

ENGINE**3.6 Liter - Multiport Fuel Injection - Engine Code(s): BLV & CNNA****24 MULTIPOINT FUEL INJECTION****GENERAL INFORMATION****FUEL INJECTION SYSTEM**

- Hose connections are secured with either spring type or clamp type clips.
- Fuel hoses in the engine compartment may only be secured with spring type clamps appropriate for the model type. The use of clamp or screw type clips is not permissible.
- Hose clip pliers VAS 6340 or VAS 6362 are recommended for installing space saving clamps.
- Read the safety precautions before starting. Refer to **SAFETY PRECAUTIONS**.
- Observe the safety precautions when disconnecting and connecting the battery. Refer to **Removal and Installation**.
- The ignition must be turned off when disconnecting the battery. Obtain the radio code for radios with an anti-theft coded before disconnecting the battery.
- For trouble free operation of the electrical components a voltage of at least 11.5 volts is necessary.
- Do not use sealants containing silicone. Particles of silicone drawn into the engine, will not be burnt and will damage the oxygen sensor.
- If the engine only starts briefly and then turns off again after troubleshooting, repairs or checking of the components, it may be that the immobilizer is blocking the Engine Control Module (ECM). The ECM must then be adapted if necessary.
- It is possible that the ECM will recognize a malfunction and store a Diagnostic Trouble Code (DTC) during some tests. After completing all tests and repairs, the DTC memory should therefore be checked and erased if necessary. Refer to "Guided Functions" in the vehicle diagnostic tester.
- Vehicles with an airbag are equipped with an emergency fuel shut off system. This is intended to reduce the risk of vehicle fire following a crash by turning off the fuel pump via the fuel pump control module - J538-.
- When the driver's side door is opened, the fuel pump is activated for 2 seconds so that pressure builds in the fuel system. This improves comfort of engine start up behavior.

CLEAN WORKING CONDITIONS

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

- Always clean the connection locations and the area around them before loosening.
- Place removed parts on a clean surface and cover them using lint free cloths.
- Carefully cover or seal unpacked components, if repairs cannot be performed immediately.
- Only install clean components: Remove the replacement parts from their packaging just prior to installing them. Do not use parts that have been stored loose (for example, in a tool box, etc.).

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

DESCRIPTION AND OPERATION

AIR FILTER HOUSING OVERVIEW

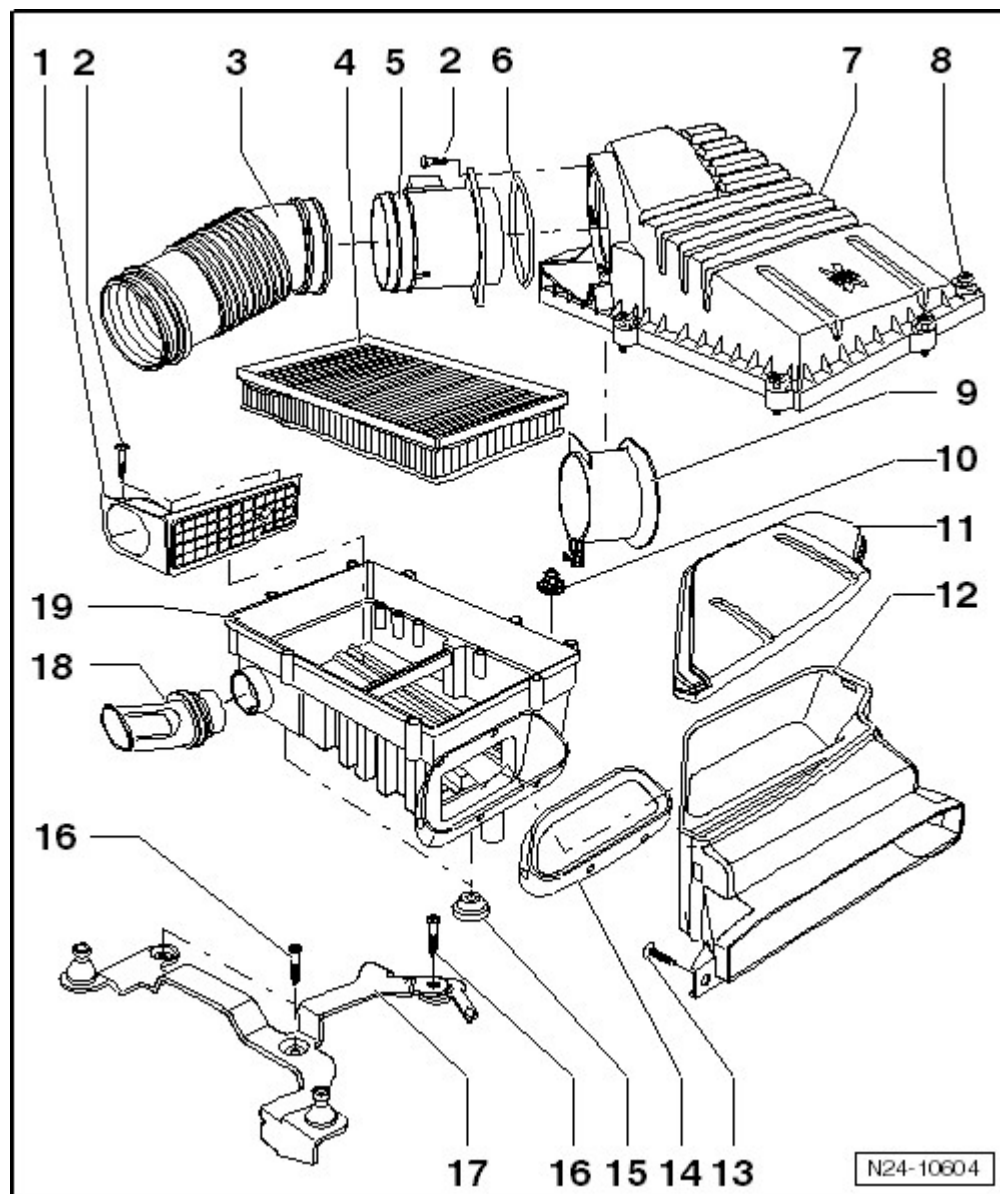


Fig. 1: Air Filter Housing Overview

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

1. Regulator Flap
 - Only on cold climate vehicles.
 - With a thermal element.

- Intake air pre-heating checking. Refer to **INTAKE AIR PRE-HEATING, CHECKING**.
- 2. Bolt
 - 2 Nm
- 3. Connecting Pipe
 - To the throttle valve control module -J338-
- 4. Air Filter Element
- 5. Mass Airflow Sensor -G70-
- 6. Seal
 - Replace if damaged.
- 7. Upper Air Filter Housing
- 8. Bolt
 - 2 Nm
- 9. Connection
 - Clipped into the upper air filter housing.
- 10. Nut
 - 8 Nm
- 11. Cover
- 12. Air Duct
 - Fastened to the lock carrier.
- 13. Bolt
 - 5 Nm
- 14. Gasket
 - Replace if damaged.
- 15. Rubber Bushing
- 16. Bolt
 - 10 Nm
- 17. Bracket
 - For the air filter housing.
- 18. Connection
 - Not installed on all vehicles.
 - For the warm air intake.
- 19. Lower Air Filter Housing

INTAKE MANIFOLD OVERVIEW

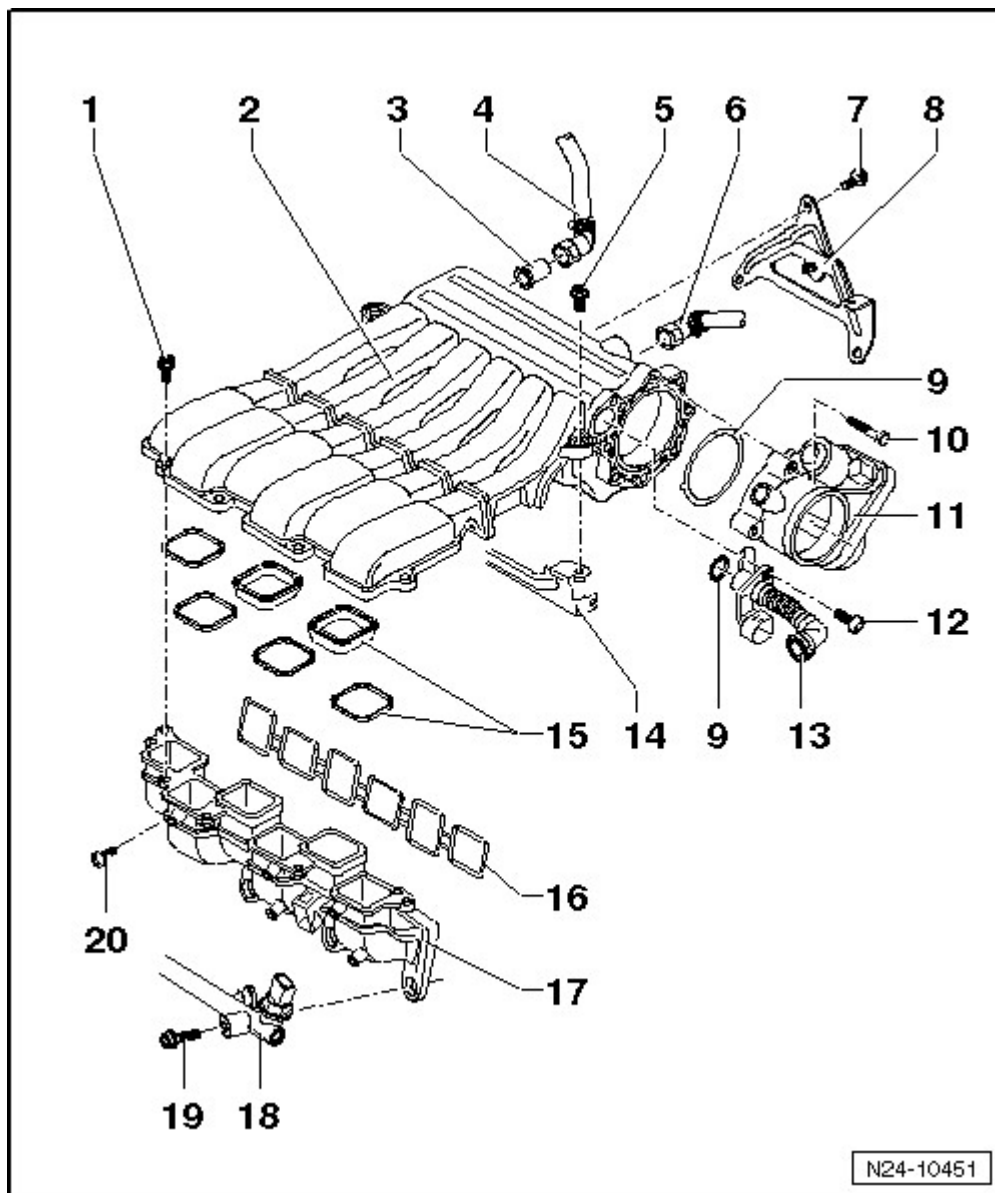


Fig. 2: Intake Manifold Overview

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

1. Bolt
 - 10 Nm
2. Upper Intake Manifold
 - Removing and installing, refer to **UPPER INTAKE MANIFOLD.**
3. Grommet
 - Replace if damaged.
4. to the Brake Booster
5. Bolt
 - 10 Nm

6. from the EVAP canister purge regulator valve 1 -N80-
7. Bolt
 - 20 Nm
8. Intake Manifold Rear Support
9. Seal
 - Always replace.
10. Bolt
 - 7 Nm
11. Throttle Valve Control Module -J338-
 - With EPC throttle drive -G186-, EPC throttle drive angle sensor 1 -G187- and EPC throttle drive angle sensor 2 -G188-.
 - When replacing, adapt the Engine Control Module (ECM) to the throttle valve control module. Refer to "Guided Functions" in the vehicle diagnostic tester.
12. Bolt
 - 3.5 Nm
13. Vent Hose
 - For crankcase ventilation.
 - With the positive crankcase ventilation heating element -N79-.
 - From the cylinder head cover.
14. Intake Manifold Front Support
15. Seal
 - Replace if damaged.
 - Coat lightly with engine oil before installing and insert it into the upper intake manifold.
16. Seal
 - Always replace.
 - Make sure it fits securely inside the lower intake manifold.
17. Lower Intake Manifold
 - Removing and installing, refer to **LOWER INTAKE MANIFOLD, WITH FUEL RAIL.**
18. Fuel Rail
 - For cylinders 2, 4 and 6.
 - Replace the fuel injector springs -item 23- in the **FUEL RAIL, INJECTORS AND HIGH PRESSURE PUMP OVERVIEW**, before installing.
 - Tighten uniformly, starting from the inside and working toward the outside.
 - Fuel rail, injectors and high pressure pump overview. Refer to **FUEL RAIL, INJECTORS AND HIGH PRESSURE PUMP OVERVIEW**.
19. Bolt
 - 30 Nm + 90° (1/4) additional turn.
 - Always replace.

- Tighten uniformly, starting from the inside and working toward the outside.

20. Bolt

- 8 Nm

FUEL RAIL, INJECTORS AND HIGH PRESSURE PUMP OVERVIEW

NOTE: Do not disassemble the high pressure pump!

If a fuel injector is removed, then the combustion chamber Teflon seal and washer must always be replaced. Refer to FUEL INJECTOR TEFLON SEAL AND WASHER.

Read the safety precautions before starting. Refer to SAFETY PRECAUTIONS .

Pay attention to the rules of cleanliness. Refer to CLEAN WORKING CONDITIONS.

WARNING:

- If the battery is not going to be disconnected, then remove the fuel pump fuse. Otherwise the door contact switch inside the driver's door could activate the fuel pump. Fuse assignment, refer to SYSTEM WIRING DIAGRAM.
- Fuel pressure in the high pressure pipe can be up to 120 bar! Always wear protective eyewear and protective clothing to prevent injuries and fuel from coming in contact with your skin. Before loosening the fuel pipe, place a cloth around the connection point. Then release pressure by carefully loosening the union nuts.

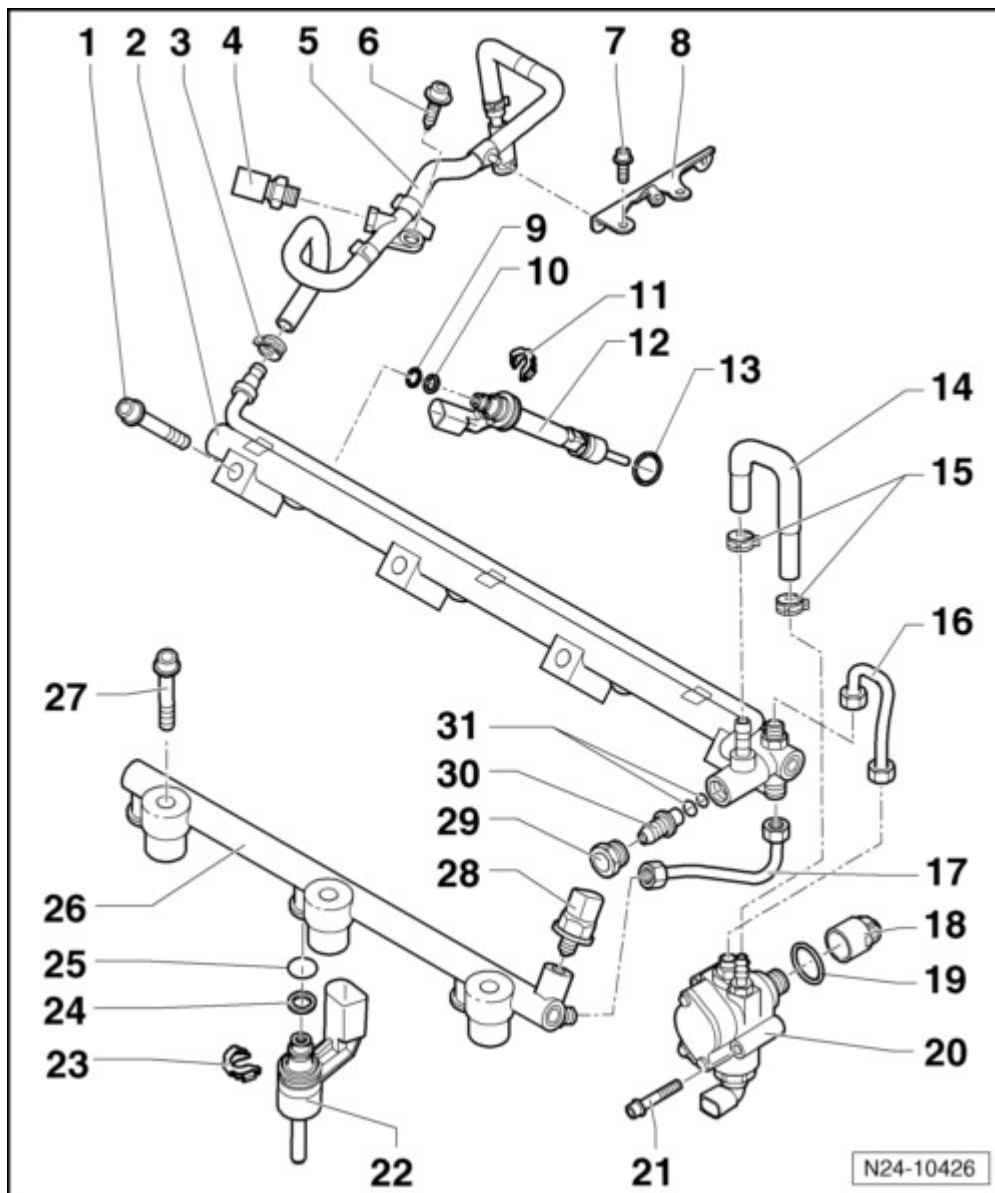


Fig. 3: Identifying High Pressure Pump Components

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

1. Bolt

- 30 Nm + 90° (1/4) additional turn.
- Always replace.
- Tighten uniformly, starting from the inside and working toward the outside.

2. Fuel Rail

- For cylinders 1, 3 and 5.
- Always replace the fuel injector springs -items 11 and 23- before installing.
- Tighten the bolts uniformly, starting from the inside and working toward the outside.
- To remove, remove the lower intake manifold. Refer to **LOWER INTAKE MANIFOLD, WITH**

FUEL RAIL.

3. Spring Clamp
4. Low Fuel Pressure Sensor -G410-
 - 15 Nm
5. Fuel Supply Hose
 - From the fuel tank.
 - With a mount for the low fuel pressure sensor.
 - Always replace the supply hose because it is damaged when it is removed from the ridged connections.
6. Bolt
 - 8 Nm
7. Bolt
 - 8 Nm
8. Bracket
 - For the fuel hose.
9. O-ring
 - Always replace.
 - Before installing, lubricate with clean engine oil.
10. Washer
 - Replace if damaged. Refer to **FUEL INJECTOR TEFLON SEAL AND WASHER.**
11. Spring
 - Replace every time the fuel rail is removed.
 - Make sure it is secure.
12. Cylinder 1 Fuel Injector -N30-
 - Cylinder 3 fuel injector -N32-
 - Cylinder 5 fuel injector -N83-
 - Removing and installing, refer to **FUEL INJECTORS.**
 - The long fuel injectors for cylinders 1, 3 and 5 must not be separated.
13. Seal
 - Always replace.
 - Before installing, lubricate with clean engine oil.
14. Low Pressure Fuel Hose
 - Between the high pressure pump and fuel rail.
 - Always replace the fuel hose because it is damaged when it is removed from the ridged connections.
15. Spring Clamp
16. High Pressure Fuel Pipe
 - 28 Nm

- Place a clean cloth around the connection before disconnecting. Then release pressure by carefully loosening the union nuts.
- The fuel pipe must not touch other components!
- To loosen and tighten the union nuts, counter hold the connection on the high pressure pump using a wrench.
- Before installing: First, tighten the connection on the high pressure pump to 40 Nm.
- Loosen and tighten the union nuts using the flare nut attachment 17 mm T10456
- Do not install when under tension.
- To install, first tighten the union nuts by hand.

17. Connecting Pipe

- 28 Nm
- The pipe must not touch other components!
- Do not install when under tension.
- To install, first tighten the union nuts by hand.
- Before installing: First, tighten the connection on the high pressure pump to 40 Nm.

18. Cam Follower

- Lubricate the O-rings with clean engine oil before installing.

19. O-ring

- Always replace.
- Before installing, lubricate with clean engine oil.

20. High Pressure Pump

- With the fuel pressure regulator valve -N276-.
- To loosen and tighten the fuel lines, counter hold the connection using a wrench.
- Removing and installing, refer to **HIGH PRESSURE PUMP**.
- Before installing the fuel lines, first, tighten the connection for the fuel lines:

Connection for the high pressure line: 40 Nm

Connection for the low pressure line: 28 Nm

21. Bolt

- 10 Nm

22. Cylinder 2 Fuel Injector -N31-

- Cylinder 4 fuel injector -N33-
- Cylinder 6 fuel injector -N84-
- Removing and installing, refer to **FUEL INJECTORS**.

23. Spring

- Replace every time the fuel rail is removed.
- Make sure it is secure.

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24. Washer

- Replace if damaged. Refer to **FUEL INJECTOR TEFLON SEAL AND WASHER**.

25. O-ring

- Always replace.
- Before installing, lubricate with clean engine oil.

26. Fuel Rail

- For cylinders 2, 4 and 6.
- Replace the springs -item 23- before installing.
- Tighten the bolts uniformly, starting from the inside and working toward the outside.
- Removing and installing, refer to **LOWER INTAKE MANIFOLD, WITH FUEL RAIL**.

27. Bolt

- 30 Nm + 90° (1/4) additional turn.
- Always replace.
- Tighten uniformly, starting from the inside and working toward the outside.

28. Fuel Pressure Sensor -G247-

- 22 Nm
- Before installing, coat the front sealing point and threads with clean engine oil.

29. Plug

- 22 Nm

30. Pressure Relief Valve

- Lightly coat the O-rings with clean engine oil before installing.
- Replace the removed valve.
- Press in by hand using a 8 mm hex wrench.

31. O-ring

- Always replace.
- Before installing, lubricate with clean engine oil.

SPECIFICATIONS

TECHNICAL DATA

Engine Codes	BLV and CNNA
Idle check	
Engine idle speed ⁽¹⁾ RPM	640 to 760
Engine Control Module (ECM)	
System designation	Motronic MED 9.1
Part number:	
Engine speed limitation RPM	approximately 6700
(1) Idle speed is not adjustable	

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FASTENER TIGHTENING SPECIFICATIONS

Component	Fastener Size	Nm
Air Cleaner Housing Bracket to Body Bolt	-	10
Air Duct to Lock Carrier Bolt	-	5
Engine Control Module, with Anti-Theft Immobilizer		
-- Engine Control Module Bracket to Engine Control Module Retainer Bolt	-	6
Engine Control Module, without Anti-Theft Immobilizer		
-- Engine Control Module Bracket to Engine Control Module Retainer Bolt	-	7
-- Engine Control Module Retainer to Plenum Chamber Nut	-	6
Fuel Pipe to Fuel Rail Fitting	-	28
Fuel Pressure Sensor to Fuel Rail	-	22
Fuel Pressure Sensor to Pressure Sensor Tester VAS 6394	-	22
Fuel Rail to Lower Intake Manifold Bolt ^{1, 2}	-	30 + 90°
Fuel Supply Hose Bracket Bolt	-	8
Fuel Supply Hose Clamp Bolt	-	8
High Pressure Fuel Pipe Fitting to Fuel Rail	-	28
High Pressure Fuel Pipe Fitting to High Pressure Pump ⁽³⁾	-	28
High Pressure Pump Connection		
-- for the High Pressure Fuel Line	-	40
-- for the Low Pressure Fuel Hose	-	28
High Pressure Pump to Cylinder Block Bolt	-	10
Intake Manifold Rear Support to Upper Intake Manifold Bolt	-	20
Lower Air Filter Housing to Bracket Nut	-	8
Lower Intake Manifold to Cylinder Head Bolt	-	8
Low Fuel Pressure Sensor to Fuel Supply Hose	-	15
Mass Airflow Sensor to Upper Air Filter Housing Bolt	-	2
Plug to Fuel Rail	-	22
Pressure Sensor Tester VAS 6394 to Fuel Rail	-	22
Regulator Flap to Lower Air Filter Housing Screw	-	2
Throttle Valve Control Module to Upper Intake Manifold Bolt	-	7
Upper Air Filter Housing to Lower Air Filter Housing Bolt	-	2
Upper Intake Manifold to Intake Manifold Front Support Bolt	-	10
Upper Intake Manifold to Lower Intake Manifold Bolt	-	10
Vent Hose to Upper Intake Manifold Bolt	-	3.5
(1) Always replace		
(2) Tighten the fuel rail uniformly, starting from the inside and working toward the outside		
(3) To loosen and tighten the union nut on the high pressure pump, counter hold the connection on the pump using a wrench		

DIAGNOSIS AND TESTING**INTAKE AIR PRE-HEATING, CHECKING****Special tools and workshop equipment required**

- Chilling Spray (commercially available)

NOTE: Installed only on cold climate vehicles.

Regulator Flap, Checking:

- Remove the upper air filter housing and filter element. Refer to **AIR FILTER HOUSING OVERVIEW**.
- Check the position of the regulator flap -1-.

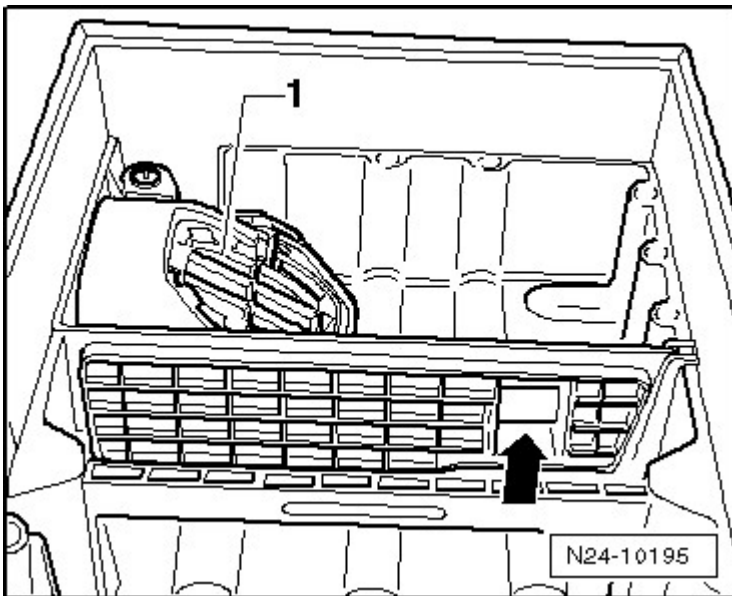


Fig. 4: Checking Position Of Regulator Flap
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Spray the thermal element -arrow- with chilling spray.
- The regulator flap must close the warm air connection completely at 14 °C (57.2 °F) and above.
- Below 0 °C (32 °F), the regulator flap must open the warm air connection completely.

FUEL PRESSURE SENSOR CHECKING**Special tools and workshop equipment required**

- Assembly Tool T10118
- 3/8" Drive, 27 mm, Box End Wrench

- Pressure Sensor Tester VAS 6394
- Test Instrument Adapter/DSO (3-pin) VAS 5570
- Adapter VAS 6394/3

Procedure**WARNING:**

- The fuel pressure sensor is under pressure. Always wear protective eyewear and protective clothing to prevent injuries and fuel from coming in contact with your skin. Wrap a cloth around the connection point before loosening the fuel pressure sensor. Then release pressure by carefully loosening.

-- Disconnect the connector from the fuel pressure sensor -A- and remove the sensor using a box end wrench.

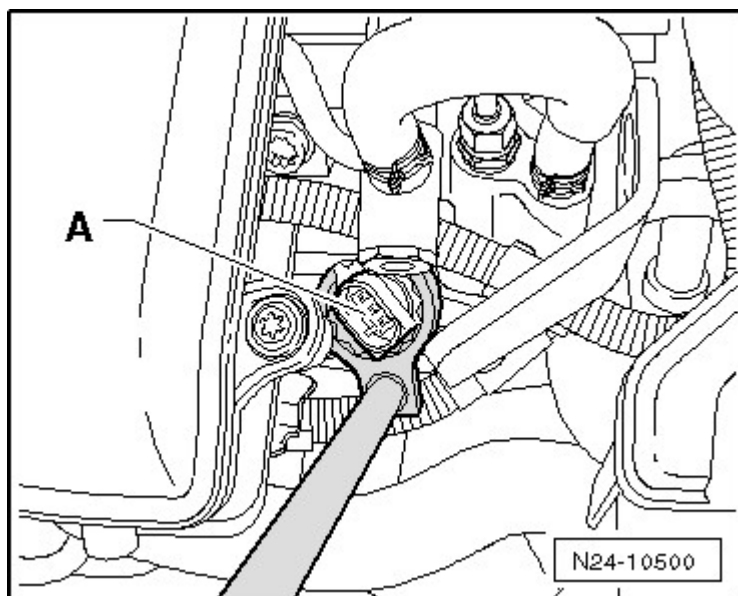


Fig. 5: Identifying Removal Of Connector From Fuel Pressure Sensor -A-
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Remove the locking bolt -2- and install the fuel pressure sensor in the pressure sensor tester VAS 6394/1. Tightening specification: 22 Nm.

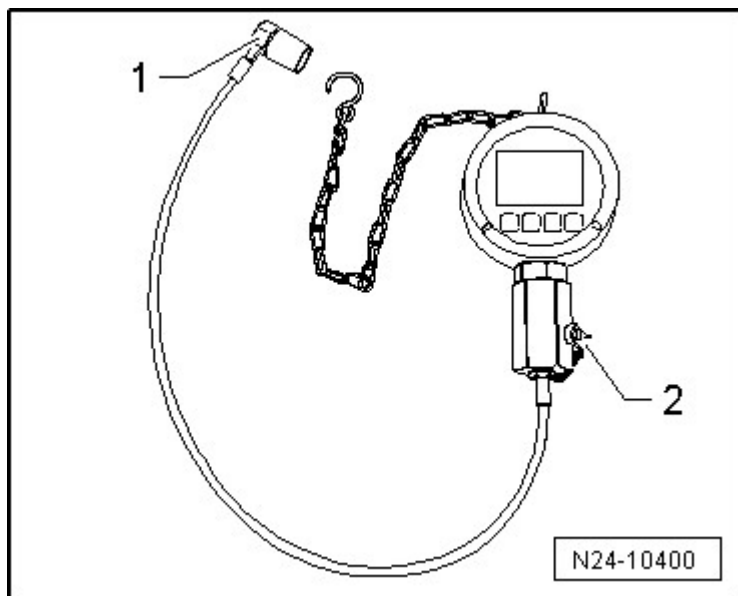


Fig. 6: Identifying Locking Bolt, Pressure Sensor Tester And Fuel Pressure Sensor
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Coat the adapter VAS 6294/3 sealing point with clean engine oil and install it in the fuel rail -arrow-.
Tightening specification: 22 Nm.

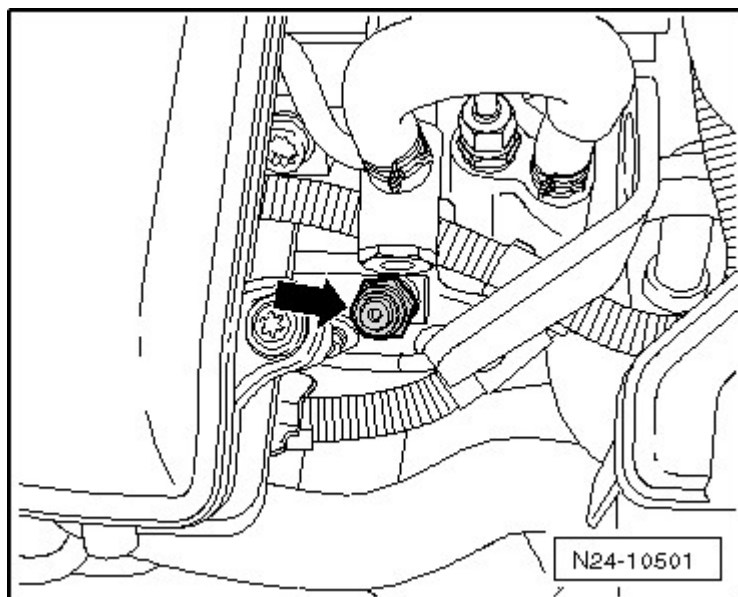


Fig. 7: Identifying Adapter -VAS 6294/3- Sealing Point
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Connect the pressure sensor tester VAS 6394/1 pressure line to the adapter VAS 6394/3 -arrow-.

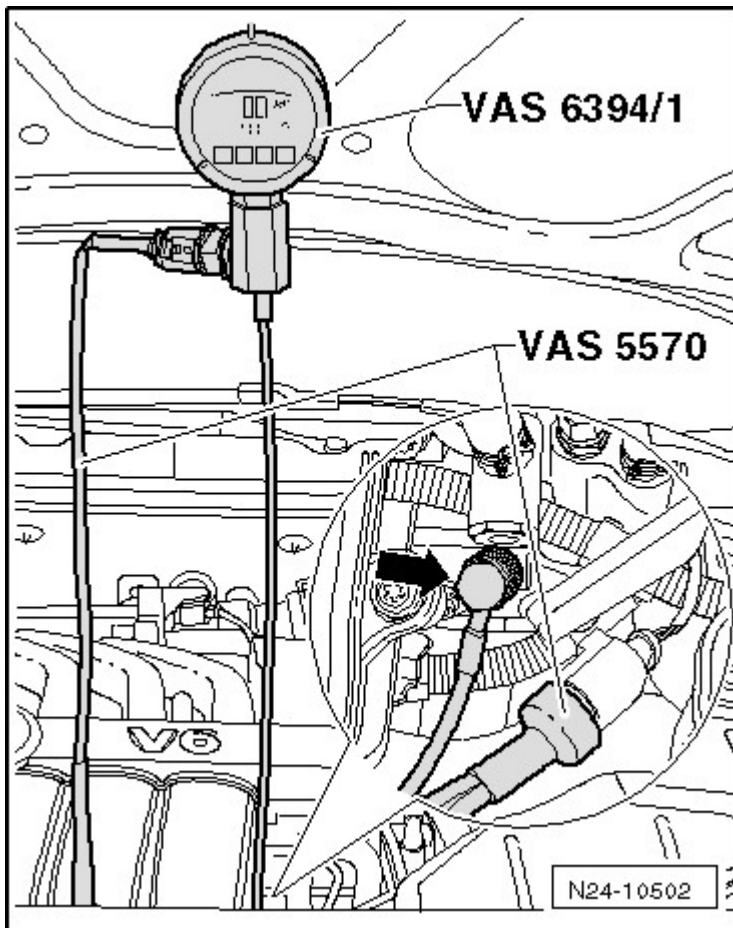


Fig. 8: Identifying Test Instrument Adapter/DSO (3-pin) -VAS 5570- And Pressure Sensor Tester -VAS 6394/1

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Connect the fuel pressure sensor and its connector to the test instrument adapter/DSO (3-pin) VAS 5570.
- Turn the pressure sensor tester VAS 6394/1 on by pressing the button -A- briefly.

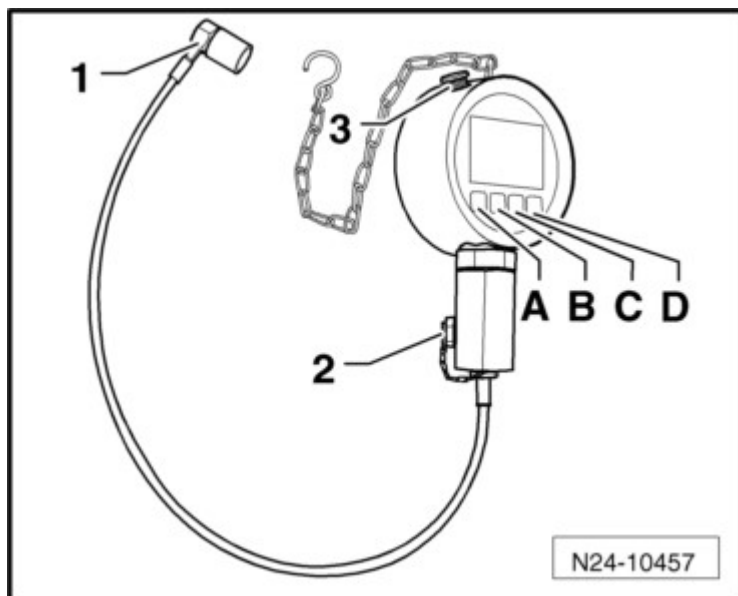


Fig. 9: Identifying Button -A- On Pressure Sensor Tester -VAS 6394/1-
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

NOTE: Holding the button -A- for 2 seconds turns on the illumination for 20 seconds.

If the pressure sensor tester VAS 6394/1 does not display 0 bar, set it back to zero. Refer to the operating instructions.

- Connect the vehicle diagnostic tester to the diagnostic connector.
- Turn the ignition on.
- Press the following buttons on the vehicle diagnostic tester screen one after another.

OBD

OBD -->

01 - engine electronics -->

011 - measured values -->

- Select measured values block **1 4 0** and confirm with **Q** .

Display field 3 shows the fuel pressure actual value as measured by the fuel pressure sensor.

- Start the engine.

- Compare the pressure displayed by the pressure sensor tester VAS 6394/1 with the actual value displayed on the vehicle diagnostic tester.

- The pressures may have a maximum difference of 5 bar.

-- If the difference is greater than 5 bar, replace the fuel pressure sensor.

WARNING: The pressure sensor tester VAS 6394/1 is under high fuel pressure. Disconnect the connector from the fuel pressure sensor when the engine is running. This reduces the pressure to approximately 6 bar. Turn off the ignition. Place a cloth around the fuel pressure sensor, then carefully loosen the sensor to release the remaining pressure.

-- Repeat the test with the new fuel pressure sensor and compare both measured values.

If the measured value do not match again:

-- Perform a wiring test. Refer to the vehicle diagnostic tester.

REMOVAL AND INSTALLATION

UPPER INTAKE MANIFOLD

Special tools and workshop equipment required

- Torque Wrench (5-50 Nm) V.A.G 1331
- Assembly Tool T10118

Removing

NOTE: Read the safety precautions before starting. Refer to **SAFETY PRECAUTIONS** .

Pay attention to the rules of cleanliness. Refer to **CLEAN WORKING CONDITIONS**.

Intake manifold overview. Refer to **INTAKE MANIFOLD OVERVIEW**.

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

- Route all lines and wires in their original locations.
- Ensure sufficient clearance to all moving or hot components.

-- Remove the ignition coil wiring harness cover strip in the -direction of the arrows-.

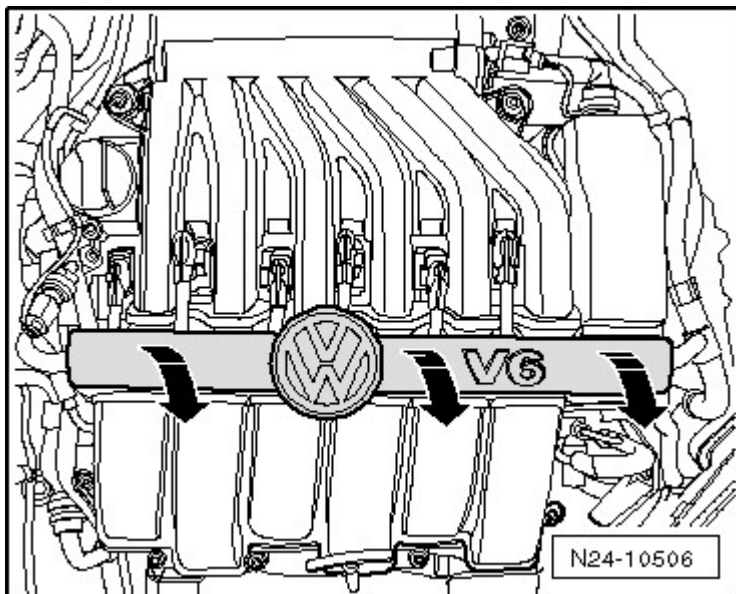


Fig. 10: Removing Ignition Coil Wiring Harness Cover Strip
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Place the assembly tool T10118 against the release button -arrow-, and carefully remove all the connectors from the ignition coils with power output stage.

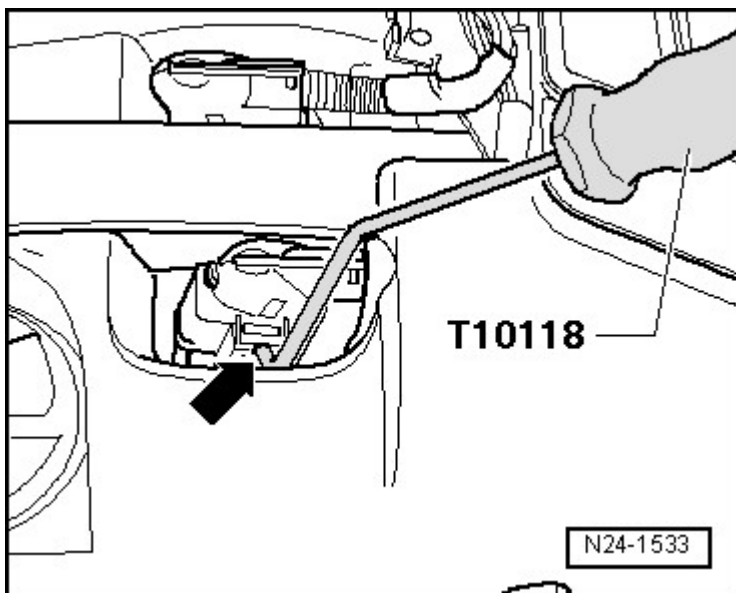


Fig. 11: Disconnecting Electrical Harness Connectors To Ignition Coils
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Press the wire duct upward using a screwdriver and move the connectors to the side.

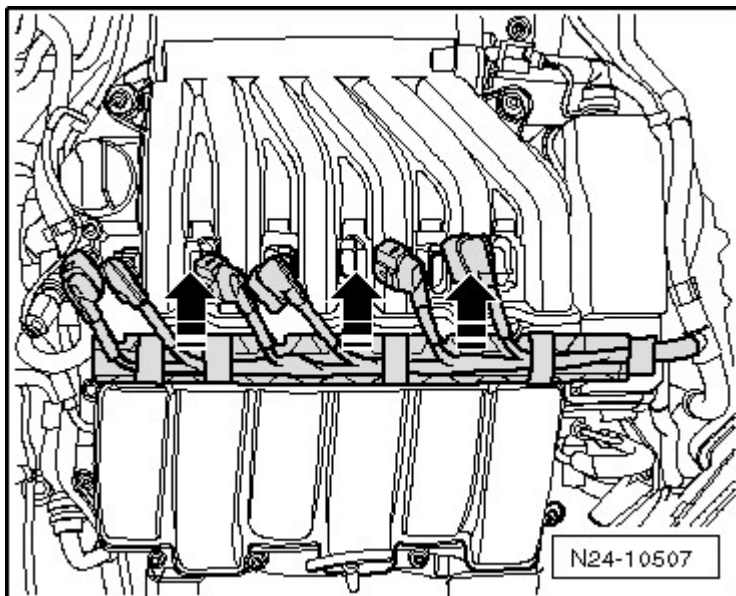


Fig. 12: Identifying Removal Of Wire Duct

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Disconnect the connectors -1-, remove the connecting pipe -2- and disconnect the crankcase ventilation vent hose -3- from the cylinder head cover.

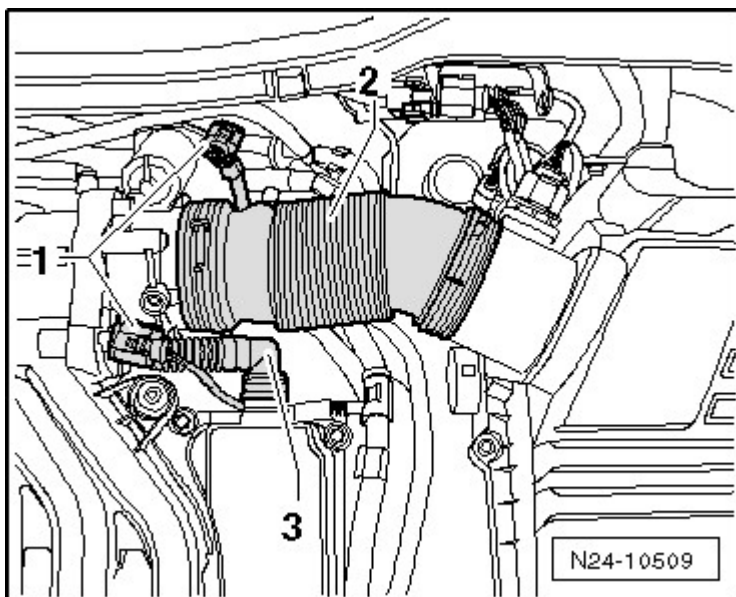


Fig. 13: Identifying Connectors, Connecting Hose And Vent Hose

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Disconnect the lines -arrows- from the upper intake manifold.

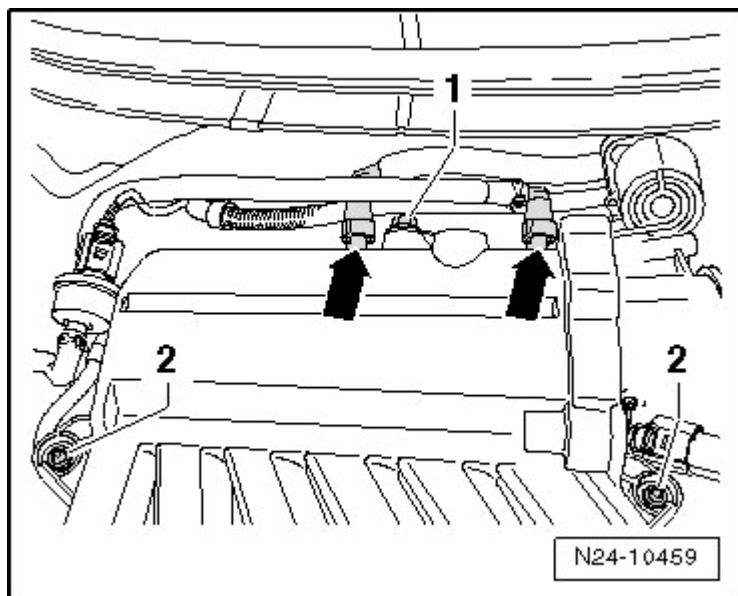


Fig. 14: Identifying Removal Of Intake Manifold Support Bolts
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Remove the rear intake manifold support bolt -1-.
- Remove the front intake manifold support bolts -2-.
- Remove the upper intake manifold to lower intake manifold bolts -1 through 5-.

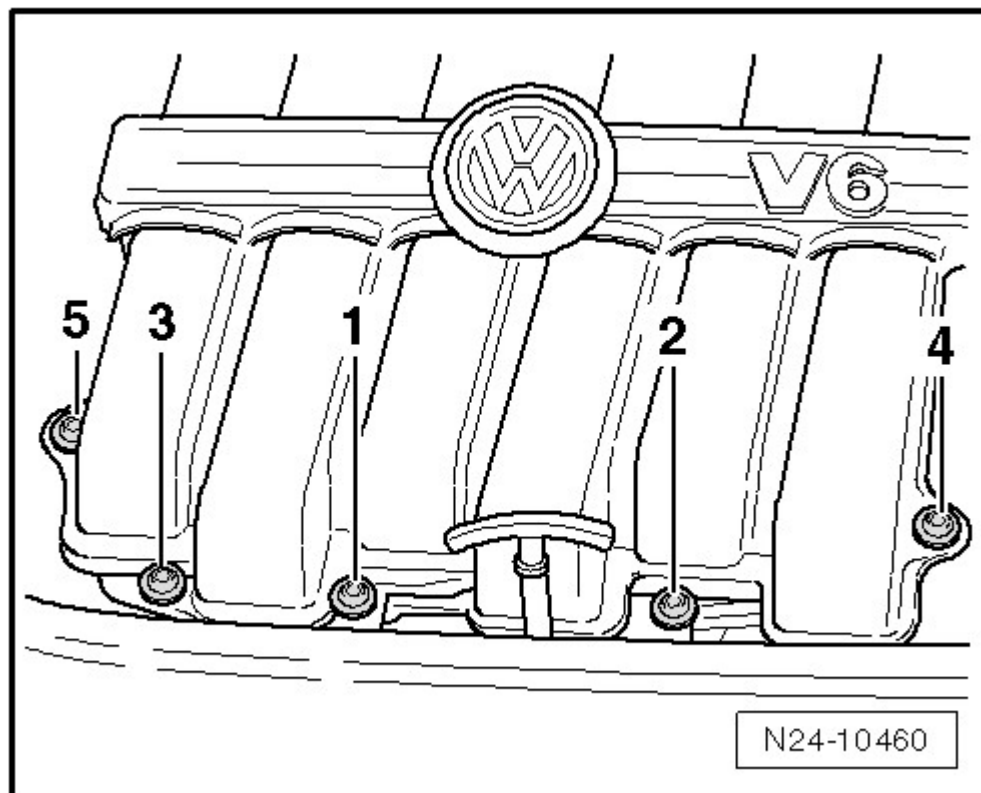


Fig. 15: Identifying Installation Of Upper Intake Manifold To Lower Intake Manifold Bolts -1 Through 5-
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Remove the upper intake manifold downward and lay it on a suitable surface.

NOTE: **Seal the intake passages inside the lower intake manifold with clean cloths.**

Installing

-- Install the seal in the upper intake manifold and lightly coat them with clean engine oil.

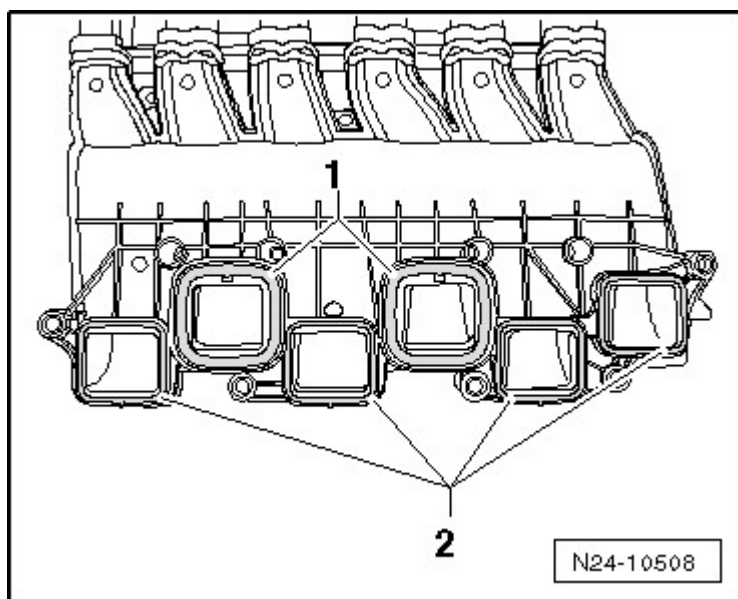


Fig. 16: Identifying Seals On Upper Intake Manifold
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-1- large seals

-2- small seals

-- Mount the upper intake manifold onto the lower intake manifold.

-- Tighten the bolts -1 through 5- that connect the upper intake manifold to the lower intake manifold starting from the inside and working toward the outside. Tightening specification: 10 Nm

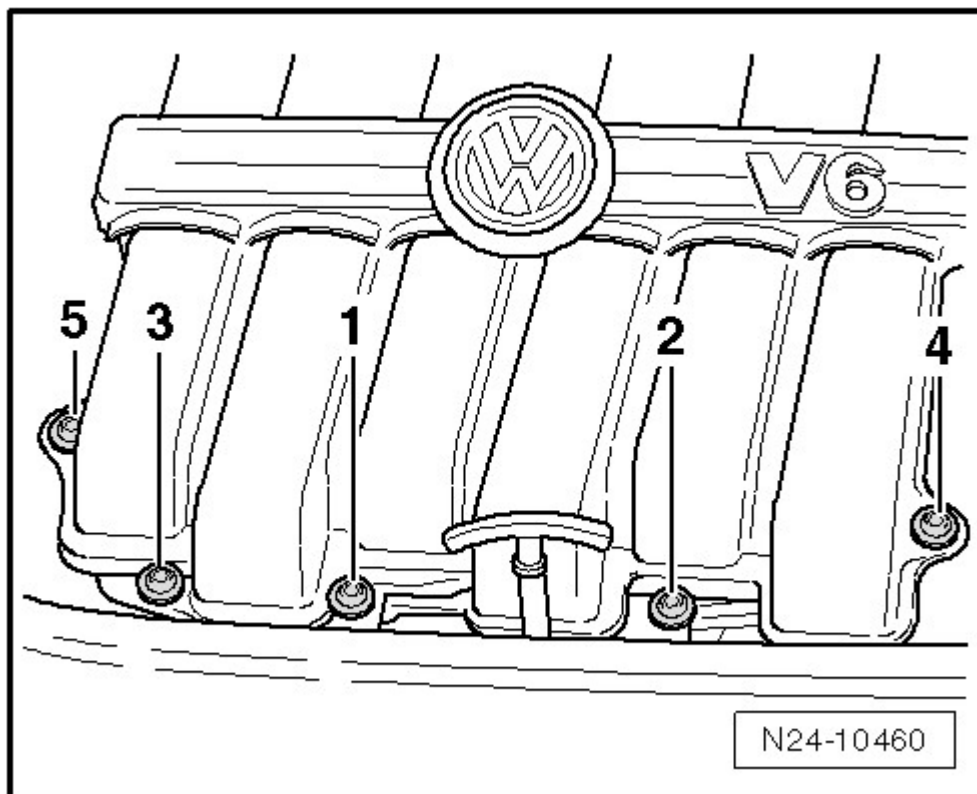


Fig. 17: Identifying Installation Of Upper Intake Manifold To Lower Intake Manifold Bolts -1 Through 5-
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Then, tighten the intake manifold support bolts.

Further installation is in the reverse order of removal.

For the correct tightening specifications, refer to **INTAKE MANIFOLD OVERVIEW**.

LOWER INTAKE MANIFOLD, WITH FUEL RAIL

Special tools and workshop equipment required

- Torque Wrench (5-50 Nm) V.A.G 1331
- Assembly Tool T10118

Removing

NOTE: Read the safety precautions before starting. Refer to **SAFETY PRECAUTIONS** .

Pay attention to the rules of cleanliness. Refer to CLEAN WORKING CONDITIONS.

If a fuel injector is removed, then the combustion chamber Teflon seal and the

washer must always be replaced. Refer to FUEL INJECTOR TEFLON SEAL AND WASHER.

The seal -item 13- in the FUEL RAIL, INJECTORS AND HIGH PRESSURE PUMP OVERVIEW must also be replaced on the fuel injectors for cylinders 1, 3 and 5.

If the fuel rail is removed, the fuel injector springs -arrow- must be replaced.

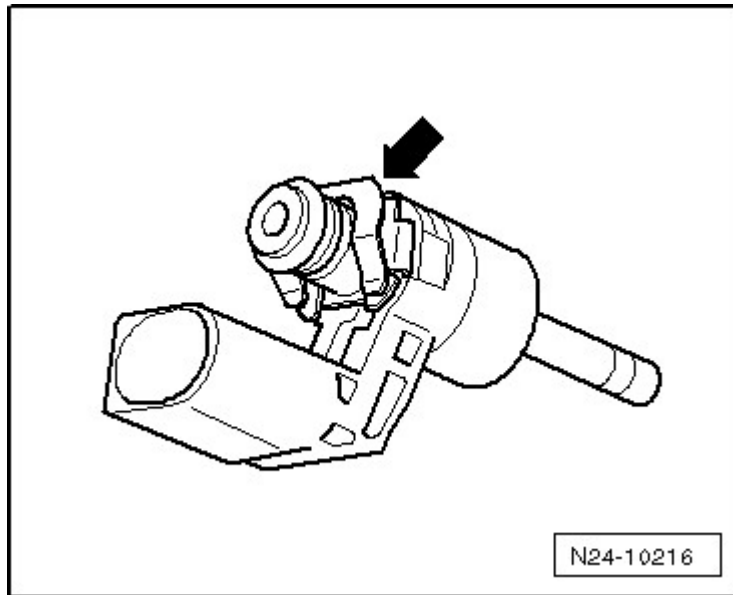


Fig. 18: Identifying Spring Elements For Fuel Injectors
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

Fuel rail, injectors and high pressure pump overview. Refer to FUEL RAIL, INJECTORS AND HIGH PRESSURE PUMP OVERVIEW.

Intake manifold overview. Refer to INTAKE MANIFOLD OVERVIEW.

CAUTION: Note the following whenever working inside the engine compartment due to limited space:

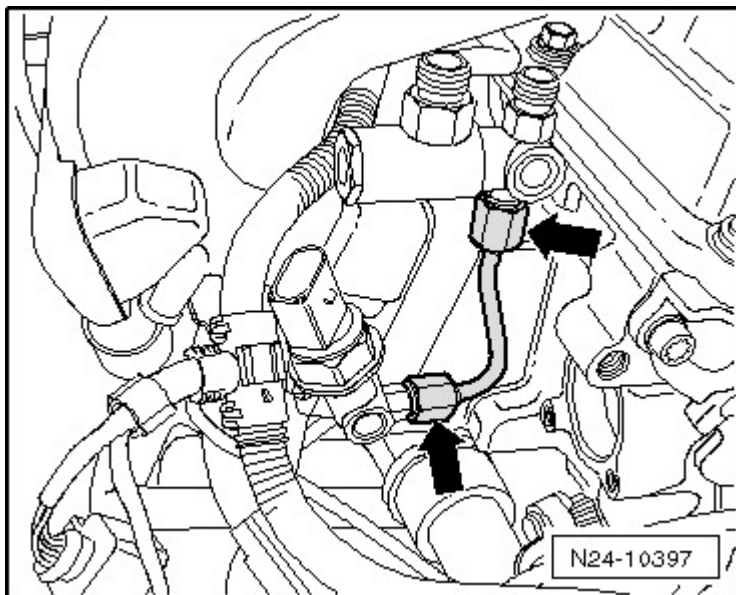
- Route all lines and cables in their original locations.
- Ensure sufficient clearance to all moving or hot components.

WARNING: Follow the safety measures for releasing the high side fuel pressure. Refer to HIGH SIDE FUEL PRESSURE, RELEASING .

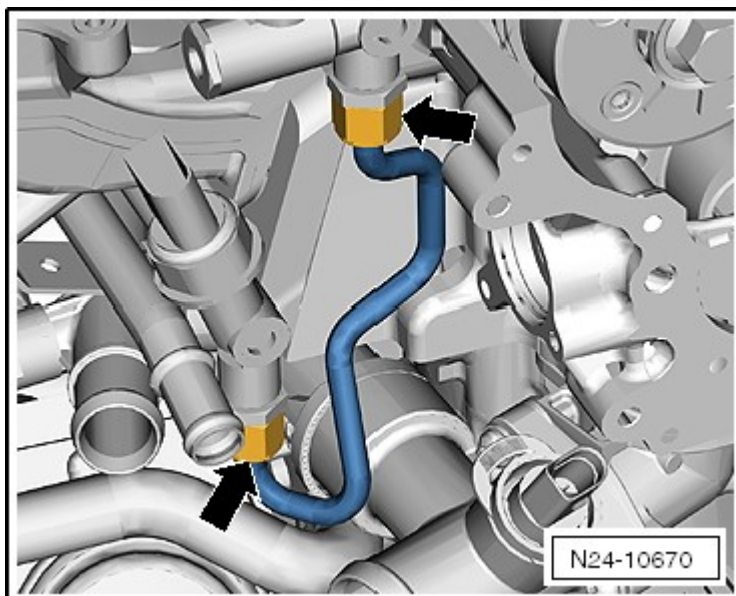
-- Disconnect the battery ground strap with the ignition turned off. Refer to Removal and Installation .

-- Remove the noise insulation. Refer to Description and Operation .

- Remove the upper intake manifold. Refer to **UPPER INTAKE MANIFOLD**.
- Remove the high pressure pump. Refer to **HIGH PRESSURE PUMP**.
- Remove fuel rail connecting pipe -arrows-.

Engine Code BLV**Fig. 19: Identifying Fuel Rail Connecting Line**

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

Engine Code CNNA**Fig. 20: Identifying Fuel Rail Connecting Pipe**

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Remove the lower intake manifold to cylinder head bolts -arrows-.

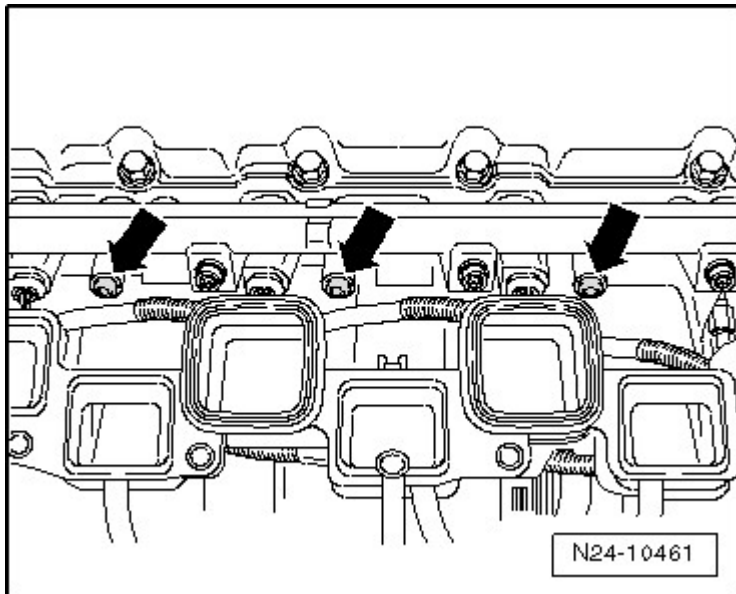


Fig. 21: Identifying Removal Of Lower Intake Manifold To Cylinder Head Bolts -Arrows-
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Remove the oil dipstick guide tube bolt -1-.

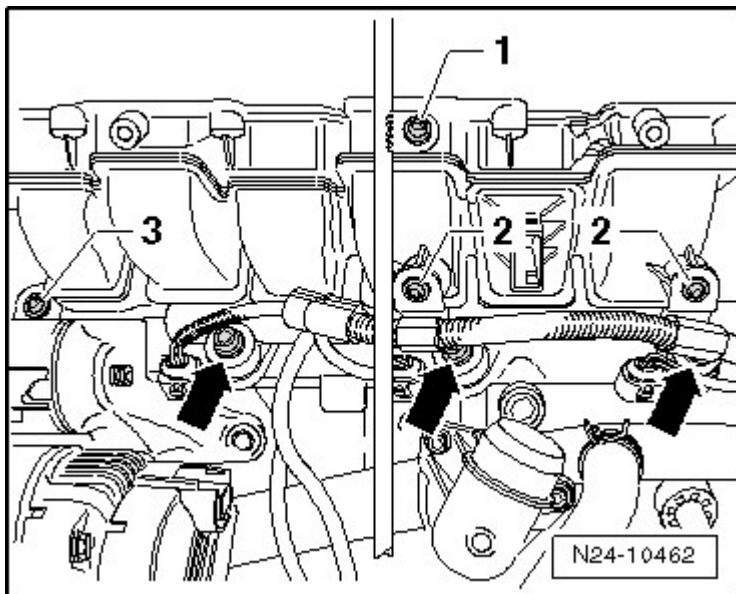


Fig. 22: Identifying Guide Tube Bolt And Brackets
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Remove the bracket bolts -2- from the lower intake manifold.

- Remove the bolt -3-.
- Remove fuel rail bolts for cylinders 2, 4 and 6 -arrows-.
- Carefully pull off the fuel rail from the fuel injectors.
- Remove the lower intake manifold.

NOTE: If a fuel injector was removed from the cylinder head, then the Teflon seal must be replaced. Refer to **FUEL INJECTOR TEFLON SEAL AND WASHER.**

Seal the intake passages in the cylinder head using clean cloths.

Installing

Installation is carried out in the reverse order while noting the following:

- Replace the O-rings between the fuel injectors and fuel rail and coat them lightly with clean engine oil.
- Replace the springs -arrow- on all the fuel injectors.

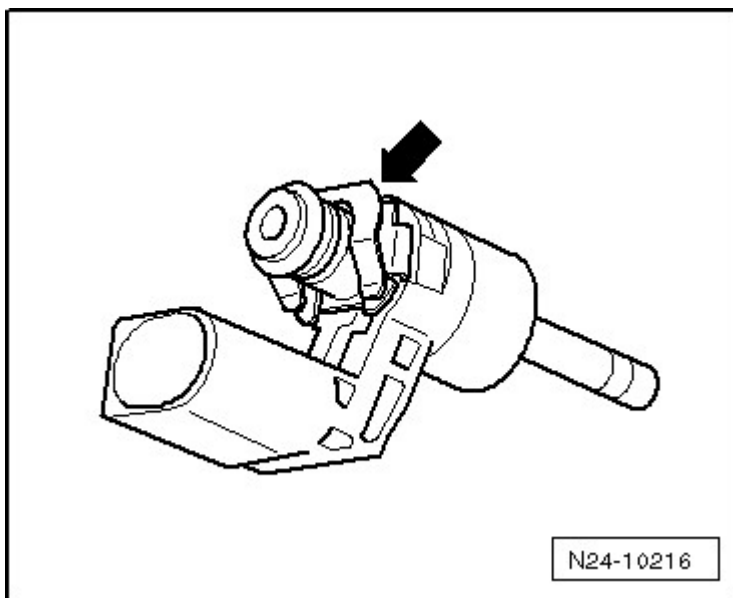


Fig. 23: Identifying Spring Elements For Fuel Injectors
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Install the lower intake manifold with new seals.
- Place the fuel rail on and press it evenly onto the fuel injectors.
- Install all the bolts for the intake manifold and fuel rail by hand.

NOTE: First, evenly tighten the new fuel rail to cylinder head bolts working from the inside to the outside.

Tighten the bolts that connect the lower intake manifold to the cylinder head.

-- Install the fuel rail connecting pipe -arrows--.

Engine code BLV

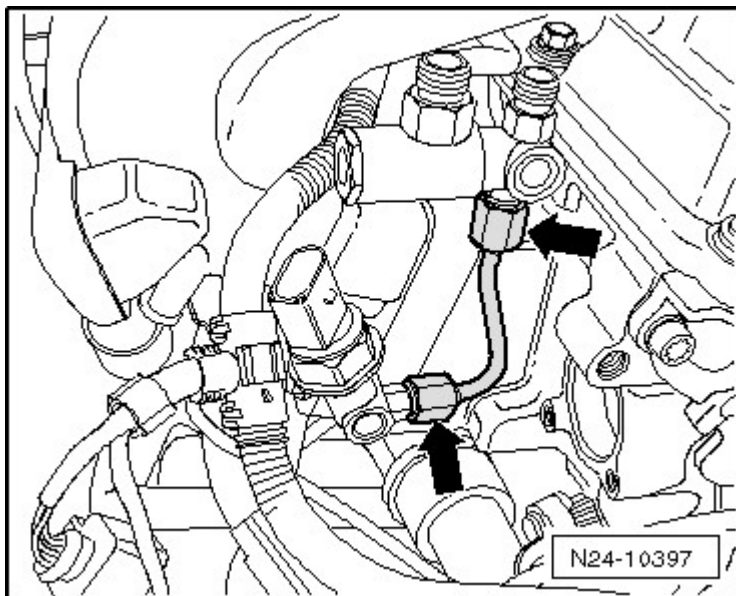


Fig. 24: Identifying Fuel Rail Connecting Line
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

Engine code CNNA

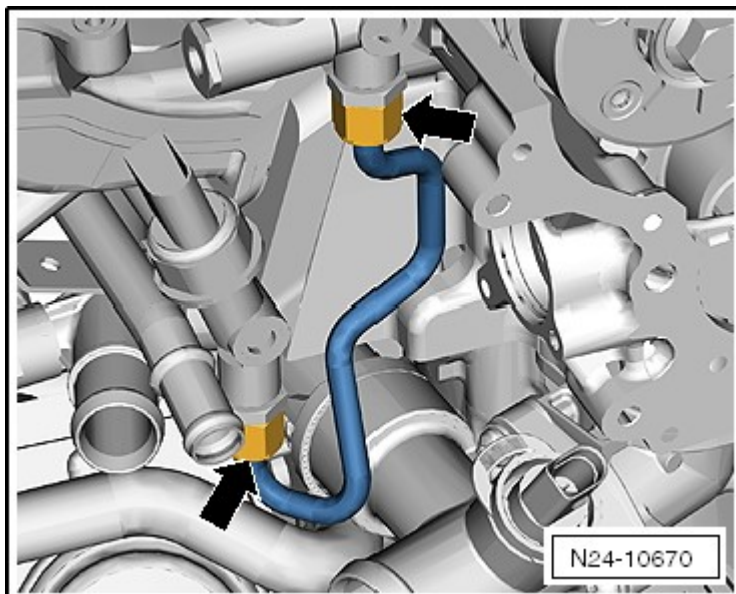


Fig. 25: Identifying Fuel Rail Connecting Pipe

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

NOTE: First, tighten the connecting pipe union nuts by hand and then tighten them to specification.

-- Install the high pressure pump. Refer to **HIGH PRESSURE PUMP**.

-- Install the upper intake manifold. Refer to **UPPER INTAKE MANIFOLD**.

Tightening Specifications	Nm
Lower intake manifold to cylinder head	8
Fuel rail to cylinder head ⁽¹⁾	30 Nm + 90° (1/4) additional turn
High pressure pump to cylinder head	10
High pressure fuel line union nuts	28
Connecting pipe to fuel rail union nuts	28
(1) always replace	

HIGH PRESSURE PUMP**Special tools and workshop equipment required**

- Flare Nut Attachment 17 mm T10456

Removing**WARNING:**

- Follow the safety measures for releasing the high side fuel pressure. Refer to **HIGH SIDE FUEL PRESSURE, RELEASING**.
- Fuel pipes are under pressure. Always wear protective eyewear and protective clothing to prevent injuries and fuel from coming in contact with your skin. Before loosening the fuel pipe, place a cloth around the connection point. Then release pressure by carefully loosening.

-- Remove the cover -1- from the air duct, disengage the clips sideways to do so.

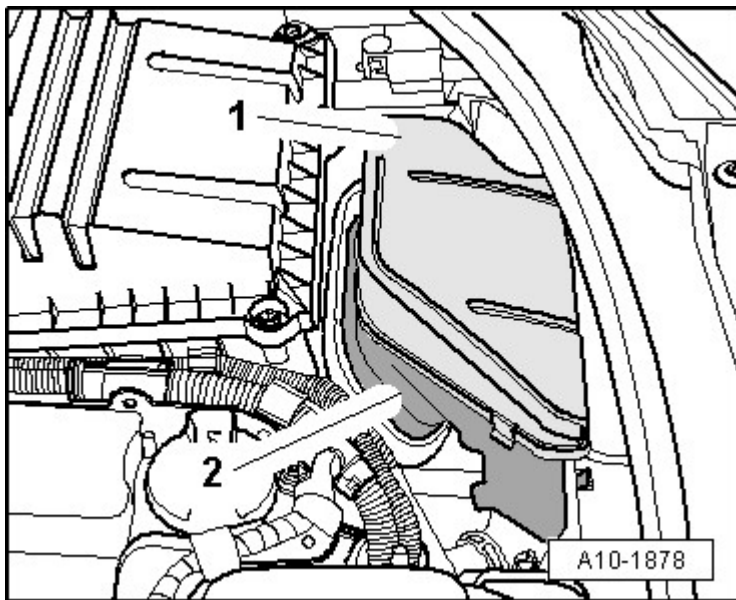


Fig. 26: Identifying Air Duct Cover & Air Duct
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Unclip the air duct -2-.

-- Remove the air filter housing and connecting pipe, while doing this remove the bolt -A-, disconnect the connector -B- and remove the spring clip -C-. When reinstalling, observe the mark -D-.

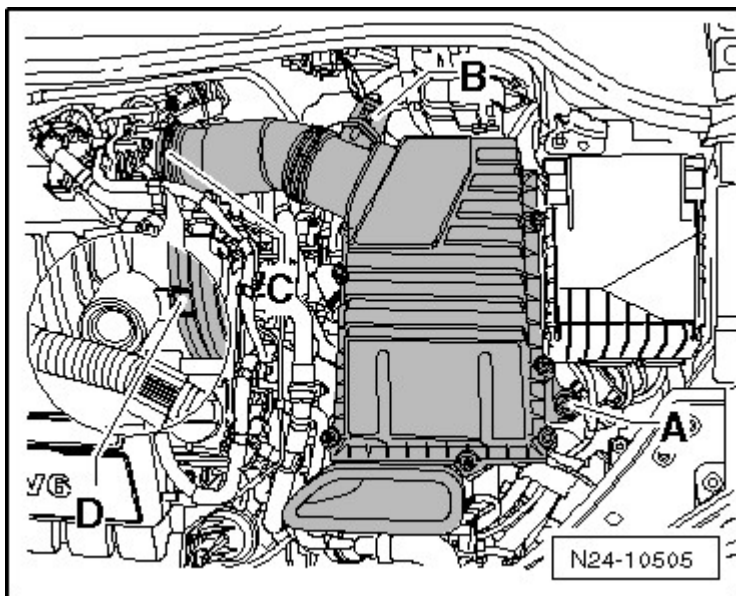


Fig. 27: Air Filter Housing Bolt, Connector, Spring Clip & Vacuum Line
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Remove the air duct bolts -arrows- from the lock carrier and remove the air duct.

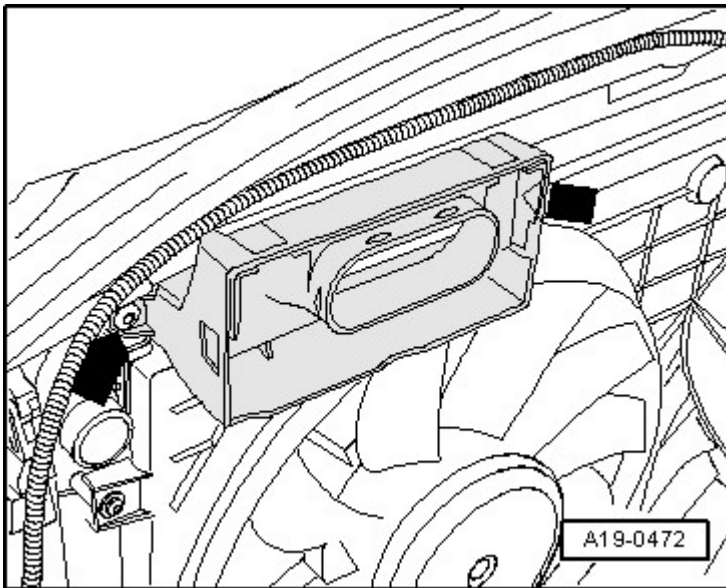


Fig. 28: Identifying Air Guide Screws -Arrows- And Air Guide
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Remove the lifting eye bolts -arrows- and lifting eye -A-.

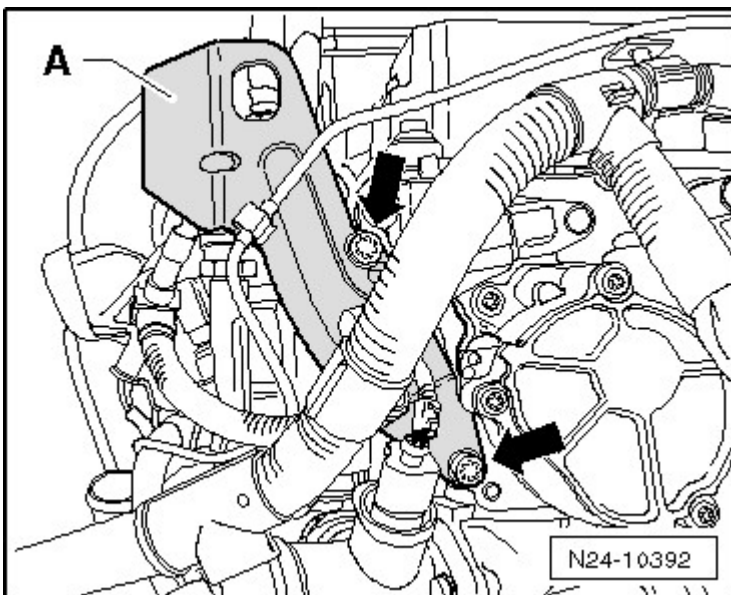


Fig. 29: Identifying Removal Of Lifting Eyes
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Disconnect the connector -arrow- from the fuel pressure sensor -G247-.

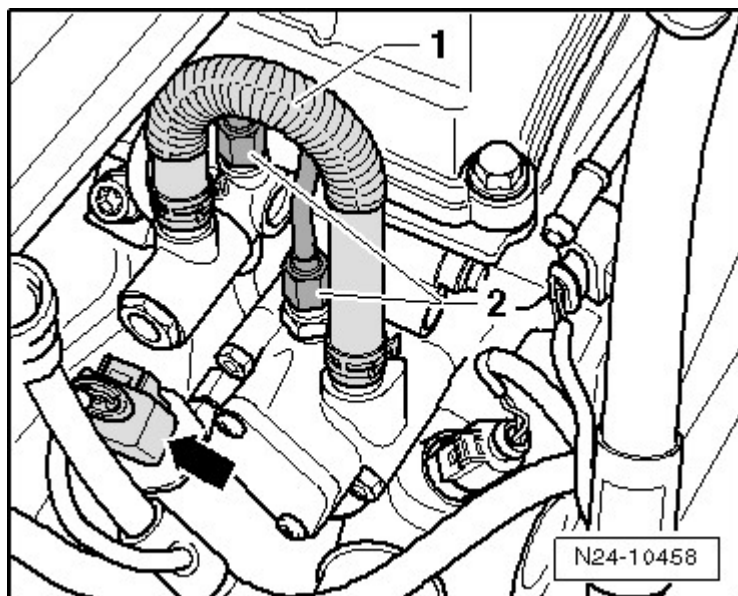


Fig. 30: Identifying Removal Of Low Pressure Hose -1- And High Pressure Line -2-
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Disconnect the low pressure hose -1-.

-- Remove the high pressure line -2-. When doing this, counter hold the connections on the high pressure pump using a wrench.

NOTE: For the union nuts, use the flare nut attachment 17 mm T10456.

The low pressure hose must always be replaced because it is damaged when it is removed from the ridged connections. Fuel rail, injectors and high pressure pump overview. Refer to FUEL RAIL, INJECTORS AND HIGH PRESSURE PUMP OVERVIEW.

-- Disconnect the connector -A-, remove the bolts -arrows- and remove the high pressure pump -B- from the engine.

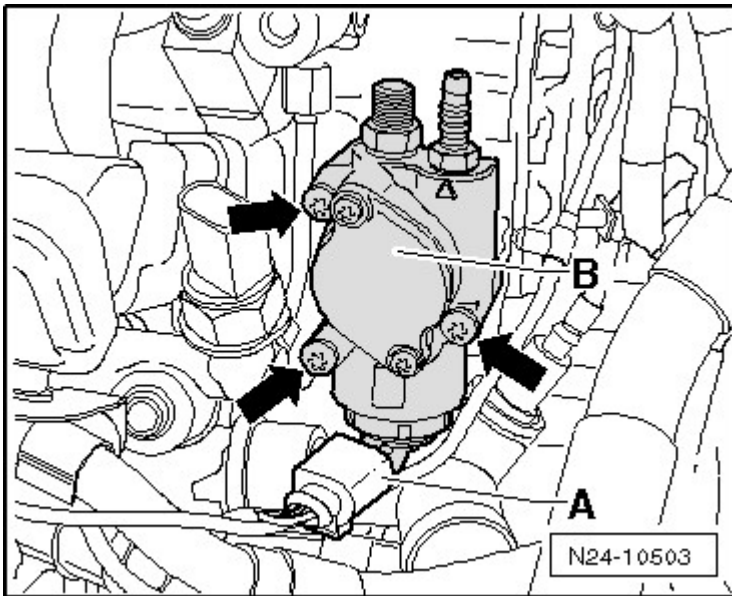


Fig. 31: Identifying Connector -A-, Bolts And High Pressure Pump -B-
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

Installing

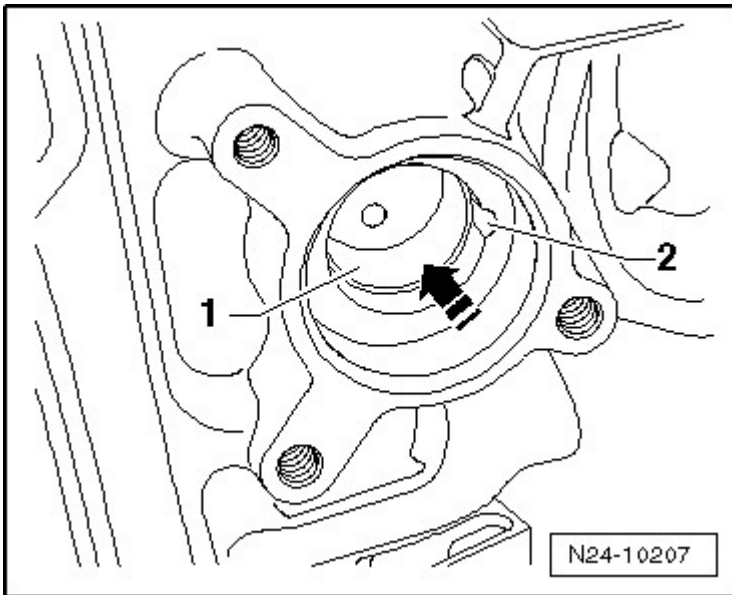


Fig. 32: Identifying Oiled Lifter With Guide Inserted Perpendicularly Into Cylinder Head
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Check the high pressure pump cam follower for damage; replace it if necessary.
- Insert the lubricated cam follower -1- with the guide -2- perpendicularly into the cylinder head.
- Rotate the engine at the vibration damper slowly in engine rotation direction. When doing this, press the cam follower in the -direction of the arrow- until it reaches the deepest point in the cylinder head.

- Replace the O-ring on the high pressure pump and coat it lightly with clean engine oil.
- Install the high pressure pump and evenly tighten the bolts -arrows-.

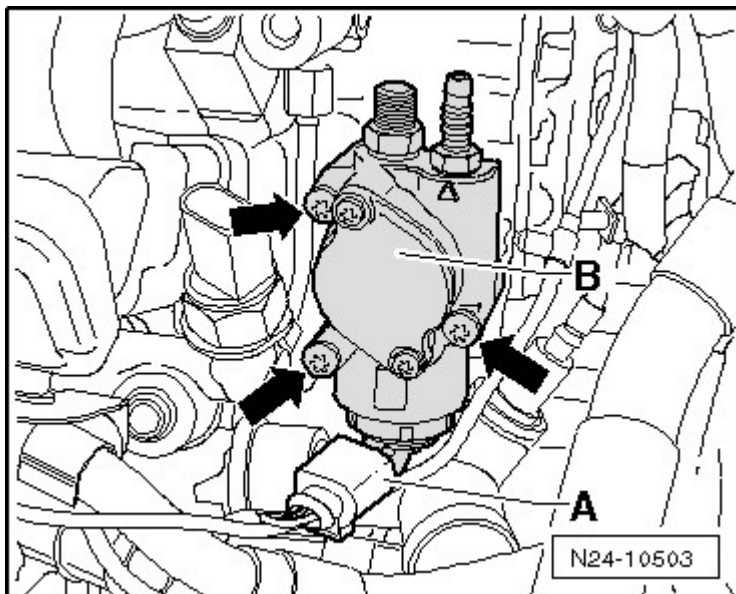


Fig. 33: Identifying Connector -A-, Bolts And High Pressure Pump -B-
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

For the correct tightening specification, refer to **FUEL RAIL, INJECTORS AND HIGH PRESSURE PUMP OVERVIEW**.

- Tighten the connections on the high pressure pump for the low pressure hose at the high pressure pipe.

Connection for the high pressure pipe: 40 Nm

Connection for the low -pressure hose: 28 Nm

CAUTION:

- The low pressure hose must always be replaced because it is damaged when it is removed from the ridged connections.
- The low pressure hose and high pressure pipe must not touch after being tightened. Ensure sufficient clearance.

- Install the new low pressure hose -A-. Pay attention to the installation marks and position of the spring clamps -arrows-.

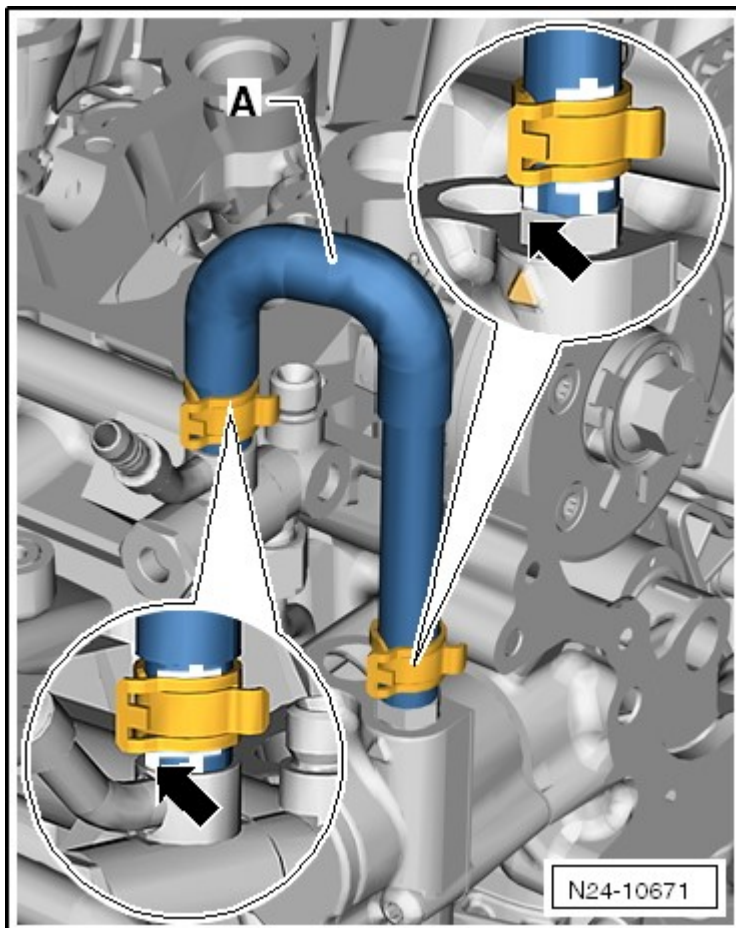


Fig. 34: Identifying Low Pressure Hose -A- And Installation Marks
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Install the high pressure pipe and tighten by hand.

-- Tighten the high pressure pipe -A- evenly while counter holding the high pressure pipe in the -direction of the arrow-. The high pressure pipe -A- and low pressure hose -B- must not touch after being tightened.

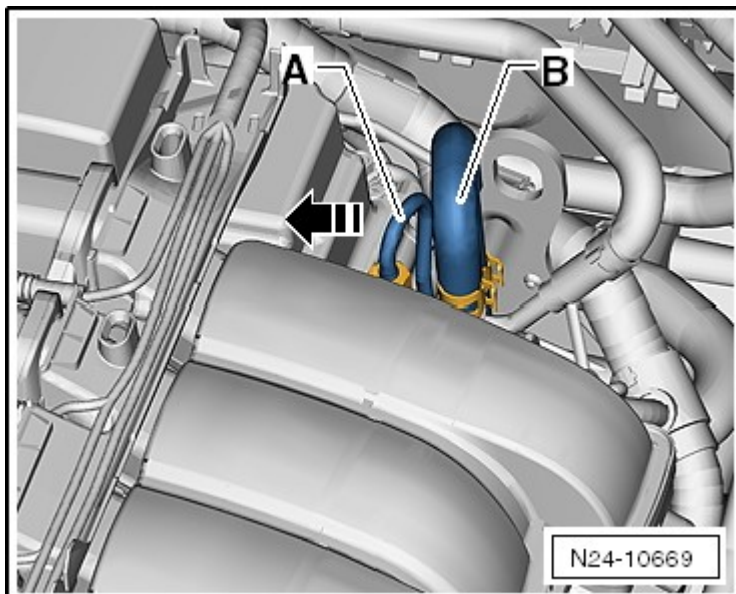


Fig. 35: Identifying High Pressure Pipe -A- And Low Pressure Hose -B-
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

For the union nuts, use the flare nut attachment 17 mm T10456.

- Tightening specification: 28 Nm

Install the engine lifting eye.

FUEL INJECTORS

Read the safety precautions before starting. Refer to SAFETY PRECAUTIONS .

NOTE: Each time a fuel injector is replaced, the Teflon seal must also be replaced.
Refer to FUEL INJECTOR TEFLON SEAL AND WASHER.

The long fuel injectors for cylinders 1, 3 and 5 must not be separated.

Special tools and workshop equipment required

- Torque Wrench (5-50 Nm) V.A.G 1331
- Tool Set T10133

Removing

-- Remove the upper intake manifold. Refer to UPPER INTAKE MANIFOLD.

Cylinder 1, 3 and 5 Injectors

-- Remove the lower intake manifold. Refer to LOWER INTAKE MANIFOLD, WITH FUEL RAIL.

-- Remove the fuel rail.

Cylinder 2, 4 and 6 Injectors

-- Remove the fuel rail.

Continuation for all Injectors

-- Push the O-ring upward by hand as shown and remove it from the fuel injector.

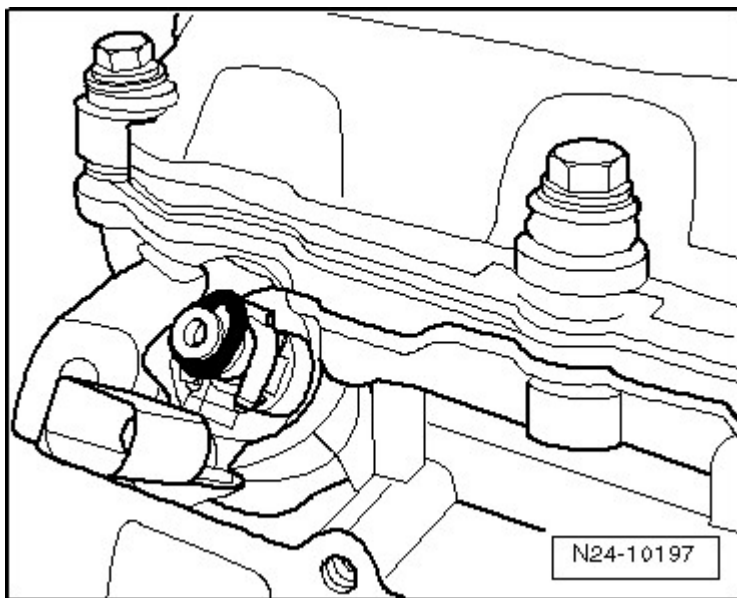


Fig. 36: Identifying Fuel Injector O-Ring

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Install the hammer T10133/3 to the puller T10133/15.

-- Then guide the puller T10133/15 into the groove -arrow- on the fuel injector.

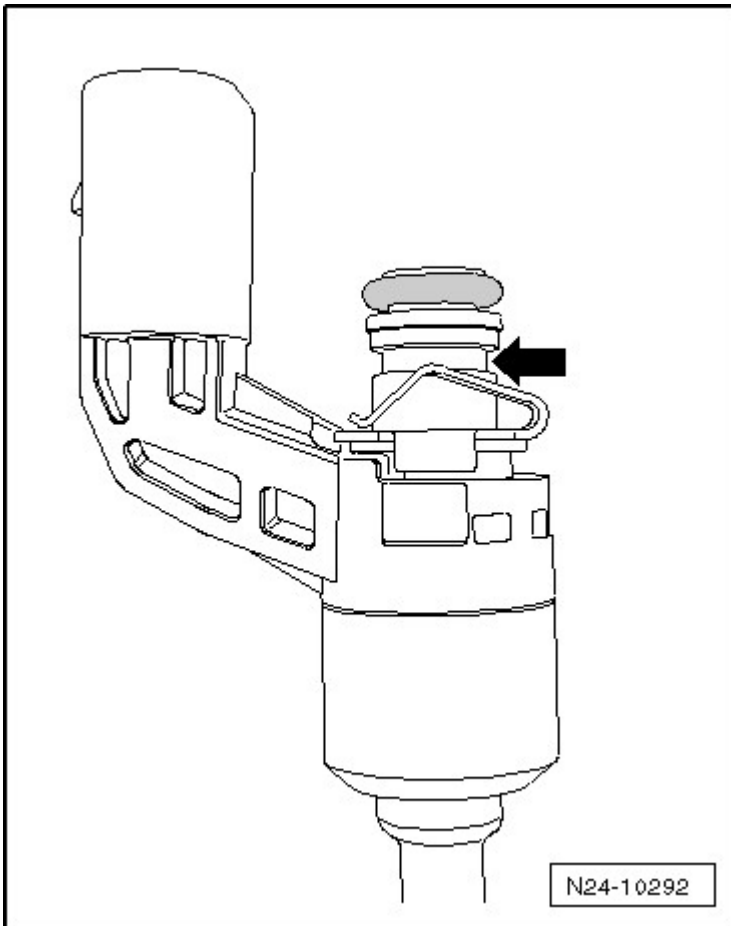


Fig. 37: Guiding Puller T10133/15 Onto Groove On Fuel Injector
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

NOTE: The spring -arrow- must not be removed prior to removing the injectors.

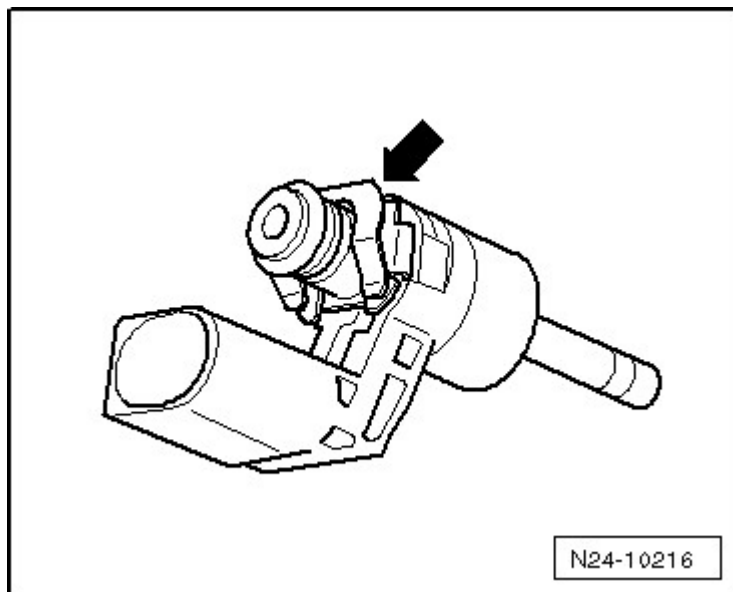


Fig. 38: Identifying Spring Elements For Fuel Injectors
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Remove the fuel injector carefully.

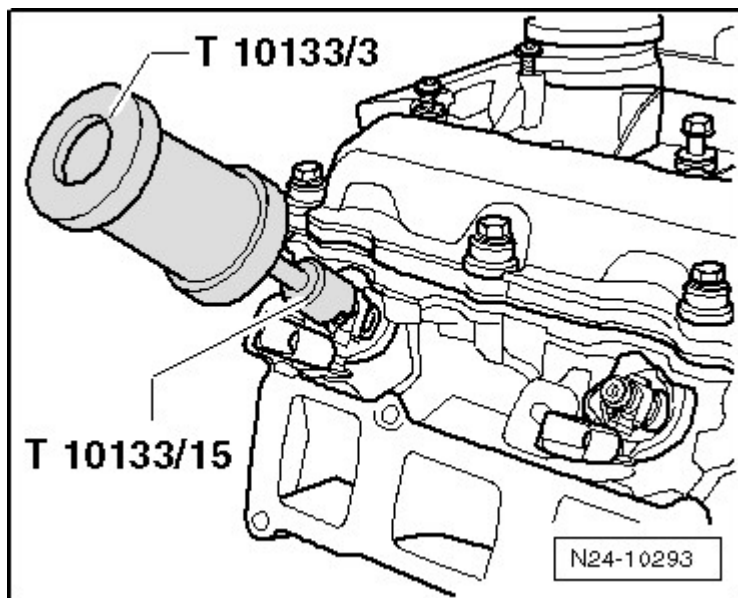


Fig. 39: Identifying Fuel Injector
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

Installing

-- Thoroughly clean the injector bores in the cylinder head using a nylon brush T10133/4.

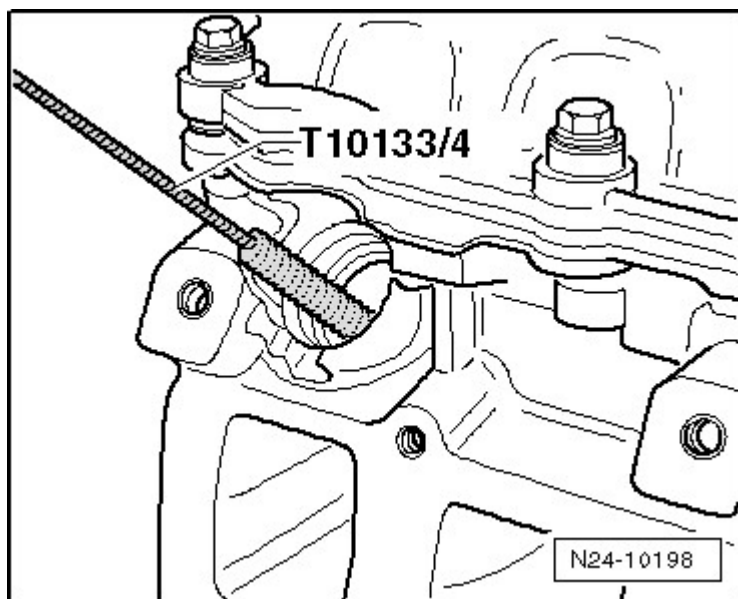


Fig. 40: Cleaning Bores For Fuel Injectors In Cylinder Head Using Nylon Brush T10133/4
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Check the washer -item 10- in the **FUEL RAIL, INJECTORS AND HIGH PRESSURE PUMP OVERVIEW** for damage and replace it if necessary. Refer to **FUEL INJECTOR TEFLON SEAL AND WASHER**.

-- Replace the spring -arrow- and Teflon seal each time the fuel injector is removed. Refer to **FUEL INJECTOR TEFLON SEAL AND WASHER**.

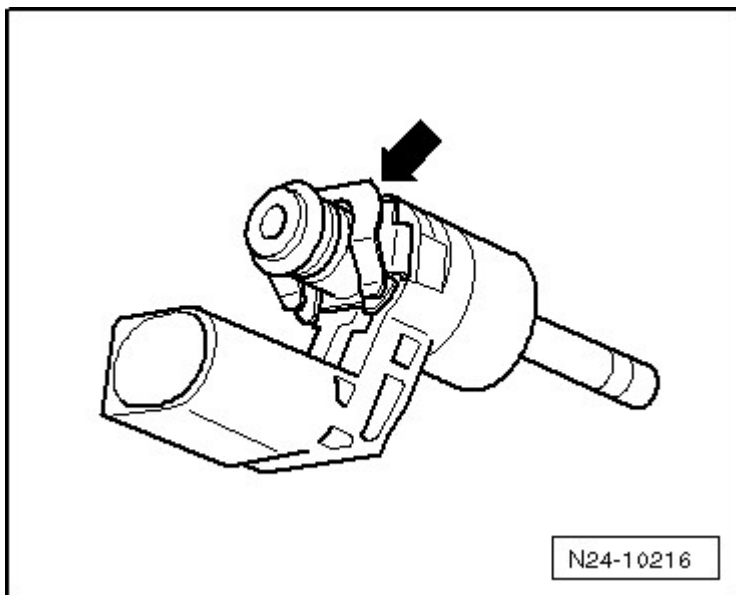


Fig. 41: Identifying Spring Elements For Fuel Injectors
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Replace the O-rings between the fuel injectors and fuel rail and coat them lightly with clean engine oil.

NOTE: The seal -item 13- in the **FUEL RAIL, INJECTORS AND HIGH PRESSURE PUMP OVERVIEW** must also be replaced on the fuel injectors for cylinders 1, 3 and 5.

The Teflon seal must not be oiled or greased.

-- Press the fuel injector by hand, into the cylinder head bore until it is seated.

-- Check the fuel injectors for correct seating and installed position in the cylinder head.

Cylinder 1, 3 and 5 Injectors

-- Place the fuel rail on and press evenly onto the fuel injectors.

-- Tighten the new fuel rail bolts uniformly. Tightening specification: 30 Nm + 90° (1/4) additional turn.

Cylinder 2, 4 and 6 Injectors

-- Install the fuel rail.

Continuation for all Injectors

-- Install the upper intake manifold. Refer to **UPPER INTAKE MANIFOLD**.

FUEL INJECTOR TEFLON® SEAL AND WASHER

NOTE: The long fuel injectors for cylinders 1, 3 and 5 must not be separated.

Special tools and workshop equipment required

- Tool Set T10133

Teflon Seal, Replacing

-- Remove the upper intake manifold. Refer to **UPPER INTAKE MANIFOLD**.

-- Remove the fuel injectors. Refer to **FUEL INJECTORS**.

-- Clean the fuel injector.

-- Cut the seal -arrow- off using a knife. When doing so, do not allow the knife blade to come into contact with the injector body.

-- Remove the seal and clean the groove for the seal -arrow- area. Remove any deposits (coking) using a brass wire brush.

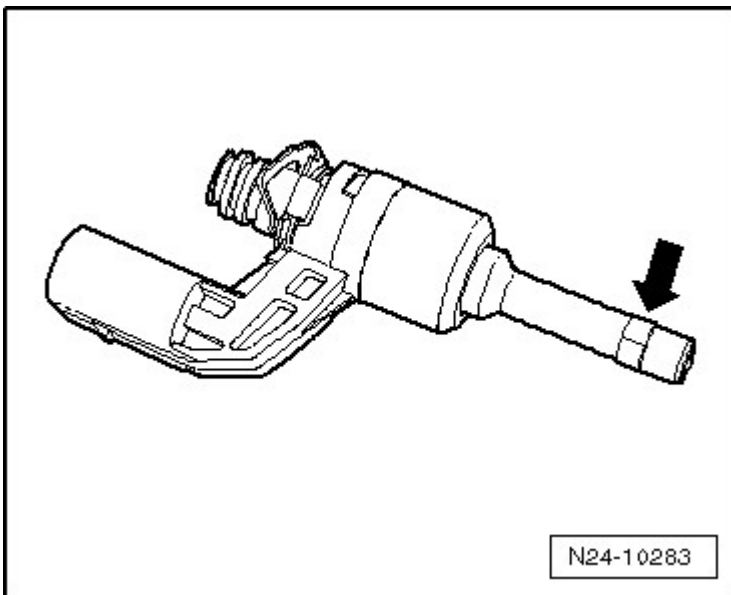


Fig. 42: Identifying Removal Of Sealing Ring And Cleaning Ring Groove In Seal Area
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Place a new seal -1- onto the assembly cone T10133/5. Slide the seal with the assembly sleeve T10133/6

(knurl faces toward the seal -1-) lightly onto the assembly cone T10133/5 as far as it will go.

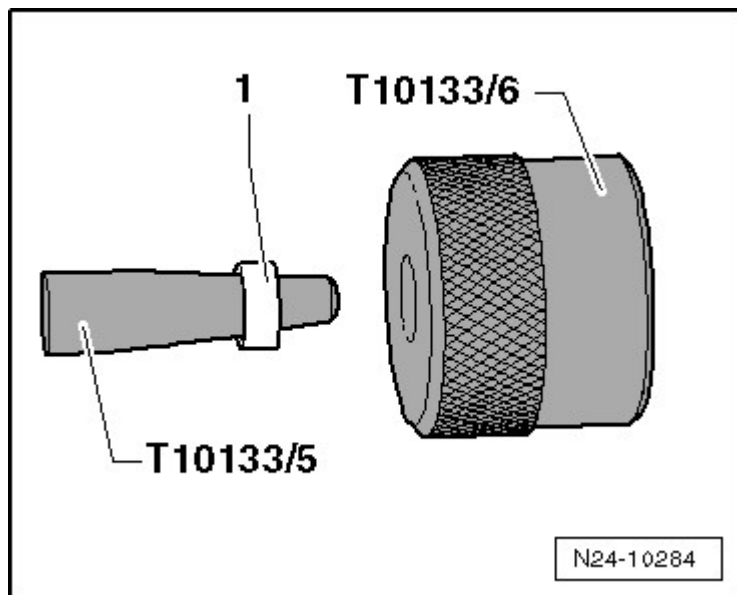


Fig. 43: Identifying Sealing Ring, Assembly Cone T10133/5 & Assembly Sleeve T10133/6
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Rotate the assembly sleeve T10133/6 (knurl no longer faces toward the seal) and slide the seal -1- to the end of the assembly cone T10133/5.

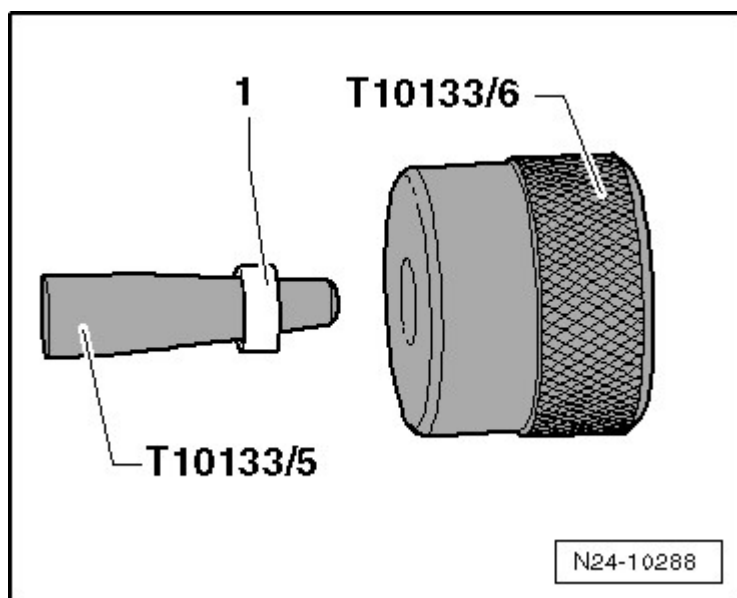


Fig. 44: Identifying Assembly Cone T10133/5, Assembly Sleeve T10133/6, And Sealing Ring
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Now, place the assembly cone T10133/5 with the seal onto the fuel injector. Slide the seal with the assembly sleeve T10133/6 farther onto the fuel injector.

The seal no longer sits in its groove.

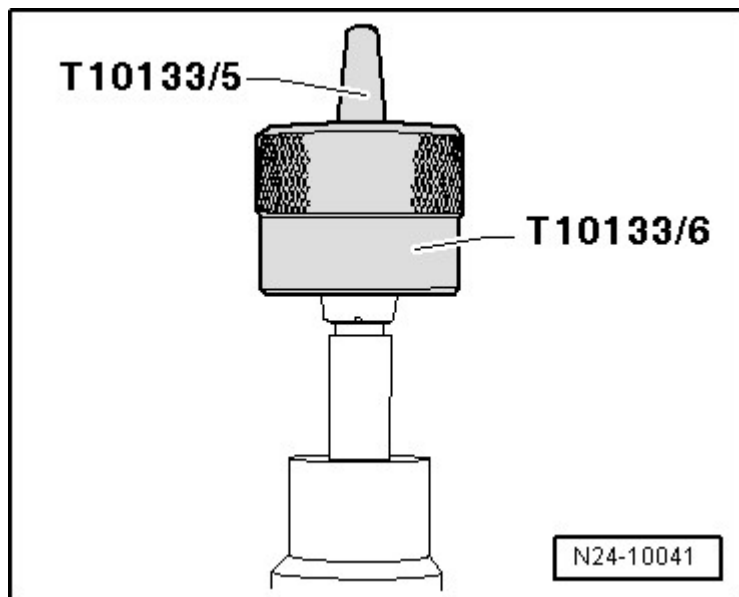


Fig. 45: Identifying Sealing Ring Slid On To Fuel Injector Using Assembly Sleeve T10133/6
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Remove the assembly sleeve T10133/6 and the assembly cone T10133/5.
- Slide the seal by hand into the groove.
- Place the spacer sleeve T10133/11 on the injector body.
- Now, press the sizing sleeve T10133/7 over the seal to the stop on the spacer sleeve T10133/11.
- Remove the sizing sleeve T10133/7.

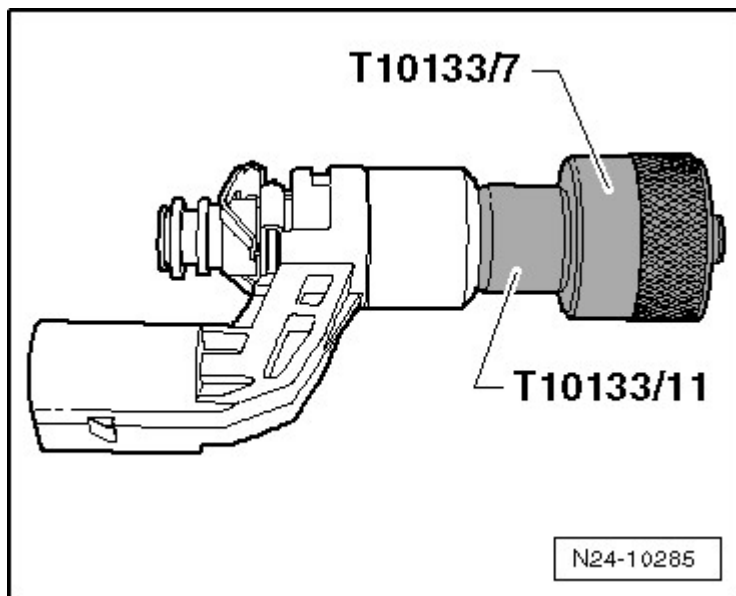


Fig. 46: Identifying Sizing Sleeve T10133/7 And Spacer Sleeve T10133/11
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Now, press the sizing sleeve T10133/8 over the seal to the stop on the spacer sleeve T10133/11.

-- Remove the sizing sleeve T10133/8.

The Teflon seal now has the correct installed dimension.

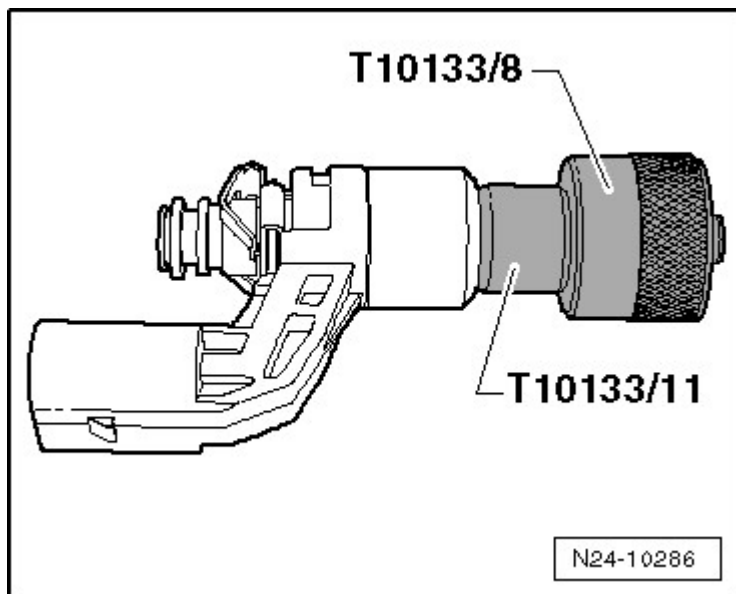


Fig. 47: Identifying Sizing Sleeve T10133/8
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

Washer, Replacing

-- Remove the O-ring -3-.

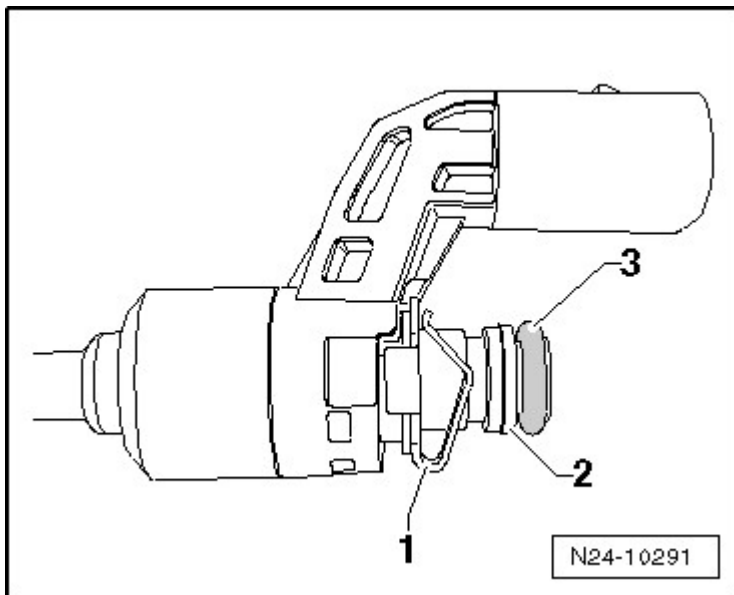


Fig. 48: Identifying O-Ring, Support Washer & Spring Element
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Cut the washer -2- with a small edge knife and remove it.

-- Remove the spring -1- from the fuel injector and slide on the locking plate T10133/12.

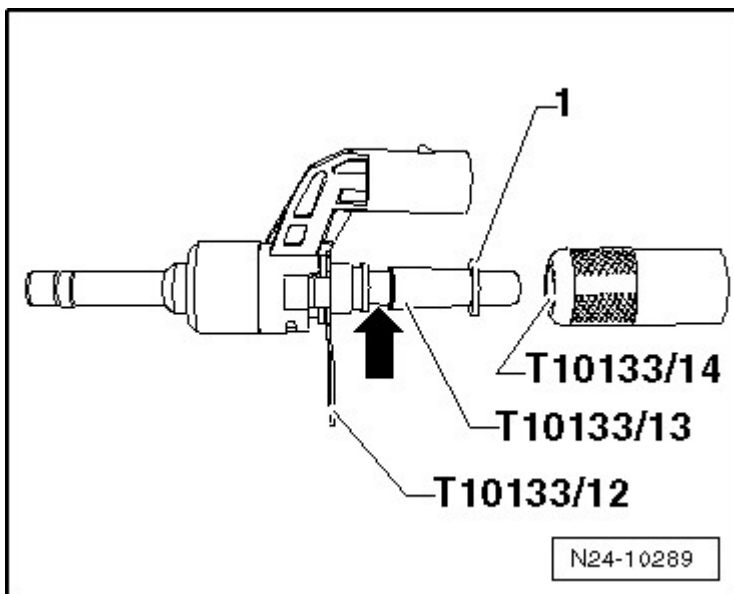


Fig. 49: Identifying Support Washer With Sizing Sleeve T10133/14 (Knurled Side Faces Toward Fuel Injector) And Fuel Injector

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Place a new washer -1- on the assembly cone T10133/13 and place this as shown on the fuel injector.

-- Slide the washer -1- with the sizing sleeve T10133/14 (knurled side faces toward the fuel injector) up to the first groove -arrow- on the fuel injector.

-- Now, rotate the sizing sleeve T10133/14 (knurled side no longer faces toward the fuel injector). Slide the sizing sleeve over the support washer -1- in the -direction of the arrow- to the stop on the locking plate T10133/12.

-- Remove the sizing sleeve T10133/14.

The support washer is now the correct size.

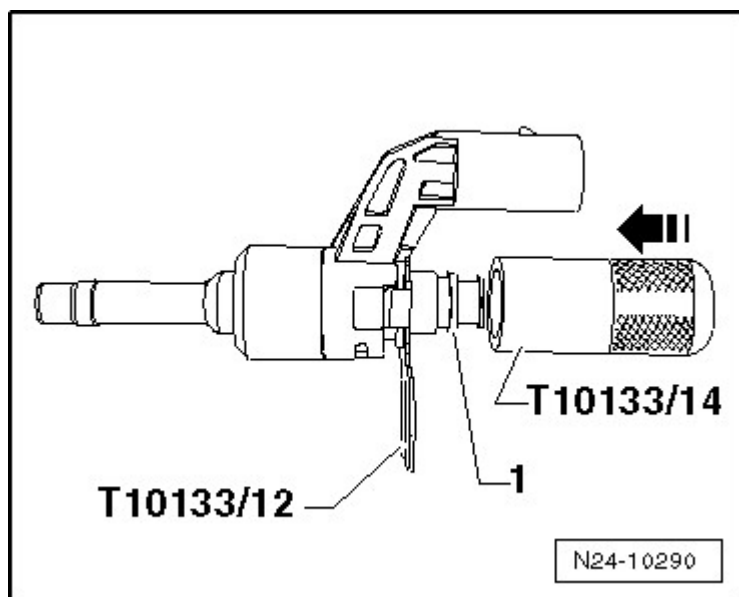


Fig. 50: Identifying Sizing Sleeve, Support Washer And Locking Plate T10133/12
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Now, install a new spring -1- for the locking plate T10133/12 and place a new O-ring -3- in front of the support washer -2-.

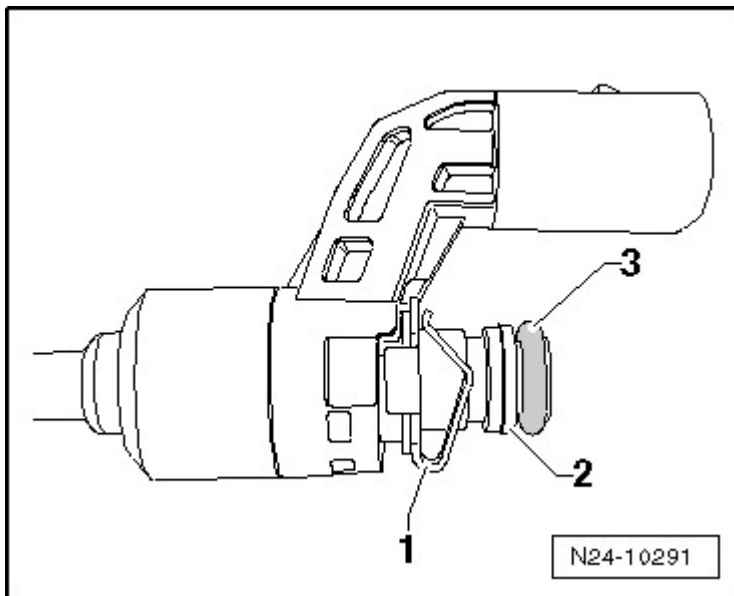


Fig. 51: Identifying O-Ring, Support Washer & Spring Element
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

NOTE: The Teflon seal -arrow- must not be oiled for installing fuel injector.

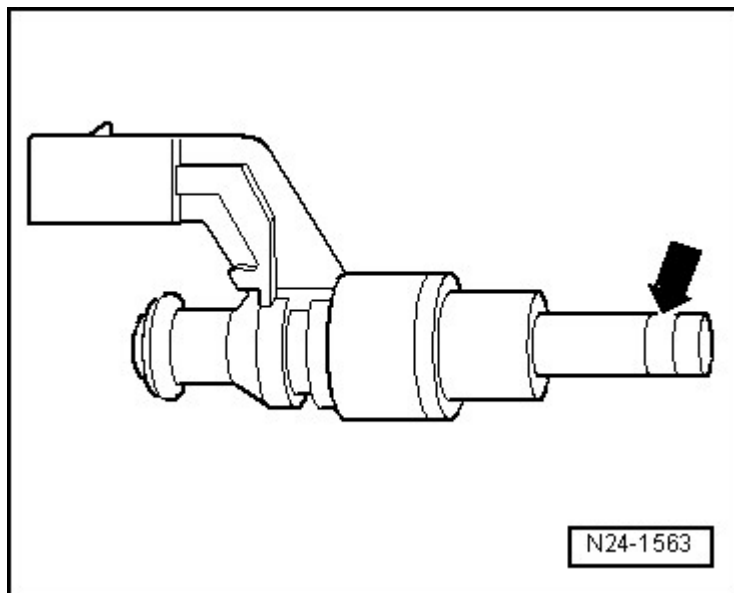


Fig. 52: Cleaning Fuel Injector In Area Of Sealing Ring
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Install the fuel injectors.

NOTE: The seal -item 13- in the **FUEL RAIL, INJECTORS AND HIGH PRESSURE PUMP OVERVIEW** must also be replaced for the fuel injectors for cylinders 1, 3 and 5.

ENGINE CONTROL MODULE -J623- WITHOUT AN ANTI-THEFT IMMOBILIZER

NOTE: If it is desired to replace the Engine Control Module (ECM), connect the vehicle diagnostic tester and perform the guided function "Replace Engine Control Module (ECM)".

Removing

- Turn off the ignition.
- Remove the windshield wiper arms. Refer to **Removal and Installation Removal and Installation** .
- Remove the plenum chamber cover. Refer to "Moldings and Trim" in **Removal and Installation** .
- Disconnect the connector -1- from the windshield defogger control module -J505-.
- Slide the connector catches -2- on the ECM outward and remove both connectors.

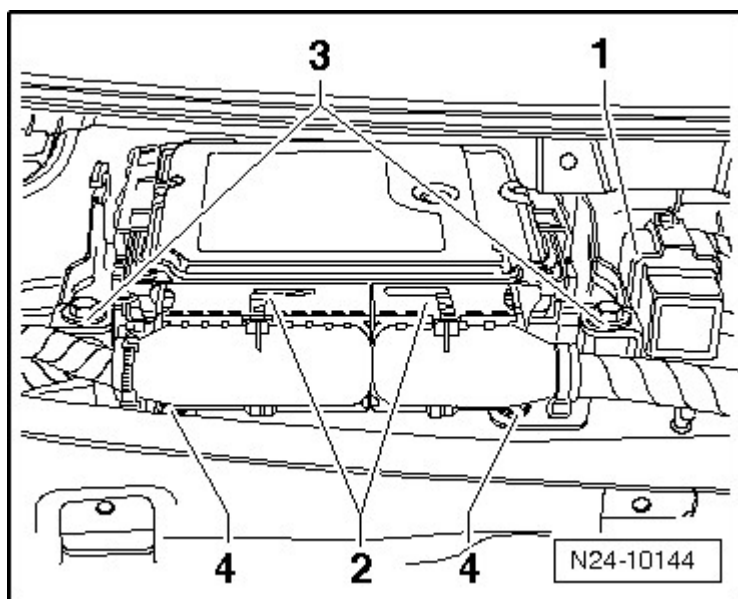


Fig. 53: Identifying Placement Of Mounting Frame With Engine Control Module (ECM) On To Bracket
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Remove the bolts -3-.
- Remove the mounting frame with the ECM from the plenum chamber.
- Press the release catches -1- outward and slide the ECM -2- from the mounting frame.

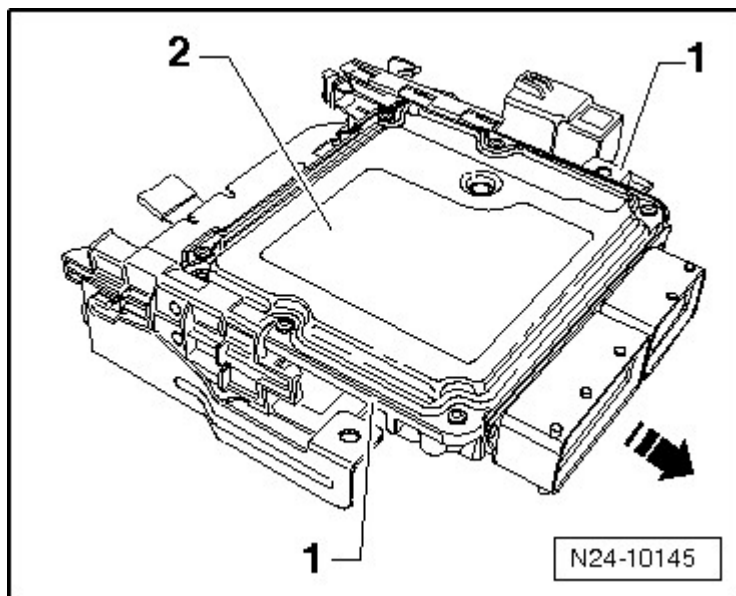


Fig. 54: Identifying Pressing Of Release Catches Outward And Slide Engine Control Module (ECM) From Mounting Frame

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

Installing

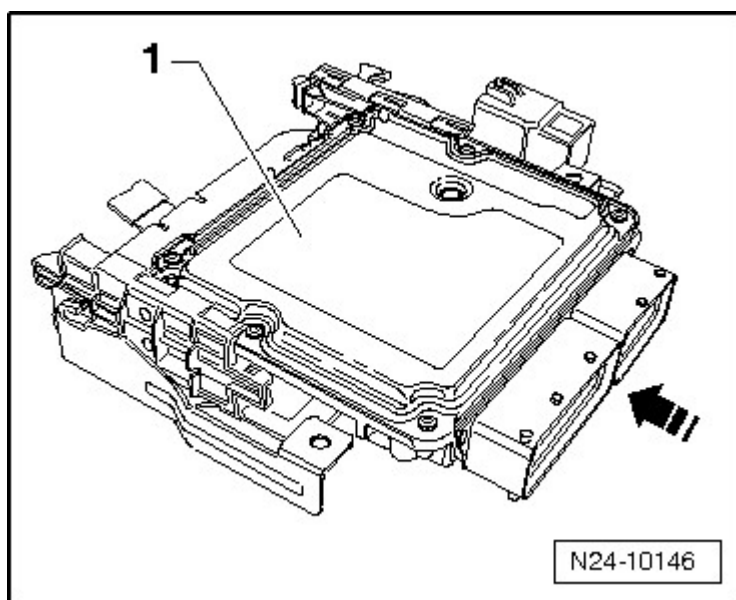


Fig. 55: Identifying Engine Control Module (ECM) And Mounting Frame

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Slide the ECM -1- into the mounting frame in the -direction of the arrow-.

-- Place the mounting frame with the ECM onto the bracket -4-.

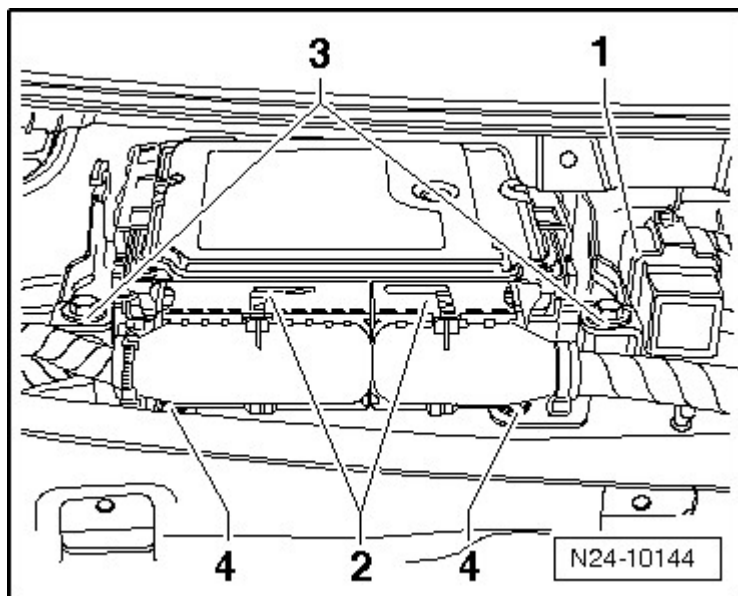


Fig. 56: Identifying Placement Of Mounting Frame With Engine Control Module (ECM) On To Bracket
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

Tightening specification of the bracket nuts: 6 Nm.

- Tighten the bolts -3- to 7 Nm.
- Connect the connector to the ECM and slide the catches -2- inward.
- Connect the connector -1- to the windshield defogger control module.
- Install the plenum chamber cover. Refer to "Moldings and Trim" in **Removal and Installation** .
- Install the windshield wiper arms. Refer to **Removal and Installation** .

ENGINE CONTROL MODULE -J623- WITH AN ANTI-THEFT IMMOBILIZER

NOTE: If it is desired to replace Engine Control Module (ECM), connect the vehicle diagnostic tester and perform the guided function "Replace Engine Control Module (ECM)".

Special tools and workshop equipment required

- Locking Pliers

Removing

- Turn off the ignition.
- Remove the windshield wiper arms. Refer to **Removal and Installation** .

-- Remove the plenum chamber cover. Refer to "Moldings and Trim" in **Removal and Installation** .

NOTE: In order to prevent the control module from coming in contact with water, some control modules have a cover. They are secured to the ECM with bolts -1-.

-- Remove the bolts -1-.

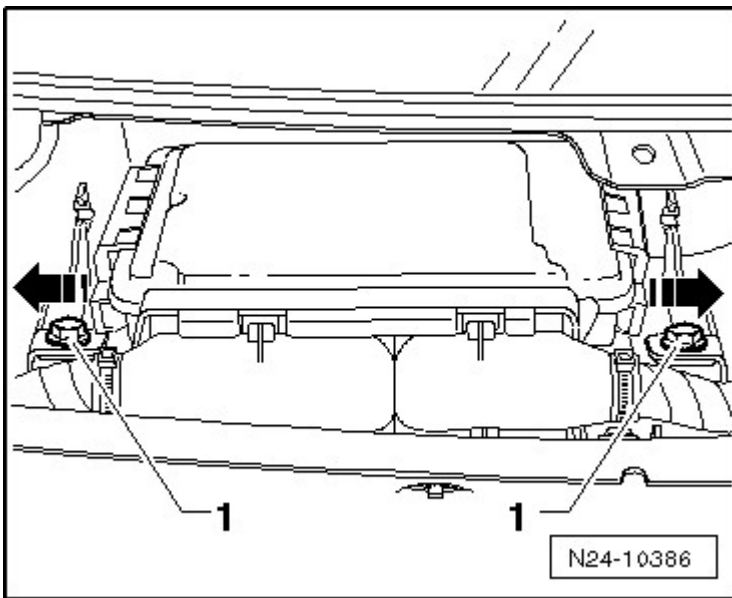


Fig. 57: Identifying Bolts And Engine Control Module
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

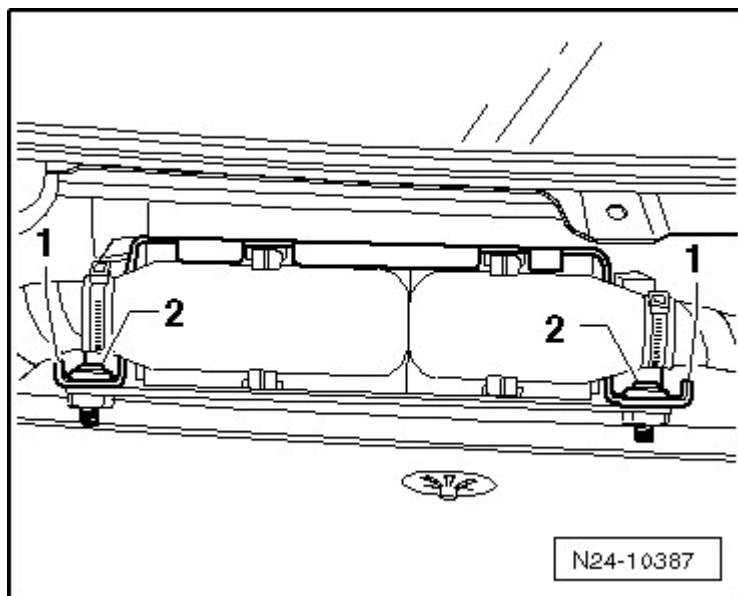
-- Remove the cover, if present, carefully.

-- Cover the plenum chamber with a clean cloth so that it does not get scratched.

-- Raise the ECM with retaining mount slightly.

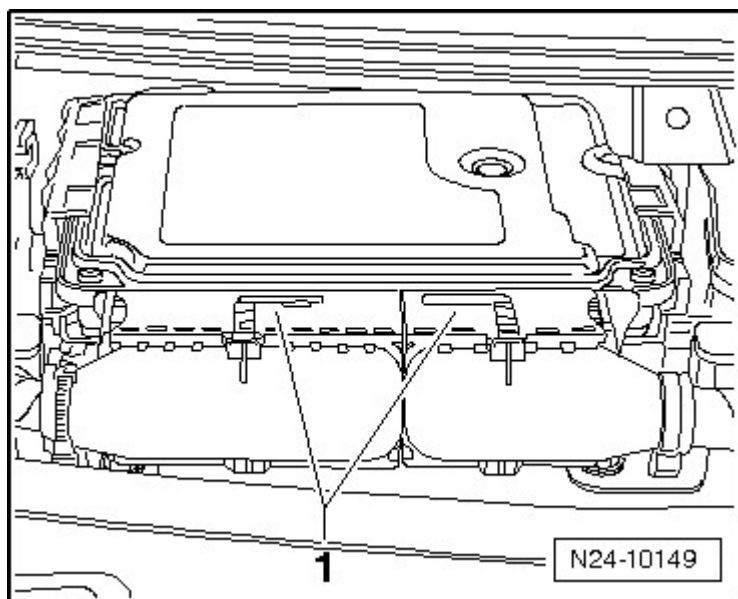
-- Release the ECM -arrows- and pull it out slightly.

-- Bend the raised ends -1- of the locking bracket outward.

**Fig. 58: Identifying Raised Ends & Shear Bolts**

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Remove the shear bolts -2- using locking pliers and remove the locking bracket.
- Slide the connector catches -1- on the ECM outward and remove both connectors.

**Fig. 59: Identifying Connector Release Catches**

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Remove the ECM.

Installing

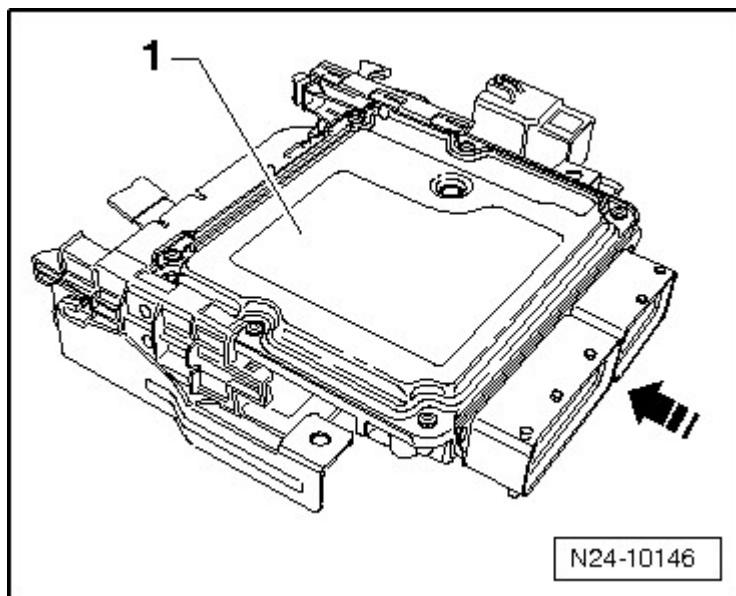


Fig. 60: Identifying Engine Control Module (ECM) And Mounting Frame
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Slide the ECM -1- in the -the direction of the arrow- into the mounting frame until it engages.

-- Tighten the mounting frame.

Tightening specification: 6 Nm

-- Connect the connector on the ECM and slide the catches -1- inward.

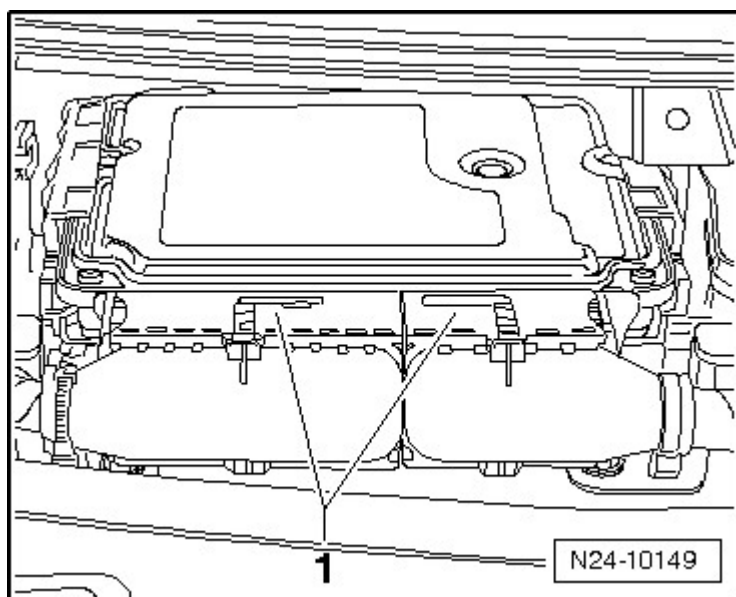


Fig. 61: Identifying Connector Release Catches
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Take a new locking bracket and tighten the new shear bolts evenly until bolt heads shear off.
- Install the plenum chamber cover. Refer to "Moldings and Trim" in **Removal and Installation** .
- Install the windshield wiper arms. Refer to **Removal and Installation** .

SPECIAL TOOLS

Special tools and workshop equipment required

- Flare Nut Attachment 17 mm T10456
- Assembly Tool T10118

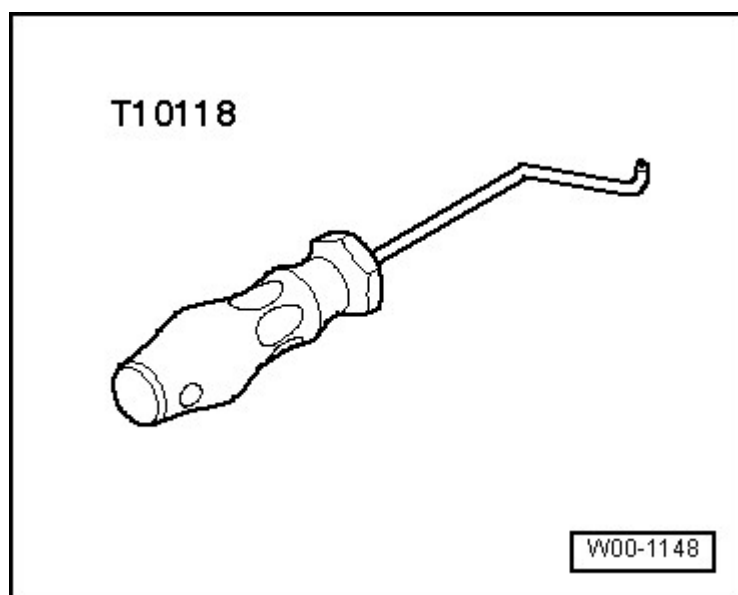


Fig. 62: Assembly Tool T10118

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Pressure Sensor Tester VAS 6394
- Test Instrument Adapter/DSO (3-pin) VAS 5570
- Adapter VAS 6394/3

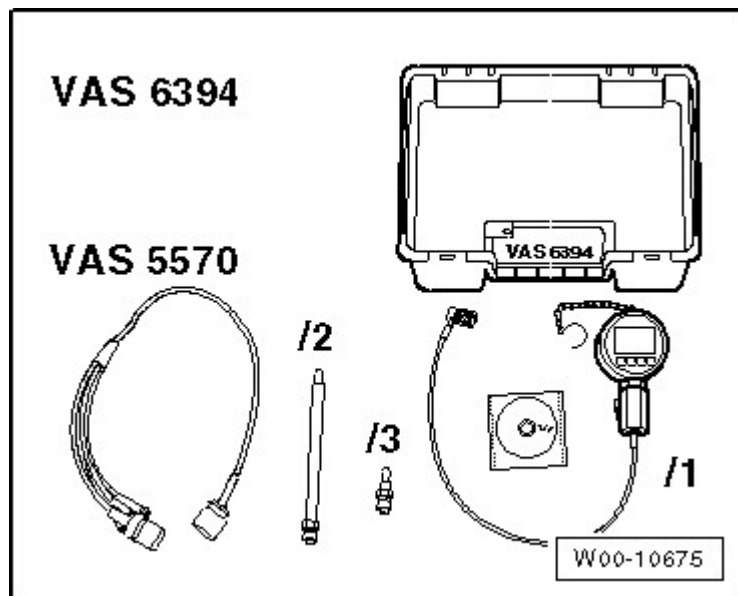


Fig. 63: Identifying Adapter VAS 6394/2

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

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

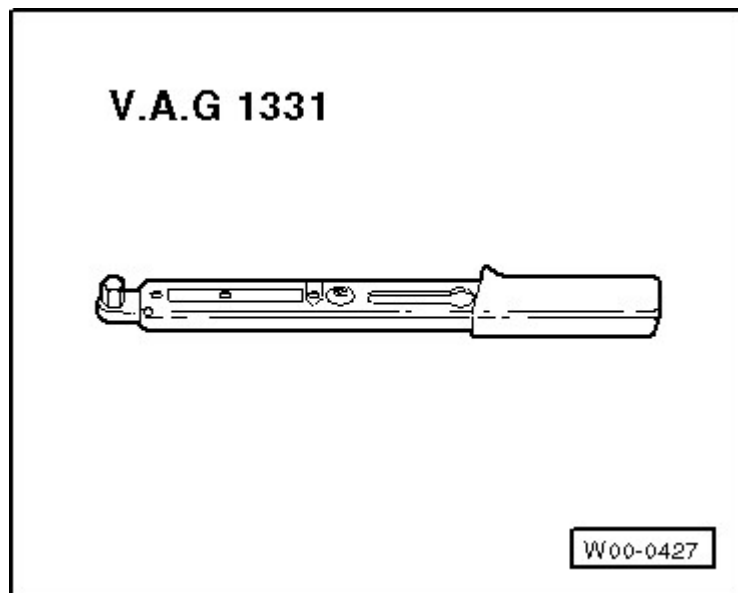


Fig. 64: Identifying Torque Wrench (5 To 50 Nm) V.A.G 1331

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Assembly Tool T10118

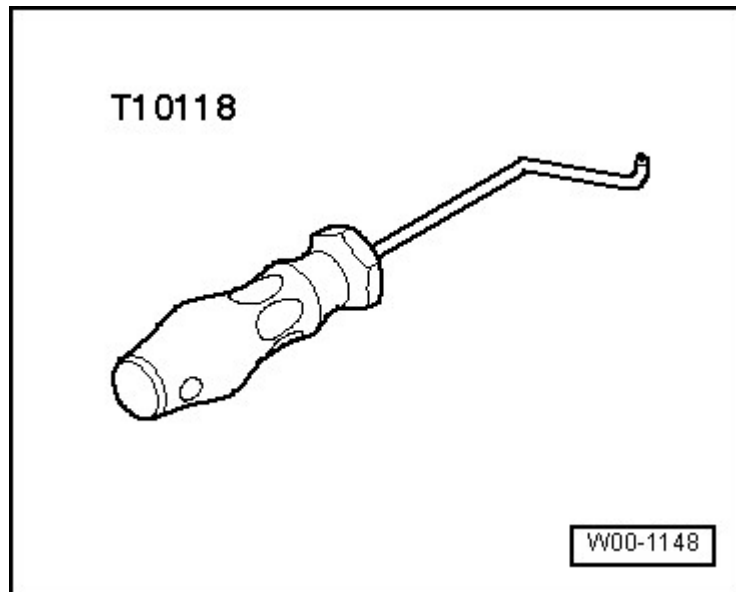


Fig. 65: Assembly Tool T10118

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Tool Set T10133

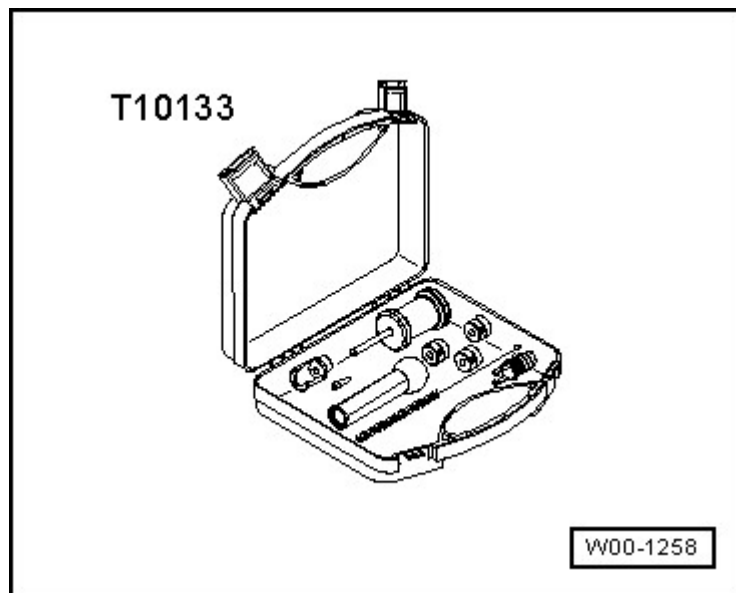


Fig. 66: Identifying Tool Set T10133

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.