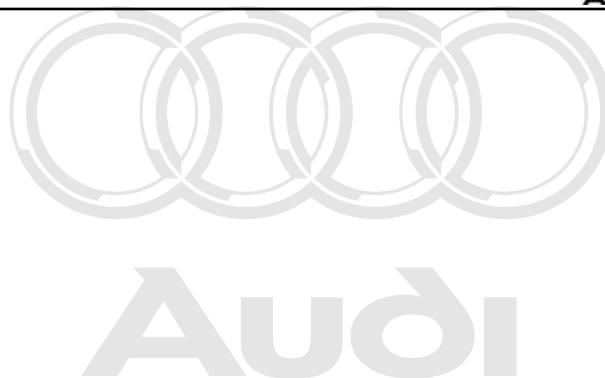




Audi A4 1995 ➤

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Motronic injection and ignition system (6 cyl. turbo)

Engine ID	ASJ	AZR							
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Edition 05.2000

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

Motronic injection and ignition system (6 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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01 - Self-diagnosis

1 - Self-diagnosis for the Motronic system

1.1 - Self-diagnosis for the Motronic system

1.2 - Technical data of self-diagnosis

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Features

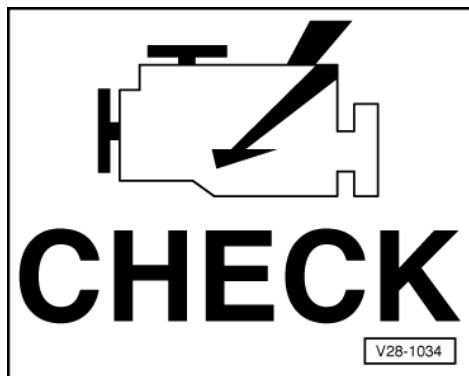
- ◆ The data transfer between control unit and vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 takes place in "Rapid data transfer" mode.
- ◆ The fault memory is a non-volatile memory and thus independent of the power supply.
- ◆ Stored faults are displayed by calling up the fault display => Page 6 .
- ◆ The fault memory must be erased once the faults have been eliminated => Page 6 .
- ◆ On vehicles which conform to emission standard EU III: If the engine control unit detect faults which result in deterioration of exhaust emissions, these faults will be indicated by illumination of exhaust gas warning lamp (fault lamp for self-diagnosis -K83). Explanations on this lamp =>Page 1 .
- ◆ Faults related to EPC are additionally indicated by the warning lamp for the electronic throttle control ("EPC warning lamp") which is situated in the dash panel insert.

1.3 - Significance of the warning lamp for self-diagnosis (exhaust gas warning lamp); On vehicles which conform to emission standard EU III.

Note:

Vehicles which only conform to emission EU II are not equipped with this fault lamp.

If the engine control unit detect faults which result in deterioration of exhaust emissions, these faults will be indicated by illumination of exhaust gas warning lamp.



-> -> Fitting location of exhaust gas warning lamp

**Note:**

When switched on, the exhaust gas warning lamp may flash or illuminate constantly. In every case the fault memory must be interrogated => Page 6.

- ♦ Flashing: A fault is present which under these driving conditions will cause damage to the catalytic converter (e.g. misfiring). In this case driving may only continue at reduced power.
- ♦ Continuous: A fault is present which causes deterioration of the exhaust emission. Interrogate fault memory for Motronic-control unit or autom. transmission (if available).
- ♦ If an engine running problem is present or a customer complaint is made and the exhaust gas warning lamp does not illuminate, the fault memory must be interrogated, as faults can also be stored which do not immediately illuminate the exhaust gas warning lamp until after the engine has been re-started and the fault re-detected.

Functional check:

- Switch on ignition:
The exhaust gas warning lamp must illuminate.

If the exhaust gas warning lamp does not illuminate with ignition switched on:

- Check wiring from engine control unit to exhaust gas warning lamp as follows:

Cause Exhaust gas warning lamp has not been activated or has not illuminated because of an open circuit.	Remedy: Switch off ignition. Connect test box V.A.G 1598/31 =>Page 53 . Bridge sockets 2 and 47 on test box. Switch ignition on. Exhaust gas warning lamp must illuminate. If the exhaust gas warning lamp does not illuminate: Find and rectify short circuit or open circuit between engine control unit and exhaust gas warning lamp with the aid of current flow diagram.
	If no fault is found in wiring to exhaust gas warning lamp:
Cause of fault	Dash panel insert defective => Renew dash panel insert

If the exhaust gas warning lamp illuminates with ignition switched on, continue testing as follows:

- Start engine and run at idling speed:
The exhaust gas warning lamp must go out after a few seconds.

If the exhaust gas warning lamp does not go out:

- Interrogate fault memory => Page 6.

If no fault is stored:

Cause Exhaust gas warning lamp is continuously activated by short circuit to earth.	Remedy: Switch off ignition. Connect test box V.A.G 1598/31 =>Page 53 . Measure resistance between vehicle earth and socket 47 test box. Specified value: infinite resistance ($\infty\omega$) If specified value is not attained: Short circuit to earth in actuation line from engine control unit to exhaust gas warning lamp. Find and rectify this fault with the aid of current flow diagram.
	If specified value for infinite resistance ($\infty\omega$) is obtained, and no short circuit to earth is found:
Cause of fault =>	Dash panel insert defective => Renew dash panel insert.

Functions which can be selected when using fault reader V.A.G 1551.

The conditions to be met when selecting the desired functions are given in the following table.

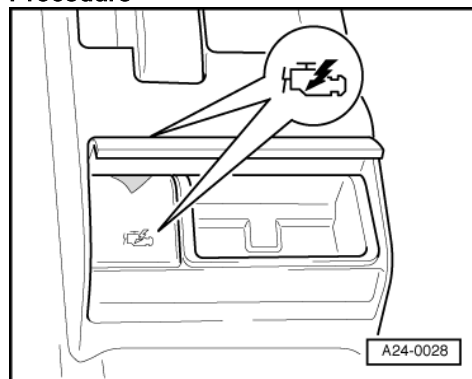
Functions on fault reader V.A.G 1551 or V.A.G 1552		Ignition on, engine stopped	Engine running at idle	Vehicle running
Address words				
00	Automatic test sequence	yes	yes	yes
01	Engine electronics	yes	yes	yes
Functions				
01	Check control unit version	yes	yes	yes
02	Interrogate fault memory	yes	yes	yes
03	Final control diagnosis	yes	no	no
04	Basic setting	yes	yes	yes
05	Erase fault memory	yes	yes	yes
06	End of output	yes	yes	yes
07	Encoding control unit	no	no	no
08	Reading measured value block	yes	yes	yes

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

Test requirements:

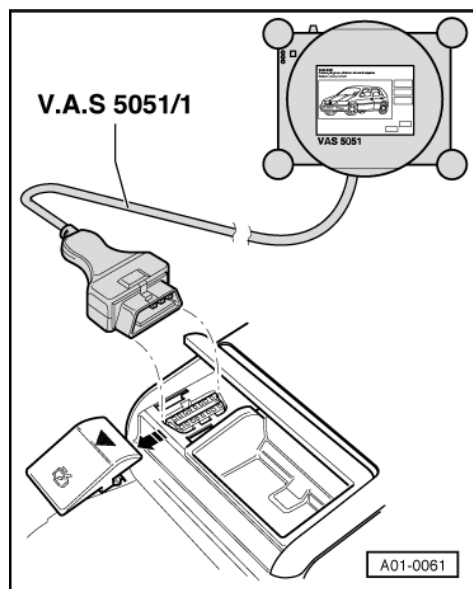
- Battery voltage at least 11 V
- Earth connections on engine and gearbox OK.

Procedure





- -> 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 with diagnostic cable V.A.G 1551/3A.

Important!

- ♦ **When driving the vehicle for measurement and test purposes, always secure the vehicle diagnostic, testing and information system VAS 1551 or fault reader V.A.G 1551 to the rear seat and operate it from there.**
- ♦ **Pay attention to the safety precautions => Page 38**

Note:

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

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

-> Display:

```
V.A.G self diagnosis      HELP
1 - Rapid data transfer*
2 - Flash code output*
```

*Displays appear alternately

- If no display appears check diagnostic cables:

=> "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder; Fault-finding programme "Diagnostic wiring"

Depending on the function required:

- Switch the ignition on.

or

start engine => Page 3 , "Selectable functions" table.

- Switch on printer using the Print button (warning lamp in button lights up).
- Press key 1 for "Rapid data transfer".

-> Display:

Rapid data transfer HELP
Enter address word XX

Rapid data transfer Q
01 -Engine electronics

-> Press keys 0 and 1 for address word "Engine electronics" and press the Q key to confirm entry.

-> If one of the messages shown appears on the display, run through the fault finding procedure as described in the diagnosis management fault-finding program.

Rapid data transfer HELP
Control unit does not answer.

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

Rapid data transfer HELP
Communication problem

Rapid data transfer HELP
K - wire not switching to earth

Rapid data transfer HELP
K - wire not switching to positive

Control unit identification (example)

-> The display on fault reader V.A.G 1551 will show the control unit identification code e.g.:

8D0907551.. 2.7l V6/5VT G 0002
Code 04711 WSC 06388

- 8D0907551.. Control unit number (see also spare parts program)
- 2.7l Engine capacity
- V6/5VT Engine type (V engine, 6 cy-linder, 5-valve, turbo1))
- "G" or no display Vehicle with or without cruise control
- 0002 Control unit software version
- Code 04711 Engine control unit code
- WSC 06388 Workshop Code from V.A.G 1551 which was used to perform the last coding

1)This engine is a "biturbo" engine, i.e. two turbochargers are installed in the engine. "Bi" (Latin) signifies two or double.

If the coding differs from the vehicle version, then:

- Check control unit coding => Page 35 .
Encoding engine control unit
- Press the =>key.

-> Display readout (relevant chassis number):

xxxxxxxxxxxxxxxxxxxxx yyyyyyyyyyyyyyy

- ◆ xxxxxxxxxxxxxxxxxxxx: 17-digit vehicle identification number (chassis number)
- ◆ yyyyyyyyyyyyyyy: 14-digit identification number for immobiliser control unit



Note:

The additional readout (vehicle and immobiliser identification number) is displayed, because the vehicle is fitted with what is known as "Immobiliser III".

- Press the ➡key.

-> Display:

Rapid data transfer HELP
Select function XX

Note:

Press HELP key to obtain a printout of available functions.

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2 - Interrogating and erasing fault memory

2.1 - Interrogating and erasing fault memory

- Connect up vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "Address word" 01 => Page 3 .
For this purpose, the engine must be running at idle speed

Only if engine does not start:

- Interrogate fault memory with ignition switched on.
- Switch on printer using the Print button (warning lamp in button lights up).

-> Display:

Rapid data transfer HELP
Select function XX

- Operate fault reader, taking into account the information on the display:
- Press keys 0 and 2 for "Interrogate fault memory" function and press Q key to confirm entry.

-> When adjacent display appears:

No fault recognised!

- Press the ➡key.

or

-> When adjacent display appears:

X fault(s) detected

The stored faults are displayed and printed in sequence when the printer is switched on.

- Locate and eliminate faults listed on printout as per fault table => Page 7 .
- Press the ➡key.

-> When adjacent display appears:

Rapid data transfer HELP
Select function XX

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

Notes:

-> When adjacent display appears:

Important!
Fault memory has not been interrogated

Sequence has not been correctly followed.

- Interrogate fault memory.

The fault memory will also not be erased if:

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

-> When adjacent display appears:

Rapid data transfer
Fault memory is erased

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

Note:

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

End of output

-> When adjacent display appears:

Rapid data transfer HELP
Select function XX

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

-> When adjacent display appears:

Rapid data transfer HELP
Enter address word XX

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- Switch off ignition and detach diagnostic connector.

2.2 - Fault table

Notes:

- ♦ If faults occur in the monitored sensors and components, these are stored in the fault memory together with an indication of type of fault.
- ♦ "Faults related to EPC are additionally indicated by a warning lamp "EPC warning lamp") which is located in the combination instrument, Notes on EPC system =>Page 107 .
- ♦ On vehicles which conform to emission standard EU III, faults which cause deterioration in exhaust emissions are displayed via an exhaust gas warning lamp (fault lamp for self-diagnosis), which is also located in the dash panel insert. Certain faults cause the exhaust gas warning lamp to switch on immediately after detection. However, other faults may occur whereby the exhaust gas warning lamp will only be switched on when the fault is re-detected after two engine re-starts.
- ♦ Sporadic faults are marked "SP" (sporadic fault) on the V.A.G 1551 display. The word "sporadic" signifies individually occurring, random faults.
- ♦ The fault table is sorted according to the 5 digit fault code on the left.
- ♦ If a stored fault does not appear within the next 40 engine starts, the fault code will be automatically erased.
- ♦ Do not immediately renew components indicated as faulty by the V.A.G 1551 but First check the wiring and connectors of these components according to the current flow diagram.



Also check the earth connections according to the current flow diagram. This is particularly relevant for faults recorded as "occurring sporadically" (SP).

- ♦ If the connector is pulled off the engine control unit or if the battery is disconnected, all the stored values in the control unit will be erased. However, the contents of the fault memory are retained. If the engine is then started, it may run rough for a short period. In this case, the engine should be run at idle for a few minutes until the learning process is concluded.

2.3 - Fault codes up to fault code P1330 (17738)

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P0101	16485	Air mass meter -G70 Implausible signal 2)	Air mass meter => Page 73
P0102	16486	Air mass meter -G70 Signal too small 2)	
P0103	16487	Air mass meter -G70 Signal too great 2)	
P0106	16490	Intake manifold pressure/air pressure =>-G71/-F96 Implausible signal 4)	=> 6-cylinder Engine (5-valve Turbo), Mechanical Components; Repair Group 21; Boost air system with exhaust gas turbocharger; Checking boost pressure sender -G31.

2) With this fault the engine control unit only switches on exhaust gas warning lamp (MIL), if fault has been re-detected after two engine re-starts. Significance of MIL warning lamp => 1.

4) The intake manifold pressure is determined by the boost pressure sender -G31 (in place of displayed -G71), the air pressure is determined by altitude sender -F96 (in engine control unit).

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Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P0112	16496	Intake air temperature sender -G42 Signal too small 2)	Check the intake air temperature sender => Page 141
P0113	16497	Intake air temperature sender -G42 Signal too great 2)	
P0116	16500	Coolant temperature sender -G62 Implausible signal 2)	Test coolant temperature sender => Page 144
P0117	16501	Coolant temperature sender -G62 Signal too small 2)	
P0118	16502	Coolant temperature sender -G62 Signal too great 2)	

2) With this fault the engine control unit only switches on exhaust gas warning lamp (MIL), if fault has been re-detected after two engine re-starts. Significance of MIL warning lamp => 1.

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P0130	16514	Bank 1, probe 1 Electrical fault in circuit 2)	Check lambda control and lambda probe heating and wiring connections => Page 77
P0131	16515	Bank 1, probe 1 Voltage too low 2)	
P0132	16516	Bank 1, probe 1 Voltage too high 2)	
P0133	16517	Bank 1, probe 1 Signal too slow 2)	

Fault code		Fault readout	Fault remedy
P0134	16518	Bank 1, probe 1 No activity 2)	

2) With this fault the engine control unit only switches on exhaust gas warning lamp (MIL), if fault has been re-detected after two engine re-starts. Significance of MIL warning lamp => **1**.

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P0136	16520	Bank 1, probe 2 Electrical fault in circuit 2)	Check lambda probe heating => Page 91 Test lambda probe signal wiring and activation => Page 94
P0137	16521	Bank 1, probe 2 Voltage too low 2)	
P0138	16522	Bank 1, probe 2 Voltage too high 2)	
P0139	16523	Bank 1, probe 2 Signal too slow	Check lambda probe and lambda control after catalytic converter => Page 85
P0140	16524	Bank 1, probe 2 No activity 2)	

2) With this fault the engine control unit only switches on exhaust gas warning lamp (MIL), if fault has been re-detected after two engine re-starts. Significance of MIL warning lamp => **1**.

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Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P0150	16534	Bank 2, probe 1 Electrical fault in circuit 2)	Check lambda control and lambda probe heating and wiring connections => Page 77
P0151	16535	Bank 2, probe 1 Voltage too low 2)	
P0152	16536	Bank 2, probe 1 Voltage too high 2)	
P0153	16537	Bank 2, probe 1 Signal too slow 2)	
P0154	16538	Bank 2, probe 1 No activity 2)	

2) With this fault the engine control unit only switches on exhaust gas warning lamp (MIL), if fault has been re-detected after two engine re-starts. Significance of MIL warning lamp => **1**.

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P0156	16540	Bank 2, probe 2 Electrical fault in circuit 2)	Check lambda probe heating => Page 91 Test lambda probe signal wiring and activation => Page 94
P0157	16541	Bank 2, probe 2 Voltage too low 2)	
P0158	16542	Bank 2, probe 2 Voltage too high 2)	
P0159	16543	Bank 2, probe 2 Signal too slow	Check lambda probe and lambda control after catalytic converter => Page 85



Fault code		Fault readout	Fault remedy
P0160	16544	Bank 2, probe 2 No activity 2)	Check lambda probe heating for lambda probe => Page 91

2) With this fault the engine control unit only switches on exhaust gas warning lamp (MIL), if fault has been re-detected after two engine re-starts. Significance of MIL warning lamp => 1.

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P0236	16620	Boost pressure sender -G31 Implausible signal	=> Mechanical Components; Repair Group 21; Boost air system with exhaust gas turbocharger; Checking boost pressure sender -G31. Boost air system with exhaust gas turbocharger; Checking boost pressure sender -G31.
P0237	16621	Boost pressure sender -G31 Signal too low	
P0238	16622	Boost pressure sender -G31 Signal too high	

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Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P0300	16684	Misfire detected 2)	- Test misfire detection => Page 156 - Refuel the vehicle
P0301	16685	Cyl. 1 misfire detected 2)	
P0302	16686	Cyl. 2 misfire detected 2)	
P0303	16687	Cyl. 3 misfire detected 2)	
P0304	16688	Cyl. 4 misfire detected 2)	
P0305	16689	Cyl. 5 misfire detected 2)	
P0306	16690	Cyl. 6 misfire detected 2)	

2) With this fault the engine control unit only switches on exhaust gas warning lamp (MIL), if fault has been re-detected after engine re-start. Significance of MIL warning lamp => 1.

Exhaust gas warning lamp flashes if engine control unit detects misfires that could damage the catalytic converters.

Notes:

- The fault "P1250, fuel level too low" is additionally displayed with faults that may be caused through fuel shortage (i.e. misfire). This means that misfires were not detected due to a technical defect, but only because not enough fuel is or was in tank.
- Depending on fault detection, exhaust gas warning lamp illuminates immediately or after confirmation of fault.

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P0321	16705	Engine speed sender -G28 Implausible signal	Test engine speed sender => Page 143
P0322	16706	Engine speed sender -G28 No signal2)	
P0327	16711	Knock sensor 1 -G61 Signal too small	Check knock sensor => Page 150
P0328	16712	Knock sensor 1 -G61 Signal too great	
P0332	16716	Knock sensor 2 -G66 Signal too small	

P0333	16717	Knock sensor 2 -G66 Signal too great	
P0341	16725	Camshaft position sensor => sender -G40 Implausible signal 2)	Check Hall sender => Page 153
P0346	16730	Camshaft position sensor => sender -G163 Implausible signal 2)	

2) With this fault the engine control unit only switches on exhaust gas warning lamp (MIL), if fault has been re-detected after two engine re-starts. Significance of MIL warning lamp => **1**.

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P0420	16804	Bank 1, catalytic converter system inefficient 2)	Replace catalytic converter. Bank 1. => Mechanical Components; Repair Group 26; Removing and installing parts of the exhaust gas system; Removing and installing catalytic converter Removing and installing parts of the exhaust gas system; Removing and installing catalytic converter
P0430	16814	Bank 2, catalytic converter system inefficient 2)	Replace catalytic converter Bank 2. => Mechanical Components; Repair Group 26; Removing and installing parts of the exhaust gas system; Removing and installing catalytic converter Removing and installing parts of the exhaust gas system; Removing and installing catalytic converter

2) With this fault the engine control unit only switches on exhaust gas warning lamp (MIL), if fault has been re-detected after two engine re-starts. Significance of MIL warning lamp => **1**.

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P0441	16825	Fuel tank breather system Throughput malfunction	Test solenoid valve 1 for active carbon canister, perform final control diagnosis =>Page 28 .

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P0501	16885	Vehicle speed signal Implausible signal 2)	Check speed signal =>Page 126 .
P0506	16890	Idling speed regulation Engine speed below specified value	Perform adaptation of the throttle valve control unit => Page 110
P0507	16891	Idling speed regulation Engine speed above specified value	Check system for unmetered air => Page 76
P0560	16944	Voltage supply Implausible signal	Voltage supply Checking => Page 147
P0562	16946	Voltage supply Voltage too low	
P0563	16947	Voltage supply Voltage too high	



P0571	16955	Brake light switch -F Implausible signal	Check brake light switch and brake pedal switch => Page 127 or => Electrical system; Repair Group 01; CCS self-diagnosis; Checking brake light switch CCS self-diagnosis; Checking brake light switch
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2) With this fault the engine control unit only switches on exhaust gas warning lamp (MIL), if fault has been re-detected after two engine re-starts. Significance of MIL warning lamp => **1**.

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P0601	16985	Control unit defective 2)	Renew engine control unit => Page 55
P0604	16988	Control unit defective 2)	
P0605	16989	Control unit defective 2)	
P0606	16990	Control unit defective	
P1066	17474	Intake air change-over valve -N335 Short to positive	
P1067	17475	Intake air change-over valve -N335 Short to earth	Test intake air change-over valve -N335 => Page 100
P1068	17476	Intake air change-over valve -N335 Open circuit.	

2) With this fault the engine control unit only switches on exhaust gas warning lamp (MIL), if fault has been re-detected after two engine re-starts. Significance of MIL warning lamp => **1**.

Fault code		Fault readout	Fault remedy
SAE	V.A.G	Protected by copyright 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.	
P1102	17510	Bank 1, probe 1, heating circuit Short to positive 2)	Checking lambda probe heating => Page 91
P1105	17513	Bank 1, probe 2, heating circuit Short to positive 2)	
P1107	17515	Bank 2, probe 1, heating circuit Short to positive 2)	
P1110	17518	Bank 2, probe 2, heating circuit Short to positive 2)	
P1111	17519	Lambda control bank 1 System too lean	Check lambda probe learned values and lambda control => Page 80
P1112	17520	Lambda control bank 1 System too rich	

2) With this fault the engine control unit only switches on exhaust gas warning lamp (MIL), if fault has been re-detected after two engine re-starts. Significance of MIL warning lamp => **1**.

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P1113	17521	Bank 1, probe 1 Internal resistance too high 2)	Check lambda probe heating for lambda probe => Page 91
P1114	17522	Bank 1, probe 2, Internal resistance too high 2)	Test lambda probe signal wiring and activation => Page 94
P1115	17523	Bank 1, lambda probe 1, heating circuit Short to earth 2)	Check lambda probe heating for lambda probe => Page 91

P1116	17524	Bank 1, lambda probe 1, heating circuit Open circuit 2)	
P1117	17525	Bank 1, probe 2, heating circuit Short to earth 2)	
P1118	17526	Bank 1, probe 2, heating circuit Open circuit 2)	

2) With this fault the engine control unit only switches on exhaust gas warning lamp (MIL), if fault has been re-detected after two engine re-starts. Significance of MIL warning lamp => **1** .

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P1119	17527	Bank 2, lambda probe 1, heating circuit Short to earth 2)	Check lambda probe heating for lambda probe => Page 91
P1120	17528	Bank 2, lambda probe 1, heating circuit Open circuit 2)	
P1121	17529	Bank 2, probe 2, heating circuit Short to earth 2)	
P1122	17530	Bank 2, probe 2, heating circuit Open circuit 2)	

2) With this fault the engine control unit only switches on exhaust gas warning lamp (MIL), if fault has been re-detected after two engine re-starts. Significance of MIL warning lamp => **1** .

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P1127	17535	Bank 1, mixture adaptation (mult.) system too rich 2)	Test drive vehicle (fuel in oil) Check fuel system pressure => Page 59
P1128	17536	Bank 1, mixture adaptation (mult.) System too lean 2)	
P1129	17537	Bank 2, mixture adaptation (mult.) System too rich 2)	Test air mass meter => Page 76 .
P1130	17538	Bank 2, mixture adaptation (mult.) System too lean 2)	Test lambda probe before catalytic converter => Page 85
P1131	17539	Bank 2, probe 1 Internal resistance too high 2)	Check injectors => Page 63
			Check lambda probe heating for lambda probe => Page 94

2) With this fault the engine control unit only switches on exhaust gas warning lamp (MIL), if fault has been re-detected after two engine re-starts. Significance of MIL warning lamp => **1** .

Note:

mult. - multiplicative means that the fault occurs throughout the entire speed range and load range.

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P1136	17544	Bank 1, mixture adaptation (add.) System too lean 2)	Test drive vehicle (fuel in engine oil)



P1137	17545	Bank 1, mixture adaptation (add.) System too rich 2)	Check fuel system pressure => Page 59 Test air mass meter => Page 73 Test lambda probe before catalytic converter => Page 104
P1138	17546	Bank 2, mixture adaptation (add.) System too lean 2)	
P1139	17547	Bank 2, mixture adaptation (add.) System too rich 2)	
P1140	17548	Bank 2, probe 2 Internal resistance too high 2)	Check lambda probe heating for lambda probe => Page 94

2) With this fault the engine control unit only switches on exhaust gas warning lamp (MIL), if fault has been re-detected after two engine re-starts. Significance of MIL warning lamp => 1.

Note:

add. - additive means that fault only has effect during idling

Fault code		Fault readout	Fault remedy
SAE	V.A.G		Check lambda probe learned values and lambda control => Page 80
P1147	17555	Lambda control, bank2 System too lean	
P1148	17556	Lambda control, bank2 System too rich	
P1149	17557	Lambda control, bank1 Implausible control value	Check lambda probe learned values and lambda control =>Page 80 Check fuel system pressure => Page 76
P1150	17558	Lambda control, bank2 Implausible control value	

Fault code		Fault readout	Fault remedy
SAE	V.A.G		Check angle sender for throttle valve actuator =>Page 112 .
P1171	17579	Angle sender 2 for throttle valve actuator -G188 Implausible signal 1) 3)	
P1172	17580	Angle sender 2 for throttle valve actuator -G188 Signal too small 1) 3)	
P1173	17581	Angle sender 2 for throttle valve actuator -G188 Signal too great 1) 3)	

1) With this fault, engine control unit switches on EPC warning lamp in dash panel insert. Significance of EPC warning lamp =>Page 108 .

3) With this fault the engine control unit switches on exhaust gas warning lamp immediately after detecting fault. Significance of MIL warning lamp => 1.

Fault code		Fault readout	Fault remedy
SAE	V.A.G		Check lambda probe ageing of lambda probe before catalytic converter => Page 82 Check lambda probe and lambda control after catalytic converter => Page 85 Check lambda probe heating for lambda probe => Page 91
P1176	17584	Bank1, lambda correction after catalytic converter Control limit reached	
P1177	17585	Bank2, lambda correction after catalytic converter Control limit reached	
P1198	17606	Bank1, probe 2, heating circuit Electrical fault 2)	

P1199	17607	Bank2, probe 2, heating circuit Electrical fault2)	Check lambda probe heating for lambda probe => Page 91
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2) With this fault the engine control unit only switches on exhaust gas warning lamp (MIL), if fault has been re-detected after two engine re-starts. Significance of MIL warning lamp => 1.

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P1201	17609	Injector, cylinder 1 -N30 Electrical fault in circuit 2)	Check injectors =>Page 61
P1202	17610	Injector, cylinder 2 -N31 Electrical fault in circuit 2)	
P1203	17611	Injector, cylinder 3 -N32 Electrical fault in circuit 2)	
P1204	17612	Injector, cylinder 4 -N33 Electrical fault in circuit 2)	
P1205	17613	Injector, cylinder 5 -N83 Electrical fault in circuit 2)	
P1206	17614	Injector, cylinder 6 -N84 Electrical fault in circuit 2)	

2) With this fault the engine control unit only switches on exhaust gas warning lamp (MIL), if fault has been re-detected after two engine re-starts. Significance of MIL warning lamp => 1.

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P1213	17621	Injector, cylinder 1 -N30 Short to positive 2)	Check injectors =>Page 61
P1214	17622	Injector, cylinder 2 -N31 Short to positive 2)	
P1215	17623	Injector, cylinder 3 -N32 Short to positive 2)	
P1216	17624	Injector, cylinder 4 -N33 Short to positive 2)	
P1217	17625	Injector, cylinder 5 -N83 Short to positive 2)	
P1218	17626	Injector, cylinder 6 -N84 Short to positive 2)	

2) With this fault the engine control unit only switches on exhaust gas warning lamp (MIL), if fault has been re-detected after two engine re-starts. Significance of MIL warning lamp => 1.

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P1225	17633	Injector, cylinder 1 -N30 Short to earth 2)	Check injectors =>Page 61
P1226	17634	Injector, cylinder 2 -N31 Short to earth 2)	
P1227	17635	Injector, cylinder 3 -N32 Short to earth 2)	
P1228	17636	Injector, cylinder 4 -N33 Short to earth 2)	
P1229	17637	Injector, cylinder 5 -N83 Short to earth 2)	



Fault code		Fault readout	Fault remedy
P1230	17638	Injector, cylinder 6 -N84 Short to earth 2)	

2) With this fault the engine control unit only switches on exhaust gas warning lamp (MIL), if fault has been re-detected after two engine re-starts. Significance of MIL warning lamp => **1**.

Fault code		Fault readout	Fault remedy
SAE	V.A.G		Check injectors =>Page 61
P1237	17645	Injector, cylinder 1 -N30 Open circuit 2)	
P1238	17646	Injector, cylinder 2 -N31 Open circuit 2)	
P1239	17647	Injector, cylinder 3 -N32 Open circuit 2)	
P1240	17648	Injector, cylinder 4 -N33 Open circuit 2)	
P1241	17649	Injector, cylinder 5 -N83 Open circuit 2)	
P1242	17650	Injector, cylinder 6 -N84 Open circuit 2)	

2) With this fault the engine control unit only switches on exhaust gas warning lamp (MIL), if fault has been re-detected after two engine re-starts. Significance of MIL warning lamp => **1**.

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P1250	17658	Fuel level too low	

- Resulting fault, see note
Refuel vehicle, erase fault memory
Interrogate fault memory of dash panel insert
=> Electrical System; Repair Group 01; Dash panel insert self-diagnosis
Dash panel insert self-diagnosis

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The information "Fuel level too low" is stored only in conjunction with misfiring or faults concerning lambda control if too little fuel is or was in the tank. The fault is stored in the control unit as static fault and is not set as a sporadic fault even if the vehicle is refuelled in the meantime by the customer.

Fault code		Fault readout	Fault remedy
SAE	V.A.G		=> Mechanical Components; Repair Group 21; Boost air system with exhaust gas turbocharger; Testing air recirculation valve for turbocharger -N249. Boost air system with exhaust gas turbocharger; Testing air recirculation valve for turbocharger -N249.
P1287	17695	Air recirculation valve for turbocharger -N249 Open circuit.	
P1288	17696	Air recirculation valve for turbocharger -N249 Short to positive	
P1289	17697	Air recirculation valve for turbocharger -N249 Short to earth	

P1296	17704	Fault in coolant system 2)	Check coolant temperature sender => Page 144 Check coolant thermostat => Mechanical Components; Repair Group 19; Cooling system; Parts of cooling system on front engine side Cooling system; Parts of cooling system on front engine side
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2) With this fault the engine control unit only switches on exhaust gas warning lamp (MIL), if fault has been re-detected after two engine re-starts. Significance of MIL warning lamp => 1 .

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P1325	17733	Knock control, cylinder 1 Control limit reached	Check knock control => Page 148
P1326	17734	Knock control, cylinder 2 Control limit reached	
P1327	17735	Knock control, cylinder 3 Control limit reached	
P1328	17736	Knock control, cylinder 4 Control limit reached	
P1329	17737	Knock control, cylinder 5 Control limit reached	
P1330	17738	Knock control, cylinder 6 Control limit reached	

2.4 - Fault codes up to fault code P1854 (18262)

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P1335	17743	Engine torque monitoring 2 Control limit exceeded 1)	Check hoses (pressure hoses, hose clamps that may have become loose) =>Page 144 .

1) With this fault, engine control unit switches on EPC warning lamp in dash panel insert. Significance of EPC warning lamp => 108 .

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P1336	17744	Engine torque monitoring Control limit exceeded	Check hoses (pressure hoses, hose clamps that may have become loose) =>Page 144 . If the above operations were carried out successfully, replace engine control unit

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P1337	17745	Bank 1, camshaft position sensor => - G163 Short to earth 2)	Check Hall sender

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P1338	17746	Bank 1, camshaft position sensor => - G163 Open circuit/short to positive 2)	=> Page 153
P1340	17748	Camshaft/crankshaft position sensor Incorrect assignment 2)	Check phase position of Hall sender =>Page 153 .
P1347	17755	Bank 2, camshaft/crankshaft position sensor Incorrect assignment 2)	

2) With this fault the engine control unit only switches on exhaust gas warning lamp (MIL), if fault has been re-detected after two engine re-starts. Significance of MIL warning lamp => 1 .

Note:

Camshaft position sensor at fault code 17748 refers to bank 1 sensor.

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P1355	17763	Ignition actuation, cylinder 1 Open circuit 2)	Check actuation of output stages =>Page 139
P1356	17764	Ignition actuation, cylinder 1 Short to positive 2)	
P1357	17765	Ignition actuation, cylinder 1 Short to earth 2)	
P1358	17766	Ignition actuation, cylinder 2 Open circuit 2)	
P1359	17767	Ignition actuation, cylinder 2 Short to positive 2)	
P1360	17768	Ignition actuation, cylinder 2 Short to earth 2)	



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2) With this fault the engine control unit only switches on exhaust gas warning lamp (MIL), if fault has been re-detected after two engine re-starts. Significance of MIL warning lamp => 1 .

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P1361	17769	Ignition ac- tuation, cylin- der 3 Open circuit 2)	Check actuation of out- put stages =>Page 139
P1362	17770	Ignition ac- tuation, cylin- der 3 Short to posi- tive 2)	
P1363	17771	Ignition ac- tuation, cylin- der 3 Short to earth 2)	
P1364	17772	Ignition ac- tuation, cylin- der 4 Open circuit 2)	
P1365	17773	Ignition ac- tuation, cylin- der 4 Short to posi- tive 2)	
P1366	17774	Ignition ac- tuation, cylin- der 4 Short to earth 2)	

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2) With this fault the engine control unit only switches on exhaust gas warning lamp (MIL), if fault has been re-detected after two engine re-starts. Significance of MIL warning lamp => **1**.

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P1367	17775	Ignition ac- tuation, cylin- der 5 Open circuit 2)	Check actuation of out- put stages =>Page 139
P1368	17776	Ignition ac- tuation, cylin- der 5 Short to posi- tive 2)	
P1369	17777	Ignition ac- tuation, cylin- der 5 Short to earth 2)	
P1370	17778	Ignition ac- tuation, cylin- der 6 Open circuit 2)	



P1371	17779	Ignition actuation, cylinder 6 Short to positive 2)	
P1372	17780	Ignition actuation, cylinder 6 Short to earth 2)	

2) With this fault the engine control unit only switches on exhaust gas warning lamp (MIL), if fault has been re-detected after engine re-start. Significance of MIL warning lamp => **1**.

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P1386	17794	Control unit defective	Renew engine control unit => Page 55
P1387	17795	Control unit defective 2)	
P1388	17796	Control unit defective 1)	

1) With this fault, engine control unit switches on EPC warning lamp in dash panel insert. Significance of EPC warning lamp => **108**.

2) With this fault the engine control unit only switches on exhaust gas warning lamp (MIL), if fault has been re-detected after two engine re-starts. Significance of MIL warning lamp => **1**.

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P1391	17799	Bank 2, camshaft position sensor => -G40 Short to earth 2)	Check Hall sender => Page 153
P1392	17800	Bank 2, camshaft position sensor => -G40 Open circuit, short to positive 2)	
P1409	17817	Tank breather valve -N80 Electrical fault in circuit 2)	Check solenoid valve 1 for active carbon canister => Page 104
P1410	17818	Tank breather valve -N80 Short to positive 2)	

2) With this fault the engine control unit only switches on exhaust gas warning lamp (MIL), if fault has been re-detected after two engine re-starts. Significance of MIL warning lamp => **1**.

Fault code		Fault readout	Fault remedy
SAE	V.A.G		

P1411	17819	Bank 2, secondary air system Throughput too small 2)	Check secondary air pump fuse Check vacuum hoses Check hoses from pump to secondary air inlet valve (combination valve) => 6-cylinder engine, Mechanical Components; Repair Group 26; Secondary air system
P1414	17822	Bank 2, secondary air system Leakage detected	Check hoses from pump to mechanical secondary air inlet valve, cylinder bank 2 => 6-cylinder engine, Mechanical Components; Repair Group 26; Secondary air system

2) With this fault the engine control unit only switches on exhaust gas warning lamp (MIL), if fault has been re-detected after two engine re-starts. Significance of MIL warning lamp => 1.

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P1420	17828	Secondary air inlet valve - N112 Electrical fault in circuit 2)	Check secondary air inlet valve -N112 => 6-cylinder engine, Mechanical Components; => Repair Group 26; Exhaust system; Testing secondary air inlet valve -N112
P1421	17829	Secondary air inlet valve - N112 Short to earth 2)	
P1422	17830	Secondary air inlet valve - N112 Short to positive 2)	

2) With this fault the engine control unit only switches on exhaust gas warning lamp (MIL), if fault has been re-detected after two engine re-starts. Significance of MIL warning lamp => 1.

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Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P1423	17831	Bank 1, secondary air system Throughput too small 2)	Test secondary air pump fuse Check vacuum hoses Check hoses from pump to secondary air inlet valve (combination valve) => 6-cylinder engine, Mechanical Components; Repair Group 26; Secondary air system



P1424	17832	Bank 1, secondary air system Leakage detected	Check hoses from pump to mechanical secondary air inlet valve, cylinder bank 1 => 6-cylinder engine, Mechanical Components; Repair Group 26; Secondary air system
P1425	17833	Tank breather valve -N80 Short to earth 2)	Check solenoid valve 1 for active carbon canister => Page 104
P1426	17834	Tank breather valve -N80 Open circuit 2)	

2) With this fault the engine control unit only switches on exhaust gas warning lamp (MIL), if fault has been re-detected after two engine re-starts. Significance of MIL warning lamp => 1.

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P1432	17840	Secondary air inlet valve -N112 Open circuit 2)	Check secondary air inlet valve -N112 => 6-cylinder engine, Mechanical Components; => Repair Group 26; Exhaust system; Checking secondary air inlet valve -N112 => Mechanical Components; Repair Group 26; Exhaust system; Testing secondary air pump relay -J299 and actuation Exhaust system; Testing secondary air pump relay -J299 and actuation
P1433	17841	Secondary air pump relay -J299 Open circuit 2)	
P1434	17842	Secondary air pump relay -J299 Short to positive 2)	
P1435	17843	Secondary air pump relay -J299 Short to earth 2)	
P1436	17844	Secondary air pump relay -J299 Electrical fault in circuit 2)	

2) With this fault the engine control unit only switches on exhaust gas warning lamp (MIL), if fault has been re-detected after two engine re-starts. Significance of MIL warning lamp => 1.

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P1453	17861	Exhaust gas temperature sender 1 -G235 Open circuit / short to positive	=> Mechanical Components; Repair Group 26; Testing exhaust gas temperature sender 1 -G235 Testing exhaust gas temperature sender 1 -G235
P1454	17862	Exhaust gas temperature sender 1 -G235 Short to earth	
P1455	17863	Exhaust gas temperature sender 1 -G235 Implausible signal	
P1456	17864	Exhaust gas temperature control, bank 1 Control limit reached	=> Mechanical Components; Repair Group 26; Testing exhaust gas temperature control Testing exhaust gas temperature control

Fault code		Fault readout	Fault remedy
SAE	V.A.G		

P1457	17865	Exhaust gas temperature sender 2 -G235 Open circuit / short to positive	=> Mechanical Components; Repair Group 26; Testing exhaust gas temperature sender 2 -G236 Testing exhaust gas temperature sender 2 -G236
P1458	17866	Exhaust gas temperature sender 2 -G235 Short to earth	
P1459	17867	Exhaust gas temperature sender 2 -G235 Implausible signal	
P1460	17868	Exhaust gas temperature control, bank 2 Control limit reached	=> Mechanical Components; Repair Group 26; Testing exhaust gas temperature control Testing exhaust gas temperature control
P1461	17869	Exhaust gas temperature control, bank 1 Implausible signal	
P1462	17870	Exhaust gas temperature control, bank 2 Implausible signal	

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P1500	17908	Fuel pump relay -J17 Electrical fault in circuit 2)	Check fuel pump relay =>Page 71 .
P1501	17909	Fuel pump relay -J17 Short to earth 2)	
P1502	17910	Fuel pump relay -J17 Short to positive 2)	

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2) With this fault the engine control unit only switches on exhaust gas warning lamp (MIL), if fault has been re-detected after two engine re-starts. Significance of MIL warning lamp => 1 .

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P1519	17927	Bank 1, camshaft adjustment Malfunction	=> Mechanical Components; Repair Group 15; Checking camshaft adjustment; Checking function of camshaft adjustment Checking camshaft adjustment; Checking function of camshaft adjustment
P1522	17930	Bank 2, camshaft adjustment Malfunction	
P1523	17931	Crash signal from airbag control unit Implausible signal	Test crash signal => Page 130
P1525	17933	Bank 1, camshaft adjustment - N205 Electrical fault in circuit	=> Mechanical Components; Repair Group 15; Checking camshaft adjustment; Checking valve 1 for camshaft adjustment -N205 Checking camshaft adjustment; Checking valve 1 for camshaft adjustment -N205
P1526	17934	Bank 1, camshaft adjustment - N205 Short to positive	
P1527	17935	Bank 1, camshaft adjustment - N205 Short to earth	



Fault code		Fault readout	Fault remedy
P1528	17936	Bank 1, camshaft adjustment - N205 Open circuit.	

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P1533	17941	Bank 2, camshaft adjustment - N208 Electrical fault in circuit	=> Mechanical Components; Repair Group 15; Checking camshaft adjustment; Checking valve 2 for camshaft adjustment -N208 Checking camshaft adjustment; Checking valve 2 for camshaft adjustment -N208
P1534	17942	Bank 2, camshaft adjustment - N208 Short to positive	
P1535	17943	Bank 2, camshaft adjustment - N208 Short to earth	
P1536	17944	Bank 2, camshaft adjustment - N208 Open circuit.	
P1539	17947	Clutch pedal switch -F36 Implausible signal	- Test clutch pedal switch => Page 129

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P1542	17950	Angle sender for throttle valve actuator -G187 Implausible signal 1) 3)	Checking angle sender for throttle valve actuator => Page 112
P1543	17951	Angle sender for throttle valve actuator -G187 Signal too small 1) 3)	
P1544	17952	Angle sender for throttle valve actuator -G187 Signal too great 1) 3)	Test angle sender for throttle valve actuator => Page 112
P1545	17953	Throttle valve control Malfunction 1) 3)	Check throttle valve control => Page 109 .
P1546	17954	Boost pressure control solenoid valve -N75 Short to positive	=> Mechanical Components; Repair Group 21; Boost air system with exhaust gas turbocharger Boost air system with exhaust gas turbocharger
P1547	17955	Boost pressure control solenoid valve -N75 Short to earth	
P1548	17956	Boost pressure control solenoid valve -N75 Open circuit.	

1) With this fault, engine control unit switches on EPC warning lamp in dash panel insert. Significance of EPC warning lamp => 108 .

3) With this fault the engine control unit switches on exhaust gas warning lamp immediately after detecting fault. Significance of MIL warning lamp => 1 .

Fault code		Fault readout	Fault remedy
SAE	V.A.G		

P1555	17963	Maximum boost pressure exceeded	=> Mechanical Components; Repair Group 21; Boost air system with exhaust gas turbocharger Boost air system with exhaust gas turbocharger
P1556	17964	Boost pressure control Control limit not reached	=> Mechanical Components; Repair Group 21; Boost air system with exhaust gas turbocharger Boost air system with exhaust gas turbocharger
P1557	17965	Boost pressure control Control limit exceeded	

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P1558	17966	Throttle valve drive -G186 Electrical fault in circuit 1) 3)	Test throttle valve control unit => Page 109 .
P1559	17967	Throttle valve control unit -J338 Fault in basic setting 2)	Perform adaptation =>Page 110 .
P1560	17968	Maximum engine speed exceeded	Rectify possible mechanical damage
P1564	17972	Throttle valve control unit -J338 Undervoltage during basic setting	Charge battery, repeat basic setting or adaptation =>Page 110 .
P1565	17973	Throttle valve control unit -J338 Lower stop not reached 1) 3)	Test throttle valve control unit => Page 109 .
P1568	17976	Throttle valve control unit -J338 Mechanical fault 1) 3)	

1) With this fault, engine control unit switches on EPC warning lamp in dash panel insert. Significance of EPC warning lamp =>Page 108 .

2) With this fault the engine control unit only switches on exhaust gas warning lamp (MIL), if fault has been re-detected after two engine re-starts. Significance of MIL warning lamp => 1 .

3) With this fault the engine control unit switches on exhaust gas warning lamp immediately after detecting fault. Significance of MIL warning lamp => 1 .

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P1569	17977	CCS Switch -E45 Implausible signal	Test cruise control system switch => Electrical System; Repair Group 01; Self-diagnosis for cruise control system (CCS)
P1570	17978	and the engine control unit disabled	Adjust electronic immobiliser to match the engine control unit => Electrical System; Repair Group 01; Self-diagnosis for immobiliser
P1579	17987	Throttle valve control unit -J338 Adaptation not started	- Carry out adaptation of throttle valve control unit in accordance with preconditions => Page 110
P1600	18008	Voltage supply, terminal 15 Voltage too low	Check supply voltage to engine control unit =>Page 147 .
P1602	18010	Voltage supply, terminal 30 Voltage too low	

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P1603	18011	Control unit defective	Renew engine control unit =>Page 55 .
P1604	18012	Control unit defective 1)	



P1606	18014	Rough-road detection/engine specified torque from ABS control unit Electrical fault in circuit	Check cable connection to ABS control unit => Page 131
P1609	18017	Crash cut-off was activated	Accident involving activation of airbag or a final control diagnosis was carried out in airbag control unit, which caused a fault entry in engine control unit (erase fault memory); Notes on crash cut-off => Page 130
P1612	18020	Engine control unit incorrectly coded 1) 3)	Check coding or code engine control unit => Page 35

1) With this fault, engine control unit switches on EPC warning lamp in dash panel insert. Significance of EPC warning lamp => 108 .

3) With this fault the engine control unit switches on exhaust gas warning lamp immediately after detecting fault. Significance of MIL warning lamp => 1 .

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P1620	18028	Coolant temperature signal Open circuit / short to positive	Check coolant temperature sender => Page 125 . Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by Audi AG. All rights reserved. Copyright by Audi AG.
P1621	18029	Coolant temperature signal Short to earth	
P1622	18030	Coolant temperature signal Implausible signal	

Note on fault codes P1620, P1621 and P1622:

Engine control unit receives "coolant temperature signal" from dash panel insert. If engine control unit detects this signal, boost pressure is reduced.

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P1624	18032	Request fault lamp on, active	Exhaust-related fault from gearbox control unit, exhaust gas warning lamp (MIL) is switched on by gearbox control unit Read out fault memory of gearbox control unit => Automatic Gearbox; Repair Group 01; Performing self-diagnosis Performing self-diagnosis
P1626	18034	Data bus drive, no message from gearbox-CU	Testing data exchange between engine/ABS/ gearbox control unit =>Page 132 .

Note on fault code P1624:

- "Fault lamp" refers to exhaust gas warning lamp (MIL). In simple terms, the engine control unit switches on the "MIL" when faults are detected which cause deterioration of exhaust emissions.
- The "MIL" is usually switched on by the engine control unit, as an electrical cable connection only exists between engine control unit and "MIL".
- However, it is also possible for the gearbox control unit to detect faults which cause deterioration of exhaust emissions. These faults are also displayed by actuation of "MIL".
- If then the gearbox control unit detects a fault which causes engine emissions to deteriorate, the gearbox control unit sends a message to the engine control unit. The engine control unit then switches on the "MIL". Simultaneously, the "fault" P1624 is recorded in the engine control unit as an indication that the "MIL" was not switched on due to an engine problem, but due to a gearbox problem.

Fault code		Fault readout	Fault remedy
SAE	V.A.G		

P1630	18038	Accelerator position sender -G79 Signal too small 1)3)	Check accelerator position sender =>Page 114 .
P1631	18039	Accelerator position sender -G79 Signal too great 1)3)	
P1633	18041	Accelerator position sender 2 -G185 Signal too small 1)3)	
P1634	18042	Accelerator position sender 2 -G185 Signal too great 1)3)	

1) With this fault, engine control unit switches on EPC warning lamp in dash panel insert. Significance of EPC warning lamp => **108** .

3) With this fault the engine control unit switches on exhaust gas warning lamp immediately after detecting fault. Significance of MIL warning lamp => **1** .

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P1639	18047	Accelerator position sender -G79/-G185 Implausible signal 1) 3)	Check accelerator position sender =>Page 114 .
P1640	18048	Control unit Defective 2)	Renew engine control unit => Page 55
P1645	18053	Drive data bus No message from four-wheel drive electronics	Testing data exchange between engine/ABS/ gearbox control unit =>Page 132 .
P1648	18056	Drive data bus Defective 2)	

1) With this fault, engine control unit switches on EPC warning lamp in dash panel insert. Significance of EPC warning lamp => **108** .

2) With this fault the engine control unit only switches on exhaust gas warning lamp (MIL), if fault has been re-detected after two engine re-starts. Significance of MIL warning lamp => **1** .

3) With this fault the engine control unit switches on exhaust gas warning lamp immediately after detecting fault. Significance of MIL warning lamp => **1** .

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P1649	18057	Drive data bus No message from ABS control unit	Interrogate ABS fault memory => Running Gear Self-diagnosis for ABS, ESP; Repair Group 01; Interrogating fault memory Testing data exchange between engine/ABS/ gearbox control unit =>Page 132 .
P1650	18058	Drive data bus No message from dash panel	Check data exchange via bus system => Page 132 .
P1654	18062	Read out fault memory of dash panel insert	Read out fault memory of dash panel insert

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P1676	18084	Electrical throttle actuator fault lamp -K132 Electrical fault in circuit 1)	Significance of the EPC control lamp =>Page 108 .



P1677	18085	Electrical throttle actuator fault lamp -K132 Short to positive 1)	
P1690	18098	Fault lamp for self-diagnosis - K83 Electrical fault in circuit 2)	Check wiring from engine control unit to exhaust gas warning lamp => Page 1 .
P1693	18101	Fault lamp for self-diagnosis - K83 Short to positive 2)	

1) With this fault, engine control unit switches on EPC warning lamp in dash panel insert. Significance of EPC warning lamp => 108 .

2) With this fault the engine control unit only switches on exhaust gas warning lamp (MIL), if fault has been re-detected after engine re-start. Significance of MIL warning lamp => 1 .

Note:

The fault lamp for electrical throttle activation - K132 is also known as the EPC control lamp.

Fault code		Fault readout	Fault remedy
SAE	V.A.G		
P1851	18259	Data bus drive, no message from ABS-CU	Interrogate ABS fault memory => Running Gear Self-diagnosis for ABS, ESP; Repair Group 01; Interrogating fault memory
P1853	18261	Drive data bus Implausible message from ABS-CU	
P1854	18262	Data bus drive hardware defective	Testing data exchange between engine/ABS/gearbox control unit =>Page 132 .

3 - Final control diagnosis

3.1 - Final control diagnosis

Notes:

- ♦ The final control diagnosis can only be performed with the engine stopped and the ignition switched on.
- ♦ The final control diagnosis is terminated if the engine is started or if an engine speed pulse is detected.
- ♦ During final control diagnosis, the individual control elements are operated in turn for about one minute (except injectors) unless the next control element is selected by pressing the ➡ key.
- ♦ The control elements can be checked acoustically or by way of touch.
- ♦ Engine must be started before repeating the final control diagnosis. (Engine control unit has to have recognised a speed greater than 300 rpm.)
- ♦ The electric fuel pump runs throughout the final control diagnosis.

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

Actuation sequence
1 Solenoid valve 1 for activated charcoal filter -N80 (Tank breather valve -N80)
2 Secondary air inlet valve -N112
3 Secondary air pump relay -J299
4 Boost pressure control solenoid valve -N75
5 Bank 2, camshaft adjustment -N208
6 Air recirculation valve for turbocharger -N249

Actuation sequence
7 Bank 1, camshaft adjustment -N205
8 Intake air change-over valve -N335
9 Injector, cylinder 1 -N30
10 Injector, cylinder 4 -N33
11 Injector, cylinder 3 -N32
12 Injector, cylinder 6 -N84
13 Injector, cylinder 2 -N31
14 Injector, cylinder 5 -N83

Test conditions

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- Fuses for engine electronics OK
- Fuel pump relay OK.
- Connect vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "Address word" 01 => Page 3 .
For this purpose, the ignition must be switched on.

-> Display:

Rapid data transfer HELP
Select function XX

- Press keys 0 and 3 for "Final control diagnosis" function

-> Display:

Rapid data transfer Q
03 - Final control diagnosis

Actuation of activated charcoal filter system solenoid valve (tank breather valve)

- Confirm input with Q key.

-> Display:

Final control diagnosis
Tank breather valve -N80

This solenoid valve is actuated (clicks) for approx. one minute if the operation is not switched to the next control element by pressing the ➡ key.

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

- Check the activated charcoal filter system solenoid valve 1 -N80 =>Page 104 .

Actuation of secondary air inlet valve

- Press the ➡key.

-> Display:

Final control diagnosis
Secondary air inlet valve -N112

This valve is actuated (clicks) for approx. one minute if the operation is not switched to the next control element by pressing the ➡ key.

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

- Check secondary air inlet valve -N112



=> Mechanical Components; Repair Group 26; Testing secondary air inlet valve Testing secondary air inlet valve

Actuation of secondary air pump relay

Note:

- Press the ⇒key.

-> Display:

Final control diagnosis
Secondary air pump relay -J299

Secondary air pump relay -J299 actuates secondary air pump motor -V101. This runs intermittently for approx. one minute if the operation is not switched to the next control element by pressing the ⇒ key.

If secondary air pump does not run intermittently:

- Check secondary air pump relay -J299

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=> Mechanical Components; Repair Group 26; Testing secondary air pump relay -J299 Testing secondary air pump relay -J299

Solenoid valve for boost pressure limitation - N75 defective

- Press the ⇒key.

-> Display:

Final control diagnosis
Solenoid valve for boost pressure
limitation
-N75

This solenoid valve is actuated (clicks) for approx. one minute if the operation is not switched to the next control element by pressing the ⇒ key.

If the solenoid valve for boost pressure limitation does not click:

=> Mechanical Components; Repair Group 21; Boost air system with exhaust gas turbocharger; Checking boost pressure control solenoid valve -N75. Boost air system with exhaust gas turbocharger Checking boost pressure control solenoid valve -N75.

Actuate valve 2 for camshaft adjustment (N208) (bank 2)

- Press the ⇒key.

-> Display:

Final control diagnosis
Bank 2, camshaft adjustment -N208

- Valve 2 for camshaft adjustment -N208 is actuated (clicks) for approx. one minute if the operation is not switched to the next control element by pressing the ⇒key.

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

=> Mechanical Components; Repair Group 15; Checking camshaft adjustment; Checking camshaft adjustment solenoid valves Checking camshaft adjustment Checking camshaft adjustment solenoid valves

Actuating air recirculation valve for turbocharger

- Press the ⇒key.

-> Display:

Final control diagnosis
Air recirculation valve for turbocharger
-N249

This solenoid valve is actuated (clicks) for approx. one minute if the operation is not switched to the next control element by pressing the ⇒ key.

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

=> Mechanical Components; Repair Group 21; Boost air system with exhaust gas turbocharger; Testing air recirculation valve for turbocharger -N249 Boost air system with exhaust gas turbocharger Testing air recirculation valve for turbocharger -N249

Actuate valve 1 for camshaft adjustment (N205) (bank 1)

- Press the ⇒key.

-> Display:

Final control diagnosis
Bank 1, camshaft adjustment -N205

- Valve 1 for camshaft adjustment -N205 is actuated (clicks) for approx. one minute if the operation is not switched to the next control element by pressing the ⇒key.

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

=> Mechanical Components; Repair Group 15; Checking camshaft adjustment; Checking camshaft adjustment solenoid valves Checking camshaft adjustment Checking camshaft adjustment solenoid valves

Actuate intake air change-over valve -N335

- Press the ⇒key.

-> Display:

Final control diagnosis
Intake air change-over valve -N335

- The intake air change-over valve -N335 is actuated (clicks) for approx. one minute if the operation is not switched to the next control element by pressing the ⇒key.

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

Check intake air change-over valve

=>Page 100 .

Actuate injectors

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The injectors are actuated in firing order sequence, i.e. cyl. 1, cyl. 4, cyl. 3, cyl. 6, cyl. 2, cyl. 5.

- Press the ⇒key.

-> Display:

Final control diagnosis
Injector, cylinder 1 -N30

- Press the ⇒key.

-> Display:

Final control diagnosis
Injector, cylinder 1 -N30



After the arrow key is pressed, the injector must click five times.

If the injector does not click:

- Test injectors =>Page 61 .
- Press the ➡key.

-> Display:

Final control diagnosis
Injector, cylinder 4 -N33

- Press the ➡key.

-> Display:

Final control diagnosis
Injector, cylinder 4 -N33

After the arrow key is pressed, the injector must click five times.

If the injector does not click:

- Test injectors =>Page 61 .
- Press the ➡key.

-> Display:

Final control diagnosis
Injector, cylinder 3 -N32

- Press the ➡key.

-> Display:

Final control diagnosis
Injector, cylinder 3 -N32

After the arrow key is pressed, the injector must click five times.

If the injector does not click:

- Test injectors =>Page 61 .
- Press the ➡key.

-> Display:

Final control diagnosis
Injector, cylinder 6 -N84

- Press the ➡key.

-> Display:

Final control diagnosis
Injector, cylinder 6 -N84

After the arrow key is pressed, the injector must click five times.

If the injector does not click:

- Test injectors =>Page 61 .
- Press the ➡key.

-> Display:

Final control diagnosis
Injector, cylinder 2 -N31



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- Press the $\Rightarrow$ key.

-> Display:

Final control diagnosis
Injector, cylinder 2 -N31

After the arrow key is pressed, the injector must click five times.

If the injector does not click:

- Test injectors $\Rightarrow$ Page 61 .
- Press the $\Rightarrow$ key.

-> Display:

Final control diagnosis
Injector, cylinder 5 -N83

- Press the $\Rightarrow$ key.

-> Display:

Final control diagnosis
Injector, cylinder 5 -N83

After the arrow key is pressed, the injector must click five times.

If the injector does not click:

- Test injectors $\Rightarrow$ Page 61 .
- Press the $\Rightarrow$ key.

-> Display:

Final control diagnosis
END

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Press the $\Rightarrow$ key.

-> Display readout (function selection):

Rapid data transfer HELP
Select function XX

Important note:

The final control diagnosis can only then be started again after the engine has started and the ignition has been switched off and on again.

4 - Basic setting

4.1 - Basic setting

With engine stopped and ignition switched on, the following operation can be carried out with the "Function 04" basic setting:

- ♦ Adaptation of the throttle valve control unit to the engine control unit $\Rightarrow$ Display group 60 ($\Rightarrow$ Page 110)
- ♦ Vehicles with automatic gearbox: Learning kickdown function of accelerator position sender to engine control unit $\Rightarrow$ Display group 63 ($\Rightarrow$ Page 117)

With the engine running, the following operations can be performed with the basic setting function:

- ♦ Learning process for lambda control
 $\Rightarrow$ each display group



- ♦ Fault finding by selective activation and deactivation of the lambda control => Display group 99 (please note relevant instructions on Page 79).

Test conditions for operations with engine running

- No fault stored in fault memory
- Coolant temperature at least 80 oC (display group 4, display zone 3).
- Electrical consumers switched off (radiator fan must not run during the check)
- Air conditioner switched off
- Connect up vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "Address word" 01 => Page 3 .
For this purpose, the engine must be running at idle speed
- Interrogating and erasing fault memory.
=>Page 6 . No faults must be stored (if necessary, rectify fault, erase fault memory, switch off and re-start engine, perform test drive and interrogate the fault memory again as a check.
- Leave engine idling.

-> Display:

Rapid data transfer HELP
Select function XX

- Press keys 0 and 4

(04 is used to select the function "Basic Setting")

-> Display:

Rapid data transfer Q
04Basic setting

- Confirm entry with Q key.

-> Display:

Basic setting Q
Enter display group number XXX

Note:

Display group number 000 is used here as an example to demonstrate the procedure.

- Press key 0 three times.

(000 is used to select the function "Display group 000").

Note:

After the display group number is selected, the active carbon canister valve is closed and the air conditioner compressor is switched off.

-> Display:

Basic setting Q
Enter display group number 000

- Confirm entry with Q key.

-> Display:

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

Display group 000 (decimal readouts)

- Engine idling (coolant temperature not less than 80 oC)

Display group 000 (decimal readouts)												
Display zones										Specified value	Corresponds to	
1	2	3	4	5	6	7	8	9	10	Learned value for mixture formation Bank 2	108...148	-4...4 %
										Learned value for mixture formation Bank 1	108...148	-4...4 %
										Control value for mixture formation, bank 2 (if outside tolerance, perform test drive)	122...134	-4...4 %
										Control value for mixture formation, bank 1 (if outside tolerance, perform test drive)	122...134	-4...4 %
										Learned value for torque loss at idle	124...135	-3...5 %
										Idling torque	126...130	-1.5...1.5 %
										Throttle valve angle	1...7	0.4...2.75 %
										Engine speed (idling speed)	77...83	770...830 rpm
										Engine load (no consumption units)	21...34	15...26%
										Coolant temperature (requirement for basic setting)	177...203	85...105 oC

1) Current values:

=> Exhaust Emissions Check binder

- Run engine at idling speed for a few minutes, coolant temperature at least 80 oC.

Notes:

- ◆ Each time the PRINT key is pressed, the current display readout is printed out.
- ◆ Press the C key before selecting further display groups.
- If specified values are achieved in all display zones, press the => key.

-> Display:

Rapid data transfer HELP
Select function XX

- Press keys 0 and 6

(06 is used to select the function "End of output".)

-> Display:

Rapid data transfer Q
06 - End of output

- Confirm entry with Q key.

-> Display:

Rapid data transfer HELP
Select function XX

5 - Encoding control unit

5.1 - Encoding control unit

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- ◆ If engine control unit is replaced, the new unit must be subsequently checked to determine whether it has the correct coding.



- Connect up vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "Address word" 01 => Page 3 .
For this purpose, the ignition must be switched on.

-> The display on fault reader V.A.G 1551 will show the control unit identification code e.g.:

```
8D0907551.. 2.7l      V6/5VT      G
0002      "
Code 04711      WSC 06388
```

The code corresponding to the vehicle must be displayed, see encoding table
=>Page 36 .

Coding variants for the engine control unit

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Country/emissions	Drive/auxiliary functions	Gearbox	Model
04 = Emission standard EU II	6 = Four-wheel drive without traction control system/electronic stability program (with CAN bus system)	1 = 6-speed manual gearbox	1 = Audi A4
10 = Emission standard EU II	7 = Four-wheel drive with traction control system/electronic stability program (with CAN bus system)		

Notes:

- ♦ Traction control system is often abbreviated with "TCS". Electronic stability program is abbreviated with "ESP".
- ♦ If the vehicle is fitted with "ESP", this is shown by the "ESP" switch in the centre console.

The displayed code number is composed as follows (example):

Emission standard EU II	04
Four-wheel drive with traction control system/ electronic stability program	7
6-speed manual gearbox	1
Audi A4	1
Code number	04 7 1 1

If the corresponding vehicle coding is not displayed:

- Press the =>key.

-> When adjacent display appears:

```
Rapid data transfer      HELP
Select function XX
```

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

-> When adjacent display appears:

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

- Enter the corresponding vehicle control unit code as per encoding table and press the Q key => Page 36 .

-> If following message is displayed on tester:

```
Function unknown or cannot
be carried out at the moment
```

Please check using parts catalogue whether correct engine control unit is fitted (part number; control unit may not be codeable). It may also be possible that an unauthorised code number was entered. If necessary repeat the coding procedure.

- Press the =>key.

-> Display:

Rapid data transfer	HELP
Select function XX	

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

6 - Reading measured value block

6.1 - Reading measured value block

Test conditions

- Coolant temperature at least 80 °C.
 - Electrical consumers switched off (radiator fan **must not run during the check**)
 - Air conditioner switched off
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- Connect up vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "Address word" 01 => Page 3 .
 For this purpose, the engine must be running at idle speed

-> Display:

Rapid data transfer	HELP
Select function XX	

- Press keys 0 and 8 for the function "Read measured value block" and confirm entry with Q key.

-> Display:

Read measured value block 08
Enter display group number XXX

- Enter relevant display group number (3 figures) and confirm entry by pressing Q.

Note:

The choice of display group depends on the particular functions and components to be tested.

-> Display readout (for example):

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

Note:

To change to another display group, proceed as follows:

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



24 - Mixture preparation, Injection

1 - Servicing Motronic injection system

1.1 - Servicing Motronic injection system

1.2 - Safety precautions

Note the following points if testers and measuring instruments have to be used during a road test:

- ♦ Testers and measuring instruments must always be secured to the rear seat and operated by a 2nd person from this location.

If test equipment were operated from the front passenger seat, the person sitting there could be injured if the front passenger airbag were triggered in the event of an accident.

Important!

Secure fault reader to the rear seat and operate from this location.

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

- ♦ Always switch off the ignition before connecting or disconnecting injection or ignition system wiring or tester cables.
- ♦ To run engine at starting speed without actually starting it (for example, in order to test compression), unplug connector from the output stage of the ignition coils and also the connectors on the injectors.
- ♦ During certain tests it is possible that faults are detected and stored by the control unit. At the end of all tests and repairs, therefore, the fault memory should be interrogated and, if necessary, erased.
- ♦ Always switch off the ignition before washing the engine.
- ♦ Always switch off the ignition before connecting or disconnecting the battery, otherwise the engine control unit may be damaged.

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Important!

The fuel system is pressurised! Before loosening hose connections or opening the test connection (to measure fuel pressure), place a cloth around the connection. Then release pressure by carefully loosening the connection.

1.3 - Rules for cleanliness

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

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

Ensure that connections are dry when connecting.

1.4 - Technical data

Engine code letters	ASJ (conforms to emission standard EU II at start of production) ASJ (already conforms to emission standard EU III at start of production)	
Idling speed Not adjustable - controlled by the idling speed stabilisation	750...850 rpm	
Engine speed limitation by deactivation of injectors	approx. 7200 rpm	
Fuel pressure at idling speed	Vacuum hose connected	approx. 3.5 bar
	Vacuum hose disconnected	approx. 4 bar
Holding pressure after 10 minutes	at least 2.5 bar	
Injectors	Spray pattern	Same for all injectors
	Injection quantity (30 s)	210...230 ml
	Resistance (room temperature) ¹⁾	13.5...15.5 ω

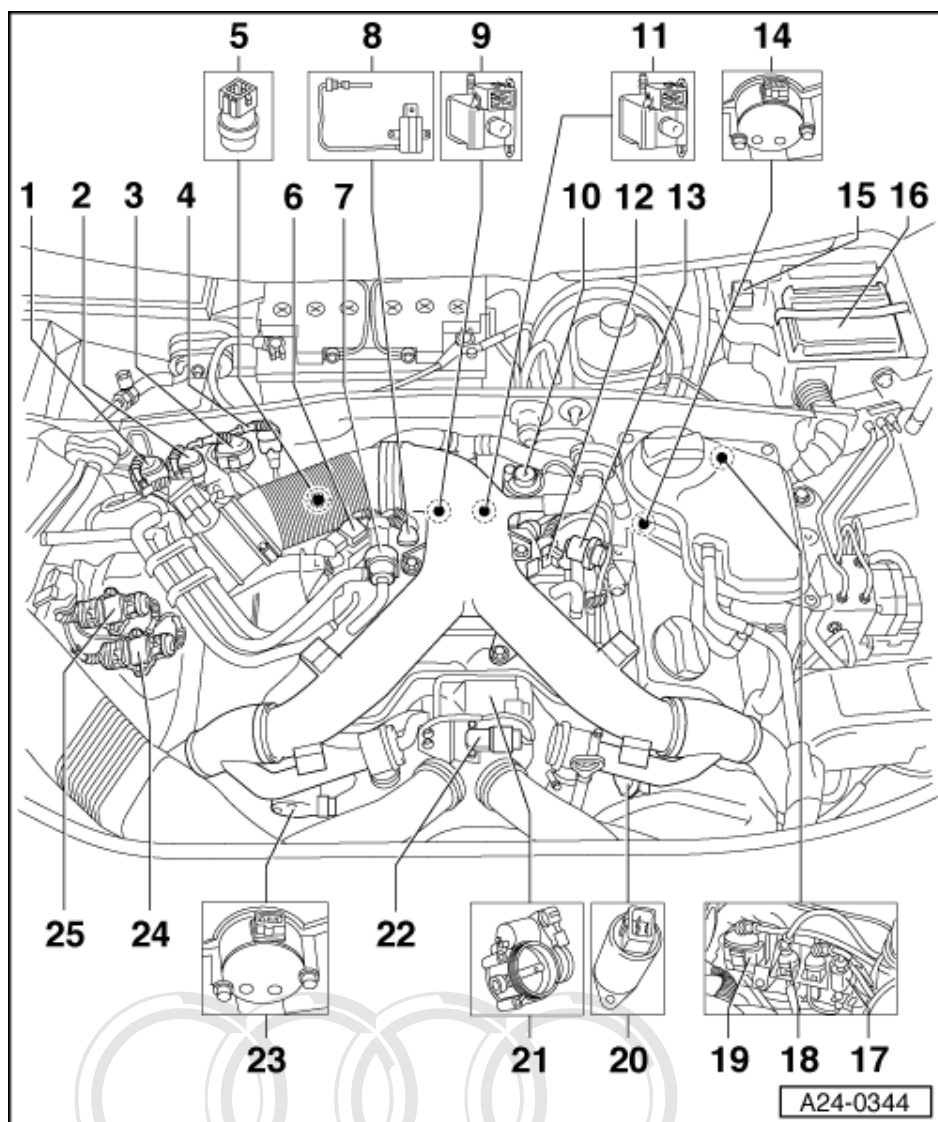
1) When the engine is at operating temperature the resistance of the injectors is increased by approx. 4 - 6 ω .

1.5 - Fitting locations overview

Components A to H are not shown in the following exploded views.

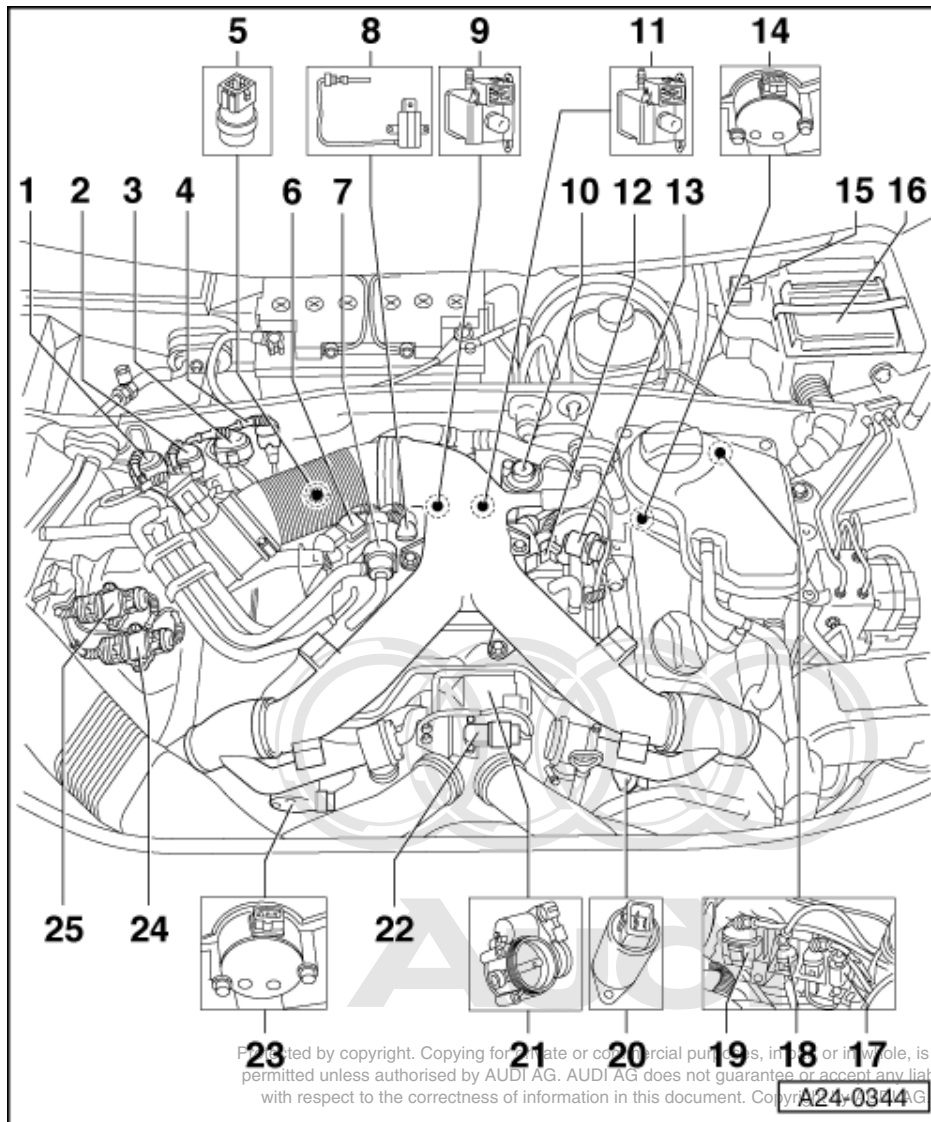
- A - Brake light switch (F) and brake pedal switch (F47)**
 - ♦ in footwell on pedal bracket near brake pedal
- B - Diagnosis plug**
 - ♦ in rear ashtray on central console
- C - Fuel pump relay**
 - ♦ At relay position 4 of the central electronics beneath dash panel
- D - Clutch pedal switch (F36)**
 - ♦ in footwell on pedal bracket near brake pedal
- E - Sender for accelerator position (G79) and sender 2 for accelerator position (G185)**
 - ♦ in footwell on accelerator pedal (both senders are accommodated in one housing)
- F - "EPC" warning lamp**
 - ♦ in dash panel insert (significance of lamp
=>Page 108 .
- G - Bank 1, lambda probe 2 -G130 with lambda probe heating -Z29**
 - ♦ This lambda probe is accessible from below after raising vehicle.
- H - Bank 2, lambda probe 2 -G131 with lambda probe heating -Z30**
 - ♦ This lambda probe is accessible from below after raising vehicle.

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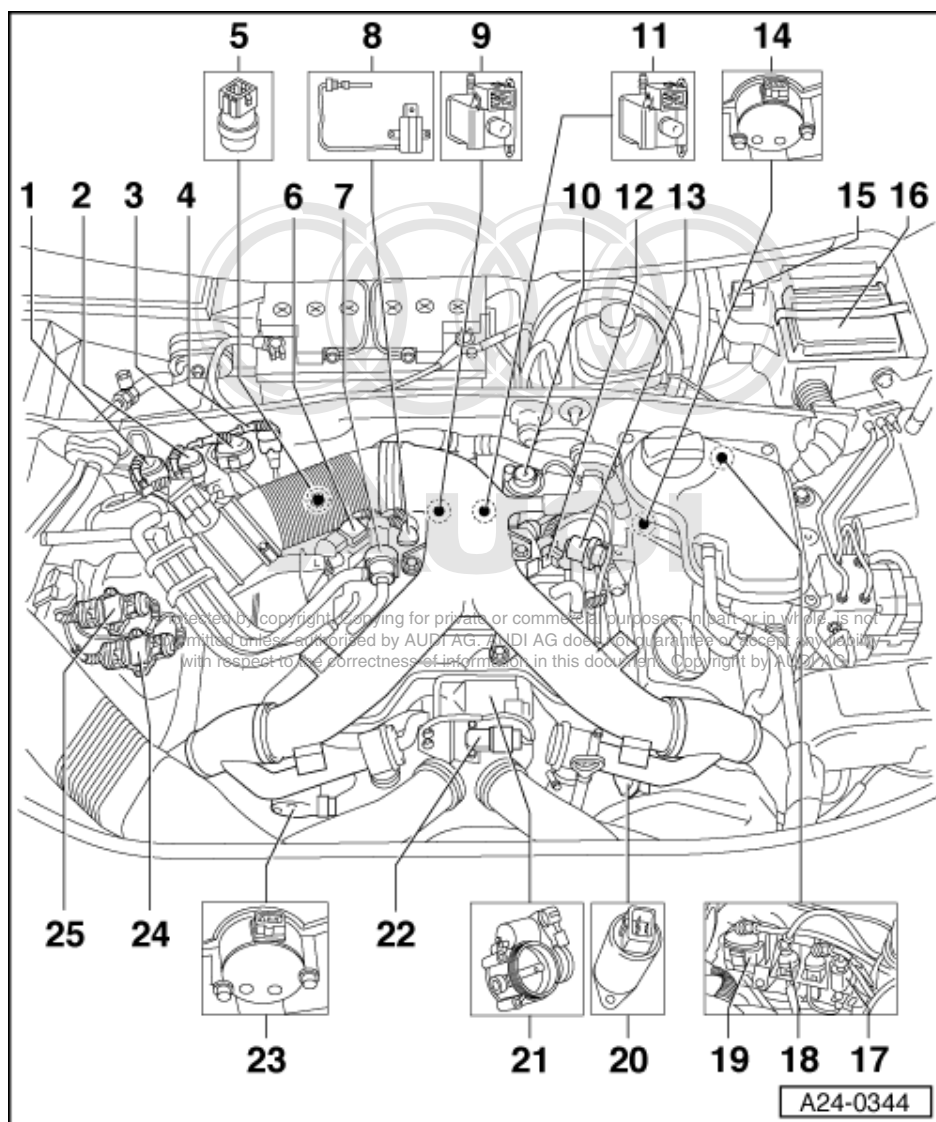


- 1** Connector for bank 1, lambda probe 2 -G130 and lambda probe heating -Z29
♦ 4-pin/green
- 2** Connector for bank 2, lambda probe 2 -G131 and lambda probe heating -Z30
♦ 4-pin/brown
- 3** Connector for bank 1, lambda probe 1 -G39 and lambda probe heating -Z19
♦ 4-pin/black

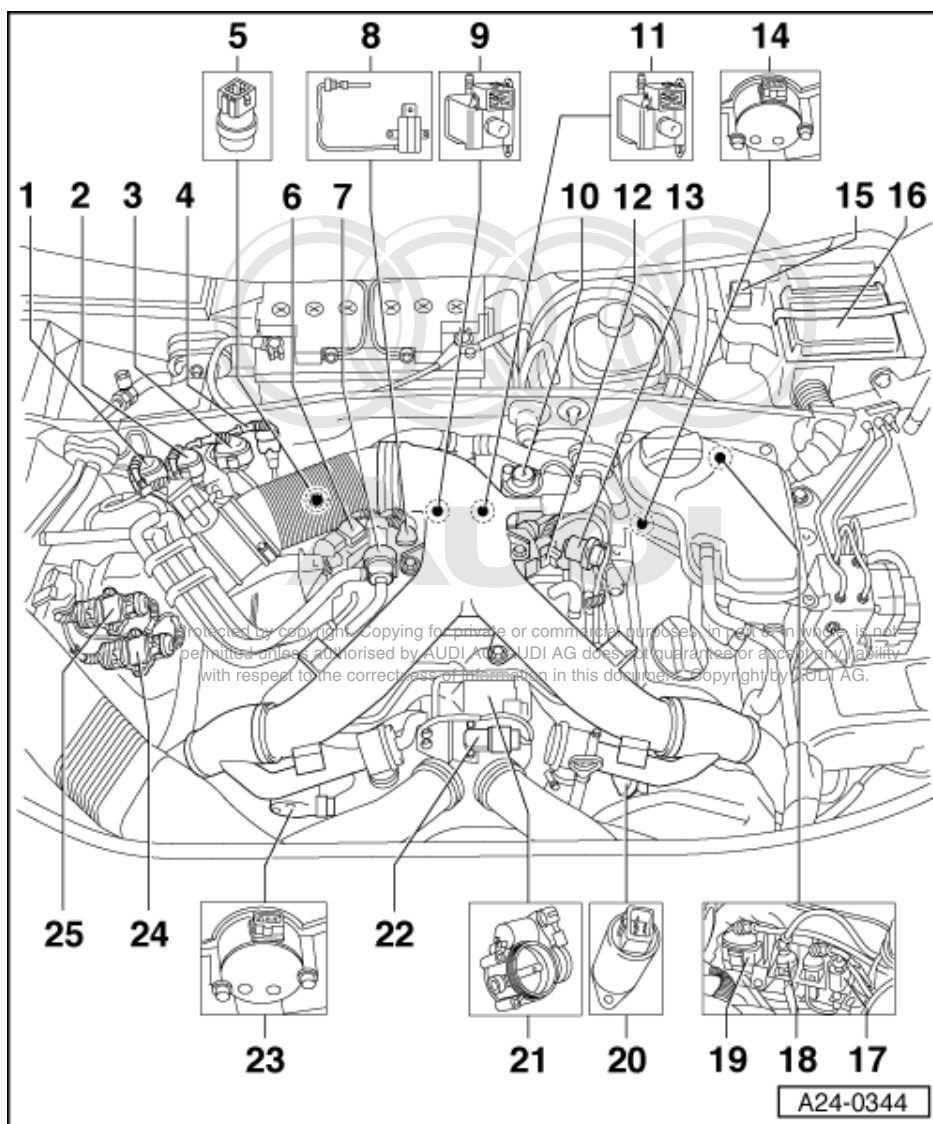
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- 4 3-pin connector
 - ♦ For knock sensor 1 (G61)
- 5 Coolant temperature sender (G62)
 - ♦ On coolant pipe behind cylinder head, bank 1
- 6 Solenoid valve for boost pressure control (N75)
- 7 Activated charcoal filter solenoid valve 1 (N80)



- 8 Exhaust gas temperature sender 1 (G235) and exhaust gas temperature sender 2 (G236)
♦ Both senders are arranged one after the other; see also Page 48 .
- 9 Intake air change-over valve -N335
- 10 Secondary air pump motor -V101
- 11 Checking secondary air inlet valve -N112



12 Air recirculation valve for turbocharger (N249)

13 Fuel pressure regulator

14 Hall sender (G40)

- ♦ Cylinder bank 2

15 Secondary air pump relay (J299)

16 Engine control unit (J220)

17 3-pin connector

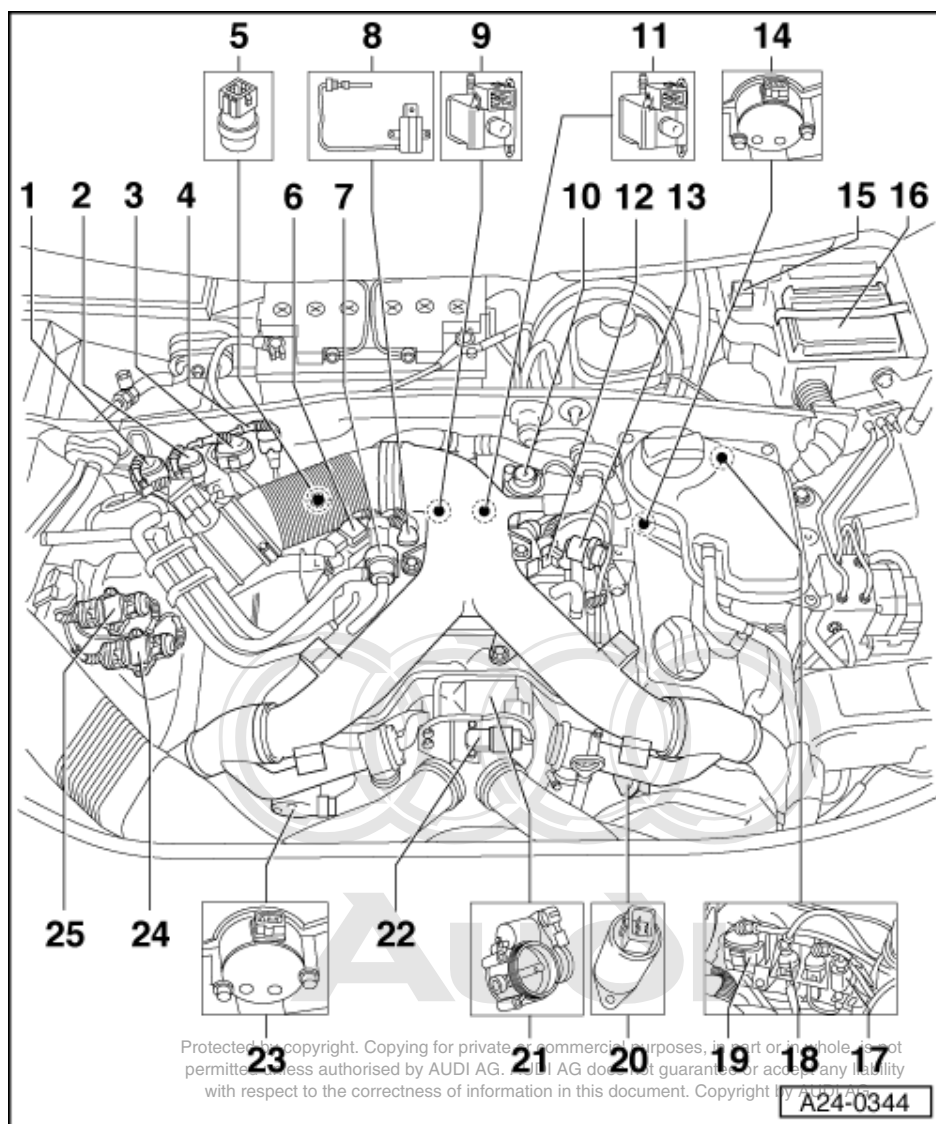
- ♦ For engine speed sender (G28)
- ♦ Grey

18 3-pin connector

- ♦ For knock sensor 2 (G66)

19 Connector for bank 2, lambda probe 1 -G108 and lambda probe heating -Z28

- ♦ 4-pin/black



20 Valve 2 for camshaft adjustment (N208)

21 Throttle valve control unit (J338)

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

22 Boost pressure sender -G31

23 Hall sender (G163)

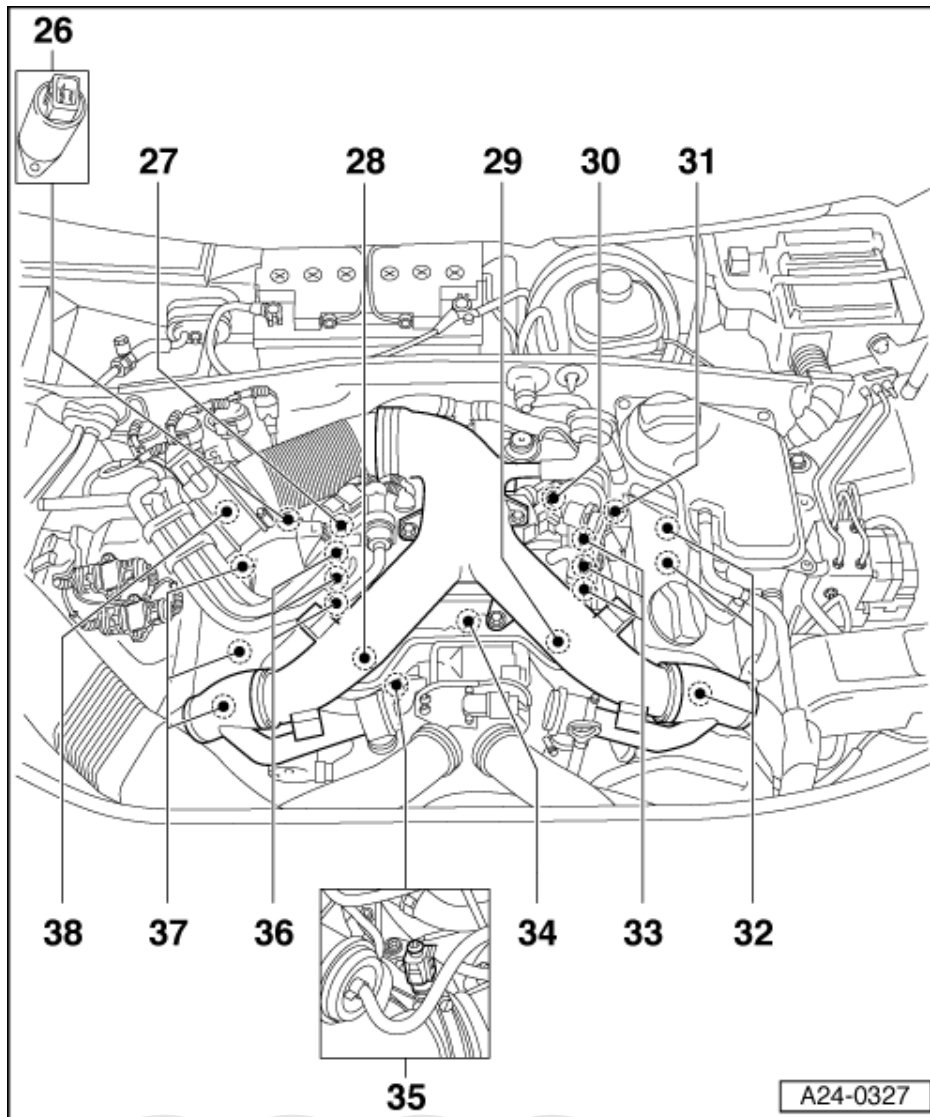
- ♦ Cylinder bank 1

24 Final power stage 2 (N192)

- ♦ For ignition coils, cylinder bank 2

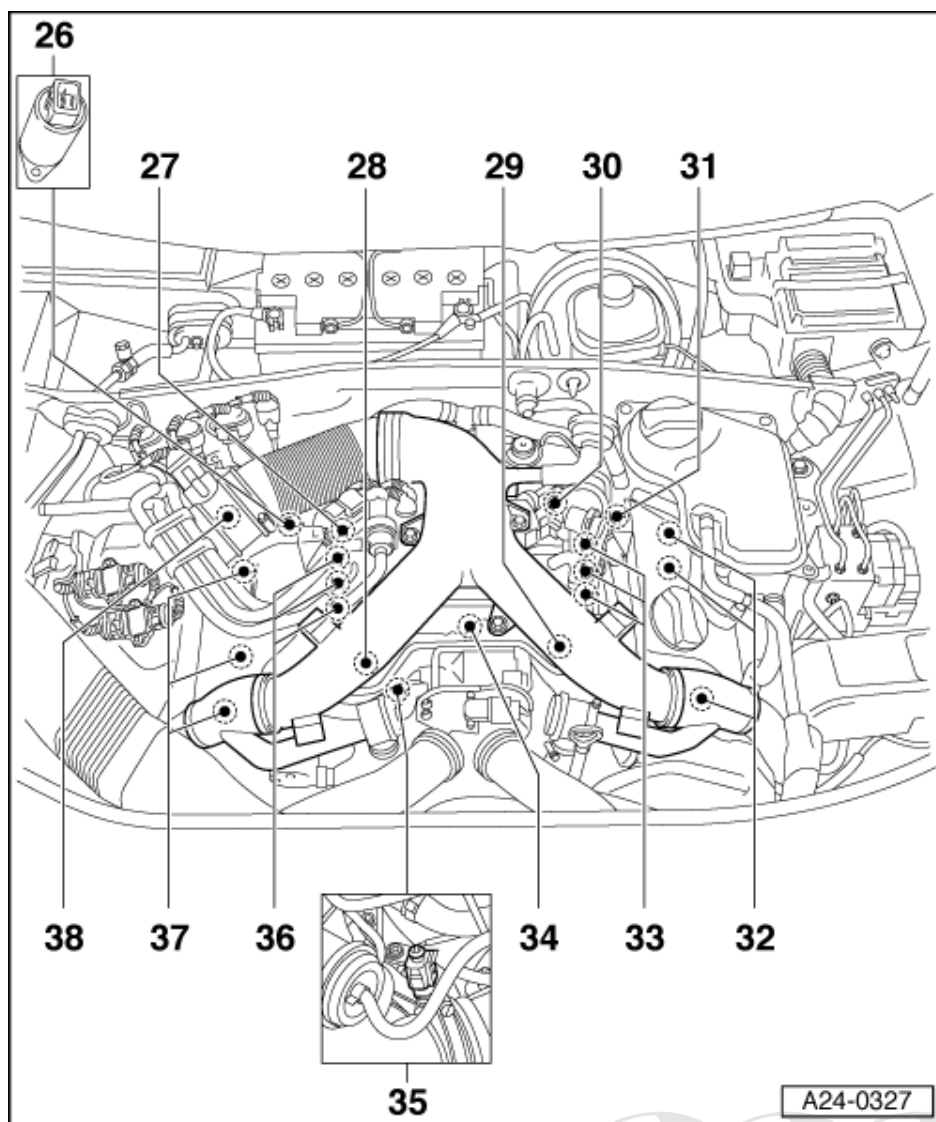
25 Final power stage (N122)

- ♦ For ignition coils, cylinder bank 1



- 26 Valve 1 for camshaft adjustment (N205)
 27 Bank 1, lambda probe 1 -G39 with lambda probe heating
 -Z19
 28 Knock sensor 1 (G61)
 29 Knock sensor 2 (G66)
 30 Engine speed sender (G28)
 ♦ In gearbox casing above sender disc
 31 Bank 2, lambda probe 1 -G108 with lambda probe heating
 -Z28

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32 Ignition coils, cylinder bank 2

- ◆ Cylinder 4 -N163
- ◆ Cylinder 5 -N164
- ◆ Cylinder 6 -N189

33 Injectors

- ◆ Cylinder bank 2
- Cylinder 4 (N33)
- Cylinder 5 (N83)
- Cylinder 6 (N84)

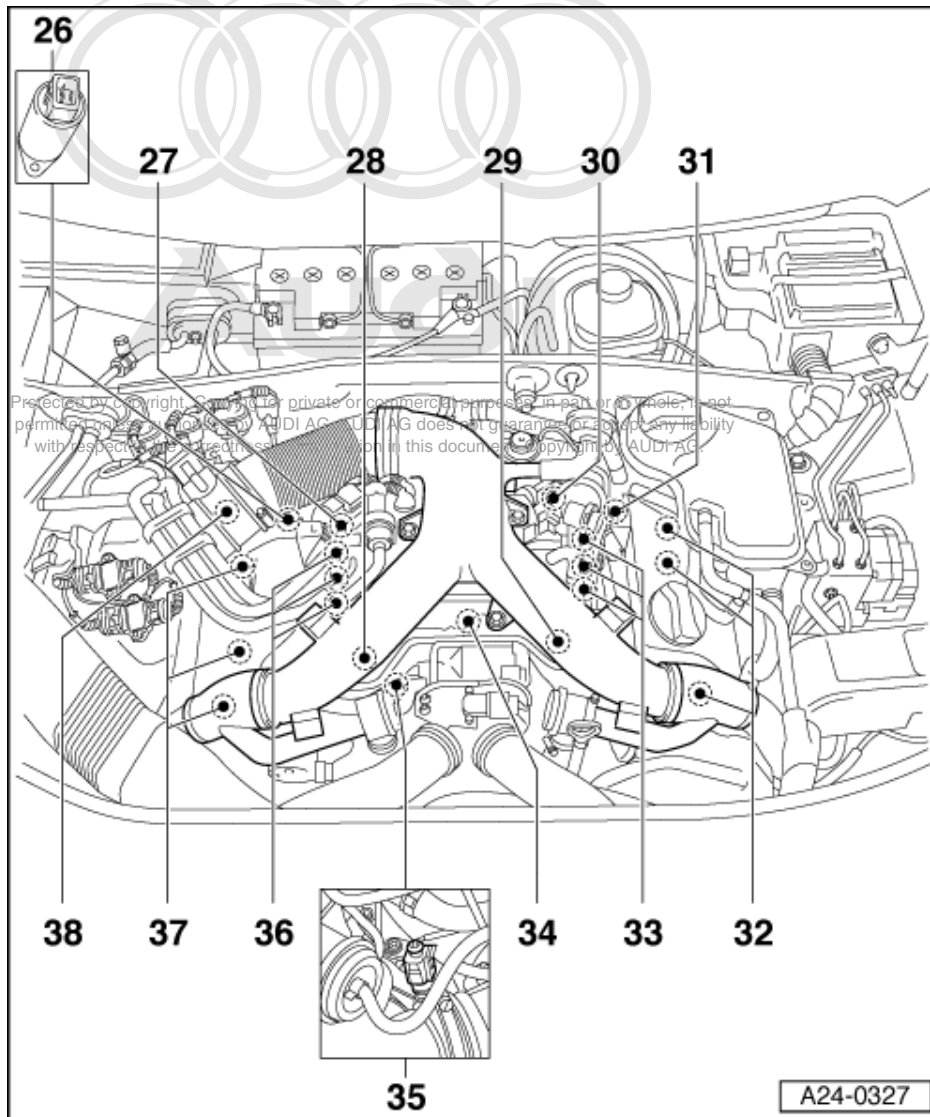
34 Intake air temperature sender (G42)

- ◆ Under the intake manifold at the front, near the throttle control unit

35 2-pin connector

- ◆ For intake air temperature sender (measurements to be carried out at this connector)

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36 Injectors

- ♦ Cylinder bank 1
- Cylinder 1 (N30)
- Cylinder 2 (N31)
- Cylinder 3 (N32)

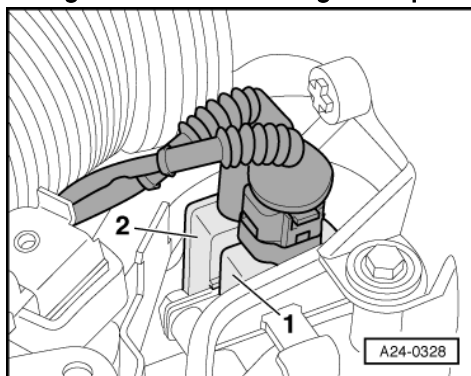
37 Ignition coils, cylinder bank 1

- ♦ Cylinder 1 -N
- ♦ Cylinder 2 -N128
- ♦ Cylinder 3 -N158

38 Air mass meter (G70)



Fitting location of exhaust gas temperature sender



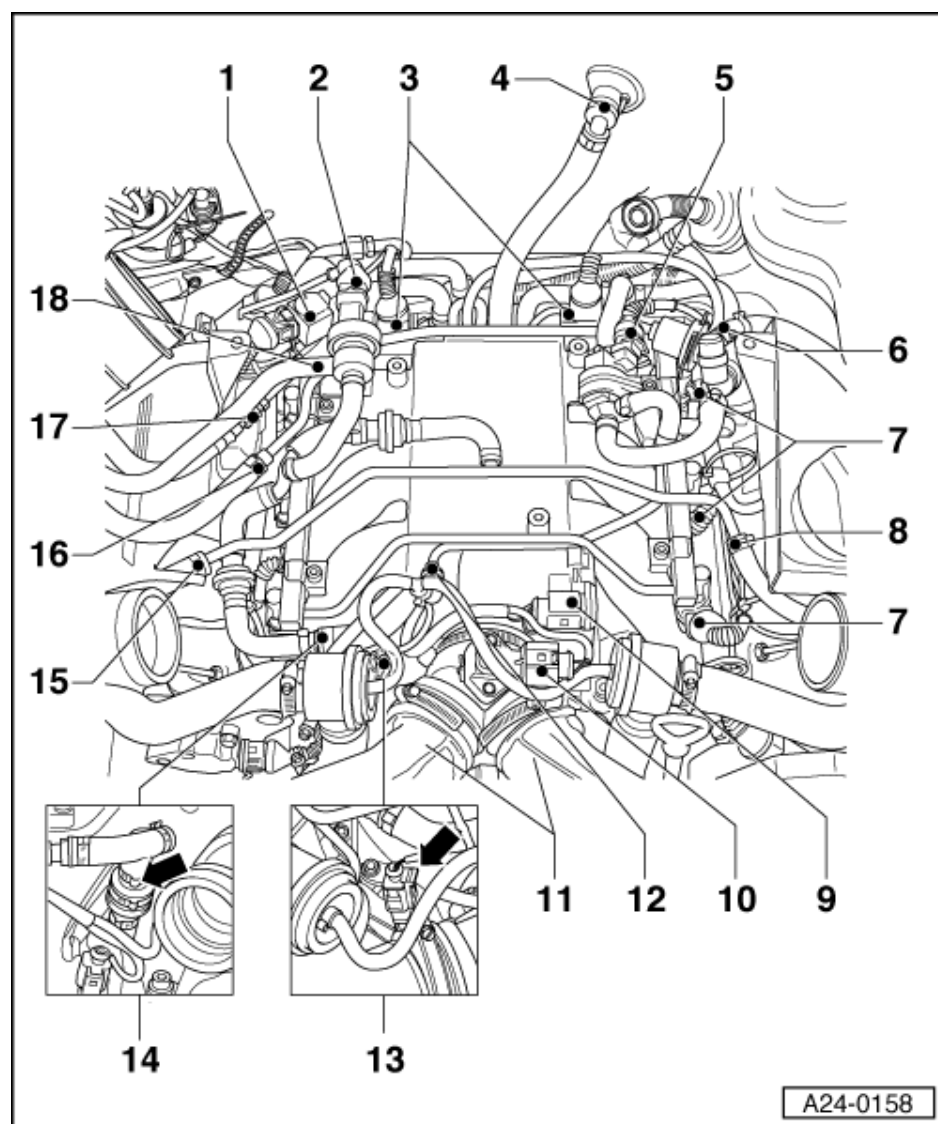
-> Fig.1 Fitting location of exhaust gas temperature sender

-1--= Exhaust gas temperature sender -G235

-2- = Exhaust gas temperature sender -G236

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1.6 - Removing and installing intake manifold

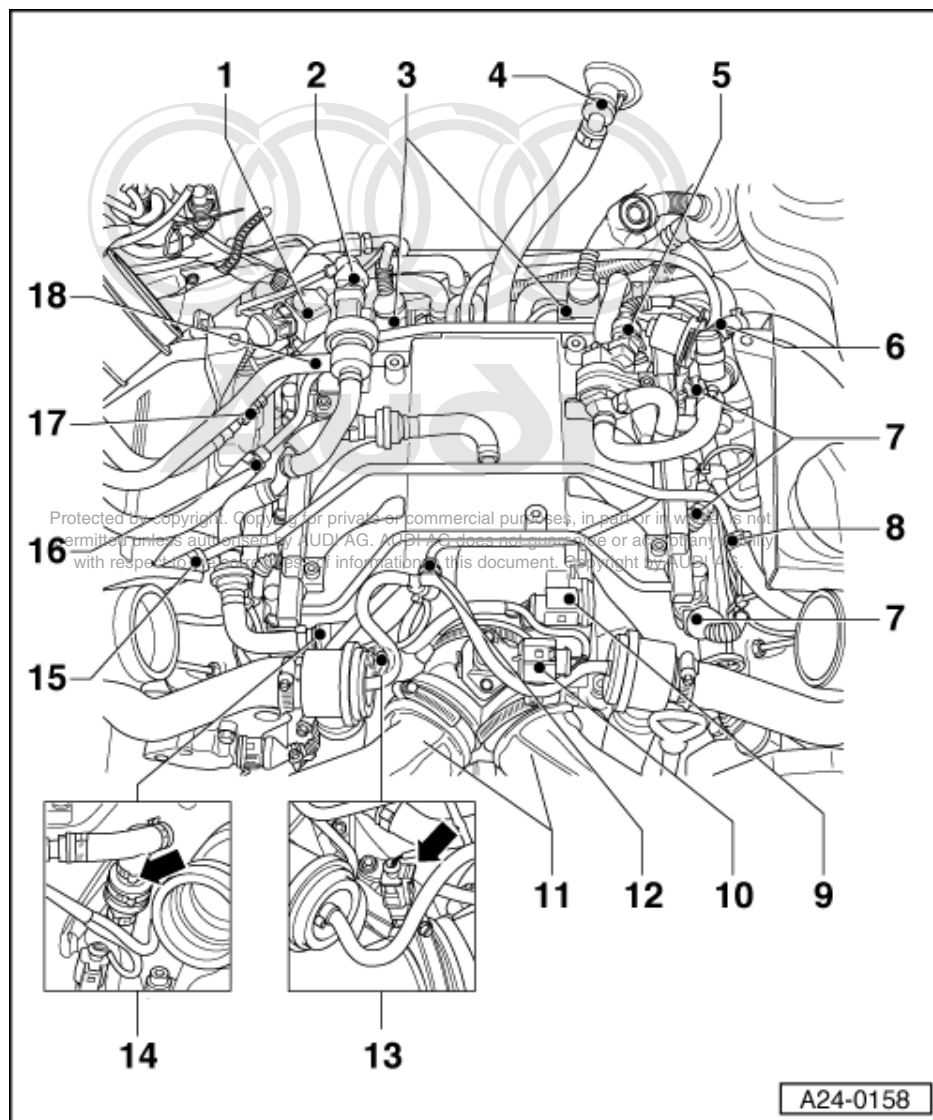


Note:

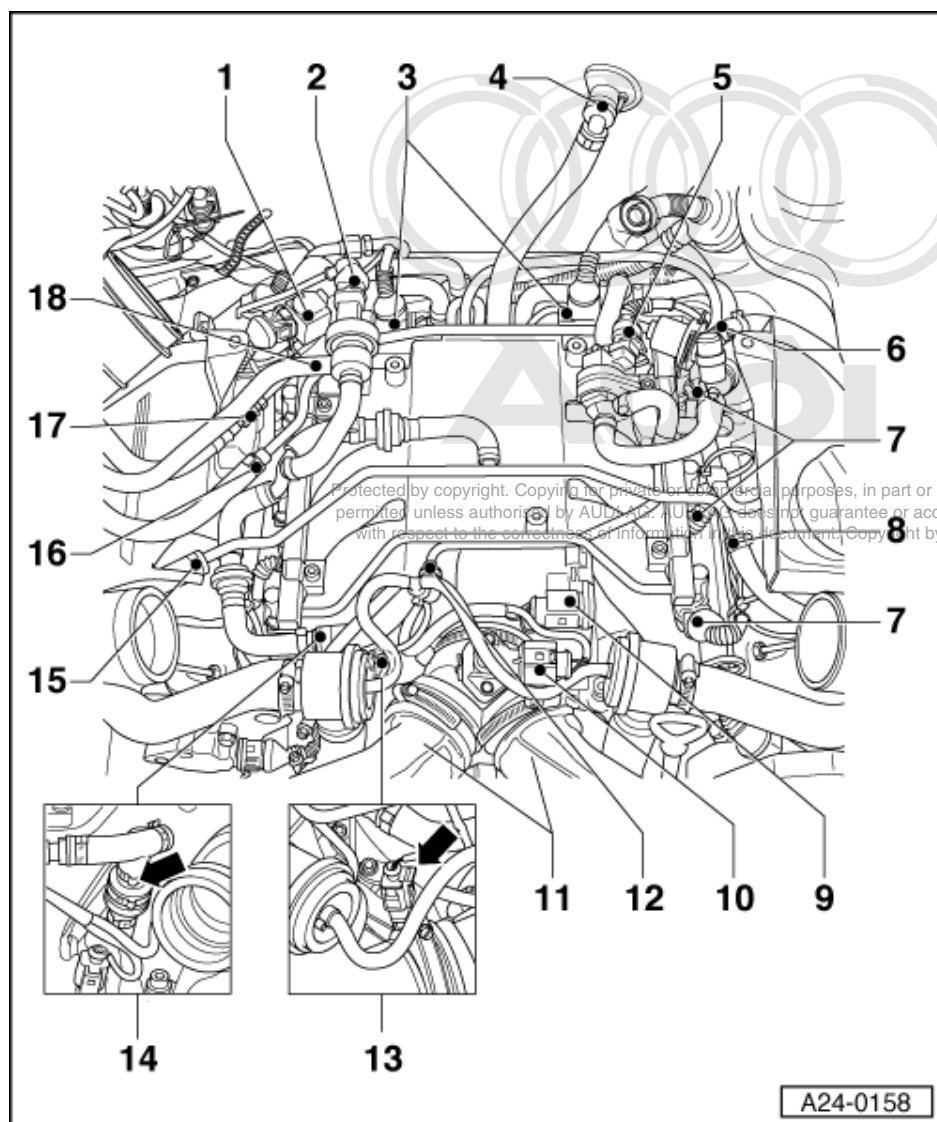
Further steps may be necessary depending on version, these will be included in the procedure.

- Remove air duct =>Page 63 .

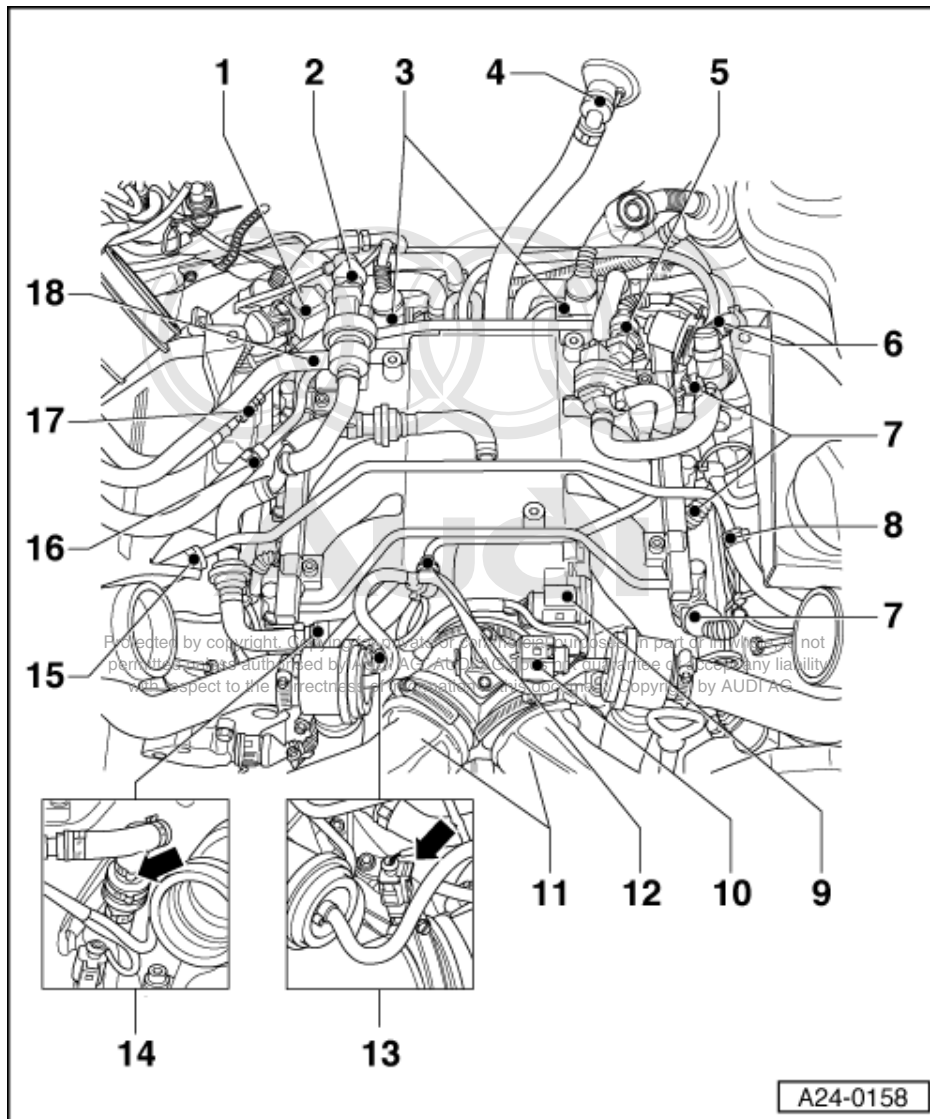
1 Unclip solenoid valve for boost pressure limitation (N75) from fuel rail.



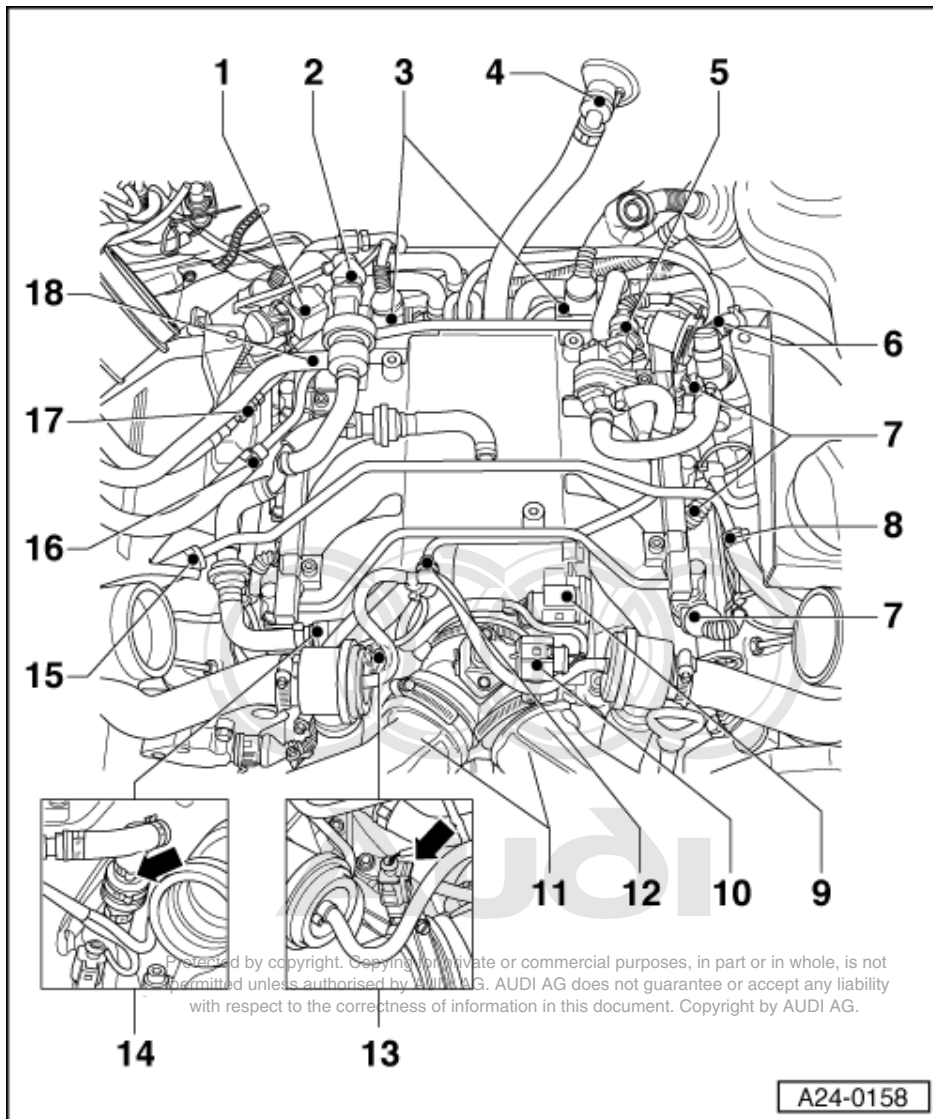
- 2 Disconnect connector on solenoid valve 1 for active carbon canister (N80).
- 3 Detach both exhaust gas temperature senders (G235, G236) from intake manifold (on right of vehicle). The senders must remain connected. When re-installing, make sure that earth wires are firmly seated. Also detach secondary air pump from intake manifold (on right of vehicle).
- 4 Detach brake servo hose from bulkhead.



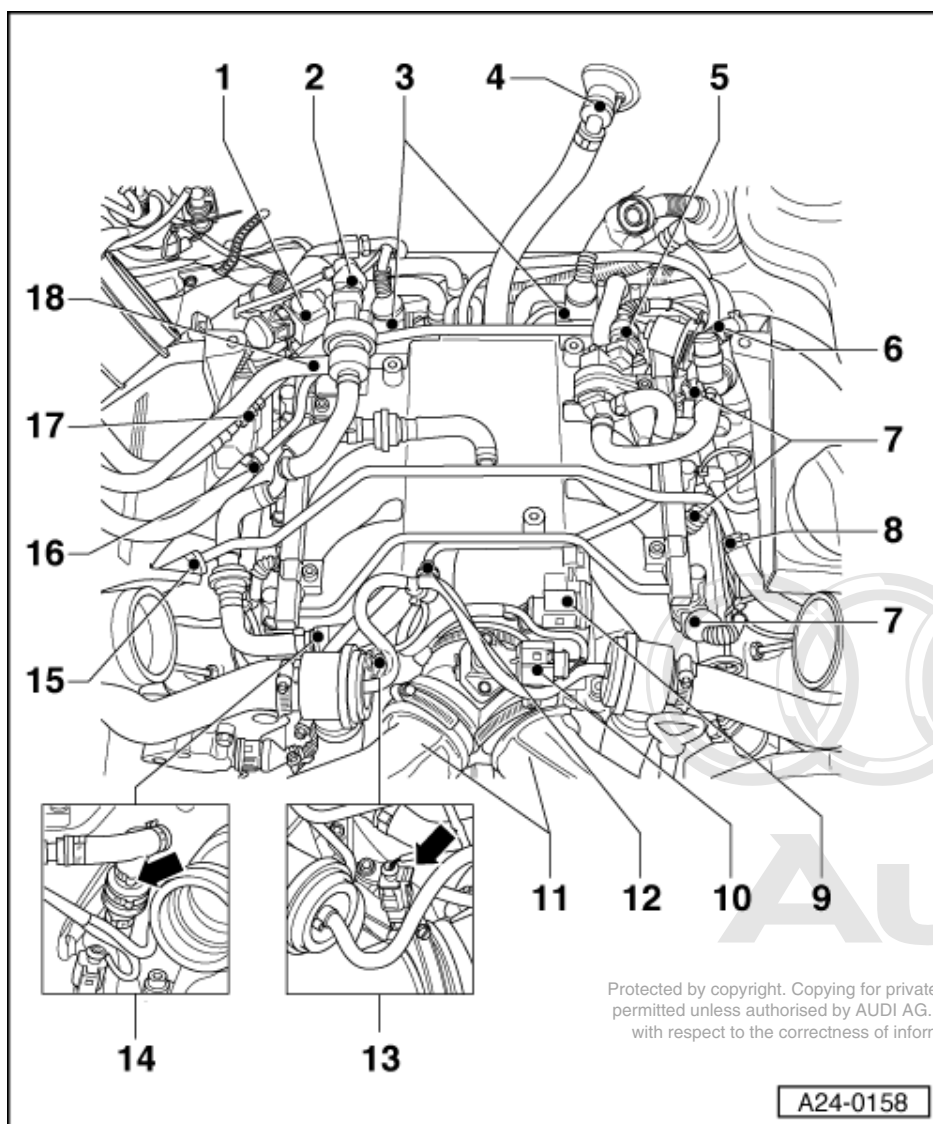
- 5 Disconnect connector on air recirculation valve for turbocharger (N249).
- 6 Detach hose shown. The hose leads to a vacuum reservoir.
- 7 Unplug the connectors on injectors of cylinder bank 1 and cylinder bank 2.
- 8 Detach hose shown. This leads to intake of turbocharger, bank 2.



- 9 Disconnect the connector on throttle valve control unit (J338).
- 10 Disconnect connector on boost pressure sender (G31).
- 11 Remove the pressure pipes shown.
- 12 Detach the hose shown; this leads to the recirculation valves.
- 13 Disconnect connector for intake air temperature sender (G42).
- 14 Detach the hose shown; this is the crankcase breather hose.



- 15 Detach hose shown. This leads to intake of turbocharger, bank 1.
16 Detach fuel return from fuel rail (catch emerging fuel with a clean rag).
17 Detach fuel supply line from fuel rail.
18 Detach line shown on active carbon canister valve.



Other hoses/connections must also be detached depending on variant; this will be included in the procedure.

- Unbolt intake manifold from cylinder heads.
- Carefully lift intake manifold from cylinder heads.

Installation of intake manifold is performed in the reverse sequence. (tightening torque of bolts: 10 Nm).

Always use new seals and clamps.

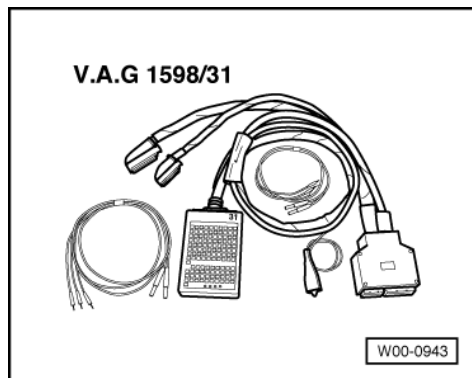
1.7 - Wiring and component check with test box V.A.G 1598/31

Notes:

- ♦ The test box V.A.G 1598/31 is designed in such a way that it can be connected simultaneously to the engine control unit wiring harness and to the engine control unit itself.
- ♦ This has the advantage that the electronic motor control system remains fully functional when the test box is connected (for example, for measuring signals when the engine is running).
- ♦ Whether the engine control unit has to be additionally connected to the test box or not is described in the respective test procedures.



- ♦ Always use adapter set V.A.G 1594 A for connecting up measuring instruments (e.g. voltage tester V.A.G 1527 B, hand-held multimeter V.A.G 1526 A etc.)

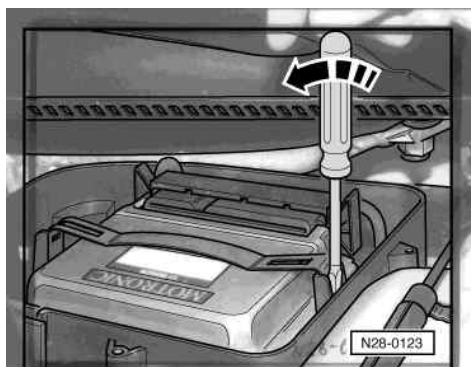


Special tools and workshop equipment required

- ♦ V.A.G 1598/31

Procedure

- Switch ignition off.
- Remove rubber seal from the front.
- Detach plenum chamber cover to front.
- Remove cover for electronics box in plenum chamber.

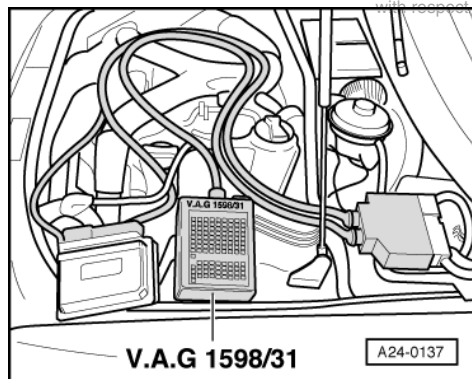


- -> Carefully lever off the retainer bar with a screwdriver -arrow-.
- Release the connector latches and pull of the control unit connectors.

Important!

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

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- -> Connect V.A.G 1598/31 test box to connector on wiring harness. The earth clip on the test box is to be connected to the battery negative. Whether or not the engine control unit has to be additionally connected to the test box is described in the respective test procedures.
- Carry out test as described in the appropriate repair procedures.

Perform the following operations after re-connection of engine control unit:

- Interrogate fault memory and erase, if necessary => Page 6 .
- Perform adaptation of throttle valve control unit -J338 => Page 110 .

Note:

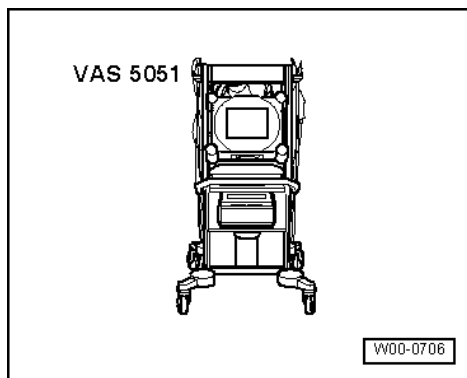
In the first learning phase, during the basic setting operation for the engine, slightly irregular idling and slight jolting during driving are possible.

1.8 - Procedure following interruption of voltage supply

Note:

In the first learning phase, during the basic setting operation for the engine, slightly irregular idling and slight jolting during driving are possible.

Special tools and workshop equipment required



- ♦ VAS 5051 with VAS 5051/1

or

- ♦ V.A.G 1551 with V.A.G 1551/3 A

Procedure

Perform the following operations after a voltage interruption:

- Interrogate fault memory and erase, if necessary => Page 6 .
- Perform adaptation of throttle valve control unit -J338 => Page 110 .

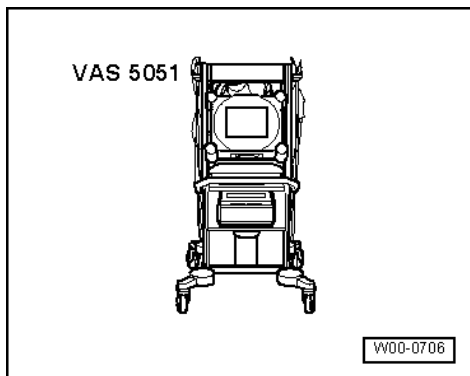
1.9 - Renewing engine control unit

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 with VAS 5051/1

or

- ♦ V.A.G 1551 with V.A.G 1551/3 A

Removing

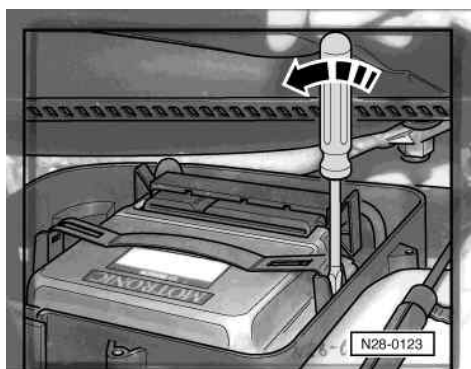
- Connect up vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "Address word" 01 => Page 3 .
For this purpose, the ignition must be switched on.

-> The display on fault reader V.A.G 1551 will show the control unit identification code e.g.:

8D0907551..	2.7L	V6/5VT	G
0002			
Code 04711		WSC 06388	

- Always start by displaying and printing out the control unit identification => Page 5 .
- Compare code to encoding versions => Page 35 .
- Switch ignition off.
- Remove rubber seal forwards.
- Detach plenum chamber cover to front.
- Remove cover for electronics box in plenum chamber.

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

Installing

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

Note:

In the first learning phase, during the basic setting operation for the engine, slightly irregular idling and slight jolting during driving are possible.

Important note:

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

- Interrogate fault memory and erase, if necessary => Page 6 .
- Adapt immobiliser to engine control unit

=> Electrical System; Repair Group 01; Immobiliser self-diagnosis; Adaptation after renewal of engine control unit Immobiliser self-diagnosis Adaptation after renewal of engine control unit

- Perform adaptation of throttle valve control unit -J338 => Page 110 .
- Note instructions for encoding new engine control unit => Page 35 .
- In vehicles with cruise control (recognisable from steering column switch), this should be freed in engine control unit:

=> Electrical System; Repair Group 01; cruise control system self-diagnosis; check cruise control system cruise control system self-diagnosis check cruise control system

- Perform learning of kickdown function on vehicles with automatic gearbox =>Page 117 .

1.10 - Checking idling speed

Test conditions

- No leaks in exhaust system
- Coolant temperature at least 80 °C (display group 4, display zone 3).
- Electrical consumers switched off (radiator fan must not run during the check)
- Air conditioner switched off
- Pressure gauge not connected
- Place selector lever in P or N position (vehicles with automatic gearboxes).

Checking idling speed

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 air conditioner compressor is automatically switched off and the solenoid valve for the active carbon canister (ACC valve) is closed.
- Interrogate fault memory The fault memory must be clear. If necessary, rectify any faults and erase the fault memory. Switch off the engine, then start up again. Take vehicle for a test drive and interrogate the fault memory again to make sure it is clear.
- Leave engine idling.

Important!
The electric radiator fan should not be running.

-> Display:

Rapid data transfer HELP
Select function XX

- Press keys 0 and 4 for the function "Introduction of basic setting" and confirm entry with Q key.

-> Display:



Initiate basic setting **HELP**
Enter display group number XXX

- Press keys 0, 5 and 6 for "display group number 56" and confirm entry with Q key.

-> Display:
(1...4 = display zones)

Basic setting 56
1 2 3 4

- Check whether the engine speed in the display zone 1 (actual speed) is within the permitted tolerance range (750 rpm...850 rpm).

	Display zones			
	1	2	3	4
Display group 56: Idling stabilisation when idling at operating temperature				
Display	xxx rpm	xxx rpm	x.x %	X X X X X
Display	Engine speed (actual)	Engine speed (specified)	Idling speed control Change in torque	Operating conditions
Specified value	750 rpm...850 rpm	800 rpm	x.x %	0 0 0 0 0
Note:	If specified value not attained =>Page 58			Significance of figures =>Page 58

Note:

- The engine speed in display zone 1 (actual speed) is the actual engine speed.
- The engine speed in display zone 2 (specified speed) is a theoretical value calculated by the engine control unit.
- See next Page for further notes: 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.
- During idling, the engine control unit always tries to adapt the actual engine speed to the specified engine speed.
- This means that during idling the actual engine speed must always approximate to the specified engine speed.
- The display zones three and four are there for information but are irrelevant to the control of the engine idling speed.
- Press the ➡key.
- Press keys 0 and 6 for the "End output" function and press the Q key to confirm entry.
- If specified value is not attained, interrogate the fault memory again.

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

- Check induction system for unmetered air => Page **76** .
- Test throttle valve control unit =>Page **107** .
- Solenoid valve for active carbon canister continuously open, test =>Page **104** .
- Perform adaptation of throttle valve control unit =>Page **110** .

Significance of 5-digit readout of display group 56

x	x	x	x	x	Display zone 4
				0	Air conditioner compressor 0 = A/C compressor off 1 = A/C compressor on
			0		Gear engaged 0 = selector lever set to "P" or "N" 4 = selector lever in 1/2/3/D/R

x	x	x	x	x	Display zone 4
		0			Air conditioner; ready for maximum heating or cooling output
	0				Display always 0
0					Display always 0

1.11 - Checking fuel pressure regulator and holding pressure

Test conditions

- Fuel pump relay OK, testing =>Page 71 .
- Fuel pump OK
- Fuel filter OK
- Battery voltage at least 11 V

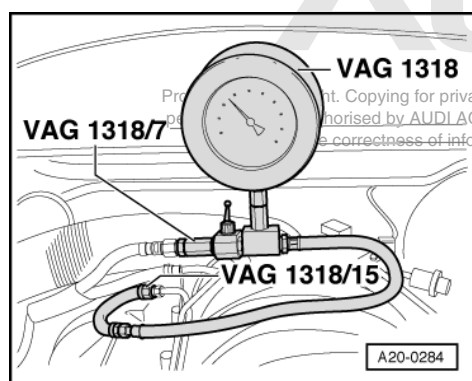
Note:

Fuel pressure regulator regulates fuel pressure as a function of intake pressure. As a result, the pressure drop at the injectors remains constant for each engine speed and load range.

Important!

The fuel system is pressurised! Before loosening hose connections or opening the test connection (to measure fuel pressure), place a cloth around the connection. Then release pressure by carefully loosening the connection.

Check system pressure



- -> Connect pressure gauge V.A.G 1318 to fuel supply line using adapters 1318/7, 1318/8 (pressure hose) and 1318/13.
- Withdraw vacuum line from pressure regulator to induction manifold at pressure regulator and close off line.

Note:

Replace pressure regulator if fuel emerges at the vacuum connection of the pressure regulator in the course of the following pressure test.

- Start the engine and run at idling speed.
- Measure the fuel pressure.

Specified value: approx. 3.8...4.2 bar gauge.

- If specified value is not attained, try replacing the pressure regulator and repeating the pressure test.
- If specified value is still not attained, check the fuel pump/feed pipe for damage (e.g. crushing) and replace, if necessary.
- If specified value is exceeded, check the return pipe for damage (e.g. crushing) and replace, if necessary.



Note:

When performing the following test, do not leave the engine running for an unnecessarily long time with the vacuum hose detached, because the higher fuel pressure causes the fuel/air mixture to be enriched. This could lead to the lambda control limits to be exceeded, which would then result in a fault being recorded.

- Start the engine and run at idling speed.
- Switch off electrical consumption units (air conditioner system, etc).
- Attach vacuum hose to pressure regulator and observe drop in pressure on pressure gauge.
- Fuel pressure must decrease by approx. 0.5 bar when vacuum hose is attached.

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

- Check vacuum hose for cracks and damage.
- Check vacuum hose at intake manifold for blockage; to do so, pull off hose at pressure regulator and blow into it.
- If there is no leak and no blockage in the vacuum hose, replace the pressure regulator.
- Renew the hose clamp which secures the vacuum hose to the pressure regulator and ensure that it is correctly fitted.

Checking holding pressure:

- Holding pressure 10 minutes after switching off engine (minimum pressure).

With engine cold: at least 2.2 bar

With engine at operating temperature: approx. 3.0 bar

Note:

The increase in temperature with the engine at operating temperature is caused by the expansion of the fuel and is normal.

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

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

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

=> 6-cylinder Engine, Mechanical Components; Repair Group 20; Removing and installing fuel pump Removing and installing fuel pump

Note:

After the isolating valve has been closed, the pressure gauge shows the pressure after the isolating valve "induction manifold end" (direction of injectors, fuel pressure regulator). If the pressure before the isolating valve (tank direction) should now fall, the equipment cannot recognise this fact. For this reason, "If the pressure does not drop..." appears in the middle of this Page.

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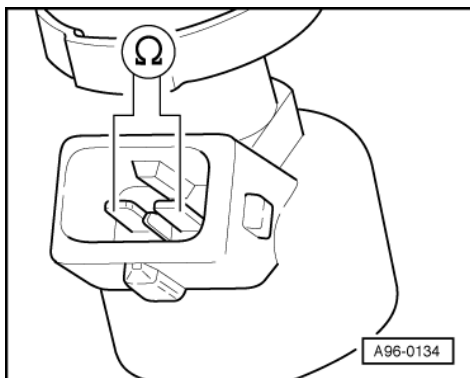
If the pressure drops again, the following faults are possible:

- ♦ Fuel pressure regulator defective
- ♦ Injectors leaking
- ♦ Unions on pressure gauge after cut-off valve leaking

Note:

To disconnect the pressure gauge, close the cut-off valve, unscrew the union on adapter V.A.G 1318/15, then open the cut-off valve to drain off excess fuel into a suitable container.

1.12 - Checking injectors



A - Electrical testing of injectors

- Remove connector from the injector which is to be tested.
- -> Measure resistance between the valve contacts using V.A.G 1526.

Specified value: 13.5...15.5 Ohm

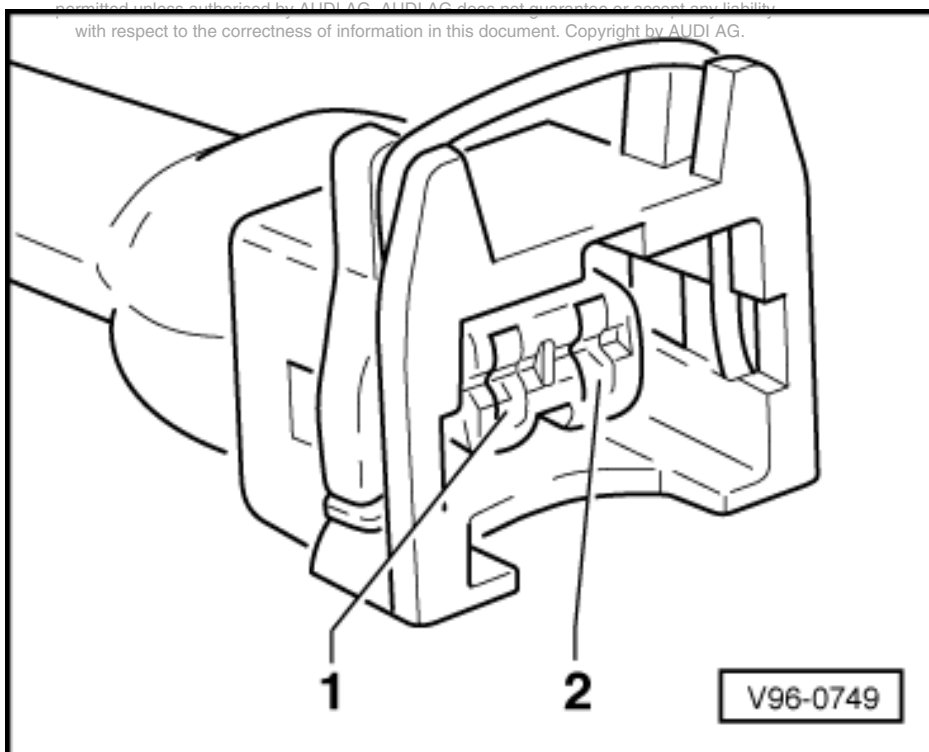
When the engine is at operating temperature, the resistance is increased by approx. 4...6 ω .

- If specified value is not attained, replace injector => Page 68.

B - Testing power supply

Test conditions

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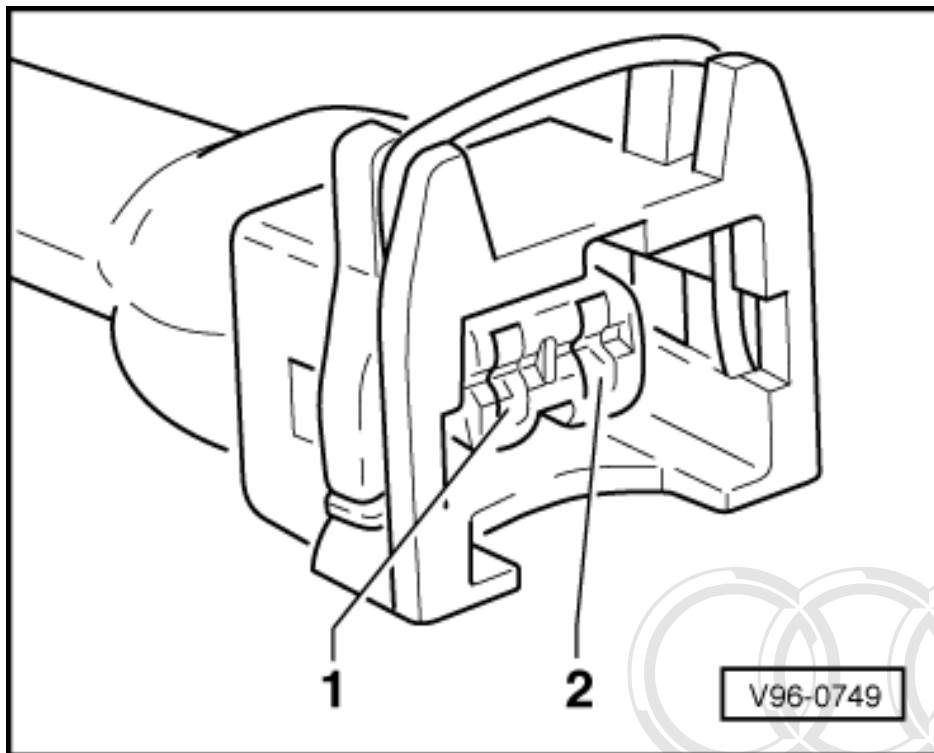
- Fuse for injectors OK.

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

- Remove connector from the injector which is to be tested.

- -> Connect diode test lamp V.A.G 1527 between engine earth and contact 1 on the connector.
- Switch on ignition, the diode test lamp should come on.
- If the diode test lamp does not light up, test for open circuits in the wiring between contact 1 and the fuse for the injectors - if necessary rectify open circuit.

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



- If the diode test lamp lights up, test activation of injectors.

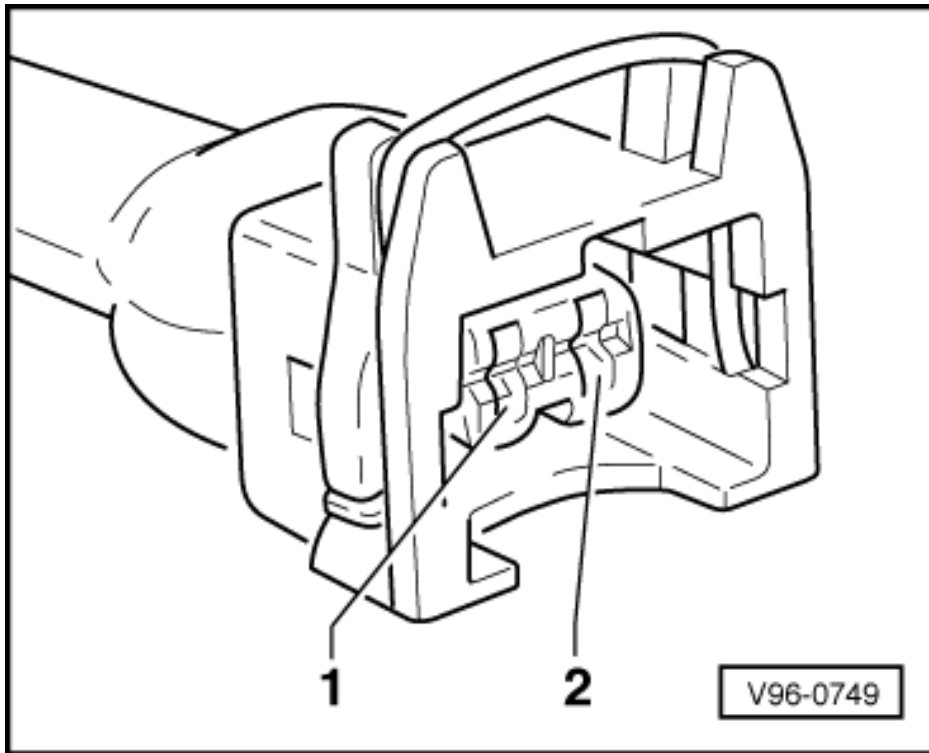
C - Testing activation of injectors

- Remove connector from the injector which is to be tested.
- -> Connect diode test lamp V.A.G 1527 between contact 2 of connector and battery positive (+).
- Operate starter for a few seconds (the engine can be allowed to start).

Specified value: The diode test lamp should flash. 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.

Note:

Diode test lamps 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 diode test lamp does not flash:

- Connect the V.A.G 1598/31 test box to wiring harness leading to engine control unit; the engine control unit should not be connected.
=>Page 53 .
- -> Test for open circuit or short to positive in wiring between contact 2 of connector of respective injector and engine control unit.

Contact 2 on plug connector of injector for cylinder	Test box V.A.G 1598/31, socket
1	96
2	112
3	88
4	97
5	113
6	89

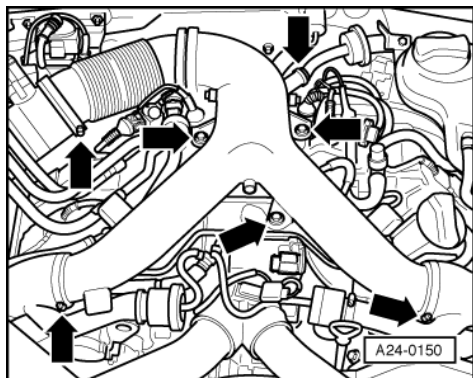
- Rectify any open/short circuit as necessary.
 - If the wiring is OK, replace engine control unit => Page 55.
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1.13 - Testing injection quantity, leak tightness and spray pattern of injectors

Test conditions

- Fuel pressure OK, checking =>Page 59 .

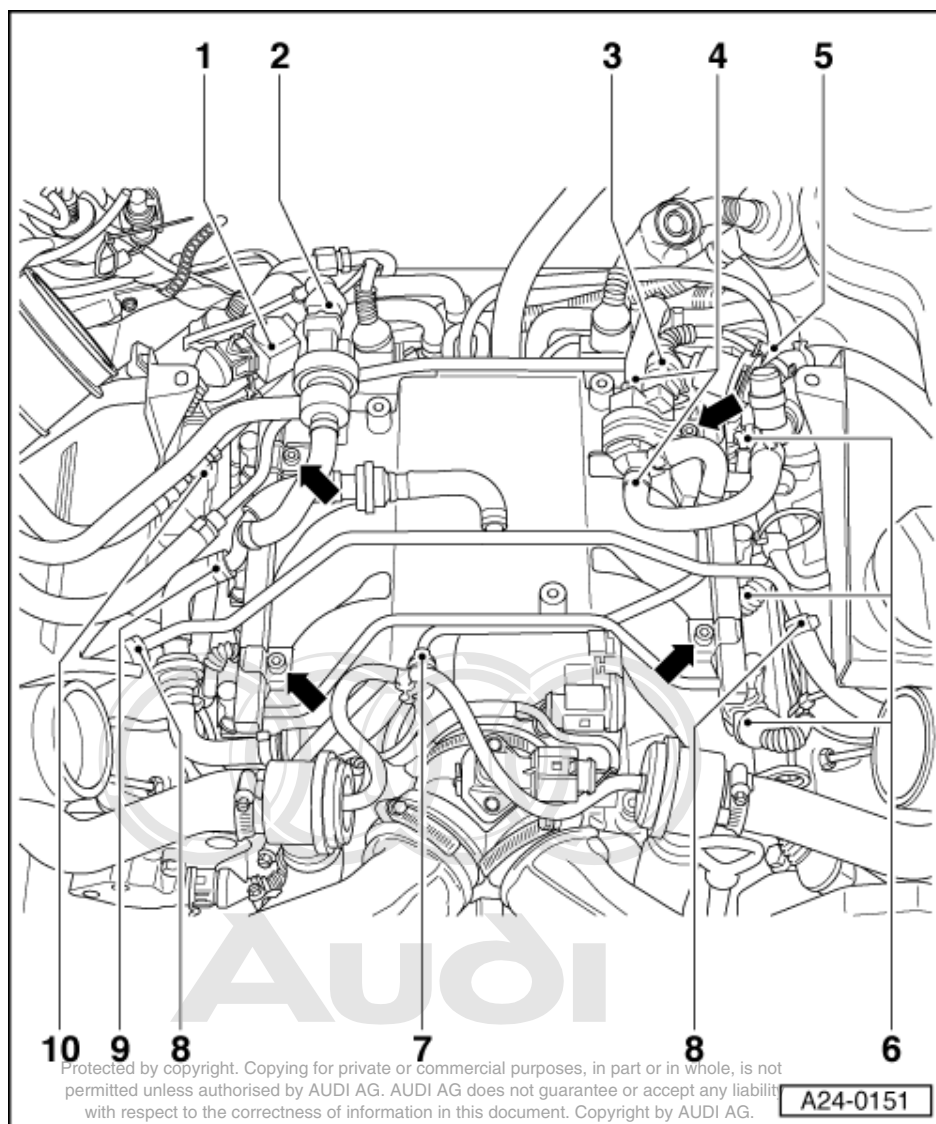
To gain access to the fuel rail (fuel manifold), the following steps must be performed. Procedure may vary depending on version.



- -> Release air duct at points indicated by arrows and remove air duct.

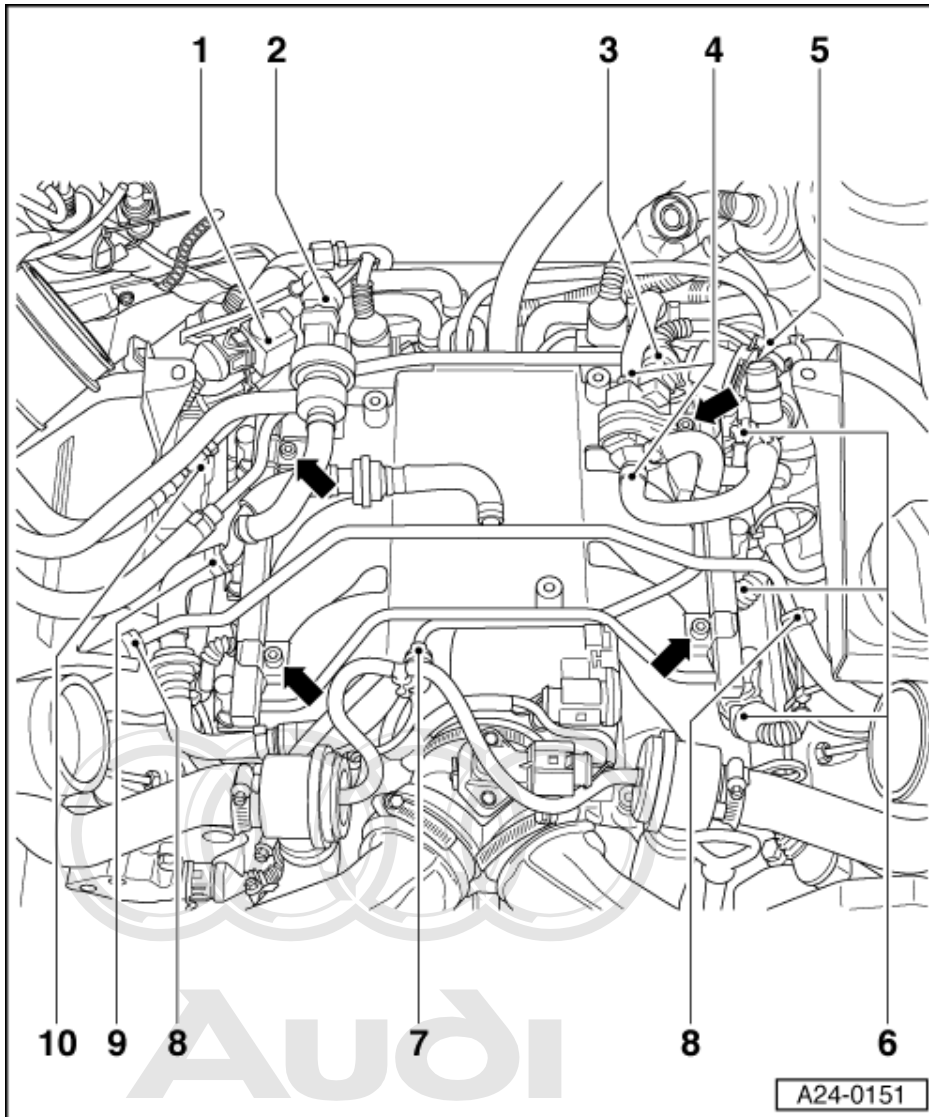
Some hoses must then be disconnected.

- Be most careful about cleanliness.
- After the test, renew the clamps and secure them correctly.

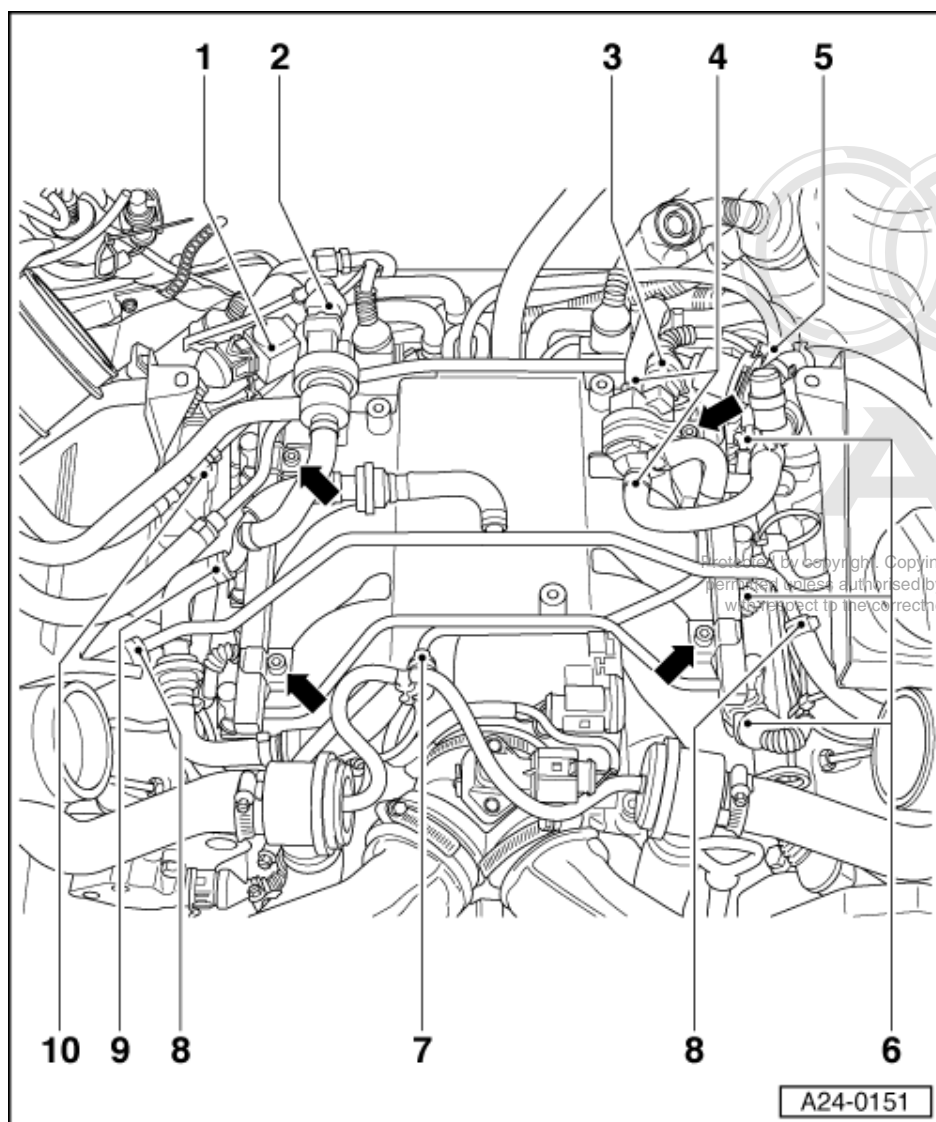


- 1 Release solenoid valve for boost pressure limitation (N75) from fuel rail; hoses remain connected.
- 2 Disconnect connector on solenoid valve for active carbon canister (N80).
- 3 Disconnect connector on air recirculation valve for turbocharger (N249).
- 4 Open the clamps shown on the recirculation valve and pull off the hoses.

- 5 Open the clamps shown on the fuel pressure regulator and pull off the hoses.
- 6 Disconnect connectors from injectors, cylinder bank 1 and cylinder 2.



- 7 **Open hose clamp and detach the hose (if required, vacuum is supplied to mechanical circulation valve via this hose).**
- 8 **Open the clamps shown and pull off the hoses. The hoses lead to the respective intakes of the bank 1 and bank 2 turbochargers.**
- 9 **Open hose clamp shown and detach the hose (fuel vapours are fed to the intake manifold via this hose).**



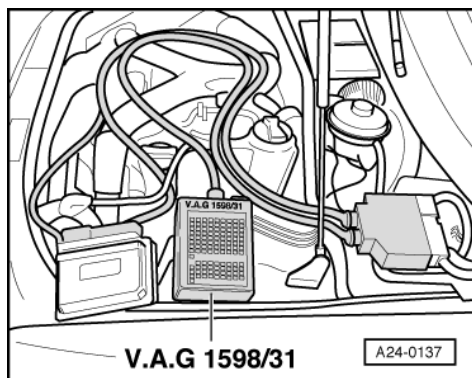
10 Briefly open the screw connection on the fuel rail (supply line) in order to release pressure. Collect emerging fuel with a clean cloth. Retighten the screw connection.

11 Unscrew fuel rail from intake manifold (see arrows). (tightening torque of screws: 10 Nm).

- Lift fuel rail and injectors from intake manifold and support.

Note:

- ♦ After the fuel rail has been lifted, check whether the injectors are correctly fastened to it.
- ♦ When fuel rail is lifted, individual injectors may become released and remain stuck in the intake manifold. In this case, the injectors should be refitted correctly to the fuel rail.
=>Page 69.



- -> Connect the V.A.G 1598/31 test box to wiring harness leading to engine control unit; the engine control unit must not be connected.
=>Page 53 .
- Place test box inside vehicle.

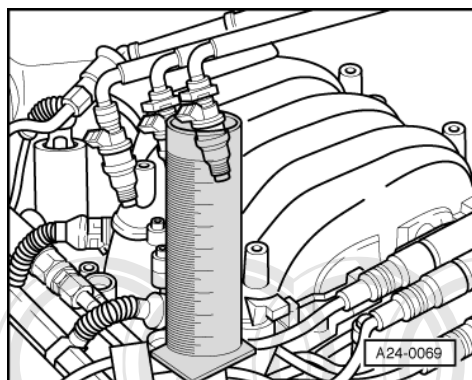
Leak test

- Bridge contacts 1 and 65 on the test box using test leads from adapter set V.A.G 1594 (this creates an earth connection to one side of the fuel pump relay coil).

Note:

After bridging, the fuel pump runs continuously even if engine is not running; this is because the fuel pump relay is supplied with permanent positive via central electrics. The negative voltage supply for the fuel pump relay comes via the cable bridge in the test box.

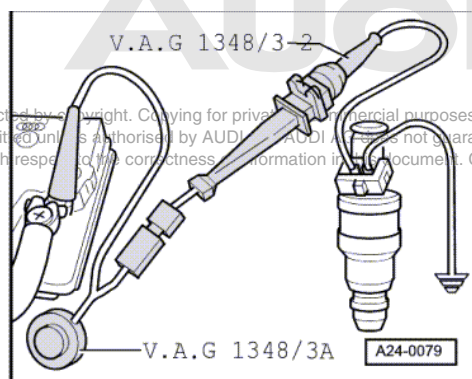
- Check injectors for leaks (visual check). When the fuel pump is running, only 1 or 2 drops a minute should escape from each injector.



- If the fuel loss is greater switch off fuel pump (remove cable bridge) and replace defective injector => Page 68 .

Checking injection quantity

- -> Place injector to be tested in a measuring glass from injection quantity tester V.A.G 1602.



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- -> Connect one of the injector contacts to engine earth using test cable and crocodile clamp from V.A.G 1594.
- 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.

Ensure that test box is inside the vehicle.

- Bridge contacts 1 and 65 on the test box using test leads from adapter set V.A.G 1594 (this creates an earth connection to one side of the fuel pump relay coil).

The fuel pump should run.

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- Activate the V.A.G 1348/3 A remote control for 30 seconds.
- Once all three injectors of a cylinder bank have been actuated, place the three measuring glasses on a flat surface.

Specified value per injector: 210...230 ml

- If measured values for one or more injectors are outside tolerance, switch off fuel pump (switch off ignition) and replace defective injector => Page 68 .
- Repeat the check on injectors of second cylinder bank.
- If the measured values for all the injectors are outside the tolerance range, check the fuel pressure => Page 59 .

Note:

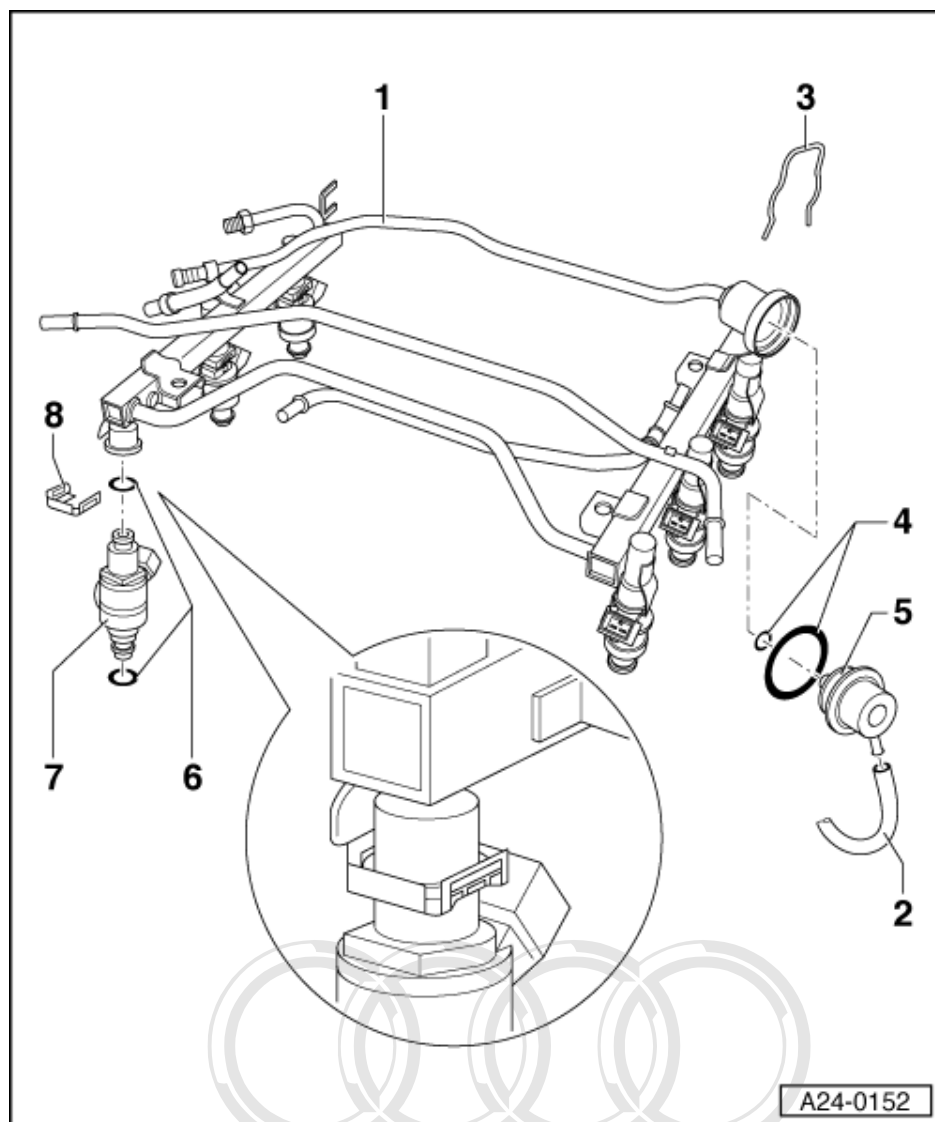
When checking the injection quantity, also check the spray pattern. The spray pattern should be the same for all the injectors.

Notes on installation of fuel manifold and injectors:

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

- Renew the O-rings at all opened connections. (when renewing the front O-ring, ensure that the plastic cap is not removed from the injector head. The O-ring must be pulled off over the plastic cap).
- Moisten the O-rings with clean engine oil.
- Insert injectors perpendicularly and in correct position into fuel manifold and secure with fasteners.
- Position fuel rail with secured injectors on intake manifold and press evenly into place.
- Renew hose clamps and ensure that they are securely fitted.

1.14 - Dismantling and assembling fuel manifold with injectors



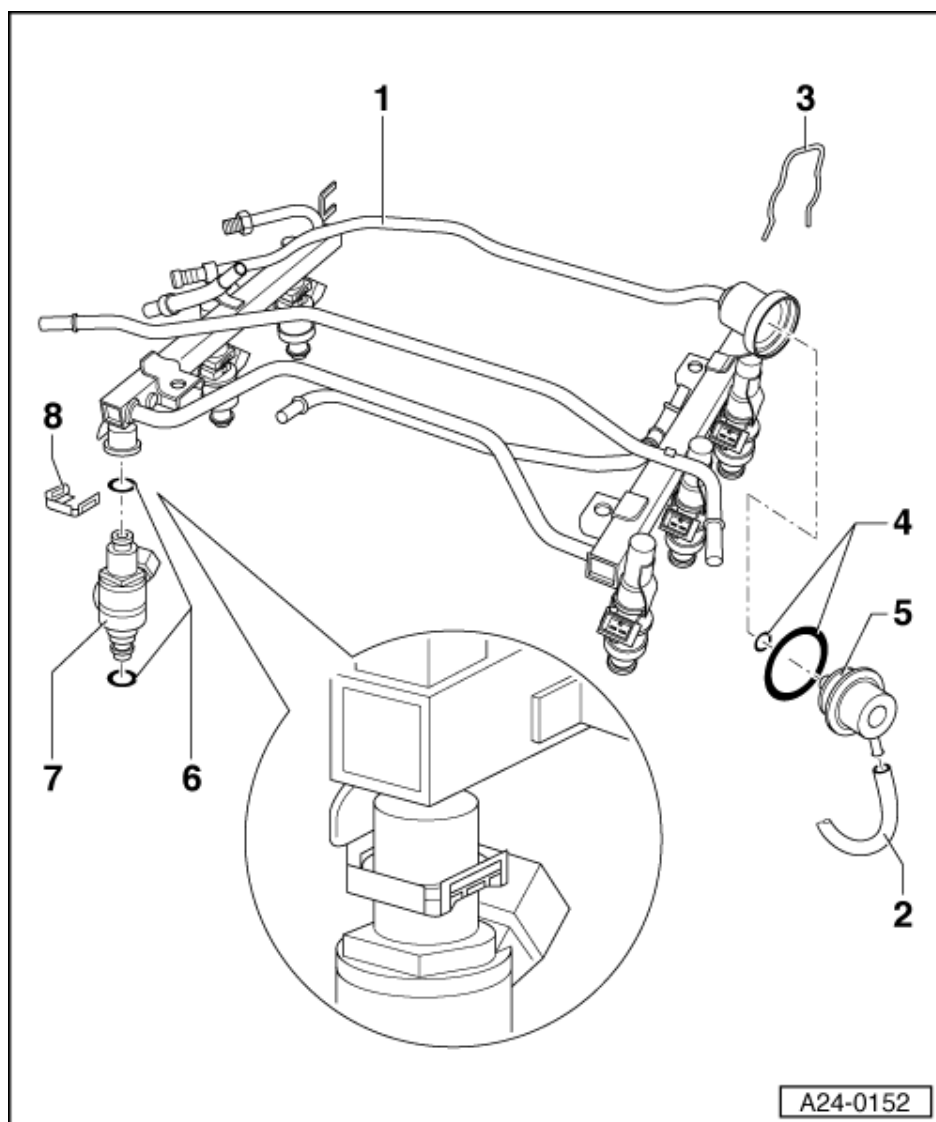
Note:

Depending on version, the fuel manifold may differ slightly to that illustrated.

- 1 Fuel rail
- 2 To intake manifold
- 3 Bracket
- 4 O-ring
- 5 O-ring
- 6 Injector
- 7 Fuel rail
- 8 Bracket

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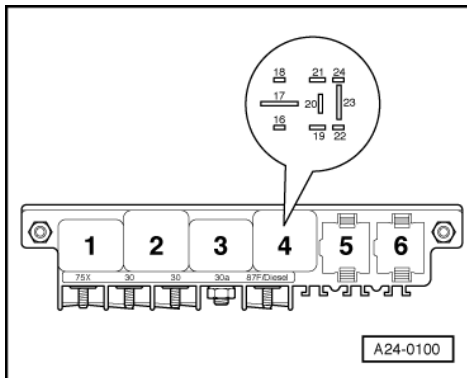
- ♦ Replace



- 5 Fuel pressure regulator
- 6 O-ring
 - ♦ Replace
- 7 Injector (N30...N32, N33...N84)
- 8 Bracket
 - ♦ Ensure it is positioned correctly on injector and fuel manifold

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1.15 - Testing fuel pump relay and activation

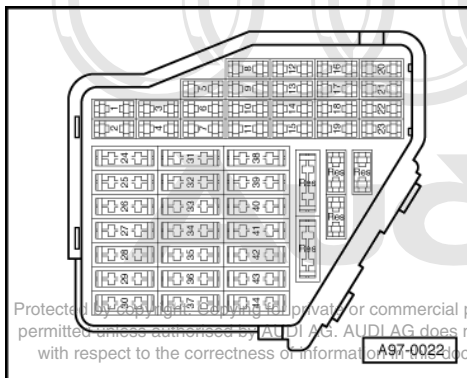


Note:

-> The fuel pump relay is located in central electrics in left hand footwell, relay position 4.

A - Testing fuel pump relay -J17

- Remove storage compartment from front left hand footwell.



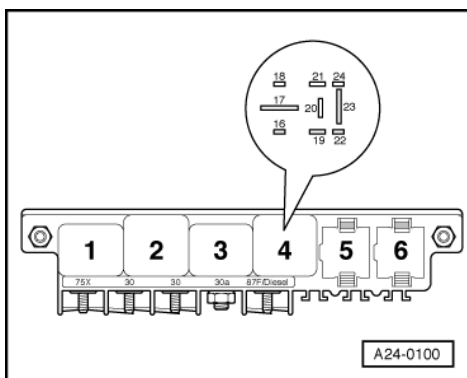
- -> Remove fuel pump fuse from fuse holder and connect diode test lamp V.A.G 1527 between earth and one of the two contacts of fuel pump fuse.

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

- Operate the starter briefly.

The fuel pump relay should pick up (can be felt and heard) and the diode test lamp should light up.

- If the fuel pump relay does not pick up, test activation => Page 72 .
- If the fuel pump relay picks up but the diode test lamp does not light up, repeat the test on the other contact.





- -> If the diode test lamp still does not light up, test for open circuit in wiring between fuel pump fuse and contact 23 in relay position 4. If necessary, rectify open circuit.

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

- If the power supply, activation and wiring for the fuel pump relay are OK, fit a new fuel pump relay.

B - Testing power supply and activation of fuel pump relay

Note:

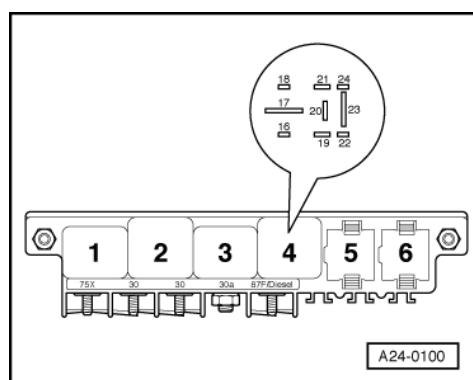
Activation of the fuel pump relay can also be tested using the final control diagnosis.

=>Page 28.

- Remove fuel pump relay -J17 from central electrics, relay position 4.

Checking power supply

- Switch the ignition on.

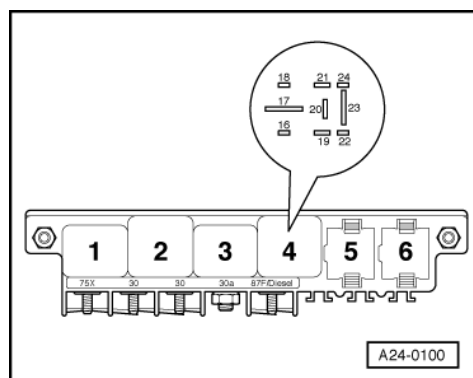


- -> Connect hand-held multimeter V.A.G 1526 first between contact 19 of relay panel and earth and then between contact 17 of relay panel and earth (each permanent positive; terminal 30 from battery).

Specified value: approx. battery voltage in each case

- If the values are not as specified, rectify the open circuit.

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



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Checking actuation

- -> Connect diode test lamp V.A.G 1527 to contact 16 of relay panel (earth activation from engine control unit) and positive.
- Operate the starter briefly.

- The diode test lamp should light up and remain lit when the starter is operated.

Note:

Diode test lamps with a low current consumption do not go out completely but continue to glow faintly until the starter is operated.

- If the activation, wiring and power supply for the fuel pump relay are OK but the fuel pump relay still does not pick up, fit a new fuel pump relay.

If the diode test lamp does not light up, test the wiring as follows:

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- Connect the V.A.G 1598/31 test box to wiring harness leading to engine control unit; the engine control unit should not be connected
=>Page 53 .
- Connect hand-held multimeter between contact 16 on relay panel and socket 65 on the test box, then test wiring for open circuits.
- Rectify open circuit if necessary

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

- If there is no open circuit and the diode test lamp still does not light up, fit a new engine control unit
=>Page 55 .
- Refit the fuel pump fuse.

1.16 - Testing air mass meter

Test conditions

- Coolant temperature at least 80 °C (display group 4, display zone 3).
- Electrical consumers switched off (radiator fan must not run during the check)
- Air conditioner switched off
- Fuse for airflow meter OK.

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

checking function

- Connect up vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "Address word" 01 => Page 3 .
For this purpose, the engine must be running at idle speed

-> Display:

Rapid data transfer	HELP
Select function XX	

- Press keys 0 and 4 for the function "Introduction of basic setting" and confirm entry with Q key.

Note:

During basic setting, the solenoid valve for the active carbon canister (valve N80) is closed and the air conditioner compressor is switched off by the engine control unit.

-> Display:

Initiate basic setting	HELP
Enter display group number XXX	

- Press keys 0, 0 and 2 for "display group 2" and confirm entry with Q key.

-> Display:



Basic setting 2

1 2 3 4

- Check specified results for recorded load.

	Display zones			
	1	2	3	4
Display group 2: Intake airflow at idle and operating temperature				
Display	xxx rpm	xx.x %	x.x ms	xxx.x g/s
Display	Engine speed (in steps of 40 rpm)	Load	Average injection pe- riod	Air mass
Range	min.: 750 rpm max.: 7200 rpm	min.: 15 % max.: greater than 175 %	min.: 2.0 ms max.: 19.0 ms	min.: 3.0 g/s max.: approx. 225 g/s
Specified value	750...850 rpm	15.0...25.0 %	2.0...4.0 ms	3.0...40.5 g/s
Note:	---	---	If specified value is not attained: Evalua- tion, display zone 3 => Page 74	If specified value is not attained: Evaluation, display zone 4 => Page 74

If specified value is attained:

- Press the ➤key.
- Press keys 0 and 6 for the "End output" function and press the Q key to confirm entry.
- Switch ignition off.

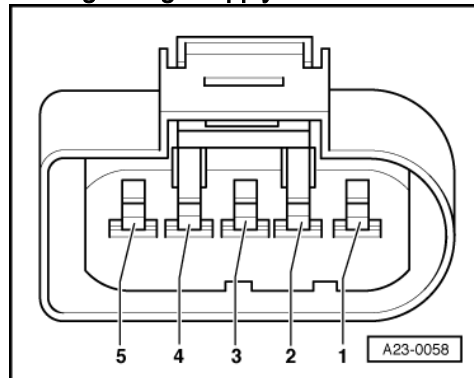
Interpreting display group 2

Display zone: 3	Possible causes of fault	Fault remedy
Less than 2.0 ms	- Lower values can only occur when vehicle is on overrun	
Greater than 4.0 ms	- Engine load from ancillaries	- Eliminate load (air conditioner system/ power steering/alternator)
	- Poor idling (not running on all cylinders)	- Test spark plugs Check injectors =>Page 61
	- Throttle valve control unit -J338 defective	- Check throttle valve control unit => Page 107

Interpreting display group 2

Display zone: 4	Possible causes of fault	Fault remedy
Less than 3.0 g/s	- Large quantity of unmetered air between intake manifold and airflow meter - Voltage supply to airflow meter or wiring to engine control unit	- Test for leaks (unmetered air) in intake air system =>Page 74
Greater than 4.5 g/s	- Engine load from ancillaries	- Eliminate load (air conditioner system/ power steering/alternator)
	- Voltage supply to airflow meter or wiring to engine control unit	- Check voltage supply and/or wiring => Page 74

Testing voltage supply to air mass meter



- -> Disconnect connector from air mass meter.
- Connect hand-held multimeter (voltage test range) between engine earth and contact 2 on the connector.
- Operate the starter briefly.

Specified value: approx. battery voltage

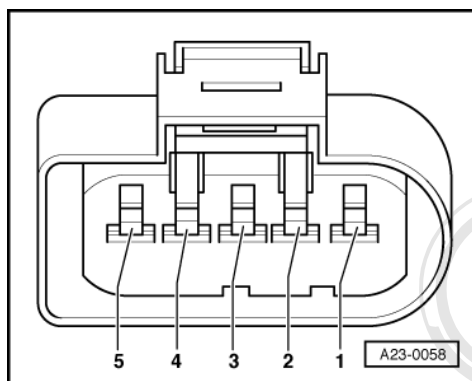
Note:

Voltage supply to airflow meter is from fuel pump relay.

If battery voltage is not present:

- Test wiring from contact 2 on connector via fuse to fuel pump relay for open circuit or short to earth. Rectify if necessary.

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



- -> Connect hand-held multimeter to contact 2 and contact 3 of the connector to measure voltage.
- Operate the starter briefly.

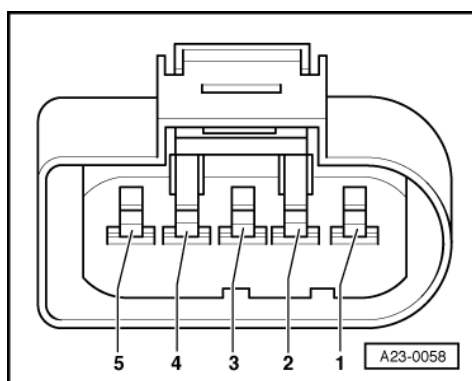
Specified value: approx. battery voltage

Note:

Engine control unit earth is present at contact 3 of the connector.

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If specified value is not attained, check wiring => Page 76 .



- -> Connect hand-held multimeter to contact 3 and contact 4 of the connector to measure voltage.
- Switch the ignition on.

Specified value: approx. 5 V.

If specified value is not attained, check wiring => Page 76 .



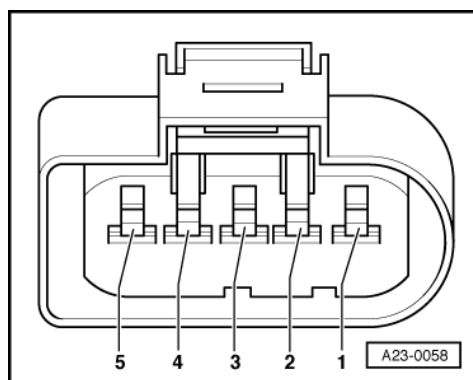
Check wiring to airflow meter.

Note:

The signal wire is also checked during the wiring check.

- Connect the V.A.G 1598/31 test box to wiring harness leading to engine control unit; the engine control unit should not be connected => Page **53**.

The following wiring connections are to be checked for open circuits and/or short to positive or negative.



Connector for airflow meter -G70	Test box V.A.G 1598/31 Contact
3	27
4	53
5	29

Wire resistance: max. 1.5 Ohm

- Additionally check all wires for short to one another.

Specified value: infinite resistance (open circuit)

- If the voltage supply and the wiring are OK, renew the airflow meter (G70).

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

Checking with engine leak detector spray G 001 800 A1

Notes:

- ♦ The vacuum in the intake system will cause the leak detector spray to be drawn in with the unmetered air. The leak detector spray reduces the 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 adhered to.
- Connect up vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "Address word" 01 => Page **3**.
For this purpose, the engine must be running at idle speed

-> Display:

Rapid data transfer HELP
Select function XX

- Press keys 0 and 8 for the function "Read measured value block" and confirm entry with Q key.

-> Display:

Reading measured value block
Enter display group number XXX

- Press keys 0, 0 and 1 for "Display group number 01" and confirm entry by pressing Q.

-> 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 engine speed does not change:

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

If engine speed drops:

- Press the ➡key.
- Press keys 0 and 6 for the "End output" function and press the Q key to confirm entry.
- Check sprayed areas of intake system for leaks and rectify if necessary.

2 - Checking lambda control

2.1 - Checking lambda control

2.2 - Function of lambda control

The lambda probes compare the oxygen content in the air with the residual oxygen content in the exhaust gas and send a voltage signal to the control unit.

The voltage signal for "Mixture rich" (low level of residual oxygen) is between about 0.5 and 1.0 V (referenced to reference earth).

The voltage signal for "Mixture weak" (high residual oxygen) is between about 0...0.5 V (referred to reference earth).

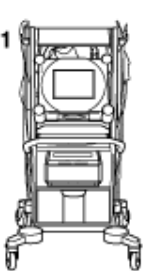
During the transition from "rich" to "lean" and vice versa ($\lambda = 1.0$), there is a voltage jump from 0.5... 1.0 V to 0...0.5 V or vice versa.

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 through the fine cavities in the electrical wiring as a result of thermal fluctuations and capillary effects).
- ◆ Lambda probe damaged by silicone vapours (the engine draws in traces of any silicone based sealants that may have been used. The silicone does not burn and damages the lambda probe).

2.3 - Checking lambda probe and lambda control before catalytic converter

V.A.G 1526 A 	V.A.G 1594 A 
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

Notes:

- ♦ All vehicles (both emission standard EU II and EU III) are fitted with two lambda probes per cylinder bank (pre-converter and post-converter probe). The probes and lambda control after catalytic converters (post-converter control) however, are only active on vehicles which conform to emission standard EU III. Measured value blocks or display zones, which are only required for EU III vehicles are not visible on EU II vehicles.
- ♦ For specific fault search, it is possible to switch off the lambda control by selecting display group 99 "Basic setting" mode and to switch it on again by selecting display group 99 in "Read measured value block" mode.
- ♦ After selecting the display group 99 (whether in "Basic setting" or "Read measured value block" mode), it is possible to switch back and forth between the functions 04 "Basic setting" and 08 "Read measured value block" by pressing the keys 4 or 8 on V.A.G 1551.

- ♦ On leaving function 04 "Basic setting", the lambda control is automatically re-activated.

Test conditions

- Test drive vehicle and do not erase fault memory.
- Coolant temperature at least 85 °C (display group 4, display zone 3)

Functional test

- Connect up vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "Address word" 01 => Page 3 .
For this purpose, the engine must be running at idle speed

-> Display:

Rapid data transfer	HELP
Select function XX	

- Press keys 0 and 4 for the function "Introduction of basic setting" and confirm entry with Q key.

Note:

During basic setting, the solenoid valve for the active carbon canister (valve -N80) is closed and the air conditioner compressor is switched off.

-> Display:

Basic setting
Enter display group number XXX

- Press keys 0, 3 and 0 for "display group number 30" and confirm entry with Q key.

-> Display:
(1...4 = display zones)

System in basic setting 30			
1	2	3	4

- Check lambda probe status
(display zones 1 to 4)

Note:

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

Please note:

On vehicles which do not conform to emission standard EU III, the display zones 2 and 4 remain empty, the "post-converter control is not active. This also applies for the further tests.

	Display zones			
	1	2	3	4
Display group 30: Lambda status at idle (coolant temperature at least 85 °C)				
Display	X X X	X X X	X X X	X X X
Display	Lambda probe status, bank 1, probe 1	Lambda probe status, bank 1, probe 2	Lambda probe status, bank 2, probe 1	Lambda probe status, bank 2, probe 2
Range	0 = off 1 = on	0 = off 1 = on	0 = off 1 = on	0 = off 1 = on
Specified value	1 1 1	1 1 0	1 1 1	1 1 0
Note:	Relevance of figures => Page 91			



Significance of 3-digit readout of display group 30

1	1	1	Display zones 1 to 4
		X	Lambda control = inactive = active
	X		Operational readiness of lambda probe = inactive = active
X			Condition of lambda probe heating = inactive = active

Notes:

- On vehicles with emission standard EU III: The lambda control of lambda probes after catalytic converters (B1-P2 and B2-P2) are not active at certain operating points without engine load, therefore the third digit of the lambda control after the catalytic converter can fluctuate between 0 and 1.
- The first digit of the 3-digit display (heating) fluctuates between 0 and 1 at certain operating points.

Checking lambda probe learned values and lambda control

- Connect up vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "Address word" 01 => Page 3 .
For this purpose, the engine must be running at idle speed.

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-> Display:

Rapid data transfer HELP
Select function XX

- Press keys 0 and 4 for the function "Introduction of basic setting" and confirm entry with Q key.

Note:

During basic setting, the solenoid valve for the active carbon canister (valve -N80) is closed and the air conditioner compressor is switched off.

-> Display:

Basic setting
Enter display group number XXX

- Press keys 0, 3 and 3 for "display group number 33" and confirm entry with Q key.

-> Display:

(1...4 = display zones)

System in basic setting 33
1 2 3 4

- Check lambda control
(display zones 1 to 4):

	Display zones			
	1	2	3	4
Display group 33: Lambda control at idle				
Display	xx.x %	x.xxx Volt	xx.x %	x.xxx V
Display	Lambda control Bank 1	Lambda probe voltage bank 1	Lambda control Bank 2	Lambda probe-voltage bank 2

	Display zones			
Range	min.: -25.0 % max.: 25.0 %	min.: 0 V max.: 1.000 V	min.: -25.0 % max.: 25.0 %	min.: 0 V max.: 1.000 V
Specified value	In range -4.0...4.0 % value must fluctuate by at least 2 %	In range 0.000...1.000 volts, the voltage must fluctuate	In range -4.0...4.0 % value must fluctuate by at least 2 %	In range 0.000...1.000 volts, the voltage must fluctuate
Note:	If specified value not attained =>Page 81	If specified value not at- tained, see evaluation => Page 82	If specified value not attained =>Page 81	If specified value not at- tained, see evaluation => Page 82

- Press Ckey.
- Press keys 0, 3 and 2 for "display group number 32" and confirm entry with Q key.

-> Display:
(1...4 = display zones)

System in basic setting 32
1 2 3 4

- Check lambda control
(display zones 1 to 4):

	Display zones			
	1	2	3	4
Display group 32: Lambda probe-learned values at idle				
Display	xx.x %	xx.x %	xx.x %	xx.x %
Display	Lambda learned value Bank 1, probe 1 at idle (additive)	Lambda learned value Bank 1, probe 1 on part throttle (multiplicative)	Lambda learned value Bank 2, probe 1 at idle (additive)	Lambda learned value Bank 2, probe 1 on part throttle (multiplicative)
Range	min.: -25.0 % max.: 25.0 %	min.: -25.0 % max.: 25.0 %	min.: -25.0 % max.: 25.0 %	min.: -25.0 % max.: 25.0 %
Specified value	-4.0...4.0 % can fluctuate slightly	-7.0...7.0 % can fluctuate slightly	-4.0...4.0 % can fluctuate slightly	-7.0...7.0 % can fluctuate slightly
Note:	If specified value not attained =>Page 82	If specified value not attained =>Page 82	If specified value not attained =>Page 82	If specified value not attained =>Page 82

If specified value is not attained in display zone 1 or display zone 3, or if the value does not fluctuate by at least 2%:

- Check the lambda probe heating
=>Page **91**.
- Check lambda probe signal wiring and activation => Page **94**.
- Test for leaks (unmetered air) in intake air system =>Page **76**.
- Check fuel pressure / fuel pressure regulator
=> Page **59**.
- Fuel return line kinked or blocked.
- Press the =>key.
- Press keys 0 and 6 for the "End output" function and press the Q key to confirm entry.
- Switch ignition off.

Interpreting display group 32

Display group 32	Possible causes of fault	Fault remedy
Display zone: 1 / 3		
Lambda learned values in range -4.0 to -25.0 %	- Oil dilution	- Carry out oil change or drive vehicle fairly fast on out-of-town roads



Display zone: 2 / 4	- High oil consumption	- Test air mass meter => Page 73
Lambda learned values in range -7.0 to -25.0 %	- Air mass meter defective	- Check solenoid valve for activated charcoal canister =>Page 104 .
	- Solenoid valve for active carbon can- ister stuck open	- Check fuel pressure regulator => Page 59
	- Fuel pressure too high	Check fuel return line
	- Fuel return line kinked or blocked.	- Check injectors =>Page 61
	- Injector leaking	

Interpreting display group 32

Display group 32	Possible causes of fault	Fault remedy
Display zone: 1 / 3		
Lambda learned values in range 4.0 to 25.0 %	- Unmetered air in intake area	- Check intake system for leaks and rectify unmetered air
Display zone: 2 / 4	- Fuel pressure too low	- Check fuel pressure regulator => Page 59
Lambda learned values in range 7.0 to 25.0 %	- Lambda probe heating defective	- Check lambda probe heating =>Page 91 .
	- Injector only opens partially or not at all	- Check injectors =>Page 61
	- Solenoid valve for active carbon canister stuck open	- Check solenoid valve for activated charcoal canister =>Page 104 .

Interpreting display group 33

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Display group 33	Possible causes of fault	Fault remedy
Display zone: 2 / 4		
approx. 0.450 V	- Open circuit in line 4 (at lambda probe) between lambda probe and control unit - Open circuit in line 3 (at lambda probe) between lambda probe and control unit - Lambda probe heating defective - Lambda probe defective	- Check signal line and actuation => Page 94 - Checking lambda probe heating => Page 91 Fit a new lambda probe
Greater than 1.100 V	- Short to positive in line 4 between lambda probe and control unit	- Check lambda probe wiring for bank 1, lambda probe 1 => Page 95
Less than 0.100 V	- Short circuit to earth in line 4 (at lambda probe) between lambda probe and control unit - Short circuit between lines 3 and 4	- Check lambda probe wiring for bank 2, lambda probe 1 => Page 97

2.4 - Checking ageing of lambda probes before catalytic converter (on vehicles which conform to emission standard EU III)

Test conditions

- Coolant temperature at least 85 °C (display group 4, display zone 3)

Test procedure for lambda probe 1 before catalytic converter bank 1

- Connect up vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "Address word" 01 => Page 3 .
 For this purpose, the engine must be running at idle speed

-> When adjacent display appears:

Rapid data transfer HELP
 Select function XX

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

-> When adjacent display appears:

Initiate basic setting Q
 Enter display group number XXX

- Enter "034" for "display group number 034" and confirm entry with Q key.

Test conditions

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- Engine runs at 1900...2200 rpm.

-> Display readout:

System in basic setting 34
 1 2 3 4

- Perform the test as soon as "Test ON" appears in display zone 4.

Note:

This process can take a few minutes.

	Display zones			
	1	2	3	4
Display group 034: Lambda probe ageing diagnosis (bank 1)				
Display	xxxx rpm	xxx oC	x,x s	Test ON
Display	Engine speed	Exhaust gas temperature	Period Lambda probe before catalytic converter	Diagnosis status
Range	0...7200 rpm	70...850 oC	0...3.0 seconds	Test OFF Test ON B1-P1 OK B1-P1 not OK
Specified value	1900...2200 rpm	greater than 260 oC	0.1...1.0 s	B1-P1 OK
Note:			If specified value not attained => ContinuePage 84	

Note on display zone 2:

Calculated value from engine speed and load.

Note on display zones 3 and 4:

The period specifies the time between two jumps in the lambda probe voltage (e.g. rich - lean - rich) thereby providing a measurement basis for the ageing status of the lambda probe. If the specified time is exceeded, display zone 4 shows = B1-P1 not OK.



(cont.)

If specified value in display zone 4 is not attained:

- Replace lambda probe 1 before catalytic converter -G39, bank 1.

Test procedure for lambda probe 1 before catalytic converter, bank 2

- Connect up vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "Address word" 01 => Page 3 .
For this purpose, the engine must be running at idle speed

-> When adjacent display appears:

Rapid data transfer HELP
Select function XX

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

-> When adjacent display appears:

Basic setting Q
Enter display group number XXX

- Enter "035" for "display group number 035" and confirm entry with Q key.

Test conditions

- Engine runs at 1900...2200 rpm.

-> Display readout:

System in basic setting 35
1 2 3 4

- Perform 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 035: Diagnosis, lambda probe ageing, (bank 2)				
Display	xxxx rpm	xxx oC	x,x s	Test ON
Display	Engine speed	Exhaust gas temperature	Period Lambda probe before catalytic converter	Diagnosis status
Range	0...7200 rpm	70...850 oC	0...3.0 seconds	Test OFF Test ON B2-P1 OK B2-P1 not OK
Specified value	1900...2200 rpm	greater than 260 oC	0.1...1.0 s	B2-P1 OK
Note:			If specified value not attained => ContinuePage 84	

Note on display zone 2:

Calculated value from engine speed and load.

Note on display zones 3 and 4:

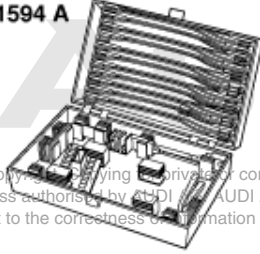
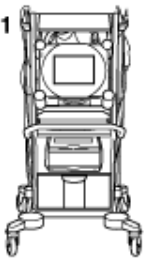
The period specifies the time between two voltage jumps of lambda probe (e.g. rich - lean - rich) thereby providing a measurement basis for the ageing status of the lambda probe. If the specified time is exceeded, display zone 4 shows = B1-P1 not OK.

(cont.)

If specified value in display zone 3 or 4 is not attained:

- Replace lambda probe 1 before catalytic converter -G108, bank 2.

2.5 - Checking lambda probe and lambda control after catalytic converter (on vehicles which conform to emission standard EU III)

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 authorized by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.
V.A.G 1598/31 	V.A.G 1788/10 
VAS 5051 	G24-0024

Special tools and workshop equipment required

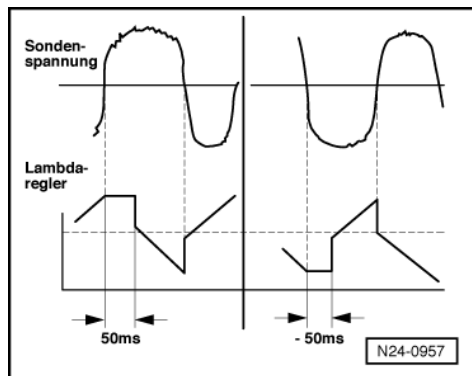
- ◆ V.A.G 1526 A
- ◆ V.A.G 1594 A
- ◆ V.A.G 1598/31
- ◆ V.A.G 1788/10



- ♦ VAS 5051 with VAS 5051/1

or

- ♦ V.A.G 1551 with V.A.G 1551/3 A



Note:

The lambda control after catalytic converter serves as a correction control.

-> It corrects slight mixture changes (e.g. enriches) through the lambda probe before catalytic converter, by maintaining the lambda control for a certain period (dwell time) at the upper / lower point. If the time is in the positive range (e.g. 50 ms), the mixture is made richer. If the time is in negative range (e.g. -50 ms), the mixture is made leaner.

Fitting location of connectors => Page 39.

Test conditions

- Test drive vehicle and do not erase fault memory.
- Coolant temperature at least 85 °C (display group 4, display zone 3)

Test sequence

- Connect up vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "Address word" 01 => Page 3.

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

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-> When adjacent display appears:

Rapid data transfer	HELP
Select function XX	

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

Note:

During basic setting, the solenoid valve for the active carbon canister (valve -N80) is closed and the air conditioner compressor is switched off.

-> When adjacent display appears:

Starting basic setting	Q
Enter display group number xxx	

- Enter "034" for "display group number 034" and confirm entry with Q key.

-> Display readout:

System in basic setting 34
1 2 3 4

- Set engine speed to 2800...3200 rpm using engine speed controller V.A.G 1788/10.
- Perform the test as soon as an exhaust gas temperature above 320 °C is attained in display zone 2.

Note:

This process can take a few minutes.

- Press C key.
- Set engine speed to 1900...2200 rpm using engine speed controller V.A.G 1788/10.

-> When adjacent display appears:

Basic setting Q
Enter display group number XXX

- Enter "030" for "display group number 030" and confirm entry with Q key.

-> When adjacent display appears:

System in basic setting 30
1 2 3 4

- Check lambda probe status for lambda probe after catalytic converter in display zones 2 and 4.

Note:

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

Display zones				
	1	2	3	4
Display group 030: Lambda status at idle				
Display	X X X	X X X	X X X	X X X
Display	Lambda probe status, bank 1, probe 1	Lambda probe status Bank 1, probe 2	Lambda probe status, bank 2, probe 1	Lambda probe status Bank 2, probe 2
Range	0 = off 1 = on	0 = off 1 = on	0 = off 1 = on	0 = off 1 = on
Specified value	1 1 1	1 1 0	1 1 1	1 1 0
Note:	Significance of readout => Page 91			

Notes:

- ♦ The lambda control of lambda probe after catalytic converter (bank 1-probe 2 and bank 2-probe 2) is not active without engine load, i.e. the display is 0.
- ♦ The first digit of the 3-digit display (heating) fluctuates between 0 and 1.
- ♦ The third digit of the 3-digit display (lambda control) fluctuates between 0 and 1.

Significance of 3-digit readout of display group 30

1	1	1	Display zones 1 to 4
		X	Lambda control = inactive = active
	X		Operational readiness of lambda probe = inactive = active



X			Condition of lambda probe heating = inactive = active
---	--	--	---

- Press C key.

-> When adjacent display appears:

Basic setting Q
Enter display group number xxx

- Enter "043" for "display group number 043" and confirm entry with Q key.

Test conditions

- Engine runs at 1900...2200 rpm.

-> Display readout:

System in basic setting 43
1 2 3 4

- Check specified value in display zone 4:

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	Display zones			
	1	2	3	4
Display group 043: Lambda probe ageing, lambda probe after catalytic converter (bank 1)				
Display	xxxx rpm	xxx oC	x.xxx V	Test ON
Display	Engine speed	Exhaust gas temperature	Voltage, lambda probe after catalytic converter, bank 1	Diagnosis status
Range	0...7200 rpm	70...850 oC	0.000...1.000 volts	Test OFF Test ON B1-P2 OK B1-P2 not OK
Specified value	1900...2200 rpm	greater than 320 oC	0.000...1.000 volts	B1-P2 OK
Note:				If specified value is not attained: Check lambda probe heating => Page 91

If specified value "B1-P2 OK" is attained:

- Press C key.

Test conditions

- Engine runs at 1900...2200 rpm.
- Press keys 0, 4 and 4 for "display group number 44" and confirm entry with Q key.

	Display zones			
	1	2	3	4
Display group 044: Lambda probe ageing, lambda probe after catalytic converter (bank 2)				
Display	xxxx rpm	xxx oC	x.xxx V	Test ON
Display	Engine speed	Exhaust gas temperature	Voltage, lambda probe after catalytic converter, bank 2	Diagnosis status
Range	0...7200 rpm	70...850 oC	0.000...1.000 volts	Test OFF Test ON B2-P2 OK B2-P2 not OK

	Display zones			
Specified value	1900...2200 rpm	greater than 320 °C	0.000...1.000 volts	B2-P2 OK
Note:				If specified value is not attained: Check lambda probe heating => Page 91

If specified value "B2-P2 OK" is attained:

- Press C key.

Checking lambda control after catalytic converter

- Carry out a test drive lasting at least 10 minutes.

-> When adjacent display appears:

Initiate basic setting Q
Enter display group number XXX

- Enter "037" for "display group number 037" and confirm entry with Q key.

-> Display readout:

System in basic setting 37
1 2 3 4

- Check lambda probe voltage in display zone 2.
- Check dwell time between lambda probe 1 before catalytic converter and lambda probe 2 after catalytic converter in display zone 3 and diagnosis result in display zone 4.

	Display zones			
	1	2	3	4
Display group 037: Diagnosis, lambda control system (bank 1)				
Display	xxx %	x.xxx Volt	xxx ms	Test ON
Display	Engine load	Voltage of lambda probe after catalytic converter, bank 1	Lambda correction value between lambda probe 1 and lambda probe 2, bank 1	Diagnosis status
Range	15.0 ...greater than 175.0 %	0.000...1.000 V	-1000...1000 ms	Test OFF Test ON SYST. OK SYST. NOK
Specified value	15.0...25.0 %	0.000...1.000 V	-500...500 ms	SYST. OK
Note:		If specified value is not attained: Evaluation, display zone 2 => Page 90	If specified value is not attained: Continued => Page 90	If "SYST. not OK" is displayed: Interrogate fault memory =>Page 90

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Note on display zone 3:

The lambda control after catalytic converter serves as a correction control. It corrects slight rich / lean mixture changes of the lambda probe before converter, by maintaining the lambda control before converter for a certain period (dwell time) at the upper / lower point. If the time is in positive range (e.g. 50 ms), the mixture is made richer. If the time is in negative range (e.g. -50 ms), the mixture is made leaner.

- Press C-key.
- Press keys 0, 3 and 8 for "display group number 38" and confirm entry with Q key.

-> Display:



(1...4 = display zones)

System in basic setting 38
1 2 3 4

	Display zones			
	1	2	3	4
Display group 038: Lambda control system diagnosis (bank 2)				
Display	xxx %	x.xxx Volt	xxx ms	Test ON
Display	Engine load	Voltage of lambda probe after catalytic converter, bank 2	Lambda correction value between lambda probe 1 and lambda probe 2, bank 2	Diagnosis status
Range	15.0 ...greater than 175.0 %	0.000...1.000 V	-1000...1000 ms	Test OFF Test ON SYST. OK SYST. NOK
Specified value	15.0...25.0 %	0.000...1.000 V	-500...500 ms	SYST. OK
Note:		If specified value is not attained: Evaluation, display zone 2 => Page 90	If specified value is not attained: Continued => Page 90	If "SYST. not OK" is displayed: Interrogate fault memory =>Page 90

Note on display zone 3:

The lambda control after catalytic converter serves as a correction control. It corrects slight rich / lean mixture changes of the lambda probe before converter, by holding the lambda control before converter for a certain period (dwell time) at the upper / lower point. If the time is in positive range (e.g. 50 ms), the mixture is made richer. If the time is in negative range (e.g. -50 ms), the mixture is made leaner.

Evaluation of display groups 037 and 038

Display group 37/38	Possible causes of fault	Fault remedy
Display zone: 2		
approx. 0.450 V	- Open circuit in line 4 between lambda probe and control unit - Open circuit in line 3 between lambda probe and control unit - Lambda probe heating defective - Lambda probe defective	- Check signal line and actuation => Page 94 - Checking lambda probe heating => Page 91 - Fit a new lambda probe
Greater than 1.100 V	- Short to positive in line 4 between lambda probe and control unit	- Check lambda probe wiring bank 1, lambda probe 2 (after catalytic converter) => Page 96
Less than 0.100 V	- Short to earth in line 4 between lambda probe and control unit - Short circuit between lines 3 and 4	- Check lambda probe wiring bank 2, lambda probe 2 (after catalytic converter) => Page 98

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(cont.)

If specified value in display group 37 and 38, display zone 3 or 4 is not attained:

- Check for air leak at exhaust or catalytic converter (check screw clamps and exhaust for damage)
- If values of display zones 3 differ greatly (e.g. +500 ms, -500 ms) (lambda correction value) in measured value blocks 37 and 38, the lambda probes after catalytic converter of cylinder bank 1 and 2 could be mixed.

If none of the given causes apply:

- Replace respective lambda probe
"pre" catalytic converter.

2.6 - Checking lambda probe heating

Note:

The lambda probe heating circuit is monitored by the self-diagnosis system.

Interrogate fault memory=> Page 6.

- Connect up vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "Address word" 01 => Page 3.
For this purpose, the engine must be running at idle speed

-> Display:

Rapid data transfer HELP
Select function XX

- Press keys 0 and 8 for the function "Read measured value block" and confirm entry with Q key.

-> Display:

Read measured value block 08
Enter display group number XXX

- Press keys 0, 4 and 1 for "display group number 41" and confirm entry with Q key.

-> Display:

Read measured value block 41
1 2 3 4

- Set engine speed to approx. 3000 rpm.
- Check resistance of lambda probe.

Note:

A readout appears in display zones 3 and 4 only on vehicles which conform to emission standard EU III.

	Display zones			
	1	2	3	4
Display group 41: Lambda probe heating bank 1 at idling speed				
Display	xxx kOhm	Htg. bC. ON	xxx kOhm	Htg. aC. ON
Display	Bank1 - probe 1	Status of heating	Bank1 - probe 2	Status of heating
Range		Htg. bC. ON Htg. bC. OFF		Htg. aC. ON Htg. aC. OFF
Specified value	0...0.5 kOhm	Htg. bC. ON/OFF	0...0.5 kOhm	Htg. aC. ON/OFF
Note:	It may take a few minutes until specified value is attained. Until then this field remains empty.		It may take a few minutes until specified value is attained. Until then this field remains empty.	

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- Press C-key.

- Press keys 0, 4 and 2 for "display group number 42" and confirm entry with Q key.

**Note:**

A readout appears in display zones 3 and 4 only on vehicles which conform to emission standard EU III.

	Display zones			
	1	2	3	4
Display group 42: Lambda probe heating bank 2 at idling speed				
Display	xxx kOhm	Htg. bC. ON	xxx kOhm	Htg. aC. ON
Display	Bank1 - probe 2	Status of heating	Bank 2, probe 2	Status of heating
Range		Htg. bC. ON Htg. bC. OFF		Htg. aC. ON Htg. aC. OFF
Specified value	0...0.5 kOhm	Htg. bC. ON/OFF	0...0.5 kOhm	Htg. aC. ON/OFF
Note:	It may take a few minutes until specified value is attained. Until then this field remains empty.		It may take a few minutes until specified value is attained. Until then this field remains empty.	

If specified value is not attained:

- Check the voltage supply to the lambda probe heating=> Page 92 .
- Check lambda probe signal line and actuation => Page 94 .

Checking voltage supply for lambda probe heating

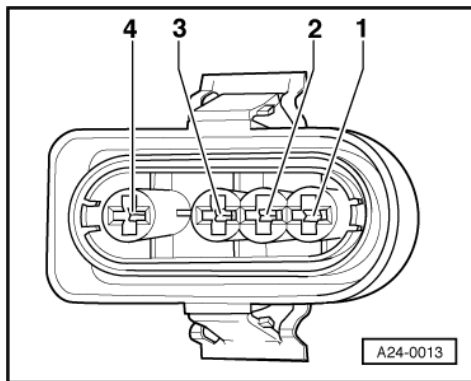
Fitting locations of 4-pin connectors of lambda probes => Page 39 .

- Checking fuse for lambda probe heating.

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

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- Disconnect 4-pin connector of relevant lambda probe.



- -> Using leads from V.A.G 1594, connect hand-held multimeter (voltage measurement range) to sockets 1 (positive) and 2 (earth).
- Operate starter briefly.

Specified value: approx. battery voltage

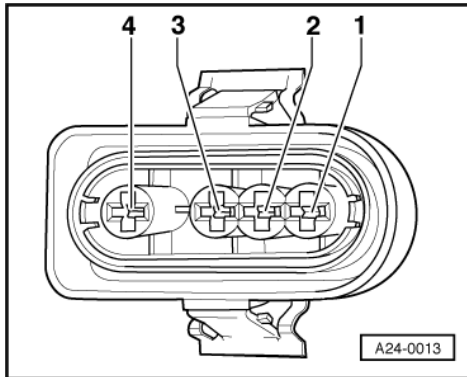
If no voltage is present:

- -> Using leads from V.A.G 1594, connect hand-held multimeter (voltage measurement range) to socket 1 (positive) and vehicle earth.
- Operate starter briefly.

Specified value: approx. battery voltage

If no voltage is present:

- Check the wiring from socket 1 on the relevant lambda probe connector on the wiring harness via the fuse to the fuel pump relay for open circuit or short.



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

If the power supply is OK:

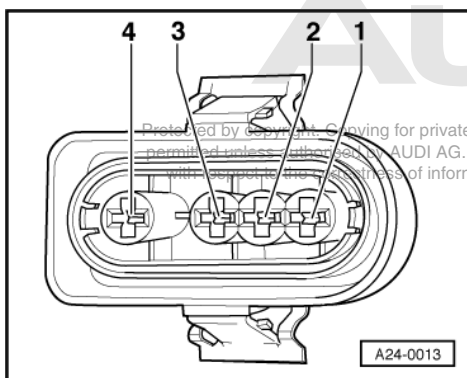
- -> Using leads from V.A.G 1594, connect hand-held multimeter (voltage measurement range) to socket 2 (earth activation from engine control unit) and battery positive.
- Start the engine.

Specified value: approx. battery voltage, fluctuating

Note:

At certain operating points, the engine control unit "cycles" the earth for the lambda probe heating. This means that at these points, the earth is continuously switched on and off. For this reason, the voltage reading on the tester may fluctuate.

- Switch ignition off.



If no voltage is present:

- Connect the V.A.G 1598/31 test box to wiring harness leading to engine control unit; the engine control unit should not be connected => Page 53 .
- -> Check for open circuit in the following wiring connections:



Lambda probe before catalytic converter: bank 1 -G39

Connector on wiring harness, socket	Test box V.A.G 1598/31 socket
2	5 (earth)

Lambda probe before catalytic converter: bank 2 -G108

Connector on wiring harness, socket	Test box V.A.G 1598/31 socket
2	4 (earth)

Lambda probe after catalytic converter: bank 1 -G130

Connector on wiring harness, socket	Test box V.A.G 1598/31 socket
2	63 (earth)

Lambda probe after catalytic converter: bank 2 -G131

Connector on wiring harness, socket	Test box V.A.G 1598/31 socket
2	6 (earth)

Wire resistance: max. 1.5 Ohm

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

If wiring connections are OK:

- Replace appropriate lambda probe.

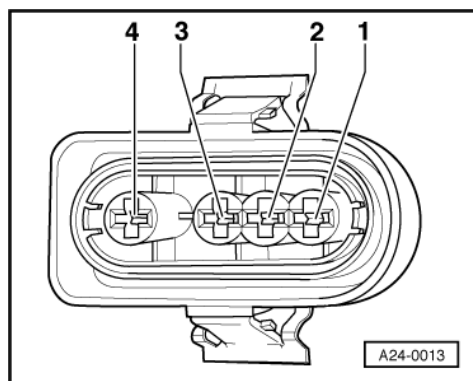
2.7 - Testing lambda probe signal wiring and activation

Note:

The lambda probe signal is monitored by the self-diagnosis system.

- Interrogate fault memory => Page 6 .
- If a fault related to the lambda probe is displayed and the lambda probe heating is OK unplug the connector for the relevant lambda probe.

Fitting locations of 4-pin connectors of lambda probes => Page 39 .



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- -> Check voltage by connecting hand-held multimeter V.A.G 1526 (measuring range 2 V) between sockets 3 and 4 of plug on wiring harness.
- Switch the ignition on.

Specified value: 450 ± 50 mV.

If specified value is not attained:

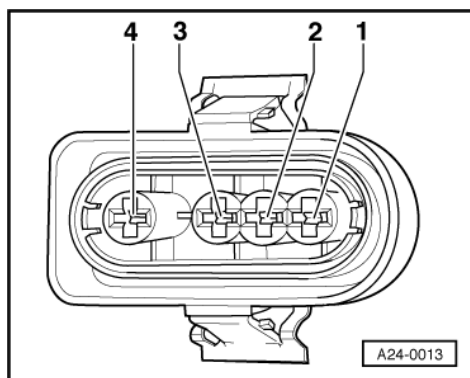
- Check lambda probe wiring => Page Bank 1, lambda probe 1, Page 98 .

If specified value is attained:

- Renew lambda probe.

Checking lambda probe wiring bank 1 lambda probe 1 -G39 before catalytic converter

Fitting location of 4-pin connector of lambda probe => Page 39 .



- Unplug 4-pin connector (black) to bank 1 lambda probe 1 -G39.
- Connect the V.A.G 1598/31 test box to wiring harness leading to engine control unit; the engine control unit should not be connected => Page 53 .
- -> Test for open circuit in the following wiring connections.

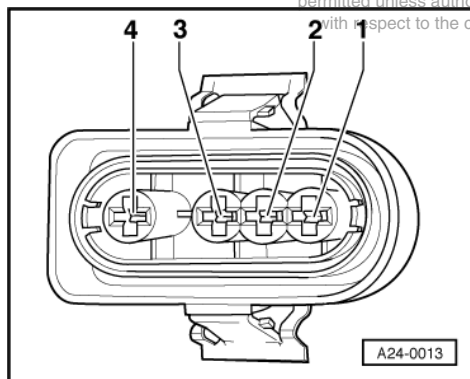
Connector on wiring harness, socket	Test box V.A.G 1598/31 socket
3	51
4	70

Wire resistance: max. 1.5 Ohm

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

- Also test wires on 4-pin connection for shorts between them.

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Connector on wiring harness, socket	Test box V.A.G 1598/31 socket
4	51

Specified value: infinite resistance (open circuit)

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

- Test screen wiring for short to lambda probe wiring.

Connector on wiring harness, socket	Test box V.A.G 1598/31 socket
4	32
3	32

Specified value: infinite resistance (open circuit)

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

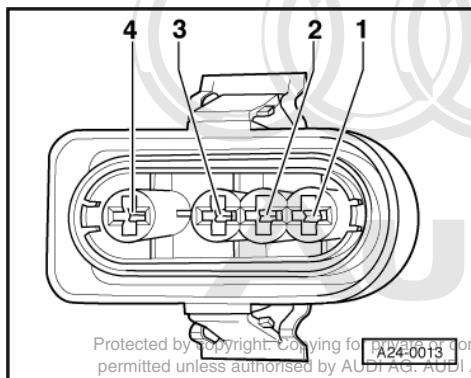
If no wiring fault is detected:

- Replace engine control unit -J220

=>Page 55 .

Checking lambda probe wiring bank 1 lambda probe 2 -G130 after catalytic converter

Fitting location of 4-pin connector of lambda probe => Page 39 .



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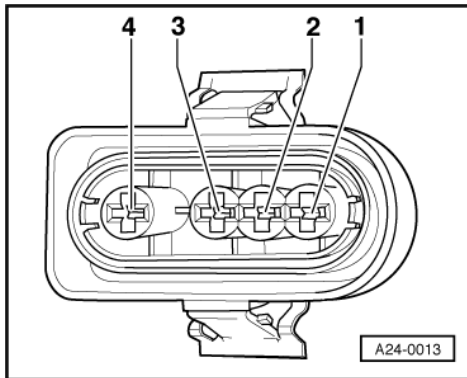
- Unplug 4-pin connector for bank 1, lambda probe 2 -G130.
- Connect the V.A.G 1598/31 test box to wiring harness leading to engine control unit; the engine control unit should not be connected => Page 53 .
- -> Test for open circuit in the following wiring connections.

Connector on wiring harness, socket	Test box V.A.G 1598/31 socket
3	68
4	69

Wire resistance: max. 1.5 Ohm

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

- Also test wires on 4-pin connection for shorts between them.



Connector on wiring harness, socket	Test box V.A.G 1598/31 socket
4	68

Specified value: infinite resistance (open circuit)

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

- Test screen wiring for short to lambda probe wiring.

Connector on wiring harness, socket	Test box V.A.G 1598/31 socket
4	32
3	32

Specified value: infinite resistance (open circuit)

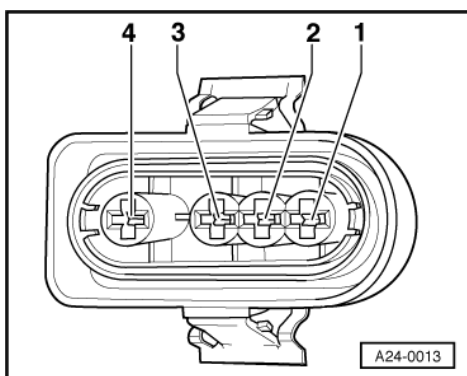
=> Current Flow Diagrams, Electrical Fault-Finding and Fitting Locations

If no wiring fault is detected:

- Replace engine control unit -J220
=>Page 55 .

Checking lambda probe wiring bank 2, lambda probe 1 -G108 after catalytic converter

Fitting location of 4-pin connector of lambda probe => Page 39 .



- Disconnect 4-pin connector (black) for bank 2, lambda probe 1 -G108.
- Connect the V.A.G 1598/31 test box to wiring harness leading to engine control unit; the engine control unit should not be connected => Page 53 .
- -> Test for open circuit in the following wiring connections.

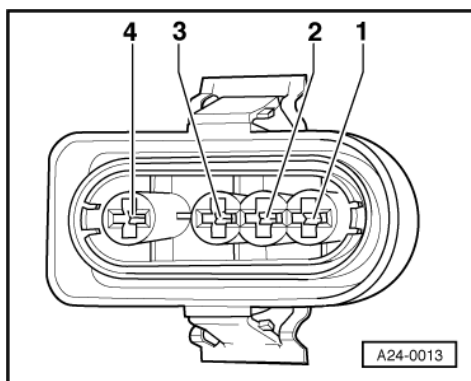


Connector on wiring harness, socket	Test box V.A.G 1598/31 socket
3	12
4	13

Wire resistance: max. 1.5 Ohm

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

- Also test wires on 4-pin connection for shorts between them.



Connector on wiring harness, socket	Test box V.A.G 1598/31 socket
4	12

Specified value: infinite resistance (open circuit)

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

- Test screen wiring for short to lambda probe wiring.

Connector on wiring harness, socket	Test box V.A.G 1598/31 socket
4	32
3	32

Specified value: infinite resistance (open circuit)

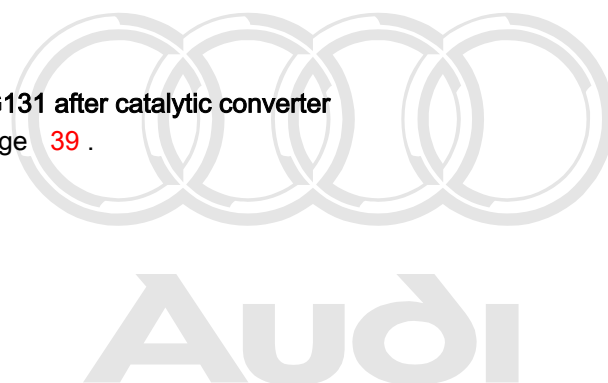
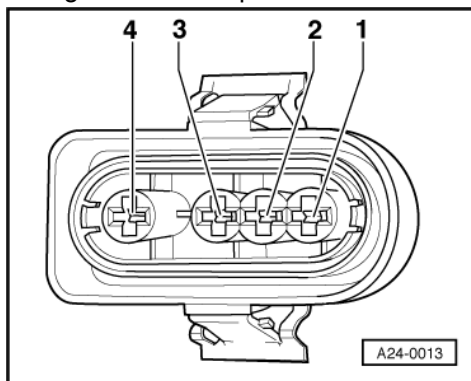
=> Current Flow Diagrams, Electrical Fault-Finding and Fitting Locations

If no wiring fault is detected:

- Replace engine control unit -J220
=>Page 55 .

Checking lambda probe wiring bank 2 lambda probe 2 -G131 after catalytic converter

Fitting location of 4-pin connector of lambda probe => Page 39 .



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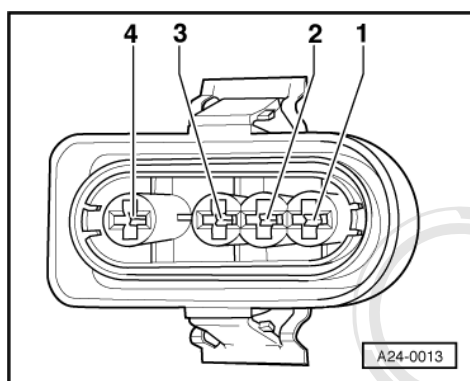
- Disconnect 4- pin connector to bank 2 lambda probe 2 -G131.
- Connect the V.A.G 1598/31 test box to wiring harness leading to engine control unit; the engine control unit should not be connected => Page 53 .
- -> Test for open circuit in the following wiring connections.

Connector on wiring harness, socket	Test box V.A.G 1598/31 socket
3	10
4	11

Wire resistance: max. 1.5 Ohm

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

- Also test wires on 4-pin connection for shorts between them.



Connector on wiring harness, socket	Test box V.A.G 1598/31 socket
4	10

Specified value: infinite resistance (open circuit)

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

- Test screen wiring for short to lambda probe wiring

Connector on wiring harness, socket	Test box V.A.G 1598/31 socket
4	32
3	32

Specified value: infinite resistance (open circuit)

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

If no wiring fault is detected:

- Replace engine control unit -J220
=>Page 55 .

2.8 - Removing and installing lambda probes

Removing

- Disconnect connector of relevant lambda probe before catalytic converter from cylinder bank 1 and cylinder bank 2 (fitting location => Page 39).

- Disconnect connector of relevant lambda probe after catalytic converter from cylinder bank 1 and cylinder bank 2 (fitting location => Page 39).
- Remove relevant lambda probe using special tool 3337/9.
- Transmission must be lowered in order to replace lambda probes after catalytic converter. This process is explained in repair manual Audi A4 1995: 6-speed Manual Gearbox 01E, Four-wheel Drive; Repair Group 34.

When installing, note the following points:

Notes:

- ♦ 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.
- ♦ The screw thread on the lambda probe is coated with assembly paste. This paste must not be allowed to penetrate the openings on the probe.
- ♦ Tightening torque 55 Nm.

3 - Testing intake air change-over valve

3.1 - Testing intake air change-over valve

3.2 - Testing solenoid valve for intake air change-over valve -N335

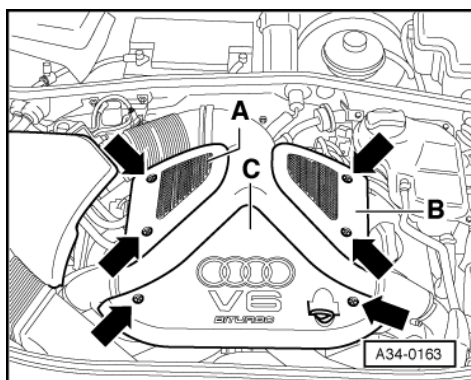
Note:

The electrical solenoid valve for intake air change-over valve -N335 actuates a mechanical valve through vacuum, which is housed in the air cleaner housing.

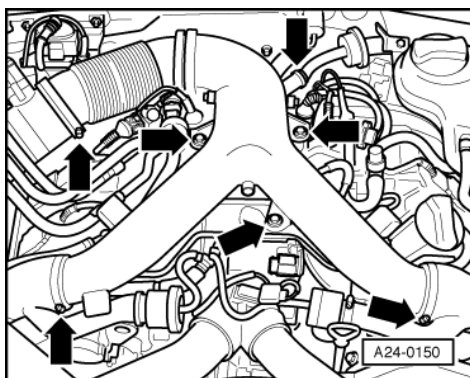
The electrical valve can be tested via the final control diagnosis. On actuation of the valve during final control diagnosis, the electric valve has to click and a changeover of the mechanical valve must be clearly audible.

Before dismantling anything, carry out final control diagnosis and note whether both valves (electric as well as mechanical in air cleaner housing) are audible on actuation of electric valve. The mechanical valve can be heard until vacuum in vacuum reserve is used up (approx. 5 change-overs)

Briefly start the engine, to be able to carry out another final control diagnosis after opening of possible hoses (i.e. to subsequently test actuation of electric valve from engine control unit).

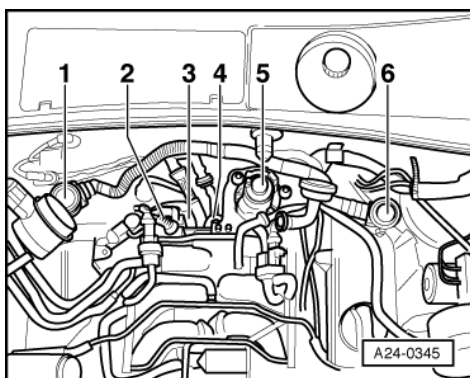


- -> Undo screw fastenings -arrows- and remove engine covers -A...C-.

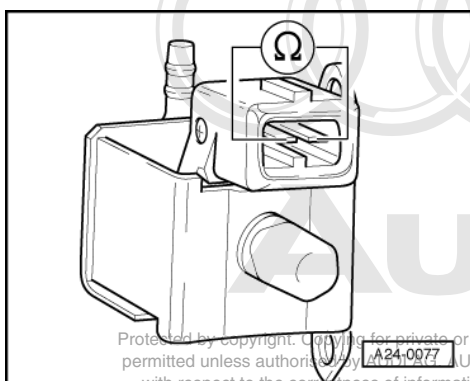


- -> Remove air duct -arrows-.

The intake air change-over valve -N335 and secondary air inlet valve -N112 are both secured to a common bracket below exhaust gas temperature senders. The bracket in turn is secured to the suction pipe with the fastening screws of the exhaust gas temperature senders. To carry out measurements, the bracket together with exhaust gas temperature sender must be detached.



- 1 - -> Combination valve for secondary air inlet (bank 1)
- 2 - Exhaust gas temperature senders -G235 and -G236
- 3 - Intake air change-over valve -N335
- 4 - Secondary air inlet valve -N112
- 5 - Secondary air pump motor -V101
- 6 - Secondary air inlet combination valve (bank 2)



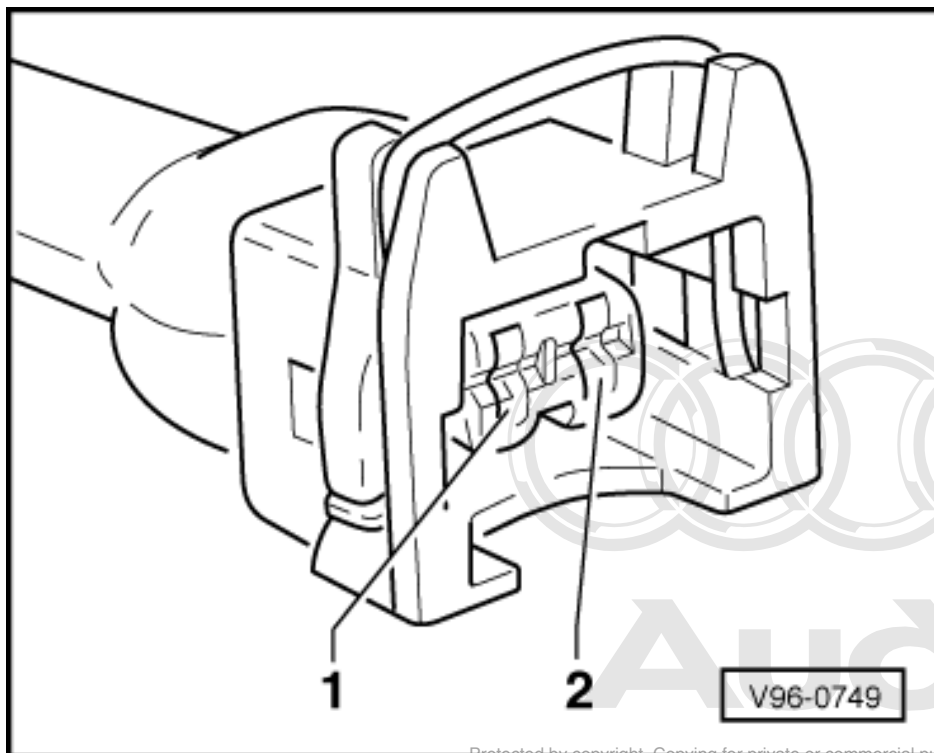
Electrical testing of intake air change-over valve -N335

Fitting location =>Page 39 .

- Unplug connector from intake air change-over valve -N335.

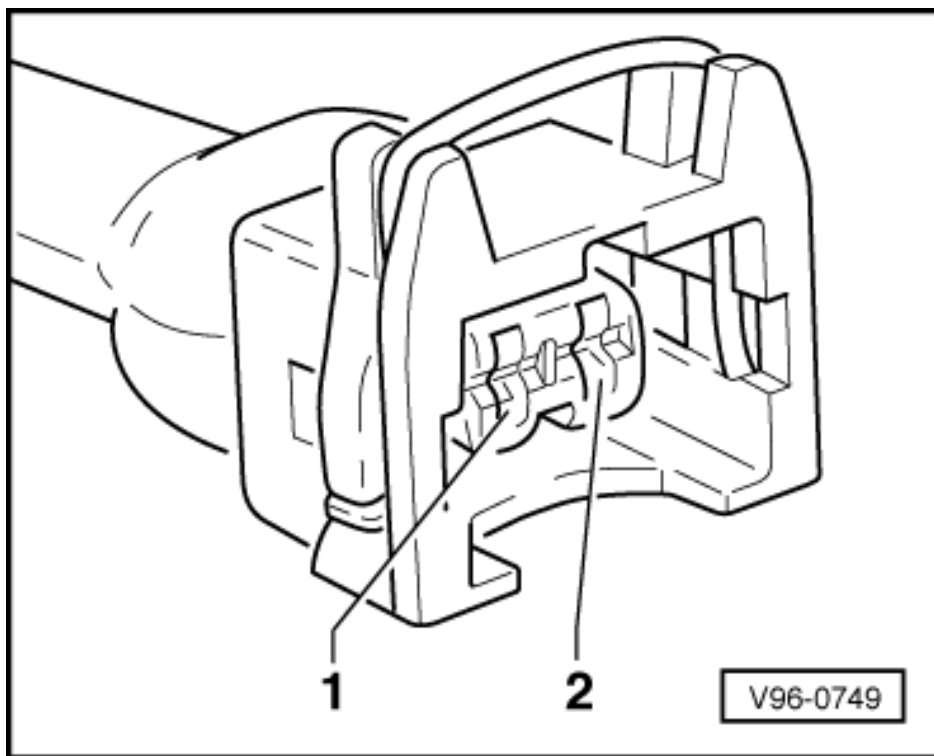


- -> Measure resistance between the valve contacts using V.A.G 1526.
Specified value: 25...35 Ohms
- If specified value is not attained, replace intake air change-over valve -N335.



Testing power supply to intake air change-over valve -N335

- -> Unplug connector from intake air change-over valve -N335.



- -> Connect diode test lamp V.A.G 1527 between engine earth and contact 1 on connector using cables from adapter set V.A.G 1594.
- Operate the starter briefly.

The diode test lamp should light up.

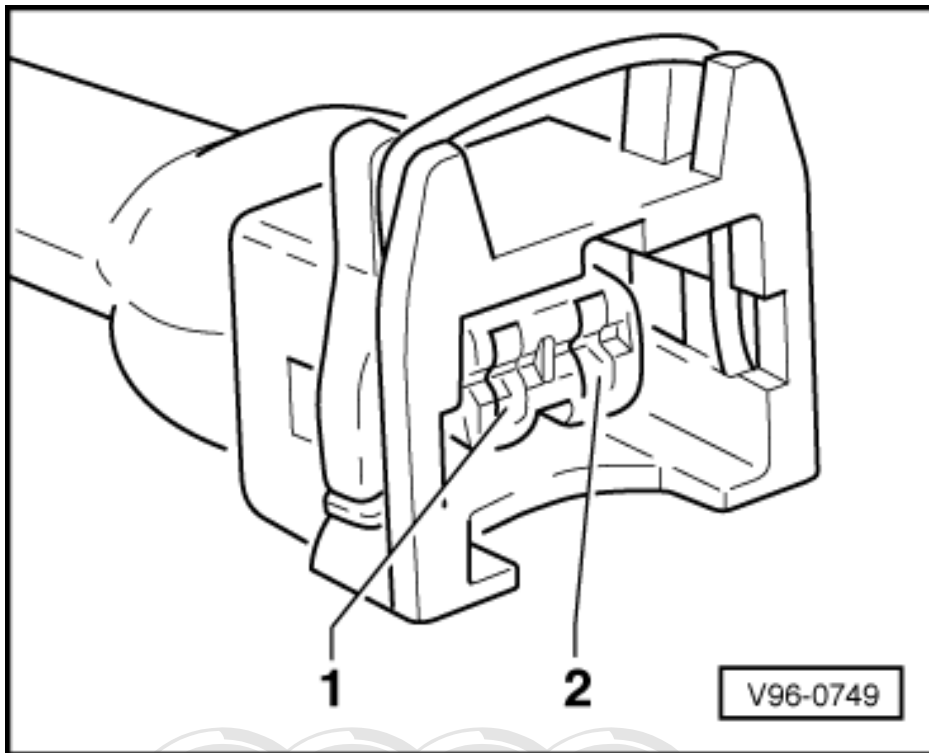
If the diode test lamp does not light up, carry out the following tests:

- Test fuse for -N335
- Test for open circuit in wiring between fuse and contact 1 on connector for intake air change-over valve using current flow diagram.

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

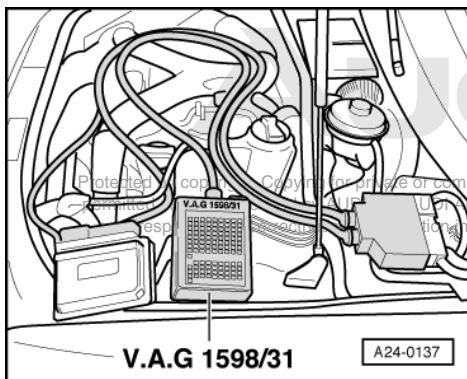
Specified value: max. 1 ω .

- Check the fuel pump relay and actuation => Page 71 .



Testing actuation of intake air change-over valve

- -> Connect diode test lamp V.A.G 1527 between contacts 1 and 2 on connector for intake air change-over valve using cables from adapter set V.A.G 1594.
- Start final control diagnosis =>Page 28 . Diode test lamp must flash on actuation of intake air change-over valve.





- -> If the diode test lamp 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 engine control unit.
=>Page 53 .
- If the diode test lamp lights up continuously, test for short to earth in wiring between contact 2 on connector for intake air change-over valve and socket 105 on V.A.G 1598/31 test box.
- If the diode test lamp does not flash, test for open circuits and short circuits to positive in the wiring between contact 2 on intake air change-over valve connector and socket 105 on test box.

Specified value: max. 1 ω .

- Rectify the short-circuit or open-circuit as appropriate.
- If no open circuits or short circuits are found, fit a new engine control unit =>Page 55 .

4 - Checking fuel tank breather

4.1 - Checking fuel tank breather

4.2 - Test solenoid valve 1 for activated charcoal filter

Note:

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

Testing for leaks

When there is no electrical supply, solenoid valve remains closed.

- Disconnect hoses from solenoid valve for activated carbon canister (N80).
- Start final control diagnosis and select solenoid valve for activated carbon canister (N80)
=>Page 28 .

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-> Display:

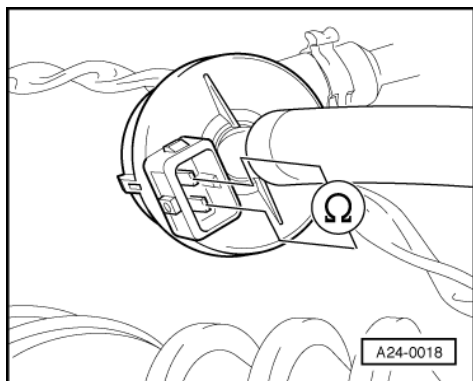
Final control diagnosis
Tank breather valve - N80

The valve should click...

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

- If the valve does not click, electrically check the solenoid valve for active carbon canister => Page 104 .
- If the valve does not open and close correctly, renew solenoid valve 1 for active carbon canister.

Electrical check for solenoid valve 1 for active carbon canister (N80)



- Unplug connector on ACF valve.
- -> Measure resistance between contacts on valve using hand-held multimeter V.A.G 1526.

Specified value: 22...30 Ohms

If specified value is not attained:

- Replace -N80 solenoid valve for active carbon canister.

If specified value is attained, check voltage supply => Page **105**.

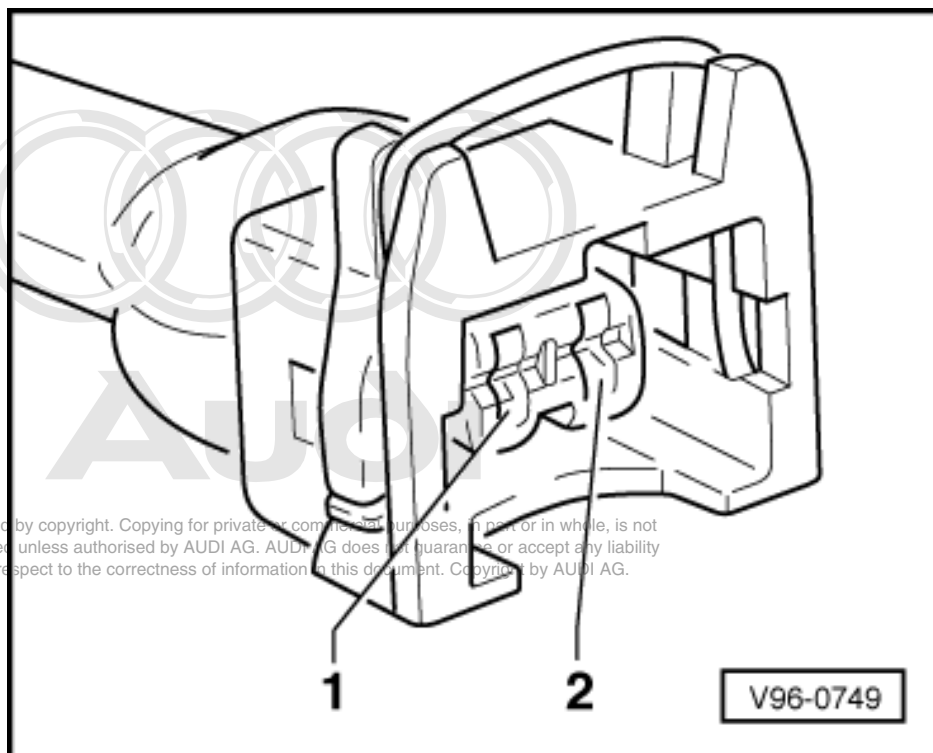
Checking solenoid valve voltage supply

Note:

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

Test conditions

- Fuse for active carbon canister valve OK



- Unplug connector on ACF valve.
- -> Connect diode test lamp V.A.G 1527 between engine earth and contact 1 on the connector.
- Operate starter.

The diode test lamp should light up.

If the diode test lamp does not light up:

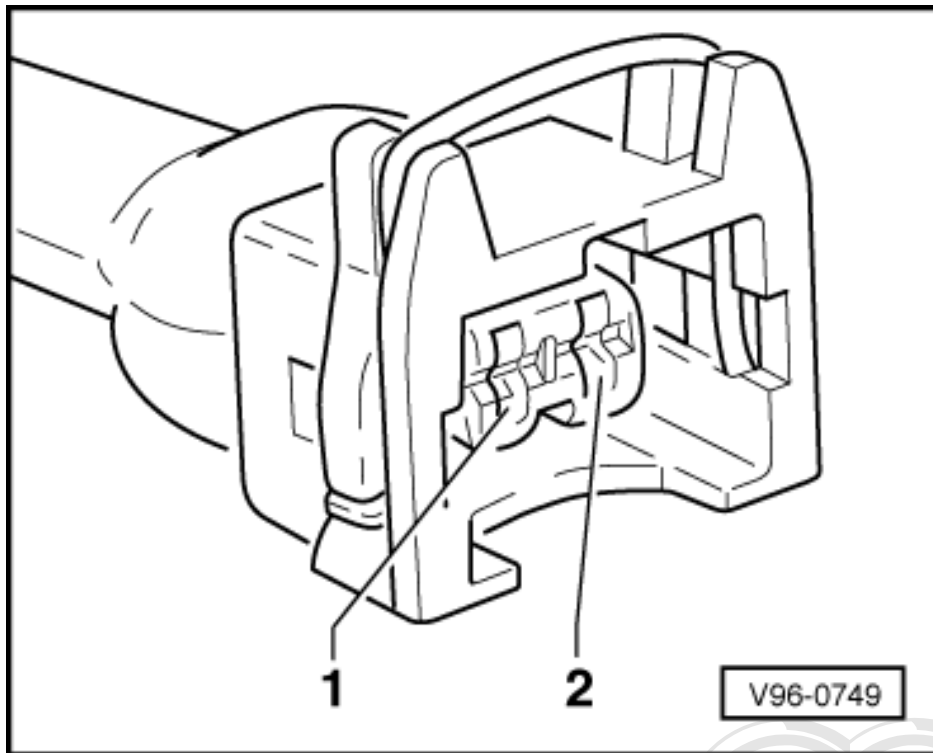
- Check the wiring from contact 1 via the fuse to the fuel pump relay for continuity, repair if necessary.

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

- If wiring is OK, test fuel pump relay => Page **71**.



If diode test lamp comes on, check activation => Page **106** .

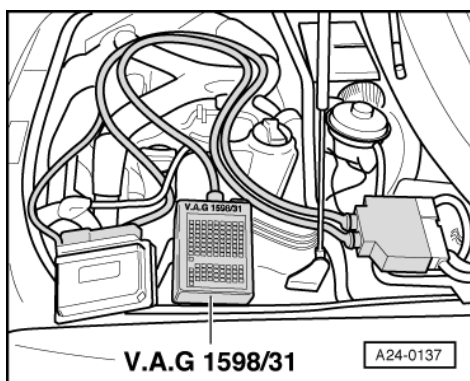


Testing ACF valve activation

- -> Connect the V.A.G 1527 diode test lamp between contact 2 and contact 1 (positive) in the connector.
- Start final control diagnosis and select solenoid valve for activated carbon canister (N80)
=>Page **28** . (Please note that final control diagnosis can only be carried out twice if engine was started between tests.)

Diode test lamp should flash.

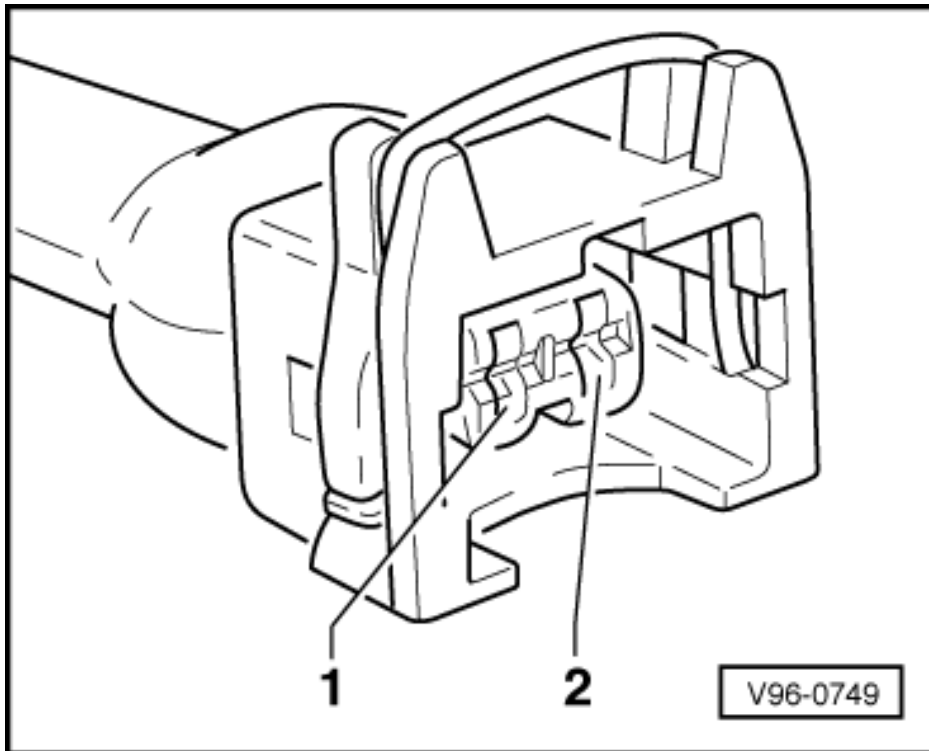
If the diode test lamp does not flash or is continuously lit:



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- -> Connect the V.A.G 1598/31 test box to wiring harness leading to engine control unit; the engine control unit should not be connected
=>Page **53** .

If the diode test lamp is continuously lit:



- -> Test for the line from contact 2 on the ACF valve connector and socket 64 on the test box for a short to earth.

If the diode test lamp does not flash:

- Check line from contact 2 on active carbon canister valve connector to contact 64 on test box for continuity and for short to positive.

Wire resistance: max. 1.5 Ohm

- If necessary, rectify short circuit to earth or open circuit.
- If no short circuit or open circuit is found, fit a new engine control unit
=>Page 55 .

5 - Checking electronic engine power control (electronic throttle)

5.1 - Checking electronic engine power control (electronic throttle)

5.2 - Function of the electronic throttle system

In the electronic throttle system, the throttle valve is not operated by a cable connected to the accelerator pedal. There is no mechanical connection between the accelerator pedal and the throttle valve.

The throttle valve is actuated, over the full range of engine speed and power, by an electric motor (throttle valve actuator) in the throttle valve control unit.

The throttle valve actuator moves the throttle valve as instructed by the engine control unit.

The position of the accelerator pedal is communicated to the engine control unit by two accelerator position senders (variable resistances located in a single housing). These senders are linked to the accelerator pedal.



The position of the accelerator pedal (decided by the driver) is one of the main input parameters to the engine control unit.

With the ignition switched on and the engine not running, the engine control unit controls the throttle valve precisely in accordance with the signals from the accelerator position senders. This means that when the accelerator is pressed half way down, the throttle valve actuator opens the throttle valve to an equivalent extent; the throttle valve is then about half open.

When the engine is running (and under load), the engine control unit can open and close the throttle valve independently of the accelerator position senders.

As an example, the throttle valve can be fully open even though the accelerator pedal is only pressed half way down. This has the advantage of preventing throttle losses at the throttle valve.

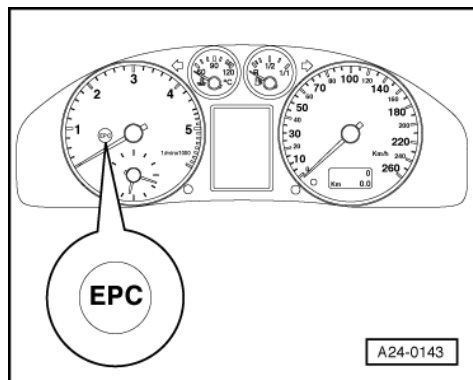
Under certain engine load conditions, markedly improved emission and consumption figures are also attained.

The engine torque necessary can be provided by the engine control unit by an optimum combination of throttle opening and boost pressure.

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The electronic control system does not simply consist of one or two components but is, rather, a system which includes all the components which contribute to determining the position of the throttle valve and to controlling and monitoring this position. These components include, for example, the throttle valve control unit, the EPC warning lamp, the engine control unit.

5.3 - Significance of the EPC warning lamp (fault warning lamp for electronic throttle) in dash panel insert

"EPC" is an abbreviation for Electronic Power Control and refers to the electronic throttle control system.



-> Location of the EPC warning lamp

When the ignition is switched on, the engine control unit checks all the components of importance to the electronic throttle system.

After switching on the ignition the engine control unit switches on the EPC warning lamp. The EPC lamp goes out shortly after starting the engine, if, on the one hand, the engine control unit does not detect any faults in the EPC system, and, on the other, if actuation of the lamp by the engine control unit is OK.

If a fault is detected in the electronic throttle system while the engine is running, the engine control unit switches on the EPC warning lamp. At the same time, an entry is made in the engine control unit fault memory.

Functional check on control lamp

- Switch the ignition on.

Specified value: EPC warning lamp should light up.

If the EPC warning lamp does not come on:

- Check the line from the engine control unit to the EPC warning lamp as follows:

Cause EPC warning lamp has not been activated or has not lit because of an open circuit.	Remedy: -Switch off ignition. -Connect test box V.A.G 1598/31; do not connect engine control unit. -Bridge sockets 1 and 48 on test box. -Switch on ignition. EPC warning lamp should come on.If the EPC warning lamp does not come on: -Switch off ignition. -Find and rectify short circuit or open circuit between engine control unit and EPC warning lamp with the aid of current flow diagram.
	If no fault is found in line to EPC warning lamp:
Cause of fault	Dash panel insert defective => renew dash panel insert

- Start engine and run at idling speed.
Specified value: EPC warning lamp should go out shortly after starting.

If the EPC warning lamp does not go out:

- Interrogate the fault memory of the engine control unit.

If no fault is stored:

Cause EPC Warning lamp is continuously activated by short to earth.	Remedy: -Switch off ignition. -Connect test box V.A.G 1598/31; do not connect engine control unit. -Measure resistance between vehicle earth and socket 48 in test box. Specified value: infinite resistance (because this line should have no direct connection to earth). If specified value is not attained: -Find and rectify short circuit to earth in line between engine control unit and EPC warning lamp with the aid of current flow diagram.
	If no fault is found in line to EPC warning lamp:
Cause of fault	Dash panel insert defective => renew dash panel insert

5.4 - Checking throttle valve control unit

The following components are located in the housing of the throttle valve control unit.
(this housing must not be opened):

- Throttle valve drive - G186 (This is an electric motor which is activated by the engine control unit. This electric motor opens the throttle valve against the force of a spring).
- Angle sender for throttle valve drive -G187
- Angle sender 2 for throttle valve drive -G188

Note:

The angle senders are in the form of potentiometers (variable resistances). They provide the position of the throttle valve to the engine control unit completely independently of one another (redundant system).

The potentiometers cannot be adjusted mechanically. The settings are performed as part of the basic setting (function 04) using the V.A.G 1551 or 1552 fault reader.



5.5 - Performing adaptation of throttle valve control unit

The adaptation process enables the engine control unit to learn the various positions of the throttle valve control unit 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 throttle valve drive angle senders.

An adaptation must always be performed if the throttle valve control unit (J338) or the engine control unit is removed and refitted or replaced, or if the voltage supply to the engine control unit is interrupted.

The learning process (adaptation process) is performed:

- ♦ By initiating the basic setting (Function 04) of display group 60 with ignition switched on.
- ♦ Automatically if the ignition is switched on once for at least 6 seconds without actuating the starter or the accelerator pedal and the engine control unit recognises "Learning requirement". In this case, however, it is not obvious whether the adaptation process was successful or not. Learning demand is recognised if stored voltage values from the angle senders do not coincide with current measured voltage values in a certain tolerance band.

Note:

Engine will not start during automatic adaptation.

Test conditions

- No fault stored in fault memory
=> Page 6, Interrogating fault memory.
 - Engine stopped, ignition switched on
 - Accelerator not depressed
 - Coolant temperature at least 5 °C but below 100 °C (display group 4, display zone 3).
 - Intake air temperature at least 10 °C (display group 4, display zone 4).
 - Voltage supply to engine control unit greater than 11 V, Testing =>Page 147.
- Connect up vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "Address word" 01 => Page 3.
- For this purpose, the ignition must be switched on.

-> Display:

Rapid data transfer	HELP
Select function XX	

- Press keys 0 and 4 for the function "Introduction of basic setting" and confirm entry with Q key.

-> Display:

Basic setting	Q	
Enter display group number		xxx

- Press keys 0, 6 and 0 for "display group number 60" and confirm entry with Q key.

-> Display:

Basic setting 60			
1	2	3	4

- Check specified value for throttle valve control unit in display zone 4 =>Page 111.

After the Q key is pressed, the throttle valve actuator is first disconnected from the electricity supply.

In this condition, the throttle valve is pulled into an emergency running position by a mechanical spring which is located in the throttle valve control unit. The values supplied by the two angle senders in this emergency running position are stored in the engine control unit.

The throttle valve is then opened by a predetermined amount. When this value is reached, the throttle valve actuator is again disconnected from the electricity supply. The mechanical spring should then close the throttle valve to the previously learnt emergency running position within a specified period of time (spring test).

The throttle valve actuator then closes the throttle valve; the values supplied by the angle senders in the throttle valve control unit are stored in the engine control unit.

If the engine control unit disconnects the throttle valve actuator from the electricity supply while the vehicle is being driven, the result will be an increased and fluctuating idling speed and a very poor throttle response.

- Check specified value for throttle valve control unit (Display zone 4).

	Display zones			
	1	2	3	4
Display group 60: Adaptation of throttle valve control unit				
Display	xx %	xx %	---	---
Display	Throttle valve angle (angle sender 1)	Throttle valve angle (angle sender 2)	Learning stage counter	Adaptation status
Range	min.: 0 % max.: 100 %	min.: 0 % max.: 100 %	0 to 8	ADP process running ADP process OK ADP ERROR
Specified value	3...20 %	80...97 %	8	ADP process OK
Note:			Learning stage counter moves from 0 to 8 during adaptation process. (some numbers may also be skipped).	If specified value is not attained: Notes => Page 111

Note:

The deciding factor is not how the learning stage counter (display zone 3) behaves during the adaptation process, but that specified value in display zone 4 "ADP OK" has been attained after adaptation.

"ADP" in display zone 4 stands for "Adaptation".

Note:

If the adaptation is interrupted by the control unit, the reason could be one of the following:

- ◆ The throttle valve cannot close completely (e.g. dirt).
- ◆ Connectors (e.g. on throttle valve control unit) have become loose, are not properly engaged or contacts in plugs are corroded/bent.
- ◆ The battery voltage is too low.
- ◆ Throttle valve control unit or wiring is defective.
- ◆ Engine was started or accelerator was actuated during the adaptation process.
- ◆ Distortion of throttle valve housing (check screw connection; tightening torque: 10 Nm)

When adaptation process is interrupted, message "Function is unknown or cannot be carried out at the moment" is displayed on tester. The next time the ignition is switched on (for several seconds), the adaptation process is automatically performed again.

- End the engine basic setting by pressing the ➔ key.
- Press keys 0 and 6 for the function "End data transfer" and confirm entry with the Q key.

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5.6 - Checking angle sender for throttle valve actuator

The throttle valve drive angle senders G187 and G188 signal the position of the throttle valve to the engine control unit. Both angle senders are located in the throttle valve control unit.

- Connect up vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "Address word" 01 => Page 3 .
For this purpose, the ignition must be switched on.

-> Display:

Rapid data transfer	HELP
Select function XX	

- Press keys 0 and 8 for the function "Read measured value block" and confirm entry with Q key.

-> Display:

Reading measured value block	Q
Enter display group number	xxx

- Press keys 0, 6 and 2 for "display group number 62" and confirm entry with Q key.

-> Display:

Read measured value block 62
1 2 3 4

- Check specified values for electronic throttle potentiometer voltages.

	Display zones			
	1	2	3	4
Display group 62: Electronic throttle potentiometer voltages				
Display	xx %	xx %	xx %	xx %
Display	Throttle valve angle (angle sender 1)	Throttle valve angle (angle sender 2)	Sender for accelerator pedal posi- tion	Sender 2 for accelerator pedal posi- tion
Range	min.: 0 % max.: 100 %	min.: 0 % max.: 100 %	min.: 0 % max.: 100 %	min.: 0 % max.: 100 %
Specified values	3...93 % (Idling speed value: 8...18 %)	97...3 % (Idling speed value: 80...90 %)	12...97 %	4...49 %

Note:

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

- Observe readouts in display zones 1 and 2.
- Slowly depress accelerator pedal.

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Percentage displayed in zone 1 should rise evenly. The tolerance range from 3...93 % is not fully utilised.

Percentage displayed in zone 2 should fall evenly. The tolerance range from 97...3 % is not fully utilised.

If the displays are not as described:

- Check throttle valve control unit voltage supply and wiring =>Page 113 .

Pay particular attention to connectors, which may be loose, not properly engaged or corroded.

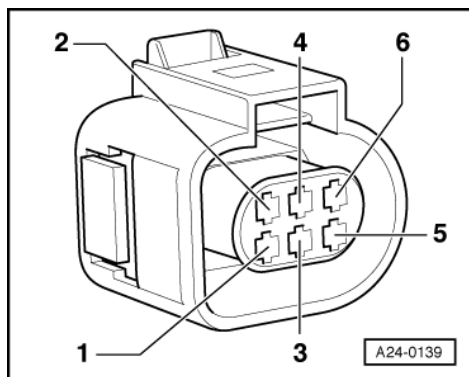
=> Current Flow Diagrams, Electrical Fault-Finding and Fitting Locations

- Check the accelerator position senders
=>Page 114 .

Notes:

- ♦ The reason why the value in display zone 1 rises and that in zone 2 falls is that the potentiometers (angle senders) in the throttle valve control unit operate in opposite directions.
- ♦ This means that the voltage picked off by one of the angle senders runs in the direction of 5 V. (As the throttle is opened, the voltage becomes greater and the percentage increases).
- ♦ The voltage picked off by the angle sender 2 runs from 5 V in the direction of 0 V. (As the throttle is opened, the voltage becomes smaller and the percentage decreases).

Checking the voltage supply to the throttle valve control unit.



- Unplug the connector from the throttle valve control unit.
- Switch the ignition on.
- -> Connect hand-held multimeter (voltage range) between the following contacts on the connector:

6-pin connector on the wiring harness, contact.	Specified value
2 + earth	approx. 5 V
2 + 6	approx. 5 V

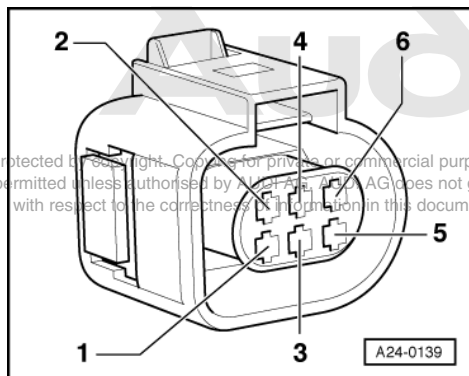
If specified values are not attained, also check the signal and activation lines of the throttle valve actuator => Page 113 .

If specified values are not attained:

Check wiring between engine control unit and throttle valve control unit

=>Page 113 .

Checking wiring



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- -> Unplug the connector from the throttle valve control unit.
- Connect the V.A.G 1598/31 test box to wiring harness leading to engine control unit; the engine control unit should not be connected.

=>Page **53** .

The following wiring connections are to be checked for open circuits and/or short to positive or negative.

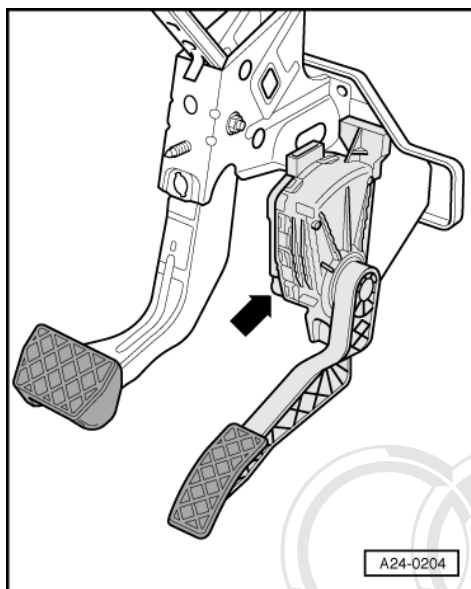
6-pin connector on the wiring harness, contact.	Test box V.A.G 1598/31, socket
1	92
2	83
3	117
4	84
5	118
6	91

- Rectify any open/short circuit as necessary.

If no wiring fault is detected:

- Replace throttle valve control unit

5.7 - Checking accelerator position sender



-> Installation position for gas pedal position sender -G79 and sender 2 for gas pedal position -G185

Both accelerator pedal position senders (G79 and G185) are located on the accelerator pedal and (completely independently) signal the driver's requirements to the engine control unit. Both senders are located in one housing.

- Connect up vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "Address word" 01 => Page **3** .

For this purpose, the ignition must be switched on.

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-> When adjacent display appears:

Rapid data transfer **HELP**
Select function XX

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

-> When adjacent display appears:

Reading measured value block Q
Enter display group number XXX

- Enter "062" for "display group number 062" and confirm entry with Q key.

-> Display:

Read measured value block 62
1 2 3 4

- Check specified values for electronic throttle potentiometer voltages.

	Display zones			
	1	2	3	4
Display group 062: Electronic throttle potentiometer voltages				
Display	xx %	xx %	xx %	xx %
Display	Throttle valve angle (angle sender 1)	Throttle valve angle (angle sender 2)	Sender for accelerator pedal position	Sender 2 for accelerator pedal position
Range	min.: 0 % max.: 100 %	min.: 0 % max.: 100 %	min.: 0 % max.: 100 %	min.: 0 % max.: 100 %
Specified value	3...93 %	97...3 %	12...97 % Idling speed value: 12...18 %	4...49 % (Idling speed value: 4...13 %)

Note:

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

- Observe readouts in display zones 3 and 4.
- Slowly depress accelerator pedal.

Percentage displayed in zone 3 should rise evenly. The tolerance range from 12...97% is not fully utilised.

Percentage displayed in zone 4 should also rise evenly. The tolerance range from 4...49 % is not fully utilised.

Note:

The value displayed in zone 3 must always be about twice as large as that in zone 4.

If the displays are not as described:

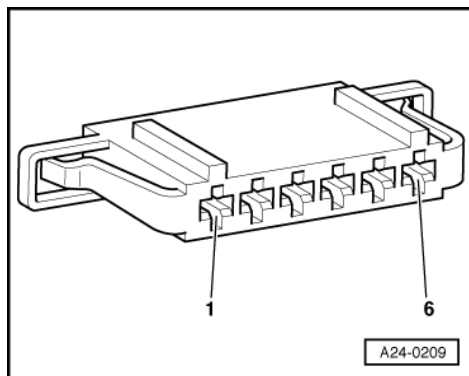
- Check voltage supply and wiring for accelerator position sender => Page 115 .

Checking voltage supply for accelerator position senders

- Remove driver's storage compartment.

=> General Body Assembly - Interior; Repair Group 68; Dash panel; Removing driver's shelf Dash panel Removing driver's shelf

- Detach connector from accelerator position senders.
- Switch the ignition on.





- -> Connect multimeter as follows to measure voltage:

Connector contact	Specified value
1 + earth	approx. 5 V
1 + 5	approx. 5 V
2 + earth	approx. 5 V
2 + 3	approx. 5 V

If specified values are attained:

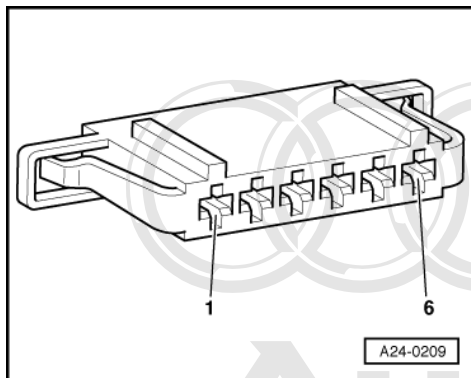
- Additionally check signal wires.

If specified values are not attained:

- Check wiring between engine control unit and accelerator position senders.

Checking wiring

- Connect the V.A.G 1598/31 test box to wiring harness leading to engine control unit; the engine control unit should not be connected=> Page 53 .



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

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 wiring fault is detected:

- Replace accelerator position senders.

Note:

After replacement of accelerator position sender on vehicles with automatic/continuously variable gearbox, kickdown function must be learnt by engine control unit => Page 117 .

5.8 - Learning kickdown function

If accelerator position sender or engine control unit is replaced on vehicles with automatic/continuously variable gearbox, kickdown function must be learnt by engine control unit.

Preconditions:

- Fault recorded in memory during diagnosis; interrogate fault memory =>Page 6 .
- Engine stopped, ignition switched on
- Connect up vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "Address word" 01 => Page 3 .
For this purpose, the ignition must be switched on.

-> When adjacent display appears:

Rapid data transfer HELP
Select function XX

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

-> When adjacent display appears:

StarStarting basic setting Q
Enter display group number XXX

- Enter "063" for "display group number 063" and confirm entry with Q key.

-> Display readout:

System in basic setting 63
1 2 3 4

Note:

You will now be instructed to: "Actuate kickdown"

- Fully depress accelerator pedal beyond kickdown point and keep it pressed.

Note:

V.A.G 1551 displays "Kickdown ADP running" while learning kickdown point. After successful learning of kick-down point, V.A.G 1551 displays "Kickdown ADP OK".

- Check specified value in display zone 4:

	Display zones			
	1	2	3	4
Display group 063: Learning kickdown function				
Display	xx %	xx %		---
Display	Sender for accelerator pedal posi- tion	Sender 2 for accelerator pedal posi- tion	Adaptation status	
Range	0...100 %	0...100 %	Kick Down	Starting ADP. running ADP. OK ADP ERROR
Specified value	12...97 %	4...49 %	Kick Down	ADP OK
Note:			If "ADP ERROR" is displayed: Interrogate fault memory => Page 6 .	



Notes:

- ♦ "ADP" in display zone 4 stands for adaptation.
- ♦ "ERROR" can be displayed, if e.g. accelerator pedal is not pressed when instructed by tester, or if accelerator pedal was released while adaptation was already running but process was not yet complete.
In both cases it is necessary to exit the "Basic setting" mode and restart the adaptation process afresh
=>Page 117.

If specified value "ADP OK" is attained:

- Press the ➡key.

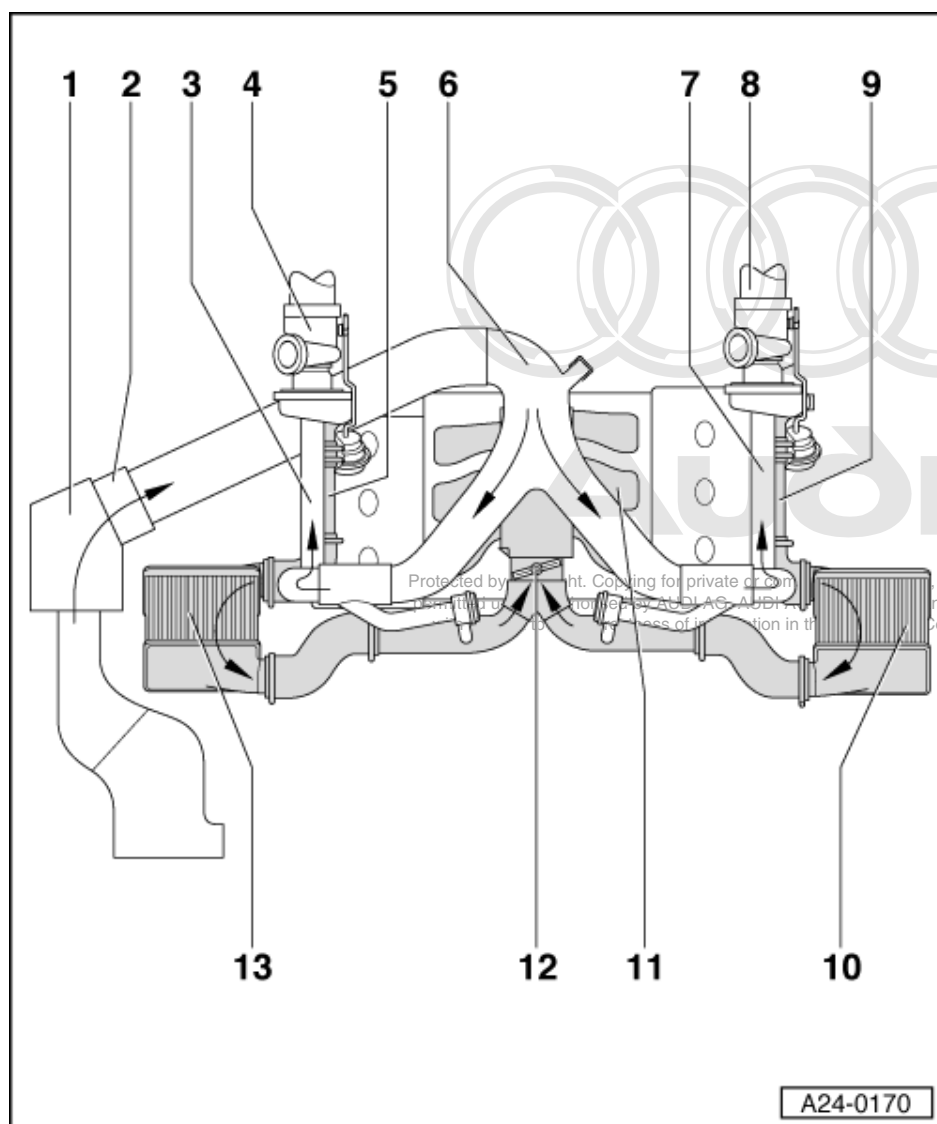
-> Display readout (function selection):

Rapid data transfer	HELP
Select function XX	

- Enter "06" to end output.

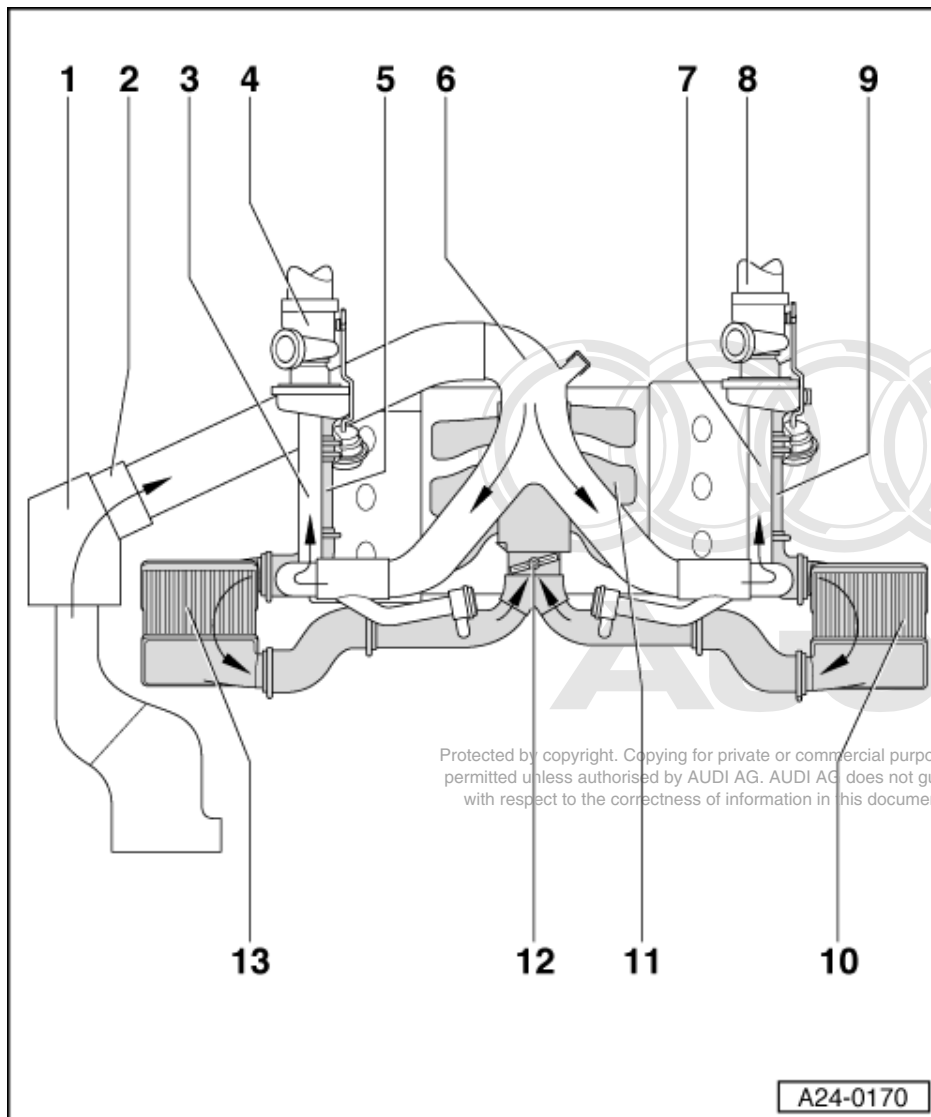
6 - Vacuum diagram

6.1 - Vacuum diagram



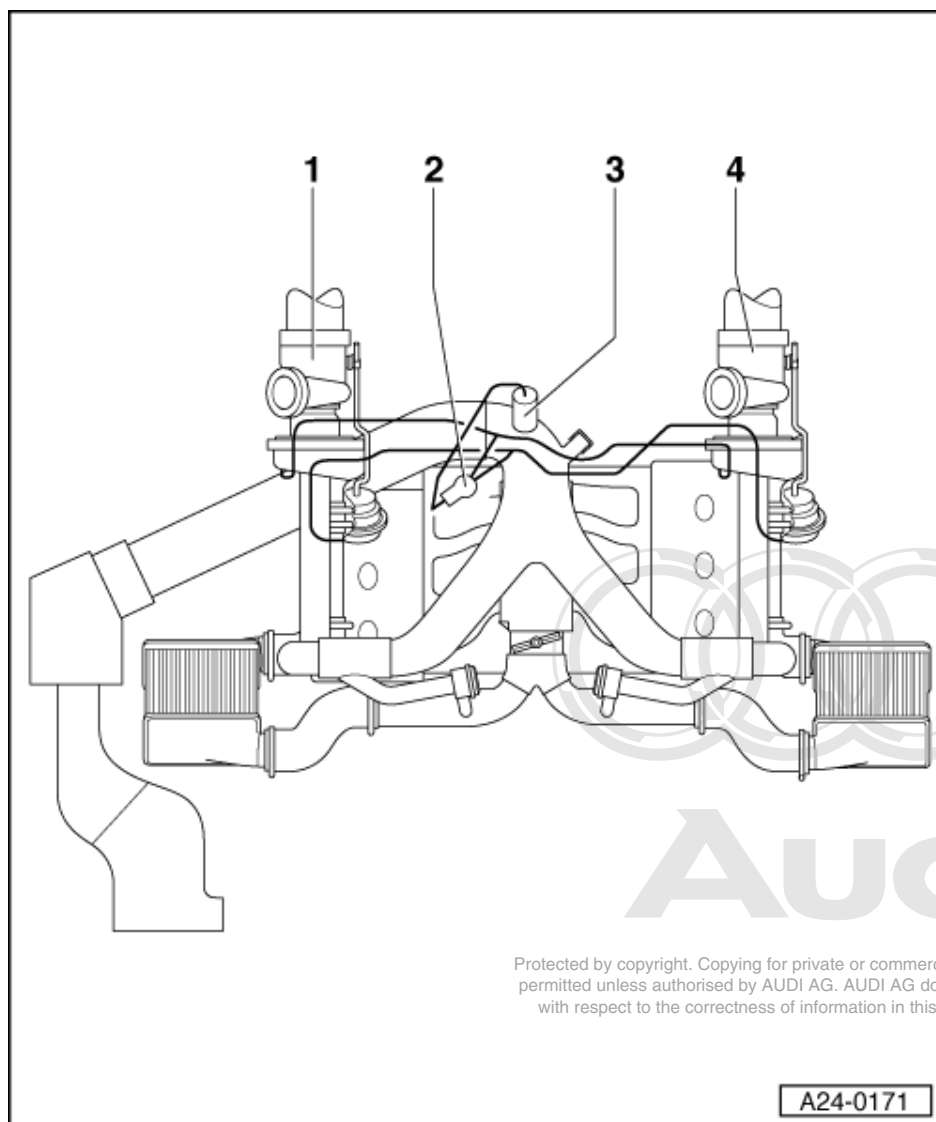
6.2 - Air duct, general

- 1 Air cleaner
- 2 Air mass meter (G70)
- 3 Intake side turbocharger, bank 1
- 4 Turbocharger, bank 1
- 5 Pressure side turbocharger, bank 1
- 6 Air duct



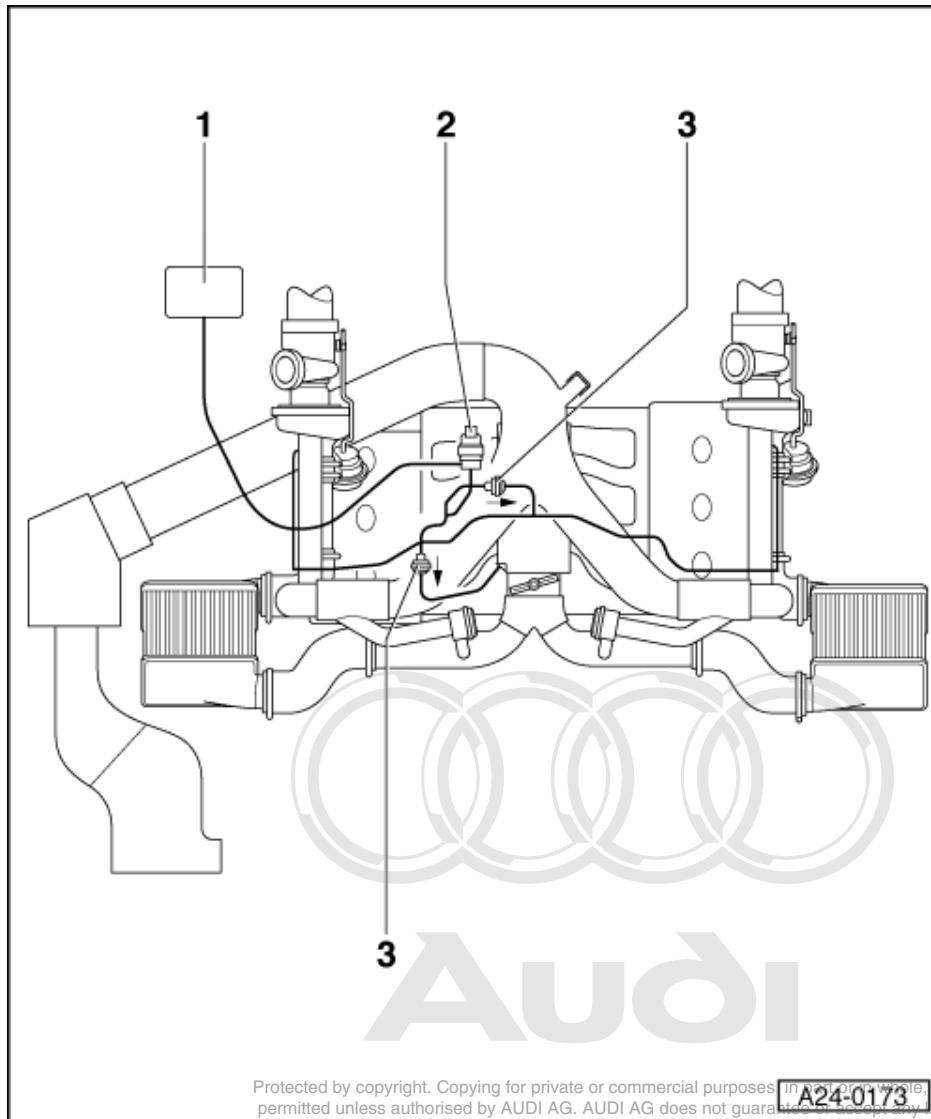
- 7 Intake side turbocharger, bank 2
- 8 Turbocharger, bank 2
- 9 Pressure side turbocharger, bank 2
- 10 Boost air cooler, bank 2
- 11 Intake manifold
- 12 Throttle valve control unit (J338)
- 13 Boost air cooler, bank 1

6.3 - Subsystem, charge pressure control



- 1 Turbocharger, bank 1
- 2 Solenoid valve for boost pressure limitation (N75)
- 3 Distributor piece
- 4 Turbocharger, bank 2

6.4 - Subsystem, fuel tank breather (ACF-system)



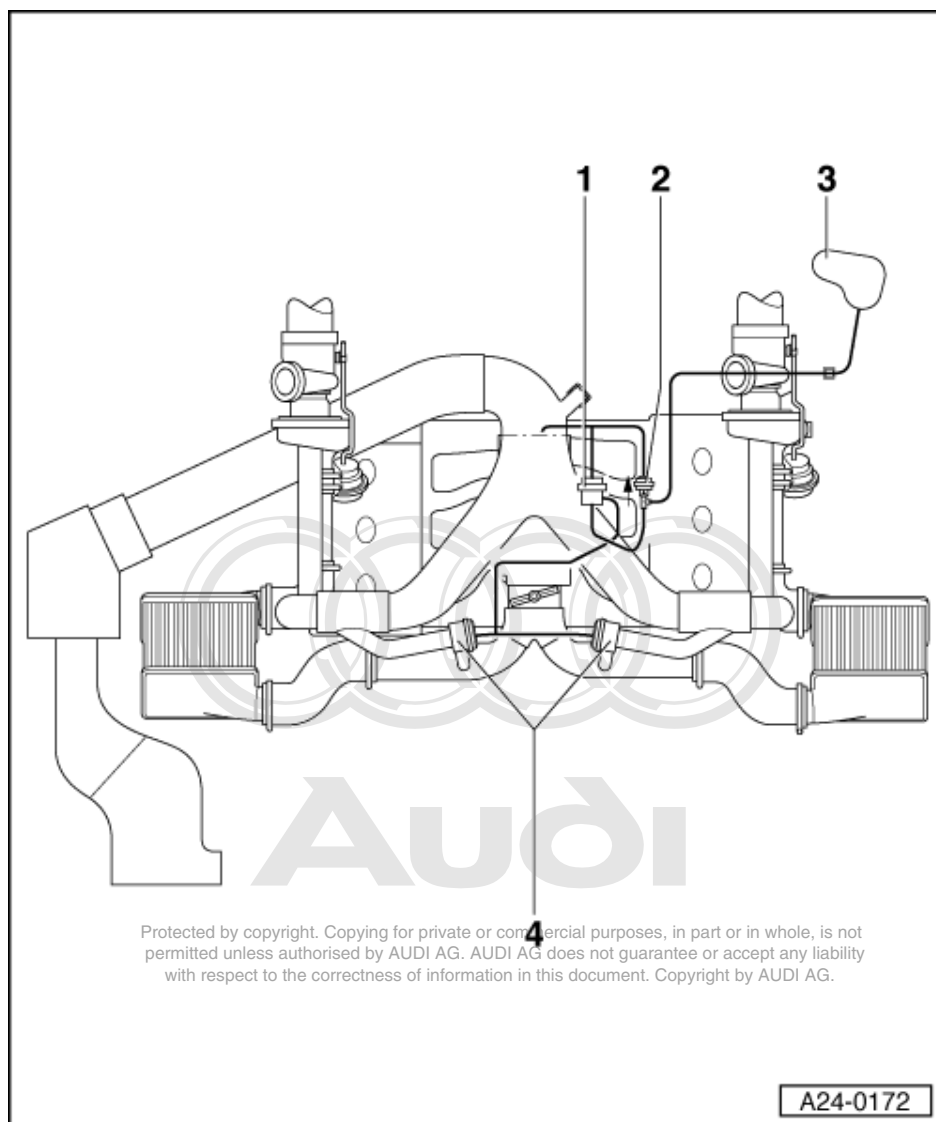
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A24-0173

- 1 Active carbon canister system
- 2 Solenoid valve 1 for active carbon canister (N80)
- 3 Non-return valves (arrow on each non-return valve indicates flow direction)

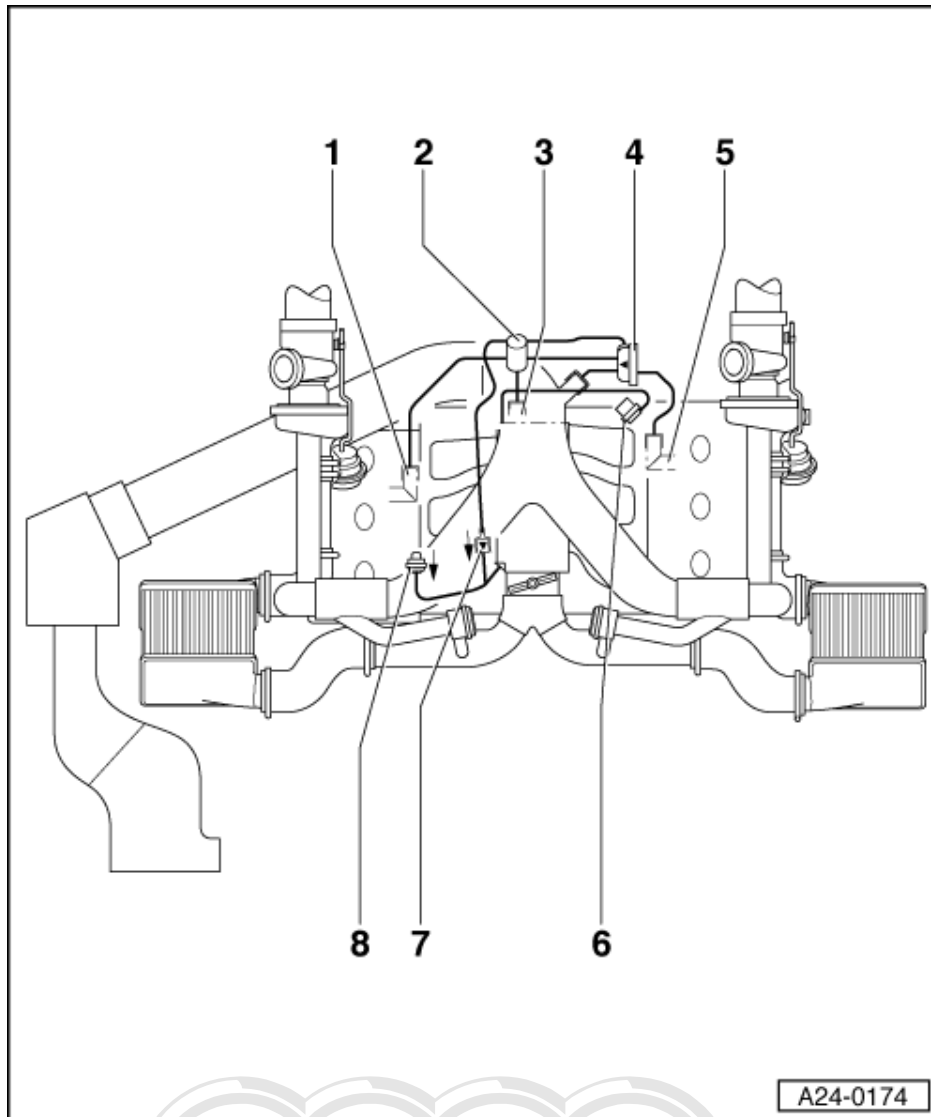


6.5 - Subsystem air recirculation control (air recirculation thrust control)



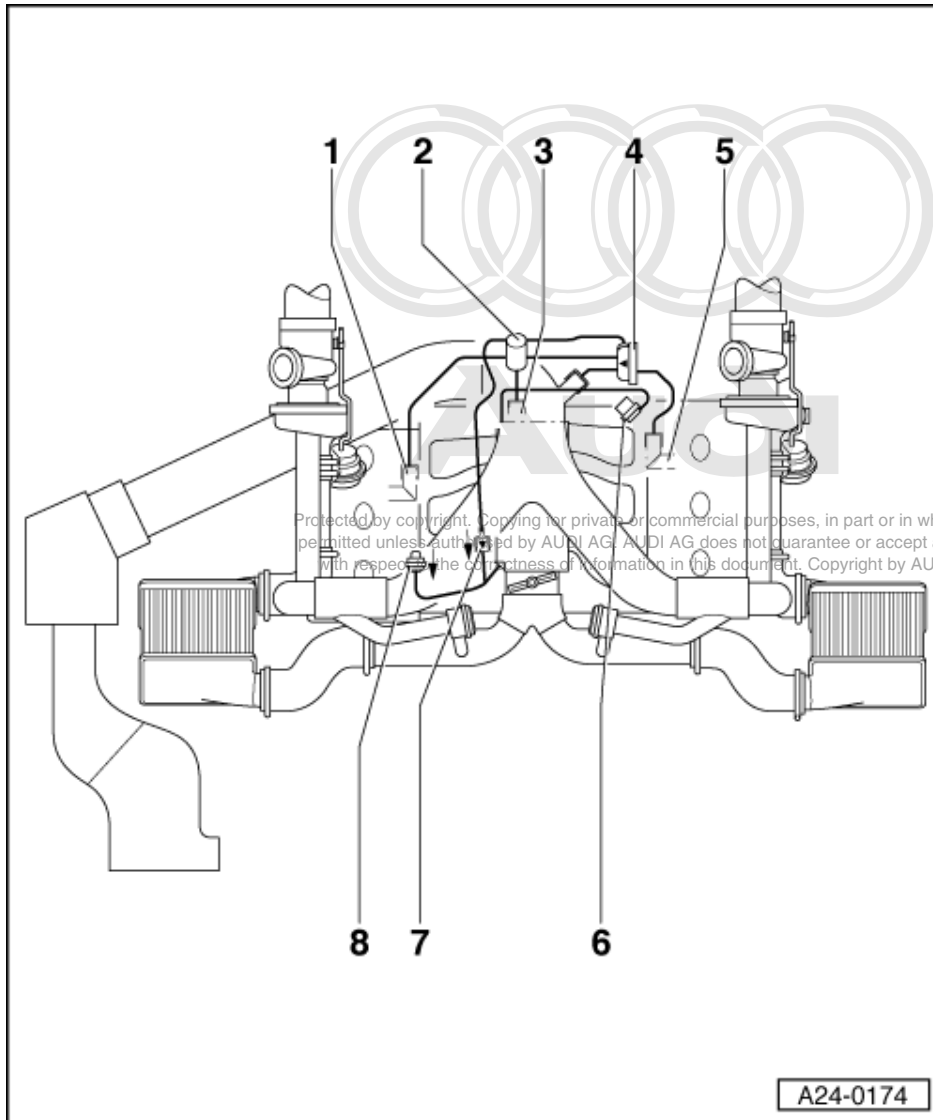
- 1 Air recirculation valve for turbocharger (N249)
- 2 Non-return valve (arrow indicates flow direction through valve)
- 3 Vacuum reservoir
- 4 Mechanical air recirculation valves

6.6 - Subsystem, crankcase breather



- 1 Connection on valve cover, cylinder bank 1
- 2 Distributor piece
- 3 Connection on crankcase
- 4 Pressure limiting valve
- 5 Connection on valve cover, cylinder bank 2

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- 6 Fuel pressure regulator
- 7 Non-return valve (arrow on valve indicates flow direction)
- 8 Non-return valve (arrow on valve indicates flow direction); see also subsystem, fuel tank breather system
=>Page **121** .

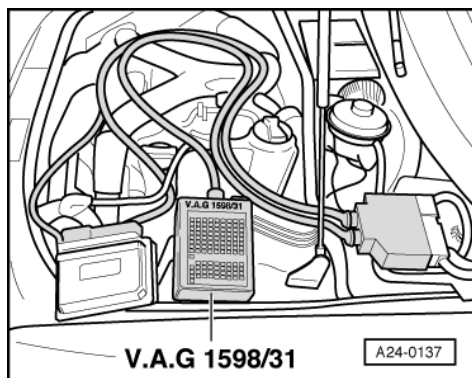
7 - Checking auxiliary signals

7.1 - Checking auxiliary signals

7.2 - Checking engine speed signal

Note:

The engine speed signal is taken from contact 37 of the engine control unit. The signal is used, among other things, for the engine speed display in the dash panel insert.



- -> Connect V.A.G 1598/31 test box to wiring harness leading to engine control unit; the engine control unit should not be connected =>Page 53 .
- Test for open circuit in wiring between dash panel insert and contact 37 on the test box, using current flow diagram.

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

7.3 - Checking consumption signal for vehicle computer

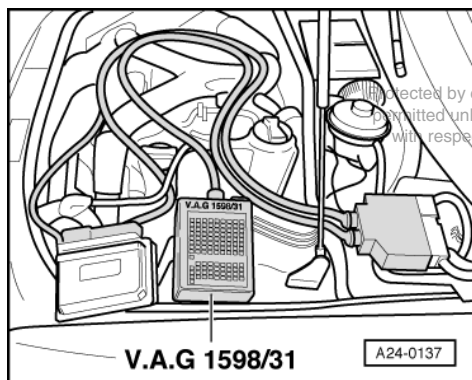
Notes:

- ♦ The consumption signal is calculated by the engine control unit from the injection period and relayed to the on-board computer. Consumption signal is taken from contact 81 of engine control unit.
- ♦ Checking fuel consumption signal

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

7.4 - Checking coolant temperature sender

Notes:



- ♦ Engine control unit receives coolant temperature signal from instrument cluster. When this signal arrives, the boost pressure is reduced to prevent engine overheating.
- -> Connect V.A.G 1598/31 test box to wiring harness leading to engine control unit; the engine control unit should not be connected =>Page 53 .
- Test for open circuit in wiring between dash panel insert and contact 19 on the test box, using current flow diagram.

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

7.5 - Checking vehicle speed signal

Notes:

- ♦ The vehicle speed signal is generated by the road speed sender -G68 (on the gearbox) and is processed in instrument cluster (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.
- Start the engine.
- Connect up vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "Address word" 01 => Page 3 .
- Select "Read measured value block" (function 08) and display group 5.

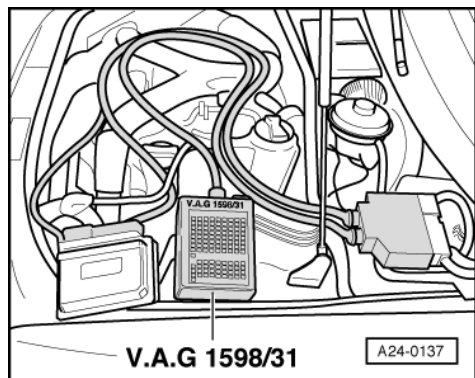
-> Display:

Read measured value block 5			
1	2	3	4

Important!

The V.A.G 1551 must be operated by a second person.

- Take vehicle for a test drive and check whether the vehicle 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 V.A.G 1598/31 test box to wiring harness leading to engine control unit; the engine control unit should not be connected =>Page 53 .
- Connect diode test lamp between socket 3 (positive) and socket 54 (road speed signal).
- Switch on the ignition and turn the front left wheel by hand.
- The diode test lamp should flash (very brief flashes).
- If the diode test lamp does not flash, check for open circuit or short circuit to positive/earth in wiring between dash panel insert and contact 54 on connector of engine control unit.

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

7.6 - Checking fuel level signal wiring

Notes:

- ♦ Engine control unit receives fuel level signal from dash panel insert.
- ♦ The processed signal goes to contact 30 on the engine control unit and is used for determining the cause of certain detected faults (e.g. misfire).
- Connect the V.A.G 1598/31 test box to wiring harness leading to engine control unit; the engine control unit should not be connected => Page 53 .

- Test for short and open circuit to positive or earth in wiring between dash panel insert and contact 30 on test box.

7.7 - Checking brake light switch and brake pedal switch

Test sequence

- Connect up vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "Address word" 01 => Page 3 .
 For this purpose, the ignition must be switched on.

-> When adjacent display appears:

Rapid data transfer HELP
 Select function XX

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

-> When adjacent display appears:

Reading measured value block Q
 Enter display group number XXX

- Enter "066" for "display group number 066" and confirm entry with Q key.

-> Display:

Read measured value block 66
 1 2 3 4

- Check brake light/brake pedal switch in 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
Display	ACTUAL speed	Switch settings	SPECIFIED speed	Switch settings
Range		XX00 XX11		
Specified value		XX00 (with brake pedal not pressed)		
		XX11 (with brake pedal pressed)		
Note:		Value: X = no meaning. Switching points are slightly offset		

If the display is not as described:

Checking switch

- Remove driver's storage compartment.

=> General Body Assembly - Interior; Repair Group 68; Dash panel; Removing driver's shelf Dash panel Removing driver's shelf

- Unplug connector from brake light/brake pedal switch.



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

Note:

Receptacles are marked on back of plug.

- Specified value: $\infty \omega$ (no continuity)
Press brake pedal.
- Specified value: approx. 0ω
Connect multimeter between contacts 3 and 4 to measure resistance.
- Specified value: approx. 0ω
Press brake pedal.
- Specified value: $\infty \omega$ (no continuity)

If specified values are not attained:

- Check adjustment or replace brake light/brake pedal switch.

If specified values are attained:

Checking power supply

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

Connector contact	Measure to
1	Car body earth point

- The LED should light up.

Connector contact	Measure to
3	Car body earth point

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

If the LED does not light up:

- Check the wiring between contact 1 and 3 of connector for open circuit (fuse) or short to earth:

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

- Rectify any open/short circuit as necessary.

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If the LED lights up:

Checking actuation

- Connect the V.A.G 1598/31 test box to wiring harness leading to engine control unit; the engine control unit should not be connected => Page 53.
- Check for open circuit and short to earth/positive or earth in the following wiring connections:

Connector contact	Test box V.A.G 1598/31 socket
2	56
4	55

- Rectify any open/short circuit as necessary.

7.8 - Checking F36 clutch pedal switch F36

Note:

This signal is designed to prevent speed overshoots and jerkiness on switching from throttle open to throttle closed and vice versa when disengaging clutch. It is needed for the cruise control system.

Test sequence

- Connect up vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "Address word" 01 => Page 3. For this purpose, the ignition must be switched on.

-> When adjacent display appears:

Rapid data transfer HELP
Select function XX

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

-> When adjacent display appears:

Reading measured value block Q
Enter display group number XXX

- Enter "066" for "display group number 066" and confirm entry with Q key.

-> Display:

Read measured value block 66
1 2 3 4

- Check clutch pedal switch in 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
Display	ACTUAL speed	Switch settings	SPECIFIED speed	Switch settings
Range		X0XX X1XX		
Specified value		X0XX (clutch pedal not pressed)		
		X1XX (clutch pedal pressed)		
Note:		Value: X = no meaning		

If the display is not as described:

Checking switch

- Remove driver's storage compartment.

=> General Body Assembly - Interior; Repair Group 68; Dash panel; Removing driver's shelf Dash panel Removing driver's shelf

- Unplug the connector from clutch pedal switch.



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

Note:

Receptacles are marked on back of plug.

- Specified value: approx. 0 ω
Operate clutch pedal.
- Specified value: $\infty\omega$ (no continuity)

If specified value is not attained:

- Replace clutch pedal switch.

If specified value is attained:

Checking power supply

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

Connector contact	Measure to
2	Car body earth point

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

If the LED does not light up:

- Check the wiring from contact 2 of connector to central electrics for open circuit via the fuse (in fuse holder):

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

- Rectify open circuit, if necessary

If the LED lights up:

Checking actuation

- Connect the V.A.G 1598/31 test box to wiring harness leading to engine control unit; the engine control unit should not be connected => Page 53 .
- Check 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 any open/short circuit as necessary.

7.9 - Testing crash signal

The engine control unit receives the crash signal ("Crash cut-off was activated") from the airbag control unit.

If airbag control unit sends the crash signal to the engine control unit (during an accident or if a final control diagnosis is carried out relating to the airbag system), the engine control unit switches off the fuel pump, which stops the engine. It can however be restarted (e.g. to move vehicle out of danger area)

The engine control unit is unable to switch off the fuel pump in the case of an accident involving activation of airbag if the fault entry "Crash signal from airbag control unit, implausible signal" exists, because the engine



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control unit is unable to recognise the crash signal from the airbag control unit; e.g. due to a wiring problem between engine control unit and airbag control unit.

- Connect the V.A.G 1598/31 test box to wiring harness leading to engine control unit; the engine control unit should not be connected => Page 53 .

Check the following wiring connections for open circuit and short circuit to positive or earth.

Test box V.A.G 1598/31, socket	Airbag control unit, contact
67	=> Current Flow Diagrams, Electrical Fault-Finding and Fitting Locations

Wire resistance: max. 1.5 Ohm

- Rectify any open/short circuit as necessary.

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

If no wiring fault is detected: Interrogate the fault memory of the airbag control unit.

7.10 - Testing rough-road detection signal from ABS/EDS control unit

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Notes:

- ♦ If the ABS/EDS control unit detects a spinning wheel, the ABS/EDS control unit generates the rough-road signal.
If the engine control unit detects the rough-road signal, the misfire detection is switched off in engine control unit.
- ♦ The rough-road signal must only be tested if the fault "18014 (P1606) Rough-road detection/engine specified torque ABS CU, electrical fault in circuit" is stored.
The possible additional fault "Misfire" is then a sequential fault and can be ignored.
- ♦ The wiring and rough-road signal are monitored by the engine control unit

Test conditions

- Control unit code OK => Page 35 .

Test sequence

- Switch ignition off.
- Connect the V.A.G 1598/31 test box to wiring harness leading to engine control unit; the engine control unit should not be connected => Page 53 .
- Check wiring from socket 74 on test box to ABS control unit for short circuit or open circuit according to current flow diagram.

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

If no wiring fault is detected:

- Replace ABS control unit

If fault is re-displayed after replacing ABS control unit:

- Fit a new engine control unit => Page 55 .

7.11 - Testing data exchange between engine/ABS/gearbox control unit, dash panel insert

Notes:

- ♦ Data is exchanged between individual control units by means of a bus system.
- ♦ "Bus" is used to describe a system that transports and distributes data.
- ♦ The wires between the control units that are used to transfer the data are known as signal wires.
- ♦ These signal wires are used for serial transmission of data, i.e. data is sent to each of the connected control units in turn.

Testing the bus system

The test in principle is unaffected by the number of control units/systems connected to the databus. As an example the following test is conducted on three control units connected to the bus system.

The fault table includes instructions to test the data exchange between engine control unit, gearbox control unit and ABS control unit.

- Check that the vehicle is fitted with the correct engine control unit, gearbox control unit and ABS control unit (part number) and that coding of control units is correct. (Display the control unit identifications for this purpose). If the correct control units are installed:
- Interrogate the fault memory of the gearbox control unit.

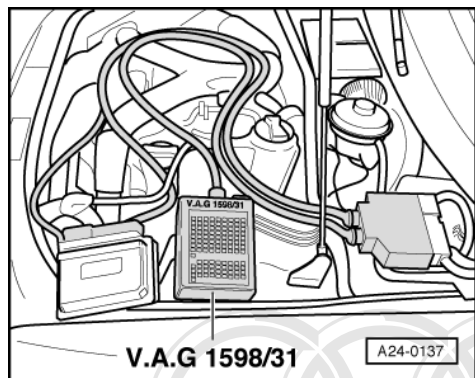
=> Automatic gearbox; Repair group 01; Performing self-diagnosis Performing self-diagnosis

- Interrogate the fault memory of the ABS control unit.

=> Running Gear FWD and 4WD; Repair group 01; Self-diagnosis; Electrical tests Self-diagnosis Electrical tests

If a fault is displayed relating to "Data bus..." or "...communication":

- Switch ignition off.



- -> Connect V.A.G 1598/31 test box to wiring harness leading to engine control unit; the engine control unit should not be connected =>Page 53 .
- Check the signal wires between pin 60 and pin 58 of the engine control unit and the gearbox control unit (if fitted) and the ABS control unit for short or open circuit using the current flow diagram.

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

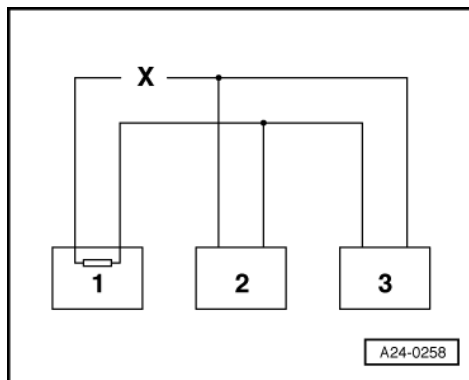
- If the wiring is OK, try installing a new engine/gearbox/ABS control unit in turn.

If the communication between three or more control units takes place via a "two-line bus system", the following systematic procedure for fault-finding will be useful:

- Evaluate the faults stored in the control units.

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This helps to localise line faults.



Example 1:

The faults stored in the fault memories indicate that the control unit 1 does not communicate with control units 2 and 3.

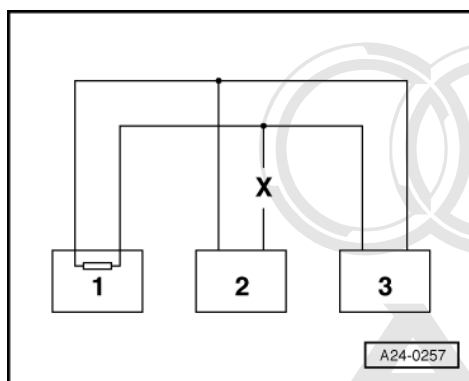
Control unit	Faults stored in fault memory
1	- No message from control unit 2 - No message from control unit 3
2	- No message from control unit 1
3	- No message from control unit 1

- Switch ignition off.
- Disconnect the control units connected to each other via the bus lines and investigate whether there is a short circuit between the bus lines.

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

- If no fault can be detected in the bus lines exchange control unit 1.

Example 2:



The faults stored in the fault memories indicate that the control unit 2 does not communicate with control units 1 and 3.

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

Control unit	Faults stored in fault memory
3	- No message from control unit 2

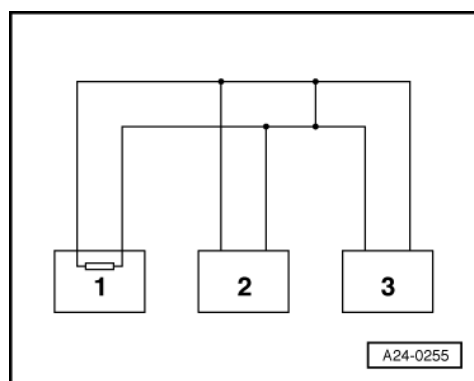
- Switch ignition off.
- Disconnect the control units connected to each other via the bus lines and investigate whether there is a short circuit between the bus lines.

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

- If no fault can be detected in the bus lines exchange control unit 2.

Example 3:

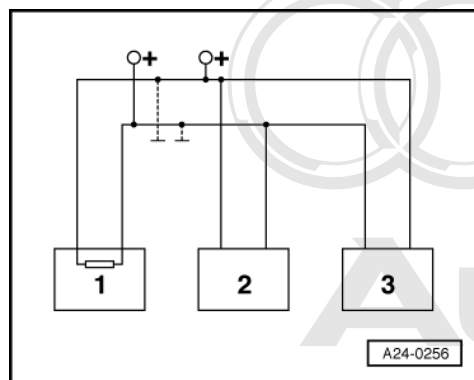
The faults stored in the fault memories indicate that sending or receiving operations are not possible in any of the control units.



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

- Switch ignition off.
- -> Disconnect the control units that are linked by the bus wires and check for a short circuit between the bus wires

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



- -> Check the bus wires for short to positive and short to earth

If cause of fault "Data bus drive defective" cannot be found in bus lines check whether one of the control units is responsible for the fault.

All the control units that communicate via the CAN data bus are still disconnected. The ignition is switched off.

- Connect one of the control units.
- Connect fault reader V.A.G 1551. Switch the ignition on and erase the fault memory of the control unit that has just been connected Terminate fault readout by selecting 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 fault "Signal wire defect" is not read out, connect the next control unit and repeat the procedure.



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28 - Ignition system

1 - Checking ignition system

1.1 - Checking ignition system

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1.2 - General notes on ignition system

- ♦ Always switch off the ignition before connecting or disconnecting the battery, otherwise the engine control unit may be damaged.
- ♦ The engine control unit is equipped with self-diagnosis.
- ♦ A voltage of at least 11.5 V is necessary for satisfactory functioning of the electrical components.
- ♦ In the case of some tests, a fault may be recognised and stored by the control unit. At the end of all tests and repairs, therefore, the fault memory should be interrogated and, if necessary, erased.
- ♦ If the engine starts briefly and then stops after fault search, repair or tests on components, this may be because the immobiliser is blocking the engine control unit. The fault memory must then be interrogated and, if necessary, adaptation carried out on the control unit.

1.3 - Safety precautions

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

- ♦ Do not touch or disconnect ignition wiring when the engine is running or at starter speed.
- ♦ Always switch off the ignition before connecting or disconnecting injection or ignition system wiring or tester cables.
- ♦ To run engine at starting speed without actually starting it (for example, in order to test compression), unplug connector from the output stage of the ignition coils and also the connectors on the injectors. After completing the work, interrogate the fault memory and erase it.
- ♦ Always switch off the ignition before washing the engine.
- ♦ Always switch off the ignition before connecting or disconnecting the battery, otherwise the engine control unit may be damaged.

1.4 - Technical data for ignition system

Engine code letters	ASJ (conforms to original emission standard EU II) ASJ (already conforms to emission standard EU III at start of production)
Idling speed Not adjustable - controlled by the idling speed stabilisation	750...850 rpm
Engine speed limitation By closing of throttle valve or deactivation of injectors	7200 rpm
Ignition timing is determined by the control unit. Ignition timing cannot be adjusted.	
Ignition system	Individual coil system with 6 ignition coils connected directly to spark plugs via spark plug connectors. The output stages for ignition coils are located as a separate component on the air cleaner housing.

Engine code letters	ASJ (conforms to original emission standard EU II) ASJ (already conforms to emission standard EU III at start of production)
Spark plug connectors	Resistance approx. 2 kw
Firing order	1-4-3-6-2-5

1.5 - Checking ignition coils

Note:

On vehicles that conform to emission standard EU III, misfires are monitored by the self-diagnosis. That means an inoperative cylinder is stored in the fault memory with indication of the cylinder number. This has the advantage that when a fault occurs the fault-finding can e.g. be started with a certain cylinder. For this reason interrogate the engine control unit fault memory before starting this test.

Test conditions

- No faults relating to injector(s) stored

Identify an inoperative or misfiring cylinder as follows:

- Disconnect connectors from the injectors in sequence 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.

If the defective cylinder has been identified:

- Connect multimeter (resistance measurement range) to spark plug connector.

Note:

The spark plug connector can be unplugged from the ignition coil.

Specified value: approx. 2 kw

If specified value is not attained:

- Replace the spark plug connector.

If specified value is attained:

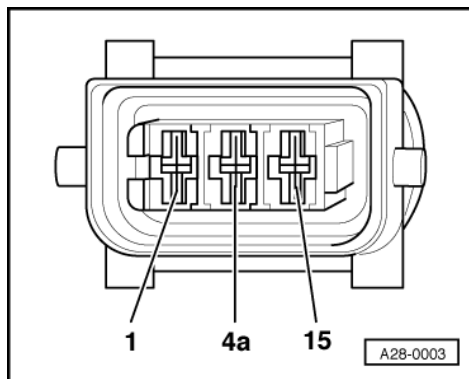
- Replace the spark plug of the defective cylinder with one from another cylinder. First perform visual inspection of spark plug for possible damage, e.g. cracks in ceramic body of spark plug.
- If the fault now occurs at the other cylinder, renew the spark plug.

If the fault remains in the same cylinder:

- Replace the ignition coil from the defective cylinder with one from another cylinder. First perform visual inspection of ignition coil for damage (ignition coil may have cracked or split open).
- If the fault now occurs at the other cylinder, renew the ignition coil.

If the fault remains in the same cylinder:

- Unplug the connector from the ignition coil.





- -> Check earth connection from contact 4a to engine earth for open circuit or short to positive.

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

- Rectify any open/short circuit as necessary.

If the earth connection is OK:

- -> Connect multimeter between earth and contact 15 on the connector to measure the voltage.
- Disconnect injector of cylinder to be tested.
- Operate starter.

Specified value on multimeter: approx. battery voltage

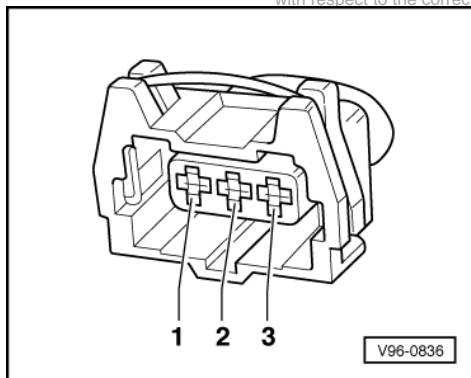
If specified value is not attained:

- Check the wiring connections.

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

If specified value is attained:

- Disconnect 3-pin connectors on output stages for ignition coils; Installation locations overview =>Page 39.
- Then connect diode test lamp to the 3-pin connectors of both output stages.

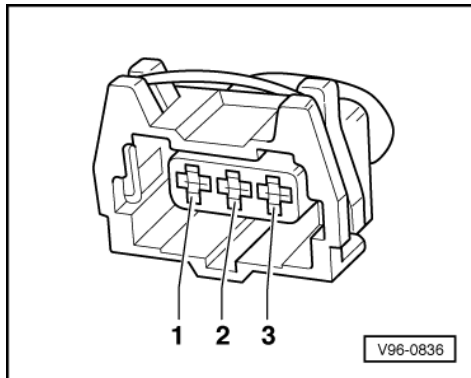


- -> Connect the V.A.G 1527 diode test lamp to the following contacts on the output stage connector. Then operate the starter for a few seconds.

3-pin connector on wiring harness, contact	Specified value on actuation of starter
1 + earth	Diode test lamp should light up
2 + earth	
3 + earth	

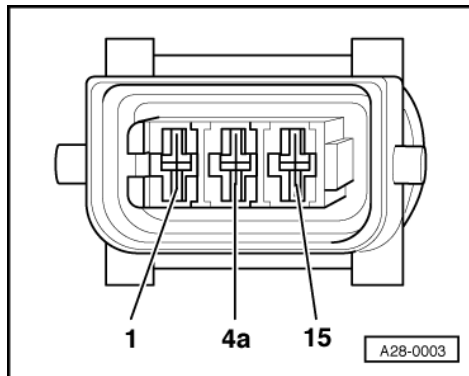
If specified values are not attained:

- Switch ignition off.



The following wiring connections are to be checked for open circuits and/or short to positive or negative.

3-pin connector on the power stage, contact.	3-pin connector on ignition coil, contact.
1	1 (cylinder 1)
2	1 (cylinder 2)
3	1 (cylinder 3)



3-pin, brown connector on power stage, contact.	3-pin connector on ignition coil, contact.
1	1 (cylinder 4)
2	1 (cylinder 5)
3	1 (cylinder 6)

- Rectify any open/short circuit as necessary.

1.6 - Checking output stages for ignition coils

Note:

- ♦ The output stage -N122 (black connector) activates the ignition coils of cylinder bank 1 (cylinders 1 to 3).
- ♦ The output stage 2 -N122 (brown connector) activates the ignition coils of cylinder bank 2 (cylinders 4 to 6).

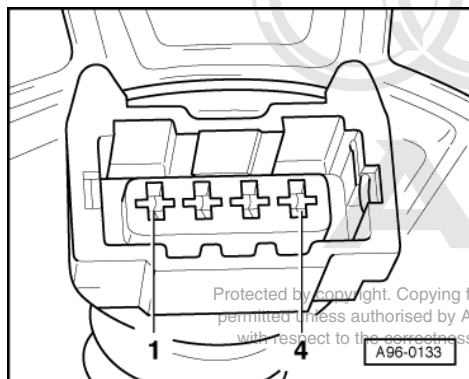
Checking actuation of power output stages

- Pull the connectors off all six injectors.

Note:

It is important to ensure that no fuel is injected during the test, as this would damage the catalytic converter. Therefore, the connectors on the injectors must be unplugged.

- Disconnect 4-pin connectors on output stages; Installation locations overview =>Page 39 .



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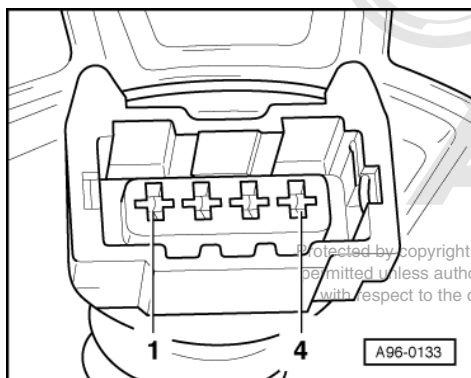
- -> Connect the V.A.G 1527 diode test lamp one after the other to the following contacts of the two 4-pin connectors on the output stage. Then actuate the starter for a few seconds.

4-pin connector on the wiring harness, contact	Specified value
1 + earth	Diode test lamp should flash (brief impulse)
3 + earth	
4 + earth	

If specified values are not attained:

- Switch ignition off.
- Connect the V.A.G 1598/31 test box to wiring harness leading to engine control unit; the engine control unit should not be connected => Page 53.

The following wiring connections are to be checked for open circuits and/or short to positive or negative.



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4-pin, black connector on wiring harness, contact	Test box V.A.G 1598/31, socket
1	94
3	110
4	102

4-pin, brown connector on wiring harness, contact	Test box V.A.G 1598/31, socket
1	95
3	111
4	103

- Rectify any open/short circuit as necessary.

If no wiring fault is detected:

- Connect 4-pin connector to output stage.
- Connect 3-pin connector to output stage.
- Connect V.A.G 1527 diode test lamp to battery positive (+) and to one of the contacts on the 3-pin output of the relevant output stage.
- Operate the starter for a few seconds.

Diode test lamp should flash.

- Carry out the test with all three contacts on the 3-pin connectors of the relevant output stage.

The diode test lamp should flash each time.

If the diode test lamp does not flash when testing one or more of the contacts:

Test the earth connection for the output stages as follows:

- Disconnect 4-pin connectors from output stages.
- Connect the V.A.G 1527 diode test lamp to battery positive (+) and contact 2 on the 4-pin connector.

The diode test lamp should light up.

- If the diode test lamp does not light up, check the wiring for open circuit, using the current flow diagram.

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

If the diode test lamp lights up:

- Replace the power output stage.

Important note:

Before installation coat metallic side of new output stage with thermal conductivity paste (part no.: G 052 170 A1). This thermal conductivity paste is for the purpose of preventing corrosion between the output stage and the connection point and to dissipate the heat of the output stage.

1.7 - Checking the intake air temperature sender

Fitting location of sender and connector

=>Page **39**

- Connect up vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "Address word" 01 => Page **3**.
For this purpose, the ignition must be switched on.

-> Display:

Rapid data transfer HELP
Select function XX

- Press keys 0 and 8 for the function "Read measured value block" and confirm entry with Q key.

-> Display:

Read measured value block HELP
Enter display group number xxx

- Press keys 0, 0 and 4 for "display group number 4" and confirm entry with Q key.

-> Indicated on display:

(1...4 = display zones)

Read measured value block 4
1 2 3 4

- Check specified result for intake air temperature sender (Display zone 4):

	Display zones			
	1	2	3	4
Display group 4: Intake air temperature with engine idling				
Display	xxxx rpm	xx.xxx Volt	xxx.x oC	xxx.x oC
Display	Engine speed	Battery voltage	Coolant temperature	Intake air temperature
Range	min.: 750 rpm max.: 7200 rpm	min.: 10.000 Volt max.: 15.000 V	min.: - 48.0 oC max.: 143.0 oC	min.: - 48.0 oC max.: 143.0 oC

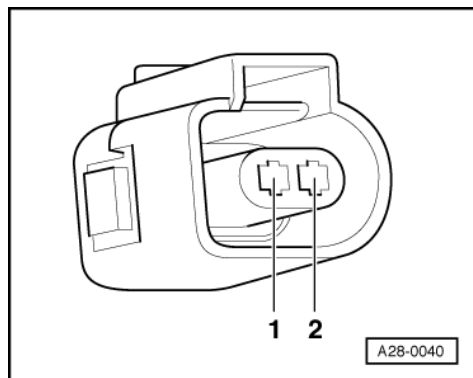


Specified value	Display zones			
	xxxx rpm	12.000...15.000 volts	80.0...110.0 oC	Between ambient temperature and up to 120 oC 1)

1) If a temperature is displayed which deviates greatly from the ambient temperature of the sender, check sender and sender wiring for contact resistances and open circuit.

Checking wiring:

- Switch ignition off.
 - Connect the V.A.G 1598/31 test box to wiring harness leading to engine control unit; the engine control unit should not be connected.
- =>Page 53 .



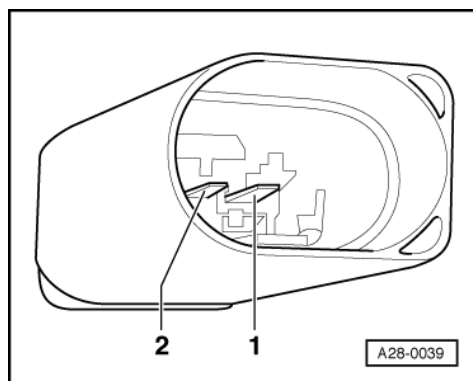
- -> Check wiring between test box and 2- pin connector for open circuit using current flow diagram. Specified result; max. 1.5 ω

Contact on 2-pin connector	Contact on control unit connector or test box
1	85
2	108

- Check the wiring for short circuit between Contact 1 and Contact 2 on 2-pin connector and for short to earth or positive.

If no wiring fault is detected:

Checking sender:



- -> Measure resistance on connector to intake air temperature sender (G42) between contact 1 (signal) and contact 2 (earth).

Temperature oC	Resistance k ω
-20	approx. 13.8
0	approx. 5.5

Temperature oC	Resistance kΩ
20	approx. 2.4
40	approx. 1.1
60	approx. 0.6

- If the value does not match specified value, fit a new intake air temperature sender.
- In order to renew the sender, the intake manifold must be removed => Page 49.

1.8 - Testing engine speed sender

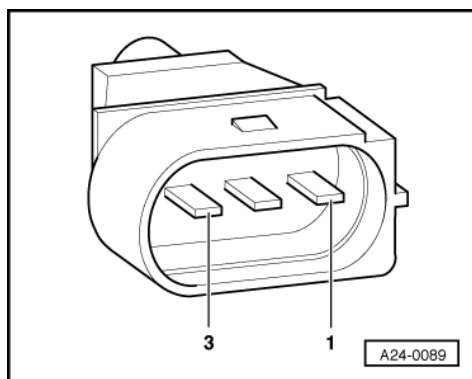
Note:

- ♦ The engine speed sender is a combined speed sender and reference mark sender. The engine cannot be started without a signal from the -G28 engine speed sender. If the signal from the -G28 engine speed sender fails while the engine is running, the engine will cut out immediately.

Testing engine speed sender

Fitting location of sender and connector
=>Page 39.

- Before carrying out the test, make sure that the sender is correctly installed and firmly seated.
- Disconnect connector for engine speed sender (identification: grey connector).



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- -> Connect hand-held multimeter V.A.G 1526 (resistance test range) to contacts 2 and 3 on connector for engine speed sender using test lead from V.A.G 1594.

Specified value: 730...1000 Ω.

Note:

The resistance figure for the engine speed sender is associated with a temperature of 20 oC.

The resistance increases with increasing temperature.

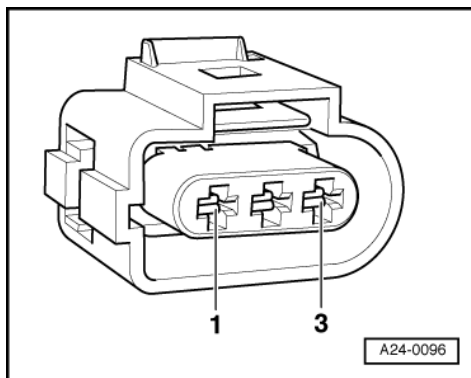
- If the value does not match specified value, fit a new engine speed sender.
- If specified value is attained, connect hand-held multimeter (resistance range) to contacts 2 and 1 (earth) and to contacts 3 and 1 (earth).

Specified value: infinite resistance (open circuit) in each test.

- If specified value is not attained, renew engine speed sender.



- If the value does match specified value, test the wiring between the sender connector and the engine control unit as follows:



- Connect the V.A.G 1598/31 test box to wiring harness leading to engine control unit; the engine control unit should not be connected => Page 53 .
- -> Test continuity of screening from contact 1 on sender connector to socket 108 on test box.

Specified value: max. 1 ω .

- Check continuity of negative line from contact 2 on sender connector to socket 90 on test box.

Specified value: max. 1 ω .

- Test continuity of signal wire from contact 3 on sender connector to socket 82 on test box.

Specified value: max. 1 ω .

- If specified value is not attained, rectify short or open circuit in wiring between sender connector and control unit connector.

Contact on sender connector	Contact on control unit connector
1	108
2	90
3	82

- If no open circuits or short circuits are found, fit a new engine control unit =>Page 55 .

1.9 - Testing coolant temperature sender

Notes:

- ♦ Fitting location of coolant temperature sender => Page 39 .

Test requirements:

- Engine cold

Test sequence

- Connect up vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "Address word" 01 => Page 3 .
For this purpose, the engine must be running at idle speed

-> When adjacent display appears:

Rapid data transfer
Select function XX

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

-> When adjacent display appears:

Reading measured value block Q
Enter display group number XXX

- Enter "004" for "display group number 004" and confirm entry with Q key.

-> Indicated on display:

Read measured value block 4
1 2 3 4

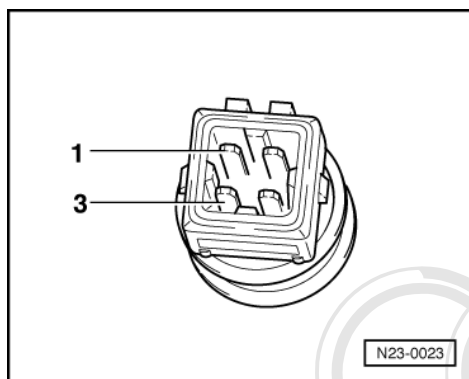
- Check display in display zone 3.

	Display zones			
	1	2	3	4
Display group 004: Coolant temperature with engine idling				
Display	xxxx rpm	xx.x V	xxx.x oC	xxx.x oC
Display	Engine speed	Battery voltage	Coolant temperature	Intake air temperature
Specified value	xxxx rpm	12.0....15.0 V:	The temperature reading should increase evenly	Between ambient temperature and up to 120 oC

If display zone 3 shows an implausible value:

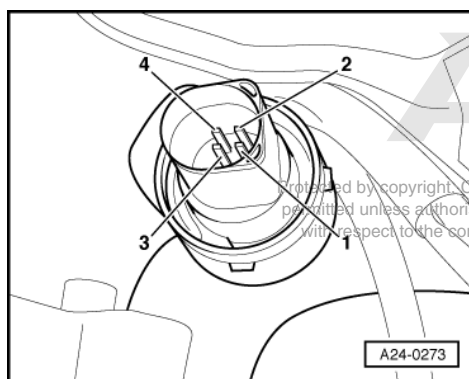
- Disconnect connector on coolant temperature sender.

Coolant temperature sender with square plug:



- -> Connect multimeter to contacts 1 and 3 of sender to measure resistance.

Coolant temperature sender with oval plug:

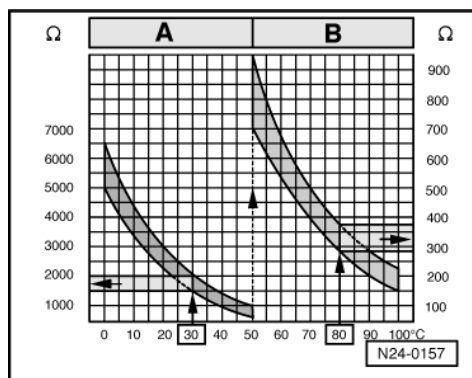


- -> Connect multimeter to contacts 3 and 4 of sender to measure resistance.



All models:

Range A shows resistance values for temperature range 0...50 °C and range B the values for temperature range 50...100 °C.



-> Sample readings:

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

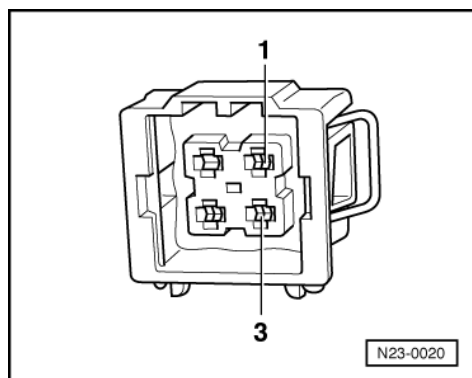
If specified value is not attained:

- Replace coolant temperature sender.

If specified value is attained:

- Connect the V.A.G 1598/31 test box to wiring harness leading to engine control unit; the engine control unit should not be connected => Page 53 .

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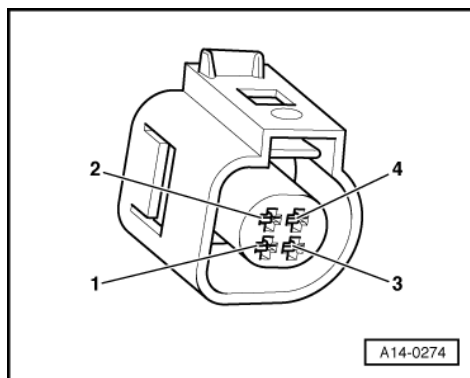


Coolant temperature sender with square plug:

- -> Check 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

Coolant temperature sender with oval plug:



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

Connector contact	Test box V.A.G 1598/31 Socket
3	108
4 (signal)	93

All models:

- Test for short circuits between the two wires.
- Rectify any open/short circuit as necessary.

If no wiring fault is detected:

- Fit a new engine control unit => Page 55 .

1.10 - Checking control unit power supply

Test requirements:

- Fuse for engine control unit OK

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

- Battery voltage at least 11 V
- Alternator OK
- Connect the V.A.G 1598/31 test box to wiring harness leading to engine control unit; the engine control unit should not be connected => Page 53 .
- Switch the ignition on.

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Note:

- ♦ The positive voltage supply to the engine control unit is provided via contact 3 (terminal 15) and contact 62 (terminal 30).
- ♦ The earth connection to the engine control unit is provided via contact 1 and contact 2.
- Connect the V.A.G 1526 handheld multimeter for voltage measurement to the following contacts on the test box:

Contact	Specified value
3 + 2	approx. battery voltage
3 + 1	approx. battery voltage



Contact	Specified value
62 + 2	approx. battery voltage

If specified values are not attained:

- Check the wiring connections.

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

1.11 - Checking knock control stop

If a fault entry relating to "knock control stop reached" is made, carry out the following checks: Also see measured value blocks 20, 21, 22, 23 and 24; Page => Page **148**.

	Possible causes of fault	Fault remedy
Fault entry for all cylinders or Fault entry for all cylinders of one bank	- Poor fuel quality	- Change fuel quality (see operating instructions)
	- Knock sensor tightened to incorrect torque	- Loosen sensor and tighten to 20 Nm.
	- Knock sensor defective	- Check knock sensor => Page 150 .
	- Corrosion on plug the connector	
	- Loose components on engine	- Secure components
Fault entry for one cylinder	- Engine fault	- Check compression
	- Loose components on engine	- Secure components

Measured value blocks for ignition timing retardation

Display group 20, -Ignition- Knock control						
▪ Operation of the vehicle						
Read measured value block 20				⇒		
xx.x ocrank-shaft	xx.x ocrank-shaft	xx.x ocrank-shaft	xx.x ocrank-shaft	▪ Indicated on display		
1	2	3	4	▪ Display zones	Specified value	Evaluation
				Ignition timing retardation by knock control, cylinder 4	0...12 ocrank-shaft	=> Page 150
				Ignition timing retardation by knock control, cylinder 3	0...12 ocrank-shaft	=> Page 150
				Ignition timing retardation by knock control, cylinder 2	0...12 ocrank-shaft	=> Page 150
				Ignition timing retardation by knock control, cylinder 1	0...12 ocrank-shaft	=> Page 150

Note:

The displayed values in display zones 1 to 4 represent the actual ignition timing retardation through the knock control of individual cylinders. The ignition timing retardation takes place in ocrankshaft (crankshaft degrees) in retard direction.

Display group 21, -Ignition- Knock control						
▪ Operation of the vehicle						
Read measured value block 21				⇒	▪ Indicated on display	
xx.x ocrankshaft xx.x ocrankshaft						
1	2	3	4	▪ Display zones	Specified value	Evaluation
		Ignition timing retardation by knock control, cylinder 6			0...12 ocrankshaft	⇒ Page 150
		Ignition timing retardation by knock control, cylinder 5			0...12 ocrankshaft	⇒ Page 150

Note:

The displayed values in display zones 1 and 2 represent the actual ignition timing retardation through the knock control of individual cylinders. The ignition timing retardation takes place in ocrankshaft (crankshaft degrees) in retard direction.

Display group 22, -Ignition- Knock control						
▪ Operation of the vehicle						
Read measured value block 22				⇒	▪ Indicated on display	
xxxx rpm x.x % xx.x ocrankshaft xx.x ocrankshaft						
1	2	3	4	▪ Display zones	Specified value	Evaluation
				Ignition timing retardation by knock control, cylinder 2	0...12 ocrankshaft	⇒ Page 150
				Ignition timing retardation by knock control, cylinder 1	0...12 ocrankshaft	⇒ Page 150
		Engine load			15 ...greater than 175 %	---
		Engine speed			750...7200 rpm	---

Note:

The displayed values in display zones 3 and 4 represent the actual ignition timing retardation through the knock control of cylinders one and two. The ignition timing retardation takes place in ocrankshaft (crankshaft degrees) in retard direction.

Display group 23, -Ignition- Knock control						
▪ Operation of the vehicle						
Read measured value block 23				⇒	▪ Indicated on display	
xxxx rpm x.x % xx.x ocrankshaft xx.x ocrankshaft						
1	2	3	4	▪ Display zones	Specified value	Evaluation
				Ignition timing retardation by knock control, cylinder 4	0...12 ocrankshaft	⇒ Page 150



	Ignition timing retardation by knock control, cylinder 3	0...12 ocrankshaft	=> Page 150
	Engine load	15 ...greater than 175 %	---
	Engine speed	750...7200 rpm	---

Note:

The displayed values in display zones 3 and 4 represent the actual ignition timing retardation through the knock control of cylinders three and four. The ignition timing retardation takes place in ocrankshaft (crankshaft degrees) in retard direction.

Display group 24, -Ignition- Knock control						
• Operation of the vehicle						
Read measured value block 24				⇒	• Indicated on display	
xxxx rpm x.x % xx.x ocrankshaft xx.x ocrankshaft					• Display zones	
1	2	3	4		Ignition timing retardation by knock control, cylinder 6	0...12 ocrankshaft => Page 150
					Ignition timing retardation by knock control, cylinder 5	0...12 ocrankshaft => Page 150
		Engine load			15 ...greater than 175 %	---
		Engine speed			750...7200 rpm	---

Note:

The displayed values in display zones 3 and 4 represent the actual ignition timing retardation through the knock control of cylinders five and six. The ignition timing retardation takes place in ocrankshaft degrees in retard direction.

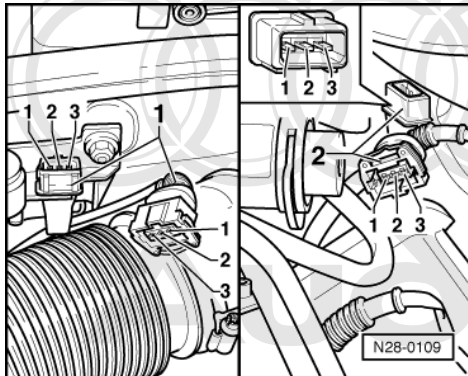
Evaluation of display group 20/21/22/23/24, - Ignition timing retardation

Indicated on display	Possible causes of fault	Fault remedy
All cylinders greater than 12 ocrankshaft	- Knock sensor defective	- Check knock sensor => Page 150 .
	- Connector corroded	
	- Knock sensor incorrectly tightened	- Loosen sensor and tighten to 20 Nm.
	- Loose components on engine	- Secure components
	- Poor fuel quality	- Change fuel type
One cylinder deviates significantly from the others	- Connector corroded	- Check knock sensor => Page 150 .
	- Engine fault	- Check compression
	- Loose components on engine	- Secure components

1.12 - Checking knock sensors**Notes:**

- ♦ The knock sensors -G61 and -G62 cannot themselves be tested electrically.
- ♦ Use only gold-plated contacts when repairing the cable connectors for the knock sensors.

- ♦ To ensure that the knock sensors function properly it is important to keep exactly to the specified tightening torque of 20 Nm.
- ♦ Check connector between knock sensor and wiring harness for corrosion.



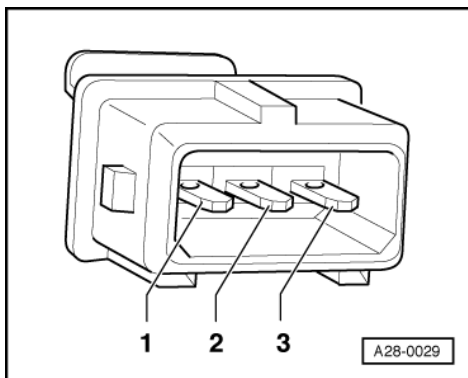
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Checking knock sensors

> Disconnect the connector for the relevant knock sensor in the engine compartment.

Note:

- ♦ Installation locations OverviewPage 39 .
- ♦ In order to reach the connector of the knock sensor for bank 2, the coolant reservoir securing bolts must be removed and the reservoir moved to one side. Do not detach hoses.



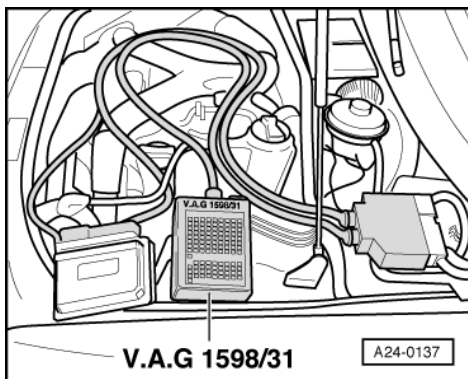
- -> Test for short between all three contacts in the knock sensor connector (contacts 1+2, 1+3, 2+3).

Specified value: There must be no connection between any of the wires (infinite resistance).

- If there is a connection between the contacts, fit a new knock sensor.

Notes:

- ♦ In order to reach the knock sensor, the air duct must be removed, =>Page 64 .
- ♦ Use special tool 3247 to remove the knock sensors.

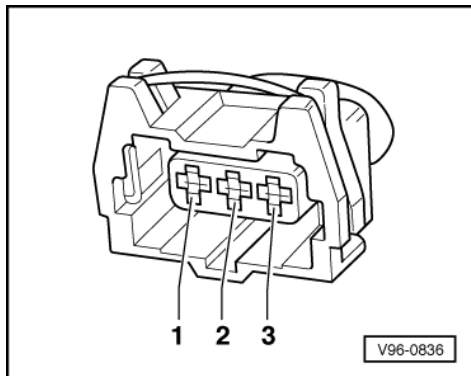




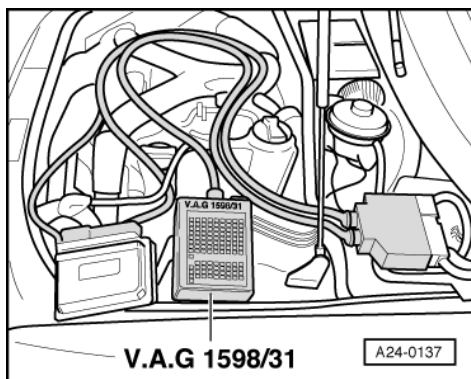
- If no short is found, check knock sensor wiring.

Checking wiring from knock sensors to engine control unit

- -> Connect V.A.G 1598/31 test box to wiring harness leading to engine control unit; the engine control unit should not be connected =>Page 53 .



- -> Check wiring from the relevant sensor connector ...



- -> ...to engine control unit for open circuit and short to positive or earth.

Knock sensor 1 - G61 (bank 1)

3-pin connector on wiring harness, contact	Test box V.A.G 1598/31 or engine control unit
1 (earth)	99
2 (signal)	106
3 (screening)	108

Knock sensor 2 -G61 (bank 2)

3-pin connector on wiring harness, contact	Test box V.A.G 1598/31 or engine control unit
1 (earth)	99
2 (signal)	107
3 (screening)	108

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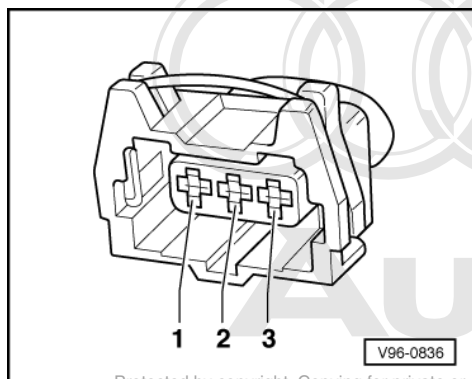
Wire resistance: max. 1.5 Ohm

- Rectify any open/short circuit as necessary.

1.13 - Checking Hall sender

Notes:

- ◆ Installation location of Hall sender => Page 39 .
- ◆ Hall sender -G40 is located at rear of left-hand cylinder head (bank 2).
- ◆ Hall sender -G163 is located at front of right-hand cylinder head (bank 1).



Checking activation of Hall sender

For following checks, use leads from adapter set V.A.G 1594.

- Push back rubber sleeve on relevant Hall sender connector.
- -> Connect the V.A.G 1527 diode test lamp to contacts 1 and 2 on the Hall sender connector from behind (the connector remains attached to the Hall sender).

Note:

Receptacles are numbered accordingly on the back of the connector.

- Operate the starter for a few seconds.

The diode test lamp must flash briefly on each second engine revolution.

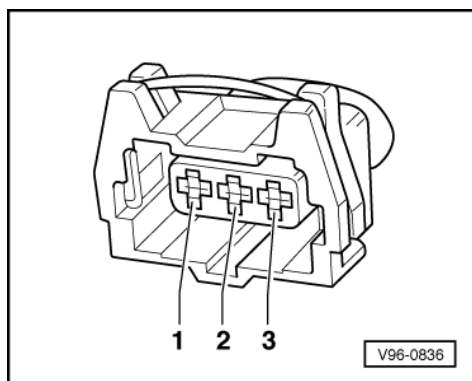
Note:

Diode test lamps 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 diode test lamp does not flash, check voltage supply.

Checking the power supply for the Hall sender.

- Disconnect connector from relevant Hall sender.
- Switch the ignition on.





- -> Connect V.A.G 1526 hand-held multimeter (voltage measurement) to contact 1 on the relevant connector and engine earth.

Specified value: approx. 5 V.

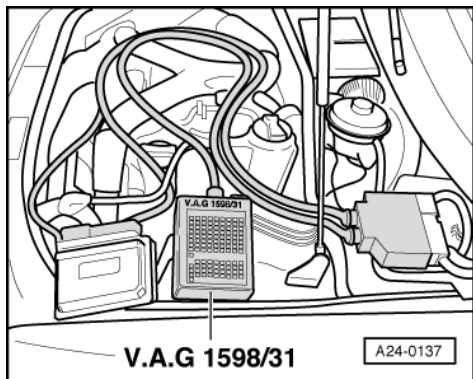
Checking signal line for Hall sender:

- -> Connect V.A.G 1526 hand-held multimeter (voltage measurement) to contact 2 on the relevant connector and engine earth.

Specified value: approx. battery voltage

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Checking earth line for Hall sender:



- -> Connect V.A.G 1598/31 test box to wiring harness leading to engine control unit; the engine control unit should not be connected =>Page 53 .
- Connect V.A.G 1526 hand-held multimeter (resistance measurement) between contact 3 on the relevant connector and contact 108 in the test box.

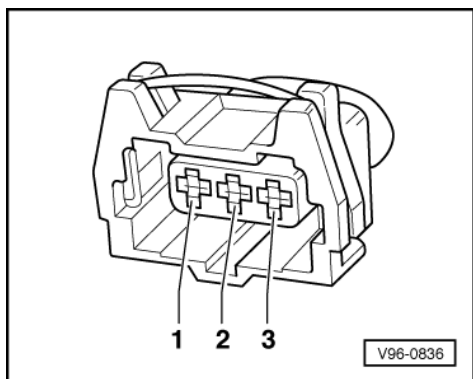
Specified value: Continuity.
Wire resistance: max. 1.5 Ohm

If specified values are all achieved and the diode test lamp does not flash (measured between contacts 1 and 2 with starter connector attached),

- Replace relevant Hall sender.

If specified values are not attained, check wiring connections.

Checking the wiring between the Hall sender and engine control unit.



- Connect the V.A.G 1598/31 test box to wiring harness leading to engine control unit; the engine control unit should not be connected => Page 53 .
- -> Check the wiring from the Hall sender ...
- ...to engine control unit for checking for open circuit and short to positive or earth.

Hall sender (bank 2)

3-pin connector on wiring harness, contact	Test box V.A.G 1598/31, socket
1 (positive)	98
2 (signal)	86
3 (earth)	108

Hall sender (bank 1)

3-pin connector on wiring harness, contact	Test box V.A.G 1598/31, socket
1 (positive)	98
2 (signal)	87
3 (earth)	108

Wire resistance: max. 1.5 Ohm

- Rectify any open/short circuit as necessary.
- If a trial erasure of the fault memory is followed by the replaced indication of a fault relating to the camshaft sensor (Hall sender) although all previous tests were OK, the following faults are possible:
 - Rotor ring for Hall sender misaligned, check phase location.

Checking phase location of Hall sender

- Connect up vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "Address word" 01 => Page 3.
 For this purpose, the engine must be running at idle speed

-> Display:

Rapid data transfer	HELP
Select function XX	

- Press keys 0 and 8 for the function "Read measured value block" and confirm entry with Q key.

-> Display:

Read measured value block 08
Enter display group number XXX

- Press keys 0, 9 and 3 for "display group number 93" and confirm entry with Q key.

-> Display:

Read measurement block 93
1 2 3 4

- Check specified results for Hall sender.

	Display zones			
	1	2	3	4
Display group 93: Phase locations of Hall senders (bank 1 and bank 2), engine idling				
Display	xxx rpm	xx %	0 ± 6 o crankshaft	0 ± 6 o crankshaft
Display	Engine speed	Engine load	Phase location bank 1	Phase location bank 2
Range	min.: 750 rpm max.: 7200 rpm	min.: 15 % max.: greater than 175 %	-20.3....14.8 ocrankshaft	-20.3....14.8 ocrankshaft
Specified value	750 ... 850 rpm	15...25 %	0 ± 6 o crankshaft	0 ± 6 o crankshaft



	Display zones	
Note:		If the specified values are not attained, unscrew Hall sender and check to ensure that the rotor ring is correctly mounted on the camshaft (if it is incorrectly installed, the catch will be pressed flat when the securing screw is tightened). - Additionally check valve timing => Engine Mechanical Components; Repair Group 13; Crankshaft; Removing and installing ribbed belt; Removing and installing toothed belt.

1.14 - Testing misfire detection

Note:

Misfire detection is only active on vehicles that conform to emission standard EU III.

Test sequence

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- Connect up vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "Address word" 01 => Page 3 .
For this purpose, the engine must be running at idle speed

-> When adjacent display appears:

Rapid data transfer HELP
Select function XX

- Press keys 0 and 8 for the function "Read measured value block" and confirm entry with Q key.

-> When adjacent display appears:

Reading measured value block Q
Enter display group number XXX

- Press keys 0, 1 and 4 for "display group number 14" and confirm entry with Q key.

-> When adjacent display appears:

Read measured value block 14
1 2 3 4

- Test misfire detection.

	Display zones			
	1	2	3	4
Display group 014: Misfire detection				
Display	xxx rpm	xxx %	xxx	---
Display	Engine speed	Load	Total misfires	Misfire detection
Range	min.: 750 rpm max.: 6800 rpm	min.: 0 max.: 175		activated blocked
Specified value	750...850 rpm	15.0...22.0 %	0...15	activated
Note:	---	---	If specified value is not attained: Evaluation, display zone 3 => Page 157 .	---

If specified value is attained:

- Press the =>key.

-> Display readout (function selection):

Rapid data transfer HELP
Select function XX

Evaluation display group 14, display zone 3

Display zone: 3	Possible causes of fault	Fault remedy
higher than 15	- Defective spark plug - Defective spark plug connector - Ignition coil or output stage - Injector defective - Poor compression on one or more cylinders	- Test spark plugs and ignition wiring Check ignition coils => Page 139 - Check injectors =>Page 61 - Check compression

The measured value blocks that indicate the misfires of the individual cylinders are as follows:

	Display zones			
	1	2	3	4
Display group 015: Misfire detection of cylinders 1, 2 and 3				
Display	xxx	xxx	xxx	---
Display	Number of misfires in cylinder 1	Number of misfires in cylinder 2	Number of misfires in cylinder 3	Misfire detection
Range				activated blocked
Specified value	0...15	0...15	0...15	activated
Note:	If specified value is not attained: Evaluation =>Page 158 .	If specified value is not attained: Evaluation =>Page 158 .	If specified value is not attained: Evaluation =>Page 158 .	---

Note:

Note that misfire detection is only displayed on vehicles that conform to emission standard EU III .

	Display zones			
	1	2	3	4
Display group 016: Misfire detection of cylinders 4, 5 and 6				
Display	xxx	xxx	xxx	---
Display	Number of misfires in cylinder 4	Number of misfires in cylinder 5	Number of misfires in cylinder 6	Misfire detection
Range				activated blocked
Specified value	0...15	0...15	0...15	activated
Note:	If specified value is not attained: Evaluation =>Page 158 .	If specified value is not attained: Evaluation =>Page 158 .	If specified value is not attained: Evaluation =>Page 158 .	---

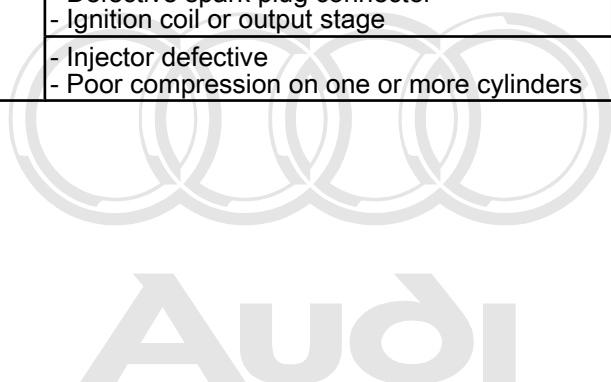
Note:

Note that misfire detection is only displayed on vehicles that conform to emission standard EU III .



Evaluation of measured value blocks 15 and 16

Display zones: 1/2/3	Possible causes of fault	Fault remedy
higher than 15	- Defective spark plug - Defective spark plug connector - Ignition coil or output stage	- Test spark plugs and ignition wiring - Check ignition coils => Page 139
	- Injector defective - Poor compression on one or more cylinders	- Check injectors => Page 61 - Check compression



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