

Audi 100 1991 ➤

Motronic injection and ignition system (8-cyl.)

Engine ID	ABH	AEC							
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Edition 12.1992

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List of Workshop Manual Repair GroupsList of Workshop Manual
Repair GroupsList of Workshop Manual Repair Groups

Audi 100 1991 ➤

Motronic injection and ignition system (8-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 - Motronic self-diagnosis

1.1 - Motronic self-diagnosis

1.2 - Technical data of self-diagnosis

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Features

- ◆ Data are transferred between control unit and vehicle diagnostic, testing and information system VAS 5051 in "self-diagnosis" mode.
- ◆ The fault memory is designed as a non-volatile memory and is thus independent of the power supply.

1.3 - Safety precautions

Pay attention to the following if testers and measuring instruments have to be used in the course of a test drive:

Attention:

- ◆ Always attach testers and measuring instruments to back seat and have them operated from there by a second person.
- ◆ If testers and measuring instruments were to be operated from front passenger's seat, person sitting there could suffer injury in the event of an accident due to triggering of front passenger's airbag.

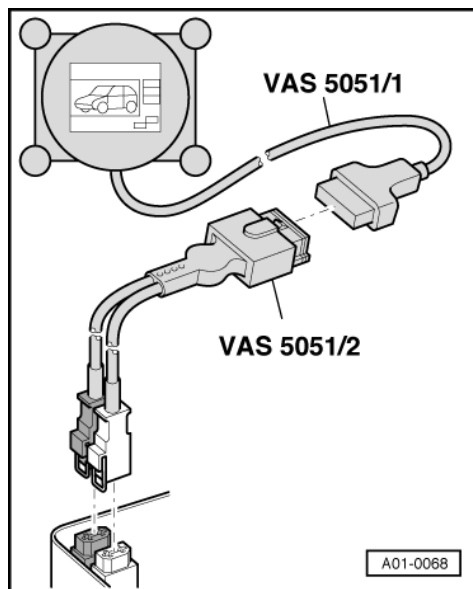
1.4 - Connecting up vehicle diagnostic, testing and information system VAS 5051 and selecting functions

Test requirements:

- Vehicle supply voltage OK
- Earth connections at rear of engine as well as between left cylinder block and left longitudinal member OK
- Fuses for engine electronics OK

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- Fuel pump relay OK; checking => Page 68



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Sequence of operations

- Detach cover from auxiliary relay carrier I in plenum chamber on left.
- -> Use diagnostic wire VAS 5051/1 and diagnostic adapter VAS 5051/2 to connect up vehicle diagnostic, testing and information system VAS 5051.

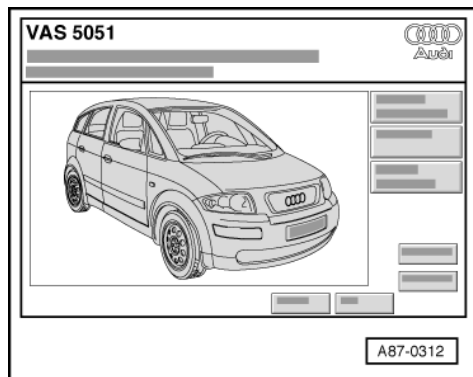
Attention:

Heed safety precautions => Page 1 .

Note:

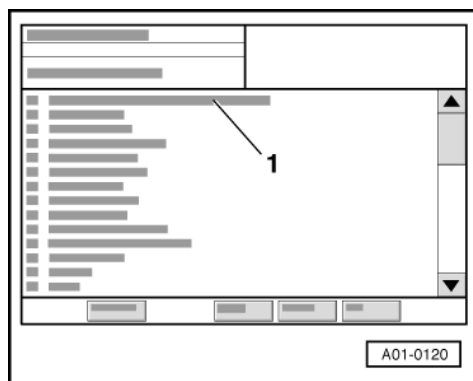
If fault message appears on display:

=> Operating instructions for vehicle diagnostic, testing and information system VAS 5051



-> Display on VAS 5051:

- Touch "Vehicle self-diagnosis" key.



-> Display on VAS 5051:

Note:

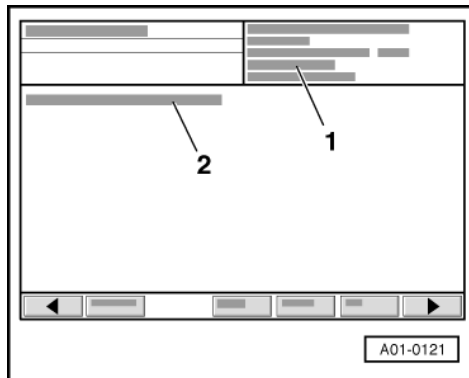
Touching "00 - Interrogating fault memory - entire system" in list -1- implements the automatic test sequence, i.e. fault memory interrogation takes place for all vehicle systems with self-diagnosis capability.

Depending on desired function => "Diagnosis functions" table, Page **4** :

- Switch on ignition.

Or

- Start engine.
- From list -1- select vehicle system "01 - Engine electronics".



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- Wait until next display appears.

-> Display on VAS 5051:

- 1 - Engine control unit identification => Page **3**

Engine control unit identification (example)	
01 - Engine electronics	Vehicle system
4A0 907 557..	Part No.; Assignment => Parts List
ENGINE1)D042)	1) Engine electronics 2) Data level (software version) of control unit
Code 1	Control unit encoding (checking => Page 26)

- Touch ▶ key.





-> Display on VAS 5051:

1 - List of diagnosis functions:

Diagnosis functions	Ignition on, engine stopped	Engine idling	Vehicle in operation	Page
02 Interrogating fault memory	no	yes	yes	4
03 Final control diagnosis	yes	no	no	19
04 Basic setting	yes	yes	yes	24
05 Erasing fault memory	yes	yes	yes	4
06 End of output	yes	yes	yes	7
07 Encoding control unit	no	no	no	-
08 Reading measured value block	yes	yes	yes	28
09 Reading individual measured value	no	no	no	-
10 Adaption	no	no	no	-
11 Login procedure	no	no	no	-

2 - Interrogating and erasing fault memory

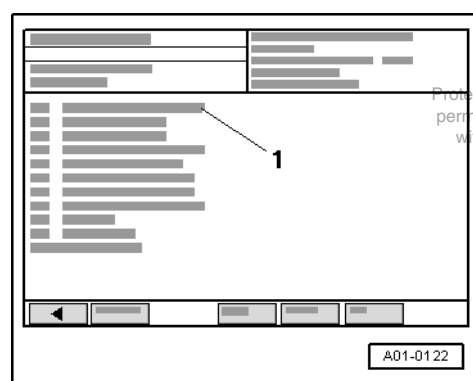
2.1 - Interrogating and erasing fault memory

2.2 - Interrogating fault memory

- Connect up vehicle diagnostic, testing and information system VAS 5051 => Page 1 and select vehicle system "01 - Engine electronics" from list. Engine should be idling.

Note:

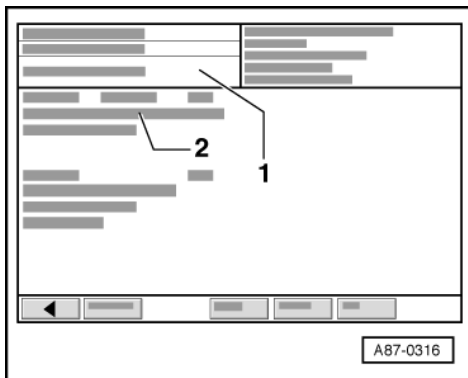
If engine will not start, crank it with starter for at least 5 seconds and then always leave ignition switched on.



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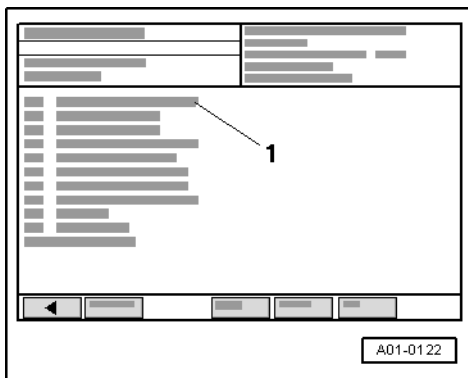
-> Display on VAS 5051:

- From list -1- select diagnosis function "02 - Interrogating fault memory".



-> Display on VAS 5051:

- 1 - Content of fault memory:
 - 0 faults detected
 - Or
 - X faults detected
- 2 - Fault
 - Fault code
 - Fault location
 - Type of fault



A - Faults detected:

- Print out information on screen or self-diagnosis log.
- Terminate function "02 - Interrogating fault memory" by touching ◀ key.

-> Display on VAS 5051:

- Eliminate fault(s) in line with fault table => Page 7 .
- Select diagnosis function "02 - Interrogating fault memory" again in list and erase fault memory => Page 6 .
- Select diagnosis function "06 - End of output" in list => Page 7 .

B - No fault detected:

- Select diagnosis function "06 - End of output" in list => Page 7 .

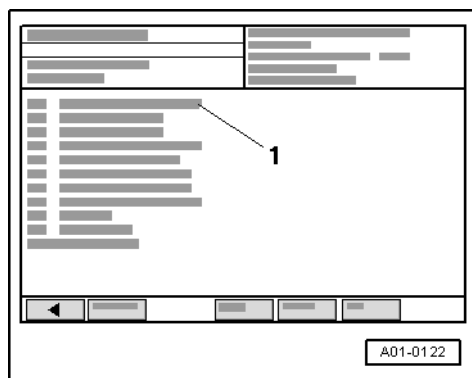
2.3 - Erasing fault memory

Note:

If fault memory cannot be erased, interrogate fault memory again and eliminate fault.

Requirements:

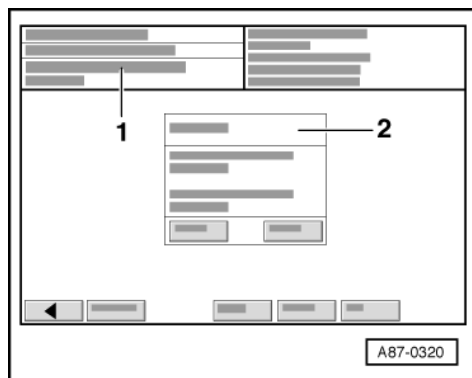
- Fault memory interrogated=> Page 4
- All faults eliminated



After fault memory interrogation:

-> Display on VAS 5051:

- From list -1- select diagnosis function "05 - Erasing fault memory".



-> Display on VAS 5051:

- 1 - - No display (prior to erasing)
- Or
- Fault memory erased

Note:

If the following message appears in display zone -1-: "Fault memory not yet interrogated", this means that sequence of operations has not been precisely observed. Fault memory cannot be erased until it has been interrogated.

2 - Note:

Is function to be implemented?

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Note: Data will be erased!

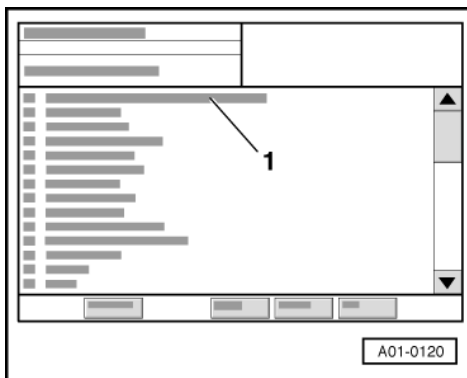
- Touch "OK" key in display -2-.
- Terminate function "05 - Erasing fault memory" by touching ◀ key.
- Start engine basic setting => Page 24 .
- Perform test drive (minimum duration 5 minutes).
- Interrogate fault memory again after performing repair work.

2.4 - End of output



-> Display on VAS 5051:

- From list -1- select diagnosis function "06 - End of output".



-> Display on VAS 5051:

- Switch off ignition and unplug diagnostic connector when this display appears.

2.5 - Fault table

Notes:

- ◆ Faults occurring in monitored sensors or components are stored in fault memory together with an indication of the type of fault.
- ◆ The fault table is arranged according to the 5-digit fault codes on the left.
- ◆ If a stored fault does not re-occur within the next 50 engine starts, the fault code is erased automatically.
- ◆ Sporadic faults are marked "sporadic" on the display. "Sporadic" faults are faults which only occur occasionally.



- ♦ Do not immediately replace components indicated as being defective by VAS 5051, but rather: Start by checking wiring and connectors to these components in line with current flow diagram. Also use current flow diagram to check earth connections. This is particularly important if faults are output as being "sporadic".

2.6 - Fault codes 00281 - 00537

Display on VAS 5051	Possible cause of trouble	Possible effects	Fault remedy
00281 Road speed sender -G68 No signal	- Speedometer sender - G22/ road speed sender - G68 defective - Speedometer -G21 defective - Open circuit in wiring or short circuit between speedometer sender and speedometer - Open circuit in wiring or short circuit between dash panel insert and engine control unit	- No air-conditioner compressor shutoff in 1st gear at full throttle - Idling speed briefly undershot on disengaging clutch in overrun phase	- Check vehicle speed signal => Page 107 - Check wiring
	- Signal input in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 49

Display on VAS 5051	Possible cause of trouble	Possible effects	Fault remedy
00513 Engine speed sender -G28 No signal Implausible signal	- Open circuit or short circuit in signal wire - Open circuit in screen wiring	- Engine will not start/cuts out - Misfiring	- Check wiring
	- -G28 loose/defective - Gap between -G28 and ring gear of flywheel greater than 1.2 mm - Chipped teeth at flywheel ring gear		- Check -G28 =>Page 119 - Check flywheel
Mechanical fault	- Interchanged -G4 and -G28 connectors - Signal input in engine control unit defective (control unit defective)	- Engine will not start	- Check for interchanged -G4 and -G28 connectors - Replace engine control unit =>Page 49

Display on VAS 5051	Possible cause of trouble	Possible effects	Fault remedy
00514 Ignition timing sender -G4 No signal	- Firing point sender -G4 loose - Gap between -G4 and flywheel pin greater than 1.2 mm	- Fault before starting engine - Engine does not start (no ignition and injection)	- Check -G4 =>Page 117

Display on VAS 5051	Possible cause of trouble	Possible effects	Fault remedy
	- -G4 defective	- Fault after starting engine: - Fault is stored	
	- Open circuit in wiring or short circuit between -G4 and engine control unit - Open circuit in screen wiring		- Check wiring
	- Interchanged -G4 and -G28 connectors		- Check for interchanged -G4 and -G28 connectors
	- Signal input in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 49

Display on VAS 5051	Possible cause of trouble	Possible effects	Fault remedy
00515 Hall sender -G40 Open circuit/short to positive Short to earth No signal	- Open circuit in wiring or short circuit between -G40 and engine control unit - Power supply/earth supply for -G40 defective - -G40 defective	- Loss of power	- Check -G40 =>Page 130
	- Firing point sender -G4 defective		- Check -G4 =>Page 117
	- Incorrect valve timing (toothed belt missing tooth)		- Check valve timing => Engine, Mechanics; Repair Group 13
	- Signal input in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 49

Display on VAS 5051	Possible cause of trouble	Possible effects	Fault remedy
00516 Idling switch -F60 Open circuit/short to positive	- Throttle valve sticking - -F60 defective - Moisture in connector of -F60	- Fault code 00516 only: No noticeable effect - Fault code 00518 as well: Idling speed outside specified range, loss of power, poor throttle response	- Check idling-speed switch=> Page 101
	- Open circuit in wiring or short circuit between -F60 and engine control unit		- Check wiring
	- Throttle cable setting - Floor covering pressing on accelerator pedal		- Adjust throttle cable => Fuel Supply System - Petrol Engines; Repair Group 20
	- Signal input in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 49

Display on VAS 5051	Possible cause of trouble	Possible effects	Fault remedy
00518 Throttle valve potentiometer -G69			



Short to earth Open circuit/short to positive	- Open circuit in wiring or short circuit between - G69 and engine control unit - -G69 defective - Moisture/corrosion in connector at -G69	- Rough engine running on acceleration	- Check wiring Check -G69 => Page 98
	- Signal input in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 49

Display on VAS 5051	Possible cause of trouble	Possible effects	Fault remedy
00522 Coolant temperature sender -G62 Short to earth Open circuit/short to positive	- Open circuit or short circuit in wiring between -G62 and engine control unit	- Cold starting problems - Engine running problems during warm-up	- Read measured value block => Page 28
	- -G62 defective - Moisture/corrosion in connector at -G62		- Check -G62 =>Page 124
	- Signal input in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 49

Display on VAS 5051	Possible cause of trouble	Possible effects	Fault remedy
00523 Intake-air temperature sender -G42 Short to earth Open circuit/short to positive	- Open circuit or short circuit in wiring between -G42 and engine control unit	- Slight loss of power - Increased fuel consumption	- Check wiring
	- -G42 defective		- Check -G42 => Page 121
	- Signal input in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 49

Display on VAS 5051	Possible cause of trouble	Possible effects	Fault remedy
00524 Knock sensor 1 -G61 No signal	- Knock sensor defective - Corrosion at connector of -G61	- High fuel consumption - Loss of power	- Check -G61 => Page 127
	- Knock sensor loose		- Knock sensor tightening torque: 20 Nm
	- Open circuit/short to positive in wiring between -G61 and engine control unit		- Check wiring
	- Short circuit between -G61 and earth or to screen		

	- Signal input in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 49
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Display on VAS 5051	Possible cause of trouble	Possible effects	Fault remedy
00525 Lambda probe -G39 Short to positive No signal Short to earth	- Open circuit/short circuit in wiring between -G39 and engine control unit	- Emission values not OK - Increased fuel consumption - Formation of black smoke - Soot deposits on spark plugs	- Check wiring
	- Short to earth/screen in Lambda probe signal wire - -G39 defective	- Lambda control switches to open-loop control	- Check Lambda control =>Page 83
	- No Lambda probe heater -Z19 function - Fuse for Lambda probe heating/Lambda probe heating control unit -J208 defective - Heating resistor in -G39 defective - Open circuit/short circuit in wire for Lambda probe heater -Z19		- Check Lambda probe heating => Page 86

Display on VAS 5051	Possible cause of trouble	Possible effects	Fault remedy
00532 Supply voltage Signal too low	- Poor earth connection to engine control unit	- Voltage less than 6 V - Engine does not run	- Check power supply of engine control unit => Page 125
	- Battery flat - Current draw with ignition off (discharge)		- Check voltage Check charge
Signal too high	- Supply voltage greater than 16 V - Overvoltage caused by boost starting - Alternator defective	- Destruction of engine control unit	- Check voltage

Note:

Display can be ignored if fault is indicated as being sporadic. This fault may be stored if engine is left idling for a lengthy period with numerous electr. loads switched on and very low battery charge.

Display on VAS 5051	Possible cause of trouble	Possible effects	Fault remedy
00533 Idling speed regulation Adaption limit exceeded	- Fuse defective - Idling speed stabilisation valve -N71 stuck in closed position - Contact resistance in connector of idling-speed stabilisation valve -N71	- Idling speed too low	- Check -N71 => Page 74



	- Shift in characteristic curve of air-mass meter -G70 Continued ▼		- Check -G70 => Page 78
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Display on VAS 5051	Possible cause of trouble	Possible effects	Fault remedy
00533 Idling speed regulation Adaption limit not reached	(Fault 00533 continued) - Idling speed stabilisation valve -N71 stuck open - Shift in characteristic curve of air-mass meter -G70 - Unmetered air in intake system - Throttle valve potentiometer -G69 incorrectly set - Throttle valve unit sticking	- Excessive idling speed - Jolting of engine - Poor throttle response - Rough idling (uneven)	- Check -N71 => Page 74 - Check -G70 => Page 78 - Check intake system for leaks (unmetered air) => Page 81 - Check -G69 => Page 78 - Check and if necessary replace throttle valve unit

Display on VAS 5051	Possible cause of trouble	Possible effects	Fault remedy
00535 First knock regulation Max. control limit exceeded	- Poor fuel grade (less than 91 RON) - Knock sensor 1 -G61 loose - Open circuit in signal wire between -G61 and engine control unit - Open circuit in screen wiring - Abnormal engine running noise (ancillaries loose)	- Slight loss of power - Slight increase in fuel consumption - Max. speed not reached - Uneven engine running	- Fill tank with fuel with at least 91 RON - Tighten knock sensor to 20 Nm - Check -G61 => Page 127 - Eliminate mechanical damage

1) Knock sensor 1 -G61 for bank 1 is monitored.

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Display on VAS 5051	Possible cause of trouble	Possible effects	Fault remedy
00536 2nd knock regulation2) Max. control limit exceeded	- Poor fuel grade (less than 91 RON) - Knock sensor 2 -G66 loose - Open circuit in signal wire between -G66 and engine control unit - Open circuit in screen wiring	- Slight loss of power - Slight increase in fuel consumption - Max. speed not reached - Uneven engine running	- Fill tank with fuel with at least 91 RON - Tighten knock sensor to 20 Nm - Check -G66 => Page 127

Display on VAS 5051	Possible cause of trouble	Possible effects	Fault remedy
	- Abnormal engine running noise (ancillaries loose)		- Eliminate mechanical damage

2) Knock sensor 2 -G66 for bank 2 is monitored.

Display on VAS 5051	Possible cause of trouble	Possible effects	Fault remedy
00537 Lambda control Control limit exceeded	- Fuel tank empty, min. 10 l	- CO upstream of catalytic converter less than 0.3 % by vol.	- Fill tank with fuel
	- Fault in power supply/ Lambda probe heating control unit -J208 defective		- Check Lambda probe heating => Page 86
	- Fuel system pressure too low		- Check fuel system pressure => Page 53
	- Leaks in exhaust system as far as catalytic converter Continued ▼		- Eliminate leakage

Display on VAS 5051	Possible cause of trouble	Possible effects	Fault remedy
00537 Lambda control Control limit not reached	(Fault 00537 continued)		
	- Spark plug failure	- CO upstream of catalytic converter greater than 1.0 % by vol.	- Perform visual inspection
	- Fuel system pressure too high	- Soot deposits on spark plugs Excessive consumption	- Check fuel system pressure => Page 53
	- Lambda probe defective	- Formation of black smoke - Engine running problems	- Check Lambda control =>Page 83
	- Unmetered air downstream of air-mass meter -G70		- Eliminate leakage
	- Activated charcoal filter solenoid valve -N80 leaking, permanently open		- Check activated charcoal filter solenoid valve -N80 for leaks => Page 94

2.7 - Fault codes 00540 - 65535

Display on VAS 5051	Possible cause of trouble	Possible effects	Fault remedy
00540 Knock sensor 2 -G66 No signal	- Knock sensor defective	- High fuel consumption - Loss of power	- Check -G66 => Page 127
	- Corrosion at connector of -G66		- Knock sensor tightening torque: 20 Nm
	- Knock sensor loose		- Check wiring
	- Open circuit/short to positive in wiring between -G66 and engine control unit		



	- Short circuit between -G66 and earth or to screen		
	- Signal input in engine control unit defective (control unit defective)		
			- Replace engine control unit =>Page 49

Display on VAS 5051	Possible cause of trouble	Possible effects	Fault remedy
00545 Engine/gearbox electrical connection Short to earth	- Short to earth in signal wire from gearbox control unit - Automatic gearbox control unit-J217 defective	- Gearshift jolts	- Check wiring=>Page 108

Display on VAS 5051	Possible cause of trouble	Possible effects	Fault remedy
00553 Air-mass meter -G70 Signal too high Signal too low	- Power supply for -G70 defective - Open circuit or short to earth/positive in signal wire between -G70 and engine control unit - Earth supply for -G70 defective - -G70 defective - Signal input in engine control unit defective (control unit defective)	- Slight engine running problems	- Check -G70 => Page 78 - Replace engine control unit =>Page 49

Display on VAS 5051	Possible cause of trouble	Possible effects	Fault remedy
00561 Mixture adaptation Adaption limit (add) exceeded	- Fuel system pressure too low	- Jolting	- Fill fuel tank and check fuel system pressure => Page 53
Adaption limit (mul) exceeded	- Leaks in exhaust system as far as catalytic converter - Unmetered air downstream of air-mass meter - Activated charcoal filter solenoid valve -N80 sticking Continued ▼	- Rough idling	- Eliminate leakage - Check -N80 => Page 94

Display on VAS 5051	Possible cause of trouble	Possible effects	Fault remedy
00561 Mixture adaptation Adaption limit (add) not reached	(Fault 00561 continued) - Fuel system pressure too high	- Jolting - Increased fuel consumption	- Check fuel system pressure => Page 53
Adaption limit (mul) not reached	- Fuel in engine oil (short-distance driving)	- Rough idling	- Drive on motorway for 15 minutes or change oil

	- Injectors leaking	- Formation of black smoke, soot deposits on spark plugs	- Check injection quantity => Page 66
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Notes:

- ♦ add. = additive i.e. fault only takes effect at idle
- ♦ mul = multiplicative, i.e. fault takes effect over entire engine-speed and load range

Display on VAS 5051	Possible cause of trouble	Possible effects	Fault remedy
00577 Knock control, cylinder 13) Control limit exceeded	- Poor fuel grade (less than 91 RON)	- High fuel consumption - Loss of power - Maximum speed not reached	- Use fuel of at least 91 RON
	- Open circuit (loose contact) in signal wire of engine speed sender -G28 or firing point sender -G4 or wires interchanged		- Check -G28 signal wire =>Page 117
	- Open circuit in wiring of screen of knock sensor		- Check knock sensor => Page 127
	- Abnormal engine running noise (ancillaries loose)		- Eliminate mechanical damage
	- Injector dirty		- Check injectors =>Page 56

3) Ignition timing retard by way of knock control is implemented jointly for cylinders 1 and 5.

Display on VAS 5051	Possible cause of trouble	Possible effects	Fault remedy
00578 Knock control, cylinder 24) Control limit exceeded	- Poor fuel grade (less than 91 RON)	- High fuel consumption - Loss of power - Maximum speed not reached	- Use fuel of at least 91 RON
	- Open circuit (loose contact) in signal wire of engine speed sender -G28 or firing point sender -G4 or wires interchanged		- Check -G28 signal wire =>Page 117
	- Open circuit in wiring of screen of knock sensor		- Check knock sensor => Page 127
	- Abnormal engine running noise (ancillaries loose)		- Eliminate mechanical damage
	- Injector dirty		- Check injectors =>Page 56

4) Ignition timing retard by way of knock control is implemented jointly for cylinders 2 and 6.

Display on VAS 5051	Possible cause of trouble	Possible effects	Fault remedy
00579 Knock control, cylinder 35) Control limit exceeded	- Poor fuel grade (less than 91 RON)	- High fuel consumption - Loss of power	- Use fuel of at least 91 RON



	- Open circuit (loose contact) in signal wire of engine speed sender -G28 or firing point sender -G4 or wires interchanged	- Maximum speed not reached	- Check -G28 signal wire =>Page 117
	- Open circuit in wiring of screen of knock sensor		- Check knock sensor => Page 127
	- Abnormal engine running noise (ancillaries loose)		- Eliminate mechanical damage
	- Injector dirty		- Check injectors =>Page 56

5) Ignition timing retard by way of knock control is implemented jointly for cylinders 3 and 7.

Display on VAS 5051	Possible cause of trouble	Possible effects	Fault remedy
00580 Knock control, cylinder 46) Control limit exceeded	- Poor fuel grade (less than 91 RON)	- High fuel consumption - Loss of power - Maximum speed not reached	- Use fuel of at least 91 RON
	- Open circuit (loose contact) in signal wire of engine speed sender -G28 or firing point sender -G4 or wires interchanged		- Check -G28 signal wire =>Page 117
	- Open circuit in wiring of screen of knock sensor		- Check knock sensor => Page 127
	- Abnormal engine running noise (ancillaries loose)		- Eliminate mechanical damage
	- Injector dirty		- Check injectors =>Page 56

6) Ignition timing retard by way of knock control is implemented jointly for cylinders 4 and 8.

Display on VAS 5051	Possible cause of trouble	Possible effects	Fault remedy
01244 Lambda probe heating control valve -J208 Open circuit/short to earth Short to positive	- Open circuit/short circuit in wiring between -J208 and engine control unit	- No Lambda probe heating function - Emission values not OK - Increased fuel consumption - Formation of black smoke - Soot deposits on spark plugs - Lambda control switches to open-loop control	- Check wiring Check Lambda probe heating => Page 24
	- Signal output in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 49

Display on VAS 5051	Possible cause of trouble	Possible effects	Fault remedy
01247			

Display on VAS 5051	Possible cause of trouble	Possible effects	Fault remedy
ACF solenoid 1 -N80 Short to positive Open circuit/short to earth	- Power supply for -N80 defective - Open circuit in wiring or short to earth between -N80 and engine control unit - -N80 defective	- Poor transient response in part-throttle range - Vehicle smells of petrol - Idling speed not OK	- Check -N80 =>Page 94
	- Signal output in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 49

Display on VAS 5051	Possible cause of trouble	Possible effects	Fault remedy
01249 Injector, cylinder 1 -N30 7) Signal to negative Signal to positive	- Open circuit in wiring or short to earth/positive between -N30 and engine control unit - Power supply for -N30 defective - -N30 defective	- Uneven engine running - Engine cuts out - CAT lamp comes on in the event of short to earth and heavy engine load	- Check injectors =>Page 56
	- Signal output in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 49

7) Injectors of cylinders 1 and 5 are actuated jointly. Perform checks at both injectors.

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Display on VAS 5051	Possible cause of trouble	Possible effects	Fault remedy
01250 Injector, cylinder 2 -N31 8) Signal to negative Signal to positive	- Open circuit in wiring or short to earth/positive between -N30 and engine control unit - Power supply for -N31 defective - -N31 defective	- Uneven engine running - Engine cuts out - CAT lamp comes on in the event of short to earth and heavy engine load	- Check injectors =>Page 56
	- Signal output in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 49

8) Injectors of cylinders 2 and 6 are actuated jointly. Perform checks at both injectors in each case.

Display on VAS 5051	Possible cause of trouble	Possible effects	Fault remedy
01251 Injector, cylinder 3 -N32 9) Signal to negative Signal to positive	- Open circuit in wiring or short to earth/positive between -N30 and engine control unit - Power supply for -N32 defective - -N32 defective	- Uneven engine running - Engine cuts out - CAT lamp comes on in the event of short to earth and heavy engine load	- Check injectors =>Page 56



	- Signal output in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 49
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9) Injectors of cylinders 3 and 7 are actuated jointly. Perform checks at both injectors in each case.

Display on VAS 5051	Possible cause of trouble	Possible effects	Fault remedy
01252 Injector, cylinder 4 -N33 10) Signal to negative Signal to positive	- Open circuit in wiring or short to earth/positive between -N30 and engine control unit - Power supply for -N33 defective - -N33 defective	- Uneven engine running - Engine cuts out - CAT lamp comes on in the event of short to earth and heavy engine load	- Check injectors =>Page 56
	- Signal output in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 49

10) Injectors of cylinders 4 and 8 are actuated jointly. Perform checks at both injectors in each case.

Display on VAS 5051	Possible cause of trouble	Possible effects	Fault remedy
01257 Idling stabilisation valve - N71 Short to positive Open circuit/short to earth	- Open circuit in wiring or short to earth/positive between -N71 and engine control unit - Power supply for -N71 defective	- Difference between engine speed and specified speed at engine operating temperature - Engine running problems	- Check -N71 => Page 74

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Display on VAS 5051	Possible cause of trouble	Possible effects	Fault remedy
17978 Engine control unit blocked	- Attempted starting with unauthorised key	- Engine only starts briefly (cuts out after one second)	- Check and if necessary implement key matching => Electrical System; Repair Group 01; Self-diagnosis Self-diagnosis
	- Fault in immobilizer system		- Interrogate immobilizer fault memory => Electrical System; Repair Group 01; Self-diagnosis Self-diagnosis
	- Immobilizer control unit not matched to engine control unit		- Perform control unit adaptation => Electrical System; Repair Group 01; Self-diagnosis Self-diagnosis

	- Open circuit in wiring between immobilizer and engine control units		- Eliminate open circuit in wiring => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder
--	---	--	---

Display on VAS 5051	Possible cause of trouble	Possible effects	Fault remedy
65535 Control unit defective	- No earth connection to engine control unit	- Engine will not start	- Check earth connections => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder
	- Engine control unit defective		- Replace engine control unit => Page 49

3 - Final control diagnosis

3.1 - Final control diagnosis

Notes:

- ◆ Final control diagnosis can only be performed with engine stopped and ignition switched on.
- ◆ Final control diagnosis is terminated if engine is started or an engine speed pulse is detected.
- ◆ During final control diagnosis the individual control elements (exception: injectors) are actuated until ▶ key is pressed to select next control element.
- ◆ The control elements are checked acoustically or by means of touch.

The final control diagnosis function actuates the following components in the stated sequence:

Actuation sequence
1 Injector, cylinder 1 -N30
2 Injector, cylinder 2 -N31
3 Injector, cylinder 3 -N32
4 Injector, cylinder 4 -N33
5 Injector, cylinder 5 -N83
6 Injector, cylinder 6 -N84
7 Injector, cylinder 7 -N85
8 Injector, cylinder 8 -N86
9 Idling-speed stabilisation valve -N71
10 Activated charcoal filter solenoid valve -N80
11 Exhaust-gas recirculation valve -N18 1)
12 Lambda probe heating control unit -J208

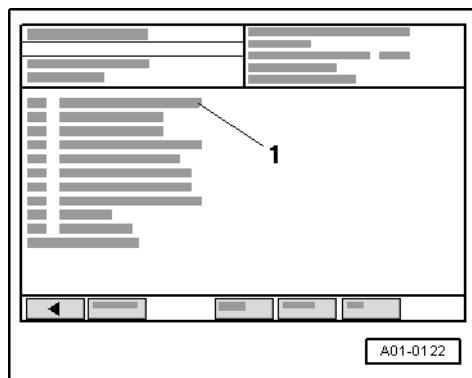
1) Vehicles with EGR only

Test requirements:

- Fuses for engine electronics OK

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- Fuel pump relay OK; checking => Page 68

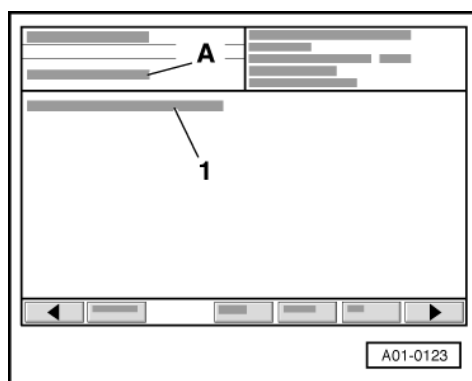


Test sequence

- Connect up vehicle diagnostic, testing and information system VAS 5051 => Page 1 and select vehicle system "01 - Engine electronics" from list. Engine should be idling.

-> Display on VAS 5051:

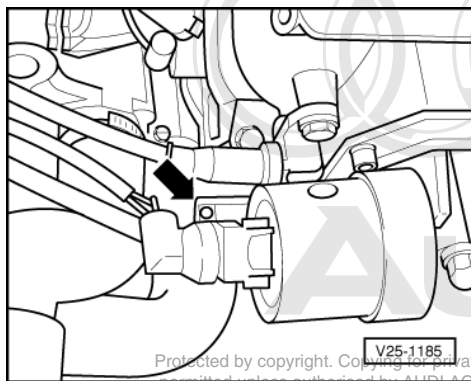
- From list -1- select diagnosis function "03 - Final control diagnosis".



Actuating injectors

-> Display on VAS 5051:

- A - 1st control element being tested
- 1 - Injector, cylinder 1 - N30



- -> Briefly lift throttle lever - arrow -

- ♦ Injector must click five times after touching ▶ key.

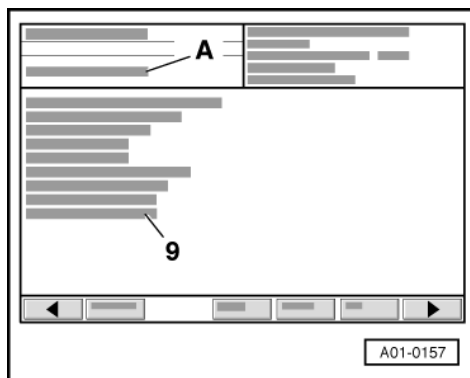
- ♦ Control unit then switches automatically to next injector (observe display).
- All injectors are to be checked consecutively in this manner.

Note:

If next injector is to be selected without testing, touch ▶ key.

If one of the injectors is not actuated (does not click):

- Check injectors=>Page **56** .



Actuating idling-speed stabilisation valve

- Touch ▶ key.

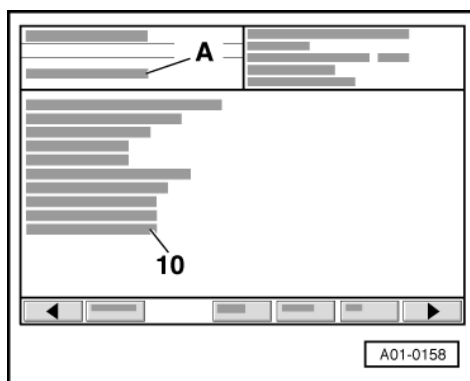
-> Display on VAS 5051:

- A - 9th control element being tested
- 9 - Idling-speed stabilisation valve -N71

- ♦ This valve is actuated (clicks) until ▶ key is touched to select next control element.

If valve is not actuated (does not click):

- Check idling-speed stabilisation valve -N71 => Page **74** .



Actuating activated charcoal filter solenoid valve (fuel tank breather valve)

- Touch ▶ key.

-> Display on VAS 5051:

- A - 10th control element being tested

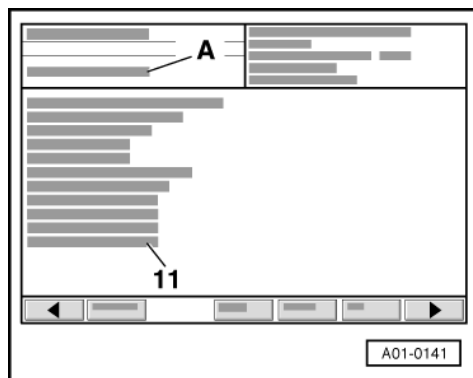
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10 - Activated charcoal filter solenoid valve -N80

- ♦ This valve is actuated (clicks) until ▶ key is touched to select next control element.

If valve is not actuated (does not click):

- Check activated charcoal filter solenoid valve -N80 => Page 94 .



Actuating exhaust-gas recirculation valve 1)

1) Vehicles with EGR only

- Touch ▶ key.

-> Display on VAS 5051:

A - 11th control element being tested
11 - Exhaust-gas recirculation valve -N18

- ♦ This valve is actuated (clicks) until ▶ key is touched to select next control element.

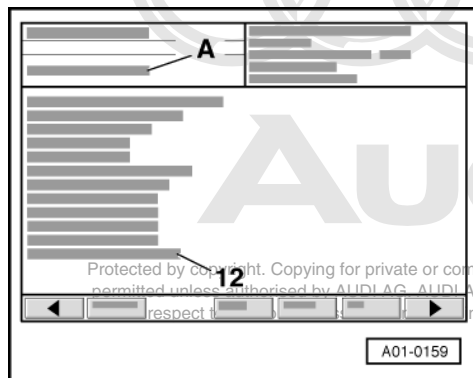
Note:

This control element is called up even if vehicle is not fitted with EGR. Touch ▶ key to continue with final control diagnosis on vehicles with no EGR.

If valve is not actuated (does not click):

- Check exhaust-gas recirculation valve -N18.

=> Engine, Mechanics; Repair Group 26

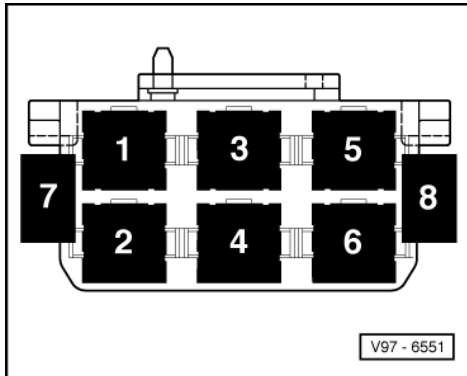


Actuating Lambda probe heating control unit

- Touch ▶ key.

-> Display on VAS 5051:

- A - 12th control element being tested
- 12 - Lambda probe heating control unit -N208



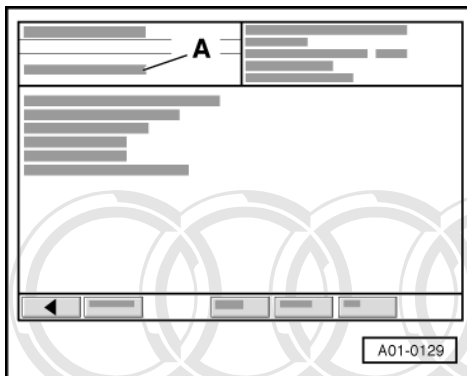
- ♦ -> Lambda probe heating control unit -J208 (in auxiliary relay carrier III in passenger's footwell, position 1) is switched on and off (clicks) until final control diagnosis is terminated by touching ▶ key.

Note:

Clicking of control unit can only be heard inside vehicle.

If valve is not actuated (does not click):

- Check Lambda probe heating control unit -J208 => Page 90 .
- Touch ▶ key.



-> Display on VAS 5051:

- A - Control element test over
- Terminate function "03 - Final control diagnosis" by touching ◀ key.

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4 - Basic setting

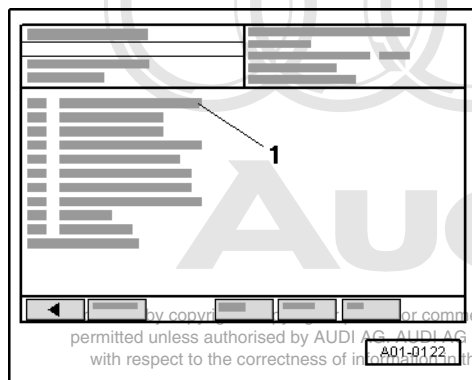
4.1 - Basic setting

Requirements:

- Test drive of at least 5 minutes' duration performed
- No faults stored in fault memory
- Engine still idling after fault memory interrogation
- Coolant temperature at least 85 °C
- Electr. loads switched off (radiator fan must not run during test)
- Air conditioner switched off
- Vehicles with automatic gearbox: Selector lever set to P or N

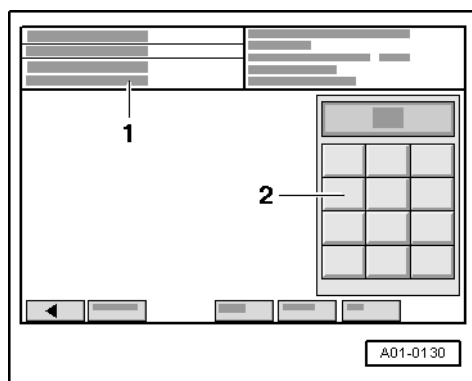
Sequence of operations

- Connect up vehicle diagnostic, testing and information system VAS 5051 => Page **1** and select vehicle system "01 - Engine electronics" from list. Engine must be idling.



-> Display on VAS 5051:

- From list -1- select diagnosis function "04 - Basic setting".

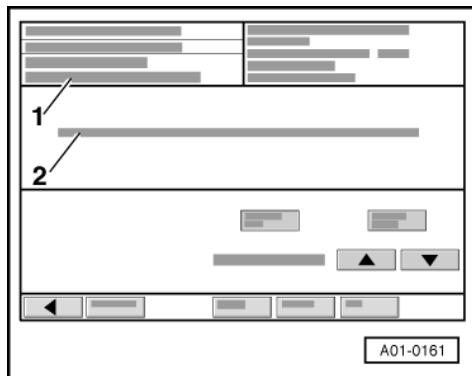


-> Display on VAS 5051:

- 1 - Enter display group
Highest possible entry = 255
- Use keypad -2- to enter "000" for "Display group number 000" and confirm by touching Q key.

Note:

ACF valve is closed after selecting display group number.



-> Display on VAS 5051:

- 1 - Display group 0
- 2 - Display zone 1 2 3 4 5 6 7 8 9 10

- Terminate function "04 - Basic setting" by touching ◀ key.

Vehicles with engine code letters ABH

Display zones											Specifica- tion	Corre- sponds to
1	2	3	4	5	6	7	8	9	10			
										Ignition timing	42 ... 47	3.8 ... 10.4° BTDC
										Lambda adaption	78 ... 178	
										Lambda control	121 ... 135	
										Idling-speed stabilisation char- acteristic curve control	42 ... 53	
										Idling-speed stabilisation load adaption	120 ... 138	
										Idling-speed stabilisation characteristic curve zero	80 ... 128	
										Idling-speed stabilisation operating range	123 ... 140	
										Engine speed	69 ... 75	690 ... 750 rpm
										Engine load; ignore	32 ... 46	
										Coolant temperature	189 ... 210	+ 85 ... 100 ° C

The individual measured values are evaluated where appropriate as part of the "Reading measured value block" function => Page 28.

Vehicles with engine code letters AEC

Display zones											Specification	Corre- sponds to
1	2	3	4	5	6	7	8	9	10			
										Ignition timing	38 ... 48	



								Lambda adap- tion	78 ...178	
								Lambda control	121 ...135	
								Idling-speed stabilisation char- acteristic curve control	42 ... 53	
								Idling-speed stabilisation load adap- tion	121...150	
								Idling-speed stabilisation characteristic curve zero	80 ...128	
								Idling-speed stabilisation operating range	123 ...143	
								Engine speed	77 ... 83	770 ... 830
								▪ Vehicles with manual gearbox	67 ... 73	rpm
								▪ Vehicles with automatic gearbox	670 ... 730	rpm
								Engine load; ignore	36 ... 50	
Coolant temperature	189 ... 218	+ 85 ... 106 ° C								

The individual measured values are evaluated where appropriate as part of the "Reading measured value block" function => Page 28 .

5 - Encoding control unit

5.1 - Encoding control unit

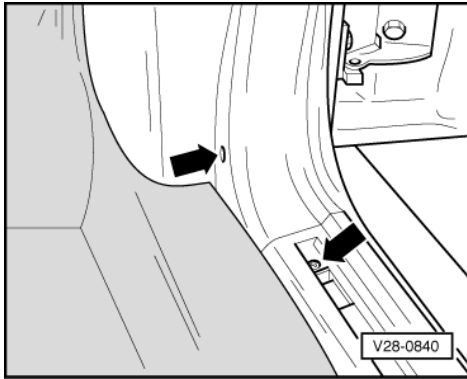


Note:

-> Control unit must be encoded if the control unit identification feature displays a code -2- which does not correspond to the vehicle concerned.

Encoding options

Code	Vehicles for	Link between contacts of encoding connector
1	European countries	No
7	USA, Canada, California	1 and 4
11	Countries using leaded fuel	2 and 4



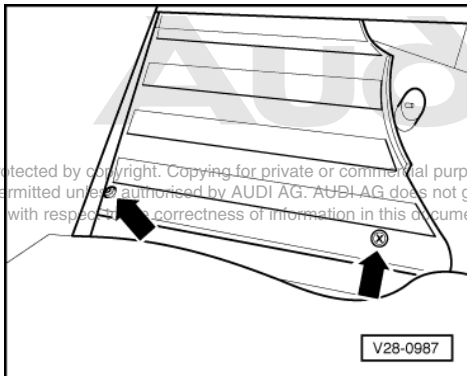
If corresponding code is not displayed:

- -> Remove bottom right A-pillar trim and right sill panel trim in area of front door.

=> General Body Repairs; Repair Group 70; Trim; Removing and installing A-pillar trim Trim Removing and installing A-pillar trim

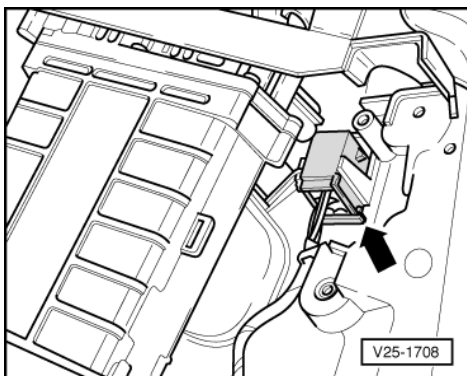
=> General Body Repairs; Repair Group 70; Trim; Removing and installing inner sill panel trim Trim Removing and installing inner sill panel trim

- Fold back floor covering in front right footwell (if necessary, use knife to cut open perforated seam on left).

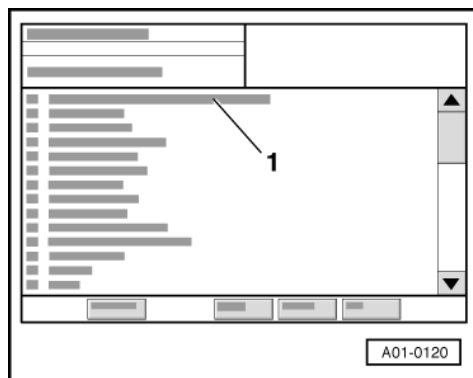


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- -> Screw out bolts for cover of electronics box -arrows-.
- Carefully disengage upper and lower cover section.

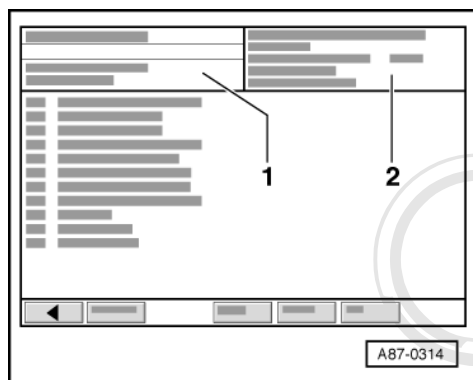


- -> Use encoding table to check contacts of encoding connector -arrow-.



-> Display on VAS 5051:

- With vehicle diagnostic, testing and information system VAS 5051 still connected, select vehicle system "01 - Engine electronics" from list -1-.



-> Control unit identification and code -2- appear on display of vehicle diagnostic, testing and information system VAS 5051.

If corresponding code is not displayed:

- Check wiring of encoding connector => Page 38

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6 - Reading measured value block

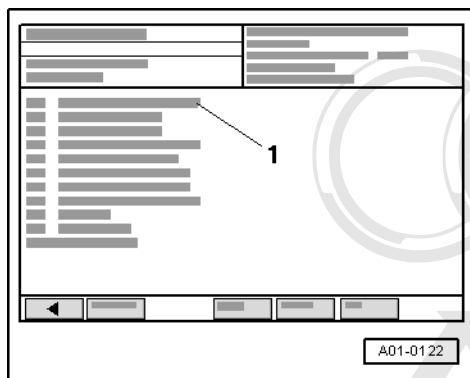
6.1 - Reading measured value block

Requirements:

- Test drive of at least 5 minutes' duration performed
- No faults stored in fault memory
- Engine still idling after fault memory interrogation
- Coolant temperature at least 85 °C
- Electr. loads switched off (radiator fan must not run during test)
- Air conditioner switched off
- Vehicles with automatic gearbox: Selector lever set to P or N

Sequence of operations

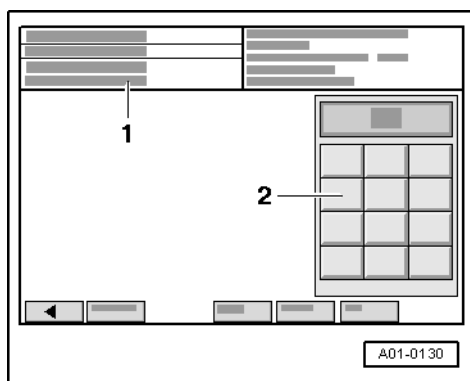
- Connect up vehicle diagnostic, testing and information system VAS 5051 => Page 1 and select vehicle system "01 - Engine electronics" from list. Engine must be idling.



-> Display on VAS 5051:

- From list -1- select **diagnosis function "08 - Reading measured value block"**

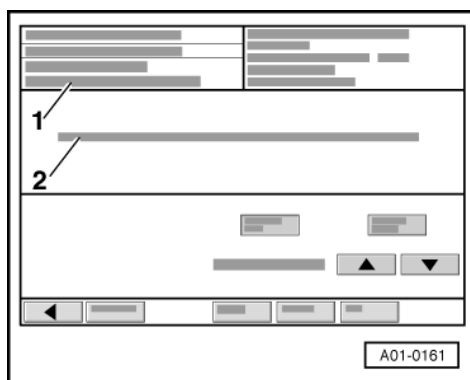
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-> Display on VAS 5051:

1 - Enter display group
Highest possible entry = 255

- Use keypad -2- to enter "000" for "Display group number 000" and confirm by touching Q key.



-> Display on VAS 5051:

1 - Display group 0
2 - Display zone 1 2 3 4 5 6 7 8 9 10

- Terminate function "08 - Reading measured value block" by touching ◀ key.



Vehicles with engine code letters ABH

Display zones										Specification	Corresponds to
1	2	3	4	5	6	7	8	9	10		
									Ignition timing	42 ... 47	3.8 ... 10.4° BTDC
									Lambda adaption	78 ... 178	
									Lambda control	121 ... 135	
									Idling-speed stabilisation characteristic curve control	42 ... 53	
									Idling-speed stabilisation load adaption	120 ... 138	
									Idling-speed stabilisation characteristic curve zero	80 ... 128	
									Idling-speed stabilisation operating range	123 ... 140	
									Engine speed	69 ... 75	690 ... 750 rpm
									Engine load; ignore	32 ... 46	
									Coolant temperature	189 ... 210	+ 85 ... 100 °C

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- 1) Lambda adaption must be checked within 5 minutes following test drive and fault memory interrogation. If engine is allowed to idle for a lengthy period, specification may be exceeded although there is no fault present.
- 2) Only assess tolerance range of Lambda control at idle in diagnosis function "04 - Basic setting", as diagnosis function "08 - Reading measured value block" includes control of ACF effect.

Vehicles with engine code letters AEC

Display zones										Specification	Corresponds to
1	2	3	4	5	6	7	8	9	10		
									Ignition timing	38 ... 48	
									Lambda adaption	78 ... 178	
									Lambda control	121 ... 135	
									Idling-speed stabilisation characteristic curve control	42 ... 53	
									Idling-speed stabilisation load adaption	121 ... 150	
									Idling-speed stabilisation characteristic curve zero	80 ... 128	
									Idling-speed stabilisation operating range	123 ... 143	
									Engine speed	77 ... 83	770 ... 830 rpm
									▪ Vehicles with manual gearbox	67 ... 73	670 ... 730 rpm
									▪ Vehicles with automatic gearbox		
									Engine load; ignore	36 ... 50	
									Coolant temperature	189 ... 218	+ 85 ... 106 °C

- 1) Only assess tolerance range of Lambda control at idle in function 04 "Basic setting" as function 08 "Reading measured value block" includes control of ACF effect.

Test table

Display zone	Display on VAS 5051	Cause of trouble	Fault remedy
1	Less than lower tolerance value	- Engine too cold	- Perform test drive if necessary
		- Coolant temperature sender -G62/wiring to engine control unit	- Check -G62 =>Page 124

Display zone	Display on VAS 5051	Cause of trouble	Fault remedy
		- Thermostat constantly open	- Check thermostat
	Greater than upper tolerance value	- Radiator dirty	- Clean radiator
		- Coolant temperature sender -G62/wiring to engine control unit	- Check -G62 =>Page 124

Display zone	Display on VAS 5051	Cause of trouble	Fault remedy
2	Less than lower tolerance value	- Unmetered air downstream of air-mass meter	- Eliminate cause
		- Unmetered air downstream of throttle valve	
	Greater than upper tolerance value	- Vacuum hose dropped off	- Check fuel system pressure => Page 53
		- Fuel pressure regulator	
		- Loads switched on, e.g. air conditioner on; steering wheel on full lock; selector lever of automatic gearbox not set to "P" or "N"	
		- Lambda control on rich or lean stop	
		- AC compressor in operation although air conditioner switched off	
		- Air-mass meter -G70 defective	
		- Central hydraulic pump	- Check central hydraulic pump => Running Gear, Front-wheel Drive and Four-wheel Drive; Repair Group 48

Display zone	Display on VAS 5051	Cause of trouble	Fault remedy
3	Less than lower tolerance value	- Idling-speed stabilisation valve - N71 sticking, stiff or defective	- Perform final control diagnosis =>Page 74
	Greater than upper tolerance value	- Idling-speed stabilisation valve - N71 at lower control stop	- Give brief burst of throttle 4 times at 15 second intervals
		- Unmetered air downstream of throttle valve	- Eliminate cause
		- Unmetered air at injectors	
		- Vacuum hose dropped off	- Perform final control diagnosis =>Page 74
		- Idling-speed stabilisation valve - N71 in emergency operating mode	
		- AC compressor signal applied although air conditioner switched off	
		- Air conditioner	- Check air conditioner => Heating, Air Conditioner; Repair Group 01; Self-diagnosis Self-diagnosis

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Display zone	Display on VAS 5051	Cause of trouble	Fault remedy
4	Less than lower tolerance value	- Unmetered air downstream of throttle valve	- Eliminate cause
		- Idling-speed stabilisation valve - N71 sticking, stiff or defective	- Perform final control diagnosis =>Page 74



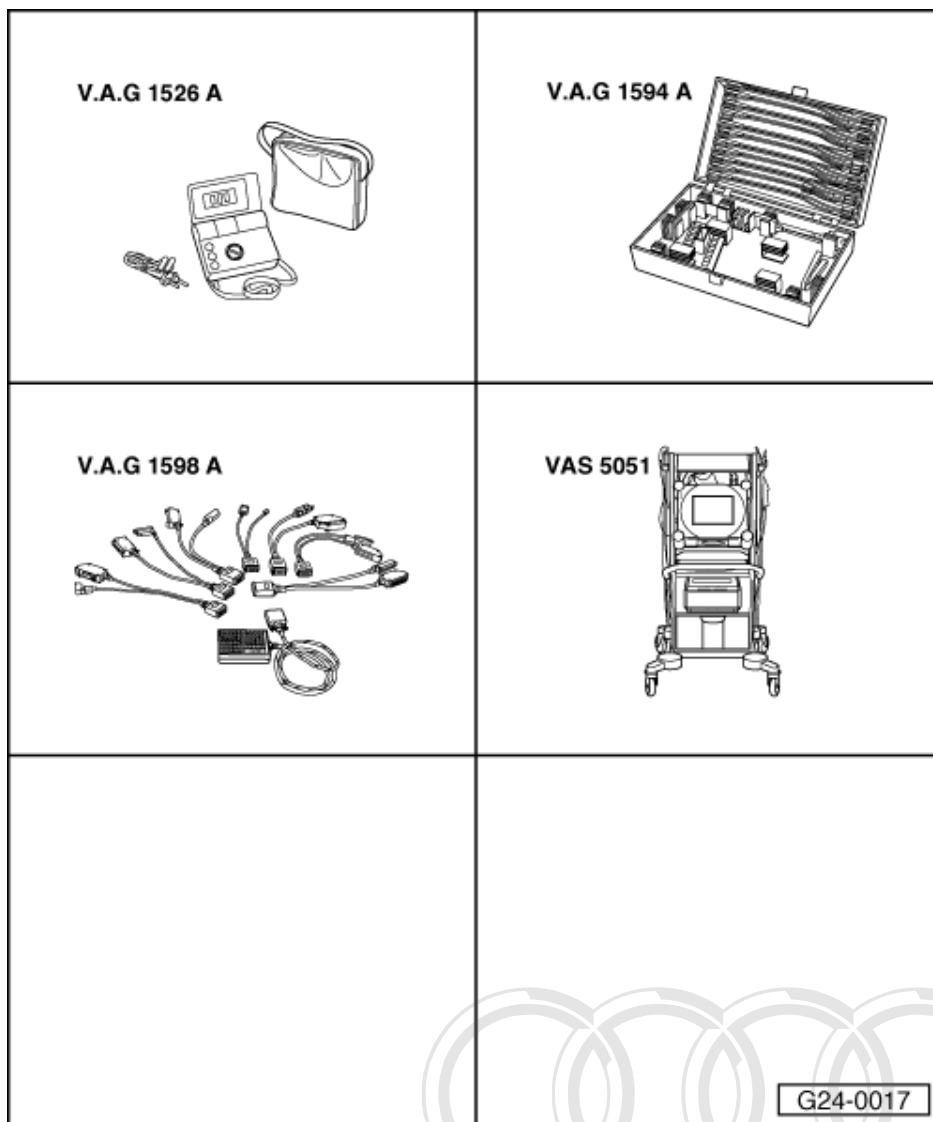
	Greater than upper tolerance value	- Loads switched on, e.g. air conditioner on; steering wheel on full lock; selector lever of automatic gearbox not set to "P" or "N"	- Switch off all electr. loads Move steering wheel to centre position Move selector lever to position "P" or "N"
5	Less than lower tolerance value	- Idling speed stabilisation valve - N71 stuck open	- Check -N71 => Page 74
	Greater than upper tolerance value	- Unmetered air downstream of idling-speed stabilisation valve	- Eliminate cause
		- Idling speed stabilisation valve - N71 stuck in closed position	- Check -N71 => Page 74

Display zone	Display on VAS 5051	Cause of trouble	Fault remedy
6	Outside tolerance range	- Unmetered air downstream of idling-speed stabilisation valve - N71	- Give brief burst of throttle and check whether display settles in tolerance range
7	Outside tolerance range	- Idling-speed stabilisation valve - N71 sticking, stiff or defective	- Perform final control diagnosis =>Page 74
8	Outside tolerance range	- Lambda adaption	- Check Lambda adaption => Display zone 9
		- Lambda probe dirty/defective	- Check Lambda probe =>Page 84
		- Unmetered air downstream of air mass meter	- Eliminate cause
		- Fuel system pressure	- Check fuel system pressure => Page 53
	Constantly 128	- Exhaust system leaking	- Eliminate cause
		- Lambda probe heating defective or Lambda probe dirty/defective	- Check Lambda probe heating => Page 84
	Jumps	- Insufficient fuel	- Re-fuel, min. 10 l in tank

Display zone	Display on VAS 5051	Cause of trouble	Fault remedy
9	Less than lower tolerance value	- Fuel system pressure	- Check fuel system pressure => Page 53
		- Lambda probe dirty/defective	- Check Lambda probe =>Page 84
		- Oil dilution (high fuel level in oil)	- Pull off and seal crankcase breather Disappears after driving on motorway or changing oil
	Greater than upper tolerance value	- Unmetered air	- Eliminate cause
10	Outside tolerance range	- Insufficient fuel	- Re-fuel, min. 10 l in tank
		- Idling-speed stabilisation valve - N71 sticking	- Perform final control diagnosis =>Page 74
		- Unmetered air at injectors	- Eliminate cause
	Jumps	- Spark plug defective	- Check spark plugs

7 - Checking wiring of diagnostic connectors

7.1 - Checking wiring of diagnostic connectors



Special tools and workshop equipment required

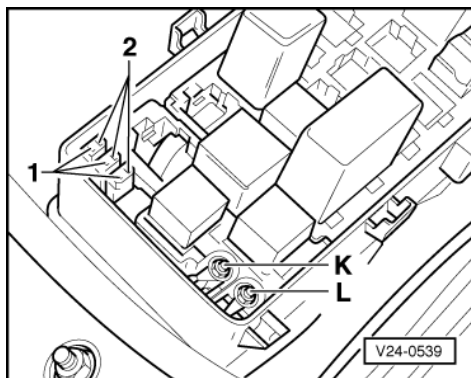
- ◆ V.A.G 1526 A
- ◆ V.A.G 1594 A
- ◆ V.A.G 1598 A
- ◆ V.A.G 1598/3
- ◆ VAS 5051 with VAS 5051/1 and VAS 5051/2

Attention:

Switch off ignition before checking wiring.

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7.2 - Checking power supply for "black" diagnostic connector



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-> Installation position of diagnostic connectors: In auxiliary relay carrier I

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

Contact assignment for "black" diagnostic connector:

- 1 - Earth
- 2 - Terminal 30

- Connect up multimeter for voltage measurement as follows.

Black diagnostic connector Contact	Measure to
1	Battery positive
2	Body earth

- Specification: approx. battery voltage in each case

If readings do not match specifications:

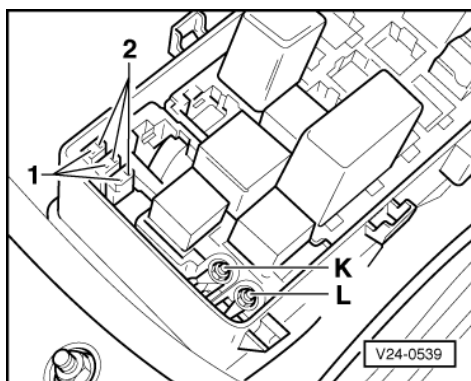
- If necessary, eliminate open circuit in wiring/short circuit.

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

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

Note:

This check must be performed if VAS 5051 indicates a problem with the communication link.



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

Checking K and L-wires - vehicles with no immobilizer

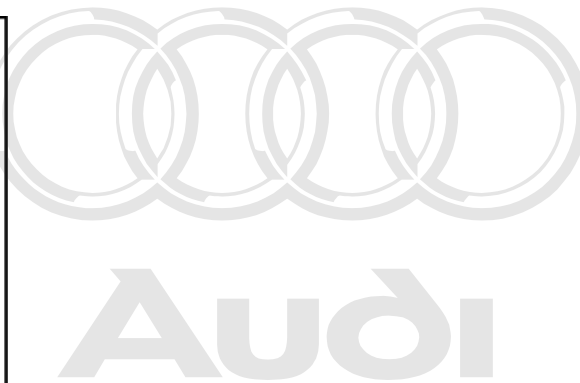
- Switch off ignition.
- Disconnect all wires of vehicle systems with self-diagnosis from wiring junction K.
- Establish K-wire for engine control unit and connect to wiring junction K.

Notes:

- ◆ Determine wiring colour if wires with different cable colours are connected to wiring junction K.

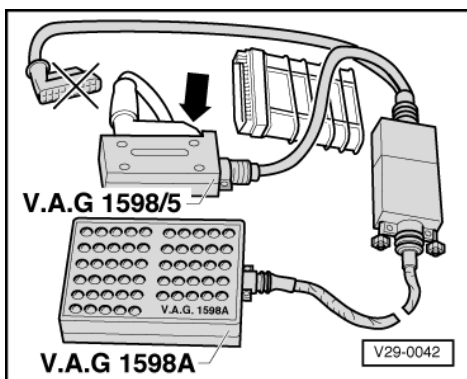
=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- ◆ If wires of the same colour are connected to wiring junction K, use test box V.A.G 1598 A (resistance measurement) to establish wire.
- Connect up vehicle diagnostic, testing and information system VAS 5051 => Page 1 and select vehicle system "01 - Engine electronics" from list. Ignition must be on.



-> If engine control unit identification **2** is displayed on vehicle diagnostic, testing and information system VAS 5051:

- ◆ Fault is to be found in a different system with self-diagnosis capability
- Establish other systems with self-diagnosis capability, connect them consecutively to wiring junction K and perform testing.



If control unit identification is still not displayed:

- -> With ignition switched off, use adapter V.A.G 1598/5 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit) => Page 48 .



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

White diagnostic connector Contact	Wiring junction	Test box V.A.G 1598 A Socket
1	L	13
2	K	55

- If necessary, eliminate open circuit in wiring/short circuit.

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

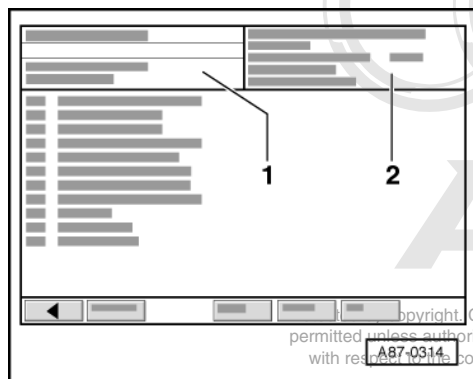
Note:

Proceed in the same manner to check L-wire.

Checking K and L-wires - vehicles with immobilizer

Wiring between "white" diagnostic connector and engine control unit is routed via wiring junction K in relay plate with fuse box and immobilizer control unit.

Wiring junction	White diagnostic connector Contact	Immobilizer control unit		Engine control unit Contact
		IN	OUT	
K	2	10	9	55
L	1	-	-	13



- Connect up vehicle diagnostic, testing and information system VAS 5051 => Page 1 and select vehicle system "25 - Immobilizer" from list. Ignition must be on.

-> If immobilizer control unit identification -2- is displayed on vehicle diagnostic, testing and information system VAS 5051:

- Continue with test A => Page 36 .

If immobilizer control unit identification is not displayed:

- Continue with test B => Page 37 .

Test A

- Check immobilizer control unit and wiring as follows.
- Switch off ignition.
- Unplug connector at immobilizer control unit -J362.

=> Electrical System; Repair Group 96; Servicing immobilizer; Removing and installing immobilizer control unit
Servicing immobilizer Removing and installing immobilizer control unit

- Use cable link to jumper contacts 9 and 10 in connector.
- Switch on ignition and select vehicle system "25 - Immobilizer" from vehicle diagnostic, testing and information system VAS 5051 list.

If engine control unit identification is displayed:

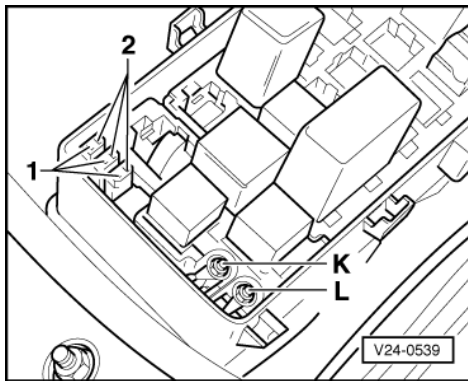
- Replace immobilizer control unit.

If engine control unit identification is not displayed:

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

Test B

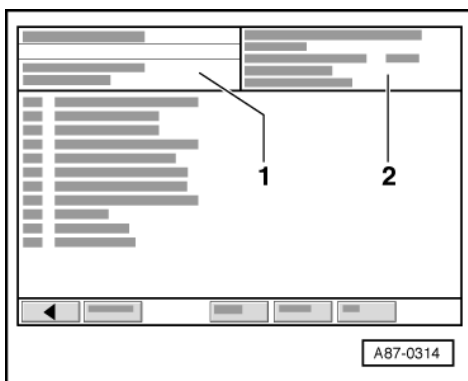
- Switch off ignition.



Note:

-> All the diagnostic wires of the various systems merge in the wiring junction K. A defective wire (short to earth or positive)/a defective control unit may also result in one of the fault messages listed.

- Disconnect all wires of vehicle systems with self-diagnosis from wiring junction K.
- Establish K-wire for immobilizer control unit -J362 and engine control unit and connect to wiring junction K.



- Switch on ignition and select vehicle system "25 - Immobilizer" from vehicle diagnostic, testing and information system VAS 5051 list.

-> If immobilizer control unit identification -2- is displayed on vehicle diagnostic, testing and information system VAS 5051:

- ◆ Fault is to be found in a different system with self-diagnosis capability

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- Establish other systems with self-diagnosis capability, connect them to wiring junction K and perform testing.

If immobilizer control unit identification is not displayed:

- Unplug connector at immobilizer control unit -J362.

=> Electrical System; Repair Group 96; Servicing immobilizer; Removing and installing immobilizer control unit
Servicing immobilizer Removing and installing immobilizer control unit

- Use current flow diagram to check for open circuit or short to earth/positive in wiring between contact 10 of immobilizer control unit connector and wiring junction K.
- If necessary, eliminate open circuit in wiring/short circuit.

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- Replace immobilizer control unit if there is neither an open circuit in the wiring nor a short circuit.

7.4 - Checking wiring of encoding connector

The following test need only be performed if the correct code is not displayed by the fault reader V.A.G 1551 although encoding connector is not assigned.

- With ignition switched off, use adapter V.A.G 1598/5 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit) => Page 48 .
- Check for short to earth/positive in the following wiring.

Encoding connector Contact	Test box V.A.G 1598 A Socket
1	38
2	39
3	12
4	30
5	9

- Eliminate short circuit if necessary.

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

If wiring is OK, but fault reader V.A.G 1551 does not display correct code:

- Replace engine control unit => Page 49 .

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24 - Mixture preparation, Injection

1 - Servicing Motronic injection system

1.1 - Servicing Motronic injection system

1.2 - Safety precautions

Attention:
 Fuel system is pressurised. Wrap cloth around joint before opening system. Then dissipate pressure by carefully unfastening joint.

Heed the following so as to avoid possible injury and/or the destruction of the injection and ignition system:

- ◆ Always switch off ignition before disconnecting and connecting injection and ignition system wires (also applies to measuring instrument leads).
- ◆ Never touch/disconnect ignition cables with engine running or at cranking speed.
- ◆ If engine is to be operated at cranking speed without it starting (e.g. compression test), unplug connectors from both output stages for ignition coils and from injectors. Interrogate fault memory on completion of work.
- ◆ Boost starting with rapid charger is only permitted for up to 1 minute at a maximum of 16.5 V.
- ◆ Always switch off ignition before washing engine.
- ◆ Always switch off ignition before disconnecting and connecting battery so as not to damage engine control unit.
- ◆ For connection of measuring instruments (e.g. voltage tester V.A.G 1527 B, portable multimeter V.A.G 1526), always make use of adapter set V.A.G 1594 A.

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Pay attention to the following if testers and measuring instruments have to be used in the course of a test drive:

- Attention:**
- ◆ **Always attach testers and measuring instruments to back seat and have them operated from there by a second person.**
 - ◆ **If testers and measuring instruments were to be operated from front passenger's seat, person sitting there could suffer injury in the event of an accident due to triggering of front passenger's airbag.**

1.3 - Rules for cleanliness

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

- ◆ Carefully clean all joints and adjacent areas before disconnecting.
- ◆ Place parts removed on a clean surface and cover them over. Do not use fluffy cloths.
- ◆ Carefully cover or seal opened components if repairs are not to be performed immediately.
- ◆ Only install clean components:
 Do not remove replacement parts from wrapping until immediately prior to installation.
 Do not use parts that have been stored loose (e.g. in tool boxes).
- ◆ When system is open:
 Do not work with compressed air if at all possible.
 Do not move vehicle unless absolutely necessary.
- ◆ Unplugged connectors:
 Protect against dirt and damp.



Only connect when dry.

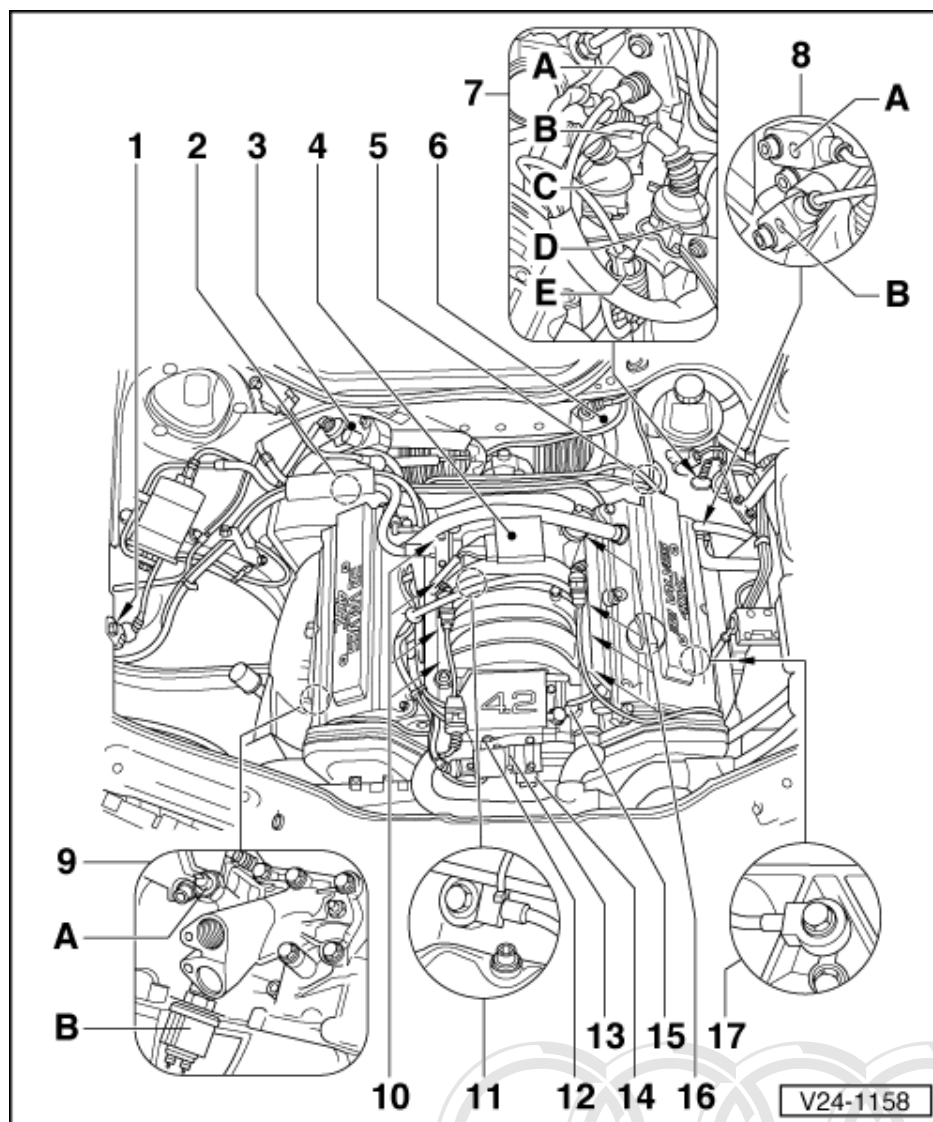
1.4 - Technical data

Engine codes		ABH (4.2 l / 206 kW engine)	AEC (4.2 l / 213 kW engine)
Idling speed Speed cannot be adjusted; regulated by idling speed stabilisation		690 ... 750 rpm	770 ... 830 rpm (manual gearbox) 670 ... 730 rpm (autom. gearbox)
Speed governing By deactivation of injectors		approx.. 6600 rpm	
Fuel pressure at idling speed	Vacuum hose connected	3.4 ... 3.7 bar	
	Vacuum hose disconnected	4.0 ... 4.3 bar	
Holding pressure after 10 minutes	Cold engine	approx. 3.5 bar	
	Warm engine	approx. 3.8 bar	
Injectors	Spray pattern	Two-hole nozzle/same for all injectors	
	Injection quantity (30 s)	105 ... 115 ml	
	Resistance (ambient temperature)	15 ... 17 ω	



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1.5 - Exploded view of fitting locations



1 Activated charcoal filter solenoid valve -N80

- ♦ Checking =>Page 94

2 Ignition distributor -O

- ♦ Bank 1
- ♦ With Hall sender -G40

3 Ignition coil -N

- ♦ Bank 1
- ♦ With output stage -N70
- ♦ Checking =>Page 112

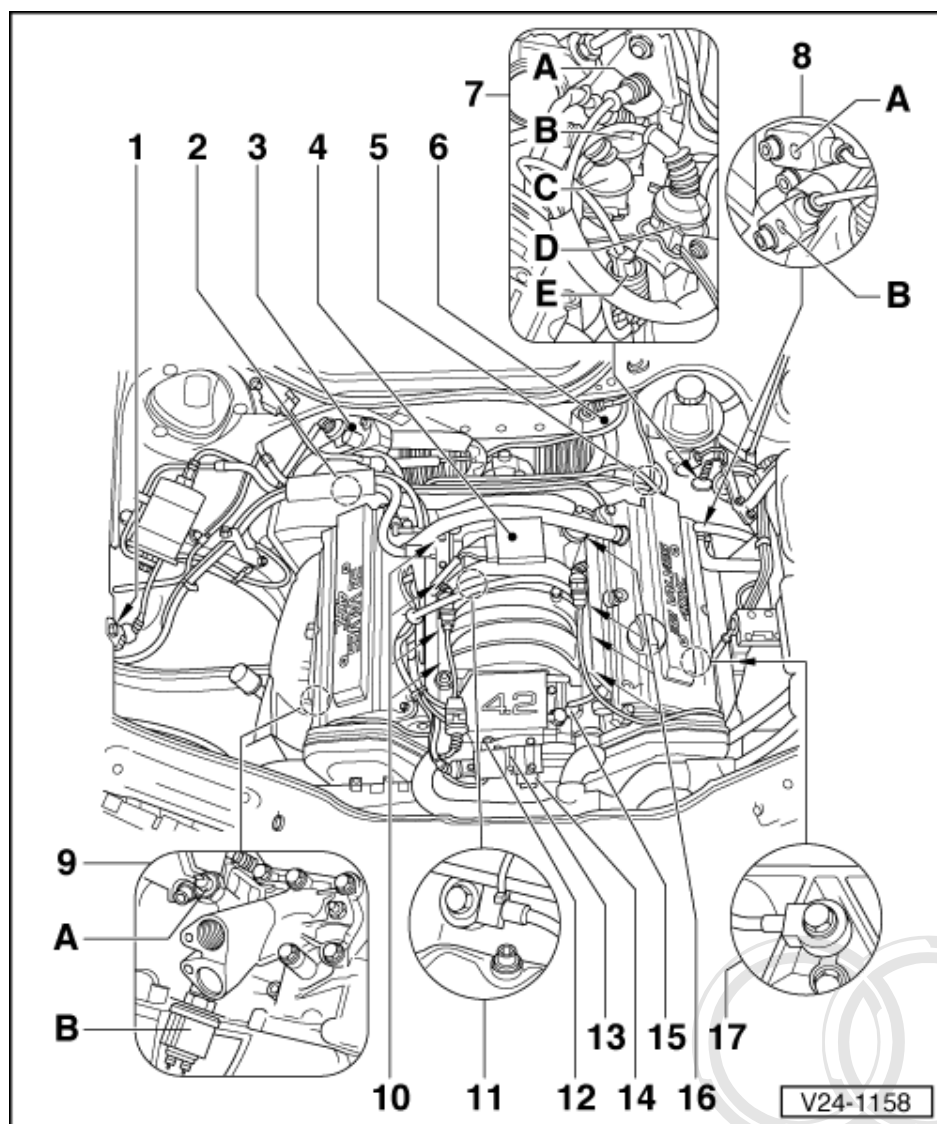
4 Air-mass meter -G70

- ♦ Checking =>Page 78

5 Ignition distributor 2 -O3

- ♦ Bank 2

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6 Ignition coil 2 -N128

- ◆ Bank 2
- ◆ With output stage-N127
- ◆ Checking =>Page **112**

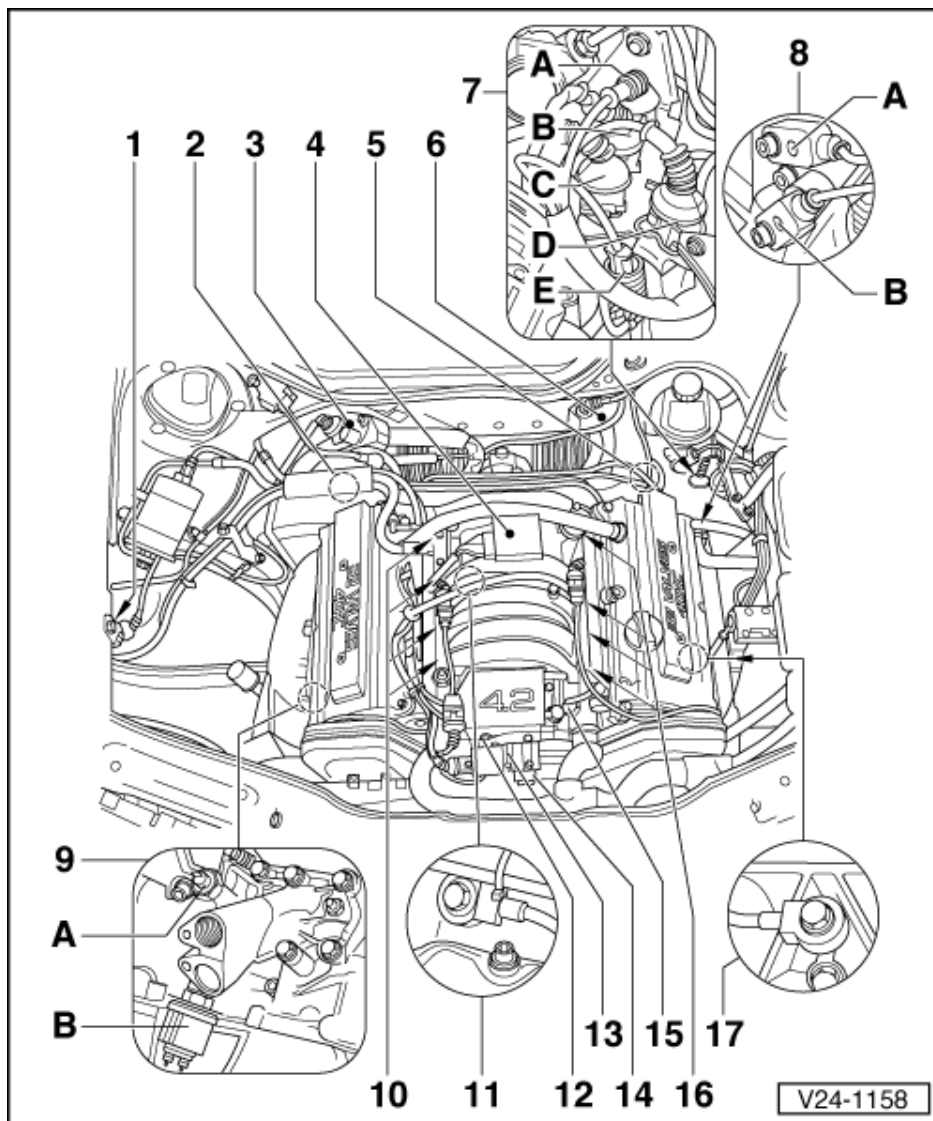
7 Connectors

- ◆ A - grey, 3-pin, for engine speed sender -G28
- ◆ B - brown, for gearbox speed sender
- ◆ C - black, 2-pin, for Lambda probe heater -Z19
- ◆ D - black, 3-pin, for firing point sender -G4
- ◆ E - 1-pin, for Lambda probe -G39 signal

8 Senders at cylinder bank 2

- ◆ A - Firing point sender -G4, black
- ◆ B - Engine speed sender -G28, grey

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9 Senders/switches at cylinder bank 1

- ♦ A - Oil pressure switch
- ♦ B - Oil pressure sender

10 Injectors

- ♦ Bank 1
- ♦ Cylinder 1 -N30
- ♦ Cylinder 2 -N31
- ♦ Cylinder 3 -N32
- ♦ Cylinder 4 -N33

11 Knock sensor 1 -G61

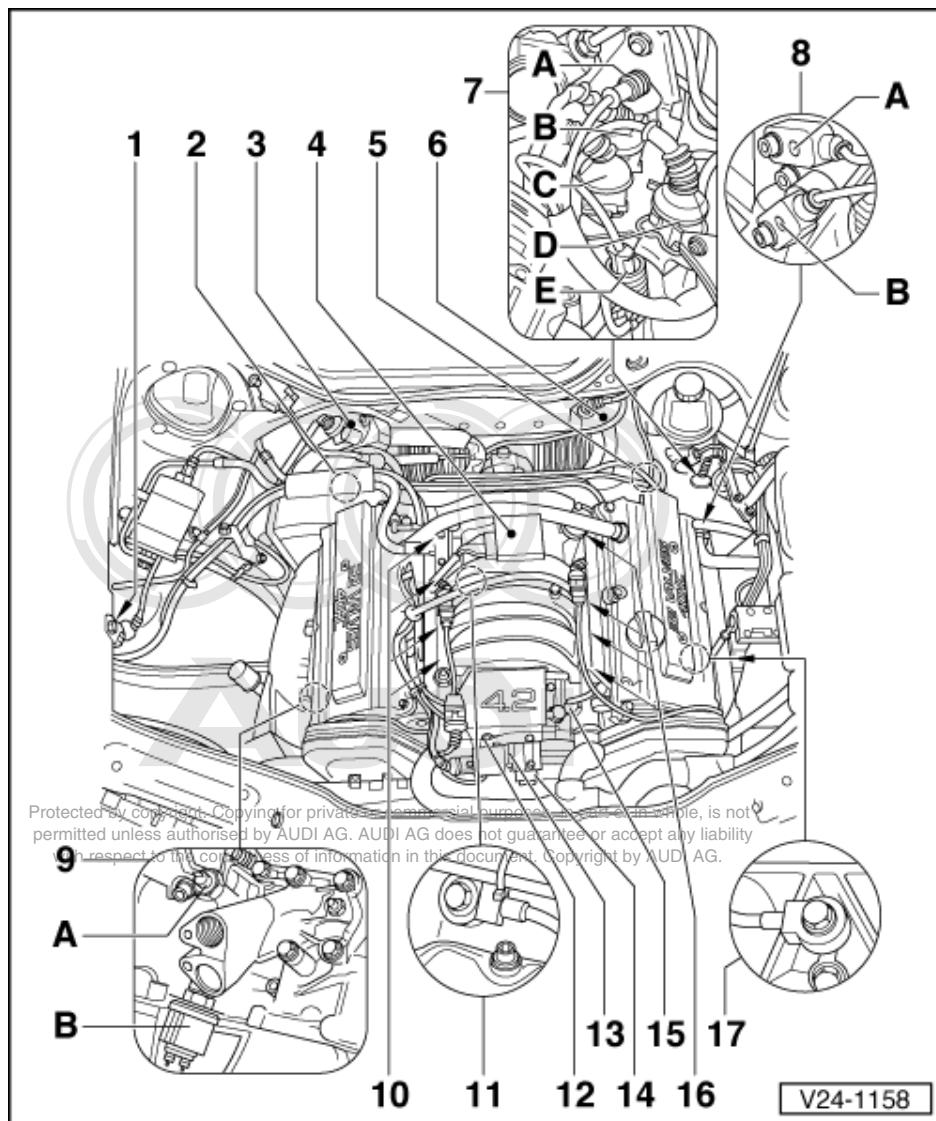
- ♦ Bank 1
- ♦ Beneath intake manifold

12 Intake-air temperature sender -G42

- ♦ Checking =>Page 121



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13 Idling-speed stabilisation valve -N71

14 Throttle valve potentiometer -G69

- ◆ With idling switch -F60

15 Coolant temperature sender -G62

- ◆ Checking =>Page **124**
- ◆ Dissipate cooling system pressure if necessary prior to removal

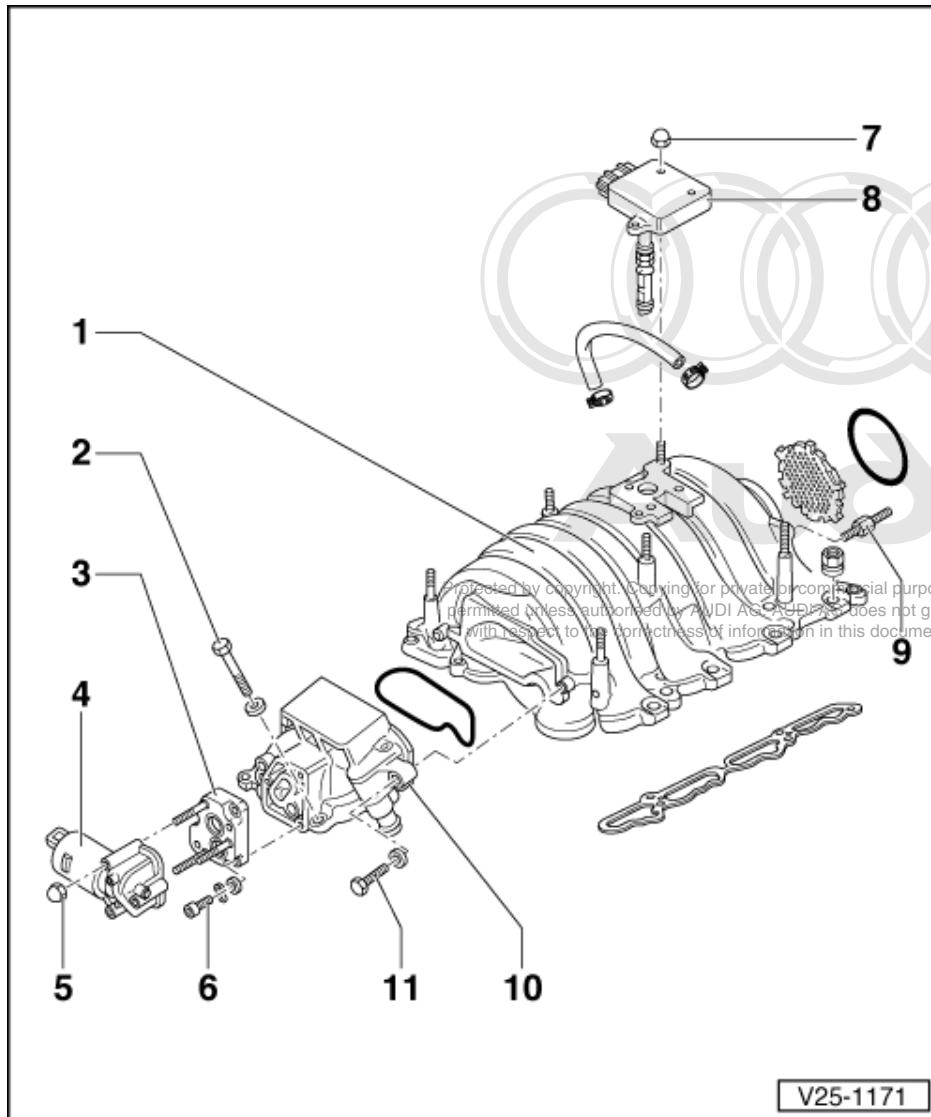
16 Injectors

- ◆ Bank 2
- ◆ Cylinder 5 -N83
- ◆ Cylinder 6 -N84
- ◆ Cylinder 7 -N85
- ◆ Cylinder 8 -N86

17 Knock sensor 2 -G66

- ◆ Bank 2

1.6 - Removing and installing injection system components

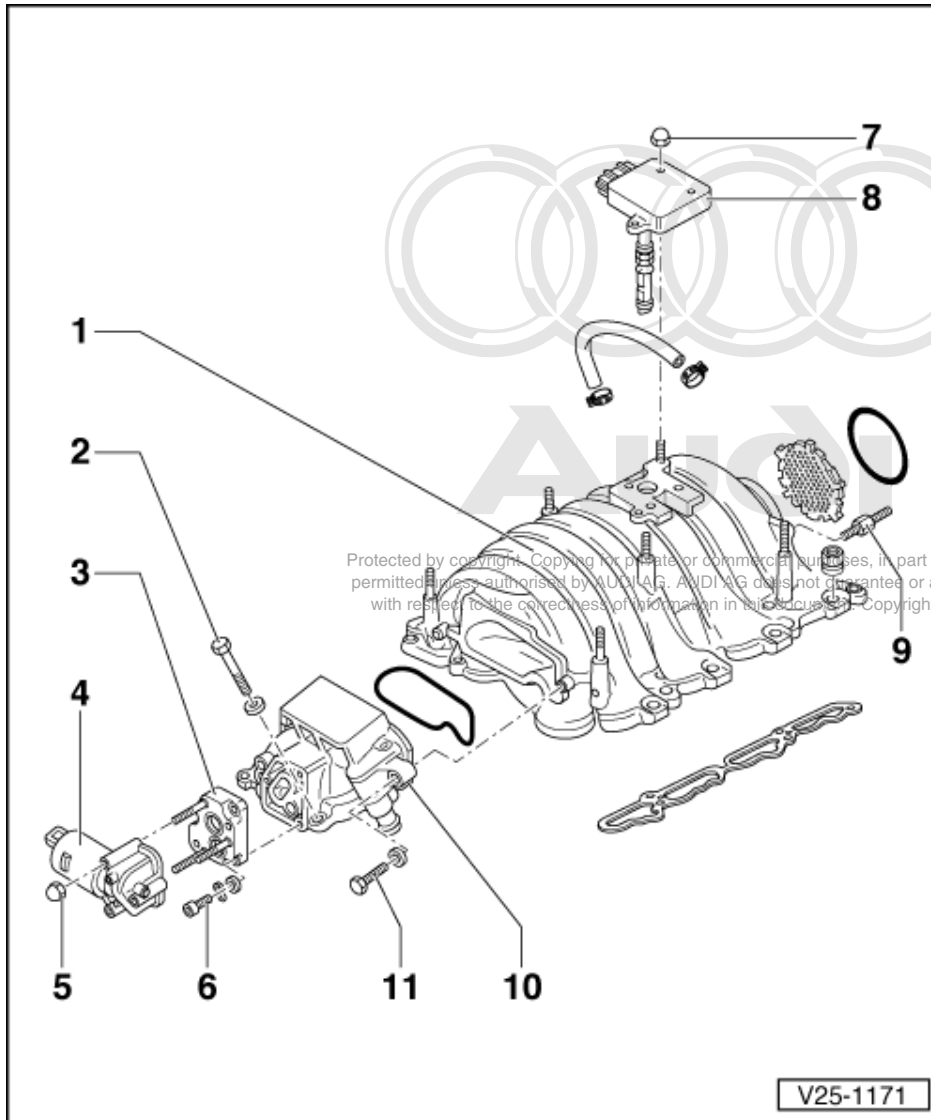


Note:

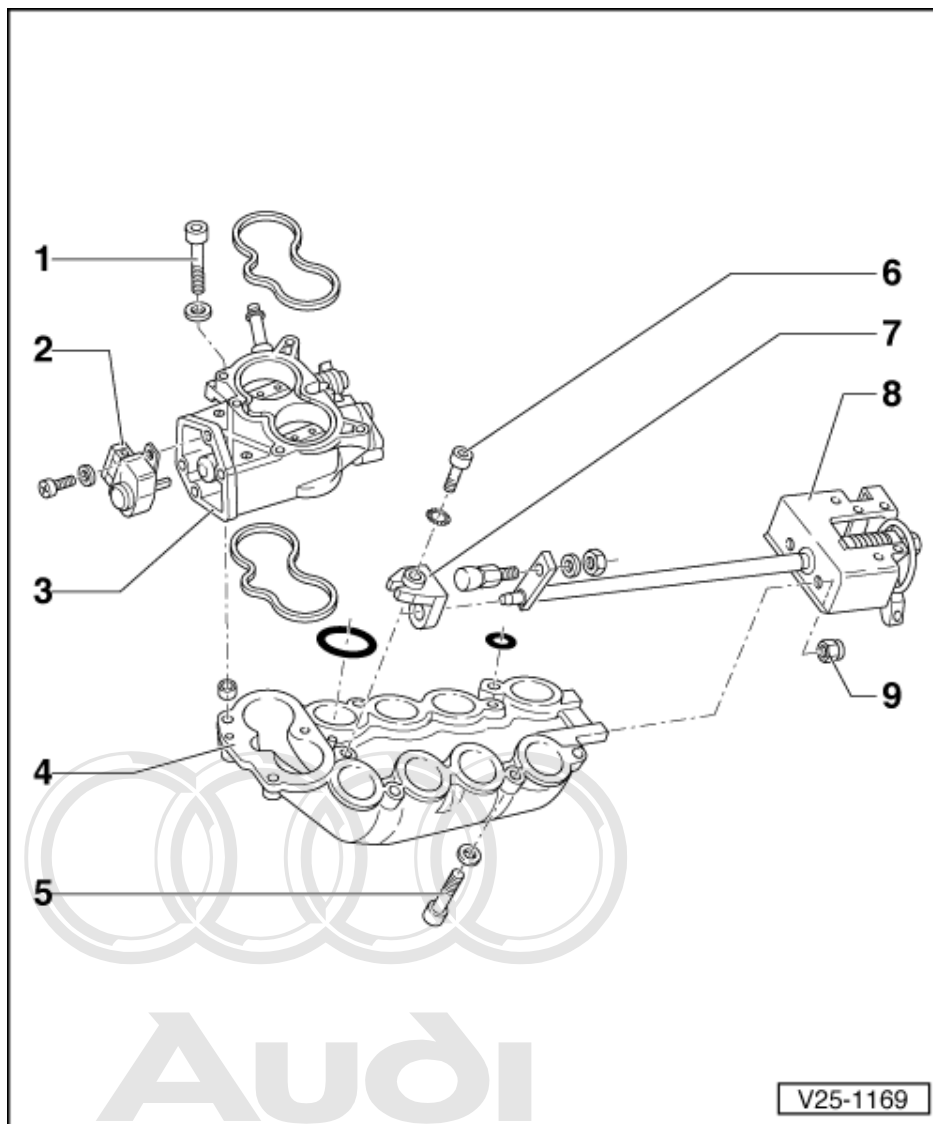
Always replace gaskets.

Part 1

- 1 Upper part of intake manifold
- 2 10 Nm
- 3 Flange
- 4 Idling-speed stabilisation valve -N71
- 5 10 Nm
- 6 5 Nm



- 7 5 Nm
- 8 Air-mass meter -G70
- 9 10 Nm
- 10 Connecting elbow
- 11 10 Nm



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Part 2

- 1 10 Nm
- 2 Throttle valve potentiometer -G69
 - ♦ With idling switch -F60
- 3 Throttle valve unit
- 4 Lower part of intake manifold
- 5 15 Nm
- 6 10 Nm
- 7 Mount
 - ♦ For linkage
- 8 Relay point
 - ♦ For accelerator mechanism
- 9 10 Nm
 - ♦ Apply locking fluid on fitting
 - ♦ For locking fluid refer to

=> Parts List

1.7 - Wiring and component check with test box V.A.G 1598 A and adapter 1598/5

Notes:

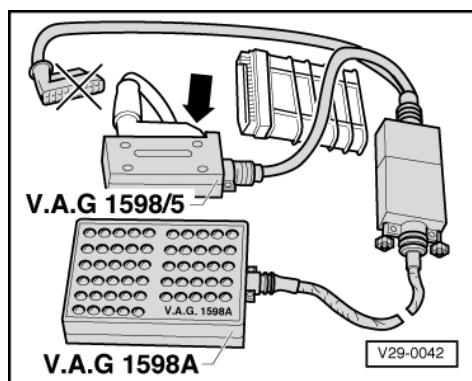
- ♦ Test box V.A.G 1598 A is not to be connected during diagnosis using vehicle diagnostic, testing and information system VAS 5051.
- ♦ Engine control-unit connector is only to be unplugged or attached 30 seconds after switching off ignition.
- ♦ For connection of measuring instruments (e.g. voltage tester V.A.G 1527 B, portable multimeter V.A.G 1526 A), always make use of adapter set V.A.G 1594 A.

Attention:

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

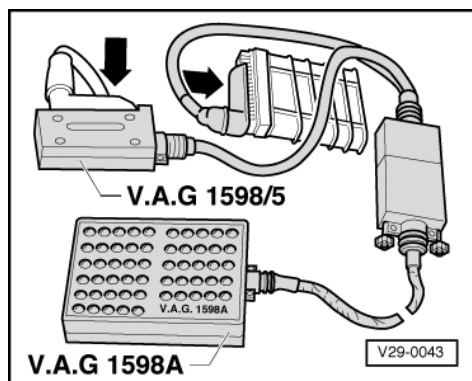
- Switch off ignition.
- Remove engine control unit => Page 49 .
- Disconnect control-unit plug after releasing clip.

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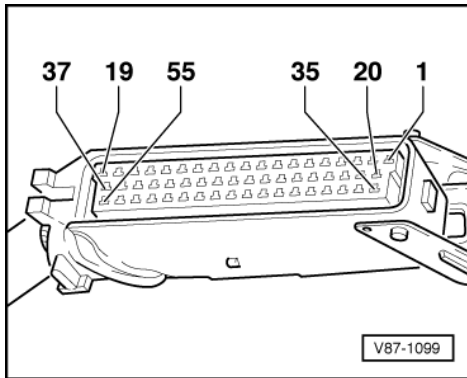
-> Checks at engine control-unit connector

- With ignition switched off, use adapter V.A.G 1598/5 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit).



-> Checks with engine control unit connected

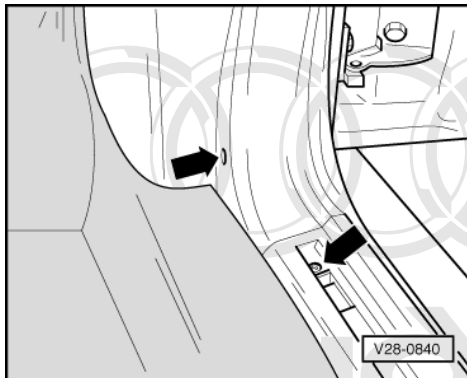
- Additionally connect test box V.A.G 1598 A to control unit using adapter V.A.G 1598/5.
- Perform testing as described in appropriate repair operations.



Notes:

- ◆ -> Contact assignment at engine control-unit connector
- ◆ Contact assignment is identical to socket assignment of test box V.A.G 1598 A.

1.8 - Replacing engine control unit



Removing

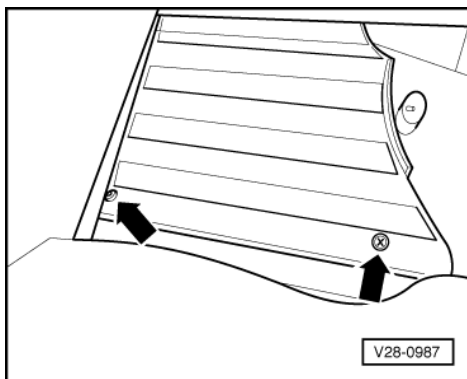
Switch off ignition.
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-> Remove bottom right A-pillar trim and right sill panel trim in area of front door.

=> General Body Repairs; Repair Group 70; Trim; Removing and installing A-pillar trim Trim Removing and installing A-pillar trim

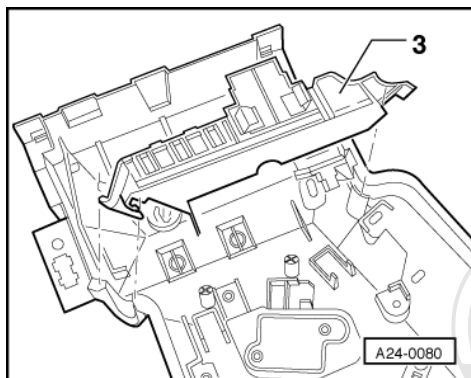
=> General Body Repairs; Repair Group 70; Trim; Removing and installing inner sill panel trim Trim Removing and installing inner sill panel trim

- Fold back floor covering in front right footwell (if necessary, use knife to cut open perforated seam on left).

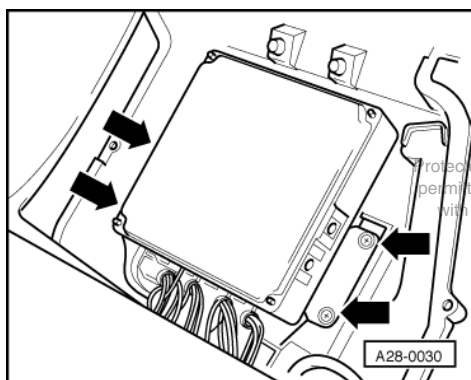




- -> Screw out bolts for cover of electronics box -arrows-.
- Carefully disengage upper and lower cover section.



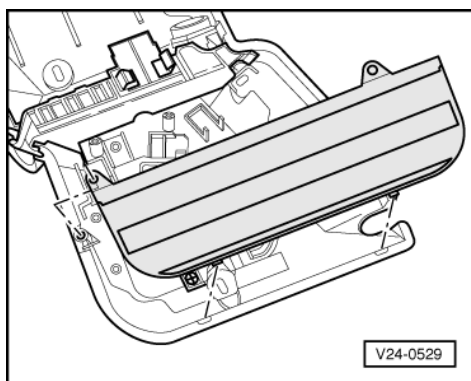
- -> Pull out transverse brace -3- with attachments.



- -> Unscrew engine control unit from electronics box in footwell on right -arrows-.
- Take out engine control unit.
- Disconnect control-unit plug after releasing clip.

Note:

Control-unit connector is only to be unplugged or attached 30 seconds after switching off ignition.



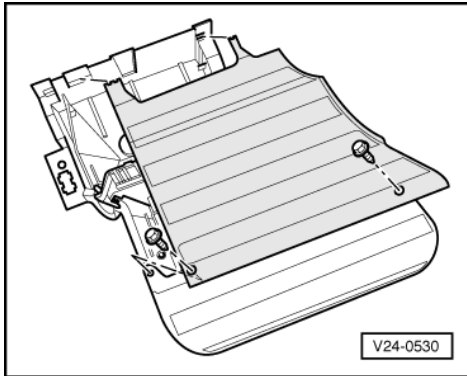
Installing

Install in reverse order, paying attention to the following:

Note:

Control-unit connector is only to be unplugged or attached 30 seconds after switching off ignition.

- -> Guide lower cover section into both openings of electronics box in footwell on right.



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

Vehicles with immobilizer:

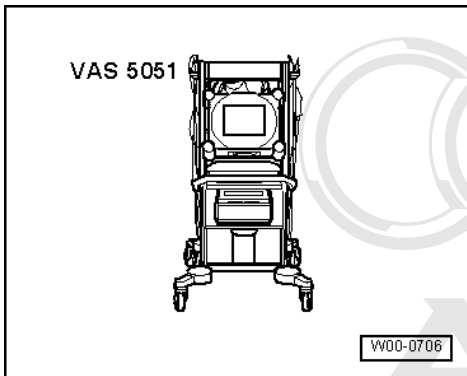
- Match engine electronics control unit to immobilizer control unit.

=> Electrical System; Repair Group 01; Self-diagnosis; Adaption on replacement of engine control unit Self-diagnosis Adaption on replacement of engine control unit

1.9 - Checking idling speed

Notes:

- ◆ Idling speed cannot be adjusted.
- ◆ Idling speed is checked during basic setting of engine.



Special tools and workshop equipment required

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

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Test requirements:

- No leaks in exhaust system
- Coolant temperature at least 85 °C
- No faults stored in fault memory
- Electr. loads switched off (radiator fan must not run during test)
- Air conditioner switched off
- No pressure gauge connected
- Vehicles with automatic gearbox: Selector lever set to P or N



Test sequence

- Connect up vehicle diagnostic, testing and information system VAS 5051 => Page **1** and select vehicle system "01 - Engine electronics" from list. Engine must be idling.
- Interrogate fault memory =>Page **4**. There must not be any faults stored. If necessary, eliminate fault, erase fault memory, switch off and re-start engine, perform test drive and re-interrogate fault memory as a check.
- Leave engine idling.

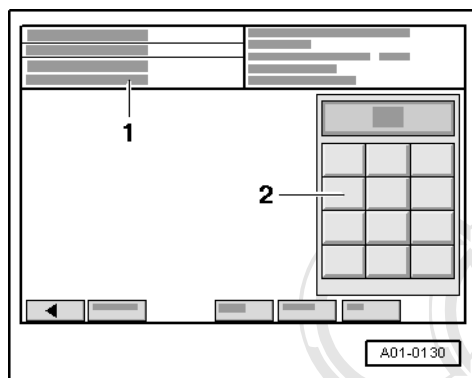
Attention:

Electric radiator fan must not run.



-> Display on VAS 5051:

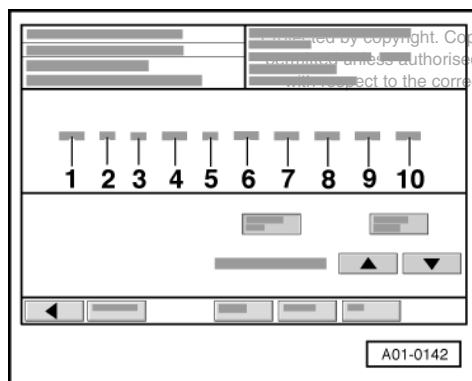
- From list -1- select diagnosis function "04 - Basic setting".



-> Display on VAS 5051:

- 1 - Enter display group
Highest possible entry = 255

- Use keypad -2- to enter "000" for "Display group number 000" and confirm by touching Q key.

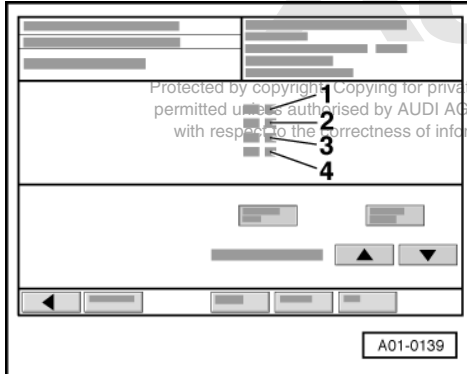


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-> Display on VAS 5051:

- Check whether engine speed in display zone -3- is within permitted tolerance range.

Engine	Specification	Indicated on display
ABH	690...750 rpm	69...75
AEC with manual gearbox	770...830 rpm	77...83
AEC with autom. gearbox	670...730 rpm	67...73



-> Display on VAS 5051:

If reading matches specification:

- Terminate function "04 - Basic setting" by touching ◀ key.

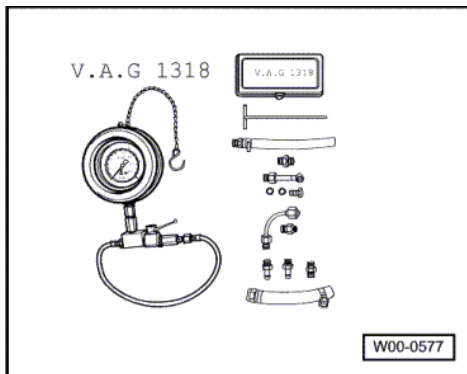
If reading does not match specification:

- Interrogate fault memory again =>Page 4 .

Perform the following tests marked with a dot if idling speed is too high/too low and no faults have been stored in the fault memory:

- Check intake system for unmetered air =>Page 81 .
- Check idling-speed switch =>Page 101 .
- Activated charcoal filter solenoid valve permanently open; checking =>Page 94 .

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





Special tools and workshop equipment required

- ♦ V.A.G 1318

Note:

The fuel pressure regulator controls the fuel pressure as a function of the intake manifold pressure at the throttle valve unit.

Test requirements:

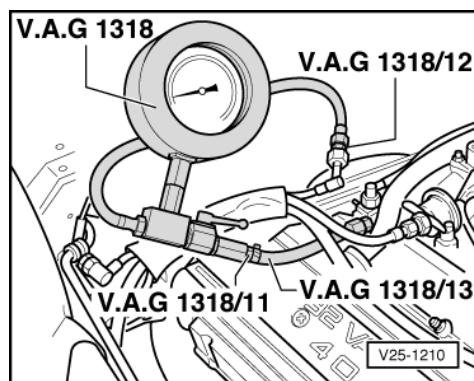
- Fuel pump relay OK; checking => Page 68
- Fuel pump OK; checking

=> Fuel Supply System - Petrol Engines; Repair Group 20

- Fuel filter OK
- Battery voltage at least 12.7 V

Attention:

Fuel system is pressurised. Wrap cloth around joint before opening system. Then dissipate pressure by carefully unfastening joint.



Checking system pressure and fuel pressure regulator

- -> Connect up pressure gauge V.A.G 1318 as shown between fuel supply pipe and fuel rail.
- Open pressure gauge cut-off valve. Lever points in direction of flow.
- Disconnect vacuum pipe between pressure regulator and intake manifold at pressure regulator and seal pipe.

Notes:

- ♦ Replace pressure regulator if fuel emerges at vacuum connection of pressure regulator when performing the following pressure test.
- ♦ In the course of the following test, the engine is not to be run for any longer than necessary with vacuum hose detached, as the higher fuel pressure enriches the fuel/air mixture, which could cause the Lambda control limits to be exceeded and result in a fault entry.
- Start engine and let it idle.
- Switch off electr. loads (air conditioner etc.).
- Measure fuel pressure.
 - Specification: 4.0 ... 4.3 bar
- If reading does not match specification, try replacing pressure regulator and repeat pressure test.
- If reading still does not match specification, check fuel pump/supply pipe for damage (e.g. crushing) and replace if necessary.
- If specification is exceeded, check return pipe for damage (e.g. crushing) and replace if necessary.
- Attach vacuum hose to pressure regulator and in doing so observe drop in pressure on pressure gauge.

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- Fuel pressure must decrease by roughly 0.5 bar when vacuum hose is connected.

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

- 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 pressure regulator if there is no leakage and vacuum connection is not blocked.

Checking holding pressure

- Holding pressure 10 minutes after switching off engine (minimum pressure):
 - Specification with cold engine: approx. 3.0 bar
 - Specification with warm engine: approx. 3.5 bar

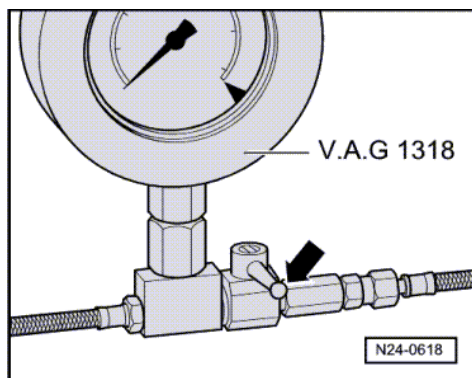
Note:

Increase in pressure with warm engine is normal on account of fuel expansion.

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If reading does not match specification:

- Start engine and let it idle.



- -> Switch off ignition once pressure has built up. At the same time, close cut-off valve of pressure gauge V.A.G 1318 (lever at right angles to direction of flow -arrow-).

Possible faults if pressure does not now decrease:

- ♦ Leak in union between pressure gauge and fuel supply pipe
- ♦ Leak in supply pipe at fuel tank
- ♦ Non-return valve in fuel pump leaking

=> Fuel Supply System - Petrol Engines; Repair Group 20

Possible faults if pressure decreases again:

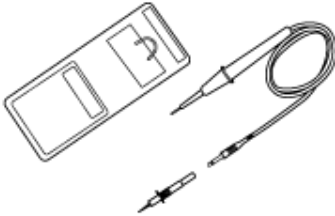
- ♦ Fuel pressure regulator defective
- ♦ Injectors leaking
- ♦ Leak in pressure gauge unions downstream of cut-off valve

Note:

Before detaching pressure gauge, dissipate fuel pressure by opening cut-off valve. When doing so, hold vessel in front of connection.

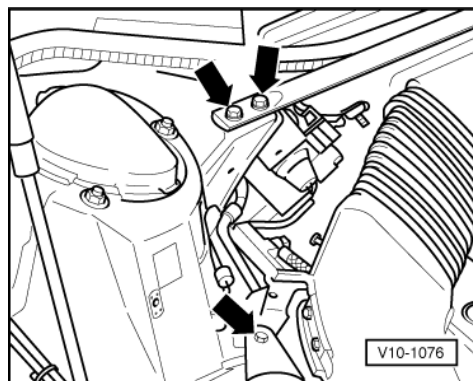


1.11 - Checking injectors

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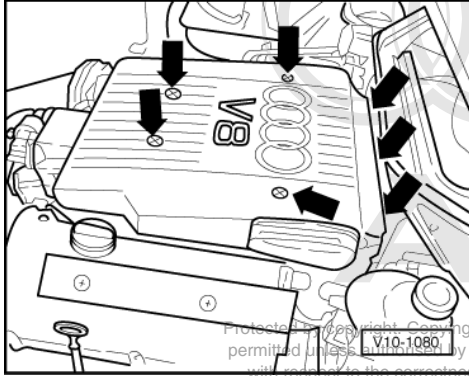
Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1527 B
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598 with V.A.G 1598/5

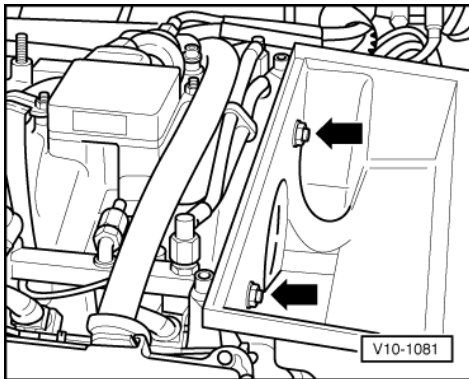


Checking internal resistance

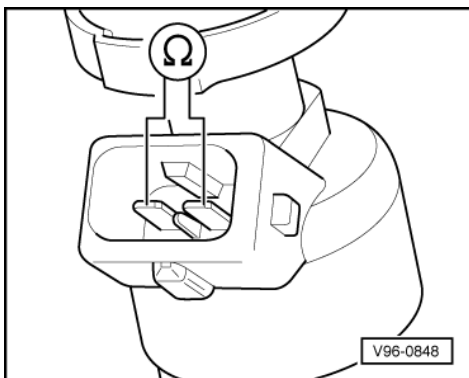
- -> Unscrew air pipe holders on left and right -bottom arrow-.
- Pull out air pipes.
- Unscrew dome brace -top arrows-.



- -> Unscrew top part of air cleaner housing -arrows-.



- -> Unscrew bottom part of air cleaner housing -arrows-.
- Press bottom part of housing to rear and lift it out.



- Unplug connector at injector to be checked.
- -> Connect multimeter to injector for resistance measurement.
 - Specification: 15 ... 17 Ω (at ambient temperature)

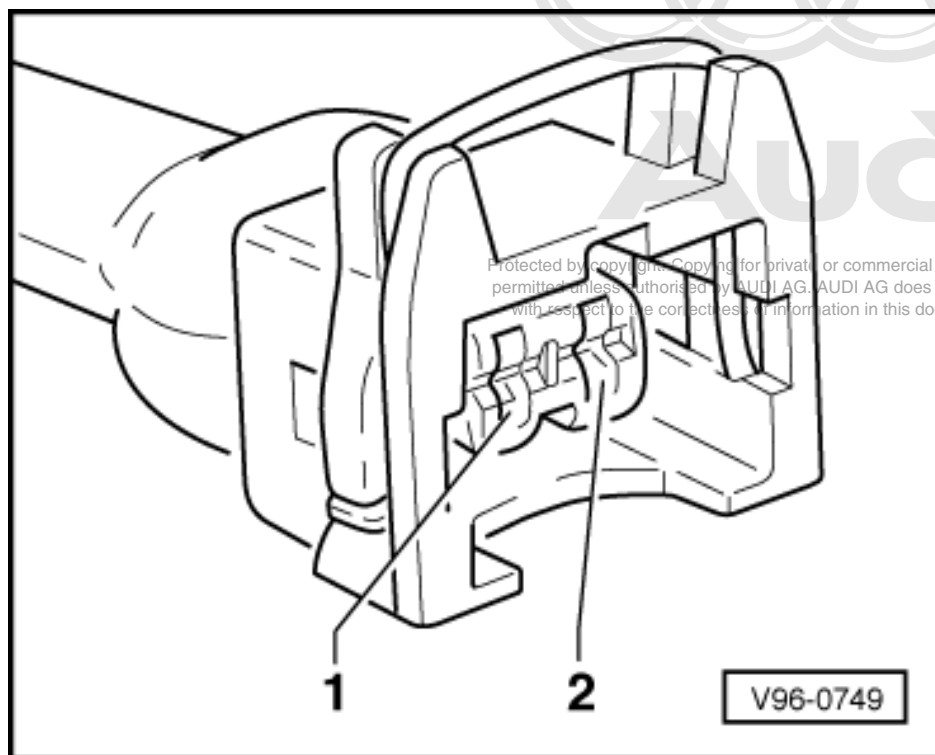
If reading does not match specification:

- Replace injector.

If reading matches specification:



- Check power supply.



Checking power supply

Test requirements:

- Fuse for injectors OK
- => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder
- Fuel pump relay OK; checking => Page 68
 - Unplug connector at injector to be checked.
 - -> Connect up voltage tester V.A.G 1527 B as follows.

Connector Contact	Measure to
2	Engine earth

- Briefly operate starter (engine may start).
 - LED must light

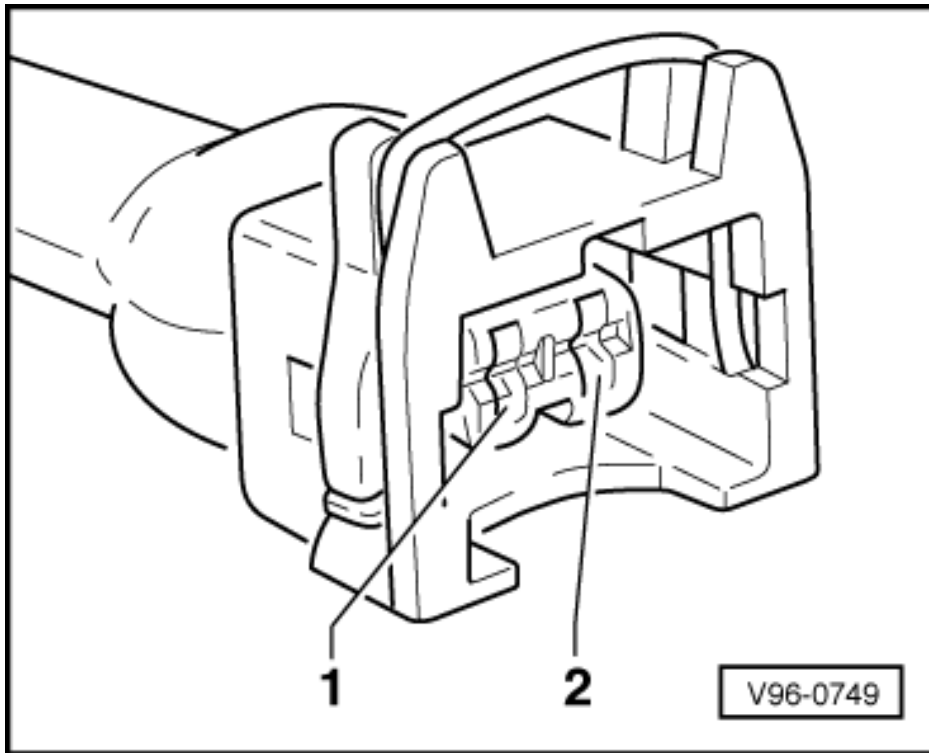
If LED does not light:

- Check for open circuit in wiring between contact 2 and fuse for injectors

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

If LED lights:

- Check actuation of injectors.



Checking actuation

Test requirement:

- Injector internal resistance OK
- -> Connect up voltage tester V.A.G 1527 B as follows.

Connector Contact	Measure to
1	Battery positive

- Briefly operate starter (engine may start).
- LED must flash

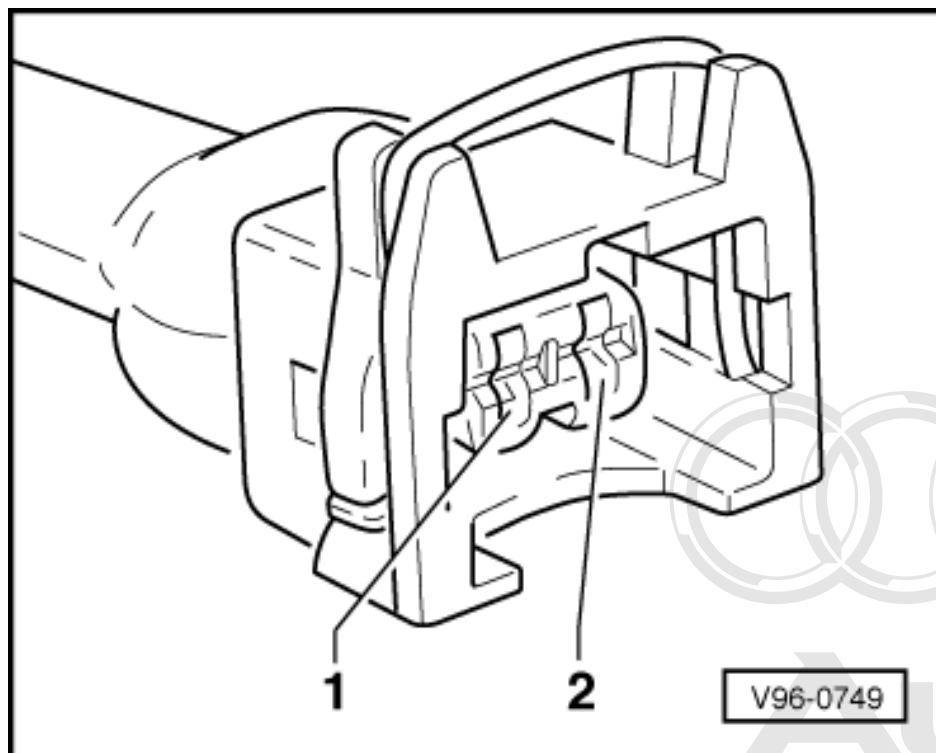
Note:

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Voltage testers with a low current input do not go out completely between actuation of engine control unit, but rather continue to glow slightly and become somewhat brighter on actuation.

If LED does not flash:

- With ignition switched off, use adapter V.A.G 1598/5 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit) => Page 48 .



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

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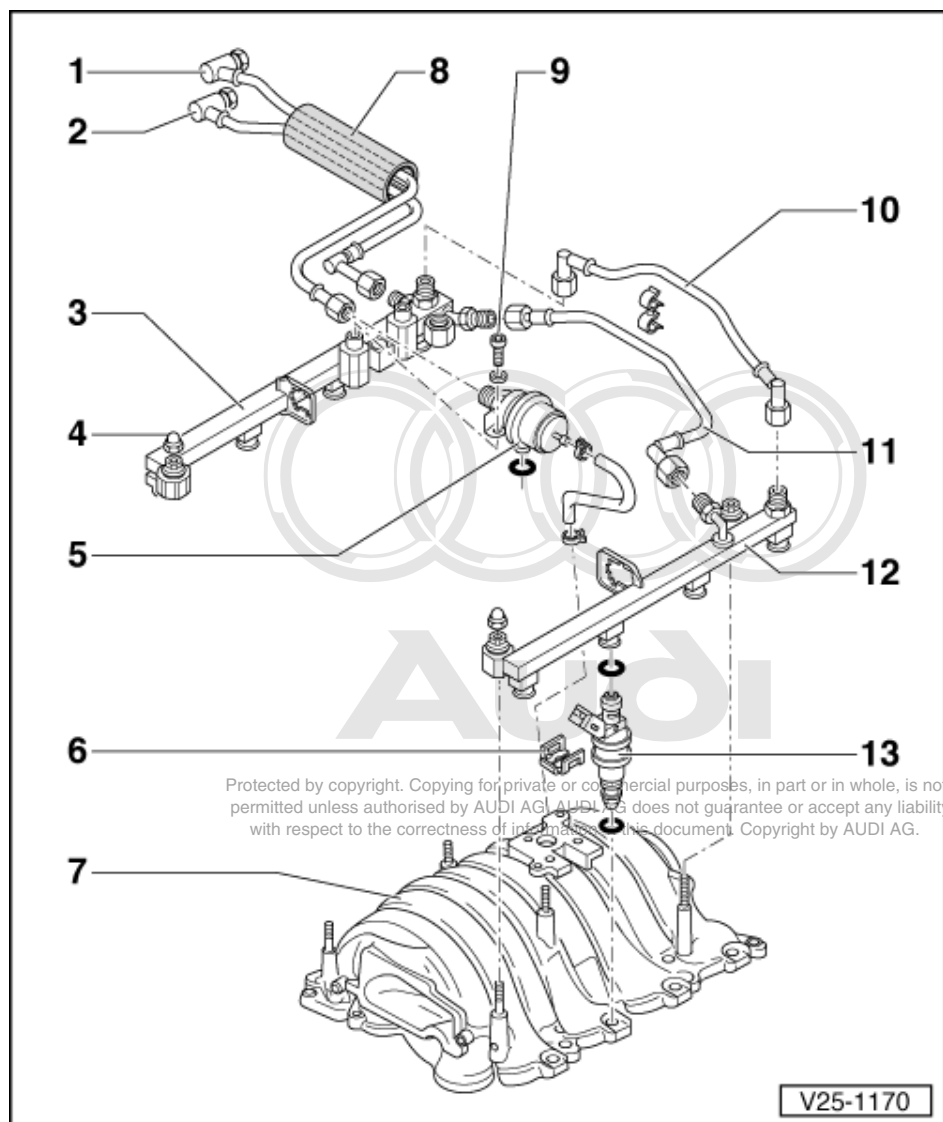
Cylinder	Injector connector Contact	Test box V.A.G 1598 A Socket
1	1	36
2	1	32
3	1	15
4	1	35
5	1	17
6	1	34
7	1	33
8	1	16

- If necessary, eliminate open circuit in wiring/short circuit.

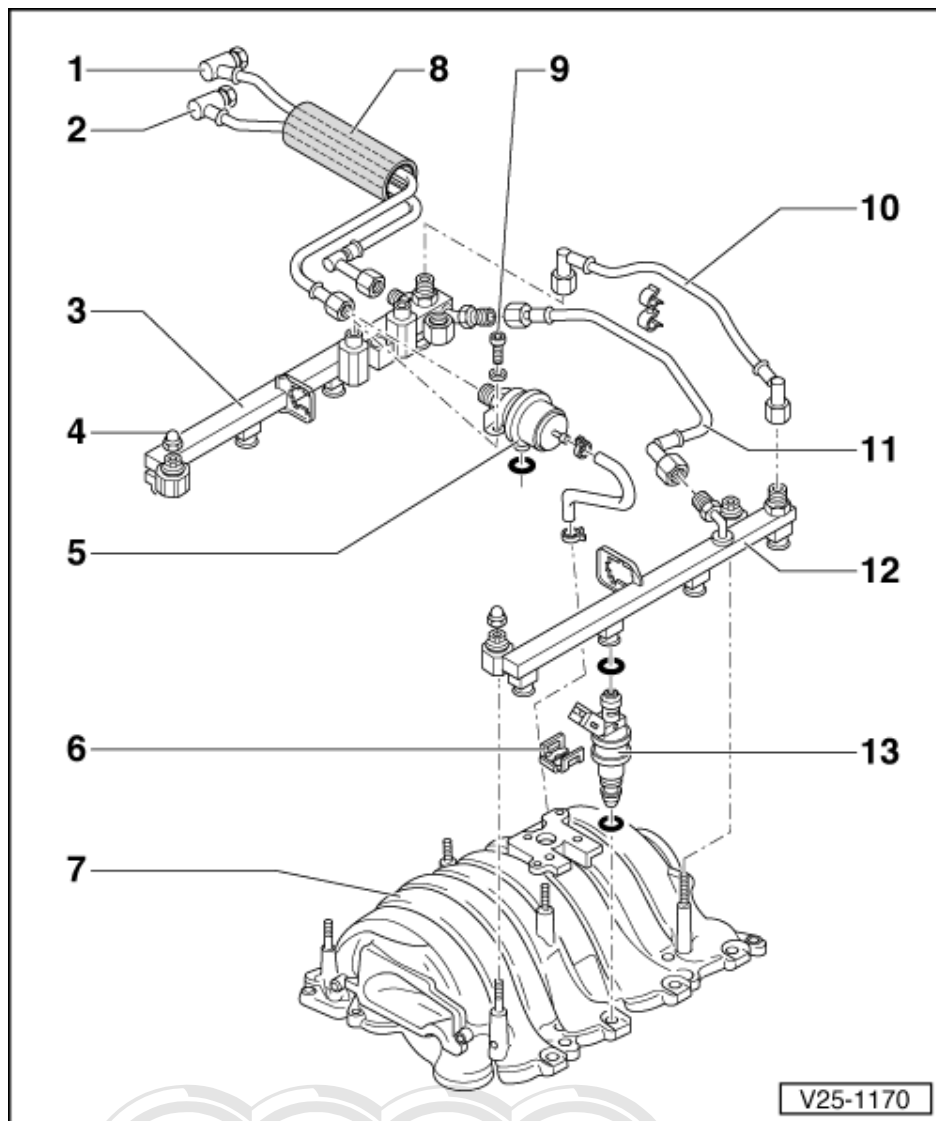
If wiring is OK:

- Replace engine control unit => Page 49 .

1.12 - Dismantling and assembling fuel rail with injectors



- 1 Fuel return pipe**
 - ♦ Tighten to 25 Nm
- 2 Fuel supply pipe**
 - ♦ Tighten to 25 Nm
- 3 Fuel rail**
 - ♦ Cylinder bank 1
- 4 10 Nm**
- 5 Fuel pressure regulator**
- 6 Clip**
- 7 Intake manifold**
- 8 Protective sleeve**



9 10 Nm

10 Supply connecting pipe

- ♦ Tighten to 25 Nm

11 Return connecting pipe

- ♦ Tighten to 25 Nm

12 Fuel rail

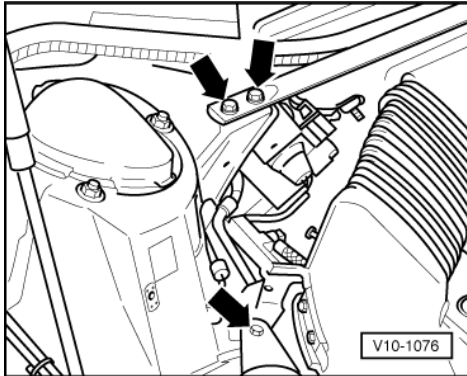
- ♦ Cylinder bank 2

13 Injector

- ♦ Replace O-ring
- ♦ Moisten O-ring with fresh engine oil on fitting

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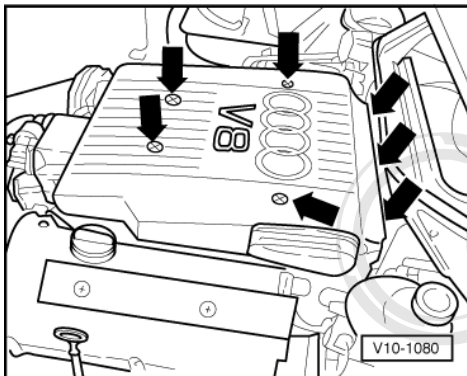
1.13 - Removing and installing injectors



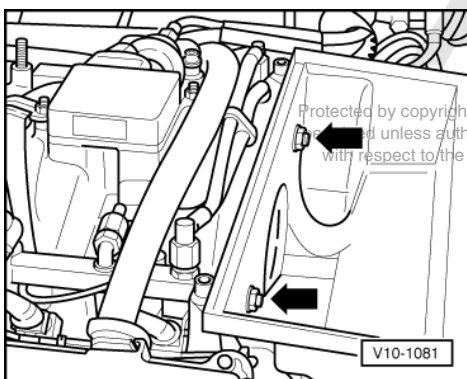
Note:

All cable ties unfastened or cut open on removal are to be re-attached in same position on installation.

- -> Unscrew air pipe holders on left and right -bottom arrow-.
- Pull out air pipes.
- Unscrew dome brace -top arrows-.

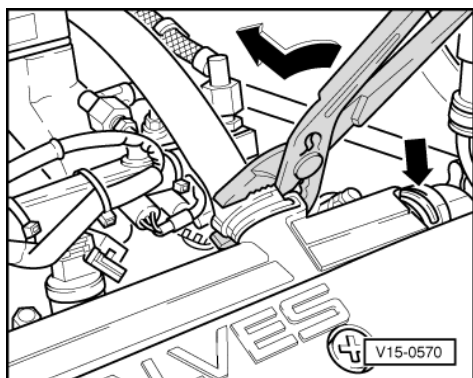


- -> Unscrew top part of air cleaner housing -arrows-.

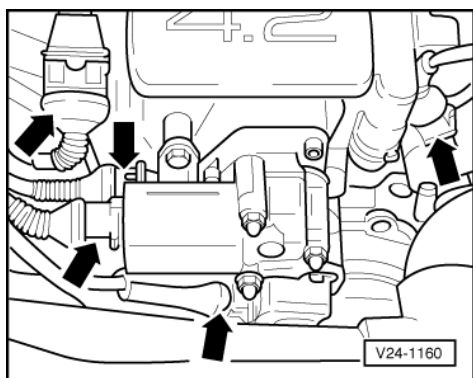


- -> Unscrew bottom part of air cleaner housing -arrows-.
- Press bottom part of housing to rear and lift it out.

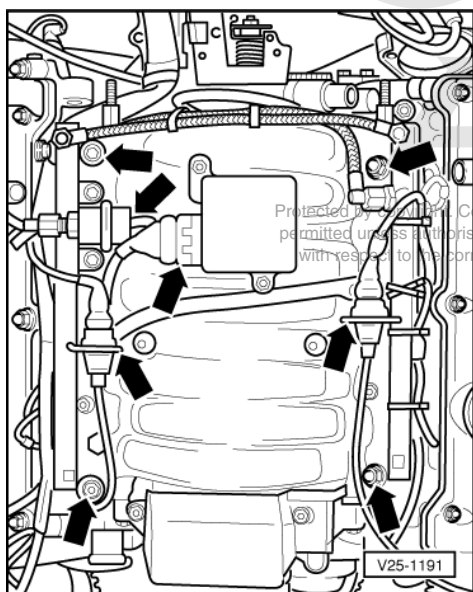
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- -> Remove breather hose at top by turning hose with pliers until retainer tab disengages -top arrow-.
- Cut through cable ties at fuel rails.
- Unscrew top part of clamp for engine wiring harness behind intake manifold -right arrow-.



- -> Unplug connectors -arrows- at:
- Throttle-valve potentiometer -G69
- Coolant temperature sender -G62
- Idling-speed stabilisation valve -N71
- Intake-air temperature sender -G42
- Oil pressure switch/oil pressure sender



- -> Unplug connectors at:

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- Air-mass meter -G70
- Knock sensors -G61 and -G66
- Detach vacuum hose at fuel pressure regulator.
- Unscrew fuel rails on left and right.
- Evenly lift fuel rails together with injectors off intake manifold.

Attention:
 Fuel system is pressurised. Wrap cloth around joint before opening system. Then dissipate pressure by carefully unfastening joint.

- Pull off clip and detach injector.

Install in reverse order, paying attention to the following:

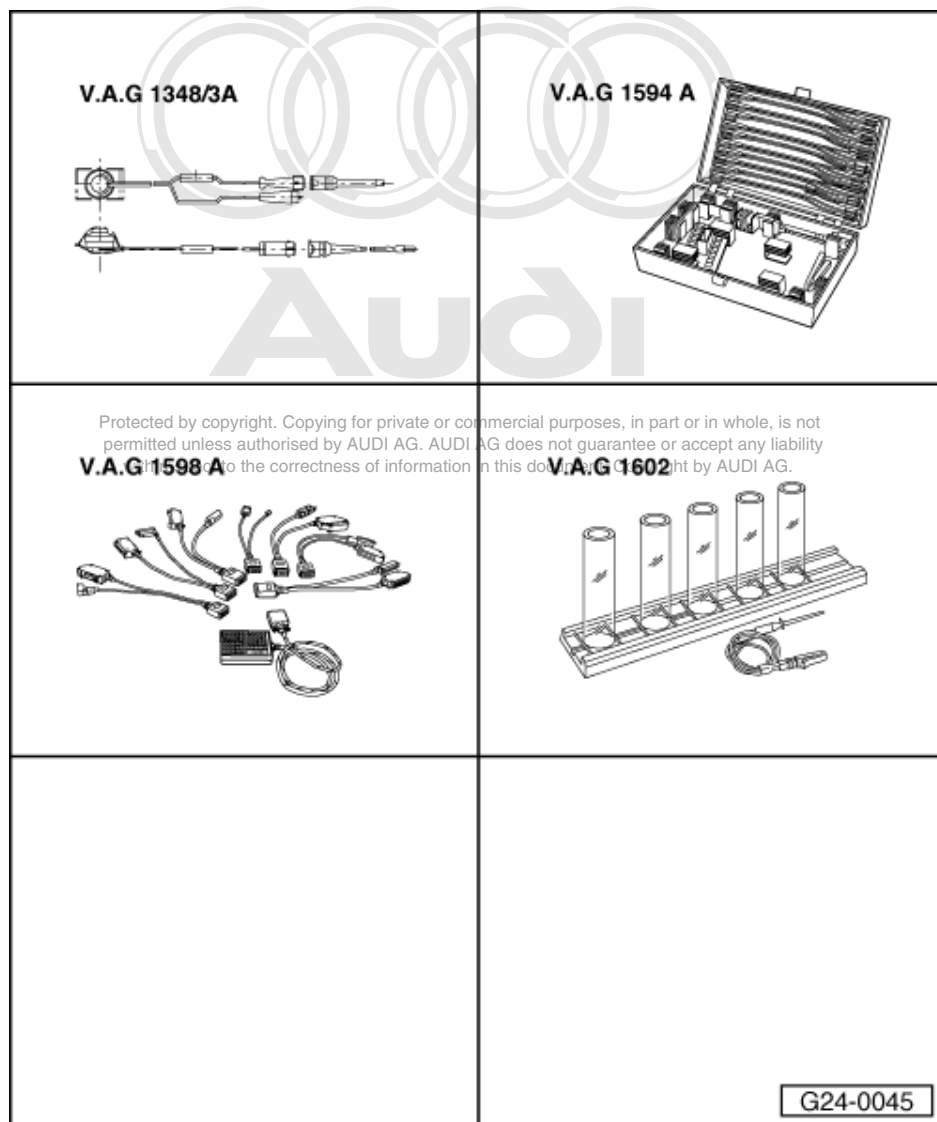
- Replace O-rings at all joints opened. (to replace front O-ring, never pull plastic cap off valve head - lift O-ring over plastic cap).
- Moisten O-rings with fresh engine oil.
- Make sure injectors are installed in correct position.
- Make sure clips are properly connected.
- Position fuel rails with secured injectors at intake manifold and press in evenly.

Tightening torque

Component	Nm
Fuel rail to intake manifold	10

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1.14 - Checking injection quantity, freedom from leaks and spray pattern of injectors



Special tools and workshop equipment required

- ♦ V.A.G 1348/3A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598 with V.A.G 1598/5
- ♦ V.A.G 1602

Test requirement:

- Fuel pressure OK; checking => Page 53

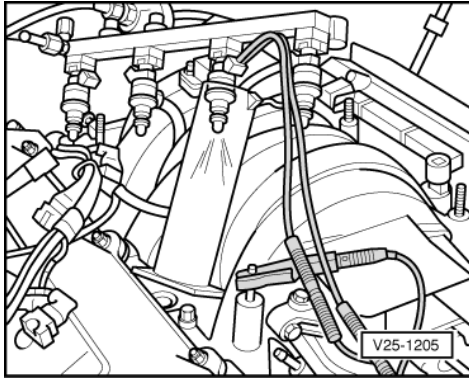
Test sequence

- Remove fuel rails with injectors installed from intake manifold
=> Page 63 .
- With ignition switched off, use adapter V.A.G 1598/5 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit) => Page 48 .

Leak test

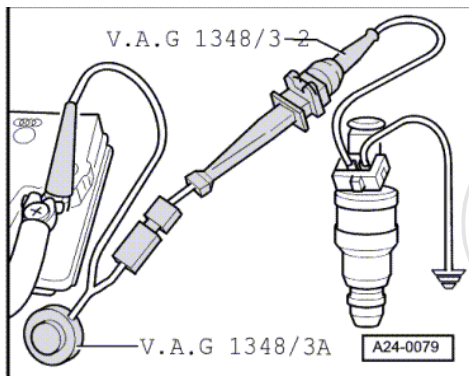
- Use leads from adapter set V.A.G 1594 A to jumper contacts 3 and 10 at test box.
- Switch on ignition.

- Fuel pump must run
- Check injectors for leaks (visual inspection). With fuel pump running, only 1...2 drops per minute per injector may emerge.
- In the event of greater fuel loss, switch off fuel pump (switch off ignition) and replace defective injector => Page 63 .



Checking injection quantity

- -> Hold injector to be tested over graduated beaker of injection quantity tester V.A.G 1602.



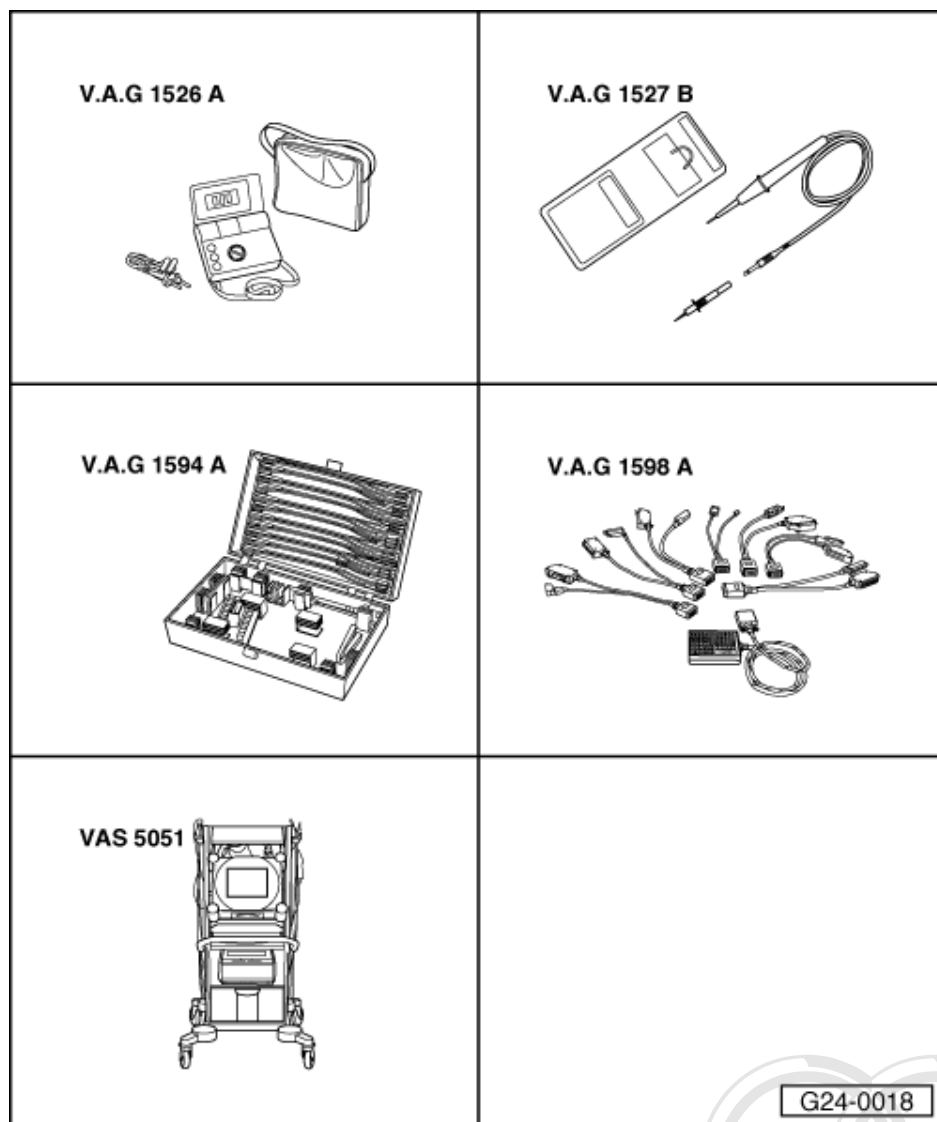
- -> Connect one contact of injector to engine earth using test lead and crocodile clamp from V.A.G 1594 A.
- Connect second contact of injector to positive with remote control V.A.G 1348/3A, adapter lead V.A.G 1348/3-2 and test lead.
- Operate remote control V.A.G 1348/3A for 30 seconds.
- Once all 4 injectors of a cylinder bank have been actuated, place the graduated beakers on a flat surface.
 - Specification for each injector: 105 ... 115 ml
- Repeat test at injectors of second cylinder bank.
- If the measured value for one or more injectors is outside the tolerance, switch off fuel pump (switch off ignition) and replace defective injector => Page 63 .
- If measured values for all injectors are outside tolerance, check fuel pressure => Page 53 .

Note:

Spray pattern is also to be checked when checking injection quantity. It must be the same for all injectors.



1.15 - Checking fuel pump relay -J17 and actuation



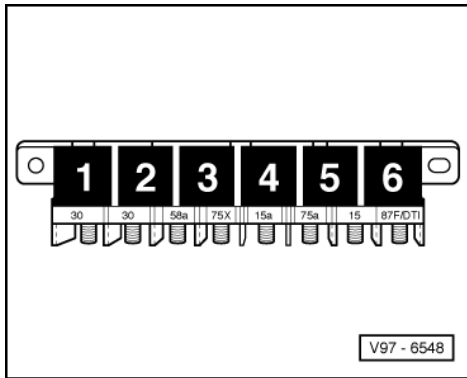
Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1527 B
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598 with V.A.G 1598/5
- ♦ VAS 5051 with VAS 5051/1 and VAS 5051/2

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

A prerequisite for energisation of the fuel pump relay -J17 is that the engine is running. In other words, earth is not applied to the relay (via the engine control unit) until engine speed pulses are detected in the engine control unit.

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Note:

-> Fitting location of fuel-pump relay: Central electrics beneath dash panel on left, position 6

Test requirement:

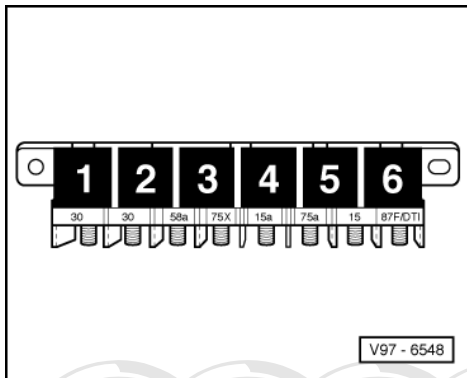
- Battery voltage at least 12.7 V

Checking operation of fuel-pump relay

- Remove driver's storage compartment.

=> General Body Repairs; Repair Group 70; Dash Panel; Removing and installing storage compartment and glove box Dash Panel Removing and installing storage compartment and glove box

- Connect up vehicle diagnostic, testing and information system VAS 5051 => Page 1 and select vehicle system "01 - Engine electronics" from list. Ignition must be on.



- Start final control diagnosis => Page 19 and actuate injector, cylinder 1 -N30.
- -> Fuel-pump relay (central electrics beneath dash panel on left, position 6) must be energised and fuel pump must run
- Terminate function "03 - Final control diagnosis" by touching ◀ key.

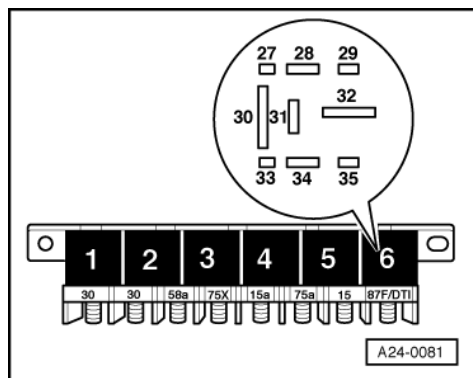
A - If relay is not energised:

- Check power supply of fuel-pump relay => Page 70 .
- Check actuation of fuel pump relay => Page 70 .

B - If relay is energised, but fuel pump does not run:

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

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Checking power supply of fuel-pump relay

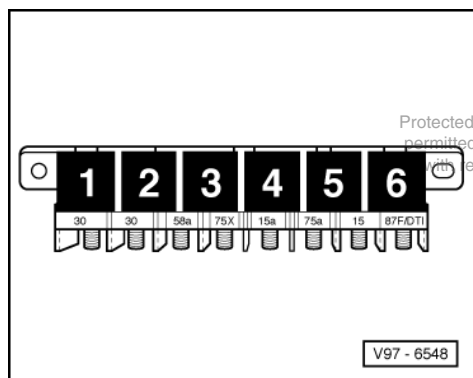
- Disconnect fuel-pump relay.
- ➔ Connect multimeter for voltage measurement to contact 32 of relay socket and earth.
- Specification: approx. battery voltage
- Switch off ignition.

If reading does not match specification:

- Replace central electrics.

Checking actuation of fuel pump relay

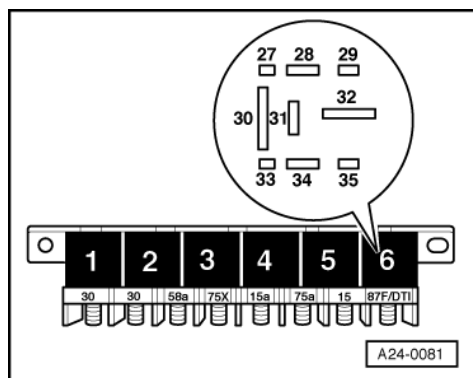
- With ignition switched off, use adapter V.A.G 1598/5 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit) => Page 48 .
- Use leads from adapter set V.A.G 1594 A to jumper contacts 3 and 10 at test box.



- Switch on ignition.
- ➔ Fuel-pump relay (central electrics beneath dash panel on left, position 6) must be energised

If relay is now energised, but not during final control diagnosis:

- Replace engine control unit => Page 49 .



If relay is not energised:

- Switch off ignition.
- Disconnect cable link.
- Disconnect fuel-pump relay.
- -> Connect up multimeter for voltage measurement as follows.

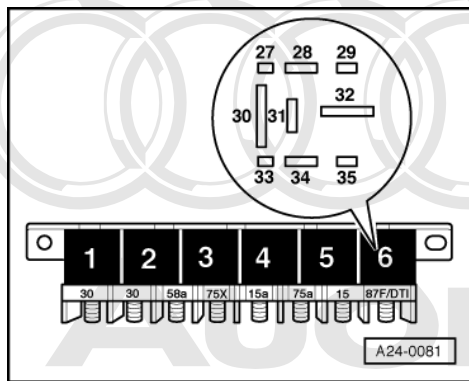
Central electrics at front beneath dash panel on left, position 6 Contact	Measure to
28	Engine earth

- Switch on ignition.
- Specification: approx. battery voltage

If reading does not match specification:

- Check wiring.

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder



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If reading matches specification:

- Switch off ignition.

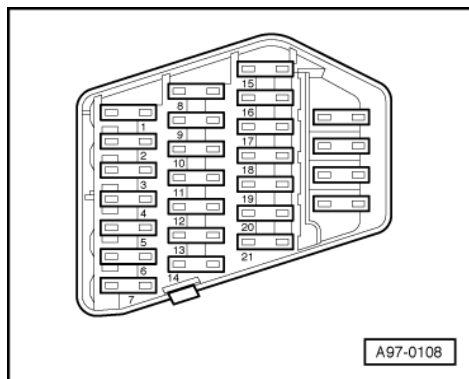
- -> Check for open circuit and short to earth/positive in the following wiring.

Central electrics at front beneath dash panel on left, position 6 Contact	Test box V.A.G 1598 A Socket
29	3

- If necessary, eliminate open circuit in wiring/short circuit.

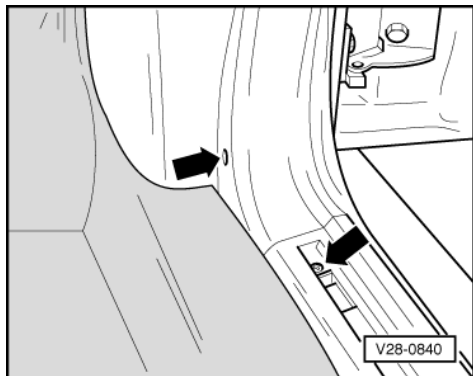
If no fault is found:

- Replace fuel pump relay -J17.
- Re-connect engine control unit.



Checking power supply for fuel pump and components

- Detach cover from fuse box on left.
- -> Pull out fuse S17.

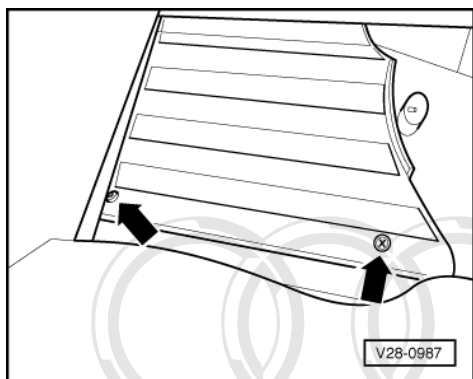


- -> Remove bottom right A-pillar trim and right sill panel trim in area of front door.

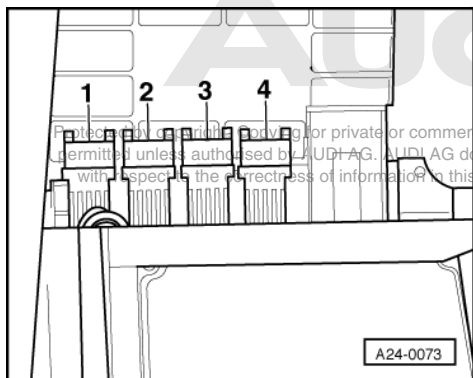
=> General Body Repairs; Repair Group 70; Trim; Removing and installing A-pillar trim Trim Removing and installing A-pillar trim

=> General Body Repairs; Repair Group 70; Trim; Removing and installing inner sill panel trim Trim Removing and installing inner sill panel trim

- Fold back floor covering in front right footwell (if necessary, use knife to cut open perforated seam on left).



- -> Screw out bolts for cover of electronics box -arrows-.
- Carefully disengage upper and lower cover section.



- -> Pull out fuses S72/S116 (in brown box -2-) and S75 (in black box -1-) in electronics box in passenger's footwell.

- Start final control diagnosis => Page **19** and actuate injector, cylinder 1 -N30.
- Connect up multimeter for voltage measurement to earth and to one of the contacts of the following fuses.

Fuse	Specification at one of the contacts
S17 (No. 17 in fuse box)	approx. battery voltage
S72 (in brown box) or S116	approx. battery voltage
S75 (in black box)	approx. battery voltage

If readings do not match specifications:

- Repeat test at other contact of fuse socket.

If readings still do not match specifications:

- Check wiring.

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

If no fault is found in wiring:

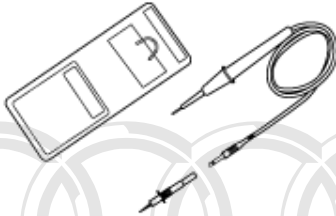
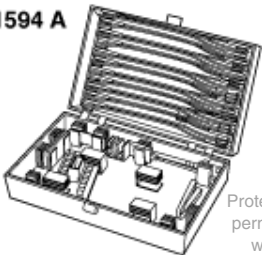
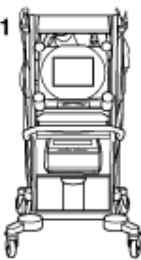
- Replace fuel pump relay -J17.
- Re-insert fuses.



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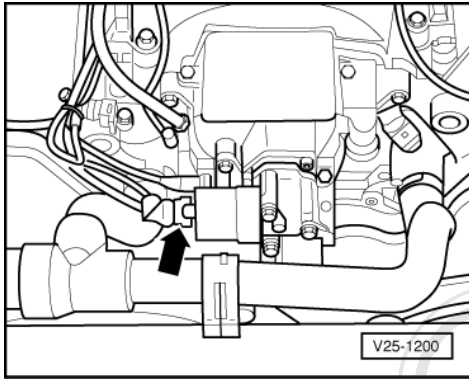
1.16 - Checking idling-speed stabilisation valve -N71

V.A.G 1526 A 	V.A.G 1527 B 
V.A.G 1594 A 	V.A.G 1598 A  Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.
VAS 5051 	G24-0018

Special tools and workshop equipment required

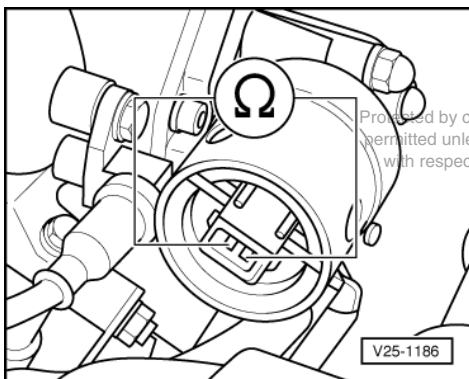
- ♦ V.A.G 1526 A
- ♦ V.A.G 1527 B
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598 with V.A.G 1598/5
- ♦ VAS 5051 with VAS 5051/1 and VAS 5051/2

Fitting location => Exploded view of fitting locations - Page 41



Checking internal resistance

- Switch off ignition.
- -> Unplug connector -arrow- at idling-speed stabilisation valve.



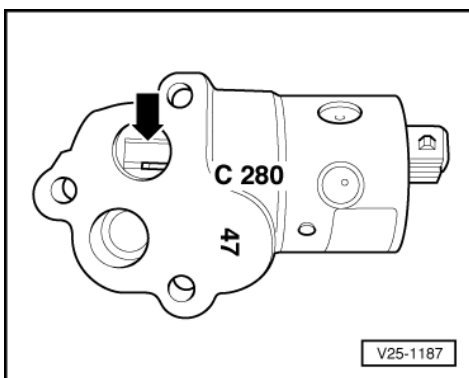
- -> Connect multimeter to valve for resistance measurement.
- Specification: 7 ... 11 Ω

Note:

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

If reading does not match specification:

- Replace idling-speed stabilisation valve.



Mechanical checking

- Remove idling-speed stabilisation valve.

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

Note:

To check freedom of movement, never use screwdriver or the like to move piston slide.

- Attach connector to removed idling-speed stabilisation valve.
- Switch on ignition.
- Start final control diagnosis and actuate idling-speed stabilisation valve -N71 => Page 19 .
- Check whether piston slide moves properly from stop to stop.

If scoring is found which impairs freedom of movement or if piston slide does not move freely (sticking, sluggish or not moving from stop to stop):

- Replace idling-speed stabilisation valve.
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If idling-speed stabilisation valve does not react during final control diagnosis:

- Check power supply.

Checking power supply**Test requirements:**

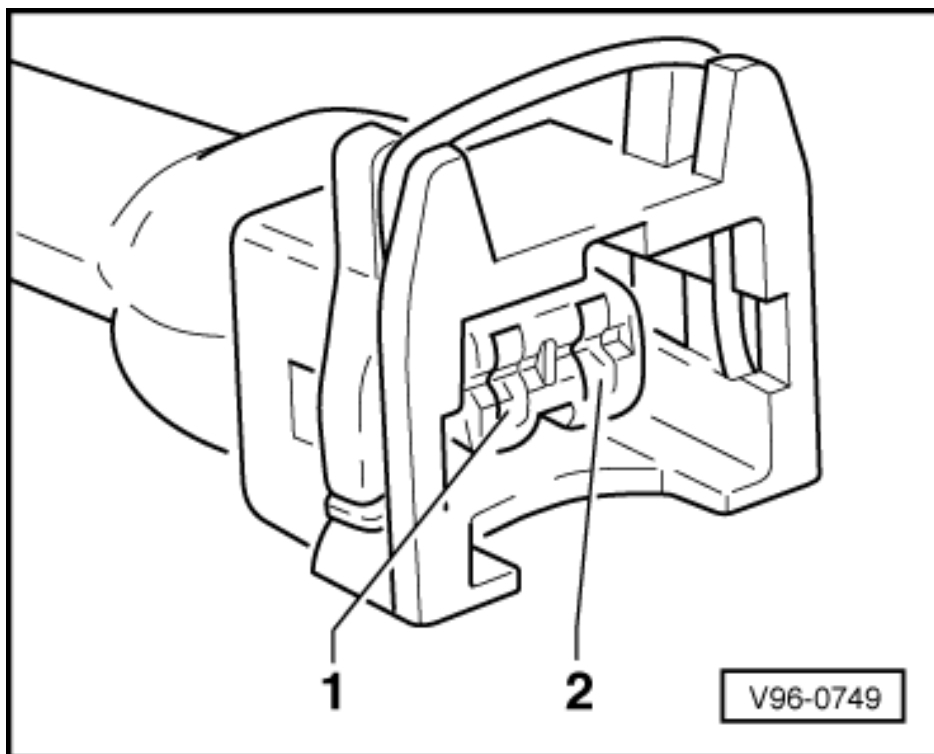
- Fuse for idling speed stabilisation valve OK

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- Fuel pump relay OK; checking => Page 68

Note:

Idling speed stabilisation valve is supplied with power by fuel pump relay.



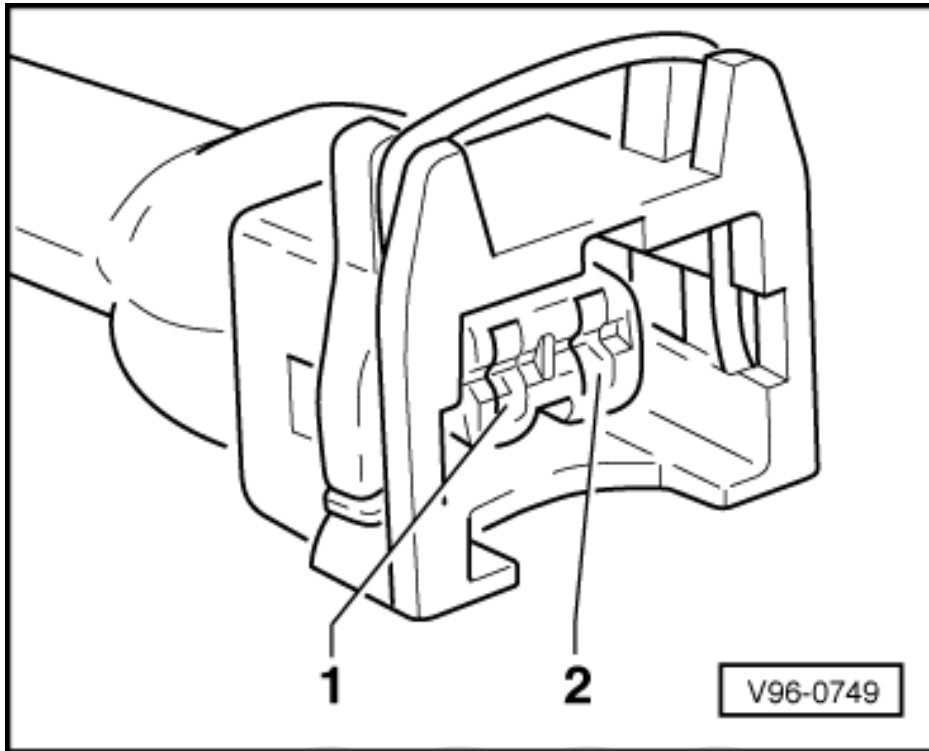
- -> Connect up multimeter for voltage measurement as follows.

Connector Contact	Measure to
1	Engine earth

- Briefly operate starter (engine may start).
 - Specification: approx. battery voltage

If reading does not match specification:

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



Checking actuation of idling-speed stabilisation valve

- -> Connect up voltage tester V.A.G 1527 B between contacts 1 and 2.
- Start final control diagnosis and actuate idling-speed stabilisation valve -N71 => Page 19 .
 - LED must flash

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

- With ignition switched off, use adapter V.A.G 1598/5 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit) => Page 48 .
- Check for open circuit and short to earth/positive in the following wiring.

Connector Contact	Test box V.A.G 1598 A Socket
2	4

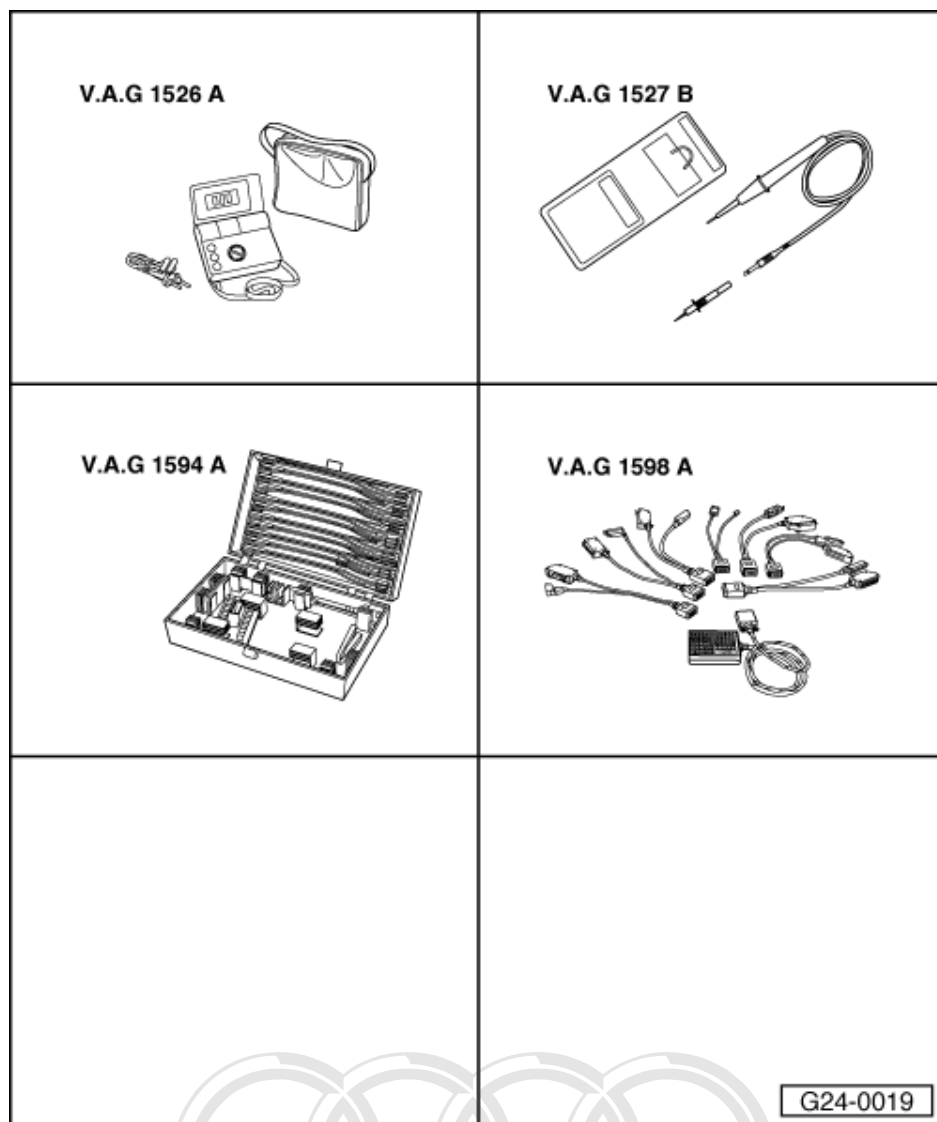
- If necessary, eliminate open circuit in wiring/short circuit.

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- If actuation and wiring are OK, but idling-speed stabilisation valve does not react, then valve has seized. Replace idling-speed stabilisation valve.



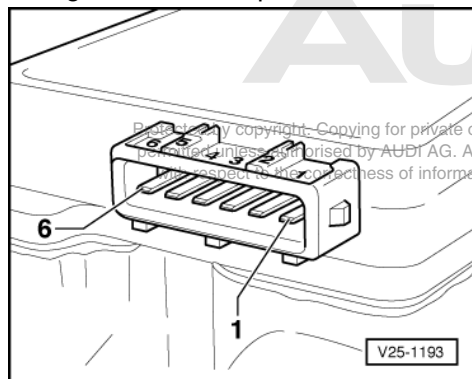
1.17 - Checking air-mass meter -G70



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 with V.A.G 1598/5

Fitting location => Exploded view of fitting locations - Page **41**



Checking operation

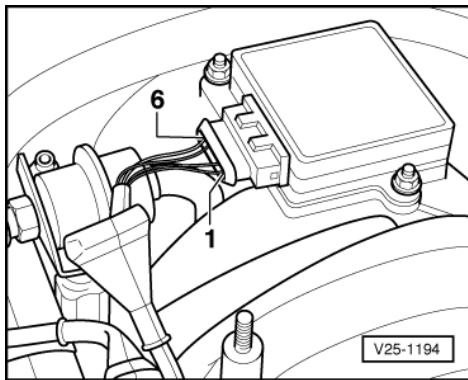
- Switch off ignition.
- Unplug connector from air-mass meter.
- -> Connect up multimeter for resistance measurement between contacts 1 and 2.
- Disconnect test leads at air-mass meter and interconnect them.
 - Specification: in each case 0 ... 0.1 ω

Note:

Value displayed must be the same for both measurements (earth link in air-mass meter is measured). Measured value corresponds to internal resistance of test leads.

If measured values differ by more than 0.1 ω :

- Replace air-mass meter -G70.
- Re-attach connector to air-mass meter.
- Push back rubber grommet at connector of air-mass meter.



- -> Connect up multimeter for voltage measurement between contacts 1 and 2.

Note:

Pin assignment is marked on back of connector.

- Switch on ignition.
 - Specification: 1.3 ... 1.6 V
- Start engine and let it idle.
 - Specification: approx. 2.5 V
- Abruptly floor accelerator pedal and release it again (brief burst of throttle).
 - ◆ Specification: Distinct increase in voltage to 3 ... 5 V

If readings do not match specifications:

- Replace air-mass meter -G70.

Checking power supply for air-mass meter

Test requirements:

- Fuse for air-mass meter OK

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- Fuel pump relay OK; checking => Page 68

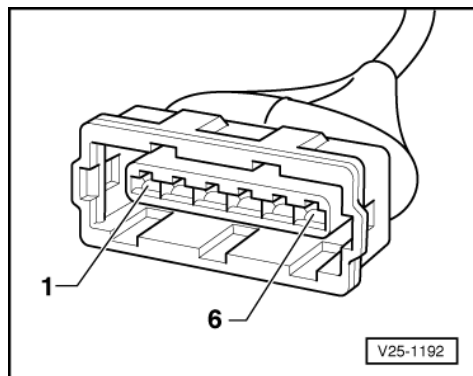
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Note:

Air-mass meter is supplied with power by fuel pump relay.

- Unplug connector from air-mass meter.



- -> Connect up multimeter for voltage measurement as follows.

Connector Contact	Measure to
5	Engine earth

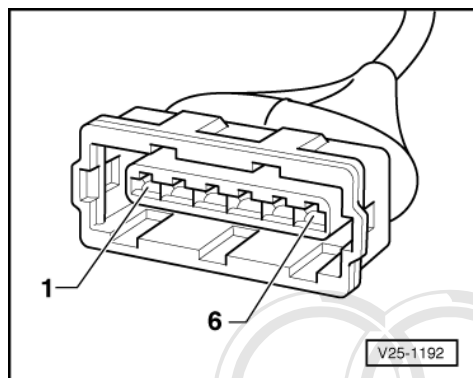
- Briefly operate starter.
 - Specification: approx. battery voltage

If reading does not match specification:

- Check for open circuit/short to earth in wiring from contact 5 of connector via fuse to fuel pump relay.

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- If necessary, eliminate open circuit in wiring/short circuit.



- -> Connect up portable multimeter for voltage measurement to contacts 1 and 5 of connector.
- Briefly operate starter.
 - Specification: approx. battery voltage

If reading does not match specification:

- Check for open circuit in wiring from contact 1 of connector to body earth.

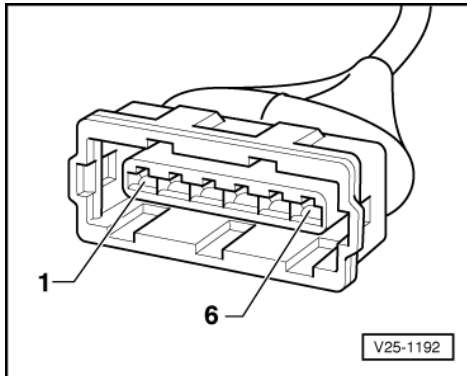
=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

Checking wiring for air-mass meter

Note:

Signal wire is also checked as part of wiring test.

- With ignition switched off, use adapter V.A.G 1598/5 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit) => Page **48** .



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

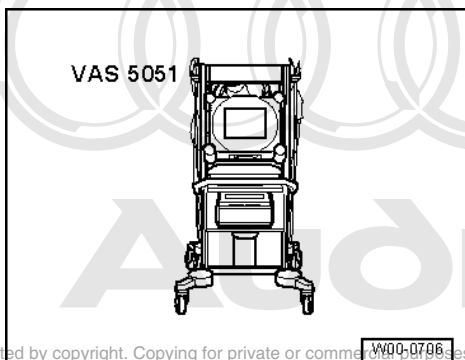
Connector Contact	Test box V.A.G 1598 A Socket
2	26
3	7
4	25

- If necessary, eliminate open circuit in wiring/short circuit.
- Also check all wires for mutual short circuit.

If wiring is OK:

- Replace air-mass meter -G70.

1.18 - Checking intake system for leaks (unmetered air)



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Special tools, workshop equipment and other items required

- ◆ VAS 5051 with VAS 5051/1 and VAS 5051/2
- ◆ Engine leak detector spray G 001 800 A1



Notes:

- ♦ Due to the vacuum in the intake system, the leak detector spray is drawn in with the unmetered air. The spray reduces the ignition performance of the mixture, thus causing a drop in engine speed and a sharp increase in CO content.
- ♦ Always heed the safety instructions on the can.

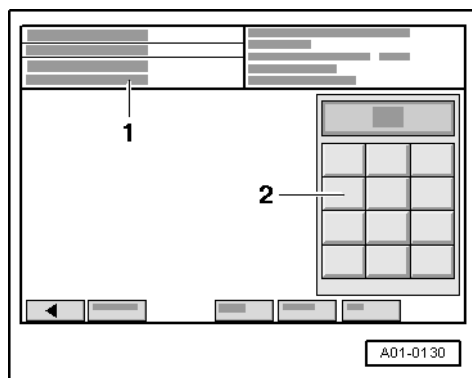
Test sequence

- Connect up vehicle diagnostic, testing and information system VAS 5051 => Page **1** and select vehicle system "01 - Engine electronics" from list. Engine must be idling.



-> Display on VAS 5051:

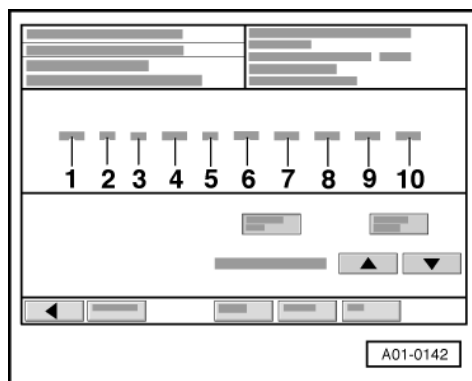
- From list -1- select diagnosis function "08 - Reading measured value block".



-> Display on VAS 5051:

1 - Enter display group
Highest possible entry = 255

- Use keypad -2- to enter "000" for "Display group number 000" and confirm by touching Q key.



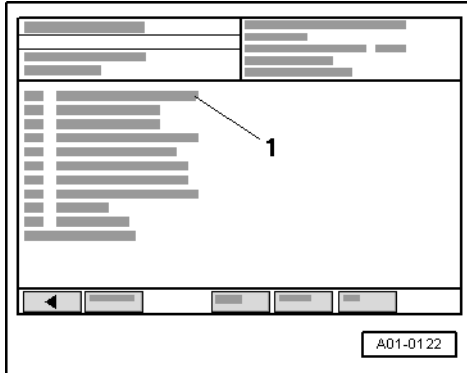
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-> Display on VAS 5051:

- Observe engine speed in display zone -3-.
- Systematically apply engine leak detector spray to intake system components.

If engine speed decreases:

- Check sprayed section of intake system for leaks and rectify fault.
- Terminate function "08 - Reading measured value block" by touching ◀ key.



-> Display on VAS 5051:

- From list -1- select diagnosis function "06 - End of output".
- Switch off ignition.

2 - Checking Lambda control

2.1 - Checking Lambda control

Notes:

Lambda probe compares oxygen content of air to residual oxygen in exhaust gas and provides control unit with a voltage signal.

Voltage signal "Rich mixture (low residual oxygen level)" is approx. 0.7... 1.1 V.

Voltage signal "Lean mixture (high residual oxygen level)" is approx. 0.0... +0.3 V.

Transition from "rich" to "lean" and vice versa ($\lambda = 1.0$) results in a voltage step change from 0.7... 1.1 V to 0.0... +0.3 V and vice versa.

On account of the steep voltage step change, the Lambda control cannot maintain the ideal mixture composition (corresponding to $\lambda = 1.0$) at a constant level. The control constantly fluctuates between the two statuses "slightly too lean" and "slightly too rich".

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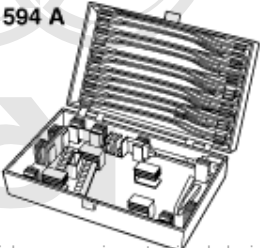
If there is no change in voltage or if the voltage change is sluggish, this may be due to the following:

- ◆ Slits or holes in probe head clogged
- ◆ Thermal overloading of probe
- ◆ Contact resistance in signal wire/reference earth wire
- ◆ Probe too cold, no probe heating function
- ◆ Lambda control off (fault detected in injection system by control unit => Interrogate fault memory)
- ◆ Probe damaged by contact spray or the like (on account of thermal fluctuations and capillary action, contact spray is drawn through the fine cavities in the wires into the probe)



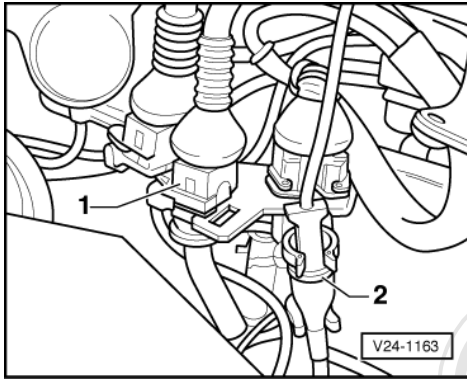
- ♦ Probe damaged by silicone vapours (the use of sealants containing silicone causes traces of silicone constituents to be drawn in by the engine; these are not burnt and damage the Lambda probe)

2.2 - Checking Lambda-probe signal wire and actuation

V.A.G 1526 A 	V.A.G 1594 A 
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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 with V.A.G 1598/5



Test sequence

- -> Unplug connector -2-.
- Connect up multimeter for voltage measurement between connector to engine control unit and engine earth.
- Switch on ignition.
 - Specification: $450 \pm 50 \text{ mV}$

If reading does not match specification:

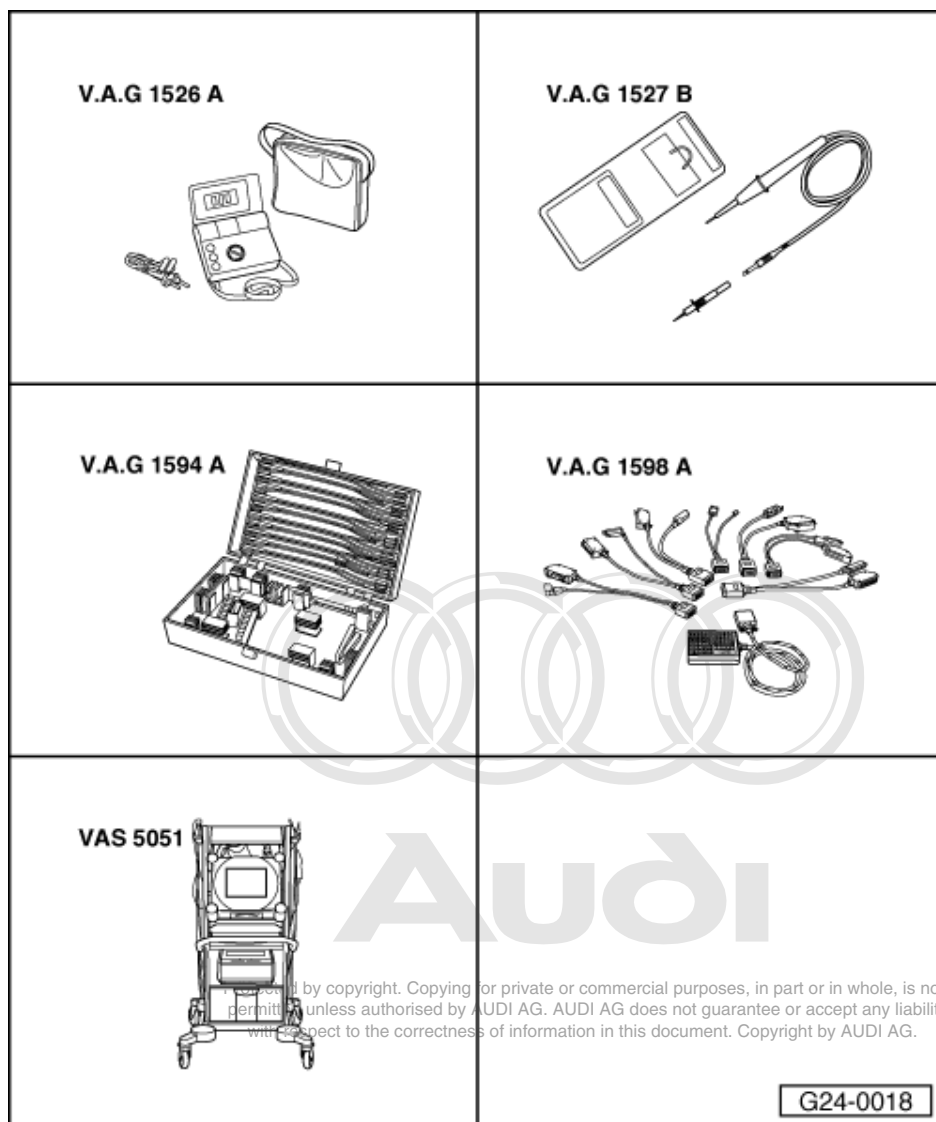
- With ignition switched off, use adapter V.A.G 1598/5 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit) => Page 48.
- Check for open circuit or short to positive/earth in wiring from connector to test box V.A.G 1598 A, socket 28.
- If necessary, eliminate open circuit in wiring/short circuit.

If wiring is OK:

- Replace engine control unit => Page 49 .

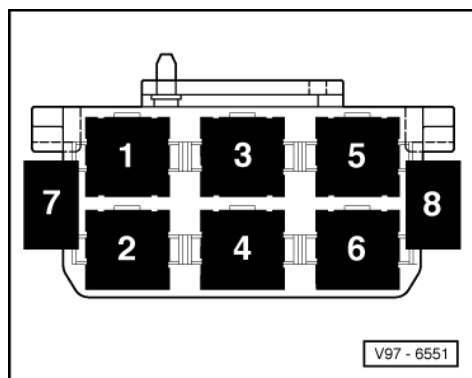


2.3 - Checking Lambda probe heating



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 with V.A.G 1598/5
- ♦ VAS 5051 with VAS 5051/1 and VAS 5051/2



Note:

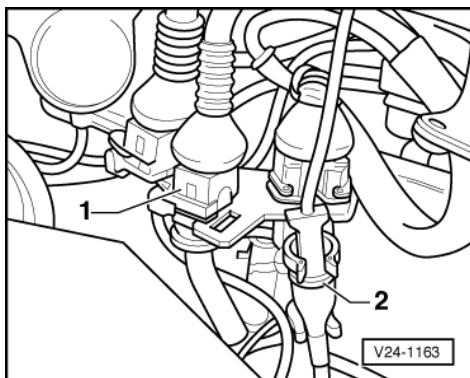
-> Lambda probe heater -Z19 is regulated by engine control unit via Lambda probe heating control unit -J208 (in auxiliary relay carrier III in passenger's footwell, position 1).

Test requirements:

- Fuse for Lambda probe heating OK

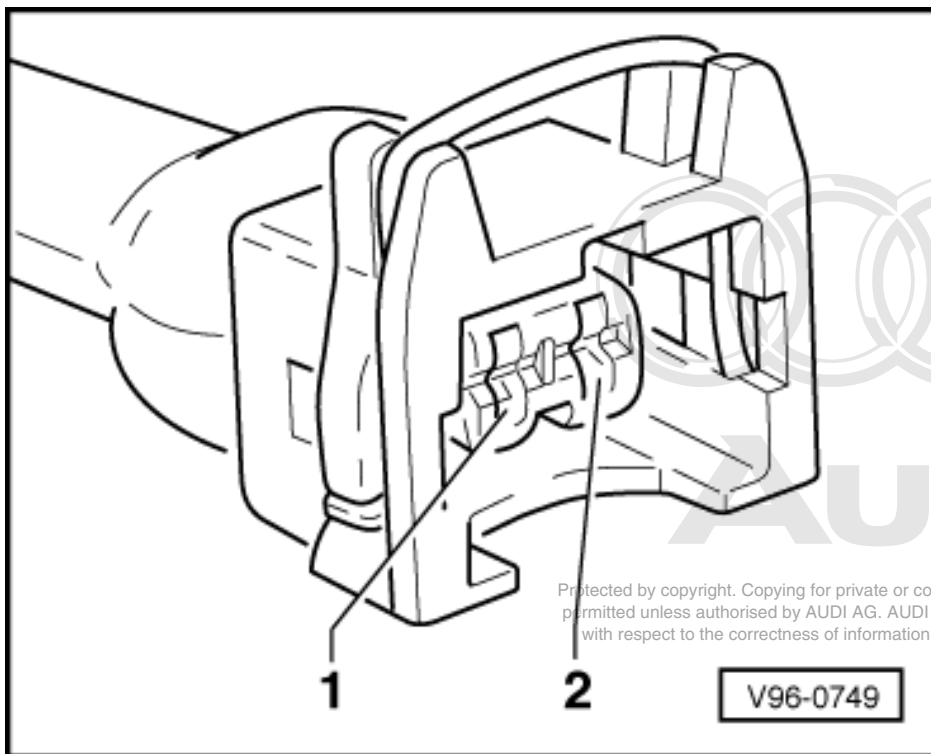
=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- Battery voltage at least 12.7 V

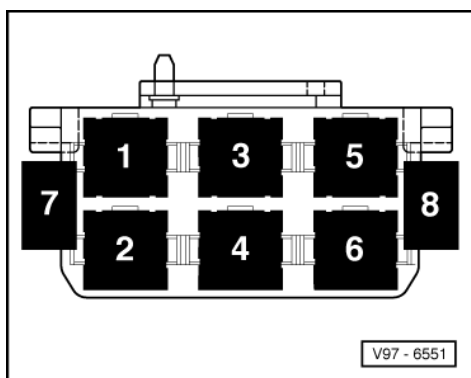


Test sequence

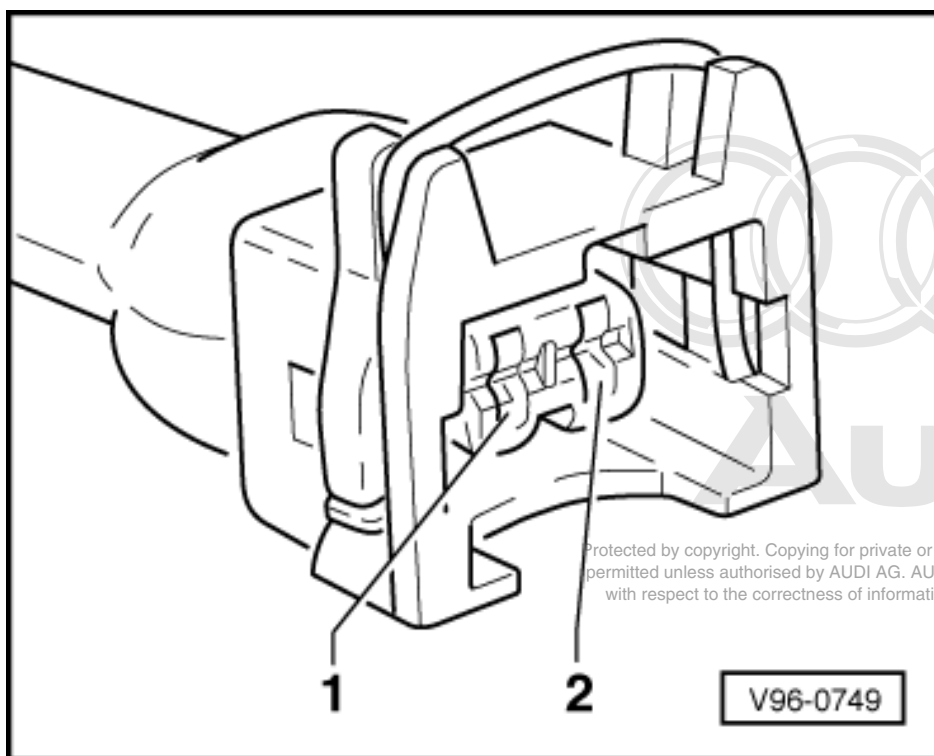
- -> Unplug connector -1-.



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



- Start final control diagnosis => Page 19 and actuate Lambda probe heating control unit -J208.
- -> Lambda probe heating control unit -J208 (in auxiliary relay carrier III in passenger's footwell, position 1) must click ...
- ... and LED must flash



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

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

Connector Contact	Measure to
1	Engine earth

If LED now flashes:

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

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

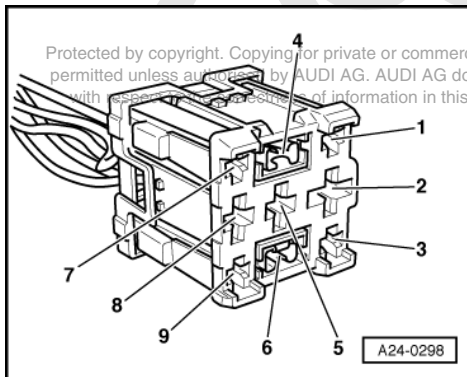
- Eliminate open circuit in wiring if necessary.

If LED flashes:

- Check heating current of Lambda probe heating => Page 91 .

If LED still does not flash:

- Switch off ignition.
- Detach Lambda probe heating control unit.



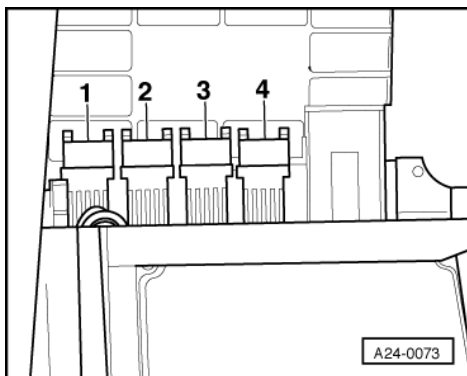
- -> Check for open circuit in the following wiring.

Auxiliary relay carrier III, passenger's footwell, position 1 Contact	Connector Contact
8	1

- Eliminate open circuit in wiring if necessary.
- Connect up voltage tester V.A.G 1527 B as follows.

Auxiliary relay carrier III, passenger's footwell, position 1 Contact	Measure to
2	Engine earth

- Switch on ignition.
 - LED must light



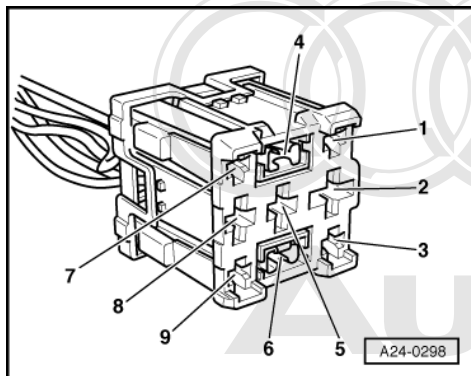
If LED does not light:

- -> Check for open circuit in wiring between Lambda probe heating control unit -J208 (in auxiliary relay carrier III in passenger's footwell, position 1, contact 2) and fuse S73 (in white box in electronics box in passenger's footwell).

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

If no fault is found:

- Replace Lambda probe heating control unit -J208.

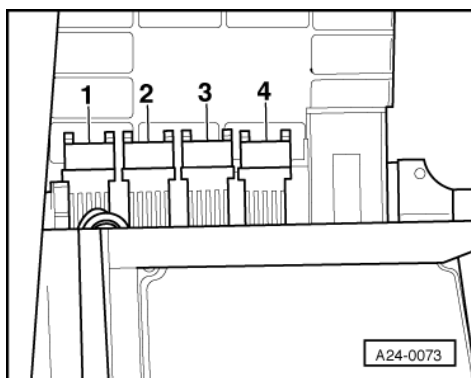


B - If LED does not flash and relay does not click:

- Detach Lambda probe heating control unit.
- -> Connect up voltage tester V.A.G 1527 B as follows.

Auxiliary relay carrier III, passenger's footwell, position 1 Contact	Measure to
6	Engine earth

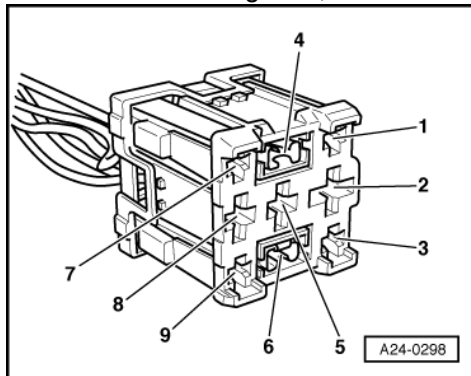
- Switch on ignition.
- LED must light



If LED does not light:

- -> Check for open circuit in wiring between Lambda probe heating control unit -J208 (in auxiliary relay carrier III in passenger's footwell, position 1, contact 6) and fuse S73 (in white box in electronics box in passenger's footwell).

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

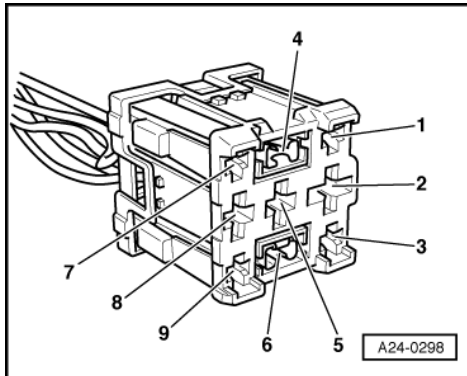


If wiring is OK:

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

Auxiliary relay carrier III, passenger's footwell, position 1 Contact	Measure to
4	Battery positive

- Start final control diagnosis => Page **19** and actuate Lambda probe heating control unit -J208.
- LED must flash



If LED does not flash:

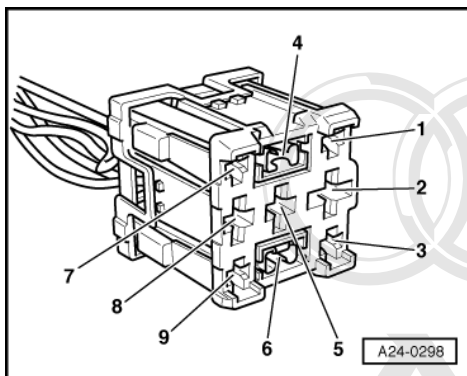
- With ignition switched off, use adapter V.A.G 1598/5 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit) => Page **48**.
- -> Check for open circuit and short to positive in the following wiring.

Auxiliary relay carrier III, passenger's footwell, position 1 Contact	Test box V.A.G 1598 A Socket
4	23

- If necessary, eliminate open circuit in wiring/short circuit.

If no fault is found:

- Replace engine control unit => Page **49**.



Checking heating current of Lambda probe heating

- Detach Lambda probe heating control unit.
- -> Connect up multimeter for current measurement to contacts 2 and 8 of relay socket.
- Switch multimeter to 10 A measuring range (connect test lead to 10 A connection).
- Switch on ignition.

- Specification: 0.5 ... 4.0 A

Note:

Current input decreases as Lambda probe becomes warmer.

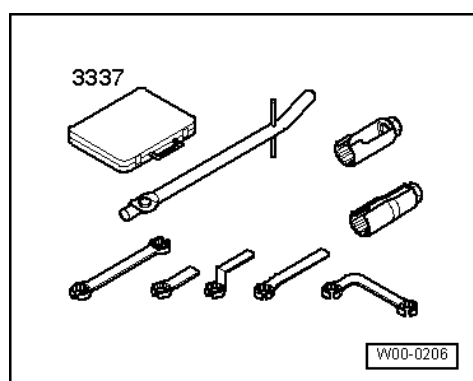
If reading does not match specification:

- Replace Lambda probe.

2.4 - Removing and installing Lambda probe

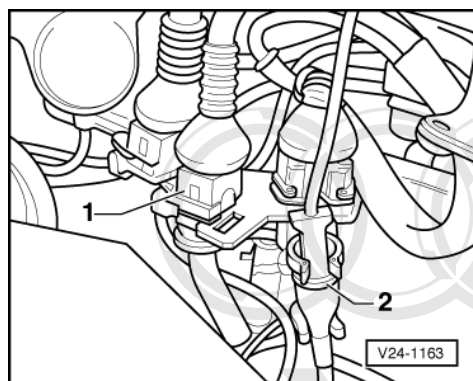
Note:

Lambda probe fitting location: In constant volume sampler on left next to gearbox



Special tools, workshop equipment and other items required

- ♦ Ring spanner set 3337
- ♦ Hot bolt paste G 052 112 A3



Removing

- -> Unplug connectors -1- and -2-.
 - Lay bare wires.
 - Use special tool 3337 to screw out Lambda probe.
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Installing

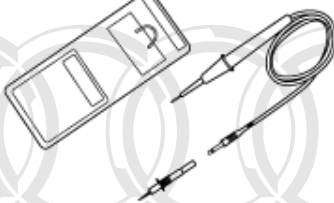
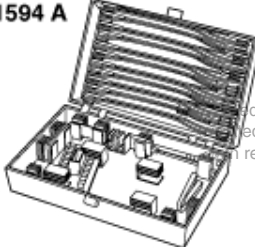
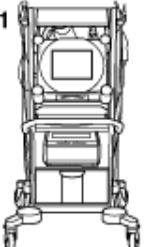
Pay attention to the following on installation:

Notes:

- ♦ The thread of the Lambda probe is coated with an assembly paste, which must not be allowed to ingress into the openings in the probe.
- ♦ Tightening torque 55 Nm
- ♦ On installation, always re-attach wires and cable ties at the same location to stop probe wire coming into contact with exhaust pipe.

3 - Checking fuel tank breather system

3.1 - Checking fuel tank breather system

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



3.2 - Checking activated charcoal filter solenoid valve -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 with V.A.G 1598/5
 - ♦ VAS 5051 with VAS 5051/1 and VAS 5051/2
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Fitting location => Exploded view of fitting locations - Page **41**

Leak test

Activated charcoal filter solenoid valve -N80 is closed when deenergised.

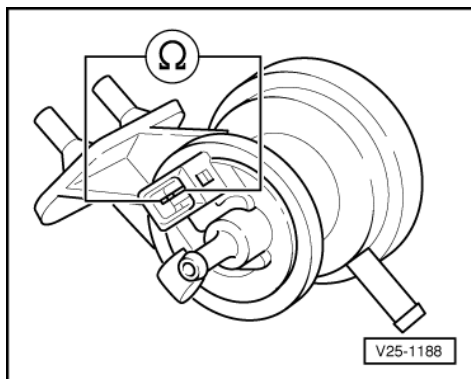
- Pull hoses off ACF valve; leave connector attached.
 - Connect test hose to one connection of ACF valve.
 - Connect up vehicle diagnostic, testing and information system VAS 5051 => Page **1** and select vehicle system "01 - Engine electronics" from list. Engine must be idling.
 - Start final control diagnosis and actuate activated charcoal filter solenoid valve -N80 =>Page **19** .
-
- ♦ Valve must click...
 - ♦ ...and must open and close (can be checked by blowing into test hose).

If valve does not click:

- Check internal resistance of ACF valve.

If valve does not open or close properly:

- Replace ACF valve.



Checking internal resistance

- Unplug connector at ACF valve.
- > Connect multimeter to valve for resistance measurement.
 - Specification: 40 ...50 ω

If reading does not match specification:

- Replace ACF valve.

If reading matches specification:

- Check power supply => Page 95 .

Checking power supply

Test requirements:

- Fuse for ACF valve OK

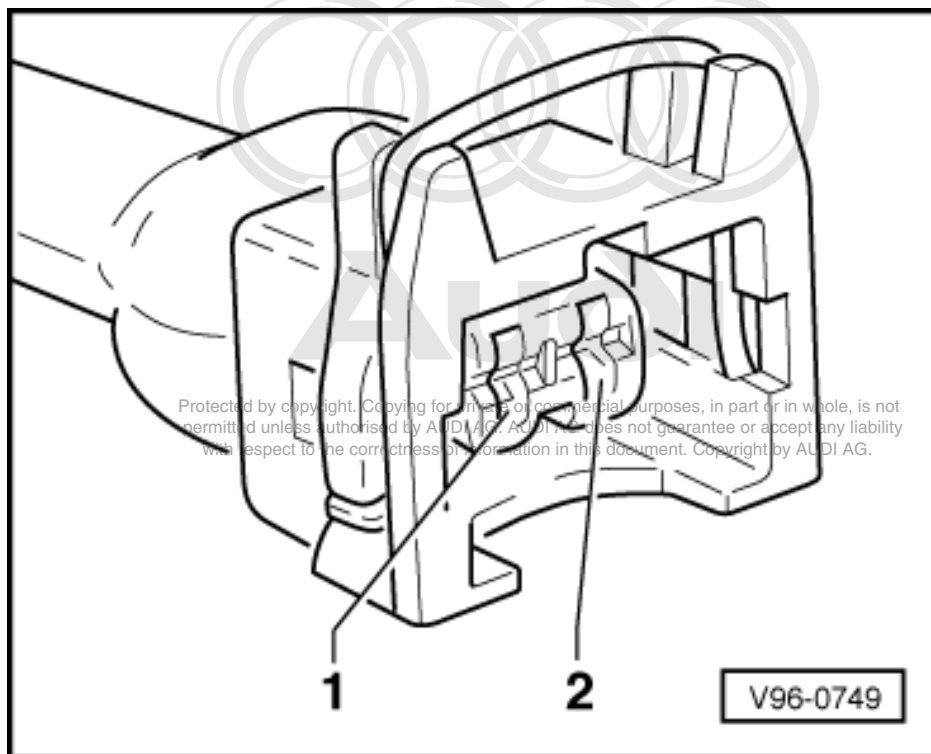
=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- Fuel pump relay OK; checking => Page 68

Note:

Activated charcoal filter solenoid valve is supplied with power by way of fuel pump relay.

- Unplug connector at ACF valve.



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

Connector Contact	Measure to
2	Engine earth

- Operate starter.
 - LED must light

If LED does not light:

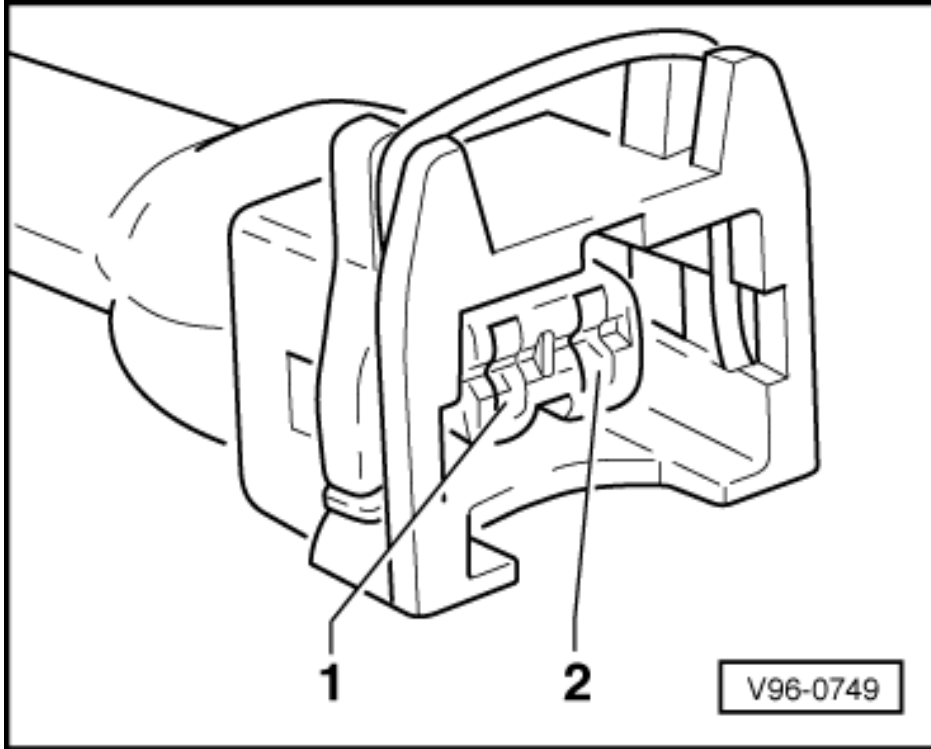
- Check for open circuit in wiring from contact 2 of connector via fuse to fuel pump relay.

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- Eliminate open circuit in wiring if necessary.

If LED lights:

- Check actuation.



Checking actuation

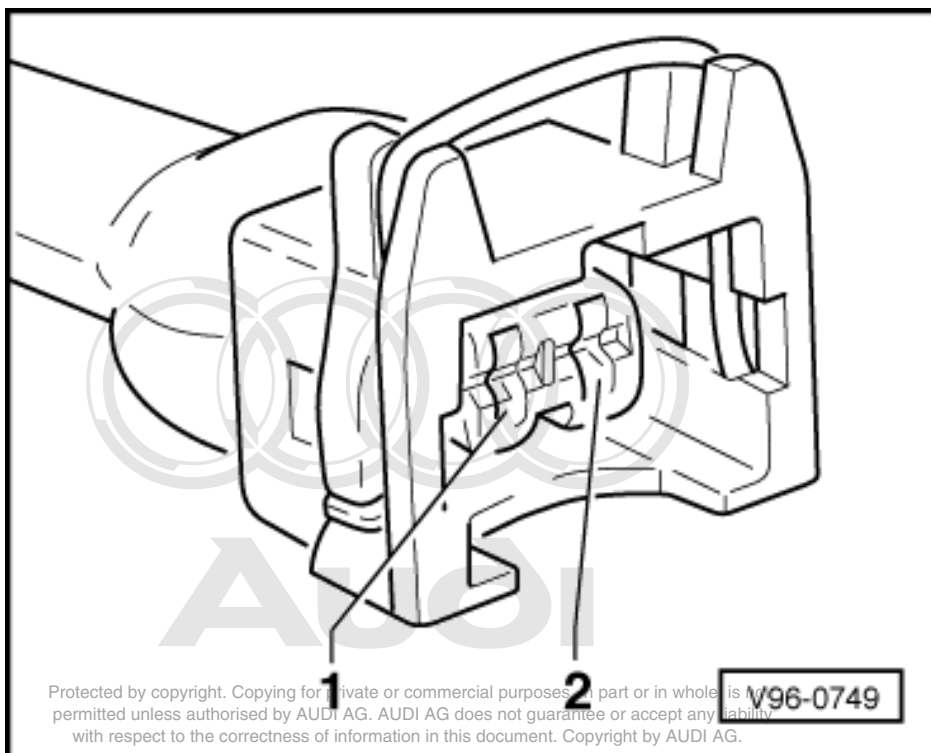
- -> Connect up voltage tester V.A.G 1527 B between contacts 1 and 2.
- Start final control diagnosis and actuate activated charcoal filter solenoid valve -N80 =>Page 19 .
 - LED must flash

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

- With ignition switched off, use adapter V.A.G 1598/5 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit) => Page 48 .



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

Connector Contact	Test box V.A.G 1598 A Socket
1	5

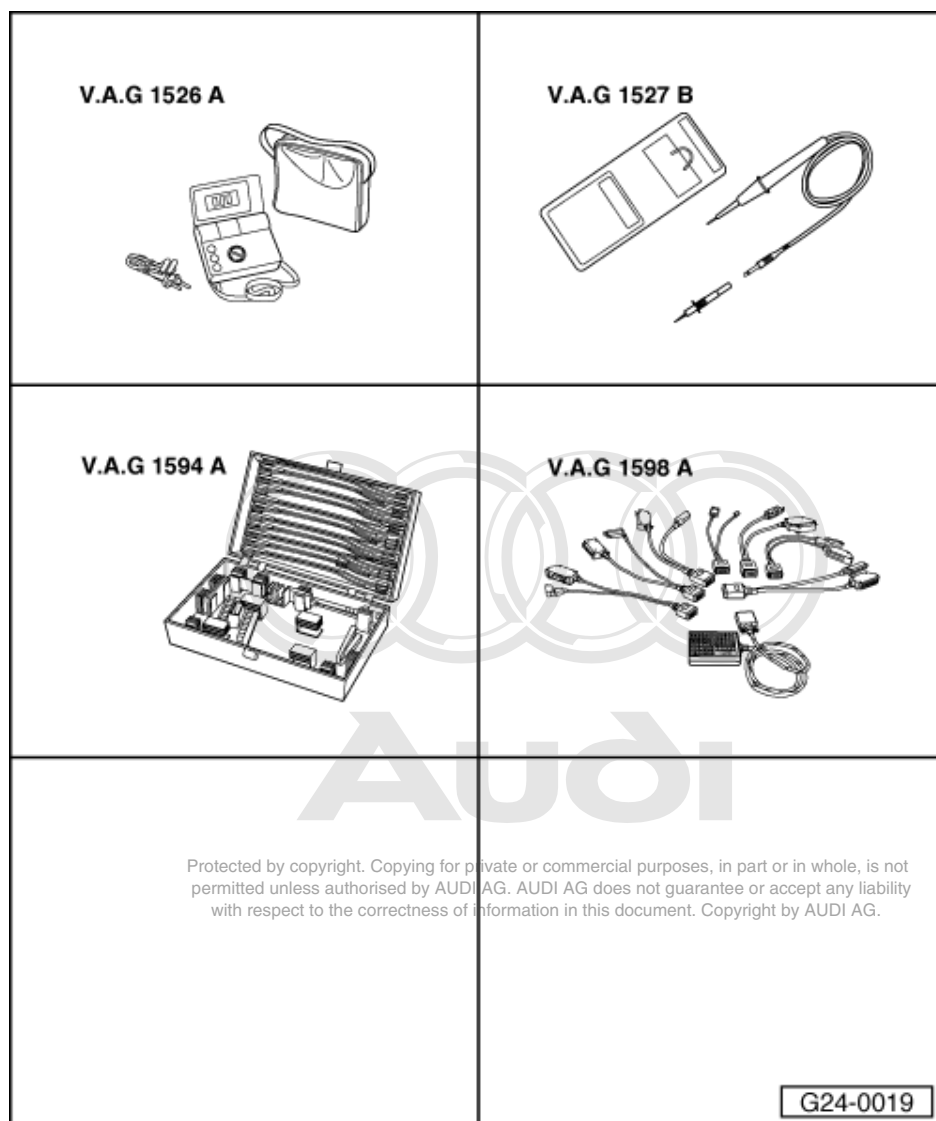
- If necessary, eliminate open circuit in wiring/short circuit.

If wiring is OK:

- Replace engine control unit => Page 49 .

4 - Checking throttle valve potentiometer -G69

4.1 - Checking throttle valve potentiometer -G69



Special tools and workshop equipment required

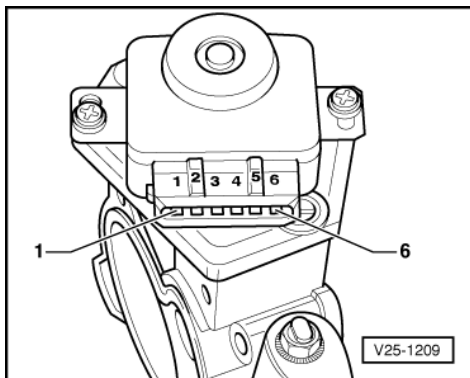
- ♦ V.A.G 1526 A
- ♦ V.A.G 1527 B
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598 with V.A.G 1598/5

Fitting location => Exploded view of fitting locations - Page **41**

Note:

Connection assignment of throttle valve potentiometer is the reverse of that of the connector.

Throttle valve potentiometer	1	2	3	4	5	6
Connector	6	5	4	3	2	1



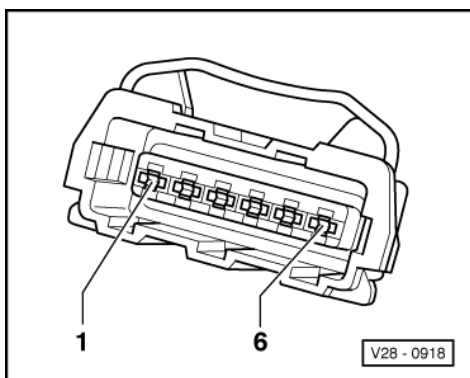
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Checking internal resistance

- Unplug connector at throttle valve potentiometer.
- ➔ Connect up multimeter for resistance measurement between contacts 1 and 2.
 - Specification: 1.5 ... 2.6 kΩ
- Connect up multimeter for resistance measurement between contacts 2 and 3.
 - Specification: 0.75 ... 1.3 kΩ
- Move throttle lever slowly into full throttle position.
 - Specification: Resistance increasing to max. 3.6 kΩ

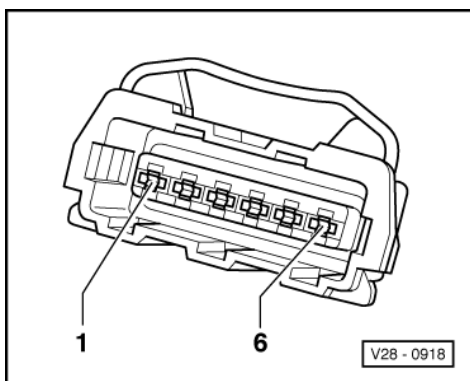
If a reading does not match specification:

- Replace throttle valve potentiometer.



Checking power supply

- Unplug connector at throttle valve potentiometer.
- ➔ Connect up multimeter for voltage measurement between contacts 5 (earth) and 6 (positive).
 - Specification: 4.5 ... 5.5 V
- Connect up multimeter for voltage measurement between contacts 4 (signal) and 5 (earth).
 - Specification: 4.5 ... 5.5 V





If a reading does not match specification:

- With ignition switched off, use adapter V.A.G 1598/5 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit) => Page 48 .
- -> Check for open circuit and short to earth/positive in the following wiring.

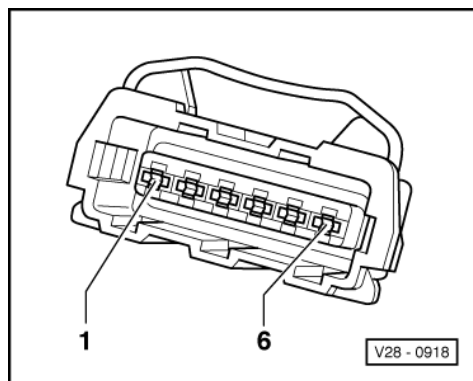
Connector Contact	Test box V.A.G 1598 A Socket
4	53
6	12

- If necessary, eliminate open circuit in wiring/short circuit.

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

Note:

Exclusive use is to be made of gold-plated contacts when repairing contacts in connector.



If no fault is found in wiring:

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

Connector Contact	Measure to
5	Battery positive

- LED must light

If LED does not light:

- Check for open circuit in wiring between contact 5 of connector and earth connection (sender earth) in engine compartment wiring harness and repair if necessary.

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

Note:

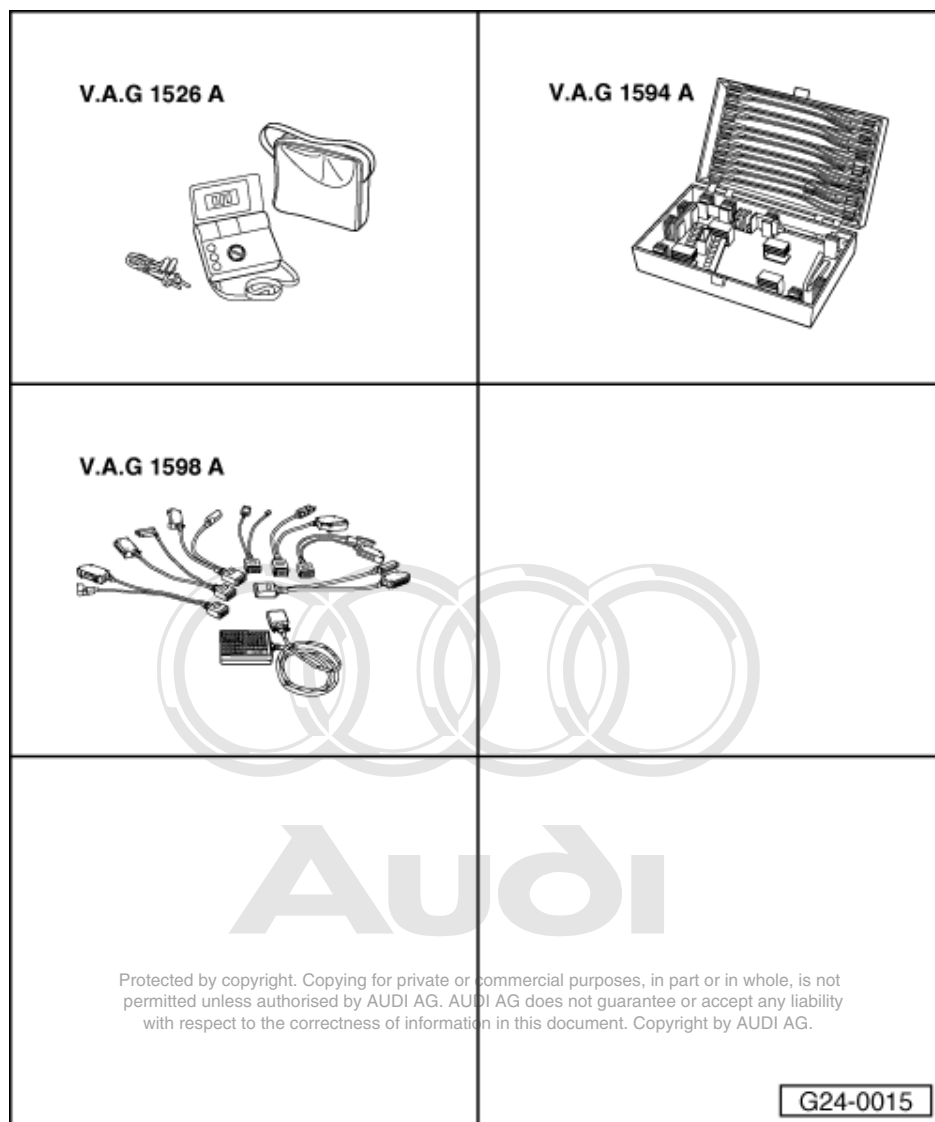
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Exclusive use is to be made of gold-plated contacts when repairing contacts in connector.

If wiring is OK:

- Replace engine control unit => Page 49 .

4.2 - Checking idling switch -F60



Special tools and workshop equipment required

- ◆ V.A.G 1526 A
- ◆ V.A.G 1594 A
- ◆ V.A.G 1598 with V.A.G 1598/5

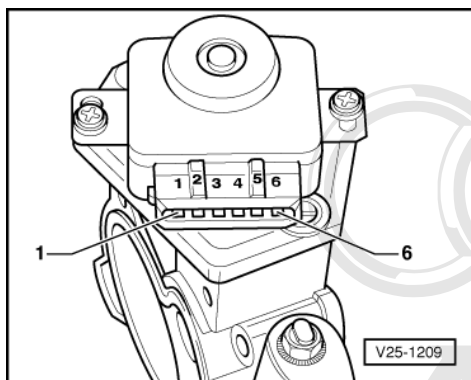
Notes:

- ◆ Idling-speed switch is located in throttle valve potentiometer.
- ◆ Connection assignment of throttle valve potentiometer is the reverse of that of the connector.

Throttle valve potentiometer	1	2	3	4	5	6
Connector	6	5	4	3	2	1

Test requirement:

- Throttle cable setting OK



Test sequence

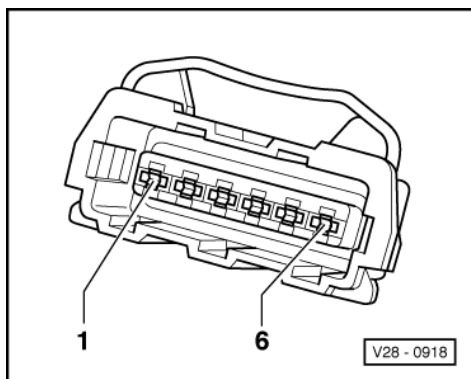
- Unplug connector at throttle valve potentiometer.
- -> Connect up multimeter for resistance measurement between contacts 4 and 6.
 - Specification: $0 \, \Omega$
- Open throttle valve slightly.
 - Specification: $\infty \, \Omega$ (no continuity)

If readings do not match specifications:

- Adjust idling-speed switch =>Page 103 .

If readings still do not match specifications:

- Replace throttle valve potentiometer.



Checking wiring

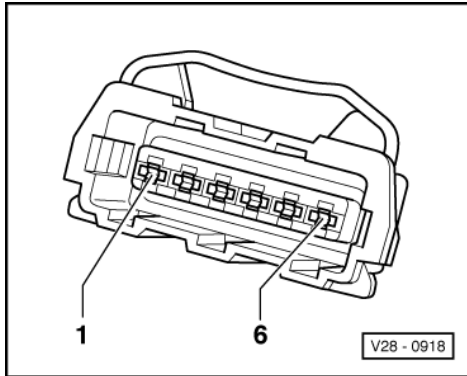
- With ignition switched off, use adapter V.A.G 1598/5 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit) => Page 48 .
- -> Check for open circuit and short to earth/positive in the following wiring.

Connector Contact	Test box V.A.G 1598 A Socket
1	52

- If necessary, eliminate open circuit in wiring/short circuit.

Note:

Exclusive use is to be made of gold-plated contacts when repairing contacts in connector.



If no fault is found in wiring:

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

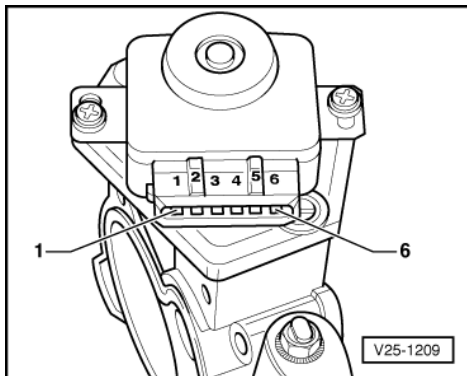
Connector Contact	Measure to
3	Battery positive

- LED must light

If LED does not light:

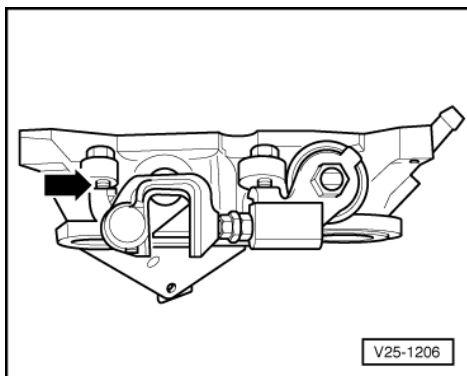
- Check for open circuit in wiring between contact 3 of connector and earth connection (screen) in engine compartment wiring harness and repair if necessary.

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder



Adjusting idling-speed switch

- Remove throttle valve unit.
- Slacken off both bolts of throttle valve potentiometer.
- -> Connect up multimeter for resistance measurement between contacts 4 and 6.



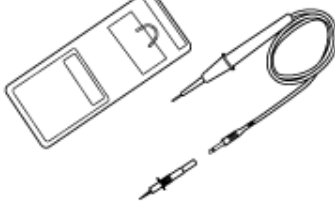
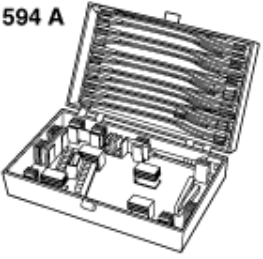
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- -> Insert 0.25 mm feeler gauge between stop and stop adjusting screw -arrow-.
- Turn throttle valve potentiometer anti-clockwise and then clockwise until multimeter reading is 0 ω .
- Tighten bolts of throttle valve potentiometer in this position.
- Insert 0.30 mm feeler gauge instead of 0.25 mm gauge.
 - Specification: $\infty \omega$ (no continuity)

5 - Checking additional signals

5.1 - Checking additional signals

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 with V.A.G 1598/5

5.2 - Checking engine-speed signal

Notes:

- ♦ Engine speed signal is output at contact 40 of engine control unit and is required, for example, for rev counter display in dash panel insert.
- ♦ Checking engine-speed signal

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

5.3 - Checking consumption signal for on-board computer

Notes:

- ♦ Consumption signal is calculated by engine control unit from injection period and relayed at contact 31 to on-board computer.
- ♦ Checking consumption signal:

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

5.4 - Checking signals from/to air conditioner

Checking engine-speed adjustment and compressor shutoff

Notes:

- ♦ Shortly after switching on air conditioner, a positive signal is applied to contact 6 at engine control unit. The signal from the air conditioner increases the pilot control value for idling-speed stabilisation to keep idling-speed stabilisation in control mid-range.
- ♦ The engine control unit uses the same wire to briefly shut off the air-conditioner compressor on accelerating from a standstill and from low vehicle speed.

Test requirements:

- Air conditioner OK
- No faults stored in engine control unit fault memory
- Vehicle at ambient temperature (more than +15 °C)

Test sequence

- With ignition switched off, use adapter V.A.G 1598/5 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit) => Page 48.
- Connect up voltage tester V.A.G 1527 B as follows.

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

- Start engine and let it idle.
- Switch on air conditioner.
 - LED must light after 1 ... 6 seconds
- Abruptly floor accelerator pedal and release it again (brief burst of throttle).
 - LED must go out for several seconds
- Switch off ignition.



If display is not as described:

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

Test box V.A.G 1598 A Socket	Operating and display unit -E87 Contact
6	=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- If necessary, eliminate open circuit in wiring/short circuit.
- If there is no fault in the wiring, check operation of air conditioner.

=> Heating, Air Conditioner; Repair Group 87; Air Conditioner; Servicing components for control and regulation of fully automatic air conditioner Air Conditioner Servicing components for control and regulation of fully automatic air conditioner

If both air conditioner and wiring OK:

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- Replace engine control unit => Page 49 .

Checking engine-speed increase

Note:

This air-conditioner signal increases idling speed in the event of high heating/ cooling output by approx. 80 rpm.

Test requirements:

- Air conditioner OK
- No faults stored in engine control unit fault memory
- Vehicle at ambient temperature (more than +15 °C)
- With ignition switched off, use adapter V.A.G 1598/5 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit) => Page 48 .
- Connect up voltage tester V.A.G 1527 B as follows.

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

- Start engine and let it idle.
- Switch on air conditioner and set it to maximum cooling/ heating output. Compressor must run.
 - LED must light
- Switch off air conditioner.
 - LED must go out
- Switch off ignition.

If display is not as described:

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

Test box V.A.G 1598 A Socket	Operating and display unit -E87 Contact
41	=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- If necessary, eliminate open circuit in wiring/short circuit.
- If there is no fault in the wiring, check operation of air conditioner.

=> Heating, Air Conditioner; Repair Group 87; Air Conditioner; Servicing components for control and regulation of fully automatic air conditioner Air Conditioner Servicing components for control and regulation of fully automatic air conditioner

If both air conditioner and wiring OK:

- Replace engine control unit => Page 49 .

5.5 - Checking vehicle-speed signal

Test requirement:

- Speedometer function and display OK

Test sequence

- Raise vehicle (if at all possible using lifting platform) until front left wheel is free to turn.
- With ignition switched off, use adapter V.A.G 1598/5 to connect test box V.A.G 1598 A to engine control-unit connector and also to actual engine control unit => Page 48 .
- Connect up voltage tester V.A.G 1527 B as follows.

Test box V.A.G 1598 A Socket	Measure to
50	Battery positive

- Switch on ignition.
 - LED must light faintly
- Turn front left wheel.
 - LED must flash
- Switch off ignition.

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If LED does not flash:

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

Test box V.A.G 1598 A Socket	Dash panel insert Contact
50	=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

If no fault is found in wiring:

- Detach adapter V.A.G 1598/5 from engine control unit.

If LED now flashes:

- Replace engine control unit => Page 49 .

If LED still does not flash:

- Identify all components making use of vehicle-speed signal (e.g. radio, air conditioner), consecutively disconnect them from dash panel insert and repeat test until cause has been established.



5.6 - Checking gear signal

Note:

This signal provides compensation for increased load with gear engaged by altering pilot control value for idling-speed stabilisation.

- With ignition switched off, use adapter V.A.G 1598/5 to connect test box V.A.G 1598 A to engine control-unit connector and also to actual engine control unit => Page 48 .
- Connect up voltage tester V.A.G 1527 B as follows.

Test box V.A.G 1598 A	
Socket	Socket
19 (earth)	42 (signal)

- Start engine and let it idle.
- Press foot brake and engage gear.
 - LED must light
- Set selector lever to P or N.
 - LED must go out
- Switch off ignition.

If display is not as described:

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

Test box V.A.G 1598 A Socket	Automatic gearbox control unit Contact
42	=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- If necessary, eliminate open circuit in wiring/short circuit.

If wiring is OK:

- Determine fault in automatic gearbox control unit.

5.7 - Checking ignition timing retard on changing gear

Note:

This signal briefly retards the ignition timing on changing gear to reduce gearshift jolt.

Attention:

Attach test box to rear seat and operate it from there. Heed relevant safety precautions => Page 39 .

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- With ignition switched off, use adapter V.A.G 1598/5 to connect test box V.A.G 1598 A to engine control-unit connector and also to actual engine control unit => Page 48 .
- Connect up voltage tester V.A.G 1527 B as follows.

Test box V.A.G 1598 A	
Socket	Socket
19 (earth)	51 (signal)

- Perform test drive.

- LED must light
- Observe voltage tester during gearshift.
 - LED must go out briefly
- Switch off ignition.

If display is not as described:

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

Test box V.A.G 1598 A Socket	Automatic gearbox control unit Contact
51	=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- If necessary, eliminate open circuit in wiring/short circuit.

If wiring is OK:

- Determine fault in automatic gearbox control unit.

5.8 - Checking output signal for throttle valve position

Note:

In conjunction with engine speed, this signal is used by the automatic gearbox control unit as information for calculating gearshift points.

- With ignition switched off, use adapter V.A.G 1598/5 to connect test box V.A.G 1598 A to engine control-unit connector and also to actual engine control unit => Page 48 .
- Connect up voltage tester V.A.G 1527 B as follows.

Test box V.A.G 1598 A	
Socket	Socket
19 (earth)	54 (signal)

- Start engine and let it idle.
 - LED must light faintly and become brighter on pressing accelerator pedal
- Switch off ignition.

If LED lights but does not become brighter:

- Check throttle valve potentiometer =>Page 98 .
- If throttle valve potentiometer is OK, replace engine control unit
=>Page 49 .

If LED does not light:

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

Test box V.A.G 1598 A Socket	Automatic gearbox control unit Contact
54	=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- If necessary, eliminate open circuit in wiring/short circuit.



If wiring is OK:

- Determine fault in automatic gearbox control unit.



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28 - Ignition system

1 - Checking ignition system

1.1 - Checking ignition system

1.2 - Safety precautions

Heed the following so as to avoid possible injury and/or the destruction of the injection and ignition system:

- ◆ Never touch/disconnect ignition cables with engine running or at cranking speed.
- ◆ Always switch off ignition before disconnecting and connecting ignition system wires (also applies to H.T. wires and measuring instrument leads).
- ◆ If engine is to be operated at cranking speed without it starting (e.g. compression test), unplug connectors from output stage for ignition coils and from injectors. Interrogate fault memory on completion of work.
- ◆ Always switch off ignition before washing engine.
- ◆ Always switch off ignition before disconnecting and connecting battery so as not to damage engine control unit.
- ◆ Boost starting with rapid charger is only permitted for up to 1 minute at a maximum of 16.5 V.

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1.3 - Technical data

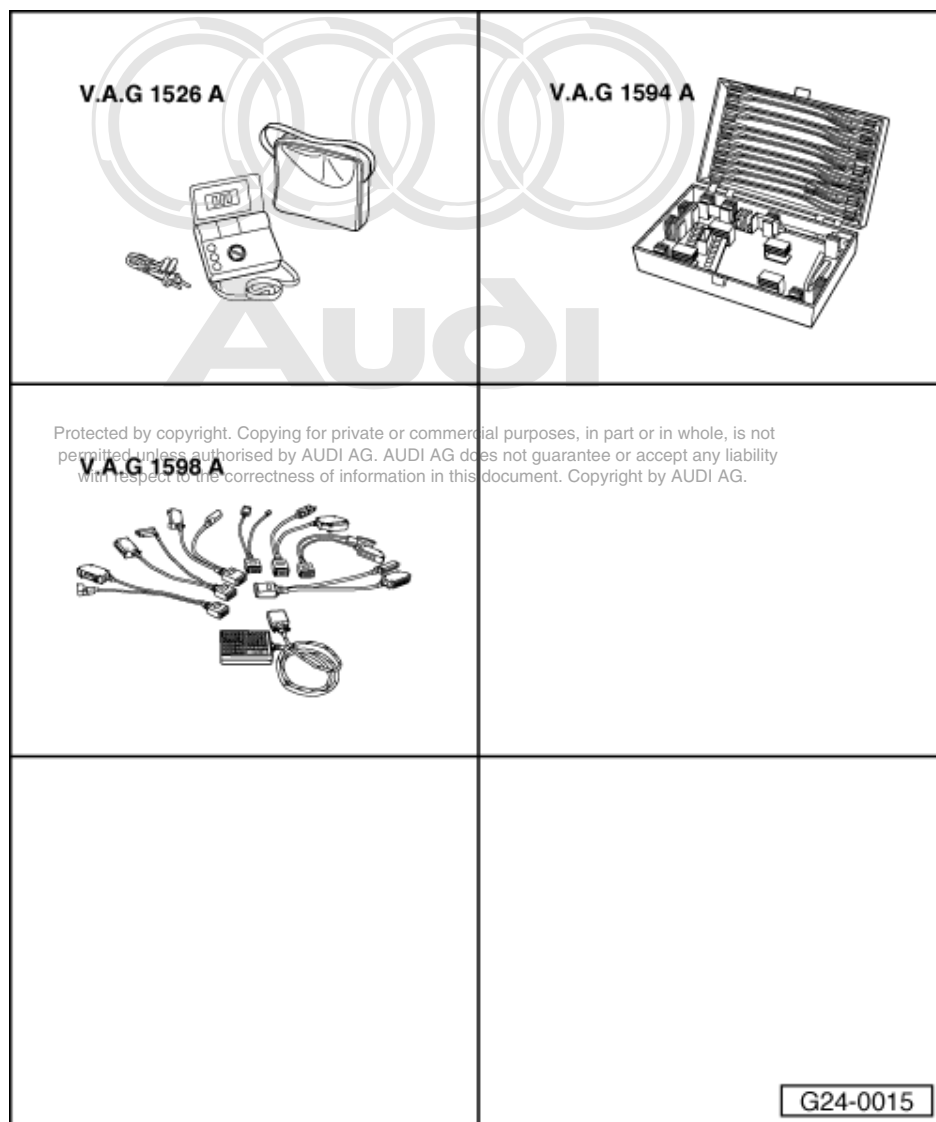
Engine codes	ABH (4.2 l / 206 kW engine)	AEC (4.2 l / 213 kW engine)
Idling speed Speed cannot be adjusted; regulated by idling speed stabilisation	690 ... 750 rpm	770 ... 830 rpm (manual gearbox) 670 ... 730 rpm (autom. gearbox)
Speed governing By deactivation of injectors	approx.. 6600 rpm	
Ignition point is determined in control unit		
Ignition distributor rotor	Resistance 1 kΩ	
Ignition cable	Resistance 1 kΩ	
Spark plug connector	Resistance 5 kΩ	
Spark plugs 1)	Tightening torque 30 Nm	
Firing order	1-5-4-8-6-3-7-2	

1) Current values:

=> Exhaust emission test binder



1.4 - Checking ignition coils with output stages



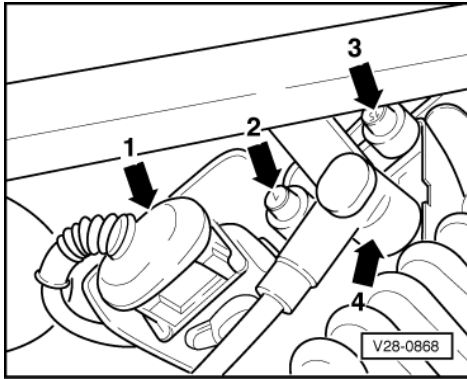
Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598 with V.A.G 1598/5

Fitting location => Exploded view of fitting locations - Page **41**

Notes:

- ♦ Ignition coils and output stage form a joint component.
- ♦ Check for corrosion/damage in wiring between output stage and ignition transformer.
- ♦ Always perform the following checks at both ignition coils.



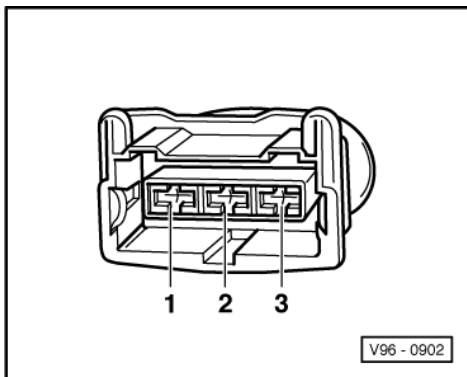
Checking power supply

Test requirement:

- Fuse for ignition coils OK

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- -> Unplug connector -1-.



- -> Connect up multimeter for voltage measurement as follows.

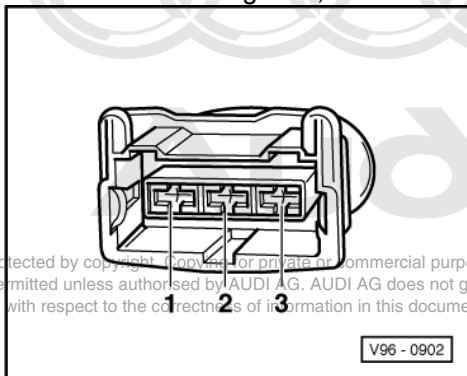
Connector Contact	Measure to
1	Engine earth

- Switch on ignition.
 - Specification: approx. battery voltage
- Connect up multimeter for voltage measurement between contacts 1 and 3 of connector.
 - Specification: approx. battery voltage

If readings do not match specifications:

- Check for open circuit in wiring.

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder



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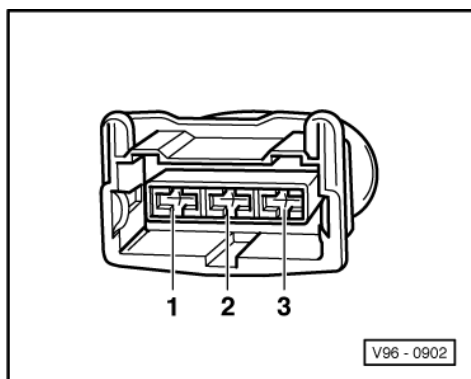


Checking actuation of output stages

- -> Connect up multimeter for voltage measurement between contacts 2 and 3 of connector.
- Briefly operate starter.
- Specification: min. 0.2 V

If reading does not match specification:

- With ignition switched off, use adapter V.A.G 1598/5 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit) => Page 48 .



- Check for open circuit and short to earth in the following wiring.

-> Output stage/bank 1

Connector Contact	Test box V.A.G 1598 A Socket
2	1

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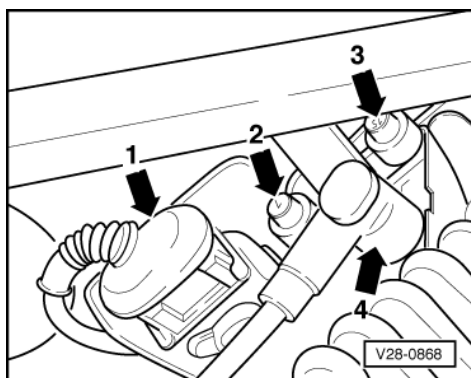
Output stage/bank 2

Connector Contact	Test box V.A.G 1598 A Socket
2	20

- If necessary, eliminate open circuit in wiring/short circuit.

If wiring is OK:

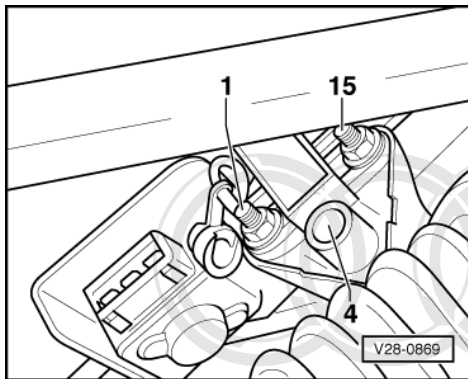
- Replace engine control unit => Page 49 .



Checking ignition coils

- -> Unplug connector -1- and detach caps -2- and -3-.

- Disconnect ignition cable -4-.

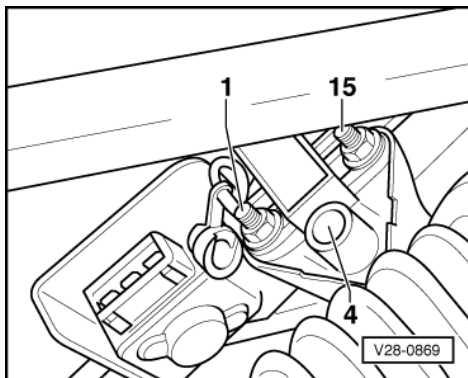


Checking secondary resistance

- -> Connect up multimeter for resistance measurement between terminals 1 and 4.
- Specification: 5 ... 9 k Ω

If reading does not match specification:

- Replace combined ignition coil and output stage component.



Checking primary resistance

- -> Connect up multimeter for resistance measurement between terminals 1 and 15.
- Specification: 0.5 ... 1.0 Ω

If reading does not match specification:

- Replace combined ignition coil and output stage component.

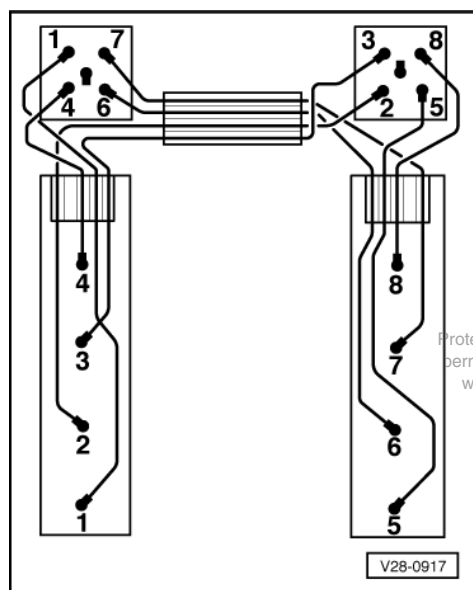
If all readings match specifications but engine does not run or runs only on one cylinder bank:

- Check distributor caps, rotor arms and ignition cables at cylinder banks 1 and 2.

If no fault is found:

- Try replacing output stage with ignition coil.

1.5 - Ignition cable routing

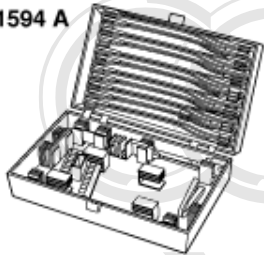


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Notes:

- ♦ To avoid interference, never attach other wires to ignition cables or route them in immediate vicinity.
- ♦ When unscrewing and screwing on distributor caps, take care not to scratch insides with rotor arm.

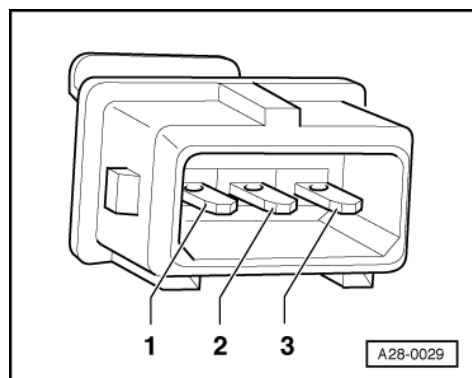
1.6 - Checking firing point sender -G4

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

Special tools and workshop equipment required

- ◆ V.A.G 1526 A
- ◆ V.A.G 1594 A
- ◆ V.A.G 1598 with V.A.G 1598/5

Fitting location => Exploded view of fitting locations - Page **41**

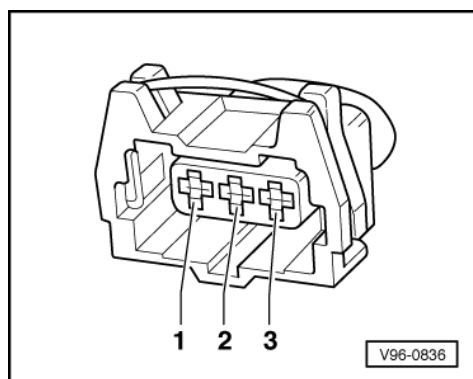


Checking internal resistance

- Unplug black 3-pin connector at firing point sender.
- -> Connect up multimeter for resistance measurement between contacts 1 and 2 at sender.
 - Specification: approx. 1 k Ω
- Connect up multimeter for resistance measurement between contacts 1 and 3 as well as 2 and 3 at sender.
 - Specification: $\infty \Omega$ (no continuity)

If readings do not match specifications:

- Replace firing point sender.



Checking wiring

- With ignition switched off, use adapter V.A.G 1598/5 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit) => Page 48 .
- -> Check for open circuit and short to earth/positive in the following wiring.

Connector Contact	Measure to
1 (positive)	Test box V.A.G 1598 A Socket 48
2 (signal)	Test box V.A.G 1598 A Socket 4
3 (screen)	Engine earth

- If necessary, eliminate open circuit in wiring/short circuit.

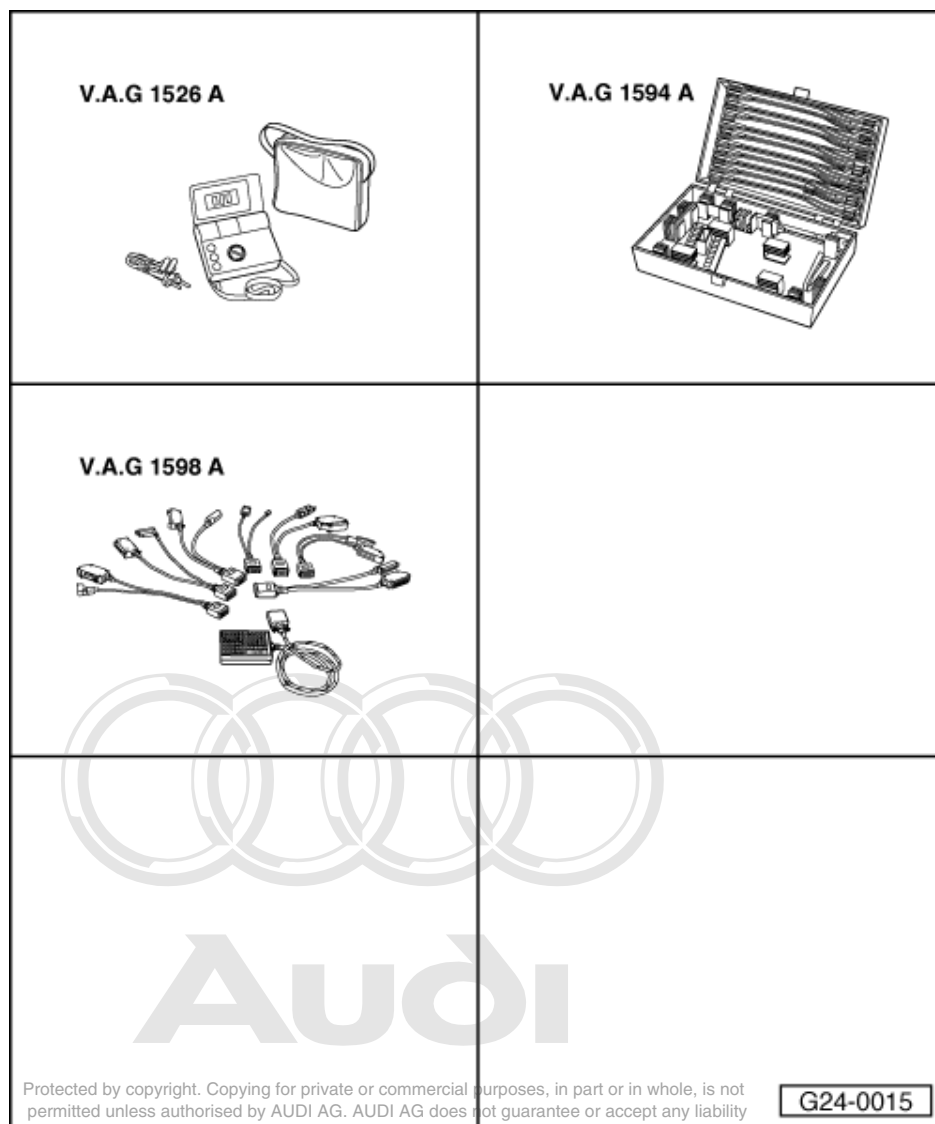
If wiring is OK Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

- With starter removed, check proper installation and firm attachment of sender; to do so, crank engine until pin becomes visible in starter opening.

If no fault is found:

- Replace engine control unit => Page 49 .

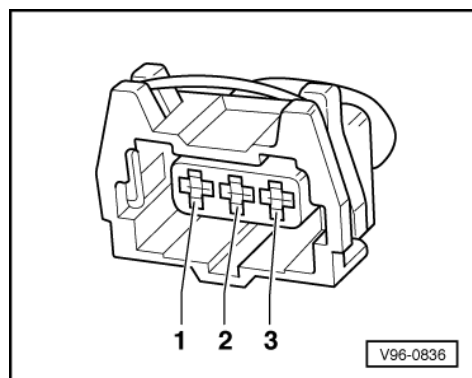
1.7 - Checking engine speed sender -G28



Special tools and workshop equipment required

- ◆ V.A.G 1526 A
- ◆ V.A.G 1594 A
- ◆ V.A.G 1598 with V.A.G 1598/5

Fitting location => Exploded view of fitting locations - Page **41**



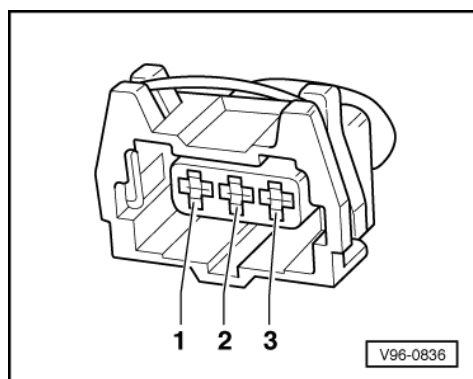


Checking internal resistance

- Unplug connector of engine speed sender (identification: grey connector).
- -> Connect up multimeter for resistance measurement to contacts 1 and 2.
 - Specification: approx. 1 k Ω
- Connect up multimeter for resistance measurement between contacts 1 and 3 as well as 2 and 3.
 - Specification: $\infty \Omega$ (no continuity)

If readings do not match specifications:

- Replace engine speed sender.



Checking wiring

- With ignition switched off, use adapter V.A.G 1598/5 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit) => Page 48 .
- -> Check for open circuit and short to earth/positive in the following wiring.

Connector Contact	Measure to
1 (positive)	Test box V.A.G 1598 A Socket 48
2 (signal)	Test box V.A.G 1598 A Socket 49
3 (screen)	Engine earth

- If necessary, eliminate open circuit in wiring/short circuit.

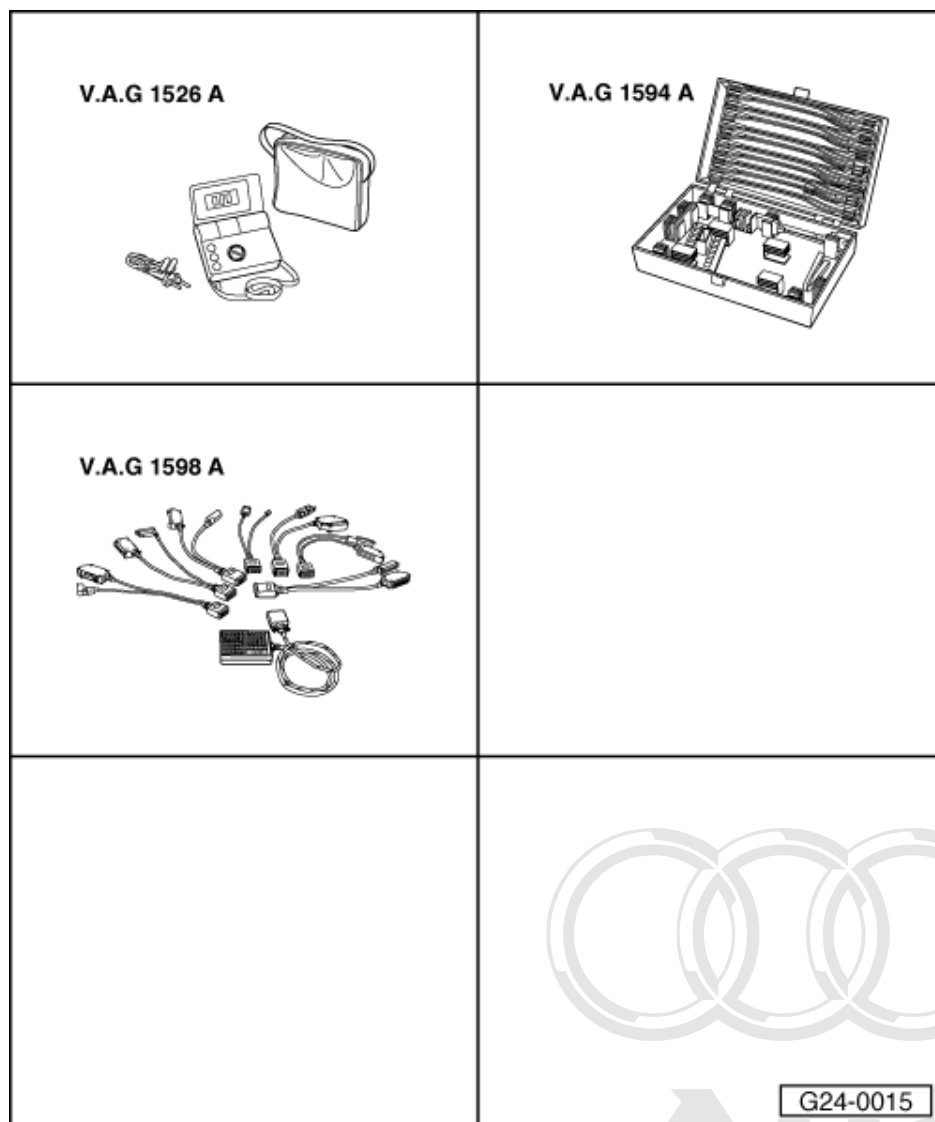
If wiring is OK:

- With starter removed, crank engine and check starter ring gear for concentricity and chipped/damaged teeth.

If no fault is found:

- Replace engine control unit => Page 49 .

1.8 - Checking intake-air temperature sender -G42



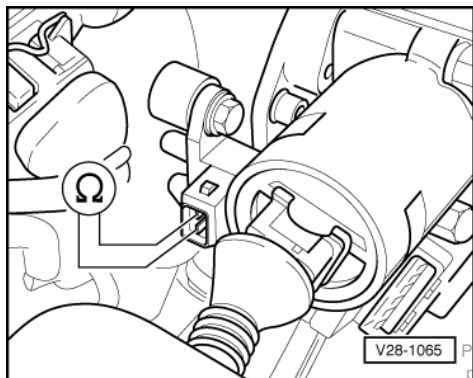
Special tools and workshop equipment required

- ◆ V.A.G 1526 A
- ◆ V.A.G 1594 A
- ◆ V.A.G 1598 with V.A.G 1598/5

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Fitting location => Exploded view of fitting locations - Page **41**

- Unplug connector from intake-air temperature sender.



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Checking sender

Test requirement:

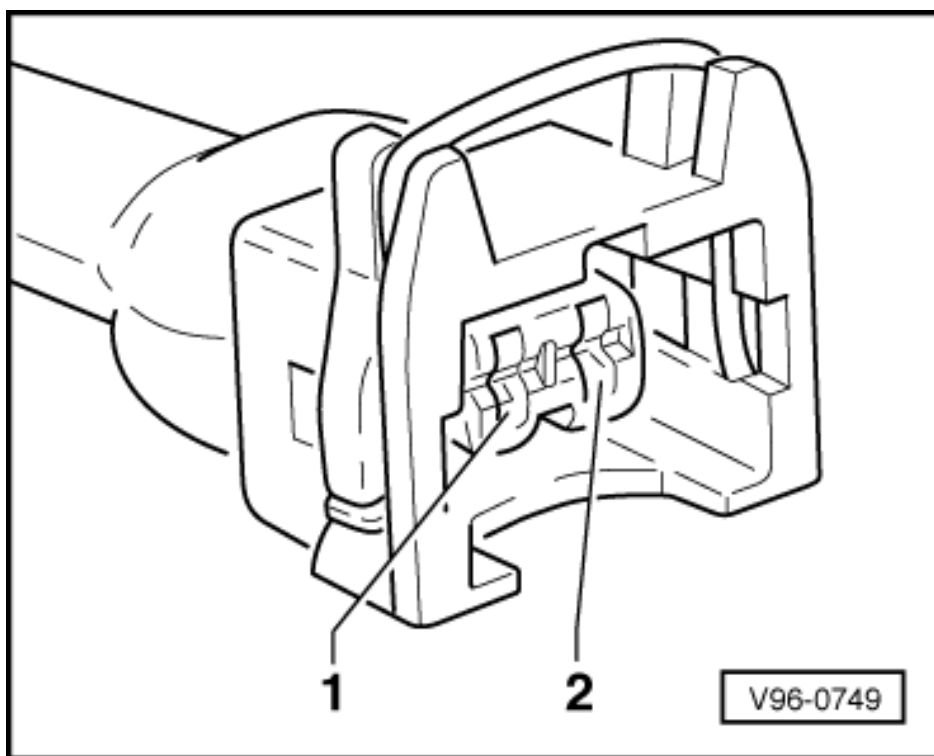
- Engine allowed to cool down to ambient temperature (approx. 20 °C)
- -> Connect multimeter to sender for resistance measurement.
 - Specification: 450 ... 550 Ω

If reading does not match specification:

- Replace intake-air temperature sender.

If reading matches specification:

- Check wiring.



Checking wiring

- With ignition switched off, use adapter V.A.G 1598/5 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit) => Page 48.

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

Connector Contact	Test box V.A.G 1598 A Socket
1	30
2	44

- Check both wires for mutual short circuit.
- If necessary, eliminate open circuit in wiring/short circuit.

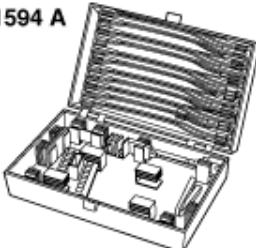
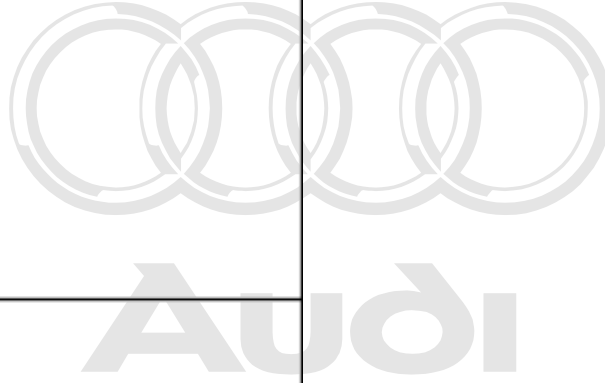
Note:

Exclusive use is to be made of gold-plated contacts when repairing contacts in connector.

If no fault is found:

- Replace engine control unit => Page **49** .

1.9 - Checking coolant temperature sender -G62

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 with V.A.G 1598/5

Checking sender

Test requirement:

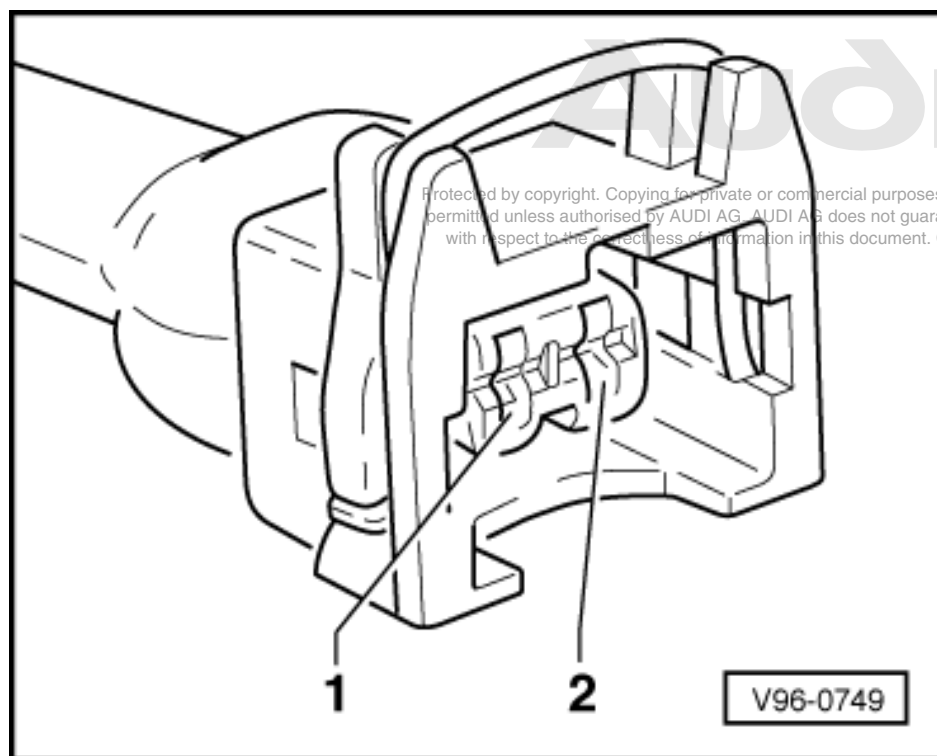
- Engine allowed to cool down to ambient temperature (approx. 20 °C)
- Unplug connector at coolant-temperature sender.
- Connect up multimeter for resistance measurement between contacts 1 and 2 at sender.
 - Specification: 1.3 ... 3.0 kΩ

If reading does not match specification:

- Replace coolant temperature sender.

If reading matches specification:

- Check wiring.



Checking wiring

- With ignition switched off, use adapter V.A.G 1598/5 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit) => Page 48 .
- -> Check for open circuit and short to earth/positive in the following wiring.

Connector Contact	Test box V.A.G 1598 A Socket
1	30

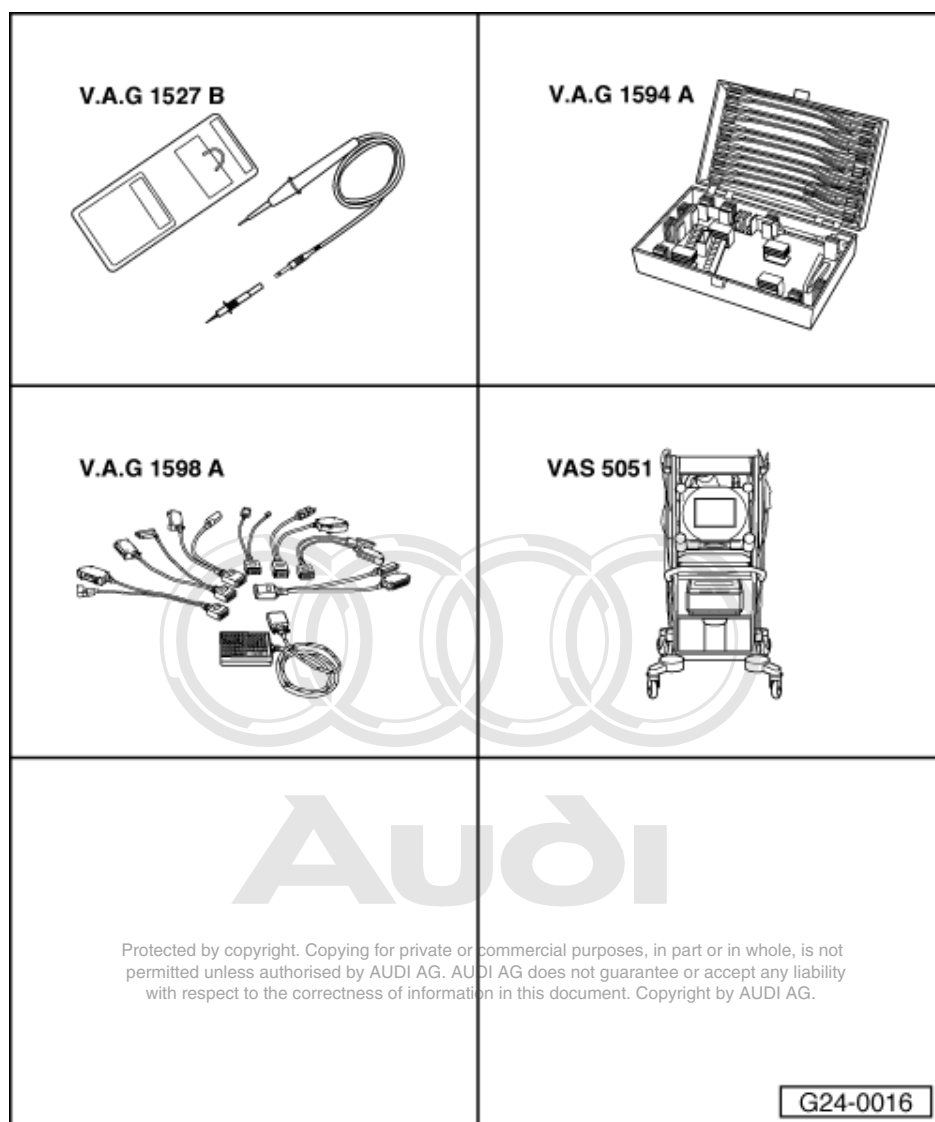
Connector Contact	Test box V.A.G 1598 A Socket
2	45

- Check both wires for mutual short circuit.
- If necessary, eliminate open circuit in wiring/short circuit.

If no fault is found:

- Replace engine control unit => Page **49** .

1.10 - Checking control unit power supply



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 with V.A.G 1598/5

**Test requirements:**

- Fuses for engine electronics OK

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- Battery voltage at least 12.7 V
- Alternator OK

Test sequence

- With ignition switched off, use adapter V.A.G 1598/5 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit) => Page 48 .
- Connect up voltage tester V.A.G 1527 B as follows.

Test box V.A.G 1598 A Socket	Measure to
18	Engine earth
10	Battery positive
14	Battery positive
19	Battery positive
24	Battery positive

- LED must light in each case
- Connect up voltage tester V.A.G 1527 B as follows.

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

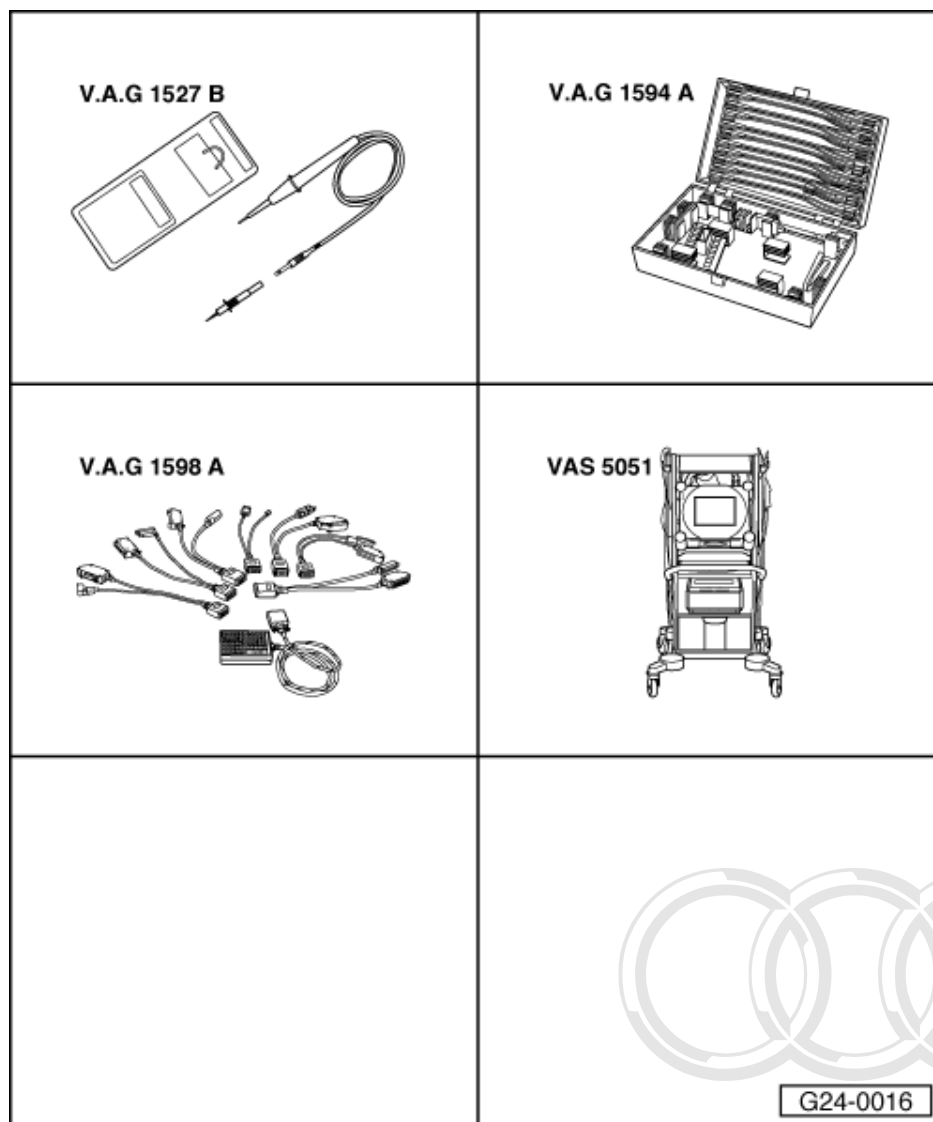
- Switch on ignition.
 - LED must light
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If readings do not match specifications:

- Check for open circuit in wiring.

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

1.11 - Checking knock sensors



Special tools and workshop equipment required

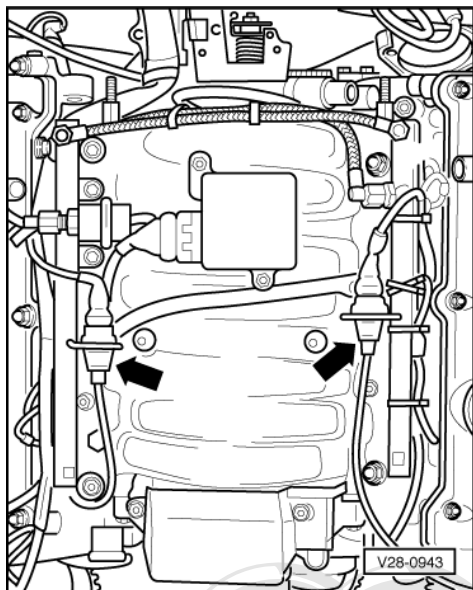
- ◆ V.A.G 1526 A
- ◆ V.A.G 1594 A
- ◆ V.A.G 1598 with V.A.G 1598/5

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Fitting location => Exploded view of fitting locations - Page **41**

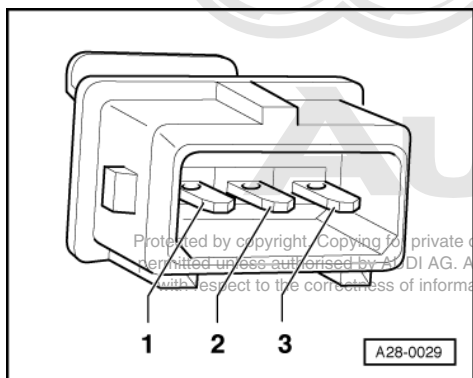
Notes:

- ◆ The actual knock sensors 1 and 2 -G61 and -G66 cannot be electrically checked.
- ◆ Exclusive use is to be made of gold-plated contacts when repairing cable connectors for knock sensors.
- ◆ Exact compliance with tightening torque of 20 Nm is essential to proper knock sensor operation.
- ◆ Check connector between knock sensor and wiring harness for corrosion.

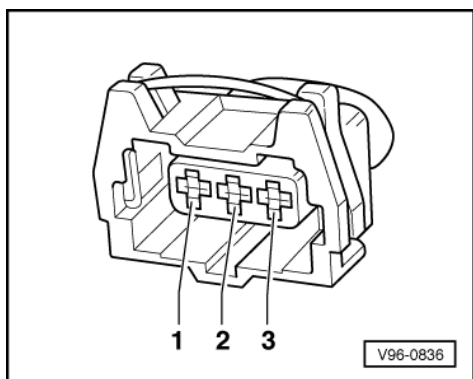


Checking knock sensor wiring

- -> Unplug connector of appropriate knock sensor in engine compartment -arrows-.



- -> Check all three contacts at knock sensor connector for mutual short circuit (contacts 1+2, 1+3, 2+3).
- Specification: $\infty \omega$ (no continuity) - there must be no contact between wires
- Replace knock sensor if there is contact.
- Check knock sensor wiring if no short circuit is found.



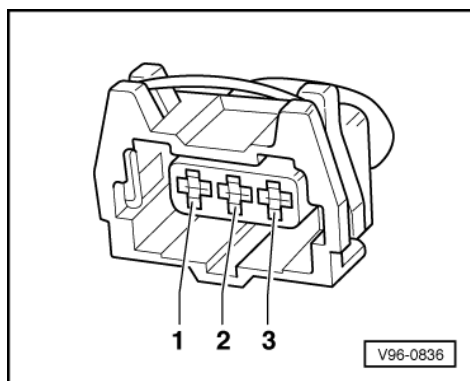
Checking wiring between knock sensors and engine control unit

- With ignition switched off, use adapter V.A.G 1598/5 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit) => Page 48.

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

-> Knock sensor 1 -G61 (bank 1)

Connector Contact	Test box V.A.G 1598 A Socket
1 (signal)	11
2 (earth)	30
3 (screen)	19



-> Knock sensor 2 -G66 (bank 2)

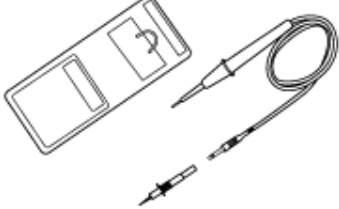
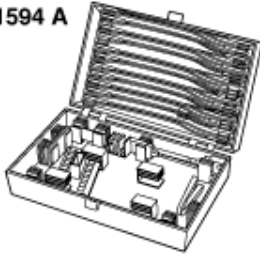
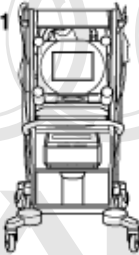
Connector Contact	Test box V.A.G 1598 A Socket
1 (signal)	29
2 (earth)	30
3 (screen)	19

- If necessary, eliminate open circuit in wiring/short circuit.



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1.12 - Checking Hall sender -G40

V.A.G 1527 B 	V.A.G 1594 A 
V.A.G 1598 A 	VAS 5051 
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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 with V.A.G 1598/5

Fitting location => Exploded view of fitting locations - Page **41**

Note:

To check operation of Hall sender, unplug 3-pin connector at both output stages and then interrogate fault memory.

Checking actuation

- If fitted, push back rubber grommet of Hall sender connector but leave connector attached.
- Connect up voltage tester V.A.G 1527 B in each case between contact 2 (Hall sender signal) and contact 1 (positive).

Note:

Pin assignment is marked on back of connector.

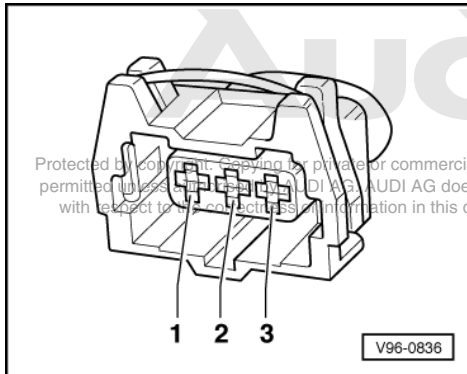
- Operate starter for several seconds.
- LED must flash

Note:

Voltage testers with a low current input do not go out completely between actuation of engine control unit, but rather continue to glow slightly and become distinctly brighter on actuation.

If LED does not flash:

- Switch off ignition.



Checking power supply

- Unplug connector at Hall sender.
- -> Connect up multimeter for voltage measurement between contacts 1 and 3.
- Switch on ignition.
- Specification: 4.5 ... 5.5 V

Checking signal wire

- Connect up multimeter for voltage measurement between contacts 2 and 3.
- Specification: 4.3 ... 5.2 V

Checking earth wire

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

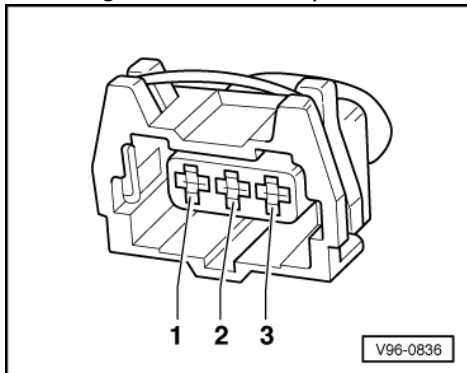
Connector Contact	Measure to
3	Engine earth

- If necessary, eliminate open circuit in wiring/short circuit.

If all readings match specifications and LED does not flash (measured between contacts 1 and 2 with connector attached):

- Replace Hall sender.

If readings do not match specifications:





Checking wiring between Hall sender and engine control unit

- With ignition switched off, use adapter V.A.G 1598/5 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit) => Page **48** .
- -> Check for open circuit and short to earth/positive in the following wiring.

Connector Contact	Test box V.A.G 1598 A Socket
1 (positive)	12
2 (signal)	8

- If necessary, eliminate open circuit in wiring/short circuit.

If no fault is found:

- Replace engine control unit => Page **49** .



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