



Audi 100 1991 ➤

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MPI Fuel injection and ignition system (6-cyl.) ➤ 05.94									
Engine ID	AAH								

Edition 11.1998

List of Workshop Manual Repair GroupsList of Workshop Manual Repair Groups Audi 100 1991 ➤

MPI Fuel injection and ignition system (6-cyl.) ➤ 05.94

Repair Group

01 - Self-diagnosis

24 - Mixture preparation, Injection

28 - Ignition system

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Technical information should always be available to the foremen and mechanics, because their careful and constant adherence to the instructions is essential to ensure vehicle road-worthiness and safety. In addition, the normal basic safety precautions for working on motor vehicles must, as a matter of course, be observed.

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Audi 100 1991 ➤

MPI Fuel injection and ignition system (6-cyl.) ➤ 05.94 - Edition 11.1998



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01 - Self-diagnosis

1 - Self-diagnosis of Multi Point Injection

1.1 - Self-diagnosis of Multi Point Injection

1.2 - Control unit overview

Control unit no.	Index	Introduction date	Description
4A0 906 266			Introduction version => Self study programme no. 130 - EGR without EGR temperature sensor - In Europe, the EGR system in the current series is discontinued
4A0 906 266 4A0 906 266 4A0 906 266	A1) AA1) AB1)	10.91 10.91 03.92	Additional information in function 09 "Reading individual measured value" - Channel 005: Display of air mass meter discrepancy earth connection - Channel 009: Display of throttle valve angle
8A0 906 266	B	09.92	- Adaptive lambda control, therefore CO potentiometer for air mass meter discontinued - Modified coding - CO adjustment on vehicles without lambda control via the function 10 "adaption"

1) These control units can also be installed in vehicles with control unit no. 4A0 906 266.

1.3 - Technical self-diagnosis data

Equipment

- ◆ The data transfer between control unit and vehicle diagnosis, measurement and information system VAS 5051 or fault reader V.A.G 1551 takes place in "Rapid data transfer" mode.
- ◆ The fault memory is designed as a non-volatile memory. It is however dependent on the power supply. Disconnecting the permanent positive supply erases the fault memory of the engine control unit.
- ◆ For the California version, faults which affect the exhaust gas are indicated additionally by the illumination of the CARB lamp on the dash panel insert.

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1.4 - Safety precautions

Observe the following if testers and measuring instruments have to be used during test drives:

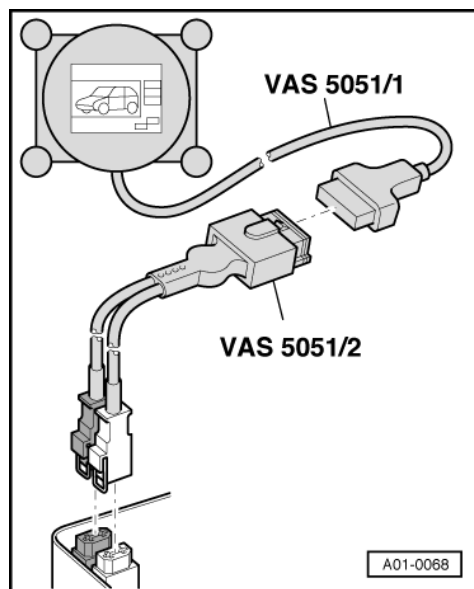
Warning

- ◆ Always attach testers and measuring instruments to the back seat and have a second person operate them from there.
- ◆ Operation of testers and measuring instruments from the front passenger seat could result in injuries to the person sitting there in the event of an accident (activation of passenger's airbag).

1.5 - Connecting vehicle diagnosis, measurement and information system VAS 5051 or fault reader V.A.G 1551 and selecting functions

Test requirements:

- Supply voltage of vehicle electrical system OK
- Earth connections at engine, intake manifold and bodywork OK.



- Engine fuses OK

=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

- Fuel pump relay -J17 OK, checking => Page 98 .
- Remove cover for auxiliary relay I on left side of plenum chamber.
- -> Connect vehicle diagnosis, measurement and information system VAS 5051 with diagnostic cable VAS 5051/1 and diagnostic adapter VAS 5051/2. Alternatively, connect fault reader V.A.G 1551 with diagnostic cable V.A.G 1551/1.
- With ignition switched off, connect black connector to black diagnostic connection.

Warning

- ♦ When driving the vehicle for measurement and test purposes, always secure the vehicle diagnosis, measurement and information system VAS 5051 or fault reader V.A.G 1551 to the rear seat only and operate it from there.
- ♦ Pay attention to the safety precautions => Page 1 .

Note:

The following describes self-diagnosis using the fault reader V.A.G 1551 only.

When using the vehicle diagnosis, measurement and information system VAS 5051, follow the procedures described in equipment's operating instructions.

-> Indicated on display:

V.A.G - SELF DIAGNOSIS HELP
1 - Rapid data transfer 1)
2 - Flash code output 1).

- 1) appears alternately

Note:

If the display remains blank, check voltage supply to black diagnostic connector => Page 65.

- Connect white connector to white diagnostic connection (blue connector is not used).

Depending on the which function is required => "Available functions" table, Page 4 :

- Switch the ignition on.

or

- Start the engine.
- Switch on the fault reader printer with the print key. The indicator lamp in the key must illuminate.
- Press key 1 for "Rapid data transfer".

-> Indicated on display:

Rapid data transfer	HELP
Enter address word XX	

Note:

Address word 00 is used to start the automatic test sequence i.e. interrogation of fault memories of all vehicle systems with self-diagnosis capability in "Rapid data transfer" mode.

- Press keys 0 and 1 for address word "Engine electronics" and confirm entry with Q key.

-> The fault reader V.A.G 1551 display will show the control unit identification. For example:

4A0906266	2.8l	Engine-1
Coding	1111	

or

4A0906266A	2.8 V6 MPI 2 valve D08
Coding	1010

8A0906266B	V6 2.8 2V MPI	V6AC39 D08
Coding	000	WSC 12345

Control unit identification (example)

- 8A0 906 266 B	Part no.; assignment => Parts catalogue
- V6	Design of engine (V-engine, 6-cylinder)
- 2.8l	Engine capacity
- 2 valve	2-valve
- 2V	
- MPI	Multi Point Injection and ignition system
- Engine-1	Hardware and software versions of control unit
- V6AC39	
- D08	Data status (software status) of control unit
- Coding 000	Control unit code
- WSC 12345	Workshop Code of V.A.G 1551 with which encoding was last performed

**Note:**

The control unit identification can be printed out by pressing the PRINT key on fault reader V.A.G 1551.

- Press the ➡key.

-> Indicated on display (function selection):

Rapid data transfer HELP
Select function XX

Note:

- ♦ After entering the function "01" for "Interrogating control unit version" and confirming with the Q key, you may display the control unit identification again.

Rapid data transfer HELP
No reply from control unit

-> Indicated on display:

- Press HELP key to print out a list of possible fault causes.

Rapid data transfer HELP
L-wire not switching to earth

Checking wiring of white diagnostic connector => Page 65.

Rapid data transfer HELP
L-wire not switching to positive

Rapid data transfer HELP
K-wire not switching to earth

Rapid data transfer HELP
K-wire not switching to positive

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Rapid data transfer HELP
Communication problem

-> If this display appears when starting or during the program, faults have occurred and data exchange between fault reader V.A.G 1551 and the engine control unit is no longer possible.

- After eliminating the possible causes of the fault, enter "01" again for address word "Engine electronics" => Page 2.

Available functions

Vehicle diagnosis, measurement and information system VAS 5051 or Fault reader V.A.G 1551		Ignition on, engine stopped	Engine idling	Vehicle running	Page
Address words					
01	Engine electronics	yes	yes	yes	2
00	Automatic test routine	yes	yes	yes	3
Functions					
01	Interrogating control unit version	yes	yes	yes	4
02	Interrogating fault memory	no	yes	yes	5
03	Final control diagnosis	yes	no	no	23
04	Basic setting	no	yes	yes	25
05	Erase fault memory	yes	yes	yes	5

06	End of output	yes	yes	yes	6
07	Encoding control unit1)	yes	no	no	32
08	Reading measured value block	yes	yes	yes	35
09	Read individual measured value2)	no	yes	yes	58
10	Adaption1)	yes	yes	no	61

- 1) Only for control unit no. 8A0 906 266 B (09.92 ä).
- 2) Only for control unit no. 4A0 906 266/A/AA/AB (ä 08.92).

2 - Interrogating and erasing fault memory

2.1 - Interrogating and erasing fault memory

- Connect up vehicle diagnosis, measurement and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "Address word" 01 => Page 2 .
For this purpose, the engine should be idling.

Note:

If the engine will not start, crank it for at least 5 seconds with the starter and then always leave the ignition on.

-> Indicated on display:

Rapid data transfer HELP
Select function XX

- Enter "02" for the function "Interrogate fault memory" and confirm entry with Q key.

-> Indicated on display:

No fault detected!

- Press the =>key.

or

-> Indicated on display:

X faults detected!

If the printer is switched on, the stored faults will be displayed and printed out in sequence.

- Locate and eliminate printed faults as per fault table => Page 6 .
- Press the =>key.

-> Indicated on display:

Rapid data transfer HELP
Select function XX

- Enter "05" for the function "Erase fault memory" and confirm entry with Q key.

Note:

-> Indicated on display:

Warning
Fault memory not interrogated



Sequence has not been correctly followed.

- Interrogate the fault memory:

The fault memory will also not be erased if :

- ♦ The ignition has been switched off after interrogating the fault memory.
- ♦ A static fault has not been rectified.

-> Indicated on display:

Rapid data transfer
Fault memory is erased.

- Press the ➡key.
- Interrogate fault memory again after carrying out the repairs.

Note:

This erases faults that have been stored whilst the fault was being rectified, for example, faults that have arisen as a result of connectors being detached.

- Carry out a test drive (lasting at least 10 minutes).
- Enter "00" for address word "Automatic test sequence" and confirm entry with Q key.

Note:

If, when rectifying faults on vehicles with automatic gearbox, the connector is pulled off the engine control unit, the fault memory of the gearbox control unit must also be interrogated and erased. This is because the "Engine/gearbox electrical connection: Open circuit" fault will have been stored in the gearbox control unit.

End of output

-> Indicated on display:

Rapid data transfer HELP
Select function XX

- Enter "06" for "End output" function and confirm entry with Q key.

-> Indicated on display:

Rapid data transfer HELP
Enter address word XX

- Switch off ignition and detach diagnostic connector.

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2.2 - Fault table

Note:

- ♦ The fault table is sorted according to the 5 digit fault code on the left.
- ♦ Before replacing components shown as being faulty, check the wiring and connectors to these components and the earth connections using the current flow diagram. This is particularly relevant for faults recorded as "occurring sporadically" (SP).
- ♦ Sporadic faults are faults which only occur occasionally (sporadic = at irregular intervals, intermittently).

2.3 - Fault codes 00281 - 00537

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00281 Vehicle speed sender -G68 No signal	Is stored when no pulse is received for more than 21 seconds, for engine speed in excess of 3000 rpm and engine load greater than idling speed - Vehicle speed sender - G22/-G68 defective - Speedometer -G21 defective - Open circuit or short circuit between speedometer sender and speedometer - Open circuit or short in wiring between dash panel insert and engine control unit Continued ▼	- Engine cuts out when actuating clutch in overrun phase - Load change jolt	- Test speed signal => Page 43 Rectify open circuit or short circuit => "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

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V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00281 Vehicle speed sender -G68 No signal	(Fault 00281 continued) - Faulty signal input in engine control unit (control unit defective)		- Replace engine control unit =>Page 82

Note on Fault code 00281:

Start by checking whether speedometer reading is OK. If reading is not OK, fault can be ignored.

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00513 Engine speed sensor -G28 No signal	No ignition or injection if this fault is detected on starting engine - Open circuit or short to earth or short to positive in signal wire - -G28 loose or defective - Gap between -G28 and ring gear of flywheel greater than 1.2 mm - Broken teeth on ring gear of flywheel - Faulty signal input in engine control unit (control unit defective)	- Engine will not start/ cuts out	- Rectify open circuit or short circuit => "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder - ä 08.92: Basic setting, read display zone 3 =>Page 201 Checking flywheel - Replace engine control unit =>Page 82 .

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00514 Ignition timing sender -G4			



V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
No signal	Stored if signal from ignition timing sender is not detected for more than 2 seconds on starting - Checking ignition timing - -G4 loose - Gap between -G4 and groove at crankshaft balancing weight greater than 1.3 mm	- If fault occurs before starting engine: - Engine will not start (no ignition or injection) - If fault occurs after starting engine: - Fault is stored	- Check tightness of -G4 (bottom left in cylinder block)
	- -G4 defective		- Checking -G4 => Page 198
	- Open circuit or short to earth in signal wire between -G4 and engine control unit		- Rectify open circuit or short circuit => "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder
	Continued ▼		

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00514 Ignition timing sender -G4 No signal	(Fault 00514 continued) - Faulty signal input in engine control unit (control unit defective)		- Replace engine control unit =>Page 82 .
Mechanical fault	Connections for -G4 and -G28 interchanged	- Engine will not start	- Checking for interchange of connections for -G4 and -G28

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00515 Hall sender -G40 Short circuit to earth	Stored if, Hall sender signal is "low" for more than 5 seconds with engine running - Short to earth between Hall sender - G40 and engine control unit - -G40 defective - Faulty signal input in engine control unit (control unit defective) Continued ▼	- No engine power at full throttle - Emissions not OK - High fuel consumption	- Checking -G40 => Page 214 - Replace engine control unit =>Page 82 .

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00515 Hall sender -G40 Open circuit / short to positive	(Fault 00515 continued) - Stored if, Hall sender signal is "high" for more than 5 seconds with engine running - Open circuit or short to positive between Hall sender -G40 and engine control unit - Fault in power supply or earth supply for -G40 - -G40 defective	- No engine power at full throttle - Emissions not OK - High fuel consumption	- Checking -G40 => Page 214

	- Incorrect valve timing (toothed belt skipped)		- Check valve timing => 6-cyl.injection engine (2-valve), Mechanical components; Repair Group 13
	- Faulty signal input in engine control unit (control unit defective)		- Replace engine control unit =>Page 82 .

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00516 -F60 idling switch Open circuit / short to positive	Stored if idling switch is not detected as being closed at least once after starting engine and after driving for 10 minutes at less than 100 km/h		
	- Throttle valve sticking - -F60 defective		- Check idling switch =>Page 142
	- Throttle cable setting - Floor mat pressing down on accelerator pedal		- Adjust throttle cable => Repair group 20
	- Open circuit or short to positive between -F60 and engine control unit		- ä 08.92: Basic setting, read display zone 7 and 10 => Page 42
	- Faulty signal input in engine control unit (control unit defective)		- Replace engine control unit =>Page 82
	Continued ▼		

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00516 -F60 idling switch Short circuit to earth	(Fault 00516 continued)		
	Stored if throttle valve opening greater than 70 and idling switch is closed for more than 1 second		
	- Short to earth between -F60 and engine control unit - Moisture in connector of -F60 - -F60 defective		- ä 08.92: Basic setting, read display zone 7 and 10 => Page 142
	- Faulty signal input in engine control unit (control unit defective)		- Replace engine control unit =>Page 82

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00518 Throttle valve potentiometer - G69 Implausible signal	Stored if signal voltage is greater than 0.72 V for more than 1 second with idling switch closed (corresponds to throttle valve opening greater than 70)		
	- Unmetered air between throttle valve and engine (possible leakage in hose connections at air cleaner) - -G69 incorrectly adjusted - -G69 loose or shaft connection worn - Moisture or corrosion in connector at -G69	- Loss of power - Engine running problems	- ä 08.92: Basic setting, reading display zone 10 =>Page 138



Continued ▼

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00518 Throttle valve potentiometer -G69 Open circuit/short circuit to earth	(Fault 00518 continued) Stored if signal voltage is less than 0.1 V for more than 1 second - Open circuit or short to earth in signal wire between -G69 and engine control unit - Power supply for -G69 defective - -G69 defective Continued ▼	- Loss of power - Engine running problems	- ä 08.92: Basic setting, read display zone 10 => Page 138 Rectify short circuit or open circuit => "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00518 Throttle valve potentiometer -G69 Open circuit/short circuit to earth	(Fault 00518 continued) - Faulty signal input in engine control unit (control unit defective) Stored if signal voltage is greater than 4.9 V for more than 1 second - Short to positive in signal wire between -G69 and engine control unit - Fault in earth supply for -G69 - -G69 defective - Faulty signal input in engine control unit (control unit defective) Continued ▼	- Loss of power - Engine running problems	- Replace engine control unit =>Page 82 . - Reading measured value blockdisplay group 002 => Page 138 - Replace engine control unit =>Page 82 .

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00518 Throttle valve potentiometer - G69 Signal too small	(Fault 00518 continued) Stored if signal voltage is less than 0.96 V for more than 1 second when ignition is switched on (corresponds to throttle valve being open less than 12 °C) under the following conditions: Coolant temperature greater than 70 °C, engine speed 1500 ... 3500 rpm, medium engine load (air mass meter signal) - Open circuit or short to earth in signal wire between -G69 and engine control unit - Power supply for -G69 defective - -G69 defective	- Loss of power - Engine running problems	- Reading measured value blockdisplay group 002 => Page 138 Rectify short circuit or open circuit => "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

	Continued ▼		
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V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00518 Throttle valve potentiometer -G69 Signal too small	(Fault 00518 continued) - Faulty signal input in engine control unit (control unit defective)		- Replace engine control unit =>Page 82 .
00521 CO potentiometer -G74 Open circuit / short to positive	- Thermo-fuse S74 (black bracket) defective - Open circuit or short to positive in signal wire between -G74 and engine control unit	- Starting difficulties - Poor throttle response - CO not adjustable	- Basic setting, reading display zone 8 and 9 =>Page 107

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00522 Coolant temperature sensor - G62 Short circuit to earth	Stored if signal voltage is less than 0.1 V for more than 1 second when ignition is switched on (corresponds to coolant temperature of more than 200 oC) - Short to earth in wiring between -G62 and engine control unit - -G62 defective - Faulty signal input in engine control unit (control unit defective) Continued ▼	- Cold start problems at very low temperatures - Engine running problems when warm	- ä 08.92: Basic setting, reading display zone 1 =>Page 40 - Checking -G62 => Page 205 - Replace engine control unit =>Page 82 .

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V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00522 Coolant temperature sensor -G62 Open circuit / short to positive	(Fault 00522 continued) Stored if signal voltage is greater than 4.94 V for more than 1 second when ignition is switched on (corresponds to coolant temperature of less than 50 oC) - Open circuit or short to positive in wiring between -G62 and engine control unit - -G62 defective - Earth supply to -G62 defective - Faulty signal input in engine control unit (control unit defective) Continued ▼	- Cold start problems at very low temperatures - Engine running problems when warm	- ä 08.92: Basic setting, reading display zone 1 =>Page 40 - Checking -G62 => Page 205 - Replace engine control unit =>Page 82 .



V.A.G 1551 print-out 00522 Coolant temperature sensor - G62 Implausible signal	Possible causes of fault (Fault 00522 continued)	Possible effects	Fault remedy
	Stored if coolant temperature is less than 55 °C on starting engine and is still less than 70 °C 18 minutes later		
	- G62 supplies implausible signal due to loose contact/corrosion caused by moisture in connector	- Cold start problems at very low temperatures - Engine running problems when warm	- Reading measured value block, display group 001 =>Page 205
	- Faulty signal input in engine control unit (control unit defective)		- Replace engine control unit =>Page 82 .

V.A.G 1551 print-out 00524 Knock sensor 1 -G61 No signal	Possible causes of fault	Possible effects	Fault remedy
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	Stored if output voltage of knock sensor is too low (coolant temperature greater than 20 °C, engine speed greater than 3500 rpm). The ignition timing is then retarded by 12° crankshaft in map knock ranges.		
	- Knock sensor loose	- High fuel consumption - Loss of power	- Tightening torque for knock sensor: 20 Nm
	- Corrosion at connector of -G61 - Open circuit or short to earth in signal wire between -G61 and engine control unit - Open circuit in sender earth wire between -G61 and engine control unit Continued ▼	- Abrupt loss of power (similar to misfiring)	- Reading measured value block, display group 015 or 016 =>Page 56 Rectify open circuit or short circuit => "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

V.A.G 1551 print-out 00524 Knock sensor 1 -G61 No signal	Possible causes of fault (Fault 00524 continued)	Possible effects	Fault remedy
	- Knock sensor defective		- Checking -G61 => Page 211
	- Faulty signal input in engine control unit (control unit defective)		- Replace engine control unit =>Page 82 .

V.A.G 1551 print-out 00525 Lambda probe -G39 No signal	Possible causes of fault	Possible effects	Fault remedy
	Stored if, 5 minutes after starting engine, signal voltage is between 0.37 and 0.43V for more than 5 seconds for a coolant temperature of greater than 80 °C and normal engine operation		
	- Open circuit or short circuit in wiring between -G39 and engine control unit	- Emissions not OK - Lambda control switches to open loop control	- Rectify open circuit or short circuit

	- Heating for lambda probe -Z19 not functioning - Heating resistor -G39 defective - Open circuit or short circuit in heater wire for lambda probe -Z19 Continued ▼		- ä 08.92: Basic setting, reading display zone 8 =>Page 52
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V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00525 Lambda probe -G39 No signal	(Fault 00525 continued) - Thermo-fuse S73 (brown bracket) defective - -G39 defective		- Check lambda control =>Page 123
	- Faulty signal input in engine control unit (control unit defective)		- Replace engine control unit =>Page 82 .
Short to positive	Stored if the signal voltage is greater than 2 V for normal engine operation - Short to positive in lambda probe signal wire	- Emissions not OK - Lambda control switches to open loop control	- Check lambda control =>Page 123
	Continued ▼		

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V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00525 Lambda probe -G39 Short to earth	(Fault 00525 continued) Stored if, 5 minutes after starting engine, signal voltage is less than 0.35 V for normal engine operation and a coolant temperature greater than 22 oC - Short to earth in lambda probe signal wire	- Exhaust gas not OK - Lambda control switches to open loop control	- Check lambda control =>Page 123
Implausible signal	Stored if, 60 seconds after start of control, the difference between min. and max. signal voltage is less than 0.4 V for a coolant temperature greater than 80 oC - Loose contact or corrosion due to moisture in connector for lambda probe heating or lambda probe	- Emissions not OK - Lambda control switches to open loop control	- Read measured value block, Display Group 010 =>Page 123

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00531 Air mass meter reference voltage Open circuit / short to positive	Stored if the signal voltage is greater than 1 V - Open circuit or short to positive between -G70 and engine control unit		- Rectify open circuit or short circuit ä 08.92: Basic setting, reading display zone 2 =>Page 40

Note:

If fault "00531" is stored, a substitute value of 0.02 V is displayed:



Control unit no. 4A0 906 266 A/AA/AB in the function 09 "Reading individual measured value", channel 05;

Control unit no. 8A0 906 266 B A in the function 08 "Reading measured value block", display group 001, display zone 3.

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00532 Supply voltage Signal too small	Stored if supply voltage is less than 10.0 V for more than 1 second (engine control unit does not function below 6.5 V) - Poor earth connection to engine control unit	- Voltage less than 6 V - Engine will not run	- ä 08.92: Reading individual measured value, channel 14 =>Page 208
	- Battery flat - Current draw with "ignition off" (discharge)		- Check voltage Check charge

Note:

If fault 00532 is shown as a sporadic fault, ignore the fault message on the display. This fault is often stored when the engine is left idling for a long period with a large number of electrical consumers switched on, causing the battery charge to become very low.

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00535 First knock regulation Control limit exceeded	Is stored if ignition timing for cyl. 1, 2 or 3 is fully retarded for more than 5 seconds during driving - Poor quality fuel (less than RON 95) - Knock sensor 1 -G61 loose	- Slight loss of power - Maximum speed too low	- Fill tank with petrol of at least 95 RON - Tighten knock sensor to 20 Nm
	- Open circuit in screening for knock sensor -G61 Continued ▼	- Rough idling	- Checking -G61 => Page 211

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00535 First knock regulation Control limit exceeded	(Fault 00535 continued) - Abnormal engine running noise (ancillaries loose) - Faulty knock control in engine control unit (control unit defective)		- Rectify mechanical damage - Replace engine control unit =>Page 82 .
00536 Second knock control1) Control limit exceeded	=> First knock control Fault code 00535	=> First knock control Fault code 00535	=> First knock control Fault code 00535

1) Knock sensor 2 -G66 for cylinders 4, 5 and 6 is monitored.

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V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00537 Lambda control			

Control limit exceeded	Stored if lambda probe voltage in control range is less than 0.3 V for more than 2 minutes for a coolant temperature greater than 80 °C - Thermo-fuse S73 (brown bracket) defective - CO upstream of catalytic converter less than 0.3 % by vol. - Fuel tank empty; at least 10 ltr. Continued ▼	- ä 08.92: Basic setting, reading display zone 8 =>Page 51 - Refuel the vehicle
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V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00537 Lambda control Control limit exceeded	(Fault 00537 continued) - Fuel system pressure too low - Unmetered air downstream of air mass meter -G70 - Leakage air from exhaust system as far as lambda probe - Injector does not open Continued ▼		- Check fuel system pressure =>Page 87 - Vacuum connections =>Page 173 - Locate and eliminate cause - Check injectors =>Page 90

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00537 Lambda control Control limit not reached	(Fault 00537 continued) Stored if lambda probe voltage in control range is greater than 0.6 V for more than 2 minutes for a coolant temperature greater than 80 °C - Failure of spark plugs - Fuel pressure too high - Lambda probe defective - Activated charcoal filter system solenoid valve N80 leaking permanently open - Injector not closing	- CO upstream of catalytic converter greater than 1.2 % by vol. - Soot deposits on spark plugs - Fuel consumption too high - Black smoke	- Perform visual inspection - Check fuel system pressure =>Page 87 - Check lambda control =>Page 123 - Check activated charcoal filter system solenoid 1 - N80 for leaks =>Page 134 - Check injectors =>Page 90

2.4 - Fault codes 00540 - 65535

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00540 Knock sensor 2 -G66 No signal	=>Knock sensor 1 -G61 Fault code 00524	=>Knock sensor 1 -G61 Fault code 00524	=>Knock sensor 1 -G61 Fault code 00524



V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00553 Air mass meter -G70 Short circuit to positive	Stored if signal voltage is more than 5 V for more than 0.3 seconds (engine speed less than 2000 rpm) - Short to positive in signal wire between -G70 and engine control unit - Fault in earth supply for -G70 - -G70 defective - Faulty signal input in engine control unit (control unit defective) Continued ▼	- Emergency running mode - Poor throttle response - Loss of power - Engine may cut out after starting or in overrun phase	- 09.92 ä: Reading measured value block, display group 001 =>Page 112 - Replace engine control unit =>Page 82

Note:

If fault 00553 is shown as a sporadic fault, ignore the fault message on the display.

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00553 Air mass meter -G70 Open circuit/short circuit to earth	(Fault 00553 continued) Stored if signal voltage is less than 0.3 V (engine speed less than 2000 rpm) - Unmetered air between air mass meter -G70 and engine - Air cleaner blocked - Power supply for - -G70 defective - Open circuit or short to earth in signal wire between -G70 and engine control unit - -G70 defective - Faulty signal input in engine control unit (control unit defective)	- Emergency running mode - Poor throttle response - Loss of power - Engine may cut out after starting or in overrun phase	- Locate and eliminate leak Replace filter element - 09.92 ä: Reading measured value block, display group 001 =>Page 112 - Replace engine control unit =>Page 82

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V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00554 Lambda control 2 Control limit exceeded Control limit not reached	=>Lambda control Fault code 00537	=>Lambda control Fault code 00537	=>Lambda control Fault code 00537

Note:

Lambda probe 2 -G108 for cylinders 4, 5 and 6 is monitored.

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00555 Lambda probe 2 -G108			

No signal Short circuit to positive Short circuit to earth	=> Lambda probe -G39 Fault code 00525	=> Lambda probe -G39 Fault code 00525	=> Lambda probe -G39 Fault code 00525
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V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00560 EGR system Mechanical fault	Stored if EGR temperature signal in warm-up phase is greater than 60 °C measured on cold start (-10... 30 °C coolant temperature) and at 35 °C coolant temperature - Mechanical EGR valve permanently open/leaking - Exhaust gas recirculation valve -N18 defective Continued ▼	- Rough idling - Poor starting - Jolting - Sudden loss of power	- Check EGR system => Page 57

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00560 EGR system Implausible signal	(Fault 00560 continued) Stored if mechanical EGR valve is permanently closed for a coolant temperature greater than 60 °C, throttle valve angle less than 35°, vehicle speed 70 ... 105 km/h, engine speed 1500 ... 3000 rpm, medium engine load - Thermo-fuse S73 (brown bracket) defective - Open circuit in wiring between -G98, -N121 and engine control unit - Vacuum pipe kinked/dropped off - Mechanical EGR valve permanently closed		- Check EGR system => Page 57

Note:

Fault message for USA version vehicles only. If the fault is stored for vehicles which are not destined for the USA, check coding of engine control unit => Page 32.

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00577 Knock control, cyl. 1 Control limit exceeded	Stored if ignition timing is fully retarded for more than 5 seconds whilst driving - Poor quality fuel (less than RON 95) - Knock control module in engine control unit defective (control unit defective) - Abnormal engine running noise (ancillaries loose) - Open circuit in knock sensor screen wiring - Loose contact in the connector - Knock sensor tightened to incorrect torque	- High fuel consumption - Loss of power - Rough engine running - Maximum speed is not reached	- Fill up with petrol of at least RON 95 - Replace engine control unit =>Page 82. - Reading measured value block, display group 013 or 014 =>Page 211 - Tightening torque for knock sensor: 20 Nm

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
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00578 Knock control, cyl. 2 Control limit exceeded	=> Knock control, cyl. 1 Fault code 00577	=> Knock control, cyl. 1 Fault code 00577	=> Knock control, cyl. 1 Fault code 00577
00579 Knock control, cyl. 3 Control limit exceeded	=> Knock control, cyl. 1 Fault code 00577	=> Knock control, cyl. 1 Fault code 00577	=> Knock control, cyl. 1 Fault code 00577
00580 Knock control, cyl. 4 Control limit exceeded	=> Knock control, cyl. 1 Fault code 00577	=> Knock control, cyl. 1 Fault code 00577	=> Knock control, cyl. 1 Fault code 00577

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00581 Knock control, cyl. 5 Control limit exceeded	=> Knock control, cyl. 1 Fault code 00577	=> Knock control, cyl. 1 Fault code 00577	=> Knock control, cyl. 1 Fault code 00577
00582 Knock control, cyl. 6 Control limit exceeded	Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG. => Knock control, cyl. 1 Fault code 00577	=> Knock control, cyl. 1 Fault code 00577	=> Knock control, cyl. 1 Fault code 00577

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00585 EGR temperature sensor - G98 Short circuit to earth	Stored if EGR temperature signal greater than 200 °C is received for 3 seconds after starting engine under the following condition: Coolant temperature less than 30 °C - Short to earth between -G98 and engine control unit - -G98 defective - Faulty signal input in engine control unit (control unit defective)		- ä 08.92: Reading individual measured value, channel 10 =>Page 152 - Replace engine control unit =>Page 82 .

Note:

Fault message for USA version vehicles only. If the fault is stored for vehicles which are not destined for the USA, check coding of engine control unit => Page 32 .

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00609 Ignition output 1 Output does not switch/ short circuit to earth	- Short to earth between output stage -N122 and engine control unit - -N122 defective	- Corresponding injectors are deactivated (no injection) - Lambda control switches to open loop control - Loss of power (no full throttle enrichment)	- Check -N122 => Page 195

	- Signal output in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 82 .
Open circuit / short to positive	- Open circuit or short to positive between output stage -N122 and engine control unit - -N122 defective		- Check -N122 => Page 195
	- Signal output in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 82 .

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00610 Ignition output 2 Output does not switch/short circuit to earth Open circuit / short to positive	=>Ignition output 1 Fault code 00609	=>Ignition output 1 Fault code 00609	=>Ignition output 1 Fault code 00609
00611 Ignition output 3 Output does not switch/short circuit to earth Open circuit / short to positive	=>Ignition output 1 Fault code 00609	=>Ignition output 1 Fault code 00609	=>Ignition output 1 Fault code 00609

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00689 Unmetered air in intake system Mechanical fault	- Large quantity of unmetered air - Mechanical fault in the idling stabilisation valve -N71 - 2nd stage of throttle valve unit does not close	- Engine speed deviates from specified speed when the engine is at operating temperature - Possibly no idling if engine is cold	- Read measured value block, Display group 004 =>Page 103 - Perform visual inspection

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
01243 Intake manifold changeover valve N156 Open circuit/short circuit to earth	- Open circuit or short to earth between -N156 and engine control unit - Fault in power supply to -N156 - -N156 defective - Signal output in engine control unit defective (control unit defective) Continued ▼	- In the event of an open circuit: - -N156 does not open, loss of power above 4000 rpm - In the event of a short circuit to earth: - -N156 always open, loss of torque up to 4000 rpm	- Check -N156 =>Page 116 - Replace engine control unit =>Page 82 .

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
01243	(Fault 01243 continued)		



V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
Checking intake manifold changeover valve -N156 1) Output does not switch/ short circuit to positive	- Short to positive in wiring between -N156 and engine control unit - -N156 defective	- -N156 does not open, loss of power above 4000 rpm	- Check -N156 =>Page 116
	- Signal output in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 82

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
01247 Solenoid valve 1 for active carbon canister -N80 Open circuit/short circuit to earth	- Power supply for -N80 defective - Open circuit or short to earth between -N80 and engine control unit - -N80 defective	- Poor progression in part throttle range - Smell of petrol in vehicle	- Reading measured value block, display group 009 =>Page 146
	- Signal output in engine control unit defective (control unit defective) Continued ▼		- Replace engine control unit =>Page 82

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
01247 Solenoid valve 1 for active carbon canister -N80	(Fault 01247 continued)	- Poor progression in part throttle range	- Reading measured value block, display group 009 =>Page 146 - Replace engine control unit =>Page 82
	- Short to positive between -N80 and engine control unit - -N80 defective - Signal output in engine control unit defective (control unit defective)		

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
01249 Injector, cylinder 1 -N30 Open circuit/short circuit to earth	Lambda control is deactivated at the same time	- Rough engine running	- Check injectors =>Page 90 - Replace engine control unit =>Page 82
	- Open circuit or short to earth between -N30 and engine control unit - Fault in power supply to -N30 - -N30 defective - Signal output in engine control unit defective (control unit defective)		

	Continued ▼		
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V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
01249 Injector, cylinder 1 -N30 Output does not switch/ short circuit to positive	(Fault 01249 continued) At the same time, the injector concerned is no longer actuated until ignition is switched off and the lambda control is deactivated. - Short to positive between -N30 and engine control unit - -N30 defective - Signal output in engine control unit defective (control unit defective)	- Rough engine running - No full throttle enrichment	- Check injectors =>Page 90 - Replace engine control unit =>Page 82
01250 Injector, cylinder 2 N31 Open circuit/short circuit to earth Output does not switch/ short circuit to positive	=>Injector, cylinder 1 - N30 Fault code 01249	=>Injector, cylinder 1 -N30 Fault code 01249	=>Injector, cylinder 1 -N30 Fault code 01249

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
01251 Injector, cylinder 3 N32 Open circuit/short circuit to earth Output does not switch/ short circuit to positive	=>Injector, cylinder 1 -N30 Fault code 01249	=>Injector, cylinder 1 -N30 Fault code 01249	=>Injector, cylinder 1 -N30 Fault code 01249
01252 Injector, cylinder 4 N33 Open circuit/short circuit to earth Output does not switch/ short circuit to positive	=>Injector, cylinder 1 -N30 Fault code 01249	=>Injector, cylinder 1 -N30 Fault code 01249	=>Injector, cylinder 1 -N30 Fault code 01249

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
01253 Injector, cylinder 5 -N83 Open circuit/short circuit to earth Output does not switch/ short circuit to positive	=>Injector, cylinder 1 -N30 Fault code 01249	=>Injector, cylinder 1 -N30 Fault code 01249	=>Injector, cylinder 1 -N30 Fault code 01249
01254 Injector, cylinder 6 -N84 Open circuit/short circuit to earth Output does not switch/ short circuit to positive	=>Injector, cylinder 1 -N30 Fault code 01249	=>Injector, cylinder 1 -N30 Fault code 01249	=>Injector, cylinder 1 -N30 Fault code 01249

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
01257 Idling stabilisation valve -N71			



Short circuit to earth	- Open circuit or short to earth between -N71 and engine control unit - -N71 defective	- Engine speed deviates from specified speed when the engine is at operating temperature - Possibly no idling if engine is cold	- ä 08.92: Basic setting, reading display zone 2, 4, 5 and 6 =>Page 103
	- Signal output in engine control unit defective (control unit defective) Continued ▼		

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
01257 Idling stabilisation valve - N71 Short circuit to positive	(Fault 01257 continued) - Short to positive between -N71 and engine control unit - -N71 defective - Signal output in engine control unit defective (control unit defective)	- Engine speed deviates from specified speed when the engine is at operating temperature - Possibly no idling if engine is cold	- ä 08.92: Basic setting, reading display zone 2, 4, 5 and 6 =>Page 103 - Replace engine control unit =>Page 82
Mechanical fault	- -N71 mechanically defective - 2nd stage of throttle valve unit not closing - Large quantity of unmeasured air		- Checking -N71 => Page 103

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
01265 EGR valve -N18 Open circuit/short circuit to earth	Stored if engine speed less than 900 rpm and low engine load - Power supply for -N18 defective - Open circuit or short to earth between -N18 and engine control unit - -N18 defective - Signal output in engine control unit defective (control unit defective) Continued ▼	- Rough idling	- ä 08.92: Reading individual measured value, channel 09 =>Page 146 - Replace engine control unit =>Page 82 .

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
01265 EGR valve -N18 Output does not switch/ short circuit to positive	(Fault 01265 continued) Stored if, after starting engine, control unit output of EGR valve -N18 is "high" for more than 1 second under the following conditions: Engine speed 1000 ... 3500 rpm and medium engine load - Short to positive between -N18 and engine control unit - -N18 defective		- ä 08.92: Reading individual measured value, channel 09 =>Page 146

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
	- Signal output in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 82 .

Note:

Fault message for USA version vehicles only. If the fault is stored for vehicles which are not destined for the USA, check coding of engine control unit => Page 32 .

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
65535 Control unit faulty	Stored in the event of errors in ROM/RAM or EPROM - Engine control unit defective	Engine will not start	- Replace engine control unit => Page 82

3 - Final control diagnosis

3.1 - Final control diagnosis

Note:

- ◆ The final control diagnosis can only be performed with the engine stopped and the ignition switched on.
- ◆ The final control diagnosis is terminated if the engine is started or if an engine speed pulse is detected.
- ◆ During the final control diagnosis, individual control elements continue to be actuated until the test programme is advanced to the next control element by pressing the ➡ key.
- ◆ The control elements can be checked acoustically or by way of touch.
- ◆ If the final control diagnosis is to be repeated without first starting the engine briefly, switch off the ignition for approx. 20 seconds.

The final control diagnosis activates the following components in the stated order:

Activation sequence
1 Fuel pump relay -J17
2 Idling stabilisation valve -N71
3 Intake manifold changeover valve -N156
4 Activated charcoal filter system solenoid valve - N801)
5 EGR valve -N182)

- 1) Only vehicles with lambda probes
- 2) Only vehicles with EGR

Test requirements:

- Engine fuses OK
- Idling switch -F60 OK
- Fuel pump relay -J17 OK

Test sequence

- Connect up vehicle diagnosis, measurement and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "Address word" 01 => Page 2 .



Engine must not be running.

-> Indicated on display:

Rapid data transfer HELP
Select function XX

- Press keys 0 and 3 for the function "Final control diagnosis" and confirm entry with Q key.

-> Indicated on display:

Final control diagnosis
Fuel pump relay -J17

The relay must be energised and the fuel pump must run. Flow noise at fuel pressure regulator is clearly audible.

If the relay does not respond:

- Checking activation of the fuel pump relay -J17 => Page 99 .

Actuating idling stabilisation valve

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- Press the =>key.

-> Indicated on display:

Final control diagnosis
Idling stabilisation valve -N71

The idling stabilisation valve must hum and vibrate.

Note:

The humming of the valve is difficult to hear and is therefore best checked by touching the valve.

If the valve does not hum and vibrate:

- Checking idling stabilisation valve -N71 => Page 103 .

Actuation of intake manifold changeover valve

- Press the =>key.

-> Indicated on display:

Final control diagnosis
Intake manifold changeover valve -N156

The injector valve must click.

If the valve is not actuated (does not click).

- Checking intake manifold changeover valve -N156 => Page 116 .

Actuation of activated charcoal filter system solenoid valve

- Press the =>key.

-> Indicated on display:

Final control diagnosis
Solenoid valve 1 for activated charcoal
filter -N80

The injector valve must click.

If the injector does not click:

- Check the -N80 solenoid valve 1 for the activated carbon canister =>Page 133 .

Actuating the EGR valve (vehicles with EGR only)

- Press the =>key.

-> Indicated on display:

Final control diagnosis
EGR valve -N18

The injector valve must click.

If the valve is not actuated (does not click).

- Check EGR valve => Page 146 .
- Press the =>key.

-> Indicated on display (function selection):

Rapid data transfer HELP
Select function XX

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Note:

Before selecting function 03 "Final control diagnosis" again, switch off the ignition for approx. 20 seconds.

4 - Basic setting

4.1 - Basic setting

4.2 - Control unit no. 4A0 906 266/A/AA/AB (ä 08.92)

Note:

- ♦ The basic setting is performed with the engine running.
- ♦ After initiating the basic setting, the MPI control unit executes the following operations:
 - Constant ignition point of 12°TDC is output at idling speed.
 - Digital idling stabilisation is blocked.
 - ACF valve is closed.
 - Air-conditioner compressor is deactivated
 - EGR valve is closed (vehicles with EGR only)
 - No coolant temperature correction is implemented (fixed value of 80 °C)

Test requirements:

- Coolant temperature at least 85 °C.
- Accelerator pedal not depressed.
- Electrical consumers switched off (radiator fan must not run during the test)
- Air conditioner switched off. Repeatedly press the minus button for the fresh-air blower on the air-conditioner operating and display unit until all displays disappear.
- Vehicles with automatic gearbox: Selector lever in position P or N
- No faults stored in fault memory

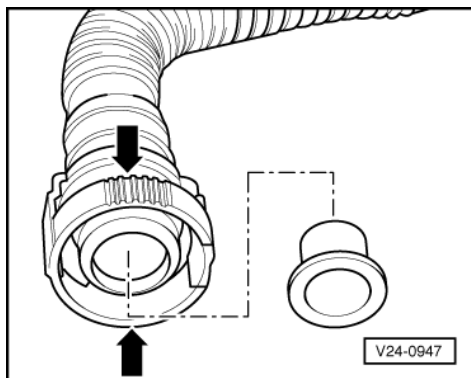


Work sequence

Vehicles ä approx. 06.91:

- Detach both breather hoses on the cylinder head covers and seal both hoses.

Vehicles approx. 07.97 ä:



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- -> Detach both breather hoses on the cylinder head covers after pressing together the oval outer rings - arrows- and seal both hoses with plastic plugs as used, for example, in new and replacement units.

All vehicles:

- Connect up vehicle diagnosis, measurement and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "Address word" 01 => Page 2 .
For this purpose, the engine must be running at idle speed

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	

- Enter "04" to select "Start basic setting" and confirm with Q key.

-> Indicated on display:

Basic setting	Q
Enter display group number XXX	

- Enter "000" to select "Display group 000" and confirm entry with the Q key.

-> Indicated on display:

Default setting 0						
1	2	3	4	5	6	7
8	9	10				

Note:

- ♦ In display group 000 the measured values are shown in decimal form.
- ♦ If the printer is switched on, the current display can be printed out on the record slip.

- If all the display zones show the specified values, press the => key.

-> Indicated on display (function selection):

Rapid data transfer	HELP
Select function XX	

Audi

Audi

Cause of fault	Fault remedy
-----------------------	---------------------

Cause of fault	Fault remedy
-----------------------	---------------------

Cause of fault	Fault remedy
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Cause of fault	Fault remedy
-----------------------	---------------------

- | | |
|-----------------------|---------------------|
| Cause of fault | Fault remedy |
|-----------------------|---------------------|



- ♦ Subtract the measured value in channel 05 from the increased value in display zone 2. If the result lies within the tolerance range, the increased value in display zone 2 is no longer valid.
- ♦ If the measured value in channel 05 is greater than 4, check the earth connection for -G70:

=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
3	Higher than 32	- Idling switch -F60 incorrectly set or defective	- => Checking display zone 7 or idling switch -F60 and adjusting => Page 142
		- Air intake system drawing in large quantities - Unmetered air	- Check air intake system for leaks
		- Idling stabilisation valve -N71 is sticking or stiff	- Performing final control diagnosis =>Page 103
	Lower than 28	- Idling stabilisation valve -N71 is sticking or stiff	- Performing final control diagnosis =>Page 103
		- Idling switch -F60 incorrectly set or defective	- => Checking display zone 7 or idling switch -F60 and adjusting => Page 142

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
4	Higher than 10	- Loads switched on, e.g. air conditioner is on; steering wheel is at end stop; selector lever of automatic gearbox not set to position "P" or "N"	- Switch off all electrical loads Centre steering wheel Move selector lever to "P" or "N"
	Lower than 240	- Large volume of unmetered air, intake manifold area, throttle valve stop not OK, leakage air at throttle valve 2nd stage	- Eliminate cause
5	Outside the tolerance range	Vehicles with automatic gearbox only:	
		- Display zone 4 outside tolerance range	- => Display zone 4
		- Display zone 4 within tolerance range - Set selector lever to D and observe idling speed for approx. 1 min; if display zone 5 remains outside tolerance range, then the gearbox will not operate smoothly	- Check gearbox

Notes on display zones 4 and 5:

- ♦ Displayed values of 0 ... 10 indicate a higher learned value than in basic setting (-N71 opened further). Displayed values of 255 ... 240 indicate a lesser learned value than in basic setting (-N71 closed further). In the basic setting, the display is always 0.
- ♦ For older engines, deviations in the learned values may be caused by dirty -N71. Deviation for manual gearbox, 0 ... 18.
- ♦ Vehicles with automatic gearbox and vacuum pump must be converted to suction jet pump.

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
6	Outside the tolerance	- Display zones 4 and 5 outside tolerance range	- => Display zones 4 and 5

Display zone	Readout on V.A.G 1551 range	Cause of fault	Fault remedy
		- Display zones 4 and 5 within tolerance range	- No further measures required
		- Display zones 4 and 5 exceed tolerance range	- Interrogate fault memory =>Page 5
		- No fault recorded in fault memory, but partial tolerance range 240 ... 255 exceeded in display zones 4 and 5:	- Interrogate fault memory =>Page 5
		- Large quantity of unmetered air which does not enter the intake manifold via -N71, intake manifold changeover system	- Eliminate cause

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
7	Not 20	- A/C compressor switched on	- Switch off the air conditioner Checking air conditioner compressor shut-off =>Page 157
		- Idling switch actuated	- Check idling speed => Page 142
		- Selector lever for automatic gearbox not in "P" or "N" position	- Move selector lever to "P" or "N" Checking wiring between gearbox control unit and engine control unit => "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

Note on display zone 7:

Possible displays for operating errors => Page 29.

Possible displays in display zone 7 for operating errors

Display	Air conditioner	AC compressor	Idling switch	Manual gearbox or automatic gearbox with selector lever in position P or N	Automatic gearbox with selector lever in position R, D, 3, 2 or 1
00	Off	Off	Open	no	yes
04	Off	Off	Open	yes	no
16	Off	Off	Closed	no	yes
32	Off	On	Open	no	yes
36	Off	On	Open	yes	no
48	Off	On	Closed	no	yes
52	Off	On	Closed	yes	no
64	On	Off	Open	no	yes
68	On	Off	Open	yes	no
80	On	Off	Closed	no	yes
84	On	Off	Closed	yes	no
96	On	On	Open	no	yes
100	On	On	Open	yes	no
112	On	On	Closed	no	yes



Display	Air conditioner	AC compressor	Idling switch	Manual gearbox or automatic gearbox with selector lever in position P or N	Automatic gearbox with selector lever in position R, D, 3, 2 or 1
116	On	On	Closed	yes	no

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
8	Outside tolerance range	Less than 128 - engine too rich Effect: Lambda control leans the mixture	- Wait for 30 seconds until the display has stabilised, then set CO potentiometer to 128 + 2 => Page 86
		Greater than 128 - engine too lean Effect: Lambda control enriches the mixture - Unmetered air	- Eliminate air leak
		- Breather hoses not detached from cylinder head and sealed	- Detach breather hoses => Page 26

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Note on display zone 8:

If a stable lambda value is not achieved during adjusting, read individual measured value, channel 02 and 03 and check the control response of both lambda probes. The display values must intermittently drop below 30 and exceed 60; if not, check lambda probe heating and lambda probe.

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
9	Outside the tolerance range	- Display zone 8 outside tolerance range	- => Display zone 8
		- Injector leaking	- Check injection valves => Page 90
	Higher than 90	- Differing injection quantity	- Checking injection quantity => Page 95
		- Defective spark plug	- Test spark plugs
	Lower than 65	- Oil dilution (high petrol content in oil)	- Problem eliminated after motorway drive or oil change
		- Differing injection quantity	- Checking injection quantity => Page 95
		- Air mass meter -G70 defective	- Check -G70 => Page 112

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
10	Outside the tolerance range	- Display zone 7 outside tolerance range	- Display zone 7
		- Fault in fault memory	- Interrogating fault memory => Page 5
		- Throttle valve potentiometer -G69 incorrectly set	- Checking throttle valve potentiometer -G69 => Page 138
		- Idling switch -F60 actuated or defective	- Reading individual measured value, channel 11 => Page 142
		- Earth point at intake manifold	- Check earth connection => "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

Notes on display zone 10:

- ♦ If the difference between the measured value in channel 11 and the value in display zone 10 is greater than ± 0.04 V, check the idling switch. If the value is OK, check throttle valve potentiometer.
- ♦ Briefly run engine at full throttle after adjusting the throttle valve potentiometer. The measured value in channel 09 must be greater than 175.

4.3 - Control unit no. 8A0 906 266 B (09.92 >)

Note:

- ♦ All learned values in the control unit are erased when the connector on the engine control unit is disconnected or when the battery is disconnected. This may be followed by rough idling for a brief period. In this case, leave the engine idling for several minutes until learning process has been completed.
- ♦ On initiating the basis setting (function 04), all learning demand displays (display group 007 or 008) are set to 0 so that the lambda learned values have to be learned again after the vehicle has been serviced.
- ♦ Learning is prohibited as soon as a fault affecting the lambda control has been stored in the fault memory (does not apply to sporadic faults).
- ♦ The basic setting is performed with the engine running.
- ♦ After initiating the basic setting, the MPI control unit executes the following operations:
 - Constant ignition point of 12°TDC is output at idling speed.
 - Digital idling stabilisation is blocked.
 - ACF valve is closed.
 - Air-conditioner compressor is deactivated
 - EGR valve is closed (vehicles with EGR only)
 - No coolant temperature correction is implemented (fixed value of 80 °C)
 - Renewed learning of lambda learned values is prompted.
 - Learned values are re-learned (idling speed and CO content are set automatically).

Test requirements:

- Coolant temperature at least 85 °C.
- Accelerator pedal not depressed.
- Electrical consumers switched off (radiator fan must not run during the test)
- Air conditioner switched off. Repeatedly press the minus button for the fresh-air blower on the air-conditioner operating and display unit until all displays disappear.
- Vehicles with automatic gearbox: Selector lever in position P or N
- No faults stored in fault memory

Work sequence

- Connect up vehicle diagnosis, measurement and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "Address word" 01 => Page 2 .
For this purpose, the engine must be running at idle speed

-> Indicated on display:

Rapid data transfer HELP
Select function XX

- Enter "04" to select "Start basic setting" and confirm with Q key.

-> Indicated on display:

Basic setting Q
Enter display group number XXX

- Enter "000" to select "Display group 000" and confirm entry with the Q key.

-> Indicated on display:

Default setting 0
1 2 3 4 5 6
8 9 10

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**Note:**

- ♦ In display group 000 the measured values are shown in decimal form.
- ♦ If the printer is switched on, the current display can be printed out on the record slip.

- If all the display zones show the specified values, press the ➔ key.

-> Indicated on display (function selection):

Rapid data transfer **HELP**
Select function XX

Display group 000 (decimal values)1)									
Basic setting 0 ➔									
1	2	3	4	5	6	7	8	9	10
									• Indicated on display • Display zones Learned value for throttle valve potentiometer Specification 50...100 250...500 mV
									Lambda learning demand 0 = Learning demand at idling speed and part throttle range 3 = Learning process completed at idling speed Specification 3
									Lambda control value (mean value 128/cyl. 1...3) 0 is displayed for vehicles with no lambda probes Specification 120...136
									Switching inputs Specification 20
									Idling stabilisation feedback (mean value 128) Specification 126...130
									Learned value for idling stabilisation, automatic gearbox with gear engaged (0 is displayed for manual gearbox) Specification 0...10 or 240...255
									Learned value for idling stabilisation, manual gearbox in idling position, automatic gearbox in selector lever position P or N Specification 0...10 or 240...255
									Engine speed Specification 28...32 700...800 rpm
									Air mass meter output voltage Specification 147...162 1.47...1.62 V
									Coolant temperature Specification 135...160 85...110 °C

1) Where appropriate, the individual measured values are evaluated in display groups 001 ... 019 in the "Reading measured value block" function => Page 35 onwards.

5 - Coding control unit

5.1 - Coding control unit

5.2 - Control unit no. 4A0 906 266/A/AA/AB (ä 08.92)

Warning

Always start by displaying the control unit identification and printing out if required => Page 3.

Note:

4A0 906 266A 2.8 V6 MPI 2 valve D08
Coding 1010

- > When starting self-diagnosis, coding of engine control unit must be displayed in 4-digit form.
- ◆ The coding is encoded by the manufacturer, in the engine control unit wiring harness at connectors B and C.
 - ◆ The first three digits are encoded via connector B, contacts 14, 16 and 19.
 - ◆ The fourth digit is encoded via connector C, contact 9.
 - ◆ If one of these contacts is connected to earth, "0" is displayed. If one of these contacts is not connected (open), "1" is displayed.

Example:

Coding	1	1	1	1
Connector	B	B	B	C
Contact	14	16	19	9
Lambda	Open	Open	Open	Open

If, for control unit identification, a coding is displayed which does not correspond to the vehicle:

- Check the connections:

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- If incorrect connection is detected, repair wiring harness for connector B or C according to current flow diagram (connect accordingly).
- If incorrect connection is not detected, replace the engine control unit =>Page 82 .

Encoding table for control unit no. 4A0 906 266/A/AA/AB (ä 08.92)

Coding	with	without
1010	Manual gearbox	Exhaust gas recirculation system
1111	Manual gearbox, EGR system	Temperature sensor for EGR system
1011	Manual gearbox, EGR system, temperature sensor for EGR system (California version)	
1110	Manual gearbox (ECE version)	Lambda probes, solenoid valve 1 for activated charcoal filter system, EGR system
0010	Front wheel drive, automatic gearbox	Exhaust gas recirculation system
0111	Front wheel drive, automatic gearbox, EGR system	Temperature sensor for EGR system
0011	Front wheel drive, automatic gearbox, EGR system, temperature sensor for EGR system (California version)	
0110	Front wheel drive, automatic gearbox (ECE version)	Lambda probes, solenoid valve 1 for activated charcoal filter system, EGR system

Coding	with	without
1000	Four-wheel drive, automatic gearbox	Exhaust gas recirculation system
1101	Front wheel drive, automatic gearbox, EGR system	Temperature sensor for EGR system
1001	Four-wheel drive, automatic gearbox, EGR system, temperature sensor for EGR system (California version)	
1100	Four-wheel drive, automatic gearbox (ECE version)	Lambda probes, solenoid valve 1 for activated charcoal filter system, EGR system



Coding	with	without
0000 0001 0100 0101	Incorrect coding	

5.3 - Control unit no. 8A0 906 266 B (09.92 ➤)

If the appropriate code for the vehicle is not displayed or if the control unit has been replaced, the control unit must be encoded as follows.

- Connect up vehicle diagnosis, measurement and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "Address word" 01 => Page 2 .
For this purpose, the ignition must be switched on.

-> Indicated on display:

Rapid data transfer HELP
Select function XX

- Enter "07" for the function "Encode control unit" and confirm entry with Q key.

-> Indicated on display:

Coding control unit Q
Enter code number XXX

- Enter the control unit code in accordance with the encoding table => Page 35 .

-> Indicated on display (example):

Coding control unit Q
Enter code number 000

- Confirm input with the Q key.

-> The fault reader V.A.G 1551 display will show the control unit identification. For example:

8A0906266B V6 2.8 2V MPI V6AC39 D08
□
Coding 000 WSC 12345

Note:

-> Indicated on display:

Function unknown or cannot
be carried out at present.

The code number that was entered was not authorised.

- Press the ➡key.

-> Indicated on display (function selection):

Rapid data transfer HELP
Select function XX

- Switch off ignition and detach diagnostic connector.

Note:

The next time the ignition is switched on the newly entered code will be activated.

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Encoding table for control unit no. 8A0 906 266 B (09.92 ä)

Coding	Gearbox	with	without
000	Manual gearbox	Lambda probes, solenoid valve 1 for activated charcoal filter	Exhaust gas recirculation system
001	Automatic gearbox 097		
002	Automatic gearbox 01K/01F		
003	Manual gearbox	Lambda probes, solenoid valve 1 for activated charcoal filter system, EGR system, Temperature sensor for EGR, speed restriction (USA and California version)	
004	Automatic gearbox 097		
005	Automatic gearbox 01K/01F		
009	Manual gearbox		
010	Automatic gearbox 097		Lambda probes, solenoid valve 1 For activated charcoal filter, Exhaust gas recirculation system
011	Automatic gearbox 01K/01F		

6 - Reading measured value block

6.1 - Reading measured value block

6.2 - Control unit no. 4A0 906 266/A/AA/AB (ä 08.92)

Warning
To avoid danger of accident when performing measurement and test drives, heed safety precautions =>
Page 1 .

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Vehicles with air conditioner:

Note:

- ◆ The purpose of the "Reading measured value block" function is exclusively for checking the auxiliary signals for air conditioner and compressor shut-off (display in display zone 7).
- ◆ CO adjustments to the CO potentiometer must not be performed in the "Reading measured value block" function.
- ◆ The crankcase breather hoses must not be detached.

Test requirements:

- Coolant temperature at least 85 °C.
 - Electrical consumers switched off (radiator fan must not run during the test)
 - Air conditioner system switched on.
 - Vehicles with automatic gearbox: Selector lever in position P or N
 - No faults stored in fault memory
- Connect vehicle diagnosis, measurement and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "Address word" 01 => Page 2 .
For this purpose, the engine must be running at idle speed

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	



- Switch on the fault reader printer with the print key. The indicator lamp in the key must illuminate.
- Enter "08" to select the function "Reading measured value block" and confirm entry with Q key.

-> Indicated on display:

Reading measured value block	Q
Enter display group number XXX	

- Enter "000" to select "Display group 000" and confirm entry with the Q key.

-> Display for display group 000:

Reading measurement block 0									
1	2	3	4	5	6	7			
8	9	10							

Note:

- ♦ In display group 000 the measured values are shown in decimal form.
- ♦ => Basic setting, Page 27 for explanation of individual displays in the display zones.
- ♦ Disregard display zones 1 ... 6 and 8 ... 10.
- ♦ Possible displays in display zone 7 for operating errors => Page 29.
- ♦ If the printer is switched on, the current display can be printed out on the record slip.

- If the specified value is not achieved in display zone 7, press the => key.

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-> Indicated on display (function selection):

Rapid data transfer	HELP
Select function XX	

6.3 - Control unit no. 8A0 906 266 B (09.92 ➤)

Warning

To avoid danger of accident when performing measurement and test drives, heed safety precautions => Page 1.

Test requirements:

- Coolant temperature at least 85 °C.
- Electrical consumers switched off (radiator fan must not run during the test)
- Air conditioner switched off.
- Vehicles with automatic gearbox: Selector lever in position P or N
- No faults stored in fault memory

Work sequence

- Connect up vehicle diagnosis, measurement and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "Address word" 01 => Page 2.
For this purpose, the engine must be running at idle speed

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	

- Switch on the fault reader printer with the print key. The indicator lamp in the key must illuminate.
- Enter "08" to select the function "Reading measured value block" and confirm entry with Q key.

-> Indicated on display:

Reading measured value block	Q
Enter display group number XXX	

- Enter the required display group number =>Display group overview, Page 37 .
- Confirm input with the Q key.

-> Display for display group 000:

Reading	measurement	block	0						
1	2	3	4	5	6	7			
8	9	10							

-> Display for display group 001 (example):

Reading	measured	value	block	1
1	2	3	4	

Note:

- ◆ If the printer is switched on, the current display can be printed out on the record slip.
- ◆ Proceed as follows to switch to a different display group:

Display group	V.A.G 1551	VAS 5051
Up	Press key 3	Press s key
Lower	Press key 1	Press t key

- If all the display zones show the specified values, press the ➔ key.

-> Indicated on display (function selection):

Rapid data transfer	HELP
Select function XX	

6.4 - Display group overview

Display group no.	Indicated on display	Designation
000 Basic function	Reading measured value block 1 2 3 4 5 6 7 8 9 10	1 = Coolant temperature 2 = Air mass meter output voltage 3 = Engine speed 4 = Learned value for idling stabilisation 5 = Learned value for idling stabilisation 6 = Idling stabilisation feedback 7 = Switching inputs 8 = Lambda control value 9 = Lambda learning demand 10 = Learned value for throttle valve potentiometer

Display group no.	Indicated on display	Designation
001 Basic function	Read measured value block 1 1 2 3 4	1 = Coolant temperature 2 = Air mass meter output voltage 3 = Air mass meter discrepancy 4 = Engine control unit power supply
002 Throttle valve	Read measured value block 2 1 2 3 4	1 = Throttle valve potentiometer voltage - idling speed to full throttle 2 = Throttle valve potentiometer voltage - idling speed, lower part throttle 3 = Learned value for throttle valve potentiometer



Display group no.	Indicated on display	Designation
potentiometer		4 = Idling switch
003 Basic function	Read measured value block 3 1 2 3 4	1 = Engine speed 2 = Engine load - idling speed 3 = Throttle valve angle 4 = Vehicle speed

Display group no.	Indicated on display	Designation
004 Idling speed stabilisation	Read measured value block 4 1 2 3 4	1 = Idling speed control 2 = Learned value for idling stabilisation 3 = Idling stabilisation learned value for automatic gearbox 4 = Switching inputs (auxiliary signals)
005 Lambda learned values	Read measured value block 5 1 2 3 4	1 = Lambda learned value - idling speed (bank 1) 2 = Lambda learned value - part throttle 1 (bank 1) 3 = Lambda learned value - part throttle 2 (bank 1) 4 = Lambda learned value - part throttle 3 (bank 1)
006 Lambda learned values	Read measured value block 6 1 2 3 4	1 = Lambda learned value - idling speed (bank 2) 2 = Lambda learned value - part throttle 2 (bank 1) 3 = Lambda learned value - part throttle 2 (bank 2) 4 = Lambda learned value - part throttle 3 (bank 2)

Display group no.	Indicated on display	Designation
007 Lambda control	Read measured value block 7 1 2 3 4	1 = Lambda control (bank 1) 2 = Instantaneous lambda learned value 3 = Lambda learning range - display 4 = Lambda learning demand - display
008 Lambda control	Read measured value block 8 1 2 3 4	1 = Lambda control (bank 2) 2 = Instantaneous lambda learned value 3 = Lambda learning range - display 4 = Lambda learning demand - display
009 Lambda control	Read measured value block 9 1 2 3 4	1 = Lambda control (bank 1) 2 = Lambda control (bank 2) 3 = Signal ratio of ACF solenoid 1 -N80 4 = Throttle valve angle

Display group no.	Indicated on display	Designation
010 Lambda control/ Voltage signal	Read measured value block 10 1 2 3 4	1 = Sum total of lambda control and instantaneous lambda learned value (bank 1) 2 = Sum total of lambda control and instantaneous lambda learned value (bank 2) 3 = Lambda probe 1 voltage signal (bank 1) 4 = Lambda probe 1 voltage signal (bank 2)
011	Read measured value block 11	1 = Ignition timing without knock control and digital idling speed stabilisation

Display group no.	Indicated on display	Designation
Ignition timing	1 2 3 4	2 = Ignition timing with knock control and digital idling speed stabilisation (mean value of all cylinders) 3 = Ignition timing intervention for digital idling speed stabilisation 4 = Idling switch

Display group no.	Indicated on display	Designation
012 Ignition timing	Read measured value block 12 1 2 3 4	1 = Engine speed 2 = Engine load 3 = Ignition timing map switching 4 = Ignition timing retardation by knock control (mean value of all cylinders)
013 Knock system	Read measured value block 13 1 2 3 4	1 = Ignition timing map switching 2 = Ignition timing retardation by knock control, cylinder 1 3 = Ignition timing retardation by knock control, cylinder 2 4 = Ignition timing retardation by knock control, cylinder 3
014 Knock system	Read measured value block 14 1 2 3 4	1 = Ignition timing map switching 2 = Ignition timing retardation by knock control, cylinder 4 3 = Ignition timing retardation by knock control, cylinder 5 4 = Ignition timing retardation by knock control, cylinder 6

Display group no.	Indicated on display	Designation
015 Knock sensor	Read measured value block 15 1 2 3 4	1 = Engine speed 2 = Knock sensor signal, cylinder 1 3 = Knock sensor signal, cylinder 2 4 = Knock sensor signal, cylinder 3
016 Knock sensor	Read measured value block 16 1 2 3 4	1 = Engine speed 2 = Knock sensor signal, cylinder 4 3 = Knock sensor signal, cylinder 5 4 = Knock sensor signal, cylinder 6
017 EGR	Read measured value block 17 1 2 3 4	1 = Engine speed 2 = Engine load 3 = Duty cycle of EGR valve 4 = EGR temperature

Display group no.	Indicated on display	Designation
018 Idling speed stabilisation	Read measured value block 18 1 2 3 4	1 = Internal specified duty cycle of idling stabilisation valve 2 = Current input of idling stabilisation valve 3 = Current regulation of idling stabilisation valve 4 = Engine control unit power supply
019 Mixture preparation	Read measured value block 19 1 2 3 4	1 = Engine power (internal calculated value) 2 = Intake air mass 3 = Vehicle speed



	4 = Injection period (mean value of all cylinders)
--	--

6.5 - Reading measured value block: Display groups 000 to 010

Read measured value block 0										⇒	◀ Indicated on display	Specification	Corresp. to
1	2	3	4	5	6	7	8	9	10		◀ Display zones		
											Learned value for throttle valve potentiometer	50...100	250...500 mV
											Lambda learning demand 0 = Learning demand at idling speed and part throttle range 3 = Learning process completed at idling speed	3	
											Lambda control value (mean value 128/cyl. 1...3) 0 is displayed for vehicles with no lambda probes	120...136	
											Switching inputs	...	
											Idling stabilisation feedback (mean value 128)	126...130	
											Learned value for idling stabilisation, automatic gearbox with gear engaged (0 is displayed for manual gearbox)	0...10 or 240...255	
											Learned value for idling stabilisation, manual gearbox in idling position, automatic gearbox in selector lever position P or N	0...10 or 240...255	
											Engine speed	28...32	700...800 rpm
											Air mass meter output voltage	147...162	1.47...1.62 V
											Coolant temperature	135...160	85...110 °C

Notes on Display Group 000:

- ♦ If the values displayed do not correspond to the specified values, use the following display groups 001 - 019 for fault rectification.
- ♦ Do not deal with any deviations in display zone 8 until the lambda learning process at idling speed has been completed => display zone 9.
- ♦ If values greater than 3 are displayed in display zone 9 => Display group 007 or 008.

Display Group 001; basic function

Reading measured value block 1				⇒	◀ Indicated on display
... °C	... V	... V		... V	
					Engine control unit power supply ▪ 12.0 ... 14.0 V OK
					Air mass meter discrepancy ▪ 0.000 ... 0.025 V

	Air mass meter output voltage ▪ 1.470 ... 1.620 V OK (for new engines, max. 1.680 V) ▪ In the event of engine speed increase, display value rises to 2.500 V, drops to 0.000 V and starts rising again.
	Coolant temperature ▪ 85 ... 110 °C OK

Test table, Display group 001

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
1	Less than 85 °C 1)	- Engine too cold	- Perform test drive if necessary
		- Coolant temperature sender or wiring to engine control unit	- Interrogate fault memory =>Page 205
	Greater than 110 °C 1)	- Radiator dirty	- Clean radiator
		- Radiator fan not working	- Check function
		- Thermostat defective	- Check coolant thermostat
		- Coolant temperature sender or wiring to engine control unit	- Interrogate fault memory =>Page 205

1) Vehicle at operating temperature.

Note on display zone 1:

The coolant temperature sender is a temperature-sensitive resistor. If the sender signal is biased, for example due to moisture in a connector (effect similar to parallel resistor), this biasing may be in a range which the fault memory is still not able to detect.

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
2	Less than 1.470 V	- Large quantity of unmetered air between intake manifold and air mass meter	- Eliminate air leak
	Greater than 1.620 V	- Loads switched on, e.g. air conditioner is on; steering wheel is at end stop; selector lever of automatic gearbox not set to position "P" or "N"	- Switch off all electrical loads Centre steering wheel Move selector lever to "P" or "N"

Notes on display zone 2:

- ◆ Only assess the tolerance range of the air mass meter output voltage in function 04 "Basic setting" at idling speed.
- ◆ The air mass meter output voltage decreases by 0.01 V for every 500 m above sea level.
- ◆ If the above-mentioned fault causes are not applicable, subtract the value in display zone 3 (air mass meter discrepancy) from the increased value in display zone 2. If the result lies within the tolerance range, the increased value in display zone 2 is no longer valid.

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
3	Greater than 0.025 V	- Defective wiring or contacts or oxidised earthing point	- Checking earth supply for air mass meter -G70 => "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder



Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
4	Less than 12 V	- Alternator defective, battery heavily discharged	- Check voltage, charge battery
		- High load on electrical system shortly after starting engine due to high charge current and load from ancillaries	- Increase engine speed for several minutes and switch off ancillaries
		- Contact resistance in power supply or earth connection for engine control unit	- Checking voltage supply to engine control unit => Page 208
		- Current drain with ignition off	- Eliminate current drain
	Greater than 14.0 V	- Voltage control on alternator defective	- Check voltage; if necessary, fit a new voltage regulator.
		- Excess voltage from assisted start or high speed charger	- Interrogating fault memory =>Page 5

Note on display zone 3:

If fault "00531 air mass meter reference voltage" is stored, a substitute value of constant 0.02 V is displayed.

Display group 002, throttle valve potentiometer:

Reading measured value block 2				⇒	◀ Indicated on display
... V	... V	... V		0	
				Idling switch	
				▪ 0 = open	
				▪ 1 = closed	
				Learned value for throttle valve potentiometer	
				▪ 0.250 ... 0.500 V OK	
				Throttle valve potentiometer voltage (idling speed to part throttle range)	
				▪ 0.250 ... 1.275 V OK	
				Throttle valve potentiometer voltage (idling speed to full throttle range)	
				▪ 0.250 ... 4.750 V OK	

Test table, Display group 002

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
1	Deviation from tolerance range	- Throttle valve potentiometer -G69 defective or incorrectly set	- Interrogate fault memory =>Page 138 or => Display group 009, display zone 4
2	Outside the tolerance range	- Throttle valve potentiometer -G69 defective or incorrectly set	- Interrogate fault memory =>Page 138 or => Display group 009, display zone 4
3	Outside the tolerance range	- Idling switch actuated or defective	- Interrogate fault memory =>Page 138 or => Display group 009, display zone 4
		- Throttle valve potentiometer -G69 defective or incorrectly set	
		- Loads switched on, e.g. air conditioner is on; steering wheel is at end stop; selector lever of automatic gearbox not set to position "P" or "N"	- Switch off all electrical loads Centre steering wheel Move selector lever to "P" or "N"

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
		- Moisture in connector of throttle valve potentiometer -G69	- Check connector
		- Earth point at intake manifold	- Check earth connection => "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

Notes on display zone 3:

- ♦ Idling switch must be closed for checking throttle valve potentiometer learned value => Display zone 4.
- ♦ If the displays in zones 2 and 3 agree at idling speed, the learning process is OK. The last value learned is constantly displayed if no learning process takes place.
- ♦ The throttle valve potentiometer learned value is set to 0.550 V if the control unit is de-energised.

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
4	0 or 1	- F60 idling switch defective - Throttle valve potentiometer -G69 defective or incorrectly set	- Interrogate fault memory =>Page 142
		- Throttle valve sticking - Floor mat pressing down on accelerator pedal	- => Display group 011, Display zone 4 Eliminate cause
		- Moisture in connector of throttle valve potentiometer -G69	- Check connector
		- Throttle cable setting	- Adjust throttle cable => Repair group 20

Display Group 003; basic function

Reading measured value block 3				⇒	Indicated on display
... rpm	... %	... %	... km/h		
			Road speed		
			Throttle valve angle:		
			▪ Idling: 0% OK		
			▪ Full throttle: Greater than 95% OK		
			Engine load (idling speed)		
			▪ 15.0 ... 32.0% OK		
			Engine speed (idling speed)		
			▪ 700 ... 800 rpm OK		

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Test table, Display group 003

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
1	Greater than 800 rpm	- Idling switch -F60 incorrectly set or defective	- Checking and adjusting idling speed switch -F60 => Page 142 or => Display group 004, Display zone 4
		- Idling stabilisation valve -N71 is sticking or stiff	- Perform final control diagnosis =>Page 103



Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
	Less than 700 rpm	- Air intake system drawing in large quantities unmetered air	- Check air intake system for leaks
		- Idling stabilisation valve -N71 is sticking or stiff	- Perform final control diagnosis =>Page 103
		- Idling switch -F60 incorrectly set or defective	- Checking and adjusting idling speed switch -F60 => Page 142 or => Display group 004, Display zone 4
		- Loads switched on, e.g. air conditioner is on; steering wheel is at end stop; selector lever of automatic gearbox not set to position "P" or "N"	- Switch off all electrical loads Centre steering wheel Move selector lever to "P" or "N"

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
2	Outside the tolerance range	- Poor idling (not running on all cylinders)	- Injector or spark plugs defective
		- Air mass meter -G70 defective	- Interrogate fault memory => Page 5 or => Display group 001, Display zone 2
		- Idling stabilisation valve -N71 defective	- Interrogating fault memory =>Page 5 or =>Display group 018
		- Loads switched on, e.g. air conditioner is on; steering wheel is at end stop; selector lever of automatic gearbox not set to position "P" or "N"	- Switch off all electrical loads Centre steering wheel Move selector lever to "P" or "N"
		- Exhaust gas recirculation valve - N18 leaking	- Interrogating fault memory =>Page 5 or =>Display group 017

Note on display zone 2:

Only assess engine load tolerance range at idling speed in function 04 "Basic setting"

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
3	Greater than 0 % at idling speed	- -G69 throttle valve potentiometer defective	- Interrogating fault memory =>Page 5 or =>Display group 002
		- Throttle cable setting	- Adjust throttle cable => Repair group 20
		- Throttle valve sticking	- Eliminate cause
	Less than 95 % at full throttle	- -G69 throttle valve potentiometer defective	- Interrogating fault memory =>Page 5 or =>Display group 002
		- Throttle cable setting	- Adjust throttle cable => Repair group 20
		- Throttle valve potentiometer -G69 incorrectly set	- Checking throttle valve potentiometer -G69 => Page 138

Note on display zone 3:

For checking at full throttle, switch engine off and ignition on.

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
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4	No Display	- Fault in wiring between dash panel insert and engine control unit	- Checking wiring => "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder
		- Open circuit or short circuit between vehicle speed sender -G22/-G68 and engine control unit	- Checking wiring => "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder
		- Vehicle speed sender -G22/-G68	- Checking vehicle speed sender -G22/-G68 => Page 162

Note on display zone 4:

If vehicle speed is not displayed on V.A.G 1551, start by checking whether speedometer reading is OK. If not, check speedometer:

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=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

Display group 004: Idling speed stabilisation:

Reading measured value block 4							Indicated on display
1	4	0	0	0	1	1	
			X	X	X	X	- Fresh-air blower for air conditioner: 0 = high, 1 = low - Air conditioner compressor: 0 = off, 1 = on - Idling switch: 0 = open, 1 = closed - Gear recognition signal: 1 = manual gearbox or automatic gearbox in selector lever position "P" or "N" 0 = automatic gearbox in selector lever position R, D, 3, 2, 1
			Idling stabilisation learned value for automatic gearbox (AT) - In selector lever position D, 2, 3, 4 or R +10 ... -20 OK - Display always 0 for manual gearbox (MT)				
			Learned value for idling stabilisation - For manual gearbox (MT) in idling position +14... -16 OK (new engines +20 ... -16) - For automatic gearbox (AT) in selector lever position "P" or "N" +10 ... -20 OK (new engines +16... -20)				
			Idling control at idle 0 ± 2 OK				

Notes on display zones 2 and 3:

- Only assess values in display zone 2 or 3 if idling control is within tolerance at idle (display zone 1). If idling control is not within the tolerance after 1 minute waiting time, learning does not take place in display zone 2 or 3.
- Positive learned values indicate higher learned value than in basic setting: -N71 still open.
Negative learned values indicate lower learned value than in basic setting: -N71 is still closed.



Test table, Display group 004

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
1	Outside the tolerance range	- Fault in fault memory	- Interrogating fault memory =>Page 5
		- Idling switch -F60 actuated or defective	- Checking idling switch -F60 => Page 142 and => Display group 002, display zone 4
		- Idling stabilisation valve -N71 defective	- Checking idling stabilisation valve - N71 => Page 103
		- Loads switched on e.g. air conditioner is on; steering wheel is at end stop; selector lever of automatic gearbox not set to position "P" or "N"	Switch off all electrical loads Centre steering wheel Move selector lever to "P" or "N"
		- Throttle valve sticking - Floor mat pressing down on accelerator pedal - Unmetered air	- Eliminate cause

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
2	Greater than +14 (MT) or Greater than +10 (AT)	- Idling stabilisation valve -N71 defective	- Checking idling stabilisation valve - N71 => Page 103
		- Loads switched on, e.g. air conditioner is on; steering wheel is at end stop; selector lever of automatic gearbox not set to position "P" or "N"	- Switch off all electrical loads Centre steering wheel Move selector lever to "P" or "N"
		- Suction jet pump blocked (automatic gearbox)	- Eliminate cause
		- EGR valve -N18 open	- Interrogating fault memory =>Page 5 or =>Display group 017
	Less than -16 (MT) or Less than -20 (AT)	- Idling stabilisation valve -N71 defective	- Interrogating fault memory =>Page 5 or =>Display group 018
		- Large volume of unmetered air, intake manifold area, throttle valve stop not OK, leakage air at throttle valve 2nd stage	- Eliminate cause

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
3	Outside the tolerance range	Vehicles with automatic gearbox only: - Display zone 2 outside tolerance range	- => Display zone 2
		- Display zone 2 within tolerance range - Set selector lever to D and observe idling speed for approx. 1 min; if display zone 3 remains outside tolerance range, then the gearbox will not operate smoothly	- Check gearbox
4	Not 001 1	- Idling switch -F60 actuated or defective	- Checking and adjusting idling speed switch -F60 =>Page 142
		- A/C compressor switched on	- Switch off the air conditioner

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
		- Air conditioner requires higher cooling or heat output ("high")	- Checking air conditioner compressor shut-off =>Page 160
		- Gear engaged (automatic gearbox)	- Move selector lever to P or N

Display group 005, lambda learned values, cylinder bank 1:

Reading measured value block 5		⇒	• Indicated on display
... %	... %	... %	... %
			Lambda learned value, part throttle 3 (bank 1) ▪ -19% ... +19% OK
			Lambda learned value, part throttle 2 (bank 1) ▪ -19% ... +19% OK
			Lambda learned value, part throttle 1 (bank 1) ▪ -19% ... +19% OK
			Lambda learned value, idling speed (bank 1) ▪ -25% ... +25% OK

Notes on all display zones => Display group 006

Display group 006, lambda learned values, cylinder bank 2:

Reading measured value block 6		⇒	• Indicated on display
... %	... %	... %	... %
			Lambda learned value, part throttle 3 (bank 2) ▪ -19% ... +19% OK
			Lambda learned value, part throttle 2 (bank 2) ▪ -19% ... +19% OK
			Lambda learned value, part throttle 1 (bank 2) ▪ -19% ... +19% OK
			Lambda learned value, idling speed (bank 2) ▪ -25% ... +25% OK

Notes on all display zones:

- ◆ Positive learned value (+ %) signifies:
Mixture too lean, more fuel must be injected (programmed basic injection period too short, actual injection period ... % longer, so that $\lambda = 1$ is achieved)
- ◆ Negative learned value (- %) signifies:
Mixture too rich, less fuel must be injected (programmed basic injection period too long, actual injection period ... % shorter, so that $\lambda = 1$ is achieved)



Test table: Display groups 005 and 006

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
1/2/3/4 (cont.) t	Low lambda learned values	If learned value in display zone 1 is low and the learned values in display zones 2, 3 and 4 are normal: - Oil dilution (high petrol content in oil)	- Disconnect and seal off crankcase breather Problem eliminated after motorway drive or oil change
		- Injector leaking	- Check injection valves => Page 90
		If all 4 lambda learned values are very low: - Fuel pressure too high	- Checking fuel pressure =>Page 87
		- Solenoid valve 1 for activated charcoal filter -N80 is constantly open	- Check -N80 => Page 133 or => Display group 009, display zone 3
		- Air mass meter -G70 defective	- Check -G70 => Page 112
		- Lambda probe heating defective or lambda probe dirty	- Checking lambda probe => Page 127 or =>Display group 010, display zones 1 and 2

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
1/2/3/4	High lambda learned values	If learned value in display zone 1 is high and the learned values in display zones 2, 3 and 4 are normal: - Unmetered air in intake manifold area	- Eliminate causes
		- Injector blocked	- Checking injection quantity =>Page 95
		If all 4 lambda learned values are very high: - Air mass meter -G70 defective	- Check -G70 => Page 112
		- Fuel pressure too low	- Checking fuel pressure =>Page 87
		- Unmetered air between -G70 and throttle valve - Unmetered air at manifold gasket	- Eliminate cause
		- Lambda probe heating defective or lambda probe dirty	- Checking lambda probe => Page 127 or =>Display group 010, display zones 1 and 2

Notes on display groups 005 and 006:

- ◆ Differences in lambda learned values (=> Display group 010, display zones 1 and 2) of more than 8% between display group 005 (bank 1) and display group 006 (bank 2) may be due to the following:
 - Defective spark plugs
 - Defective injectors (leaking, blocked)
 - Unmetered air on one side
 - Lambda probe defective or dirty
 - Mechanical base setting (valve timing) of engine not OK
- ◆ If the difference between the richest and leanest lambda learned value of a display group is 9%, any further leaning of the two learning ranges in question is stopped (=> Display group 007 or 008). The learning demand display (=> Display group 007 or 008) for these learning ranges cannot be "1".

- ♦ All values are reset to 0.0% if control unit is deenergised.

Display group 007, lambda control, cylinder bank 1:

Reading measured value block 7 ⇒						• Indicated on display
... %	... %	X	X	X	X	XXXXXXXXX
						Lambda learning demand display (bank 1); significance =>Page 50
						Lambda learning range display (bank 1) ▪ Part throttle 3:0 = engine speed and load for this learning range not attained ▪ 1 = engine speed and load for this learning range attained ▪ Part throttle 2:0 = engine speed and load for this learning range not attained ▪ 1 = engine speed and load for this learning range attained ▪ Part throttle 1:0 = engine speed and load for this learning range not attained ▪ 1 = engine speed and load for this learning range attained ▪ Idling speed:0 = engine speed for this learning range not attained ▪ 1 = engine speed for this learning range attained
						Instantaneous lambda learned value (bank 1)
						Lambda control (bank 1) ▪ 0.0 ± 6.0% OK 1)

- 1) Only assess the lambda control tolerance range at idling speed in function 04 "Basic setting", as function 08 "Reading measured value block" also includes control of ACF influence.

Display group 008, lambda control, cylinder bank 2:

Reading measured value block 8 ⇒					• Indicated on display
... %	... %	X	X	X	XXXXXXXX
					Lambda learning demand display (bank 2); significance =>Page 50
X X X X					Lambda learning range display (bank 2) ▪ Part throttle 3:0 = engine speed and load for this learning range not attained ▪ 1 = engine speed and load for this learning range attained ▪ Part throttle 2:0 = engine speed and load for this learning range not attained ▪ 1 = engine speed and load for this learning range attained ▪ Part throttle 1:0 = engine speed and load for this learning range not attained ▪ 1 = engine speed and load for this learning range attained ▪ Idling speed:0 = engine speed for this learning range not attained ▪ 1 = engine speed for this learning range attained
Instantaneous lambda learned value (bank 2)					
Lambda control (bank 2) ▪ 0.0 ± 6.0% OK 1)					

- 1) Only assess the lambda control tolerance range at idling speed in function 04 "Basic setting", as function 08 "Reading measured value block" also includes control of ACF influence.



Significance of 8-digit display "Lambda learning demand diagnosis/Lambda learning demand display"

X	X	X	X	X	X	X	X	
								Idling speed (bank 1)
								Idling speed (bank 2)
								Part throttle 1 (bank 1)
								Part throttle 1 (bank 2)
								Part throttle 2 (bank 1)
								Part throttle 2 (bank 2)
								Part throttle 3 (bank 1)
								Part throttle 3 (bank 2)

Note:

- ♦ Lambda learning demand diagnosis:
0 = diagnosis not yet performed, 1 = diagnosis performed.
- ♦ Lambda learning demand display:
0 = Re-learning prompt, 1 = learning process completed.

Test table: Display groups 007 and 008

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
1	Outside tolerance range	Negative display - engine too rich Effect: Lambda control leans the mixture	- Wait 30 seconds for the display to stabilise
		Positive display ("+" is not displayed) - engine too lean Effect: Lambda control enriches the mixture	- Eliminate air leak
		- Unmetered air	- Checking injection quantity => Page 95
		- Injector defective	
		- Not successfully learned	- => Display zone 4
		- Lambda learned values at stop	- Check lambda learned values => Display group 005 or 006
2	-		- => Notes
3	-		- => Notes
4	-		- => Notes

Notes on display zone 1:

- ♦ Do not assess lambda control in either function 04 "Basic setting" or function 08 "Reading measured value block" until after the learning process has been completed successfully (=> Learning demand display).
- ♦ The lambda control indicates the instantaneous control status. After the learning process has been successfully completed (=> Learning demand display), the values fluctuate by $0.0 \pm 6.0\%$. If the learning process (display zone 4) has been completed and a value around $0.0 \pm 6.0\%$ is not attained, observe display group 010, display zone 3 or 4 and check control action of both lambda probes. The display values must intermittently drop below 0.3 V and exceed 0.6 V; if not, check lambda probe heating and lambda probe.
- ♦ The lambda control stop must also be assessed only after the learning process has been completed successfully (=> Learning demand display):
Control stop max. +29%
Control stop min. -60%

- ◆ For values of more than $\pm 20\%$ in function 04 "Basic setting", the following faults are possible:
 - Unmetered air
 - Engine damage (oil combustion due to defective piston)

Note on display zone 2:

Depending upon the instantaneous learning range (display zone 3), the instantaneous lambda learned value for this learning range (display group 005 or 006) is displayed. If 0.0 % is displayed as instantaneous lambda learned value, interrogate fault memory for lambda faults => Page 5.

Notes on display zone 3:

- ◆ The instantaneous learning range (load status) is displayed in zone 3 (learning range display). Only idling speed and part throttle learning ranges are displayed, as learning does not take place at full throttle.
- ◆ The following procedure must be implemented to reach the corresponding learning range (load status):
 - Idling speed learning range: Run engine at idling speed.
 - Part throttle 1, 2, 3 learning range: Performing test drive (observe safety precautions => Page 1); for this purpose, increase engine speed to 1500... 3000 rpm and generate load by pressing the brake gently.

Notes on display zone 4:

- ◆ Display zone 4 (learning demand display) shows the learning range (display zone 3) in which there is a demand for learning.
- ◆ Learning requirements:
 - No fault stored in fault memory
 - Engine speed at idle (700... 800 rpm or 1500 ... 3000 rpm)
 - Coolant temperature 80... 110 oC
 If these requirements are met, but learning still does not start immediately, give a burst of throttle.

Notes on display zone 4 - continued:

- ◆ Learning is prohibited:
 - With rough idling (hunting), during acceleration and at full throttle
 - If faults have been stored in the fault memory (does not apply to sporadic faults)
 - If the difference between the richest and the leanest lambda learned value of a display group is 9%.
 Learning in both learning ranges is discontinued in the event of a 9% difference. The learning demand display for these learning ranges cannot be "1" => Display group 005 or 006 .
- ◆ Learning commences 20 seconds after start of function 04 "Basic setting", or 2 ... 4 minutes after every start with a coolant temperature of less than 40 oC.
- ◆ The following list indicates the conditions under which the re-learn prompt (learning demand) is enforced:
 - On starting function 04 "Basic setting" with V.A.G 1551 or whenever fault memory has been erased, all learning demand displays are set to "0" in order to force a re-learn prompt for the lambda learned values after vehicle servicing.
 - A learning demand is always enforced in all learning ranges whenever the engine is started with the coolant temperature less than 40 oC.
 - A learning demand is always enforced in all learning ranges whenever the engine is started with the coolant temperature less than 40 oC.
 - All learning demand displays are set to "0" again if a major learned value deviation (between a stored learned value and a newly learned value) occurs in a learning range during the learning process.
- ◆ If learning is successful, the learning demand values of the respective learning range (display zone 3) are set to "1".
- ◆ Significance of the 8-digit learning demand display: 0 = re-learn prompt
 1 = learning process completed

Display group 009, lambda control:

Reading measured value block 9			⇒	◀ Indicated on display
... %	... %	... %	... %	
				Throttle valve angle => Display group 003, display zone 3



		Duty cycle (activation) of ACF solenoid valve 1 -N80 ▪ 0 ... 99% OK
		Lambda control (bank 2) => Display group 008, display zone 1
		Lambda control (bank 1) => Display group 007, display zone 1

Note on display zones 1 and 2:

Do not assess lambda control in either function 04 "Basic setting" or function 08 "Reading measured value block" until after the learning process has been completed successfully (=> Display group 007 or 008, display zone 4).

Notes on display zone 3:

- ♦ ACF solenoid valve 1 -N80 is closed during learning process.
- ♦ The influence of ACF can be assessed by comparing the display value in function 04 "Basic setting" (ACF valve closed: 99%) and function 08 "Reading measured value block" (ACF valve open: 0%).

Display group 010: Lambda control, lambda probe voltage signal:

Reading measured value block 10				⇒	Indicated on display
... %	... %	... V	... V		
		Protected by copyright. Copying for private use is permitted unless expressly prohibited. Copyright by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.			
		Voltage signal: Bank 2, lambda probe			
		▪ Intermittently greater than 0.6 V/less than 0.3 B OK (display must fluctuate)			
		Voltage signal: Bank 1, lambda probe 1			
		▪ Intermittently greater than 0.6 V/less than 0.3 B OK (display must fluctuate)			
		Sum total of lambda control (bank 2) and instantaneous lambda learned value (bank 2)			
		▪ Difference between display values 1 and 2 less than 8% OK			
		Sum total of lambda control (bank 1) and instantaneous lambda learned value (bank 1)			
		▪ Difference between display values 1 and 2 less than 8% OK			

Test table, Display group 010

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
1/2	Difference between Display zone 1 and Display zone 2 greater than 8%	- Defective spark plug	- Test spark plugs
		- Unmetered air on one side	- Eliminate cause
		- Injector leaking	- Interrogating fault memory =>Page 90
		- Lambda probe defective or dirty	- Interrogating fault memory => Page 5 or => Display zones 3 and 4

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
		- Mechanical base setting (valve timing) of engine not OK	- Check valve timing => 6-cyl.-injection engine (2-valve), Mechanical Components; Repair group 13; Dismantling and assembling engine; Removing and installing toothed belt Dismantling and assembling engine; Removing and installing toothed belt

Note on display zones 1 and 2:

The sum total of lambda control and lambda learned value indicates the overall influence of the lambda control. Comparison of display zones 1 and 2 permits direct assessment of differences between banks.

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
3/4	Display not fluctuating (constant 0.0 ... 0.3 V or constant 0.6 ... 0.9 V)	- Injector defective	- Check injection valves => Page 90
		- Defective spark plug	- Test spark plugs
		- Large quantity of unmetered air	- Eliminate cause
		- Solenoid valve 1 for activated charcoal filter N80	- Performing final control diagnosis => Page 133
		- Lambda probe defective or dirty	- Interrogate fault memory =>Page 124
		- Lambda probe heating defective	- Checking lambda probe heating => Page 127
		- Fuel system pressure too high or too low	- Checking fuel pressure =>Page 87
		- Coolant temperature sender -G62 defective	- Interrogating fault memory =>Page 205

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
3/4	Constant 2.550 V	- Short to positive through: - Lambda probe - Signal wire - Engine control unit	- Check Lambda probe => Page 124
	constant 0.350... 0.450 V	- Open circuit through: - Lambda probe - Signal wire - Engine control unit	- Check Lambda probe => Page 124
	Constant 0.000 V	- Short to earth through: - Lambda probe - Signal wire - Engine control unit	- Check Lambda probe => Page 124

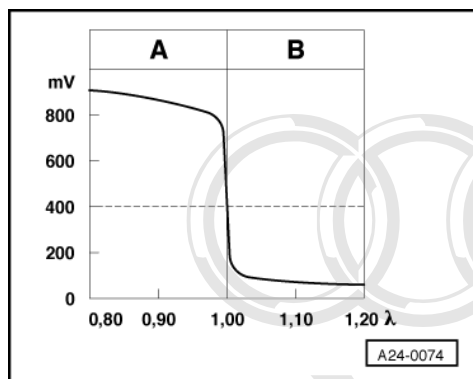
Notes on display zones 3 and 4:

- ♦ The voltage signal for "Rich mixture (low level of residual oxygen)" is between about 0.6 and 1.0 V.
- ♦ The voltage signal for "Lean mixture (high level of residual oxygen)" is between about 0.0 and 0.3 V.
- ♦ During the transition from "rich" to "lean" and vice versa ($\lambda = 1.0$), there is a voltage jump from 0.6...1.0 V to 0.0 ... 0.3 V or vice versa.

Notes on display zones 3 and 4 - continued:

- ♦ Because of the sharp voltage jump the lambda control cannot maintain a constant ideal mixture composition of $\lambda = 1.0$. The system fluctuates continuously between "slightly too lean" and "slightly too rich".

- ♦ The display value must intermittently drop below 0.3 V and exceed 0.6 V. Display values less than 0.45 V indicate "lean", whilst values over 0.45 V indicate "rich".



➔ **Lambda probe voltage U_{λ} in mV**

A: High lambda probe voltage

- ♦ Rich mixture (excess fuel or lack of air)
- ♦ High CO value

B: Low lambda probe voltage

- ♦ Lean mixture (lack of fuel or excess air)
- ♦ Low CO value

6.6 - Reading measured value block: Display groups 011 to 019

Display group 11, ignition timing:

Reading measured value block 11			⇒	◀ Indicated on display
... oBTDC	... oBTDC	± ... ocrankshaft	0	
				Idling switch
				▪ 0 = open
				▪ 1 = closed
				Ignition timing intervention for digital idling speed stabilisation
				Ignition timing with knock control and digital idling-speed stabilisation (mean value of all cylinders)
				Ignition timing without knock control and digital idling-speed stabilisation

Notes on display zone 1:

- ♦ Ignition timing of 12 o BTDC is displayed at idling speed (idling switch closed) in functions 04 "Basic setting" and 08 "Reading measured value block".
- ♦ In the event of an increase in engine speed (idle switch open) the current ignition timing without knock control and digital idling stabilisation is displayed.

Notes on display zone 2:

- ♦ Digital idling stabilisation is only active when the idling switch is closed.

- ♦ Knock control is active as of an engine load greater than 40% => Display group 013 or 014.

Notes on display zone 3:

- ♦ Digital idling stabilisation (DIS) is only active when the idling switch is closed.
- ♦ Ignition timing for DIS with idling switch open 0.0ocrankshaft.
- ♦ DIS is blocked in function 04 "Basic setting", display 0.0ocrankshaft
- ♦ Ignition timing intervention for DIS in function 08 "Reading measured value block" at idling speed without electrical loads 0.0 ±3.0ocrankshaft

Display group 012, ignition timing:

Reading measured value block 12 =>				◀ Indicated on display
... rpm	... %	1st map	... ocrankshaft	
			Ignition timing retardation of knock control (mean value of all cylinders)	
			Ignition timing map switching	
			▪ 1st map = basic map (98 octane)	
			▪ 2nd map = map with reduced ignition timing (95 octane)	
Engine load => Display group 003, display zone 2				
Engine speed =>Display group 003, display zone 1				

Notes on display zone 3:

- ♦ Ignition timing map switching is selected by the knock control
- ♦ The ignition timing difference between the 1st and 2nd map is approx. 3ocrankshaft. The 2nd map is selected if ignition timing retardation (display zone 4) of approx. 4ocrankshaft is detected.

Notes continued:

- ♦ 2nd map is selected in the event of:
 - Poor fuel grade (less than 95 RON)
 - Abnormal engine running noise (ancillaries loose)
 - Engine damage (oil combustion caused by defective piston)
- ♦ Ignition timing map switching is disabled if there is a knock sensor fault stored in the fault memory.
- ♦ For more precise assessment with 2nd map selected => Display groups 013 and 014

Notes on display zone 4:

- ♦ Knock control is active as of an engine load greater than 40% => Display group 013 or 014.
- ♦ The ignition timing retardation values are only used when the knock control is "active".

Display group 013, Knock control:

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Reading measured value block 13				⇒	◀ Indicated on display
1st map	...ocr/shaft	...ocr/shaft	...ocr/shaft		
			Ignition timing retardation by knock control, cyl. 3		
			Ignition timing retardation by knock control, cyl. 2		
			Ignition timing retardation by knock control, cyl. 1		
Ignition timing map switching => Display group 012, display zone 3					

**Display Group 14 - Knock control:**

Reading measured value block 14				⇒		◀ Indicated on display
1st map	...ocr/shaft	...ocr/shaft	...ocr/shaft			
						Ignition timing retardation by knock control, cyl. 6
						Ignition timing retardation by knock control, cyl. 5
						Ignition timing retardation by knock control, cyl. 4
Ignition timing map switching => Display group 012, display zone 3						

Notes on display groups 013 and 014:

- ♦ The knock control is active from an engine load of greater than 40%.
- ♦ At engine loads of more than 40%, the display will show the current ignition timing retardation values. At engine loads of less than 40% the display will constantly show the last values used.
- ♦ If there is audible knocking and no perceptible ignition timing retardation, increase the engine speed to above 3500 rpm for 5 seconds in order to activate the knock sensor fault detection (diagnosis) function.
- ♦ If there is a significant difference between the ignition timing retardation value for one of the cylinders and the values for the other cylinders, the following faults are possible:
 - Loose ancillaries
 - Corrosion at connector
 - Engine damage (e.g. oil combustion as a result of a defective piston/tooth broken on ring gear/defective piston pin)
- ♦ If the ignition timing retardation values for all the cylinders are high, the following faults are possible:
 - Corrosion at connector => Display groups 015 and 016
 - Tightening torque (20 Nm) not OK
 - Open circuit.
 - Knock sensor defective
 - Loose ancillaries
- ♦ High ignition timing retardation values for all cylinders (banks 1 and 2) are caused by the use of fuel with a low octane number (less than 95 RON).

Display group 15, knock sensor signal:

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Reading measured value block 15				⇒		◀ Indicated on display
... rpm	... V	... V	... V			
						Knock sensor signal, cylinder 3
						Knock sensor signal, cylinder 2
						Knock sensor signal, cylinder 1
Engine speed => Display group 003, display zone 1						

Display group 016, knock sensor signal:

Reading measured value block 16				⇒		◀ Indicated on display
... rpm	... V	... V	... V			
						Knock sensor signal, cylinder 6
						Knock sensor signal, cylinder 5
						Knock sensor signal, cylinder 4
Engine speed => Display group 003, display zone 1						

--

Notes on display groups 015 and 016, display zones 2, 3, and 4:

- ◆ Differences of more than a factor of three between the min. and max. knock sensor signal in a display group may be caused by the following fault:
 - Corrosion at connector
- ◆ Signal differences of more than a factor of three between display group 015 (cylinder 1 to 3) and display group 016 (cylinder 4 to 6) may result from the following faults:
 - Corrosion at connector
 - Open circuit.
 - Knock sensor defective
- ◆ If no faults are found when checking the knock sensor, wiring and connector, check the engine for loose ancillaries or engine damage => Display group 013 and 014.

Display group 017, EGR (if fitted):

Reading measured value block 17			⇒		◀ Indicated on display
... rpm	... %	... %		... oC	
					EGR temperature ▪ Determined by EGR temperature sensor - G98
					Duty cycle (activation) of exhaust gas recirculation valve -N18 ▪ 0 % = closed ▪ 100 % = opened
					Engine load =>Display group 003, display zone 2
					Engine speed =>Display group 003, display zone 1

Note:

- ◆ Display 017 must only be observed for vehicles fitted with exhaust gas recirculation system (EGR).
- ◆ "0" is always displayed in zones 3 and 4 for vehicles without EGR.
- ◆ Exhaust gas recirculation does not occur at idling speed and in function 04 "Basic setting"; "0" is displayed in display zone 3.
- ◆ Display group 017 is only to be assessed in function 08 "Reading measured value block" by comparison of the values in display zone 4 at idling speed (exhaust gas recirculation switched off) and at increased engine speed (exhaust gas recirculation activated).

Display group 018: Idling speed stabilisation:

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Reading measured value block 18			⇒		◀ Indicated on display
... %	... A	... %		... V	
					Engine control unit voltage supply => Display group 001, display zone 4
					Current regulation of idling stabilisation valve -N71
					Current consumption of idling stabilisation valve -N71
					Internal specified duty cycle of idling stabilisation valve -N71

**Note on display zone 1:**

The display shows the internal control unit computed value for the specified duty cycle without current and voltage correction.

Note on display zone 2:

The display shows the actual current consumption of the idling stabilisation valve -N71.

Notes on display zone 3:

- ♦ Positive/negative values signify increase/decrease in duty cycle to obtain specified current.
- ♦ If +60% is displayed for a lengthy period of time, this is an indication of contact resistance/ -N71 overheating; a display of -40% for a lengthy period indicates an interturn short circuit in -N71.

Display group 019, mixture preparation:

Reading measured value block 19			⇒	Indicated on display
... %	... g/s	... km/h	... ms	
				Injection period (mean value of all cylinders)
				Speed => Display group 003, display zone 4
				Intake air mass
				Engine power (internal calculated value)

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Note on display zone 1:

The engine power is an internal control unit computed value calculated from the air intake under standard conditions (atmospheric pressure 1013 mbar, air temperature 20 °C).

7 - Read individual measured value

7.1 - Read individual measured value

7.2 - Control unit no. 4A0 906 266/A/AA/AB (ä 08.92)

Warning
To avoid danger of accident when performing measurement and test drives, heed safety precautions =>
Page 1 .

Prerequisite:

- Basic setting performed => Page 25 .

After successful basic setting:

- Leave engine idling.

-> Indicated on display:

Rapid data transfer Select function XX	HELP
---	------

- Enter "09" to select the function "Reading measured value block" and confirm entry with Q key.

-> Indicated on display:

Read individual measured value Q
Enter channel number XX

- Enter the desired channel number => Channel overview, Page 59 and confirm entry with Q key.

Note:

Before checking channel numbers 00 and 01, detach the connector from activated charcoal filter system solenoid valve 1 -N80. Interrogate the fault memory after reattaching the connector => Page 5.

Example:

- Enter "01" to select "Channel number 01" and confirm entry with the Q key.

-> Indicated on display:

Read individual measured value
Channel 01 Measured value 128

Note:

- ♦ For the "Read individual measured value" function, the measured values are shown in decimal form.
- ♦ If the printer is switched on, the current display can be printed out on the record slip.
- ♦ In order to change to another channel number, press the C key and enter the new channel number.

- If the specified value is not achieved in the display zone, press the => key.

-> Indicated on display (function selection):

Rapid data transfer HELP
Select function XX

7.3 - Channel overview

Channel number	Designation
00	Lambda control factor - bank 1 (connector detached from ACF valve)
01	Lambda control factor - bank 2 (connector detached from ACF valve)
02	Lambda probe 1 signal voltage
03	Lambda probe 2 signal voltage
04	Injection period, cylinder 1 ... 3
05	▪ Control unit no. 4A0 906 266: Injection period, cylinder 4 ... 6 ▪ Control unit no. 4A0 906 266 A/AA/AB: Air mass meter discrepancy
06	Duty cycle (activation) of ACF system solenoid valve 1 -N80
07	Duty cycle (activation) of idling stabilisation valve -N71

Channel number	Designation
08	Current regulation for idling stabilisation valve -N71
09	▪ Control unit no. 4A0 906 266: Duty cycle (activation) of exhaust gas recirculation valve -N18 ▪ Control unit no. 4A0 906 266 A/AA/AB: Throttle valve angle
10	EGR temperature (EGR temperature sensor -G98)
11	Signal voltage of throttle valve potentiometer -G69
12	Ignition timing map switching



Channel number	Designation
13	Ignition timing for all cylinders
14	Engine control unit power supply voltage
15	Vehicle speed

Test table

Channel number	Specification	Corresponds to	Measures in the event of deviation
00	120...136		- Adjusting CO =>Page 86
01	(mean value 128)		
02	Less than 30 or higher than 60	less than 0.3 V or Greater than 0.6 V	- Interrogate fault memory =>Page 124 - Checking wiring => "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder
03			
04	0...255	0.128...32.640 ms	For function check only
05	0...255	0.128...32.640 ms	- Control unit no. 4A0 906 266: - For function check only
	0...4	0.00...0.04 V	
06	0...255	0...100%	- Checking -N80 solenoid valve 1 for the activated carbon canister =>Page 133

Channel number	Specification	Corresponds to	Measures in the event of deviation
07	0...255 (mean value 128)	0...74 %	- Checking idling stabilisation valve -N71 => Page 103
08	-	-	- Internal control unit computed value
09	0 ... 200	0...100 %	- Control unit no. 4A0 906 266: - Checking exhaust gas recirculation valve - N18 => Page 146
	0 1) ... greater than 175 2)	0 1)... greater than 71° 2)	
10	...	... °C	- Checking EGR temperature sensor -G98 => Page 152
11	12...25 (mean value 19)	0.24...0.5 V (mean value 0.38 V)	- Checking throttle valve potentiometer - G69 and adjust if necessary => Page 138
12	Lower than 128 higher than 128	1st map = basic map 2nd map = map with reduced ignition timing	2nd map is selected in the event of: - Poor fuel grade (less than 95 RON) - Abnormal engine running noise (ancillaries loose) - Engine damage (oil combustion caused by defective piston)

1) At idling speed.

2) For brief full throttle actuation.

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Channel number	Specification	Corresponds to	Measures in the event of deviation
----------------	---------------	----------------	------------------------------------

13	...	...°crankshaft (x 1.333)	Digital idling stabilisation is only active when the idling switch is closed The knock control is active above an engine load of 40%
14	132...182	10.56...14.56 V	- Checking voltage supply to engine control unit => Page 208
15	...	... km/h	- Checking vehicle speed sender -G22/-G68 => Page 162

8 - Adaption

8.1 - Adaption

8.2 - CO adjustment for vehicles without lambda probes 09.92 ä

Note:

- ◆ In the "Adaption" function, the engine control unit performs the same operations as in function 04 "Basic setting" => Page 25.
- ◆ The "Adaption" function sets the CO content on vehicles without lambda probes.
- ◆ Channels 01 and 02 can be selected; channel 01 is used to set the CO content on vehicles with no lambda probe, whilst channel 02 has no function.
- ◆ If the stored adaption values are altered on vehicles with lambda probes by entering different adaption values, this has no effect on the fuel injection and ignition system.

Work sequence

- Connect up vehicle diagnosis, measurement and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "Address word" 01 => Page 2.

For this purpose, the engine must be running at idle speed

-> Indicated on display:

Rapid data transfer HELP
 Select function XX

- Enter "10" to select the "Adaption" function and confirm with the Q key.

-> Indicated on display:

Adaption
 Enter channel number XX

- Enter "01" to select "adaption channel 01" and confirm entry with Q key.

-> The last stored adaption value is displayed

Channel 1 Adaption 128

Note:

- ◆ Adaption value 128 is the mean value stored at the factory.
- ◆ Reducing the value of 128 signifies leaning (CO content decreases), whilst increasing the value signifies enrichment (CO content increases).
- ◆ Any change in adaption value must remain within the tolerance range of 110 ...150.
- ◆ Adaption can be performed in stages => Page 63.

**A - Step-by-step adaption****Note:**

Channel 1	Adaption 128
-----------	--------------

- > <- 1: Adaption value is reduced in steps by pressing key 1.
- ♦ 3 ->: Adaption value is increased in steps by pressing key 3.

- Press the ➡ key.

-> Indicated on display:

Channel 1	Adaption 128
-----------	--------------

- Press key 1.

-> Indicated on display:

Channel 1	Adaption 127	Q	
1	2	3	4
5	6	7	
8	9	10	

Adaption value decreases

or

- Press key 3.

-> Indicated on display:

Channel 1	Adaption 129	Q	
1	2	3	4
5	6	7	
8	9	10	

Adaption value increases

Note:

- ♦ The display shows the corresponding adaption values, as well as the 10 measured values from display group 000.
- ♦ If modified adaption is not to be stored, press the C key to return to previous display.
- Confirm input with the Q key.

-> Indicated on display:

Channel 1	Adaption 129	Q
Store changed value?		

- Confirm input with the Q key.

-> Indicated on display:

Channel 1	Adaption 129
Changed value is stored	

- Terminate adaption by pressing the ➡ key.

-> Indicated on display (function selection):

Rapid data transfer	HELP
Select function XX	

B- Direct adaption

-> Indicated on display:

Channel 1 Adaption 128

- Press the →key.

-> Indicated on display:

Channel 1 Adaption 128 Q
Enter adaption value XXXXX

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- Enter desired 5-digit adaption value
e.g. 120 = 00120

-> Indicated on display:

Channel 1 Adaption 128 Q
Enter adaption value 00120

- Confirm input with the Q key.

-> Indicated on display:

Channel 1 Adaptation 120 Q
1 2 3 4 5 6 7
8 9 10

Note:

- ◆ The display shows the corresponding adaption values, as well as the 10 measured values from display group 000.
- ◆ If modified adaption is not to be stored, press the C key to return to previous display.

-> Indicated on display:

Channel 1 Adaptation 120 Q
Store changed value?

- Confirm input with the Q key.

-> Indicated on display:

Channel 1 Adaptation 120
Changed value is stored

- Terminate adaptation by pressing the ⇒ key.

-> Indicated on display (function selection):

Rapid data transfer HELP
Select function XX



9 - Checking wiring for diagnostic connector

9.1 - Checking wiring for diagnostic connector

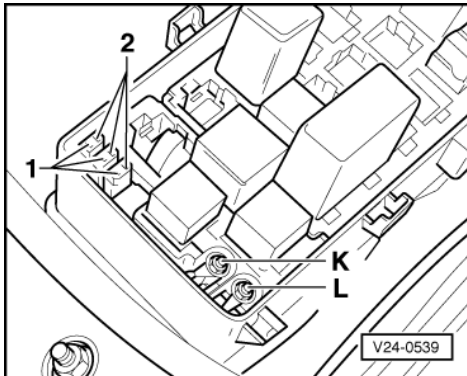
V.A.G 1526 A 	V.A.G 1594 A 
V.A.G 1598 A  Protected by copyright for private or commercial purposes, in part or in whole, is not permitted unless authorized by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.	
	G24-0015

Special tools, testers and auxiliary items required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598 A
- ♦ V.A.G 1598/11

Warning
Switch off ignition before checking wiring.

9.2 - Check power supply for "black" diagnostic connector



-> Location of diagnostic connector: In auxiliary relay carrier I

=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

Contact assignment for "black" diagnostic connector:

- 1 - Earth
- 2 - Terminal 30

- Connect multimeter as follows to measure voltage:

Black diagnostic connector Contact	Measure to
1	Battery positive
2	Car body earth point

- Specification: approx. battery voltage

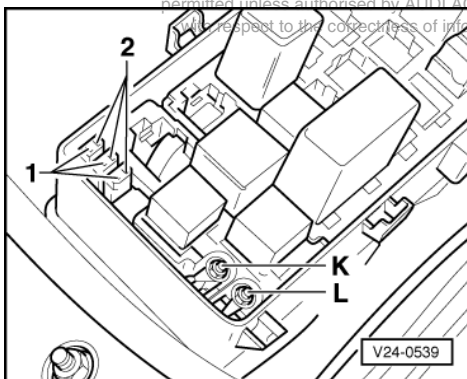
If the specified values are not obtained:

- Rectify any open/short circuit as necessary.

=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

9.3 - Check wiring between "white" diagnostic connector and engine control unit

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-> Installation position of diagnostic connector and junctions K and L: In auxiliary relay carrier I

=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

Contact assignment for "white" diagnostic connector:

- 1 - L-line
- 2 - K-line

The wiring between the "white" diagnostic connector and engine control unit is routed via junctions K and L.

Note:

This check has to be performed if one of the following displays appears on the connected fault reader V.A.G 1551.

-> Indicated on display:

Rapid data transfer
Communication problem

or

Rapid data transfer HELP
K-line does not switch to earth

or

Rapid data transfer HELP
K-line does not switch to positive

or

Rapid data transfer HELP
L-wire does not switch to earth

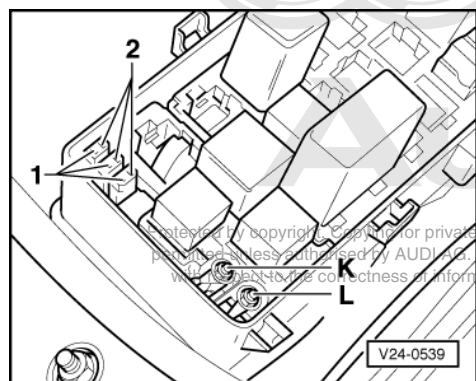
or

Rapid data transfer HELP
L-wire does not switch to positive

- Switch off ignition.
- Check for open circuit and short to earth/positive or earth in the following wiring connections:

White diagnostic connector Contact	Junctions	Engine control unit Contact	Test box 1598 A Contact
2	K	C12	12
1	L	C13	13

Note:



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- ♦ -> All other diagnostic lines for the various vehicle systems terminate in junctions K and L. A defective line (short to earth or positive) or a defective control unit may also lead to one of the fault messages listed.
 - Determine K or L wire for engine control unit.
- ♦ If lines with different cable colours are connected to junction K or L, determine line colour:

=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

- ♦ If lines with the same cable colours are connected to junction K or L, determine line using test box V.A.G 1598 A (resistance measurement)
 - Consecutively detach connectors to control units of other vehicle systems with self-diagnosis.
 - After connector to specific vehicle system has been detached, enter address word "01" again for engine electronics after switching on ignition.
 - If control unit identification is then displayed, replace the last control unit to be disconnected from the diagnosis line.



24 - Mixture preparation, Injection

1 - Servicing Multi Point Injection system

1.1 - Servicing Multi Point Injection system

1.2 - Safety precautions

Warning

The fuel system is pressurised! Before opening the system place a cloth around the connection. Then release pressure by carefully loosening the connection.

To prevent injuries to persons and/or damage to the fuel injection and ignition system, the following must be noted:

- ♦ Do not touch or disconnect ignition wiring when the engine is running or at starter speed.
- ♦ Always switch off the ignition before connecting or disconnecting injection or ignition system wiring or tester cables.
- ♦ To operate the engine at starting speed without actually starting it (for example, to check the compression), unplug the connector from the power output stage for the ignition coils and the connectors from the injectors. After completing the work, interrogate the fault memory.
- ♦ For assisted starts with a rapid charging unit the maximum permissible voltage is 16.5 V and the maximum charging time is 1 minute.
- ♦ Always switch off the ignition before washing the engine.
- ♦ Always switch off the ignition before connecting or disconnecting the battery, otherwise the engine control unit may be damaged.
- ♦ Always use adapter set V.A.G 1594 A for connecting up measuring instruments (e.g. voltage tester V.A.G 1527 B, hand-held multimeter V.A.G 1526 A etc.)

Observe the following if testers and measuring instruments have to be used during test drives:

Warning

- ♦ **Always attach testers and measuring instruments to the back seat and have a second person operate them from there.**
- ♦ **Operation of testers and measuring instruments from the front passenger seat could result in injuries to the person sitting there in the event of an accident (activation of passenger's airbag).**

1.3 - Rules for cleanliness

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When working on the fuel supply/injection system, pay careful attention to the following 6 cleanliness rules:

- ♦ Thoroughly clean all connections and the surrounding areas before disconnecting.
- ♦ Place removed parts on a clean surface and cover. Use lint-free cloths!
- ♦ Carefully cover or seal open components if repairs cannot be carried out immediately.
- ♦ Only install clean components:
Only remove replacement parts from packaging immediately prior to installation.
Do not use parts that have been stored loose (e.g. in tool boxes etc.).
- ♦ When the system is open:
Do not work with compressed air if this can be avoided.
Do not move vehicle unless absolutely necessary.

- ♦ Separated electrical connections:
Protect from dirt and moisture.
Make sure connections are dry when attaching.

1.4 - Technical data

Engine code letters		AAH (2.8 l / 2V / 128 kW-engine)
MPI control unit	Part no.	=>Parts list
	Speed governing by deactivation of injectors	6500 rpm
Idling speed adjustment	Speed not adjustable, controlled by the idling speed stabilisation	
	CO content ¹⁾	700 ... 800 rpm
	Test value	0.3 ... 1.2 % by vol.
		Setting
		0.7 ± 0.2 % by vol.
Fuel pressure at idling speed	Vacuum hose connected	3.2 ... 3.8 bar
	Vacuum hose detached	3.8 ... 4.2 bar

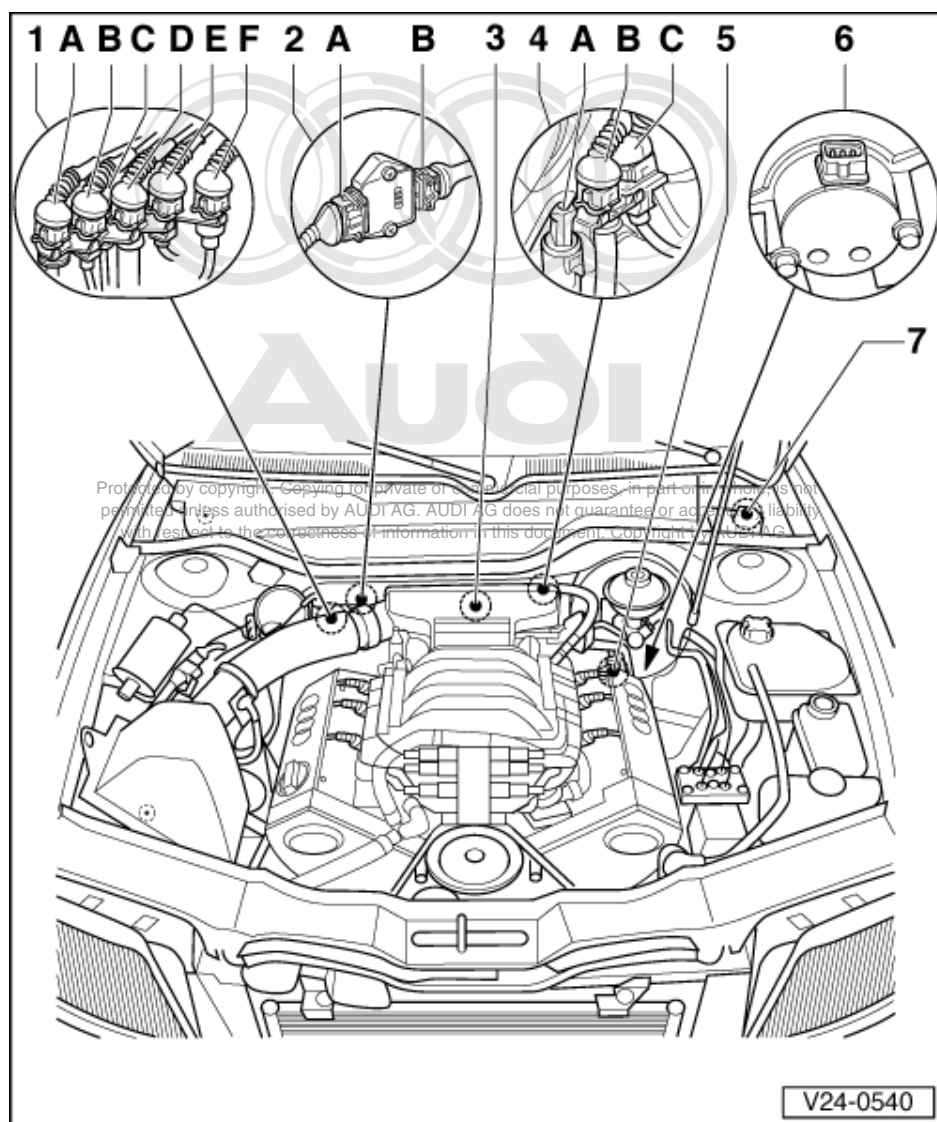
1) Vehicles without lambda probes.

Engine code letters		AAH (2.8 l / 2V / 128 kW-engine)
Holding pressure after 10 minutes	Engine cold	approx. 2.2 bars
	Engine warm	approx. 3.0 bars
Injectors	Spray pattern	Same for all injectors
		Injection quantity (30 s)
	Resistance	85 ... 100 ml
	Manufacturer	
		Bosch
		15 ... 17 Ω
		Siemens
		13.5 ... 15.5 Ω

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1.5 - Fitting locations overview



- Control unit -J192

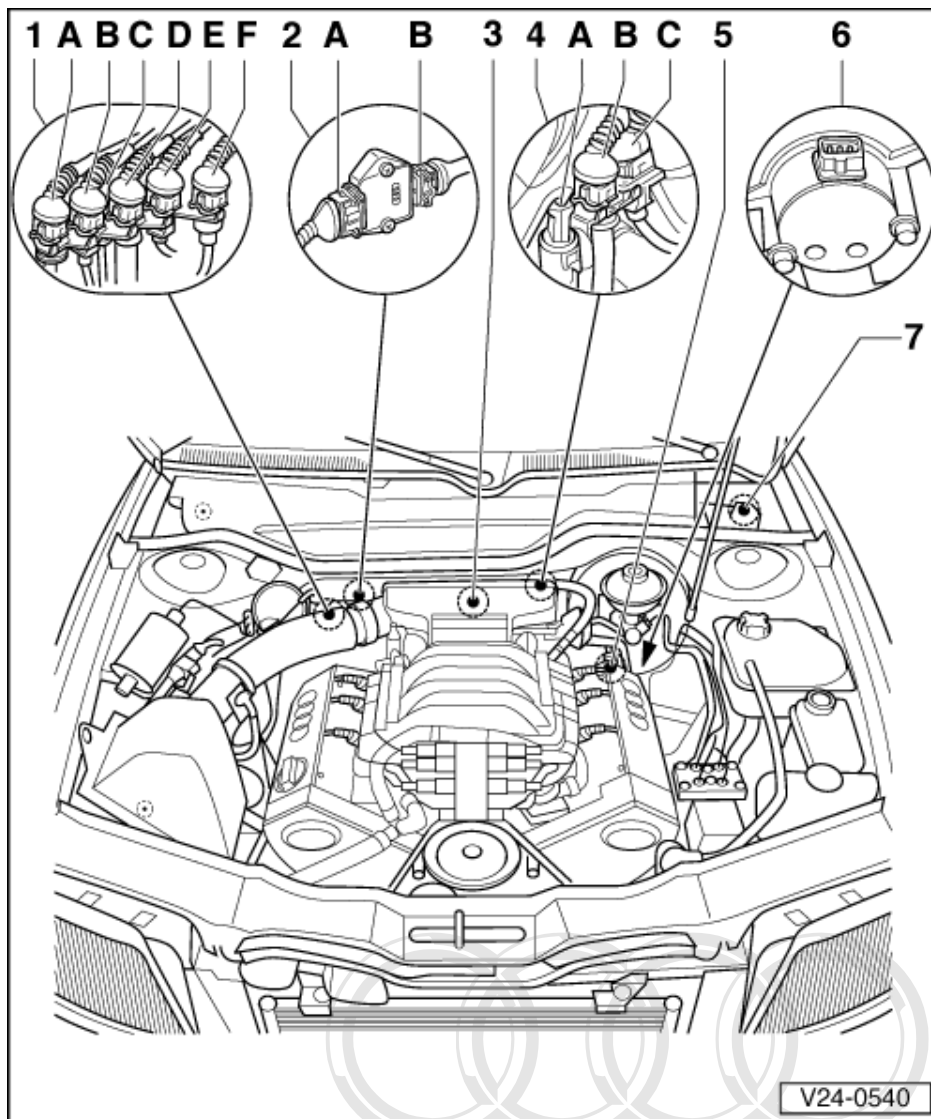
- ♦ in the passenger-side footwell electronics box

1 Connectors

- ♦ A - black 2-way, for lambda probe heating -Z19
- ♦ B - white 3-way, for power supply of ignition coils
- ♦ C - 1-way, for signal of lambda probe -G39
- ♦ D - blue 2-way, for knock sensor 1 -G61
- ♦ E - grey 3-way, for engine speed sender -G28
- ♦ F - black 3way, for ignition timing point sender-G4

2 Output stage -N122

- ♦ A- light brown 4-way connector, signal wires from engine control unit
- ♦ B - dark brown 3-way connector, primary connections for ignition coils



3 Throttle valve potentiometer -G69

- ♦ With idling switch -F60

4 Connectors

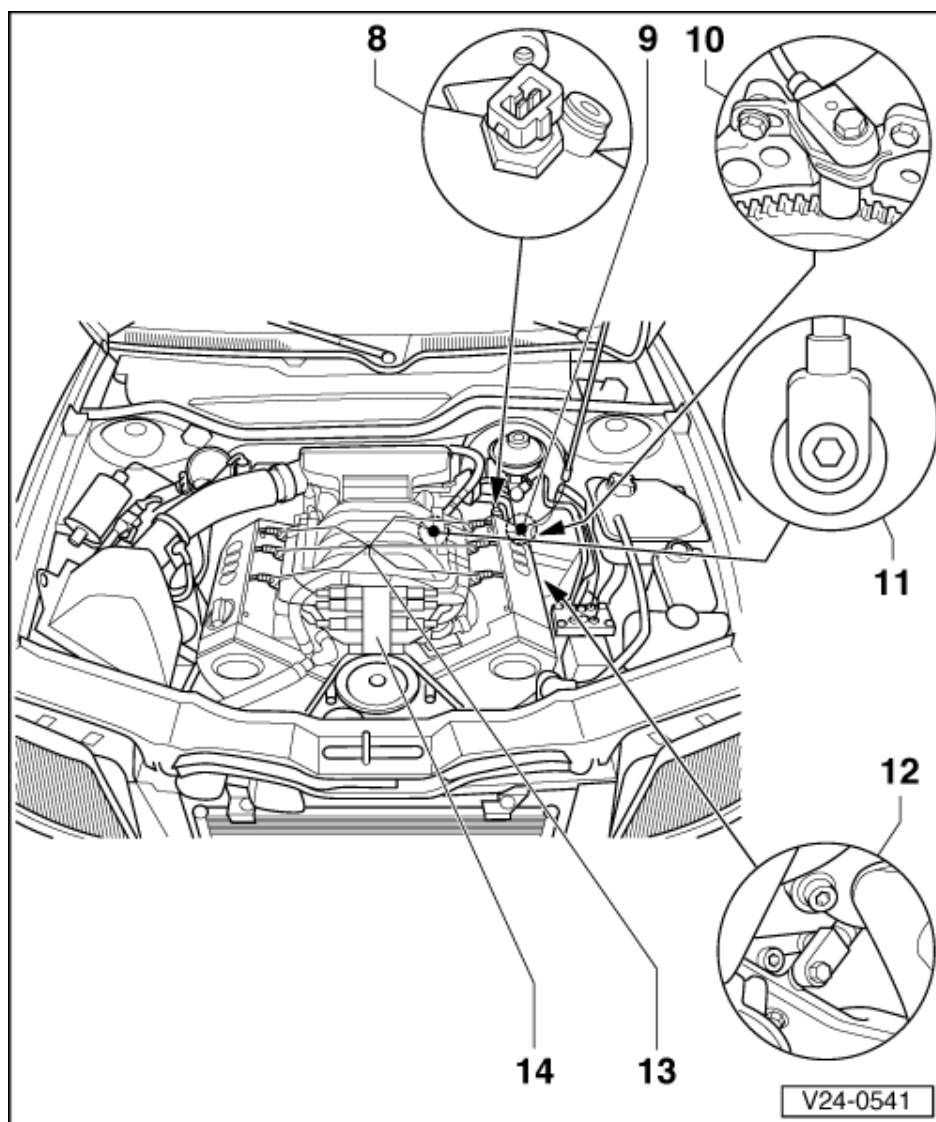
- ♦ A - 1-way, for signal of lambda probe 2 -G108
- ♦ B - black 2-way, for lambda probe heating -Z28
- ♦ C - blue 2-way, for knock sensor 2 -G66

5 EGR temperature sensor -G98

- ♦ On bottom section of intake manifold, beneath throttle valve unit
- ♦ For vehicles with EGR

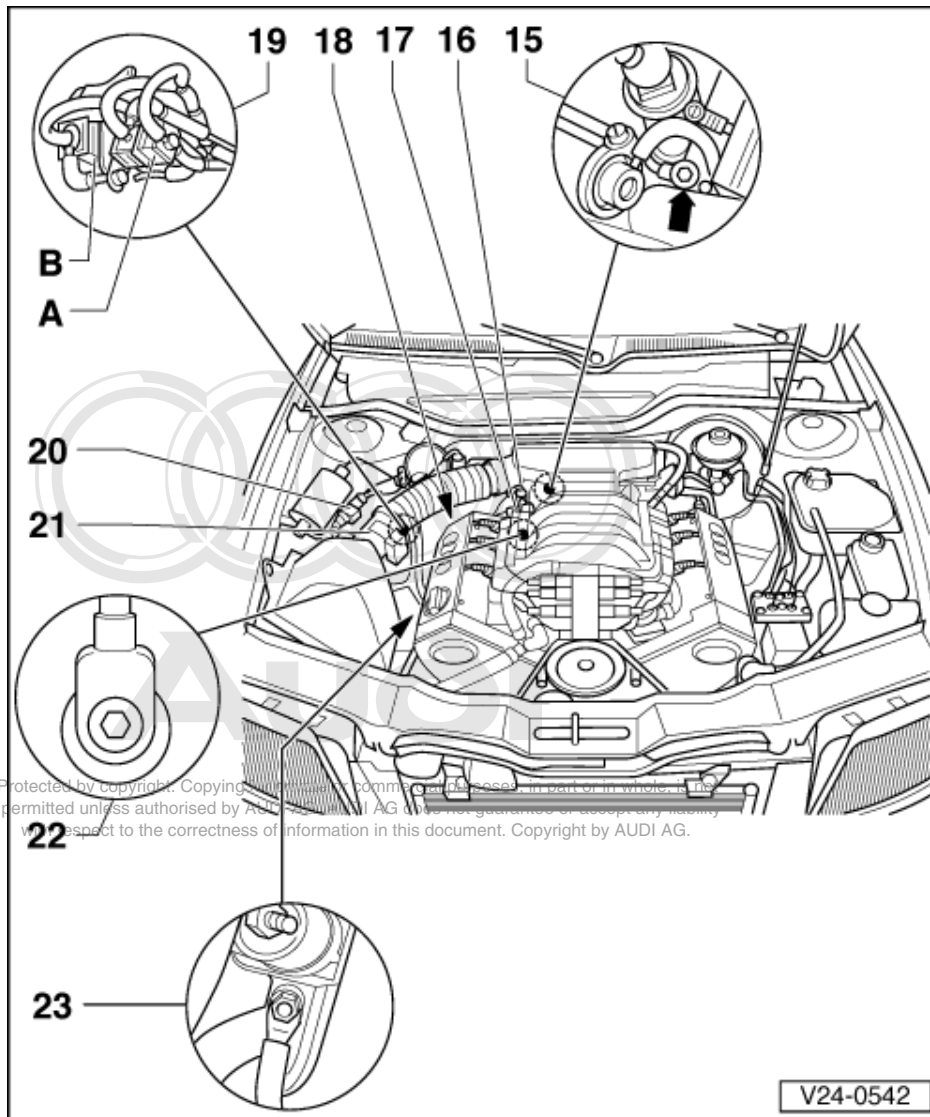
6 Hall sender -G40

7 Diagnosis socket



- 8 Coolant temperature sender G62**
 - ♦ On coolant pipe behind cylinder head, bank 1
- 9 Lambda probe 2 -G108**
- 10 Engine speed sensor -G28**
 - ♦ In gear case above ring gear
- 11 Knock sensor 2 -G66**
- 12 Ignition timing sender -G4**
 - ♦ Reference mark sender on left on cylinder block
- 13 Injectors -N30...-N33
-N83, -N84**
- 14 Ignition coils -N, -N128, -N158**

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15 Earthing point

- ♦ On intake manifold

16 Idling stabilisation valve -N71

17 Fuel pressure regulator

18 Lambda probe 1 -G39

19 Solenoid valves

- ♦ exhaust gas recirculation valve -N18
- ♦ B - intake manifold changeover solenoid valve -N156

20 Solenoid valve 1 for activated charcoal filter -N80

21 Air mass meter -G70

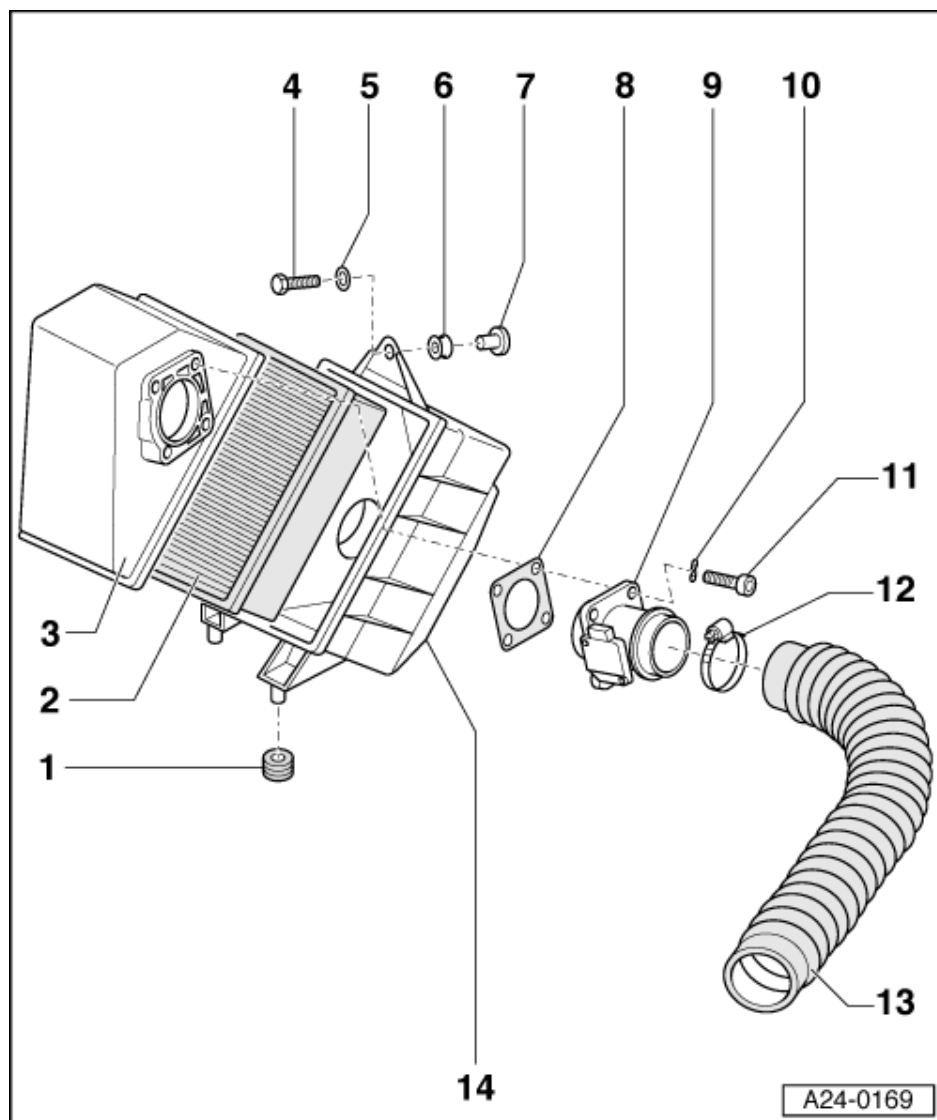
22 Knock sensor 1 -G61

23 Earthing point

- ♦ On right hand engine support



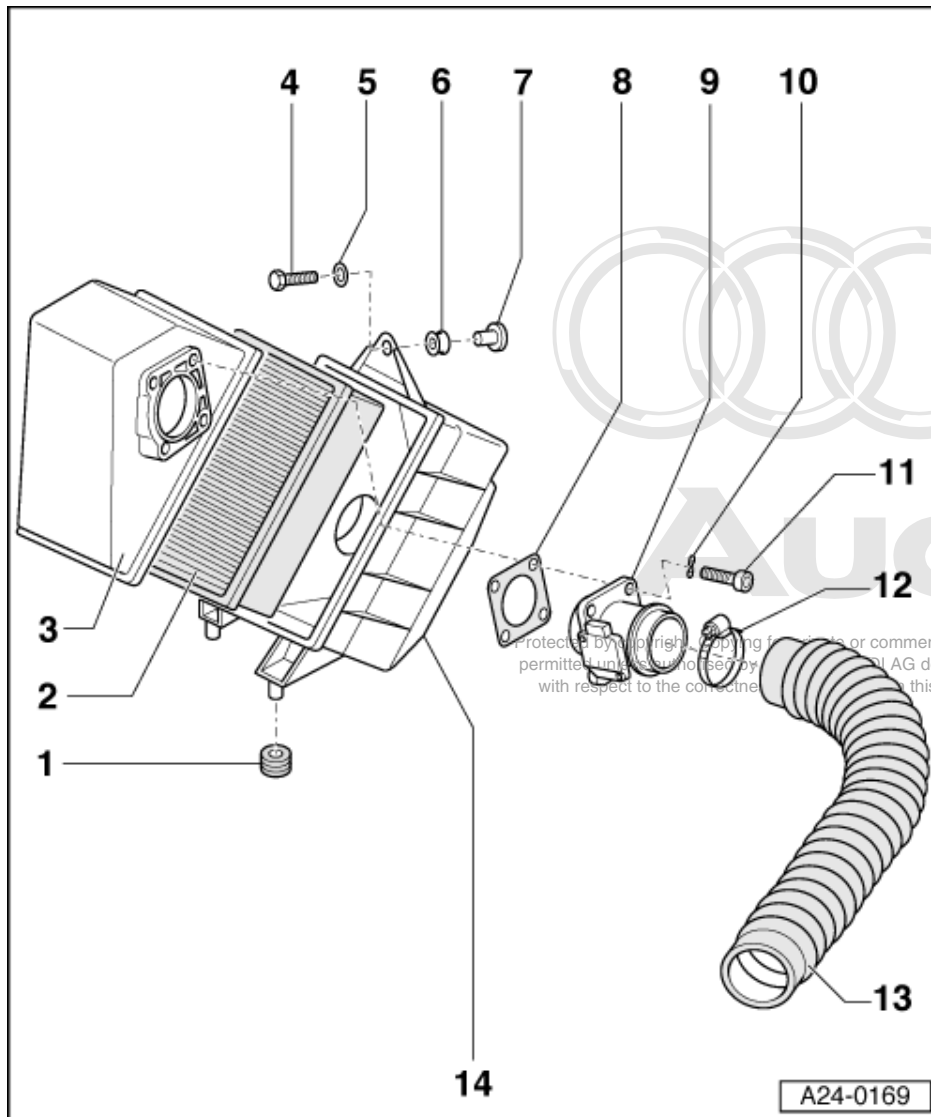
1.6 - Dismantling and assembling air cleaner



- 1 Grommet
- 2 Filter element
- 3 Top part of air cleaner
- 4 20 Nm
- 5 Washer
- 6 Grommet
- 7 Sleeve
- 8 Gasket
- 9 Air mass meter -G70



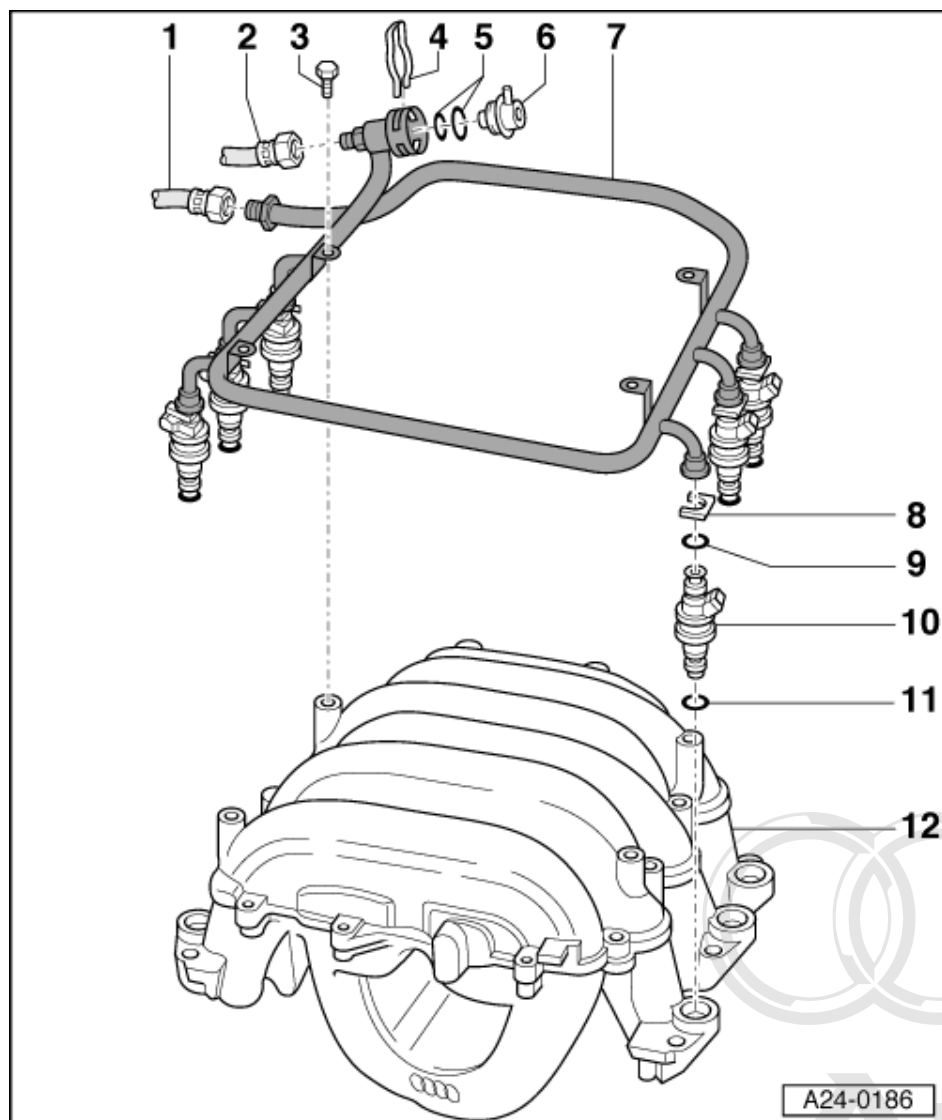
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- 10 Spring lock washer
- 11 10 Nm
- 12 Screw-type clip
- 13 Connecting hose
- 14 Bottom part of air cleaner

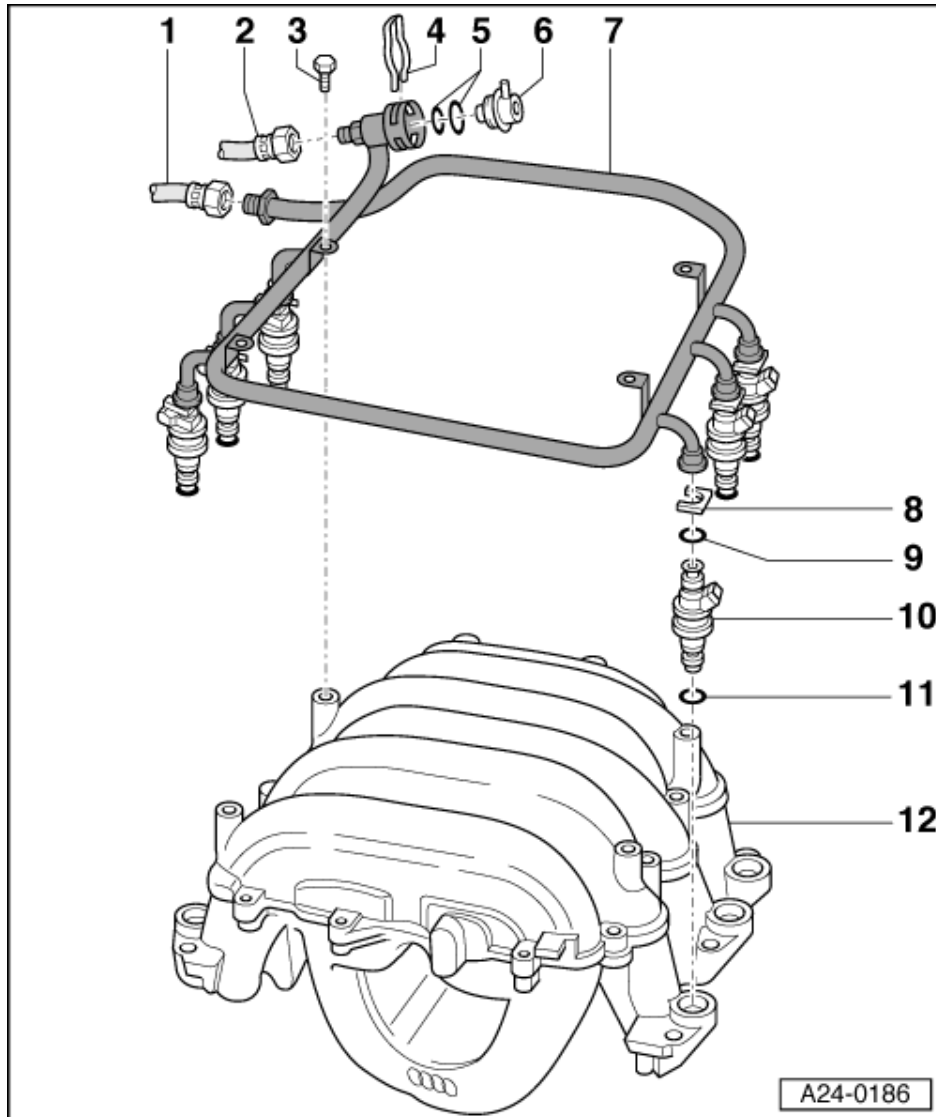


1.7 - Dismantling and assembling fuel manifold with injectors



- 1 Supply pipe**
 - ◆ From fuel filter
 - ◆ Tighten to 25 Nm
- 2 Return pipe**
 - ◆ Tighten to 25 Nm
- 3 10 Nm**
- 4 Securing clip**
- 5 O-ring**
 - ◆ Replace
- 6 Fuel pressure regulator**
- 7 Fuel manifold**

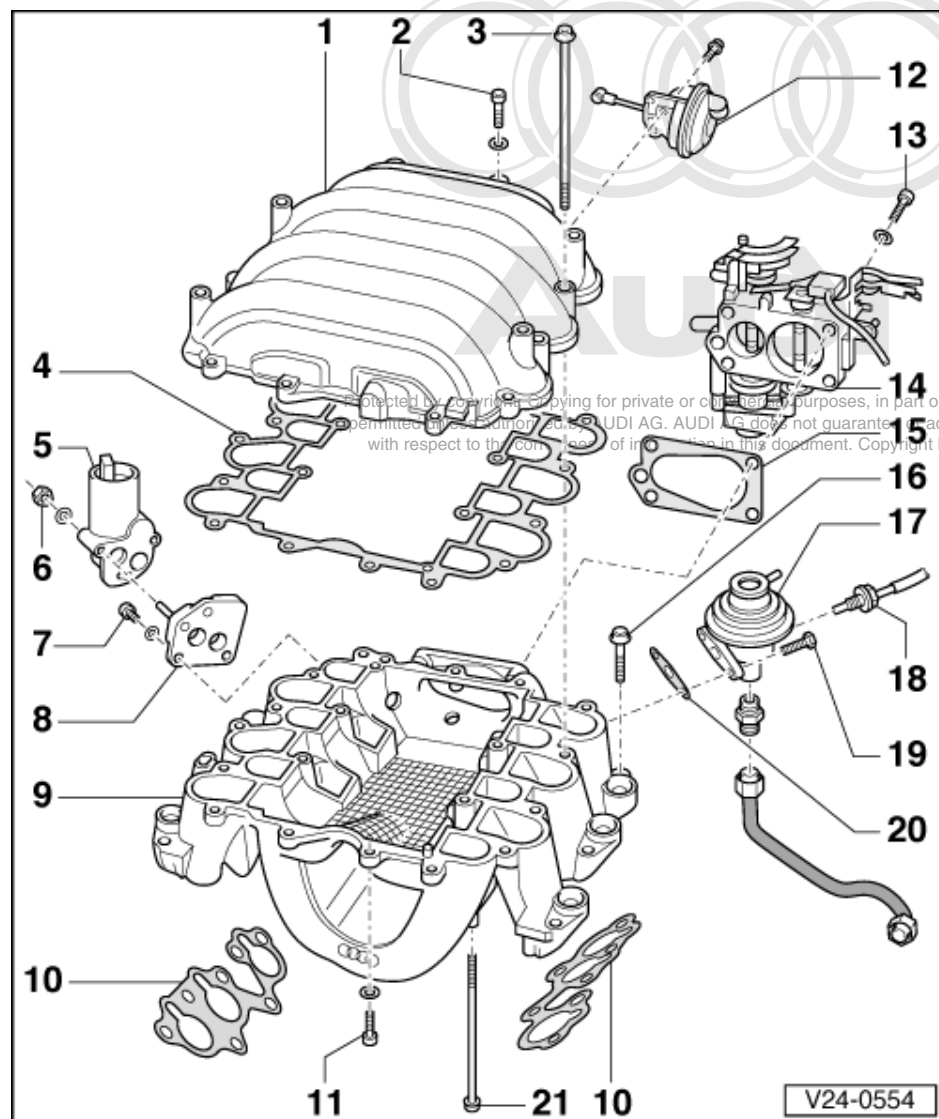
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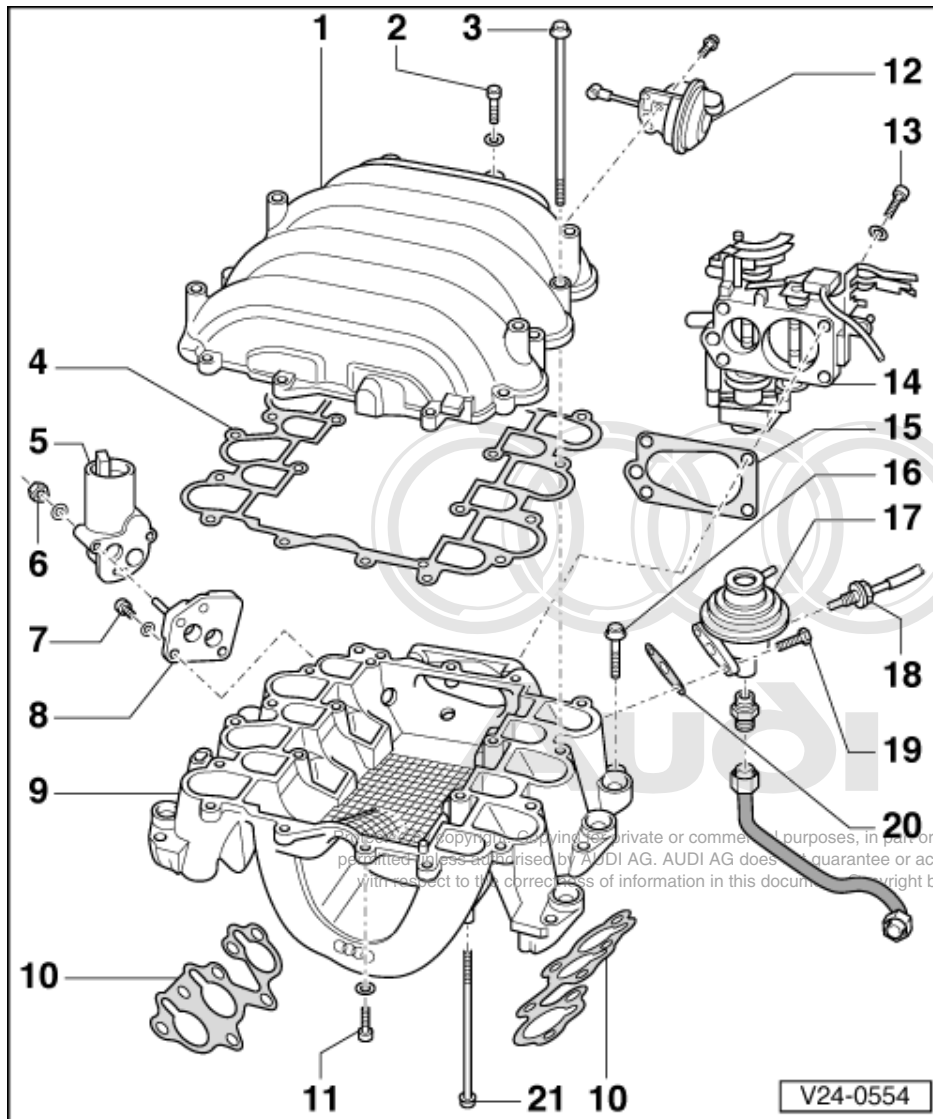
- 8 Securing clip**
 - ◆ Ensure it is positioned correctly on injector and fuel manifold
- 9 O-ring**
 - ◆ Replace
- 10 Injectors -N30...-N33
-N83, -N84**
- 11 O-ring**
 - ◆ Replace
- 12 Intake manifold**

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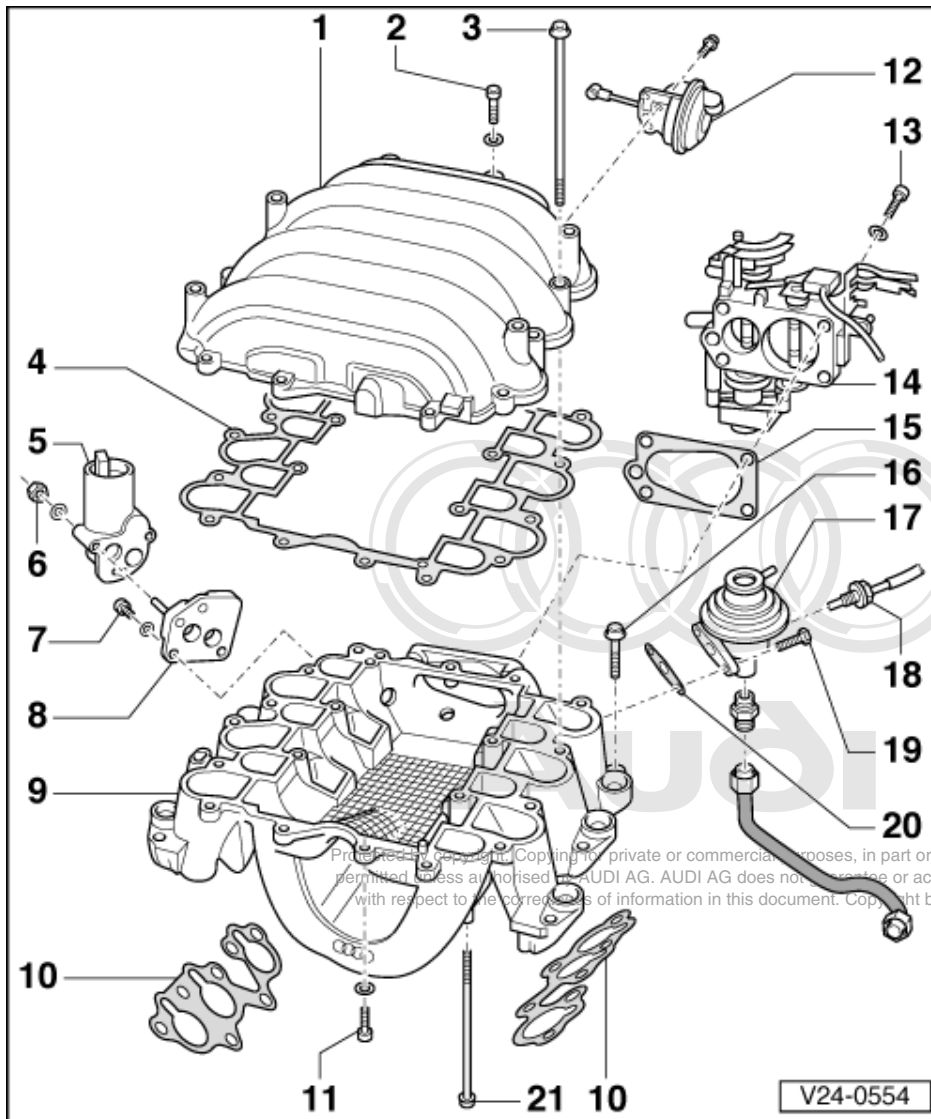
1.8 - Removing and installing throttle valve unit and intake manifold changeover system components



- 1 Top part of intake manifold
- 2 10 Nm
- 3 20 Nm
- 4 Gasket
 - ♦ Replace
- 5 Idling stabilisation valve -N71
- 6 10 Nm
- 7 6 Nm



- 8 Flange
 9 Bottom part of intake manifold
 10 Gasket
 ♦ Replace
 11 10 Nm
 12 Vacuum unit
 ♦ For intake manifold changeover valve
 13 20 Nm
 14 Throttle valve unit
 15 Gasket
 ♦ Replace
 16 20 Nm



17 Mechanical EGR valve

- ♦ For vehicles with EGR

18 EGR temperature sensor -G98

- ♦ For vehicles with EGR

19 10 Nm

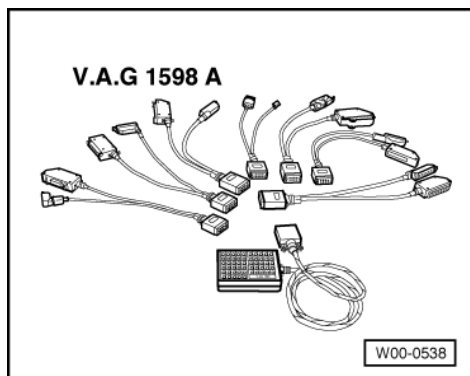
20 Gasket

- ♦ Replace

21 10 Nm

1.9 - Checking wiring and components with test box V.A.G 1598 A

Special tools, testers and workshop equipment required



- ♦ V.A.G 1598 A
- ♦ V.A.G 1598/11
- ♦ V.A.G 1598/12

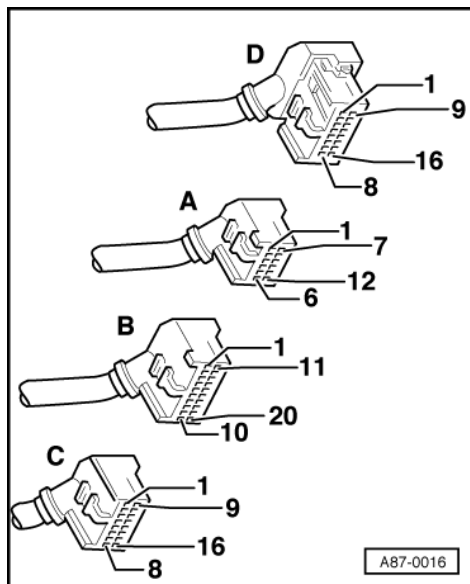
Note:

- ♦ Test box V.A.G 1598 A must not be connected when performing diagnosis with fault reader V.A.G 1551.
- ♦ Allow 30 seconds after switching off ignition before detaching or attaching connectors of engine control unit.

Warning

To prevent damage to the electronic components, select appropriate measuring range before connecting the measuring cables and observe the test requirements.

- Switch off ignition.
- Remove engine control unit => Page 83
- Release catches and detach connectors from control unit.



- -> Connect adapter cables V.A.G 1598/11 and V.A.G 1598/12 to detached connectors of engine control unit.

Note:

- ♦ For measurement purposes, connect test box V.A.G 1598A to the respective adapter cable.



- ♦ The contact assignment of connectors A and B with adapter cable V.A.G 1598/11 is not identical to the assignment of the sockets on the test box V.A.G 1598A =>Pin assignment, Page 82 .
- ♦ The contact assignment of connector C with adapter cable V.A.G 1598/11 is identical to the assignment of the sockets on the test box V.A.G 1598A.
- ♦ The contact assignment of connector D with adapter cable V.A.G 1598/12 is identical to the assignment of the sockets on the test box V.A.G 1598A.

- Carry out test as described in the appropriate repair procedures.

Pin assignment of test box V.A.G 1598 A with adapter cable V.A.G 1598/11

Connector A Contact	V.A.G 1598 A Socket	Connector B Contact	V.A.G 1598 A Socket	Connector B Contact	V.A.G 1598 A Socket
1	41	1	21	13	33
2	42	2	22	14	34
3	43	3	23	15	35
4	44	4	24	16	36
5	45	5	25	17	37
6	46	6	26	18	38
7	47	7	27	19	39
8	48	8	28	20	40
9	49	9	29		
10	50	10	30		
11	51	11	31		
12	52	12	32		

Note:

The contact assignment of connectors C and D corresponds to the sockets on the test box V.A.G 1598A.

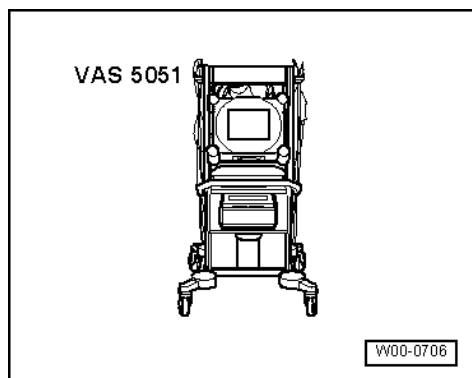
1.10 - Replacing engine control unit

Installation position => Installation position overview - Page 70

Note:

- ♦ Allow 30 seconds after switching off ignition before detaching or attaching connector of engine control unit.
- ♦ When the connectors are pulled off the engine control unit, the learned values and the contents of the fault memory are erased.

Required special tools and workshop equipment (only vehicles 09.92 ä)



- ♦ VAS 5051 with VAS 5051/1 and VAS 5051/2

or

- ♦ V.A.G 1551 with V.A.G 1551/1

Removing

Vehicles with control unit no. 8A0 906 266 B

(09.92 ä):

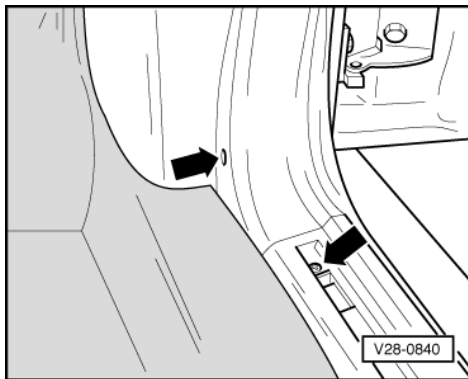
- Connect up vehicle diagnosis, measurement and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "Address word" 01 => Page 2 .
For this purpose, the ignition must be switched on.

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-> The fault reader V.A.G 1551 display will show the control unit identification. For example:

8A0906266B	2.8l V6/2V	MPI D03
□		
Coding 04001	WSC 12345	

- Always start by displaying and printing out the control unit identification => Page 4 .
- Compare code to encoding versions => Page 34 .

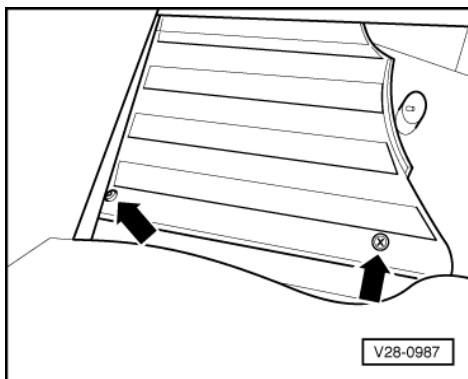


All vehicles:

- Switch off ignition.
- -> Remove lower right A-pillar panel and right door sill in the front door area

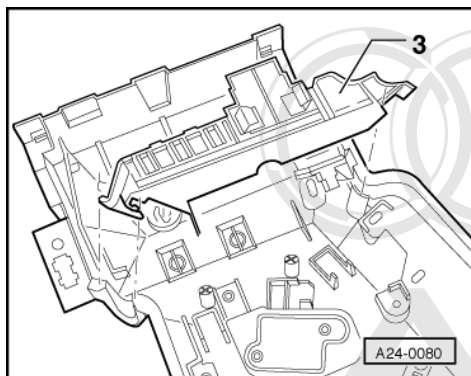
=> General body repairs; Repair group 70; Panels; Removing and installing A-pillar panels/interior door sill Panels Removing and installing A-pillar panels/interior door sill

- Fold back right front footwell floor covering (if necessary, use knife to cut through pre-stamped seam).

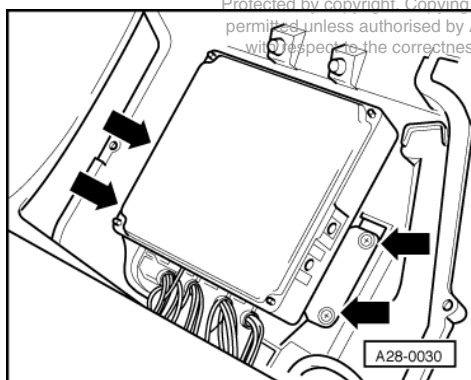




- -> Remove screws to electronic box cover -arrows-.
- Carefully detach upper and lower cover half.



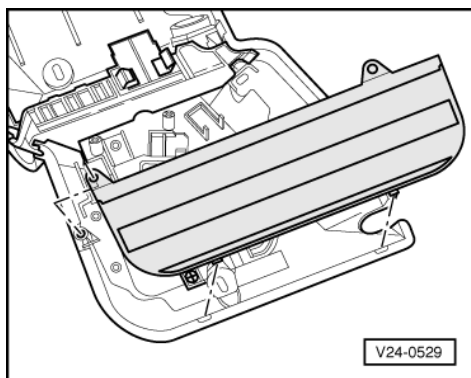
- -> Remove cross-strut -3- with attaching parts.



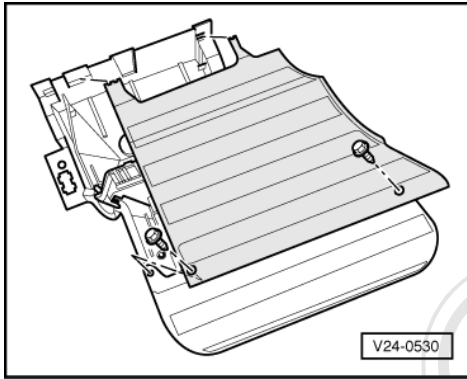
- Unscrew engine control unit -> -2- from electronics box in right footwell -arrows-.
- Remove engine control unit.
- Release catches and detach connectors from control unit.

Installing

Install in reverse order, paying attention to the following:



- -> Insert lower cover half in both openings of electronics box in right footwell.



- -> Engage upper cover half in both openings of electronics box in right footwell.

Note:

- ◆ Allow 30 seconds after switching off ignition before detaching or attaching connector of engine control unit.
- ◆ If rough idling is encountered after installing engine control unit, allow engine to run at idling speed for several minutes so that learning process can be implemented => Function 04 "Basic setting", Page 49).

- Interrogate and erase fault memory => Page 5 .

Vehicles with control unit no. 8A0 906 266 B Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

(09.92 ä):

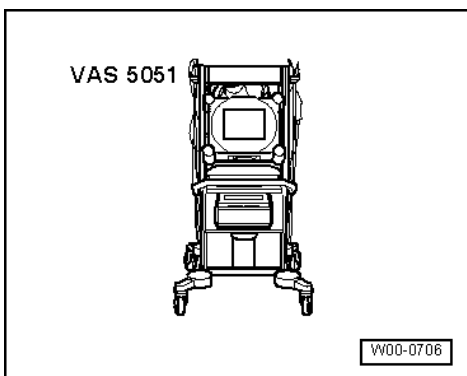
- Encode control unit => Page 34 .

1.11 - Checking idling speed and CO content

Note:

- ◆ The idling speed cannot be adjusted.
- ◆ The idling speed is tested during the basic setting of the engine.
- ◆ For vehicles with lambda probes, the CO content is influenced by the lambda control.

Special tools, testers and workshop equipment required



- ◆ VAS 5051 with VAS 5051/1 and VAS 5051/2

or

- ◆ V.A.G 1551 with V.A.G 1551/1



Test requirements:

- No leaks in exhaust system
- Coolant temperature at least 85 °C.
- Electrical consumers switched off (radiator fan must not run during the test)
- Air conditioner switched off.
- Pressure gauge not connected
- Vehicles with automatic gearbox: Selector lever in position P or N

Vehicles with control unit no.

4A0 906 266/A/AA/AB (ä 08.92)

Test sequence

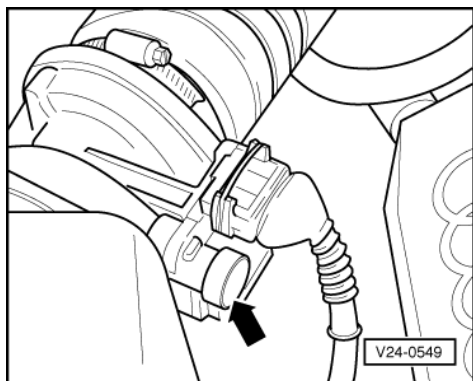
- Perform basic setting
=>Page **25**
- Check display in display zone 3.
 - Specification: 28 ... 32 (700 ... 800 rpm)

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If the display is outside tolerance => Test table, Page **27** .

- Check display in display zone 8.

If the display is outside tolerance:



- -> Detach the cap -arrow- and lever out the plugs using a scribe.
- Adjust the CO content by turning the screw on the CO potentiometer.
 - Setting: Display 128

Note:

- ♦ Basic setting value 128 is the mean value stored at the factory.
- ♦ Reducing the value of 128 signifies leaning (CO content decreases), whilst increasing the value signifies enrichment (CO content increases).
- ♦ Any change in basic setting value must remain within the tolerance range of 120 ... 136.
- Press the =>key.
- Enter "06" for "End output" function and confirm entry with Q key.

Vehicles with control unit no. 8A0 906 266 B

(09.92 ä)

- ♦ For vehicles with lambda probes (Encoding => Page **34**), the CO content cannot be set. The CO content is influenced by the lambda control.
- ♦ For vehicles without lambda probes (Encoding => Page **61** .

Test sequence

- Interrogate fault memory =>Page 5 . The fault memory must be clear. If necessary, rectify any faults and erase the fault memory. Switch off the engine, then start up again. Take vehicle for a test drive and interrogate the fault memory again to make sure it is clear.
- Leave engine idling.
- Start basic setting =>Page 25 , Display group 003, engine idling.

-> Indicated on display:

System in basic setting 3
1 2 3 4

- Check display in display zone 1.
 - Specification: 700 ... 800 rpm

If the specification is obtained:

- Press the =>key.
- Enter "06" for "End output" function and confirm entry with Q key.

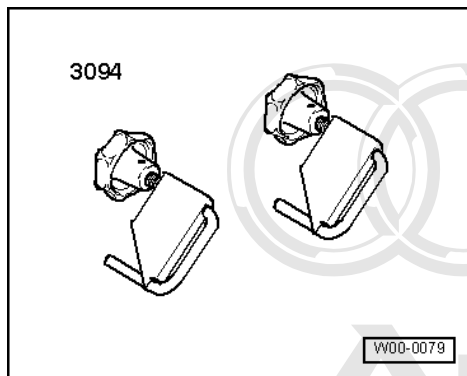
If the specification is not obtained:

- Interrogate fault memory again =>Page 5 .

If the idling speed is too high or too low and there are no faults recorded in the fault memory, carry out the following tests marked with a dot:

- Test idling switch =>Page 142 .
- Large volume of unmetered air => Reading measured value block, display groups 001, 005, 006 or 010, Page 40 onwards.
- Check idling stabilisation valve => Page 103
- Check learned values of idling speed stabilisation: Start the basic setting => Page 25 , display group 004.

1.12 - Checking system pressure, fuel pressure regulator and holding pressure

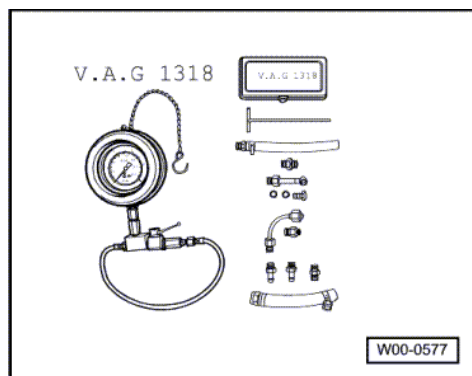


Note:

The fuel pressure regulator regulates the fuel pressure according to the intake manifold pressure at the throttle valve unit.

Special tools, testers and workshop equipment required

- ♦ Special tool 3094



- ♦ V.A.G 1318 with V.A.G 1318/6 and V.A.G 1318/7

Test requirements:

- Fuel pump relay OK; checking =>Page 98 .
- Fuse No. 17 OK
- Fuel pump OK; checking:

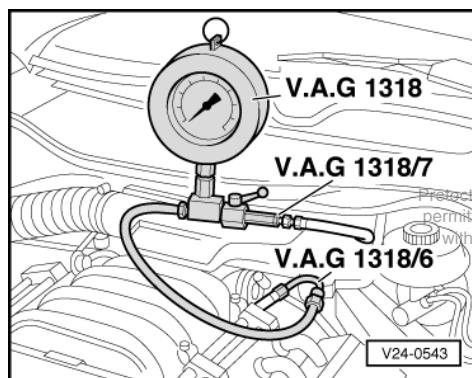
=> Repair Group 20

- Fuel filter OK
- Battery voltage at least 11 V

Warning

The fuel system is pressurised! Before opening the system place a cloth around the connection. Then release pressure by carefully loosening the connection.

Checking system pressure and fuel pressure regulator



- -> Connect up pressure gauge V.A.G 1318 with test adapters 1318/6 and 1318/7 between fuel feed pipe and fuel manifold; lever on pressure gauge set to - open-position (lever in direction of flow).
- Disconnect vacuum pipe between pressure regulator and intake manifold at the pressure regulator and seal off pipe with hose clamp 3094.

Note:

- ♦ Replace pressure regulator if fuel emerges at the vacuum connection of the pressure regulator in the course of the following pressure test.
- ♦ When performing the following test, do not leave the engine running for an unnecessarily long time with the vacuum hose detached, because the higher fuel pressure causes the fuel/air mixture to be enriched. This could lead to the Lambda control limits to be exceeded, which would then result in a fault being recorded.
- Start the engine and run at idling speed.
- Switch off air conditioner.
- Measure the fuel pressure.
 - Specification: 3.8 ... 4.2 bar
- If the specified value is not attained, try replacing the pressure regulator and repeating the pressure test.

- If the specified value is still not attained, check the fuel pump/feed pipe for damage (e.g. crushing) and replace, if necessary.
- If the specified value is exceeded, check the return pipe for damage (e.g. crushing) and replace, if necessary.
- Remove 3094, attach vacuum hose to pressure regulator and observe drop in pressure on pressure gauge.
- Fuel pressure must decrease by approx. 0.5 bar when vacuum hose is attached.

Perform the following checks if there is no change in pressure as described above:

- Check vacuum hose for cracks and damage.
- Check vacuum hose at intake manifold for blockage; for this purpose, detach hose at pressure regulator and blow into it.
- Replace the pressure regulator if no leakage is found and the vacuum connection is not blocked.

Checking holding pressure:

- Start the engine and run at idling speed.
- Switch off ignition.
- Check holding pressure 10 minutes after switching off engine (minimum pressure).
 - Specified value for cold engine: approx. 2.2 bar
 - Specified value for warm engine: approx. 3.0 bar

Note:

The increase in pressure in a warm engine due to fuel expansion is normal.

If the specification is not obtained:

- Start the engine and run at idling speed.
- Allow the pressure to build up, then switch off the ignition. At the same time close the cut off valve on the pressure gauge V.A.G 1318 (valve lever at right angles to direction of flow).

If the pressure does not drop, the following faults are possible:

- ◆ Union between pressure gauge and fuel supply pipe leaking
- ◆ Supply pipe leaking at fuel tank
- ◆ Non-return valve in fuel pump leaking

=> Repair Group 20

If the pressure drops again, the following faults are possible:

- ◆ Fuel pressure regulator defective
- ◆ Injectors leaking
- ◆ Unions on pressure gauge downstream of cut-off valve leaking

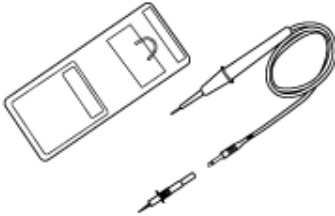
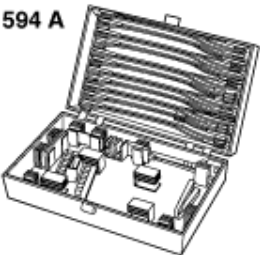
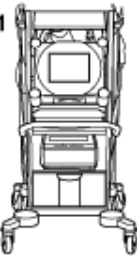
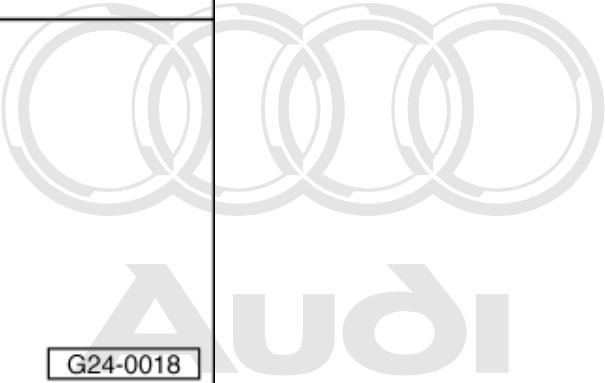
Note:

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To remove the pressure gauge, close the shut-off valve, unscrew the union on adapter V.A.G 1318/6, then open the shut-off valve to drain off excess fuel into a suitable container.



1.13 - Checking injectors

V.A.G 1526 A 	V.A.G 1527 B 
V.A.G 1594 A 	V.A.G 1598 A 
VAS 5051 	 G24-0018

Special tools, testers and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1527 B
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598 A
- ♦ V.A.G 1598/12
- ♦ VAS 5051 with VAS 5051/1 and VAS 5051/2

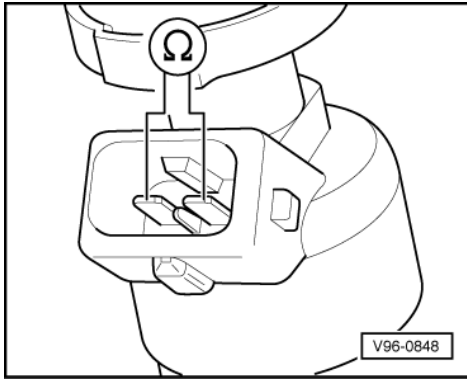
or

- ♦ V.A.G 1551 with V.A.G 1551/1

Checking internal resistance

- Unplug connector on injector to be checked.

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- -> Connect multimeter to valve to measure resistance
- Specification
 - Bosch injector: 15 ... 17 ω
 - Siemens injector: 13.5 ... 15.5 ω

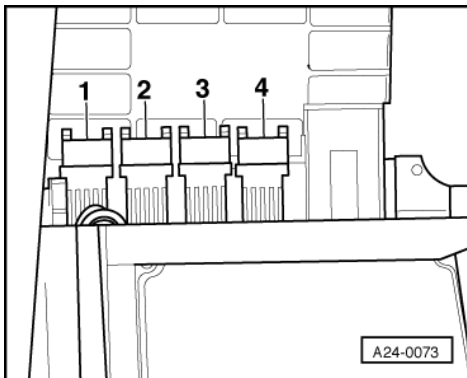
If the specification is not obtained:

- Replace injector.

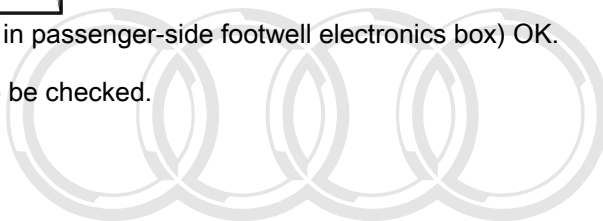
Checking power supply

Test requirements:

- Fuel pump relay OK; checking =>Page 98 .

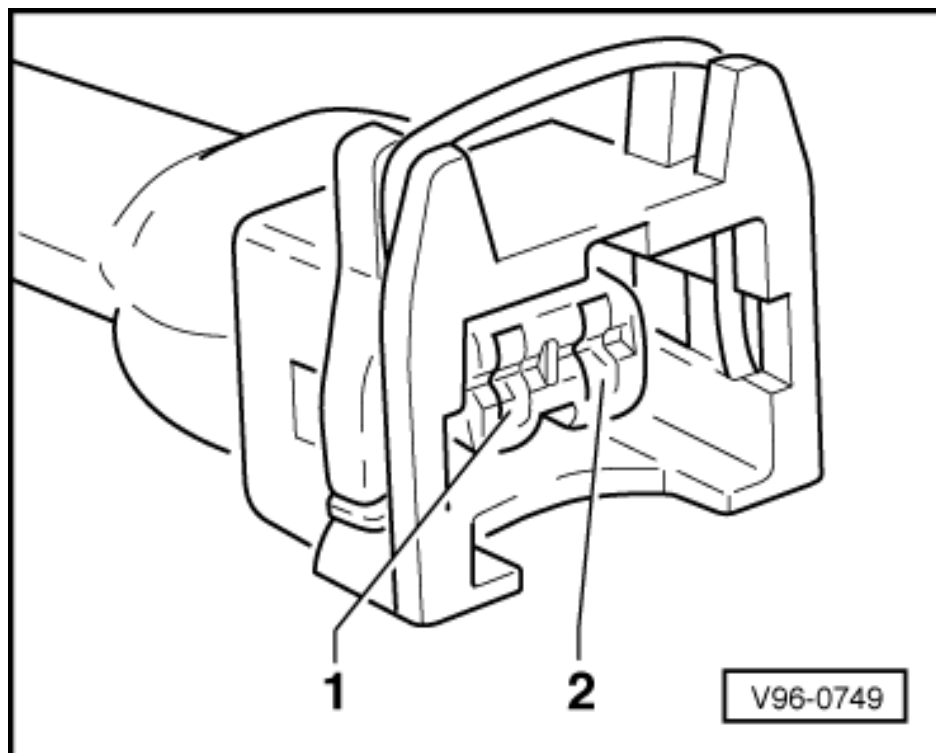


- -> Fuse S72 (in red bracket -3- in passenger-side footwell electronics box) OK.
- Unplug connector on injector to be checked.



Audi

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

Injector connector contact	Measure to
1	Engine earth

- Start final control diagnosis => Page 23 and actuate fuel pump relay -J17.
- The LED must illuminate.

If the LED does not illuminate:

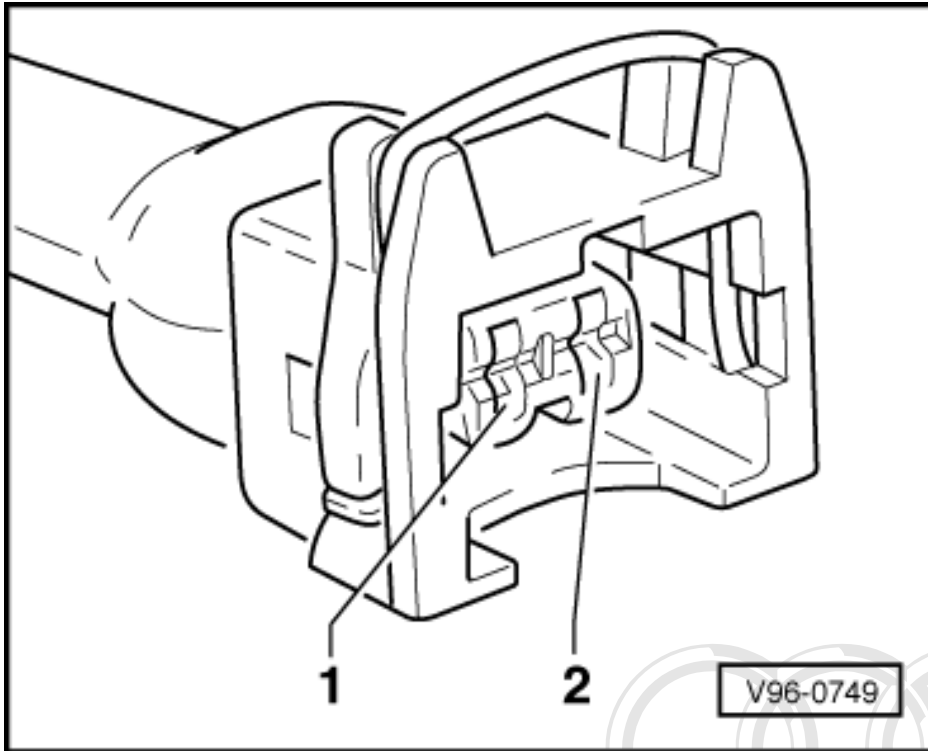
- Check wiring from contact 1 via fuse S72 (in red bracket, position 3 in the passenger-side footwell electronics box) to fuel pump relay.

=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

Checking activation

- Unplug connector on injector to be checked.

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

Injector connector Contact	Measure to
2	Battery positive

- Operate the starter briefly (the engine may start).
- The LED must flash.

If LED does not flash:

- Check wiring => Page 93

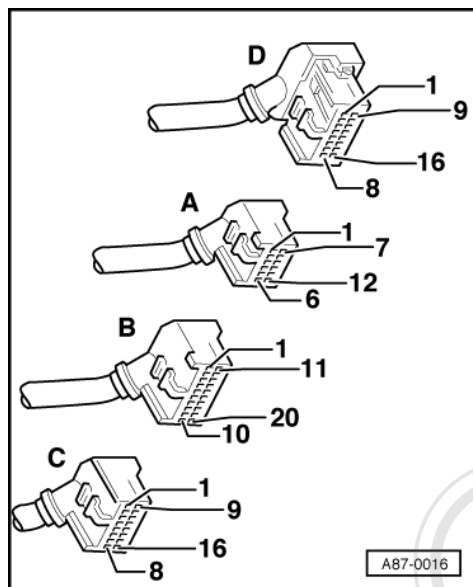
Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

If the LED does not flash for any of the injectors:

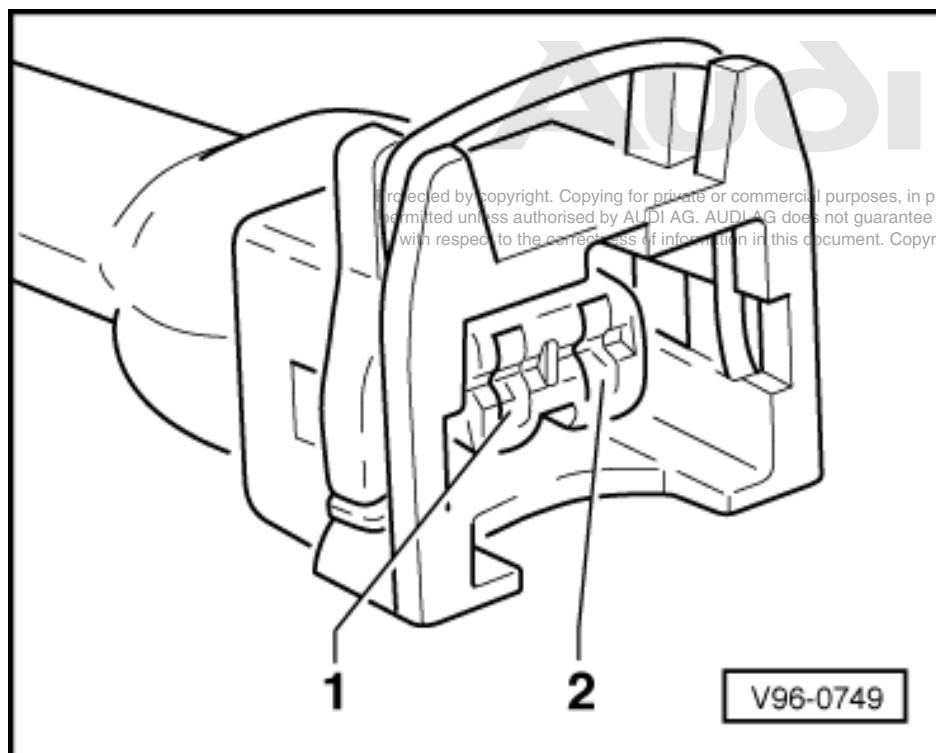
- Check the power supply to the engine control unit => Page 208 .

Checking wiring

- Unplug connector on injector to be checked.



- -> With the ignition off, use adapter V.A.G 1598/12 to connect test box V.A.G 1598 A to engine control unit connector D (control unit remains disconnected) => Page **81** .



- -> Check for open circuit and short to earth/positive or earth in the following wiring connections:

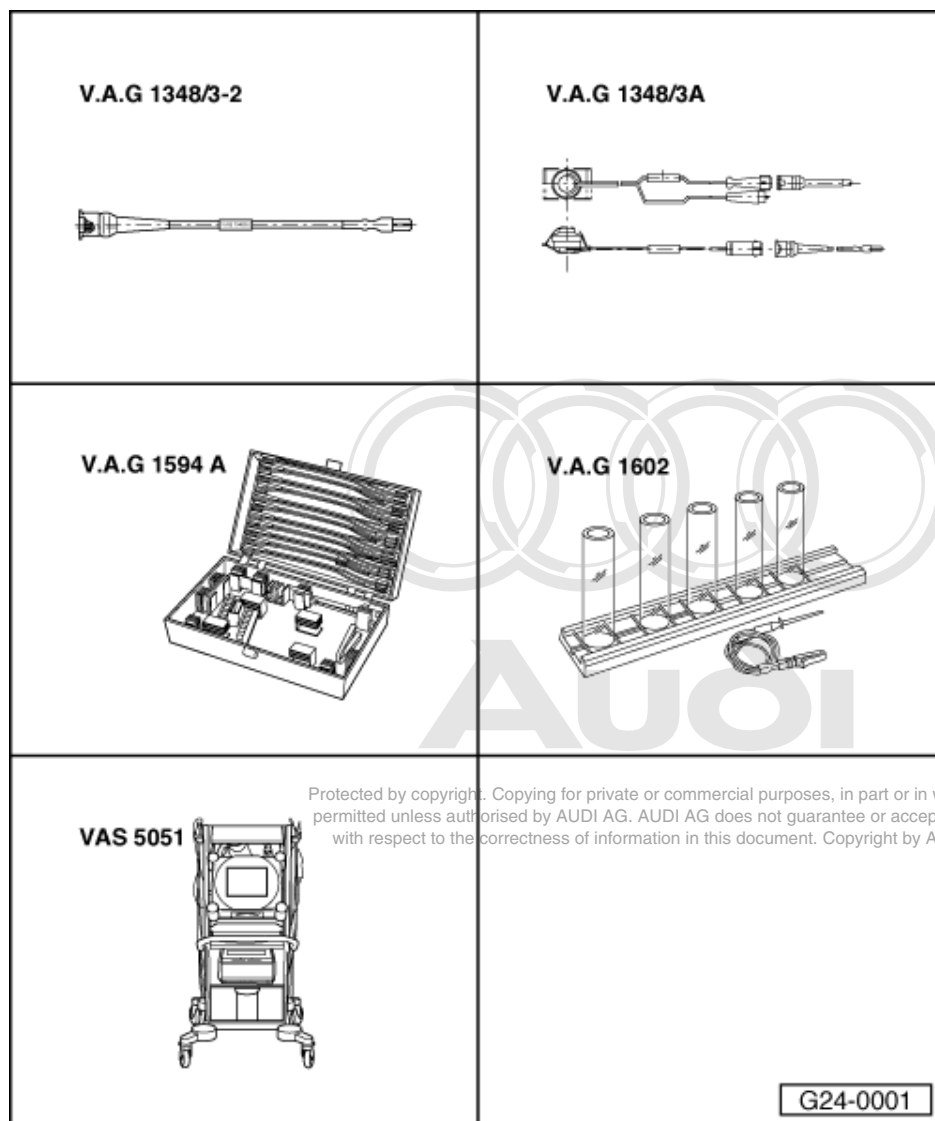
Cylinder	Injector connector Contact	Test box V.A.G 1598 A Socket
1	2	4
2	2	5
3	2	6
4	2	9
5	2	10

Cylinder	Injector connector Contact	Test box V.A.G 1598 A Socket
6	2	13

- Rectify any open/short circuit as necessary.

=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

1.14 - Checking injection quantity, leak tightness and spray pattern of injectors



Special tools, testers and workshop equipment required

- ◆ V.A.G 1348/3-2
- ◆ V.A.G 1348/3A
- ◆ V.A.G 1594 A
- ◆ V.A.G 1602
- ◆ VAS 5051 with VAS 5051/1 and VAS 5051/2

or



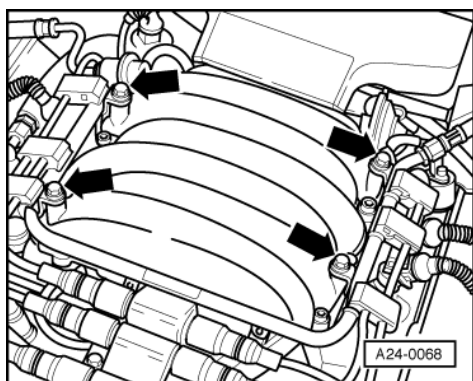
- ♦ V.A.G 1551 with V.A.G 1551/1

Test requirements:

- Fuel pressure OK, checking =>Page 87 .

Work sequence

- Remove the intake hose between air mass meter and air cleaner.
- Unplug connectors from injectors.



- -> Unscrew fuel manifold from intake manifold.
- Pull vacuum hose off fuel pressure regulator.
- Lift fuel manifold, together with injectors, off intake manifold and support it.

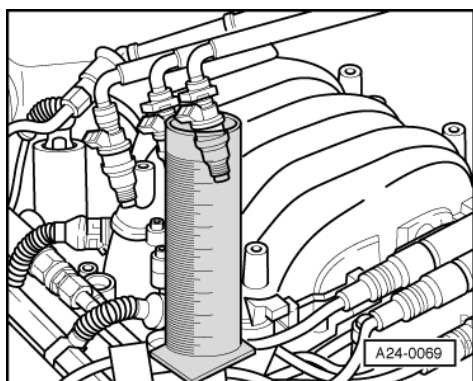
Leak test

- Start final control diagnosis => Page 23 and actuate fuel pump relay -J17.
- The fuel pump must run.

Note:

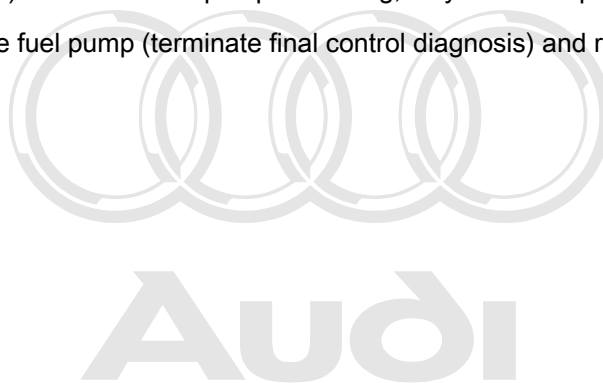
This step is merely designed to make the fuel pump run with the engine stopped.

- Check injectors for leaks (visual check). When the fuel pump is running, only 1 or 2 drops a minute should escape from each injector.
- If the fuel loss is greater, switch off the fuel pump (terminate final control diagnosis) and replace the faulty injector.



Note:

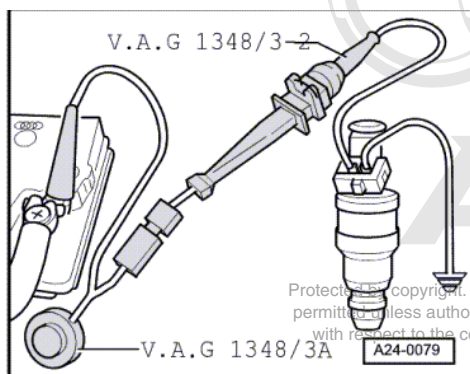
Replace O ring.



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Checking injection quantity

- -> Place the injector which is to be checked into the measuring glass of injection quantity tester V.A.G 1602.



- -> Connect one of the injector contacts to the engine earth using a test cable and crocodile clip from the V.A.G 1594 A.
- Connect second contact of injector with remote control V.A.G 1348/3A, adapter lead V.A.G 1348/3-2 and auxiliary cable to positive.
- Start final control diagnosis => Page 23 and actuate fuel pump relay -J17.
 - The fuel pump must run.

Note:

This step is merely designed to make the fuel pump run with the engine stopped.

- Activate remote control V.A.G 1348/3A for 30 seconds.
- Once all three injectors of a cylinder bank have been actuated, place the three measuring glasses on a flat surface.
 - Specified value per injector: 85 ... 100 ml
- If the measured value for one or more of the injectors is outside the tolerance range, replace the defective injector(s).
- Repeat the check on injectors of second cylinder bank.
- If the measured values for all the injectors are outside the tolerance range, check the fuel pressure => Page 87.

Note:

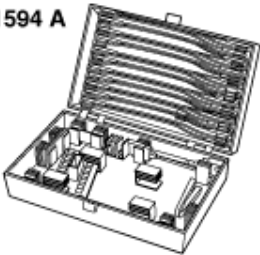
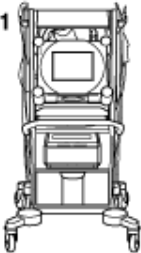
When checking the injection quantity, also check the spray pattern. The spray pattern must be the same for all the injectors.

Installation of the fuel manifold together with injectors is performed in the reverse sequence. The following points must be noted when installing:

- Replace the O-rings at all opened connections. (When replacing the front O-ring, make sure not to remove the plastic cap from the injector head. The O-ring must be pulled off over the plastic cap.)
- Moisten the O-rings with clean engine oil.
- Insert injectors perpendicularly and in correct position into fuel manifold and secure with fasteners.
- Place fuel manifold with secured injectors in position at intake manifold and press in evenly.



1.15 - Fuel pump relay - check -J17 and activation

V.A.G 1526 A 	V.A.G 1594 A 
V.A.G 1598 A 	VAS 5051 
	G24-0017

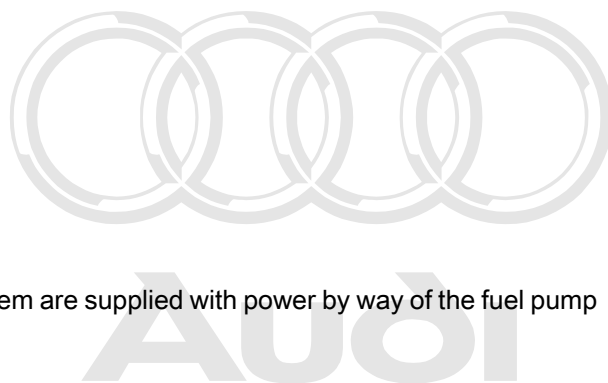
Special tools, testers and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598 A
- ♦ V.A.G 1598/12
- ♦ VAS 5051 with VAS 5051/1 and VAS 5051/2

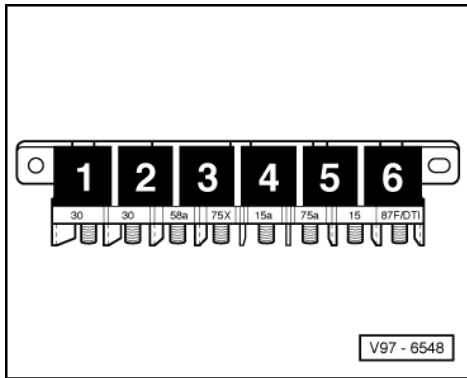
or

- ♦ V.A.G 1551 with V.A.G 1551/1

The fuel pump and certain components of the injection system are supplied with power by way of the fuel pump relay -J17.



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The fuel pump relay -J17 is only energised when the engine is running, i.e. the relay is only connected to earth (via the engine control unit) when engine speed pulses are detected in the engine control unit.

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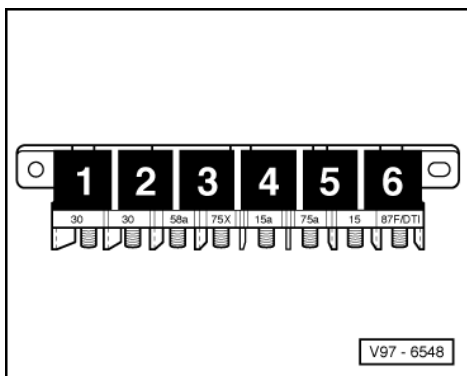
Note:

-> *Fitting location of fuel pump relay: On central electrics beneath the dash panel, position 6.*

Test requirements:

- Battery voltage at least 11 V

Functional check of fuel pump relay



- Start final control diagnosis => Page 23 and actuate fuel pump relay -J17.
- -> Fuel pump relay (on central electrics beneath the left dash panel, position 6) must respond and fuel pump must run.

If the relay does not respond:

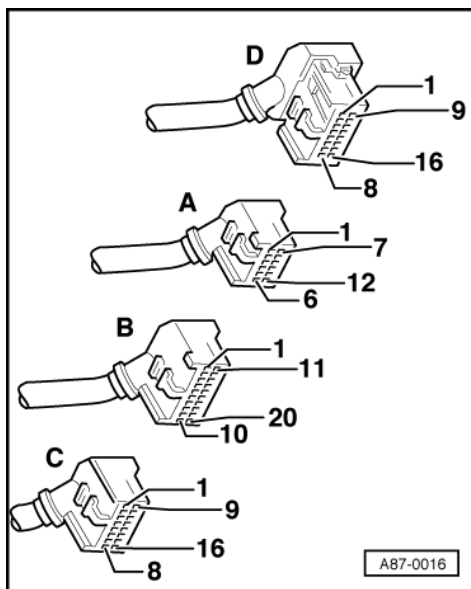
- Check activation of fuel pump relay

If the fuel pump does not run:

- Check voltage supply for fuel pump and components (via fuel pump relay) =>Page 101 .

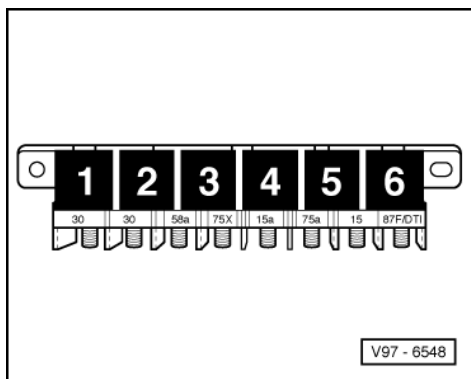
Checking activation of fuel pump relay

- Switch off ignition.



- -> With the ignition off, use adapter V.A.G 1598/12 to connect test box V.A.G 1598 A to engine control unit connector D (control unit remains disconnected) => Page 81 .
- Connect together sockets 1 and 15 on the test box using an auxiliary cable from V.A.G 1594A.
- Switch the ignition on.

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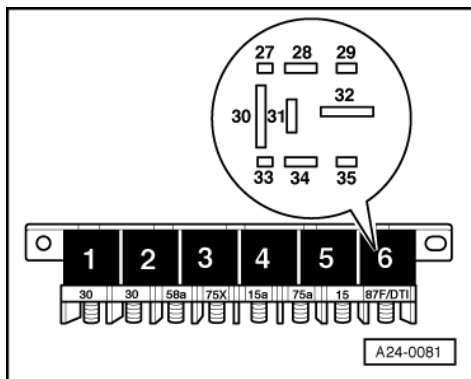
- -> Fuel pump relay (on central electrics beneath left dash panel, position 6) must respond.

If the relay responds now, but not during final control diagnosis:

- Replace engine control unit => Page 82 .

If the relay does not respond:

- Switch off ignition.
- Disconnect fuel pump relay.



- -> Connect the multimeter to contact 28 of relay socket and earth to measure voltage.
- Switch the ignition on.
 - Specification: approx. battery voltage

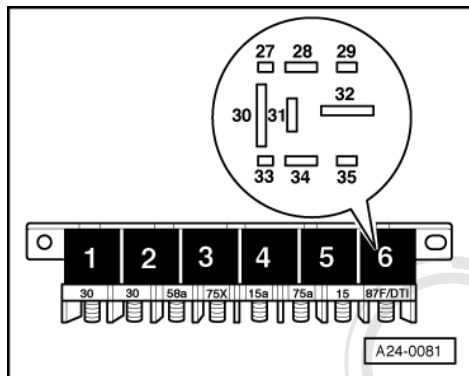
If the specification is not obtained:

- Check the wiring.

=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

If the specification is obtained:

- Switch off ignition.



- -> Check for open circuit and short to positive or earth in the following wiring connections:

Central electrics, position 6 Contact	Test box V.A.G 1598 A Socket
29	15

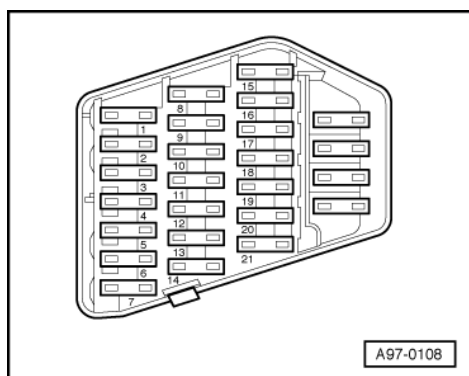
- Rectify any open/short circuit as necessary.

=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

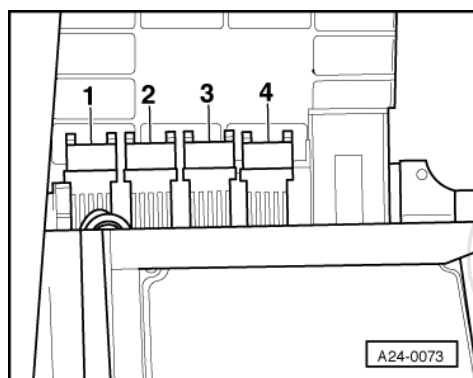
- If wiring is OK, replace fuel pump relay -J17.

Checking power supply for fuel pump and components (from fuel pump relay)

- Remove cover from left fuse holder.



- -> Detach fuse 17.



- ➔ Remove fuses S72 (in red holder -3-) and S73 (in brown holder -2-) in passenger-side footwell electronics box.
- Start final control diagnosis => Page **23** and actuate fuel pump relay -J17.
- To measure the voltage, connect multimeter to earth and to one of the contacts of the following fuses in the fuse holder.

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Locking clip	Specified value at one of the contacts
S17 (No. 17 in fuse holder)	approx. battery voltage
S72 (in red holder)	approx. battery voltage
S73 (in brown holder)	approx. battery voltage

If the specified values are not obtained:

- Repeat the test at the other contact of the fuse base.

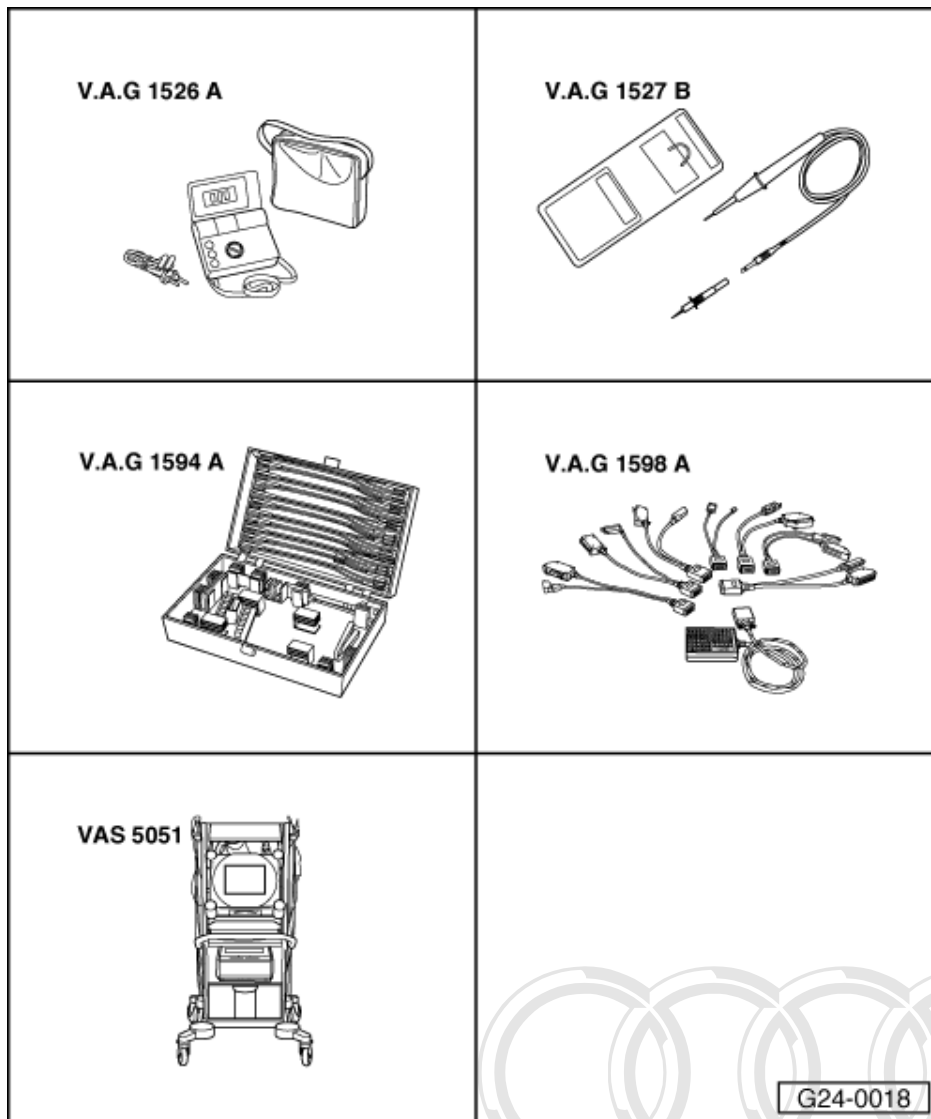
If the specifications are still not attained:

- Check the wiring.

=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

- If wiring is OK, replace the fuel pump relay -J17.

1.16 - Check idling stabilisation valve -N71



Special tools, testers and auxiliary items required

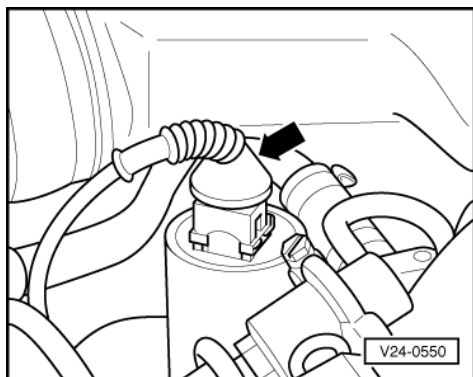
- ◆ V.A.G 1526 A
- ◆ V.A.G 1527 B
- ◆ V.A.G 1594 A
- ◆ V.A.G 1598 A
- ◆ V.A.G 1598/12
- ◆ VAS 5051 with VAS 5051/1 and VAS 5051/2

or

- ◆ V.A.G 1551 with V.A.G 1551/1

Installation position => Installation position overview - Page 70

Note:

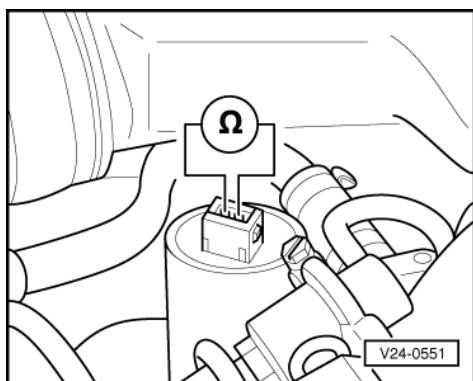


Checking operation:

- 08.92 => basic setting, display group 000, display zone 4, Page 25 ;
- 09.92 ➤ => reading measured value block, display group 004, Page 57 .

Checking internal resistance

- Switch off ignition.
- ➔ Pull connector -arrow- off idling stabilisation valve.



- ➔ Connect multimeter to valve to measure resistance
- Specification: 7 ... 11 Ω

Note:

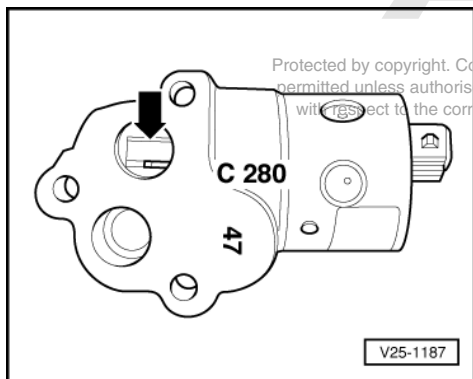
Resistance is in the lower tolerance range at ambient temperature and in the upper tolerance range when the engine is warm.

If the specification is not obtained:

- Replace idling stabilisation valve.

Mechanical checking

- Remove idling stabilisation valve



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- -> Check piston slide -arrow- for scoring (visual inspection).

Note:

Never use a screwdriver or similar tool to move the piston slide when checking for freedom of movement.

- Attach connector to removed idle stabilisation valve
- Switch the ignition on.
- Start final control diagnosis => Page 23 and actuate idling stabilisation valve -N71.
- Check whether piston slide moves properly from stop to stop.

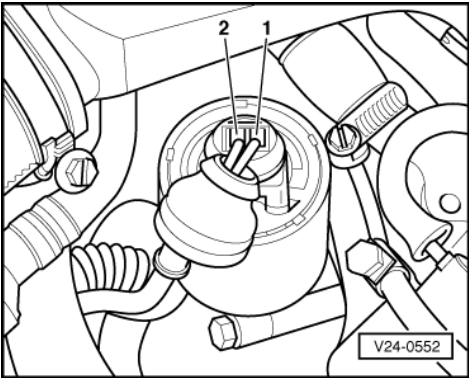
If scoring is found which impairs freedom of movement or if piston slide does not move freely (sticking, sluggish or not full range of travel):

- Replace idling stabilisation valve.

If idling stabilisation valve does not react in final control diagnosis:

Checking activation

- Push back protective cap at connector
- Start final control diagnosis => Page 23 and actuate idling stabilisation valve -N71.



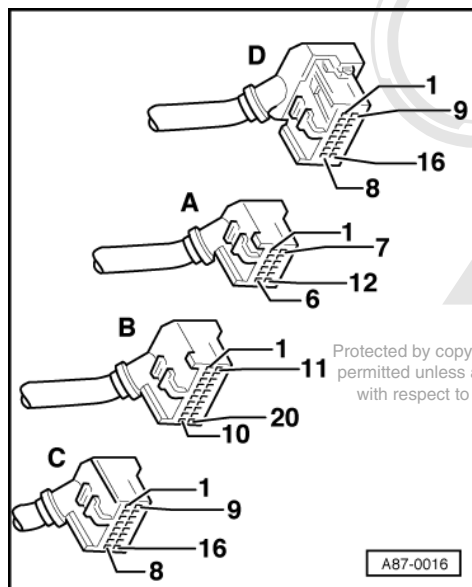
- -> Connect voltage tester V.A.G 1527 B as follows:

Idling stabilisation valve Contact	Measure to
1	Engine earth

- The LED must flash.
- Connect voltage tester V.A.G 1527 B as follows:

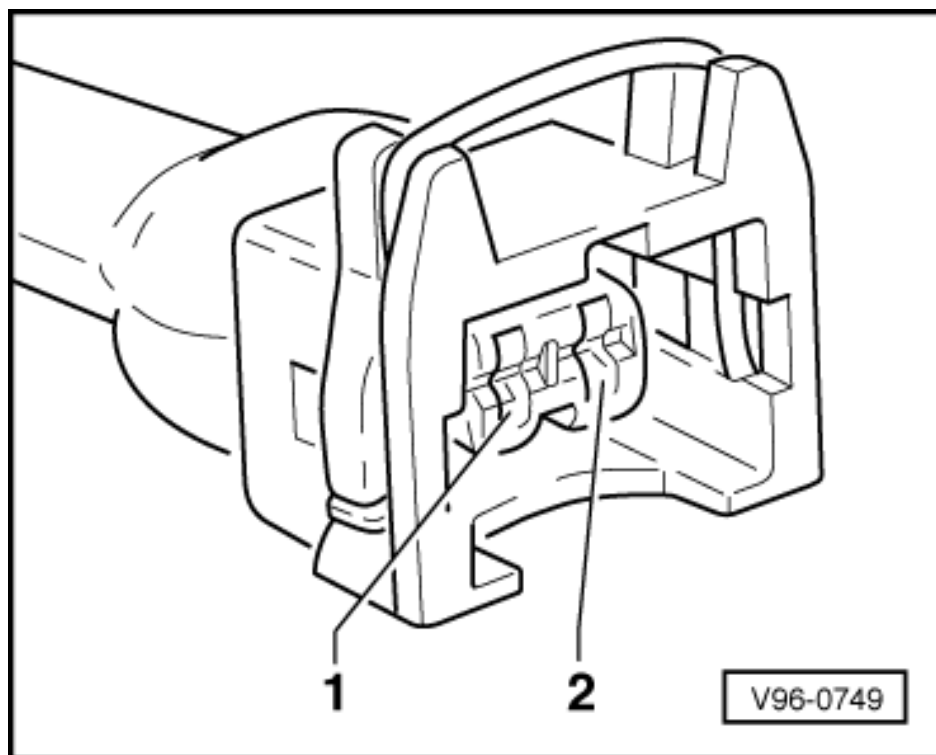
Idling stabilisation valve Contact	Measure to
2	Battery positive

- The LED must illuminate.



If the specified values are not obtained:

- -> With the ignition off, use adapter V.A.G 1598/12 to connect test box V.A.G 1598 A to engine control unit connector D (control unit remains disconnected) => Page 81 .



- -> Check for open circuit and short to earth/positive or earth in the following wiring connections:

Connector contact	Test box V.A.G 1598 A socket
1	11
2	7

- Rectify any open/short circuit as necessary.

=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

- If activation and wiring are OK, but idling stabilisation valve does not react, valve is seized up. Replace idling stabilisation valve.
- If the wiring is OK, but the valve is not activated, replace the engine control unit => Page **82**.

1.17 - Checking air mass meter -G70 with CO-potentiometer -G74 for control unit-Nr. 4A0 906 266/A/AA/AB (à 08.92)



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Special tools, testers and workshop equipment required

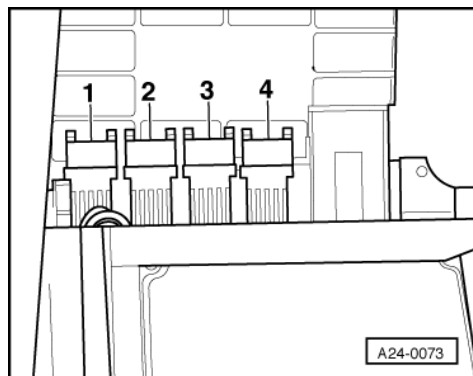
- ◆ V.A.G 1526 A
- ◆ V.A.G 1527 B
- ◆ V.A.G 1594 A
- ◆ V.A.G 1598 A
- ◆ V.A.G 1598/11

Installation position => Installation position overview - Page **70**



Note:

Checking operation=> Basic setting, display group 000, display zone 2, Page **25**.



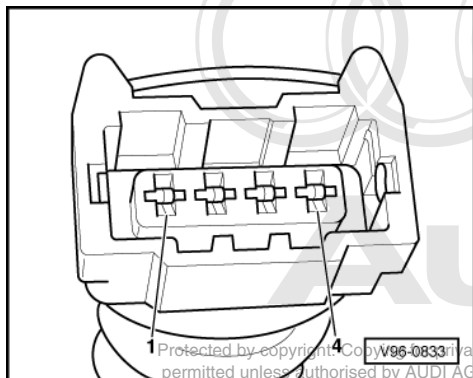
Test requirements:

- -> Fuse S74 (in red holder -1- in passenger-side footwell electronics box) OK.

Note:

Use only gold-plated contacts when repairing the contacts in the plug connectors.

Checking power supply



- Pull connector off air-mass meter.
- -> Connect voltage tester V.A.G 1527 B as follows:

Connector Contact	Measure to
3	Engine earth

- Switch the ignition on.
 - The LED must illuminate.

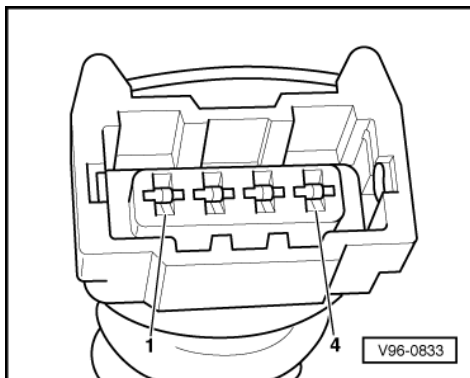
If the LED does not illuminate:

- Check the wiring between contact 3 of connector and fuse for open circuit/short to earth and repair if necessary.

=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

Checking earth supply

- Pull connector off air-mass meter.

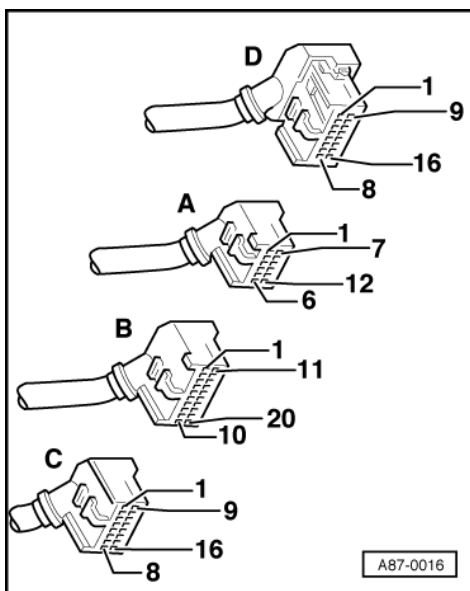


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- -> Connect voltage tester V.A.G 1527 B as follows:

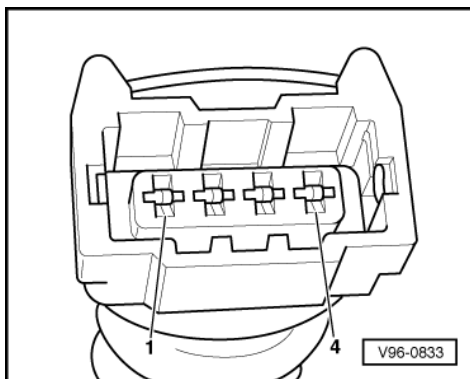
Connector Contact	Measure to
2	Battery positive

- The LED must illuminate.



If the LED does not illuminate:

- -> With ignition switched off, use adapter V.A.G 1598/11 to connect test box V.A.G 1598 A to engine control unit connector A only (control unit remains disconnected) => Page 81 .



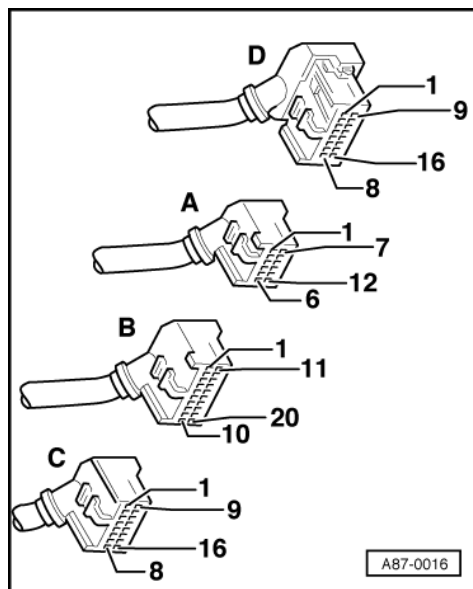


- -> Check for open circuit and short to positive or earth in the following wiring connections:

Connector Contact	Test box V.A.G 1598 A Socket
2	45

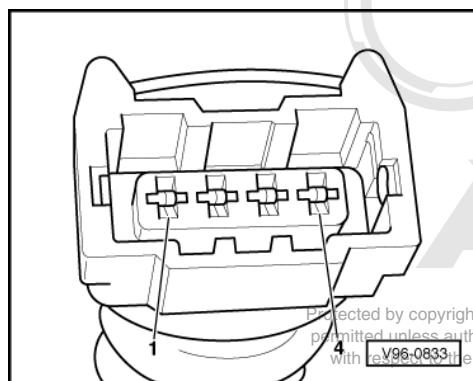
- Rectify any open/short circuit as necessary.

=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder



Checking signal wiring for air mass meter

- -> With ignition switched off, use adapter V.A.G 1598/11 to connect test box V.A.G 1598 A to engine control unit connector A only (control unit remains disconnected) => Page 81 .



- -> Check for open circuit and short to earth/positive or earth in the following wiring connections:

Connector Contact	Test box V.A.G 1598 A Socket
1	42
4	41

- Rectify any open/short circuit as necessary.

=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

Checking signal voltage

Test requirements:

- Wiring OK
- Air mass meter connected
- Electrical consumers switched off (radiator fan must not run during the test)
- Push back rubber grommet at connector of air mass meter

Note:

Pin assignment is marked on back of connector.

CO potentiometer:

- Connect multimeter to contacts 2 and 4 of air mass meter connector to measure the voltage.
- Switch the ignition on.
 - Specification: 1.0 ... 7.5 V

If the specification is not obtained:

- Replace air mass meter.

Air mass meter:

- Connect multimeter to contacts 1 and 2 of air mass meter connector to measure the voltage.
- Switch the ignition on.
 - Specification: 0.3 ... 1.1 V
- Start engine and run at idling speed.
- Increase engine speed and observe change in voltage.
 - Specification:
With increasing engine speed, and thus increasing air throughput, signal voltage increases proportionally up to approx. 3.4 V at 4000 rpm.

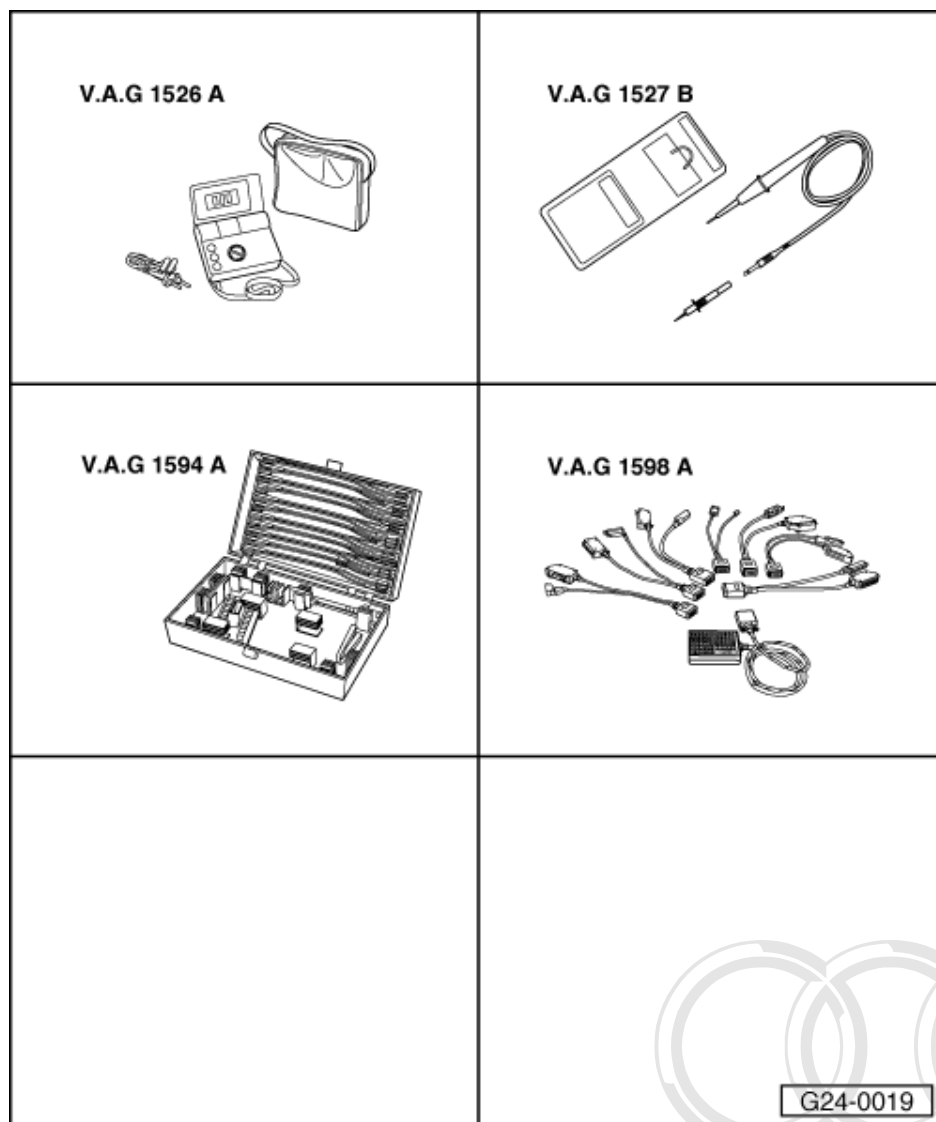
If voltage does not change, or if voltage dips with increasing engine speed:

- Replace air mass meter.

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1.18 - Checking air mass meter -G70 for control unit no. 8A0 906 266 B (09.92 ➤)



Special tools, testers and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1527 B
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598 A
- ♦ V.A.G 1598/11
- ♦ VAS 5051 with VAS 5051/1 and VAS 5051/2

or

- ♦ V.A.G 1551 with V.A.G 1551/1

Installation position => Installation position overview - Page 70

Check function

- Reading measured value block, Display group 001, engine at idling speed =>Page 40 .

-> Indicated on display:

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Reading measurement block 1

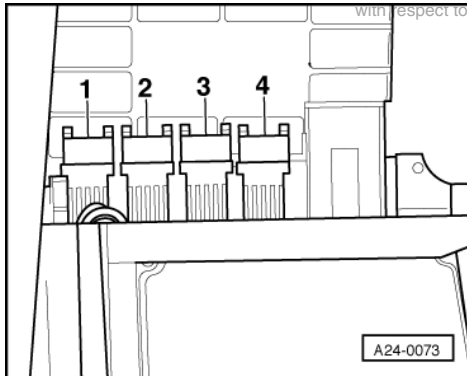
1 2 3 4

- Check display in display zone 2.
 - Specification: 1.470 ... 1.620 V
- If the values are not as specified or if the fault memory has recorded a fault relating to the air mass meter, check the power supply to the air mass meter.

Checking power supply

Test requirements:

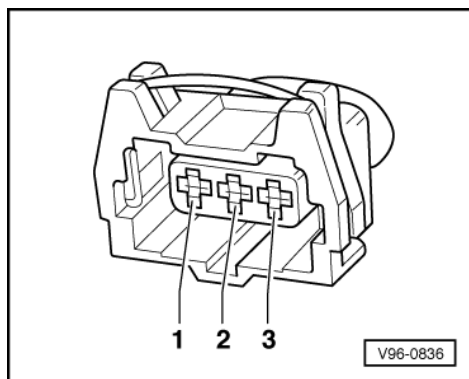
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- -> Fuse OK (in passenger-side footwell electronics box)

Assembly date	Locking clip	Bracket
09.92 ä 06.93:	S74	black -1-
07.93 ä	S103	yellow -4-

- Pull connector off air-mass meter.



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

Connector Contact	Measure to
3	Engine earth

- Switch the ignition on.
 - The LED must illuminate.

If the LED does not illuminate:

- Check the wiring between contact 3 of connector and fuse for open circuit/short to earth and repair if necessary.



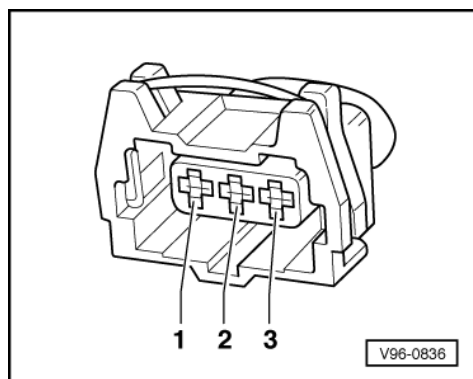
=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

Note:

Use only gold-plated contacts when repairing the contacts in the plug connectors.

Checking earth supply

- Pull connector off air-mass meter.



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

Connector Contact	Measure to
2	Battery positive

- The LED must illuminate.

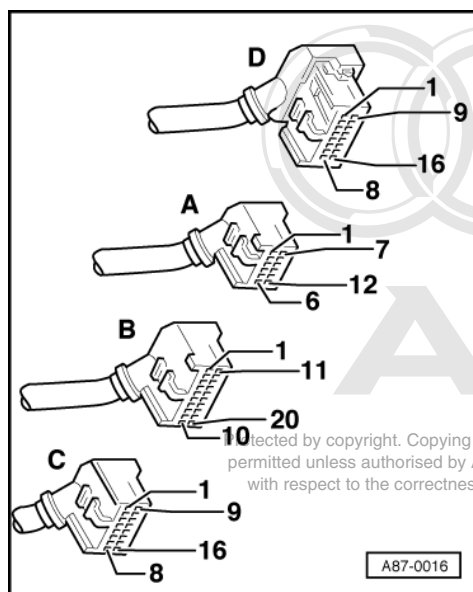
If the LED does not illuminate:

- Check wiring between contact 2 of connector and earth connection in wiring harness on right of engine compartment for open circuit and repair if necessary.

=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

Note:

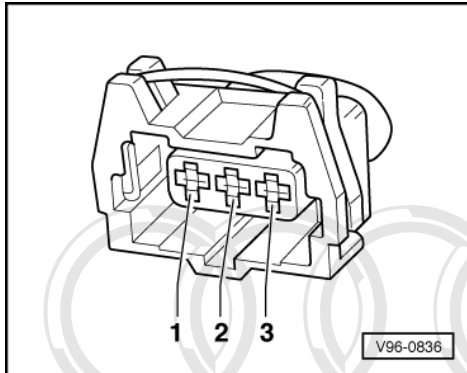
Use only gold-plated contacts when repairing the contacts in the plug connectors.



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Checking signal wiring for air mass meter

- -> With ignition switched off, use adapter V.A.G 1598/11 to connect test box V.A.G 1598 A to engine control unit connector A only (control unit remains disconnected) => Page 81 .



- -> Check for open circuit and short to positive or earth in the following wiring connections:

Connector Contact	Test box V.A.G 1598 A Socket
1	42

- Rectify any open/short circuit as necessary.

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- If the wiring is OK, fit a new air mass meter (G70).

Checking signal voltage

Test requirements:

- Wiring OK
- Air mass meter connected
- Electrical consumers switched off (radiator fan must not run during the test)
- Push back rubber grommet at connector of air mass meter
- Connect multimeter to contacts 1 and 2 of air mass meter connector to measure the voltage.

Note:

Pin assignment is marked on back of connector.

- Switch the ignition on.
 - Specification: 0.3 ... 1.1 V
- Start engine and run at idling speed.
- Increase engine speed and observe change in voltage.
 - Specification:
 - With increasing engine speed, and thus increasing air throughput, signal voltage increases proportionally up to approx. 3.4 V at 4000 rpm.

If voltage does not change, or if voltage dips with increasing engine speed:

- Replace air mass meter.



2 - Checking intake manifold changeover function

2.1 - Checking intake manifold changeover function

This test should only be carried out if the engine is losing power.

The intake manifold change over function switches over from the long intake tract to the short intake tract at about 4000 rpm.

2.2 - Check function

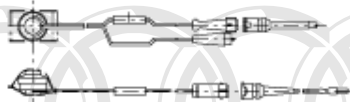
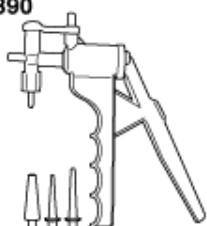
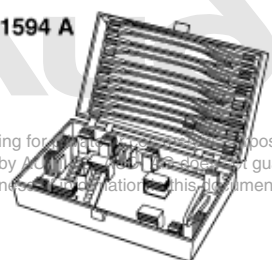
- Increase the engine speed to well above 4000 rpm: the vacuum unit for the intake manifold change over system must respond. (Fitting location: (on the intake manifold, at the rear)

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If the changeover is not taking place, carry out the following tests:

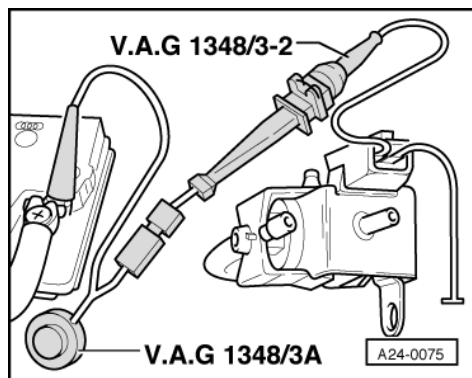
- Check intake manifold changeover valve -N156 (if necessary, check valve and actuation => Page 122).
- Checking vacuum system for leaks
=> Page 117
- Check that vacuum hoses are properly connected and free of leaks and obstructions.
- Check that changeover mechanism operates freely (move push rod by hand).

2.3 - Checking vacuum system for leaks

V.A.G 1348/3-2 	V.A.G 1348/3A 
V.A.G 1390 	V.A.G 1594 A  Protected by copyright. Copying for private use, in part or in whole, is not permitted unless authorised by Audi AG. Audi AG does not guarantee or accept any liability with respect to the correctness or completeness of this document. Copyright by AUDI AG.
	G24-0010

Special tools, testers and workshop equipment required

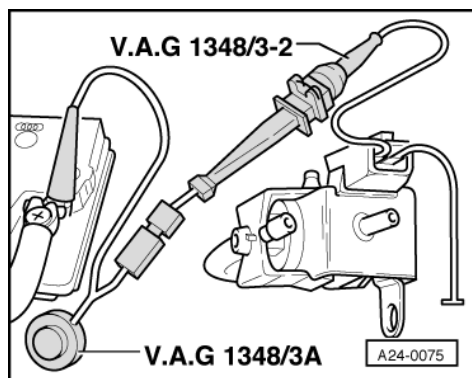
- ◆ V.A.G 1348/3-2
 - ◆ V.A.G 1348/3A
 - ◆ V.A.G 1390
 - ◆ V.A.G 1594 A
- Run engine at idling speed for 2 or 3 minutes to build up vacuum pressure.
 - Switch off ignition.
 - Unplug connector from intake manifold changeover valve -N156.



- ➔ Connect one of the contacts on the solenoid valve to engine earth using test leads and crocodile clamp from V.A.G 1594 A.
- Connect second contact on -N156 to positive using remote control V.A.G 1348/3A, adapter lead V.A.G 1348/3-2 and auxiliary cable.
- Operate remote control V.A.G 1348/3A approx. 2 to 3 minutes; throughout this period, the vacuum unit must remain energised.

If the vacuum unit returns to its original "rest" position, carry out the following test:

- Disconnect vacuum hoses from vacuum unit for intake manifold changeover system.
- Connect hand vacuum pump V.A.G 1390 to vacuum unit.
- Operate hand pump and check whether changeover function is working.
- Check vacuum unit for leaks. (The vacuum unit must not return to rest position until the hand pump is vented to atmosphere.)
- If necessary, replace vacuum unit.
- If the vacuum unit is not energised, check -N156 as follows for blockage:



- ➔ Connect one of the contacts of -N156 to engine earth using test leads and crocodile clamp from V.A.G 1594 A.
- Connect second contact on -N156 to positive using remote control V.A.G 1348/3A, adapter lead V.A.G 1348/3-2 and auxiliary cable.
- Operate remote control V.A.G 1348/3A.
- Check valve for obstructions (remove vacuum hoses and blow through).
- If necessary, replace intake manifold changeover valve.
- If no faults have been found in any of the tests so far, check the vacuum system for leaks.

2.4 - Checking intake manifold changeover valve -N156



Special tools, testers and workshop equipment required

- ◆ V.A.G 1526 A
- ◆ V.A.G 1527 B
- ◆ V.A.G 1594 A
- ◆ V.A.G 1598 A
- ◆ V.A.G 1598/11
- ◆ VAS 5051 with VAS 5051/1 and VAS 5051/2

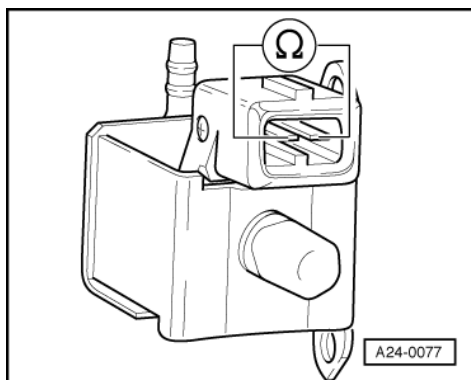
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- ◆ V.A.G 1551 with V.A.G 1551/1

Installation position => Installation position overview - Page **70**

Test requirements:

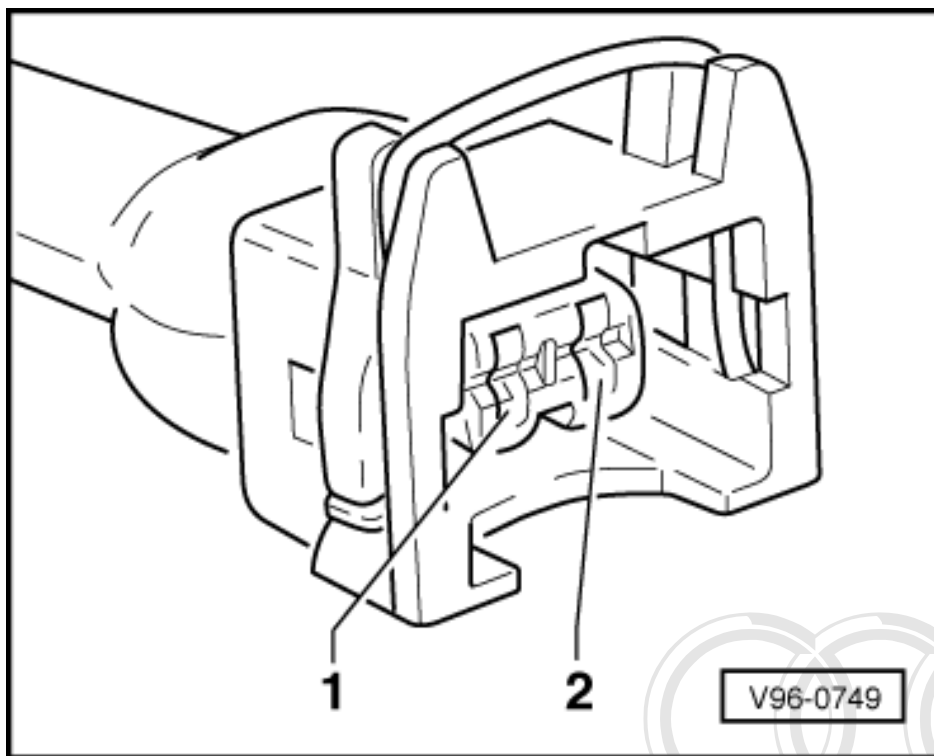
- Final control diagnosis has been performed



Checking internal resistance

- Unplug connector from intake manifold changeover valve -N156.
- -> Connect multimeter to valve to measure resistance
 - Specification: 25 ... 35 ω
- If the reading does not match the specification, replace intake manifold changeover valve -N156.

Checking power supply



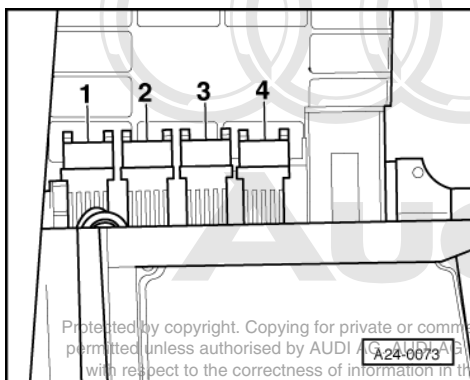
- Unplug connector from intake manifold changeover valve -N156.
- -> Connect voltage tester V.A.G 1527 B as follows:

Connector Contact	Measure to
1	Engine earth

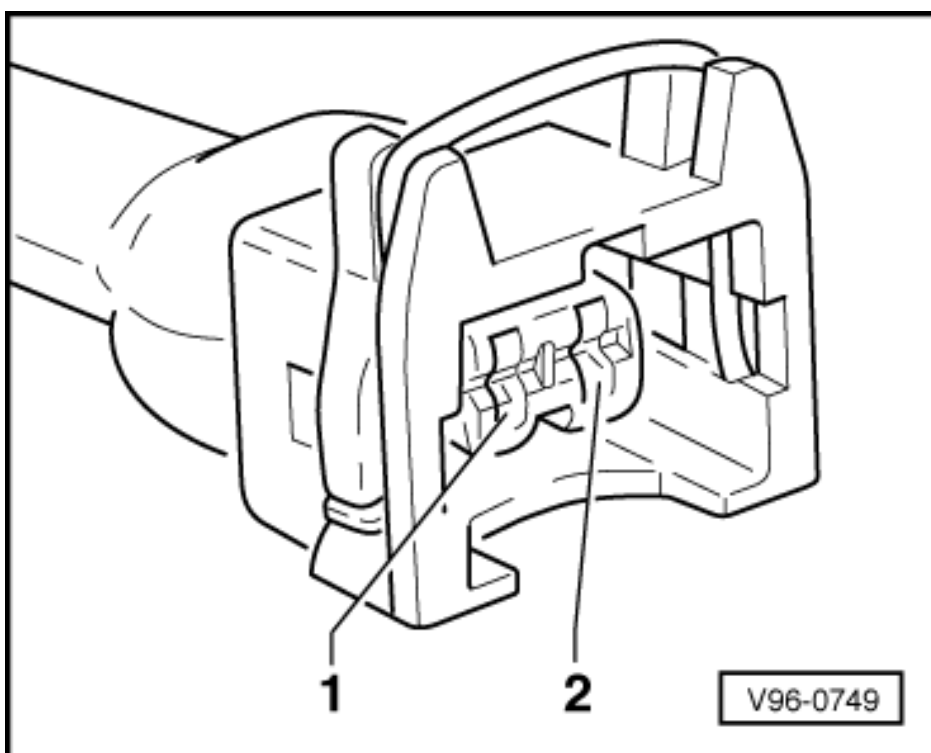
- Start final control diagnosis => Page 23 and actuate fuel pump relay -J17.
- The LED must illuminate.

If the LED does not illuminate:

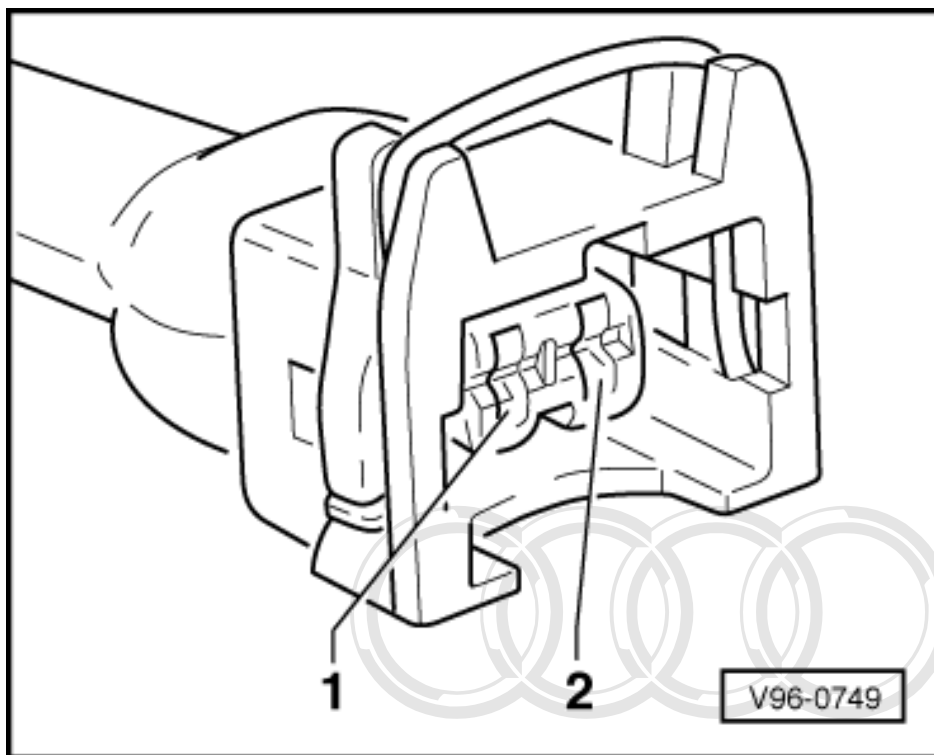
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- Carry out the following tests (marked with dots):
- -> Fuse S73 (in brown holder -2- in passenger-side footwell electronics box) OK.



- -> Check for open circuit between contact 1 on connector and fuse in fuse holder .
- => "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder
- Check fuel pump relay =>Page 98 .

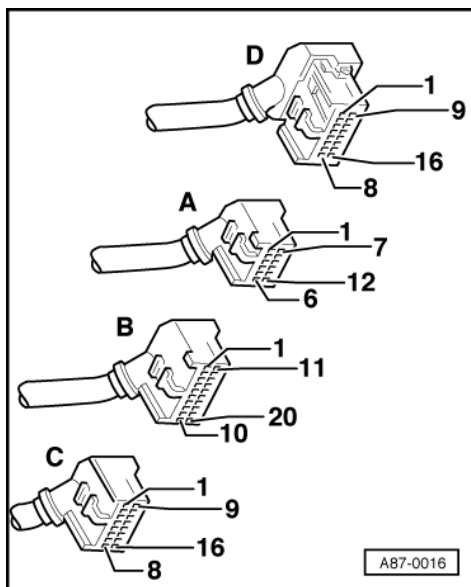


Checking actuation

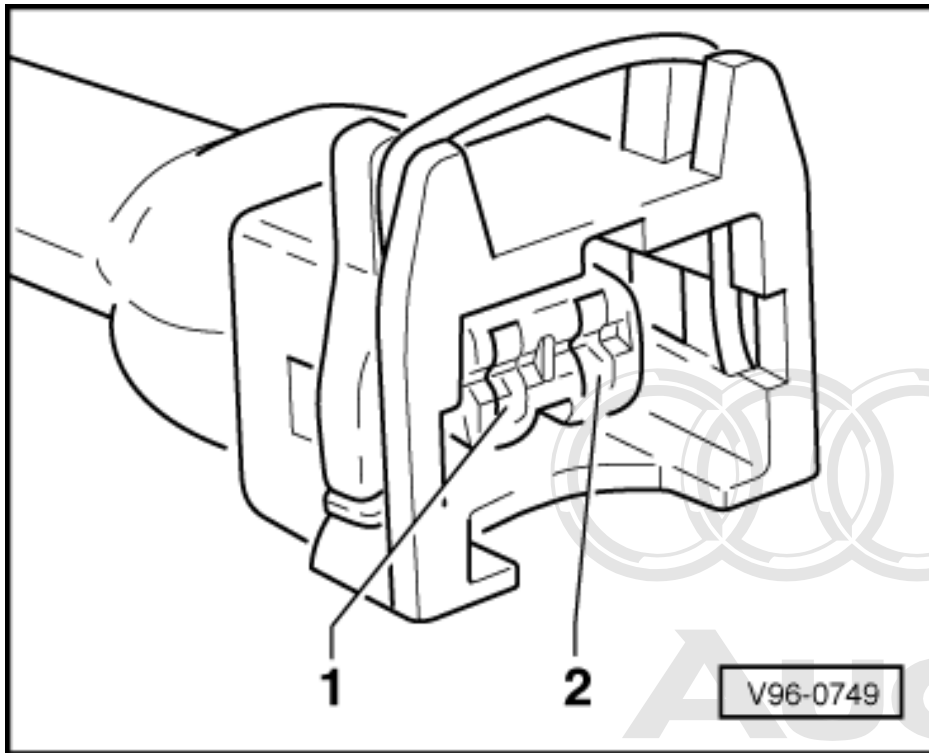
- -> Connect up voltage tester V.A.G 1527 B between contacts 1 and 2.
- Start final control diagnosis => Page 23 and actuate the intake manifold changeover valve.
- The LED must flash:

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



- -> With ignition switched off, use adapter V.A.G 1598/11 to connect test box V.A.G 1598 A to engine control unit connector C only (control unit remains disconnected) => Page 81 .



- -> Check for open circuit and short to positive or earth in the following wiring connections:

Connector Contact	Test box V.A.G 1598 A Socket
2	3

- Rectify any open/short circuit as necessary.

=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

- If the wiring is OK, fit a new engine control unit => Page 82 .

3 - Test lambda control

3.1 - Test lambda control

Note:

The lambda probe compares the oxygen content in the air with the residual oxygen content in the exhaust gas and sends a voltage signal to the control unit.

The voltage signal for "Rich mixture" (low level of residual oxygen) is at approx. 0.6 ... 1.0 V.

The voltage signal for "Lean mixture (high level of residual oxygen) " is at approx. 0.0 ... +0.3 V.

A voltage jump from 0.6 ... 1.0 V to 0.0 ... +0.3 V and vice versa occurs during the transition from "rich" to "lean" and vice versa ($\lambda = 1.0$).

Because of the sharp voltage jump the lambda control cannot maintain a constant ideal mixture composition of $\lambda = 1.0$. The system fluctuates continuously between "slightly too lean" and "slightly too rich".

If the voltage does not change or only changes slowly the following faults are possible:

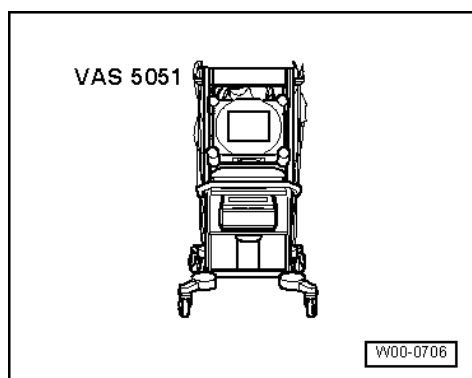


- ♦ Slots or holes in probe head are blocked.
- ♦ Lambda probe has been subjected to excessive thermal stress.
- ♦ Contact resistance in signal wiring.
- ♦ Lambda probe too cold; lambda probe heating not working.
- ♦ Lambda control switched off (control unit has detected a fault in the injection system => interrogate fault memory and individual measured value, channel 02 and 03 or read measured value block, display group 010).
- ♦ Lambda probe damaged by contact spray or similar product (the contact spray is drawn into the Lambda probe via the fine cavities in the electrical wiring as a result of temperature fluctuations and capillary effects).
- ♦ Lambda probe damaged by silicone vapours (the engine draws in traces of any silicone based sealants that may have been used. The silicone does not burn and damages the lambda probe).

3.2 - Checking function of lambda probes

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Special tools, testers and workshop equipment required



- ♦ VAS 5051 with VAS 5051/1 and VAS 5051/2

or

- ♦ V.A.G 1551 with V.A.G 1551/1

3.3 - Vehicles with control unit no. 4A0 906 266/A/AA/AB (ä 08.92)

Test sequence

- Perform basic setting
=>Page 25

-> Indicated on display:

Default setting 0						
1	2	3	4	5	6	7
8	9	10				

Do not proceed with the test until the coolant temperature shown in display zone 1 has reached the displayed value of at least 135 (85 °C).

- Press the ➡key.

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	

- Enter "09" to select the function "Reading measured value block" and confirm entry with Q key.
- Enter "02" to select "Channel number 02" and confirm entry with the Q key.

-> Indicated on display:

Read individual measured value Channel 02 Measured value XX

The signal voltage for lambda probe 1 is shown in channel 02.

- Press C key.
- Enter "03" to select "Channel number 03" and confirm entry with the Q key.

-> Indicated on display:

Reading individual measured value Channel 03 Measured value XX
--

The signal voltage for lambda probe 2 is shown in channel 03.

- If the lambda probe voltage fluctuates very slowly, test the lambda probe heating => page 127 .
- If the display shows a constant 0 (lambda probe voltage of 0.000 V) - short circuit to earth; check wiring => Page 130 .
- If constant 35 ... 45 (lambda probe voltage 0.35 ... 0.45 V is displayed, there is an open circuit in the signal wiring; check wiring => Page 130 .
- If the display shows a constant 255 (lambda probe voltage of 2.550 V), check wiring connection => Page 130 .
- If constant 0 ... 30 is displayed (0.0 ... 0.3 V; mixture too lean), the mixture control has reached the control stop in the "enrich" direction but the lambda probe still detects "mixture too lean".
- If constant 70 ... 110 is displayed (0.7 ... 1.1 V; mixture too rich), the mixture control has reached the control stop in the "lean" direction but the lambda probe still detects "mixture too rich".

3.4 - Vehicles with control unit no. 8A0 906 266 B (09.92 >)

Test sequence

- Reading measured value block, Display group 001, engine at idling speed =>Page 40 .

-> Indicated on display:

Reading measured value block 1
1 2 3 4

Do not proceed with the test until the coolant temperature shown in display zone 1 has reached at least 85 oC.

- Press C key.
- Enter "010" to select "Display group 010" and confirm entry with the Q key.

-> Indicated on display:

Reading measured value block 10
1 2 3 4

Display zone 3 will show the signal voltage for lambda probe 1.

Display zone 4 will show the signal voltage for lambda probe 2.

- If the lambda probe voltage fluctuates very slowly, test the lambda probe heating => page 127 .
- If the display shows a constant lambda probe voltage reading of 0.000 V, there is a short circuit to earth; check wiring => Page 130 .
- If a constant lambda probe voltage of 0.35 ... 0.45 V is displayed, there is an open circuit in the signal wiring; check the wiring => Page 130 .
- If the display shows a constant lambda probe voltage reading of 2.550 V, there is a short circuit to positive; check wiring => Page 130 .

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- If the display shows a constant voltage reading of 0.0 ... +0.3 V (mixture too lean), this means that the lambda control has reached the control stop in the "enrich" direction, but the lambda probe is still registering "Mixture too lean".
- If the display shows a constant voltage reading of 0.7...1.1 V (mixture too rich), this means that the lambda control has reached the control stop in the "lean" direction, but the lambda probe is still registering "Mixture too rich".
- Press C key.

-> Indicated on display:

Reading measured value block	Q
Enter display group number XXX	

- If the lambda probe is functioning properly, select display group 005/006 and check the lambda learned values =>Page 47 .

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-> Indicated on display:

Reading measured value block 5
1 2 3 4

Display zone 1 will show the lambda learned value at idle for cylinder bank 1.

-> Indicated on display:

Reading measured value block 6
1 2 3 4

Display zone 1 will show the lambda learned value at idle for cylinder bank 2.

The lambda control is adaptive, i.e. it has a learning capability. Faults such as unmetered air or defective injectors have the effect of changing the air/fuel mixture composition. The lambda probes detect this and compensate by adjusting the basic injection periods programmed in the maps. The injection periods are extended or reduced until a " $\lambda = 1$ " mixture composition is achieved. The difference between the actual injection period and the basic period programmed in the map is given as a percentage.

- ♦ Positive learned value (+...%): Pre-programmed basic injection period is too short, actual injection period ... % longer in order to achieve a " $\lambda = 1$ " mixture composition.
- ♦ Negative learned value (-...%): Pre-programmed basic injection period is too long, actual injection period ... % shorter in order to achieve a " $\lambda = 1$ " mixture composition.

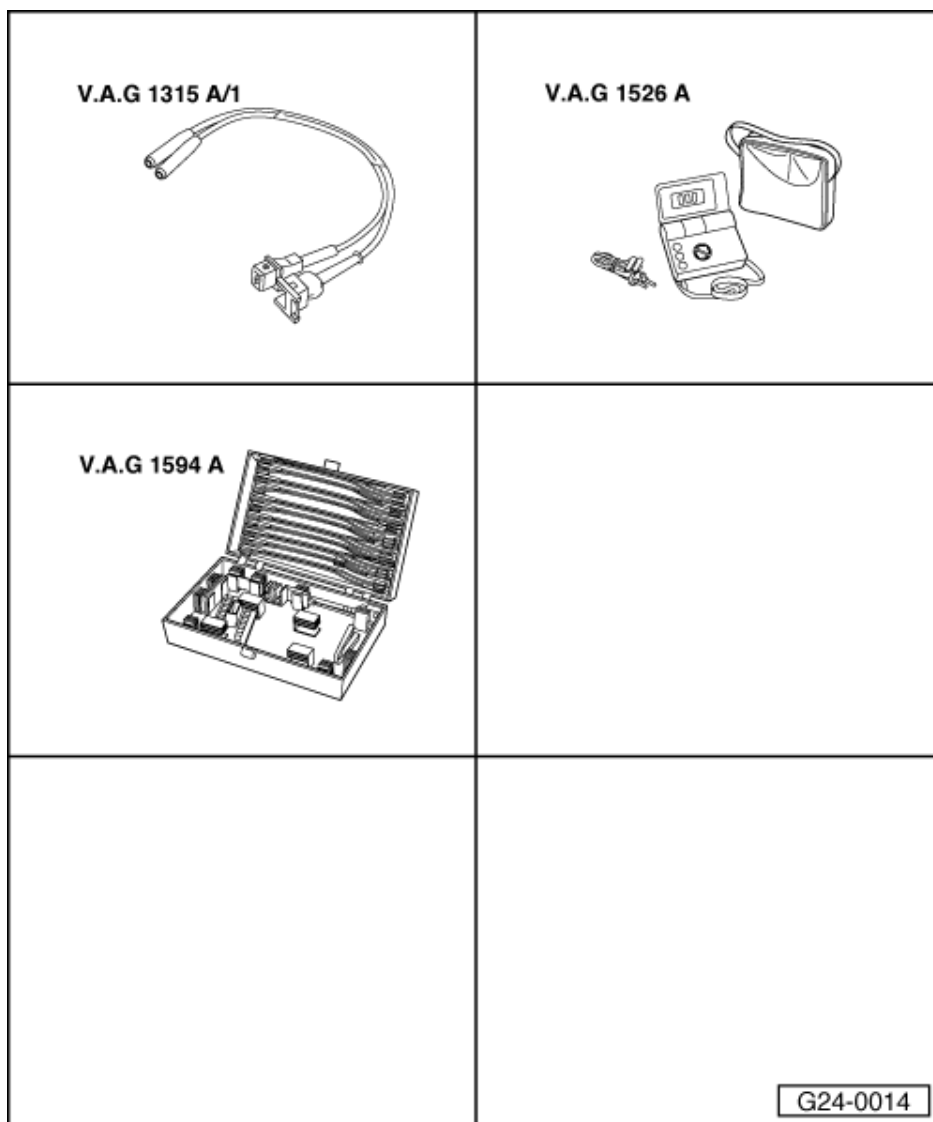
Specifications: Read measured value block => Page 52 .

- If the specified values are not obtained: Test table display group 007 =>Page 50

Note:

If necessary, display group 007 can also be checked and printed out in the "Basic setting" mode (function 04) for the purposes of fault finding. This function excludes, for example, the influence of the ACF =>Page 25 .

3.5 - Checking lambda probe heating



Special tools, testers and workshop equipment required

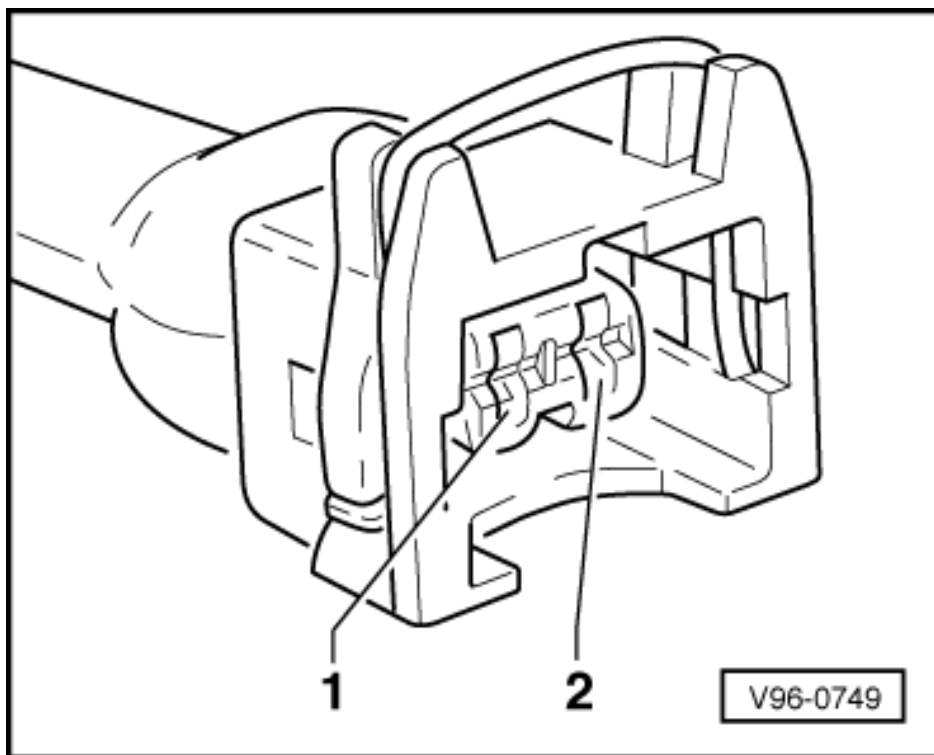
- ◆ V.A.G 1315 A/1
- ◆ V.A.G 1526 A
- ◆ V.A.G 1594 A

Note:

Checking operation:

►08.92=> basic setting display group 000, display zone 8, Page 25;

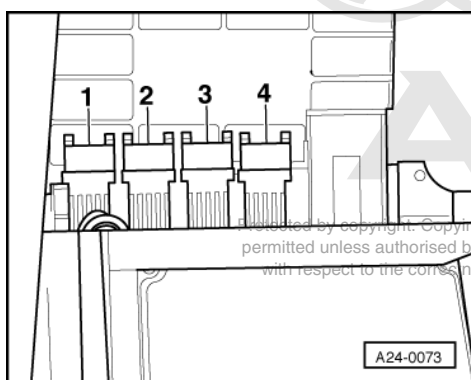
09.92 ►=> reading measured value block, display group 007 or 008, Page 49 onwards.



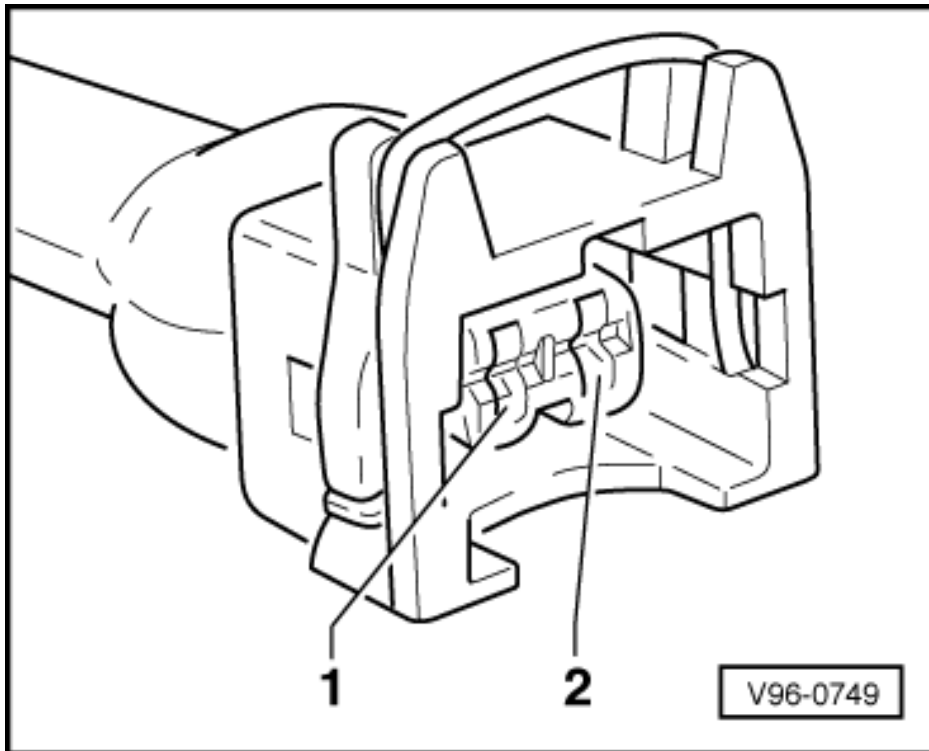
Test sequence

- Unplug Lambda probe connector for left hand or right hand cylinder bank.
(Installation position => Page 71)
- -> Connect multimeter to contacts 1 (positive) and 2 (earth) to measure voltage.
- Start the engine.
 - Specification: 12 ... 14 V

If the specification is not obtained:



- Carry out the following tests (marked with dots):
 - -> Check fuse S73 (in brown holder -2- in passenger-side footwell electronics box).



- -> Check for open circuit between contact 1 of connector and fuse in fuse holder (if necessary, check contact assignment).

=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

- Check wiring between contact 2 and engine earth for open circuit.
- Check fuel pump relay =>Page 98 .

If the specification is obtained:

- Connect auxiliary measurement lead V.A.G 1315 A/1 to the 2-way connector.
- Switch multimeter to 10 A measuring range (connect measurement lead to 10 A connection).
- Start engine and run at idling speed.
 - Specification: 0.5 ... 3.0 A

Note:

The current input decreases as the lambda probe becomes warmer.

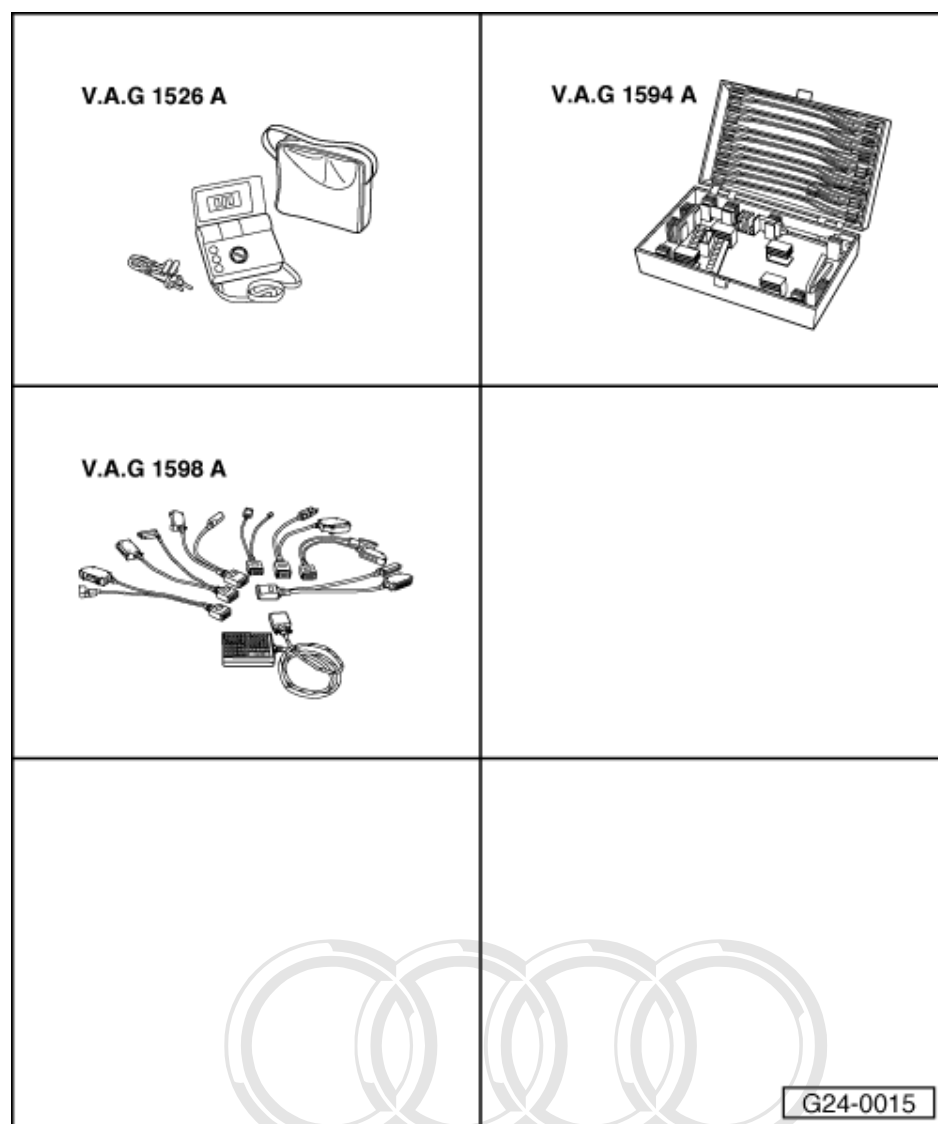
If the specification is not obtained:

- Fit a new Lambda probe.

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3.6 - Checking lambda probe and signal wire



Special tools, testers and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598 A
- ♦ V.A.G 1598/11

Note:

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Checking operation:

• 08.92=> basic setting display group 000, display zone 8, Page **25** ;

09.92 ➤=> reading measured value block, display group 007 or 008, Page **49** onwards.

Test sequence

- Unplug Lambda probe connector for left hand or right hand cylinder bank.
(Installation position => Page **71**)
- Connect multimeter between signal wire and engine earth to measure resistance.

- Specified value: $\infty \Omega$

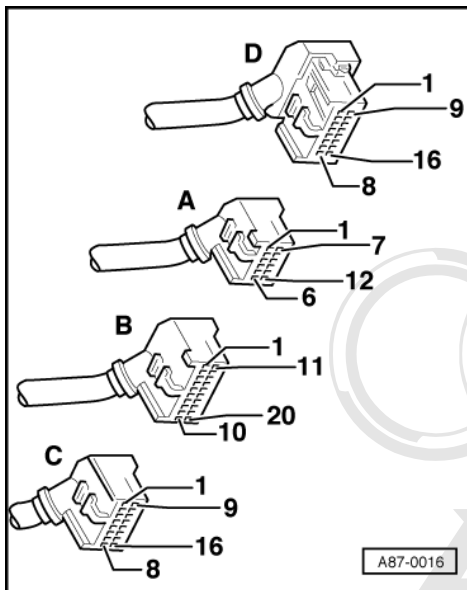
If the specification is not obtained:

- Fit a new Lambda probe.

If the specification is obtained:

- Connect up multimeter between connector of signal wire to engine control unit and engine earth to measure voltage.
- Switch the ignition on.
 - Specification: $400 \pm 50 \text{ mV}$.

If the specification is not obtained:



- -> With ignition switched off, use adapter V.A.G 1598/11 to connect test box V.A.G 1598 A to engine control unit connector A only (control unit remains disconnected) => Page 81.
- Check for open circuit and short to earth/positive or earth in the following wiring connections:

Signal wire	Test box V.A.G 1598 A Socket
Lambda probe bank 1 -G39	50
Lambda probe bank 2 -G108	48

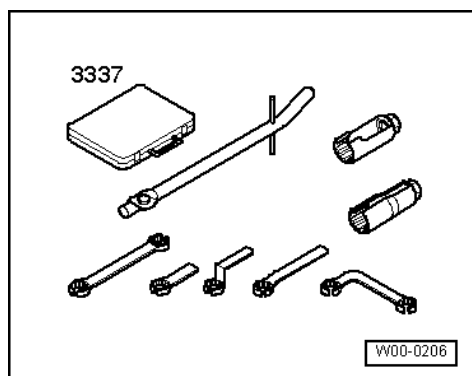
- Rectify any open/short circuit as necessary.

=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

- If the wiring is OK, fit a new engine control unit => page 82.

3.7 - Removing and installing lambda probe

Special tools, testers and workshop equipment required



- ♦ Set of ring spanners for lambda probe 3337
- ♦ Hot bolt paste G 052 112 A3

Work sequence

- Unplug Lambda probe connector for left hand or right hand cylinder bank.
(Installation position => Page 71)
- Open cable ties.
- Unscrew lambda probe.

When installing, note the following points:

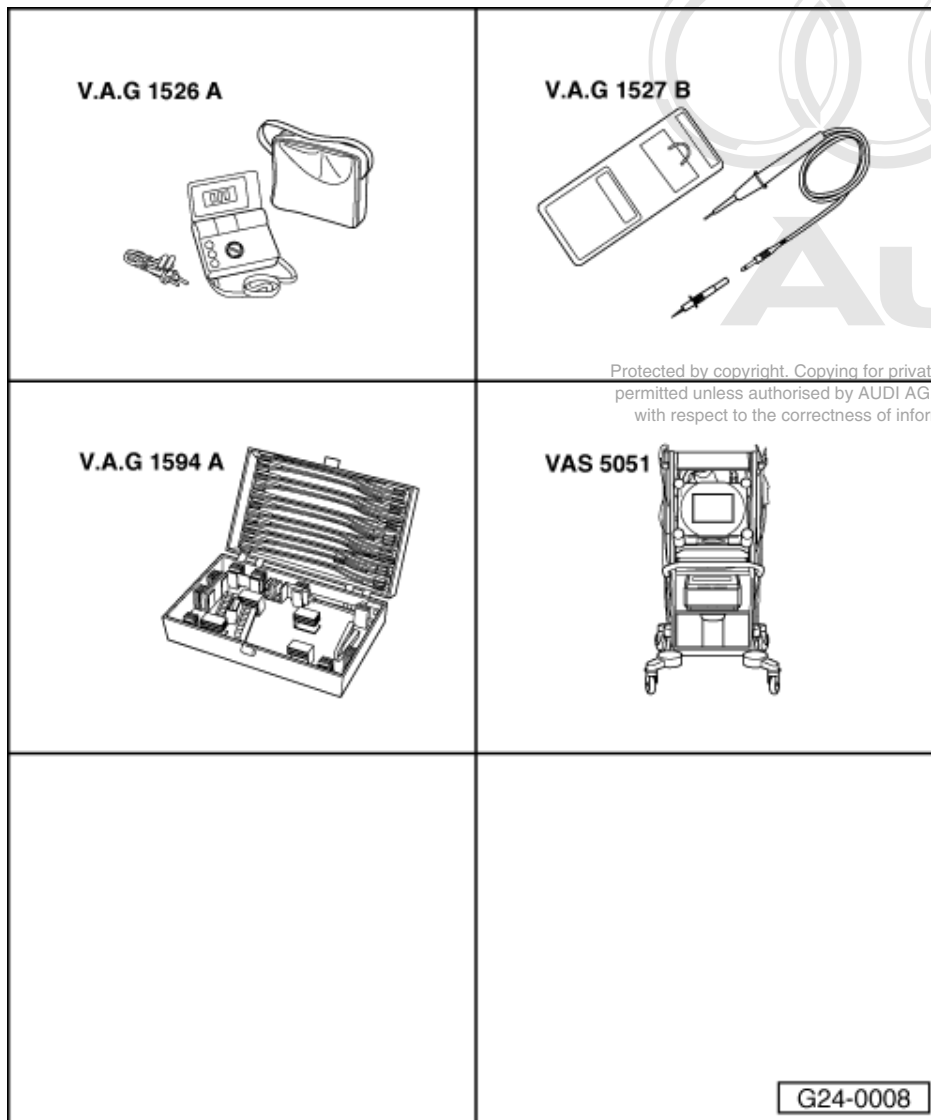
Note:

- ♦ Tightening torque 55 Nm.
- ♦ The screw thread on the lambda probe is coated with assembly paste. This paste must not be allowed to penetrate the openings on the probe.
- ♦ When installing, the cable ties must be refitted at exactly the same points in order to prevent contact between the Lambda probe wire and the exhaust pipe.

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4 - Checking fuel tank breather

4.1 - Checking fuel tank breather



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4.2 - Checking activated charcoal filter system solenoid valve 1 -N80

Special tools, testers and workshop equipment required

- ◆ V.A.G 1526 A
- ◆ V.A.G 1527 B
- ◆ V.A.G 1594 A
- ◆ VAS 5051 with VAS 5051/1 and VAS 5051/2

or

- ◆ V.A.G 1551 with V.A.G 1551/1

Installation position => Installation position overview - Page 70

Note:

Checking operation:

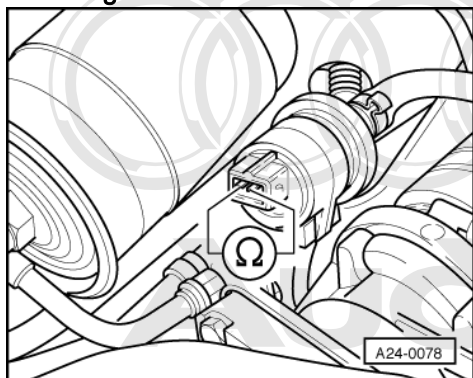
- 08.92 => Reading individual measured value, channel 06, Page 58 ;
- 09.92 ➤ => reading measured value block, display group 009, Page 51 .

Checking for leaks

ACF solenoid valve -N80 remains closed when deenergised.

- Disconnect hoses from ACF valve but leave the electrical connector plugged in.
- Start final control diagnosis => Page 23 and actuate ACF valve.
- While final control diagnosis is running, blow into solenoid valve to check whether it opens properly. If necessary, fit a new solenoid valve.

Checking internal resistance



- Unplug connector on ACF valve.
- ➤ Connect multimeter to valve to measure resistance.
- Specification: 20 ... 28 Ω

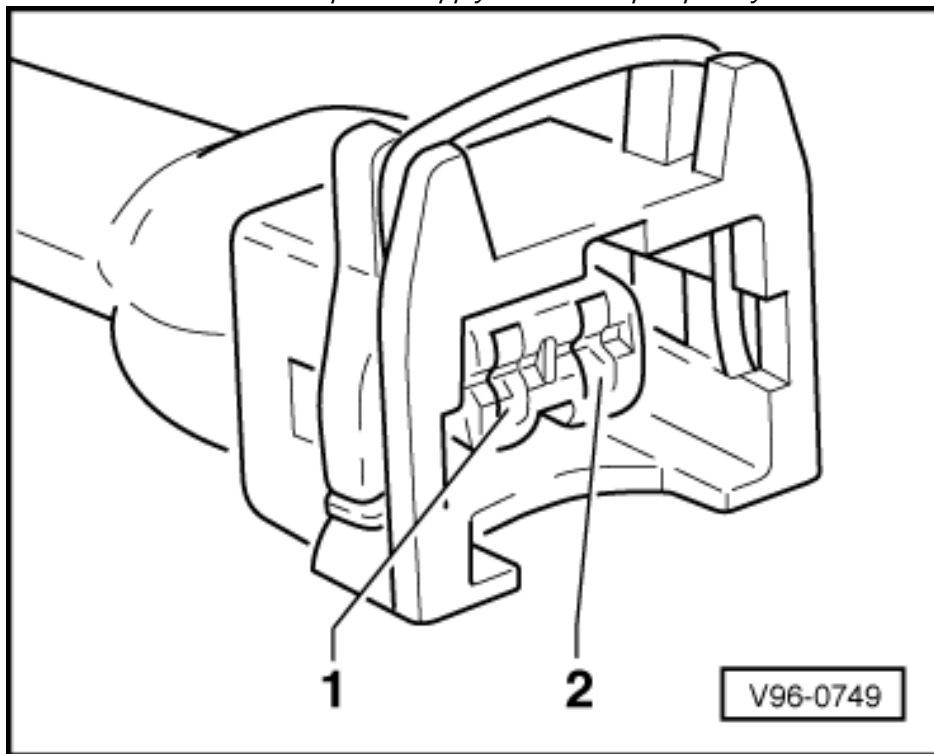
If the specification is not obtained:

- Fit a new ACF valve.

Checking power supply

Note:

The ACF valve receives its power supply via the fuel pump relay.

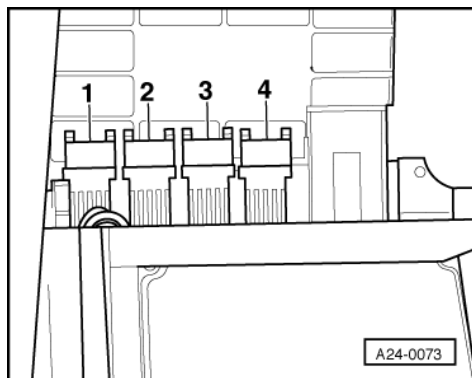


- Unplug connector on ACF valve.
- ➔ Connect voltage tester V.A.G 1527 B as follows:

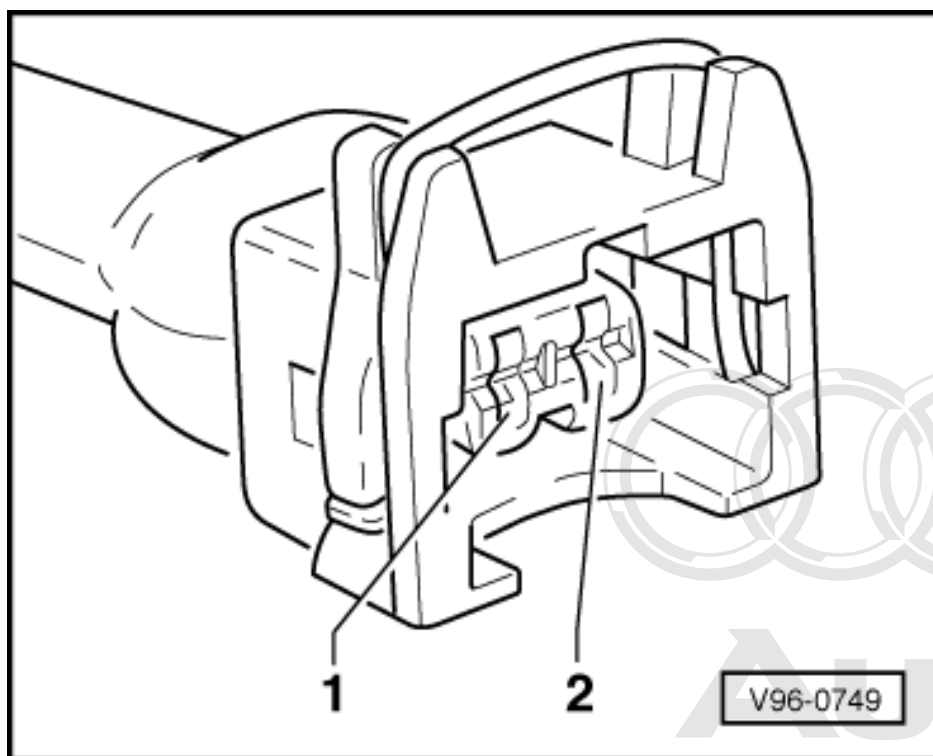
Connector contact	Measure to
1	Engine earth

- Start final control diagnosis => Page 23 and actuate fuel pump relay -J17.
- The LED must illuminate.

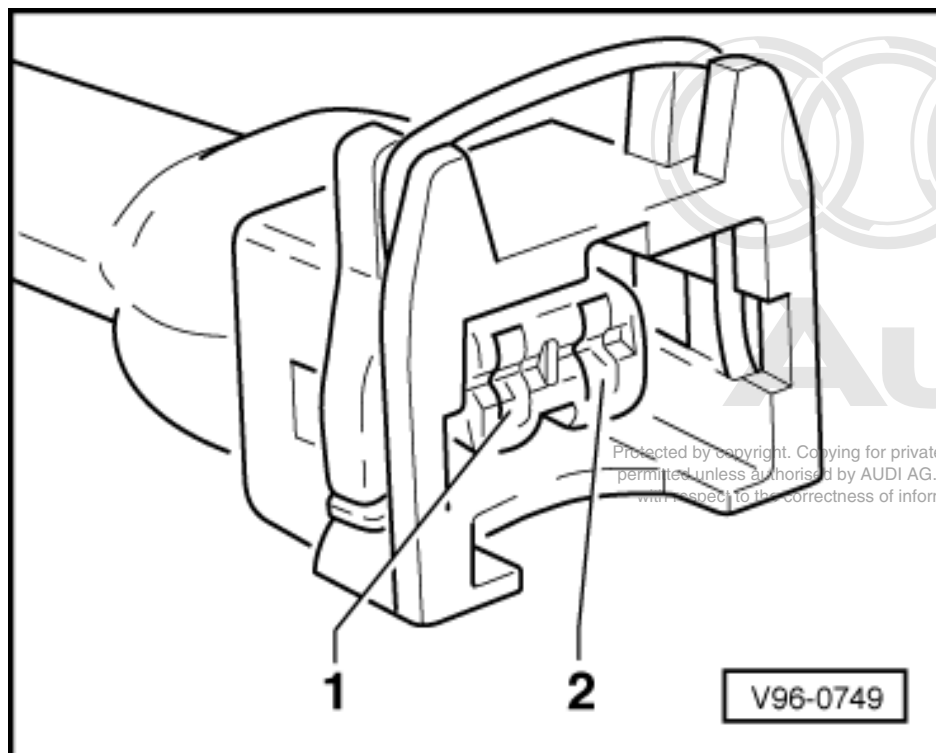
If the LED does not illuminate:



- Carry out the following tests (marked with dots):
- ➔ Fuse S73 (in brown holder -2- in passenger-side footwell electronics box) OK.



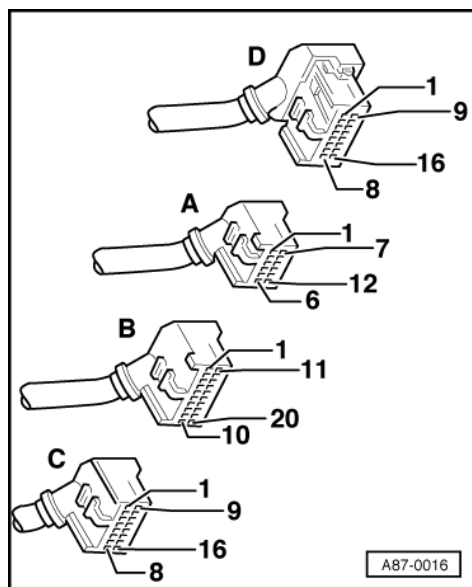
- ➔ Check for open circuit between contact 1 on connector and fuse in fuse holder
- => "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder
- Check fuel pump relay =>Page 98 .



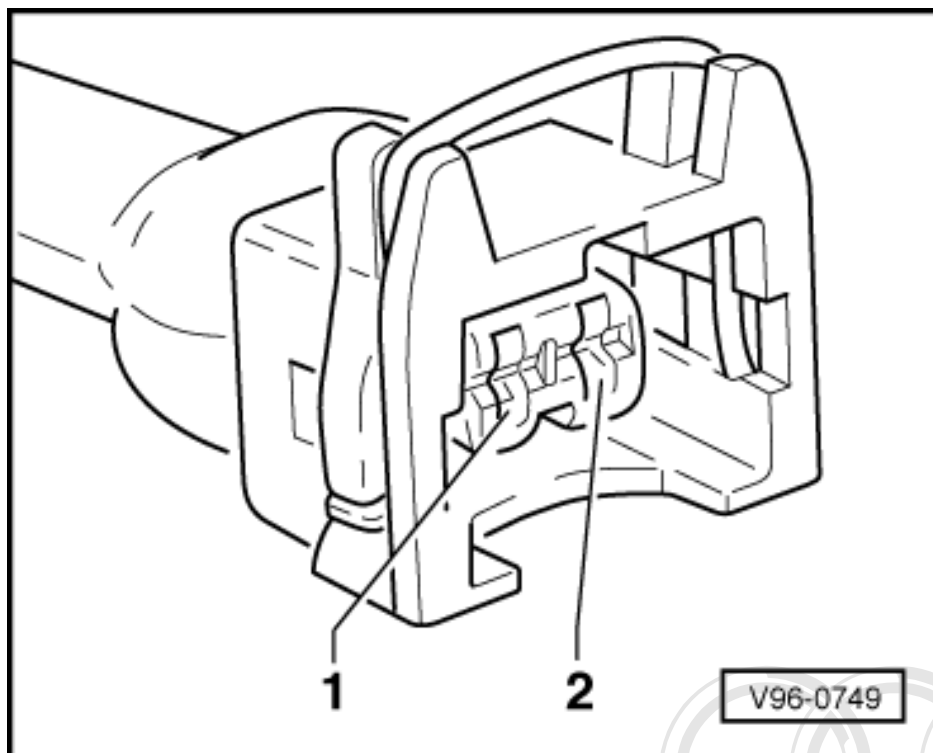
Checking actuation

- -> Connect voltage tester V.A.G 1527 B between contacts 1 and 2 using auxiliary cables from V.A.G 1594 A.
- Start final control diagnosis =>Page 23 and actuate ACF solenoid -N80.
 - The LED must flash.

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



- -> With the ignition off, use adapter V.A.G 1598/12 to connect test box V.A.G 1598 A to engine control unit connector D (control unit remains disconnected) => Page 81 .



- -> Check for open circuit and short to positive or earth in the following wiring connections:

Connector Contact	Test box V.A.G 1598 A Socket
2	12

- Rectify any open/short circuit as necessary.

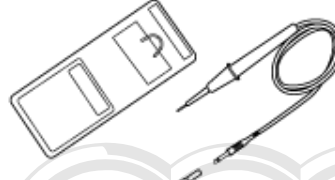
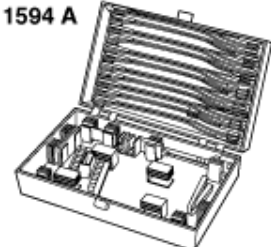
=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

- If the wiring is OK, fit a new engine control unit => [page 82](#)

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5 - Checking throttle valve potentiometer -G69

5.1 - Checking throttle valve potentiometer -G69

V.A.G 1526 A 	V.A.G 1527 B 
V.A.G 1594 A 	V.A.G 1598 A  Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.
	G24-0019

Special tools, testers and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1527 B
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598 A
- ♦ V.A.G 1598/11

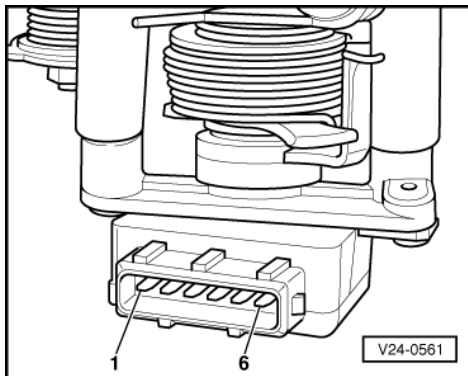
Installation position => Installation position overview - Page **70**

Note:

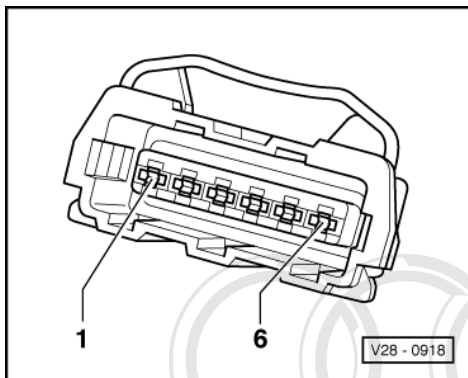
- ♦ The throttle valve potentiometer (G69) informs the engine control unit of the position of the throttle valve.
- ♦ Check function.
 - 08.92=> basic setting display group 000, display zone 10, Page **42**.

Checking internal resistance

- Pull connector off throttle valve potentiometer.



- ➔ Connect multimeter between contacts 1 and 2 to measure resistance.
 - Specification: 1.5 ... 2.6 kΩ
- Connect multimeter between contacts 2 and 3 to measure resistance.
 - Specification: 0.75 ... 1.3 kΩ
- Slowly move the throttle valve lever to full throttle position.
 - Specification: Increasing resistance up to max. 3.6 kΩ



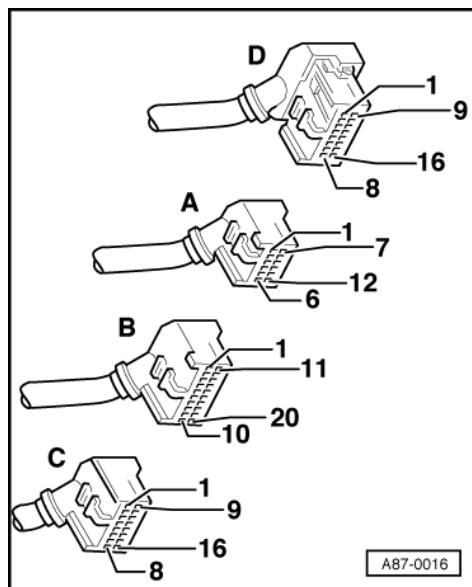
If a specification is not met:

- Replace throttle valve potentiometer.

Checking power supply

- Pull connector off throttle valve potentiometer.
- Switch the ignition on.
- ➔ Connect multimeter between contacts 1 (positive) and 2 (earth) to measure voltage.

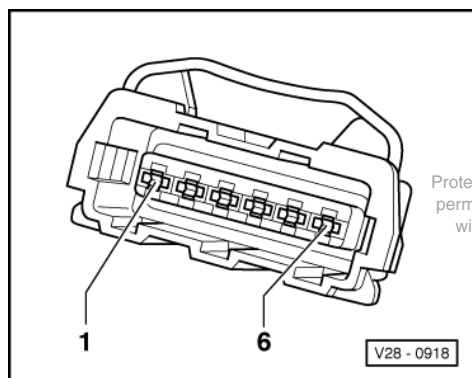
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- Specification: 4.5 ... 5.5 V
Connect multimeter between contacts 1 (positive) and 3 (signal) to measure voltage.
- Specification: 4.5 ... 5.5 V

If a specification is not met:

- -> With ignition switched off, use adapter V.A.G 1598/11 to connect test box V.A.G 1598 A to engine control unit connector A only (control unit remains disconnected) => Page 81 .



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- -> Check for open circuit and short to earth/positive or earth in the following wiring connections:

Connector Contact	Test box V.A.G 1598 A Socket
1	46
3	47

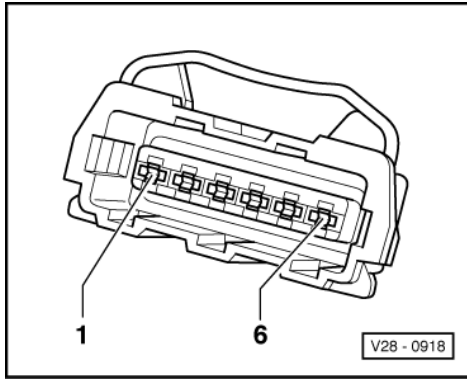
- Rectify any open/short circuit as necessary.

=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

Note:

Use only gold-plated contacts when repairing the contacts in the plug connectors.

If no wiring fault is detected:



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

Connector Contact	Measure to
2	Battery positive

- The LED must illuminate.

If the LED does not illuminate:

- Check wiring between contact 2 of connector and earth connection 1 in engine compartment wiring harness for open circuit and repair if necessary.

=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

Note:

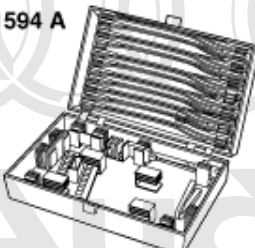
Use only gold-plated contacts when repairing the contacts in the plug connectors.

- If the wiring is OK, fit a new engine control unit => page **82**.

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5.2 - Checking idling switch -F60

V.A.G 1526 A 	V.A.G 1594 A 
V.A.G 1598 A 	Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.
	G24-0015

Special tools, testers and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598 A
- ♦ V.A.G 1598/11

Note:

- ♦ The idling switch is located in the throttle valve potentiometer.
- ♦ Check function.
 - 08.92=> basic setting display group 000, display zone 7, Page 42 .

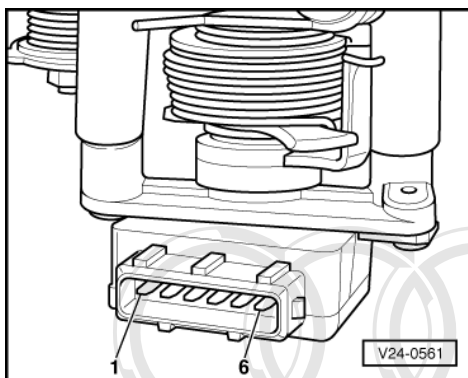
Test requirements:

- Throttle cable setting OK

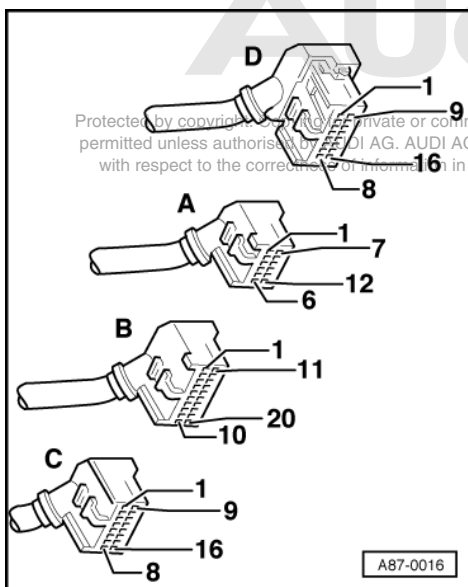
=> Repair Group 20

Test sequence

- Remove noise insulation.
- Pull connector off throttle valve potentiometer.



- ➔ Connect multimeter between contacts 4 and 6 to measure resistance.
- Specification: 0Ω
- Open throttle valve slightly.
- Specified value: $\infty \Omega$



If the specified values are not obtained:

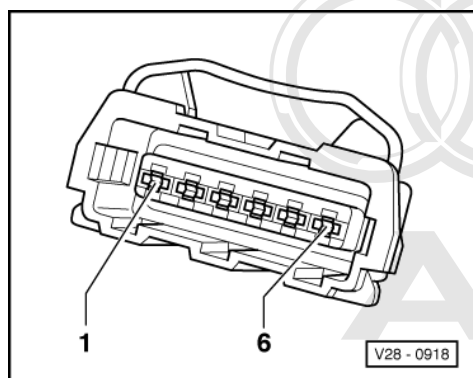
- Adjust idling switch =>Page 145 .

If the specifications are still not attained:

- Replace throttle valve potentiometer.

Checking wiring

- ➔ With ignition switched off, use adapter V.A.G 1598/11 to connect test box V.A.G 1598 A to engine control unit connector A only (control unit remains disconnected) => Page 81 .



- ➔ Check for open circuit and short to positive or earth in the following wiring connections:

Connector contact	Test box V.A.G 1598 A socket
6	49

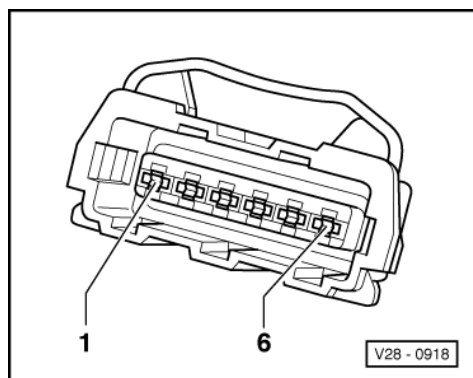
- Rectify any open/short circuit as necessary.

=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

Note:

Use only gold-plated contacts when repairing the contacts in the plug connectors.

If no wiring fault is detected:



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

Connector contact	Measure to
4	Battery positive

- The LED must illuminate.

If the LED does not illuminate:

- Check wiring between contact 4 of connector and earth connection 1 in engine compartment wiring harness for open circuit and repair if necessary.

=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

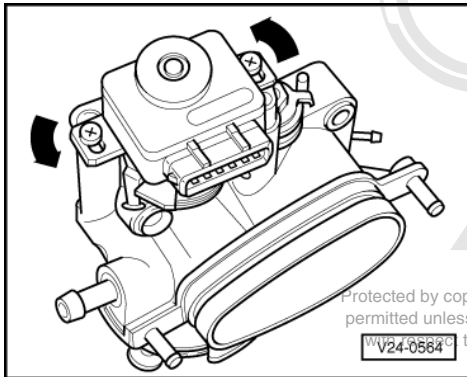
Note:

When installing noise insulation, pay particular attention to proper positioning of noise insulation at throttle valve unit so as to avoid unmetered air.

By way of verification, check output voltage of air mass meter for vehicle with control unit no. 8A0 906 266 B (09.92 ➤) 42.

Adjusting idling switch

- Remove the throttle valve unit.
- Slacken off both bolts of throttle valve potentiometer.



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- -> Turn throttle valve potentiometer in direction of arrow until a stop is felt.

Note:

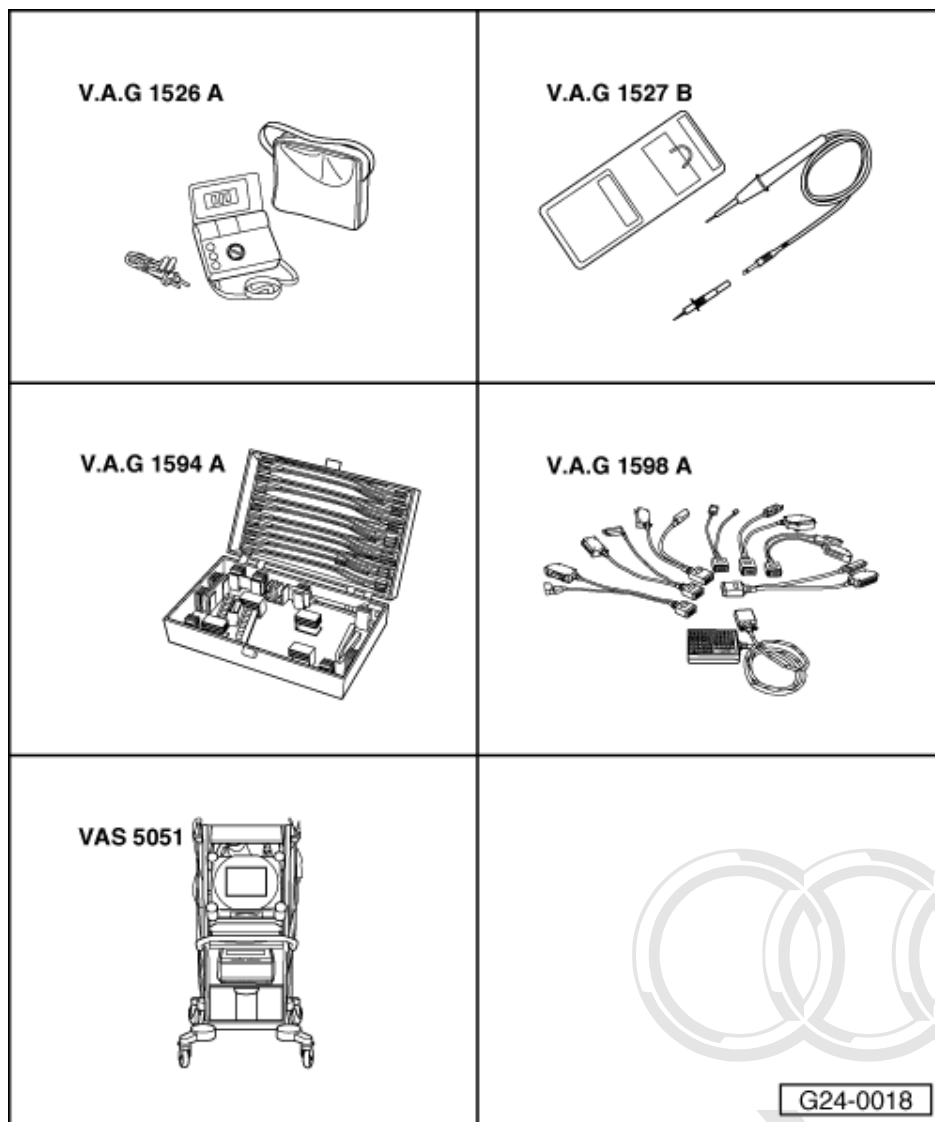
Do not move the throttle valve.

- Tighten bolts of throttle valve potentiometer in this position.
- Checking adjustment => Page 143.



6 - Checking EGR

6.1 - Checking EGR



6.2 - Checking EGR valve -N18

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Special tools, testers and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1527 B
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598 A
- ♦ V.A.G 1598/12
- ♦ VAS 5051 with VAS 5051/1 and VAS 5051/2

or

- ♦ V.A.G 1551 with V.A.G 1551/1

Installation position => Installation position overview - Page 70

Note:

Checking operation:

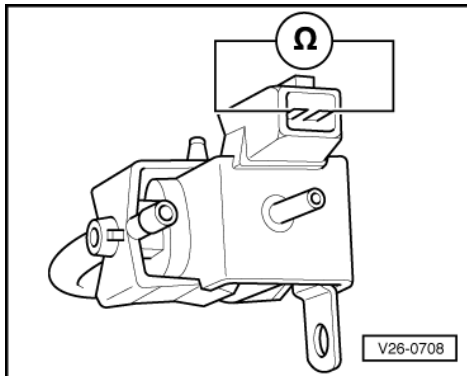
- 08.92 => reading individual measured value, channel 09, Page 58;
- 09.92 => reading measured value block, display group 017, Page 57.

Test requirements:

- Final control diagnosis has been performed

Checking internal resistance

- Pull connector off EGR valve -N18

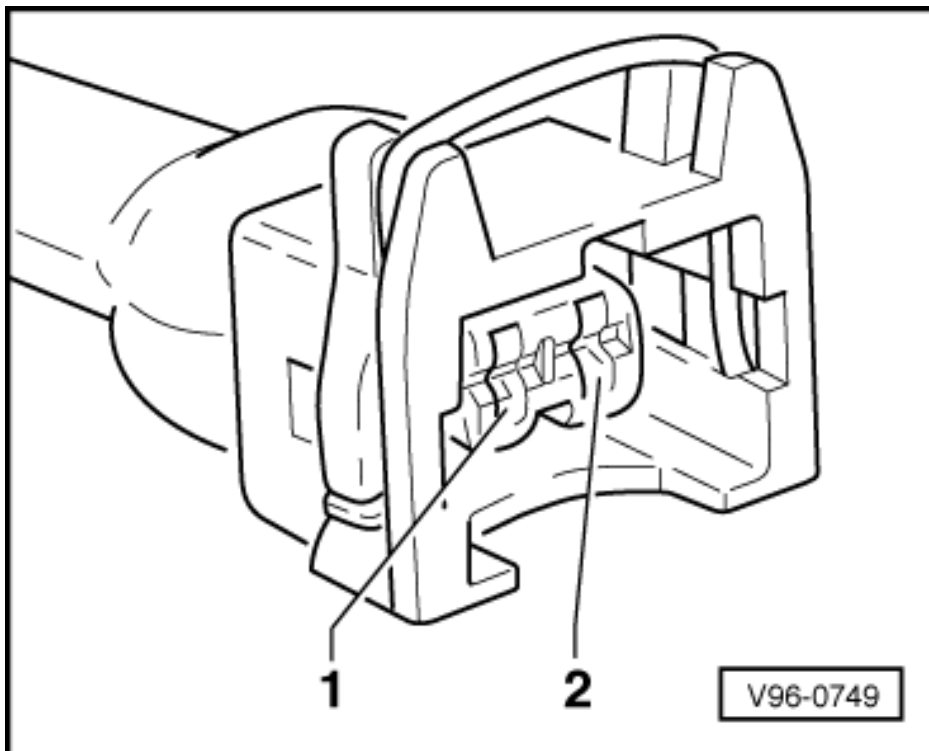


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- -> Connect multimeter to valve to measure resistance
 - Specification: 25 ... 35 ω
- If the specification is not met, replace EGR valve -N18.

Checking power supply

- Pull connector off EGR valve -N18



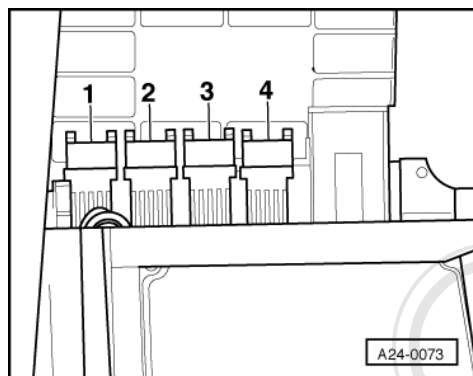


- -> Connect voltage tester V.A.G 1527 B as follows:

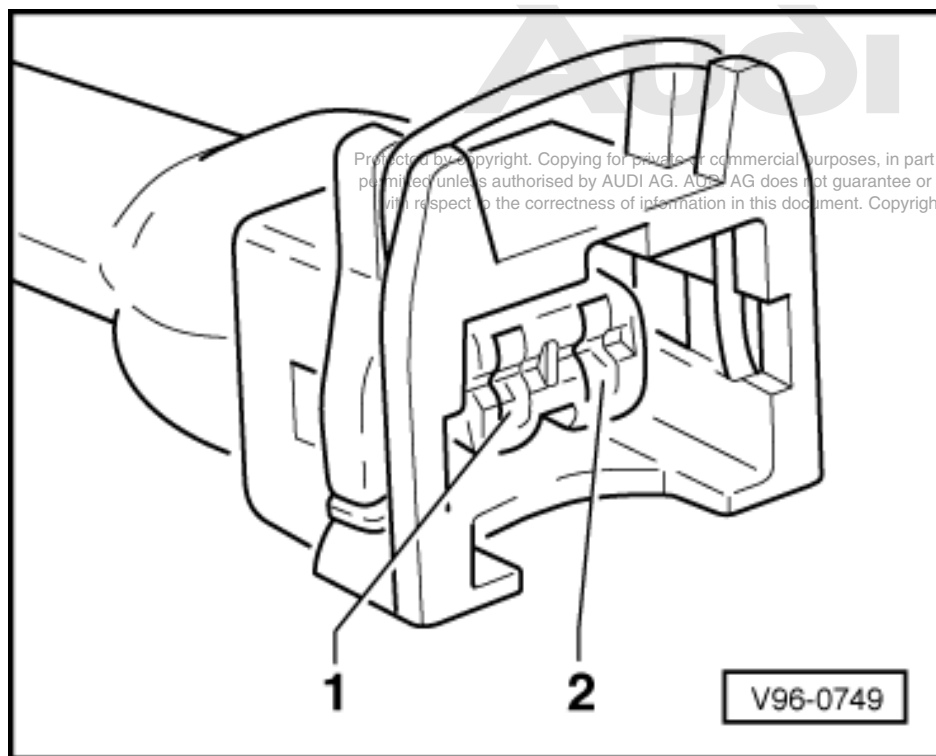
Connector Contact	Measure to
1	Engine earth

- Start final control diagnosis => Page **23** and actuate fuel pump relay -J17.
 - The LED must illuminate.

If the LED does not illuminate:



- Carry out the following tests (marked with dots):
 - -> Check fuse S73 (in brown holder -2- in passenger-side footwell electronics box).

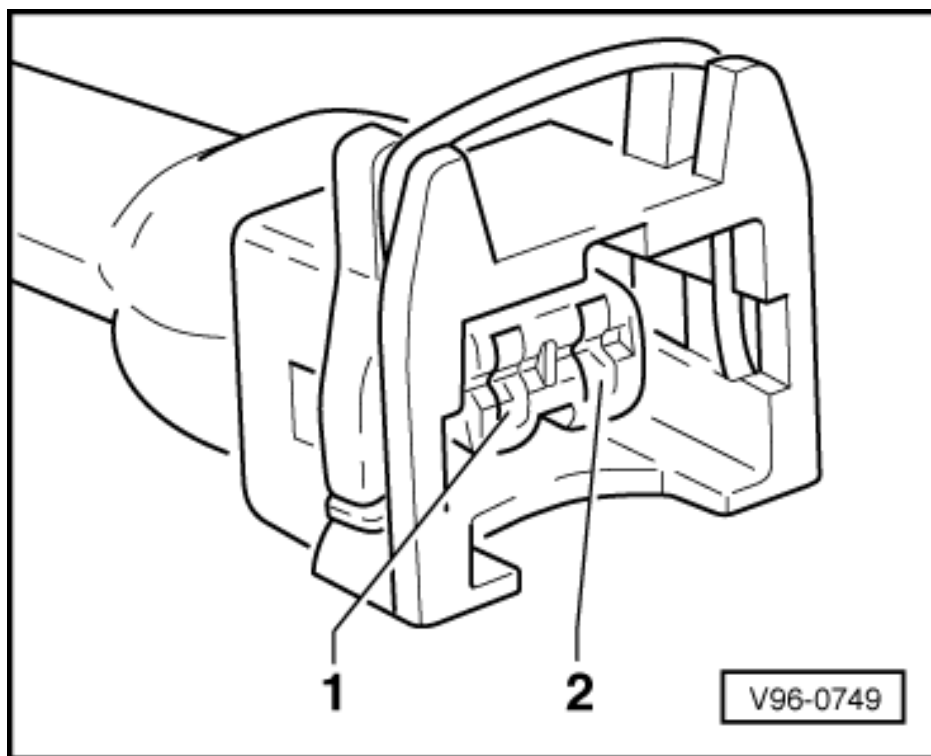


- -> Check for open circuit between contact 1 on connector and fuse in fuse holder.

=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

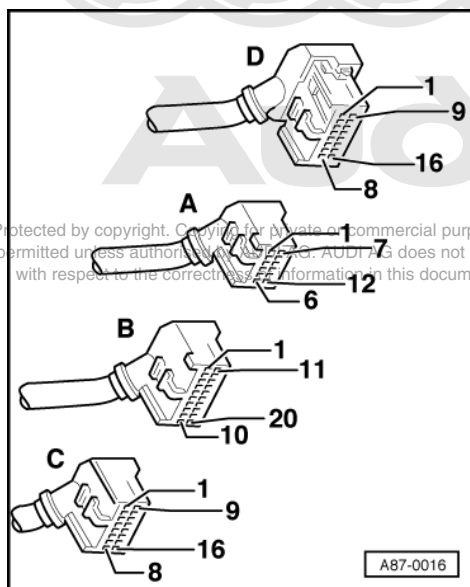
- Check fuel pump relay =>Page **98** .

Checking activation



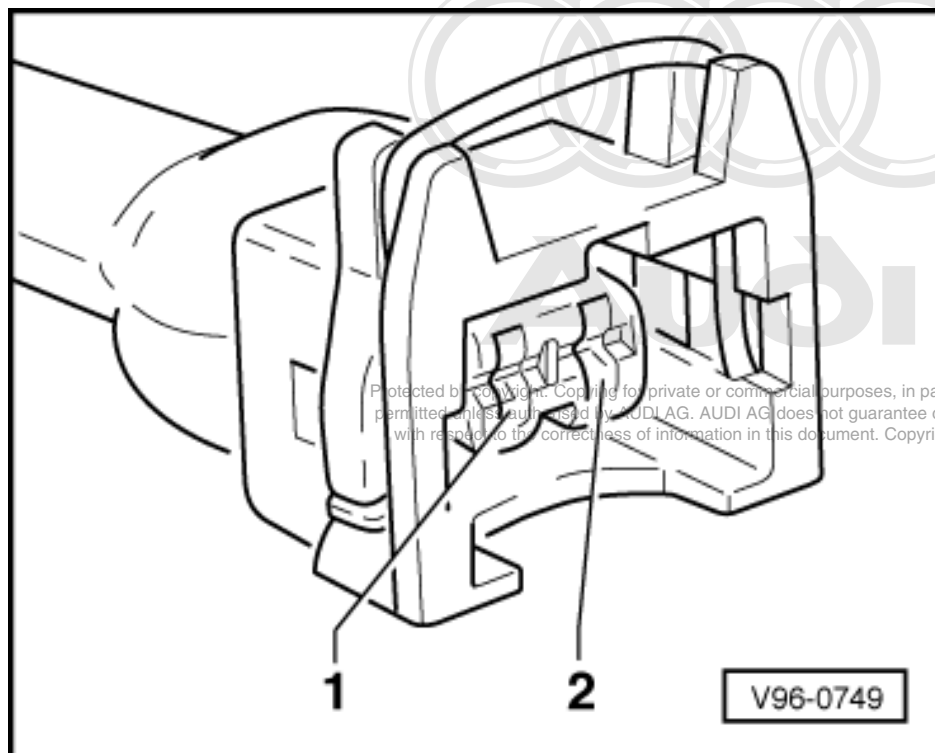
- -> Connect voltage tester V.A.G 1527 B to contacts 1 and 2 of connector.
- Start final control diagnosis => Page 23 and actuate EGR valve.
 - The LED must flash.

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



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- -> With the ignition switched off, use adapter V.A.G 1598/12 to connect test box V.A.G 1598 A to connector A only of engine control unit (control unit remains disconnected) => Page 81 .



- ➔ Check for open circuit and short to positive or earth in the following wiring connections:

Connector Contact	Test box V.A.G 1598 A Socket
2	14

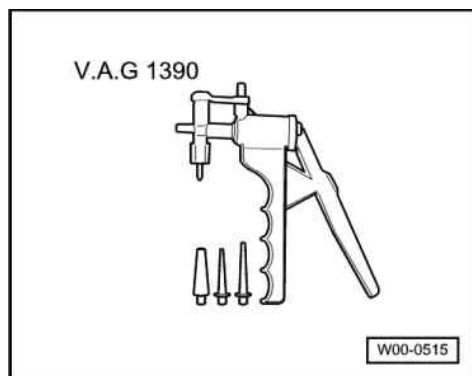
- Rectify any open/short circuit as necessary.

=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

- If the wiring is OK, fit a new engine control unit => page 82 .

6.3 - Test mechanical exhaust gas recirculation valve

Special tools, testers and workshop equipment required



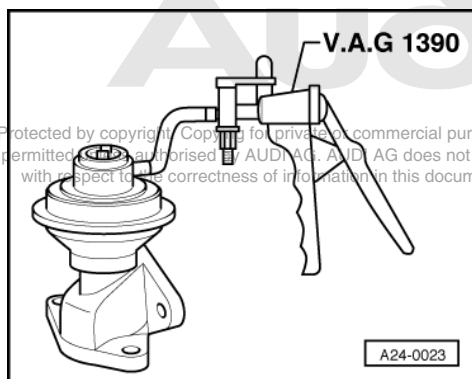
- ♦ V.A.G 1390

Test requirements:

- No leaks in vacuum pipes and intake manifold connections
- Vacuum pipes not blocked or kinked.
- Engine oil temperature at least 50 °C

Test sequence

- Start engine and run at idling speed.
- Pull vacuum hose off mechanical EGR valve.



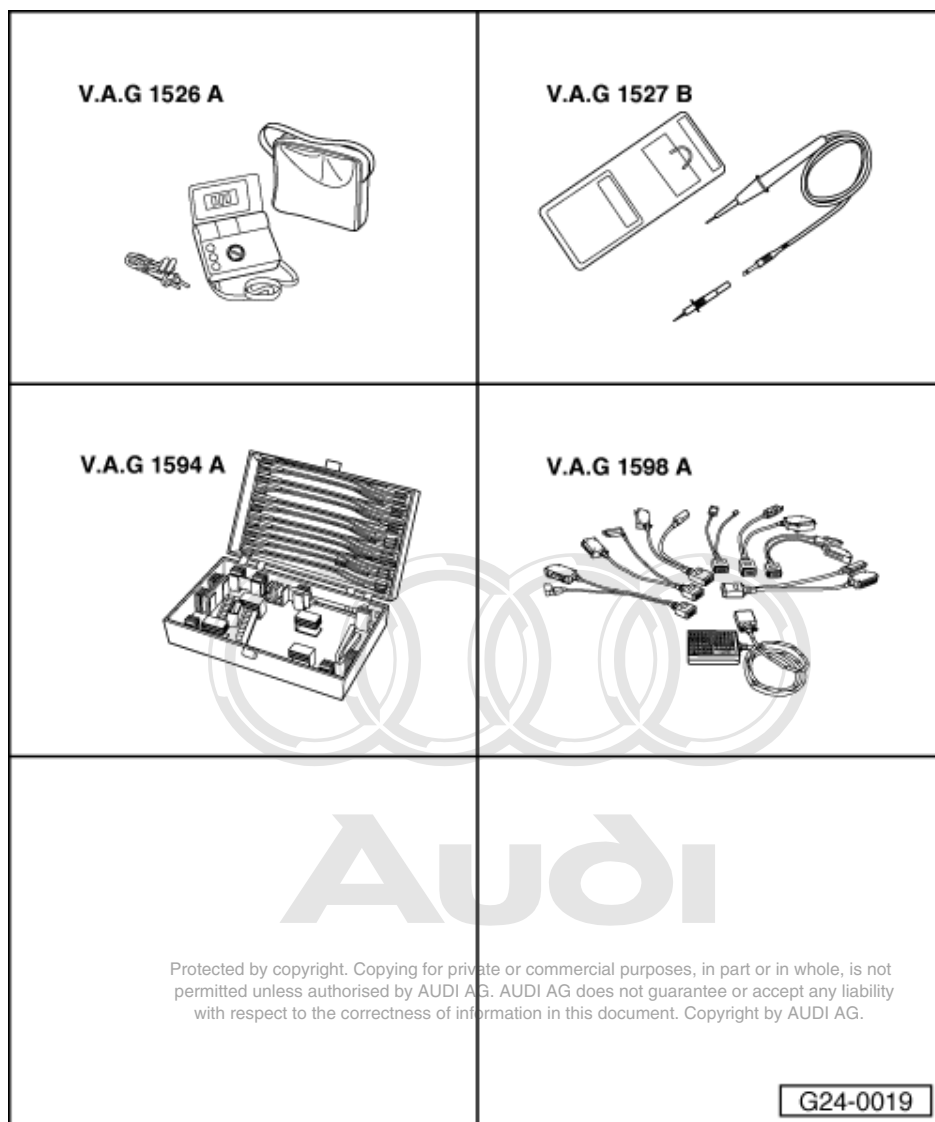
- -> Connect hand vacuum pump V.A.G 1390 to valve.
- Operate pump.
 - There must be a noticeable impairment of idling speed behaviour

If this is not the case:

- Check pipes and connections for clogging; if necessary, replace mechanical EGR valve.



6.4 - Checking EGR temperature sensor -G98



Special tools, testers and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1527 B
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598 A
- ♦ V.A.G 1598/11

Note:

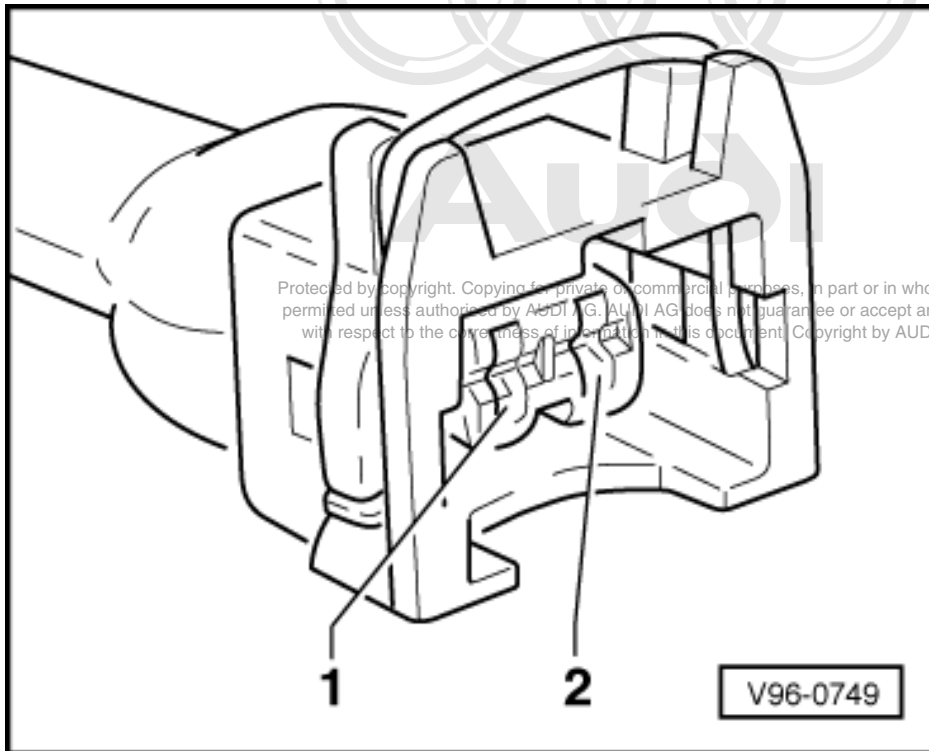
Check gear signal

▸08.92=> Reading individual measured value, channel 10, Page **58** ;

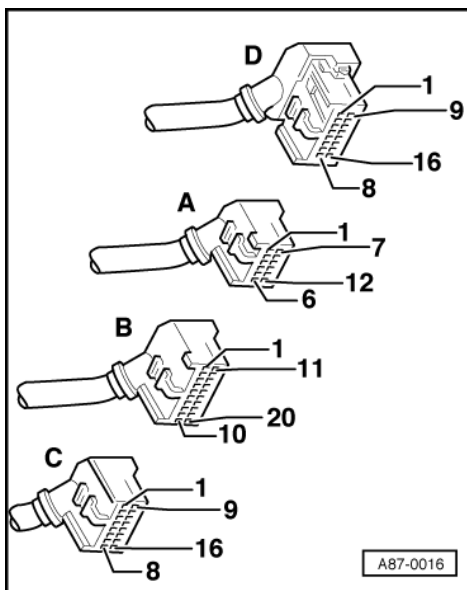
09.92 ▸=> reading measured value block, display group 017, Page **57** .

Checking power supply

- Remove connector from EGR -G98 temperature sensor.

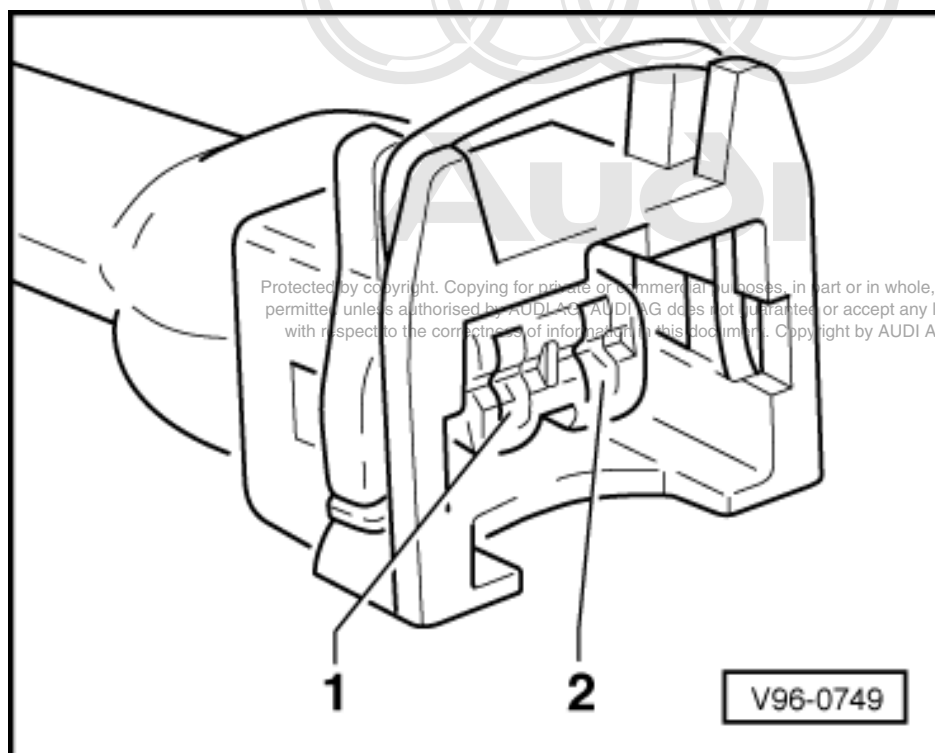


- -> Connect the multimeter for voltage measurement range between contact 1 and contact 2.
- Switch the ignition on.
 - Specification: 4.5 ... 5.0 V



If the specification is not obtained:

- -> With the ignition switched off, use adapter V.A.G 1598/11 to connect test box V.A.G 1598 A to connector B only of engine control unit (control unit remains disconnected) => Page 81 .



- -> Check for open circuit and short to positive or earth in the following wiring connections:

Connector Contact	Measure to
1	Test box V.A.G 1598 A Socket 27
2	Engine earth

- Rectify any open/short circuit as necessary.

=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

Note:

Use only gold-plated contacts when repairing the contacts in the plug connectors.

Check function

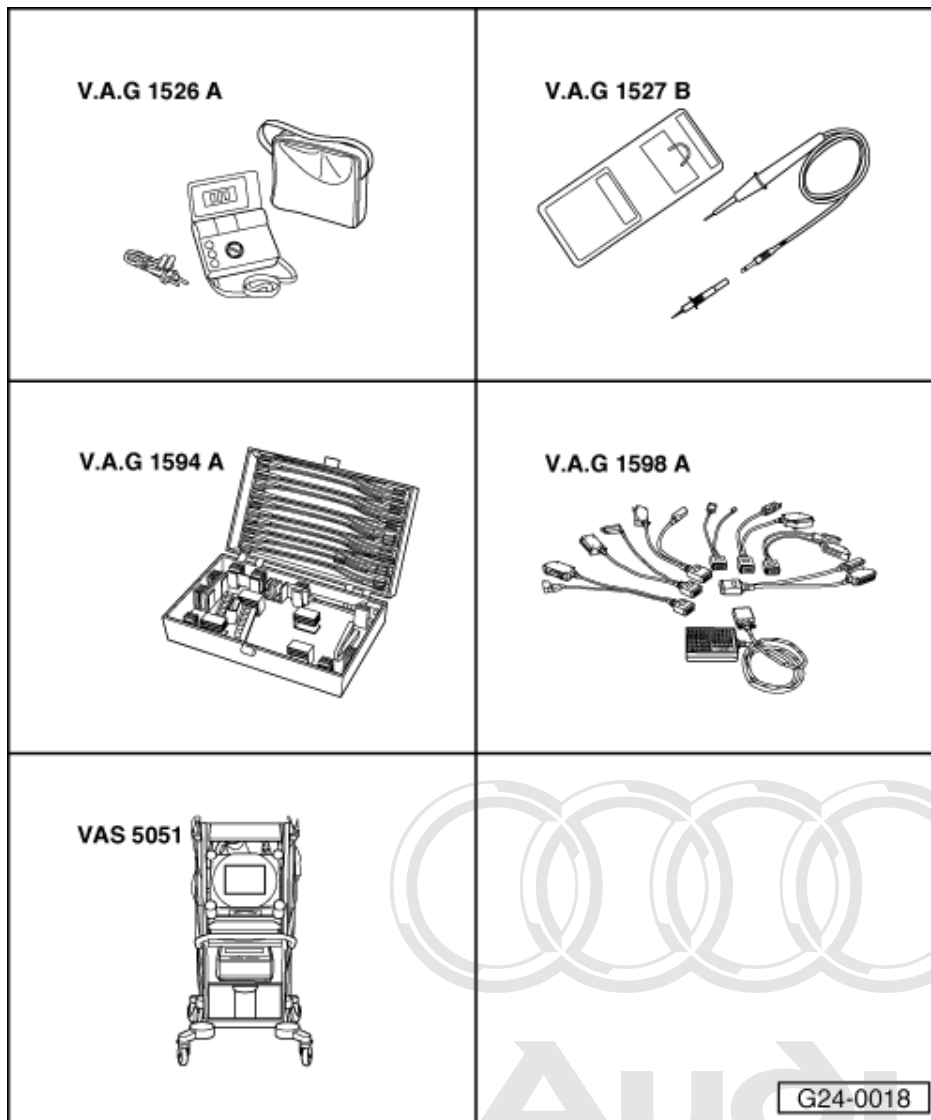
- Unscrew EGR -G98 temperature sensor from mechanical EGR valve.
- Connect multimeter to temperature sensor to measure resistance.
- Hold temperature sensor in boiling water and observe the multimeter.
 - Specification: The resistance value must change.

If the display does not change:

- Replace EGR -G98 temperature sensor.

7 - Checking auxiliary signals

7.1 - Checking auxiliary signals



7.2 - Checking air conditioner compressor signal and air conditioner compressor shut-off

Special tools, testers and workshop equipment required

- ◆ V.A.G 1526 A
- ◆ V.A.G 1527 B
- ◆ V.A.G 1594 A
- ◆ V.A.G 1598 A
- ◆ V.A.G 1598/11
- ◆ VAS 5051 with VAS 5051/1 and VAS 5051/2

or

- ◆ V.A.G 1551 with V.A.G 1551/1



7.3 - Control unit no. 4A0 906 266/A/AA/AB (ä 08.92)

Checking air conditioner compressor signal

Note:

The idling stabilisation pilot control value is raised by means of the signal from the air conditioner to ensure that the idling stabilisation remains in the mid-range of the regulating zone.

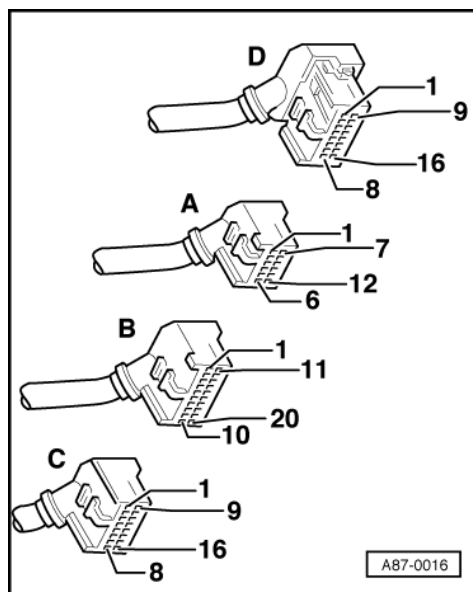
- Perform basic setting
=>Page 25

-> Indicated on display:

Reading	measured	value	block	0		
1	2	3	4	5	6	7
8	9	10				

- Switch on air conditioner system:
 - Manual air conditioner: Press "A/C" key.
 - Fully automatic air conditioner: Press "AUTO" key; set temperature to "LO" and blower speed to "HI".
- Check display in display zone 7.
 - The value must increase to 64 when AC is switched on.

If the display does not change:



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- -> With the ignition switched off, use adapter V.A.G 1598/11 to connect test box V.A.G 1598 A to connector C only of engine control unit (control unit remains disconnected) => Page 81 .
- Connect voltage tester V.A.G 1527 B as follows:

Test box V.A.G 1598 A Socket	Measure to
11	Engine earth

- Switch the ignition on.
- Switch on air conditioner system:
 - Manual air conditioner: Press "A/C" key.
 - Fully automatic air conditioner: Press "AUTO" key; set temperature to "LO" and blower speed to "HI".
 - The LED must illuminate.

If the LED does not illuminate:

- Detach connector C from adapter V.A.G 1598/11.

If the LED then illuminates:

- Replace engine control unit => Page 82 .

If LED still does not illuminate:

- Check for open circuit and short to positive or earth in the following wiring connections:

Test box V.A.G 1598 A Socket	Air conditioner re- lay -J32 Contact	Operating and dis- play unit -E87 Contact
11	=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder	

- If there are no faults in the wiring, check the operation of air conditioner.

=> Heater, air conditioner; Repair Group 87; air conditioner; Repair manual air conditioner components air conditioner Repair manual air conditioner components

=> Heater, air conditioner; Repair Group 87; air conditioner; Repair control components of fully automatic air conditioner air conditioner Repair control components of fully automatic air conditioner

Checking the air conditioner compressor shutoff

Note:

- ♦ The air conditioner compressor is shut off by the engine control unit on accelerating from standstill and from low vehicle speed for approx. 12 seconds. If the accelerator pedal is released sooner, the time is reduced to min. 3 seconds.
- ♦ The air conditioner compressor is also shut off by the engine control unit after initiating function 04 "Basic setting".

Test requirements:

- No faults stored in fault memory
- Vehicles with automatic gearbox: Selector lever in position P or N
- Engine running at idling speed
- Vehicle at ambient temperature (warmer than + 15 °C)
- Air conditioner system OK

Test sequence

- Switch on air conditioner system:
 - Manual air conditioner: Press "A/C" key.
 - Fully automatic air conditioner: Press "AUTO" key; set temperature to "LO" and blower speed to "HI".
- Start basic setting =>Page 25 , Display group 000, engine idling.
 - Air-conditioner compressor must come to a halt (visual inspection)

If the conditioner compressor is not switched off:

- Switch off air conditioner and leave engine idling.
- Enter "8" for switching to "Reading measured value block" function.

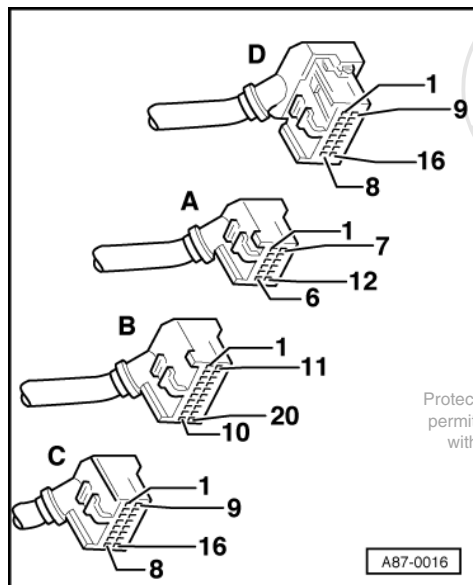
-> Indicated on display:

Reading	measured	value	block	0					
1	2	3	4	5	6	7			
8	9	10							

- Switch on air conditioner => Page 157 .
- Check display in display zone 7.
 - Specification: 116



- Actuate full throttle briefly - maximum engine speed must not reach.
 - Specification: The displayed value must drop briefly to 68, increase to 84 after releasing the accelerator and then increase again to 116 after a few seconds



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- Visually inspect whether air conditioner compressor stops for a few seconds.

If the display is not as described:

- Checking idling switch -F60 => Page 142
- -> With the ignition switched off, use adapter V.A.G 1598/11 to connect test box V.A.G 1598 A to connector C only of engine control unit (control unit remains disconnected) => Page 81 .
- Check for open circuit and short to positive or earth in the following wiring connections:

Test box V.A.G 1598 A Socket	Magnetic clutch control unit -J153 Contact	Operating and dis- play unit -E87 Contact
10	=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder	

- If there are no faults in the wiring, check the operation of air conditioner.

=> Heater, air conditioner; Repair Group 87; air conditioner; Repairing manual air conditioner components air conditioner Repairing manual air conditioner components

=> Heater, air conditioner; Repair Group 87; air conditioner; Repairing control components of fully automatic air conditioner air conditioner Repairing control components of fully automatic air conditioner

If both air conditioner and wiring OK:

- Replace engine control unit => Page 82 .

7.4 - Control unit no. 8A0 906 266 B (09.92 >)

Checking air conditioner compressor signal

Note:

The idling stabilisation pilot control value is raised by means of the signal from the air conditioner to ensure that the idling stabilisation remains in the mid-range of the regulating zone.

- Reading measured value block, Display group 004, engine at idling speed =>Page 45 .

-> Indicated on display:

Reading measured value block 4			
1	2	3	4

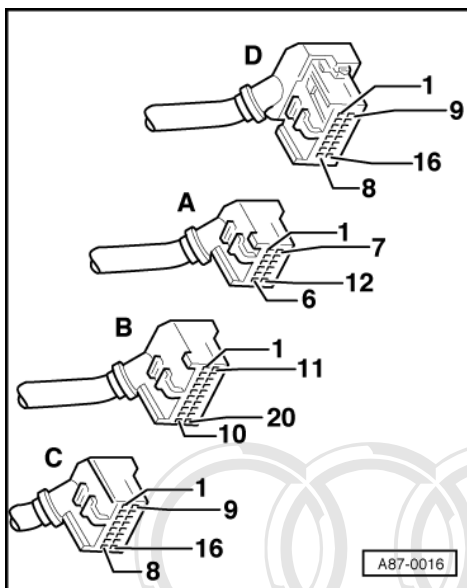
- Check display in display zone 4.
- Specification: 0XX X

Note:

Switching inputs at locations marked "X" can be ignored for this test.

- Switch on air conditioner system:
 - Manual air conditioner: Press "A/C" key.
 - Fully automatic air conditioner: Press "AUTO" key; set temperature to "LO" and blower speed to "HI".
- Specification: 1XX X

If the display is not as described:



- -> With the ignition switched off, use adapter V.A.G 1598/11 to connect test box V.A.G 1598 A to connector C only of engine control unit (control unit remains disconnected) => Page 81 .
- Connect voltage tester V.A.G 1527 B as follows:

Test box V.A.G 1598 A Socket	Measure to
11	Engine earth

- Switch the ignition on.
- Switch on air conditioner system:
 - Manual air conditioner: Press "A/C" key.
 - Fully automatic air conditioner: Press "AUTO" key; set temperature to "LO" and blower speed to "HI".



- The LED must illuminate.

If the LED does not illuminate:

- Detach connector C from adapter V.A.G 1598/11.

If the LED then illuminates:

- Replace engine control unit => Page **82** .

If LED still does not illuminate:

- Check for open circuit and short to positive or earth in the following wiring connections:

Test box V.A.G 1598 A Socket	Air conditioner re- lay -J32 Contact	Operating and dis- play unit -E87 Contact
11	=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder	

- If there are no faults in the wiring, check the operation of air conditioner.

=> Heater, air conditioner; Repair Group 87; air conditioner; Repairing manual air conditioner components air conditioner Repairing manual air conditioner components

=> Heater, air conditioner; Repair Group 87; air conditioner; Repairing control components of fully automatic air conditioner air conditioner Repairing control components of fully automatic air conditioner

Checking the air conditioner compressor shutoff

Note:

- ♦ The air conditioner compressor is shut off by the engine control unit on accelerating from standstill and from low vehicle speed for approx. 12 seconds. If the accelerator pedal is released sooner, the time is reduced to min. 3 seconds.
- ♦ The air conditioner compressor is also shut off by the engine control unit after initiating function 04 "Basic setting".

Test requirements:

- No faults stored in fault memory
- Engine running at idling speed
- Vehicle at ambient temperature (warmer than + 15 °C)
- Air conditioner system OK

Test sequence

- Switch on air conditioner as follows:
 - Manual air conditioner: Press "A/C" key.
 - Fully automatic air conditioner: Press "AUTO" key; set temperature to "LO" and blower speed to "HI".
- Start basic setting =>Page **25** , Display group 004, engine idling.
 - Air-conditioner compressor must come to a halt (visual inspection)

If the conditioner compressor is not switched off:

- Switch off air conditioner and leave engine idling.
- Enter "8" for switching to "Reading measured value block" function.

-> Indicated on display:

Reading measured value block 4
1 2 3 4

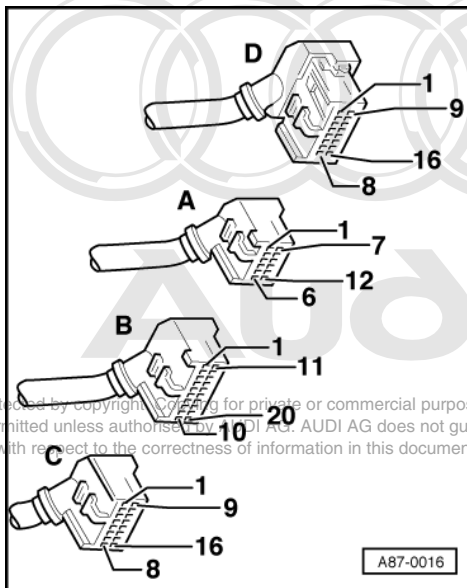
- Check display in display zone 4.
 - Specification: X0X X

Note:

Switching inputs at locations marked "X" can be ignored for this test.

- Switch on air conditioner => Page 160 .
 - Specification: X1X X

If the display is not as described:



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- -> With the ignition switched off, use adapter V.A.G 1598/11 to connect test box V.A.G 1598 A to connector C only of engine control unit (control unit remains disconnected) => Page 81 .
- Check for open circuit and short to positive or earth in the following wiring connections:

Test box V.A.G 1598 A Socket	Magnetic clutch control unit -J153 Contact	Operating and dis- play unit -E87 Contact
10	=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder	

- If there are no faults in the wiring, check the operation of air conditioner.

=> Heater, air conditioner; Repair Group 87; air conditioner; Repairing manual air conditioner components air conditioner Repairing manual air conditioner components

=> Heater, air conditioner; Repair Group 87; air conditioner; Repairing control components of fully automatic air conditioner air conditioner Repairing control components of fully automatic air conditioner

If both air conditioner and wiring OK:

- Replace engine control unit => Page 82 .



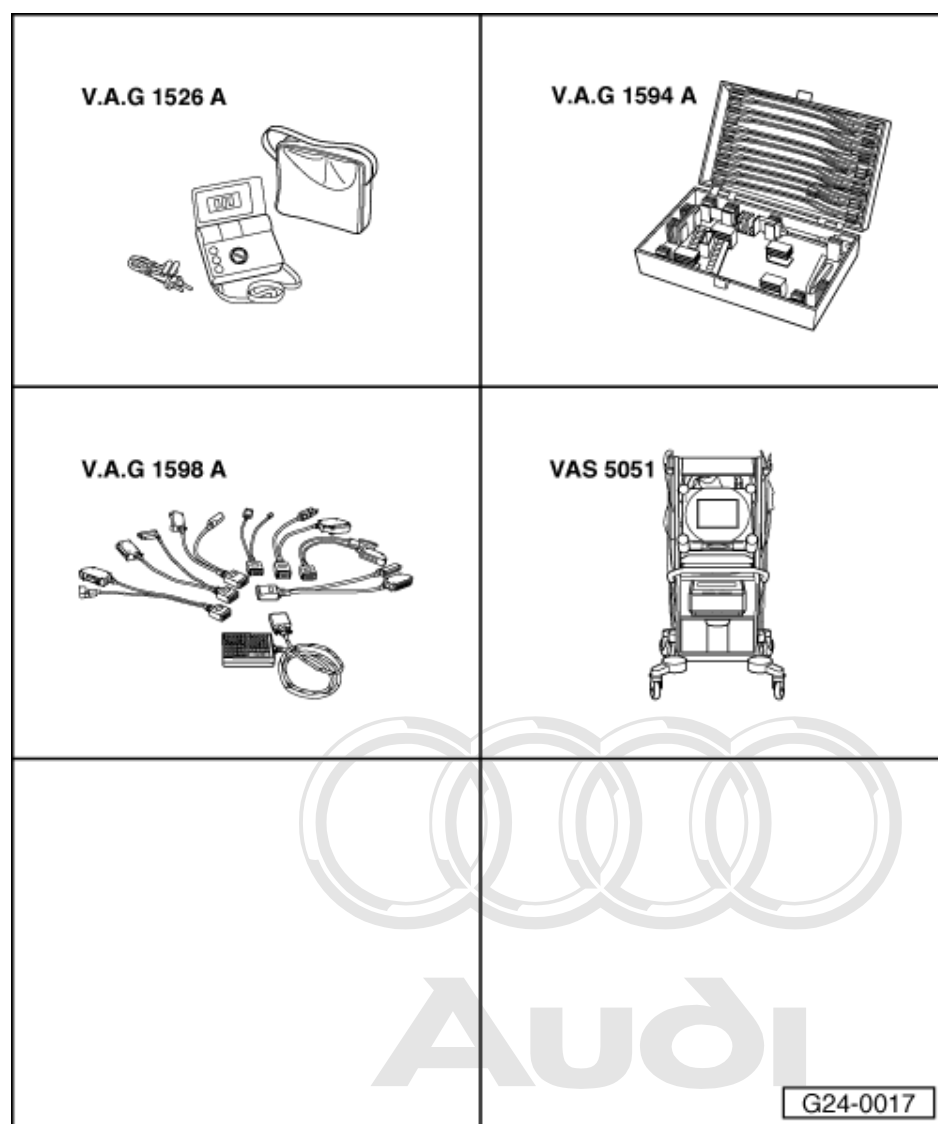
7.5 - Checking engine speed signal

Note:

- ♦ The signal is generated by the engine speed sender -G28, processed in the engine control unit and relayed by the engine control unit to various electronic systems (e.g. control unit for air conditioner, automatic gear-box or ABS/EDL). The engine speed signal and wiring are monitored by these systems.
- ♦ Checking engine speed signal:

=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

7.6 - Check vehicle speed signal



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Special tools, testers and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598 A
- ♦ V.A.G 1598/11

- ♦ VAS 5051 with VAS 5051/1 and VAS 5051/2

or

- ♦ V.A.G 1551 with V.A.G 1551/1

Note:

The speed signal is generated by the speedometer sender -G22 (at gearbox) and processed in the dash panel insert.

Test requirements:

- Speedometer function and display OK

Test sequence

Warning

Secure fault reader to the rear seat and operate from this location. For this purpose, always observe the relevant safety precautions.

=> Page 68

- Take the vehicle for a test drive.

Vehicles with control unit no.

4A0 906 266/A/AA/AB (ã 08.92):

- Reading individual measured value, channel 15, engine at idling speed =>Page 58 .

-> Indicated on display:

Reading individual measured value
Channel 15 measured value

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- The current road speed must be displayed (compare with speedometer).

Vehicles with control unit no. 8A0 906 266 B

(09.92 ã):

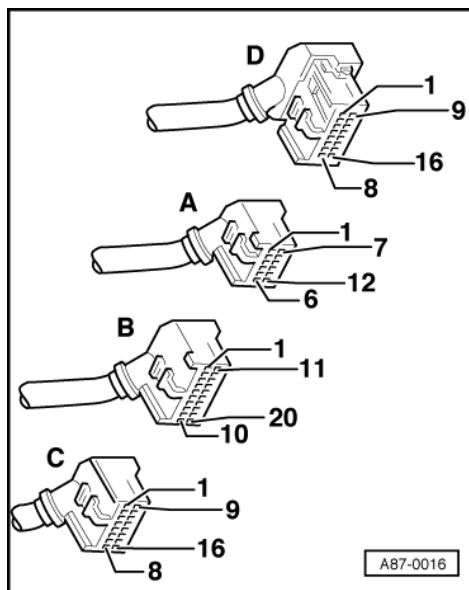
- Reading measured value block, Display group 003, engine at idling speed =>Page 43 .

-> Indicated on display:

Read measurement block 3
1 2 3 4

- Check display in display zone 4.
 - The current road speed must be displayed (compare with speedometer).

All vehicles:





If the vehicle speed is not displayed:

- -> With the ignition switched off, use adapter V.A.G 1598/11 to connect test box V.A.G 1598 A to connector B only of engine control unit (control unit remains disconnected) => Page **81** .
- Check for open circuit and short to positive or earth in the following wiring connections:

Test box V.A.G 1598 A Socket	Dash panel insert Contact
29	=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

If no wiring fault is detected:

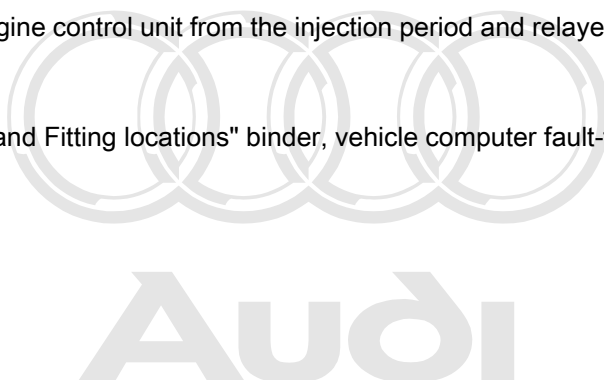
- Establish which "recipients" of the road speed signal (e.g. radio, automatic gearbox, air conditioner etc.) are using the speed signal, disconnect them one by one from the dash panel insert, then keep repeating the test until the cause of the problem has been identified.

7.7 - Checking consumption signal for vehicle computer

Note:

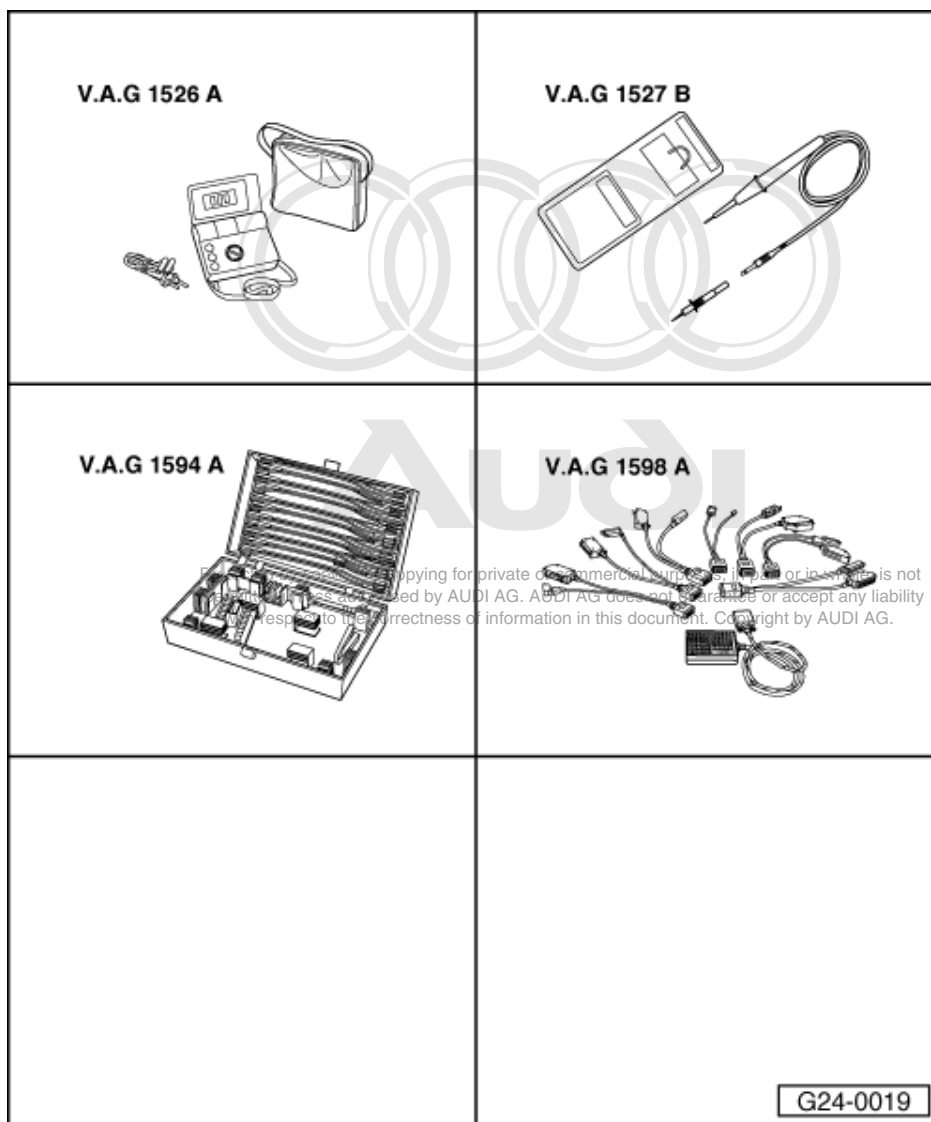
- ♦ The consumption signal is calculated by the engine control unit from the injection period and relayed to the on-board computer.
- ♦ Checking fuel consumption signal

=> "Current flow diagrams, Electrical fault-finding and Fitting locations" binder, vehicle computer fault-finding



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7.8 - Checking output signal for throttle valve position



Special tools, testers and workshop equipment required

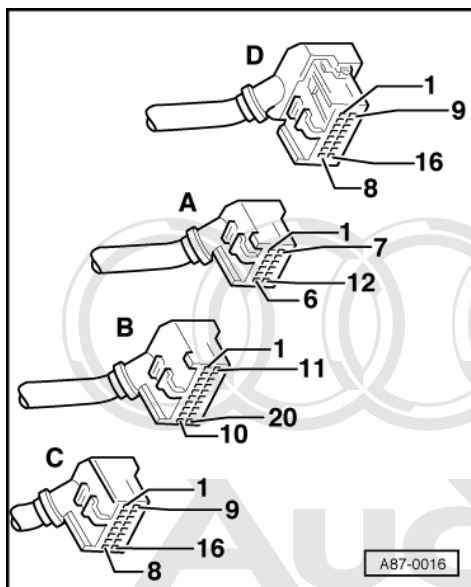
- ◆ V.A.G 1526 A
- ◆ V.A.G 1527 B
- ◆ V.A.G 1594 A
- ◆ V.A.G 1598 A
- ◆ V.A.G 1598/11

Note:

- ◆ This signal is used as a load signal by the gearbox control unit.
- ◆ The wiring and load signal are monitored by gearbox control unit:

=> Automatic gearbox Self-diagnosis; Repair Group 01; Performing self-diagnosis; Interrogating fault memory
Performing self-diagnosis Interrogating fault memory

- ◆ The following check is only to be performed if a fault relating to the load signal has been stored in the fault memory of the gearbox control unit.



- ➔ With the ignition switched off, use adapter V.A.G 1598/11 to connect test box V.A.G 1598 A to connector B only of engine control unit and to control unit => Page 81.
- Connect voltage tester V.A.G 1527 B as follows:

Test box V.A.G 1598 A Socket	Measure to
28	Engine earth

- Switch the ignition on.
 - The LED must illuminate dimly and become brighter on pressing the accelerator pedal.

If the LED does not illuminate and does not become brighter:

- Check throttle valve potentiometer
=> Page 138
- If the throttle valve potentiometer is OK, fit a new engine control unit => Page 82.

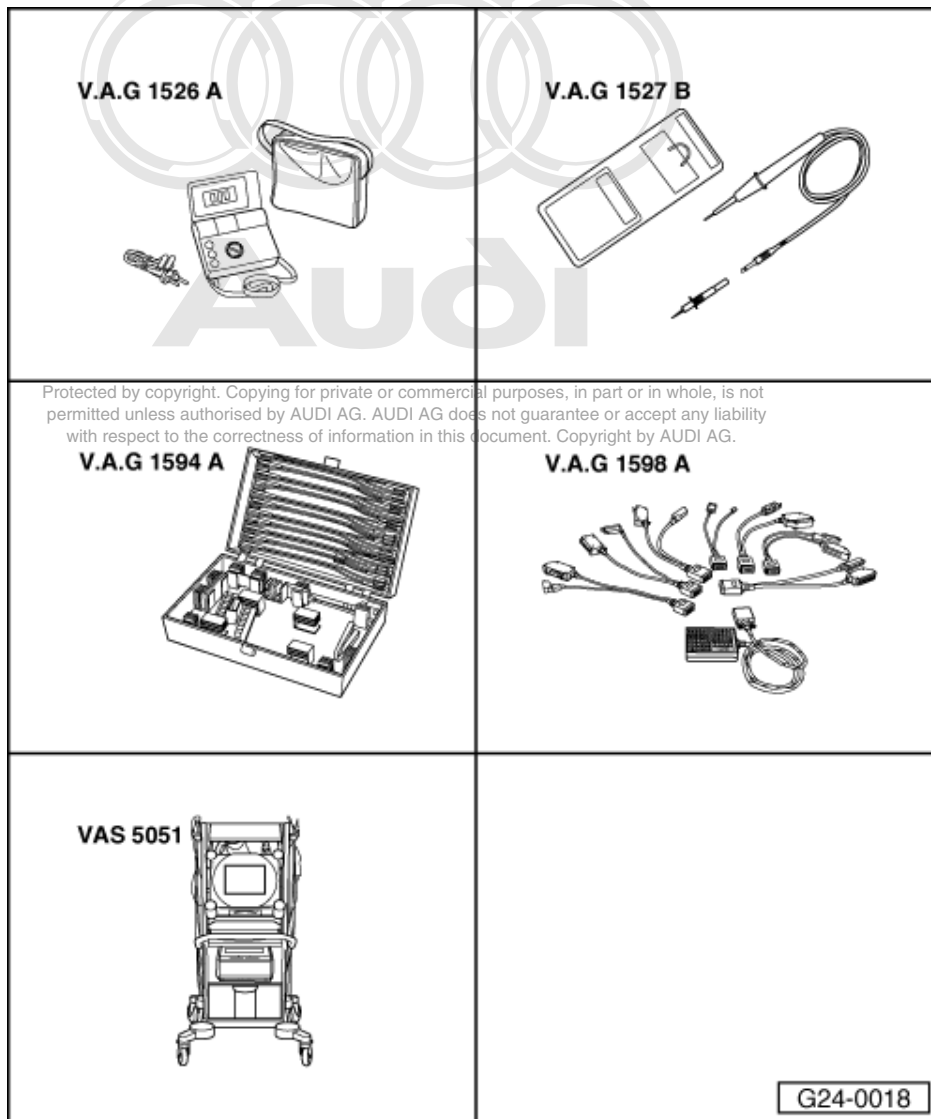
If the LED illuminates and becomes brighter:

- Pull connector off automatic gearbox control unit.
- Check for open circuit and short to positive or earth in the following wiring connections:

Test box V.A.G 1598 A Socket	Control unit for Automatic gearbox Contact
28	=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

- If wiring is OK, establish defect in automatic gearbox control unit.

7.9 - Checking gear signal



Special tools, testers and workshop equipment required

- ◆ V.A.G 1526 A
- ◆ V.A.G 1527 B
- ◆ V.A.G 1594 A
- ◆ V.A.G 1598 A
- ◆ V.A.G 1598/11
- ◆ VAS 5051 with VAS 5051/1 and VAS 5051/2

or

- ◆ V.A.G 1551 with V.A.G 1551/1

Note:

The engine control unit recognises the selector lever position of the automatic gearbox from this signal. When gear is engaged (selector lever in R / D / 3 / 2 / 1), engine speed drops to approx. 50 rpm in order to reduce vehicle creeping tendency.



Test requirements:

- Control unit encoding OK => Page 32 .

Test sequence

Vehicles with control unit no.

4A0 906 266/A/AA/AB (ä 08.92):

- Reading measured value block, Display group 000, engine at idling speed =>Page 37 .

-> Indicated on display:

Reading	measured	value	block	0		
1	2	3	4	5	6	7
8	9	10				

- Check display in display zone 7.
 - The value must decrease by 4 when gear is engaged

Vehicles with control unit no. 8A0 906 266 B

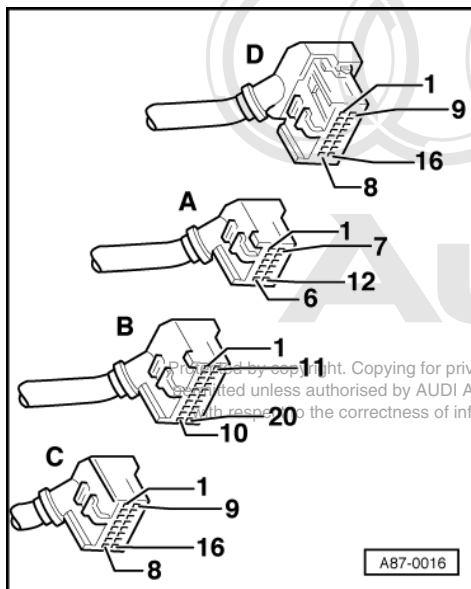
(09.92 ä):

- Reading measured value block, Display group 004, engine at idling speed =>Page 45 .

-> Indicated on display:

Reading	measured	value	block	4
1	2	3	4	

- Move selector lever to position P or N.
- Check display in display zone 4.
 - Specification: XXX 1



- Depress the brake pedal and engage a gear.
 - Specification: XXX 0

Note:

Switching inputs at locations marked "X" can be ignored for this test.

If the display is not as described:

- -> With the ignition switched off, use adapter V.A.G 1598/11 to connect test box V.A.G 1598 A to connector B only of engine control unit and to control unit => Page **81** .
- Connect voltage tester V.A.G 1527 B as follows:

Test box V.A.G 1598 A Socket	Measure to
32	Engine earth

- Switch the ignition on.
- Depress the brake pedal and engage a gear.
 - The LED must illuminate when a gear is engaged.

If the LED does not illuminate:

- Pull connector B off adapter V.A.G 1598/11.

If the LED still does not illuminate (irrespective of selector lever position):

- Replace engine control unit => Page **82** .

If the LED then illuminates:

- Check the following wiring for short to earth:

Test box V.A.G 1598 A Socket	Control unit for Automatic gearbox Contact
32	=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

- If wiring is OK, establish defect in automatic gearbox control unit.

If the LED illuminates with connector B attached and does not go out on engaging gear:

- Check for open circuit in the following wiring connections:

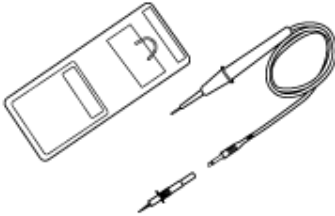
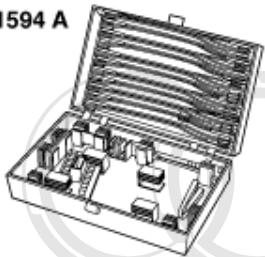
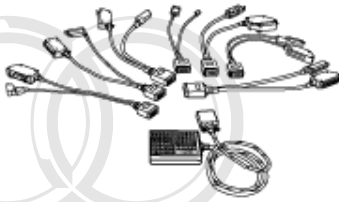
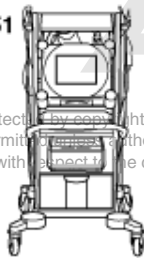
Test box V.A.G 1598 A Socket	Control unit for Automatic gearbox Contact
32	=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

- If wiring is OK, establish defect in automatic gearbox control unit.

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7.10 - Checking ignition timing retardation on changing gear

V.A.G 1526 A 	V.A.G 1527 B 
V.A.G 1594 A 	V.A.G 1598 A 
VAS 5051  Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted without authorisation by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.	G24-0018

Special tools, testers and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1527 B
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598 A
- ♦ V.A.G 1598/11
- ♦ VAS 5051 with VAS 5051/1 and VAS 5051/2

or

- ♦ V.A.G 1551 with V.A.G 1551/1

Note:

The engine control unit receives the gearshift signal from the gearbox control unit. As a function of vehicle speed and engine speed, the engine control unit then briefly retards the ignition timing, thus reducing torque and making the gear change smoother.

Test requirements:

- Control unit encoding OK => Page 32 .

Test sequence

- Reading measured value block, Display group 000, engine at idling speed =>Page 37 .

-> Indicated on display:

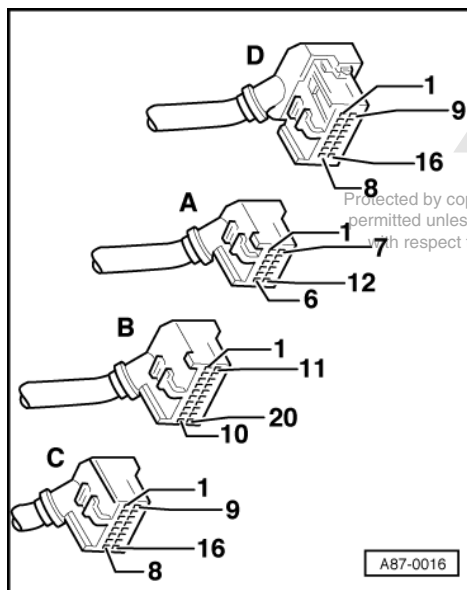
Reading measured value block 0						
1	2	3	4	5	6	7
8	9	10				

Warning

Secure fault reader to the rear seat and operate from this location. For this purpose, always observe the relevant safety precautions
=> Page 68 .

- Take the vehicle for a test drive.
- Check display in display zone 7.
 - On changing gear, the value must be briefly incremented by 2.

If the display is not as described:



- > With the ignition switched off, use adapter V.A.G 1598/11 to connect test box V.A.G 1598 A to connector B only of engine control unit and to control unit => Page 81 .
- Connect voltage tester V.A.G 1527 B as follows:

Test box V.A.G 1598 A Socket	Measure to
33	Engine earth

- Switch the ignition on.
 - The LED must illuminate.

If the LED does not illuminate:

- Pull connector B off adapter V.A.G 1598/11.

If LED still does not illuminate:



- Replace engine control unit => Page **82** .

If the LED then illuminates:

- Check the following wiring for short to earth:

Test box V.A.G 1598 A Socket	Control unit for Automatic gearbox Contact
33	=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

- If wiring is OK, establish defect in automatic gearbox control unit.

If the LED illuminates with connector B attached:

- Reading measured value block, Display group 000, engine at idling speed =>Page **37** .

-> Indicated on display:

Reading	measured	value	block	0		
1	2	3	4	5	6	7
8	9	10				

- Connect socket 33 of test box to engine earth for approx. 3 seconds.
- Check display in display zone 7.
 - Value must be briefly incremented by 2.

If value is not incremented:

- Replace engine control unit =>Page **82** .

If value is now incremented:

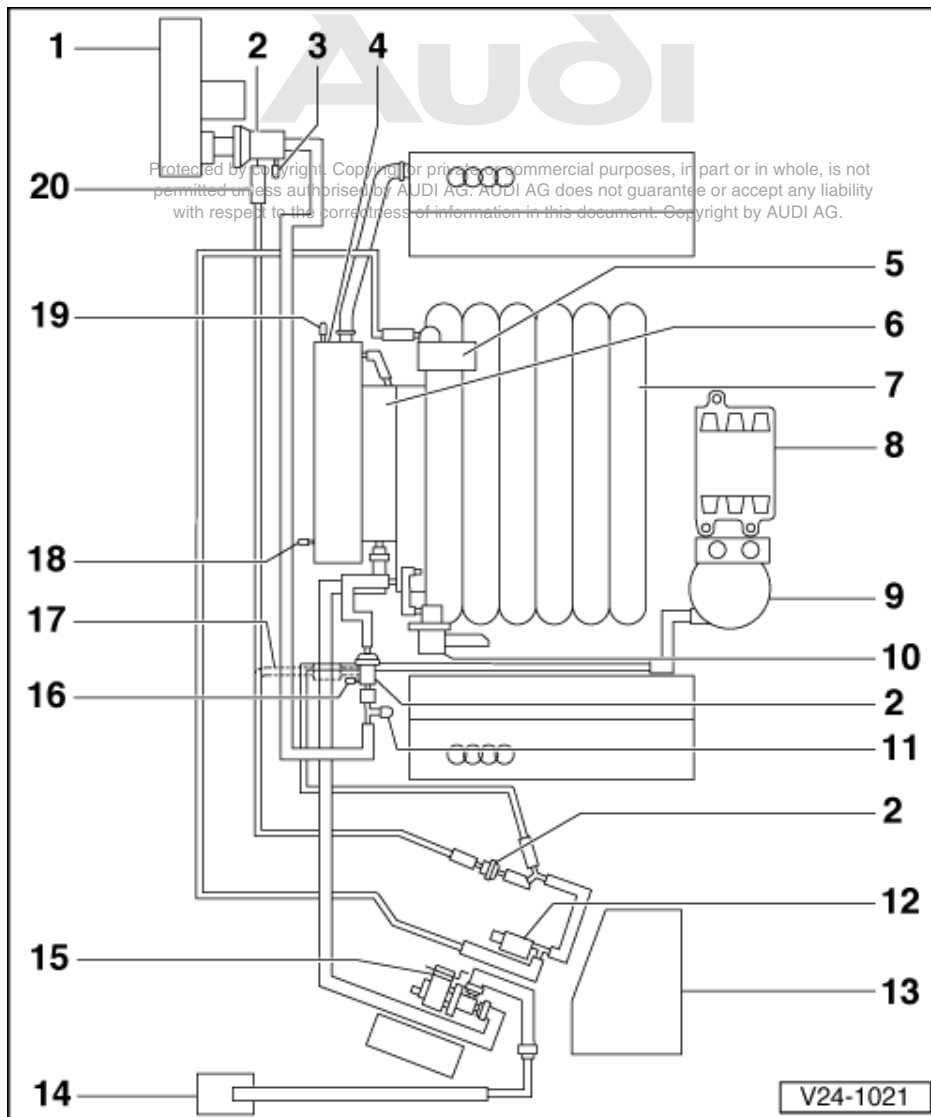
- Check for open circuit in the following wiring connections:

Test box V.A.G 1598 A Socket	Control unit for Automatic gearbox Contact
33	=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

- If wiring is OK, establish defect in automatic gearbox control unit.

8 - Vacuum diagram

8.1 - Vacuum diagram

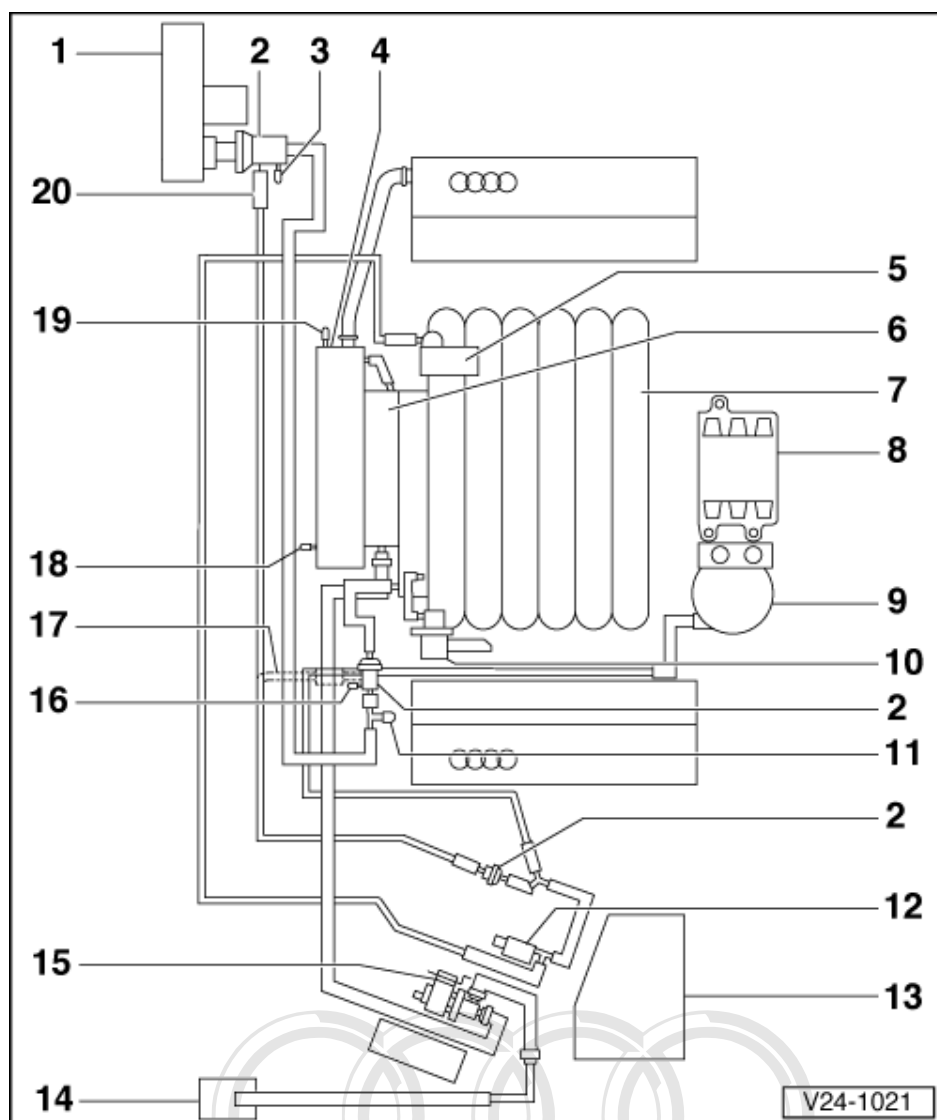


8.2 - Vehicles with manual gearbox without EGR

- 1 Brake servo
- 2 Non return valve
- 3 to air conditioner and/or differential lock
- 4 Noise insulation
- 5 Vacuum unit
 - ♦ For intake manifold changeover valve
- 6 Throttle valve unit
- 7 Intake manifold
- 8 Ignition coils -N, -N128, -N158
- 9 Vacuum reservoir



- ♦ For intake manifold changeover valve



10 Fuel pressure regulator

11 T-piece

- ♦ Sealing free connection with sealing plug

12 Intake manifold changeover valve -N156

13 Air cleaner

14 Activated charcoal filter

15 Solenoid valve 1 for activated charcoal filter -N80

16 Not installed

17 Not installed

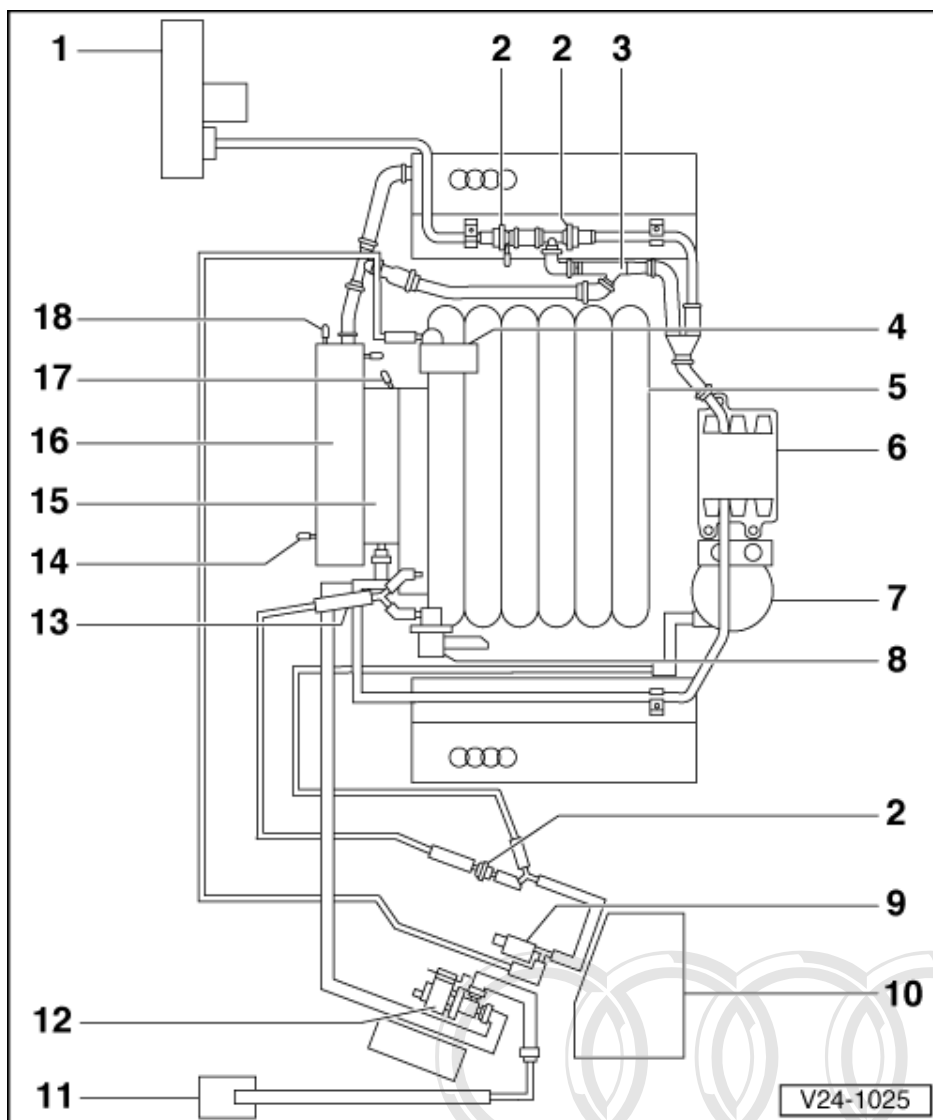
18 Not installed

19 Vent connection

20 Vacuum line

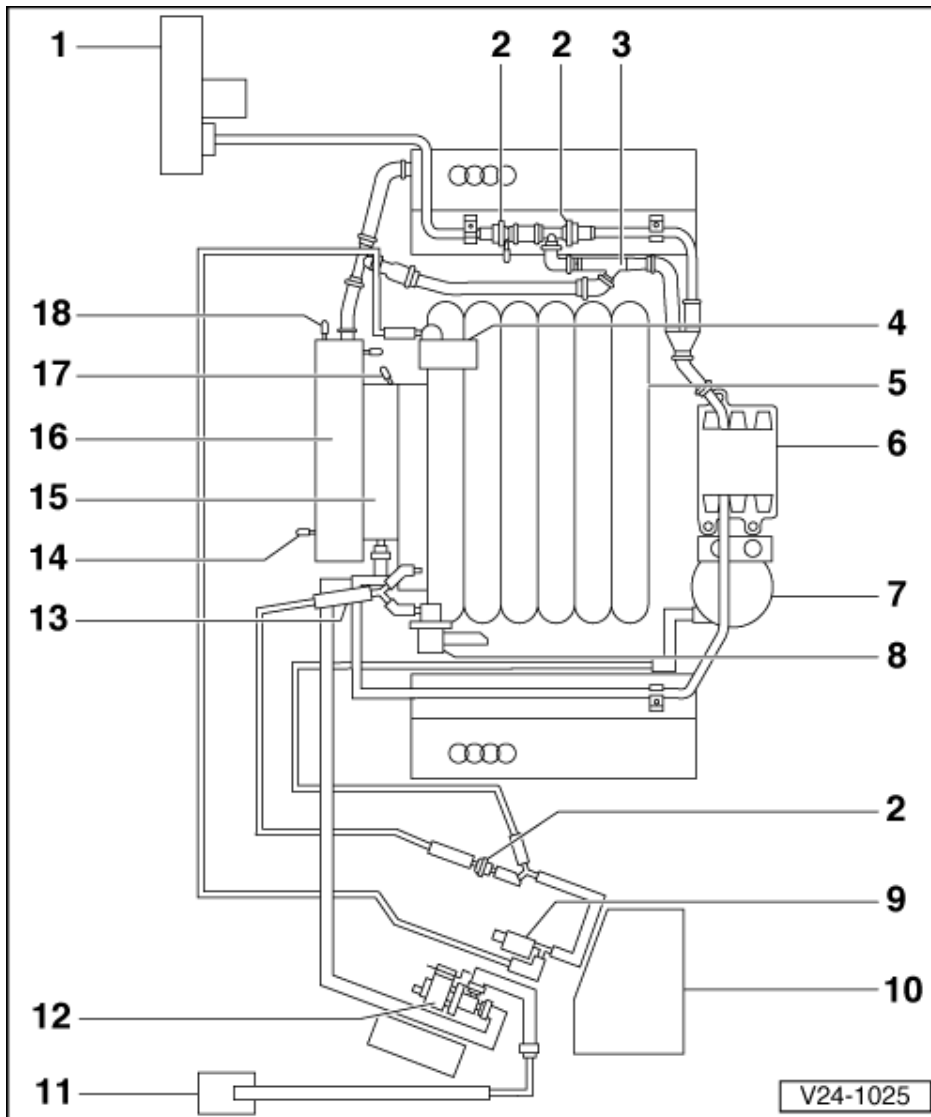
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8.3 - Vehicles with automatic gearbox without EGR



- 1 Brake servo
- 2 Non return valve
- 3 Suction jet pump
- 4 Vacuum unit
 - ♦ For intake manifold changeover valve
- 5 Intake manifold
- 6 Ignition coils -N, -N128, -N158
- 7 Vacuum reservoir
 - ♦ For intake manifold changeover valve
- 8 Fuel pressure regulator

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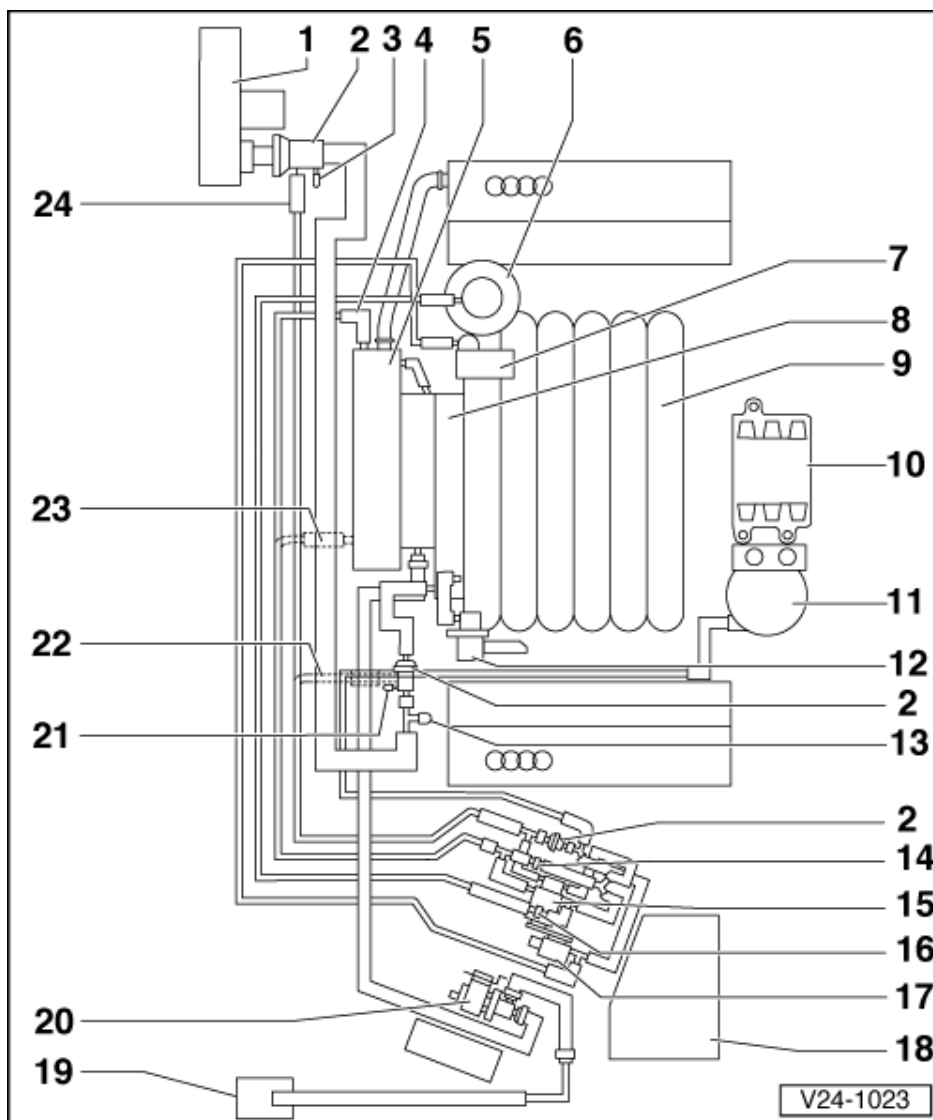


- 9 Intake manifold changeover valve -N156
- 10 Air cleaner
- 11 Activated charcoal filter
- 12 Solenoid valve 1 for activated charcoal filter -N80
- 13 Vacuum line
- 14 Vent connection
- 15 Throttle valve unit
- 16 Noise insulation
- 17 To air conditioner and/or differential lock
- 18 Vent connection



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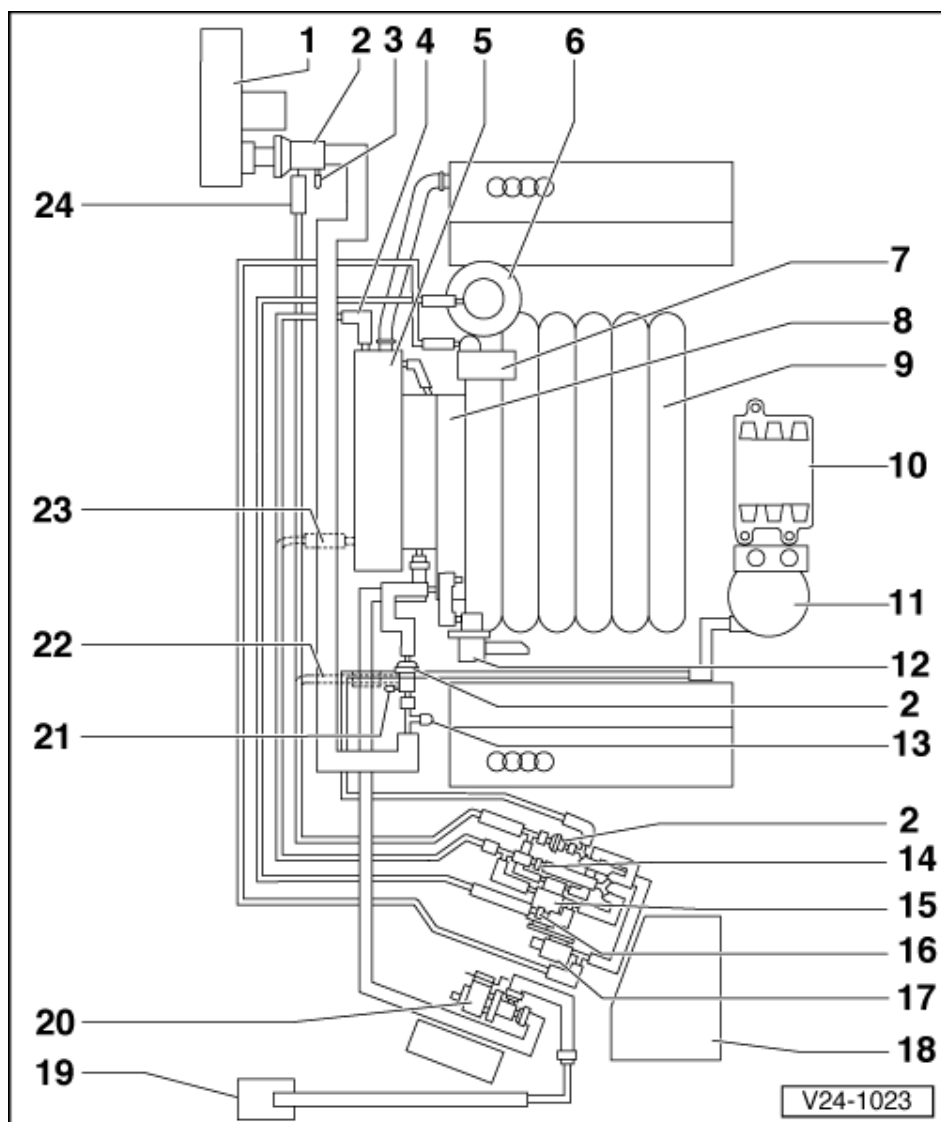
8.4 - Vehicles with manual gearbox and EGR



Version 1

- 1 Brake servo
- 2 Non return valve
- 3 To air conditioner and/or differential lock
- 4 Vent line
 - ♦ From EGR valve -N18
- 5 Noise insulation
- 6 Mechanical EGR valve
- 7 Vacuum unit
 - ♦ For intake manifold changeover valve

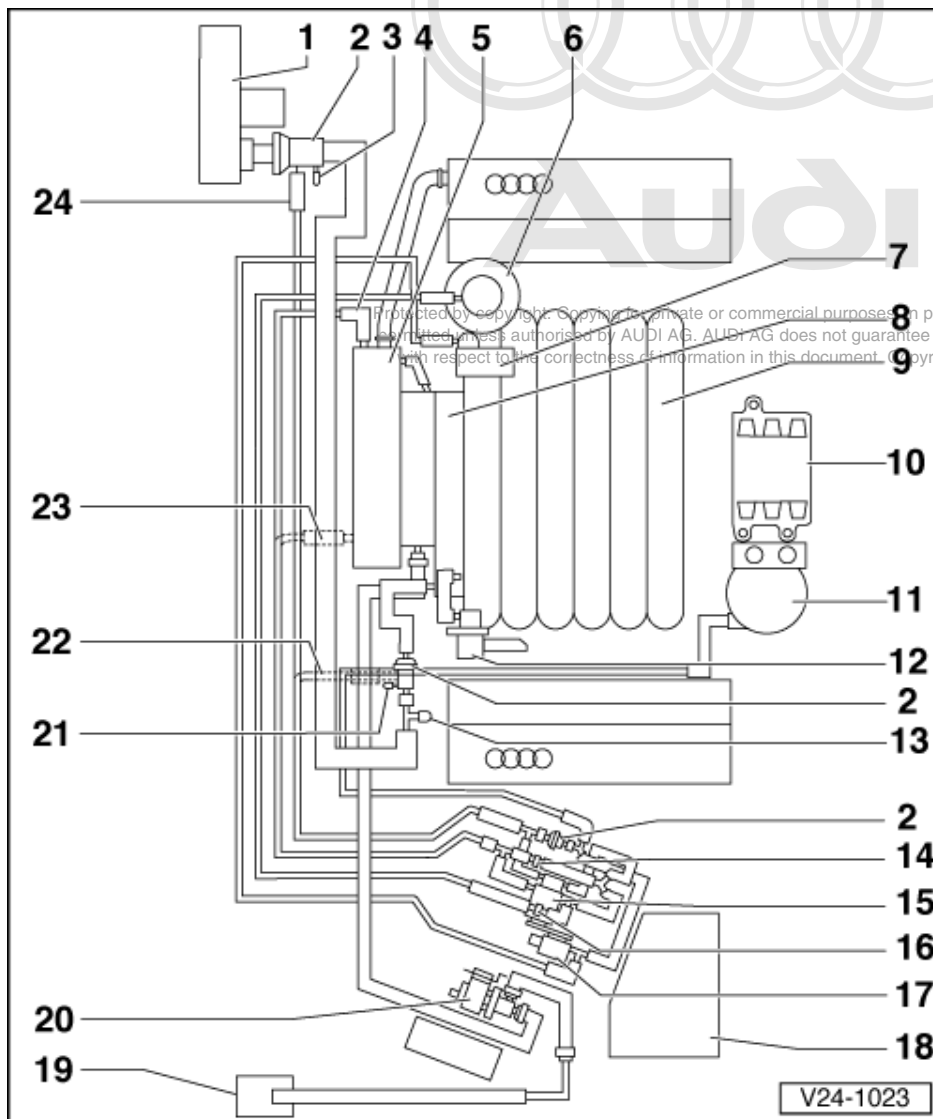
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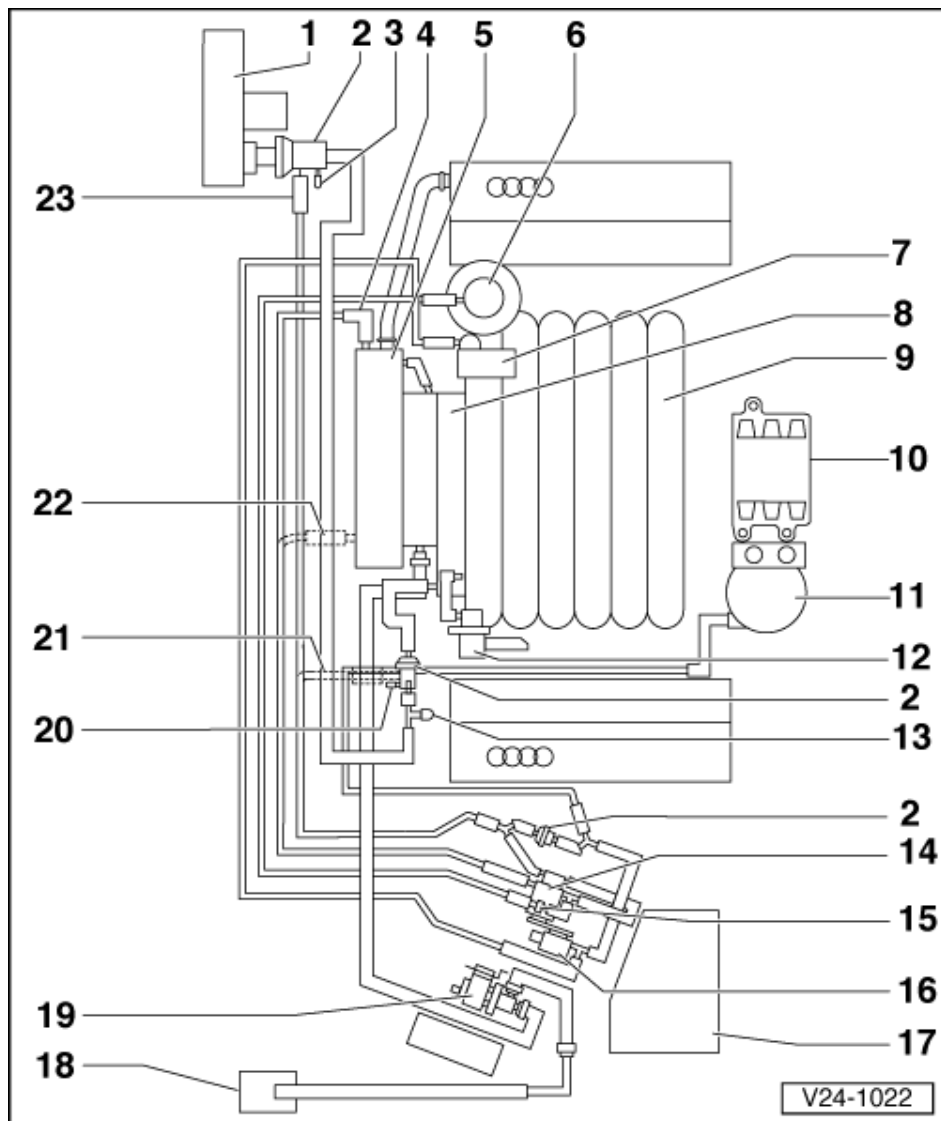
- 8 Throttle valve unit
- 9 Intake manifold
- 10 Ignition coils -N, -N128, -N158
- 11 Vacuum reservoir
 - ♦ For intake manifold changeover valve
- 12 Fuel pressure regulator
- 13 T-piece
 - ♦ Sealing free connection with sealing plug
- 14 Restrictor 1
- 15 EGR valve -N18
- 16 Restrictor 2
- 17 Intake manifold changeover valve -N156



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- 18 Air cleaner
- 19 Activated charcoal filter
- 20 Solenoid valve 1 for activated charcoal filter -N80
- 21 Not installed
- 22 Not installed
- 23 Not installed
- 24 Vacuum line

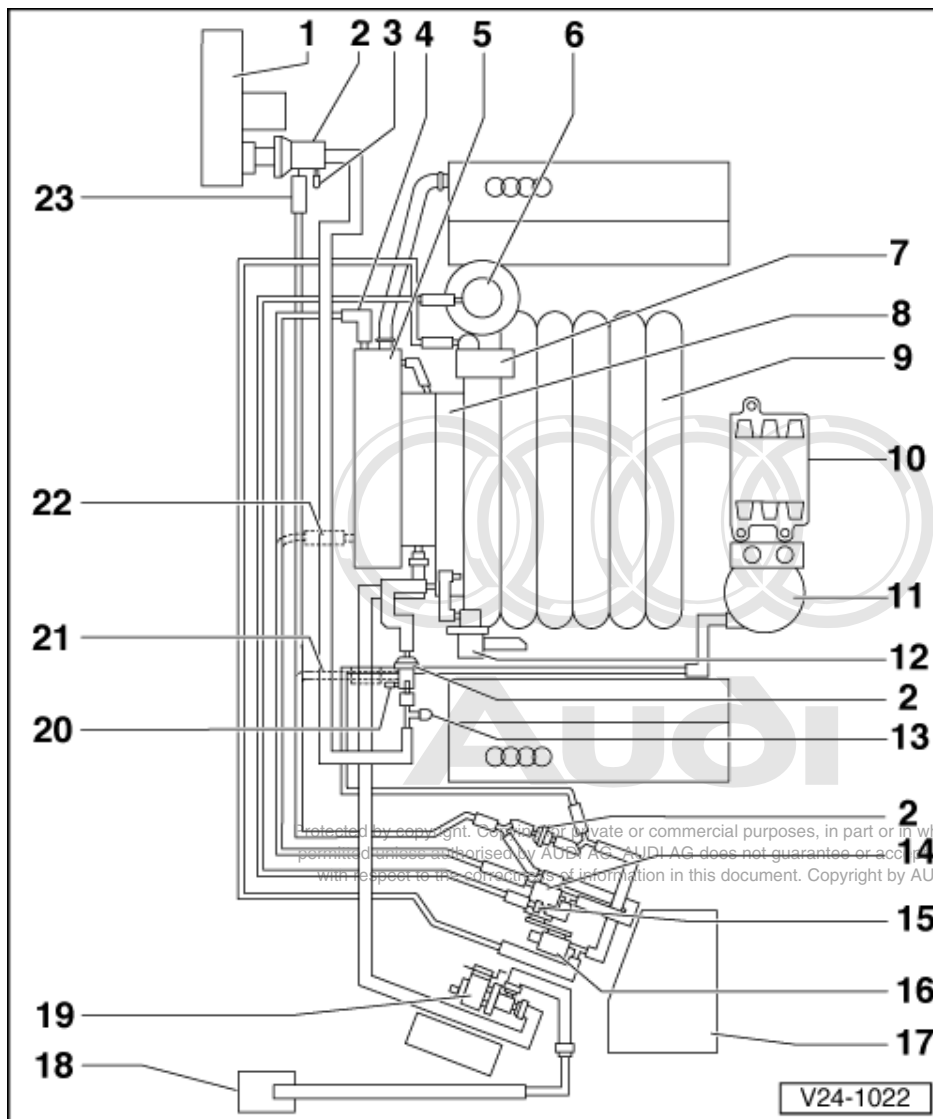


Version 2

- 1 Brake servo
- 2 Non return valve
- 3 To air conditioner and/or differential lock
- 4 Vent line
 - ♦ From EGR valve -N18
- 5 Noise insulation
- 6 Mechanical EGR valve
- 7 Vacuum unit
 - ♦ For intake manifold changeover valve
- 8 Throttle valve unit
- 9 Intake manifold



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10 Ignition coils -N, -N128, -N158

11 Vacuum reservoir

- ♦ For intake manifold changeover valve

12 Fuel pressure regulator

13 T-piece

- ♦ Sealing free connection with sealing plug

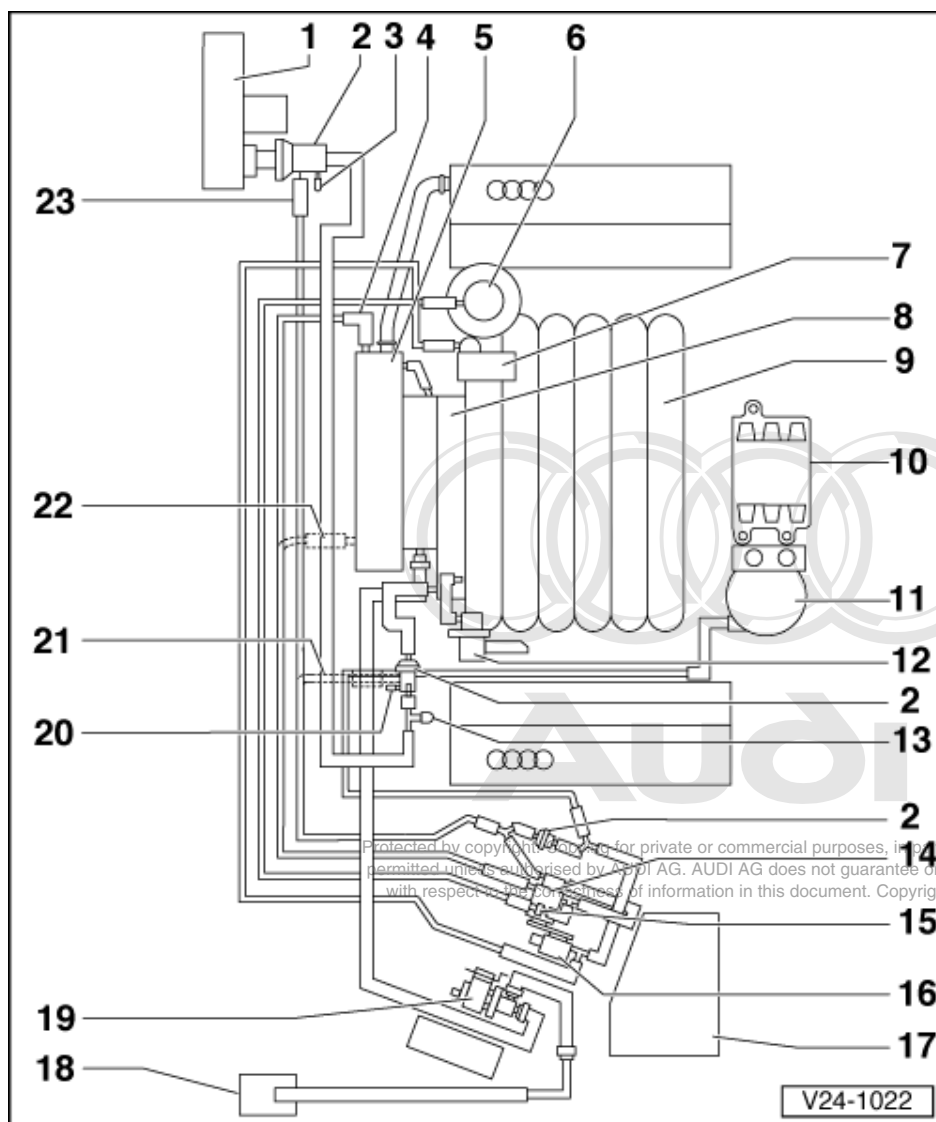
14 EGR valve
-N18

15 Restrictor

16 Intake manifold changeover valve -N156

17 Air cleaner

18 Activated charcoal filter



19 Solenoid valve 1 for activated charcoal filter -N80

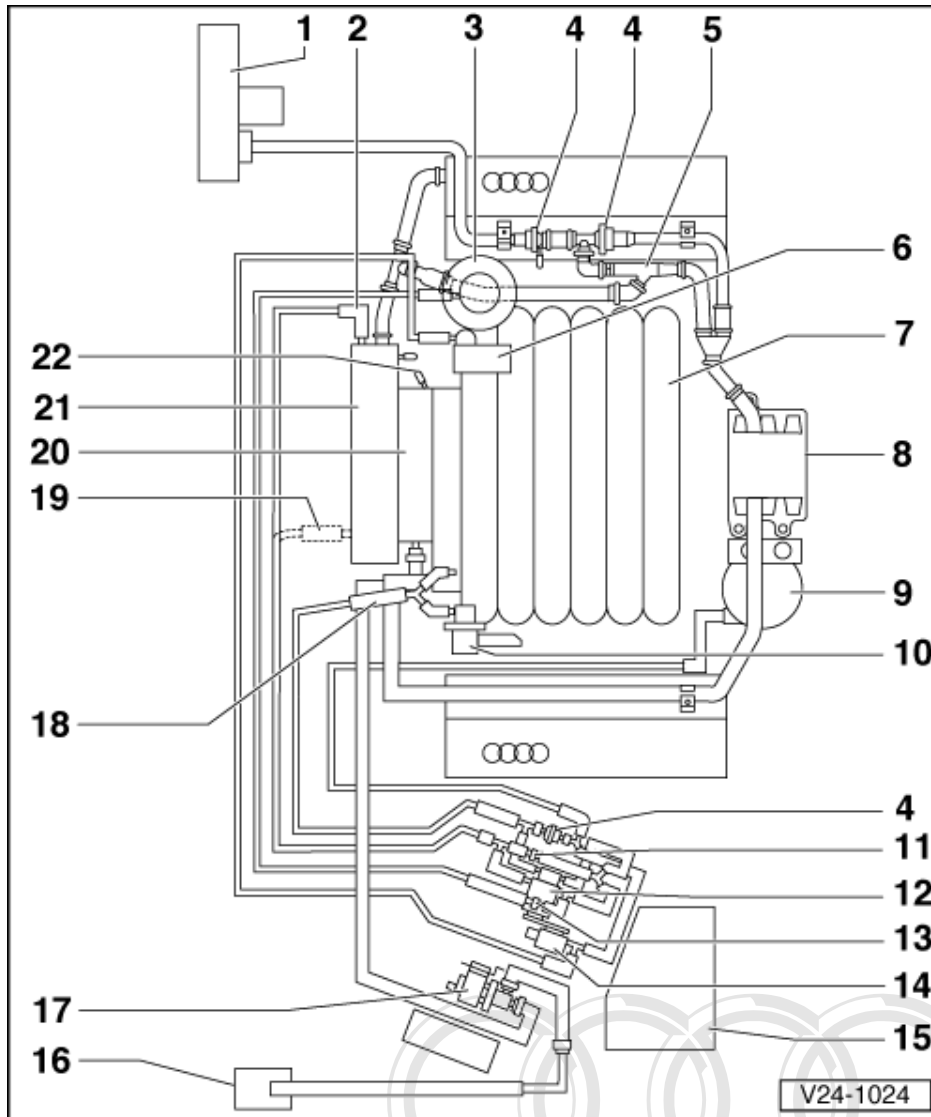
20 Not installed

21 Not installed

22 Not installed

23 Vacuum line

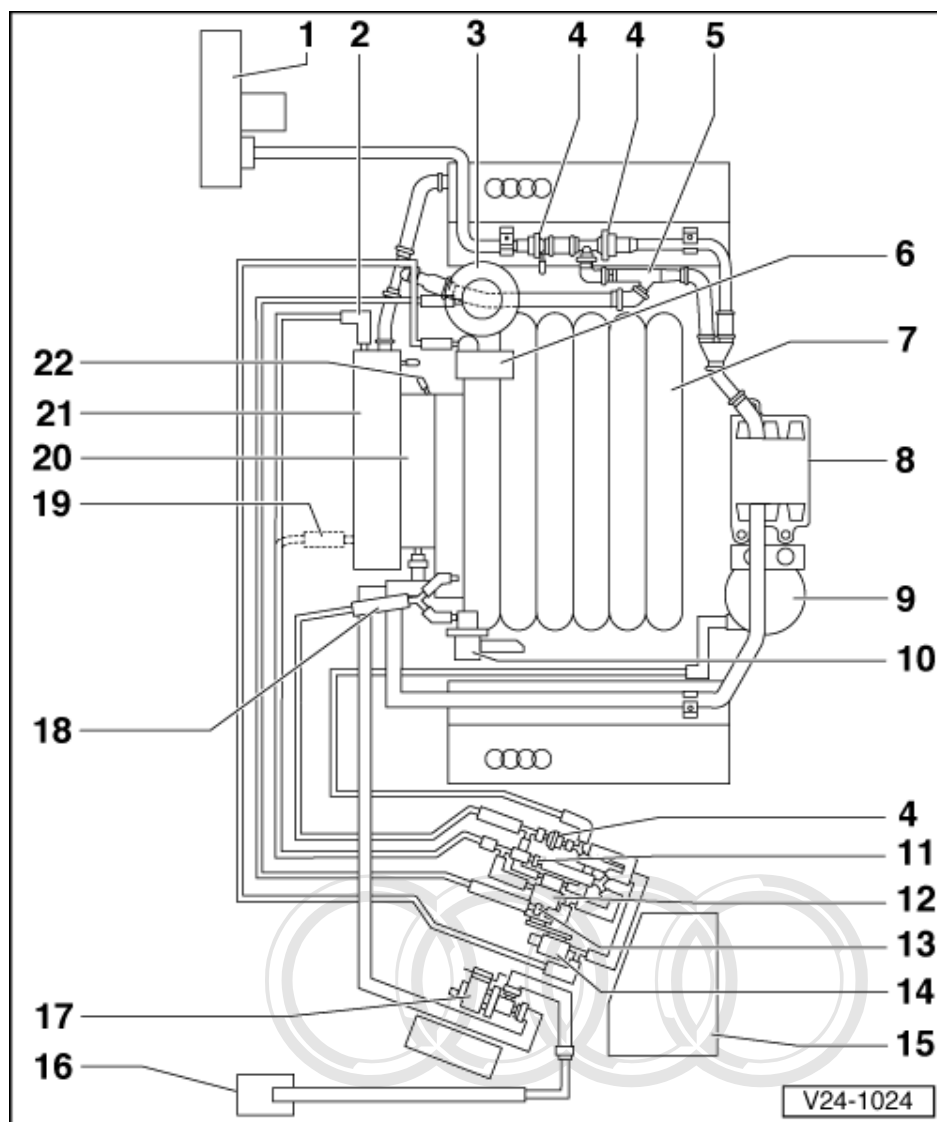
8.5 - Vehicles with automatic gearbox and EGR



Version 1

- 1 Brake servo
- 2 Vent line
 - ♦ From EGR valve -N18
- 3 Mechanical EGR valve
- 4 Non return valve
- 5 Suction jet pump
- 6 Vacuum unit
 - ♦ For intake manifold changeover valve

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7 Intake manifold

8 Ignition coils -N, -N128, -N158

9 Vacuum reservoir

- ♦ For intake manifold changeover valve

10 Fuel pressure regulator

11 Restrictor 1

12 EGR valve
-N18

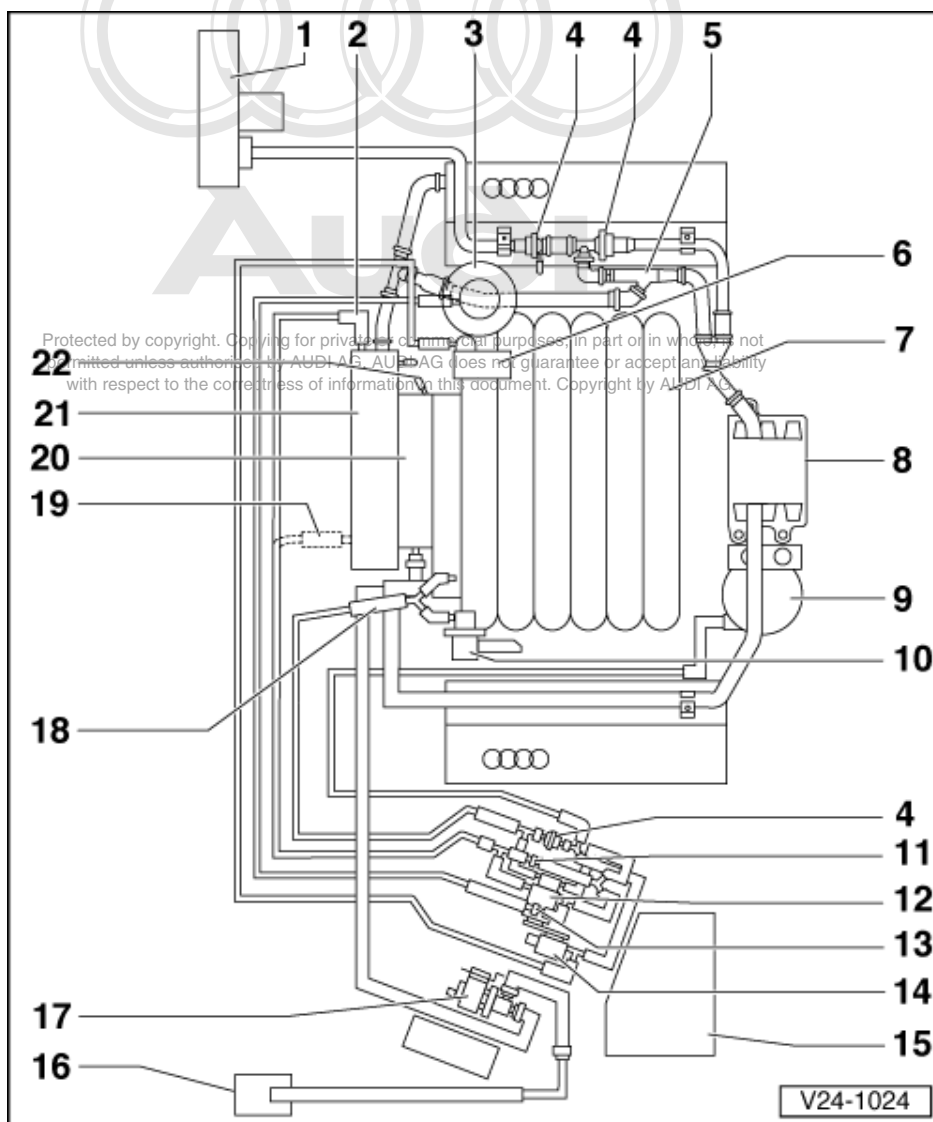
13 Restrictor 2

14 Intake manifold changeover valve -N156

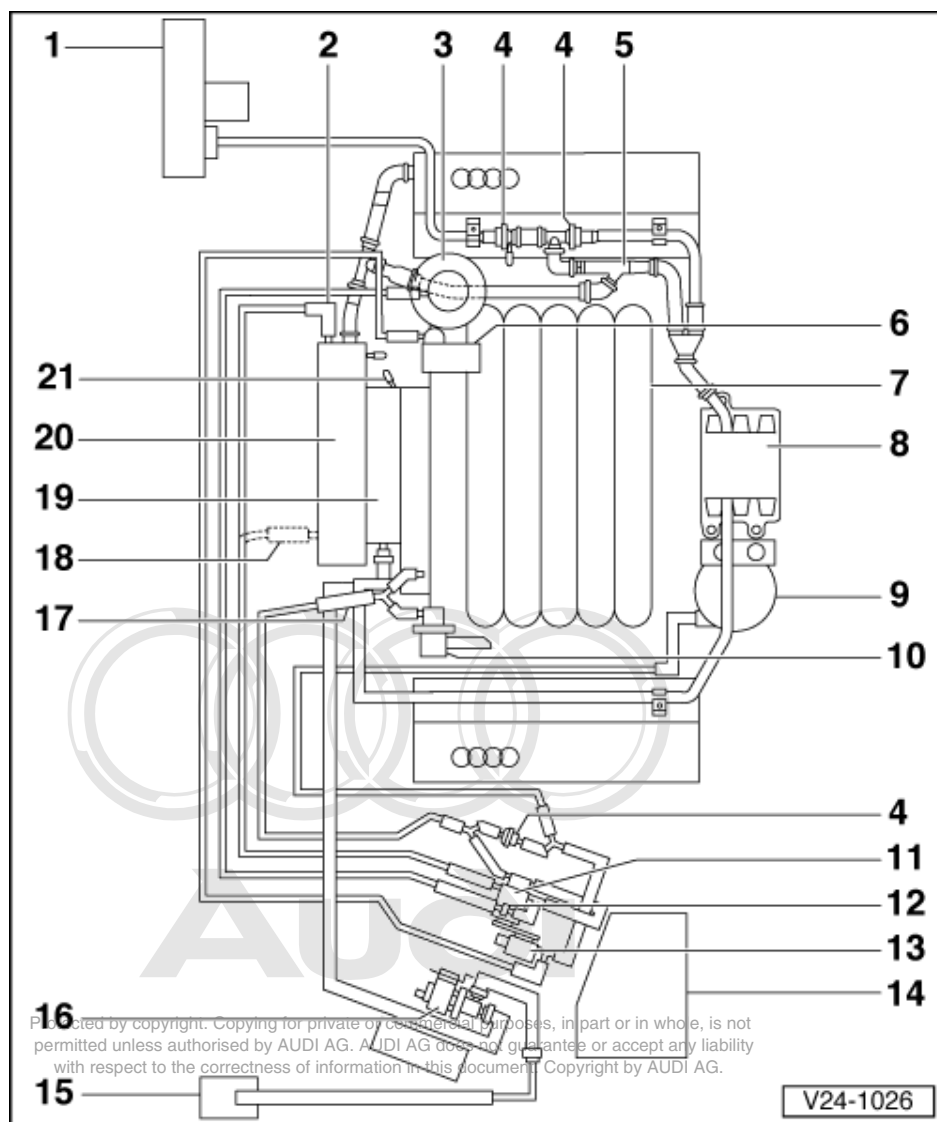
15 Air cleaner

16 Activated charcoal filter

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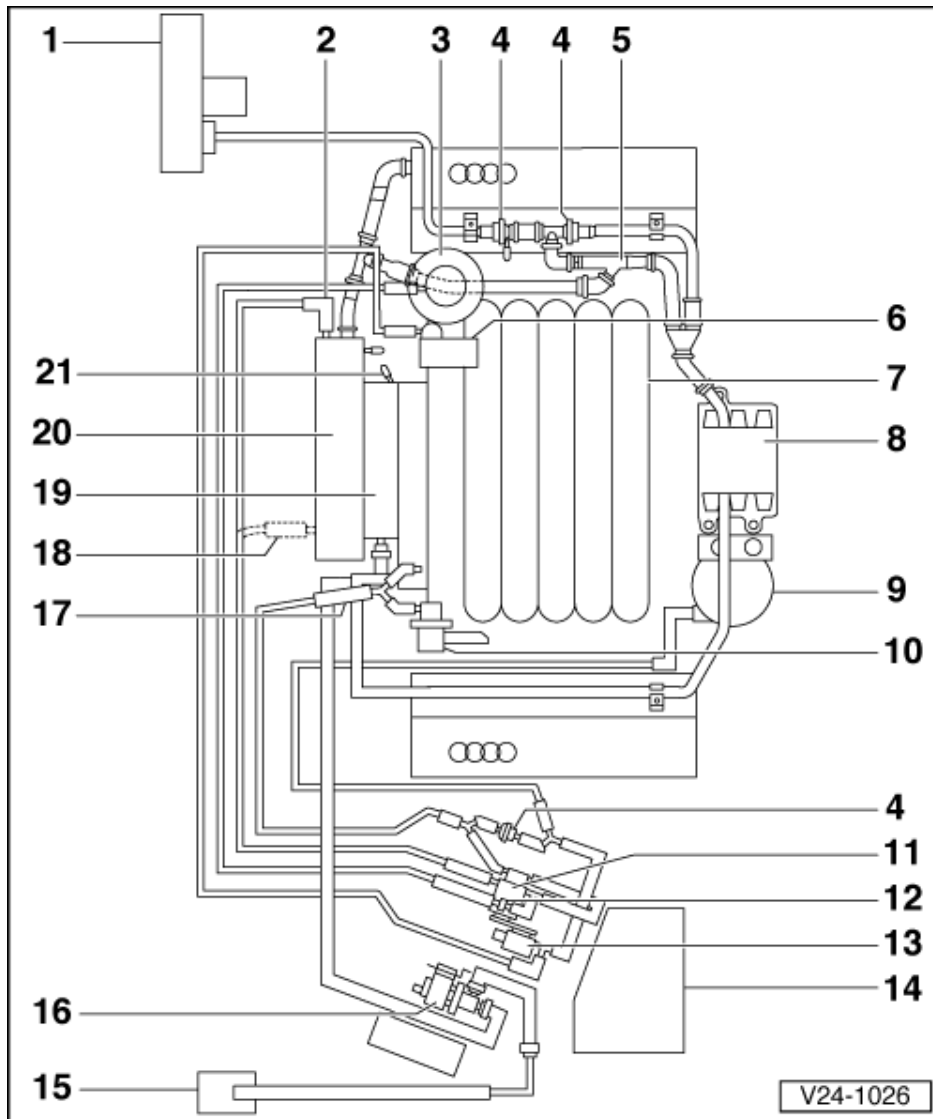


- 17 Solenoid valve 1 for activated charcoal filter -N80
- 18 Vacuum line
- 19 Not installed
- 20 Throttle valve unit
- 21 Noise insulation
- 22 To air conditioner and/or differential lock



Version 2

- 1 Brake servo
- 2 Vent line
 - ♦ From EGR valve -N18
- 3 Mechanical EGR valve
- 4 Non return valve
- 5 Suction jet pump
- 6 Vacuum unit
 - ♦ For intake manifold changeover valve
- 7 Intake manifold
- 8 Ignition coils -N, -N128, -N158
- 9 Vacuum reservoir
 - ♦ For intake manifold changeover valve



- 10 Fuel pressure regulator
- 11 EGR valve
-N18
- 12 Restrictor
- 13 Intake manifold changeover valve -N156
- 14 Air cleaner
- 15 Activated charcoal filter
- 16 Solenoid valve 1 for activated charcoal filter -N80
- 17 Vacuum line
- 18 Not installed
- 19 Throttle valve unit
- 20 Noise insulation
- 21 To air conditioner and/or differential lock



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28 - Ignition system

1 - Checking ignition system

1.1 - Checking ignition system

1.2 - Safety precautions

To prevent injuries to persons and/or damage to the fuel injection and ignition system, the following must be noted:

- ♦ Do not touch or disconnect ignition wiring when the engine is running or at starter speed.
- ♦ Always switch off the ignition before connecting or disconnecting ignition system wiring. This also applies to HT cables and measuring instrument leads.
- ♦ To operate the engine at starting speed without actually starting it (for example, to check the compression), unplug the connector from the power output stage for the ignition coils and the connectors from the injectors. After completing the work, interrogate the fault memory.
- ♦ Always switch off the ignition before washing the engine.
- ♦ Always switch off the ignition before connecting or disconnecting the battery, otherwise the engine control unit may be damaged.
- ♦ For assisted starts with a rapid charging unit the maximum permissible voltage is 16.5 V and the maximum charging time is 1 minute.

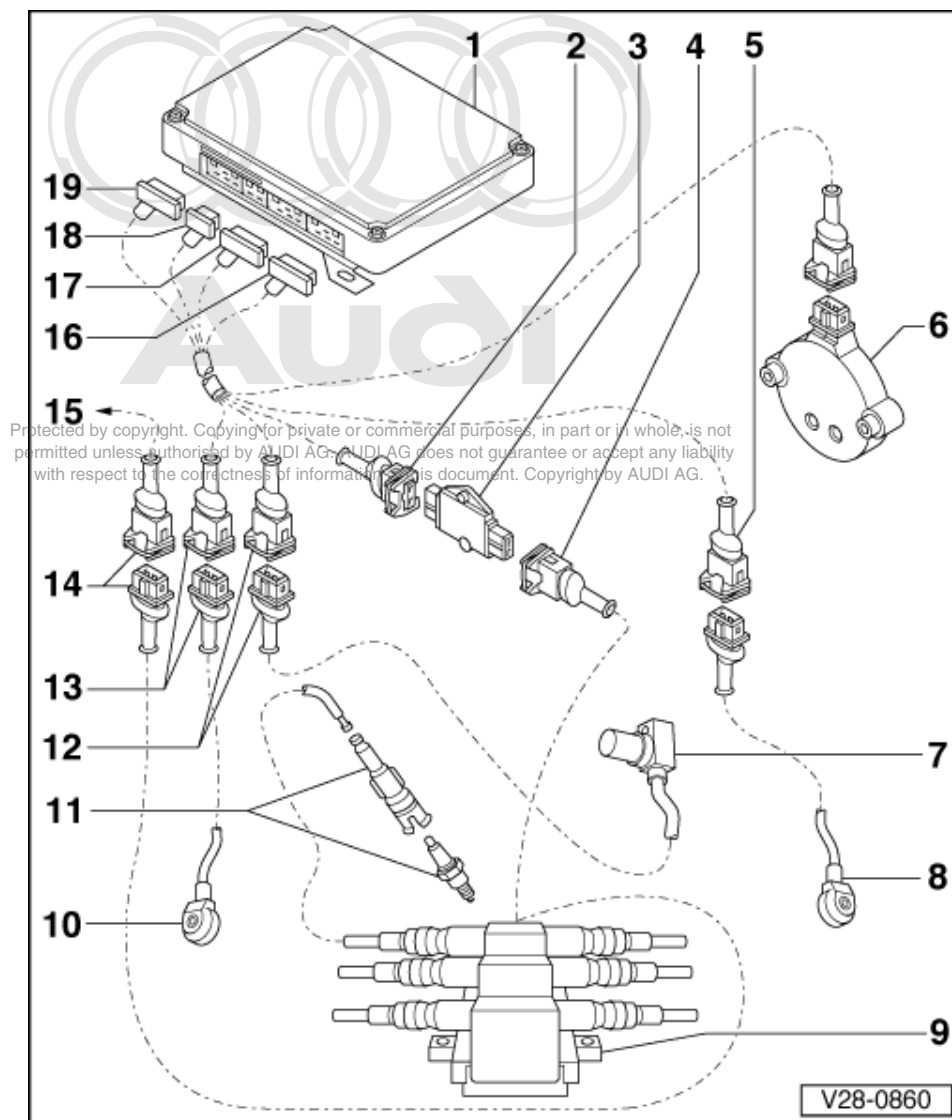
1.3 - Technical data

Engine code letters		AAH (2.8 l / 2V / 128 kW-engine)
Ignition timing is determined by the control unit. Ignition timing cannot be adjusted.		
Ignition system		Twin-spark ignition system with three ignition coils
Spark plugs 1)		Tightening torque: 30 Nm
Firing order		1-4-3-6-2-5
Ignition coils	Secondary resistance	9 ... 14 kΩ
	Primary resistance	0.5 ... 1.0 Ω

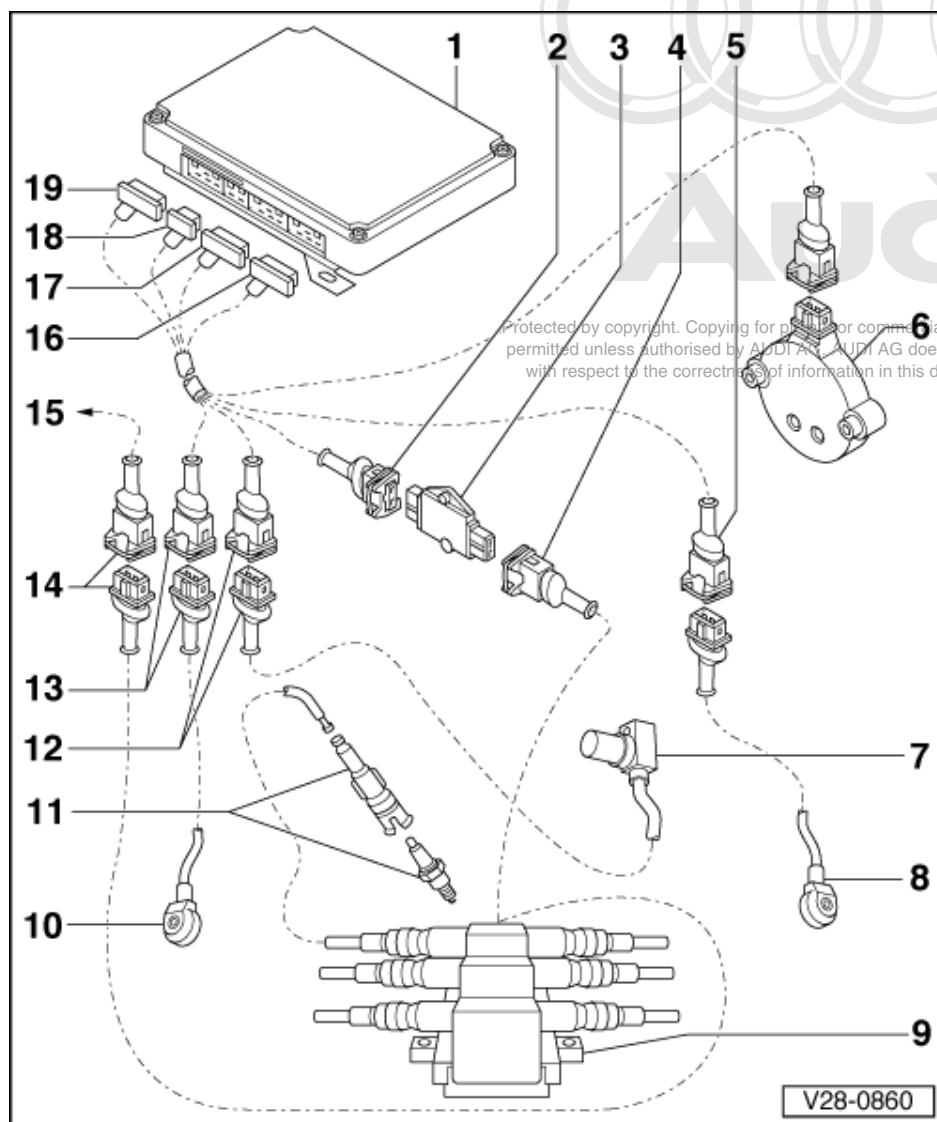
1) Current values:

=> "Exhaust emission test" binder

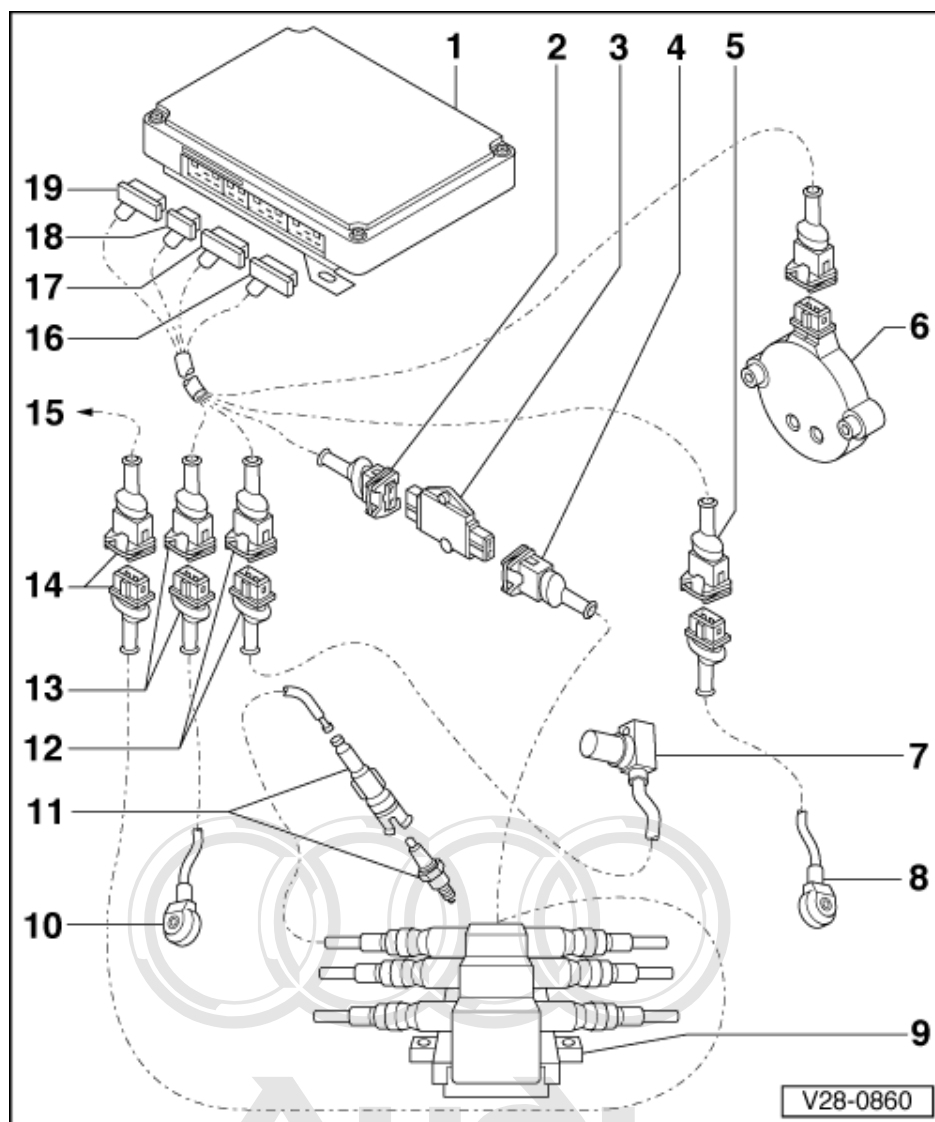
1.4 - Removing and installing ignition system components



- 1 Engine control unit -J192
 - ♦ In the passenger-side footwell electronics box
- 2 4-pin connector
 - ♦ Light brown
 - ♦ Signal wires from engine control unit
- 3 Output stage -N122
- 4 3-pin connector
 - ♦ Dark brown
 - ♦ Primary connections for ignition coils
- 5 3-pin connector
 - ♦ Blue
 - ♦ For knock sensor 2 -G66



- 6 Hall sender G40**
- 7 Ignition timing sender -G4**
 - ◆ Reference mark sender on left on cylinder block
- 8 Knock sensor 2 -G66**
- 9 Ignition coils -N, -N128, -N158**
 - ◆ With ignition cable identification, do not interchange
- 10 Knock sensor 1 -G61**
- 11 Spark plug connector with spark plug**
- 12 3-pin connector**
 - ◆ Black
 - ◆ For ignition timing sender -G4
- 13 3-pin connector**
 - ◆ Blue
 - ◆ For knock sensor 1 -G61



14 Connector

- ♦ For ignition coils

15 To fuse S115

- ♦ In yellow holder in passenger-side footwell electronics box

16 Connector C

- ♦ 16-way, brown

17 Connector B

- ♦ 20-way, red

18 Connector A

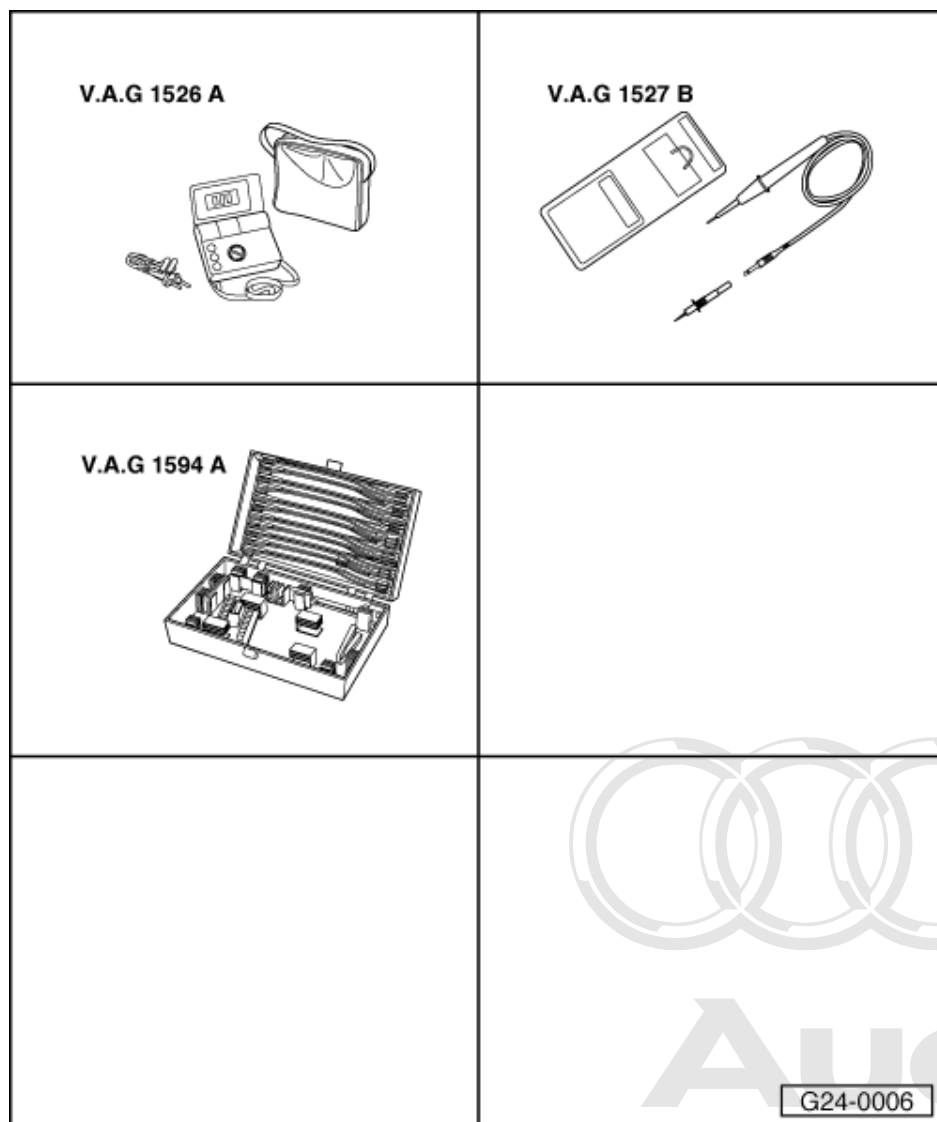
- ♦ 12-way, black

19 Connector D

- ♦ 16-way, black



1.5 - Checking ignition coils -N, -N128, and -N158



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Special tools, testers and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1527 B
- ♦ V.A.G 1594 A

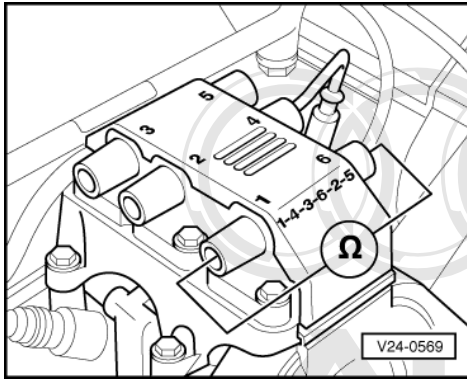
Installation position => Installation position overview - Page **70**

Note:

Check connecting leads between output stage and ignition coils as well as between ignition coils and plug connection for insulation damage.

Checking secondary resistance

- Disconnect ignition cables from ignition coils.



- -> Connect multimeter between both ignition wire connections of relevant ignition coil to measure resistance.
- Specification: 9 ... 14 kΩ

If the specification is not attained at one ignition coil:

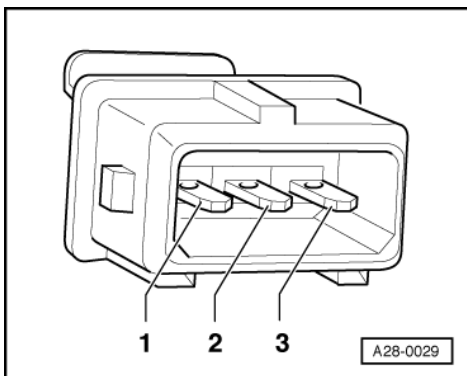
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- Replace ignition coils.

Checking primary resistance

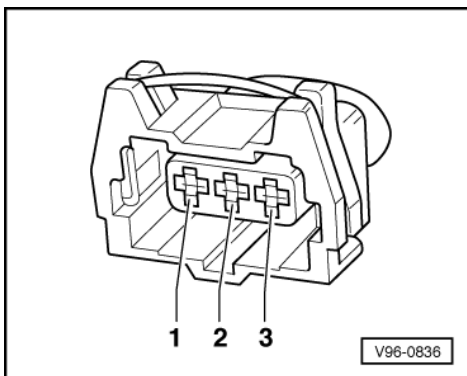
- Pull 3-way connector off output stage.
- Check connector for loose, corroded or disengaged contacts and service if necessary.

Note:



For test purposes, the contact assignment at the plug connection is of no significance, as voltage is routed to the ignition coils by way of all 3 contacts.

- -> Connect multimeter in each case to one contact of output stage to measure resistance ...



- -> ... and one contact of 3-way connector.



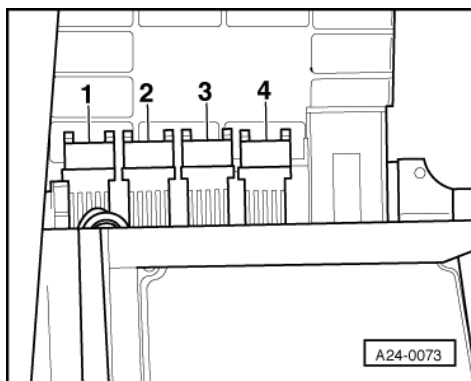
- Specification: Less than 5.0 win each case

If the specification is not attained during a measurement:

- Replace ignition coils.

Checking power supply

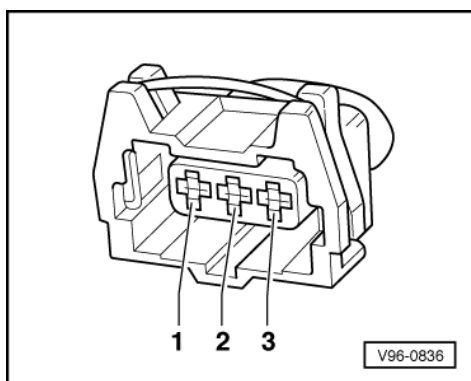
Test requirements:



- -> Fuse OK (in passenger-side footwell electronics box)

Assembly date	Locking clip	Bracket
ä 07.91	-	-
08.91 ä 08.92	S64	yellow -4-
09.92 ä	S103	yellow -4-

- Pull white 3-way connector off ignition coils.



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

Connector Contact	Measure to
1	Engine earth
2	Engine earth
3	Engine earth

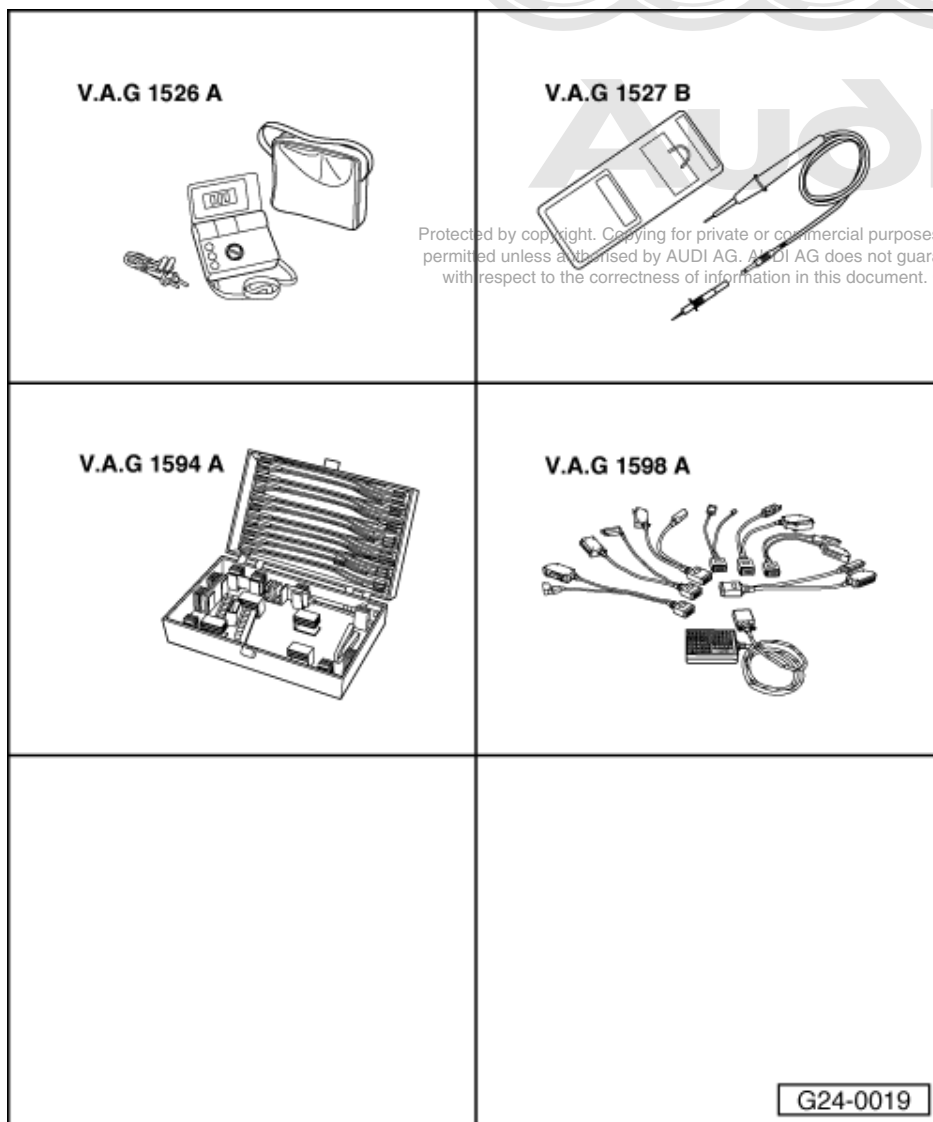
- Switch the ignition on.
 - The LED must illuminate each time.

If the LED does not illuminate:

- Check appropriate wiring for open circuit and service if necessary.

=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

1.6 - Check output stage -N122



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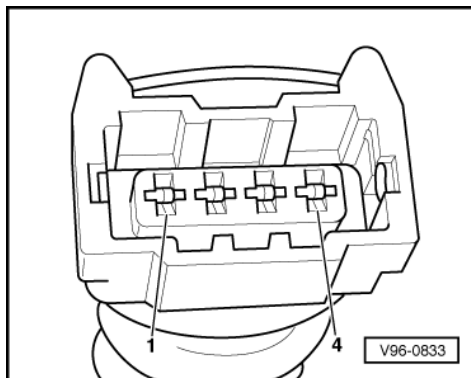
Special tools, testers and auxiliary items

- ◆ V.A.G 1526 A
- ◆ V.A.G 1527 B
- ◆ V.A.G 1594 A
- ◆ V.A.G 1598 A
- ◆ V.A.G 1598/11

Installation position => Installation position overview - Page **70**

Checking earth supply

- Pull 4-way connector off output stage.



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

Connector Contact	Measure to
2	Battery positive

- The LED must illuminate.

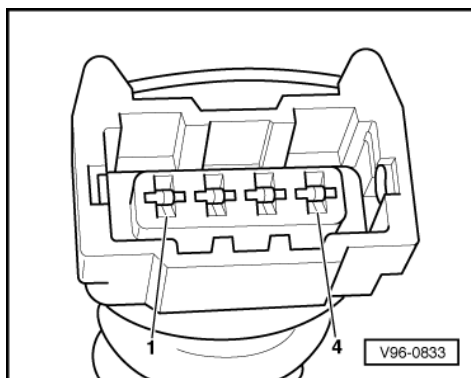
If the LED does not illuminate:

- Check wiring for open circuit and service if necessary.

=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

Checking activation

- Pull 4-way connector off output stage.
- Pull connectors off all 6 injectors (then interrogate fault memory)



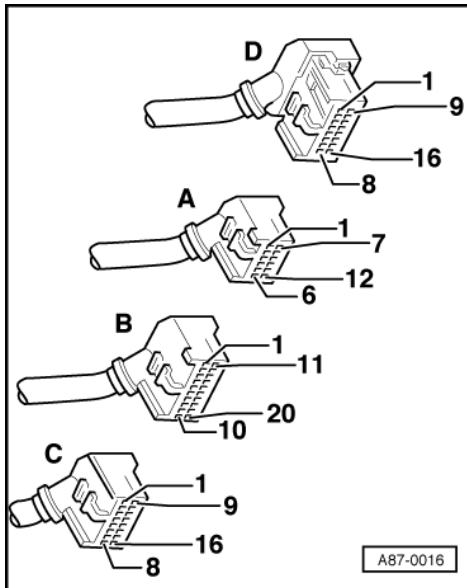
- ➔ Connect voltage tester V.A.G 1527 B as follows:

Connector Contact	Measure to
1	Engine earth
3	Engine earth
4	Engine earth

- Operate starter briefly.
 - The LED must flash.
- If the diode test lamp flashes, wiring is OK; however if one of the faults "ignition output 1/2/3" is output during self-diagnosis, replace output stage -N122.

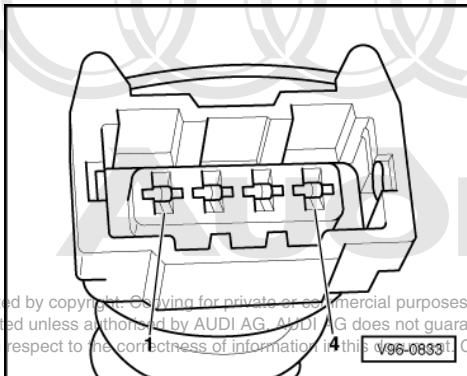


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If LED does not flash:

- -> With the ignition switched off, use adapter V.A.G 1598/11 to connect test box V.A.G 1598 A to connector B only of engine control unit (control unit remains disconnected) => Page 81 .



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- -> Check for open circuit and short to earth/positive or earth in the following wiring connections:

Connector Contact	Test box V.A.G 1598 A Socket
1	35
3	38
4	37

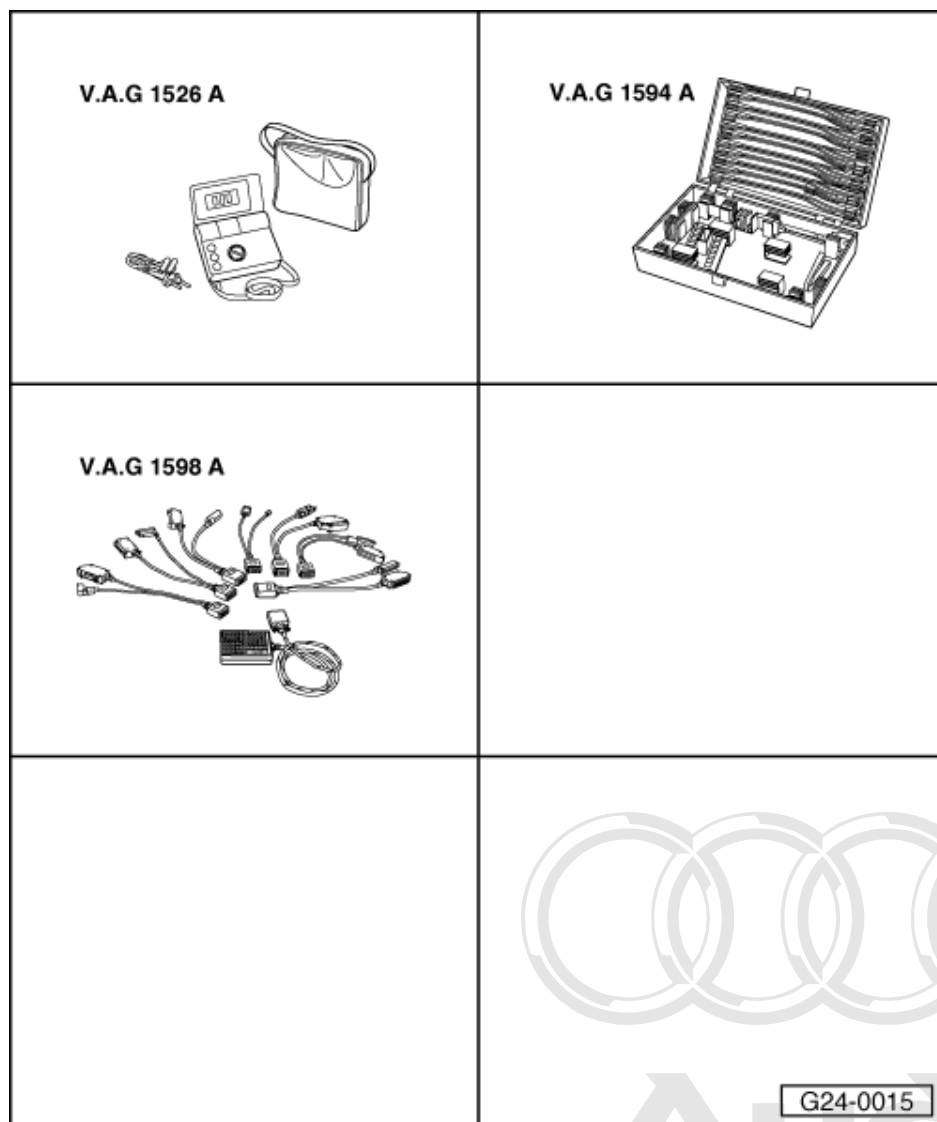
- Rectify any open/short circuit as necessary.

=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

- If the wiring is OK, fit a new engine control unit => Page 82 .



1.7 - Checking ignition timing -G4



Special tools, testers and auxiliary items

- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598 A
- ♦ V.A.G 1598/11

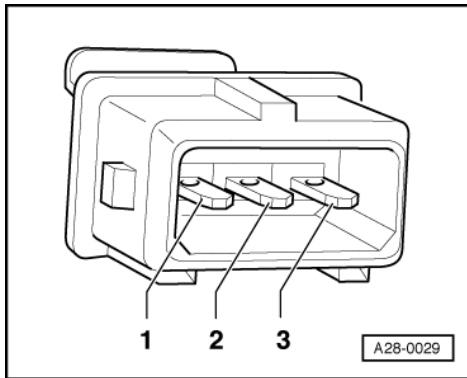
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Installation position => Installation position overview - Page **70**

- Before carrying out the test, make sure that the sender is correctly installed and firmly seated.

Checking internal resistance

- Pull black 3-way connector off ignition timing sender.



- -> Connect multimeter between contacts 1 and 2 on sender to measure resistance.
- Specification: approx. 1 k Ω

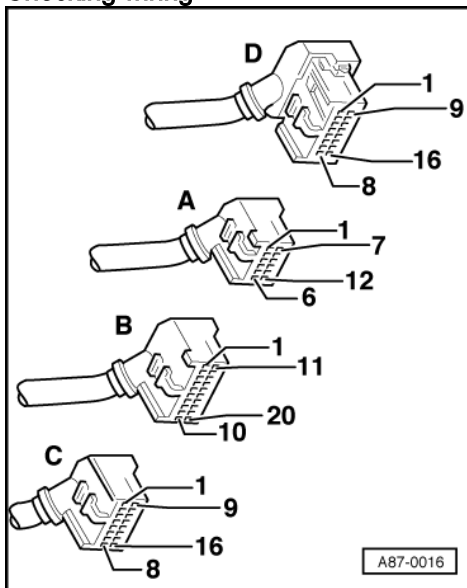
If the specification is not obtained:

- Replace ignition timing sender.
- Connect multimeter between contacts 1 and 3 and 2 and 3 on sender to measure resistance.
- Specified value: $\infty \Omega$

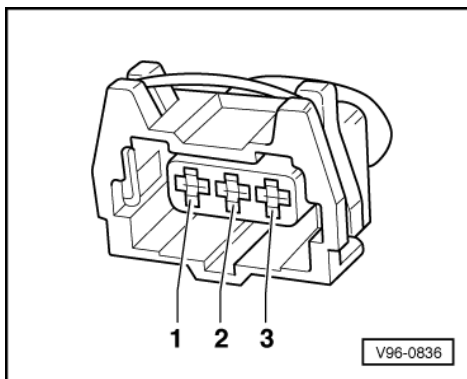
If the specified values are not obtained:

- Replace ignition timing sender.

Checking wiring



- -> With the ignition switched off, use adapter V.A.G 1598/11 to connect test box V.A.G 1598 A to connector C only of engine control unit (control unit remains disconnected) => Page 81.



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- -> Check for open circuit and short to earth/positive or earth in the following wiring connections:

Connector Contact	Measure to
1 (earth)	Test box V.A.G 1598 A Socket 5
2 (signal)	Test box V.A.G 1598 A Socket 4
3 (screening)	Engine earth

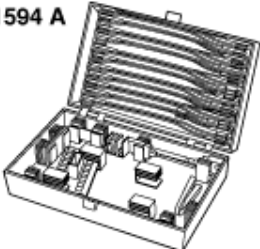
- Rectify any open/short circuit as necessary.

=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

- If the wiring is OK, fit a new engine control unit => Page 82 .

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1.8 - Checking engine speed sender - G28

V.A.G 1526 A 	V.A.G 1594 A 
V.A.G 1598 A 	
	G24-0015

Special tools, testers and auxiliary items

- ◆ V.A.G 1526 A
- ◆ V.A.G 1594 A
- ◆ V.A.G 1598 A
- ◆ V.A.G 1598/11

Installation position => Installation position overview - Page 70

Note:

Checking function

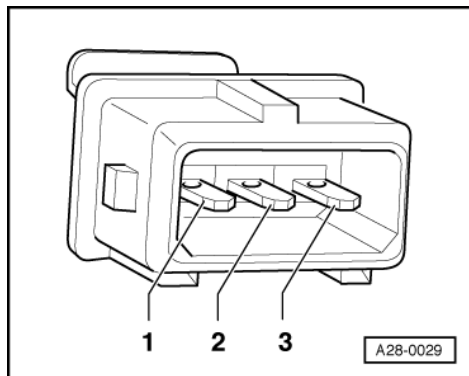
08.92 => basic setting display group 000, display zone 3, Page 25;

09.92 => reading measured value block display group 003, Page 43

- Before carrying out the test, make sure that the sender is correctly installed and firmly seated.

Checking internal resistance

- Pull grey 3-way connector off engine speed sender.



- -> Connect multimeter between contacts 1 and 2 on sender to measure resistance.
- Specification: approx. 1 kΩ

If the specification is not obtained:

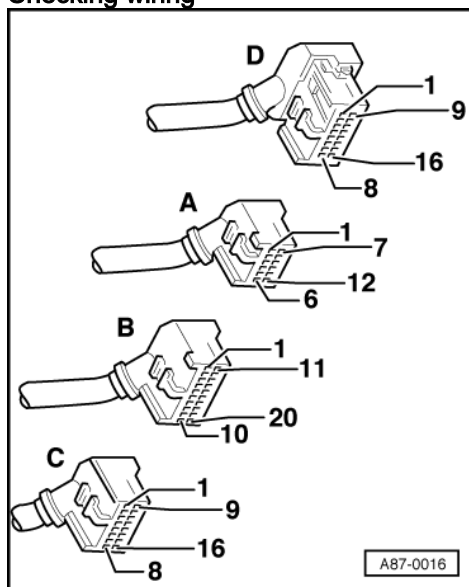
- Fit a new engine speed sender.

- Connect multimeter between contacts 1 and 3 and 2 and 3 on sender to measure resistance.
- Specified value: ∞ Ω

If the specified values are not obtained:

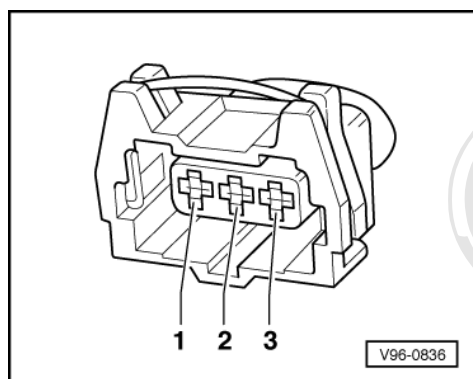
- Fit a new engine speed sender.

Checking wiring





- -> With the ignition switched off, use adapter V.A.G 1598/11 to connect test box V.A.G 1598 A to connector C only of engine control unit (control unit remains disconnected) => Page **81** .



- -> Check for open circuit and short to earth/positive or earth in the following wiring connections:

Connector Contact	Measure to
1 (earth)	Test box V.A.G 1598 A Socket 1
2 (signal)	Test box V.A.G 1598 A Socket 2
3 (screening)	Engine earth

- Rectify any open/short circuit as necessary.

=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

If no wiring fault is detected:

- Remove starter.

=> Electrical system; Repair group 27; Removing and installing starter Removing and installing starter

- Slowly crank engine and check ring gear for concentricity and broken/damaged teeth; replace if necessary

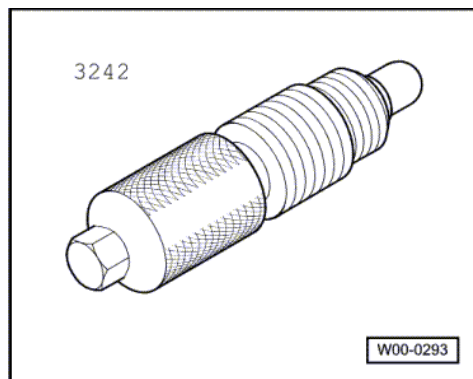
If no fault is found:

- Replace engine control unit => Page **82** .

Adjusting holder for engine speed sender

Note:

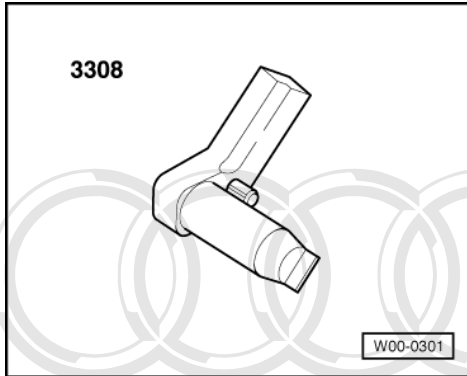
- ♦ The holder for the engine speed sender can be moved in slots. The position is set at the factory and must not be altered.



- ♦ If the bolts have been accidentally slackened off and the holder moved, carry out the adjustment as follows:

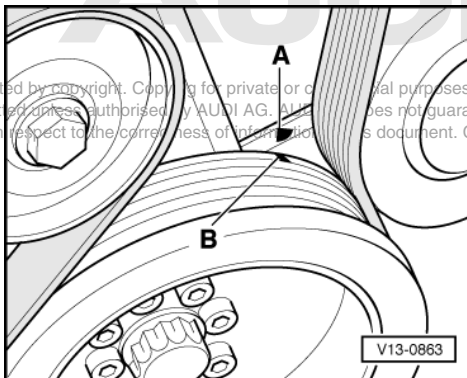
Special tools, testers and auxiliary equipment required

- ♦ Special tool 3242



- ♦ Special tool 3308

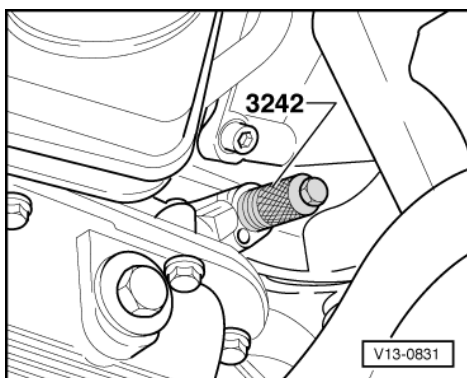
Work sequence



- -> Move crankshaft in direction of engine rotation to cylinder TFC mark 1 (notch -B- is opposite marking -A-).
- Unscrew ignition timing sender -G4 from left cylinder block.

Note:

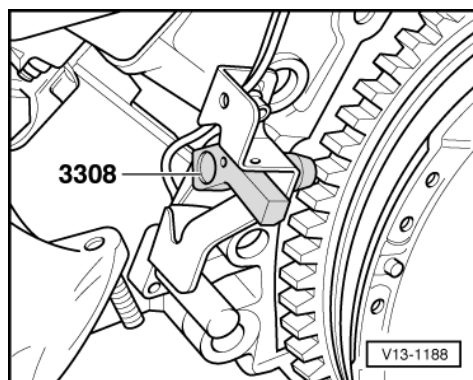
TDC hole is located exactly behind the sender in the crankshaft (can be felt).



- -> Screw crankshaft clamping bolt 3242 into threaded hole where plug has been removed, and tighten.
- Unscrew heat shield over engine speed sender.

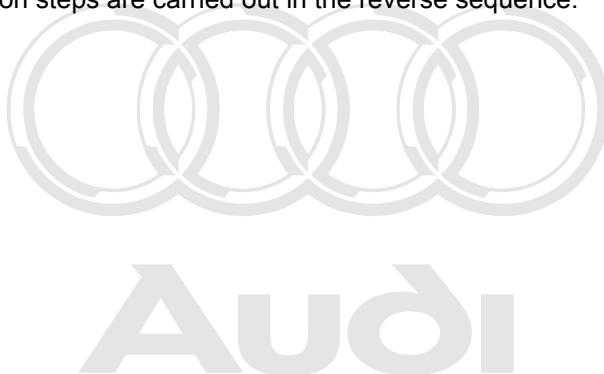


- Remove engine speed sender and unfasten holder.



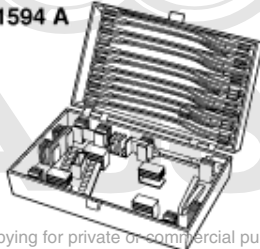
- -> Insert special tool 3308 instead of sender, so that it engages in ring gear.
- Screw on holder.

The remaining installation steps are carried out in the reverse sequence:



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1.9 - Checking coolant temperature sender -G62

V.A.G 1526 A 	V.A.G 1594 A 
V.A.G 1598 A 	Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.
	G24-0015

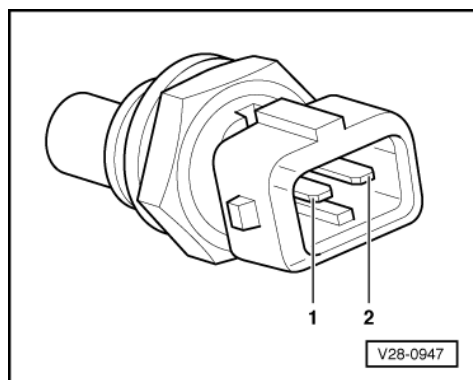
Special tools, testers and auxiliary items

- ◆ V.A.G 1526 A
- ◆ V.A.G 1594 A
- ◆ V.A.G 1598 A
- ◆ V.A.G 1598/11

Installation position => Installation position overview - Page **70**



Note:



Check function.

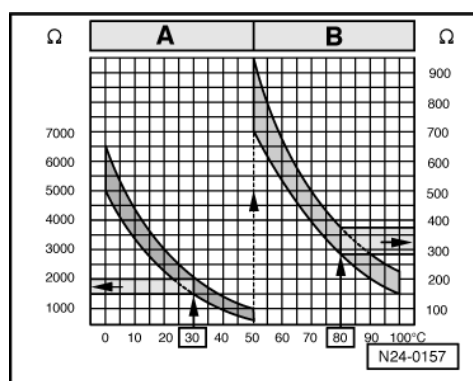
➤ 08.92 => Reading measured value block, display group 000, display zone 1, Page 35 ;

09.92 ➤ => Reading measured value block, display group 001, Page 40 .

Checking internal resistance

- Unplug connector on coolant temperature sender.
- -> Connect multimeter between contacts 1 and 2 on sender to measure resistance.

Scale A shows resistance values for temperature range 0...50 °C and scale B the values for temperature range 50...100 °C.



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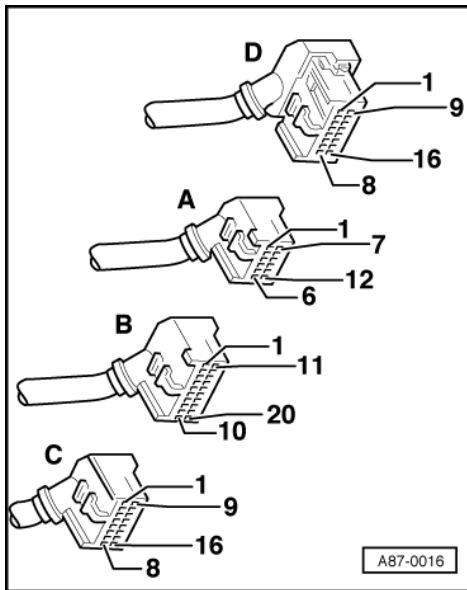
-> Examples:

- ♦ 30 °C corresponds to a resistance of 1500...2000 Ω
- ♦ 80 °C corresponds to a resistance of 275...375 Ω

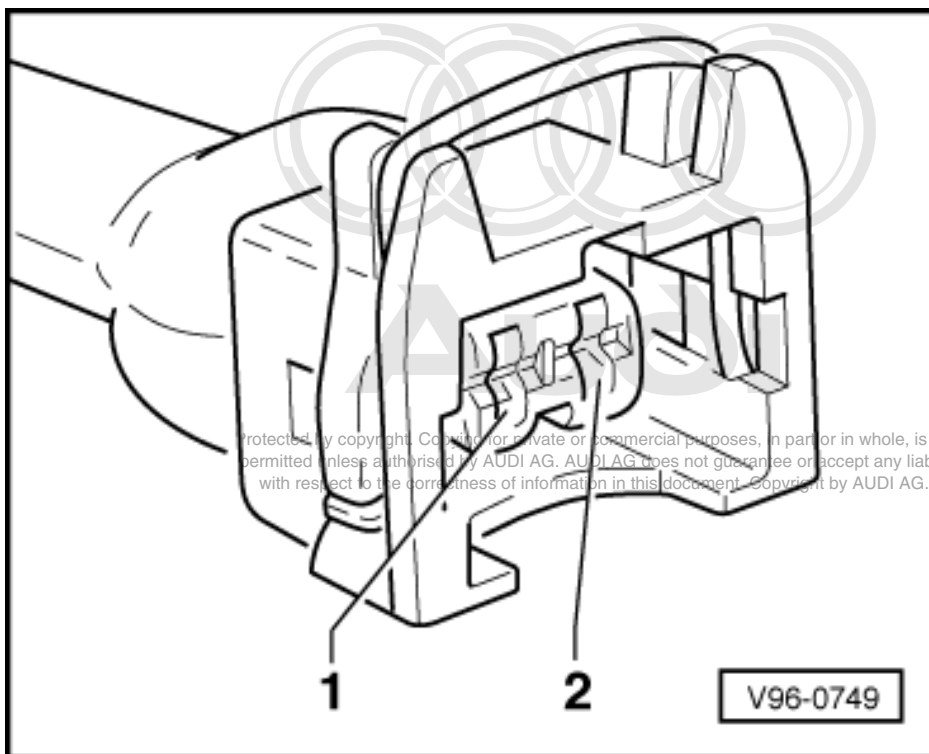
If the specified values are not obtained:

- Replace coolant temperature sender.

Checking wiring



- -> With the ignition switched off, use adapter V.A.G 1598/11 to connect test box V.A.G 1598 A to connector C only of engine control unit (control unit remains disconnected) => Page **81**.



- -> Check for open circuit and short to earth/positive or earth in the following wiring connections:

Connector Contact	Measure to
1	Test box V.A.G 1598 A Socket 15
2	Engine earth

- Rectify any open/short circuit as necessary.



=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

- If wiring is OK, replace engine control unit => Page **82**.

1.10 - Checking control unit power supply



Special tools, testers and auxiliary items

- ♦ V.A.G 1526 A
- ♦ V.A.G 1527 B
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598 A
- ♦ V.A.G 1598/11
- ♦ V.A.G 1598/12

Installation position => Installation position overview - Page **70**

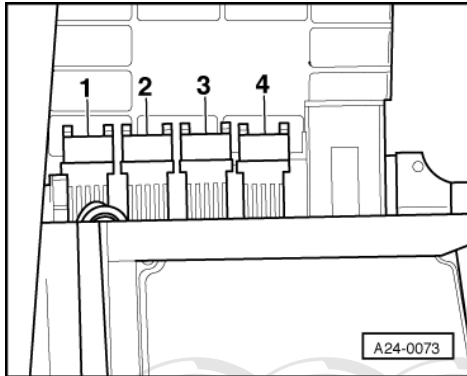
Note:

Checking power supply:

► 08.92 => Reading individual measured value, channel 14, Page 58 ;

09.92 ► => Reading measured value block, Display group 001, Page 40 .

Test requirements:

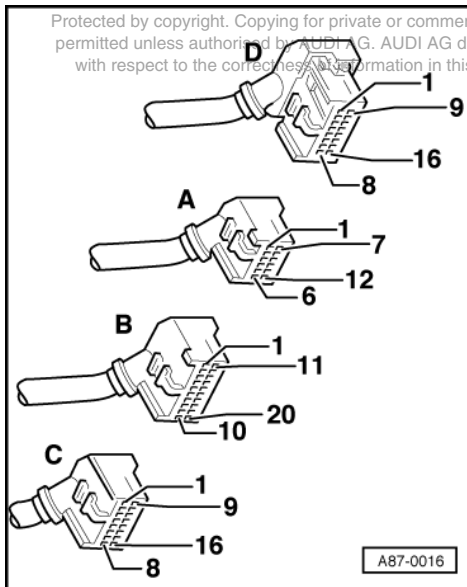


- -> Fuse OK (in passenger-side footwell electronics box)

Assembly date	Locking clip	Bracket
ä 07.91	-	-
08.91 ä 08.92	S64	yellow -4-
09.92 ä	S103	yellow -4-

- Battery voltage at least 11 V
- Alternator OK

Test sequence



- -> With the ignition switched off, use adapter V.A.G 1598/12 to connect test box V.A.G 1598 A to connector A only of engine control unit (control unit remains disconnected) => Page 81 .
- Connect voltage tester V.A.G 1527 B as follows:

Test box V.A.G 1598 A Socket	Measure to
8 (positive via ignition)	Engine earth
	Test box V.A.G 1598 A

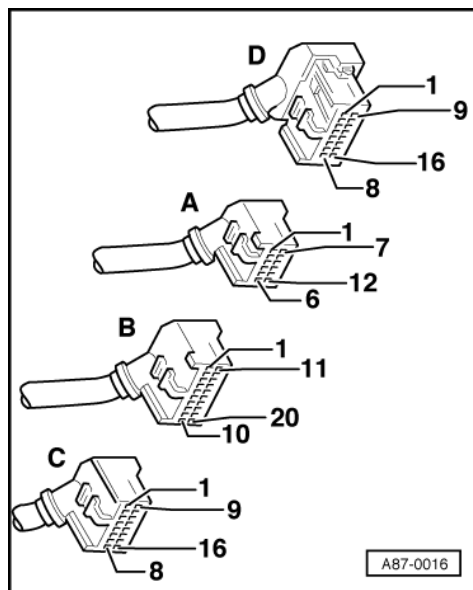
Test box V.A.G 1598 A Socket	Measure to
8 (positive via ignition)	Socket 1 (earth) Socket 2 (earth) Socket 3 (earth) Socket 16 (earth)

- Switch the ignition on.
 - The LED must illuminate each time.

If the LED does not illuminate:

- Rectify any open/short circuit as necessary.

=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder



- -> With the ignition switched off, use adapter V.A.G 1598/11 to connect test box V.A.G 1598 A to connector B only of engine control unit (control unit remains disconnected) => Page 81
- Connect voltage tester V.A.G 1527 B as follows

Test box V.A.G 1598 A Socket	Measure to
40 (permanent positive)	Engine earth

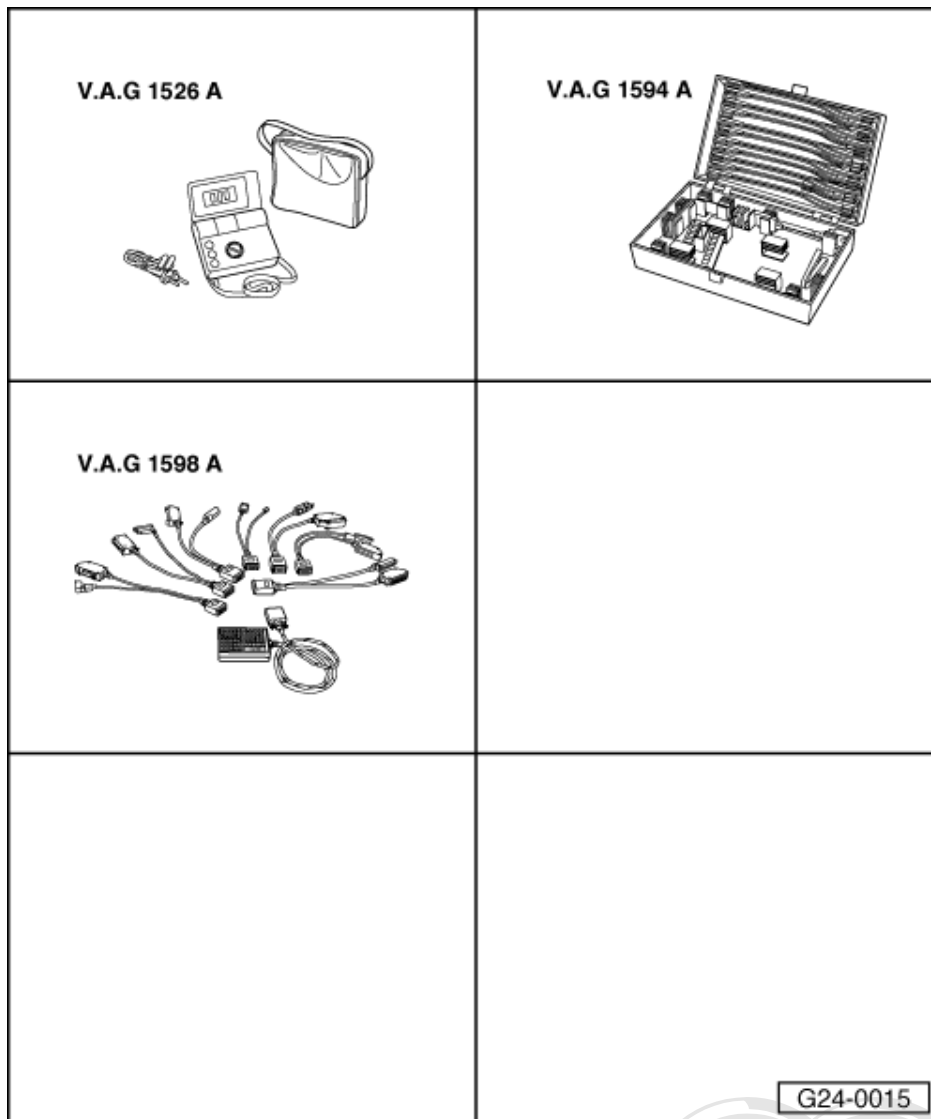
- The LED must illuminate.

If the LED does not illuminate:

- Rectify any open/short circuit as necessary.

=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

1.11 - Checking knock sensors



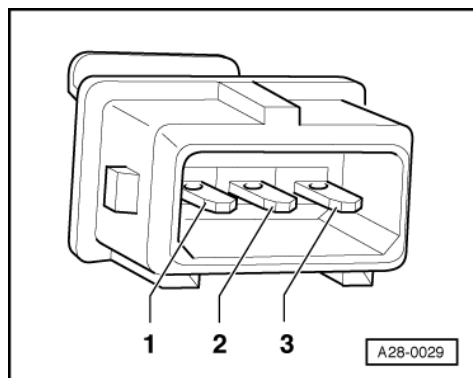
Special tools, testers and auxiliary items

- ◆ V.A.G 1526 A
- ◆ V.A.G 1594 A
- ◆ V.A.G 1598 A
- ◆ V.A.G 1598/11

Installation position => Installation position overview - Page **70**

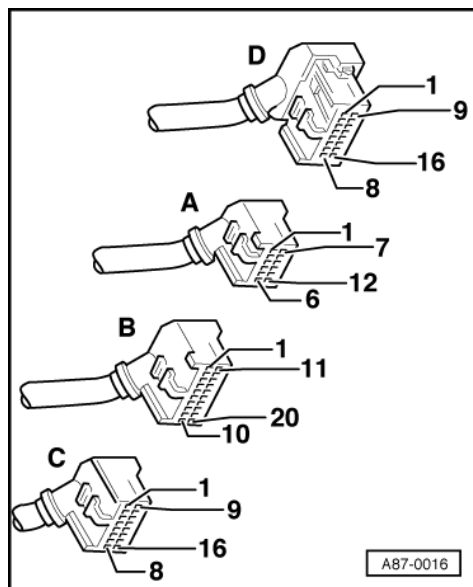
Note:

- ◆ 08.92 ➤: Checking function => Reading measured value block, display groups 015 and 016, Page **56**.
- ◆ It is not possible to carry out an electrical test of the knock sensors themselves (interrogating fault memory => Page **5**).
- ◆ Use special tool 3247 when removing and installing knock sensors.
- ◆ To ensure that the knock sensors function properly it is important to keep exactly to the specified tightening torque of 20 Nm.
- ◆ Check connectors for corrosion.
- ◆ Use only gold-plated contacts when repairing the contacts in the plug connectors.



Checking knock sensor wiring

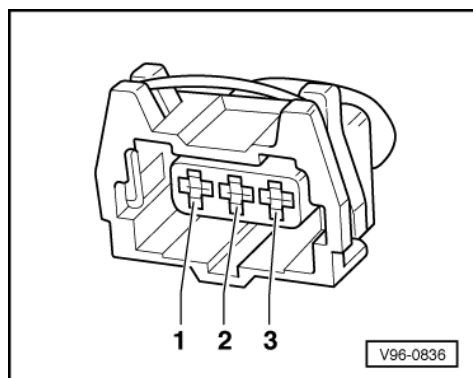
- Unplug the connector for the relevant knock sensor in the engine compartment.
- -> Check for a short circuit between all three contacts in the knock sensor connector. There must be no connection between any of the wires.
- If there is a connection between the contacts, fit a new knock sensor.



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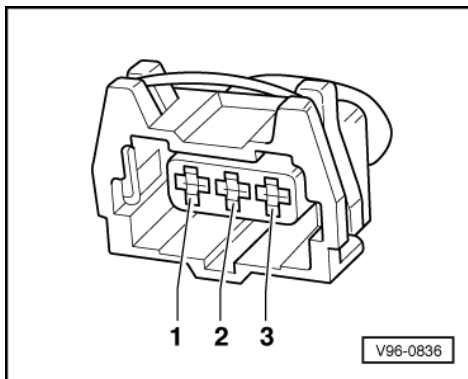
Checking wiring from knock sensors to engine control unit

- -> With the ignition switched off, use adapter V.A.G 1598/11 to connect test box V.A.G 1598 A to connector B only of engine control unit (control unit remains disconnected) => Page 81 .
- Check for open circuit and short to earth/positive or earth in the following wiring connections:



- -> Knock sensor 1

Connector -G61 Contact	Test box V.A.G 1598 A Socket
1 (signal)	22
2 (earth)	21
3 (screening)	23



- -> Knock sensor 2

Connector -G66 Contact	Test box V.A.G 1598 A Socket
1 (signal)	25
2 (earth)	24
3 (screening)	26

- Rectify any open/short circuit as necessary.

=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder



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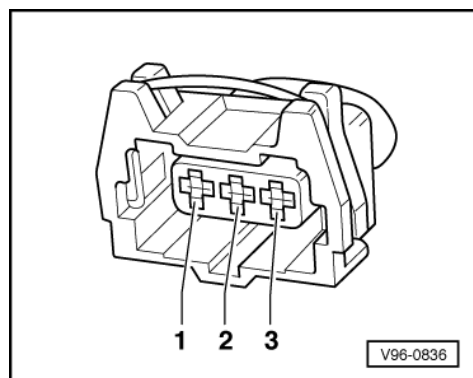


1.12 - Checking Hall sender -G40



Special tools, testers and auxiliary items

- ♦ V.A.G 1526 A
- ♦ V.A.G 1527 B
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598 A
- ♦ V.A.G 1598/11

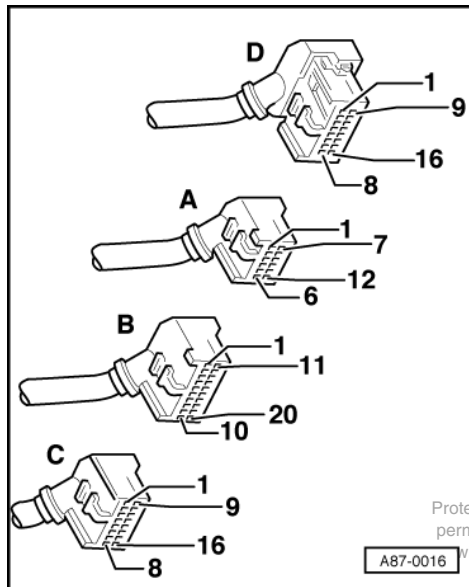


Installation position => Installation position overview - Page 70

Checking power supply

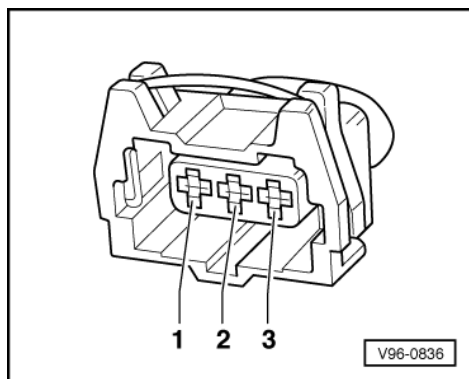
- Pull connector off Hall sender.
- -> Connect multimeter to contacts 1 (positive) and 3 (earth) to measure voltage.
- Switch the ignition on.
 - Specification: at least 9 V

If the specification is not obtained:



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- -> With the ignition switched off, use adapter V.A.G 1598/11 to connect test box V.A.G 1598 A to connector C only of engine control unit (control unit remains disconnected) => Page 81 .



- -> Check the following wires for open circuit and short to positive or earth (or short circuit to each other):

Connector Contact	Measure to
1 (positive)	Test box V.A.G 1598 A Socket 7
3 (earth)	Engine earth

- Rectify any open/short circuit as necessary.

=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

- If wiring is OK, replace engine control unit => Page 82 .

Check function

Note:

To check Hall sender function, detach 4-way connector from output stage and following function test interrogate fault memory.

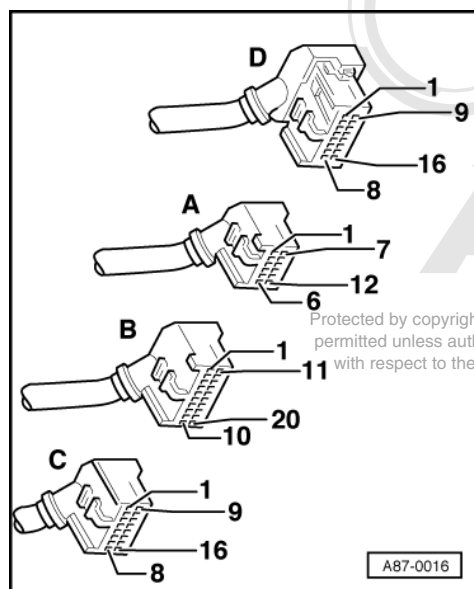
Test requirements:

- Power supply of Hall sender OK; checking => Page 215 .
- Slide back rubber grommets on connector for Hall sender but leave connector plugged in.
- Connect up voltage tester V.A.G 1527 B between receptacle 2 (Hall sender signal) and receptacle 1 (positive).

Note:

Receptacles are numbered accordingly on the back of the connector.

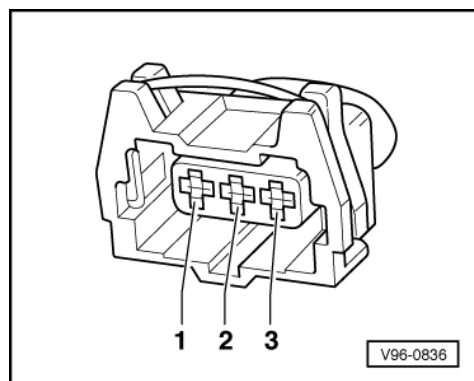
- Operate the starter for a few seconds.



- The LED must flash briefly every second engine revolution.

If LED does not flash:

- Switch off ignition.
- Pull connector off Hall sender.
- -> With the ignition switched off, use adapter V.A.G 1598/11 to connect test box V.A.G 1598 A to connector C only of engine control unit (control unit remains disconnected) => Page 81 .



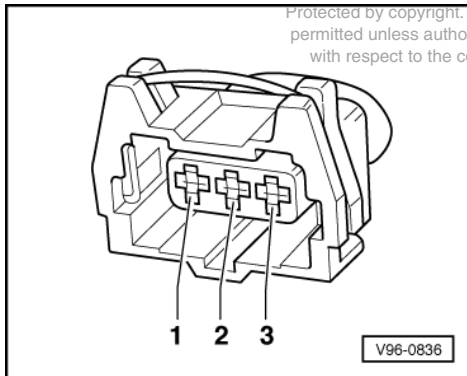
- -> Check for open circuit and short to earth/positive or earth in the following wiring connections:

Connector Contact	Test box V.A.G 1598 A Socket
2 (signal)	8

- Rectify any open/short circuit as necessary.

=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

- If there are no open circuits or short circuits, reconnect engine control unit to engine wiring harness.



- -> Connect multimeter between contacts 2 and 3 to measure voltage.
- Switch the ignition on.
 - Specification: at least 4 V

If the specification is not obtained:

- Replace engine control unit => Page 82 .

If the specification is obtained:

- Fit a new Hall sender.