Workshop Manual
Audi 80 1992 ►

Engine code	ABY				
Booklet	**Motronic Fuel Injection and Ignition System (5-Cylinder) Edition 09.92**				

Edition 09.92

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Service.

List of Workshop Manual Repair Groups

Audi 80 1992 ▶

Engine code	ABY										

Booklet **Motronic Fuel Injection and Ignition System (5-Cylinder)**
Edition 09.92

Please note: the technical supplements given here start at page 106

Repair Group		Technical Bulletins
01	Self-diagnosis, Electrical test	1
24	Fuel preparation, Fuel injection	
28	Ignition system	

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Technical information should always be available to all foremen and mechanics, because their compliance with the instructions given is essential to ensure vehicle roadworthiness and safety.
In addition, the normal safety precautions to be observed when working on motor vehicles are also applicable.

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Self-diagnosis of Motronic system

Technical data of self-diagnosis:

Memory	
• Permanent memory	yes
• Volatile memory	no
Data output	
• Rapid data transfer	yes
• Additional flash code output at CARB lamp	no
Final control diagnosis	yes
Engine basic setting	yes
Reading measured value block	yes
Reading individual measured values	no
Fitting locations of components	⇒ Repair Group 24

The Motronic control unit (–J220) features self-diagnosis. If faults occur in the monitored sensors or components, these are stored in the fault memory with an indication of the type of fault.
Faults which occur sporadically are additionally identified as such.

The Motronic control unit analyses the information and distinguishes between different types of faults ⇒ Fault table page 01–12, and stores these until the contents of the fault memory are erased or after not more than 50 engine starts.

In addition, the Motronic control unit is equipped with final control diagnosis for 8 control elements ⇒ page 01–44.

Notes:

- *Final control diagnosis can only be performed when the engine is not running.*
- *By contrast, the fault memory should be interrogated, if possible, with the engine running.*

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The possibilities of self-diagnosis can only be utilized with the fault reader V.A.G 1551.

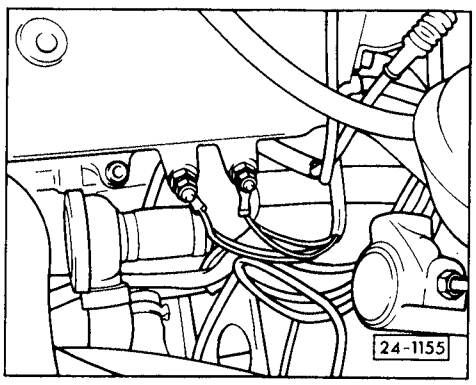
In Repair Group 01 only operating mode 1 with V.A.G 1551 is described.

Note regarding fault recognition:

If a fault condition exists for longer than a certain time, the fault is stored as a static fault. If the fault condition no longer exists for a certain time, the fault is classified as a sporadic fault. This procedure is repeated constantly.

- Conversion of a fault from a static to a sporadic fault is only done if the fault no longer exists for a certain time.
- If the fault no longer occurs within the next 50 engine starts, this sporadic fault is automatically erased.

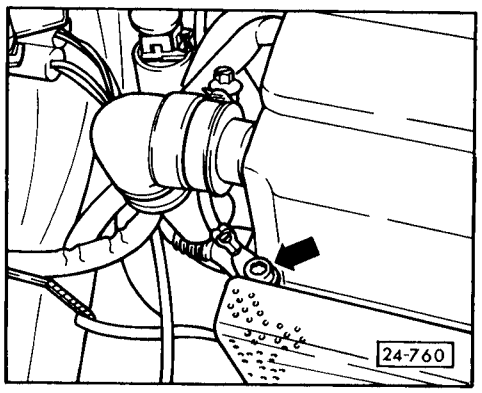
Test requirements
- Fuse 21 in order.
- Fuel pump relay in order.



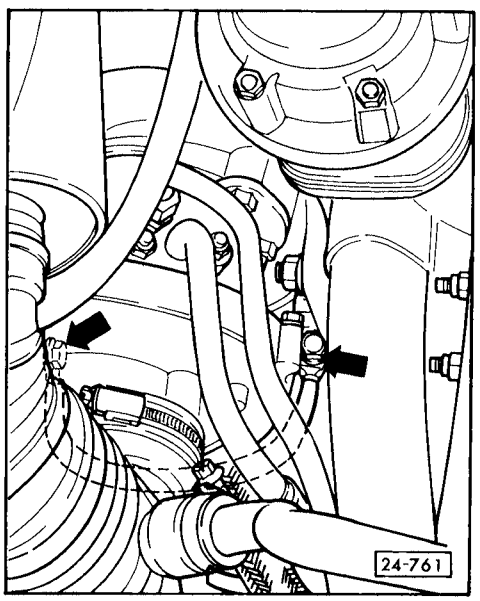
Checking engine earth connections

Before interrogating the fault memory, performing final control diagnosis, testing wiring and replacing com-ponents, check the following earth connections for signs of corrosion and poor connection, repair if necessary:

- Power earth cable (thick cables)
- Electronic earth cable (thin cables)



- Earth connection for ignition coils at rear right of cylinder head cover.



- Attachment points of earth cable between engine and right side member.

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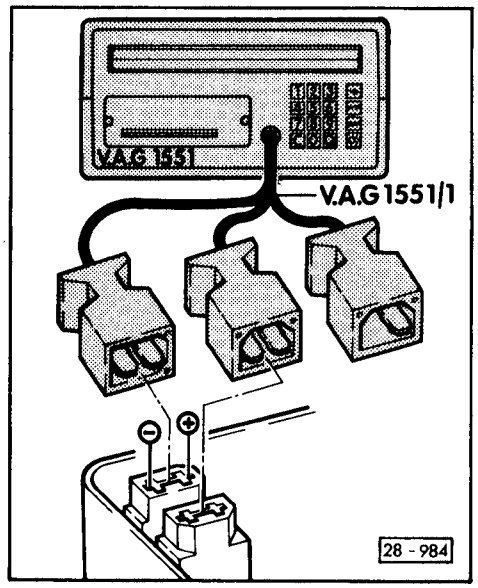

Interrogating and erasing fault memory

Test requirements:
- Fuses –S28 and –S24 for engine in auxiliary fuse carrier in order.
- Fuse –S21 in order.
- Fuel pump relay in order.

Note:

The fault memory cannot be erased until after it has been interrogated.

◄ – Connect fault reader with diagnostic cable V.A.G 1551/1 to the diagnostic sockets in the electrical centre as follows:

– Remove cover from the electrical centre in the plenum chamber.

– **Black** connector to **"black"** diagnostic socket.

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

◄ Readout in display:
* appears alternately

– If no readout appears in the display, test voltage supply for black diagnostic socket ⇒ page 01–69.

– **White** connector to **"white"** diagnostic socket.

– **Blue** connector is not required.

Notes:

- *Additional operating information can be retrieved by pressing the HELP key of V.A.G 1551.*
- *The → key is used for advancing within the programme.*

– Run engine, otherwise crank engine with starter for at least 5 seconds **without** then switching off the ignition.

– Switch on printer with the Print key (indicator lamp in the key lights up).

– Press key 1 for the "Rapid data transfer" mode.

Rapid data transfer HELP Enter address word XX

◄ Readout in display:

Note:

After entering the address word 00 and confirming with the key Q, an automatic test run is performed (interrogation of fault memories of all systems with data transfer).

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– Press keys 0 and 1.
(The address word "Engine electronics" is entered with 01).

Rapid data transfer Q 01 – Engine electronics

◄ Readout in display:

– Confirm entry with the key Q.

Rapid data transfer Tester sends address word 01

◄ Readout in display:

Rapid data transfer HELP Control unit does not answer!

◄ If the following appears in the display:

– A list of the possible causes of faults can be printed out by pressing the HELP key.

Notes:

- *Test cable connection of "white" diagnostic socket ⇒ page 01–69.*
- *Control unit faulty ⇒ Fault table, page 01–12 under fault code **65535.***
- *Test voltage supply of Motronic control unit ⇒ Repair Group 28.*

Rapid data transfer Fault in communication buildup

◄ If the following appears in the display:

Notes:

- *On vehicles with several systems with "Rapid data transfer" self-diagnosis, separate cable connection between the individual systems ⇒ page 01–68.*
- *Vehicles only with faulty Motronic control unit ⇒ Fault table, page 01–12 under fault code **65535.***

Rapid data transfer HELP L wire not switching to earth

◄ If one of the 4 faults appears in the display:

– A list of the possible causes of faults can be printed out by pressing the HELP key.

Rapid data transfer HELP L wire not switching to positive

or

Rapid data transfer HELP K wire not switching to earth

or

Rapid data transfer HELP K wire not switching to positive

Notes:

- *Test cable connection of diagnostic sockets ⇒ page 01–69.*
- *On vehicles with several systems with "Rapid data transfer" self-diagnosis, separate cable connection between the individual systems ⇒ page 01–69.*
- *Vehicles only with control unit for diesel direct injection system ⇒ Fault table, page 01–12 under fault code **65535.***

– After rectifying the possible causes of faults, once again enter the address word 01 for "Engine electronics" and confirm with the key Q.

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895 907551 2.21 R5 MOTR. RHV HS D01 Coding 01

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◄ The control unit identification appears in the display.

- Explanation of display: Interrogating control unit version with V.A.G 1551 ⇒ page 01–86.

– Press → key.

Rapid data transfer HELP Select function XX	◄ Readout in display:

Note:

A list of the possible causes of faults is printed out after pressing the HELP key.

– Press keys 0 and 2.
(The function "Interrogate fault memory" is selected with 02).

Rapid data transfer Q 02 – Interrogate fault memory	◄ Readout in display:

– Confirm entry with the key Q.

X faults recognized! Readout in display:	◄ The number of stored faults or "No fault recognized" appears in the display.

or

No fault recognized!

Notes:

- *If the printer is switched on, the stored faults are displayed and printed out one after the other.*
- *If the printer is switched off, the → key must be pres sed in order to display the next fault.*
- *Fault code **00513** engine speed sender is not always output with ignition on and engine running. This fault display should be ignored in this state. The fault should be heeded after an unsuccessful attempt at starting (engine does not start) without then switching off the ignition.*

– After displaying and printing out the last fault, press → key.

Note:

*If a complaint exists and has **not** been recognized by self-diagnosis, perform further fault finding on the basis of the fault table from the "Fault Finding Engine" binder.*

Rapid data transfer HELP Select function XX	◄ Readout in display:

– Press keys 0 and 5.
(The fault memory is erased with 05).

Rapid data transfer Q 05 – Erase fault memory	◄ Readout in display:

– Confirm entries with the key Q.

Important! ***Fault memory was not interrogated.***	◄ If the following appears in the display:

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Note:

If, for example, the ignition was switched off or the engine left running between interrogating and erasing fault memory, the fault memory is then not erased.

– Adhere precisely to the sequence of operations, i.e. first of all interrogate fault memory.

Rapid data transfer Fault memory is erased!

◄ Readout in display:

– Press → key.

Rapid data transfer Select function XX	HELP

◄ Readout in display:

– Rectify faults printed out on the basis of the fault table ⇒ page 01–12.

– Interrogate and erase fault memory (this ensures that faults which were stored during rectification of faults, e.g. as a result of unplugging connectors, are erased).

– Perform a road test lasting at least 5 minutes.

– Once again interrogate the fault memory as a check.

Notes:

- *After entering the address word 00, the fault memories of all the systems with rapid data transfer are interrogated.*
- *If on vehicles with "automatic gearbox" the connector was unplugged from the Motronic control unit when rectifying a fault, the fault "Engine/Gearbox electrical connection interruption" is stored in the gearbox control unit and should be erased.*

Fault table

- All the possible faults which can be recognized by the Motronic control unit –J220 are listed below according to the fault code. Existing faults are printed out with the fault code (5-digit) and flash code (4-digit) only of the printer of V.A.G 1551 is switched on.
- Only the fault code is listed in the fault table.
- If faults occur only occasionally or if the fault memory was not erased after rectifying faults, such faults are also displayed as "sporadic faults". In this case, an "SP" appears on the right of the display of V.A.G 1551.
- If faulty components are found, additionally test the wiring to the components for short circuit and open circuit on the basis of the current flow diagram.
- Before rectifying faults or replacing components, test the earth connections of the Motronic control unit –J220 at contacts 10, 14, 19 and 24 (specification max. 1.0 Ω) and also check the earthpoints at the engine for signs of corrosion and damage, test fuel pump relay ⇒ Repair Group 24.
- Faults may be stored in the fault memory as a result of unplugging connectors from electronic components with the ignition switched on. For this reason, do not unplug connectors at electronic components unless the ignition is switched off.
- After rectifying faults and erasing the fault memory, check the basic setting of the engine with V.A.G 1551, perform a road test and, after the road test, once again interrogate the fault memory and also re-check the basic setting.

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Output at printer of V.A.G 1551	Possible causes of fault	Possible effects	Rectifying fault
00000 No fault recognized	If a complaint exists: Fault not recognized by self-diagnosis.	———	Continue fault finding on basis of fault table, "Fault Finding Engine" binder.
00000 End of output	———	———	———
00281 Road speed sender –G68 * No signal	– Open circuit in wiring or short circuit from contact 50 at –J220 to speedometer –G21 in dash panel insert. – Speedometer sender –G22 faulty. – Speedometer –G21 faulty.	– A/C compressor does not cut out in 1st gear at full load. – Engine speed briefly drops below idling speed when disengaging clutch in overrun phase. – Engine speed limited to 5300 rpm (only with USA coding!).	– Test road speed signal ⇒ Repair Group 24. – After repairing, perform brief road test.

* This readout appears in addition to the relevant component.

Output at printer of V.A.G 1551	Possible causes of fault	Possible effects	Rectifying fault
00513 Engine speed sender –G28 * Implausible signal * No signal	– Metal swarf on –G28. – Base of –G28 loose. – Clearance from –G28 to ring gear of flywheel greater than 1.2 mm. – Teeth at ring gear of flywheel broken off. – Open circuit in wiring between 3-pin connector in engine compartment and –G28. – Open circuit in wiring between –J220 and –G28. – Short circuit between contact 47 at –J220 and screening or engine earth. – Open circuit in screening of –G28.	– Engine does not start. – Misfiring. – Engine cuts out.	– Test –G28 ⇒ Repair Group 28. – Rectify short circuit and open circuit according to current flow diagram.
* Mechanical fault	– 3-pin plug connection of –G28 and –G4 in engine compartment mixed up. – –G28 faulty. – Input for –G28 in –J220 faulty (–J220 faulty).	– Engine does not start.	– Plug in connectors at –G4, –G28 correctly.

* One of these readouts appears in addition to the relevant component.

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Output at printer of V.A.G 1551	Possible causes of fault	Possible effects	Rectifying fault
00514			
Ignition timing sender –G4 * No signal	– Base of –G4 loose. – Clearance from –G4 to pin of flywheel greater than 1.2 mm. – Pin on flywheel bent or broken off.	– Fault prior to engine start or attempt at starting: engine does not start.	– Test –G4 ⇒ Repair Group 28.
	– Open circuit in wiring between 3-pin connector in engine compartment and –G4. – Open circuit in wiring between –J220 and –G4. – Short circuit between contact 49 at –J220 and screening or engine earth. – Open circuit of screening of –G4.	– Fault after engine start: engine continues running in emergency mode.	– Rectify short circuit or open circuit according to current flow diagram.
	– 3-pin plug connection of –G4 and –G28 in engine compartment mixed up. – –G4 faulty. – Input for –G4 in –J220 faulty (–J220 faulty).	– Engine does not start.	

* This readout appears in addition to the relevant component.

Output at printer of V.A.G 1551	Possible causes of fault	Possible effects	Rectifying fault
00515			
Hall sender –G40 * Open circuit/short circuit to positive * Signal to positive * Short circuit to earth * Signal to earth * Mechanical fault * Fault in basic setting	– No supply voltage for –G40 from –J220. – No earth for –G40. – Open circuit in signal wire to –J220 or short to earth of signal wire. – Short circuit between contacts 8 and 12 at –J220. – Open circuit in wiring between 3-pin plug connection in engine compartment and –J220. – Position of pin of –G4. – –G40 faulty. – Input for –G40 in –J220 faulty (–J220 faulty).	– Engine does not start.	– Test –G40 ⇒ Repair Group 28. – Rectify short circuit and open circuit on basis of current flow diagram.
	– Toothed belt jumped off.	– Poor performance.	– Check toothed belt (camshaft setting) ⇒ Repair Group 15. – Test –G40 ⇒ Repair Group 28.
	– Basic setting of Hall sender. – Pin of ignition timing sender –G4 bent or broken off.		– Basic setting of Hall sender ⇒ Repair Group 28. – Check pin of –G4 ⇒ Repair Group 28.

* One of these readouts appears in addition to the relevant component.

Note regarding fault code 00515:

If the fault appears as a sporadic fault, ignore fault display!

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Output at printer of V.A.G 1551	Possible causes of fault	Possible effects	Rectifying fault
00516			
Idling speed switch –F60	– Setting of –F60. – Throttle valve jamming.	– Idle speed control moves to open-loop control.	– Test F60 and adjust ⇒ Repair Group 24.
	– Closing damper jamming or incorrectly set.	– A/C compressor is switched off.	– Check closing damper ⇒ Repair Group 20.
* Open circuit/short circuit to positive * Short circuit to earth	– Footmat pressing on accelerator pedal. – Accelerator cable adjustment. – Open circuit in wiring between –F60 and –J220. – Input for –F60 in –J220 faulty (–J220 faulty). – Cable from –F60 to –J220 has short to earth. – Moisture in throttle valve connector.	– Idling speed not within specified range.	– Adjust throttle cable ⇒ Repair Group 20. – Rectify open circuit in wiring on basis of current flow diagram. – Rectify short circuit.

* One of these readouts appears in addition to the relevant component.

Output at printer of V.A.G 1551	Possible causes of fault	Possible effects	Rectifying fault
00518			
Throttle valve potentiometer –G69	– Open circuit or short circuit to positive in –G69 or in cable connection between –G69 and –J220.	– Boost pressure is not reached. – Poor performance.	– Test G69 ⇒ Repair Group 24.
* Open circuit/short circuit to positive * Signal too large * Short circuit to earth * Signal too small * Implausible signal	– Short circuit to earth in –G69 or in cable connection between –G69 and –J220. – G69 faulty. – J220 faulty. – Moisture or corrosion in plug connection at –G69.		

* One of these readouts appears in addition to the relevant component.

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Output at printer of V.A.G 1551	Possible causes of fault	Possible effects	Rectifying fault
00519 Intake manifold pressure sender –G71 * Signal too small * Signal too large * Control difference	– Vacuum line from intake manifold to –J220 interrupted, blocked, kinked, crimped. – Liquid separator in hose line from intake manifold to –J220 full of liquid. – Blow-off valve faulty. – Solenoid valve for boost pressure limiter –N75 faulty. – Pressure sensor in Motronic control unit –J220 faulty. – Turbocharger faulty.	– Poor performance.	– Check/drain vacuum lines of liquid separator. – Test solenoid valve for boost pressure limiter –N75 ⇒ Repair Group 24. – Test turbocharger ⇒ Repair Group 20.

* One of these readouts appears in addition to the component.

Output at printer of V.A.G 1551	Possible causes of fault	Possible effects	Rectifying fault
00522 Coolant temperature sender –G62 * Short circuit to earth * Open circuit/short circuit to positive	– Short circuit to earth. – Moisture in connector of –G62. – Open circuit between –G62 and –J220. – Contact resistances between –G62 and –J220. – –G62 faulty. – Input of –G62 in –J220 faulty (–J220 faulty).	– Cold starting problems at very low temperatures. – Driving faults in warming-up phase	– Test –G62 ⇒ Repair Group 28.

* One of these readouts appears in addition to the relevant component.

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Output at printer of V.A.G 1551	Possible causes of fault	Possible effects	Rectifying fault
00524 Intake air temperature sender –G42 * Short circuit to earth * Open circuit/short circuit to positive	– Short circuit to earth. – Open circuit in wiring between –G42 and –J220. – –G42 faulty. – Input of –G42 in –J220 faulty (–J220 faulty).	– Possible driving faults in warming-up phase at low temperatures.	– Test –G42 ⇒ Repair Group 28.

* One of these readouts appears in addition to the relevant component.

Output at printer of V.A.G 1551	Possible causes of fault	Possible effects	Rectifying fault
00524 Knock sensor 1 –G61 * No signal	– Corrosion in connector. – –G61 loose. – Open circuit in wiring or short circuit between –G61 and –J220. – Short circuit between –G61 and earth or to screening. – –G61 faulty. – Input for –G61 in –J220 faulty (–J220 faulty).	– High fuel consumption. – Poor performance. – Boost pressure is not reached.	– Repair contacts. – Tightening torque 20 Nm. – Rectify open circuit or short circuit.

* This readout appears in addition to the relevant component.

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Output at printer of V.A.G 1551	Possible causes of fault	Possible effects	Rectifying fault
00525 Lambda probe –G39 * Short circuit to positive * No signal * Short circuit to earth	– Open circuit in wiring to –J220. – Probe heater not operating. – Fuse –S25 (probe heater) faulty. – Heating resistor in probe faulty. – Wiring of probe heater. – Short circuit of signal wire to earth. – Short circuit of signal wire to screening. – Fuel tank empty, at least 10 ltr. – Fuel system pressure. – Failure of spark plugs, ignition coils and ignition output stages. – Ingress of air to –G70. – Leak in exhaust system up to catalyst. – Faulty lambda probe. – Open circuit in earth cable to contact 10, –J220 to engine block.	– Exhaust not in order. – Increased fuel consumption. – Formation of black smoke. – Spark plugs soot up. – Lambda control moves to open-loop control.	– Rectify open circuit in wiring. – Test lambda probe heater ⇒ Repair Group 24. – Basic setting of engine with V.A.G 1551 ⇒ page 01–50.

* One of these readouts appears in addition to the relevant component.

Output at printer of V.A.G 1551	Possible causes of fault	Possible effects	Rectifying fault
00528 Altitude sender –F69 * Open circuit/short circuit to positive * Short circuit to earth	– Short circuit to positive in –F96 or in cable connection between –F96 and –J220. – Short circuit to earth in –F96 or in cable connection between –F96 and –J220. – –F96 faulty. – Input for –F96 in –J220 faulty (–J220 faulty).	– Poor performance. – Boost pressure is not reached.	– Test –F96 ⇒ Repair Group 24. – Test boost pressure ⇒ Repair Group 21.

* One of these readouts appears in addition to the relevant component.

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Output at printer of V.A.G 1551	Possible causes of fault	Possible effects	Rectifying fault
00532			
Supply voltage	– Supply voltage greater than 16 V.		– Test voltage.
* Signal too large	– Alternator faulty.		
* Signal too small	– Starting with two series-connected batteries.	– –J220 destroyed.	– Check battery charge state.
	– Poor earth connection to –J220.	– Idling speed not within specified range.	– Test voltage supply ⇒ Repair Group 28.
	– Battery discharged.	– Voltage below 6 volts.	
	– Current drain with ignition off.	– Engine not running.	

* One of these readouts appears in addition to the relevant component.

Note regarding fault code 00532:

This fault may be stored if the engine is operated for a lengthy period at idling speed with a large number of electrical consumers switched on and the battery is severely discharged.

Output at printer of V.A.G 1551	Possible causes of fault	Possible effects	Rectifying fault
00533			
Idle speed control	– Idling speed stabilization valve –N71 sticking.	– Idling speed too low.	– Test –N7 ⇒ Repair Group 24.
* Adaptation limit exceeded	– Air mass meter –G70 characteristic curve shifted.		– Test –G70 ⇒ Repair Group 24.
* Adaptation limit	– Contact resistance at connector of –N71.		
* Adaptation limit not reached	– –N71 sticking in open position.	– Idling speed too high.	
	– –G70 characteristic curve shifted.		
	– Ingress of air between –G70 and –N71.		– Rectify leak.
	– Throttle valve potentiometer –G69 incorrectly set.	– Engine vibrating. – Poor throttle response. – Irregular idling (surging).	– Test –G69 and adjust ⇒ Repair Group 24.
	– Throttle valve body jamming.		– Test throttle valve body, replace if necessary.

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* One of these readouts appears in addition to the relevant component.

Output at printer of V.A.G 1551	Possible causes of fault	Possible effects	Rectifying fault
00537			
Lambda control * Control limit exceeded * Control limit not reached	– Fuel tank empty, at least 10 ltr. – Fuel system pressure too low. – Failure of spark plugs, ignition coils and ignition output stages. – Ingress of air to air mass meter –G70. – Leak in exhaust system up to catalyst. – Lambda probe faulty. – Fuel system pressure too high.	– CO upstream of catalyst less than 0.3 %. – Formation of black smoke. – Spark plugs sooted. – CO upstream of CAT greater than 1 %.	– Fill up fuel tank. – Rectify leak. – Test lambda probe ⇒ Repair Group 24. – Test fuel system pressure ⇒ Repair Group 24. – Check hose connection intake manifold/pressure regulator (fuel shut-off valve on overrun). – Check fuel return line for fouling, kinking and damage.

* One of these readouts appears in addition to the relevant component.

Output at printer of V.A.G 1551	Possible causes of fault	Possible effects	Rectifying fault
00540			
Knock sensor 2 –G66 * No signal	– Corrosion in connector. – –G66 loose. – Open circuit in wiring or short circuit between –G66 and –J220. – Short circuit between –G66 and earth or to screening. – –G66 faulty. – Input for –G66 in –J220 faulty (–J220 faulty).	– High fuel consumption. – Poor performance. – Boost pressure is not reached.	– Repair contacts. – Tightening torque 20 Nm. – Rectify open circuit in wiring and short circuit.

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* This readout appears in addition to the relevant component.

Output at printer of V.A.G 1551	Possible causes of fault	Possible effects	Rectifying fault
00543 Engine speed to maximum exceeded * Signal too large	– Engine overrevs (switching fault).	– Possible engine damage.	_____

* This readout appears in addition to the relevant component.

Note regarding fault code 00543:

Engine speed to maximum exceeded is stored as a fault if engine speed of 7200 rpm is exceeded. This engine speed can only be exceeded if the engine has been overrevved as a result of an operating fault (incorrect switching).

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Output at printer of V.A.G 1551	Possible causes of fault	Possible effects	Rectifying fault
00544 Boost pressure to maximum exceeded * Implausible signal * Signal too large	– Ingress of air downstream of turbocharger. – Blow-off valve faulty. – Solenoid valve for boost pressure limiter –N75 faulty. – Leak in vacuum line from intake manifold to –J220, vacuum line dropped off. – Pressure sensor in Motronic control unit –J220 faulty.	– Hard misfiring at full load. – Boost pressure too high. – Severe boost pressure fluctuations at full load.	– Check connections. – Test blow-off valve ⇒ Repair Group 21. – Test solenoid valve for boost pressure limiter –N75 ⇒ Repair Group 24. – Test boost pressure ⇒ Repair Group 21.

* One of these readouts appears in addition to the relevant component.

Output at printer of V.A.G 1551	Possible causes of fault	Possible effects	Rectifying fault
00545 Engine/gearbox electrical connection * Short circuit to earth	– Signal wire from gearbox control unit to –J220 has short circuit to earth.	– Hard gearshifts.	– Test cable connections to gearbox control unit (signal for gearshift) ⇒ Repair Group 24.

* This readout appears in addition to the relevant component.

Note:

This fault is only relevant to vehicles with automatic gearbox.

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eWn

Output at printer of V.A.G 1551	Possible causes of fault	Possible effects	Rectifying fault
00553 Air mass meter –G70 * Signal too large * Signal too small	– Open circuit in wiring between –G70 and –J220. – Voltage supply to –G70 interrupted or short to earth. – Short to earth of signal wire to –J220. – Short circuit of signal wire to –J220. – –G70 faulty. – Input for –G70 in –J220 faulty (–J220 faulty).	– Slight handling faults.	– Test –G70 ⇒ Repair Group 24.

* One of these readouts appears in addition to the relevant component.

Output at printer of V.A.G 1551	Possible causes of fault	Possible effects	Rectifying fault
00561 Mixture adaptation * Adaptation limit (multiplicative) exceeded * Adaptation limit (multiplicative) not reached * Adaptation limit (additive) exceeded * Adaptation limit (additive) not reached	– Fuel system pressure too low or too high. – Failure of spark plugs, ignition coils and ignition output stages. – Ingress of air to –G70. – Leak in exhaust system up to catalyst. – Incorrect signal from air mass meter –G70.	– Increased fuel consumption. – Formation of black smoke. – Spark plugs sooted up.	– Fill fuel tank. – Rectify leak. – Test fuel system pressure ⇒ Repair Group 24. – Test –G70 ⇒ Repair Group 24.

* One of these readouts appears in addition to the relevant component.

Output at printer of V.A.G 1551	Possible causes of fault	Possible effects	Rectifying fault
00577 Knock control cylinder 1 **00578** Knock control cylinder 2 **00579** Knock control cylinder 3 * Control limit exceeded	– Poor quality fuel, less than 91 RON. – Open circuit in signal wire from engine speed sender –G28 or ignition timing sender –G4 (loose contact, sporadic fault) or signal wire wrongly connected. – Abnormal engine noises (ancillaries loose). – Open circuit in screening of –G61. – Injector fouled.	– High fuel consumption. – Poor performance. – Maximum speed is not reached. – Boost pressure reduction.	– Replace –J220. – Fill up with fuel of at least 91 RON. – Test –G28 and –G4 ⇒ Repair Group 28. – Rectify open circuit. – Replace injector.

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* This readout appears in addition to the relevant component.

Note:

The knock control retards the ignition angle always only for the cylinder indicated.

Output at printer of V.A.G 1551	Possible causes of fault	Possible effects	Rectifying fault
00580 Knock control cylinder 4			– Replace –J220.
00581 Knock control cylinder 5 * Control limit exceeded	– Poor quality fuel, less than 91 RON. – Open circuit in signal wire from engine speed sender –G28 or ignition timing sender –G4 (loose contact, sporadic fault) or signal wire wrongly connected. – Abnormal engine noises (ancillaries loose). – Open circuit in screening of –G66. – Injector fouled.	– High fuel consumption. – Poor performance. – Maximum speed is not reached. – Boost pressure reduction.	– Fill up with fuel of at least 91 RON. – Test signal wire from –G28 and –G4 according to CFD ⇒ Repair Group 28. – Rectify open circuit. – Replace injector.

* This readout appears in addition to the relevant component.

Note:

The knock control retards the ignition angle always only for the cylinder indicated.

Output at printer of V.A.G 1551	Possible causes of fault	Possible effects	Rectifying fault
01247 Solenoid valve 1 for activated charcoal filter –N80 * Short circuit to positive * Open circuit/short circuit to earth	– Short circuit to positive in –N80 or in the cable connection between –N80 and –J220. – Short circuit to earth in –N80 or in the cable connection between –N80 and –J220. – Thermofuse –S75 faulty. – Open circuit in wiring.	– Short circuit to positive in –N80 or in the cable connection between –N80 and –J220. – Short circuit to earth in –N80 or in the cable connection between –N80 and –J220. – Thermofuse –S75 faulty. – Open circuit in wiring.	– Test –N80 ⇒ Repair Group 24.

* One of these readouts appears in addition to the component.

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Output at printer of V.A.G 1551	Possible causes of fault	Possible effects	Rectifying fault
01249 Injector cylinder 1 –N30 * Open circuit/short circuit to earth * Short circuit to positive	– Short circuit to earth. – Open circuit in wiring. – Fuse –S28 faulty. – Short circuit to positive at connector or in injector.	– Engine does not run smoothly.	– Test injectors ⇒ Repair Group 24.

* One of these readouts appears in addition to the component.

Output at printer of V.A.G 1551	Possible causes of fault	Possible effects	Rectifying fault
01250 Injector cylinder 2 –N31 * Open circuit/short circuit to earth * Short circuit to positive	– Short circuit to earth. – Open circuit in wiring. – Fuse –S28 faulty. – Short circuit to positive at connector or at injector.	– Engine does not run smoothly.	– Test injectors ⇒ Repair Group 24.

* One of these readouts appears in addition to the component.

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Output at printer of V.A.G 1551	Possible causes of fault	Possible effects	Rectifying fault
01251 Injector cylinder 3 –N32 * Open circuit/short circuit to earth * Short circuit to positive	– Short circuit to earth. – Open circuit in wiring. – Fuse –S28 faulty. – Short circuit to positive at connector or in injector.	– Engine does not run smoothly.	– Test injectors ⇒ Repair Group 24.

* One of these readouts appears in addition to the component.

Output at printer of V.A.G 1551	Possible causes of fault	Possible effects	Rectifying fault
01252 Injector cylinder 4 –N33 * Open circuit/short circuit to earth * Short circuit to positive	– Short circuit to earth. – Open circuit in wiring. – Fuse –S28 faulty. – Short circuit to positive at connector or in injector.	– Engine does not run smoothly.	– Test injectors ⇒ Repair Group 24.

* One of these readouts appears in addition to the component.

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Output at printer of V.A.G 1551	Possible causes of fault	Possible effects	Rectifying fault
01253 Injector cylinder 5 –N83 * Open circuit/short circuit to earth * Short circuit to positive	– Short circuit to earth. – Open circuit in wiring. – Fuse –S28 faulty. – Short circuit to positive at connector or in injector.	– Engine does not run smoothly.	– Test injectors ⇒ Repair Group 24.

* One of these readouts appears in addition to the component.

Output at printer of V.A.G 1551	Possible causes of fault	Possible effects	Rectifying fault
01257 Idling speed stabilization valve –N71 * Short circuit to positive * Open circuit/short circuit to earth	– Short circuit to positive in –N71 or in cable connection between –N71 and contact 4 of –J220. – Short circuit to earth in –N71 or in cable connection between –N71 and –J220. – Fuse –S24 faulty. – Open circuit in wiring.	– At engine operating temperature idling speed differs from specification. – With cold engine, engine may cut out. – In emergency running mode, idling speed 1100 – 1200 rpm when engine warm. – A/C compressor cuts out when idling. – Irregular idling speed.	– Test –N71 ⇒ Repair Group 24.

* This readout appears in addition to the relevant component.

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Output at printer of V.A.G 1551	Possible causes of fault	Possible effects	Rectifying fault
01262 Solenoid valve for boost pressure limiter –N75 * Short circuit to positive * Open circuit/short circuit to earth	– Short circuit to positive in –N75 or in cable connection between –N75 and contact 23 of –J220. – Short circuit to earth in –N75 or in cable connection between –N75 and –J220. – Fuse –S24 faulty. – Open circuit in wiring.	– Boost pressure too high. – Boost pressure too low. – Hard misfiring at full load because of "Boost pressure to max. exceeded, implausible signal" fault.	– Test –N75 ⇒ Repair Group 24.
65535 Control unit faulty	– Earth connection to –J220, contacts 10, 14, 19 and 24. – Control unit faulty.	– Engine does not start. – With ignition on, no voltage at contact 37 of –J220.	– Test earth connection according to current flow diagram.

* One of these readouts appears in addition to the component.

Final control diagnosis with fault reader V.A.G 1551

Test requirements:
- Fuses –S24, –S27 and –S28 in auxiliary fuse carrier in order.
- Fuse –S21 in order.
- Fuel pump relay in order.
- Control unit connected **without** test adapter V.A.G 1598/5 and test box V.A.G 1598.

Note:

During the final control diagnosis, all the injectors, the idling speed stabilization valve, the activated charcoal filter solenoid valve and boost pressure limiter solenoid valve are checked audibly or by touching. The injectors are each actuated for only 2 ms 5 times. Avoid background noises when conducting the audible check of the injectors as the switching noise (clicking) of the injectors is very quiet and brief.

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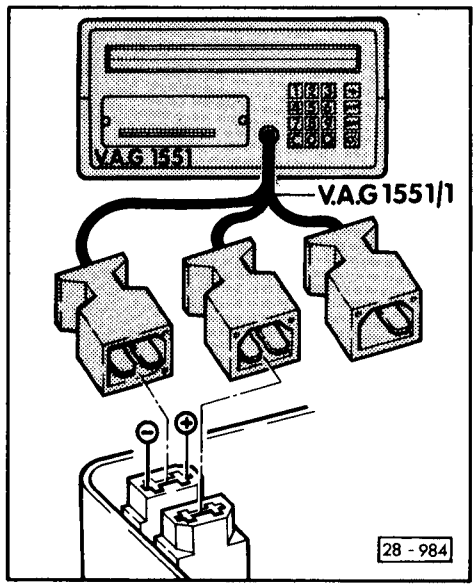
The final control diagnosis is aborted if the engine is started or if an engine speed pulse is detected.

Actuating sequence of final control diagnosis:
Injector cylinder 1 –N30
Injector cylinder 2 –N31
Injector cylinder 4 –N33
Injector cylinder 5 –N83
Injector cylinder 3 –N32
Idling speed stabilization valve –N71
Solenoid valve 1 for activated charcoal filter –N80
Solenoid valve for boost pressure limiter –N75



◄ – Connect fault reader with diagnostic cable V.A.G 1551/1 to the diagnostic sockets in the electrical centre as follows:

– Remove cover from the electrical centre in the plenum chamber.

– Black connector to "**black**" diagnostic socket.

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

◄ Readout in display:

* appears alternately

• If no readout appears in the display, test voltage supply for black diagnostic socket ⇒ page 01–69.

– **White** connector to "white" diagnostic socket.

– **Blue** connector is not required.

– Switch on ignition.

– Switch on printer with the Print key (indicator lamp in key lights up).

– Press key 1 for "Rapid data transfer" mode.

Rapid data transfer HELP Enter address word XX

◄ Readout in display:

– Press keys 0 and 1.
(The address word "Engine electronics" is entered with 01).

Rapid data transfer Q 01 – Engine electronics

◄ Readout in display:

– Confirm entry with the key Q.

Rapid data transfer Tester sends address word 01

◄ Readout in display:

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Rapid data transfer HELP Control unit does not answer!

◄ If the following appears in the display:

– ⇒ page 01–5 and 01–7.

Rapid data transfer
Fault in communication buildup

or

Rapid data transfer
* .....

* L – wire not switching to earth
  L – wire not switching to positive
  K – wire not switching to earth
  K – wire not switching to positive

895907551 2.21 R5 MOTR. RHV D01 →
Coding 01

◄ The control unit identification and the coding appear in the display.

- Current control unit version ⇒ Parts programme.
- Coding variants ⇒ page 01–66.

– Press → key.

Rapid data transfer HELP
Select function XX

◄ Readout in display:

Note:

A list of the possible functions is printed out after pressing the HELP key.

– Press keys 0 and 3.
(The function "Final control diagnosis" is selected with 03).

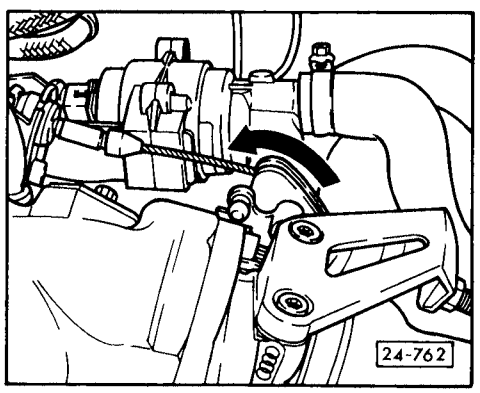
Rapid data transfer Q
03 – Final control diagnosis

◄ Readout in display:

– Confirm entry with the key Q.

Final control diagnosis
Injector cylinder 1 –N30

◄ Readout in display:



◄ – Raise throttle control lever, hold tight for 2 to 3 seconds and then slowly release. As soon as idling speed position is again reached, the injector for cylinder 1 clicks five times. Following this, the control unit automatically switches to the next injector (pay attention to readout on V.A.G 1551).

– To move to the next injector without the test, press the → key each time.

– All the injectors are tested one after the other in this way.

– Press → key.

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Final control diagnosis
Idling speed stabilization valve –N71

◄ Readout in display:

This valve continues to be operated (clicks) until the programme is advanced to the next control element by pressing the → key.

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

◄ Readout in display:

This valve continues to be operated (clicks) until the programme is advanced to the next control element by pressing the → key.

Final control diagnosis Solenoid valve for boost pressure limiter –N75

◄ Readout in display:

This valve continues to be operated until the programme is advanced to the next control element by pressing the → key.

Rapid data transfer Select function XX	HELP

◄ Readout in display:

– If function 03 – Final control diagnosis is once again selected after this, the final control diagnosis can be repeated. If one of the valves does not click, test valve or actuation ⇒ Repair Group 24.

Basic setting of engine with V.A.G 1551

Notes:

- *The basic setting is performed with the engine running.*
- *During the basic setting the Motronic control unit performs the following function:*

– ACF valve is closed.

- The values appear either in display group 00 as a block of ten or in display group 01 as a block of four.
- The display as a block of four also includes the physical dimension (e.g. rpm or °C).

Requirements:
- Engine temperature at least 85 °C.
- All electrical components switched off.
- Air conditioner switched off.

– Perform a road test lasting at least 5 minutes, if possible, including a stop at traffic lights.

– Interrogate and erase fault memory ⇒ page 01–5.

– Continue running engine at idling speed after interrogating and erasing fault memory and do not depress accelerator pedal.

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Rapid data transfer HELP Select function XX

◄ Readout in display:

Note:

A list of the possible functions is printed out after pressing the HELP key.

– Press keys 0 and 4.
(The function "Initiate basic setting" is selected with 04).

Function is unknown or cannot be carried out at the moment

◄ If the following readout appears in the display:

Notes:

- *Interrogate control unit version ⇒ page 01–86.*
- *Requirements on page 01–44 are not met.*

Rapid data transfer Q 04 – Initiate basic setting

◄ Readout in display:

– Confirm entry with the key Q.

Initiate basic setting HELP Enter display group number XX

◄ Readout in display:

Note:

The procedure for entering the display group number is printed out after pressing the HELP key.

List of display groups

Display group number	Readout in display field
00	System in basic setting 1 2 3 4 5 6 7 8 9 10
01	1 = Engine speed 2 = Coolant temperature 3 = Lambda control 4 = Ignition angle

Note:

The display group should be selected depending on the type of fault which exists.

– Select desired display group number according to the list of display groups and confirm entry with the key Q.

Display group number 00:

– Press key 0 twice.
("System in basic setting" is selected with 00).

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Initiate basic setting Q Enter display group number 00

◄ Readout in display:

– Confirm entry with the key Q.

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

◄ Readout in display:

– Wait at least 5 seconds before comparing readouts in the display fields with the explanation ⇒ page 01–56.

Notes:

- *The figures which are displayed in display fields 1 to 10 are shown as decimals. The conversions into physical values, to the extent necessary, are listed in the column "equals measured value" ⇒ page 01–56.*
- *After performing a road test and interrogating the fault memory, compare the readout in display field 9 with the specification ⇒ page 01–56 within the next 5 minutes. If the engine runs at idling speed for a longer period, the specification may be exceeded without a fault actually existing.*
- *The readout in display field 10 represents the ignition angle calculated by the control unit –J220.*
- *When the printer is switched on, the current display is printed out on the report log.*
- *The current display is printed out again each time the **Print** is pressed.*
- *Before selecting **further** display groups, press the key C.*
- *After selecting another display group, the printer must once again be switched on in each case.*

Display group number 01:

Note:

If the display group 00 (or 02) has been selected beforehand and the programme then advanced with the → key or the C key pressed twice, the function "04 Initiate basic setting" must first of all again be selected.

– Press keys 0 and 1.
(The function "Display group number 01" is selected with 01).

Initiate basic setting	Q
Enter display group number 01	

◄ Readout in display:

– Confirm entry with the key Q.

System in basic setting 1			
1	2	3	4

◄ Display fields in display:

Notes:

- *In the case of display group numbers 01 and 02, the respective display group number appears in the display **without** the 0 in the case of the display "System in basic setting".*
- *In the case of display group number 00, **only** "System in basic setting" appears in the display. Description of individual displays in the display fields ⇒ page 01–56.*
- *Before selecting **further** display groups, press key C.*

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Display group number 02:
The procedure for display group 02 is identical to display group 01.
Display group 02 does not contain any information of use for the Service Department.

Note:

When retrieving a display group number from 03 to 99, the values of display group 02 are always displayed.

Explanation of the readouts in display fields 1 to 10

Display field	Readout specifications*	equals measured value	Designation	Remarks
1	184 ... 215	85° ... 105°C	Coolant temperature	Requirement for all other displays/ specifications
2	20 ... 24		Engine load	With air conditioner off, without electrical components
3	77 ... 83	770 ... 830 rpm	Engine speed	With air conditioner off, without electrical components
4	121 ... 135		Idling stabilization working range	Air volume change as the result of –N71
5	70 ... 125		Idling stabilization characteristic curve zero point	Internal computation value
6	123 ... 137		Idling speed stabilization load adaptation	Air volume change as the result of –N71
7	41 ... 61		Idling speed stabilization characteristic curve control	Internal computation value
8	123 ... 133		Lambda control	after about 1.5 minutes
9	100 ... 150		Learning value for lambda control	If readout is high, once again perform road test
10	35 ... 37	8 ... 12° BTDC	Ignition angle when idling	Ignition angle calculated by –J220

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* ***Note:***

If the values displayed do not correspond to the specifications, check whether air conditioner is switched off. If air conditioner is switched off ⇒ Test table, page 01–55.

Test table for display group 00:

The tests which require to be performed if the display/specifications are not achieved are listed in the table.

Note:

Before performing the tests, ensure that the air conditioner and A/C compressor are switched off.

Display field	Readout on V.A.G 1551	Cause of fault	Rectifying fault
1	greater than 215	Coolant temperature sender –G62 Radiator fan not operating	– Test –G62 ⇒ Repair Group 28. – Interrogate fault memory ⇒ page 01–5.
1	less than 184	Coolant thermostat Coolant temperature sender –G62	– Test coolant thermostat ⇒ Repair Group 19. – Test –G62 ⇒ Repair Group 28. – Interrogate fault memory ⇒ page 01–5.
2	greater than 24	Air conditioner switched on Electrical components switched on A/C compressor running although air conditioner switched off Air mass meter –G70 Central hydraulics pump Ingress of air between turbocharger and throttle valve	– Switch off air conditioner. – Switch off electrical components. – Test air conditioner ⇒ Repair Group 87. – Test –G70 ⇒ Repair Group 24. – Test central hydraulics pump ⇒ Repair Group 48. – Determine cause of ingress of air.

* One of these readouts appears in addition to the component.

Display field	Readout on V.A.G 1551	Cause of fault	Rectifying fault
2	less than 20	Ingress of air between air mass meter –G70 and turbocharger Ingress of air downstream of throttle valve Vacuum hose has dropped off Leak in crankcase ventilation Fuel tank ventilation Solenoid valve 1 for activated charcoal filter jamming Air mass meter –G70	– Determine cause for ingress of air. – Determine cause for ingress of air. – Check vacuum system. – Check crankcase for leaks. – Check fuel ventilation system ⇒ Repair Group 24. – Perform final control diagnosis ⇒ page 01–44. – Test –G70 ⇒ Repair Group 24.
3	greater than 83	Idling speed stabilization valve –N71 at bottom control stop Ingress of air downstream of throttle valve Vacuum hoses dropped off (rear of intake manifold ⇒ Repair Group 24) Air conditioner not switched off A/C compressor control signal supplied although compressor is switched off Idling speed stabilization valve faulty	– Briefly blip throttle 4 times at intervals of 15 seconds. – Rectify cause for ingress of air. – Switch off air conditioner. – Test air conditioner ⇒ Repair Group 87. – Perform final control diagnosis ⇒ page 01–44. ***Note:*** *If air conditioner has high capacity demand (cooling or heating) idling speed is increased to 880 rpm (readout 88).*

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Display field	Readout on V.A.G 1551	Cause of fault	Rectifying fault
3	less than 77	Idling speed stabilization valve –N71 jamming Idling speed stabilization valve –N71	– Test –N71 ⇒ Repair Group 24. – Perform final control diagnosis ⇒ page 01–44.
4	less than 121	Ingress of air downstream of throttle valve Idling speed stabilization valve –N71 jamming	– Rectify cause for ingress of air. – Test –N71 ⇒ Repair Group 24.
4	greater than 135	A/C compressor running although air conditioner off Charge state of battery	– Test air conditioner ⇒ Repair Group 87. – Check charge state.
5	less than 70	Idling speed stabilization valve –N71 jamming Throttle valve potentiometer –G69 incorrectly set	– Test –N71 ⇒ Repair Group 24. – Adjust –G69 ⇒ Repair Group 24.
5	greater than 125	Leak between throttle valve/intake manifold or air flow meter and turbocharger (in vacuum circuit) Idling speed stabilization valve –N71	– Rectify cause. – Test –N71 ⇒ Repair Group 24.
6	not between 123 – 137	Control for idling speed stabilization valve –N71 Throttle valve potentiometer –G69 incorrectly set Ingress of air	– Briefly blip throttle and check readout, readout must be between 123 and 137. – Adjust –G69 ⇒ Repair Group 24. – Determine cause.

Display field	Readout on V.A.G 1551	Cause of fault	Rectifying fault
7	less than 41 greater than 61	dling speed stabilization valve –N71 Ingress of air	– Test –N71 ⇒ Repair Group 24. – Determine cause of fault.
8	constant 128	Fuel supply too low Lambda probe faulty Lambda probe heater faulty	– At least 10 ltr. of fuel in tank. – Test lambda probe and lambda control ⇒ Repair Group 24.
8	not between 123 and 133	Lambda adaptation not yet completed Lambda probe Ingress of air downstream of air mass meter –G70 Fuel system pressure Leak in exhaust system	– After disconnecting battery or control unit or replacing control unit, run warm engine at idling speed for at least 10 minutes. – Check specification display field 9. – Test lambda control ⇒ Repair Group 24. – Rectify cause of fault. – Test system pressure ⇒ Repair Group 24. – Check ⇒ Repair Group 26.
8	jumps	Fuel supply too low Loose contact in lambda probe signal cable Lambda probe heater faulty	– At least 10 ltr. of fuel in tank. – Test lambda probe and lambda control ⇒ Repair Group 24.

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Display field	Readout on V.A.G 1551	Cause of fault	Rectifying fault
9	less than 100	Fuel system pressure too high Air mass meter –G70 Lambda probe Ingress of air between turbocharger and throttle valve	– Test system pressure ⇒ Repair Group 24. – Test –G70 ⇒ Repair Group 24. – Test lambda control ⇒ Repair Group 24. – Determine cause of fault.
9	greater than 150	Fuel system Fuel supply too low Ingress of air between air mass meter and turbocharger or in intake manifold	– At least 10 ltr. of fuel in tank. Rectify cause for ingress of air.
10	greater than 37	Idling speed stabilization valve –N71	– Perform final control diagnosis ⇒ page 01–44. – Test –N71 ⇒ Repair Group 24. – Test –F60 ⇒ Repair Group 24. – Coolant temperature too low (check display field 1).
10	less than 35	Idling speed stabilization valve –N71 Idling speed switch –F60	– Perform final control diagnosis ⇒ page 01–44. – Test –N71 ⇒ Repair Group 24. – Test idling speed switch –F60.

Explanation of readouts for display group 01:

Display field	Readout specifications	Designation	Remarks
1	770 ... 830 rpm	Engine speed	With the air conditioner off, without electrical components
2	85 ... 105°C	Coolant temperature	Requirement for all other displays/ specifications
3	0.96 ... 1.04	Lambda control	after about 1.5 minutes
4	8 ... 12° BTDC	Ignition angle at idling speed	Ignition angle calculated by –J220

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Test table for display group 01:

The test required if the readout/specifications are not reached are listed in the table.

Note:

Prior to the tests, ensure that the air conditioner and compressor are switched off.

Display field	Readout on V.A.G 1551	Cause of fault	Rectifying fault
1	greater than 830	Idling speed stabilization valve –N71 at bottom control stop Ingress of air downstream of throttle valve Vacuum hoses dropped off (rear of intake manifold ⇒ Repair Group 24) Air conditioner not switched off A/C compressor control signal supplied although compressor is switched off Idling speed stabilization valve jamming	– Briefly blip throttle 4 times at intervals of 15 seconds. – Rectify cause for ingress of air. – Switch off air conditioner. – Test air conditioner ⇒ Repair Group 87. – Perform final control diagnosis ⇒ page 01–44.
1	less than 770	Idling speed stabilization valve –N71 jamming Idling speed stabilization valve –N71	– Test –N71 ⇒ Repair Group 24. – Peform final control diagnosis ⇒ page 01–44.
2	greater than 105°C	Coolant temperature sender –G62 Radiator fan not operating	– Test –G62 ⇒ Repair Group 28. – Interrogate fault memory ⇒ page 01–5.
2	less than 85°C	Coolant thermostat Coolant temperature sender –G62	– Test coolant thermostat ⇒ Repair Group 19. – Test –G62 ⇒ Repair Group 28. – Rectify fault memory ⇒ page 01–5.

Display field	Readout on V.A.G 1551	Cause of fault	Rectifying fault
3	constant 1.0	Fuel supply too low Lambda probe faulty Lambda probe heater faulty	– At least 10 ltr. of fuel in tank. – Test lambda probe and lambda control ⇒ Repair Group 24.
3	not between 0.96 and 1.04	Lambda adaptation not yet completed Lambda probe Ingress of air downstream of air mass meter –G70 Fuel system pressure Leak in exhaust system	– After disconnecting battery or control unit or replacing control unit, run warm engine at idling speed for at least 10 minutes. – Check display group 02, display field 2. – Test lambda control ⇒ Repair Group 24. – Rectify cause of fault. – Test system pressure ⇒ Repair Group 24. – Check ⇒ Repair Group 26.
3	jumps	Fuel supply too low Loose contact in lambda probe signal cable Lambda probe heater faulty	– At least 10 ltr. of fuel in tank. – Test lambda probe and lambda control ⇒ Repair Group 24.

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Display field	Readout on V.A.G 1551	Cause of fault	Rectifying fault
4	greater than 12° BTDC	Idling speed stabilization valve –N71 Idling speed switch –F60	– Perform final control diagnosis ⇒ page 01–44. – Test –N71 ⇒ Repair Group 24. – Test –F60 ⇒ Repair Group 24.
4	less than 8° BTDC	Idling speed stabilization valve –N71	– Perform final control diagnosis ⇒ page 01–44. – Test –N71 ⇒ Repair Group 24.

Coding variants of Motronic control unit –J220

The coding connector is located in the right front passenger footwell in the area of the A pillar. When interrogating the fault memory, the control unit identification and the coding are displayed.

Coding is performed at the coding connector by appropriately assigning the contacts 1, 2, 3 and 4. The contact designation is stamped on the connector.

At present there are only the codings 1 and 4.

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Coding 1: (applies to European countries)
This coding does not contain any speed limit.

All the contacts of the coding connector with this coding are open.

Coding 4: (applies to USA and Canada)
With this coding vehicle speed is limited to 210 km/h. Contact 1 in the coding connector is connected to contact 4. Consequently, contact 38 of the Motronic control unit –J220 is connected to earth.

– If the correct coding is not displayed, test cable connection for coding connector ⇒ page 01–68.

Important !

Removing the coding connector alters the coding from 1 to 4 and thus cancels the vehicle speed limit. This modification is only permissible if tyres which are approved for a higher speed (in excess of 210 km/h) are fitted (see also Owner's Manual).

Testing cable connection of coding connector

The following test can only be performed if the correct coding is not displayed when interrogating the control unit version.

– Connect test box V.A.G 1598 with adapter cable 1598–5 to the wiring harness running to the Motronic control unit ⇒ page 01–78 (the connector at the control unit is not plugged in).

– Test the following wiring for short circuit to positive or to earth on the basis of the current flow diagram.

Contact at coding connector	V.A.G 1598 socket control unit	Connector for Motronic
1	38	38
2	39	39
3	12	12
4	30	30

– Rectify any short circuit.

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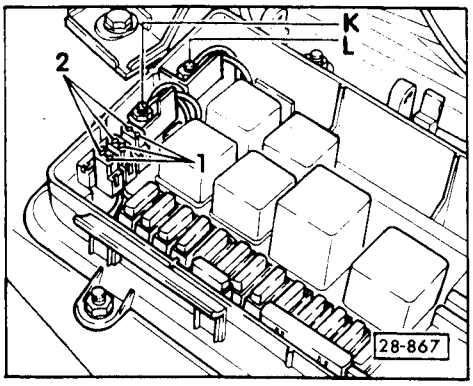


Testing cable connection of diagnostic sockets

- The diagnostic sockets and the cable junctions "K" and "L" are located in the electrical centre in the left of the plenum chamber.

Testing voltage supply for "black" diagnostic socket

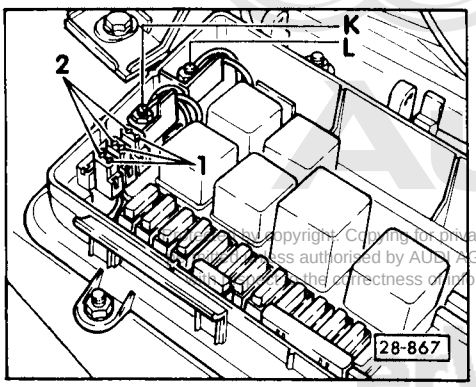
Contact 2 connected to earth
Contact 1 positive (terminal 30 protected by fuse 21)

Testing cable connection from "white" diagnostic connector to Motronic control unit

- Switch off ignition.
- Connect test box V.A.G 1598 with adapter cable 1598–5 only to the wiring harness of the Motronic control unit ⇒ page 01–78.

Notes:

- *The cable connection between the "white" diagnostic socket and the Motronic control unit runs via the cable junctions K and L in the electrical centre.*
  All other vehicle systems with "Rapid data transfer" self-diagnosis are connected via these two cable junctions ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations Binder.
- *Test cable connection for open circuit in wiring, short circuit to positive or negative.*



Diagnostic socket contact	Cable junction	V.A.G 1598 with V.A.G 1598 –5 socket
2	L	13
1	K	55

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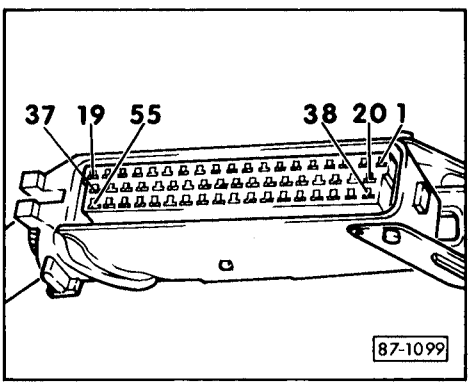


- Contact assignment at connector for control unit –J220 (the contact assignment is identical to the socket assignment of the test box V.A.G 1598).

Testing cable connection of "white" diagnostic socket for short circuit to positive or earth

Rapid data transfer Fault in communication build-up

or

Rapid data transfer L wire not switching to earth	HELP

or

Rapid data transfer L wire not switching to positive	HELP

or

Rapid data transfer K wire not switching to earth	HELP

or

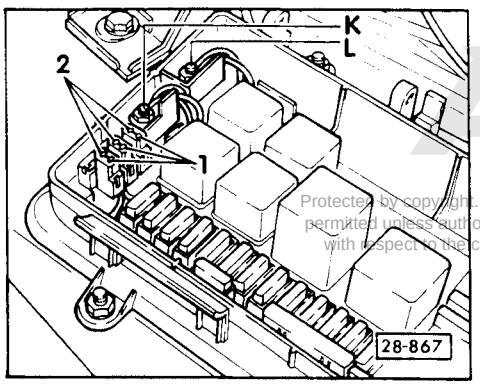
Rapid data transfer K wire not switching to positive	HELP

◄ Only if one of the following appears in the display of V.A.G 1551:

– Switch off ignition.

Notes:

- *The cable connection between the "white" diagnostic socket and the Motronic control unit –J220 runs via the cable junctions K and L in the electrical centre ⇒ Current flow diagram.*
- *For colour of cables and other vehicle systems connected to the "white" diagnostic socket ⇒ Current flow diagram, Electrical fault finding and Fititng locations binder.*
- *Other vehicle systems may be connected both to cable junctions K and L or only to cable junction K ⇒ Current flow diagram or Additional current flow diagrams.*



A – Only if cables of different cable colours are connected to the cable junctions

◄ – Determine colour of cables between "white" diagnostic socket and Motronic control unit on the basis of current flow diagram.

– Separate all the cable connections of the other vehicle systems with "Rapid data transfer" self-diagnosis one after the other from the cable junctions K and L.

– After each cable connection to a vehicle system has been separated, run engine at idling speed and once again enter address word "01 – Engine electronics" ⇒ page 01–5.

– If the control unit identification and coding then appear in the display, test cable connection to the control unit last separated on the basis of CFD. If no open circuit in the wiring, short circuit to positive or to earth is found, replace the control unit last separated and re-connect all the cables to the cable junctions K and L.

– If "Control unit does not answer" is displayed, there is an open circuit in the cable connection to the Motronic control unit.

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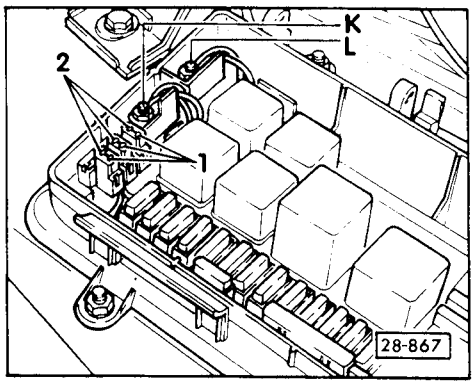


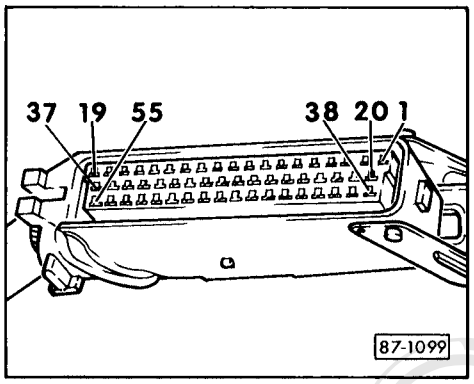
B – Only if several cables with the same cable colours are connected to the cable junctions

◄ – Separate all the cables from the cable junctions K and L.

– Connect test box V.A.G 1598 with adapter cable V.A.G 1598–5 ⇒ page 01–78.

– Use hand-held multimeter V.A.G 1526 and adapter cable set V.A.G 1594 to determine the cable connections to the Motronic control unit and re-connect to the cable junctions K and L.

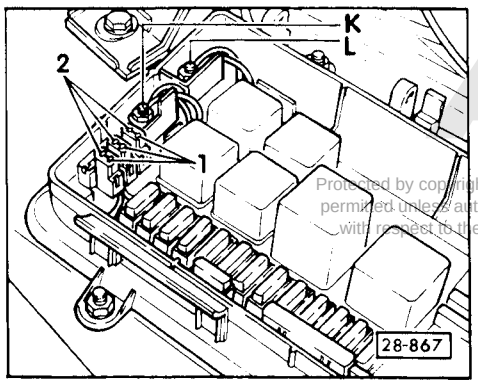
"White" diagnostic socket contact	Cable junction	V.A.G 1598 socket
2	L	13
1	K	55



◄ Contact assignment at the connector for Motronic control unit –J220 (the contact assignment is identical to the socket assignment of the test box V.A.G 1598).

– Run engine at idling speed and once again enter address word "01 – Engine electronics" ⇒ page 01–5.

– If the control unit identification and coding do **not** then again appear in the display, replace Motronic control unit and reconnect all the cables to the cable junctions K and L and repeat interrogation of fault memory.



– If the control unit identification and coding appear in the display, the fault is not at the Motronic control unit.

– Switch off ignition.

◄ – Determine one after the other all the cable connections between the control units and the cable junctions K and L, as described for the Motronic control unit, and connect one after the other to the cable junctions K and L on the basis of the current flow diagram or additional current flow diagram.

– After re-establishing each cable connection to the vehicle system, run engine at idling speed and once again enter address word "01 – Engine electronics" ⇒ page 01–5.

– If the control unit identification and coding are displayed, switch off ignition.

– Determine cable connection of the next control unit to the cable junctions K and L and re-create.

– If the control unit identification and coding are not displayed, replace the control unit last connected and re-establish all the cable connections.

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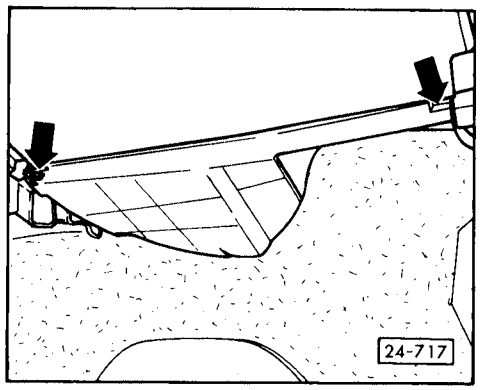
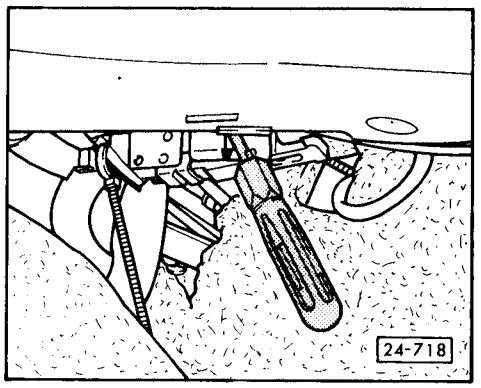


Removing and installing Motronic control unit

– Switch off ignition.

◄ – Remove cover below glove box.



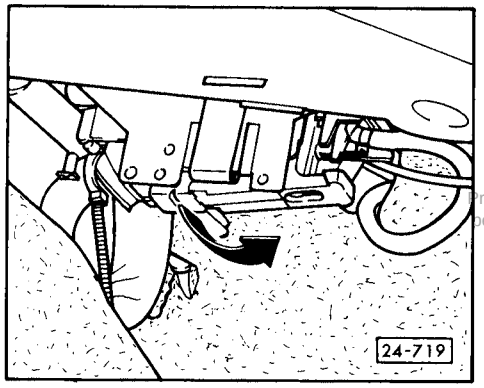
– Turn back carpet below the Motronic control unit.

◄ – Insert screwdriver next to the retaining clip between carrier plate of Motronic control unit and plastic shaft.

– Turn screwdriver slightly, if necessary, in order to release the catches on the carrier plate above the clip from the recess of the plastic shaft.

– Pull control unit down slightly and remove screwdriver.

– Pull control unit down 3 ... 4 cm. In this position the control unit locks in a second catch (service position).



◄ – Wait at least 30 seconds after switching off the ignition before releasing and unplugging connector from the Motronic control unit.
In this position the test box V.A.G 1598 can be connected with adapter cable V.A.G 1598–5 to the Motronic control unit or to the engine wiring harness for measurement and test purposes. The vacuum line remains connected.

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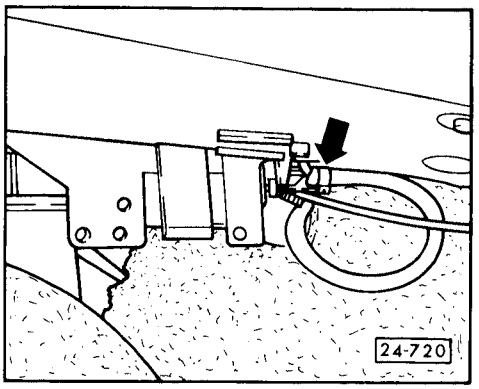
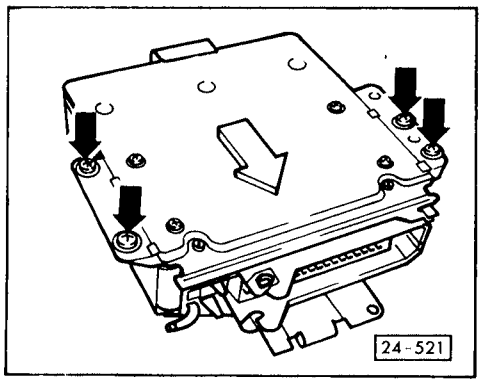
Note:

The further operations only require to be performed if the Motronic control unit has to be removed completely.



◄ – Remove hose clip at the pressure line and detach vacuum line.

– Release catch with screwdriver, as described on the previous page and carefully pull control unit down out of the shaft. On vehicles with air conditioner, the condensation water drain hose must be carefully pushed to the side when performing this step far enough to avoid the side flange of the control unit damaging the drain hose (detach hose, if necessary).



Note:

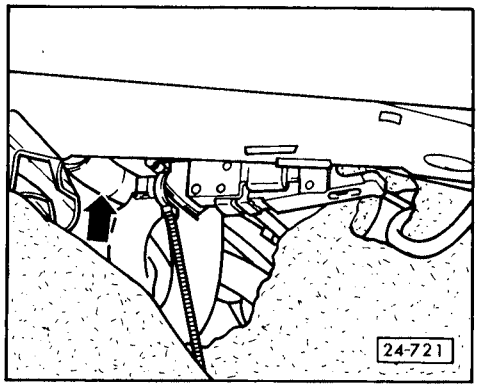
The vacuum line must not be damaged when removing the control unit.

◄ – Unscrew Motronic control unit from the carrier plate.

– The Motronic control unit is installed in the reverse order by analogy.

Note:

- *When installing, ensure the vacuum line is laid free of kinks.*
- *The vacuum line runs from the Motronic control unit to the moisture separator located on pillar A on the left and from the moisture separator on to the engine compartment.*



Important !

The connector on Motronic control unit must not be unplugged or plugged in unless the ignition is switched off.

Note:

◄ *Before installing the cover below the glove box, check whether condensation water hose on vehicles with air conditioner (arrow) is fitted on.*

Connecting test box V.A.G 1598

Notes:

- *The test box V.A.G 1598 must not be connected during the diagnosis with the fault reader V.A.G 1551.*
- *Wait at least 30 seconds after switching off the ignition before unplugging the connector from the Motronic control unit.*
- *Unplugging the connector from the Motronic control unit also separates the continuous positive power supply and thus erases the fault memory and the learning value memory.*

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– Switch off ignition.

– Remove Motronic control unit ⇒ page 01–75.

– Connect adapter cable V.A.G 1598–5 between Motronic control unit and engine wiring harness.

Reading measured value block with V.A.G 1551

Notes:

- *Perform Reading measured value block with engine running.*
- *In contrast to the basic setting, the solenoid valve for the activated charcoal filter is **not** permanently closed during reading measured value block.*
- *The readout of the values may either appear in the display group 00 as a block of ten or in the display groups 01 to 09 as a block of four.*
- *The physical dimension (e.g. rpm or °C) also appears together with the display as a block of four.*

Requirements:
- Engine temperature at least 85°C
- All electrical components switched off.
- Air conditioner switched off. Press and hold minus button in the control display unit of the air conditioner until all the readouts on the displays are cancelled.
- Move selector lever to position P or N.

– Interrogate and erase fault memory ⇒ page 01–5.

– Continue running engine at idling speed after interrogating fault memory and erasing fault memory.

Rapid data transfer HELP Select function XX

Readout in display:

Note:

A list of the possible functions is printed out after pressing the HELP key.

– Press keys 0 and 8.
(The function "Read measured value block" is selected with 08).

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Function is not known or cannot be carried out at the moment

◄ If the following appears in the display:

Notes:

- *Interrogate control unit version ⇒ page 01–86.*
- *Requirements on page 01–79 are not met.*

Rapid data transfer Q 08 – Read measured value block

◄ Readout in display:

– Confirm entry with the key Q.

Read measured value block HELP Enter display group number XX

◄ Readout in display:

Note:

The procedure for entering the display group number is printed out after pressing the HELP key.

List of display groups

Display group number	Readout in display field
00	Read measured value block → 1 2 3 4 5 6 7 8 9 10
01	1 = Engine speed 2 = Coolant temperature 3 = Lambda control 4 = Ignition angle
02	1 = Engine speed 2 = Injection time 3 = Vehicle voltage 4 = Altitude
03	1 = Engine speed 2 = Engine load 3 = Throttle valve angle 4 = Intake manifold temperature
04	1 = Engine speed 2 = Engine load 3 = Vehicle speed 4 = Switch positions
05	1 = Engine speed 2 = Idling speed stabilization characteristic curve zero point 3 = Idling speed stabilization duty cycle 4 = Switch positions

Display group number	Readout in display field
07	1 = Idling speed stabilization working range 2 = Idling speed stabilization characteristic curve zero point 3 = Idling speed stabilization characteristic curve control 4 = Idling speed stabilization load adaptation

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Notes:

- *Display groups 06, 08 and 09 do not contain any information of use for the Service Department.*
- *The display group should be selected depending on the type of fault which exists.*

– Select desired display group number according to the list of display groups and confirm with the key Q.

Display group number 00:

– Press key 0 twice.
("Read measured value block" is selected with 00).

Read measured value block Q Enter display group number 00

◄ Readout in display:

– Confirm entry with the key Q.

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

◄ Readout in display:

Notes:

- *Explanation of the individual displays in the display fields is identical to the basic setting function ⇒ page 01–50.*
- *If the printer is switched on, the current display is printed out on the log.*
- *Each time the **Print** key is pressed, the current display is again printed out.*
- *Press key C before selecting **further** display groups.*
- *After selecting another display group, the printer must once again be switched on.*

Display group numbers 01 to 09:

Notes:

- *The C key must be pressed each time to move forward to a different display group.*
- *If the → key is used for moving forward or if the C key is inadvertently pressed twice, the function "08 Read measured value block" must first of all be selected again.*
- *The explanation of the individual displays as well as the indication of the specifications is given in the respective test description in which the values for the test are used (Repair Group 24 and 28).*
- *The displays in the display groups 01 to 05 and 07 described are not all used in Repair Groups 24 and 28.*
- *The example only describes selecting display group 01. The other display groups should be selected in the same manner.*

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– Press keys 0 and 1.
(Function "Display group number 01" is selected with 01).

Read measured value block	Q
Enter display group number 01	

◄ Readout in display:

– Confirm entry with the key Q.

Read measured value block	1
1 2 3	4

◄ Display fields in the display:

Notes:

- *In the case of display group number 00,* ***only*** *"Read measured value block" appears in the display.*
- *In the case of display group numbers 01 to 09, the respective display group number* ***without*** *the 0 appears in the display together with "Read measured value block".*

Interrogating control unit version with V.A.G 1551

– Interrogate fault memory ⇒ page 01–5.

Rapid data transfer	HELP
Select function XX	

◄ Readout in display:

– Press keys 0 and 1.
(The function "Interrogate control unit version" is selected with 01).

Rapid data transfer	Q
01 – Interrogate control unit version	

◄ Readout in display:

– Confirm entry with the key Q.

8959077551A 2.21 R5 MOTR:
RHV HS D01
Coding 1

◄ Readout in display:

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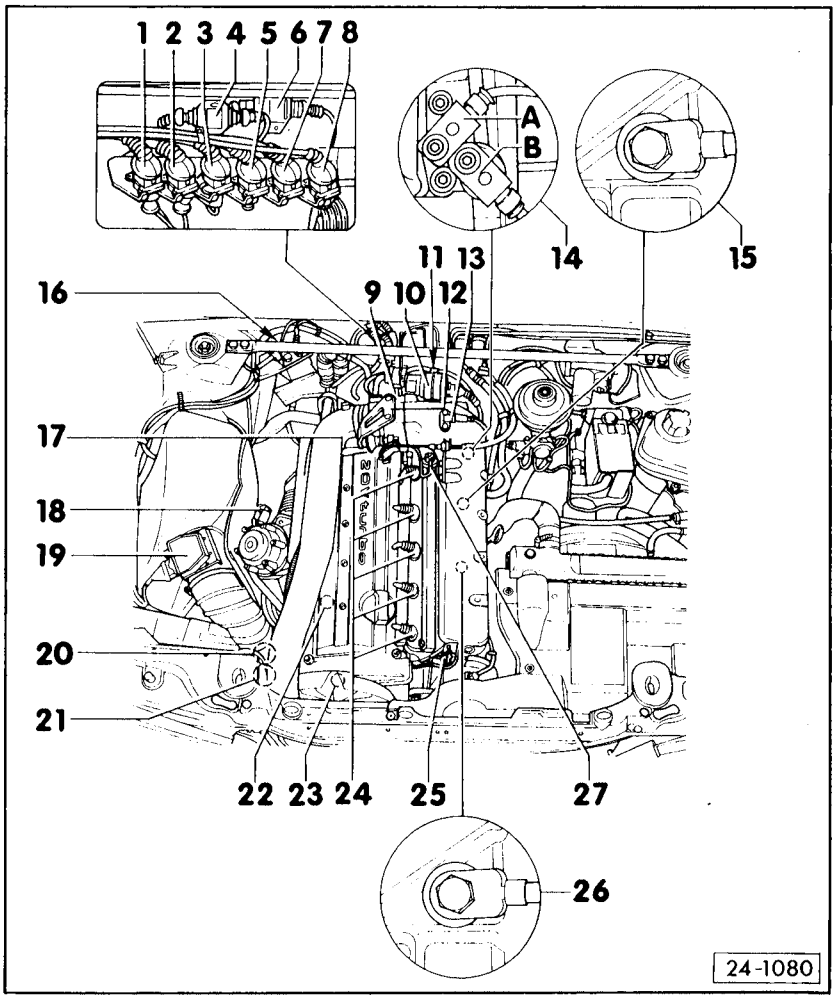
This display contains the following information:

- Control unit identification (895 907 551 A, for current control unit version ⇒ Part programme).
- Cubic capacity of engine (2.2 ltr.)
- Type of engine (in-line engine, 5-cylinders)
- Injection system (**MOTRONIC**)
- Ignition system version (distributorless ignition)
- Gearbox version (HS = manual gearbox or AT = automatic gearbox)
- Sofware version of control unit (D.., only for vehicle manufacturer)
- Coding ⇒ Coding variants of Motronic control unit, page 01–66.



Motronic components

1 – **Plug connection, cylinders 4 and 5 (N 163 and N 164)**
(white plug connection)

2 – **Plug connection, cylinders 1, 2 and 3 (N, N 128 and N 158)**
(white plug connection)

3 – **Plug connection for sender, knock sensor I front –G61**
(blue plug connection)

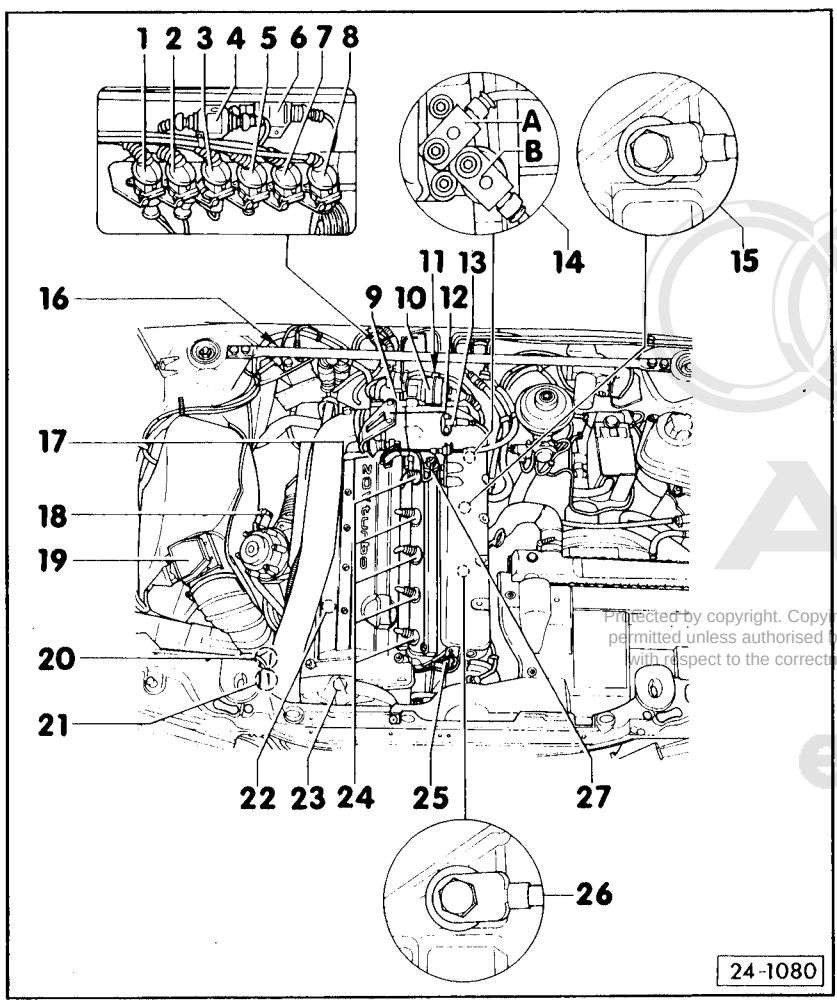
4 – **Power output stage I –N122**
(actuation for cylinders 1, 2 and 3)

5 – **Plug connection for sender, knock sensor II rear –G66**
(green plug connection)

6 – **Power output stage II –N127**
(actuation for cylinders 4 and 5)

7 – **Plug connection for engine speed sender –G28**
(grey plug connection)

8 – **Plug connection for ignition timing sender –G4**
(reference mark sender, black plug connection)



9 – **Throttle valve potentiometer –G69**
(with integral idling speed switch)

10 – **Idling speed stabilization valve –N71**
• Testing ⇒ page 24–28

11 – **Solenoid valve for activated charcoal filter –N80**
• Testing ⇒ page 24–37

12 – **Throttle valve body**

13 – **Intake air temperature sender –G42**
• Testing ⇒ page 28–18

14 – **A – Ignition timing sender –G4**
(reference mark sender, black plug connection)
• Testing ⇒ page 28–13

B – Engine speed sender –G28
(grey plug connection)
• Testing ⇒ page 28–15

15 – **Knock sensor II rear –G66**

16 – **Plug connection for lambda probe**
Lambda probe heater –Z19
(two-pin black plug connection)

Lambda probe –G39
(one-pin signal wire)

17 – **Coolant temperature sender –G62**
(at rear right of cylinder head)
• Testing ⇒ page 28–21

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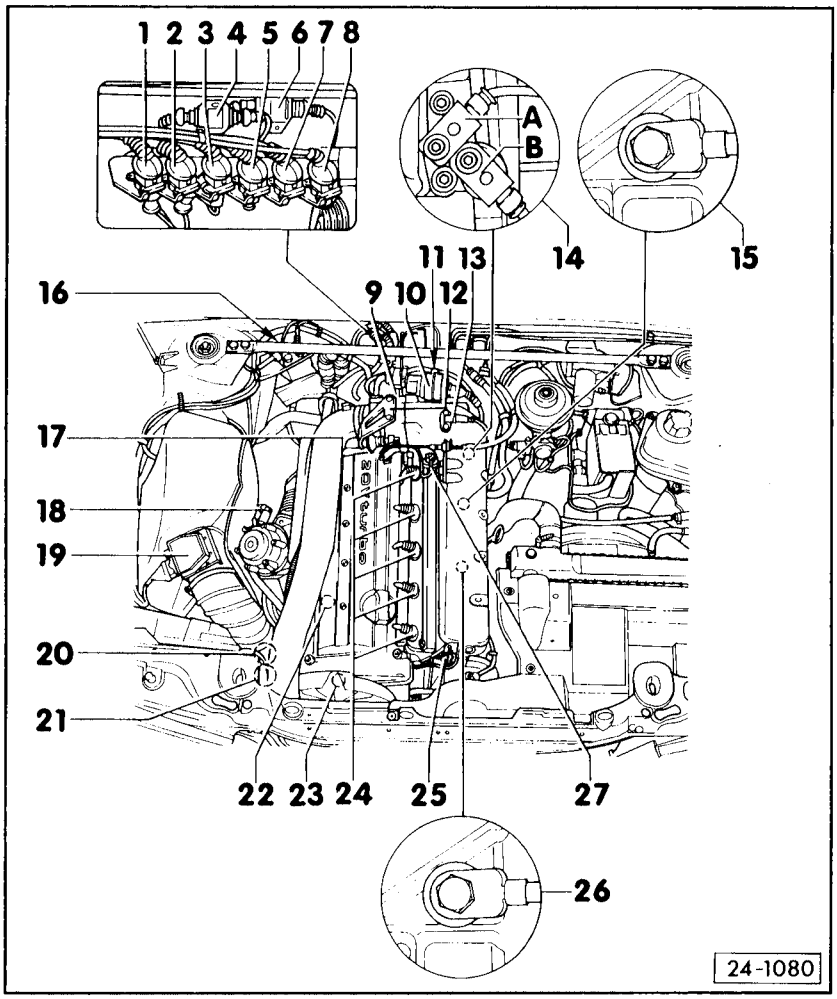

18 – **Lambda probe –G39**
- Testing ⇒ page 24–33

19 – **Air mass meter –G70**
- Testing ⇒ page 24–58

20 – **Overrun shut-off valve**
- Testing ⇒ Repair Group 21

21 – **Solenoid valve for boost pressure limiting –N75**
- Testing ⇒ page 24–41

22 – **Ignition coils –N, N128, N158, N163, N164**
- Testing ⇒ page 28–12

23 – **Hall sender –G40**
- Testing ⇒ page 28–27
- Basic setting ⇒ page 28–30

24 – **Injectors**
- Testing ⇒ page 24–19

25 – **Plug connection for Hall sender –G40**

26 – **Knock sensor I front –G61**

27 – **Fuel pressure regulator**
- Testing system and holding pressure ⇒ page 24–11

Technical data

System pressure (in bar gauge) with engine running (idling):	
without vacuum:	4.0 ... 4.2
with vacuum:	3.4 ... 3.7
Holding pressure 10 minutes (minimum pressure in bar)	
Engine cold:	3.5
Engine hot:	3.8
Injectors	
Quantity injected ml/30 s	150 ... 170
Idle speed test*	
Speed in rpm	800 ± 30
CO content % by vol.	0.70 ± 0.20

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* Pay attention to test requirements ⇒ page 24–26

Rules for cleanliness

Note:

Carefully observe the following "5 rules" for cleanliness when performing work on the fuel supply/fuel injection system.

1 – Thoroughly clean connection points and surrounding area before disconnecting.

2 – Place removed parts down on a clean surface and cover over. Use sheeting or paper. Do not use fluffing cloth!

3 – Carefully cover over or seal opened components if repairs are not performed immediately.

4 – Install only clean parts.
- Do not remove replacement parts from their wrapping until just before installing.
- Do not use parts which have been stored unwrapped (e.g. in tool boxes etc.).

5 – When the system is open:
- Avoid working with compressed air if possible.
- Avoid moving vehicle if possible.

Safety precautions

Pay attention to the following points when performing work on vehicles with Motronic system to avoid injuries to persons and/or damage to the Motronic control unit:

Notes:

- *Before disconnecting the battery, determine the coding of radios equipped with anti-theft coding.*
- *Do not disconnect or connect the battery unless the ignition is **switched off** otherwise the Motronic control unit may be damaged.*
- *Wait at least 30 seconds after switching off the ignition before unplugging the connector from the Motronic control unit otherwise the Motronic control unit may be damaged.*
- *Do not disconnect cables of the ignition system unless the ignition is switched off.*
- *Do not connect or disconnect cables of test equipment unless the ignition is switched off.*

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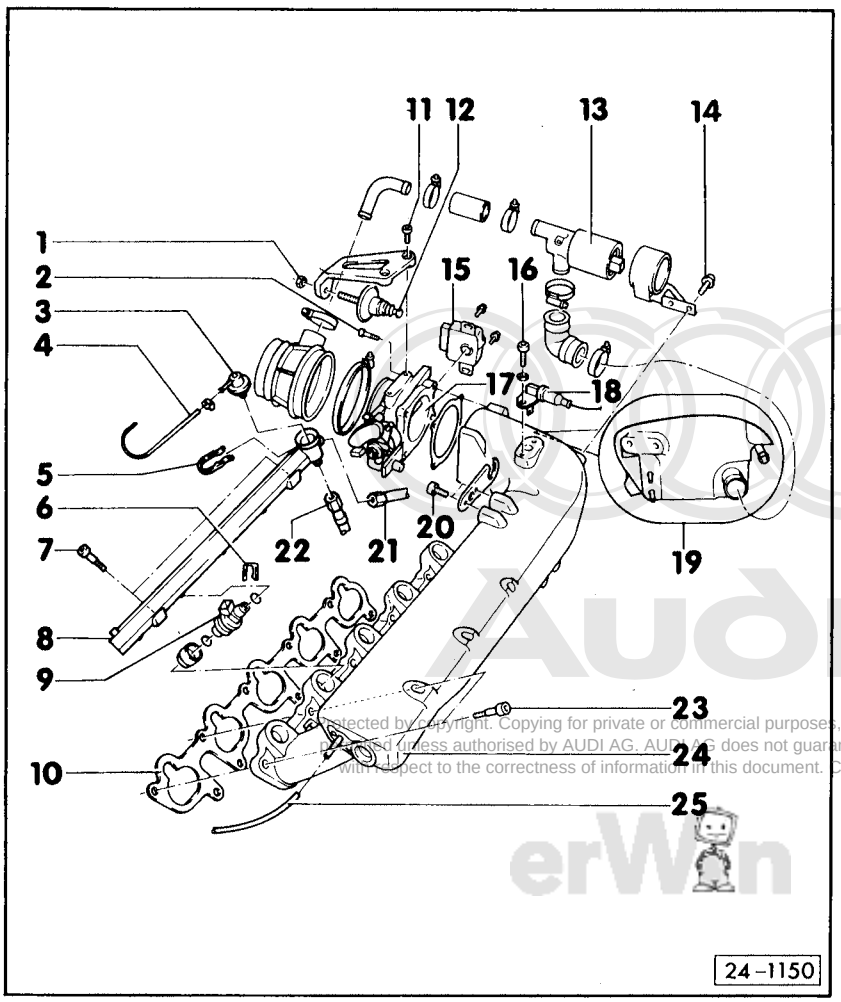
- To operate the engine at starting speed (e.g. for testing compression pressure, testing Motronic system), unplug the three-pin connectors from the power output stages of the ignition coil and also the connectors of all five injectors.
- Do not disconnect the battery when the engine is running.
- Do not apply voltage to the control unit for simulating output signals.
- Do not operate starter when the injectors are removed.



Servicing Motronic injection system

Notes:

- *Before performing repair work on the injection system, interrogate fault memory and perform final control diagnosis.*
- *Always fit new seals and gaskets.*
- *Interrogating fault memory ⇒ Repair Group 01.*
- *Final control diagnosis ⇒ Repair Group 01.*

1 – 10 Nm

2 – 10 Nm

3 – Fuel pressure regulator

4 – Control pressure line from intake manifold (connection item 19)

5 – Securing clip for fuel pressure regulator

6 – Securing clip for injectors

7 – 10 Nm

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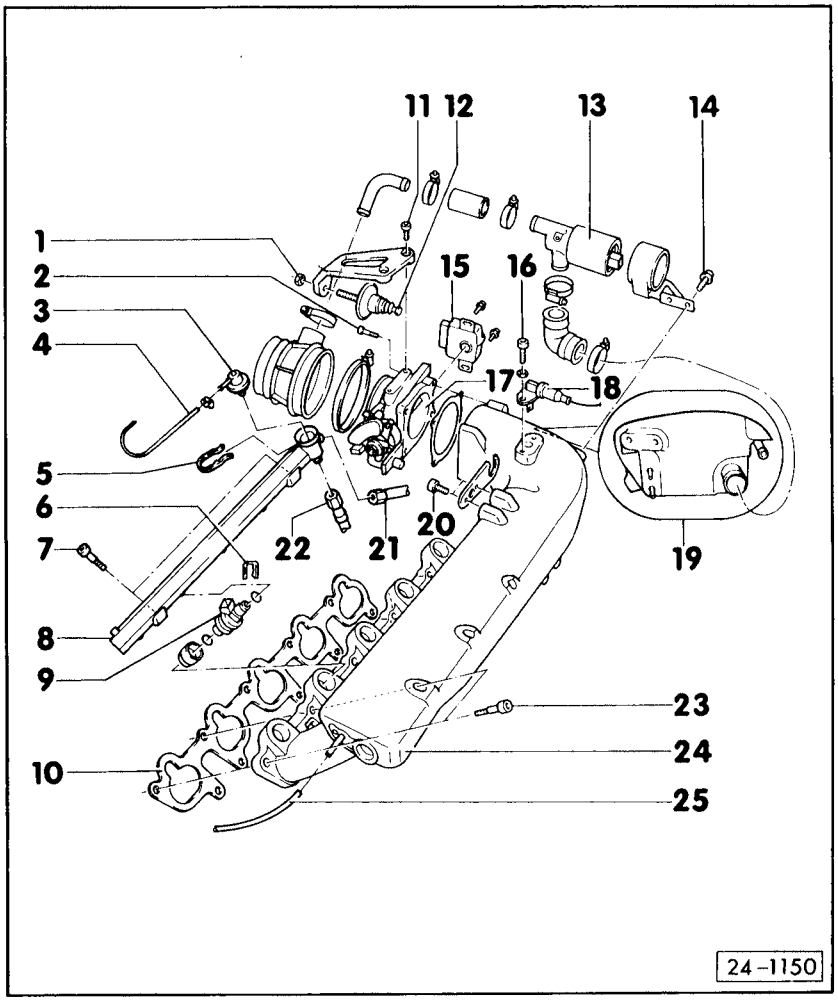


8 – **Fuel manifold**

9 – **Injector**
- When removing, replace bottom and top O-ring of injector

10 – **Gasket**

11 – **10 Nm**

12 – **Closing damper**
- Checking and adjusting ⇒ Repair Group 20

13 – **Idling speed stabilization valve –N71**
- Testing ⇒ page 24–28

14 – **10 Nm**

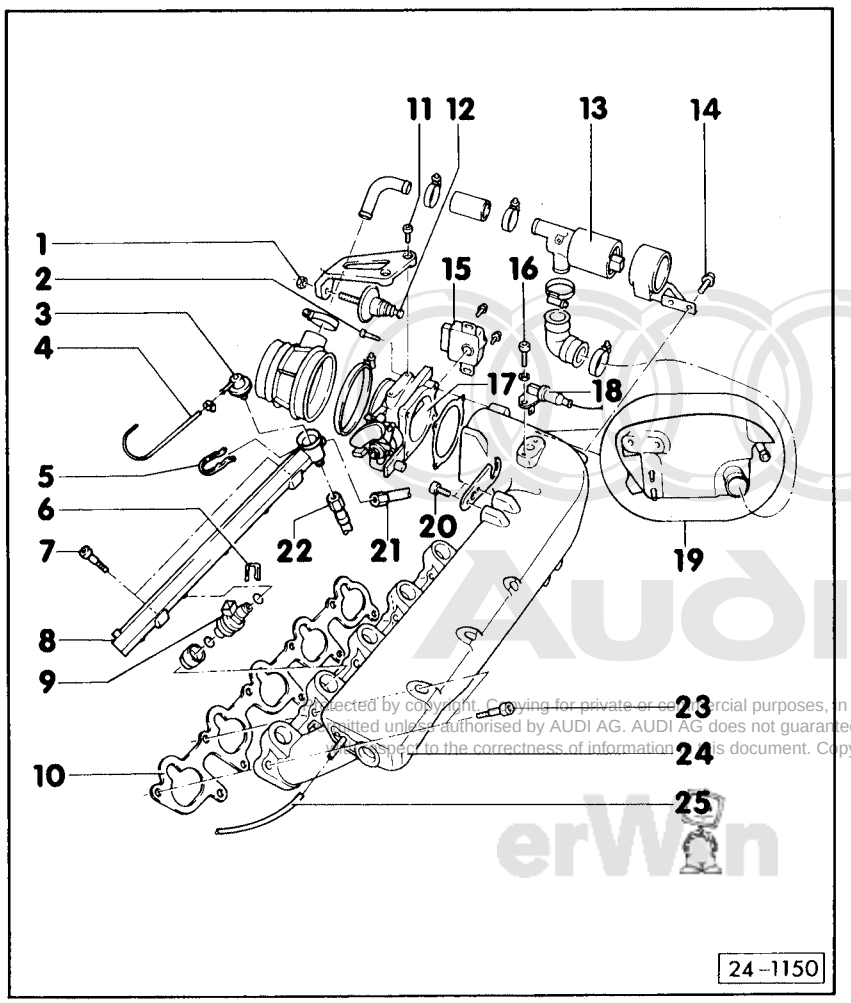
15 – **Throttle valve potentiometer –G69** (idling switch integrated)
- Testing ⇒ page 24–53

16 – **10 Nm**

17 – **Throttle valve body**

18 – **Intake air temperature sender –G42**
- Testing ⇒ page 28–18

19 – **Pressure connections**
- Page 24–81



21 – **Fuel feed pipe**

22 – **Fuel return pipe (25 Nm)**

23 – **25 Nm**

24 – **Intake manifold**

25 – **Vacuum connection for overrun shut-off valve**

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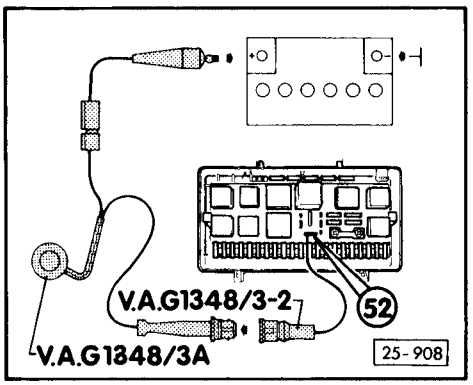


Testing system pressure and holding pressure

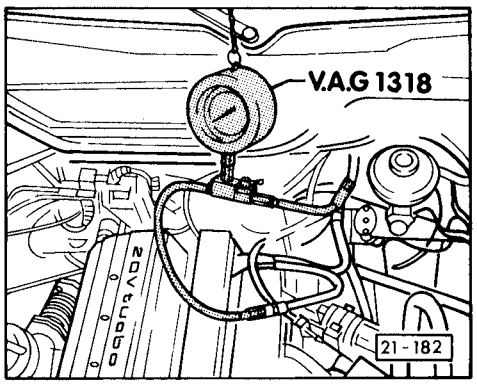
Test requirements:

- Fuse 13 in relay plate intact with fuse holder
- Fuel filter in proper condition
- Battery fully charged (min. 12 V)

Testing system pressure

– Remove fuel pump relay from the relay plate (relay position 10).

◄ – Connect remote control V.A.G 1348/3A with adapter cable V.A.G 1348/3–2 to contact 52 and to battery positive.



– Detach vacuum line from fuel pressure regulator.

◄ – Install pressure measuring device V.A.G1318 with adapters 1318/11, 1318/13 and 1318/15 into the fuel feed pipe, as shown in the illustration, and move lever at pressure measuring decive to "open" position – feed pipe ⇒ page 24–10.

Note:

If fuel flows out at the vacuum connection of pressure regulator during the subsequent pressure test, replace pressure regulator.

– Briefly operate remote control – fuel pump must run.

– If the fuel pump does not run, test fuel pump ⇒ Repair Group 20.

– Continue operating remote control until the pressure no longer builds up.

Specifications:
4.0 ... 4.2 bar with pump running
3.5 ... 3.7 bar immediately after switching off fuel pump

Note:

If no fuel pressure is built up, check whether the fuel feed and return pipes have been wrongly connected.

– If the specification is not achieved, test fuel pump (Repair Group 20) and check fuel feed pipe for leaks or damage (e.g. crimping points in area of vehicle floor), replace if necessary.

– If the specification is again not achieved, replace pressure regulator and repeat pressure test.

– If the specification is exceeded, check return pipe for damage (e.g. crimping points in area of vehicle floor) and check flow, replace if necessary.

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Note:

Excessive fuel pressure may cause the diaphragm of the pressure regulator to tear, allowing fuel to pass along the vacuum line into the engine (risk of explosion).

– Remove remote control and re-insert fuel pump relay into relay position 10.

Note:

During the subsequent test, the engine must not run unnecessarily long with the vacuum hose detached as the fuel/air mixture will be enriched as a result of the higher fuel pressure, which may cause the lambda control limits to be exceeded and a fault to be stored.

– Run engine at idling speed.

– Switch off all electrical components (air conditioner etc.).

– Fit intake manifold pressure connection onto pressure regulator and observe pressure drop at pressure gauge.

– When the vacuum hose is fitted on, the fuel pressure must drop by about 0.5 bar. If this pressure change does not occur, perform the following checks:
  • Check vacuum hose for signs of leaks (split, damage).
  • Check whether vacuum connection at intake manifold is blocked; to do this detach hose at pressure regulator and blow into hose.

– If no leak exists and the vacuum connection is not blocked, replace pressure regulator.

Testing holding pressure

– Holding pressure 10 minutes after switching off engine (minimum pressure)

cold engine:3.5 bar
hot engine: 3.8 bar

Note:

The pressure rise when the engine is hot is normal as a result of the expansion of the fuel.

– If the holding pressure is not reached, perform the following checks:
  • Check connections of pressure measuring device for leaks.
  • Check fuel pipes for leaks.
  • Check non-return valve in electric fuel pump (⇒ Repair Group 20).
  • Check injectors for leaks ⇒ page 24–23.

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– If no leaks exist and if the non-return valve in the electric fuel pump is operating properly, replace pressure regulator and repeat holding pressure test.

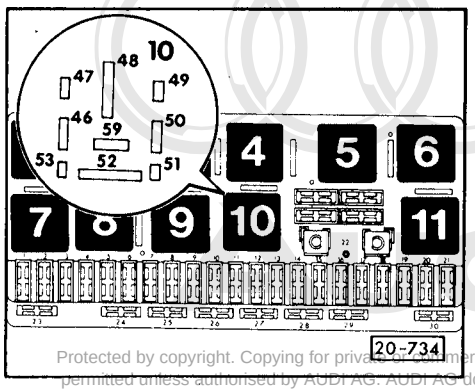
– After testing system and holding pressure, interrogate fault memory and erase ⇒ Repair Group 01.

Testing fuel pump relay and actuation

Testing fuel pump relay –J17

- Remove fuses 13, 24, 25 and 28. Connect diode test lamp V.A.G 1527 between earth and rear contact for fuse 13.
- Briefly operate starter.
- Specification: Fuel pump relay must pick up, diode test lamp must light up.
- If the fuel pump relay does not pick up (can be felt and heard), test actuation ⇒ page 24–17.
- If the diode test lamp does not light up, test cable connection ⇒ page 24–16.
- Connect diode test lamp to earth and **one after the other** between the left contacts of the fuses 24, 25 and 28.
- Briefly operate starter.
- Specification: Diode test lamp must light up.
- If the diode test lamp does not light up or if it lights up as soon as the ignition is switched on, connect diode test lamp to the right-hand contact of the respective fuse and repeat test.

- Specification: Diode test lamp must light up.
- If the diode test lamp again does not light up, test cable connection ⇒ below.
- If the diode test lamp lights up, re-insert fuses 13, 24, 25 and 28.



B – Testing cable connections

- Ignition switched off.
- Remove fuel pump relay –J17 from the relay plate, relay position 10.
- Test cable connections between fuse 13 and contact 52, fuse 25 and contact 52, fuse 24 and contact 59 and also between fuse 28 and contact 59 of the relay position 10 for open circuit with digital multimeter V.A.G 1526.

Specification: max. 0.5 ohms

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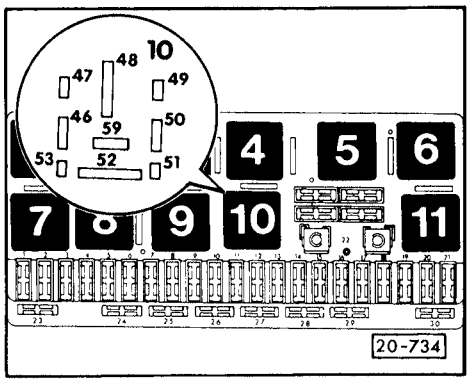
- If the specification is not achieved, rectify open circuit in wiring on basis of current flow diagram.
- If no open circuit in the wiring is found, test actuation of fuel pump relay ⇒ next page.
- If actuation is in order, replace fuel pump relay.



C – Testing actuation of fuel pump relay

◄ – Remove fuel pump relay –J17 from the relay plate, relay position 10.

– Switch on ignition.

◄ – Connect hand-held multimeter V.A.G 1526 with auxiliary cables from V.A.G 1594 one after the other between contacts 46 and 50 and also 48 and 50 of the relay base.

– Specification: approx. 12 volts.

– If the specifications are not achieved, rectify open circuit in wiring on basis of current flow diagram.

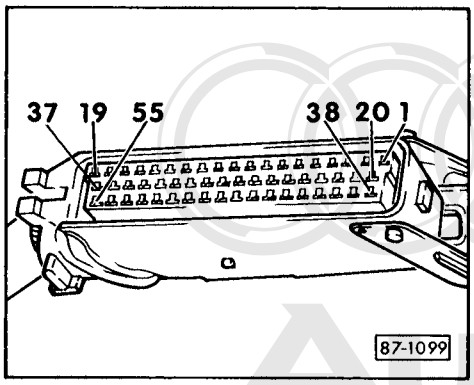
– Connect diode test lamp V.A.G 1527 to contacts 46 and 47.

– When the ignition is switched on, the diode test lamp must light up weakly and become brighter when the starter is operated.

– If the diode test lamp lights up weakly when the ignition is switched on but does not become brighter when the starter is operated, replace Motronic control unit.

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

Connect test box V.A.G 1598 with adapter cable 1598/5 **only** to the wiring harness to the Motronic control unit ⇒ page 01–77.



◄ – Test cable from contact 47 at relay position 10 to socket 3 of the test box for open circuit.

– Specification: max. 1.0 Ω

– If the specification is not achieved, rectify open circuit between contact 47 at relay base and contact 3 of the connector at the control unit on the basis of the CFD.

– If no open circuit exists and the diode test lamp does not light up, replace control unit.

– Re-insert fuses 13, 24, 25 and 28 as the case may be.

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Testing injectors

- Perform final control diagnosis ⇒ Repair Group 01.

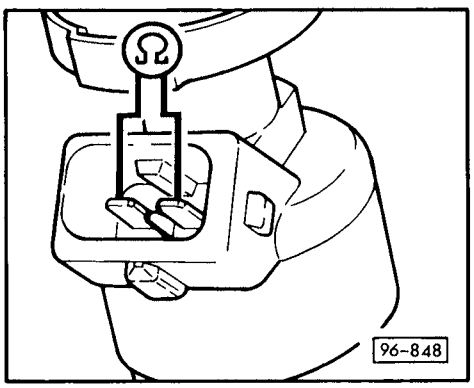
- If none of the injectors clicks, test actuation of injectors.

- If one or several injectors do not click, first of all perform electrical test of injectors ⇒ below.
  If the injectors are electrically in order, connect replacement injector as a test and repeat final control diagnosis. If this injector does not click, replace faulty injector.

Note:

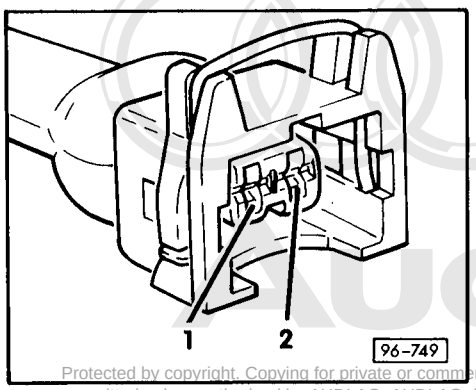
Only a genuine injector for 5-cylinder Motronic system may be used for this test.

- If the injectors do not click although they are in order, test actuation of the injectors.



Performing electrical test of injectors

- Unplug connector at the injector to be tested.
- Connect hand-held multimeter V.A.G 1526 to the particular injector.
- Specification: 15 ... 17 Ω
- If the specification is not achieved, replace appropriate injector.



Testing actuation of injectors

- Unplug connector at the injector to be tested.
- Remove fuse 28, test fuse 27.
- Connect diode test lamp V.A.G 1527 to contact 2 of the connector and to engine earth.
- Switch on ignition, diode test lamp must light up.
- If the diode test lamp does not light up, connect test box V.A.G 1598 with adapter cable 1598/5 to the Motronic control unit (⇒ Repair Group 01).

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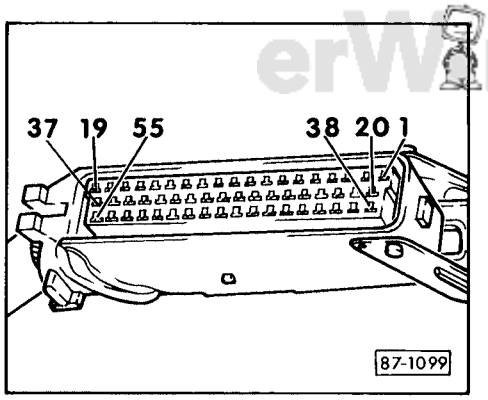
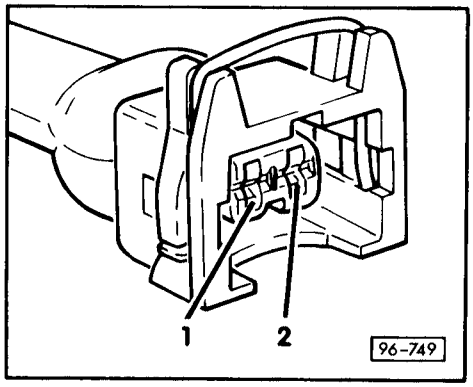


- Connect diode test lamp V.A.G 1527 to earth (socket 19) and to socket 37 of the test box.
- Switch on ignition, diode test lamp must light up.
- If the diode test lamp does not light up, determine open circuit between contact 37 of the connector at the Motronic control unit and contact 2 of the connector at the respective injector on the basis of the current flow diagram, and rectify.
- If the diode test lamp does not light up, replace Motronic control unit.

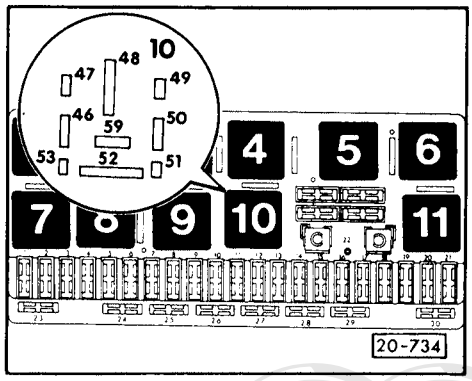


– Insert fuse 28.

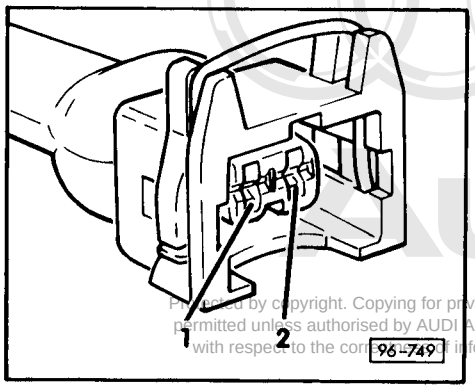
– Connect diode test lamp V.A.G 1527 to contact 2 of the connector at the injector and to engine earth.

– Switch on ignition and operate starter for a few seconds.

– The diode test lamp must light up when the ignition is switched on and during starting.



– If the diode test lamp goes out when the starter is operated, perform the following tests:
- Test fuse 28.
- Test cable from contact 1 of the respective connector at the injector to fuse 28 for open circuit with ohmmeter on the basis of the CFD.
- Test cable from fuse 28 to the fuel pump relay –J17 (relay position 10), contact 59 for open circuit on the basis of the CFD.
- Test fuel pump relay and, if necessary, actuation of fuel pump relay ⇒ page 24–15.



– Connect diode test lamp V.A.G 1527 to contacts 1 and 2 of the connector at the injector being tested.

– Initiate final control diagnosis (⇒ Repair Group 01). When the injector being tested is actuated, the diode test lamp must briefly flash (max. 5 times).

– If the diode test lamp does not light up or shows a steady light, connect test box V.A.G 1598 with adapter cable V.A.G 1598/5 to the wiring harness to the Motronic control unit ⇒ Repair Group 01 (the connector at the control unit is **not** plugged in).

– Test the following cables for open circuit or short to earth with ohmmeter on the basis of the CFD:

Injector cylinder	Between contacts at injector	and socket of test box
1	2	36
2	2	17
3	2	34
4	2	35
5	2	16

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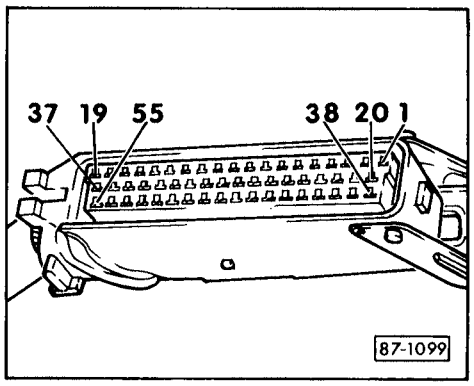


- Rectify any open circuit between the respective contact of the connector at the Motronic control unit and contact 2 of the connector at the respective injector.

- Rectify any short to earth.

- If neither an open circuit nor a short to earth exists, replace Motronic control unit.

Testing quantity of fuel injected and leaktightness of injectors

Test requirement:
- System pressure in order.

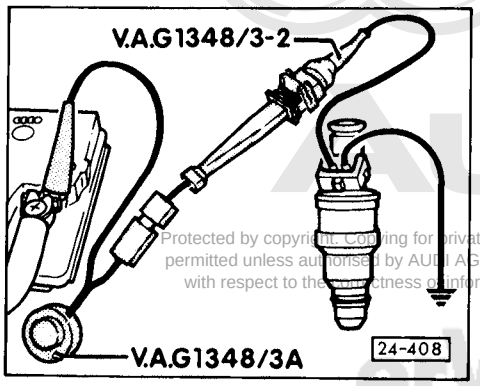
- Detach pressure line from fuel pressure regulator.

- Unplug connectors from the injectors.

- Unscrew fuel manifold and pull up and out complete together with the injectors.

Note:

When installing, ensure that the O-rings on the injectors are not damaged. Replace O-rings and moisten lightly with clean engine oil.



- Connect one contact of the injector being tested to engine earth with test cables and crocodile clamp from V.A.G 1594.

- Connect second contact of the injector to positive with remove control V.A.G 1348/3 A, adapter cable V.A.G 1348/3–2 and auxiliary cable.

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- Connect test box V.A.G 1598 with adapter cable 1598/5 to the Motronic control unit ⇒ Repair Group 01.

- Switch on ignition.

- Connect socket 3 and socket 10 of the test box with test cable and removable fuse (8 A) (this activates the electric fuel pump).

- Check injectors for leaks (visual inspection). When fuel pump is running, only 1 to 2 drops per minute must flow out of each injector.

  If the fuel loss is greater:

- Switch off ignition and replace leaking injector.

– Switch on ignition.

– Insert injector being tested into a measuring glass from tester for injected quantity V.A.G 1602.

– Operate remote control V.A.G 1348/3 A for 30 seconds.

– After all five injectors have been operated, switch off ignition and place measuring glasses on a flat surface.

  Specification: 150 ... 170 ml

  If the quantity measured for one or several injectors is less or more than the specification:

– Replace faulty injector.

Note:

After removing the injectors, always replace the top and bottom O-rings.

Testing idling speed and CO content

Testing idling speed

Note:

The idling speed cannot be adjusted.

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Test requirements:

- Interrogate fault memory (Repair Group 01).
- Engine warm, engine temperature at least 85°C.
- Throttle valve in idle position.
- All electrical components switched off.
- Air conditioner switched off.
- Pressure measuring device not connected.

Note:

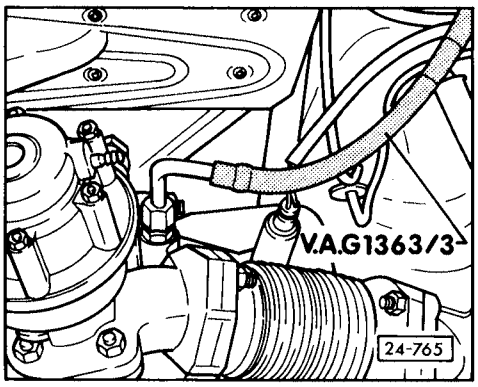
The radiator fan must not cut in during the test.

– Run engine at idling speed.

– Basic setting of engine, select display group 01 ⇒ Repair Group 01.

– The reading in display field 1 must be between 770 and 830 rpm.

– If the specification is not achieved, perform the following tests, as described in Repair Group 01:
  - Once again interrogate fault memory.
  - Perform final control diagnosis.
  - Check possible causes of fault according to test table for basic setting of engine and rectify as necessary.



Testing CO content

Note:
The CO content cannot be adjusted.

Test requirements:
- Engine warm, oil temperature at least 85°C.
- Throttle valve in idle position.
- All electrical components switched off.
- Air conditioner switched off.
- Pressure measuring device not connected.
- Crankcase ventilation remains fitted on.
- Interrogate fault memory (Repair Group 01).

◄ – Connect CO tester V.A.G 1363 with hose adapter V.A.G 1363/3 to the CO sampling pipe next to the lambda probe according to the operating instructions.

– Run engine at idling speed.

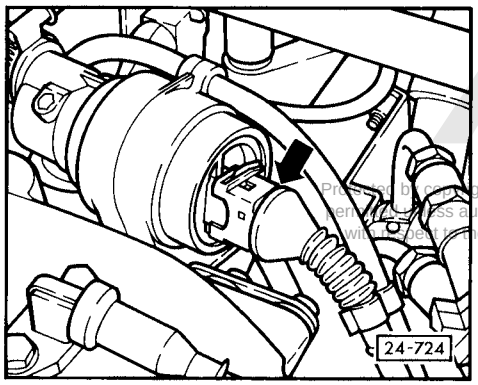
– Specification: 0.5 ... 0.9 % by vol.

– If the specification is not achieved, check whether all spark plugs are operating properly.

Note:

Failure of a spark plug causes a sharp rise in the CO content.

– If the specification is not achieved, perform the following test ⇒ Repair Group 01:
- Once again interrogate fault memory.
- Perform final control diagnosis.
- Check basic setting values (display group 01, display field 3).



Testing idling speed stabilization

Performing electrical test of idling speed stabilization valve –N71

◄ – Unplug connector from the idling speed stabilization valve.

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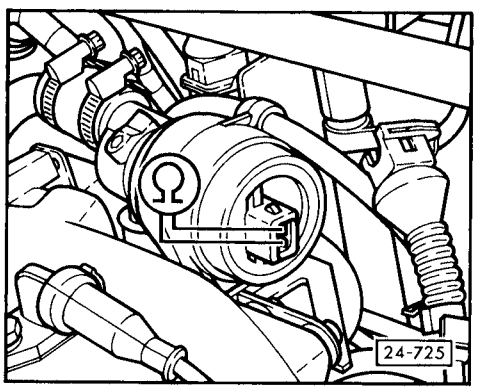


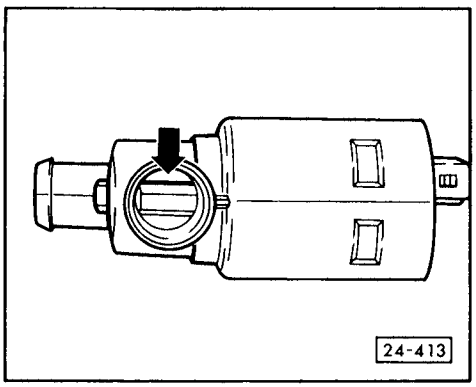
◄ – Connect hand-held multimeter V.A.G 1526 with auxiliary cables from V.A.G 1594 for resistance measurement to the idling stabilization valve.

Specification: 7 ... 11 Ω

– If the specification is not achieved, replace valve

Note:

At room temperature the resistance is in the lower tolerance range, when engine is at normal operating temperature it is in the upper tolerance range.



Performing mechanical test of idling speed stabilization valve

– Remove idling speed stabilization valve.

◄ – Check rotary slide for signs of rubbing (visual check).

Note:

Do not attempt to move rotary slide with screwdriver or other tools in order to check its ease of movement.

– Plug in connector at removed valve.

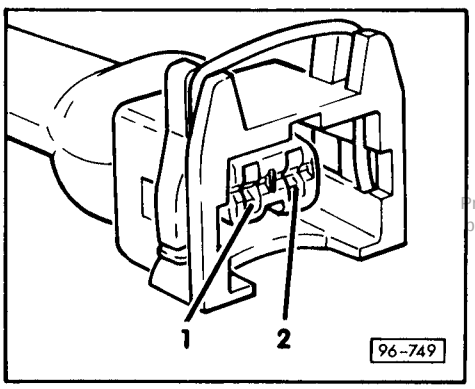
– Initiate final control diagnosis (Repair Group 01) and actuate idling speed stabilization valve.

– Check whether the rotary slide runs properly from stop to stpop.

– If signs of rubbing are present which impair ease of movement or if the rotary slide does not operate freely (sticks, runs sluggishly or does not reach the stops), replace valve.

Testing actuation of idling speed stabilization valve

– Unplug connector from the idling speed stabilization valve.



◄ – Connect diode test lamp V.A.G 1527 with test cable from adapter cable set V.A.G 1594 to contact 1 of the connector and to engine earth.

– Operate starter for a few seconds; the diode test lamp must light up when this is done. If the diode test lamp does not light up, perform the following tests:

- Test fuses –S24 and –S28.
- Test cable from contact 1 of connector at idling speed stabilization valve to fuse –S24 for open circuit on the basis of the CFD.
  Specification max. 0.5 Ω.

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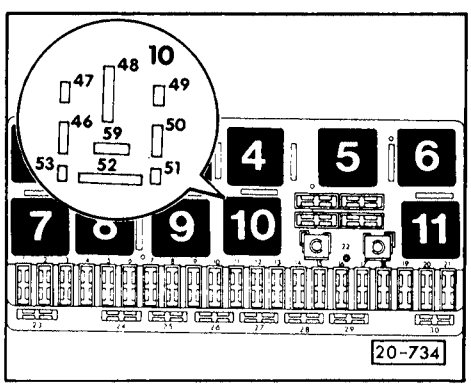


◄ - Test cable from fuse –S24 to the fuel pump relay –J17 (relay position 10), contact 59, for open circuit on the basis of the CFD.
  Specification max. 0.5 Ω.
- Test actuation of the fuel pump relay ⇒ page 24–15.

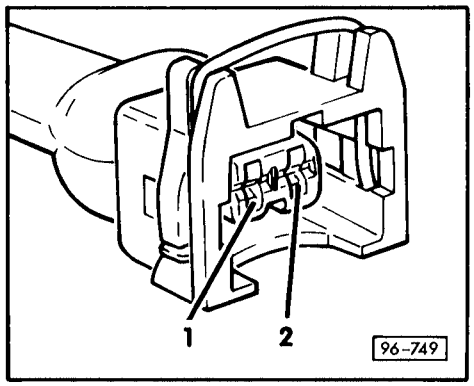
– Reconnect diode test lamp to the connector as described above.

– Initiate final control diagnosis (Repair Group 01).

– Diode test lamp must light up.

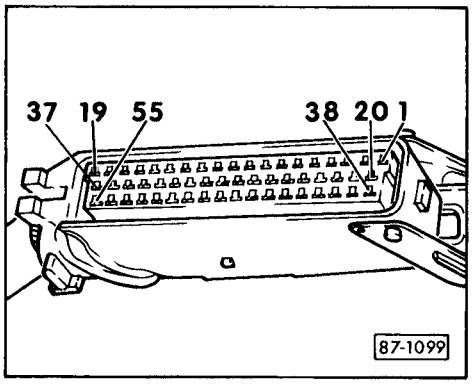
Note:

Irrespective of which actuator is selected, positive must exist at contact 1 of the connector.



– If the diode test lamp does not light up, connect test box V.A.G 1598 with adapter cable 1598/5 **only** to the wiring harness to the Motronic control unit ⇒ Repair Group 01.

◄ – Test cable from contact 1 of the connector of the idling speed stabilization valve to socket 37 of the test box for open circuit on the basis of CFD ...

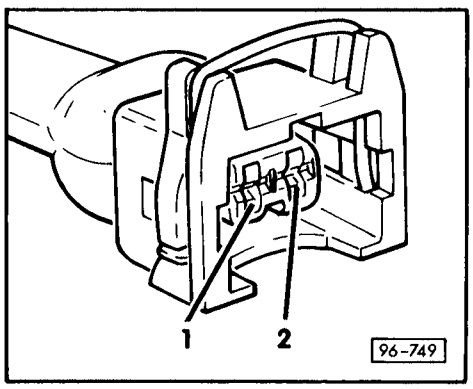


◄ – ... and rectify any open circuit between contact 37 of the connector at the control unit and contact 1 of the connector at the idling speed stabilization valve.

– If no open circuit exists, replace control unit.

– Remove test box V.A.G 1598 and adapter cable V.A.G 1598/5.

– Connect Motronic control unit to vehicle wiring harness.



◄ – Connect diode test lamp V.A.G 1527 with test cable to contacts 1 and 2 of the connector of the idling speed stabilization valve.

– Initiate final control diagnosis (Repair Group 01). When the idling speed stabilization valve is operated, the diode test lamp must flash (diode test lamps with very low current consumption become only slightly brighter and darker, but do not go out).

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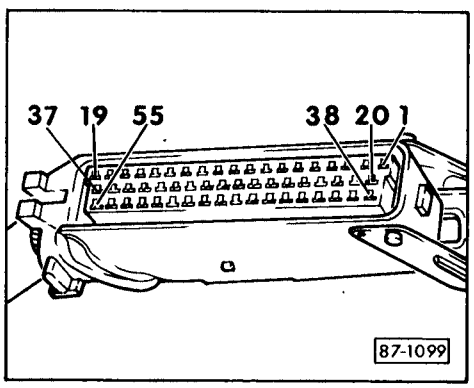
– If the diode test lamp does not flash or if it shows a steady light, connect test box V.A.G 1598 with adapter cable V.A.G 1598/5 **only** to the wiring harness to the Motronic control unit ⇒ Repair Group 01.

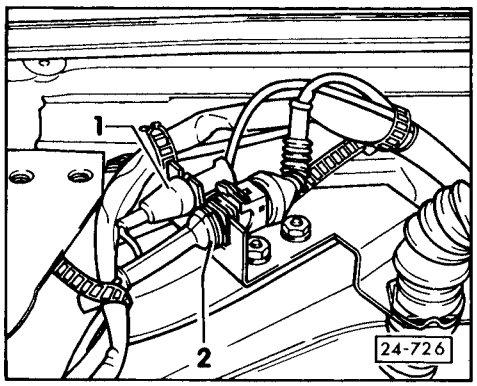


– If the diode test lamp shows a steady light, test cable from contact 2 of connector at the idling speed stabilization valve to socket 4 of the test box for short to earth.

– If the diode test lamp does not flash, test cable from contact 2 of the connector at the idling speed stabilization valve to socket 4 of the test box for open circuit.

◄ – Rectify any short to earth or open circuit between contact 2 of the connector at the idling speed stabilization valve and contact 4 of the connector at the Motronic control unit.

– If there is neither an open circuit nor a short to earth in the cable, replace control unit.

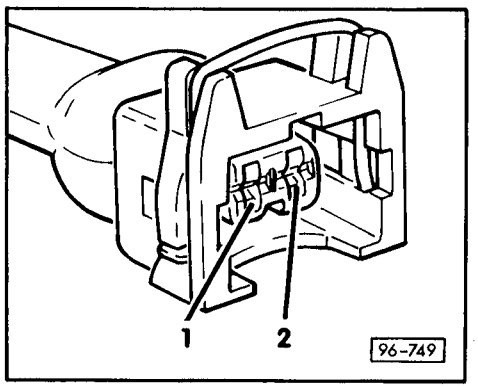


Testing lambda probe –G39 and lambda control

Testing lambda probe heater –Z19

The plug connection for the heater of the lambda probe is located in the rear of the engine compartment ⇒ also page 24–1, item 2.

◄ – Separate plug connection (2).

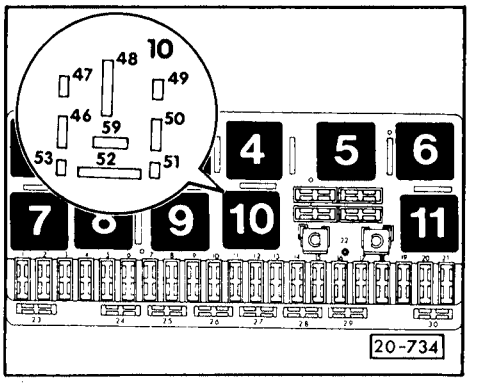


◄ – Connect hand-held multimeter V.A.G 1526 with auxiliary cables from V.A.G 1594 for voltage measurement between contacts 1 and 2 of the connector.

– Run engine.

– Specification: approx. 12 ... 14 volts.

– If the specification is not achieved, perform the following steps marked with a dot:
- Test fuse 25.
- Test cable from contact 2 to fuse 25 for open circuit on the basis of the CFD.
  Specification max. 0.5 Ω (check pin assignment if necessary).
- Test cable from contact 1 to engine earth for open circuit.
  Specification max. 0.5 Ω.



◄ • Test cable from fuse 25 to fuel pump relay –J17 (replay position 10), contact 52, for open circuit on the basis of the CFD.
Specification max. 0.5 Ω.

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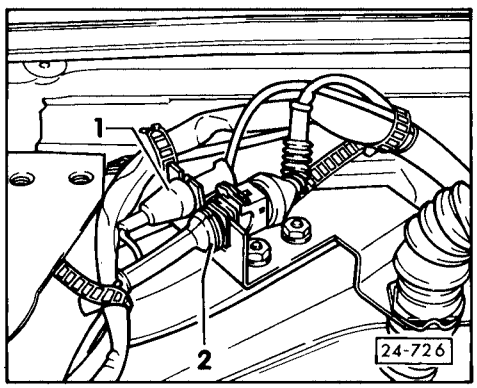
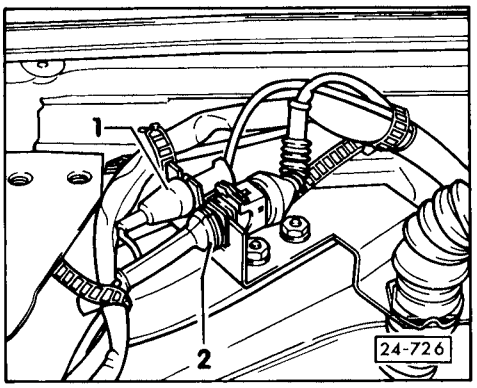


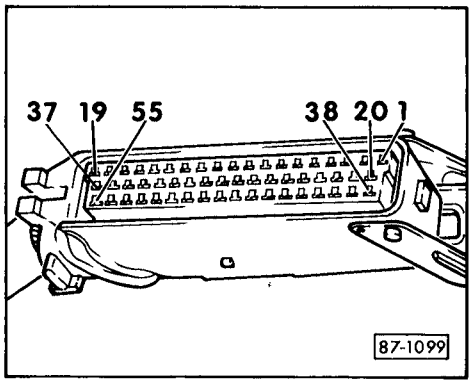
◄ – If no open circuit exists, connect additional test cable V.A.G 1315 A/1 into plug connection (2) and to 10A test input of the hand-held multimeter V.A.G 1526.

– Run engine.

– Specification: 0.5 ... 3.0 A (the current decreases as the probe heats up).

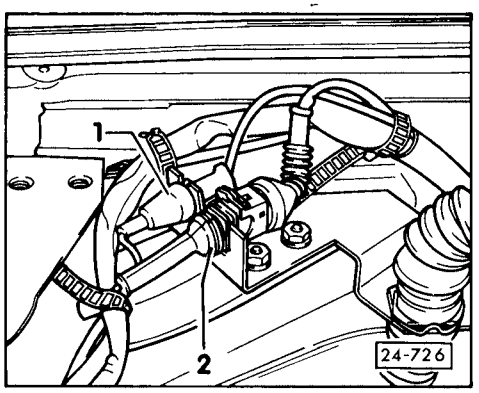
– If the specification is not achieved, replace lambda probe.





Testing actuation of lambda probe (–G39)

- Separate plug connection (1) (lambda signal wire).
- Connect hand-held multimeter V.A.G 1526 with auxiliary cables from V.A.G 1594 for voltage measurement between connector of the wiring harness to the Motronic control unit and engine earth.
- Switch on ignition.
- Specification: 450 ± 50 mV.
- If the specification is not achieved, connect test box V.A.G 1598 with adapter cable 1598/5 **only** to the wiring harness to the Motronic control unit ⇒ Repair Group 01.
- Test cable from the connector in the engine compartment to socket 28 of the test box for open circuit on the basis of the CFD. Specification max. 1.0 Ω. Rectify any open circuit between the connector in the engine compartment and contact 28 of the connector at the control unit.
- Test earth connection between engine housing and socket 10 of the test box with ohmmeter for open circuit according to CFD. Specification max. 1.0 Ω. Rectify any open circuit.
- To test operation of lambda control, check basic setting of engine ⇒ Repair Group 01.
  The readout in display field 8 must not be at a constant 128, but must fluctuate between 123 and 133.



Removing and installing lambda probe –G39

The plug connections for the lambda probe are located in the rear right of the engine compartment ⇒ also page 24–1, item 2.

- Separate both plug connections.
- Open cable straps.
- Unscrew lambda probe (fitting location and tightening torque ⇒ Repair Group 26).

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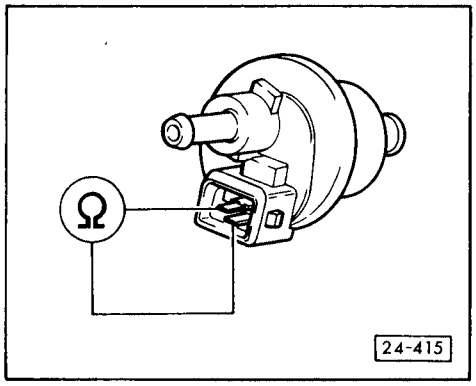
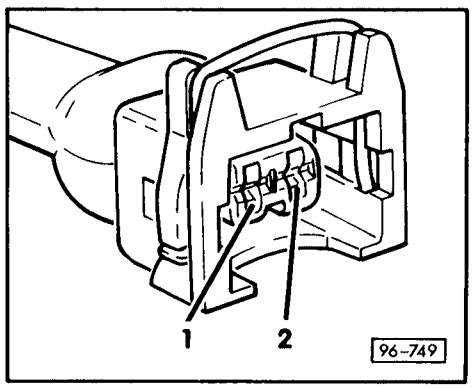
When installing the lambda probe, pay attention to the following points:

- It is important that the cable straps are carefully re-attached in order to prevent the probe cable touching the exhaust pipe.
- The thread of the lambda probe is coated with installation paste.
  This paste must not get onto the slot of the probe.





Testing solenoid valve I for activated charcoal filter –N80

The solenoid valve for the activated charcoal filter is located behind the engine between cylinder head and bulkhead.

Performing electrical test of solenoid valve I for activated charcoal filter

– Unplug connector at the solenoid valve.

◄ – Connect hand-held multimeter V.A.G 1526 with auxiliary cables from V.A.G 1594 for resistance measurement to the solenoid valve.

Specification: 40 ... 50 Ω

– If the specification is not achieved, replace valve.

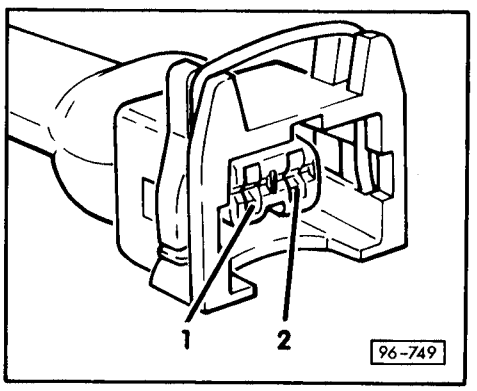
Testing actuation of solenoid valve

– Unplug connector at the solenoid valve.

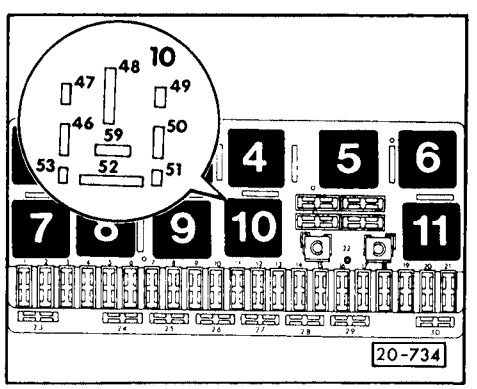
◄ – Connect diode test lamp V.A.G 1527 with test cable from adapter cable set V.A.G 1594 to contact 2 of the connector and to engine earth.

– Operate starter for a few seconds; the diode test lamp must light up when this is done.

– If the diode test lamp does not light up, perform the following tests identified with a dot:
• Test fuses 24 and 28.



◄ • Test cable from contact 2 of the connector at the ACF valve to fuse –S24 for open circuit on the basis of CFD.
Specification max. 0.5 Ω.



◄ • Test cable from fuse 24 to the fuel pump relay –J17 (relay position 10) contact 59 for open circuit on the basis of the CFD.
Specification max. 0.5 Ω.
• Test actuation of the fuel pump relay ⇒ page 24–15.

– Re-connect diode test lamp, as described on page 24–37.

– Initiate final control diagnosis (Repair Group 01).

– Diode test lamp must light up.

Note:

Irrespective of which actuator is selected, positive must exist at contact 2 of the connector at the solenoid valve.

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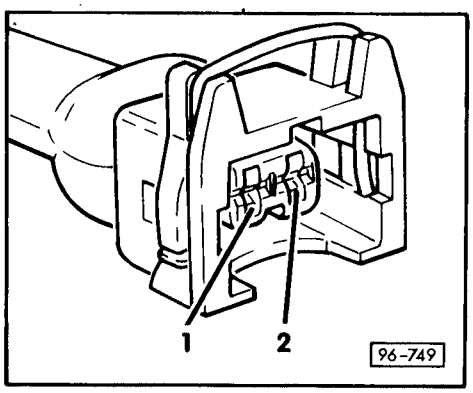
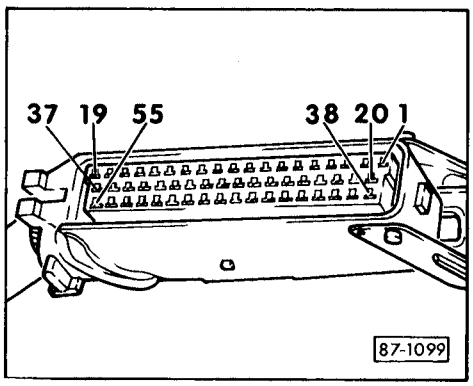


- If the diode test lamp does not light up, connect test box V.A.G 1598 with adapter cable 1598/5 **only** to the wiring harness to the Motronic control unit ⇒ Repair Group 01.

◄ - Test cable from contact 2 of the connector at the solenoid valve to socket 37 of the test box for open circuit on the basis of the CFD.
Specification max. 1.0 Ω.

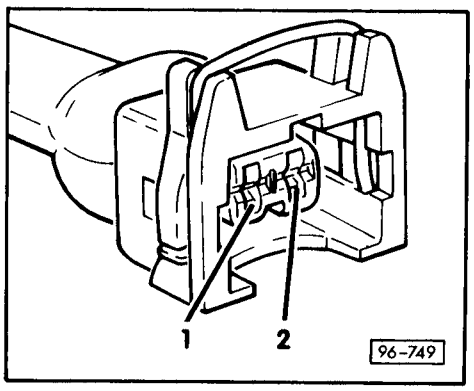


◄ - Rectify any open circuit between contact 37 of the connector at the control unit and contact 2 of the connector at the solenoid valve for the activated charcoal filter.

- If no open circuit exists, replace control unit.

- Remove test box V.A.G 1598 and adapter cable V.A.G 1598/5.

- Connect Motronic control unit to vehicle wiring harness.



◄ - Connect diode test lamp V.A.G 1527 with test cable to contacts 1 and 2 of the connector at the ACF valve.

- Initiate final control diagnosis (Repair Group 01). When the solenoid valve is operated, the diode test lamp must flash.

- If the diode test lamp does not flash or if it shows a steady light, connect test box V.A.G 1598 with adapter cable V.A.G 1598/5 **only** to the wiring harness to the Motronic control unit ⇒ Repair Group 01.

- If the diode test lamp shows a steady light, test cable from contact 1 of the connector at the ACF valve to socket 5 of the test box for short to earth.

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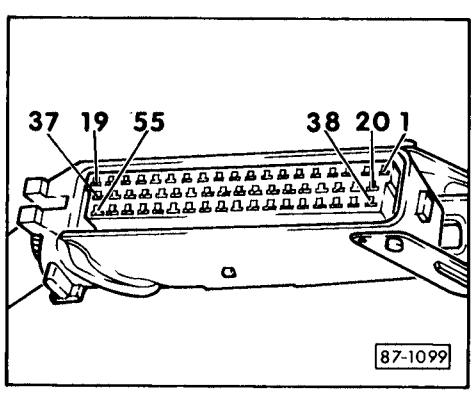
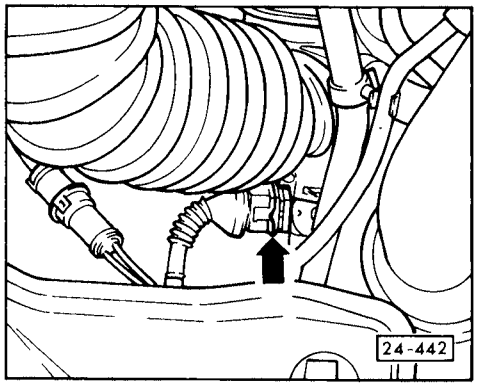
- If the diode test lamp does not flash, test cable from contact 1 of the connector at the ACF valve to socket 5 of the test box for open circuit. Specification max. 1.0 Ω.



◄ - Rectify any short to earth or open circuit between contact 1 of the connector at the solenoid valve and contact 5 of the connector at the Motronic control unit.

- If neither an open circuit nor a short to earth exists in the cable, replace control unit.

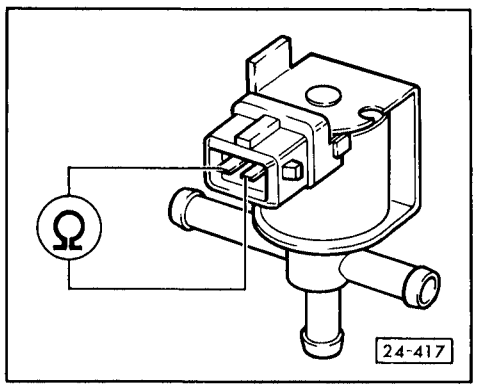


Testing solenoid valve for boost pressure limiting –N75

The solenoid valve for boost pressure limiting is located in front of the turbocharger (behind the right headlamp).
The solenoid valve for boost pressure limiting controls the control pressure of the blow-off valve and thus the boost pressure.
If the solenoid valve is not energized (e.g. connector unplugged), the boost pressure is lowered.

Performing electrical test of solenoid valve for boost pressure limiting

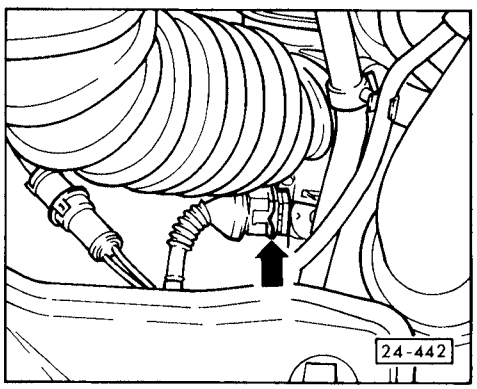
◄ – Unplug connector at the boost pressure limiter solenoid valve.



◄ – Connect hand-held multimeter V.A.G 1526 with auxiliary cables from V.A.G 1594 for resistance measurement to the solenoid valve for boost pressure limiting.

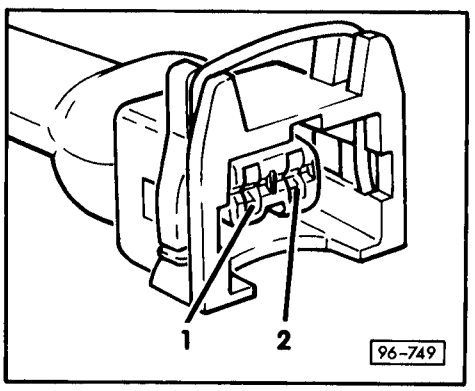
Specification: 25 ... 35 Ω.

– If the specification is not achieved, replace valve.



Testing actuation of solenoid valve for boost pressure limiting

◄ – Unplug connector at the solenoid valve for boost pressure limiting.



◄ – Connect diode test lamp V.A.G 1527 with test cable from adapter cable set V.A.G 1594 to contact 1 of the connector and to engine earth.

– Operate starter for a few seconds; the diode test lamp must light up when this is done.

– If the diode test lamp does not light up, perform the following tests marked with a dot:
• Test fuses 24 and 28.

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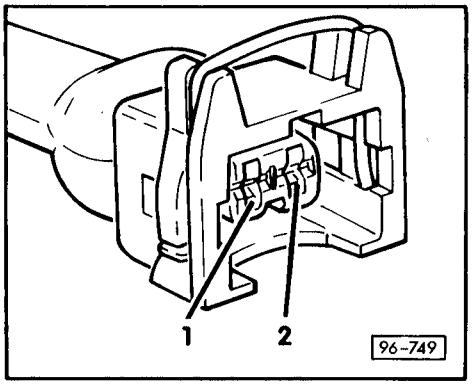
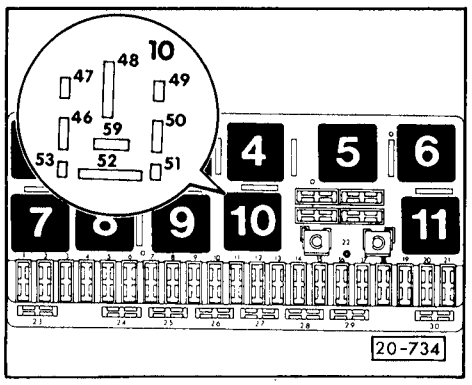


- Test cable from contact 1 of the connector at the solenoid valve for boost pressure limiting to fuse 24 for open circuit on the basis of the CFD. Specification max. 0.5 Ω.



- Test cable from fuse 24 to the fuel pump relay –J17 (relay position 10) contact 59 for open circuit on the basis of the CFD. Specification max. 0.5 Ω.
- Test actuation of the fuel pump relay ⇒ page 24–15.

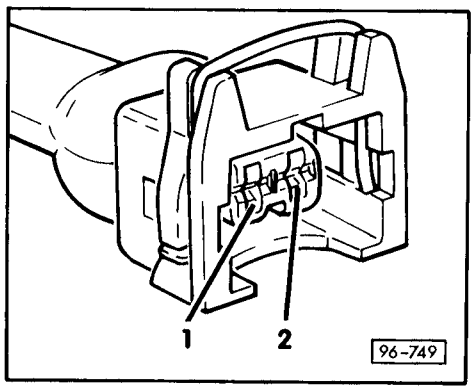
– Re-connect diode test lamp, as described on page 24–42.

– Initiate final control diagnosis (Repair Group 01).

– Diode test lamp must light up.

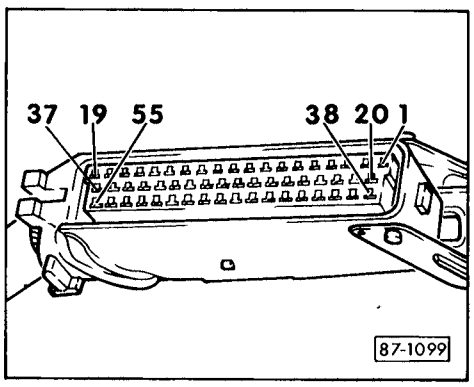
Note:

Irrespective of which actuator is selected, positive must exist at contact 1 of the connector at the solenoid valve for boost pressure limiting.



– If the diode test lamp does not light up, connect test box V.A.G 1598 with adapter cable 1598/5 **only** to the wiring harness to the Motronic control unit ⇒ Repair Group 01.

– Test cable from contact 1 of the connector at the solenoid valve for boost pressure limiting to socket 37 of the test box for open circuit on the basis of the CFD. Specification max. 1.0 Ω.



– Rectify any open circuit between contact 37 of the connector at the control unit and contact 1 of the connector at the solenoid valve for boost pressure limiting.

– If no open circuit exists, replace control unit.

– Remove test box V.A.G 1598 and adapter cable V.A.G 1598/5.

– Connect Motronic control unit to vehicle wiring harness.

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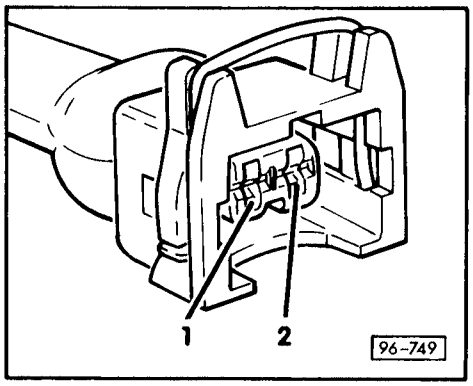
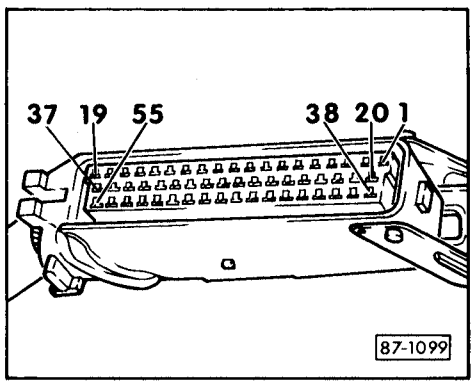


- Connect diode test lamp V.A.G 1527 with test cable to contacts 1 and 2 of the connector at the solenoid valve for boost pressure limiting.
- Initiate final control diagnosis (Repair Group 01). When the solenoid valve is operated, the diode test lamp must flash.
- If the diode test lamp does not flash or if it shows a steady light, connect test box V.A.G 1598 with adapter cable 1598/5 **only** to the wiring harness to the Motronic control unit ⇒ Repair Group 01.



- If the diode test lamp shows a steady light, test cable from contact 2 of the connector at the solenoid valve for boost pressure limiting to socket 23 of the test box for short to earth.
- If the diode test lamp does not flash, test cable from contact 2 of the connector at the solenoid valve to socket 23 of the test box for open circuit. Specification max. 1.0 Ω.
- Rectify any short to earth or open circuit between contact 2 of the connector at the solenoid valve and contact 23 of the connector at the Motronic control unit.
- If no open circuit or short to earth exists in the cable, replace control unit.

Testing and adjusting idling speed switch

The idling speed switch is located in the throttle valve potentiometer.

- Fitting location of throttle valve potentiometer ⇒ page 24–1.

Testing operation of idling speed or part load detection of Motronic control unit with V.A.G 1551

- Read measured value block and select display group 04 ⇒ Repair Group 01.
- Check readout in display field 4:

Read measured value block			4
840 rpm	41 %	4 km/h	00010

00010
- Idling speed
- Part load and full load

- When the accelerator pedal is depressed (pedal travel several mm) the part load/full load display must jump from 0 to 1 and the idling speed display from 1 to 0.
- If this change in the display does not occur until the pedal has been depressed further, adjust idling speed switch ⇒ page 24–48.
- If the display does not jump, test idling speed switch and cable connection.
- If the part load/full load display is already at 1 and the idling speed display at 0 before the accelerator pedal is depressed, adjust idling speed switch.

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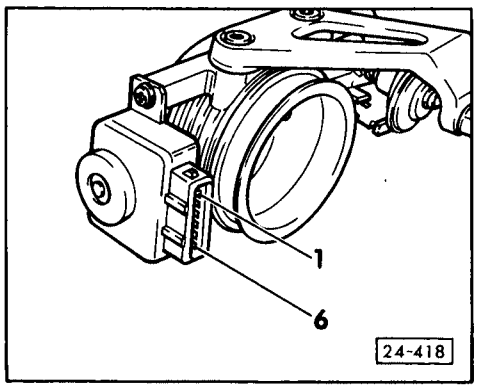
– If the fault cannot be rectified by adjusting the switch, test idling speed switch and cable connection.

Testing idling speed switch

Test requirements:
- Throttle adjustment in order ⇒ Repair Group 20.
- Throttle pedal mechanism and throttle cable operate easily.
- Adjustment of linkage for cruise control system in order.
- Throttle valve body operates easily, closes properly.
- Closing damper and adjustment in order.



– Unplug connector at the throttle valve potentiometer.

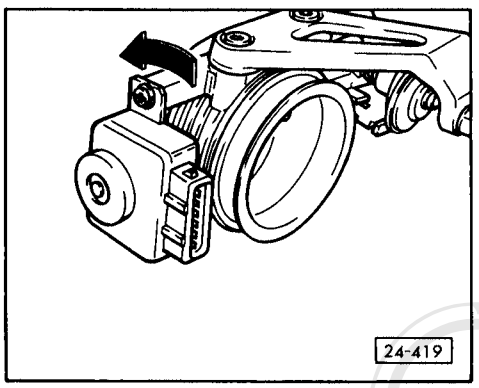
◄ – Connect hand-held multimeter V.A.G 1526 with auxiliary cables from V.A.G 1594 for resistance measurement to contacts 4 and 6.

Specification: zero ohms (continuity).

– Operate throttle valve slightly.

Specification: infinite ohms (no continuity).
If the specification is not achieved or if the specification is not achieved until the throttle valve is opened further, adjust idling speed switch.

– If the specification is still not achieved after adjusting the idling speed switch, replace throttle valve potentiometer.



Adjusting idling speed switch

– Slacken both screws of the throttle valve potentiometer.

◄ – Turn throttle valve potentiometer in direction of arrow until a stop is felt. The throttle valve (throttle mechanism) must not be moved when performing this step.

– Tighten throttle valve potentiometer in this position.

– Once again test idling speed switch.

Testing wiring between idling speed switch and Motronic control unit

– Connect test box V.A.G 1598 with adapter cable V.A.G 1598/5 **only** to the wiring harness to the Motronic control unit ⇒ Repair Group 01.

– Unplug connector from the throttle valve potentiometer.

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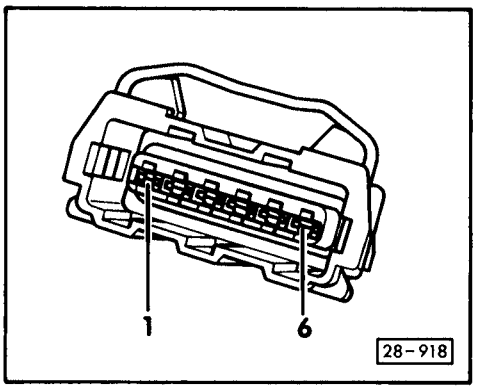
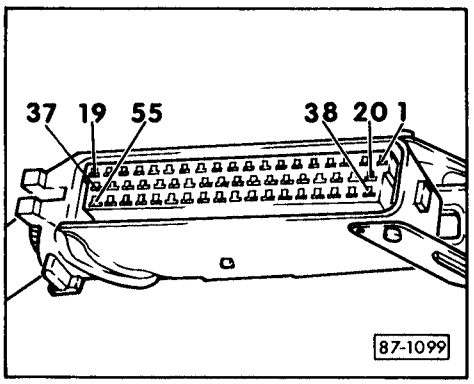


– Test the following cables for open circuit or short circuit on the basis of the CFD:

Connector contact	V.A.G 1598 socket
4	19
6	52

Specification: max. 1.0 Ω.



– Rectify any open circuit or short circuit on the basis of the current flow diagram.

Note:

Only gold-plated contacts may be used for repairing contacts in the connector of the throttle valve potentiometer.

Testing and adjusting throttle valve potentiometer –G69

- Fitting location of throttle valve potentiometer ⇒ page 24–1.

Test requirement:
- Accelerator cable correctly set.

– Switch off ignition.

– Read measured value block (do **not** run engine at idling speed) and select display group 03 ⇒ Repair Group 01.

– Check readout in display field 3:
  - Throttle valve closed (accelerator pedal not depressed)
    Specification: 5 ... 10°
  - Throttle valve fully open (accelerator pedal fully de-pressed)
    Specification: 90 ... 102°

Notes:

- *Readouts below 5° indicate a short circuit in the cable connection or in the throttle valve potentiometer.*
- *Readouts of more than 102° indicate an open circuit in the wiring or an open circuit in the throttle valve potentiometer.*

– *If the specifications are not achieved, adjust throttle valve potentiometer ⇒ page 24–54.*

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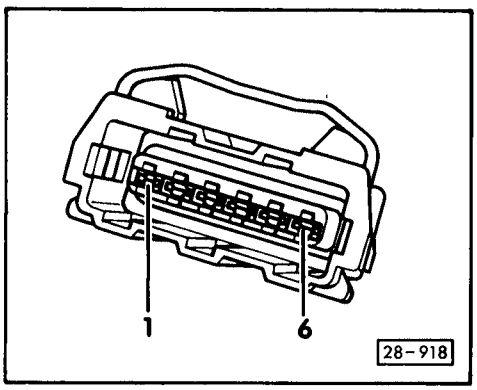
– If the specifications are not achieved although the setting is in order, perform the following tests:
  • Test voltage supply.
  • Test cable connection.
  • Test resistance of throttle valve potentiometer.



Testing voltage supply

– Unplug connector at the throttle valve potentiometer.

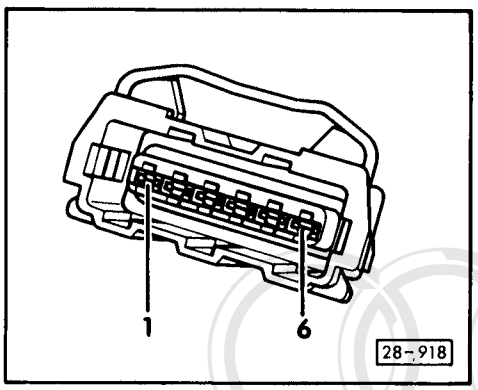
– Switch on ignition.

◄ – Connect hand-held multimeter V.A.G 1526 with auxiliary cables from V.A.G 1594 for voltage measurement in turn between contacts 1 and 2 and also 2 and 3.

– Specification: 4.5 ... 5.5 volts in each case.

– If the specifications are achieved, test resistance of the throttle valve potentiometer ⇒ page 24–53.

– If one of the specifications is not achieved, test wiring to the Motronic control unit and the Motronic control unit.



Testing cable connection

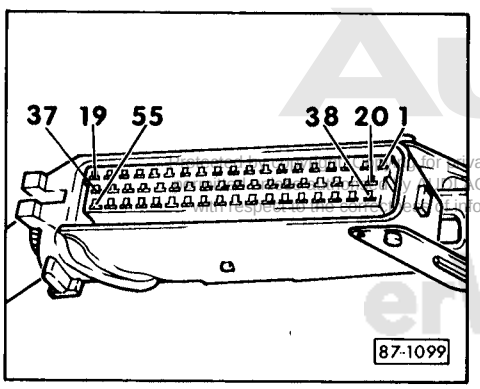
– Switch off ignition.

– Connect test box V.A.G 1598 with adapter cable V.A.G 1598/5 **only** to the wiring harness to the Motronic control unit ⇒ Repair Group 01.

◄ – Test the following cables for open circuit or short circuit on the basis of the CFD:

Connector contactsocket	V.A.G 1598
1	12
2	30
3	53

Specification: max. 1.0 Ω.



◄ – Rectify any open circuit or short circuit on the basis of the current flow diagram.

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Note:

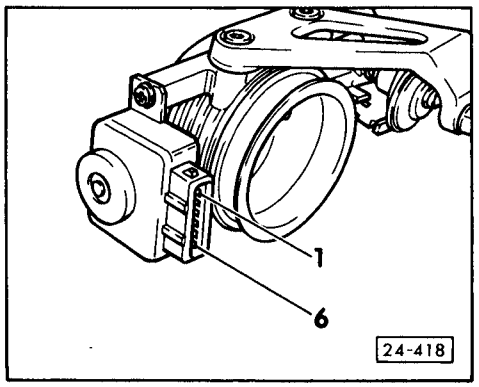
Only gold-plated contacts may be used for repairing contacts in the connector of the throttle valve potentiometer.

– Connect adapter cable V.A.G 1598–5 to the Motronic control unit.

– Switch on ignition.

– Connect hand-held multimeter V.A.G 1526 in turn between sockets 12 and 30 and also 30 and 53.

Specification: 4.5 ... 5.5 volts in each case.



– If one of the specifications is not achieved, replace Motronic control unit.

Testing resistance of throttle valve potentiometer

– Connect hand-held multimeter V.A.G 1526 with auxiliary cables from V.A.G 1594 for resistance measurement to contacts 1 and 2.

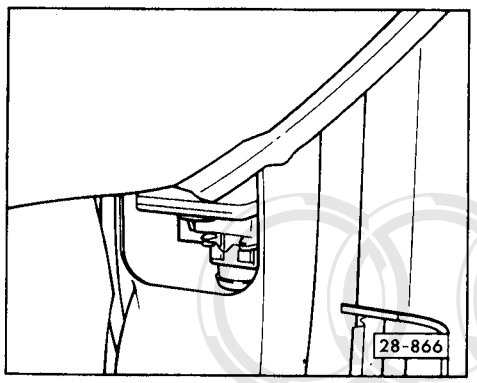
Specification: 1.5 ... 2.6 kΩ.

– Connect hand-held multimeter to contacts 2 and 3.

Specification in idle speed position:
approx. 0.75 ... 1.3 kΩ.

– Slowly move throttle valve lever into end position (full throttle position). When this is done, the resistance must rise to a max. of 3.6 kΩ.

– If one of the specifications is not achieved, replace throttle valve potentiometer.



Adjusting throttle valve potentiometer

The throttle valve potentiometer is also adjusted when the idling speed switch is adjusted.

Adjusting idling speed switch ⇒ page 24–48.

Testing altitude sender

The altitude sender is located in the footwell on the front passenger's side below the trim in a recess of pillar A.

– Read measured value block and select display group 02 ⇒ Repair Group 01.

– Check readout in display field 4.

The current atmospheric pressure in mbar is indicated.

Notes:

- *The current atmospheric pressure is dependent on altitude and weather-related pressure fluctuations.*
- *The atmospheric pressure at mean sea level in normal weather conditions is approx. 1013 mbar and decreases by approx. 100 mbar for each 1000 m altitude.*
- *Weather-related pressure fluctuations as a rule amount to less than ± 50 mbar (with the exception of extreme weather conditions and tropical countries).*

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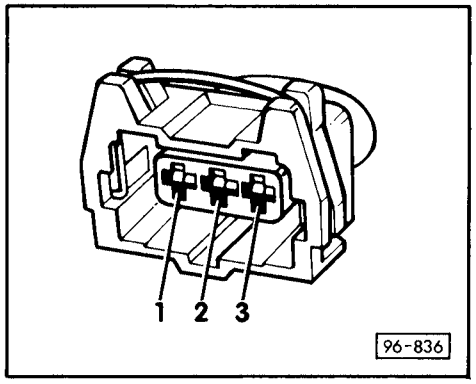
– If a constant 968 mbar is indicated in place of the actual atmospheric pressure or if the readout differs so greatly from the figure which would be normal on the basis of the altitude and weather conditions, test voltage supply of altitude sender and cable connection.

  • If the altitude sender fails, a substitute altitude of approx. 3000 m is assumed by the control unit and a constant 968 mbar displayed.

After rectifying the fault, it is classified as a sporadic fault and normal control is resumed.



Testing voltage supply of altitude sender

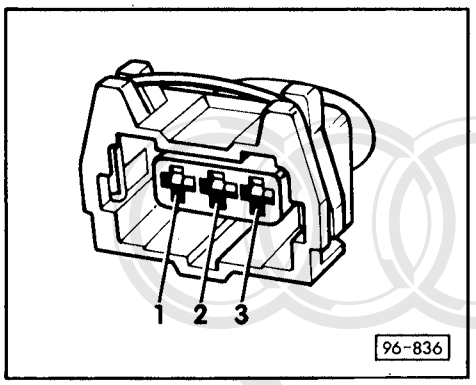
– Unplug connector from altitude sender.

– Switch on ignition.

◄ – Connect hand-held multimeter V.A.G 1526 with auxiliary cables from V.A.G 1594 for voltage measurement in turn between contacts 1 and 3 and also 2 and 3.

Specification: 4.5 ... 5.5 volts in each case.

– If the specifications are achieved, replace altitude sender.



– If one of the specifications is not achieved, test wiring to Motronic control unit and also Motronic control unit as follows:

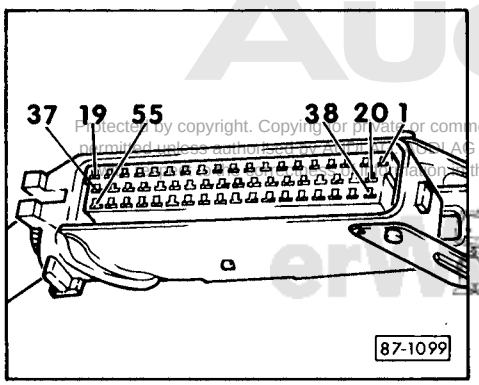
Testing cable connection of altitude sender

– Switch off ignition.

– Connect test box V.A.G 1598 with adapter cable V.A.G 1598/5 **only** to the wiring harness to the Motronic control unit ⇒ Repair Group 01.

◄ – Test the following cables for open circuit or short circuit on the basis of the CFD:

Connector contactsocket	V.A.G 1598
1	9
2	12
3	30



Specification: max. 1.0 Ω.

◄ – Rectify any open circuit or short circuit on the basis of the current flow diagram.

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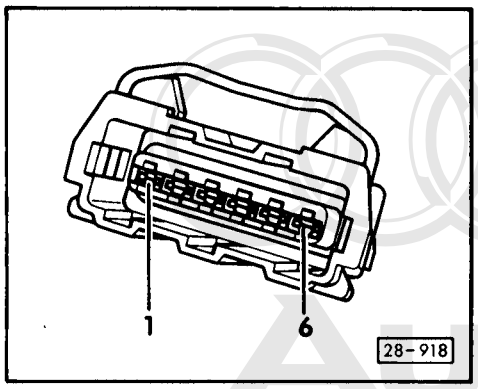
– Connect adapter cable V.A.G 1598/5 to the Motronic control unit.

– Switch on ignition.

– Connect hand-held multimeter V.A.G 1526 in turn between sockets 12 and 30 and also 9 and 30.

Specifications:
Sockets 12 and 30: 4.5 ... 5.5 volts
Sockets 9 and 30: 0.5 ... 5.0 volts

– If one of the specifications is not achieved, replace Motronic control unit.



Testing air mass meter –G70

• Fitting location of air mass meter –G70 ⇒ page 24–2.

Note:

The wire grille and the hot wire of the air mass meter must not be touched.

– Unplug connector from the air mass meter.

– Connect diode test lamp V.A.G 1527 between contact 1 of the connector and the positive contact of the battery.

– The diode test lamp must light up.

– If the diode test lamp does not light up, determine open circuit in wiring on the basis of the CFD and rectify.

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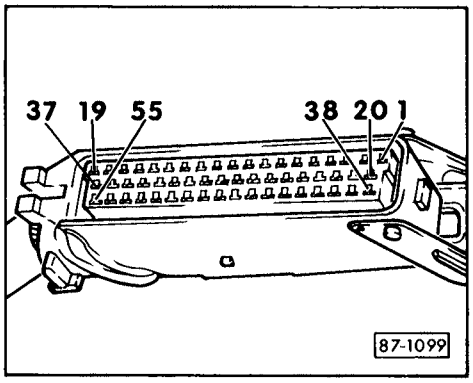
– Connect diode test lamp V.A.G 1527 between contact 5 of the connector and the air mass meter and engine earth.

– Switch on ignition.

– The diode test lamp must light up.

– If the diode test lamp does not light up, connect test box V.A.G 1598 with adapter cable V.A.G 1598/5 to the Motronic control unit ⇒ Repair Group 01.

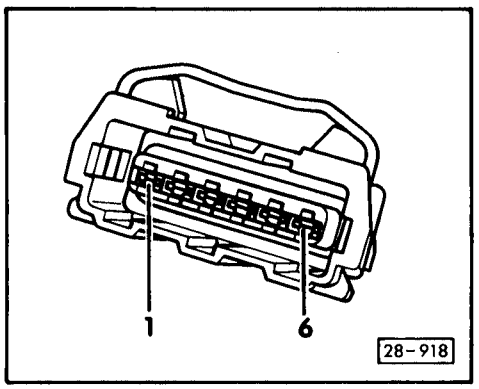


– Connect diode test lamp V.A.G 1527 to earth (socket 19) and to socket 37 of the test box.

– Switch on ignition, diode test lamp must light up.

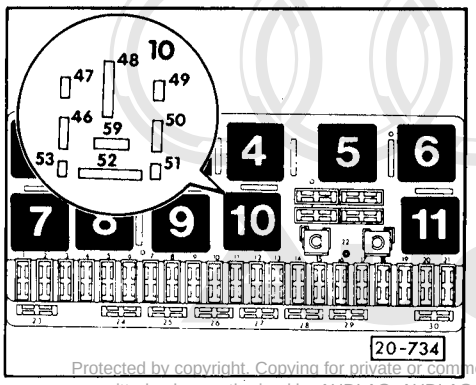
◄ – If the diode test lamp now lights up, determine open circuit between contact 37 of the connector at the control unit and contact 5 of the connector at the air mass meter on the basis of the CFD and rectify.

– If the diode test lamp does not light up, replace control unit.



◄ – Connect diode test lamp to contact 5 of the connector at the air mass meter and to engine earth.

– Switch on ignition and operate starter for a few seconds.



– The diode test lamp must light up when the ignition is switched on and during starting.

– If the diode test lamp goes out when the starter is operated, perform the following tests:

◄
- Test fuse –S28.
- Test cable from contact 5 of the connector at the air mass meter to fuse –S28 for open circuit on the basis of the CFD. Specification max. 0.5 Ω.
- Test cable from fuse –S28 to the fuel pump relay –J17 (relay position 10) contact 59 for open circuit on the basis of the CFD. Specification max. 0.5 Ω.
- Test fuel pump relay and, if necessary, actuation of fuel pump relay ⇒ page 24–15.

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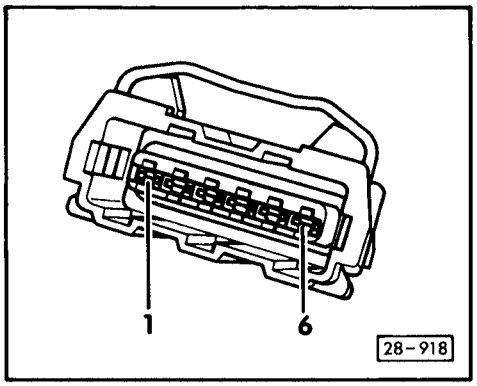
Testing signal wires

– Connect test box V.A.G 1598 with adapter cable V.A.G 1598/5 **only** to the wiring harness to the Motronic control unit ⇒ Repair Group 01.

– Unplug connector at the air mass meter.

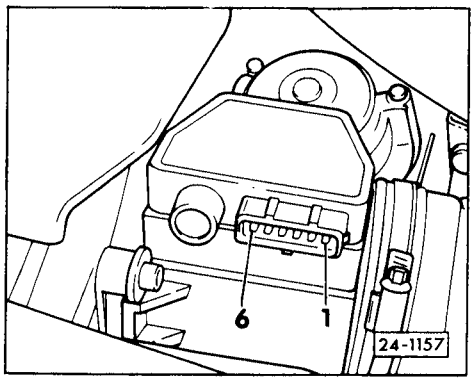


- Test the following cables for open circuit or short circuit:

From connector at air mass meter, contact	To socket of test box
2	26
3	7
4	25

Specification: max. 1.0 Ω.

- Rectify any open circuit or short circuit.

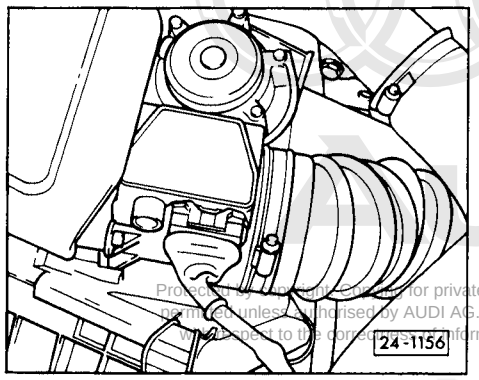


Note:

Only gold-plated contacts may be used for repairing contacts in the connector of the air mass meter.

Testing operation of air mass meter

- Unplug connector at the air mass meter.
- Connect hand-held multimeter V.A.G 1526 with auxiliary cables from V.A.G 1594 for resistance measurement to contacts 1 and 2 of the air mass meter and note resistance.
- Unplug test cables at the air mass meter and short-circuit.



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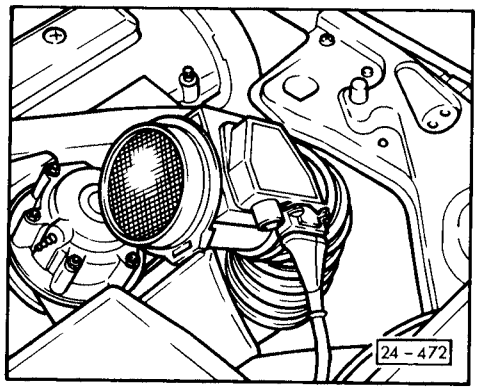
- The reading now displayed must agree with the noted reading (what is measured is the earth bridge in the air mass meter). The reading corresponds to the internal resistance of the test cables.
- If the readings differ by more than 0.1 Ω from each other, replace air mass meter.
- Plug in connector at air mass meter and push back rubber grommet.
- Connect hand-held multimeter V.A.G 1526 with auxiliary cables from V.A.G 1594 for voltage measurement at contacts 1 and 3.
- Switch on ignition.
  Specification approx. 1.2 V ... 1.5 V.
- Run engine at idling speed.
  Specification approx. 2.5 V.
- Briefly increase engine speed (blip throttle).
  Specification: Clear rise in voltage to approx. 3 ... 5 V.
- If the specifications are not achieved, replace air mass meter.

Testing cleaning operation of air mass meter

The cleaning operation is performed about 4 seconds after switching off the engine and takes about 1 second.

The cleaning operation is only performed under the following preconditions:

- Coolant temperature above 60°C.
- Engine speed above 2000 rpm.
- Signal wires in order.
- Fuse –S28 in order.

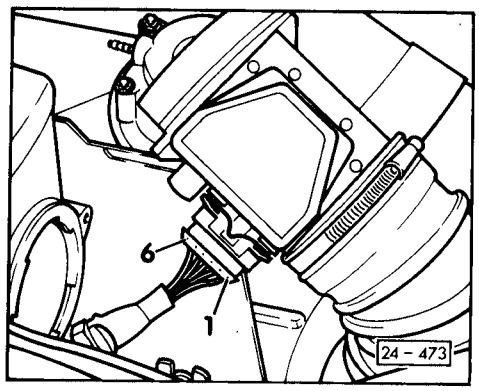


◄ – Unscrew air mass meter from air cleaner housing and pull forward sufficiently so that the cleaning operation can be observed (the connector remains plugged in and the intake hose connected).

– Run engine and increase engine speed to more than 2000 rpm.

– Switch off engine and observe cleaning operation (the hot wire glows for about 1 second).

– If no cleaning operation is performed, push back rubber grommet at connector of air mass meter (the connector remains plugged into the air mass meter).



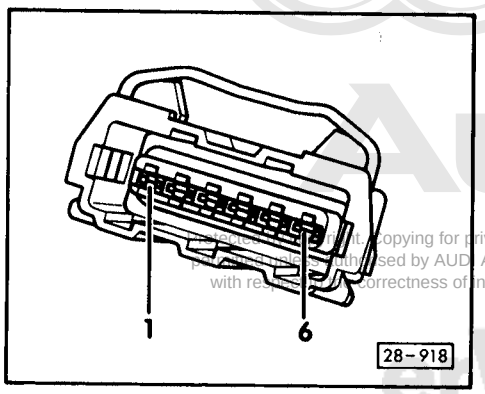
◄ – Connect diode test lamp V.A.G 1527 to contacts 1 and 4.

– Repeat test sequence and observe diode test lamp. The diode test lamp must light up during the cleaning operation.

– If the diode test lamp lights up, replace air mass meter.

– If the diode test lamp does not light up, connect test box V.A.G 1598 with adapter cable V.A.G 1598/5 to the Motronic control unit ⇒ Repair Group 01.

– Connect diode test lamp to socket 26 (earth) and to socket 25.



– Repeat test sequence and observe diode test lamp. The diode test lamp must light up during the cleaning operation.

– If the diode test lamp does not light up, replace control unit.

◄ – If the diode test lamp lights up, test cable between contact 4 of connector at air mass meter and socket 25 of the test box for continuity with an ohmmeter, specification max. 0.5 Ω, and also test for short to earth.

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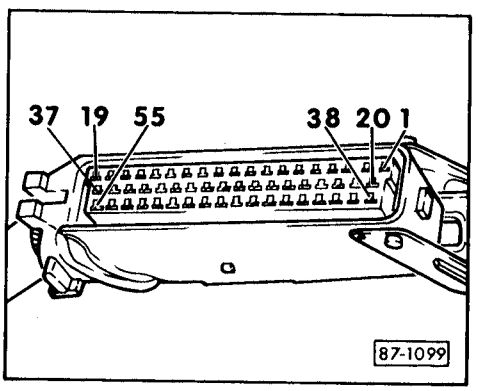

◄ – Rectify any short circuit or open circuit between contact 4 of the connector at the air mass meter and contact 25 of the connector at the Motronic control unit.

Testing air conditioner auxiliary signal and compressor cutoff

This signal from the air conditioner raises the pilot control value for idling speed stabilization when the air conditioner compressor is switched on so that idling speed stabilization remains in the mid-range of the control field.

When accelerating from a standing start and from a low speed, the Motronic control unit supplies this signal to earth and thus briefly switches off the air conditioner compressor.

Test requirements:
- Air conditioner operating properly.
- No fault stored in fault memory.
- Vehicle at room temperature (warmer than +15°C).

– Run engine at idling speed (air conditioner switched off).

– Read measured value block and select display group ⇒ Repair Group 01.

– Check readout in display field 4.

Note:

The third (middle) position of the five-digit display is not assigned.

– 0 must appear in the first and second positions.

Notes:

- *The first position indicates whether the air conditioner compressor is switched on.*
- *The second position indicates whether the air conditioner is switched on.*

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– Switch on air conditioner.
(Lowest temperature and fastest blower speed).

– The readout in the first and second positions must jump from 0 to 1.

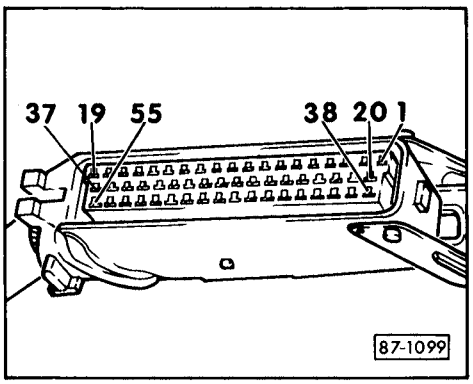
– Fully depress accelerator pedal rapidly and release again (brief blip of throttle).
When the accelerator pedal is depressed, the readout of the first position must jump for a few seconds from 1 to 0.

– If the readout does not change as described, connect test box V.A.G 1598 with adapter cable V.A.G 1598/5 to the Motronic control unit ⇒ Repair Group 01.

– Connect diode test lamp V.A.G 1527 to socket 6 (signal) and to socket 19 (earth).

– Run engine at idling speed.

– Switch on air conditioner (lowest temperature and fastest blower speed).



Specifications:

- The diode test lamp must light up after 1 ... 6 seconds.
- Fully depress accelerator pedal rapidly and release again (brief blip of throttle). When the accelerator pedal is depressed, the diode test lamp must go out for a few seconds.

– If the specifications are not achieved, switch off engine and wait at least 30 seconds before unplugging the connector of the adapter cable V.A.G 1598/5 from the Motronic control unit.

– Test cable connection from contact 6 at the connector for Motronic control unit (socket 6 of the test box) to the air conditioner for open circuit or short circuit on the basis of the CFD.

– If there is no fault in the cable connection, check operation of the control unit for the magnetic clutch –J153 or of the control and display unit –E87.

– If the control unit for the magnetic clutch or for the control and display unit is operating properly, replace Motronic control unit.

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Testing air conditioner auxiliary signal for increasing engine speed

This signal from the air conditioner raises the idling speed of the engine by about 80 rpm if increased output is required from the heating or cooling system.

Test requirements:

- Air conditioner operating properly.
- No fault stored in fault memory.
- Vehicle at room temperature (warmer than +15°C).

– Run engine at idling speed (air conditioner switched off).

– Read measured value block and select display group 05 ⇒ Repair Group 01.

– Check readout in display field 4.

Note:

The third (middle) position of the five-digit display is not assigned.

– 0 must appear in the first and second positions.

Notes:

- *The first position indicates whether the air conditioner compressor is switched on.*
- *The second position indicates whether the air conditioner is switched on.*

– Switch on air conditioner.
(Lowest temperature and fastest blower speed).

- The readout in the first and second positions must jump from 0 to 1.

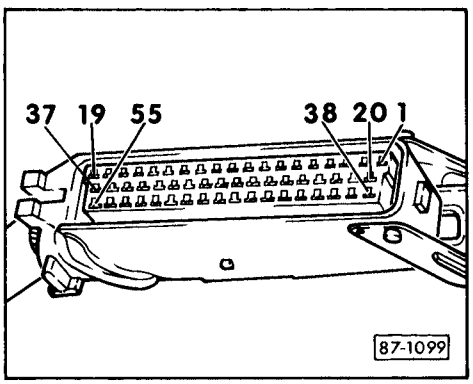
- If the readout does not change as described, connect test box V.A.G 1598 with adapter cable V.A.G 1598/5 to the Motronic control unit ⇒ Repair Group 01.

- Connect diode test lamp V.A.G 1527 to socket 41 (signal) and to socket 19 (earth).

- Run engine at idling speed.

- Switch on air conditioner (lowest temperature and fastest blower speed).

- When the air conditioner compressor switches on, the diode test lamp must light up (idling speed also increases).



- If the diode test lamp does not light up, switch off engine and wait at least 30 seconds before unplugging the connector of the adapter cable V.A.G 1598/5 from the Motronic control unit.

◄ - Test cable connection from contact 41 at the connector for Motronic control unit (socket 41 at the test box) to the air conditioner switch –E30 or to the control and display unit –E87 for open circuit or short circuit on the basis of the CFD.

- If there is no fault in the cable connection, check operation of the air conditioner.

- If the air conditioner is operating properly, replace Motronic control unit.

Testing actuation of on-board computer for fuel consumption display

Note:

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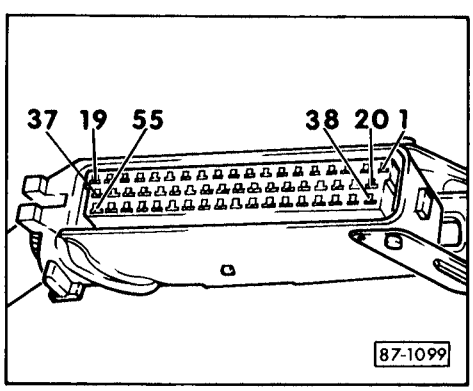
Perform the following test only if a missing or incorrect fuel consumption signal is determined when testing the on-board computer.

- Connect test box V.A.G 1598 with adapter cable V.A.G 1598/5 to the Motronic control unit ⇒ Repair Group 01.

- Connect voltmeter between socket 19 (earth) and socket 31 (signal).

- Run engine and vary engine speed continuously between 1000 rpm and 4000 rpm.



- Specification: approx. 0.3 ... 10 volts (corresponding to engine speed).

- If the specification is achieved although the on-board computer does not indicate a consumption reading, switch off engine and remove dash panel insert.

◄ - Test cable connection between Motronic control unit (contact 31 or socket 31 at test box, respectively) and black 10-pin connector of the on-board computer for open circuit on the basis of the CFD.

– If no open circuit exists, the fault is in the dash panel insert ⇒ Workshop Manual "Electrical System".

– If the specification is not achieved, switch off engine and remove dash panel insert.

– Unplug black 10-pin connector at the on-board computer.

– Run engine.

– Specification: approx. 0.3 ... 10 volts (corresponding to engine speed).

– If the specification is now achieved, there is a fault at the on-board computer.

– If the specification is not achieved, test cable connection between Motronic control unit and 10-pin connector for short circuit to positive or to earth on the basis of the CFD.

– If the specification is not achieved although no short circuit exists, replace Motronic control unit.

Testing road speed signal

The road speed signal is required for the following functions:

- Gear detection for switching off air conditioner compressor when accelerating in first gear.
- Switching idling speed stabilization over from closed-loop control to open-loop control above 6 km/h.
- Torque converter protection for automatic gearbox – below 20 km/h the stall speed is lowered after 2 seconds to 2900 rpm.
- Speed limit of 210 km/h for vehicles with comfort tyres and for vehicles for USA and Canada.

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Notes:

- *If the road speed signal fails, engine speed is limited at full load to 5320 rpm after 4 seconds.*
- *The fault "00281, Road speed sender –G68 no signal" is not stored in the fault memory until it exists and an engine speed of 4000 rpm has been maintained or exceeded at full load for at least 4 seconds.*

– Perform road test and read measured value block (select display group 04) ⇒ Repair Group 01.
  - Have a second person operate V.A.G 1551!

– Check readout in display field 3.

Note:

4 km/h is always displayed if the vehicle is stationary.

– The road speed must be displayed if vehicle speed exceeds 4 km/h.

Note:

The road speed is displayed in steps of two. Intermediate figures cannot be displayed.

– If the road speed is not displayed, raise vehicle at front left until the wheel is clear off the ground.

– Connect test box V.A.G 1598 with adapter cable V.A.G 1598/5 to the Motronic control unit ⇒ Repair Group 01.

– Connect diode test lamp to socket 18 (positive) and to socket 50 (signal).

– Switch on ignition.

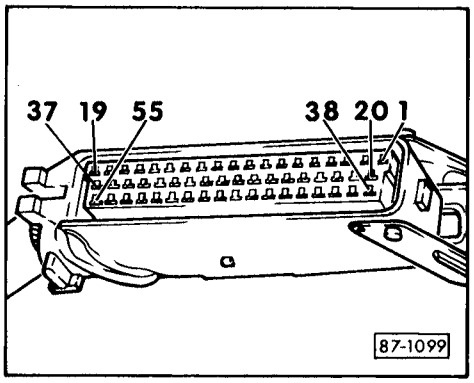
– Rotate left front wheel by hand. When this is done, the diode test lamp must flash (very short flash signal).

– If the diode test lamp does not flash, switch off ignition and wait at least 30 seconds before unplugging the connector of the adapter cable V.A.G 1598/5 from the Motronic control unit.

– Switch on ignition.

– Rotate left front wheel by hand. When this is done, the diode test lamp must flash.

– If the diode test lamp now flashes, replace Motronic control unit.



◄ – If the diode test lamp does not flash, test cable connection from contact 50 at the connector for Motronic control unit (socket 50 of the test box) to the dash panel insert for open circuit or short circuit on the basis of the CFD.

– If no fault exists in the cable connection, continue fault finding with the fault finding programme "Testing road speed signal" in the Current flow diagram, Electrical fault finding and Fitting locations binder.

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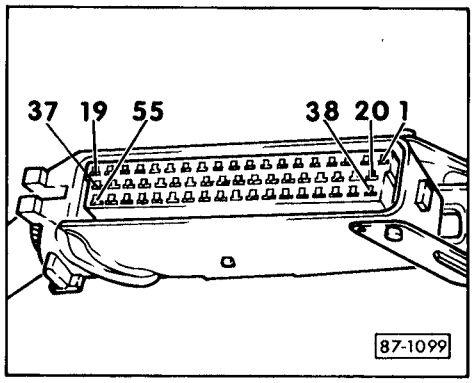
Testing actuation of tachometer

Notes:

- *Perform the following test only if no engine speed is displayed at the tachometer in the dash panel insert.*
- *The tachometer in the dash panel insert is actuated by the Motronic control unit.*

– Connect test box V.A.G 1598 with adapter cable V.A.G 1598/5 to the Motronic control unit ⇒ Repair Group 01.

– Connect tester V.A.G 1367 for measuring engine speed as specified in the operating instructions. The signal wire (green terminal) is connected to socket 40 of the test box (use adapter cable set V.A.G 1594).



– Run engine at idling speed.

– Specification: Engine speed is displayed.

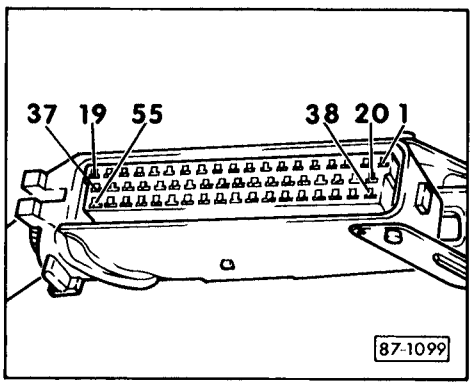
– If the engine speed is displayed on V.A.G 1367, switch off engine and remove dash panel insert.

◄ – Test cable connection between Motronic control unit (contact 40 or socket 40 at the test box, respectively) and dash panel insert for open circuit on the basis of the CFD.

– If no open circuit exists, rectify fault in dash panel insert ⇒ Workshop Manual "Electrical System".

– If the engine speed is not displayed on V.A.G 1367, switch off engine, remove dash panel insert and unplug the green 26-pin connector.

– Run engine at idling speed.



– If engine speed is now displayed on V.A.G 1367, the fault is in the dash panel insert ⇒ Workshop Manual "Electrical System".

◄ – If engine speed is not displayed on V.A.G 1367, test cable connection between Motronic control unit (contact 40 or socket 40 at test box, respectively) and dash panel insert for short circuit to positive or to negative on the basis of the CFD.

– If the engine speed is not displayed although no short circuit exists, replace Motronic control unit.

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Testing output signal for throttle valve position

This signal can be used as a load signal for other components (e.g. automatic gearbox).
The test must only be performed if the signal is actually used for another component.
At present this signal is output but is not used.

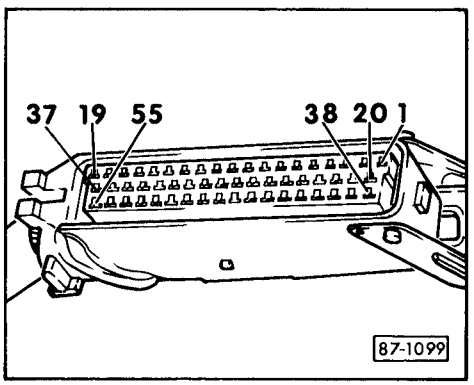
- Connect test box V.A.G 1598 with adapter cable V.A.G 1598/5 to the Motronic control unit ⇒ Repair Group 01.

- Connect diode test lamp V.A.G 1527 to socket 19 (earth) and to socket 54 (signal).

- Run engine at idling speed.

- The diode test lamp must light up with a weak light and become brighter when the accelerator pedal is depressed.

- If the diode test lamp does not light up or does not become brighter when the accelerator pedal is depressed, the following fault may exist:
  - Throttle valve potentiometer faulty, testing ⇒ page 24–50 (no input information exists for this for the Motronic control unit) or replace Motronic control unit.



- If the diode test lamp lights up and becomes brighter when the accelerator pedal is depressed, the following faults may exist:
  - Short to earth in the cable from contact 54 of the connector at the Motronic control unit to the gearbox control unit.
  - Fault in gearbox control unit (constant short to earth).

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Testing auxiliary signal for reducing boost pressure when engine hot

- Perform the following test only if an insufficient boost pressure is determined when testing the boost pressure!

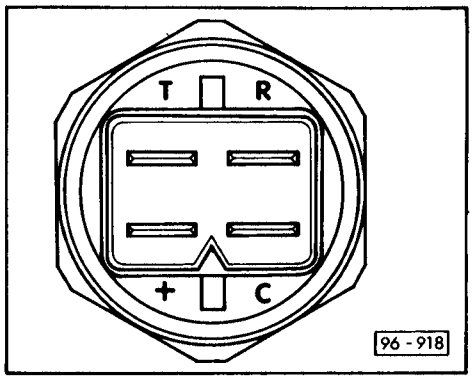
Note:

This signal switches off the boost pressure control if engine temperature is too high and results in the boost pressure being lowered below 1.5 bar.
The boost pressure control is switched off if the engine temperature rises above approx. 118° C. Once the engine temperature has again dropped below approx. 113 °C, the boost pressure control is restored.

- If the boost pressure is too low and the engine is too hot, test the signal at the Motronic control unit, contact 46.

– Connect test box V.A.G 1598 with adapter cable V.A.G 1598/5 to the Motronic control unit and to the wiring harness ⇒ Repair Group 01.

– Measure with hand-held multimeter V.A.G 1526 between socket 13 (earth) and socket 46 (signal) during the test of the turbocharger and blow-off valve (Mechanics, Repair Group 21).



Voltage at Motronic ECU contact 46	Boost pressure control	Engine temperature
greater than 2 V	active	less than about 113°C
less than 2 V	inactive (boost pressure reduced)	greater than about 118°C

- If the boost pressure is too low and the engine is not too hot, test electronic thermoswitch –F76 (is located in water manifold below intake manifold).

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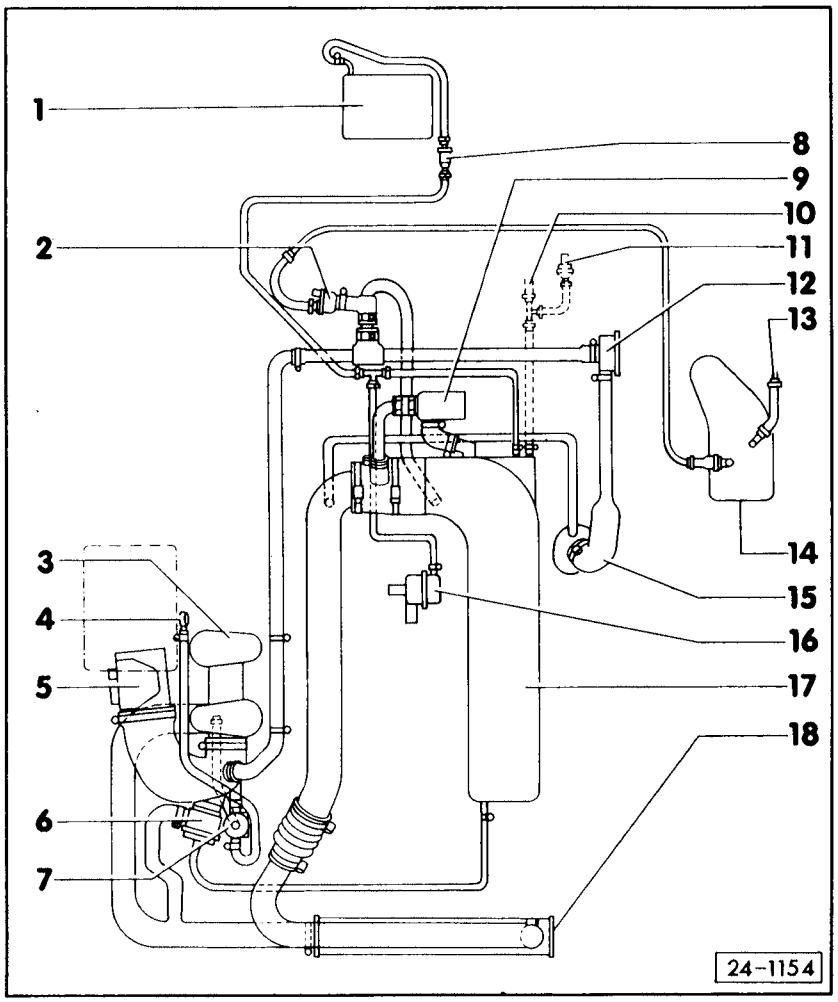


Pressure connections

1 – **Motronic control unit**
- Fitting location: behind cover below glove box

2 – **Solenoid valve for activated charcoal filter**

3 – **Turbocharger**

4 – **To blow-off valve**

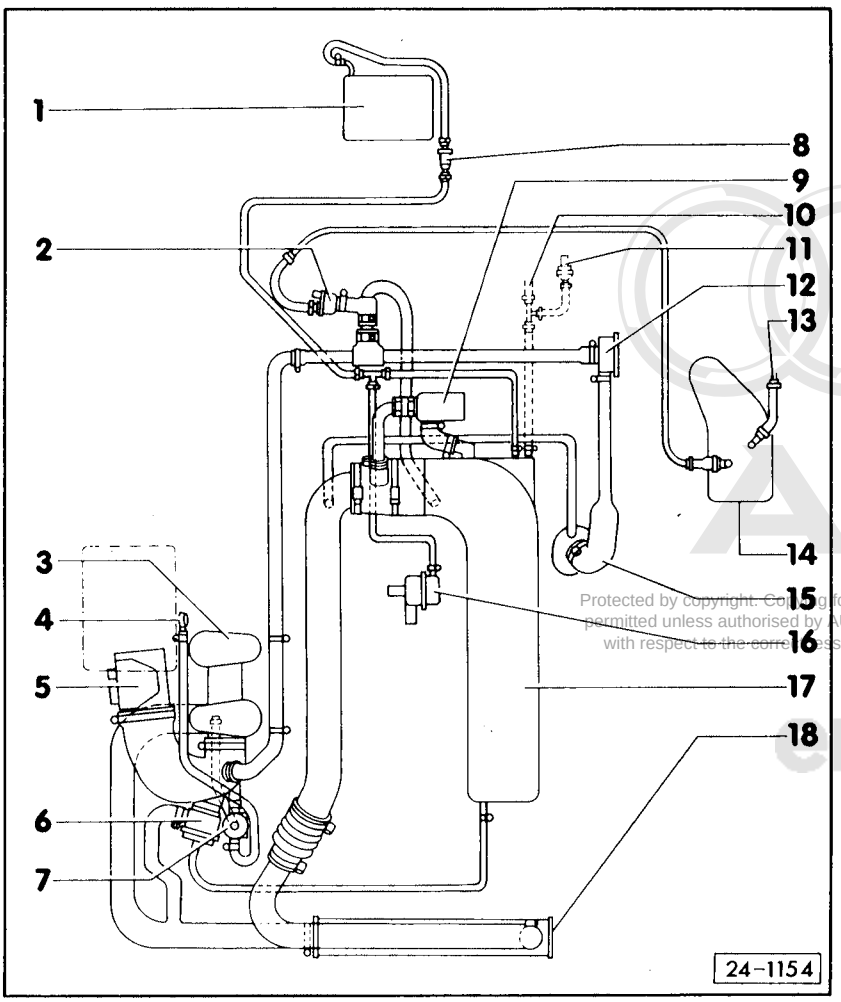
5 – **Air mass meter**

6 – **Overrun shut-off valve**
- The overrun shut-off valve reduces the boost pressure on overrun

7 – **Solenoid valve for boost pressure limiting**

8 – **Liquid separator**

9 – **Idling speed stabilization valve**



10 – **Connection for differential lock**

11 – **Connection for air conditioner** (only on vehicles with air conditioner)

12 – **Pressure control valve for crankcase ventilation**

13 – **From fuel tank**

14 – **Activated charcoal filter**

15 – **Crankcase ventilation**

16 – **Fuel pressure regulator**

17 – **Manifold**

18 – **Charge air cooler**

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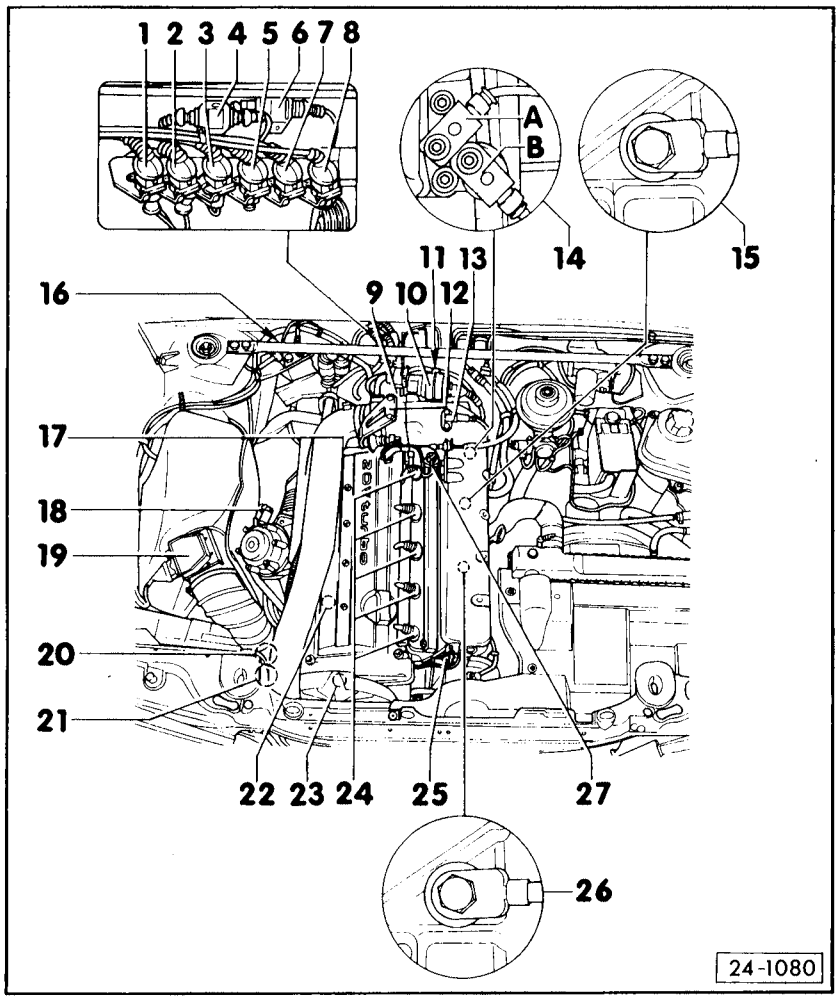


Motronic components

1 – **Plug connection, cylinders 4 and 5 (N 163 and N 164)**
(white plug connection)

2 – **Plug connection, cylinders 1, 2 and 3 (N, N 128 and N 158)**
(white plug connection)

3 – **Plug connection for sender, knock sensor I front –G61**
(blue plug connection)

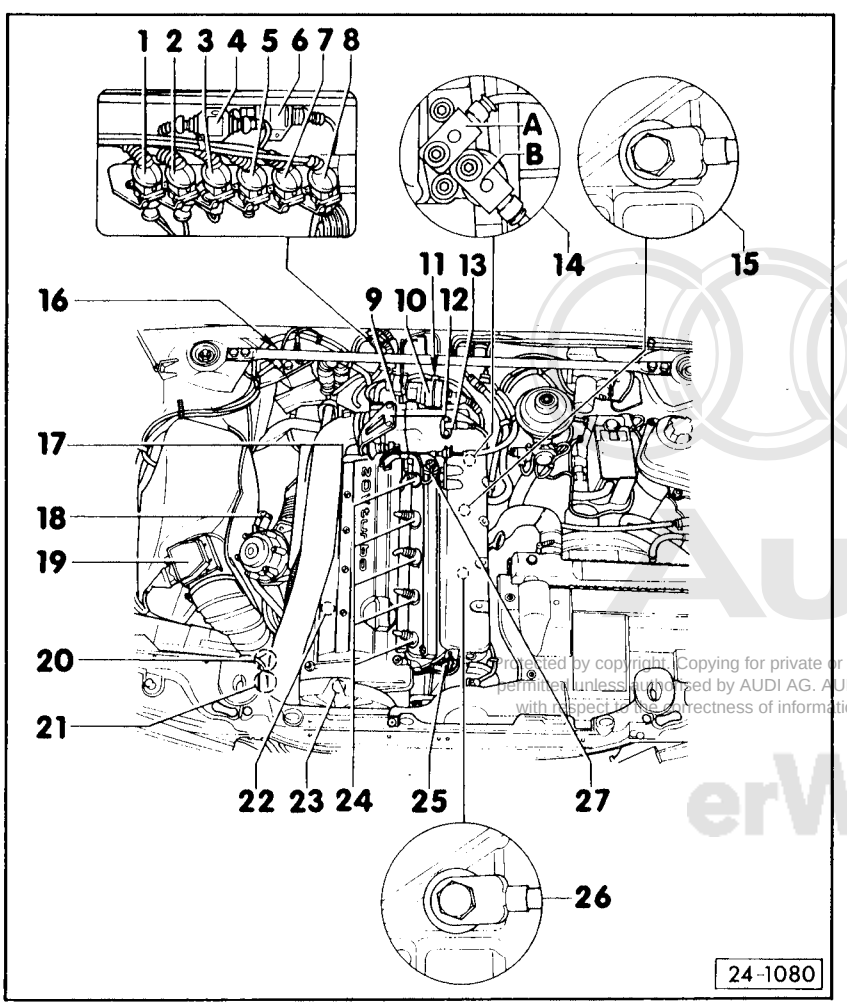
4 – **Power output stage I –N122**
(actuation for cylinders 1, 2 and 3)

5 – **Plug connection for sender, knock sensor II rear –G66**
(green plug connection)

6 – **Power output stage II –N127**
(actuation for cylinders 4 and 5)

7 – **Plug connection for engine speed sender –G28**
(grey plug connection)

8 – **Plug connection for ignition timing sender –G4**
(reference mark sender, black plug connection)



9 – **Throttle valve potentiometer –G69**
(with integral idling speed switch)

10 – **Idling speed stabilization valve –N71**
• Testing ⇒ page 24–28

11 – **Solenoid valve for activated charcoal filter –N80**
• Testing ⇒ page 24–37

12 – **Throttle valve body**

13 – **Intake air temperature sender –G42**
• Testing ⇒ page 28–18

14 – **A – Ignition timing sender –G4**
(reference mark sender, black plug connection)
• Testing ⇒ page 28–13

B – Engine speed sender –G28
(grey plug connection)
• Testing ⇒ page 28–15

15 – **Knock sensor II rear –G66**

16 – **Plug connection for lambda probe**
Lambda probe heater –Z19
(two-pin black plug connection)
Lambda probe –G39
(one-pin signal wire)

17 – **Coolant temperature sender –G62**
(at rear right of cylinder head)
• Testing ⇒ page 28–21

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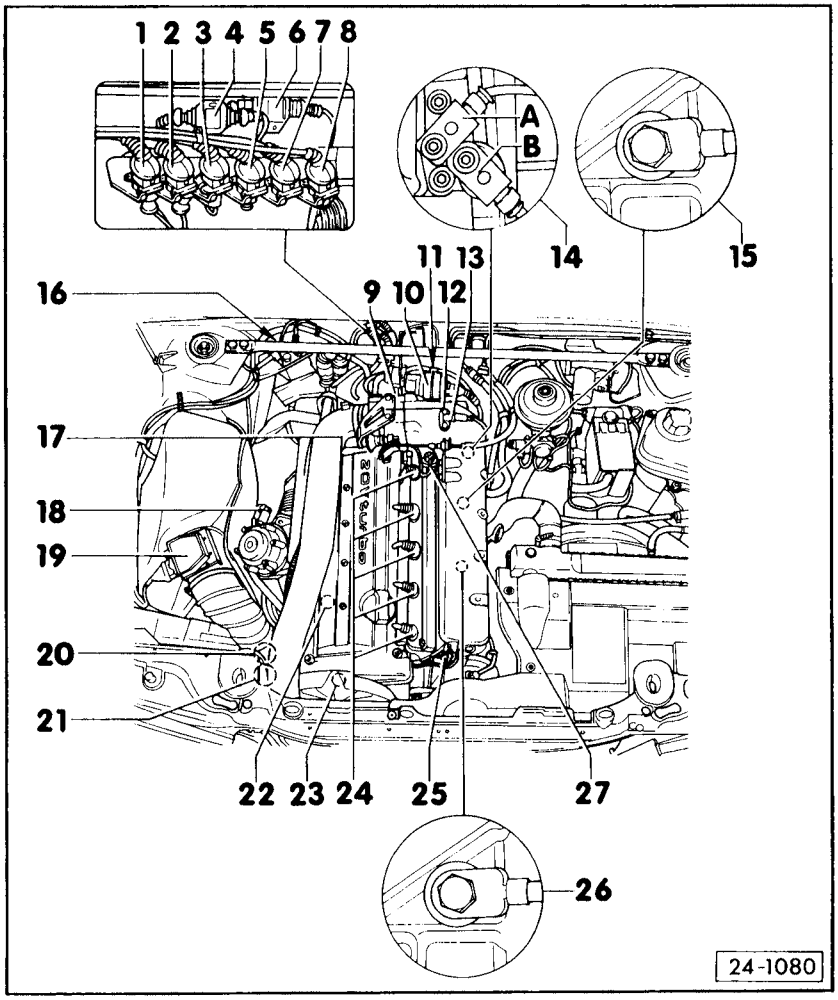

18 – **Lambda probe –G39**
- Testing ⇒ page 24–33

19 – **Air mass meter –G70**
- Testing ⇒ page 24–58

20 – **Overrun shut-off valve**
- Testing ⇒ Repair Group 21

21 – **Solenoid valve for boost pressure limiting –N75**
- Testing ⇒ page 24–41

22 – **Ignition coils –N, N128, N158, N163, N164**
- Testing ⇒ page 28–12

23 – **Hall sender –G40**
- Testing ⇒ page 28–27
- Basic setting ⇒ page 28–30

24 – **Injectors**
- Testing ⇒ page 24–19

25 – **Plug connection for Hall sender –G40**

26 – **Knock sensor I front –G61**

27 – **Fuel pressure regulator**
- Testing system and holding pressure ⇒ page 24–11

Technical data ignition

Engine code letters		ABY
Ignition timing sender**	Resistance kΩ	approx. 1.0
Engine speed sender***	Resistance kΩ	approx. 1.0
** – Testing ignition timing sender ⇒ page 28–13 *** – Testing engine speed sender ⇒ page 28–15		
Important! • ***The ignition timing is determined in the control unit.*** • ***It is not possible to adjust the ignition timing point.***		

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Spark plugs (tightening torque 30 Nm)	* Part No.	N 101 000 016 AA
	* Bosch	F 5 DPO R
Electrode gap	mm	0.6 + 0.1
Firing order		1–2–4–5–3
Engine speed limited by Motronic system Governed speed	rpm	7200 ± 40
Spark plug connector Resistance	kΩ	5.0

* Current data ⇒ Emissions and idling test binder.

Safety precautions regarding Motronic system

Pay attention to the following points when performing work on vehicles with Motronic system to avoid injuries to persons and/or damage to the Motronic control unit:

Notes:

- *Before disconnecting the battery, determine the coding of radios equipped with anti-theft coding.*
- *Do not disconnect or connect the battery unless the ignition is switched off otherwise the Motronic control unit may be damaged.*
- *Wait at least 30 seconds after switching off the ignition before unplugging the connector from the Motronic control unit otherwise the Motronic control unit may be damaged.*
- *Do not disconnect cables of the ignition system unless the ignition is switched off.*
- *Do not connect or disconnect cables of test equipment unless the ignition is switched off.*

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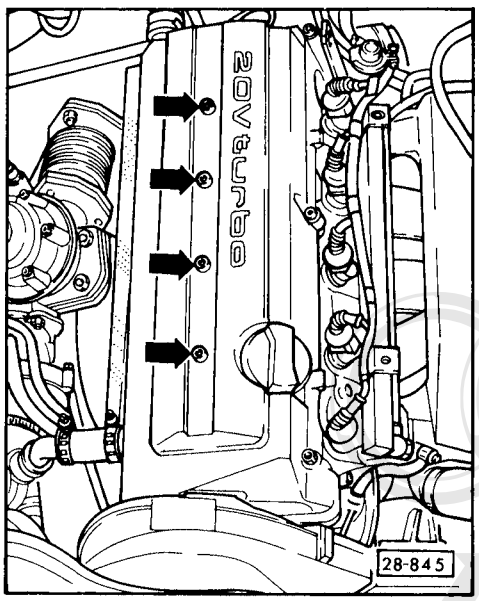
- *To operate the engine at starting speed (e.g. for testing compression pressure, testing Motronic system), unplug the three-pin connectors from the power output stages of the ignition coil and also the connectors of all five injectors.*
- *Do not disconnect the battery when the engine is running.*
- *Do not apply voltage to the control unit for simulating output signals.*
- *Do not operate starter when the injectors are removed.*

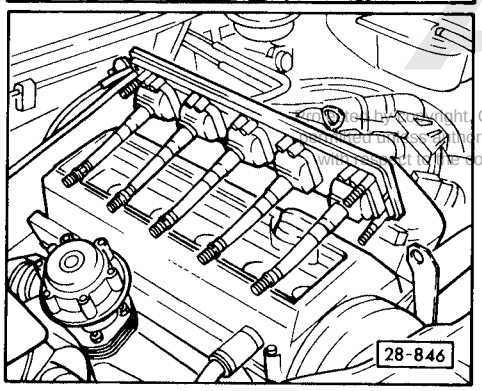


Testing ignition coils, spark plug connectors and power output stages

◄ – Unscrew ignition coil carrier.

– Unscrew spark plugs.

– Unplug connectors from all five injectors.



◄ – Insert spark plugs in the spark plug connectors (use new spark plugs if necessary) and place ignition coils down onto the cylinder head cover as shown in the illustration.

– Operate starter and check formation of spark at the spark plugs.

Important!

Do not touch ignition coil holder and spark plugs during the test – risk of high-voltage shock.

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– If one or several spark plugs does not properly spark, repeat test with other spark plugs.

– If the spark is again not properly generated, unplug appropriate spark plug connector.

– Measure resistance of spark plug connector with hand-held multimeter V.A.G 1526.

Specification: approx. 5 kΩ.

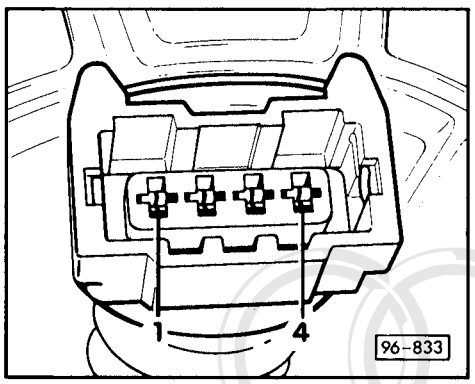
– If the specification is not achieved, replace spark plug connector.

– If the specification is achieved, test voltage supply of the ignition coils ⇒ page 28–12.

– If the voltage supply is in order, test actuation of the power output stages.

– If the actuation of the power output stages is in order and the fault occurs only at one or at a few spark plugs, switch over both power output stages as a test and repeat test of ignition sparks.

– If the fault now occurs at different spark plugs, replace faulty power output stage.



– If the fault again occurs at the same spark plugs, replace appropriate ignition coil.

Testing actuation of power output stages –N122 and –N127

Fitting location ⇒ page 28–1.

– Unplug both four-pin connectors from the power output stages.

– Connect diode test lamp V.A.G 1527 between battery positive and contact 2 (earth) of the connector for the right-hand power output stage – diode test lamp must light up.

– Connect diode test lamp V.A.G 1527 between battery positive and contact 2 (earth) of the connector for the left-hand power output stage – diode test lamp must light up.

– If the diode test lamp does not light up during one or both tests, test cable connection on basis of CFD, rectify any open circuit.

– Unplug connectors from all five injectors.

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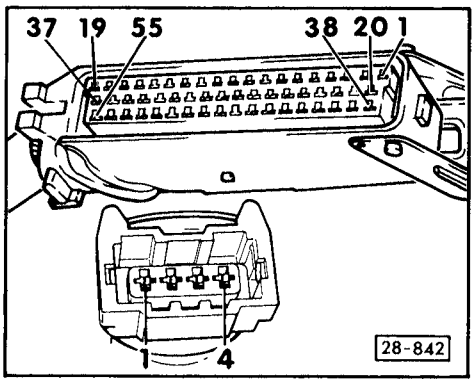

– Connect diode test lamp between engine earth and in turn contact 1, 3 and 4 of the connector for the left-hand power output stage and also to contacts 3 and 4 of the connector for the right-hand power output stage.

– Operate starter each time for a few seconds. When this is done, the diode test lamp must flash.

– If the diode test lamp does not flash, connect test box V.A.G 1598 with adapter cable V.A.G 1598/5 **only to the wiring harness** to the Motronic control unit ⇒ Repair Group 01.

◄ – Test the following cables for open circuit or short circuit on the basis of the CFD:

Connector for left-hand power output stage	V.A.G 1598 socket	Connector at Motronic control unit
1	23	23
3	2	2
4	1	1

Connector for left-hand power output stage	V.A.G 1598 socket	Connector at Motronic control unit
3	21	21
4	20	20

– Rectify any open circuit or short circuit.

– If neither an open circuit nor a short circuit is found and the diode test lamp does not flash, replace Motronic control unit.

Testing voltage supply for ignition coils –N, –N128, –N158, –N163 and –N164

Fitting location of plug connections ⇒ page 28–1, items 1 to 8.

– Separate both plug connections (white) at the connector holder.

– Connect diode test lamp V.A.G 1527 between engine earth and in turn all six contacts of the two three-pin connectors.

– Specification: Diode test lamp must light up each time.

– If the specifications are not achieved, test cable connection on the basis of CFD and repair, if necessary.

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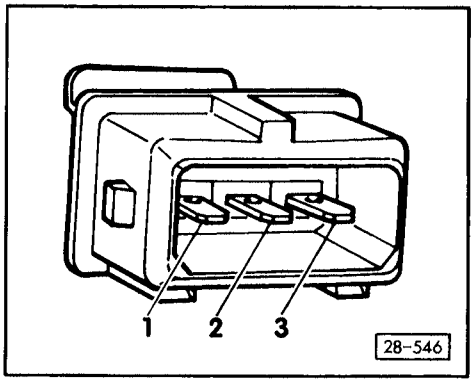
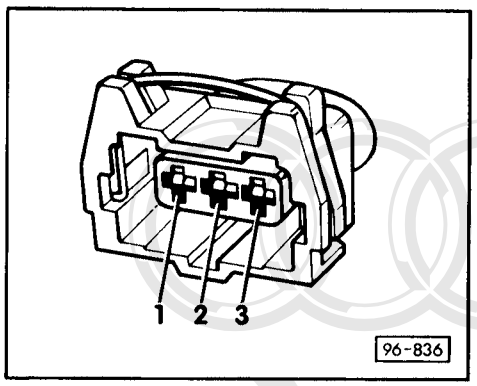


Testing ignition timing sender –G4

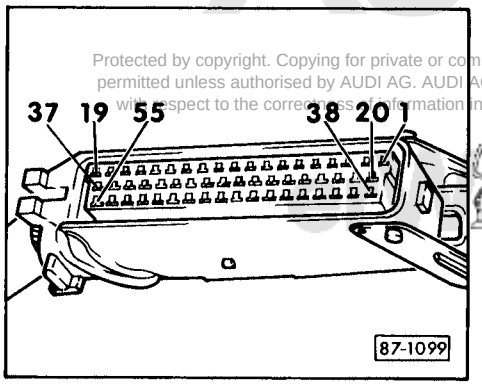
Fitting location of sender and of plug connection ⇒ page 28–1.

- Separate plug connection of ignition timing sender (identification: black plug connection).
- Connect hand-held multimeter V.A.G 1526 with auxiliary cables from V.A.G 1594 for resistance measurement to contacts 1 and 2.
- Specification: approx. 1 kΩ.
- If the specification is not achieved, replace ignition timing sender.
- If the specification is achieved, connect hand-held multimeter to contacts 1 and 3 and also to contacts 2 and 3.

  Specification: infinite ohms (no continuity) in each case.
- If the specification is not achieved, replace ignition timing sender.
- If the specification is achieved, test cables between sender coupling and Motronic control unit as follows:



- Connect test box V.A.G 1598 with adapter cable V.A.G 1598/5 **only** to the wiring harness to the Motronic control unit ⇒ Repair Group 01.
- Test the following cables for open circuit or short circuit to each other on the basis of the CFD:
  - From sender coupling contact 1 to socket 48.
  - From sender coupling contact 2 to socket 47.
  - From sender coupling contact 3 to socket 19 (earth).



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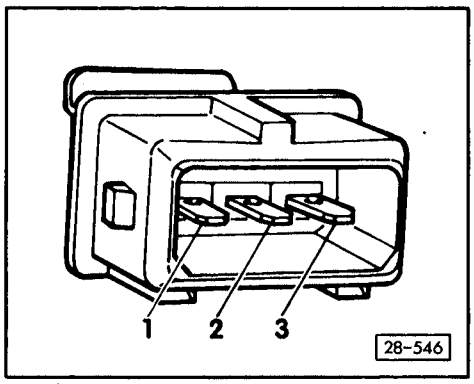
- Rectify any open circuit or short circuit in the cables between sender coupling and the connector for the Motronic control unit, contacts 47/48 and 19.
- If no fault has been found up to this point, check pin for sender at ring gear:
  The holder with ignition timing point sender and engine speed sender must be removed in order to inspect the pin.
- Crank engine sufficiently until the pin appears in the opening.

– Check condition of pin (damaged/bent) and check that it is tight; replace flywheel if necesary.

– If no fault has been found during all the tests so far, replace Motronic control unit.

Testing engine speed sender –G28



Fitting location of sender and of plug connection ⇒ page 28–1.

– Separate plug connection of engine speed sender (identification: **grey** plug connection).

◄ – Connect hand-held multimeter V.A.G 1526 with auxiliary cables from V.A.G 1594 for resistance measurement to contacts 1 and 2.

– Specification: approx. 1 kΩ.

– If the specification is not achieved, replace engine speed sender.

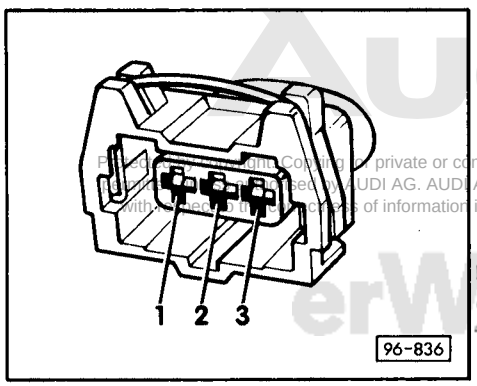
– If the specification is achieved, connect ohmmeter to contacts 1 and 3 and also to contacts 2 and 3.

Specification: infinite ohms (no continuity) in each case.

– If the specification is not achieved, replace engine speed sender.

– If the specification is achieved, test cables between sender coupling and Motronic control unit as follows:

– Connect test box V.A.G 1598 with adapter cable V.A.G 1598/5 **only** to the wiring harness to the Motronic control unit ⇒ Repair Group 01.



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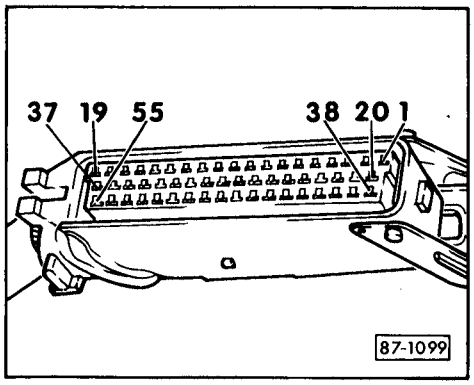
◄ – Test the following cables for open circuit or short circuit to each other on the basis of the CFD:
- From sender coupling contact 1 to socket 48.
- From sender coupling contact 2 to socket 49.
- From sender coupling contact 3 to socket 19 (earth).



- Rectify any open circuit or short circuit in the cables between sender coupling and the connector for Motronic control unit (contacts 48/49 and 19).
- If no fault has been found up to this point, check the teeth of the starter ring gear:
  The holder with engine speed sender and ignition timing point sender must be removed in order to examine the teeth.
- Slowly crank engine and check concentricity of ring gear and also check whether teeth broken off or damaged; replace flywheel if necesary.
- If no fault has been found in all the tests so far, replace Motronic control unit.

Testing intake air temperature sender –G42

Fitting location of intake air temperature sender ⇒ page 28–2.

- Engine cooled down to room temperature (approx. 20 °C).
- Connect test box V.A.G 1598 with adapter cable V.A.G 1598/5 **only** to the wiring harness to the Motronic control unit ⇒ Repair Group 01.
- Connect hand-held multimeter V.A.G 1526 with auxiliary cables from V.A.G 1594 for resistance measurement to sockets 30 and 44.
- Specification: 450 ... 650 Ω.
- If the specification is not achieved, push back rubber grommet on intake air temperature sender.
- Connect hand-held multimeter between the two contacts of the sender.
- Specification: approx. 450 ... 650 Ω.
- If the specification is not achieved, replace intake air temperature sender.
- If the specification is achieved, test wiring between sender and control unit as follows:
- Connect hand-held multimeter to socket 30 of the test box and in turn to the two contacts of the sender.

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- Specification: approx. 0 Ω (continuity) or approx. 450 ... 650 Ω.

- This test should be repeated at socket 44 of the test box.

- If the specifications are not achieved, rectify open circuit in wiring or short circuit on the basis of the CFD.

- Read measured value block and select display group 03 ⇒ Repair Group 01.

- Check readout in display field 4.
  The intake air temperature is displayed in°C.

Note:

If the engine has cooled down to room temperature, the intake air temperature is approximately in the range of the ambient temperature immediately after starting.

- If the intake air temperature displayed appears implausible relative to the ambient temperature, test cable connection for short circuit to each other and also for short circuit to other cables (shunt).

Replacing intake air temperature sender –G42

- Unscrew intake air temperature sender.

- Push back rubber grommet on intake air temperature sender.

- Cut off cables at sender and pull off rubber grommet.

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- Fit on new rubber grommet, fit shrink hoses onto both cables.

- Attach cable shoes to the bared cable ends and fit on at sender.

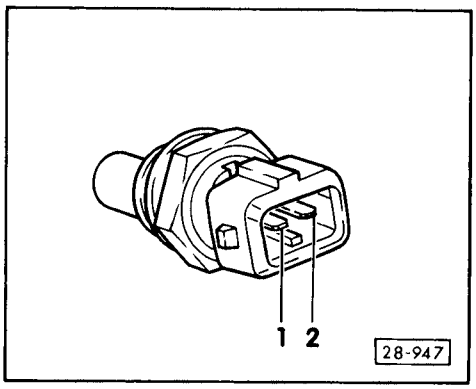
- Carefully solder both cable shoes to the sender (sender must not become too hot).

Note:

Do not allow any soldering metal to flow beyond the cable shoe into the strand of the cable otherwise there is a risk of a fracture point.

- Push shrink-fit hoses over the soldered points and heat.

- Fit on rubber grommet and install sender.



Testing coolant temperature sender –G62

Fitting location of coolant temperature sender ⇒ page 28–2.

- Engine cooled down to room temperature (approx. 20 °C)

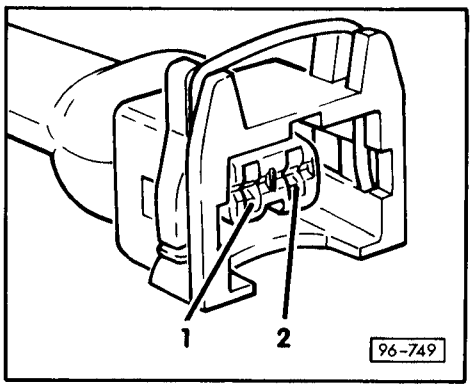
– Unplug connector at the coolant temperature sender.

◄ – Connect hand-held multimeter V.A.G 1526 with auxiliary cables from V.A.G 1594 for resistance measurement to contacts 1 and 2 of the sender.

– Specification: approx. 1.5 ... 3.0 kΩ.

– If the specification is not achieved, replace sender.

– If the specification is achieved, test wiring from sender to Motronic control unit as follows:

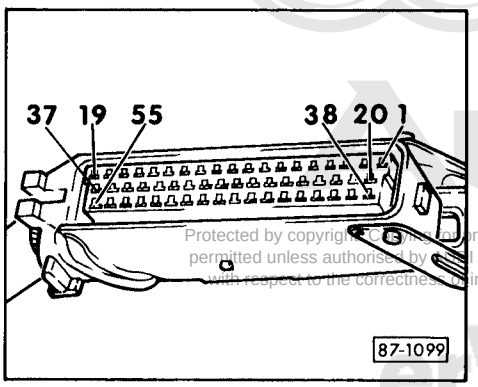


– Connect test box V.A.G 1598 with adapter cable V.A.G 1598/5 **only** to the wiring harness to the Motronic control unit ⇒ Repair Group 01.

◄ – Test cable from socket 45 to contact 1 of the connector at the coolant temperature sender for open circuit. Specification max. 1.0 Ω.

– Test cable from socket 30 to contact 2 of the connector at the coolant temperature sender for open circuit. Specification max. 1.0 Ω.

– Test both cables for short circuit to each other.



◄ – Determine any short circuit or open circuit in the wiring between the connector at the sender and the connector at the Motronic control unit (contact 30 and 45) on the basis of the CFD and rectify.

Testing signal for coolant temperature

Notes:

- *The coolant temperature sender is a temperature-dependent resistor. If, for example, the sender signal is falsified as the result of moisture in a plug connection (same effect as resistor connected in parallel), this falsification may still be within a range which is not detected by the control unit.*
- *If a fault regarding the coolant temperature sender is stored, a substitute value derived from the intake air temperature sender is displayed in the measured value block for a time determined by the control unit.*
  After this time has elapsed, a substitute value for an engine at normal operating temperature is assumed.

– Interrogate fault memory and erase ⇒ Repair Group 01.

– Read measured value block and select display group 01 ⇒ Repair Group 01.

– Check readout in display field 2.
The coolant temperature is displayed in°C.

Note:

If the engine has cooled down to room temperature, the coolant temperature is approximately within the range of the ambient temperature immediately after starting and rises as the engine heats up.

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- If the coolant temperature displayed appears implausible relative to the ambient temperature or to the initial heating up of the engine although no fault is stored, test cable connection for short circuit to each other and also for short circuit to other cables (shunt, e.g. as a result of moisture in plug connections).

- If no fault has been found during the tests up to this point, install another coolant temperature sender as a check.

- If the fault still occurs after installing a different sender, replace Motronic control unit.

Testing voltage supply of Motronic control unit

- Test fuse –S27 in the auxiliary fuse carrier.

- Connect test box V.A.G 1598 with adapter cable V.A.G 1598/5 **only** to the wiring harness to the Motronic control unit ⇒ Repair Group 01.

- Connect diode test lamp V.A.G 1527 to socket 18 (continuous positive) and in turn to the sockets 10, 14, 19 and 24 (earth connections).

- The diode test lamp must light up in each case.

- If the diode test lamp does not light up, rectify open circuit in wiring on basis of CFD.

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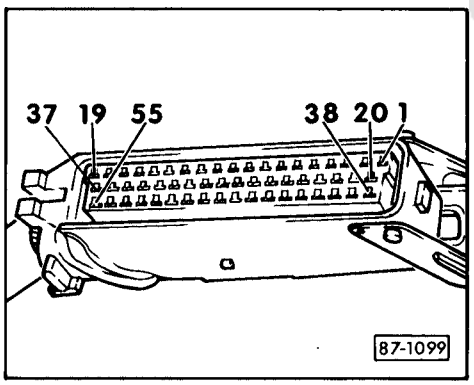
- Connect Motronic control unit to the adapter cable V.A.G 1598/5.

- Remove fuse –S28 (auxiliary fuse holder).

- Connect diode test lamp V.A.G 1527 to earth (socket 19) and to socket 37 of the test box.

- Switch on ignition, diode test lamp must light up.

- If the diode test lamp does not light up, replace Motronic control unit.



- Insert fuse –S28.

- If the diode test lamp lights up, operate starter for a few seconds.

- The diode test lamp must light up when the ignition is switched on and during starting.

- If the diode test lamp goes out when the starter is operated, perform the following tests:
  - Test fuse –S28.
  - Test cable from contact 37 to fuse –S28 for open circuit on the basis of the CFD.
  - Test cable from fuse –S28 to the fuel pump relay –J17 (relay position 10) contact 31 for open circuit on the basis of the CFD.
  - Test fuel pump relay and, if necessary, actuation of fuel pump relay ⇒ Repair Group 24.

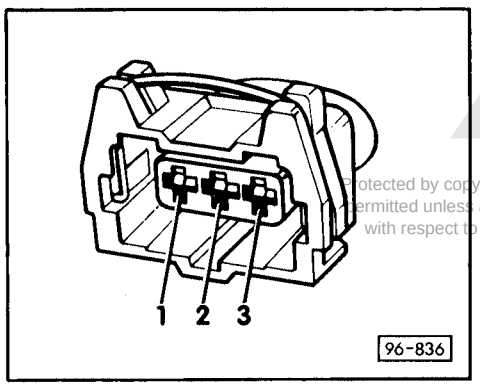
Testing knock sensors –G61 and –G66

Notes:

- *The knock sensors themselves cannot be tested electrically.*
- *Interrogate fault memory ⇒ Repair Group 01.*
- *It is important to adhere exactly to the tightening torque of 20 Nm if the knock sensors are to operate properly.*
- *Check plug connection from knock sensor to wiring harness for signs of corrosion.*

– Connect test box V.A.G 1598 with adapter cable V.A.G 1598/5 **only** to the wiring harness to the Motronic control unit ⇒ Repair Group 01.

– Separate plug connections of the two knock sensors in the engine compartment (fitting location of plug connections ⇒ page 28–1).



– Test the following cables for open circuit or short circuit to each other on the basis of the CFD:

–G61 (front):
- From brown sensor coupling, contact 1 to socket 11 (signal wire).
- From brown sensor coupling, contact 2 to socket 30 (sensor earth connection to control unit).
- From brown sensor coupling, contact 3 to socket 19 (screening at earth).

–G66 (rear):
- From green sensor coupling, contact 1 to socket 29 (signal wire).
- From green sensor coupling, contact 2 to socket 30 (sensor earth connection to control unit).
- From green sensor coupling, contact 3 to socket 19 (screening at earth).

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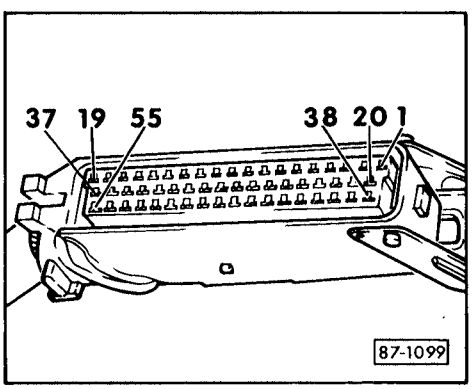
– Continuity – specification max. 1.0 Ω.
Short circuit – specification approx. 1 MΩ to infinite ohms.



– Rectify any open circuit or short circuit in the cables between the respective sensor coupling and the connector at the Motronic control unit, contacts 11/29, 30, 19.

Note:

Use only gold-plated contacts for repairing contacts in the connectors of the knock sensor.

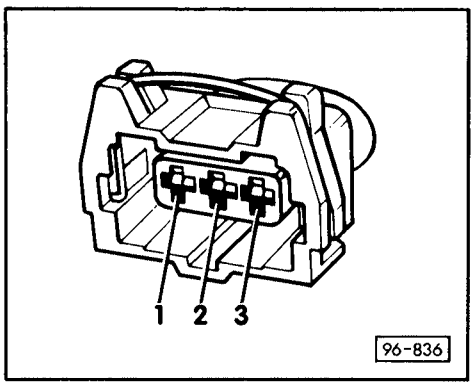
– If a fault is displayed for the respective knock sensor although the cable connection is in order, replace knock sensor.

Testing Hall sender –G40

The Hall sender is located at the front of the cylinder head behind the camshaft sprocket ⇒ page 28–3, item 23.

– Connect test box V.A.G 1598 with adapter cable V.A.G 1598/5 to the Motronic control unit (⇒ Repair Group 01).

– Connect diode test lamp V.A.G 1527 to sockets 8 and 12.



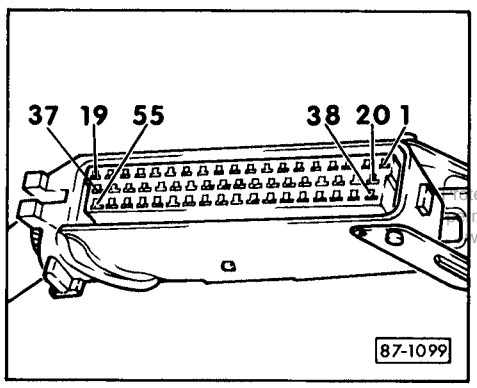
– Operate starter for a few seconds.

– The diode test lamp must flash briefly during each second engine revolution.

– If the diode test lamp does not flash, switch off ignition and unplug three-pin connector for Hall sender in front of intake manifold ⇒ page 28–3, item 25.

◄ – Test the following cables for open circuit or short circuit to each other on the basis of the CFD:
- From Hall sender connector, contact 1 to socket 12
- From Hall sender connector, contact 2 to socket 8
- From Hall sender connector, contact 3 to socket 19

– Continuity – specification max. 0.5 Ω.
Short circuit – specification infinite ohms.



◄ – Rectify any open circuit or short circuit in the cables between the Hall sender connector and the connector for the Motronic control unit (contacts 12, 8 and 19).

– If neither an open circuit nor a short circuit exists, switch on ignition.

– Connect hand-held multimeter V.A.G 1526 with auxiliary cables from V.A.G 1594 for voltage measurement to sockets 12 and 19.

– Specification: 4.5 ... 5.5 volts.

– Connect hand-held multimeter V.A.G 1526 to sockets 8 and 19.

– Specification: 4.3 ... 5.2 volts.

– If the specifications are not achieved, replace Motronic control unit.

– If the specifications are achieved, replace Hall sender (Removing and installing Hall sender ⇒ Basic setting of Hall sender, page 28–30).

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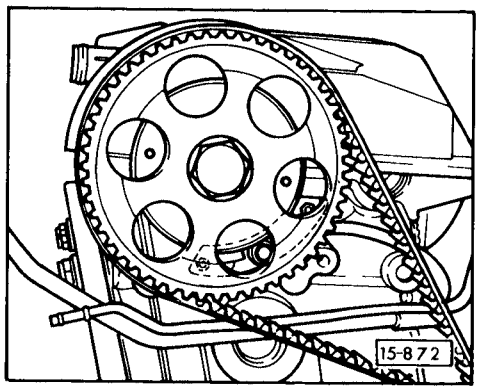

Basic setting of Hall sender

Note:

◄ *The Hall sender is located behind the camshaft sprocket. It is set by being attached to the cylinder head.*

- The Hall sender and the camshaft sprocket should only be checked for signs of mechanical damage.
- Installing and removing Hall sender ⇒ Repair Group 13 (Mechanics).

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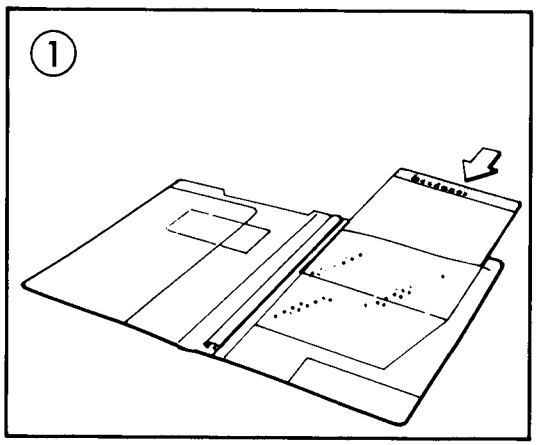

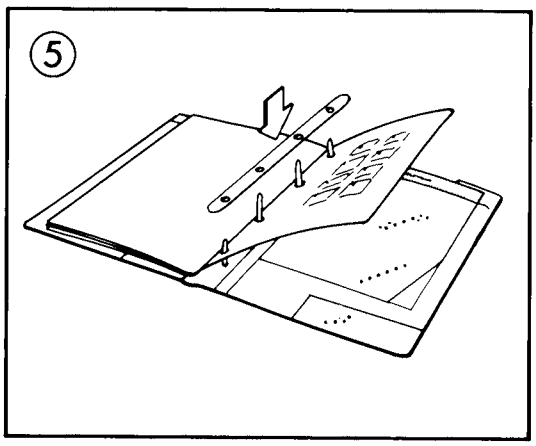

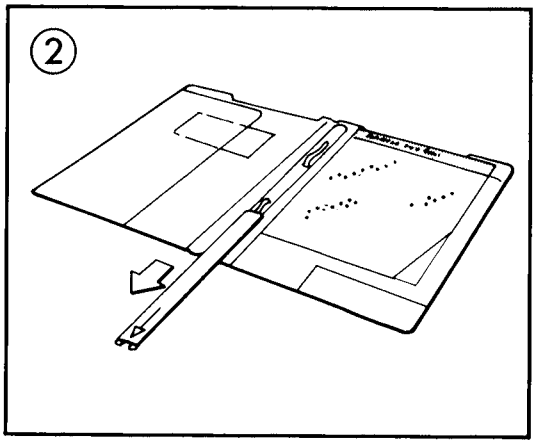

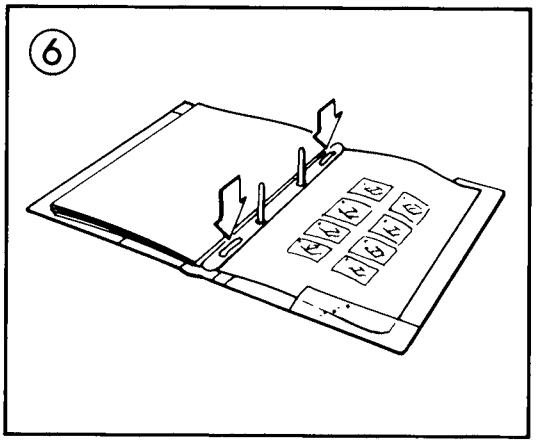

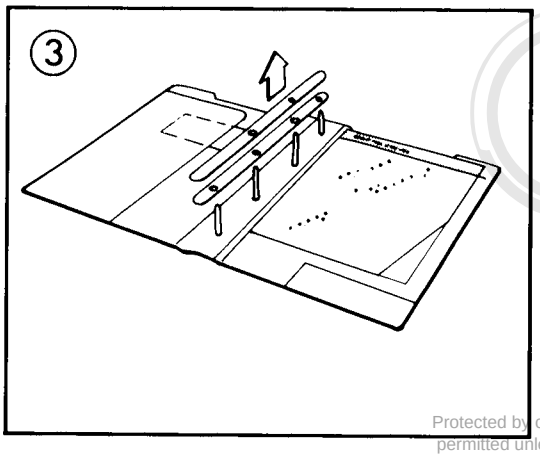

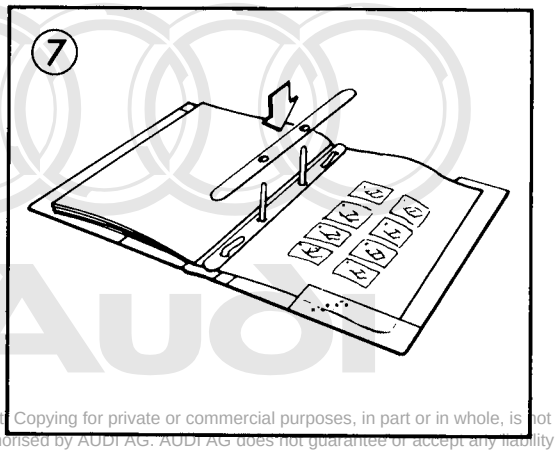

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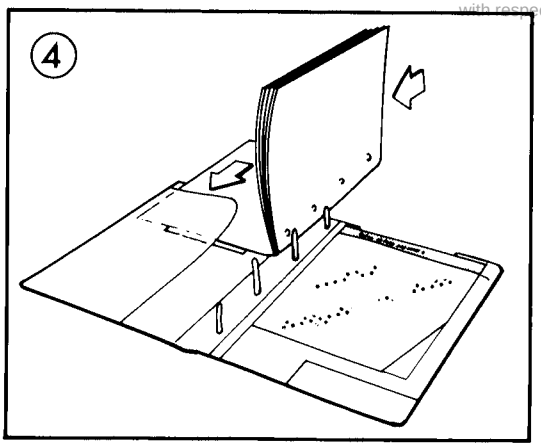

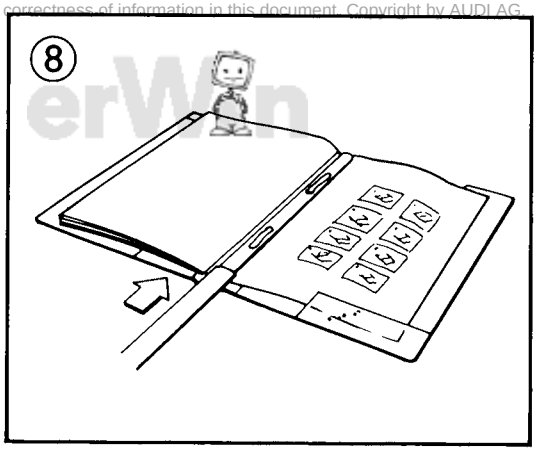

Service.

Technical Bulletin to Workshop Manual

Audi 80 1992 >

Engine code letters	ABY									

Booklet Motronic fuel injection and ignition system (5 cylinder) Edition 09/92

Enter in Repair Group list

Repair Group 01 **Bulletin No.** 1

Affected: Vehicles with control unit, part number 895 907 551A*

* see "Interrogating control unit version"

Subject

New control unit:
A new control unit with extended self-diagnosis functions has been introduced in production. This bulletin contains the main technical changes, which also apply to Audi 100 1991 > vehicles with engine code letters "AAN".

Contents	Bulletin page	Booklet from page
- Reading measuring value block	1	01-18
- Basic setting of engine	18	01-50

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Reading measuring value block

Test requirements:

- *Engine oil temperature at least 80°C.*
- *All electrical equipment switched off.*
- *Air conditioner switched off. Keep pressing "-" button on operating and display unit of air conditioner until all displays go out.*
- *Selector lever at "P" or "N".*
- Interrogate and erase fault memory, see repair group 01.
- Leave engine running at idle speed.

Rapid data transfer	HELP
Select function XX	

< Readout in display

Note :

A list of available functions is printed out if the HELP button is pressed.

1

- Press buttons 0 and 8.
  (This selects function 08 "Read measuring value block".)

Rapid data transfer	Q
08 - Read measuring value block	

< Readout in display

- Confirm entry with Q button.

Read measuring value block	HELP
Enter display group number	XX

< Readout in display

- Enter required display group number (00...09) - a list of the display groups with specified display readings is given on page 4.

Notes :

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- *The measured values in display group number 00 are given in decimal form.*
- *Display group number 01 is taken as an example here to demonstrate the procedure.*

- Press buttons 0 and 1.
  (To select "display group number 01").

Read measuring value block Q Enter display group number 01

< Readout in display

- Confirm entry with Q button.

Read measuring value block 1 1 2 3 4

< Readout in display

Notes:

- *The current information in the display is printed out every time the PRINT button is pressed.*
- *Press "C" before selecting another display group.*

- Press button →.

Rapid data transfer HELP Select function XX

< Readout in display

List of display groups

Display group number	Readout in display	Designation
00	Read measuring value block 0 1 2 3 4 5 6 7 8 9 10	See basic setting, repair group 01
01	Read measuring value block 1 1 2 3 4	1 = Engine speed 2 = Coolant temperature 3 = Lambda control value for air/fuel mixture 4 = Ignition timing
02	Read measuring value block 2 1 2 3 4	1 = Engine speed 2 = Duration of injection 3 = Supply voltage at control unit 4 = Atmospheric pressure
03	Read measuring value block 3 1 2 3 4	1 = Engine speed 2 = Engine load 3 = Throttle valve angle 4 = Intake manifold temperature
04	Read measuring value block 4 1 2 3 4	1 = Engine speed 2 = Engine load 3 = Road speed 4 = Operating condition: XXXX1 Overrun cut-off XXX1X Idle switch closed XX1XX Part throttle and full throttle X1XXX Disregard display 1XXXX Disregard display

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Display group number	Display readout	Designation
05	Read measuring value block 5 1 2 3 4	1 = Engine speed 2 = Self-adaptive value 1 of operating curve of idling speed stabilisation valve -N71 3 = Duty cycle of control signal for -N71 4 = Operating condition: XX X1 Gear engaged (automatic gearbox only) XX 1X Engine torque reduction (for gearshift: vehicles with automatic gearbox) X1 XX Increased idling speed (air conditioner requires higher heating or cooling output) 1X XX Air conditioner compressor on
06	Read measuring value block 6 1 2 3 4	1 = Control value for air/fuel mixture (lambda control value) 2 = Self-adaptive value, air/fuel mixture (lambda self-adaptive value) at idle speed with fuel tank vent function inactive[1)] 3 = Self-adaptive value, air/fuel mixture (lambda self-adaptive value) at idle speed or part throttle and fuel tank vent function active[2)] 4 = Self-adaptive value, air/fuel mixture (lambda self-adaptive value) at part throttle with fuel tank vent function inactive[1)] 1) Solenoid valve 1 for active carbon filter -N80 remains closed for a period of 1 min 2) Pulsed operation of solenoid valve 1 for active carbon filter -N80 for a period of 6 min

Display group number	Display readout	Designation
07	Read measuring value block 7 1 2 3 4	1 = Control value for idling speed stabilisation 2 = Self-adaptive value 1 of operating curve of idling speed stabilisation valve -N71 3 = Self-adaptive value 2 of operating curve of idling speed stabilisation valve -N71 4 = Self-adaptive value of idling speed stabilisation (basic air requirement) - with air conditioner compressor off - with no gear engaged (automatics)
08	Read measuring value block 8 1 2 3 4	1 = Self-adaptive value of idling speed stabilisation (basic air requirement) - with air conditioner compressor off - with no gear engaged (automatics) 2 = Self-adaptive value of idling speed stabilisation (basic air requirement) - with air conditioner compressor on - with no gear engaged (automatics) 3 = Self-adaptive value of idling speed stabilisation (basic air requirement) - with air conditioner compressor off - with gear engaged (automatics) 4 = Self-adaptive value of idling speed stabilisation (basic air requirement) - with air conditioner compressor on - with gear engaged (automatics)
09 (and 10 ... 99)	Read measuring value block 9 1 2 3 4	1 = Engine speed 2 = Internal processing value for duration of injection (engine load signal) 3 = Duty cycle of control signal for solenoid valve 1 for active carbon filter -N80 4 = Self-adaptive value, air/fuel mixture (lambda self-adaptive value) at idle speed or part throttle with tank vent function active (pulsed operation of solenoid valve 1 for active carbon filter -N80 for a period of 6 min)

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erWin

Display group number 01

Display field	Display on V.A.G 1551	Cause of fault	Remedy
1	760...840 rpm	OK	
	higher than 840 rpm	Idling speed stabilisation valve -N71 at bottom end of control range Air leaks downstream of throttle Vacuum hoses have become disconnected Air conditioner not switched off Air conditioner compressor switching signal is present although compressor is switched off Idling speed stabilisation valve defective	- Accelerate engine briefly 4 times at intervals of 15 seconds. - Rectify cause of air leak. - Switch off air conditioner. - Check air conditioner - see repair group 87
	less than 760 rpm	Idling speed stabilisation valve -N71 sticking or defective	- Perform final control diagnosis - see repair group 01 - Check -N71 - see repair group 24
2	85 ... 105 ° C	OK	
	higher than 105 ° C	Sender for coolant temperature -G62 defective Radiator fan not working	- Check -G62 - see repair group 28
	less than 85 ° C	Sender for coolant temperature -G62 defective Thermostat defective	- Check -G62 - see repair group 28

Display field	Display on V.A.G 1551	Cause of fault	Remedy
3	disregard display	Can only be tested with "System in basic setting 1", display field 3	
4	8 ... 12 ° before TDC	OK	
	greater than 12 ° before TDC	Idling speed stabilisation valve -N71 defective Idle switch -F60 defective	- Perform final control diagnosis - see repair group 01 - Check -N71 - see repair group 24 - Check -F60 - see repair group 24
	less than 8 ° before TDC	Idling speed stabilisation valve -N71 defective	- Perform final control diagnosis - see repair group 01 - Check -N71 - see repair group 24

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Display group number 02

Display field	Display on V.A.G 1551	Cause of fault	Remedy
1	760...840 rpm	Display group number 01, display field 1	
2	disregard display		
3	12.5 ... 14.5 V	OK	
	greater than 14.5 V	Voltage regulator defective	- Check voltage regulator - see repair group 90
	less than 12.5 V	Battery discharged Voltage regulator defective Voltage drop in wiring to Motronic control unit	- Check battery voltage - Check voltage regulator - see repair group 90 - Check wiring connections according to current flow diagram
4	... mbar	Compare reading with barometer (e.g. turbocharger tester V.A.G 1397/A) : the readings must be approximately the same.	- Check altitude sender -F96 - see repair group 24.

Display group number 03

Display field	Display on V.A.G 1551	Cause of fault	Remedy
1	760...840 rpm	See display group number 01, display field 1	
2	26 ... 35 %	OK	
	greater than 35 %	Air conditioner switched on Electrical equipment switched on Air conditioner compressor is running, even though air conditioner is switched off Air mass meter -G70 defective Central hydraulic pump defective Air leaks between turbocharger and throttle valve	- Switch off air conditioner. - Switch off electrical equipment. - Check air conditioner - see repair group 87. - Check -G70 - see repair group 24. - Check central hydraulic pump - see repair group 48. - Repair leaks.
	less than 26 %	Air leaks between air mass meter -G70 and turbocharger or downstream of throttle valve Vacuum hose come off Crankcase breather leaking Tank vent system Solenoid valve 1 for active carbon filter sticking Air mass meter -G70	- Repair leaks - Check vacuum system - Check crankcase breather - Check tank vent system - Perform final control diagnosis - see repair group 01 - Check -G70 - see repair group 24

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Display field	Display on V.A.G 1551	Cause of fault	Remedy
3	5 ... 10 < °	OK	
3	greater than 10 <°	Throttle valve potentiometer -G69 defective or incorrectly adjusted Throttle cable incorrectly adjusted Throttle valve sticking	- Check throttle valve potentiometer -G69 - see repair group 24 - Adjust throttle cable - see repair group 20 - Check throttle valve
	less than 5 <°	Throttle valve potentiometer -G69 defective or incorrectly adjusted	- Check throttle valve potentiometer -G69 - see repair group 24
4	... ° C	No specified value: depends on ambient temperature	

Display group number 04

Display field	Display on V.A.G 1551	Cause of fault	Remedy
1	760...840 rpm	See display group number 01, display field 1	
2	26 ... 35 %	See display group number 03, display field 2	
3	4 km/h	OK (a constant speed of 4 km/h is displayed at speeds below 4 km/h)	
4	00010	OK (only in idle condition)	
	00000	Idle switch -F60 defective	- Check -F60 - see repair group 24

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Display group number 05

Display field	Display on V.A.G 1551	Cause of fault	Remedy
1	770...830 rpm	OK (displayed in steps of 10 rpm)	
	greater than 830 or less than 770 rpm	See display group number 01, display field 1	
2	70 ... 125	OK	
	less than 70	Idling speed stabilisation valve -N71 sticking or defective Throttle valve potentiometer -G69 defective or incorrectly adjusted	- Check -N71 - see repair group 24 - Check throttle valve potentiometer -G69 - see repair group 24
	greater than 125	Air leaks between air mass meter -G70 and turbocharger or downstream of throttle valve Idling speed stabilisation valve -N71 defective	- Repair leaks - Check -N71 - see repair group 24
3	disregard display		
4	00 00	OK (only with air conditioner switched off and no gear selected - automatics)	

Display group number 06

Display field	Display on V.A.G 1551	Cause of fault	Remedy
1	disregard display	Value can only be checked with "System in basic setting 2", display field 1	
2	0.79 ... 1.20	See "System in basic setting 2", display field 2	
3	disregard display		
4	disregard display		

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Display group number 07

Display field	Display on V.A.G 1551	Cause of fault	Remedy
1	121 ... 140	OK	
	less than 121	Air leaks downstream of throttle valve Idling speed stabilisation valve -N71 sticking or defective	- Repair leaks. - Check -N71 - see repair group 24.
	greater than 140	Air conditioner compressor is running although air conditioner is switched off Battery discharged	- Check air conditioner - see repair group 87. - Check battery voltage.
2	70 ... 125	OK	
	less than 70 or greater than 125	See display group number 05, display field 2	
3	41 ... 61	OK	
	less than 41 or greater than 61	Idling speed stabilisation valve -N71 defective Air leaks	- Check -N71 - see repair group 24. - Repair leaks.
4	123 ... 137	OK	
	less than 123 or greater than 137	Control function for idling speed stabilisation valve -N71 Throttle valve potentiometer -G69 incorrectly adjusted Air leaks	- Accelerate engine briefly and watch display; display must be between 123 and 137. - Adjust -G69 - see repair group 24. - Repair leaks.

Display group number 09 (and 10 ... 99)

Display field	Display on V.A.G 1551	Cause of fault	Remedy
1	770 ... 830 rpm	OK (displayed in steps of 10 rpm)	
	greater than 830 rpm or less than 770 rpm	See display group number 01, display field 1	
2	1.0 ... 1.3 ms	OK	
	less than 1.0 ms	Air leaks between air mass meter -G70 and turbocharger or downstream of throttle valve Vacuum hose come off Crankcase breather leaking Tank vent system Solenoid valve 1 for active carbon filter sticking Air mass meter -G70	- Repair leaks. - Check vacuum system. - Check crankcase breather. - Check tank vent system. - Perform final control diagnosis -see repair group 01. - Check -G70 - see repair group 24
	greater than 1.3 ms	Air conditioner switched on Electrical equipment switched on Air conditioner compressor is running although air conditioner is switched off Air mass meter -G70 defective Central hydraulic pump defective Air leaks between turbocharger and throttle valve	- Switch off air conditioner. - Switch off electrical equipment. - Check air conditioner - see repair group 87 - Check -G70 - see repair group 24 - Check central hydraulic pump - see repair group 48 - Repair leaks

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Display field	Display on V.A.G 1551	Cause of fault	Remedy
3	0 ... 7 %	OK (tank vent function active for 6 min)	
	constant 0 %	OK (tank vent function inactive for 1 min)	
	greater than 7 %	See display group number 02, display fields 1 and 2	
	constant 0 %	System error	- Interrogate fault memory
4	disregard display		

Basic setting of engine

The Motronic control unit performs the following functions during the basic setting:

- Solenoid valve 1 for active carbon filter -N80 is closed.
- Self-adaptive function of lambda mixture control and idle speed stabilisation are not influenced by active carbon filter system.

Requirements:

- *Engine temperature at least 85° C.*
- *All electrical equipment switched off.*
- *Air conditioner switched off. Keep pressing "-" key on operating and display unit of air conditioner until all displays go out.*
- *Set selector lever to "P" or "N".*

- Road test vehicle for at least 5 minutes, if possible without stopping at traffic lights, etc.

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- Interrogate and erase fault memory - see repair group 01.

- Continue running engine at idle speed.

Rapid data transfer	HELP
Select function XX	

< Readout in display

Note :

A list of possible functions will be printed out if the HELP button is pressed.

- Press buttons 0 and 4.
  (To select function 04 "System in basic setting.)

Rapid data transfer	Q
04 - Introduction of basic setting	

< Readout in display

- Confirm entry with Q button.

Introduction of basic setting	HELP
Enter display group number XX	

< Readout in display

- Press buttons 0 and 1.
  (01 selects the function "System in basic setting 1".)

- Confirm entry with Q button.

System in basic setting	1
1 2 3	4

< Readout in display

- See page 21 for list of displays and specified values.

- Press button C if specified values are obtained.

Introduction of basic setting	HELP
Enter display group number XX	

< Readout in display

- Press buttons 0 and 2.
  (02 selects function "System in basic setting 2").

- Confirm entry with Q button.

System in basic setting	2
1 2 3	4

< Readout in display

- See page 21 for list of displays and specified values.

- Press → button if specified readings are obtained.

Rapid data transfer	HELP
Select function XX	

< Readout in display

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- Press buttons 0 and 6.
  (06 selects function "End output".)

Rapid data transfer	Q
06 - End output	

< Readout in display

- Confirm entry with Q button.

Rapid data transfer	HELP
Enter address word XX	

< Readout in display

Display group number 01

Display field	Display on V.A.G 1551	Cause of fault	Remedy
1	770...830 rpm	OK	See "Read measuring value block 5", display field 1
2	85 ... 105 ° C	OK	See "Read measuring value block 1", display field 2

Display field	Display on V.A.G 1551	Cause of fault	Remedy
3	0.96 ... 1.04	OK	
	constant 1.0	Insufficient fuel Lambda probe defective Lambda probe heating defective	- At least 10 litres of fuel in tank. - Check lambda probe and lambda control function - see repair group 24.
	less than 0.96 or greater than 1.04	Lambda self-adaptive function not yet completed Lambda probe Air leaks downstream of air mass meter -G70 Fuel system pressure Leaks in exhaust system	- Run engine at idle speed for at least 10 minutes at operating temperature after power supply to control unit is interrupted (terminal 30). - See display group 02, display field 2 - Repair leaks. - Check system pressure - see repair group 24. - Check for leaks - see repair group 26.
	display fluctuates irregularly	Insufficient fuel Loose contact in lambda probe signal wire Lambda probe heating defective	- At least 10 litres of fuel in tank. - Check lambda probe and lambda control function - see repair group 24.
4	8 ... 12° before TDC	OK	See "Read measuring value block 1", display field 4

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Display group number 02 (and 03 ... 99)

Display field	Display on V.A.G 1551	Cause of fault	Remedy
1	0.96...1.04	See display group number 01, display field 3	
2	0.78...1.17	OK	
	less than 0.78	Fuel system pressure to high Air mass meter -G70 defective Lambda probe defective Air leaks between turbocharger and throttle assembly	- Check system pressure - see repair group 24. - Check -G70 - see repair group 24. - Check lambda control function - see repair group 24. - Repair leaks.
	greater than 1.17	Fuel system Insufficient fuel Air leaks between air mass meter and turbocharger or in intake manifold	- Check fuel system - see repair group 20 - At least 10 litres of fuel in tank. - Repair leaks.
3	disregard display		
4	disregard display		

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