

Audi A4 1995 ➤

Motronic injection and ignition system (4-cyl. turbo)								
Engine ID	ANB	APU						

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List of Workshop Manual Repair GroupsList of Workshop Manual Repair Groups Audi A4 1995 ➤

Motronic injection and ignition system (4-cyl. turbo)

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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Contents

01 - Self-diagnosis	1
1 Self-diagnosis of Motronic system	1
1.1 Self-diagnosis of Motronic system	1
1.2 Technical data for self-diagnosis	1
1.3 Safety precautions	1
1.4 Connecting vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 and selecting functions	1
2 Interrogating and erasing fault memory	4
2.1 Interrogating and erasing fault memory	4
2.2 Fault table	6
3 Final control diagnosis	16
3.1 Final control diagnosis	16
4 Basic setting	19
4.1 Basic setting	19
5 Coding control unit	20
5.1 Coding control unit	20
5.2 Coding table	21
6 Reading measured value block	22
6.1 Reading measured value block	22
7 Readiness code	23
7.1 Readiness code	23
7.2 Reading off readiness code	23
7.3 Generating readiness code	25
24 - Mixture preparation, Injection	32
1 Servicing Motronic injection system	32
1.1 Servicing Motronic injection system	32
1.2 Safety precautions	32
1.3 Rules for cleanliness	32
1.4 Technical data	33
1.5 Fitting locations overview	34
1.6 Dismantling and assembling air cleaner	46
1.7 Wiring and component check with test box V.A.G 1598/31	47
1.8 Procedure after voltage supply open circuit	49
1.9 Renewing engine control unit	49
1.10 Testing idling speed	51
1.11 Checking system pressure, fuel pressure regulator and holding pressure	53
1.12 Testing injectors	56
1.13 Dismantling and assembling fuel rail with injectors	60
1.14 Removing and installing injectors	62
1.15 Checking injection quantity, leak-tightness and spray pattern of injectors	64
1.16 Testing fuel pump relay -J17 and activation	66
1.17 Testing air mass meter -G70	71
1.18 Checking intake air system for leaks (unmetered air)	75
2 Testing lambda control	76
2.1 Testing lambda control	76
2.2 Function of lambda control (before catalytic converter)	76
2.3 Testing lambda probe and lambda control (before catalytic converter)	77
2.4 Testing lambda probe (before catalytic converter) for ageing - engine code ANB	83
2.5 Testing lambda probe and lambda control (after catalytic converter) - engine code ANB	85
2.6 Testing lambda probe heating -Z19 and -Z29 at lambda probes (before and after catalytic converter)	91
2.7 Removing and installing lambda probe	94



3	Testing secondary air system - engine code ANB	96
3.1	Testing secondary air system - engine code ANB	96
3.2	Testing secondary air inlet valve -N112	99
3.3	Testing secondary air pump relay -J299 and activation	104
4	Testing fuel tank breather	108
4.1	Testing fuel tank breather	108
4.2	Testing solenoid valve 1 for activated charcoal filter -N80	109
5	Testing electronic engine power control (electronic throttle)	113
5.1	Testing electronic engine power control (electronic throttle)	113
5.2	Operation of electronic throttle system	113
5.3	Notes on EPC warning lamp (fault warning lamp for electronic throttle) in dash panel insert	114
5.4	Testing electronic throttle warning lamp -K132	114
5.5	Testing throttle valve control part -J338	116
5.6	Performing adaption of throttle valve control part	116
5.7	Checking throttle valve for dirt	119
5.8	Cleaning throttle valve control part	121
5.9	Testing angle senders for throttle valve drive	122
5.10	Testing accelerator position senders	125
5.11	"Learning" kickdown function	128
5.12	Testing brake light switch and brake pedal switch	130
5.13	Testing clutch pedal switch -F36	134
6	Testing auxiliary signals	137
6.1	Testing auxiliary signals	137
6.2	Checking engine speed signal	138
6.3	Testing speed signal	138
6.4	Testing air conditioner compressor shut-off	139
6.5	Testing crash signal wiring	140
6.6	Testing fuel consumption signal for on-board computer	141
6.7	Testing fuel level signal wiring	141
6.8	Testing poor road signal	141
6.9	Testing data exchange between engine control unit and other control units with CAN interface	142
7	Vacuum system layout	145
7.1	Vacuum system layout	145
28 - Ignition system		149
1	Testing ignition system	149
1.1	Testing ignition system	149
1.2	General notes on ignition system	149
1.3	Safety precautions	149
1.4	Technical data	149
1.5	Removing and installing parts of the ignition system	150
1.6	Testing ignition coils	154
1.7	Testing output stage -N122 for ignition coils	159
1.8	Testing Motronic current supply relay -J271 - Vehicles from model year 2000 onwards	162
1.9	Testing intake air temperature sender -G42	166
1.10	Testing engine speed sender -G28	169
1.11	Testing coolant temperature sender -G62	172
1.12	Testing voltage supply for control unit	175
1.13	Testing knock sensor control limit	177
1.14	Testing knock sensors	178
1.15	Testing Hall sender -G40	180
1.16	Check misfiring recognition	183

01 - Self-diagnosis

1 - Self-diagnosis of Motronic system

1.1 - Self-diagnosis of Motronic system

1.2 - Technical data for self-diagnosis

Equipment

- ♦ The data transfer between the control unit and vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) is carried out in "Rapid data transfer" mode.
- ♦ The fault memory is equipped with a non-volatile memory and therefore does not depend on the power supply.
- ♦ Faults relating to the electronic throttle are also indicated by the EPC warning lamp in the dash panel insert (EPC = electronic power control).

1.3 - Safety precautions

Note the following points if test equipment has to be used during a road test:

Warning

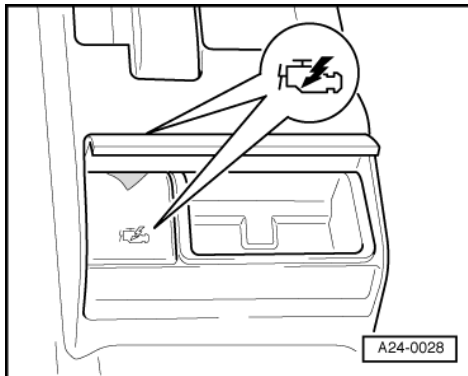
- ♦ **Test equipment must always be secured on the rear seat and operated from the rear seat by a second person.**
- ♦ **If test equipment is operated from the front passenger seat, the occupant could be injured by the passenger's airbag in an accident.**

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1.4 - Connecting vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 and selecting functions

Requirements for test:

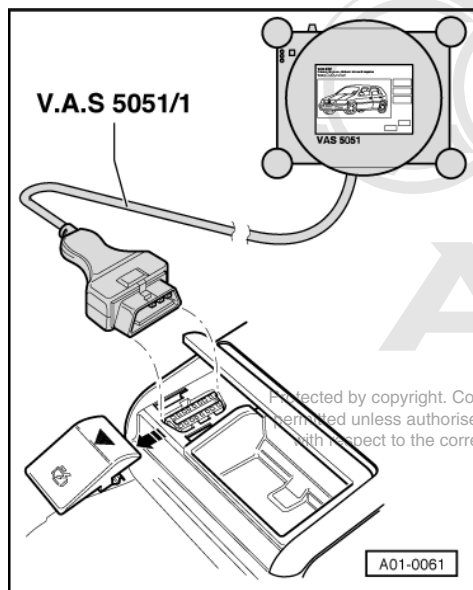
- Battery voltage not less than 11 V
- Earth connections on engine and gearbox OK





Work sequence

- -> Open rear ashtray and remove cover for diagnostic connector.



- -> Connect up vehicle diagnostic, testing and information system VAS 5051 with diagnostic cable VAS 5051/1. Alternatively, connect fault reader V.A.G 1551 using diagnostic cable V.A.G 1551/3A.

Warning

Observe safety precautions => Page 1 .

Note:

The following description only covers the procedure for performing self-diagnosis with fault reader V.A.G 1551.

If using vehicle diagnostic, testing and information system VAS 5051, follow the operating instructions supplied with the equipment.

-> Indicated in display

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

- 1) appears alternately

Note:

If the display remains blank:

=> Fault reader operating instructions

Depending on the function required, see table of selectable functions => Page 4 .

- Switch on ignition.

or

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

-> When this display appears:

Rapid data transfer HELP
Enter address word XX

Note:

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

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

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

4B0906018K 1.8l R4/5VT G
0002 □
Coding 05701 WSC 12345

Note:

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

Control unit identification (example)

- 4B0906018K	Part No. => Parts list
- 1.8 ltr.	Engine capacity
- R4/5VT	In-line engine, 4 cylinders, 5 valves per cylinder, turbo
- "G"	With cruise control (G)
- or no display	or without cruise control
- 0002	Status of data (software version) in control unit
- Coding 05701	Control unit coding
- WSC 12345	Workshop Code of V.A.G 1551 which was used to perform the last coding

- Press =>key.

-> Indicated on display (function selection):

Rapid data transfer HELP
Select function XX

Notes:

- ♦ By entering "01" ("Interrogate control unit version") and confirming with the Q key, the control unit identification can be displayed again.

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Rapid data transfer HELP
Control unit does not answer

-> Indicated on display:

- Perform fault-finding procedure as described in "Fault-finding programme: diagnostic wiring".

=> Current flow diagrams, Electrical fault-finding and Fitting locations binder

Rapid data transfer HELP
K wire not switching to earth

Rapid data transfer HELP
K wire not switching to positive



Rapid data transfer **HELP**
Fault in communication build-up

Selectable functions

Vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551		Ignition on, engine not running	Engine idling	Vehicle being driven	Page
Address words					
01	Engine electronics	Yes	Yes	Yes	1
00	Automatic test sequence	Yes	Yes	Yes	3
Functions					
01	Interrogate control unit version	Yes	Yes	Yes	3
02	Interrogate fault memory	No	Yes	Yes	4
03	Final control diagnosis	Yes	No	No	16
04	Basic setting	Yes	Yes	Yes	19
05	Erase fault memory	Yes	Yes	Yes	4
06	End output	Yes	Yes	Yes	5
07	Code control unit	Yes	No	No	20
08	Read measured value block	Yes	Yes	Yes	22

2 - Interrogating and erasing fault memory

2.1 - Interrogating and erasing fault memory

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page **1**).
When doing this the engine must be running at idling speed.

Note:

If the engine does not start, turn the engine over for at least 5 seconds using the starter. After doing this, do not switch off the ignition.

-> Indicated on display:

Rapid data transfer **HELP**
Select function XX

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- Press keys **0** and **2** for the function "Interrogate fault memory" and confirm entry with Q key.

-> Indicated on display:

No fault recognised

- Press =>key.

or

-> Indicated on display:

X faults recognised

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

- Locate and eliminate faults printed out as per fault table
=> Page 6 .

Vehicles with engine code ANB:

Notes:

- ◆ Do not erase the fault memory if no fault is stored, otherwise the readiness code will be reset.
- ◆ The readiness code must be re-generated if the fault memory has been erased => Page 25 .

All models

- Press ➔key.

-> Indicated on display:

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

- Press keys 0 and 5 for the function "Erase fault memory" and confirm entry with Q key.

Notes:

-> Indicated on display:

Attention! Fault memory is not interrogated
--

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- Interrogate fault memory.

In the following cases the fault memory is not erased:

- ◆ If the ignition was switched off after interrogating the fault memory
- ◆ If an existing static fault was not rectified

-> Indicated on display:

Rapid data transfer Fault memory is erased!
--

- Press ➔key.
- After completing repair work, interrogate the fault memory again.

Note:

This has the effect of erasing any faults that may have been stored while carrying out repairs (e.g. as a result of unplugging connectors).

Vehicles with engine code ANB:

- If the fault memory was erased the readiness code must be generated again => Page 25 .

End output

-> Indicated on display:

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

- Press keys 0 and 6 for the function "End output" and confirm entry with Q key.

-> Indicated on display:



Rapid data transfer HELP
Insert address word XX

- Switch off ignition and unplug the diagnostic connector.

2.2 - Fault table

Notes:

- If faults occur in the sensors and components being monitored, they will be stored in the fault memory together with an indication of the type of fault.
- Faults relating to the electronic throttle are also indicated by the EPC warning lamp in the dash panel insert (EPC = Electronic Power Control).
- Sporadically occurring faults (temporary faults) will be indicated on the V.A.G 1551 display as "SP". The word "sporadic" means "intermittent" or "occurring at irregular intervals".
- The fault table is arranged according to the 5-digit fault codes in the left-hand column.
- If a fault is stored in the fault memory and then does not occur again during the next 40 engine warm-up phases, the fault code will be automatically erased.
- Components that are indicated as being faulty by the V.A.G 1551 should not be renewed immediately.
 - Always start by checking the wiring and connectors for the component using the current flow diagram.
 - Also test the earth connections using the current flow diagram. This is particularly important in the case of sporadic faults (indicated by the letters "SP" on the fault reader display).
- If the connector for the engine control unit is unplugged or if the battery is disconnected, all the learned values stored in the control unit will be erased, although the contents of the fault memory will remain intact. The next time the engine is started the idling may be rough at first, in which case it should be left to idle for a few minutes until the learning process has been completed.
- Vehicles with engine code ANB: after erasing fault memory (=>Page 25).

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P0101	16485	Air mass meter -G70 Implausible signal	- Test air mass meter => Page 71 Check charge air system with turbocharger
P0102	16486	Air mass meter -G70 Signal too small	- Check throttle valve for dirt =>Page 71 Check charge air system with turbocharger
P0103	16487	Air mass meter -G70 Signal too large	- Test air mass meter => Page 71 Check charge air system with turbocharger:
P0106	16490	Intake manif. press./air press. => -G71/-F96 1) Implausible signal	=> 4-cylinder engine (5-valve turbo), Mechanics; Repair group 21; Charge air system with turbocharger; Testing charge pressure sender -G31
P0112	16496	Intake air temp. sender -G42 Signal too small	- Test intake air temperature sender => Page 166
P0113	16497	Intake air temp. sender -G42 Signal too large	

1) The intake manifold pressure is measured by charge pressure sender -G31 (not by -G71 as indicated on the display). The air pressure is measured by altitude sender -F96 (in the engine control unit).

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P0116	16500	Coolant temp. sender -G62 Implausible signal	- Test coolant temperature sender => Page 172
P0117	16501	Coolant temp. sender -G62 Signal too small	
P0118	16502	Coolant temp. sender -G62 Signal too large	



Fault code		Readout on fault reader display	Fault rectification
P0130	16514	Bank 1, Probe 1 Electrical fault in current circuit	- Test lambda control => Page 76
P0131	16515	Bank 1, Probe 1 Voltage too low	
P0132	16516	Bank 1, Probe 1 Voltage too high	
P0133	16517	Bank 1, Probe 1 Signal too slow	
P0134	16518	Bank 1, Probe 1 No activity	
P0135	16519	Bank 1, Probe 1, Electrical fault in heating element circuit	

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P0136	16520	Bank 1, Probe 2 Electrical fault in current circuit	- Test lambda control => Page 76
P0137	16521	Bank 1, Probe 2 Voltage too low	
P0138	16522	Bank 1, Probe 2 Voltage too high	
P0139	16523	Bank 1, Probe 2 Signal too slow	
P0140	16524	Bank 1, Probe 2 No activity	
P0236	16620	Charge pressure sender -G31 Implausible signal	=> 4-cylinder engine (5-valve turbo), Mechanics; Repair group 21; Charge air system with turbocharger; Testing charge pressure sender -G31
P0237	16621	Charge pressure sender -G31 Signal too small	
P0238	16622	Charge pressure sender -G31 Signal too large	

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P0300	16684	Misfiring recognised	- Test injectors=>Page 56 - Test ignition cables, connectors and spark plugs - Test ignition coils => Page 154 - Test output stage=> Page 159 - Test misfiring recognition=> Page 183
P0301	16685	Cyl.1 Misfiring recognised	
P0302	16686	Cyl.2 Misfiring recognised	
P0303	16687	Cyl.3 Misfiring recognised	
P0304	16688	Cyl.4 Misfiring recognised	
P0321	16705	Engine speed sender -G28 Implausible signal	- Test engine speed sender =>Page 169
P0322	16706	Engine speed sender -G28 No signal	

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P0327	16711	Knock sensor 1 -G61 Signal too small	- Test knock sensor => Page 178
P0328	16712	Knock sensor 1 -G61 Signal too large	



Fault code		Readout on fault reader display	Fault rectification
P0332	16716	Knock sensor 2 -G66 Signal too small	
P0333	16717	Knock sensor 2 -G66 Signal too large	
P0341	16725	Camshaft pos. sensor => Hall sender -G40 Implausible signal	
P0342	16726	Camshaft pos. sensor =>Hall sender -G40 Signal too small	- Test Hall sender => Page 180
P0343	16727	Camshaft pos. sensor =>Hall sender -G40 Signal too large	
P0346	16730	Bank 1, Camshaft pos. sensor => -G163 Implausible signal	
P0411	16795	Secondary air system Through-flow defective	- Check secondary air system => Page 96

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P0422	16806	Bank 1, Main catalyst Efficiency too low	- Generate readiness code => Page 25 . Replace catalytic converter if the same fault is indicated again.
P0441	16825	Tank breathing system Flow rate faulty	- Test solenoid valve 1 for activated charcoal filter => Page 109
P0501	16885	Vehicle speed signal Implausible signal	- Test vehicle speed signal=> Page 138
P0506	16890	Idling speed control Revs below specification	- Test throttle valve control part => Page 116
P0507	16891	Idling speed control Revs above specification	
P0560	16944	Voltage supply Implausible signal	- Test voltage supply to control unit => Page 175
P0562	16946	Voltage supply Voltage too low	
P0563	16947	Voltage supply Voltage too high	
P0571	16955	Brake light switch -F 1) Implausible signal	- Test brake light switch and brake pedal switch => Page 130

1) The system monitors both brake light switch -F and brake pedal switch -F47.

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P0601	16985	Control unit defective	- Renew engine control unit => Page 49
P0604	16988	Control unit defective	
P0605	16989	Control unit defective	
P0606	16990	Control unit defective	
P0685	17069	Motronic current supply relay => - J271 Open circuit	- Test Motronic current supply relay -J271 => Page 162
P0686	17070	Motronic current supply relay => - J271 Short circuit to earth	
P0687	17071	Motronic current supply relay => - J271 Short circuit to positive	

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Fault code		Readout on fault reader display	Fault rectification
P0688	17072	Motronic current supply relay, load circuit => -J271 Open circuit	
P1102	17510	Bank 1 - Probe 1, Heating element circuit Short to Positive	- Test lambda probe heating before catalytic converter => Page 91
P1103	17511	Bank 1 - Probe 2, Heating element circuit Performance too low	
P1105	17513	Bank 1 - Probe 2, Heating element circuit Short to Positive	

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P1111	17519	Lambda control, Bank1 System too lean	- Test lambda control => Page 76
P1112	17520	Lambda control, Bank1 System too rich	
P1113	17521	Bank 1, Probe 1 Internal resistance too great	- Test lambda probe heating => Page 91
P1114	17522	Bank 1, Probe 2 Internal resistance too great	
P1115	17523	Bank 1 - Probe 1, Heating element circuit Short to Earth	
P1116	17524	Bank 1 - Probe 1, Heating element circuit Open circuit	
P1117	17525	Bank 1 - Probe 2, Heating element circuit Short to Earth	
P1118	17526	Bank 1 - Probe 2, Heating element circuit Open circuit	

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P1127	17535	Bank 1, Mixture adaption (mult.) System too rich	- Take car for road test (fuel in oil) Check fuel system pressure => Page 76
P1128	17536	Bank 1, Mixture adaption (mult.) System too lean	- Check fuel system pressure => Page 56
P1136	17544	Bank 1, Mixture adaption (add.) System too lean	- Test air mass meter => Page 76
P1137	17545	Bank 1, Mixture adaption (add.) System too rich	- Take car for road test (fuel in oil) Check fuel system pressure => Page 76

Note:

mult. = multiplicative, i.e. the fault occurs across the whole range of engine speeds and engine loads.

add. = additive, i.e. the fault only occurs at idling speed.

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		



Fault code		Readout on fault reader display	Fault rectification
P1141	17549	Load determination Implausible value	- Test air mass meter => Page 116 ; also check that correct version of throttle valve control part is installed (check part No.) - Test lambda control => Page 76 - Test angle sender for throttle valve drive => Page 122
P1149	17557	Lambda control, Bank 1 Implausible control value	
P1171	17579	Angle sens. 2 for throt. valve drive -G188 Implausible signal 1)	
P1172	17580	Angle sens. 2 for throt. valve drive -G188 Signal too small 1)	
P1173	17581	Angle sens. 2 for throt. valve drive -G188 Signal too large 1)	- Check lambda probe ageing on lambda probe before catalytic converter => Page 85
P1176	17584	Bank 1, Lambda correction after cat Control limit reached	
P1198	17606	Bank 1 - Probe 2, Heating element circuit Electrical fault	- Test lambda probe heating => Page 91

1) If this fault occurs the engine control unit activates the EPC warning lamp in the dash panel insert.

Notes on EPC warning lamp =>Page 114 .

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		- Test injectors =>Page 56
P1213	17621	Injector Cyl. 1 -N30 Short to Positive	
P1214	17622	Injector Cyl. 2 -N31 Short to Positive	
P1215	17623	Injector Cyl. 3 -N32 Short to Positive	
P1216	17624	Injector Cyl. 4 -N33 Short to Positive	
P1225	17633	Injector Cyl. 1 -N30 Short to Earth	
P1226	17634	Injector Cyl. 2 -N31 Short to Earth	
P1227	17635	Injector Cyl. 3 -N32 Short to Earth	
P1228	17636	Injector Cyl. 4 -N33 Short to Earth	

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		- Test injectors =>Page 56
P1237	17645	Injector Cyl. 1 -N30 Open circuit	
P1238	17646	Injector Cyl. 2 -N31 Open circuit	
P1239	17647	Injector Cyl. 3 -N32 Open circuit	
P1240	17648	Injector Cyl. 4 -N33 Open circuit	

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Fault code		Readout on fault reader display	Fault rectification
P1250	17658	Fuel status too low	- Successive fault =>Note Fill up tank, erase fault memory Interrogate fault memory of dash panel insert => Electrical system; Repair group 01; Self-diagnosis of dash panel insert Self-diagnosis of dash panel insert

Note:

The fault "Fuel status too low" is stored in conjunction with misfiring or faults relating to lambda control, if the fuel level in the tank is or was too low. The fault is stored in the fault memory as a static fault and is not set to a sporadic fault even if, for instance, the tank was filled in the meantime.

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P1287	17695	Air recirc. valve for turbocharger - N249 Open circuit	=> 4-cylinder engine (5-valve turbo), Mechanics; Repair group 21; Charge air system with turbocharger; Testing air recirculation valve for turbocharger -N249 Charge air system with turbocharger; Testing air recirculation valve for turbocharger -N249
P1288	17696	Air recirc. valve for turbocharger - N249 Short to Positive	
P1289	17697	Air recirc. valve for turbocharger - N249 Short to Earth	
P1297	17705	Connection turbocharger-throttle valve Loss of pressure	=> 4-Cylinder engine (5-valve, turbo), Mechanics; Repair group 21; Testing charge air system with turbocharger Test- ing charge air system with turbocharger
P1325	17733	Knock control Cyl. 1 Control limit reached	- Test knock control => Page 177
P1326	17734	Knock control Cyl. 2 Control limit reached	
P1327	17735	Knock control Cyl. 3 Control limit reached	
P1328	17736	Knock control Cyl. 4 Control limit reached	

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1) If this fault occurs the engine control unit activates the EPC warning lamp in the dash panel insert.

Notes on EPC warning lamp =>Page 114 .

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P1335	17743	Engine torque monitoring 2 Control limit surpassed 1)	- Check hose connections => Page 166
P1336	17744	Engine torque monitoring Control limit surpassed	- Test air mass meter => Page 172
P1337	17745	Bank 1, Camshaft pos. sensor => -G163 Short to Earth	- Test Hall sender => Page 180
P1338	17746	Bank 1, Camshaft pos. sensor => -G163 Open circuit / Short to Positive	
P1355	17763	Ignition activation, Cyl. 1 Open circuit	- Test activation of output stages => Page 159
P1356	17764	Ignition activation, Cyl. 1 Short to Positive	



Fault code		Readout on fault reader display	Fault rectification
P1357	17765	Ignition activation, Cyl. 1 Short to Earth	
P1358	17766	Ignition activation, Cyl. 2 Open circuit	
P1359	17767	Ignition activation, Cyl. 2 Short to Positive	

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P1360	17768	Ignition activation, Cyl. 2 Short to Earth	- Test activation of output stages => Page 159
P1361	17769	Ignition activation, Cyl. 3 Open circuit	
P1362	17770	Ignition activation, Cyl. 3 Short to Positive	
P1363	17771	Ignition activation, Cyl. 3 Short to Earth	
P1364	17772	Ignition activation, Cyl. 4 Open circuit	
P1365	17773	Ignition activation, Cyl. 4 Short to Positive	
P1366	17774	Ignition activation, Cyl. 4 Short to Earth	

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P1386	17794	Control unit defective	- Renew engine control unit => Page 49
P1387	17795	Control unit defective	
P1388	17796	Control unit defective 1)	
P1410	17818	Tank breather valve -N80 Short to Positive	- Test ACF solenoid valve 1 => Page 109
P1421	17829	Secondary air inlet valve -N112 Short to Earth	- Test secondary air system=>Page 96
P1422	17830	Secondary air inlet valve -N112 Short to Positive	
P1424	17832	Bank 1, Secondary air system Leak recognised	- Check pipes/hoses and components of secondary air system => 4-cylinder engine (5-valve turbo), Mechanics; Repair group 26; Secondary air system Secondary air system

1) If this fault occurs the engine control unit activates the EPC warning lamp in the dash panel insert.

Notes on EPC warning lamp =>Page 114 .

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P1425	17833	Tank breather valve -N80 Short to Earth	- Test ACF solenoid valve 1 => Page 109
P1426	17834	Tank breather valve -N80 Open circuit	
P1432	17840	Secondary air inlet valve -N112 Open circuit	- Test secondary air system=>Page 96

Fault code		Readout on fault reader display	Fault rectification
P1433	17841	Relay for secondary air pump -J299 Open circuit	
P1434	17842	Relay for secondary air pump -J299 Short to Positive	
P1435	17843	Relay for secondary air pump -J299 Short to Earth	

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P1500	17908	Fuel pump relay -J17 Electrical fault in current circuit	- Test fuel pump relay => Page 66
P1502	17910	Fuel pump relay -J17 Short to Positive	
P1517	17925	Main relay => -J271 Fault in electrical circuit	- Test Motronic current supply relay -J271 => Page 162
P1523	17931	Crash signal from airbag control unit Implausible signal 2)	=> Body, Self-diagnosis; Repair group 01; Self-diagnosis of airbag system Self-diagnosis of airbag system
P1539	17947	Clutch pedal switch -F36 Implausible signal	- Test clutch pedal switch => Page 134
P1542	17950	Angle sender for throt. val. drive - G187 Implausible signal 1)	- Test angle sender for throttle valve drive => Page 122
P1543	17951	Angle sender for throt. val. drive - G187 Signal too small 1)	
P1544	17952	Angle sender for throt. val. drive - G187 Signal too large 1)	
P1545	17953	Throttle valve control Faulty 1)	- Test throttle valve control part => Page 116

1) If this fault occurs the engine control unit activates the EPC warning lamp in the dash panel insert.

Notes on EPC warning lamp =>Page 114 .

2) This fault is stored if a crash signal has been transmitted by the airbag control unit

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P1546	17954	Charge press. control solenoid valve -N75 Short to Positive	=> 4-cylinder engine (5-valve turbo), Mechanics; Repair group 21; Charge air system with turbocharger; Testing air recirculation valve for turbocharger -N249 Charge air system with turbocharger; Testing air recirculation valve for turbocharger -N249
P1547	17955	Charge press. control solenoid valve -N75 Short to Earth	
P1548	17956	Charge press. control solenoid valve -N75 Open circuit	
P1550	17958	Charge pressure Control difference	
P1555	17963	Maximum charge pressure surpassed	



Fault code		Readout on fault reader display	Fault rectification
P1556	17964	Charge pressure control Regulating limit not reached	- Perform adaption => Page 116
P1557	17965	Charge pressure control Regulating limit surpassed	
P1559	17967	Throttle valve control part -J338 Fault in basic setting 1)	

1) If this fault occurs the engine control unit activates the EPC warning lamp in the dash panel insert.

Notes on EPC warning lamp =>Page 114 .

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P1560	17968	Maximum engine revs surpassed	- Rectify mechanical faults
P1564	17972	Throttle valve control part -J338 Low voltage at base setting	- Charge battery and repeat basic setting
P1565	17973	Throttle valve control part -J338 Lower stop is not reached 1)	- Test throttle valve control part => Page 116
P1568	17976	Throttle valve control part -J338 Mechanical fault 1)	
P1569	17977	CCS switch -E45 Implausible signal	=> Electrical system; Repair group 01; Self-diagnosis of cruise control system (CCS)
P1570	17978	Engine control unit blocked	- Perform adaption of electronic immobilizer to engine control unit => Electrical system; Repair group 01; Self-diagnosis of im- mobilizer

1) If this fault occurs the engine control unit activates the EPC warning lamp in the dash panel insert.

Notes on EPC warning lamp =>Page 114 .

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P1579	17987	Throttle valve control part -J338 Adaption not started	- Perform adaption of throttle valve control part; observe test requirements => Page 116
P1602	18010	Voltage supply Kl. 30 Voltage too low	- Test voltage supply from terminal 30 to control unit => Page 175
P1603	18011	Control unit defective	- Renew engine control unit => Page 49
P1604	18012	Control unit defective 1)	
P1606	18014	Poor road info/eng.sp.mom from ABS CU (specified engine torque from ABS control unit) Electrical fault in current circuit	- Test wiring between engine control unit and ABS control unit => Current flow diagrams, Electrical fault finding and Fit- ting locations
P1609	18017	Crash switch-off triggered (Crash triggered) 2)	=> Body, Self-diagnosis; Repair group 01; Self-diagnosis of airbag system 4

1) If this fault occurs the engine control unit activates the EPC warning lamp in the dash panel insert.

Notes on EPC warning lamp =>Page 114 .

2) The fault is stored if the corresponding signal is transmitted from the airbag control unit (also when final control diagnosis is performed on the airbag system).

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P1612	18020	Engine control unit wrongly coded	- Code engine control unit => Page 20
P1626	18034	Drive train data bus No message from gearbox CU	- Test drive train data bus =>Page 142
P1630	18038	Accelerator position sender -G79 Signal too small 1)	- Test accelerator position sender =>Page 125
P1631	18039	Accelerator position sender -G79 Signal too large 1)	
P1633	18041	Accelerator position sender 2 -G185 Signal too small 1)	
P1634	18042	Accelerator position sender 2 -G185 Signal too large 1)	
P1639	18047	Accelerator position sender 1/2 -G79/-G185 Implausible signal 1)	
P1640	18048	Control unit defective	- Renew engine control unit => Page 49

1) If this fault occurs the engine control unit activates the EPC warning lamp in the dash panel insert.

Notes on EPC warning lamp =>Page 114 .

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P1645	18053	Drive train data bus No message from 4WD elec.	- Test CAN bus => Page 142
P1648	18056	Drive train data bus Defective	
P1649	18057	Drive train data bus No message from ABS CU	
P1650	18058	Drive train data bus Message from combi-instrument missing	
P1654	18062	Please interrogate fault memory of combi-instrument	=> Electrical system; Repair group 01; Self-diagnosis of dash panel insert Self-diagnosis of dash panel insert
P1676	18084	Electr. throttle control fault lamp - K132 Electrical fault in current circuit 1)	- Test EPC warning lamp => Page 114
P1677	18085	Electr. throttle control fault lamp - K132 Short to Positive 1)	

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P1682	18090	Drive train data bus Implausible info. from ABS CU	- Test data exchange between engine control unit and other control units with CAN interface => Page 142 - Test CAN bus => Page 142
P1853	18261	Drive train data bus Implausible message from ABS CU	



Fault code	Readout on fault reader display	Fault rectification
P3078	19534 Throttle valve control part Insufficient air flow at idle	- Clean throttle valve control part =>Page 121

1) If this fault occurs the engine control unit activates the EPC warning lamp in the dash panel insert.

Notes on EPC warning lamp =>Page 114 .

Note:

Electronic throttle control fault lamp -K132 (designation used in current flow diagrams) is also known as the EPC warning lamp (EPC = Electronic Power Control).

3 - Final control diagnosis

3.1 - Final control diagnosis

Notes:

- The final control diagnosis can only be performed with the ignition switched on and the engine not running.
- The electric fuel pump runs continuously throughout the final control diagnosis.
- During the final control diagnosis, each control element is activated for about 1 minute unless the test programme is deliberately advanced to the next control element by pressing the ➔ key.
- The control elements can be tested either by listening or by touching.
- The final control diagnosis is terminated if the engine is started or if an engine speed pulse is detected.
- If the final control diagnosis is to be repeated, the engine must be started. The engine control unit needs to detect an engine speed of more than 300 rpm.

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

Activation sequence
1 ACF solenoid valve 1 (-N80)
2 Secondary air inlet valve -N112 (only on vehicles with secondary air system)
3 Secondary air pump relay -J299 (only on vehicles with secondary air system)
4 Charge pressure control valve -N75
5 Air recirculation valve for turbocharger -N249
6 Injector Cyl. 1 -N30 (only on vehicles from model year 2000 onwards with engine code ANB)
7 Injector Cyl. 3 -N32 (only on vehicles from model year 2000 onwards with engine code ANB)
8 Injector Cyl. 4 -N33 (only on vehicles from model year 2000 onwards with engine code ANB)
9 Injector Cyl. 2 -N31 (only on vehicles from model year 2000 onwards with engine code ANB)

Requirements for test:

- Fuses for engine electronics OK.
- Fuel pump relay OK.

Test sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page 1 .)

When doing this the ignition must be switched on.

-> Indicated on display:

Rapid data transfer HELP
Select function XX

- Enter "03" to select the function "Final control diagnosis".

-> Indicated on display:

Rapid data transfer Q
03-Final control diagnosis

Activating solenoid valve for activated charcoal filter

- Confirm input with Q key.

-> Indicated on display:

(Appears on V.A.G 1551 as "Tank breather valve -N80")

Final control diagnosis
ACF solenoid 1 -N80

- ◆ This valve is activated for about 1 minute (clicks) unless the test programme is deliberately advanced to the next control element by pressing the ⇒ key.

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

- Test solenoid valve 1 for activated charcoal filter -N80
=> Page 109 .

Activating secondary air inlet valve

(only on vehicles with secondary air system)

- Press ⇒key.

-> Indicated on display:

Final control diagnosis
Secondary air inlet valve -N112

- ◆ This valve is activated for about 1 minute (clicks) unless the test programme is deliberately advanced to the next control element by pressing the ⇒ key.

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

- Test secondary air inlet valve -N112
=> Page 99 .

Activating relay for secondary air pump

(only on vehicles with secondary air system)

- Press ⇒key.

-> Indicated on display:

Final control diagnosis
Secondary air pump relay -J299

- ◆ The secondary air pump relay -J299 (in 3-point relay carrier in electronics box on left side of plenum chamber, plug-in position 2) switches the secondary air pump motor -V101 on and off at intervals of approx. 1 minute, unless the test programme is deliberately advanced to the next control element by pressing the ⇒ key.



If secondary air pump motor -V101 does not run at intervals:

- Test secondary air pump relay -J299
=> Page 104 .

Activating charge pressure control valve -N75

- Press =>key.

-> Indicated on display:

Final control diagnosis
Boost pressure control solenoid -N75

- ♦ This valve is activated for about 1 minute (clicks) unless the test programme is deliberately advanced to the next control element by pressing the => key.

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

=> 4-cylinder engine (5-valve turbo), Mechanics; Repair group 21; Charge air system with turbocharger; Testing charge pressure control valve -N75 Charge air system with turbocharger Testing charge pressure control valve -N75

Activating air recirculation valve for turbocharger

- Press =>key.

-> Indicated on display:

Final control diagnosis
Air recirculation valve for turbocharger
-N249

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- ♦ This valve is activated for about 1 minute (clicks) unless the test programme is deliberately advanced to the next control element by pressing the => key.

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

=> 4-cylinder engine (5-valve turbo), Mechanics; Repair group 21; Charge air system with turbocharger; Testing air recirculation valve for turbocharger -N249 Charge air system with turbocharger Testing air recirculation valve for turbocharger -N249

Activating injectors(only on vehicles from model year 2000 onwards with engine code ANB)

- Press =>key.

Note:

The injectors are actuated according to the firing order: Cyl. 1, Cyl. 3, Cyl. 4, Cyl. 2.

-> Indicated on display:

Final control diagnosis
Injector, cylinder 1 -N30

- Press =>key.

-> Indicated on display:

Final control diagnosis
Injector, cylinder 1 -N30

- ♦ The injector should click five times after pressing the => key.
- Use this procedure to test all the injectors in sequence.

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

- Test injectors => Page 56 .
- Press =>key after the last injector (cylinder 2) has been actuated.

All models

- Press =>key.

-> Indicated on display:

Final control diagnosis END

- Press =>key.

-> Indicated on display (function selection):

Rapid data transfer	HELP
Select function XX	

Note:

If the final control diagnosis has to be repeated, the engine must be started again first.

4 - Basic setting

4.1 - Basic setting

With the ignition on and engine not running, the following operation can be performed in the "Basic setting" mode (function 04):

- ◆ Adaption of throttle valve control part to engine control unit
=>Page 116

With the engine running, the following operations can be performed in the basic setting mode:

- ◆ Learning process for lambda control => Page 79
- ◆ Fault-finding by deliberate activation and deactivation of lambda control=> Page 78

Requirements for operations performed with the engine running:

- No faults stored in fault memory
- Coolant temperature at least 80 °C
- Electrical consumers switched off (radiator fan must not run during the test)

Test sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page 1 .)
- When doing this the engine must be idling.
- Interrogate and erase fault memory => Page 4 .
- Leave engine idling.

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	

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

-> Indicated on display:



Basic setting Q
Enter display group number XXX

- Enter the required Display Group number.

Example:

- Enter "000" to select Display Group number 000 and confirm entry with Q key.

Note:

When the display group is selected the ACF valve is closed and the air conditioner compressor is switched off.

-> Indicated on display:

System in basic setting 0 Q
1 2 3 4 5 6 7
8 9 10

Notes:

- ♦ In Display Group 000 the measured values are shown in decimal form.
- ♦ If the printer is switched on, the current display can be printed out.
- ♦ Other display groups can be selected as follows:

Display group	V.A.G 1551	VAS 5051
Higher	Press key 3	Press skey
Lower	Press key 1	Press tkey

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

-> Indicated on display (function selection):

Rapid data transfer HELP
Select function XX

Display Group 000 (decimal readouts)									
▪ Engine idling (coolant temperature not below 80°C)									
1	2	3	4	5	6	7	8	9	10
▪ Display zones									
Learned value for mixture formation at part throttle						Specification		Corresponds to	
Learned value for mixture formation at idling speed						103...153		-10...10%	
Control value for mixture formation						78...178		-10...10 %	
Learned value for torque loss at idling speed						103...153		-10...10 %	
Torque at idling speed						120...143		-3...3 %	
Throttle valve angle						106...189		-4.3...12.2 %	
Voltage of on-board electrical system						1...7		0.4...2.75 %	
Engine speed (idling speed)						142...206		10...14.5 V	
▪ Front-wheel drive						74...86		740...860 rpm	
▪ Four-wheel drive						80...92		800...920 rpm	
Engine load (without electrical consumers)						21...41		15...35 %	
Coolant temperature (requirement for basic setting)						185...205		85...105 °C	

5 - Coding control unit

5.1 - Coding control unit

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page 1 .)

When doing this the ignition must be switched on.

-> Indicated on display:

Rapid data transfer HELP
Select function XX

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

-> Indicated on display:

Code control unit Q
Enter code number XXXX (0-32000)

- Enter control unit coding as specified in coding table => Page 21 .

Meaning of coding:

XX	Country / emissions
X	Drive layout / additional functions
X	Gearbox
X	Model

Example of coding	
05701	Emissions standard D4, four-wheel drive with traction control (ASR) / ESP, 5-speed manual gearbox, Audi A4

- Confirm input with Q key.

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

4B0906018K 1.8l R4/5VT G
0002 □
Coding 05701 WSC 12345

- Press =>key.

-> Indicated on display (function selection):

Rapid data transfer HELP
Select function XX

5.2 - Coding table

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Country/Emission standard	03	Emissions standard ECE 83-A
	04	Emissions standard MVEG II
	05	Emissions standard D4
	0	Front-wheel drive without traction control (ASR) / ESP
Drive layout / Auxiliary functions	2	Four-wheel drive without traction control (ASR) / ESP
	5	Front-wheel drive with traction control(ASR) / ESP
	7	Four-wheel drive with traction control (ASR) / ESP
	0	5-speed manual gearbox
Gearbox 1)	5	Automatic gearbox 01V



Model	1	Audi A4
-------	---	---------

1) Different control units are installed to match the gearbox version, rather than using different codings. A control unit cannot be re-coded for other gearbox versions. Part No.

=> Parts list

6 - Reading measured value block

6.1 - Reading measured value block

Requirements for test:

- Coolant temperature at least 80 °C
- Electrical consumers switched off (radiator fan must not run during the test)
- Air conditioner switched off

Test sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page 1).
- When doing this the engine must be idling.

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-> Indicated on display:

Rapid data transfer	HELP
Select function XX	

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

-> Indicated on display:

Read measured value block	Q
Enter display group number XXX	

- Enter the required Display Group number (3 figures) and confirm entry with Q key.

Note:

The choice of display group number depends on which functions and components are to be tested.

-> Indicated on display for Display Group 000:

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

-> Indicated on display (example) for Display Group 001:

Read measured value block	1
1 2 3 4	

Notes:

- ♦ If the printer is switched on, the current display can be printed out.
- ♦ Other display groups can be selected as follows:

Display group	V.A.G 1551	VAS 5051
Higher	Press key 3	Press skey
Lower	Press key 1	Press tkey

7 - Readiness code

7.1 - Readiness code

The readiness code appears as an 8-digit display in the measured value block 086, Display zone 1. Each digit represents a specific component of the emission control system.

During the test procedure, which has to be run to the end, the operation of each of these components is tested via self-diagnosis. If the component is found to be okay the corresponding digit on the 8-digit display will change from "1" to "0".

If the readiness code is generated after successfully completing the test procedure, it will therefore appear as "0 0 0 0 0 0 0 0" (Measured value block 086, display zone 1).

If one of the components is found to be not okay after the test procedure is completed, the fault is stored in the fault memory.

Interrogating fault memory => Page 4.

The readiness code will revert back to "0 1 1 0 1 1 0 1" if:

- ◆ the fault memory has been erased,
- ◆ or if the voltage supply to the engine control unit has been cut off (e.g. connector unplugged or battery disconnected).
- ◆ a new engine control unit was installed

If this happens, the readiness code has to be regenerated

=>Page 25

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Note:

During a test drive the control unit runs the various emission-related tests as the vehicle is operated in different load ranges, and generates the readiness code automatically. In this case, however, if no final check is performed, there is no indication to confirm that the vehicle is fault-free when handed over to the customer.

7.2 - Reading off readiness code

Test sequence

- Connect the vehicle diagnostic, test and information system VAS 5051 (or fault reader V.A.G 1551). Select engine electronics control unit by entering address word "01" => Page 1; when doing this the ignition must be on.

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	

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

-> Indicated on display:

Read measured value block	Q
Enter display group number XXX	

- Enter "086" for "Display Group 086" and confirm entry with Q key.

-> Indicated on display:

Read measured value block 86			
1	2	3	4

- Check readiness code in display zone 1.



- Specification: 0 0 0 0 0 0 0

	Display zones			
	1	2	3	4
Display group 086: Readiness code				
Display	0 0 0 0 0 0 0	X X X X X X X X	X X X X X X X X	
Indicates	Ready-Bits finalised tests	performed tests	performed tests	
Range	1 = not finalised 0 = finalised	1 = not finalised 0 = finalised	1 = not finalised 0 = finalised	
Specification	0 0 0 0 0 0 0	X X X X X X X X	X X X X X X X X	
Note	Significance of readiness code => Page 24			

Note on display zone 1:

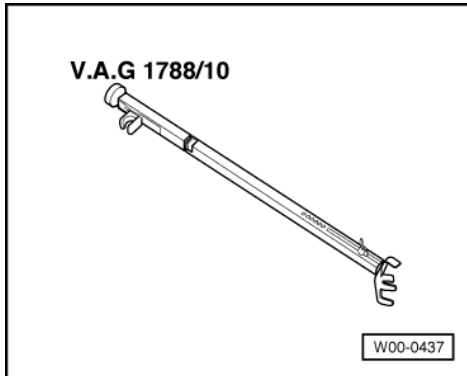
Display zone 1 is of main importance. This display indicates which component was tested by self-diagnosis since the last time the fault memory was erased or a new control unit was installed. After erasing the fault memory, all test values (except the values which cannot be tested) are set to "1". After performing the test procedure successfully all values are set to "0".

X	X	X	X	X	X	X	X	Notes on Display group 086, Display zone 1
								Diagnosis of catalytic converter - Display 0 = Test finalised - Display 1 = Test not finalised (Generating readiness code => Page 25.)
								Display constantly 0
								Activated charcoal filter system - Display 0 = Test finalised - Display 1 = Test not finalised (Generating readiness code => Page 25)
								Secondary air system - Display 0 = Test finalised - Display 1 = Test not finalised (Generating readiness code => Page 25)
								Display constantly 0
								Lambda probes - Display 0 = Test finalised - Display 1 = Test not finalised (Generating readiness code => Page 25)
								Lambda probe heating - Display 0 = Test finalised - Display 1 = Test not finalised (Generating readiness code => Page 25)
								Display constantly 0

Note:

The readiness code has only been successfully generated if all digits in display zone 1 are set to "0".

7.3 - Generating readiness code



Special tools and workshop equipment required

- ◆ Speed regulator V.A.G 1788/10

Requirements:

- Vehicle is stationary
- Electrical consumers switched off (radiator fan must not run during the test)

Work sequence

- Connect the vehicle diagnostic, test and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" => Page 1 .

Work step 1: interrogate fault memory

- Ignition switched on.

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	

- Press keys 0 and 2 for the function "Interrogate fault memory" and confirm entry with Q key.

-> The number of faults stored or "No fault recognised!" will be shown on the display.

X Faults recognised!

If a fault is stored:

- Rectify fault and erase fault memory. Then take vehicle for a road test and interrogate fault memory once again to check for faults.

If no faults are stored:

- Press =>key.

Work step 2: erase fault memory

- Ignition switched on.

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	

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- Press keys 0 and 5 for the function "Erase fault memory" and confirm entry with Q key.

Note:

If the fault memory is erased, the readiness code is set back and therefore has to be regenerated.

-> Indicated on display:

Rapid data transfer
Fault memory is erased!

- Press =>key.

Work step 3: adjust the throttle valve control part to the engine control unit

- Ignition switched on.

-> Indicated on display:

Rapid data transfer HELP
Select function XX

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

-> Indicated on display:

Introduction of basic setting Q
Enter display group number XXX

- Enter "060" for Display Group 060 and confirm entry with Q key.

-> Indicated on display:

System in basic setting 60
1 2 3 4

- Check the specifications in display zone 3 and 4:

	Display zones			
	1	2	3	4
Display Group 060: Adaption of throttle valve control part				
Display	xx %	xx %	x	---
Indicates	Throttle valve angle (angle sender 1)	Throttle valve angle (angle sender 2)	Learning stage counter	Adaption status
Range	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.			ADP. runs ADP. O.K. ERROR
Specification	3...93 %	97...3 %	8	ADP O.K.
Note			During the adaption process the learning stage counter should reach "8". (Some of the digits may be skipped)	If display reads "ERROR", interrogate fault memory => Page 118.

If the specification "ADP O.K." is attained:

- Press C key.

Work step 4: diagnosis of fuel tank breather system

- Engine idling

Note:

After starting the engine, enter address word "01" to re-select the engine control unit if necessary, and enter "04" to select the function "Introduction of basic setting".

-> Indicated on display:

Introduction of basic setting Q
Enter display group number XXX

- Enter "070" for Display Group 070 and confirm entry with Q key.

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-> Indicated on display:

System in basic setting 70
1 2 3 4

- Check the specification in display zone 4:

Note:

If the test does not start or if the display jumps from "Test ON" to "Test OFF", press the accelerator briefly. The test will now be repeated.

	Display zones			
	1	2	3	4
Display Group 070: Diagnosis of fuel tank breather valve				
Display	xx %	xx.x %		---
Indicates	Fuel tank breather valve: amount of opening	Lambda control variation		Status of diagnosis
Range	0...99 %	-25.0 ... 25.0 %		Test OFF Test ON TBV O.K. TBV n. O.K.
Specification	0...99 %	-7.0...7.0 %		TBV O.K.
Note				If "TBV n. O.K." appears on display, interrogate fault memory (=> Page 109).

If the specification "TBV O.K." is attained:

- Press =>key.

Work step 5: check lambda control operation

- Engine running between 1800 and 2200 rpm.

Note:

To obtain the higher engine speed specified above, use the speed regulator V.A.G 1788/10.

-> Indicated on display:

Rapid data transfer HELP
Select function XX

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

-> Indicated on display:

Read measured value block Q
Enter display group number XXX



- Enter "030" to select Display Group 030 and confirm entry with Q key.

-> Indicated on display:

Read measured value block 30
1 2 3 4

- Check the readouts in display zones 1 and 2:

Note:

The readouts can be obtained more quickly by increasing engine speed.

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Display zones				
	1	2	3	4
Display Group 030: Lambda probe status				
Display	X X X		X X X	
Indicates	Lambda probe status Bank 1, Probe 1		Lambda probe status Bank 1, Probe 2	
Range	0 = off 1 = on		0 = off 1 = on	
Specification	1 1 1		1 1 0	
Note	If the specification is not attained, interrogate fault memory => Page 4			

Explanation of 3-figure displays in Display Group 030

X	X	X	Display zones 1 and 2
		1	Lambda control active
	1		Lambda probe condition
1			Status of lambda probe heating

Notes:

- ♦ The lambda control function of the lambda probe (after catalytic converter; B1-P2) is inactive when the engine is not running under load
- ♦ The first digit of the three-digit display (for heating) fluctuates between 0 and 1.

If the specifications are obtained:

- Press =>key.

Work step 6: diagnosis of lambda probe ageing (cycle duration)

- Engine still running between 1800 and 2200 rpm.

-> Indicated on display:

Rapid data transfer HELP
Select function XX

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

-> Indicated on display:

Introduction of basic setting Q
Enter display group number XXX

- Enter "034" for Display Group 034 and confirm entry with Q key.

-> Indicated on display:

System in basic setting 34
1 2 3 4

- Check the readout in display zone 4:

Note:

It may take a few minutes before a diagnosis result is obtained.

	Display zones			
	1	2	3	4
Display group 034: Diagnosis of lambda probe ageing				
Display	xxxx rpm	xxx °C	x.x s	---
Indicates	Engine speed	Exhaust temperature	Cycle duration of lambda probe (before catalytic converter)	Status of diagnosis
Range	0...6800 rpm	70...850 °C	0.0...3.0 s	Test OFF Test ON B1-P1 O.K. B1-P1 n. O.K.
Specification	1800...2200 rpm	Higher than 350 °C	0.0...1.0 s	B1-P1 O.K.
Note				If "B1-P1 n. O.K." appears on display: interrogate fault memory => Page 4.

If the specification "B1-P1 O.K." is attained:

- Press =>key.

Work step 7: diagnosis of lambda control system

- Engine still running between 1800 and 2200 rpm.

-> Indicated on display:

Introduction of basic setting Q
Enter display group number XXX

- Enter "037" for Display Group 037 and confirm entry with Q key.

-> Indicated on display:

System in basic setting 37
1 2 3 4

- Check the readout in display zone 4:

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	Display zones			
	1	2	3	4
Display group 037: Diagnosis of lambda control system				
Display	xxx %	x.xxx Volt	xxx ms	---
Indicates	Engine load	Lambda probe voltage Bank 1, Probe 2	Delay period of lambda control (before catalytic converter) Bank 1	Status of diagnosis
Range	15...150 %	0.000...1.000 V	-800...800 ms	Test OFF Test ON SYST. O.K. SYST. n. O.K.



	Display zones			
Specification	15...25 %	0.100...0.900 V	-150...150 ms	SYST. O.K.
Note				If "SYST. n. O.K." appears on display: interrogate fault memory => Page 4.

If the specification "SYST. O.K." is attained:

- Press =>key.

Work step 8: diagnosis of catalytic converter

- Engine still running between 1800 and 2200 rpm.

-> Indicated on display:

Introduction of basic setting Q
Enter display group number XXX

- Enter "046" for Display Group 046 and confirm entry with Q key.

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-> Indicated on display:

System in basic setting 46
1 2 3 4

- Check the readout in display zone 4:

Note:

The diagnostic test of the catalytic converter takes approx. 60 seconds.

	Display zones			
	1	2	3	4
Display group 046: Diagnosis of catalytic converter				
Display	xxxx rpm	xxx °C	x.x s	---
Indicates	Engine speed	Exhaust temperature	Catalytic converter: conversion	Status of diagnosis
Range	0...6800 rpm	70...850 °C	0.0...1.0	Test OFF Test ON Cat B1 O.K. Cat B1 n. O.K.
Specification	1800...2200 rpm	Higher than 350 °C	0.0...0.4	Cat B1 O.K.
Note				If "Cat B1 n. O.K." appears on display, interrogate fault memory (=> Page 4). If there is no fault stored in fault memory, replace catalytic converter.

If the specification "Cat B1 O.K." is attained:

- Press =>key.

Work step 9: diagnosis of secondary air system

- Engine still running between 1800...2200 rpm.

-> Indicated on display:

Introduction of basic setting Q
Enter display group number XXX

- Enter "077" for Display Group 077 and confirm entry with Q key.

-> Indicated on display:

System in basic setting 77
1 2 3 4

- Check the readout in display zone 4:

	Display zones			
	1	2	3	4
Display Group 077: Diagnosis of secondary air system				
Display	xxxx rpm	xxx °C	xx.x g/s	---
Indicates	Engine speed	Coolant temperature	Air mass Secondary air system	Status of diagnosis
Range	0...6800 rpm	-48...143 °C	0...20 g/s	Test OFF Test ON SYST. O.K. SYST. n. O.K.
Specification	2000...2200 rpm	80...110 °C	5.0...10.0 g/s	SYST. O.K.
Note			The readout in display zone 3 appears only if the secondary air system is active (after a cold start or during diagnosis)	If "SYST. n. O.K." appears on display, interrogate fault memory => Page 4.

If the specification "SYST. O.K." is attained:

- Press =>key.

-> Indicated on display (function selection):

Rapid data transfer HELP
Select function XX

Work step 10: read off readiness code

- Read off the readiness code => Page 23



24 - Mixture preparation, Injection

1 - Servicing Motronic injection system

1.1 - Servicing Motronic injection system

1.2 - Safety precautions

To prevent injuries to persons and/or damage to the fuel injection and ignition system, note the following points:

- ♦ Always switch off the ignition before connecting or disconnecting injection or ignition system wiring or tester cables.
- ♦ In order to run the engine at starting speed without actually starting it (for example, to test compression), unplug the connectors on the ignition coils and also the connectors on the injectors.
- ♦ During some of the tests the control unit may identify and record faults. The fault memory should therefore be interrogated and (if necessary) erased after completing the tests and any repair work that may be required.
- ♦ Always switch off the ignition before cleaning the engine.
- ♦ Always switch off the ignition before connecting or disconnecting the battery, otherwise the engine control unit may be damaged.

Warning

Fuel system is under pressure. Before opening the system place a cloth around the connection. Then release pressure by carefully loosening the connection.

Note the following points if test equipment has to be used during a road test:

Warning

- ♦ **Test equipment must always be secured on the rear seat and operated from the rear seat by a second person.**
- ♦ **If test equipment is operated from the front passenger seat, the occupant could be injured by the passenger's airbag in an accident.**

1.3 - Rules for cleanliness

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

- ♦ Thoroughly clean all unions and the adjacent areas before disconnecting.
- ♦ Place parts that have been removed on a clean surface and cover them over. Do not use fluffy cloths.
- ♦ Carefully cover or seal opened components if the repair cannot be completed immediately.
- ♦ Only install clean components:
Only unpack replacement parts immediately prior to installation.
Do not use parts that have been stored loose (e.g. in tool boxes etc.).
- ♦ When the system is open:
Do not work with compressed air if this can be avoided.
Do not move vehicle unless absolutely necessary.
- ♦ Electrical connectors:
Protect against dirt and moisture when disconnected.

Make sure they are dry before re-connecting.

1.4 - Technical data

Engine code		ANB (1.8 ltr. / 5V / 110 kW engine) APU (1.8 ltr. / 5V / 110 kW engine)
Idling speed	Front-wheel drive	740 ... 860 rpm
Not adjustable - controlled by idling speed stabilisation Four-wheel drive		800 ... 920 rpm ¹⁾
Engine speed limitation by switching off the injectors		6800 rpm
Fuel pressure at idling speed	Vacuum hose connected	approx. 3.5 bar
	Vacuum hose disconnected	approx. 4.0 bar
Holding pressure after 10 minutes		at least 2.5 bar
Injectors	Spray pattern	Two-hole nozzle (same on all injectors)
	Injection qty. (30 sec.)	135 ± 10 ml ²⁾
	Resistance (room temperature)	12 ... 13 Ω

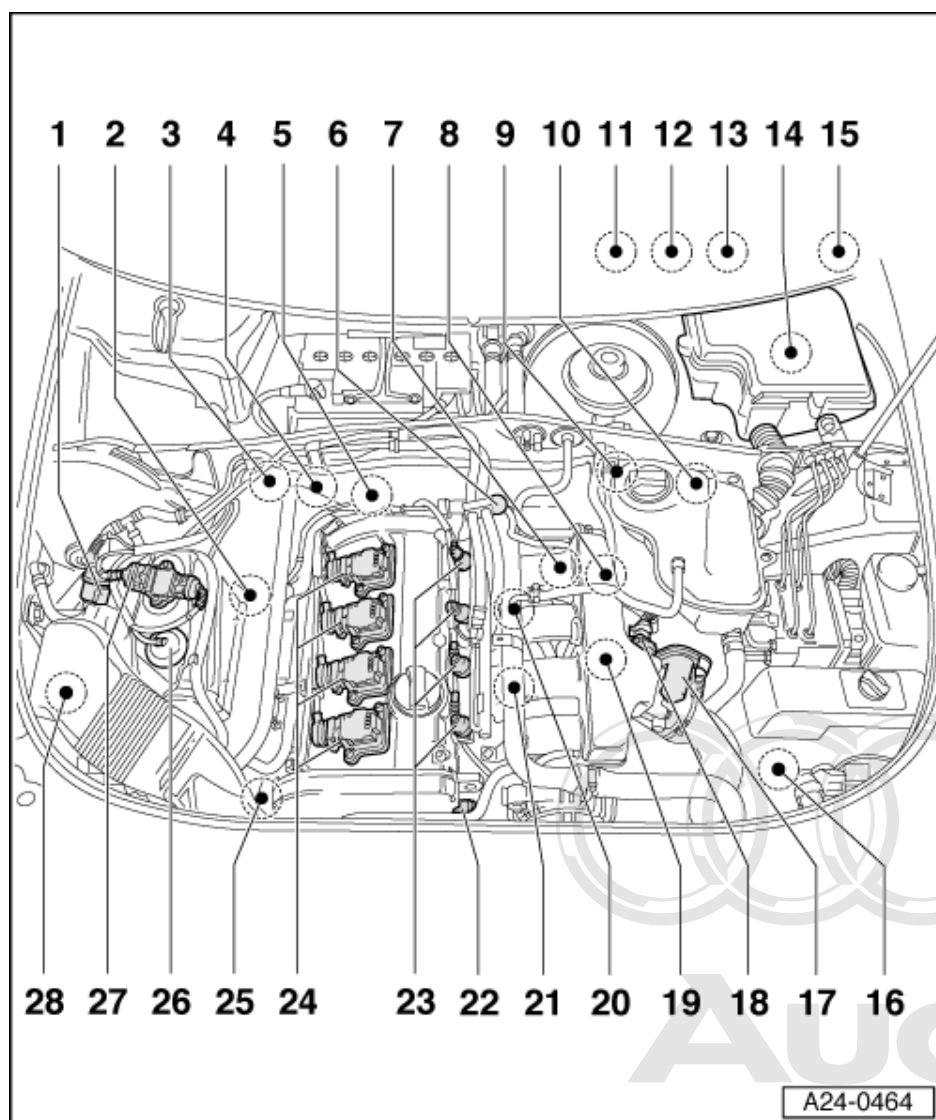
- 1) Idling speed on four-wheel drive vehicles with air conditioner switched on: 840 ... 960 rpm.
- 2) On export models for Brazil the injection quantity (30 sec.) is: 148 ± 12 ml



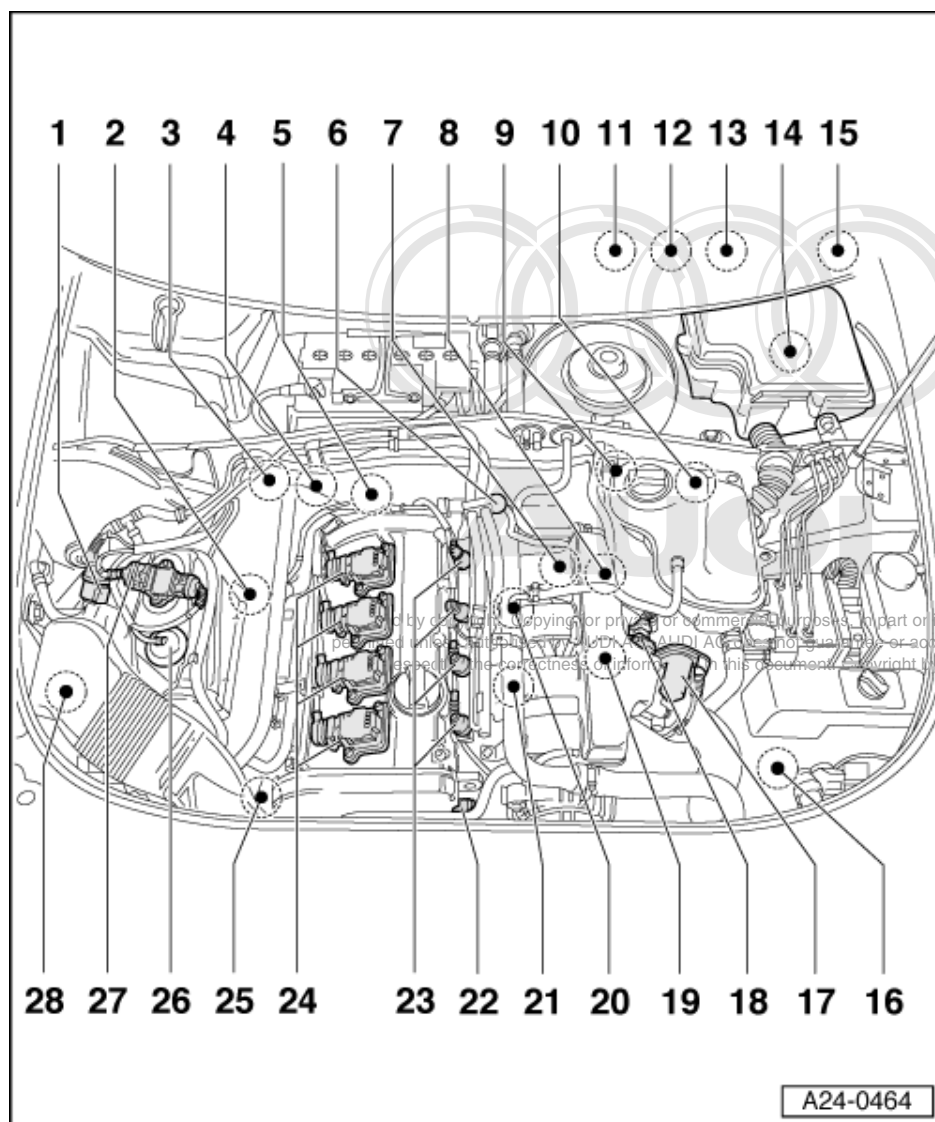
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1.5 - Fitting locations overview



- 1 **Activated charcoal filter solenoid valve 1 - N80**
♦ Testing => Page 109
- 2 **Lambda probe (before catalytic converter) -G39 - 55Nm**
♦ Checking lambda probe heating before catalytic converter
=> Page 91
♦ Checking lambda probe and lambda control before catalytic converter
=> Page 78
♦ Testing lambda probe ageing on lambda probe (before catalytic converter) => Page 83
♦ Removing and installing
=> Page 94



3 Lambda probe (after catalytic converter) -G130 - 55 Nm

- ♦ Testing lambda probe heating for lambda probe (after catalytic converter) => Page 91
- ♦ Checking lambda probe and lambda control after catalytic converter
=> Page 85
- ♦ Removing and installing
=> Page 94

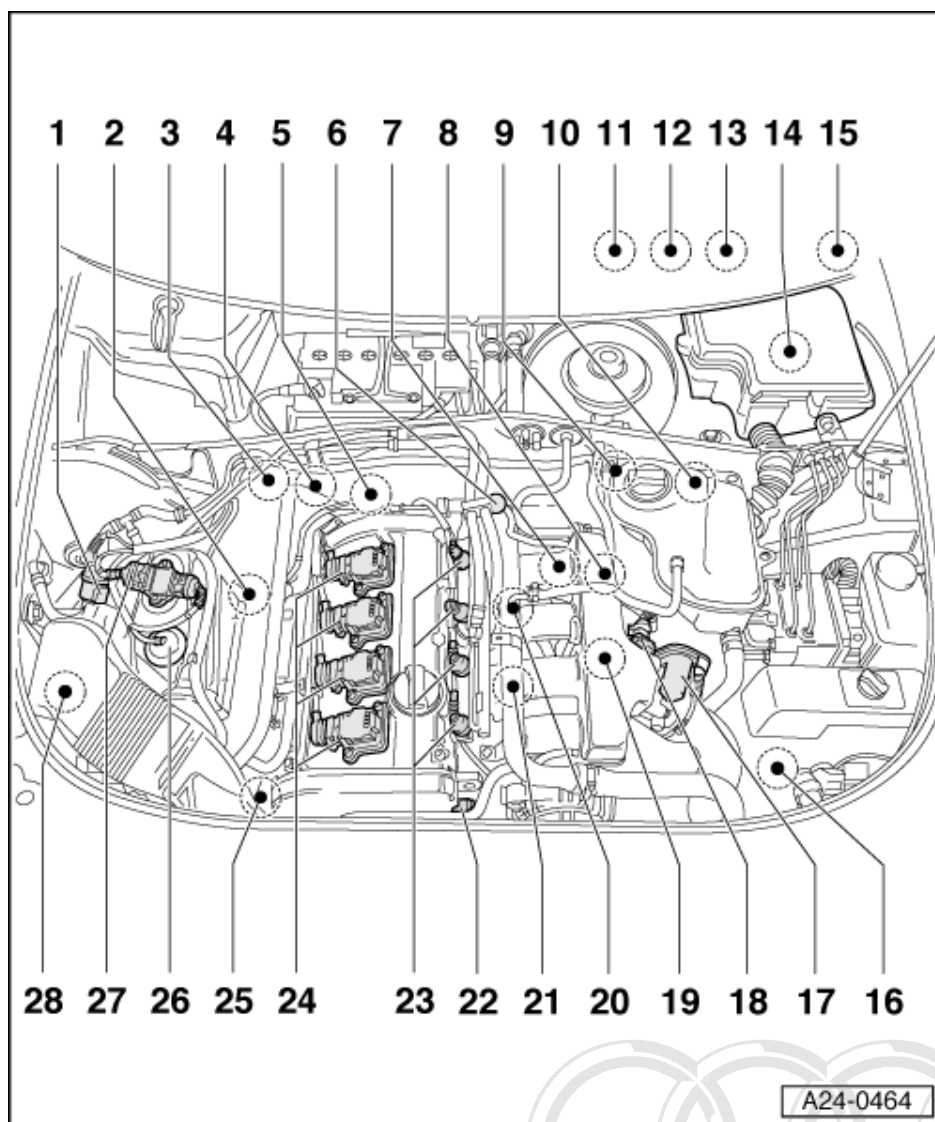
4 Combination valve for secondary air system

- ♦ Only with engine code ANB
- ♦ Testing, removing and installing

=> 4-Cylinder engine (5-valve turbo), Mechanics; Repair group 26; Secondary air system; Removing and installing parts of secondary air system Secondary air system Removing and installing parts of secondary air system

5 Coolant temperature sender -G62

- ♦ Testing =>Page 172



6 Fuel pressure regulator

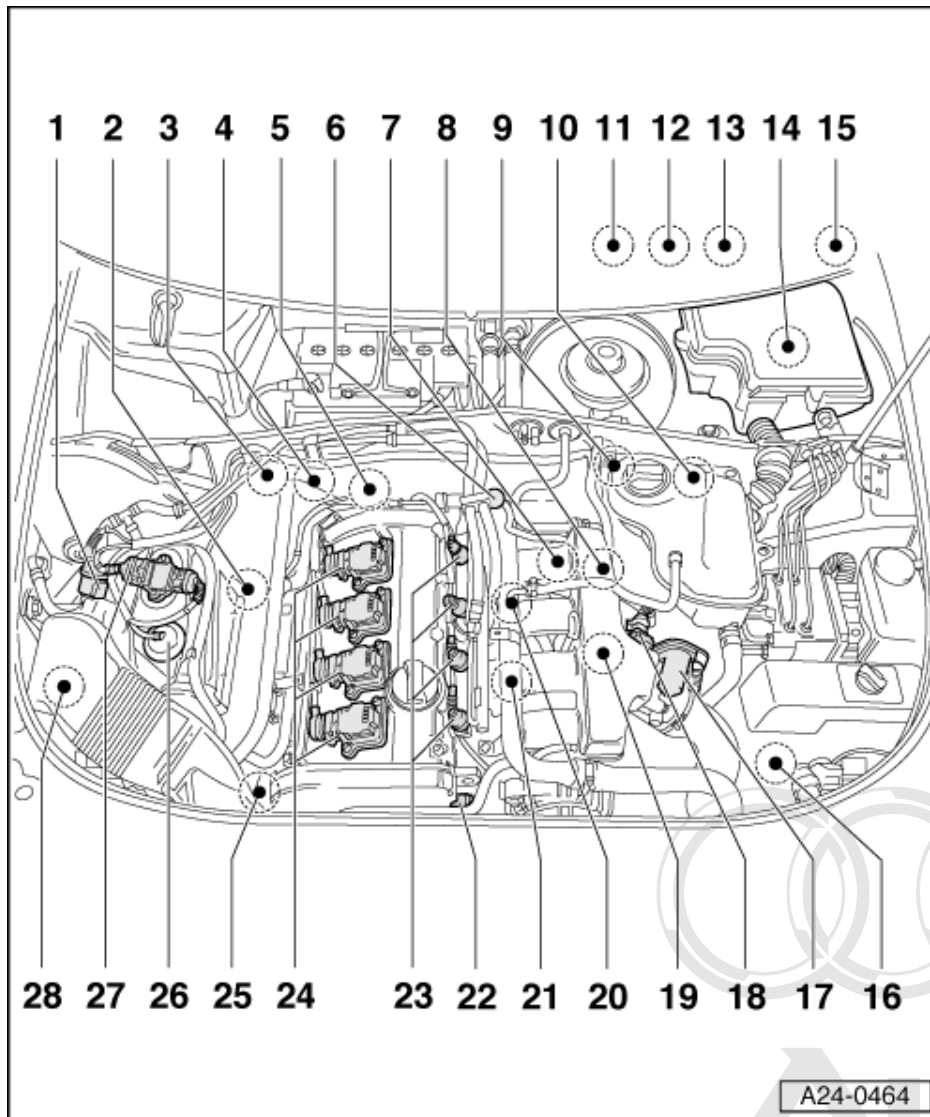
7 Engine speed sender -G28

8 Secondary air inlet valve -N112

- ◆ Only with engine code ANB
- ◆ Fitting location=>Fig. 45
- ◆ Testing =>Page 99
- ◆ Green connector

9 4 pin connector

- ◆ Qty. 2
- ◆ For lambda probe (before catalytic converter) -G39 and lambda probe heating -Z19 (black)
- ◆ For lambda probe (after catalytic converter) -G130 and lambda probe heating -Z29 (brown)
- ◆ Fitting location
=> Fig. 43



10 3 pin connector

- ◆ Qty. 3
- ◆ Fitting location
=> Fig. 43
- ◆ For knock sensor 1 -G61 (green)
- ◆ For engine speed sender -G28 (grey)
- ◆ For knock sensor 2 -G66 (blue)

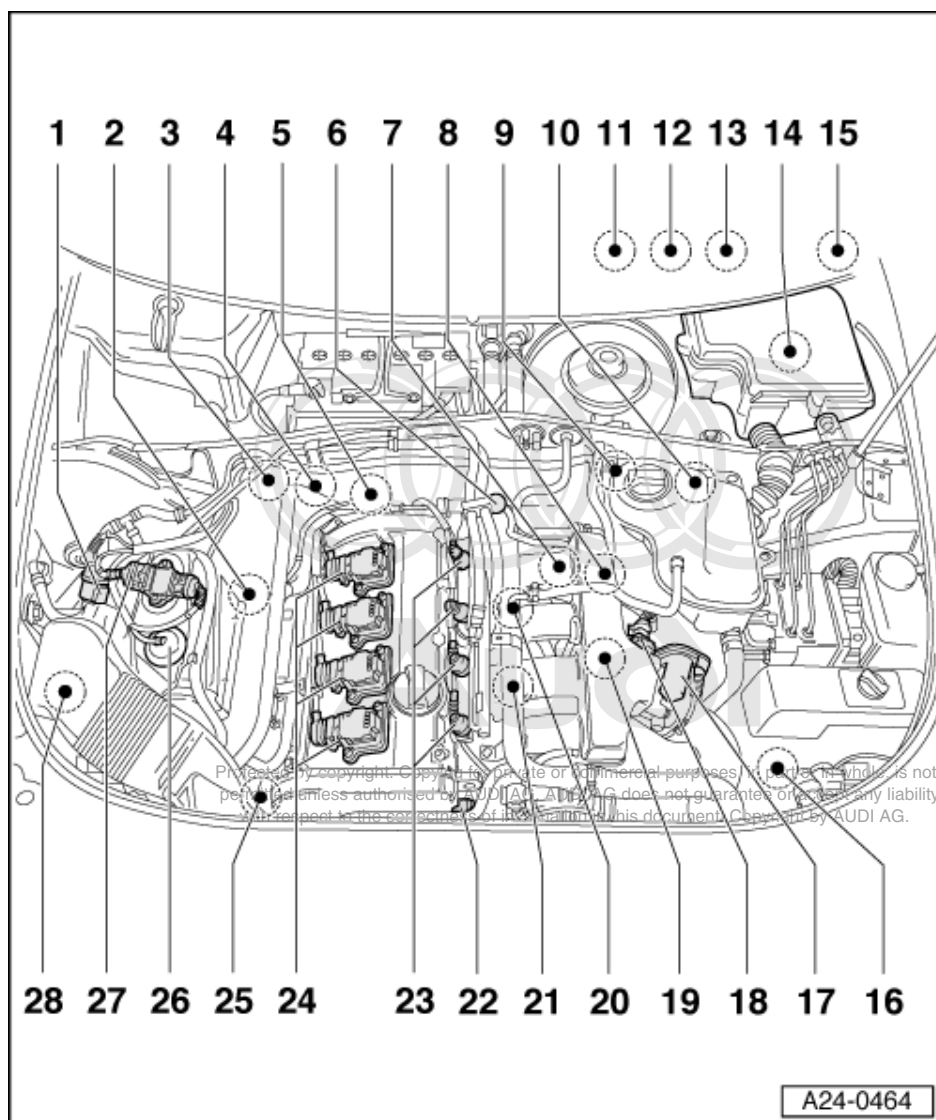
11 Electronic throttle control warning lamp -K132

- ◆ EPC warning lamp
- ◆ Fitting location
=> Fig. 44

12 Accelerator position sender -G79 and accelerator position sender 2 -G185

- ◆ Fitting location
=> Fig. 44
- ◆ Testing =>Page 125
- ◆ "Learning" kickdown function
=>Page 128

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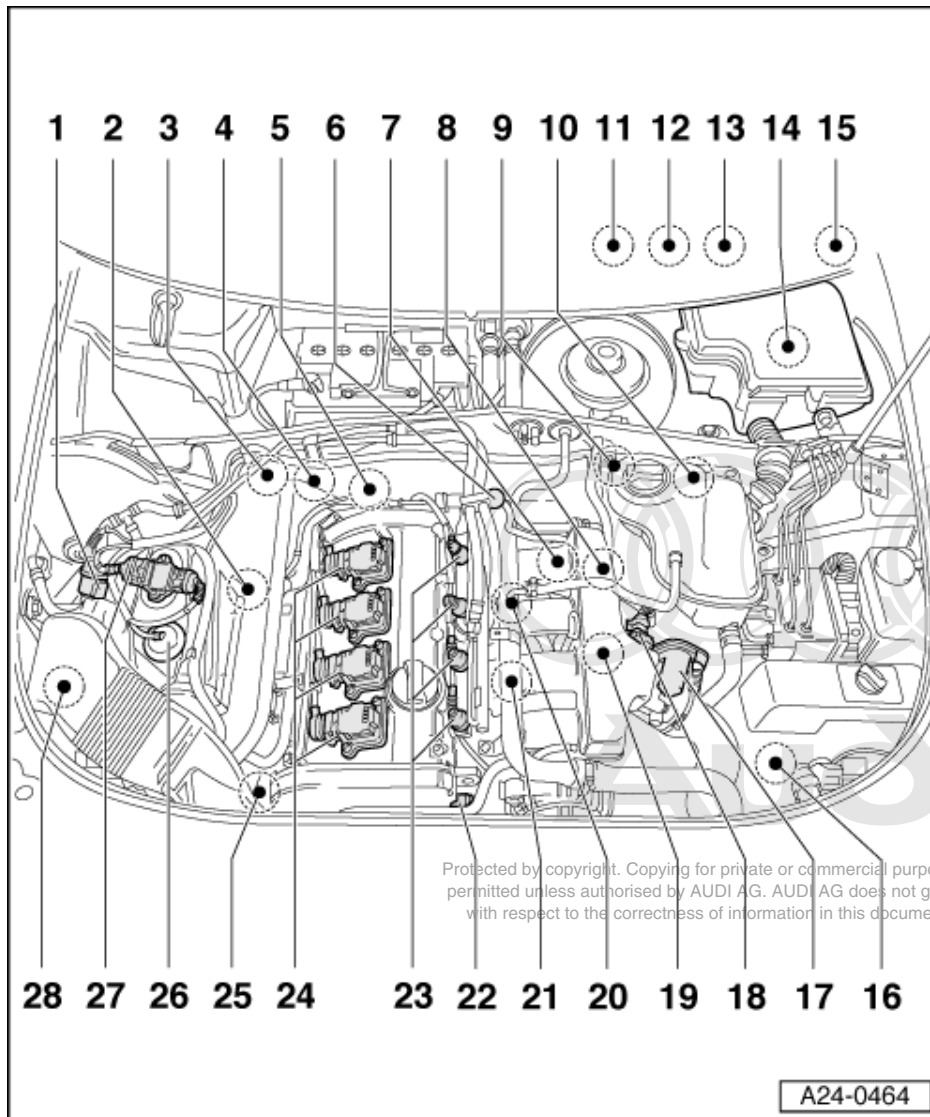


13 Brake light switch -F and brake pedal switch -F47

- ♦ Fitting location
=> Fig. 44

14 Electronics box in plenum chamber

- ♦ Fitting locations
=> Fig. 45
- ♦ Fitting location of engine control unit -J220 with integrated altitude sender -F96
- ♦ Testing voltage supply of engine control unit => Page 175
- ♦ Procedure after voltage supply open circuit => Page 49
- ♦ Replacing engine control unit => Page 49



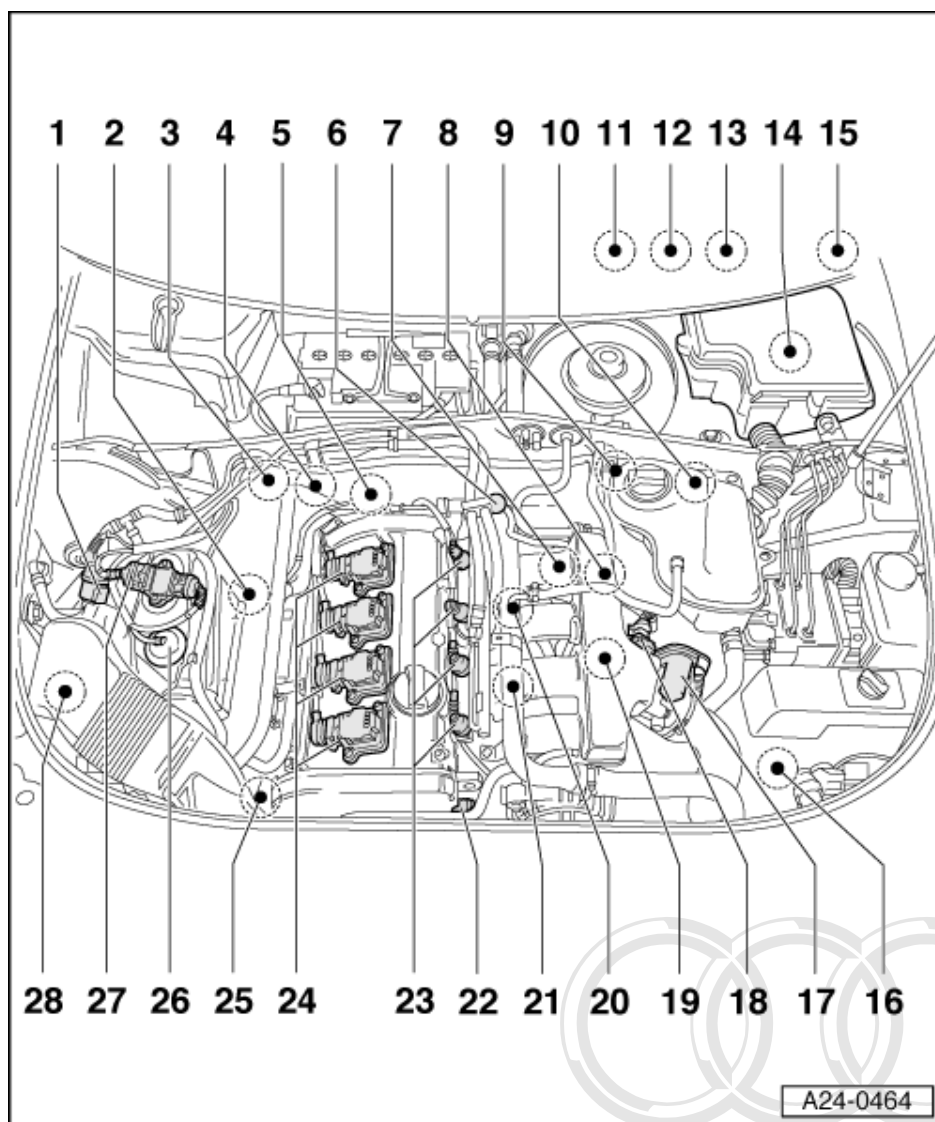
- ♦ Fitting location of secondary air pump relay -J299 (engine code ANB only)
- ♦ Testing secondary air pump relay -J299:

=> 4-Cylinder engine (5-valve turbo), Mechanics; Repair group 26; Testing secondary air system Testing secondary air system

- ♦ Fitting location of Motronic current supply relay -J271 (engine code ANB from model year 2000 only)
- ♦ Testing Motronic current supply relay -J271=>Page 162
- ♦ Fitting location of fuse -S130 for secondary air pump -V101 (engine code ANB only)

15 Clutch pedal switch -F36

- ♦ Fitting location
=> Fig. 44

**16 Charge pressure sender -G31**

- ♦ Fitting location
=>Fig. 45
- ♦ Checking:

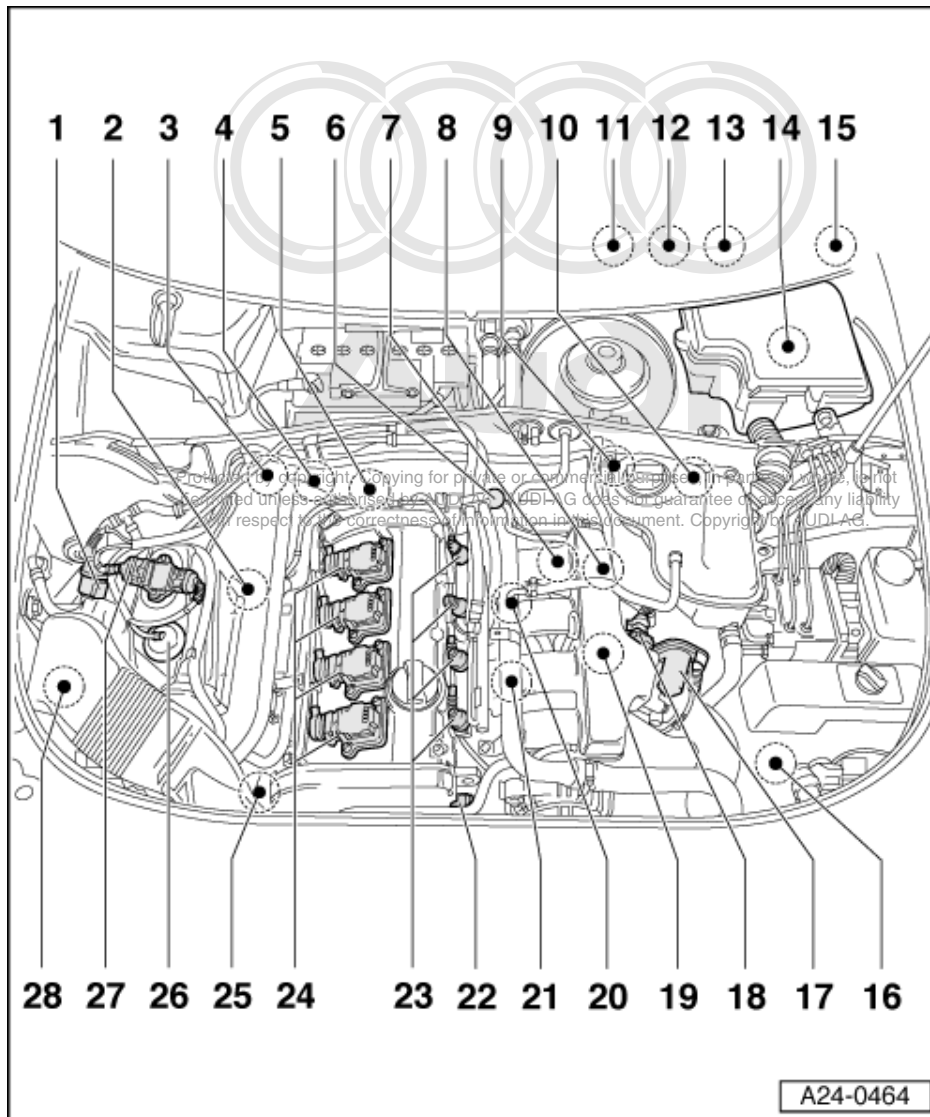
=> 4-Cylinder engine (5-valve turbo), Mechanics; Repair group 21; Charge air system with turbocharger; Testing charge pressure sender -G31 Charge air system with turbocharger Testing charge pressure sender -G31

17 Throttle valve control part -J338

- ♦ With throttle valve drive -G186, angle sender for throttle valve drive -G187 and angle sender 2 for throttle valve drive -G188

18 Intake air temperature sender -G42

- ♦ Testing =>Page 166



19 Air recirculation valve for turbocharger -N249

- ◆ Fitting location => Fig. 45
- ◆ Blue connector

20 Knock sensor 1 -G61

21 Knock sensor 2 -G66

22 Hall sender -G163

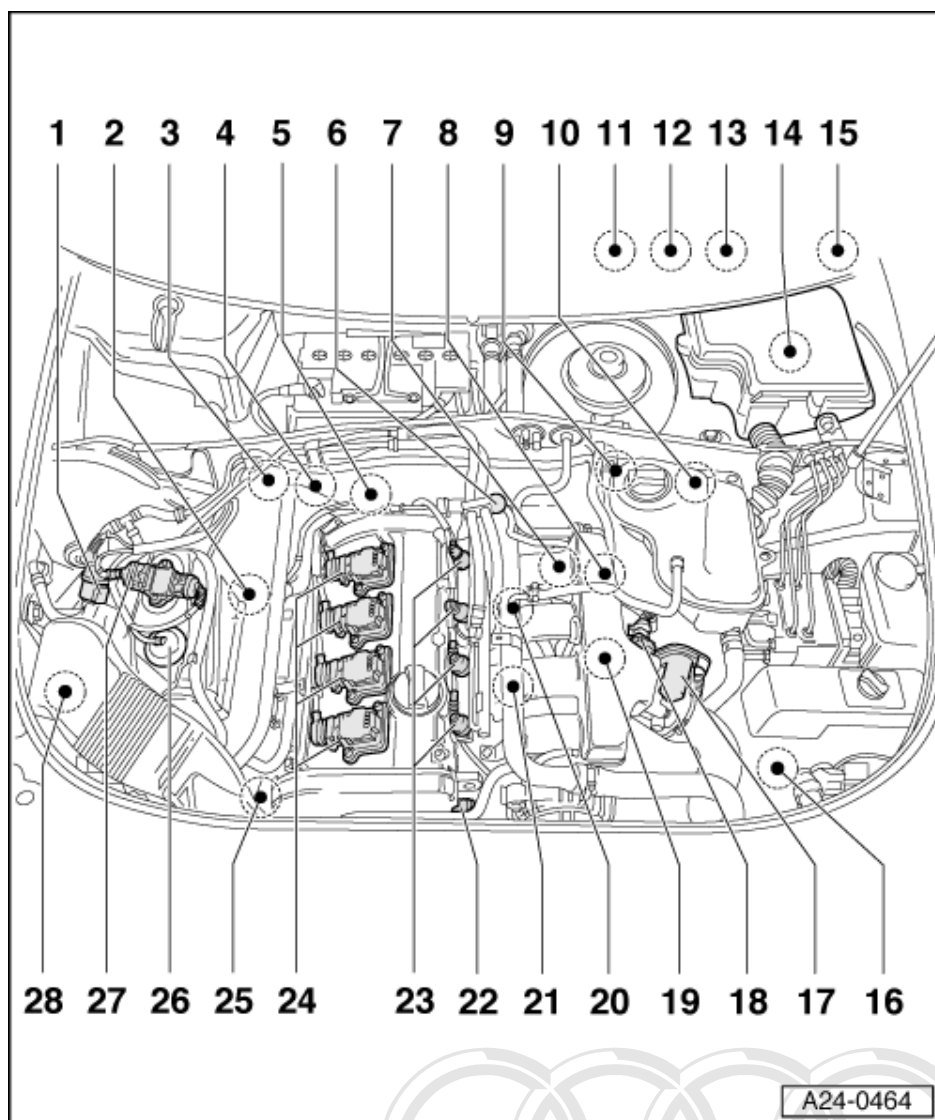
23 Injector -N30...-N33

24 Ignition coils -N, -N128, -N158, -N163

25 Solenoid valve for charge pressure control -N75

- ◆ Checking:

=> 4-Cylinder engine (5-valve turbo), Mechanics; Repair group 21; Testing charge air system with turbocharger and charge pressure control valve Testing charge air system with turbocharger and charge pressure control valve



26 Air mass meter -G70

27 Output stage -N122

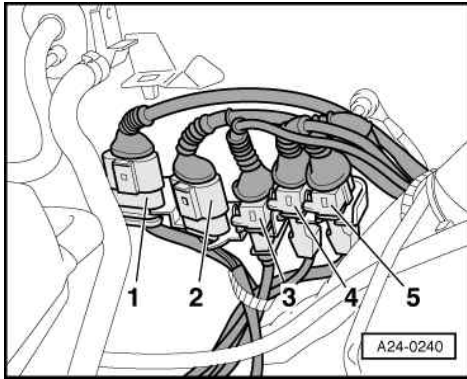
- ♦ Testing =>Page 159

28 Secondary air pump motor -V101

- ♦ Only with engine code ANB
- ♦ Checking:

=> 4-Cylinder engine (5-valve turbo), Mechanics; Repair group 26; Secondary air system; Removing and installing parts of secondary air system Secondary air system Removing and installing parts of secondary air system

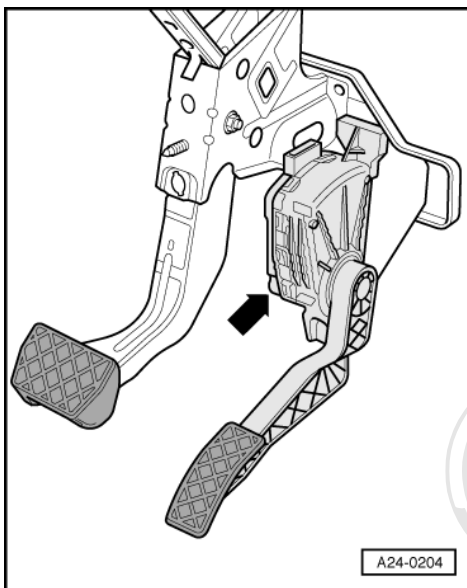
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-> Fig.1 Fitting location of connectors

The following connectors are located underneath the coolant expansion tank:

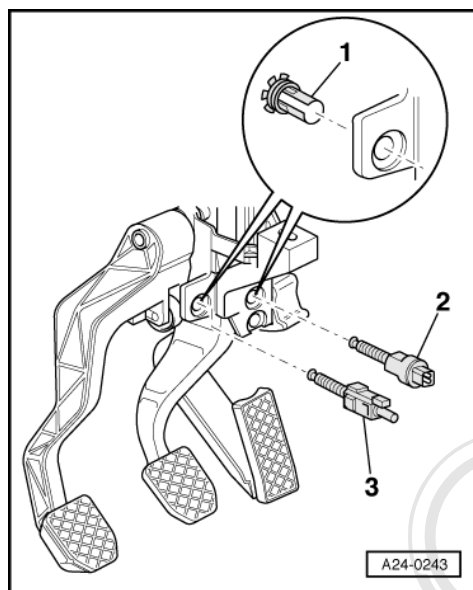
- 1 - For lambda probe 2, (after catalytic converter) and heating (brown) - only on engines with engine code ANB.
- 2 - For lambda probe 1, (before catalytic converter) and heating (black)
- 3 - For engine speed sender -G28 (grey)
- 4 - For knock sensor 2 -G66 (blue)
- 5 - For knock sensor 1 -G61 (green)



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-> Fig.2 Fitting location of accelerator position senders -G79 and -G185



-> Fig.3 Fitting location of brake light switch -F, brake pedal switch -F47 and clutch pedal switch -F36

- 1 - Clip
- 2 - Clutch pedal switch -F36
- 3 - Brake light switch -F, Brake pedal switch -F47

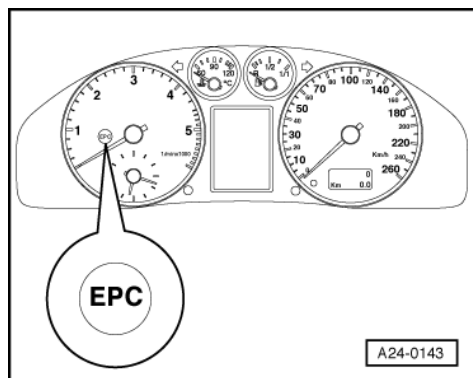
Note:

To ensure a secure fitting, the switches may be installed only once.

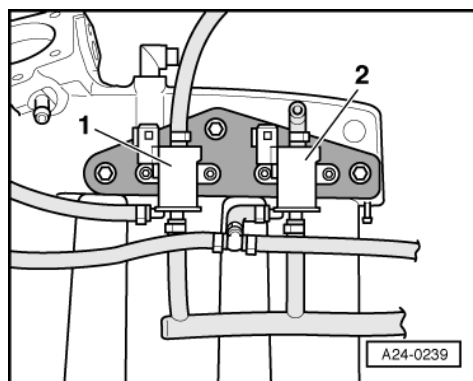
Adjusting switch:

=> Brake system; Repair group 46

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-> Fig.4 Fitting location of electronic throttle control warning lamp -K132

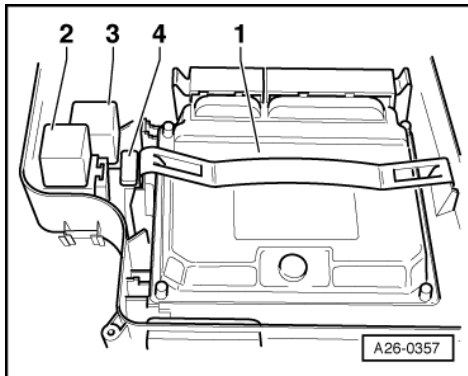


-> Fig.5 Fitting location of secondary air inlet valve -N112 and air recirculation valve for turbocharger -N249

- ♦ Fitting location: underneath intake manifold
- 1 - Air recirculation valve for turbocharger -N249
- 2 - Secondary air inlet valve -N112

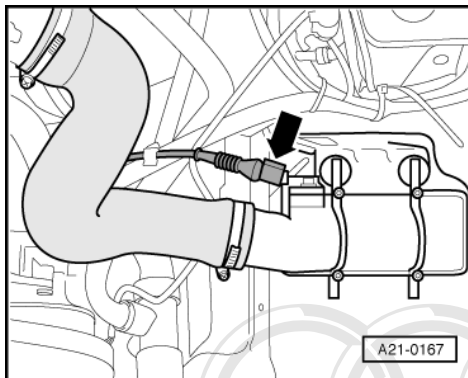
Note:

Illustration shows removed intake manifold from below.



-> Fig.6 Fitting locations of components in electronics box in plenum chamber

- 1 - Engine control unit
- 2 - Secondary air pump relay -J299
- 3 - Motronic current supply relay -J271
- 4 - Fuse -S130 for secondary air pump

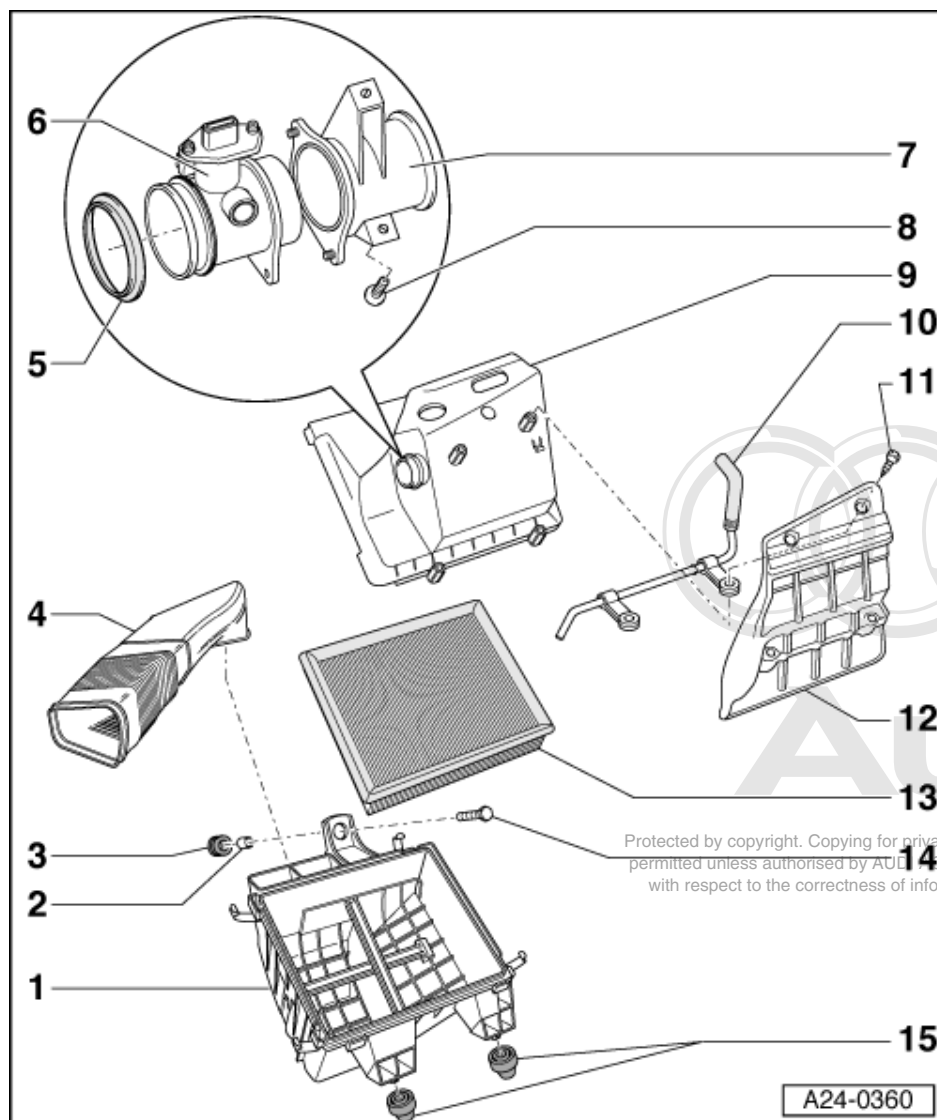


-> Fig.7 Fitting location of charge pressure sender -G31

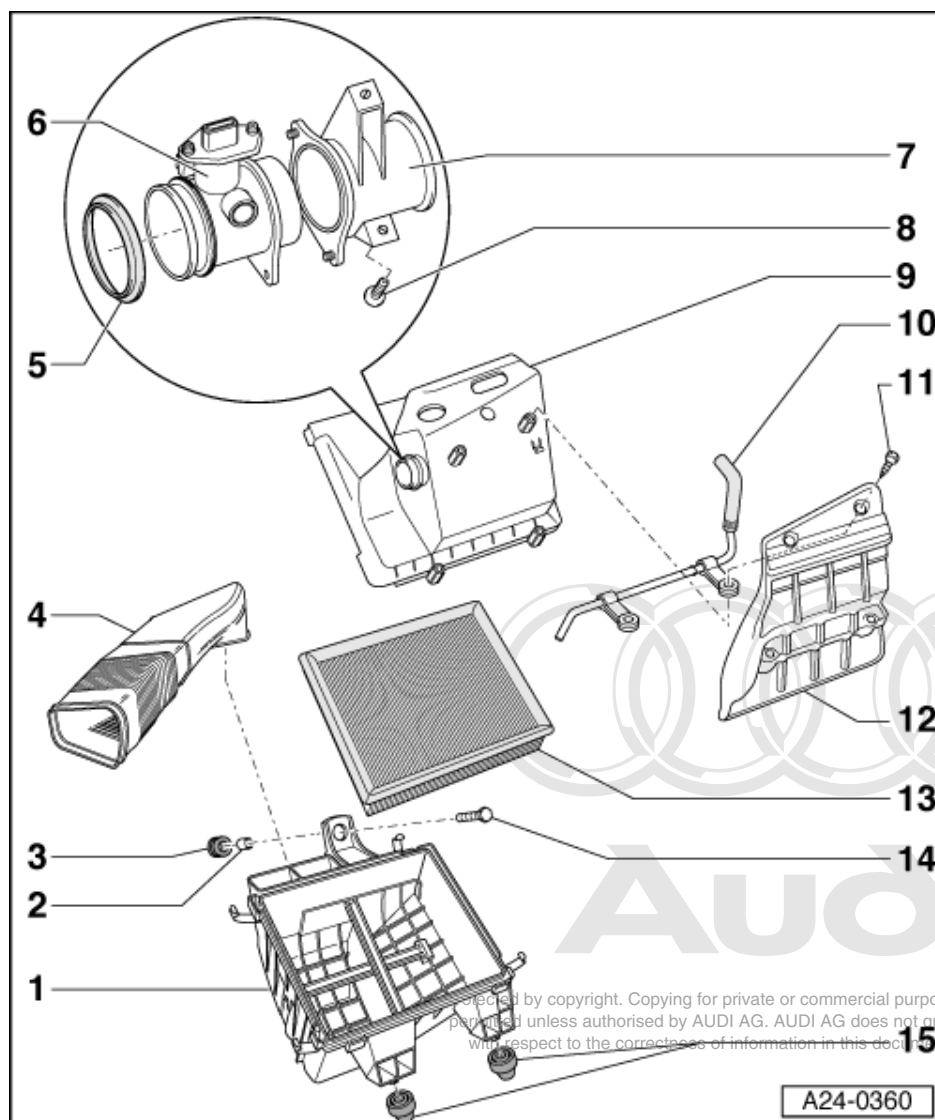
Charge pressure sender -G31 -arrow- is installed at top of charge air cooler.

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1.6 - Dismantling and assembling air cleaner



- 1 Air cleaner housing, lower part
- 2 Bush
- 3 Rubber grommet
- 4 Air ducting
 - ♦ To lock carrier
- 5 Seal
- 6 Air mass meter -G70
 - ♦ Testing =>Page 71
- 7 Air ducting
- 8 6 Nm
- 9 Air cleaner housing, upper part

**10 Pipe/hose**

- ♦ For activated charcoal filter system

11 10 Nm**12 Heat shield****13 Filter element**

- ♦ Observe change intervals

=> Maintenance manual

14 10 Nm**15 Rubber grommet****1.7 - Wiring and component check with test box V.A.G 1598/31****Notes:**

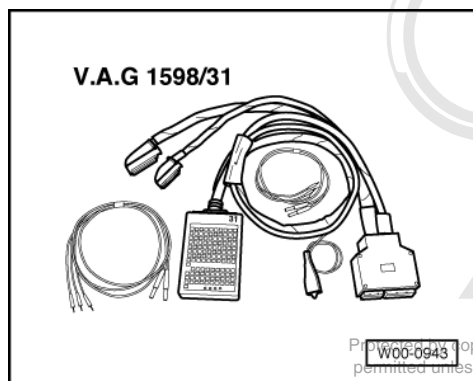
- ♦ Test box V.A.G 1598/31 is designed so that it can be connected to the wiring harness for the engine control unit and to the engine control unit itself at the same time.
- ♦ This has the advantage of enabling the engine management system to remain fully operational even with the test box connected (for example, when testing signals while the engine is running).



- ♦ The instructions for performing the individual tests indicate whether or not the engine control unit itself also needs to be connected to the test box.
- ♦ Always use adapter set V.A.G 1594A to connect test equipment (e.g. voltage tester V.A.G 1527B, hand-held multimeter V.A.G 1526A etc.).

Warning!

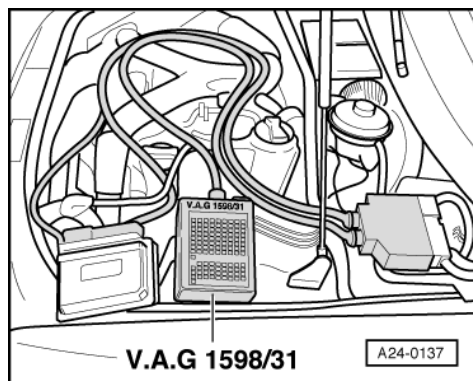
To prevent damage to the electronic components, switch to the respective measuring range before connecting the measuring cable and observe the test prerequisites.



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Special tools and workshop equipment required

- ♦ V.A.G 1598/31



Work sequence

- Switch off ignition.
- Remove engine control unit => Page 49 .
- -> Connect test box V.A.G 1598/31 to wiring harness connectors. Also connect the earth clamp on the test box (not shown in the illustration) to vehicle earth. The instructions for performing the individual tests indicate whether or not the engine control unit itself also needs to be connected to the test box.
- Carry out test as described in the repair instructions.

Note:

After reconnecting the engine control unit the following operations must be performed:

- Perform adaption of throttle valve control part -J338 => Page 116 .
- On models with an automatic gearbox, program the kick-down function =>Page 128 .
- Interrogate and if necessary erase the fault memory => Page 4 .

Models with engine code letters ANB:

- If the fault memory was erased, generate the readiness code => Page 25 .

1.8 - Procedure after voltage supply open circuit

Important note:

After re-connecting the voltage supply the following operations must be performed:

- Perform adaption of throttle valve control part -J338 => Page 116 .
- On models with an automatic gearbox, program the kick-down function =>Page 128 .
- Interrogate and if necessary erase the fault memory => Page 4 .

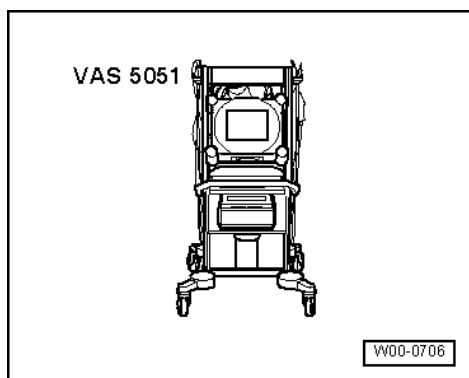
Models with engine code letters ANB:

- If the fault memory was erased, generate the readiness code => Page 25 .

1.9 - Renewing engine control unit

Note:

When the engine control unit is disconnected the learned values are erased but the contents of the fault memory remain intact.



Special tools and workshop equipment required

- ♦ VAS 5051 and VAS 5051/1
- or
- ♦ V.A.G 1551 and V.A.G 1551/3 A

Removing

- Connect the vehicle diagnostic, test and information system VAS 5051 (or fault reader V.A.G 1551). Select engine electronics control unit by entering address word "01" => Page 1 ; when doing this the ignition must be on.

-> The display on fault reader V.A.G 1551 will show the control unit identification (example).

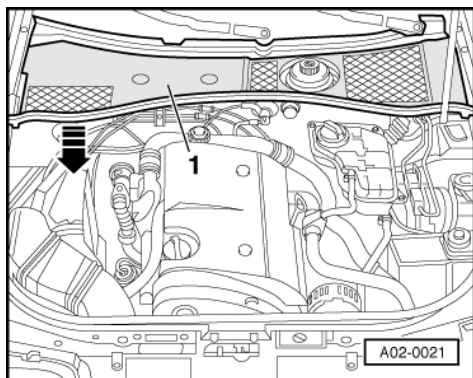
4B0906018K	1.8l R4/5VT
0002	
Coding 05701	WSC 12345



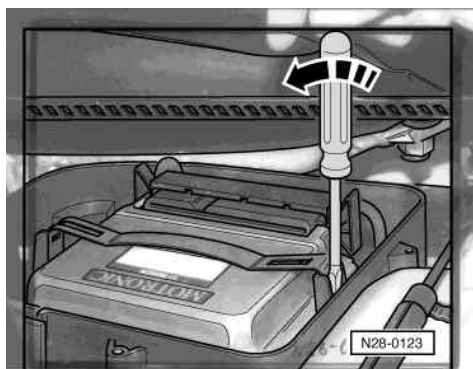
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- Always start by calling up and printing out the control unit identification => Page 3 .



- Check the coding against the list of coding variants => Page 21 .
- Switch off ignition.
- -> Remove rubber seal from the front -arrow-.
- Remove plenum chamber cover -1- from the front.
- Remove cover for electronics box in plenum chamber.



- -> Carefully lever off the retainer bar with a screwdriver -arrow-.
- Release catches and unplug control unit connectors.
- Take out engine control unit.

Installing

Install in reverse sequence; note the following points:

Important note:

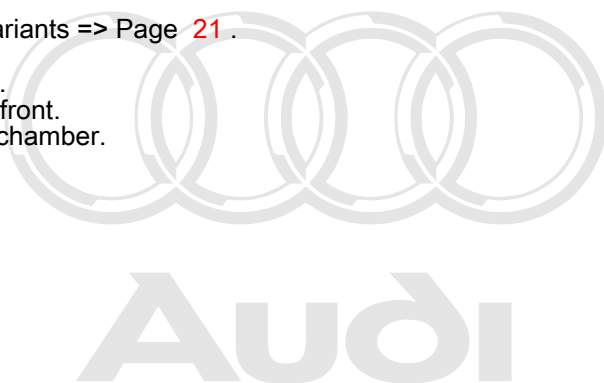
After installing the new engine control unit the following operations must be performed:

- Interrogate and if necessary erase the fault memory => Page 4 .
- Perform adaption of throttle valve control part -J338 => Page 116 .
- Check the notes on coding new engine control units => Page 20 .
- On vehicles with cruise control (identifiable by controls on steering column), activate the cruise control via the engine control unit.

=> Electrical system; Repair group 01; Self-diagnosis of cruise control system (CCS); Testing cruise control system (CCS) Self-diagnosis of cruise control system (CCS) Testing cruise control system (CCS)

- On models with an automatic gearbox, program the kick-down function =>Page 128 .
- Perform adaption of immobilizer to engine control unit.

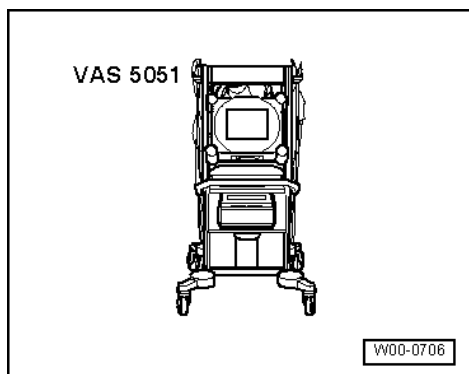
=> Electrical System; Repair Group 01; Self-diagnosis of electronic immobilizer; Adaptation procedure when engine control unit is replaced Self-diagnosis of electronic immobilizer Adaptation procedure when engine control unit is replaced



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- On models with engine code letters ANB, generate the readiness code => Page 25 .

1.10 - Testing idling speed



Special tools and workshop equipment required

- ♦ VAS 5051 and VAS 5051/1

or

- ♦ Fault reader V.A.G 1551 with V.A.G 1551/3 A

Requirements for test:

- Exhaust system free of leaks
- Coolant temperature at least 80 °C
- Electrical consumers switched off (radiator fan must not run during the test)
- Air conditioner switched off
- No pressure gauge connected
- Vehicles with automatic gearbox: selector lever in position P or N

Notes:

- ♦ The idling speed cannot be adjusted.
- ♦ The idling speed is tested during the basic setting of the engine.
- ♦ During the basic setting of the engine, the solenoid valve for the activated charcoal filter (ACF valve -N80) is closed and the air conditioner compressor is automatically switched off.

Test sequence

- Interrogate fault memory =>Page 4 . The fault memory must be clear. If necessary, rectify any faults and erase the fault memory. Switch off the engine, then start up again. Take vehicle for a test drive and interrogate the fault memory again to make sure it is clear.
- Run the engine at idling speed.

Warning!
The electric radiator fan should not be running.

-> Indicated on display:

Rapid data transfer HELP
Select function XX
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- Enter "04" to select "Basic setting" and confirm with Q key.

-> Indicated on display:



Introduction of basic setting Q
Enter display group number XXX

- Enter "056" for Display Group 056 and confirm entry with Q key.

-> Indicated on display:

Basic setting 56
1 2 3 4

- Check whether the engine speed shown in display zone 1 (actual engine speed) is within the specified tolerance range.

	Display zones			
	1	2	3	4
Display Group 056: Idling speed stabilisation with engine idling at normal operating temperature				
Display	xxx rpm	xxx rpm	x.x %	X X X X X
Indicates	Engine speed (actual)	Engine speed (specified)	Idling speed control - torque change	Operating status
Specification	FWD: 740-860 rpm 4WD: 800-920 rpm	FWD: 800 rpm 4WD: 860 rpm	x.x %	0 0 0 0 0
Note	If readout does not match specification =>Page 52			Relevance of figures => Page 53

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Notes:

- ♦ The value shown in display zone 1 is the actual engine speed.
- ♦ The value shown in display zone 2 (specified engine speed) is a theoretical value calculated by the engine control unit.
- ♦ When the engine is idling the engine control unit tries constantly to adjust the actual engine speed so that it matches the specified value.
- ♦ This means that the actual engine speed when idling should always be approximately the same as the specified engine speed.
- ♦ Display zones 3 and 4 provide additional information which is not relevant when checking the idling speed.

If the specification is obtained:

- Press =>key.

-> Indicated on display (function selection):

Rapid data transfer HELP
Select function XX

If the specification is not attained:

- Interrogate fault memory again =>Page 4 .

Models with engine code letters ANB:

- If the fault memory was erased the readiness code must be generated again => Page 25 .

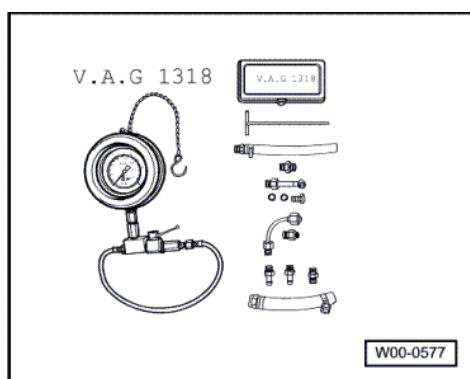
If the idling speed is too high or too low and there are no faults recorded in the fault memory, carry out the following tests (marked with dots):

- Test for unmetered air in the intake system =>Page 75 .
- Test throttle valve control part =>Page 116 .
- Solenoid valve for activated charcoal filter constantly open
Test =>Page 109 .
- Perform adaption of throttle valve control part =>Page 116 .

Relevance of figures in 5-digit readout for Display Group 056

x	x	x	x	x	Display zone 4
				0	Air conditioner compressor 0 = air conditioner compressor off 1 = air conditioner compressor on
			0		Gear selected (automatics) 0 = selector lever in position P or N 1 = selector lever in 2, 3, 4, D or R
		0			Display always reads "0"
	0				Display always reads "0"
0					Display always reads "0"

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



Special tools and workshop equipment required

- ♦ V.A.G 1318
- ♦ V.A.G 1318 with V.A.G 1318/11, V.A.G 1318/12 and V.A.G 1318/13

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Note:

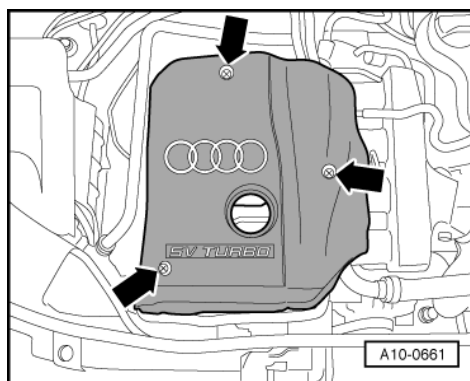
The fuel pressure regulator regulates the fuel pressure according to the intake manifold pressure. This ensures that the drop in pressure at the injectors remains the same throughout all engine speed and engine load ranges.

Requirements for test:

- Fuel pump relay OK. Testing => Page 66 .
- Fuel pump OK. Testing:

=> Fuel supply system - Petrol engines; Repair group 20

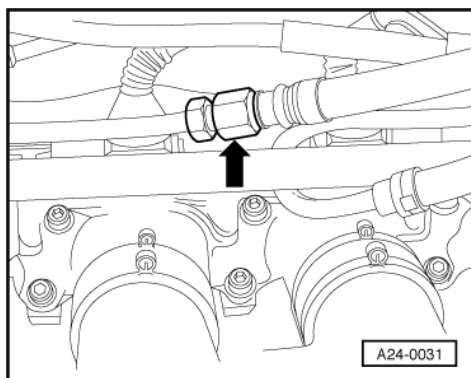
- Fuel filter OK
- Battery voltage not less than 12.7 V





Testing system pressure

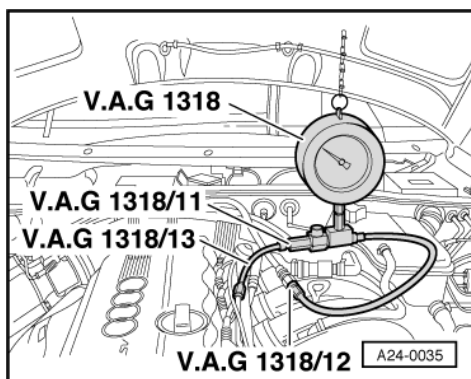
- Briefly open fuel tank filler cap (to release pressure).
- -> Remove engine cover panel -arrows-.



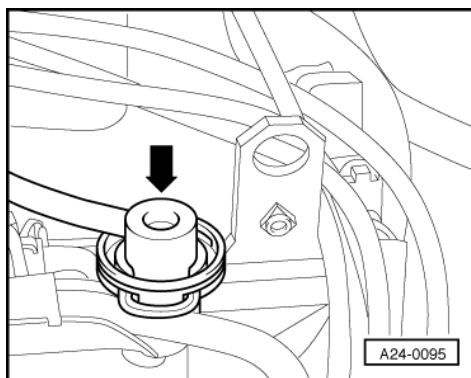
Warning

Fuel system is under pressure. Before opening the system place a cloth around the connection. Then release pressure by carefully loosening the connection.

- -> Open the union -arrow- and catch escaping fuel with a cloth.
- Connect pressure gauge V.A.G 1318 into fuel supply pipe using adapters 1318/11, 1318/12 and 1318/13.



- -> Open cut-off valve on pressure gauge (valve handle points in direction of flow).
- Start the engine and run at idling speed.
- Measure fuel pressure.
 - Specification: approx. 3.5 bar

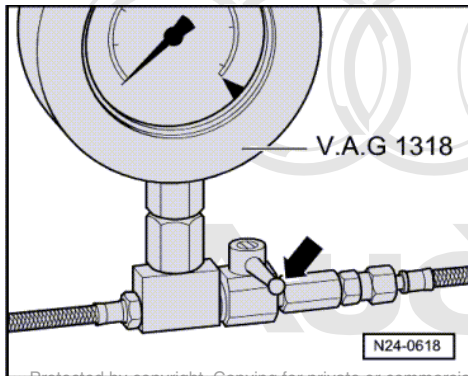


- -> Disconnect vacuum hose from fuel pressure regulator.
 - The fuel pressure should rise to approx. 4.0 bar.
- Switch off ignition.
- Check leak-tightness and holding pressure by watching the drop in pressure on the pressure gauge.

- After 10 minutes there should still be a pressure of at least 2.5 bar.

If the holding pressure drops below 2.5 bar:

- Start the engine and run at idling speed.



- **> Allow pressure to build up, then switch off ignition and at the same time close cut-off valve on pressure gauge V.A.G 1318 (valve handle at right angles to direction of flow -arrow-).**
- Observe pressure drop on gauge.

If the pressure does not drop:

- Check fuel pump non-return valve.

If the pressure drops again:

- Open cut-off valve on pressure gauge (valve handle points in direction of flow).
- Start the engine and run at idling speed.
- Allow the pressure to build up, then switch off the ignition. At the same time pinch the return hose (with blue marking) firmly together.

If the pressure does not drop:

- Renew fuel pressure regulator.

If the pressure drops again:

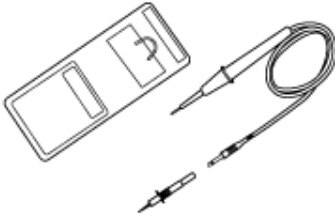
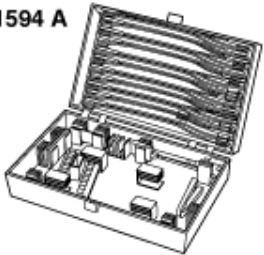
- Check pipe connections, O-rings on fuel manifold and injectors for leaks.
- Check pressure gauge for leaks.

Note:

Before removing the pressure gauge, release the fuel pressure by opening the cut-off valve. When doing this hold a container over the connection.

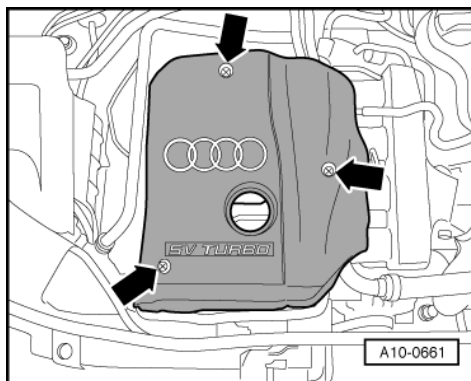


1.12 - Testing injectors

V.A.G 1526 A 	V.A.G 1527 B 
V.A.G 1594 A 	V.A.G 1598/31 
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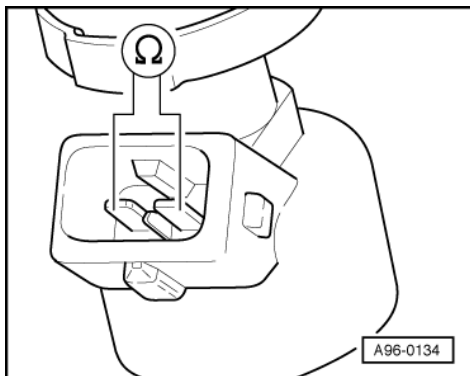
Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1527 B
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/31



Testing internal resistance

- -> Remove engine cover panel -arrows-.
- Remove plug connector from the injector which is to be tested.



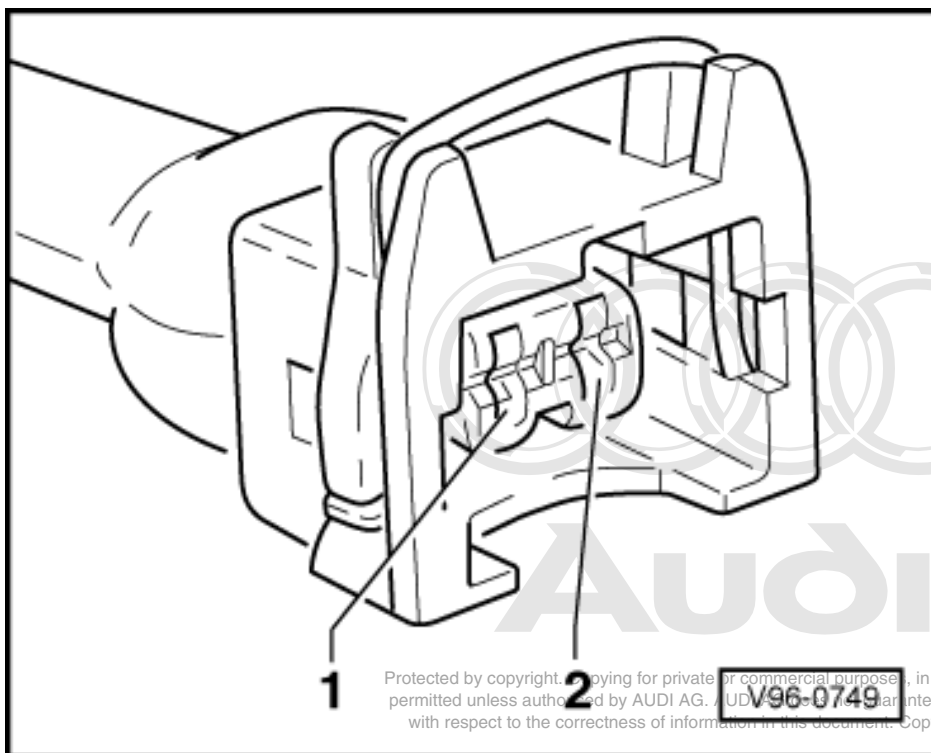
- -> Connect multimeter to valve (resistance measurement range)
- Specification: 12 ... 13 ω (at room temperature)

If the specification is not attained:

- Renew the injector.

If the specification is obtained:

- Check voltage supply.



Checking voltage supply

Requirements for test:

- Fuel pump relay OK. Testing => Page 66 .



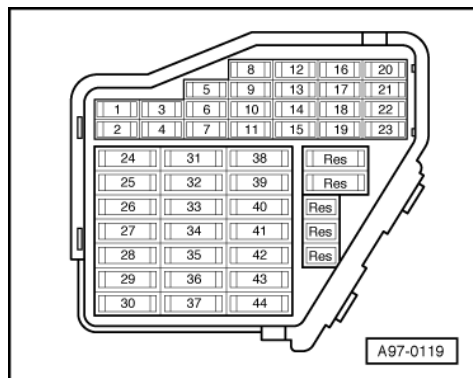
- Fuse No. S232 for injectors (socket position 32) OK.

=> Current flow diagrams, Electrical fault finding and Fitting locations binder

- Remove plug connector from the injector which is to be tested.
- -> Connect voltage tester V.A.G 1527 B as follows:

Connector Contact	Measure against
1	Engine earth

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



If the LED does not light up:

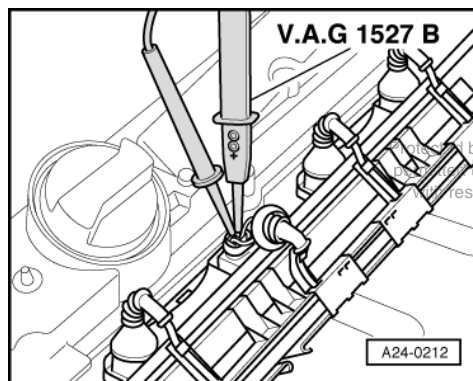
- -> Test for open circuit in wiring between contact 1 and fuse No. S232 for injectors (socket position 32).

=> Current flow diagrams, Electrical fault finding and Fitting locations binder

- Rectify any open circuits.

If the LED lights up:

- Test activation of injectors.



Checking activation

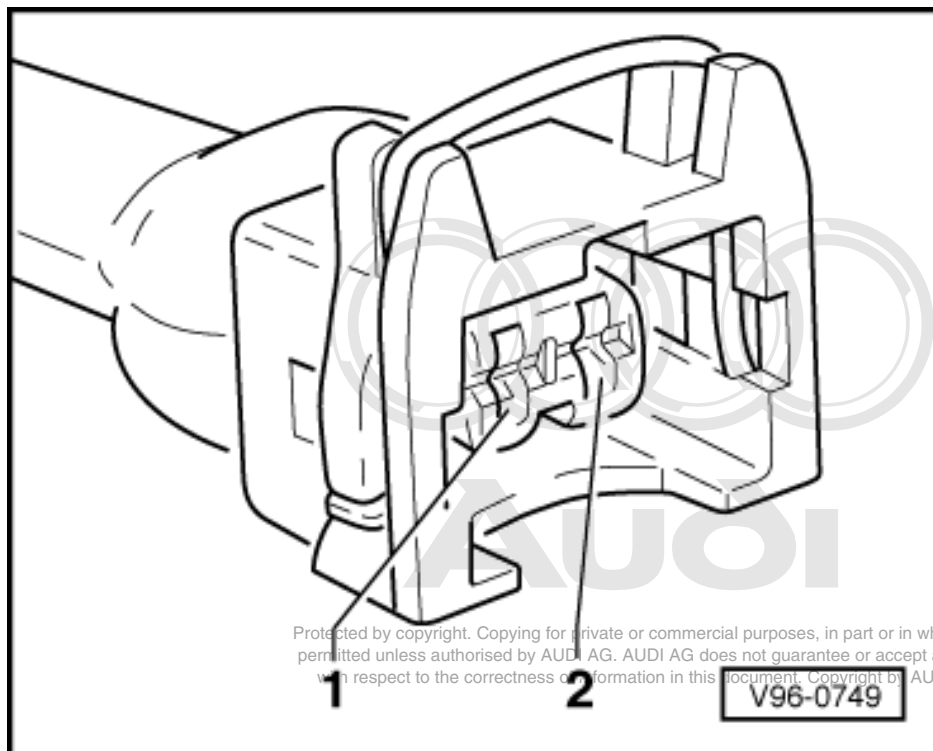
Test requirement:

- Internal resistance of injector OK.
- Slide back rubber sleeve on connector for injector but do not unplug the connector.
- -> Connect voltage tester V.A.G 1527 B between contact 2 (signal) and contact 1 (positive).
- Operate the starter briefly. (The engine can be allowed to start.)

- The LED should flash.

Note:

The LEDs on voltage testers with a low current draw continue to glow faintly between impulses from the engine control unit (rather than going out completely) and become much brighter when receiving an impulse.



If the LED does not flash:

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
=> Page 47 .
- -> Test for open circuit and short to positive or earth in the following wiring connections:

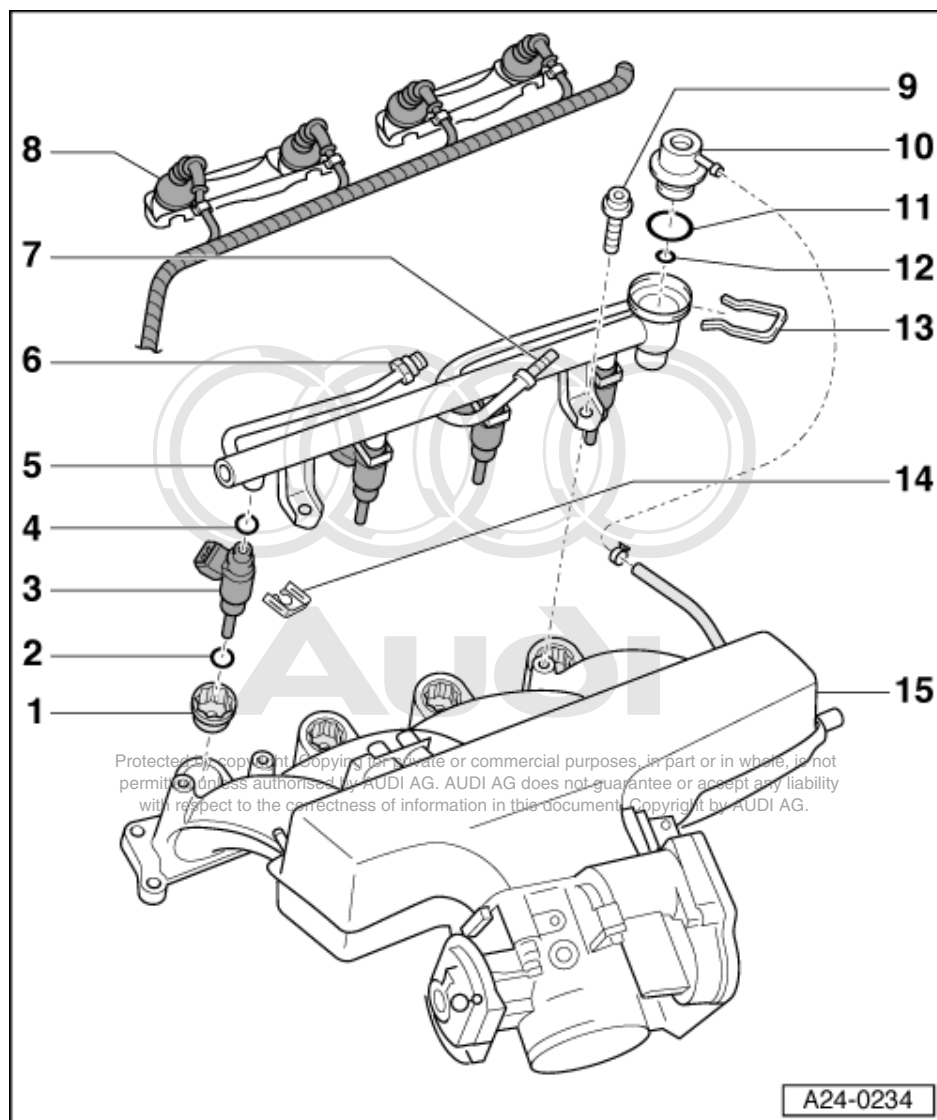
Cylinder	Connector for injector Contact	Test box V.A.G 1598/31 Socket
1	2	96
2	2	89
3	2	97
4	2	88

- Rectify short circuit or open circuit if necessary.

If the wiring is OK:

- Fit a new engine control unit => Page 49 .

1.13 - Dismantling and assembling fuel rail with injectors



1 Insert for injector - 3 Nm

- ◆ Install with locking fluid D 000 600 A2

2 O ring

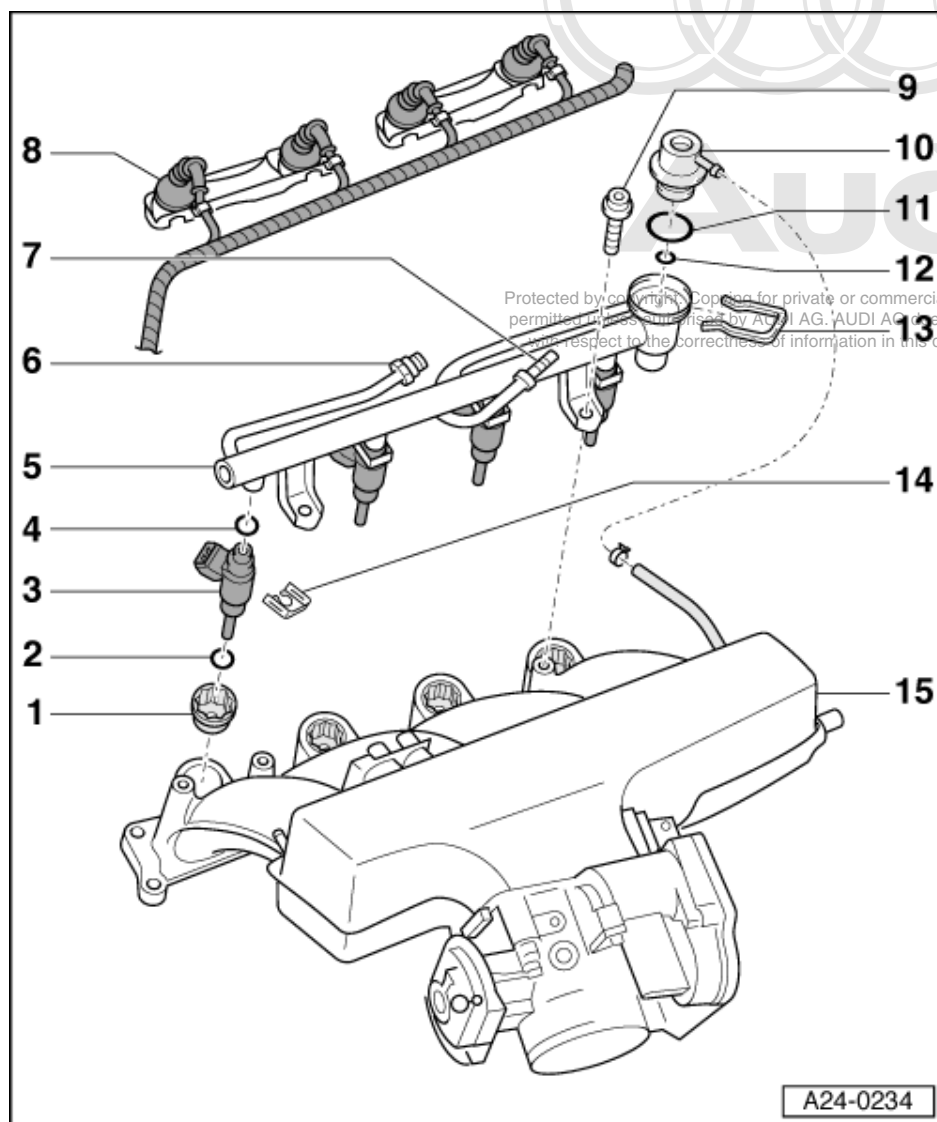
- ◆ Removing and installing
=> Page 62
- ◆ Renew
- ◆ Lubricate with clean engine oil

3 Injector -N30...-N33

- ◆ Removing and installing
=> Page 62



- A24-0234



11 O ring

- ♦ Renew

12 O ring

- ♦ Renew

13 Retaining clip

- ♦ For fuel pressure regulator

14 Retaining clip

- ♦ Ensure seated correctly at injector and fuel rail

15 Intake manifold

- ♦ With throttle valve control unit -J338
- ♦ With intake air temperature sender -G42
- ♦ Removing:

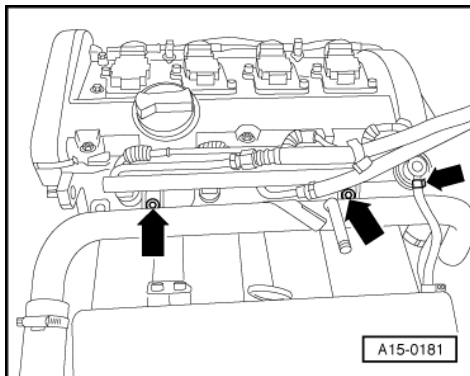
=> 4-Cylinder engine (5-valve turbo), Mechanics; Repair group 15; Removing and installing cylinder head; Removing and installing intake manifold Removing and installing cylinder head Removing and installing intake manifold

1.14 - Removing and installing injectors

- Remove engine cover panels.

- Disconnect wiring and unplug connectors for the following components:

- Injectors -N30, -N31, -N32, -N33
- Intake air temperature sender -G42
- Hall sender -G163
- Throttle valve control part -J338



- -> Unscrew retaining bolts for fuel distributor rail and pull vacuum line off fuel pressure regulator -arrows-.
- Pull fuel distributor rail together with injectors off intake manifold and place it on a clean cloth at the back of the engine compartment.

Warning

Fuel system is under pressure. Before opening the system place a cloth around the connection. Then release pressure by carefully loosening the connection.

- Take off retaining clip and remove injector.

Note:

To install a new fuel rail, first disconnect the fuel hoses.

Installation is carried out in the reverse order. When doing this, note the following:

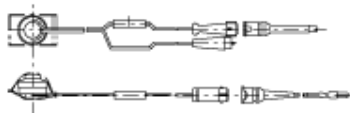
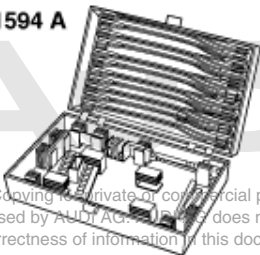
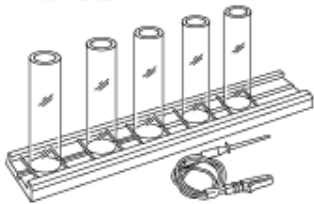
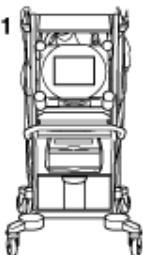
- Renew the O-rings at all opened connections. (When renewing the front O-ring, make sure not to remove the plastic cap from the injector head. The O-ring must be pulled off over the plastic cap.)
- Moisten the O-rings with clean engine oil.
- Make sure that the injectors are installed in the correct positions.
- Check to make sure that the retainer clamps are properly seated.
- Position fuel rail together with injectors (properly secured) against intake manifold and press into place evenly all round.

Tightening torque

Component	Nm
Fuel rail to intake manifold	10



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

V.A.G 1348/3A 	V.A.G 1594 A 
V.A.G 1598/31 	V.A.G 1602 
VAS 5051 	G24-0025

Special tools and workshop equipment required

- ♦ V.A.G 1348/3A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/31
- ♦ V.A.G 1602
- ♦ VAS 5051 with VAS 5051/1

or

- ♦ V.A.G 1551 with V.A.G 1551/3 A

Test requirement:

- Fuel pressure OK. Testing => Page 53 .

Test sequence

- Remove fuel rail (together with injectors) from intake manifold => Page 62 . Do not disconnect the fuel hoses.
- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.

=> Page **47** .

Testing for leaks

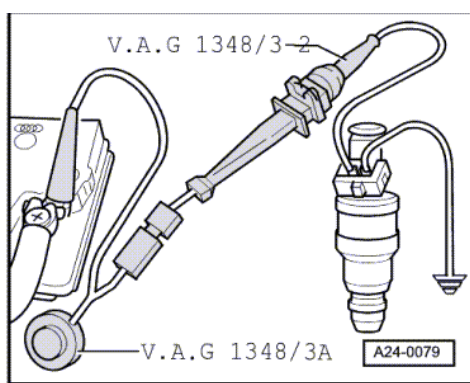
- Bridge contacts 1 and 65 on the test box using test leads from adapter set V.A.G 1594 A.

Only on vehicles from model year 2001 onwards with engine code ANB:

- Switch on ignition.

All models

- The fuel pump should run.
Check injectors for leaks (visual check). When the fuel pump is running, only 1 or 2 drops should escape per minute from each injector.
- If a greater amount of fuel escapes, switch off the fuel pump (disconnect the cable bridge) and replace the faulty injector => Page **62** .



Checking injection quantity

- Place the injector which is to be tested into a measuring glass from injection quantity tester V.A.G 1602.
- -> Connect one of the injector contacts to engine earth using test lead and crocodile clamp from V.A.G 1594 A.
- Connect second injector contact to positive using remote control V.A.G 1348/3 A, adapter cable V.A.G 1348/3-2 and auxiliary cable.
- Bridge contacts 1 and 65 on the test box using test leads from adapter set V.A.G 1594 A.

Only on vehicles from model year 2001 onwards with engine code ANB:

- Switch on ignition.

All models

- The fuel pump should run.
- Activate remote control V.A.G 1348/3A for 30 seconds.
- Carry out measurement on all injectors.
- Once all four injectors have been actuated, place measuring glasses on a level surface.
 - Specification for each injector: 135 ±10 ml

Note:

*Export models for Brazil=> Page **33** .*

- If the measured value for one or more of the injectors is outside the tolerance range, switch off the fuel pump (by disconnecting the cable bridge) and replace the defective injector => Page **62** .

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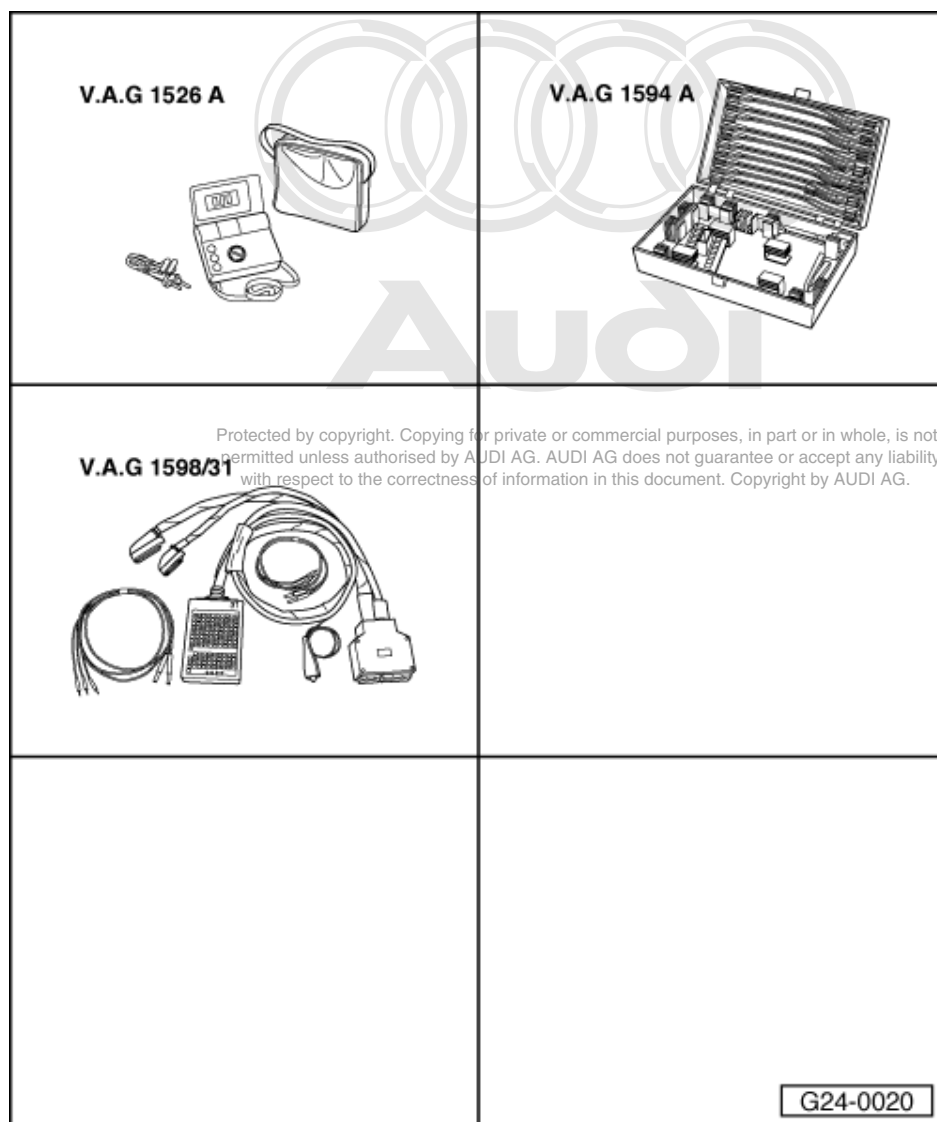


Note:

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

- Install injectors together with fuel rail => Page **63** .

1.16 - Testing fuel pump relay -J17 and activation



Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/31

The fuel pump and some of the injection system components receive their voltage supply via fuel pump relay -J17.

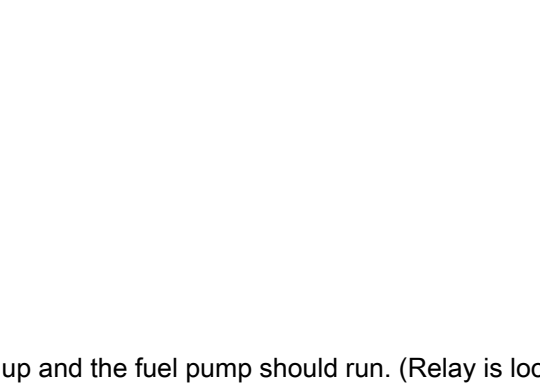
Fuel pump relay -J17 will only close if the engine is turning over. In other words, the relay is only earthed (via the engine control unit) when the engine control unit is receiving engine revolution impulses.

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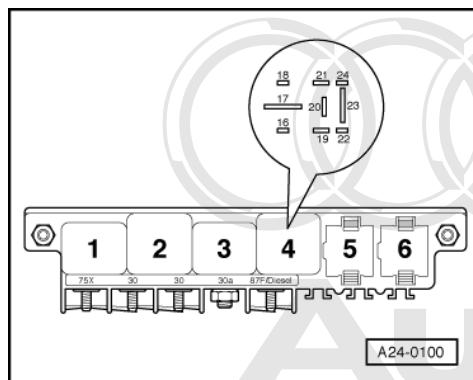
0.7 V

- 2.7 V



- of driver's footwell)

of driver's footwell):

**Testing voltage supply to fuel pump relay**

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- -> Connect multimeter (voltage measurement range) to earth and contact 17 on relay panel.
- Specification: approx. battery voltage

If the specification is not obtained:

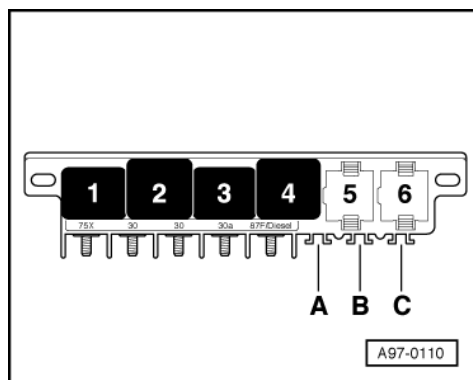
- Replace central electrics unit

Testing activation of fuel pump relay

- Switch off ignition.
- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
=> Page 47 .
- Bridge contacts 1 and 65 on the test box using test leads from adapter set V.A.G 1594 A.

Only on vehicles from model year 2001 onwards with engine code ANB:

- Switch on ignition.

**All models**

- -> The fuel pump relay should pick up. (Relay is located in relay position 4 in central electrics on left of driver's footwell).

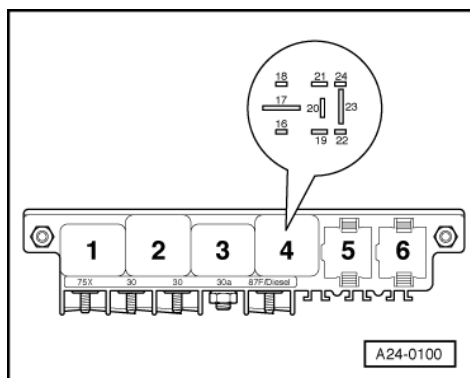
If the relay picks up now but not during the final control diagnosis:

- Fit a new engine control unit => Page 49 .

If the relay does not pick up:

- Switch off ignition.
- Disconnect cable bridge.

- Disconnect fuel pump relay.

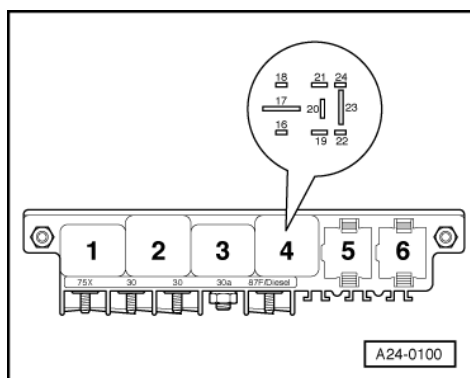


- -> Connect multimeter (voltage measurement range) between earth and contact 19 on relay panel.
- Specification: approx. battery voltage

If the specification is not obtained:

- Check the wiring.

=> Current flow diagrams, Electrical fault finding and Fitting locations binder



If the specification is obtained:

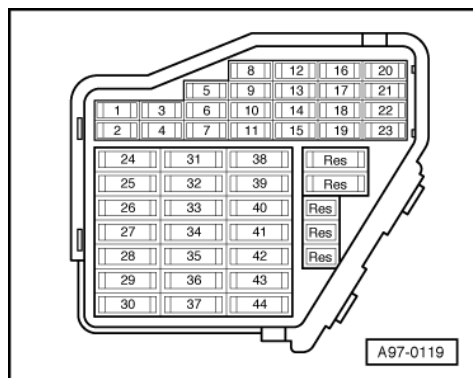
- -> Test for open circuit and short to positive or earth in the following wiring connections:

Central electrics on left of driver's footwell, relay position 4 Contact	Test box V.A.G 1598/31 Socket
16	65

- Rectify any open/short circuit as necessary.

If no fault is found:

- Fit a new fuel pump relay -J17.
- Reconnect the engine control unit.



Testing voltage supply to fuel pump and other components

- -> Remove fuse Nos.S228, S2291), S2322) and S234 from fuse holder(at socket positions 28, 32 and 34).

1) only on vehicles up to model year 1999

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2) only on vehicles from model year 2000 onwards

- Start final control diagnosis (=> Page 16) and activate ACF solenoid valve 1 (-N80).
- For each of the following fuse positions in the fuse holder, connect the multimeter (voltage measurement range) between earth and one of the fuse contacts:

Fuse	Specification (for one contact)
S228	Approx. battery voltage
S229 1)	Approx. battery voltage
S232 2)	Approx. battery voltage
S234	Approx. battery voltage

1) only on vehicles up to model year 1999

2) only on vehicles from model year 2000 onwards

If the specifications are not obtained:

- Repeat the test on the other fuse contact.

If the specifications are again not attained:

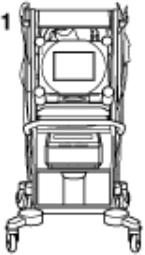
- Check wiring

=> Current flow diagrams, Electrical fault finding and Fitting locations binder

If no fault is found:

- Fit a new fuel pump relay -J17.
- Refit fuses.

1.17 - Testing air mass meter -G70

V.A.G 1526 A 	V.A.G 1594 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.
V.A.G 1598/31 	VAS 5051 
	G24-0021

Special tools and workshop equipment required

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

or

- ◆ V.A.G 1551 with V.A.G 1551/3 A

Requirements for test:

- Coolant temperature at least 80 °C
- Electrical consumers switched off (radiator fan must not run during the test)
- Air conditioner switched off
- Fuse for air mass meter OK

=> Current flow diagrams, Electrical fault finding and Fitting locations binder

**Testing operation**

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page 1 .)
When doing this the engine must be idling.

-> Indicated on display:

Rapid data transfer HELP
Select function XX

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

Note:

During the basic setting the activated charcoal filter solenoid valve (ACF valve -N80) is closed and the air conditioner compressor is switched off.

-> Indicated on display:

Introduction of basic setting Q
Enter display group number XXX

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

-> Indicated on display:

Basic setting 2
1 2 3 4

- Check display values for engine load.

	Display zones			
	1	2	3	4
Display Group 002: Intake air mass at idling speed with engine at normal operating temperature				
Display	xxx rpm	xxx %	xx.x ms	xxx.x g/s
Indicates	Engine speed	Load	Avg. injection period	Air mass
Range	0...6800 rpm	15...150%	0.0...19.0 ms	2.0...170 g/s
Specification	FWD: 740...860 rpm 4WD: 800...920 rpm	15 ... 35 %	1.0...4.0 ms	2.0....4.5 g/s
Note	---	---	If readout does not match specification, see table for display zone 3 => Page 72	If readout does not match specification, see table for display zone 4 => Page 73

If the specification is obtained:

- Press =>key.

-> Indicated on display (function selection):

Rapid data transfer HELP
Select function XX

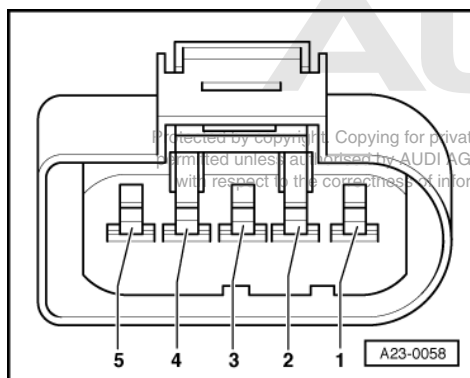
Reading Display Group 002

Display zone 3	Possible cause of fault	Fault remedy
Less than 1.0 ms	- Lower values can only occur when vehicle is on overrun	
More than 4.0 ms	- Load on engine due to ancillaries	- Eliminate load (air conditioner, power steering, alternator)

	- Rough idling (engine not running on all cylinders)	- Test spark plugs Test injectors => Page 56
	- Throttle valve control part -J338 defective	- Test throttle valve control part => Page 116

Reading Display Group 002

Display zone 4	Possible cause of fault	Fault remedy
Less than 2.0 g/s	- Large quantity of unmetered air (air leak) between intake manifold and air mass meter - Voltage supply to air mass meter or wiring to engine control unit	- Check intake system for leaks (unmetered air) => Page 73
More than 4.5 g/s	- Load on engine due to ancillaries	- Eliminate load (air conditioner, power steering, alternator)
	- Voltage supply to air mass meter or wiring to engine control unit	- Test voltage supply and wiring => Page 73



Testing power supply to air mass meter

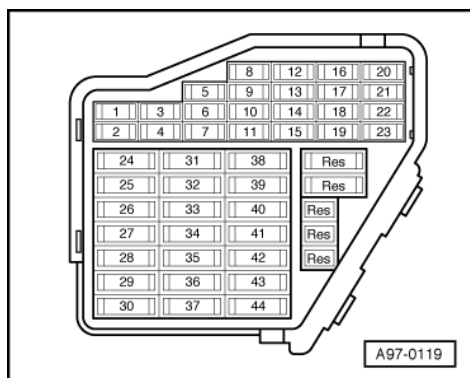
- Unplug connector from air mass meter.
- -> Connect multimeter (voltage measurement range) as follows:

Connector Contact	Measure against
2	Engine earth

- Operate the starter briefly. (The engine can be allowed to start.)
 - Specification: approx. battery voltage

Note:

The air mass meter receives its voltage supply via the fuel pump relay.



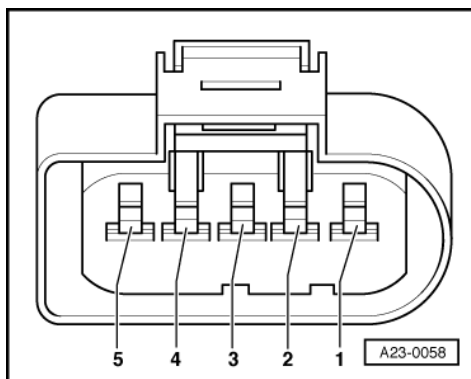


If the specification is not attained:

- Test for open circuit or short to earth in wiring between fuel pump relay and contact 2 on connector via fuse S234 (in fuse holder, position 34).

=> Current flow diagrams, Electrical fault finding and Fitting locations binder

- Rectify short circuit or open circuit if necessary.



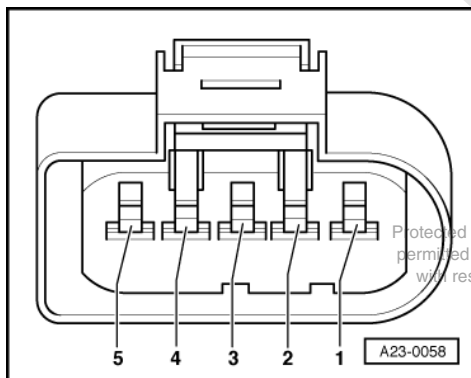
- -> Connect hand-held multimeter (voltage measurement range) between contacts 2 and 3 of connector.
- Operate the starter briefly. (The engine can be allowed to start.)
 - Specification: approx. battery voltage

Note:

Contact 3 on the connector is for the earth connection from the engine control unit.

If the specification is not attained:

- Test the wiring => Page 74 .



- -> Connect hand-held multimeter (voltage measurement range) between contacts 3 and 4 of connector.
 - Specification: approx. 5 V

If the specification is not attained:

- Test the wiring => Page 74 .

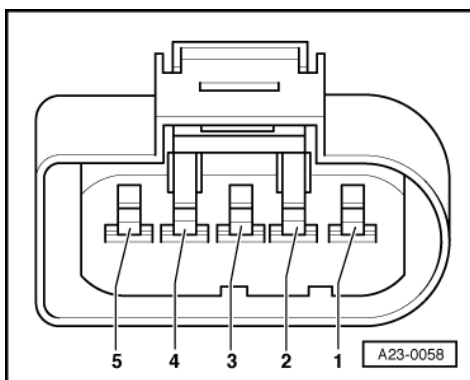
Testing wiring for air mass meter

Note:

The wiring test also tests the signal wire.

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.

=> Page 47 .



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

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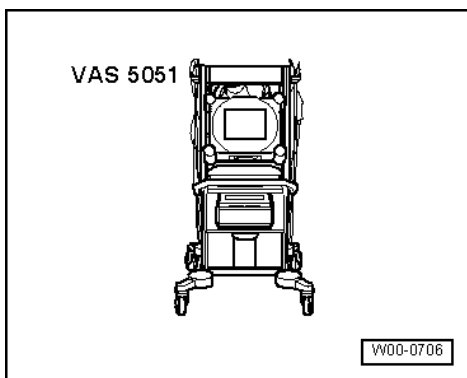
Connector Contact	Test box V.A.G 1598/31 Socket
3	27
4	53
5	29

- Rectify short circuit or open circuit if necessary.
- Test all wires for short circuits with each other.

If the wiring is OK:

- Fit a new air mass meter -G70.

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



Special tools and workshop equipment and additional materials required:

- ♦ VAS 5051 with VAS 5051/1

or

- ♦ V.A.G 1551 and V.A.G 1551/3 A
- ♦ Engine leak detector spray G 001 800 A1

Notes:

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



Test sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page 1 .)
When doing this the engine must be idling.

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	

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

-> Indicated on display:

Read measured value block	Q
Enter display group number XXX	

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

-> Indicated on display:

(1...4 = Display zones)

Read measured value block	1
1 2 3 4	

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

If the engine speed does not change:

- Press the ⇒key.

-> Indicated on display (function selection):

Rapid data transfer	HELP
Select function XX	

If the engine speed drops:

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

2 - Testing lambda control

2.1 - Testing lambda control

2.2 - Function of lambda control (before catalytic converter)

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Notes:

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

The voltage signal for "Mixture too rich" (low residual oxygen) is between about 0.7 and 1.1 V (based on reference earth).

The voltage signal for "Mixture too lean" (high residual oxygen) is between about 0.0 and +0.3 V.

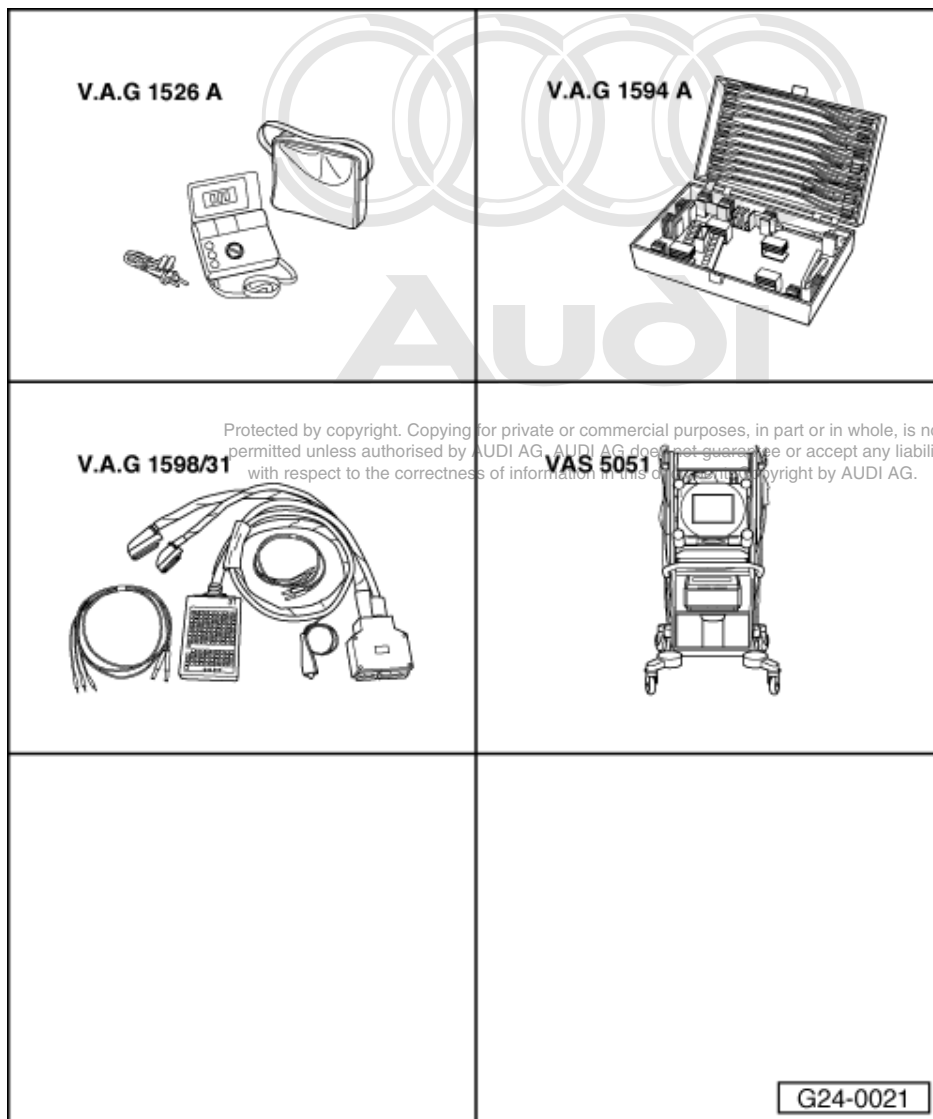
The transition from "rich" to "lean" is accompanied by a voltage jump from between 0.7 and 1.1 V to between -0.1 and +0.3 V (based on reference earth) and vice versa ($\lambda = 1.0$).

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

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

- ◆ Slots or holes in probe head are blocked.
- ◆ Lambda probe has been subjected to excessive thermal stress.
- ◆ Contact resistance in signal wire or earth wire.
- ◆ Lambda probe too cold; lambda probe heating not working.
- ◆ Lambda probe damaged by contact spray or similar product. (The contact spray is drawn into the probe via the fine cavities in the electrical wiring as a result of temperature fluctuations and capillary effect.)
- ◆ Lambda probe damaged by silicone vapours. (The engine draws in traces of any silicone-based sealants that may have been used. The silicone does not burn and damages the lambda probe.)

2.3 - Testing lambda probe and lambda control (before catalytic converter)





Special tools and workshop equipment required

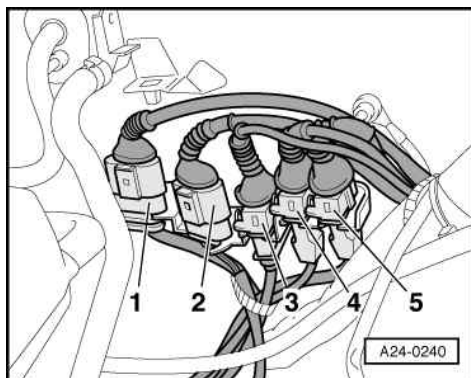
- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/31
- ♦ VAS 5051 with VAS 5051/1

or

- ♦ V.A.G 1551 with V.A.G 1551/3 A

Notes:

- ♦ For the purposes of fault-finding it is possible to switch off the lambda control by selecting Display Group 99 in "Basic setting" mode and to switch it on again by selecting Display Group 99 in "Read measured value block" mode.
- ♦ After selecting Display Group 99 (either in "Basic setting" mode or in "Read measured value block" mode) it is possible to switch back and forth between function 04 ("Basic setting") and function 08 ("Read measured value block") by pressing keys 4 and 8 on fault reader V.A.G 1551.
- ♦ When exiting the "Basic setting" mode (function 04) the lambda control is automatically switched on again.



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- ♦ -> The 4-pin connector -2- (black) for the lambda probe (before catalytic converter) -G39 and lambda probe heating -Z19 is located underneath the coolant expansion tank

Requirements for test:

- Take the car for a test drive and do not erase the fault memory.
- Coolant temperature at least 80 °C

Testing operation

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page 1 .)
When doing this the engine must be idling.

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	

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

Note:

During the basic setting the activated charcoal filter solenoid valve (ACF valve -N80) is closed and the air conditioner compressor is switched off.

-> Indicated on display:

Introduction of basic setting	Q
Enter display group number XXX	

- Enter "030" to select Display Group 030 and confirm entry with Q key.

-> Indicated on display:

Basic setting 30			
1	2	3	4

- Check lambda probe status in display zone 1.

Note:

The "lambda probe status" display indicates the status of the lambda control and lambda probes.

	Display zones			
	1	2	3	4
Display Group 030: Lambda probe status				
Display	X X X	XXX		
Indicates	Lambda probe status Bank 1, probe 1	Lambda probe status Bank 1, probe 2		
Range	0 = off 1 = on	0 = off 1 = on		
Specification	1 1 1	110		
Note	If readout does not match specification => Page 79 .			

Relevance of 3-figure display in Display Group 030

X	X	X	Display zone 1
		1	Lambda control active
	1		Lambda probe condition
1			Status of lambda probe heating

Note:

The first digit in this three-digit display (heating) fluctuates between 0 and 1.

Testing lambda probe learned values and lambda control

- Press C key.
- Enter "032" to select Display Group 032 and confirm entry with Q key.

-> Indicated on display:

Basic setting 32			
1	2	3	4

- Check readouts for lambda control in display zones 1 and 2.

	Display zones			
	1	2	3	4
Display Group 032: Lambda learned values				
Display	xx.x %		xx.x %	
Indicates	Lambda learned value, Bank 1, Probe 1 at idling speed (additive)		Lambda learned value, Bank 1, Probe 1 at part throttle (multiplicative)	
Range	-25.0...25.0 %		-25.0...25.0 %	
Specification	-10.0...10.0 % (slight fluctuation possible)		-10.0...10.0 % (slight fluctuation possible)	



	Display zones		
Note	If the specification is not attained =>Page 80		

- Press C key.
- Enter "033" to select Display Group 033 and confirm entry with Q key.

-> Indicated on display:

Basic setting 33

1 2 3 4

- Check readouts for lambda control in display zones 1 and 2.

	Display zones		
	1	2	3 4
Display Group 033: Lambda control			
Display	xx.x %	x.xxx V	
Indicates	Lambda control Bank 1	Lambda probe voltage Bank 1	
Range	-25.0...25.0 %	0.000...1.000 V	
Specification	Between -10.0 and 10.0 % the readout should fluctuate by at least 2 %	Between 0.000 and 1.000 V the voltage should fluctuate by about 0.3 V	
Note	If readout does not match specification =>Further notes, Page 80	If readout does not match specification =>Reading Display Group 033, Page 81	

Further notes

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If the readout in display zone 1 does not match the specification, or if the readout does not fluctuate by at least 2 %:

- Take car for a test drive to free lambda probe of any deposits, then repeat the test.

If the readout in display zone 1 still does not match the specification even after the test drive, or if the readout still does not fluctuate by at least 2 %:

- Test the basic voltage => Page 82 .
- Test the lambda probe heating=> Page 91 .

Models with engine code letters ANB:

- Check the lambda probe (before the catalytic converter) for ageing => Page 83

Reading Display Group 032

Display zone 1 / 2	Possible cause of fault	Fault remedy
Lambda learned values between -10.0 and -25.0 %	- Air leak in intake system (pressure side between turbocharger and intake manifold)	- Check intake system for leaks and eliminate unmetered air => Page 75
	- Oil dilution	- Change oil or drive car at moderate to high speeds on out-of-town roads
	- High oil consumption	
	- Air mass meter defective	- Test air mass meter => Page 71

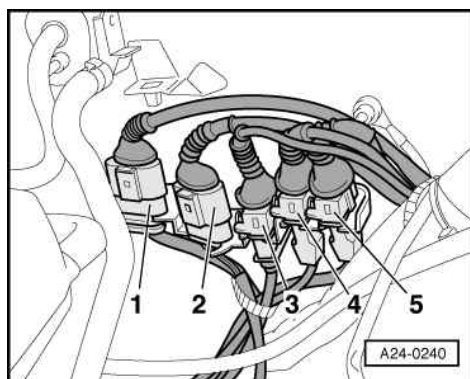
- Solenoid valve for activated charcoal filter sticking in open position	- Test solenoid valve for activated charcoal filter => Page 109
- Fuel pressure too high	- Test fuel pressure regulator => Page 53
- Injector does not close	- Test injectors => Page 56
- Lambda probe heating defective - Lambda probe defective	- Test lambda probe heating => Page 91

Reading Display Group 032

Display zone 1 / 2	Possible cause of fault	Fault remedy
Lambda learned values between 10.0 and 25.0 %	- Unmetered air in intake tract	- Check intake system for leaks and eliminate unmetered air => Page 75
	- Fuel pressure too low	- Test fuel pressure regulator => Page 53
	- Air mass meter defective	- Test air mass meter => Page 71
	- Lambda probe heating defective - Lambda probe defective	- Test lambda probe heating => Page 91
	- Injector not opening or only opening partially	- Test injectors => Page 56
	- Solenoid valve for activated charcoal filter sticking	- Test solenoid valve for activated charcoal filter => Page 109

Reading Display Group 033

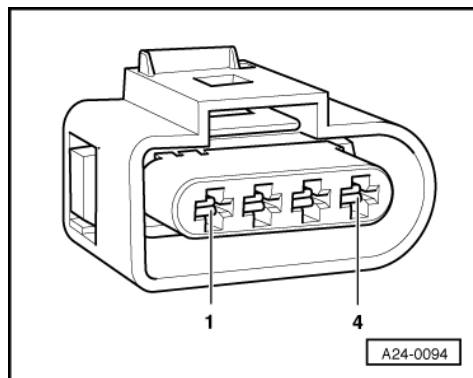
Display zone 2	Possible cause of fault	Fault remedy
Approx. 0.450 V (constant)	- Open circuit in wire 4 between lambda probe and control unit	- Test basic voltage => Page 82
	- Open circuit in wire 3 between lambda probe and control unit	
Approx. 0.200 V (constant)	- Lambda probe defective	- Renew lambda probe
More than 1.100 V	- Short to positive in wire 4 between lambda probe and control unit	- Test lambda probe (before catalytic converter) => Page 82
Less than 0.150 V	- Short to earth in wire 4 between lambda probe and control unit	





Testing basic voltage

- -> Unplug 4-pin connector -2- (black) for lambda probe (before catalytic converter) -G39.



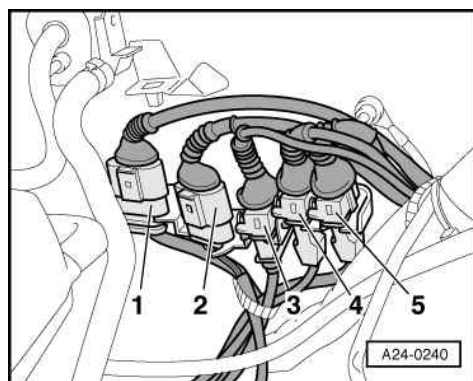
- -> Connect multimeter (voltage measurement range) between contacts 3 and 4.
- Switch ignition on.
 - Specification: 0.400 ... 0.500 V
- Switch off ignition.

If the specification is not obtained:

- Test lambda probe wiring.

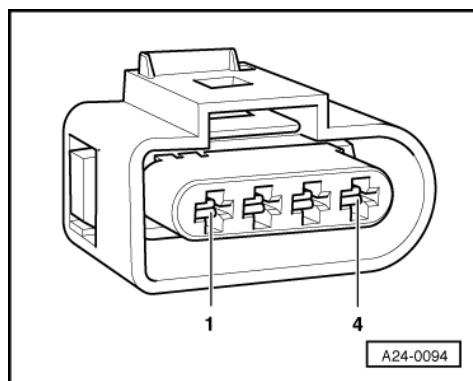
If the specification is obtained:

- Replace the lambda probe (before catalytic converter) -G39.



Testing lambda probe wiring

- -> Unplug 4-pin connector -2- (black) for lambda probe (before catalytic converter) -G39.
 - Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
- => Page 47 .



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- -> Test the following wiring connections for open circuits:

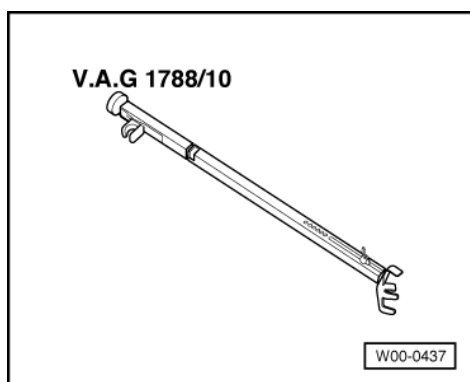
Connector Contact	Test box V.A.G 1598/31 Socket
3	51
4	70

- Rectify any open circuits.
- Test for short circuits between the wires.

If the wiring is OK:

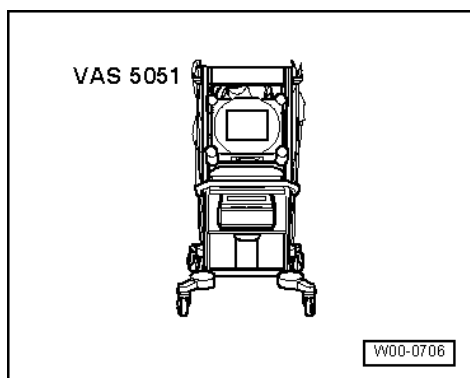
- Fit a new engine control unit => Page 49 .

2.4 - Testing lambda probe (before catalytic converter) for ageing - engine code ANB



Special tools and workshop equipment required

- ♦ -> V.A.G 1788/10 Engine speed adjuster



- ♦ VAS 5051 and VAS 5051/1

or

- ♦ V.A.G 1551 and V.A.G 1551/3 A

Test requirement:

- Coolant temperature at least 80 °C =>Display group 004, Display zone 3.

**Test sequence**

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551). Select engine electronics control unit by entering the address word "01" => Page 1 ; when doing this the engine must be running at idling speed.

-> Indicated on display:

Rapid data transfer HELP
Select function XX

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

-> Indicated on display:

Introduction of basic setting Q
Enter display group number XXX

- Enter "034" for Display Group 034 and confirm entry with Q key.

-> Indicated on display:

System in basic setting 34
1 2 3 4

- Set engine speed at between 1800 and 2200 rpm using the speed regulator V.A.G 1788/10.
- Continue the test as soon as "Test ON" appears in display zone 4.

Note:

This process can take a few minutes.

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	Display zones			
	1	2	3	4
Display group 034: Diagnosis of lambda probe ageing				
Display	xxxx rpm	xxx °C	x.x s	---
Indicates	Engine speed	Exhaust temperature	Cycle duration of lambda probe (before catalytic converter)	Status of diagnosis
Range	0...6800	70...850 °C	0...3.0 s	Test OFF Test ON B1-P1 O.K. B1-P1 n. O.K.
Specification	1800...2200 rpm	Higher than 350 °C	0.0...1.0 s	B1-P1 O.K.
Note			If specification is not attained, refer to Page 84	

Note on display zone 2:

Value calculated from engine speed and engine load.

Note on display zones 3 and 4:

The cycle duration of the lambda probe indicates the time between two voltage pulses (e.g. rich - lean - rich). It is therefore a means of evaluating lambda probe ageing (i.e. the condition of the lambda probe). If the indicated cycle duration is exceeded, "B1-P1 n. OK" will appear in display zone 4.

Further notes

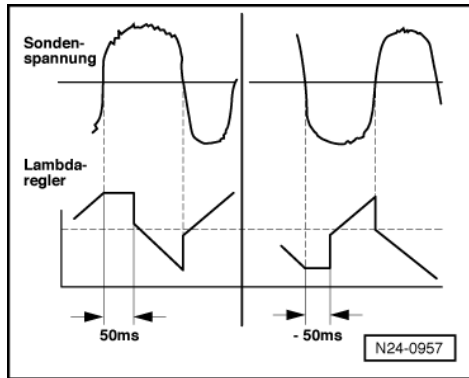
If the readout in display zone 3 or 4 does not match the specification:

- Take car for a test drive to free lambda probe of any deposits, then repeat the test.

If the readout in display zone 3 or 4 still does not match the specification even after the test drive:

- Replace the lambda probe 1 (before catalytic converter) -G39.

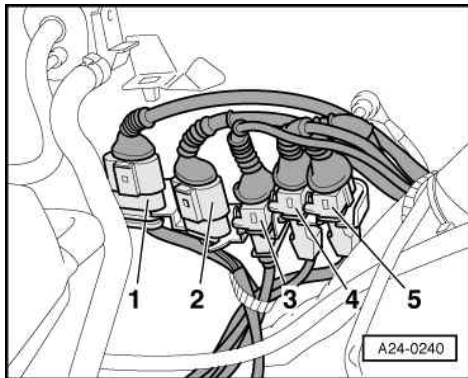
2.5 - Testing lambda probe and lambda control (after catalytic converter) - engine code ANB



Note:

The lambda control function after (i.e. downstream of) the catalytic converter takes precedence over the lambda control before the catalytic converter and serves as a corrective regulation.

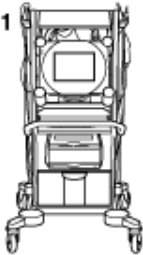
-> It corrects slight variations in the fuel mixture (e.g. an enriched mixture) originating from the lambda probe before the catalytic converter. It does so by holding the lambda control before the catalytic converter for a specified period of time (delay period) at the richest or leanest state. If the delay period is on the positive side (50 ms in the example), then the mixture will be enriched. Conversely, if the delay period is on the negative side (-50 ms in the example), the mixture will be made leaner.



-> The 4-pin connector -1- (brown) for the lambda probe (after the catalytic converter) -G130 and lambda probe heating -Z30 is located underneath the coolant expansion tank.

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V.A.G 1526 A 	V.A.G 1594 A 
V.A.G 1598/31 	V.A.G 1788/10 
VAS 5051 	G24-0024

Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/31
- ♦ V.A.G 1788/10
- ♦ VAS 5051 with VAS 5051/1

or

- ♦ V.A.G 1551 with V.A.G 1551/3 A

Requirements for test:

- Take the car for a test drive and do not erase the fault memory.
- Coolant temperature at least 80 °C

Test sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page 1.)
When doing this the engine must be idling.

-> Indicated on display:

Rapid data transfer HELP
Select function XX

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

Note:

During the basic setting the activated charcoal filter solenoid valve (ACF valve -N80) is closed and the air conditioner compressor is switched off.

-> Indicated on display:

Introduction of basic setting Q
Enter display group number XXX

- Enter "034" for Display Group 034 and confirm entry with Q key.

-> Indicated on display:

System in basic setting 34
1 2 3 4

- Set an engine speed of 2800...3200 rpm using speed regulator V.A.G 1788/10:
- Continue the test as soon as an exhaust temperature of more than 350 °C is reached in display zone 2.

Note:

This process can take a few minutes.

- Press C key.
- Set an engine speed of 1800...2200 rpm using speed regulator V.A.G 1788/10:

-> Indicated on display:

Introduction of basic setting Q
Enter display group number XXX

- Enter "030" to select Display Group 030 and confirm entry with Q key.

-> Indicated on display:

System in basic setting 30
1 2 3 4

- Check status of lambda probe (after catalytic converter) in display zone 2.

Note:

The "lambda probe status" display indicates the status of the lambda control and lambda probes.

	Display zones			
	1	2	3	4
Display Group 030: Lambda probe status at idling speed				
Display	X X X	X X X		
Display	Lambda probe status Bank 1, Probe 1	Lambda probe status Bank 1, Probe 2		
Range	0 = off 1 = on	0 = off 1 = on		
Specification	1 1 1	1 1 0		
Note	If readout does not match specification => Page 91 .			



Relevance of 3-figure display in Display Group 030

X	X	X	Display zone 2
		1	Lambda control active
	1		Lambda probe condition
1			Status of lambda probe heating

Notes:

- ♦ The lambda control of lambda probe (after the catalytic converter; B1-P2) is not active when the engine is not running under load.
- ♦ The first digit of the three-digit display (heating) fluctuates between 0 and 1.

Testing lambda control (after catalytic converter)

- Press C key.

-> Indicated on display:

Introduction of basic setting Q
Enter display group number XXX

- Enter "037" for Display Group 037 and confirm entry with Q key.

-> Indicated on display:

System in basic setting 37
1 2 3 4

- Check lambda probe voltage in display zone 2:
- Check the delay period of the lambda control (before the catalytic converter) in display zone 3 and the result of the diagnosis in display zone 4.

	Display zones			
	1	2	3	4
Display group 037: Diagnosis of lambda control system				
Display	xxx %	x.xxx V	xxx ms	---
Indicates	Engine load	Lambda probe voltage Bank 1, Probe 2	Delay period of lambda control (before catalytic converter), Bank 1	Status of diagnosis
Range	15...150 %	0.000...1.000 V	-800...800 ms	Test OFF Test ON SYST. O.K. SYST. n. O.K.
Specification	15...35 %	0.100...0.900 V	-150...150 ms	SYST. O.K.
Note		If the specification is not attained, refer to "Reading display zone 2" => Page 89	If the value increases to over 300 ms, this could indicate a leak in the exhaust system or a defective lambda probe.	If "SYST. n. O.K." appears on the display, interrogate fault memory => Page 4

Note on display zone 3:

The lambda control after the catalytic converter (downstream) takes precedence over the lambda control before the catalytic converter (upstream). The lambda control after the catalytic converter makes corrections in the mixture control process to compensate for slight variations in the fuel mixture (e.g. an enriched mixture) originating from the lambda probe before the catalytic converter. It does so by holding the lambda control before the catalytic converter for a specified period of time (delay period) at the richest or leanest state. If the delay

period is on the positive side (50 ms in the example), then the mixture will be enriched. Conversely, if the delay period is on the negative side (50 ms in the example), the mixture will be made leaner.

Reading Display Group 037

Display zone 2	Possible cause of fault	Fault remedy
Approx. 0.450 V (constant)	- Open circuit in wire 4 between lambda probe and control unit	- Test basic voltage => Page 89
	- Open circuit in wire 3 between lambda probe and control unit	
More than 1.100 V	- Short to positive in wire 4 between lambda probe and control unit	- Test wiring of lambda probe (after the catalytic converter) => Page 90
Less than 0.150 V	- Short to earth in wire 4 between lambda probe and control unit	

Further notes

If the readout in display zone 3 or 4 does not match the specification:

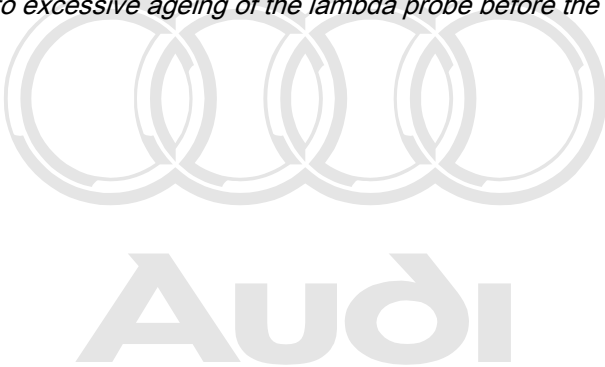
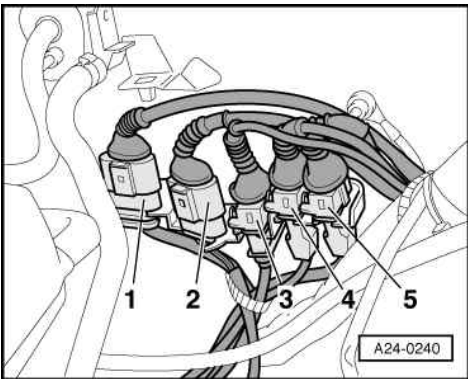
- Take car for a test drive to free lambda probe of any deposits, then repeat the test.

If the readout in display zone 3 or 4 still does not match the specification even after the test drive:

- Replace the lambda probe (before the catalytic converter) -G39.

Note:

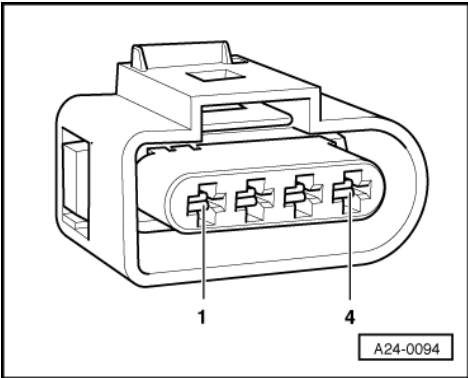
If the lambda probe voltage is OK and the delay period for the lambda control after the catalytic converter is still above 1200 ms even after a test drive, this points to excessive ageing of the lambda probe before the catalytic converter.



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-> Testing basic voltage

- Unplug 4-pin connector -1- (brown) for lambda probe (after catalytic converter) -G130.





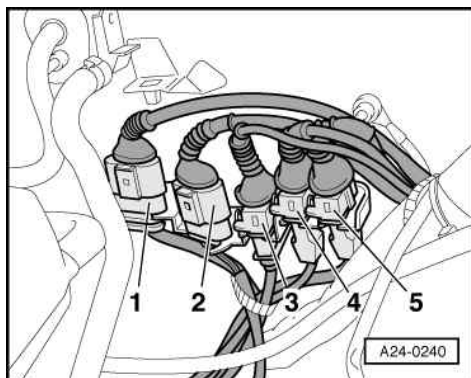
- -> Connect multimeter (voltage measurement range) between contacts 3 and 4.
- Switch ignition on.
 - Specification: 0.400 ... 0.500 V
- Switch off ignition.

If the specification is not obtained:

- Test lambda probe wiring.

If the specification is obtained:

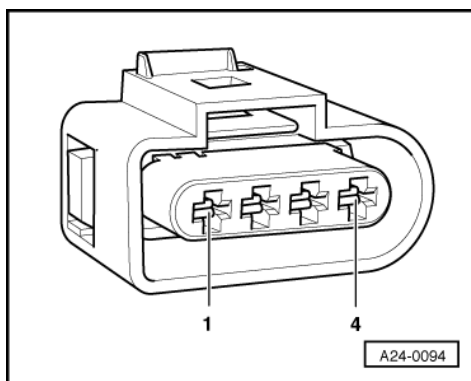
- Replace the lambda probe (after catalytic converter) -G130.



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Testing lambda probe wiring

- Unplug 4-pin connector -1- (brown) for lambda probe (after catalytic converter) -G130.
 - Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
- => Page 47 .



- -> Test the following wiring connections for open circuits:

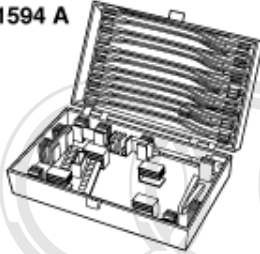
Connector Contact	Test box V.A.G 1598/31 Socket
3	68
4	69

- Rectify any open circuits.
- Test for short circuits between the wires.

If the wiring is OK:

- Fit a new engine control unit => Page 49 .

2.6 - Testing lambda probe heating -Z19 and -Z29 at lambda probes (before and after catalytic converter)

V.A.G 1526 A 	V.A.G 1594 A 
V.A.G 1598/31 	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.
	G24-0020

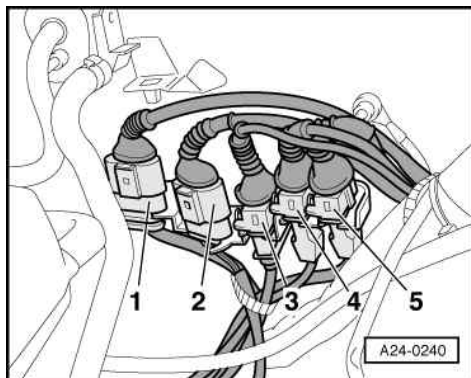
Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/31

Requirements for test:

- Coolant temperature at least 80 °C
- Fuse for lambda probe heating OK

=> Current flow diagrams, Electrical fault finding and Fitting locations binder



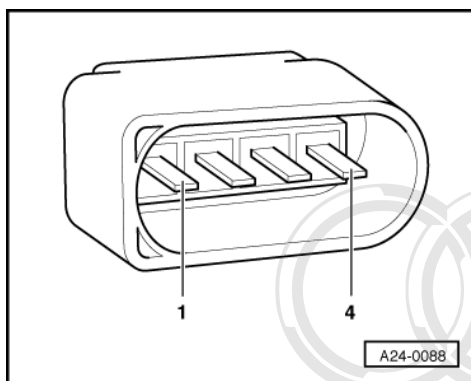
Test sequence

Vehicles with engine code letters APU:

- -> Unplug 4-pin connector -2- (black) for lambda probe (before catalytic converter) -G39.

Models with engine code letters ANB:

- Unplug 4-pin connector -1- (brown) for lambda probe (after catalytic converter) -G130.



All models

- -> Connect multimeter (resistance measurement range) between contacts 1 and 2.
- Specification: 1 ... 5 ω (at room temperature)

Note:

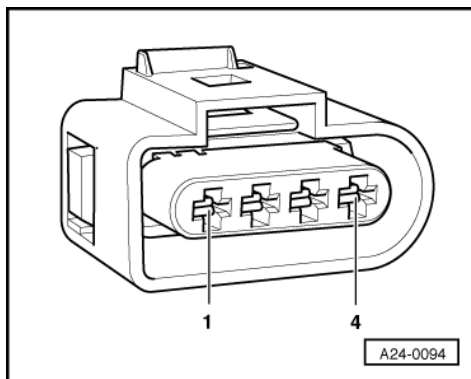
The resistance will increase sharply at higher temperatures.

If the specification is not attained:

- Renew the lambda probe.

If the specification is obtained:

- Test voltage supply for lambda probe heating
=> Page 93 .



Testing voltage supply for lambda probe heating

- -> Connect multimeter (voltage measurement range) between contacts 1 (positive) and 2 (earth).
- Start the engine.
 - Specification: approx. battery voltage (may fluctuate)

Notes:

- ♦ At certain points during operation, the engine control unit intervenes by constantly connecting and disconnecting the earth connection for lambda probe heating. For this reason the voltage displayed on the tester may fluctuate.
- ♦ If required, observe Display Group 041 in the "Read measured value block" function to find out when the engine control unit is switching the lambda probe heating on and off.

If no voltage is present:

- Connect multimeter (voltage measurement range) as follows:

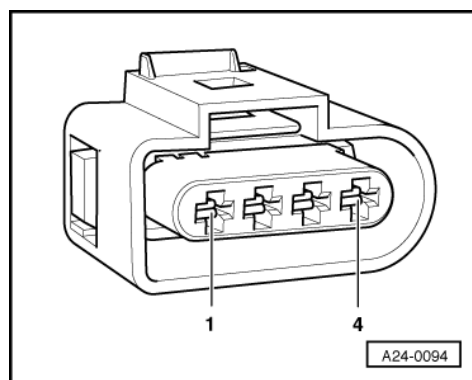
Connector Contact	Measure against
1 (positive)	Vehicle earth

- Operate starter briefly.
 - Specification: approx. battery voltage

If there is still no voltage reading:

- Test for open circuit in wiring connection between fuel pump relay and contact 1 on connector via fuse S234 (at socket position 34).

=> Current flow diagrams, Electrical fault finding and Fitting locations binder

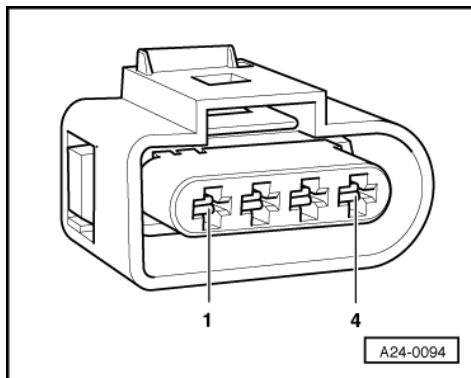


If the voltage supply is OK:

- -> Connect multimeter (voltage measurement range) as follows:

Connector Contact	Measure against
2 (switched earth connection from engine control unit)	Battery positive

- Start the engine.
 - Specification: approx. battery voltage (may fluctuate)
- Switch off ignition.



If no voltage is present:

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
=> Page 47 .
- -> Test for open circuits in the following wiring connection:

Lambda probe heating -Z19 for lambda probe (before catalytic converter):

Connector Contact	Test box V.A.G 1598/31 Socket
2	5

Lambda probe heating -Z29 for lambda probe (after catalytic converter) - only for engines with engine code ANB:

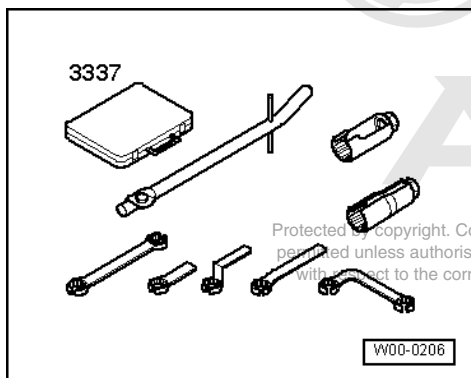
Connector Contact	Test box V.A.G 1598/31 Socket
2	63

- Rectify any open circuits.

If the wiring connection is O.K. but the lambda probe heating still has no earth connection:

- Fit a new engine control unit => Page 49 .

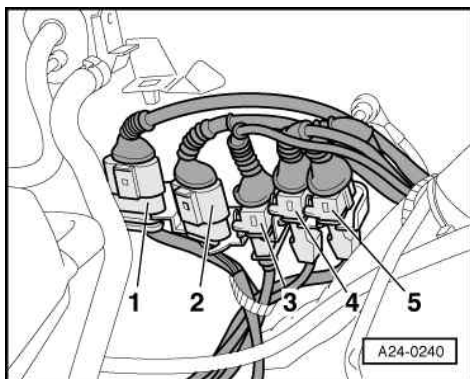
2.7 - Removing and installing lambda probe



Special tools, workshop equipment and other materials required

- ♦ Ring spanner set 3337

- ♦ Hot paste G 052 112 A3



Work sequence

- -> Unplug 4-pin connector for lambda probe and move wiring clear.
 - 1 - (brown) for lambda probe (after catalytic converter) -G130
 - 2 - (black) for lambda probe (before catalytic converter) -G39
- Unscrew lambda probe using special tool 3337.

When installing, note the following points:

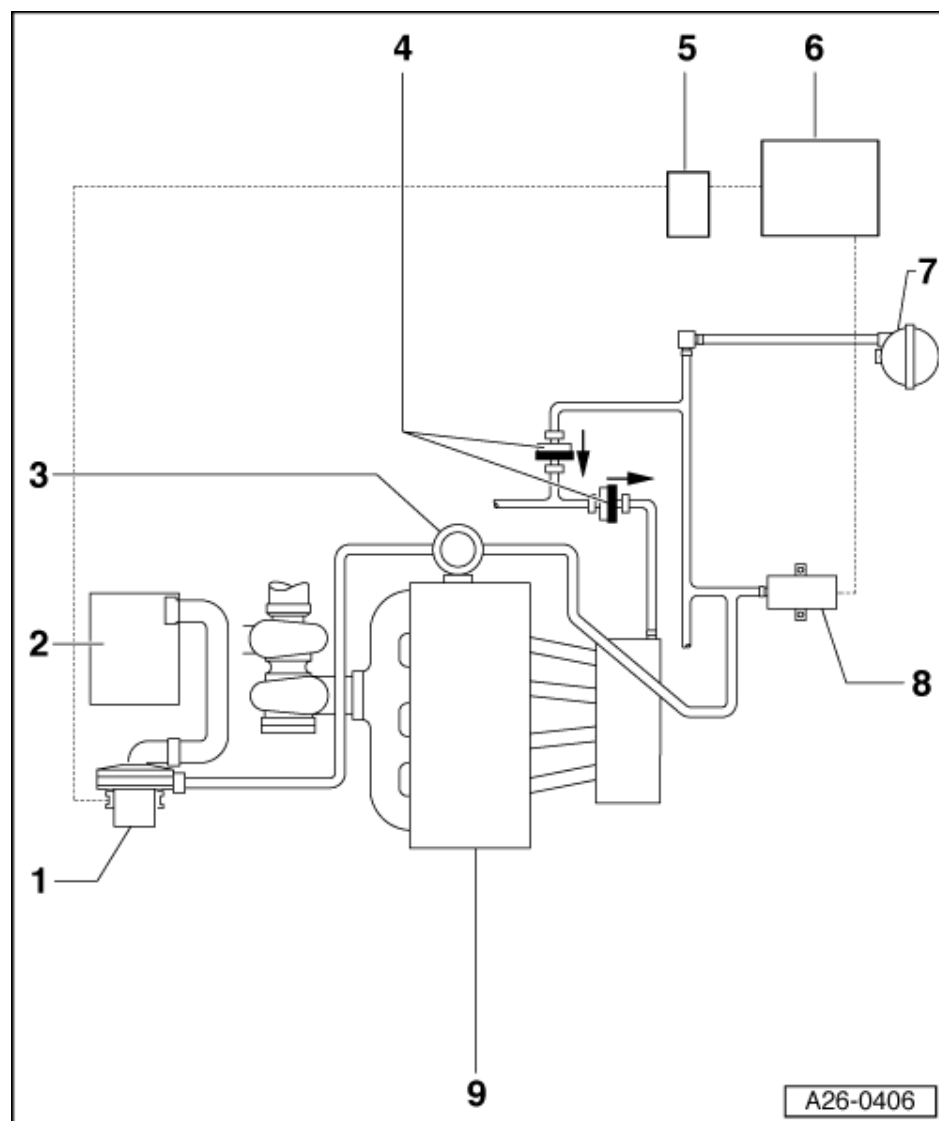
Notes:

- ♦ The screw thread on the lambda probe is coated with a special paste. This paste must not be allowed to penetrate the openings on the probe.
- ♦ Tightening torque: 55 Nm.
- ♦ When installing, the lambda probe wire must be secured in exactly the same position as before in order to avoid contact between the wire and the exhaust pipe.

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3 - Testing secondary air system - engine code ANB

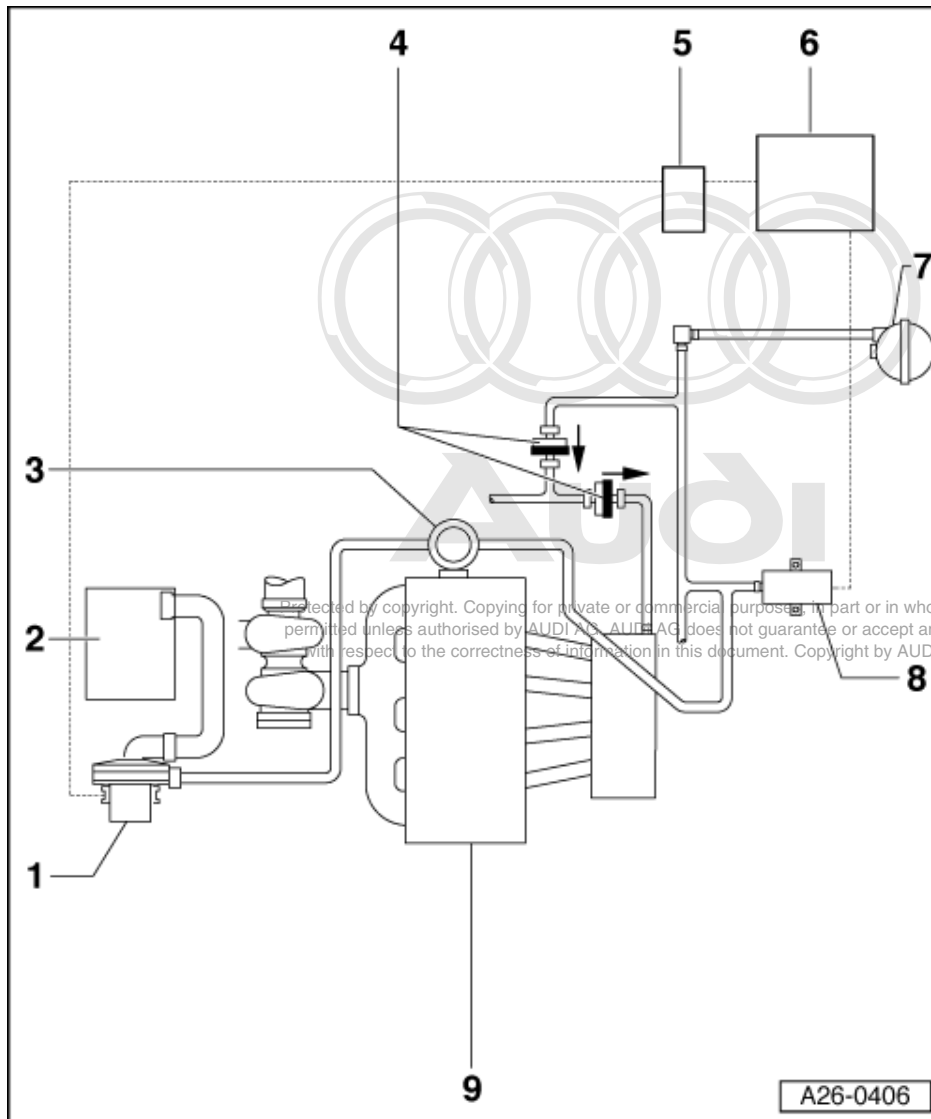
3.1 - Testing secondary air system - engine code ANB



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

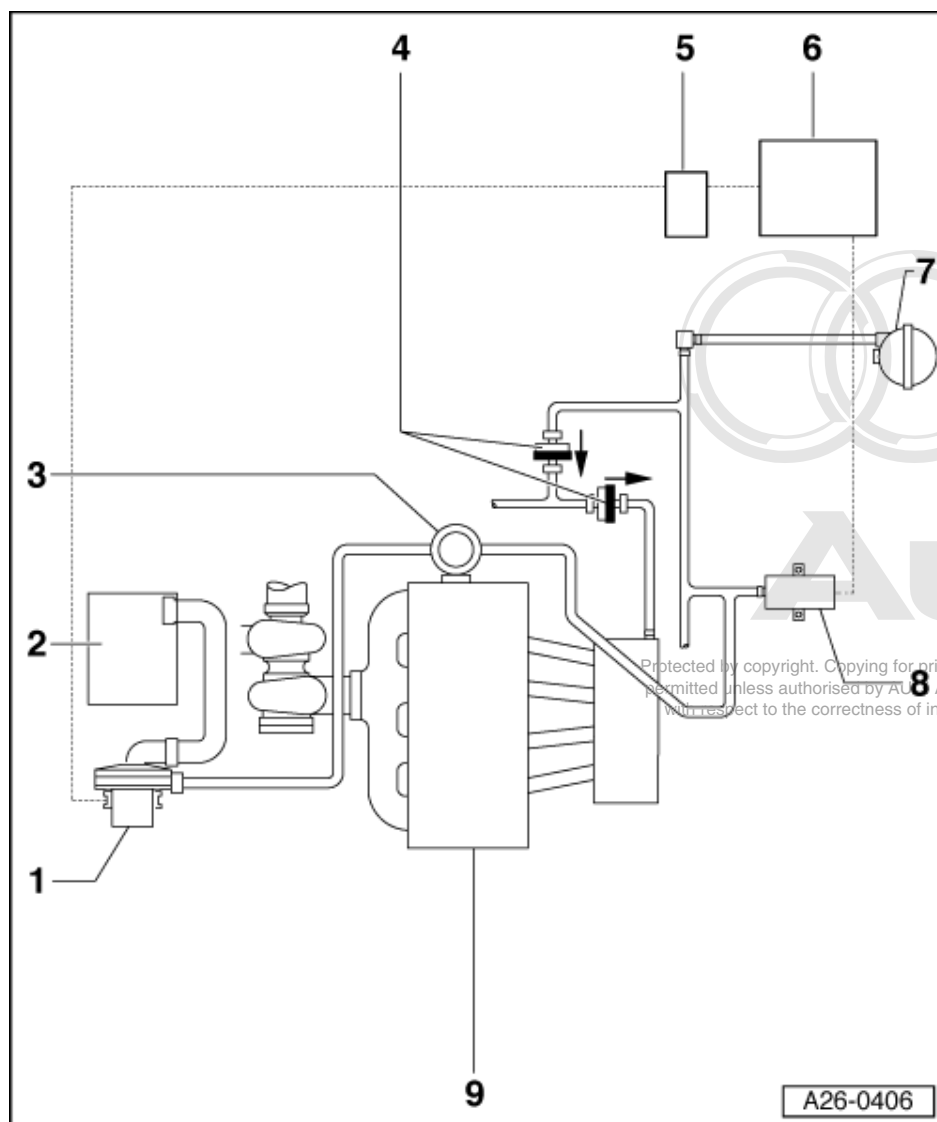
Principle of operation

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



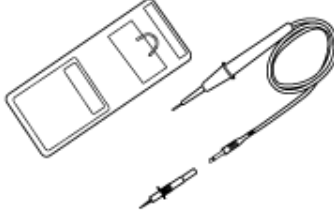
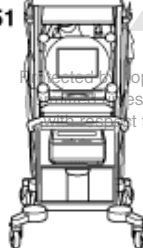
Function

- ♦ After a cold start, engine control unit -6-activates secondary air pump relay -5-, and air is fed to combination valve for secondary air system -3-.
- ♦ At the same time, the system activates secondary air inlet valve -8-, which supplies vacuum to combination valve -3-. The combination valve opens a passage for the secondary air system to supply air to the exhaust ports in the cylinder head -9-.



- 1 Secondary air pump motor -V101
- 2 Air cleaner
- 3 Combination valve for secondary air system
- 4 Non-return valve
 - ♦ Installation position (light side/ dark side or arrow marking) as shown in illustration. Arrow indicates direction of flow
- 5 Secondary air pump relay -J299
- 6 Engine control unit -J220
- 7 Vacuum reservoir
 - ♦ Fitting location: in front left wheel housing behind wheel housing liner
- 8 Secondary air inlet valve -N112
- 9 Cylinder head

3.2 - Testing secondary air inlet valve -N112

V.A.G 1526 A 	V.A.G 1527 B 
V.A.G 1594 A 	V.A.G 1598/31 
VAS 5051 	G24-0023

Special tools and workshop equipment required

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

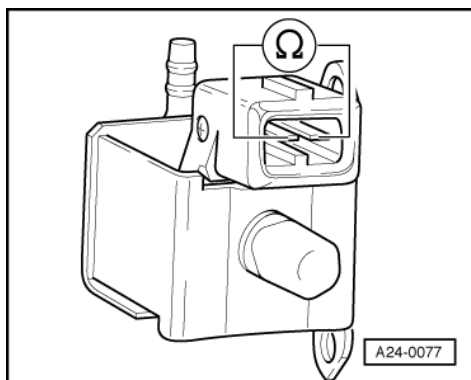
or

- ◆ V.A.G 1551 with V.A.G 1551/3 A

Fitting location => Fitting locations overview, Page 34

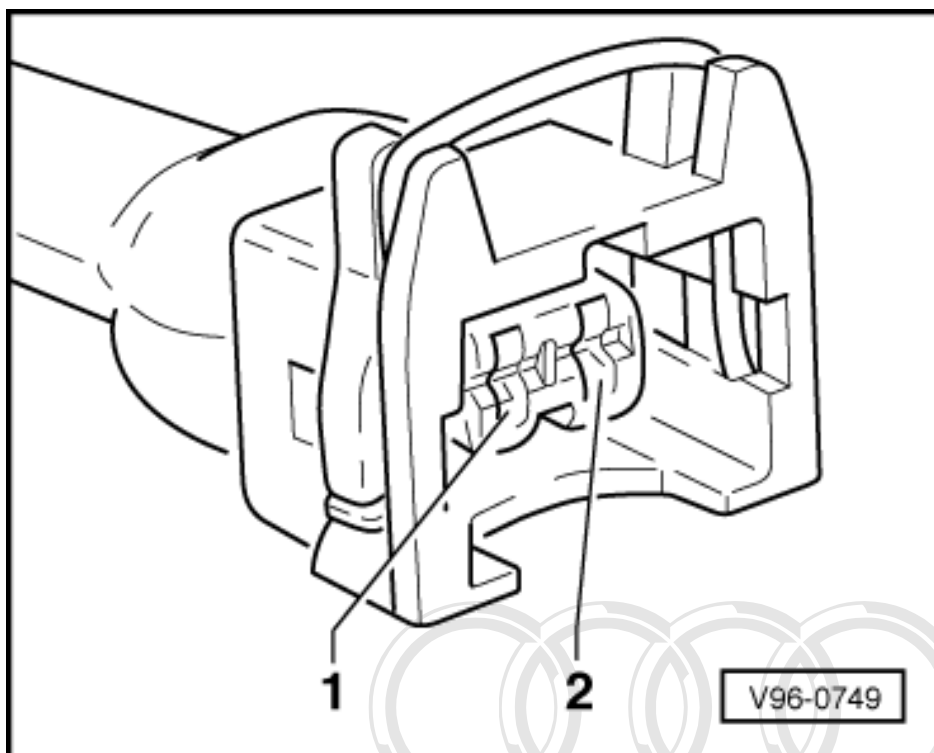
Test requirement:

- Final control diagnosis has been performed



Testing internal resistance

- Unplug green connector from secondary air inlet valve -N112.
- -> Connect multimeter to valve (resistance measurement range)
 - Specification: 25 ... 35 ω
- If the reading does not match the specification, renew secondary air inlet valve -N112.



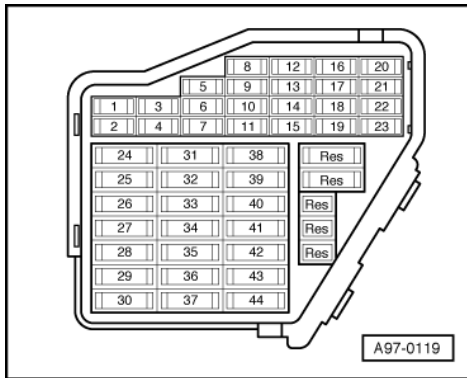
Checking voltage supply

- Unplug connector from secondary air inlet valve -N112.
- -> Connect voltage tester V.A.G 1527 B as follows:

Connector Contact	Measure against
1	Engine earth

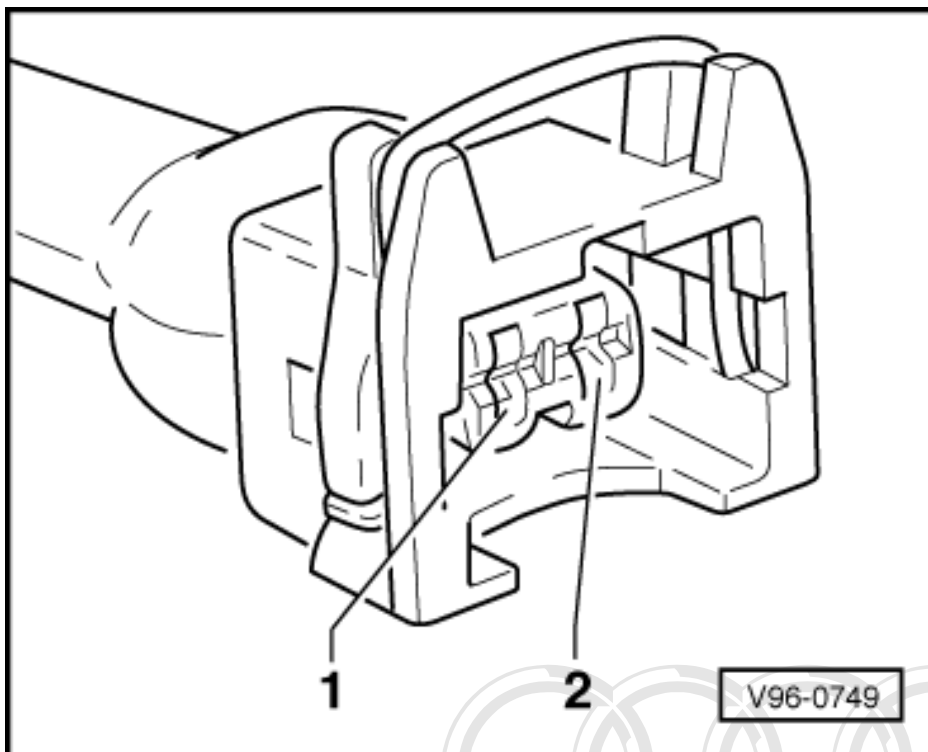
- Operate starter briefly.
 - The LED should light up.

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If the LED does not light up:

- Carry out the following tests (marked with dots):
- -> Test fuse No. S234 (in fuse box, socket 34)

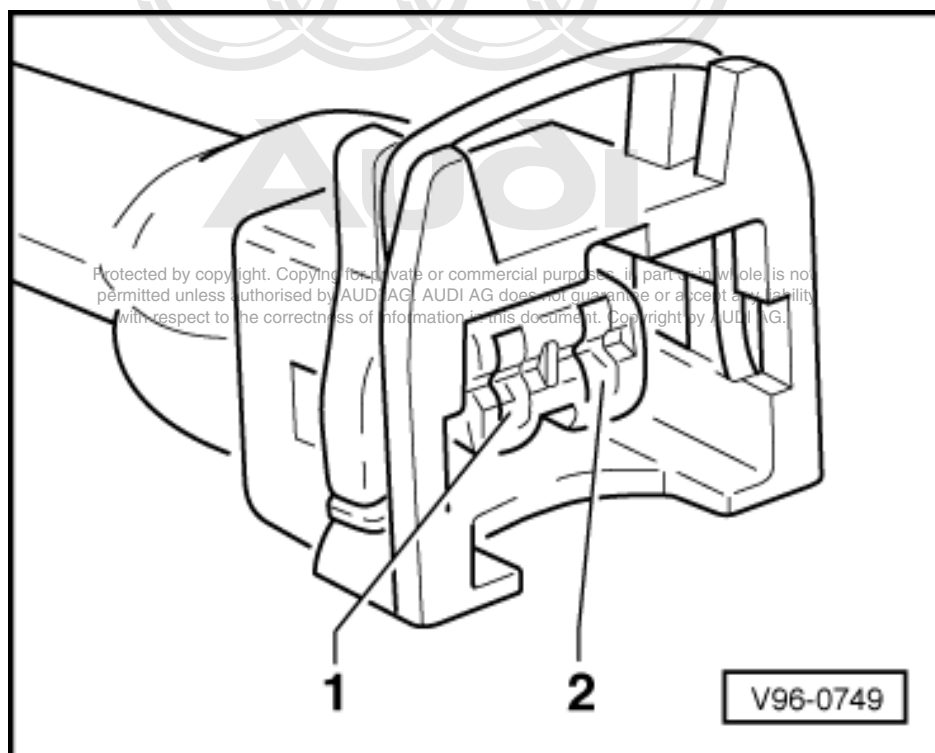


- -> Test for open circuit in wiring from contact 1 of connector to fuel pump relay via fuse No. S234 (in fuse box, socket 34):

=> Current flow diagrams, Electrical fault finding and Fitting locations binder

- Test fuel pump relay => Page 66 .

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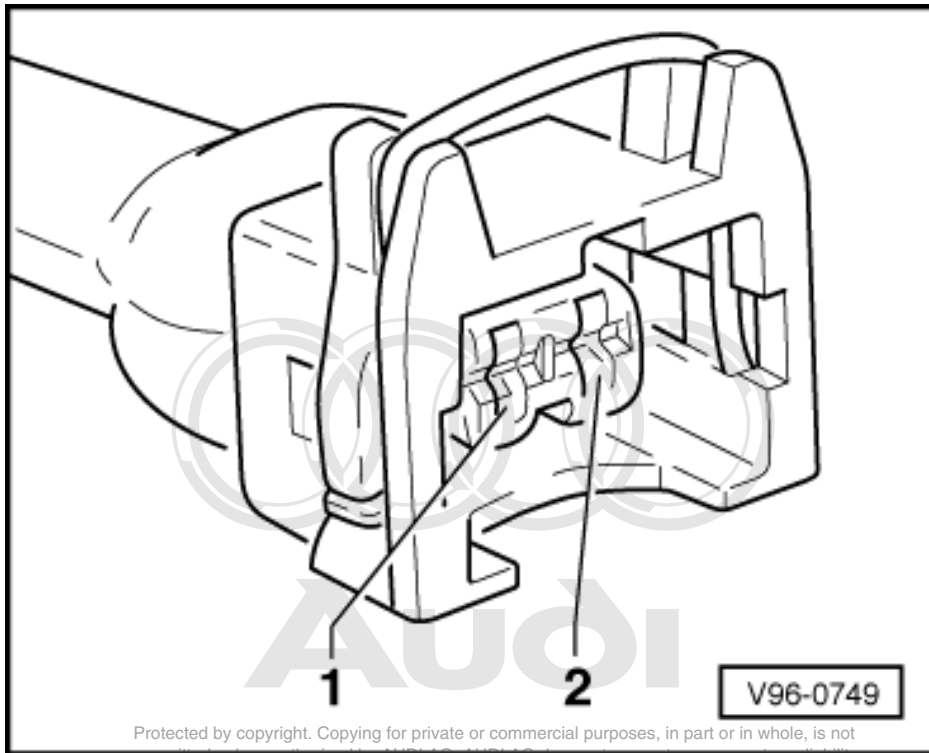
**Testing activation**

- -> Connect voltage tester V.A.G 1527 B between contacts 1 and 2 using auxiliary cables from V.A.G 1594 A.
- Connect fault reader V.A.G 1551
=> Page **1**.
- Start final control diagnosis and select secondary air inlet valve -N112.
=> Page **16**.

-> Indicated on display:

Final control diagnosis Secondary air inlet valve -N112
--

- The LED should flash.



If the LED does not flash or lights up continuously:

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
=> Page 47 .
- -> Test for open circuit and short to positive or earth in the following wiring connections:

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

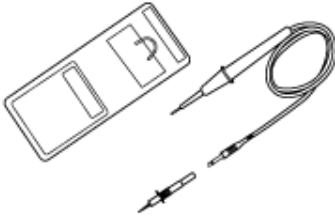
- Rectify any open/short circuit as necessary.

If the wiring is OK:

- Fit a new engine control unit => Page 49 .



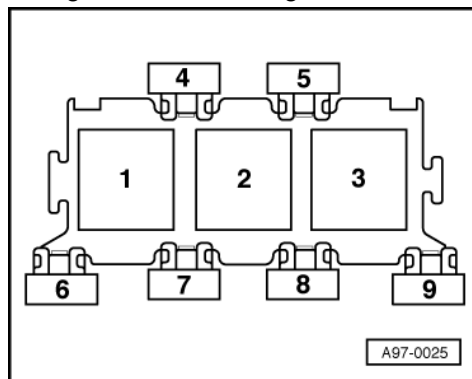
3.3 - Testing secondary air pump relay -J299 and activation

V.A.G 1526 A 	V.A.G 1527 B 
V.A.G 1594 A 	V.A.G 1598/31 
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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 1598/31

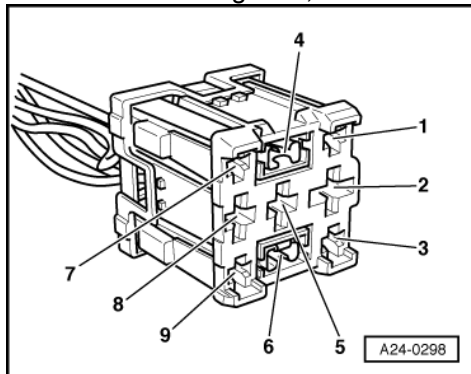
Fitting location => Fitting locations overview, Page 34





- Test for open circuit in wiring from battery + (terminal 30) via fuse No. S130 to secondary air pump relay - J299 (located in socket position 2 of 3-way relay carrier in electronics box in plenum chamber.)

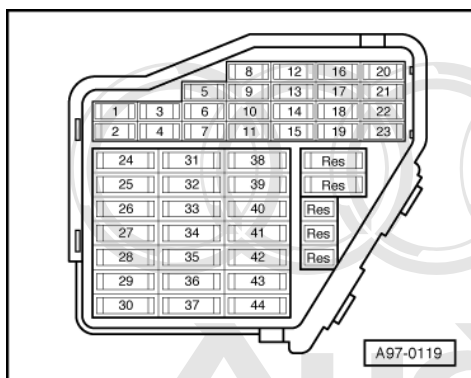
=> Current flow diagrams, Electrical fault finding and Fitting locations binder



- -> Connect multimeter (voltage measurement range) as follows:

3-way relay carrier (electronics box in plenum chamber) socket position 2: contact	Test against
4	Engine earth

- Operate starter briefly.
- Specification: approx. battery voltage

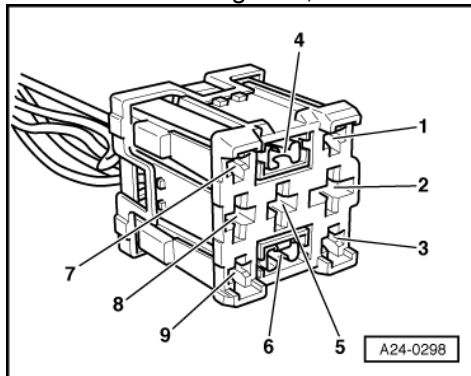


If the specification is not obtained:

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

- -> Test fuse No. S234 (in fuse box, socket 34)
- Test for open circuit in wiring from secondary air pump relay -J299 (located in 3-way relay carrier in electronics box in plenum chamber) to fuel pump relay via fuse No. S234 (in fuse box, socket 34).

=> Current flow diagrams, Electrical fault finding and Fitting locations binder



Testing activation of secondary air pump relay

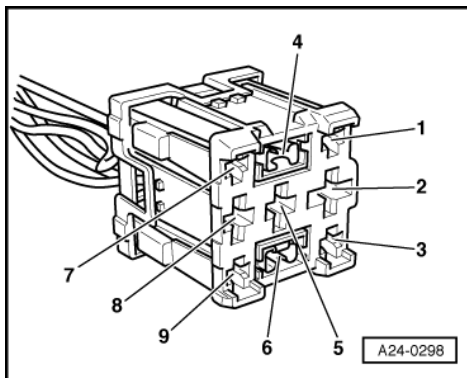
- Switch off ignition.
- Disconnect secondary air pump relay.
- -> Connect voltage tester V.A.G 1527 B as follows:

3-way relay carrier (electronics box in plenum chamber) socket position 2: contact	Test against
6	Engine earth

- Start final control diagnosis and select secondary air pump relay -J299
=> Page 16 .
- The LED should flash.

If the LED does not flash:

- Switch off ignition.
- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
=> Page 47 .



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

3-way relay carrier (electronics box in plenum chamber) socket position 2: contact	Test box V.A.G 1598/31 socket
6	46

- Rectify any open/short circuit as necessary.

If no fault is found:

- Fit a new secondary air pump relay -J299.

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Testing voltage supply to secondary air pump motor

- Unplug connector from secondary air pump motor -V101.
- Connect voltage tester V.A.G 1527 B between contacts 1 and 2.
- Start final control diagnosis and select secondary air pump relay -J299
=> Page 16 .
- The LED should light up.

If the LED does not light up:

- Carry out the following tests (marked with dots):
- Test for open circuit in wiring from connector for secondary air pump motor -V101 to secondary air pump relay -J299 (located in 3-way relay carrier in electronics box in plenum chamber, socket position 2)



=> Current flow diagrams, Electrical fault finding and Fitting locations binder

- Test for open circuit in wiring from connector for secondary air pump motor -V101 to earth connection 1 in engine compartment harness

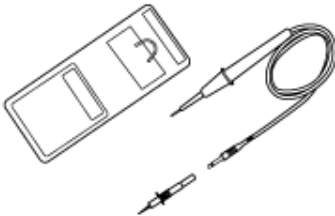
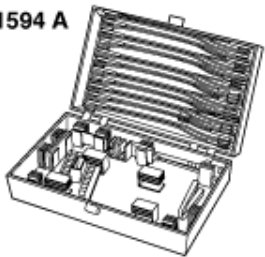
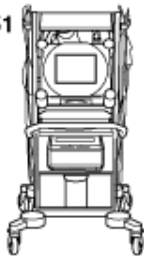
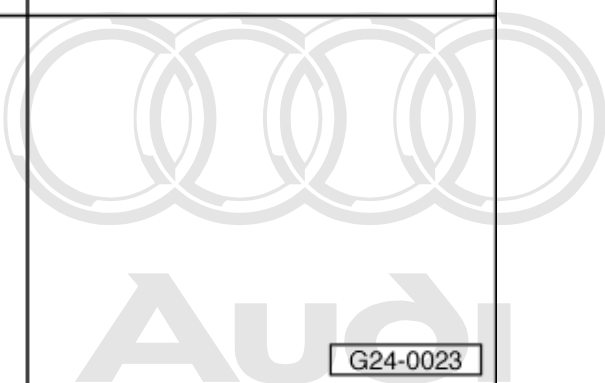
=> Current flow diagrams, Electrical fault finding and Fitting locations binder

If no fault is found:

- Renew secondary air pump motor -V101.

4 - Testing fuel tank breather

4.1 - Testing fuel tank breather

V.A.G 1526 A 	V.A.G 1527 B 
V.A.G 1594 A 	V.A.G 1598/31 
VAS 5051 	 G24-0023

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4.2 - Testing solenoid valve 1 for activated charcoal filter -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 1598/31
- ◆ VAS 5051 with VAS 5051/1

or

- ◆ V.A.G 1551 with V.A.G 1551/3 A

Testing for leaks

ACF solenoid valve -N80 remains closed when it is not receiving any current.

- Disconnect hoses from ACF valve but leave the electrical connector plugged in.
- Connect an auxiliary hose to one of the connections on the ACF valve.
- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page 1.)
- When doing this the ignition must be switched on.
- Start final control diagnosis and select solenoid valve for activated charcoal filter -N80 =>Page 16 .

-> Indicated on display:

Final control diagnosis
ACF solenoid 1 -N80

- ◆ The valve should click...
- ◆ ...and open and close (can be checked by blowing into auxiliary hose).

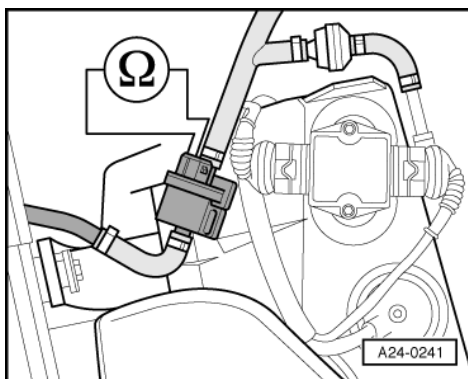
The valve should click...

If the valve does not click:

- Test internal resistance of ACF valve.

If the valve does not open and close properly:

- Renew activated charcoal filter system solenoid valve -N80.



Testing internal resistance

- Unplug connector on ACF valve.
- -> Connect multimeter to valve (resistance measurement range)



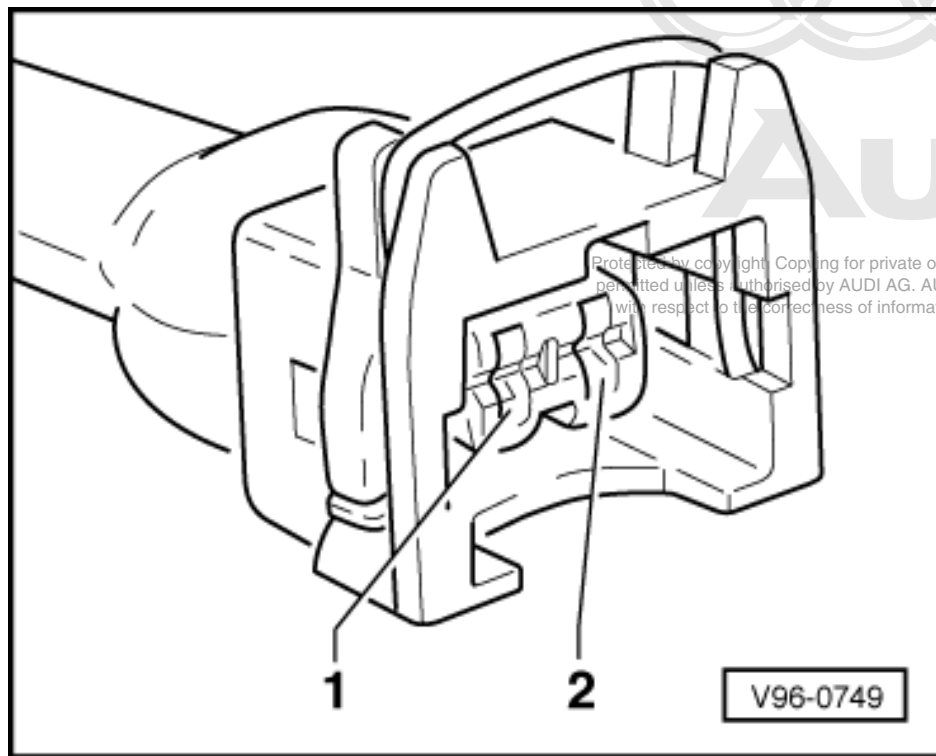
- Specification: 22 ... 30 ω

If the specification is not attained:

- Renew activated charcoal filter system solenoid valve -N80.

If the specification is obtained:

- Test voltage supply => Page **110** .

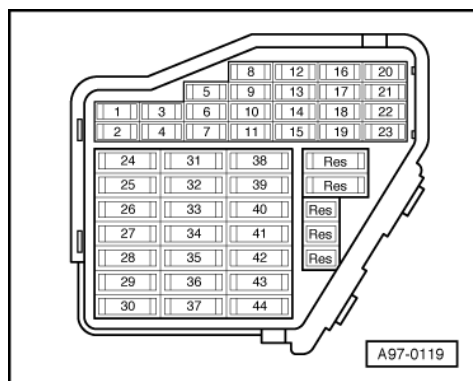


Testing voltage supply

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

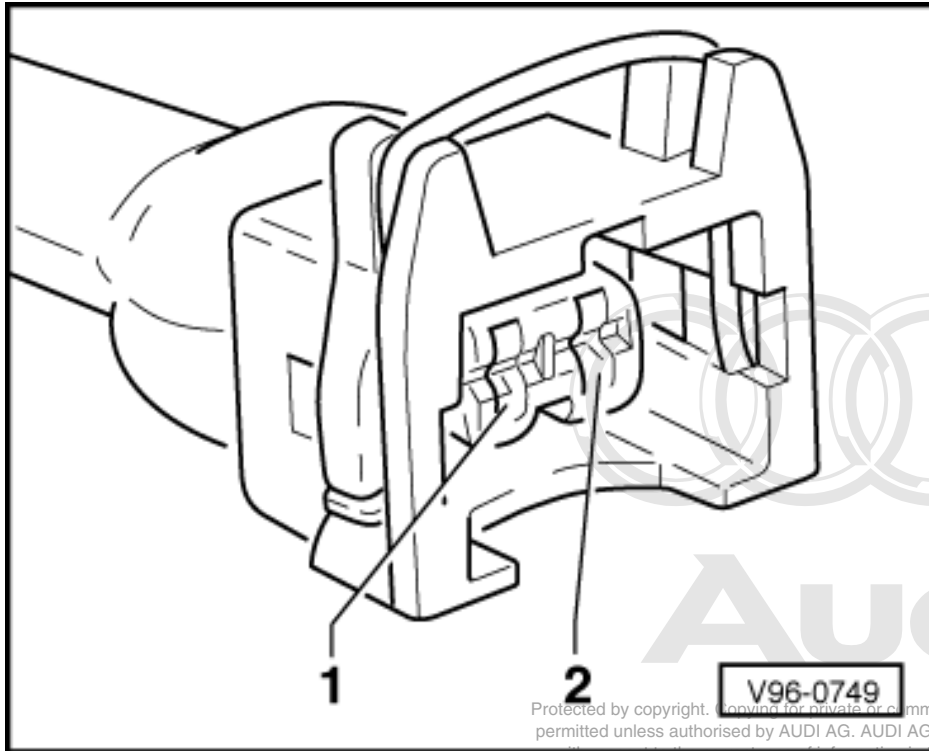
Connector Contact	Measure against
1	Engine earth

- Operate the starter briefly. (The engine can be allowed to start.)
- The LED should light up.



If the LED does not light up:

- Carry out the following tests (marked with dots):
- -> Test fuse No. S234 (in fuse box, socket position 34).



- -> Test for open circuit in wiring from contact 1 of connector to fuel pump relay via fuse No. S234 (in fuse box, socket position 34):

=> Current flow diagrams, Electrical fault finding and Fitting locations binder

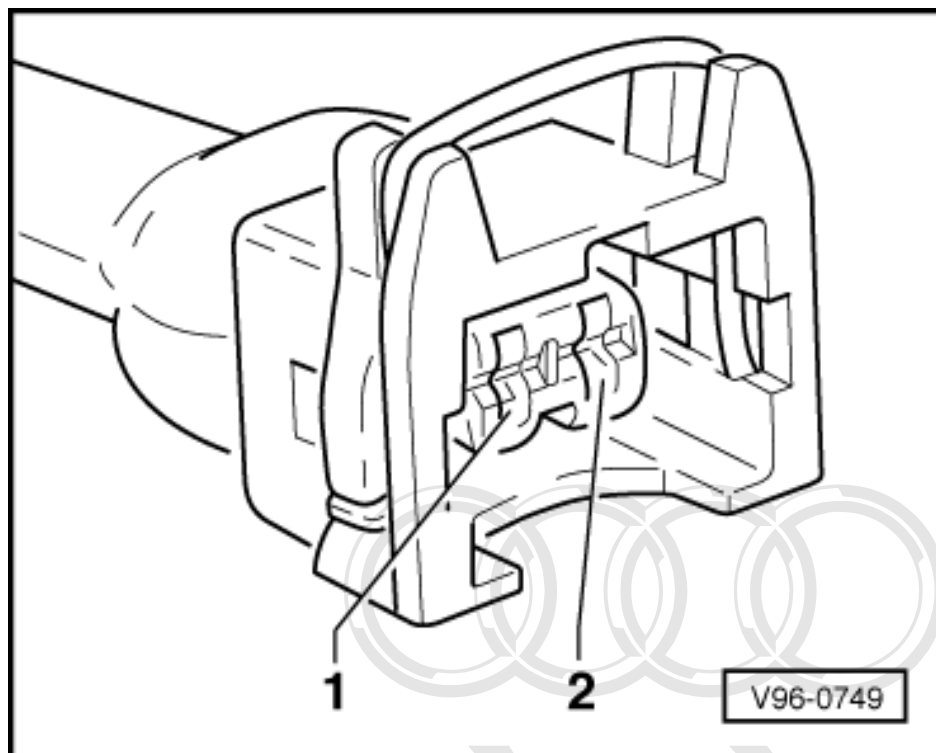
- Rectify any open circuits.

If no fault is found:

- Test fuel pump relay => Page 66 .

If the LED lights up:

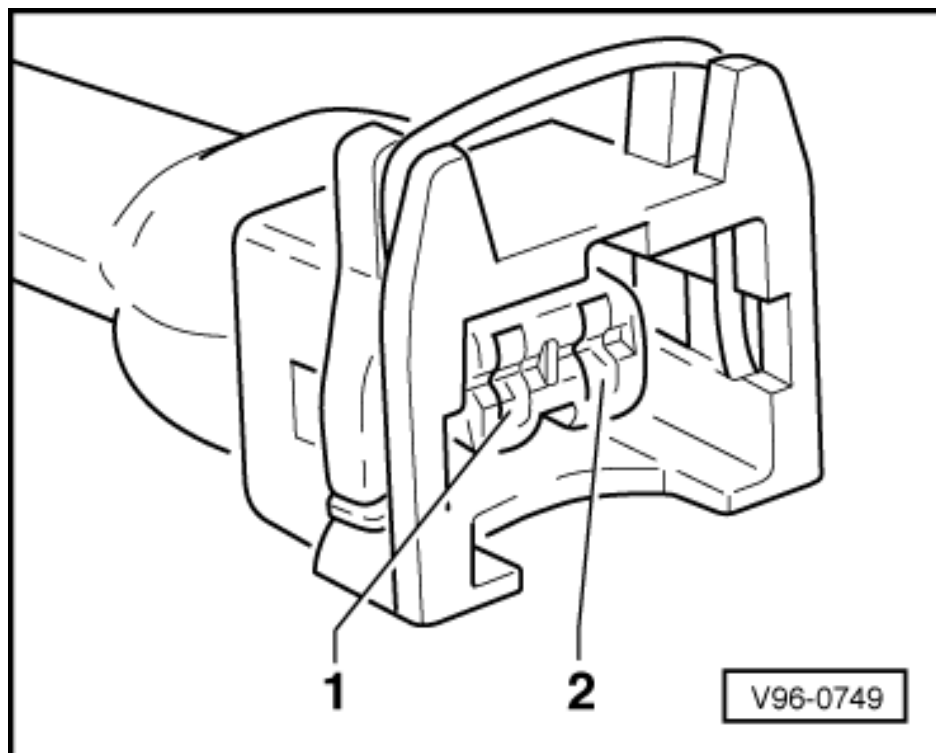
- Test activation.



Checking activation

- -> Connect voltage tester V.A.G 1527 B to contact 1 (positive) and contact 2 of the connector.
- Start final control diagnosis and select solenoid valve for activated charcoal filter-N80 =>Page 16 .
- The LED should flash.

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If the LED does not flash or lights up continuously:

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
=> Page 47 .
- -> Test for open circuit and short to positive or earth in the following wiring connections:

Connector Contact	Test box V.A.G 1598/31 Socket
2	64

- Rectify short circuit or open circuit if necessary.

If the wiring is OK:

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- Fit a new engine control unit => Page 49 .

5 - Testing electronic engine power control (electronic throttle)

5.1 - Testing electronic engine power control (electronic throttle)

5.2 - Operation of electronic throttle system

With the electronic throttle the throttle valve is not operated by a cable connected to the accelerator pedal. There is no mechanical link between the accelerator and the throttle valve.

The position of the accelerator pedal is communicated to the engine control unit by two accelerator position senders (variable resistors, both fitted in a single housing) which are connected to the accelerator pedal.

The accelerator position (as determined by the driver) is one of the main input values for the engine control unit.

The throttle valve is actuated by a servomotor (throttle valve positioner) in the throttle valve control part over the full range of engine speeds and load conditions.

The throttle valve positioner actuates the throttle valve according to the commands it receives from the engine control unit.

When the ignition is on and the engine is not running, the engine control unit operates the throttle valve positioner in exact accordance with the signals from the accelerator position senders. For example, when the accelerator is pressed down half way, the throttle valve positioner opens the throttle valve by an equivalent amount, i.e. about half way.

When the engine is running (i.e. under load) the engine control unit can open and close the throttle valve freely (i.e. independently of the signals being sent by the accelerator position sender).

For example, the throttle valve might already be fully open even though the accelerator is only pressed down half way. This has the advantage of preventing throttling losses at the throttle valve.

Under certain engine load conditions there is also a significant reduction in harmful emissions and noticeably improved fuel consumption.

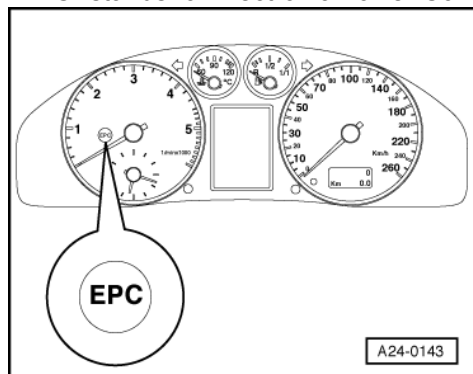
The engine control unit can provide the optimum combination of throttle valve opening and charge pressure in order to create the required torque.

The electronic throttle is not simply a combination of two or three components, but rather a complete system comprising all the elements that together determine the position of the throttle valve and also control and monitor it. For example, the accelerator position sender, throttle valve control part, EPC warning lamp, engine control unit etc.



5.3 - Notes on EPC warning lamp (fault warning lamp for electronic throttle) in dash panel insert

"EPC" stands for Electronic Power Control and refers to the electronic throttle control system.



-> Fitting location of EPC warning lamp

When the ignition is switched on the engine control unit tests all the components whose functions relate to the electronic throttle system.

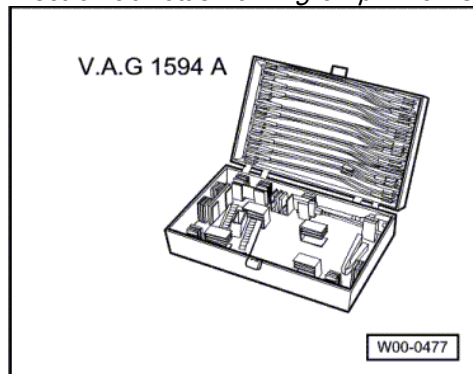
During the test sequence the engine control unit activates the EPC warning lamp for about 1 second. If a fault is detected during this test phase the warning lamp will remain lit.

If a fault is detected in the electronic throttle system while the engine is running, the engine control unit will activate the EPC warning lamp (see Fault Table for list of possible faults). At the same time a fault code is stored in the fault memory of the engine control unit.

5.4 - Testing electronic throttle warning lamp -K132

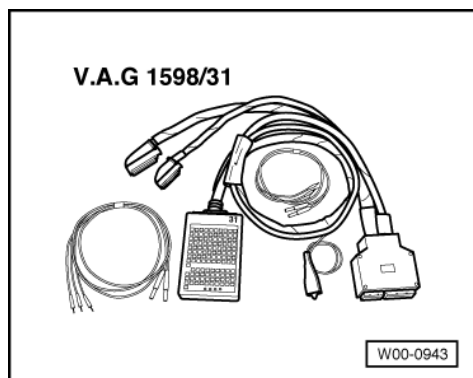
Note:

Electronic throttle warning lamp -K132 is also known as the EPC warning lamp (EPC = electronic power control).



Special tools and workshop equipment required

- ♦ V.A.G 1594 A



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♦ V.A.G 1598/31

Testing operation of warning lamp (dash panel insert without CAN interface)

- Switch on ignition.
 - If the fault memory has not registered any faults relating to the electronic throttle, the EPC warning lamp should light up for about 3 seconds.

A - Electronic throttle warning lamp -K132 does not light up

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
=> Page 47 .
- Bridge contacts 1 and 48 on the test box using test leads from adapter set V.A.G 1594 A.
- Switch on ignition.
 - The warning lamp should light up.

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If the warning lamp does not light up:

- Switch off ignition.
- Remove dash panel insert

=> Electrical system; Repair group 90; Dash panel insert; Removing and installing dash panel insert Dash panel insert Removing and installing dash panel insert

- Test for open circuit and short to positive in the following wiring connection:

Test box V.A.G 1598/31 Socket	Dash panel insert Contact
48	=> Current flow diagrams, Electrical fault-finding and Fitting locations binder

- Rectify short circuit or open circuit if necessary.

If the wiring is OK:

- Fit a new engine control unit => Page 49 .

B - Electronic throttle warning lamp -K132 lights up continuously

- Interrogate fault memory of engine control unit=>Page 4 .

If no faults are stored:

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
=> Page 47 .
- Remove dash panel insert

=> Electrical system; Repair group 90

- Test for short to earth in the following wiring connection:

Test box V.A.G 1598/31 Socket	Dash panel insert Contact
48	=> Current flow diagrams, Electrical fault-finding and Fitting locations binder

- Rectify any short circuits.



If the wiring is OK:

- Fit a new engine control unit => Page **49** .

Testing operation of warning lamp (dash panel insert with CAN interface)

- Switch on ignition.
 - The engine control unit switches on the EPC warning lamp.
- Start the engine.
 - If the fault memory has not registered any faults relating to the electronic throttle, the EPC warning lamp should go out shortly after starting the engine.

Note:

*The warning lamp signal is transmitted from the engine control unit to the dash panel insert via CAN data bus. Testing data transfer between engine control unit and other control units with CAN interface =>Page **142** .*

5.5 - Testing throttle valve control part -J338

The housing for the throttle valve control part contains the following components:

- ♦ Throttle valve drive -G186.
(This is an electric motor that is operated by the engine control unit. The motor has to overcome spring pressure in order to open the throttle valve.)
- ♦ Angle sender 1 for throttle valve drive -G187
- ♦ Angle sender 2 for throttle valve drive -G188

Notes:

- ♦ The housing for the throttle valve control part must not be opened.
- ♦ The angle senders are potentiometers with variable resistance. They inform the engine control unit of the position of the throttle valve and are completely independent of each other.
- ♦ It is not possible to adjust the potentiometers mechanically. Adjustments can be made using vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 (in basic setting mode, function 04).

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5.6 - Performing adaption of throttle valve control part

The adaption process enables the engine control unit to learn the different positions of the throttle valve with the ignition switched on and the engine not running. These positions are stored in the control unit. The feedback signal indicating the position of the throttle valve comes from the two angle senders for throttle valve drive.

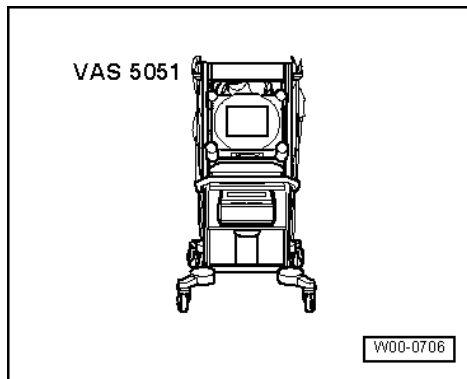
The adaption process must always be performed if the throttle valve control part -J338 or the engine control unit is replaced.

The learning process (adaption process) is carried out:

- ♦ By selecting "Basic setting" (function 04), Display Group 60 with the ignition switched on.
- ♦ Automatically if the ignition is switched on for at least 6 seconds without operating the starter or depressing the accelerator, and if the engine control unit registers a "learning requirement". (In this case, however, there is no way of knowing whether the adaption process was successful or not.) The engine control unit will register a learning requirement if the previously stored voltage readings from the angle senders do not correspond (within a certain tolerance range) to the new voltage readings.

Note:

The engine will not start while the automatic adaption process is being performed.



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Special tools and workshop equipment required

- ♦ VAS 5051 and VAS 5051/1
- or
- ♦ V.A.G 1551 and V.A.G 1551/3 A

Requirements:

- No faults stored in fault memory.
Interrogating fault memory => Page 4 .
- Engine not running; ignition switched on.
- Accelerator not depressed.
- Coolant temperature 10 ... 95 °C.
- Intake air temperature 10 ... 90 °C.
- Voltage supply to engine control unit more than 12.7 V.
Testing=>Page 175 .

Work sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page 1 .)
When doing this the ignition must be switched on.

-> Indicated on display:

Rapid data transfer HELP
Select function XX

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

-> Indicated on display:

Introduction of basic setting Q
Enter display group number XXX

- Enter "060" for Display Group 060 and confirm entry with Q key.

When the Q key is pressed the current supply to the throttle valve positioner will be disconnected.

In this condition the throttle valve is pulled into an "emergency running" or default position by a spring in the throttle valve control part. The values supplied by the two angle senders for this position are stored in the engine control unit.

The throttle valve is then opened by a predetermined amount. As soon as it reaches this position the current supply to the throttle valve positioner is again disconnected. The spring should then close the throttle valve mechanically to the previously learned default position within a specified period of time (spring test).



The throttle valve positioner then closes the throttle valve and the values supplied by the angle senders in the throttle valve control part are stored in the engine control unit.

If the engine control unit disconnects the current supply to the throttle valve positioner while the vehicle is being driven, the result will be an increase in idling speed with fluctuating engine rpm (hunting) and very slow throttle response.

-> Indicated on display:

System in basic setting 60
1 2 3 4

- Check display values for throttle valve control part (display zones 3 and 4).

	Display zones			
	1	2	3	4
Display Group 060: Adaption of throttle valve control part				
Display	xx %	xx %	---	---
Indicates	Throttle valve angle (angle sender 1)	Throttle valve angle (angle sender 2)	Learning stage counter	Adaption status
Range			0...8	ADP. runs ADP. O.K. ERROR
Specification	3...93 %	97...3 %	8	ADP O.K.
Note			During the adaption process the learning stage counter should count from 0 to 8. (Some of the figures may be skipped)	If readout does not match specification, see note => Page 118

Note:

The abbreviation "ADP" in display zone 4 stands for "Adaption".

Note:

If the adaption process is interrupted by the control unit, the cause could be one of the following:

- ♦ The throttle valve is unable to close completely (e.g. because of dirt).
- ♦ Battery voltage too low.
- ♦ Throttle valve control part or wiring is defective.
- ♦ The engine was started or the accelerator depressed during the adaption process.
- ♦ Distortion of throttle valve housing (check bolts).

When the adaption process is interrupted the message "Function is unknown or cannot be carried out at the moment" will appear on the fault reader display. The adaption process will start again automatically the next time the ignition is switched on (for several seconds).

- End the engine basic setting by pressing the⇒ key.

-> Indicated on display (function selection):

Rapid data transfer HELP
Select function XX

5.7 - Checking throttle valve for dirt

Fitting location => Fitting locations overview, Page 34

Requirements:

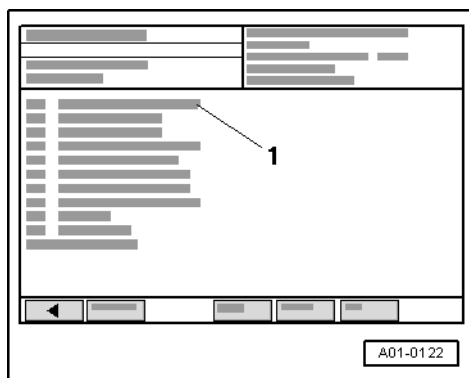
- Genuine air cleaner fitted; air cleaner O.K.
 - Intake air system O.K.
 - Fuel pressure O.K.
 - Fuel tank breather system O.K.
 - Injectors O.K.
 - Coolant temperature above 80°C.
 - Lambda probe learned values and lambda control O.K.
- =>Page 119 .

Work sequence=>Page 120

Testing lambda probe learned values and lambda control

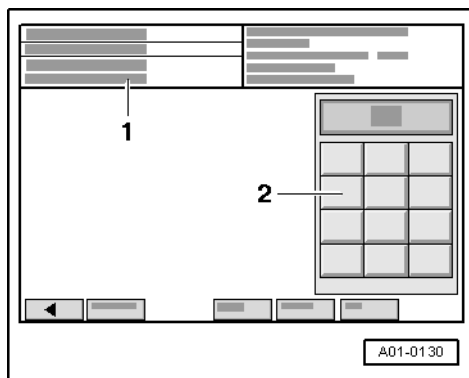
Test sequence

- Connect the vehicle diagnostic, testing and information system VAS 5051 => Page 1 , and select the vehicle system "01 - Engine electronics" from the menu. When doing this the engine should be idling.



-> Display on VAS 5051:

- Select the diagnosis function "04 - Basic settings" from the menu -1-.

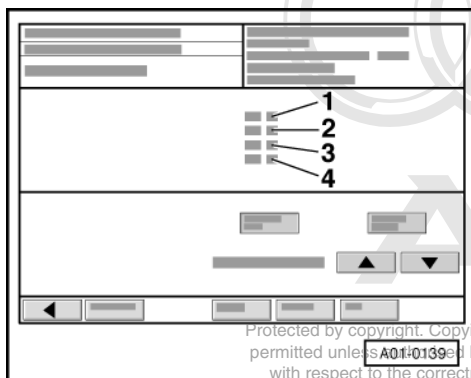


-> Display on VAS 5051:



1 - Enter display group
(figures up to 255)

- Using keypad -2-, enter "032" to select "Display group 032" and confirm entry with Q button.



-> Display on VAS 5051:

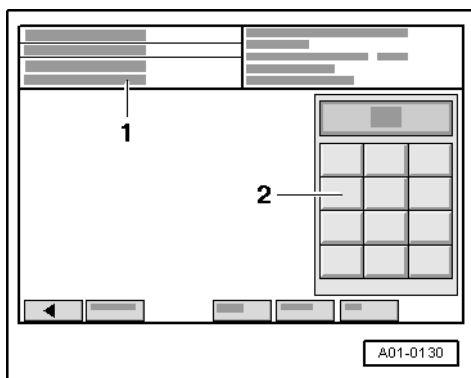
- Check readout in display zone -2-.

	Display zones			
	1	2	3	4
Display Group 032: Lambda learned values				
Display	xx.x %	xx.x %		
Indicates	Lambda learned value, Bank 1, Probe 1 at idling speed (additive)	Lambda learned value, Bank 1, Probe 1 at part throttle (multiplicative)		
Specification	-9.0...9.0 %	-25.0...25.0 %		

Work sequence =>Page 120

Work sequence

- Unplug electrical connector from air mass meter.
- Connect the vehicle diagnostic, testing and information system VAS 5051 => Page 1 , and select the vehicle system "01 - Engine electronics" from the menu. When doing this the engine should be idling.

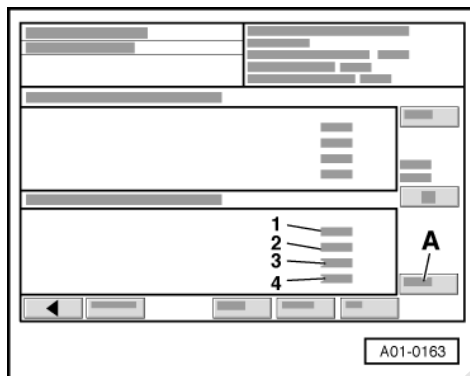


Test requirement:

- With engine idling, select "address word" 01 and function "initiating basic setting" by pressing "04".

-> Display on VAS 5051:

- 1 - Enter display group
- Using the keypad -2-, enter "107" to select "Display group 107" and confirm entry with Q key.



-> Display on VAS 5051:

- Check readout in display zone -4-.

	Display zones			
	1	2	3	4
Display group 107: Lambda control - short test				
Display	xxx rpm	x.x %	x.x %	Test ON
Indicates	Engine speed (actual)	Lambda control average (bank 1)	Lambda control average (bank 2)	Status of diagnosis
Range				Test OFF Test ON Syst. O.K. Syst. n.O.K.
Specification				Syst. O.K.

If the specification "Syst O.K." is attained in in display field 4:

- Press the ◀ button.
- Again connect air mass meter.
- Perform the next work step in the fault table to continue fault finding.

If the specification "SYST. O.K." is not attained in display zone 4:

- Press the ◀ button.
- Clean the air duct in the throttle valve control part with a lint-free cloth and cleaning solvent.
- Again perform adaption of throttle valve control part=>Page 116 .
- Repeat test procedure: lambda control - short test, measured value block 107 in basic setting 04.
- Again connect air mass meter.
- Erase fault memory=>Page 4 .
- Perform road test observing notes on safety precautions=>Page 32
- Fault memory interrogated=>Page 4 .

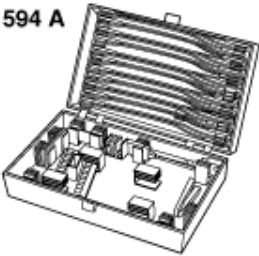
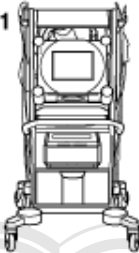
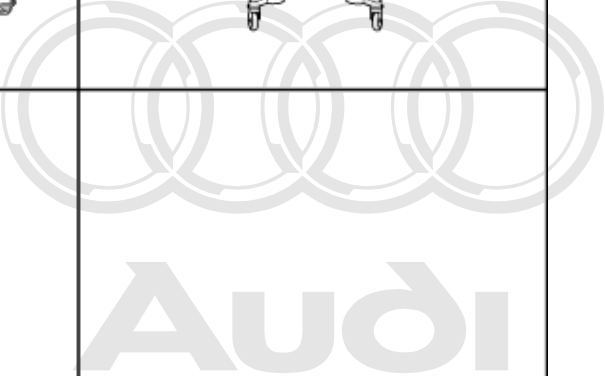
5.8 - Cleaning throttle valve control part

Fitting location => Fitting locations overview, Page 34



- Clean the air duct in the throttle valve control part with a lint-free cloth and cleaning solvent.
- Again perform adaption of throttle valve control part=>Page 116 .
- Erase fault memory=>Page 4 .
- Perform road test observing notes on safety precautions
=>Page 32
- Fault memory interrogated=>Page 4 .

5.9 - Testing angle senders for throttle valve drive

V.A.G 1526 A 	V.A.G 1594 A 
V.A.G 1598/31 	VAS 5051 
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Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/31
- ♦ VAS 5051 with VAS 5051/1

or

- ♦ V.A.G 1551 with V.A.G 1551/3 A

The angle senders for throttle valve drive (-G187 and -G188) inform the engine control unit of the position of the throttle valve. Both angle senders are located in the throttle valve control part.

Test sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page 1 .)
When doing this the ignition must be switched on.

-> Indicated on display:

Rapid data transfer HELP
Select function XX

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

-> Indicated on display:

Read measured value block Q
Enter display group number XXX

- Enter "062" for Display Group 062 and confirm entry with Q key.

-> Indicated on display:

Read measured value block 62
1 2 3 4

- Check display values for electronic throttle potentiometer voltages.

	Display zones			
	1	2	3	4
Display Group 062: Electronic throttle potentiometer voltages				
Display	xx %	xx %	xx %	xx %
Indicates	Throttle valve angle (angle sender 1)	Throttle valve angle (angle sender 2)	Accelerator position sender 1	Accelerator position sender 2
Specification	3...93 %	97...3 %	12...97 %	4...49 %

Note:

The engine control unit converts the voltage readings from the angle senders into percentages of 5 V and displays them as percentages. (A supply voltage of 5 V is equivalent to 100%.)

- Observe display zones 1 and 2.
- Slowly depress accelerator to full throttle position.

The percentage value in display zone 1 should rise steadily between 3 and 93 % but without covering the full range of values.

The percentage value in display zone 2 should fall steadily between 97 and 3 % but without covering the full range of values.

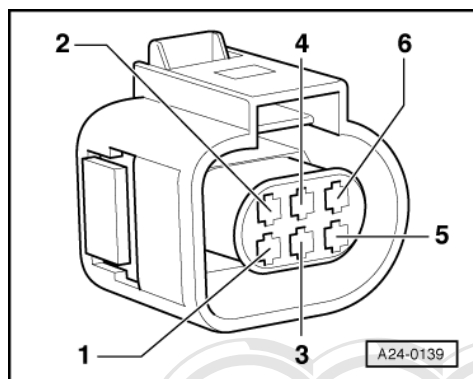
Notes:

- ♦ The reason why the value in display zone 1 rises and the value in display zone 2 falls is because the potentiometers (angle senders) in the throttle valve control part work in opposite directions.
- ♦ The percentage value for the first potentiometer increases as the voltage rises towards 5 V because the voltage at this potentiometer increases as the throttle valve opens.
- ♦ The percentage value for the second potentiometer decreases as the voltage drops away from 5 V and towards 0 V because the voltage at this potentiometer decreases as the throttle valve opens.

If the display values do not appear as described:



- Test voltage supply and wiring to throttle valve control part =>Page **124** . Pay particular attention to the connectors, which may have corroded or become detached.
- Test accelerator position senders
=>Page **125** .



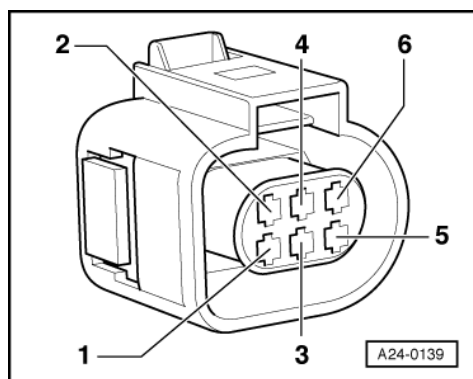
Testing voltage supply to throttle valve control part

- Unplug connector from throttle valve control part.
- Switch ignition on.
- -> Connect multimeter (voltage measurement range) as follows:

Connector Contact	Specification
2 + earth	approx. 5 V
2 + 6	approx. 5 V

If the specifications are not obtained, the wiring must be checked. This document is not to be used for repair 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.

- Test wiring between engine control unit and throttle valve control part => Page **124** .



Testing wiring

- -> Unplug connector from throttle valve control part.
- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
=> Page **47** .
- Test for open circuit and short to earth or positive in the following wiring connections:

Connector Contact	Test box V.A.G 1598/31 Socket
1	92
2	83
3	117

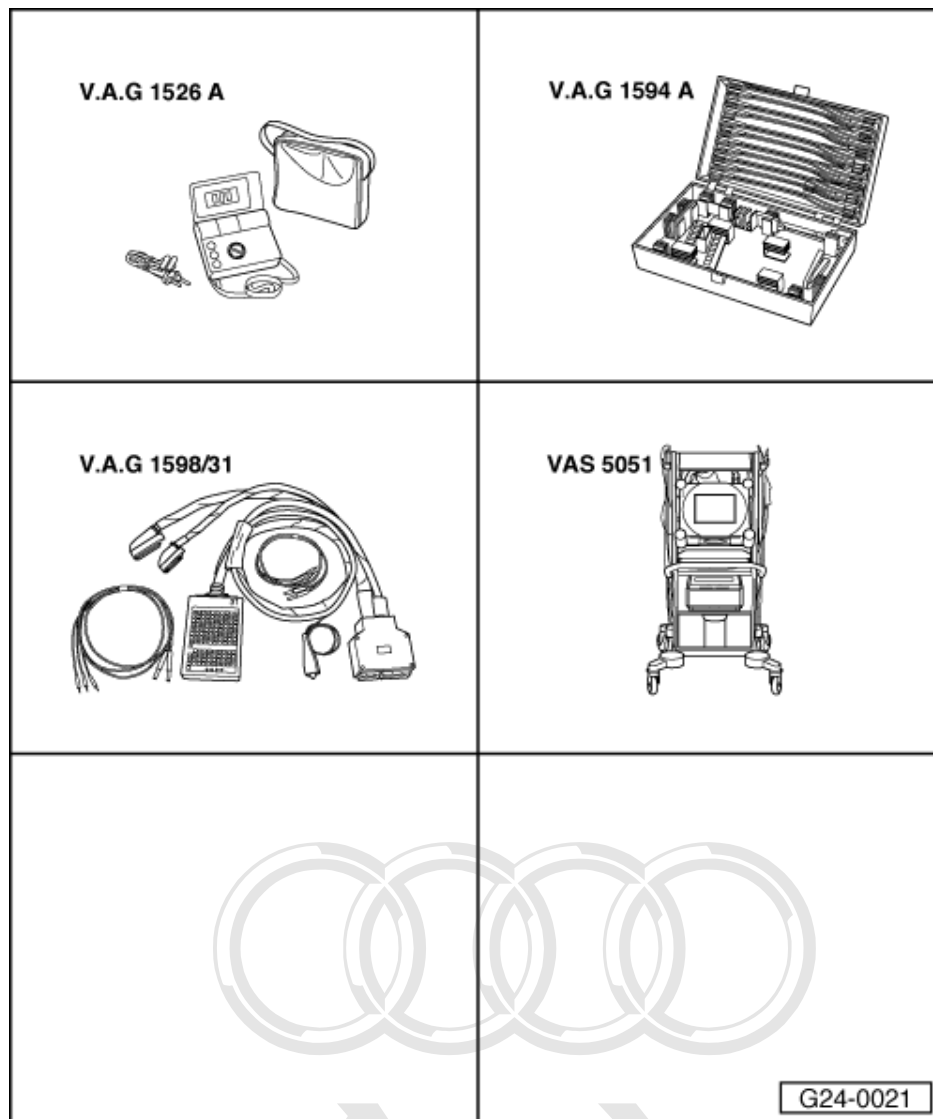
Connector Contact	Test box V.A.G 1598/31 Socket
4	84
5	118
6	91

- Rectify any open/short circuit as necessary.

If no fault is detected in the wiring:

- Fit a new throttle valve control part.

5.10 - Testing accelerator position senders



Special tools and workshop equipment required

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

or

- ♦ V.A.G 1551 with V.A.G 1551/3 A

Accelerator position senders -G79 and -G185 are located on the accelerator pedal. Both senders inform the engine control unit of the driver's throttle requirement (pedal position), but each functions completely independently of the other (redundancy principle). Both senders are located in a single housing.

Test sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page 1).
When doing this the ignition must be switched on.

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	

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

-> Indicated on display:

Read measured value block	Q
Enter display group number xxx	

- Enter "062" for Display Group 062 and confirm entry with Q key.

-> Indicated on display:

Read measured value block 62
1 2 3 4

- Check display values for electronic throttle potentiometer voltages.

	Display zones			
	1	2	3	4
Display Group 062: Electronic throttle potentiometer voltages				
Display	xx %	xx %	xx %	xx %
Indicates	Throttle valve angle (angle sender 1)	Throttle valve angle (angle sender 2)	Accelerator position sender	Accelerator position sender 2
Range	0 ... 100 %	0 ... 100 %	0 ... 100 %	0 ... 100 %
Specification	3...93 %	97...3 %	12...97 %	4...49 %

Note:

The engine control unit converts the voltage readings from the angle senders into percentages of 5 V and displays them as percentages. (A supply voltage of 5 V is equivalent to 100%.)

- Observe display zones 3 and 4.
- Slowly depress accelerator to full throttle position.

The percentage value in display zone 3 should rise steadily between 12 and 97 % but without covering the full range of values.

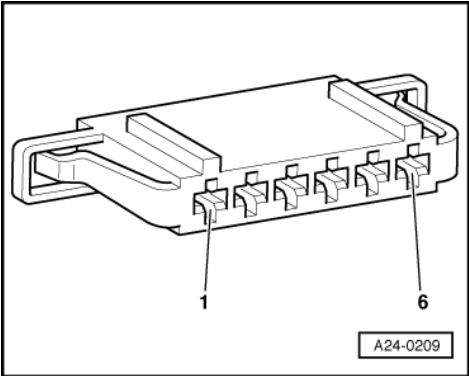
The percentage value in display zone 4 should also rise steadily but without covering the full range of values (in this case 4...49 %).

Note:

The value shown in display zone 3 should always be about twice as high as the value shown in display zone 4.

If the display values do not appear as described:

- Test voltage supply and wiring to accelerator position senders
=>Page 127 .

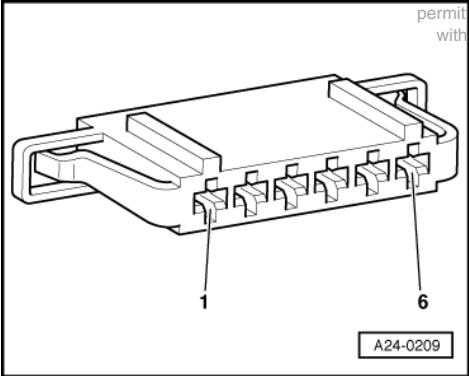


Testing voltage supply to accelerator position senders

- Remove storage compartment on driver's side.
- => General body repairs, Interior; Repair group 68; Storage compartments, covers and trim parts; Removing and installing driver's storage compartment Storage compartments, covers and trim parts Removing and installing driver's storage compartment
- Unplug connector for accelerator position sender.
 - Switch ignition on.
 - -> Connect multimeter (voltage measurement range) as follows:

Connector Contact	Specification
1 + earth	approx. 5 V
1 + 5	approx. 5 V
2 + earth	approx. 5 V
2 + 3	approx. 5 V

- If the specifications are obtained:
- Test the signal wires.
- If the specifications are not obtained:
- Test wiring between engine control unit and accelerator position senders.



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Testing wiring

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
=> Page 47 .
- -> Test for open circuit and short to positive or earth in the following wiring connections:

Connector Contact	Test box V.A.G 1598/31 Socket
1	72
2	73
3	36
4	35
5	33
6	34

- Rectify any open/short circuit as necessary.

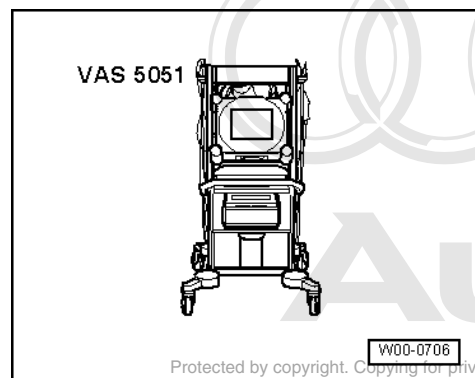
If no fault is detected in the wiring:

- Renew accelerator position senders.

=> Fuel supply system, Petrol engines; Repair group 20; Servicing accelerator mechanism Servicing accelerator mechanism

5.11 - "Learning" kickdown function

On vehicles with automatic gearbox the kickdown function must be programmed into the control unit if the accelerator position sender or the engine control unit is replaced.



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Special tools and workshop equipment required

- ♦ VAS 5051 and VAS 5051/1

or

- ♦ V.A.G 1551 and V.A.G 1551/3 A

Requirements:

- No faults stored in fault memory.
Interrogating fault memory => Page 4 .
- Engine not running; ignition switched on.

Work sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page 1 .)
- When doing this the ignition must be switched on.

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	

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

-> Indicated on display:

Introduction of basic setting	Q
Enter display group number XXX	

- Enter "063" for Display Group 063 and confirm entry with Q key.

-> Indicated on display:

System in basic setting 63			
1	2	3	4

- Press accelerator all the way down past the kickdown point and hold in position.
- Check the readout in display zone 4:

	Display zones			
	1	2	3	4
Display Group 063: Learning kickdown function				
Display	xx %	xx %	Kick Down	---
Indicates	Accelerator position sender 1	Accelerator position sender 2	Kick Down	Adaption status
Range			Kick Down	Operate ADP runs ADP. O.K. ERROR
Specification	12...97 %	4...49 %	Kick Down	ADP O.K.
Note				If readout shows "ERROR", see note => Page 4

If the specification "ADP. O.K." is attained:

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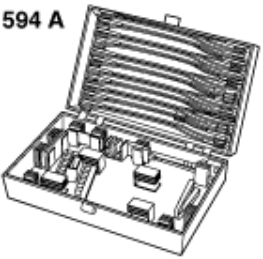
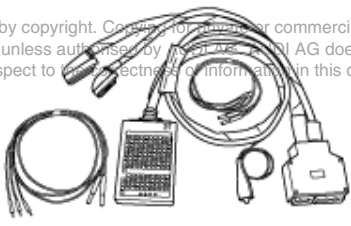
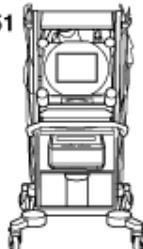
- Press =>key.

-> Indicated on display (function selection):

Rapid data transfer	HELP
Select function XX	



5.12 - Testing brake light switch and brake pedal switch

V.A.G 1526 A 	V.A.G 1527 B 
V.A.G 1594 A 	V.A.G 1598/31 
VAS 5051 	G24-0023

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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 1598/31
- ♦ VAS 5051 with VAS 5051/1

or

- ♦ V.A.G 1551 with V.A.G 1551/3 A

Note:

For safety reasons, the signal from the accelerator position sender (potentiometer) instructing the engine control unit to open the throttle valve is suppressed whenever the brake is operated. The engine control unit therefore needs the brake light signal and also the brake pedal signal.

Test sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page 1.)
When doing this the ignition must be switched on.

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	

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

-> Indicated on display:

Read measured value block	Q
Enter display group number	XXX

- Enter "066" for Display Group 066 and confirm entry with Q key.

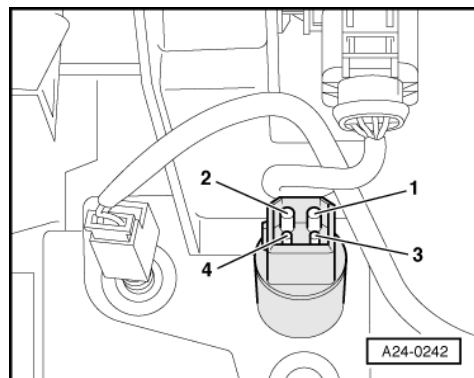
-> Indicated on display:

Read measured value block 66			
1	2	3	4

- Check display value for brake light switch / brake pedal switch (display zone 2).

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	Display zones			
	1	2	3	4
Display Group 066: Signals to engine control unit				
Display	xxx km/h	XXXX	xxx km/h	XXXX
Indicates	Actual road speed	Switch positions	Specified road speed	Switch positions
Range		XX00 XX11		
Specification		XX00 (brake pedal not depressed)		
		XX11 (brake pedal depressed)		
Note		X = irrelevant The switching points do not coincide exactly.		





If the display values do not appear as described:

Testing switches

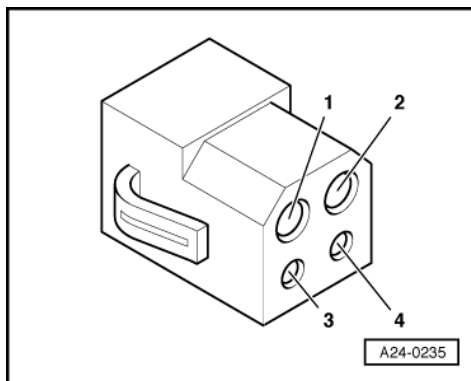
- Remove storage compartment on driver's side.

=> General body repairs, Interior; Repair group 68; Storage compartments, covers and trim parts; Removing and installing driver's storage compartment Storage compartments, covers and trim parts Removing and installing driver's storage compartment

- Unplug connector from brake light switch / brake pedal switch.
- -> Connect multimeter (resistance measurement range) between contacts 1 and 2.
 - Specification: $\infty \omega$ (no continuity)
- Depress the brake pedal.
 - Specification: approx. 0ω
- Connect multimeter (resistance measurement range) between contacts 3 and 4.
 - Specification: approx. 0ω
- Depress the brake pedal.
 - Specification: $\infty \omega$ (no continuity)

If the specifications are not obtained:

- Renew brake light switch / brake pedal switch.



If the specifications are obtained:

Checking voltage supply

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

Connector Contact	Measure against
1	Body earth

- The LED should light up.

Connector Contact	Measure against
3	Body earth

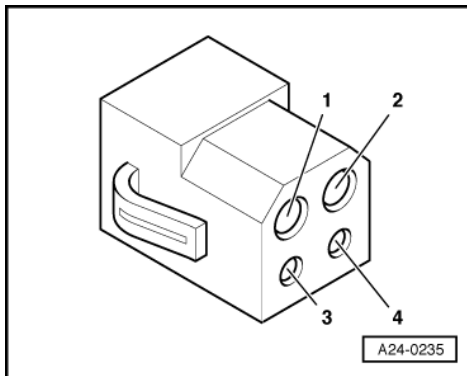
- Switch on ignition.
 - The LED should light up.

If the LED does not light up:

- Test for open circuit or short to earth in wiring from contact 1 and/or contact 2 of connector

=> Current flow diagrams, Electrical fault finding and Fitting locations binder

- Rectify short circuit or open circuit if necessary.



If the LED lights up:

Checking activation

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
 => Page 47.
- -> Test for open circuit and short to positive or earth in the following wiring connections:

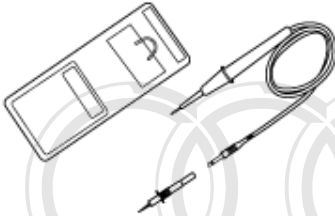
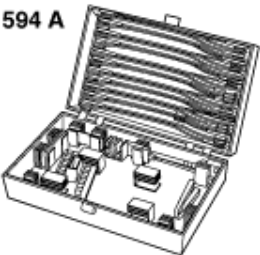
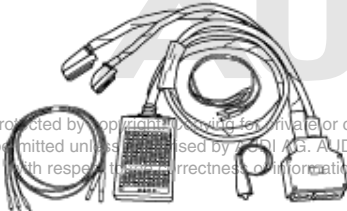
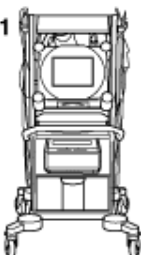
Connector Contact	Test box V.A.G 1598/31 Socket
2	56
4	55

- Rectify short circuit or open circuit if necessary.

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5.13 - Testing clutch pedal switch -F36

V.A.G 1526 A 	V.A.G 1527 B 
V.A.G 1594 A 	V.A.G 1598/31  Protected by copyright. No copying for private or commercial purposes, in part or in whole, is not permitted unless expressly permitted 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 	G24-0023

Special tools and workshop equipment required

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

or

- ♦ V.A.G 1551 with V.A.G 1551/3 A

Note:

This signal is used to avoid over-revving and load change jolts when disengaging the clutch. It is also needed for the cruise control system.

Test sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page 1 .)

When doing this the ignition must be switched on.

-> Indicated on display:

Rapid data transfer HELP
Select function XX

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

-> Indicated on display:

Read measured value block Q
Enter display group number XXX

- Enter "066" for Display Group 066 and confirm entry with Q key.

-> Indicated on display:

Read measured value block 66
1 2 3 4

- Check display value for clutch pedal switch (display zone 2).

	Display zones			
	1	2	3	4
Display Group 066: Signals to engine control unit				
Display	xxx km/h	XXXX	xxx km/h	XXXX
Indicates	Actual road speed	Switch positions	Specified road speed	Switch positions
Range		X0XX X1XX		
Specification		X0XX (clutch pedal not depressed) X1XX (clutch pedal depressed)		
Note		X = irrelevant		

If the display values do not appear as described:

Testing switch

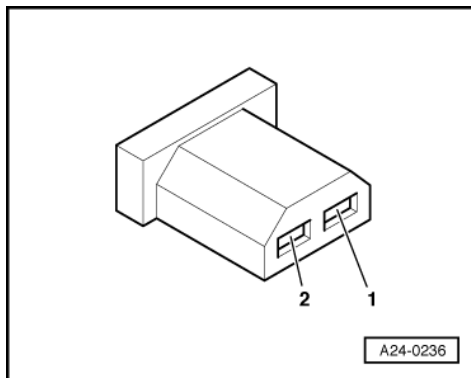
- Remove storage compartment on driver's side.

=> General body repairs, Interior; Repair group 68; Storage compartments, covers and trim parts; Removing and installing driver's storage compartment Storage compartments, covers and trim parts Removing and installing driver's storage compartment

- Unplug connector from clutch pedal switch.
- Connect multimeter (resistance measurement range) between contacts 1 and 2.
 - Specification: approx. 0 ω
- Depress the clutch pedal.
 - Specification: $\infty \omega$ (no continuity)

If the specification is not attained:

- Renew clutch pedal switch.



If the specification is obtained:

Testing voltage supply

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

Connector Contact	Measure against
2	Body earth

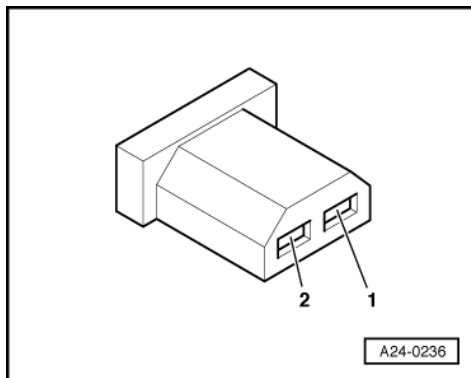
- Switch on ignition.
- The LED should light up.

If the LED does not light up:

- Test for open circuit in wiring between fuel pump relay and contact 1 of connector via fuse No. S234 (in fuse box, socket position 34):

=> Current flow diagrams, Electrical fault finding and Fitting locations binder

- Rectify any open circuit as necessary.



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If the LED lights up:

Checking activation

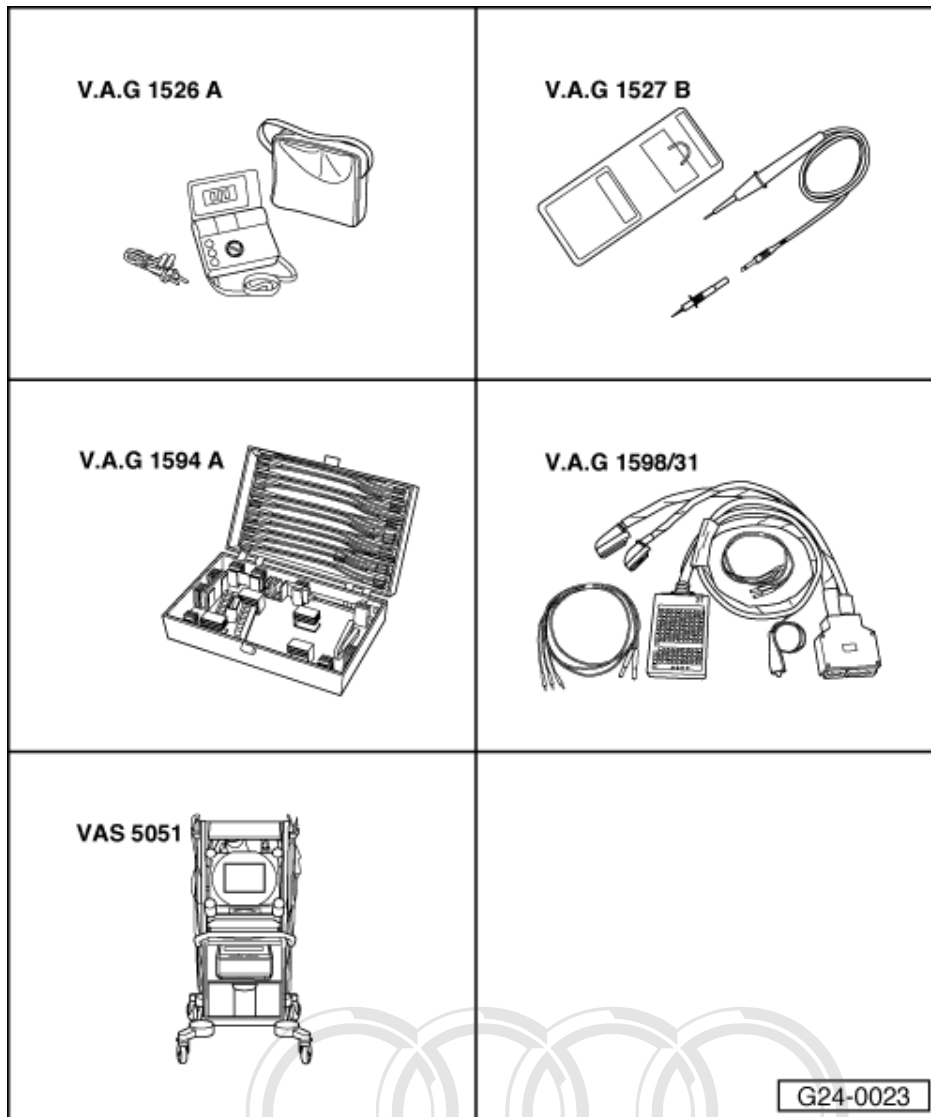
- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
- => Page 47 .
- -> Test for open circuit and short to positive or earth in the following wiring connections:

Connector Contact	Test box V.A.G 1598/31 Socket
1	39

- Rectify short circuit or open circuit if necessary.

6 - Testing auxiliary signals

6.1 - Testing auxiliary signals



Special tools and workshop equipment required

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

or

- ◆ V.A.G 1551 with V.A.G 1551/3 A

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6.2 - Checking engine speed signal

Note:

The engine speed signal is taken from contact 37 on the engine control unit. The signal is used for various functions including the rev counter display on the dash panel insert.

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
=> Page 47 .
- Test for open circuit and short to positive or earth in the following wiring connection:

Test box V.A.G 1598/31 Socket	Dash panel insert Contact
37	=> Current flow diagrams, => Electrical fault-finding => and Fitting locations binder

- Rectify short circuit or open circuit if necessary.

6.3 - Testing speed signal

Notes:

- ♦ The road speed signal is generated by the speedometer sender -G22 (on the gearbox) and is processed in the dash panel insert.
- ♦ The processed signal goes to contact 54 on the engine control unit and is used for idling speed stabilisation and for the damping of load change jolts when changing gear.

Test requirement:

- Speedometer (including display) must be functioning properly.
Fault-finding:

=> Electrical system; Repair group 90

Test sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page 1 .)
When doing this the engine must be idling.

Warning:

To avoid accident risks when road testing the vehicle with test equipment, always observe the relevant safety precautions =>

-> Indicated on display:

Rapid data transfer HELP
Select function XX

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

-> Indicated on display:

Read measured value block Q
Enter display group number XXX

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- Enter "005" for Display Group 005 and confirm entry with Q key.

-> Indicated on display:

Read measured value block 5
1 2 3 4

- Take vehicle for a test drive and check whether the road speed appears in display zone 3.
- If the road speed does not appear, raise the vehicle (preferably using a lifting platform) until the front left wheel is clear of the ground.
- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
=> Page 47 .
- Connect voltage tester V.A.G 1527 B to sockets 3 (positive) and 54 (road speed signal) on test box V.A.G 1598/31.
- Switch on the ignition and turn the front left wheel by hand.
 - The LED should flash very briefly.

If the LED does not flash:

- Test for open circuit and short to positive or earth in the following wiring connection:

Test box V.A.G 1598/31 Socket	Dash panel insert Contact
54	=> Current flow diagrams, => Electrical fault-finding => and Fitting locations binder

- Rectify short circuit or open circuit if necessary.

6.4 - Testing air conditioner compressor shut-off

Notes:

- ♦ The air conditioner compressor signal informs the engine control unit that the compressor will be switched on in 140 ms.
- ♦ The engine control unit can send a signal via the same wire to shut off the air conditioner compressor.
- ♦ The engine control unit will shut off the air conditioner compressor in the following circumstances:
 - Under heavy acceleration (full throttle in 1st gear)
 - In emergency running mode (back-up)
 - When the "Basic setting" function is started (function 04)

Requirements for test:

- Air conditioner okay
- No faults stored in fault memory of engine control unit
- Vehicle at room temperature (above +15 °C)

Test sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page 1 .)
When doing this the engine must be idling

-> Indicated on display:

Rapid data transfer HELP
Select function XX



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

-> Indicated on display:

Read measured value block	Q
Enter display group number XXX	

- Enter "050" for Display Group 050 and confirm entry with Q key.

-> Indicated on display:

Read measured value block 50
1 2 3 4

- Switch off air conditioner.
 - Specification for display zone 4: "Compr.OFF"
- Switch on air conditioner by pressing "AUTO" key and select maximum warm or cold air setting. The compressor should run.
 - Specification for display zone 4: "Compr. ON"
- Floor and release the accelerator quickly (short blip).
 - Specification for display zone 4: The display should change from "Compr.ON" to "Compr.OFF" for a few seconds (air conditioner compressor shut-off during acceleration).

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If the readout in display zone 4 is not as described:

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
=> Page 47 .
- Test for open circuit and short to positive or earth in the following wiring connection:

Test box V.A.G 1598/31 Socket	AC operating and display unit -E87 Contact
41	=> Current flow diagrams, => Electrical fault-finding => and Fitting locations binder

- Rectify short circuit or open circuit if necessary.
- If there are no faults in the wiring, test operation of air conditioner.

=> Heating, air conditioner; Repair Group 01; Self-diagnosis for air conditioner Self-diagnosis for air conditioner

6.5 - Testing crash signal wiring

The crash signal ("Crash switch-off triggered") is transmitted to the engine control unit by the airbag control unit.

If the airbag control unit transmits the crash signal to the engine control unit (in case of an accident or if a final control diagnosis for the airbag system is carried out), the engine control unit switches off the fuel pump. The engine stops but can be restarted immediately (e.g. to move the vehicle out of the danger zone).

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
=> Page 47 .
- Test for open circuit and short to positive or earth in the following wiring connection:

Test box V.A.G 1598/31 Socket	Airbag control unit -J234 Contact
-------------------------------------	--------------------------------------

67	=> Current flow diagrams, => Electrical fault-finding => and Fitting locations binder
----	---

- Rectify short circuit or open circuit if necessary.

=> Current flow diagrams, Electrical fault finding and Fitting locations binder

If no wiring fault is detected:

- Interrogate fault memory of airbag control unit:

=> Body, Self-diagnosis; Repair group 01

6.6 - Testing fuel consumption signal for on-board computer

Dash panel insert without CAN interface

Notes:

- ◆ The fuel consumption is calculated by the engine control unit on the basis of the injection period, and the signal is transmitted to the on-board computer via contact 81 on the engine control unit.
- ◆ Testing fuel consumption signal

=> Electrical system; Repair group 90

Dash panel insert with CAN interface

Note:

The fuel consumption signal is transmitted between engine control unit and dash panel insert via CAN bus. Testing data transfer between engine control units and other control units with CAN interface =>Page 142 .

6.7 - Testing fuel level signal wiring

Notes:

- ◆ The signal serves to determine the cause of certain detected faults (such as misfiring).
- ◆ The fuel level signal is transmitted between dash panel insert and engine control unit via CAN bus. Testing data transfer between engine control unit and other control units with CAN interface =>Page 142 .

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6.8 - Testing poor road signal

Notes:

- ◆ If the ABS/EDL control unit detects a spinning wheel, it generates a "poor road signal". If the engine control unit recognizes the poor road signal, the misfiring recognition in the engine control unit is switched off.
- ◆ Only test poor road signal if the fault "18014 (P1606) Poor road info/eng. sp. mom from ABS CU - Fault in electrical circuit" is stored in fault memory.
The fault "misfiring" which might be stored in the fault memory as well results out of the poor road signal and can be ignored.

- ♦ The "poor road signal" is transmitted from the ABS/EDL control unit to the engine control unit via the CAN data bus. Testing data exchange between engine control unit and other control units with CAN interface=>Page 142 .

6.9 - Testing data exchange between engine control unit and other control units with CAN interface

Notes:

- ♦ The data exchange between the various control units is carried out via a data bus.
- ♦ The term "CAN data bus" refers to a system for transmitting and distributing data.
- ♦ The wires which connect the control units and convey the data between them are called data wires.
- ♦ Data is transmitted via data wires in sequence, i.e. in a specific order to the connected control units (e.g. engine rpm and accelerator pedal position).

Testing bus system

The fault table indicates that the data exchange between the engine control unit and other control units with CAN interface should be tested.

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551)=>Page 1 , and select the "Automatic test sequence" by entering address word 00.
When doing this the ignition must be switched on.
- The fault memory of all on-board systems with self-diagnostic capability will be read.

When a control unit answers with its identification the number of stored faults appears on the display or "No fault recognised".

Any system faults that are stored will be displayed one after the other and printed out. The V.A.G 1551 will then transmit the next address word.

-> The automatic test sequence has ended when the following appears on the display:

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

If faults have been stored relating to the "Drive train data bus" or to the "CAN data bus":

- Check that the engine control unit and other control units with CAN interface are the correct versions for the vehicle (check Part No. and coding).

If the correct control units are installed:

- Check that multi-pin connectors for control units are properly seated.

If the multi-pin connectors are properly seated:

- Test CAN bus system.

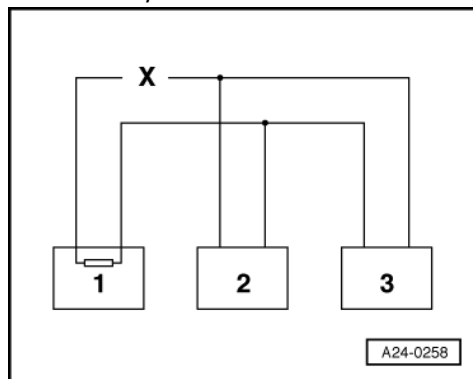
Testing a "two-wire bus system"

Three or more control units communicating via a "two-wire bus system"

- Read out the faults stored in the control units.

Note:

This will help to trace a fault in the wiring.



Example 1:

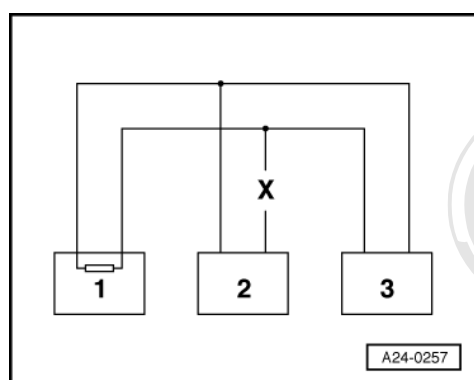
From the faults present in the fault memories, you can see that control unit 1 has no connection to control units 2 or 3.

Control unit	Faults present in fault memory:
1	- No message from control unit 2 - No message from control unit 3
2	- No message from control unit 1
3	- No message from control unit 1

- Switch off ignition.
- Disconnect the control units which are linked by the bus wires and check whether there is an open circuit in one of the bus wires

=> Current flow diagrams, Electrical fault finding and Fitting locations binder

- If no fault can be found in the bus wires replace control unit 1.



Example 2:

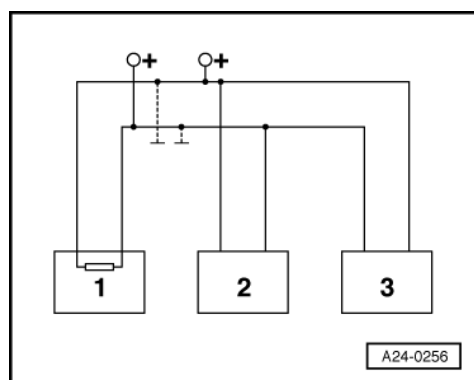
From the faults present in the fault memories, you can see that control unit 2 has no connection to control units 1 or 3.

Control unit	Faults present in fault memory:
1	- No message from control unit 2
2	- No message from control unit 1 - No message from control unit 3
3	- No message from control unit 2

- Switch off ignition.
- Disconnect the control units which are linked by the bus wires and check whether there is an open circuit in one of the bus wires

=> Current flow diagrams, Electrical fault finding and Fitting locations binder

- If no fault can be found in the bus wires replace control unit 2.





Example 3:

From the faults present in the fault memories, you can see that none of the control units are able to transmit or receive signals.

Control unit	Faults present in fault memory:
1	- Data bus drive defective
2	- Data bus drive defective
3	- Data bus drive defective

- Switch off ignition.
- Disconnect the control units which are linked by the bus wires and check for a short circuit to positive or earth in the bus wires

=> Current flow diagrams, Electrical fault finding and Fitting locations binder

If the cause of the fault "Data bus drive defective" cannot be found in the data bus wires, check whether one of the control units is causing the fault.

At this stage all the control units which communicate via the CAN data bus are disconnected. The ignition is switched off.

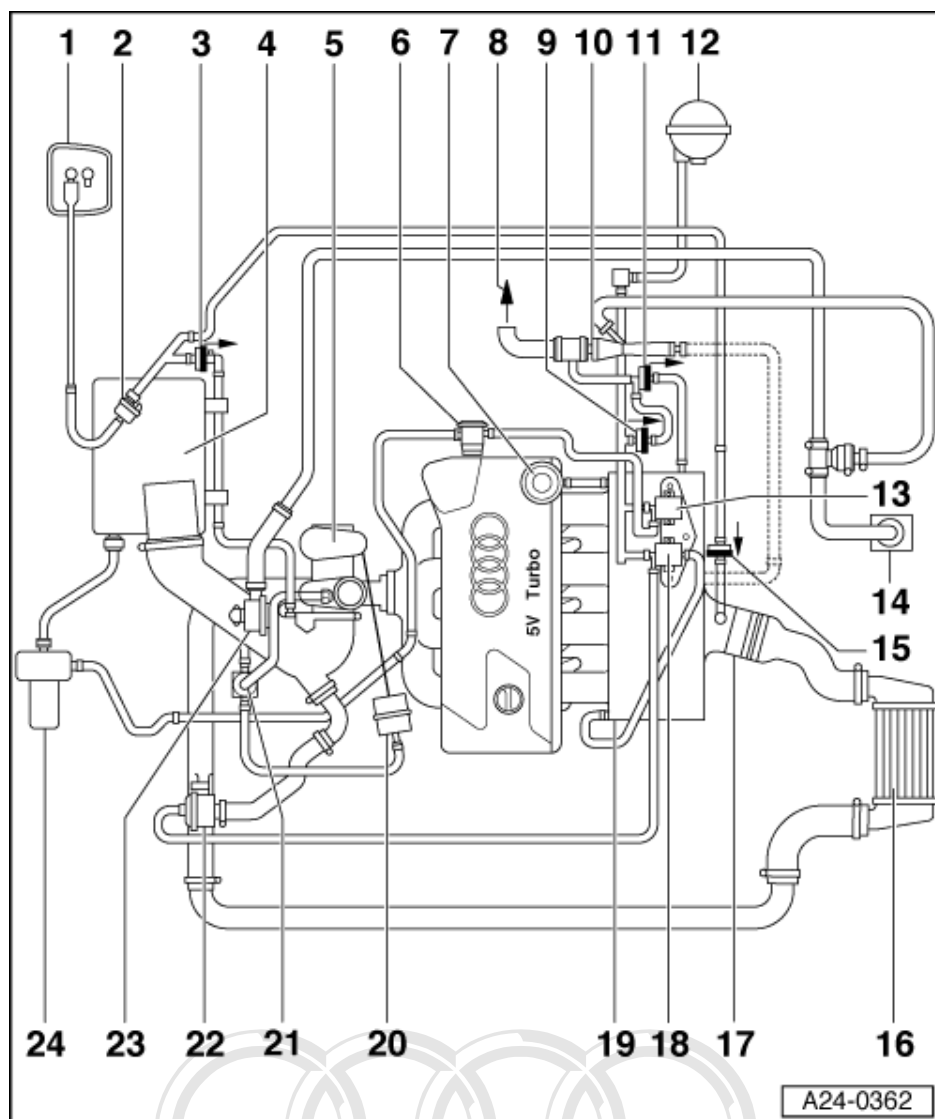
- Connect one of the control units.
- Connect fault reader V.A.G 1551. Switch on the ignition and erase the fault memory of the control unit which has just been connected. End output from fault reader with function 06 "End output".
- Switch the ignition off and then on again.
- Leave the ignition switched on for 10 seconds. Then interrogate the fault memory of the control unit that has just been connected, using the fault reader.
- If the fault "Data bus drive defective" is now indicated, replace the control unit which has just been connected.
- If the fault "Data bus drive defective" is not indicated, connect the next control unit, and repeat the above procedure.



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7 - Vacuum system layout

7.1 - Vacuum system layout



1 Activated charcoal filter

2 Activated charcoal filter solenoid valve 1 -N80

3 Non-return valve for ACF

- ♦ Between activated charcoal filter and intake pipe upstream of turbocharger
- ♦ Installation position (light side/ dark side) as shown in illustration. Arrow indicates direction of flow

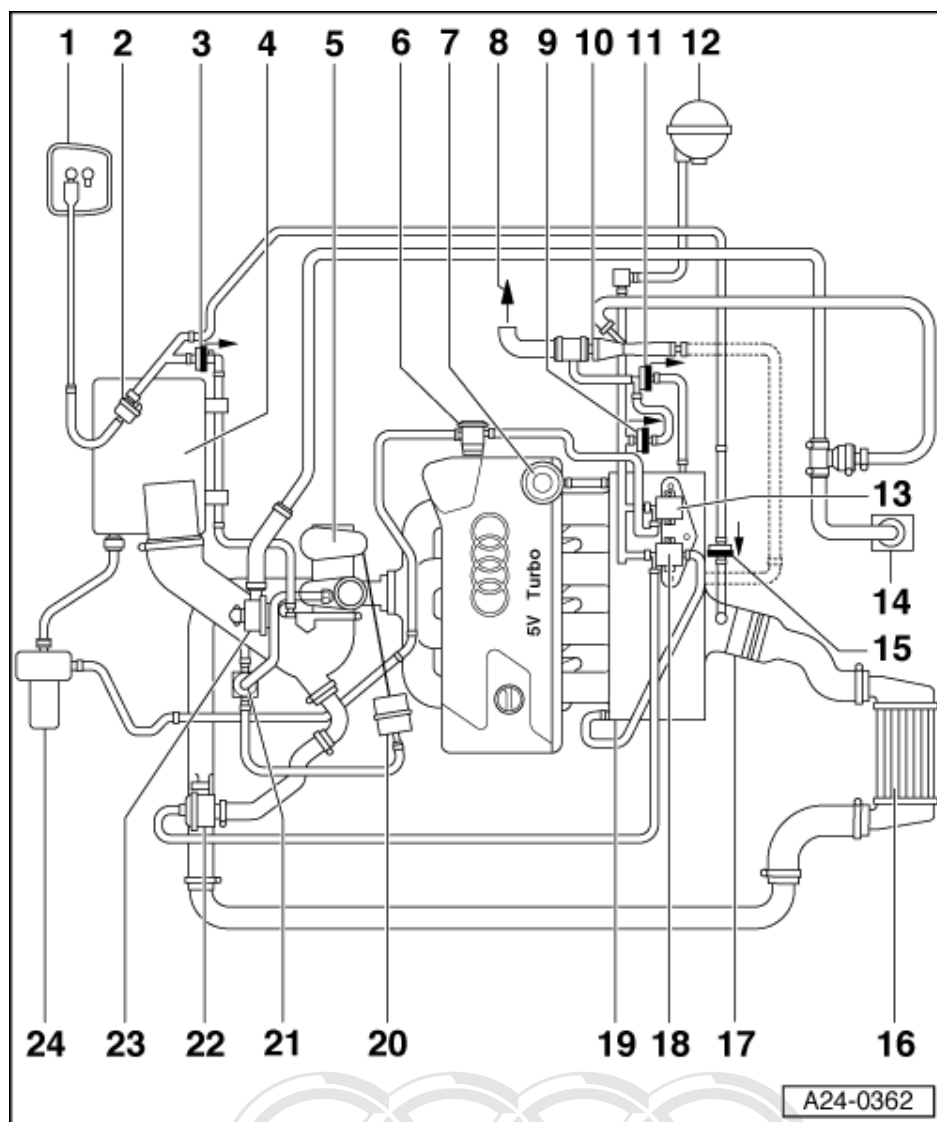
4 Air cleaner

- ♦ With air mass meter -G70

5 Turbocharger

6 Combination valve for secondary air system

- ♦ Only with engine code ANB
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7 Fuel pressure regulator

8 To brake servo

9 Non-return valve

- ◆ Between brake servo and intake manifold
- ◆ Installation position (light side/ dark side) as shown in illustration. Arrow indicates direction of flow

10 Vacuum booster

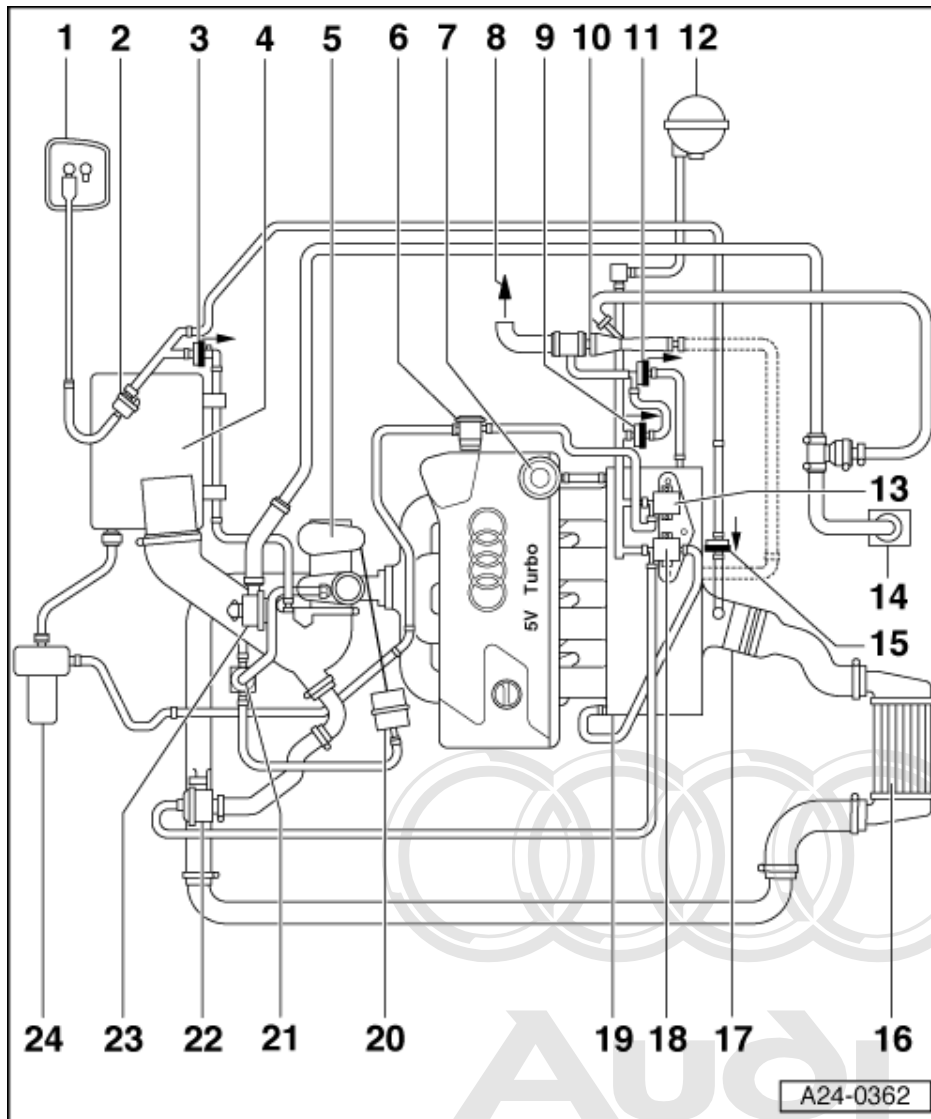
11 Non-return valve

- ◆ Between brake servo and intake manifold
- ◆ Installation position (light side/ dark side) as shown in illustration. Arrow indicates direction of flow

12 Vacuum reservoir

- ◆ Fitting location: in front left wheel housing behind wheel housing liner

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**13 Secondary air inlet valve
 -N112**

- ♦ Only with engine code ANB
- ♦ Fitting location: below intake manifold

14 Crankcase breather

15 Non-return valve

- ♦ Between activated charcoal filter and intake manifold
- ♦ Installation position (light side/ dark side) as shown in illustration. Arrow indicates direction of flow

16 Charge air cooler

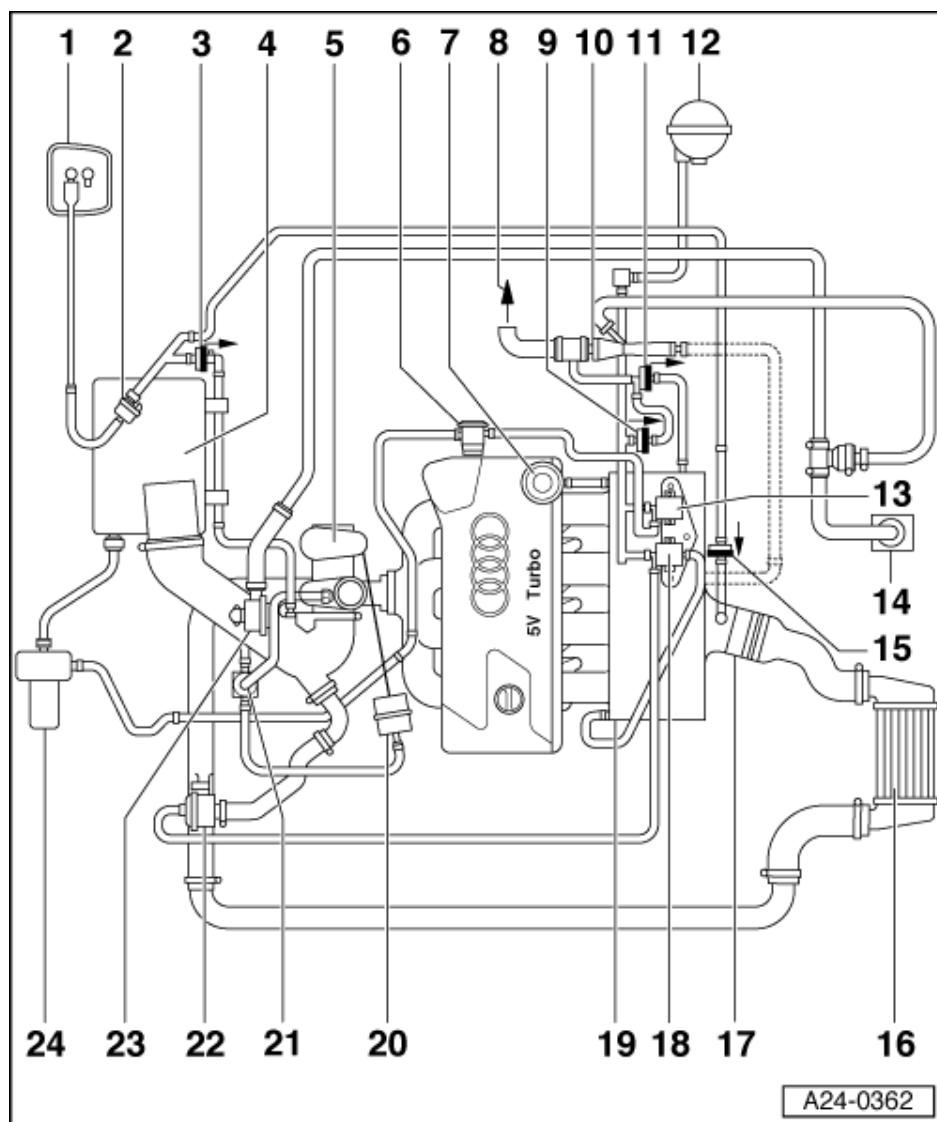
- ♦ With charge pressure sender -G31

17 Throttle valve control part -J338

**18 Air recirculation valve for
 turbocharger -N249**

- ♦ Fitting location: below intake manifold

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19 Intake manifold

- ♦ With intake air temperature sender -G42

20 Vacuum unit for charge pressure control

21 Solenoid valve for charge pressure control -N75

22 Mechanical air recirculation valve

23 Crankcase breather pressure regulating valve

24 Secondary air pump motor -V101

- ♦ Only with engine code ANB



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28 - Ignition system

1 - Testing ignition system

1.1 - Testing ignition system

1.2 - General notes on ignition system

- ◆ The engine control unit is equipped with self diagnosis.
- ◆ For trouble-free operation of the electrical components a voltage of at least 12.7 V is necessary.
- ◆ During some of the tests it is possible that the control unit will detect and record a fault. The fault memory must therefore be interrogated and if necessary erased when all tests and repair work have been completed.
- ◆ After completing fault finding, repairs or component tests, it is possible that the engine will start, run for a short period and then cut out. If this happens it may be that the immobilizer is blocking the engine control unit. In such cases the fault memory must be interrogated and if necessary the control unit must be adapted.

1.3 - Safety precautions

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To prevent injuries to persons and/or damage to the fuel injection and ignition system, note the following points:

- ◆ Do not touch or disconnect ignition wiring when the engine is running or being turned at starter speed.
- ◆ The ignition must be switched off before disconnecting or connecting ignition system wiring and high-voltage cables for test instruments.
- ◆ In order to run the engine at starting speed without actually starting it (for example, to test compression), unplug the connectors on the ignition coils and also the connectors on the injectors. After completing the work, interrogate and erase the fault memory.
- ◆ The ignition must always be switched off when cleaning the engine.
- ◆ Always switch off the ignition before connecting or disconnecting the battery, otherwise the engine control unit may be damaged.

1.4 - Technical data

Engine code	ANB (1.8 ltr / 5V / 110 kW engine) APU (1.8 ltr / 5V / 110 kW engine)
Idling speed Not adjustable - controlled by the idling speed stabilisation	Front-wheel drive: 740...860 rpm Four-wheel drive: 800...920 rpm 1)
Engine speed limiter - shuts off injectors	approx. 6800 rpm
Ignition timing is determined by the control unit. Ignition timing cannot be adjusted.	
Ignition system	Individual coil system with 4 ignition coils separate output stage
Spark plugs 2)	Tightening torque: 30 Nm



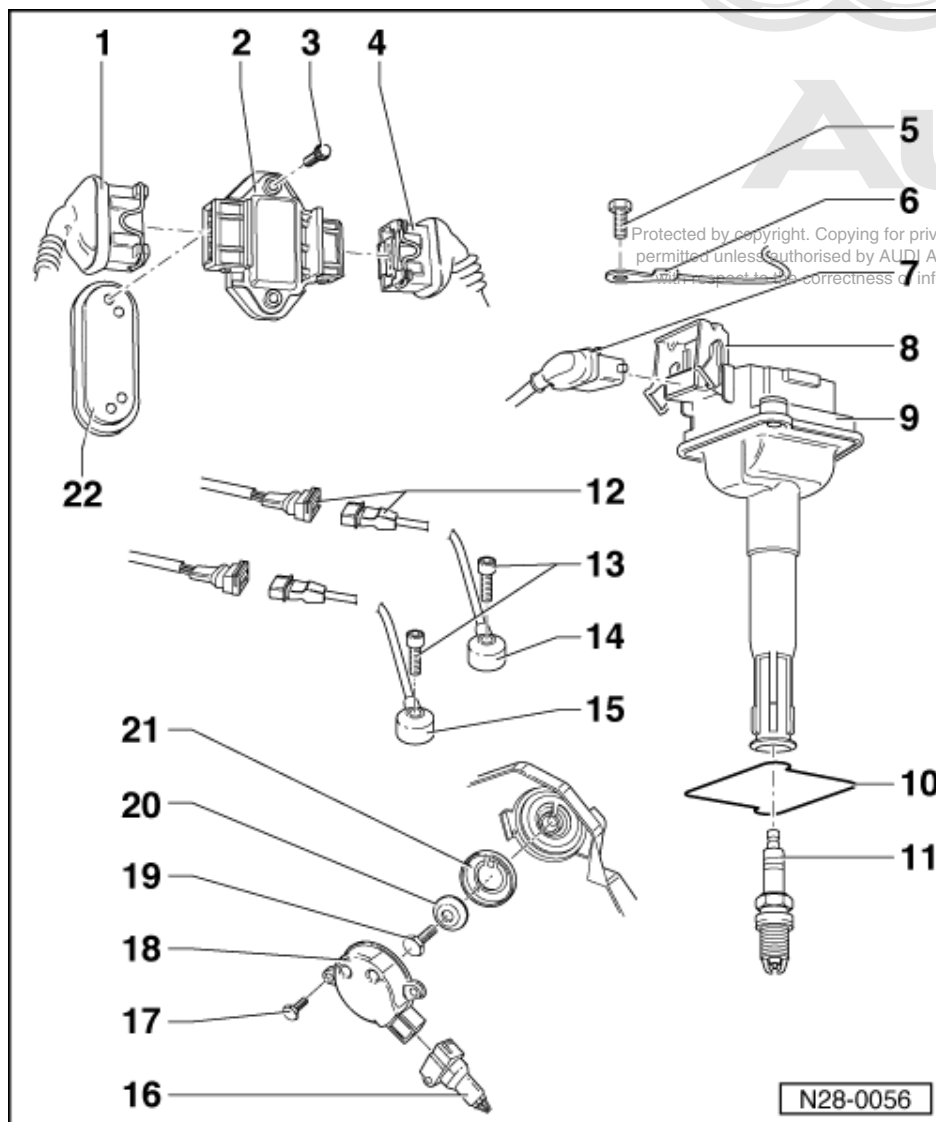
Firing order	1-3-4-2
--------------	---------

1) Idling speed on four-wheel drive vehicles with air conditioner switched on: 840...960 rpm

2) Current specifications:

=> Exhaust emissions test binder

1.5 - Removing and installing parts of the ignition system



1 5 pin connector

- ♦ Black

2 Output stage -N122

- ♦ Testing =>Page 159
- ♦ Coat underside evenly with heat-conducting paste G 052 170 A2

3 6 Nm

4 4 pin connector

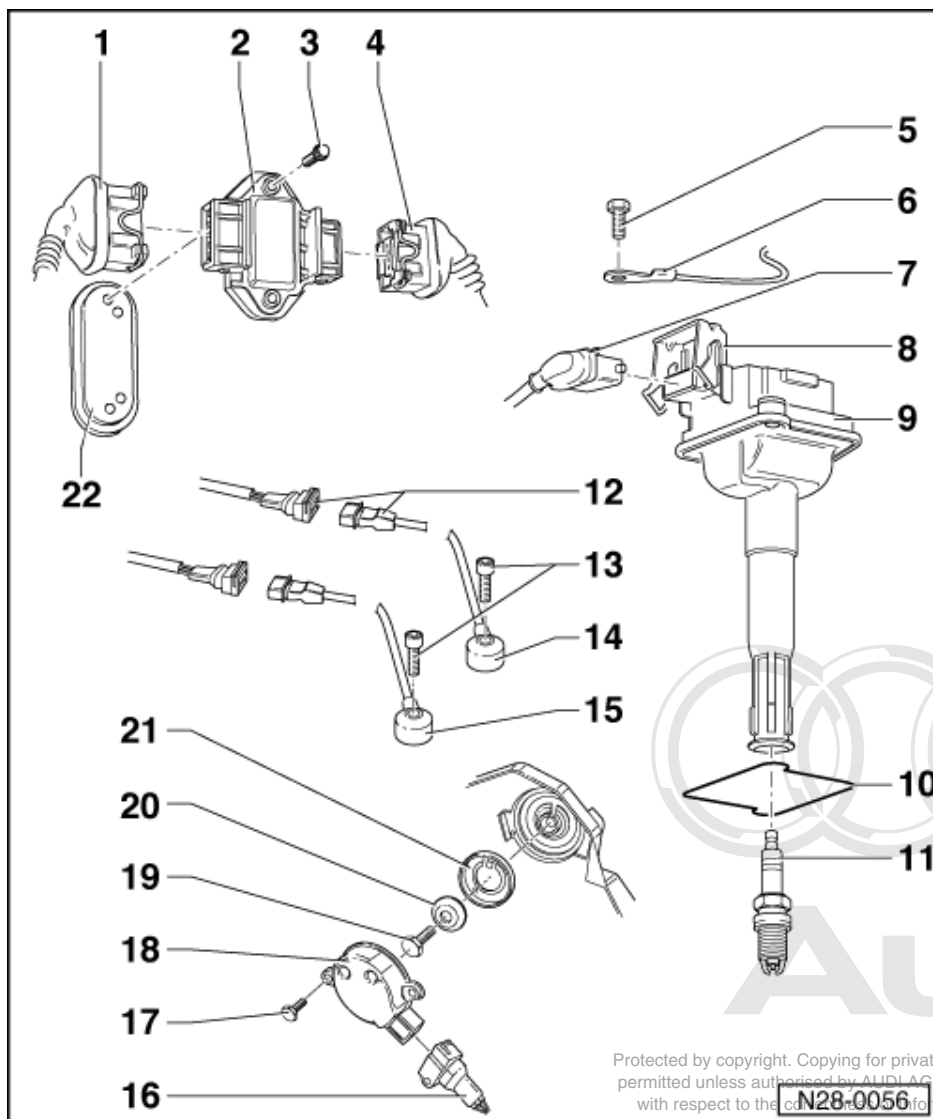
- ♦ Black

5 10 Nm

- ♦ Ignition must always be switched off when loosening or tightening

6 Earth wire

- ♦ Ignition must always be switched off when loosening or tightening



7 3 pin connector

- ♦ Black

8 Retaining catch

- ♦ For connector

9 Ignition coils -N, -N128, -N158 and -N163

- ♦ Testing =>Page 154
- ♦ Spark plug connectors can be replaced separately
- ♦ Internal resistance of spark plug connectors: approx. 2 kΩ

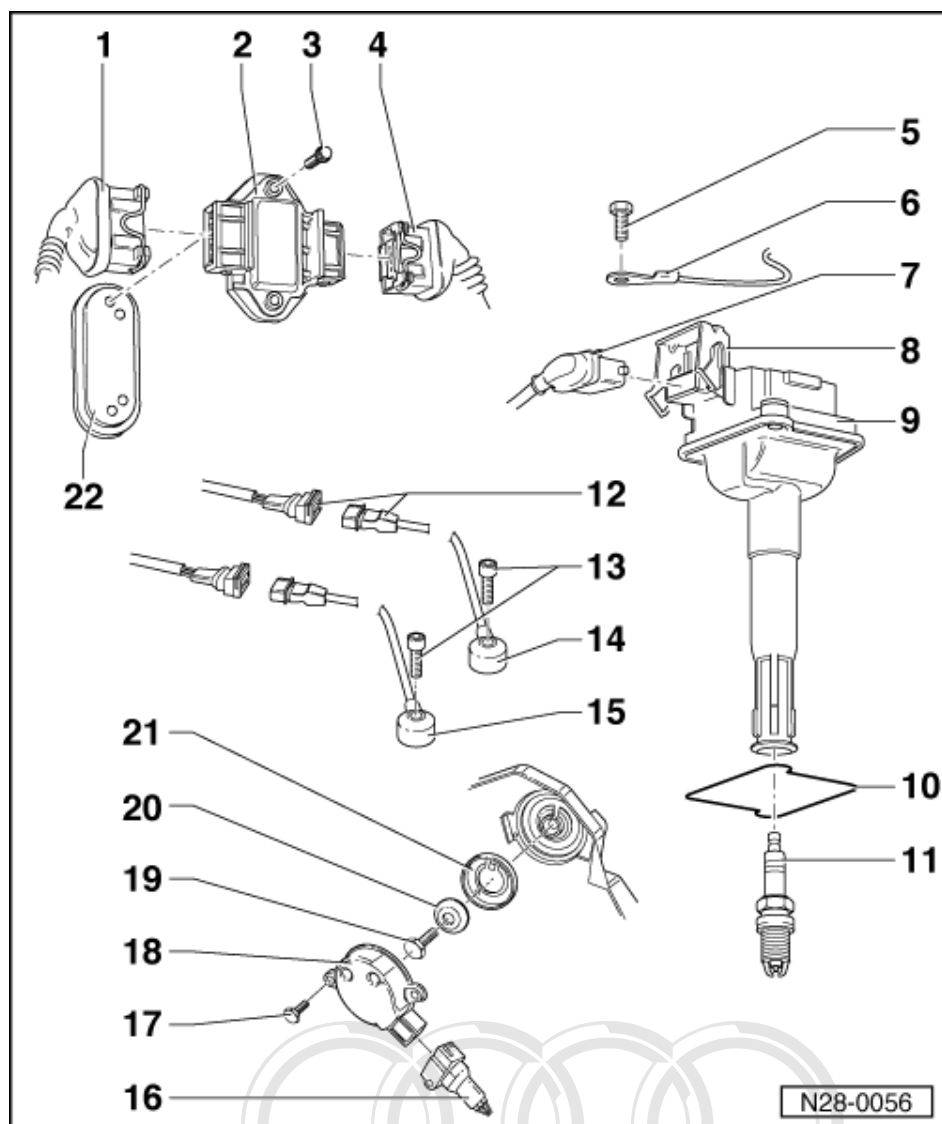
10 Seal

- ♦ Renew if damaged

11 Spark plug, 30 Nm

- ♦ Use 3122 B for removing and installing
- ♦ Current specifications

=> "Exhaust emission test" binder

**12 3 pin connector**

- ♦ Green for knock sensor 1 -G61
- ♦ Blue for knock sensor 2 -G66
- ♦ Gold-plated contacts

13 20 Nm

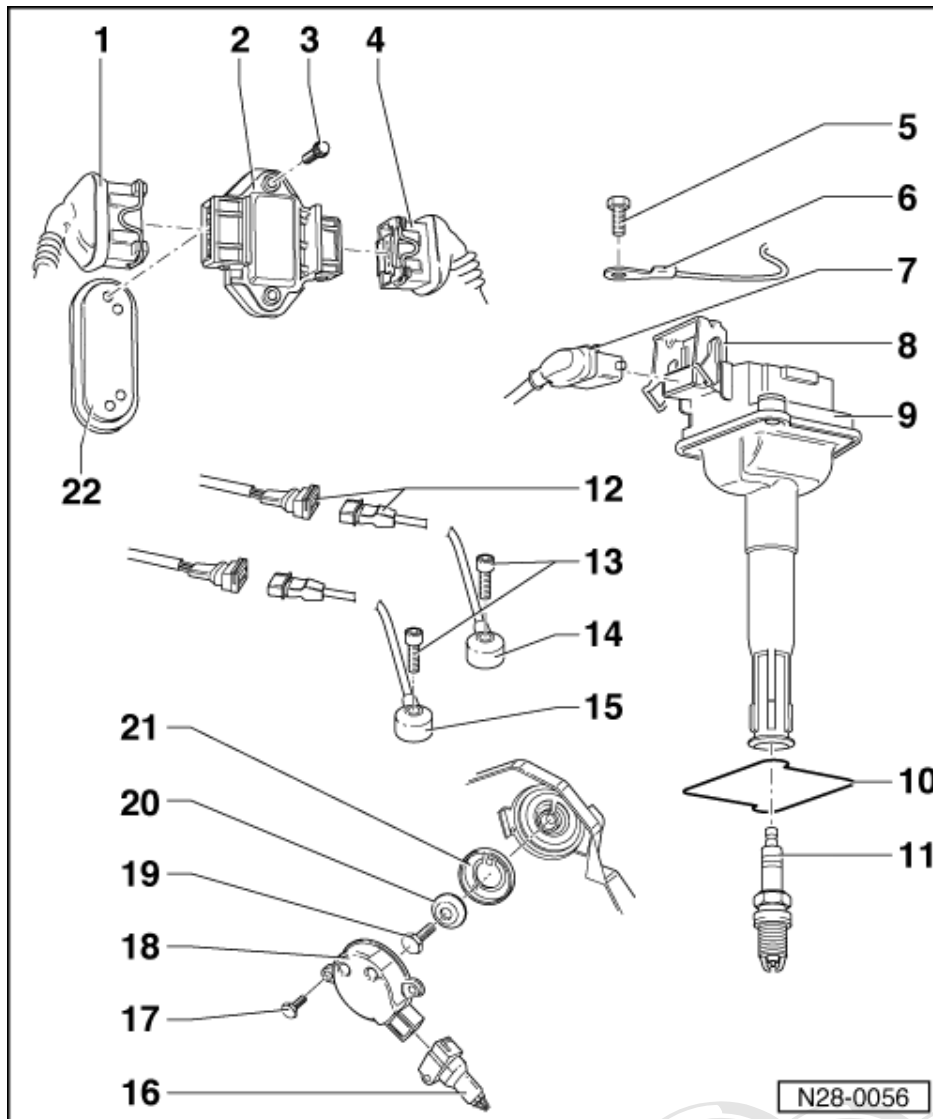
- ♦ Correct tightening torque is important for proper function of knock sensor.

14 Knock sensor 1, -G61

- ♦ Connector contacts and sensor contacts are gold-plated.
- ♦ Checking =>Page 178

15 Knock sensor 2, -G66

- ♦ Connector contacts and sensor contacts are gold-plated.
- ♦ Testing =>Page 178



16 3 pin connector

- ◆ Black
- ◆ For Hall sender -G40

17 10 Nm

18 Hall sender -G40

- ◆ Testing =>Page 180

19 25 Nm

20 Washer

- ◆ Conical shape

21 Hall sender rotor

- ◆ Ensure proper location when installing

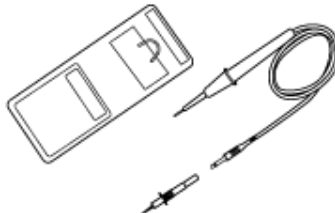
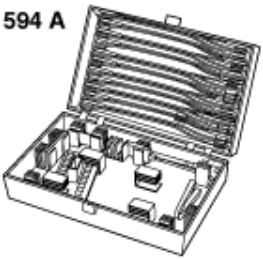
22 Heat sink

- ◆ Coat top side evenly with heat-conducting paste G 052 170 A2

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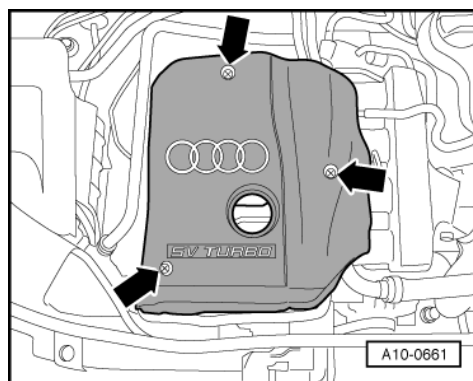


1.6 - Testing ignition coils

V.A.G 1526 A 	V.A.G 1527 B 
V.A.G 1594 A 	V.A.G 1598/31 
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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 1598/31



Test sequence

The procedure for identifying an inoperative or misfiring cylinder is as follows:

- -> Remove engine cover panel -arrows-.
 - Unplug the connectors from the injectors in turn with the engine running, and observe how the engine runs.
- or

- Compare the spark plugs of all cylinders with each other and check for soot on the electrodes.

When the defective cylinder has been identified:

- Connect hand-held multimeter (resistance measurement range) to spark plug connector.
 - Specification: approx. 2 kΩ

If the specification is not obtained:

- Renew spark plug connector.

If the specification is obtained:

- Swap spark plug of defective cylinder with one from another cylinder.

If the fault moves with the spark plug:

- Renew spark plug.

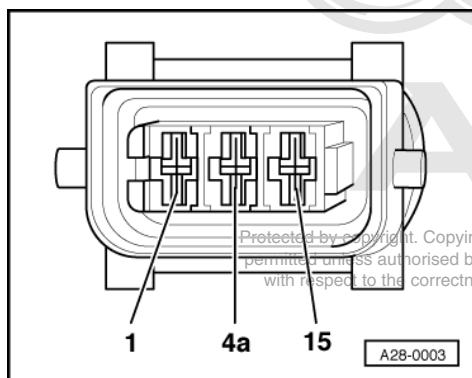
If the fault remains in the same cylinder:

- Swap ignition coil of defective cylinder with one from another cylinder.

If the fault moves with the ignition coil:

- Renew ignition coil.

If the fault remains in the same cylinder:



Test earth connection for ignition coil:

- Unplug connector from ignition coil.
- -> Test earth connection from contact 4a on the 3-pin connector to engine earth for open circuit or short circuit to positive.
- Rectify any open/short circuit as necessary.

If the earth connection is OK:



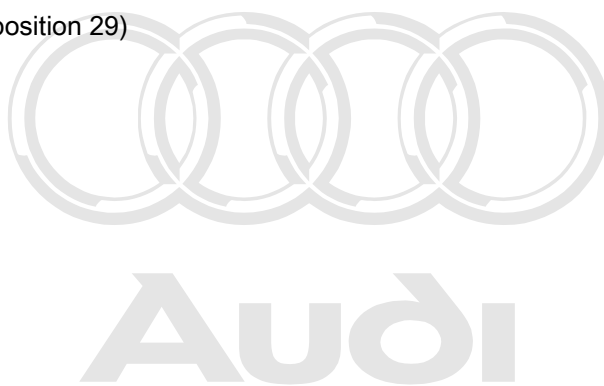
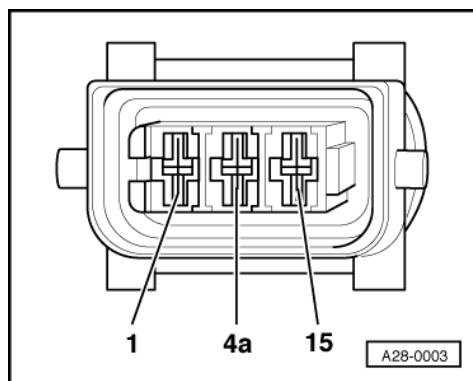
Test voltage supply to ignition coil:

Note:

It is important to ensure that no fuel is injected during the test as this would damage the catalytic converter. The connectors on the injectors must therefore be unplugged.

Test requirement:

- Fuse No. 229 OK (in fuse box, socket position 29)



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- -> Connect multimeter (voltage measurement range) as follows:

Connector Contact	Measure against
15	Engine earth

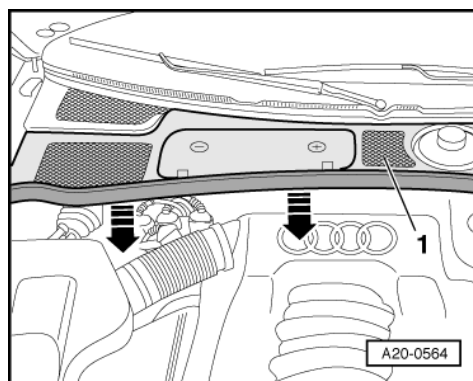
- Operate starter briefly.
 - Specification: approx. battery voltage

If the specification is not obtained:

Vehicles up to model year 1999:

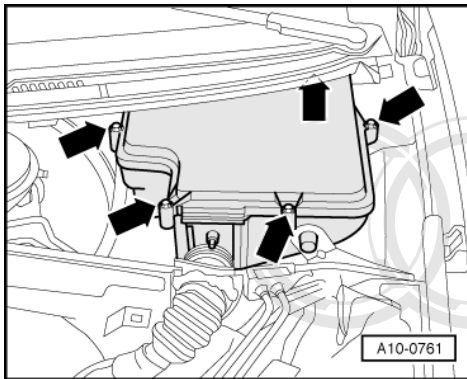
- Check the wiring.

=> Current flow diagrams, Electrical fault finding and Fitting locations binder

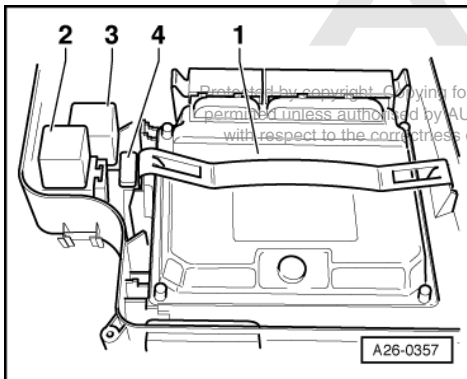


Vehicles from model year 2000 onwards:

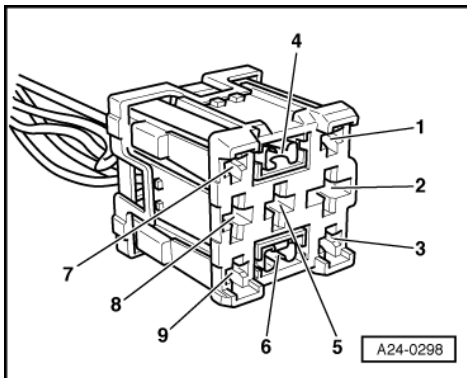
- -> Remove rubber seal from plenum chamber in direction of arrow.
- Remove plenum chamber cover -1- from the front.



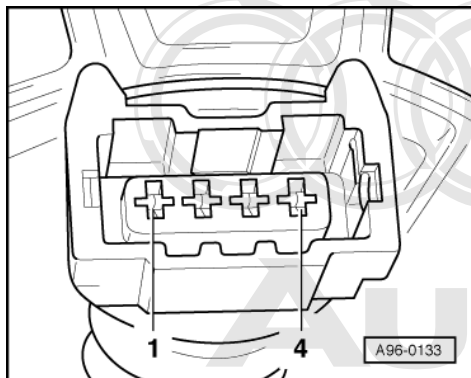
- -> Remove cover for electronics box in plenum chamber -arrows-.



- -> Unplug current supply relay -3-.



- Carry out the following tests (marked with dots):
 - -> Check wiring between 3-way relay carrier, plug-in position 3, contact 6 and contact 15 of ignition coil connector.
 - Test Motronic current supply relay -J271 => Page 162 .



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All models

If the specification is obtained:

Test activation:

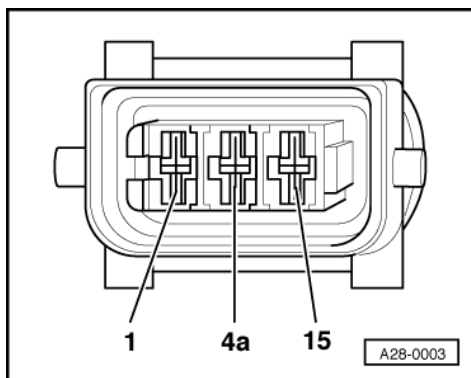
- All ignition coil connectors connected
- Unplug 4-pin connector from output stage
=> Fitting locations overview, Page 34 .
- -> Connect voltage tester V.A.G 1527 B as follows:

Connector Contact	Measure against
1	Engine earth
2	Engine earth
3	Engine earth
4	Engine earth

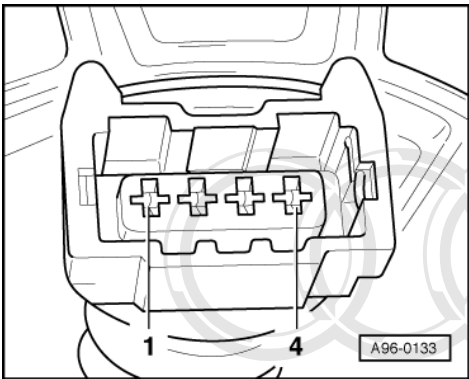
- Operate starter.
 - The LED should light up each time.

If the test result at one contact is not as specified:

- Switch off ignition.



- -> Unplug 3-pin connector from the relevant ignition coil.

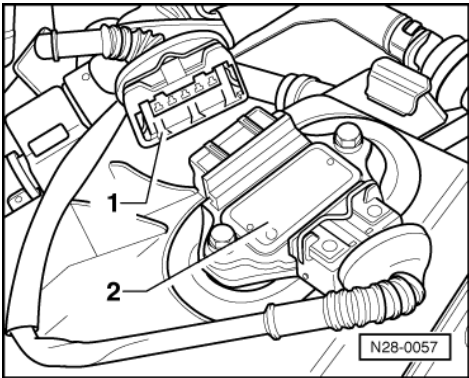


- -> Test for open circuit in wiring between output stage and contact 1 of the relevant ignition coil connector.

Contact on 4-pin connector for output stage	Contact 1 on 3-pin con- nector for ignition coil
Connector	Cylinder
1	1
2	2
3	3
4	4

- Rectify any open/short circuit as necessary.

1.7 - Testing output stage -N122 for ignition coils

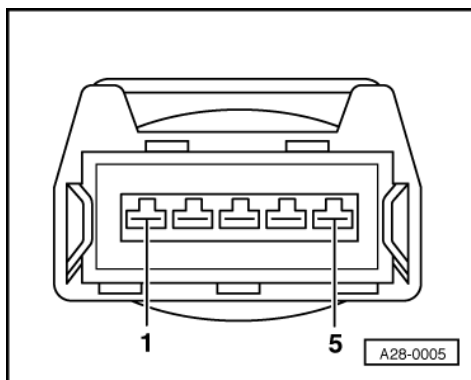


Testing activation of output stages

Note:

It is important to ensure that no fuel is injected during the test as this would damage the catalytic converter. The connectors on the injectors must therefore be unplugged.

- -> Unplug 5-pin connector -1- from output stage -2- for ignition coils.



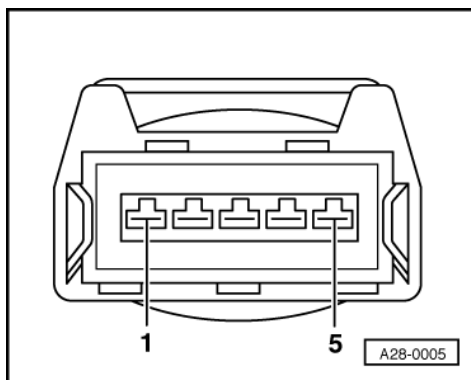
- -> Connect voltage tester V.A.G 1527 B as follows:

Connector Contact	Measure against
1	Engine earth
2	Engine earth
4	Engine earth
5	Engine earth

- Operate starter for a few seconds.
- The LED should flicker.

If the specifications are not obtained:

- Switch off ignition.
 - Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
- => Page 47 .



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

Connector Contact	Test box V.A.G 1598/31 Socket
1	94
2	103
3	1 or 2
4	95
5	102

- Rectify any open/short circuit as necessary.

If no fault is detected in the wiring:

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- Connect 5-pin connector to output stage.
- Unplug 4-pin connector from output stage.
- Connect voltage tester V.A.G 1527 B to battery positive (+) and to one of the contacts on the 4-pin output connection on the ignition output stage.

Output connection on ignition output stage Contact	Measure against
1	Battery positive
2	Battery positive
3	Battery positive
4	Battery positive

- Operate starter for a few seconds.
 - The LED should flash.

If the LED does not flash when testing one or more of the output connections:

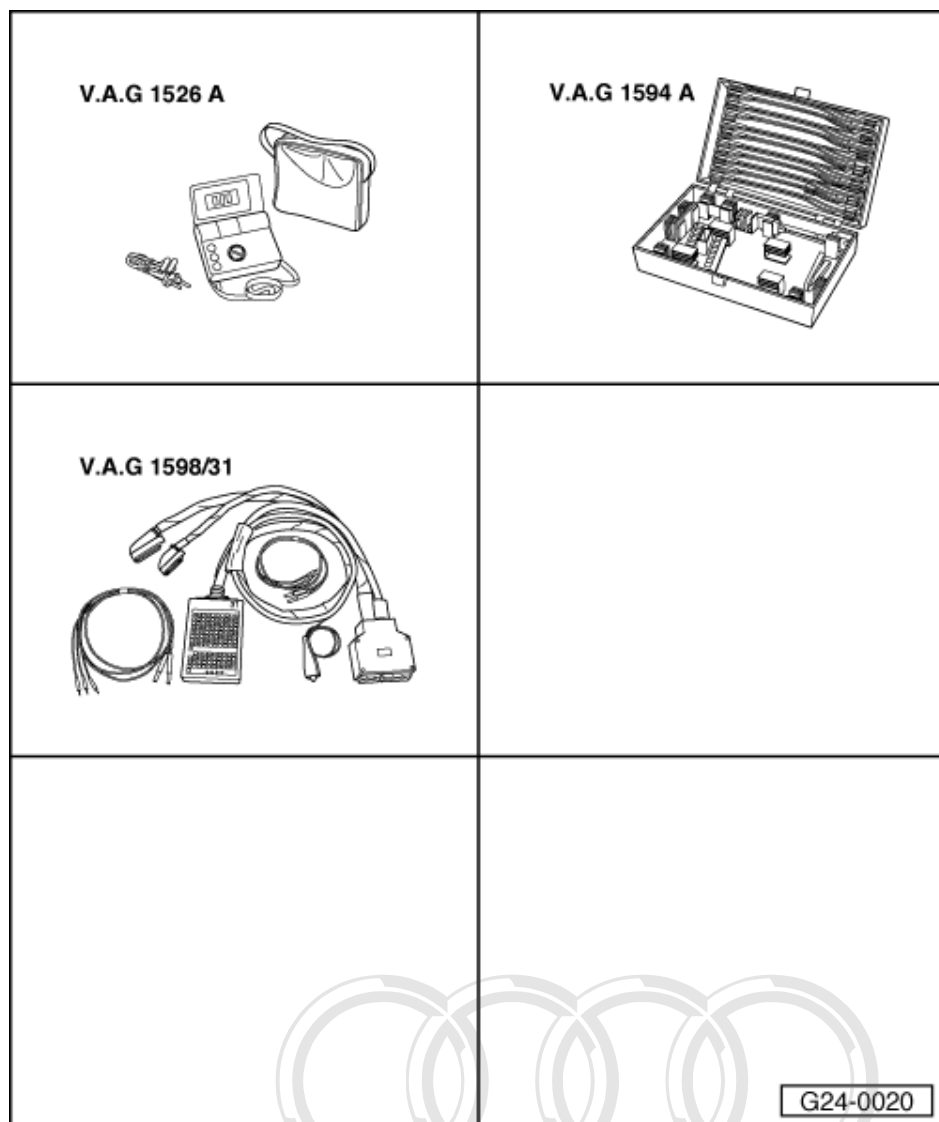
- Renew output stage.



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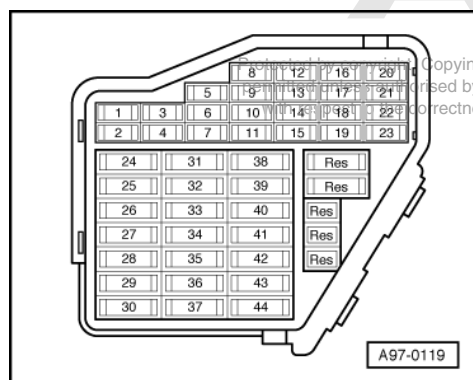


1.8 - Testing Motronic current supply relay -J271 - Vehicles from model year 2000 onwards



Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/31

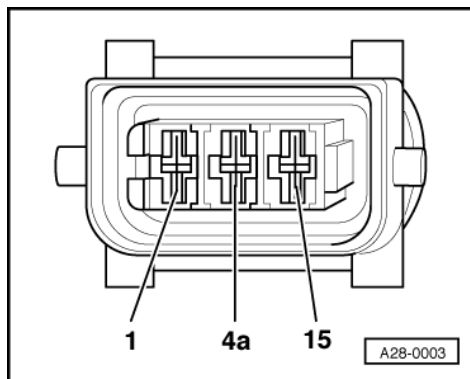


Note:

The Motronic current supply relay -J271 supplies voltage to the ignition coils with output stages and to the engine control unit (pin 121).

Test requirement:

- Fuse No. 229 OK (in fuse box, socket position 29)

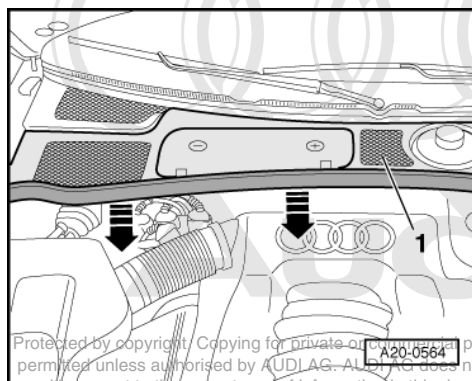


Test sequence

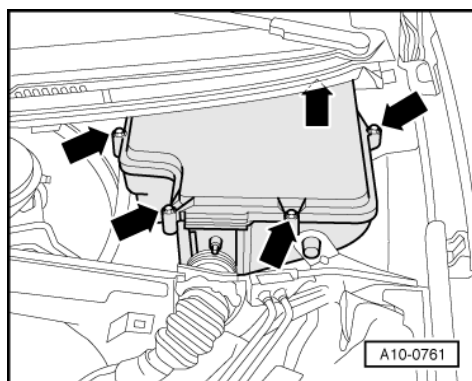
- -> Unplug 3-pin connector from one ignition coil.
- Connect multimeter (voltage measurement range) as follows:

Connector Contact	Measure against
15	Engine earth

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

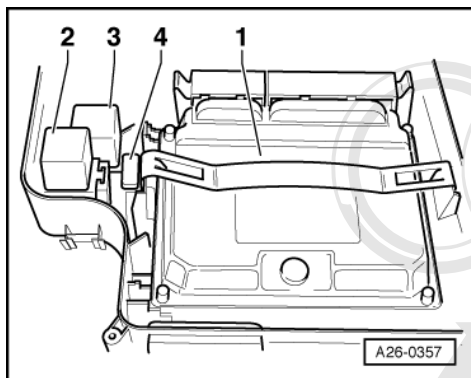


- -> Remove rubber seal from plenum chamber in direction of arrow-.
- Remove plenum chamber cover -1- from the front.

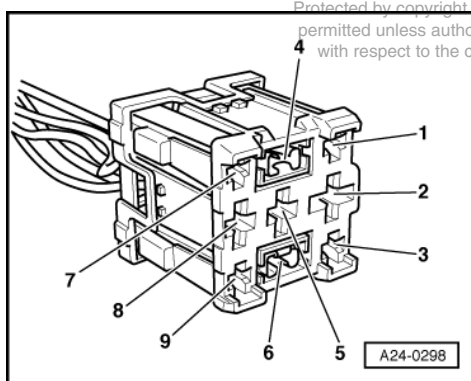




- -> Remove cover for electronics box in plenum chamber -arrows-.



- -> Unplug current supply relay -3-.



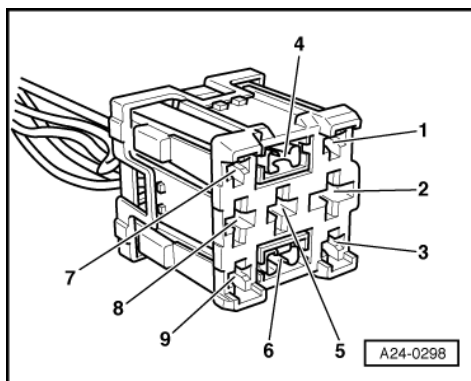
- -> Test for open circuits in the following wiring connection according to current flow diagram:

3-way relay carrier in electronics box in plenum chamber (plug-in position 3) Contact	Connectors on ignition coils Contact
6	15

- Rectify any open circuit as necessary.

If the wiring is OK:

- Test supply voltage for Motronic current supply relay -J271 => Page 165 .
- Test activation of Motronic current supply relay -J271 => Page 165 .



Checking voltage supply

- -> Connect multimeter (voltage measurement range) as follows:

3-way relay carrier in electronics box in plenum chamber (plug-in position 3) Contact	Measure against
2	Engine earth
9	Engine earth

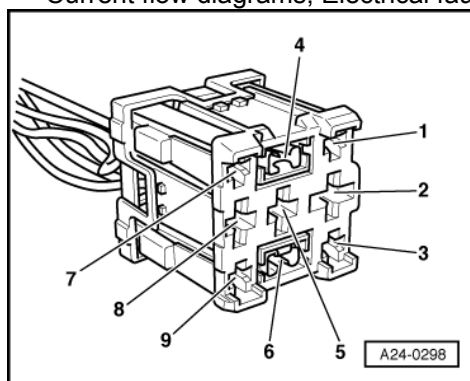
- Specification: approx. battery voltage

If the specification is not attained:

- Check for open circuit in wiring between central electrics unit and current supply relay.

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=> Current flow diagrams, Electrical fault finding and Fitting locations binder



If no fault is detected in the wiring:

Checking activation

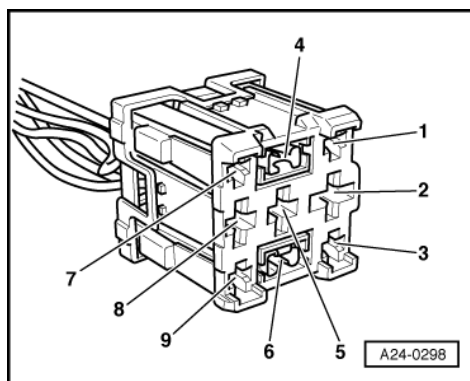
- -> Connect multimeter (voltage measurement range) as follows:

3-way relay carrier in electronics box in plenum chamber (plug-in position 3) Contact	Measure against
4	Battery positive

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

If the specification is not attained:

- Switch off ignition.
 - Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
- => Page 47 .





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

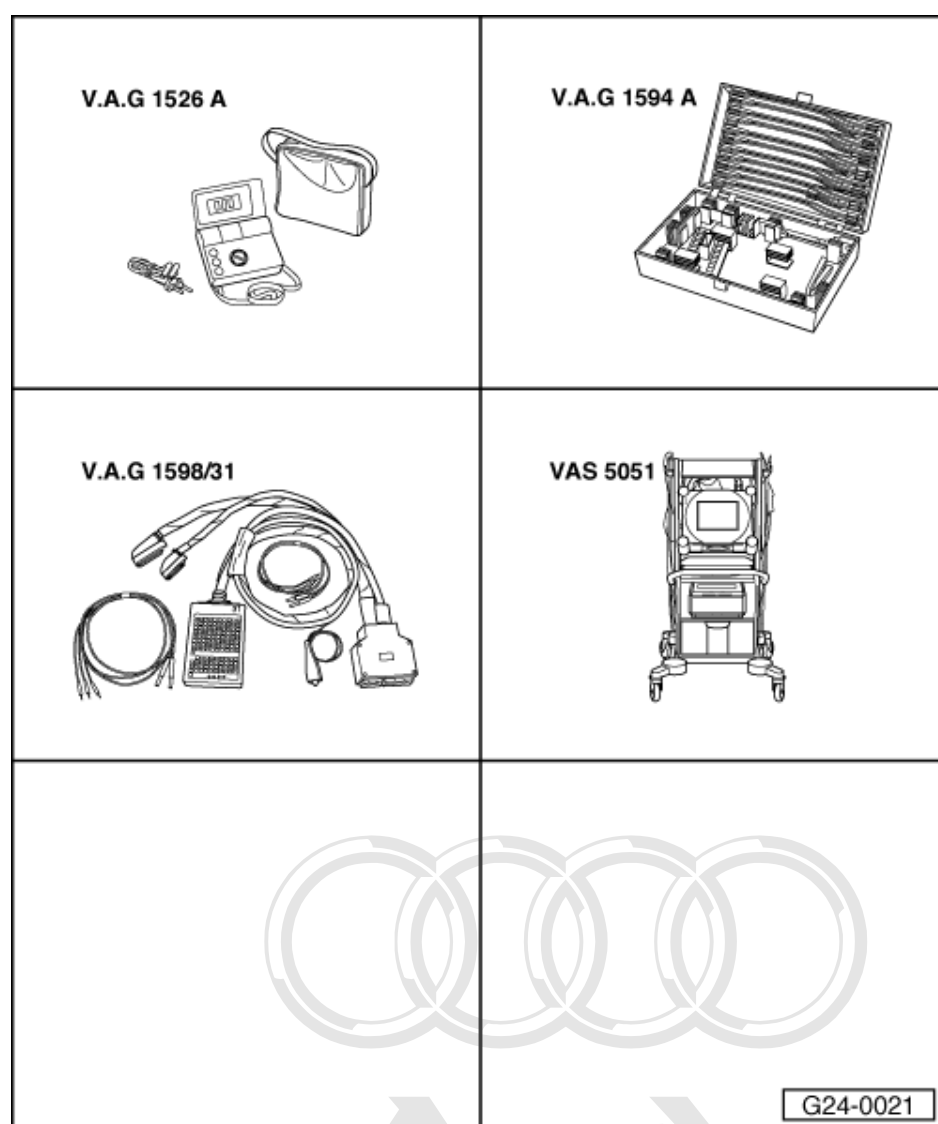
3-way relay carrier in electronics box in plenum chamber (plug-in position 3) Contact	Test box V.A.G 1598/31 Socket
4	21

- Rectify any open/short circuit as necessary.

If no fault is found:

- Fit a new Motronic current supply relay -J271.

1.9 - Testing intake air temperature sender -G42



Special tools and workshop equipment required

- ♦ V.A.G 1526 A
 - ♦ V.A.G 1594 A
 - ♦ V.A.G 1598/31
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- ♦ VAS 5051 with VAS 5051/1

or

- ♦ V.A.G 1551 with V.A.G 1551/3 A

Fitting location => Fitting locations overview, Page 34

Test sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551). Select engine electronics control unit by entering the address word "01" => Page 1; when doing this the engine must be running at idling speed.

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	

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

-> Indicated on display:

Read measured value block	Q
Enter display group number xxx	

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

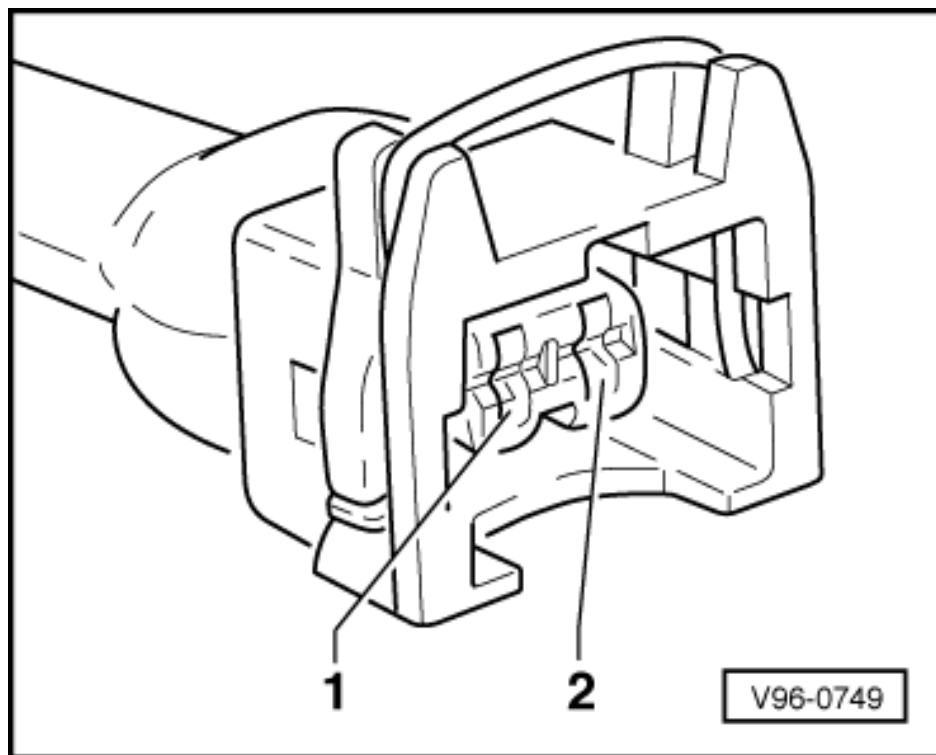
-> Indicated on display:

Read measured value block 4
1 2 3 4

- Check display value for intake air temperature sender(display zone 4):

	Display zones			
	1	2	3	4
Display Group 004: Intake air temperature with engine idling				
Display	xxxx rpm	xx.x V	xxx.x °C	xxx.x °C
Indicates	Engine speed	Battery voltage	Coolant temperature	Intake air temperature
Range	0 ... 6800 rpm	10.0 ... 15.0 V	-48.0 ... 143.0 °C	-48.0 ... 143.0 °C
Specification	xxxx rpm	12.0 ...15.0 V	80.0 ...110.0 °C	Between ambient temperature and 110 °C 1)

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- 1) If there is a large difference between the temperature displayed and the ambient temperature at the sender, check the sender and sender wiring for contact resistance and open circuit.

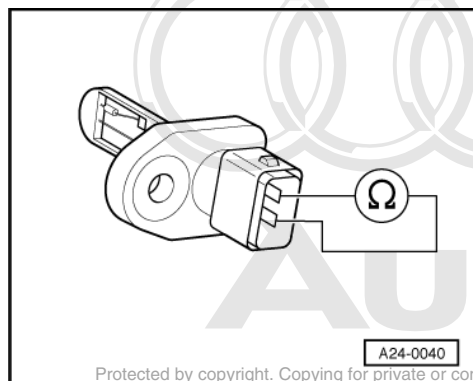


Checking wiring connections

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
=> Page 47 .
- -> Test for open circuit and short to positive or earth in the following wiring connections:

Connector Contact	Test box V.A.G 1598/31 Socket
1	85
2	108

- Test for short circuits between the two wires.
- Rectify any open/short circuit as necessary.



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If no fault is detected in the wiring:

Testing sender

- -> Connect multimeter (resistance measurement range) to sender.

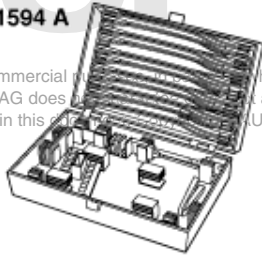
Specifications:

Temperature (°C)	Resistance (kΩ)
-20	approx. 13.8
0	approx. 5.5
20	approx. 2.4
40	approx. 1.1
60	approx. 0.6

If the specification is not attained:

- Fit a new intake air temperature sender.

1.10 - Testing engine speed sender -G28

V.A.G 1526 A 	V.A.G 1594 A 
V.A.G 1598/31 	
	G24-0020

Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A

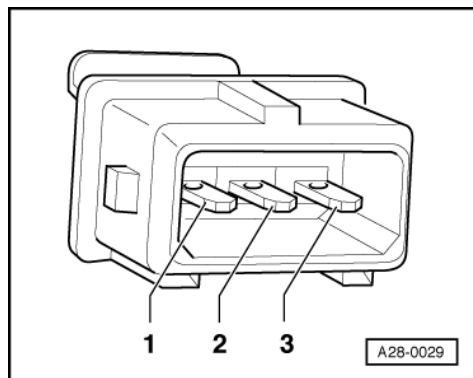


♦ V.A.G 1598/31

Fitting location => Fitting locations overview, Page 34

Note:

The engine speed sender is a combined speed sender and reference mark sender. Without a signal from the -G28 the engine cannot be started. If the signal from the -G28 fails while the engine is running, the engine will cut out immediately.

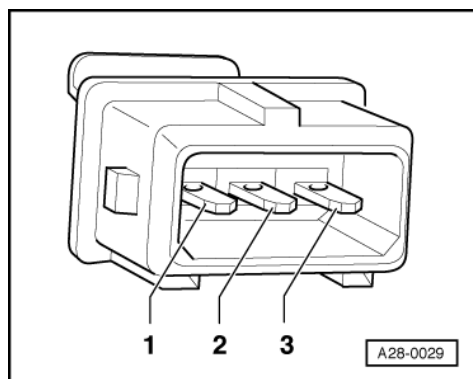


Test sequence

- Before carrying out the test, make sure that the sender is correctly installed and firmly seated.
- Unplug connector for engine speed sender (grey connector).
- -> Connect multimeter (resistance measurement range) between contacts 1 and 2.
 - Specification: 450 ... 1000 ω

If the specification is not attained:

- Fit a new engine speed sender.



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If the specification is obtained:

- -> Connect multimeter (resistance measurement range) between contacts 1 and 3 (screening) and between contacts 2 and 3 (screening).
 - Specification: ∞ ω (no continuity)

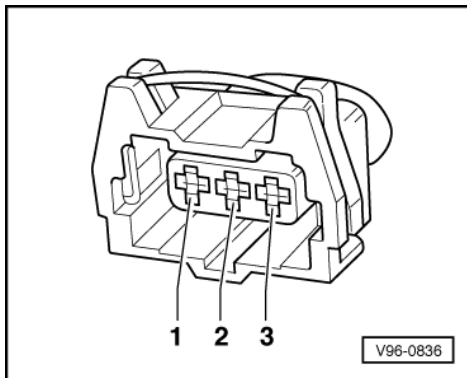
If the specification is not attained:

- Fit a new engine speed sender.

If the specification is obtained:

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.

=> Page **47** .



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

Connector Contact	Test box V.A.G 1598/31 Socket
1 (signal)	82
2 (earth)	90
3 (screening)	108

- Rectify any open/short circuit as necessary.

If no fault is detected in the wiring:

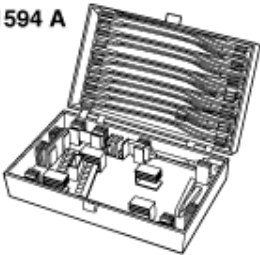
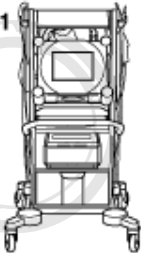
- Fit a new engine control unit => Page **49** .



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1.11 - Testing coolant temperature sender -G62

V.A.G 1526 A 	V.A.G 1594 A 
V.A.G 1598/31 	VAS 5051 
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Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/31
- ♦ VAS 5051 with VAS 5051/1

or

- ♦ V.A.G 1551 with V.A.G 1551/3 A

Fitting location => Fitting locations overview, Page 34

Test requirement:

- Engine cold

Test sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551). Select engine electronics control unit by entering the address word "01" => Page 1 ; when doing this the engine must be running at idling speed.

-> Indicated on display:

Rapid data transfer HELP
Select function XX

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

-> Indicated on display:

Read measured value block Q
Enter display group number XXX

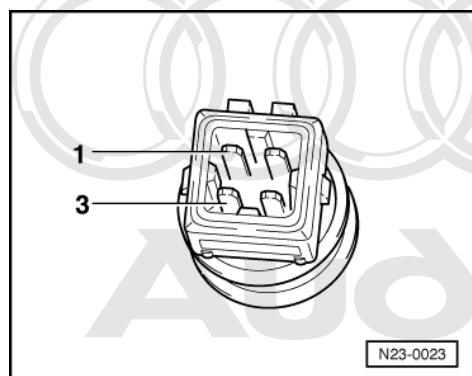
- Enter "004" to select Display Group 004 and confirm entry with Q key.

-> Indicated on display:

Read measured value block 4
1 2 3 4

- Check display in display zone 3.

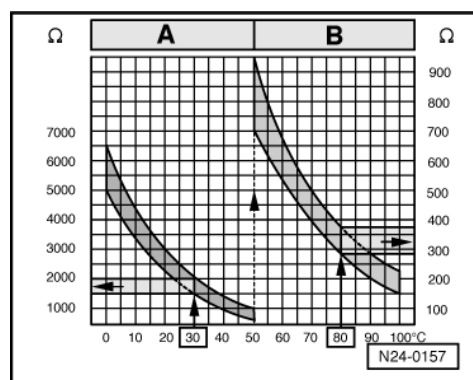
	Display zones			
	1	2	3	4
Display Group 004: Coolant temperature with engine idling				
Display	xxxx rpm	xx.x V	xxx.x °C	xxx.x °C
Indicates	Engine speed	Battery voltage	Coolant temperature	Intake air temperature
Range	0 ... 6800 rpm	10.0 ... 15.0 V	-48.0 ... 143.0 °C	-48.0 ... 143.0 °C
Specification	xxxx rpm	12.0 ... 15.0 V	Temperature display should rise steadily	Between ambient temperature and 110 °C



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If display zone 3 shows an implausible value:

- Unplug connector on coolant temperature sender.
- -> Connect multimeter (resistance measurement range) between contacts 1 and 3 on the sender.





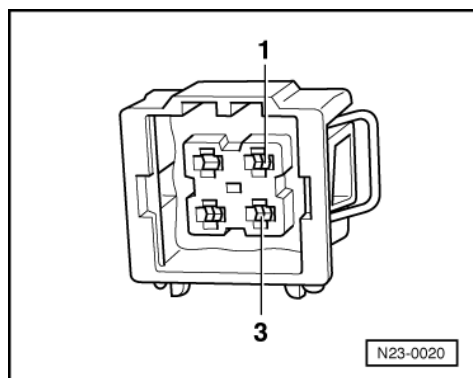
Scale A shows resistance values for temperature range 0...50 °C and scale B the values for temperature range 50...100 °C.

-> Examples:

- ♦ 30 °C corresponds to a resistance from 1500...2000 ω
- ♦ 80 °C corresponds to a resistance from 275...375 ω

If the specification is not attained:

- Fit a new coolant temperature sender.



If the specification is obtained:

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
=> Page 47 .
- -> Test for open circuit and short to positive or earth in the following wiring connections:

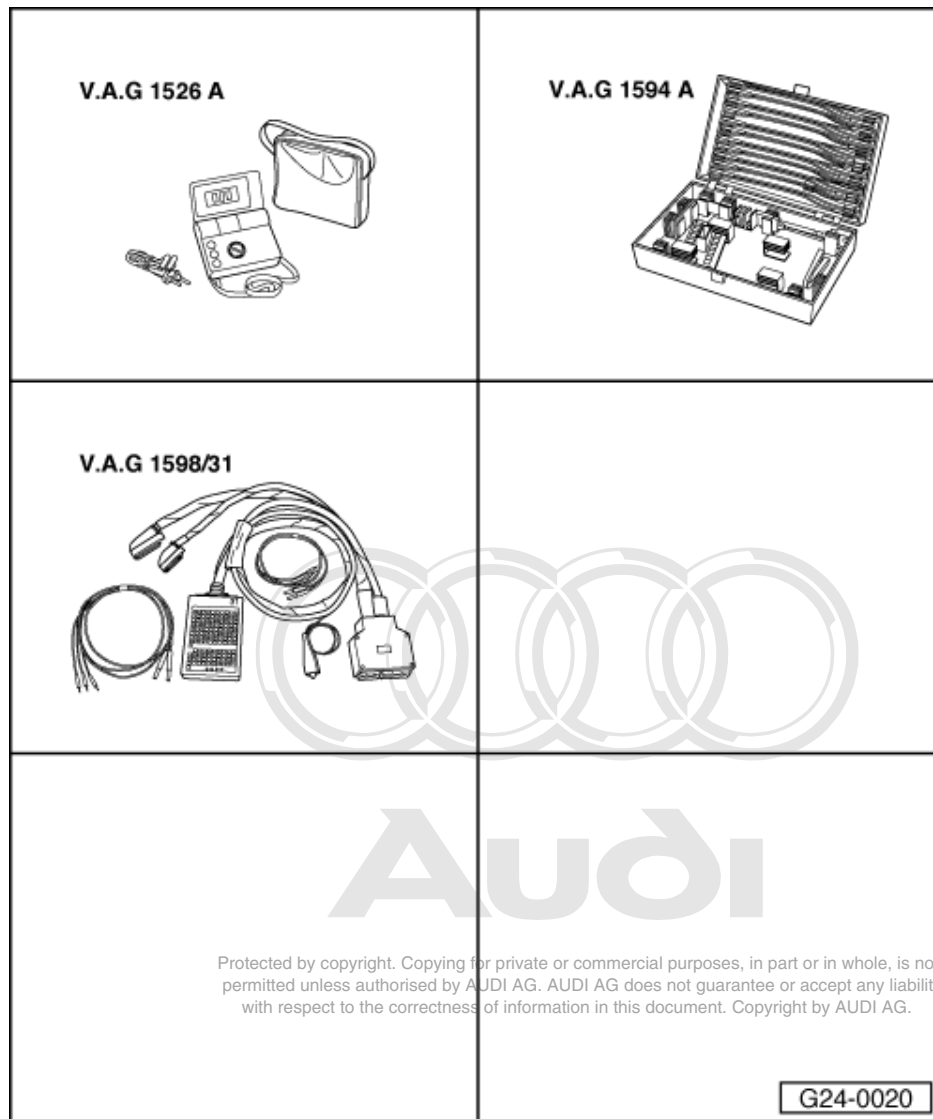
Connector Contact	Test box V.A.G 1598/31 Socket
1 (signal)	93
3	108

- Test for short circuits between the two wires.
- Rectify any open/short circuit as necessary.

If no fault is detected in the wiring:

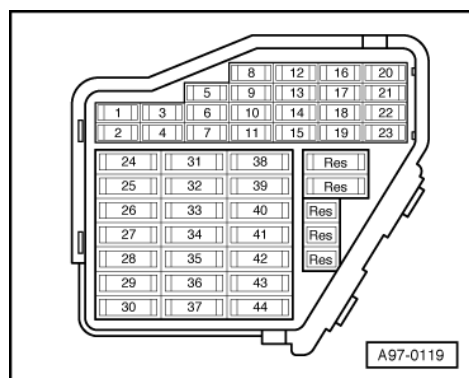
- Fit a new engine control unit => Page 49 .

1.12 - Testing voltage supply for control unit



Special tools and workshop equipment required

- ◆ V.A.G 1526 A
- ◆ V.A.G 1594 A
- ◆ V.A.G 1598/31





Requirements for test:

- -> Fuse No. 232 OK (in fuse box, socket position 32)
- Battery voltage not less than 12.7 V
- Alternator OK

Test sequence

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
=> Page 47 .
- Switch ignition on.

Notes:

- ♦ The positive voltage supply for the engine control unit comes via contact 3 (terminal 15) and contact 62 (terminal 30).
- ♦ The earth connection for the engine control unit is via contacts 1 and 2.
- Connect multimeter (voltage measurement range) as follows:

Test box V.A.G 1598/31 Socket	Measure against
1	Battery positive
2	Battery positive
62	Engine earth

- Specification: approx. battery voltage
- Connect multimeter (voltage measurement range) as follows:

Test box V.A.G 1598/31 Socket	Measure against
3	Engine earth

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

If the specifications are not obtained:

- Check the wiring.

=> Current flow diagrams, Electrical fault finding and Fitting locations binder

Vehicles from model year 2000 onwards:

- Connect multimeter (voltage measurement range) as follows:

Test box V.A.G 1598/31 Socket	Measure against
121 1)	Engine earth

1) The Motronic current supply relay -J271 supplies terminal 121 of the engine control unit with voltage for up to 15 minutes after switching off the ignition.

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

If the specification is not attained:

- Check the wiring.

=> Current flow diagrams, Electrical fault finding and Fitting locations binder

- Test Motronic current supply relay -J271 => Page **162** .

1.13 - Testing knock sensor control limit

If the fault message "Knock sensor - control limit reached" is recorded in the fault memory the following tests must be carried out:

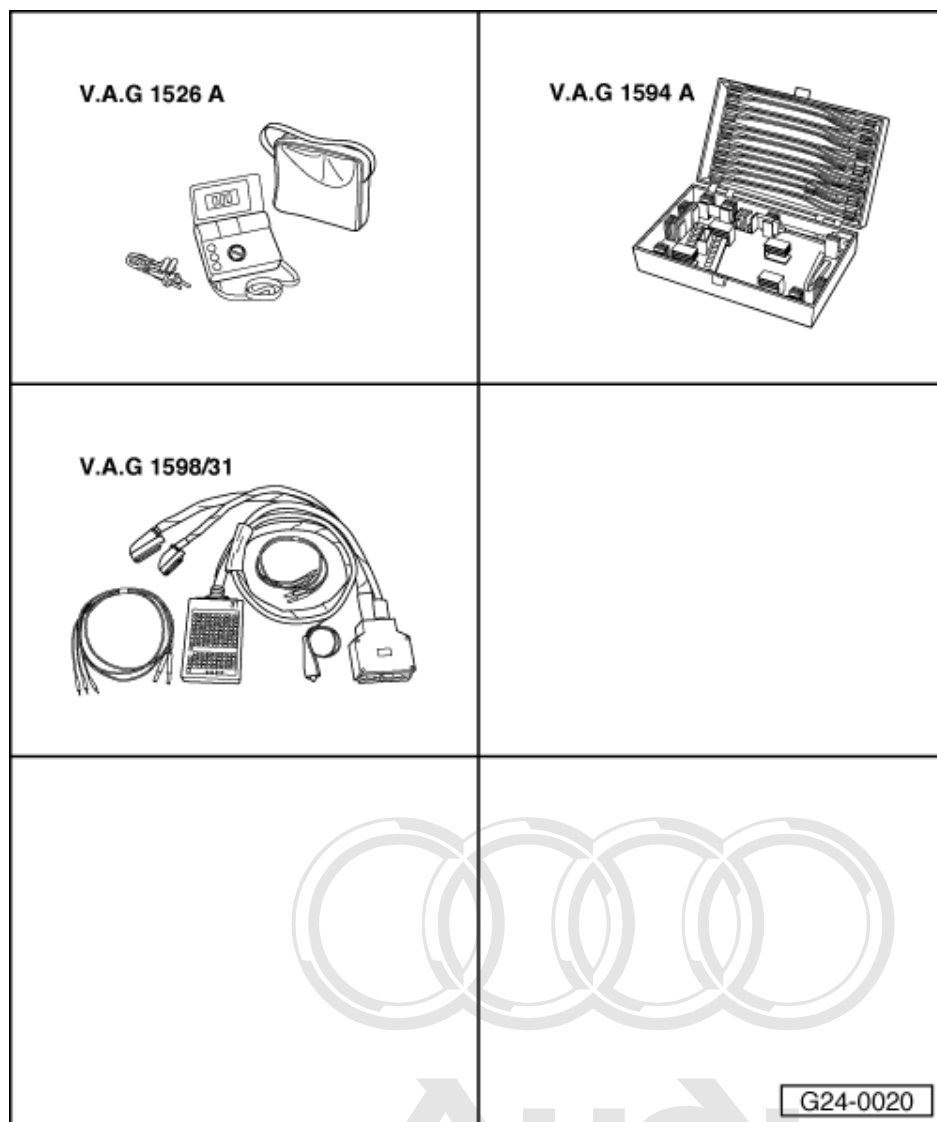
	Possible cause of fault	Fault remedy
Fault message relating to all cylinders or cylinders 1/2 or 3/4	- Poor fuel quality	- Change to higher quality fuel => Owner's Manual
	- Wrong tightening torque on knock sensor	- Loosen knock sensor, then tighten to 20 Nm
	- Knock sensor defective	- Test knock sensor => Page 178
	- Corrosion on connector	- Check connectors
	- Loose components on engine	- Secure loose components
Fault message relating to one cylinder	- Mechanical engine fault	- Test compression pressure
	- Loose components on engine	- Secure loose components



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1.14 - Testing knock sensors



Special tools and workshop equipment required

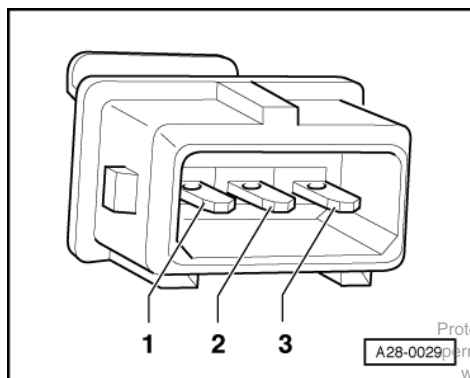
- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/31

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Fitting location => Fitting locations overview, Page **34**

Notes:

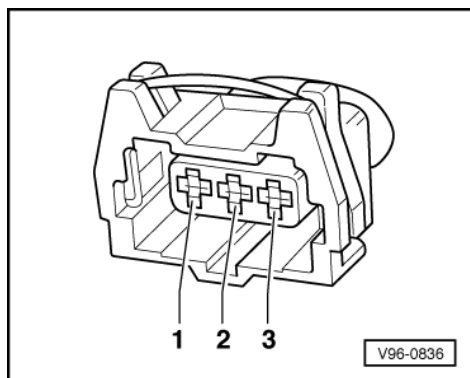
- ♦ It is not possible to carry out an electrical test of the knock sensors themselves (-G61 and -G66).
- ♦ Always use gold-plated contacts when repairing the knock sensor connectors.
- ♦ To ensure that the knock sensors function properly it is important to keep exactly to the specified tightening torque of 20 Nm.
- ♦ Check for corrosion in connection between knock sensor and wiring harness.



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Testing knock sensor wiring

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



Testing wiring between knock sensors and engine control unit

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
=> Page 47.
- Test for open circuit and short to positive or earth in the following wiring connections:
- ➔ Knock sensor 1 -G61 (cylinders 1/2)

Connector for -G61 Contact	Test box V.A.G 1598/31 Socket
1 (signal)	106
2 (earth)	99
3 (screening)	108

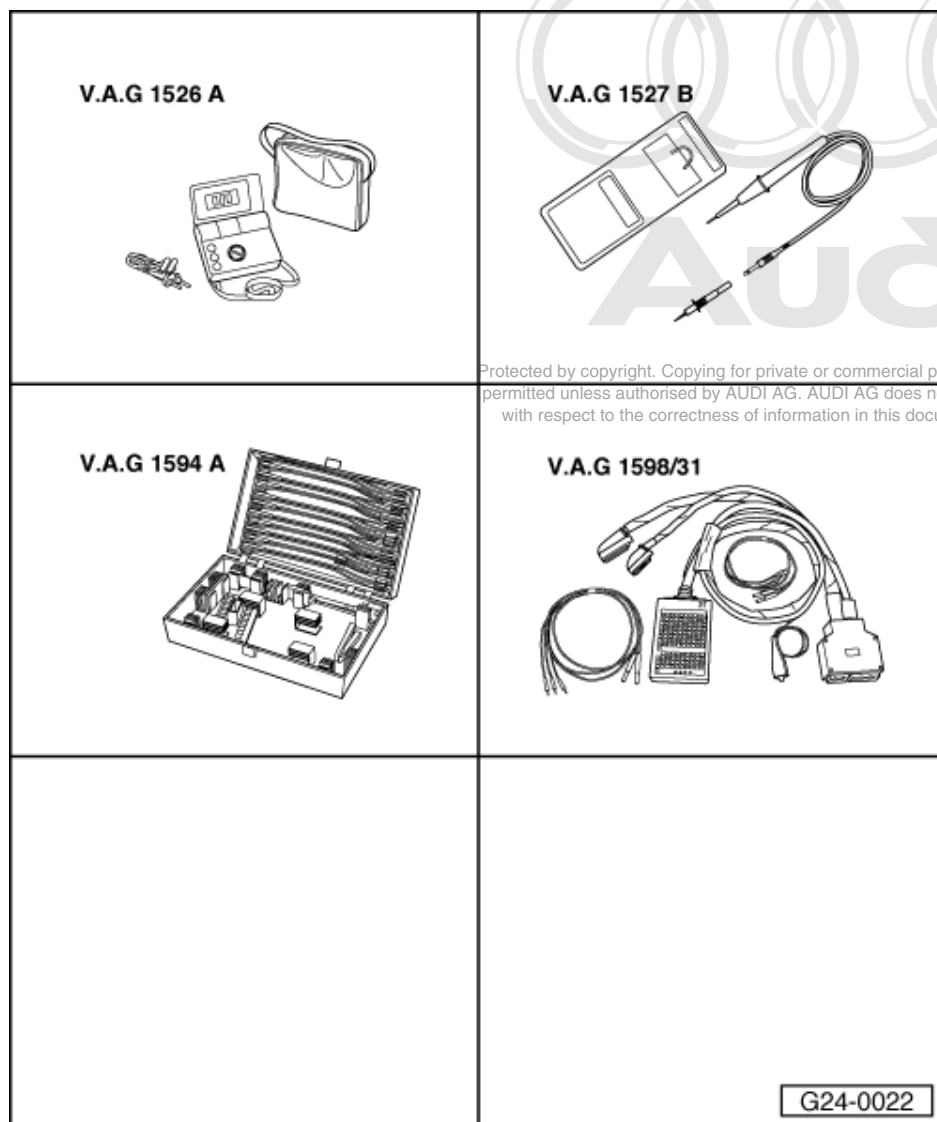
- Knock sensor 2 -G66 (cylinders 3/4)

Connector for -G66 Contact	Test box V.A.G 1598/31 Socket
1 (signal)	107
2 (earth)	99
3 (screening)	108

- Rectify any open/short circuit as necessary.



1.15 - Testing Hall sender -G40



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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 1598/31

Fitting location => Fitting locations overview, Page 34

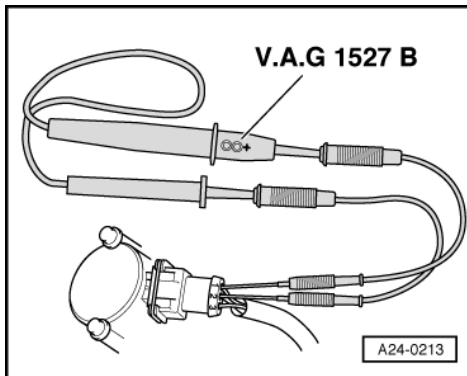
The Hall sender indicates the ignition position for Cylinder 1.

If the Hall sender fails to function, the knock control is switched off and the ignition timing is retarded slightly because the signals can no longer be assigned to the cylinders.

Even without a signal from the Hall sender the engine will continue to run and can also be re-started.

- ♦ When a fault is detected the engine control unit produces one spark per crankshaft revolution for each cylinder.

- ♦ The fact that the injection system is one revolution out of phase does not have any noticeable effect on the fuel injection. If this happens, the fuel is injected upstream of the closed inlet valve instead of while the inlet valve is open. This has only a minor influence on the quality of the air/fuel mixture.



Checking activation

- Slide back rubber sleeve (if fitted) on connector for Hall sender but leave connector plugged in.
- -> Connect voltage tester V.A.G 1527 B between contact 2 (Hall sender signal) and contact 1 (positive).

Note:

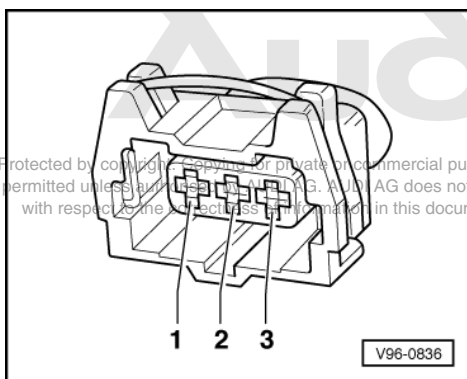
The connector contacts are marked on the back of the connector.

- Operate starter for a few seconds.
 - The LED should flash briefly on alternate engine revolutions (i.e. once every two revolutions).

Note:

The LEDs on voltage testers with a low current draw continue to glow faintly between impulses from the engine control unit (rather than going out completely) and become much brighter when receiving an impulse.

If the LED does not flash:



Checking voltage supply

- Unplug connector from Hall sender.
- -> Connect multimeter (voltage measurement range) as follows:

Connector Contact	Measure against
1	Engine earth

- Specification: approx. 5 V

Testing signal wire

- Connect multimeter (voltage measurement range) as follows:

Connector Contact	Measure against
2	Engine earth

- Specification: approx. battery voltage

Testing earth wire

- Connect multimeter (voltage measurement range) as follows:

Connector Contact	Measure against
3	Battery positive

- Specification: approx. battery voltage

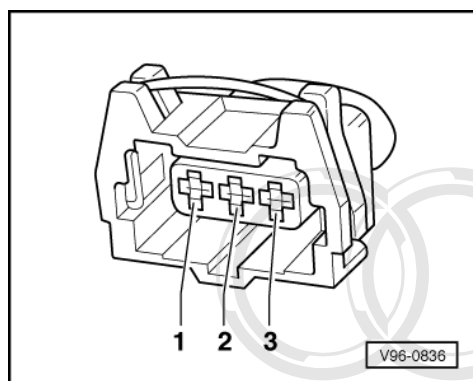
If a specification is not met:

- Check the wiring.
- Rectify any open/short circuit as necessary.

If all the readouts match the specifications but the LED does not flash (measurement taken between contacts 1 and 2 without unplugging connector and while operating starter):

- Renew the Hall sender.

If the specifications are not obtained:



Testing wiring between Hall sender and engine control unit

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
=> Page 47 .
- -> Test for open circuit and short to positive or earth in the following wiring connections:

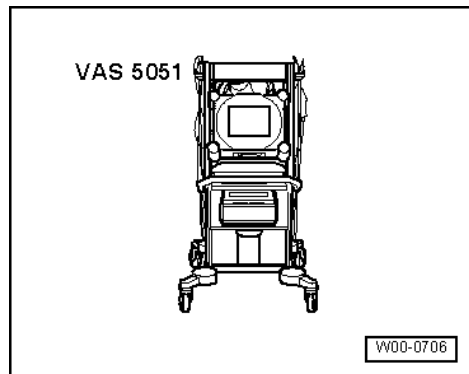
Connector Contact	Test box V.A.G 1598/31 Socket
1 (positive)	98
2 (signal)	86
3 (earth)	108

- Rectify any open/short circuit as necessary.
- If all the test results so far have been OK but a fault relating to the camshaft sensor (Hall sender) is displayed again after erasing the fault memory as a test measure, the cause may be as follows:

- Rotor ring on Hall sender out of position
- Unbolt Hall sender, then check to ensure that the rotor ring is correctly aligned on the camshaft. If incorrectly installed, the catch will be pressed flat when the securing screw is tightened.
- If the rotor ring is correctly aligned, check the position of the camshaft in relation to the crankshaft.

=> 4-Cylinder engine (5-valve turbo), Mechanics; Repair Group 15; Cylinder head, valve gear; Removing and installing camshafts Cylinder head, valve gear Removing and installing camshafts

1.16 - Check misfiring recognition



Special tools and workshop equipment required

- ♦ VAS 5051 and VAS 5051/1
- or
- ♦ V.A.G 1551 and V.A.G 1551/3 A

Test sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page 1 .)
When doing this the engine must be idling.

-> Indicated on display:

Rapid data transfer HELP
Select function XX

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

-> Indicated on display:

Read measured value block Q
Enter display group number XXX

- Enter "014" for display group 014 and confirm with Q key.

-> Indicated on display:

Read measured value block 14
1 2 3 4

- Check display values for misfiring recognition

	Display zones			
	1	2	3	4



Display zones				
Display Group 014: Misfiring recognition				
Display	xxxx rpm	xxx %	xxx	---
Indicates	Engine speed	Load	Total No. of misfires	Misfiring recognition
Range	0 ... 6800 rpm	15 ... 150 %		activated not activated
Specification	FWD: 740 ... 860 rpm 4WD: 800 ... 920 rpm	15 ... 35 %	0 ... 5	activated
Note	---	---	If readout does not match specification, see "Reading display zone 3" => Page 184	

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If the specification is obtained:

- Press ⇒key.

-> Indicated on display (function selection):

Rapid data transfer HELP
Select function XX

Reading Display Group 003

Display zone 3	Possible cause of fault	Fault remedy
Higher than 5	- Spark plug defective - Spark plug connector defective - Ignition coil defective - Output stage for ignition coil defective	- Test spark plugs, ignition wiring and connectors Test ignition coils => Page 159
	- Injector defective	- Check injectors => Page 56