

2004 Volkswagen Phaeton

ENGINE 4.2 Liter V8 5V Engine Mechanical, Fuel Injection & Ignition, Engine Code(s): BGH, BGJ

ENGINE

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00 - GENERAL, TECHNICAL DATA

TECHNICAL DATA

Technical Data

--> Engine Data

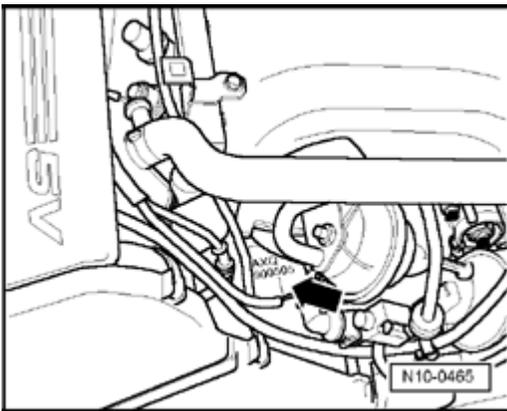


Fig. 1: Locating Engine Number

Courtesy of VOLKSWAGEN UNITED STATES, INC.

The engine number ("engine code" and "serial number") are stamped on the right side of the cylinder block - **arrow** -.

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

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

Engine Data

Engine Data

Engine code		BGH	BGJ
Manufactured		from 05.03	from 05.03
Cylinder arrangement		V-engine	V-engine
Cylinder angle		90 °	90 °
Displacement	ltr.	4.2	4.2
Output	kW at 1/rpm	228/6200	228/6200
Torque	Nm at rpm	410/3200	410/3200
Bore	dia. mm	84.5	84.5

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Stroke	mm	93.0	93.0
Compression ratio		11.0	11.0
Valves per cylinder		5	5
Fuel injection, ignition		Motronic ME7.1.1	Motronic ME7.1.1
Ignition sequence		1-5-4-8-6-3-7-2	1-5-4-8-6-3-7-2
Knock control		2 knock sensors	2 knock sensors
Lambda sensor		4 sensors	4 sensors
On Board Diagnosis (OBD)		EOBD	OBDII
Leak detection system		no	yes
Catalytic converter		yes	yes
Exhaust gas recirculation		no	no
Charging		no	no
Secondary air injection (AIR) system		yes	yes
Electronic Power Control (EPC)		yes	yes
Variable intake manifold		yes	yes
Variable valve timing		yes	yes
RON	min.	98 unleaded	98 unleaded

*In exceptional circumstances min. 95 RON, however with reduced performance

10 - ENGINE - ASSEMBLY

ENGINE, REMOVING AND INSTALLING

Engine, Removing and Installing

Engine, Removing and Installing

--> Engine, Securing to Assembly Stand

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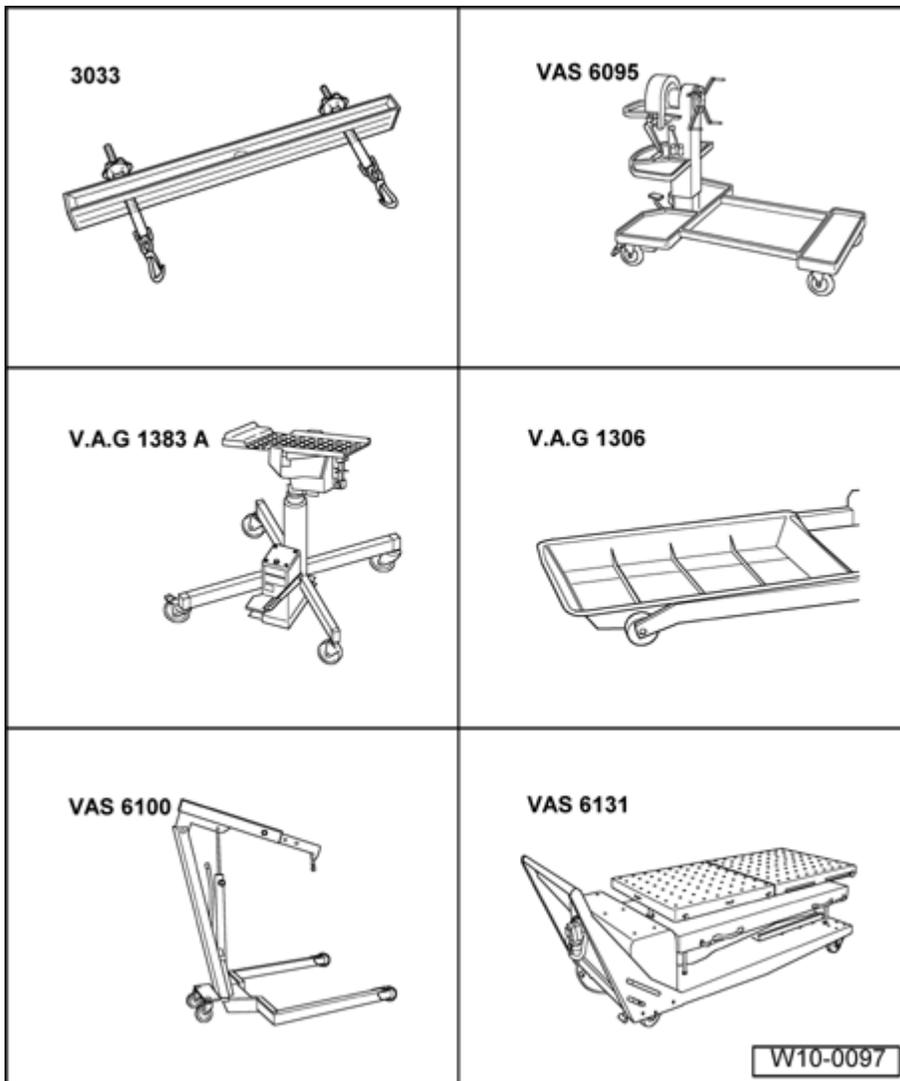


Fig. 2: Identifying Special Tools - Engine, Removing And Installing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Lifting tackle VAS 3033
- Drip tray V.A.G 1306
- Engine and transmission holder VAS 6095
- Shop crane VAS 6100

- Scissor lift table VAS 6131
- Engine/transmission jack V.A.G 1383 A

Not illustrated:

- Basic set VAS 6131/1

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- Support for left engine carrier VAS 6131/5-1
- Support for right engine carrier VAS 6131/5-2
- Engine support VAS 6131/5-4

- Brace VAS 6131/1-2
- Supports (Qty. 2) VAS 6131/1-3
- Supports (Qty. 2) VAS 6131/1-4
- Universal engine support VAS 6131/1-1

- Adapter VAS 6131/5-3
- Mounting pins VAS 6131/1-5
- Mounting pins VAS 6131/1-6
- Torque wrench (5 to 50 Nm) V.A.G 1331

Engine, removing

The engine with transmission is removed downward.

- Check DTC memories of all control modules, before removing engine:

NOTE:

- **To allow free rotation of the driveshaft, move the selector lever in the "N" position.**
- **Leave key in the ignition lock to prevent the steering wheel lock from engaging.**
- **When the engine is installed in the engine compartment some components cannot be removed or can only be removed with great difficulty. Therefore determine which components are faulty before removing engine.**
- **To prevent damage to removed components, use the container for removed components V.A.G 1698 for storage.**
- **All cable ties which are opened or cut open when removing engine, must be replaced in the same position when installing engine.**
- **Before disconnecting batteries, move the wiper arms to the service position --> 92 - WINDSHIELD WIPER AND WASHER SYSTEM**

Disconnecting batteries

The procedure must be strictly followed!

- Switch off ignition and all electrical consumers.
- First, disconnect vehicle battery, at right of luggage compartment. --> 27 - BATTERY, STARTER, GENERATOR, CRUISE CONTROL
- Then, disconnect auxiliary battery, at left of luggage compartment --> 27 - BATTERY, STARTER, GENERATOR, CRUISE CONTROL

Continued work procedure

- Pull engine compartment cover seal off bulkhead.
- Remove covers for plenum chamber. --> **64 GLASS, WINDOWS**

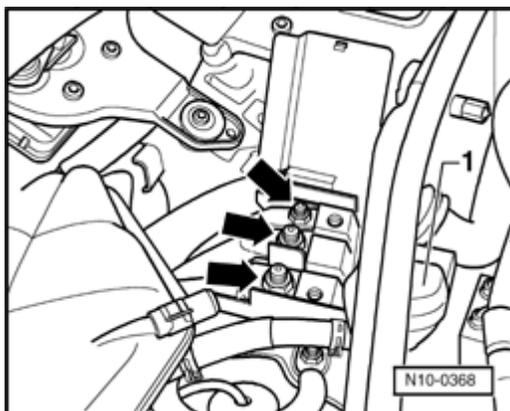


Fig. 3: Terminal 30 And Bracket With Positive Terminal In Engine Compartment
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove cable from terminal 30 - **arrows** - and remove bracket with positive terminal in engine compartment - **1** -.
- Lay cable harness aside on the engine.

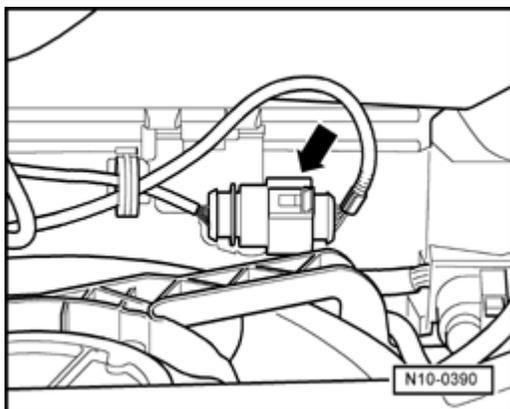


Fig. 4: 4-Pin Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect 4-pin connector - **arrow** - at lock carrier.
- Remove right windshield wiper motor. --> **92 - WINDSHIELD WIPER AND WASHER SYSTEM**
- Disconnect the smaller connector from the Engine Control Module (ECM).
- Disconnect remainder of connectors and Ground (GND) connections for this wiring harness.
- Lay cable harness aside on the engine.
- Disconnect connectors from left and right mass air flow (MAF) sensors, and remove respective intake hoses and air filter housing --> **Air Filter, Assembly Overview.**

CAUTION: Fuel supply lines are under pressure! Wear eye protection and protective gloves to avoid injuries and skin contact with fuel. Before removing from hose connection wrap a cloth around the connection. Then release pressure by carefully pulling hose off connection.

- Place a rag around connection to catch escaping fuel.

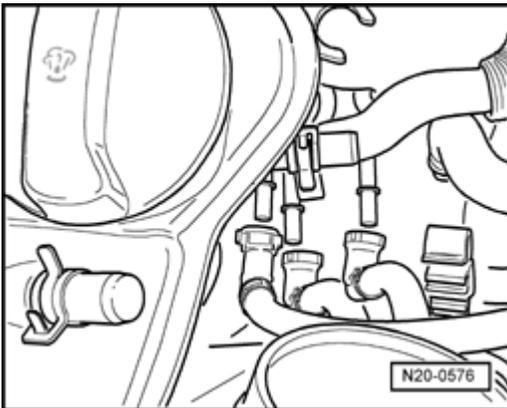


Fig. 5: Fuel Supply And Fuel Return Lines And Line At Evaporative Emissions Charcoal Canister
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect fuel supply and fuel return lines and line to evaporative emissions (EVAP) charcoal canister.

NOTE:

- Press buttons on hose couplings to do this.

- Seal the lines with a clean rag so that the fuel system is not contaminated by dirt, etc.
- Pull cover of protective housing for oxygen sensor connector upward and off.
- Separate connectors for oxygen sensors - 1 to 4 - and place wiring on engine.

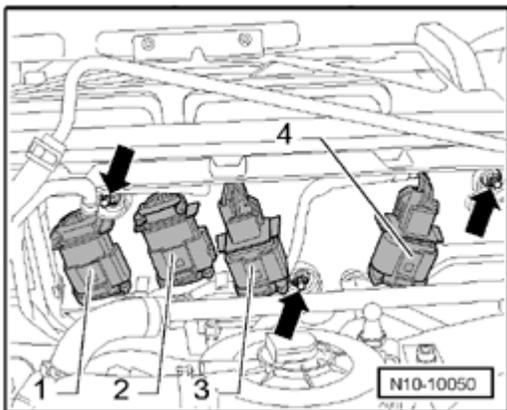


Fig. 6: Oxygen Sensors Connectors And Protective Housing From The Bulkhead
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- For improved accessibility, remove the protective housing from the bulkhead - **arrows** -.

NOTE:

- **Connector for cylinder bank 1 = Black, Connector for cylinder bank 2 = Brown**

- Extract refrigerant from air conditioning system: --> **87 - AIR CONDITIONING**
- Remove noise insulation tray: --> **50 BODY - FRONT**
- Loosen double pipe clamp between catalytic converter / center muffler and push clamp forward.
- Remove right and left catalytic converters with front muffler.

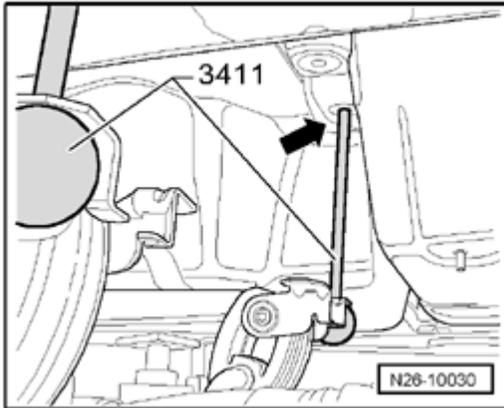


Fig. 7: Exhaust System With The Support Tool 3411 Supported At The Mounting Of The Exhaust Pipe Junction

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Support the exhaust system with the support tool 3411 at the mounting of the exhaust pipe junction - **arrow -**
- One after the other, replace the bolts with the large washer at driveshaft center bearing with bolts without washer.
- Remove driveshaft heat shield from vehicle underbody.

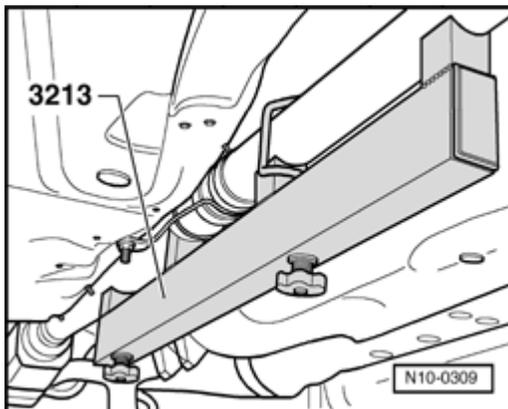


Fig. 8: Driveshaft Alignment Fixture 3213

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure driveshaft with alignment fixture 3213.

- Remove drive shaft: --> **39F - FRONT FINAL DRIVE, DIFFERENTIAL** or **39R - FINAL DRIVE, REAR DIFFERENTIAL** for 6 SPD. AUTOMATIC TRANSMISSION 09L ALL WHEEL DRIVE
- Press off the selector lever cable from the ball stud at the transmission and pull out the cable retaining clip.
- Remove front wheels.

- Remove left and right driveshafts from transmission.
- Remove front wheel housing liners. --> **66 EXTERIOR EQUIPMENT**
- In wheel housings, separate all connectors between body and front axle.
- Remove front brake calipers and secure them to the body. --> **46 - BRAKES - MECHANICAL COMPONENTS**

- Remove front stabilizer bar.

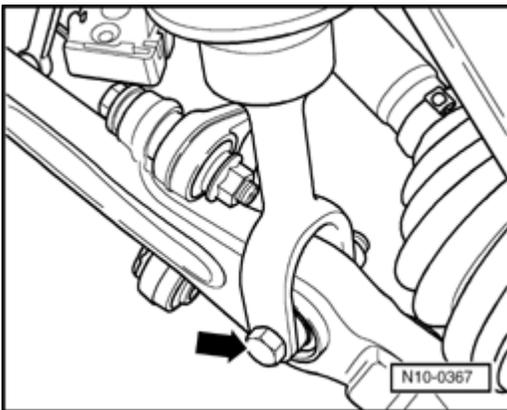


Fig. 9: Suspension Struts Lower Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove lower bolts - **arrow** - of suspension struts.
- Remove nut - **1** - and bolt.

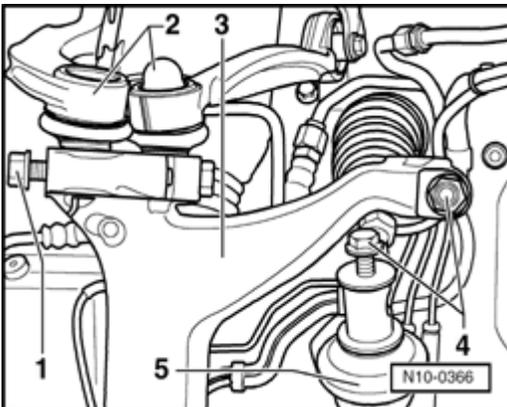


Fig. 10: Upper Control Arms, Wheel Bearing Housings And Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press upper control arms - **2** - off from wheel bearing housings - **3** -.
- Remove bolts - **4** - and press off tie rod ends.
- Remove subframe. --> **40 - FRONT SUSPENSION**
- Separate hose connection from engine mount to vacuum reservoir, in front of left wheel housing.

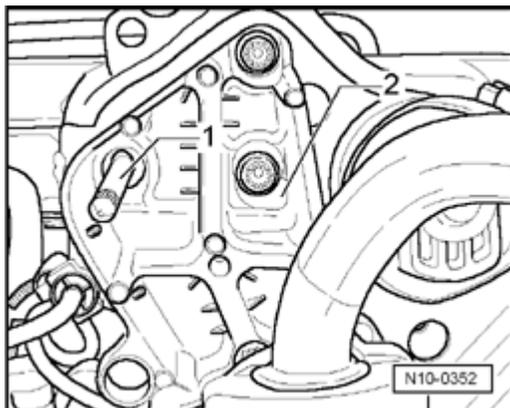


Fig. 11: Engine Carrier, Bolts And Mounting Pins VAS 6131/1-6
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front bolts from engine carrier - **2** - and install mounting pins VAS 6131/1-6 - **1** -.

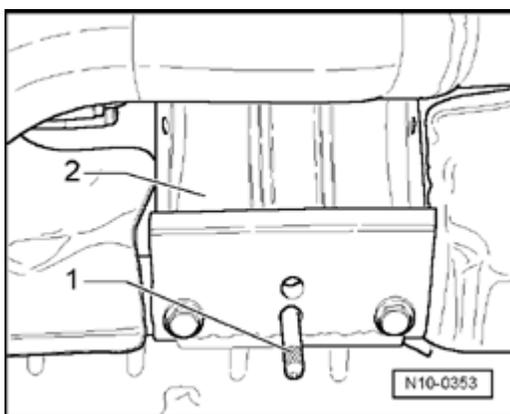


Fig. 12: Transmission Plate Center Bolts And Mounting Pins VAS 6131/1-5
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove center bolts from transmission plate - **2** - and install mounting pins VAS 6131/1-5 - **1** -.
- Remove Ground (GND) wire behind windshield washer fluid reservoir on longitudinal member.
- Drain engine coolant --> **Cooling System, Draining and Filling**
- Disconnect hose connections to heater core from left wheel housing and catch escaping coolant.
- Pull upper coolant hose off radiator, and lower coolant hose off coolant pipe.

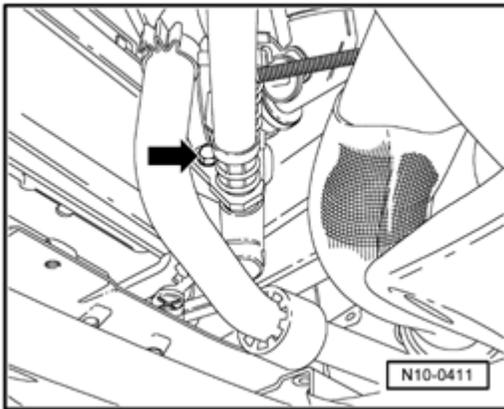


Fig. 13: Transmission Oil Cooler Lines

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect lines - **arrow** - from transmission oil cooler below on right. Catch fluid which runs out.
- Disconnect line from power steering fluid cooler below on left. Catch fluid which runs out.

Preparing Scissor lift table VAS 6131 for further steps:

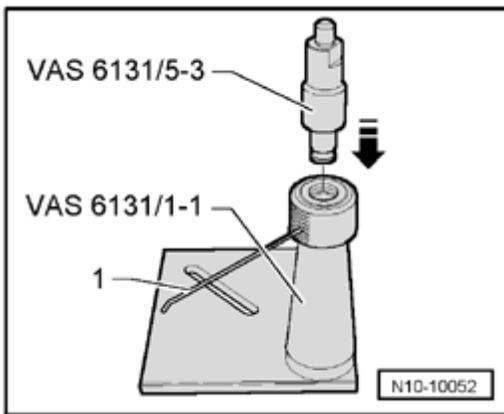


Fig. 14: Loosening Bolt Of Universal Engine Support VAS 6131/1-1

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using a Allen wrench - **1** - , loosen bolt of universal engine support VAS 6131/1-1 , set adapter VAS 6131/5-3 in place and lightly fasten bolt against it.
- Install knurled nut of universal engine support VAS 6131/1-1 as far downward as possible.

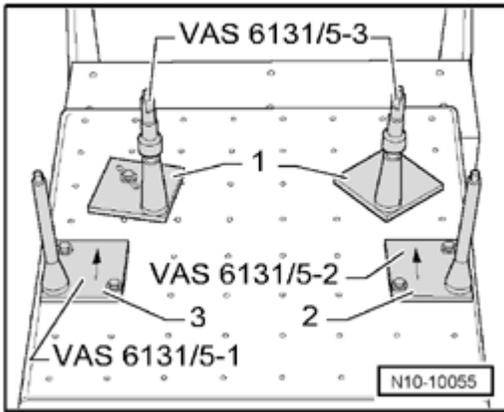


Fig. 15: Converted Universal Engine Support VAS 6131/1-1 Fastened By Hand Into Positions B3 And G3 Of The Lifting Table
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- o Fasten converted universal engine support VAS 6131/1-1 - 1 - by hand into positions B3 and G3 of the lifting table.

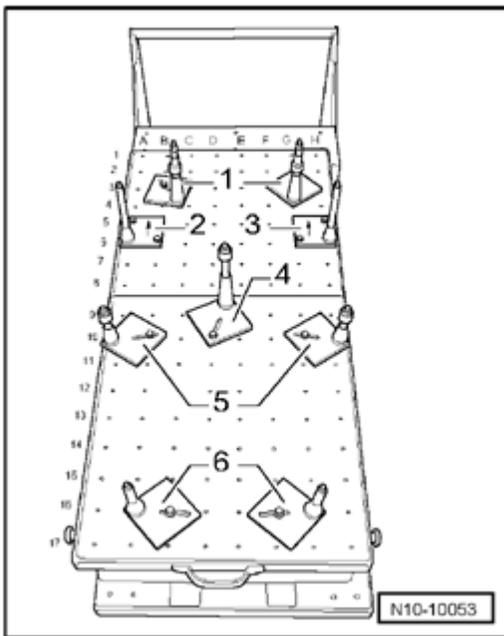


Fig. 16: Support For Left Engine Carrier VAS 6131/5-1 In Positions A5 And B6, As Well As Support For Right Engine Carrier VAS 6131/5-2 In Positions H5 And G6 On The Lift Table
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- o Now install support for left engine carrier VAS 6131/5-1 - 2 - in positions A5 and B6, as well as support for right engine carrier VAS 6131/5-2 - 3 - in positions H5 and G6 on the lift table. The arrows on supports indicate forward.
- o Place supports universal engine support VAS 6131/1-3 for subframe - 5 - and universal engine support VAS 6131/1-4 for transmission console - 6 - in the corresponding positions on the lift table.
- o Move the horizontally aligned lift table under the powertrain aggregate. The supports - 2 - and - 3 - must

be guided into corresponding mount at right and left of engine carrier.

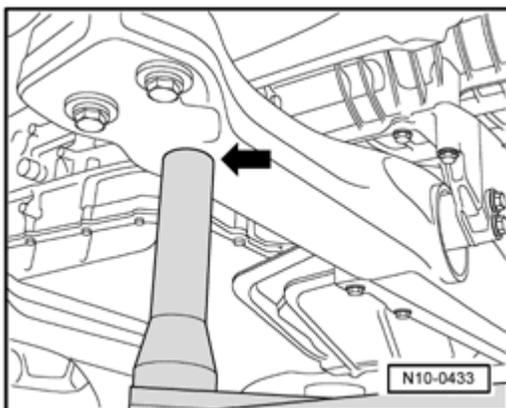


Fig. 17: Right And Left Supports For Transmission Console Guided Into Corresponding Holes
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Simultaneously, guide right and left supports for transmission console into corresponding holes - **arrow** -.
- Make sure that the universal engine support VAS 6131/1-1 with the flattened side of the adapter VAS 6131/5-3 - **arrow** - is guided into the hole of the upper part of oil pan.

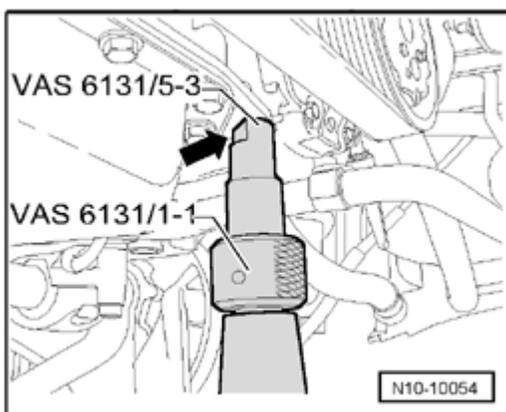


Fig. 18: Adjusting Height Level Using Universal Engine Support VAS 6131/1-1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using the knurled nut, the height level can be adjusted in case the universal engine support VAS 6131/1-1 is adjusted too low.
- When all supports are in the appropriate mounting holes, without pressure:
- Remove the bolts from the engine carrier and the transmission cross beam.
- Slowly lower engine/transmission assembly, constantly observing clearance.

Procedure for transmission/engine separation

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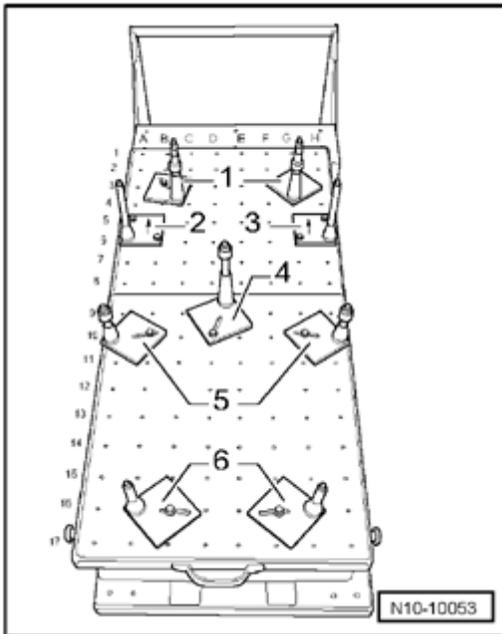


Fig. 19: Support For Left Engine Carrier VAS 6131/5-1 In Positions A5 And B6, As Well As Support For Right Engine Carrier VAS 6131/5-2 In Positions H5 And G6 On The Lift Table
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Support transmission with support VAS 6131/1-2 - 4 - on lift table.

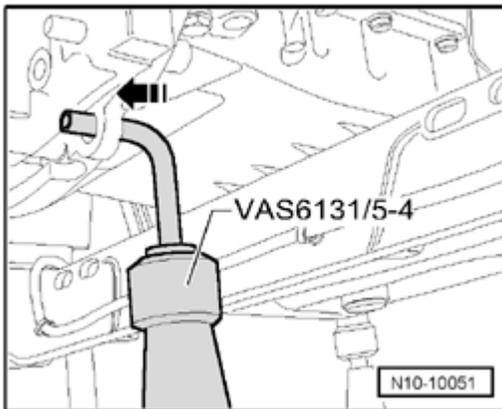


Fig. 20: Angled Mounting Pin Of Support VAS 6131/5-4 Inserted Into Hole Of Oil Pan
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert angled mounting pin of support VAS 6131/5-4 into hole of oil pan, as shown, in direction of - **arrow** - from engine side.
- Fasten supports, positioned free of stress, to table.
- Now the transmission can be removed.

NOTE:

- **To separate engine and transmission: --> Operating instructions for scissor lift table VAS 6131**

Engine, Securing to Assembly Stand

Engine, Securing to Assembly Stand

- Secure torque converter to prevent it from "falling out" after engine and transmission are separated.

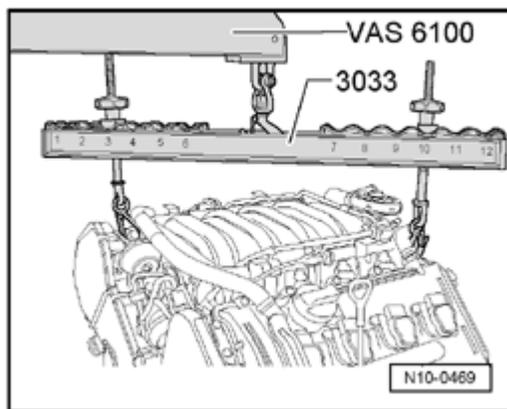


Fig. 21: Lifting Engine From Assembly Platform Using Shop Crane VAS 6100 And Lifting Device VAS 3033

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Attach lifting device VAS 3033 as follows and lift engine from assembly platform using shop crane VAS 6100.

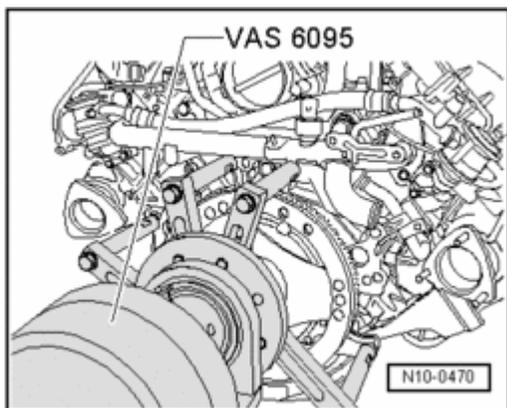


Fig. 22: Center Of The Flywheel At The Height Of The Mounting Plate Of The Engine And Transmission Holder VAS 6095

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift engine on shop crane VAS 6100 so far that the center of the flywheel is at the height of the mounting plate of the engine and transmission holder VAS 6095. Thereafter, fasten the four universal mounting points to cylinder block as shown.

Installation Information

Procedure

NOTE:

- When moving the drivetrain into the body, it is absolutely necessary to bring the engine carrier with the scissor lift table VAS 6131 to rest against the body. By "pulling up" on the engine carrier and bolts, the threaded inserts can be damaged!

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

When engine is separated from transmission:

- Check whether alignment bushings for centralizing the engine/transmission are equipped in cylinder block, install if necessary. --> **37 - AUTOMATIC TRANSMISSION - CONTROLS, HOUSING**

If transmission is not yet bolted on:

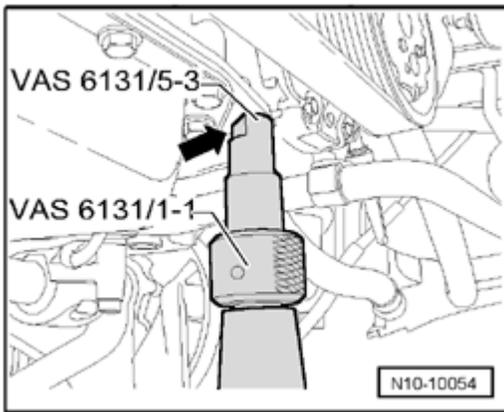


Fig. 23: Adjusting Height Level Using Universal Engine Support VAS 6131/1-1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Support engine at front left and right using universal engine support VAS 6131/1-1 and installed adapter VAS 6131/5-3.

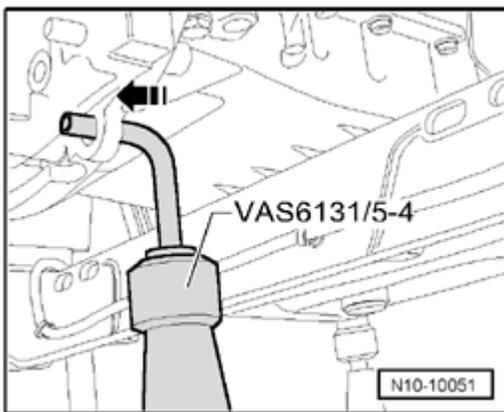


Fig. 24: Angled Mounting Pin Of Support VAS 6131/5-4 Inserted Into Hole Of Oil Pan
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- Also, support engine with support VAS 6131/5-4.
- Before installing the assembly, install the exhaust manifold with catalytic converters to the engine, --> **Exhaust Manifolds with Primary Catalytic Converters and Attachments, Assembly Overview** and align the exhaust system --> **Primary Catalytic Converters, Aligning with Exhaust Pipes**.
- Install subframe again.

CAUTION: When doing any repair work, especially in the engine compartment, pay attention to the following due to clearance issues:

- **Route all the various lines (e.g. for fuel, hydraulics, EVAP system, coolant, refrigerant, brake fluid and vacuum lines and hoses) and electrical wiring so that the original positions are restored.**
- **Ensure sufficient clearance to all moving or hot components.**

Vehicles with automatic transmission

- When installing the engine, use scissor lift table to lift so far that the selector cable can be attached.
- Reconnect all lines, hoses and electrical connections that were disconnected for the removal procedure.
- Top-off ATF level: --> **37 - AUTOMATIC TRANSMISSION - CONTROLS, HOUSING**

Continued for all vehicles

- Connect air conditioning lines: --> **87 - AIR CONDITIONING**
- Fill air conditioning system with refrigerant again: --> **87 - AIR CONDITIONING**
- Top off oil for power steering system: --> **48 - STEERING**
- Fill with coolant --> **Cooling System, Draining and Filling**.
- If necessary, top off engine oil.

NOTE: ● **After installing the assembly, perform a vehicle alignment --> 44 - WHEELS, TIRES, WHEEL ALIGNMENT**

Observe safety precautions that apply to road tests.

- Perform road test and check all DTC memories: --> Vehicle diagnostic, test and information system VAS 5051; Guided Fault Finding; Vehicle system test

Tightening Specifications

Bolted connections		Torque specifications
Bolts, nuts	M6	10 Nm
	M7	15 Nm
	M8	25 Nm

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	M10	40 Nm
	M12	60 Nm
Deviation from		
Engine holder to engine mount (bolt)	M10	40 Nm + 1 / 4 turn (90 °)
Engine mount to engine carrier (nut)	M10	30 Nm + 1 / 4 turn (90 °)
Engine carrier to chassis (bolt)	M12	90 Nm + 1 / 4 turn (90 °)
Driveshafts to transmission: Suspension, Wheels, Steering 40 Front Suspension, Servicing		

13 - ENGINE - CRANKSHAFT, CYLINDER BLOCK

ENGINE, DISASSEMBLING AND ASSEMBLING

Engine, Disassembling and Assembling

--> **Part I - Toothed Belt Drive, Assembly Overview**

--> **Part II - Cylinder Block, Assembly Overview**

--> **Engine Holder and Engine Mount, Removing and Installing**

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

--> **Ribbed Belt, Checking Alignment**

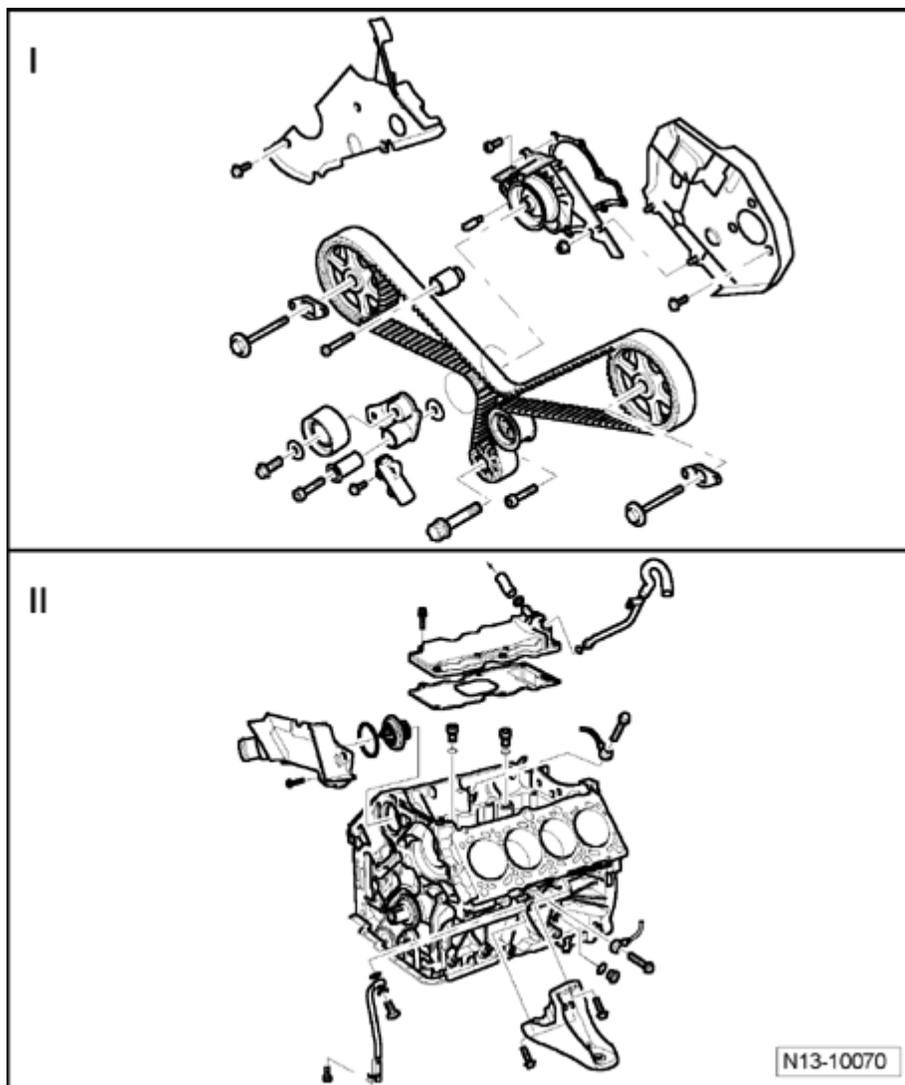


Fig. 25: Engine, Disassembling And Assembling - Parts I And II
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

CAUTION: The crankshaft must not be removed. Even just by loosening the crankshaft bearing cap bolts, the bearing seats of the cylinder block are already deformed. These deformations reduce the bearing clearance. Even if the bearing shells are not replaced, bearing damage could occur due to the changed bearing clearance.

If the bearing cap bolts are loosened, the complete cylinder block with crankshaft must be replaced.

It is not possible to measure crankshaft bearing clearance using workshop equipment.

NOTE:

- Secure engine in engine and transmission holder VAS 6095 when working

on engine.

- The engine must not be set down on the oil pan otherwise the liquid gasket between upper and lower oil pan will be damaged.
- If large quantities of metal particles or abraded material are detected during engine repairs, it may be an indication for a damaged crankshaft or rod bearings. To prevent further damage, perform the following steps after the repair:
 - Thoroughly clean oil passages
 - Replace oil return valve,
 - Replace oil spray jets
 - Replace oil cooler
 - Replace oil filter

Part I - Toothed Belt Drive, Assembly Overview

Part I - Toothed Belt Drive, Assembly Overview

Toothed belt, removing, installing and tensioning --> **Toothed Belt, Removing and Installing**

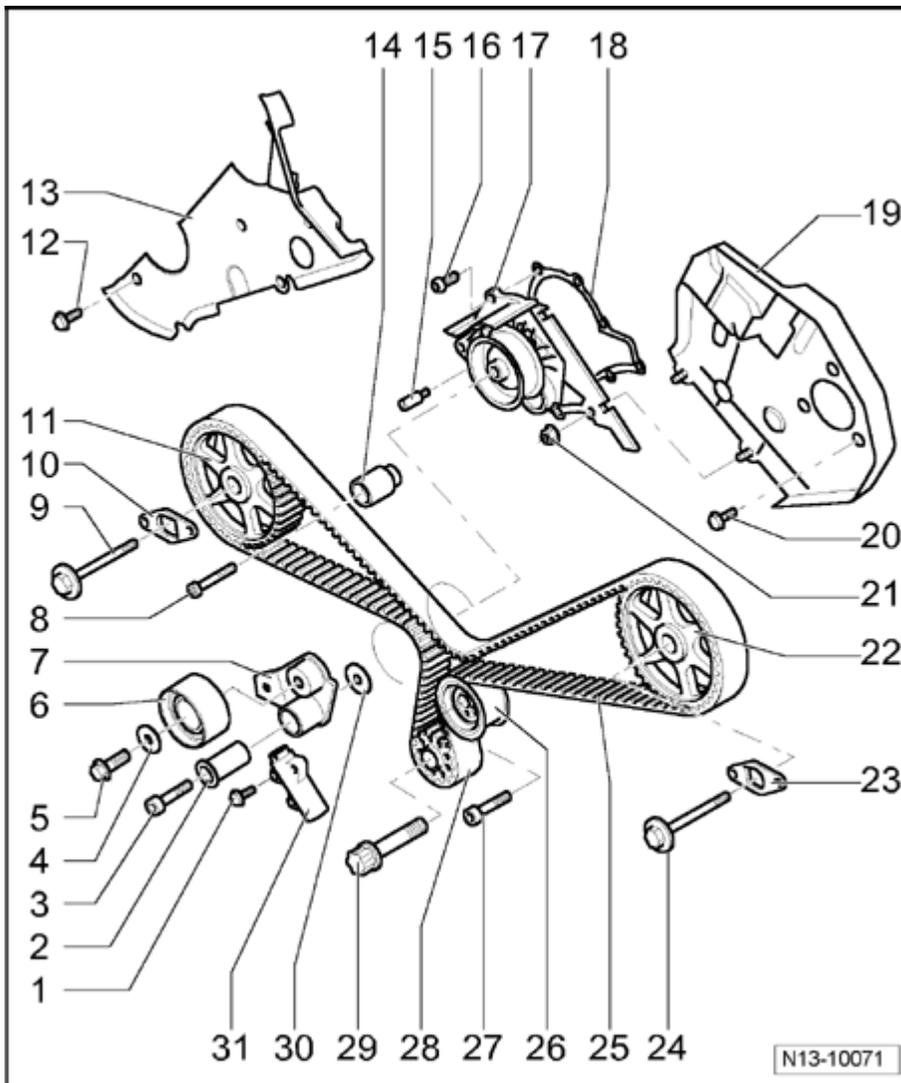


Fig. 26: Part I - Toothed Belt Drive, Assembly Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - 10 Nm

2 - Bearing sleeve

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

- Replace

4 - Washer

- For tensioning roller

5 - 40 Nm

6 - Tensioning roller

7 - Tensioning lever

8 - 22 Nm

9 - 55 Nm

- Replace
- Lubricate threads and cylinder head contact surface

10 - Securing plate

- Replace
- Note installed position: Labelled side faces toward rear

11 - Right camshaft sprocket

- Pull off from camshaft with puller T40001 and claw T40001/2
- Removing and installing --> **Toothed Belt, Removing and Installing**

12 - 10 Nm

- Insert with locking fluid D 000 600 A2

13 - Right rear toothed belt guard

14 - Idler roller

15 - Bolt, 6 Nm

16 - 15 Nm

17 - Coolant pump

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

18 - Gasket

- Replace

19 - Left rear toothed belt guard

20 - 10 Nm

- Insert with locking fluid D 000 600 A2

21 - 10 Nm

22 - Left camshaft sprocket

- Pull off from camshaft with puller T40001 and claw T40001/2
- Removing and installing --> **Toothed Belt, Removing and Installing**

23 - Securing plate

- Replace
- Note installed position: Labelled side faces toward rear

24 - 55 Nm

- Replace
- Lubricate threads and cylinder head contact surface

25 - Toothed belt

- Mark direction of rotation before removing
- Check for wear
- Do not kink
- Removing and installing, tensioning --> **Toothed Belt, Removing and Installing**

26 - Eccentric roller

27 - 45 Nm

28 - Crankshaft toothed belt sprocket

- Only possible to install in one position
- To remove, lock crankshaft with crankshaft holder 3242 --> **Drive Plate, Removing and Installing**

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

- Replace
- Do not oil lubricate additionally
- Additional rotation can occur in several stages

30 - Washer

- For tension lever

31 - Tensioning element

Part II - Cylinder Block, Assembly Overview

Part II - Cylinder Block, Assembly Overview

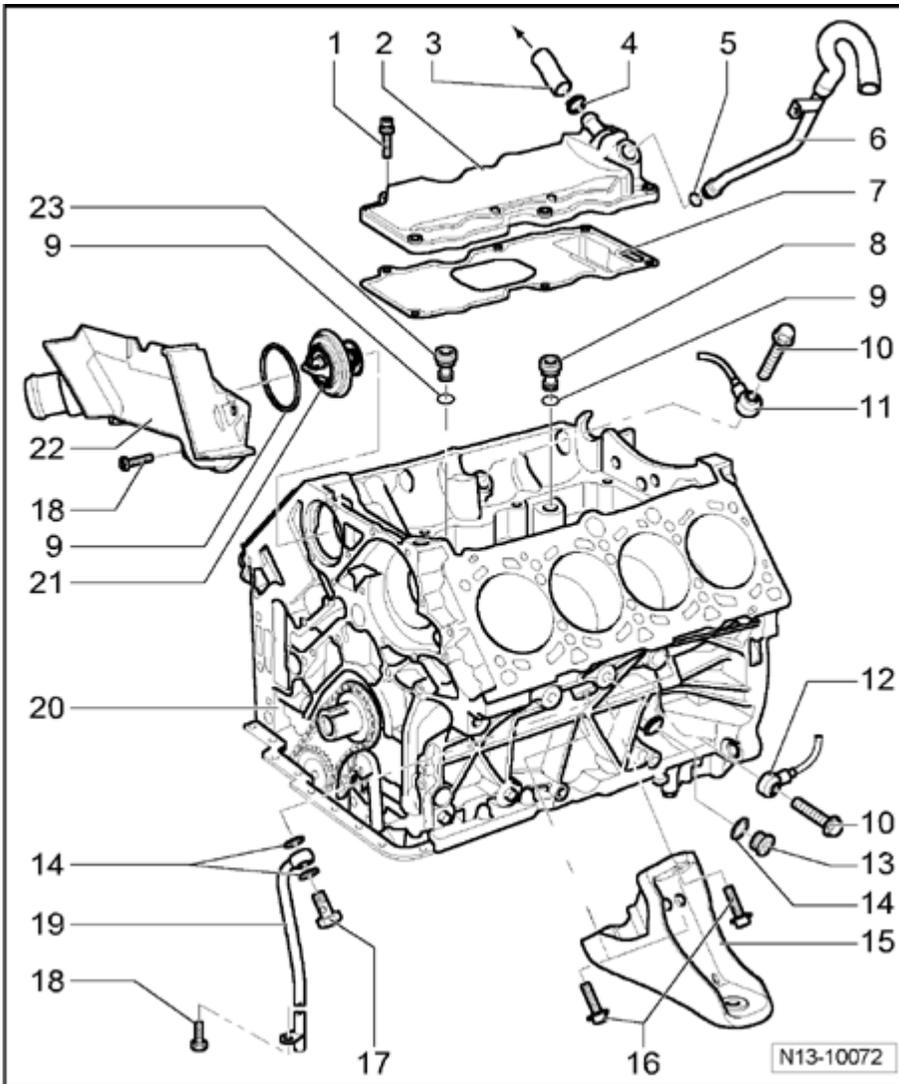


Fig. 27: Part II - Cylinder Block, Assembly Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - 10 Nm

2 - Cover

- With connection for crankcase ventilation

3 - Connecting hose

- For crankcase ventilation

2004 Volkswagen Phaeton

ENGINE 4.2 Liter V8 5V Engine Mechanical, Fuel Injection & Ignition, Engine Code(s): BGH, BGJ

4 - Clamp

5 - O-ring

- Replace

6 - Connecting pipe

- For crankcase ventilation

7 - Trim strip

- With gasket
- Replace

8 - Oil return valve

- For right cylinder head

9 - O-ring

- Replace

10 - 20 Nm

- Tightening torque affects function of Knock Sensor (KS)

11 - Knock sensor 1 G61

12 - Knock sensor 2 G66

13 - Sealing plug, 35 Nm

14 - Oil seal

- Replace

15 - Engine holder

- Engine holder and engine mount, removing and installing --> **Engine Holder and Engine Mount, Removing and Installing**
- Tightening torques --> **Engine holder and torque specifications**

16 - 50 Nm

- Replace

17 - Banjo bolt, 30 Nm

18 - 10 Nm

19 - Coolant drain tube

20 - Cylinder block

21 - Coolant thermostat

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

22 - Coolant thermostat housing

23 - Oil return valve

- For left cylinder head

Engine holder and torque specifications

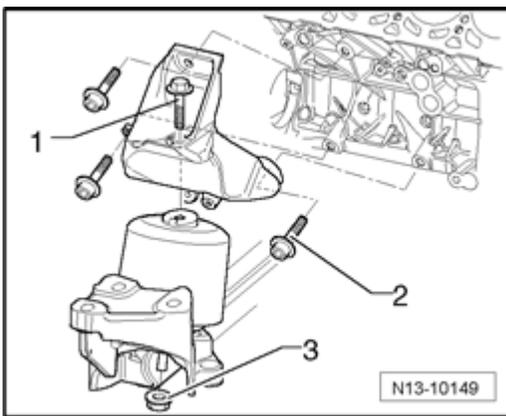


Fig. 28: Engine Holder

Courtesy of VOLKSWAGEN UNITED STATES, INC.

Engine holder and engine mount, removing and installing --> **Engine Holder and Engine Mount, Removing and Installing**

Torque specification for bolt - 1 - : 40 Nm plus an additional $1/4$ turn (90)

Torque specification for bolt - 2 - : 50 Nm.

Torque specification for nut - 3 - : 30 Nm plus an additional $1/4$ turn (90)

Engine Holder and Engine Mount, Removing and Installing

Engine Holder and Engine Mount, Removing and Installing

Special tools, testers and auxiliary items required

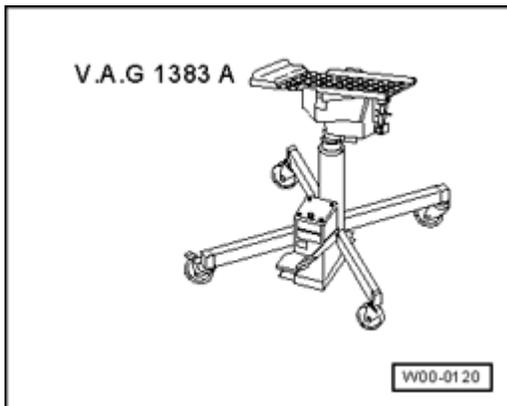


Fig. 29: Identifying Engine/Transmission Jack V.A.G. 1383 A
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Engine/transmission jack V.A.G 1383 A
- Assembly support T10296
- Remove noise insulation --> **50 BODY - FRONT**

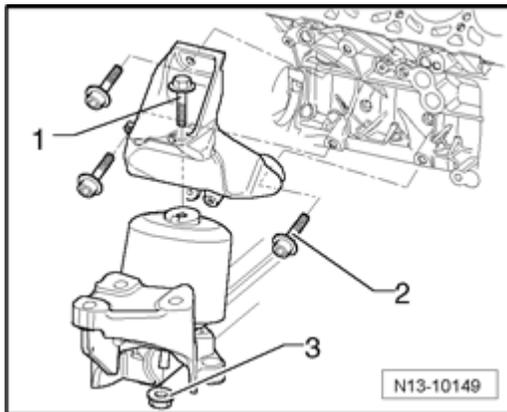


Fig. 30: Engine Holder
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- First remove bolt - **1** - and nut - **3** - on left and right side of engine.
- Place assembly supports T10296 with adapters T10296/1 onto engine/transmission jack V.A.G 1383 A.

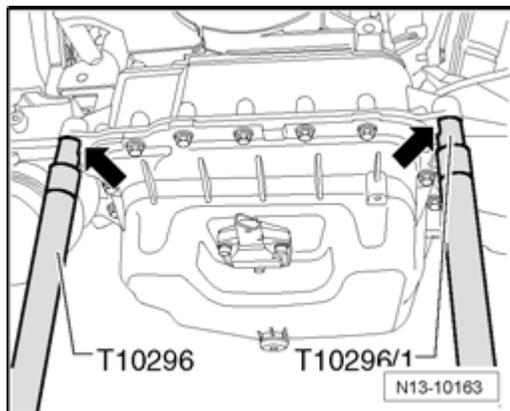


Fig. 31: Assembly Supports T10296 With Adapters T10296/1 Placed At Lifting Points
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place the assembly supports T10296 with adapters T10296/1 at lifting points - **arrows** - with flattened sides toward oil pan, and positioned centrally.
- Tighten braces of assembly supports.
- Carefully lift the engine, maintaining clearance of engine to bulkhead.
- Pry respective engine mount slightly out of subframe and pull off vacuum hose.
- Now remove engine mount.

When installing, observe upper locating pin of engine mount. It must face outward and install into engine holder.

The rest of assembly is a reverse of disassembling sequence.

Torque specifications for installation --> **Engine holder and torque specifications**

Ribbed Belt, Removing and Installing

Ribbed Belt, Removing and Installing

Alignment of ribbed belt, checking --> **Ribbed Belt, Checking Alignment**

Removing

- Remove noise insulation --> **50 BODY - FRONT** .
- Mark direction of rotation of ribbed belt.

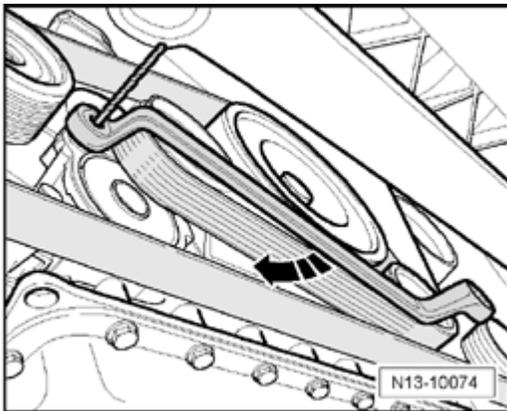


Fig. 32: Turning Wrench Clockwise Until Tensioning Element Can Be Locked In Place
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Turn wrench clockwise - **arrow** - until tensioning element can be locked in place with a 5 mm drill.
- Remove ribbed belt.

Installing

NOTE:

- **Ensure, before installing ribbed belt, that all ancillaries (generator, air conditioner compressor, power steering pump) are secured tightly.**
- **Check that idler roller turns easily.**
- **When installing the ribbed belt, be aware of the direction of rotation and ensure that the belt is seated correctly in the belt pulleys.**

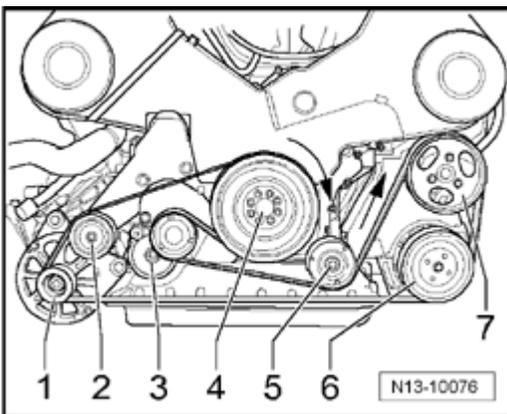


Fig. 33: Ribbed Belt Routing
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Route ribbed belt as shown.
- 1 = Generator belt pulley
- 2 = Idler roller (Torque specification 40 Nm)
- 3 = Tensioning element with tensioning roller (Torque specification 40 Nm)

- 4 = Belt pulley/vibration damper
- 5 = Idler roller (Torque specification 25 Nm)
- 6 = Air conditioning compressor belt pulley
- 7 = Power steering pump belt pulley

After completing repairs:

- Always start engine and check belt running.

Ribbed Belt, Checking Alignment

Ribbed Belt, Checking Alignment

NOTE:

- If the power steering pump, the air conditioning compressor or the bracket for power steering pump or air conditioning compressor were replaced, the alignment of the ribbed belt must be checked to prevent damage to the ribbed belt:

Special tools, testers and auxiliary items required

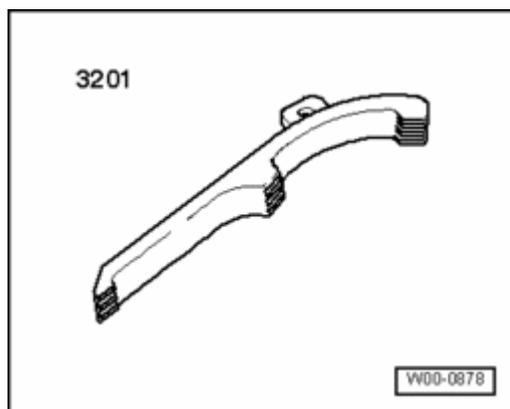


Fig. 34: Alignment Gauge 3201

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Alignment gauge 3201

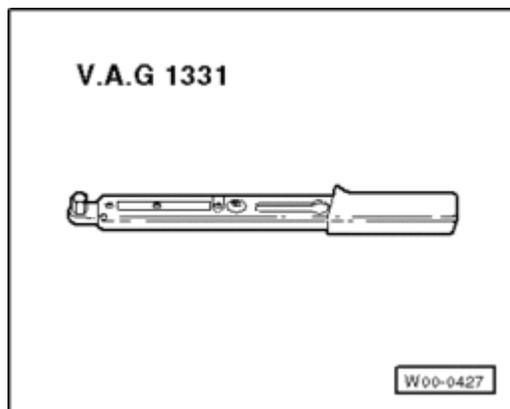


Fig. 35: Torque Wrench V.A.G 1331

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Torque wrench (5 to 50 Nm) V.A.G 1331

Work procedure

- Remove ribbed belt --> **Ribbed Belt, Removing and Installing**

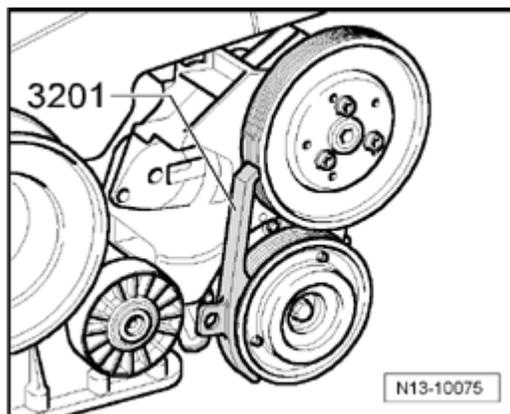


Fig. 36: Alignment Gauge 3201 Set Onto Belt Pulley Of Air Conditioning Compressor

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set alignment gauge 3201 onto belt pulley of air conditioning compressor.

NOTE:

- The air conditioning compressor belt pulley must align with power steering pump belt pulley.

If belt pulleys do not align

- Remove power steering pump belt pulley.

NOTE:

- To loosen bolts, counterhold belt pulley using Retainer 3036.

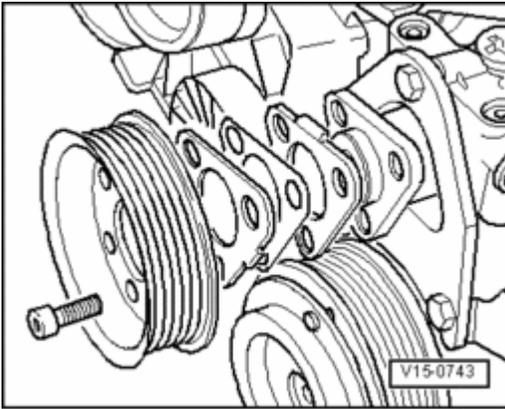


Fig. 37: Belt Pulley And Spacers

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Even up distance of belt pulley using spacers of thicknesses 0.6, 0.8, 1.0, 1.2, and 1.4 mm.
- To finish, verify alignment of belt pulley using alignment gauge 3201
- Tighten power steering belt pulley bolts to 22 Nm.
- Install ribbed belt --> **Ribbed Belt, Removing and Installing.**

SEALING FLANGE AND DRIVE PLATE, ASSEMBLY OVERVIEW

Sealing Flange and Drive Plate, Assembly Overview

Sealing Flange and Drive Plate, Assembly Overview

--> **Sealing Flange, Drive Plate Side, Removing and Installing**

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

--> **Crankshaft Seal, Vibration Damper Side, Replacing**

NOTE:

- **Secure engine in engine and transmission holder VAS 6095 when working on engine.**

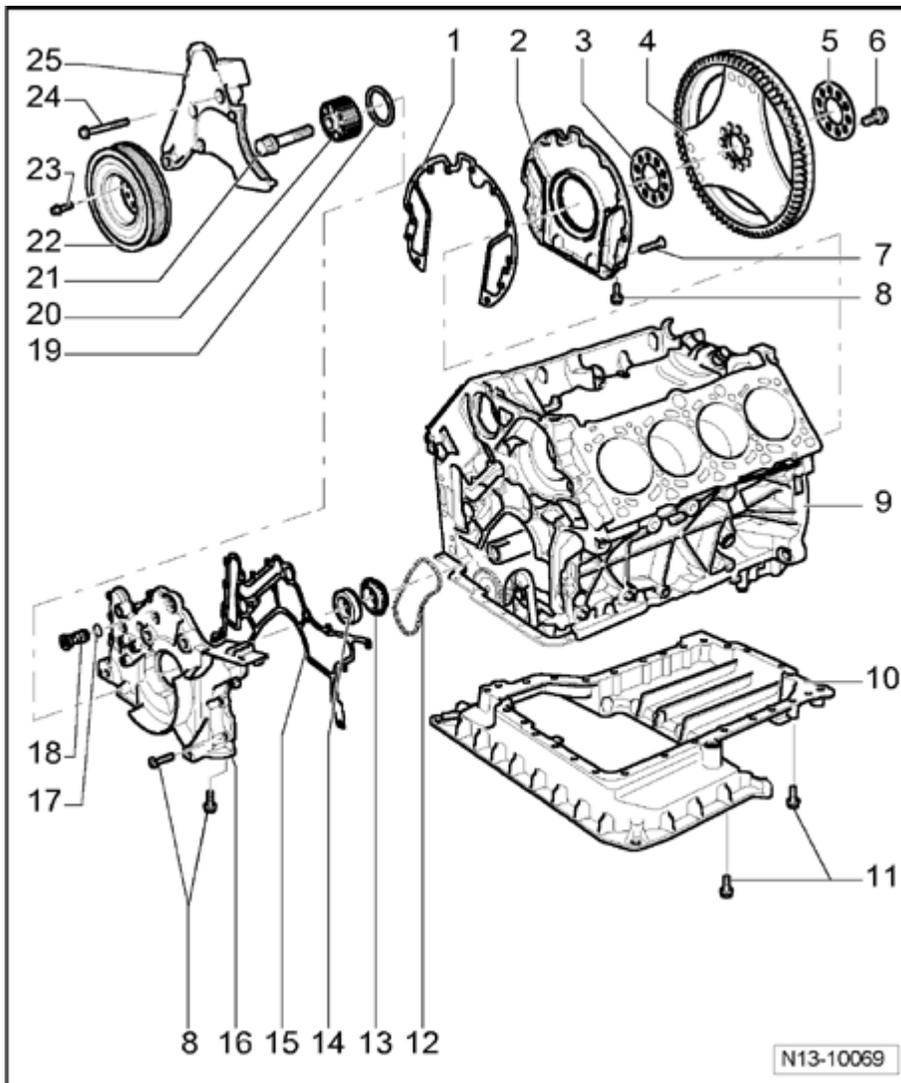


Fig. 38: Sealing Flange And Drive Plate, Assembly Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Gasket

- Replace

2 - Sealing flange

- With seal
- To remove and install, remove oil pan --> **Oil Pump, Removing and Installing**
- Must be located on alignment bushings
- Before installing, remove oil remains from crankshaft journal with a clean cloth
- Do not additionally oil or grease sealing lip of sealing ring
- To install, use provided support sleeve

- Support sleeve may only be removed after the sealing flange has been slid onto the crankshaft pin.
- If sealing flange is not replaced, use assembly tool T10122 to install --> **Crankshaft Seal, Vibration Damper Side, Replacing**
- Removing and installing --> **Sealing Flange, Drive Plate Side, Removing and Installing**

3 - Shim

4 - Drive plate

- Use crankshaft holder 3242 to loosen and tighten --> **Drive Plate, Removing and Installing**

5 - Washer

6 - 30 Nm plus an additional $1/4$ turn (90°)

- Replace

7 - 10 Nm

8 - 15 Nm

9 - Cylinder block

10 - Oil pan

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

11 - Bolt

- M7 = 15 Nm
- M8 = 22 Nm

12 - Drive chain

- For oil pump
- Before removing, mark the direction of rotation, e.g. with paint
- Do not mark with a center punch or similar means
- Removal of drive chain --> **Oil Pump Drive Chain, Removing and Installing**

13 - Chain sprocket

- For crankshaft

14 - Thrust collar

- If signs of wear exist, pull off and turn around or replace

15 - Gasket

- Replace

16 - Sealing flange (belt pulley side)

- To remove and install, remove oil pan --> **Oil Pump, Removing and Installing**
- Must be located on alignment bushings
- Before installing, remove oil remains from crankshaft journal with a clean cloth

17 - O-ring

- Replace

18 - Spray nozzle valve, 35 Nm

19 - Oil seal

- Replace --> **Crankshaft Seal, Vibration Damper Side, Replacing**

20 - Crankshaft toothed belt sprocket

- Only possible to install in one position
- To remove, lock crankshaft with crankshaft holder 3242 --> **Drive Plate, Removing and Installing**

21 - 200 Nm plus an additional $1/2$ turn (180)

- Replace
- Do not oil lubricate additionally
- Additional rotation can occur in several stages

22 - Vibration damper/belt pulley

- For ribbed belt
- To remove, lock crankshaft with crankshaft holder 3242 --> **Drive Plate, Removing and Installing**

23 - 22 Nm

24 - 40 Nm

25 - Cover

Sealing Flange, Drive Plate Side, Removing and Installing

Sealing Flange, Drive Plate Side, Removing and Installing

Special tools, testers and auxiliary items required

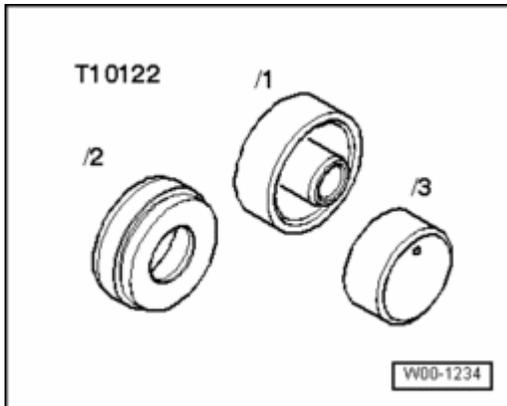


Fig. 39: Pulling Fixture T10122

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pulling fixture T10122

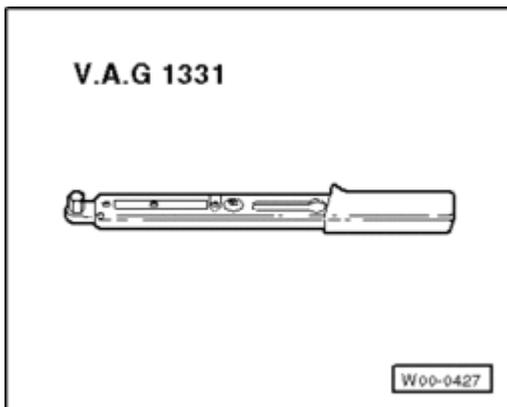


Fig. 40: Torque Wrench V.A.G 1331

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Torque wrench (5 to 50 Nm) V.A.G 1331

Removing

- Remove engine --> **Engine, Removing and Installing.**
- Separate engine from transmission.
- Remove drive plate --> **Drive Plate, Removing and Installing.**
- Remove oil pan --> **Oil Pump, Removing and Installing**

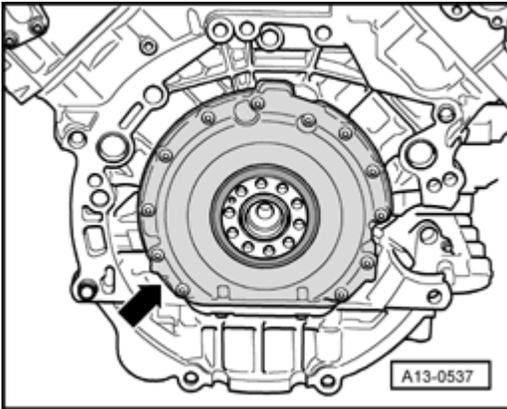


Fig. 41: Cylinder Block Sealing Flange

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove sealing flange - **arrow** - from cylinder block.
- Remove old gasket.

Installing

NOTE:

- In the following work procedure, the seal is shown without the sealing flange.
- If repairs are required, the complete sealing flange with seal must be replaced. Then to install, use the supplied support sleeve.

- Clean sealing surfaces of sealing flange and cylinder block. Sealing surfaces must be free of oil and grease.
- Before installing, remove oil remains from end of crankshaft with a clean cloth.

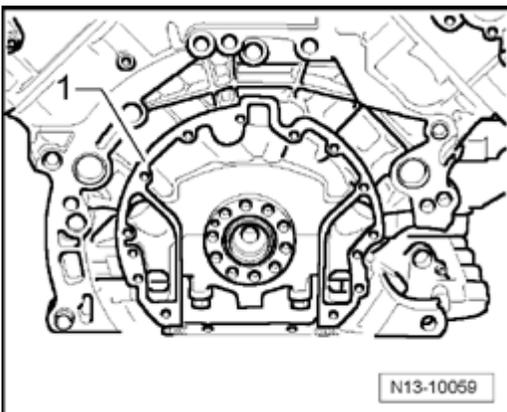


Fig. 42: Alignment Bushings Of Cylinder Head And New Gasket

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place a new gasket - **1** - onto alignment bushings of cylinder head.

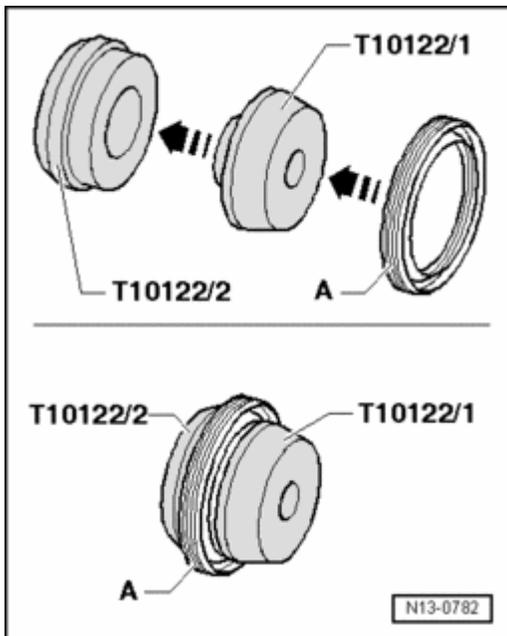


Fig. 43: Identifying Seal, Sleeve T10122/1 And Assembly Tool T10122/2
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull seal and sealing flange - A - with outer side over sleeve T10122/1 onto assembly tool T10122/2.
- Separate both assembly sleeves.
- Place assembly tool T10122/2 with dry seal and sealing flange onto crankshaft flange.
- Fasten sealing flange to cylinder block. Torque specification: and
- Install oil pan --> **Oil Pump, Removing and Installing**
- Install drive plate --> **Drive Plate, Removing and Installing.**
- Install engine --> **Engine, Removing and Installing.**

Drive Plate, Removing and Installing

Drive Plate, Removing and Installing

Special tools, testers and auxiliary items required

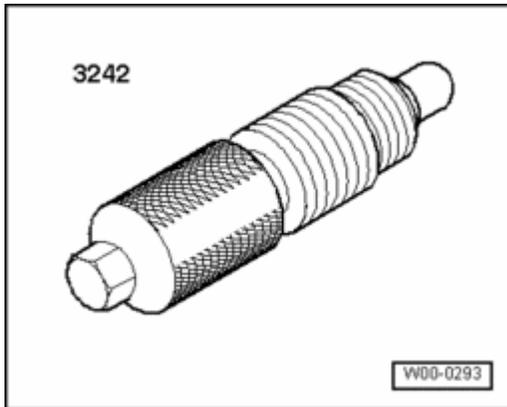


Fig. 44: Crankshaft Holder 3242

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Crankshaft holder 3242

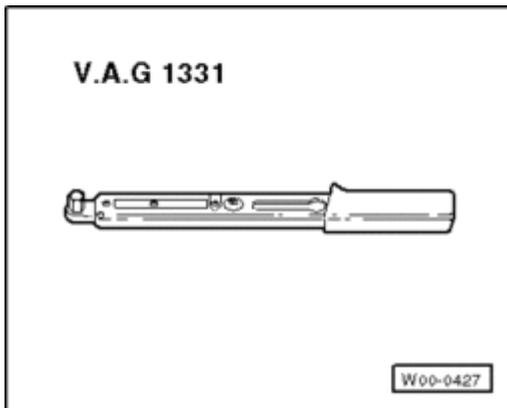


Fig. 45: Torque Wrench V.A.G 1331

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Torque wrench (5 to 50 Nm) V.A.G 1331

Removing

- Remove engine --> **Engine, Removing and Installing.**
- Separate engine from transmission.

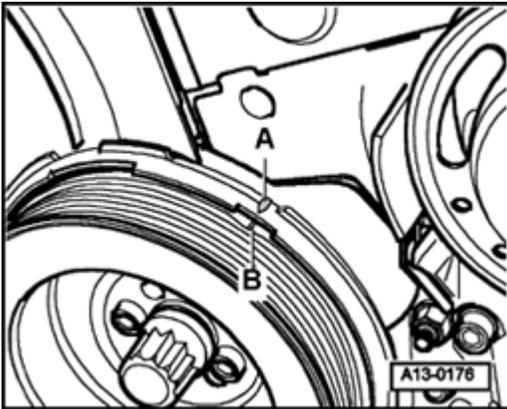


Fig. 46: Engine At TDC

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set engine to TDC. For this, the notches - A - and - B - must stand across from one another.

NOTE:

- Turning the engine over is performed at the centered bolt of the crankshaft.
- Turning the engine over must only be performed in clockwise direction.

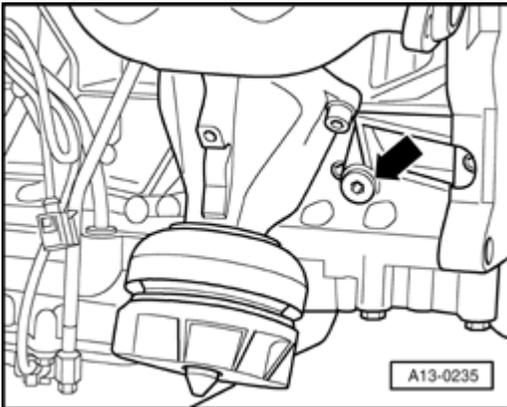


Fig. 47: Locating Sealing Plug

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove sealing plug - arrow -.

NOTE:

- Behind the sealing plug, the TDC hole is located in the crankshaft (can be felt).

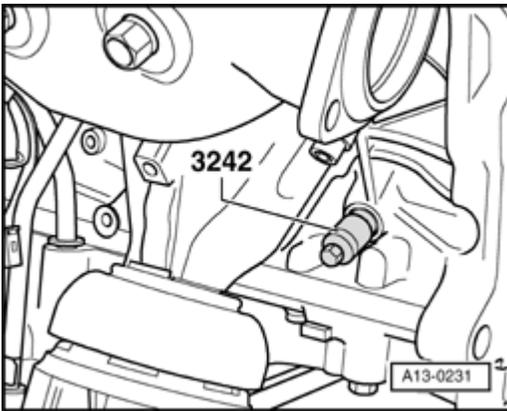


Fig. 48: Crankshaft Holder 3242 Installed Into Crankshaft
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install crankshaft holder 3242 into crankshaft.
- Loosen drive plate securing bolts diagonally and remove.
- Remove drive plate with washer and shim (not always equipped).

Installing

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

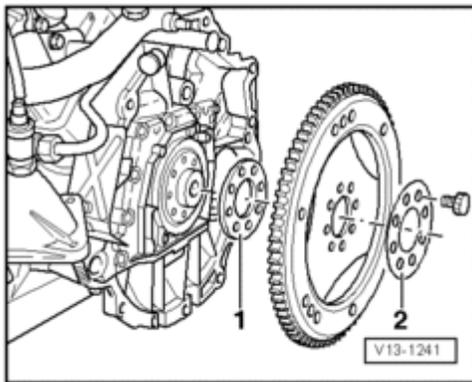


Fig. 49: Identifying Shim, Drive Plate And Washer
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place shim - 1 - on end of crankshaft.
- Then, install drive plate with washer - 2 - (thickness 1.0 mm).
- Insert new securing bolts and tighten by hand.
- Tighten bolts to 30 Nm plus an additional $1/4$ turn (90) (turning further may be performed in several steps).
- Remove crankshaft holder 3242.
- Install sealing plug with new seal. Torque specification: 35 Nm

Crankshaft Seal, Vibration Damper Side, Replacing

Crankshaft Seal, Vibration Damper Side, Replacing

Special tools, testers and auxiliary items required

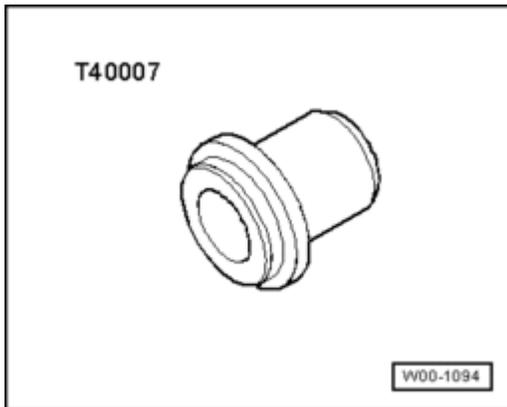


Fig. 50: Pressure Piece T40007

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pressure piece T40007

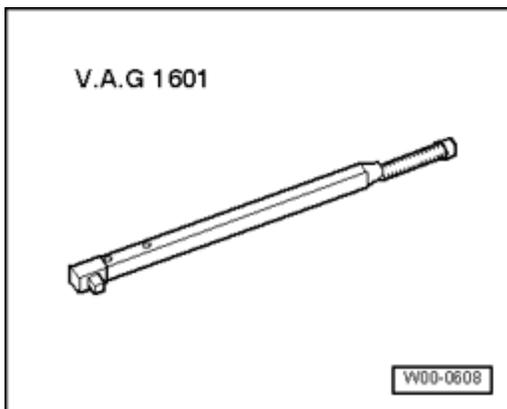


Fig. 51: Torque Wrench V.A.G 1601

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Torque wrench (150 to 800 Nm) V.A.G 1601

Removing

- Remove noise insulation --> **50 BODY - FRONT** .
- Remove ribbed belt --> **Ribbed Belt, Removing and Installing.**
- Remove toothed belt --> **Toothed Belt, Removing and Installing.**

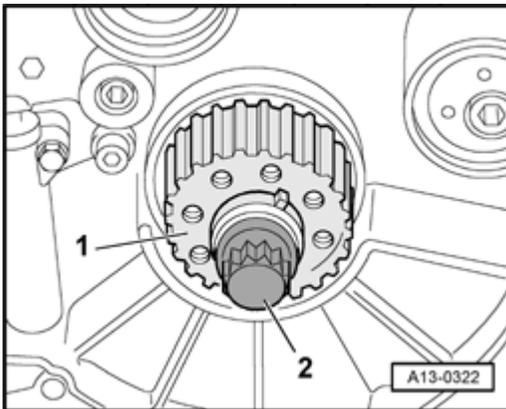


Fig. 52: Center Bolt Of Toothed Belt Crankshaft Sprocket
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove center bolt - 2 - of toothed belt crankshaft sprocket - 1 - and remove the sprocket from the end of the crankshaft.
- Then, pull out seal using pulling hook T20143/1.

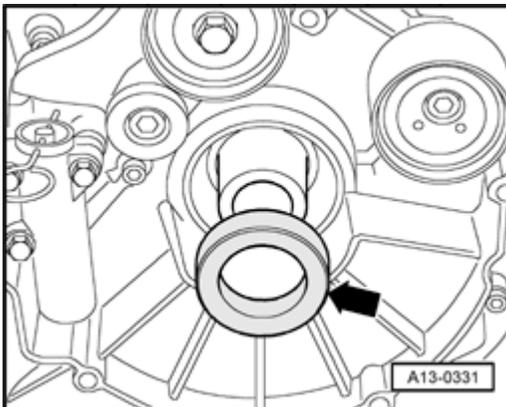


Fig. 53: Thrust Collar At End Of Crankshaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove thrust collar from end of crankshaft and mark thrust collar on its face surface - **arrow** - with a waterproof felt pen.

Installing

- Before installing, remove oil remains from end of crankshaft and thrust collar with a clean cloth.

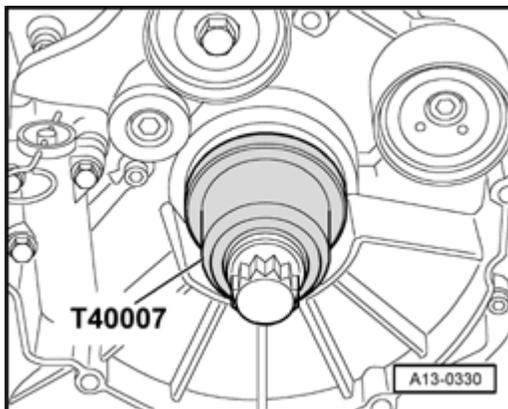


Fig. 54: Pressing In New Seal Up To Stop Using Pressure Piece T40007
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press in new seal up to stop using pressure piece T40007.
- Turn thrust collar and press it onto end of crankshaft so that the marked surface faces engine.
- Install toothed belt crankshaft sprocket, using a new central bolt. Torque specification: 200 Nm plus an additional $1/2$ turn (180).
- Install toothed belt --> **Toothed Belt, Removing and Installing.**
- Install ribbed belt --> **Ribbed Belt, Removing and Installing.**
- Install noise insulation pan.

15 - ENGINE - CYLINDER HEAD, VALVETRAIN

CYLINDER HEAD, ASSEMBLY OVERVIEW

Cylinder Head, Assembly Overview

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

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

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

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

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

--> **Compression, Checking**

NOTE:

- To remove the cylinder head the engine must first be removed --> **Engine, Removing and Installing.**
- If an exchange cylinder head is installed, all contact surfaces between

bearing elements, roller rocker levers and cam running surfaces of camshaft must be oiled before installing cylinder head cover.

- The plastic protectors installed to protect the open valves must only be removed immediately before installing the cylinder head.
- When replacing the cylinder head or cylinder head gasket, the complete amount of coolant must be replaced --> [Cooling System, Draining and Filling](#)
- Intake manifold, disassembling and assembling --> [Intake Manifold, Assembly Overview](#)
- Compression, checking --> [Compression, Checking.](#)

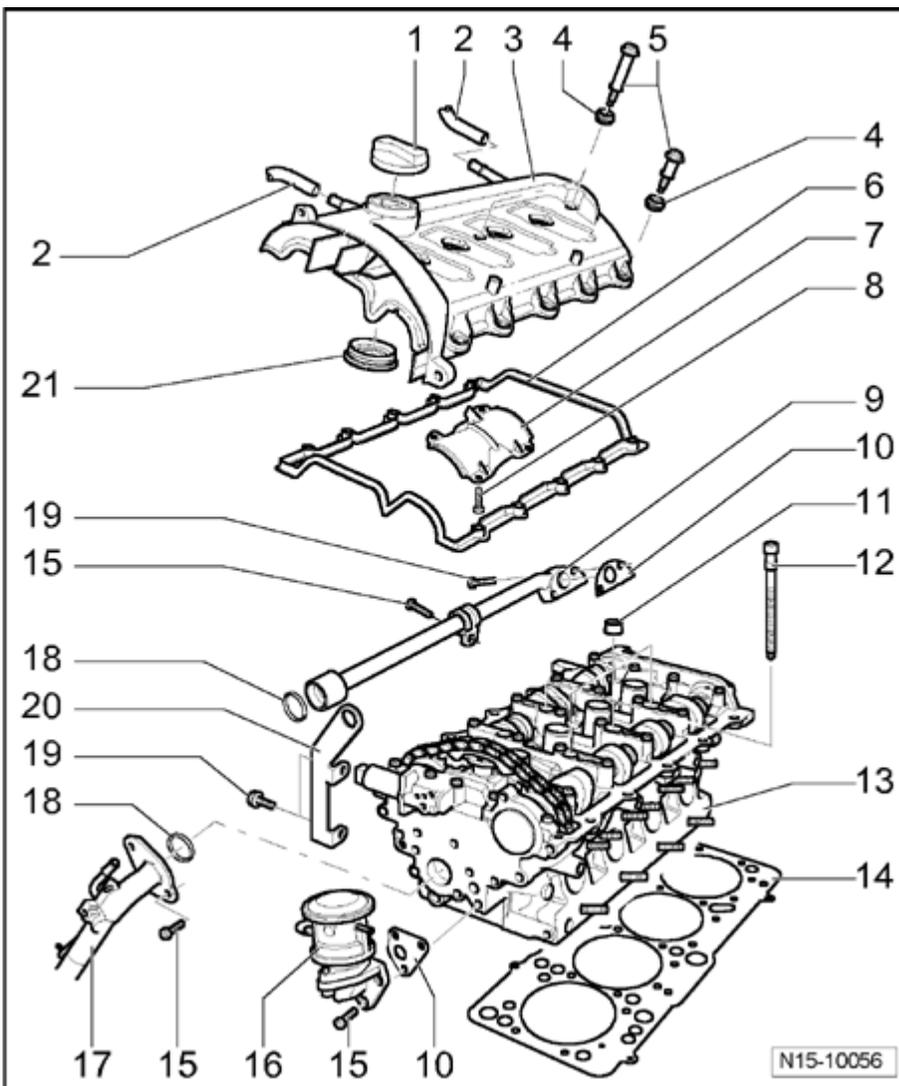


Fig. 55: Cylinder Head, Assembly Overview

Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Sealing cap

- Replace gaskets if damaged

2 - Connecting hose

- For crankcase ventilation

3 - Cylinder head cover

- Left cylinder head cover, removing and installing --> **Left Cylinder Head Cover, Removing and Installing**
- Right cylinder head cover, removing and installing --> **Right Cylinder Head Cover, Removing and Installing**
- Replace if damaged

4 - Gasket

- Note installation position
- Replace if damaged or leaking

5 - 10 Nm

- Observe tightening sequence
- Left cylinder head cover, removing and installing --> **Left Cylinder Head Cover, Removing and Installing**
- Right cylinder head cover, removing and installing --> **Right Cylinder Head Cover, Removing and Installing**

6 - Gasket for cylinder head cover

- Ensure correct positioning on studs of cylinder head cover
- Replace if damaged or leaking
- Note installation position
- Left cylinder head cover, removing and installing --> **Left Cylinder Head Cover, Removing and Installing**
- Right cylinder head cover, removing and installing --> **Right Cylinder Head Cover, Removing and Installing**

7 - Baffle plate

8 - 5 Nm

9 - Coolant line

10 - Gasket

- Replace

11 - Grommet

- Insert into cylinder head cover
- Replace if damaged or leaking

12 - Cylinder head bolt

- Replace
- Observe installation instructions and sequence when loosening and tightening
- Right cylinder head, removing and installing --> **Right Cylinder Head, Removing and Installing**
- Left cylinder head, removing and installing --> **Left Cylinder Head, Removing and Installing**

13 - Cylinder head

- Check for distortion --> **Checking cylinder head for distortion**
- Right cylinder head, removing and installing --> **Right Cylinder Head, Removing and Installing**
- Left cylinder head, removing and installing --> **Left Cylinder Head, Removing and Installing**
- After replacing replace entire amount of coolant

14 - Cylinder head gasket

- Metal gasket
- Replace
- Must be located on alignment pins
- After replacing replace entire amount of coolant

15 - 10 Nm

16 - Combi-valve

- For Secondary Air Injection (AIR) system

17 - Coolant line

18 - O-ring

- Replace

19 - 20 Nm

20 - Lifting eye

21 - Oil seal

- Replace if damaged or leaking

Checking cylinder head for distortion

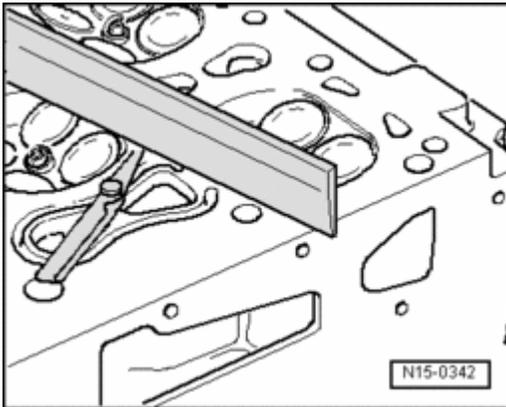


Fig. 56: Checking Cylinder Head For Distortion
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Straight edge
- Feeler gauge

Max. permissible distortion: 0.1 mm

Right Cylinder Head Cover, Removing and Installing

Right Cylinder Head Cover, Removing and Installing

Special tools, testers and auxiliary items required

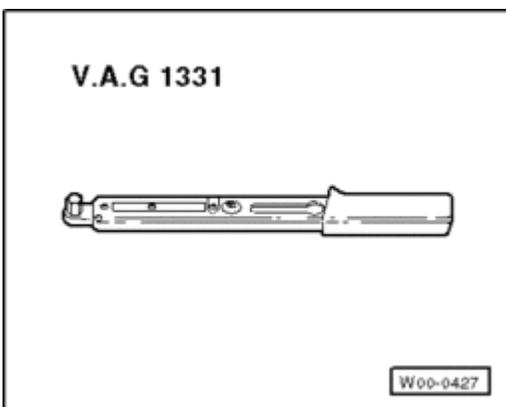


Fig. 57: Torque Wrench V.A.G 1331
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Torque wrench (5 to 50 Nm) V.A.G 1331
- Not illustrated:
- **Cable tie**
- Sealant D 454 300 A2

Removing

CAUTION: When doing any repair work, especially in the engine compartment, pay attention to the following due to clearance issues:

- **Route all the various lines (e.g. for fuel, hydraulics, EVAP system, coolant, refrigerant, brake fluid and vacuum lines and hoses) and electrical wiring so that the original positions are restored.**
 - **Ensure sufficient clearance to all moving or hot components.**
- All cable ties which are opened or cut open when removing, must be replaced in the same position when installing.
 - Remove right air filter --> [Air Filter, Assembly Overview](#).

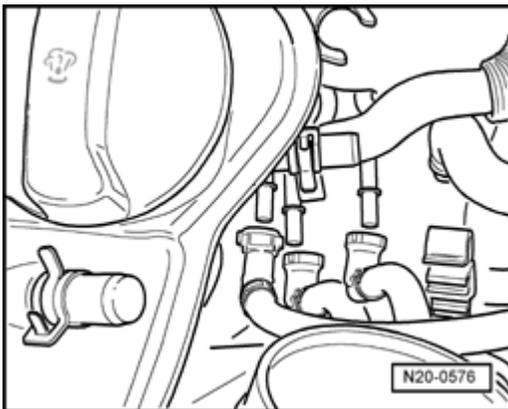


Fig. 58: Fuel Supply And Fuel Return Lines And Line At Evaporative Emissions Charcoal Canister
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove fuel supply and return lines, as well as the vent line.

NOTE:

- **Press buttons on hose couplings to do this.**

- Seal lines so that the fuel system is not contaminated by dirt etc.

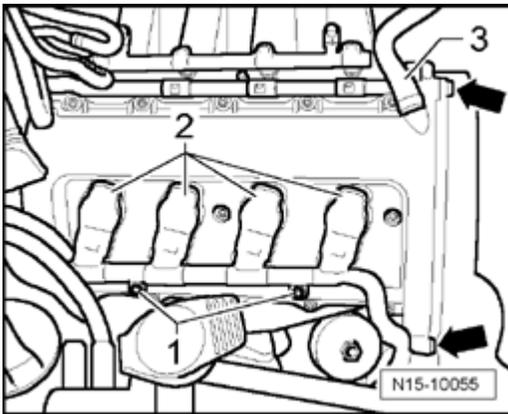


Fig. 59: Ignition Coils And Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **1** - for connector socket strip.
- Disconnect connectors from ignition coils.
- Remove ignition coils - **2** - --> **Ignition Coils with Power Output Stage, Removing and Installing.**
- Disconnect crankcase ventilation hose - **3** -.
- Remove bolts - **arrows** - from toothed belt cover and remove toothed belt cover.

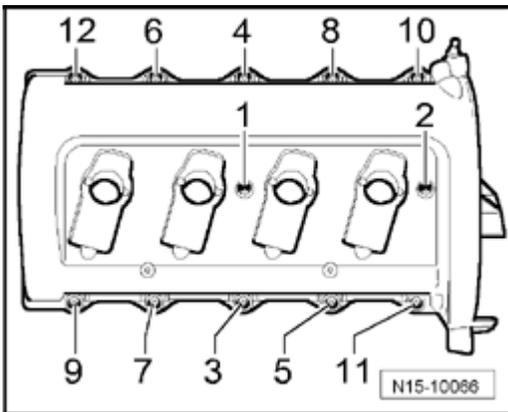


Fig. 60: Cylinder Head Tighten Bolts Sequence

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen bolts in sequence - **12** - through - **1** - and remove cylinder head cover.

Installing

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

NOTE:

- **Replace the gasket if it is damaged or leaking.**
- **Before installing, make sure that the gaskets between the cylinder head cover and cylinder head are not damaged and are correctly installed.**

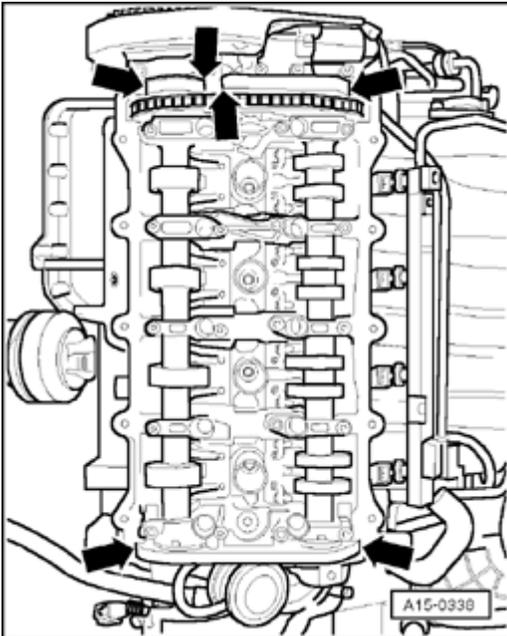


Fig. 61: Locating Transitions On Sealing Surface Of Cylinder Head
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Coat transitions - **arrows** - on sealing surface of cylinder head with a small amount of sealant D 454 300 A2.
- Carefully set cylinder head cover in place.

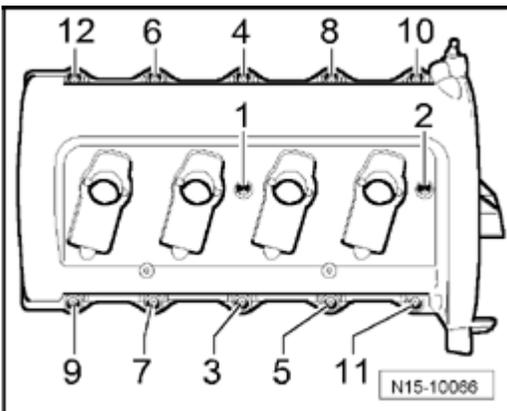


Fig. 62: Cylinder Head Tighten Bolts Sequence
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten bolts in sequence - **1** - through - **12** -. Torque specification: 10 Nm

Left Cylinder Head Cover, Removing and Installing

Left Cylinder Head Cover, Removing and Installing

Special tools, testers and auxiliary items required

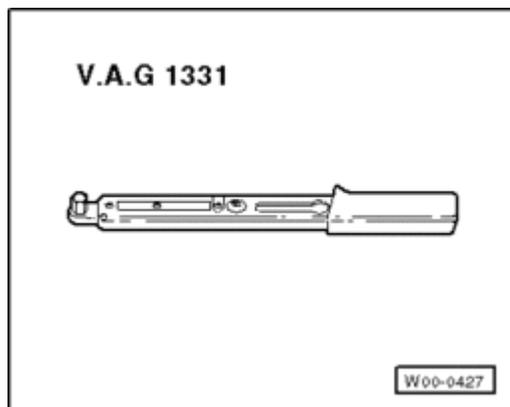


Fig. 63: Torque Wrench V.A.G 1331

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Torque wrench (5 to 50 Nm) V.A.G 1331
- Not illustrated:
- **Cable tie**
- Sealant D 454 300 A2

Removing

CAUTION: When doing any repair work, especially in the engine compartment, pay attention to the following due to clearance issues:

- **Route all the various lines (e.g. for fuel, hydraulics, EVAP system, coolant, refrigerant, brake fluid and vacuum lines and hoses) and electrical wiring so that the original positions are restored.**
 - **Ensure sufficient clearance to all moving or hot components.**
- All cable ties which are opened or cut open when removing, must be replaced in the same position when installing.
 - Remove left air filter --> [Air Filter, Assembly Overview](#).

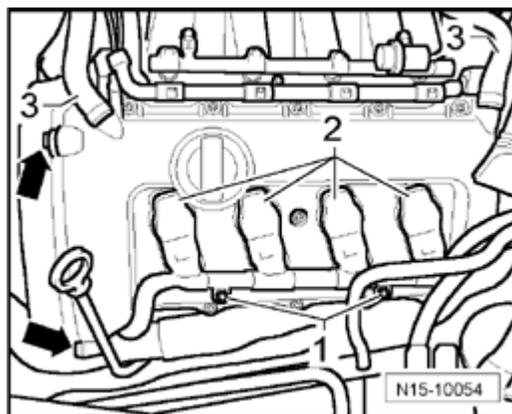


Fig. 64: Ignition Coils And Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **1** - for connector socket strip.
- Disconnect connectors from ignition coils.
- Remove ignition coils - **2** - --> **Ignition Coils with Power Output Stage, Removing and Installing.**
- Disconnect crankcase ventilation hoses - **3** -.
- Remove bolts - **arrows** - from toothed belt cover and remove toothed belt cover.

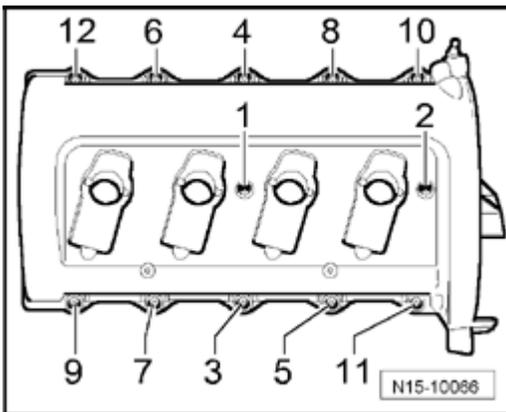


Fig. 65: Cylinder Head Tighten Bolts Sequence

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen bolts in sequence - **12** - through - **1** - and remove cylinder head cover.

Installing

Installation is reverse order of removal, note the following:

NOTE:

- **Replace the gasket if it is damaged or leaking.**
- **Before installing, make sure that the gaskets between the cylinder head cover and cylinder head are not damaged and are correctly installed.**

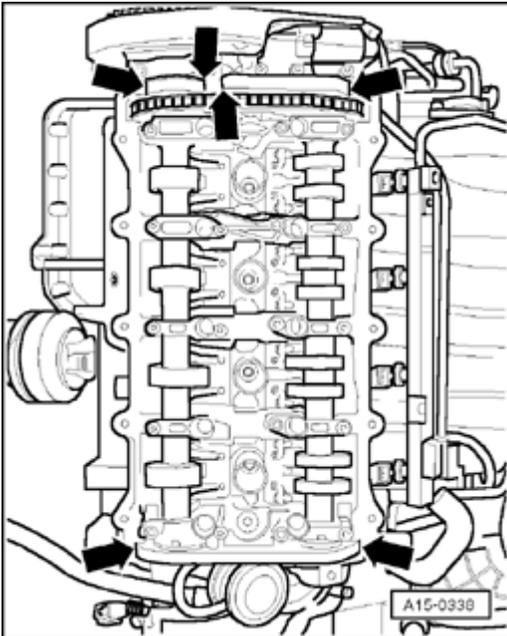


Fig. 66: Locating Transitions On Sealing Surface Of Cylinder Head
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Coat transitions - **arrows** - on sealing surface of cylinder head with a small amount of sealant D 454 300 A2.
- Carefully set cylinder head cover in place.

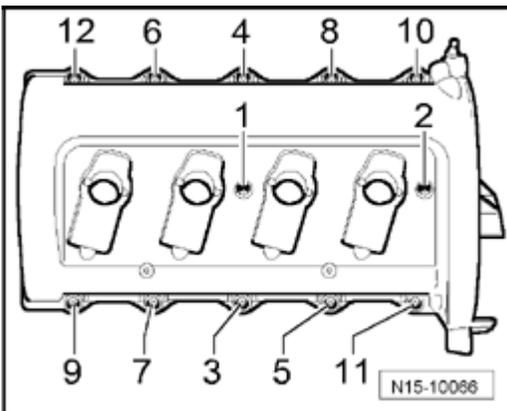


Fig. 67: Cylinder Head Tighten Bolts Sequence
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten bolts in sequence - **1** - through - **12** -. Torque specification: 10 Nm

Toothed Belt, Removing and Installing

Toothed Belt, Removing and Installing

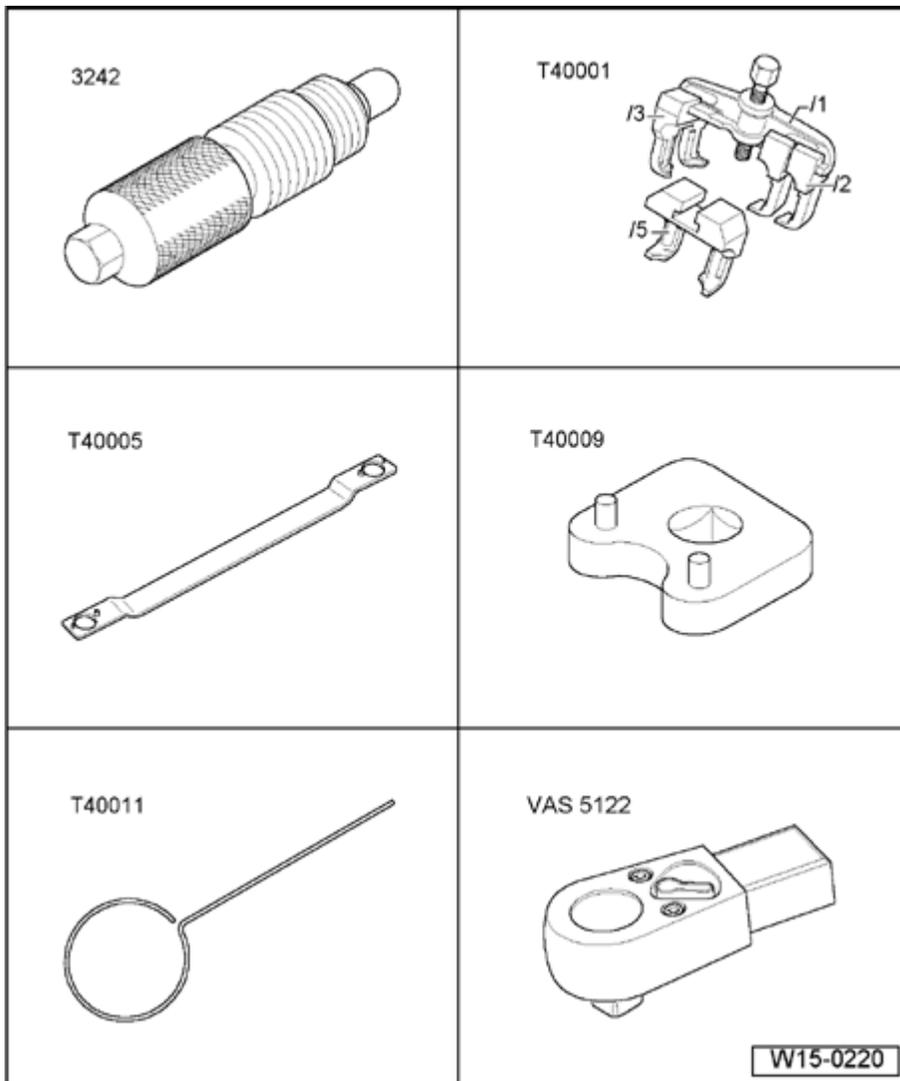


Fig. 68: Identifying Special Tools - Toothed Belt, Removing And Installing
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Crankshaft holder 3242
- Puller T40001
- Camshaft locating tool T40005
- Tensioning roller wrench T40009

- Securing pin T40011
- Reversible ratchet VAS 5122
- Torque wrench V.A.G 1410
- Torque wrench V.A.G 1331

Removing

CAUTION: When doing any repair work, especially in the engine compartment, pay attention to the following due to clearance issues:

- Route all the various lines (e.g. for fuel, hydraulics, EVAP system, coolant, refrigerant, brake fluid and vacuum lines and hoses) and electrical wiring so that the original positions are restored.
 - Ensure sufficient clearance to all moving or hot components.
- Remove noise insulation pan: --> **50 BODY - FRONT**
 - Bring lock carrier into service position: --> **50 BODY - FRONT**
 - Remove ribbed belt --> **Ribbed Belt, Removing and Installing.**
 - Remove left and right toothed belt cover.

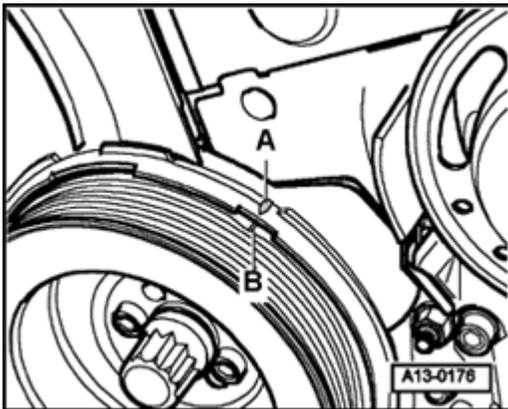


Fig. 69: Engine At TDC

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set crankshaft to top dead center (TDC). The marking on the toothed belt cover - **A** - must be aligned with notch on belt pulley - **B** -.

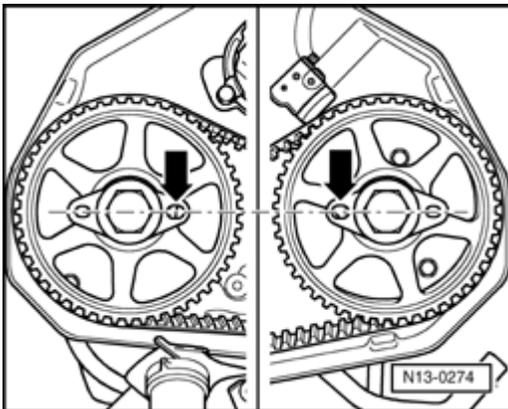


Fig. 70: Checking Position Of Camshaft Gears

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check position of camshaft gears. The large holes on securing plates - **arrows** - must align on inside.

NOTE:

- If large holes stand on outer side of toothed belt gears, crankshaft must be turned one rotation once more.

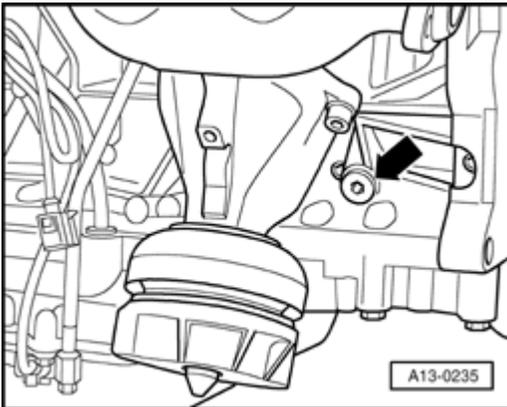


Fig. 71: Locating Sealing Plug

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove sealing plug from left-side of cylinder block - **arrow** -. The TDC hole for crankshaft must be visible or felt behind hole for sealing plug.

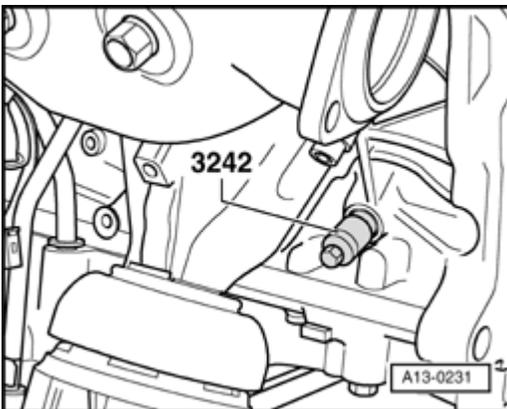


Fig. 72: Crankshaft Holder 3242 Installed Into Crankshaft

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Carefully install crankshaft holder 3242 into hole up to stop, and thereby secure crankshaft against turning.
- Remove center toothed belt cover.
- Remove vibration damper.

NOTE:

- The vibration damper is fastened to the crankshaft with 8 bolts.

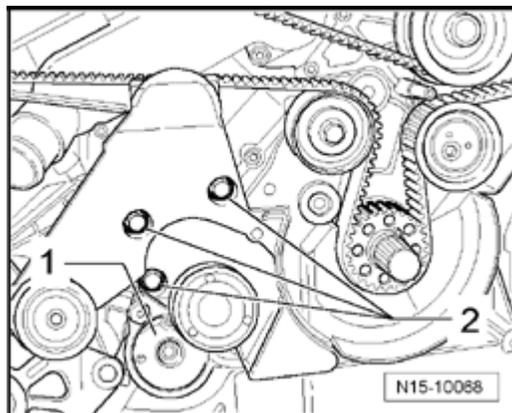


Fig. 73: Ribbed Belt Tensioning Element And Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove the ribbed belt tensioning element - 1 -.
- Remove bolts - 2 - for toothed belt tensioning element cover.
- Remove cover.
- Mark direction of rotation of toothed belt.

NOTE:

- **The toothed belt tensioner is oil-dampened. Therefore it can only be compressed slowly.**
- **Use locking pin T40011 to secure tensioning element.**

- If necessary, align lifter using needle nose pliers or thin wire before tensioning.
- Turn tensioning lever of toothed belt tensioning roller - 1 - in direction of - **arrow** - using an Allen wrench.

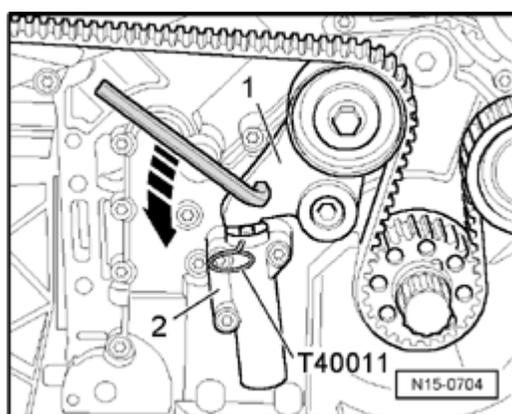


Fig. 74: Identifying Tensioning Lever
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- When tensioning lever - 2 - pushes toothed belt tensioning element together so that the holes in housing and piston align, secure tensioning element using locking pin T40011.

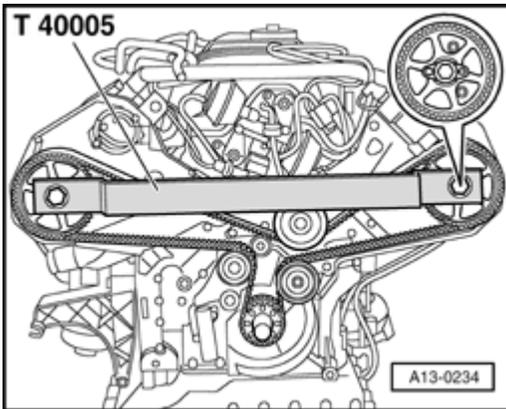


Fig. 75: Camshaft Adjustment T40005 Placed Into Securing Plates Of Camshafts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place camshaft adjustment T40005 into securing plates of camshafts and loosen bolts approx. 5 turns.
- Remove camshaft locator T40005 again.

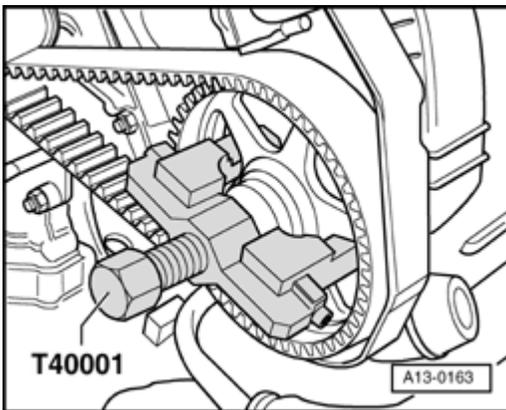


Fig. 76: Removing Camshaft Gears Using Puller T40001 With Claws T40001/2
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove camshaft gears from cone using puller T40001 with claws T40001/2.

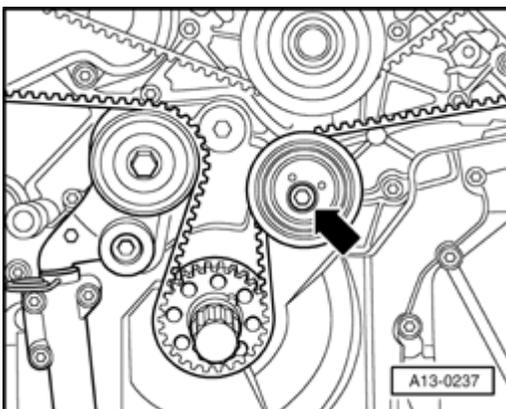


Fig. 77: Locating Tensioning Roller

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen tensioning roller - **arrow** - and remove toothed belt.

Installing

- On used toothed belts, observe marking for direction of rotation.

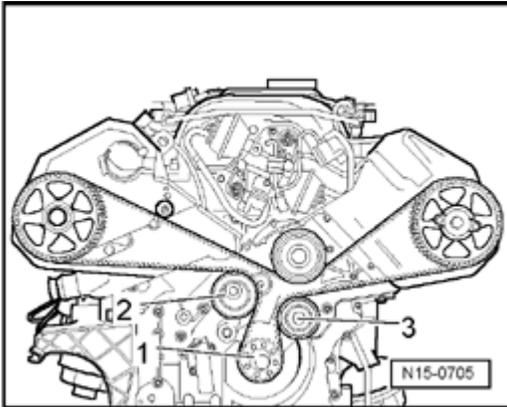


Fig. 78: Crankshaft Gear, Toothed Belt Tensioner And Tensioning Roller
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set toothed belt onto toothed belt crankshaft gear - **1** - first, then onto idler roller of toothed belt tensioner - **2** - and then onto tensioning roller - **3** -. Then, set it onto camshaft gears and coolant pump belt pulley as shown in the illustration.

NOTE:

- **Camshaft gears must just be able to be twisted on cone for camshafts.**

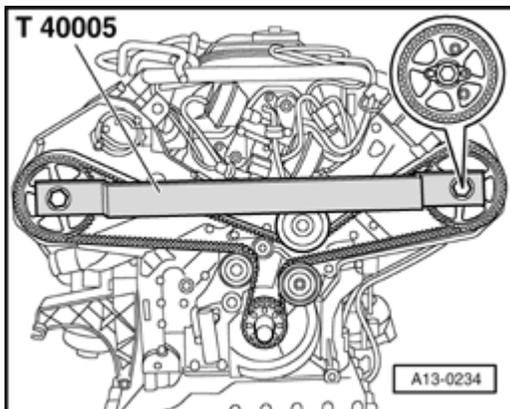


Fig. 79: Camshaft Adjustment T40005 Placed Into Securing Plates Of Camshafts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set camshaft adjustment T40005 onto camshaft gears again.

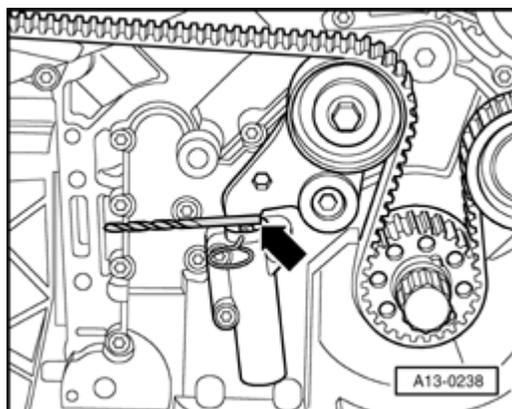


Fig. 80: Drill Set Between Tensioning Lever And Piston Of Hydraulic Element
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set a 5 mm drill between tensioning lever and piston of hydraulic element - **arrow** -.

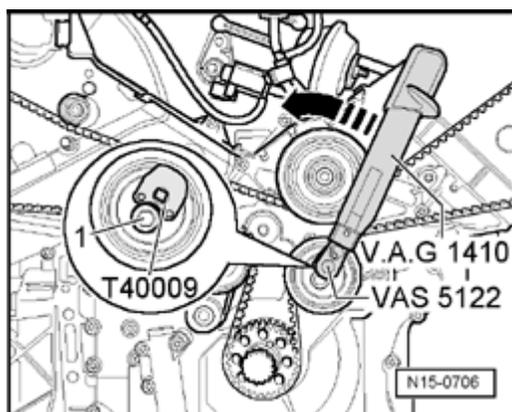


Fig. 81: Tensioning Roller, Torque Wrench V.A.G 1410 And Connected Reversible Ratchet VAS 5122 With Tensioning Roller Wrench T40009
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pretension still loosened tensioning roller using torque wrench V.A.G 1410 and connected reversible ratchet VAS 5122 with tensioning roller wrench T40009 counter-clockwise - **arrow** - to 4 Nm.
- In this position, tighten the bolt - **1** - to 45 Nm.
- Remove 5 mm drill again.
- Turn tensioning lever of toothed belt tensioning roller - **1** - in direction of - **arrow** - using an Allen wrench.

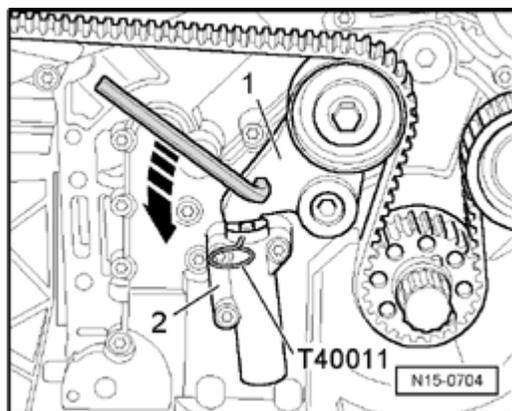


Fig. 82: Identifying Tensioning Lever

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- When tensioning lever - 2 - has compressed piston in toothed belt tensioning element, pull out locking pin T40011.

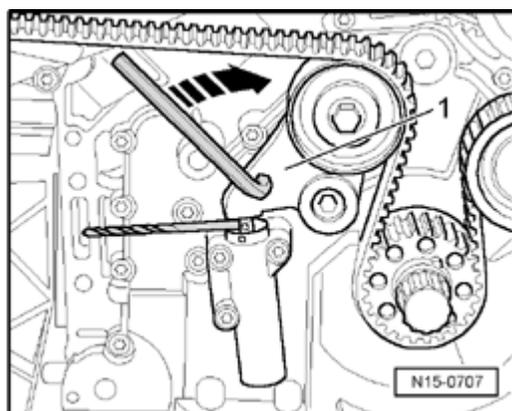


Fig. 83: Turning Toothed Belt Tensioning Roller Using An Allen Wrench

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Turn toothed belt tensioning roller - 1 - in direction of - **arrow** - using an Allen wrench. Place a 7 mm drill between the housing and tensioning lever.
- Tighten camshaft gears to 55 Nm.
- Remove camshaft locator T40005 again.
- Remove drill, that was inserted between housing and tensioning element.

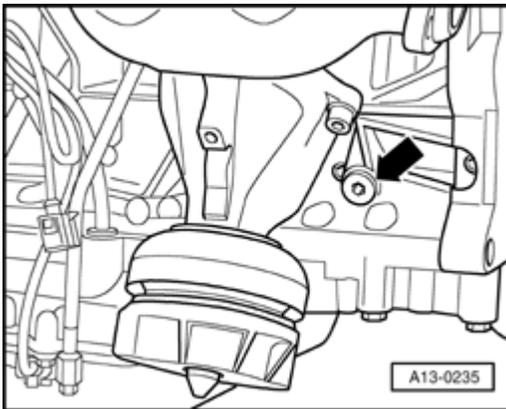


Fig. 84: Locating Sealing Plug

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove crankshaft holder 3242 from hole and install sealing plug with new seal - **arrow** - and tighten to 35 Nm.

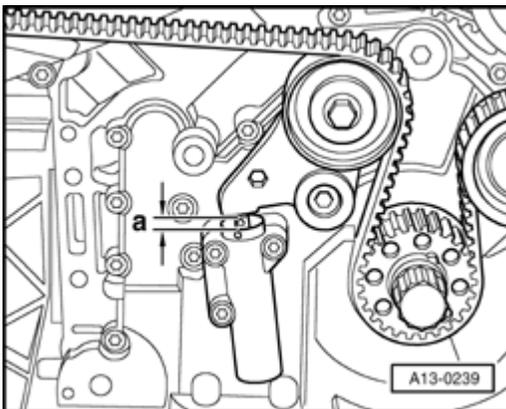


Fig. 85: Identifying Adjustment Dimension

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Turn over crankshaft twice in direction of engine rotation and adjustment dimension - **a** -. Specification: 5 mm
- Install cover and ribbed belt tensioning roller. Torque specification: 40 Nm

The rest of assembly is in reverse order of removal.

Left Cylinder Head, Removing and Installing

Left Cylinder Head, Removing and Installing

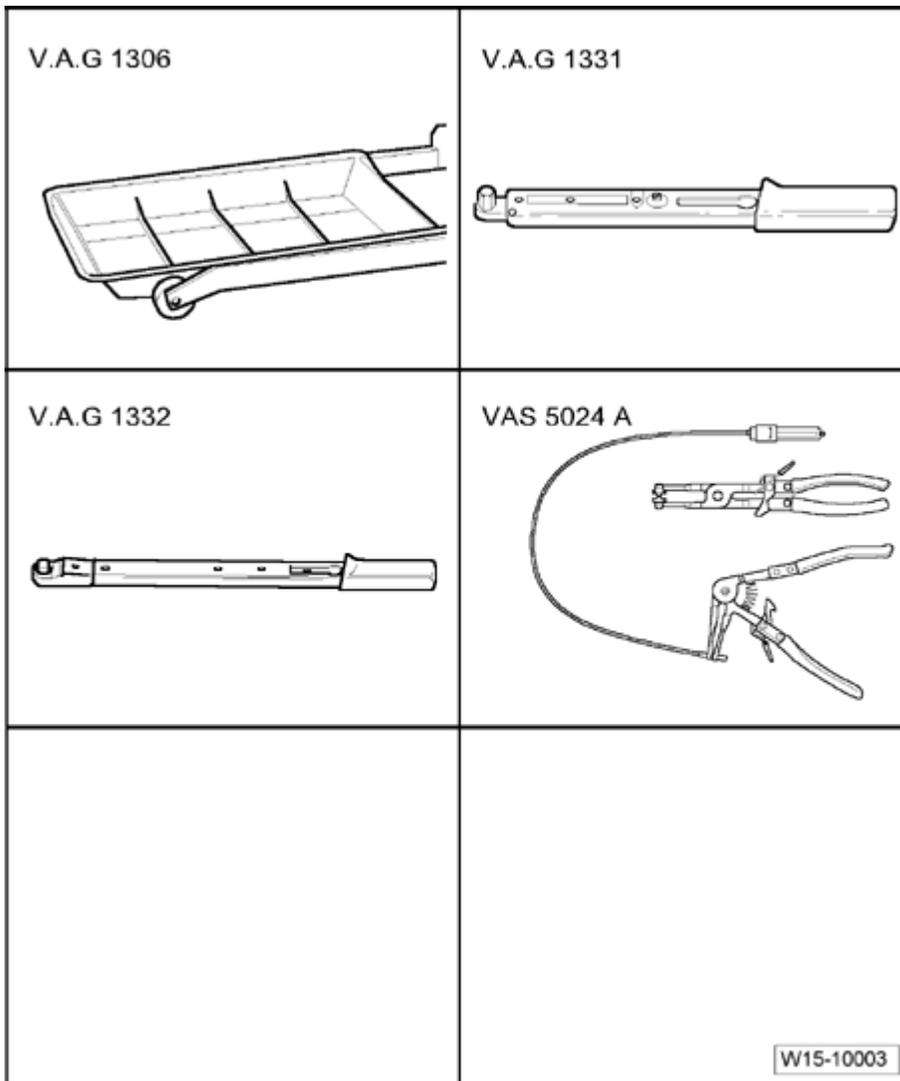


Fig. 86: Identifying Special Tools - Cylinder Head, Removing And Installing
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Drip tray V.A.G 1306
- Torque wrench (5 to 50 Nm) V.A.G 1331
- Torque wrench (40 to 200 Nm) V.A.G 1332
- Spring-type clip pliers VAS 5024A

Not illustrated:

Special tools, testers and auxiliary items required

- Cable tie

Requirement

- The engine must be no more than warm to touch.

Removing

- Remove engine --> **Engine, Removing and Installing.**

CAUTION: When doing any repair work, especially in the engine compartment, pay attention to the following due to clearance issues:

- Route all the various lines (e.g. for fuel, hydraulics, EVAP system, coolant, refrigerant, brake fluid and vacuum lines and hoses) and electrical wiring so that the original positions are restored.
 - Ensure sufficient clearance to all moving or hot components.
- All cable ties which are opened or cut open when removing, must be replaced in the same position when installing.
 - Remove front exhaust pipe from exhaust manifold --> **Exhaust Manifolds with Primary Catalytic Converters and Attachments, Assembly Overview.**

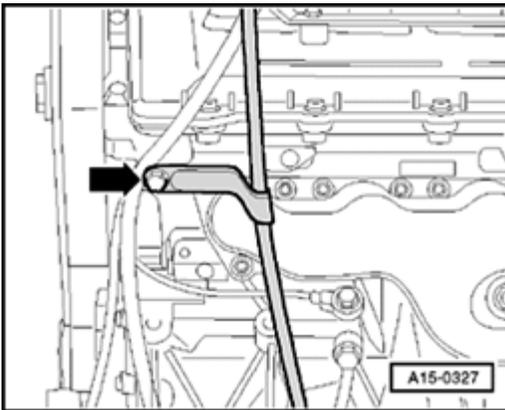


Fig. 87: Oil Dipstick Guide Tube

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove oil dipstick guide tube - **arrow** - from cylinder head.

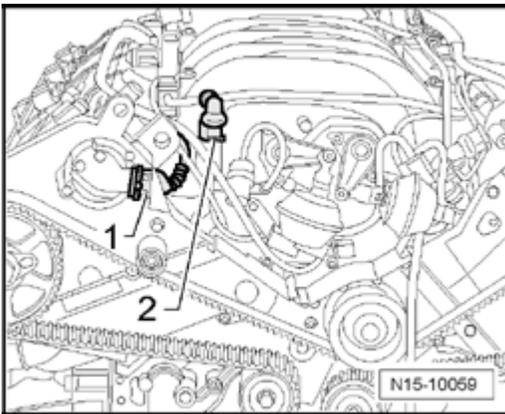


Fig. 88: Identifying Connectors

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect connector - 2 -.
- Remove toothed belt --> **Toothed Belt, Removing and Installing.**
- Remove camshaft gear --> **Toothed Belt, Removing and Installing**

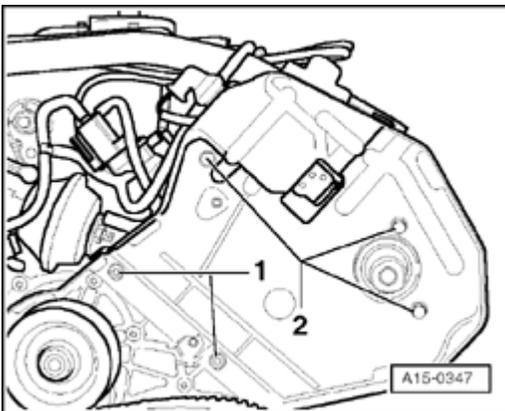


Fig. 89: Rear Toothed Belt Cover And Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - 1 - and - 2 - and remove rear toothed belt cover.

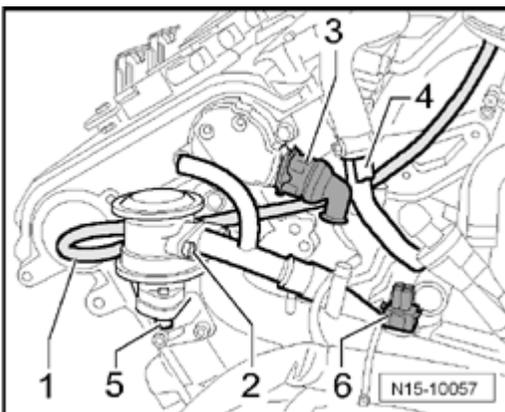


Fig. 90: Combination Valve And Connecting Components
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect vacuum hose - 1 - from combination valve.
- Remove bolts - 2 -.
- Disconnect connector - 3 -.
- Remove oil tube - 4 -.
- Remove bolts - 5 - and remove combination valve.
- Disconnect connector - 6 -.

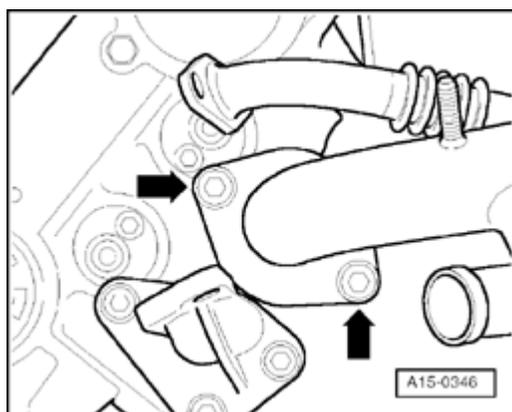


Fig. 91: Coolant Pipe Bolts
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - from coolant pipe.
- Disconnect connectors from all fuel injectors.

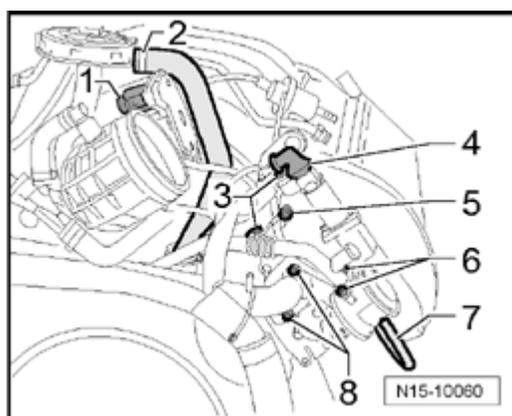


Fig. 92: Coolant Pipe Connecting Components
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect connector - 1 -.
- Disconnect hose - 2 -.

- Remove bolts - 8 -.
- Remove coolant pipe.
- Remove intake manifold.
- Remove cylinder head cover --> **Left Cylinder Head Cover, Removing and Installing.**

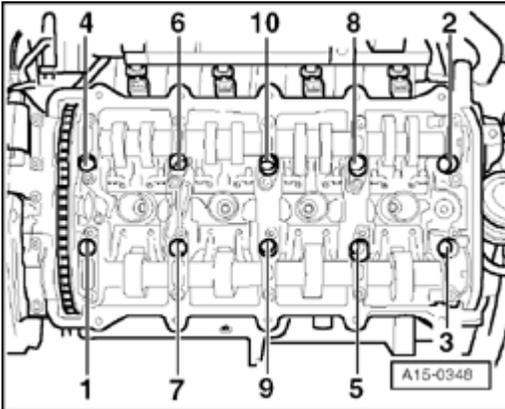


Fig. 93: Socket Head Bolts Loosening Sequence
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen socket head bolts in given sequence from outside to inside and then remove completely.
- Carefully lift cylinder head off.
- Place a clean cloth in cylinders so that no dirt or emery cloth particles can get in between cylinder wall and piston.
- Also prevent dirt and emery cloth particles from getting into coolant.
- Carefully clean cylinder head and cylinder block sealing surfaces. This ensures that no scoring or scratches are formed (when using abrasive paper grade must not be less than 100).

Installing

- Carefully remove metal particles, emery remains and cloths.

NOTE:

- **Only remove the new cylinder head gasket from its packing immediately before installing.**
- **Handle the new gasket with extreme care. Damaging will lead to leaks.**

- Install new cylinder head gasket. Install new cylinder head gasket. Inscription (Part No.) must be legible.

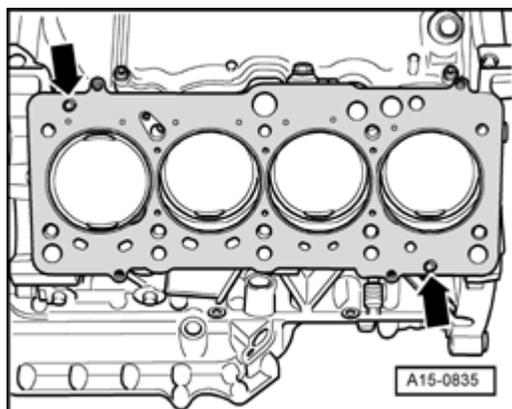


Fig. 94: Cylinder Head Gasket Alignment Bushings
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Ensure that alignment bushings - **arrows** - are inserted into cylinder block and that cylinder head gasket is seated.
- Install cylinder head, insert new cylinder head bolts and hand tighten.

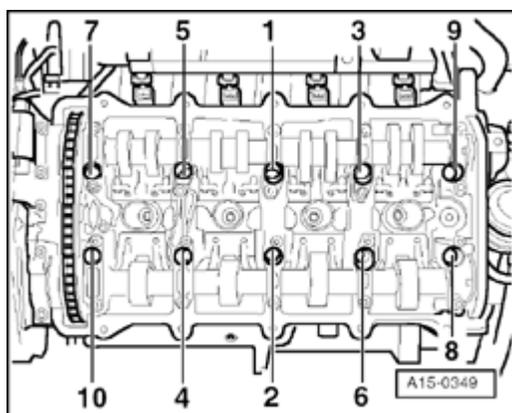


Fig. 95: Cylinder Head Tightening Sequence
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten cylinder head bolts in tightening sequence as follows from inside to outside.
- Pre-tighten all bolts to 35 Nm.
- Then tighten all bolts to 60 Nm.
- Tighten all bolts ($1/4$ turn) (90) further using a rigid wrench.
- Afterwards, tighten all bolts again $1/4$ turn (90) further

Valve timing --> **Toothed Belt, Removing and Installing.**

- Install cylinder head cover --> **Left Cylinder Head Cover, Removing and Installing.**
- Install intake manifold.

The rest of assembly is in reverse order of disassembling sequence.

NOTE: • There is no requirement to retighten the cylinder head bolts after repairs.

Right Cylinder Head, Removing and Installing

Right Cylinder Head, Removing and Installing

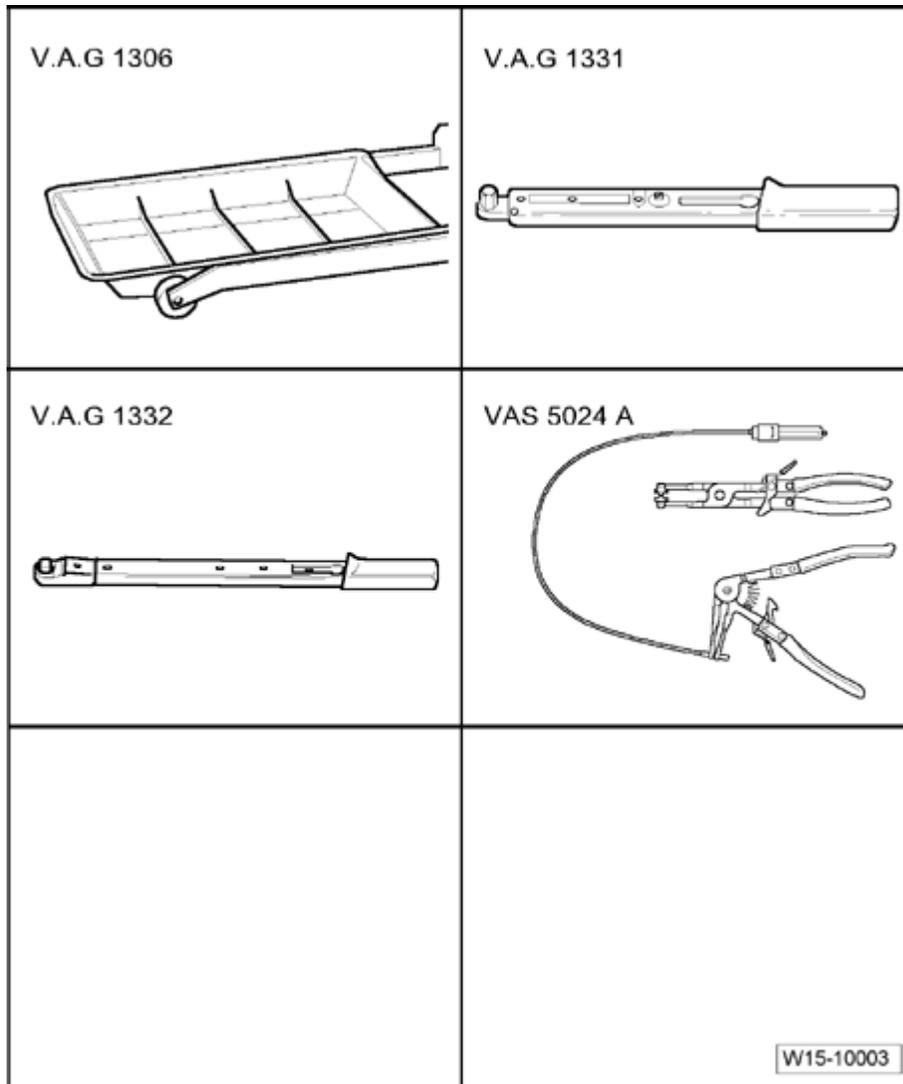


Fig. 96: Identifying Special Tools - Cylinder Head, Removing And Installing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Drip tray V.A.G 1306
- Torque wrench (5 to 50 Nm) V.A.G 1331
- Torque wrench (40 to 200 Nm) V.A.G 1332

- Spring-type clip pliers VAS 5024A

Not illustrated:

Special tools, testers and auxiliary items required

- Cable tie

Requirement

- The engine must be no more than warm to touch.

Removing

- Remove engine --> Engine, Removing and Installing.

CAUTION: When doing any repair work, especially in the engine compartment, pay attention to the following due to clearance issues:

- Route all the various lines (e.g. for fuel, hydraulics, EVAP system, coolant, refrigerant, brake fluid and vacuum lines and hoses) and electrical wiring so that the original positions are restored.
 - Ensure sufficient clearance to all moving or hot components.
- All cable ties which are opened or cut open when removing, must be replaced in same position when installing.
 - Remove front exhaust pipe from exhaust manifold --> Exhaust Manifolds with Primary Catalytic Converters and Attachments, Assembly Overview.

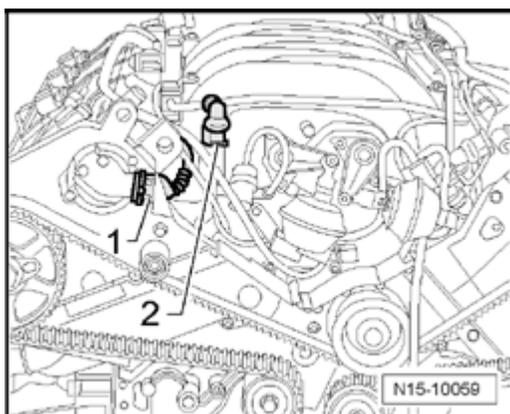


Fig. 97: Identifying Connectors

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect connectors - 1 - and - 2 -.
- Remove toothed belt --> Toothed Belt, Removing and Installing.

- Remove camshaft gear --> **Toothed Belt, Removing and Installing**

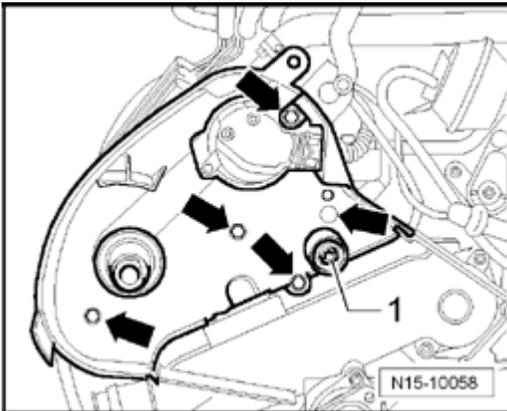


Fig. 98: Identifying Idler Roller And Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove idler roller - 1 -.
- Remove bolts - **arrows** - and rear toothed belt cover.
- Disconnect connectors from all fuel injectors.

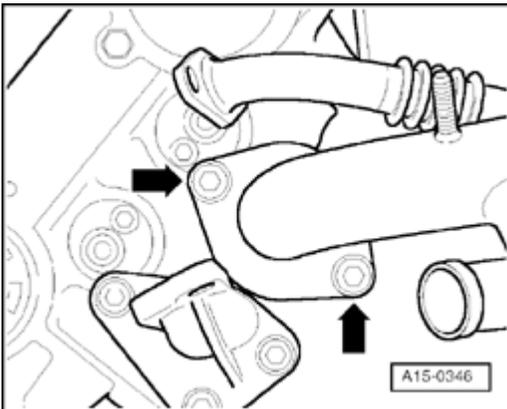


Fig. 99: Coolant Pipe Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - from coolant pipe.

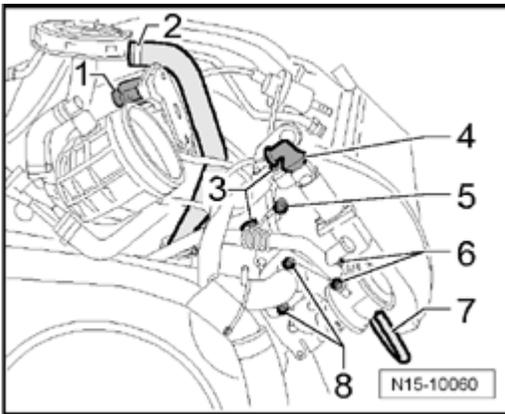


Fig. 100: Coolant Pipe Connecting Components
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect connector - 1 -.
- Disconnect hose - 2 -.
- Disconnect connector - 4 -.
- Remove bolts - 6 -.
- Disconnect vacuum hose - 7 - from combination valve.
- Remove bolts - 8 -.
- Remove coolant pipe.
- Remove intake manifold.

NOTE:

- The intake manifold and its gaskets are centralized on cylinder head bank 1 and bank 2 on small central locating pins. When removing the intake manifold, make sure the locating pins are not pulled out and fall into the intake canals!

- Remove cylinder head cover --> Right Cylinder Head Cover, Removing and Installing.

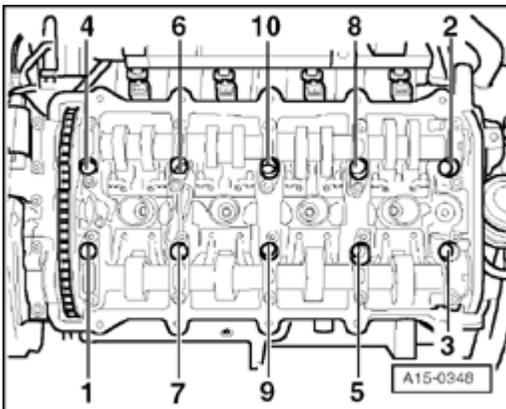


Fig. 101: Socket Head Bolts Loosening Sequence
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen socket head bolts in the given sequence from outside to inside and then remove completely.
- Carefully lift cylinder head off.
- Place a clean cloth in cylinders so that no dirt or emery cloth particles can get in between cylinder wall and piston.
- Also prevent dirt and emery cloth particles from getting into coolant.
- Carefully clean cylinder head and cylinder block sealing surfaces. This ensures that no scoring or scratches are formed (when using abrasive paper, grade must not be less than 100).

Installing

- Carefully remove metal particles, emery remains and cloths.

NOTE:

- **Only remove new cylinder head gasket from its packing immediately before installing.**
- **Handle new gasket with extreme care. Damaging will lead to leaks.**

- Install new cylinder head gasket. Install new cylinder head gasket. Inscription (Part No.) must be legible.

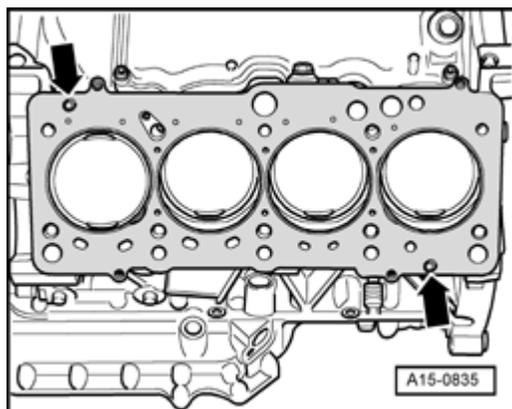


Fig. 102: Cylinder Head Gasket Alignment Bushings
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Ensure that alignment bushings - **arrows** - are inserted into cylinder block and that cylinder head gasket is seated.
- Install cylinder head, insert new cylinder head bolts and hand tighten.

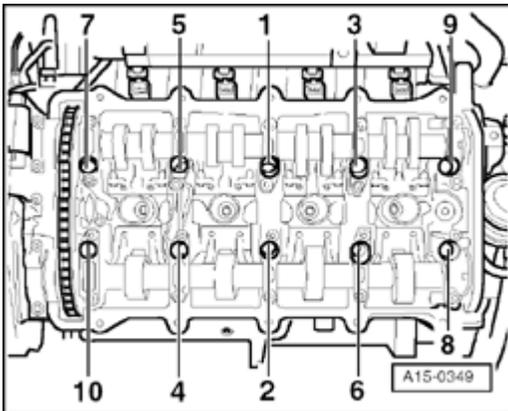


Fig. 103: Cylinder Head Tightening Sequence

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten cylinder head bolts in tightening sequence as follows from inside to outside.
- Pre-tighten all bolts to 35 Nm.
- Then tighten all bolts to 60 Nm.
- Tighten all bolts ($\frac{1}{4}$ turn) (90) further using a rigid wrench.

- Afterwards, tighten all bolts again $\frac{1}{4}$ turn (90) further

Adjust valve timing --> **Toothed Belt, Removing and Installing.**

- Install cylinder head cover --> **Right Cylinder Head Cover, Removing and Installing.**
- Install intake manifold.

The rest of assembly is in reverse order of disassembling.

NOTE: ● **There is no requirement to retighten the cylinder head bolts after repairs.**

Compression, Checking

Compression, Checking

2004 Volkswagen Phaeton

ENGINE 4.2 Liter V8 5V Engine Mechanical, Fuel Injection & Ignition, Engine Code(s): BGH, BGJ

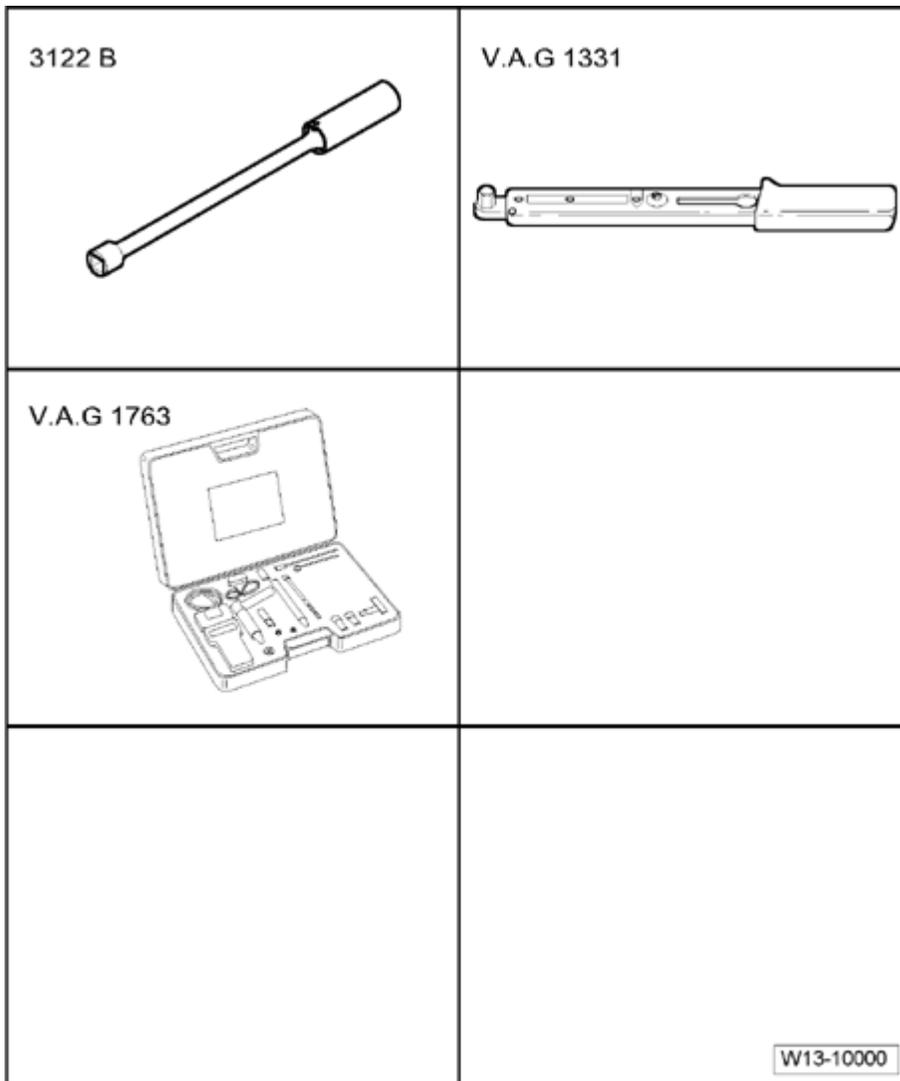


Fig. 104: Identifying Special Tools - Compression, Checking
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Spark plug removal tool 3122 B
- Torque wrench (5 to 50 Nm) V.A.G 1331
- Compression tester V.A.G 1763

Test conditions

- Engine oil temperature must be at least 86 F (30 C).
- Battery voltage must be at least 11.5 V.
- All electrical consumers such as, for example, lights and rear window defroster must be switched off.
- If vehicle is equipped with an air conditioning system, this must be switched off.

2004 Volkswagen Phaeton

ENGINE 4.2 Liter V8 5V Engine Mechanical, Fuel Injection & Ignition, Engine Code(s): BGH, BGJ

- Selector lever must be in "P" or "N" position.

Test sequence

- Remove ignition coils with power output stage --> **Ignition Coils with Power Output Stage, Removing and Installing.**
- Pull all connectors off from fuel injectors.
- Remove spark plugs with spark plug removal tool 3122B.
- Check compression pressure using the compression tester V.A.G 1763.

NOTE:

- **Using the compression tester --> Operating instructions.**

- Have a second technician fully depress accelerator pedal and crank engine.
- Operate starter until tester shows no further pressure increase.

Compression pressure:

New: 10 to 13 bar pressure (145 to 188 PSI)

Wear limit: 7.0 bar pressure (101 PSI)

Permissible difference between all cylinders: 3 bar (45 PSI)

- Install spark plugs using spark plug removal tool 3122B and tighten to 30 Nm.
- Check DTC memory, repair any stored malfunctions and then erase DTC memory --> **Engine Control Module DTC Memory, Checking and Erasing.**

VALVETRAIN, SERVICING

Valvetrain, Servicing

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

--> **Camshaft Seals, Replacing**

--> **Camshaft Position Sensor, Replacing**

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

--> **Roller Rocker Lever, Removing and Installing**

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

--> **Valve Guides, Checking**

--> Valve Seats, Reworking

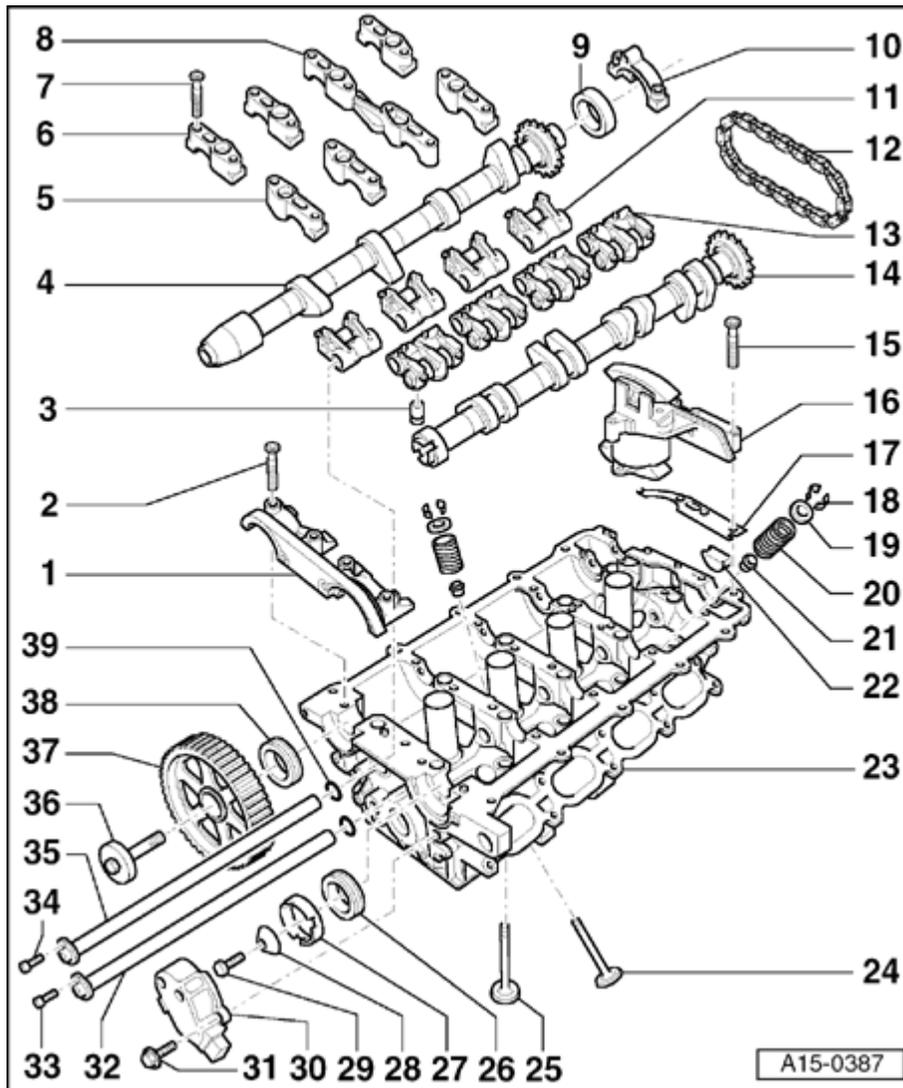


Fig. 105: Exploded View Of Valvetrain

Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Double bearing cap

- To install, seal joint surfaces of outer bearing cap with **sealant AMV 188 001 02** --> **Lightly coat separation surfaces of front and rear bearing caps with grease AMV 188 001 02 before installing under Fig. 107**

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

- Replace

3 - Support element

- Before installing check camshaft axial play --> **Camshafts, Checking Axial Clearance**
- Do not interchange
- With hydraulic valve clearance compensation

4 - Exhaust camshaft

- Checking radial clearance with Plastigage, Wear limit: 0.1 mm
- Run-out: max. 0.01 mm
- Checking axial play --> **Camshafts, Checking Axial Clearance**
- Removing and installing --> **Camshafts and Camshaft Adjuster, Removing and Installing**

5 - Intake camshaft bearing cap

- Removing and installing --> **Camshafts and Camshaft Adjuster, Removing and Installing**

6 - Exhaust camshaft bearing cap

- Removing and installing --> **Camshafts and Camshaft Adjuster, Removing and Installing**

7 - 5 Nm plus an additional $1/4$ turn (90)

- Replace

8 - Double bearing cap**9 - Sealing cap**

- Replace
- To remove, push through with screwdriver and pry out
- To install, press in with 3202

10 - Bearing cap

To install, seal joint surfaces of outer bearing cap with **sealant AMV 188 001 02** --> **Lightly coat separation surfaces of front and rear bearing caps with grease AMV 188 001 02 before installing under Fig. 107**

11 - Roller rocker lever

- For exhaust camshaft
- Before installing check camshaft axial play --> **Camshafts, Checking Axial Clearance**
- Do not interchange
- Check roller for easy movement
- Lubricate contact surface

- Removing and installing --> **Roller Rocker Lever, Removing and Installing**

12 - Camshaft roller chain

- Mark direction of rotation (installation position) before removing --> **Camshafts and Camshaft Adjuster, Removing and Installing**

13 - Roller rocker lever

- For intake camshaft
- Before installing, check camshaft axial clearance --> **Camshafts, Checking Axial Clearance**
- Do not interchange
- Check roller for easy movement
- Lubricate contact surface
- Removing and installing --> **Roller Rocker Lever, Removing and Installing**

14 - Intake camshaft

- Checking radial clearance with Plastigage, Wear limit: 0.1 mm
- Run-out: max. 0.01 mm
- Checking axial play --> **Camshafts, Checking Axial Clearance**
- Removing and installing --> **Camshafts and Camshaft Adjuster, Removing and Installing**

15 - 5 Nm plus an additional $1/4$ turn (90)

- Replace

16 - Camshaft adjuster

- Only rotate engine with camshaft adjuster installed
- Removing and installing --> **Camshafts and Camshaft Adjuster, Removing and Installing**

17 - Gasket

- Replace

18 - Valve keepers

19 - Valve spring plate

20 - Valve spring

- Note installation position

- Removing and installing --> **Valve Stem Seals, Replacing**

21 - Valve stem seal

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

22 - Gasket

- Replace

23 - Cylinder head

- Check for distortion --> **Checking cylinder head for distortion**
- Right cylinder head, removing and installing --> **Right Cylinder Head, Removing and Installing**
- Left cylinder head, removing and installing --> **Left Cylinder Head, Removing and Installing**
- After replacing replace entire amount of coolant

24 - Exhaust valve

- Do not rework, only lapping is permitted
- Valve dimensions --> **Valve dimensions**

25 - Intake valve

- Do not rework, only lapping is permitted
- Valve dimensions --> **Valve dimensions**

26 - Oil seal

- For Camshaft Position (CMP) Sensor G40
- Removing and installing --> **Camshaft Position Sensor, Replacing**

27 - Cover for Camshaft Position (CMP) Sensor G40

- Note installation position

28 - Washer

- Conical

29 - 23 Nm

30 - Camshaft Position (CMP) Sensor G40

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

- Removing and installing --> **Toothed Belt, Removing and Installing**

38 - Oil seal

- For camshaft
- Removing and installing --> **Camshaft Seals, Replacing**

39 - O-ring

- Replace

Valve dimensions

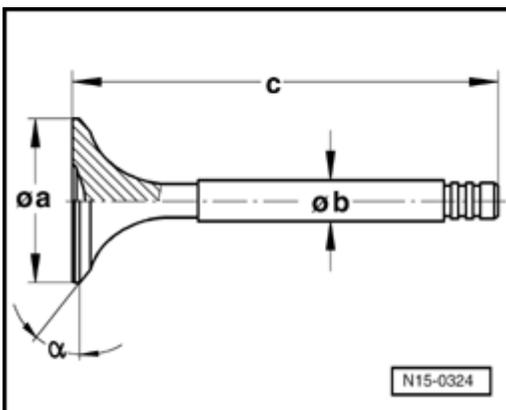


Fig. 106: Valve Dimensions

Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

2004 Volkswagen Phaeton

ENGINE 4.2 Liter V8 5V Engine Mechanical, Fuel Injection & Ignition, Engine Code(s): BGH, BGJ

- **Valves must not be reworked. Only grinding is permitted.**

Valve dimensions

Dimension		Intake valve	Exhaust valve
Dia. a	mm	26.8 to 27.0	29.8 to 30.0
Dia. b	mm	5.96 to 5.97	5.94 to 5.95
c	mm	104.84 to 105.34	103.64 to 104.14
a	Angle °	45	45

NOTE:

- **Worn sodium-filled exhaust valves must not be scrapped without first being properly treated.**

CAUTION: To prevent eye damage and skin abrasion, wear protective glasses and clothing!

- The valves must be cut at the middle of the shaft using a metal saw. While doing this, do not come into contact with water!
- Of the prepared valves, throw no more than 10 at a time into a bucket filled with water and then step away swiftly!
- A sudden chemical reaction occurs, during which the sodium filling burns.
- The treated parts may then be discarded through conventional disposal channels.

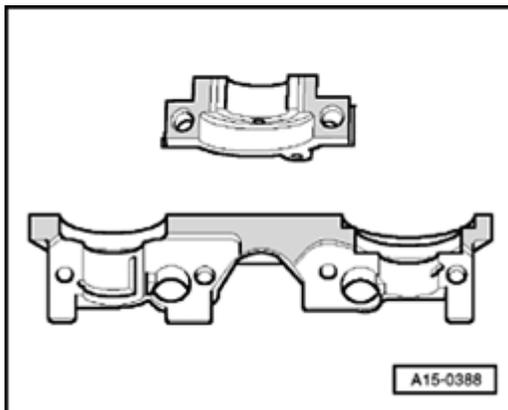


Fig. 107: Bearing Caps

Courtesy of VOLKSWAGEN UNITED STATES, INC.

Lightly coat separation surfaces of front and rear bearing caps with grease AMV 188 001 02 before installing

Camshafts, Checking Axial Clearance

Camshafts, Checking Axial Clearance

Special tools, testers and auxiliary items required

- Dial gauge holder VW 387
- Dial gauge

Test sequence

Perform measurements with support elements and roller rocker levers removed.

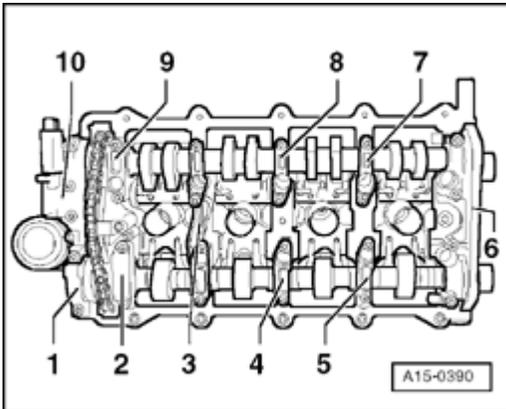


Fig. 108: Locating Bearing Caps

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set camshaft in place and fasten with bearing caps - 3 - , - 5 - and - 7 - .

Intake camshaft

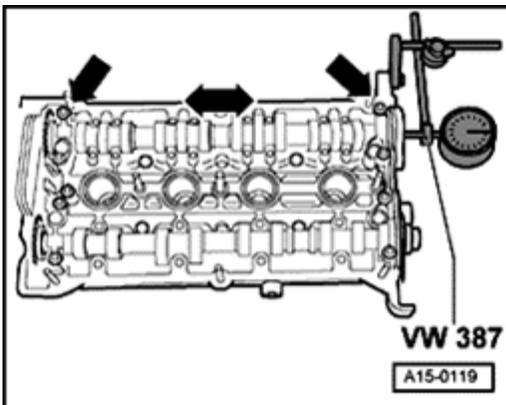


Fig. 109: Camshaft Axial Clearance, Checking - Intake Camshaft

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Attach dial gauge holder with dial gauge to cylinder head as shown.

Axial clearance wear limit: max. 0.20 mm

Exhaust camshaft

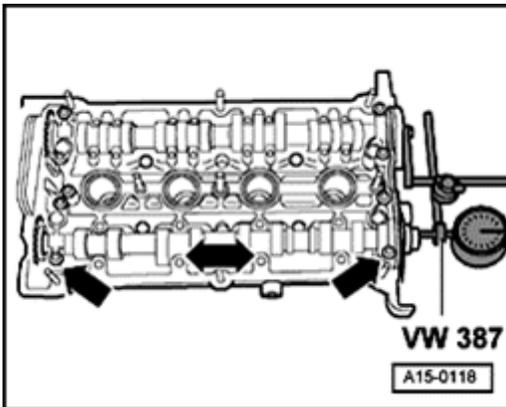


Fig. 110: Camshaft Axial Clearance, Checking - Exhaust Camshaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Attach dial gauge holder with dial gauge to cylinder head as shown.

Axial clearance wear limit: max. 0.20 mm

Camshaft Seals, Replacing

Camshaft Seals, Replacing

Special tools, testers and auxiliary items required

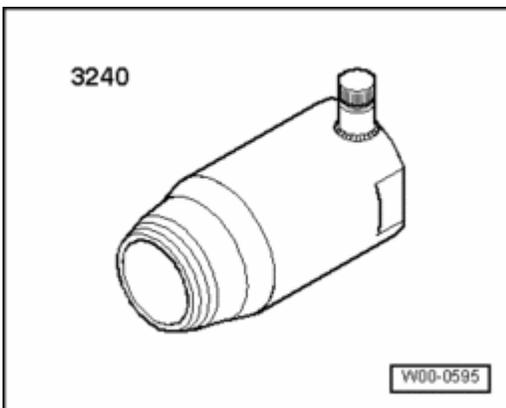


Fig. 111: Seal Remover 3240
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Seal remover 3240

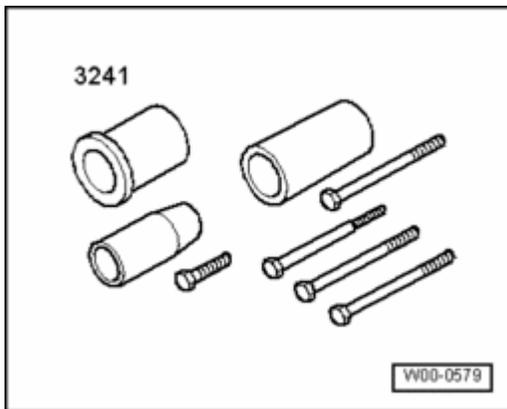


Fig. 112: Puller 3241

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pulling fixture 3241

Removing

- Remove toothed belt and camshaft gears --> **Toothed Belt, Removing and Installing.**
- Remove inner portion of seal extractor 3240 several rotations from outer portion and secure with knurled-head bolt.

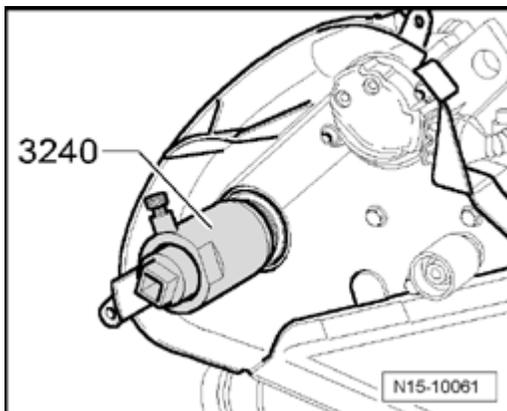


Fig. 113: Identifying Seal Extractor 3240

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Grease threaded head of Seal Puller - General Usage 2085 , position and with forced pressure 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 vice at the flat spots. Remove seal with pliers

Installing

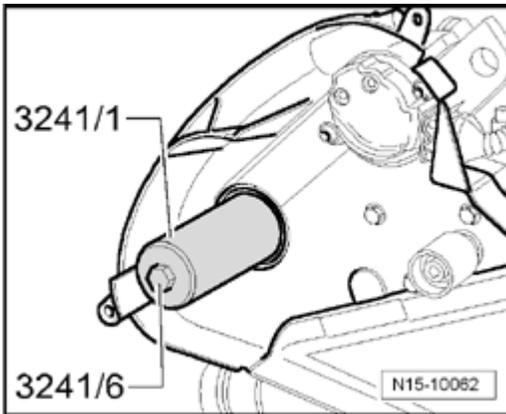


Fig. 114: Pressing Oil Seal In Until Stop Using Thrust Sleeve 3241/1 And Bolt 3241/6
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set oil seal in place and press in until stop using thrust sleeve 3241/1 and bolt 3241/6.
- Install toothed belt and camshaft gears --> **Toothed Belt, Removing and Installing.**

Camshaft Position Sensor, Replacing

Camshaft Position Sensor, Replacing

Special tools, testers and auxiliary items required

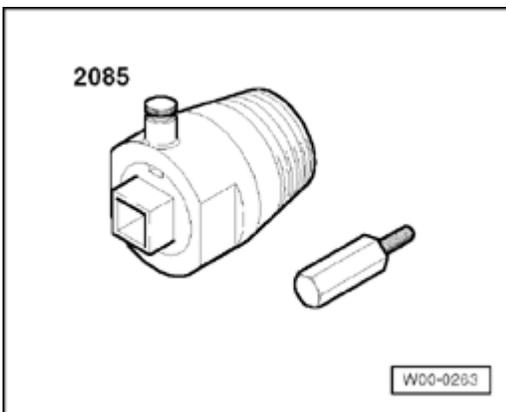


Fig. 115: Oil Seal Extractor 2085
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Seal remover 2085

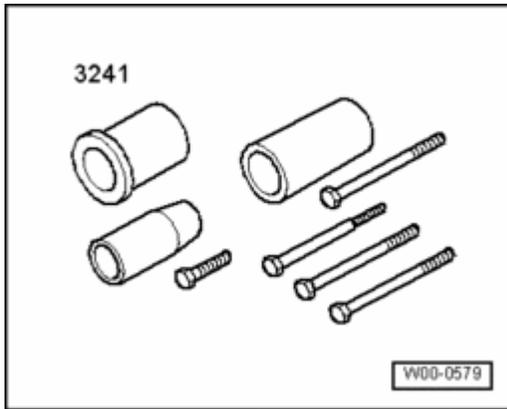


Fig. 116: Puller 3241

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pulling fixture 3241

Work procedure

Left cylinder head

- Remove air intake tube between the left air filter and the throttle valve control module.
- Remove connecting hose from combination valve.
- Disconnect connectors from ignition coils and fuel injectors and lay wiring harness aside.
- Disconnect connector from Camshaft Position (CMP) Sensor G40.
- Remove Camshaft Position (CMP) Sensor G40 housing with cover and cone.

On right of cylinder head

- Bring lock carrier into service position: --> **50 BODY - FRONT**
- Remove right toothed belt cover.
- Disconnect connector from Camshaft Position (CMP) Sensor G40.

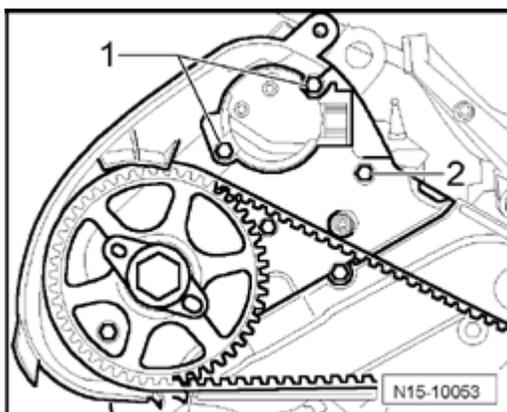


Fig. 117: CMP Sensor Bolts And Rear Toothed Belt Cover Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - 1 - from Camshaft Position (CMP) Sensor G40.
- Remove bolts - 2 - from rear toothed belt cover.
- Pull rear toothed belt cover slightly forward and remove Camshaft Position (CMP) Sensor G40 housing with cover and cone.

Continuation for both cylinder heads

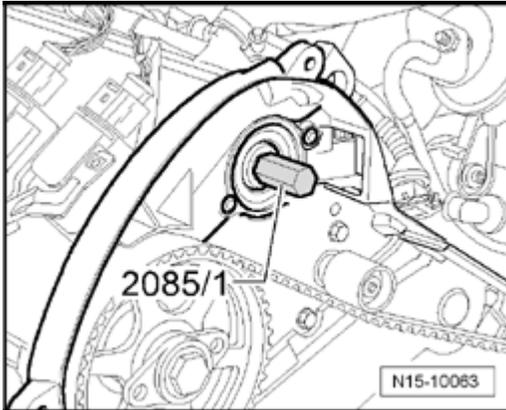


Fig. 118: Adapter 2085/1 Installed

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install adapter 2085/1 as shown.

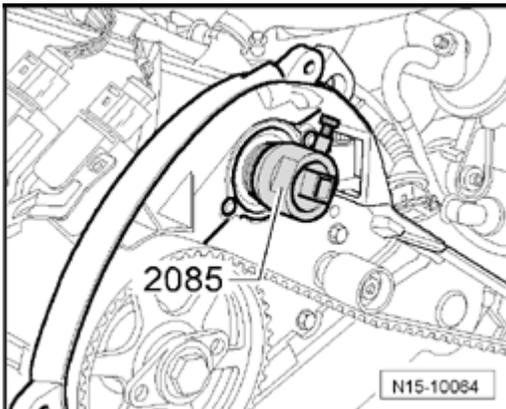


Fig. 119: Seal Extractor 2085

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove inner portion of seal extractor 2085 several rotations from outer portion and secure with knurled-head bolt.
- Grease threaded head of 2085 seal puller, position and with forced pressure screw into oil seal as far as possible.
- Loosen knurled bolt and turn inner part against adapter 2085/1 until seal is removed.
- Secure seal remover in a vice at flat spots. Remove seal with pliers

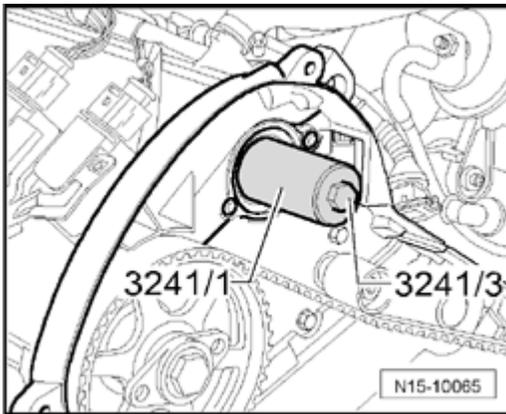


Fig. 120: Pressing In New Seal With Seal Installer 3241/1 And Bolt 3241/3
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Then press in new seal with seal installer 3241/1 and bolt 3241/3 so it sits flush.

The rest of assembly is a reverse of disassembling sequence.

Camshafts and Camshaft Adjuster, Removing and Installing

Camshafts and Camshaft Adjuster, Removing and Installing

Special tools, testers and auxiliary items required

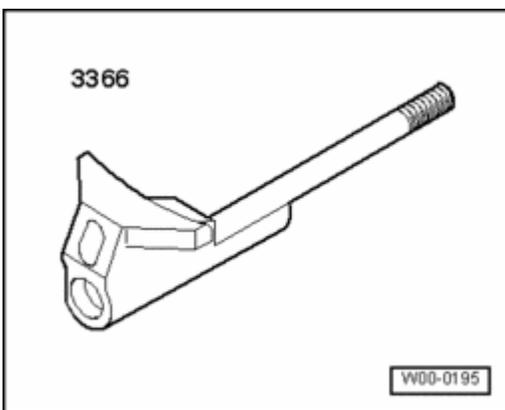


Fig. 121: Identifying Retainer For Chain Tensioner 3366
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Chain tensioner 3366

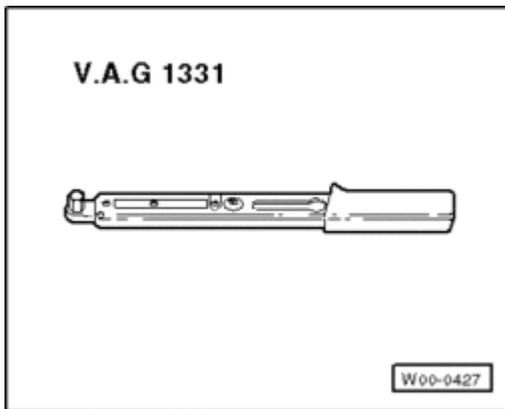


Fig. 122: Torque Wrench V.A.G 1331

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Torque wrench (5 to 50 Nm) V.A.G 1331
- Sealant AMV 188 001 02

Removing

- Set engine to TDC --> **Toothed Belt, Removing and Installing.**
- Remove the toothed belt and camshaft gear --> **Toothed Belt, Removing and Installing**

Left cylinder head

- Remove cylinder head cover --> **Left Cylinder Head Cover, Removing and Installing.**

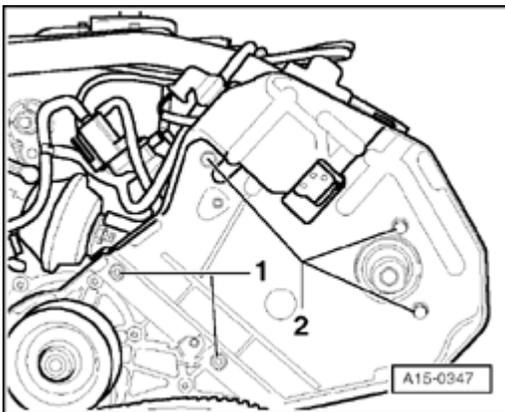


Fig. 123: Rear Toothed Belt Cover And Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - 1 - and - 2 - and remove rear toothed belt cover.

On right of cylinder head

- Remove cylinder head cover --> **Right Cylinder Head Cover, Removing and Installing.**

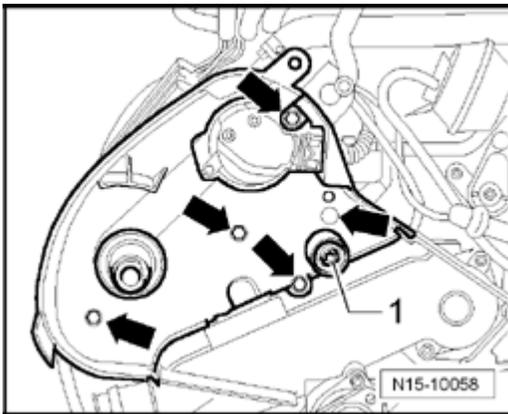


Fig. 124: Identifying Idler Roller And Bolts
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove idler roller - 1 -.
- Remove bolts - **arrows** - and remove rear toothed belt cover.

Continuation for both cylinder heads

- Disconnect connector from Camshaft Position (CMP) Sensor G40 and remove Camshaft Position (CMP) Sensor G40 housing with cover and cone.

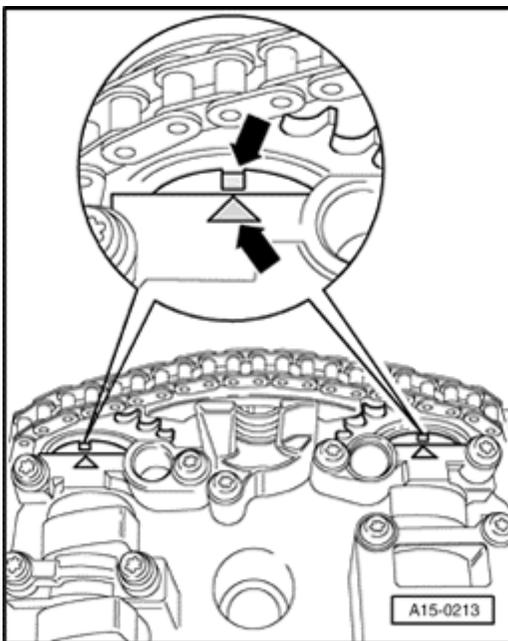


Fig. 125: Positioning Camshafts To TDC Cyl. 3
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Verify TDC position of camshafts. The markings on camshafts must be aligned with both - **arrows** - on bearing cap.

When re-using camshaft roller chain

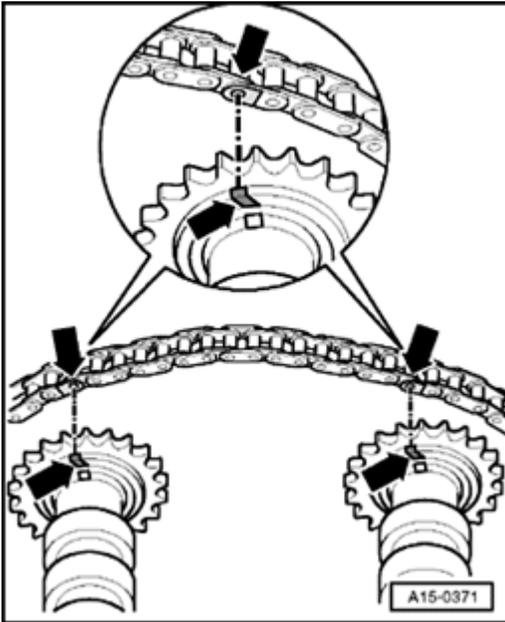


Fig. 126: Moving Color Markings to Aligned Position (Using Old Drive Chain)
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Mark roller chain - **arrows** - before removing (e.g. with paint, arrow pointing in direction of rotation).

NOTE:

- **Do not mark chain with a center punch or similar means!**

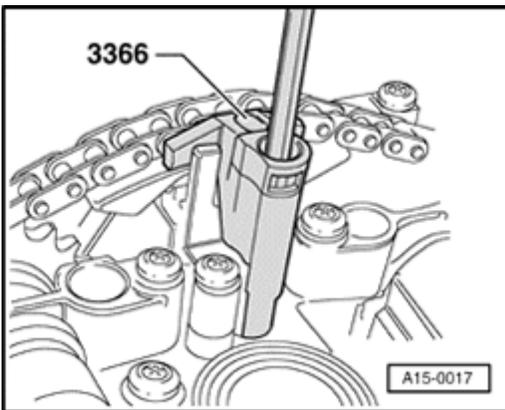


Fig. 127: Securing Camshaft Adjuster Or Chain Tensioner Using Bracket For Chain Adjustment 3366
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure camshaft adjuster with bracket for chain adjustment 3366.

NOTE:

- **If the bracket for chain adjustment is fastened too tightly, the camshaft adjuster can be damaged.**

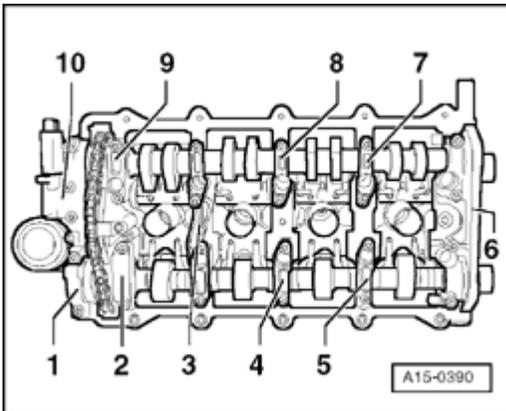


Fig. 128: Locating Bearing Caps

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Independent of existing markings, mark the installed position and sequence of all bearing caps as shown (e.g. with a water-proof felt pen).
- Remove mounting bolts of camshaft adjuster.
- Remove bearing cap - 1 -.
- Remove bearing caps - 2 - , - 4 - , - 6 - , - 8 - and - 9 - and lay on a clean surface in correct order.
- Loosen bearing caps - 3 - , - 5 - and - 7 - alternately in a diagonal sequence, and remove.
- Remove both camshafts with camshaft adjusters and place on a clean surface.

Installing

- Replace half-round sealing plugs.

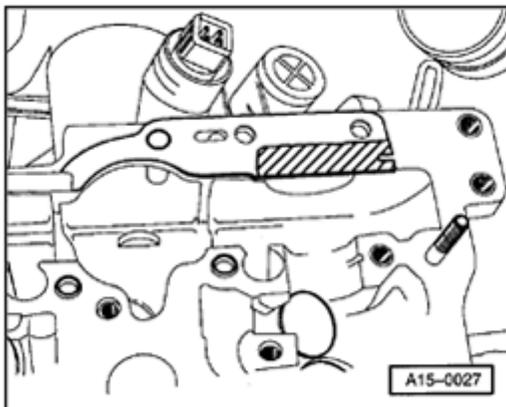


Fig. 129: Sealant Application Area Identified By Hatched Surface

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Replace gasket for camshaft adjuster.
- Lightly coat shaded area with **sealant AMV 188 001 02** .
- Place camshaft roller chain onto camshaft drive sprockets as follows.

When re-using the camshaft roller chain

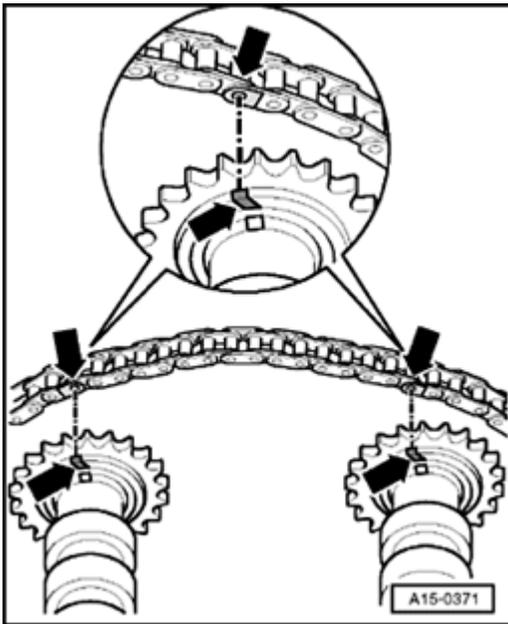


Fig. 130: Moving Color Markings to Aligned Position (Using Old Drive Chain)
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- o Move color markings to congruency - **arrows** -.

When using a new camshaft roller chain

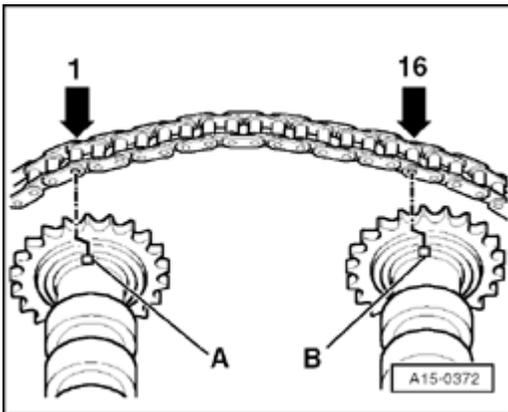


Fig. 131: Distance Between Notches A and B On Camshafts Must Consist Of 16 Rollers On The Drive Chain (Using New Drive Chain)
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

The distance between notches - **A** - and - **B** - must consist of 16 rollers on drive chain. Illustration shows where - **1** - and - **16** - drive chain rollers must be installed on chain sprockets. The chain rollers - **1** - and - **16** - are across from notches - **A** - and - **B** - , and are respectively a $\frac{1}{2}$ tooth width offset to the left.

Continued

- Push camshaft adjuster in between camshaft roller chain.
- Install camshafts with camshaft roller chain and camshaft adjuster into cylinder head.
- Oil journal surfaces of camshafts.

NOTE: ● **Alignment bushings for bearing caps and camshaft adjusters must be installed in cylinder head.**

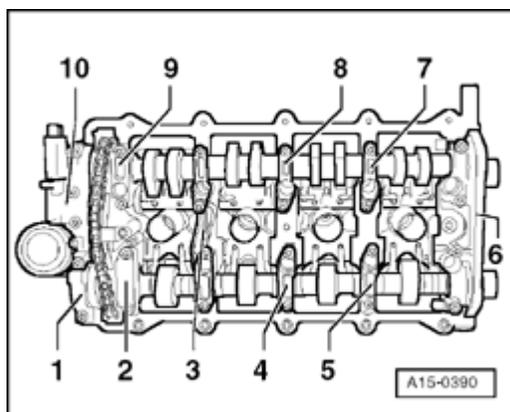


Fig. 132: Locating Bearing Caps

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install bearing caps - 3 - , - 5 - and - 7 - according to markings and fasten new bolts alternately in a diagonal sequence. Torque specification: 5 Nm plus an additional $1/4$ turn (90)
- Tighten camshaft adjuster - 10 -. Torque specification: 5 Nm plus an additional $1/4$ turn (90)
- Remove chain tensioner.

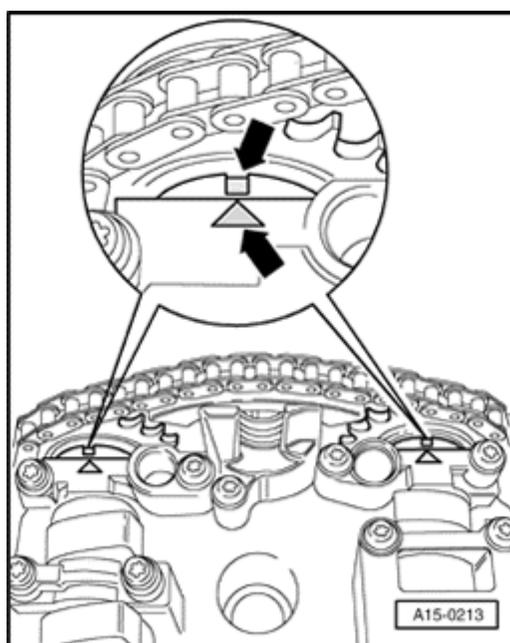


Fig. 133: Positioning Camshafts To TDC Cyl. 3

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Verify TDC position of camshafts. The markings on camshafts must be aligned with both - **arrows** - on bearing cap.

NOTE:

- **So that both markings line up, turn camshaft slightly back and forth if necessary.**

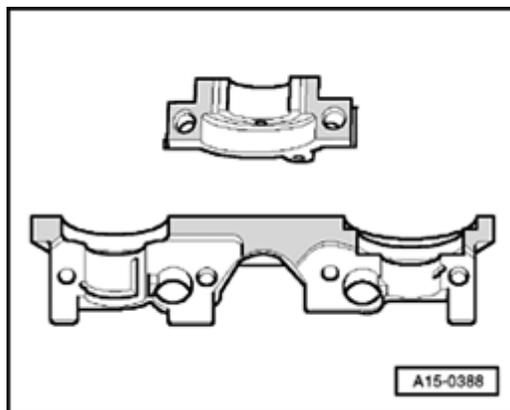


Fig. 134: Bearing Caps

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lightly coat double bearing cap - **6** - and bearing cap - **1** - with sealant AMV 188 001 02 and install the bearing caps. Torque specification: 5 Nm plus an additional $\frac{1}{4}$ turn (90)
- Install remaining bearing caps. Torque specification: 5 Nm plus an additional $\frac{1}{4}$ turn (90)
- Replace camshaft seals --> **Camshaft Seals, Replacing.**
- Replace seals for Camshaft Position (CMP) Sensor G40 --> **Camshaft Position Sensor, Replacing.**
- Carefully drive in sealing cover with pressure piece from tool set retractors 3202.

The rest of assembly is in reverse order of disassembling.

NOTE:

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

Roller Rocker Lever, Removing and Installing

Roller Rocker Lever, Removing and Installing

Special tools, testers and auxiliary items required

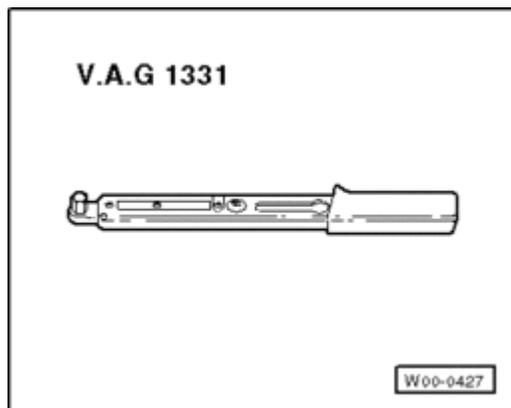


Fig. 135: Torque Wrench V.A.G 1331
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Torque wrench (5 to 50 Nm) V.A.G 1331

Work procedure

- Remove engine --> **Engine, Removing and Installing.**
- Remove camshafts with camshaft adjusters --> **Camshafts and Camshaft Adjuster, Removing and Installing.**
- Mark allocation of roller rocker lever and roller rocker lever shafts for re-installation.

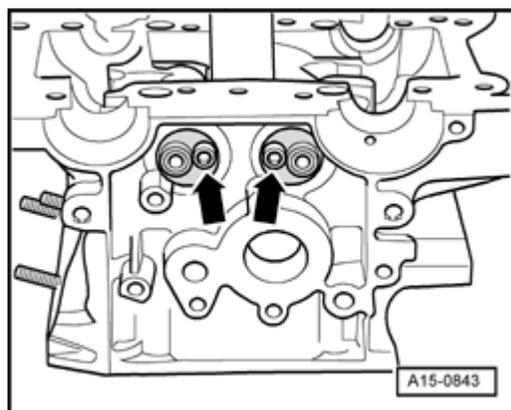


Fig. 136: Removing bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** -.
- Then, install a M6 bolt into holes of shafts and pull shafts out of cylinder head.
- Remove roller rocker levers.

NOTE: • **Always replace the O-rings of the shaft when installing.**

- Oil the bearing areas of the roller rocker levers.

- When installing, tighten bolts of shaft to 10 Nm.

The rest of assembly is in reverse order of disassembling.

Valve Stem Seals, Replacing

Valve Stem Seals, Replacing

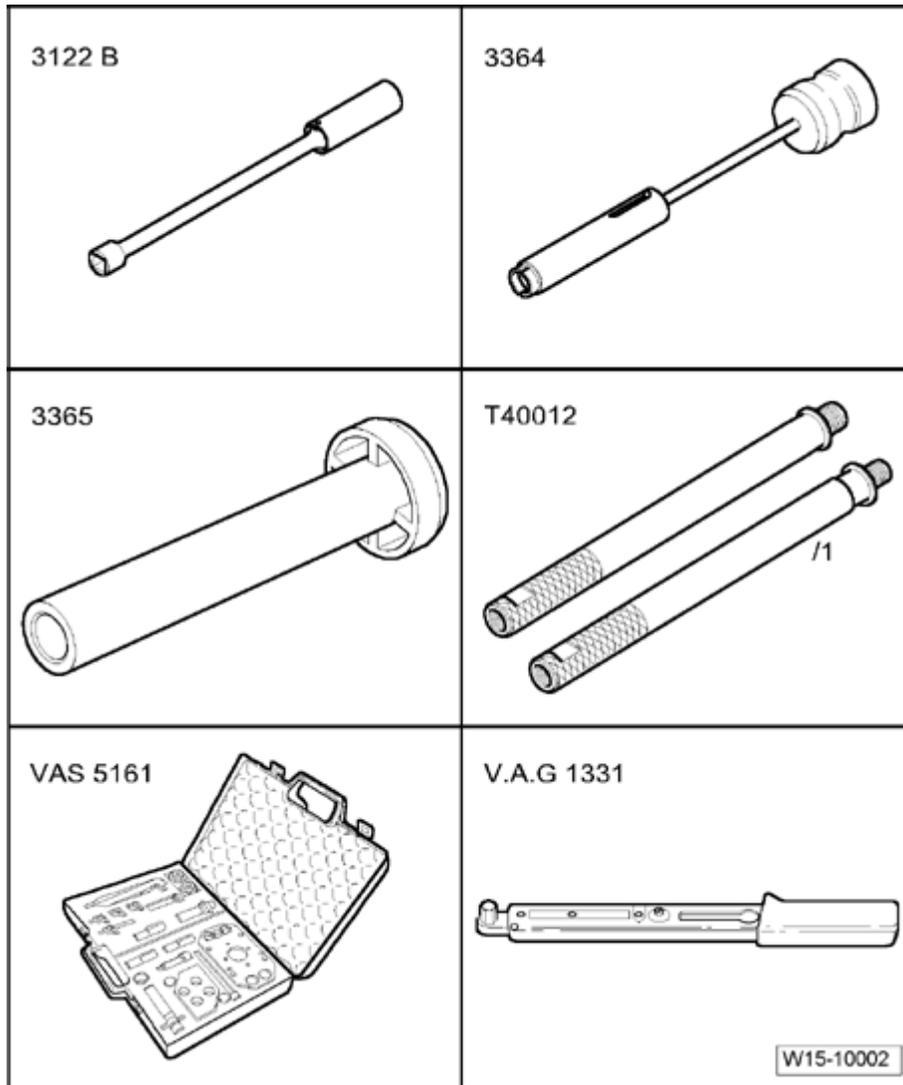


Fig. 137: Identifying Special Tools - Valve Stem Seals, Replacing
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Spark plug removal tool 3122B

- Valve seal removal tool 3364
- Valve stem seal driver 3365
- Adapter T40012

- Torque wrench (5 to 50 Nm) V.A.G 1331
- Valve cotter disassembly and assembly device VAS 5161

Removing

- Remove engine --> **Engine, Removing and Installing.**
- Remove camshafts and camshaft adjusters --> **Camshafts and Camshaft Adjuster, Removing and Installing.**
- Remove spark plugs with spark plug removal tool 3122B.

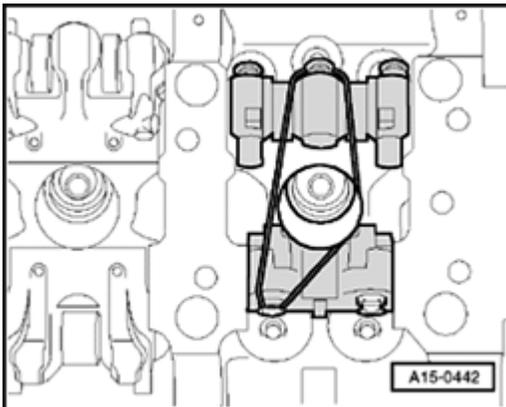


Fig. 138: Turning Roller Rocker Lever Upward And Securing With A Rubber Band
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Turn roller rocker lever upward and secure it with a rubber band.

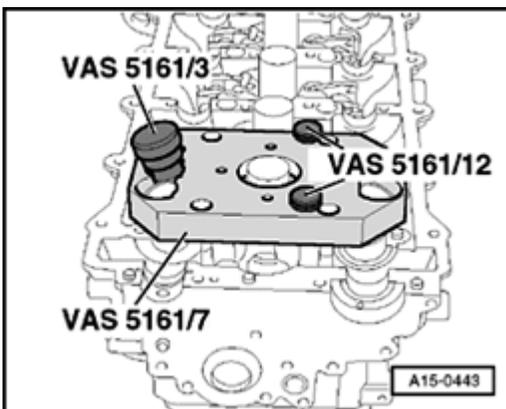


Fig. 139: Placing Guide Plate VAS 5161/7 From Valve Cotter Disassembly, Assembly Device VAS 5161 On Cylinder Head & Securing Guide Plate VAS 5161/7 With Knurled Screws VAS 5161/12
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place guide plate VAS 5161/7 onto cylinder head as shown.
- Secure guide plate with knurled screws VAS 5161/12.
- Insert drift VAS 5161/3 into guide plate and loosen stuck valve keepers using a plastic hammer.

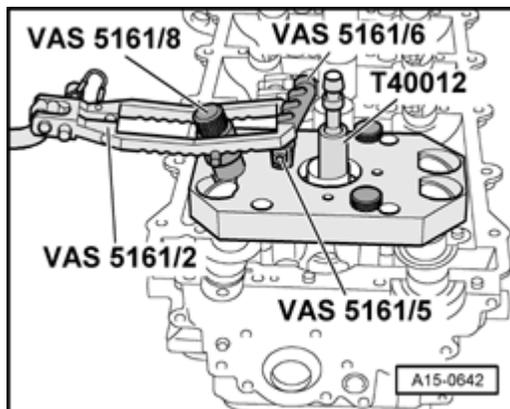


Fig. 140: Installing Engaging Device VAS 5161/6 With Installation Forks VAS 5161/5 Into Guide Plate VAS 5161/7

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 into spark plug hole and with a commercially available adapter apply a constant pressure of at least 6 bar.
- Hook in 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 the right, until the points engage in the 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 and remove installation cartridge from guide plate.
- Remove guide plate from cylinder head.

NOTE:

- **Pressurized air line remains connected.**

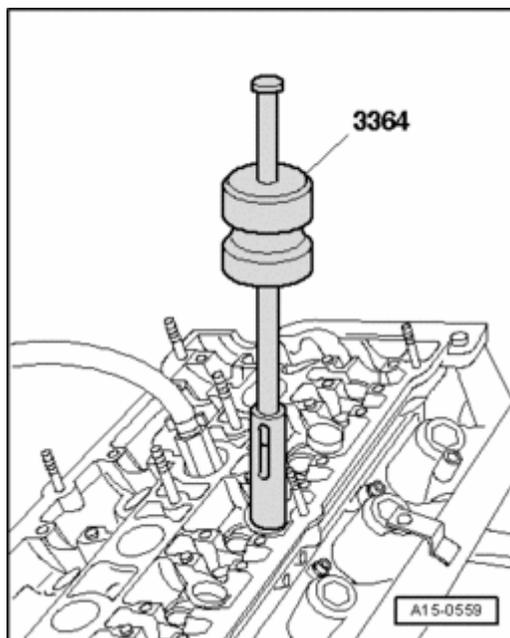


Fig. 141: Identifying Valve Seal Removal Tool 3364
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull off valve stem seals with valve stem removal tool 3364.

Installing

- To prevent damage to new valve stem seals, place plastic sleeve on valve stem.
- Lubricate sealing lip of valve stem seal, insert in valve stem seal driver 3365, and carefully push onto valve guide.
- Remove plastic sleeve again.

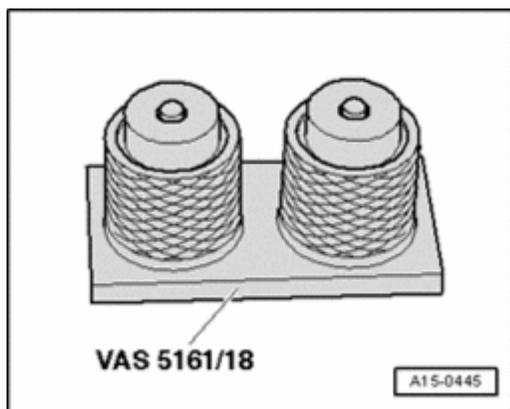


Fig. 142: Identifying VAS 5161/18
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE: • **The large diameter faces upward.**

- Insert valve spring and valve spring plate.
- Screw guide plate VAS 5161/7 onto cylinder head again.

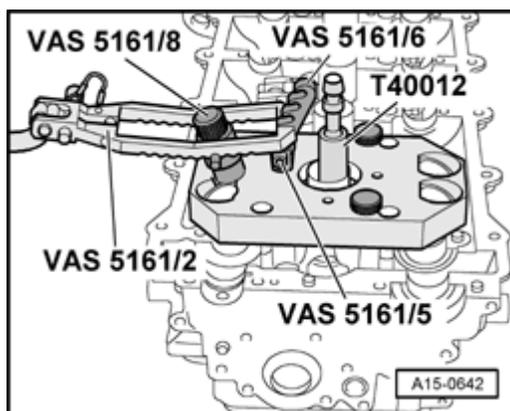


Fig. 143: Installing Engaging Device VAS 5161/6 With Installation Forks VAS 5161/5 Into Guide Plate VAS 5161/7

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert installation cartridge VAS 5161/8 into guide plate.
- Press down pressure fork and pull knurled bolt upward. The valve keepers are inserted in this manner.
- Release pressure fork with the knurled bolt still pulled.
- Install camshafts with camshaft adjusters --> **Camshafts and Camshaft Adjuster, Removing and Installing.**

Set valve timing --> **Toothed Belt, Removing and Installing**

NOTE:

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

Valve Guides, Checking

Valve Guides, Checking

Special tools, testers and auxiliary items required

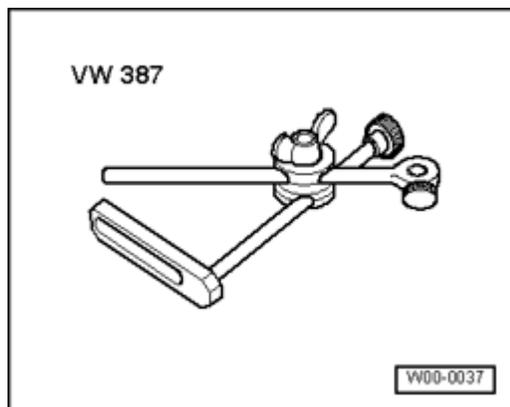


Fig. 144: Dial Gauge Holder VW 387

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Dial gauge holder VW 387
- Dial gauge

Test sequence

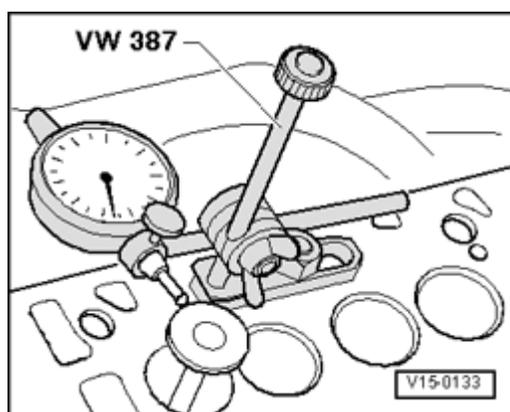


Fig. 145: Identifying Special Tool - VW 387 Installed

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert new valve into guide. The end of the valve stem must be flush with the guide. Due to the slight difference in stem diameters, ensure that only an intake valve is used in the intake guide and an exhaust valve in the exhaust guide.
- Determine tilt clearance. Wear limit: 0.8 mm

If tilt clearance is exceeded:

- Replace cylinder head.

Valve Seats, Reworking

Valve Seats, Reworking

Special tools, testers and auxiliary items required

- Depth gauge
- Valve seat refacing tool

Work procedure**NOTE:**

- When repairing engines with leaking valves, it is not sufficient to rework or replace valve seats and valves. It is also necessary to check the valve guides for wear. This is particularly important on high mileage engines --> **Valve Guides, Checking.**
- The valve seats should only be reworked just enough to produce a perfect seating pattern. The maximum permissible reworking dimension must be calculated before work is carried out. 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.

- Remove camshafts --> **Camshafts and Camshaft Adjuster, Removing and Installing.**

Maximum permitted refacing dimension is calculated as follows:

- Insert valve and press firmly against seat.

NOTE:

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

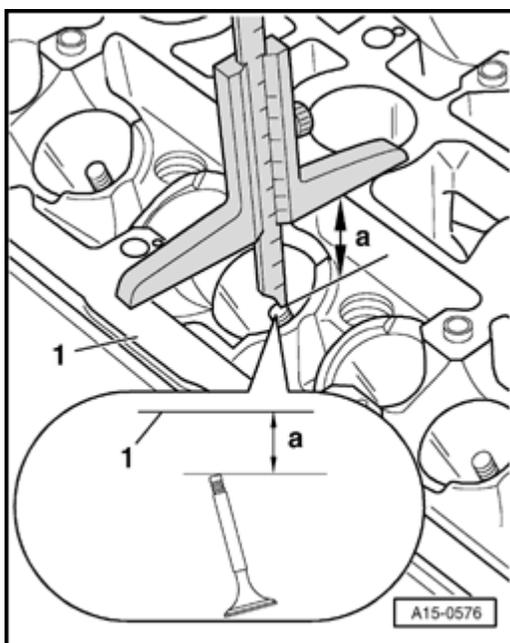


Fig. 146: Measuring Distance Between Valve Stem End (Upper Edge) And Top Surface Of Cylinder Head Using Depth Gauge

2004 Volkswagen Phaeton

ENGINE 4.2 Liter V8 5V Engine Mechanical, Fuel Injection & Ignition, Engine Code(s): BGH, BGJ

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Measure distance - **a** - between end of valve stem and upper edge of cylinder head.
- Calculate max. permissible reworking dimension from measured distance - **a** - and minimum dimension.

Minimum dimensions:

Outer intake valves	mm	34.0
Middle intake valve	mm	33.7
Exhaust valves	mm	34.4

Measured distance - **a** - minus minimum dimension = max. permissible refaced dimension.

Example:

Measured distance	34.4 mm
Minimum dimension	34.0 mm
= Max. permissible reworking dimension*	0.4 mm

NOTE:

- If the maximum allowed refaced dimension is 0 mm or less than 0 mm, repeat measurement using new valve. If the measured result does not change, replace the cylinder head.

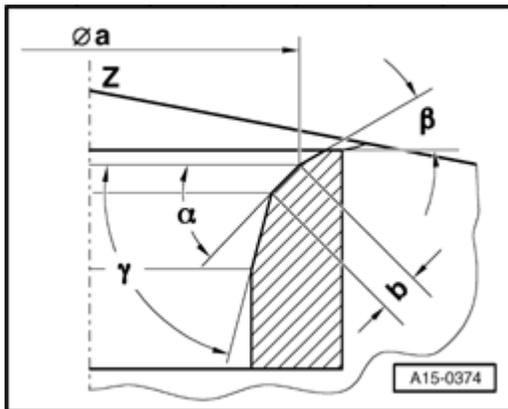


Fig. 147: Refacing Valve Seats Dimension

Courtesy of VOLKSWAGEN UNITED STATES, INC.

Valve seats, reworking

Reworking intake valve seat

a - = Dia. 26.2 mm

b - = 1.5 to 1.8 mm

Z - = Cylinder head lower edge

a - 45 valve seat angle

β - 30 upper correction angle

gamma - 60 lower correction angle

Reworking exhaust valve seat

a - = Dia. 29.0 mm

b - = approx. 1.8 mm

Z - = Cylinder head lower edge

a - 45 valve seat angle

β - 30 upper correction angle

gamma - 60 lower correction angle

17 - ENGINE - LUBRICATION

LUBRICATION SYSTEM COMPONENTS, REMOVING AND INSTALLING

Lubrication System Components, Removing and Installing

--> **Engine Oil**

--> **Oil Level, Checking**

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

--> **Oil Pan, Assembly Overview**

--> **Oil Level Thermal Sensor, Removing and Installing**

--> **Oil Pump, Assembly Overview**

--> **Oil Pump, Removing and Installing**

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

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

Oil return valve, removing and installing and

Engine Oil

Engine Oil

Oil system capacity:

With oil filter 7.5 L

Refer to: --> Fluid Capacity Charts for appropriate model and year

Engine oil specifications:

NOTE:

- The engine is filled at the factory with engine oil complying to VW standard 503 00. This engine oil is designed for long maintenance intervals.
- Engine oil conforming to VW standard 500 00, 501 01, or 502 00 may continue to be used. The oils must be changed every 12 months or every 15,000 km. The service interval display must be programmed correspondingly. Procedure: --> 01 - MAINTENANCE
- If during engine repairs, a large quantity of metal shavings is discovered, the oil channels must be cleaned and the oil cooler must be replaced to prevent subsequent damage.

Oil Level, Checking

Oil Level, Checking

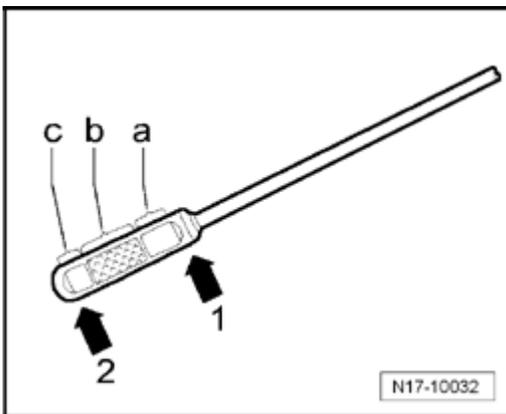


Fig. 148: Markings On Oil Dipstick
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Markings on oil dipstick

1 - Max. mark

2 - Min. mark

a - Area above hatched field up to Max. mark: Do not replenish with engine oil!

b - Oil level within hatched field: Oil may be topped off.

c - Area from Min. mark up to hatched field: Replenish with max. 0.5 ltr. of engine oil!

Oil Filter Housing, Assembly Overview

Oil Filter Housing, Assembly Overview

NOTE:

- The oil filter housing can only be removed or installed with the engine removed.

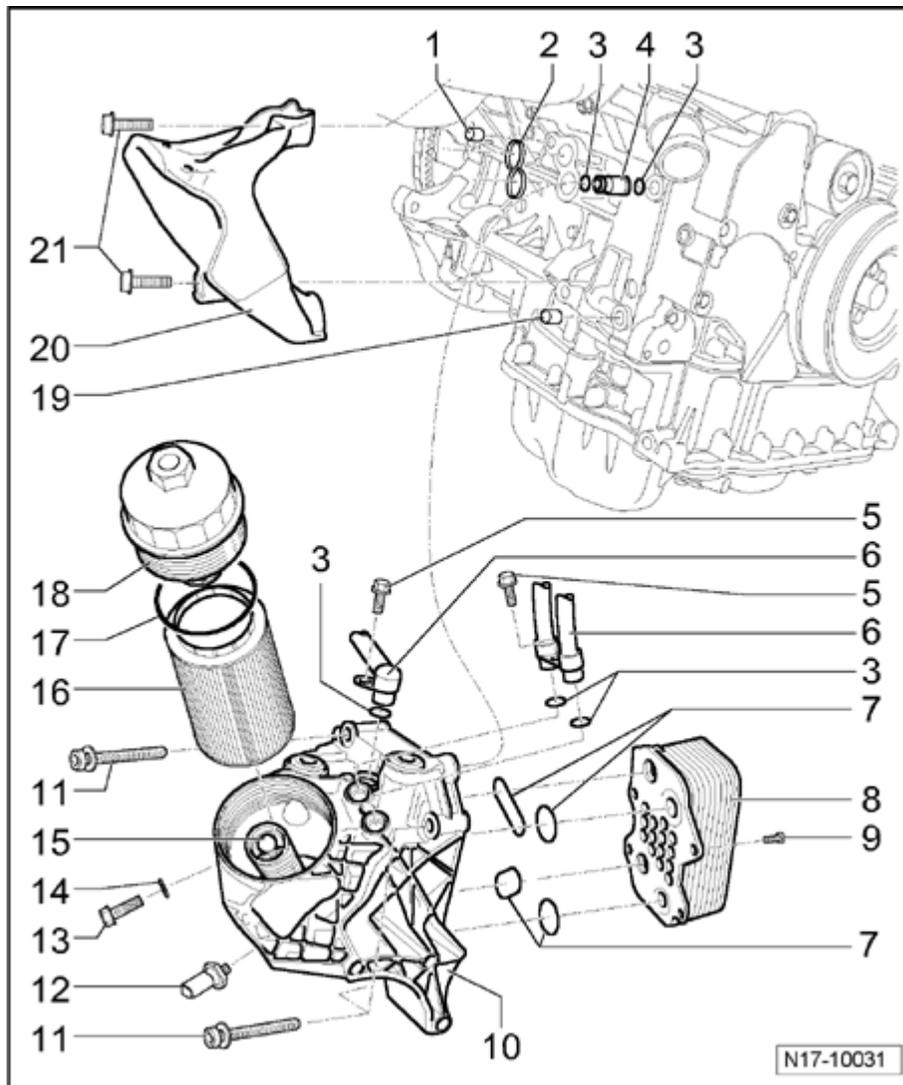


Fig. 149: Oil Filter Housing, Assembly Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Dowel sleeve

2004 Volkswagen Phaeton

ENGINE 4.2 Liter V8 5V Engine Mechanical, Fuel Injection & Ignition, Engine Code(s): BGH, BGJ

2 - Gasket

- For oil channel
- Replace

3 - O-ring

- Replace

4 - Intermediate pipe

5 - 10 Nm

6 - Coolant line

7 - Oil cooler gasket

- Replace

8 - Oil cooler

9 - 20 Nm

- Replace

10 - Oil filter housing

11 - 25 Nm

12 - Oil pressure switch F1 , 20 Nm

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

13 - Coolant drain plug, 10 Nm

14 - Oil seal

- Replace

15 - Guide pin

- With oil filter by-pass valve

16 - Oil filter element

- Observe change intervals --> **01 - MAINTENANCE**

17 - Oil seal

- Replace

18 - Screw cap, 25 Nm

19 - Dowel sleeve

20 - Engine mount

21 - 50 Nm

Oil Pan, Assembly Overview

Oil Pan, Assembly Overview

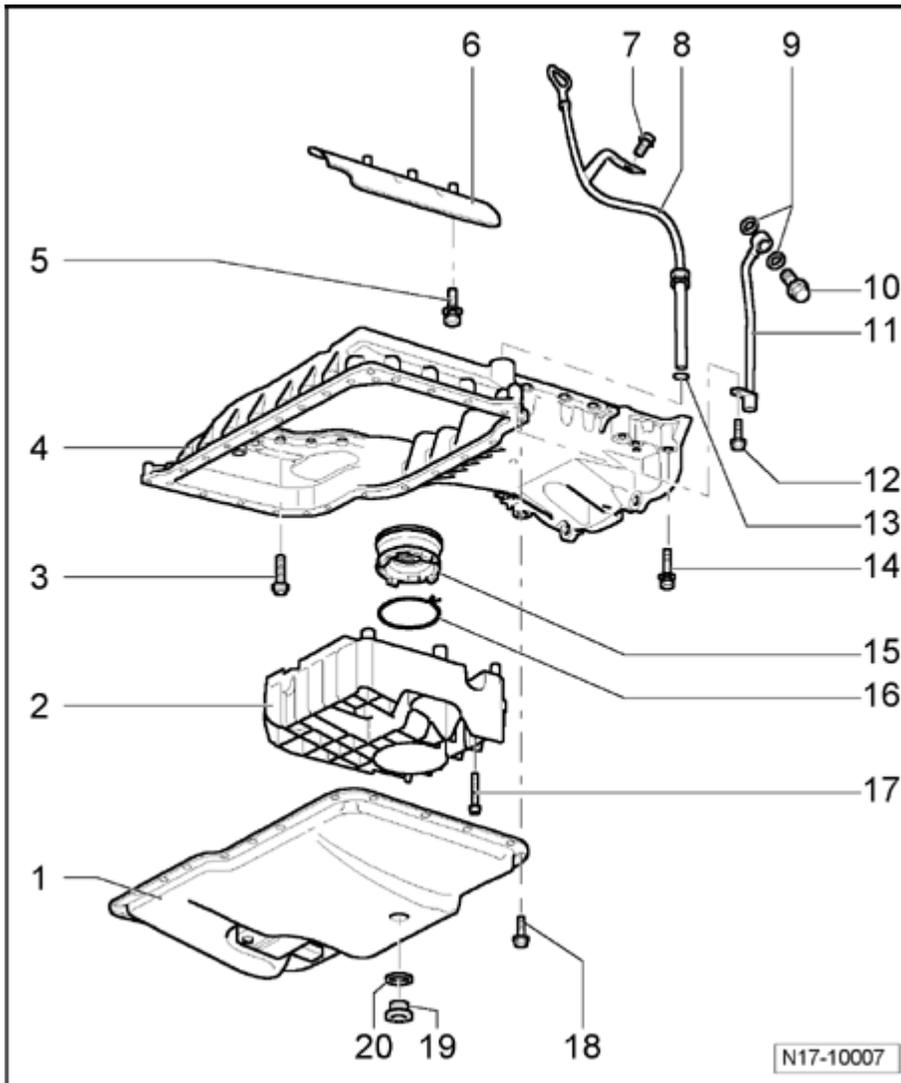


Fig. 150: Oil Pan, Assembly Overview

Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Oil pan, lower part

- Removing and installing --> **Oil Pump, Removing and Installing**
- With Oil Level Thermal Sensor G266
- Oil Level Thermal Sensor G266 , removing and installing --> **Oil Level Thermal Sensor, Removing and Installing**

2 - Oil baffle

3 - 15 Nm

4 - Oil pan, upper part

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

5 - 22 Nm

6 - Baffle plate

7 - 20 Nm

8 - Guide tube

- For dipstick

9 - Oil seal

- Replace

10 - Banjo bolt, 30 Nm

11 - Coolant drain tube

12 - 10 Nm

13 - O-ring

- Replace

14 - 22 Nm

15 - Oil intake tube

16 - Circlip

17 - 10 Nm

18 - 10 Nm

19 - Oil drain plug, 50 Nm

- For oil pan, lower part

20 - Oil seal

- Replace

Oil Level Thermal Sensor, Removing and Installing

Oil Level Thermal Sensor, Removing and Installing

- Remove noise insulation pan.
- Drain engine oil.

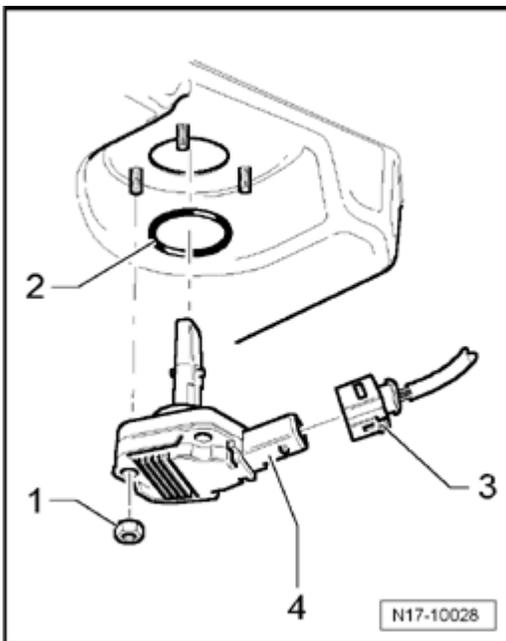


Fig. 151: Oil Level Thermal Sensor Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect the connector - 3 - from the sensor - 4 -.
- Remove nuts - 1 - and pull sensor - 4 - out from the oil pan.

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

- Replace seal - 2 -.
- Fasten sensor to the oil pan to 10 Nm.

Oil Pump, Assembly Overview

Oil Pump, Assembly Overview

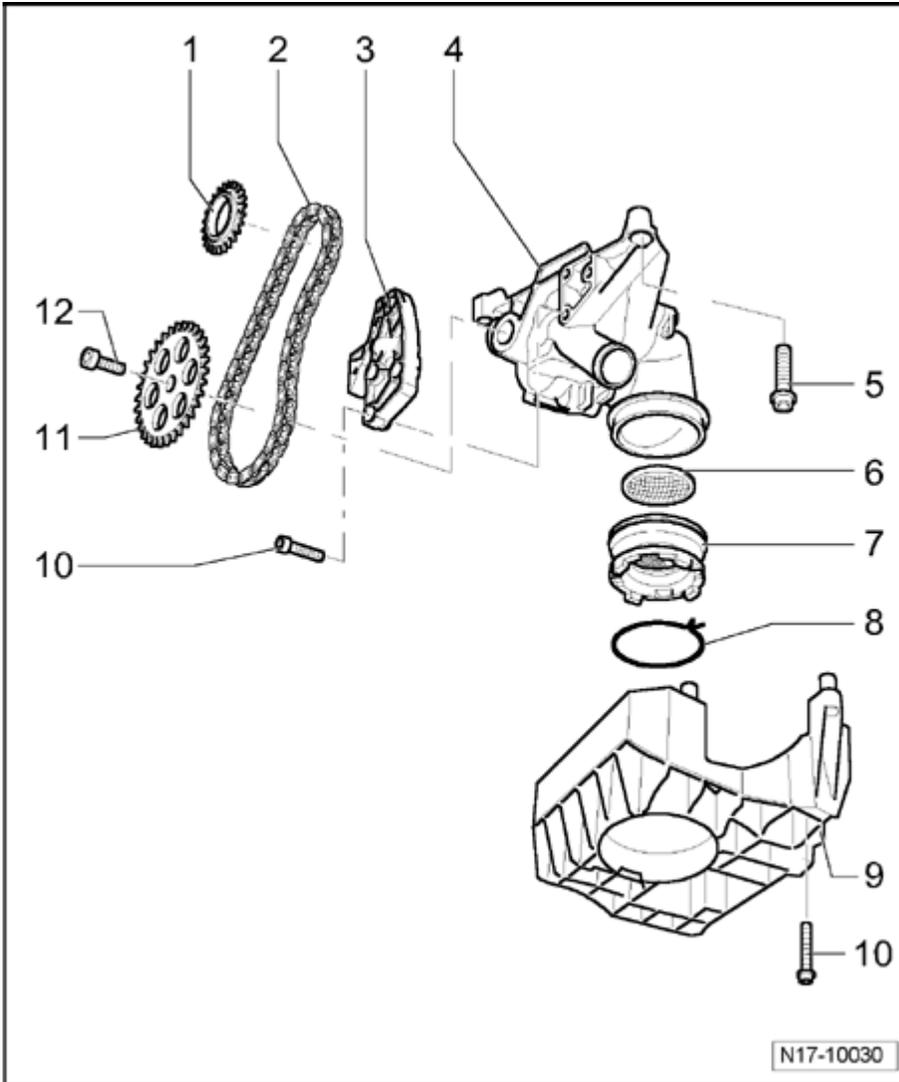


Fig. 152: Oil Pump, Assembly Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Chain sprocket

- For crankshaft

2 - Drive chain

- For oil pump
- Before removing, mark the direction of rotation, e.g. with paint
- Do not mark with a center punch or similar means

- Removal of drive chain --> **Oil Pump Drive Chain, Removing and Installing**

3 - Chain tensioner

- To remove, secure the oil pump and drive chain with locking pin T40011

4 - Oil pump

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

5 - 30 Nm

6 - Oil strainer

- Clean if soiled

7 - Oil intake tube

8 - Circlip

9 - Oil baffle

10 - 10 Nm

11 - Chain sprocket

- For oil pump
- Note installation position --> **Installation position of chain sprocket for oil pump drive**

12 - 34 Nm

Installation position of chain sprocket for oil pump drive

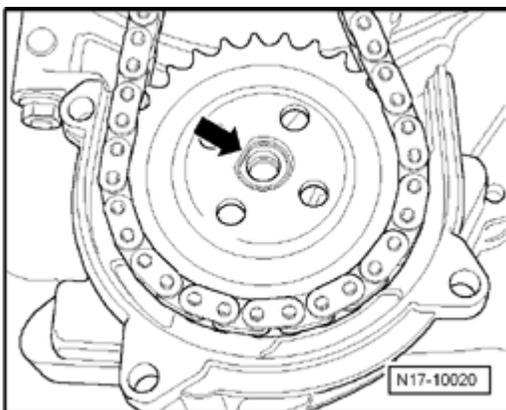


Fig. 153: Installation Position Of Chain Sprocket For Oil Pump Drive
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set chain sprocket with flattened side - **arrow** - onto oil pump shaft. The text on chain sprocket faces towards front.

--> Oil Pump, Removing and Installing

--> Oil Pump Drive Chain, Removing and Installing

Oil Pump, Removing and Installing

Oil Pump, Removing and Installing

Special tools, testers and auxiliary items required

- Engine and transmission holder VAS 6095
- Securing pin T40011
- Silicone sealant D176 404 A2
- Protective glasses

- Engine removed
- Engine is fastened to engine and transmission holder VAS 6095.

Removing

- Drain engine oil.

NOTE:

- Observe disposal regulations!

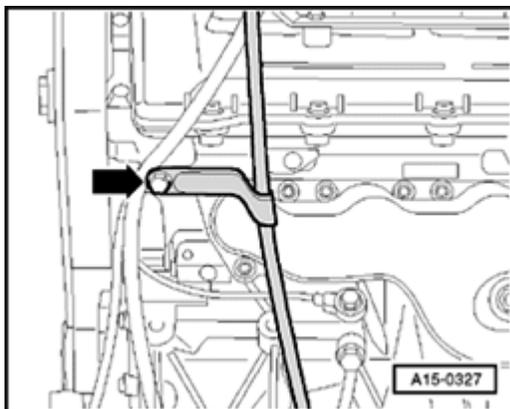


Fig. 154: Oil Dipstick Guide Tube

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- At the left cylinder head, unfasten the bracket from the oil dipstick guide tube - **arrow** - and pull the guide tube out.

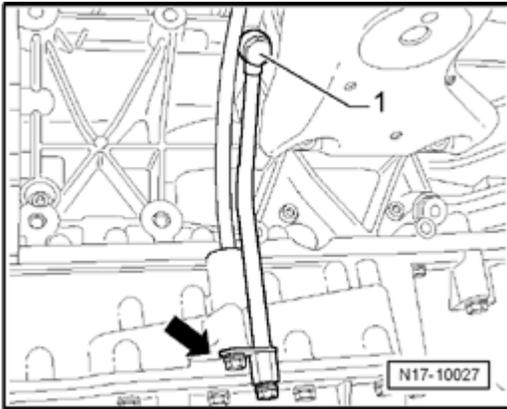


Fig. 155: Coolant Drain Pipe And Banjo Bolt

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bracket of coolant drain pipe - **arrow** - at oil pan, upper part. If necessary, loosen banjo bolt - **1** - slightly.
- Remove lower and upper part of oil pan.
- If necessary, loosen oil pan with light blows of a rubber headed hammer or by lightly prying with a pry bar.

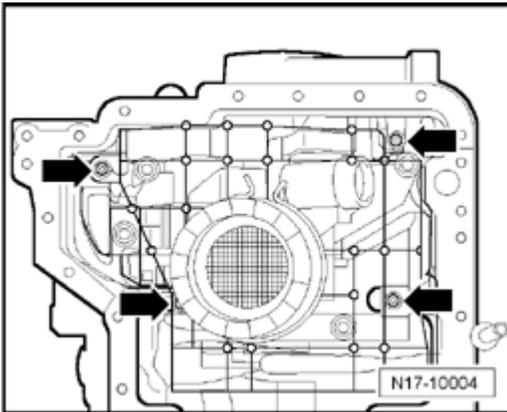


Fig. 156: Oil Baffle Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - from oil baffle and remove oil baffle.

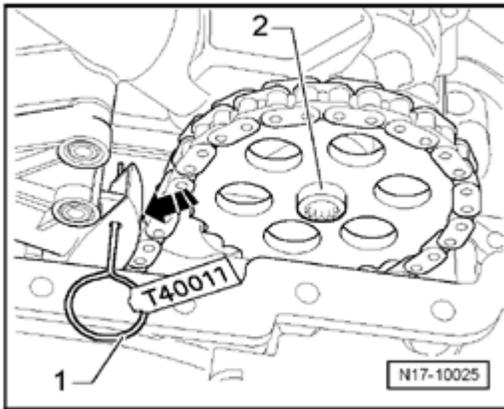


Fig. 157: Compressing Chain Tensioner And Securing It With Locking Pin T40011
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Compress chain tensioner in direction of - **arrow** - and secure it with locking pin T40011 - **1** -.
- Remove chain sprocket - **2** - from oil pump.

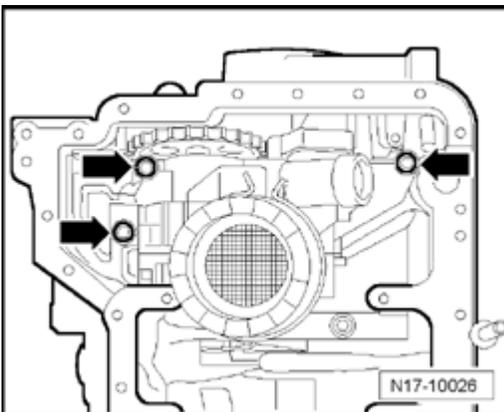


Fig. 158: Oil Pump Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove three bolts - **arrows** - from oil pump.
- Remove oil pump.
- Remove residual sealant on cylinder block.

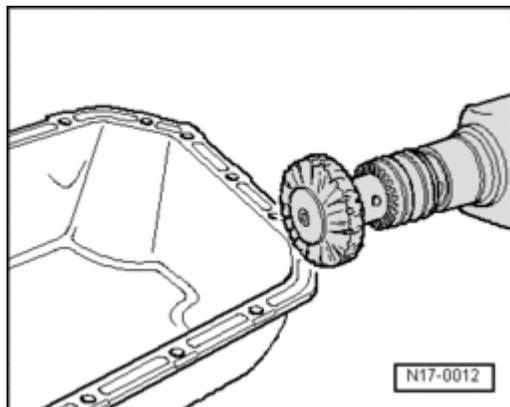


Fig. 159: Removing Sealant Residue From Oil Pan With A Rotating Brush
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove sealant residue from lower and upper part of oil pan with a rotating brush, e.g. a hand drill with a plastic brush attachment (wear eye protection).
- Clean sealing surfaces. Sealing surfaces must be free of oil and grease.

Installing

- Install oil pump again. Torque specification: 30 Nm
- Bolt the chain sprocket to the oil pump --> **Installation position of chain sprocket for oil pump drive**
- Pull locking pin T40011 out from chain tensioner.
- Install oil baffle. Torque specification: 10 Nm
- Install upper part of oil pan as follows:

NOTE:

- **Note the expiration date of the sealing compound.**
 - **Oil pan must be installed within 5 minutes of applying silicone sealing compound.**
- Cut off nozzle on tube of sealant at front mark (dia. of nozzle approx. 1 mm).

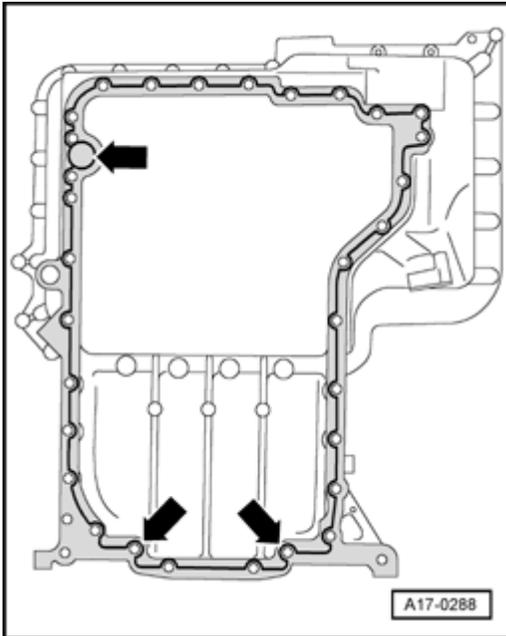


Fig. 160: Upper Part Of Oil Pan Sealant Application Areas
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Apply silicone sealing compound, as shown, to clean sealing surface of upper part of oil pan. Sealing compound bead must be: 1.5 mm thick

And run on inside of bolt holes - **arrows** -.

NOTE:

- **The sealing compound bead must not be thicker, otherwise excess sealing compound will enter the oil pan and may block the oil suction pipe strainer.**

- Install upper part of oil pan immediately and tighten all oil pan bolts lightly in a "diagonal sequence".

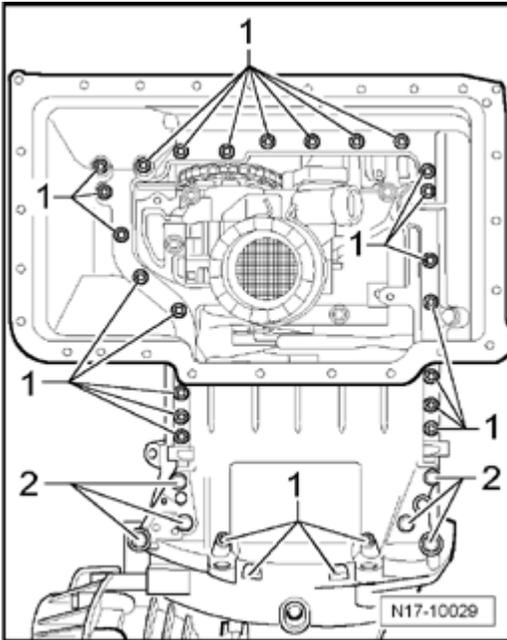


Fig. 161: Oil Pan Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Then, fasten the oil pan bolts - 1 - to 15 Nm and bolts - 2 - to 22 Nm in a "diagonal sequence".

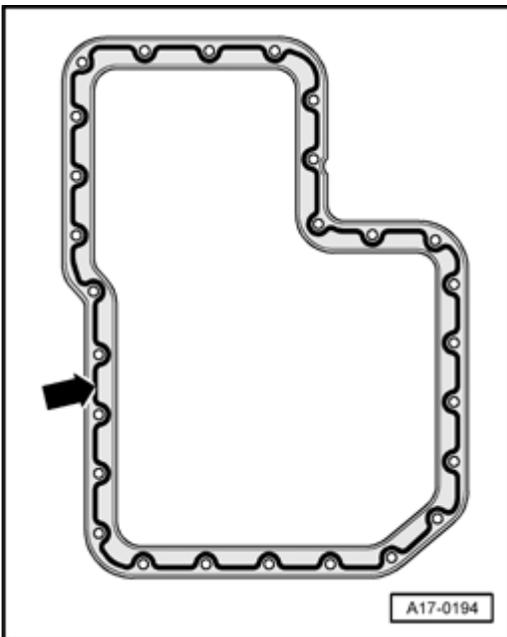


Fig. 162: Lower Part Of Oil Pan Sealant Application Areas

Courtesy of VOLKSWAGEN UNITED STATES, INC.

Apply a 1.5 mm thick bead of sealant onto clean sealing surface of lower part of oil pan, as shown - **arrow** -.

- Install lower part of oil pan immediately and tighten all oil pan bolts lightly in a "diagonal sequence".

- Then, tighten the oil pan bolts in a "diagonal sequence" to 10 Nm.
- Set the oil dipstick guide tube in place and fasten it to 20 Nm.

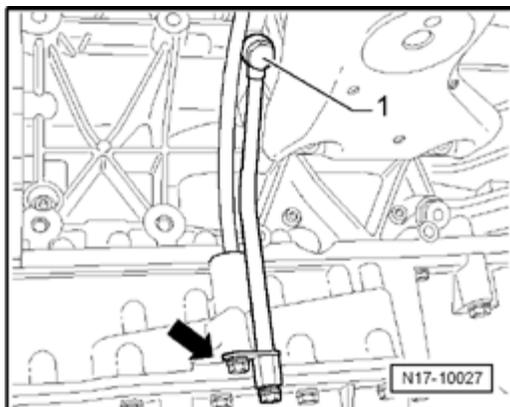


Fig. 163: Coolant Drain Pipe And Banjo Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Fasten the coolant drain pipe to upper part of oil pan - **arrow** - to 10 Nm and then to cylinder block - **1** - to 30 Nm.

NOTE:

- **After installing the oil pan the sealant must be allowed to dry for approx. 30 minutes. Only after then may the engine oil be replenished.**

The rest of assembly is in reverse order of disassembling.

Oil Pump Drive Chain, Removing and Installing

Oil Pump Drive Chain, Removing and Installing

- Engine removed
- Engine is fastened to engine and transmission holder VAS 6095.
- Remove toothed belt --> **Toothed Belt, Removing and Installing**
- Drain engine oil.

NOTE:

- **Observe disposal regulations!**

- Remove upper and lower part of oil pan --> **Oil Pump, Removing and Installing**
- Remove front sealing flange --> **Sealing Flange and Drive Plate, Assembly Overview.**
- Mark front side of the thrust collar with a felt tip marker.

NOTE:

- **If the seal is to be replaced, the thrust collar must be pushed onto the end of the crankshaft so that the previously applied mark points toward the cylinder block.**

- Remove thrust collar from end of crankshaft.

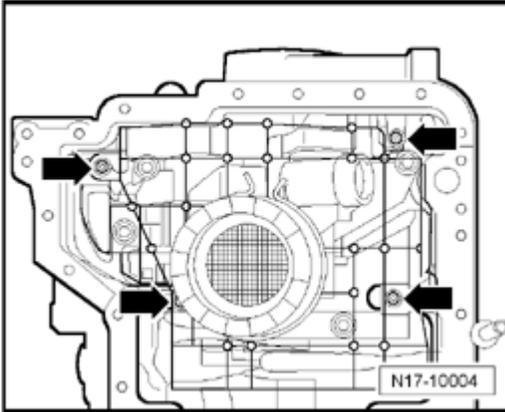


Fig. 164: Oil Baffle Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - from oil baffle and remove oil baffle.
- Mark running direction of drive chain with a felt tip marker.

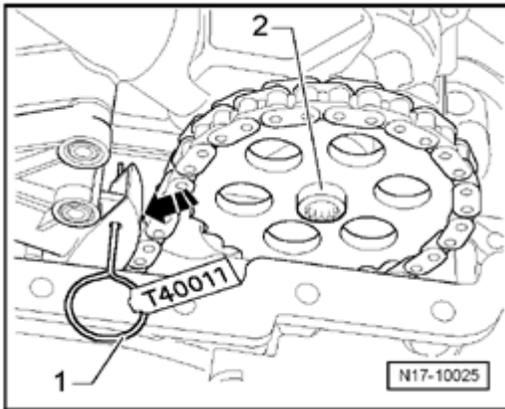


Fig. 165: Compressing Chain Tensioner And Securing It With Locking Pin T40011

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Compress chain tensioner in direction of - **arrow** - and secure it with locking pin T40011 - **1** -.
- Remove chain sprocket - **2** - from oil pump.
- Remove drive chain from the oil pump.

Assembly is in reverse order of removal.

Oil Pressure and Oil Pressure Switch, Checking

Oil Pressure and Oil Pressure Switch, Checking

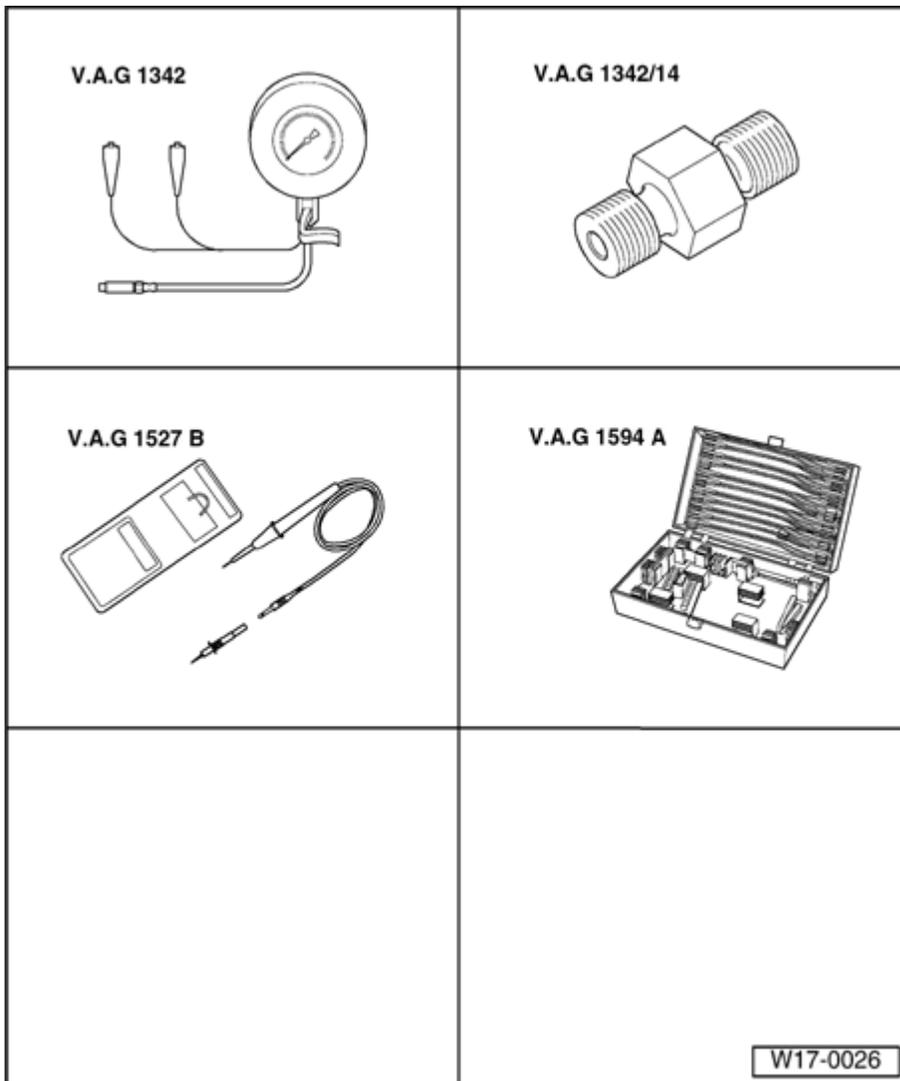


Fig. 166: Identifying Special Tools -- Oil Pressure And Oil Pressure Switch, Checking
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Oil pressure gauge V.A.G 1342
- Adapter V.A.G 1342/14
- Voltage tester V.A.G 1527B
- Connector test set V.A.G 1594C

Test conditions

- Engine oil level OK, checking --> **Oil Level, Checking.**
- Oil pressure warning lamp K3 must light up for approx. 3 seconds when ignition is switched on
- Engine oil temperature at least 176 F (80 C) (radiator fan must have run once)

Oil pressure, checking

- Check oil pressure at different speeds: 2000 rpm: 3.0 to 5.5 bar (43 to 80 PSI) over 2000 rpm: maximum 7.0 bar (101 PSI)

If specifications are not obtained:

- Correct mechanical damage, e.g. bearing damage.

At higher engine speeds oil pressure must not exceed 7.0 bar (101 PSI)

If specification is exceeded:

- If necessary, replace oil pump --> **Oil Pump, Removing and Installing**

Oil pressure switch, checking

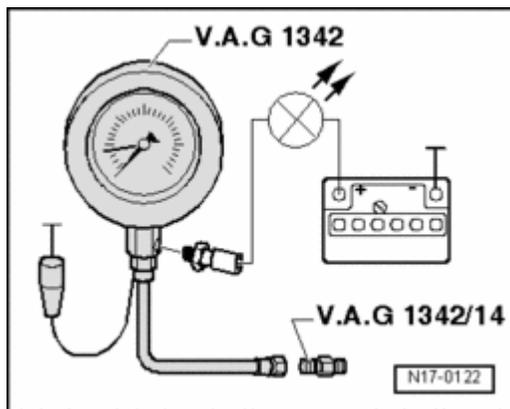


Fig. 167: Identifying V.A.G 1342 With Adapter V.A.G 1342/14
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove oil pressure switch F1 and screw into oil pressure gauge.
- Install oil pressure gauge V.A.G 1342 with adapter V.A.G 1342/14 into oil filter housing in place of oil pressure switch.

NOTE:

- **Note installation position of adapter: The conical connecting neck of the adapter is screwed to the pressure hose of the tester.**

- Connect brown wire of tester to ground (-).
- Connect voltage tester V.A.G 1527B using assist cables from V.A.G 1594 A to battery positive (+) and oil pressure switch. LED must not light up.

If LED lights up:

- Replace oil pressure switch F1.

If LED does not light up:

- Start engine and run at idle speed. At 1.2 to 1.6 (17 to 23 PSI) bar pressure LED must light up; otherwise replace oil pressure switch F1.

19 - ENGINE - COOLING SYSTEM

COOLING SYSTEM COMPONENTS

Cooling System Components

- > **Radiator, Assembly Overview**
- > **Coolant Fan, Removing and Installing**
- > **Cooling System Components, Body Side**
- > **Cooling System Components, Front Engine Side**
- > **Cooling System Components, Rear Engine Side**
- > **Coolant Hose Connection Diagram**
- > **Cooling System, Draining and Filling**
- > **Radiator, Removing and Installing**
- > **Coolant Pump and Thermostat, Removing and Installing**
- > **Cooling System, Checking for Leaks**

CAUTION: When doing any repair work, especially in the engine compartment, pay attention to the following due to clearance issues:

- Route all the various lines (e.g. for fuel, hydraulics, EVAP system, coolant, refrigerant, brake fluid and vacuum lines and hoses) and electrical wiring so that the original positions are restored.
- Ensure sufficient clearance to all moving or hot components.

NOTE:

- When the engine is warm the cooling system is under pressure. If necessary release pressure before commencing repair work.
- Hoses are secured with spring-type clips. In cases of repair only use spring-type clips.
- The spring-type clip pliers VAS 5024 A are recommended for installing spring-type clips.

- When installing coolant hoses route stress-free, so that they do not come into contact with other components (observe markings on coolant connection and hose).

Perform leak test of cooling system using cooling system tester V.A.G 1274 , adapter V.A.G 1274/7 and adapter V.A.G 1274/1A.

Radiator, Assembly Overview

Radiator, Assembly Overview

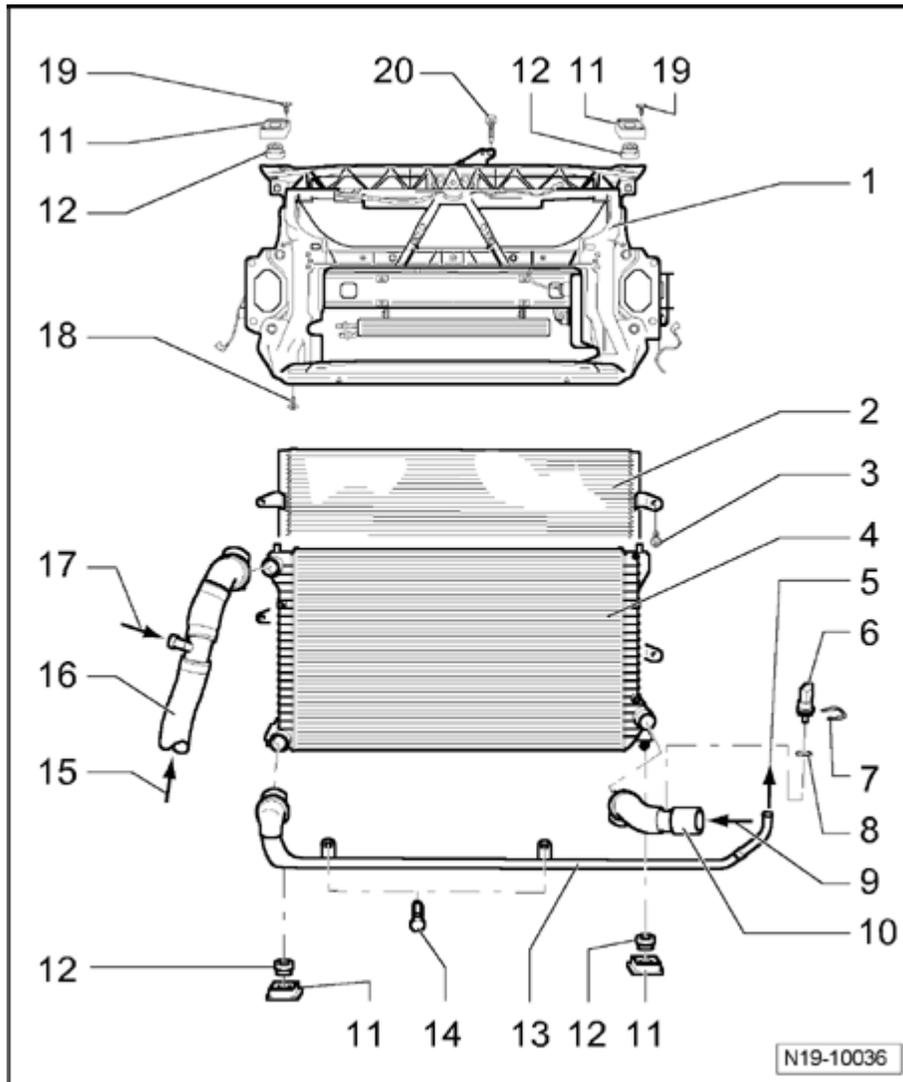


Fig. 168: Radiator, Assembly Overview

Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Lock carrier

2 - Condenser

3 - 10 Nm

4 - Radiator

- Removing and installing --> **Radiator, Removing and Installing**
- After replacing replace entire amount of coolant
- Coolant hose connection diagram --> **Coolant Hose Connection Diagram**

5 - To oil cooler

- For automatic transmission fluid.
- Coolant hose connection diagram --> **Coolant Hose Connection Diagram**

6 - Engine Coolant Temperature (ECT) Sensor (on Radiator) G83

- If necessary release pressure in cooling system before removing

7 - Retaining clip

- Ensure seated tightly

8 - O-ring

- Replace

9 - From coolant thermostat housing

10 - Lower coolant hose

- Secured to radiator with a quick coupling
- Ensure seated tightly
- Coolant hose connection diagram --> **Coolant Hose Connection Diagram**

11 - Securing rubber

12 - Rubber bushing

13 - Coolant line

- Coolant hose connection diagram --> **Coolant Hose Connection Diagram**

14 - 10 Nm

15 - From coolant line, left side of engine

- Coolant hose connection diagram --> **Coolant Hose Connection Diagram**

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ENGINE 4.2 Liter V8 5V Engine Mechanical, Fuel Injection & Ignition, Engine Code(s): BGH, BGJ

16 - Upper coolant hose

- Secured to radiator with a quick coupling
- Ensure seated tightly
- Coolant hose connection diagram --> **Coolant Hose Connection Diagram**

17 - From auxiliary heater

- Coolant hose connection diagram --> **Coolant Hose Connection Diagram**

18 - 10 Nm

19 - Bolt

20 - 10 Nm

- Bolt for hood lock

Coolant Fan, Removing and Installing

Coolant Fan, Removing and Installing

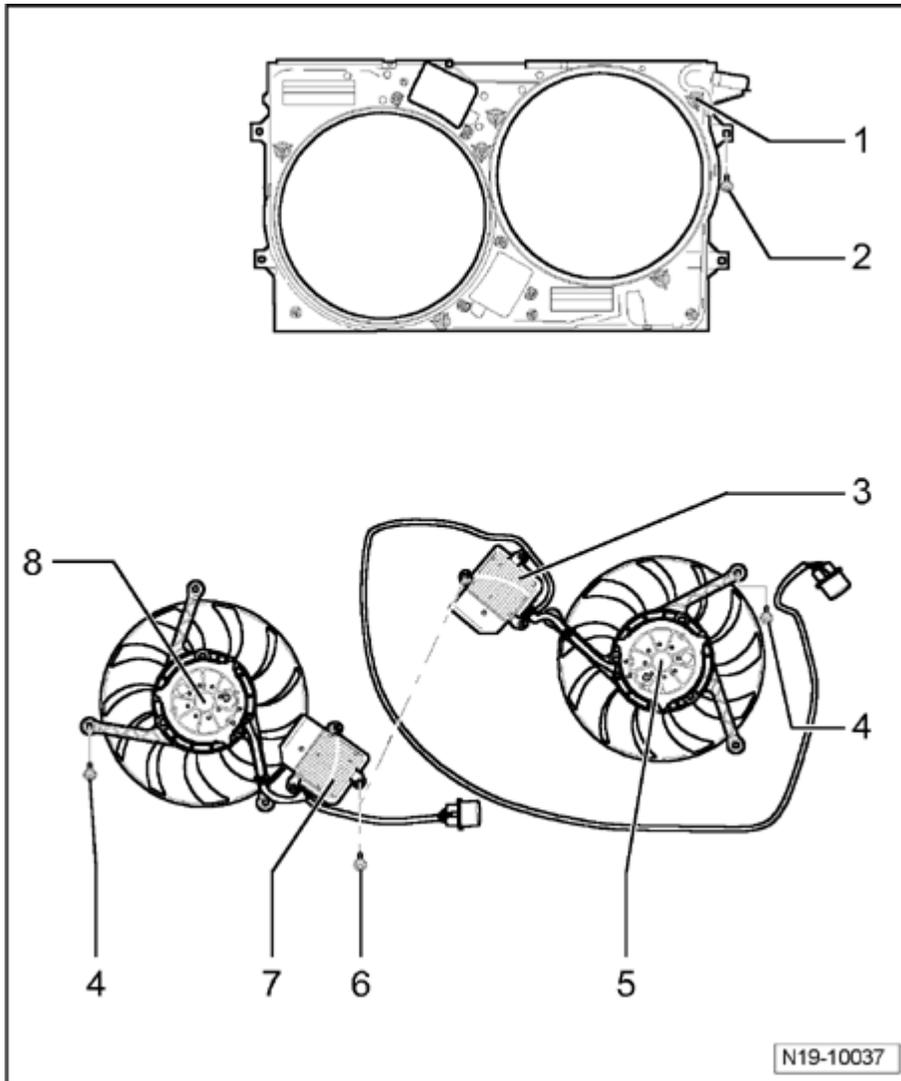


Fig. 169: Coolant Fan Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 1 - Fan support
- 2 - 10 Nm
- 3 - Coolant Fan Control (FC) Control Module J293
- 4 - 10 Nm
- 5 - Coolant Fan V7
- 6 - 10 Nm
- 7 - Coolant Fan Control (FC) Control Module 2 J671

8 - Coolant Fan 2 V177

Cooling System Components, Body Side

Cooling System Components, Body Side

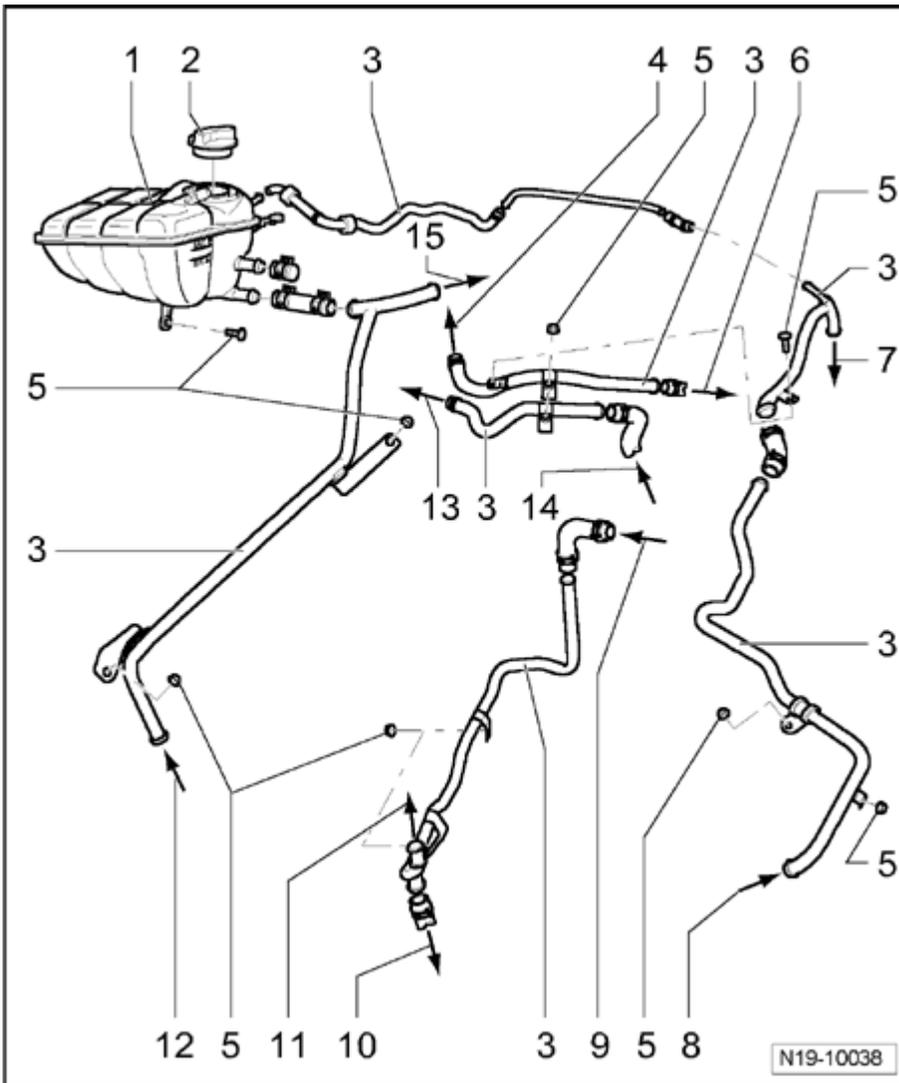


Fig. 170: Cooling System Components, Body Side
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Reservoir

- Perform cooling system leakage test with cooling system tester V.A.G 1274 and adapter V.A.G 1274/7 --> **Cooling System, Checking for Leaks**

2 - Sealing cap

- Check cap using cooling system tester V.A.G 1274 and adapter V.A.G 1274/1A --> **Cooling System,**

Checking for Leaks

- Test pressure 1.4 to 1.6 bar (20 to 23 PSI)
- Replace gaskets if damaged

3 - Coolant line

- Coolant hose connection diagram --> **Coolant Hose Connection Diagram**

4 - From heat exchanger

- Coolant hose connection diagram --> **Coolant Hose Connection Diagram**

5 - 10 Nm

6 - To Engine Coolant (EC) Switch-off Valve (heater) N279

- Coolant hose connection diagram --> **Coolant Hose Connection Diagram**

7 - To heat exchanger

- Coolant hose connection diagram --> **Coolant Hose Connection Diagram**

8 - From auxiliary heater

- Coolant hose connection diagram --> **Coolant Hose Connection Diagram**

9 - From Engine Coolant (EC) Switch-off Valve (heater) N279

- Coolant hose connection diagram --> **Coolant Hose Connection Diagram**

10 - To auxiliary heater

- Coolant hose connection diagram --> **Coolant Hose Connection Diagram**

11 - To upper coolant hose

- Coolant hose connection diagram --> **Coolant Hose Connection Diagram**

12 - From ATF cooler

- Coolant hose connection diagram --> **Coolant Hose Connection Diagram**

13 - To coolant hose

- Coolant hose connection diagram --> **Coolant Hose Connection Diagram**

14 - From Engine Coolant (EC) Switch-off Valve (heater) N279

- Coolant hose connection diagram --> [Coolant Hose Connection Diagram](#)

15 - To coolant hose

- Coolant hose connection diagram --> [Coolant Hose Connection Diagram](#)

Cooling System Components, Front Engine Side

Cooling System Components, Front Engine Side

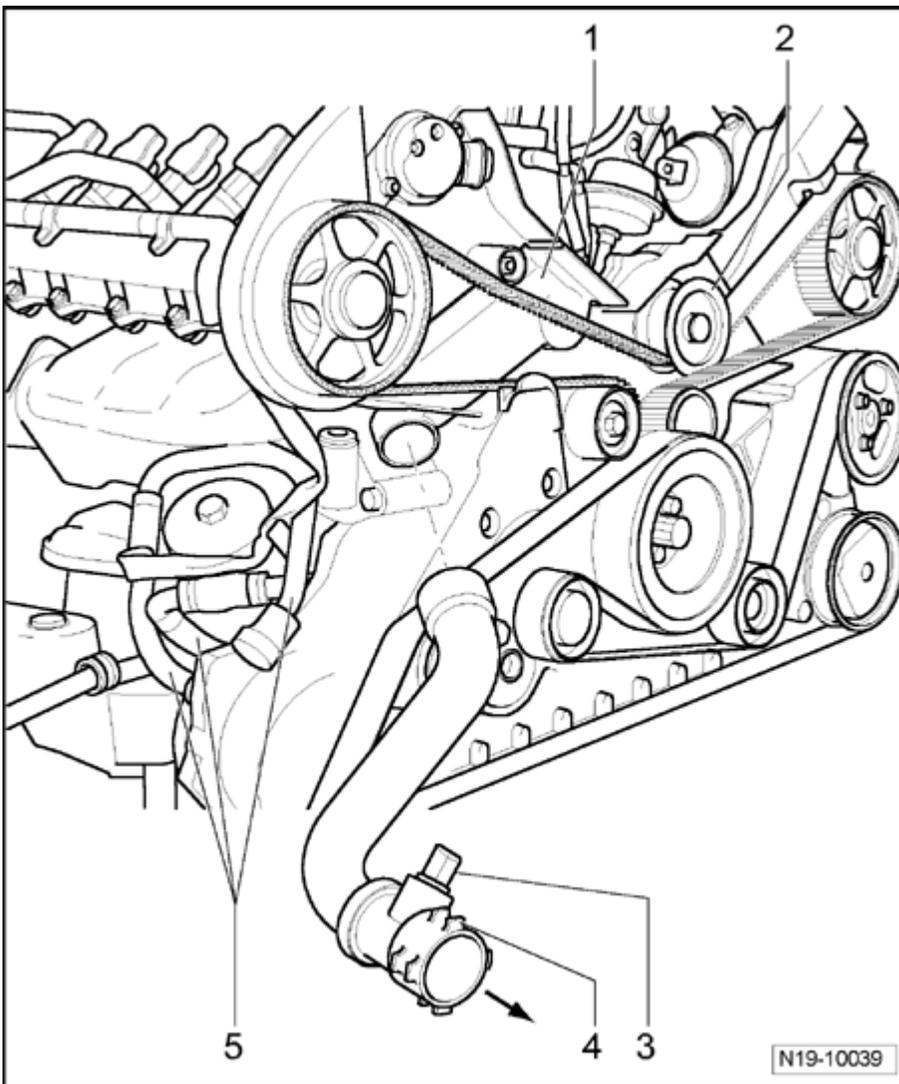


Fig. 171: Cooling System Components, Front Engine Side
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Coolant thermostat housing

- Coolant thermostat, removing and installing --> [Coolant Pump and Thermostat, Removing and Installing](#)

2 - Coolant pump

- Check for ease of movement
- Removing and installing --> **Coolant Pump and Thermostat, Removing and Installing**

3 - Engine Coolant Temperature (ECT) Sensor (on Radiator) G83

- If necessary release pressure in cooling system before removing

4 - To lower radiator

5 - Coolant lines

- For generator and oil filter housing
- Fasten to 10 Nm

Cooling System Components, Rear Engine Side

Cooling System Components, Rear Engine Side

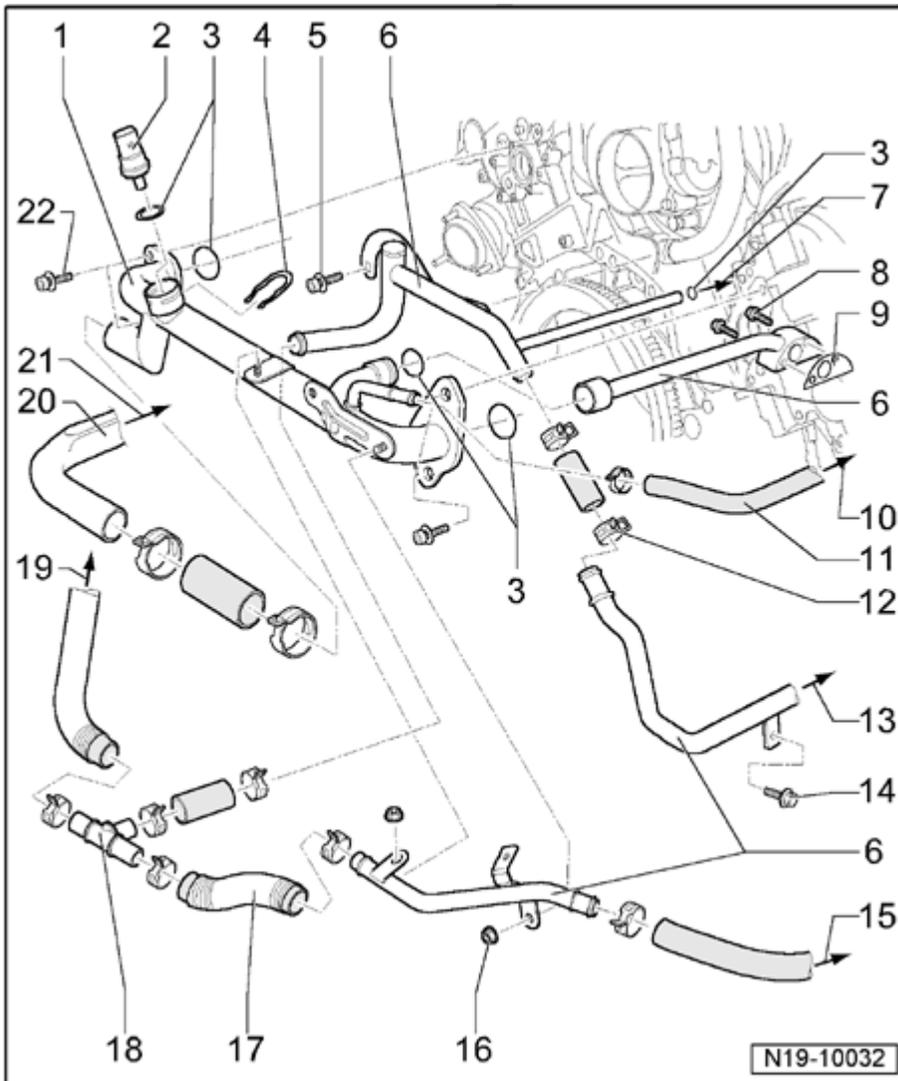


Fig. 172: Cooling System Components, Rear Engine Side
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Coolant line

- Between right and left cylinder head
- Coolant hose connection diagram --> [Coolant Hose Connection Diagram](#)

2 - Engine coolant temperature (ECT) sensor G62

- With engine coolant temperature (ECT) sensor G2
- For engine control unit
- If necessary release pressure in cooling system before removing

3 - O-ring

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ENGINE 4.2 Liter V8 5V Engine Mechanical, Fuel Injection & Ignition, Engine Code(s): BGH, BGJ

- Replace

4 - Retaining clip

- Ensure seated tightly

5 - 10 Nm

6 - Coolant line

- Coolant hose connection diagram --> [Coolant Hose Connection Diagram](#)

7 - To cylinder block

- Coolant hose connection diagram --> [Coolant Hose Connection Diagram](#)

8 - 20 Nm

9 - Gasket

- Replace

10 - To reservoir

- Coolant hose connection diagram --> [Coolant Hose Connection Diagram](#)

11 - Coolant hose

- Coolant hose connection diagram --> [Coolant Hose Connection Diagram](#)

12 - Spring-type clip

13 - To oil filter housing

14 - 10 Nm

15 - To coolant line

- Coolant hose connection diagram --> [Coolant Hose Connection Diagram](#)

16 - 10 Nm

17 - Connecting hose

18 - T-connector

19 - To coolant line

- Coolant hose connection diagram --> **Coolant Hose Connection Diagram**

20 - Coolant line

21 - To upper radiator

- Coolant hose connection diagram --> **Coolant Hose Connection Diagram**

22 - 10 Nm

Coolant Hose Connection Diagram

Coolant Hose Connection Diagram

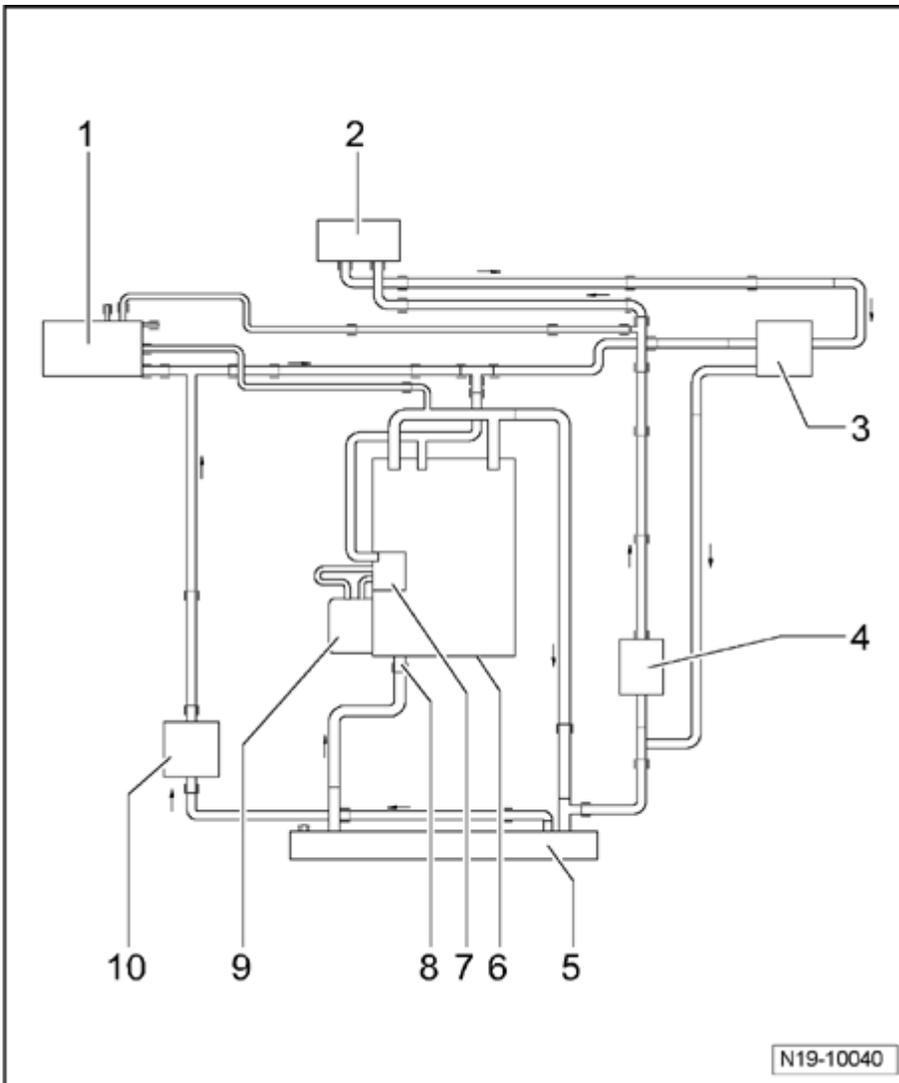


Fig. 173: Coolant Hose Connection Diagram
Courtesy of VOLKSWAGEN UNITED STATES, INC.

2004 Volkswagen Phaeton

ENGINE 4.2 Liter V8 5V Engine Mechanical, Fuel Injection & Ignition, Engine Code(s): BGH, BGJ

- 1 - Reservoir
- 2 - Heater unit heat exchanger
- 3 - Engine Coolant (EC) Switch-off Valve (heater) N279
- 4 - Auxiliary heater
 - Only vehicles with optional equipment
- 5 - Radiator
- 6 - Cylinder block/Coolant pump
- 7 - Oil filter housing with oil cooler
- 8 - Coolant thermostat housing
- 9 - Generator
- 10 - Transmission oil cooler

Cooling System, Draining and Filling

Cooling System, Draining and Filling

2004 Volkswagen Phaeton

ENGINE 4.2 Liter V8 5V Engine Mechanical, Fuel Injection & Ignition, Engine Code(s): BGH, BGJ

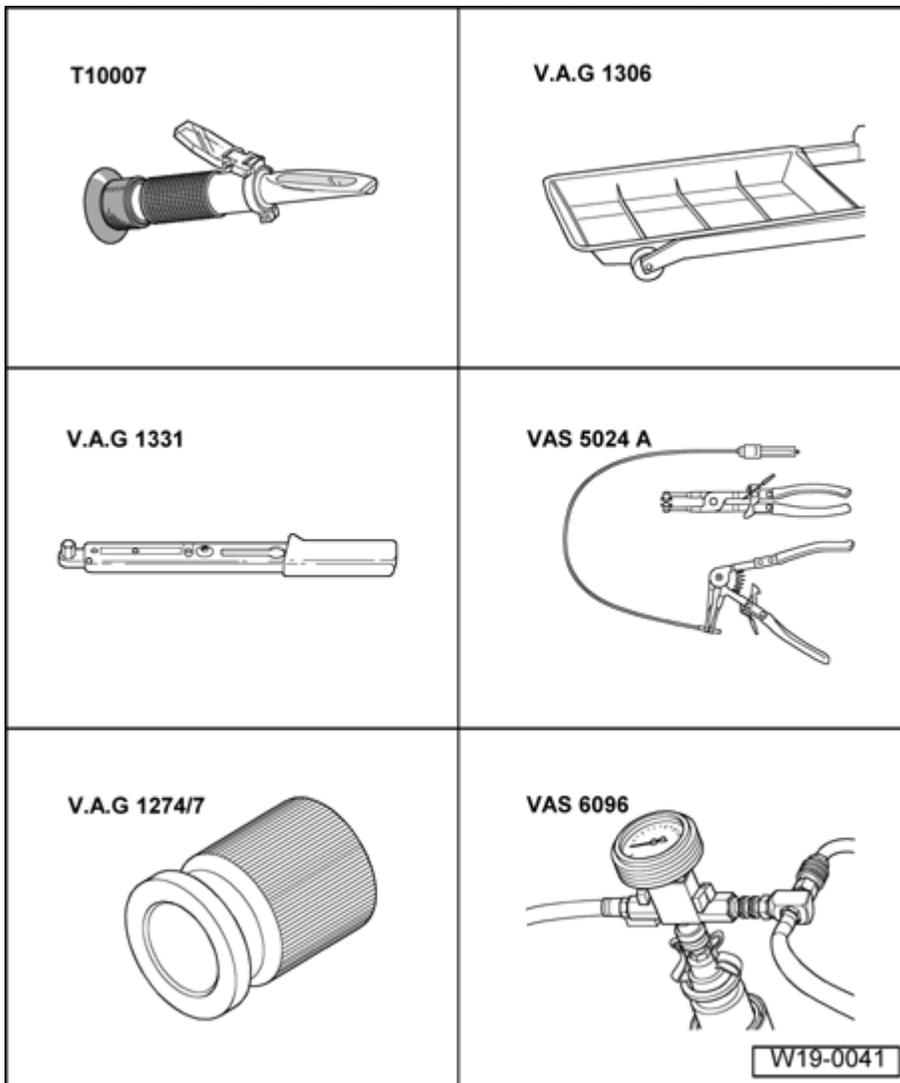


Fig. 174: Cooling System, Draining And Filling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Refractometer T10007
- Drip tray V.A.G 1306
- Torque wrench V.A.G 1331
- Spring-type clip pliers VAS 5024

- Adapter V.A.G 1274/7
- Cooling system charge unit VAS 6096

Draining

CAUTION: Hot steam may escape when opening expansion tank. Wear protective

**goggles and protective clothing to prevent damage to eyes and scalding.
Cover cap with a rag and open carefully.**

- Open cap on coolant expansion tank.
- Remove noise insulation. --> **50 BODY - FRONT**
- Place drip tray V.A.G 1306 under vehicle.

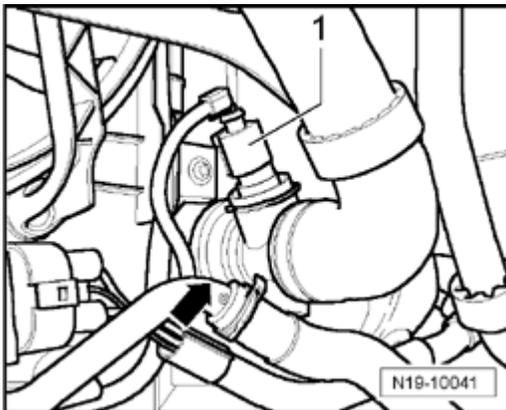


Fig. 175: Coolant Hose At Bottom Of Radiator And Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect connector - **1** - and then coolant hose - **arrow** - from bottom of radiator.

NOTE:

- **Observe disposal regulations for coolant!**

Filling

CAUTION: A new coolant additive (G12 plus plus) which must be used has been implemented in this vehicle. If the conventional G12 is used, it can cause the Climatronic to malfunction.

NOTE:

- Only G12 plus-plus conforming to "TL VW 774 G" must be used as a coolant additive.
- G 12 plus-plus marked "in accordance with TL VW 774 F" prevents freeze and corrosion damage, scaling and also raises the boiling point of the coolant. 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 -13 F (25 C) (in arctic climatic countries to about -31 F (-35 C)).
- The coolant concentration must not be reduced by adding water even in warmer seasons and in warmer countries. The anti-freeze ratio must be at

least 40%.

- If for climatic reasons a greater frost protection is required, the amount of G 12 plus-plus can be increased, but only up to 60% (frost protection to about -40 F (40 C), as otherwise frost protection is reduced again and cooling effectiveness is also reduced.
- If radiator, heat exchanger, cylinder head or cylinder head gasket is replaced, do not reuse old coolant.

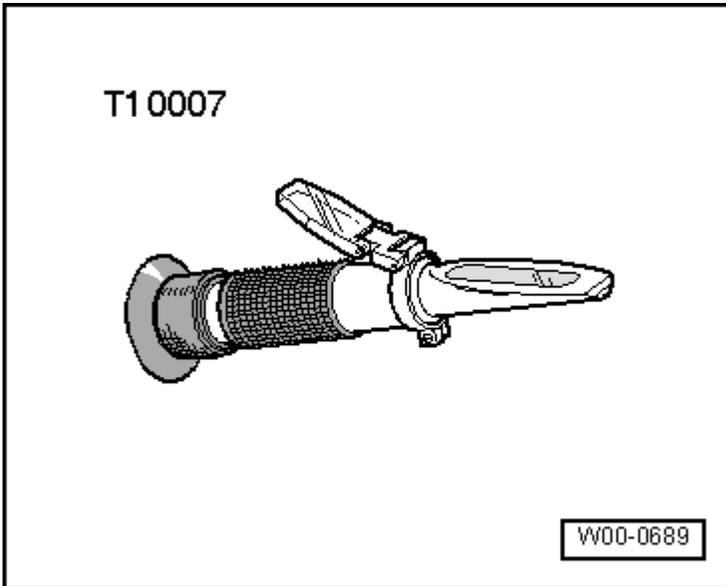


Fig. 176: Refractometer T10007
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- The refractometer T10007 is recommended for determining freeze protection density.

Recommended mixture ratios:

NOTE: • The quantity of coolant can vary depending upon the vehicle equipment.

Frost protection to	Anti-freeze portion	G 12 plus-plus	Water
-13 ° F (25 ° C) -31 ° F (-35 ° C)	4.0 4.5 1	4.0 4.5 1	5.0 4.5 1

Work procedure

- Install coolant hose and secure.
- Install adapter V.A.G 1274/7 onto expansion tank.
- Fill coolant circuit using cooling system charge unit VAS 6096. --> Operating instructions for cooling system charge unit VAS 6096.

Radiator, Removing and Installing

Radiator, Removing and Installing

Special tools, testers and auxiliary items required

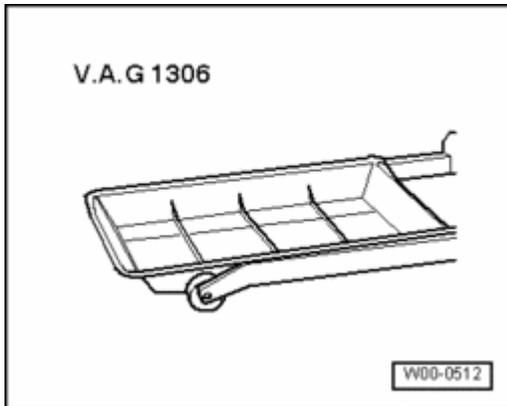


Fig. 177: Identifying Drip Tray V.A.G 1306
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drip tray V.A.G 1306

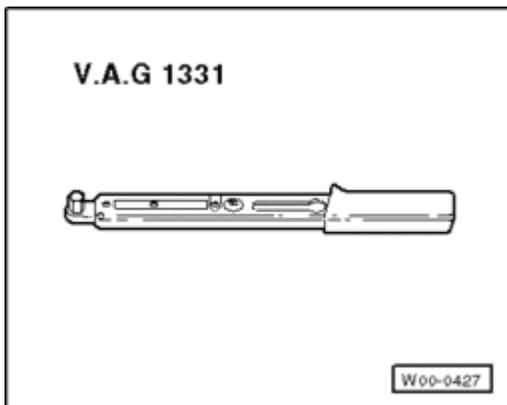


Fig. 178: Torque Wrench V.A.G 1331
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Torque wrench V.A.G 1331

Removing

- Drain coolant --> **Cooling System, Draining and Filling.**
- Disconnect the coolant hoses from the radiator.
- Remove front bumper: --> **63 BUMPERS**
- Bring lock carrier into service position: --> **50 BODY - FRONT**

- Remove coolant fan with mount --> **Coolant Fan, Removing and Installing.**
- Remove upper securing pin of radiator and remove radiator toward the rear.

Installing

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

- Fill with coolant --> **Cooling System, Draining and Filling.**
- Electrical connections and routing: --> Electrical Wiring Diagrams, Troubleshooting and Component Locations
- Install front bumper --> **63 BUMPERS**
- Check headlight adjustment and adjust if necessary: --> **01 - MAINTENANCE**

Coolant Pump and Thermostat, Removing and Installing

Coolant Pump and Thermostat, Removing and Installing

Special tools, testers and auxiliary items required

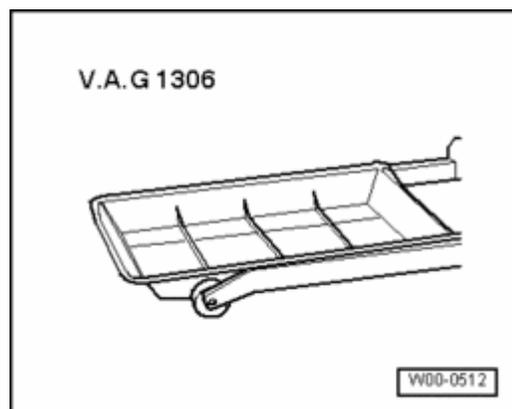


Fig. 179: Identifying Drip Tray V.A.G 1306
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drip tray V.A.G 1306

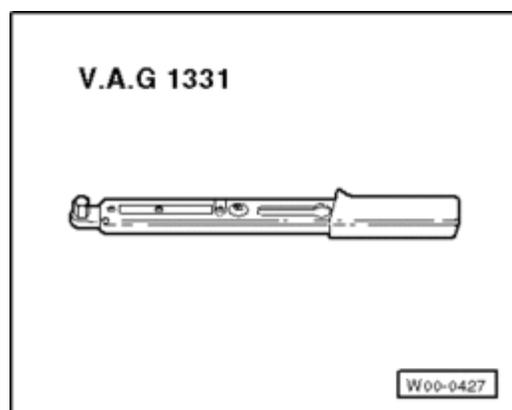


Fig. 180: Torque Wrench V.A.G 1331
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Torque wrench V.A.G 1331

Removing

- Remove ribbed belt --> **Ribbed Belt, Removing and Installing**
- Remove toothed belt --> **Toothed Belt, Removing and Installing.**

If coolant thermostat must be replaced:

- Disconnect coolant hose from coolant thermostat housing.

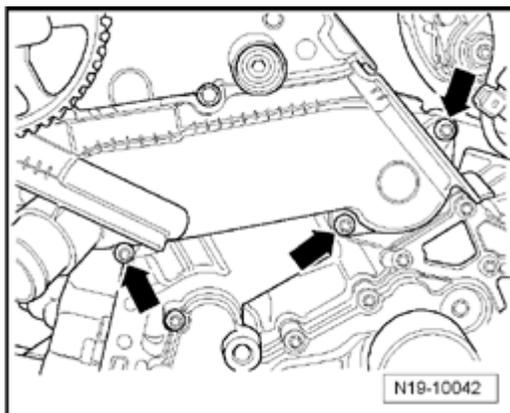


Fig. 181: Coolant Thermostat Housing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts of coolant thermostat housing - **arrows** -.
- First, remove seal and then coolant thermostat.

Installing

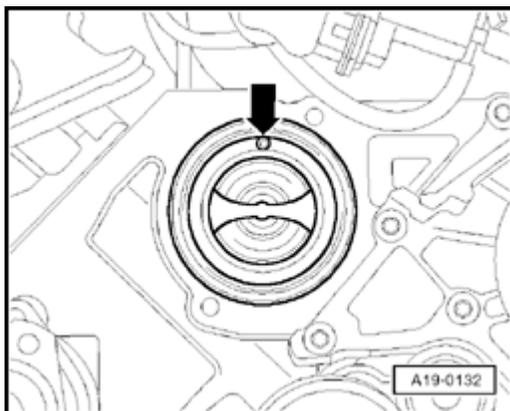


Fig. 182: Coolant Thermostat With Breather Valve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install coolant thermostat with breather valve - **arrow** - facing upward.

- Moisten new O-ring with coolant and install.
- First, fasten coolant thermostat housing bolts by hand, and then tighten to 10 Nm.

If coolant pump must be replaced:

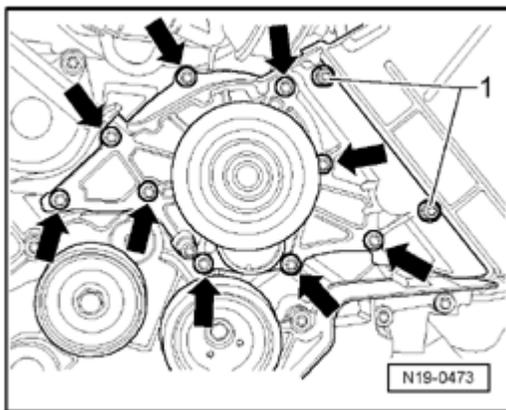


Fig. 183: Locating Toothed Belt Cover Nuts And Coolant Pump Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - **1** - for toothed belt cover.
- Remove all bolts for coolant pump - **arrows** -.

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

- Insert coolant pump with gasket.
- Fasten all bolts by hand and then tighten. Torque specification: 15 Nm
- Install toothed belt --> **Toothed Belt, Removing and Installing.**
- Install ribbed belt --> **Ribbed Belt, Removing and Installing.**
- Fill with coolant --> **Cooling System, Draining and Filling.**

Cooling System, Checking for Leaks

Cooling System, Checking for Leaks

Special tools, testers and auxiliary items required

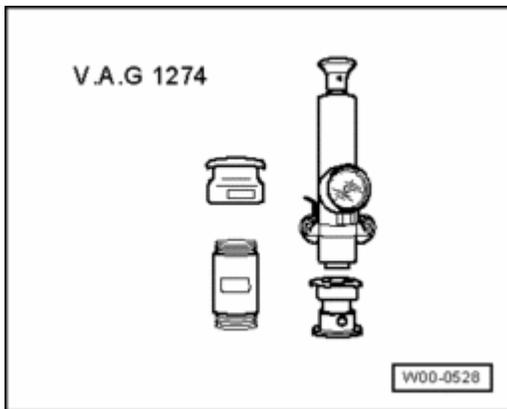


Fig. 184: Identifying Cooling System Tester V.A.G 1274 And Adapters For Cooling System Tester V.A.G 1274/8 And V.A.G 1274/9

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Cooling system tester V.A.G 1274
- Adapter V.A.G 1274/7
- Adapter V.A.G 1274/1A

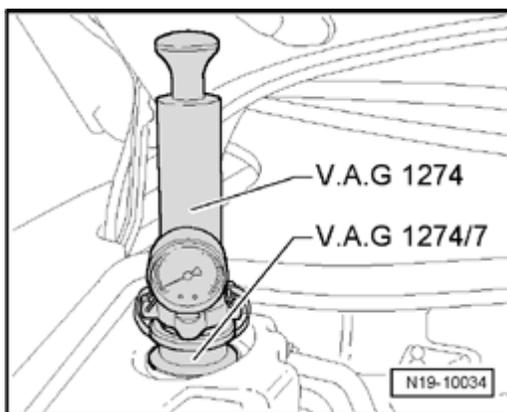


Fig. 185: V.A.G 1274 With Adapter V.A.G 1274/7

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Fasten cooling system tester V.A.G 1274 with adapter V.A.G 1274/7 onto coolant reservoir.
- Operate pump and produce a pressure of 1.4 to 1.6 bar (20 to 23 PSI).
- Inspect system for leaks.
- Also test the cap:

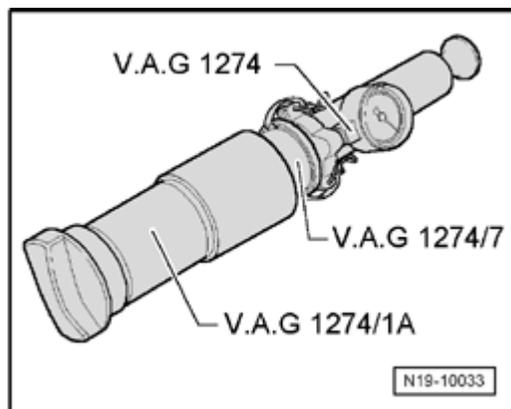


Fig. 186: V.A.G 1274, V.A.G 1274/7 And Adapter V.A.G 1274/1A
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- To do this, install adapter V.A.G 1274/7 and adapter V.A.G 1274/1A onto the cooling system tester V.A.G 1274.
- Operate pump and produce a pressure of max. 1.6 bar (23 PSI).
- The pressure relief valve must not open yet.
- If valve in cap opens prematurely, replace cap.

20 - FUEL SUPPLY

FUEL SUPPLY SYSTEM COMPONENTS, REMOVING AND INSTALLING

Fuel Supply System Components, Removing and Installing

--> Fuel Supply System, Safety Precautions

--> Clean Working Conditions

--> Fuel Tank with Attachments and Fuel Filter, Removing and Installing

--> Fuel Delivery Unit, Fuel Level Sensor and Suction Jet Pump, Right Side, Assembly Overview

--> Fuel Delivery Unit, Fuel Level Sensor and Suction Jet Pump, Left Side, Assembly Overview

--> Fuel Lines and Fuel Tank Components, Assembly Overview

--> Fuel Tank, Emptying

--> Fuel Delivery Unit, Fuel Level Sensor and Suction Jet Pump, Right Side, Removing and Installing

--> Fuel Delivery Unit, Fuel Level Sensor and Suction Jet Pump, Left Side, Removing and Installing

--> Fuel Tank with Attachments and Fuel Filter, Removing and Installing

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ENGINE 4.2 Liter V8 5V Engine Mechanical, Fuel Injection & Ignition, Engine Code(s): BGH, BGJ

--> **Fuel Pump, Checking**

--> **Fuel Pump Current Consumption, Checking**

--> **Fuel Pump Non-Return Valve, Checking**

--> **Electronic Power Control System Functions**

--> **Electronic Power Control, Checking**

NOTE:

- Hose connections are secured with couplings or spring-type or clamp-type clips.
- Always replace clamp-type clips with spring-type clips.
- Fuel hoses at engine must only be secured with spring-type clips. The use of clamp or screw type clips is not permissible.
- Pliers for spring clamps VAS 5024 A or Hose clamp pliers V.A.G 1921 are recommended for installing spring clamps.

Observe safety precautions --> **Fuel Supply System, Safety Precautions.**

Observe rules for cleanliness --> **Clean Working Conditions.**

Removing and installing fuel tank with attachments and fuel filter --> **Fuel Tank with Attachments and Fuel Filter, Removing and Installing.**

Parts of EVAP canister system:

- For engine code BGH --> **EVAP System**
- For engine code BGJ --> **EVAP System, Engine Code BGJ**

Fuel Supply System, Safety Precautions

Fuel Supply System, Safety Precautions

CAUTION: Fuel system is under pressure! Wear eye protection and protective clothing in order to avoid injuries by contact with fuel. Before removing from hose connection wrap a cloth around the connection. Then release pressure by carefully pulling hose off connection.

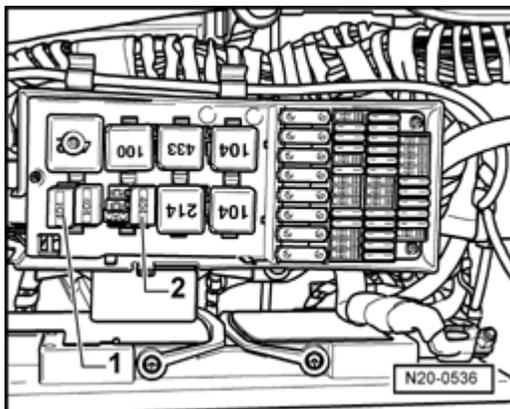


Fig. 187: Fuel Pump Relays, Right And Left Side
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- For safety reasons, fuel pump relays - 1 - (for right side) and - 2 - (for left side) must be removed before opening fuel system because fuel pump can be activated by opening the drivers door.

Always observe the following when removing and installing the sender for fuel gauge or the fuel pump (fuel delivery unit) from full or partially filled fuel tanks:

- Already before starting work, switch on exhaust extraction system and place an extraction hose close to the sensor installation opening of fuel tank to extract escaping fuel fumes. If no exhaust extraction system is available, a radial fan (as long as motor is not in air flow) with a displacement greater than 15 m³/h can be used.
- Prevent fuel from contacting skin! Wear fuel-resistant gloves!

CAUTION: When doing any repair work, especially in the engine compartment, pay attention to the following due to clearance issues:

- Route lines of all types (e.g. for fuel, hydraulic, EVAP canister system, coolant and refrigerant, brake fluid, vacuum) and electrical wiring so that the original path is followed.
- To prevent damages to the lines, make sure there is sufficient clearance to all moving or hot components.

Clean Working Conditions

Clean Working Conditions

When working on the fuel supply/injection system, pay careful attention to the following "5 rules" :

- Thoroughly clean all connections and the surrounding area before disconnecting.
- Place parts that have been removed on a clean surface and cover them. Do not use fluffy cloths!
- Carefully cover over opened components or seal, if repairs are not performed immediately.
- Only install clean components: Only unpack replacement parts immediately prior to installation. Do not

use parts that have been stored loose (e.g. in tool boxes etc.).

- When the system is open: Avoid working with compressed air if possible. Do not move vehicle unless absolutely necessary.

Fuel Tank with Attachments and Fuel Filter, Removing and Installing

Fuel Tank with Attachments and Fuel Filter, Removing and Installing

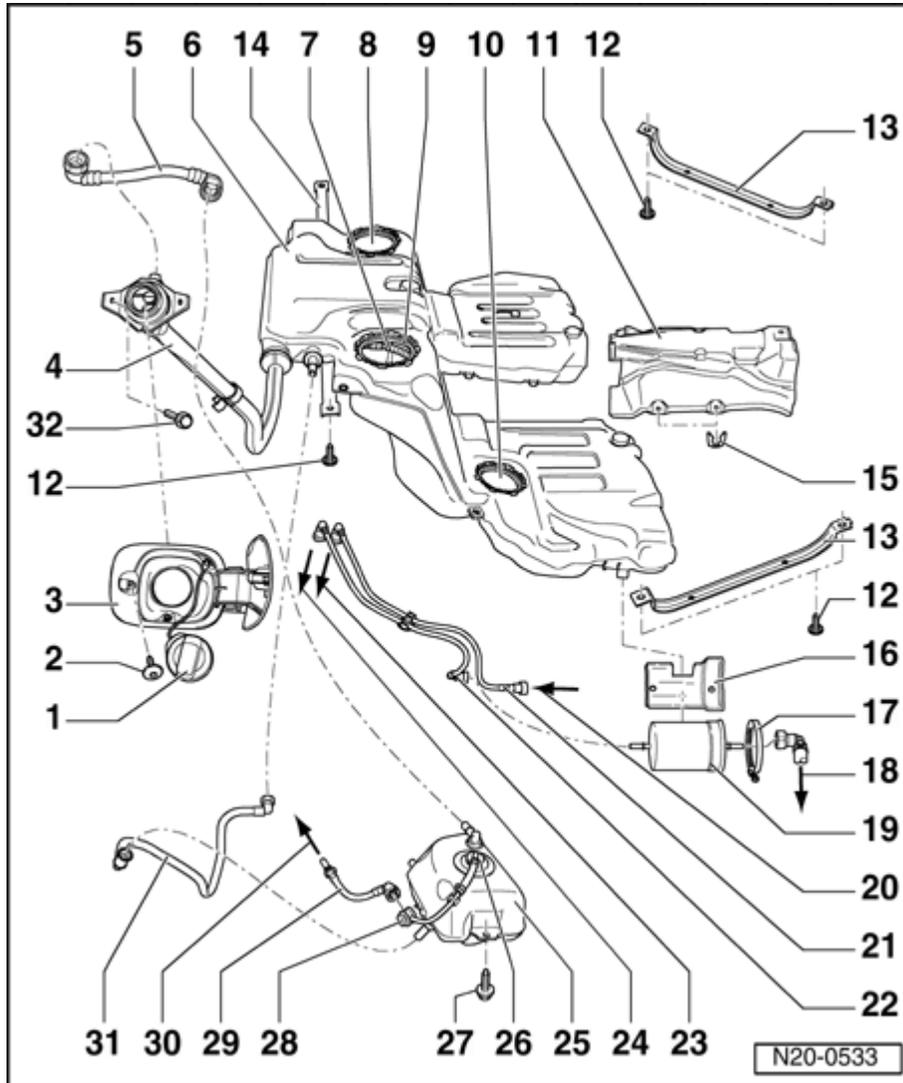


Fig. 188: Fuel Tank With Attachments And Fuel Filter Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 1 - Sealing cap
- 2 - Bolt
- 3 - Tank flap unit

- With rubber cup
- 4 - Fuel filler tube
- 5 - Vent line
- Ensure seated tightly
- 6 - Fuel tank
- Support with engine/transmission jack V.A.G 1383 A when removing
 - Removing and installing --> **Fuel Tank with Attachments and Fuel Filter, Removing and Installing**
- 7 - Fill hose
- From filler tube
- 8 - Sensor opening, left side
- Components, removing and installing --> **Fuel Delivery Unit, Fuel Level Sensor and Suction Jet Pump, Left Side, Assembly Overview**
- 9 - Sensor opening, right side
- Components, removing and installing --> **Fuel Delivery Unit, Fuel Level Sensor and Suction Jet Pump, Right Side, Assembly Overview**
- 10 - Opening for supply and return flange
- 11 - Heat shield
- For fuel tank
- 12 - 20 Nm plus an additional $1/4$ turn (90)
- 13 - Securing strap
- Note installation position
- 14 - Cross member
- For fuel tank
- 15 - Securing clip
- Ensure seated tightly

2004 Volkswagen Phaeton

ENGINE 4.2 Liter V8 5V Engine Mechanical, Fuel Injection & Ignition, Engine Code(s): BGH, BGJ

16 - Cover

17 - Screw clamp

18 - To fuel rail

19 - Fuel filter

20 - From fuel rail

21 - Return line

- Blue
- Ensure seated tightly

22 - Supply line

- Black
- Ensure seated tightly

23 - To connection on supply and return flange

24 - To connection on supply and return flange

25 - Reservoir

26 - Breather valve

27 - 8 Nm plus an additional $\frac{1}{4}$ turn (90)

28 - Pressure retention valve

- Checking --> **Checking pressure retaining valve on expansion tank**

29 - Vent line

- Ensure seated tightly

30 - To EVAP canister

31 - Vent line

32 - 8 Nm plus an additional $\frac{1}{4}$ turn (90)

Fuel Delivery Unit, Fuel Level Sensor and Suction Jet Pump, Right Side, Assembly Overview

Fuel Delivery Unit, Fuel Level Sensor and Suction Jet Pump, Right Side, Assembly Overview

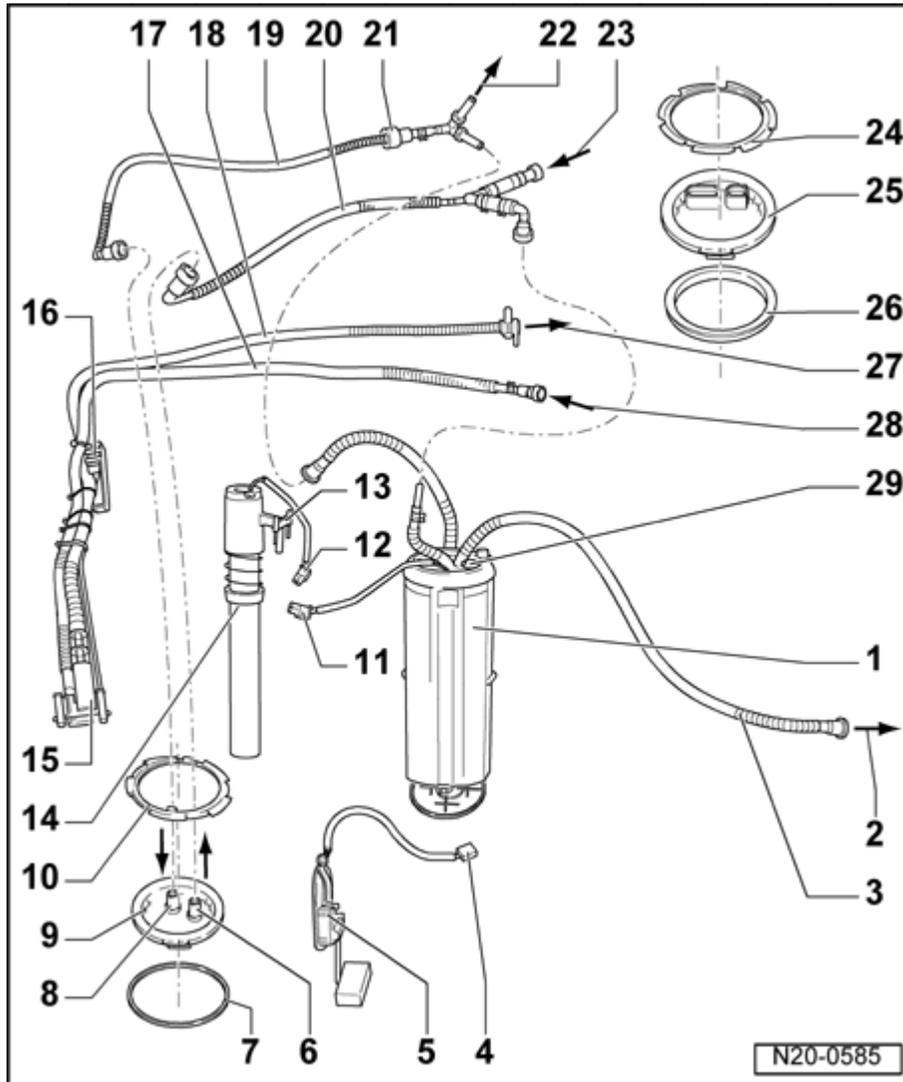


Fig. 189: Fuel Delivery Unit, Fuel Level Sensor And Suction Jet Pump, Right Side, Assembly Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Fuel delivery unit

- Check fuel pump --> **Fuel Pump, Checking**
- Removing and installing --> **Fuel Delivery Unit, Fuel Level Sensor and Suction Jet Pump, Right Side, Removing and Installing**

2 - To Y-piece on supply line for left side suction jet pump

3 - Supply line for suction jet pump

4 - Connector

5 - Fuel supply sensor 2 G169

- Lever-type sensor
- Clipped in on mount for Fuel Pump (FP) unit
- Checking: --> Wiring diagrams; troubleshooting program; Sender for fuel gauge, checking

6 - Connection

- Arrow points away from connection

7 - Oil seal

- Replace if damaged

8 - Connection

- Arrow points to connection

9 - Supply and return flange

10 - Locking ring, 60 Nm

- Ensure seated tightly
- Use wrench 3087 for removal and installation

11 - Connector

- For Fuel Pump (FP)

12 - Connector

13 - Retaining tab

- Clipped in at right on Fuel Pump (FP) unit

14 - Fuel Level Sensor G

- Tubular sensor
- Checking: --> Wiring diagrams; troubleshooting program; Sender for fuel gauge, checking

15 - Suction jet pump

16 - Retaining tab

- Clipped in on mount for Fuel Pump (FP) unit

2004 Volkswagen Phaeton

ENGINE 4.2 Liter V8 5V Engine Mechanical, Fuel Injection & Ignition, Engine Code(s): BGH, BGJ

17 - Supply line

- Suction jet pump, right side

18 - Delivery line

- Suction jet pump, right side

19 - Return line

20 - Supply line

21 - Non-return valve

22 - To return line of Fuel Pump (FP) unit, left side

23 - From supply line of fuel delivery unit, left side

24 - Locking ring, 110 Nm

- Ensure seated tightly
- Use wrench 3087 for removal and installation

25 - Flange

- Note installed position on fuel tank --> **Installation position of flanges for fuel delivery units**

26 - Oil seal

- Replace

27 - To fuel delivery unit on left side

- Clipped in at right on Fuel Pump (FP) unit

28 - From supply line for suction jet pump at Fuel Pump (FP) unit, right side

29 - Connection for fill hose

Fuel Delivery Unit, Fuel Level Sensor and Suction Jet Pump, Left Side, Assembly Overview

Fuel Delivery Unit, Fuel Level Sensor and Suction Jet Pump, Left Side, Assembly Overview

2004 Volkswagen Phaeton

ENGINE 4.2 Liter V8 5V Engine Mechanical, Fuel Injection & Ignition, Engine Code(s): BGH, BGJ

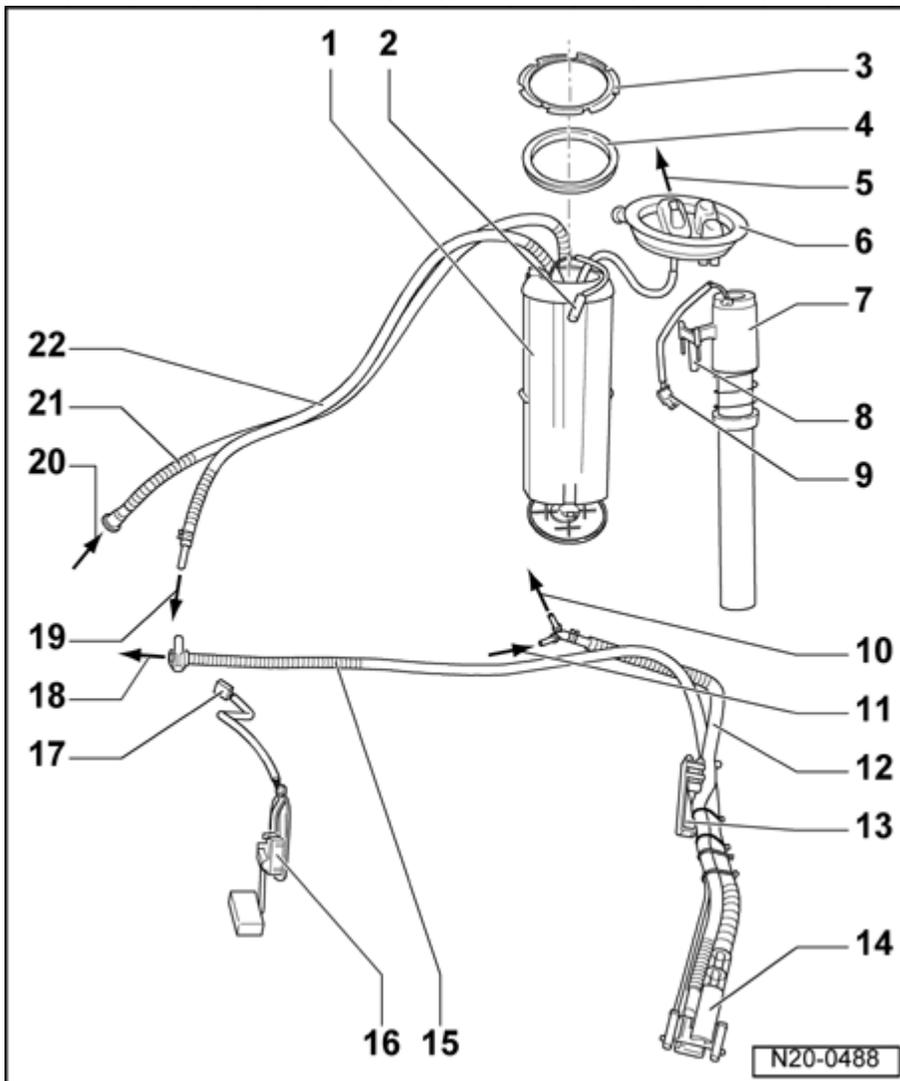


Fig. 190: Fuel Delivery Unit, Fuel Level Sensor And Suction Jet Pump, Left Side, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Fuel delivery unit

2 - Connector

- For Fuel Pump (FP)

3 - Locking ring, 110 Nm

- Ensure seated tightly
- Use wrench 3087 for removal and installation

4 - Oil seal

- Replace

5 - Supply line

- For auxiliary heater

6 - Flange

- Note installed position on fuel tank --> **Installation position of flanges for fuel delivery units**

7 - Fuel Level Sensor 3 G237

- Tubular sensor
- Checking: --> Electrical Wiring Diagrams, Troubleshooting and Component Locations

8 - Retaining tab

- Clipped in at left on Fuel Pump (FP) unit

9 - Connector

10 - To supply line of suction jet pump, right side

11 - From supply line for suction jet pump at Fuel Pump (FP) unit, right side

12 - Supply line

- Suction jet pump, left side

13 - Retaining tab

- Clipped in on mount for Fuel Pump (FP) unit

14 - Suction jet pump

15 - Delivery line

- Suction jet pump, left side

16 - Fuel Level Sensor 4 G393

- Lever-type sensor
- Clipped in on mount for Fuel Pump (FP) unit
- Checking: --> Electrical Wiring Diagrams, Troubleshooting and Component Locations

17 - Connector

18 - To fuel delivery unit on right side

- Clipped in at top left on Fuel Pump (FP) unit

19 - To supply line

20 - From return line

21 - Return line

22 - Supply line

Installation position of flanges for fuel delivery units

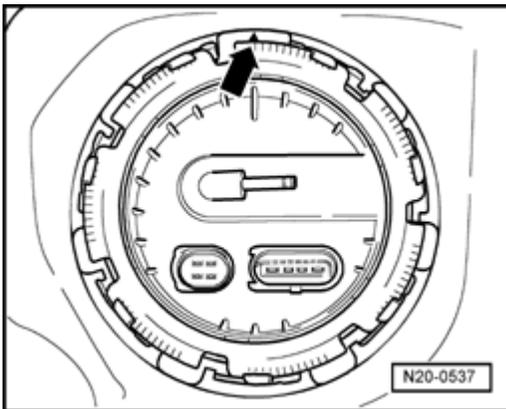
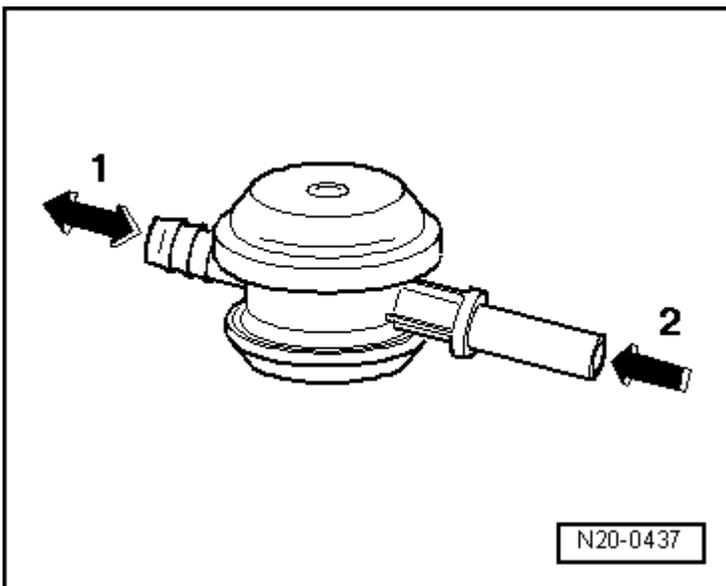


Fig. 191: Installation Position Of Flanges For Fuel Delivery Units
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Insert sender flange with marking - **arrow** - in direction of travel.

Checking pressure retaining valve on expansion tank



Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Supply and return flange

- With connections for quick acting couplings

2 - Supply line

3 - Return line

4 - Suction jet pump

- Right side

5 - Fuel delivery unit

- Right side

6 - Fill hose

- From filler tube

7 - Y-piece

8 - Non-return valve

9 - Y-piece

10 - Supply line for auxiliary heater

11 - Flange

- Left side

12 - Fuel delivery unit

- Left side

13 - Suction jet pump

- Left side

14 - Delivery line

- To fuel delivery unit on right side

15 - Y-piece

16 - Supply line for suction jet pump

17 - Delivery line

- To fuel delivery unit on left side

Fuel Tank, Emptying

Fuel Tank, Emptying

Special tools, testers and auxiliary items required

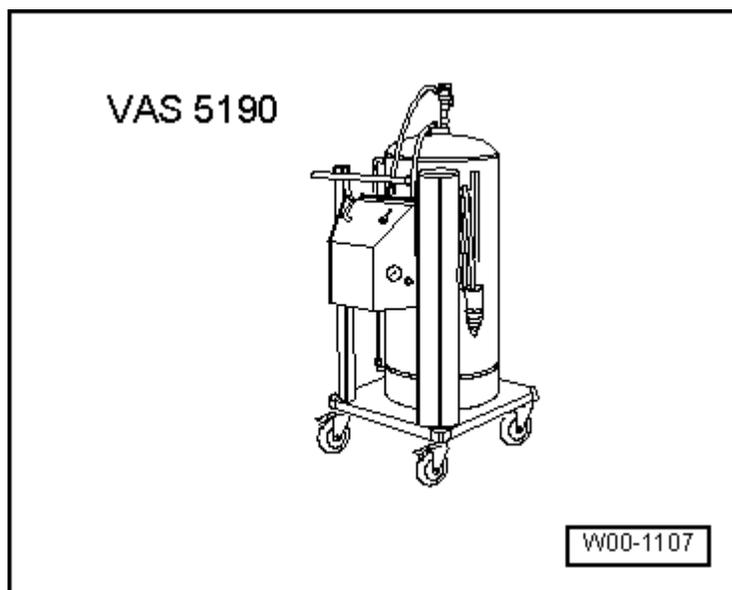


Fig. 194: Identifying Fuel Siphoning Unit VAS 5190
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Fuel siphoning unit VAS 5190

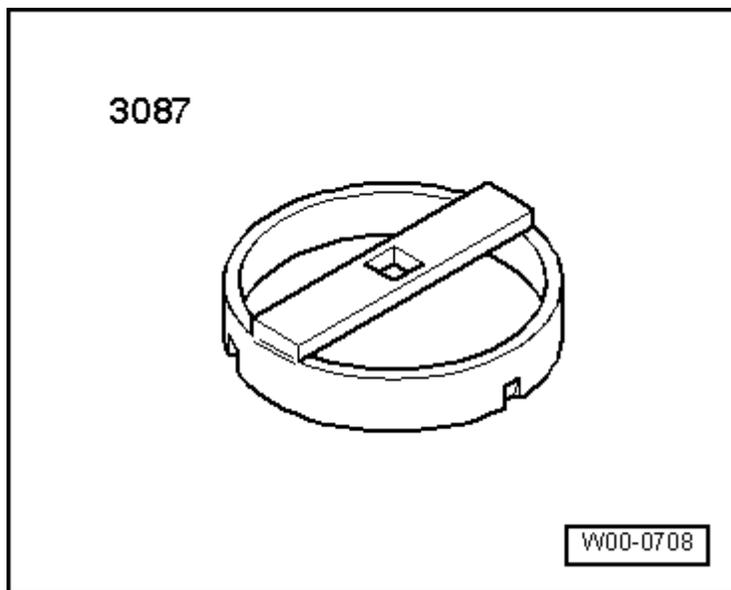


Fig. 195: Wrench 3087

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Polydrive key 3087

CAUTION: Fuel system is under pressure! Wear eye protection and protective clothing in order to avoid injuries by contact with fuel. Before removing from hose connection wrap a cloth around the connection. Then release pressure by carefully pulling hose off connection.

Work procedure

- Observe safety precautions before performing repair work --> Fuel Supply System, Safety Precautions.
- Open fuel tank flap.

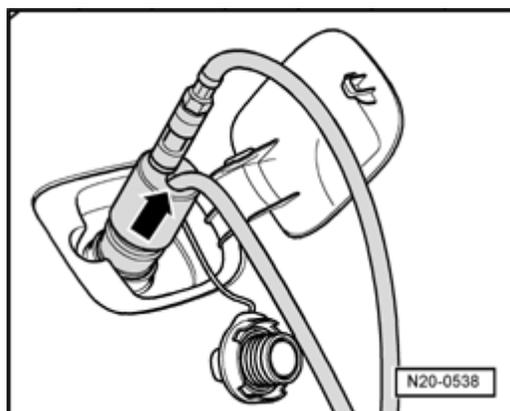


Fig. 196: Fuel Siphoning Unit VAS 5190 Suction Hose In Fuel Filler Neck

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Push suction hose - **arrow** - of fuel siphoning unit VAS 5190 about 160 to 170 cm into fuel filler neck

and extract fuel.

If no more fuel is extracted:

- Unclip both covers for sensor flanges in luggage compartment floor.

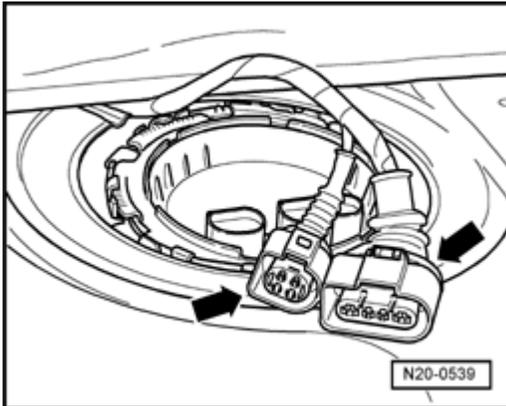


Fig. 197: Right Sensor Flange Connectors
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect connectors - **arrows** - from right sensor flange.

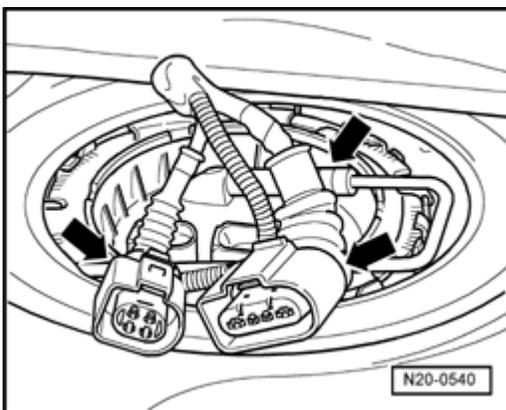


Fig. 198: Left Sensor Flange Connectors And Supply Hose
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect connectors and supply hose - **arrows** - from left sensor flange.
- Hold a rag at the fuel hose for auxiliary heater at left sensor flange and disconnect the fuel hose.

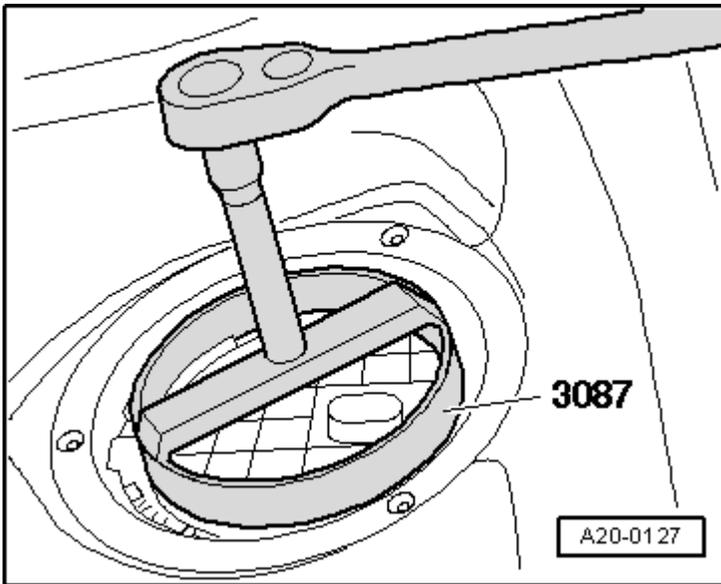


Fig. 199: Removing/Installing Locking Ring Using Wrench 3087
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove locking ring from flange using wrench 3087.
- Carefully pry flange and lift it upward slightly.
- Insert suction hose of fuel siphoning unit VAS 5190 as deeply as possible in right and then left sides of fuel tank and extract fuel.
- For work on left side of fuel tank, proceed as described above.

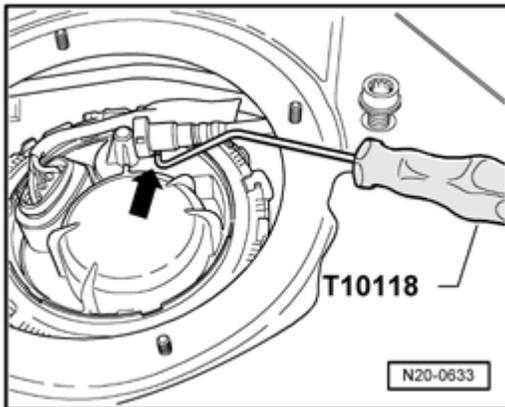


Fig. 200: Assembly Tool T10118
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- When breather line is pulled off, hose coupling button often cannot be pressed in. In that case, use assembly tool T10118 - **arrow** -.

For additional work on components inside of fuel tank, flanges may remain removed.

If fuel tank needed only to be emptied, install flanges again.

- First check that flange seals are properly seated.

NOTE:

- If seals are swollen with fuel, always replace.

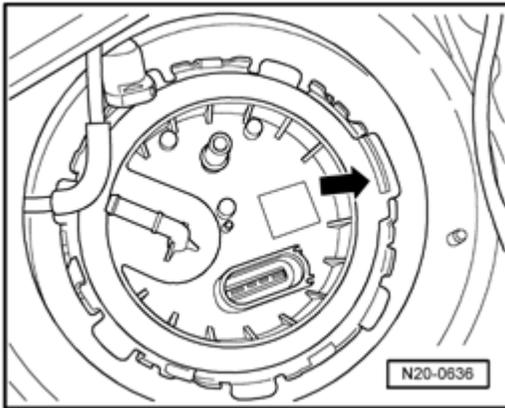


Fig. 201: Flange With Locating Tab Facing In Direction Of Travel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert flange with locating tab facing in direction of travel - **arrow** -.
- Tighten sealing rings at right and left to the specified torque using wrench.

Fuel Delivery Unit, Fuel Level Sensor and Suction Jet Pump, Right Side, Removing and Installing

Fuel Delivery Unit, Fuel Level Sensor and Suction Jet Pump, Right Side, Removing and Installing

Special tools, testers and auxiliary items required

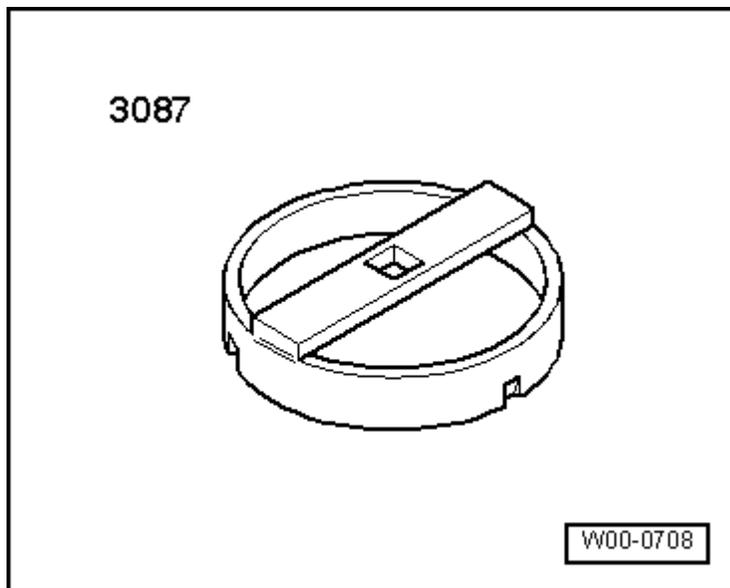


Fig. 202: Wrench 3087
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Polydrive key 3087

Test conditions

- The fuel tank must be drained --> **Fuel Tank, Emptying**
- Connectors and wires for left and right sender flanges have been removed.
- Locking rings for left and right sender flanges have been removed.
- The fuel pump relays must be removed from their sockets.

Work procedure

- Observe safety precautions before performing repair work --> **Fuel Supply System, Safety Precautions**

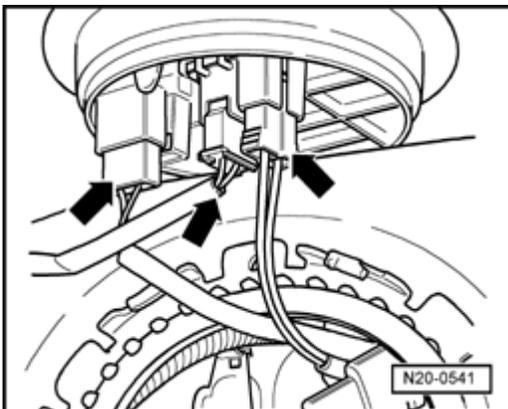


Fig. 203: Connector Underneath Right Sensor Flange
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect three connectors - **arrows** - underneath the right sensor flange.

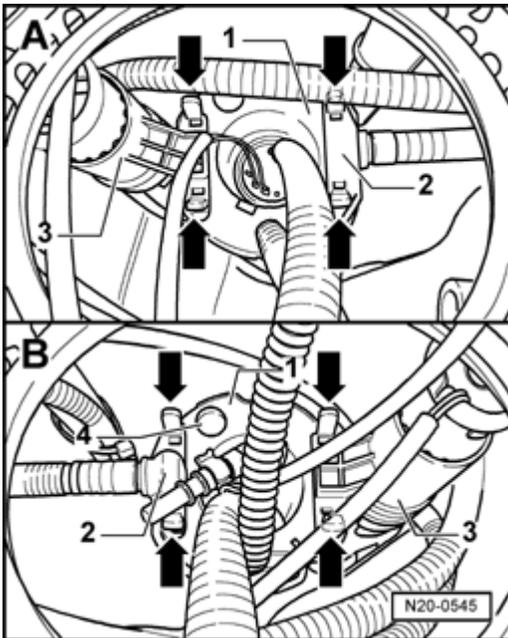


Fig. 204: Fuel Delivery Unit, Left Suction Jet Pump, Tubular Sensor And Opening In Housing For Delivery Unit

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unclip tubular sensor - 3 - from fuel delivery unit - 1 - (arrows) on right side - B - and remove it carefully.
- Now pull out black fill hose from opening - 4 - in housing for delivery unit - 1 -.
- Unclip return hose of left suction jet pump - 2 - out of fuel delivery unit - 1 - (- arrows -) on right side - B -.

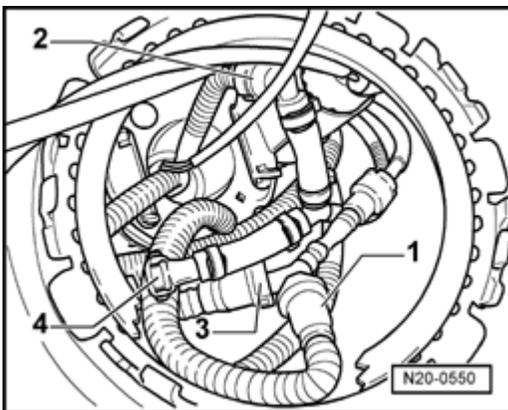


Fig. 205: Supply And Return Line On Right Side

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect return line - 1 - as well as supply line - 2 - on right side.

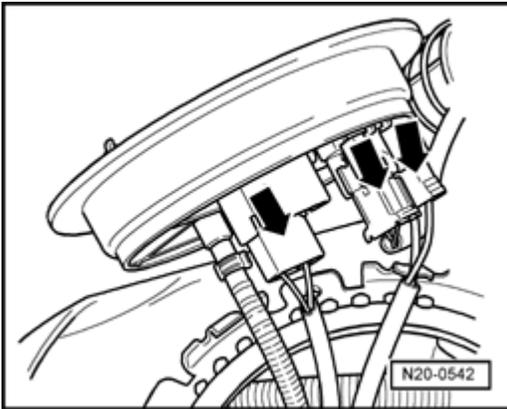


Fig. 206: Connectors Underneath Left Sensor Flange
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect three connectors - **arrows** - underneath left sensor flange.

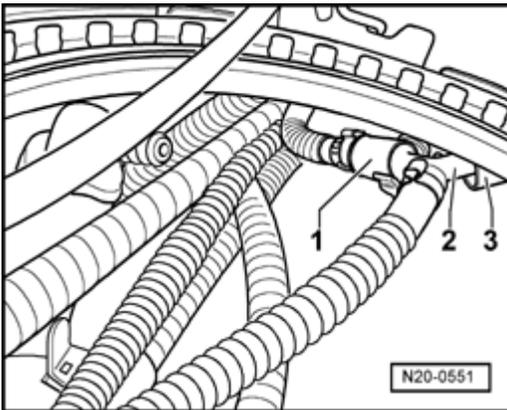


Fig. 207: Supply Hose And "Y-Piece" On Left Side
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect supply hose - **1** - from "Y-piece" - **2** - on left side and remove it from right side sensor opening.

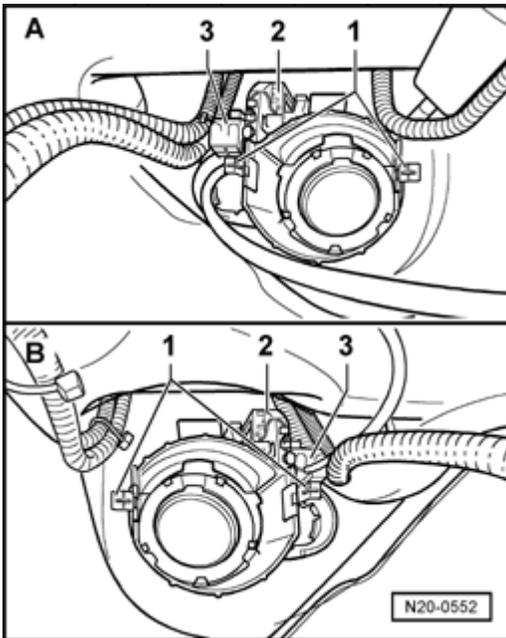


Fig. 208: Fuel Delivery Units And Retaining Clips
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press both retaining clips - 1 - of right fuel delivery unit - B - slightly to side and carefully remove delivery unit.

NOTE:

- The fuel delivery unit housing is filled with fuel. Fuel may run out if the housing is tipped or tilted.

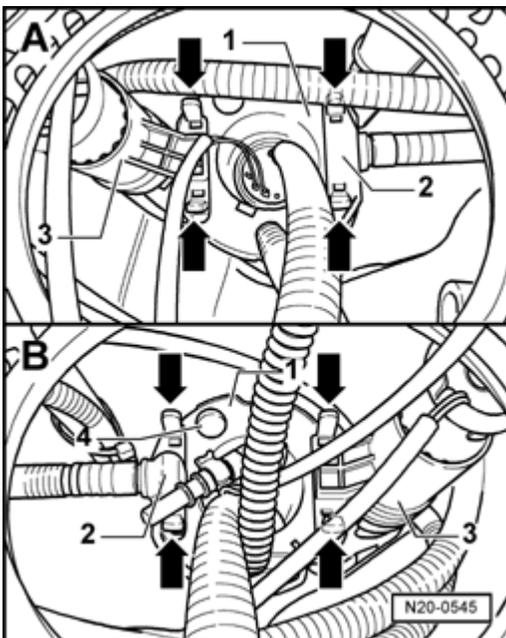


Fig. 209: Fuel Delivery Unit, Left Suction Jet Pump, Tubular Sensor And Opening In Housing For Delivery Unit

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Now, unclip black return hose - 2 - from housing for fuel delivery unit - 1 - - **arrows** - on left side - **A** -.

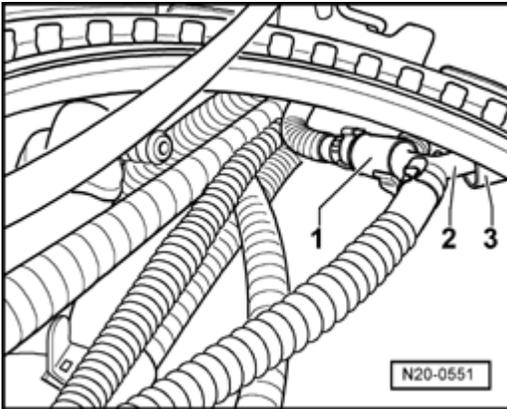


Fig. 210: Supply Hose And "Y-Piece" On Left Side
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect supply hose - 3 - from "Y-piece" - 2 -. Then, pull both hoses for suction jet pump through the right sensor opening.

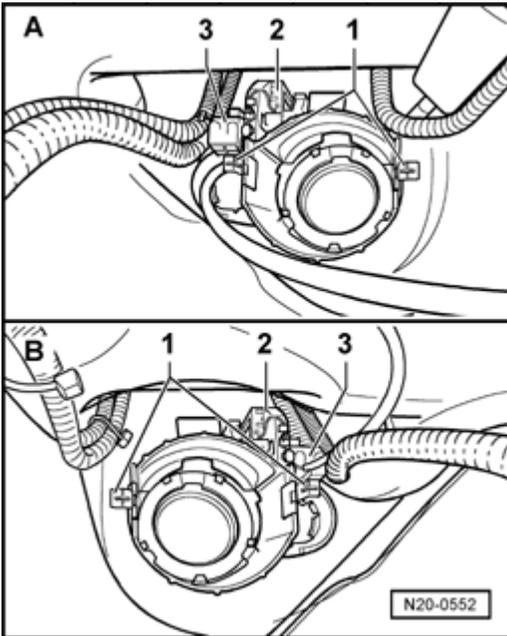


Fig. 211: Fuel Delivery Units And Retaining Clips
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Now suction jet pump - 3 - on right side - **B** - can be unclipped and removed by rotating slightly.
- Unclip fuel level sensor - 2 - and remove it.

Fuel Delivery Unit, Fuel Level Sensor and Suction Jet Pump, Left Side, Removing and Installing

Fuel Delivery Unit, Fuel Level Sensor and Suction Jet Pump, Left Side, Removing and Installing

Special tools, testers and auxiliary items required

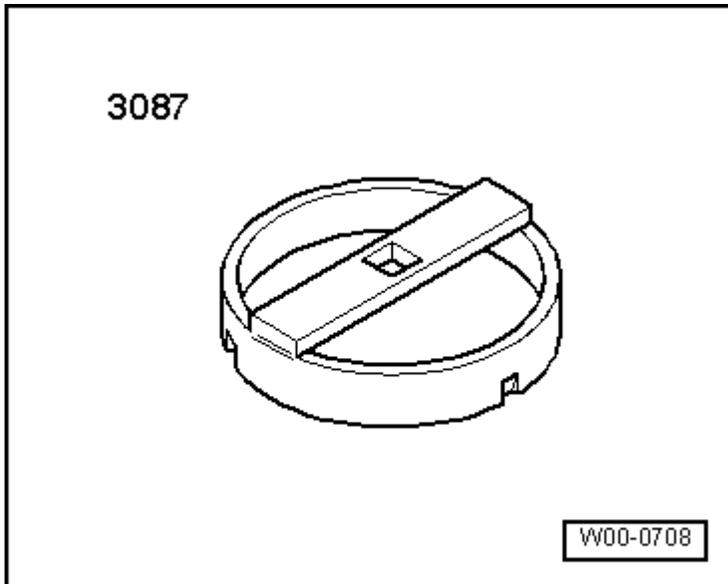


Fig. 212: Wrench 3087

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Polydrive key 3087

Test conditions

- The fuel tank must be drained --> **Fuel Tank, Emptying**
- Connectors and wires for left and right sender flanges have been removed.
- Locking rings for left and right sender flanges have been removed.
- The fuel pump relays must be removed from their sockets.

Work procedure

- Observe safety precautions before performing repair work --> **Fuel Supply System, Safety Precautions.**

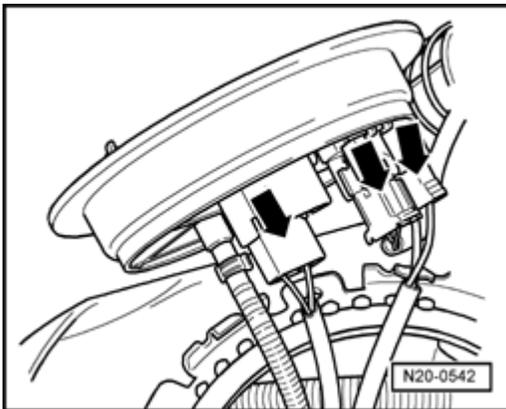


Fig. 213: Connectors Underneath Left Sensor Flange
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect the three connectors - **arrows** - underneath the left sensor flange.

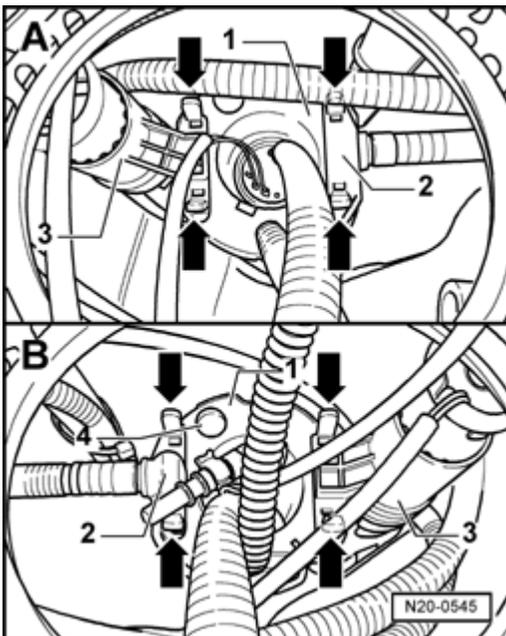


Fig. 214: Fuel Delivery Unit, Left Suction Jet Pump, Tubular Sensor And Opening In Housing For Delivery Unit
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unclip tubular sensor - **3** - from fuel delivery unit - **1** - (- **arrows** -) on left side - **A** - and remove it carefully.
- Unclip return hose of right suction jet pump - **2** - out of fuel delivery unit - **1** - (- **arrows** -) on left side - **A** -.

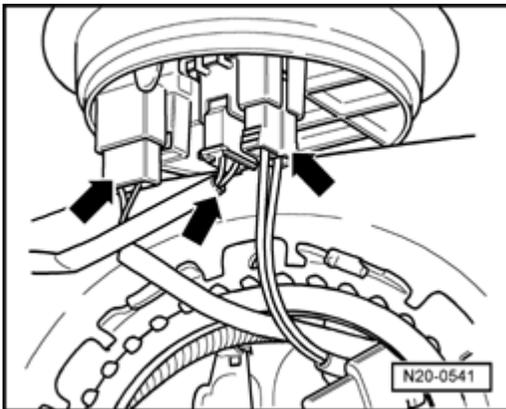


Fig. 215: Connector Underneath Right Sensor Flange
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect three connectors - **arrows** - underneath right sensor flange.

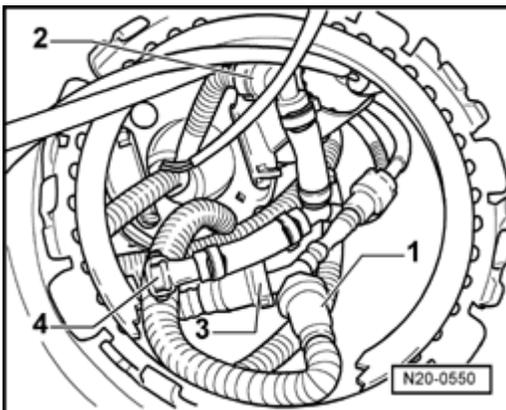


Fig. 216: Supply And Return Line On Right Side
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect return line - **3** - as well as supply line - **4** - on right side.
- Pull both hose ends through left sensor opening.

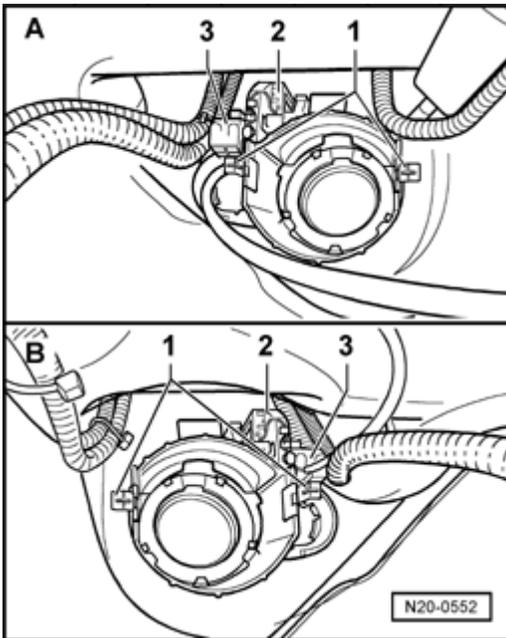


Fig. 217: Fuel Delivery Units And Retaining Clips
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press both retaining clips - 1 - of left fuel delivery unit - A - slightly to side and carefully remove delivery unit with sensor flange still connected.

NOTE:

- The fuel delivery unit housing is filled with fuel. Fuel may run out if the housing is tipped or tilted.

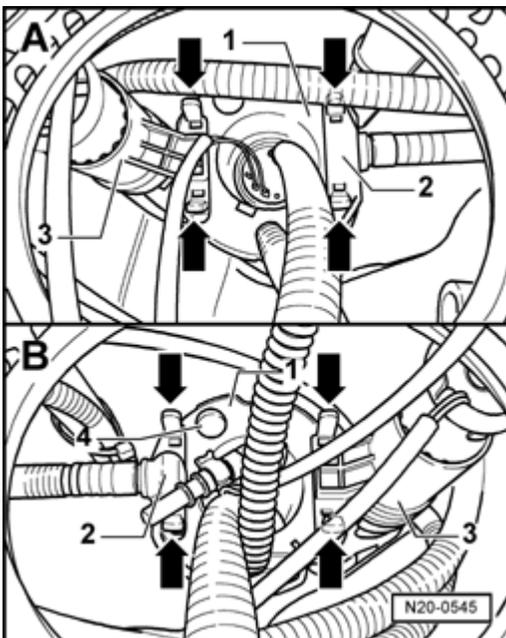


Fig. 218: Fuel Delivery Unit, Left Suction Jet Pump, Tubular Sensor And Opening In Housing For Delivery Unit

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Now, unclip black return hose - 2 - from housing for fuel delivery unit - 1 - - **arrows** - on right side - **B** -.
- Now, pull out black fill hose for suction jet pump through left sensor opening.

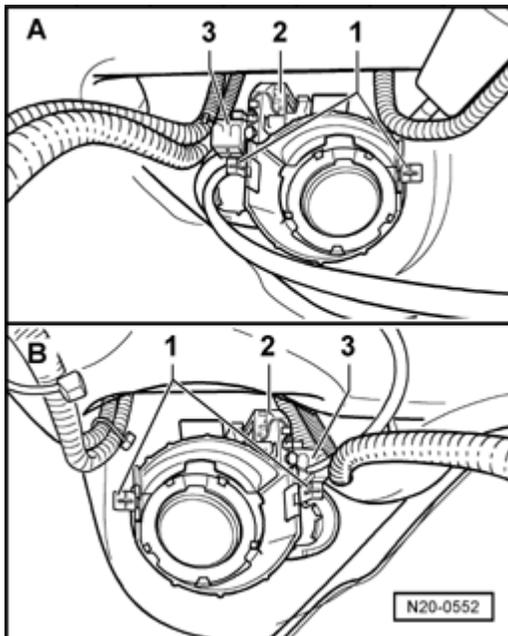


Fig. 219: Fuel Delivery Units And Retaining Clips

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Now suction jet pump - 3 - on left side - **A** - can be unclipped and removed by rotating slightly.
- Unclip fuel level sensor - 2 - and remove it.

Fuel Tank with Attachments and Fuel Filter, Removing and Installing

Fuel Tank with Attachments and Fuel Filter, Removing and Installing

2004 Volkswagen Phaeton

ENGINE 4.2 Liter V8 5V Engine Mechanical, Fuel Injection & Ignition, Engine Code(s): BGH, BGJ

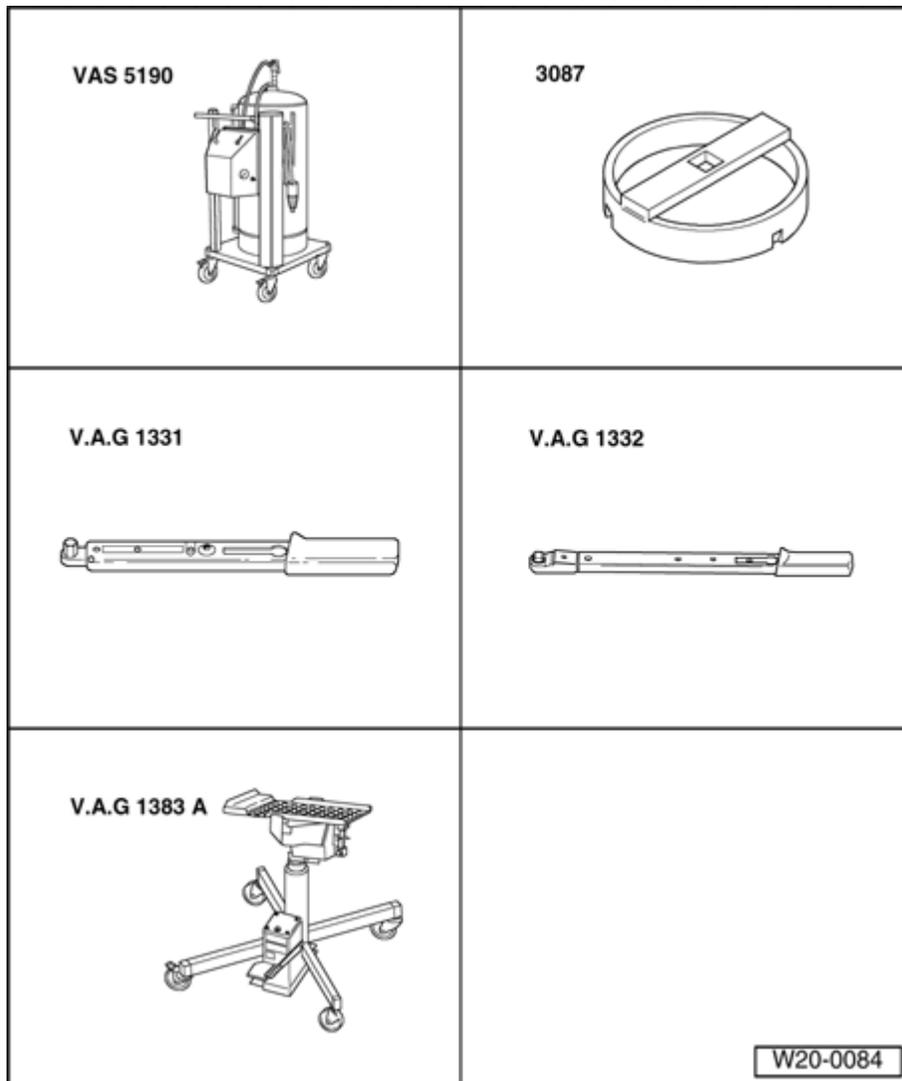


Fig. 220: Identifying Special Tools - Fuel Tank With Attachments And Fuel Filter, Removing And Installing

Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Fuel siphoning unit VAS 5190
- Torque wrench V.A.G 1331
- Torque wrench V.A.G 1332
- Engine/transmission jack V.A.G 1383 A
- Polydrive key 3087

Test conditions

- The fuel tank must be drained --> **Fuel Tank, Emptying**

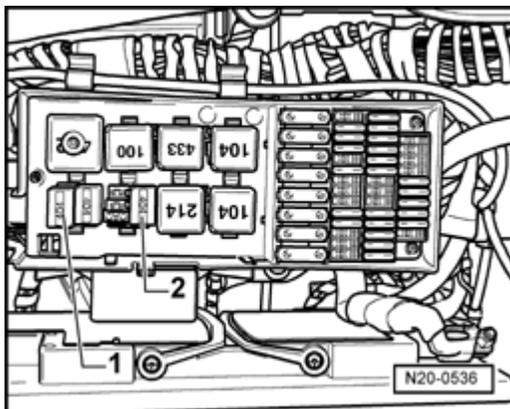


Fig. 221: Fuel Pump Relays, Right And Left Side
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Fuel pump relays - 1 - and - 2 - must be removed from their sockets.

Removing

- Observe safety precautions before performing repair work --> **Fuel Supply System, Safety Precautions.**
- Remove rear bumper: --> **63 BUMPERS**
- Remove rear right wheel housing liner: --> **66 EXTERIOR EQUIPMENT**
- Remove center and rear mufflers and mountings.
- Remove drive shaft: --> **39F - FRONT FINAL DRIVE, DIFFERENTIAL** or **39R - FINAL DRIVE, REAR DIFFERENTIAL**
- Remove rear axle: --> **42 - REAR SUSPENSION**
- Open fuel tank flap.
- Remove securing bolts and remove tank flap unit with rubber cup.
- Remove bolts from filler tube.

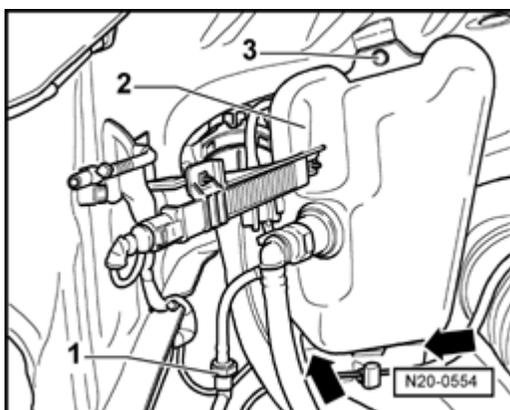


Fig. 222: Breather Reservoir, Vent Line And Bolt
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Separate vent line - 1 -.
- Remove bolt - 3 - for breather reservoir - 2 - and pull it out from its mounting in the inner wheel housing - **arrows** -.
- Unclip both covers for sensor flanges in luggage compartment floor.

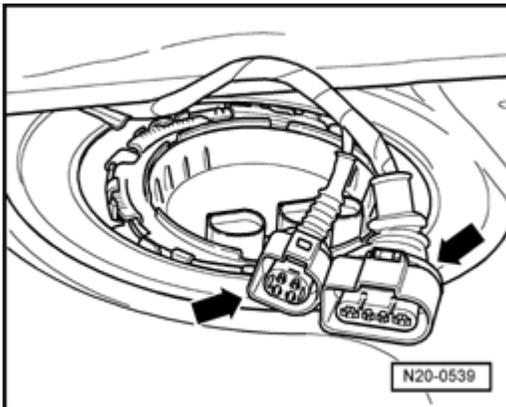


Fig. 223: Right Sensor Flange Connectors
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect connectors - **arrows** - from right sensor flange.

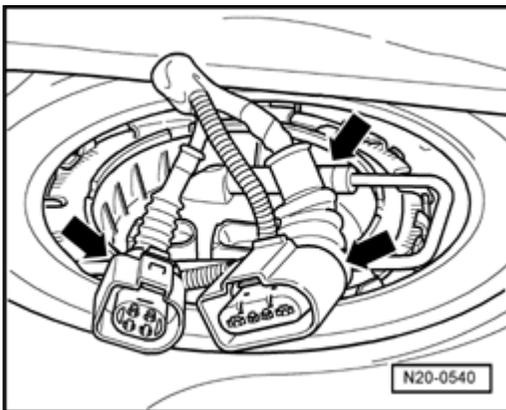


Fig. 224: Left Sensor Flange Connectors And Supply Hose
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect connectors and supply hose - **arrows** - from left sensor flange. When pulling off fuel supply line, hold a cloth around fuel supply line.

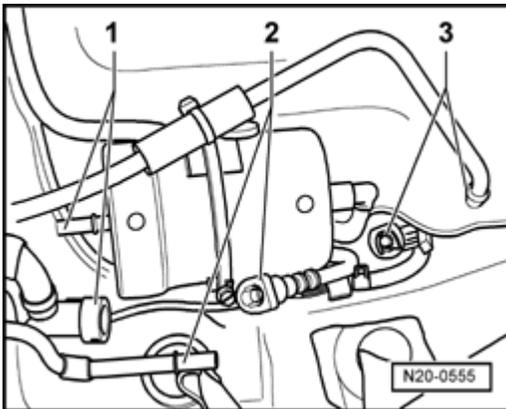


Fig. 225: Fuel Lines And Breather Line Connection
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hold a rag at connections of fuel lines - 1 - and - 2 - and pull them apart.
- Disconnect breather line connection - 3 -.

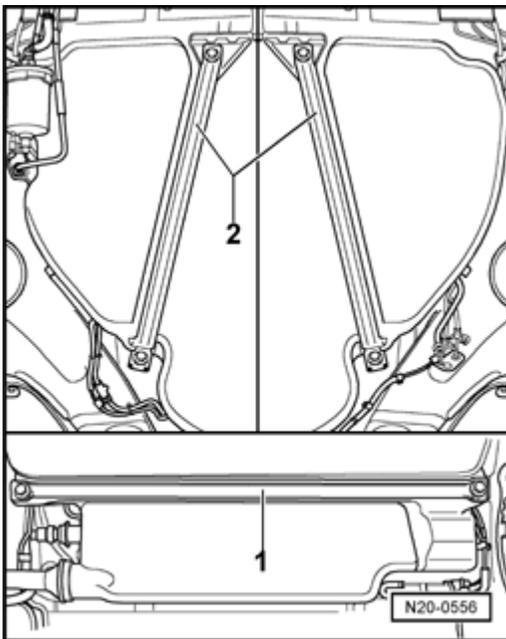


Fig. 226: Crossmember And Tension Straps
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove crossmember - 1 -.
- Support fuel tank with engine/transmission jack V.A.G 1383 A and loosen tension straps - 2 -.
- Lower fuel tank.

Installing

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

2004 Volkswagen Phaeton

ENGINE 4.2 Liter V8 5V Engine Mechanical, Fuel Injection & Ignition, Engine Code(s): BGH, BGJ

- Connections for breather and fuel lines must engage audibly when joined.
- Do not interchange supply and return hose (return hose blue or blue markings, supply hose black).
- Make sure ventilation and fuel lines are not kinked when installed.
- Secure fuel hoses with spring-type clamps.
- Ensure fuel hoses are seated securely.

NOTE:

- **Before lifting fuel tank, check that the supply, return and breather lines are still clipped onto the fuel tank.**

Fuel Pump, Checking

Fuel Pump, Checking

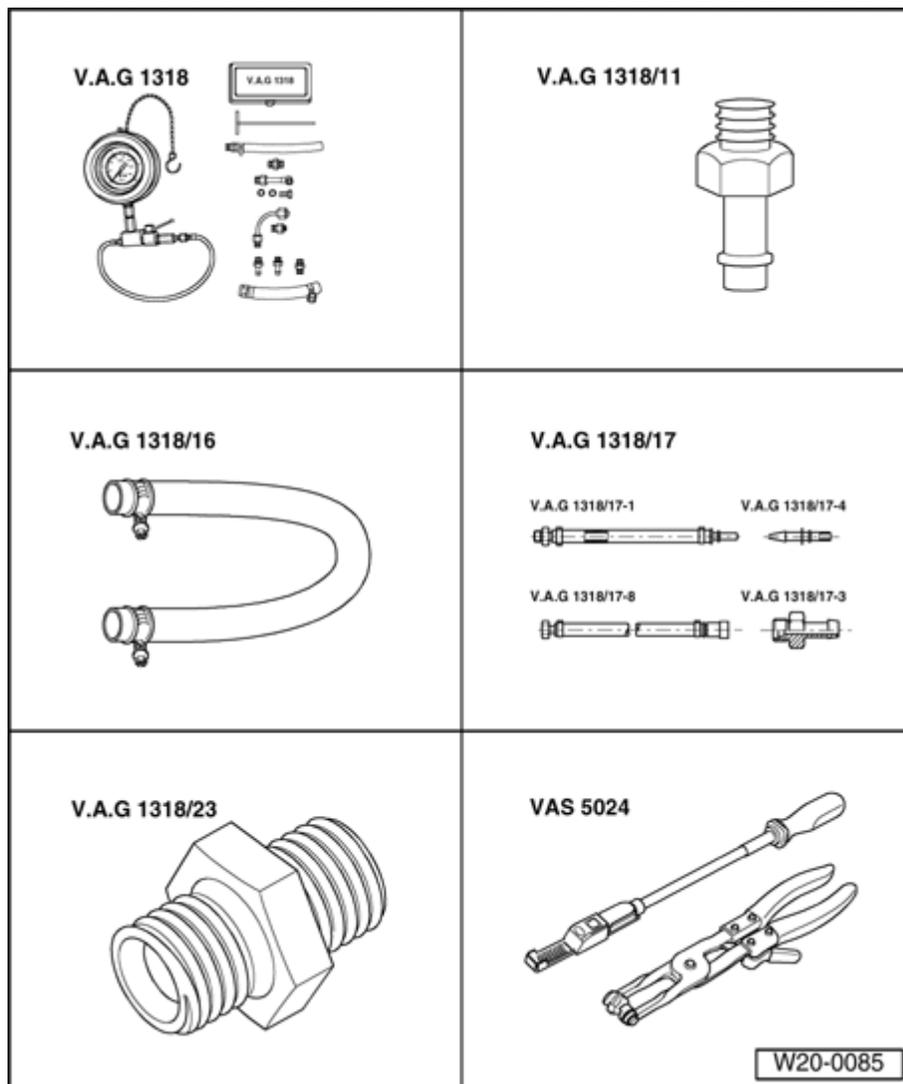


Fig. 227: Identifying Special Tools -- Fuel Pump, Checking (1 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Pressure gauge V.A.G 1318
- Adapter V.A.G 1318/11
- Adapter V.A.G 1318/16
- Adapter V.A.G 1318/17
- Adapter V.A.G 1318/23
- Spring-type clip pliers VAS 5024A

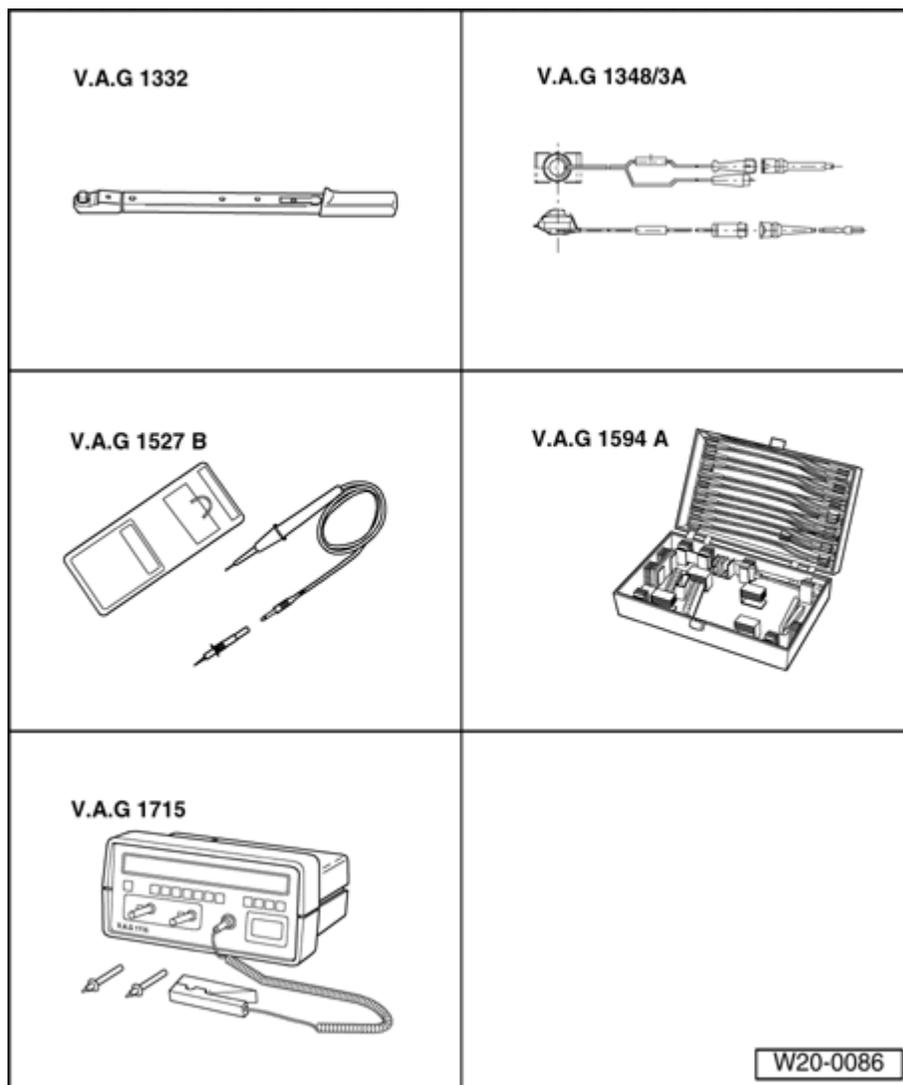


Fig. 228: Identifying Special Tools -- Fuel Pump, Checking (2 Of 2)
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Torque wrench V.A.G 1332

- Remote control V.A.G 1348/3A with adapter cable V.A.G 1348/3-3
- Voltage tester V.A.G 1527B
- Connector test set V.A.G 1594C

- Multimeter V.A.G 1715
- Measuring container
- Wiring diagram

Test conditions

- Voltage of both batteries OK

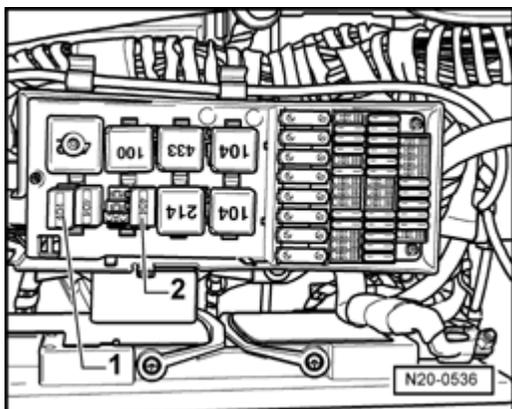


Fig. 229: Fuel Pump Relays, Right And Left Side
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Fuel pump relays - 1 - and - 2 - must be removed from their sockets.

Checking delivery rate

- Remove fuel filler cap from fuel filler tube.
- Remove intake air hose between Mass Air Flow (MAF) Sensor G70 and right throttle valve control module --> [Air Filter, Assembly Overview](#).

CAUTION: Fuel system is under pressure! Wear eye protection and protective clothing in order to avoid injuries by contact with fuel. Before removing from hose connection wrap a cloth around the connection. Then release pressure by carefully pulling hose off connection.

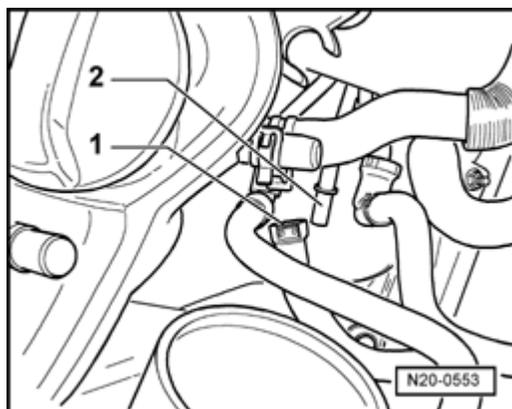


Fig. 230: Supply Hose And Supply Line

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect supply hose - 1 - from supply line - 2 - and catch escaping fuel using a rag.

NOTE:

- For this, press together buttons at hose connection.

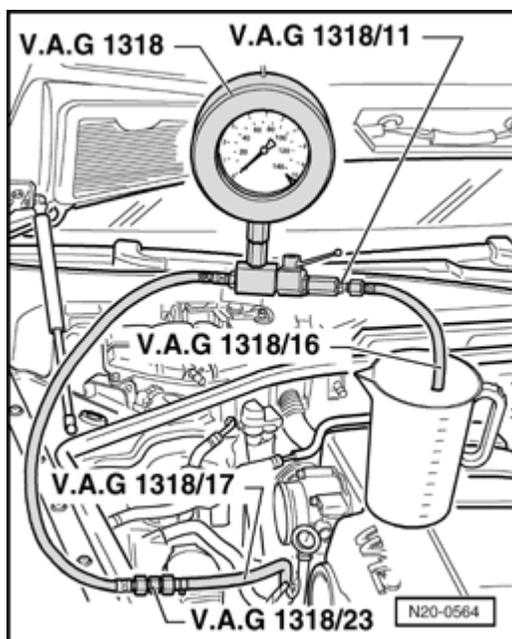


Fig. 231: V.A.G 1318 Components Assembled

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect pressure gauge V.A.G 1318 to fuel supply line using adapter V.A.G 1318/23 and V.A.G 1318/17.
- Install hose adapter V.A.G 1318/16 onto adapter V.A.G 1318/11 on pressure gauge and hold hose in a measuring container.
- Open shut-off tap on pressure gauge V.A.G 1318. The lever then points in direction of flow.

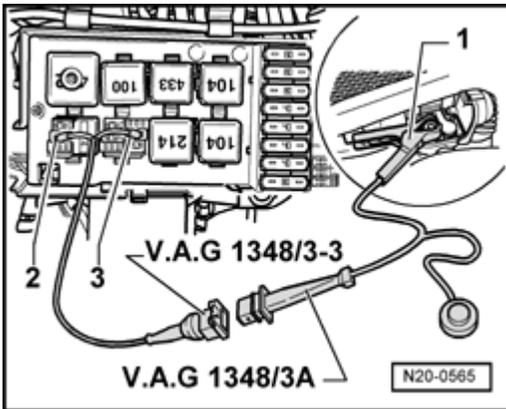


Fig. 232: Remote Control V.A.G 1348/3 A With Adapter V.A.G 1348/3-3 Connected To Connections Of Fuel Pump Relays

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect remote control V.A.G 1348/3 A with adapter V.A.G 1348/3-3 to connections of fuel pump relays - 2 - and - 3 -.
- Connect positive clamp of - 1 - of remote control to positive terminal (B+) in engine compartment.
- Operate remote control V.A.G 1348/3A. Slowly close shut-off tap, until pressure gauge shows 4 bar. From this point on do not move position of shut-off tap.
- Empty measuring container.
- Delivery rate of Fuel Pumps (FP) is dependent on battery voltage. Therefore, connect multimeter to left vehicle battery using adapter cables from V.A.G 1594 A.
- Operate remote control for 30 seconds and measure battery voltage.

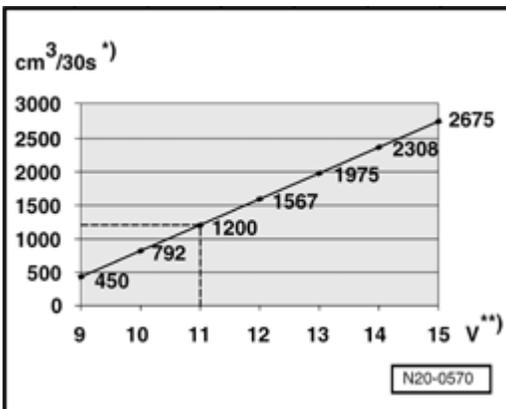


Fig. 233: Fuel Delivery Chart

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Compare the quantity of fuel delivered with specification.

* Delivery cm³ /30 seconds

* Voltage at fuel pumps with engine off and pumps running (approx. 2 volts less than battery voltage).

Example:

During the test, a voltage of 13.0 volts is measured at the battery. Since the voltage at the pumps is approx. 2 volts less than battery voltage, there is a minimum delivery rate of 1,200 cm³ /30 s.

If the delivery rate has been attained but nevertheless you suspect a fuel supply system malfunction (e.g. intermittent failure of fuel supply system):

- Check current consumption of fuel pumps --> **Fuel Pump Current Consumption, Checking.**

If minimum delivery rate is not attained:

- Check fuel lines for possible restrictions (kinks) or blockages.

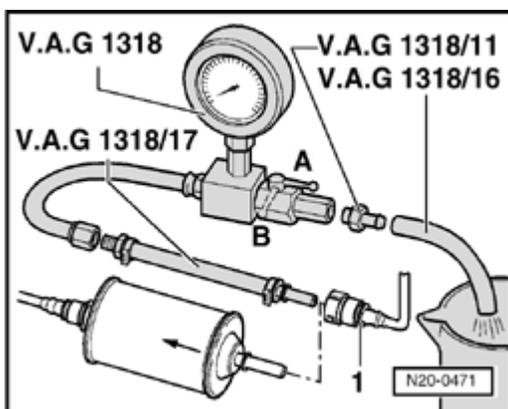


Fig. 234: Connecting Pressure Gauge VAG 1318 To Hose With Adapter VAG 1318/17 To Fuel Filter
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect supply line - 1 - from fuel filter input.

NOTE:

- **Press buttons on hose couplings to do this.**

- Connect pressure gauge V.A.G 1318 to the hose using adapter V.A.G 1318/17.
- Repeat delivery rate check.

If minimum delivery rate is now obtained:

- Replace the fuel filter.

If minimum delivery rate is again not obtained:

Checking delivery quantity of right pump

- Interrupt activation of left pump.

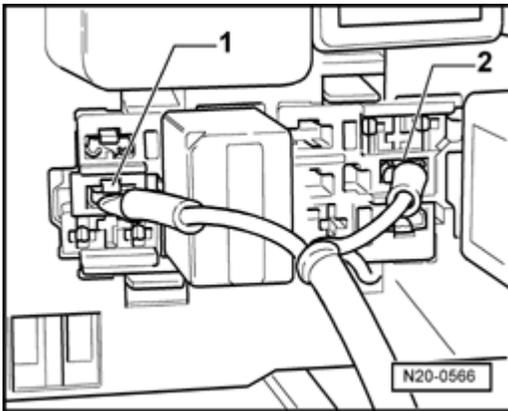


Fig. 235: Remote Control Connectors And Relays
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Do this by separating connector - 2 - of remote control from left pump relay socket.
- Empty measuring container.
- Operate remote control for 30 seconds and measure battery voltage.

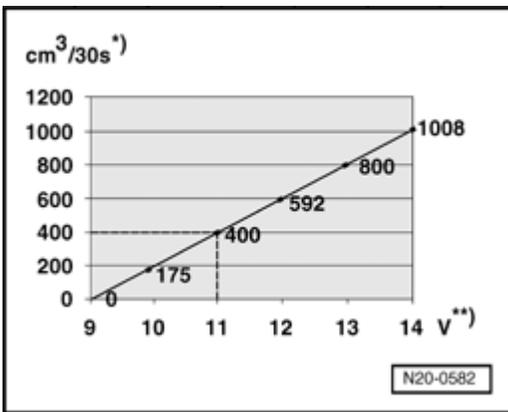


Fig. 236: Quantity Of Fuel Delivered Graph
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Compare quantity of fuel delivered with specification.

* Delivery cm³ /30 seconds

* Voltage at fuel pumps with engine off and pumps running (approx. 2 volts less than battery voltage).

If minimum delivery rate is again not obtained:

- Remove fuel delivery unit and check fuel strainer for soiling.

Only when up to now no malfunction has been detected:

- Right fuel pump is faulty. Replace fuel delivery unit --> **Fuel Delivery Unit, Fuel Level Sensor and**

Suction Jet Pump, Right Side, Removing and Installing

If minimum delivery rate is not attained:

Checking delivery quantity of left pump

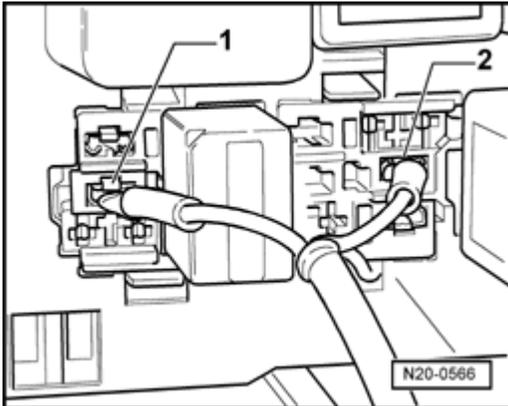


Fig. 237: Remote Control Connectors And Relays
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Re-connect remote control connector - 2 -.
- Interrupt activation of right pump:
- Do this by separating the connector - 1 - of the remote control from the right pump relay socket.
- Empty measuring container.
- Operate remote control for 30 seconds and measure battery voltage.

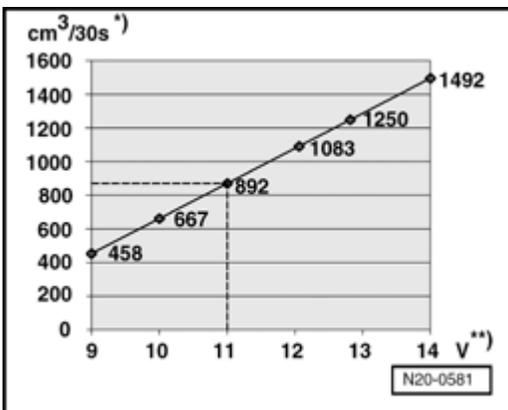


Fig. 238: Quantity Of Fuel Delivered Graph
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Compare the quantity of fuel delivered with specification.

* Delivery cm³ /30 seconds

* Voltage at fuel pumps with engine off and pumps running (approx. 2 volts less than battery voltage).

If minimum delivery rate is again not obtained:

- Remove fuel delivery unit and check fuel strainer for soiling.

Only when up to now no malfunction has been detected:

- Left fuel pump is faulty. Replace fuel delivery unit --> **Fuel Delivery Unit, Fuel Level Sensor and Suction Jet Pump, Left Side, Removing and Installing**

Fuel Pump Current Consumption, Checking

Fuel Pump Current Consumption, Checking

- Check current consumption of each fuel pump separately as follows:
- Install intake air hose between Mass Air Flow (MAF) Sensor G70 and throttle valve control module.
- Reconnect all disconnected fuel lines.

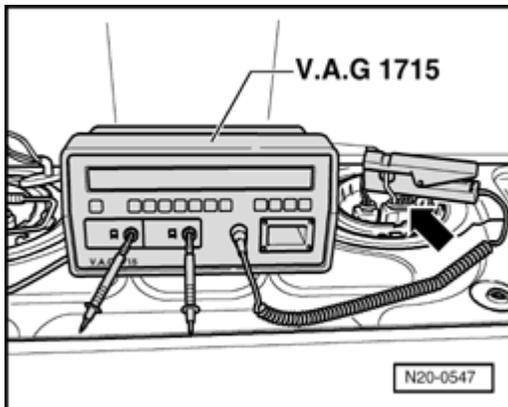


Fig. 239: V.A.G 1715

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect Multimeter V.A.G 1715 to wire for contact - **1** - - **arrow** - of 4-pin connector of wiring harness to right fuel delivery unit.
- Start engine and run at idle speed.
- Measure current draw of fuel pump. Specification: max. 11 amps.
- Repeat test on left fuel delivery unit.

NOTE:

- **Left fuel pump is switched off at idle for a few seconds after engine start.**

If current draw is exceeded:

- Right fuel pump is faulty. Replace fuel delivery unit --> **Fuel Delivery Unit, Fuel Level Sensor and Suction Jet Pump, Right Side, Removing and Installing**

- Left fuel pump is faulty. Replace fuel delivery unit --> **Fuel Delivery Unit, Fuel Level Sensor and Suction Jet Pump, Left Side, Removing and Installing.**

NOTE:

- If malfunction in fuel system is sporadic, test can also be performed during a road test, but a second person is required.

Fuel Pump Non-Return Valve, Checking

Fuel Pump Non-Return Valve, Checking

Test conditions

- Remote control V.A.G 1348/3A is still connected.

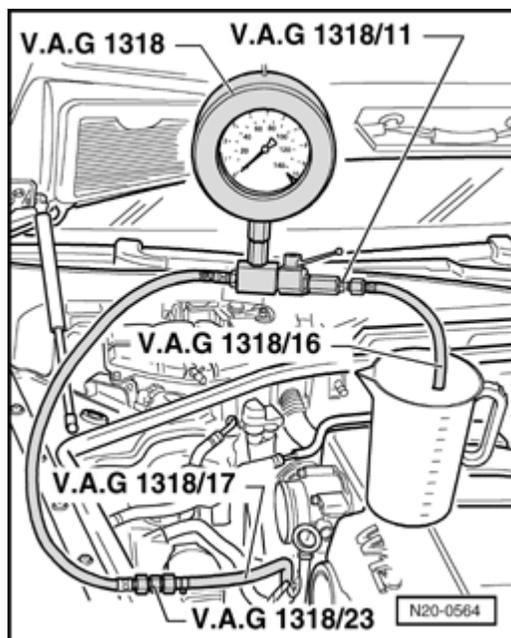


Fig. 240: V.A.G 1318 Components Assembled

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pressure gauge V.A.G 1318 is still connected.

Test sequence

NOTE:

- At the same time, this test checks for leaks in the fuel supply line connections from the fuel delivery unit to the point at which the pressure gauge V.A.G 1318 is connected.

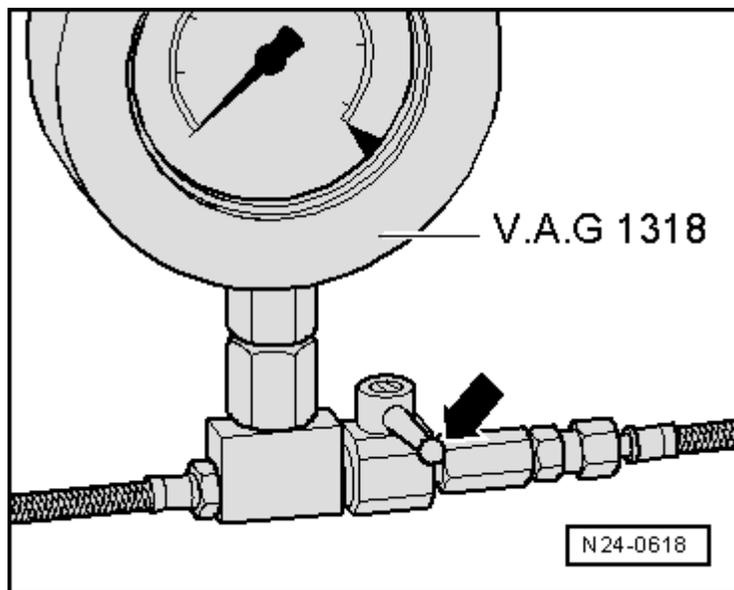


Fig. 241: Locating V.A.G 1318 Shut-Off Tap

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Close pressure gauge shut-off tap - **arrow** - (lever perpendicular to direction of flow).
- Operate remote control at short intervals, until a pressure of approx. 4 bar has built up.

CAUTION: Fuel supply lines are under pressure! When opening shut-off tap, wear protective eye wear and gloves to prevent injuries and skin contact. Before removing from hose connection wrap a cloth around the connection. Then release pressure by carefully pulling hose off connection.

- If pressure builds up too high, lower excess pressure by carefully opening the shut-off tap.
- Watch pressure drop on gauge. After 10 minutes the pressure must not drop below a 3.0 bar decrease.

If the pressure drops further:

- Check fuel lines and connections to fuel tank for leaks.

If no fault is detected in the wiring:

Checking non-return valve of right pump

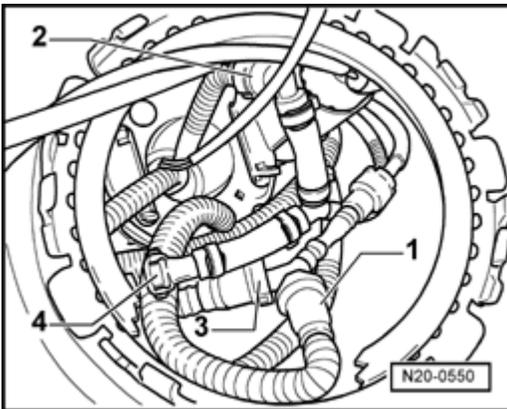


Fig. 242: Supply And Return Line On Right Side
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect supply line - 2 - on the right side.

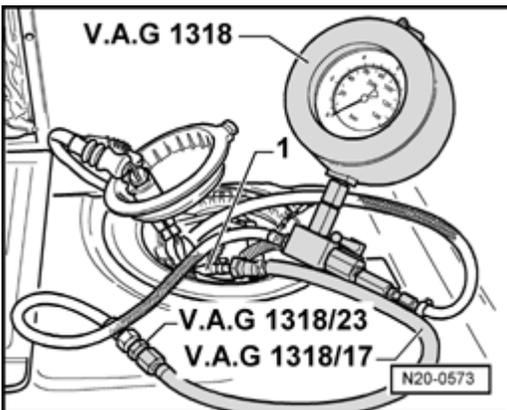


Fig. 243: Pressure Gauge V.A.G 1318 Connected With The Fuel Line Feed Adapter V.A.G 1318/23 And Adapter V.A.G 1318/17 At Hose To Pump
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect the pressure gauge V.A.G 1318 (handle perpendicular to direction of flow) with the fuel line feed adapter V.A.G 1318/23 and adapter V.A.G 1318/17 at hose - 1 - to pump.
- Interrupt activation of left pump.

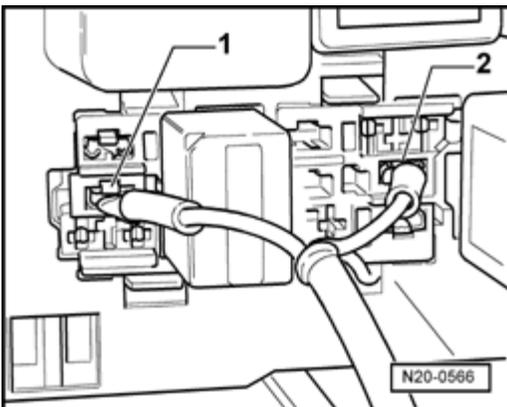


Fig. 244: Remote Control Connectors And Relays

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Do this by separating the connector - 2 - of the remote control from the left pump relay socket.
- Repeat the test.

If pressure drops further:

- Right fuel pump is faulty. Replace fuel delivery unit --> **Fuel Delivery Unit, Fuel Level Sensor and Suction Jet Pump, Right Side, Removing and Installing**

If pressure drops further:

Checking non-return valve of left pump

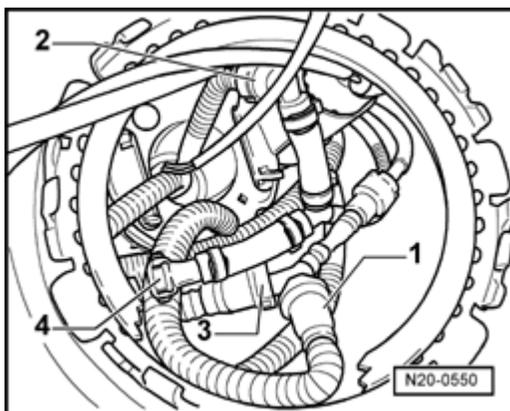


Fig. 245: Supply And Return Line On Right Side

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Reconnect supply line - 2 - on the right side.
- On right side, disconnect supply line - 4 - to left pump.

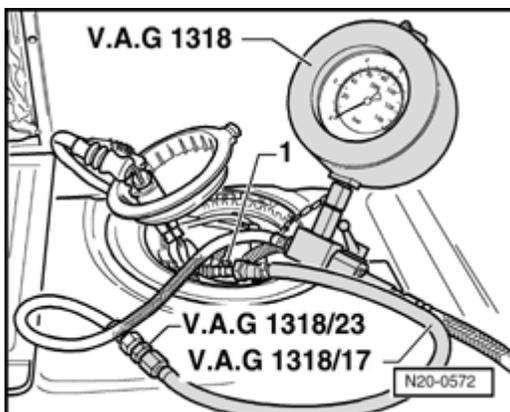


Fig. 246: Pressure Gauge V.A.G 1318 Connected With The Fuel Line Feed Adapter V.A.G 1318/23 And Adapter V.A.G 1318/17 At Hose To Pump

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect pressure gauge V.A.G 1318 (handle perpendicular to direction of flow) with the fuel line feed adapter V.A.G 1318/23 and adapter V.A.G 1318/17 at hose - **1** - to pump.

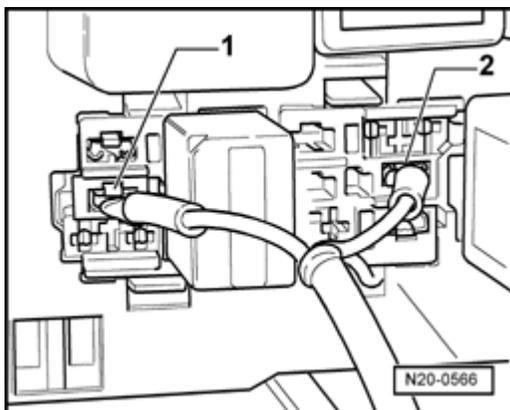


Fig. 247: Remote Control Connectors And Relays
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Reconnect remote control connector - **2** -.
- Interrupt activation of right pump.
- Do this by separating the connector - **1** - of remote control from right pump relay socket.
- Repeat test.

If pressure drops further:

- Left fuel pump is faulty. Replace fuel delivery unit --> **Fuel Delivery Unit, Fuel Level Sensor and Suction Jet Pump, Left Side, Removing and Installing.**

Electronic Power Control System Functions

Electronic Power Control System Functions

The position of the accelerator pedal is transmitted to the engine control module via two accelerator pedal position sensors (adjustable resistances, accommodated in one housing), that are connected to the accelerator pedal.

The position of the accelerator pedal (driver controlled) is a main input for the engine control module.

Operation of the throttle valve occurs via an electric motor (throttle valve actuator) in the throttle valve control module. This is true across the entire engine speed and engine load spectrum.

The throttle valve is operated by the throttle drive according to the instructions of the Engine Control Module (ECM).

With the engine at standstill and the ignition switched on, the Engine Control Module (ECM) activates the throttle valve actuator precisely according to the specifications of the Throttle Position (TP) Sensor. This means, if the accelerator pedal is depressed half way, the throttle drive opens the throttle valve to the same

degree; i.e. throttle valve is then opened approx. half way.

With engine running (under load) the engine control module can open and close the throttle valve independently of the accelerator pedal position sender.

That way e.g. the throttle valve can already be completely opened, although the accelerator pedal is only depressed half-way. An advantage of this is that throttle losses at the throttle valve are avoided.

Aside from that, it results in clearly better pollutant output and consumption values under certain load conditions.

The necessary engine torque can be produced by the Engine Control Module (ECM) via the optimal combination of throttle valve profile and charge pressure.

The Engine Control Module (ECM) calculates after evaluation of torque requirements of the different components (e.g. A/C system, automatic transmission, ABS/ESP, etc.) a throttle valve opening angle optimal for the respective situation.

Observe rules for cleanliness --> **Clean Working Conditions.**

Observe safety precautions --> **Fuel Supply System, Safety Precautions.**

Electronic Power Control, Checking

Electronic Power Control, Checking

Functions of EPC system --> **Electronic Power Control System Functions**

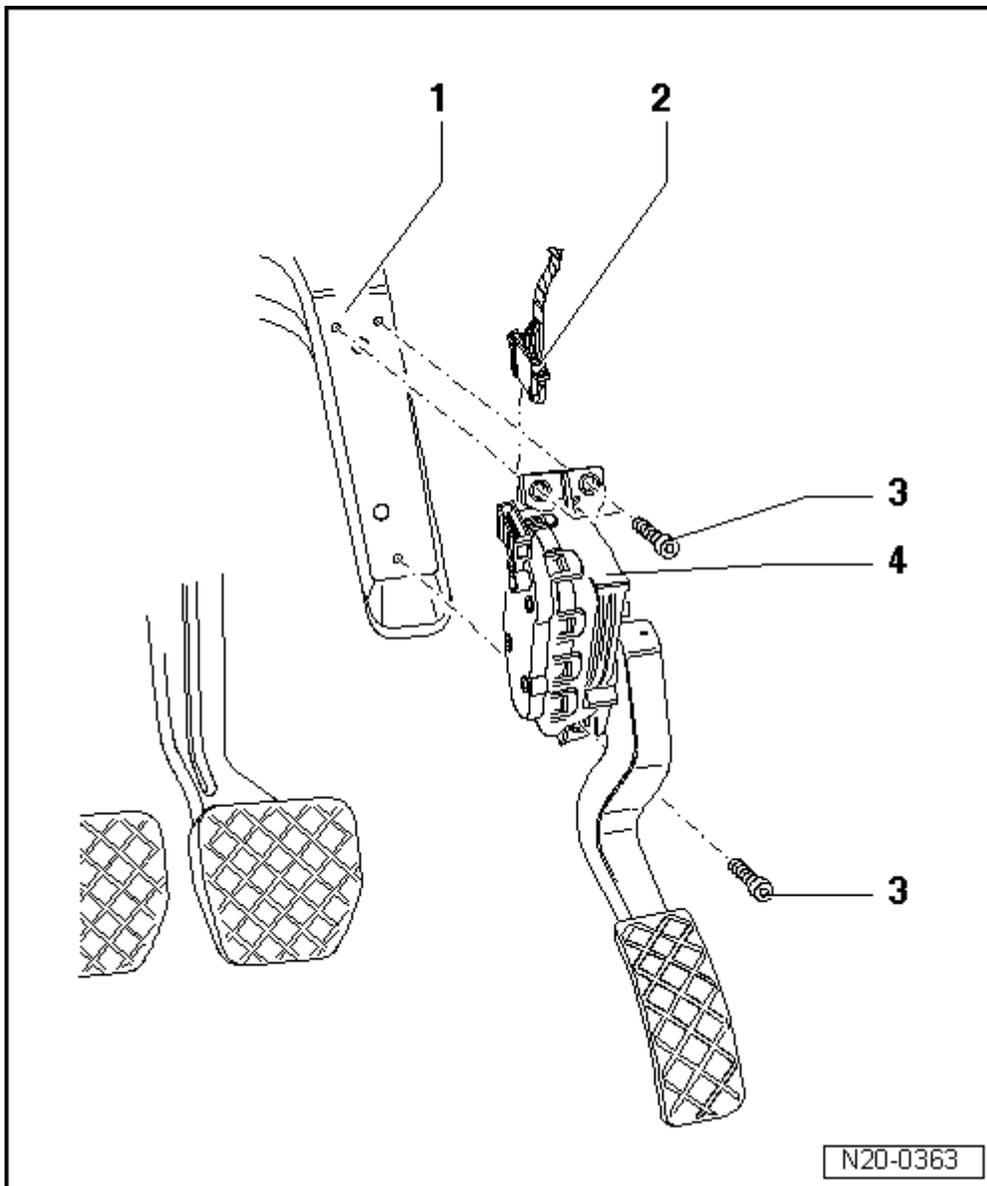


Fig. 248: Throttle Position Sensor And Accelerator Pedal Position Sensor
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Bracket

- Removing and installing: --> **46 - BRAKES - MECHANICAL COMPONENTS**

2 - Connector

- Black, 6-pin

3 - 10 Nm

4 - Throttle Position (TP) Sensor G79 and Sender 2 for accelerator pedal position G185

- Not adjustable
- Remove footwell cover to remove sensor

EVAP SYSTEM

EVAP System

EVAP System

--> [EVAP System, Assembly Overview](#)

--> [EVAP System, Checking for Leaks](#)

Function

Depending upon air pressure and ambient temperature - more or less fuel vapors will form in the fuel tank.

The evaporative emissions system prevents these HC-emissions from dispersing into the atmosphere.

Fuel vapors pass from the highest point in the tank (on the filler neck) through the expansion tank and into the EVAP canister.

The activated charcoal in the canister stores these gases like a sponge.

When driving with active Lambda regulation (engine warm), the evaporative emission (EVAP) canister purge regulator valve N80 is activated by the engine control module based on load and speed. The open duration is dependent on the input signals.

When purging (recovery of the activated charcoal), the intake manifold vacuum sucks fresh air in through the vent connection of the EVAP canister. The fuel vapors stored amongst the activated charcoal and fresh air are proportionately supplied to be burned.

Without electricity (e.g. open circuit) the evaporative emission (EVAP) canister purge regulator valve N80 remains closed. The EVAP canister is not purged.

NOTE:

- **Hose connections are secured with either spring-type or clamp-type clips.**
- **Always replace clamp-type clips with spring-type clips.**
- **The spring-type clip pliers VAS 5024A are recommended for installing spring-type clips.**

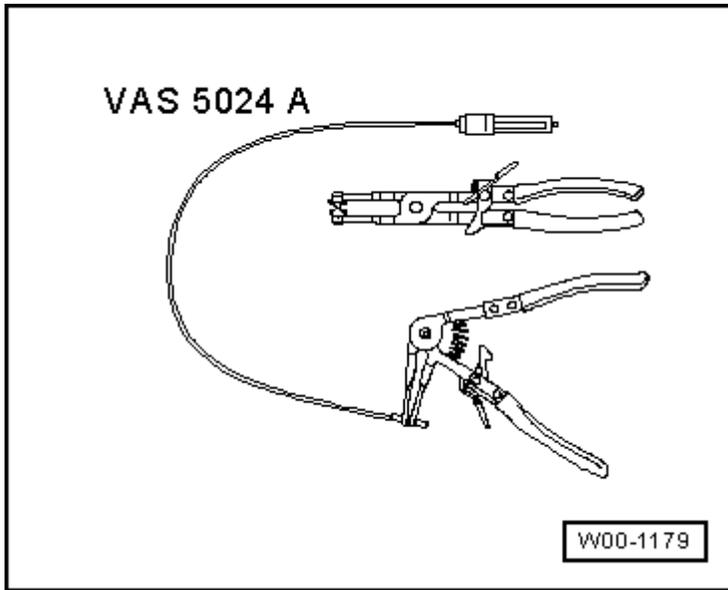


Fig. 249: Spring-Type Clip Pliers VAS 5024A
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Observe safety precautions --> **Fuel Supply System, Safety Precautions.**

Observe rules for cleanliness --> **Clean Working Conditions.**

EVAP System, Assembly Overview

EVAP System, Assembly Overview

EVAP system, checking for proper seal --> **EVAP System, Checking for Leaks.**

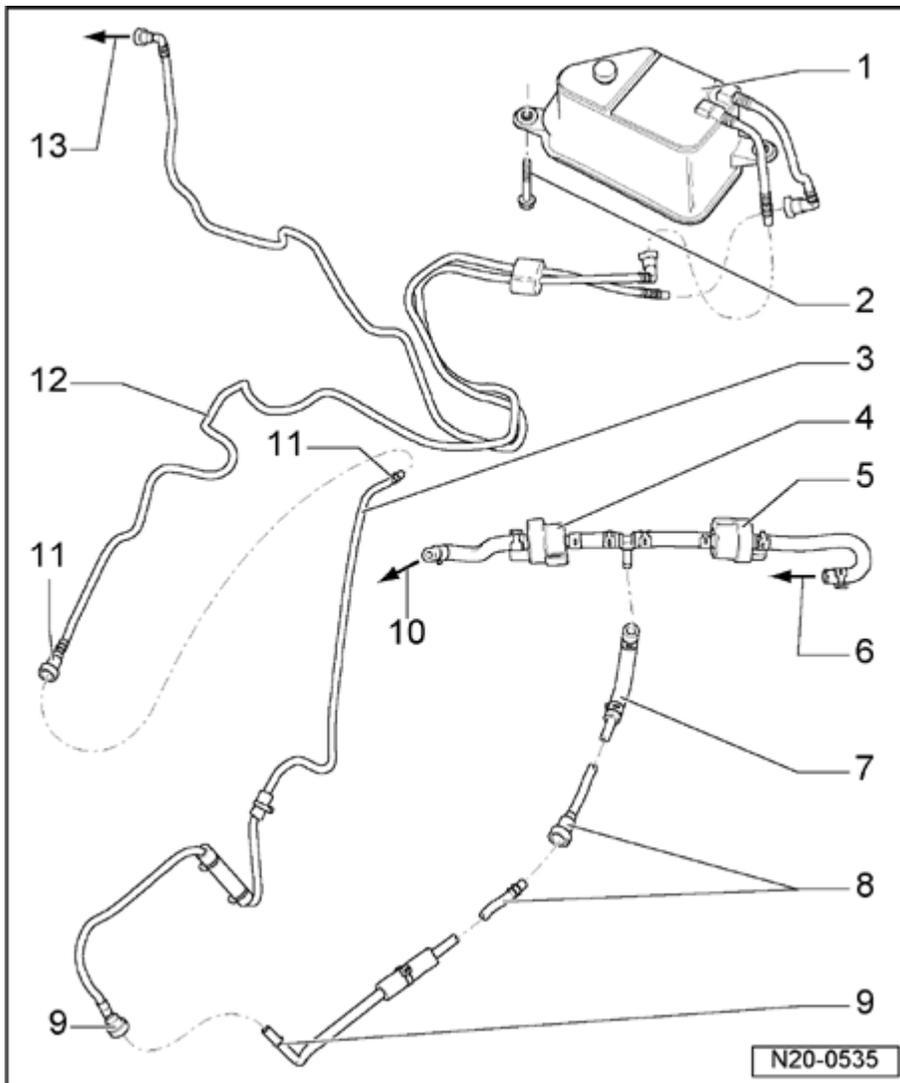


Fig. 250: EVAP System, Assembly Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - EVAP canister

- In spare wheel well on vehicle floor
- With vent at the upper end

2 - 9 Nm

3 - Breather line to solenoid valve for EVAP canister

- Ensure seated tightly

4 - Evaporative Emission (EVAP) Canister Purge Regulator Valve 2 N333

- Note installation position

5 - Evaporative emission (EVAP) canister purge regulator valve N80

- Note installation position

6 - To connection

- on intake manifold

7 - Connecting hose

- Ensure seated tightly

8 - Coupling

- In right of engine compartment

9 - Coupling

- Near fuel filter

10 - To connection

- On intake manifold

11 - Coupling

- In area of rear axle

12 - Vent line

- From EVAP canister
- Ensure seated tightly

13 - Vent line

- Ensure seated tightly

EVAP System, Checking for Leaks

EVAP System, Checking for Leaks

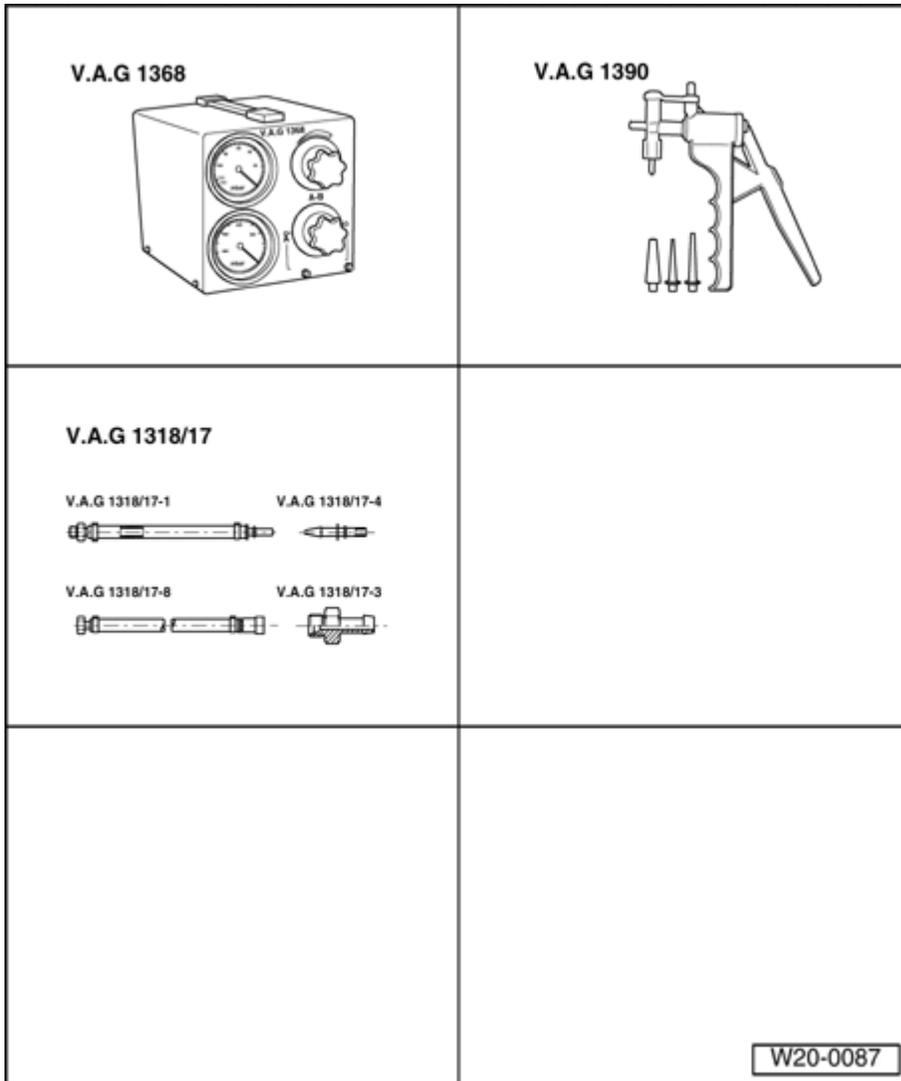


Fig. 251: EVAP System, Checking For Leaks
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Vacuum tester V.A.G 1368
- Hand vacuum pump V.A.G 1390
- Pressure gauge adapter V.A.G 1318/17

Test sequence

- Remove intake air hose between Mass Air Flow (MAF) Sensor G70 and right throttle valve control module --> **Air Filter, Assembly Overview.**

2004 Volkswagen Phaeton

ENGINE 4.2 Liter V8 5V Engine Mechanical, Fuel Injection & Ignition, Engine Code(s): BGH, BGJ

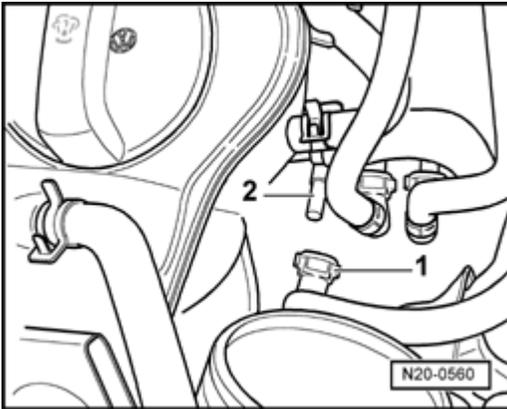


Fig. 252: Breather Hose And Line

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect breather hose - 1 - (to solenoid valve) from breather line - 2 - (from EVAP canister) in engine compartment.

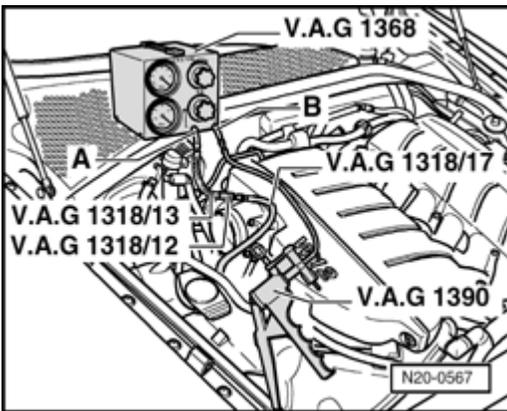


Fig. 253: V.A.G. 1368 Components Connected

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect vacuum tester V.A.G 1368 connection - A - with breather line from EVAP canister using adapter V.A.G 1318/17 and adapters V.A.G 1318/12, V.A.G 1318/13.
- Connect hand vacuum pump V.A.G 1390 to connection - B -.
- Set vacuum tester to position - A/B -.
- Operate Vacuum pump V.A.G 1390 several times. No vacuum should be built up:

If vacuum is built up:

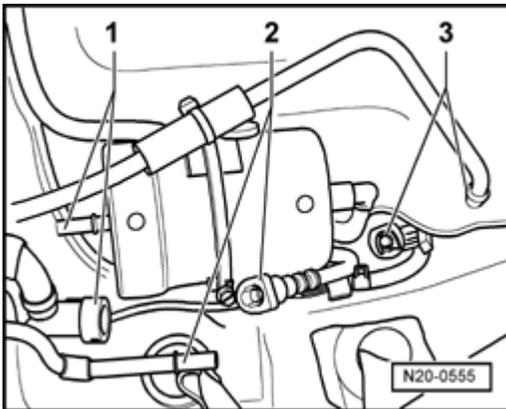


Fig. 254: Fuel Lines And Breather Line Connection
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect breather line - 3 - (to solenoid valves in engine compartment) in area of fuel filter.
- Operate Vacuum pump V.A.G 1390 several times. No vacuum should be built up.

If vacuum is built up:

- Check breather line for through-flow and, if necessary, replace.

If no vacuum is built up:

- Reconnect breather line.

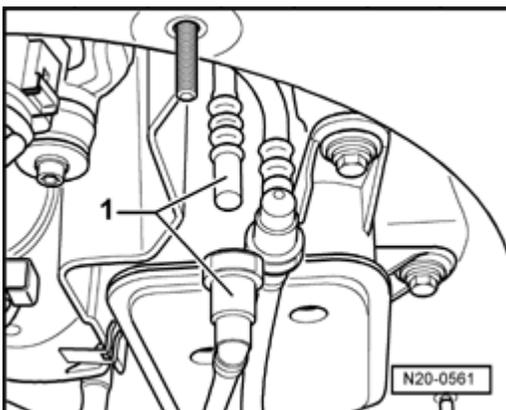


Fig. 255: Breather Line
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect breather line - 1 - (to solenoid valves in engine compartment) at EVAP canister.
- Operate Vacuum pump V.A.G 1390 several times. No vacuum should be built up.

If vacuum is built up:

- Check breather line for through-flow and, if necessary, replace.

If no vacuum is built up:

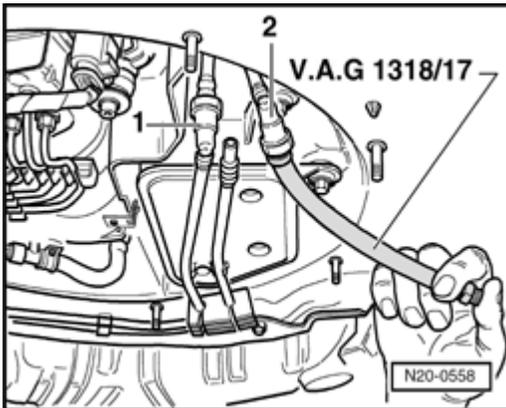


Fig. 256: Identifying Adapter V.A.G 1318/17 Connected To Line From EVAP Canister And Breather Lines

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Reconnect the breather line - 1 - (to solenoid valves in engine compartment) at EVAP canister.
- Disconnect breather line - 2 - (to expansion tank in wheel housing) at EVAP canister.
- Connect adapter V.A.G 1318/17 to line from EVAP canister and close it.
- Operate Vacuum pump V.A.G 1390 several times. No vacuum should be built up.

If vacuum is built up:

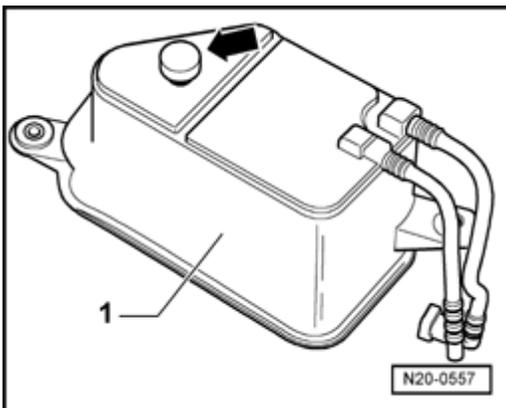


Fig. 257: EVAP Canister

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check vent - **arrow** - at EVAP canister - 1 - for damages or contamination.

If no damage or contamination is discovered:

- Replace the EVAP canister.

Vacuum Present

If no vacuum is built up, but a malfunction is still suspected in the EVAP system:

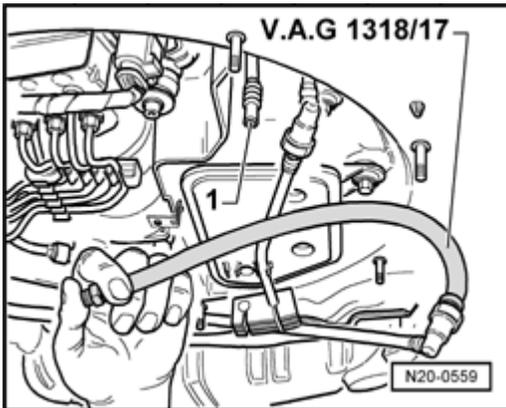


Fig. 258: Breather Line Disconnect At EVAP Canister
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect the breather line - 1 - (to the solenoid valves in engine compartment) at EVAP canister.
- Connect adapter V.A.G 1318/17 to line for solenoid valves and close it.
- Operate Vacuum pump V.A.G 1390 several times. Vacuum must be built up.

If no vacuum is built up:

- Check the breather lines for breaks and separated couplings --> **EVAP System, Assembly Overview**.

If vacuum is built up:

If vacuum is built up, the breather lines are OK. If a malfunction is still suspected in the EVAP system:

- Check breather line to wheel housing.
- Checking pressure retention valve --> **Checking pressure retaining valve on expansion tank**

EVAP SYSTEM, ENGINE CODE BGJ

EVAP System, Engine Code BGJ

EVAP System, Engine Code BGJ

--> **EVAP System, Assembly Overview**

Function

Depending upon air pressure and ambient temperature - more or less fuel vapors will form in the fuel tank.

The evaporative emissions system prevents these HC-emissions from dispersing into the atmosphere.

Fuel vapors pass from the highest point in the tank (on the filler neck) through the expansion tank and into the

EVAP canister.

The activated charcoal in the canister stores these gases like a sponge.

When driving with active Lambda regulation (engine warm), the Evaporative Emission (EVAP) Canister Purge Regulator Valve 2 N333 is activated by the engine control module based on load and speed. The open duration is dependent on the input signals.

When purging (recovery of the activated charcoal), the intake manifold vacuum sucks fresh air in through the vent connection of the EVAP canister. The fuel vapors stored amongst the activated charcoal and fresh air are proportionately supplied to be burned.

Without electricity (e.g. open circuit) the evaporative emission (EVAP) canister purge regulator valves remain closed. The EVAP canister is not purged.

Function description of leak diagnosis

The EVAP system (including fuel tank) is equipped with leak diagnosis. The leak diagnosis will detect whether the system is leaking.

The diagnosis operates by pressurizing the system and should detect leaks where the damage exceeds 1 mm in diameter.

During the diagnostic, the Leak Detection Pump (LDP) V144 generates a positive pressure of approx. 30 mbar in the EVAP canister system. The pump will switch off when the pressure is attained. When the pressure falls to below a certain figure, the pump will switch on again. On Board Diagnostic monitors the switch intervals and stores a DTC in DTC memory if the intervals are too short.

NOTE:

- **Hose connections are secured with either spring-type or clamp-type clips.**
- **Always replace clamp-type clips with spring-type clips.**
- **The spring-type clip pliers VAS 5024 A are recommended for installing spring-type clips.**

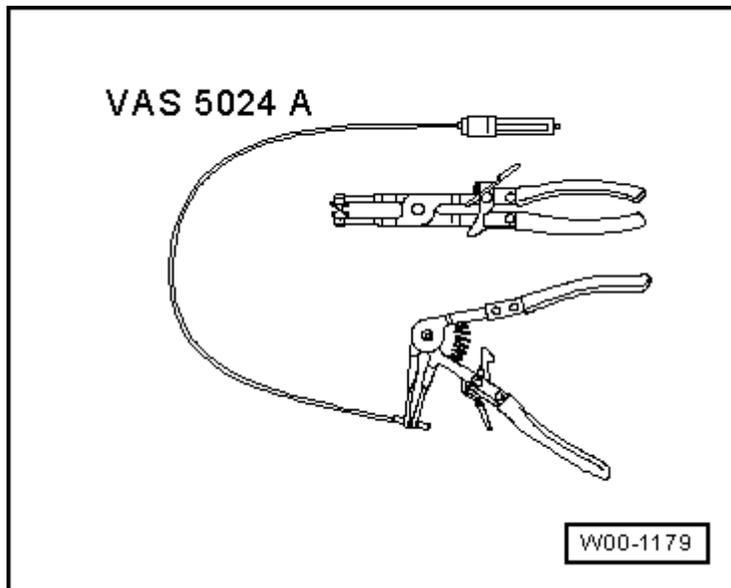


Fig. 259: Spring-Type Clip Pliers VAS 5024A
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Observe safety precautions --> **Fuel Supply System, Safety Precautions.**

Observe rules for cleanliness --> **Clean Working Conditions.**

EVAP System, Assembly Overview

EVAP System, Assembly Overview

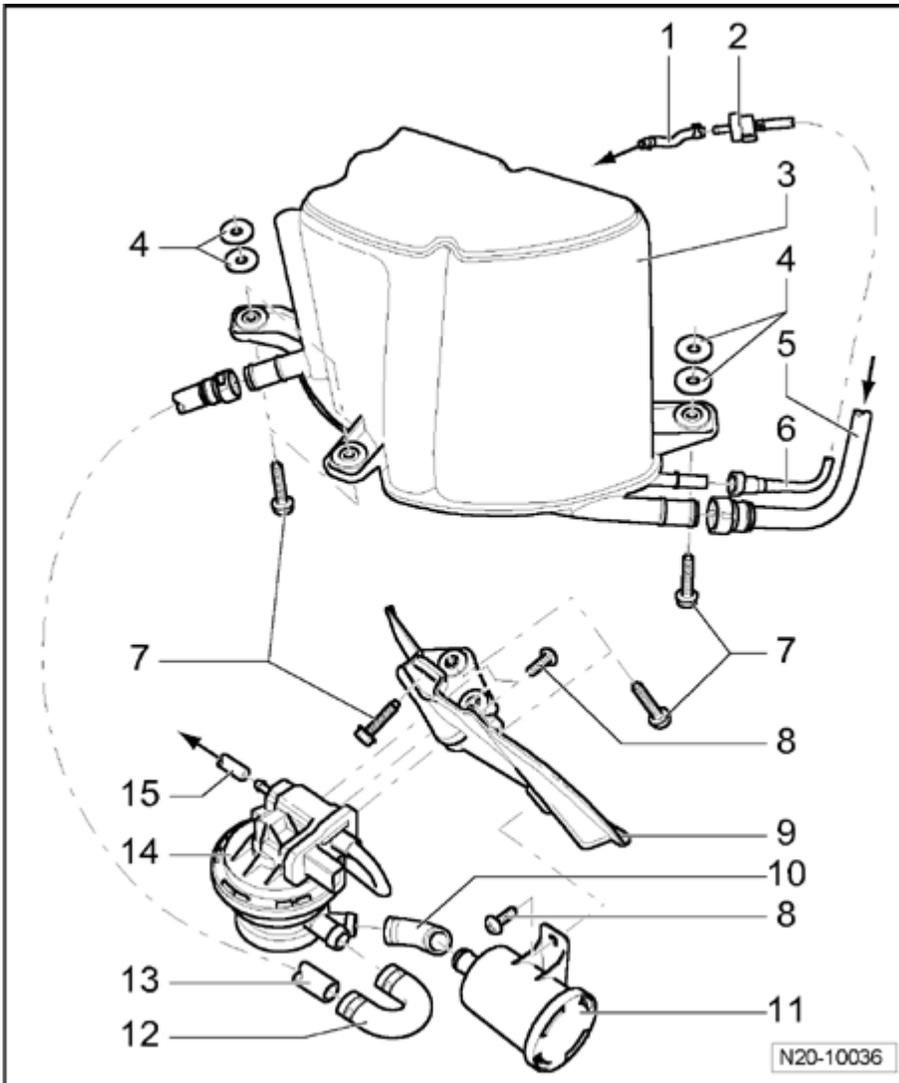


Fig. 260: EVAP System, Assembly Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 1 - To connection
- 2 - Evaporative Emission (EVAP) Canister Purge Regulator Valve 2 N333
 - Note installation position
 - Black connector, 2-pin
- 3 - EVAP canister
 - In spare wheel well on vehicle floor
- 4 - Washers
- 5 - Vent line

- Ensure seated tightly

6 - Connecting line

- Ensure seated tightly

7 - 9 Nm

8 - 5 Nm

9 - Bracket

10 - Connecting hose

- Ensure seated tightly

11 - Air filter housing

- Clean if soiled

12 - Connecting hose

- Ensure seated tightly

13 - Connecting line

- Ensure seated tightly

14 - Leak detection pump (LDP) V144

- Black connector, 3-pin

15 - Vent line

- Ensure seated tightly

24 - MULTIPOINT FUEL INJECTION (MFI)

FUEL INJECTION SYSTEM, SERVICING

Fuel Injection System, Servicing

--> **Safety Precautions**

--> **Clean Working Conditions**

--> **Technical Data**

--> [Intake Manifold, Assembly Overview](#)

--> [Fuel Rail with Fuel Injector, Assembly Overview](#)

--> [Air Filter, Assembly Overview](#)

--> [Vacuum Hose Setup at Intake Manifold](#)

General notes on fuel injection

- Fuel hoses in engine compartment must only be secured with spring-type clips. The use of clamp or screw type clips is not permissible.
- For trouble-free operation of the electrical components a voltage of at least 11.5 V is necessary.

Safety Precautions

Safety Precautions

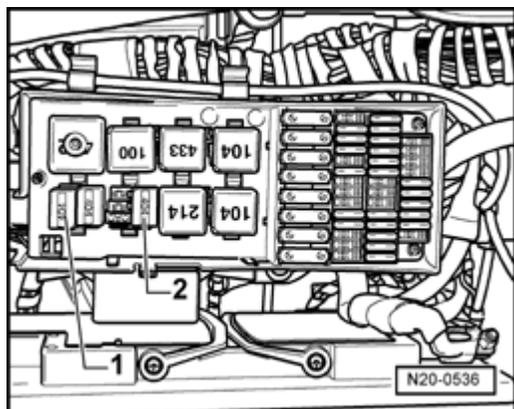


Fig. 261: Fuel Pump Relays, Right And Left Side
Courtesy of VOLKSWAGEN UNITED STATES, INC.

For safety reasons, fuel pump relays -1 (for right side) and -2 (for left side) must be removed before opening fuel system because fuel pump can be activated by opening the drivers door.

CAUTION: Fuel supply lines are under pressure! When opening shut-off tap, wear protective eye wear and gloves to prevent injuries and skin contact. Before removing from hose connection wrap a cloth around the connection. Then release pressure by carefully pulling hose off connection.

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

- Do not touch or remove ignition wires when engine is running or turning at starter speed.
- Only disconnect and reconnect wires for injection and ignition system, including test leads, when ignition is switched off.

2004 Volkswagen Phaeton

ENGINE 4.2 Liter V8 5V Engine Mechanical, Fuel Injection & Ignition, Engine Code(s): BGH, BGJ

If test and measuring equipment is required during road test, note the following:

- Test and measuring instruments must be secured to rear seat and operated by a 2nd person from this location.

If test and measuring instruments are operated from the front passenger 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.

- If the engine is to be turned at starter speed, without starting:
 - Pull connectors off from ignition coils with power output stage 1 through 8.

Clean Working Conditions

Clean Working Conditions

When working on the fuel supply/injection system, pay careful attention to the following "5 rules" :

- Thoroughly clean all connections and the surrounding area before disconnecting.
- Place parts that have been removed on a clean surface and cover them. Do not use fluffy cloths!
- Carefully cover over opened components or seal, if repairs are not performed immediately.
- Only install clean components: Only unpack replacement parts immediately prior to installation. Do not use parts that have been stored loose (e.g. in tool boxes etc.).
- When the system is open: Avoid working with compressed air if possible. Do not move vehicle unless absolutely necessary.

Technical Data

Technical Data

Engine code		BGH	BGJ
Idle check			
Engine idle speed	RPM	670 to 730	670 to 730
Engine control module			
System designation		Motronic ME71.1	Motronic ME71.1
Replacement part number			
Engine speed (RPM) limitation	RPM	from approx. 6500	from approx. 6500

* Not adjustable

Intake Manifold, Assembly Overview

Intake Manifold, Assembly Overview

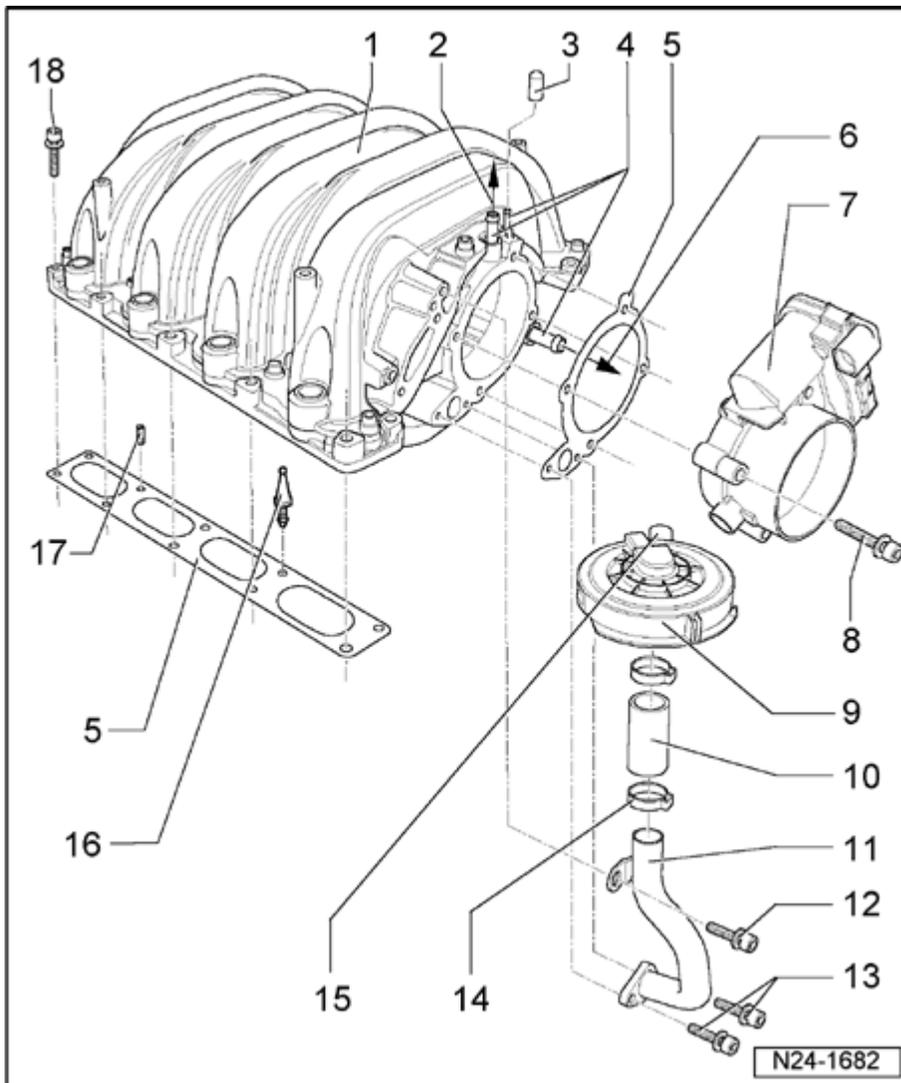


Fig. 262: Intake Manifold, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 1 - Intake manifold change-over
- 2 - To evaporative emission (EVAP) canister purge regulator valve N80
- 3 - Sealing cap
- 4 - Vacuum connection
- 5 - Gasket
- 6 - To brake booster
- 7 - Throttle valve control module J338

- When replacing, adapt Engine Control Module (ECM) to throttle valve control module ; Guided functions

8 - 10 Nm

9 - Crankcase vent valve

10 - Connecting hose

11 - Connection pipe

12 - 10 Nm

13 - 10 Nm

14 - Clamp

15 - Connection

- For crankcase ventilation

16 - Alignment cone

- Set gasket in place before fastening

17 - Alignment pin, 3 Nm

18 - 10 Nm

- For intake manifold mount
- 7 bolts per side

Fuel Rail with Fuel Injector, Assembly Overview

Fuel Rail with Fuel Injector, Assembly Overview

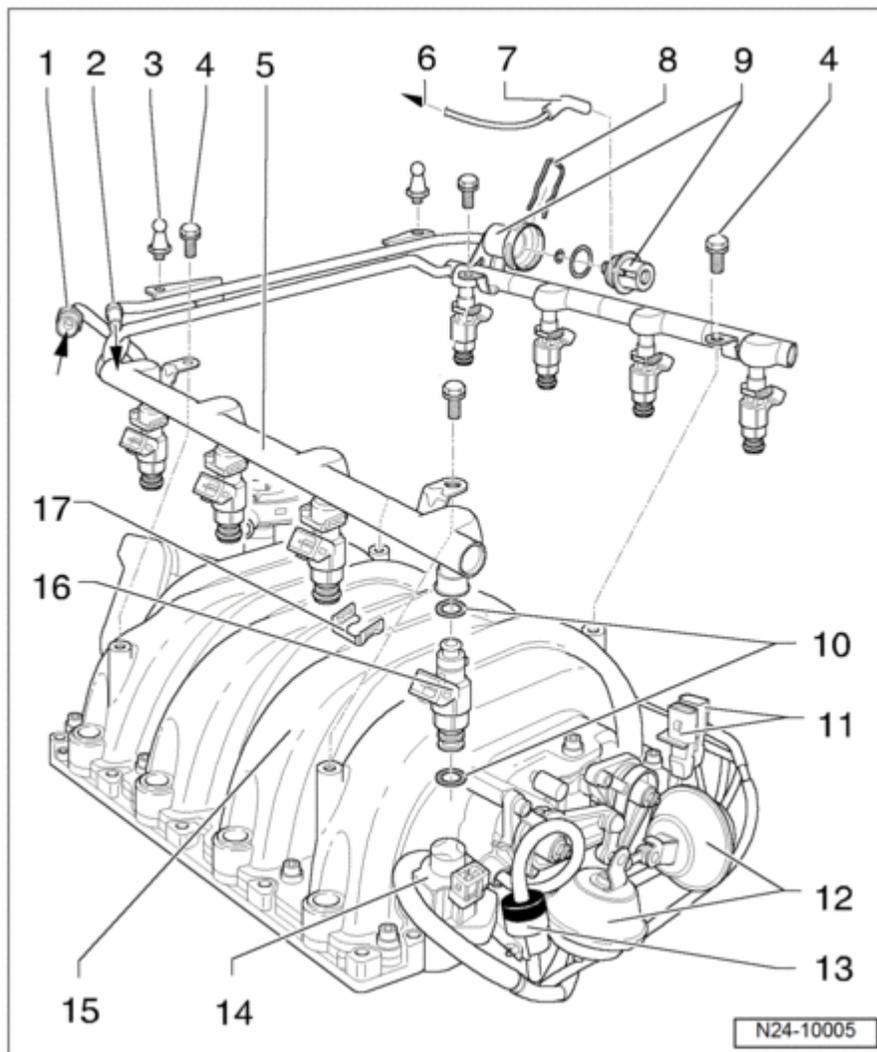


Fig. 263: Fuel Rail With Fuel Injector, Assembly Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Supply line

- Tighten to 22 Nm, while counter-holding

2 - Return line

- Secure with spring type clamp

3 - Ball pin, 3 Nm

- For engine cover

4 - 10 Nm

5 - Fuel distributor with fuel injectors

6 - To Intake manifold

7 - Vacuum connection

- For fuel pressure regulator

8 - Retaining clip

- Ensure seated tightly

9 - Fuel pressure regulator

- Checking --> **Fuel Pressure Regulator and Residual Pressure, Checking**

10 - O-ring

- Replace

11 - Connection for knock sensors

12 - Vacuum actuator

- For variable intake manifold

13 - Non-return valve

- Black side of valve faces intake manifold

14 - Intake manifold change-over valve N156

15 - Intake manifold change-over

16 - Fuel injector N30...N33, N83...N86

- Checking --> **Fuel Injectors, Checking**

17 - Retaining clip

- Ensure seated tightly

Air Filter, Assembly Overview

Air Filter, Assembly Overview

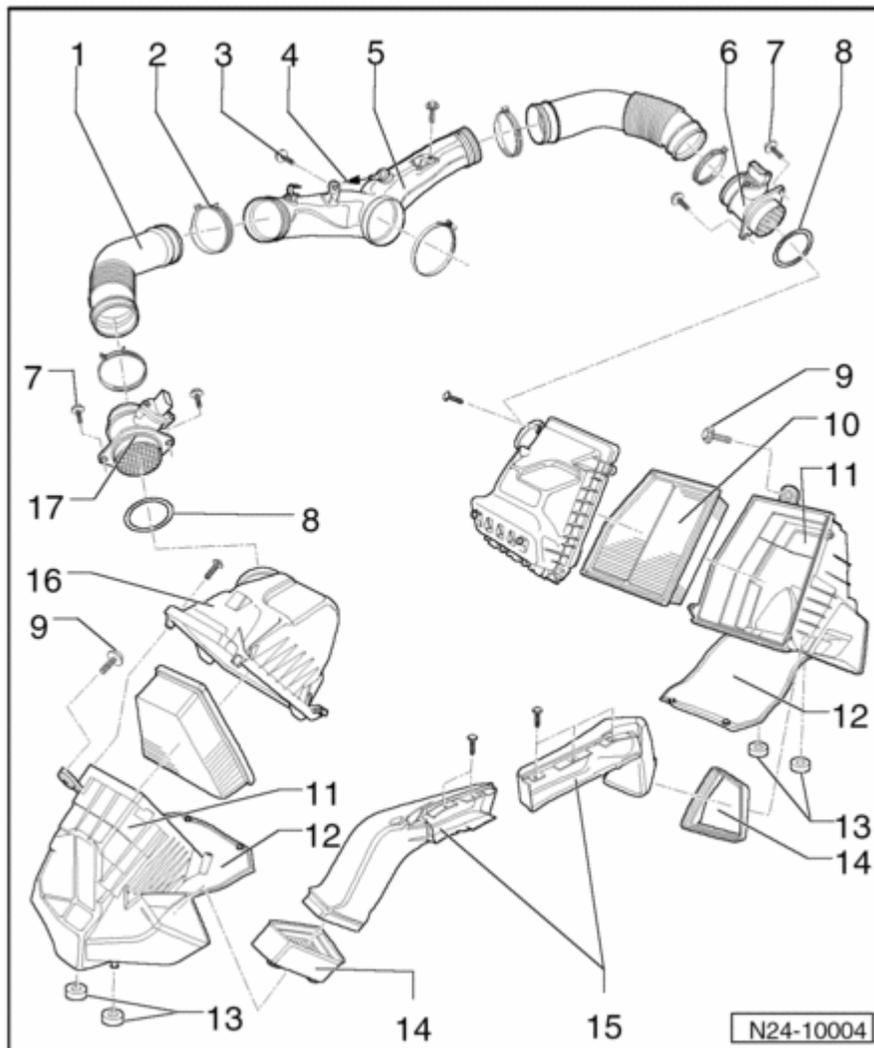


Fig. 264: Air Filter, Assembly Overview

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 1 - Intake tube
- 2 - Spring-type clip
- 3 - Bolt
- 4 - To Intake manifold
- 5 - Intake tube
- 6 - Mass Air Flow (MAF) Sensor 2 G246
 - For cylinder bank 2
 - Without Intake Air Temperature (IAT) Sensor

2004 Volkswagen Phaeton

ENGINE 4.2 Liter V8 5V Engine Mechanical, Fuel Injection & Ignition, Engine Code(s): BGH, BGJ

7 - 6 Nm

8 - Oil seal

- Replace if damaged

9 - 10 Nm

10 - Filter element

11 - Air filter lower part

12 - Foil heat shield

13 - Rubber bushing

- Clipped onto longitudinal member

14 - Connecting sleeve

15 - Air duct

- Secured to lock carrier

16 - Air filter upper part

17 - Mass air flow (MAF) sensor G70 with Intake Air Temperature (IAT) Sensor G42

- For cylinder bank 1

Vacuum Hose Setup at Intake Manifold

Vacuum Hose Setup at Intake Manifold

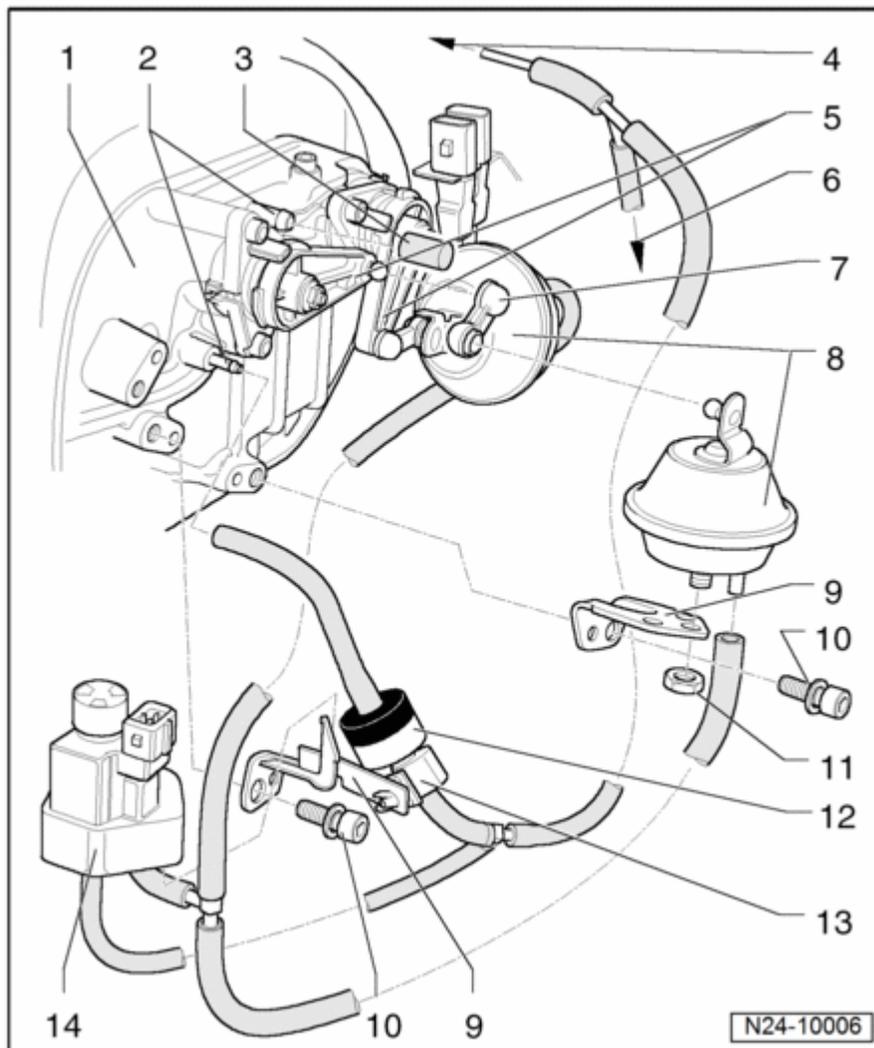


Fig. 265: Vacuum Hose Setup At Intake Manifold
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 1 - Intake manifold change-over
- 2 - Vacuum connection
 - For engine code BGJ: Connection for leak detection pump
- 3 - Sealing cap
 - For engine code BGH
- 4 - For Secondary Air Injection (AIR) Solenoid Valve N112
- 5 - Switch lever

- For variable intake manifold

6 - To vacuum reservoir

7 - Connecting rod

- Between switch lever and vacuum actuator

8 - Vacuum actuator

- For variable intake manifold

9 - Bracket

- Fastened to intake manifold

10 - 25 Nm

11 - 20 Nm

12 - Non-return valve

- Black side of valve faces intake manifold connection

13 - Securing clip

14 - Intake Manifold Tuning (IMT) Valve N156

COMPONENTS, CHECKING

Components, Checking

--> **Fuel Injectors, Checking**

--> **Fuel Pressure Regulator and Residual Pressure, Checking**

Fuel Injectors, Checking

Fuel Injectors, Checking

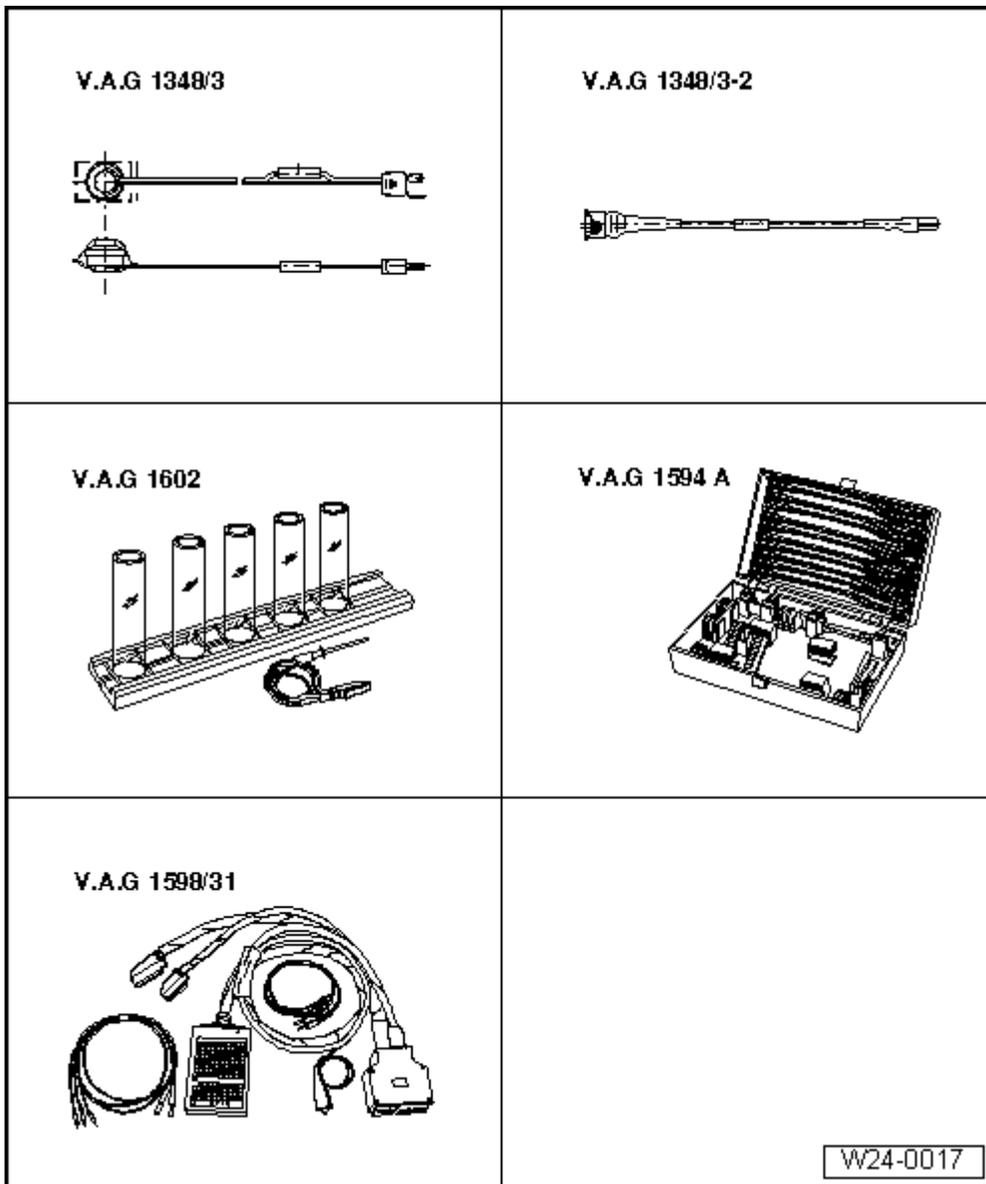


Fig. 266: Identifying Special Tools - Fuel Injectors, Checking
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Remote control connection V.A.G 1348/3A
- Adapter cable V.A.G 1348/3-2
- Injector quantity testing device V.A.G 1602
- Connector test set V.A.G 1594C

- Adapter cable, 121-pin V.A.G 1598/31

Test conditions

- Fuel pressure must be OK, checking --> **Fuel Pressure Regulator and Residual Pressure, Checking.**

CAUTION: Fuel supply lines are under pressure! When opening shut-off tap, wear protective eye wear and gloves to prevent injuries and skin contact. Before removing from hose connection wrap a cloth around the connection. Then release pressure by carefully pulling hose off connection.

Test sequence

- Connect adapter cable, 121-pin V.A.G 1598/31 to Engine Control Module (ECM) wiring harness. The Engine Control Module (ECM) remains disconnected.
- Disconnect connectors from all fuel injectors.
- Remove bolts from fuel rail.

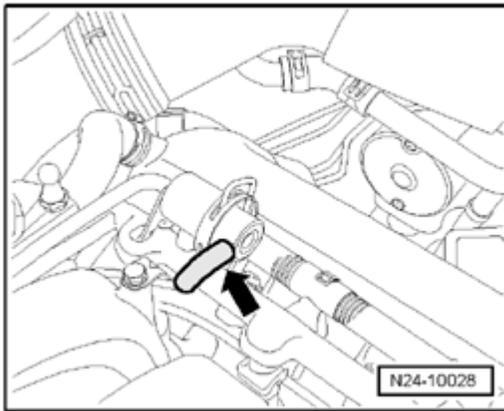


Fig. 267: Fuel Pressure Regulator

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull vacuum hose off from fuel pressure regulator - **arrow** -.
- Lift fuel rail with injectors off intake manifold and support it.
- Bridge test box sockets 1 and 65 using adapter cables from connector test kit V.A.G 1594C.

NOTE:

- **This work step allows the fuel pump to run when the engine is not running.**

- Switch ignition on.

Checking for leaks

- Check injectors for leaks (visual inspection). Only 1 to 2 drops per minute may emit from each valve when fuel pump is running.

If fuel loss is greater:

- Switch off ignition and replace leaking fuel injector.

NOTE: • **Always use new seals.**

Injection quantity, checking

Test conditions:

- Test box V.A.G 1598/31 still connected and test box sockets 1 and 65 bridged with adapter cables from connector test kit V.A.G 1594C.

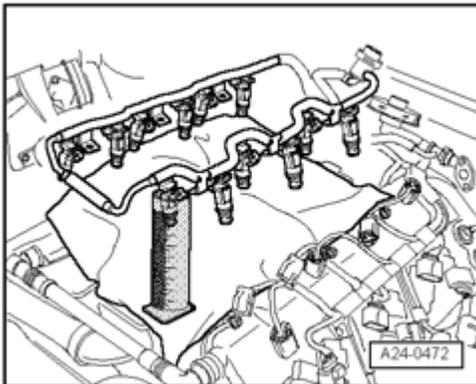


Fig. 268: Injector To Be Tested Inserted In A Measuring Glass Of Calibration Tester V.A.G 1602
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert injector to be tested in a measuring glass of calibration tester V.A.G 1602.

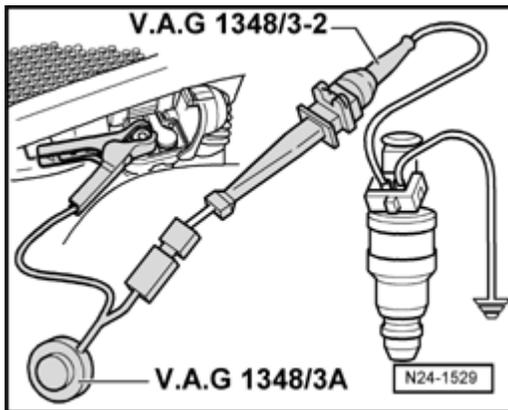


Fig. 269: V.A.G 1348/3 A And V.A.G 1348/3-2
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using adapter cables from connector test kit V.A.G 1594C , connect one terminal of fuel injector to be checked to engine Ground (GND).
- Connect second fuel injector terminal with adapter cable to remote control V.A.G 1348/3 A using adapter cable V.A.G 1348/3-2.
- Connect alligator clip to positive (+) terminal in engine compartment.
- Operate remote control V.A.G 1348/3 A for 30 seconds.

2004 Volkswagen Phaeton

ENGINE 4.2 Liter V8 5V Engine Mechanical, Fuel Injection & Ignition, Engine Code(s): BGH, BGJ

- Repeat check on other injectors. To do this use new measuring beakers.
- After all injectors have been activated, place the measuring glasses on a horizontal surface and compare the injected quantity. Specification: 95 to 115 ml per injector

If measured value of one or more fuel injectors is below or above indicated specified value:

- Replace faulty fuel injector.

Perform installation of injectors in reverse order. Note the following:

- Replace O-rings on all injectors and lightly moisten with clean engine oil.
- Insert fuel injectors into fuel rail perpendicular and in correct position, and secure them with retaining clips.
- Position fuel rail with secured fuel injectors on intake manifold and apply uniform pressure to press it in.
- Fasten bolts for fuel rail.

Fuel Pressure Regulator and Residual Pressure, Checking

Fuel Pressure Regulator and Residual Pressure, Checking

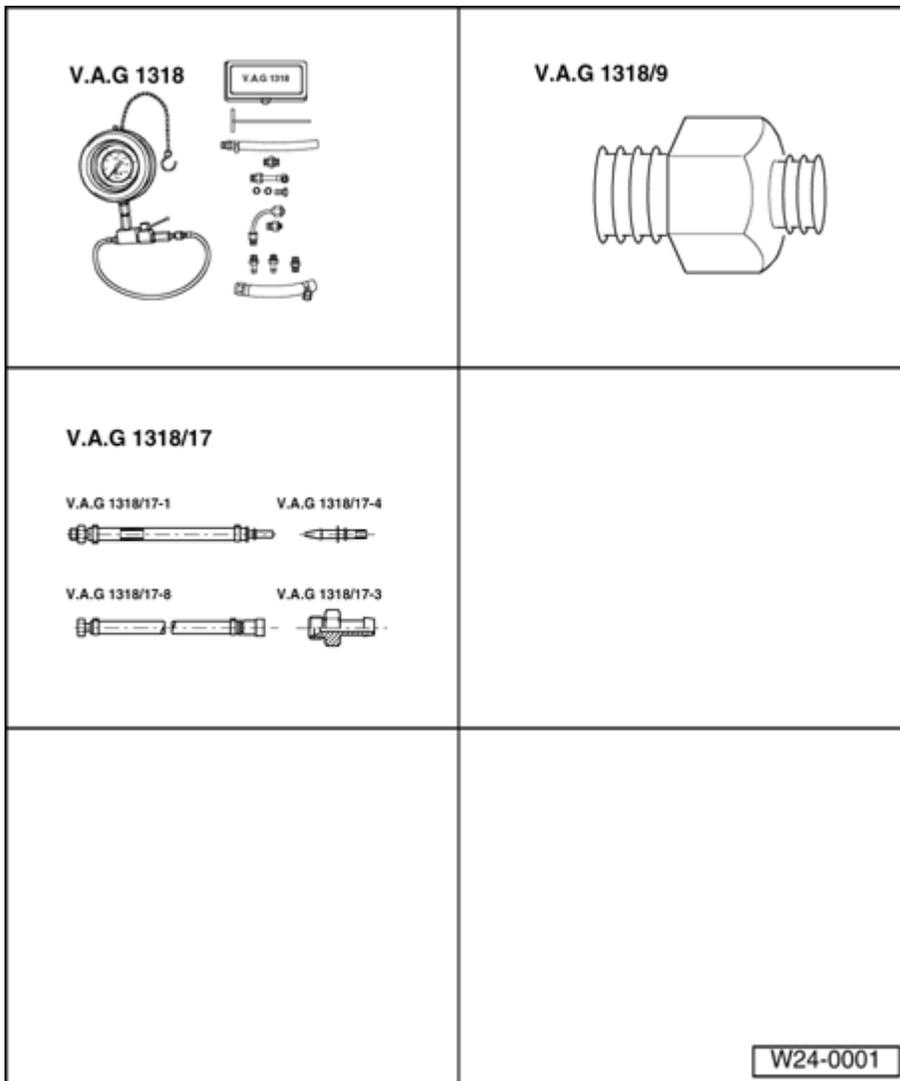


Fig. 270: Identifying Special Tools -- Fuel Pressure Regulator And Residual Pressure, Checking
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Pressure gauge V.A.G 1318
- Adapter V.A.G 1318/9
- Pressure gauge adapter V.A.G 1318/17

The fuel pressure regulator controls the fuel pressure and is dependent on intake manifold pressure.

Test sequence

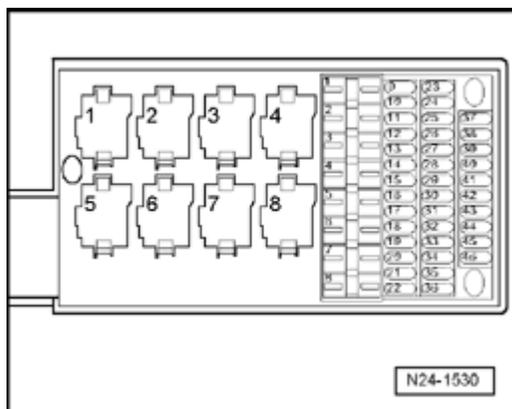


Fig. 271: Fuse Holder Of The E-Box In The Luggage Compartment
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove fuses 34 and 35 (fuel pumps) from the fuse holder of the E-box in the luggage compartment.

NOTE:

- The fuel pumps are activated when opening the door. Therefore, the fuel pump fuses must be removed as a safety precaution.

CAUTION: Fuel supply lines are under pressure! When opening shut-off tap, wear protective eye wear and gloves to prevent injuries and skin contact. Before removing from hose connection wrap a cloth around the connection. Then release pressure by carefully pulling hose off connection.

- Remove intake air hose between Mass Air Flow (MAF) Sensor G70 and right throttle valve control module --> Air Filter, Assembly Overview.

NOTE:

- By removing the intake hose, access to the supply hose coupling is improved.

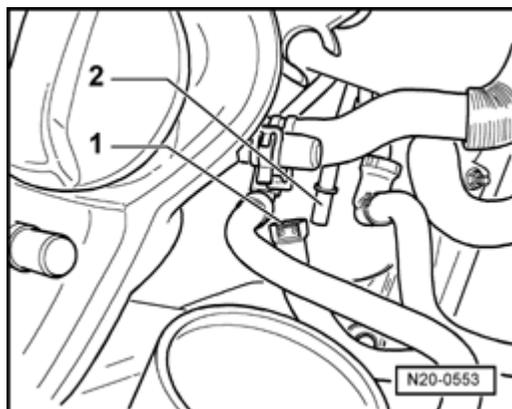


Fig. 272: Supply Hose And Supply Line
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect supply line/hose - 1 - and collect leaking fuel with a cloth.

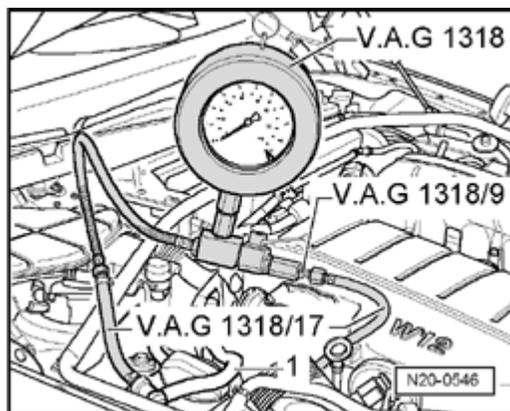


Fig. 273: Pressure Gauge V.A.G 1318 Connected To Supply Line And Hose To Fuel Rail Using Adapter V.A.G 1318/9 And Adapter V.A.G 1318/17

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect pressure gauge V.A.G 1318 to supply line and hose to fuel rail using adapter V.A.G 1318/9 and adapter V.A.G 1318/17.
- Open shut-off tap on pressure gauge V.A.G 1318. The lever points in direction of flow.
- Install fuses 34 and 35 (fuel pumps) into the fuse holder of the E-box in the luggage compartment.
- Install intake hose again.
- Start the engine and run at idle speed.
- Measure fuel pressure. Specification: approx. 3.5 bar positive pressure

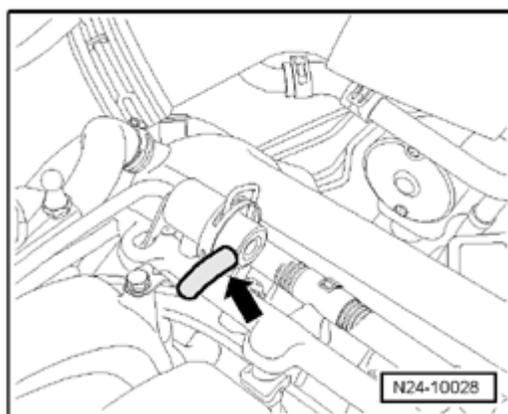


Fig. 274: Fuel Pressure Regulator

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull the vacuum hose off from fuel pressure regulator - **arrow** -. Fuel pressure must increase to approx. 4.0 bar.

If specification is not obtained:

- Check delivery rate of fuel pumps --> **Fuel Pump, Checking.**

If specification is obtained:

- Switch off ignition.
- Check for leaks and residual pressure. Observe pressure drop on pressure gauge. After 10 minutes there must be a residual pressure of at least 3.0 bar.

If residual pressure sinks below 3 bar:

- Start engine and run at idle speed.

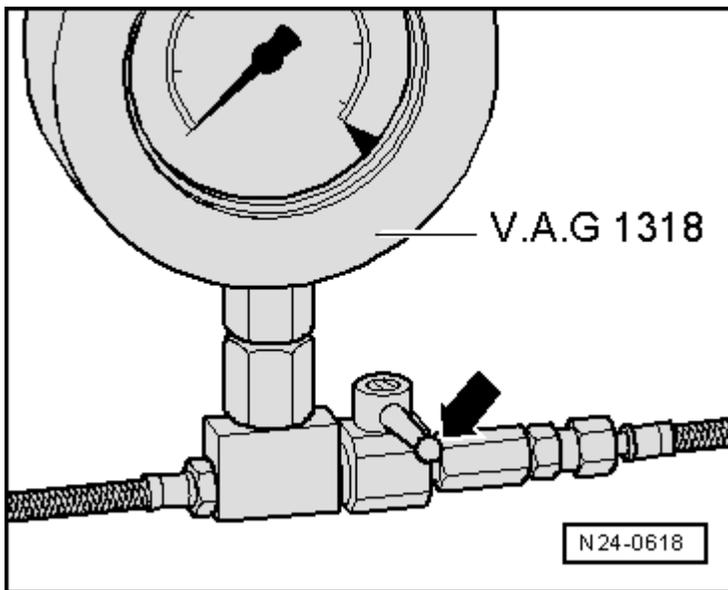


Fig. 275: Locating V.A.G 1318 Shut-Off Tap
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Wait until pressure has risen, and then switch off ignition. Simultaneously close shut-off valve of pressure gauge V.A.G 1318 (lever perpendicular to direction of flow - **arrow** -).
- Watch pressure drop on gauge.

If pressure drops again:

- Check line connections, O-rings on fuel rail and injectors for leaks.
- Check pressure gauge V.A.G 1318 for proper seal.

If pressure does not drop:

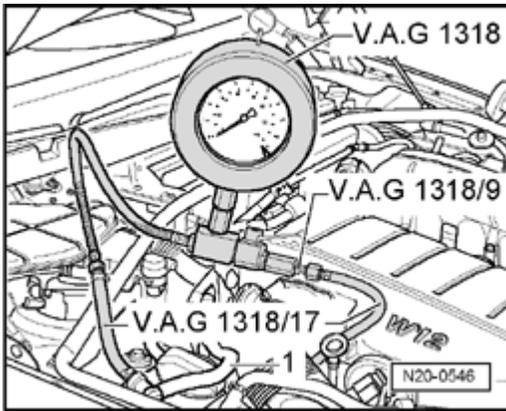


Fig. 276: Pressure Gauge V.A.G 1318 Connected To Supply Line And Hose To Fuel Rail Using Adapter V.A.G 1318/9 And Adapter V.A.G 1318/17

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Open shut-off valve of pressure gauge V.A.G 1318 (lever in direction of flow).
- Start engine and run at idle speed.
- Wait until pressure has risen, and then switch off ignition. At the same time pinch/seal the return hose together.

If pressure drops:

- Check fuel pump non-return valves --> **Fuel Pump Non-Return Valve, Checking**

If pressure does not drop:

- Replace fuel pressure regulator

NOTE:

- **Before removing the pressure gauge, remove fuses 34 and 35 (fuel pumps) from the fuse holder of the E-box in luggage compartment again, and place a rag around the line connections to be loosened.**

ENGINE CONTROL MODULE

Engine Control Module

--> **Engine Control Module, Removing and Installing**

--> **Engine Control Module DTC Memory, Checking and Erasing**

Engine Control Module, Removing and Installing

Engine Control Module, Removing and Installing

If Engine Control Module (ECM) will be replaced, connect Vehicle Diagnosis, testing info. system VAS 5051B and perform Guided Function "Replace control module".

Removing

- Switch off ignition.
- Remove windshield wiper motor on right side: --> **92 - WINDSHIELD WIPER AND WASHER SYSTEM**
- Release both connectors from control module and disconnect them.
- Control module can now be removed.

Installing

- Set control module into mounting frame.
- Connect harness connectors and engage them.
- Install windshield wiper motor on right side: --> **92 - WINDSHIELD WIPER AND WASHER SYSTEM**
- Install plenum chamber cover.
- Adapt new Engine Control Module to Throttle Valve Control Module: Guided fault function.

Engine Control Module DTC Memory, Checking and Erasing**Engine Control Module DTC Memory, Checking and Erasing****Special tools, testers and auxiliary items required**

- Vehicle diagnostic, testing, and information system VAS 5051

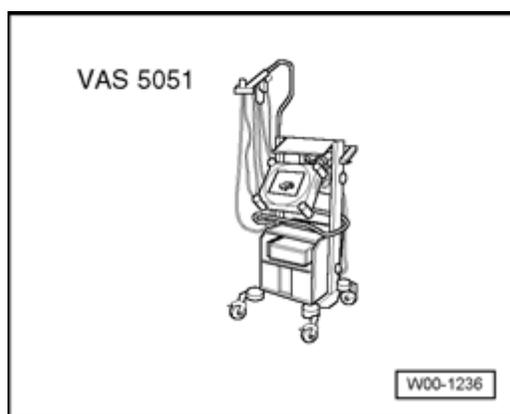


Fig. 277: VAS 5051 Vehicle Diagnostic, Testing and Information System
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Diagnosis cable VAS 5051/1 or VAS 5051/3

Work procedure

- Connect vehicle diagnostic, testing and information system VAS 5051 as follows:

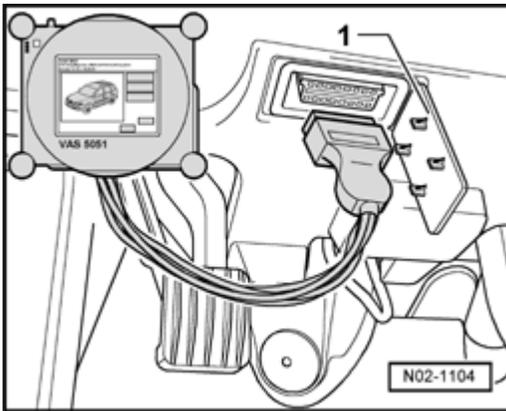


Fig. 278: Connecting Connector Of Diagnosis Cable VAS 5051/1 Or VAS 5051/3 To Data Link Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect connector of diagnosis cable VAS 5051/1 or VAS 5051/3 to Data Link Connector (DLC).
- Start engine and run at idle speed.

Only when engine does not start:

- Switch ignition on.

Selecting operating mode:

- Press button on display for "Vehicle Self-Diagnosis".

Selecting vehicle system:

- Press button "01 - Engine electronics" on display.

The control module identification with coding as well as Vehicle Identification Number (VIN) and identification of anti-theft immobilizer appear on the display.

NOTE: ● **A print-out is available. Press the Print button, if required.**

- Press the key.

Selecting diagnosis function:

- Press button "02 - Interrogate fault" on display.
- If no malfunction is stored in engine control module, "0 DTC(s) detected" is displayed.
- If malfunctions are stored in the engine control unit, these are shown one below another on the display.
- Press key.
- Press button "05 - Erase DTC memory" on display.
- Press function "06 - End output".

26 - EXHAUST SYSTEM, EMISSION CONTROLS

EXHAUST SYSTEM COMPONENTS, REMOVING AND INSTALLING

Exhaust System Components, Removing and Installing

--> Exhaust Manifolds with Primary Catalytic Converters and Attachments, Assembly Overview

--> Primary Catalytic Converters, Aligning with Exhaust Pipes

--> Muffler with Mounts, Assembly Overview

NOTE:

- After working on the exhaust system ensure that the system has sufficient clearance from the bodywork. If necessary, loosen the flange on the catalytic converter and realign mufflers and exhaust pipes --> Primary Catalytic Converters, Aligning with Exhaust Pipes and --> Aligning exhaust system.

Special tools, testers and auxiliary items required

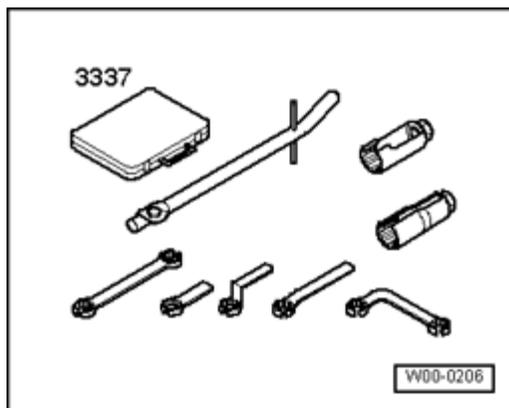


Fig. 279: Identifying Ring Spanner 7-Piece Set 3337
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Ring spanner 7-piece set for oxygen sensor 3337

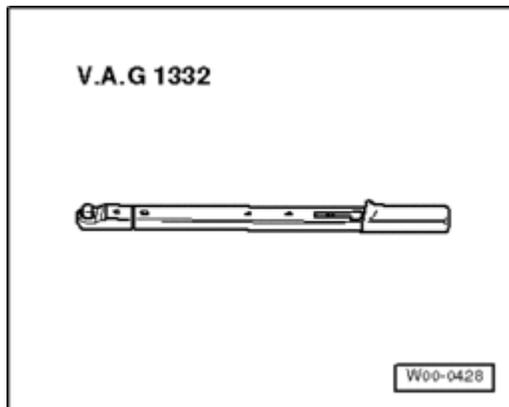


Fig. 280: Torque Wrench V.A.G. 1332

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Torque wrench V.A.G 1332

Exhaust Manifolds with Primary Catalytic Converters and Attachments, Assembly Overview

Exhaust Manifolds with Primary Catalytic Converters and Attachments, Assembly Overview

Aligning primary catalytic converters with exhaust pipes --> **Primary Catalytic Converters, Aligning with Exhaust Pipes**

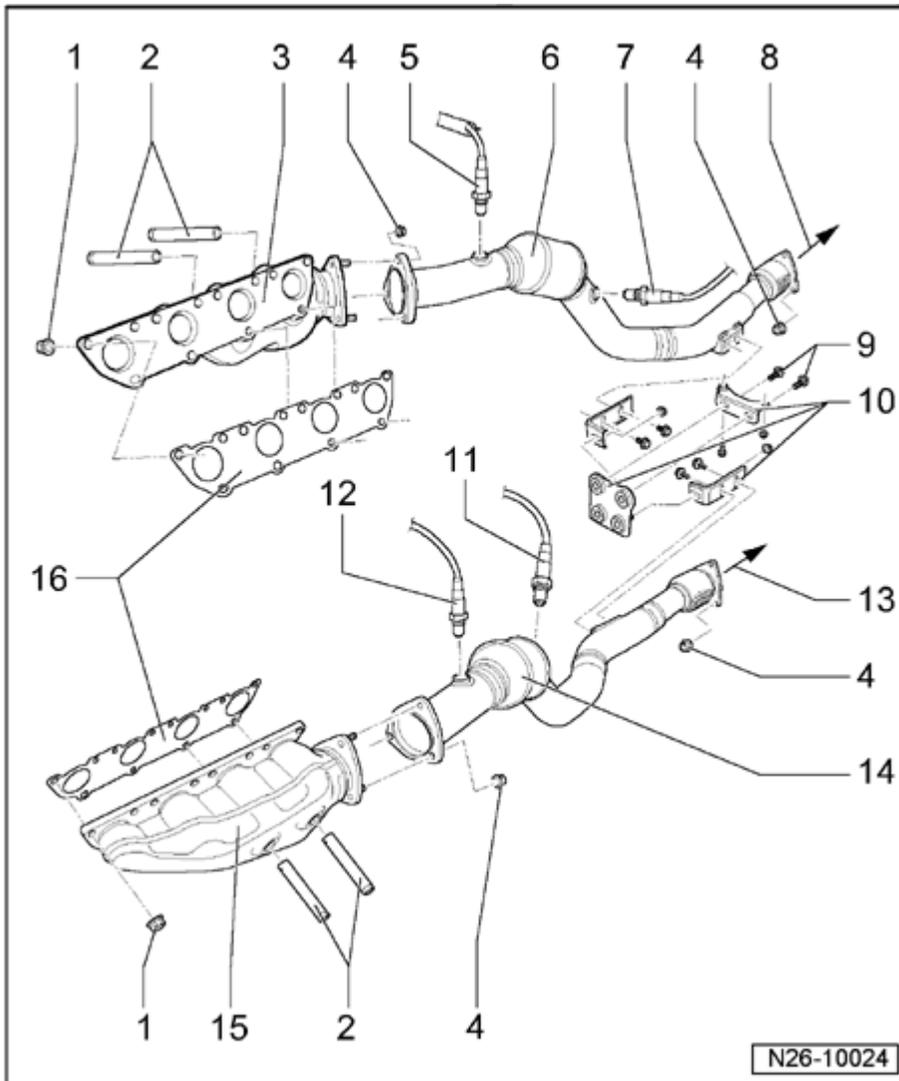


Fig. 281: Exhaust Manifolds With Primary Catalytic Converters And Attachments, Assembly Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Nut, 25 Nm

2 - Nut, 25 Nm

3 - Exhaust manifold

- For cylinder bank 1
- Removal is only possible when engine is removed

4 - M8, 25 Nm; M10, 40 Nm

5 - Heated Oxygen Sensor (HO2S) G39 , 50 Nm

- Installed in the exhaust gas stream of cylinders 1, 2, 3 and 4

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- Grease only the threads with "G 052 112 A3" ; "G 052 112 A3" must not get into the slots on the probe body
- Use ring spanner set for oxygen sensor 3337 for removal and installation

6 - Primary catalytic converter with exhaust pipe

- Installed in exhaust stream of cylinder bank 1
- Aligning the exhaust pipes --> **Primary Catalytic Converters, Aligning with Exhaust Pipes**

7 - Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130 50 Nm

- Grease only threads with "G 052 112 A3" ; "G 052 112 A3" must not get into slots on probe body
- Use ring spanner set for oxygen sensor 3337 for removal and installation

8 - To middle muffler

9 - 25 Nm

10 - Suspended mount

- Individual components of the mountings and aligning the exhaust pipes --> **Primary Catalytic Converters, Aligning with Exhaust Pipes**

11 - Oxygen Sensor (O2S) 2 Behind Three Way Catalytic Converter (TWC) G131 50 Nm

- Grease only the threads with "G 052 112 A3" ; "G 052 112 A3" must not get into the slots on the probe body
- Use ring spanner set for oxygen sensor 3337 for removal and installation

12 - Heated Oxygen Sensor (HO2S) 2 G108 50 Nm

- Installed in the exhaust gas stream of cylinders 5, 6, 7 and 8
- Grease only the threads with "G 052 112 A3" ; "G 052 112 A3" must not get into the slots on the probe body
- Use ring spanner set for oxygen sensor 3337 for removal and installation

13 - To middle muffler

14 - Primary catalytic converter with exhaust pipe

- Installed in exhaust stream of cylinder bank 2
- Aligning the exhaust pipes --> **Primary Catalytic Converters, Aligning with Exhaust Pipes**

15 - Exhaust manifold

- For cylinder bank 2
- Removal is only possible when engine is removed
- Removing --> **Exhaust manifold, removing and installing**

16 - Gasket

- Replace
- Note installation position

Exhaust manifold, removing and installing

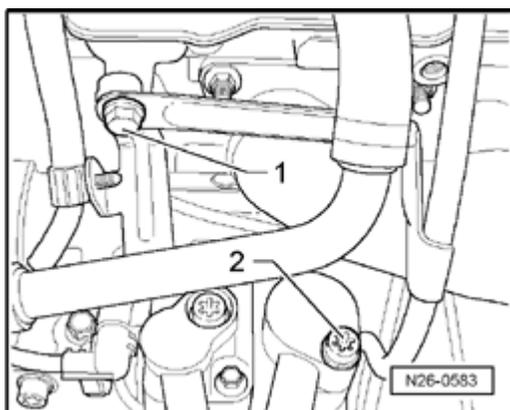


Fig. 282: Oil Dipstick Guide Tube And Refrigerant Line
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- To remove exhaust manifold from cylinder bank 2, remove bracket for oil dipstick guide tube - **1** -.
- Then disconnect refrigerant line - **2** - and close off connections with a clean rag.

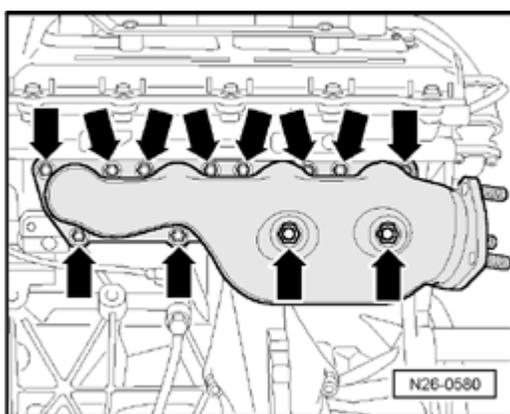


Fig. 283: Exhaust Manifold Nuts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - **arrows** -.

Primary Catalytic Converters, Aligning with Exhaust Pipes

Primary Catalytic Converters, Aligning with Exhaust Pipes

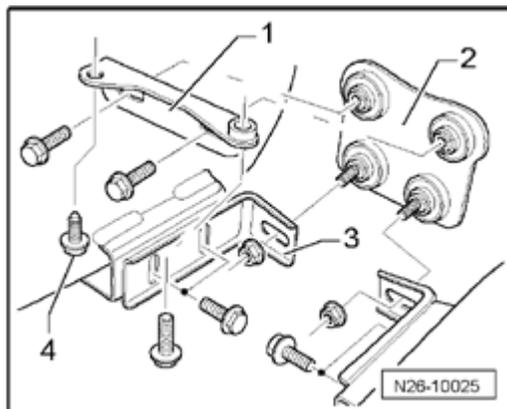


Fig. 284: Bracket, Base Plate, Angle Bracket And Bolts
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten bracket - 1 - to transmission.
- Place base plate - 2 - with fastened mounts onto bracket - 1 - , and lightly tighten bolts.
- Then, tighten angle bracket - 3 - onto exhaust pipes and base plate by lightly counter-holding.

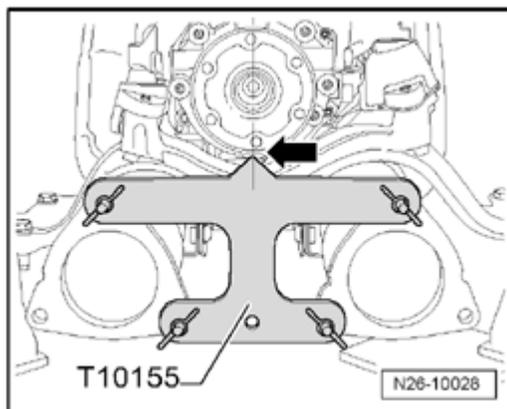


Fig. 285: Identifying Template T10155
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install template T10155 to exhaust pipes as shown and align exhaust pipes to center axis of transmission - **arrow** - .
- Tighten exhaust system when primary catalytic converters and exhaust pipes have sufficient clearance on both sides of transmission.

Muffler with Mounts, Assembly Overview

Muffler with Mounts, Assembly Overview

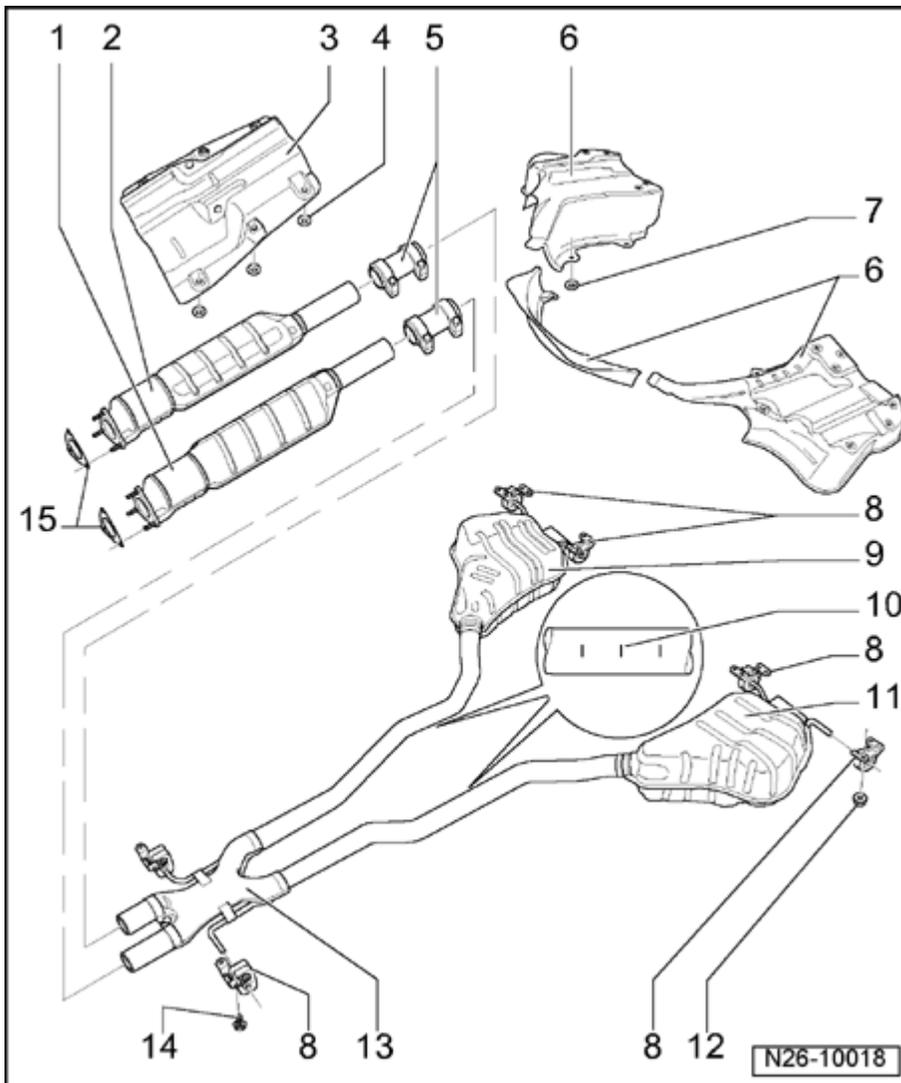


Fig. 286: Muffler With Mounts, Assembly Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 1 - Catalytic converter with front muffler, bank 2
- 2 - Catalytic converter with front muffler, bank 1
- 3 - Heat shield
- 4 - Plate nut
- 5 - Double clamp
 - Installed location --> **Installation position of double clamps**
- 6 - Heat shield

7 - Plate nut

8 - Suspended mount

- After replacing mountings, realign the exhaust system --> **Aligning exhaust system**

9 - Right rear muffler

- Installed location --> **Installation position of rear muffler**
- To remove and install, remove rear bumper

10 - Separating point

- Exhaust system is installed as a single component during production. For repairs, each rear muffler can be replaced separately. A double clamp is supplied for the connection.
- Cut through connecting pipe with body repair saw V.A.G 1523A at right angles at separating point
- Notches to left and right of separating points must be visible following installation of double clamp.
- Installed location --> **Installation position of replacement double clamps in direction of travel**

11 - Left rear muffler

- Installed location --> **Installation position of rear muffler**
- To remove and install, remove rear bumper

12 - 25 Nm

13 - Junction of exhaust pipes

14 - 25 Nm

15 - Gasket

- Replace

Aligning exhaust system

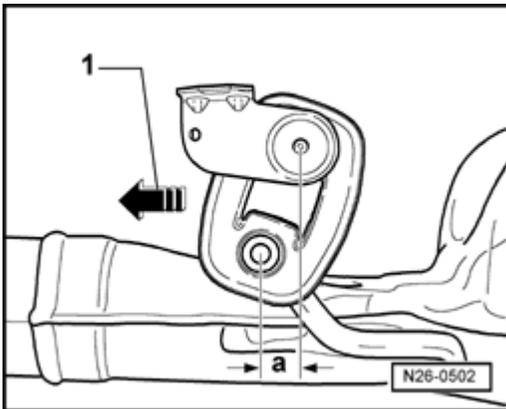


Fig. 287: Aligning Exhaust System

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Exhaust system cold
- Press exhaust system in direction of travel - **1** - and tighten double clamp so far that dimension - **a** - is attained at the supports. At the pipe junction: Dimension a = 10 mm, at rear muffler: Dimension a = 15 mm

Installation position of double clamps

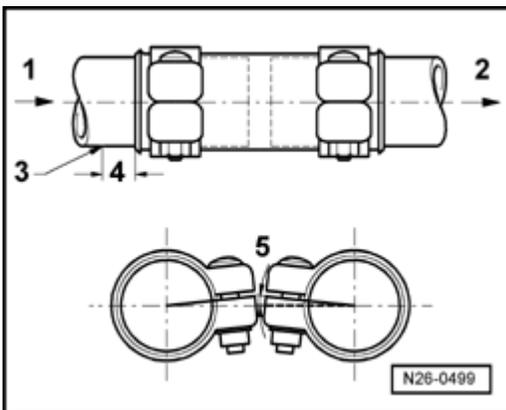


Fig. 288: Installation Position Of Double Clamps

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 1 - From primary catalytic converter
- 2 - To middle muffler
- 3 - Marking 3x at perimeter
- 4 - Dimension = 5 mm
- 5 - Angle 5

Installation position of replacement double clamps in direction of travel

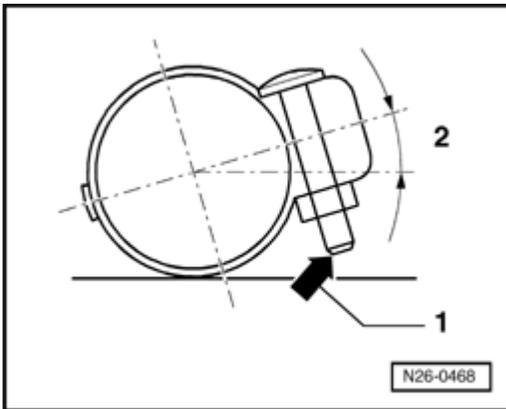


Fig. 289: Identifying Installed Position Double Clamps In Direction Of Travel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Screw tips must not project beyond the lower edge of the clamp.

2 - Angle $10 + 5$

Installation position of rear muffler

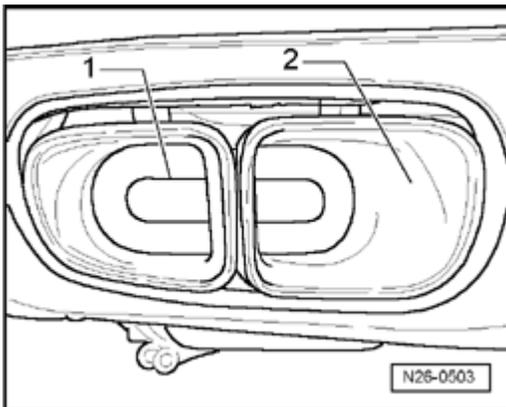


Fig. 290: Installation Position Of Rear Muffler
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Rear mufflers - 1 - must be aligned centrally in panel - 2 -.

SECONDARY AIR INJECTION SYSTEM

Secondary Air Injection System

--> [Secondary Air Injection System Components, Vehicle Side, Assembly Overview](#)

--> [Secondary Air Injection System Components, Engine Side, Assembly Overview](#)

Function

The secondary air system blows air in behind the exhaust valve for 65 seconds during the cold start (60 F to 95 F (+15 C to +35 C) coolant temperature). This produces an oxygen rich exhaust gas, causes after burning and reduces the heating-up phase of the catalytic converter. Actuation occurs from Engine Control Module (ECM) via the Secondary Air Injection (AIR) Pump Relay J299 to the Secondary Air Injection (AIR) Solenoid Valve N112, and the combination valves of cylinder banks 1 and 2. Additionally, the secondary air injection (AIR) system is switched on during idle for 5 seconds with a 20 second delay after every subsequent engine start (up to max. 176 F (80 C) engine temperature) and is checked via On Board Diagnostics (OBD).

Secondary Air Injection System Components, Vehicle Side, Assembly Overview

Secondary Air Injection System Components, Vehicle Side, Assembly Overview

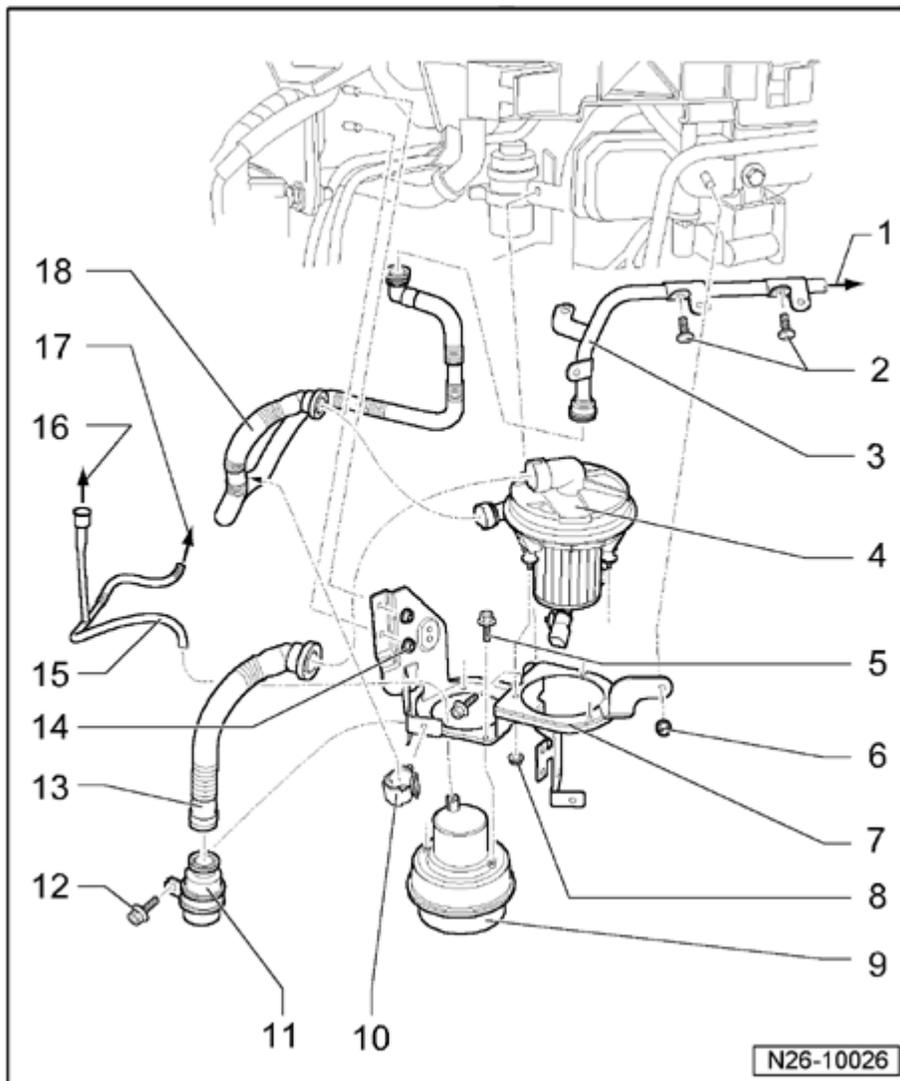


Fig. 291: Secondary Air Injection System Components, Vehicle Side, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - To connecting hose

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- From cylinder bank 1 to cylinder bank 2

2 - Bolt 25 Nm

- Fastened to cylinder head bank 2

3 - Connecting pipe

- For secondary air

4 - Secondary air injection (AIR) pump motor V101

5 - 10 Nm

6 - 10 Nm

7 - Bracket

- Secured at rear of front left bumper
- For vacuum reservoir and Secondary Air Injection (AIR) pump motor V101

8 - 10 Nm

9 - To vacuum reservoir

10 - Retaining clip

- For pressure hose

11 - Air filter housing

- With ball valve

12 - 10 Nm

13 - Pressure hose

- Ensure seated tightly
- Press together at front to release

14 - 10 Nm

15 - Vacuum hose

16 - To variable intake manifold

17 - To electro-hydraulic engine mount solenoid valve

18 - Pressure hose

- Ensure seated tightly
- Press together at front to release

Secondary Air Injection System Components, Engine Side, Assembly Overview

Secondary Air Injection System Components, Engine Side, Assembly Overview

Secondary air injection (AIR) pump relay --> **Secondary air injection (AIR) pump relay**

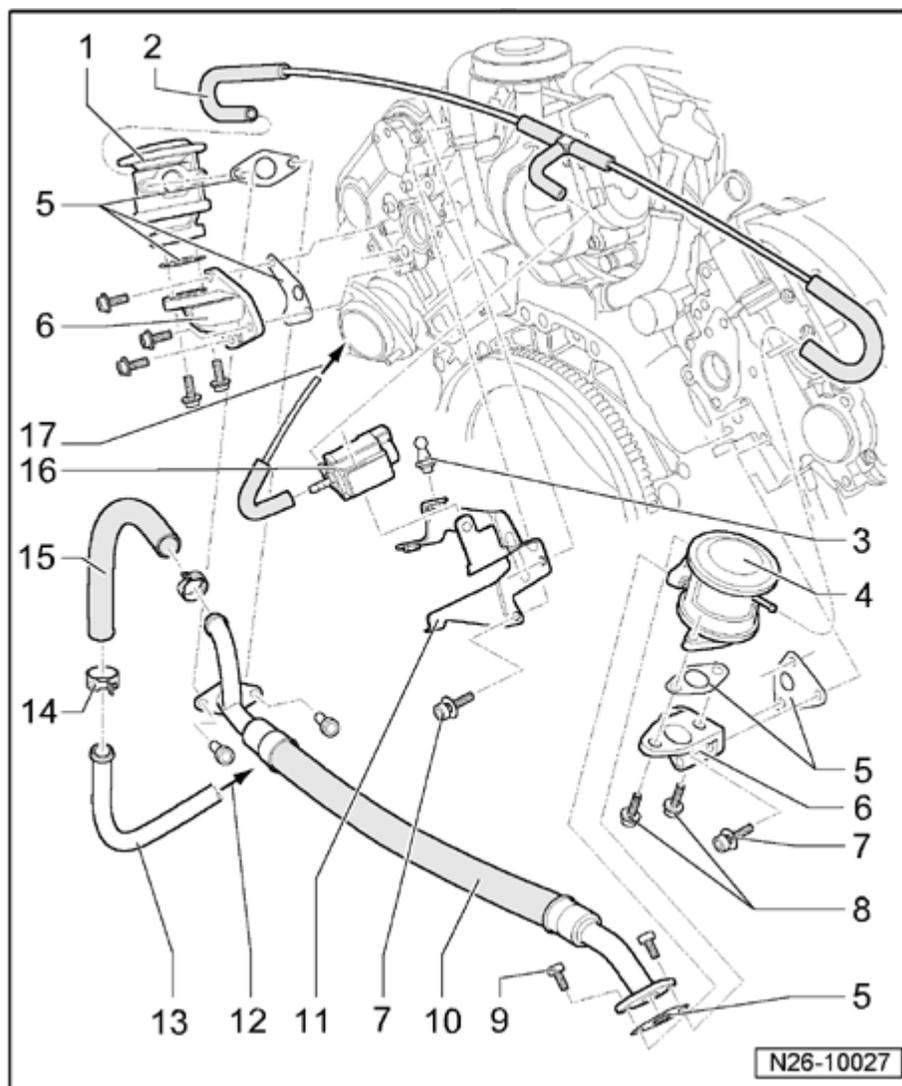


Fig. 292: Secondary Air Injection System Components, Engine Side, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Combi-valve

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ENGINE 4.2 Liter V8 5V Engine Mechanical, Fuel Injection & Ignition, Engine Code(s): BGH, BGJ

- For cylinder bank 2

2 - Vacuum hose

- For actuation of combination valves

3 - Ball pin

- For fastening the engine cover

4 - Combi-valve

- For cylinder bank 1

5 - Gasket

6 - Connection

- For combi-valve

7 - 15 Nm

8 - 10 Nm

9 - 10 Nm

10 - Connecting hose

- From cylinder bank 1 to cylinder bank 2

11 - Bracket

12 - To Secondary air injection (AIR) pump motor V101

13 - Connecting pipe

- For secondary air

14 - Spring-type clip

15 - Pressure hose

- Ensure seated tightly

16 - Secondary air injection (AIR) solenoid valve N112

17 - To vacuum reservoir

18 - Pressure pipe

- For secondary air

28 - IGNITION/GLOW PLUG SYSTEM

SECONDARY AIR INJECTION (AIR) PUMP RELAY

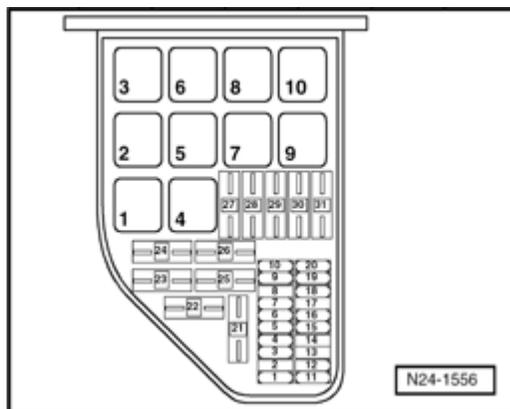


Fig. 293: Secondary Air Injection (AIR) Pump Relay
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- Secondary air injection pump relay is inserted in socket 7.
- If tools are necessary to pull relays or control modules out of the relay plate, first disconnect battery Ground (GND) cable. --> 27 - BATTERY, STARTER, GENERATOR, CRUISE CONTROL

IGNITION SYSTEM, SERVICING

Ignition System, Servicing

--> Safety Precautions

--> Spark Plug Technical Data

--> Ignition System Components, Assembly Overview

--> Ignition Coils with Power Output Stage, Removing and Installing

General notes on ignition system

- For trouble-free operation of electrical components a voltage of at least 11.5 V is necessary.
- During some checks it is possible that the control module will detect and store a malfunction. Therefore after completing all checks and repairs the DTC memory must be checked and if necessary erased.

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ENGINE 4.2 Liter V8 5V Engine Mechanical, Fuel Injection & Ignition, Engine Code(s): BGH, BGJ

Safety Precautions

Safety Precautions

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

- Only disconnect and reconnect wires for injection and ignition system, including test leads, when ignition is switched off.
- If the engine is to be turned at starter speed, without starting:
 - Pull connectors off from ignition coils with power output stage 1 through 8.

If test and measuring equipment is required during road test, note the following:

- Test and measuring instruments must be secured to rear seat and operated by a 2nd person from this location.

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.

Spark Plug Technical Data

Spark Plug Technical Data

Engine code	BGH	BGJ
Ignition sequence	1-5-4-8-6-3-7-2	1-5-4-8-6-3-7-2
Spark plugs		
VW/Audi	101 905 615 A	101 905 615 A
	101 905 616	101 905 616
Manufacturer s designation	FGR 7 KQE 0	FGR 7 KQE 0
	BKR 6 EQU A	BKR 6 EQU A
Electrode gap	max. 1.1 mm	max. 1.1 mm
Tightening torque	30 Nm	30 Nm

* Actual values, such as spark plug replacement intervals:

*Remove and install spark plugs with spark plug removal tool 3122 B

Ignition System Components, Assembly Overview

Ignition System Components, Assembly Overview

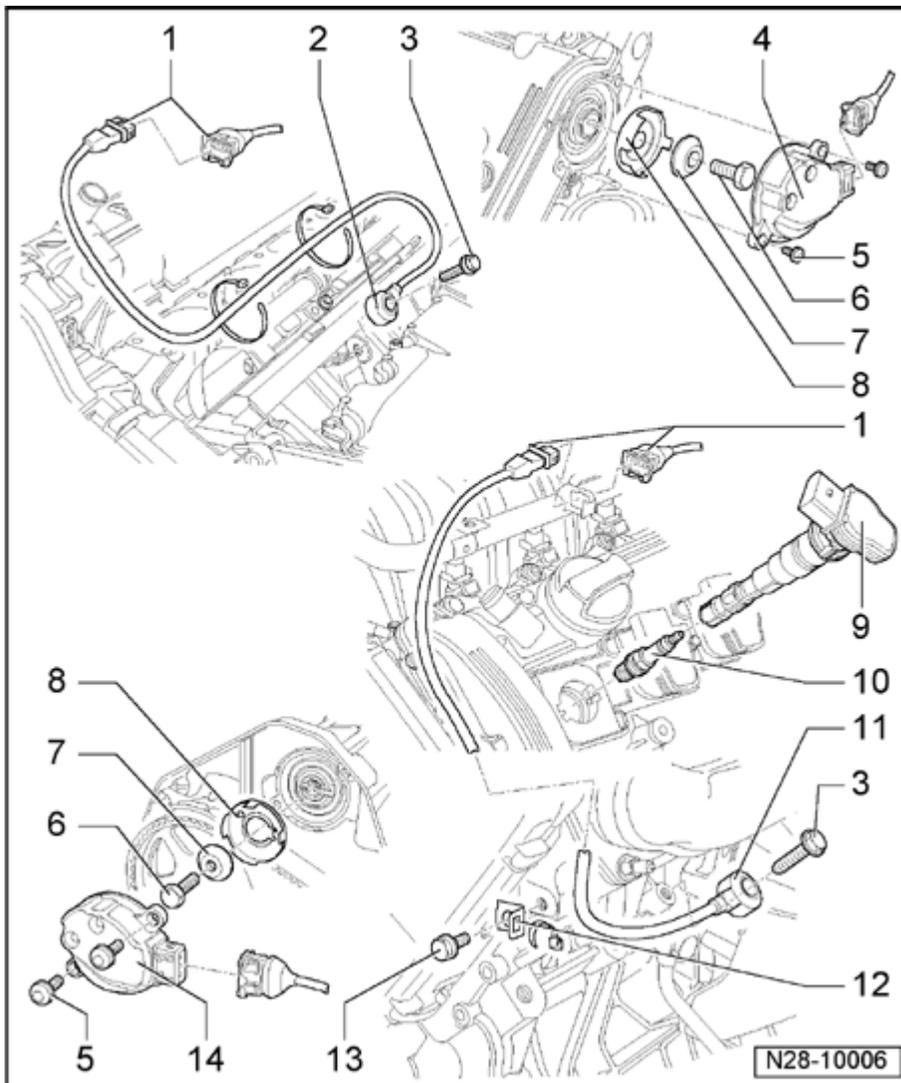


Fig. 294: Ignition System Components, Assembly Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 1 - Connection for knock sensor
- 2 - Knock sensor 1 G61
 - Sensor contacts and connector contacts gold plated
- 3 - 20 Nm
 - Torque setting influences the function of knock sensor
- 4 - Camshaft position (CMP) sensor 2 G163
 - For intake camshaft, bank 2
 - Sensor contacts and connector contacts gold plated

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ENGINE 4.2 Liter V8 5V Engine Mechanical, Fuel Injection & Ignition, Engine Code(s): BGH, BGJ

5 - 10 Nm

6 - 25 Nm

7 - Washer

- Conical
- Note installation position

8 - Hood

- For Camshaft Position (CMP) Sensor G40
- Observe installed location

9 - Ignition coil with power output stage N70, N127, N291, N292, N323, N324, N325 and N326

- Remove only with ignition coil puller T40039

10 - Spark plug, 30 Nm

- Removing and installing with spark plug removal tool 3122 B
- Type and spark plug gap --> **Spark Plug Technical Data**

11 - Knock sensor 2 G66

12 - Bracket

13 - 10 Nm

14 - Camshaft Position (CMP) sensor G40

- For intake camshaft, bank 1
- Sensor contacts and connector contacts gold plated

Ignition Coils with Power Output Stage, Removing and Installing

Ignition Coils with Power Output Stage, Removing and Installing

Special tools, testers and auxiliary items required

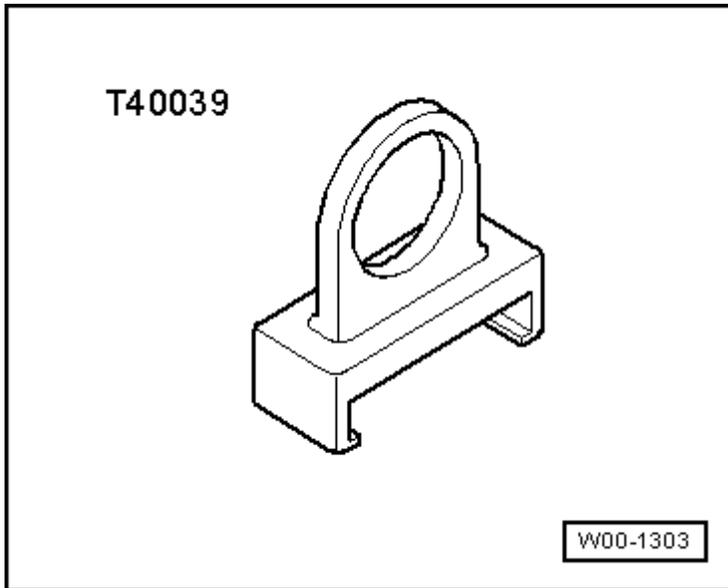


Fig. 295: Identifying Ignition Coil Puller T40039
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Puller T40039

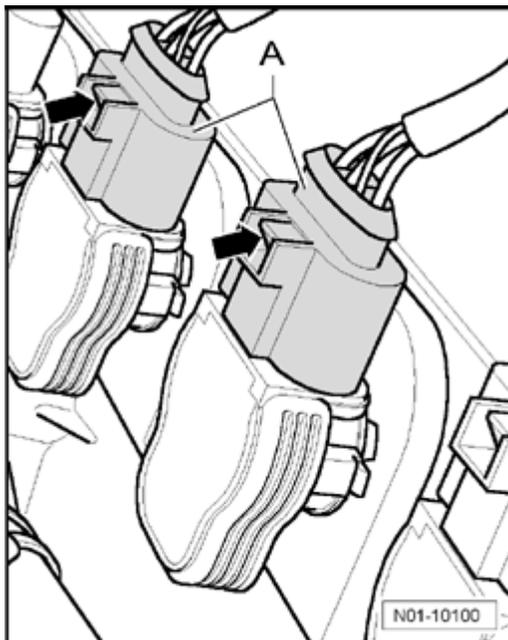


Fig. 296: Pressing In Retaining Tab Of Corresponding Connector To Be Removed
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press in retaining tab of corresponding connector to be removed - **A** - in direction of - **arrow** - , and pull it off.

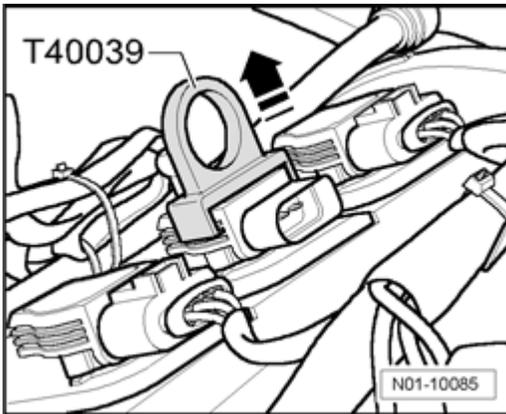


Fig. 297: Pushing Puller T40039 Onto Ignition Coil With Power Output Stage, And Pulling It Off
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Push puller T40039 onto ignition coil with power output stage, and pull it off in direction of - **arrow** -.
- To install, correctly position the ignition coil with power output stage in the spark plug shaft and press the ignition coil with power output stage onto the spark plug until the stop.