



Audi 100 1991 ➤

MPFI fuel injection and ignition system (6-cyl.)

Engine ID	ABC	ACZ						
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List of Workshop Manual Repair GroupsList of Workshop Manual Repair Groups

Audi 100 1991 ➤

MPFI fuel injection and ignition system (6-cyl.)

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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01 - Self-diagnosis

1 - Self-diagnosis of multi point fuel injection system

1.1 - Self-diagnosis of multi point fuel injection system

1.2 - Control unit overview

Control unit no.	Index	Introduction date	Description
4A0 907.473		03.92	Introductory version => Self-study program no. 150
4A0 907.473	A	05.92	- Extended self-diagnosis with final control diagnosis, basic setting and extended measured value block
4A0 907.473 4A0 907.473	B C	07.94	- Expanded fault memory
4A0 907.473 4A0 907.473	D E	approx. 09.94	- Amended 5-character coding

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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 and therefore does not depend on the power supply.

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).

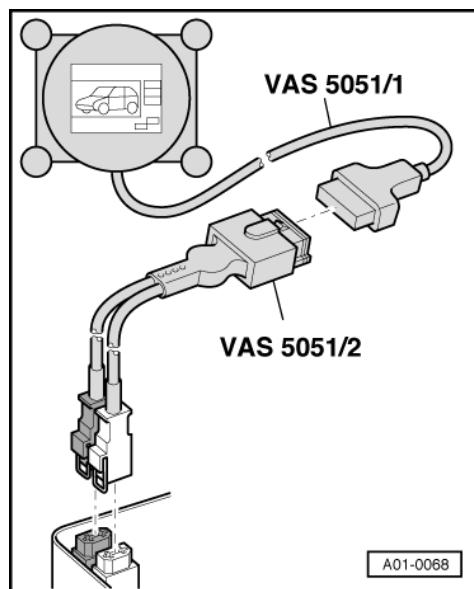
1.5 - Connecting vehicle diagnosis, measurement and information system VAS 5051 or fault reader V.A.G 1551 and selecting functions

Test requirements:

- Supply voltage of vehicle electrical system OK



- Earth connections at engine, intake manifold and bodywork OK.



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- Engine fuses OK

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

- Fuel-pump relay -J17 OK; checking => Page 68 .
- Remove cover from additional relay carrier I on left in plenum chamber.
- -> Connect the Vehicle Diagnosis, Testing and Information System VAS 5051 using diagnostic cable VAS 5051/1 and diagnosis adapter VAS 5051/2. Alternatively, connect Fault Reader V.A.G 1551 using diagnostic cable V.A.G 1551/1.

Warning

- ♦ When driving the vehicle for measurement and test purposes, always secure the vehicle diagnosis, measurement and information system VAS 1551 or fault reader V.A.G 1551 to the rear seat 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.

- With the ignition switched off, connect black connector to black diagnostic connection.

-> 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, test voltage supply to black diagnostic connector => Page 36 .

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

Depending on 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 light up.
- Press key 1 for "Rapid data transfer".

-> It this appears on the 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 in all vehicle systems with self-diagnosis capability in vehicle with rapid data transfer.

- 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:

4A0907473D 2.6l V6 MPFI
D01 □
Code 00060 WSC 12345

Note:

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

Control unit identification (example)

- 4A0 907 473 D	Part no.; assignment => Parts catalogue
- 2,6l	Engine capacity
- V6	Design of engine (V-engine, 6-cylinders)
- MPFI	Multi point fuel injection and ignition system
- D01	Data status (software status) of control unit
- Coding 00060	Control unit code
- WSC 12345	Workshop Code of V.A.G 1551 with which encoding was last performed

- 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

-> It this appears on the display:

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

Rapid data transfer HELP
L-wire not switching to earth



Check white diagnostic connector wiring => Page **36** .

Rapid data transfer HELP
L-wire not switching to positive

Rapid data transfer HELP
K-line not switching to earth

Rapid data transfer HELP
K-wire not switching to positive

Rapid data transfer
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 rectifying the faults, enter "01" again for address word "Engine electronics" => Page **1** .

Available functions

Vehicle diagnosis, measurement and information system VAS 5051 or Fault reader V.A.G 1551		Ignition on, Engine off	Engine idling	Vehicle running	Page
Address words					
01	Engine electronics	yes	yes	yes	1
00	Automatic test routine	yes	yes	yes	3
Functions					
01	Interrogating control unit version	yes	yes	yes	3
02	Interrogating fault memory	no	yes	yes	4
03	Final control diagnosis1)	yes	no	no	15
04	Basic setting1)	yes	yes	no	17
05	Erase fault memory	yes	yes	yes	4
06	End of output	yes	yes	yes	6
07	Coding control unit	yes	no	no	20
08	Reading measured value block	yes	yes	yes	22
10	Adaptation	yes	yes	no	31

- 1) Control unit no. 4A0 907 473 / A, not until software version D03.

2 - Interrogating and erasing fault memory.

2.1 - Interrogating and erasing 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 **1** . 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.

-> It this appears on the display:

No fault detected!

- Press the =>key.

or

-> It this appears on the 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.

-> It this appears on the display:

Rapid data transfer HELP
Select function XX

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

Note:

-> It this appears on the 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.
- ◆ Engine speed greater than 2500 rpm

-> It this appears on the display:

Rapid data transfer
Fault memory is erased

- Press the =>key.

Interrogate fault memory again after carrying out the repairs.

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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 removed from 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

-> It this appears on the display:

Rapid data transfer HELP
Select function XX

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

-> It this appears on the display:

Rapid data transfer HELP
Enter address word XX

- Switch off ignition and detach diagnostic connector.

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).
- ♦ After the ignition has been switched off the engine control unit goes into a self-maintaining phase for 150 minutes. If a component in the injection and ignition system is repaired within this time, a fault may be stored in the fault memory.
- ♦ Engines conforming to emission standard (=> Coding control unit, Page 20) only have one Lambda probe for bank 1.
If the engine control unit detects a fault concerning the Lambda probe or the oxygen control, the same fault is stored in the fault memory for bank 2.
- ♦ If the control unit has been incorrectly coded (=> Page 20) non-existent faults may be stored in the fault memory.

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00281 Road speed sensor G68 No signal	- Speedometer sensor/road speed sensor -G22/-G68 defective - Speedometer -G21 defective - Open circuit or short circuit between speedometer sensor and speedometer - Open circuit or short in wiring between dash panel insert and engine control unit	- Engine stalls when de-clutching in the overrun phase - Load change jolt	- Test speed signal => Page 108 - Rectify open circuit or short circuit - => "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder
	- Faulty signal input in engine control unit (control unit defective)		- Replace engine control unit =>Page 48 .

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	- Open circuit or short to earth or positive in signal wire - Open circuit in screening	- Engine will not start/ cuts out	- Rectify open circuit or short circuit => "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder
	- -G28 loose or defective - Gap between -G28 and ring gear of flywheel greater than 1.2 mm - Teeth broken on flywheel starter ring gear		- Check -G28 => Page 133 Check flywheel
	- Faulty signal input in engine control unit (control unit defective)		- Replace engine control unit =>Page 48 .
	- -G4 and -G28 connectors interchanged	- Engine will not start	- Check whether -G4 and -G28 connectors interchanged

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00514 Ignition timing sensor -G4 No signal	fault 00515 is stored at the same time - 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		- Check -G4 => Page 131
	- Hall sensor G40 defective		- Check -G40 => Page 151
	- Open circuit or short to earth or positive between -G4 and engine control unit - Open circuit in screening Continued ▼		- Rectify open circuit or short 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
00514 Ignition timing sensor -G4 No signal	(Fault 00514 continued) - Faulty signal input in engine control unit (control unit defective)		- Replace engine control unit =>Page 48 .
	- -G4 and -G28 connectors interchanged	- Engine will not start	- Check whether -G4 and -G28 connectors interchanged



V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00515 Hall sensor G40 No signal	fault 00514 is stored at the same time - Open circuit or short to earth between -G40 and engine control unit - Fault in power supply or earth supply for -G40 - - G40 defective	- If fault occurs before starting engine: - Engine will not start (no ignition or injection) - If fault occurs after starting engine: - Fault is stored - No engine power at full throttle	- Check -G40 => Page 151
	- Checking ignition timing - -G4 defective	- Emissions not OK - High fuel consumption	- Check -G4 => Page 131
	- Incorrect valve timing (toothed belt skipped)		- Check valve timing => Repair group 13
	- Faulty signal input in engine control unit (control unit defective)		- Replace engine control unit =>Page 48 .

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00516 F60 idling switch. Open circuit / short to positive	- Throttle valve sticking - -F60 defective	- Increased idling speed - No overrun cut-off	- Check idling switch => Page 100
	- Throttle cable setting - Floor mat pressing down on accelerator pedal	- Load change jolt	- Adjust throttle cable => Repair group 20
	- Open circuit or short to positive between -F60 and engine control unit		- Read measured value block, display group 009 => Page 30
	- Faulty signal input in engine control unit (control unit defective) Continued ▼		- Replace engine control unit =>Page 48 .

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)		
	- Short to earth between -F60 and engine control unit - Moisture in connector of -F60 - -F60 defective - Faulty signal input in engine control unit (control unit defective)		- Read measured value block, display group 009 => Page 100 - Replace engine control unit =>Page 48 .

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00518 Throttle valve potentiometer G69			

Short circuit to earth Open circuit / short to positive	- Open circuit or short to earth or positive between -G69 and engine control unit - -G69 defective - Moisture or corrosion in connector at -G69	- Loss of power - Engine running problems - Poor throttle response	- Rectify short circuit or open circuit => "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder Check throttle valve potentiometer => Page 97 - Replace engine control unit =>Page 48 .
	- Faulty signal input in engine control unit (control unit defective)		

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00519 Intake manifold pressure sensor -G71 Upper stop value Implausible signal Short circuit to earth Open circuit / short to positive	- -G71 (in engine control unit) defective	- Unstable idling - Load change jolt - Poor throttle response - Jolting	- Replace engine control unit =>Page 48 .

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00522 Coolant temperature sensor -G62 Implausible signal Short circuit to earth Open circuit / short to positive	- Open circuit or short to earth or positive in wiring between -G62 and engine control unit	- Cold start difficulties - Engine running problems when warm	- Read measured value block, Display group 002 =>Page 25
	- -G62 defective - Moisture or corrosion in connector at -G62		- Check -G62 => Page 142
	- Faulty signal input in engine control unit (control unit defective)		- Replace engine control unit =>Page 48 .

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00523 Intake air temperature sensor -G42 Short circuit to earth Open circuit / short to positive	- Open circuit or short to earth or positive in wiring between -G42 and engine control unit	- Engine running problems	- Rectify short circuit or open circuit => "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder
	- -G42 defective		- -Check G42 => Page 138
	- Faulty signal input in engine control unit (control unit defective)		- Replace engine control unit =>Page 48 .

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00524 Knock sensor 1 -G61			



Signal too small No signal	- Knock sensor defective - Corrosion at connector of - G61	- Slight loss of power - Max. speed to low	- Check G61 => Page 148
	- Knock sensor loose		- Tightening torque for knock sensor: 20 Nm
	- Open circuit or short to positive in wiring between -G61 and engine control unit		- Rectify short circuit or open circuit => "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder
	- Short circuit between -G61 and earth or screen		- Replace engine control unit =>Page 48 .
	- Faulty signal input in engine control unit (control unit defective)		

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00525 Lambda probe -G39 Implausible signal	- Open circuit or short in wiring between -G39 and engine control unit - Short circuit to earth or screen in Lambda probe signal wire - -G39 defective - Lambda probe heater - Z19 not working - Thermo fuse S73 (brown holder) defective or Lambda probe heater control unit -J208 defective - Heating resistor in -G39 defective - Open circuit or short circuit in Lambda probe heater - Z19 wiring.	- Emissions not OK - Lambda control switches to open loop control - Engine running problems	- Rectify short circuit or open circuit => "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder - Check lambda control =>Page 77 - Check Lambda probe heater => Page 78

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V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00532 Supply voltage Signal too small	- Poor earth connection to engine control unit - Battery flat - Current draw with "ignition off" (discharge)	- Voltage less than 6 V - Engine will not run	- Check power supply to engine control unit => Page 145 . - Check voltage - Check charge
Signal too high	- Supply voltage greater than 16 V - Excess voltage from assisted start - Alternator defective	- Damage to the engine control unit	- Check voltage

Note:

If the fault 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
00533 Idling speed regulation Adaptation limit exceeded	- Idling stabilisation valve - N71 out of position or stuck in closed position - Idling stabilisation valve - N71 defective Continued ▼	- Idling speed too low - Idling speed drops when de-clutching	- Perform basic setting => Page 73

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00533 Idling speed regulation Lower adaptation limit exceeded	(Fault 00533 continued) - Idling stabilisation valve - N71 stuck in open position - Open circuit in wiring between -N71 and engine control unit - Contact resistance at idling stabilisation valve connector-N71 - Unmetered air	- Idling speed too high - Irregular idling (hunting)	- Check -N71 => Page 73 - Rectify open circuit . => "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder - Perform visual inspection - Locate and eliminate leak

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00535 Initial knock control 1) Lower stop value	Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised in writing by Audi AG. Audi AG does not give any responsibility with respect to the correctness of information in this document. Copyright by AUDI AG. - Poor quality fuel (less than RON 91) - Knock sensor 1 -G61 loose - Open circuit in knock sensor 1 -G61 screen - Abnormal engine noise (sub-assemblies loose) due to mechanical damage such as loosened screw-in connections, sheared attachment bolts or sheared/broken brackets for components on engine. Continued ▼	- Slight loss of power - Slight increase in fuel consumption - Max. speed too low - Engine runs unevenly	- Fill tank with fuel with at least 91 RON. - Tighten knock sensor to 20 Nm - Check G61 => Page 148 - Rectify mechanical damage

1) Knock sensor 1 -G61 for cylinders 1, 2 and 3 is monitored.

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00535	(Fault 00535 continued)		



First knock regulation Lower stop value	- Knock control in engine control unit defective (engine control unit defective)		- Replace engine control unit =>Page 48 .
00536 Second knock control(2) Lower stop value	=>Initial knock control Fault code 00535	=>Initial knock control Fault code 00535	=>Initial knock control Fault code 00535

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

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00537 Lambda control(3) Upper stop value	- Fuel tank empty, min. 10 l - Thermo fuse S73 (brown holder) defective or Lambda probe heater control unit - J208 defective - Fuel system pressure too low - Leaks in exhaust system before catalytic converter Continued ▼	- CO upstream of catalytic converter less than 0.15 % by vol. - Engine running problems	- Refuel the vehicle - Check Lambda probe heater => Page 78 - Check fuel system pressure => Page 53 - Rectify leaks

3) Lambda sensor 1 -G39 for cylinders 1, 2 and 3 is monitored.

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00537 Lambda control Lower stop value	(Fault 00537 continued) - Spark plug malfunction - Fuel pressure too high - Lambda probe defective - Solenoid valve 1 for activated charcoal filter system -N80 leaking, permanently open - Intake manifold pressure sensor -G71 (in engine control unit) or hose connection defective	- CO upstream of catalytic converter more than 1.0 % by vol. - Soot deposits on spark plugs - Consumption too high - Black smoke - Engine running problems	- Perform visual inspection - Check fuel system pressure => Page 53 - Check lambda control =>Page 77 - Check activated charcoal filter solenoid valve 1 -N80 for leaks => Page 92 - =>Fault codes 00519 and 00575

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00540 Knock sensor 2 -G66 Signal too small No signal	=>Knock sensor 1 -G61 Fault code 00524	=>Knock sensor 1 -G61 Fault code 00524	=>Knock sensor 1 -G61 Fault code 00524
00545			

Engine/gearbox electrical connection Signal to earth No signal	- Open circuit or short circuit to positive or earth	- Cold start difficulties	- Rectify open circuit or short circuit => Page 115 .
	- Automatic gearbox control unit -J 217 defective		

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00554 Lambda control(4) Upper stop value Lower stop value	=> Lambda control Fault code 00537	=> Lambda control Fault code 00537	=> Lambda control Fault code 00537
00555 Lambda probe 2 -G108 Implausible signal	=> Lambda probe- G39 Fault code 00525	=> Lambda probe- G39 Fault code 00525	=> Lambda probe- G39 Fault code 00525
00561 Mixture adaptation Adaptation limit (add) not reached	- Fuel pressure too high Continued ▼	- Jolting may occur - Increased fuel consumption	- Fill up vehicle, check fuel system pressure => Page 53

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

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00561 Mixture adaptation Adaptation limit (mul) not reached	(Fault 00561 continued) Fuel in engine oil (possibly due to short journeys) - Injectors leaking - Coke injectors	Idle running may occur - Formation of black smoke, soot deposits on spark plugs	- Drive vehicle on a motorway for 15 minutes or change oil - Check injection quantity =>Page 65 . - Check injectors => Page 56

Note:

- ♦ add = additive, i.e. effect of fault (e.g. unmetered air) is less pronounced with increasing engine speed.
- ♦ mul = multiplicative, i.e. effect of fault (e.g. injector fault) is more pronounced with increasing engine speed.

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00575 Intake manifold pressure Mechanical fault 5)	- Vacuum hose from intake manifold to engine control unit split, blocked, kinked or squashed	- Engine running problems - Load change jolt	- Checking hose connection => Page 117
01119 Gear recognition signal			



V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
Short circuit to earth	- Short to earth in signal wire between engine control unit and gearbox control unit		- Check gear signal => Page 112

5) Only the hose connection is monitored.

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
01247 Solenoid valve 1 for activated charcoal filter system -N80 Open circuit/short circuit to earth	- Power supply for -N80 defective - -N80 defective - Open circuit or short to earth between -N80 and engine control unit - -N80 defective - Signal output in engine control unit defective (control unit defective)	- Smell of petrol in vehicle	- Check -N80 => Page 91 - Replace engine control unit =>Page 48 .

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
01257 Idling stabilisation valve -N71 Open circuit	- Open circuit or short to earth or positive in wiring between -N71 and engine control unit	- Engine speed deviates from specified speed when the engine is at operating temperature - Engine running problems	- Check -N71 => Page 73

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
17978 Engine control unit blocked	- Fault in immobiliser system - Immobiliser control unit not adapted to engine control unit - Open circuit between immobiliser control unit and engine control unit	- Engine will not start (stalls after 1 second)	- Interrogate immobiliser fault memory => Electrical System; Repair Group 01; Self-diagnosis; Interrogating fault memory Self-diagnosis; Interrogating fault memory - Adapt control units => Electrical system; Repair group 01; Self-diagnosis; Adaptation when changing engine control unit Self-diagnosis; Adaptation when changing engine control unit - Rectify 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
65535 Control unit faulty	- Earth connection to engine control unit at contacts A11, D1 and D9 - Engine control unit defective	- Engine will not start	- Check earth connection => "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder - Replace engine control unit => Page 48

3 - Final control diagnosis

3.1 - Final control diagnosis

Note:

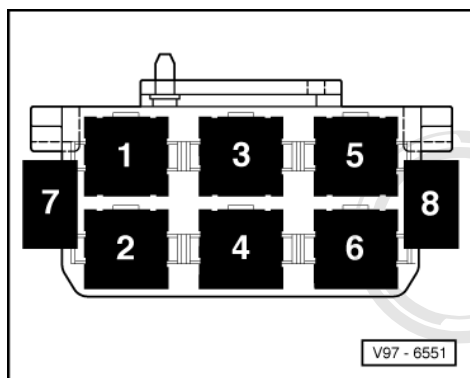
- ◆ Final control diagnosis can only be carried out as of control unit no. 4A0 907 473 / A, software version D03 and above.
- ◆ The final control diagnosis can only be performed with the engine stopped and the ignition switched on.
- ◆ The final control diagnosis is terminated if the engine is started 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:

Actuation sequence
1 Control unit for Lambda probe heater -J208 1)
2 Solenoid valve 1 for activated charcoal filter N 80

- 1) This control unit is only fitted in vehicles ä 06.96.

Note:



-> Lambda probe heater control unit -J208 location: In additional relay carrier III in the front passenger side footwell, relay position 1.

Test requirements:

- Engine fuses OK

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- Fuel pump relay -J17 OK

Test sequence

- 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 **1** .
Engine must not be running.

-> If this appears on the 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.

-> If this appears on the display:

Final control diagnosis
Contr. unit for Lambda probe heater -J208

1. - The fuel pump relay -J17 must actuate, the fuel pump must run. Flow noise at fuel pressure regulator is clearly audible.

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If the fuel pump relay does not actuate:

- Check actuation of the fuel pump relay-J17 => Page **70** .
2. - Vehicles ä 06.96: The Lambda probe heater -J208 control unit must click.

Note:

The clicking of the control unit can only be heard inside the vehicle.

If the control unit does not click:

- Check the Lambda probe heater -J208 control unit => Page **82** .

Actuation of activated charcoal filter solenoid valve

- Press the ➡key.

-> If this appears on the display:

Final control diagnosis
Solenoid valve 1 for activated charcoal
filter N80

The injector valve should click.

If the injector does not click:

- Check the activated charcoal filter system solenoid valve 1 -N80 =>Page **91** .
- Press the ➡key.

-> If this appears on the display:

Function unknown or cannot
be implemented at present.

- Press the ➡key.

-> Indicated on display (function selection):

Rapid data transfer HELP
Select function XX

Note:

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

4 - Basic setting

4.1 - Basic setting

Note:

- ◆ Basic setting can only be carried out as of control unit no. 4A0 907 473 / A, software version D03 and above .
- ◆ The idling speed stabilisation valve is moved to its basic position in the "Basic setting" function, display group 001.
- ◆ The learned mixture values are set to the programmed basic value in the "Basic setting" function, display group 002.
- ◆ The basic setting functions, display groups 001 and 002 are carried out simultaneously in the "Adaptation" function, channel 00 => Page 31 .

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 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 1 .
For this purpose, the ignition must be switched on.

-> If this appears on the display:

Rapid data transfer	HELP
Select function XX	

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

-> If this appears on the display:

Basic setting	Q
Enter display group number XXX	

- Enter the required display group number.

Note:

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- ◆ 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

Display group 001 - Moving idling speed stabilisation valve to its basic position

- Ignition on.

The idling speed stabilisation valve -N71 must be moved to its basic position if:



- The -N71 connector has been removed with the engine running;
- The N71 has been removed and installed or replaced;
- -The engine control unit has been removed and installed or replaced;
- The intake manifold has been removed and installed or replaced;
- The engine has been removed and installed or replaced.

Warning

The idling speed stabilisation valve must not be moved to its basic position if it has been removed (risk of irreparable damage).

Note:

If the ignition is switched on the idling stabilisation valve is immediately moved to its basic position.

-> If this appears on the display:

Basic setting Q
Enter display group number XXX

- Enter "001" to select "Display Group 001" and confirm entry with the Q key.

-> Indicated on display:
(1...4 = display zones)

System in basic setting 1
1 2 3 4

Note:

The values in the display zones are meaningless for the basic setting and can be ignored.

- Press the ➡key.

-> Indicated on display (function selection):

Rapid data transfer HELP
Select function XX

Display group 002 - Setting learned mixture values to programmed basic value

- Engine idling

The learned mixture values must be set to the programmed basic value if:

- The engine control unit has been removed and installed or replaced;
 - The intake manifold has been removed and installed or replaced;
 - The engine has been removed and installed or replaced.
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-> If this appears on the display:

Basic setting Q
Enter display group number XXX

- Enter "002" to select "Display Group 002" and confirm entry with the Q key.

-> Indicated on display:
(1...4 = display zones)

System in basic setting 2
1 2 3 4

Note:

The values in the display zones are meaningless for the basic setting and can be ignored.

- Press the ➡key.

-> Indicated on display (function selection):

Rapid data transfer HELP
Select function XX

Display group 003 - Ignition timing angle 0.0o after TDC

- Engine idling

An ignition timing value of 0.0o after TDC is displayed if the coolant temperature is greater than 80 oC and the idling switch is closed.

Note:

When this function is performed, the engine idles irregularly (idling speed fluctuates until the engine stalls).

-> If this appears on the display:

Basic setting Q
Enter display group number XXX

- Enter "003" to select "Display Group 003" and confirm entry with the Q key.

-> Indicated on display:
(1...4 = display zones)

System in basic setting 3
1 2 3 4

- Check display in display zone 3.

Display Group 003:

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System in basic setting 3 =>		◀ Indicated on display
... oC	1 0.0 oATDC	... rpm
Idling speed		
Ignition timing		
▪ The latest calculated ignition angle will be displayed up to a coolant temperature of 80 oC.		
Idling switch		
▪ 0 = open		
▪ 1 = closed		
Coolant temperature		
▪ at least 85 oC		

- Press the =>key.

-> Indicated on display (function selection):

Rapid data transfer HELP
Select function XX

Display group 004 - Learned Lambda value/learned tank venting value

- Engine idling

When the coolant temperature is greater than 80 oC and the idling switch is closed, the display jumps at 1 minute intervals between -Lambda probe learning function (ACF valve not actuated) and -Tank venting learning function (ACF valve actuated).

- Start the engine.

-> If this appears on the display:



Basic setting Q
Enter display group number XXX

- Enter "004" to select "Display Group 004" and confirm entry with the Q key.

-> Indicated on display:
(1...4 = display zones)

System in basic setting 4
1 2 3 4

- Check display in zones 3 and 4.

Display Group 004:

System in basic setting 4		⇒	Indicated on display
... oC	1	...	...
		Tank venting learning value	
		▪ 1 minute constant display	
		▪ 1 minute variable display	
		Lambda learning value (bank 1)	
		▪ 0.75 ... 1.25	
		Idling switch	
		▪ 0 = open	
		▪ 1 = closed	
		Coolant temperature	
		▪ at least 85 oC	

- Press the ⇒key.

-> Indicated on display (function selection):

Rapid data transfer HELP
Select function XX

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5 - Coding control unit

5.1 - Coding control unit

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 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 1 .
For this purpose, the ignition must be switched on.

-> If this appears on the display:

Rapid data transfer HELP
Select function XX

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

Control unit nos. up to index "C":

-> If this appears on the display:

Coding control unit Q
Enter code number XXX

- Enter the control unit code from the coding table => Page 21 .

-> 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:

4A0907473A 2.6l V6 MPFI
D01 ☐
Code 000 WSC 12345

Control unit nos. from index "C" onwards:

-> If this appears on the display:

Coding control unit Q
Enter code number XXXXX (0- 00127)

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- Enter the 5-character control unit code from the coding table => Page 22 .

-> Indicated on display (example):

Coding control unit Q
Enter code number 00060 (0 - 00127)

- Confirm input with the Q key.

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

4A0907473D 2.6l V6 MPFI
D01 ☐
Code 00060 WSC 12345

All vehicles:

- Press the =>key.

-> Indicated on display (function selection):

Rapid data transfer HELP
Select function XX

5.2 - Table of codes for control unit nos. up to index "C":

Country / Version	Engine code letters	Lambda probes	Gearbox	Type of drive	Code
Germany, R of W 1) (Emission standard MVEG I)	ABC	2	Manual gearbox 012	Front	000
Germany, R of W 1) (Emission standard MVEG I)	ABC	2	Manual gearbox 01A	4WD	001
Germany, R of W 1) (Emission standard MVEG I)	ABC	2	Auto. gearbox 01F Auto. gearbox 01K	4WD Front	008
South America, Africa, Middle and Near East (emission standard ECE 15.04)	ABC	1	Manual gearbox 012	Front	032



Country / Version	Engine code letters	Lambda probes	Gearbox	Type of drive	Code
South America, Africa, Middle and Near East (emission standard ECE 15.04)	ABC	1	Manual gearbox 01A	4WD	033
South America, Africa, Middle and Near East (emission standard ECE 15.04)	ABC	1	Auto. gearbox 01F Auto. gearbox 01K	4WD Front	040
China / CIS (emission standard ECE 15.04)	ACZ	1	Manual gearbox 012	Front	036
China / CIS (emission standard ECE 15.04)	ACZ	1	Manual gearbox 01A	4WD	037
China / CIS (emission standard ECE 15.04)	ACZ	1	Auto. gearbox 01F Auto. gearbox 01K	4WD Front	040

1) R of W = Rest of world.

5.3 - Table of codes for control unit nos. up to index "D":

Country / Version	Engine code letters	Lambda probes	Gearbox	Type of drive	coding
Germany, R of W 1) (Emission standard MVEG II)	ABC	2	Manual gearbox 012	Front	00060
Germany, R of W 1) (Emission standard MVEG II)	ABC	2	Manual gearbox 01A	4WD	00061
Germany, R of W 1) (Emission standard MVEG II)	ABC	2	Auto. gearbox 01F Auto. gearbox 01K	4WD Front	00068
South America, Africa, Middle and Near East (emission standard ECE 15.04)	ABC	1	Manual gearbox 012	Front	00032
South America, Africa, Middle and Near East (emission standard ECE 15.04)	ABC	1	Manual gearbox 01A	4WD	00033
South America, Africa, Middle and Near East (emission standard ECE 15.04)	ABC	1	Auto. gearbox 01F Auto. gearbox 01K	4WD Front	00040
China / CIS (emission standard ECE 15.04)	ACZ	1	Manual gearbox 012	Front	00036
China / CIS (emission standard ECE 15.04)	ACZ	1	Manual gearbox 01A	4WD	00037
China / CIS (emission standard ECE 15.04)	ACZ	1	Auto. gearbox 01F Auto. gearbox 01K	4WD Front	00040

1) R of W = Rest of world.

6 - Reading measured value block

6.1 - Reading measured value block

Note:

- ♦ The measured value blocks mentioned in the following are not available in their entirety for all control units.

- ♦ In engines which only have one Lambda probe for bank 1 (emission standard ECE 15.04 => Coding control unit, Page 20) a duplication of the values for bank 1 will be displayed for bank 2 in the measured value blocks.

Test requirements:

- Coolant temperature at least 85 oC.
- 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 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 1 .
For this purpose, the engine must be running at idle speed

-> If this appears on the 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 light up.
- Enter "08" to select the function "Reading measured value block" and confirm entry with Q key.

-> If this appears on the display:

Reading measured value block	Q
Enter display group number XXX	

- Enter the required display group number =>Display groups, Page 23 .
- Confirm input with the Q key.

-> 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	Presst key

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

6.2 - Display group overview

Display group no.	Indicated on display	Designation
001	Read measured value block 1 1 2 3 4	1 = Engine speed 2 = Intake manifold pressure 3 = Ignition timing 4 = Position of idling stabilisation valve
002	Read measured value block 2 1 2 3 4	1 = Throttle valve angle 2 = Intake manifold pressure 3 = Coolant temperature



Display group no.	Indicated on display	Designation
		4 = Intake air temperature
003	Read measured value block 3 1 2 3 4	1 = Lambda learning value (bank 1) 2 = Lambda learning value (bank 2) 3 = Lambda control (bank 1) 4 = Lambda control (bank 2)

Display group no.	Indicated on display	Designation
004	Read measured value block 4	1 = Condition of lambda control 2 = Tank venting learning value 3 = Lambda control (bank 1) 4 = Lambda control (bank 2)
005	Read measured value block 5	1 = Engine speed 2 = Knock control depth 3 = Ignition timing 4 = Coolant temperature
006	Read measured value block 6 1 2 3 4	1 = Position of idling stabilisation valve 2 = Learned value for idling stabilisation 3 = Idling stabilisation valve interference level 4 = Idling stabilisation valve control
007	Read measured value block 7 1 2 3 4	1 = Position of idling stabilisation valve 2 = Coolant temperature 3 = Lambda learning value (bank 1) 4 = Lambda learning value (bank 2)

Display group no.	Indicated on display	Designation
008	Read measured value block 8 1 2 3 4	1 = Position of idling stabilisation valve 2 = Coolant temperature 3 = Lambda learning value (bank 1) 4 = Lambda learning value (bank 2)
009	Read measured value block 9 1 2 3 4	1 = Coolant temperature 2 = Idling switch 3 = Ignition timing 4 = Engine speed
010	Read measured value block 10 1 2 3 4	1 = Coolant temperature 2 = Idling switch 3 = Lambda learning value (bank 1) 4 = Tank venting learning value
099	Read measured value block 99 1 2 3 4	1 = Engine speed 2 = Engine load 3 = Coolant temperature 4 = Lambda control OFF/ON

Display group 001

Reading measured value block 1	⇒	Indicated on display
... rpm	...	...
... %	...	...
... oBTDC	...	...

			Position of idling stabilisation valve ▪ 18 ... 75 OK
			Ignition firing point - ignore
			Intake manifold pressure (engine load) ▪ 29 ... 59% OK (100% = 1022 hPa, 32% = 327 hPa)
			Engine speed (idling speed) ▪ 680 ... 820 rpm OK

Test table, Display group 001

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
1	Greater than 820 rpm	- Idling switch -F60 defective or incorrectly set	- Check and adjust idling speed switch -F60 => Page 100 or => Display group 009, Display zone 2
		- Air intake system drawing in large quantities - Unmetered air	- Check air intake system for leaks
		- Idling stabilisation valve -N71 is sticking or stiff	- Check idling stabilisation valve - N71 => Page 73 .
	Less than 680 rpm	- Idling stabilisation valve -N71 is sticking or stiff	- Check idling stabilisation valve - N71 => Page 73 .
		- Idling switch -F60 defective or incorrectly set	- Check and adjust idling speed switch -F60 => Page 100 or => Display group 009, Display zone 2
		- 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
		- Idling stabilisation valve -N71 defective	- Interrogate fault memory =>Page 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"
3	...	ignore	
4	Outside the tolerance range	- Idling stabilisation valve -N71 is sticking or stiff	- Check idling stabilisation valve - N71 => Page 73 .

Display group 002

Reading measured value block 2	⇒	◀ Indicated on display
... % ... % ... °C	... °C	
		Intake air temperature ▪ No specified value - depends on ambient temperature



Coolant temperature ▪ 81 ... 111 °C	
Intake manifold pressure => Display group 001, display zone 2	
Throttle valve angle: ▪ Idling: 0% OK ▪ Full load: 95% OK	

Test table, Display group 002

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
1	Greater than 0% at idling speed	- G69 throttle valve potentiometer defective	- Interrogate fault memory => Page 4
		- 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	- Interrogate fault memory => Page 4
		- Throttle cable setting	- Adjust throttle cable => Repair group 20
		- Throttle valve potentiometer - G69 incorrectly set	- Check throttle valve potentiometer - G69 => Page 97

Note on display zone 1:

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

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
3	Less than 81 °C 1)	- Engine too cold	- Perform test drive if necessary
		- Coolant temperature sensor or wiring to engine control unit	- Interrogate fault memory => Page 142
	Greater than 111 °C 1)	- Radiator dirty	- Clean radiator
		- Radiator fan not working	- Check function
		- Thermostat defective	- Check coolant thermostat
		- Coolant temperature sensor or wiring to engine control unit	- Interrogate fault memory => Page 142
4	Differs from ambient temperature	- Intake air temperature sensor - G42 defective	- Interrogate fault memory => Page 138

1) Vehicle at operating temperature.

Note on display zone 3:

The coolant temperature sensor is a temperature-sensitive resistor. If the sensor 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 group 003

Reading measured value block 3	⇒	Indicated on display
...	...	...

			Lambda control (bank 2) ▪ 0.75 ... 1.25 OK
			Lambda control (bank 1) ▪ 0.75 ... 1.25 OK
			Lambda learning value (bank 2) ▪ 0.75 ... 1.25 OK
			Lambda learning value (bank 1) ▪ 0.75 ... 1.25 OK

Test table, Display group 003

Display zone	Readout on V.A.G	Cause of fault	Fault remedy
1 / 2	1551 Low Lambda learned values	Fuel pressure too high	- Check fuel pressure =>Page 53
		- Injector leaking	- Check injection valves => Page 56
		- Solenoid valve 1 for activated charcoal filter -N80 is constantly open	- Check N80 => Page 91
		- Lambda probe heater defective or Lambda probe dirty	- Checking Lambda probe => Page 78
	high lambda learned values	- Injector blocked	- Test injection quantity =>Page 65
		- Fuel pressure too low	- Check fuel pressure =>Page 53
		- Unmetered air at exhaust manifold gasket	- Eliminate cause
		- Lambda probe heater defective or Lambda probe dirty	- Checking Lambda probe => Page 78

Display zone	Readout on V.A.G	Cause of fault	Fault remedy
3 / 4	1551 Outside tolerance range	Small value - engine too rich Effect:: Lambda control leans down the mixture	- Wait 30 seconds for the display to stabilise
		Large value - engine too lean Effect:: Lambda control enriches the mixture	
		- Unmetered air	- Eliminate source of unmetered air
		- Injector defective	- Check injection quantity =>Page 65
		- Not successfully learned	- => Display zones 1 and 2
		- Learned Lambda value at limit	- Check Lambda readiness to learn => Display group 004

Display group 004

Reading measured value block 4	⇒	Indicated on display
...	...	...



		Lambda control (bank 2) => Display group 003, display zone 4
		Lambda control (bank 1) => Display group 003, display zone 3
Tank venting learning value		▪ 0.75 ... 1.25 OK
Lambda control status:		▪ 0: Lambda control learning function active (ACF valve not actuated)
		▪ 16: Lambda control learning function not active (ACF valve actuated)

Note on display zone 1:

A value of 0 must be displayed in display zone 1 for 1 minute after starting up (ACF valve not active), then a value of 16 for 7 minutes (ACF valve active) and then a value of 0 must be displayed again for 1 minute. A value between 1 and 12 is displayed if there is a fault in the system => Checking table Page 28.

Test table, Display group 004

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
1 Cont.- ▼	1	- Coolant temperature too low	- Coolant temperature of 85 °C not yet reached Interrogate fault memory =>Page 142
	4	- Idling speed too low	- Switch off all electrical loads Interrogate fault memory =>Page 51
	5	- Idling speed too high	- Interrogate fault memory =>Page 51
	6	- Lambda probe not ready	- Interrogate fault memory =>Page 89

Display zone	Display	Cause of fault	Fault remedy
1	7	- Lambda control inhibited	- Coolant temperature of 85 °C not yet reached Interrogate fault memory =>Page 97
	10	- Learning value not attained	- Coolant temperature of 85 °C not yet reached Interrogate fault memory =>Page 4
	11	- Too few firing points per evaluation interval	- Interrogate fault memory =>Page 4 Loose contact in Lambda probe wiring
	12	- Too many firing points per evaluation interval	- Interrogate fault memory =>Page 4 Lambda probe aged
2	lower than 0.75 higher than 1.25	- Activated charcoal filter system solenoid valve sticking - ACF system open	- Test ACF solenoid valve =>Page 91 - Check ACF system hose connections

Display group 005

Reading measured value block 5		⇒	◀ Indicated on display
...rpm	...°ATDC	...°BTDC.	... °C
			Coolant temperature => Display group 002, display zone 3
Average of all ignition timing angles			

	Knock control depth ▪ Basic value: 60o ATDC (when the ignition timing is retarded by the knock control the amount of retardation is subtracted from the 60o ATDC)
	Engine speed => Display group 001, display zone 1

Test table, Display group 005

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
2	Less than 60o	- Abnormal engine running noise (ancillaries loose) - Poor quality fuel (less than RON 91) - Intake air temperature too high	- Rectify cause

Display group 006

Reading measured value block 6		⇒	◀ Indicated on display
...	...	...	...
			Idling speed stabilisation control - ignore
			Idling speed stabilisation interference level ▪ 0 = no interference
			Idling stabilisation valve learning value ▪ 18 ... 75 OK (pre-control deviations from basic value in accordance with engine and operating conditions)
			Position of idling stabilisation valve ▪ 10 ... 60 OK

Test table, Display group 006

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
1	lower than 10	- Intake air system drawing in unmet-tered air	- Check air intake system for leaks
	higher than 60	- Idling stabilisation valve -N71 de-fective	- Interrogate fault memory =>Page 73 .
3	higher than 5	- Automatic gearbox selection lever not in position "P" or "N"	- Move selector lever to "P" or "N"
	higher than 10	- Air conditioner switched on	- Switch off the air conditioner

Display groups 007 and 008:

Read measured value block 7/8		⇒	◀ Indicated on display
...	... oC	...	...
			Lambda control (bank 2) => Display group 003, display zone 4
			Lambda control (bank 1) => Display group 003, display zone 3
			Coolant temperature => Display group 002, display zone 3
			Idling speed stabilisation valve position => display group 006, display zone 1



Display Group 009:

Reading measured value block 9				⇒	◀ Indicated on display
... oC	...	...oBTDC.	...rpm		
				Engine speed => Display group 001, display zone 1	
				Ignition firing point - ignore	
		Idling switch			
		▪ 0 = open			
		▪ 1 = closed			
		Coolant temperature => Display group 002, display zone 3			

Test table, Display group 009

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
2	0 or 1	- F60 idling switch defective	- Interrogate fault memory =>Page 100
		- Throttle valve potentiometer -G69 defective or incorrectly set	
		- Throttle valve sticking	- Eliminate cause
		- Floor mat pressing down on accelerator pedal	
		- Moisture in connector of throttle valve potentiometer -G69	- Check connector
		- Throttle cable setting	- Adjust throttle cable => Repair group 20

Display Group 010:

Reading measured value block 10				⇒	◀ Indicated on display
... oC	...	...	...rpm		
				Tank venting learned value => Display group 004, Display zone 2	
				Lambda control (bank 1) => Display group 003, display zone 3	
		Idling speed switch => Display group 009, Display zone 2			
Coolant temperature => Display group 002, display zone 3					

Display group 099, Lambda control:

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Reading measured value block 99				⇒	◀ Indicated on display
...rpm	...%	... oC	λ-control...		

			Lambda control ▪ Basic setting 04: λ-control OFF ▪ Reading measured value block 08: λ-control ON
			Coolant temperature => Display group 002, display zone 3
			Engine load => Display group 001, display zone 2
			Engine speed => Display group 001, display zone 1

Notes on display zone 4:

- ♦ For defined fault finding, the lambda control is switched off when display group 099 in function 04 "Basic setting" is selected and is switched on when this group is selected in function 08 "Reading measured value block".
- ♦ Lambda control is automatically re-activated on exit from function 04 "Basic setting".

7 - Adaptation

7.1 - Adaptation

Note:

- ♦ The idling speed stabilisation valve is moved to its basic position in the "Adaptation" function, channel 00. The learned mixture values will be set to the programmed basic value at the same time.
- ♦ The idling speed can be decreased or increased using the "Adaptation" function, channel 01.

Work sequence

- 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 1. For this purpose, the ignition must be switched on and the engine running at idling speed.

-> If this appears on the display:

Rapid data transfer HELP
 Select function XX

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

-> If this appears on the display:

Adaptation Q
 Enter channel number XX

- Enter the required channel number.

Channel 00 - Moving idling speed stabilisation valve to basic position and setting learned mixture values to the basic programmed value.

- Ignition on.

The idling speed stabilisation valve -N71 must be moved to its basic position if:

- The -N71 connector has been removed with the engine running;
- The N71 has been removed and installed or replaced;
- The engine control unit has been removed and installed or replaced;
- The intake manifold has been removed and installed or replaced;
- The engine has been removed and installed or replaced.

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Warning

The idling speed stabilisation valve must not be moved to its basic position if it has been removed (risk of irreparable damage).

-> If this appears on the display:

Adaptation Q
Enter channel number XX

- Enter "00" to select "adaptation channel 00" and confirm entry with Q key.

-> If this appears on the display:

Adaptation Q
Erase learned values?

- Confirm entry with Q key.

-> If this appears on the display:

Adaptation
Learnt values have been erased

- Press the ➡key.

-> Indicated on display (function selection):

Rapid data transfer HELP
Select function XX

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Channel 01 - Idling speed adaptation

Note:

Only perform the idling speed adaptation described in the following in order to eliminate vibration noises if they are the cause of a customer complaint.

- Engine idling

-> If this appears on the display:

Adaptation Q
Enter channel number XX

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

-> Last stored adaptation value is displayed

Channel 1 Adaptation 0

Note:

- ♦ Adaptation value 0 is the factory-set idling speed,
- ♦ Adaptation can be performed in stages => Page 33 .

A- Step-by-step adaptation

Note:

Channel 1 Adaptation 0

-> <- 1: Adaptation value is reduced in steps by pressing key 1.

- ◆ 3 ->: Adaptation value is increased in steps by pressing key 3.

- Press the =>key.

-> If this appears on the display:

Channel 1	Adaptation 0
-----------	--------------

- Press key 1.

-> Indicated on display:

Channel 1	Adaptation 255	Q
740 rpm		

The idling speed decreases by 10 rpm

or

- Press key 3.

-> Indicated on display:

Channel 1	Adaptation 1	Q
760 rpm		

The idling speed increases by 10 rpm

Note:

- ◆ The relevant adaptation value and the engine speed will be displayed.
- ◆ If modified adaptation is not to be stored, press the C key to return to previous display.

- Confirm input with the Q key.

-> If this appears on the display:

Channel 1	Adaptation 1	Q
Store changed value?		

- Confirm entry with Q key.

-> If this appears on the display:

Channel 1	Adaptation 1
Changed value is stored	

- Terminate adaptation by pressing the => key.

-> Indicated on display (function selection):

Rapid data transfer	HELP
Select function XX	

B- Direct adaptation

-> If this appears on the display:

Channel 1	Adaptation 0
-----------	--------------

- Press the =>key.

-> If this appears on the display:

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Channel 1 Adaptation 0 Q
Enter adaptation value XXXXX

- Enter desired 5-digit adaptation value => adaptation values, Page 34 .

-> If this appears on the display:

Channel 1 Adaptation 0 Q
Enter adaptation value 00254

- Confirm input with the Q key.

-> Indicated on display:

Channel 1 Adaptation 254 Q
730 rpm

Note:

- ♦ The relevant adaptation value and the engine speed will be displayed.
- ♦ If modified adaptation is not to be stored, press the C key to return to previous display.

-> If this appears on the display:

Channel 1 Adaptation 254 Q
Store changed value?

- Confirm input with the Q key.

-> If this appears on the display:

Channel 1 Adaptation 254
Changed value is stored

- Terminate adaptation by pressing the ⇒ key.

-> Indicated on display (function selection):

Rapid data transfer HELP
Select function XX

Adaptation values

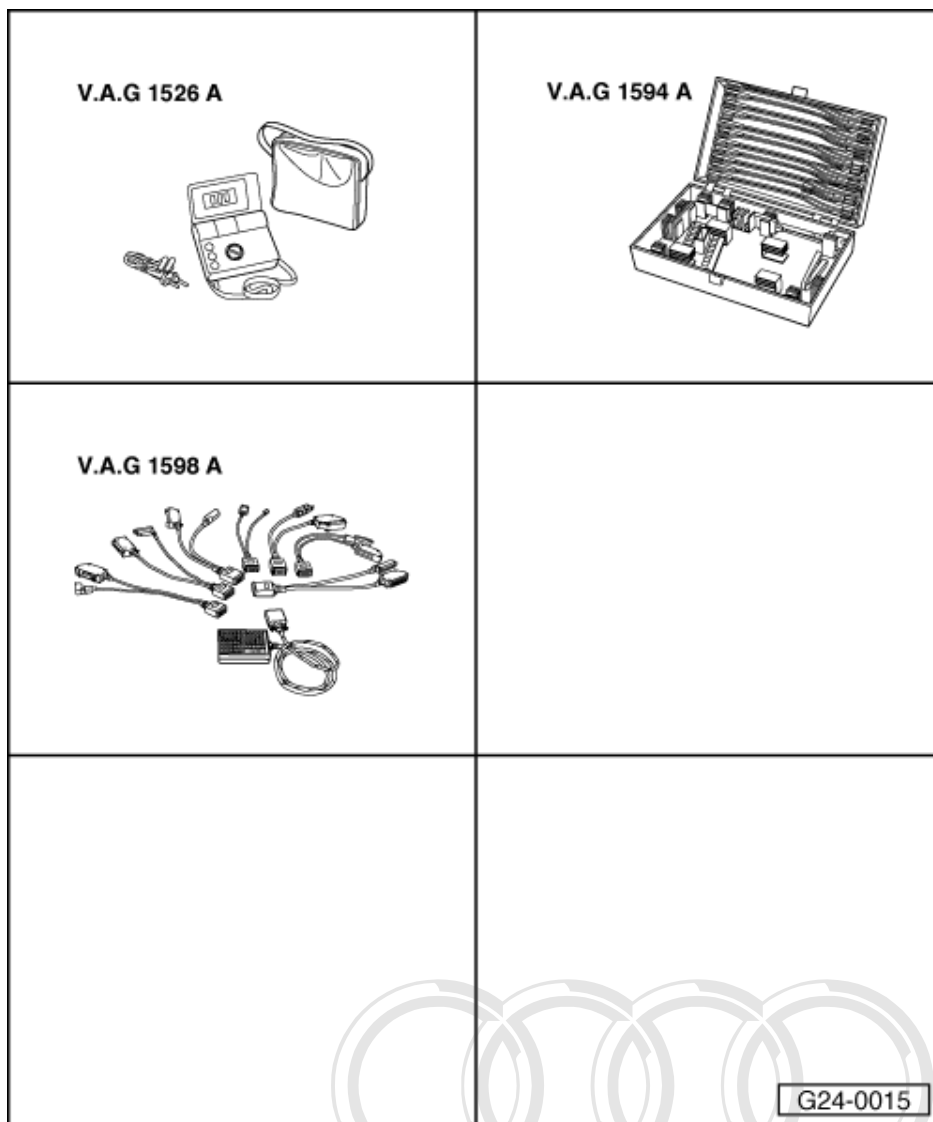
Engine speed increase							
Adaptation value	00001	00002	00003	00004	00005	00006	00007
Engine speed in steps	+10 rpm	+20 rpm	+30 rpm	+40 rpm	+50 rpm	+60 rpm	+70 rpm
Engine speed decrease							
Adaptation value	00255	00254	00253	00252	00251	00250	00249
Engine speed in steps	-10 rpm	-20 rpm	-30 rpm	-40 rpm	-50 rpm	-60 rpm	-70 rpm



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8 - Testing diagnostic connector wiring connections

8.1 - Testing diagnostic connector wiring connections



Special tools and workshop equipment required

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

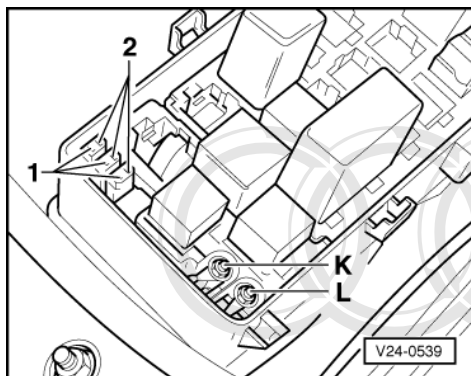
Warning

Switch off ignition before checking wiring.

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8.2 - Checking voltage supply to "black" diagnostic connector:



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

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

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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

8.3 - Checking wiring connection between "white" diagnostic connector and engine control unit

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 not switching to earth

or

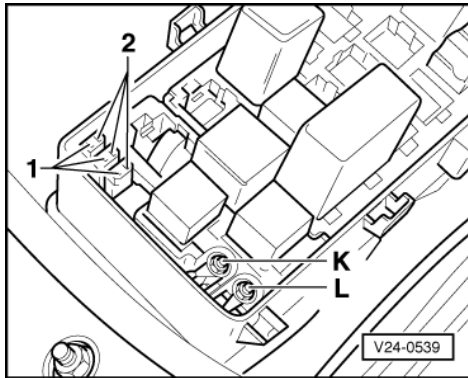
Rapid data transfer **HELP**
K-wire not switching to positive

or

Rapid data transfer **HELP**
L-wire not switching to earth

or

Rapid data transfer **HELP**
L-wire not switching to positive



-> Location of diagnostic connectors and wiring junctions K and L: In additional relay carrier I

Checking K and L wires, vehicles without immobiliser

- Switch off ignition.
- Disconnect all other wires for vehicle systems with self-diagnosis from wiring junctions K and L.
- Determine which is the K lead for the engine control unit and connect it to wiring junction K.

Note:

- ♦ If differently coloured wires are connected to wiring junction K, determine the colour assignments.

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

- ♦ If wires of the same colour are connected to wiring junction K, determine wire assignment using test box V.A.G 1598-A (resistance measurement)

- Start engine, allow to run at idling speed and re-enter address word 01 for "Engine electronics" => Page 1.

-> If the control unit identification of the engine control unit appears in the fault reader V.A.G 1551 display:

4A0907473D	2.6l	V6	MPFI
D01	☐		
Code 00060	WSC 12345		

The fault lies in another system with self-diagnosis capability.



- Determine which other systems are capable of self-diagnosis, connect each one to wiring junction K in turn and test.

If control unit identification is still 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 47 .
- Check for open circuit and short to earth/positive or earth in the following wiring connections:

White diagnosis- connector contact	Wiring junction	Test box V.A.G 1598 A socket
2	K	26
1	L	25

- Rectify any open/short circuit as necessary.

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

Note:

Proceed in the same way to test the L wire.

Checking K and L wires in vehicles with immobiliser

The wiring between the white diagnostic connector and the engine control unit is routed via junction K in the relay carrier with fuse box and the immobiliser control unit.

Wiring junction	White diag- nostic con- nector contact	Immobiliser control unit		Engine control unit contact
		IN	OUT	
K	2	10	9	B6
L	1	-	-	B5

- Switch on ignition, press keys 2 and 5 for "Immobiliser" address word and confirm entry with Q key.

-> If immobiliser control unit identification is displayed on connected fault reader V.A.G 1551:

4A0953234 IMMO AUZ9Z0R4010830 D66
Code 00000 WSC 00000

- Continue with check A => Page 38 .

If immobiliser control unit identification is not displayed:

- Continue with check B => Page 39 .

Check A

- Test the immobiliser control unit and the wiring connections as follows:
- Switch off ignition.
- Pull connector off immobiliser control unit -J362.

=> Repair electrical system; Repair Group 96; Repairing immobiliser; Removing and installing immobiliser control unit Repairing immobiliser Removing and installing immobiliser control unit

- Use cable link to jumper contacts 9 and 10 in connector.
- Switch on ignition, press keys 0 and 1 for address word "Engine electronics" and confirm entry with Q key.

If engine control unit identification is displayed:

- Replace immobiliser control unit.

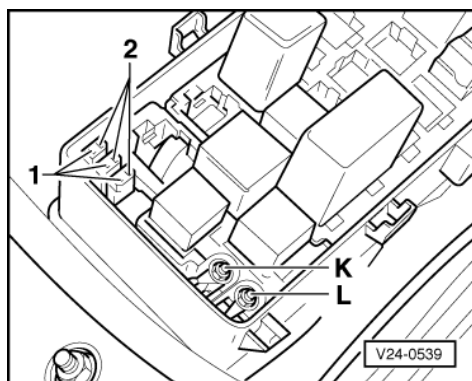
If engine control unit identification is not displayed:

- Use current flow diagram to check wiring between immobiliser control unit -J362 and engine control unit for open circuit or short to earth/positive.

Check B

- Switch off ignition.

Note:



-> All the diagnostic wiring of the various systems come together in wiring junction K. A defective line (short to earth or positive) or a defective control unit may also lead to one of the fault messages mentioned.

- Disconnect all other wires for vehicle systems with self-diagnosis from wiring junctions K and L.
- Determine which is the K lead for the immobiliser -J362 and the engine control unit and connect it to wiring junction K.
- Switch ignition on and re-enter address word 25 for "Immobiliser".

-> If immobiliser control unit identification is displayed on connected fault reader V.A.G 1551:

4A0953234	IMMO	AUZ9Z0R4010830	D66
Code 00000		WSC 00000	

The fault lies in another system with self-diagnosis capability.

- Determine which other systems are capable of self-diagnosis, connect each one to wiring junction K in turn and test.

If immobiliser control unit identification is not displayed:

- Pull connector off immobiliser control unit -J362.

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=> Repair electrical system; Repair Group 96; Repairing immobiliser; Removing and installing immobiliser control unit Repairing immobiliser Removing and installing immobiliser control unit

- Test the wiring connections between contact 10 of the immobiliser control unit connector and wiring junction K for open circuit or short circuit to earth or positive using the current flow diagram.
- Rectify any open/short circuit as necessary.

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

- Replace immobiliser control unit if neither an open circuit nor a short circuit is found.



24 - Mixture preparation, Injection

1 - Servicing multi point fuel injection system

1.1 - Servicing multi point fuel 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

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.

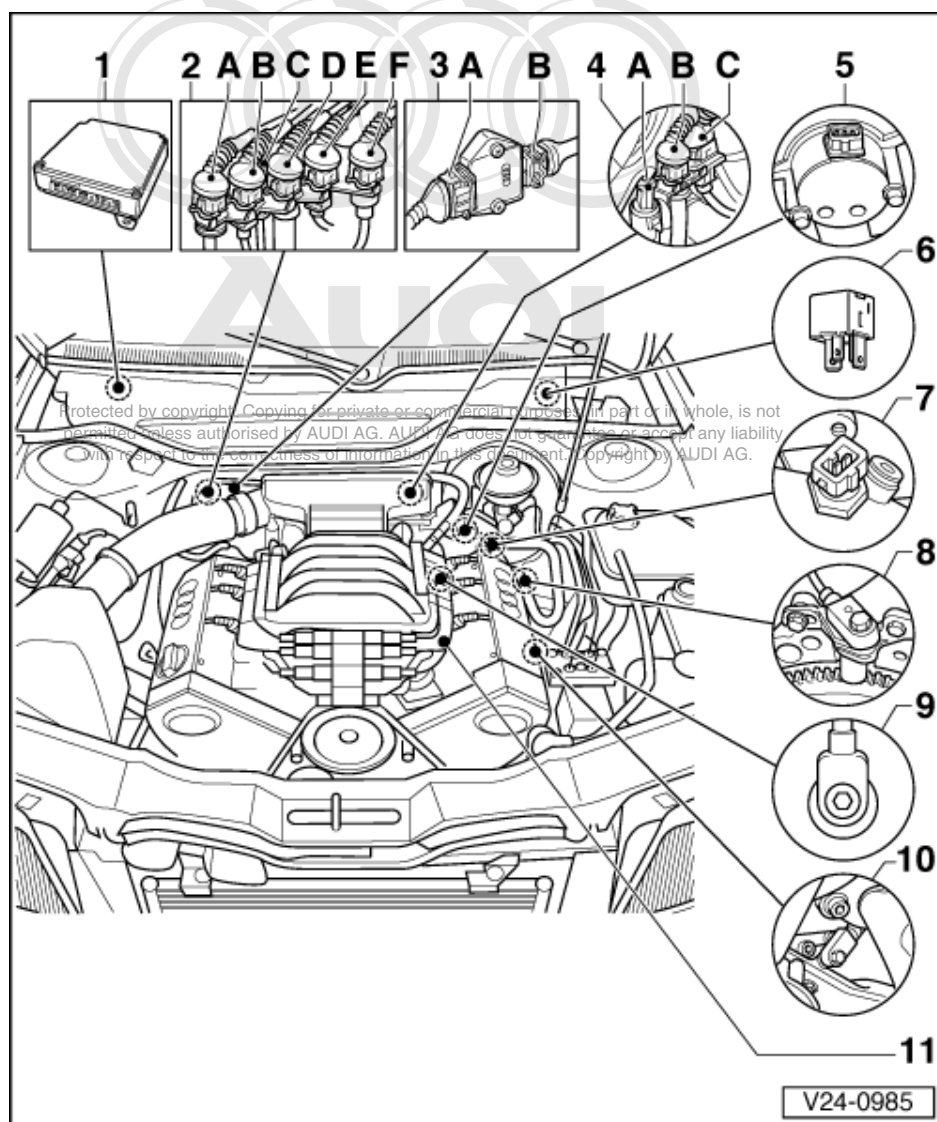
1.4 - Technical data

Engine code letters		ABC (2.6 l / 2V / 110 kW-engine) 1) ACZ (2.6 l / 2V / 102 kW-engine) 2)
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	680 ... 820 rpm 3.
Fuel pressure at idling speed		3.8 ... 4.2 bar
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)	85 ... 100 ml
Resistance		13.5 ... 17 ω

- 1) Engines conforming to emission standard ECE 15.04 (=> Coding control unit, Page 20) only have one Lambda sensor for bank 1.
- 2) China, CIS; only one Lambda probe for bank 1.
- 3) Test value without adaptation



1.5 - Fitting locations overview

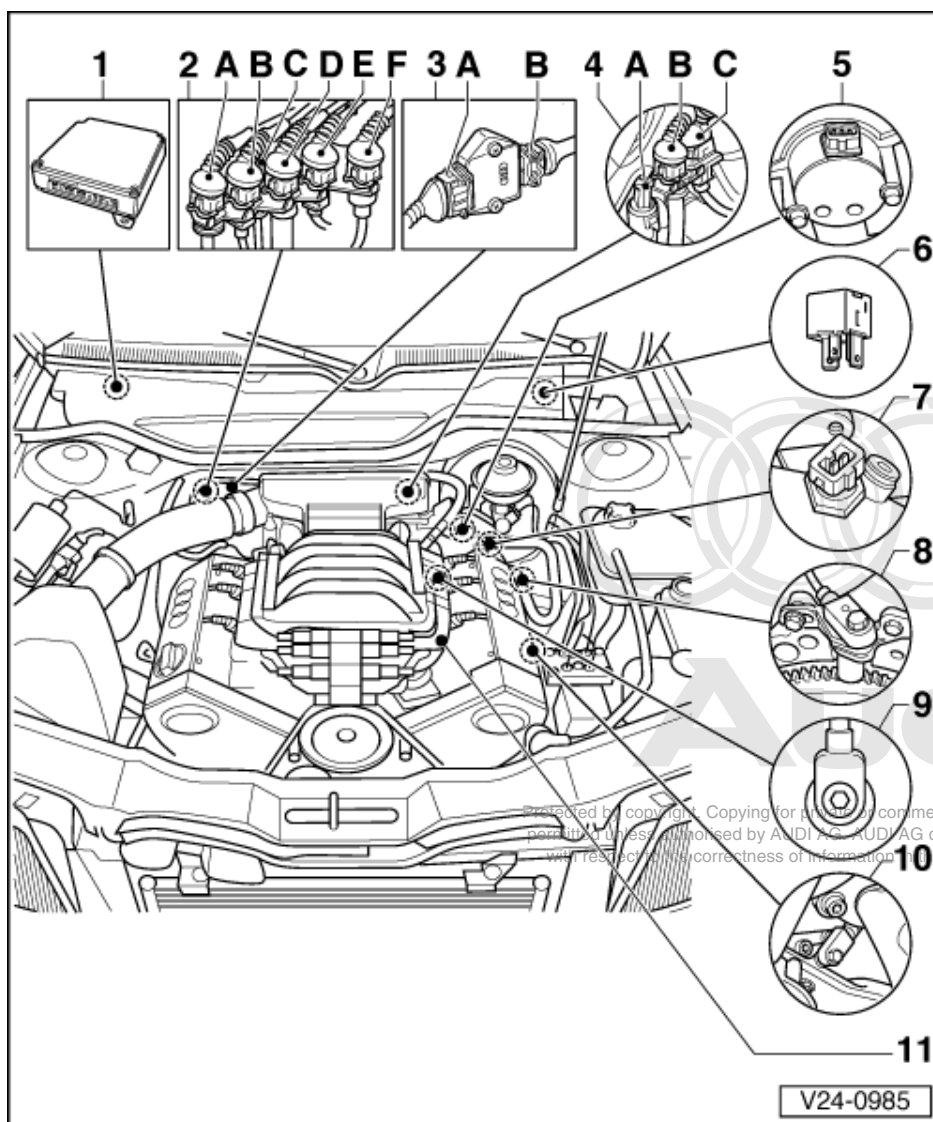


1 Engine control unit -J192

- ♦ In electric box, front passenger side footwell

2 Connectors

- ♦ A - black 2-pin, for Lambda probe heater -Z19
- ♦ B - white 3-pin, for voltage supply to ignition coils
- ♦ C - 1-pin, for Lambda probe -G39 signal (behind connectors)
- ♦ D - blue 2-pin, for knock sensor 1 -G61
- ♦ E - grey 3-pin, for engine speed sensor -G28
- ♦ F - black 3-pin, for ignition timing point sensor -G4



3 Output stage -N122

- ◆ A- brown 4-pin connector, signal wires from engine control unit
- ◆ B - 3-pin connector, primary connections for ignition coils

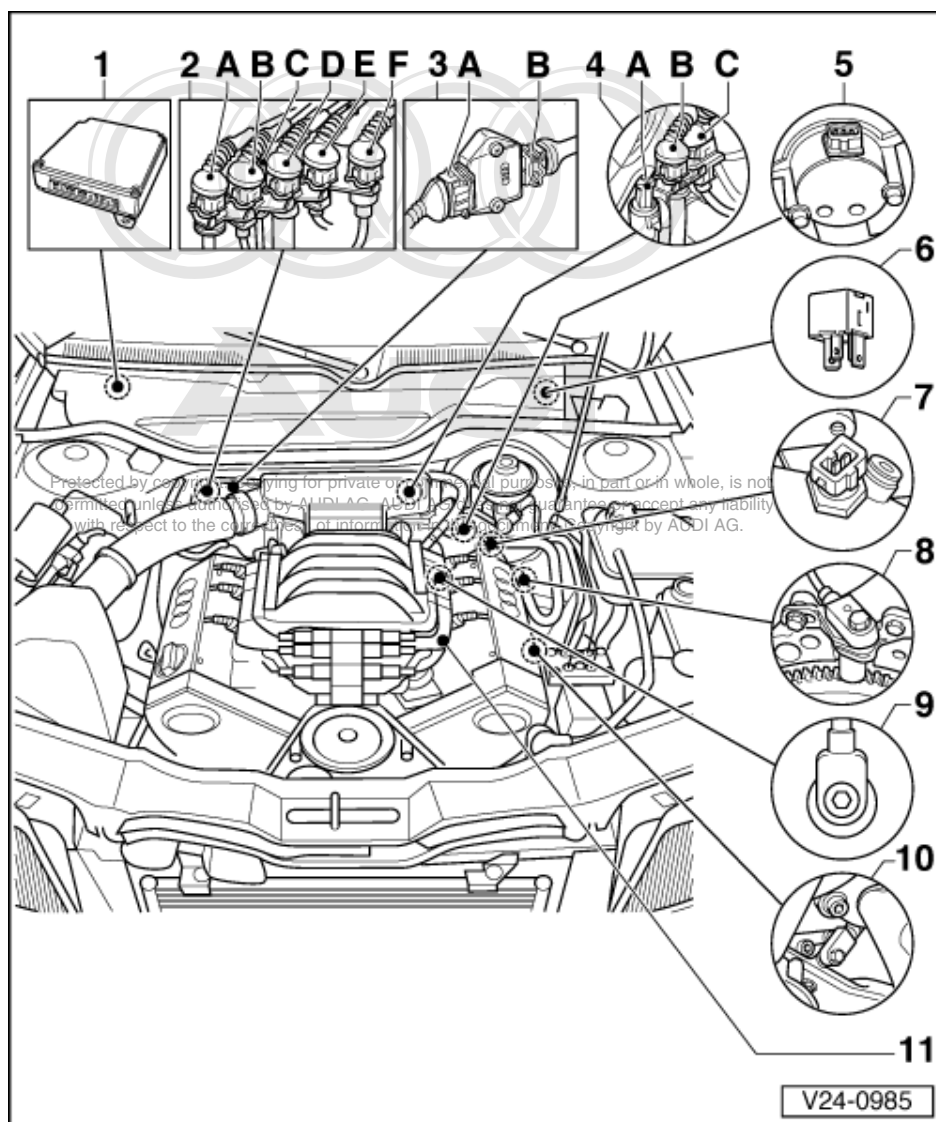
4 Connectors

- ◆ A - 1-pin, for Lambda probe 2 -G108 signal
- ◆ B - black 2-pin, for Lambda probe heater -Z28
- ◆ C - blue 2-pin, for knock sensor 2 -G66

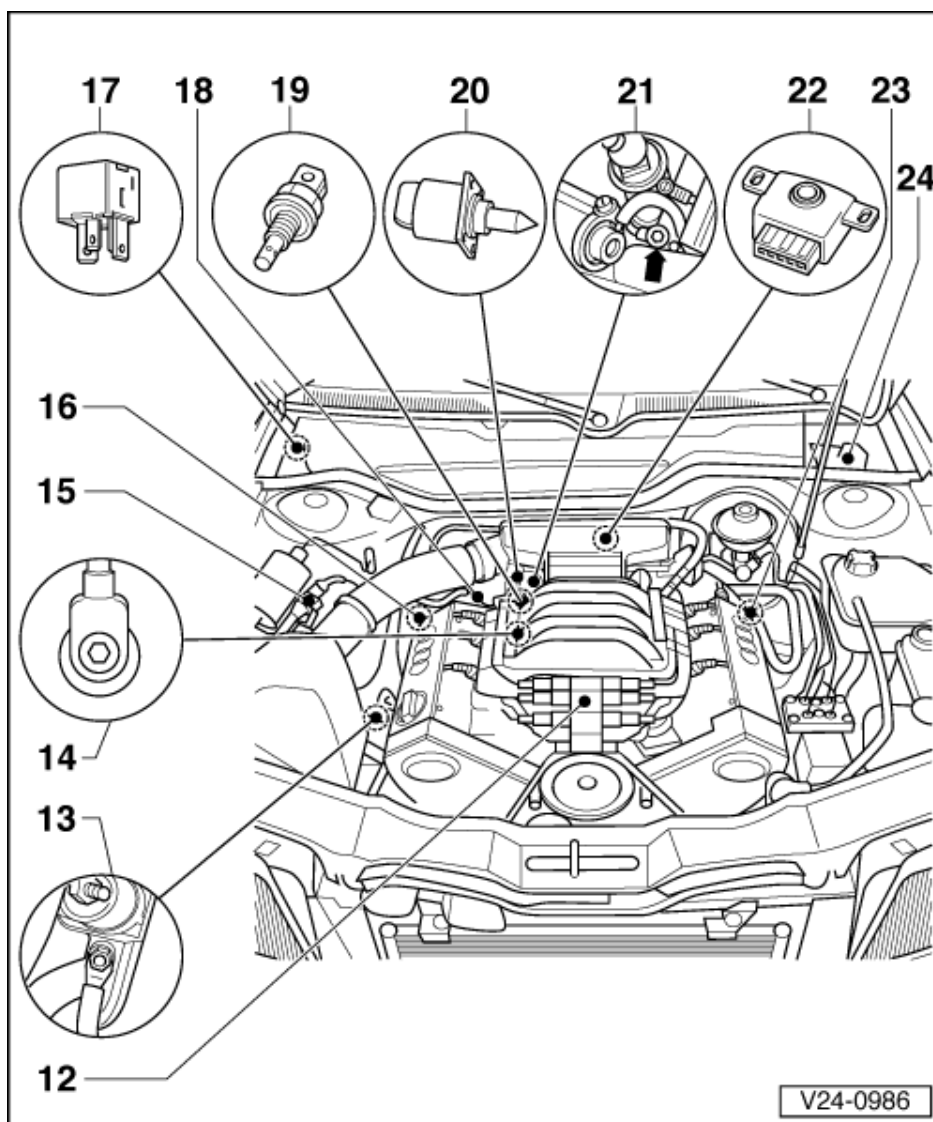
5 Hall sensor -G40

6 Fuel pump relay -J17

- ◆ On central electrics on left below dash panel, relay position 6
- ◆ Checking => Page 68



- 7 Coolant temperature sensor -G62
 - ♦ On coolant pipe behind cylinder head, bank 1
- 8 Engine speed sensor -G28
- 9 Knock sensor 2 -G66
- 10 Ignition timing sensor -G4
 - ♦ Reference mark sensor on left on cylinder block
- 11 Injectors -N30...-
-N83, -N84



12 Ignition coils -N, -N128, -N158

13 Earthing point

- ♦ On right hand engine support

14 Knock sensor 1 -G61

15 Solenoid valve 1 for activated charcoal filter N80

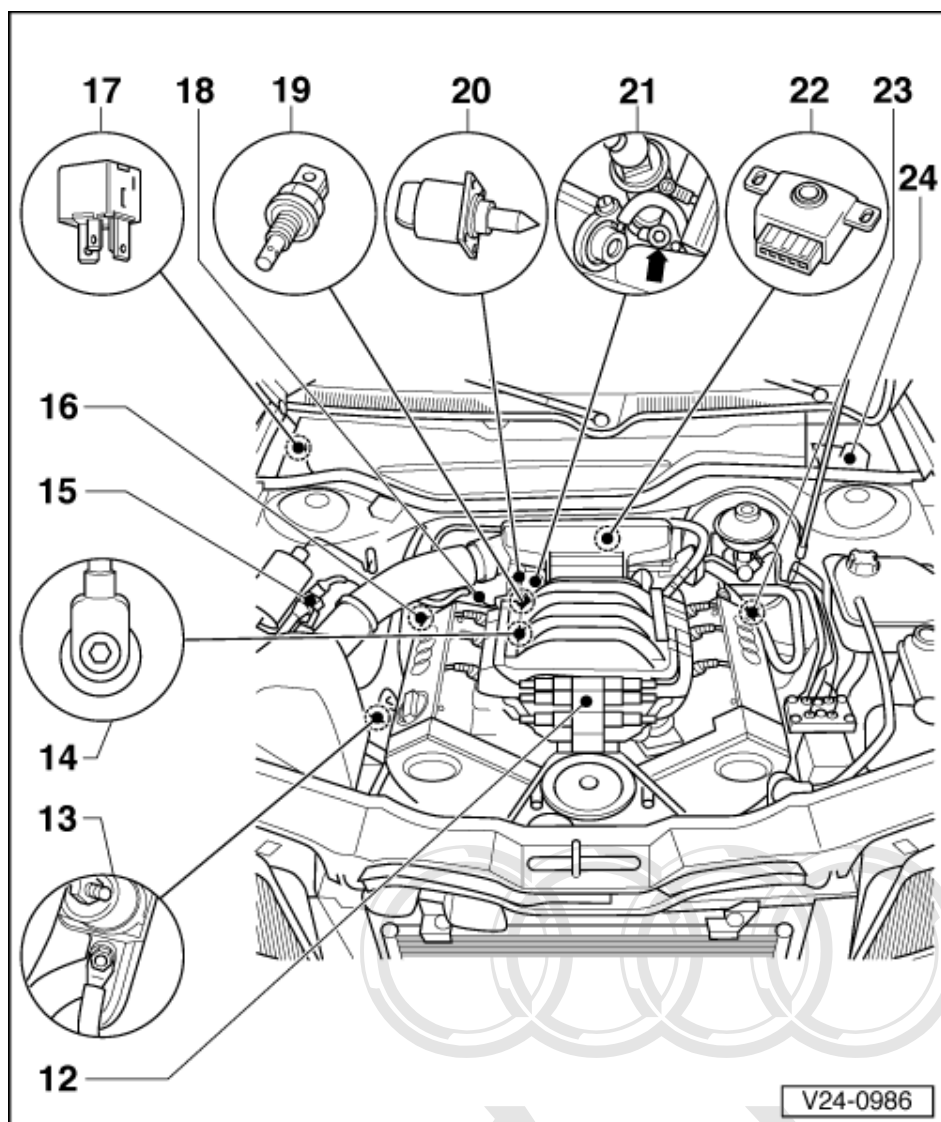
16 Lambda probe 1 -G39

17 Control unit for Lambda probe heater - J208

- ♦ On additional relay carrier III in the front passenger side footwell, relay position 1.
- ♦ Only for vehicles à 06.96

18 Fuel pressure regulator

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19 Intake air temperature sensor -G42

20 Idling stabilisation valve - N71

21 Earthing point

- ♦ On intake manifold

22 Throttle valve potentiometer -G69

- ♦ With idling switch -F60

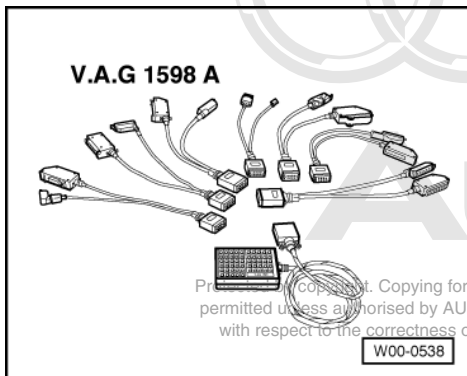
23 Lambda probe 2 -G108

24 Diagnosis socket

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

Special tools and workshop equipment required



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

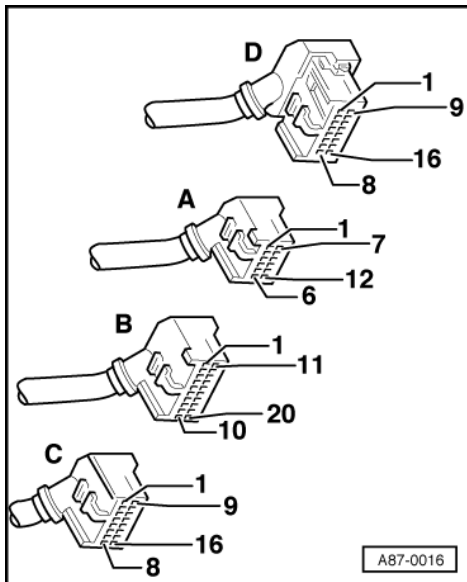
Note:

- ♦ 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 engine control unit connectors.

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 49 .
- Release catches and detach connectors from control unit.



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

Notes:

- ♦ For measurement purposes, connect test box V.A.G 1598 A 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 1598 A =>Pin assignment, Page 48 .
 - ♦ 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 1598 A.
 - ♦ 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 1598 A.
- 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

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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 1598 A.

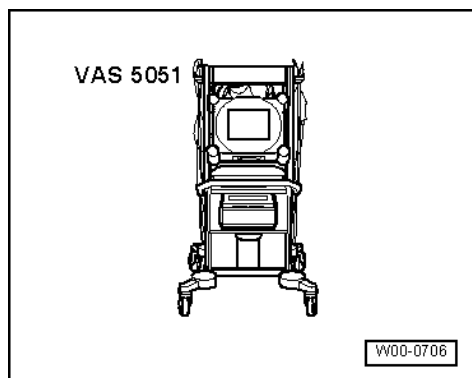
1.7 - Replacing engine control unit

Installation position => Installation position overview - Page 42

Notes:

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

Special tools 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

Removing

- 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 1 .
For this purpose, the ignition must be switched on.

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

4A0907473D	2.6l	V6	MPFI
D01	□		
Code 00060	WSC 12345		

- Always start by displaying and printing out the control unit identification => Page 3 .
- Compare code to encoding versions => Page 20 .
- Press the =>key.

-> If this appears on the display:

Rapid data transfer	HELP
Select function XX	

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

-> If this appears on the display:

Adaptation	Q
Enter channel number XX	

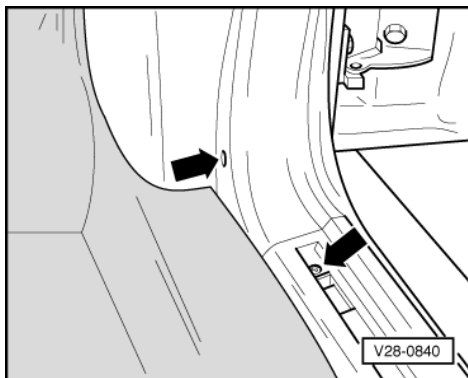
- Enter "01" to select "adaptation channel 01" and confirm entry with Q key.

-> Last stored adaptation value is displayed

Channel 1	Adaptation 0
-----------	--------------

Notes:

- ♦ Adaptation value 0 is the factory-set idling speed,
- ♦ Breakdown of adaptation values => Page 34
- ♦ If a value other than 0 is displayed, print out or note the modified value.
- Switch off ignition.

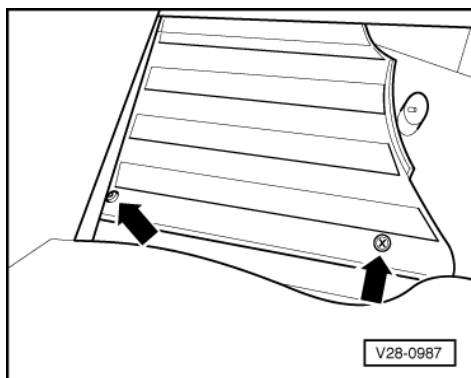


- -> Remove the lower part of the right A pillar trim and the front door sill panel tread strip

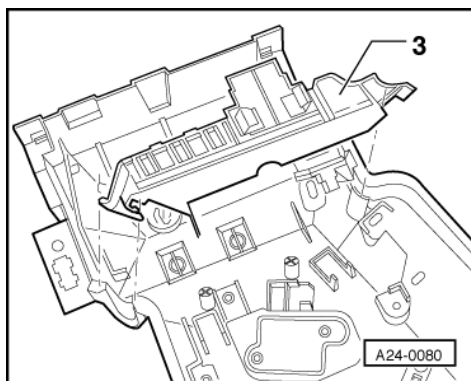


=> General Body Repairs; Repair group 70; Trim panels; Removing and installing A pillar trim and sill panel tread strip Trim panels Removing and installing A pillar trim and sill panel tread strip

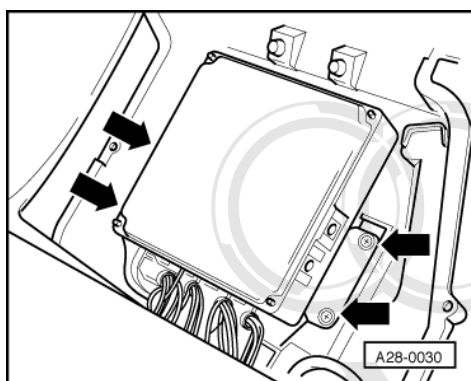
- Pull back the carpet in the front right footwell (cut carpet at perforated seam on left using a knife if necessary).



- -> Release screws on electronic box cover arrows.
- Carefully unhook the upper and lower parts of the cover.



- -> Pull out the cross brace -3- with attachments.



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

Notes:

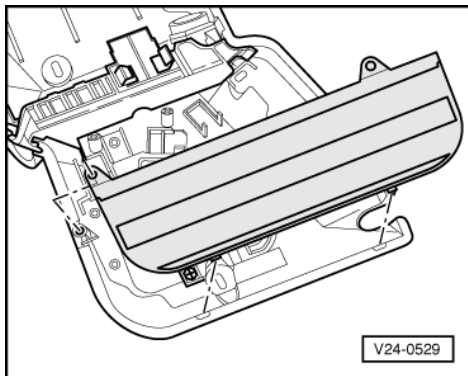
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- ♦ Allow 30 seconds after switching off ignition before detaching or attaching engine control unit connectors.
- ♦ If the vacuum hose was damaged when it was pulled off, it must be replaced with a hose of the same length and same internal diameter.

=> Parts catalogue

Installing

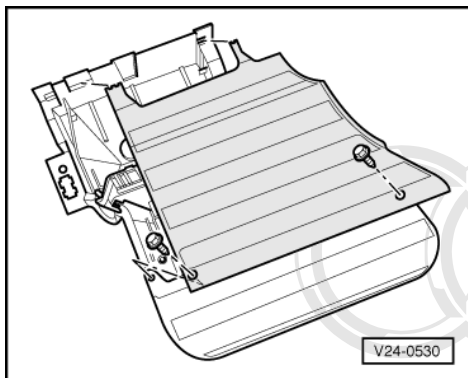
Install in reverse order, paying attention to the following:



Note:

Always switch off ignition before detaching or attaching connectors of control unit.

- -> Guide the lower part of the cover into the two openings in the electronic box in the right footwell.



- -> Guide the upper part of the cover into the two openings in the electronic box in the right footwell.
- Interrogate and erase fault memory => Page 4 .
- Encode control unit => Page 20 .
- Adapt engine electronics control unit to the immobiliser control unit:

=> Electrical system; Repair group 01: Self-diagnosis, Adaptation when changing engine control unit Self-diagnosis Adaptation when changing engine control unit

- Perform "Adaptation" in channel 00 => Page 31 . The idling stabilisation valve will be moved to the basic setting and the learned mixture values returned to the basic setting at the same time.
- Perform idling speed "Adaptation" in channel 01 => Page 32 , if the old engine control unit displayed an adaptation value other than 0.

1.8 - Checking idling speed

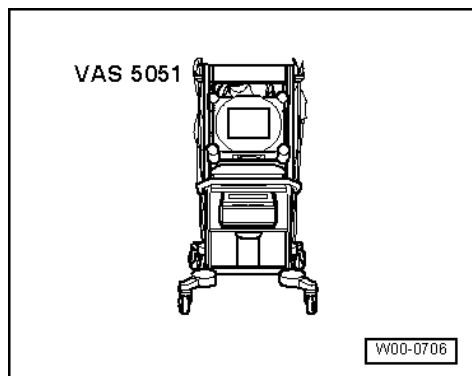
Notes:

- ◆ The idling speed cannot be adjusted manually.
- ◆ The idling speed can be increased and decreased in the "Adaptation" function, channel 0, using the Vehicle Diagnosis, Testing and Information System VAS 5051 or the Fault Reader V.A.G 1551 => Page 32 .



- ♦ Only perform idling speed adaptation in order to eliminate vibration noises if they are the cause of a customer complaint.

Special tools 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

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Test requirements:

- No leaks in exhaust system
- Electrical consumers switched off (radiator fan must not run during the test)
- Vehicles with automatic gearbox: Selector lever in position P or N
- Accelerator cable correctly adjusted

=> Repair group 20

- Pressure gauge not connected.
- Air conditioner switched off.
- Coolant temperature at least 85 °C.

Test sequence

- 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 1 .
For this purpose, the engine must be running at idle speed
- Interrogate fault memory =>Page 4 . 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.

-> If this appears on the display:

Rapid data transfer HELP
Select function XX

- Enter "08" to select the function "Reading measured value block" and confirm entry with Q key.

-> If this appears on the display:

Reading measured value block Q
Enter display group number XXX

- Enter "001" to select "Display Group 001" and confirm entry with the Q key.

-> Indicated on display:
(1...4 = display zones)

Read measured value block 1
1 2 3 4

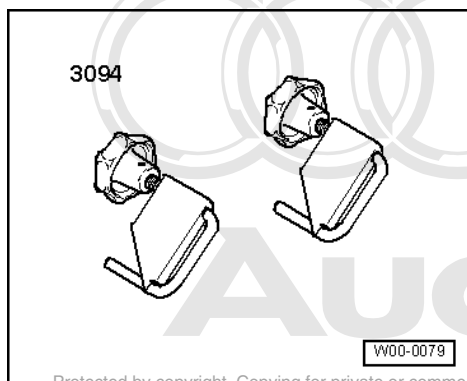
- Read off idling speed from display zone 1.
 - Specification: 680 ... 820 rpm
- Press the $\Rightarrow$ key.
- Enter "06" for "End output" function and confirm entry with Q key.
- If the value does not match the specification, interrogate the fault memory again $\Rightarrow$ Page 4 .

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 $\Rightarrow$ Page 100 .
- Large volume of unmetered air $\Rightarrow$ Reading measured value block, display groups 001, 003 or 006, Page 24 onwards.
- Check idling stabilisation valve $\Rightarrow$ Page 73

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

Note:

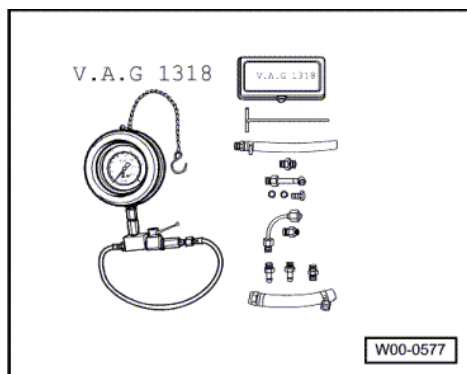


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The fuel pressure regulator regulates the fuel pressure according to the intake manifold pressure at the throttle valve unit.

Special tools 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:

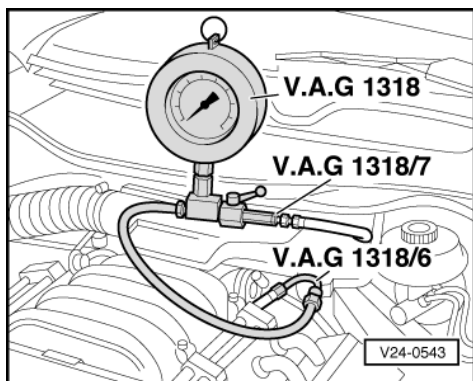
- Fuel pump relay OK; checking =>Page 68 .
- Fuel pump OK; checking:

=> 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.



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Checking system pressure and fuel pressure regulator

- -> Connect pressure gauge V.A.G 1318 between fuel feed pipe and fuel manifold using test adapters 1318/6 and 1318/7; move lever on pressure gauge 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.

Notes:

- ♦ 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.
- 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; to do so, pull off 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:

- Holding pressure 10 minutes after switching off engine (minimum pressure).
 - Specified value for cold engine: approx. 2.2 bar
 - Specified value with 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

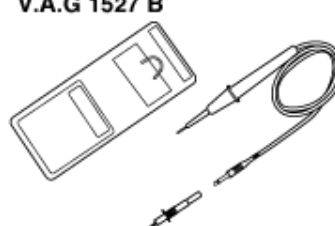
Note:

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.



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1.10 - Checking injectors

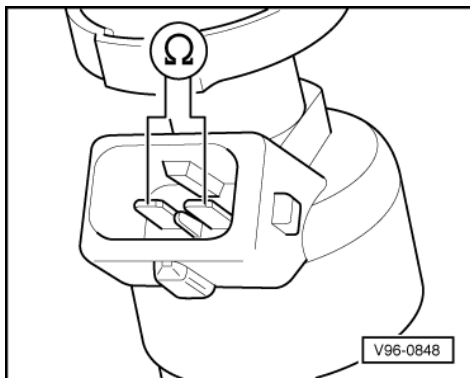
V.A.G 1526 A 	V.A.G 1527 B 
V.A.G 1594 A 	V.A.G 1598 A 
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Special tools and workshop equipment required

- ♦ 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

Checking internal resistance

- Unplug connector on injector to be checked.



- -> Connect multimeter to injector to measure resistance
- Specification: 13.5 ... 17 ω

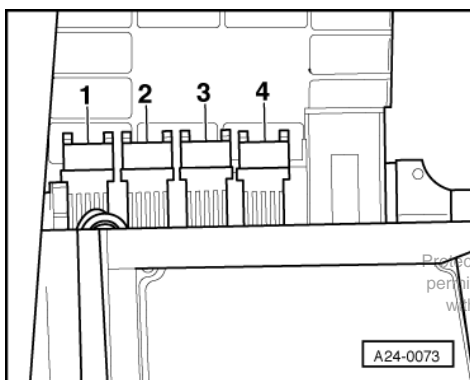
If the specification is not obtained:

- Replace injector.

Checking power supply

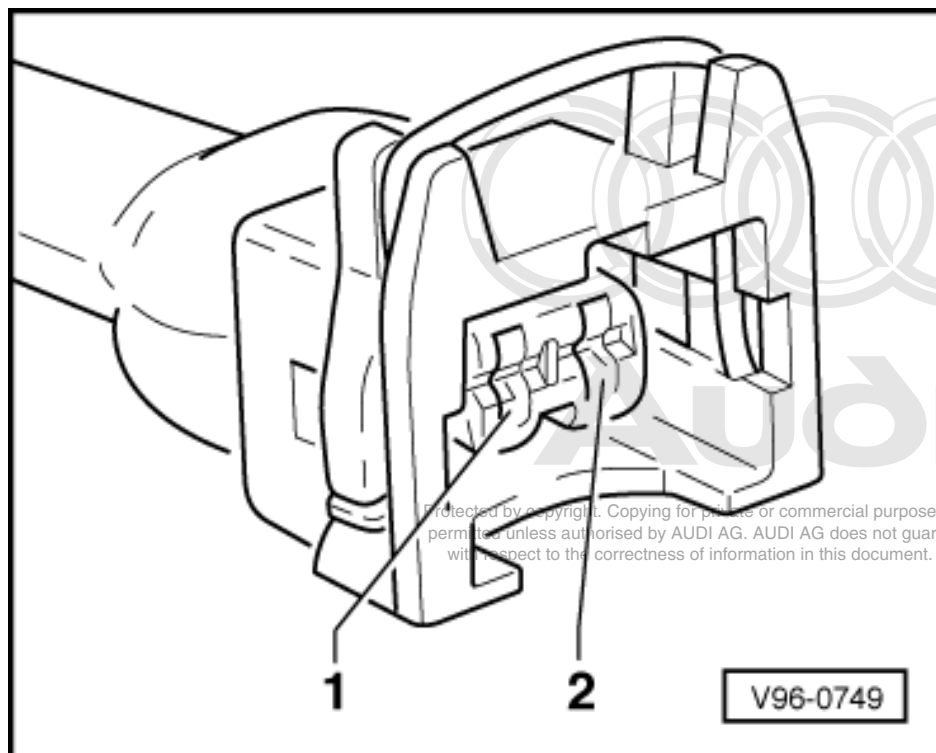
Test requirements:

- Fuel pump relay OK; checking =>Page 68 .



- -> Fuse OK ▶ 05.94: S72; 06.94 ▶: S116 (in red holder -3- in electronic box in front passenger side footwell)
- Unplug connector on injector to be checked.

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

Connector contact	Measure to
ä05.94: 2	Engine earth
06.94ä: 1	Engine earth

- Operate the starter briefly (the engine may start).
 - The LED should light up.

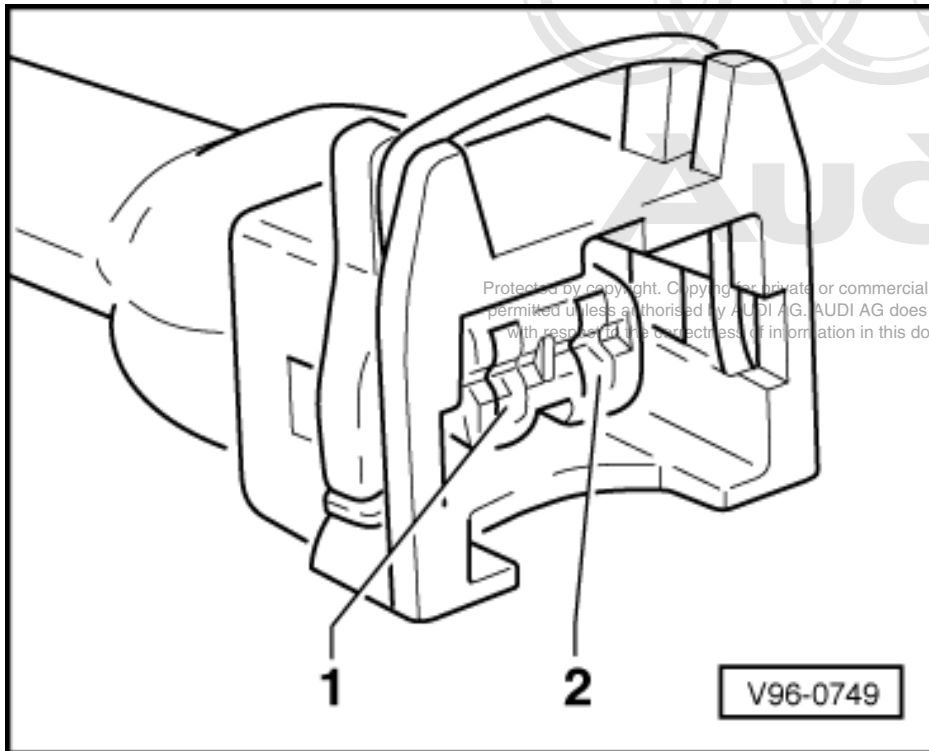
If the LED does not light up:

- Test wiring connection from contact 2 via fuse S72 (ä05.94) or contact 1 via fuse S116 (06.94ä) to fuel pump relay:

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

Checking actuation

- Unplug connector on injector to be checked.



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

Connector contact	Measure to
ä05.94: 1	Battery positive
06.94ä: 2	Battery positive

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

If LED does not flash:

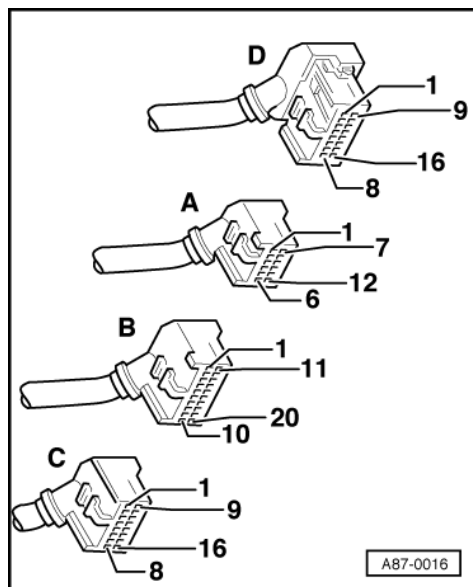
- Check the wiring
=>Page **59**

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

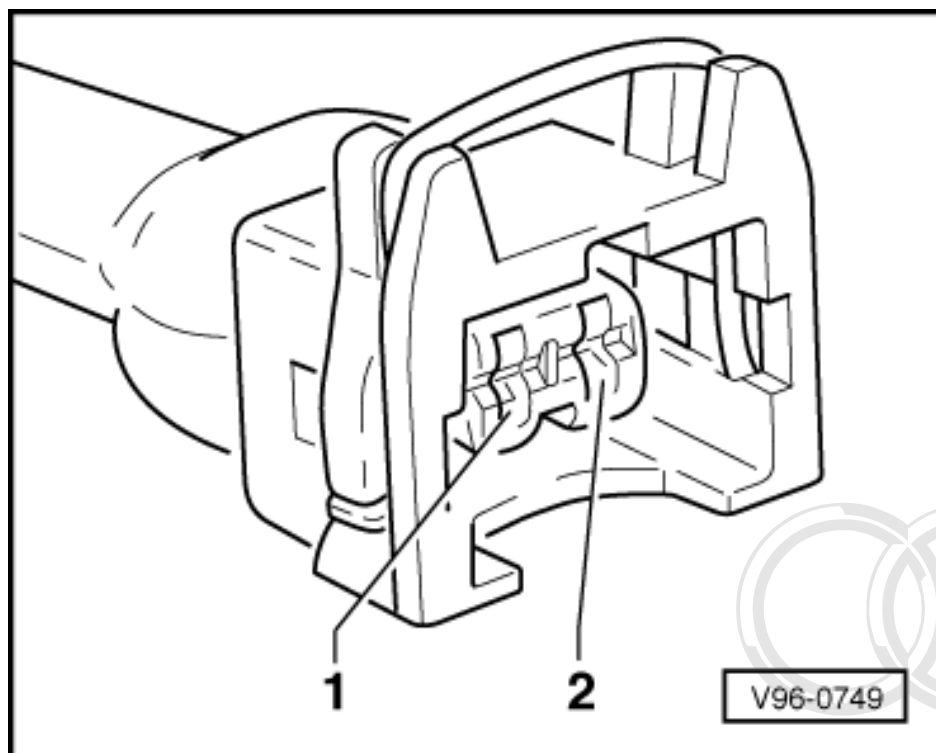
- Check the power supply to the engine control unit => Page **145**.

Checking wiring

- Unplug connector on injector to be checked.



- -> With the ignition switched off, use adapter V.A.G 1598/12 to connect test box V.A.G 1598 A to connector D only of engine control unit (control unit remains disconnected) => Page 47 .



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

Cylinder	Injector connector contact	Test box V.A.G 1598 A socket
1	ä05.94: 1 06.94ä: 2	6
2		7
3		8
4		13
5		14

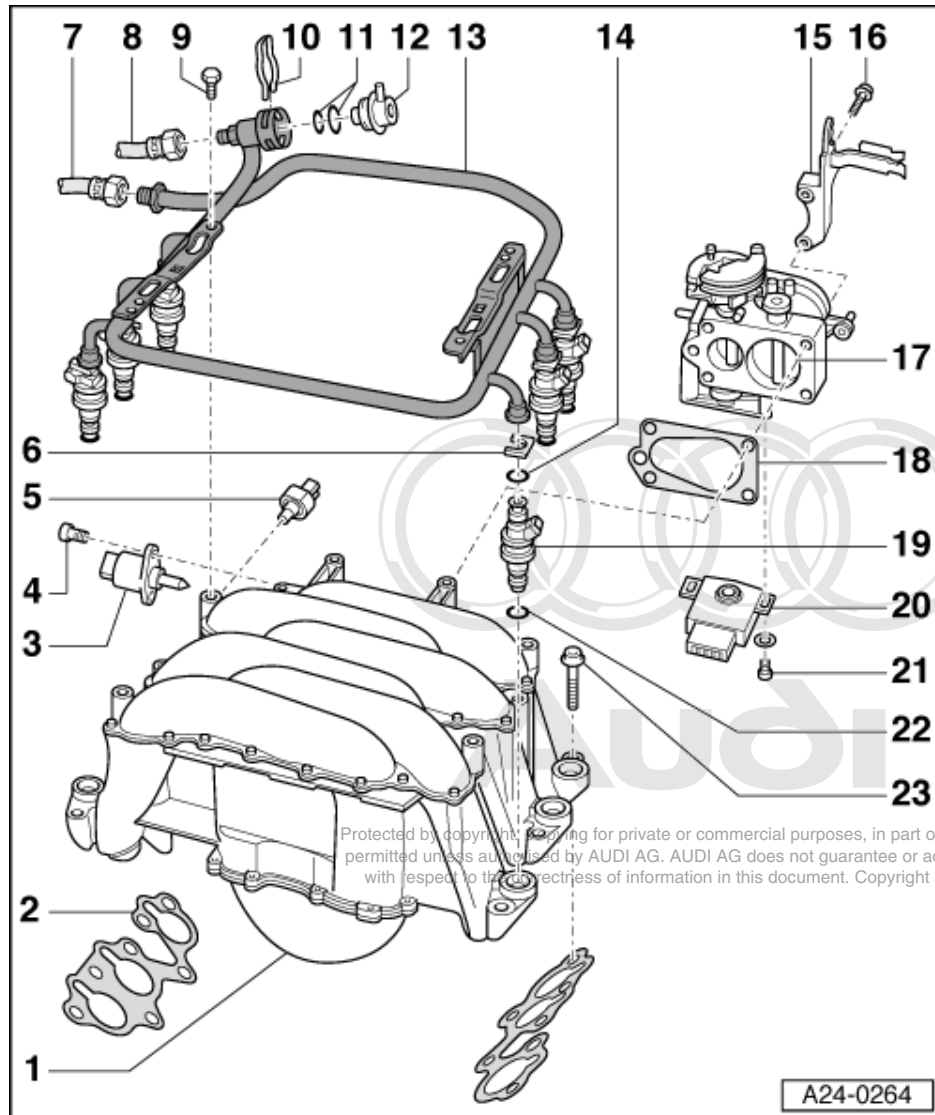
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Cylinder	Injector connector contact	Test box V.A.G 1598 A socket
6		15

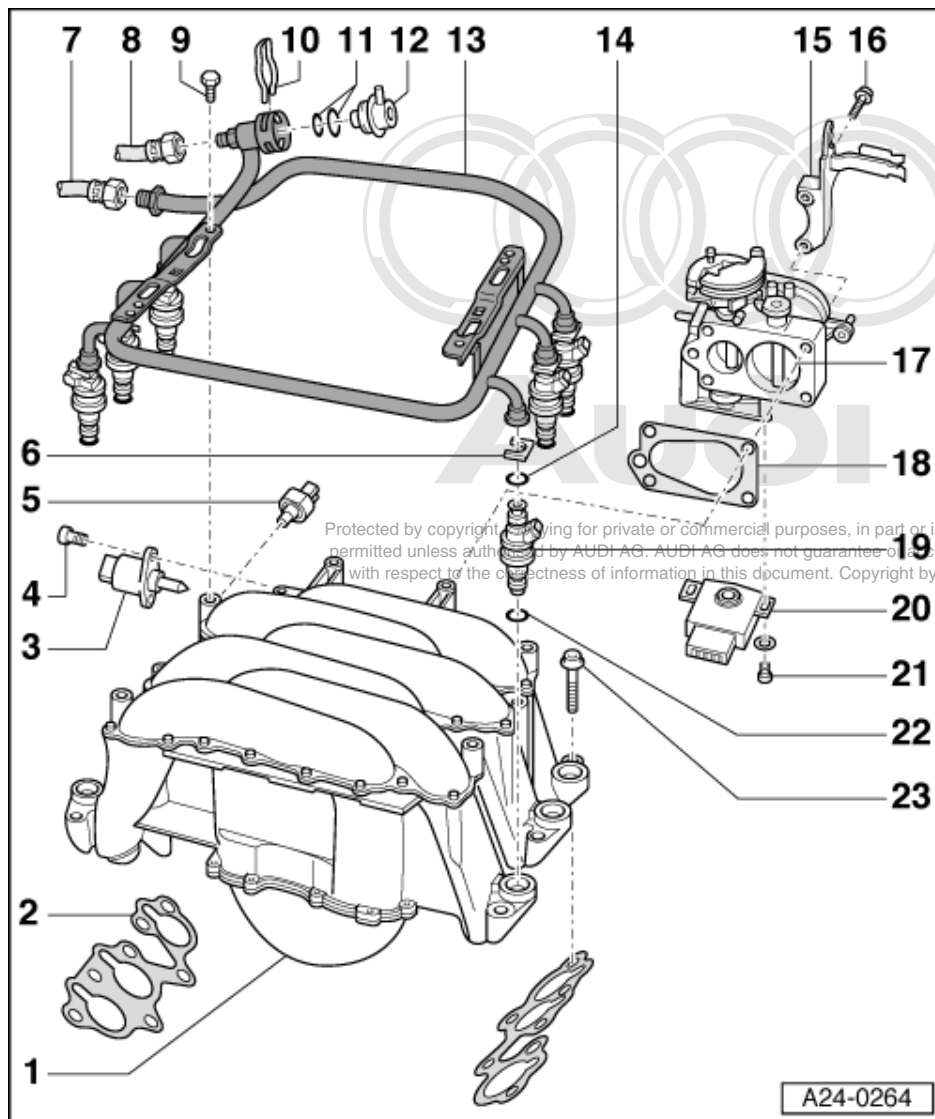
- Rectify any open/short circuit as necessary.

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

1.11 - Removing and installing fuel rail with injectors and throttle valve unit



- 1 Intake manifold
- 2 Gasket
 - ♦ Replace
- 3 Idling stabilisation valve - N71
- 4 9 Nm
- 5 Intake air temperature sensor -G42
- 6 Securing clip
 - ♦ Ensure it is positioned correctly on injector and fuel manifold


7 Supply pipe

- ◆ From fuel filter
- ◆ Tighten to 25 Nm

8 Return pipe

- ◆ Tighten to 25 Nm

9 10 Nm
10 Securing clip
11 O-ring

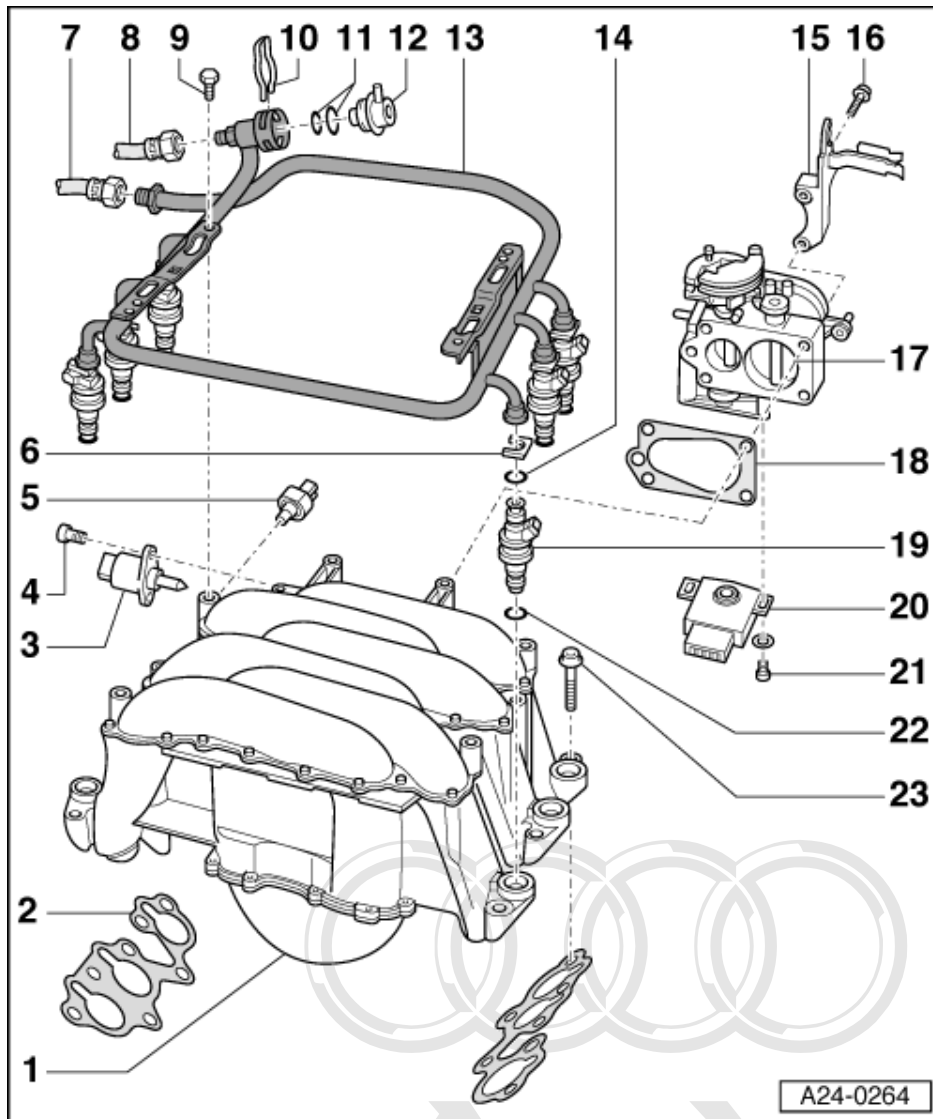
- ◆ Replace

12 Fuel pressure regulator
13 Fuel manifold
14 O-ring

- ◆ Removing and installing
=> Page 63
- ◆ Replace
- ◆ moisten with clean engine oil.

15 Support bracket

- ◆ For throttle cable



16 20 Nm

17 Throttle valve unit

18 Gasket

- ♦ Replace

19 Injectors -N30...-N33,
-N83, -N84

- ♦ Removing and installing
=> Page 63

20 Throttle valve potentiometer -G69

21 4 Nm

22 O-ring

- ♦ Removing and installing
=> Page 63
- ♦ Replace
- ♦ moisten with clean engine oil.

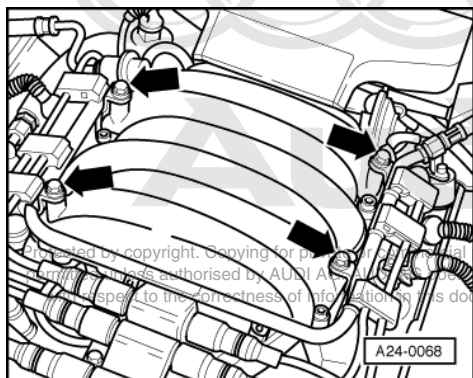
23 20 Nm

1.12 - Removing and installing injectors

- Remove engine covers.
- Remove intake hose between air filter and intake silencer.
- Unplug connectors from all injectors.



- Pull vacuum hose off fuel pressure regulator.
- Lay bare wires at fuel manifold.



- -> Unscrew fuel rail from intake manifold.
- Pull fuel rail complete with injectors evenly off the intake manifold and place it on a clean cloth at the back of the engine compartment.

Warning

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

- Pull off retainer and detach injector.

Note:

Replacement of fuel manifold involves detaching fuel hoses.

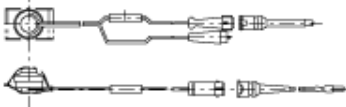
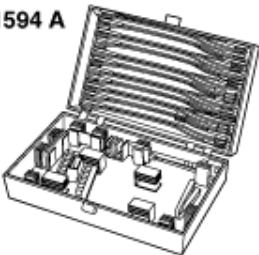
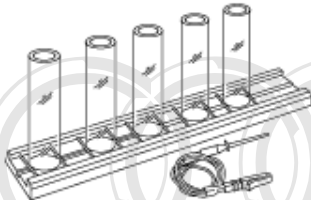
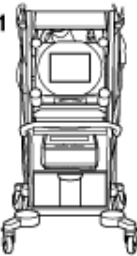
Install in reverse order, paying attention to the following:

- 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.
- Make sure that the injectors are installed in the correct positions.
- Check to make sure that the retainer clamps are properly seated.
- Position fuel manifold with secured injectors on intake manifold and press evenly into place.

Tightening torque

Component	Nm
Fuel distributor rail to intake manifold	10

1.13 - Testing injection quantity, leak tightness and spray pattern of injectors

V.A.G 1348/3-2 	V.A.G 1348/3A 
V.A.G 1594 A 	V.A.G 1602 
VAS 5051 	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. G24-0001

Special tools 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, testing =>Page 53 .

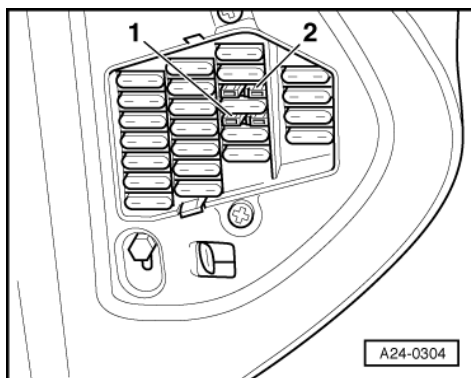
Test sequence

- Remove fuel manifold with injectors fitted from intake manifold => Page 63 . Fuel hoses remain connected.
- Lift fuel rail, together with injectors, off intake manifold and support it.



Vehicles with control unit no. 4A0 907 473 up to software version D02 (self-diagnosis without final control diagnosis):

- Pull fuses S17 and S19 out of fuse box.



- -> Create a bridge using auxiliary cables and intermediate 15A fuse as follows:
 - Connect contact 1 of fuse S19 to contact 2 of fuse S17 (direct connection between positive and fuel pump so that it can operate with the engine switched off)
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Vehicles with control unit no. 4A0 907 473 / A up to software version D03 (self-diagnosis with final control diagnosis):

- Initiate final control unit diagnosis => Page 15 (allows fuel pump to operate with engine switched off).

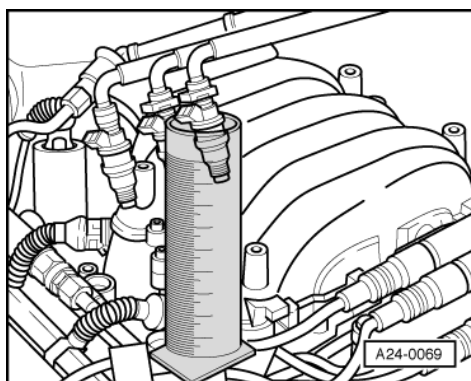
All vehicles:

- The fuel pump should run.

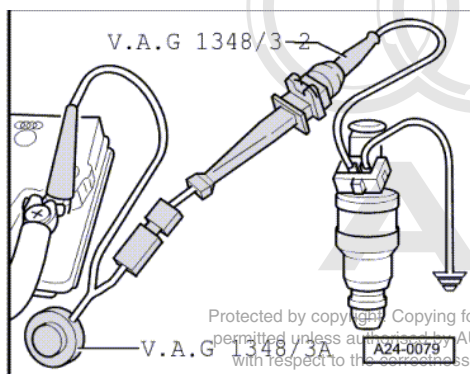
Leak test

- 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 fuel pump (detach cable bridge) and replace defective injector => Page 63.

Checking injection quantity



- -> Place the injector to be tested into the measuring glass of fuel injection rate 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.

Vehicles with control unit no. 4A0 907 473 up to software version D02 (self-diagnosis without final control diagnosis):

- Start the fuel pump
=>Page **65**

Vehicles with control unit no. 4A0 907 473 / A up to software version D03 (self-diagnosis with final control diagnosis):

- Initiate final control unit diagnosis => Page **15** (allows fuel pump to operate with engine switched off).

All vehicles:

- The fuel pump should run.
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 values for one or more injectors are outside tolerance, switch off fuel pump (detach jumper cable and terminate final control diagnosis) and replace defective injector => Page **63**.
- 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 **53**.

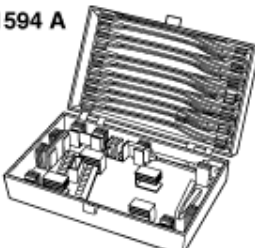
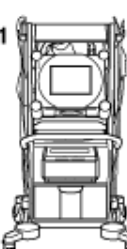
Note:

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

- Install injectors with fuel manifold => Page **64**.



1.14 - Testing fuel pump relay -J17 and actuation

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

Special tools 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

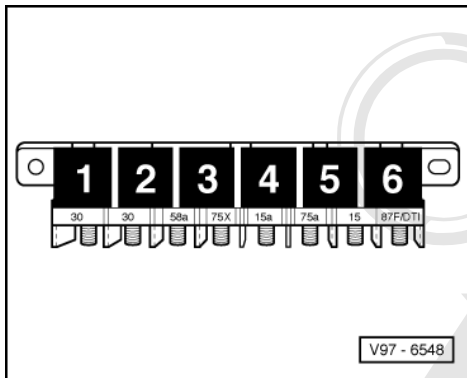
- ♦ V.A.G 1551 with V.A.G 1551/1

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

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:



-> Location of fuel pump relay: On central electrics on left below dash panel, relay position 6

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Test requirements:

- Battery voltage at least 11 V

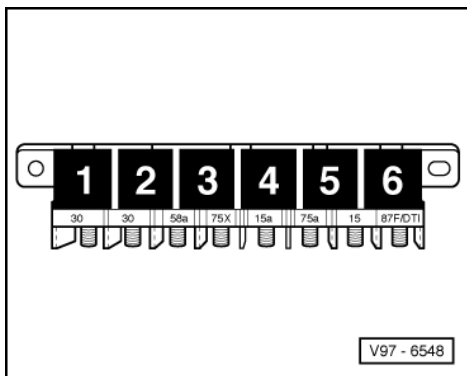
Functional check of fuel pump relay

Vehicles with control unit no. 4A0 907 473 up to software version D02 (self-diagnosis without final control diagnosis):

- Operate the starter briefly (the engine may start).

Vehicles with control unit no. 4A0 907 473 / A up to software version D03 (self-diagnosis with final control diagnosis):

- Start the final control diagnosis => Page 15 .



All vehicles:

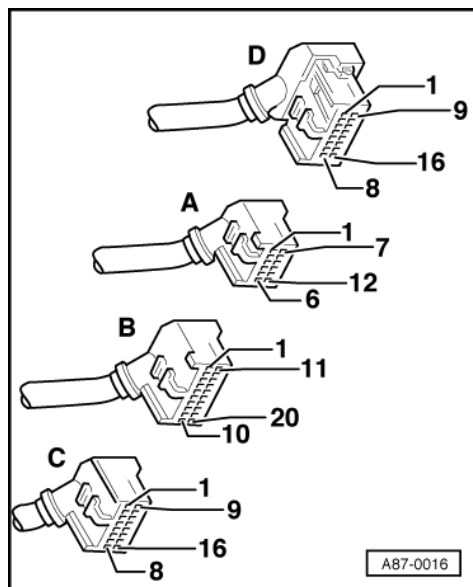
- -> The fuel pump relay (in central electrics on left below the dash panel, position 6) must actuate and the fuel pump must run.

If the relay does not respond:

- Check actuation of fuel pump relay

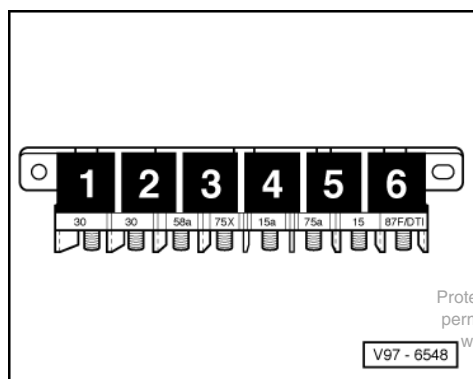
If the fuel pump does not run:

- Check voltage supply for fuel pump and components (via fuel pump relay) =>Page 72 .



Checking actuation of fuel pump relay

- Switch off ignition.
- -> With the ignition switched off, use adapter V.A.G 1598/11 to connect test box V.A.G 1598 A to connector A only of engine control unit (control unit remains disconnected) => Page 47.
- Connect together sockets 47 and 51 on the test box using an auxiliary cable from V.A.G 1594 A.
- Switch the ignition on.



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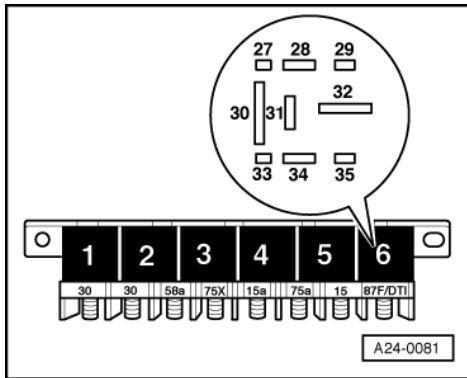
- -> The fuel pump relay (on central electrics on left below dash panel, position 6) must actuate.

If the relay now actuates, but not when operating the starter or initiating final control diagnosis:

- Replace engine control unit => Page 48.

If the relay does not respond:

- Switch off ignition.
- Disconnect fuel pump relay.



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

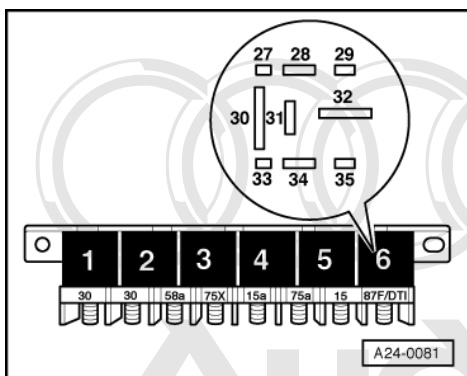
If the specification is not obtained:

- 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	47

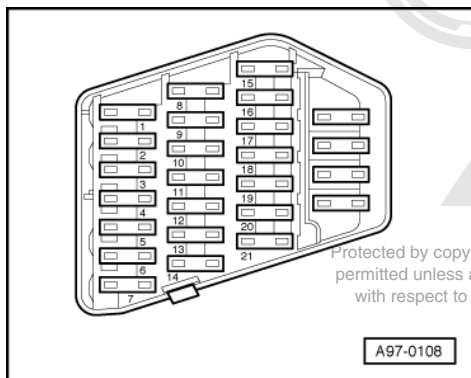
- Rectify any open/short circuit as necessary.

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

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

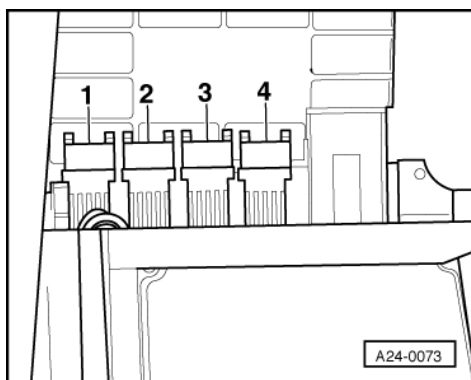


Checking power supply for fuel pump and components (from fuel pump relay)



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- -> Pull out fuse S17.



- -> Pull out fuses S73 (in brown holder -2-) and S72 (in red holder -3-, ä 05.94) and S116 (in red holder -3-, 06.94 ä) from electronic box in front passenger's footwell.

Vehicles with control unit no. 4A0 907 473 up to software version D02 (self-diagnosis without final control diagnosis):

- Operate starter briefly.

Vehicles with control unit no. 4A0 907 473 / A up to software version D03 (self-diagnosis with final control diagnosis):

- Start the final control diagnosis => Page 15 .

All vehicles:

- To measure the voltage, connect multimeter to earth and to one of the contacts of the following fuses in the fuse box.

Locking clip	Specified value at one of the contacts
S17 (No. 17 in fuse box)	approx. battery voltage
S72 (in red fuse box, ä 05.94)	approx. battery voltage
S116 (in red fuse box, 06.94 ä)	approx. battery voltage
S73 (in brown fuse box)	approx. battery voltage

If the specified values are not obtained:

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

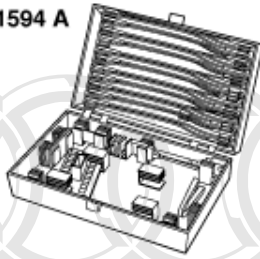
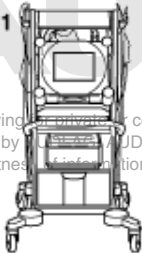
If the specifications are still not attained:

- Check the wiring.

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

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

1.15 - Checking idling stabilisation valve -N71

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

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Special tools 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

Installation position => Installation position overview - Page 42

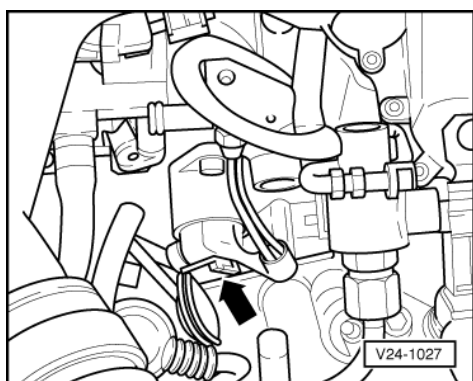
Notes:

- ♦ After the idling speed stabilisation valve has been installed, it must be moved to the basic position using the "Adaptation" (channel 00) or "Basic setting" function, display group 001 (only from control unit no. 4A0 907 473 / A, as of software version D03) => Page 17 .
- ♦ After the ignition has been switched off the engine control unit goes into a self-maintaining phase for 150 minutes. If a repair is carried out on the idling speed stabilisation valve in this time, a fault may be stored in the fault memory.

Warning

The idling speed stabilisation valve must not be moved to its basic position if it has been removed (risk of irreparable damage).

Mechanical checking

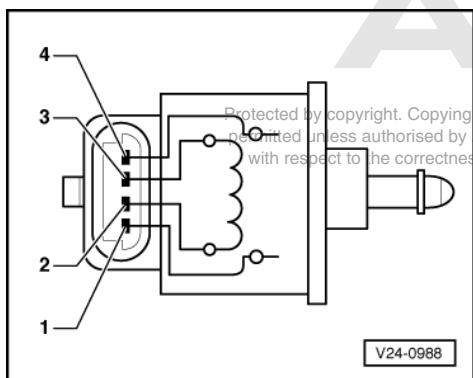


- -> Remove idling stabilisation valve arrow.
- Attach connector to removed idle stabilisation valve
- Switch the ignition on.
 - The idling speed stabilisation valve must retract.
- Switch off ignition.
 - The idling speed stabilisation valve must extend.

If the idling speed stabilisation valve does not react as described:

Checking internal resistance

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



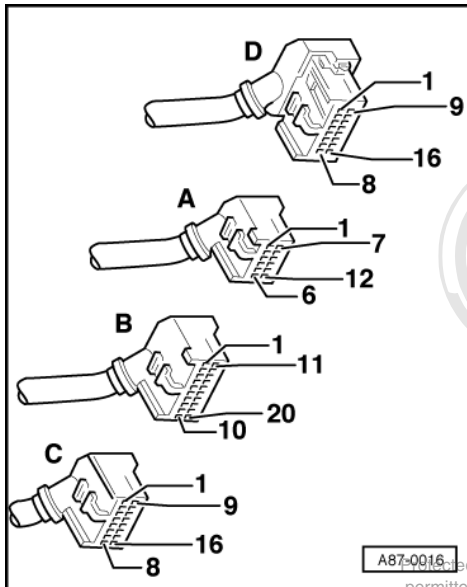
- -> Connect multimeter between contacts 1 and 4 and 2 and 3 on valve to measure resistance.
 - Specification: 45 ... 60 Ω

Note:

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

If a specification is not met:

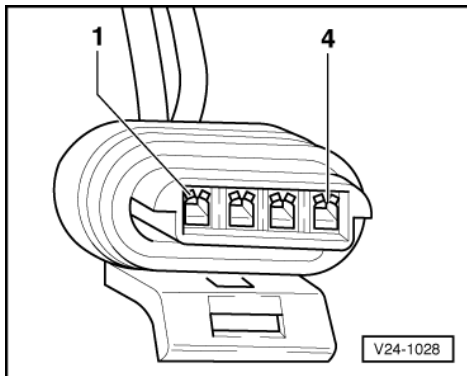
- Replace idling stabilisation valve.



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If the idling speed stabilisation valve is OK:

- -> With the ignition switched off, use adapter V.A.G 1598/12 to connect test box V.A.G 1598 A to connector D only of engine control unit (control unit remains disconnected) => Page 47 .



- -> 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 (A)	2
2 (B)	10
3 (C)	11
4 (D)	3

- Rectify any open/short circuit as necessary.



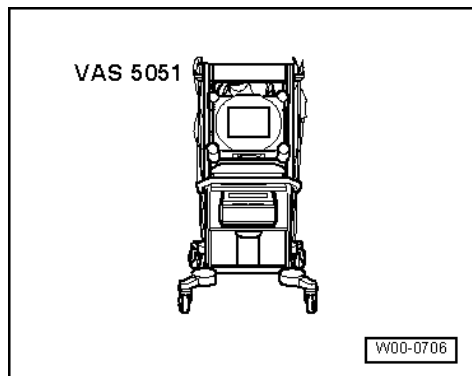
=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

If no fault is found:

- Replace engine control unit => Page 48 .

1.16 - Checking intake air system for leaks (unmetered air)

Special tools 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
- ♦ Engine leak detector spray G 001 800 A1

Notes:

- ♦ The vacuum in the intake system will cause the leak detector spray to be drawn in with the unmetered air. The leak detector spray reduces the ignition qualities of the mixture. This leads to a drop in engine speed and to a significant increase of the CO content.
- ♦ The safety precautions listed on the container must be adhered to.

Test sequence

- 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 1 .
For this purpose, the engine must be running at idle speed

-> If this appears on the display:

Rapid data transfer	HELP
Select function XX	

- Enter "08" to select the function "Reading measured value block" and confirm entry with Q key.

-> If this appears on the display:

Reading measured value block	Q
Enter display group number XXX	

- Enter "001" to select "Display Group 001" and confirm entry with the Q key

-> Indicated on display:

(1...4 = display zones)

Read measured value block 1
1 2 3 4

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- Note engine speed in display zone 1.
- Systematically spray parts of the intake system with engine leak detector spray.

If engine speed does not change:

- Press the ➔key.

-> Indicated on display (function selection):

Rapid data transfer	HELP
Select function XX	

If engine speed drops:

- Press the ➔key.
- Enter "06" for "End output" function and confirm entry with Q key.
- Switch off ignition.
- Check sprayed areas of intake system for leaks and rectify if necessary.

2 - Test lambda control

2.1 - Test lambda control

Notes:

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.

During the transition from "rich" to "lean" or vice versa ($\lambda = 1.0$) a voltage jump of 0.6... 1.0 V to 0.0... +0.3 V or vice versa occurs.

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".

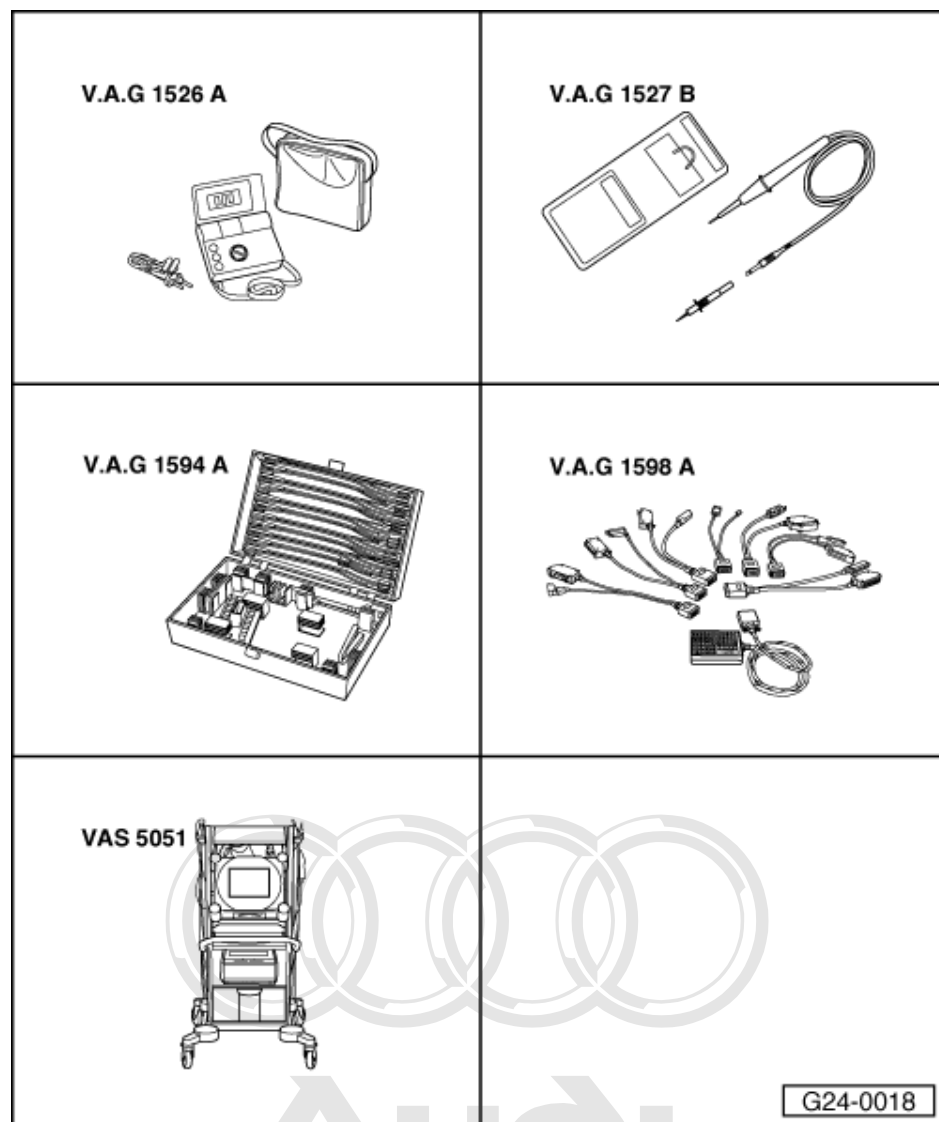
If the voltage does not change or only changes slowly the following faults are possible:

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- ◆ 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 heater not working.
- ◆ Lambda control switched off (control unit has registered a fault in the injection system => interrogate fault memory and 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).



2.2 - Testing Lambda probe heater-vehicles > 06.96:



Special tools and workshop equipment required

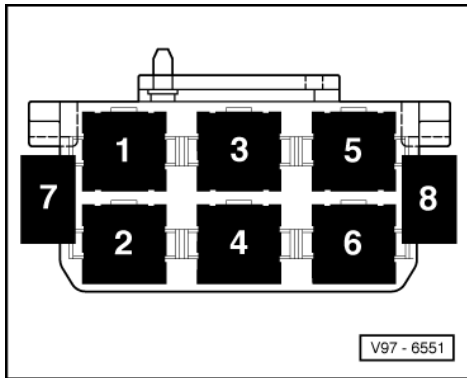
- ♦ V.A.G 1526 A
- ♦ V.A.G 1527 B
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598 A
- ♦ V.A.G 1598/11
- ♦ VAS 5051 with VAS 5051/1 and VAS 5051/2

or

- ♦ V.A.G 1551 with V.A.G 1551/1

Notes:

- ♦ Engines conforming to emission standard (=> Coding control unit, Page 20) only have one Lambda probe for bank 1.



- ♦ -> In vehicles > 06.96 the Lambda probe heater -Z19 and -Z28 is controlled by the engine control unit via the Lambda probe heater control unit -J208 (in additional relay carrier III in front passenger's footwell, position 1).

Checking internal resistance

- Unplug Lambda probe connector for left hand or right hand cylinder bank.
(Installation position => Page 43)
- Connect multimeter between contacts 1 and 2 to measure resistance.
 - Specified value at room temperature 3 ... 15 ω

Note:

The resistance will increase sharply at higher temperatures.

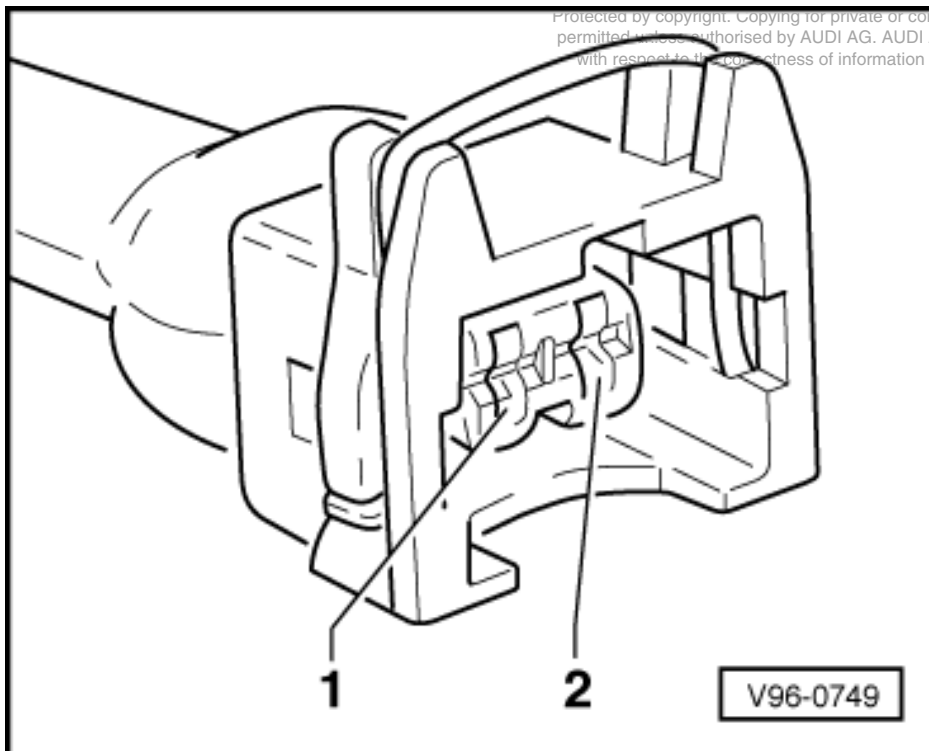
If the specification is not obtained:

- Fit a new Lambda probe.

Checking power supply

Test requirements:

- Voltage supply to engine control unit greater than 11 V, Testing =>Page 145 .



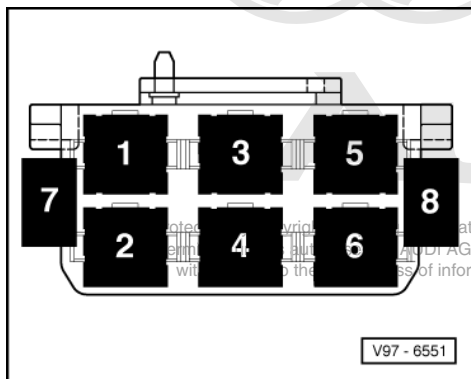


- -> Connect voltage tester V.A.G 1527 B between contacts 1 and 2.

Vehicles with control unit no. 4A0 907 473 up to software version D02 (self-diagnosis without final control diagnosis):

- Operate the starter briefly (the engine may start).

Vehicles with control unit no. 4A0 907 473 / A up to software version D03 (self-diagnosis with final control diagnosis):

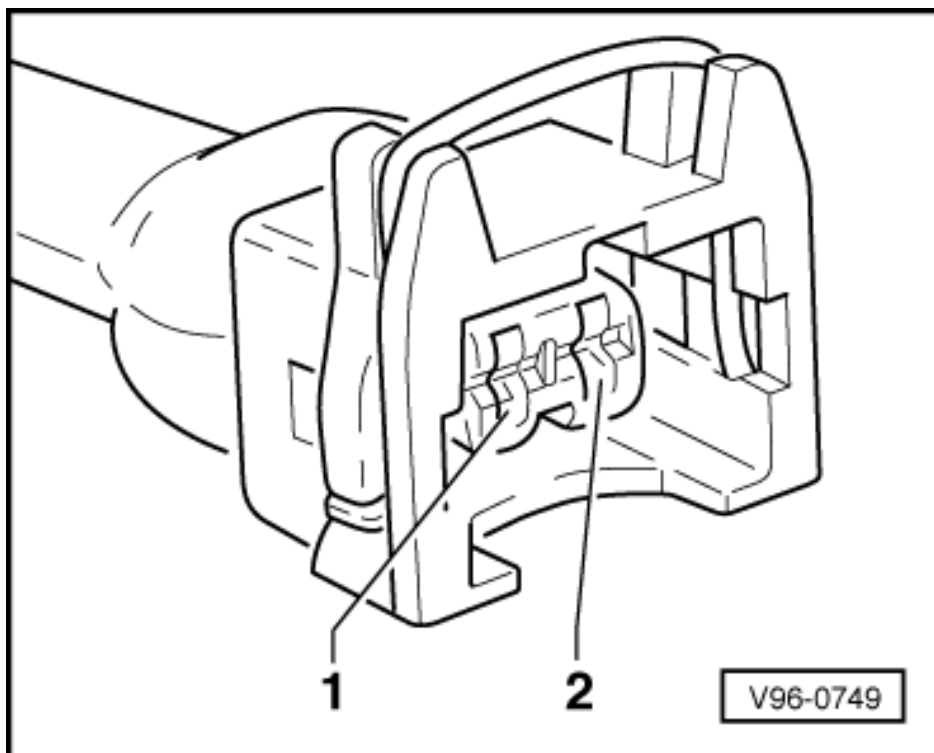


- Start final control diagnosis =>Page **15** and actuate the Lambda probe heater control unit -J208.

All vehicles:

- -> The Lambda probe heater control unit -208 (in additional relay carrier III in the front passenger side footwell, position 1) must actuate/click ...
- ... and the LED must light up/flash.

A - If the control unit clicks but the LED does not flash:



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

Connector contact	Measure to
-------------------	------------

1	Engine earth
---	--------------

If LED now flashes:

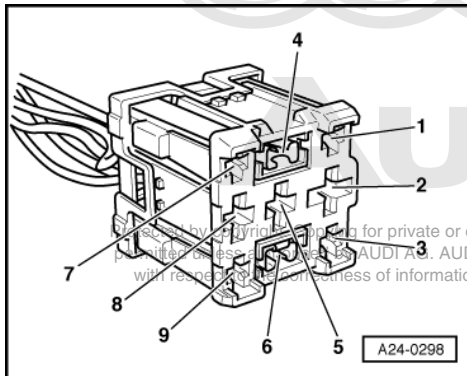
- Check wiring between contact 2 of connector and earth connection 1 in front passenger side wiring harness for open circuit and repair if necessary.

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

- Rectify open circuit, if necessary

If LED still does not flash:

- Switch off ignition.
- Remove the Lambda probe heater control unit.



- -> Check for open circuit in the following wiring connections:

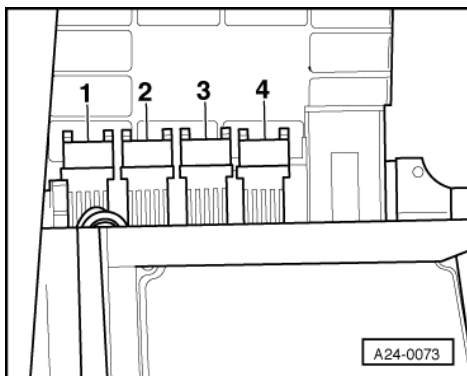
Additional relay carrier III in the front passenger side footwell, relay position 1. contact	Connector contact
2	1

- Rectify open circuit, if necessary
- Connect voltage tester V.A.G 1527 B as follows:

Additional relay carrier III in the front passenger side footwell, relay position 1. contact	Measure to
8	Engine earth

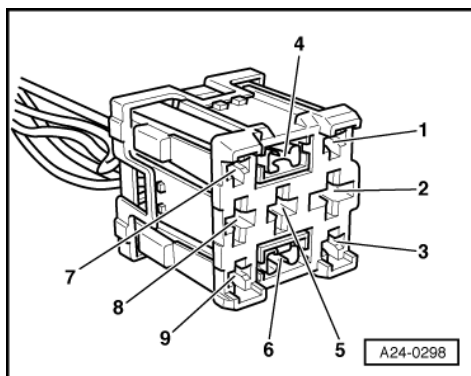
- Operate the starter briefly (the engine may start).
 - The LED should light up.

If the LED does not light up:





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



- -> Check wiring connections from Lambda probe heater control unit -J208 (in additional relay carrier III in front passenger side footwell, position 1, contact 8) to fuse S73 (in brown holder -2- in the electronic box in the front passenger side footwell) for open circuit:

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

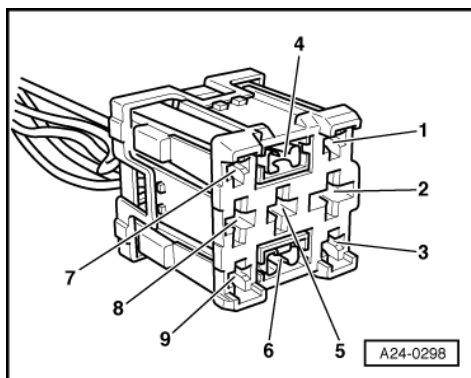
- Check fuel pump relay =>Page 68 .

If no fault is found:

- Replace the Lambda probe heater control unit -J208.

B - If the LED does not blink and the relay does not click:

- Remove the Lambda probe heater control unit.



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

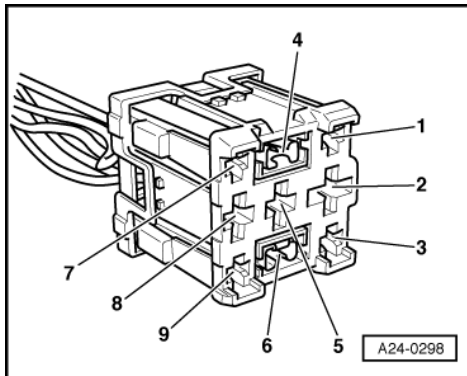
Additional relay carrier III in the front passenger side footwell, relay position 1. contact	Measure to
4	Engine earth

- Operate the starter briefly (the engine may start).
 - The LED should light up.

If the LED does not light up:

- Check wiring connections from Lambda probe heater control unit -J208 (in additional relay carrier III in front passenger side footwell, position 1, contact 8) to fuse S73 (in brown holder -2- in the electronic box in the front passenger side footwell) for open circuit:

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



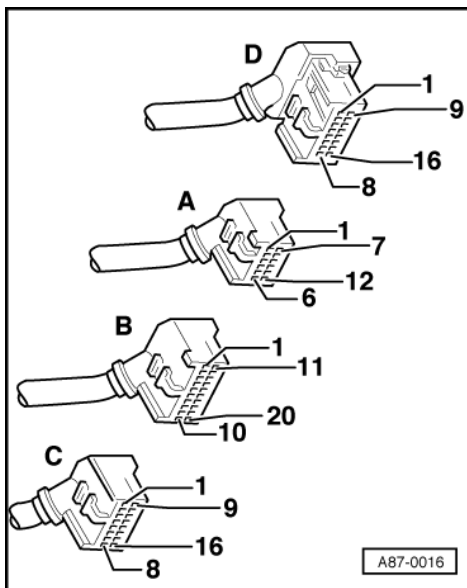
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If the wiring is OK:

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

Additional relay carrier III in the front passenger side footwell, relay position 1. contact	Measure to
6	Battery positive

- Operate the starter briefly (the engine may start).



- The LED should light up.

If the LED does not light up:

- -> With the ignition switched off, use adapter V.A.G 1598/11 to connect test box V.A.G 1598 A to connector A only of engine control unit (control unit remains disconnected) => Page 47 .
- Check for open circuit and short to positive or earth in the following wiring connections:

Additional relay carrier III in the front passenger side footwell, relay position 1. contact	Test box V.A.G 1598 A socket
--	------------------------------



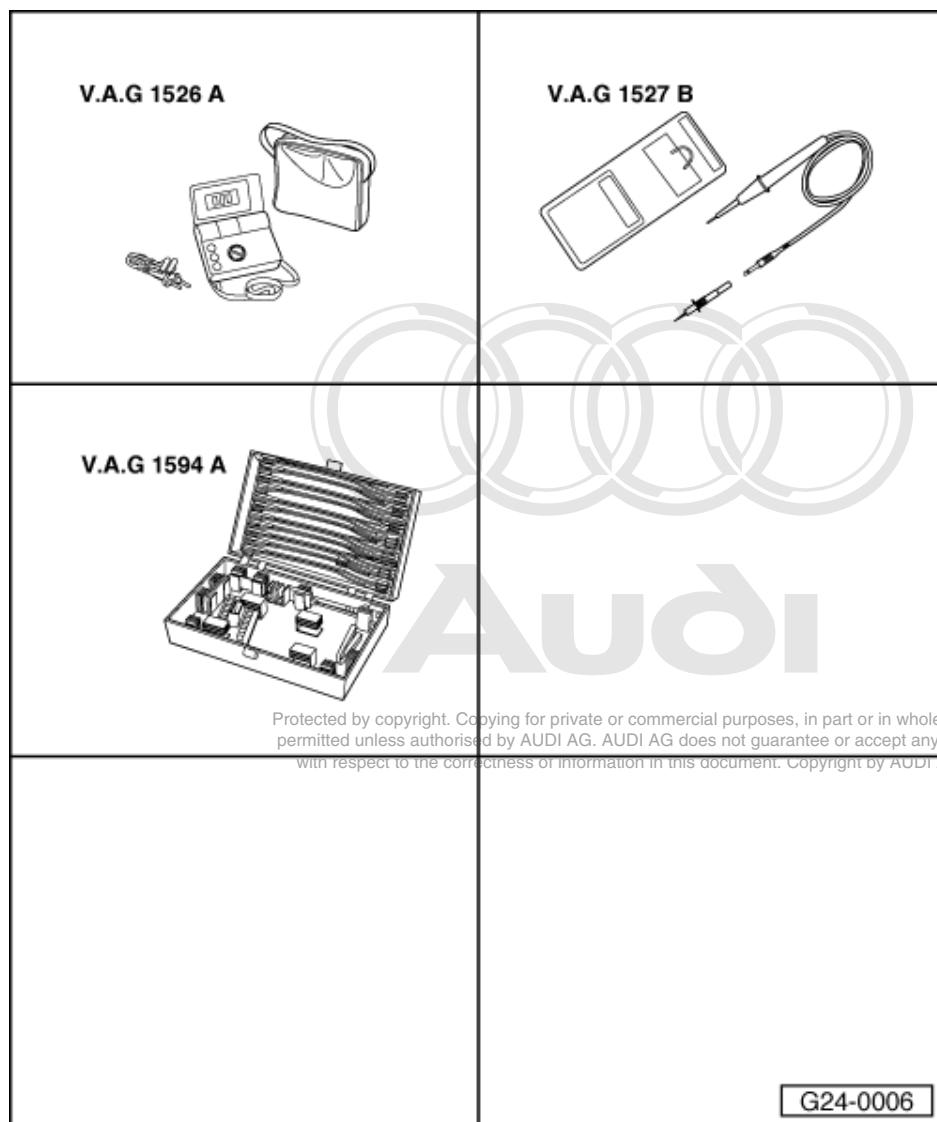
6	48
---	----

- Rectify any open/short circuit as necessary.

If no fault is found:

- Replace engine control unit => Page 48 .

2.3 - Testing Lambda probe heater-vehicles 07.96 ä



Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1527 B
- ♦ V.A.G 1594 A

Note:

Engines conforming to emission standard (=> Coding control unit, Page 20) only have one Lambda probe for bank 1.

Checking internal resistance

- Unplug Lambda probe connector for left hand or right hand cylinder bank.
(Installation position => Page 43)
- Connect multimeter between contacts 1 and 2 to measure resistance.
 - Specified value at room temperature 3 ... 15 Ω

Note:

The resistance will increase sharply at higher temperatures.

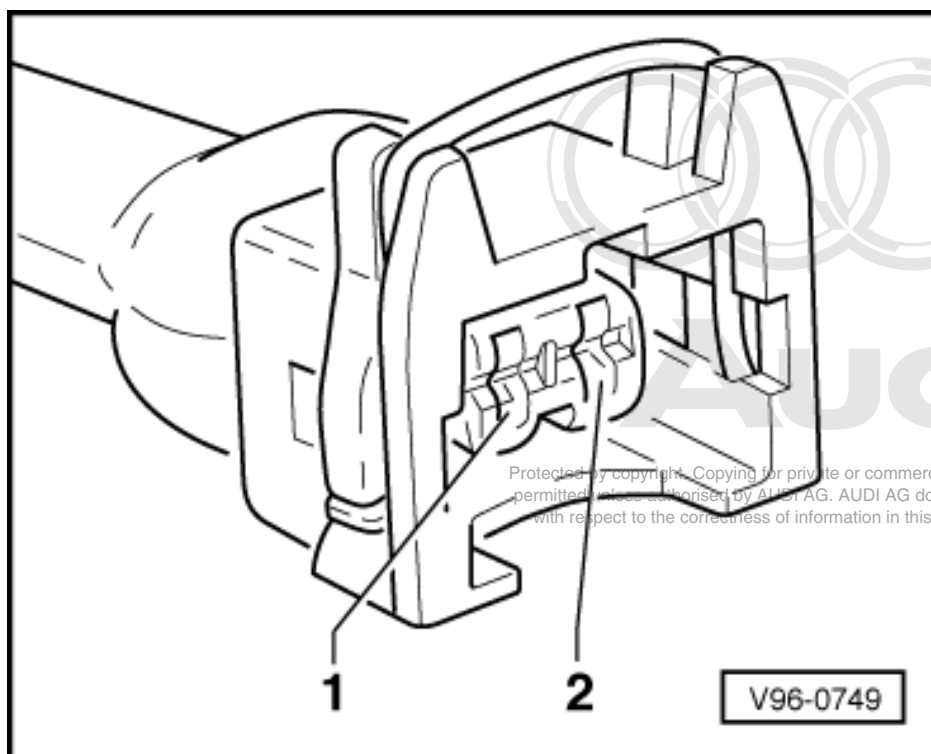
If the specification is not obtained:

- Fit a new Lambda probe.

Checking power supply

Test requirements:

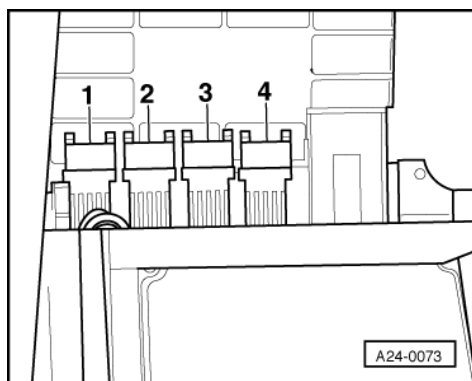
- Voltage supply to engine control unit greater than 11 V, Testing =>Page 145 .



- -> Connect voltage tester V.A.G 1527 B between contacts 1 and 2.
- Operate the starter briefly (the engine may start).
 - The LED should light up.

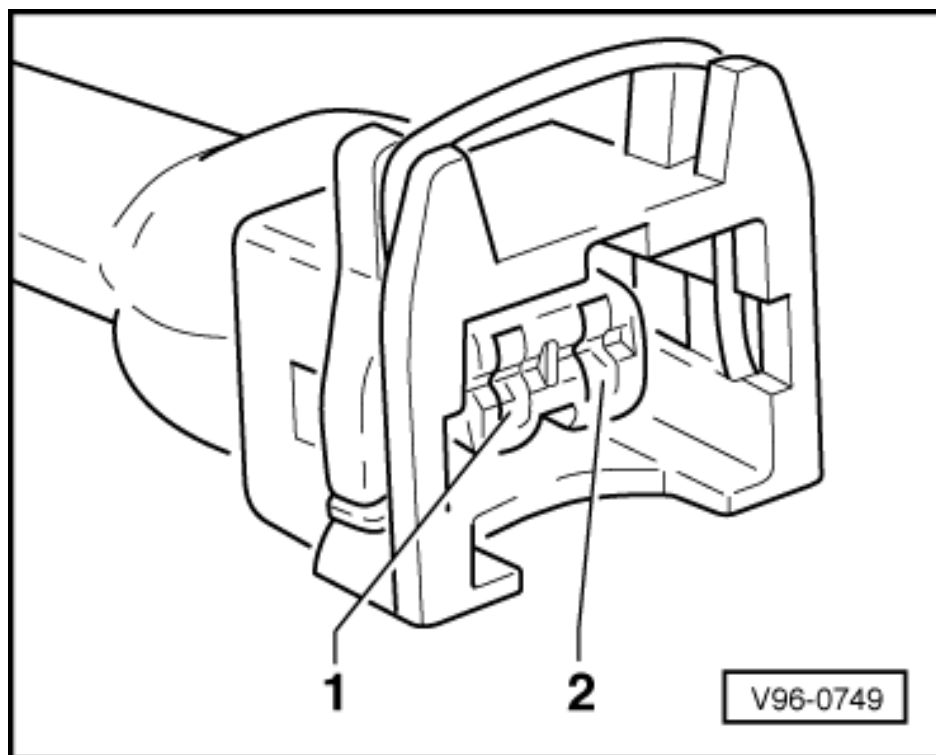
If the LED does not light up:

- Carry out the following tests (marked with dots):





- -> Test fuse S73 (in brown holder -2- in the electronic box in the front passenger side footwell).



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

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

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

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

- Check fuel pump relay =>Page **68** .



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2.4 - Checking Lambda probe and signal wire

V.A.G 1526 A 	V.A.G 1594 A 
V.A.G 1598 A 	
	G24-0015

Special tools 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:

Engines conforming to emission standard ECE 15.04 (=> Coding control unit, Page 20) only have one Lambda probe for bank 1.

Test sequence

- Unplug Lambda probe connector for left hand or right hand cylinder bank.
(Installation position => Page 43)
- Connect multimeter between signal wire and engine earth to measure resistance.
 - Specification: $\infty \omega$

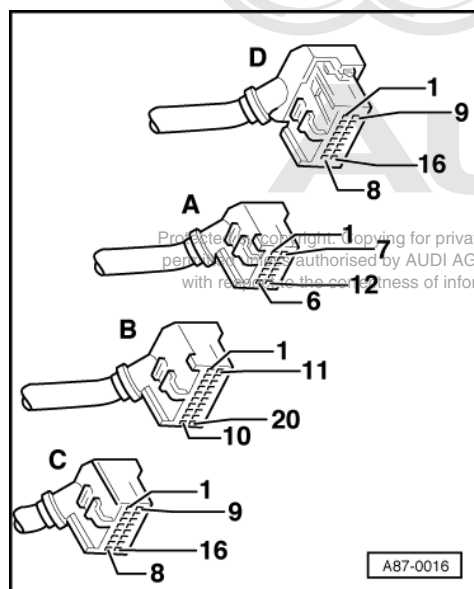
If the specification is not obtained:

- Fit a new Lambda probe.

If the specification is obtained:

- Connect multimeter between connector of signal wire to engine control unit and engine earth to measure voltage.
- Switch the ignition on.
 - Specification: 400 ± 50 mV.

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 C only of engine control unit (control unit remains disconnected) => Page 47 .
- Check for open circuit and short to earth/positive or earth in the following wiring connections:

Lambda probe, bank 1 -G39

Connector contact	Test box V.A.G 1598 A socket
Signal wire	2

Lambda probe, bank 2 -G108

Connector contact	Test box V.A.G 1598 A socket
Signal wire	3

- Rectify any open/short circuit as necessary.

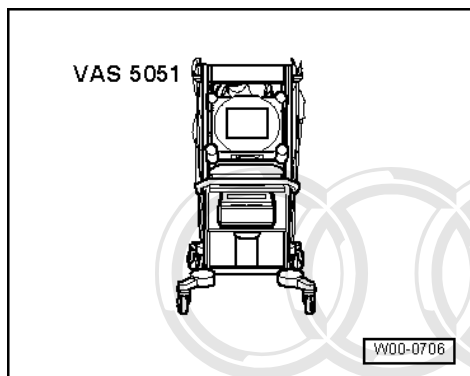
=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

If no fault is found:

- Replace engine control unit => Page 48 .

2.5 - Checking function of Lambda probes

Special tools 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

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Test sequence

Read measured value block 2

1	2	3	4
---	---	---	---

-> Read measured value block, display group 002 => Page 25 .

Do not continue the test until the coolant temperature shown in display zone 3 has reached at least 85 oC.

- Press C key.
- Enter "003" to select "Display Group 003" and confirm entry with the Q key.

-> Indicated on display:

Read measured value block 3

1	2	3	4
---	---	---	---

The control value for Lambda probe 1 will be displayed in display zone 3.

The control value for Lambda probe 2 will be displayed in display zone 4.

Note:

In engines which only have one Lambda probe for bank 1 (emission standard ECE 15.04 => Coding control unit, Page 20) a duplication of the values for bank 1 will be displayed for bank 2 in the measured value blocks.

- If the control fluctuates very slowly, test the Lambda probe heater => Page 78 .
- If a constant value of 1.25 is displayed (mixture too lean), this means that the mixture control has reached the control limit in the "enrich" direction, but the Lambda probe is still detecting "mixture too lean".
- If a constant value of less than 0.75 is displayed (mixture too rich), this means that the mixture control has reached the control limit in the "lean" direction, but the Lambda probe is still detecting "mixture too rich".

If the Lambda probe works perfectly:

- Check the learned Lambda probe values.

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

Display zone 2 will show the learned Lambda value at idling speed for cylinder bank 2.

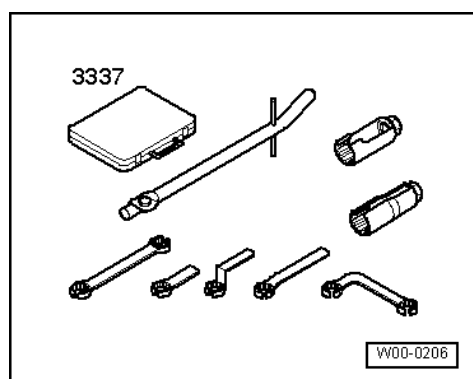
The lambda control is adaptive, i.e. it has a learning capability. Faults such as unmetered air or defective injectors have the effect of changing the air/fuel mixture composition. The Lambda probes detect this and compensate by adjusting the basic injection periods programmed in the maps. The injection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

Specifications: Read measured value block, display group 003 =>Page 26

- If the specified values are not obtained: Test table display group 003 =>Page 27

2.6 - Removing and installing Lambda probe

Special tools and workshop equipment required



- ♦ Box wrench set 3337
- ♦ Hot bolt paste G 052 112 A3

Removing

- Unplug Lambda probe connector for left hand or right hand cylinder bank.
(Installation position => Page 43)

Note:

Engines conforming to emission standard ECE 15.04 (=> Coding control unit, Page 20) only have one Lambda probe for bank 1.

- Open cable ties.
- Screw out Lambda probe using special tool 3337.

Installing

When installing, note the following points:

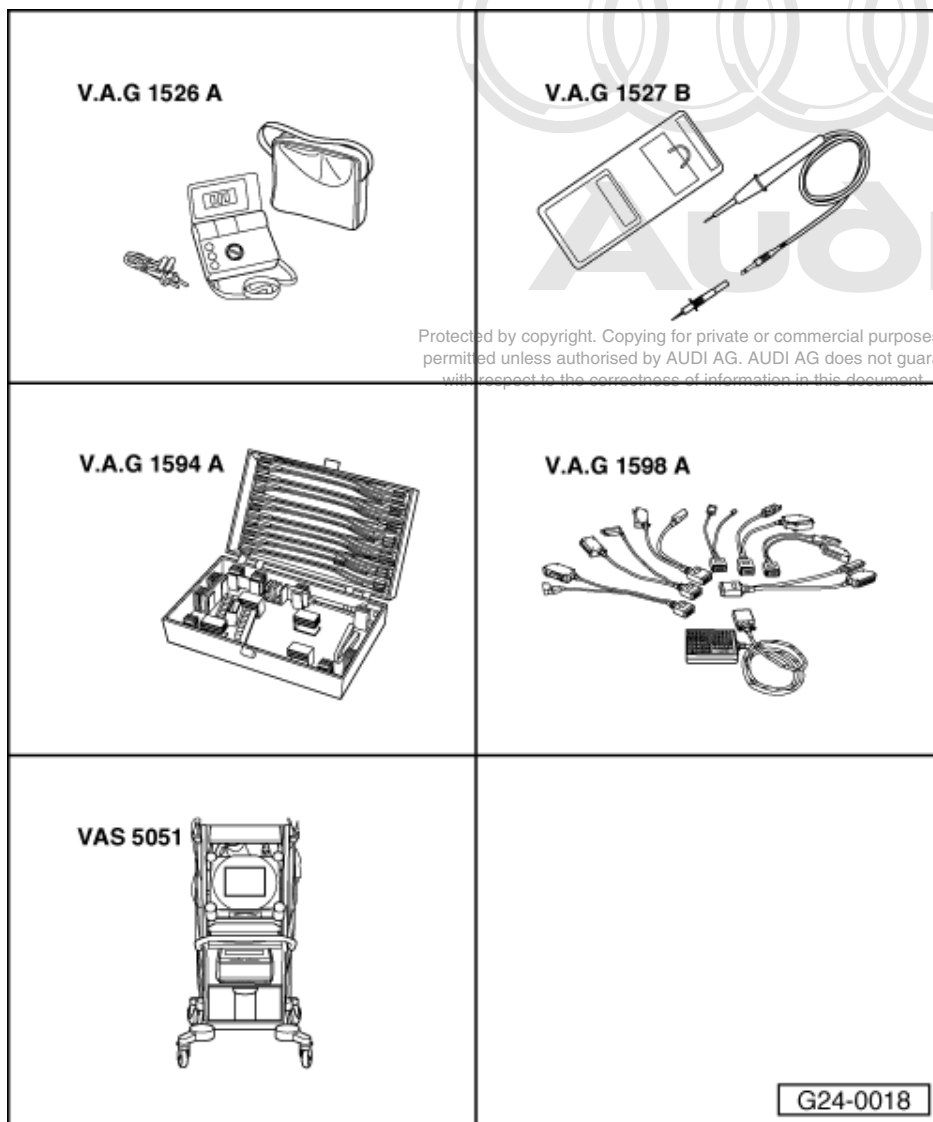
Notes:

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- ♦ 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.

3 - Checking fuel tank breather

3.1 - Checking fuel tank breather



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3.2 - Checking activated charcoal filter solenoid valve 1 -N80

Special tools 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 42

Note:

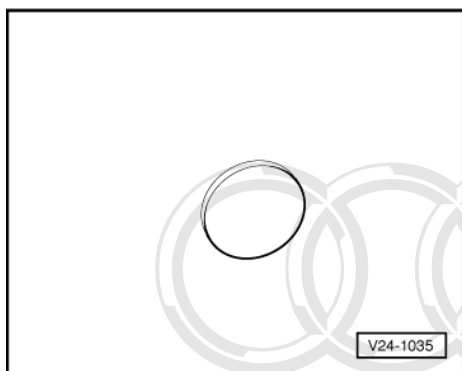
The activated charcoal filter system solenoid valve 1 is also referred to in this context as fuel tank breather valve of ACF valve.

Testing for leaks

ACF solenoid valve -N80 remains closed when deenergised.

- Remove the hoses from the ACF valve.
- Connect auxiliary hose to one connection of ACF valve.

Vehicles with control unit no. 4A0 907 473 up to software version D02 (self-diagnosis without final control diagnosis):



1 ←

- Unplug connector on ACF valve.
- -> Connect contact 2 of the ACF valve to battery positive using an auxiliary cable from the V.A.G 1594 A
- Connect contact 1 to earth.

The injector valve must actuate (click.)

...and must open (check by blowing into the auxiliary hose).

- Remove the connection from contact 1.
 - It must not be possible to blow into the auxiliary hose.

If valve does not open and close properly:

- Replace -N80 solenoid valve for activated charcoal filter.

If the injector does not click:

- Checking internal resistance to ACF valve.

Vehicles with control unit no. 4A0 907 473 / A up to software version D03 (self-diagnosis with final control diagnosis):

- Start final control diagnosis =>Page 15 and actuate activated charcoal filter solenoid valve -N80.

-> Indicated on display:

Final control diagnosis
Solenoid valve 1 for activated charcoal
filter N80

The valve should click...

...and should open and close (check by blowing into the auxiliary hose).

If valve does not open and close properly:

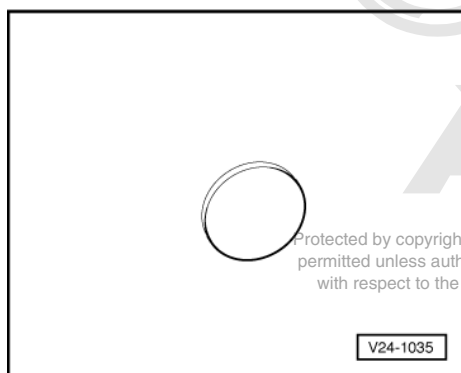
- Replace -N80 solenoid valve for activated charcoal filter.

If the injector does not click:

- Checking internal resistance to ACF valve.

Checking internal resistance

- Unplug connector on ACF valve.



1 ←

- -> Connect multimeter between contacts 1 and 2 to measure resistance.
- Specification: 20 ... 28 ω

If the specification is not obtained:

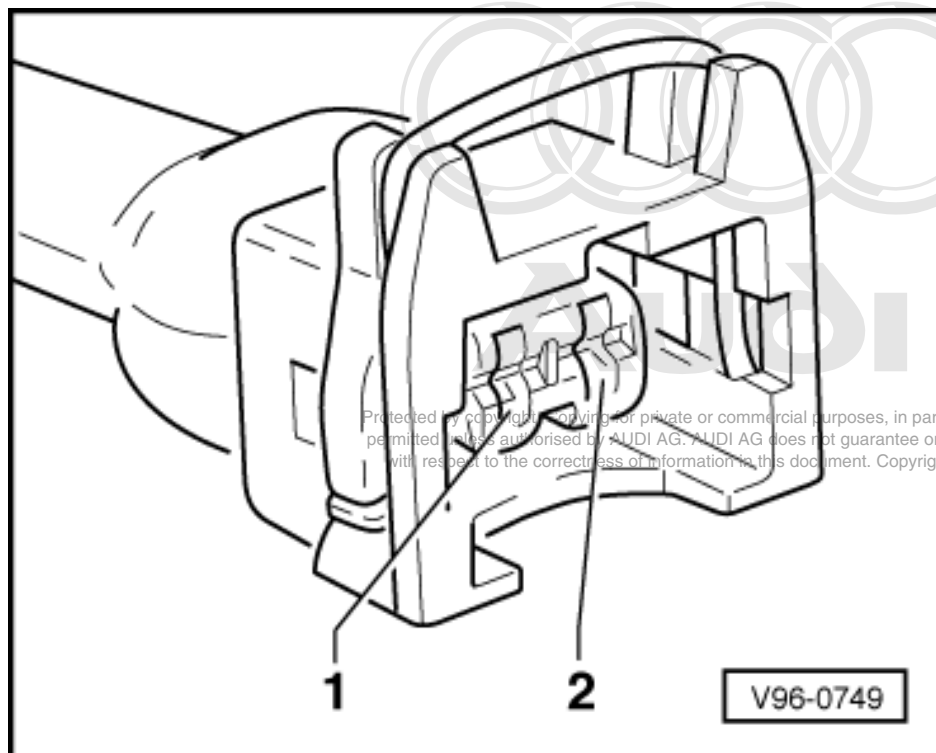
- Fit a new ACF valve.

Checking power supply

Note:

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

- Unplug connector on ACF valve.



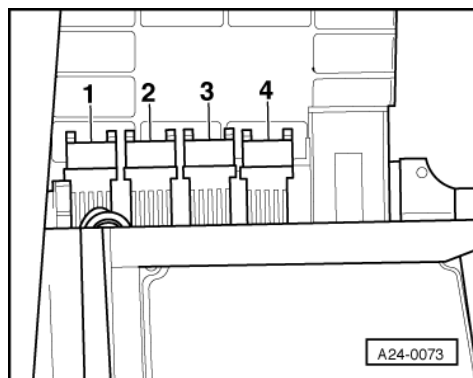
- -> Connect voltage tester V.A.G 1527 B as follows:

Connector contact	Measure to
1	Engine earth

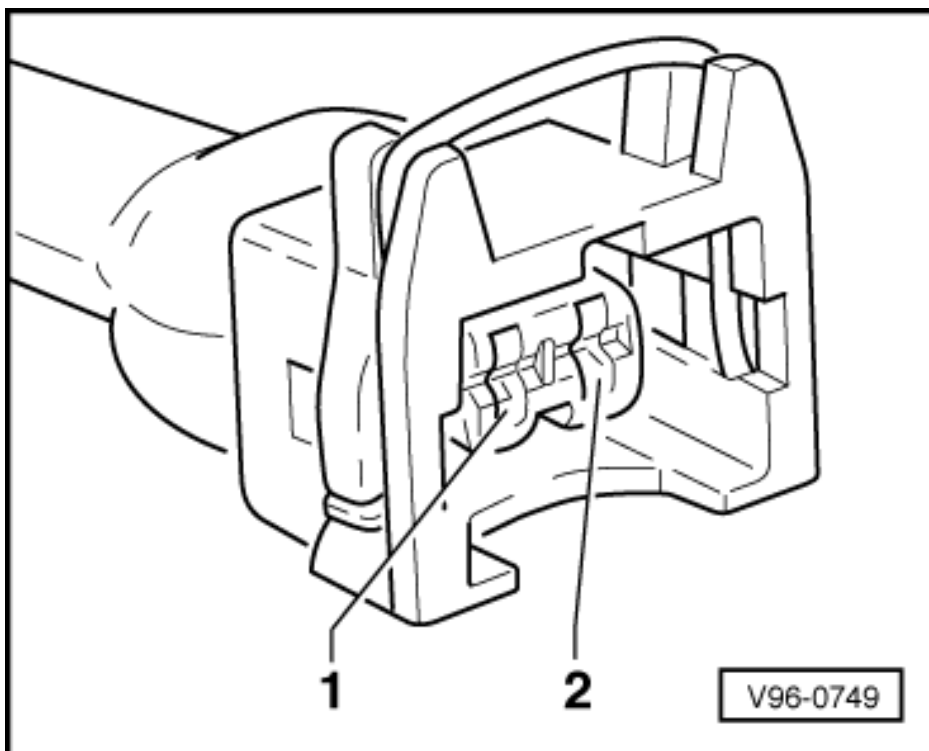
- Operate starter briefly.
- The LED should light up.

If the LED does not light up:

- Carry out the following tests (marked with dots):



- -> Test fuse S73 (in brown holder -2- in the electronic box in the front passenger side footwell).



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

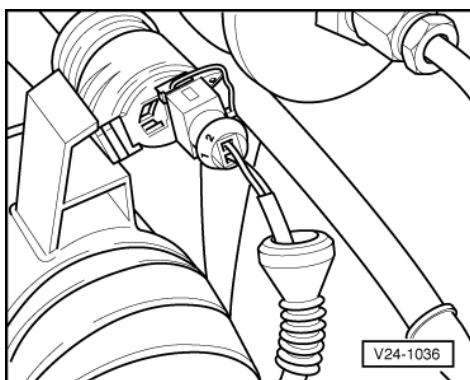
=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

- Check fuel pump relay =>Page 68 .

Checking actuation

Vehicles with control unit no. 4A0 907 473 / A up to software version D03 (self-diagnosis with final control diagnosis):

- Push back rubber grommets on connector for ACF valve but leave connector plugged in.



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

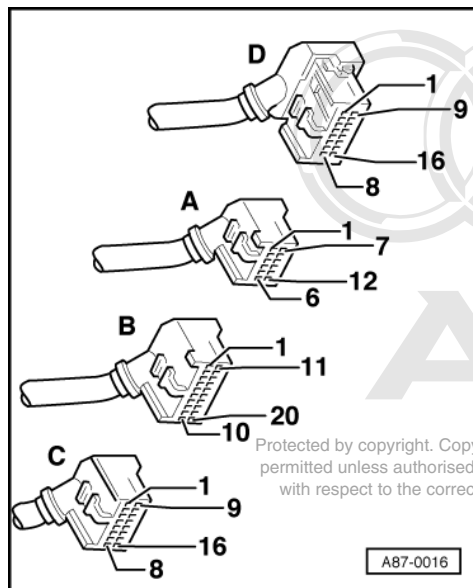
Connector contact	Measure to
2	Engine earth

- Start final control diagnosis =>Page 15 and actuate ACF solenoid -N80.
 - The LED should flash.

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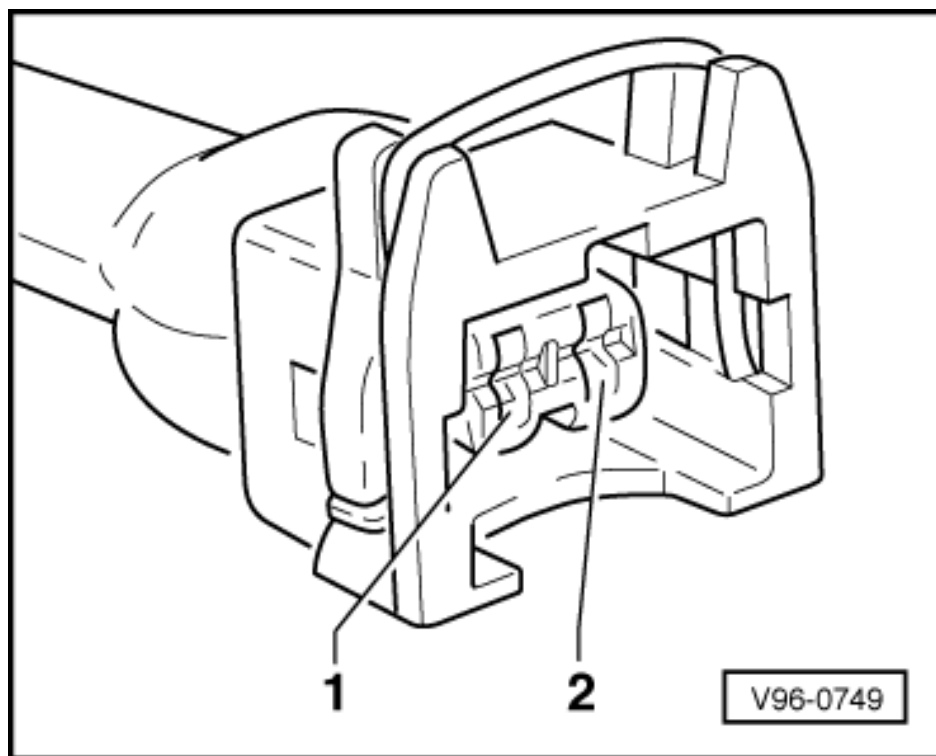
If the LED lamp does not flash or if it lights up continuously:

All vehicles:



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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 D only of engine control unit (control unit remains disconnected) => Page 47 .



- -> 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.

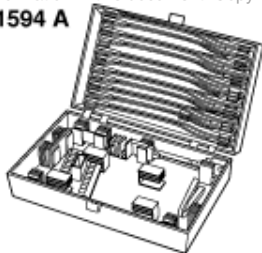
=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

If no fault is found:

- Replace engine control unit => Page 48.

4 - Checking throttle valve potentiometer -G69

4.1 - Checking throttle valve potentiometer -G69

V.A.G 1526 A 	V.A.G 1594 A 
V.A.G 1598 A 	
	G24-0015

Special tools and workshop equipment required

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

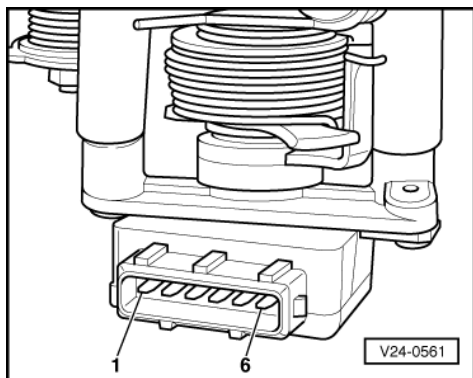
Installation position => Installation position overview - Page 42

Notes:

- ♦ The throttle valve potentiometer (G69) informs the engine control unit of the position of the throttle valve.
- ♦ Checking function=> Reading measured value block display group 002, Page 25.
- ♦ After the ignition has been switched off the engine control unit goes into a self-maintaining phase for 150 minutes. If a repair is carried out on the throttle valve potentiometer during this time, a fault may be stored in the fault memory.

Checking internal resistance

- Pull connector off throttle valve potentiometer.



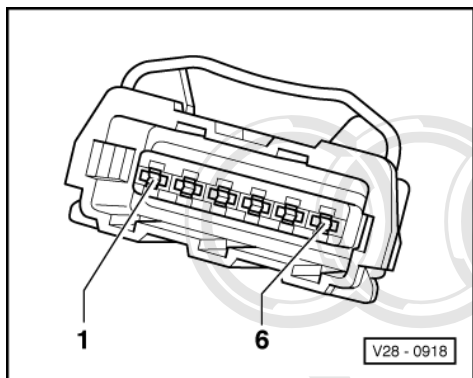
- -> Connect multimeter between contacts 1 and 2 to measure resistance.
 - Specification: 1.5 ... 2.6 k Ω
- Connect multimeter between contacts 2 and 3 to measure resistance.
 - Specification: 0.75 ... 1.3 k Ω
- Slowly move the throttle valve lever to full throttle position.
 - Specification: Increasing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

If a specification is not met:

- Replace throttle valve potentiometer.

Checking power supply

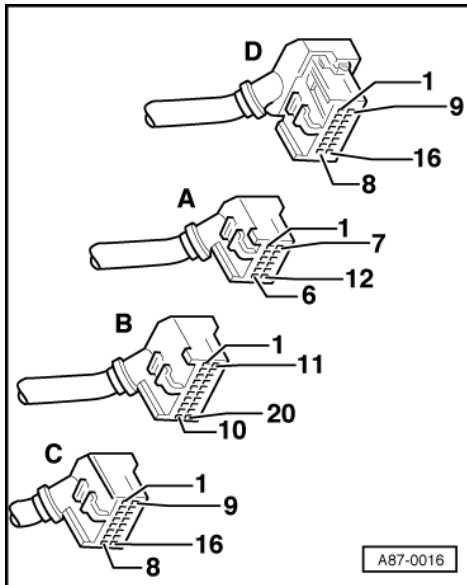
- Pull connector off throttle valve potentiometer.
- Switch the ignition on.



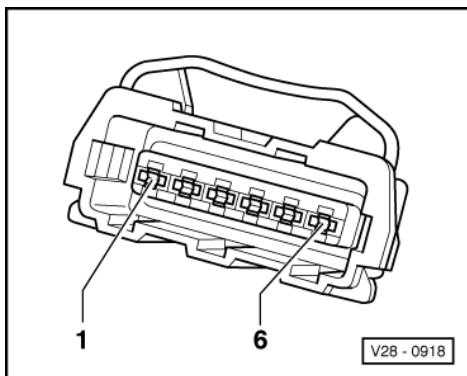
- -> Connect multimeter between contacts 1 and 2 to measure resistance.
 - Specification: 4.5 ... 5.5 V
- Connect multimeter between contacts 2 and 3 to measure resistance.
 - Specification: 4.5 ... 5.5 V

If a specification is not met:

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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 47 .



- -> 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	4
2	12
3	5

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- Rectify any open/short circuit as necessary.

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

Note:

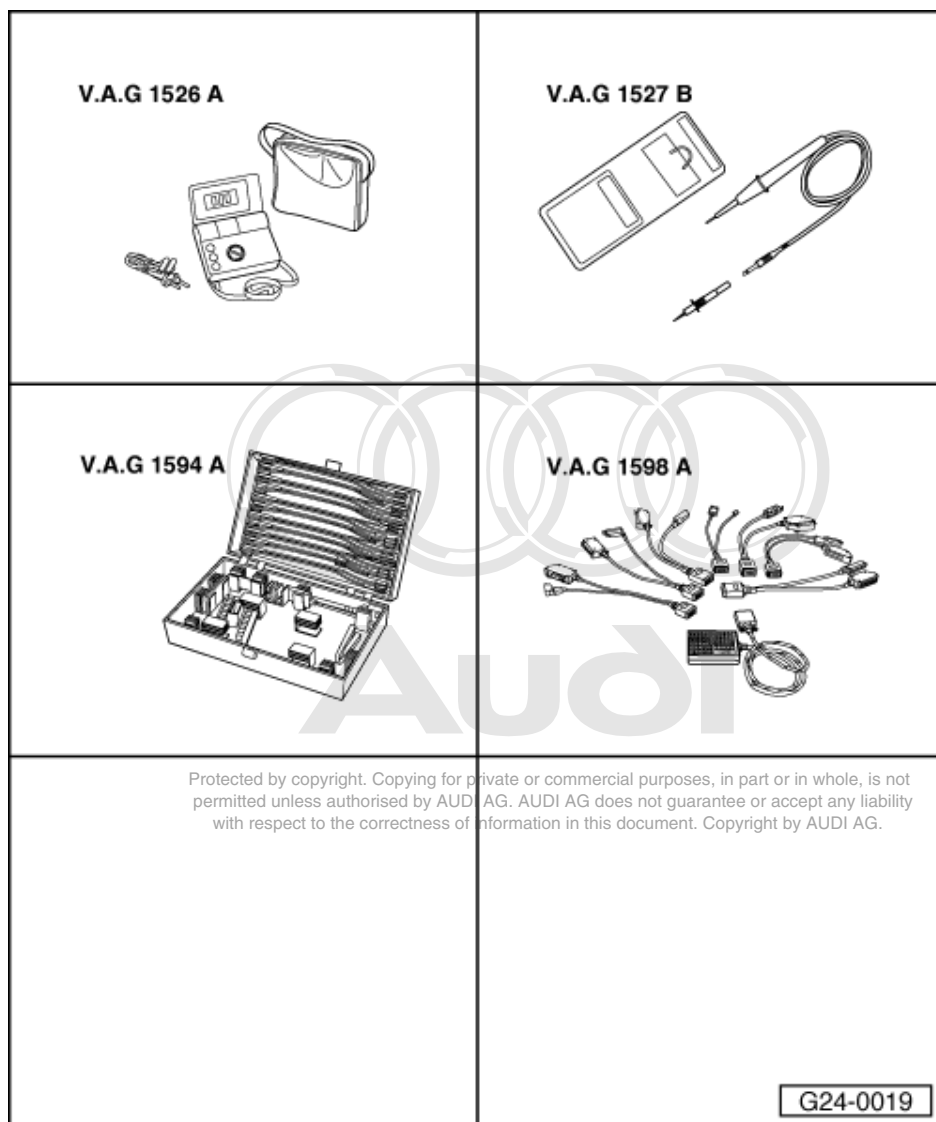
Use only gold-plated contacts when repairing the contacts in the plug connectors.

If the wiring is OK:

- Replace engine control unit => Page 48 .



4.2 - Checking idling switch -F60



Special tools 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

Notes:

- ♦ The idling switch is located in the throttle valve potentiometer.
- ♦ Checking function=> Reading measured value block display group 009, Page 30 .

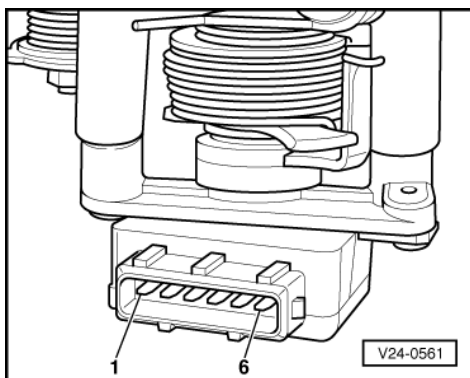
Test requirements:

- Throttle cable setting OK

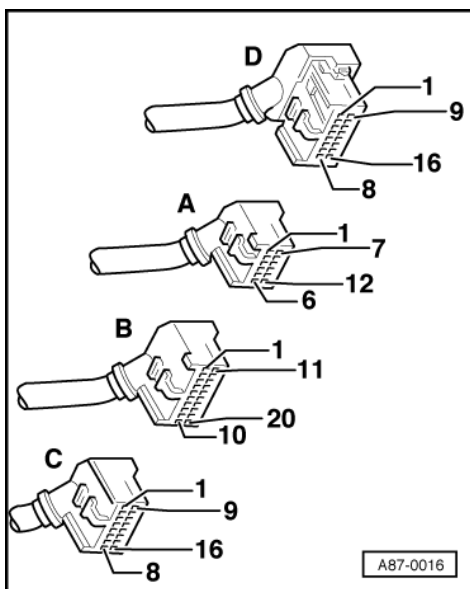
=> Repair group 20

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.
 - Specification: $\infty \Omega$ (no continuity)



If the specified values are not obtained:

- Adjust idling switch =>Page **103** .

If the specifications are still not attained:

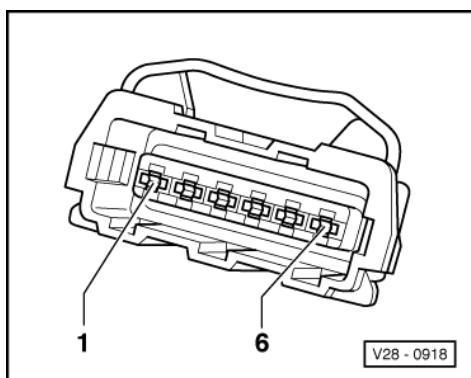
- Replace throttle valve potentiometer.

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 B only of engine control unit (control unit remains disconnected) => Page **47** .



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- -> 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	24

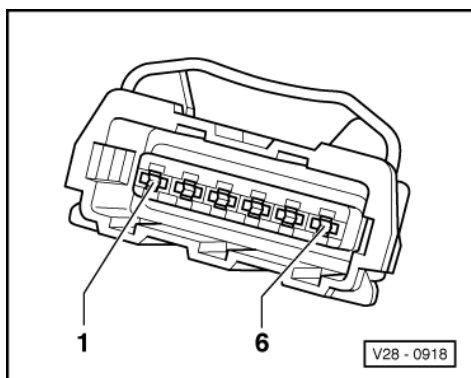
- Rectify any open/short circuit as necessary.

=> "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 should light up.

If the LED does not light up:

- Check wiring between contact 4 of connector and the earth connection on the intake manifold for open circuit and repair if necessary.

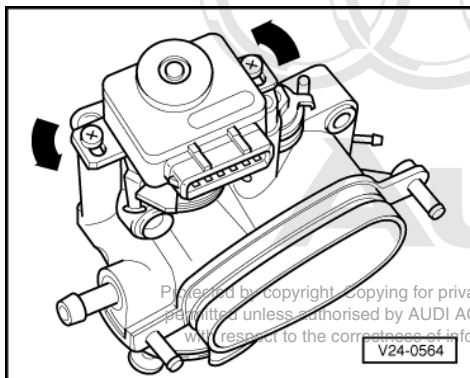
=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

Note:

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

Adjusting idling switch

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



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

Note:

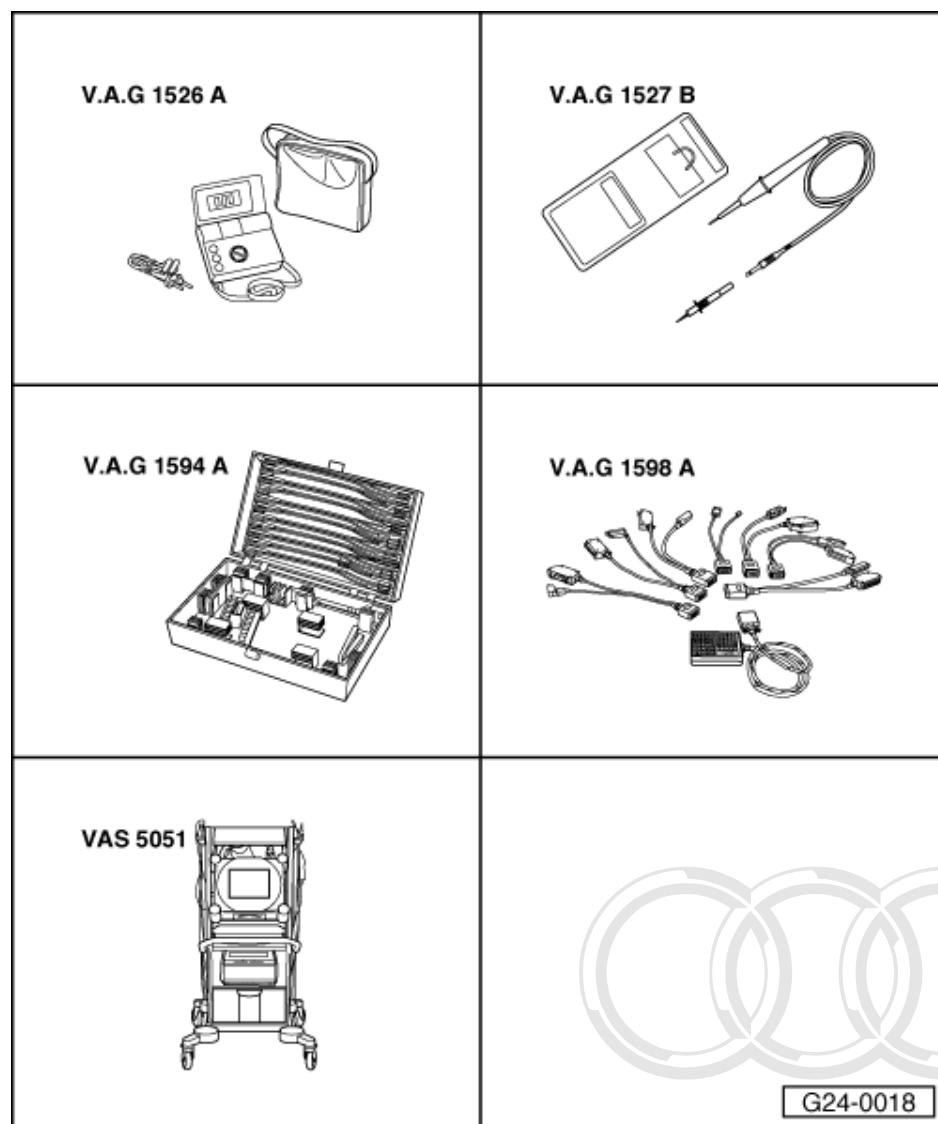
Do not move the throttle valve.

- Tighten bolts of throttle valve potentiometer in this position.
- Check adjustment => Page **101** .



5 - Checking auxiliary signals

5.1 - Checking auxiliary signals



5.2 - Testing air conditioner compressor signal and air conditioner compressor shut-off

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Special tools 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

Testing signal from air conditioner compressor

Note:

In vehicles ▶ 05.94 the pre-control value for idling speed stabilisation is increased by the signal from the air conditioner so that the idling speed stabilisation remains in the middle of the control range.

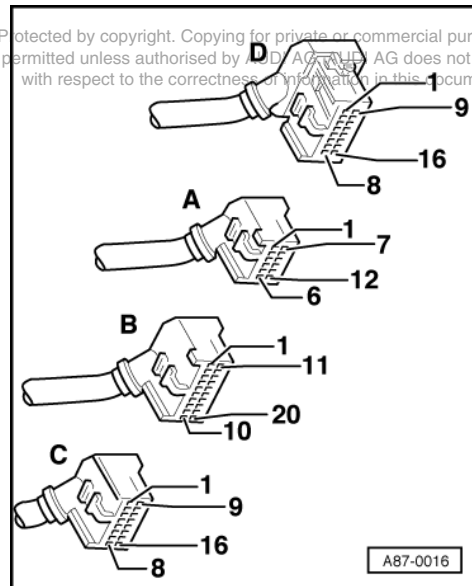
- Read measured value block, Display Group 006, engine at idling speed =>Page 29 .

-> Indicated on display:

Read measured value block 6			
1	2	3	4

- Check display in display zone 3.
- Switch on air conditioner system:
 - Manually controlled air conditioners: Press the "A/C" button.
 - Fully automatic air conditioners: Press the "AUTO" button, set the temperature to "LO" and the blower speed to "HI".
 - Value must increase by at least 16.

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 and additionally to the engine control unit => Page 47 .
- Connect voltage tester V.A.G 1527 B as follows:

Test box V.A.G 1598 A socket	Measure to
31	Engine earth

- Switch the ignition on.
- Switch on air conditioner system:
 - Manually controlled air conditioners: Press the "A/C" button.
 - Fully automatic air conditioners: Press the "AUTO" button, set the temperature to "LO" and the blower speed to "HI".
 - The LED should light up.

If the LED does not light up:

- Disconnect V.A.G 1598/11 adapter from engine control unit connection B.

If the LED then lights up:

- Replace engine control unit => Page 48 .

If LED still does not light:

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

Test box V.A.G 1598 A socket	Switch for air condi- tioner - E30 contact	Operating and display unit -E87 contact
31	=> "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; Servicing components of the manually controlled air conditioner Air conditioner Servicing components of the manually controlled air conditioner

=> Heater, Air conditioner; Repair group 87; Air conditioner; Servicing components for controlling and regulating the fully automatic air conditioner Air conditioner Servicing components for controlling and regulating the 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.

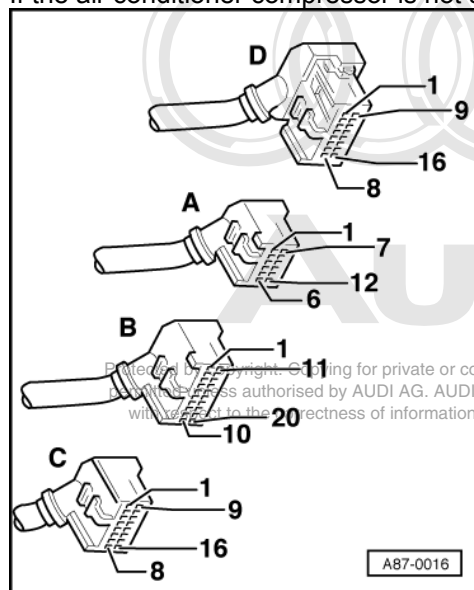
Test requirements:

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

Test sequence

- Switch on air conditioner system:
 - Manually controlled air conditioners: Press the "A/C" button.
 - Fully automatic air conditioners: Press the "AUTO" button, set the temperature to "LO" and the blower speed to "HI".
- Briefly apply full throttle - the engine must reach its maximum speed.
 - Air conditioner compressor must stop for a few seconds (visual inspection)

If the air conditioner compressor is not switched off:



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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 B only of engine control unit (control unit remains disconnected) => Page 47 .
- 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 magnetic coupling - J153 contact	Operating and display unit -E87 contact
21	=> "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; Servicing components of the manually controlled air conditioner Air conditioner Servicing components of the manually controlled air conditioner

=> Heater, Air conditioner; Repair group 87; Air conditioner; Servicing components for controlling and regulating the fully automatic air conditioner Air conditioner Servicing components for controlling and regulating the fully automatic air conditioner

If both air conditioner and wiring OK:

- Replace engine control unit => Page 48 .

5.3 - Checking engine speed signal

Notes:

- ♦ The signal is generated by the engine speed sensor -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

5.4 - Checking consumption signal for on-board computer

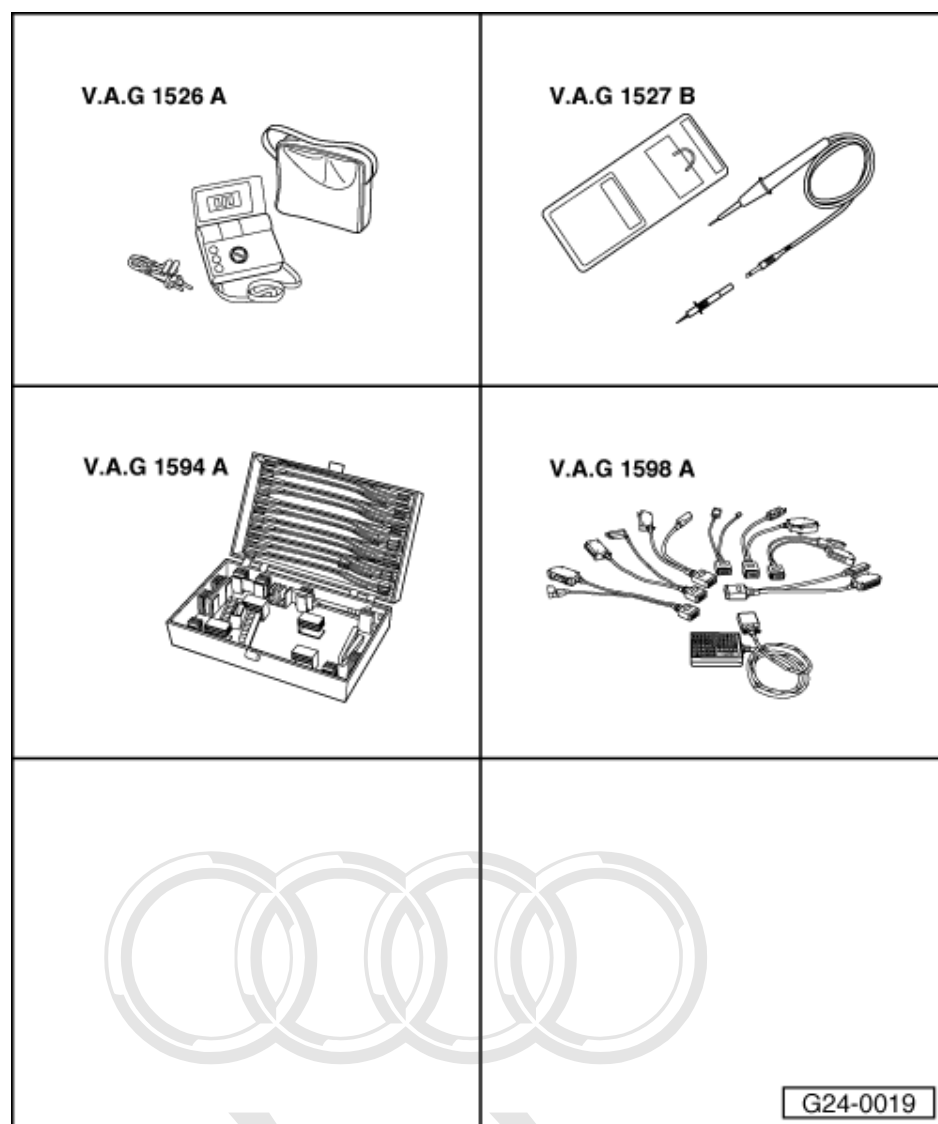
Notes:

- ♦ 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, on-board computer fault-finding



5.5 - Checking vehicle speed signal



Special tools 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

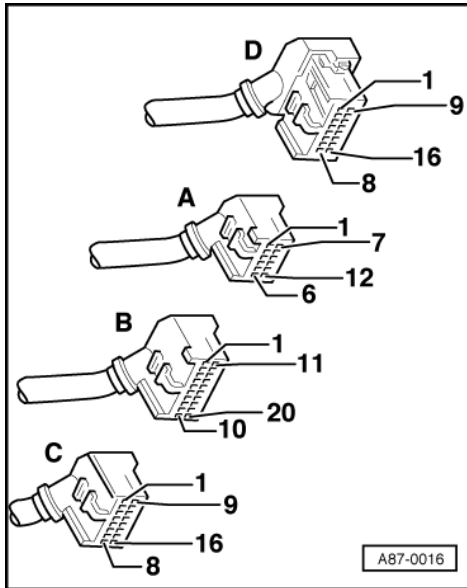
Note:

The speed signal is generated by the speedometer sensor -G22 (at the gearbox) and processed in the dash panel insert.

Test requirements:

- Speedometer function and display OK

Test sequence



- Raise vehicle using a vehicle hoist until the front left wheel is off the ground.
- -> With the ignition switched off, use adapter V.A.G 1598/11 to connect test box V.A.G 1598 A to connector B and additionally to the engine control unit => Page 47 .
- Connect voltage tester V.A.G 1527 B as follows:

Test box V.A.G 1598 A socket	Measure to
29	Battery positive

- Switch the ignition on.
 - The LED must light up dimly.
- Rotate the front left wheel.
 - The LED should flash.

If LED does not flash:

- 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:

- Disconnect V.A.G 1598/11 adapter from engine control unit connection B.

If LED now flashes:

- Replace engine control unit => Page 48 .

If LED still does not flash:

- 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.



5.6 - Checking output signal for throttle valve position



Special tools and workshop equipment required

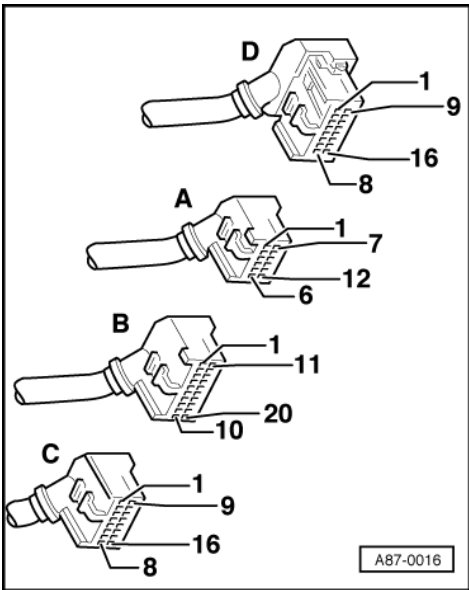
- ♦ V.A.G 1526 A
- ♦ V.A.G 1527 B
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598 A
- ♦ V.A.G 1598/11

Notes:

- ♦ 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; Interrogating fault memory 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 and also to the engine control unit => Page 47 .
- Connect voltage tester V.A.G 1527 B as follows:

Test box V.A.G 1598 A socket	Measure to
27	Engine earth

- Switch the ignition on.
 - The LED must light dimly and become brighter on pressing the accelerator pedal.

If the LED does not light up and does not become brighter:

- Check throttle valve potentiometer
=> Page 97
- If the throttle valve potentiometer is OK, replace the engine control unit => Page 48 .

If the LED lights up and becomes brighter:

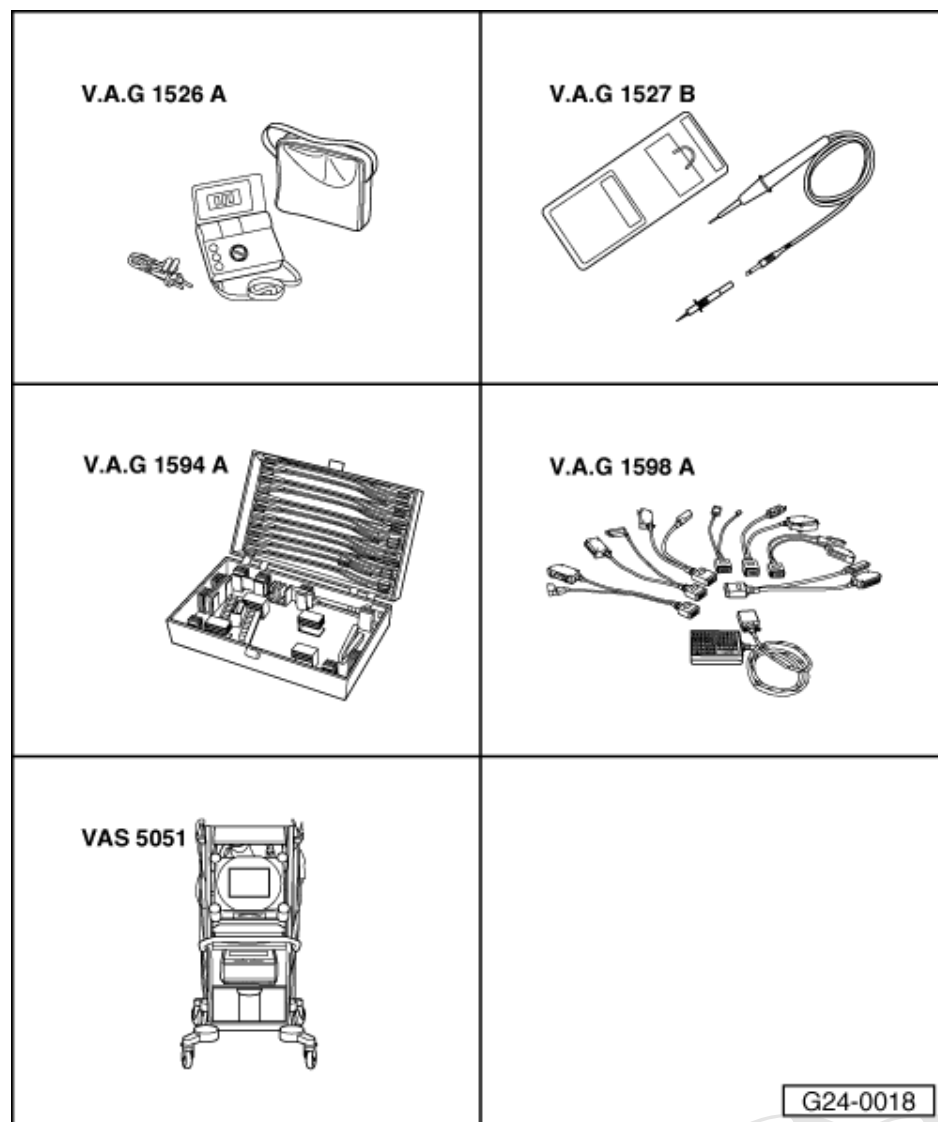
- Pull connector off automatic gearbox control unit.
- Check for open circuit and short to positive or earth in the following wiring connections:

Test box V.A.G 1598 A socket	Control unit for Automatic gearbox contact
27	=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

- If wiring is OK, establish defect in automatic gearbox control unit.



5.7 - Checking gear signal



Special tools 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. With a gear selected (selector lever set to R / D / 3 / 2 / 1), idling speed is reduced by approx. 50 rpm to reduce the tendency of the vehicle to creep.

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Test requirements:

- Control unit encoding OK => Page 20 .

Test sequence

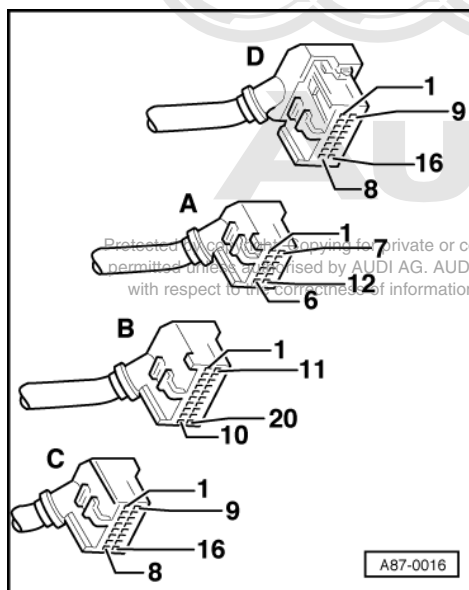
- Read measured value block, Display Group 006, engine at idling speed =>Page 29 .

-> Indicated on display:

Read measured value block 6			
1	2	3	4

- Check display in display zone 3.
- Depress the brake pedal and engage a gear.
 - Value must increase by 10.

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 and additionally to the engine control unit => Page 47 .
- Connect voltage tester V.A.G 1527 B as follows:

Test box V.A.G 1598 A socket	Measure to
23	Engine earth

- Switch the ignition on.
- Depress the brake pedal and engage a gear.
 - The LED must light up when a gear is engaged.

If the LED does not light up:

- Pull connector B off adapter V.A.G 1598/11.

If the LED still does not light up (irrespective of selector lever position):

- Replace engine control unit =>Page 48 .

If the LED then lights up:

- Check the following wiring for short to earth:



Test box V.A.G 1598 A socket	Control unit for Automatic gearbox contact
23	=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

- If wiring is OK, establish defect in multi-function switch -F125.

If the LED lights up when connector B is attached and does not go off when "P" or "N" is selected:

- Check for open circuit in the following wiring connections:

Test box V.A.G 1598 A socket	Control unit for Automatic gearbox contact
23	=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

- If wiring is OK, establish defect in multi-function switch -F125.



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5.8 - Checking ignition timing retardation on changing gear



Special tools 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

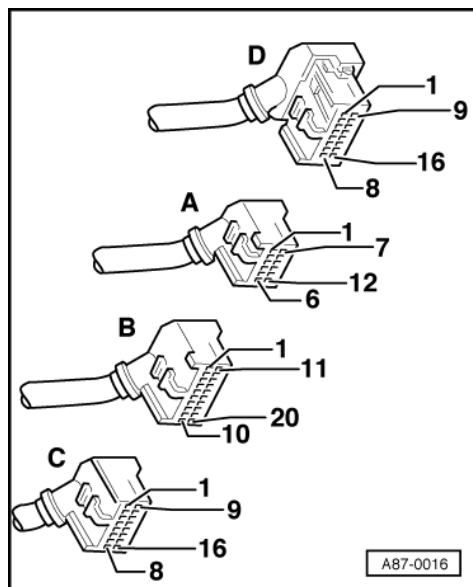
Notes:

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- ◆ Only perform the following test if fault 00545 is displayed on the V.A.G 1551.
- ◆ This signal causes the ignition timing to be briefly retarded during gearshifts to ensure a smoother gear change.

Test requirements:

- Battery voltage OK.



- -> With the ignition switched off, use adapter V.A.G 1598/11 to connect test box V.A.G 1598 A to connector B and additionally to the engine control unit => Page 47 .
- Connect voltage tester V.A.G 1527 B as follows:

Test box V.A.G 1598 A socket	Measure to
22	Engine earth

- Switch the ignition on.
 - The LED should light up.

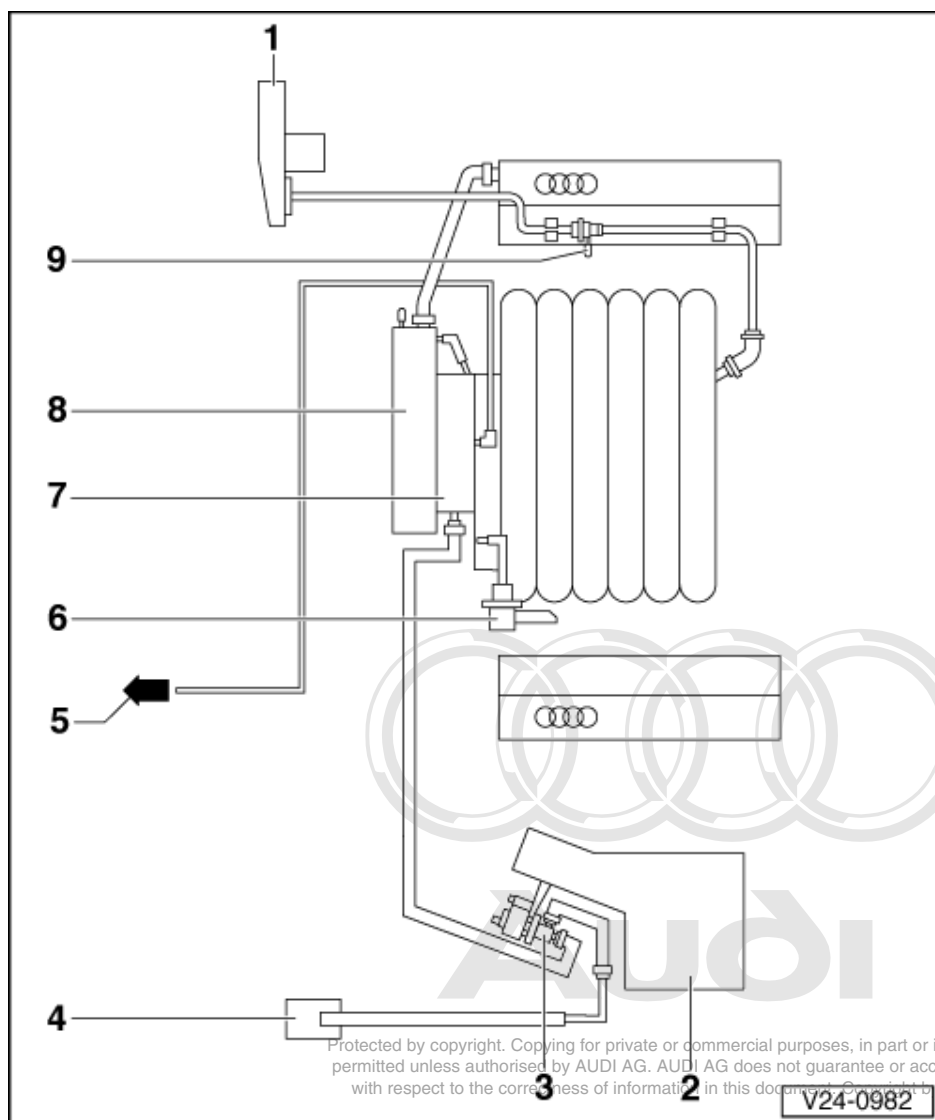
If the LED does not light up:

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

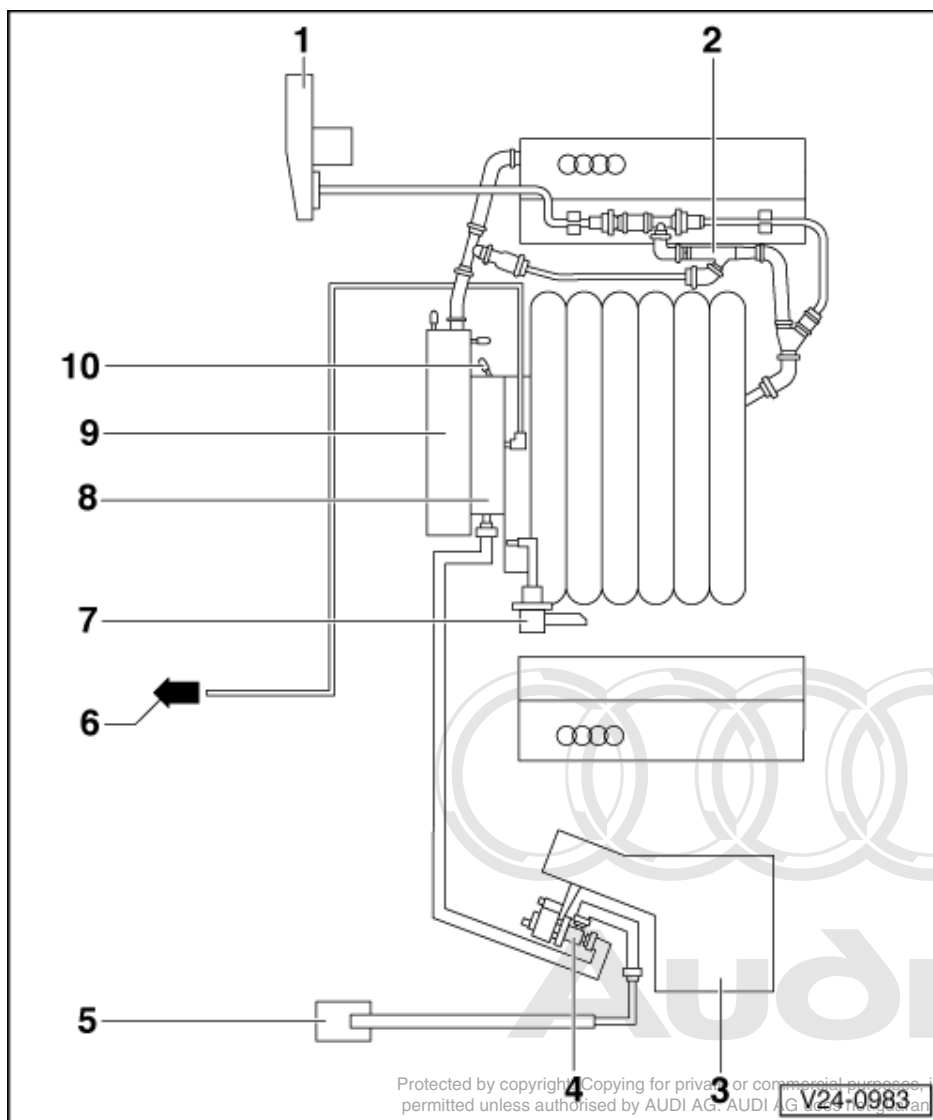
- If wiring is OK, establish defect in automatic gearbox control unit.

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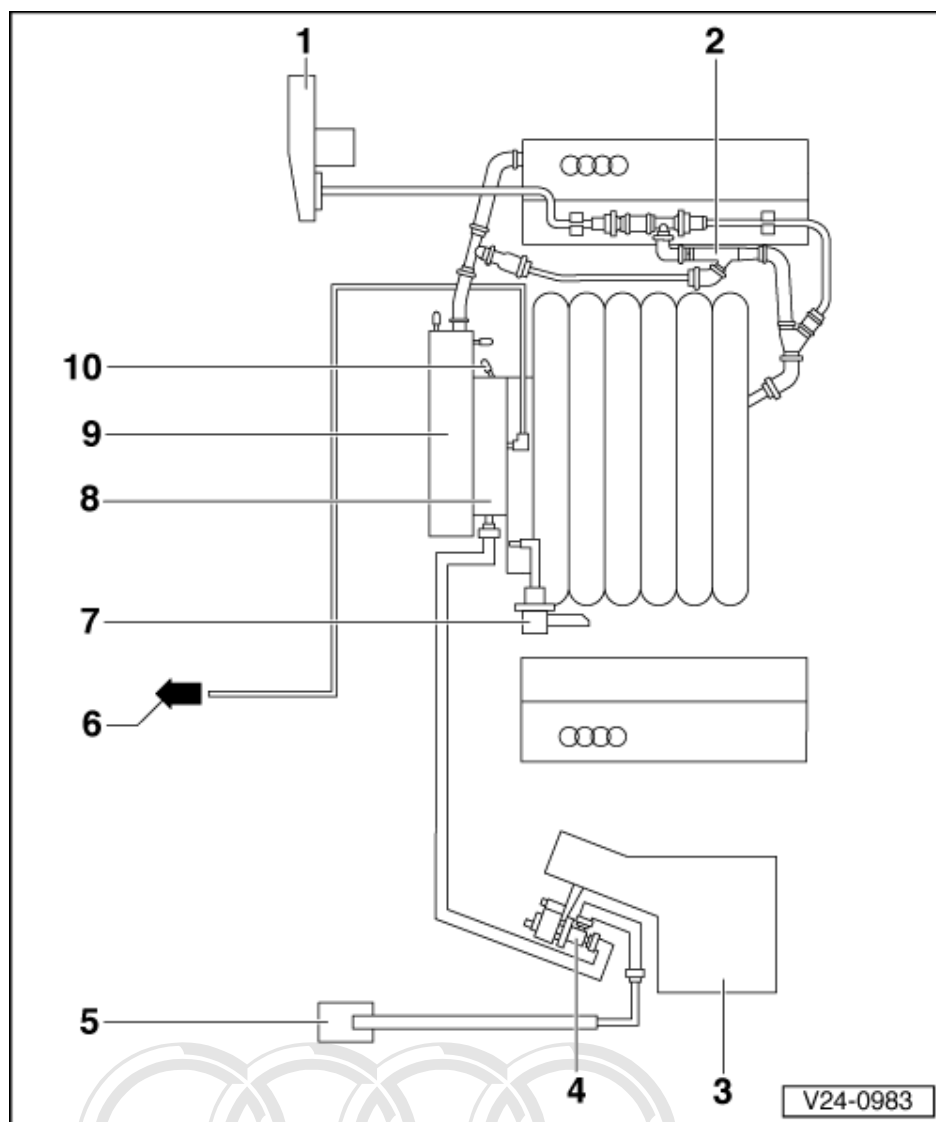
- | | |
|---|---|
| 6 | Fuel pressure regulator |
| 7 | Throttle valve unit |
| 8 | Noise insulation |
| 9 | Vacuum connection |
| | ♦ Only for vehicles with air conditioner and/or differential lock |

6.3 - Vehicles with automatic gearbox:



- 1 Brake servo
- 2 Suction jet pump
- 3 Air cleaner
- 4 Solenoid valve 1 for activated charcoal filter N80
- 5 Activated charcoal filter
- 6 Vacuum line
 - ◆ to engine control unit
 - ◆ in engine wiring harness
 - ◆ must not be shortened or lengthened
 - ◆ use same length and internal diameter when replacing:

=> Parts catalogue



- 7 Fuel pressure regulator
8 Throttle valve unit
9 Noise insulation
10 Vacuum connection
- ♦ Only for vehicles with 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	ABC (2.6 l / 2V / 110 kW-engine) 1) ACZ (2.6 l / 2V / 102 kW-engine) 2)
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 3)	Tightening torque: 30 Nm.
Firing order	1-4-3-6-2-5
Ignition coils	Secondary resistance Primary resistance
	9 ... 14 k Ω 0.5 ... 1.0 Ω

1) Engines conforming to emission standard ECE 15.04 (=> Coding control unit, Page 20) only have one Lambda sensor for bank 1.

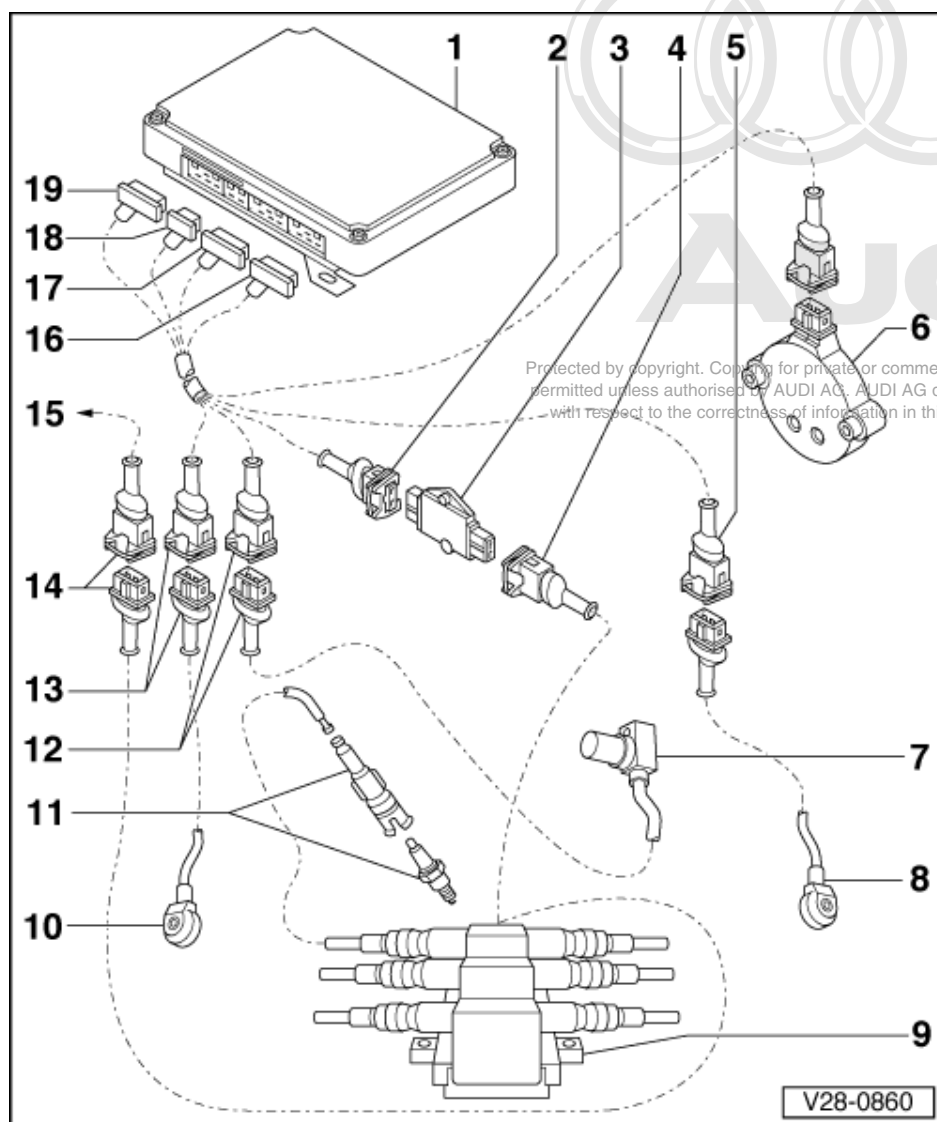
2) China, CIS: only one Lambda probe for bank 1.
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3) Current values:

=> "Exhaust emission test" binder



1.4 - Removing and installing ignition system components



1 Engine control unit -J192

- ♦ In electric box, front passenger side footwell

2 4-pin connector

- ♦ Brown
- ♦ Signal wires from engine control unit

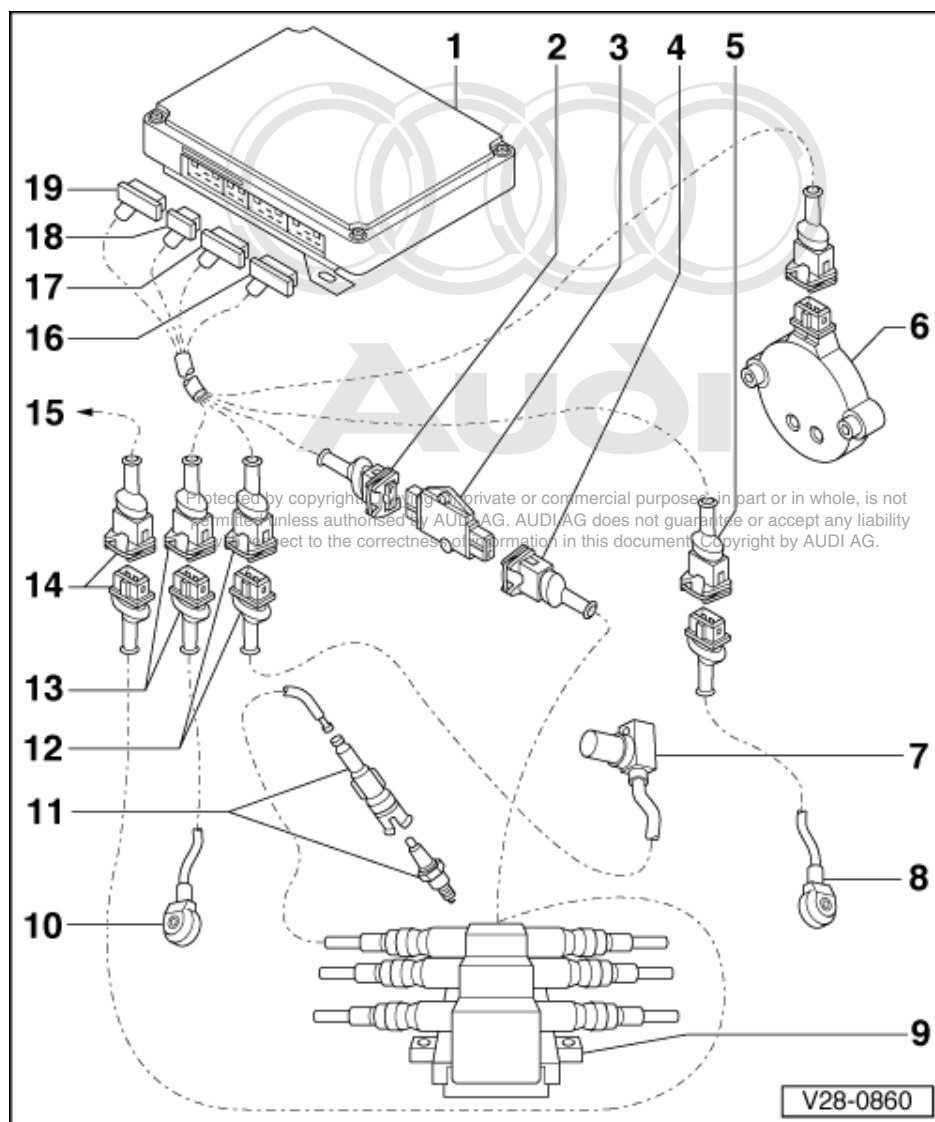
3 Output stage -N122

4 3-pin connector

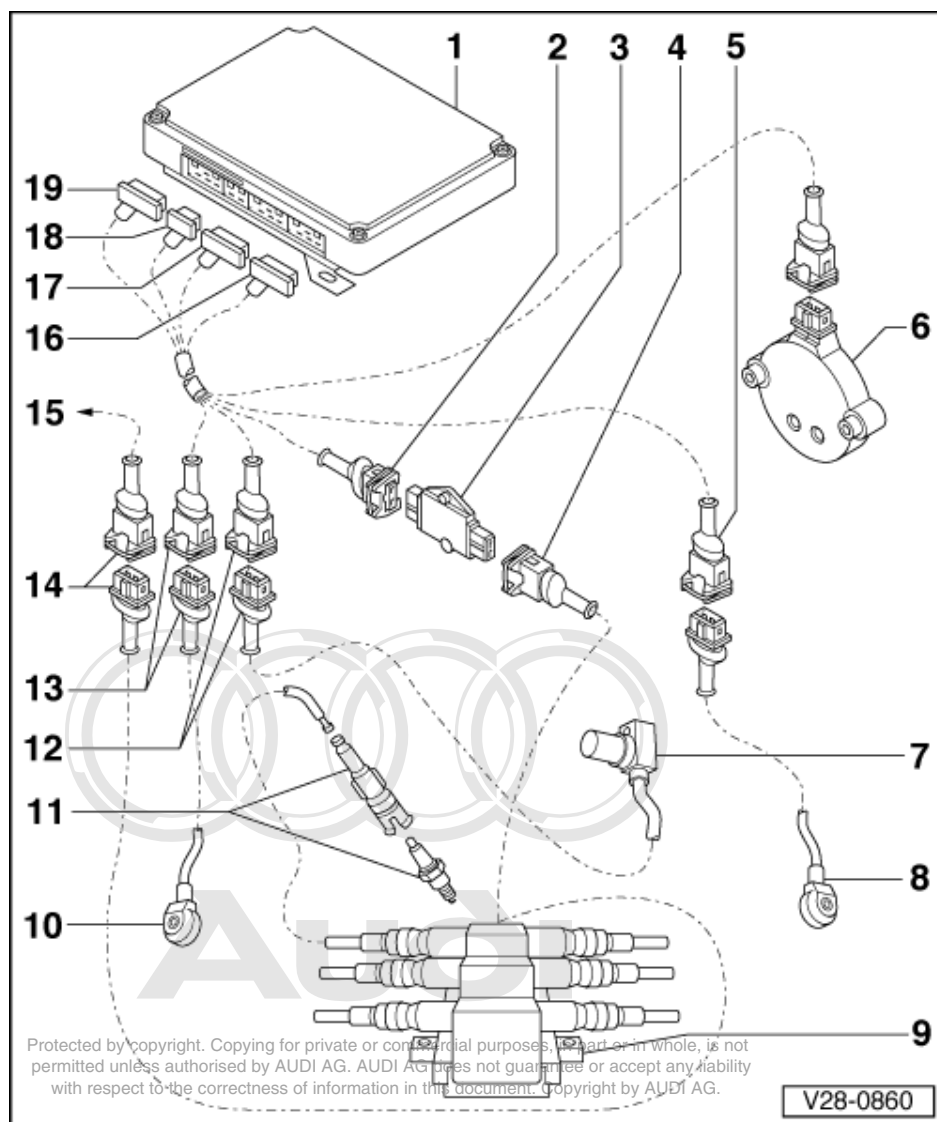
- ♦ Primary connections for ignition coils

5 3-pin connector

- ♦ Blue
- ♦ For knock sensor 2 -G66



- 6 Hall sensor G40
- 7 Ignition timing sensor -G4
 - ♦ Reference mark sensor 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 sensor -G4
- 13 3-pin connector
 - ♦ Blue
 - ♦ For knock sensor 1 -G61



14 Connector

- ♦ For ignition coils

15 to fuse

- ♦ In yellow holder in electronic box, front passenger side footwell

16 Connector C

- ♦ 16- pin, brown

17 Connector B

- ♦ 20-pin, red

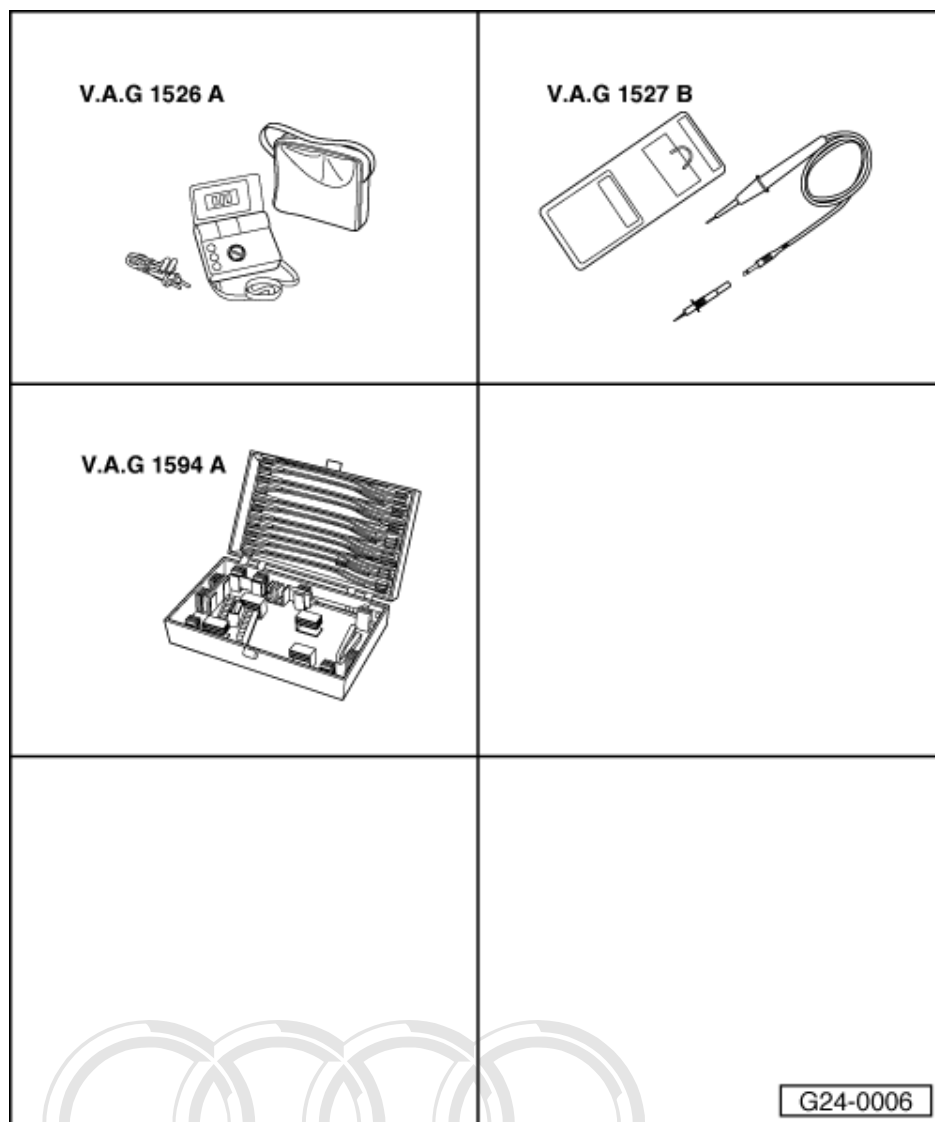
18 Connector A

- ♦ 12-pin, black

19 Connector D

- ♦ 16-pin, black

1.5 - Checking ignition coils -N, -N128, and -N158



Special tools 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 42

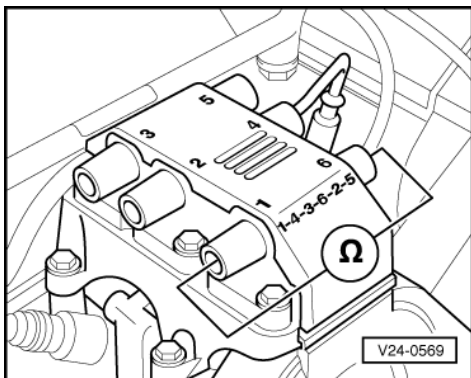
Note:

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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 the two ignition cable connections of the ignition coil to be tested in order to measure the resistance.
- Specification: 9 ... 14 Ω

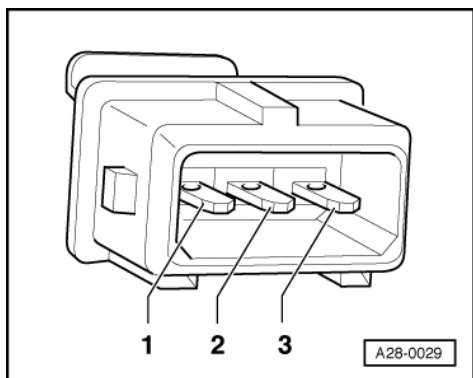
If the specification is not attained at one ignition coil:

- Replace ignition coils.

Checking primary resistance

- Pull 3-pin connector off output stage
- Check connector for loose, corroded or disengaged contacts and service if necessary.

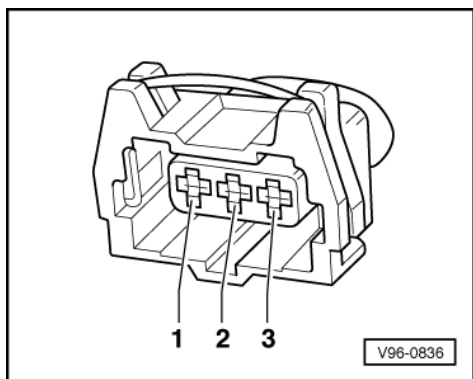
Note:



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.

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- -> Connect multimeter to each contact of output stage in turn in order to measure the resistance...



- -> ... and one contact of 3-pin connector to measure resistance.

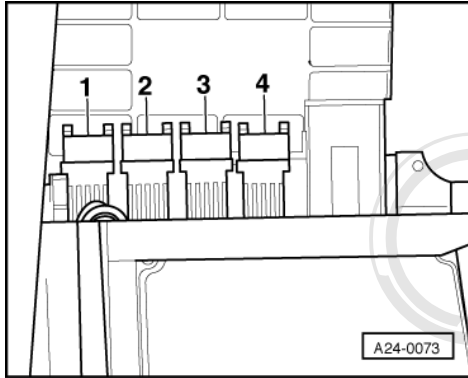
- Specification: Less than 5.0 Ω in each case

If the specification is not attained during a measurement:

- Replace ignition coils.

Checking power supply

Test requirements:

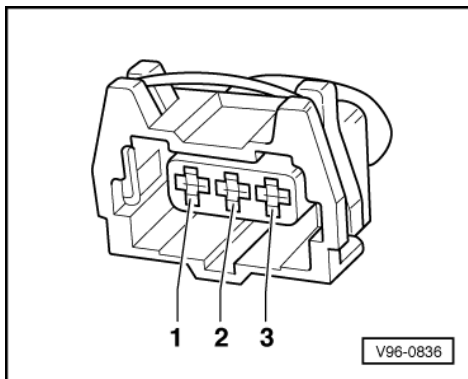


- -> Fuse OK (in brown holder -4- in the electronic box in the front passenger side footwell).

Date of manufacture	Fuse
ä 07.92	S64
08.92 ä 05.94	S103
06.94 ä	S115

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- Pull white 3-pin 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 should light up each time.

If the LED does not light up:

- Check appropriate wiring for open circuit and service if necessary.



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

1.6 - Checking output stage -N122



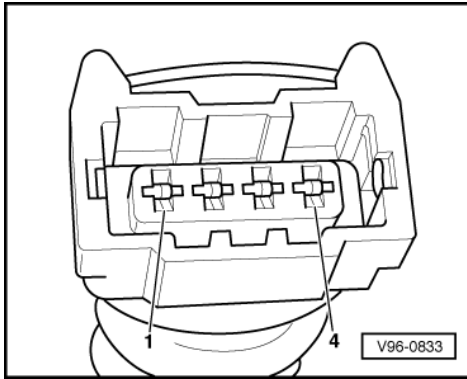
Special tools and workshop equipment required

- ♦ 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 42

Checking earth supply

- Pull 4-pin connector off output stage



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

Connector contact	Measure to
2	Battery positive

- The LED should light up.

If the LED does not light up:

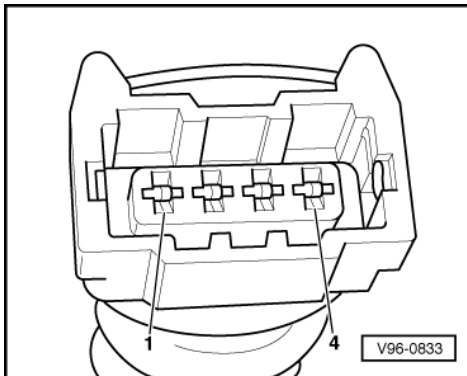
- Check wiring for open circuit and service if necessary.

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

Checking actuation

- Pull 4-pin connector off output stage
- Pull connectors off all 6 injectors. (then interrogate fault memory).

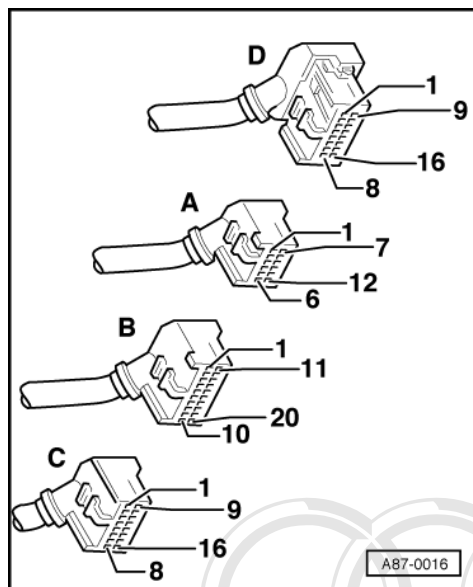
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- -> Connect voltage tester V.A.G 1527 B as follows:

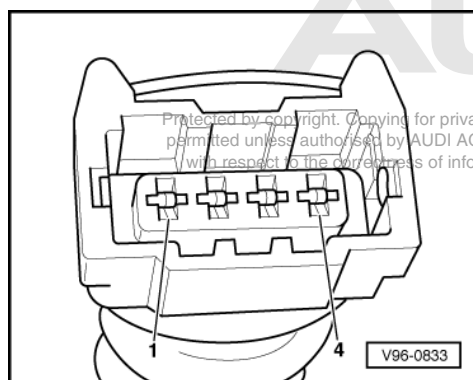
Connector contact	Measure to
1	Engine earth
3	Engine earth
4	Engine earth

- Operate starter briefly.
 - The LED should 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.



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 A only of engine control unit (control unit remains disconnected) => Page 47 .



- -> 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	43
3	42
4	41

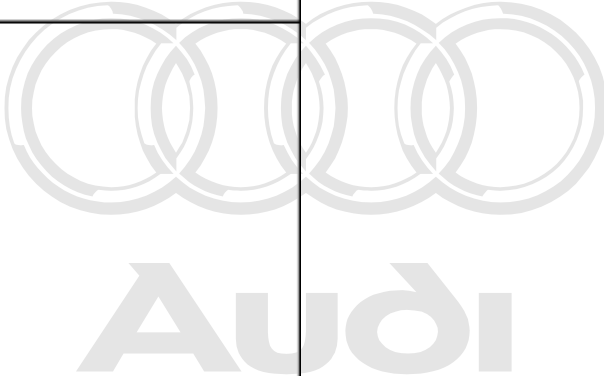
- Rectify any open/short circuit as necessary.

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

If no fault is found:

- Replace engine control unit => Page 48 .

1.7 - Checking ignition timing sensor -G4

V.A.G 1526 A 	V.A.G 1594 A 
V.A.G 1598 A 	
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Special tools and workshop equipment required

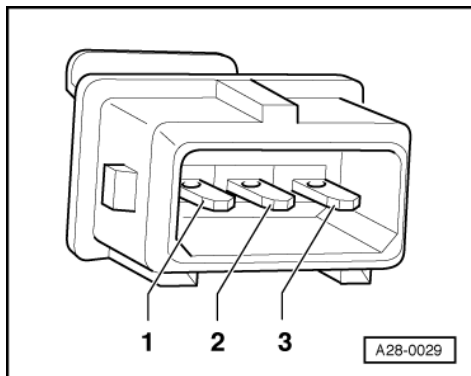
- ◆ V.A.G 1526 A
- ◆ V.A.G 1594 A
- ◆ V.A.G 1598 A
- ◆ V.A.G 1598/11

Installation position => Installation position overview - Page **42**

- Before carrying out the test, make sure that the sensor is correctly installed and firmly seated.

Checking internal resistance

- Pull black 3-pin connector off ignition timing sensor



- -> Connect multimeter between contacts 1 and 2 of sensor in order to measure resistance.
- Specification: approx. 1 k Ω

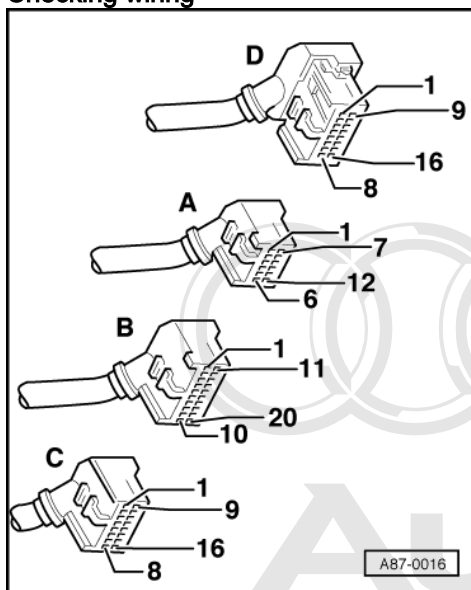
If the specification is not obtained:

- Replace ignition timing sensor.
- Connect multimeter between contacts 1 and 3 and 2 and 3 on sensor to measure resistance.
- Specification: $\infty \Omega$ (no continuity)

If the specified values are not obtained:

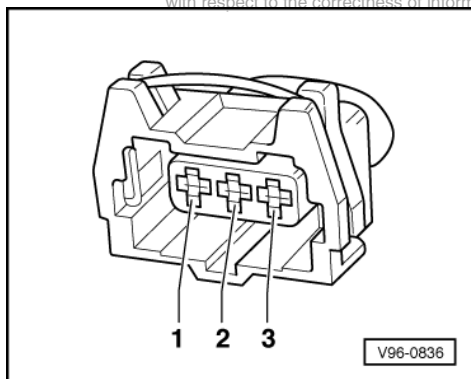
- Replace ignition timing sensor.

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 B only of engine control unit (control unit remains disconnected) => Page 47 .

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- -> 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 (earth)	35
2 (signal)	39
3 (screening)	34

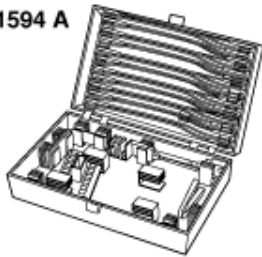
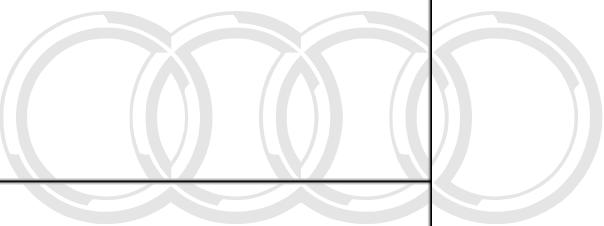
- Rectify any open/short circuit as necessary.

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

If no fault is found:

- Replace engine control unit => Page 48 .

1.8 - Checking engine speed sensor -G28

V.A.G 1526 A 	V.A.G 1594 A 
V.A.G 1598 A 	
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Special tools and workshop equipment required



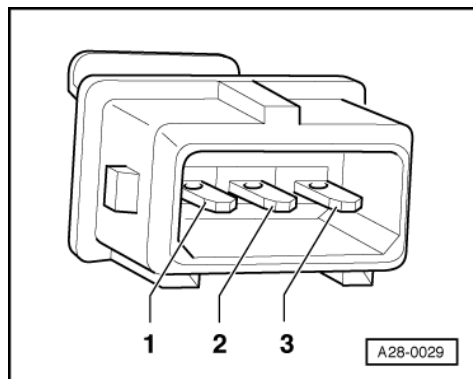
- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598 A
- ♦ V.A.G 1598/11

Installation position => Installation position overview - Page 42

- Before carrying out the test, make sure that the sensor is correctly installed and firmly seated.

Checking internal resistance

- Pull grey 3-pin connector off engine speed sensor



- -> Connect multimeter between contacts 1 and 2 of sensor in order to measure resistance.
 - Specification: approx. 1 k Ω

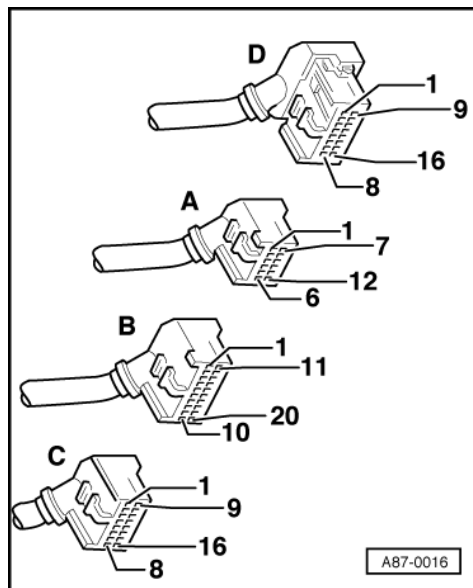
If the specification is not obtained:

- Fit a new engine speed sensor.
- Connect multimeter between contacts 1 and 3 and 2 and 3 on sensor to measure resistance.
 - Specification: $\infty \Omega$ (no continuity)

If the specified values are not obtained:

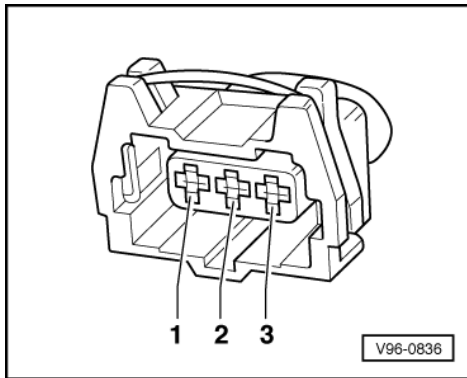
- Fit a new engine speed sensor.

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 B only of engine control unit (control unit remains disconnected) => Page 47.

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- -> 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 (earth)	38
2 (signal)	37
3 (screening)	36

- 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

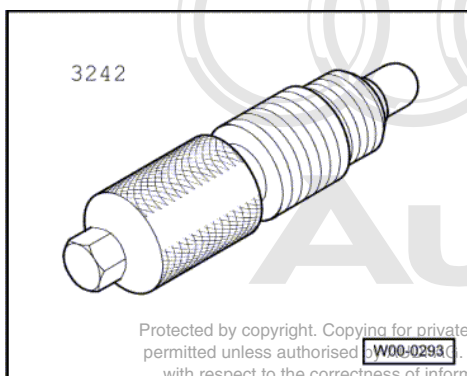
If no fault is found:

- Replace engine control unit => Page 48 .

Adjusting holder for engine speed sensor

Notes:

- ♦ The holder for the engine speed sensor can be moved in slots. The position is set at the factory and must not be altered.

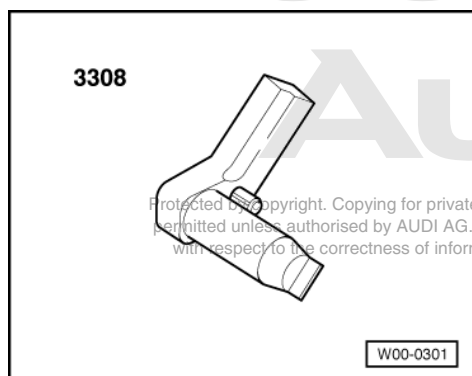


- ♦ If the bolts have been accidentally slackened off and the holder moved, carry out the adjustment as follows:



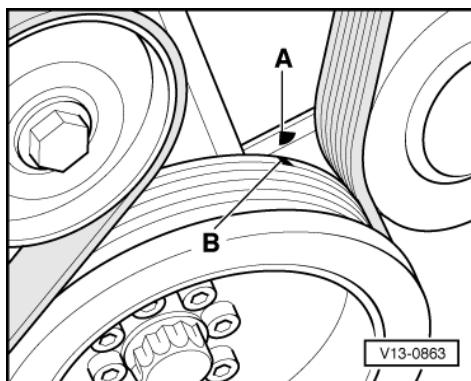
Special tools and workshop equipment required

- ♦ Special tool 3242



- ♦ Special tool 3308

Work sequence



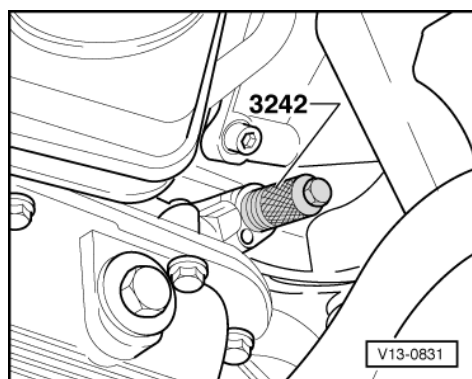
- -> Move crankshaft in direction of engine rotation to cylinder no.1 TDC mark (notch -B- aligned with mark - A-)
- Unscrew ignition timing sensor -G4 from the cylinder block on the left.

Note:

TDC hole is located exactly behind the sensor in the crankshaft (can be felt).

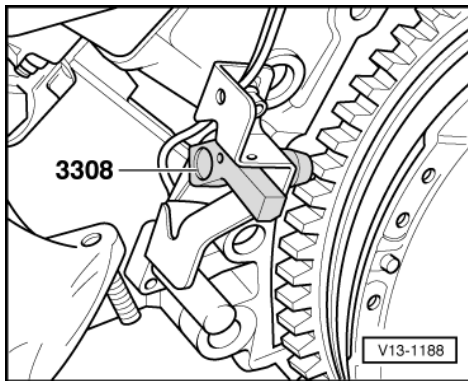
Warning

Do not rotate the crankshaft whilst feeling for the TDC hole with your finger - risk of injury.



- -> crew crankshaft securing bolt 3242 into hole where sensor has been removed, and tighten.
- Unscrew heat shield over engine speed sensor.

- Remove engine speed sensor and unfasten holder.



- -> Insert special tool 3308 in place of sensor, so that it engages in ring gear.
- Screw on holder.

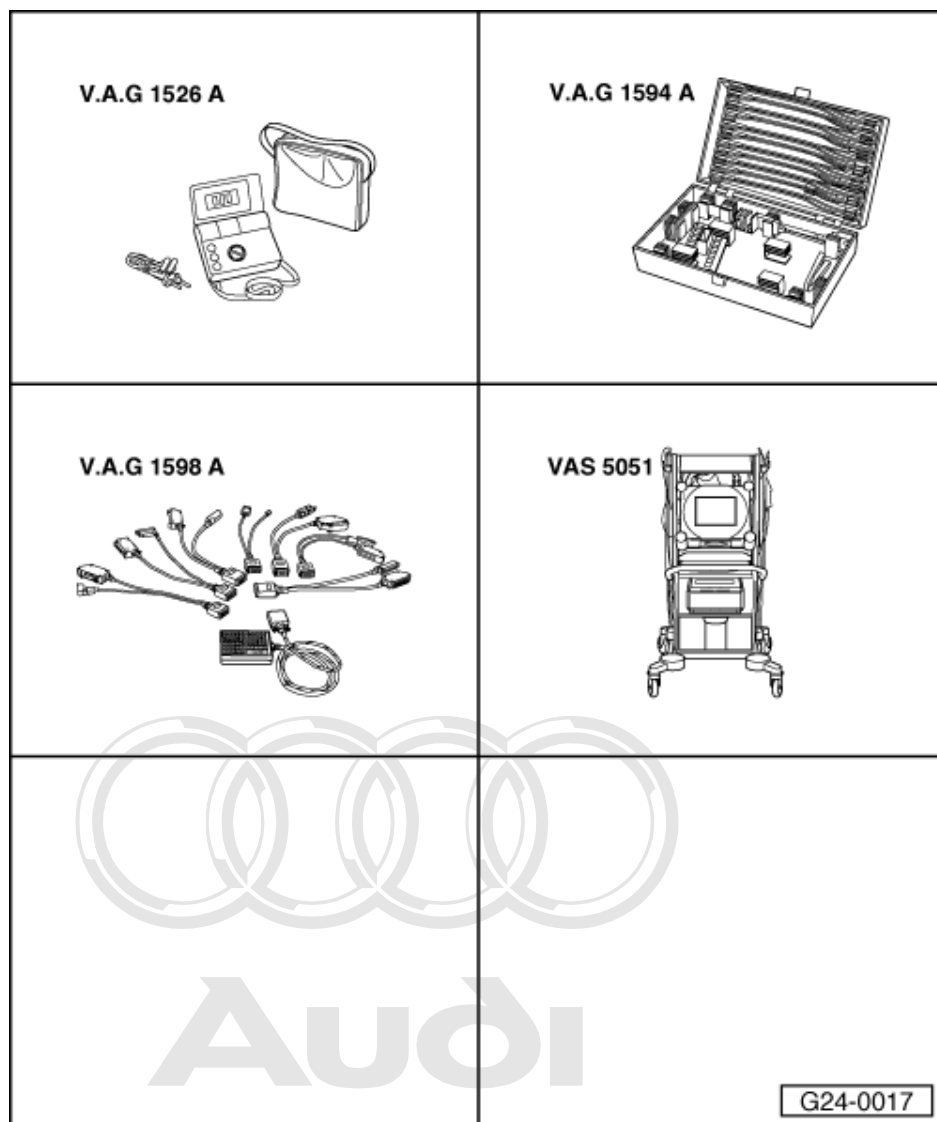
The remaining installation steps are carried out in the reverse sequence:



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1.9 - Checking intake air temperature sensor -G42



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Special tools and workshop equipment required

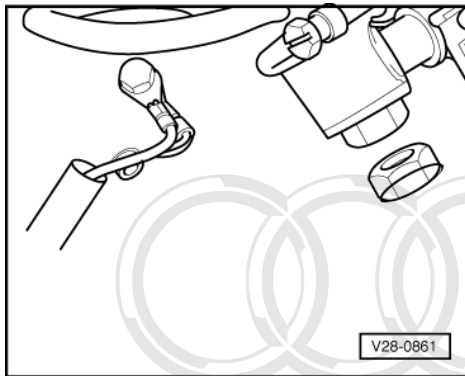
- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598 A
- ♦ V.A.G 1598/11
- ♦ VAS 5051 with VAS 5051/1 and VAS 5051/2

or

- ♦ V.A.G 1551 with V.A.G 1551/1
- ♦ Chilling spray (commercially available)

Installation position => Installation position overview - Page 42

Note:



1 ←

After the ignition has been switched off the engine control unit goes into a self-maintaining phase for 150 minutes. If a repair is carried out on the sensor during this time, a fault may be stored in the fault memory.

- -> Remove the intake air temperature sensor arrow and re-attach the connector to the sensor.

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Read measured value block 2

1 2 3 4

- > Read measured value block, display group 002 => Page 25 .
- Check display in display zone 4.
- Spray the intake air temperature sensor.
- G42 with chilling spray.
- Specification: The temperature value must drop

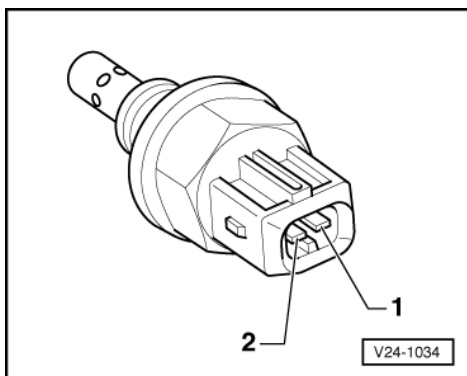
Note:

If the air intake temperature sensor is defective, a certain substitute value is displayed by the engine control unit.

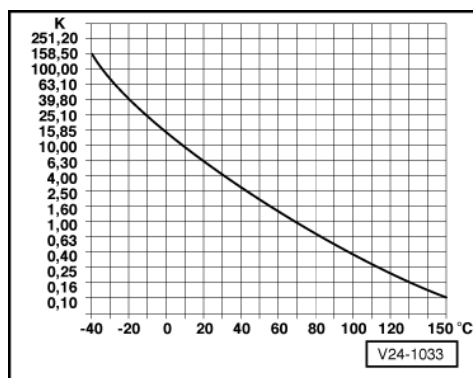
If the value displayed in display zone 4 does not change:

Checking internal resistance

- Remove the connector from the intake air temperature sensor.



- -> Connect multimeter between contacts 1 and 2 to measure resistance.

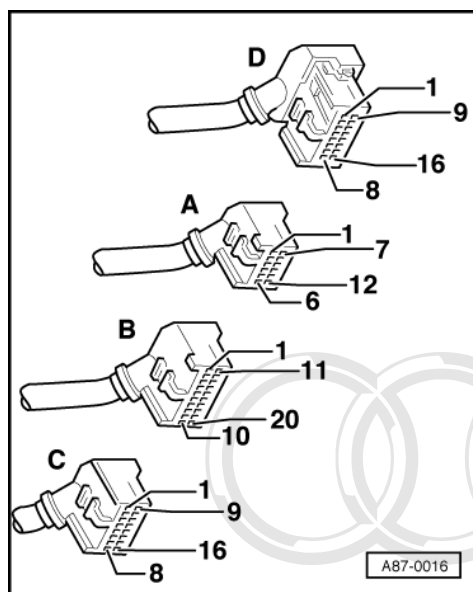


-> Readout examples:

- ♦ 0 °C corresponds to a resistance of approx. 15.85 ω
- ♦ 20 °C corresponds to a resistance of approx. 6.3 ω

If the specified values are not obtained:

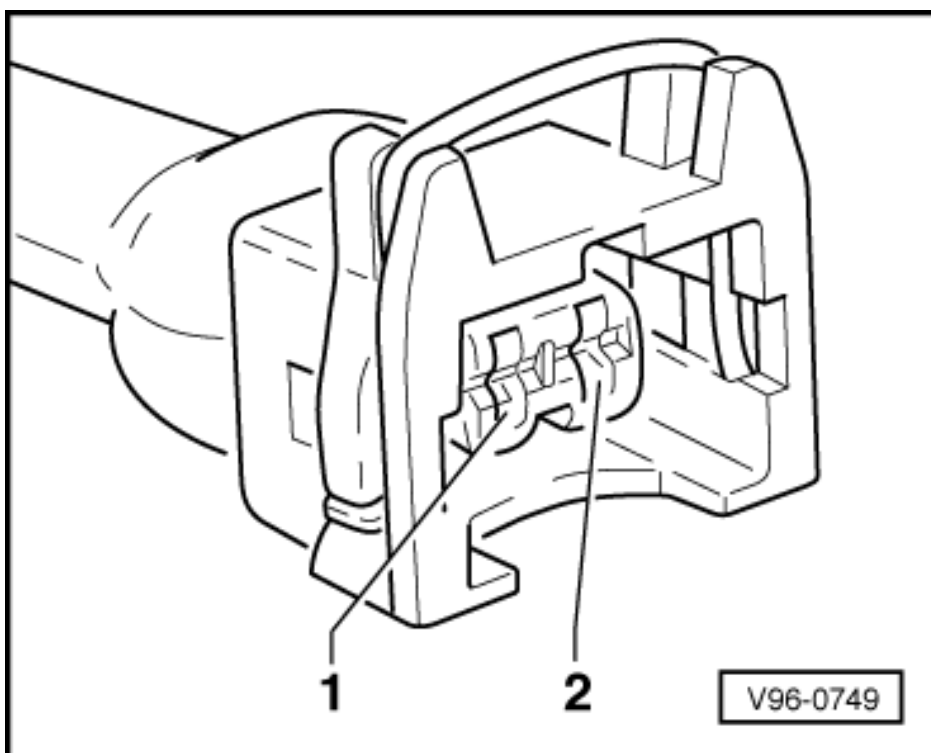
- Replace intake air temperature sensor.



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 47 .

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- -> 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	1
2	9

- Rectify any open/short circuit as necessary.

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

If no fault is found:

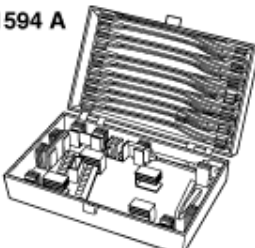
- Replace engine control unit => Page 48 .



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1.10 - Checking coolant temperature sensor -G62

V.A.G 1526 A 	V.A.G 1594 A 
V.A.G 1598 A 	
	G24-0015

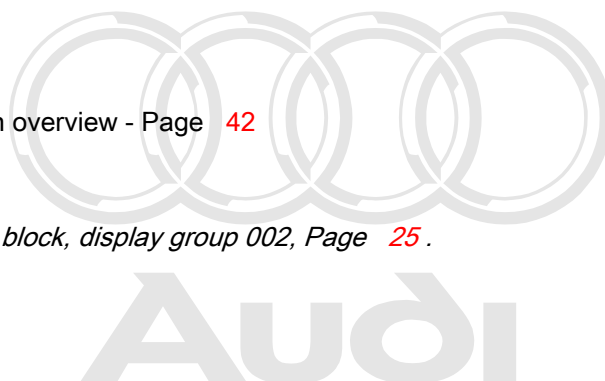
Special tools and workshop equipment required

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

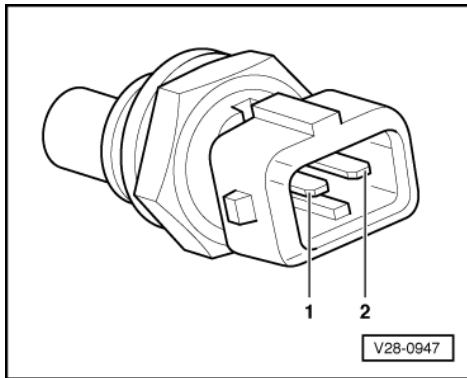
Installation position => Installation position overview - Page **42**

Note:

Function test=> Reading measured value block, display group 002, Page **25**.



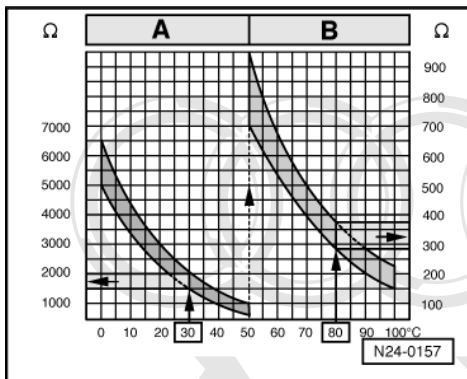
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Checking internal resistance

- Unplug connector on coolant temperature sensor.
- ➔ Connect multimeter between contacts 1 and 2 of sensor in order 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.

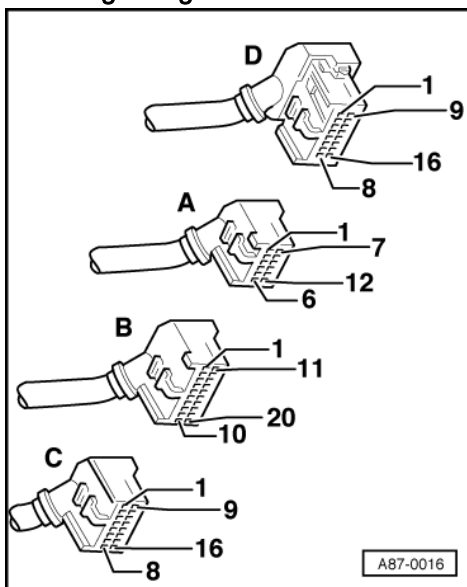


➔ Readout examples:

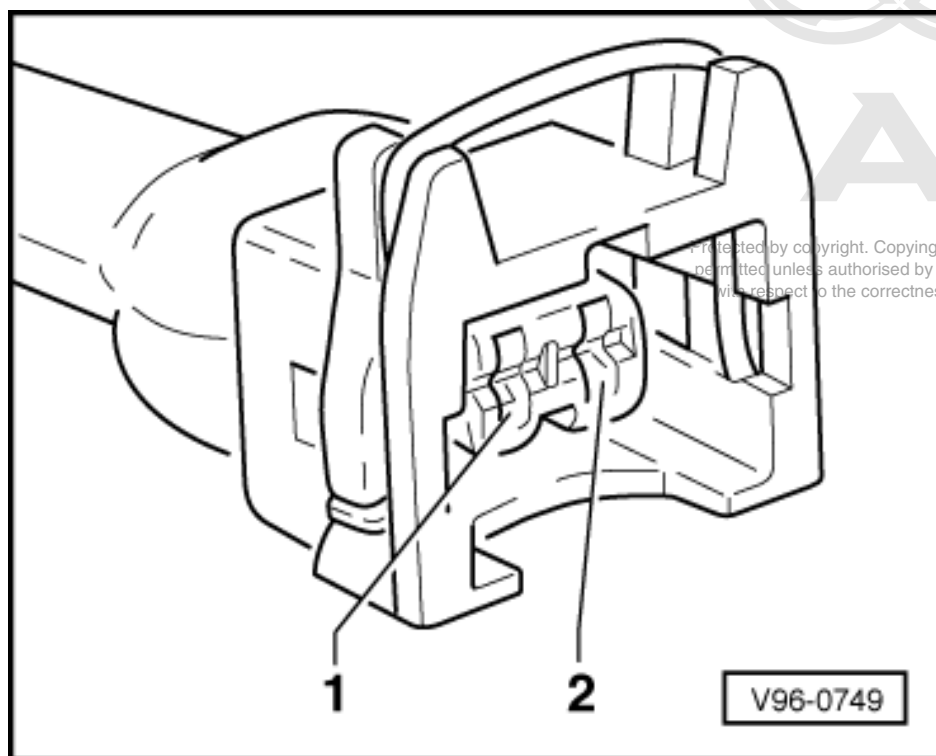
- ◆ 30 °C corresponds to a resistance of 1500...2000 Ω
- ◆ 80 °C corresponds to a resistance of 275...375 Ω

If the specified values are not obtained:
- Replace coolant temperature sensor.

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 A only of engine control unit (control unit remains disconnected) => Page 47 .



- -> 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	46
2	52

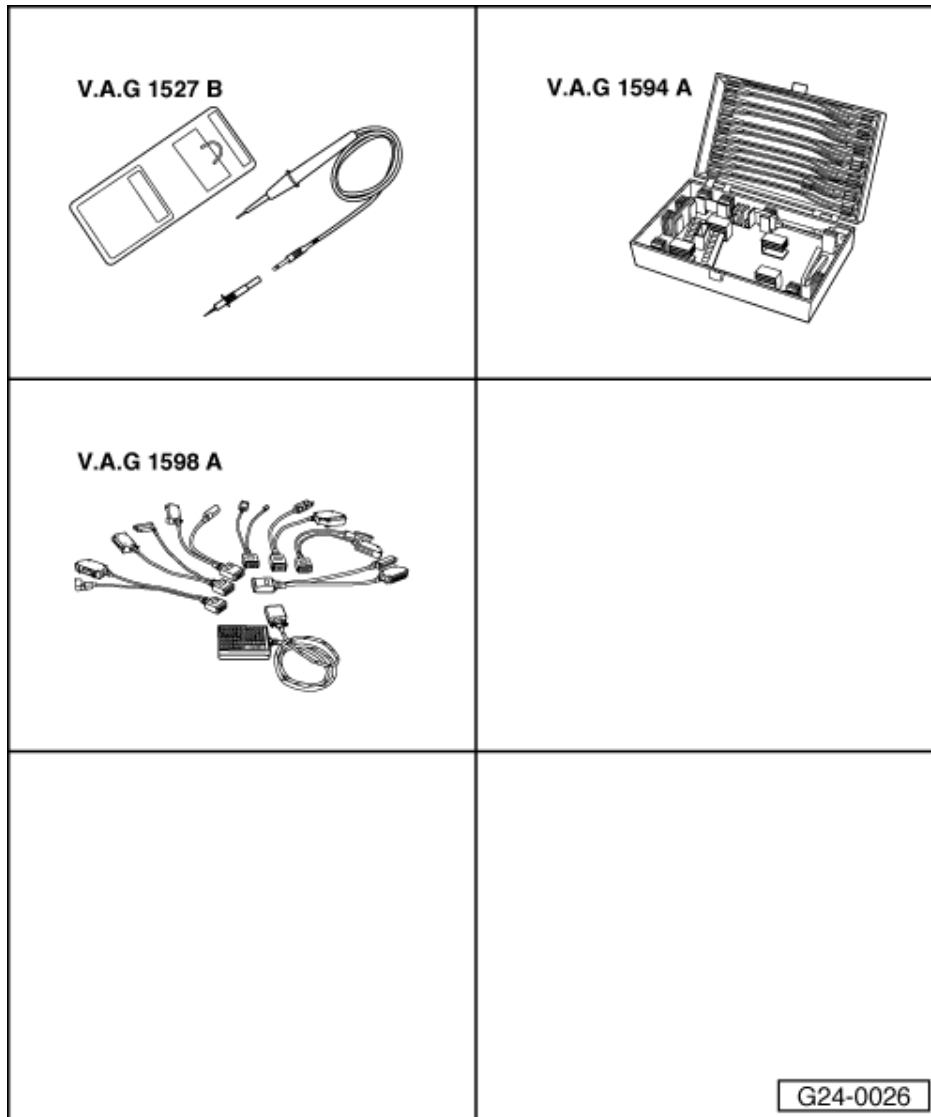
- Rectify any open/short circuit as necessary.

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

If no fault is found:

- Replace engine control unit => Page 48 .

1.11 - Checking control unit power supply



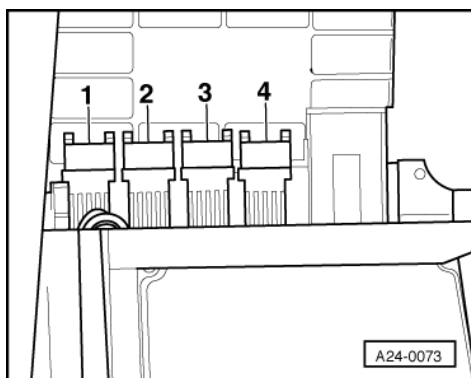
Special tools and workshop equipment required

- ◆ 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 42

Audi

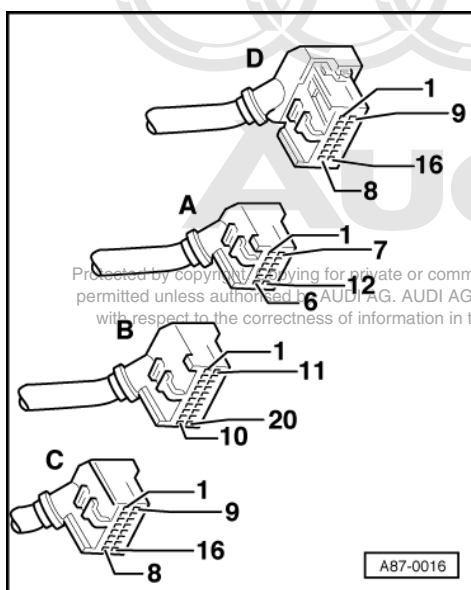
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**Test requirements:**

- -> fuse OK (in brown holder -4- in the electronic box in the front passenger side footwell).

Date of manufacture	Fuse
ä 07.92	S64
08.92 ä 05.94	S103
06.94 ä	S115

- Battery voltage at least 11 V
- Alternator OK

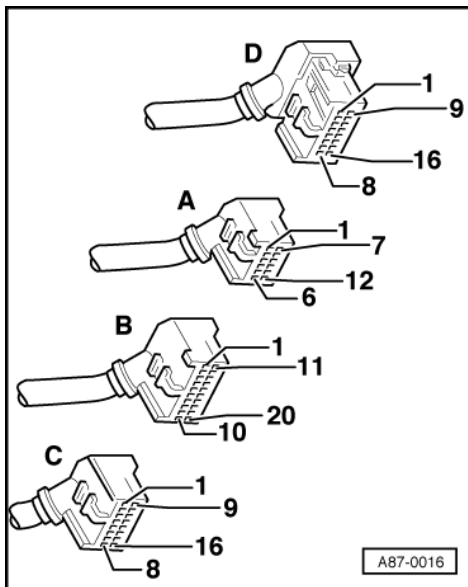
Test sequence

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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 D only of engine control unit (control unit remains disconnected) => Page 47 .
- Connect voltage tester V.A.G 1527 B as follows:

Test box V.A.G 1598 A socket	Measure to
5 (permanent positive)	Engine earth
1 (earth)	Battery positive
9 (earth)	Battery positive

- The LED should light up each time.



- -> With the ignition switched off, use adapter V.A.G 1598/11 to connect test box V.A.G 1598 A to connector A only of engine control unit (control unit remains disconnected) => Page 47 .

Test box V.A.G 1598 A socket	Measure to
51 (earth)	Battery positive

If the LED does not light up:

- 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 1598/12 to connect test box V.A.G 1598 A to connector D only of engine control unit (control unit remains disconnected) => Page 47 .
- Connect voltage tester V.A.G 1527 B as follows:

Test box V.A.G 1598 A socket	Measure to
4 (positive via ignition)	Engine earth

- Switch the ignition on.
 - The LED should light up.

If the LED does not light up:

- Rectify any open/short circuit as necessary.

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

1.12 - Checking knock sensors

V.A.G 1526 A 	V.A.G 1594 A 
V.A.G 1598 A 	
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Special tools and workshop equipment required

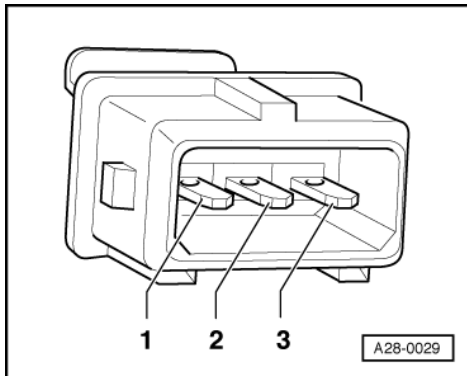
- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598 A
- ♦ V.A.G 1598/11

Installation position => Installation position overview - Page **42**

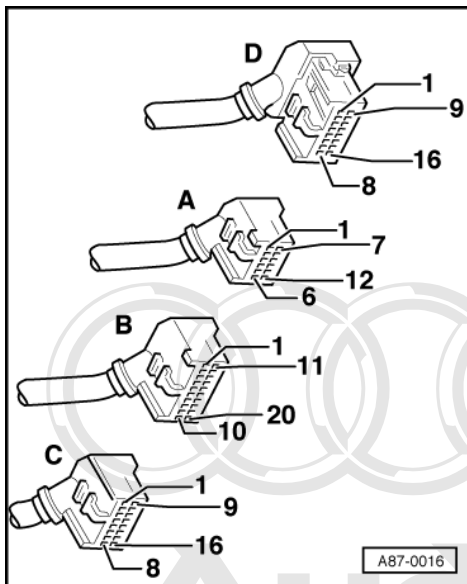
Notes:

- ♦ It is not possible to carry out an electrical test of the knock sensors themselves (interrogating fault memory => Page **4**)
- ♦ 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



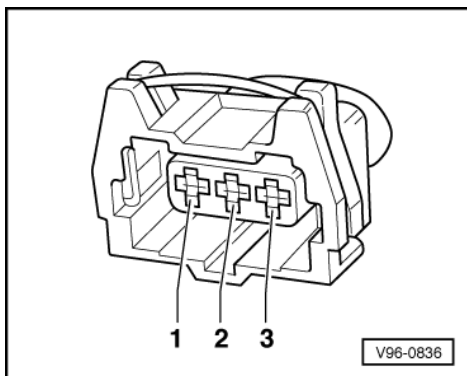
- Unplug the connector for the relevant knock sensor in the engine compartment.
- -> Test all three contacts in the knock sensor connector for short circuits. There must be no connection between any of the wires.
- If there is a connection between the contacts, fit a new knock sensor.



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 C only of engine control unit (control unit remains disconnected) => Page 47.

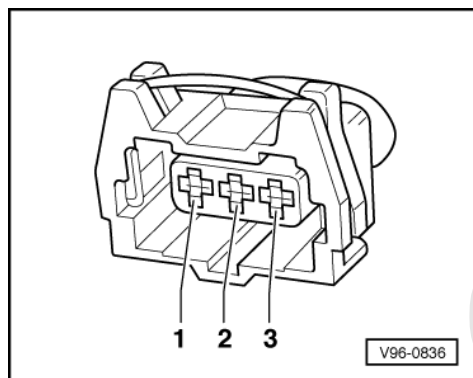
- Check for open circuit and short to earth/positive or earth in the following wiring connections:





- -> Knock sensor 1

Connector -G61 contact	Test box V.A.G 1598 A socket
1 (signal)	7
2 (earth)	14
3 (screening)	13



- -> Knock sensor 2

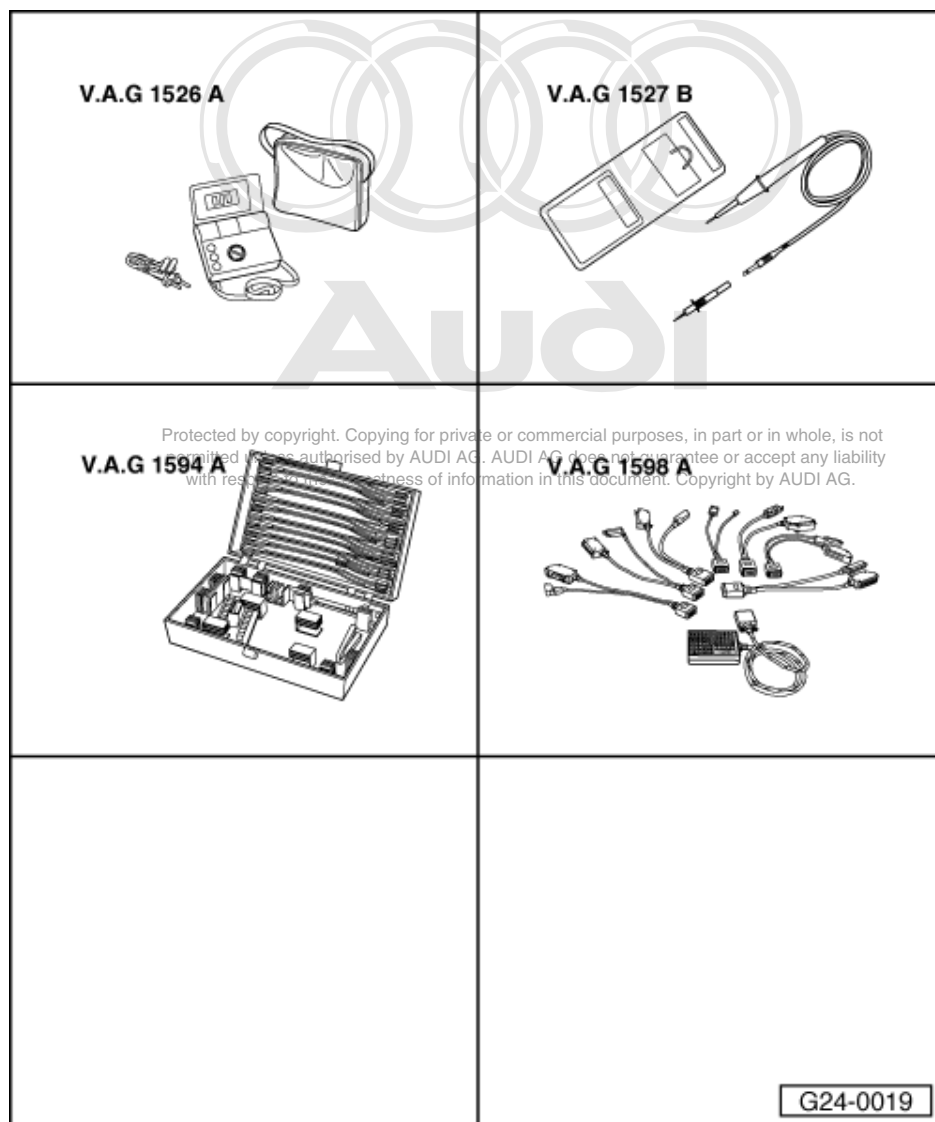
Connector -G66 contact	Test box V.A.G 1598 A socket
1 (signal)	8
2 (earth)	16
3 (screening)	15

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- Rectify any open/short circuit as necessary

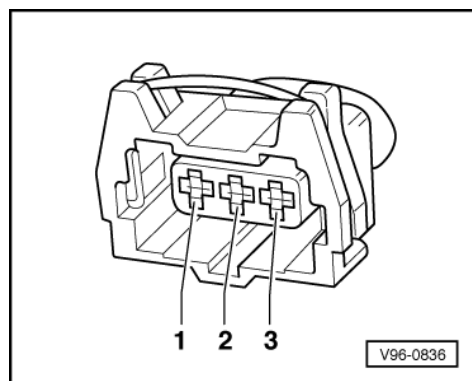
=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

1.13 - Checking Hall sensor -G40



Special tools 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



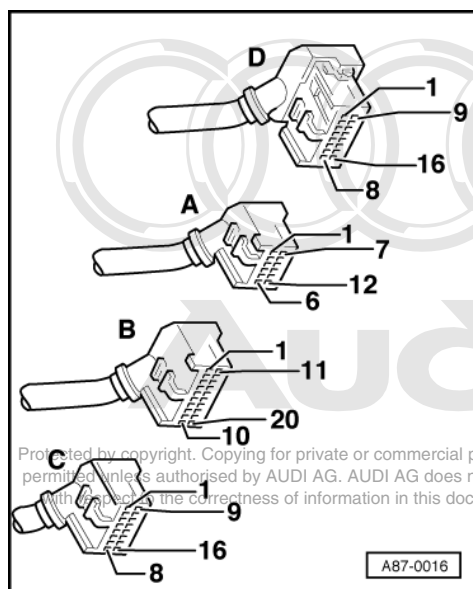


Installation position => Installation position overview - Page 42

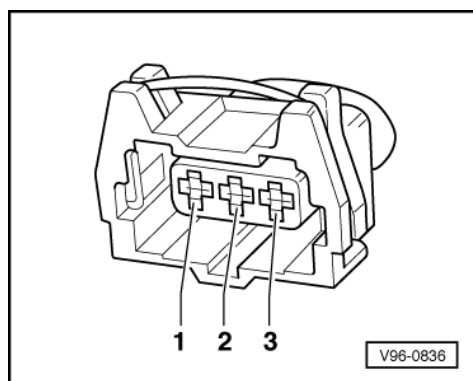
Checking power supply

- Pull connector off Hall sensor.
- -> 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:



- -> With the ignition switched off, use adapter V.A.G 1598/11 to connect test box V.A.G 1598 A to connector A only of engine control unit (control unit remains disconnected) => Page 47 .



- -> Check the following wires for open circuit and short to positive or earth (or short circuit to each other):

Connector contact	Test box V.A.G 1598 A socket
1 (positive)	44
3 (earth)	50

- Rectify any open/short circuit as necessary.

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

- If the wiring is OK, replace with engine control unit => Page 48 .

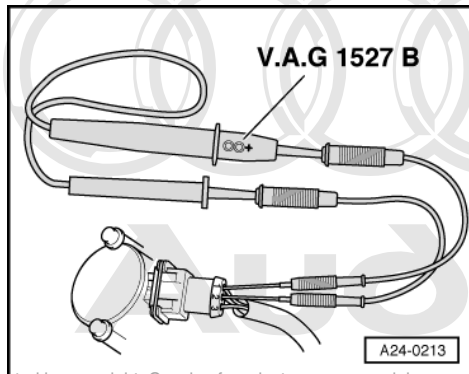
check function

Note:

To check the operation of the Hall sensor, unplug the 4-pin connector from the output stage and interrogate fault memory after performing functional check.

Test requirements:

- Power supply of Hall sensor OK; checking => Page 152 .



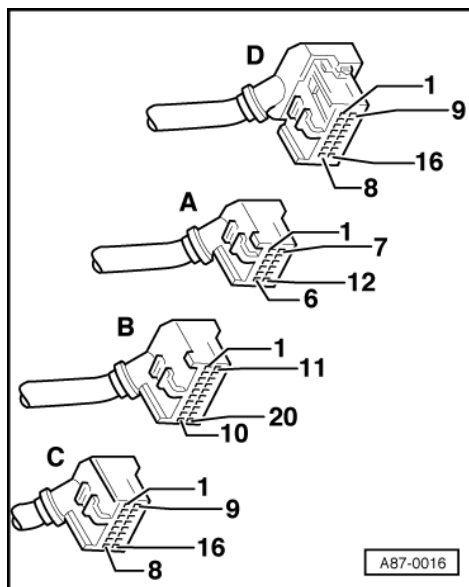
Slide back rubber grommets on connector for Hall sensor but leave connector plugged in.

-> Connect voltage tester V.A.G 1527 B between receptacle 2 (Hall sensor signal) and receptacle 1 (positive).

Note:

Receptacles are numbered accordingly on the back of the connector.

- Operate the starter for a few seconds.

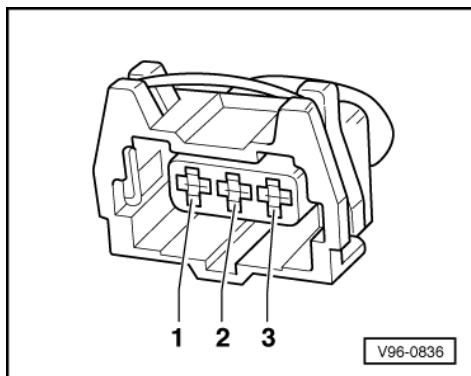


- The LED should flash briefly every second engine revolution.

If LED does not flash:

- Switch off ignition.
- Pull connector off Hall sensor.

- -> With the ignition switched off, use adapter V.A.G 1598/11 to connect test box V.A.G 1598 A to connector A only of engine control unit (control unit remains disconnected) => Page **47**.



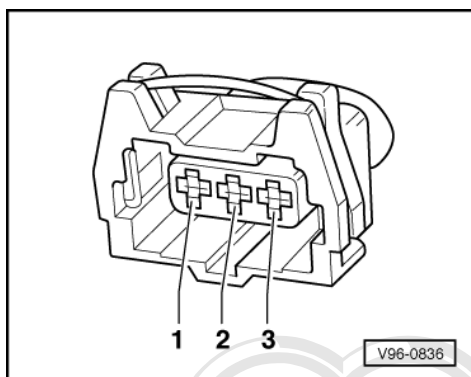
- -> Check for open circuit and short to positive or earth in the following wiring connections:

Connector contact	Test box V.A.G 1598 A socket
2 (signal)	45

- 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 of the connector in order to measure the voltage.
- Switch the ignition on.
 - Specification: at least 4 V

If the specification is not obtained:

- Replace engine control unit => Page **48**.

If the specification is obtained:

- Fit a new Hall sensor.

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