

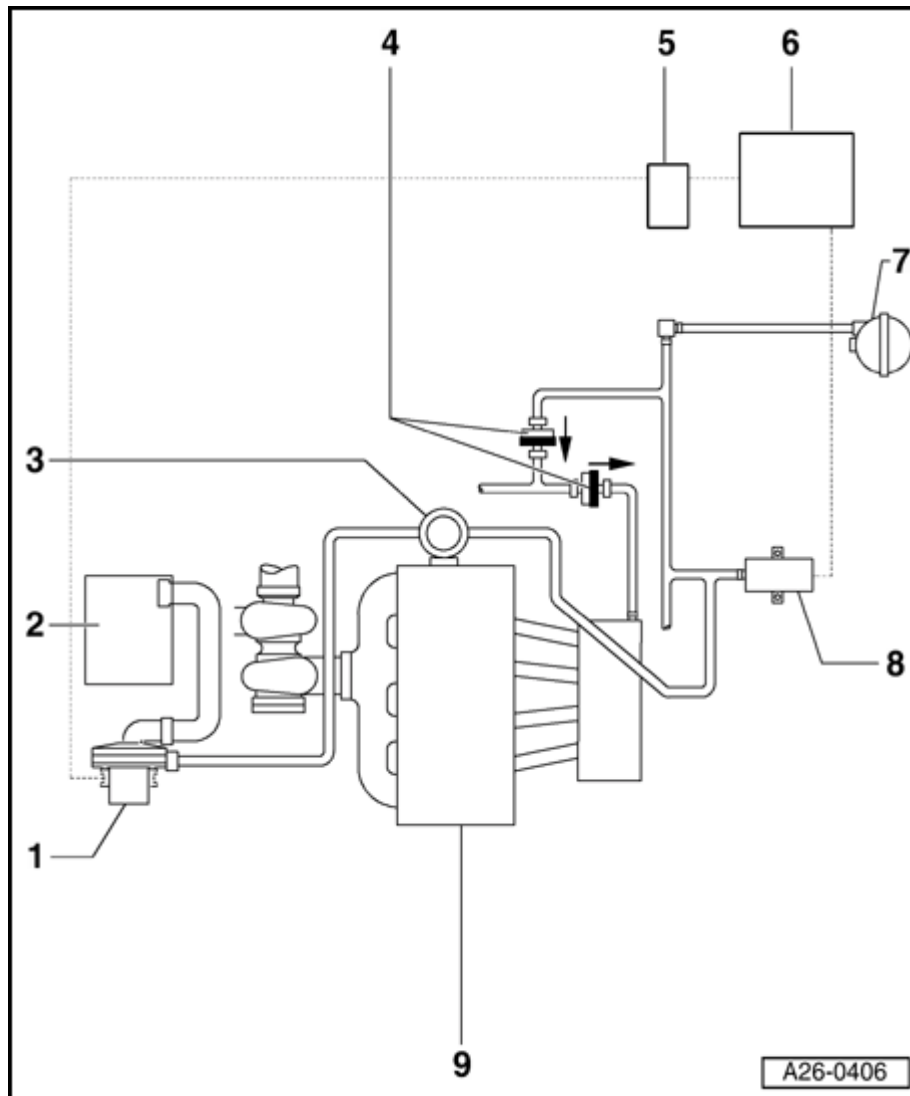
Secondary air system

Secondary air system, function/components

The secondary air system permits faster warm-up and thus makes the catalytic converter ready for operation sooner after cold starting.

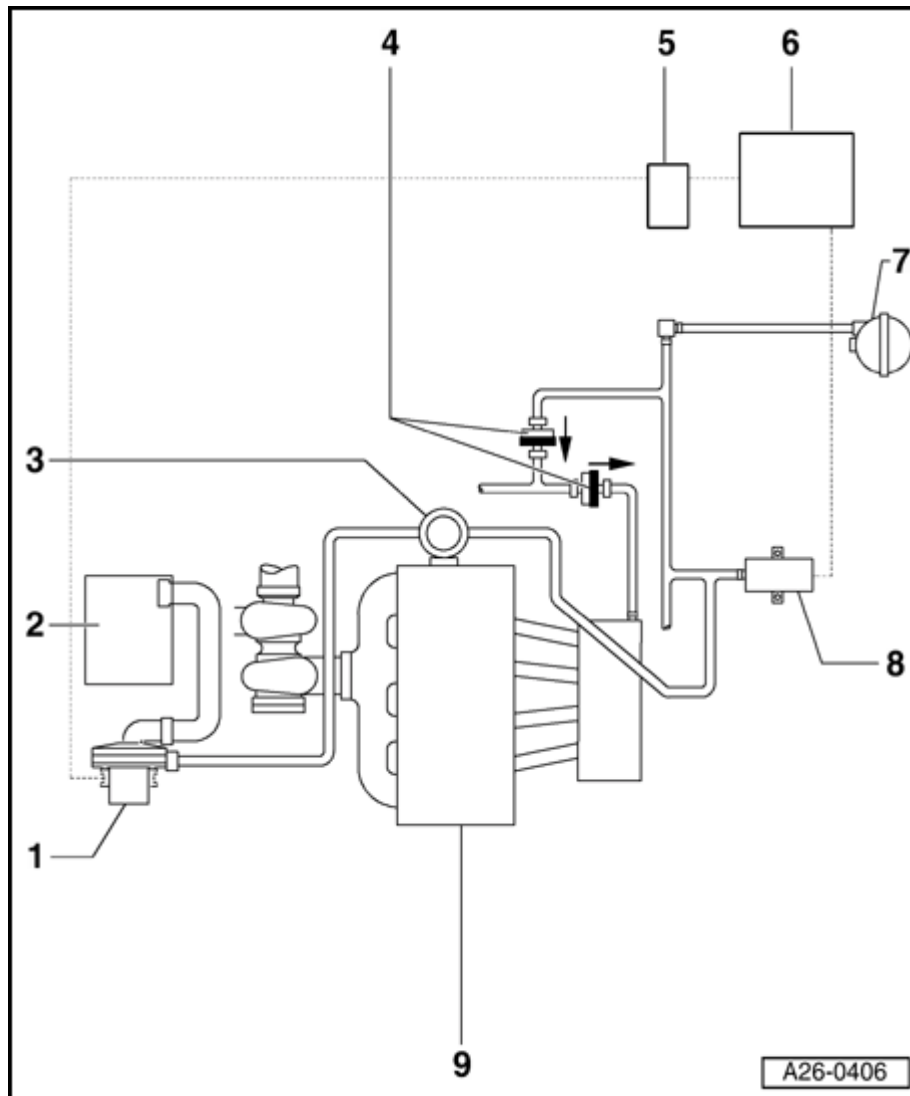
Principle

Due to over-enrichment of the mixture in the cold start phase, there is an increased amount of unburned hydrocarbons in the exhaust gas. The injection of secondary air improves the oxidation in the catalytic converter and thus reduces emissions. The heat produced by secondary oxidation reduces start-up time for the catalytic converter therefore improving the emission quality in the cold-running phase.



Function

- ◆ During the cold running phase, the engine control module -6- actuates the secondary air injection pump -1- via the secondary air injection pump relay -5-. Air reaches the combination valve for the secondary air inlet -3-.
- ◆ Parallel to this the secondary air inlet valve -8- is actuated, which allows the vacuum to reach the combination valve for secondary air inlet -3-. The combination valve for secondary air inlet thus allows the secondary air to enter the exhaust ducts of the cylinder head -9-.



1 - Secondary Air Injection (AIR) Pump motor -V101-

◆ Location ⇒ Fig. ⇒ [2](#) , ⇒ [Page 26-45](#)

2 - Air cleaner

3 - Combination valve for secondary air inlet

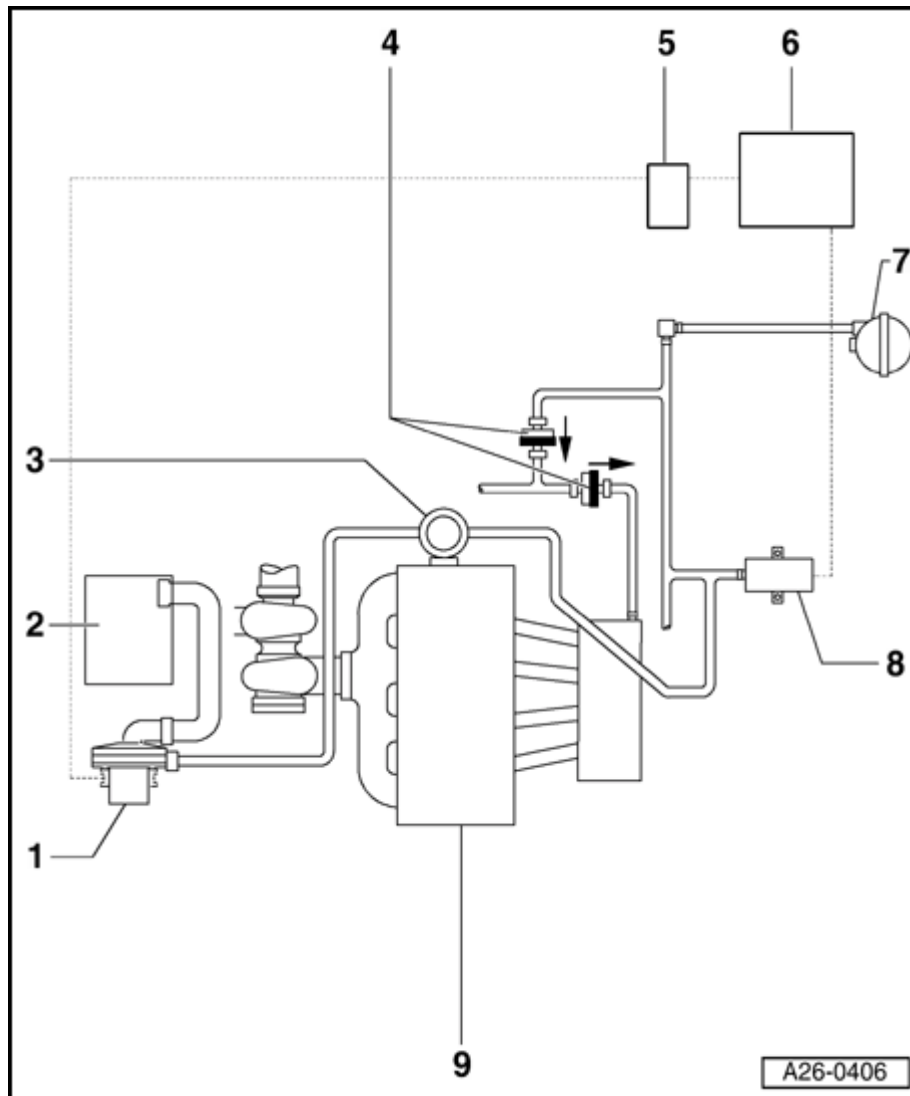
◆ Location ⇒ Fig. ⇒ [4](#) , ⇒ [Page 26-46](#)

4 - Non-return valve

◆ Position (light side/ dark side or direction of arrow) as shown in illustration, arrow faces in direction of flow

5 - Secondary Air Injection (AIR) Pump relay - J299-

◆ Location ⇒ Fig. ⇒ [3](#) , ⇒ [Page 26-46](#)



6 - Engine Control Module -J220-

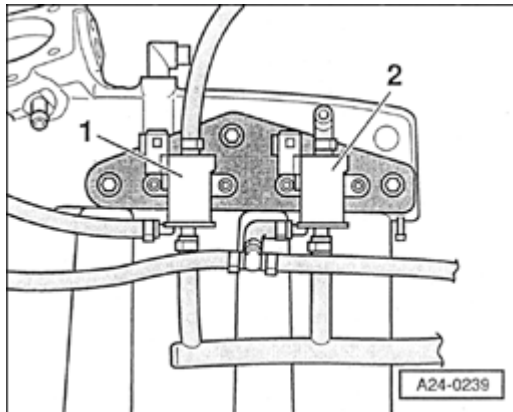
7 - Vacuum reservoir

◆ Location: In front left wheel housing
beneath wheel housing liner

**8 - Secondary Air Injection (AIR) Solenoid
valve -N112-**

◆ Location ⇒ Fig. ⇒ [1](#) , ⇒ [Page 26-45](#)

9 - Cylinder head



A

Fig. 1 Installation position Secondary Air Injection (AIR) valve - N112-

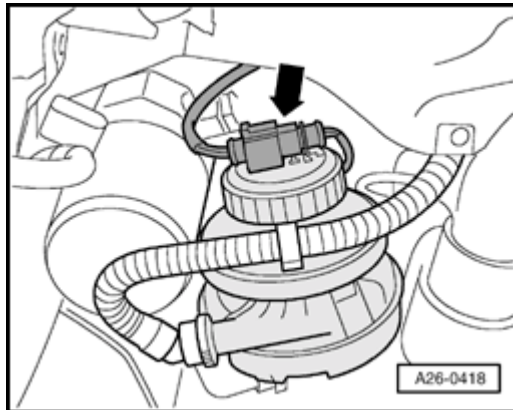
◆ Location: below intake pipe

1 - Recirculating valve for turbocharger -N249- (green connection)

2 - Secondary air injection valve -N112- (brown connection)

Note:

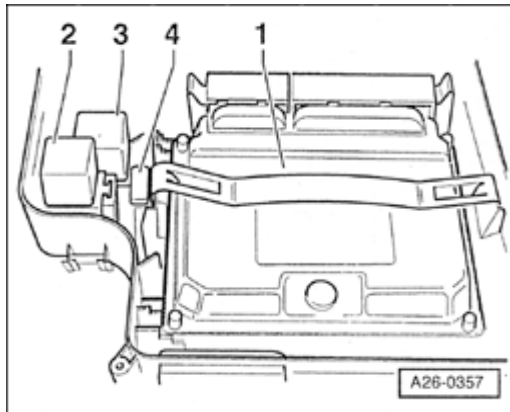
The illustration shows bottom view of intake pipe.



A

Fig. 2 Installation position for Secondary Air Injection (AIR) Pump motor -V101-

◆ Front right in engine compartment beneath air filter housing



A

Fig. 3 Installation position Secondary Air Injection (AIR) Pump relay -J299-

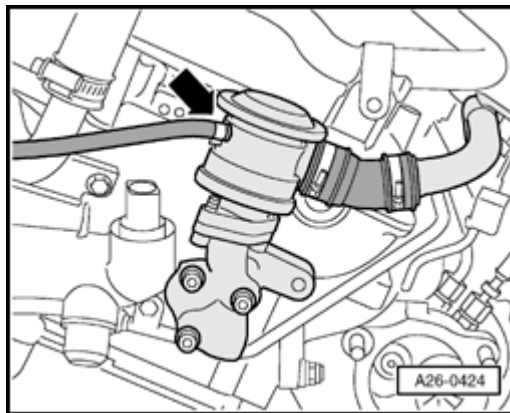
◆ In E-box in plenum chamber

1 - Engine control module

2 - Secondary air pump relay -J299-

3 - Power supply relay for Motronic -J271-

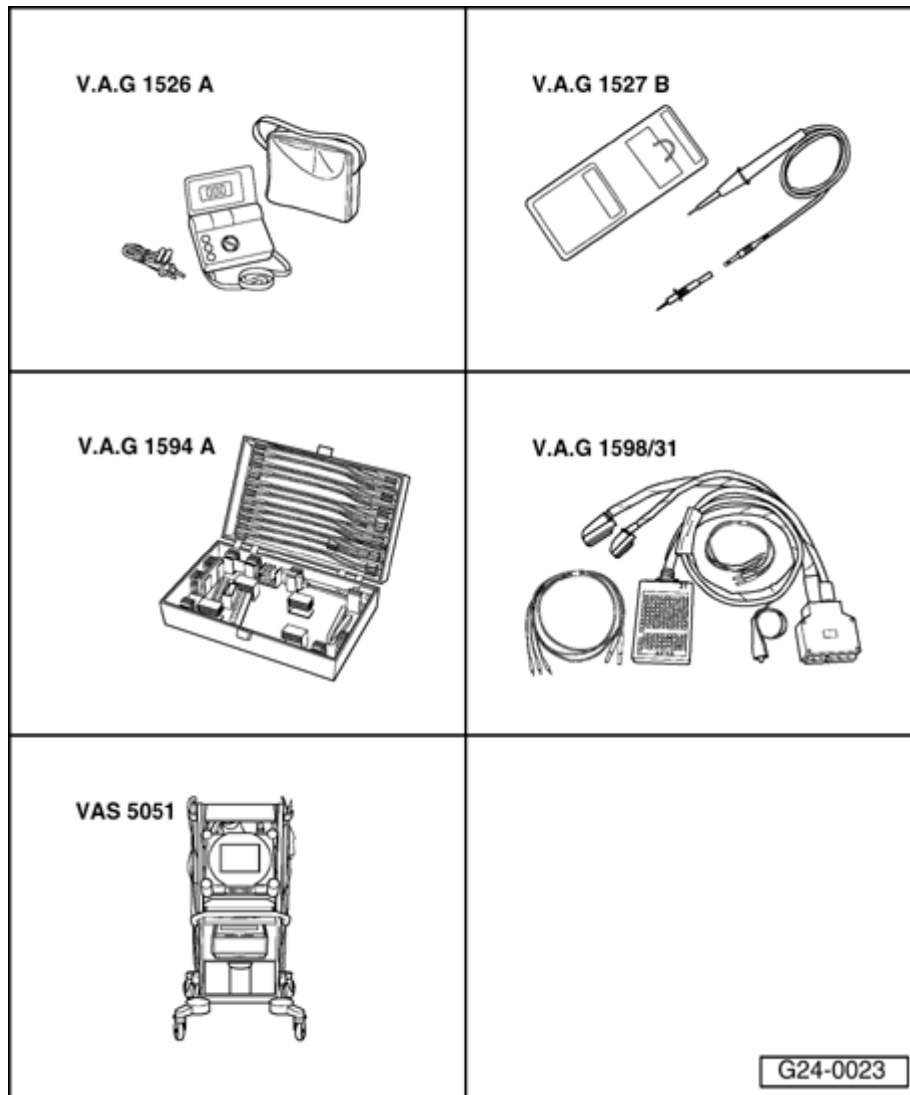
4 - Fuse S130 for secondary air pump



A

Fig. 4 Combination valve for secondary air injection

◆ Right rear on cylinder head



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

Special tools and equipment

- ◆ VAG 1526 A
- ◆ VAG 1527 B
- ◆ VAG 1594 A
- ◆ VAG 1598/31
- ◆ VAS 5051 with VAS 5051/1
- or
- ◆ VAG 1551 with VAG 1551/3 A

Test requirements:

- Vehicle diagnostic, testing and information system VAS 5051 or VAG 1551 Scan Tool connected.

Test sequence**Note:**

The secondary air injection solenoid valve - N112- and the wiring connections are monitored by the engine control module.

- Read out Diagnostic Trouble Code (DTC) memory of engine control module.

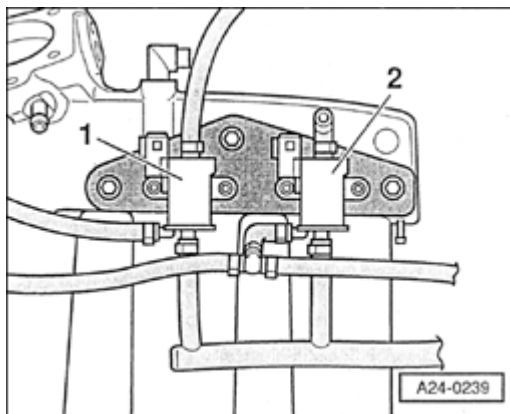
If a DTC relating to the secondary air injection solenoid valve -N112- is displayed:

- Remove hoses from secondary air injection solenoid valve -N112- (-2-) but leave electrical connector plugged in.

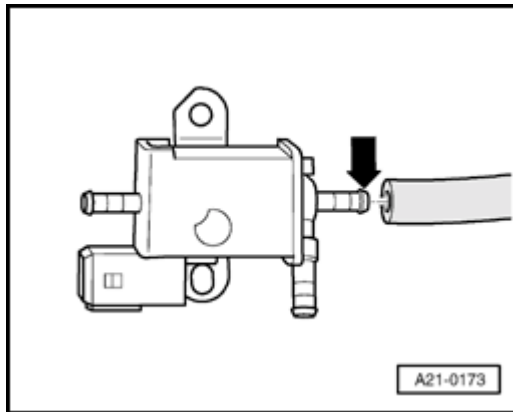
◆ Location: below intake line


Note:

The illustration shows bottom view of intake line.



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Output Diagnostic Test Mode 

Secondary air injection solenoid valve -N112-



- Connect auxiliary hose to valve connector marked with an arrow.
- Initiate output Diagnostic Test Mode (DTM) and activate secondary air injection solenoid valve -N112-.



Display:

- ◆ The valve should click ...
- ◆ ... and should open and close (check by blowing into the auxiliary hose).

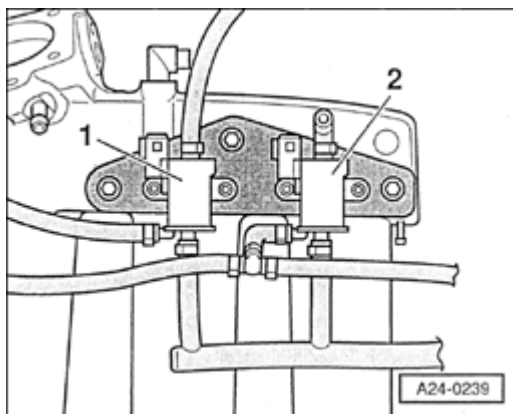
If the injector does not click:

- Check internal resistance of valve.

If valve does not open or close properly:

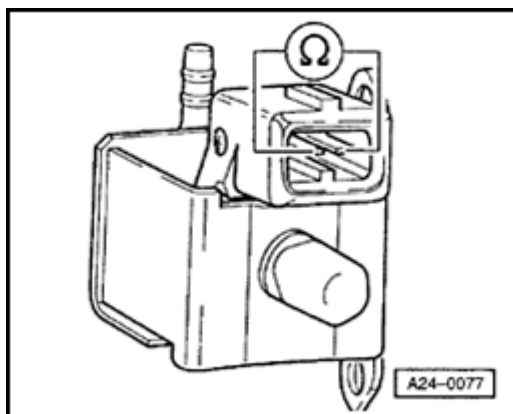
- Replace secondary air injection solenoid valve -N112-.

Checking internal resistance



A

- Disconnect connector of secondary air injection solenoid valve - N112- (-Item 2-).



A

- Connect multimeter to injector to measure resistance.
 - Specified value: 27 to 30 Ω

If specified value is not attained:

- Replace secondary air injection solenoid valve -N112-.

If specified value is attained:

- Check power supply.

Checking power supply

Note:

The power supply for the secondary air injection solenoid valve -N112- is via the fuel pump relay.

Test requirements:

- Fuse for secondary air injection solenoid valve OK.

⇒ *Electrical Wiring Diagrams, Troubleshooting & Component Locations binder*

- Fuel pump relay OK.

⇒ [Repair Manual, 1.8 Liter 4-Cyl. 5V Turbo Fuel Injection & Ignition, Engine Code\(s\): AWM, Repair Group 24](#)

- Disconnect connector from valve.

- Connect voltage tester VAG 1527 B as follows:

Connector	Measure to



A

contact	
1	Engine Ground

- Operate starter briefly.
 - LED must light up.

If the LED does not light up:

- Check wiring from contact 1 on the connector via the fuse to the fuel pump relay for an open circuit:

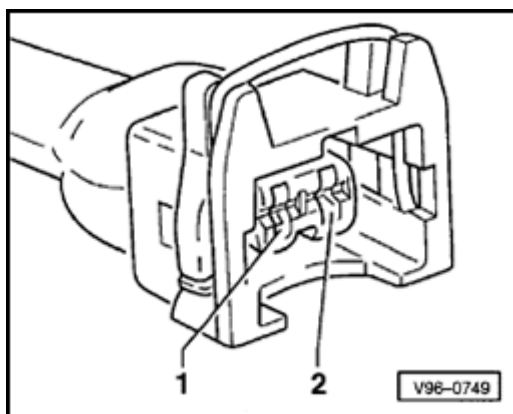
⇒ *Electrical Wiring Diagrams, Troubleshooting & Component Locations binder*

- Repair open circuit, if necessary

If the LED lights up:

- Check actuation.

Checking actuation



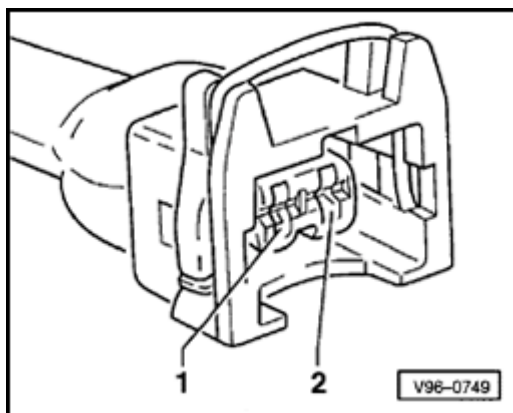
A

- Connect voltage tester VAG 1527 B to contacts 1 (positive) and 2 of connector.
- Initiate output Diagnostic Test Mode (DTM) and activate secondary air injection solenoid valve -N112-.
 - ◆ LED must flash.

If the LED lamp does not flash or if it lights up continuously:

- Connect VAG 1598/31 test box to wiring harness leading to engine control module; engine control module should not be connected:

⇒ [Repair Manual, 1.8 Liter 4-Cyl. 5V Turbo Fuel Injection & Ignition, Engine Code\(s\): AWM, Repair Group 24](#)



A

- Check for open circuit and short to positive or Ground in following wiring connection:

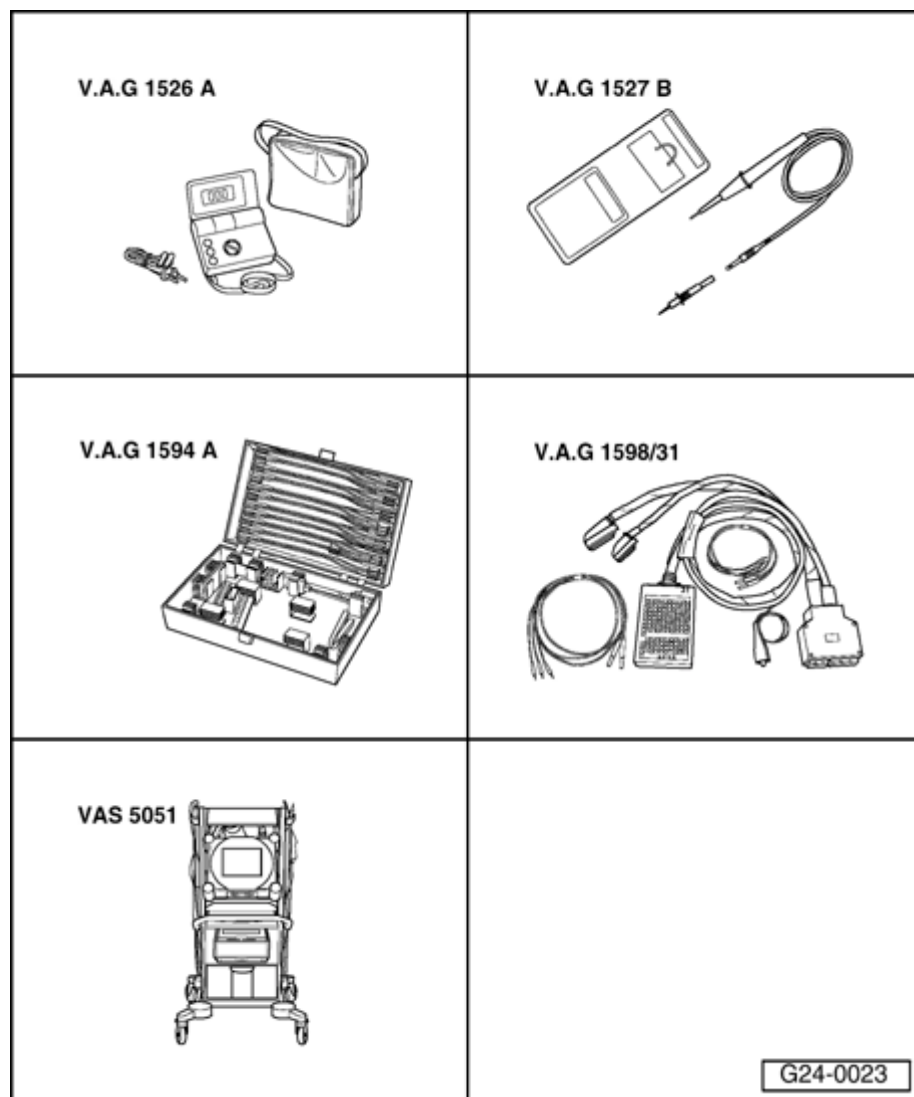
Connector contact	Test box VAG 1598/31
2	9

- Repair any open/short circuit as necessary.

If the wiring is OK:

- Replace engine control module.

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Secondary Air Injection (AIR) Pump relay - J299- / Secondary Air Injection (AIR) Pump motor -V101-, checking

Special tools and equipment

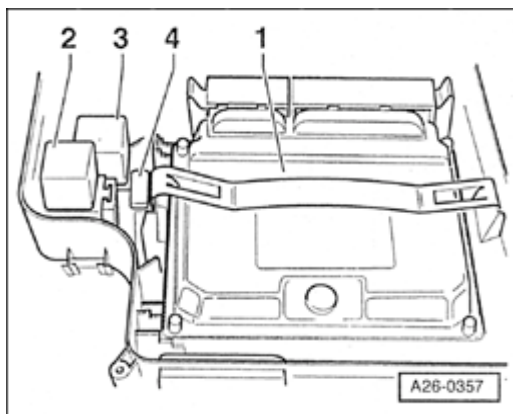
- ◆ VAG 1526 A
- ◆ VAG 1527 B
- ◆ VAG 1594 A
- ◆ VAG 1598/31
- ◆ VAS 5051 with VAS 5051/1
- or
- ◆ VAG 1551 with VAG 1551/3 A

Test requirements:

- Vehicle diagnostic, testing and information system VAS 5051 or VAG 1551 Scan Tool.

Test sequence

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

**A**

- The secondary air injection pump relay-2- (in electronics box of plenum chamber, left) must respond and secondary air injection pump motor -V101- must run intermittently.

A - If relay does not respond:

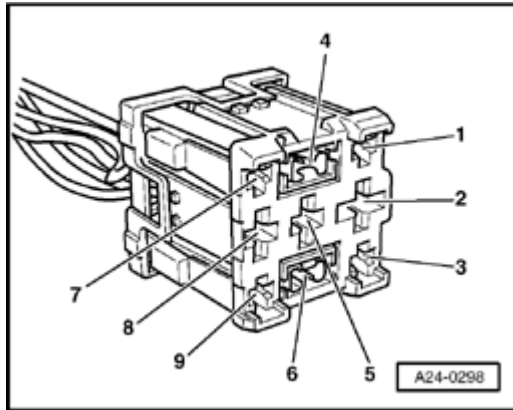
- Check voltage supply of secondary air pump relay ⇒ [Page 26-56](#) .
- Check actuation of secondary air injection pump relay ⇒ [Page 26-58](#) .

B - If relay responds but secondary air injection pump motor does not run:

- Check voltage supply of secondary air injection pump motor ⇒ [Page 26-60](#) .

Check voltage supply of secondary air injection pump relay

- Switch ignition off.
- Remove secondary air injection pump relay.



A

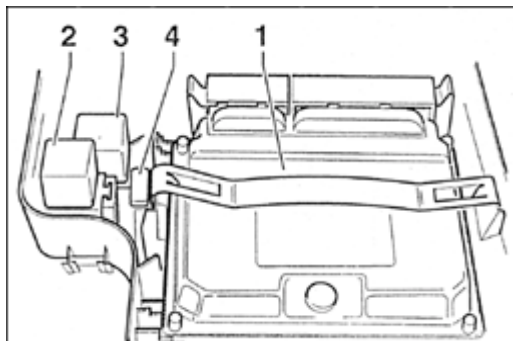
- Connect multimeter as follows to measure voltage.

3-position relay carrier in E-box in plenum chamber, position 2	Measure to
Contact	
8	Engine Ground

- Specified value: approx. battery voltage

If specified value is not attained:

- Carry out following tests:

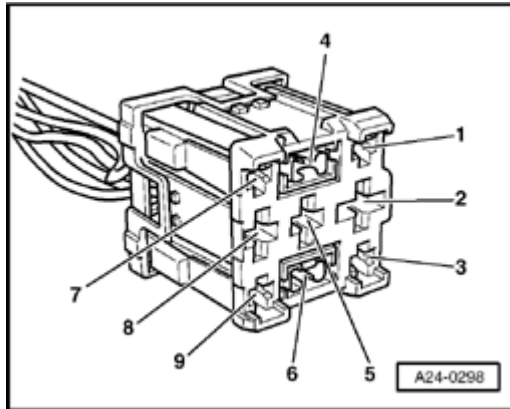


A

- Check fuse S130 (40 A) in electronics box of plenum chamber, (Pos. 4).

- Check for open circuit in wiring from battery + (terminal 30) to fuse S130 for secondary air injection pump relay (in 3-position in E-box of plenum chamber, position 2).

⇒ *Electrical Wiring Diagrams, Troubleshooting & Component Locations binder*



A

- Connect multimeter as follows to measure voltage.

3-position relay carrier in E-box in plenum chamber, position 2	Measure to
contact	
4	Engine Ground

- Operate starter briefly.
 - Specified value: approx. battery voltage

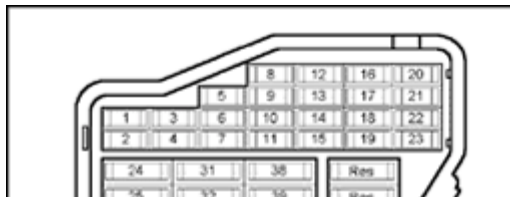
If specified value is not attained:

- Carry out following tests:

A

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

⇒ *Electrical Wiring Diagrams, Troubleshooting & Component Locations binder*

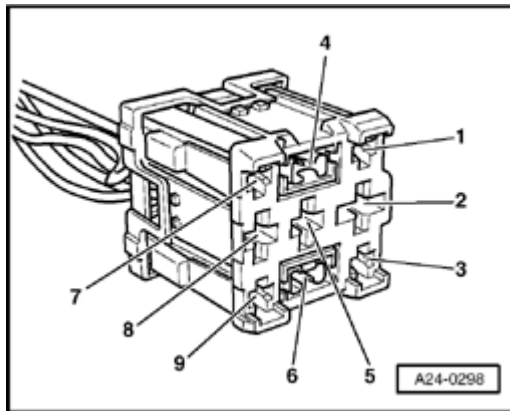


- Check for open circuit in wiring from secondary air injection pump relay (in 3-position relay carrier in E-box of plenum chamber) via fuse S234 (in fuse box, position 34) to fuel pump relay.

⇒ *Electrical Wiring Diagrams, Troubleshooting & Component Locations binder*

Check actuation of secondary air pump relay

- Switch ignition off.
- Remove secondary air injection pump relay.



▲

- Connect voltage tester VAG 1527 B as follows:

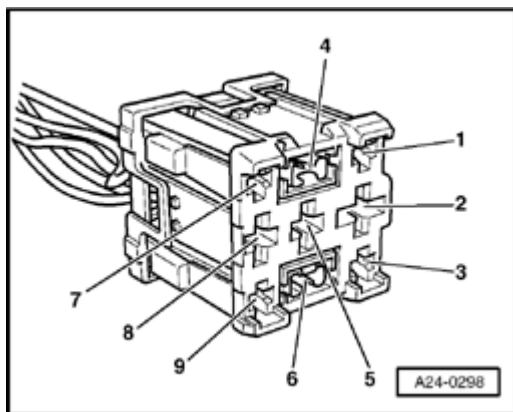
3-position relay carrier in E-box in plenum chamber, position 2 contact	Measure to
6	Engine Ground

- Initiate output Diagnostic Test Mode (DTM) and activate secondary air injection pump relay.
 - ◆ LED must flash.

If LED does not flash:

- Switch ignition off.
- Connect VAG 1598/31 test box to wiring harness leading to engine control module; engine control module should not be connected:

⇒ [Repair Manual, 1.8 Liter 4-Cyl. 5V Turbo Fuel Injection & Ignition, Engine Code\(s\): AWM, Repair Group 24](#)



A

- Check for open circuit and short to positive or Ground in following wiring connection:

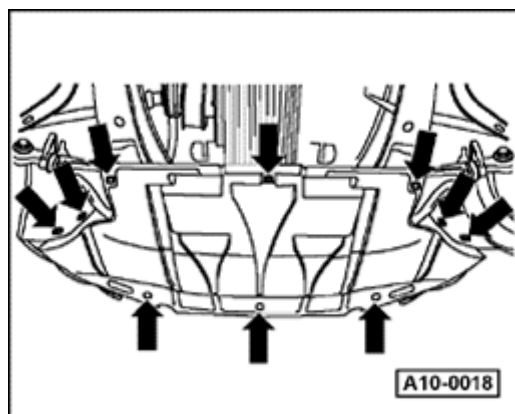
3-position relay carrier in E-box in plenum chamber, position 2	Test box VAG 1598/31
Contact	
6	66

- Repair any open/short circuit as necessary.

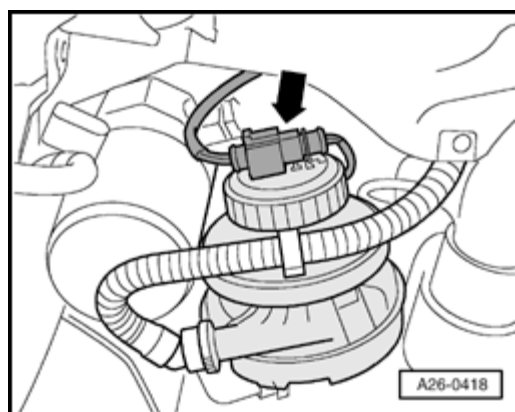
If no malfunction is found:

- Replace Secondary Air Injection Pump relay -J299-.

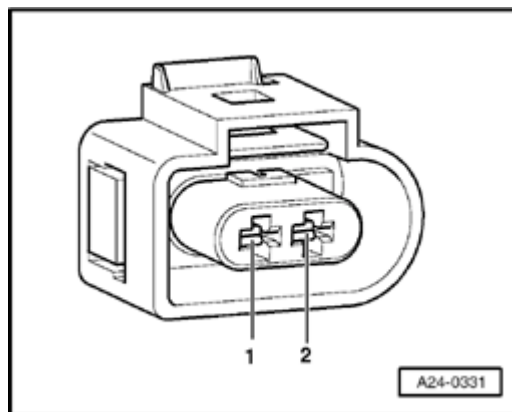
Check voltage supply for secondary air injection pump motor

**A**

- Remove sound insulation -arrows-.

**A**

- Disconnect connector from Secondary Air Injection (AIR) Pump motor - V101- (-arrow-).
- ◆ Location: Right front in engine compartment below air filter housing



- Connect voltage tester VAG 1527 B between contacts 1 and 2.
- Initiate output Diagnostic Test Mode (DTM) and activate Secondary Air Injection (AIR) Pump relay -J299-.
 - ◆ LED must flash.

If LED does not flash:

- Carry out following tests:
 - Check wiring connection from contact 1 of connector to secondary air injection pump relay (in 3-pin relay carrier in electronic box (plenum chamber), for open circuit.

⇒ *Electrical Wiring Diagrams, Troubleshooting & Component Locations binder*

- Check wiring connection of contact 2 of connector to Ground for open circuit:

⇒ *Electrical Wiring Diagrams, Troubleshooting & Component Locations binder*

If no malfunction is found:

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

Combination valve for secondary air inlet, checking function and for leaks

Special tools and equipment

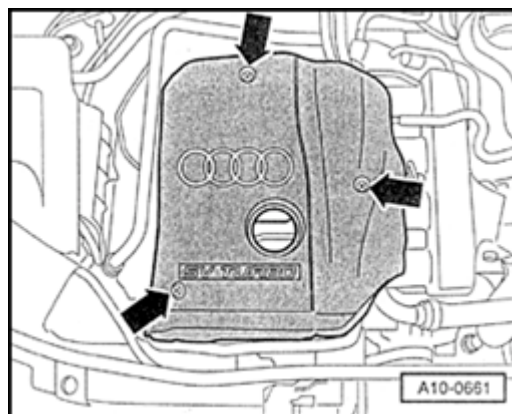
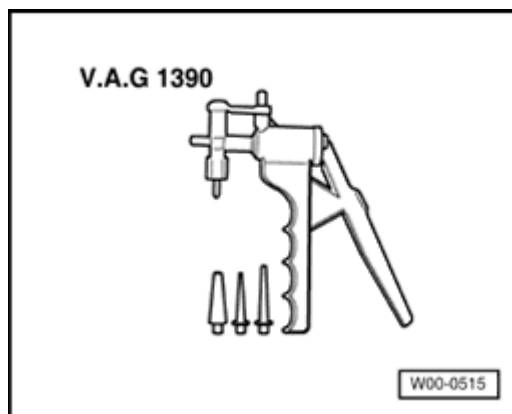
- ◆ Vacuum hand pump VAG 1390

Test requirements:

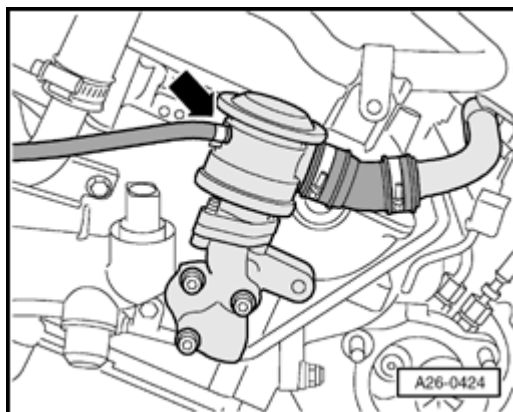
- Vacuum lines and hose connections do not leak.
- Vacuum lines not blocked.

Test sequence

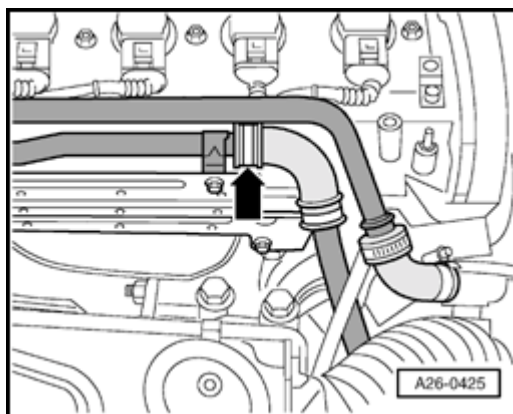
- ◆ - Remove engine cover -arrows-.



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- A**
- Remove vacuum hose -arrow- from combination valve.
 - Connect hand vacuum pump VAG 1390 to vacuum unit of combination valve.



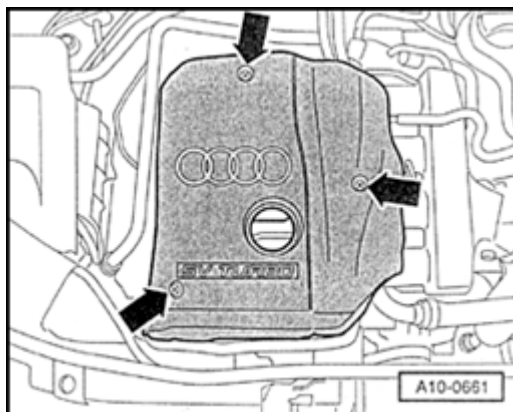
- A**
- Disconnect hose -arrow- to combination valve for secondary air inlet.
 - Blow into line with slight pressure (do not use compressed air).
 - Combi valve must be closed; blowing through must NOT be possible.
 - Actuate hand vacuum pump.
 - Combi valve must open; blowing through must be possible

If the combi valve does not open:

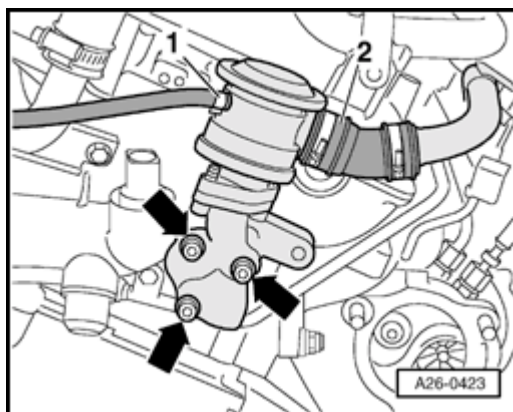
- Replace combination valve ⇒ [Page 26-64](#) .

Combination valve for secondary air inlet, removing and installing

Removing



- A**
- Remove engine cover -arrows-.



- A**
- Disconnect hoses -1- and -2- from combination valve.
 - Unbolt combination valve -arrows-.

Installing

Installation is carried out in the reverse order of removal; note the following:

Note:

Replace gaskets and seals.

Tightening torque

Component	Nm
Combination valve for secondary air inlet at cylinder head	10