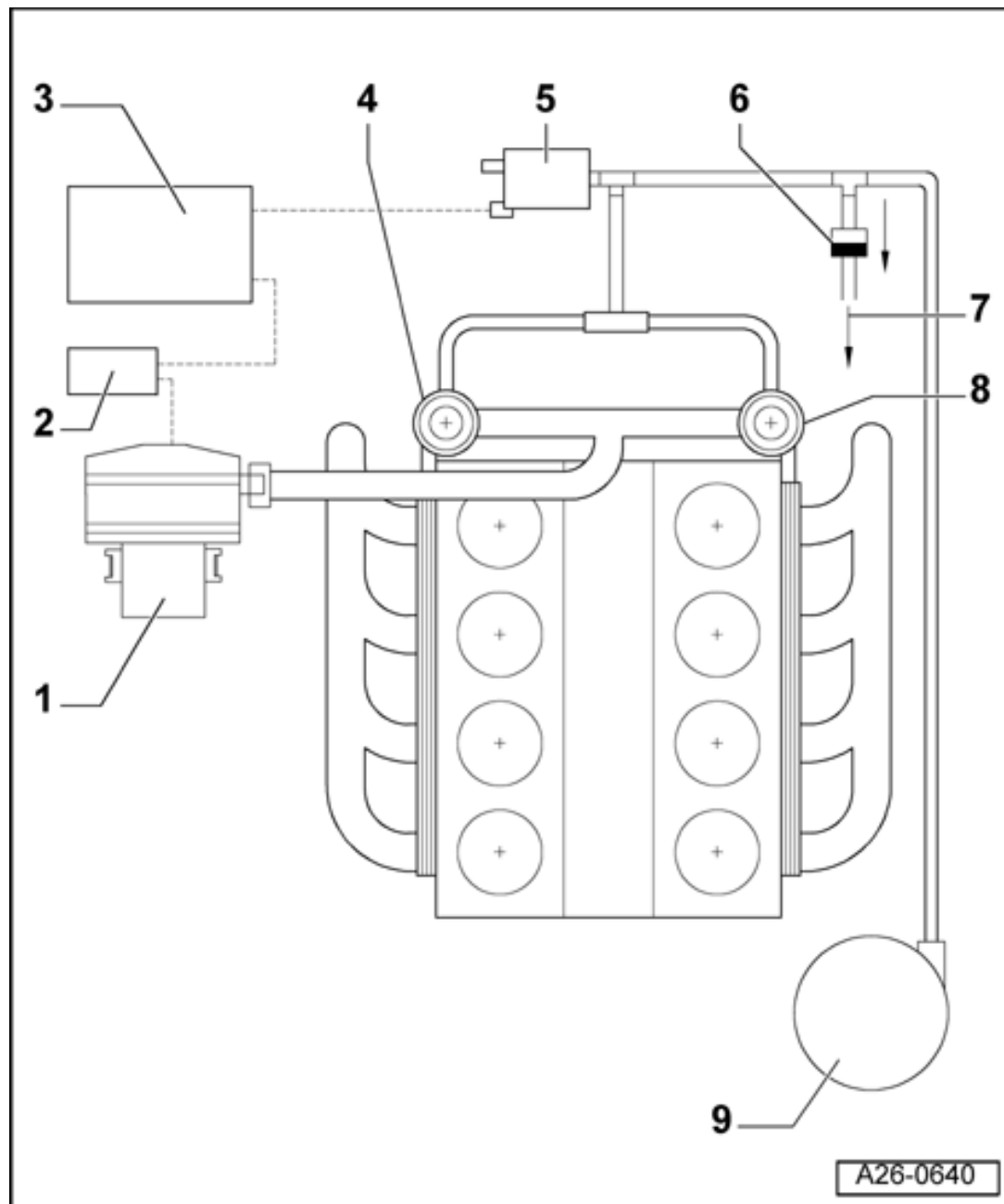



[Vehicle](#)
[System](#)
[Repair Group](#)
[Previous Topic](#)
[Next Topic](#)
[Technical Bulletins](#)
[Wiring Diagrams](#)
[Warnings & Cautions](#)
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A26-0640

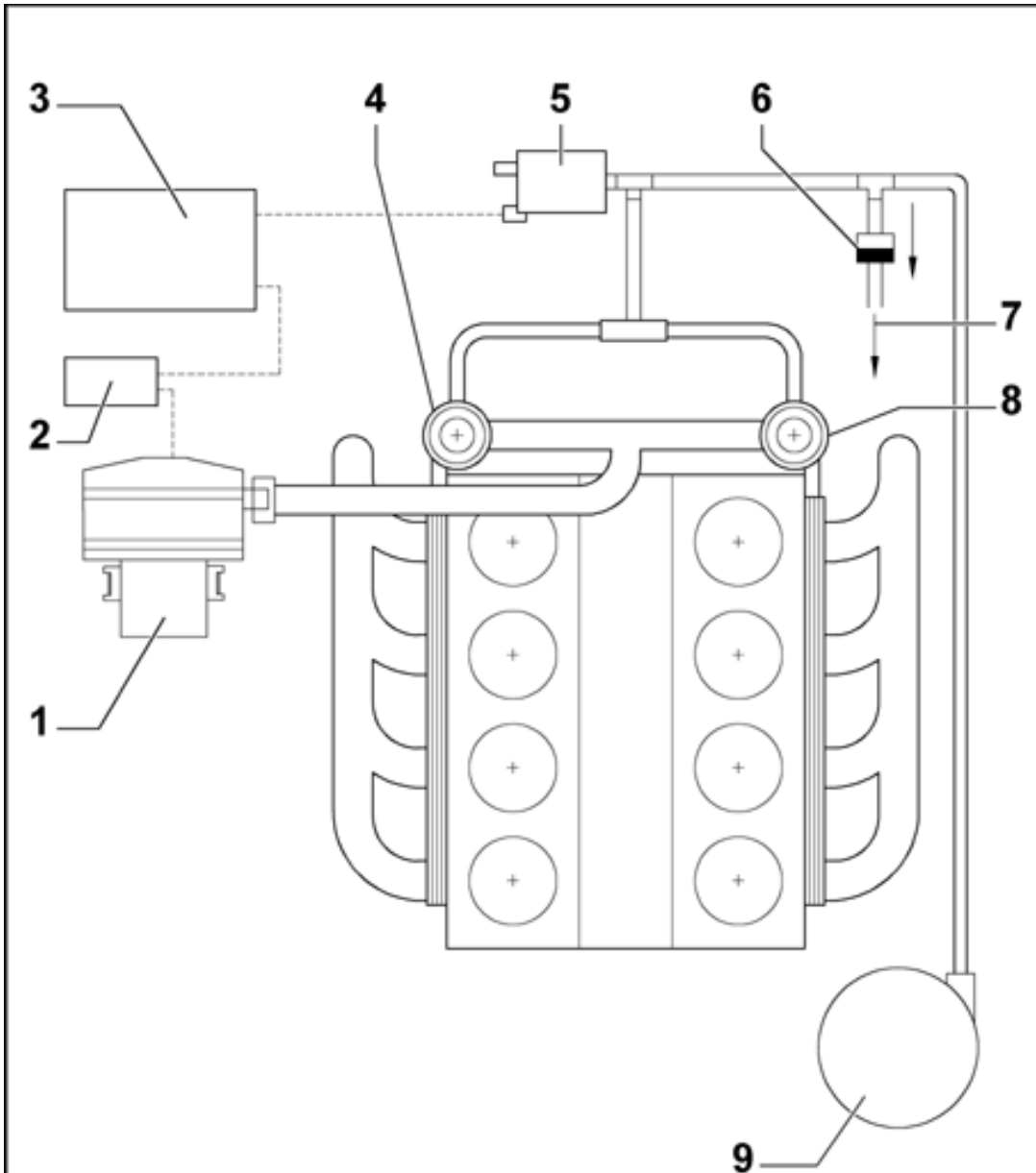
Secondary air system

The secondary air system is designed to enable catalytic converter to heat up and reach its operating temperature more quickly after a cold start.

Principle of operation

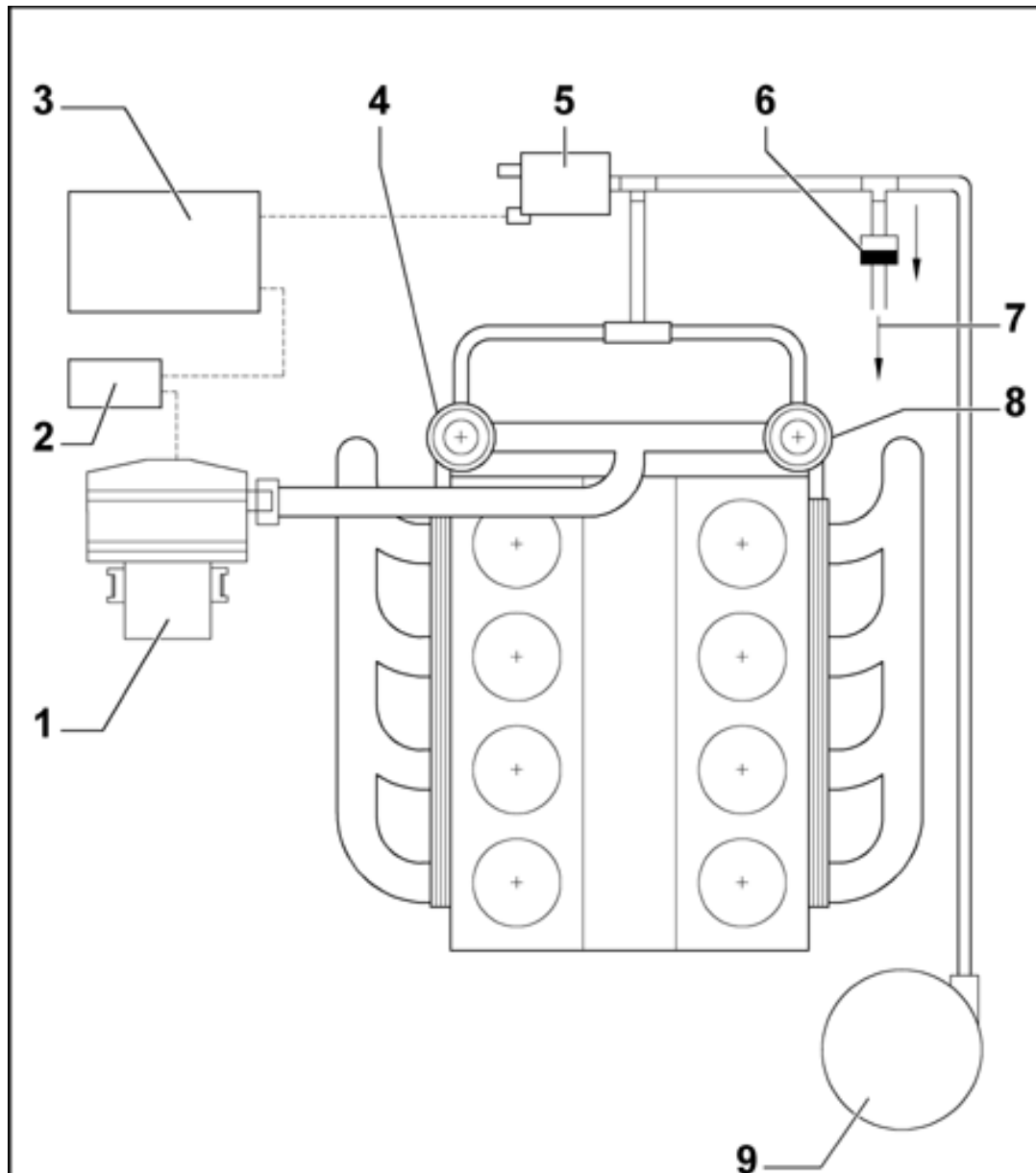
Due to extra mixture enrichment during cold-start phase, an increased amount of unburnt hydrocarbons is carried in exhaust gas. The secondary air system improves the afterburning (oxidation) process in the catalytic converter, and in this way reduces toxic emissions. Heat generated by oxidation accelerates "light off" of catalytic converter and significantly improves exhaust gas quality during warm-up.

[Advanced Search](#)



Function

- ◆ After a cold start, engine control module -3- activates secondary air pump -1- via secondary air pump relay -2-, and air is fed to combination valves for secondary air system -4- and -8-.
- ◆ At the same time, the system activates secondary air inlet valve -5-, which supplies vacuum to combination valves -4- and -8-. The relevant combination valve opens a passage for the secondary air system to supply air to exhaust ports in cylinder head.



1 - Secondary air injection (AIR) pump motor -V101-

◆ Location ⇒ [Fig. 2](#) ,
⇒ [Page 26-54](#)

◆ Removing and installing ⇒ [Page 26-77](#)

2 - Secondary air injection (AIR) pump relay -J299-

◆ Location ⇒ [Fig. 3](#) ,
⇒ [Page 26-55](#)

3 - Motronic engine control module (ECM) -J220-

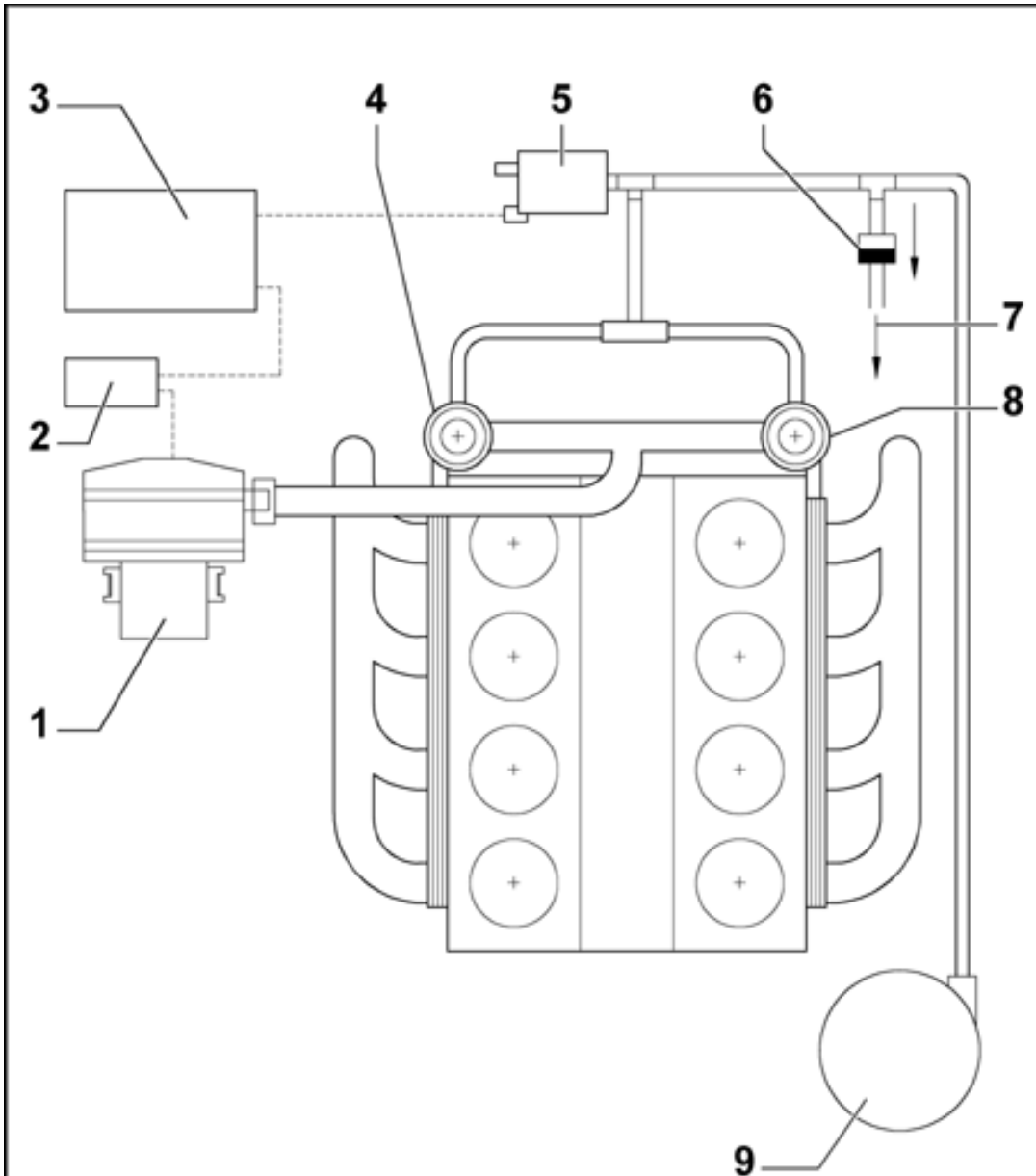
4 - Right combination valve for secondary air system

◆ Location ⇒ [Fig. 4](#) ,
⇒ [Page 26-55](#)

◆ Checking ⇒ [Page 26-79](#)

A26-0640

◆ Removing and
installing ⇒ [Page
26-86](#)



5 - Secondary Air Injection (AIR) Solenoid Valve - N112-

- ◆ Location ⇒ [Fig. 1](#) ,
⇒ [Page 26-54](#)

6 - Non-return valve

- ◆ Installation position as shown in illustration. Arrow indicates direction of flow

7 - To intake manifold

8 - Left combination valve for secondary air system

- ◆ Location ⇒ [Fig. 4](#) ,
⇒ [Page 26-55](#)
- ◆ Testing ⇒ [Page 26-79](#)
- ◆ Removing and installing ⇒ [Page 26-82](#)

A26-0640

9 - Vacuum reservoir

- ◆ Installation location:
In front left wheel
housing beneath
liner

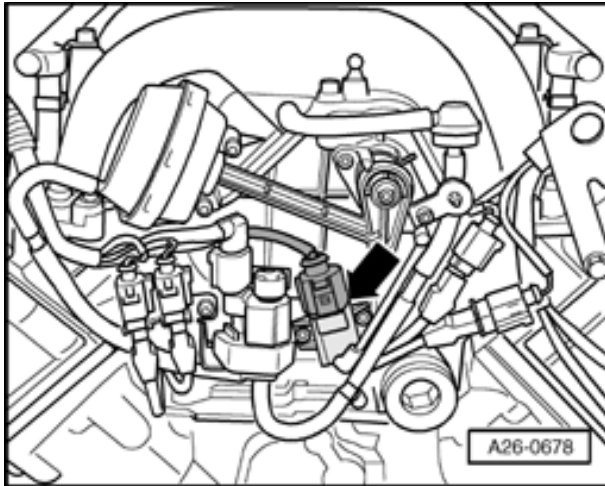


Fig. 1 Installation location of secondary air injection (AIR) solenoid valve -N112-

- ◆ At front of intake manifold (arrow)

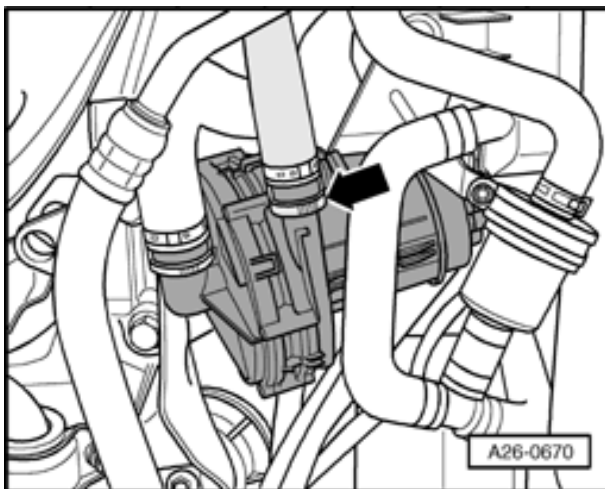


Fig. 2 Installation location of secondary air injection (AIR) pump motor -V101-

- ◆ At right front of engine compartment beneath longitudinal member

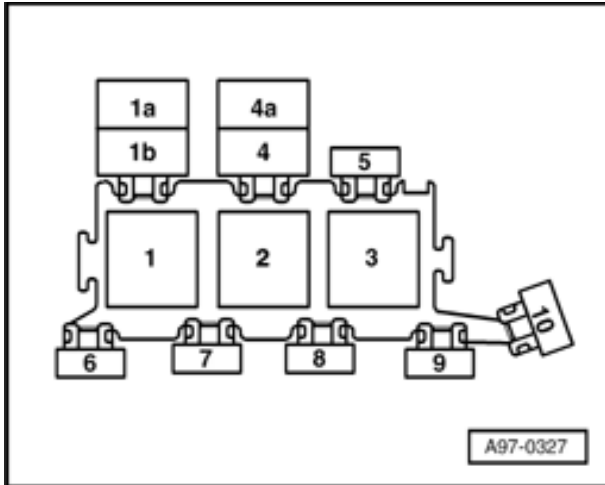


Fig. 3 Installation location of secondary air injection (AIR) pump relay -J299-

- ◆ Position 2 in 3-position relay carrier in plenum chamber electronics box

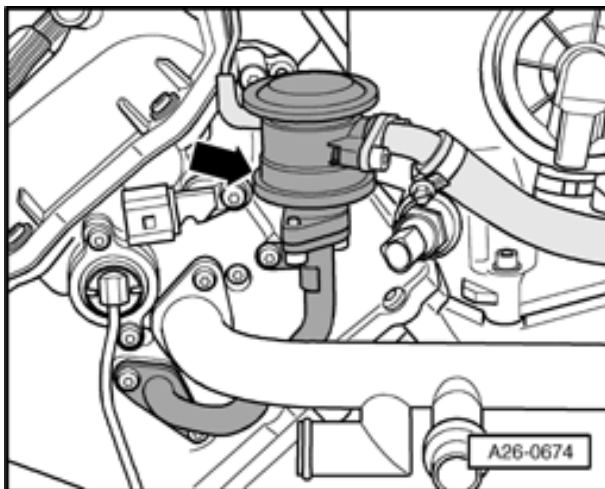


Fig. 4 Secondary air system combination valve

- ◆ On back of cylinder heads

Note:

Illustration shows left valve.

26-56



Secondary air injection (AIR) solenoid valve - N112-, checking

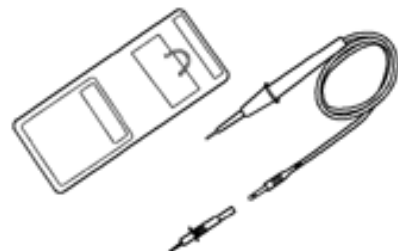
Special tools and equipment

- ◆ V.A.G 1526
A
- ◆ V.A.G 1527
B
- ◆ V.A.G 1594
A
- ◆ V.A.G
1598/31
- ◆ VAS 5051 with VAS
5051/1

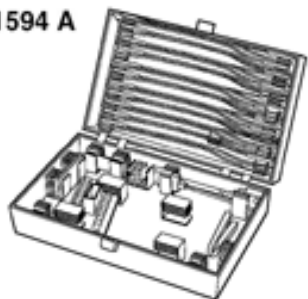
V.A.G 1526 A



V.A.G 1527 B



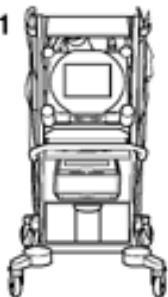
V.A.G 1594 A



V.A.G 1598/31



VAS 5051



26-57



Work sequence

Note:

Secondary Air Injection (AIR) solenoid valve -N112- and wiring are monitored by engine control module.

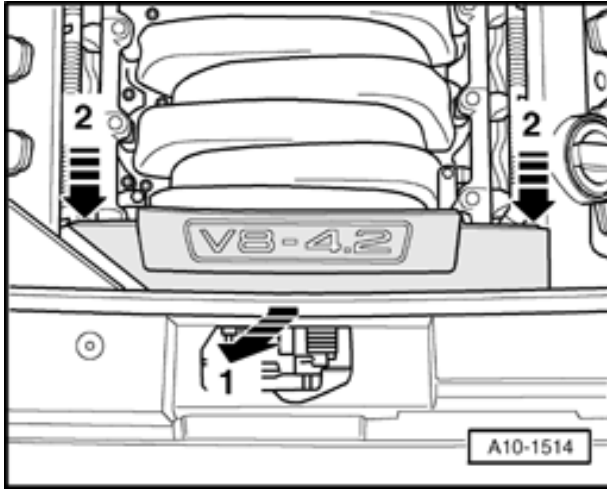
- Connect vehicle diagnostic, testing and information system VAS 5051 and select vehicle system "01 - Engine electronics" from list. Ignition must be on.

⇒Repair Manual, 4.2 Liter V8 5V Fuel Injection & Ignition, Engine Code(s): BAS, Repair Group 01

- Read out fault memory of engine control module.

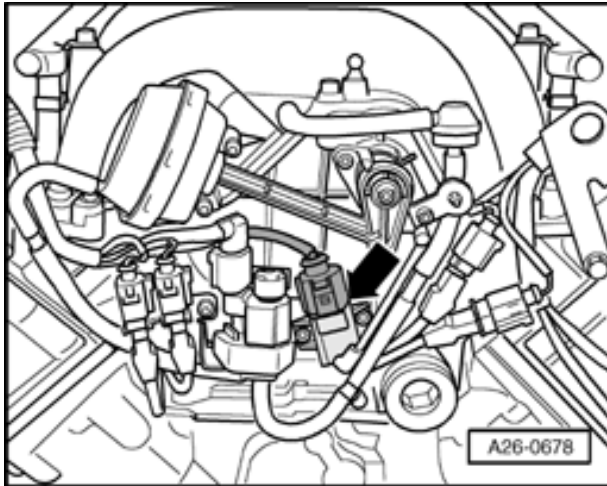
⇒Repair Manual, 4.2 Liter V8 5V Fuel Injection & Ignition, Engine Code(s): BAS, Repair Group 01; Checking and erasing fault memory

If a malfunction relating to Secondary Air Injection (AIR) solenoid valve-N112 is displayed:

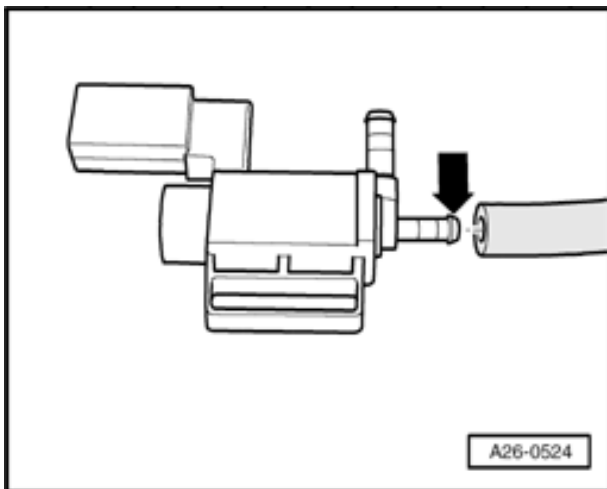


- Detach front engine cover (arrows -1- and -2-).
- Move lock carrier to service position ⇒ [Page 13-2](#).

26-58



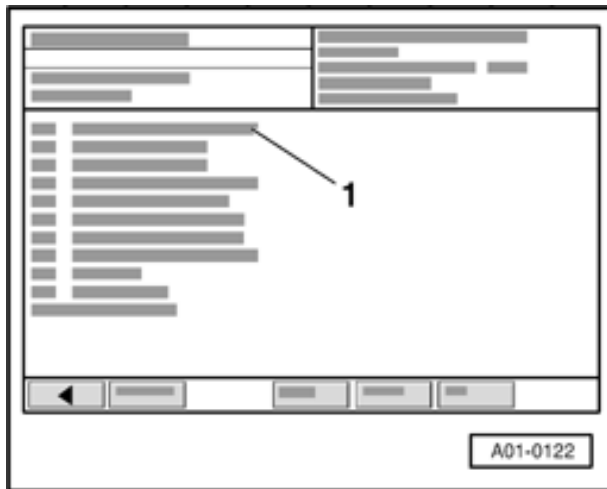
- Disconnect hoses from Secondary Air Injection (AIR) solenoid valve-N112- (arrow); leave connector attached.



- Connect test hose to valve connection marked with (arrow).



- Vehicle diagnostic, testing and information system VAS 5051 connected up; vehicle self-diagnosis and vehicle system "01 - Engine electronics" selected. Ignition must be on.



Indicated on VAS 5051:

- From list -1- select diagnostic function "03 - Final control diagnosis".
- Keep touching ► key, until the secondary air injection (AIR) solenoid valve -N112- is activated.
- ◆ Valve must click...
- ◆ ...and must open and close (can be checked by blowing into test hose).
- Terminate function "03 - Final control diagnosis" by touching ◀ key.
- Turn the ignition off.

If valve does not open or close properly:

- Replace secondary air inlet valve - N112.

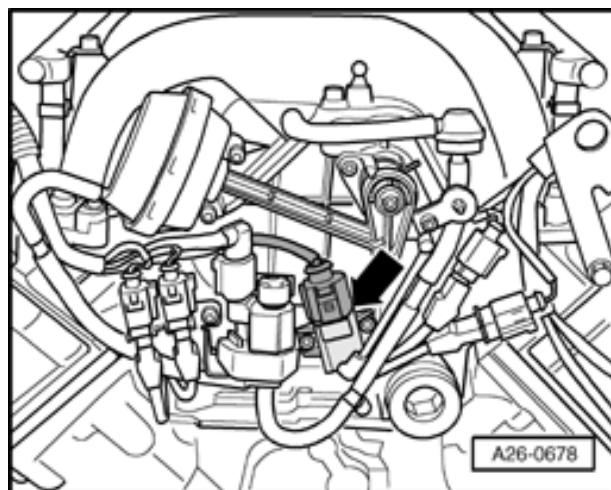
26-60

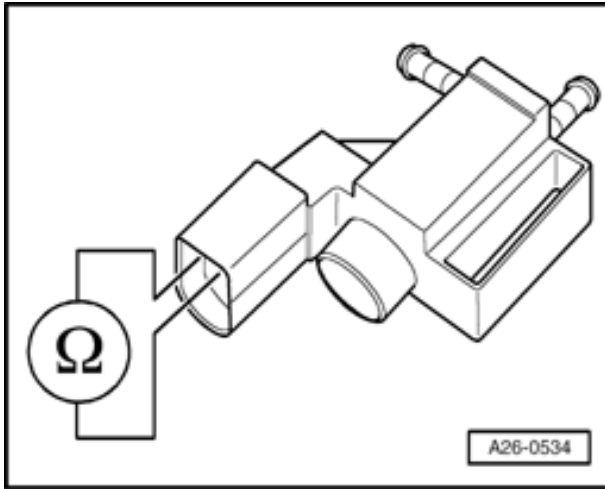


If valve does not click in final control diagnosis:

Checking internal resistance

- Switch ignition off.
- ▲ - Disconnect connector at secondary air injection (AIR) solenoid valve-N112- (arrow).





- Connect multimeter to valve for resistance measurement.

◆ Specification: 19 to 27

Ω

If reading does not match specification:

- Replace secondary air injection (AIR) solenoid valve -N112-.

If reading matches specification:

26-61



Checking power supply

Requirements:

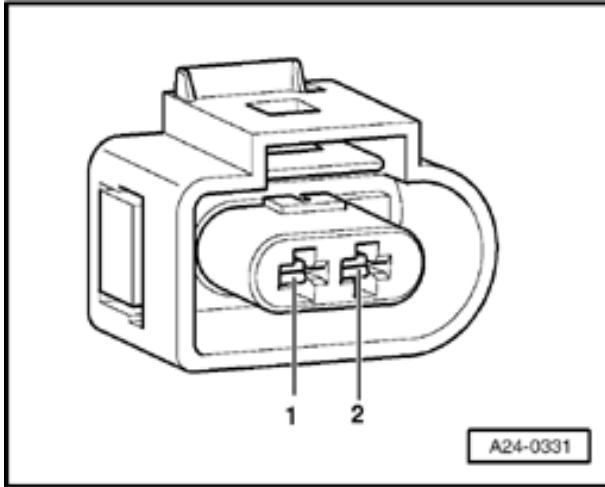
- Fuse for secondary air inlet valve OK

⇒ *Electrical Wiring Diagrams, Troubleshooting & Component Locations m.y 2003 >*

- Fuel pump relay OK

Note:

Secondary Air Injection (AIR) solenoid valve -N112- is supplied with power by way of the fuel pump relay.



- Connect voltage tester V.A.G 1527 B as follows.

Connector	Measure to
Contact	
1	Engine ground

- Briefly operate starter.
 - ◆ LED must light

26-62



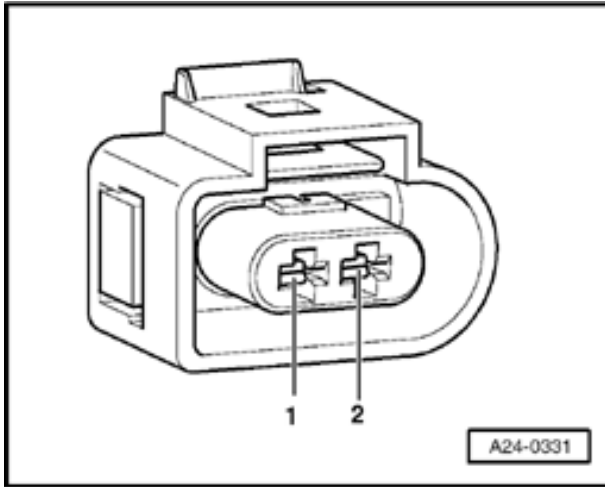
If LED does not light:

- Use wiring diagram to check for open circuit in wiring from contact 1 of connector via fuse to fuel pump relay.
- Use wiring diagram to eliminate open circuit in wiring.

If LED lights:

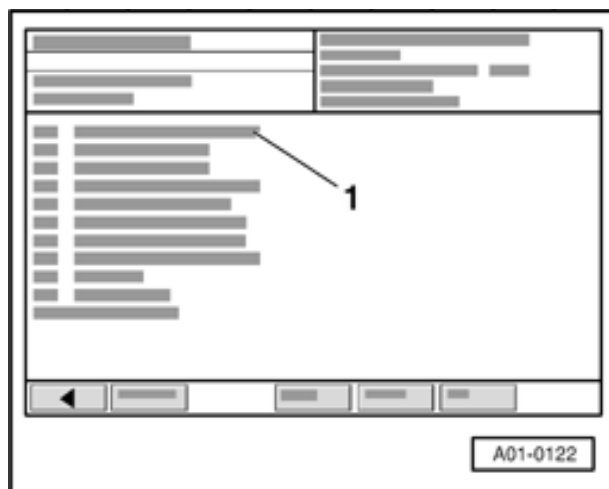
Checking actuation

- Vehicle diagnostic, testing and information system VAS 5051 connected up; vehicle self-diagnosis and vehicle system "01 - Engine electronics" selected. Ignition must be on.



- Connect up voltage tester V.A.G 1527 B between contacts 1 and 2.

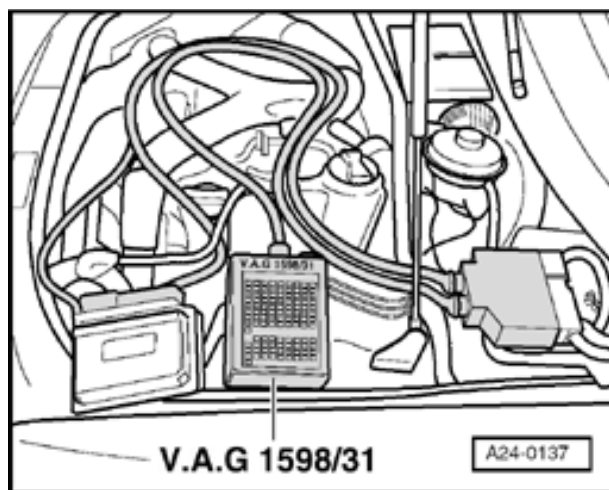
26-63



Indicated on VAS 5051:

- From list -1- select diagnostic function "03 - Final control diagnosis".
- Keep touching ► key, until the secondary air injection (AIR) solenoid valve -N112- is activated.
 - ◆ LED must flash
- Terminate function "03 - Final control diagnosis" by touching ◀ key.
- Switch ignition off.

If LED does not flash or if it is permanently lit:



- Connect up test box V.A.G 1598/31 to wiring harness connectors. Engine control module is not to be connected. Connect ground clip of test box to ground (not shown in Fig.).

⇒ [Repair Manual, 4.2 Liter V8 5V Fuel Injection & Ignition, Engine Code\(s\): BAS, Repair Group 24](#)

CAUTION!

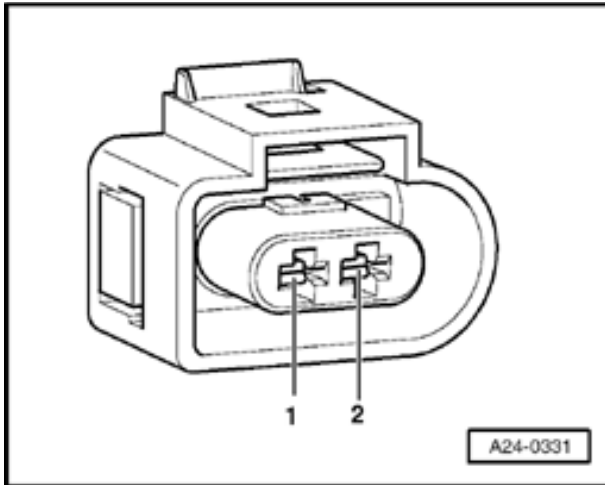
So as not to destroy electronic components, select

V.A.G 1598/31

A6A-U137

required measuring range before connecting test leads and observe test conditions.

26-64



- Check for open circuit and short to ground/positive in the following wiring.

Connector	Test box V.A.G 1598/31
Contact	Socket
2	44

- Use wiring diagram to eliminate open circuit in wiring/short circuit.

26-65



Secondary air injection (AIR) pump relay -J299- and secondary air injection (AIR) pump motor -V101-, checking

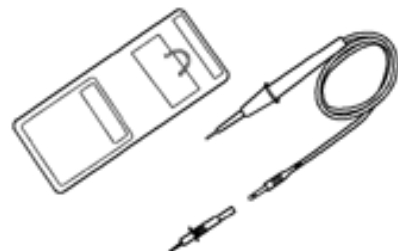
Special tools and equipment

- ◆ V.A.G 1526 A
- ◆ V.A.G 1527 B
- ◆ V.A.G 1594 A
- ◆ V.A.G 1598/31
- ◆ VAS 5051 with VAS 5051/1

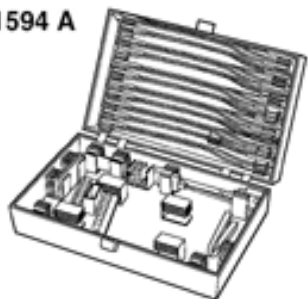
V.A.G 1526 A



V.A.G 1527 B



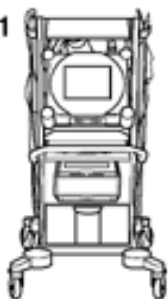
V.A.G 1594 A



V.A.G 1598/31



VAS 5051



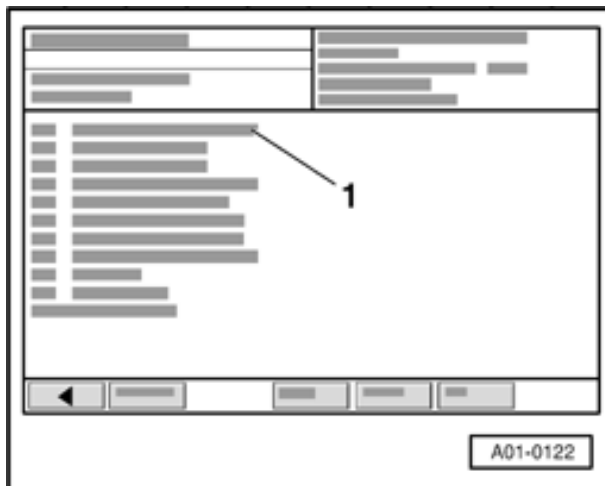
26-66



Work sequence

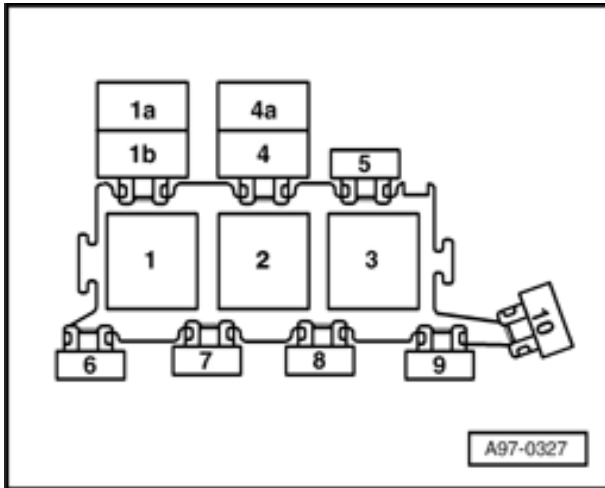
- Connect up vehicle diagnostic, testing and information system VAS 5051 and select vehicle system "01 - Engine electronics" from list. Ignition must be on.

⇒ Repair Manual, 4.2 Liter V8 5V Fuel Injection & Ignition, Engine Code(s): BAS, Repair Group 01



Indicated on VAS 5051:

- From list -1- select diagnostic function "03 - Final control diagnosis".
- Keep touching ► key, until the secondary air injection (AIR) solenoid valve -J299- is activated.



◆ Secondary air pump relay (in 3-position relay carrier in plenum chamber electronics box, position 2) must be energized and secondary air pump motor -V101 must run intermittently

- Terminate function "03 - Final control diagnosis" by touching ◀ key.
- Switch ignition off.

26-67



A - If relay is not energized:

- Check secondary air injection (AIR) pump relay power supply ⇒ [Page 26-68](#) .
- Check actuation of secondary air pump relay ⇒ [Page 26-71](#) .

B - If relay is energized but secondary air pump motor does not run:

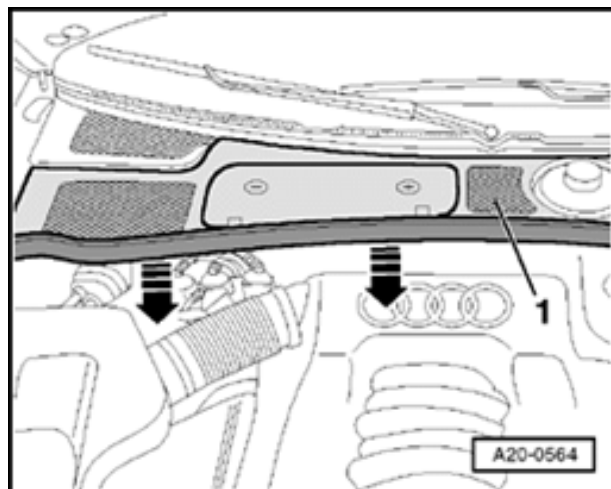
- Check power supply for secondary air pump motor ⇒ [Page 26-74](#) .

26-68

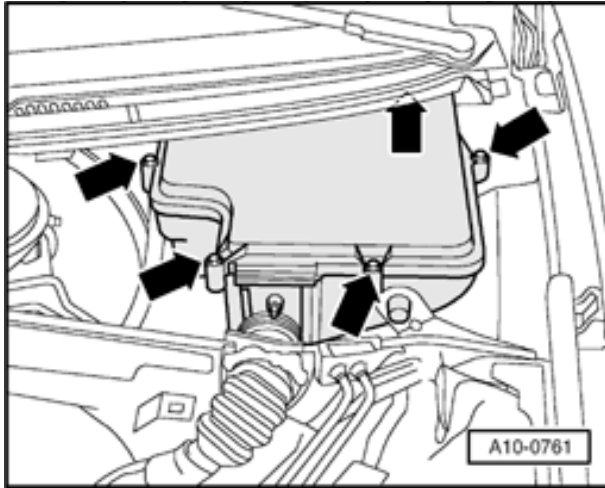


Checking secondary air injection (AIR) pump relay power supply

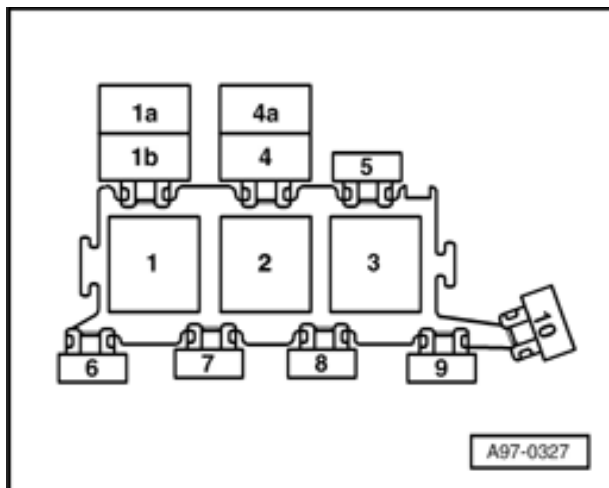
- Switch ignition off.



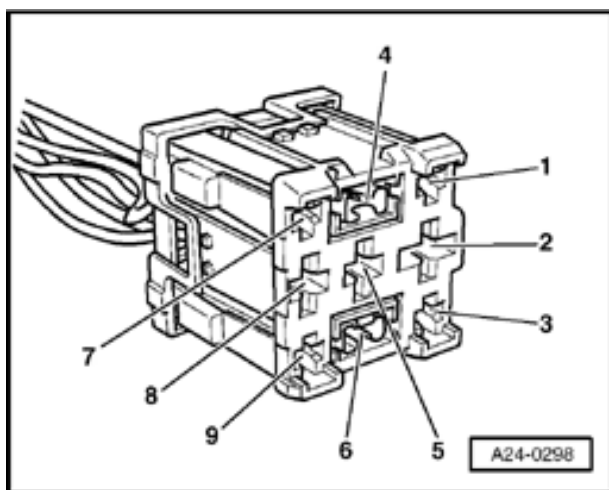
- Remove plenum chamber cover rubber seal in direction of (arrow).
- Remove plenum chamber cover -1- to front.



- Remove cover for electronics box in plenum chamber (arrows).



- ◀ - Disconnect secondary air injection (AIR) pump relay (position 2).



- ◀ - Connect multimeter for voltage measurement as follows.

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

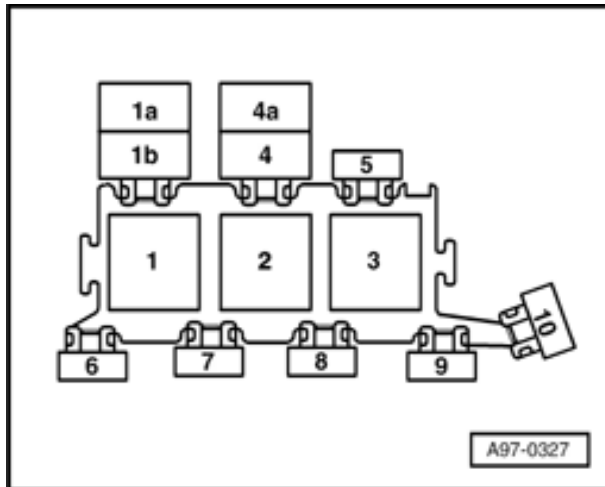
◆ Specification: approx. battery voltage

26-70

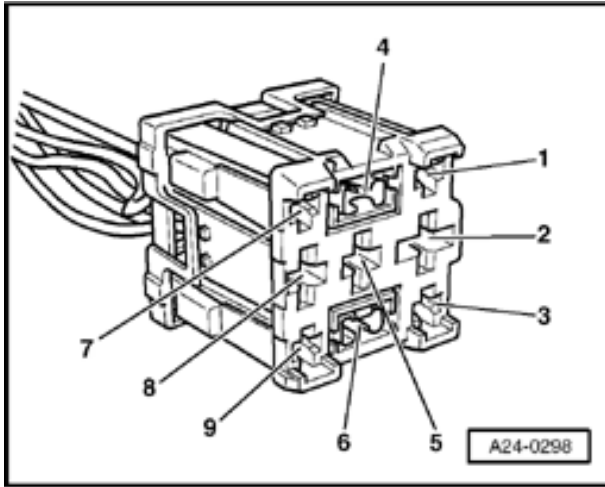


If reading does not match specification:

- Perform the following checks marked with a dot.



- Check fuse S130 (50 A) in plenum chamber electronics box, position 7.
 - Use wiring diagram to check for open circuit in wiring from battery + (terminal 30) via fuse S130 to secondary air injection (AIR) pump relay -J299- (in 3-position relay carrier in plenum chamber electronics box, position 2).
- Use wiring diagram to eliminate open circuit in wiring.



- Connect multimeter for voltage measurement as follows.

3-position relay carrier in plenum chamber electronics box, position 2	Measure to
Contact	
4	Engine ground

- Briefly operate starter.

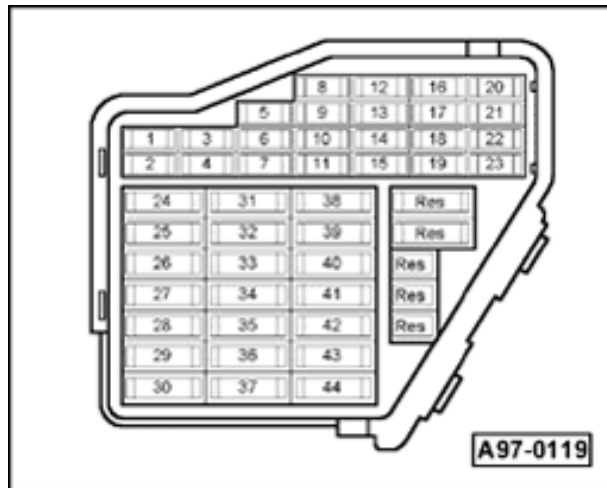
◆ Specification: approx. battery voltage

26-71



If reading does not match specification:

- Perform the following checks marked with a dot.

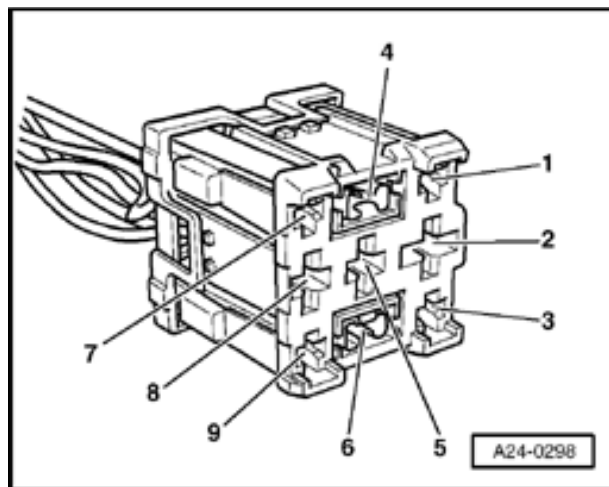


- Check fuse S234 (in fuse box, position 34).
 - Use wiring diagram to check for open circuit in wiring from secondary air injection (AIR) pump relay -J299- (in 3-position relay carrier in plenum chamber electronics box) via fuse S234 (in fuse box, position 34) to fuel pump relay.
- Use wiring diagram to eliminate open circuit in wiring.

Checking actuation of secondary air injection (AIR) pump relay

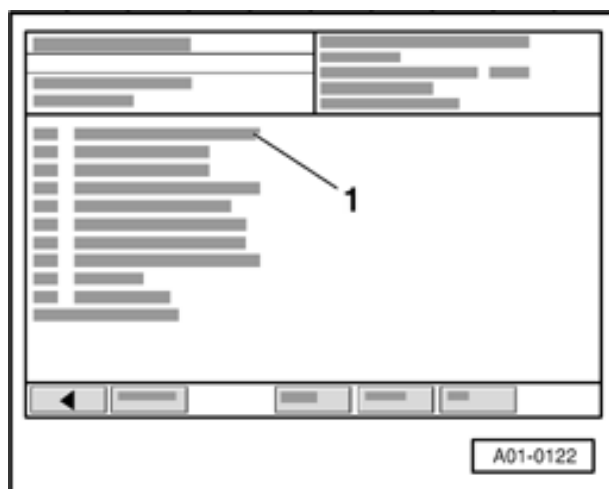
- Switch ignition off.
- Disconnect secondary air injection (AIR) pump relay.

26-72



- ◀ - Connect voltage tester V.A.G 1527 B as follows.

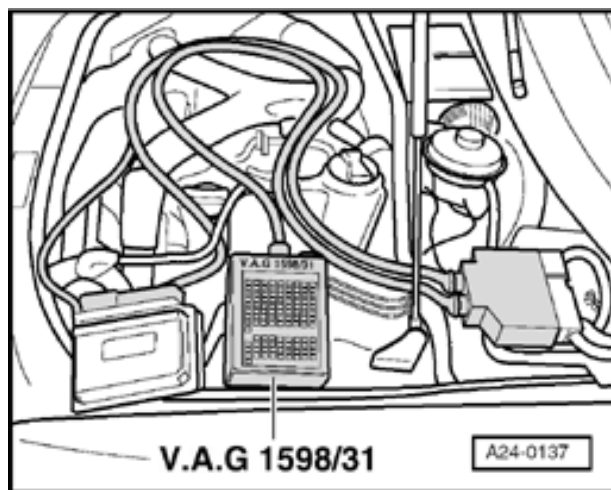
3-position relay carrier in plenum chamber electronics box, position 2	Measure to
Contact	
6	Battery positive



- ◀ Indicated on VAS 5051:
 - From list -1- select diagnostic function "03 - Final control diagnosis".
 - Keep touching ► key, until the secondary air injection (AIR) solenoid valve -J299- is activated.
 - ◆ LED must flash
 - Terminate function "03 - Final control diagnosis" by touching ◀ key.
 - Switch ignition off.



If LED does not flash:

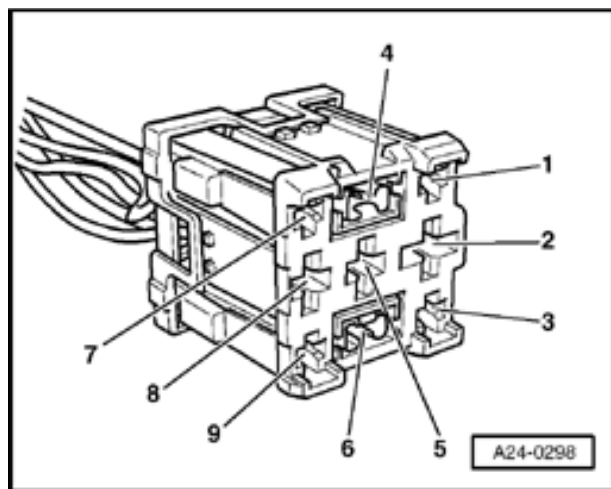


- Connect test box V.A.G 1598/31 to wiring harness connectors. Actual engine control module is not to be connected. Connect ground clip of test box to ground (not shown in Fig.).

⇒ [Repair Manual, 4.2 Liter V8 5V Fuel Injection & Ignition, Engine Code\(s\): BAS, Repair Group 24](#)

CAUTION!

So as not to destroy electronic components, select required measuring range before connecting test leads and observe test conditions.



- Check for open circuit and short to ground/positive in the following wiring.

3-position relay carrier in plenum chamber electronics box, position 2	Test box V.A.G 1598/31
Contact	Socket

6	46
---	----

- Use wiring diagram to eliminate open circuit in wiring/
short circuit.

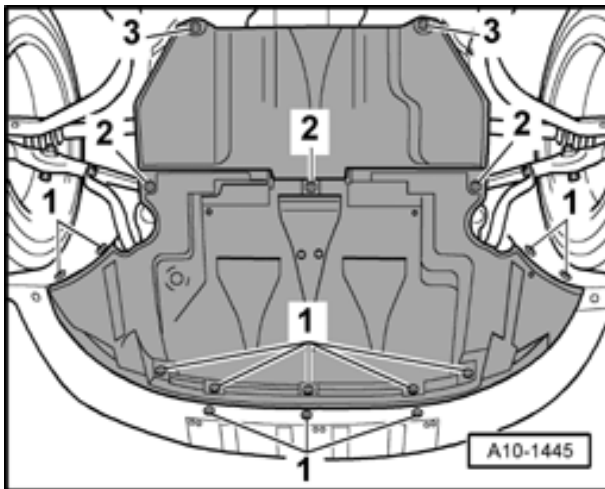
26-74



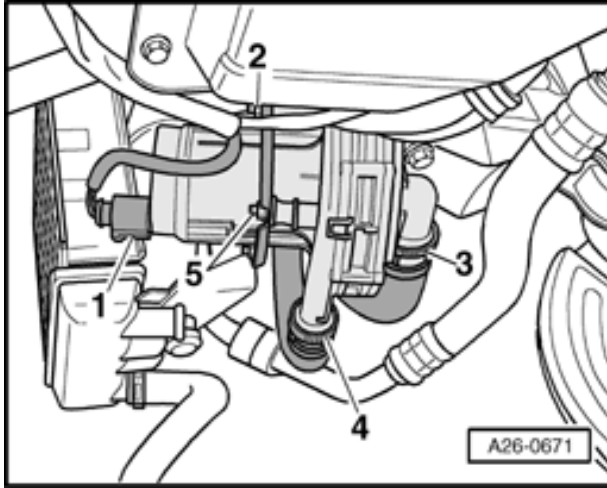
If no fault is found:

- Replace secondary air injection (AIR) pump relay - J299-.

Checking power supply for secondary air injection (AIR) pump motor

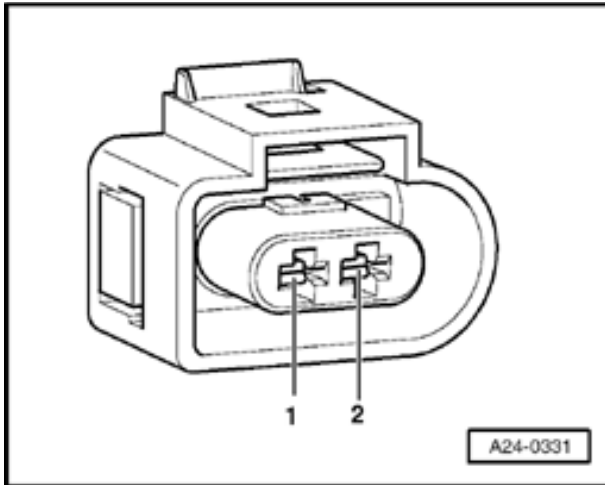


- Unfasten quick-release fasteners -1- and -2- and detach front noise insulation. Leave rear noise insulation in position.

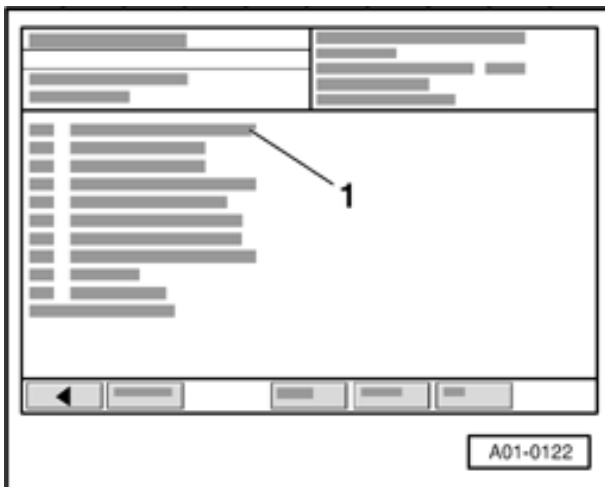


- Disconnect connector -1- at secondary air injection (AIR) pump motor -V101-.

26-75



- ◀ - Connect voltage tester V.A.G 1527 B between contacts -1- and -2-.
- Vehicle diagnostic, testing and information system VAS 5051 connected; vehicle self-diagnosis and vehicle system "01 - Engine electronics" selected. Ignition must be on.



- ◀ Indicated on VAS 5051:
 - From list -1- select diagnostic function "03 - Final control diagnosis".

26-76



- Keep touching ► key, until the secondary air injection (AIR) solenoid valve -J299- is activated.

◆ LED must flash

- Terminate function "03 - Final control diagnosis" by touching ◀ key.

If LED does not flash:

- Perform the following checks marked with a dot.
 - Use wiring diagram to check for open circuit in wiring from contact 2 of connector to secondary air injection (AIR) pump relay -J299- (in relay carrier in plenum chamber electronics box, position 2).
 - Use wiring diagram to check for open circuit in wiring from contact 1 of connector to ground.

- Use wiring diagram to eliminate open circuit in wiring.

If no fault is found:

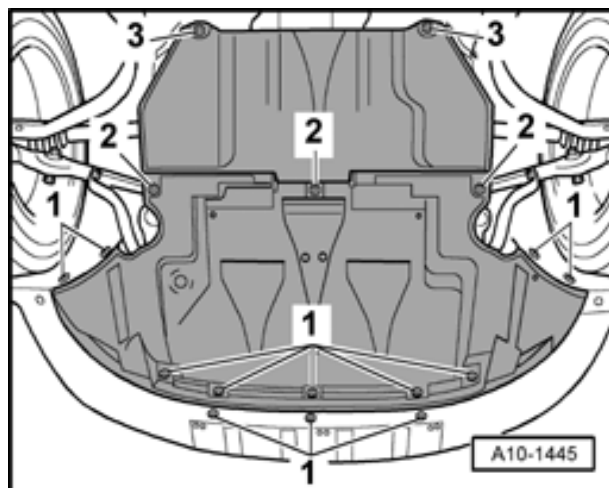
- Replace secondary air pump ⇒ [Page 26-77](#) .

26-77



Secondary air pump, removing and installing

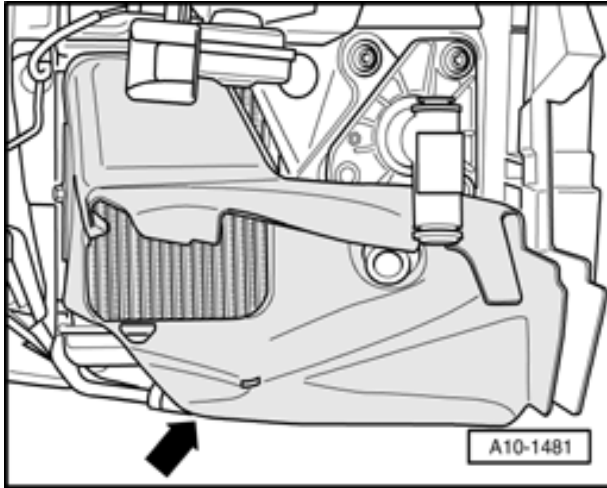
Removing



- Unfasten quick-release fasteners -1- and -2- and remove front noise insulation. Leave rear noise insulation in position.

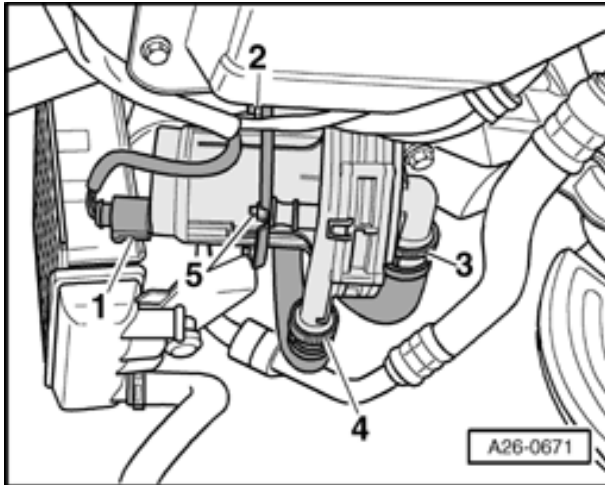
- Remove front bumper.

⇒ [Repair Manual, Body Interior, Repair Group 63; Front bumper](#)



- Remove right air duct (arrow) in front of auxiliary radiator.

26-78



- Remove hoses -3- and -4- at secondary air pump.
- Disconnect connector - 1-.
- Remove nuts -2- and -5- and detach secondary air pump from holder.

Installing

Install in reverse order, note the following:

- Install front bumper.

⇒ [Repair Manual, Body Interior, Repair Group 63; Front bumper](#)

Tightening torque

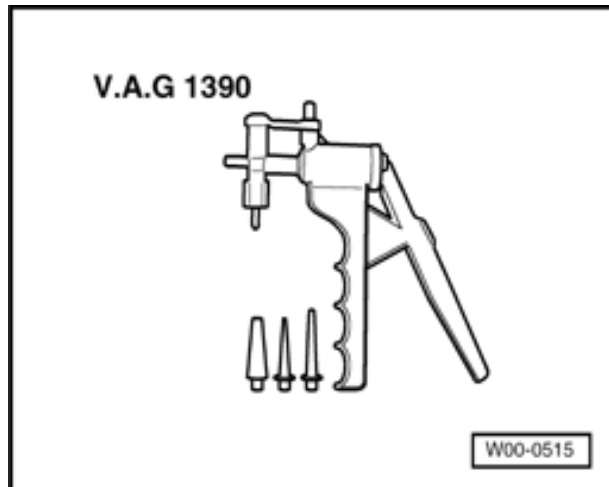
Component	Nm
Secondary air pump to holder	10

26-79



Combination valve for secondary air system for proper operation and leakage, checking

Special tools and equipment

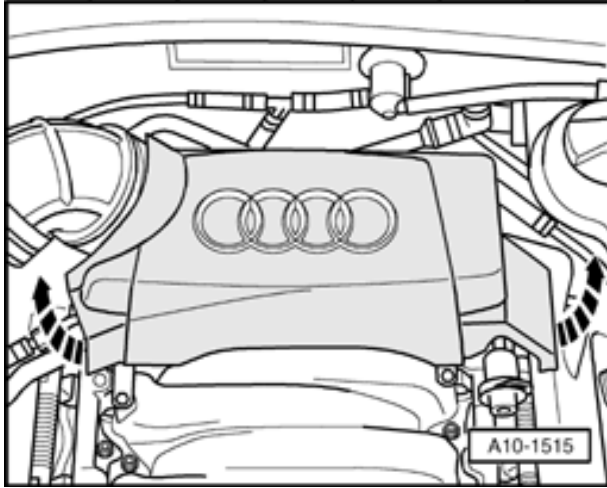


- ◆ Vacuum hand pump V.A.G 1390

Requirements:

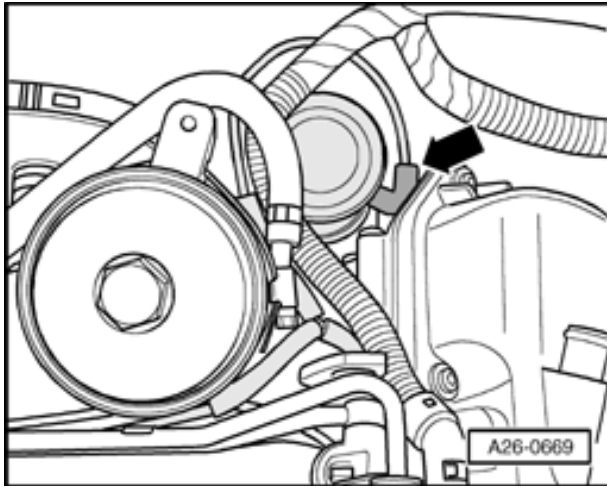
- No leaks in vacuum lines and hose connections
- Vacuum lines not clogged

Work sequence



- Remove rear engine cover (arrows).

26-80

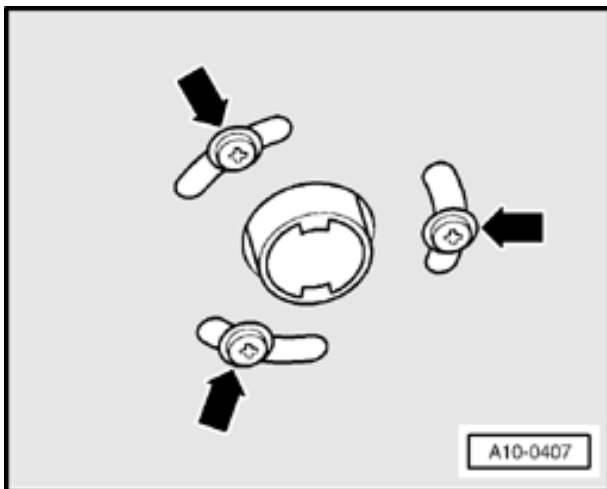


- ▲ - Disconnect vacuum hose (arrow) at combination valve to be checked.

Note:

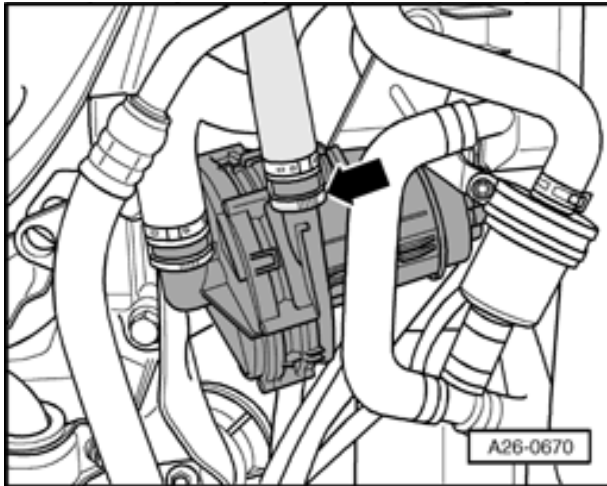
Illustration shows left combination valve.

- Connect vacuum hand pump V.A.G 1390 to vacuum hose of combination valve to be checked.



- ▲ - On vehicles with auxiliary heater, remove bolts (arrows) for exhaust pipe of auxiliary/additional heater at noise insulation.

26-81



- Remove pressure hose (arrow) at secondary air pump.
- Blow gently into pipe (do not use compressed air).
 - ◆ Both combination valves must be closed and it must not be possible to blow through them
- Operate vacuum hand pump.
 - ◆ Corresponding combination valve must open and it must be possible to blow through it

If corresponding combination valve does not open:

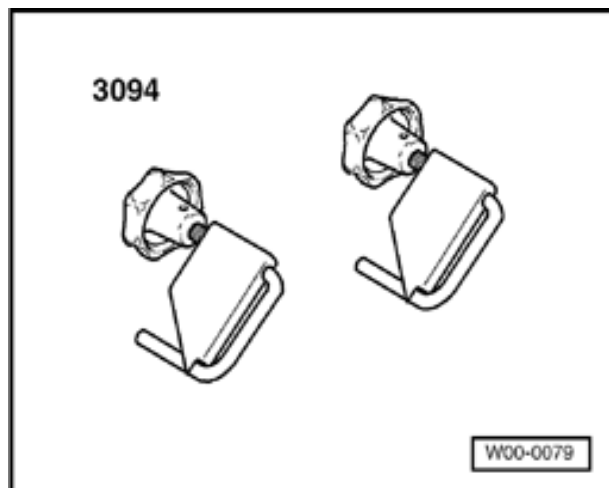
- Replace combination valve ⇒ [Page 26-82](#) or ⇒ [Page 26-86](#) .

26-82



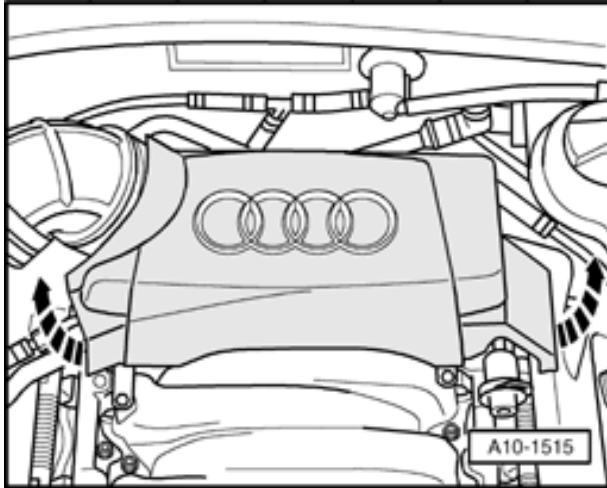
Left combination valve for secondary air system, removing and installing

Special tools and equipment



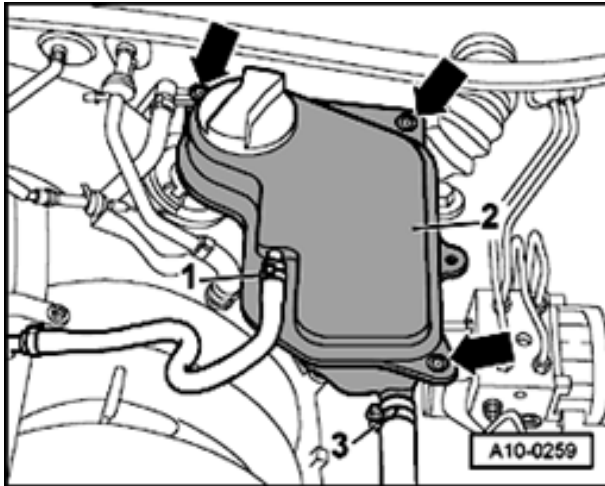
- ◆ Hose clamps
3094

Removing

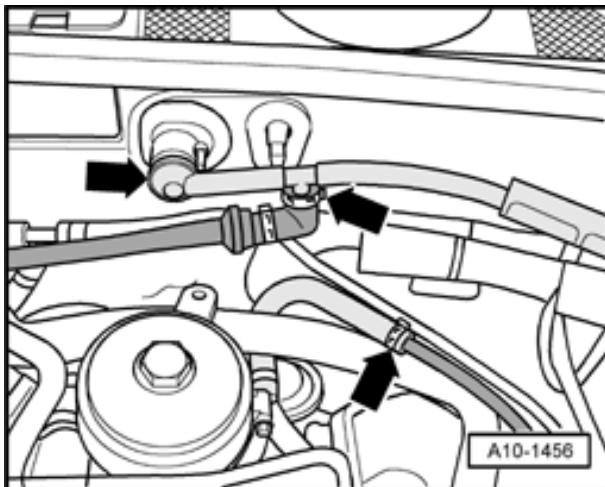


- Remove rear engine cover (arrows).

26-83

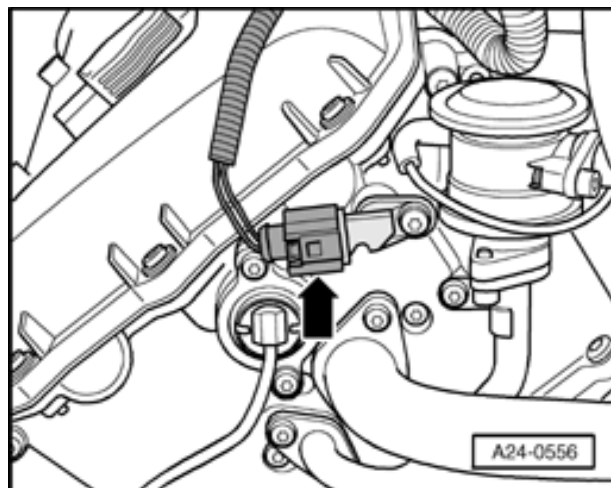


- ▲ - Pinch off coolant hose -1- with hose clamp 3094 and remove coolant expansion tank.
- Remove bolts (arrows) and coolant expansion tank - 2-.
- Disconnect wire to engine coolant level (ECL) warning switch -F66-at bottom of expansion tank and lay aside coolant expansion tank with coolant hose -3- connected.
- If necessary, use suitable plug to seal connection.



- ▲ - Disconnect vacuum hoses at locations marked by (arrows).
- Remove crankcase breather hose at left cylinder head cover.

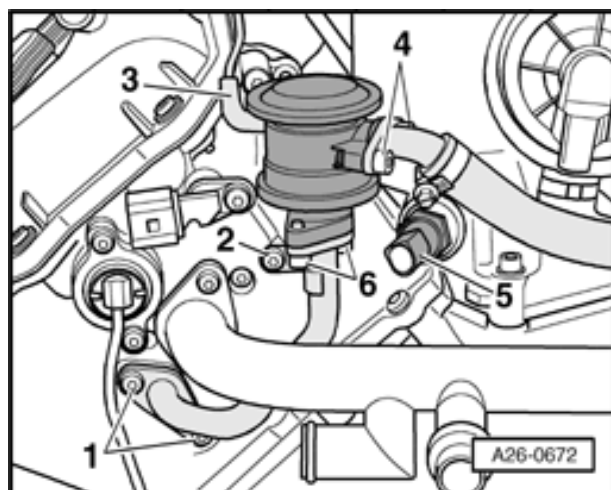
26-84



- ▲ - Disconnect connector (arrow) for camshaft position (CMP) sensor 2-G163- at left cylinder head.

Note:

Illustration shows engine from rear.



- ▲ - Remove vacuum hose - 3-.
- Remove bolts - 4-.
- Remove connector at oil pressure switch - 5-.
- Remove oil pressure switch.
- Remove bolts -1- and - 2-.
- Swivel combination valve and remove bolts - 6-.

26-85



- Detach combination valve and connecting pipe.

Note:

Illustration shows engine from rear.

Installing

Install in reverse order, note the following:

Note:

- ◆ *Replace gaskets and sealing rings.*
- ◆ *Pay attention to installation position of gasket between cylinder head and connecting pipe.*
- ◆ *Secure all hose connections with standard hose clamps. See Parts catalog*

- Check coolant level.

⇒ [Repair Manual, Maintenance](#)

Tightening torques

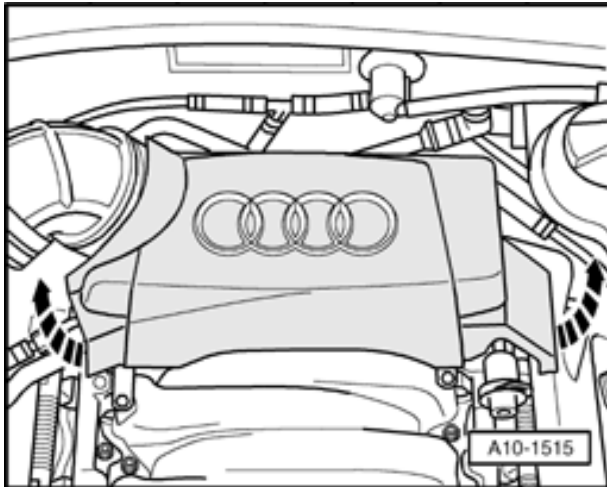
Component	Nm
Connecting pipe to cylinder head	10
Connecting pipes to combination valve	10
Oil pressure switch to oil filter housing	25

26-86

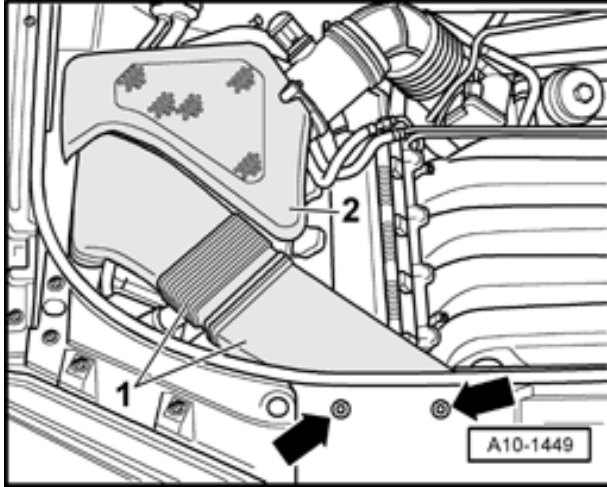


Right combination valve for secondary air system, removing and installing

Removing



- Remove rear engine cover (arrows).

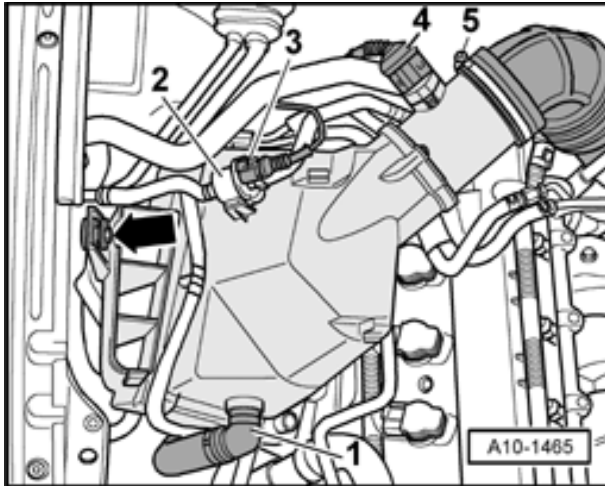


- A
- Remove air cleaner cover -
2-.
 - Remove air duct -
1-.

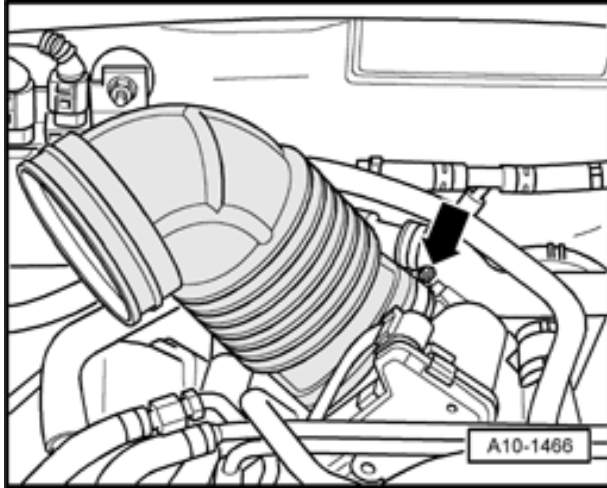
Note:

Pull out clips (arrows) using pry lever 80-200.

26-87

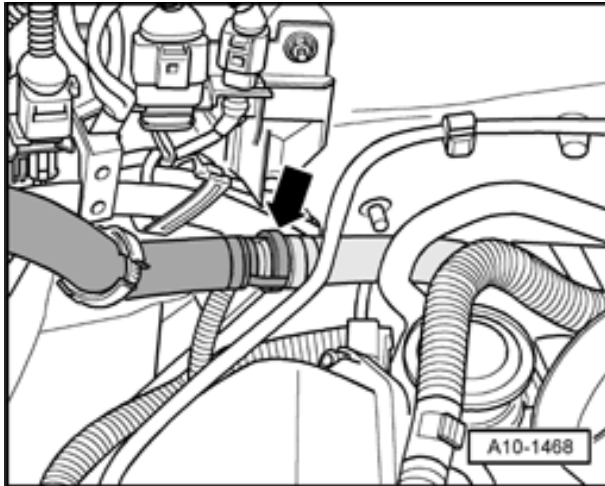


- Disconnect connector -3- at evaporative emission (EVAP) canister purge regulator valve -N80- item - 2-.
- Detach solenoid valve from holder.
- Disconnect connector -4- at mass air flow sensor.
- Turn hose -1- to secondary air pump counter-clockwise and detach.
- Remove air hose -5- at mass air flow sensor.
- Remove bolt (arrow).
- Take out air cleaner housing with mass air flow sensor.

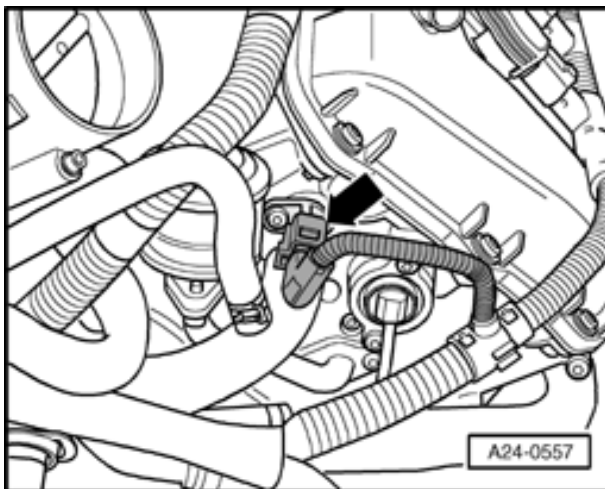


- Remove air hose from throttle valve control part (arrow).

26-88



- ✦ - Disconnect air hose (arrow) to secondary air system combination valves.

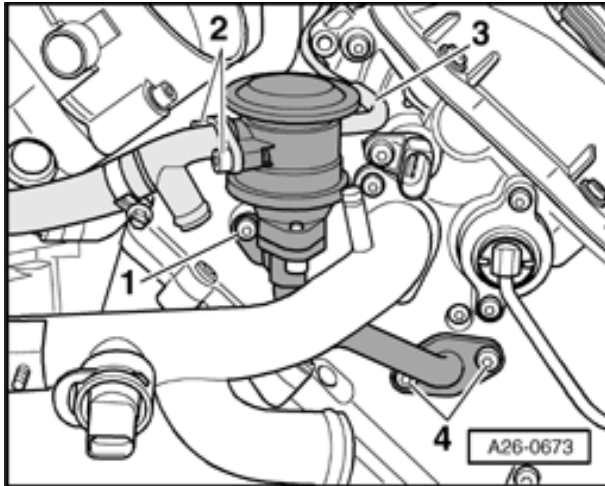


- ✦ - Disconnect connector (arrow) for camshaft position (CMP) sensor -G40- at right cylinder head.

Note:

Illustration shows engine from rear.

26-89



- Remove vacuum hose - 3-
- Remove bolts -1-, -2- and -4- and remove combination valve.

Note:

Illustration shows engine from rear.

Installing

Install in reverse order, note the following:

Note:

- ◆ *Replace gaskets.*
- ◆ *Secure all hose connections with standard hose clamps. See Parts catalog*

Tightening torques

Component	Nm
Connecting pipe to cylinder head	10

Connecting pipes to combination valve

10
