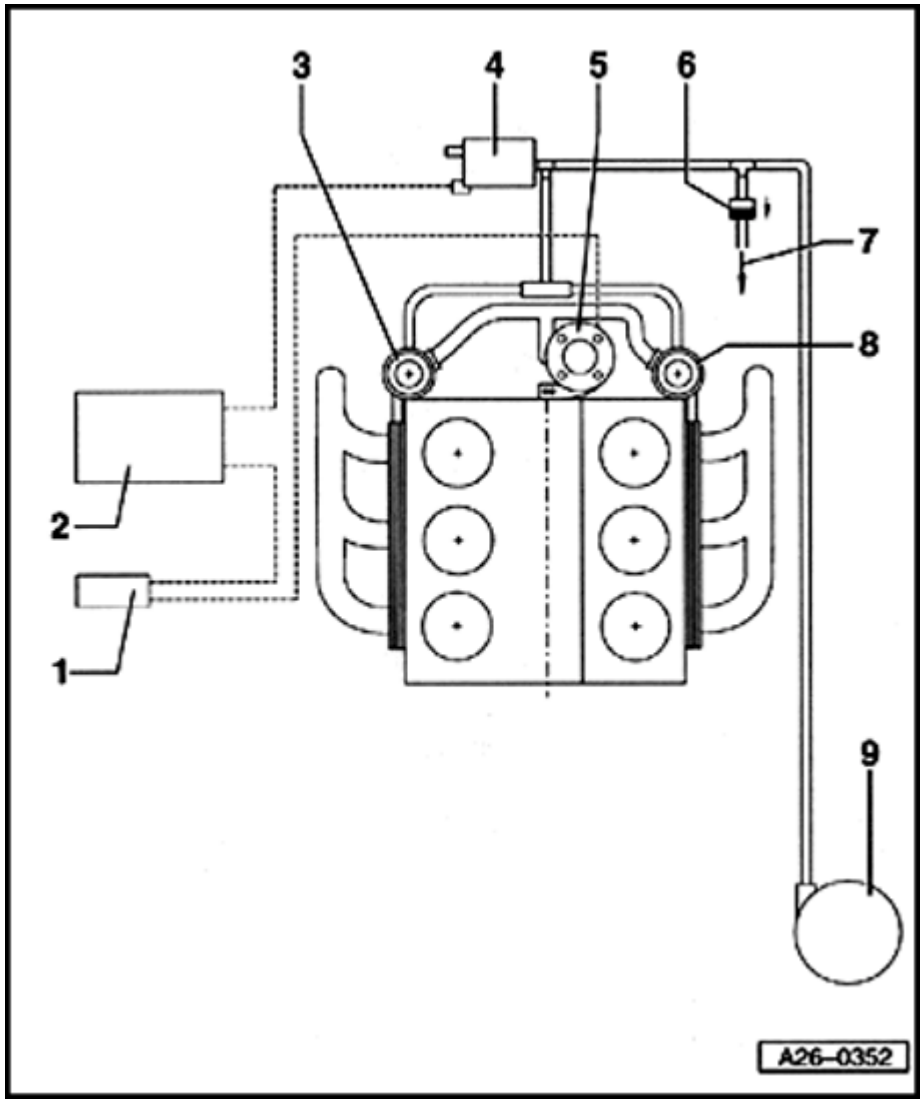
26-31



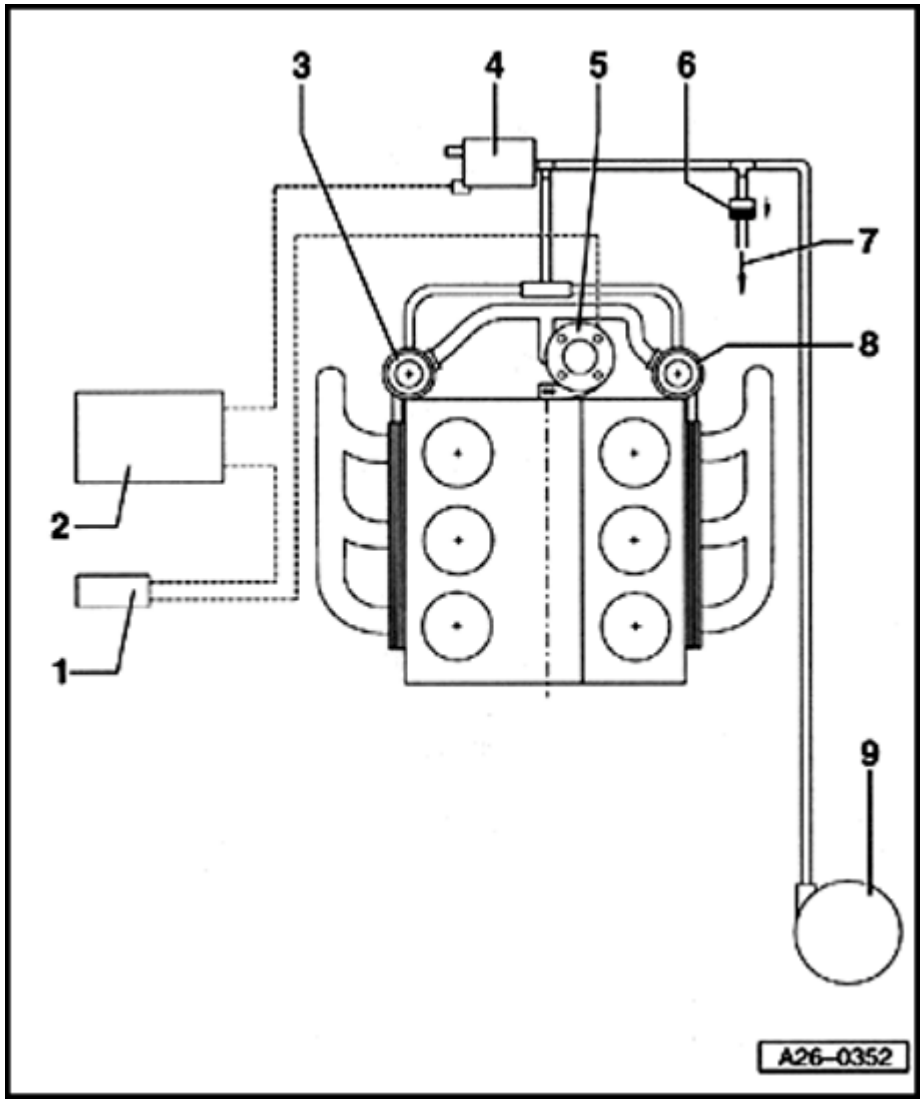
Secondary air system

The secondary air system results in quicker heating and therefore earlier operating readiness of the catalytic converter following cold start.

Principle

Due to over-enrichment of the mixture during the cold start phase, there is an increased amount of un-combusted carbon monoxide in the exhaust. Secondary Air Injection (AIR) improves secondary oxidation in the catalytic converter and therefore reduces emissions. The heat produced by secondary oxidation greatly reduces start-up time for the catalytic converter, therefore improving exhaust quality during the cold start phase significantly.

26-32



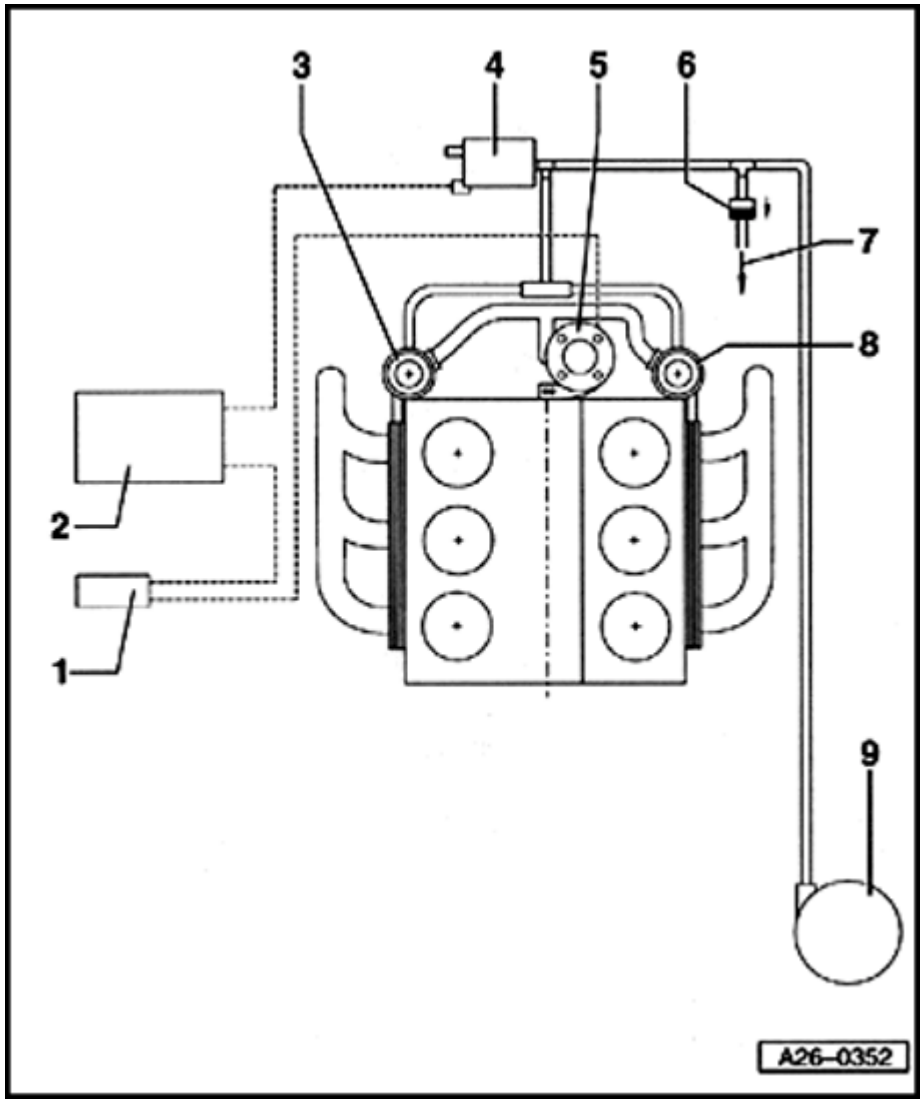
Function:

- In the cold start phase, the ECM -4- activates the secondary air pump -2- via the relay for secondary air pump -3-. Air reaches the combination valves for Secondary Air Injection (AIR) -5- and -9-.
- The Secondary Air Injection (AIR) valve -6- is activated in parallel, which allows the vacuum to reach the combination valves for Secondary Air Injection (AIR) -5- and -9-. The appropriate combination valve for Secondary Air Injection (AIR) thereby opens the path for secondary air to the exhaust channels of the cylinder head.

1 - Secondary Air Injection (AIR) pump relay - J299-

- Removing and installing ⇒ Page 26-37
- checking ⇒ Page 26-45

26-33



2 - Motronic Engine Control Module (ECM) - J220-

3 - Combination valve for secondary air injection (AIR)

4 - Secondary Air Injection (AIR) solenoid valve -N112-

- Installation position ⇒ Fig. ⇒ 1

5 - Secondary Air Injection (AIR) pump motor -V101-

- Installation position ⇒ Fig. ⇒ 2

6 - Check valve

- Installation position (light/dark side): Arrow points in direction of flow, as shown in figure.

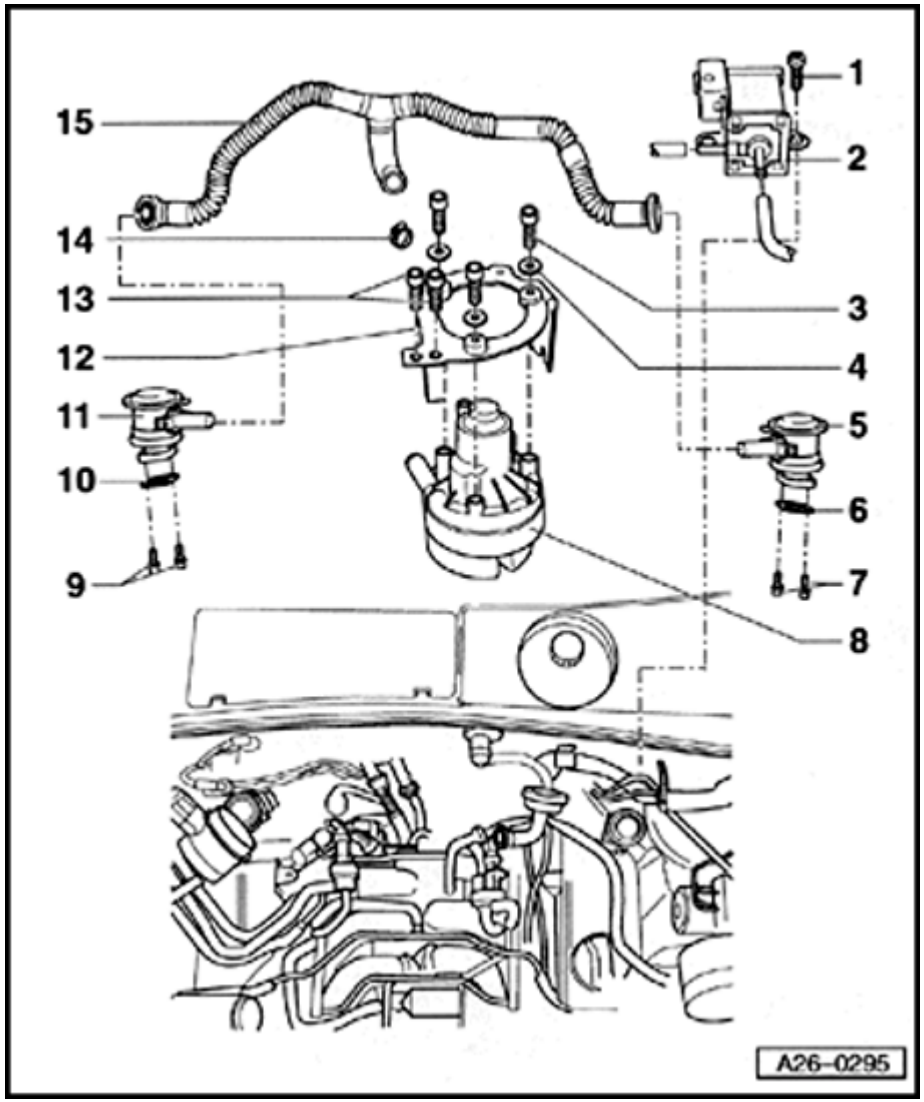
7 - To Intake manifold

8 - Combination valve for secondary air injection (AIR)

9 - Vacuum reservoir

- Installation location: Under wheel housing liner in wheel housing

26-34



Secondary Air Injection (AIR) system components, removing and installing

The components for the Secondary Air Injection (AIR) system are located under the air distributor between the intake manifold and the plenum chamber.

1 - 6 Nm

2 - Secondary Air Injection (AIR) solenoid valve -N112-

3 - 10 Nm

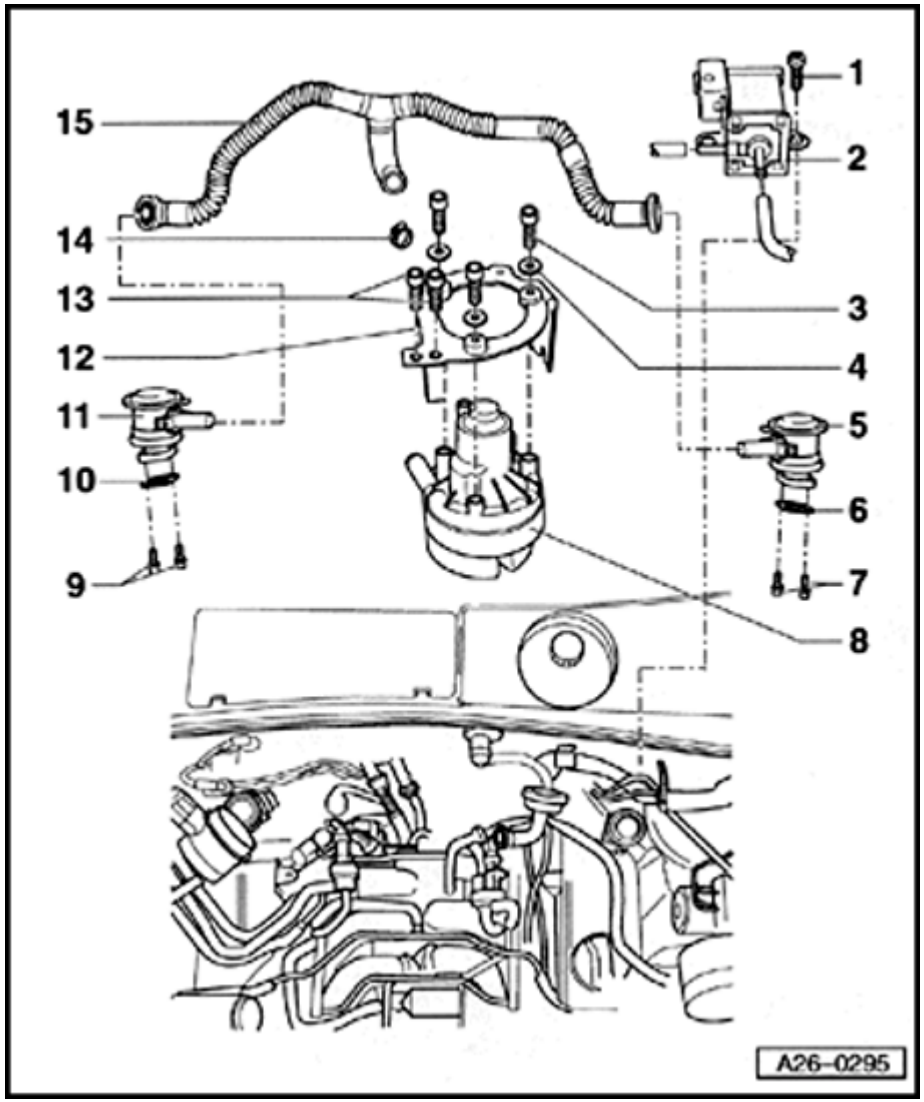
4 - Large shim washer

- For all 3 rubber bonded bushings at bracket for Secondary Air Injection (AIR) pump

5 - Combination valve, left

6 - Seal

26-35



7 - 10 Nm

8 - Secondary Air Injection (AIR) pump with air filter attached

9 - 10 Nm

10 - Seal

11 - Combination valve, right

12 - Bracket for Secondary Air Injection (AIR) pump

- Bolted to rear intake manifold.

13 - 10 Nm

14 - Screw clamp

15 - Connection tube

- Between Secondary Air Injection (AIR) pump and combination valves

26-36

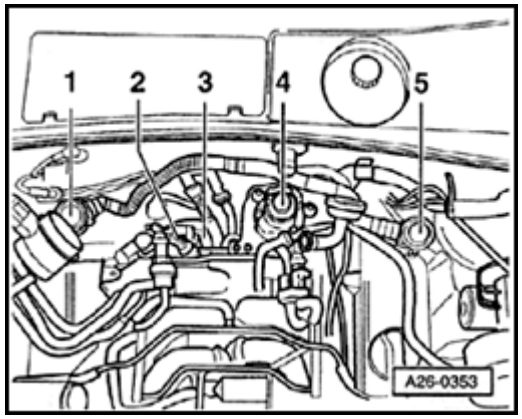


Fig. 1 Installation location of Secondary Air Injection (AIR) solenoid valve -N112-

- Bolted to rear intake manifold at bracket below control modules together with the connector for exhaust gas temperature (to the right of the AIR motor) -3-.

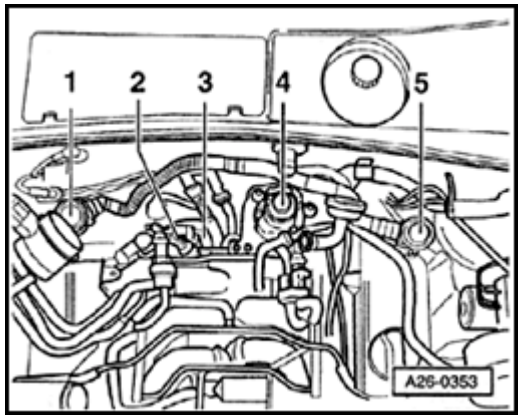
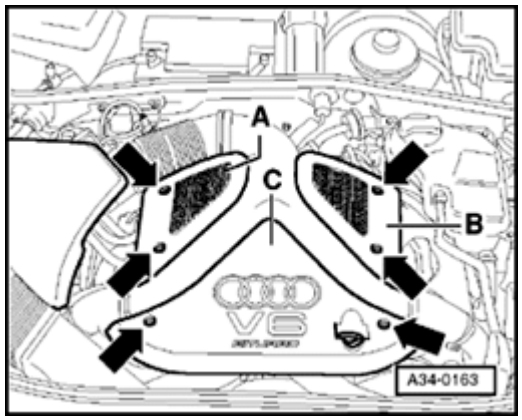


Fig. 2 Installation position of Secondary Air Injection (AIR) pump motor -V101-

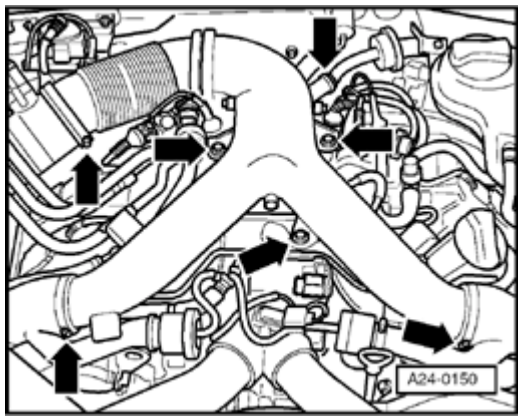
- At intake manifold, rear left -4-.

26-37

Secondary Air Injection (AIR) solenoid valve -N112-, removing and installing

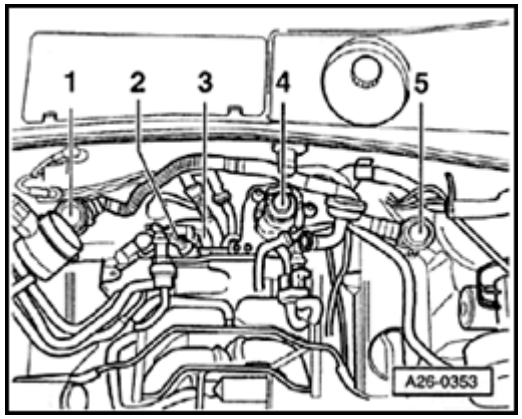


- Remove bolts (arrows) and remove engine covers -A- and -B-.



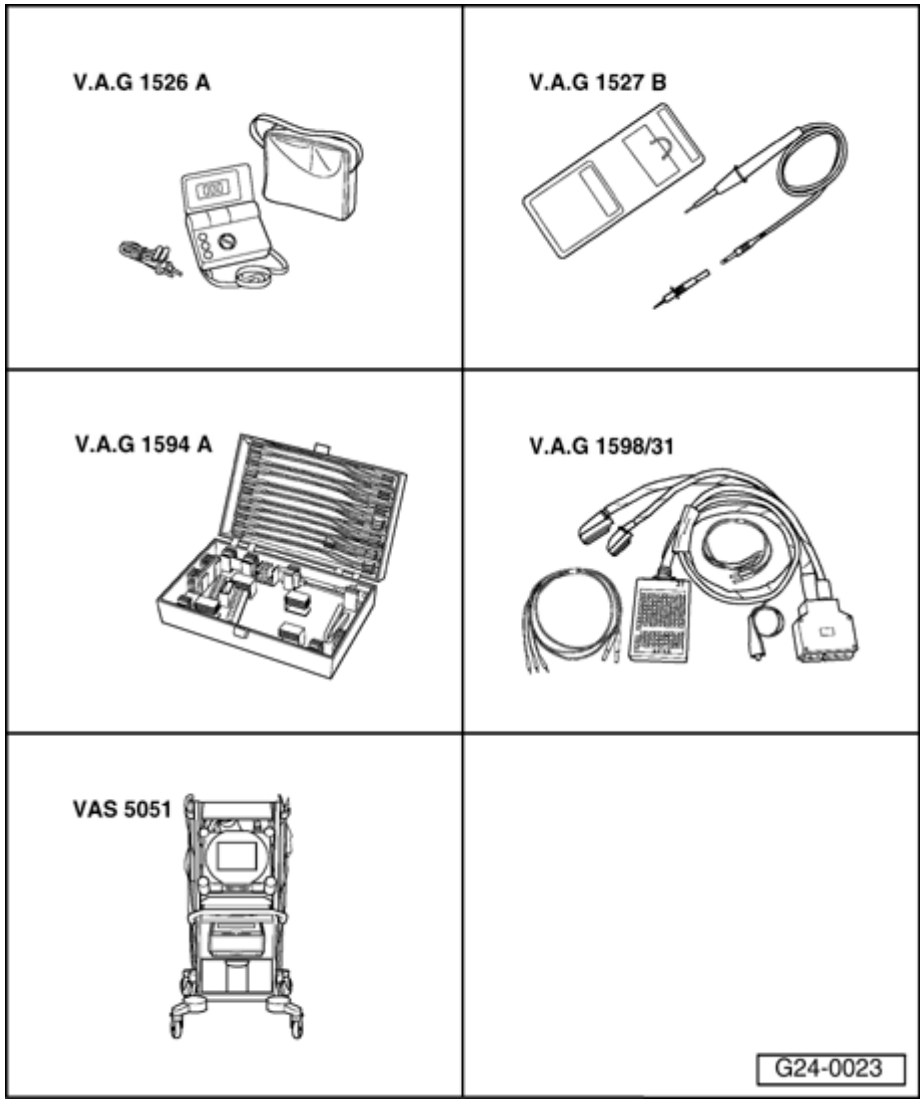
- Remove air distributor (arrows).

26-38



- Disconnect both connectors -2- from control modules for exhaust gas temperature.
- Remove control modules from intake manifold and set wires aside.
- Secondary Air Injection (AIR) solenoid valve -N112- is secured to a bracket below control modules for exhaust gas temperature sensor.
- Disconnect harness connector from valve and slide bracket off studs at intake manifold with vacuum lines connected.
- Disconnect vacuum lines from Secondary Air Injection (AIR) solenoid valve, remove valve from bracket.

26-39



Secondary Air Injection (AIR) solenoid valve -N112-, checking

Special tools and equipment

- VAG 1526A
- VAG 1527B
- VAG 1594A
- VAG 1598/31
- VAS 5051

- or

- VAG 1551 with VAG 1551/3A

26-40

Installation location ⇒ Installation locations-Overview

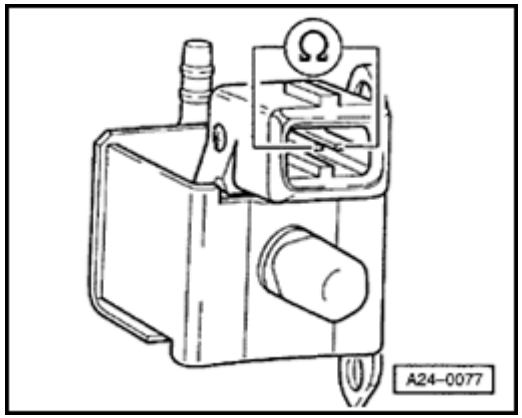
⇒ *Repair Manual, 2.7 Liter V6 5V BiTurbo Fuel Injection & Ignition, Engine Code(s): APB, Repair Group 24*

Test requirement:

- Output Diagnostic Test Mode (DTM) performed

Checking internal resistance

- Disconnect harness connector from Secondary Air Injection (AIR) valve -N112-.

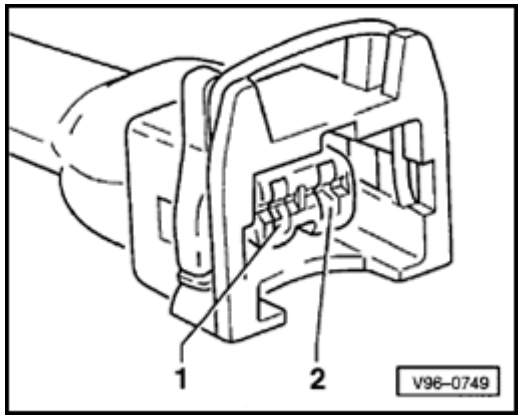


- Connect multimeter at valve for resistance measurement.
  - ♦ Specified value: 25 ... 35 Ω
- If specified value is not obtained, replace Secondary Air Injection (AIR) solenoid valve -N112-.

26-41

Checking voltage supply

- Disconnect connector from Secondary Air Injection (AIR) solenoid valve -N112-.



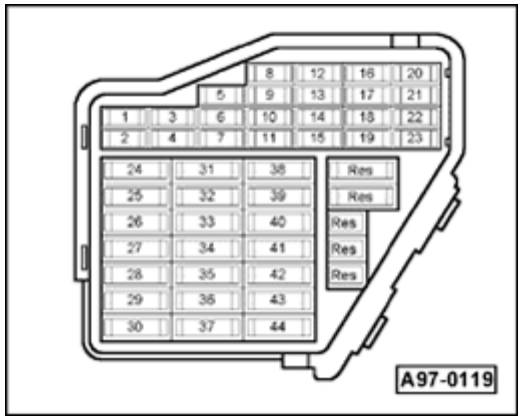
- Connect VAG 1527B voltage tester as follows:

Harness connector terminal	Measure to
1	Engine Ground (GND)

- Operate starter briefly.
  - ♦ LED must light.

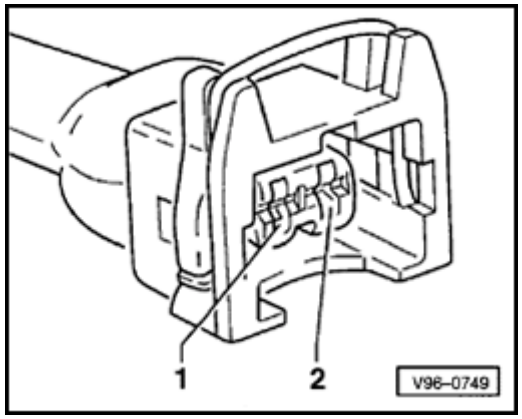
If LED does not light:

- Perform following tests marked with dots:



- Check fuse -S234- (in fuse holder, position 34).

26-42



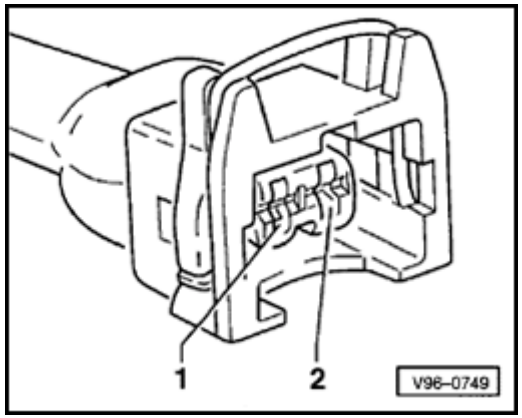
- Check wire connection from terminal 1 of connector via fuse -S234- (in fuse holder, socket 34) to Fuel Pump (FP) relay for open circuit:

⇒ *Electrical Wiring Diagrams, Troubleshooting & Component Locations*

- Check Fuel Pump (FP) relay.

⇒ *Repair Manual, 2.7 Liter V6 5V BiTurbo Fuel Injection & Ignition, Engine Code(s): APB, Repair Group 24*

Checking activation



- Connect VAG 1527B voltage tester between terminal 1 and 2.

26-43

- Initiate output Diagnostic Test Mode (DTM) and activate Secondary Air Injection (AIR) solenoid valve -N112

⇒ *Repair Manual, 2.7 Liter V6 5V BiTurbo Fuel Injection & Ignition, Engine Code(s): APB, Repair Group 01*

Output Diagnostic Test Mode →

Secondary. air. inj. solenoid valve -N112

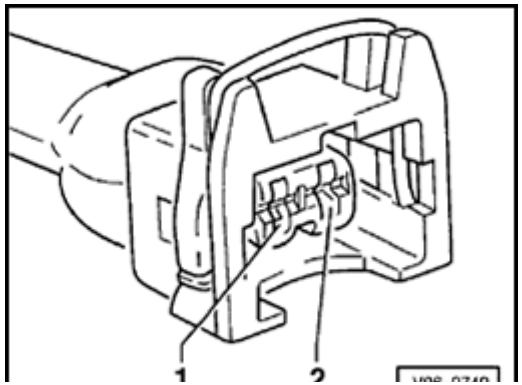
➢ Indicated on display

- ♦ LED must blink.

If LED does not blink or if it remains constantly lit:

- Connect VAG 1598/31 test box at wiring harness to ECM, do not connect ECM.

⇒ *Repair Manual, 2.7 Liter V6 5V BiTurbo Fuel Injection & Ignition, Engine Code(s): APB, Repair Group 24*



➢ - Check the following wire connections for open circuit and short circuit to Ground (GND) and B+:

Harness connector terminal	VAG 1598/31 test box Bushing
2	44

- Repair open circuit or short circuit if necessary.

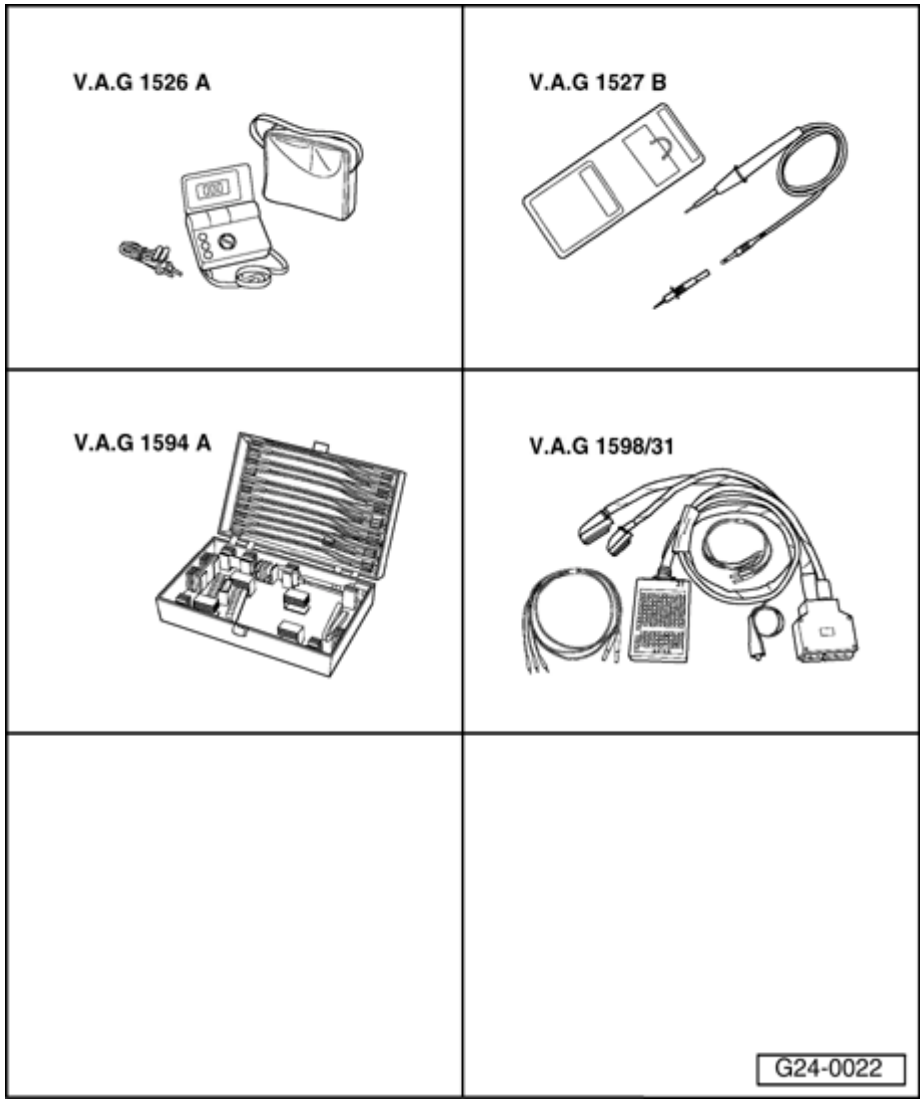
26-44

If wire connection is OK:

- Replace Engine Control Module (ECM).

⇒ *Repair Manual, 2.7 Liter V6 5V BiTurbo Fuel Injection & Ignition, Engine Code(s): APB, Repair Group 24*

26-45



Secondary Air Injection (AIR) pump relay - J299- and activation, checking

Special tools and equipment

- VAG 1526A
- VAG 1527B
- VAG 1594A
- VAG 1598/31

26-46

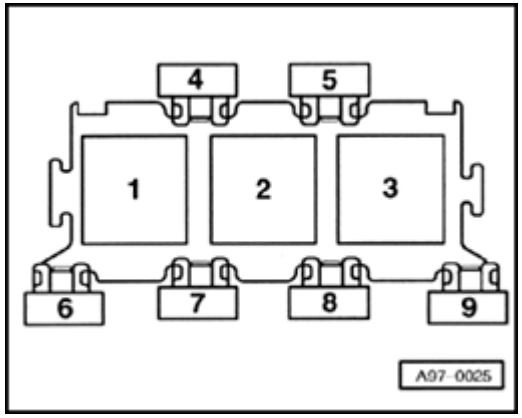
Installation location ⇒ Installation locations-Overview.

⇒ *Repair Manual, 2.7 Liter V6 5V BiTurbo Fuel Injection & Ignition, Engine Code(s): APB, Repair Group 24*

Test sequence

- Initiate output Diagnostic Test Mode (DTM) and activate Secondary Air Injection (AIR) pump relay -J299-

⇒ *Repair Manual, 2.7 Liter V6 5V BiTurbo Fuel Injection & Ignition, Engine Code(s): APB, Repair Group 01*



- The Secondary Air Injection (AIR) pump relay (in 3-socket relay carrier in the E-box, at left in plenum chamber, position 2) must engage and the Secondary Air Injection (AIR) pump motor -V101- must run in intervals

A - If relay does not trigger:

- Check voltage supply of Secondary Air Injection (AIR) pump relay ⇒ Page 26-47 .
- Check activation of Secondary Air Injection (AIR) pump relay ⇒ Page

26-49 .

B - If relay triggers, but Secondary Air Injection (AIR) pump does not run:

- Check voltage supply of Secondary Air Injection (AIR) pump motor ⇒ Page 26-51 .

26-47

Checking voltage supply of Secondary Air Injection (AIR) pump relay

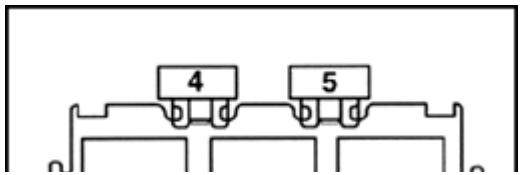
- Switch ignition off.
- Remove Secondary Air Injection (AIR) pump relay
- Connect multimeter for voltage measurement as follows.

3-socket relay carrier in E-box, plenum chamber, position 2 terminal	Measure to
8	Engine Ground (GND)

♦ Specification: approx. battery voltage

If specified value is not obtained:

- Perform following tests marked with dots:



- Check fuse -S130- (40 A) in 3-socket relay carrier in E-Box, plenum chamber, position 7.

- Check wire connection from battery + (terminal 30) to Secondary Air Injection (AIR) pump relay -J299- (in 3-socket relay carrier in E-Box, plenum chamber, position 2) for open circuit.

⇒ *Electrical Wiring Diagrams, Troubleshooting & Component Locations*

26-48

- Connect multimeter for voltage measurement as follows:

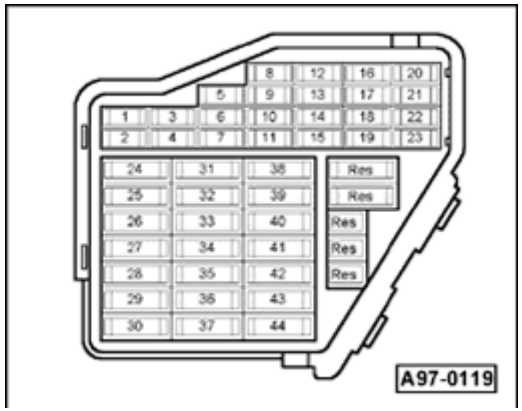
3-socket relay carrier in E-box, plenum chamber, position 2 **terminal**	**Measure to**
4	Engine Ground (GND)

- Operate starter briefly.

  ♦ Specification: approx. battery voltage

If specified value is not obtained:

- Perform following tests marked with dots:



- Check fuse -S234- (in fuse holder, position 34).
- Check wire connection from Secondary Air Injection (AIR) pump relay -J299- (in 3-socket relay carrier in E-box, plenum chamber) via fuse -S234- (in fuse holder, position 34) to Fuel Pump (FP) relay for open circuit:

⇒ *Electrical Wiring Diagrams, Troubleshooting & Component Locations*

26-49

Check activation of the Secondary Air Injection (AIR) pump relay

- Switch ignition off.
- Remove Secondary Air Injection (AIR) pump relay.
- Connect VAG 1527B voltage tester as follows:

3-socket relay carrier in E-box, plenum chamber, position 2 **terminal**	**Measure to**
6	B+

- Initiate output Diagnostic Test Mode (DTM) and activate Secondary Air Injection (AIR) pump relay -J299-.

⇒ *Repair Manual, 2.7 Liter V6 5V BiTurbo Fuel Injection & Ignition, Engine Code(s): APB, Repair Group 01*

- ♦ LED must blink.

If LED does not blink:

- Switch ignition off.

26-50

- Connect VAG 1598/31 test box at wiring harness to ECM, do not connect ECM.

⇒ *Repair Manual, 2.7 Liter V6 5V BiTurbo Fuel Injection & Ignition, Engine Code(s): APB, Repair Group 24*

- Check following wire connection for open circuit and short circuit to Ground (GND) and B+:

3-socket relay carrier in E-box, plenum chamber, position 2 **terminal**	**VAG 1598/31 test box** **Bushing**
6	46

- Repair open circuit or short circuit if necessary.

If no malfunctions are detected:

- Replace Secondary Air Injection (AIR) pump relay -J299-.

26-51

Check voltage supply of the Secondary Air Injection (AIR) pump motor

- Remove connector for Secondary Air Injection (AIR) pump motor -V101-.

- Connect VAG 1527B voltage tester between terminals 1 and 2

- Initiate output Diagnostic Test Mode (DTM) and activate Secondary Air Injection (AIR) pump relay -J299-.

⇒ *Repair Manual, 2.7 Liter V6 5V BiTurbo Fuel Injection & Ignition, Engine Code(s): APB, Repair Group 01*

- LED must blink

26-52

If LED does not blink:

- Perform following tests marked with dots:

  - Check wire connection from connector at Secondary Air Injection (AIR) pump motor- V101- to Secondary Air Injection (AIR) pump relay -J299- (in 3-socket relay carrier in E-Box, plenum chamber, position 2) for open circuit.

⇒ *Electrical Wiring Diagrams, Troubleshooting & Component Locations*

  - Check wire connection from connector at Secondary Air Injection (AIR) pump motor - V101- to Ground (GND) connection 1 in engine compartment wiring harness for open circuit:

⇒ *Electrical Wiring Diagrams, Troubleshooting & Component Locations*

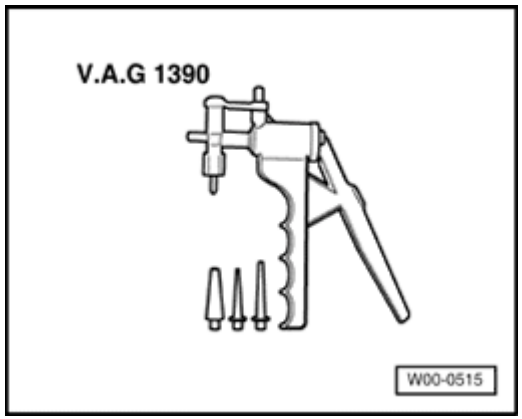
If no malfunctions are detected:

- Replace Secondary Air Injection (AIR) pump motor -V101-.

26-53

Combination valve, checking

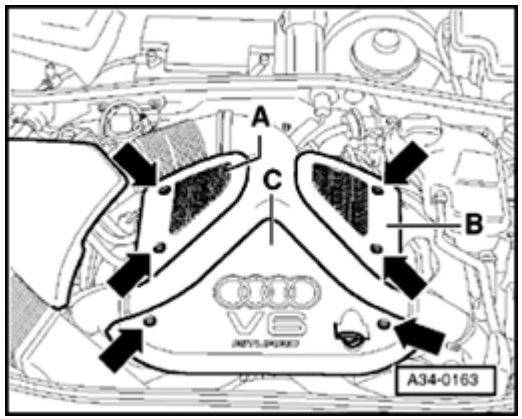
Special tools and equipment



- VAG 1390 Hand Vacuum Pump

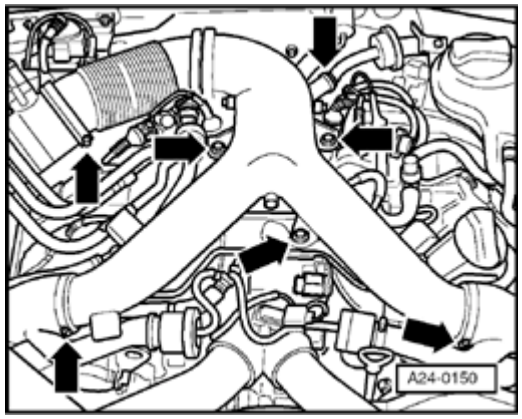
Test requirements:

- No leaks in vacuum lines or hose connections.
- Vacuum lines not clogged.



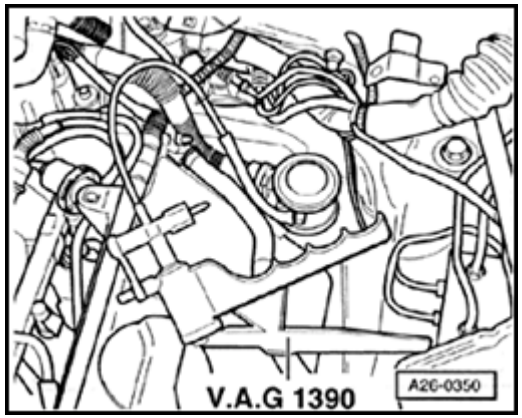
- Remove bolts (arrows) and remove engine covers -A- and -B-.

26-54



- Remove air distributor (arrows).

Leak test



- Pull hose from Secondary Air Injection (AIR) pump motor and blow in with light pressure (do not use pressurized air).

♦ Both combination valves must be closed, it must not be possible to blow through hose

If it is possible to blow through hose:

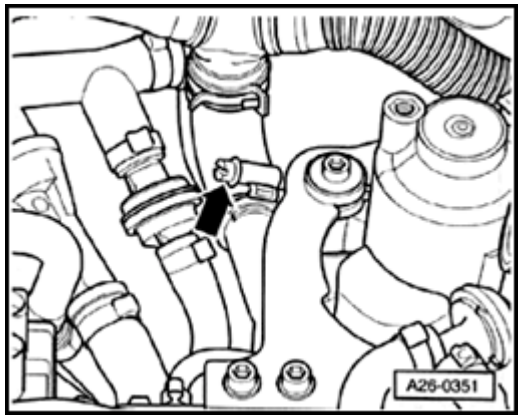
- Disconnect connecting line from Secondary Air Injection (AIR) pump motor to combination valve at one of the combination valves, close connecting line and blow through again.
- Replace combination valve remaining on connecting line

If it is no longer possible to blow through hose:

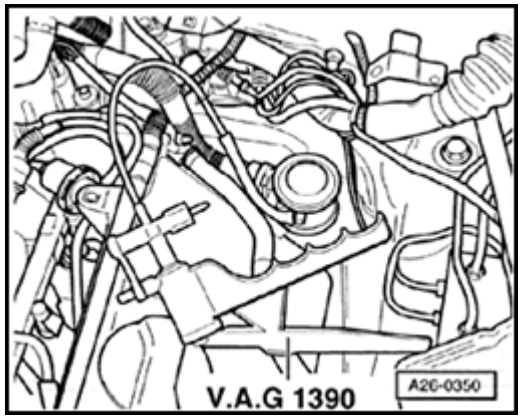
- Replace combination valve that was removed from connecting line.

26-55

Functional check



- Remove vacuum hose of combination valve to be checked and connect VAG 1390 vacuum pump to combination valve.



- Pull hose from Secondary Air Injection (AIR) pump motor and blow in with light pressure (do not use pressurized air).
- Operate hand vacuum pump.

♦ The relevant combination valve must open, it must not be possible to blow through

If the relevant combination valve does not open:

- Replace combination valve.

26-56

If the relevant combination valve opens:

- Repeat function test at second combination valve.

Note:

- *Use special tool 3231 and the Hazet carburetor adjustment key 4530.*
- *No special tools are necessary for the right combination valve.*