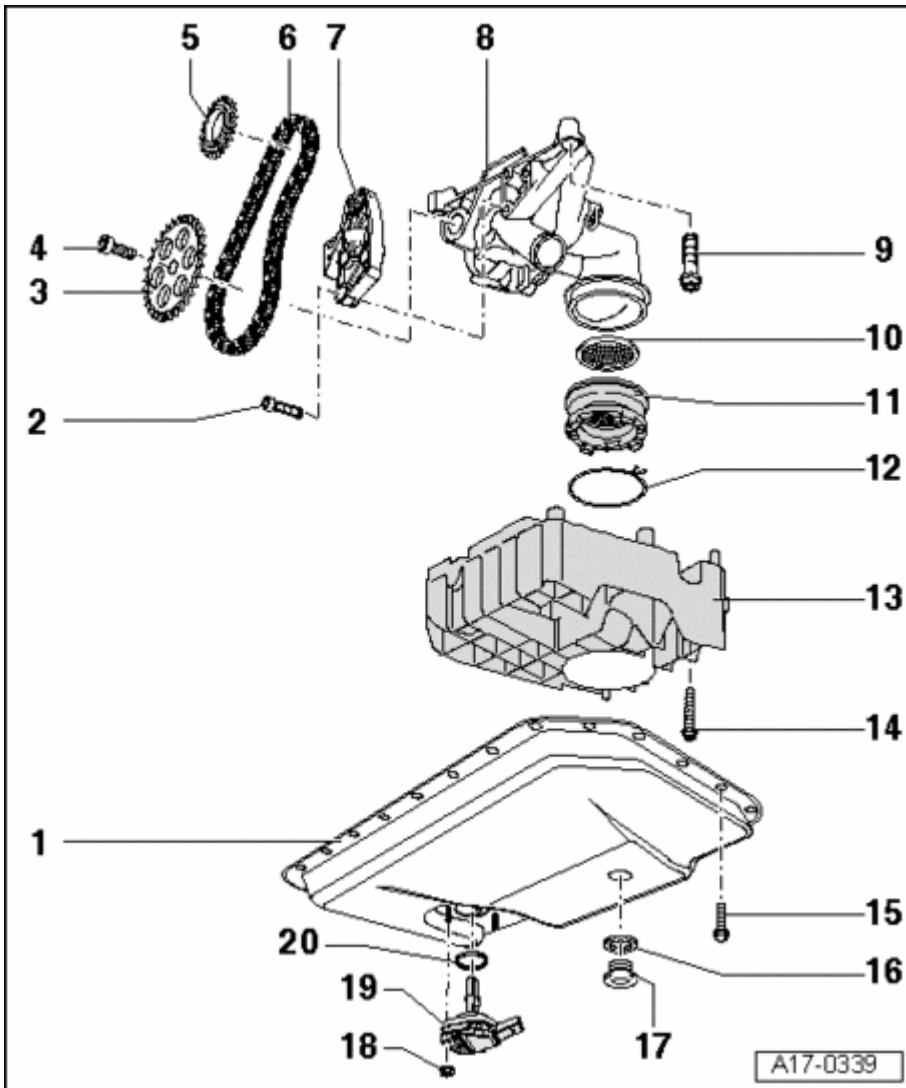


Fig. 371: Oil Pump, Lower Section Of Oil Pan, Assembly Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Oil pan (lower section)

- Removing and installing --> **Lower part of oil pan, removing and installing**
- With Oil Level Thermal Sensor G266

2 - 10 Nm

3 - Chain sprocket

- For oil pump
- Installed location: Side with writing points toward front
- Removing and installing --> Chain drive for oil pump, removing and installing --> **Oil pump drive sprocket, removing and installing**

4 - 34 Nm

5 - Chain sprocket

- For crankshaft
- Removing and installing --> Chain drive for oil pump, removing and installing --> **Oil pump drive sprocket, removing and installing**

6 - Drive chain for oil pump

- Removing and installing --> Chain drive for oil pump, removing and installing --> **Oil pump drive sprocket, removing and installing**

7 - Chain tensioner

- Before removing, secure using piece of wire
- Do not disassemble
- Removing and installing --> Chain drive for oil pump, removing and installing --> **Oil pump drive sprocket, removing and installing**

8 - Oil pump

- Do not disassemble
- With relief valve approx. 7 bar
- Removing and installing --> **Oil pump, removing and installing**

9 - 30 Nm

10 - Oil strainer

- Clean if soiled

11 - Intake tube

12 - Circlip

13 - Oil baffle

14 - 10 Nm

- Different lengths

15 - 10 Nm

- Fasten diagonally in steps

16 - Seal

- Replace

17 - Oil drain plug, 50 Nm

18 - 10 Nm

19 - Oil Level Thermal Sensor G266

- Removing and installing --> **Oil Level Thermal Sensor G266 , removing and installing**

20 - Seal

- Replace

Oil Level Thermal Sensor G266 , removing and installing

Removing

NOTE:

- Before raising the vehicle on a hoist (wheels off the ground), first activate the vehicle jack mode --> **43 - SELF LEVELING SUSPENSION** .

For vehicles with parking/auxiliary heater:

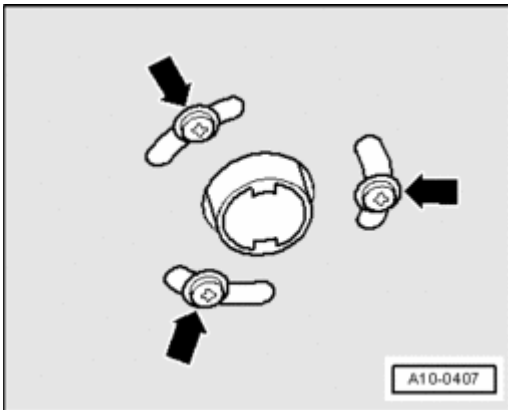


Fig. 372: Removing Bolts For Exhaust Pipe Of Parking Heater/Auxiliary Heater On Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - for exhaust pipe of parking heater/auxiliary heater on noise insulation.

All

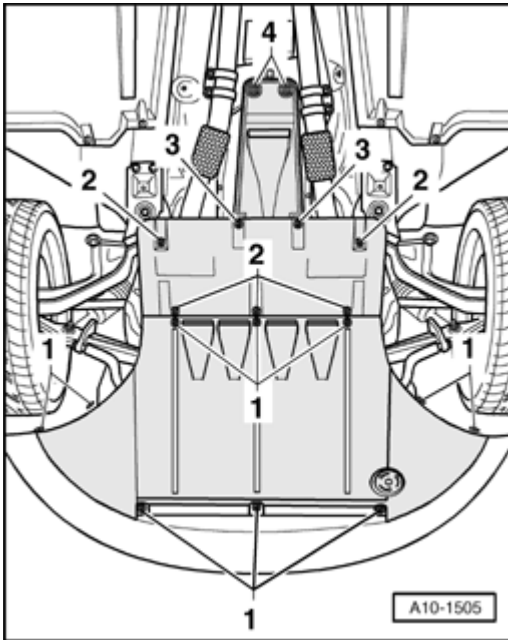


Fig. 373: Loosening Mounting Parts And Removing Noise Insulation
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen mounting parts - **1** - and remove noise insulation.
- Place oil receptacle beneath.
- Drain engine oil.

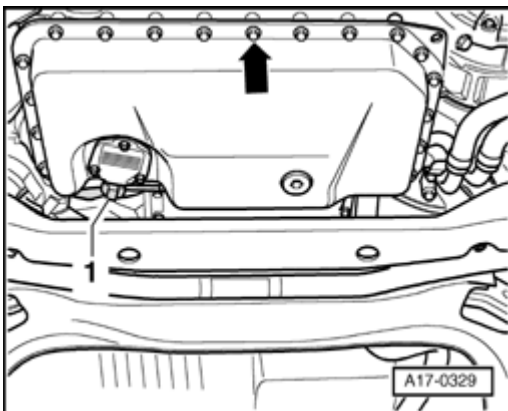


Fig. 374: Disconnecting Electrical Harness Connector At Oil Level Thermal Sensor G266
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector at Oil Level Thermal Sensor G266 - **1** -.
- Remove Oil Level Thermal Sensor G266.

Installing

NOTE: • **Replace seals.**

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

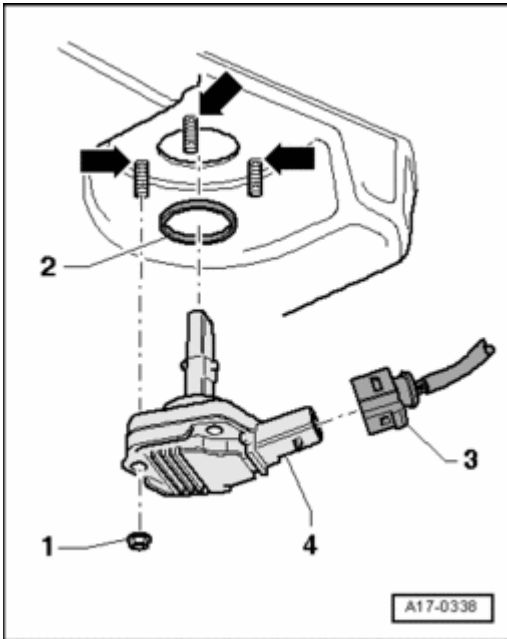


Fig. 375: Applying Sealant To Studs Of Oil Pan, Installing Oil Level Thermal Sensor G266 & Connecting Electrical Wire

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Apply sealant to studs of oil pan - **arrows** -.

Sealant

- Install Oil Level Thermal Sensor G266 - **4** -.
- Connect electrical wire - **3** -.
- Add engine oil and check oil level.
- Install sound insulation.

Torque specifications

Component	Nm
Oil Level Thermal Sensor G266	10
Oil drain plug	50

Lower part of oil pan, removing and installing

Special tools, testers and auxiliary items required

- Oil receptacle
- Hand drill with plastic brush attachment

- Protective glasses
- Silicone sealant

Removing**NOTE:**

- Before raising the vehicle on a hoist (wheels off the ground), first activate vehicle jack mode --> **43 - SELF LEVELING SUSPENSION** .

For vehicles with parking/auxiliary heater:

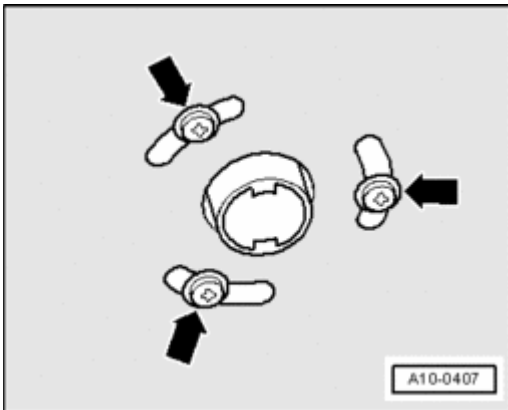


Fig. 376: Removing Bolts For Exhaust Pipe Of Parking Heater/Auxiliary Heater On Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - for exhaust pipe of parking heater/auxiliary heater on noise insulation.

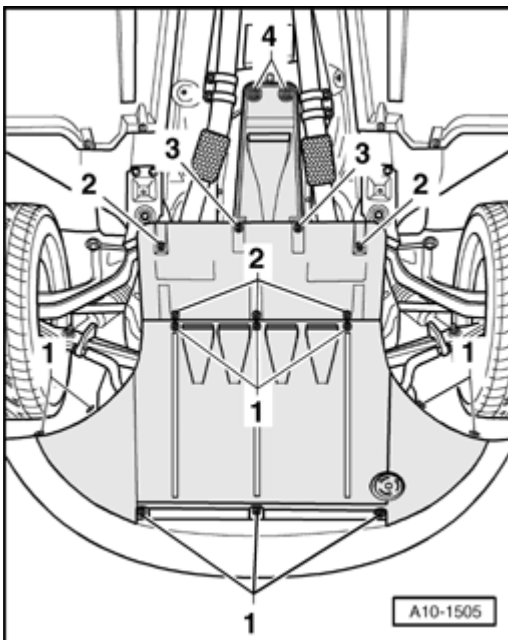
All

Fig. 377: Loosening Mounting Parts And Removing Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen mounting parts - **1** - and remove noise insulation.
- Place oil receptacle beneath.
- Drain engine oil.

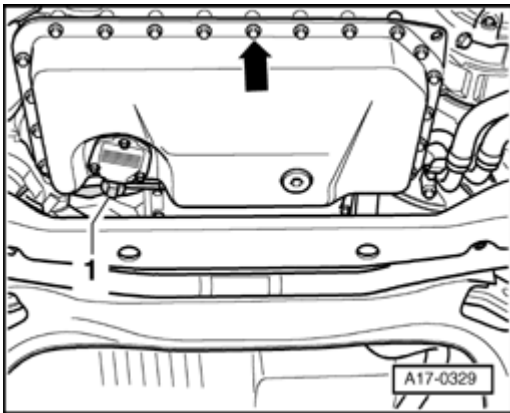


Fig. 378: Disconnecting Electrical Harness Connector At Oil Level Thermal Sensor G266
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector at Oil Level Thermal Sensor G266 - **1** -.
- Remove lower section of oil pan - **arrow** -.

Installing

NOTE: • Replace seals.

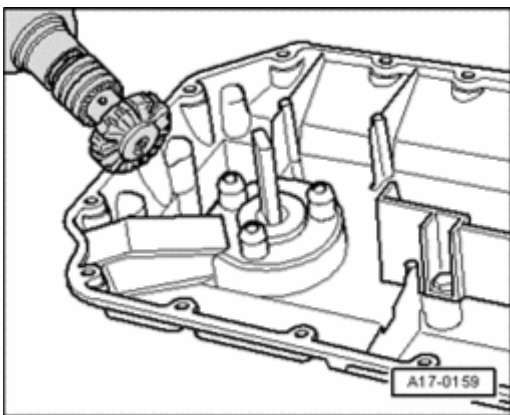


Fig. 379: Removing Remaining Sealant From Lower And Upper Part Of Oil Pan Using E.G. Rotating Plastic Brush
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove remaining sealant from lower and upper part of oil pan using e.g. rotating plastic brush.

CAUTION: Wear safety glasses.

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

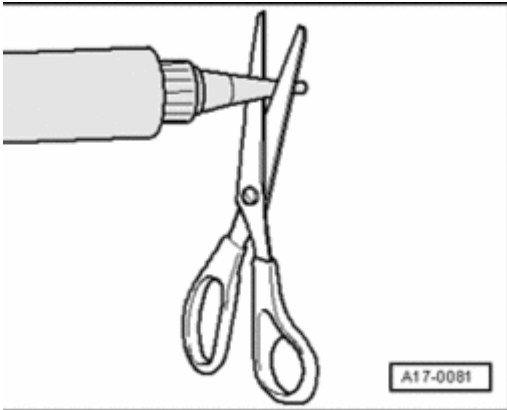


Fig. 380: Cutting Tube Nozzle At Front Marking
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

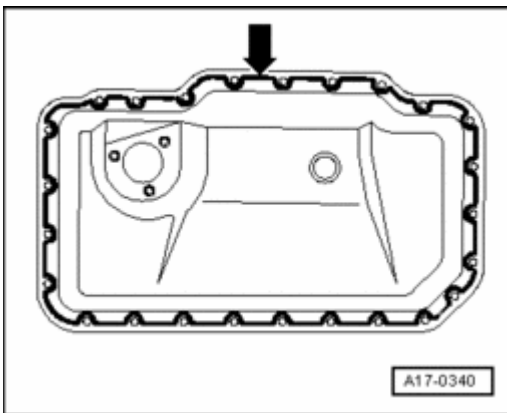


Fig. 381: Applying Silicon Sealant Bead To Clean Sealing Surfaces Of Oil Pan (Lower Section)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Apply silicon sealant bead - **arrow** - to clean sealing surfaces of oil pan (lower section) as shown in illustration.
- Thickness of sealant bead - **arrow** - : 1.5 mm

NOTE:

- The lower part of the oil pan must be installed within 5 minutes after application of silicone sealant.
- Sealant bead must not be thicker than specified, otherwise sealant could get into lower part of oil pan and clog oil pump strainer.

- Set lower part of oil pan in place and fasten all bolts in diagonal sequence to 5 Nm.
- Fasten bolts for lower part of oil pan in a diagonal sequence to 10 Nm.
- Add engine oil and check oil level.

Torque specifications

Component	Nm
Lower part of oil pan to upper part of oil pan	10
Oil drain plug	50

Chain drive for oil pump, removing and installing

Removing

- Toothed belt, removing --> **Toothed belt, removing and installing.**
- Remove front sealing flange --> **Front sealing flange, removing and installing.**

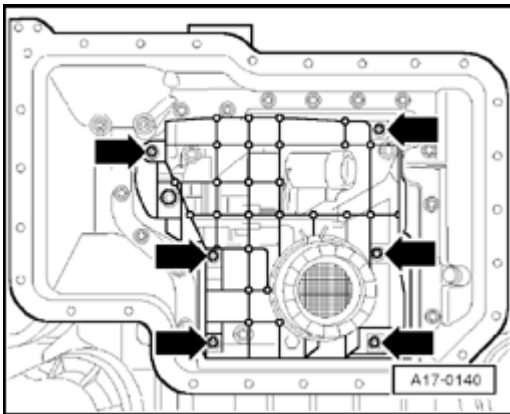


Fig. 382: Removing Baffle Plate

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove baffle plate - **arrows** -.

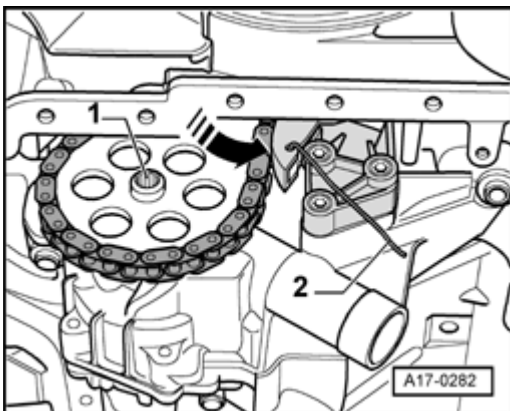


Fig. 383: Securing Chain Tensioner For Oil Pump Using An Angled Piece Of Wire & Remove Bolt

2006 Audi A8 Quattro

ENGINE 4.2 Liter V8 5V Engine Mechanical, Engine Code(s): BFM, BGK - A8

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure chain tensioner for oil pump using an angled piece of wire - 2 -.
- Remove bolt - 1 - and pull off chain sprocket from oil pump.
- Pull off chain sprocket with chain from crankshaft.
- If necessary, remove chain tensioner from oil pump.

Installing

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

NOTE:

- **Note installation position of chain sprockets. Sides with marking point toward front.**

- Note installation position of chain sprockets.
- Installed location: Marking points toward front.
- Install front sealing flange --> **Front sealing flange, removing and installing.**
- Install toothed belt (adjust timing) --> **Toothed belt, removing and installing.**
- Install torque support --> **Torque support (with torque support valve N382), assembly overview.**

Torque specifications

Component	Nm
Chain tensioner to oil pump	10
Chain sprocket to oil pump	34
Baffle plate to upper part of oil pan	10
Oil drain plug	50

Oil pump, removing and installing

Removing

- Remove lower section of oil pan --> **Lower part of oil pan, removing and installing.**

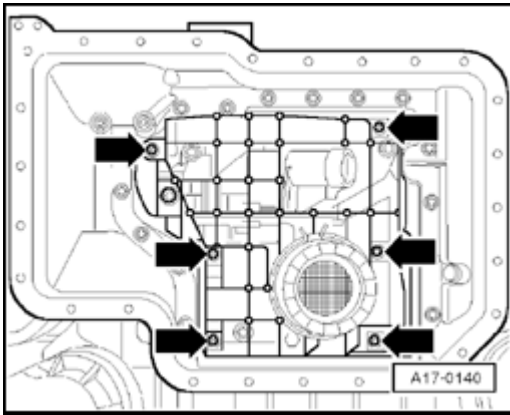


Fig. 384: Removing Baffle Plate

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove baffle plate - arrows -.

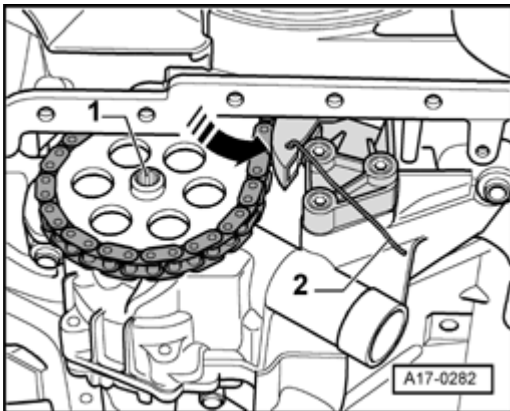


Fig. 385: Securing Chain Tensioner For Oil Pump Using An Angled Piece Of Wire & Remove Bolt

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure chain tensioner for oil pump using an angled piece of wire - 2 -.
- Remove bolt - 1 - and pull off chain sprocket from oil pump.

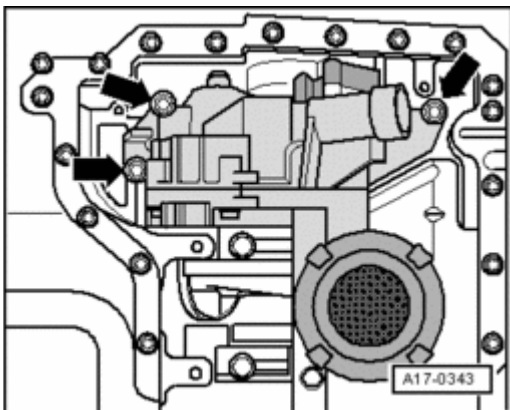


Fig. 386: Removing Oil Pump

2006 Audi A8 Quattro

ENGINE 4.2 Liter V8 5V Engine Mechanical, Engine Code(s): BFM, BGK - A8

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove oil pump - **arrows** -.

Installing

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

- Note installation position of chain sprocket for oil pump.
- Installed location: Marking points toward front.
- Install oil pan (lower part) --> **Lower part of oil pan, removing and installing.**

Torque specifications

Component	Nm
Oil pump to upper part of oil pan	30
Chain sprocket to oil pump	34
Baffle plate to upper part of oil pan	10
Oil drain plug	50

Oil pan (upper part), assembly overview

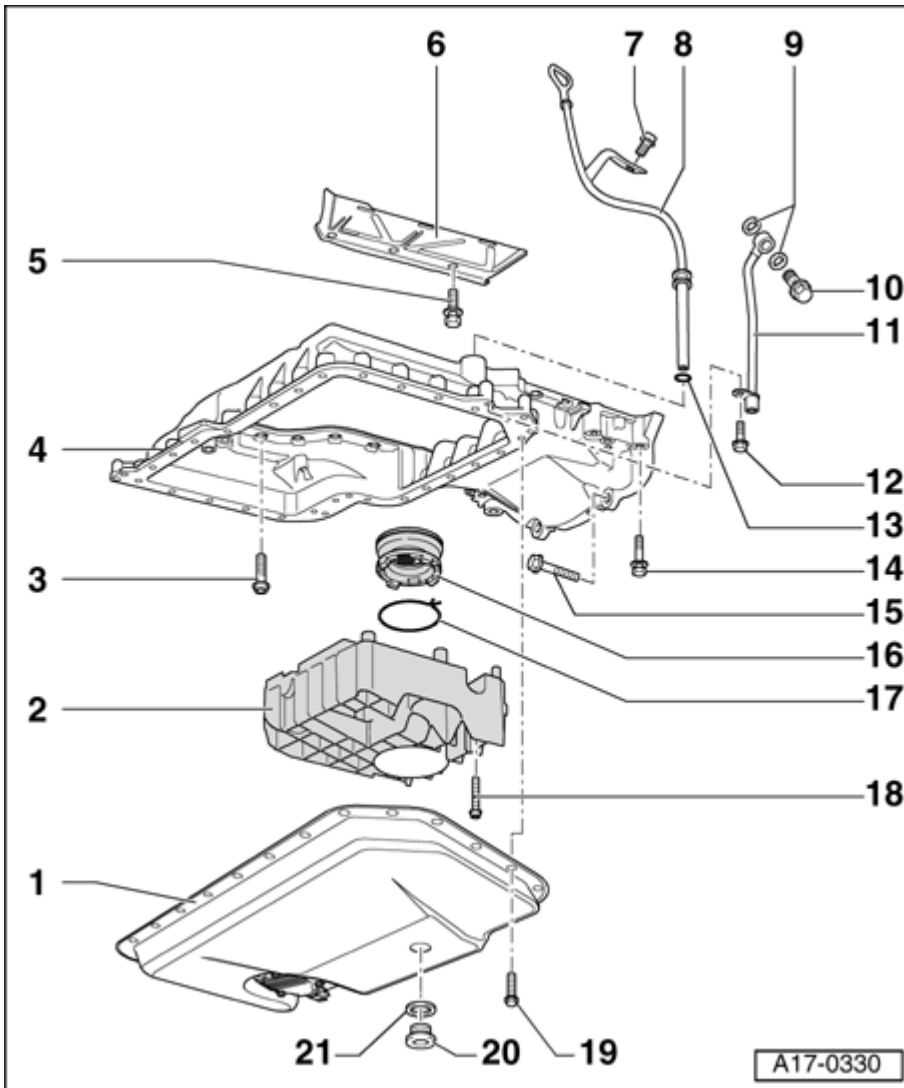


Fig. 387: Oil Pan (Upper Part), Assembly Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - 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**

2 - Oil baffle

3 - 14 Nm

- Observe sequence for tightening --> **Oil pan (upper part), removing and installing**

4 - Oil pan (upper section)

- Removing and installing --> **Oil pan (upper part), removing and installing**

5 - 22 Nm

6 - Baffle plate

7 - 22 Nm

8 - Guide tube for oil dipstick

9 - Seals

- Replace

10 - 32.5 Nm

11 - Coolant drain tube

12 - 10 Nm

13 - O-ring

- Replace

14 - 22 Nm

- Observe sequence for tightening --> **Oil pan (upper part), removing and installing**

15 - 65 Nm

16 - Intake tube

17 - Circlip

18 - 10 Nm

19 - 10 Nm

- Fasten diagonally in steps

20 - Oil drain plug, 50 Nm

21 - Seal

- Replace

Oil pan (upper part), removing and installing

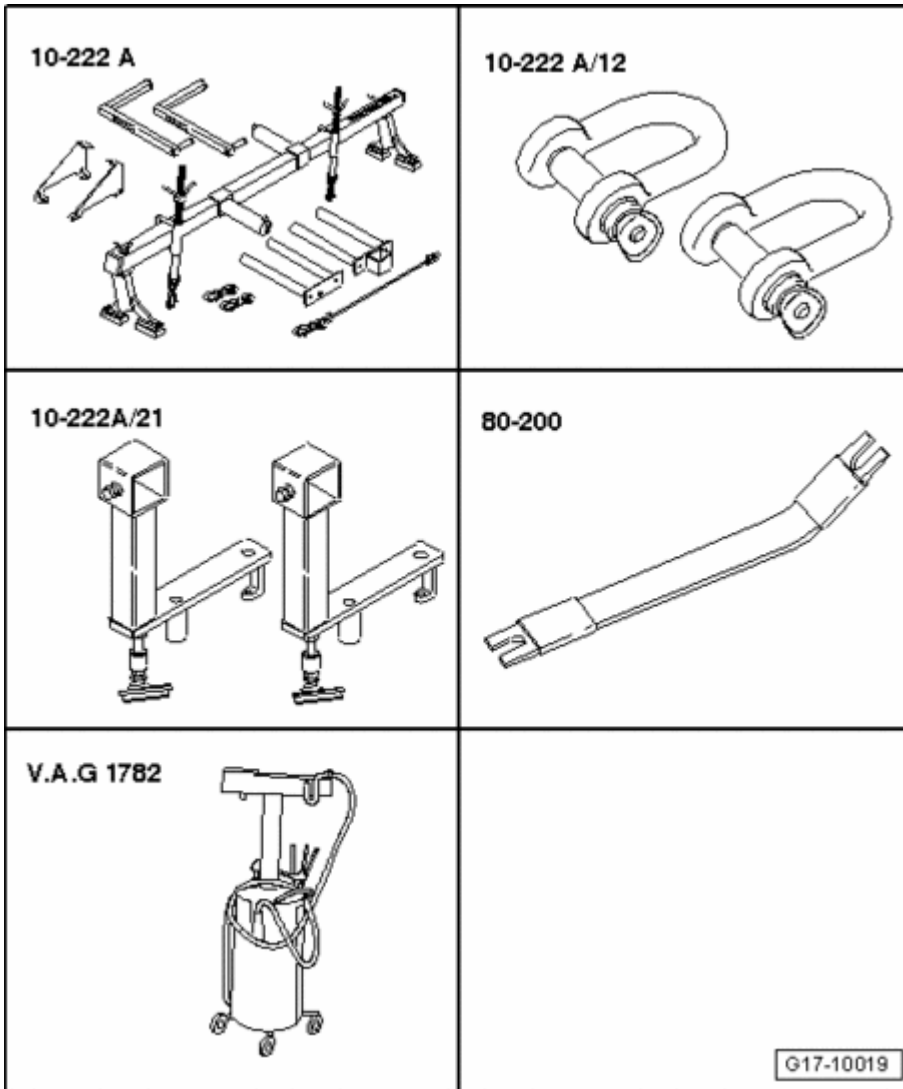


Fig. 388: Identifying Special Tools - Oil Pan (Upper Part), Removing And Installing
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Engine support bridge 10 - 222 A
- Shackle 10 - 222 A/12
- Adapter 10-222 A/21
- Pry Lever - Rmv Outside Mirror 80 - 200

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

- Block of wood, 50 x 50 x 50 mm

Removing**NOTE:**

- Before raising the vehicle on a hoist (wheels off the ground), first activate the vehicle jack mode --> **43 - SELF LEVELING SUSPENSION** .

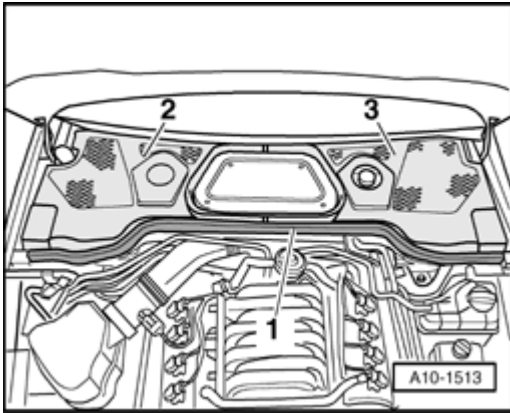


Fig. 389: Identifying Rubber Seal & Plenum Chamber Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

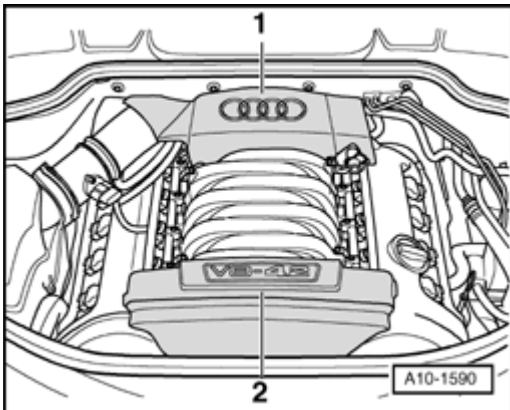


Fig. 390: Removing Engine Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove engine cover - 1 - upward.

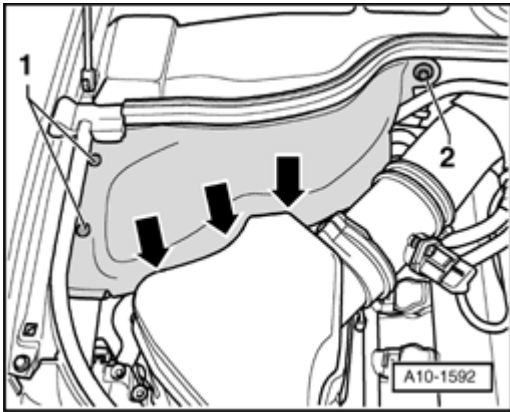


Fig. 391: Identifying Clips & Bolt

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove clips - **1** - using Pry Lever - Rmv Outside Mirror 80 - 200.
- Remove bolt - **2** - and remove cover.

NOTE:

- Note clips when installing - arrows -.

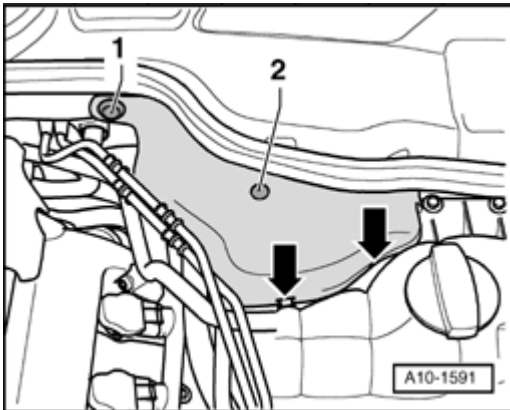


Fig. 392: Removing Left Cover By Removing Bolt And Expanding Rivet

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove left cover by removing bolt - **1** - and removing expanding rivet - **2** - using Pry Lever - Rmv Outside Mirror 80 - 200.

NOTE:

- Note clips when installing - arrows -.

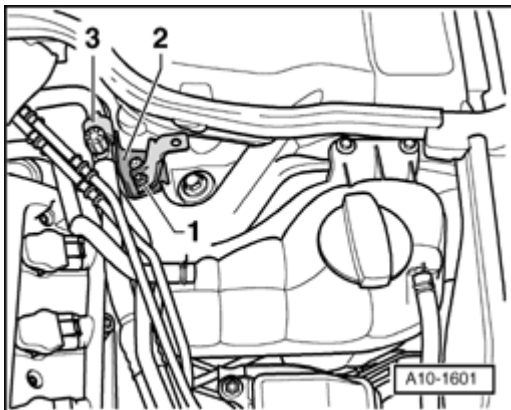


Fig. 393: Identifying Cover Bracket, Bracket For A/C Line & Bracket For A/C Line
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove cover bracket - 1 -.
- Remove bracket for A/C line - 2 -.
- Unclip bracket for A/C line - 3 -.

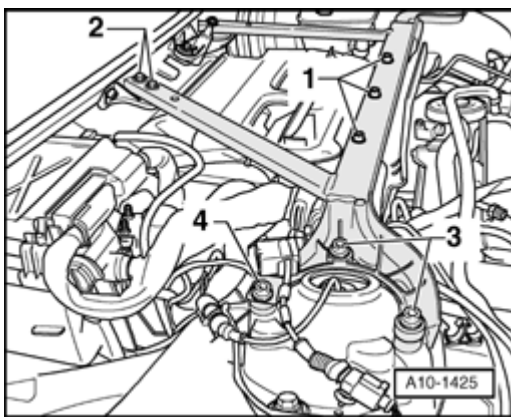


Fig. 394: Removing Dome Brace Bolts
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - 4 - on left and right.

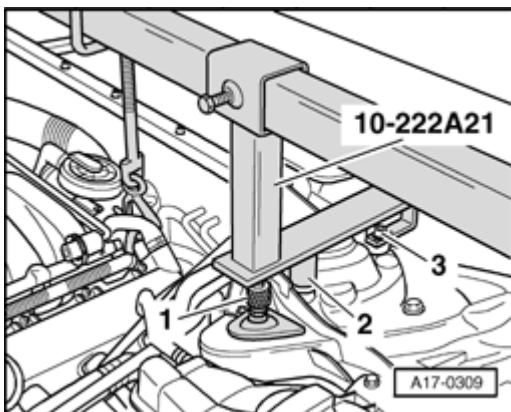


Fig. 395: Securing Engine Support Bridge 10 - 222 A With Adapters 10 - 222 A/21 At Suspension Strut Domes

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure engine support bridge 10 - 222 A with adapters 10 - 222 A/21 at suspension strut domes.
- Install adapters 10 - 222 A/21 to dome brace - 3 - at left and right.
- Support for left and right side of vehicle is marked.
- The center support point is secured on front bolts for dome brace.
- Knurled-head screw - 1 - must be turned downward far enough so that supporting plate makes contact on suspension strut dome.

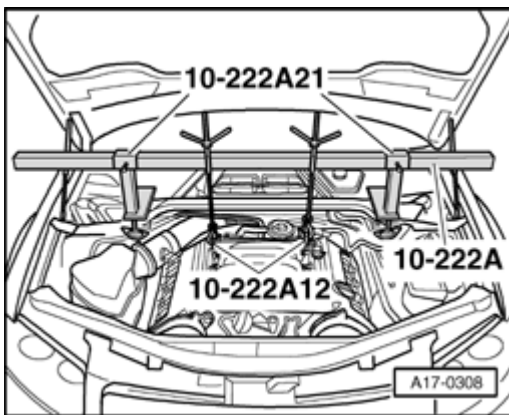


Fig. 396: Securing Shackles 10 - 222 A/12 To Right Rear Engine Lifting Eyelets

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure shackles 10 - 222 A/12 to right rear engine lifting eyelets.
- Hook shackles 10 - 222 A/12 into spindles of engine support bridge 10 - 222 A.
- Slightly pre-tension engine using engine support bridge spindles.

For vehicles with parking/auxiliary heater:

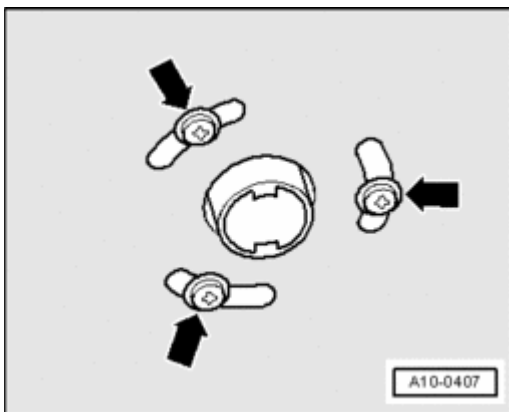


Fig. 397: Removing Bolts For Exhaust Pipe Of Parking Heater/Auxiliary Heater On Noise Insulation

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - for exhaust pipe of parking heater/auxiliary heater on noise insulation.

All

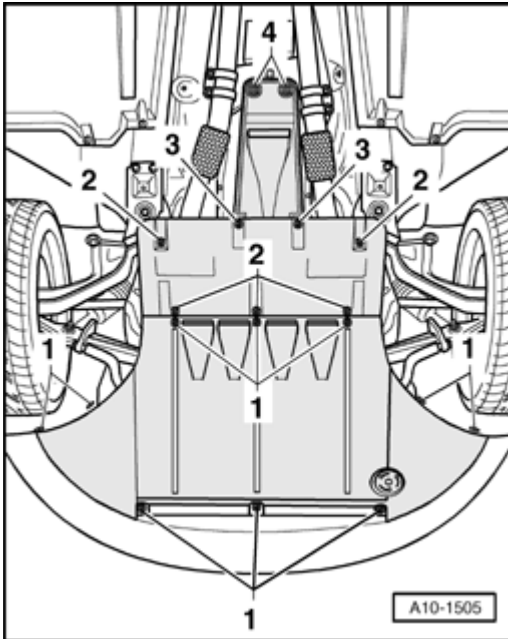


Fig. 398: Loosening Mounting Parts And Removing Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen mounting parts - **1** - and remove noise insulation.

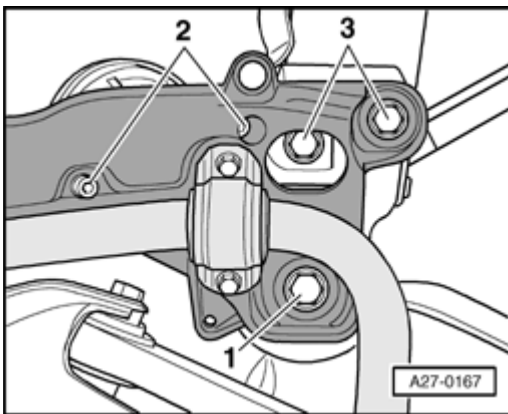


Fig. 399: Removing Bolts On Left/Right
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **1 through 3** - on left and right.
- Lower engine carrier.

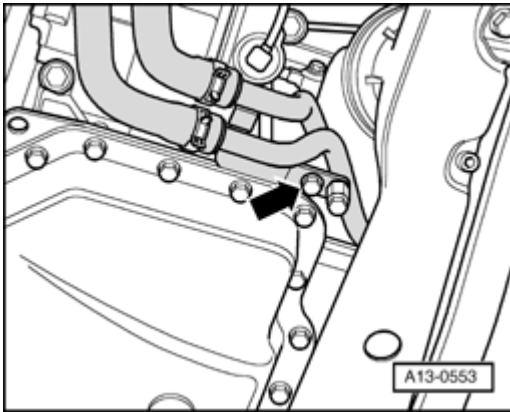


Fig. 400: Disconnecting Water Pipe From Oil Pan
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect water pipe - **arrow** - from oil pan.

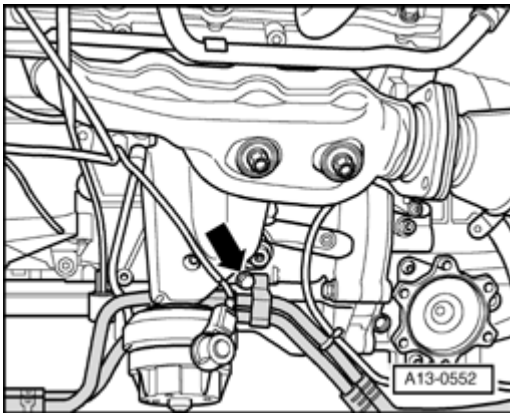


Fig. 401: Disconnecting Water Pipe From Engine Block
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect water pipe from engine block - **arrow** -.
- Drain coolant --> **Cooling system, draining and filling.**

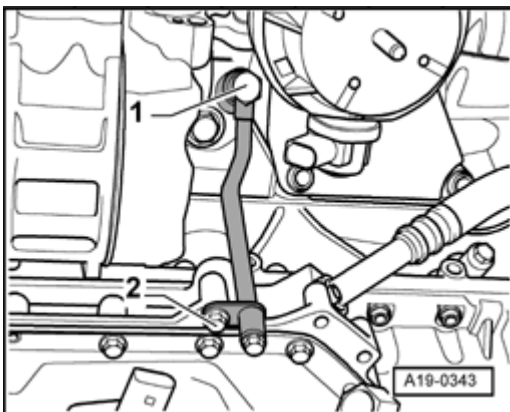


Fig. 402: Removing Bolts And Coolant Drain Tube

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - 1 - and - 2 - and remove coolant drain tube.

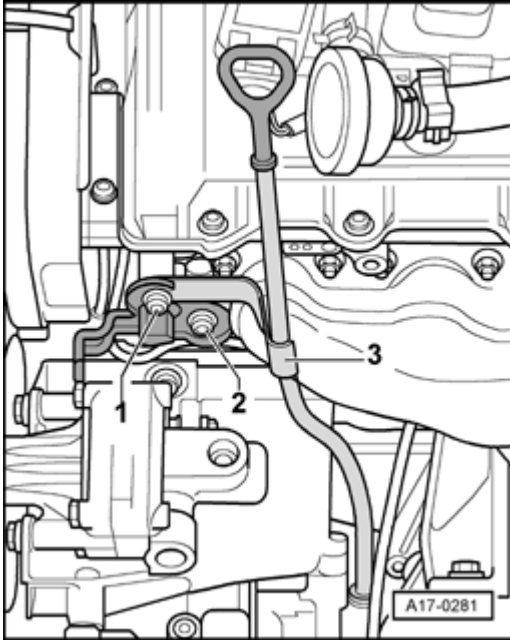


Fig. 403: Identifying Guide Tube With Oil Dipstick & Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - 1 - and loosen bolt - 2 - a few rotations.
- Remove guide tube - 3 - with oil dipstick.

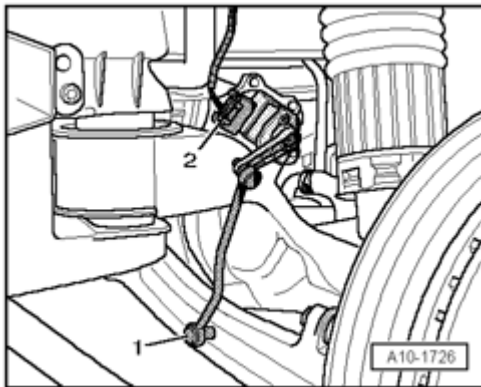


Fig. 404: Identifying Left Level Control System Sensor Electrical Harness Connector & Left/Right Control Arms Coupling Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove coupling rod - 1 - at left and right control arms.
- Pull subframe downward.

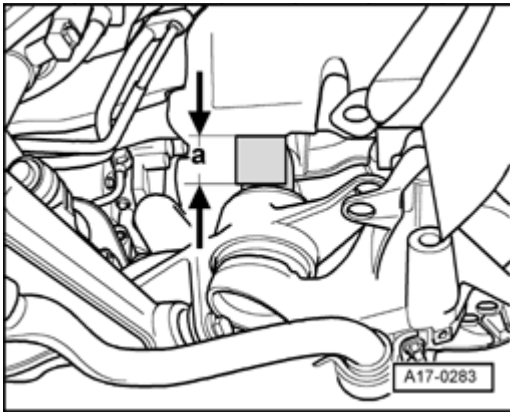


Fig. 405: Placing Block Of Wood Between Front Subframe Mount And Body
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place block of wood (height - a - = 50 mm) between front subframe mount and body.

NOTE:

- To avoid measuring wheel alignment, the subframe must only be loosened and lowered at the front end.

- Place oil receptacle beneath.
- Drain engine oil.

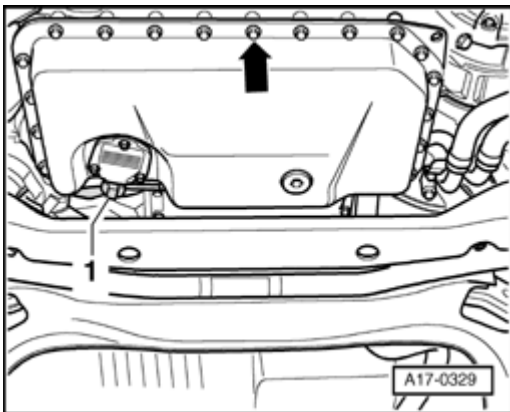


Fig. 406: Disconnecting Electrical Harness Connector At Oil Level Thermal Sensor G266
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector at Oil Level Thermal Sensor G266 - 1 -.
- Remove lower section of oil pan - **arrow** -.

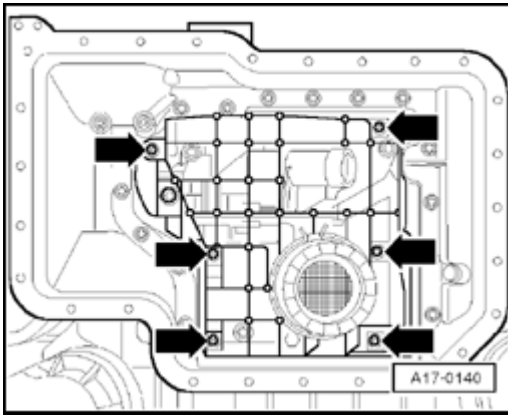


Fig. 407: Removing Baffle Plate

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove baffle plate - **arrows** -.
- Remove tensioning ring.

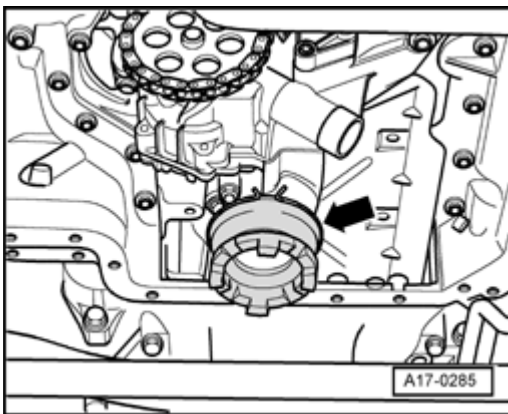


Fig. 408: Disconnecting Intake Connection From Oil Pump

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect intake connection - **arrow** - from oil pump.

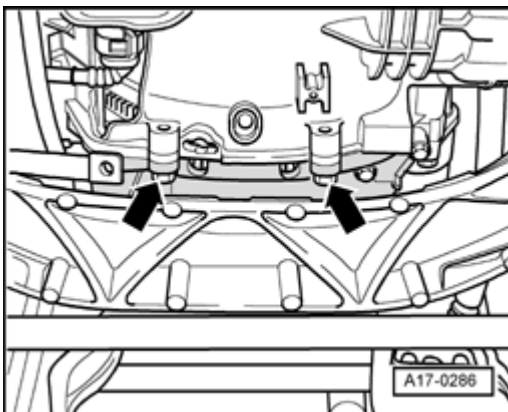


Fig. 409: Removing/Installing Engine/Transmission Connecting Bolts In Area Of Oil Pan (Upper Part)

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove engine/transmission connecting bolts - **arrows** - in area of oil pan (upper part).

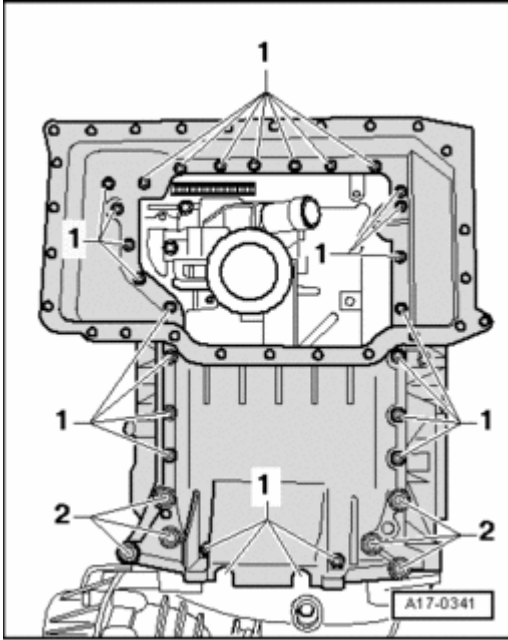


Fig. 410: Removing/Installing Oil Pan Bolts (Upper Part)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **1** - and - **2** - from oil pan (upper part).
- Press upper part of oil pan from alignment pins of cylinder block.

Installing

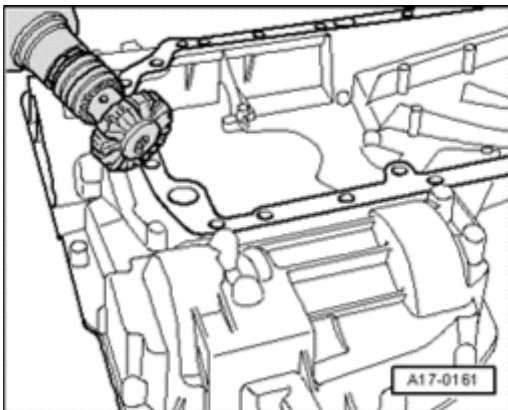


Fig. 411: Using Rotating Plastic Brush To Remove Remaining Sealant From Oil Pan (Upper Part) And Cylinder Block

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using e.g. rotating plastic brush, remove remaining sealant from upper part of oil pan and from cylinder block.

CAUTION: Wear safety glasses.

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

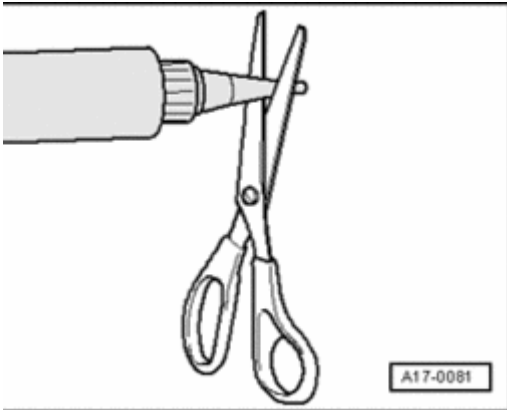


Fig. 412: Cutting Tube Nozzle At Front Marking
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

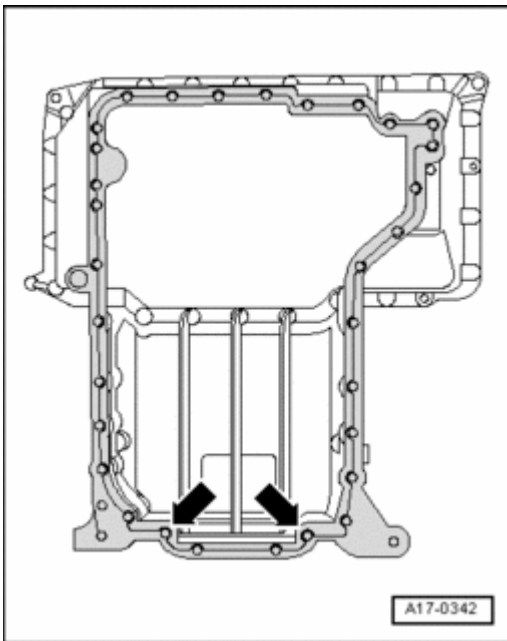


Fig. 413: Applying Silicon Sealant Bead To Clean Sealing Surfaces Of Oil Pan (Upper Section)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Apply silicon sealant bead to clean sealing surfaces of oil pan (upper section) as shown in illustration.
- Thickness of sealant bead: approx. 1.5 mm

NOTE:

- The oil pan (upper part) must be installed within 5 minutes after application of silicone sealant.
- Sealant bead must not be thicker than specified, otherwise sealant could get into oil pan and clog the oil pump strainer.
- Apply sealant bead in area of cylinder block bore as well as rear sealing flange - arrows - extremely carefully.

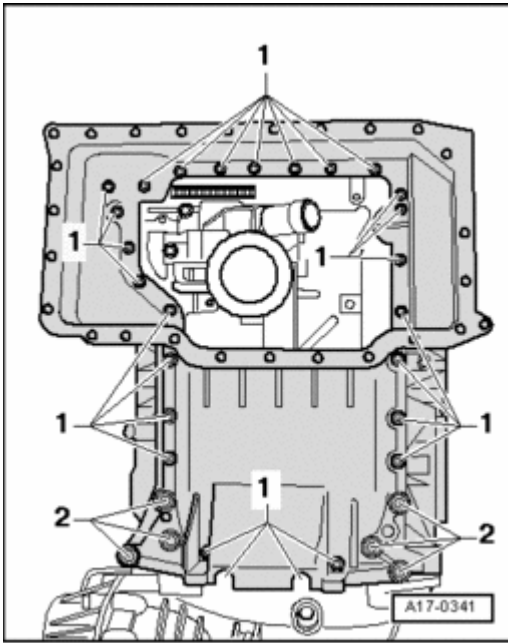


Fig. 414: Removing/Installing Oil Pan Bolts (Upper Part)

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Attach upper part of oil pan and pre-tighten all bolts - 1 - and - 2 - of oil pan (upper part) to cylinder block in diagonal sequence to 5 Nm.
- Tighten bolts - 1 - and bolts - 2 - in diagonal sequence.

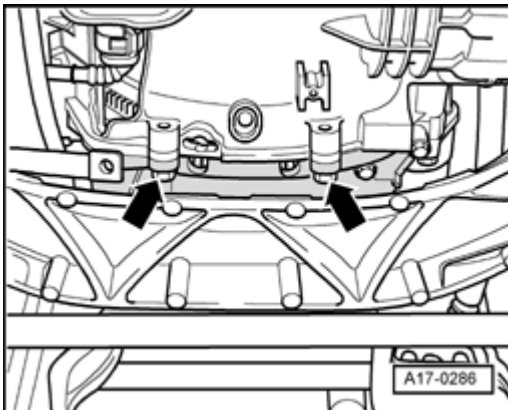


Fig. 415: Removing/Installing Engine/Transmission Connecting Bolts In Area Of Oil Pan (Upper Part)

Courtesy of VOLKSWAGEN UNITED STATES, INC.

2006 Audi A8 Quattro

ENGINE 4.2 Liter V8 5V Engine Mechanical, Engine Code(s): BFM, BGK - A8

- Install engine/transmission connecting bolts - **arrows** - in area of oil pan (upper part).
- Tighten bolts for oil pan (upper part) to transmission.
- Replace oil dipstick guide tube O-ring.

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

NOTE:

- **Replace seals and O-rings.**
- **Secure all hose connections using hose clamps of series-production status**
- **Hose connections and charge air system hoses must be free of oil and grease before installing. Do not use lubricant under any circumstances.**

- Install oil pan (lower part) --> **Oil Level Thermal Sensor G266 , removing and installing.**
- Install subframe --> **40 - FRONT SUSPENSION** .
- Add engine oil and check oil level.
- Fill with coolant.

Torque specifications

Component		Nm
Oil pan (upper part) to cylinder block and sealing flange	M7	14
	M8	22
Upper part of oil pan to transmission		65
Baffle plate to upper part of oil pan		10
Oil drain plug		50
Engine mount to subframe		23
Oil dip stick guide tube to cylinder head		22
Engine carrier to engine mount		23
Engine carrier to chassis		68
Coolant drain tube to	Cylinder block	32,5
	Oil pan (upper section)	10

Oil check valves, assembly overview

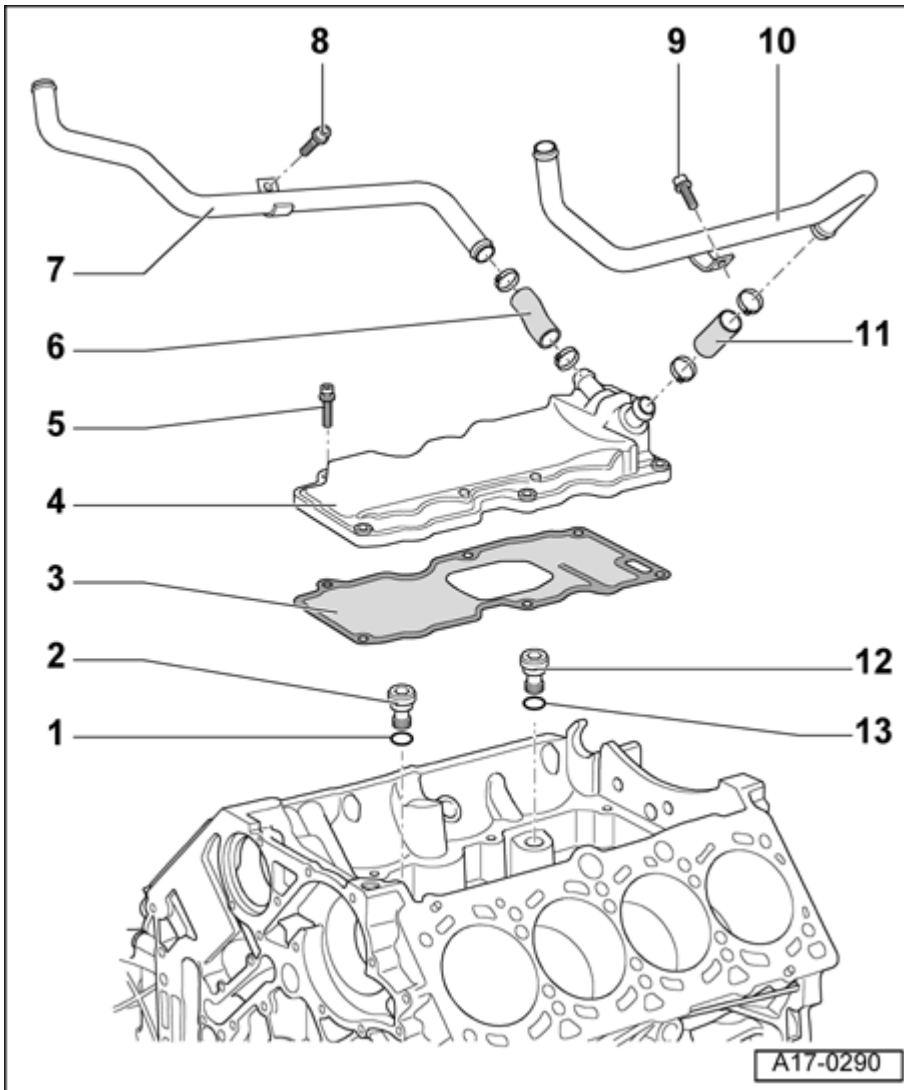


Fig. 416: Oil Check Valves, Assembly Overview

Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - O-ring

- Replace

2 - Oil check valve, 20 Nm

- For oil supply to left cylinder head

3 - Gasket

- Replace

4 - Cover

- With connection for crankshaft housing ventilation

5 - 10 Nm

6 - Connecting hose

7 - Crankcase ventilation pipe

- Cylinder bank 1 (right)

8 - 10 Nm

9 - 10 Nm

10 - Crankcase ventilation pipe

- Cylinder bank 2 (left)

11 - Connecting hose

12 - Oil check valve, 20 Nm

- For oil supply to right cylinder head

13 - O-ring

- Replace

Oil check valves, replacing

NOTE:

- If irregular valve noise occurs repeatedly during short journeys and disappears after extended driving, the oil check valves must be replaced.

Removing

- Remove intake manifold --> **24 MULTIPOINT FUEL INJECTION (MPI)** .

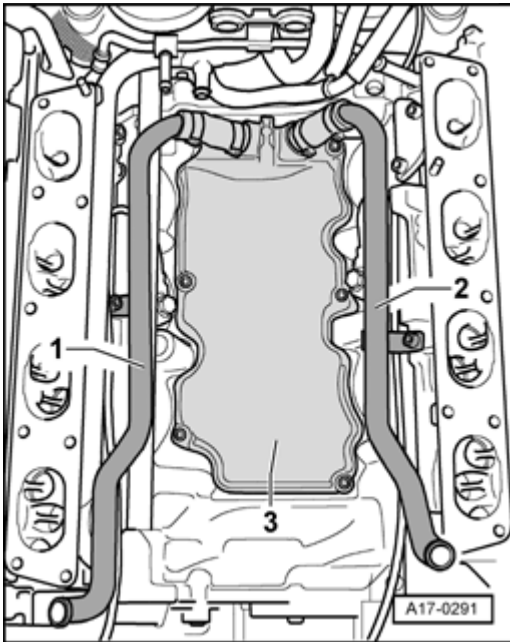


Fig. 417: Removing Crankcase Ventilation Pipes
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove crankcase ventilation pipes - 1 - and - 2 -.
- Remove cover - 3 - below intake manifold.

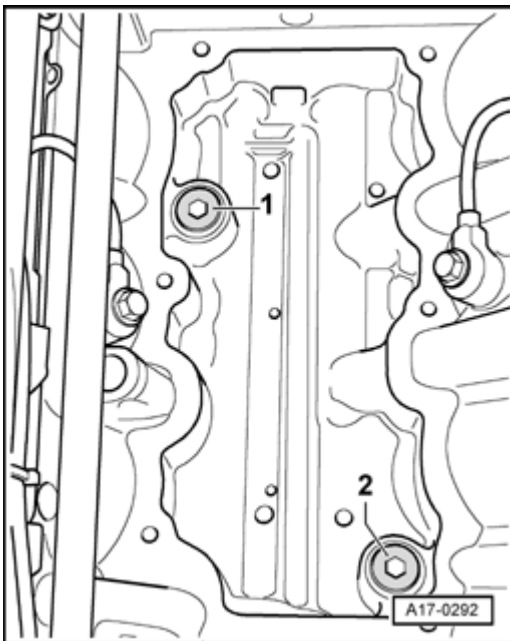


Fig. 418: Removing Oil Check Valves
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove oil check valves - 1 - and - 2 -.

2006 Audi A8 Quattro

ENGINE 4.2 Liter V8 5V Engine Mechanical, Engine Code(s): BFM, BGK - A8

Installing

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

NOTE:

- Replace gaskets and O-rings.
- Secure all hose connections using hose clamps of series-production status

- Install intake manifold --> **24 MULTIPOINT FUEL INJECTION (MPI)** .

Torque specifications

Component	Nm
Oil check valve to cylinder block	20
Cover to cylinder block	10

Oil pressure and oil pressure switch F1 , checking

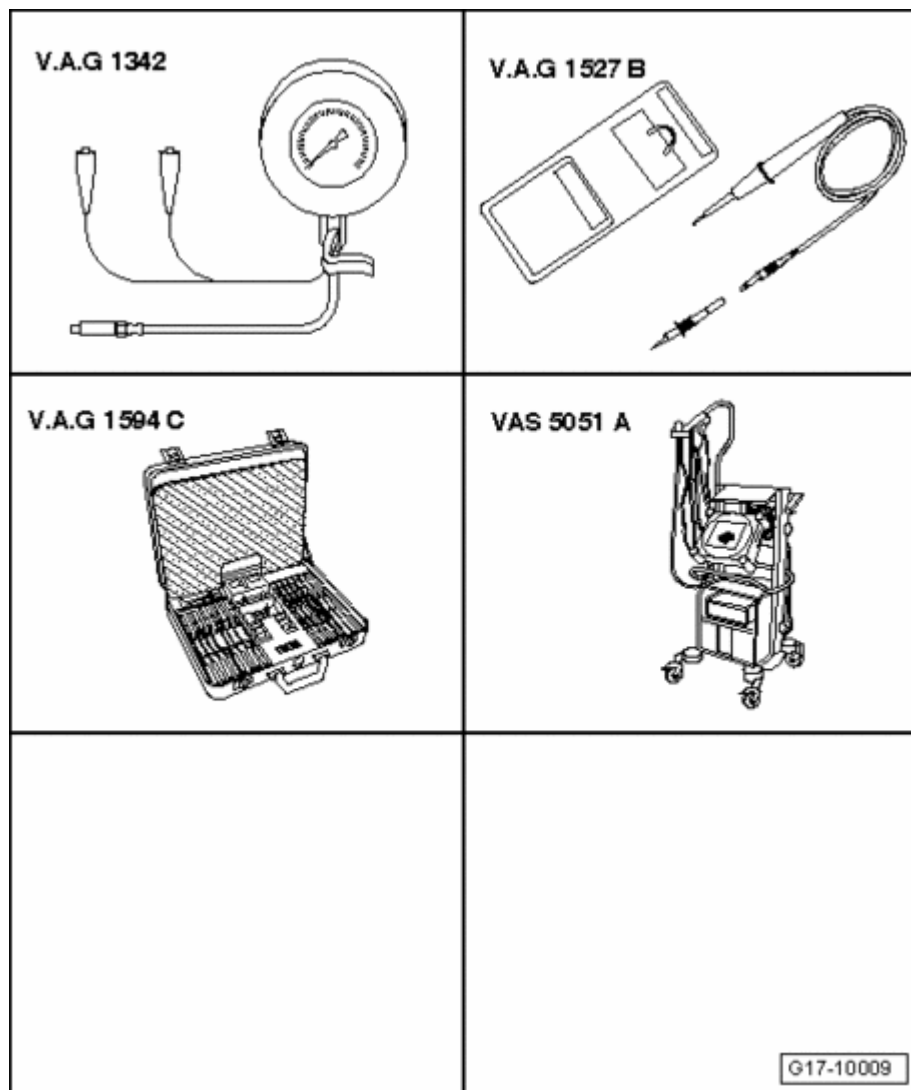


Fig. 419: Identifying Special Tools - Oil Pressure And Oil Pressure Switch F1 , Checking
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Oil pressure gauge V.A.G 1342
- Voltage tester V.A.G 1527 B
- Connector test set V.A.G 1594 C
- Vehicle diagnostic, testing, and information system VAS 5051

Test requirements

- Oil level OK
- Engine oil temperature approximately 80°C.

Checking oil pressure switch F1

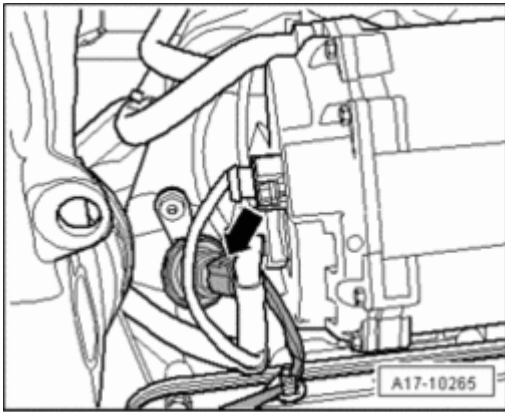


Fig. 420: Disconnecting Electrical Harness Connector From Oil Pressure Switch F1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - **arrow** - from oil pressure switch F1.
- Remove oil pressure switch F1.

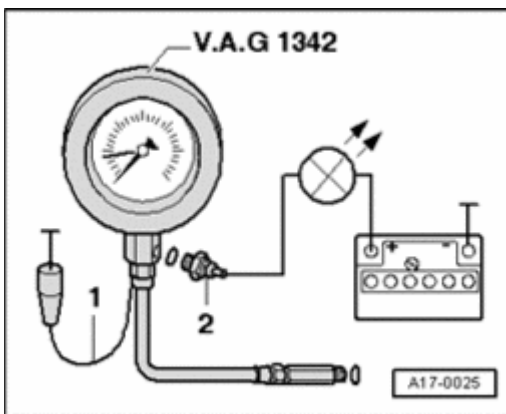


Fig. 421: Connecting Oil Pressure Gauge V.A.G 1342 With Adapter V.A.G 1342/14 To Hole For Oil Pressure Switch F1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect oil pressure gauge V.A.G 1342 with adapter V.A.G 1342/14 to hole for oil pressure switch F1.
- Install oil pressure switch F1 - **2** - into oil pressure gauge V.A.G 1342.
- Connect brown wire - **1** - of tester to Ground (GND).
- Connect voltage tester V.A.G 1527B using adapter cables from connector test kit V.A.G 1594A to oil pressure switch F1 and battery plus (+).
- LED must not light up.
- If LED is lit, replace oil pressure switch F1.
- Start engine.

NOTE:

- While starting engine, watch Pressure Tester and LED as oil pressure

switch may open during start.

Black oil pressure switch:

- At 1.2 to 1.6 bar pressure, LED must light up.
- If LED is not lit, the oil pressure switch must be replaced.

Oil pressure, checking

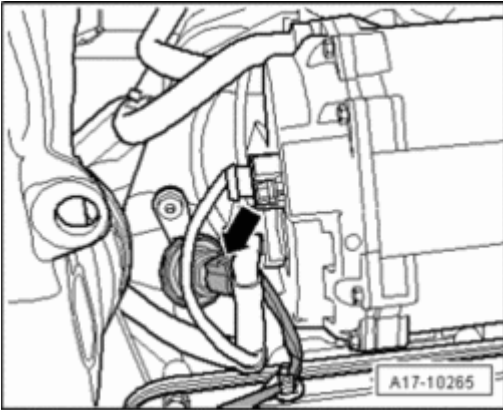


Fig. 422: Disconnecting Electrical Harness Connector From Oil Pressure Switch F1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector from oil pressure switch - **arrow** -.
- Remove oil pressure switch.

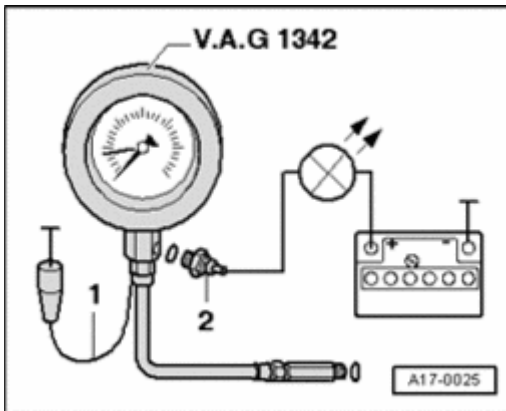


Fig. 423: Connecting Oil Pressure Gauge V.A.G 1342 With Adapter V.A.G 1342/14 To Hole For Oil Pressure Switch F1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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** - in oil pressure gauge V.A.G 1342.
- Start engine (engine oil temperature approximately 80°C).

- Oil pressure at idle: at least 1.0 bar
- Oil pressure at 2000 RPM: at least 3.5 bar

Engine oil

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

Oil level, checking**Test requirements**

- Engine oil temperature at least 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.

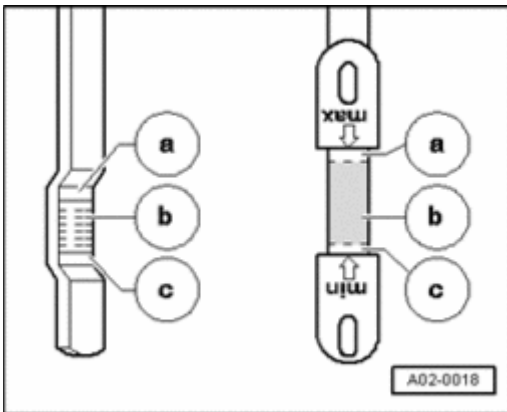
Range of markings on dipstick:

Fig. 424: Range Of Markings On Dipstick

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- a - Oil must not be added.
- b - Oil may be topped off. After topping off, oil may be in range - a -.
- c - Oil must be added. After topping off, it is sufficient if oil level is somewhere in range - b - (shaded area).

NOTE:

- Oil level must not exceed mark - a - on oil dipstick.

Oil filter housing, assembly overview

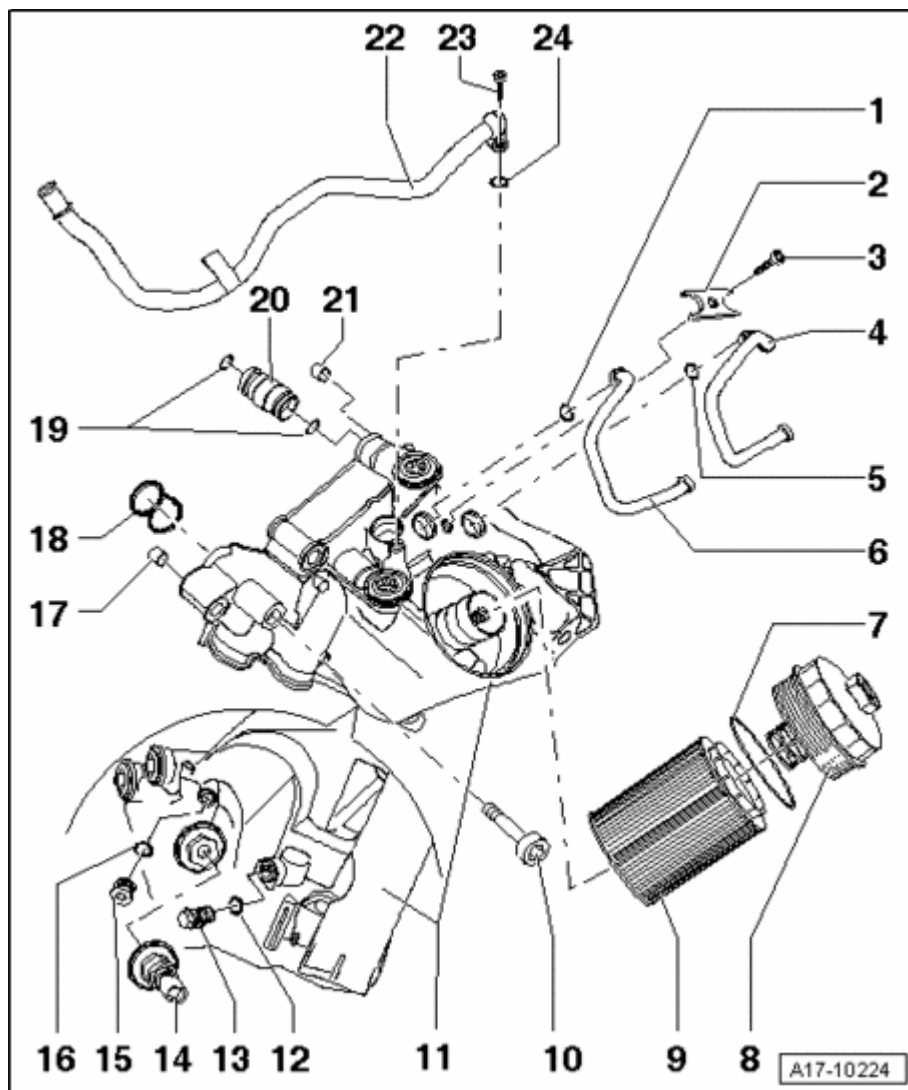


Fig. 425: Oil Filter Housing, Assembly Overview

Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Seal

- Replace

2 - Bracket

3 - Bolt

- 9 Nm

4 - Coolant line

5 - Seal

- Replace

6 - Coolant line

7 - Seal

- Replace

8 - Cap

- 25 Nm

9 - Oil filter element

- Observe change intervals --> **01 - MAINTENANCE**

10 - Bolt

- 45 Nm

11 - Oil filter housing

- With oil cooler
- Removing and installing --> **Oil filter housing, removing and installing**

12 - Gasket

- Replace

13 - Coolant drain plug

- 10 Nm

14 - Oil Pressure Switch F1

- 20 Nm
- Checking --> **Oil pressure and oil pressure switch F1 , checking**

15 - Oil drain plug

- 10 Nm

16 - Seal

- Replace

17 - Dowel sleeve

18 - Gasket

- For oil channel
- Replace

19 - Seal

- Replace

20 - Coolant line

21 - Dowel sleeve

22 - Coolant line

23 - Bolt

- 9 Nm

24 - Seal

- Replace

Oil filter housing, removing and installing

- Remove engine --> **Engine, removing and installing.**
- Remove generator --> **27 - BATTERY, STARTER, GENERATOR, CRUISE CONTROL**

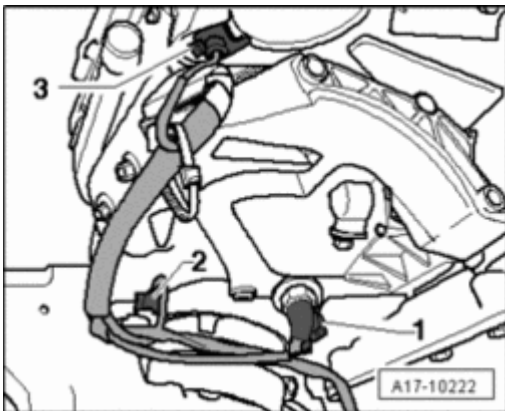


Fig. 426: Identifying Oil Filter Housing Electrical Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **1** - from oil pressure switch F1.
- Disconnect electrical connector - **2** - from engine mount.

- Disconnect electrical connector - **3** - from torque support valve N382.
- Remove right exhaust manifold --> **Right exhaust manifold, removing and installing.**
- Remove coolant pipe to oil filter housing --> **Coolant pipe to oil filter housing, removing and installing**

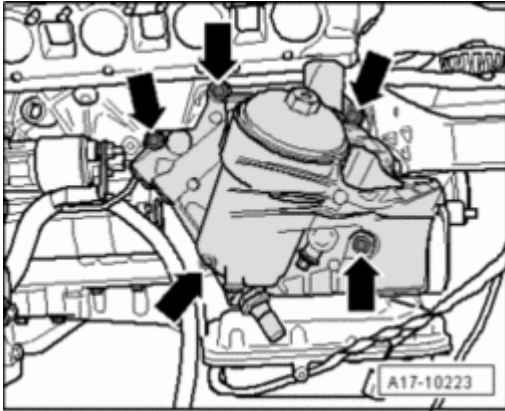


Fig. 427: Removing Oil Filter Housing

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove oil filter housing - **arrows** -.

Installing

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

NOTE:

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

- Install generator --> **27 - BATTERY, STARTER, GENERATOR, CRUISE CONTROL**
- Install right exhaust manifold --> **Right exhaust manifold, removing and installing**
- Install coolant pipe to oil filter housing --> **Coolant pipe to oil filter housing, removing and installing**
- Install torque support --> **Torque support (with torque support valve N382), assembly overview.**

Torque specifications

Tightening torques --> **Oil filter housing, assembly overview** Oil filter housing, assembly overview

19 - ENGINE - COOLING SYSTEM

COOLING SYSTEM COMPONENTS, REMOVING AND INSTALLING

Cooling system components, removing and installing

CAUTION: Cover cap of expansion tank with rag and open carefully, as hot steam i.e.

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 .
- Hose clip pliers V.A.G 1921 are recommended for installing spring-type clamps.
- Always replace gaskets and seals.
- Arrows on coolant pipes and coolant hoses must line up across from each other.

Connection diagram for coolant hoses (without auxiliary heater)

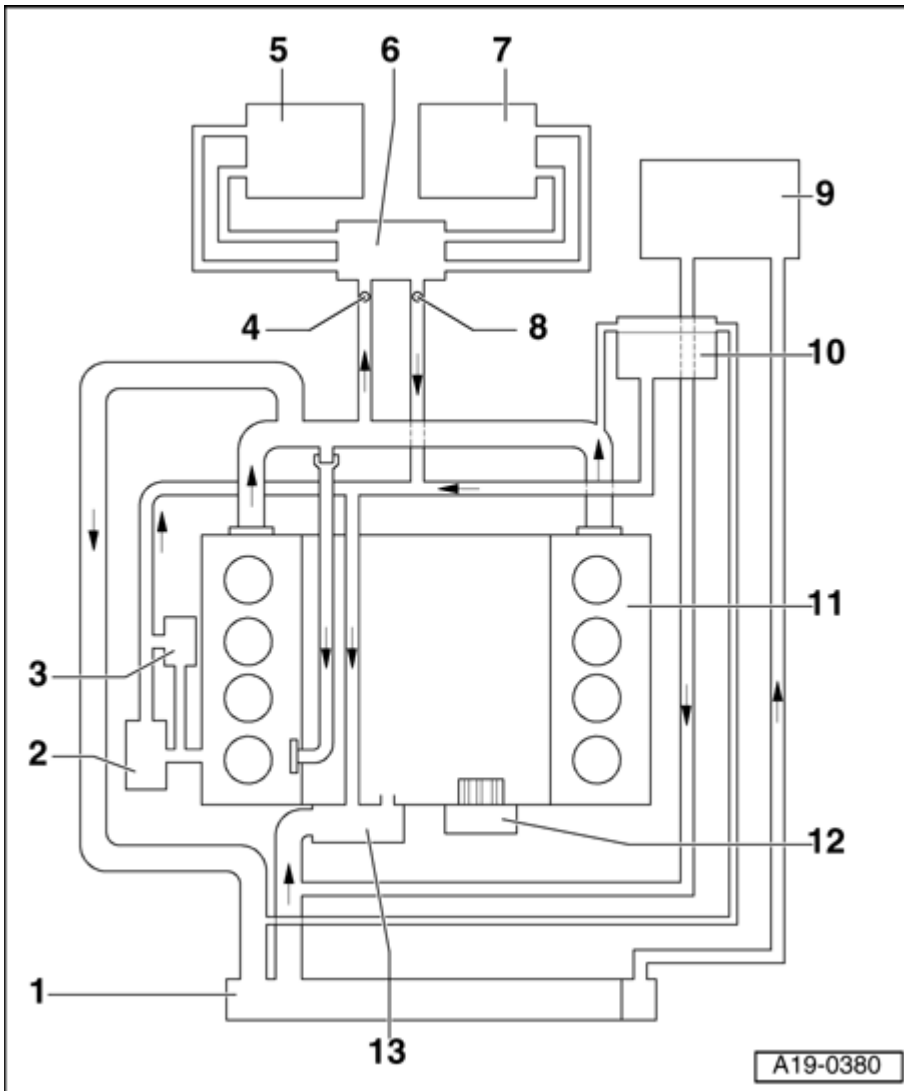


Fig. 428: Connection Diagram For Coolant Hoses (Without Auxiliary Heater)

Courtesy of VOLKSWAGEN UNITED STATES, INC.**1 - Radiator**

- Replace coolant after replacing

2 - Oil filter housing

- With oil cooler
- Removing and installing --> **Oil filter housing, removing and installing**

3 - Generator

- Liquid-cooled

4 - Bleeder screw

- In hose to pump-valve unit

5 - Heater core in air conditioner, right

- Removing and installing --> **87 - AIR CONDITIONING**
- Renew coolant after replacing

6 - Pump valve unit

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

7 - Heater core in air conditioner, left

- Removing and installing --> **87 - AIR CONDITIONING**
- Replace coolant after replacing

8 - Bleeder screw

- In hose from pump-valve unit

9 - Oil cooler for automatic transmission oil**10 - Expansion tank**

- With sealing cap
- Pressure relief valve in cap, checking

11 - Cylinder head/cylinder block

- Replace coolant after replacing

12 - Coolant pump

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

13 - Coolant thermostat

- Removing and installing --> **Coolant thermostat, removing and installing, checking**
- Checking --> **Thermostat, checking**

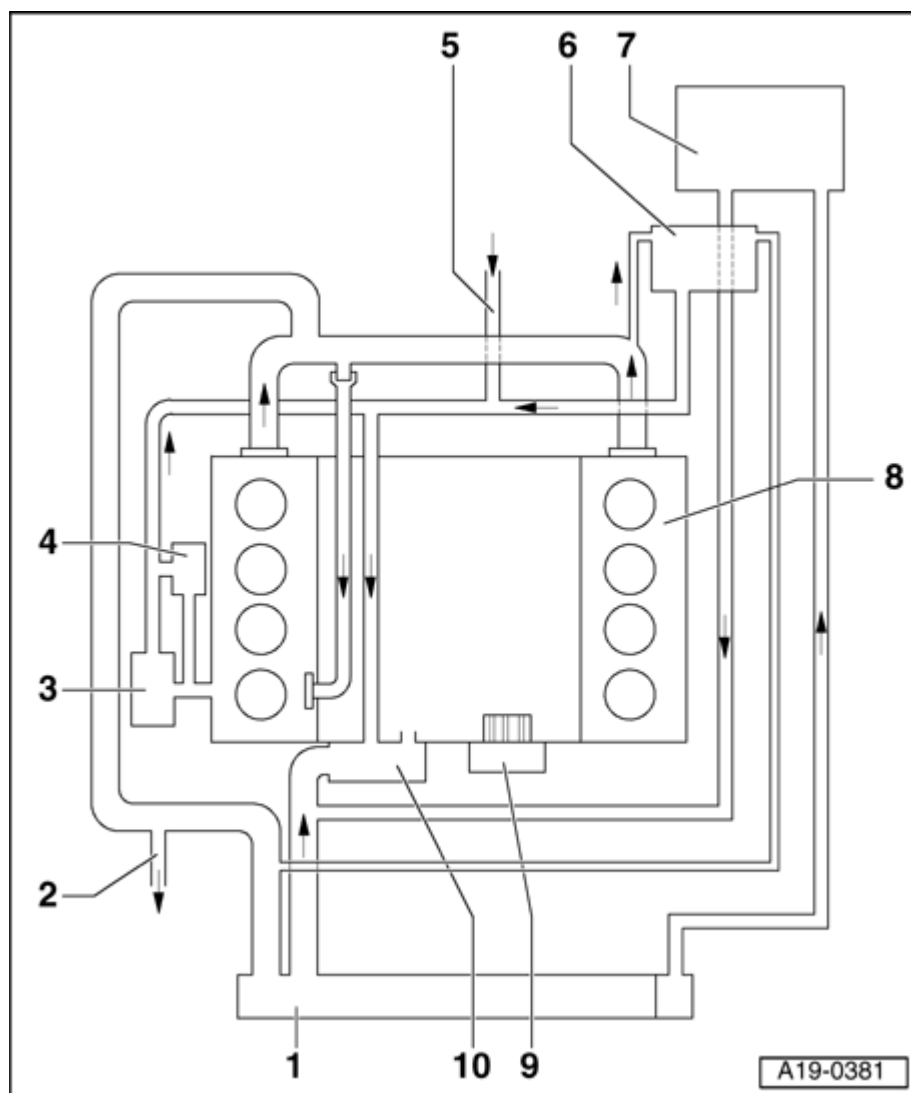
Connection diagram for coolant hoses (with auxiliary heater)**Part I****Part II --> Part II**

Fig. 429: Connection Diagram For Coolant Hoses (With Auxiliary Heater) Part I
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Radiator

- Replace coolant after replacing

2 - To auxiliary heater

3 - Oil filter bracket

- With oil cooler
- Removing and installing --> **Oil filter housing, removing and installing**

4 - Generator

- Liquid-cooled

5 - From auxiliary heater

6 - Expansion tank

- With sealing cap
- Pressure relief valve in cap, checking

7 - Oil cooler for automatic transmission oil

8 - Cylinder head/cylinder block

- Replace coolant after replacing

9 - Coolant pump

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

10 - Coolant thermostat

- Removing and installing --> **Coolant thermostat, removing and installing, checking**
- Checking --> **Thermostat, checking**

Part II

Part I --> **Part I**

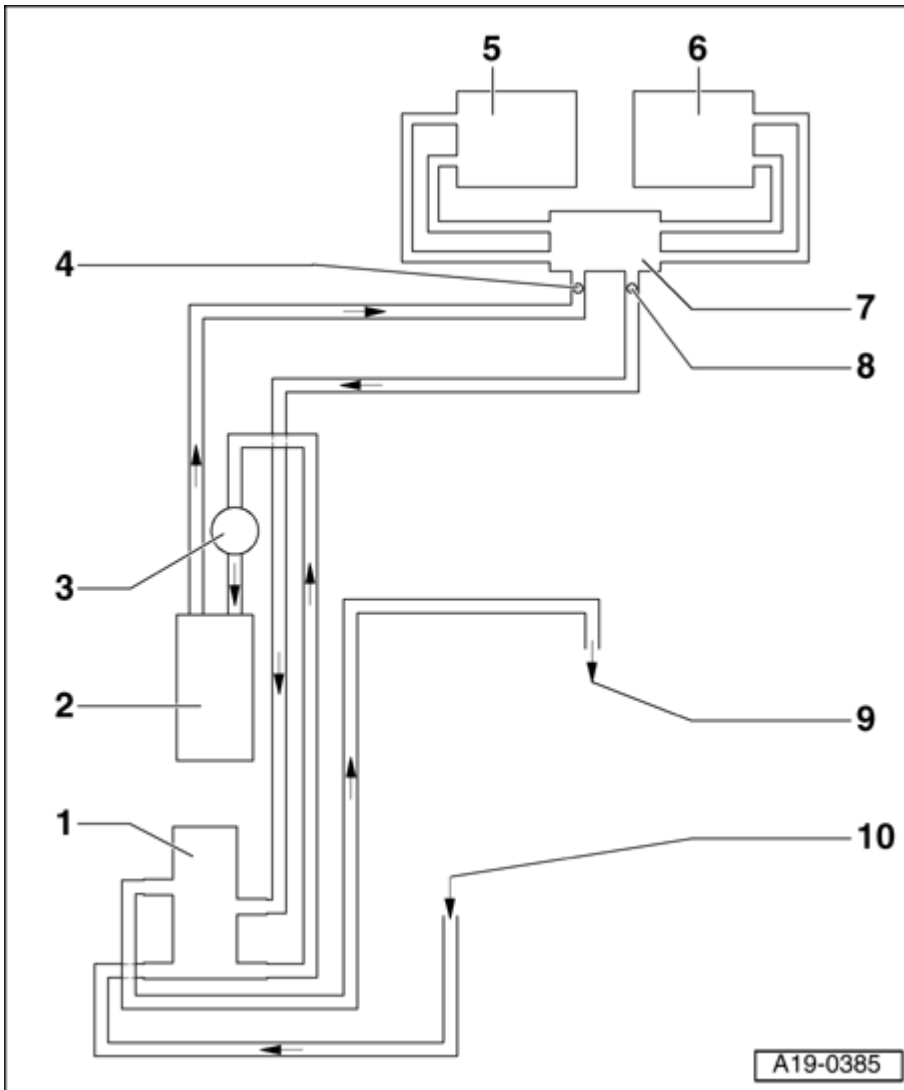


Fig. 430: Connection Diagram For Coolant Hoses (With Auxiliary Heater) Part II
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Engine Coolant (EC) Switch-Off Valve (heater) N279

2 - Auxiliary heater

3 - Recirculation Pump V55

4 - Bleeder screw

- In hose to pump-valve unit

5 - Heater core in air conditioner, right

- Removing and installing --> **87 - AIR CONDITIONING**
- Replace coolant after replacing

6 - Heater core in air conditioner, left

- Removing and installing --> **87 - AIR CONDITIONING**
- Replace coolant after replacing

7 - Pump valve unit

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

8 - Bleeder screw

- In hose from pump-valve unit

9 - To rear coolant pipe

10 - From upper coolant hose

Cooling system, draining and filling

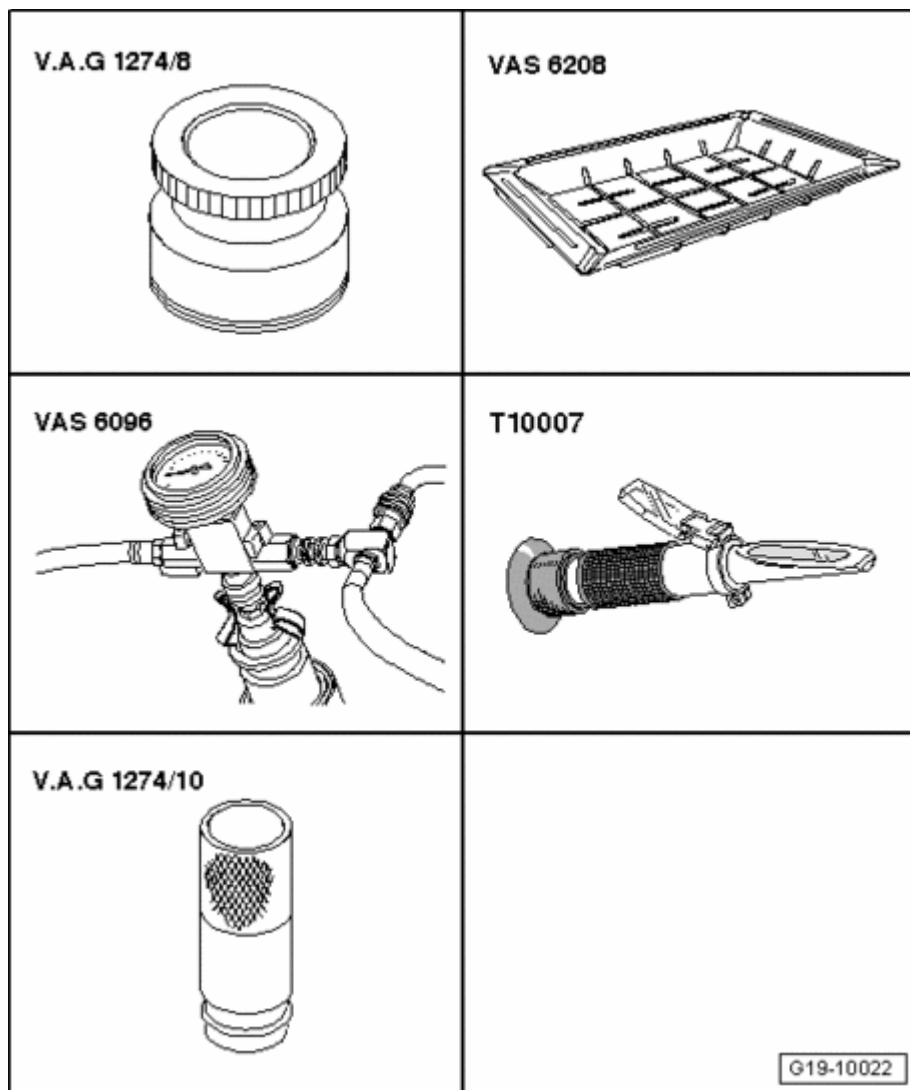


Fig. 431: Cooling System, Draining And Filling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Adapter for cooling system tester V.A.G 1274/8
- Drip tray for workshop crane VAS 6208
- Cooling system charge unit VAS 6096 with replacement reservoir VAS 6096/1
- Refractometer T10007
- Adapter V.A.G 1274 tester V.A.G 1274/10

Draining

NOTE:

- Before raising the vehicle on a hoist (wheels off the ground), first activate the vehicle jack mode --> **43 - SELF LEVELING SUSPENSION** .

- Drained coolant must be stored in a clean container for disposal or reuse.

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

- Open cap of coolant expansion tank.

For vehicles with parking/auxiliary heater:

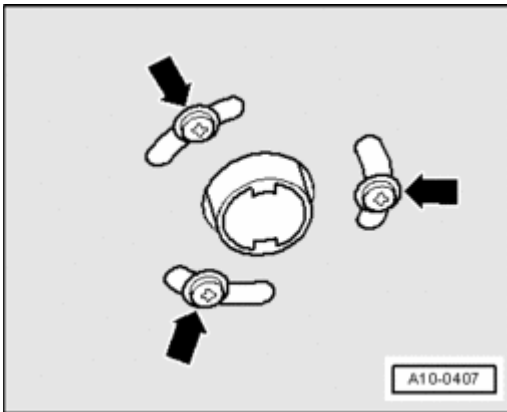


Fig. 432: Removing Bolts For Exhaust Pipe Of Parking Heater/Auxiliary Heater On Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - for exhaust pipe of parking heater/auxiliary heater on noise insulation.

All

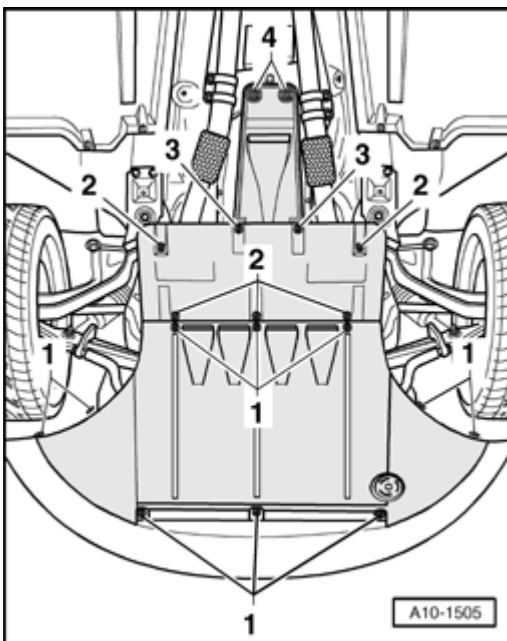


Fig. 433: Loosening Mounting Parts And Removing Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen mounting parts - **1** - and remove noise insulation.
- Place drip tray VAS 6208 under engine.

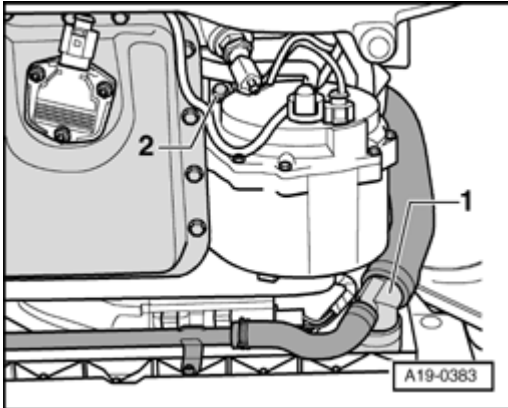


Fig. 434: Identifying Coolant Hose & Drain Plug
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect coolant hose - **1** - to drain coolant.
- Open drain plug - **2** - at oil filter bracket and drain coolant from engine at right.

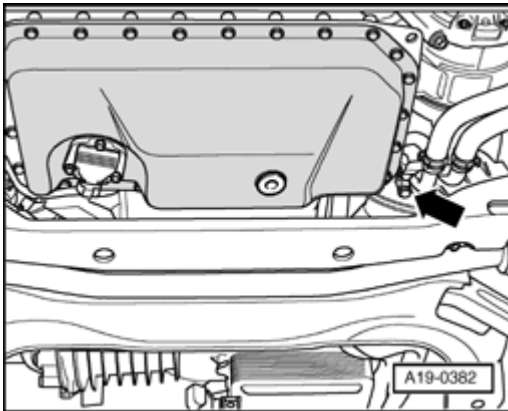


Fig. 435: Installing Drain Plug At Oil Filter Bracket With New Gasket In Engine At Left
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Open drain plug - **arrows** - and drain coolant from engine at left.

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.
- Replace seal.
- Secure all hose connections using hose clamps appropriate for the model type .

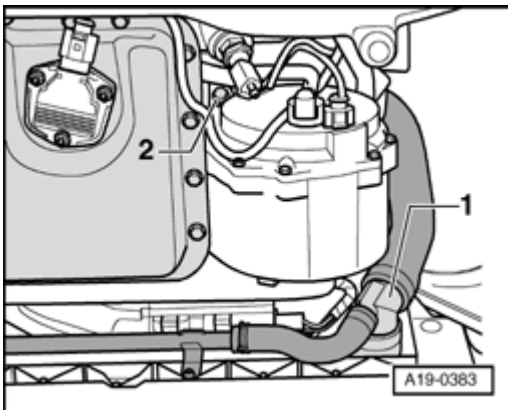


Fig. 436: Identifying Coolant Hose & Drain Plug
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect coolant hose - 1 -.
- Install drain plug - 2 - at oil filter bracket with new gasket in engine at right.

2006 Audi A8 Quattro

ENGINE 4.2 Liter V8 5V Engine Mechanical, Engine Code(s): BFM, BGK - A8

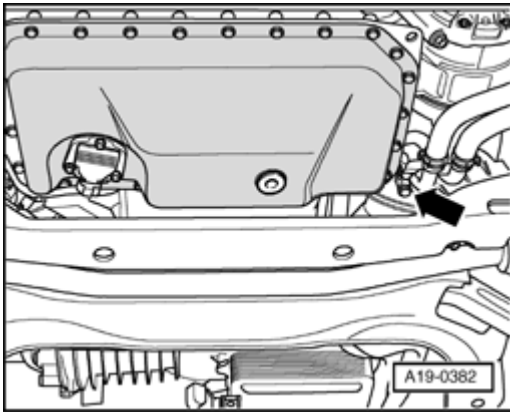


Fig. 437: Installing Drain Plug At Oil Filter Bracket With New Gasket In Engine At Left
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install drain plug - 2 - at oil filter bracket with new gasket in engine at left.

Component		Nm
Drain plug to	Oil filter bracket	10
	Drain pipe	18

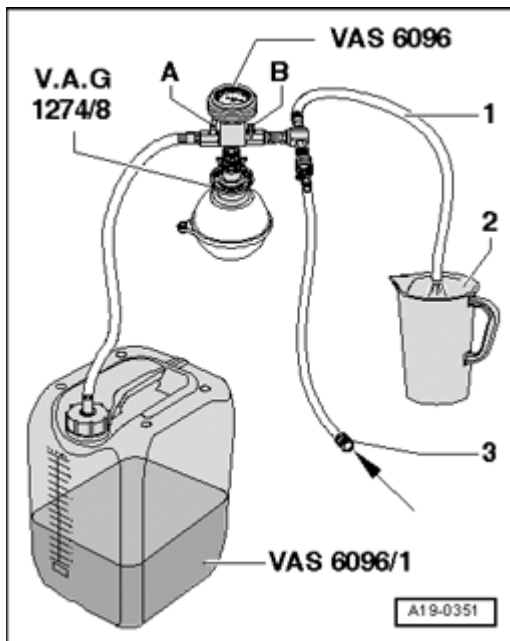


Fig. 438: Filling Replacement Reservoir VAS 6096/1 With At Least 14 Liters Of Pre-Mixed Coolant With Correct Mixture Ratio
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Fill replacement reservoir VAS 6096/1 with at least 14 liters of pre-mixed coolant with correct mixture ratio:
 - G12+ (40%) and water (60%) for frost protection up to -25°C

- G12+ (50%) and water (50%) for frost protection up to -35°C
- G12+ (60%) and water (40%) for frost protection up to -40°C
- Install adapter V.A.G 1274/8 on 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 with the discharged air which should be collected.
- Close both valves - **A** - and - **B** - (lever perpendicular to direction of flow).
- Connect hose - **3** - to pressurized air.
- Pressure: 6 to 10 bar positive pressure

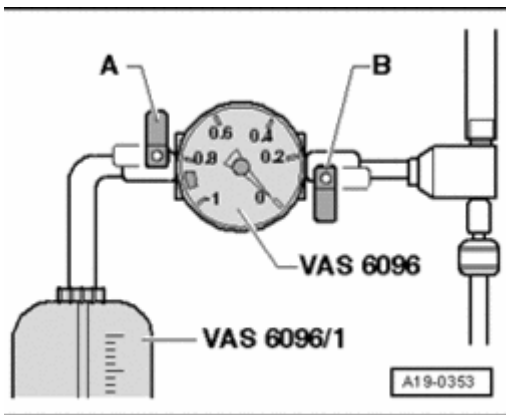


Fig. 439: Identifying VAS 6096/1 & VAS 6096 Valves
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Open valve - **B** - (lever in direction of flow).
- A vacuum is created in cooling system by suction jet pump.
- Needle on instrument display must travel into green region.
- Also, open valve briefly - **A** - (lever in direction of flow) so that hose of cooling system charge unit VAS 6096/1 is filled with coolant.
- Close valve - **A** - again.
- Let valve - **B** - remain open another 2 minutes.
- A further vacuum is created in cooling system by suction jet pump.
- Needle on instrument display must still remain in green region.
- Close valve - **B** -.
- Needle in display instrument must remain in green region, then sufficient vacuum in cooling system is

obtained for upcoming filling.

- If needle stands below green region, repeat procedure.
- If vacuum decreases, cooling system is leaking.
- Disconnect pressurized air hose.
- Open valve - A -.
- The vacuum in cooling system has effect of extracting coolant from replacement reservoir VAS 6096/1 so that cooling system is filled.
- Detach cooling system charge unit VAS 6096 from coolant expansion tank.

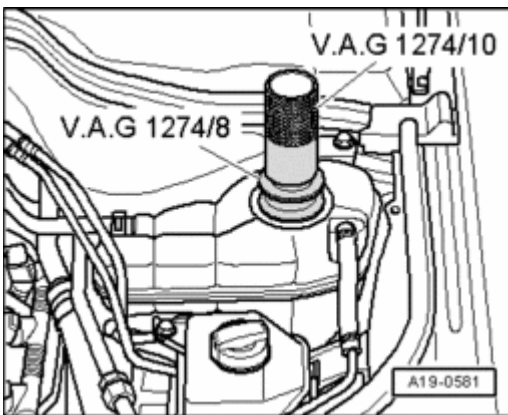


Fig. 440: Connecting Adapter For VAG1274 Tester V.A.G 1274/10 To Adapter V.A.G 1274/8.
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect adapter for VAG1274 tester V.A.G 1274/10 to adapter V.A.G 1274/8.

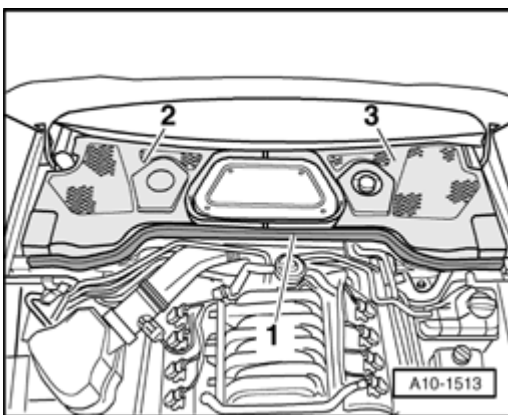
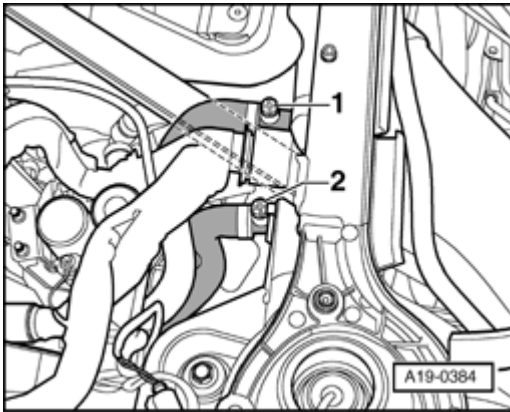


Fig. 441: Identifying Rubber Seal & Plenum Chamber Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

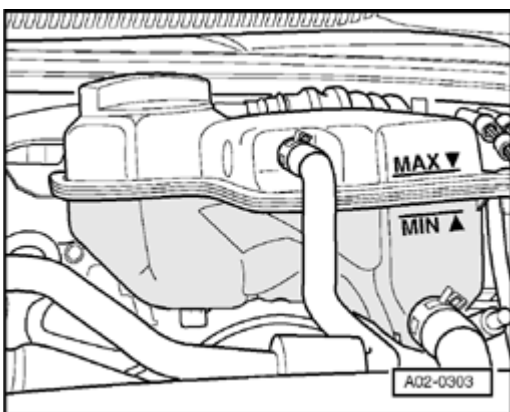
**Fig. 442: Identifying Bleeder Screws**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Open bleeder screws - **1** - and - **2** -.
- Fill up coolant until it escapes at bleeder screws - **1** - and - **2** - without bubbles.
- Close bleeder screws.
- Close expansion tank.

- If present, switch on auxiliary heater for about 30 seconds.
- Set interior temperature 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. 443: 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.

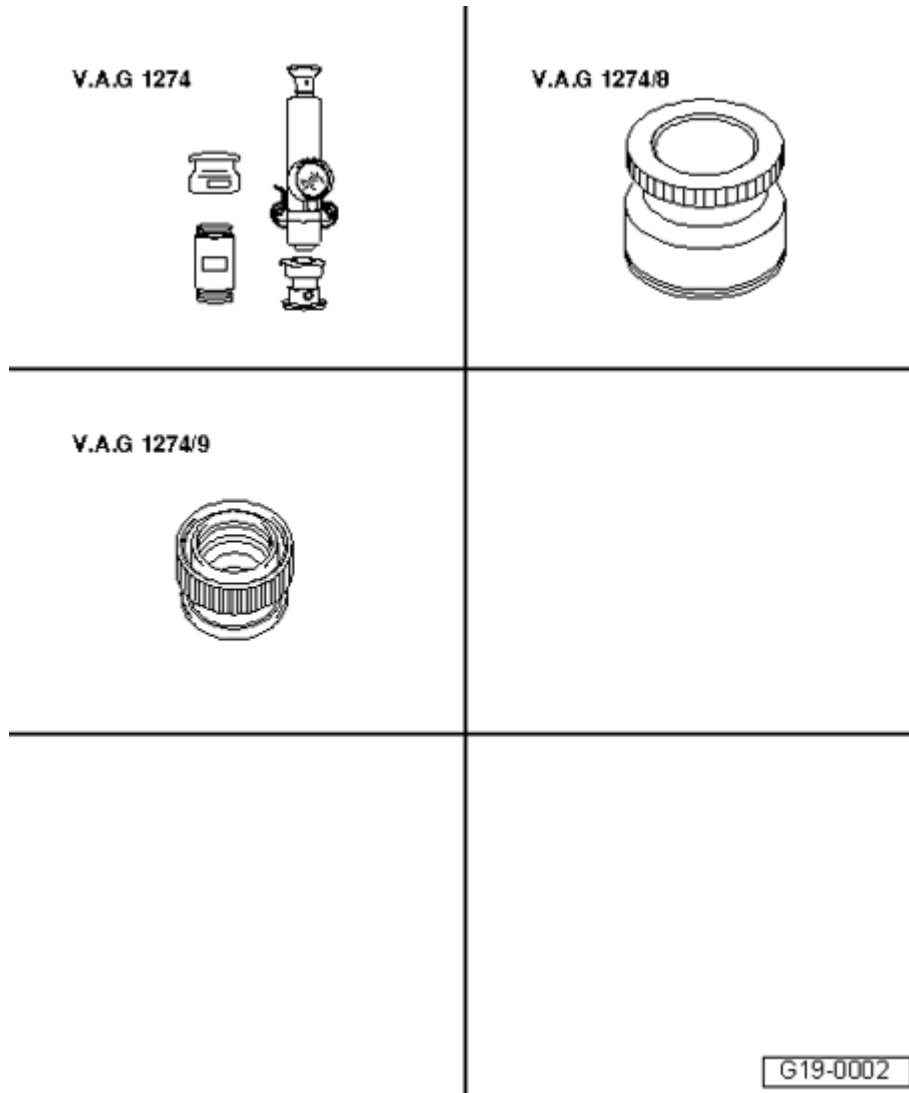
Cooling system, checking for leaks

Fig. 444: 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 for cooling system tester V.A.G 1274/8
- Adapter for cooling system tester V.A.G 1274/9

Test requirements

- Engine at operating temperature.

Test sequence

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

- Open cap of coolant expansion tank.

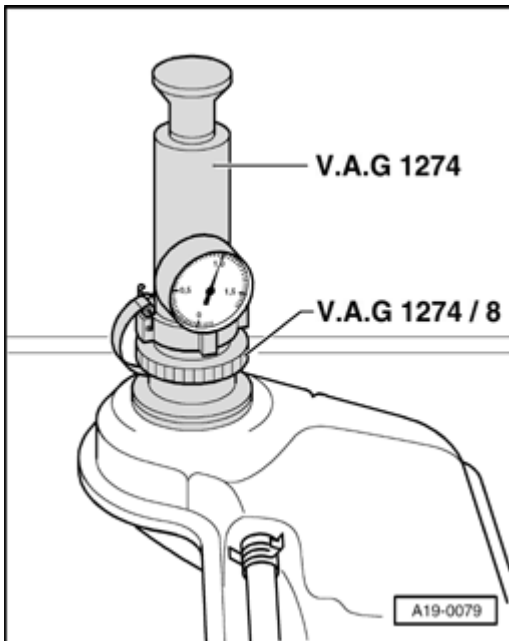


Fig. 445: Attaching Cooling System Tester V.A.G 1274 With Adapter V.A.G 1274/8 To Expansion Tank
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Attach cooling system tester V.A.G 1274 with adapter V.A.G 1274/8 to expansion tank.
- Generate a positive pressure of approx. 1.0 bar using hand pump of cooling system tester.
- If pressure decreases, search for leaking areas and repair malfunction.

Pressure relief valve in cap, checking

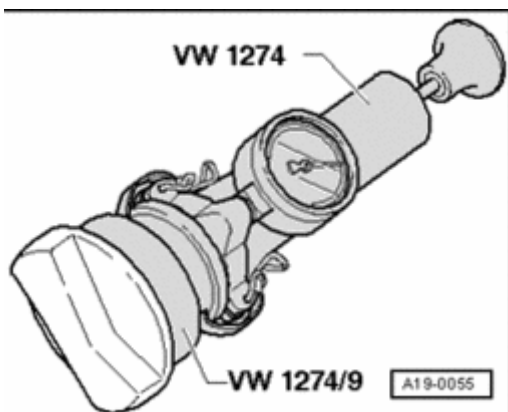


Fig. 446: Attaching Cooling System Tester V.A.G 1274 With Adapter V.A.G 1274/9 To Cap

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Attach cooling system tester V.A.G 1274 with adapter V.A.G 1274/9 to cap.
- Operate hand pump.
- Pressure release valve must open at a positive pressure of 1.4 to 1.6 bar.

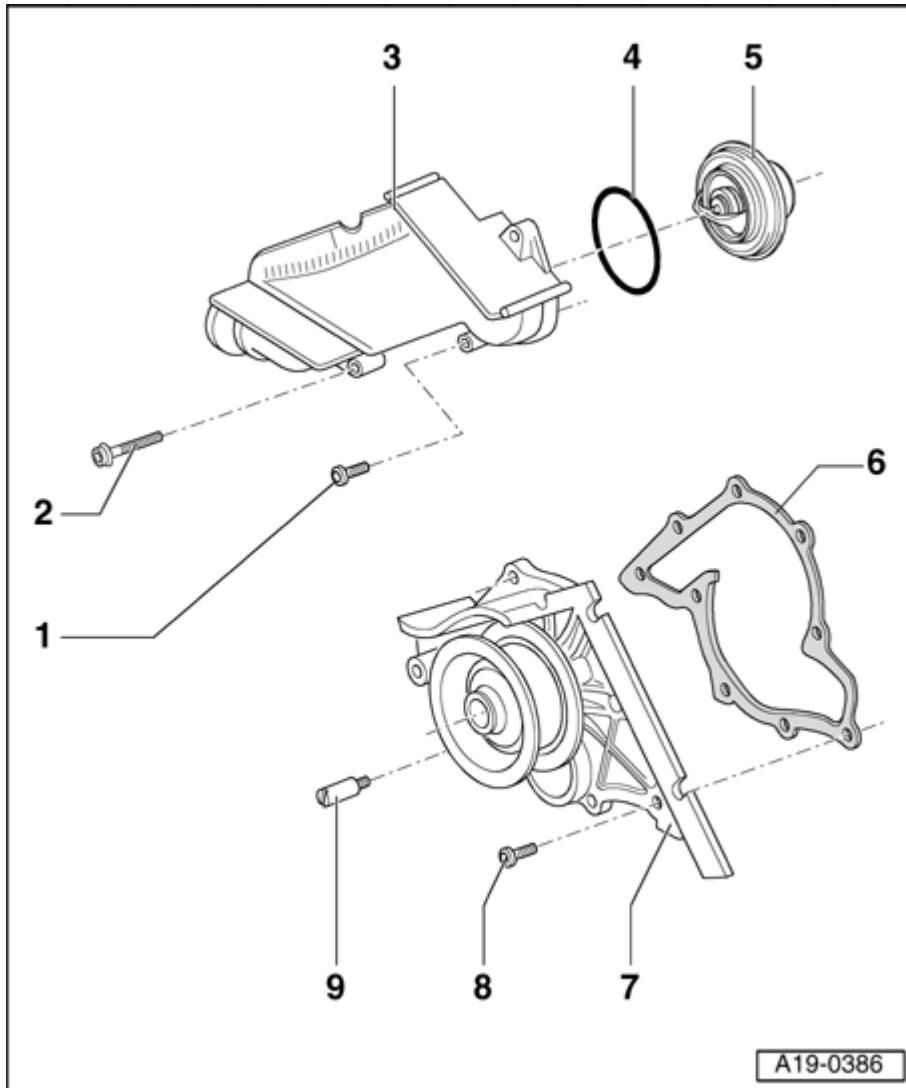
Coolant pump and coolant thermostat, assembly overview

Fig. 447: Coolant Pump And Coolant Thermostat, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - 14 Nm

- Bolt class 10.9

2 - 10 Nm

3 - Thermostat housing

4 - O-ring

- Replace

5 - Coolant thermostat

- Removing and installing --> **Coolant thermostat, removing and installing, checking**
- Checking --> **Thermostat, checking**
- Installed location --> **Coolant thermostat installation location**

6 - Gasket

- Replace

7 - Mechanical coolant pump

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

8 - 14 Nm

- Bolt class 10.9

9 - Pin bolt, 9 Nm

Coolant thermostat installation location

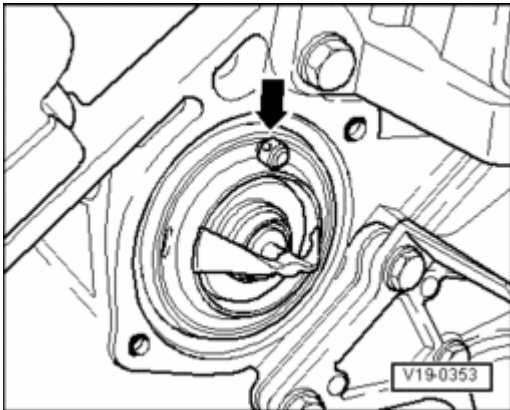


Fig. 448: Installed Position Of Thermostat (Bleeder Valve At Top)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Bleeder valve - **arrow** - toward top.

Coolant pump, removing and installing

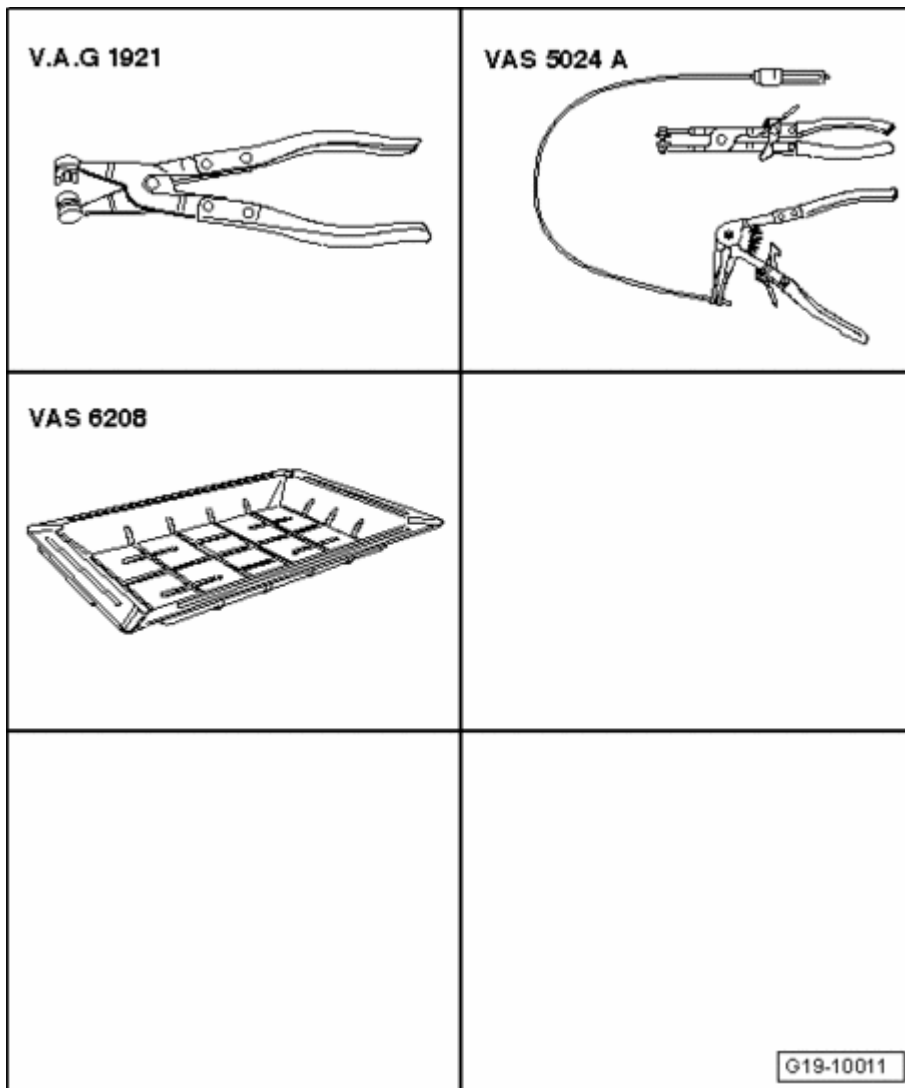


Fig. 449: Identifying Special Tools - Coolant Pump, Removing And Installing
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Drip tray for workshop crane VAS 6208
- Hose clamp pliers V.A.G 1921
- Spring-type clip pliers V.A.S 5024 A

Removing

- Drain coolant --> Cooling system, draining and filling.
- Toothed belt, removing --> Toothed belt, removing and installing.

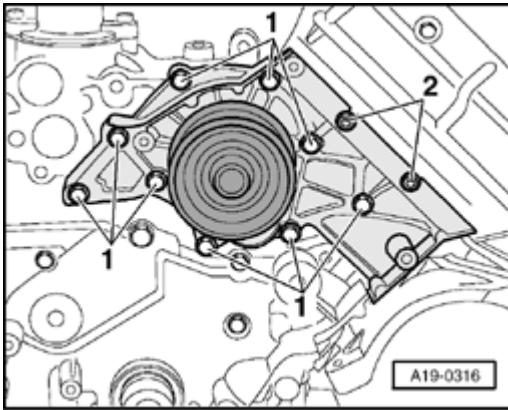


Fig. 450: Removing Nuts For Toothed Belt Guard At Left Rear, Bolts For Coolant Pump And Coolant Pump

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - **2** - for toothed belt guard at left rear.
- Remove bolts - **1** - for coolant pump and remove coolant pump.

Installing

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

NOTE:

- **Replace seals.**

- Clean sealing surfaces at cylinder block.
- Install toothed belt (adjust timing) --> **Toothed belt, removing and installing.**
- Fill with coolant.
- Install torque support --> **Torque support (with torque support valve N382), assembly overview.**

Torque specifications

Component	Nm
Coolant pump to cylinder block	14 ¹⁾

- ¹⁾ Bolt class 10.9

Coolant thermostat, removing and installing, checking

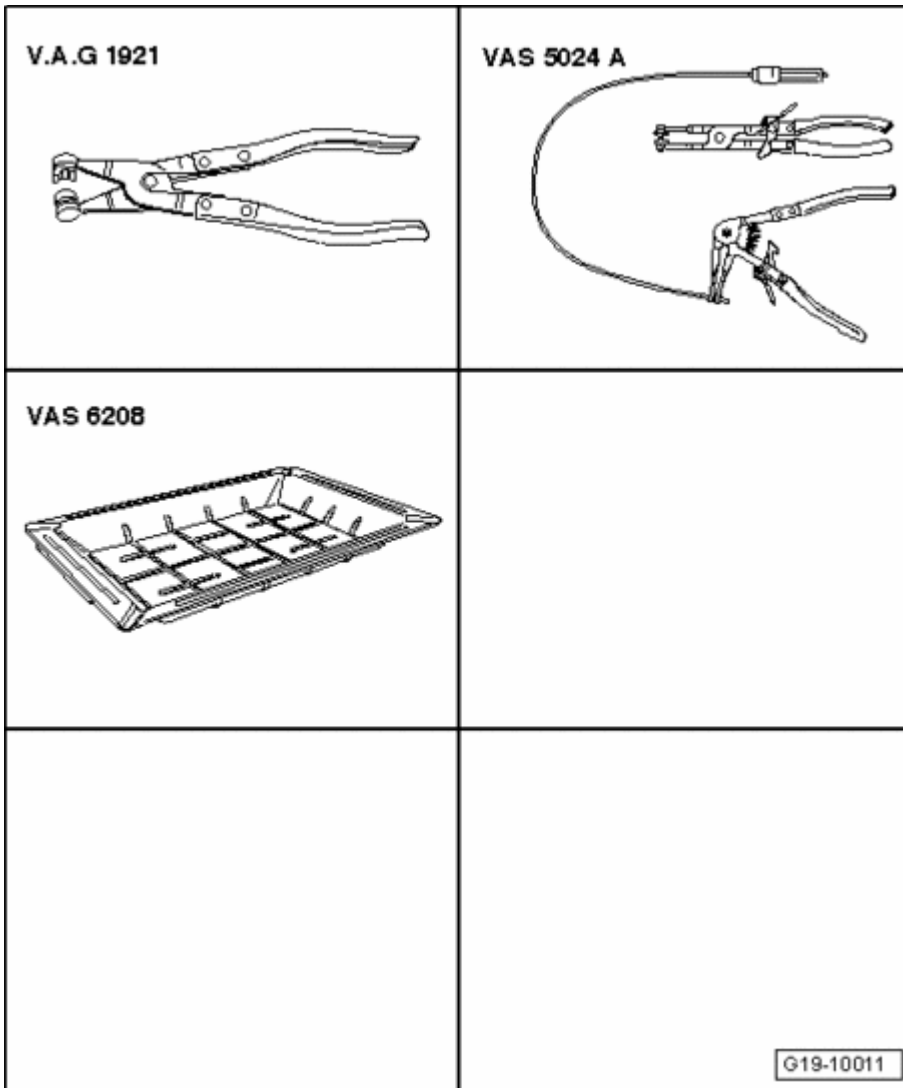


Fig. 451: Identifying Special Tools - Coolant Thermostat, Removing And Installing, Checking
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Drip tray for workshop crane VAS 6208
- Hose clamp pliers V.A.G 1921
- Spring-type clip pliers V.A.S 5024 A

Removing

- Drain coolant --> **Cooling system, draining and filling.**
- Toothed belt, removing --> **Toothed belt, removing and installing.**

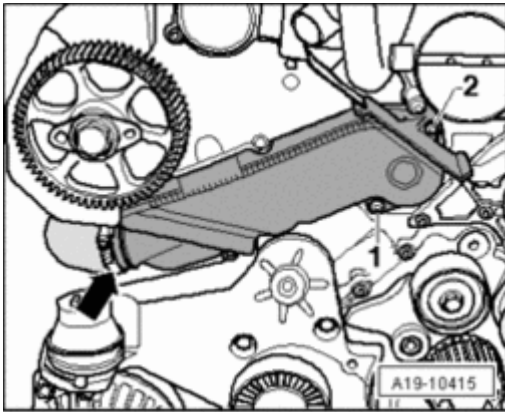


Fig. 452: Removing Coolant Hose From Coolant Thermostat Housing, Bolts & Coolant Thermostat Housing

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove coolant hose - **arrow** - from coolant thermostat housing.
- Remove bolts - **1** - and - **2** - and remove coolant thermostat housing.
- Remove O-ring and coolant thermostat.

Installing

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

- Clean and/or smooth O-ring sealing surface.
- Install coolant thermostat.

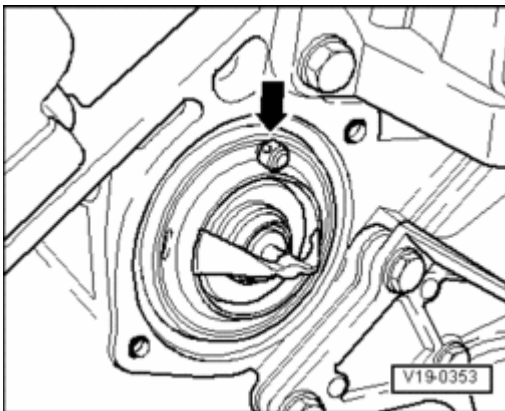


Fig. 453: Installed Position Of Thermostat (Bleeder Valve At Top)

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Installed location: Bleeder valve - **arrow** - toward top.
- Install coolant thermostat housing.

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

- Install toothed belt (adjust timing) --> **Toothed belt, removing and installing.**
- Fill with coolant.
- Install torque support --> **Torque support (with torque support valve N382), assembly overview.**

Torque specifications

Component	Nm
Coolant thermostat housing to cylinder block	14 ¹⁾
Upper idler pulley for ribbed belt to torque support bracket	10

- ¹⁾ Bolt class 10.9

Coolant pipe to oil filter housing, removing and installing

- Remove engine --> **Engine, removing and installing.**
- Remove right exhaust manifold --> **Right exhaust manifold, removing and installing.**

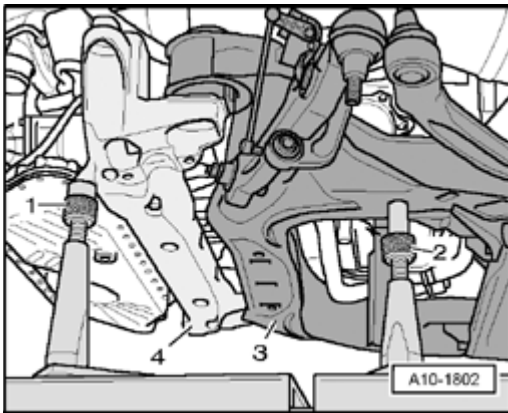


Fig. 454: Identifying Subframe, Left/Right Of Engine Carrier & Support Elements
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

- **A second technician is required to remove subframe.**

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

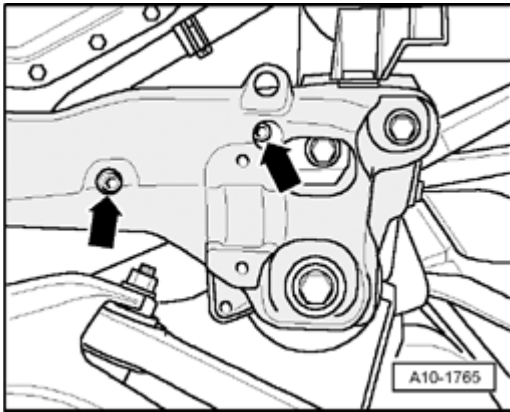


Fig. 455: Removing/Installing Bolts For Engine Mount At Left/Right
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - for engine mount at left and right.
- Remove engine carrier.

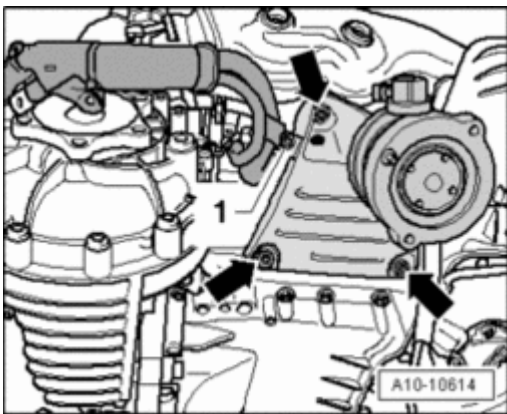


Fig. 456: Removing Wiring Harness From Engine Mount & Engine Mount
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove wiring harness from engine mount - **1** -.
- Remove engine mount - **arrows** -.

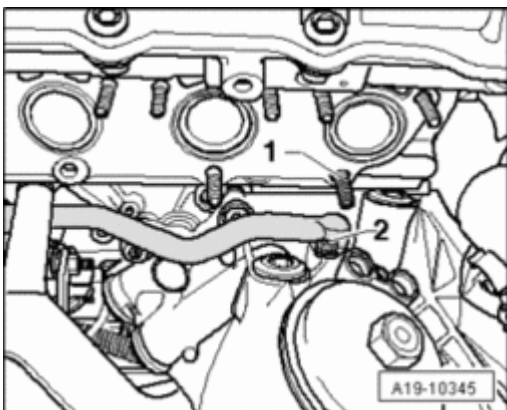
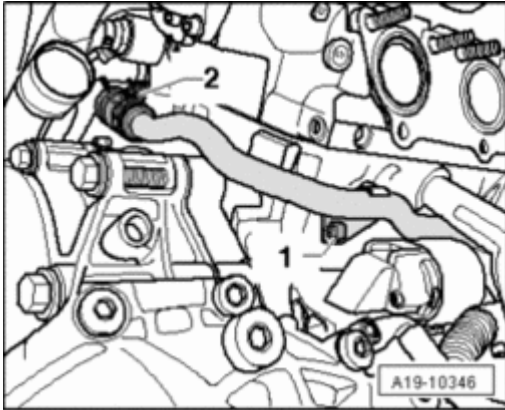


Fig. 457: Removing Studs & Coolant Pipe From Oil Filter Housing

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove studs - **1** -.
- Remove coolant pipe from oil filter housing - **2** -.

**Fig. 458: Removing Coolant Pipe From Engine & Disconnecting Water Pipe**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove coolant pipe from engine - **1** -.
- Disconnect water pipe - **2** - and remove.

Oil cooler, assembly overview

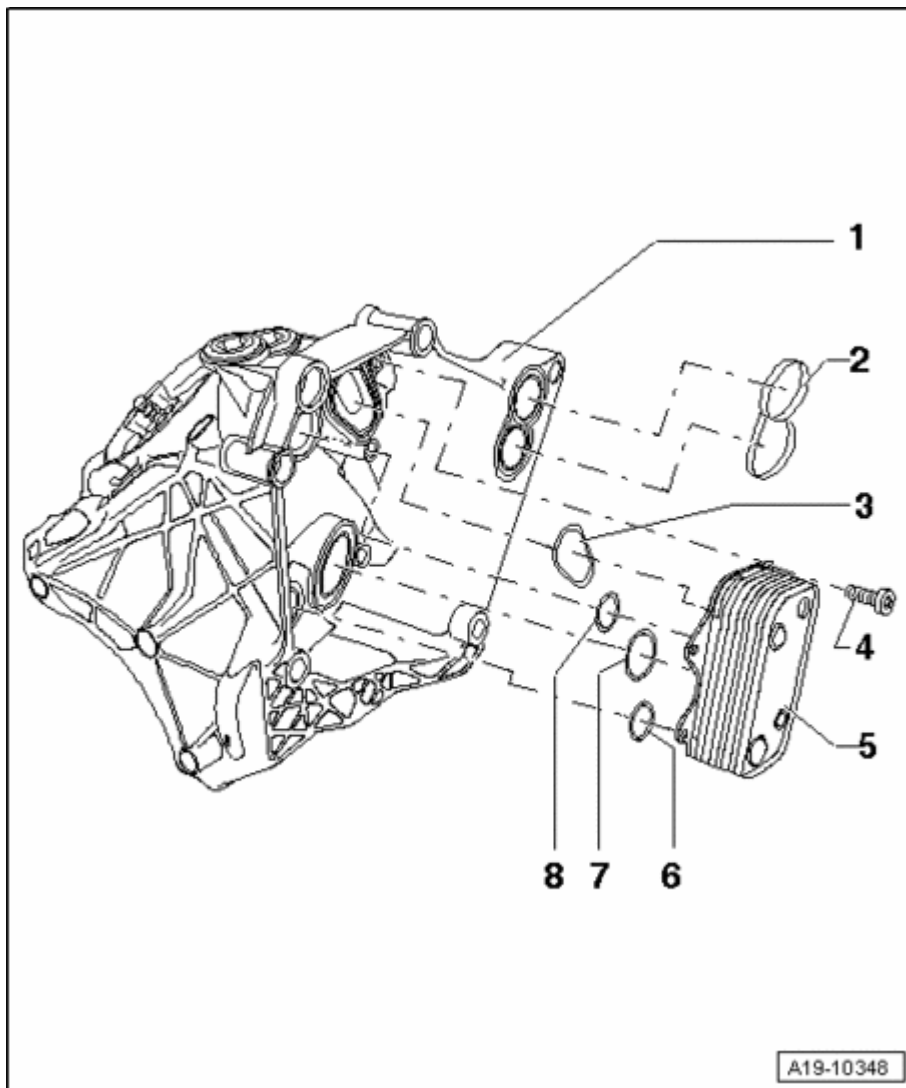


Fig. 459: Oil Cooler, Assembly Overview

Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Oil filter housing

- Removing and installing --> **Oil filter housing, removing and installing**

2 - Gasket

- For oil channel
- Replace

3 - Seal

- Replace

4 - Bolt

- 5 Nm

5 - Oil cooler

6 - Gasket

- Replace

7 - Gasket

- Replace

8 - Gasket

- Replace

Oil cooler, removing and installing

- Remove engine --> **Engine, removing and installing.**
- Remove right exhaust manifold --> **Right exhaust manifold, removing and installing.**
- Remove oil filter housing --> **Oil filter housing, removing and installing**

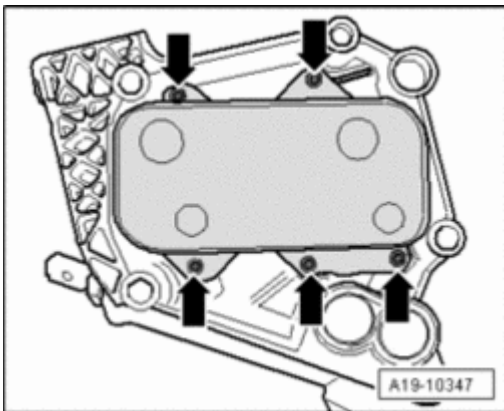


Fig. 460: Removing Oil Cooler

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove oil cooler - **arrow -.**

Installing

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

NOTE:

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

- Install generator --> **27 - BATTERY, STARTER, GENERATOR, CRUISE CONTROL**

2006 Audi A8 Quattro

ENGINE 4.2 Liter V8 5V Engine Mechanical, Engine Code(s): BFM, BGK - A8

- Install right exhaust manifold --> **Right exhaust manifold, removing and installing**
- Install coolant pipe to oil filter housing --> **Coolant pipe to oil filter housing, removing and installing**
- Install torque support --> **Torque support (with torque support valve N382), assembly overview.**

Torque specifications

Tightening torques --> **Oil cooler, assembly overview**

Thermostat, checking

- Warm thermostat in water.

Opening begins	Opening ends	Opening lift
approx. 87°C	approx. 102°C ¹⁾	min. 8 mm

- ¹⁾ Cannot be tested

Radiator and coolant fan, assembly overview



- Replace

- To pull off, disengage retaining clip

- Replace

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- Replace

5 - Coolant hose

- To pull off, disengage retaining clip
- Version pictured for radiator with bypass; converting to bypass --> **Converting to radiator with bypass**

6 - 10 Nm

- Replace

7 - Fan rib

- Removing and installing --> **Fan shroud, removing and installing**
- Version pictured for radiator with bypass; converting to bypass --> **Converting to radiator with bypass**

8 - Rubber buffer

- Disengage and remove using screwdriver

9 - Retaining pin**10 - Coolant Fan V7**

- With Coolant Fan Control (FC) Control Module J293
- Removing and installing --> **Coolant Fan V7 and Coolant Fan 2 V177 , removing and installing**

11 - Radiator

- Removing and installing --> **Radiator, removing and installing**
- After replacing, replace entire amount of coolant
- Version pictured with bypass; converting to bypass --> **Converting to radiator with bypass**

12 - 6 Nm**13 - Bracket for radiator****14 - Coolant Fan 2 V177**

- With Coolant Fan Control (FC) Control Module 2 J671
- Removing and installing --> **Coolant Fan V7 and Coolant Fan 2 V177 , removing and installing**

15 - Rubber bushing**16 - O-ring**

- Replace

17 - Coolant hose

- To pull off, disengage retaining clip

18 - O-ring

- Replace

Radiator, removing and installing

Special tools, testers and auxiliary items required

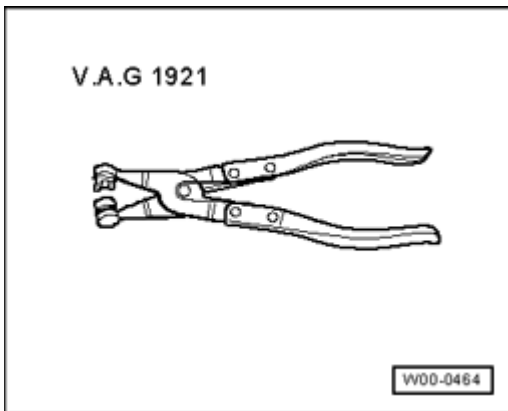


Fig. 462: Hose Clamp Pliers V.A.G 1921

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hose clamp pliers V.A.G 1921

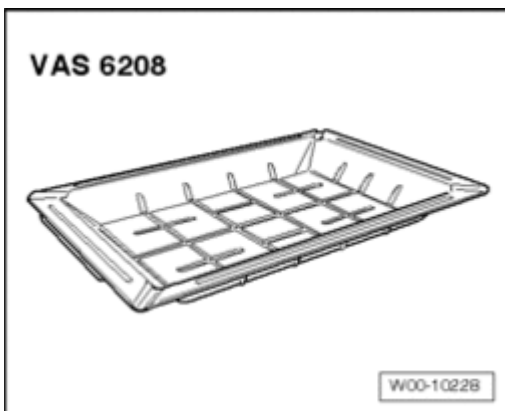


Fig. 463: Drip Tray For VAS 6100, VAS 6208

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drip tray for workshop crane VAS 6208

Removing

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

- Open cap of coolant expansion tank.

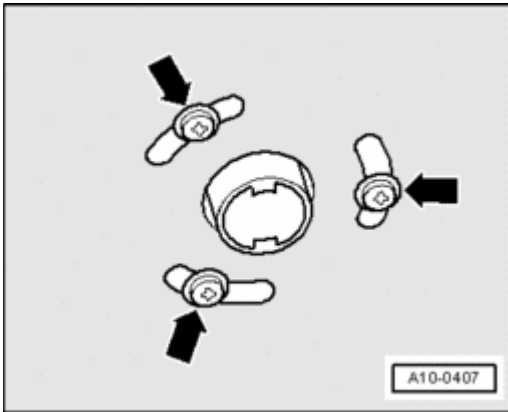


Fig. 464: Removing Bolts For Exhaust Pipe Of Parking Heater/Auxiliary Heater On Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

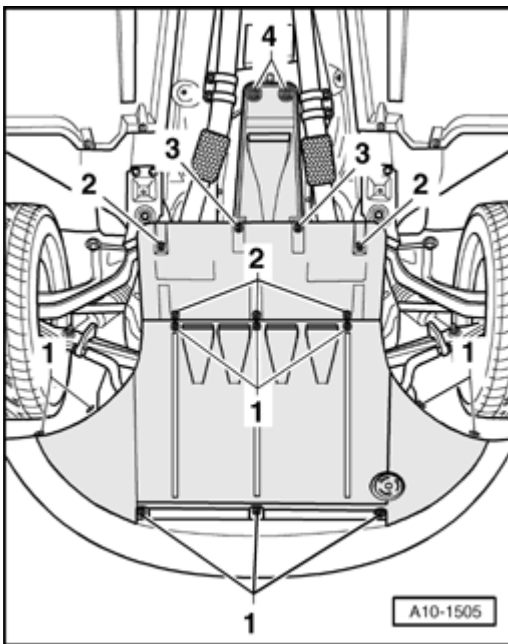


Fig. 465: Loosening Mounting Parts And Removing Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front sound insulation by loosening fasteners - **1** -.

NOTE:

- Ignore - 2, 3, 4 -.

- Remove front part of wheel housing liner at left and right front --> **66 - EXTERIOR EQUIPMENT** .
- Remove front bumper cover --> **63 - BUMPERS** .
- Place drip tray for workshop crane VAS 6208 under engine.

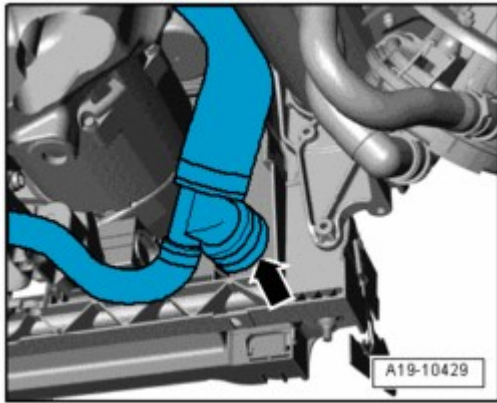


Fig. 466: Disconnecting Lower Right Coolant Hose From Radiator
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

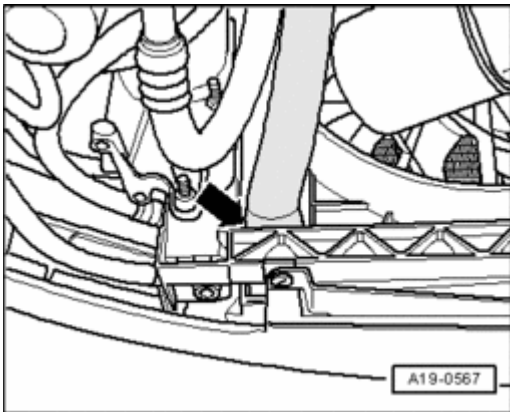


Fig. 467: Disconnecting Lower Left Coolant Hose From Radiator
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect lower left coolant hose from radiator - **arrow** -.

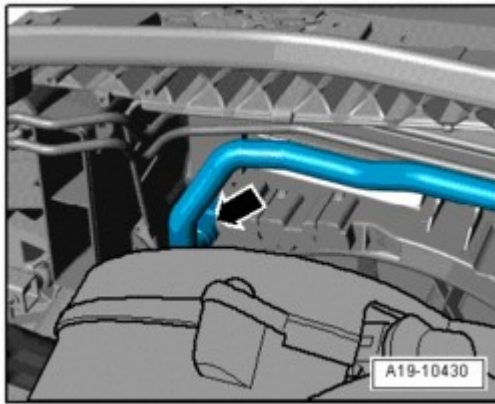


Fig. 468: Removing Left Coolant Hose In Center Of Radiator
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If present, remove left coolant hose in center of radiator - **arrow** -.

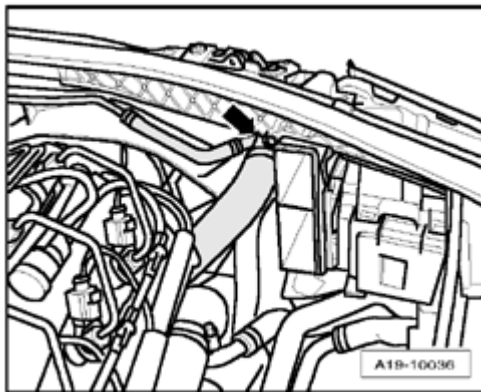


Fig. 469: Disconnecting Upper Right Coolant Hose From Radiator
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect upper right coolant hose from radiator - **arrow** -.

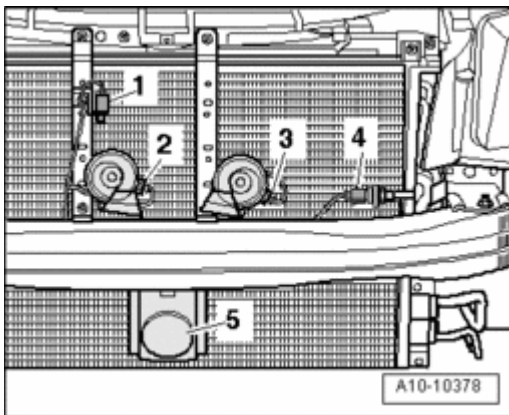


Fig. 470: Identifying Outside Air Temperature Sensor G17 & Electrical Connectors
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove Outside Air Temperature Sensor G17 - 4 -.
- Disconnect electrical connectors - 1, 2, 3 -.
- Free up wiring harness.
- On a vehicle with distance regulation, disconnect electrical connector on Distance Regulation Control Module J428 - 5 -.

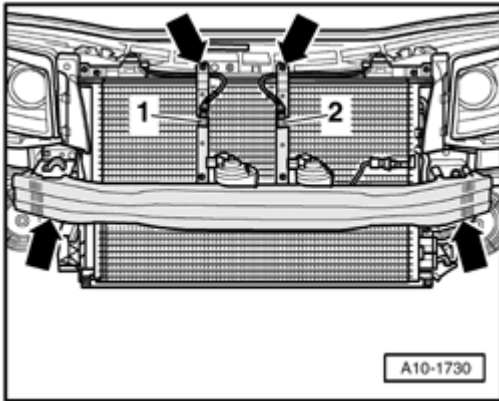


Fig. 471: Unclipping Electrical Harness Connectors From Braces
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unclip electrical harness connectors - 1 - and - 2 - from braces.

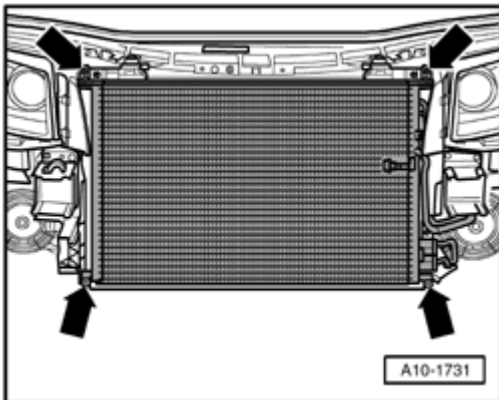


Fig. 472: Removing Bolts And Bumper With Braces
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and remove bumper with braces.

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

NOTE:

- Do not bend or stretch lines or hoses as A/C compressor and/or refrigerant lines/hoses may be damaged.

- Remove bolts - **arrows** -.
- Swivel condenser with power steering cooler downward and tie up to engine.

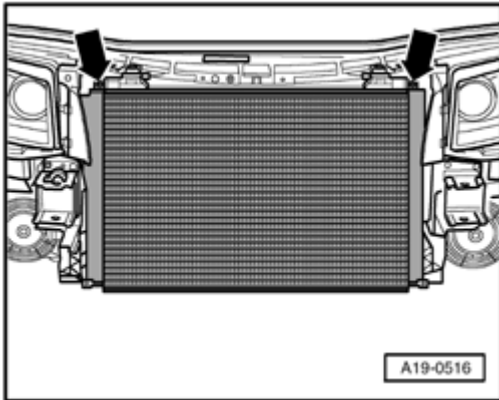


Fig. 473: Removing Both Brackets For Radiator
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove both brackets for radiator - **arrows** -.
- Move radiator slightly toward front at top and lift out of lock carrier.

Installing

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

NOTE:

- **Converting to radiator with bypass --> Converting to radiator with bypass.**
- **Secure all hose connections using hose clamps appropriate for the model type .**

- Install front bumper cover --> **63 - BUMPERS** .
- Install front part of wheel housing liner at front left and right --> **66 - EXTERIOR EQUIPMENT** .
- Fill with coolant --> **Cooling system, draining and filling.**

NOTE:

- **Complete coolant must be replaced if the radiator was replaced.**

Torque specifications

Component	Nm
Radiator bracket to lock carrier	6
Condenser to lock carrier	6
Braces to lock carrier	9

Converting to radiator with bypass

Work procedure

- Radiator removed.

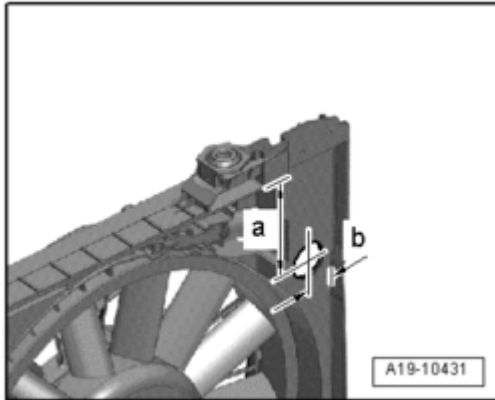


Fig. 474: Identifying Hole Drawn On Fan Shroud
Courtesy of VOLKSWAGEN UNITED STATES, INC.

On installed fan shroud, draw a hole according to dimensions - **a** and **b** - as shown in the illustration.

- Dimension - **a** - = 136 mm.
- Dimension - **b** - = 23 mm
- Make a bore dia. 32 mm.

NOTE:

- The bore must be pre-bored and then drilled to dia. 32 mm using the stepped quick-helix drill.

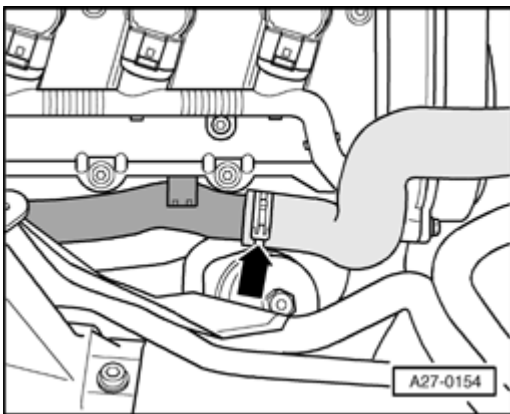


Fig. 475: Disconnecting Hose From Coolant Pipe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect upper right coolant hose from coolant pipe - **arrow** -.

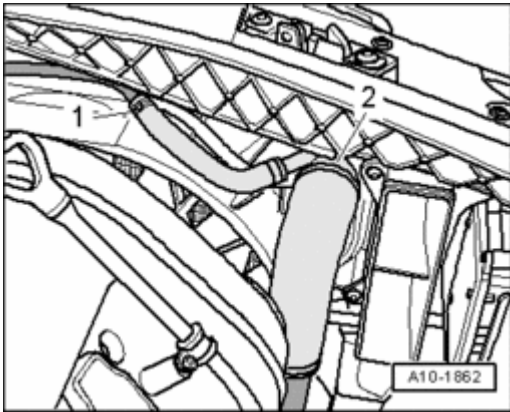


Fig. 476: Disconnecting Coolant Hose From Ventilation Lines
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect coolant hose - 1 - from ventilation lines.

NOTE:

- Ignore - 2 -.

Vehicles with auxiliary heater:

- Remove right headlight --> **94 - LIGHTS, SWITCHES - EXTERIOR** .

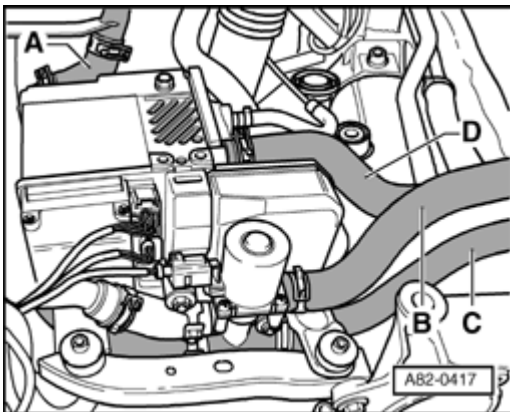


Fig. 477: Disconnecting Coolant Hose From Parking Heater
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect coolant hose - C - from parking heater.

NOTE:

- Ignore - A, B, D -.

Installing

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

NOTE:

- Secure all hose connections using hose clamps appropriate for the model type .

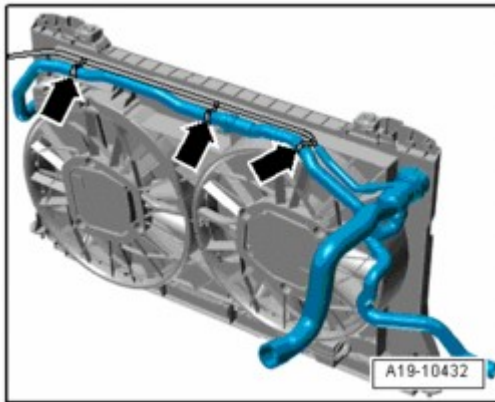


Fig. 478: Installing Hose Bracket On Ventilation Pipe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install hose bracket - **arrows** - on ventilation pipe as shown in illustration.
- Clip hose group bypass hose into hose bracket as shown.

NOTE: • Hose group for vehicles with parking heater is shown in illustration.

Vehicles with auxiliary heater:

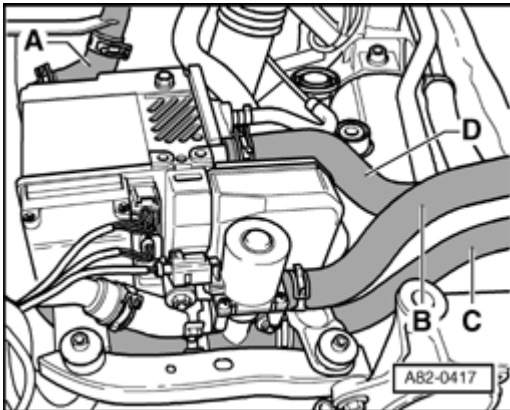


Fig. 479: Disconnecting Coolant Hose From Parking Heater
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect coolant hose - **C** - to parking heater.
- Install right headlamp --> **94 - LIGHTS, SWITCHES - EXTERIOR** .

Fan shroud, removing and installing

Removing

- Drain coolant --> **Cooling system, draining and filling.**

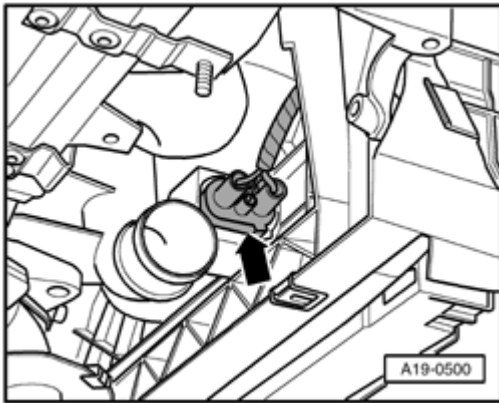


Fig. 480: Disconnecting Electrical Connector To Coolant Fan
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **arrow** - to coolant fan.
- Expose wires at rear of lock carrier.

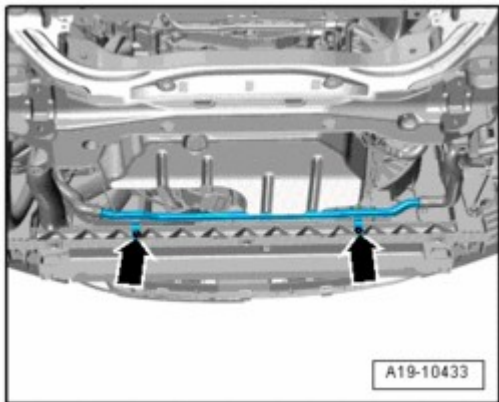


Fig. 481: Removing Lower Coolant Pipe From Fan Shroud
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove lower coolant pipe from fan shroud - **arrows** -.
- Free up ventilation line to top of fan shroud.

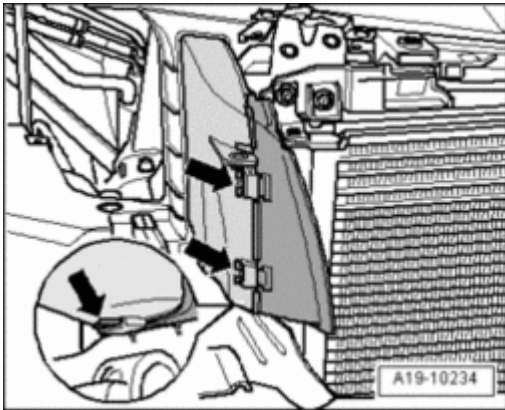


Fig. 482: Depressing Locking Mechanisms And Removing Air Guide At Right Front From Lock Carrier
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Depress locking mechanisms - **arrows** - and remove air guide at right front from lock carrier.

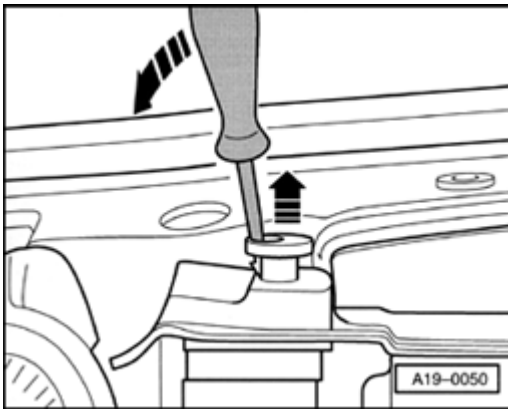


Fig. 483: Unlocking Both Retaining Bolts For Fan Shroud
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unlock both retaining bolts for fan shroud and remove by pulling upward - **arrows** -.
- Swing fan shroud toward front at upper edge.

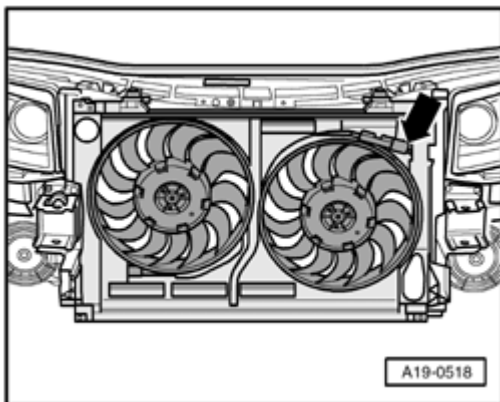


Fig. 484: Disconnecting Coolant Fan Electrical Connector By Reaching Behind Fan Shroud

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect coolant fan electrical connector - **arrow** - by reaching behind fan shroud.
- Remove fan shroud.

Installing

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

- Fill with coolant --> **Cooling system, draining and filling.**

Coolant Fan V7 and Coolant Fan 2 V177 , removing and installing

Removing

- Drain coolant --> **Cooling system, draining and filling.**
- Remove radiator --> **Radiator, removing and installing.**
- Remove fan shroud --> **Fan shroud, removing and installing.**

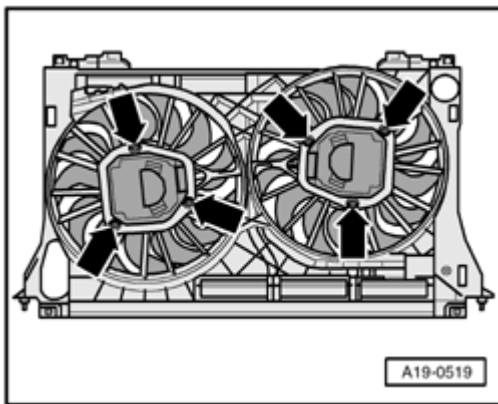


Fig. 485: Removing Coolant Fans Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Unclip electrical harness connectors and free up electrical wires.
- Remove coolant fans.

Installing

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

- Install fan shroud --> **Fan shroud, removing and installing.**
- Install radiator --> **Radiator, removing and installing.**
- Fill with coolant --> **Filling** .

2006 Audi A8 Quattro

ENGINE 4.2 Liter V8 5V Engine Mechanical, Engine Code(s): BFM, BGK - A8

Torque specifications

Component	Nm
Coolant fan to fan shroud	10 ¹⁾
• ¹⁾ Replace bolt.	

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 that it has sufficient clearance from the bodywork. If necessary, loosen double clamps and clamp and align exhaust pipe so that sufficient clearance is maintained to the bodywork and support rings carry uniform loads.
- Install exhaust system free of stress --> Exhaust system, installing free of tension.
- Replace self-locking nuts.

NOTE:

- Before raising the vehicle on a hoist (wheels off the ground), first activate the vehicle jack mode --> 43 - SELF LEVELING SUSPENSION .

Exhaust system, assembly overview

Front exhaust system

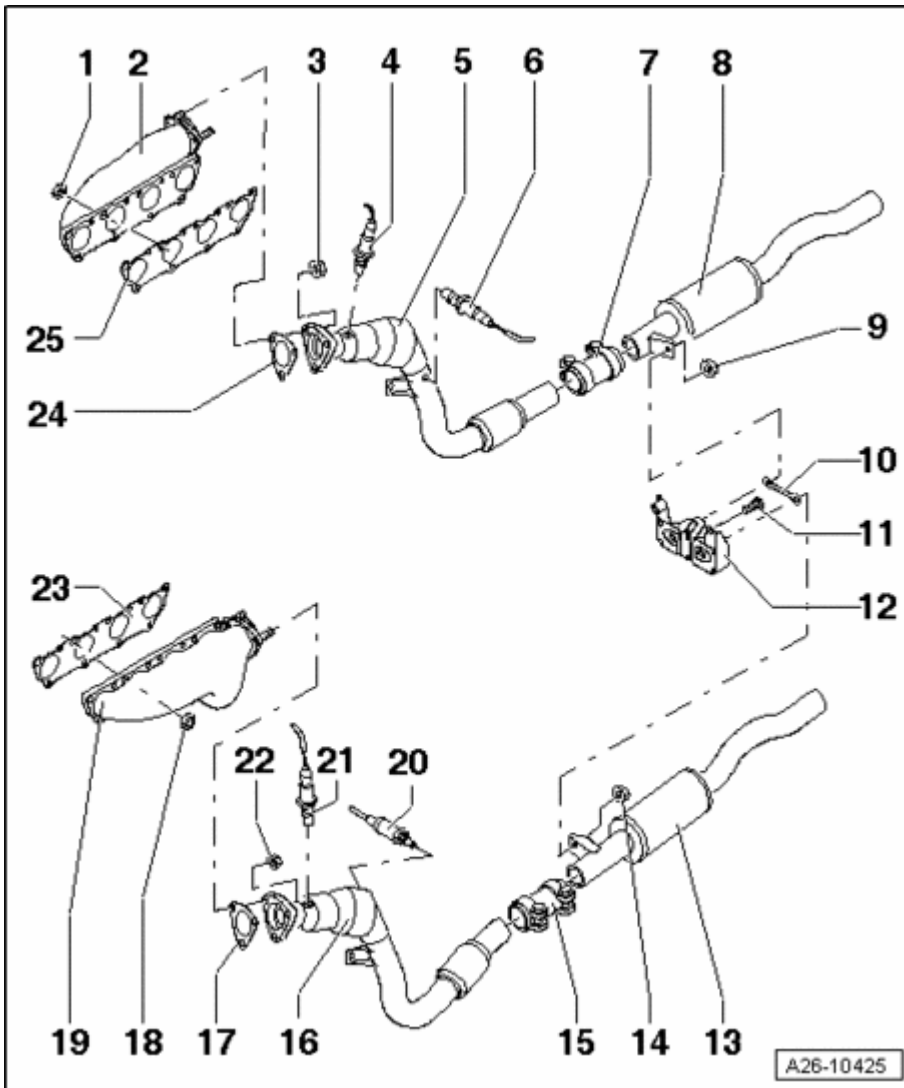


Fig. 486: Exhaust System, Assembly Overview (Front Exhaust System)
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Nut

- 25 Nm

2 - Right-side exhaust manifold

- Removing and installing --> **Right exhaust manifold, removing and installing**

3 - Nut

- 25 Nm

4 - Heated Oxygen Sensor (HO2S) G39 (before catalytic converter)

- 50 Nm
- For bank 1
- Threads of new oxygen sensors are coated with assembly paste
- If reusing oxygen sensor, coat thread with hot bolt paste, hot bolt paste
- Assembly paste or hot bolt paste must not get onto slots of sensor body.
- Removing and installing --> **24 MULTIPOINT FUEL INJECTION (MFI)**

5 - Right catalytic converter

- With flex joint
- Decoupling element must not be bent more than 10° otherwise it may be damaged
- Individual components of suspension --> **Individual components of suspension, right side**
- Removing and installing --> **Catalytic converter with right front muffler, removing and installing**

6 - Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130

- 50 Nm
- For bank 1
- Threads of new oxygen sensors are coated with assembly paste
- If reusing oxygen sensor, coat thread with hot bolt paste, hot bolt paste
- Assembly paste or hot bolt paste must not get onto slots of sensor body.
- Removing and installing --> **24 MULTIPOINT FUEL INJECTION (MFI)**

7 - Double clamp

- Installed location --> **Installation position of front double clamp**
- Before tightening, ensure exhaust system is tension-free --> **Exhaust system, installing free of tension**
- Tighten bolts evenly

8 - Right front muffler

- At factory, catalytic converter and front muffler are installed as a single component. For repairs, front muffler is supplied separately, with double clamp for connecting joint.
- Removing and installing --> **Right front muffler, removing and installing**

9 - Nut

- 25 Nm

10 - Tab

11 - Bolt

- 22 Nm

12 - Bracket

- Individual components of suspension --> **Components of center bracket**

13 - Left front muffler

- At factory, catalytic converter and front muffler are installed as a single component. For repairs, front muffler is supplied separately, with double clamp for connecting joint.
- Removing and installing --> **Left front muffler, removing and installing**

14 - Nut

- 25 Nm

15 - Double clamp

- Installed location --> **Installation position of front double clamp**
- Before tightening, ensure exhaust system is tension-free --> **Exhaust system, installing free of tension**
- Tighten bolts evenly

16 - Left catalytic converter

- With flex joint
- Decoupling element must not be bent more than 10° otherwise it may be damaged
- Individual components of suspension --> **Individual suspension components, left side**
- Removing and installing --> **Catalytic converter with left front muffler, removing and installing**

17 - Gasket

- Replace

18 - Nut

- 25 Nm

19 - Left-side exhaust manifold

- Removing and installing --> **Left exhaust manifold, removing and installing**

20 - Oxygen Sensor (O2S) 2 Behind Three Way Catalytic Converter (TWC) G131

- 50 Nm

- For bank 2
- Threads of new oxygen sensors are coated with assembly paste
- If reusing oxygen sensor, coat thread with hot bolt paste, hot bolt paste
- Assembly paste or hot bolt paste must not get onto slots of sensor body.
- Removing and installing --> **24 MULTIPOINT FUEL INJECTION (MPI)**

21 - Heated Oxygen Sensor (HO2S) 2 G108 (in front of catalytic converter)

- 50 Nm
- For bank 2
- Threads of new oxygen sensors are coated with assembly paste
- If reusing oxygen sensor, coat thread with hot bolt paste, hot bolt paste
- Assembly paste or hot bolt paste must not get onto slots of sensor body.
- Removing and installing --> **24 MULTIPOINT FUEL INJECTION (MPI)**

22 - Nut

- 25 Nm

23 - Gasket

- Replace

24 - Gasket

- Replace

25 - Gasket

- Replace

Exhaust system, rear

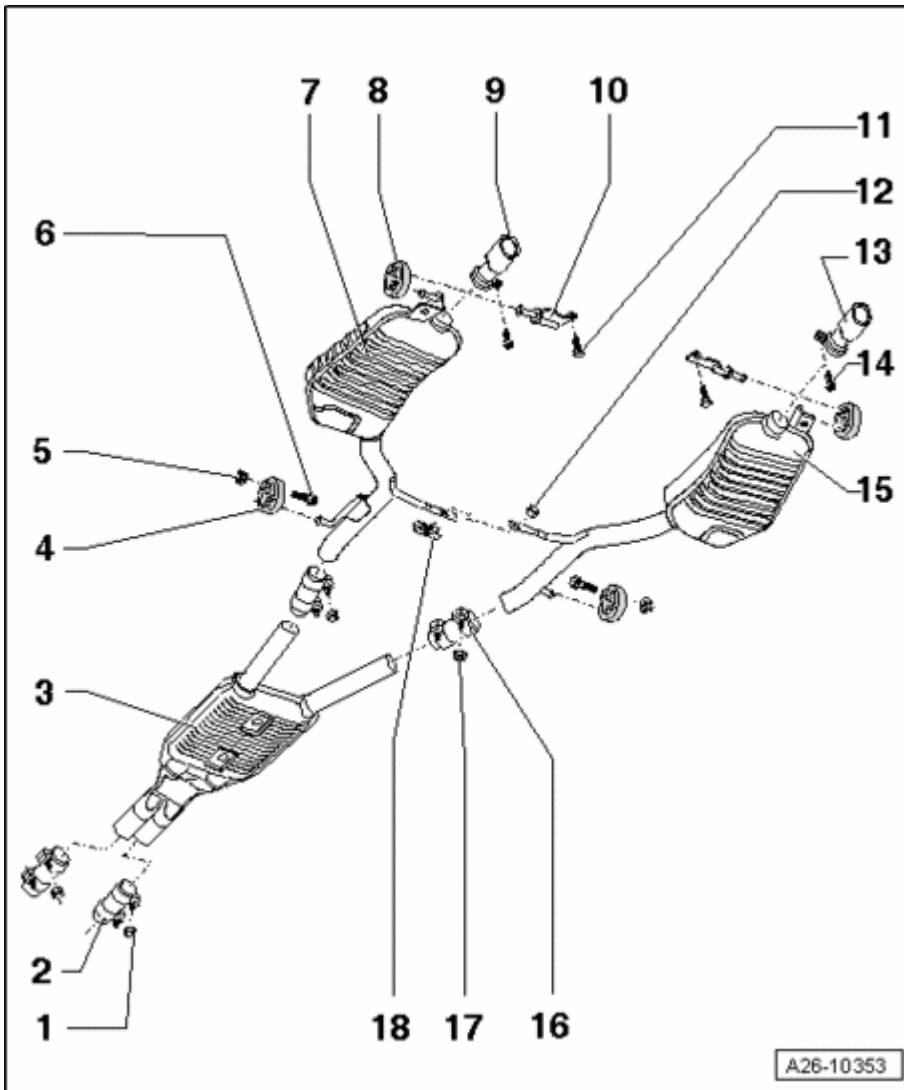


Fig. 487: Exhaust System, Assembly Overview (Exhaust System, Rear)
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Nut

- 25 Nm

2 - Double clamp

- Installed location --> **Installation position of front double clamp**
- Before tightening, ensure exhaust system is tension-free --> **Exhaust system, installing free of tension**
- Tighten bolts evenly

3 - Center muffler

- As standard, center and rear mufflers are installed as a single component. In cases of repair, the center and

2006 Audi A8 Quattro

ENGINE 4.2 Liter V8 5V Engine Mechanical, Engine Code(s): BFM, BGK - A8

rear muffler are supplied individually and with a double clamp for connecting.

- Cutting through at separating point **A separating point has been provided in the connecting pipe for individual replacement of center or rear muffler**

4 - Suspended mount

5 - Nut

- 25 Nm

6 - Bolt

7 - Left rear muffler

- As standard, center and rear mufflers are installed as a single component. In cases of repair, center and rear muffler are supplied individually and with a double clamp for connecting.
- Cutting through at separating point --> **A separating point has been provided in the connecting pipe for individual replacement of center or rear muffler**
- Replacing end pipe --> **End pipe, replacing**

8 - Suspended mount

9 - End pipe

- Replacing --> **End pipe, replacing**

10 - Bracket on body

11 - Bolt

- 22 Nm

12 - Nut

- 23 Nm

13 - End pipe

- Replacing --> **End pipe, replacing**

14 - Nut

- 23 Nm

15 - Right rear muffler

- As standard, center and rear mufflers are installed as a single component. In cases of repair, center and rear muffler are supplied individually and with a double clamp for connecting.
- Cutting through at separating point --> **A separating point has been provided in the connecting pipe for individual replacement of center or rear muffler**
- Replacing end pipe --> **End pipe, replacing**

16 - Double clamp

- For individual replacement of center and rear mufflers
- Installed location --> **Installation position of rear double clamp**
- Before tightening, ensure exhaust system is tension-free --> **Exhaust system, installing free of tension**
- Tighten bolts evenly

17 - Nut

- 25 Nm

18 - Clamping piece

Individual suspension components, left side

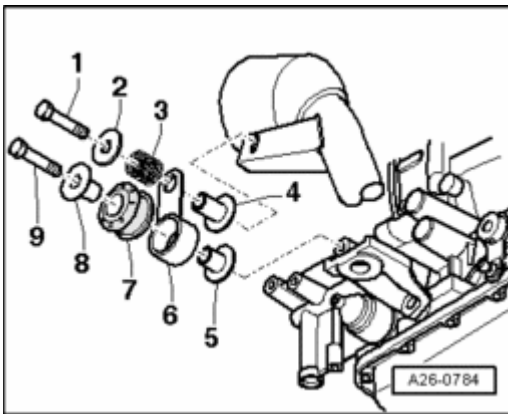


Fig. 488: Individual Suspension Components, Left Side
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1. Bolt, 25 Nm
2. Washer
3. Spring
4. Spacing sleeve
5. Spacing sleeve
6. Tab
7. Buffer
8. Spacing sleeve

9. Bolt, 25 Nm

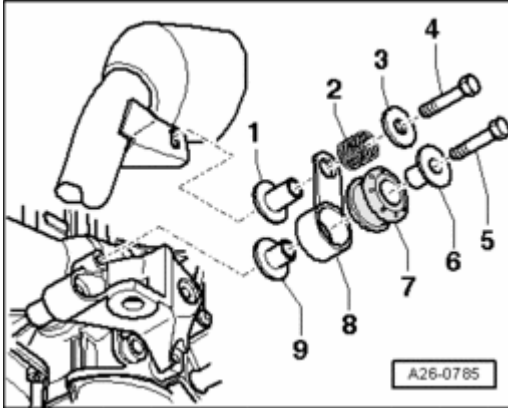
Individual components of suspension, right side

Fig. 489: Individual Components Of Suspension, Right Side
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1. Spacing sleeve
2. Spring
3. Washer
4. Bolt, 25 Nm
5. Bolt, 25 Nm
6. Spacing sleeve
7. Buffer
8. Tab
9. Spacing sleeve

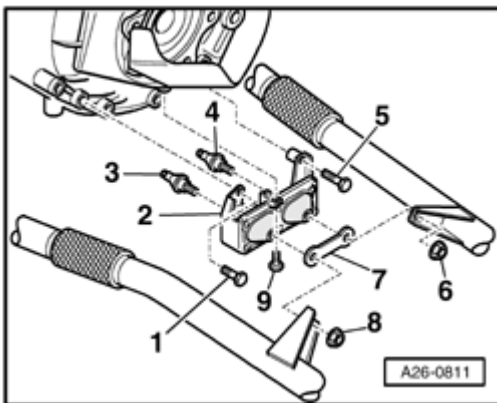
Components of center bracket

Fig. 490: Components Of Center Bracket
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1. Bolt, 22 Nm
2. Bracket
3. Threaded stud
4. Threaded stud
5. Bolt, 22 Nm
6. Nut, self-locking, 18 Nm
7. Tab
8. Nut, self-locking, 18 Nm
9. Bolt, 22 Nm

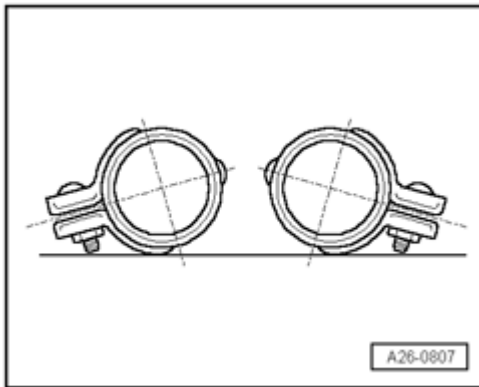
Installation position of front double clamp

Fig. 491: Adjusting Front Double Clamps So Bolt Ends Do Not Project Over Lower Edges Of Double Clamps

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- When installing double clamp, ensure that bolt ends do not project over lower edge of double clamp.
- Threaded connections point outward.

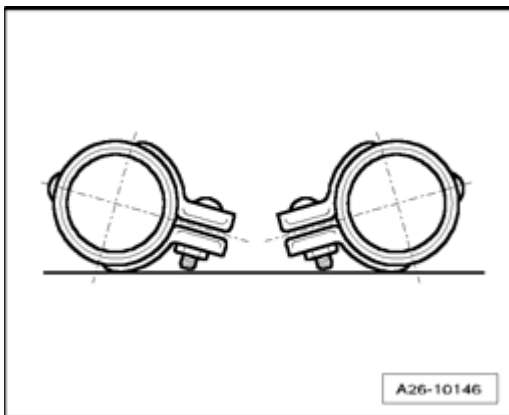
Installation position of rear double clamp

Fig. 492: Installation Position Of Rear Double Clamp

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- When installing double clamp, ensure that bolt ends do not project over lower edge of double clamp.
- Threaded connections face each other.

End pipe, replacing

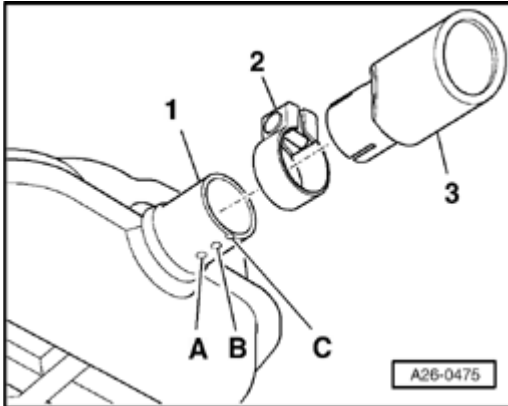


Fig. 493: End Pipe, Replacing

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Separate end pipe - 1 - at section point - C - using chain pipe cutter VAS 6254.
- Connect end pipe - 3 - up to marking - A - so that slot on end pipe lines up with marking - B -.
- Tighten bolts on double clamp - 2 -.

A separating point has been provided in the connecting pipe for individual replacement of center or rear muffler

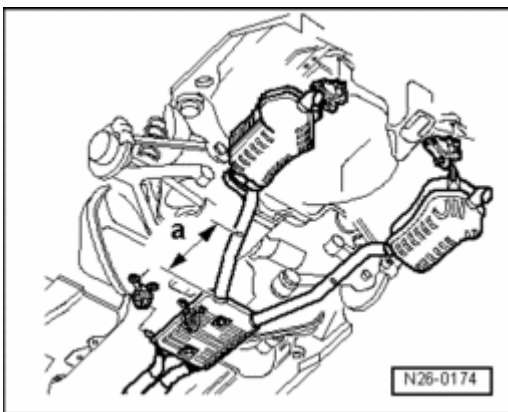


Fig. 494: A Separating Point Has Been Provided In The Connecting Pipe For Individual Replacement Of Center Or Rear Muffler

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- The separating point is marked by depressions around circumference of exhaust pipe.

- Separate exhaust pipe at section point using chain pipe cutter VAS 6254.

Dimension - **a** - approx. 244 mm

Left exhaust manifold, removing and installing

Removing

- Remove engine --> **Engine, removing and installing.**
- Free up Heated Oxygen Sensor (HO2S) 2 G108 electrical wire.

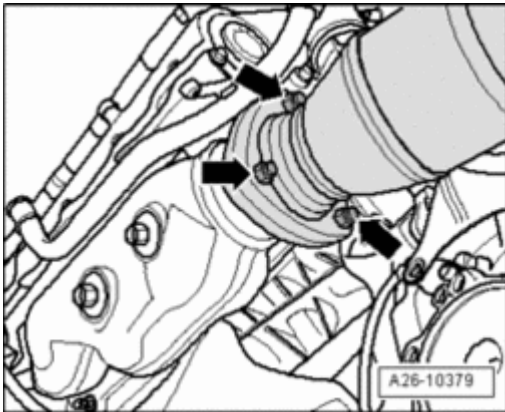


Fig. 495: Removing Catalytic Converter With Front Muffler From Exhaust Manifold
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove catalytic converter with front muffler from exhaust manifold - **arrows** -.

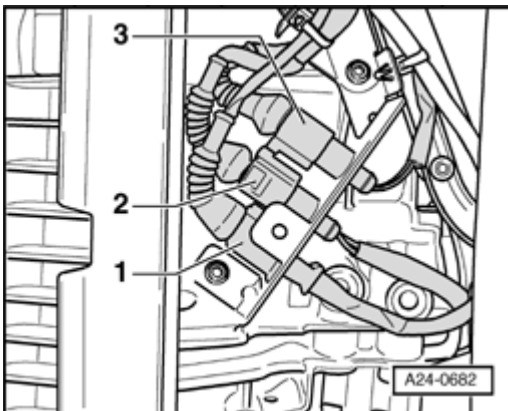


Fig. 496: Disconnecting Electrical Connector (Brown) Of Oxygen Sensor (O2S) 2 Behind Three Way Catalytic Converter (TWC) G131 And Free Up Electrical Wire
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **3** - (brown) of Oxygen Sensor (O2S) 2 Behind Three Way Catalytic Converter (TWC) G131 and free up electrical wire.

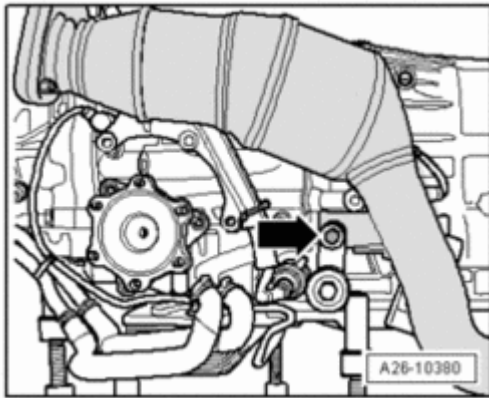


Fig. 497: Removing Bolt On Bracket For Exhaust Pipe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - **arrow** - on bracket for exhaust pipe.

NOTE:

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

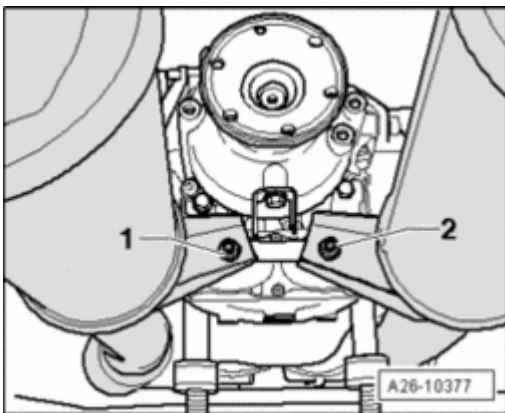


Fig. 498: Removing Bolt On Bracket For Exhaust System And Catalytic Converter With Front Muffler
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - **1** - on bracket for exhaust system and remove catalytic converter with front muffler.

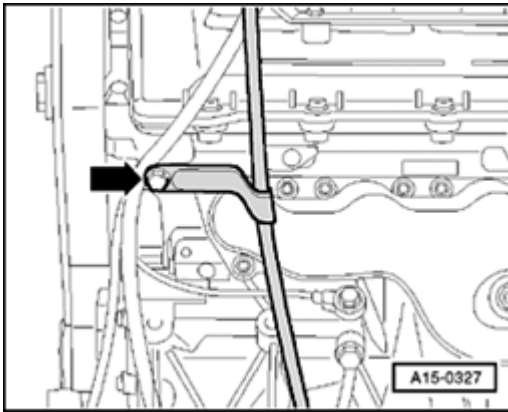


Fig. 499: Removing Guide Pipe For Oil Dipstick From Cylinder Head
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove guide pipe for oil dipstick - **arrow** -.

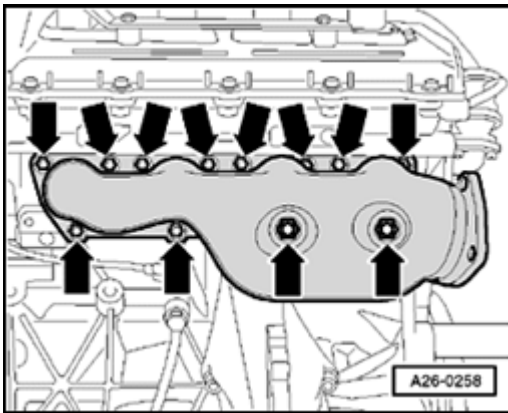


Fig. 500: Removing Exhaust Manifold
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove exhaust manifold - **arrows** -.

Installing

NOTE:

- Replace self-locking nuts.
- Replace gaskets.
- Replace sealing ring for guide tube for oil dipstick.

- Installation is in reverse order of removal.

Torque specifications

Bolted connections	Torque specifications
Exhaust manifold to cylinder head	25 Nm

Oil dip stick guide tube to cylinder head

22 Nm

Right exhaust manifold, removing and installing

Removing

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

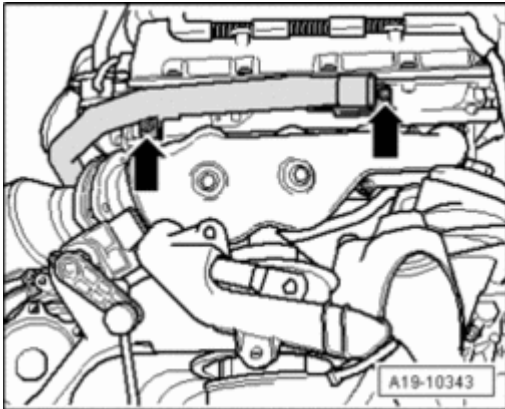


Fig. 501: Removing Water Pipe At Right
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove water pipe at right - **arrows** -.

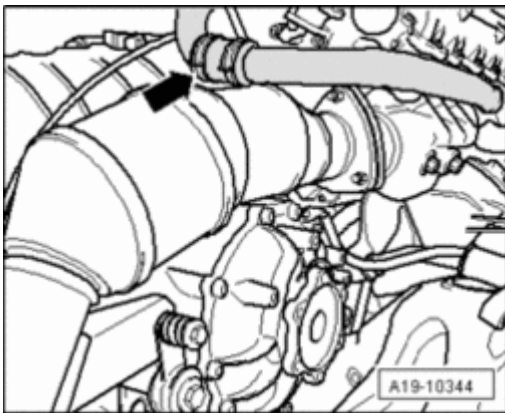


Fig. 502: Disconnecting Water Pipe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect water pipe - **arrow** - and remove.
- Free up Heated Oxygen Sensor (HO2S) G39 electrical wire.

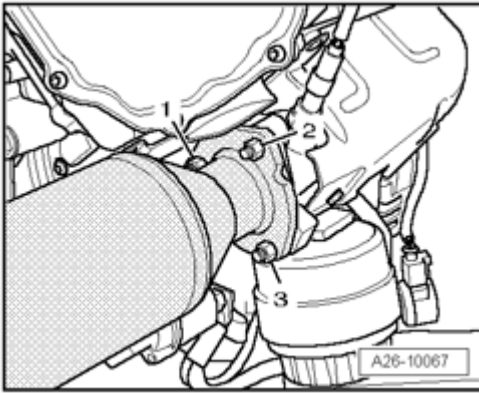


Fig. 503: Removing Catalytic Converter With Front Muffler From Exhaust Manifold
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove catalytic converter with front muffler from exhaust manifold - **arrows** -.

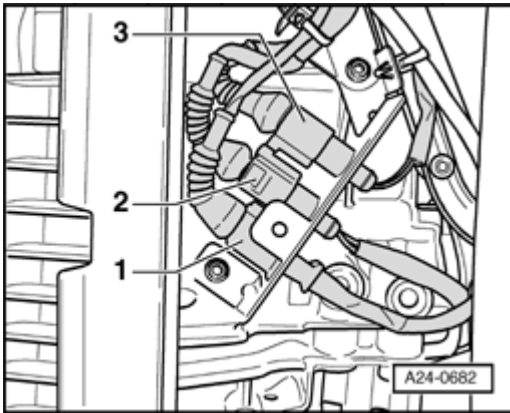


Fig. 504: Disconnecting Electrical Connector (Brown) Of Oxygen Sensor (O2S) 2 Behind Three Way Catalytic Converter (TWC) G131 And Free Up Electrical Wire
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - 2 - (black) of Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130.

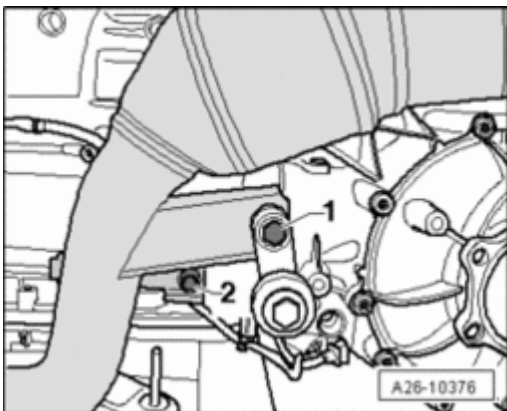


Fig. 505: Removing Bolt On Bracket For Exhaust Pipe & Heat Shield

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - 1 - on bracket for exhaust pipe.
- Remove heat shield - 2 -.
- Free up Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130 electrical wire.

NOTE:

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

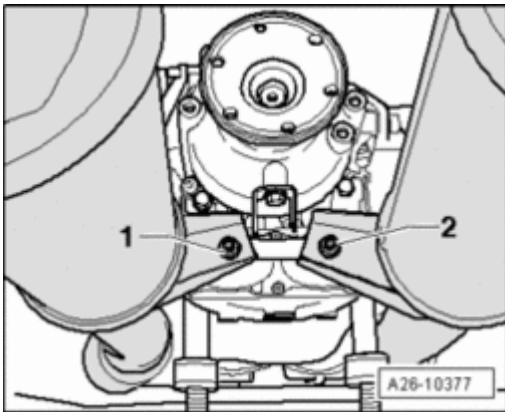


Fig. 506: Removing Bolt On Bracket For Exhaust System And Catalytic Converter With Front Muffler

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - 2 - on bracket for exhaust system and remove catalytic converter with front muffler.

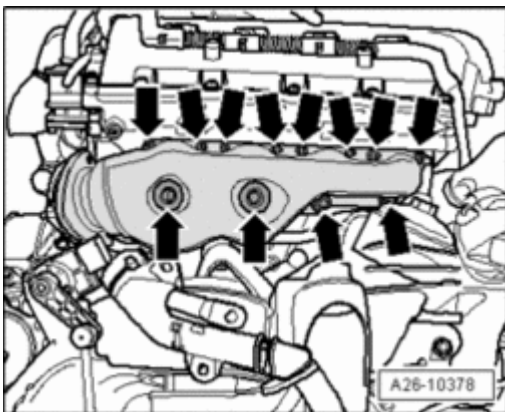


Fig. 507: Removing Exhaust Manifold

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove exhaust manifold - arrows -.

Installing

NOTE:

- **Replace self-locking nuts.**
- **Replace gaskets.**

○ Installation is in reverse order of removal.

Torque specifications

Tightening torques --> **Exhaust system, assembly overview**

Catalytic converter with left front muffler, removing and installing

- Remove engine --> **Engine, removing and installing.**
- Free up Heated Oxygen Sensor (HO2S) 2 G108 electrical wire.

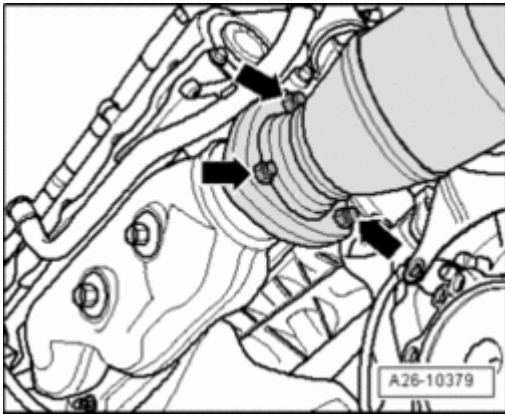


Fig. 508: Removing Catalytic Converter With Front Muffler From Exhaust Manifold
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove catalytic converter with front muffler from exhaust manifold - **arrows** -.

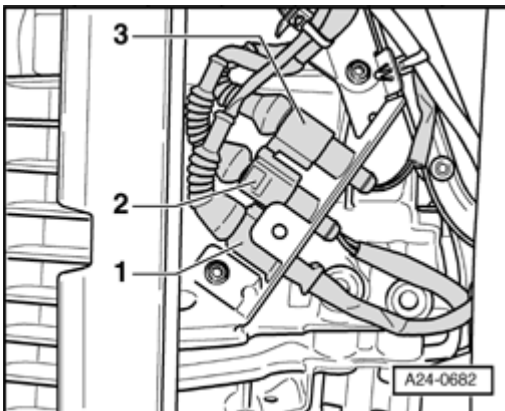


Fig. 509: Disconnecting Electrical Connector (Brown) Of Oxygen Sensor (O2S) 2 Behind Three Way Catalytic Converter (TWC) G131 And Free Up Electrical Wire
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **3** - (brown) of Oxygen Sensor (O2S) 2 Behind Three Way Catalytic Converter (TWC) G131 and free up electrical wire.

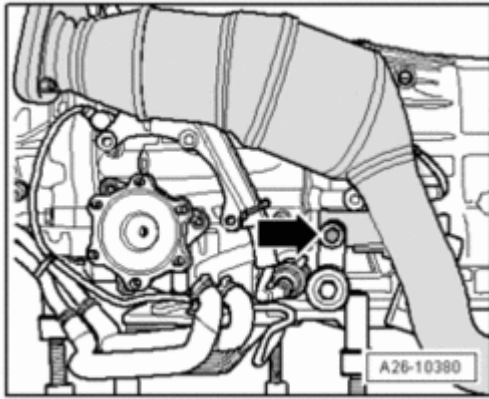


Fig. 510: Removing Bolt On Bracket For Exhaust Pipe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - **arrow** - on bracket for exhaust pipe.

NOTE:

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

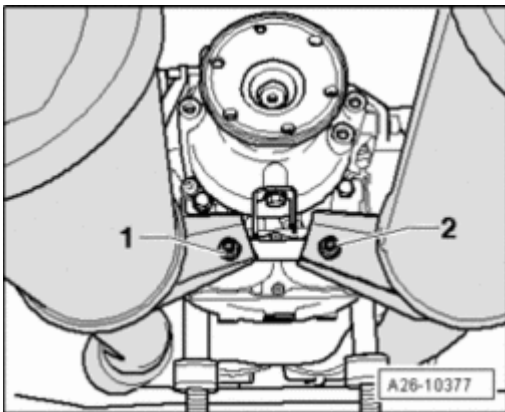


Fig. 511: Removing Bolt On Bracket For Exhaust System And Catalytic Converter With Front Muffler
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - **1** - on bracket for exhaust system and remove catalytic converter with front muffler.

Installing

- Installation is in reverse order of removal.

NOTE:

- Replace self-locking nuts.
- Replace gaskets.

- Install exhaust system free of stress --> **Exhaust system, installing free of tension.**

Torque specifications

Tightening torques --> **Exhaust system, assembly overview**

Catalytic converter with right front muffler, removing and installing

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

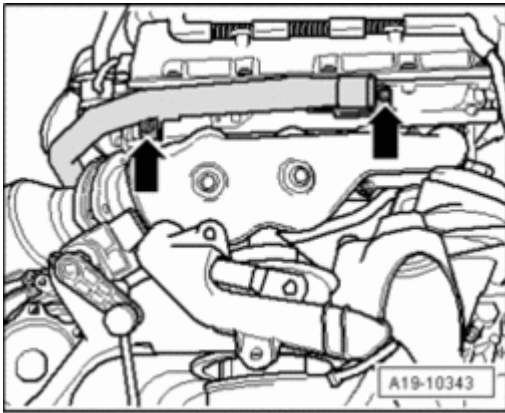


Fig. 512: Removing Water Pipe At Right

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove water pipe at right - **arrows** -.

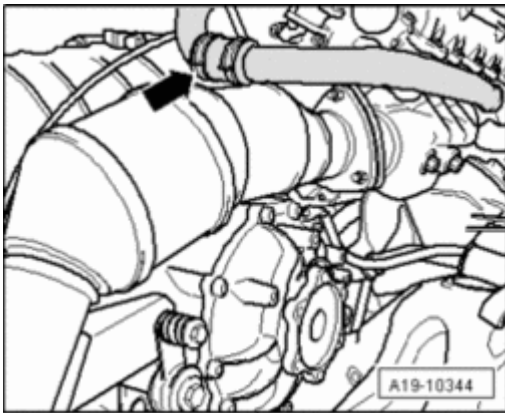


Fig. 513: Disconnecting Water Pipe

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect water pipe - **arrow** - and remove.
- Free up Heated Oxygen Sensor (HO2S) G39 electrical wire.

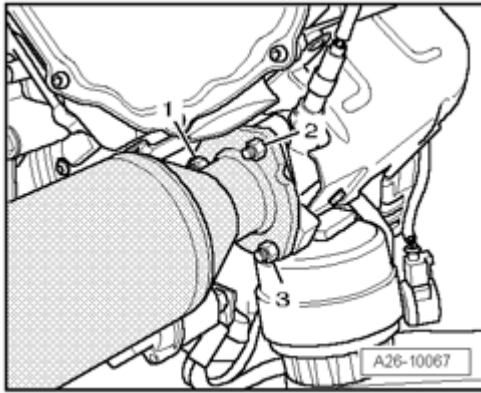


Fig. 514: Removing Catalytic Converter With Front Muffler From Exhaust Manifold
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove catalytic converter with front muffler from exhaust manifold - **arrows** -.

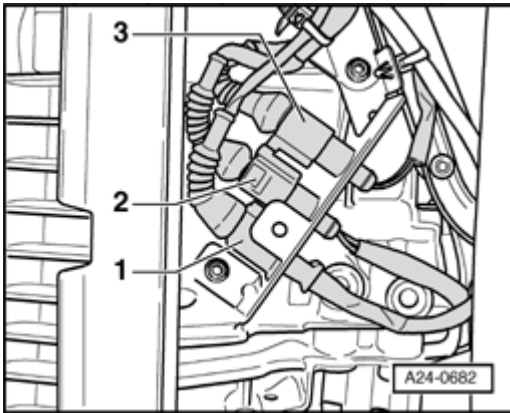


Fig. 515: Disconnecting Electrical Connector (Brown) Of Oxygen Sensor (O2S) 2 Behind Three Way Catalytic Converter (TWC) G131 And Free Up Electrical Wire
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - 2 - (black) of Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130.

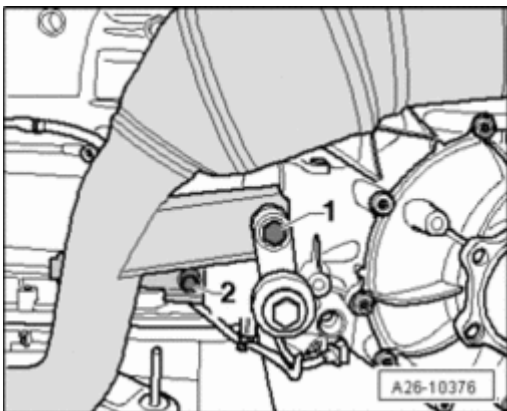


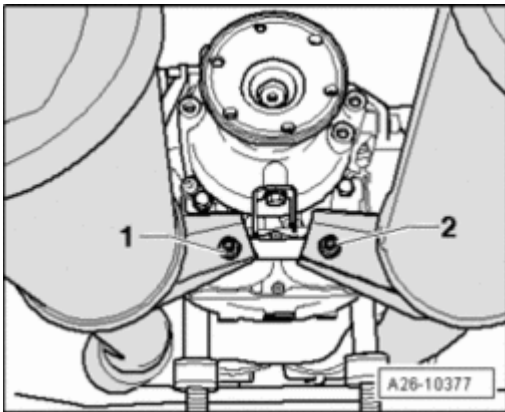
Fig. 516: Removing Bolt On Bracket For Exhaust Pipe & Heat Shield

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - 1 - on bracket for exhaust pipe.
- Remove heat shield - 2 -.
- Free up Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130 electrical wire.

NOTE:

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

**Fig. 517: Removing Bolt On Bracket For Exhaust System And Catalytic Converter With Front Muffler**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - 2 - on bracket for exhaust system and remove catalytic converter with front muffler.

Installing

- Installation is in reverse order of removal.

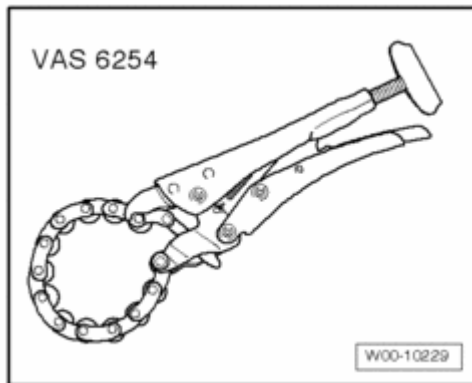
NOTE:

- Replace self-locking nuts.
- Replace gaskets.

- Install exhaust system free of stress --> **Exhaust system, installing free of tension.**

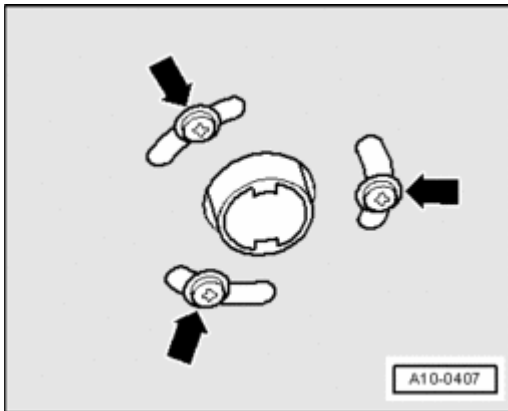
Torque specificationsTightening torques --> **Exhaust system, assembly overview****Left front muffler, removing and installing****NOTE:**

- Before raising the vehicle on a hoist (wheels off the ground), first activate the vehicle jack mode --> **43 - SELF LEVELING SUSPENSION** .

Special tools, testers and auxiliary items required**Fig. 518: Chain Pipe Cutter VAS 6254**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

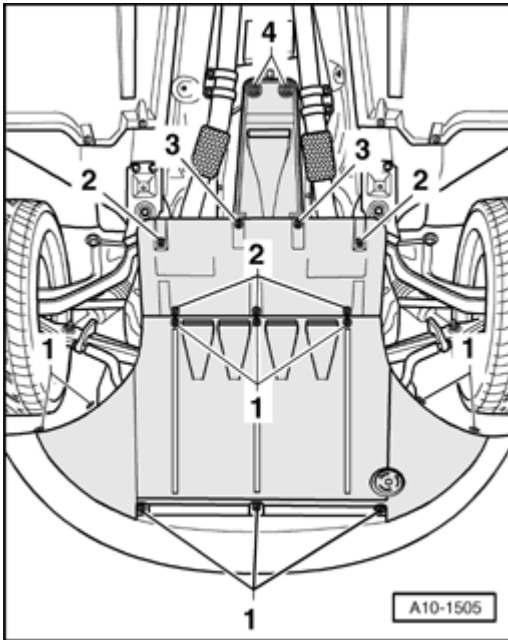
- Chain pipe cutter VAS 6254

For vehicles with parking/auxiliary heater:**Fig. 519: Removing Bolts For Exhaust Pipe Of Parking Heater/Auxiliary Heater On Noise Insulation**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

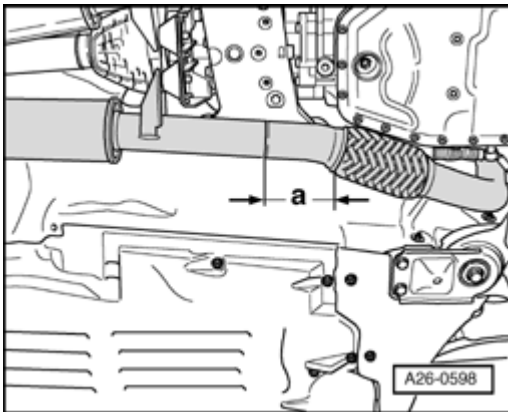
- Remove bolts - **arrows** - for exhaust pipe of parking heater/auxiliary heater on noise insulation.

All

**Fig. 520: Removing Noise Insulation**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove noise insulation - 2 through 4 -.

**Fig. 521: Separating Left Exhaust Pipe Using Chain Pipe Cutter VAS 6254**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Separate left exhaust pipe using chain pipe cutter VAS 6254.
- Dimension - a - 110 mm

NOTE:

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

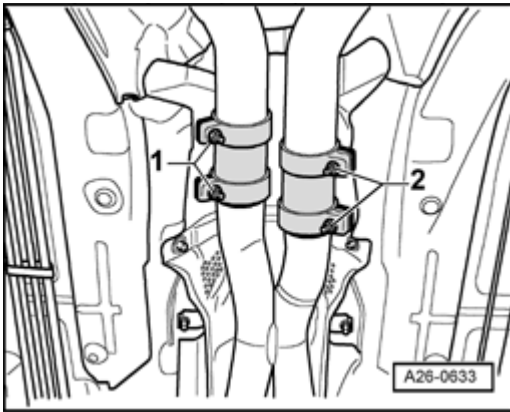


Fig. 522: Loosening Double Clamp And Sliding It Toward Front
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen double clamp - 1 - and slide it toward front.

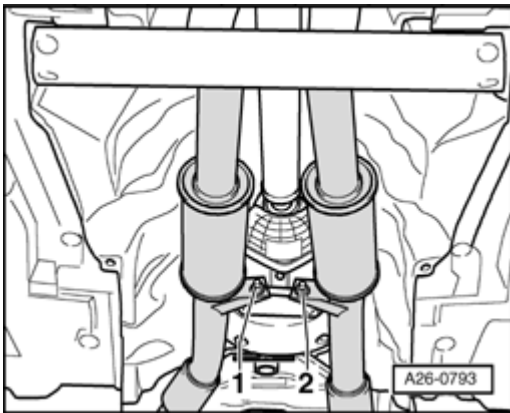


Fig. 523: Removing Right Exhaust Pipe From Bracket
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove left exhaust pipe - 1 - from bracket.

Installing

NOTE:

- Replace self-locking nuts.

- Installation is in reverse order of removal.
- Install exhaust system free of stress --> **Exhaust system, installing free of tension.**

Torque specifications

Tightening torques --> **Exhaust system, assembly overview**

Right front muffler, removing and installing

NOTE:

- Before raising the vehicle on a hoist (wheels off the ground), first activate the vehicle jack mode --> 43 - SELF LEVELING SUSPENSION .

Special tools, testers and auxiliary items required

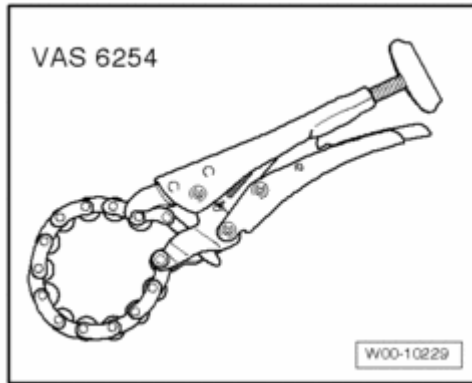


Fig. 524: Chain Pipe Cutter VAS 6254

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Chain pipe cutter VAS 6254

For vehicles with parking/auxiliary heater:

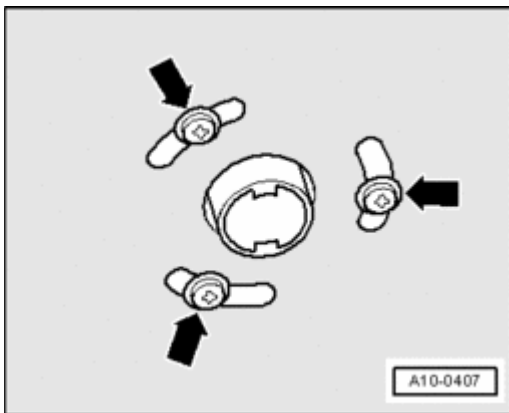


Fig. 525: Removing Bolts For Exhaust Pipe Of Parking Heater/Auxiliary Heater On Noise Insulation

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - for exhaust pipe of parking heater/auxiliary heater on noise insulation.

All

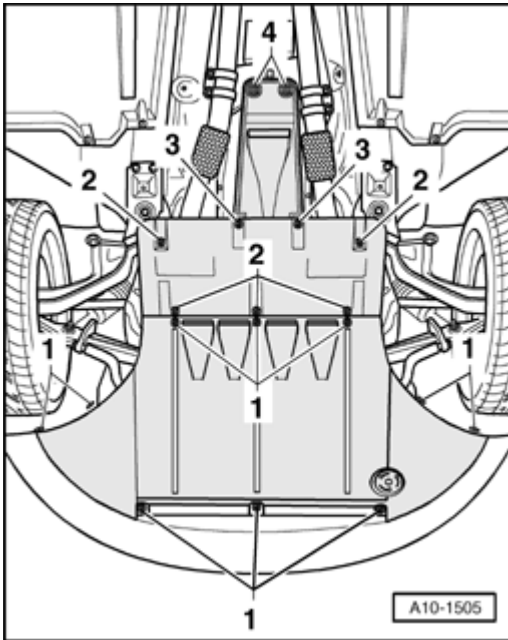


Fig. 526: Loosening Mounting Parts And Removing Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove noise insulation - 2 through 4 -.

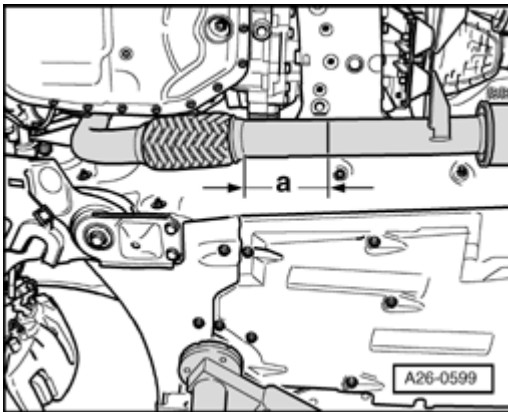


Fig. 527: Separating Right Exhaust Pipe Using Chain Pipe Cutter VAS 6254
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Separate right exhaust pipe using chain pipe cutter VAS 6254.
- Dimension - a - 67 mm

NOTE:

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

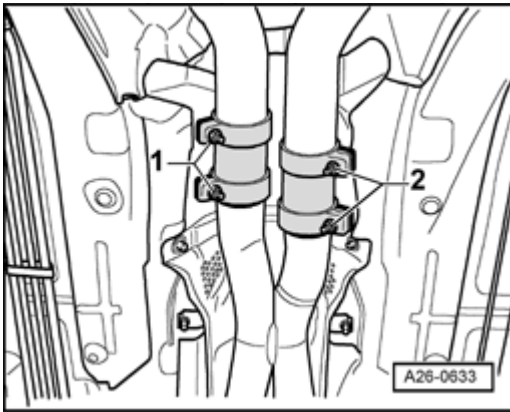


Fig. 528: Loosening Double Clamp And Sliding It Toward Front
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen double clamp - 2 - and slide it toward front.

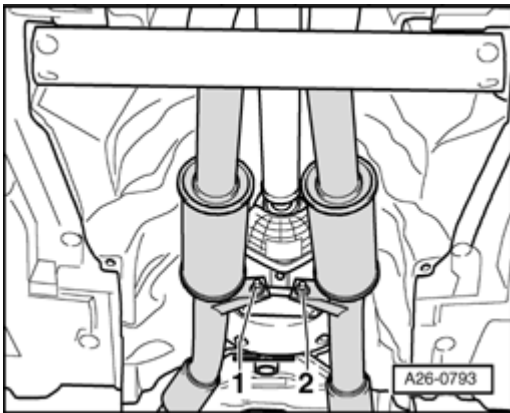


Fig. 529: Removing Right Exhaust Pipe From Bracket
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove right exhaust pipe - 2 - from bracket.

Installing

NOTE:

- Replace self-locking nuts.

- Installation is in reverse order of removal.
- Install exhaust system free of stress --> **Exhaust system, installing free of tension.**

Torque specifications

Tightening torques --> **Exhaust system, assembly overview**

Exhaust system, installing free of tension

- Align exhaust system when cold.
- Loosen threaded connections on all double clamps of exhaust system.

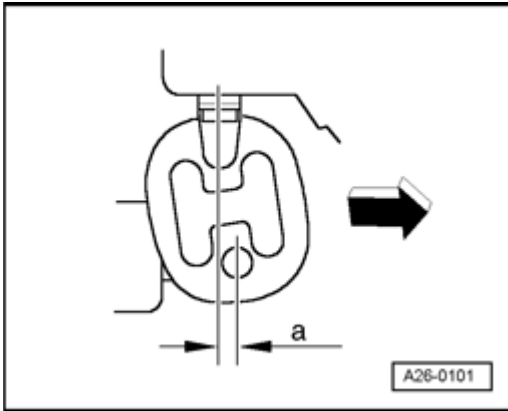


Fig. 530: Pressing Rear Muffler Toward Front
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press rear muffler toward front - **arrow** - until following pre-loads on retaining loops are achieved:
 - Front retaining loop: - **a** - = 11 mm.
 - Rear retaining loop: - **a** - = 14 mm.
- Align rear muffler horizontally.
- Position double clamps centered to section points.

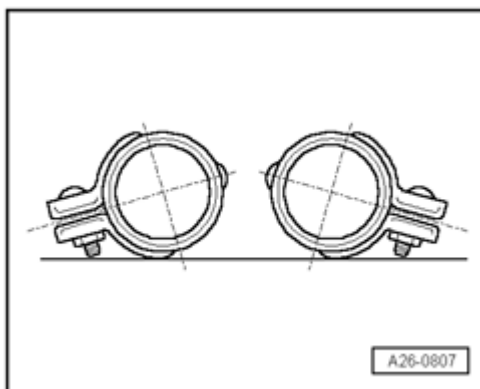


Fig. 531: Adjusting Front Double Clamps So Bolt Ends Do Not Project Over Lower Edges Of Double Clamps
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Adjust front double clamps so that bolt ends do not project over lower edges of double clamps.

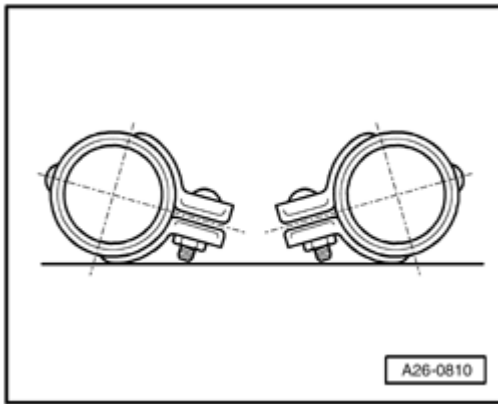


Fig. 532: Adjusting Rear Double Clamps So That Bolt Ends Do Not Project Over Lower Edges Of Double Clamps

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Adjust rear double clamps so that bolt ends do not project over lower edges of double clamps.
- Tighten threaded connections of double clamps evenly.

Tail pipes, aligning

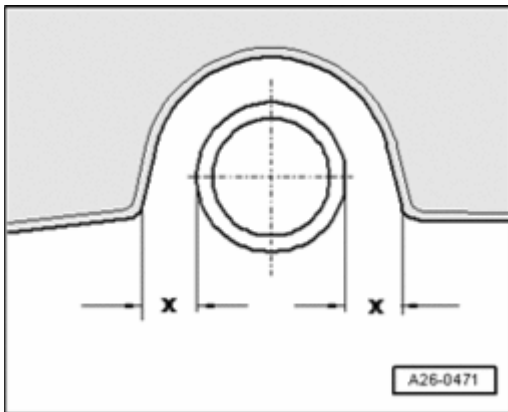


Fig. 533: Checking Distance Of End Pipes At Left/Right To Bumper Cover

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check distance of end pipes at left and right to bumper cover:
 - Dimension - x - left = dimension - x - right.

If necessary, correct dimension "x" as follows:

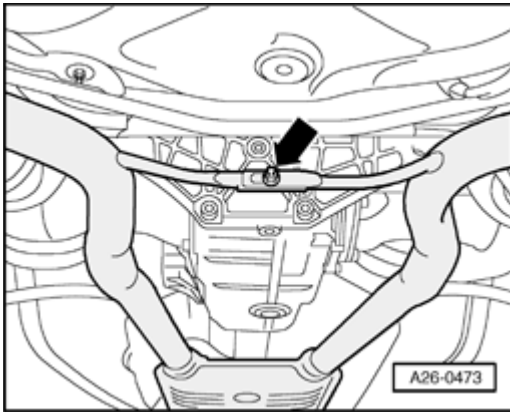


Fig. 534: Loosening Threaded Connections Of Brace Between Exhaust Pipes
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen threaded connections - **arrow** - of brace between exhaust pipes.
- Adjust distance between rear mufflers.
- Tighten bolts.

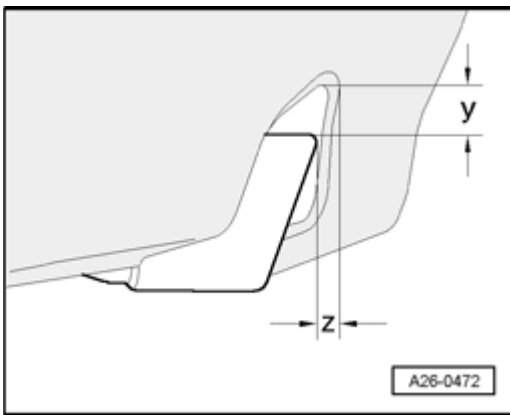


Fig. 535: Checking Distances Of End Pipes To Bumper
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check distances - **y** - and - **z** - of end pipes to bumper:
 - Dimension - **y** - = 18 to 22 mm.
 - Dimension - **z** - = 8 to 12 mm.

Exhaust system, checking for leaks

- Start engine and let run at idle.
- Seal tailpipe, e.g. with cloth or plug, for duration of leak test.
- Listen for leaks at the following connections: cylinder head/exhaust manifold, exhaust manifold/turbocharger, turbocharger/catalytic converter etc.
- Repair detected leaks.

SECONDARY AIR INJECTION (AIR) SYSTEM

Secondary air injection (AIR) system

The Secondary Air Injection (AIR) system heats up the engine faster, and thereby catalytic converter achieves operation readiness earlier after a cold start.

Principle

Due to rich mixture during cold start phase, the exhaust emissions contain an increased level of unburned hydrocarbons.

The Secondary Air Injection (AIR) system improves the secondary oxidation within the catalytic converter, thereby reducing harmful emissions.

The heat released by secondary oxidation shortens the start-up time of the catalytic converter considerably, as well as significantly improves emissions quality during the cold-running phase.

Function

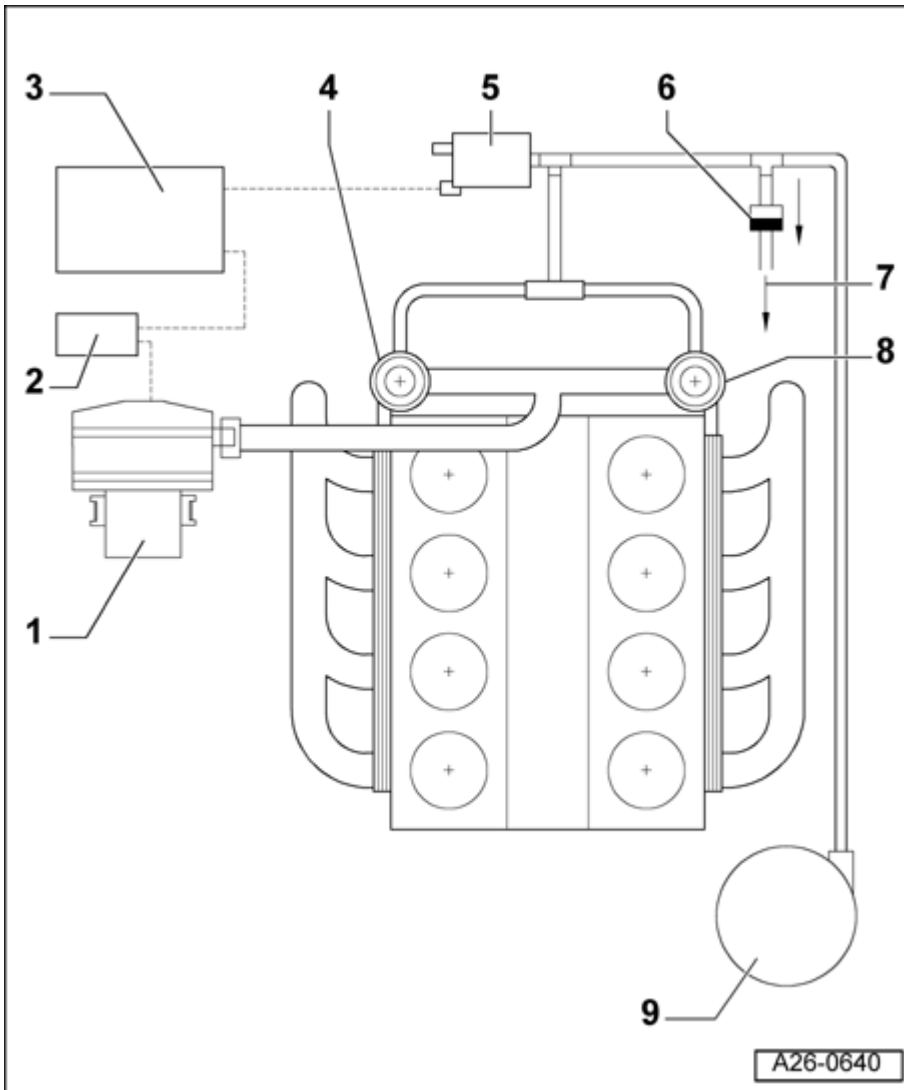


Fig. 536: Secondary Air Injection (AIR), Component Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- In cold start phase, the ECM - **3** - activates secondary air pump - **1** - via relay for secondary air pump - **2** - . Air reaches combination valves for Secondary Air Injection (AIR) - **4** - and - **8** - .
- The Secondary Air Injection (AIR) valve - **5** - is activated in parallel, which allows the vacuum to reach the combination valves for Secondary Air Injection (AIR) - **4** - and - **8** - . The appropriate combination valve for Secondary Air Injection (AIR) thereby opens the path for secondary air to the exhaust channels of the cylinder head.

Overview

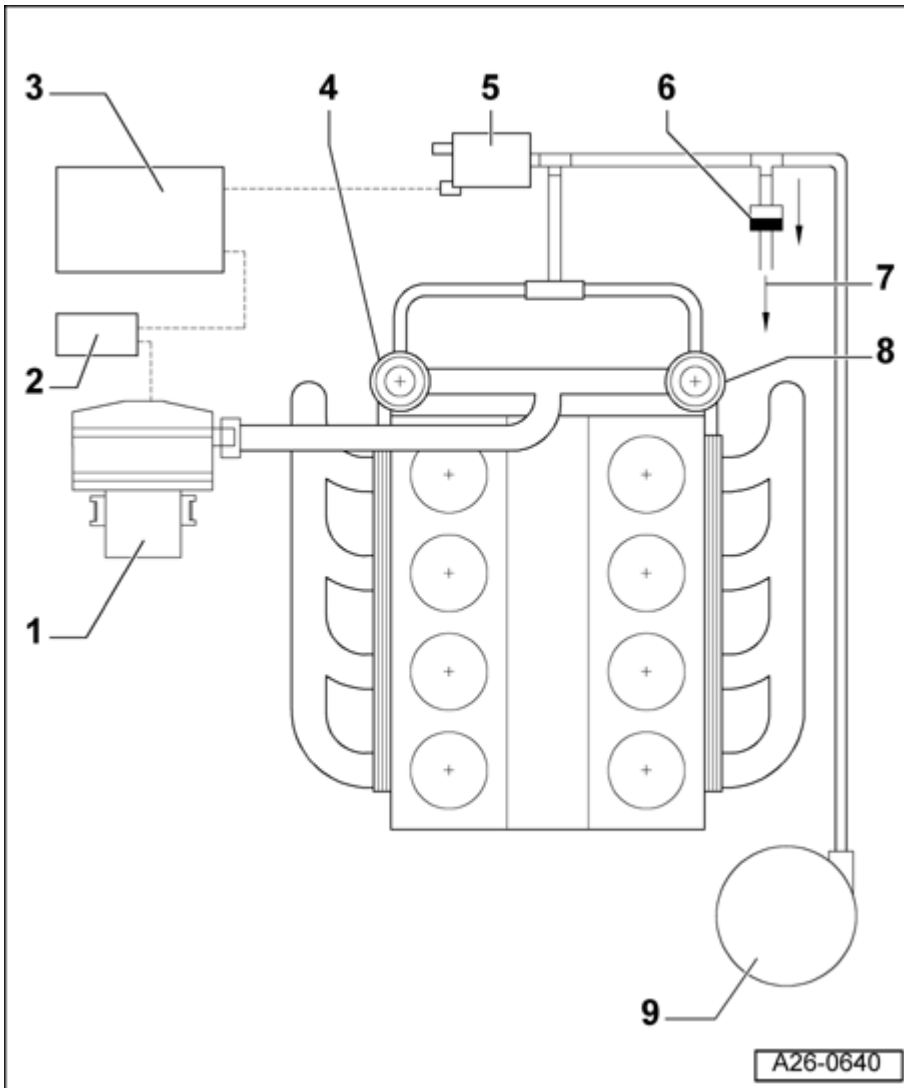


Fig. 537: Secondary Air Injection (AIR), Component Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Secondary Air Injection (AIR) Pump Motor V101

- Component location --> [Component location of Secondary Air Injection \(AIR\) Pump Motor V101](#)
- Removing and installing --> [Secondary Air Injection \(AIR\) Pump Motor V101 , removing and installing](#)

2 - Secondary Air Injection (AIR) Pump Relay J299

- Component location --> [Component location for Secondary Air Injection \(AIR\) Pump Relay J299](#)

3 - Motronic engine control module J220

4 - Right combination valve for Secondary Air Injection (AIR)

- Component location --> **Combination valve for Secondary Air Injection (AIR)**
- Checking --> **Combination valve for Secondary Air Injection (AIR), checking for function and leaks**
- Removing and installing --> **Secondary Air Injection (AIR) (right combination valve), removing and installing**

5 - Secondary air injection (AIR) solenoid valve N112

- Component location --> **Installation location of Secondary Air Injection (AIR) Solenoid Valve N112**

6 - Non-return valve

- Installed location: As shown in **Fig. 536**, - **arrow** - points in direction of flow

7 - To Intake manifold

8 - Left combination valve for Secondary Air Injection (AIR)

- Component location --> **Combination valve for Secondary Air Injection (AIR)**
- Checking --> **Combination valve for Secondary Air Injection (AIR), checking for function and leaks**
- Removing and installing --> **Secondary Air Injection (AIR) (left combination valve), removing and installing**

9 - Vacuum reservoir

- Component location: In left front wheel housing behind wheel housing liner

Installation location of Secondary Air Injection (AIR) Solenoid Valve N112

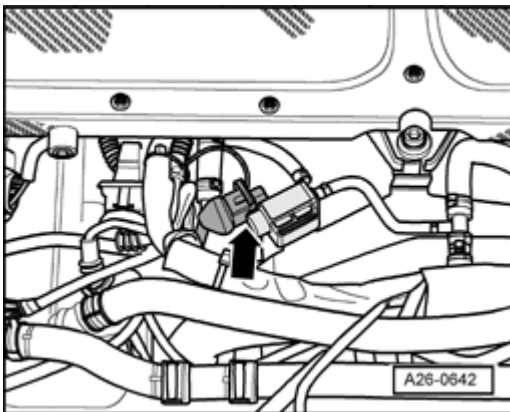


Fig. 538: Installation Location Of Secondary Air Injection (Air) Solenoid Valve N112
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- On intake manifold - **arrow** - at front, right

Component location of Secondary Air Injection (AIR) Pump Motor V101

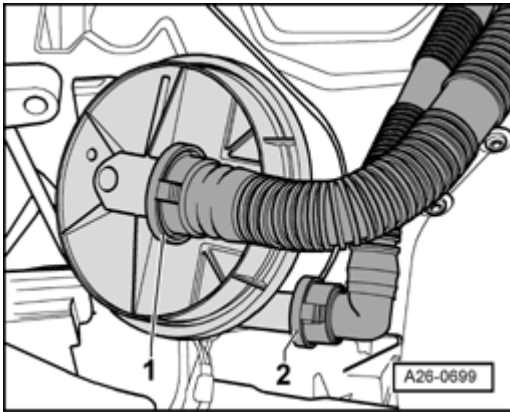


Fig. 539: Disconnecting Intake Air Duct At Secondary Air Injection (AIR) Pump Motor V101
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- At right front in engine compartment below long member

Component location for Secondary Air Injection (AIR) Pump Relay J299

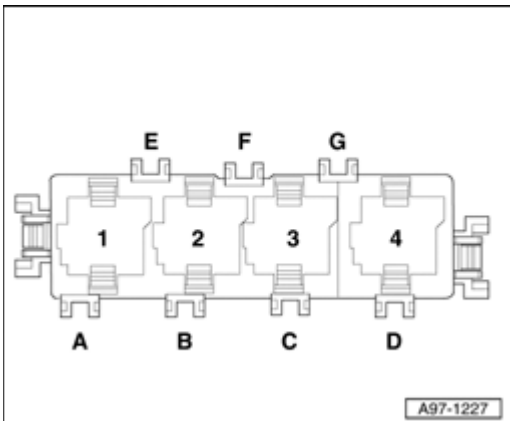


Fig. 540: Component Location Of Secondary Air Injection (AIR) Pump Motor V101
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Installation position 1 in E-box, plenum chamber

Combination valve for Secondary Air Injection (AIR)

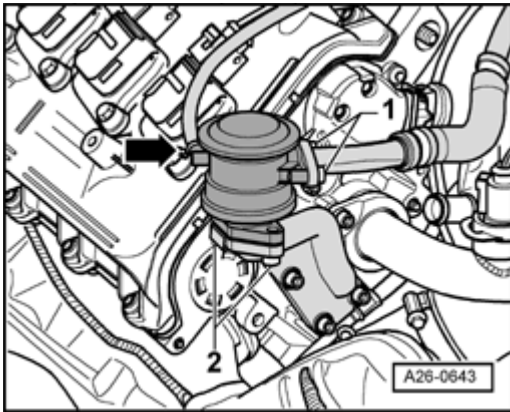


Fig. 541: Disconnecting Vacuum Hose At Combination Valve To Be Tested
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- At rear of cylinder heads

NOTE:

- Left valve is displayed in illustration.

Secondary Air Injection (AIR) Pump Motor V101 , removing and installing

Removing

For vehicles with parking/auxiliary heater:

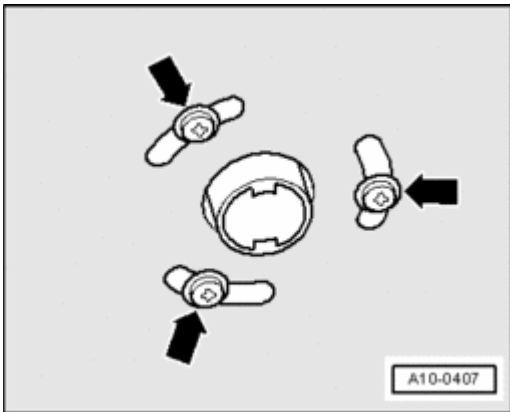


Fig. 542: Removing Bolts For Exhaust Pipe Of Parking Heater/Auxiliary Heater On Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - for exhaust pipe of parking heater/auxiliary heater on noise insulation.

All

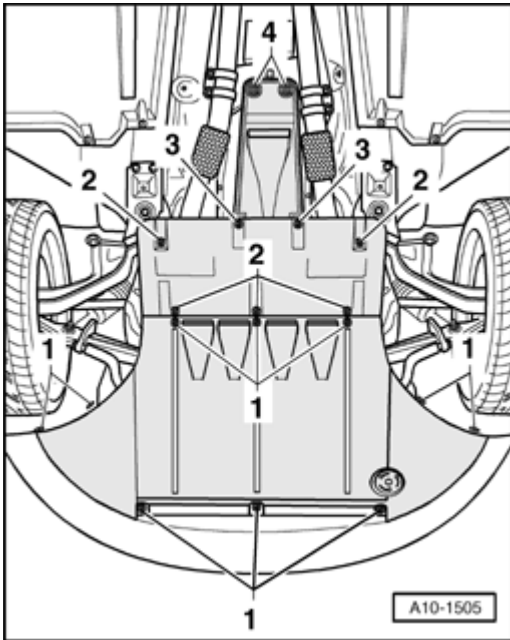


Fig. 543: Loosening Mounting Parts And Removing Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove noise insulation - 1 -.

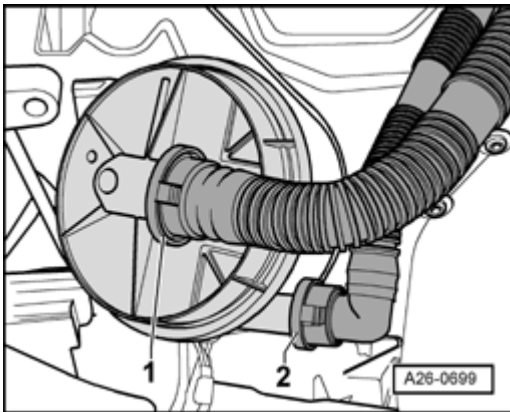


Fig. 544: Disconnecting Air Hoses
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect air hose - 1 -.
- Disconnect air hose - 2 -.

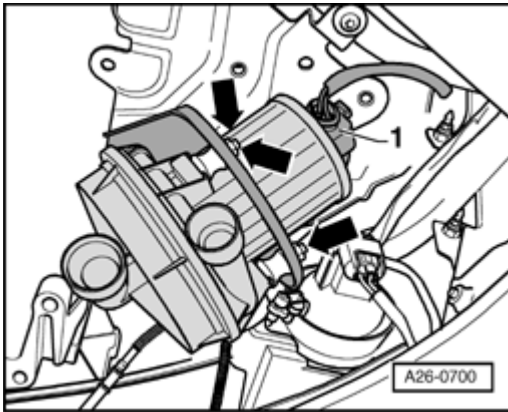


Fig. 545: Disconnecting Electrical Connector & Removing Secondary Air Injection (AIR) Pump Motor V101

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **1** -.
- Remove Secondary Air Injection (AIR) Pump Motor V101 - **arrows** -.

Installing

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

Torque specifications

Component	Nm
Secondary Air Injection motor on bracket	10

Combination valve for Secondary Air Injection (AIR), checking for function and leaks

Special tools, testers and auxiliary items required

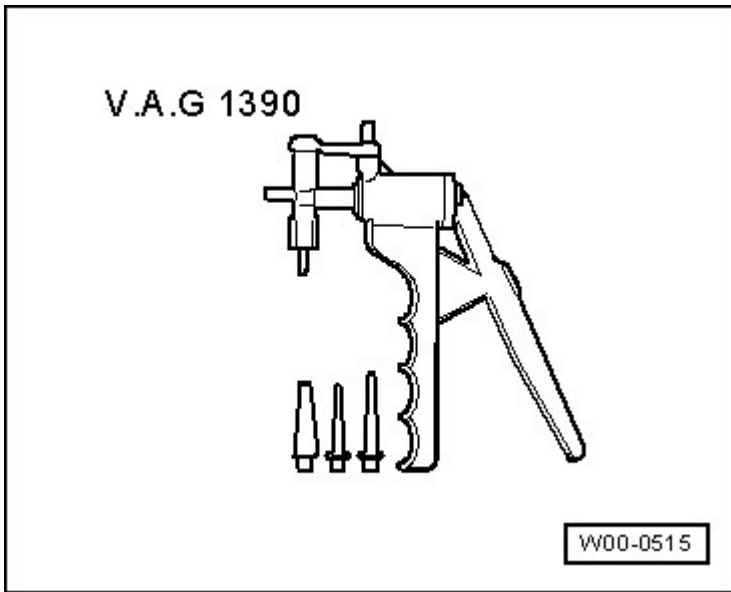


Fig. 546: Hand Vacuum Pump V.A.G 1390
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hand vacuum pump V.A.G 1390

Test requirements

- Vacuum lines and hose connections free of leaks.
- Vacuum lines not plugged.

Test sequence

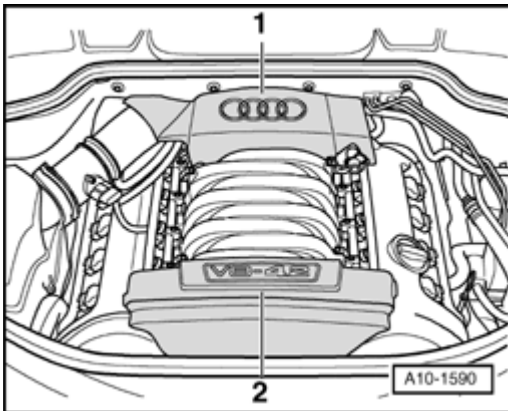


Fig. 547: Removing Engine Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove engine cover - 1 - upward.

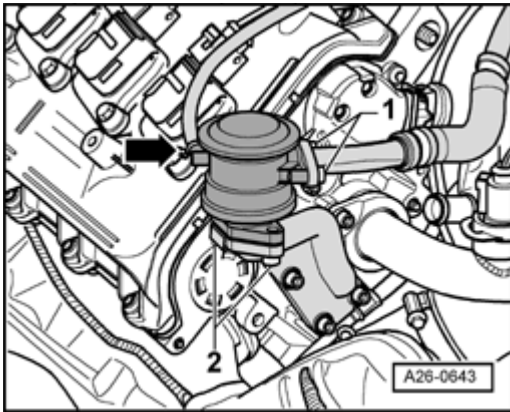


Fig. 548: Disconnecting Vacuum Hose At Combination Valve To Be Tested
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect vacuum hose - **arrow** - at combination valve to be tested.
- Connect hand vacuum pump V.A.G 1390 to vacuum hose of combination valve to be checked.

NOTE:

- Illustration depicts engine from rear.
- Left combination valve is shown in illustration.

For vehicles with parking/auxiliary heater:

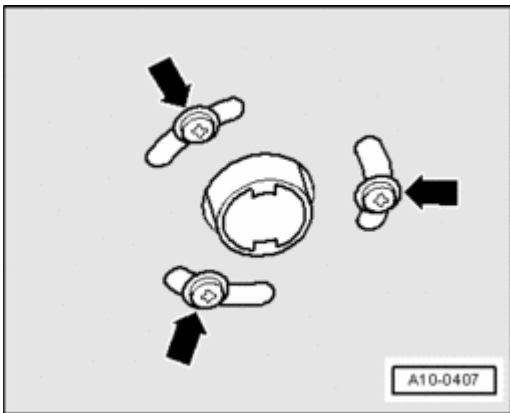


Fig. 549: Removing Bolts For Exhaust Pipe Of Parking Heater/Auxiliary Heater On Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - for exhaust pipe of parking heater/auxiliary heater on noise insulation.

All

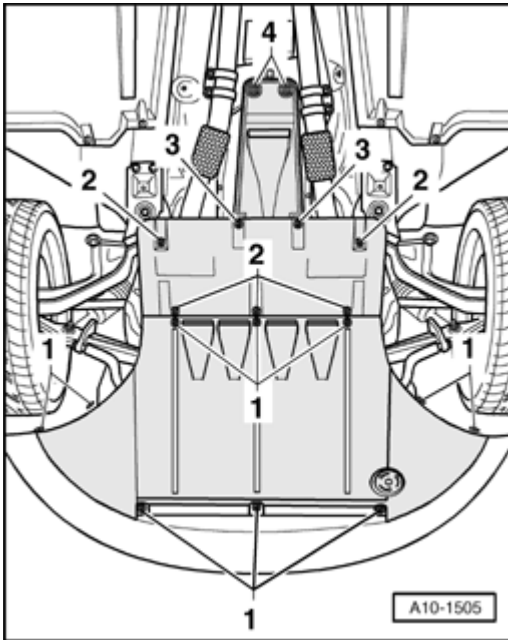


Fig. 550: Loosening Mounting Parts And Removing Noise Insulation
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove noise insulation - 1 -.

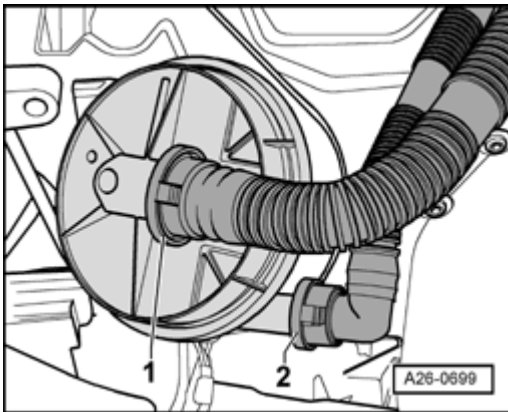


Fig. 551: Disconnecting Intake Air Duct At Secondary Air Injection (AIR) Pump Motor V101
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect pressure hose - 2 - at Secondary Air Injection (AIR) Pump Motor V101 and blow into it with light pressure (do not use pressurized air).
- Both combination valves must be closed, it must not be possible to blow through hose.
- Operate hand vacuum pump.
- The relevant combination valve must open, it must not be possible to blow through

If relevant combination valve does not open:

- Replace combination valve, left --> **Secondary Air Injection (AIR) (left combination valve), removing and installing** or right --> **Secondary Air Injection (AIR) (right combination valve), removing and installing**.

Secondary Air Injection (AIR) (left combination valve), removing and installing

Removing

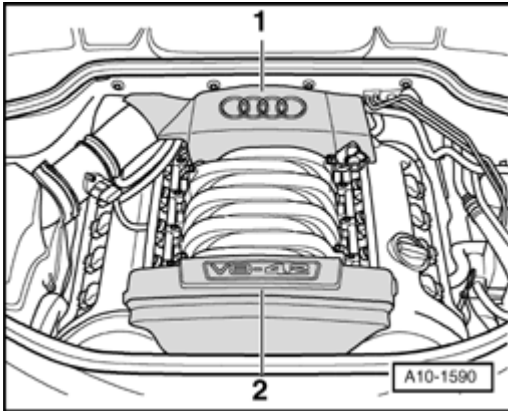


Fig. 552: Removing Engine Cover

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove engine cover - 1 - upward.

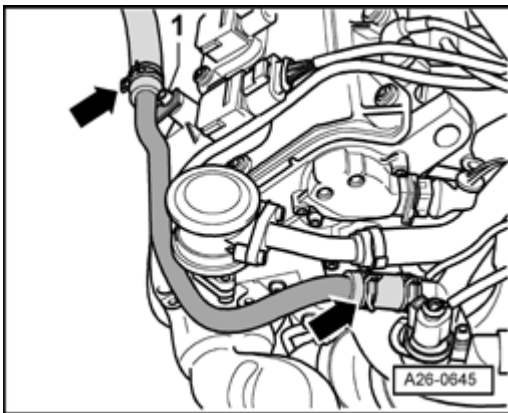


Fig. 553: Removing Pipe Of Crankshaft Housing Ventilation

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - 1 -.
- Remove pipe of crankshaft housing ventilation - **arrows** -.

NOTE:

- Illustration depicts engine from rear.

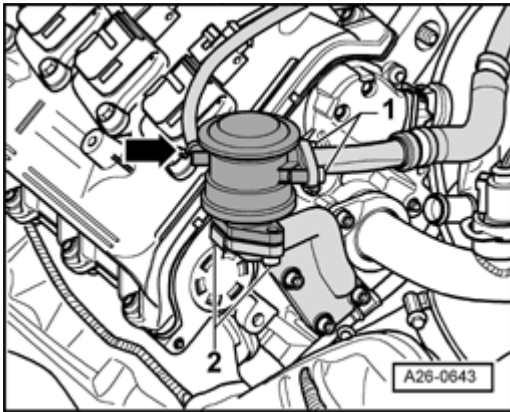


Fig. 554: Disconnecting Vacuum Hose At Combination Valve To Be Tested
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect vacuum hose - **arrow** -.
- Remove bolts - **1** - and - **2** - and remove combination valve.

NOTE: • Illustration depicts engine from rear.

Installing

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

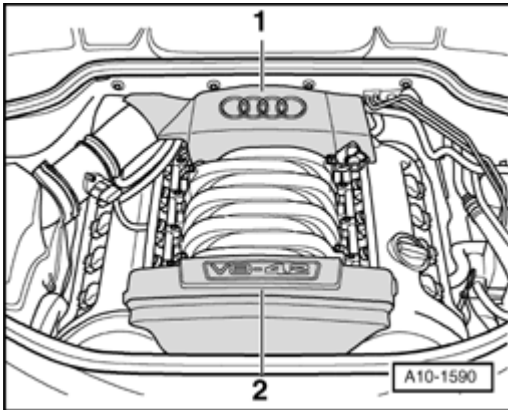
- NOTE:**
- Replace seals.
 - Secure all hose connections using hose clamps appropriate for the model type .

Torque specifications

Component	Nm
Combination valve to connection flange	10
Connecting tube to combination valve	10
Crankcase ventilation tube to cylinder head	10

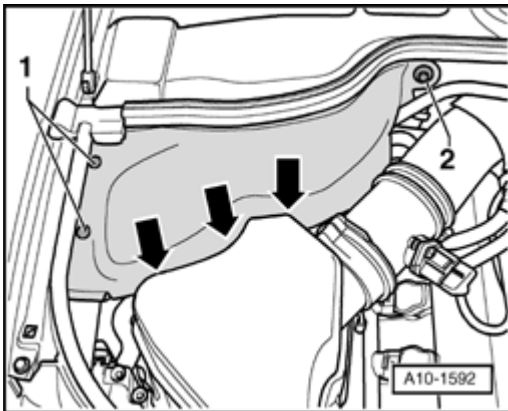
Secondary Air Injection (AIR) (right combination valve), removing and installing

Removing

**Fig. 555: Removing Engine Cover**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove engine cover - 1 - upward.

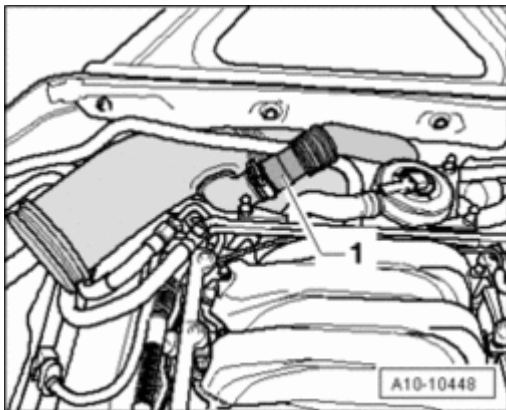
**Fig. 556: Identifying Clips & Bolt**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove clips - 1 -.
- Remove bolt - 2 - and remove cover.

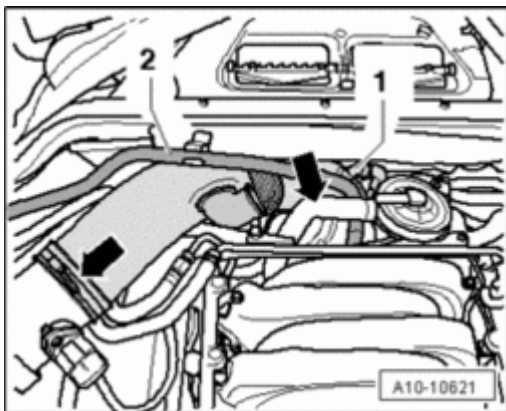
NOTE:

- Note clips when installing - arrows -.

**Fig. 557: Removing Hose**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove hose - **1** -.

**Fig. 558: Identifying Hose & Air Intake Tube**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect hose - **1** -.
- Unclip hose - **2** -.
- Remove air intake tube - **arrows** -.

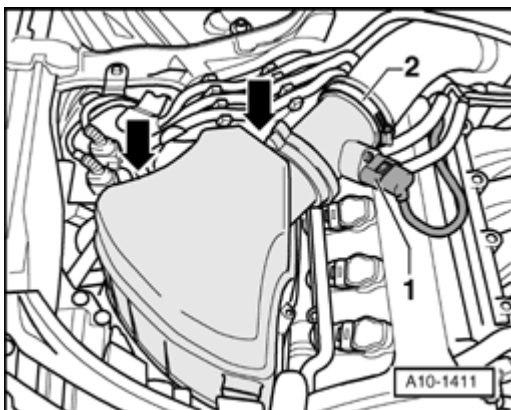


Fig. 559: Identifying Mass Air Flow (MAF) Sensor Electrical Connector & Air Filter Box
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **1** - from mass air flow (MAF) sensor.
- Remove air filter box - **arrows** -.

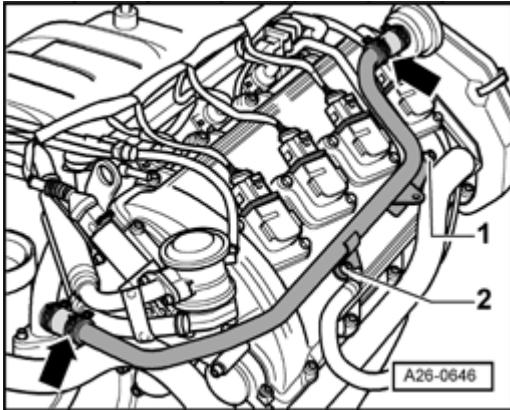


Fig. 560: Removing Bolts & Pipe Of Crankshaft Housing Ventilation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **1** - and - **2** -.
- Remove pipe of crankshaft housing ventilation - **arrows** -.

NOTE:

- **Illustration depicts engine from rear.**

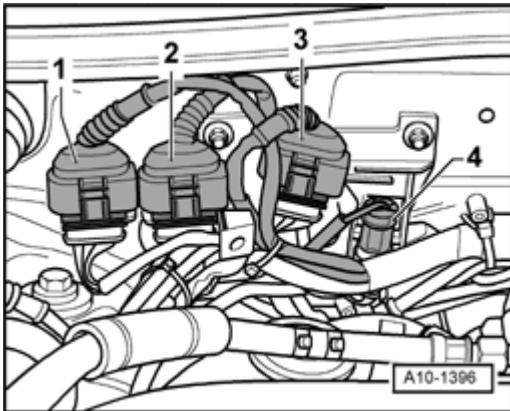


Fig. 561: Removing Electrical Harness Connectors From Bracket At Right Of Bulkhead
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove electrical harness connectors - **1 to 4** - from bracket at right of bulkhead.
- Remove bracket from bulkhead.

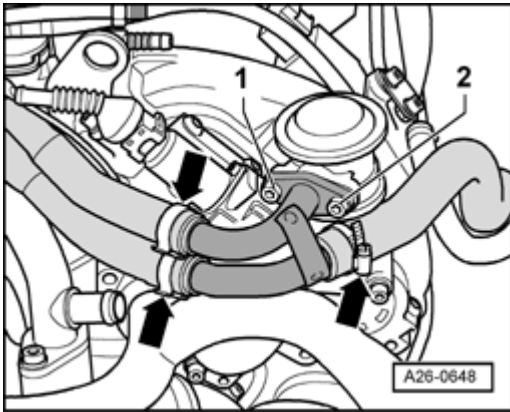


Fig. 562: Disconnecting Hoses For Secondary Air Injection (AIR) At Positions
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect hoses for Secondary Air Injection (AIR) at positions indicated by - **arrows** -.
- Remove bolts - **1** - and - **2** - and remove secondary air injection line.

NOTE: • **Illustration depicts engine from rear.**

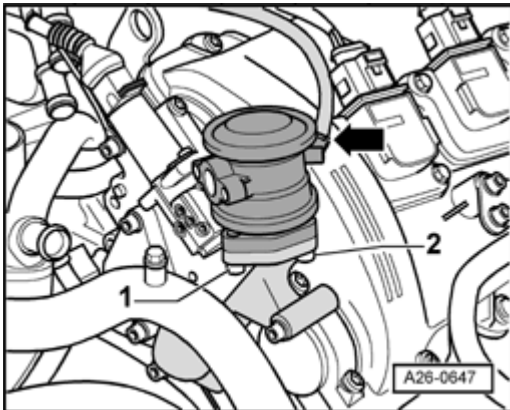


Fig. 563: Identifying Vacuum Hose, Bolts & Combination Valve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect vacuum hose - **arrow** -.
- Remove bolts - **1** - and - **2** - and remove combination valve.

NOTE: • **Illustration depicts engine from rear.**

Installing

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

NOTE: • **Always replace gaskets and seals.**
 • **Secure all hose connections using hose clamps appropriate for the model**

2006 Audi A8 Quattro

ENGINE 4.2 Liter V8 5V Engine Mechanical, Engine Code(s): BFM, BGK - A8

type .

- Install air filter --> **24 MULTIPOINT FUEL INJECTION (MPI)** .

Torque specifications

Component		Nm
Combination valve to connection flange		10
Connecting pipe at	Combi-valve	10
to	Cylinder head cover	10