Workshop Manual

Audi 80 1992 ▶

Engine code	ADA				

Booklet **MPI Fuel Injection and Ignition System (4-Cylinder)**

Edition 08.93

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Service.

List of Workshop Manual Repair Groups

Audi 80 1992 ▶

Engine code	ADA										

Booklet

MPI Fuel Injection and Ignition System (4-Cylinder)
Edition 08.93

Repair Group	Technical Bulletins
01 Self-diagnosis, Electrical test	
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 multi-point injection

Technical data of self-diagnosis

Memory:

- Permanent memory

Data output:

- Rapid data transfer

Functions:

- Interrogating control unit version
- Interrogating fault memory
- Final control diagnosis
- Engine basic setting
- Coding control unit
- Reading measured value block
- Reading individual measured values
- Adaptation

Fitting locations of components

- ⇒ Repair Group 24

The MPI control unit analyses the information and distinguishes 27 different faults ⇒ Fault table, page 01–16, and stores these until the contents of the fault memory are erased. Faults which occur sporadically are additionally identified as such ⇒ page 01–3 and page 01–16, respectively.

Notes:

- *Final control diagnosis can only be performed when the engine is not running and the ignition is switched on.*
- *Interrogation of the fault memory, in contrast, should be performed if possible with the engine running.*
  The possibilities of self-diagnosis can only be used with the fault reader V.A.G 1551 or V.A.G 1552. Only operating mode 1 – Rapid data transfer is described in Repair Group 01.

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Notes regarding fault recognition and rectification

- *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 constantly repeated. If the fault no longer occurs during the next 50 engine starts, this sporadic fault is automatically erased.*
- *When the connectors are unplugged from the MPI control unit, this also separates the permanent positive supply and thus erases the fault memory.*
- *If a fault which has been recognized by self-diagnosis is rectified, then perform the following steps:*
  - *Erase fault memory.*
  - *Switch off engine and start again.*
  - *Perform road test.*
  - *Perform automatic test sequence by entering the address word 00.*

Test requirements

- *Fuses for engine electronics in order.*
- *Fuel pump relay in order.*

Checking engine earth connections

Note:

Before interrogating the fault memory, performing final control diagnosis, basic setting and reading measured value block as well as before testing wiring and replacing components, check the following earth connections for signs of corrosion and poor connections, and rectify if necessary.

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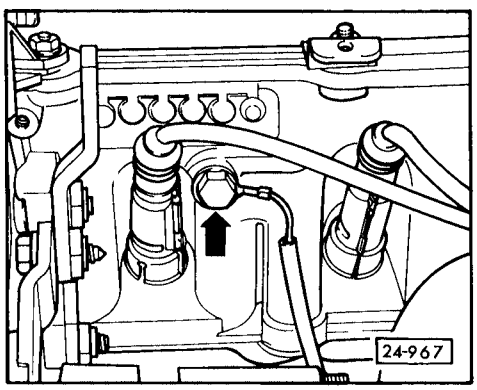
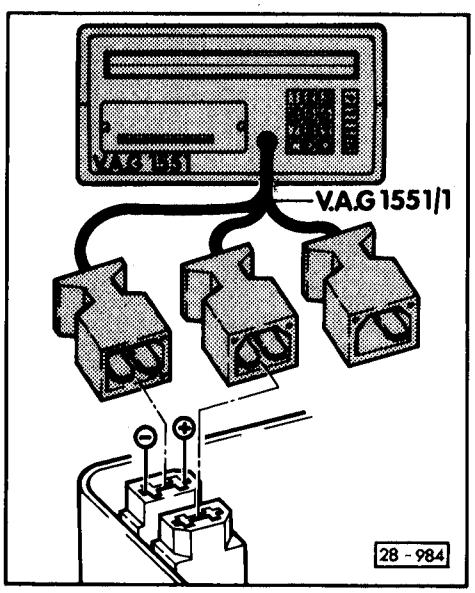


- Check earth connection point at left of cylinder head (arrow).
- Battery earth strap in order.
- Earth cable between engine and body in order.



Connecting fault reader V.A.G 1551 and selecting functions

Pay attention to test requirements fi page 01–4.

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

– Black connector to «black» diagnostic socket.

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

◄ Readout in display:

– If no readout appears in the display, test motor supply for black diagnostic socket ⇒ page 01–100.

* appears alternately

– White connector to «white» diagnostic socket.

– Blue connector is not required.

Notes:

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

For the function:

- Interrogating fault memory:
  Run engine at idling speed, otherwise crank engine with starter for at least 5 seconds without then switching off the ignition.
- Final control diagnosis:
  Switch on ignition.
- Basic setting:
  Run engine at idling speed or switch on ignition.

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- Coding control unit:
  Switch on ignition.
- Reading measured value block:
  Run engine or switch on ignition.
- Reading individual measured value:
  Run engine.
- Adaptation:
  Run engine at idling speed.

– Switch on printer with the PRINT key (indicator lamp in key comes on).

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

Rapid data transfer	HELP
Enter address word XX	

◄ Readout in display:

Note:

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

– 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 the fault can be printed out by pressing the HELP key.

Notes:

- *Testing cable connection of diagnostic sockets ⇒ page 01–100.*
- *Control unit faulty ⇒ Fault table, page 01–16.*

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Rapid data transfer	HELP
Fault in communication build-up	

◄ If the following readout appears in the display:

Notes:

- *If vehicle has several systems with self-diagnosis, separate cable connection between the individual systems ⇒ page 01–100.*
- *Vehicles only with MPI self-diagnosis – control unit faulty ⇒ Fault table, page 01–16.*

Rapid data transfer	HELP
L wire not switching to earth	

or

Rapid data transfer	HELP
L wire not switching to positive	

◄ If one of the following readouts appears on the display:

– A list of the possible causes of the fault can be printed ut by pressing the HELP key.

Notes:

- *Test cable connection of diagnostic sockets ⇒ page 01–100.*
- *If vehicle has several systems with self-diagnosis, separate cable connection between the individual systems ⇒ page 01–100.*
- *Vehicles only with MPI self-diagnosis – control unit faulty ⇒ Fault table, page 01–16.*

– After rectifying the cause of the fault, once again enter the address word 01 and confirm with key Q.

8A906264 1,6l R4 MPI 2V	D01
Coding 02001	WSC 06388

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

The readout contains the following information:

- Control unit Part No.: 8A0906264
  Current control unit version ⇒ Parts Programme
- Displacement of engine: 1.6 litres
- Type of engine: in-line engine, 4-cylinder
- Injection system: multi-point injection
- Valves per cylinder: 2 valves
- Hardware and software version of control unit: D..
  Programme status of control unit
- Coding of control unit: 02001
  ⇒ Coding table, page 01–83
- Dealership number of V.A.G dealer: WSC 06388
  (with whose V.A.G 1551 the last coding or adaptation was performed)

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Notes:

- *If the control unit version indicated does not match the vehicle, replace control unit ⇒ page 01–107.*
- *Incorrect coding of the MPI control unit results in:*
  - *Handling problems (jerky gearshift, jolts when accelerating/decelerating, etc.)*
  - *Increased fuel consumption*
  - *Increased exhaust emissions*
  - *Reduction in gearbox life*
  - *Storage of non-existant faults in fault memory*
  - *Functions not being performed (Lambda control, actuation of activated charcoal filter system, etc.)*

◄ – Press → key.

Rapid data transfer	HELP
Select function XX	

Readout in display:

Note:

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

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Interrogating and erasing fault memory

– Connect fault reader V.A.G 1551 ⇒ page 01–5.

Rapid data transfer HELP Select function XX

◄ Readout in display:

– 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!

or

No fault recognized!

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

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 pressed in order to display the next fault.*

– After displaying the last fault, press → key.

Note:

If a fault exists and has not been recognized by the self-diagnosis, continue 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 function "Erase fault memory" is selected with 05).

Rapid data transfer Q 05 – Erase fault memory

◄ Readout in display:

– Confirm entry with the key Q.

Attention! → ***Fault memory was not interrogated***

◄ If the following readout appears in the display:

If the ignition was switched off between interrogating fault memory and erasing fault memory, the fault memory is then not erased.

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

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Rapid data transfer →
Fault memory is erased!

◄ Readout in display:

– Press → key.

Rapid data transfer HELP
Select function XX

◄ Readout in display:

– Rectify faults printed out on the basis of the fault table ⇒ page 01–16.

– After rectifying the faults, once again interrogate fault memory in order to erase any faults which are stored (as a result of unplugging connectors).

– Switch off engine and start again.

– Perform a road test lasting at least 10 minutes.

– Perform automatic test sequence by entering the address word 00.

Fault table

- All the possible faults which can be recognized by the MPI control unit –J192 and are printed out at the printer of V.A.G 1551, are listed below according to the fault code.
- If faults occur only occasionally or if the fault memory was not erased after rectifying faults, these faults appear in the display as "sporadic faults" and are identified with "SP".
- If faulty components are found, additionally test the wiring to the components for short circuit nd open circuit on the basis of the current flow diagram.
- Before rectifying faults or replacing components, test the earth connections of the MPI control unit –J192, connector D at contacts 1, 2, 3 and 16 (specification 0 ... 0.5 ohms) and also check the earth points at the engine for signs of corrosion and damage, test fuel pump relay ⇒ Repair Group 24.
- The fault code and the flash code are printed out only on the log of the printer of V.A.G 1551.

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Output on printer of V.A.G 1551	Possible cause of fault	Possible effects	Rectifying fault
00281 Road speed sender –G68 * No signal	– –G68 faulty. – Cable connection between –G68 and speedometer –G21 – Speedometer –G21 faulty – Cable connection between dash panel insert and MPI control unit –J192 – MPI control unit faulty	– Engine cuts out when clutch released in overrun phase – Jolts during acceleration/ deceleration	– ⇒ Workshop Manual Current Flow Diagrams, Fault Finding Electrics and Fitting Locations – Read measured value block, display group 03, display field 4 ⇒ page 01–58 – Test road speed signal ⇒ Repair Group 24

*) This fault type is displayed in addition to the component.

Notes re-fault code 00281:

- *If this fault is displayed, first of all check whether the speedometer is indicating the correct speed. If the speedometer reading is faulty, ignore fault display.*
- *The fault type "no signal" is set as soon as no pulse is received for longer than 21 seconds when engine is running at more than 3000 rpm and engine load is more than idling.*

Output on printer of V.A.G 1551	Possible cause of fault	Possible effects	Rectifying fault
00512 Hall sender not on reference mark * Mechanical fault	– Distributor incorrectly set – Toothed belt jumped off – Sender gear on crankshaft loose	– Fault after engine start: Fault is stored – Fault before engine start: Engine does not start (no ignition, no fuel injection)	– Read measured value block, display group 17, display field 3 ⇒ page 01–81 – Distributor basic setting ⇒ Repair Group 28 – Check toothed belt ⇒ Repair Group 15 – Dismantle and assemble engine ⇒ Repair Group 13

*) This fault type is displayed in addition to the component.

Notes re-fault code 00512:

- *The fault type "mechanical fault" is set as soon as the reference mark signal is not within the phase window (orifice in distributor) for more than 24 revolutions when the engine is started or when engine running.*
- *Fault 00512 may also be stored if fault 00515 "short circuit to earth" occurs sporadically.*

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Output on printer of V.A.G 1551	Possible cause of fault	Possible effects	Rectifying fault
00513 Engine speed sender –G28 * No signal	– Metal swarf on –G28 – Distance from –G28 to ring gear greater than 1.2 mm – Open circuit in wiring between 3-pin connector in engine compartment and –G28 – Open circuit in wiring between –J192 and –G28 – Short circuit between connector C contact 4, 5 and –J192 or engine earth – Open circuit in shielding of –G28 – –G28 faulty – Signal input in control unit faulty (–J192 faulty)	– Engine does not start – Misfiring – Engine cuts out	– Read measured value block, display group 03, display field 1 ⇒ page 01–58 – Test –G28 ⇒ Repair Group 28 – Rectify short circuit or open circuit on the basis of CFD

*) This fault type is displayed in addition to the component.

Notes re-fault code 00513:

- *The engine speed sender –G28 also produces the reference mark signal with this system.*
- *If fault type "no signal" is recognized when engine is started, no ignition and fuel injection are performed.*

Output on printer of V.A.G 1551	Possible cause of fault	Possible effects	Rectifying fault
00515 Hall sender –G40 * Short circuit to earth * Open circuit/short circuit to positive	– Supply voltage for –G40 from MPI control unit –J192 – Short circuit to positive or earth in –G40 or in cable connection between –G40 and –J192 – Open circuit in wiring between –G40 and –J192 – Allocation of slot on sender wheel of crankshaft (–G28 not in order) – –G40 faulty – Signal input in control unit faulty (–J192 faulty) – Timing incorrectly set	– Engine has no power at full load – Emission levels not in order – High fuel consumption	– Test –G40 ⇒ Repair Group 28 – Rectify short circuit or open circuit on the basis of CFD – Test timing

*) One of these fault types is displayed in addition to the component.

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Notes re-fault code 00515:

- *The fault type "open circuit/short circuit to positive" is set as soon as the Hall sender signal is high during 20 revolutions when the engine is running.*
- *The fault type "short circuit to earth" is set as soon as the Hall sender signal is low during 20 revolutions when the engine is running.*
- *If the fault type "short circuit to earth" occurs sporadically, fault 00512 may also be stored.*

Output on printer of V.A.G 1551	Possible cause of fault	Possible effects	Rectifying fault
00516 Idling speed switch –F60 * Short circuit to earth * Open circuit/short circuit to positive	– Setting of –F60 – Throttle valve jamming – Foot mat pressing on accelerator pedal – Adjustment of throttle cable – Open circuit in wiring between –F60 and –J192 – Short circuit to earth or to positive in cable connection between –F60 and –J192 – Moisture in throttle valve connector – Signal input in control unit faulty (–J192 faulty)		– Read measured value block, display group 02, display field 4 ⇒ page 01–55 – Test –F60 ⇒ Repair Group 24 – Adjust throttle cable ⇒ Repair Group 20 – Rectify short circuit or open circuit on the basis of CFD

*) One of these fault types is displayed in addition to the component.

Notes re-fault code 00516:

- *The fault type "short circuit to earth" is set as soon as the throttle valve opening is greater than 7° and the idling speed switch is closed for longer than 1 second.*
- *The fault type "open circuit/short circuit to positive" is set as soon as the idling speed switch is not recognized as closed at least once after the engine is started and driving at below 100 km/h for 10 minutes.*

Output on printer of V.A.G 1551	Possible cause of fault	Possible effects	Rectifying fault
00518 Throttle valve potentiometer –G69 * Short circuit to positive * Open circuit/short circuit to earth * Implausible signal * Signal too small	– Open circuit in wiring between –G69 and –J192 – Short circuit to earth or positive in –G69 or in cable connection between –G69 and –J192 – G69 faulty – –J192 faulty. – Moisture or corrosion in plug connection at –G69 – Throttle valve potentiometer incorrectly set	– Loss of power and driving fault – No acceleration enrichment	– Read measured value block, display group 02 or display group 03, display field 3 ⇒ page 01–55 or 01–58 – Test –G69 ⇒ Repair Group 24

*) One of these fault types is displayed in addition to the component.

Notes re-fault code 00518:

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- *The fault type "open circuit/short circuit to earth" is set as soon as the signal voltage is less than 100 mV or longer than 1 second.*
- *The fault type "implausible signal" is set as soon as a signal voltage greater than 720 mV (equivalent to throttle valve opening greater than 7°) is recognized for longer than 1 second when the idling speed switch is closed.*
- *The fault type "short circuit to positive" is set as soon as the signal voltage is greater than 4900 mV for longer than 1 second.*
- *The fault type "signal too small" is set as soon as the signal voltage is less than 960 mV (equivalent to throttle valve opening of less than 12°) for longer than 1 second at coolant temperature above 70° C, engine speed between 1500 ... 3500 rpm and moderate engine load (air mass meter signal).*

Output on printer of V.A.G 1551	Possible cause of fault	Possible effects	Rectifying fault
00522 Coolant temperature sender –G62 * Short circuit to earth * Open circuit/short circuit to positive * Implausible signal	– Open circuit in wiring between –G62 and –J192 – Short circuit to earth or positive in cable connection between –G62 and –J192 – –G62 faulty – Moisture in connector of –G62 – Signal input in control unit faulty (–J192 faulty)	– Cold starting problems and very low temperatures – Driving faults in warming-up phase	– Read measured value block, display group 01, display field 1 ⇒ page 01–53

*) One of these fault types is displayed in addition to the component.

Notes re-fault code 00522:

- *The fault type "short circuit to earth" is set as soon as the signal voltage is less than 0.1 V (equivalent to a coolant temperature greater than 200° C) for longer than 1 second.*
- *The fault type "open circuit/short circuit to positive" is set as soon as the signal voltage is greater than 4.94 V (equivalent to a coolant temperature of less than –50° C) for longer than 1 second.*
- *The fault type "implausible signal" is set as soon as the coolant temperature is less than 55° C when the engine is started and the temperature has not risen above 70° C 18 minutes later.*

Output on printer of V.A.G 1551	Possible cause of fault	Possible effects	Rectifying fault
00524 Knock sensor 1 –G61 * No signal	– –G61 loose or corrosion at connector – Open circuit or short circuit between –G61 and –J192 – Short circuit between –G61 and earth or to screening – –G61 faulty – Signal input in control unit faulty (–J192 faulty)	– High fuel consumption – Poor performance – Sudden loss of performance (like misfiring)	– Read measured value block, display group 13 or display group 14 ⇒ page 01–77 or 01–78 – Tightening torque of knock sensor 20 Nm – Rectify short circuit or open circuit on the basis of CFD

*) This fault type is displayed in addition to the component.

Notes re-fault code 00524:

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- *The fault type "no signal" is set if the output voltage of the knock sensor is insufficient (coolant temperature greater than 20° C, engine speed greater than 3500 rpm and engine load greater than 40 %). The ignition angle is then retarded in the knocking ranges of the map by 12° crank angle.*

Output on printer of V.A.G 1551	Possible cause of fault	Possible effects	Rectifying fault
00525 Lambda probe –G39 * No signal * Short circuit to earth * Short circuit to positive * Implausible signal	– Open circuit in wiring between –G39 and –J192 – Probe heater not operating – Fuse for probe heater faulty – Heating resistor in probe faulty – Wiring of probe heater – Short circuit of signal wire to earth or to screening – Lambda probe faulty (fouled)	– Emission levels not in order – Lambda control moves into open-loop control mode	– Rectify short circuit or open circuit on the basis of CFD – Test Lambda control ⇒ Repair Group 24 – Basic setting, display group 08, read display field 1 and 4 ⇒ page 01–71

*) One of these fault types is displayed in addition to the component.

Notes re-fault code 00525:

- *Lambda probe –G39 = Lambda probe 1.*
- *The fault type "no signal" is set as soon as the signal voltage is between 370 ... 430 mV for longer than 4 seconds 5 minutes after starting engine, engine operating normally and coolant temperature above 80°C.*
- *The fault type "short circuit to positive" is set as soon as the signal voltage is greater than 2 V when engine not operating normally.*
- *The fault type "short circuit to earth" is set as soon as the signal voltage is less than 350 mV 5 minutes after starting engine, engine operating normally and coolant temperature above 20°C.*
- *The fault type "implausible signal" is set as soon as the difference between minimum and maximum signal voltage is less than 300 mV 60 seconds after start of closed-loop control with engine idling and coolant temperature greater than 80°C.*

Output on printer of V.A.G 1551	Possible cause of fault	Possible effects	Rectifying fault
00531 Air mass meter reference voltage * Open circuit/short circuit to positive	– Open circuit in wiring between MPI control unit –J192 connector A, contacts 2 and 5 – Short circuit between –J192 connector A, contacts 2 and 5 and positive		– Basic setting, display group 01, read display fields 2 and 3 ⇒ page 01–53 – Rectify short circuit or open circuit on the basis of CFD

*) This fault type is displayed in addition to the component.

Notes re-fault code 00531:

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- *If fault 00531 is recognized by the MPI control unit, a substitute value of 0.020 V is displayed in function 04 "Basic setting", display group 01, display field 3.*
- *The fault type "open circuit/short circuit to positive" is set as soon as the signal voltage is greater than 1 V.*

Output on printer of V.A.G 1551	Possible cause of fault	Possible effects	Rectifying fault
00532 Supply voltage * Signal too small	– Supply voltage greater 16 V – Alternator faulty – Overvoltage caused by starting assistance – Poor earth connection to MPI control unit – Battery discharged – Current drain with ignition off	– MPI control unit –J192 destroyed – Voltage less than 6 V – Engine does not run	– Test voltage – Test charge state of battery – Test voltage supply of MPI control unit – Read measured value block, display group 01, display field 4 ⇒ page 01–53

*) This fault type is displayed in addition to the component.

Notes re-fault code 00532:

- *If the fault is displayed as a sporadic fault, ignore fault readout!*
  This fault may be stored if the engine is operated at idling speed for a lengthy time with a large number of electrical components operating and the battery is severely discharged.
- *The fault type "signal too small" is set as soon as the supply voltage is below 10.08 V for longer than 1 second (control unit does not operate at voltage below 6.5 V).*

Output on printer of V.A.G 1551	Possible cause of fault	Possible effects	Rectifying fault
00537 Lambda control * Control limit exceeded * Control limit not reached * Adaptation limit exceeded * Adaptation limit not reached	– Fuse for probe heater faulty – Fuel tank empty, at least 10 litres – Fuel system pressure too low or too high – Failure of spark plugs, connectors, wiring – Unmetered air downstream of –G70 – Leak in exhaust system upstream of CAT – Lambda probe faulty – Solenoid valve 1 for activated charcoal filter –N80 jamming	– CO upstream of CAT less than 0.2 % – Increased fuel consumption – Black exhaust – Spark plugs sooted up – CO upstream of CAT greater than 1.2 %	– Basic setting, read display group 07, display field 1 or 2 ⇒ page 01–70 – Refuel vehicle – Rectify leaks – Test Lambda control ⇒ Repair Group 24 – Test fuel system pressure ⇒ Repair Group 24 – Test solenoid valve 1 for activated charcoal filter –N80 ⇒ Repair Group 24

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*) One of these fault types is displayed in addition to the component.

Notes re-fault code 00537:

- *The fault type "control limit exceeded" is set as soon as the probe voltage is less than 300 mV for longer than 2 minutes when coolant temperature is greater than 80° C in the closed-loop control range.*
- *The fault type "control limit not reached" is set as soon as the probe voltage is greater than 600 mV for longer than 2 minutes when coolant temperature is greater than 80° C in the closed-loop control range.*

Output on printer of V.A.G 1551	Possible cause of fault	Possible effects	Rectifying fault
00553 Air mass meter –G70 * Open circuit/short circuit to earth * Short circuit to positive	– Fuse for air mass meter faulty – Open circuit in wiring between –G70 and MPI control unit –J192 – Open circuit in voltage supply or earth connection to –G70 – Short circuit to positive or earth in –G70 or in cable connection between –G70 and –J192 – –G70 faulty – Signal input in control unit faulty (–J192 faulty)	– Emergency running – Poor throttle response – Poor performance – Engine cuts out after starting or on overrun	– Test –G70 ⇒ Repair Group 24

*) One of these fault types is displayed in addition to the component.

Notes re-fault code 00553:

- *If the fault is displayed as a sporadic fault, ignore fault readout!*
- *The fault type "short circuit to positive" is set as soon as the signal voltage is greater than 5 V 3 seconds after starting (engine speed less than 2000 rpm).*
- *The fault type "open circuit/short circuit to earth" is set as soon as the signal voltage is less than 0.7 V (engine speed between 700 ... 2000 rpm).*

Output on printer of V.A.G 1551	Possible cause of fault	Possible effects	Rectifying fault
00577 Knock control cylinder 1 00578 Knock control cylinder 2 00579 Knock control cylinder 3 00580 Knock control cylinder 4 * Control limit exceeded	– Knock control module in MPI control unit –J192 faulty (–J192 faulty) – Poor quality fuel (less than 95 RON) – Relates only to the cylinder displayed – Abnormal engine noises (ancillaries loose) – Open circuit in screening of knock sensor – Knock sensor loose	– High fuel consumption – Poor performance – Irregular engine running – Top speed is not reached	– Read measured value block, display group 11 or 12 ⇒ page 01–76 – Refuel with fuel of at least 95 RON – Test signal wire from –G28 on the basis of CFD – Rectify short circuit or open circuit in wiring on the basis of CFD – Tighten knock sensor to 20 Nm

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*) This fault type is displayed in addition to the component.

Note:

- *The fault type "control limit exceeded" is set as soon as the ignition angle has to be fully retarded for longer than 5 seconds.*

Output on printer of V.A.G 1551	Possible cause of fault	Possible effects	Rectifying fault
00609 Ignition output 1 * Open circuit/short circuit to positive * Output does not switch/short circuit to earth	– Short circuit to positive or negative in output stage for ignition transformer –N70 or in cable connection to MPI control unit –J192 – –J192 faulty	– Engine does not start (injectors shut off) – Poor performance – Irregular engine running	– Rectify short circuit or open circuit on the basis of CFD – Test output stage for ignition transformer –N70 ⇒ Repair Group 28 – Replace control unit –J192
00689 Unmetered air in intake system * Mechanical fault	– Large quantity of unmetered air – Idling speed stabilization valve –N71 has mechanical fault – 2nd stage of throttle valve does not close	– When engine at normal operating temperature, idling speed differs from specification – If engine cold, it may cut out	– Basic setting, read display group 04, display field 2 ⇒ page 01–61 – Read measured value block, display group 15 ⇒ page 01–79 – Test –N71 ⇒ Repair Group 24

*) One of these fault types is displayed in addition to the component.

Note re-fault code 00609:

The output stage for ignition transformer –N70 is not integrated in the MPI control unit but is a separate component which is attached to the ignition transformer.

Output on printer of V.A.G 1551	Possible cause of fault	Possible effects	Rectifying fault
01247 Solenoid valve 1 for activated charcoal filter –N80 * Output does not switch/short circuit to positive * Open circuit/short circuit to earth	– Short circuit to positive or negative in –N80 or in cable connection to MPI control unit –J192 – Fuse for –N80 faulty – Open circuit in wiring – –J192 faulty	– Poor progression in part load range – Vehicle may smell of petrol	– Test –N80 ⇒ Repair Group 24 – Read basic setting of engine or measured value block, display group 07, display field 3 ⇒ page 01–70 – Replace control unit –J192

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*) One of these fault types is displayed in addition to the component.

Output on printer of V.A.G 1551	Possible cause of fault	Possible effects	Rectifying fault
01249 Injector cylinder 1 –N30 01250 Injector cylinder 2 –N31 01251 Injector cylinder 3 –N32 01252 Injector cylinder 4 –N33 * Output does not switch/ short circuit to positive * Open circuit/short circuit to earth	– Fuse for injectors faulty – Short circuit to earth – Open circuit in wiring – Short circuit to positive at connector or at injector – –J192 faulty	– Irregular engine running or engine cuts out (relevant injector shut off until ignition off)	– Test injectors ⇒ Repair Group 24 – Replace control unit –J192

*) One of these fault types is displayed in addition to the component.

Notes:

- *If the fault "01295 Fuel pump relay –J17" is recognized, all 4 injectors are stored simultaneously with fault type "open circuit/ short circuit to earth".*
- *If fault type "output does not switch/short circuit to positive" is set, the injector is no longer actuated and the Lambda control is inhibited.*
- *If fault type "open circuit/short circuit to earth" is set, the Lambda control is inhibited.*

Output on printer of V.A.G 1551	Possible cause 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 or negative in –N71 or in cable connection to MPI control unit –J192 – Open circuit in wiring – Large quantity of unmetered air – –N71 has mechanical fault – 2nd stage of throttle valve does not close	– When engine at normal operating temperature, idling speed differs from specification – When engine cold, engine may cut out – Engine surges	– Test –N71 ⇒ Repair Group 24 – Read basic setting, display group 04, display field 2 ⇒ page 01–61 – Read measured value block, display group 15 ⇒ page 01–79
01295 Fuel pump relay –J17 * Output does not switch/ short circuit to positive * Open circuit/short circuit to earth	– Short circuit to positive or negative in cable connection to MPI control unit –J192 – Open circuit in wiring – –J192 faulty – –J17 faulty	– Engine does not start	– Rectify short circuit or open circuit on the basis of CFD – Replace control unit –J192 – Test –J17 ⇒ Repair Group 24

*) One of these fault types is displayed in addition to the component.

Notes re-fault code 01295:

- *If fault type "open circuit/short circuit to earth" is set, all 4 injectors may be stored simultaneously with fault type "open circuit/ short circuit to earth".*
- *If fault type "output does not switch/short circuit to positive" is set, fault type "open circuit/short circuit to earth" is stored simultaneously as well as all 4 injectors with fault type "open circuit/short circuit to earth".*

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Output on printer of V.A.G 1551	Possible cause of fault	Possible effects	Rectifying fault
65535 Control unit faulty	– Earth connections to –J192 connector D, contacts 1, 2, 3 and 16 – –J192 faulty	– Engine does not start	– Rectify open circuit in wiring on the basis of CFD – Replace control unit –J192

Note:

Fault type "control unit faulty" is set if faults are recognized in the ROM/RAM or EEPROM.

Final control diagnosis

Pay attention to test requirements ⇒ page 01–4

Sequence of actuations on models with Lambda probes:

- Fuel pump relay –J17
- Idling speed stabilization valve –N71
- Solenoid valve 1 for activated charcoal filter –N80

Sequence of actuations on models without Lambda probes:

- Fuel pump relay –J17
- Idling speed stabilization valve –N71

Notes:

- *Final control diagnosis can only be performed when the engine is not running and the ignition is switched on.*
- *Final control diagnosis is interrupted if the engine is started or if an engine speed pulse is detected.*

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- *During final control diagnosis the individual control elements continue to be actuated until the programme is advanced to the next control element by pressing the → key.*
- *The control elements are checked by listening or touching.*
- *Before repeating final control diagnosis without briefly running the engine, switch off the ignition for about 20 seconds.*
- *The activated charcoal filter solenoid valve is not fitted to models without Lambda probe and is thus also not actuated.*

– Connect fault reader V.A.G 1551 ⇒ page 01–5.

Rapid data transfer HELP Select function XX

◄ Readout in display:

Note:

A list of 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 → Fuel pump relay –J17

◄ Readout in display:

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The fuel pump relay must pick up and the fuel pump must run. The flow noise can be clearly heard at the fuel pressure regulator.

– If the fuel pump relay does not pick up, test actuation ⇒ Repair Group 24.

– Press → key.

Final control diagnosis → Idling speed stabilization valve –N71

◄ Readout in display:

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

– If the valve is not actuated (does not click), test –N71 ⇒ Repair Group 24.

– Press → key.

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

◄ Readout in display:

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

- If the valve is not actuated (does not click), test –N80 ⇒ Repair Group 24.

- Press → key.

Rapid data transfer HELP
Select function XX

◄ Readout in display:

Note:

Switch off ignition for about 20 seconds before again selecting function 03 "Final control diagnosis".

Basic setting of engine

Notes:

- *If the connectors are unplugged from the MPI control unit or if the battery is disconnected, all the learning values in the control unit are erased. This may briefly result in irregular idling. In this case, run engine at idling speed for several minutes until the learning process is completed.*

- *When function 04 "Basic setting" is started, all the learning demand displays (display group 06) are set to 0 in order to produce a request for renewed learning of the Lambda learning values after the car has been in the workshop.*

- *Learning is prohibited as soon as a fault which affects the Lambda control is stored in the fault memory (does not apply to sporadic faults).*

- *Basic setting is performed with the engine running.*

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- *After selecting function 04, the MPI control unit performs the following operations:*
  - *Digital idling speed stabilization is inhibited.*
  - *ACF valve is closed.*
  - *AC compressor is switched off.*
  - *No coolant temperature correction (fixed value of 80° C)*
  - *Request for renewed learning of Lambda learning values is output.*

Requirements:

- *Engine temperature at least 85° C.*
- *Do not depress accelerator pedal.*
- *All electrical components switched off.*
- *Air conditioner switched off. Press minus button in control and display unit of air conditioner repeatedly until all the readouts in the displays are erased.*
- *Move selector lever to P or N.*
- *No fault stored in fault memory.*

– Interrogate fault memory and erase ⇒ page 01–13. No fault must be stored (rectify any faults, erase fault memory, switch off engine and start again, perform road test and once again interrogate fault memory as a check).

– Continue running engine at idling speed.

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.

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

Rapid data transfer	Q
04 – Start basic setting	

◄ Readout in display:

– Confirm entry with the key Q.

Start basic setting	Q
Enter display group number XX	

◄ Readout in display:

– Select desired display group number in accordance with the list of display groups overleaf.

Note:

Display group number 01 is an example in order to demonstrate the sequence.

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

Start basic setting	Q
Enter display group number 01	

◄ Readout in display:

– Confirm entry with the key Q.

Basic setting	1	→
1	2	3 4

◄ Readout in display:

Notes:

- *The readouts in the case of display group number 00 are shown as decimals.*
- *The current readout in the display is printed out each time the PRINT key is pressed.*
- *Press C key before selecting further display groups.*

– If the specifications are achieved in all display fields, press → key.

Rapid data transfer	HELP
Select function XX	

◄ Readout in display:

– Press keys 0 and 6.
(The function "End output" is selected with 06).

Rapid data transfer	Q
06 – End output	

◄ Readout in display:

– Confirm entry with the key Q.

Rapid data transfer	HELP
Enter address word XX	

◄ Readout in display:

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List of display groups with test table

Notes:

- *Display groups 09 ... 17 are used for fault finding in the case of handling problems and specific component faults.*
- *When display groups 18 ... 98 are selected, "Function is unknown or cannot be performed at the moment" appears in the display.*

Display group number	Readout in display	Designation
00	Basic setting 0 1 2 3 4 5 6 7 8 9 10	Explanation of readouts ⇒ page 01–49
01	Basic setting 1 1 2 3 4	1 = Coolant temperature 2 = Output voltage air mass meter 3 = Air mass meter earth voltage loss 4 = MPI control unit voltage supply
02	Basic setting 2 1 2 3 4	1 = Throttle valve potentiometer voltage (coarse) 2 = Throttle valve potentiometer voltage (fine) 3 = Learning value of throttle valve potentiometer 4 = Mechanical idling speed switch
03	Basic setting 3 1 2 3 4	1 = Engine speed 2 = Engine load 3 = Throttle valve angle 4 = Road speed

Display group number	Readout in display	Designation
04	Basic setting 4 1 2 3 4	1 = Idle speed control 2 = Learning value of idling speed stabilization 3 = Learning value of idling speed stabilization 4 = Shift inputs
05	Basic setting 5 1 2 3 4	1 = Learning value of mixture formation (Lambda learning value) when idling 2 = Learning value of mixture formation (Lambda learning value) at part load 1 3 = Learning value of mixture formation (Lambda learning value) at part load 2 4 = Learning value of mixture formation (Lambda learning value) at part load 3
06	Basic setting 6 1 2 3 4	1 = Control value of mixture formation (Lambda control value) 2 = Momentarily used learning value of mixture formation (Lambda learning value) 3 = Learning range of mixture formation (Lambda learning range) 4 = Learning demand of mixture formation (Lambda learning demand)
07	Basic setting 7 1 2 3 4	1 = Control value of mixture formation (Lambda control value) 2 = Total from Lambda control value and momentarily used Lambda learning value 3 = Pulse cycle of solenoid valve 1 for activated charcoal filter –N80 4 = Throttle valve angle
08	Basic setting 8 1 2 3 4	1 = Total from Lambda control value and momentarily used Lambda learning value 2 = Momentarily used learning value of mixture formation (Lambda learning value) 3 = Learning range of mixture formation (Lambda learning range) 4 = Output voltage of Lambda probe

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Display group number	Readout in display	Designation
09	Basic setting 9 1 2 3 4	1 = Ignition timing point without knock control and without digital idling speed stabilization 2 = Ignition timing point with knock control and with digital idling speed stabilization 3 = Ignition timing intervention for digital idling speed stabilization 4 = Idling speed switch function
10	Basic setting 10 1 2 3 4	1 = Engine speed 2 = Engine load 3 = Ignition timing map changeover 4 = Ignition timing retardation of knock control
11	Basic setting 11 1 2 3 4	1 = Ignition timing map changeover 2 = Ignition timing retardation of knock control (cylinder 1) 3 = Ignition timing retardation of knock control (cylinder 2) 4 = Engine load
12	Basic setting 12 1 2 3 4	1 = Ignition timing map changeover 2 = Ignition timing retardation of knock control (cylinder 3) 3 = Ignition timing retardation of knock control (cylinder 4) 4 = Engine load
13	Basic setting 13 1 2 3 4	1 = Engine speed 2 = Knock sensor signal (cylinder 1) 3 = Knock sensor signal (cylinder 2) 4 = Engine load

Display group number	Readout in display	Designation
14	Basic setting 14 1 2 3 4	1 = Engine speed 2 = Knock sensor signal (cylinder 3) 3 = Knock sensor signal (cylinder 4) 4 = Engine load
15	Basic setting 15 1 2 3 4	1 = Internal specified pulse cycle of idling speed stabilization valve –N71 2 = Current consumption of idling speed stabilization valve –N71 3 = Current control of idling speed stabilization valve –N71 4 = MPI control unit voltage supply
16	Basic setting 16 1 2 3 4	1 = Engine output 2 = Inducted air mass 3 = Road speed 4 = Injection time
17	Basic setting 17 1 2 3 4	1 = Engine speed 2 = Engine load 3 = Position of reference mark signal in Hall window 4 = Ignition timing point with knock control and with digital idling speed stabilization
99	Basic setting 99 1 2 3 4	1 = Engine speed 2 = Engine load 3 = Coolant temperature 4 = Lambda control OFF/ON

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A – Display group 00

Note:

Differences in display field 5 should be ignored until the point where the Lambda learning demand at idling speed (display field 9) is completed.

Display field	Specified readout	Equivalent measured value	Designation and conversion into physical values
1	135 ... 160	85 ... 110°C	Momentary coolant temperature, readout –50 = ...°C
2	110 ... 130	1.1 ... 1.3 V	Air mass meter output voltage, readout x 10 = ...mV
3	32 ... 36	800 ... 900 rpm	Momentary engine speed, readout x 25 = ...rpm
4	0 ... 14 or 240 ... 255		Learning value of idling speed stabilization, manual gearbox in Neutral or automatic gearbox with selector lever in P or N
5	–		Learning value of idling speed stabilization, automatic gearbox with Drive position engaged (average value 0) (0 is always displayed for vehicles with manual gearbox)
6	126 ... 130		Feedback of idling speed stabilization (average value 128)
7	20		Shift inputs
8	120 ... 136		Lambda control value (average value 128) 0 is always displayed for engines without Lambda probe
9	0		Lambda learning demand in idling speed and part load range
	1, 5, 17, 21, 65, 69, 81, 85		Lambda learning demand in idling speed completed
10	50 ... 100	250 ... 500 mV	Learning value of throttle valve potentiometer –G69, readout x 5 = ...mV

Test table display group 00

Display field	Readout on V.A.G 1551	Cause of fault	Rectifying fault
1	greater than 160 or less than 135	⇒ Display group 01, display field 1	
2	greater than 130 or less than 110	⇒ Display group 01, display field 2	
3	greater than 36 or less than 32	⇒ Display group 03, display field 1	
4	greater than 14 or less than 240	⇒ Display group 04, display field 2	
5	differs from tolerance range	Only models with automatic gearbox: Display field 4 not to tolerance Display field 4 within tolerance, engage Drive mode and observe idling speed for about 1 minute; if readout remains out of tolerance, gearbox is sticking	– ⇒ Display field 4 – ⇒ Display group 04, display field 3 – Check gearbox

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Notes re-display field 4 and 5:

- *A readout of 0 to 14 indicates a larger learning value than in basic position (–N71 is further open).*
  A readout of 255 up to 240 indicates a smaller learning value than in the basic position (–N71 is further closed).
- *A difference in the learning values may occur on older engines as a result of fouling of the idling speed stabilization valve –N71.*
  Permitted deviation on older engines with manual gearbox: 0 ... 18

Display field	Readout on V.A.G 1551	Cause of fault	Rectifying fault
6	differs from tolerance range	Display field 4 and 5 not to tolerance: – No fault stored – Partial tolerance 236 ... 255 or 240 ... 255 exceeded, then large quantity of unmetered air passing –N71 into intake manifold Display field 4 and 5 within tolerance, no further measures	– ⇒ Display field 4 and 5 – Interrogate fault memory – Rectify cause of fault
7	greater or less than 20	Air conditioner switched on AC compressor on Idling speed switch –F60 operated	– Switch off air conditioner – Test AC compressor cutoff ⇒ Repair Group 24 – Test idling speed switch –F60 ⇒ Repair Group 24
8	differs from tolerance range	⇒ Display group 06, display field 1	
9	not 1, 5, 17, 21, 65, 69, 81, 85	⇒ Display group 06, display field 4	
10	differs from tolerance range	Display field 7 not to tolerance	– ⇒ Display field 7 or display group 02, display field 3

Note re-display field 7:

Possible readouts in display field 7 in the case of operating faults ⇒ Table, page 01–52.

Explanation of possible readouts in display field 7 in the case of operating faults:

Readout	Air conditioner	AC compressor	Idling speed switch
04	off	off	open
20	off	off	closed
36	off	on	open
52	off	on	closed
68	on	off	open
84	on	off	closed
100	on	on	open

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B – Display group 01

Readout in display	Specified readout	Designation
Basic setting 1 1 2 3 4	85 ... 105°C	1 = Coolant temperature
	1.100 ... 1.300 V**	2 = Air mass meter output voltage*
	0.000 ... 0.025 V	3 = Air mass meter earth voltage loss
	12.0 ... 14.0 V	4 = MPI control unit voltage supply (battery voltage)

*) Specification minus 0.05 V for each 500 m height above MSL.
**) Assess tolerance range of air mass meter output voltage only during basic setting with engine idling.

Test table display group 01

Display field	Readout on V.A.G 1551	Cause of fault	Rectifying fault
1	greater than 105 or less than 85	Coolant temperature sender –G62 Cable connection to MPI col unit –J192	– Interrogate fault memory ⇒ page 01–13 – Test –G62 ⇒ Repair Group 28

Display field	Readout on V.A.G 1551	Cause of fault	Rectifying fault
2	less than 1.100 V	Large quantity of unmetered air between intake manifold and air mass meter	– Rectify cause of fault
	greater than 1.300 V	Electrical components on Steering wheel at full lock Drive mode engaged (automatic gearbox) If the above causes do not exist, deduct readout 3 (air mass meter earth voltage loss) from increased readout 2. If the result is within the tolerance, ignore the increased readout 2.	– Switch off consumers – Move steering wheel into centre position – Move selector lever into P or N Permitted difference for new engines: • max. 1.350 V • If engine speed increased, readout rises up to 2.500 V, drops to 0.000 V and then begins to rise again.
3	greater than 0.025 V	Fault in wiring or contacts or earthpoint oxidized.	– Test earth supply of air mass meter –G70 on the basis of CFD. ***Note:*** *If fault "00531 Air mass meter reference voltage" is stored in fault memory, a constant substitute value of 0.020 V is displayed.*

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Display field	Readout on V.A.G 1551	Cause of fault	Rectifying fault
4	greater than 14.0 V or less than 12.0 V	Alternator faulty Overvoltage as a result of starting systems Poor earth connection to MPI control unit –J192 Battery discharged Current drain with ignition off	– Test voltage – Test charge state of battery – Test voltage supply of MPI control unit ⇒ Repair Group 28

C – Display group 02

Readout in display	Specified readout	Designation
Basic setting 2 1 2 3 4	0.250 ... 4.850 V	1 = Throttle valve potentiometer voltage (idle speed up to full load range)
	0.250 ... 1.275 V	2 = Throttle valve potentiometer voltage (idle speed and lower part load range)
	0.250 ... 0.500 V	3 = Learning value of throttle valve potentiometer
	0 or 1	4 = Mechanical idling speed switch: 0 = open 1 = closed

Test table display group 02

Display field	Readout on V.A.G 1551	Cause of fault	Rectifying fault
1	differs from tolerance range	Throttle valve potentiometer –G69 incorrectly set or faulty	– Interrogate fault memory ⇒ page 01–13 – Test –G69 and adjust ⇒ Repair Group 24 or ⇒ Display group 07, display field 4
2	outside of tolerance range	Throttle valve potentiometer –G69 incorrectly set or faulty	– Interrogate fault memory ⇒ page 01–13 – Test –G69 and adjust ⇒ Repair Group 24 or ⇒ Display group 07, display field 4

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Display field	Readout on V.A.G 1551	Cause of fault	Rectifying fault
3	outside of tolerance range	Idling speed switch operated or faulty Idling speed switch or throttle valve potentiometer –G69 incorrectly set Electrical components on Steering wheel at full lock Drive mode engaged (automatic gearbox) Moisture in connector for –G69 Earthpoint at cylinder head	– Interrogate fault memory ⇒ page 01–13 – Test –G69 and adjust ⇒ Repair Group 24 – Switch off consumers – Move steering wheel into centre position – Move selector lever into P or N – Test earth connection on the basis of CFD ***Note:*** • *The mechanical idling speed switch must be closed for testing throttle valve potentiometer learning value ⇒ Display field 4.* • *If the readouts of the display fields 2 and 3 with engine idling agree, the learning process is in order. If no learning process occurs, the last value learned is constantly displayed.* • *If control unit de-energized, throttle valve potentiometer learning value is set to 0.550 V.*

Display field	Readout on V.A.G 1551	Cause of fault	Rectifying fault
4	0 or 1	Idling speed switch –F60 faulty Throttle valve potentiometer –G69 incorrectly set Throttle valve jamming Foot mat pressing on accelerator pedal Moisture in connector of –G69 Adjustment of throttle cable	– Interrogate fault memory ⇒ page 01–13 – Test –F60 and adjust ⇒ Repair Group 24 – ⇒ Display group 09, display field 4 – Adjust throttle cable ⇒ Repair Group 20

D – Display group 03

Readout in display	Specified readout	Designation
Basic setting 3 1 2 3 4	800...900 rpm	1 = Momentary idling speed
	15.0 ... 32.0 %	2 = Engine load idling speed*
	0 % or greater than 95 %	3 = Throttle valve angle: Idling speed 0 % Full load greater than 95 %
	... km/h	4 = Momentary road speed

*) Assess engine load tolerance range only when engine idling during function 04 "Basic setting".

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Note re-display field 3:

Switch off engine and switch on ignition for test at full throttle.

Test table display group 03

Display field	Readout on V.A.G 1551	Cause of fault	Rectifying fault
1	greater than 900 rpm	Idling speed switch –F60 Large quantity of unmetered air Idlve –N71 jams or does not operate freely or does not operate freely	– ⇒ Display group 04, display field 4 – Test –F60 ⇒ Repair Group 24 – Rectify cause of fault – Perform final control diagnosis ⇒ page 01–36
	less than 800 rpm	Idling speed stabilization valve –N71 jams or does not operate freely Idling speed switch –F60 Drive mode engaged (automatic gearbox)	– ⇒ Display group 04, display field 4 – Perform final control diagnosis ⇒ page 01–36 – Test –F60 ⇒ Repair Group 24 – Move selector lever into P or N
2	outside of tolerance range	Poor idling (not running on all cylinders) Air mass meter –G70 faulty Idling speed stabilization valve –N71 faulty Electrical components on Steering wheel at full lock Drive mode engaged (automatic gearbox)	– Injectors or spark plugs faulty – Interrogate fault memory ⇒ page 01–13 or ⇒ Display group 01, display fields 2 and 3 – Interrogate fault memory ⇒ page 01–13 or ⇒ Display group 18 – Switch off consumers – Move steering wheel into centre position – Move selector lever into P or N

Display field	Readout on V.A.G 1551	Cause of fault	Rectifying fault
3	idling, greater than 0 %	Throttle valve potentiometer –G69 faulty Adjustment of accelerator cable Throttle valve sticking	– Interrogate fault memory ⇒ page 01–13 or ⇒ Display group 02 – Adjust throttle cable ⇒ Repair Group 20 – Rectify cause of fault
	full load, less than 95 %	Throttle valve potentiometer –G69 faulty Adjustment of accelerator cable Throttle valve potentiometer –G69 incorrectly set	– Interrogate fault memory ⇒ page 01–13 or ⇒ Display group 02 – Adjust throttle cable ⇒ Repair Group 20 – Test –G69 and adjust ⇒ Repair Group 24
4	no readout	Cable connection between dash panel insert and MPI control unit –J192 Open circuit or short circuit between –G68 and –J192 –G68 faulty	– Rectify short circuit or open circuit on the basis of CFD – Test –G68 ⇒ Testing speedometer – "Current Flow Diagrams, Fault Finding Electrics and Fitting Locations" binder

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Note re-display field 4:

If no speed is indicated on V.A.G 1551, first of all check whether speedometer reading is in order. If speedometer reading is faulty, test speedometer ⇒ "Current Flow Diagrams, Fault Finding Electrics and Fitting Locations" binder.

E – Display group 04

Readout in display	Specified readout	Designation
Basic setting 4 1 2 3 4	0 ± 2	1 = Idle speed controller with engine idling
	HS: +14...–16 AT: no specification	2 = Learning value of idling speed stabilization with manual gearbox (HS) in Neutral or with automatic gearbox (AT) with selector lever in position P or N
	HS: 0 AT: no specification	3 = Learning value of idling speed stabilization with automatic gearbox (AT) with selector lever in position D, 1, 2, 3 or R. 0 is always displayed for models with manual gearbox.
	001	4 = Shift input when idling: 0 off 1 on

Notes:

- *Readouts 2 or 3 can only be assessed if the idle speed controller is within the tolerance when engine idling (readout 1). If idle speed controller is not within tolerance after a waiting time of 1 minute, no learning is performed in display field 2 or 3.*
- *Positive learning values indicate a larger learning value than in the basic position: –N71 is further open.*
Negative learning values indicate a smaller learning value than in the basic position: –N71 is further closed.

Test table display group 04

Display field	Readout on V.A.G 1551	Cause of fault	Rectifying fault
1	outside of tolerance range	Fault in fault memory Idling speed switch –F60 operated or faulty Idling speed stabilization valve –N71 faulty Electrical components on Steering wheel at full lock Drive mode engaged (automatic gearbox) Throttle valve jamming, foot mat pressing on accelerator pedal, unmetered air	– Interrogate fault memory ⇒ page 01–13 – Test –F60 ⇒ Repair Group 24 or display group 02, display field 4 – Test –N71 ⇒ Repair Group 24 – Switch off consumers – Move steering wheel into centre position – Move selector lever into P or N – Rectify cause of fault
2	greater than +14	Idling speed stabilization valve –N71 faulty Electrical components on Steering wheel at full lock Drive mode engaged (automatic gearbox)	– Interrogate fault memory ⇒ page 01–13 or ⇒ Display group 15 – Switch off consumers – Move steering wheel into centre position – Move selector lever into P or N Permitted difference for new engines: HS (man. gearbox) +20...–16
	less than –16	Idling speed stabilization valve –N71 faulty Large quantity of unmetered aifold area, throttle valve stop not in order Leak air at 2nd stage of throttle valvethrottle valve	– Interrogate fault memory ⇒ page 01–13 or ⇒ Display group 15 – Rectify cause of fault

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Display field	Readout on V.A.G 1551	Cause of fault	Rectifying fault
3	outside of tolerance range	Only on models with automatic gearbox: Display field 2 outside of tolerance If display field 2 is within tolerance range, move selector lever into D and observe idling for about 1 minute; if display field 3 remains out of tolerance, gearbox is not operating freely	 – ⇒ Display field 2 – Check gearbox
4	not 001	Idling speed switch –F60 operated or faulty AC compressor switched on Air conditioner demands higher cooling or heating capacity	– Test –F60 and adjust ⇒ Repair Group 24 – Switch off air conditioner – Test AC compressor cutoff ⇒ Repair Group 24

Note:

Display field 4 (shift inputs) makes it possible to detect whether the components described below are recognized by the MPI control unit as being switched on or off.
Meaning of the 3-digit shift inputs:

0 0 1

1 = Mechanical idling speed switch (1 = closed, 0 = open)
2 = AC compressor (0 = off, 1 = on)
3 = Air conditioner demanding higher cooling or heating capacity (0 = no, 1 = yes)

F – Display group 05

Readout in display	Specified readout	Designation
Basic setting 5 1 2 3 4	–25 %...+25 %	1 = Learning value of mixture formation (Lambda learning value) at idling speed
	–19 %...+19 %	2 = Learning value of mixture formation (Lambda learning value) at part load 1
	–19 %...+19 %	3 = Learning value of mixture formation (Lambda learning value) at part load 2
	–19 %...+19 %	4 = Learning value of mixture formation (Lambda learning value) at part load 3

Test table display group 05

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Display fields	Readout on V.A.G 1551	Cause of fault	Rectifying fault
1, 2, 3, 4	low Lambda learning values	If display field 1 is low, but display fields 2 and 3 normal: oil dilution possible (high portion of fuel in oil) Injector leaking Display fields 1, 2, 3, 4 low: fuel system pressure too high Solenoid valve 1 for activated charcoal filter –N80 constantly open Air mass meter –G70 faulty Lambda probe heater faulty or Lambda probe fouled	– Detach crankcase breather and plug – Disappears after driving on motorway or changing oil – Test injector ⇒ Repair Group 24 – Test system and holding pressure ⇒ Repair Group 24 – Test –N80 ⇒ Repair Group 24 or ⇒ Display group 07, display field 3 or display group 01, display field 2 – Test –G70 ⇒ Repair Group 24 – Test Lambda probe and probe heater ⇒ Repair Group 24 or ⇒ Display group 08, display field 4

Display fields	Readout on V.A.G 1551	Cause of fault	Rectifying fault
1, 2, 3, 4	High Lambda learning values	If display field 1 is high, but display fields 2, 3 and 4 normal: unmetered air possible in intake manifold area	– Rectify cause of fault
		Injector clogged	– Test injector ⇒ Repair Group 24
		Lambda probe heater faulty or Lambda probe fouled	– Test Lambda probe and probe heater ⇒ Repair Group 24 or ⇒ Display group 08, display field 4
		Display fields 1, 2, 3, 4 high: air mass meter –G70 faulty	– Test –G70 ⇒ Repair Group 24 or display group 01, display field 2
		Fuel system pressure too low (fuel supply)	– Test system and holding pressure ⇒ Repair Group 24
		Unmetered air between –G70 and throttle valve	– Rectify cause of fault
		Unmetered air at manifold gasket	

Notes re-display group 05:

- *If a difference of 10 % is reached between the richest and leanest Lambda learning value, further learning of the two relevant learning ranges (⇒ Display group 06) is stopped. The learning demand display (⇒ Display group 06) of these learning ranges cannot become 1.*
- *If the control unit is de-energized, all the values are reset to 0.0 %.*

G – Display group 06

Readout in display	Specified readout	Designation
Basic setting 6 1 2 3 4	0.0 ± 0.8 %*	1 = Control value of mixture formation (Lambda control value)
	... %	2 = Momentarily used Lambda learning value
	XXXX	3 = Lambda learning range
	XXXX	4 = Lambda learning demand

*) Assess tolerance range of Lambda control only when idling during function 04 "Basic setting" as the ACF influence is also controlled in function 08 "Read measured value block".

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Test table display group 06

Display fields	Readout on V.A.G 1551	Cause of fault	Rectifying fault
1	outside of tolerance range	Minus display: engine too rich, Lambda control produces leaner mixture	– Wait 30 seconds until readout has stabilized
		Plus display ("+" is not displayed): engine too lean, Lambda control produces richer mixture	
		Unmetered air	
		Injector faulty	
		Not successfully learned (⇒ Display field 4)	
		Lambda learning value at stop (⇒ Display group 05)	

Display fields	Readout on V.A.G 1551	Cause of fault	Rectifying fault
2	–		– ⇒ Note
3	–		– ⇒ Note
4	–		– ⇒ Note

Notes re-display field 1

- *The Lambda control should always be assessed after successful learning (⇒ Display field 4).*
- *The Lambda control indicates the momentary control state. After successful learning, the values alter by 0.0 ± 8.0 %. Once the learning process (display field 4) is ended and no value around 0.0 ± 8.0 % is reached, observe display group 08, display field 4 and check control response of the two Lambda probes. The readouts in this case must occasionally drop below the value of 0.3 V and exceed 0.6 V otherwise test Lambda probe heater and Lambda probe.*
- *Assessing the Lambda control stop by means of diagnosis is likewise performed only after successful learning ⇒ learning demand display: Max. control stop +30 %*
  Min. control stop –60 %
- *If the readouts are more than ± 20 % in function 04 "Basic setting", the following faults are possible:*
  - *Unmetered air*
  - *Engine damage (combustion of oil because of faulty piston)*

Note re-display field 2

Depending on the learning range which is used at that moment (learning range 3), the momentarily used Lambda learning value (display group 05, display field 1, 2, 3, 4) is indicated for this learning range. If 0.0 % is displayed as the momentarily used Lambda learning value, the fault memory should be interrogated for possible Lambda faults.

Note re-display field 3

- *The momentary learning range (load state) is indicated in display field 3. Only idling speed and part load learning ranges are displayed as no learning takes place at full load.*
- *In order to achieve the appropriate learning range (load state), proceed as follows:*
  - *Learning range idling: run engine at idling speed (800...1000 rpm).*
  - *Learning range part load 1, 2, 3: perform road test (second person); during the road test increase engine speed to 1500...3000 rpm and produce a load by depressing brake slightly.*

Meaning of 4-digit learning range display:

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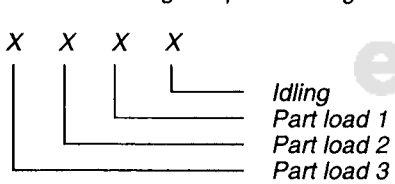
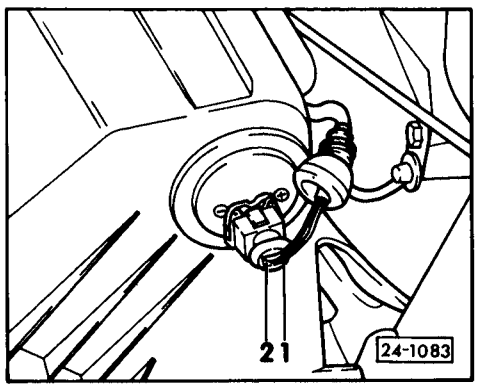
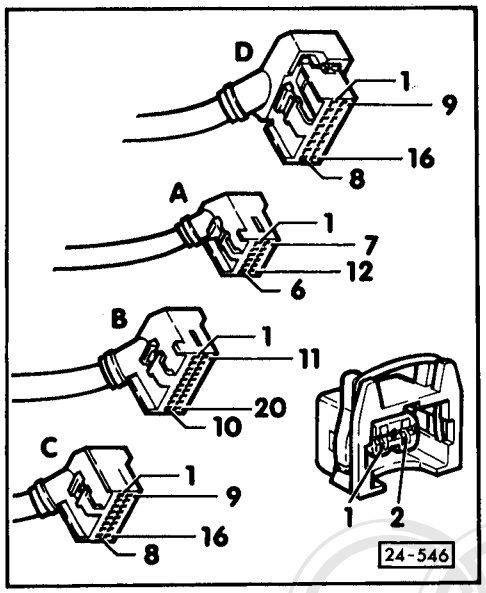
Value "0" = Engine speed or engine speed and load for this learning range not reached.
Value "1" = Engine speed or engine speed and load for this learning range reached.



Notes re-display field 4

- *The readout in display field 4 indicates the learning range (display field 3) in which learning demand is required.*
- *Requirements for learning:*
  - *No fault stored in fault memory*
  - *Engine speed in idling range 800...1000 rpm or 1500...3000 rpm, respectively*
  - *Coolant temperature 80...120° C (if learning does not start immediately after these requirements are met, blip throttle).*





Testing actuation of –N71

Test requirement:

–N71 in proper electrical order.

– Push back protective cap of connector at –N71.

◄ – Connect diode test lamp V.A.G 1527 between contact 1 and engine earth.

– Start final control diagnosis and actuate idling speed stabilization valve ⇒ Repair Group 01.
Specification: The diode test lamp must flash.

– Connect diode test lamp V.A.G 1527 between contact 2 and battery positive (+).
Specification: The diode test lamp must light up.

Note:

Actuation may also be performed the other way round on certain vehicles.

◄ – If the specifications are not achieved, test cable connection from contact 1 at connector for –N71 to contact 7 at connector D (MPI control unit) as well as from contact 2 to contact 11. Rectify any open circuit or short circuit.

– If the cable connections are in order and no actuation occurs, replace MPI control unit ⇒ Repair Group 01.

– If actuation is in order and the valve still does not react, the valve has then jammed; replace –N71.

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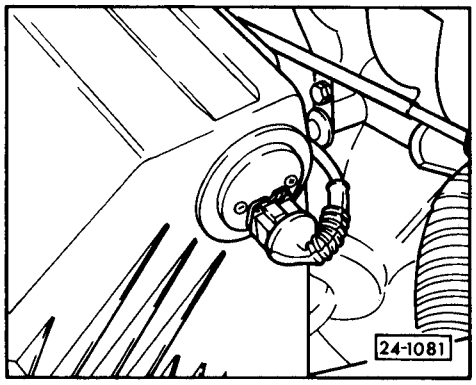


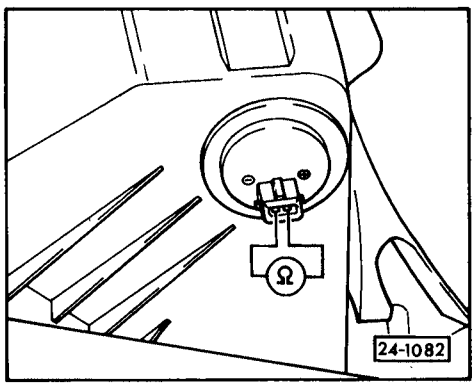
Testing idling speed stabilization valve –N71

Note:

For operational test of idling speed stabilization see also Reading measured value block, display group 04 and 15, respectively.

Testing resistance of –N71

◄ – Unplug connector from –N71.



◄ – Perform resistance measurement between the contacts of the valve with V.A.G 1526.
Specification: 7 ... 11 Ω.

– If the specification is not achieved, replace –N71.

Note:

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

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Mechanical check of –N71

– Remove –N71.

– Examine piston slide for signs of rubbing (visual check).

Note:

Do not move the piston slide with a screwdriver or any other tools to check ease of movement.

– Plug connector into the removed valve.

– Start final control diagnosis and actuate idling speed stabilization valve ⇒ Repair Group 01.
Specification: Piston slide must move properly from stop to stop.

– If signs of rubbing are present which impair ease of movement or if the piston slide does not move freely (sticks, moves sluggishly or does not touch the stops), replace –N71.

– If the valve does not react during final control diagnosis, test voltage supply or actuation, respectively.

If the measurement obtained for one or several injectors is outside of the tolerance range:

– Replace faulty injector.

– If the measurements obtained for all the injectors are outside of the tolerance range, test fuel pressure ⇒ page 24–22.

Testing injectors for leaks

– Connect injectors.

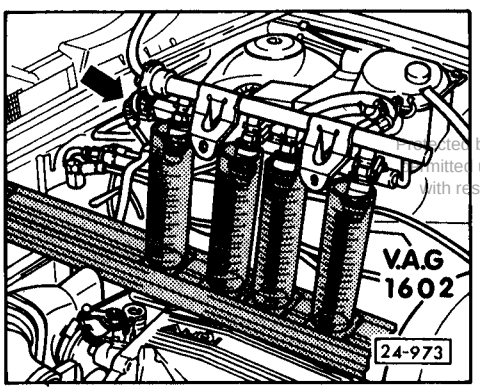
– Start final control diagnosis and actuate fuel pump relay –J17 ⇒ Repair Group 01. The fuel pump must run.

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

If the fuel loss is greater:

– Switch off ignition and replace leaking injector.

Testing spray pattern



– Connect injectors.

– Insert injectors into the opening of the measuring device V.A.G 1602.

– Operate starter for a few seconds and observe spray pattern.
Specification: The spray pattern of all the injectors must be identical.

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Testing quantity of fuel injected, leaks and spray pattern of the injectors

Note:

If an injector is removed or replaced, perform the following operations:

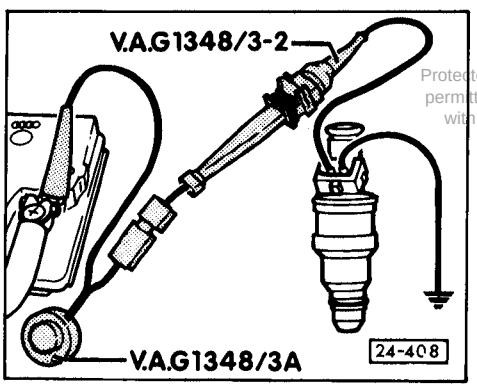
- *Replace O-rings on all injectors and moisten lightly with clean engine oil.*
- *Push injectors vertically and correctly into the fuel rail and secure with retaining clips.*
- *Fit fuel rail with secured injectors onto the intake manifold and press in evenly.*

Test requirement:

Fuel pressure in order; testing ⇒ page 24–22.

- Remove fuel distributor complete with injectors ⇒ page 24–40.
- Bolt feed and return pipes onto the fuel distributor.

Testing quantity of fuel injected



- Insert injector to be tested into a measuring glass of the injected fuel quantity tester V.A.G 1602.
- Connect one contact of the injector to engine earth using the test cable and crocodile clamp from V.A.G 1594.
- Connect second contact of the injector to positive using the remote control V.A.G 1348/3 A, adapter cable V.A.G 1348/3–2 and auxiliary cable.
- Start final control diagnosis and actuate fuel pump relay –J17 ⇒ Repair Group 01. The fuel pump must run.
- Continue operating remote control V.A.G 1348/3 A for 30 seconds.
- Perform the measurement with all the injectors.
- After all four injectors have been actuated, place the measuring glasses on a flat base. Specification: 85 ... 100 ml.

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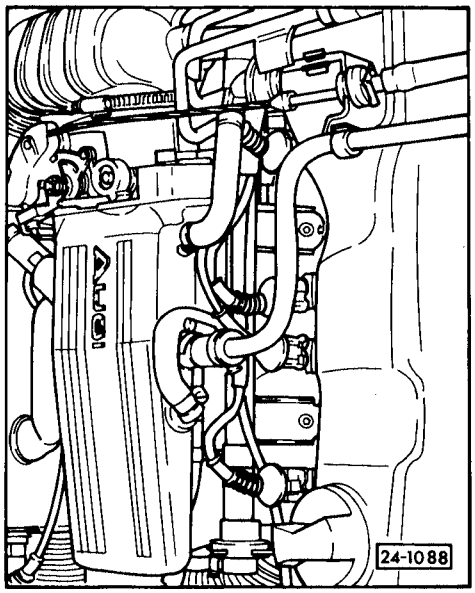
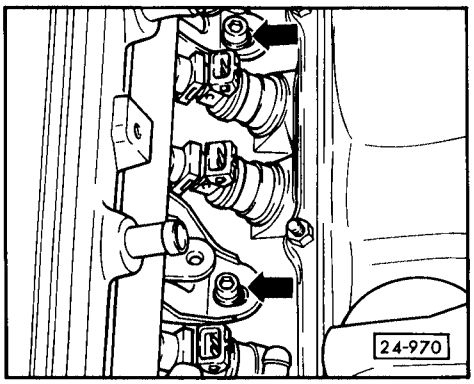


◄ – Unplug the connectors from the injectors.



◄ – Unbolt fuel distributor from intake manifold (arrows) and pull out of intake manifold together with injectors.

– Pull off retaining clip at the connection of injector/ fuel distributor and pull injectors out of fuel distributor.

Installing

Note:

Replace O-rings as well as injector inserts (in intake manifold) of the injectors.

– Moisten O-rings as well as injector inserts lightly with clean engine oil.

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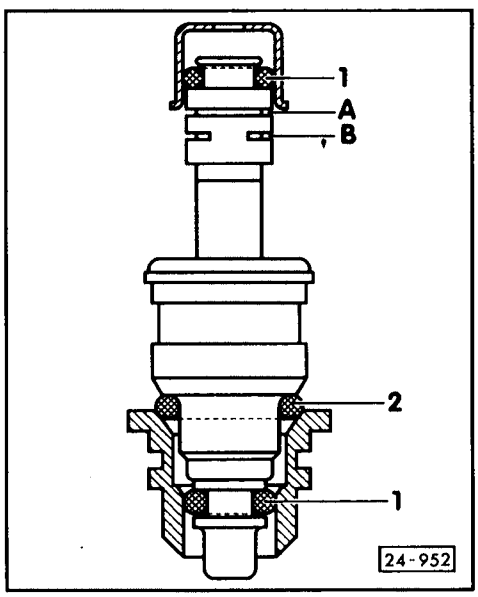
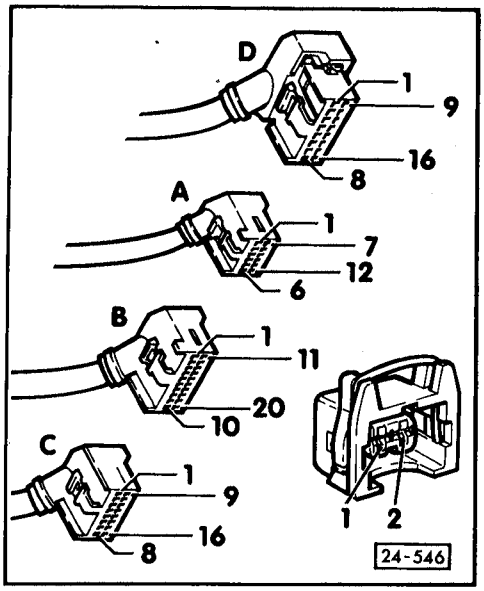


◄ – Push injectors vertically into the fuel distributor as far as the second notch –B– so that they are properly located and secure with retaining clips.

– Insert fuel distributor with the secured injectors at the intake manifold and press in evenly until it abuts the large O-ring –2–.

– Fit on securing bolts, press fuel distributor lightly by hand in the direction of the intake manifold and tighten the securing bolts.

– The remaining installation is performed in the reverse order of removal.



◄ – If the respective specification is not achieved, rectify open circuit in wiring or short circuit.

Contact 2 at connector of injector	Contact at connector –D–
1	4
2	5
3	6
4	9

– If the diode test lamp does not flash for all the injectors, test voltage supply for MPI control unit ⇒ Repair Group 28.

– If the voltage supply is in order, replace MPI control unit ⇒ Repair Group 01.

Removing and installing injectors

Removing

– Remove suction hose between air mass meter and throttle valve body.

◄ – Detach accelerator cable at bracket.

– Detach vacuum pipe to brake servo unit.

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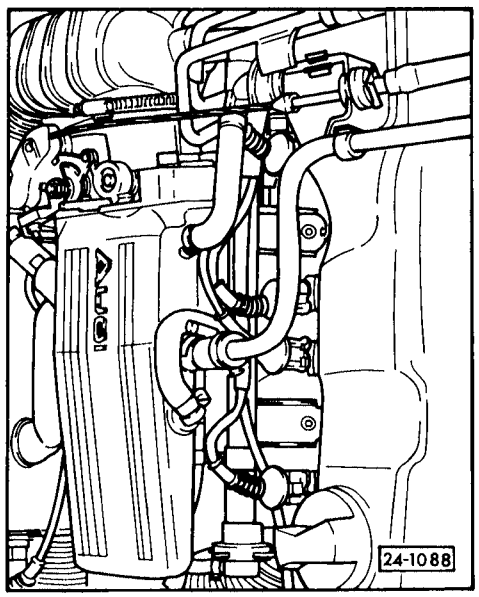
– Unbolt heat shield for throttle valve potentiometer on the side of the throttle valve body.



– Unbolt throttle valve body from intake manifold (25 Nm) and place to the rear.

– Unbolt feed and return pipes from fuel distributor (25 Nm).

Note:

Cover over the pressurized feed pipe at the fuel distributor with a clean rag as a protection against spraying fuel.

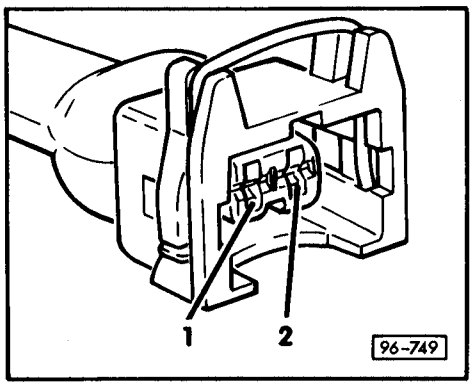
– Start final control diagnosis and actuate fuel pump relay –J17 ⇒ Repair Group 01.
Specification: Diode test lamp must light up.

– If the diode test lamp does not light up, test cable connection from contact 1 to fuse for injectors for continuity on the basis of the CFD and rectify any open circuit.

– If the diode test lamp lights up, test actuation of the injectors.

C – Testing actuation of the injectors

– Unplug connector at the injector to be tested.



– Connect diode test lamp V.A.G 1527 between contact 2 and battery positive or positive of starting assistance socket.

– Operate starter for a few seconds (engine may start when this is done).
Specification: Diode test lamp must flash.

– If the diode test lamp does not flash, test cable connection between contact 2 of the connector of the respective injector and the MPI control unit as follows:

– Connect test box V.A.G 1598 with adapter cable V.A.G 1598/12 to the wiring harness of the MPI control unit ⇒ Repair Group 01.

– Test control cable for injector 1 from contact 2 of the connector to socket 4 of the test box for continuity.
Specification: max. 1 Ω.

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– Test control cable for injector 2 from contact 2 of the connector to socket 5 of the test box for continuity.
Specification: max. 1 Ω.

– Test control cable for injector 3 from contact 2 of the connector to socket 6 of the test box for continuity.
Specification: max. 1 Ω.

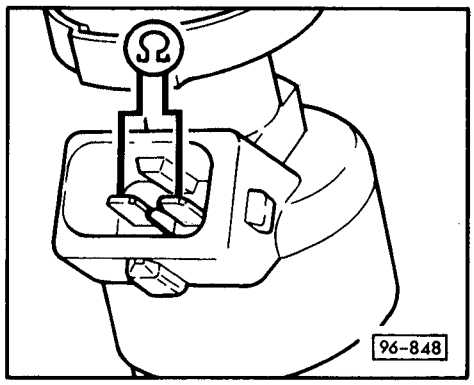
– Test control cable for injector 4 from contact 2 of the connector to socket 9 of the test box for continuity.
Specification: max. 1 Ω.

– If the specification is not achieved, rectify open circuit in wiring on the basis of the CFD.

– If no open circuit exists and the diode test lamp does not light up, replace MPI control unit ⇒ Repair Group 01.

– If the actuation of the fuel pump relay as well as the cable connection are in order, replace fuel pump relay.

– Re-insert fuse 17 and both thermofuses.



Testing injectors

A – Electrical test of injectors

– Unplug connector at the injector to be tested.

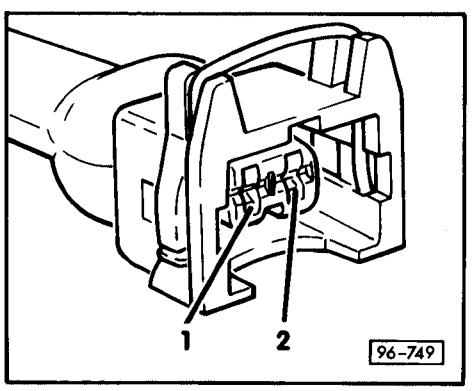
◄ – Perform resistance measurement with V.A.G 1526 between the contacts of the injector.
Specification: Bosch 15 ... 17 Ω
Siemens 13.5 ... 14.5 Ω

– If the specification is not achieved, replace injector.

B – Testing voltage supply

Test requirements:

- *Fuel pump relay in order.*
- *Actuation of fuel pump relay in order.*
- *Fuse for injectors in order.*



– Unplug connector at the injector to be tested.

◄ – Connect diode test lamp V.A.G 1527 between contact 1 and engine earth.

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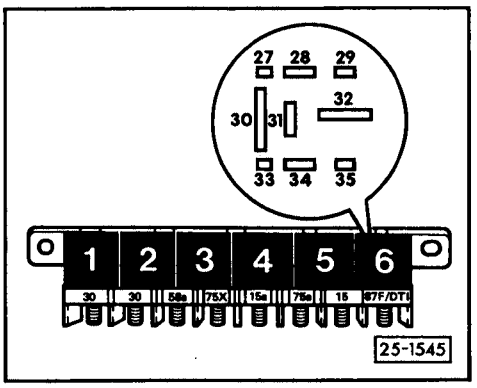


– If the diode test lamp again does not light up, test cable connection from thermofuse to contact 31 at relay position 6 for continuity on the basis of the CFD and rectify any open circuit.

B – Testing voltage supply and actuation of fuel pump relay

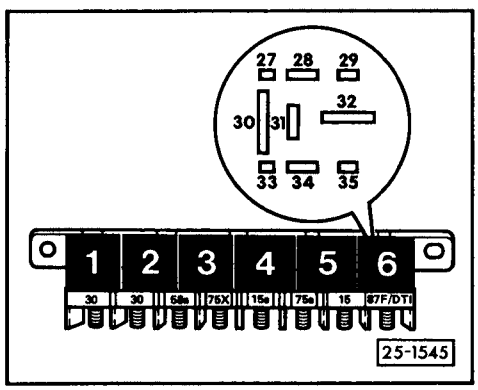
– Remove fuel pump relay /J17 from the electrical centre, relay position 6.

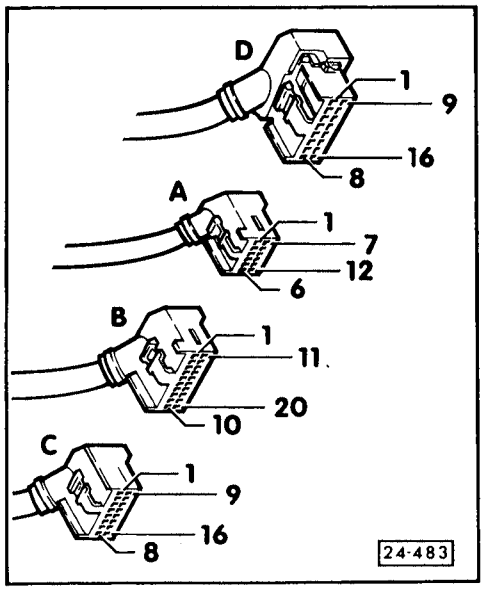
Testing voltage supply

– Switch on ignition.

– Connect hand-held multimeter V.A.G 1526 in turn between contact 28 (positive) and 34 as well as 32 (positive) and 34 of the relay base.
Specification: approx. battery voltage in each case.

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





Testing actuation

– Connect diode test lamp V.A.G 1527 between contacts 28 (positive) and 29.

– When the ignition is switched on, the diode test lamp must light up for about 1 second and then go out. When the starter is operated, the diode test lamp must come on and remain on.

Note:

Diode test lamps with low current consumption do not go out fully after 1 second but remain on with a weak light until the starter is operated.

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

– Connect test box V.A.G 1598 with adapter cable V.A.G 1598/12 to the wiring harness of the MPI control unit ⇒ Repair Group 01.

– Connect hand-held multimeter between contact 29 of the relay base and socket 15 of the test box and test cable connection for continuity.
Specification: max. 1 Ω

Audi
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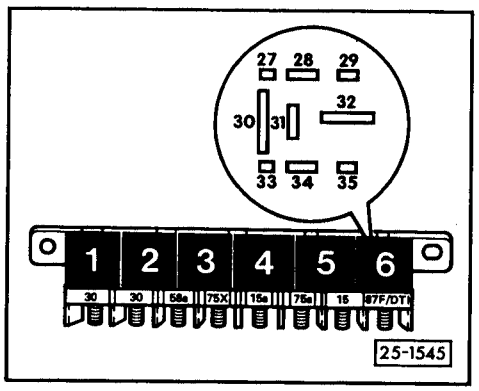
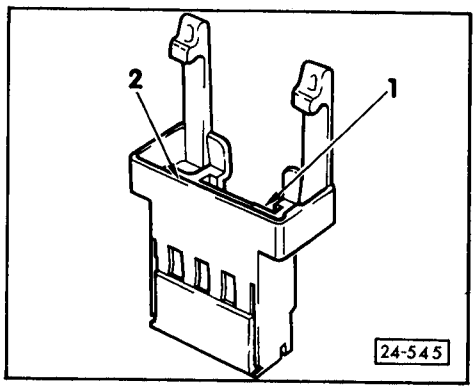


– Briefly operate starter.
Specification: Fuel pump relay must pick up (can be felt and heard), diode test lamp must come on.

– If the fuel pump relay does not pick up, test actuation ⇒ page 24–33.

– If the diode test lamp does not come on, repeat test at the other contact of fuse 17.

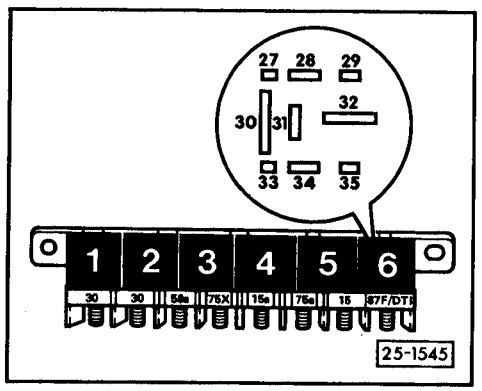
◄ – If the diode test lamp again does not come on, test cable connection from fuse 17 to contact 30 at relay position 6 for continuity on the basis of the CFD and rectify any open circuit.



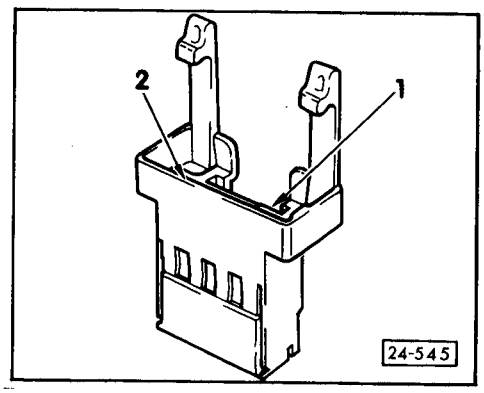
◄ – Connect diode test lamp between earth and contact 1 of fuse holder 3 (red holder).

– Start final control diagnosis and actuate fuel pump relay –J17 ⇒ Repair Group 01.
Specification: Fuel pump relay must pick up (can be felt and heard), diode test lamp must come on.

– If the diode test lamp does not light up, repeat test at contact 2.



◄ – If the diode test lamp again does not light up, test cable connection from thermofuse to contact 30 at relay position 6 for continuity on the basis of the CFD and rectify any open circuit.



◄ – Connect diode test lamp between earth and contact 1 of thermofuse 2 (brown holder).

– Start final control diagnosis and actuate fuel pump relay –J17 ⇒ Repair Group 01.
Specification: Fuel pump relay must pick up (can be felt and heard), diode test lamp must come on.

– If the diode test lamp does not light up, repeat test at contact 2.

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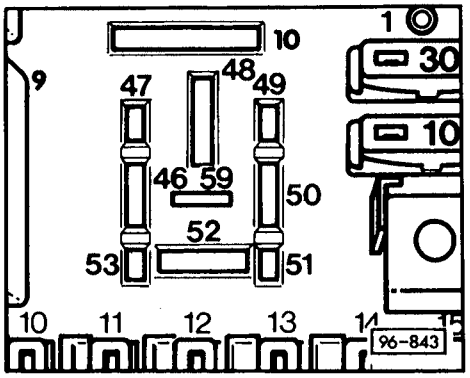


- Connect hand-held multimeter between contact 47 of the relay base and socket 14 of the test box and test cable connection for continuity. Specification: max. 1 Ω.
- If the specification is not achieved, rectify open circuit in wiring on the basis of the CFD.
- If no open circuit exists and the diode test lamp does not come on, replace MPI control unit.
- If the actuation of the fuel pump relay as well as the cable connection are in order, replace fuel pump relay.

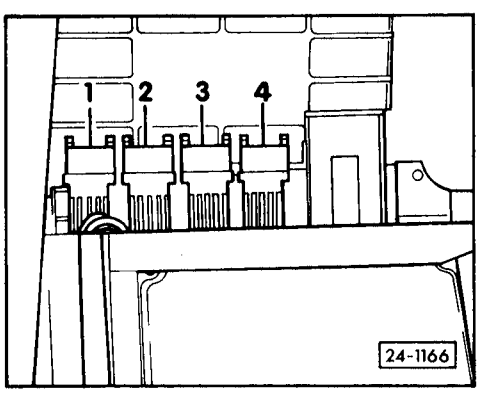
Testing fuel pump relay and actuation (Audi 100)

A – Operational test of fuel pump relay –J17

Note:

The fuel pump relay is located in the electrical centre on the left below the dash panel.

- Remove shelf in the front left footwell.
- Remove trim panel at the bottom right of pillar A.
- Turn back carpeting in front right footwell, unscrew cover from the electronics box.



- Remove thermofuses 2 and 3 (2 = brown holder, 3 = red holder).
- Remove fuse 17 at the fuse holder and connect diode test lamp V.A.G 1527 between earth and one of the two contacts of fuse 17.

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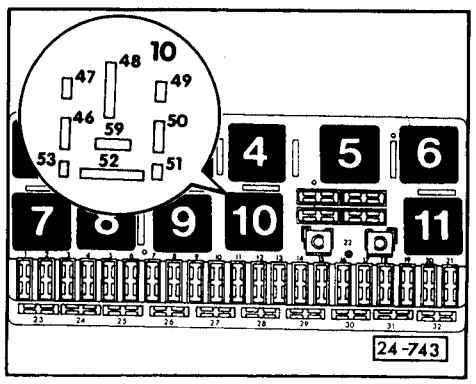
– If the fuel pump relay picks up but the diode test lamp does not come on, repeat test at the other contact of the fuse holder.

– If the diode test lamp again does not come on, remove fuel pump relay and test cable connection from fuse 25 to contact 59 of relay position 10 for continuity on the basis of the CFD; replace relay plate if necessary.

– If no open circuit is found, replace fuel pump relay.

B – Testing voltage supply and actuation of fuel pump relay



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

Testing voltage supply

– Switch off ignition.

– Connect hand-held multimeter V.A.G 1526 (voltage measurement) in turn between contacts 46 (positive) and 50 as well as 48 (positive) and 50 of the relay base.
Specification: approx. battery voltage in each case.

– Switch off ignition.

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

Testing actuation

– Connect diode test lamp V.A.G 1527 to contacts 46 (positive) and 47 of the relay base.

– When the ignition is switched on, the diode test lamp must light up for about 1 second and then go out. When the starter is operated, the diode test lamp must come on and remain on.

Note:

Diode test lamps with low current consumption do not go out fully after 1 second but remain on with a weak light until the starter is operated.

– If the diode test lamp does not come on, test wiring as follows:

– Connect test box V.A.G 1598 with adapter cable V.A.G 1598/12 to the wiring harness of the MPI control unit ⇒ Repair Group 01.

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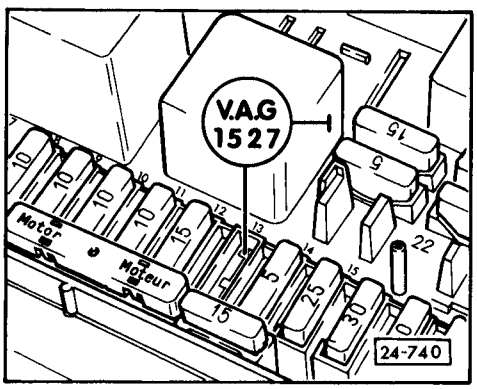
Testing fuel pump relay and actuation (Audi 80)

A – Operational test of fuel pump relay –J17

Note:

The fuel pump relay is located in the electrical centre in the left of the plenum chamber, relay position 10.

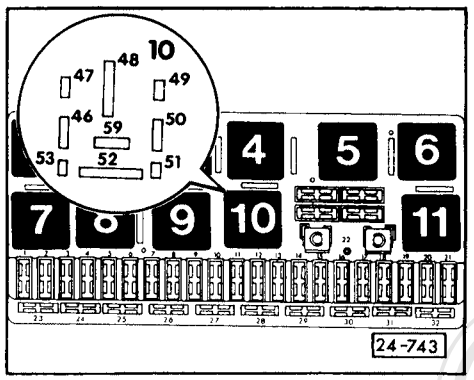
– Remove cover of electrical centre in the left of the plenum chamber.



◄ – Withdraw fuse 13 and connect diode test lamp V.A.G 1594 between earth and rear contact of fuse 13.

– Start final control diagnosis and operate fuel pump relay –J17 ⇒ Repair Group 01.
Specification: Fuel pump relay must pick up (can be felt and heard), diode test lamp must come on.

– If the fuel pump relay does not pick up, test voltage supply and actuation ⇒ page 24–27.



◄ – If the fuel pump relay picks up but the diode test lamp does not come on, remove fuel pump relay and test connection from fuse 13 to contact 52 of relay position 10 for continuity on the basis of the CFD; replace relay plate if necessary.

– If no open circuit is found, replace fuel pump relay.

– Re-insert fuse 13.

– Remove auxiliary fuse 25 at bottom (red security cover, engine) and connect diode test lamp between earth and one of the two contacts of fuse 25.

– Start final control diagnosis and operate fuel pump relay –J17 ⇒ Repair Group 01.
Specification: Fuel pump relay must pick up (can be felt and heard), diode test lamp must come on.

– If the fuel pump relay does not pick up, test actuation ⇒ page 24–27.

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Note:

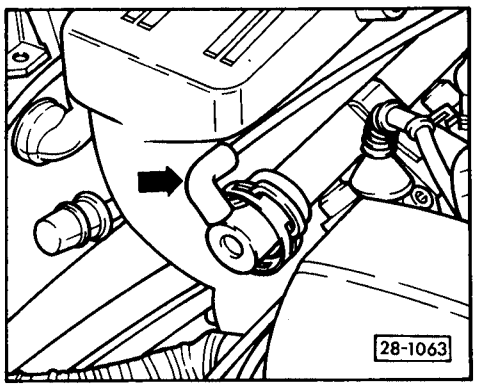
Shut-off cock of pressure measuring device must be open (lever facing direction of flow).

– Start engine and run at idling speed.

– Measure fuel pressure.
Specification: approx. 3.6 bar

Note:

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



– Detach vacuum hose (arrow) for fuel pressure regulator. The pressure must rise to about 4.2 bar.

– Switch off ignition.

– Check for leaks and check holding pressure by observing pressure drop on gauge.
At least 3.0 bar pressure must still exist after 10 minutes.

If the holding pressure drops below 3.0 bar:

– Start engine and, after building up fuel pressure, switch off ignition. At the same time, tightly pinch rubber hose of return pipe with V.A.G 3094 and observe pressure drop at gauge.

If the pressure does now not drop, the fuel pressure regulator is faulty.

If the pressure again drops:

- Pipe connections leaking.
- Seals at fuel distributor leaking.
- Injectors leaking.
- Non-return valve in fuel pump leaking ⇒ Repair Group 20.
- Pressure measuring device leaking (shut-off cock).

Note:

Drain fuel at the measuring device before disconnecting the measuring device.

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Note:

Pay attention to the following points and check:

- If the CO content is less than 0.2 % by vol., the cause may be leaks in the area of the CO sampling pipe or test pipe to V.A.G 1363/A.
- If the CO content is greater than 1.2 % by vol., the cause may be leaks in the exhaust system between engine and Lambda probe.
- Failure of a spark plug or spark plug coated with carbon causes the CO content to rise to about 1.7 %.

– If the specification is not achieved, interrogate fault memory ⇒ Repair Group 01.

– If no fault is stored in the fault memory, perform "Adaptation" ⇒ Repair Group 01.

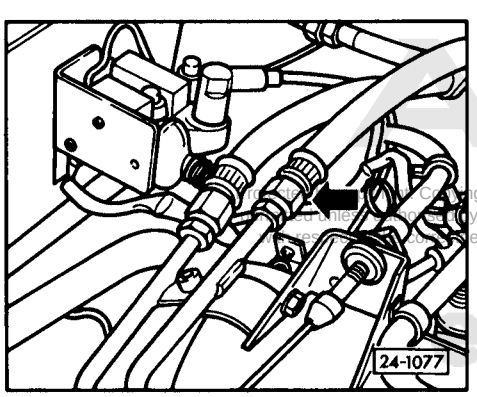
Testing fuel pressure, pressure regulator and holding pressure

Test requirements:

- *Fuel pump relay in order; testing ⇒ page 24–25 and page 24–30, respectively.*
- *Fuel pump in order; testing ⇒ Repair Group 20.*

Note:

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



– Cover over the pressurized screw union (arrow) of the feed pipe with a cleaning rag in order to prevent fuel spraying. Open screw union and collect fuel which flows out.

– Install pressure measuring device V.A.G 1318 with adapters V.A.G 1318/7 and V.A.G 1318/13 into the feed pipe.

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Note:

Pay attention to the following points and check:

- If the CO content is less than 0.2 % by vol., the cause may be leaks in the area of the CO sampling pipe or test pipe to V.A.G 1363/A.
- If the CO content is greater than 1.2 % by vol., the cause may be leaks in the exhaust system between engine and Lambda probe.
- Failure of a spark plug or spark plug coated with carbon causes the CO content to rise to about 1.7 %.

– If the specification is not achieved, interrogate fault memory ⇒ Repair Group 01.

– If no fault is stored in the fault memory, start Read measured value block until the readout "Read measured value block 6" appears in the display and observe display value 1 (Lambda control) ⇒ Repair Group 01.

Testing and adjusting CO content (vehicles without Lambda probe)

– Remove screw plug from exhaust manifold, install adapter V.A.G 1318/12 and hose nipple V.A.G 1732.

– Connect CO tester V.A.G 1363/A with hose adapter V.A.G 1363/3 for measuring CO content as stated in the operating instructions.

Note:

The hose adapter V.A.G 1363/3 must be firmly fitted over the hose nipple V.A.G 1732 so that no gas leakage can occur.

– Test CO content on V.A.G 1363.
Specification: 0.2 ... 1.2 % by vol.

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If idling speed is too high and no fault is stored in the fault memory, perform the tests below marked with a dot:

- Test idling speed switch ⇒ page 24–59.
- Large quantity of unmetered air ⇒ Basic setting of engine, display group 01, 05 or 08, respectively.
- Test idling speed stabilization valve ⇒ page 24–47.
- Test learning values for idling speed stabilization ⇒ Basic setting of engine, display group 04.

If idling speed is too low and no fault stored in the fault memory, perform the following tests marked with a dot:

- Test idling speed switch ⇒ page 24–59.
- Test idling speed stabilization valve ⇒ page 24–47.

Testing CO content (vehicles with Lambda probe)

Note:

The CO content cannot be set manually.

– Remove screw plug from exhaust manifold, install adapter V.A.G 1318/12 and hose nipple V.A.G 1732.

– Connect CO tester V.A.G 1363/A with hose adapter V.A.G 1363/3 for measuring CO content as stated in the operating instructions.

Note:

The hose adapter V.A.G 1363/3 must be firmly fitted over the hose nipple V.A.G 1732 so that no gas leakage can occur.

– Test CO content on V.A.G 1363.
Specification: 0.2 ... 1.2 % by vol.

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Testing idling speed

Notes:

- *Idling speed cannot be adjusted.*
- *Idling speed is tested during basic setting of engine.*

– Interrogate fault memory ⇒ Repair Group 01. No fault must be stored; rectify any faults, erase fault memory. Switch off engine and start again, perform road test and once again interrogate fault memory as a check.

– Continue running engine at idling speed.

Important!
The electric fan for the radiator must not cut in.

– Start basic setting of engine until the readout "Basic setting 17" appears in the display ⇒ Repair Group 01.

Basic setting	17		→
1	2	3	4

◄ Readout in display:

Do not continue with the test until

- the coolant temperature is at least 85°C
- a readout between 1 and 9 is displayed in display field 3.

If the readout in display field 3 is outside the tolerance range, adjust ignition timing before testing idling speed ⇒ Repair Group 28.

– Read off idling speed in display field 1.
Specification: 800 ... 900 rpm.

– Press → key.

– Enter 06 for "End output" and confirm with Q.

– If the specification is not achieved, once again interrogate fault memory ⇒ Repair Group 01.

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Technical data

Engine code letters	ADA	
Idling speed • Idling speed not adjustable, is controlled by idling speed stabilization	800 ... 900 rpm	
Engine speed governing • By shutting off injectors	6500 rpm	
CO content • Upstream of catalytic converter	Test value	0.2 ... 1.2 % by vol.
	Setting	0.7 ± 0.45 % by vol.
Fuel pressure • At idling speed and vacuum hose	Fitted on	approx. 3.6 bar
	Disconnected	approx. 4.2 bar
Holding pressure	After 10 minutes	at least 3.0 bar
Injectors	Fuel spray	identical for all injectors
	Quantity injected	85 ... 100 ml
	Resistance	Bosch: 15 ... 17 Ω Siemens: 13.5 ... 15.5 Ω

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Testing idling speed and CO content

Test requirements:

- *No leak in exhaust system.*
- *Coolant temperature at least 85° C.*
- *Throttle valve in idling position (adjusting throttle cable ⇒ Repair Group 20).*
- *All electrical components switched off.*
- *Air conditioner switched off.*
- *Pressure measuring device not connected.*
- *Selector lever in P or N.*

- If a fault exists or is suspected in the ignition system, the vehicle must not be towed unless the connector at the power output stage is unplugged.
- Do not connect a capacitor to terminal 1 (–).
- Do not replace distributor rotor arm 1 kΩ (identification: R1) with a different type, also not for radio interference suppression.
- Always use the adapter cable set V.A.G 1594 for connecting test equipment.

Rules for cleanliness

Pay careful attention to the following "5 rules" for cleanliness when performing work on the fuel supply and fuel injection system.

- Thoroughly clean connection points and surrounding area before disconnecting.
- Place removed parts down on a clean surface and cover over. Use sheeting or paper. Do not use fluffing cloth.
- Carefully cover over or seal opened components if repairs are not performed immediately.
- 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).
- If system is open:
  - Avoid working with compressed air, if possible.
  - Avoid moving vehicle, if possible.

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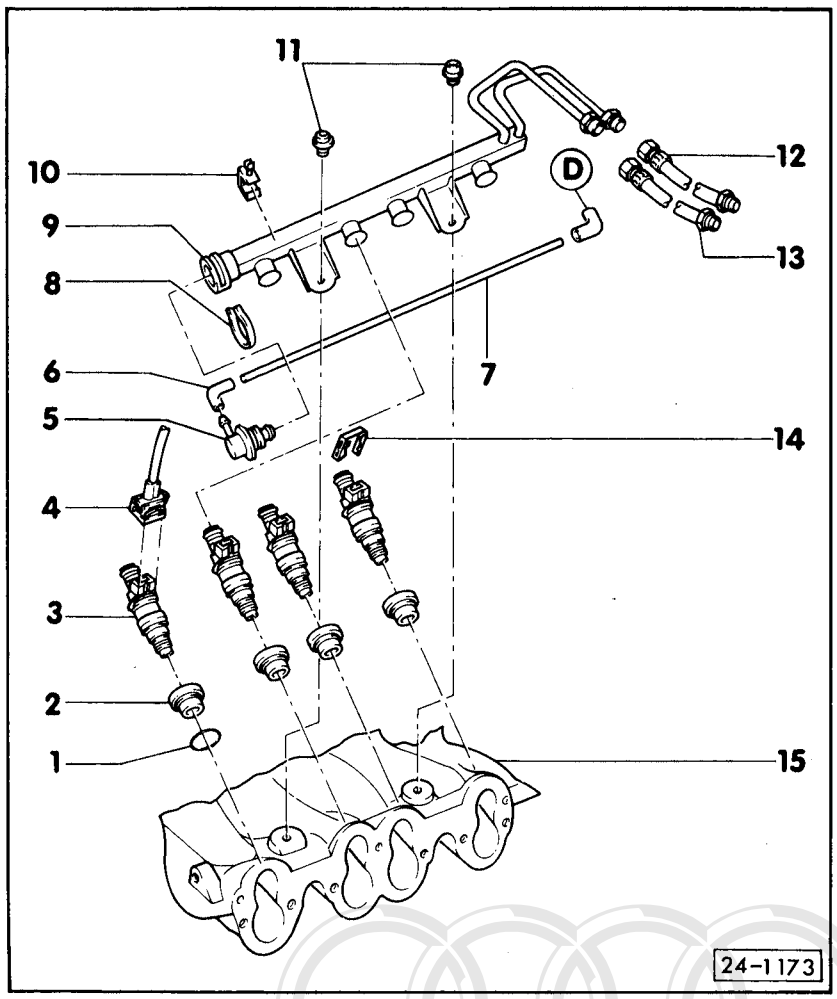

4 – Connector

5 – Fuel pressure regulator
- Testing ⇒ page 24–22

6 – Angled connector

7 – Vacuum pipe

8 – Securing clip for pressure regulator

9 – Fuel rail
- Removing and installing ⇒ Removing and installing injectors, page 24–40

10 – Bracket for vacuum pipe

11 – 10 Nm

12 – Return pipe (25 Nm)

13 – Feed pipe (25 Nm)

14 – Securing clip for injectors

15 – Intake manifold

Safety precautions

Pay attention to the following points in order to avoid injuries to persons and/or damage to the fuel injection and ignition system:

- Do not touch or disconnect ignition cables when the engine is running or at starting speed.
- Do not disconnect and connect cables of the ignition system – also not high-voltage cables and test equipment cables – unless the ignition is switched off.
- To operate the engine at starting speed without the engine starting (e.g. for testing compression), unplug connector from power output stage at ignition transformer and remove fuse for fuel pump.
- Starting assistance with quick-charger is only permitted up to 1 minute with a maximum voltage of 16.5 V.
- The ignition must be switched off when performing engine wash.
- Do not disconnect and connect battery unless the ignition is switched off otherwise the MPI control unit may be damaged.

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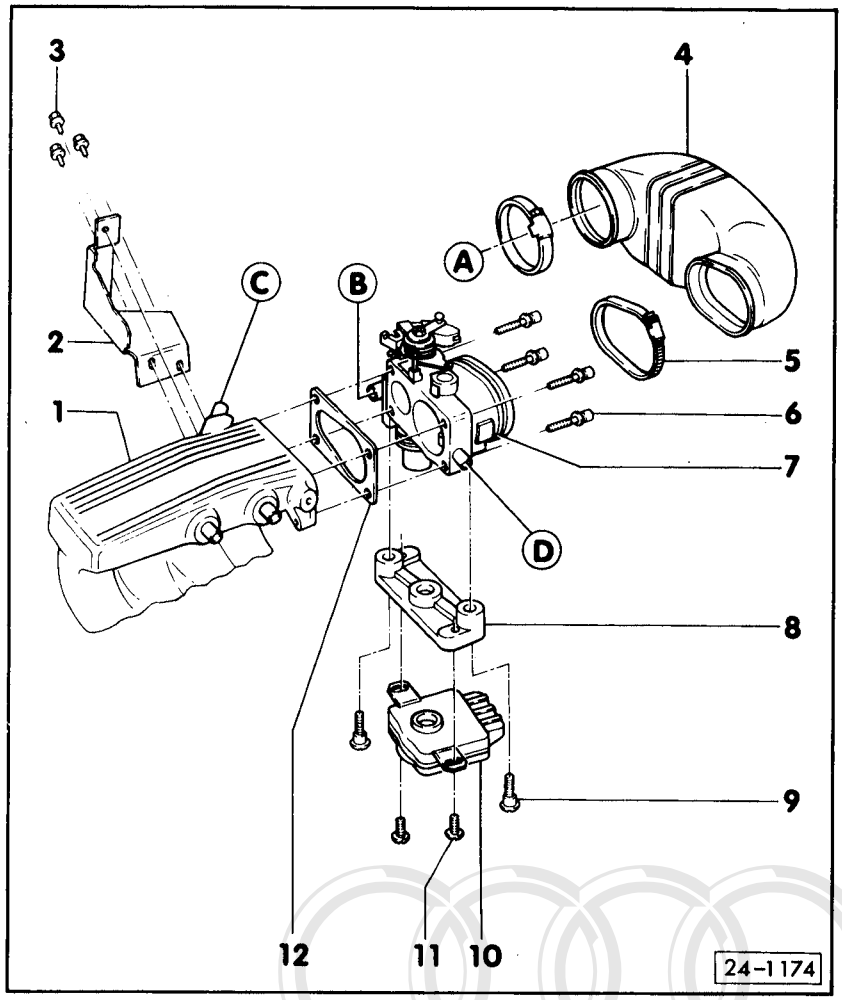


1 – **Intake manifold**

2 – **Heat shield**

3 – **10 Nm**

4 – **Suction hose**

5 – **Screw clip**

6 – **25 Nm**

7 – **Throttle valve body**

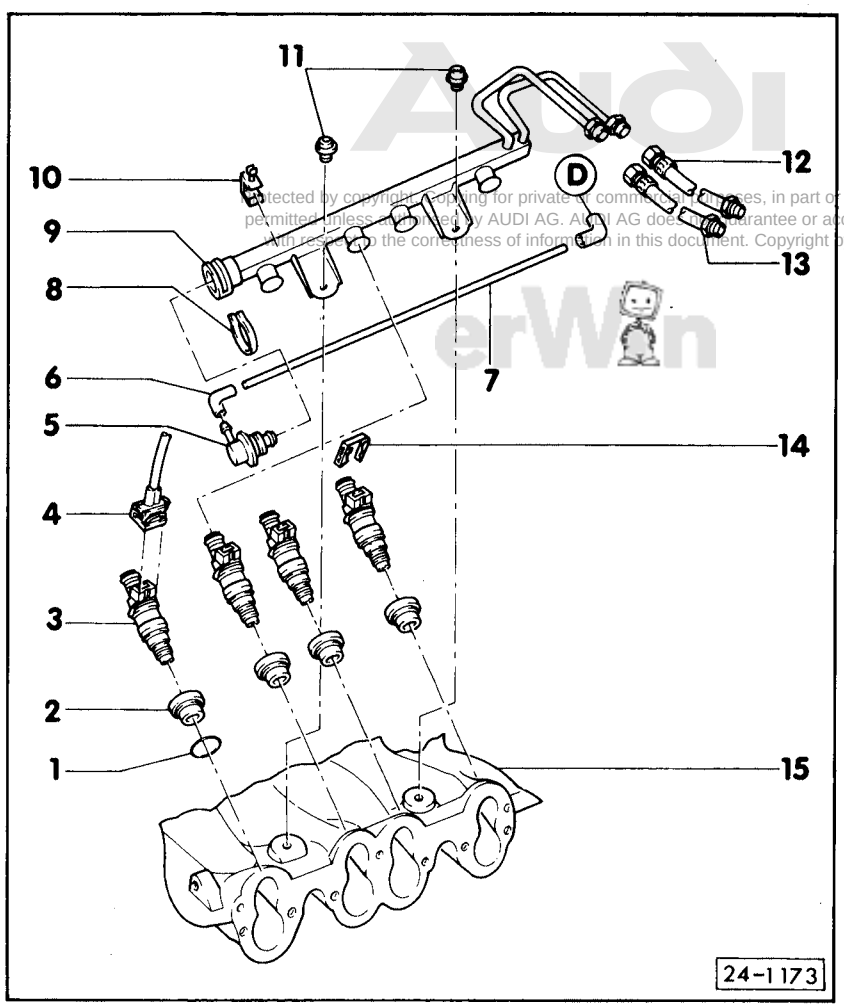
8 – **Bracket for throttle valve potentiometer with idling speed switch**

9 – **6 Nm**

10 – **Throttle valve potentiometer with idling speed switch**

11 – **4 Nm**

12 – **Gasket**



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- Rules for cleanliness ⇒ page 24–12
- Safety precautions ⇒ page 24–10

Notes:

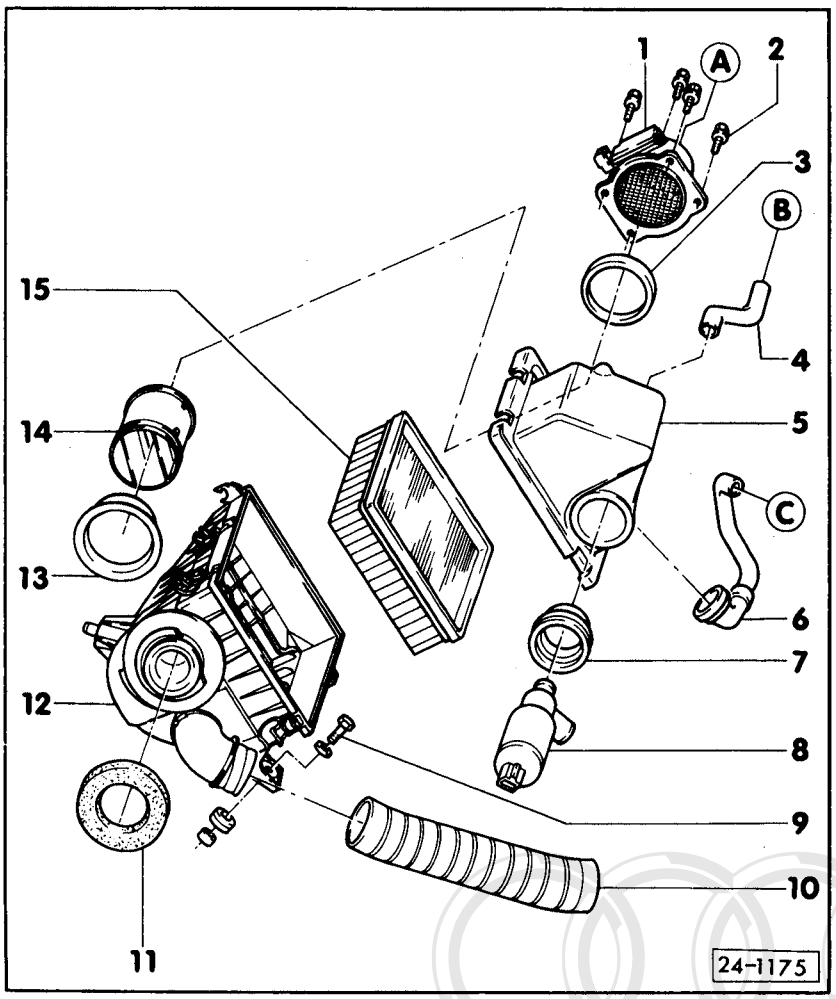
- *Before performing repair work on the fuel injection system, interrogate fault memory and perform final control diagnosis ⇒ Repair Group 01.*
- *Always fit new gaskets and seals.*

D – Page 24–6

1 – **O-ring**
- Replace if damaged

2 – **Injector insert**

3 – **Injector (N30 ... N33)**
- Testing ⇒ page 24–36
- Removing and installing ⇒ page 24–40



8 – Idling speed stabilization valve –N71

9 – 20 Nm

10 – Hose to exhaust manifold

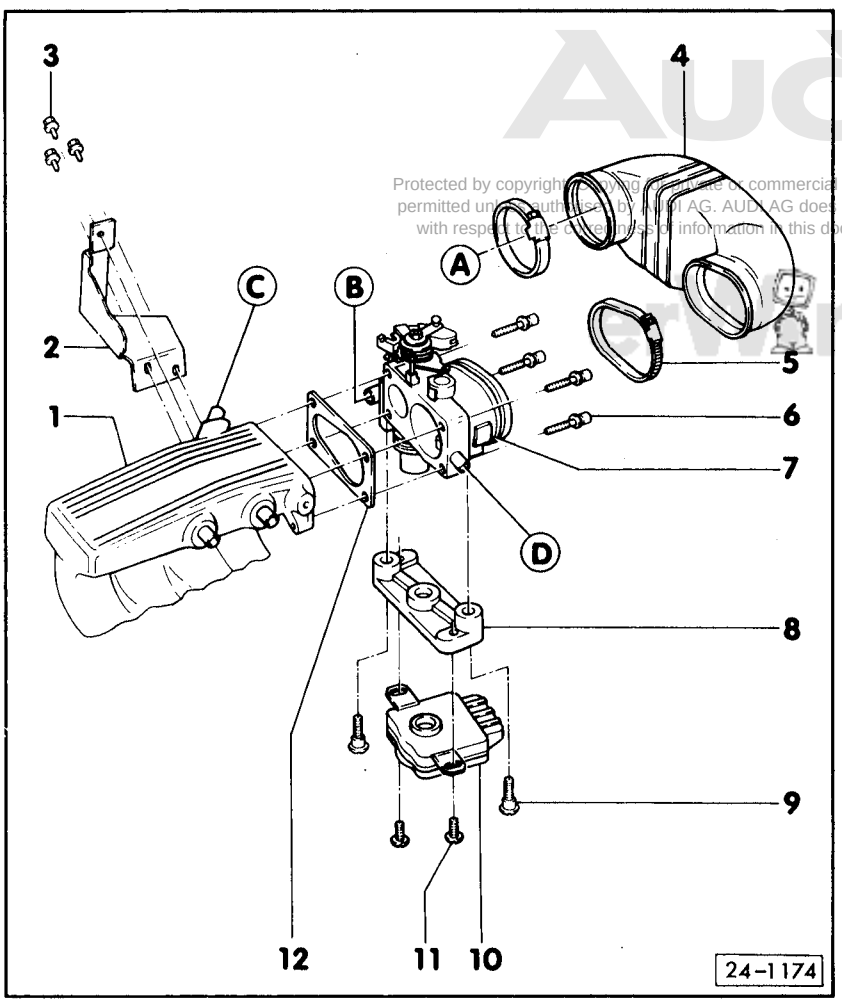
11 – Rubber seal

12 – Bottom part of air cleaner
- With changeover for intake air preheating

13 – Fixing disc

14 – Air guide

15 – Air cleaner element



- Rules for cleanliness ⇒ page 24–12
- Safety precautions ⇒ page 24–10

Notes:

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

A – Page 24–4

B – Page 24–4

C – Page 24–4

D – Page 24–8

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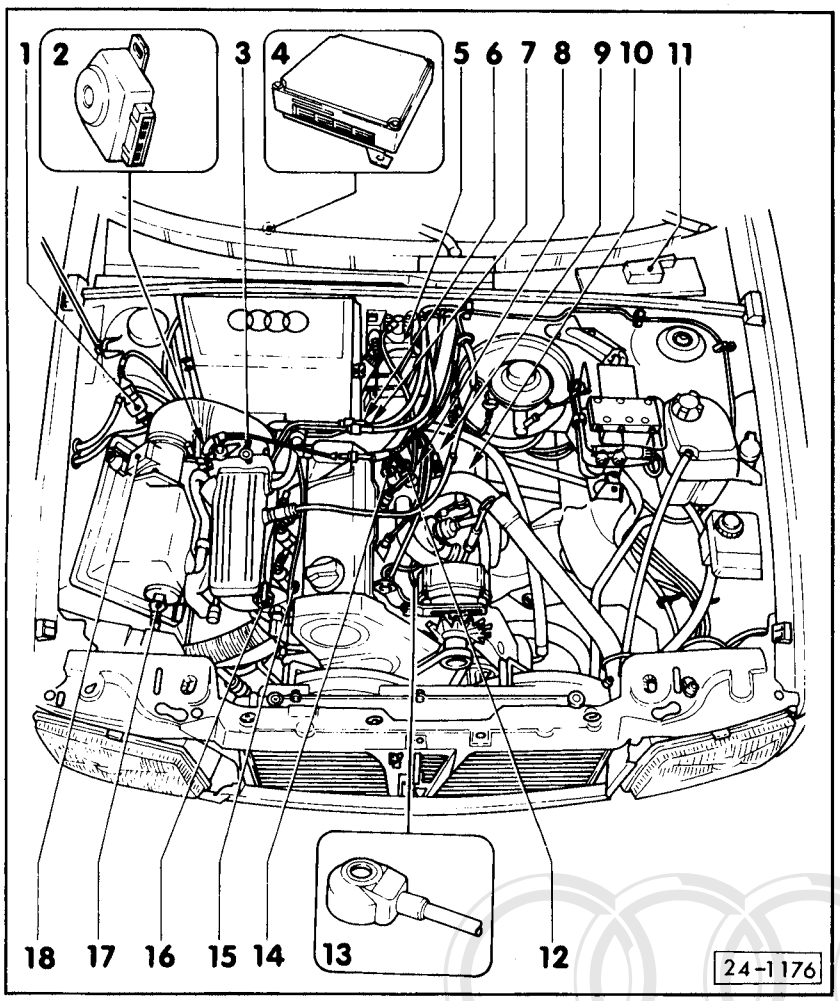
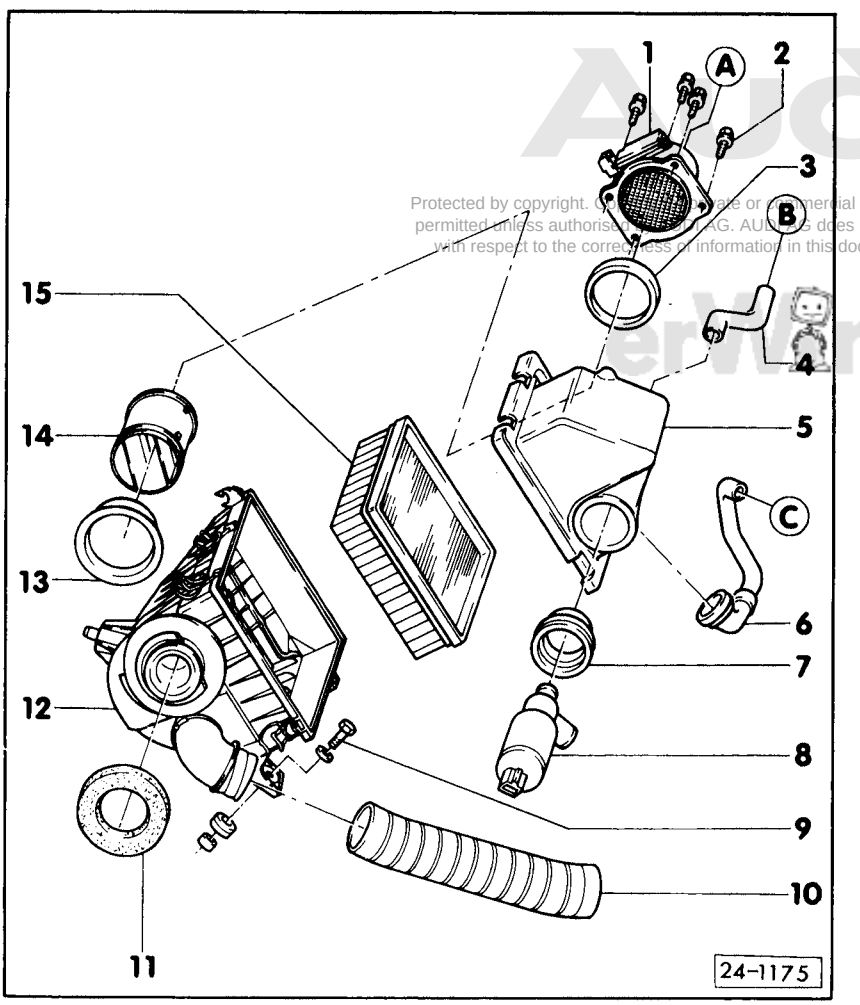


15 – **Injectors –N30, –N31, –N32, –N33**

16 – **Fuel pressure regulator**

17 – **Idling speed stabilization valve –N71**
- Testing ⇒ Final control diagnosis, Repair Group 01

18 – **Air mass meter –G70 with intake air temperature sender –G42**



Servicing multi-point fuel injection system

A – Page 24–6

B – Page 24–6

C – Page 24–6

1 – **Air mass meter –G70 with intake air temperature sender –G42**

2 – **10 Nm**

3 – **Seal**

4 – **Rubber hose**

5 – **Top part of air cleaner**

6 – **Rubber hose**

7 – **Rubber seal**

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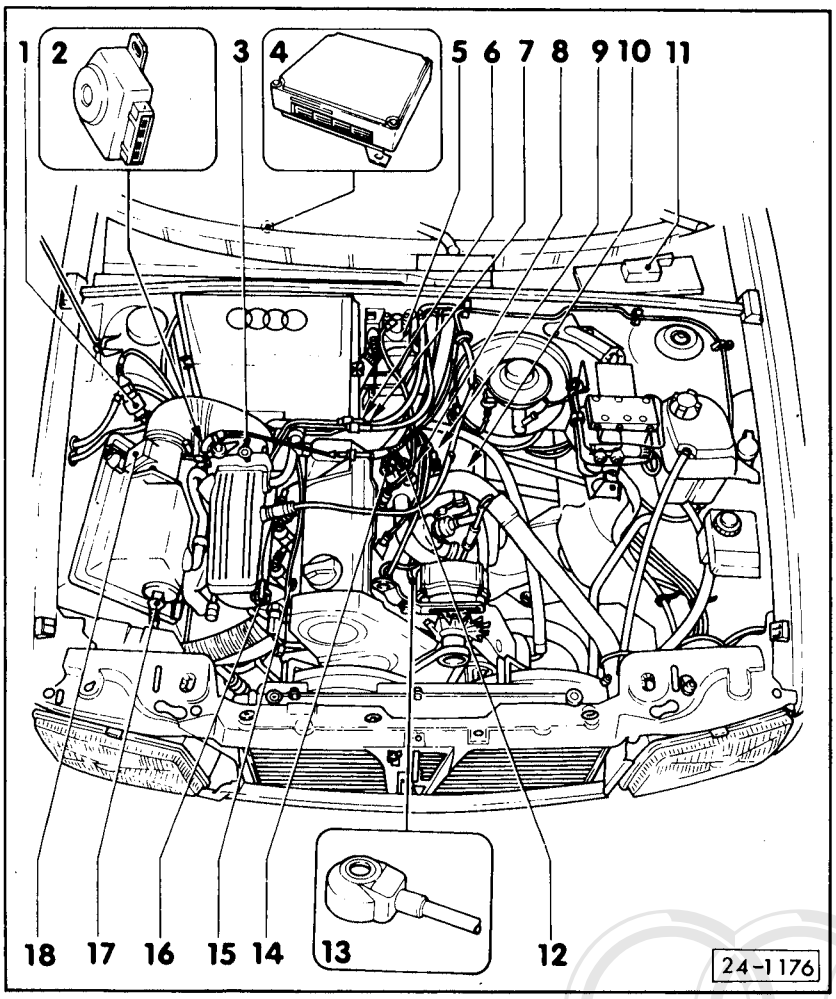


Multi-point injection (MPI) system

List of fitting locations

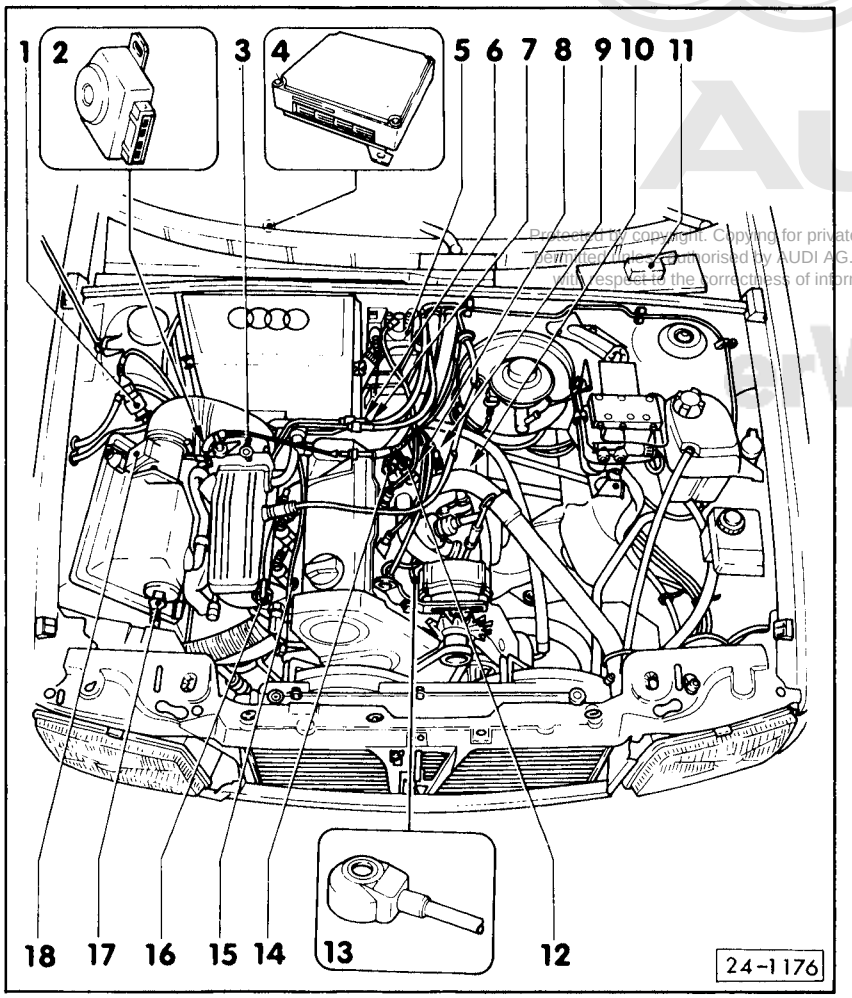
1 – **Solenoid valve 1 for activated charcoal filter –N80**
- Testing ⇒ Final control diagnosis, Repair Group 01

2 – **Throttle valve potentiometer –G69 with integral idling speed switch –F60**

3 – **Throttle valve body**

4 – **Control unit for MPI fuel injection and ignition system –J192**
- Removing and installing ⇒ Repair Group 01

5 – **Ignition transformer –N with output stage –N70**



6 – **Plug connection for knock sensor –G61**

7 – **Plug connection for engine speed sender –G28**

8 – **Distributor –O with Hall sender –G40**

9 – **Engine speed sender –G28**

10 – **Plug connection of Lambda probe –G39 and Lambda probe heater –Z19**

11 – **Diagnostic socket**

12 – **Coolant temperature sender –G62 (2-pin)**

13 – **Knock sensor I –G61**

14 – **Sender for coolant temperature gauge –G2 and switch for overheating warning lamp –F14 (3-pin)**

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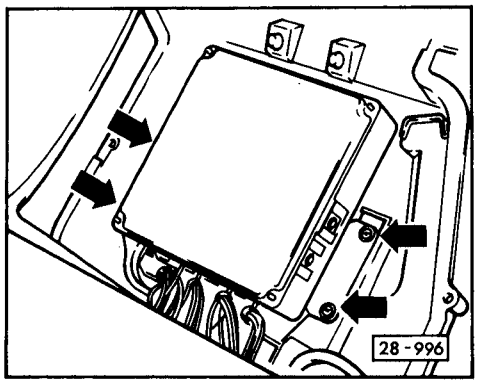


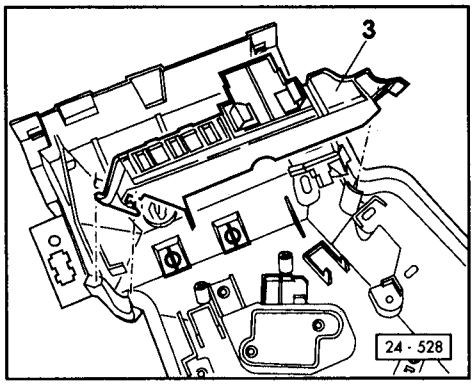
Installing MPI control unit

Note:

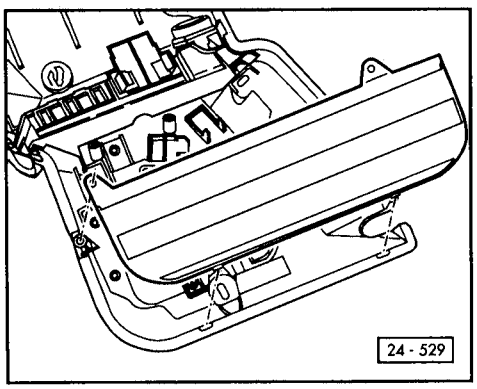
Wait 30 seconds after switching off the ignition before plugging in the connectors of the MPI control unit.

– Plug in connectors to control unit.

◄ – Screw control unit onto mounting in electronics box.



◄ – Re-insert cross strut 3.



◄ – Carefully insert bottom cover into both openings of the electronics box until it locks in place.

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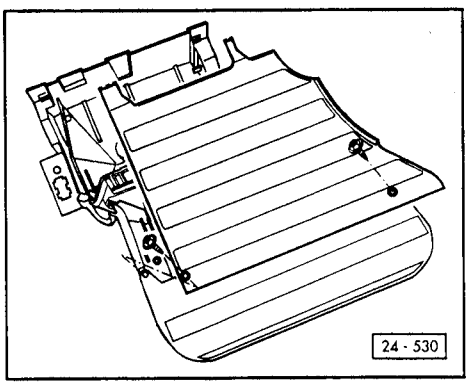


◄ – Carefully attach top cover to both openings of electronics box.

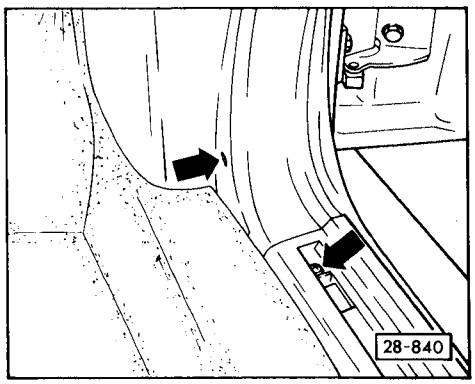
– Screw both covers of electronics box together.

– Cover over electronics box with carpeting.

– Re-attach cover trim for pillar A.

Note:

If engine idling is irregular after installing MPI control unit, run engine for several minutes at idling speed to enable the learning process to be performed ⇒ Basic setting of engine, display group 06, display field 4, page 01–66.



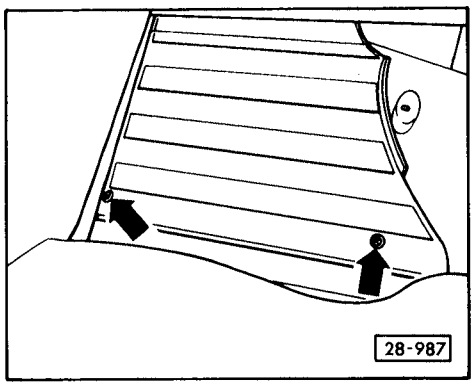
Removing and installing MPI control unit (Audi 100)

Removing MPI control unit

– Switch off ignition.

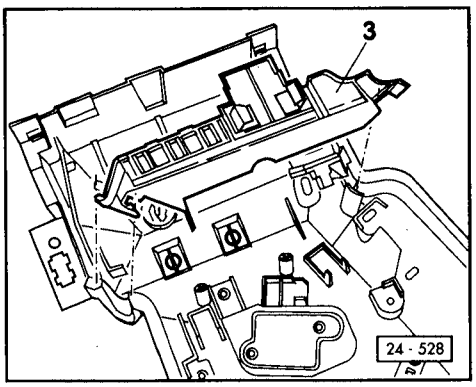
◄ – Remove cover at bottom right of pillar A.

– Turn back carpet in front right footwell.



◄ – Remove screws of electronics box cover.

– Carefully detach top and bottom cover of electronics box.



◄ – Carefully pull out cross strut 3 with attachments.

Note:

Wait 30 seconds after switching off the ignition before unplugging the connectors from the MPI control unit and do not plug in unless the ignition is switched off.

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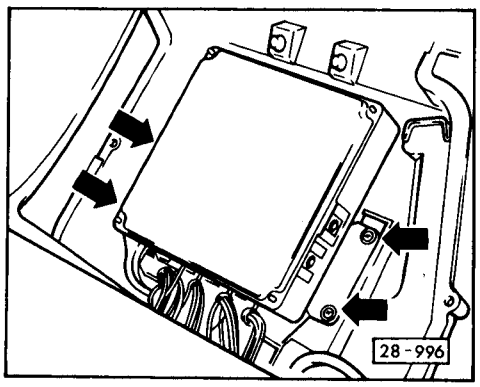


◄ – Unscrew control unit from the electronics box.

– Lift out control unit and unplug the connectors.

Notes:

- *Wait 30 seconds after switching off the ignition before unplugging the connectors from the MPI control unit and do not plug in unless the ignition is switched off.*
- *The test box can be connected in the service position in order to perform measurements and test operations.*

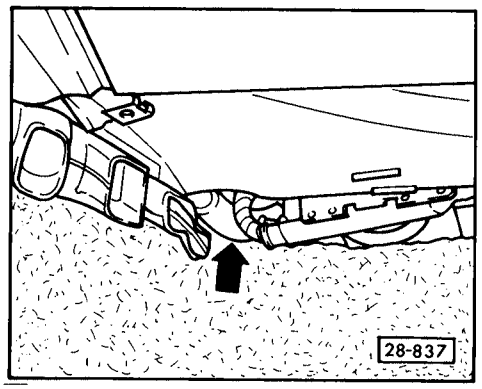
– Pull out MPI control unit fully.

– Unplug connectors.

– Unbolt control unit from the carrier plate.

Installing MPI control unit

– Installation is performed in the reverse order.



Notes:

- *Wait 30 seconds after switching off the ignition before plugging in the connectors of the MPI control unit.*
- *On models fitted with air conditioner, check whether the condensation water drain hose is fitted on before installing the cover below the glove box.*

- *If the engine does not idle smoothly after installing the MPI control unit, run engine at idling speed for several minutes to enable the learning process to be performed ⇒ Basic setting of engine, display group 06, display field 4, page 01–66.*

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Replacing MPI control unit

Notes:

- *To replace the MPI control unit perform the following operations in the sequence stated.*
- *Unplugging the connectors from the MPI control unit separates the permanent voltage supply and thus erases the fault memory.*

– Connect fault reader V.A.G 1551 and start until control unit identification appears ⇒ page 01–5.

8A0906264 1.6l R4 MPI 2V D01
Coding 02001 WSC 06388

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

– Read off coding, compare with coding table on page 01–86 and note.

– Press → key.

Rapid data transfer HELP
Select function XX

◄ Readout in display:

– Switch off ignition.

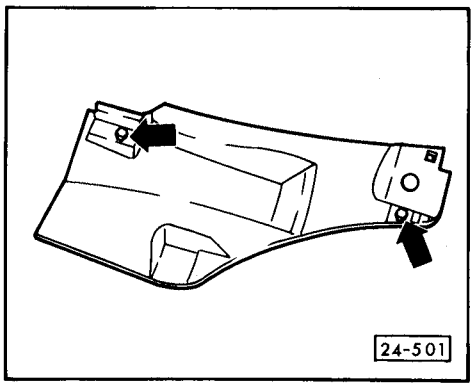
– Remove and install control unit ⇒ page 01–108 and 01–111, respectively.

– Re-code MPI control unit with noted coding ⇒ page 01–83.

Removing and installing MPI control unit (Audi 80)

Removing MPI control unit

– Switch off ignition.



◄ – Remove cover below glove box.

– Insert screwdriver next to retaining clip between carrier plate of MPI control unit and plastic recess.

– Turn screwdriver slightly, if necessary, in order to release the catches fitted to the carrier plate above the retaining clip from the opening in the plastic recess.

– Pull control unit down 3...4 cm. The control unit locks in a second opening in this position (service position).

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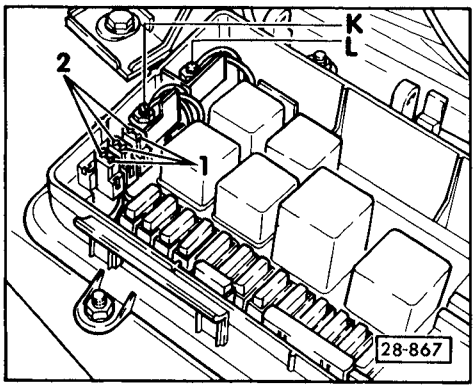

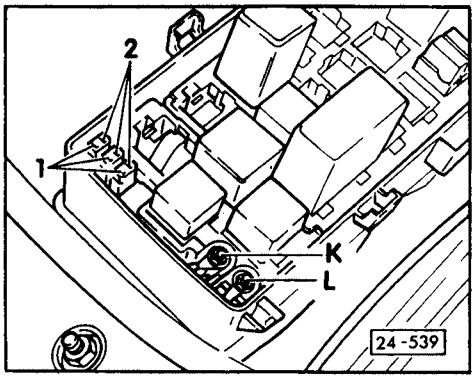

– If the control unit identification is then again not displayed, test wiring to the MPI control unit on the basis of the CFD. If the cable connection is in order, replace MPI control unit.

◄ – Re-connect all the cables of the other systems to cable junctions K and L and interrogate fault memory.

– If the control unit identification is displayed, the fault is not at the MPI control unit.

– Switch off ignition.

– Determine all the cable connections between the control unit and the cable junctions K and L one after the other and connect.

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

– If the control unit identification is displayed, switch off ignition.

– Determine cable connection of the next control unit to the cable junctions K and L and establish connection.

– If the control unit identification is not displayed, replace the control unit last connected and re-create all the cable connections.

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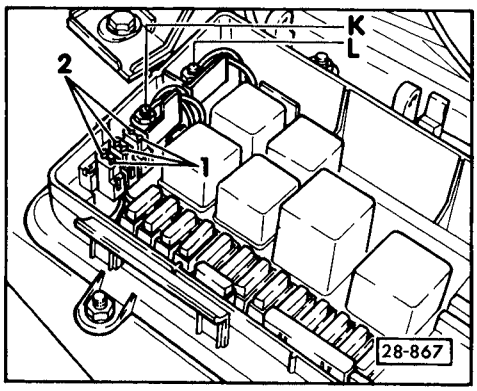
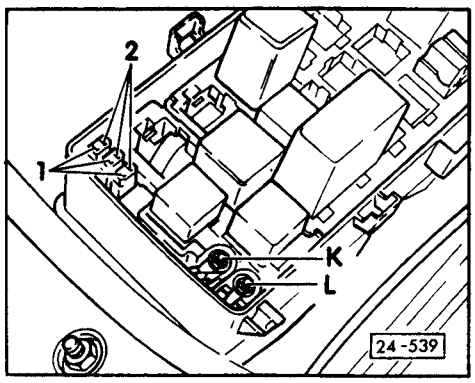


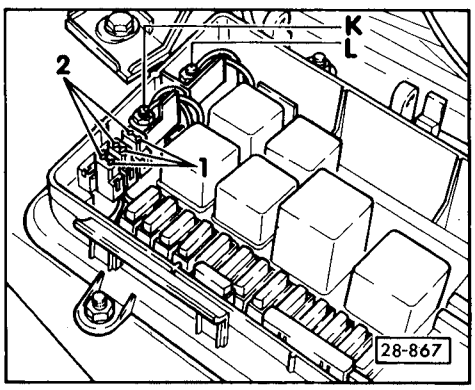


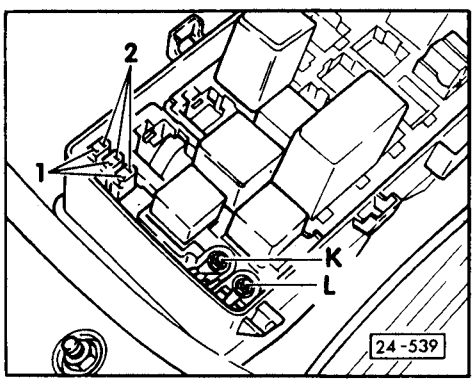
A – Only if cables with different cable colours are connected to the cable junctions

Note:

◄ *Fig. 28-867 shows the diagnostic sockets in the Audi 80, Fig. 24-539 in the Audi 100.*

- Determine cable colours between "white" diagnostic socket and MPI control unit on the basis of the CFD.
- Separate all the cable connections of the other systems with self-diagnosis one after the other from the cable junctions K and L.
- After separating each cable connection to a system, run engine at idling speed and once again enter address word "01 Engine electronics" ⇒ page 01–5.
- If the control unit identification is then displayed, test cable connection to the control unit last separated on the basis of the CFD. If the cable connection is in order, replace this control unit.
- If "Control unit does not answer" is displayed, there is an interruption in the cable connection to the MPI control unit.





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

Note:

◄ *Fig. 28-867 shows the diagnostic sockets in the Audi 80, Fig. 24-539 in the Audi 100.*

- Separate all the cables from cable junctions K and L.
- Connect test box V.A.G 1598 with adapter cable V.A.G 1598/11 ⇒ page 01–97.
- Use hand-held multimeter V.A.G 1526 to determine cable connections to the MPI control unit and reconnect to cable junctions K and L.

"White" diagnostic socket	Cable junction	Control unit connector C	V.A.G 1598 Socket
1	L	–	–
2	K	12	12

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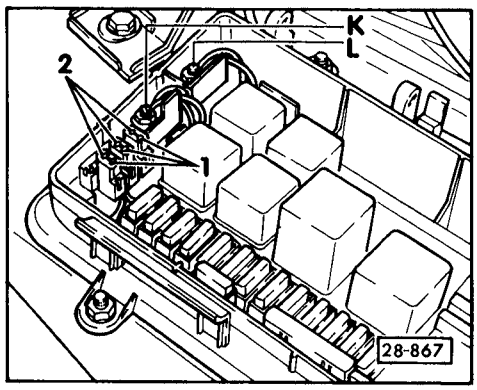
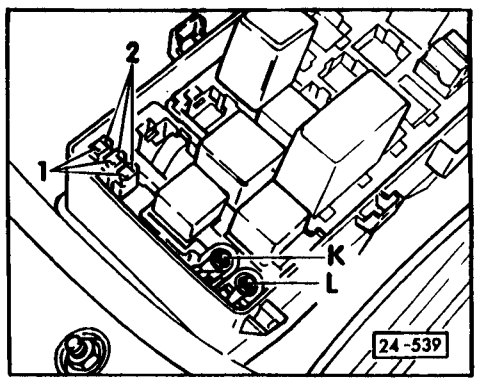
- Run engine at idling speed and once again enter address word "01 Engine electronics" ⇒ page 01–5.





Testing cable connection of "white" diagnostic socket to MPI control unit for continuity

Notes:

- *Fig. 28-867 shows the diagnostic sockets in the Audi 80, Fig. 24-539 in the Audi 100.*
- *Use hand-held multimeter V.A.G 1526 or V.A.G 1715, adapter cable set V.A.G 1594, test box V.A.G 1598/11 for the test.*
- *The cable connection between the diagnostic socket (white) and the MPI control unit runs via cable junction K. All other systems with self-diagnosis are also connected via this cable junction ⇒ Current Flow Diagrams, Fault Finding Electrics and Fitting Locations binder.*

– Switch off ignition.

– Connect test box V.A.G 1598 and adapter cable 1598/11 to the wiring harness ⇒ page 01–97.

"White" diagnostic socket	Cable junction	Control unit connector C	V.A.G 1598 Socket
1	L	–	–
2	K	12	12

Testing cable connection of "white" diagnostic socket for short circuit

Rapid data transfer Fault in communication build-up	HELP

or

Rapid data transfer K wire not switching to earth	HELP

or

Rapid data transfer K wire not switching to positive	HELP

If one of the following appears in the display:

– Switch off ignition.

Notes:

- *The cable connection between the "white" diagnostic socket and MPI control unit runs via cable junction K ⇒ Current Flow Diagram.*
- *Cable colours and other systems connected to the "white" diagnostic socket ⇒ "Current Flow Diagrams, Fault Finding Electrics and Fitting Locations" binder.*
- *All other vehicle systems may be connected to cable junctions K and L or only to cable junction K.*

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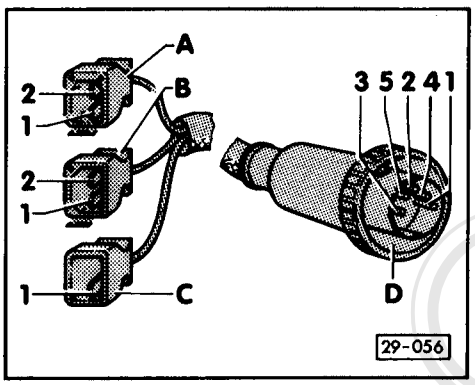
Connector assignment of test box V.A.G 1598

Notes:

- *The contact assignments of connectors A and B (adapter cable V.A.G 1598/11) are not identical to the contact assignment of the test box.*
- *The contact assignment of connector C (adapter cable V.A.G 1598/11) is identical to the contact assignment of the test box.*
- *The contact assignment of connector D (adapter cable V.A.G 1598/12) is identical to the contact assignment of the test box.*

MPI control unit Connector A	V.A.G 1598 Contact	MPI control unit Connector B	V.A.G 1598 Contact	MPI control unit Connecto	V.A.G 1598 Contact
1	41	1	21	1	1
2	42	2	22	2	2
3	43	3	23	3	3
4	44	4	24	4	4
5	45	5	25	5	5
6	46	6	26	6	6
7	47	7	27	7	7
8	48	8	28	8	8
9	49	9	29	9	9
10	50	10	30	10	10
11	51	11	31	11	11
12	52	12	32	12	12
		13	33	13	13
		14	34	14	14
		15	35	15	15
		16	36	16	16
		17	37		
		18	38		
		19	39		
		20	40		

Testing cable connection of diagnostic sockets



◄ **Testing diagnostic cable V.A.G 1551/1 for continuity**

Vehicle-side Connector	Contact	Equipment-side Connector D
black A	1	3 Battery negative
	2	2 Battery positive
white B	1	4 L wire
	2	1 K wire
blue C	1	5 Cable

Testing voltage supply of "black" diagnostic socket

Contact 1 connected to earth
Contact 2 positive (terminal 30 via fuse)

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Connecting test box V.A.G 1598

Notes:

- *The test box V.A.G 1598 must not be connected during diagnosis with the fault reader V.A.G 1551.*
- *Wait 30 seconds after switching off the ignition before unplugging the connectors from the MPI control unit.*
- *When the connectors are unplugged from the MPI control unit, the voltage supply is also interrupted and the fault memory is thus erased.*

– Switch off ignition.

– Remove MPI control unit ⇒ page 01–108 and 01–111, respectively.

– Connect adapter cable V.A.G 1598/11 or 1598/12 between MPI control unit and engine wiring harness.

– For measurement, connect test box to the respective adapter cable.

Note:

The contact assignment of the contacts of the test box are not identical with the connector assignment of the MPI control unit only when adapter cable V.A.G 1598/11 is connected ⇒ Connector assignment, page 01–99.

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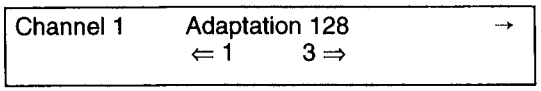
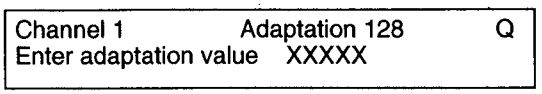
Direct adaptation



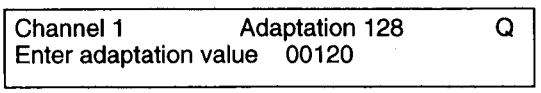
◄ Readout in display:

– Press → key.



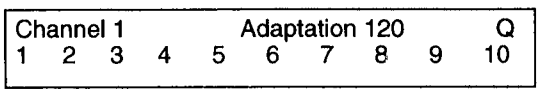
◄ Readout in display:

– Enter 5-digit adaptation value.
Example: 00120



◄ Readout in display:

– Confirm entry with the key Q.

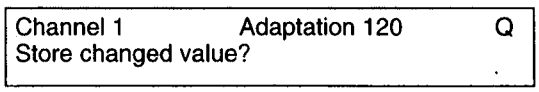


◄ Readout in display:

Notes:

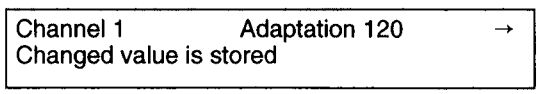
- *The relevant adaptation value as well as the 10 measured values from the function "Basic setting", display group 00 are-displayed.*
- *If you do not wish to store the altered adaptation value, switch back to the previous display by pressing the key C.*

– Confirm entry with the key Q.



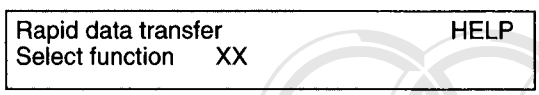
◄ Readout in display:

– Confirm entry with the key Q.



◄ Readout in display:

– Press → key.



◄ Readout in display:

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Step-by-step adaptation

Channel 1 Adaptation 128 → ⇐ 1 3 ⇒

◄ Readout in display:

– Press key 1.
The adaptation value drops.

Channel 1 Adaptation 127 Q 1 2 3 4 5 6 7 8 9 10

◄ Readout in display:

– Press key 3.
The adaptation value rises.

Channel 1 Adaptation 129 Q 1 2 3 4 5 6 7 8 9 10

◄ Readout in display:

Notes:

- *The relevant adaptation value as well as the 10 measured values from the function "Read measured value block", display group 00 are-displayed.*
- *If you do not wish to store the changed adaptation value, switch back to the previous display by pressing the key C.*

– Confirm entry with the key Q.

Channel 1 Adaptation 129 Q Store changed value?

◄ Readout in display:

– Confirm entry with the key Q.

Channel 1 Adaptation 129 → Changed value is stored

◄ Readout in display:

– Press → key.

Rapid data transfer HELP Select function XX

◄ Readout in display:

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- *If the stored adaptation values of vehicles with Lambda probe (⇒ coding variants) are altered by entering other adaptation values, this has no effect on the fuel injection and ignition system.*

– Connect fault reader V.A.G 1551 ⇒ page 01–5.

Rapid data transfer	HELP
Select function XX	

◄ Readout in display:

– Press keys 1 and 0.
(The function "Adaptation" is selected with 10).

Rapid data transfer	Q
10 – Adaptation	

◄ Readout in display:

– Confirm entry with the key Q.

Adaptation	Q
Enter channel number XX	

◄ Readout in display:

– Press keys 0 and 1.
(Channel 1 is selected with 01).

Adaptation	Q
Enter channel number 01	

◄ Readout in display:

– Confirm entry with the key Q.

Channel 1	Adaptation 128	→
	⇐ 1 3 ⇒	

◄ Readout in display:

Explanation of readout:

- Channel number: channel 1
- Adaptation: 128 (display of stored adaptation value)
- →: → key is used for advancing within the programme in order to enter adaptation value directly.
- ⇐ 1: Key 1 is used for reducing the adaptation value in steps.
- 3 ⇒: Key 3 is used for increasing the adaptation value in steps.

Notes:

- *Press C key for entering a different channel number; the system returns to the last display.*
- *Adaptation value 128 is the factory-stored average value.*
- *A reduction of the value 128 results in a leaner mixture (CO content drop); an increase means a richer mixture (CO content rises).*
- *If the adaptation value is altered, it must remain within the tolerance range of 110...150.*

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- If the specifications are achieved in all display fields, press → key.

Rapid data transfer	HELP
Select function XX	

◄ Readout in display:

- Press keys 0 and 6.
  (The function "End output" is selected with 06).

Rapid data transfer	Q
06 – End output	

◄ Readout in display:

- Confirm entry with the key Q.

Rapid data transfer	HELP
Enter address word XX	

◄ Readout in display:

Reading individual measured value

Note:

The function 09 "Read individual measured value" can be selected with the keys 0 and 9. No information for fault finding can be obtained for the Service Department from this function and it should therefore be ignored.

Adaptation

Notes:

- *If function 10 "Adaptation", channel 01 is selected, the MPI control unit performs the same operations as in function 04 "Basic setting" ⇒ page 01–40.*
- *The CO content is set on vehicles without Lambda probe with the function "Adaptation" (⇒ coding variants).*
- *Channels 01 and 02 can be selected at present. Channel 01 is used for setting the CO content; channel 02 has no function.*

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Reading measured value block

Notes:

- *Display groups 00...17 are identical to those described under function 04 "Basic setting".*
- *The request for renewed learning (⇒ Display group 06) given in "Basic setting" is not performed in the function 08 "Read measured value block".*

– Connect fault reader V.A.G 1551 ⇒ page 01–5.

Rapid data transfer HELP Select function XX

◄ Readout in display:

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

Rapid data transfer Q 08 – Read measured value block

◄ Readout in display:

– Confirm entry with the key Q.

Read measured value block Q Enter display group number XX

◄ Readout in display:

– Select desired display group number in accordance with the list of display groups of function 04 ⇒ page 01–45.

Note:

Display group number 01 is an example in order to demonstrate the procedure.

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

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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

◄ Readout in display:

Notes:

- *In the case of display group number 00, the measured values are-displayed as decimals.*
- *The current readout in the display is printed out each time the PRINT key is pressed.*
- *Press C key before selecting further display groups.*

Rapid data transfer	HELP
Enter address word XX	

◄ Readout in display:

Notes:

- *The MPI control unit does not use the coding which is entered and which appears in the display until the ignition has been switched off once.*
- *Incorrect coding results in:*
  - *Handling problems (jerky gearshifts, jolts when accelerating/decelerating, etc.)*
  - *Increased fuel consumption.*
  - *Increased emission levels.*
  - *Reduction in gearbox life.*
  - *Storage of non-existant faults in the fault memory.*
  - *Functions not being performed (Lambda control, actuation of activated charcoal filter system, etc.).*

Coding variants of MPI control unit

Exhaust	Drive/Additional functions	Gearbox	Vehicle model
00 = not assigned	0 = Front wheel drive without anti-slip control	0 = 5-speed manual gearbox	0 = not assigned
01 = not assigned	1 = not assigned	1 = not assigned	1 = Audi 80
02 = with Lambda probe and activated charcoal filter system	2 = Four-wheel drive without anti-slip control	2 = not assigned	2 = Audi 100
03 = without Lambda probe and activated charcoal filter system	3 = not assigned	3 = not assigned	3 = not assigned

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- The composition of the code number is as shown in the example below:
  - Vehicle with Lambda probe and with activated charcoal filter system: 0 2
  - Front-wheel drive without anti-slip control: 0
  - 5-speed manual gearbox: 0
  - Audi 80: 1

  Code number: 0 2 0 0 1

Note:

The Lambda control as well as the activated charcoal filter system may be switched off on vehicles fitted with Lambda probe and activated charcoal filter system by coding the MPI control unit to a vehicle without Lambda probe and without activated charcoal filter system. After doing this, interrogate fault memory.

Coding the MPI control unit

Notes:

- *A 5-digit code must always be displayed during control unit identification.*
- *Coding is performed with V.A.G 1551.*

If the coding displayed does not match the vehicle or if the control unit was replaced, the control unit must be coded as follows:

– Connect fault reader V.A.G 1551 ⇒ page 01–5.

Rapid data transfer	HELP
Select function XX	

◄ Readout in display:

– Press keys 0 and 7.
(The function "Code control unit" is selected with 07).

Rapid data transfer	Q
07 – Code control unit	

◄ Readout in display:

– Confirm entry with the key Q.

Code control unit	Q
Enter code number XXXXX	(0 – 32000)

◄ Readout in display:

– Enter the code number relevant for this vehicle and confirm with the key Q.
Coding variants ⇒ page 01–86.

Function is unknown or cannot be performed at the moment.	→

◄ If the following readout appears in the display:
The code number entered is not an approved number.

8A0906264 1.6l R4 MPI 2V	D01
Coding 02001	WSC 06388

◄ The control unit identification and the coding entered (e.g. 02001) appear in the display.

– Press → key.

Rapid data transfer	HELP
Select function XX	

◄ Readout in display:

– Press keys 0 and 6.
(The function "End output" is selected with 06).

Rapid data transfer	Q
06 – End output	

◄ Readout in display:

– Confirm entry with the key Q.

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S – Display group 17

Readout in display	Specified readout	Designation
Basic setting 17 1 2 3 4	... rpm	1 = Momentary engine speed ⇒ Display group 03, display field 1
	.. %	2 = Momentary engine load ⇒ Display group 03, display field 2
	1...10	3 = Position of reference mark signal in Hall window (orifice in distributor)
	...,. ° BTDC	4 = Ignition timing point with knock control and with digital idling speed stabilization (average of all cylinders) ⇒ Display group 09, display field 2

Notes re-display field 3:

- *The reference mark signal with this system is generated by the engine speed sender –G28.*
- *If the reference mark signal is not located within the Hall window for more than 24 revolutions when starting or when engine running, fault 00512 is stored in the fault memory ⇒ Fault table, page 01–16.*
- *If a value of less than 1 or greater than 10 (numerical sequence: ..., 58, 59, 0, 1, ...) is displayed, the reference mark signal is not positioned within the Hall window.*
- *If the reference mark signal is not positioned within the Hall window when starting the engine, the engine does not start. If the reference mark signal is not positioned within the Hall window when the engine is running, the engine nevertheless continues running.*

T – Display group 99

Readout in display	Specified readout	Designation
Basic setting 99 1 2 3 4	... rpm	1 = Momentary engine speed ⇒ Display group 03, display field 1
	... %	2 = Momentary engine load ⇒ Display group 03, display field 2
	... °C	3 = Coolant temperature ⇒ Display group 01, display field 1
	λ ctl. OFF or λ ctl. ON	4 = Lambda control OFF in function 04 "Basic setting" Lambda control ON in function 08 "Read measured value block"

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Notes re-display field 4:

- *For defined fault finding, the Lambda control is switched off when selecting display group 99 under "Basic setting" or is switched on under "Read measured value block".*
- *It is possible to switch between function 04 "Basic setting" and function 08 "Read measured value block" by pressing the keys 1 and 3 on V.A.G 1551.*

P – Display group 15

Readout in display	Specified readout	Designation
Basic setting 15 1 2 3 4	... %	1 = Internal specified pulse cycle of idling speed stabilization valve –N71
	.,. A	2 = Current consumption of idling speed stabilization valve –N71
	–40...+60 %	3 = Current control of idling speed stabilization valve –N71
	12.000...14.000 V	4 = Voltage supply of MPI control unit ⇒ Display group 01, display field 1

Note re-display field 1:

The readout which appears is the control unit-internal computed value for the specified pulse cycle without current and voltage correction.

Note re-display field 2:

The readout which appears is the current actually consumed by the idling speed stabilization valve –N71.

Notes re-display field 3:

- *Positive values indicate increase in pulse cycle without achieving specified current.*
- *If +60 % is displayed for a lengthy time, this indicates a contact resistance or too hot –N71.*
- *Negative values indicate reduction in pulse cycle in order to achieve specified current.*
- *If –40 % is displayed for a lengthy time, this indicates a winding short in –N71.*

Q – Display group 16

Readout in display	Specified readout	Designation
Basic setting 16 1 2 3 4	... %	1 = Momentary engine output (internal computed value)
	... g/s	2 = Inducted air mass
	... km/h	3 = Momentary road speed ⇒ Display group 03, display field 4
	.,. m/s	4 = Injection time (average of all cylinders)

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Note re-display field 1:

The momentary engine output is a control unit-internal computed value which is calculated from the air inducted under normal conditions (air pressure 1013 mbar, air temperature 20° C).

Notes re-display fields 2, 3 and 4 of display groups 11 and 12:

- *Knock control is active from an engine load greater than 40 %.*
  If an engine load of 40 % is exceeded, the current ignition timing retardation figures are-displayed; if engine load drops below 40 %, the values last used are constantly displayed.

- *If knocking is heard without any recognizable retardation of ignition timing, increase engine speed above 3500 rpm for 5 seconds in order to start knock sensor fault detection (diagnosis).*

- *If an ignition timing retardation figure for one cylinder differs clearly from the others, the following faults are possible:*
  - *Loose ancillaries*
  - *Corrosion at plug connection*
  - *Engine damage (e.g. oil combustion due to faulty piston)*

- *If the retardation figures for all cylinders are high, the following faults are possible:*
  - *Corrosion of plug connection ⇒ Display group 13 and 14*
  - *Tighten torque (20 Nm) not in order*
  - *Open circuit in wiring ⇒ Display group 13 and 14*
  - *Knock sensor faulty*
  - *Loose ancillaries*
  - *Poor quality fuel (less than 95 RON)*

N – Display group 13

Readout in display	Specified readout	Designation
Basic setting 13 1 2 3 4	... rpm	1 = Momentary engine speed ⇒ Display group 03, display field 1
	.,. V	2 = Knock sensor signal (cylinder 1)
	.,. V	3 = Knock sensor signal (cylinder 2)
	... %	4 = Momentary engine load ⇒ Display group 03, display field 2

M – Display group 14

Readout in display	Specified readout	Designation
Basic setting 14 1 2 3 4	... rpm	1 = Momentary engine speed ⇒ Display group 03, display field 1
	.,. V	2 = Knock sensor signal (cylinder 3)
	.,. V	3 = Knock sensor signal (cylinder 4)
	... %	4 = Momentary engine load ⇒ Display group 03, display field 2

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Notes re-display fields 2, 3 and 4 of display groups 13 and 14:

- *If a difference of more than 50 % is achieved between the smallest and largest knock sensor signal of a display group, the following faults are possible:*
  - *Corrosion at plug connection*

- *If the differences in the signals are more than 50 % between display group 13 (cylinders 1, 2) and display group 14 (cylinders 3, 4), the following faults are possible:*
  - *Corrosion at plug connection*
  - *Open circuit in wiring*
  - *Knock sensor faulty*

- *If no fault is found when performing the electrical test of the knock sensor, the wiring and the plug connection, check the engine for loose ancillaries or engine damage ⇒ Display group 11 and 12, respectively.*

K – Display group 10

Readout in display	Specified readout	Designation
Basic setting 10 1 2 3 4	... rpm	1 = Momentary engine speed ⇒ Display group 03, display field 1
	... %	2 = Momentary engine load ⇒ Display group 03, display field 2
	1st map or 2st map	3 = Ignition timing map changeover
	,,. ° CA	4 = Ignition timing retardation of knock control (average of all cylinders)

Notes re-display field 3:

- *Ignition timing map changeover is selected by the knock control:*
  1st map = basic map
  2nd map = map with reduced ignition angles
- *The 2nd map is selected:*
  - *If the fuel is of poor quality (less than 95 RON)*
  - *If abnormal engine noises exist (ancillaries loose)*
  - *If engine damage exists (oil combustion due to faulty piston)*
- *If a knock sensor fault exists in the fault memory, the ignition timing map changeover is inhibited.*
- *If the 2nd map is selected ⇒ Display group 11 and 12 for more accurate assessment.*

Notes re-display field 4:

- *Knock control is active from an engine load of greater than 40% ⇒ Display group 11 and 12.*
- *The ignition timing retardation figures are used only in the case of "active" knock control.*

L – Display group 11

Readout in display	Specified readout	Designation
Basic setting 11 1 2 3 4	1st map or 2nd map	1 = Ignition timing map changeover ⇒ Display group 10, display field 3
	,,. ° CA	2 = Ignition timing retardation of knock control (cylinder 1)
	,,. ° CA	3 = Ignition timing retardation of knock control (cylinder 2)
	... %	4 = Momentary engine load ⇒ Display group 03, display field 2

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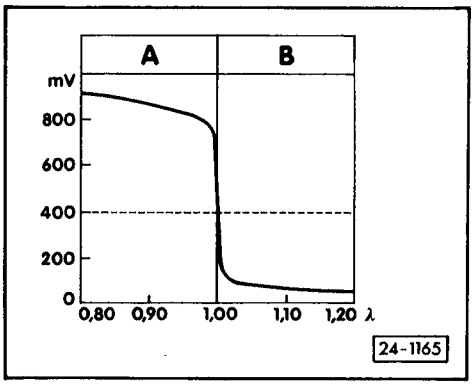
M – Display group 12

Readout in display	Specified readout	Designation
Basic setting 12 1 2 3 4	1st map or 2nd map	1 = Ignition timing map changeover ⇒ Display group 10, display field 3
	,,. ° CA	2 = Ignition timing retardation of knock control (cylinder 3)
	,,. ° CA	3 = Ignition timing retardation of knock control (cylinder 4)
	... %	4 = Momentary engine load ⇒ Display group 03, display field 2

Display fields	Readout on V.A.G 1551	Cause of fault	Rectifying fault
4	constant 2.550 V	Short circuit to positive caused by: Lambda probe –G39 Probe cable Control unit –J192	– Test –G39 ⇒ Repair Group 24
	constant value between 0.350...0.450 V	Open circuit caused by: Lambda probe –G39 Probe cable Control unit –J192	– Test –G39 ⇒ Repair Group 24
	constant 0.000 V	Short circuit to earth caused by: Lambda probe –G39 Probe cable Control unit –J192	– Test –G39 ⇒ Repair Group 24



Notes re-display field 4:

- *The readout must occasionally drop below 0.3 V and exceed 0.6 V. Readouts of less than 0.45 V indicate lean, greater than 0.45 V rich.*

◄ • *Probe voltage Uλ in mV*
Ratio λ
A:– Lambda probe voltage (mV) high
– Rich mixture (fuel excess or air deficiency)
– High CO value
B:– Lambda probe voltage (mV) low
– Lean mixture (fuel deficiency or air excess)
– Low CO value

J – Display group 09

Readout in display	Specified readout	Designation
Basic setting 9 1 2 3 4	... ° BTDC	1 = Ignition timing without knock control and without digital idling speed stabilization
	... ° BTDC	2 = Ignition timing with knock control and with digital idling speed stabilization (average value of all cylinders)
	± .,. ° CA	3 = Ignition timing point intervention for digital idling speed stabilization
	0 or 1	4 = Idling speed switch: 0 open 1 closed

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Notes re-display field 1:
- *With engine idling (idling speed switch closed) an ignition timing point of 6° BTDC is displayed in function 04 and 08.*
- *If engine speed is increased (idling speed switch open) the current ignition timing point without knock control is displayed.*

Notes re-display field 2:
- *Digital idling speed stabilization is only active when idling speed switch is closed.*
- *Knock control is active from an engine load greater than 40 % ⇒ Display group 11 and 12, respectively.*

Notes re-display field 3:
- *Digital idling speed stabilization (DISS) is only active when idling speed switch is closed.*
- *Ignition timing point intervention for DISS when idling speed switch open 0.0° CA.*
- *DISS is inhibited during function 04 "Basic setting", readout in display 0.0° CA.*
- *Ignition timing point intervention for DISS during function 08 "Read measured value block" when engine idling without electrical components 0.0 ± 5.0° CA.*

Note re-display field 2:

The total from Lambda control value and momentary Lambda learning value is a control unit-internal computed value which indicates the overall influence of the Lambda control.

Notes re-display field 3:

- *Solenoid valve 1 for activated charcoal filter –N80 is closed during the learning process.*
- *The ACF influence can be assessed by comparing the readout during "Basic setting" (ACF valve closed: 99 %) and during "Read measured value block" (ACF valve open: 0 %).*
- *It is possible to switch between function 04 "Basic setting" and function 08 "Read measured value block" by pressing the keys 1 and 3 on V.A.G 1551.*

I – Display group 08

Readout in display	Specified readout	Designation
Basic setting 8 1 2 3 4	.,. %	1 = Total from Lambda control value and momentarily used Lambda learning value (internal computed value)
	.,. %	2 = Momentarily used Lambda learning value
	XXXX	3 = Lambda learning range
	0.000...0.900 V	4 = Output voltage of Lambda probe

Test table display group 08

Display fields	Readout on V.A.G 1551	Cause of fault	Rectifying fault
1	–		– ⇒ Display group 07, display field 2
2	–		– ⇒ Display group 06, display field 2
3	–		– ⇒ Display group 06, display field 3
4	Readout does not fluctuate (less than 0.3 V or greater than 0.6 V)	Injector faulty Spark plug faulty Large quantity of unmetered air Coolant temperature sender –G62 Solenoid valve 1 for activated charcoal filter –N80 Lambda probe –G39 faulty or fouled Lambda probe heater –Z19 not operating Fuel system pressure too low or too high	– Test injectors ⇒ Repair Group 24 – Test spark plug – Rectify cause of fault – Interrogate fault memory ⇒ page 01–13 or test –G62 – Perform final control diagnosis ⇒ page 01–36 or test –N80 – Interrogate fault memory ⇒ page 01–13 or test –G39 – Test –Z19 ⇒ Repair Group 24 – Test fuel pressure regulator and holding pressure ⇒ Repair Group 24

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- *Learning is prohibited:*
  - *if idling is irregular (surging), when accelerating, at full load*
  - *if fault in fault memory (not applicable to sporadic faults)*
  - *if difference of 10 % is achieved between richest and leanest Lambda learning value. If difference of 9 % is achieved, further learning of the two relevant learning ranges is stopped. The learning demand display of these learning ranges cannot become 1 ⇒ Display group 05.*

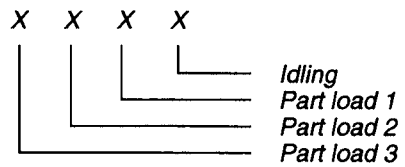
- *Learning begins 60 seconds after starting function 04 "Basic setting" or 2 to 4 minutes after each engine start.*

- *The list below shows when the request for renewed learning (learning demand) is activated:*
  - *When function 04 "Basic setting" is started, all the learning demand displays are set to 0 in order to activate the request for renewed learning of the Lambda learning values after the car has been in the workshop.*
  - *Each time the engine is started (coolant temperature less than 40° C), learning demand is activated in all learning ranges.*
  - *Each time the engine is started (coolant temperature greater than 40° C), learning demand is activated only in idling range.*
  - *If a large learning value difference (of stored learning value to re-learned value) exists in a learning range during the learning process, all the learning demand displays are reset to 0.*

- *If learning is successful, the learning demand values of the respective learning range (display field 3) are set to 1.*

Meaning of the 4-digit learning demand display:

Value "0" = request for renewed learning
Value "1" = learning process ended



H – Display group 07

Readout in display	Specified readout	Designation
Basic setting 7 1 2 3 4	.,. %	1 = Control value of mixture formation (Lambda control value)
	.,. %	2 = Total from Lambda control value and momentarily used Lambda learning value (internal computed value)
	0...99 %	3 = Pulse cycle of actuation of solenoid valve 1 for activated charcoal filter –N80
	0 % or larger than 95 %	4 = Throttle valve angle: Idling 0 % Full load greater than 95 %

Note:

The Lambda control should always only be assessed after successful learning (⇒ Display group 06, display field 4).

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Test table display group 07

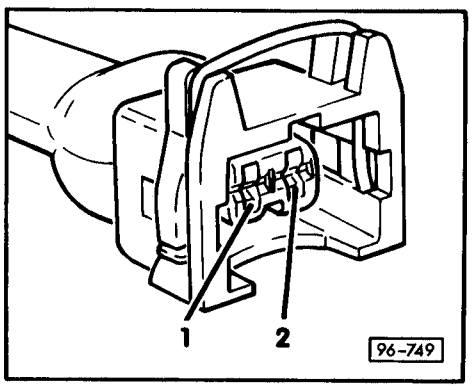
Display fields	Readout on V.A.G 1551	Cause of fault	Rectifying fault
1	–		– ⇒ Display group 06, display field 1
2	–		– ⇒ Note
3	–		– ⇒ Note
4	–		– ⇒ Display group 03, display field 3

Testing Lambda probe and Lambda probe heater

Notes:

- *For operational test of the Lambda probe see also Reading measured value block, display group 07 and 08.*
- *Sealants which contain silicone must not be used for seals in the intake area. Traces of silicone which are inducted by the engine are not combusted and damage the Lambda probe.*
- *Contact sprays must not be used in the area of the plug connection of the Lambda probe as these cause corrosion damage to the Lambda probe.*

Testing Lambda probe heater



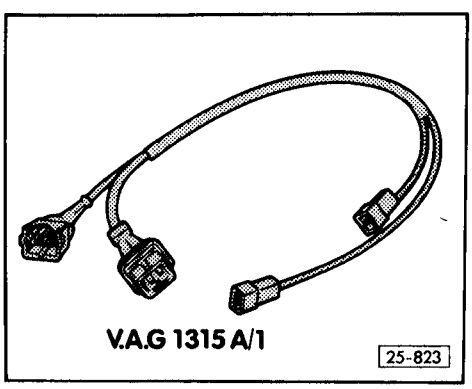
– Separate plug connection for Lambda probe heater.

◄ – Perform voltage measurement with V.A.G 1526 between contacts 1 (earth) and 2 (positive) of the connector.

– Run engine.
Specification: approx. battery voltage.

– If the specification is not achieved, perform the following tests marked with a dot:

- Test fuse for Lambda probe heater.
- Test cable connection from contact 2 to fuse for Lambda probe heater for continuity on the basis of the CFD. Specification max. 0.5 Ω.
- Test cable connection from contact 1 to engine earth for continuity. Specification max. 0.5 Ω.
- Test fuel pump relay ⇒ page 24–25 and page 24–30, respectively.



◄ – If the specification is achieved, connect additional test cable V.A.G 1315 A/1 into the 2-pin plug connection.

– Set hand-held multimeter V.A.G 1526 to 10 A measuring range and connect (plug test cable into 10 A connection).

– Run engine.
Specification: 0.5 ... 3.0 A (the current decreases as heater warms up).

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

Testing Lambda probe

– Separate plug connection for the signal wire of the Lambda probe.

– Perform resistance measurement with hand-held multimeter V.A.G 1526 between signal wire of Lambda probe and engine earth.
Specification: infinite Ω

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

– If the specification is achieved, set hand-held multimeter to 2 V measuring range and connect between connector of signal wire at wiring harness and engine earth.

– Switch on ignition.
Specification: 450 ± 50 mV

If the specification is not achieved, test wiring to the MPI control unit as follows:

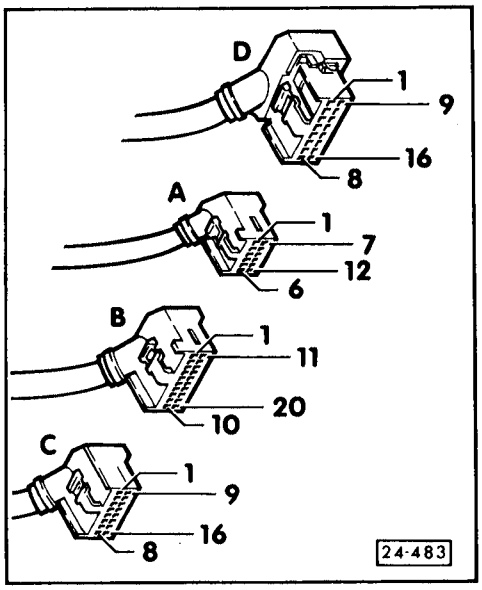
– Switch off ignition.

– Connect test box V.A.G 1598 with adapter cable V.A.G 1598/11 to the wiring harness ⇒ Repair Group 01. (The connector at the control unit is not unplugged.)

◄ – Test signal wire of Lambda probe to socket 50 of the test box for continuity.
Specification: max. 1 Ω

– Rectify any open circuit in the wiring or short circuit on the basis of the CFD.

– If no fault exists in the cable connection, replace MPI control unit ⇒ Repair Group 01.



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Removing and installing Lambda probe

– Separate plug connection of the Lambda probe.

– Open cable straps.

– Unbolt Lambda probe.

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

- It is essential that the cable straps are re-fitted at the same point 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 into the slot of the probe.
- Tightening torque 50 Nm.

Testing solenoid valve 1 for activated charcoal filter –N80

Notes:

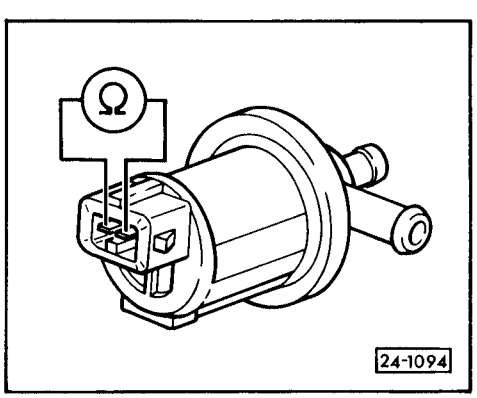
- *For the operational test of the ACF pulse cycle (actuation) see also Reading measured value block, display group 07, display field 3.*
- *If the Lambda control is not active, the solenoid valve for activated charcoal filter –N80 is closed.*
- *Fitting location ⇒ page 24–1.*

Electrical test of –N80 (ACF valve)

– Unplug connector at the ACF valve.

◄ – Perform resistance measurement with hand-held multimeter V.A.G 1526 between the contacts of the valve.
Specification: 20 ... 28 Ω.

– If the specification is not achieved, replace ACF valve.



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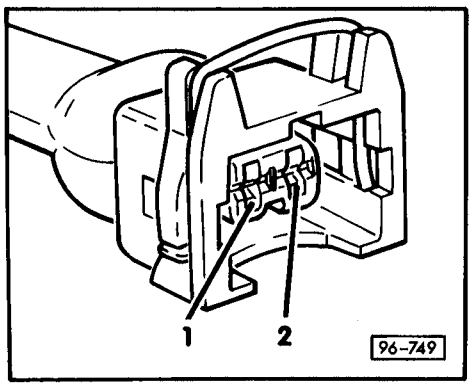


Testing voltage supply of ACF valve

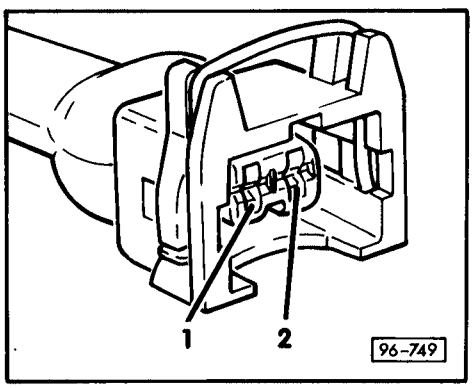
– Unplug connector at the ACF valve.

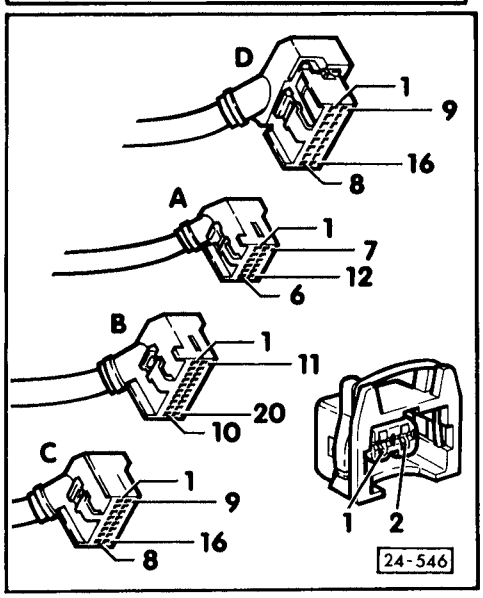
◄ – Connect diode test lamp V.A.G 1527 between contact 2 of the connector and engine earth.

– Start final control diagnosis and actuate fuel pump relay –J17 ⇒ Repair Group 01.
Specification: The diode test lamp must light up.

– If the diode test lamp does not light up, perform the following tests marked with a dot:

- Test fuse for ACF valve.
- Test cable from contact 2 at the connector to the fuse for continuity on the basis of the CFD.
Specification: max. 0.5 Ω.
- Test fuel pump relay and actuation ⇒ page 24–25 and page 24–30, respectively.





Testing actuation of ACF valve

◄ – Connect diode test lamp V.A.G 1527 between contact 2 (positive) and contact 1 of the connector.

– Start final control diagnosis and actuate solenoid valve 1 for activated charcoal filter –N80 ⇒ Repair Group 01.
Specification: The diode test lamp must flash.

– If the diode test lamp does not flash or if it comes on and remains on, connect test box V.A.G 1598 with adapter cable V.A.G 1598/12 to the wiring harness ⇒ Repair Group 01. (The connector at the control unit is not unplugged.)

◄ – If the diode test lamp comes on and remains on, test cable from contact 1 at the connector to socket 12 of the test box for short circuit to earth.

– If the diode test lamp does not flash, test cable from contact 1 at the connector to socket 12 of the test box for continuity.
Specification: max. 1 Ω.

– Rectify any short circuit or open circuit in the wiring.

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– If there is no fault in the cable connection, replace MPI control unit ⇒ Repair Group 01.

Testing and adjusting idling speed switch –F60

Notes:

- *For the operational test of the idling speed switch see also Reading measured value block, display group 02, display field 4.*
- *The idling speed switch is located in the throttle valve potentiometer.*
- *Fitting location ⇒ page 24–1.*

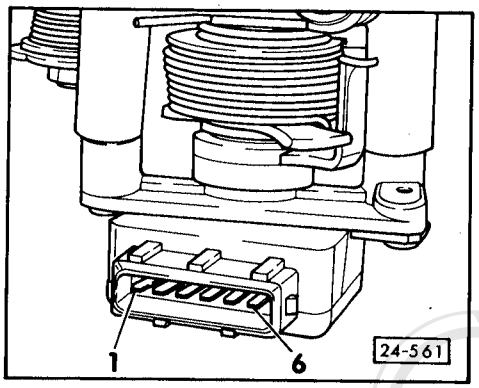
Test requirements:

- *Throttle cable correctly adjusted.*
- *Basic setting of throttle valve in order ⇒ page 24–86.*

Testing idling speed switch

– Remove suction hose between air mass meter and throttle valve body.

– Unplug connector at the throttle valve body.



◄ – Perform resistance measurement with hand-held multimeter V.A.G 1526 between contacts 4 and 6. Specification: 0 Ω (continuity).

– Operate throttle valve slightly. Specification: infinite ohms (no continuity).

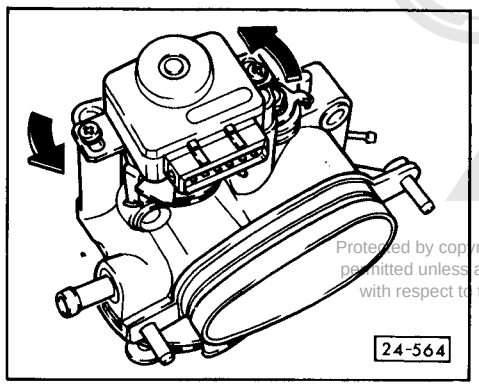
– If the specification is not achieved or is only achieved after opening the throttle valve considerably, adjust idling speed switch.

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

Adjusting idling speed switch

– Remove throttle valve body.

– Slacken both screws of the throttle valve potentiometer.



◄ – Turn throttle valve potentiometer in direction of arrow until a stop is felt. When performing this step, do not move the throttle valve (throttle operation).

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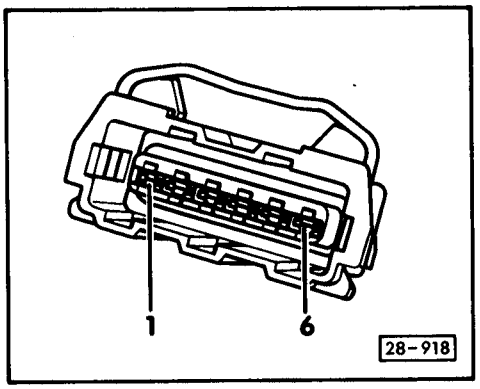


– Tighten throttle valve potentiometer in this position.

– Once again test idling speed switch ⇒ page 24–59.

– Install throttle valve body and adjust throttle cable ⇒ Repair Group 20.

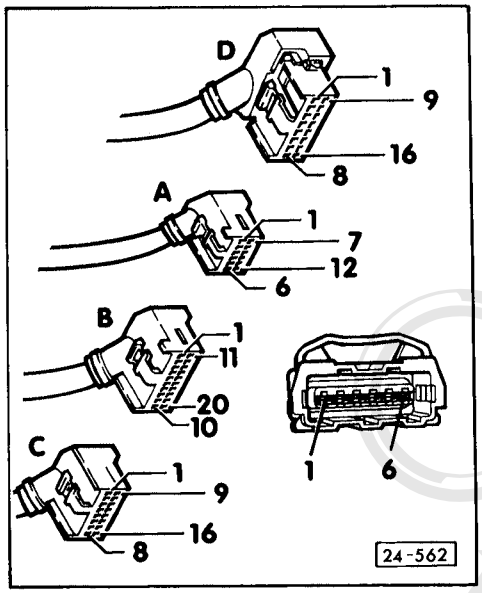
Testing cable connections

◄ Contact assignment of connector at idling speed switch and throttle valve potentiometer.

– Connect test box V.A.G 1598 with adapter cable V.A.G 1598/11 to the wiring harness ⇒ Repair Group 01. (The connector at the control unit is not unplugged.)

– Test earth cable between contact 4 at connector of the throttle valve potentiometer and earth connection in the wiring harness in right of engine compartment for continuity or short circuit to positive.
Specification: max. 1 Ω.

– Test signal wire between contact 6 and the connector of the throttle valve potentiometer and socket 49 of the test box for continuity or short circuit to earth.
Specification: max. 1 Ω.



◄ – Rectify any short circuit or open circuit in the wiring.

6-pin connector	Contact at connector –A– or engine earth
6	9
4	Engine earth

Note:

Use only gold-plated contacts for repairing contacts in the connector of the throttle valve potentiometer.

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Testing and adjusting throttle valve potentiometer –G69

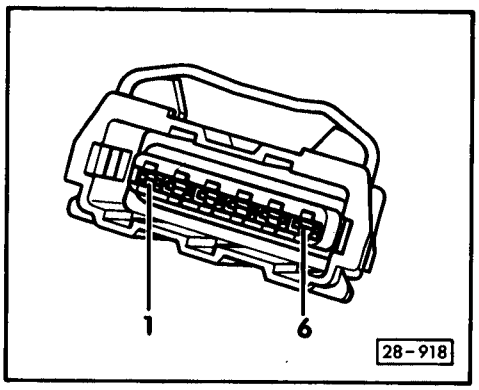
Notes:

- *For the operational test of the throttle valve potentiometer see also Reading measured value block, display group 02.*
- *Fitting location ⇒ page 24–1.*

Testing voltage supply of –G69

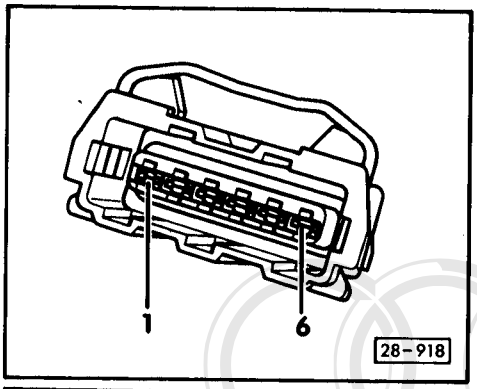
– Unplug connector from –G69.

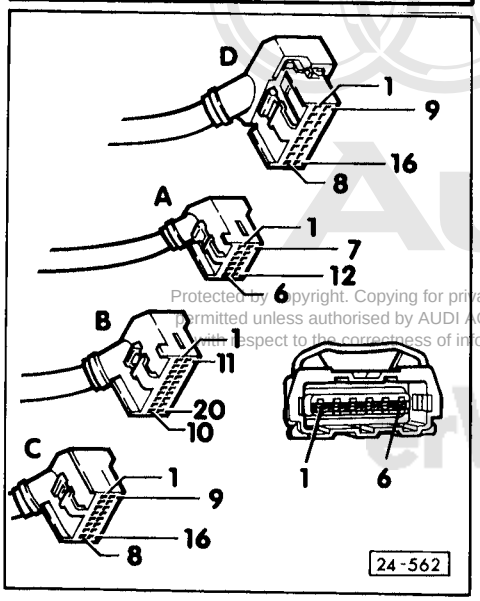
– Switch on ignition.



◄ – Perform voltage measurement with V.A.G 1526 in turn between contact 1 (positive) and 2 (earth) as well as 1 and 3 (signal).
Specification: 4.5 ... 5.5 V in each case.

– If the specifications are not achieved, test resistance of –G69 ⇒ page 24–65.





◄ – If one of the specifications is not achieved, connect test box V.A.G 1598 with adapter cable V.A.G 1598/11 to the wiring harness ⇒ Repair Group 01. (The connector at the control unit is not unplugged.)

– Test earth cable from contact 2 at the connector of –G69 to socket 45 of the test box for continuity.
Specification: max. 1 Ω.

– Test positive cable from contact 1 at connector of –G69 to socket 46 of the test box for continuity.
Specification: max. 1 Ω.

– Test signal wire from contact 3 at the connector of –G69 to socket 47 of the test box for continuity.
Specification: max. 1 Ω.

◄ – Rectify any short circuit or open circuit in the wiring.

6-pin connector	Contact at connector –A– or engine earth
1	6
3	7
2	Engine earth

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Note:

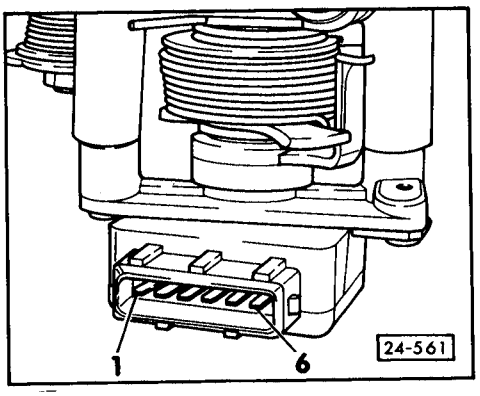
Use only gold-plated contacts for repairing contacts in the connector of the throttle valve potentiometer.

– If no fault exists in the cable connection, replace MPI control unit ⇒ Repair Group 01.

Testing resistance of –G69

– Remove suction hose between air mass meter and throttle valve body.

– Unplug connector at the throttle valve body.



◄ – Perform resistance measurement with hand-held multimeter V.A.G 1526 between contacts 1 and 2. Specification: 1.5 ... 2.6 kΩ.

– Perform resistance measurement with hand-held multimeter V.A.G 1526 between contacts 2 and 3. Specification: 0.75 ... 1.30 kΩ (in idling position).

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

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

Adjusting –G69

Adjusting the idling speed switch also adjusts the throttle valve potentiometer ⇒ Adjusting idling speed switch, page 24–60.

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Testing air mass meter –G70

Notes:

- *For operational test of the air mass meter see also Basic setting, display group 01, display field 2 and 3, respectively.*
- *Fitting location ⇒ page 24–1.*

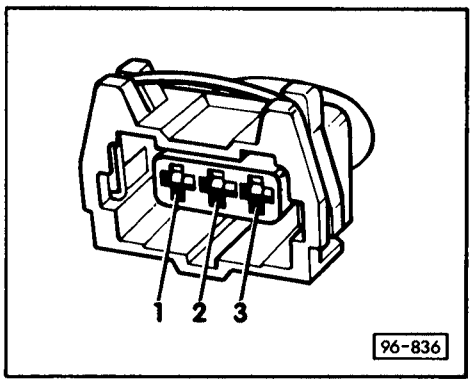
Test requirement:

Fuse for –G70 in order.

Testing voltage supply

– Unplug connector from –G70.

– Switch on ignition.

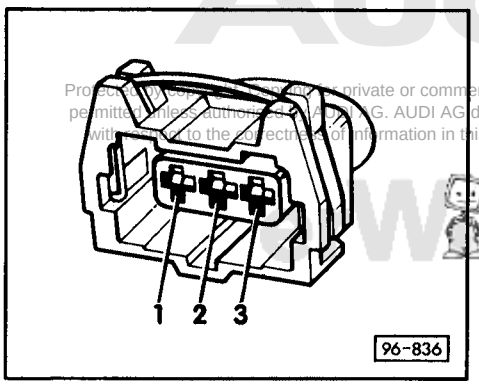


◄ – Perform voltage measurement with V.A.G 1526 between contact 2 (earth) and 3 (positive).
Specification: approx. battery voltage.

– If the specification is not achieved, perform the following tests marked with a dot:

- Test fuse for –G70.
- Test cable from contact 3 to fuse for continuity on the basis of the CFD.
Specification: max. 0.5 Ω.
- Test cable from contact 2 to engine earth for continuity.
Specification: max. 0.5 Ω.

Testing cable connections



◄ – Connect test box V.A.G 1598 with adapter cable V.A.G 1598/11 to the wiring harness ⇒ Repair Group 01. (The connector at the control unit is not unplugged.)

– Test signal wire between contact 1 of connector for –G70 and socket 42 of the test box for continuity.
Specification: max. 1 Ω.

– Test earth wire between contact 2 of connector for –G70 and socket 45 of the test box for continuity.
Specification: max. 1 Ω.

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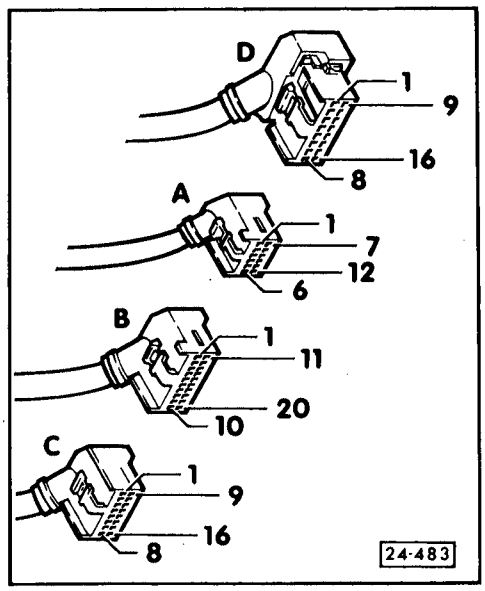

– Rectify any short circuit or open circuit in the wiring.

Connector at –G70	Contact at connector –A–
1	2
2	5

Note:

Use only gold-plated contacts for repairing contacts in the connector of the air mass meter.

Testing operation of –G70

– Push protective cap back off the plugged-in connector of the air mass meter.

Note:

The connector chambers are identified accordingly on the rear of the connector.

– Connect hand-held multimeter V.A.G 1526 for voltage measurement between contact 2 (earth) and 1 (signal).

– Switch on ignition.
Specification: 0.3 ... 1.1 V.

– Run engine, switch on electrical components (fan must not cut in) and continuously vary engine speed between idling and 4000 rpm.
Specification: Voltage varies between 1.5 ... 3.4 V in line with engine speed.

– If the specifications are not achieved, replace air mass meter –G70.

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Testing air conditioner additional signal

This signal from the air conditioner causes the pilot control value for the idling speed stabilization to be increased so that idling speed stabilization remains within the mid-range of the control field.

– Select Read measured value block (function 08) ⇒ Repair Group 01 and display group 04.

Read measured value block 4			→
1	2	3	4

◄ Readout in display:

– Observe readout in display field 4.

Specification: 0XX

Note:

The shift inputs at points 1 and 2 should be ignored for testing engine speed increase.

– Switch on air conditioner (press AC key of manual air conditioner or press "AUTO", "LO" temperature and "HI" blower speed buttons of fully automatic air conditioner.

Specification: 1XX

– Press → key.

– Enter 06 for "End output" and confirm with the key Q.

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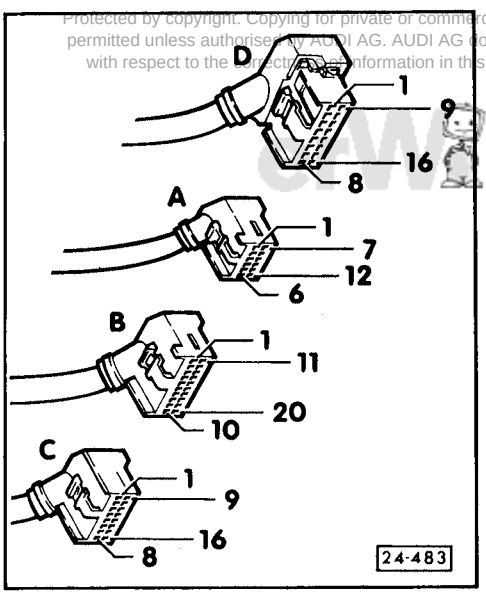
– If the readout does not change, switch off ignition and connect test box V.A.G 1598 with adapter cable V.A.G 1598/11 to the wiring harness ⇒ Repair Group 01.

– Connect diode test lamp V.A.G 1527 to sockets 11 and 45 (earth) of the test box.

– Switch on ignition.

– Switch on air conditioner as described above. When this is done, the diode test lamp must light up.



◄ – If the diode test lamp does not light up, unplug connector –C– from the MPI control unit.

– If the diode test lamp now lights up, replace MPI control unit ⇒ Repair Group 01.

– If the diode test lamp does not light up, test cable connection from contact 11 of connector –C– to air conditioner switch –E30 (manual air conditioner) or to control and display unit –E87 (fully automatic air conditioner) for continuity on the basis of the CFD.

– If no fault exists in the cable connection, test air conditioner ⇒ "Heating, Air Conditioning" Workshop Manual.

Testing AC compressor cutoff

Notes:

The AC compressor cutoff is bidirectional ("in" and "out"):

- *IN: Voltage is supplied to the MPI control unit shortly before the AC compressor cuts in. The MPI control unit thereupon increases the pilot control value for idling speed stabilization in the mid-range of the control field so that idling speed stabilization remains in the mid-range of the control.*

- *OUT: When accelerating from a standing start and from a low speed, the AC compressor is switched off for about 12 seconds. If the accelerator pedal is released sooner, the time is reduced to a minimum of 3 seconds.*

Test requirements:

- *Air conditioner operating properly.*
- *No fault in the fault memory.*
- *Car is at room temperature (warmer than 15°C).*

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- Run engine at idling speed.
- Switch on air conditioner (press AC button of manual air conditioner or "AUTO", "LO" temperature and "HI" blower speed buttons of fully automatic air conditioner). The compressor symbol must light up and the AC compressor run.
- Select function 04 "Basic setting", display group 04 with V.A.G 1551 ⇒ Repair Group 01.
  Specification: The AC compressor must stop (visual check).
- If the AC compressor does not stop, switch off air conditioner and continue running engine at idling speed.
- Select function 08 "Read measured value block", display group 04 with V.A.G 1551 ⇒ Repair Group 01.

Read measured value block 4			→
1	2	3	4

◄ Readout in display:

– Observe readout in display field 4.

Specification: X0X

Note:

Ignore the shift inputs at points 1 and 3 for testing the AC compressor cutout.

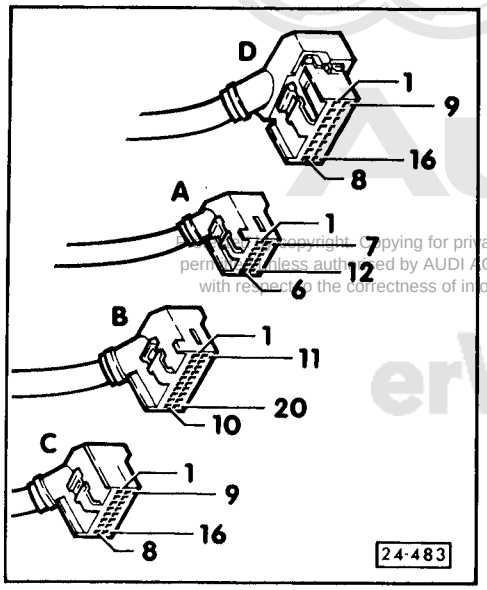
– Switch on air conditioner as described above.

Specification: X1X

– Press → key.

– Enter 06 for "End output" and confirm with the key Q.

– If the readout does not change, the following fault may exist:
Air conditioner not switched on as described.



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◄ – If the readout does not change although the fault stated does not exist, test cable connection from contact 10 of connector –C– to the control unit solenoid coupling –J153 (manual air conditioner) or to the control and display unit –E87 (fully automatic air conditioner) for continuity on the basis of the CFD.

– If no fault exists in the cable connection, test air conditioner ⇒ "Heating, Air Conditioning" Workshop Manual.

– If X1X is displayed, briefly apply full throttle (blip throttle).

– The readout must briefly drop to X0X and return after a few seconds to X1X.

– If the readout does not change as described, check whether the compressor is switched off when the throttle is blipped (visual check).

– If the compressor is not switched off, test air conditioner ⇒ "Heating, Air Conditioning" Workshop Manual.

– If the readouts do not change as described, replace MPI control unit ⇒ Repair Group 01.

Testing actuation of the tachometer

Notes:

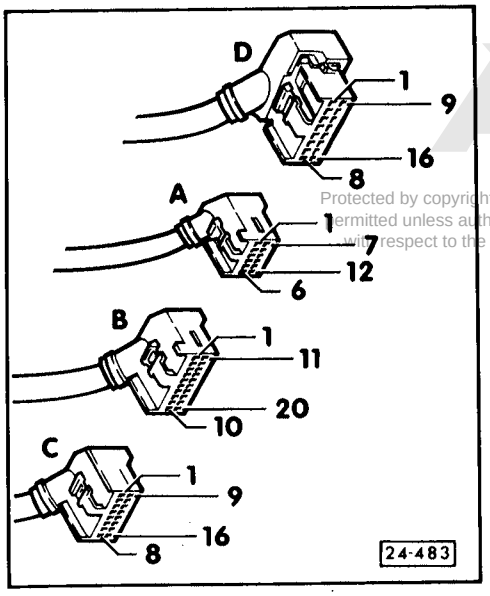
- *Perform the following test only if no readout is indicated on the tachometer.*
- *The tachometer in the dash panel insert is actuated by the MPI control unit.*

– Connect test box V.A.G 1598 with adapter cable V.A.G 1598/11 to the MPI control unit ⇒ Repair Group 01.

– Connect tester V.A.G 1367 or 1767 for measuring speed as stated in the operating instructions. The signal wire (green terminal) is connected to socket 30 of the test box (use adapter cable set V.A.G 1594).

– Run engine at idling speed.
Specification: Engine speed is indicated.

– If the speed is indicated on V.A.G 1367 or 1767, switch off engine and remove dash panel insert.



◄ – Test cable connection between MPI control unit (contact 10 at connector B) and dash panel insert for continuity on the basis of the CFD.

– If no open circuit in the wiring exists, rectify fault in dash panel insert ⇒ "Current Flow Diagrams, Fault Finding Electrics and Fitting Locations" binder.

– If engine speed is not indicated on V.A.G 1367 or 1767, switch off engine and remove dash panel insert and unplug the connector.

– Run engine at idling speed.

– If engine speed is now indicated on V.A.G 1367 or 1767, the fault is in the dash panel insert ⇒ "Current Flow Diagrams, Fault Finding Electrics and Fitting Locations" binder.

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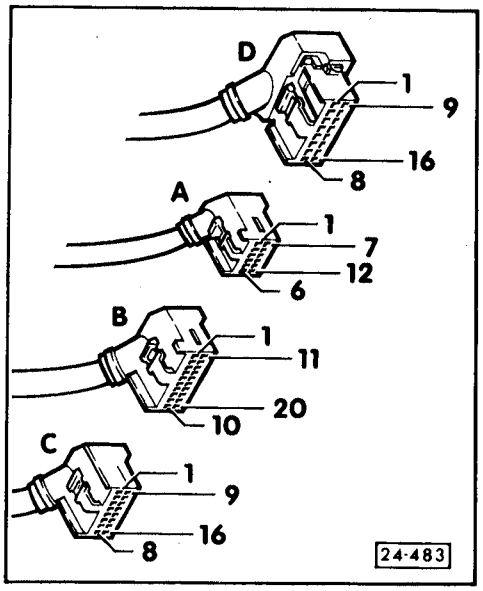

◄ – If engine speed is not indicated on V.A.G 1367 or 1767, test cable connection between MPI control unit (contact 10 at connector B) and dash panel insert for short circuit to positive or to negative on the basis of the CFD.

– If engine speed is not indicated although no short circuit exists, replace MPI control unit ⇒ Repair Group 01.

Testing actuation of the on-board computer (fuel consumption indication)

Note:

Perform the following test only if no or an incorrect fuel consumption signal is found when testing the on-board computer.

– Connect test box V.A.G 1598 with adapter cable V.A.G 1598/11 to the MPI control unit ⇒ Repair Group 01.

– Connect hand-held multimeter between socket 45 (earth) and socket 31 (signal).

– Run engine and continuously vary engine speed between 1000 and 4000 rpm.
Specification: approx. 0.3 ... 6.0 V (according to engine speed).

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

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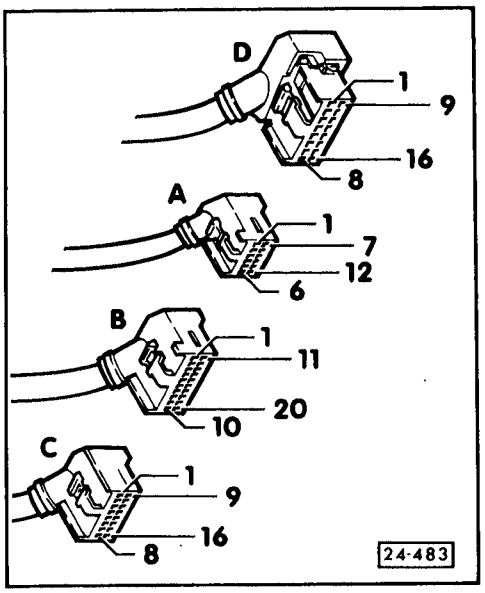

◄ – Test cable connection between MPI control unit (contact 11 at connector B) and black 10-pin connector of the on-board computer for continuity on the basis of the CFD.

– If no open circuit in the wiring exists, rectify fault in the dash panel insert or in the display unit of the on-board computer ⇒ "Current Flow Diagrams, Fault Finding Electrics and Fitting Locations" binder.

– 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 ... 0.6 V (according to engine speed).

– If the specification is now achieved, there is a fault in the dash panel insert or in the display unit of the on-board computer ⇒ "Current Flow Diagrams, Fault Finding Electrics and Fitting Locations" binder.

– If the specification is not achieved, test cable connection between MPI 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 MPI control unit ⇒ Repair Group 01.

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Testing road speed signal

Test requirement:

Speedometer gauge in the dash panel insert in order.

– Select function 08 "Read measured value block", display group 03 with V.A.G 1551 ⇒ Repair Group 01.

Read measured value block 3			→
1	2	3	4

◄ Readout in display:

– Observe speed indicated in display field 4 and drive off.

Specifications: 0 km/h (when stationary)
momentary speed (when driving)

– Press → key.

– Enter 06 for "End output" and confirm with the key Q.

– If no speed is indicated in the transition from stationary vehicle to driving, switch off ignition and connect test box V.A.G 1598 with adapter cable V.A.G 1598/11 to the MPI control unit ⇒ Repair Group 01. The connector –B– is not plugged in at the MPI control unit.

– Connect diode test lamp V.A.G 1527 to socket 29 (signal) and 40 (positive) of the test box.

– Raise vehicle at front left until wheel is clear of the ground.

– Switch on ignition. Diode test lamp comes on with about half its intensity.

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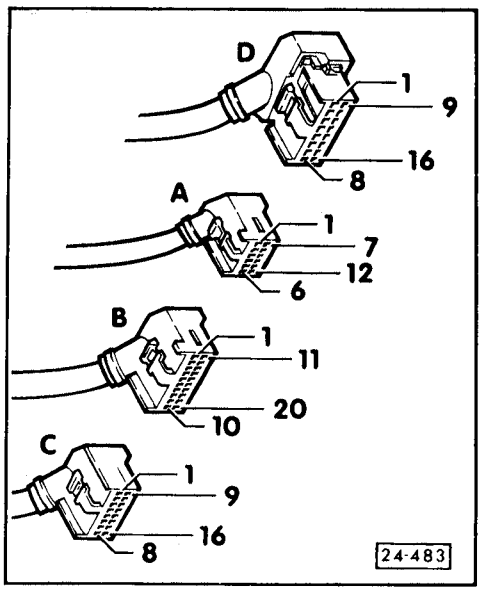
– Rotate front left wheel by hand. When this is done, the diode test lamp must become brighter (flashes).

– If the diode test lamp does not light up and flash, test cable connection from socket 29 to the dash panel insert on the basis of the CFD.

◄ – Rectify any open circuit in the wiring between contact 9 of connector –B– and dash panel insert.

– If no fault exists in the cable connection, continue fault finding with the fault finding programme "Testing road speed signal" in the "Current Flow Diagrams, Fault Finding Electrics and Fitting Locations" binder.



– If the diode test lamp lights up and flashes, switch off ignition and plug connector –B– of the adapter cable V.A.G 1598/11 into the MPI control unit.

– If necessary, connect diode test lamp again to socket 29 (signal) and 40 (positive) of the test box.

– Switch on ignition. Diode test lamp must light up with about half its intensity.

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

– If the diode test lamp does not light up and flash although no fault existed during the test when the connector –B– was not plugged into the MPI control unit, replace MPI control unit ⇒ Repair Group 01.

Basic setting of throttle valve

Note:

The limiting screw is factory-set and its setting must not be altered. Should the screw have been turned inadvertently, perform the setting described below and re-seal the screw with sealing varnish.

– Unscrew limiting screw –arrow– until a gap exists between screw and stop.

– Tighten limiting screw until it makes contact with the stop.

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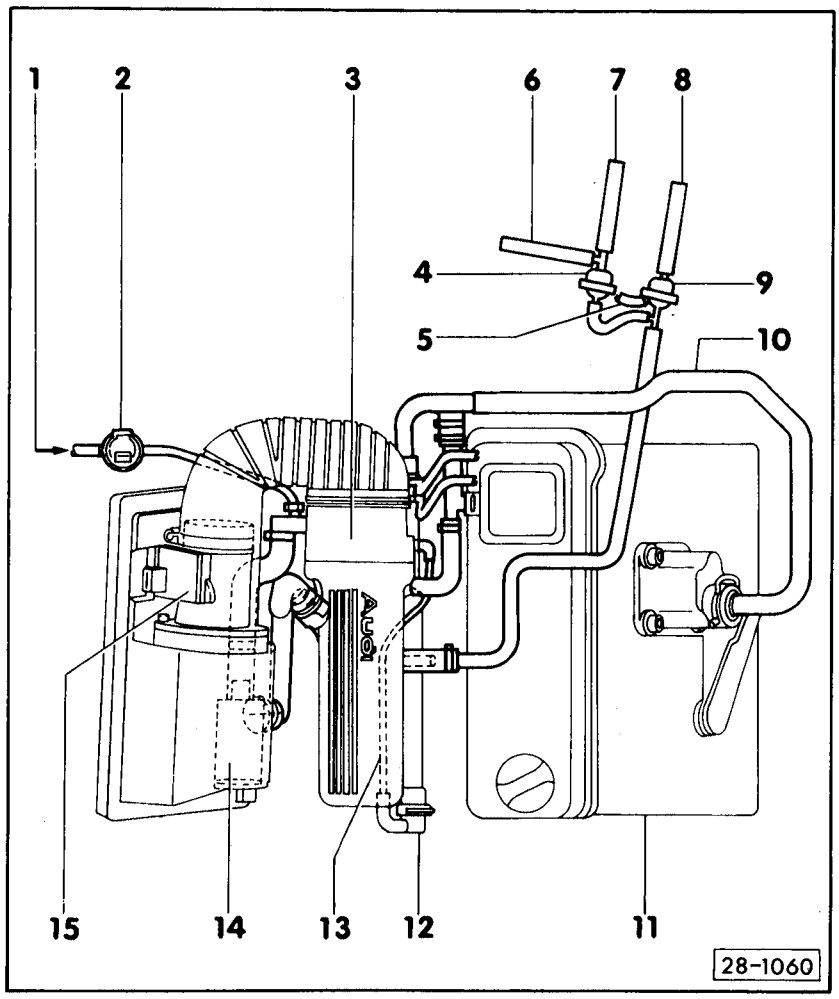
Note:

In order to exactly determine the contact point of the limiting screw, insert a thin sheet of paper between limiting screw and stop. Determine the contact point by constantly moving the paper and at the same time tightening the limiting screw.

– Tighten the screw a further 1/2 turn from this point.

– Mark screw with sealing varnish.

– Test idling speed and CO content ⇒ page 24–14.



Vacuum connections

1 – **From activated charcoal filter**
- Servicing activated charcoal filter ⇒ Repair Group 20

2 – **Solenoid valve 1 for activated charcoal filter –N80**

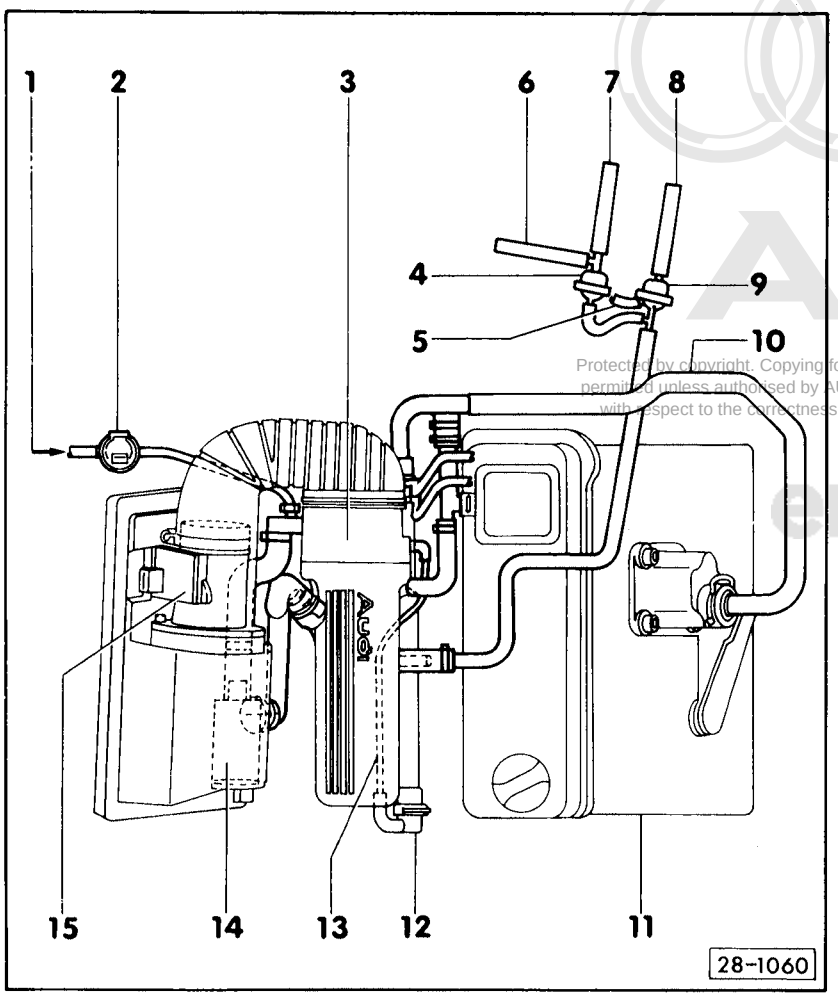
3 – **Throttle valve connection**

4 – **Non-return valve for air conditioner**

5 – **Connection for differential lock**
- Only on vehicles with four-wheel drive (otherwise dummy plug)

6 – **To two-way valve for recirculating air/fresh air flap**

7 – **To vacuum reservoir for air conditioner**



8 – **To brake servo unit**

9 – **Non-return valve**

10 – **Crankcase breather**

11 – **Engine block**

12 – **Fuel pressure regulator**

13 – **Vacuum hose**

14 – **Idling speed stabilization valve –N71**

15 – **Air mass meter –G70**

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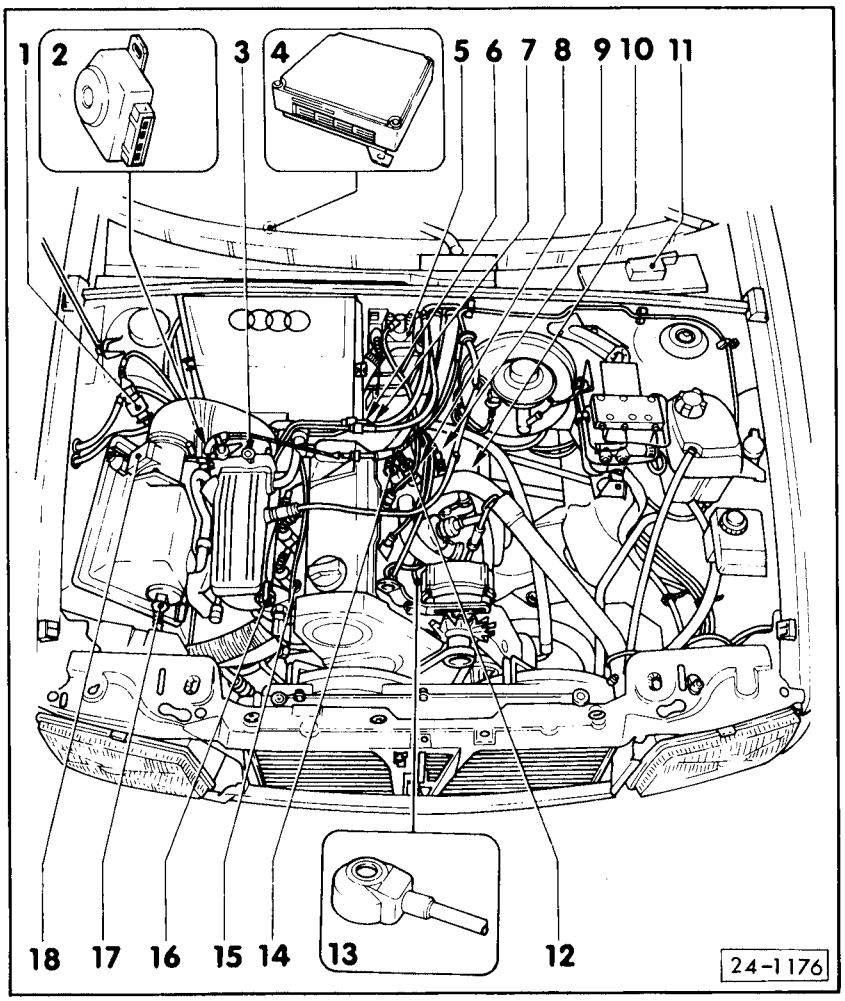


Multi-point injection (MPI) system

List of fitting locations

1 – **Solenoid valve 1 for activated charcoal filter –N80**
- Testing ⇒ Final control diagnosis, Repair Group 01

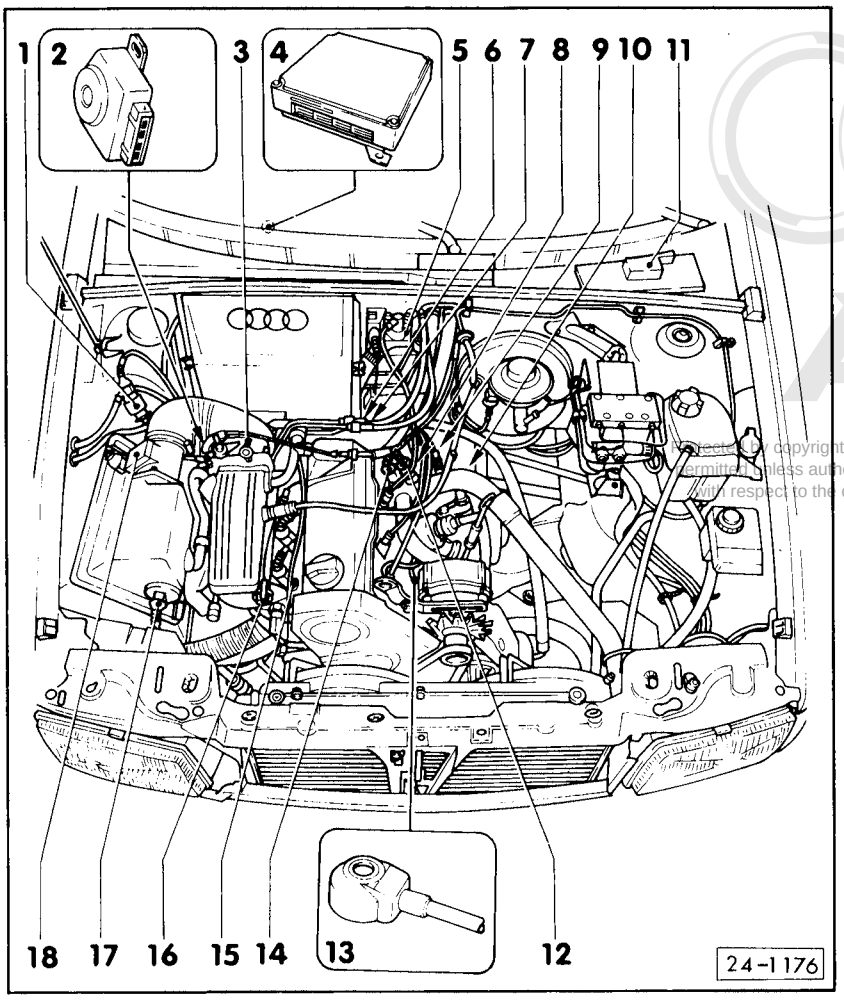
2 – **Throttle valve potentiometer –G69 with integral idling speed switch –F60**

3 – **Throttle valve body**

4 – **Control unit for MPI fuel injection and ignition system –J192**
- Removing and installing ⇒ Repair Group 01

5 – **Ignition transformer –N with output stage –N70**

6 – **Plug connection for knock sensor –G61**



7 – **Plug connection for engine speed sender –G28**

8 – **Distributor –O with Hall sender –G40**

9 – **Engine speed sender –G28**

10 – **Plug connection of Lambda probe –G39 and Lambda probe heater –Z19**

11 – **Diagnostic socket**

12 – **Coolant temperature sender –G62 (2-pin)**

13 – **Knock sensor I –G61**

14 – **Sender for coolant temperature gauge –G2 and switch for overheating warning lamp –F14 (3-pin)**

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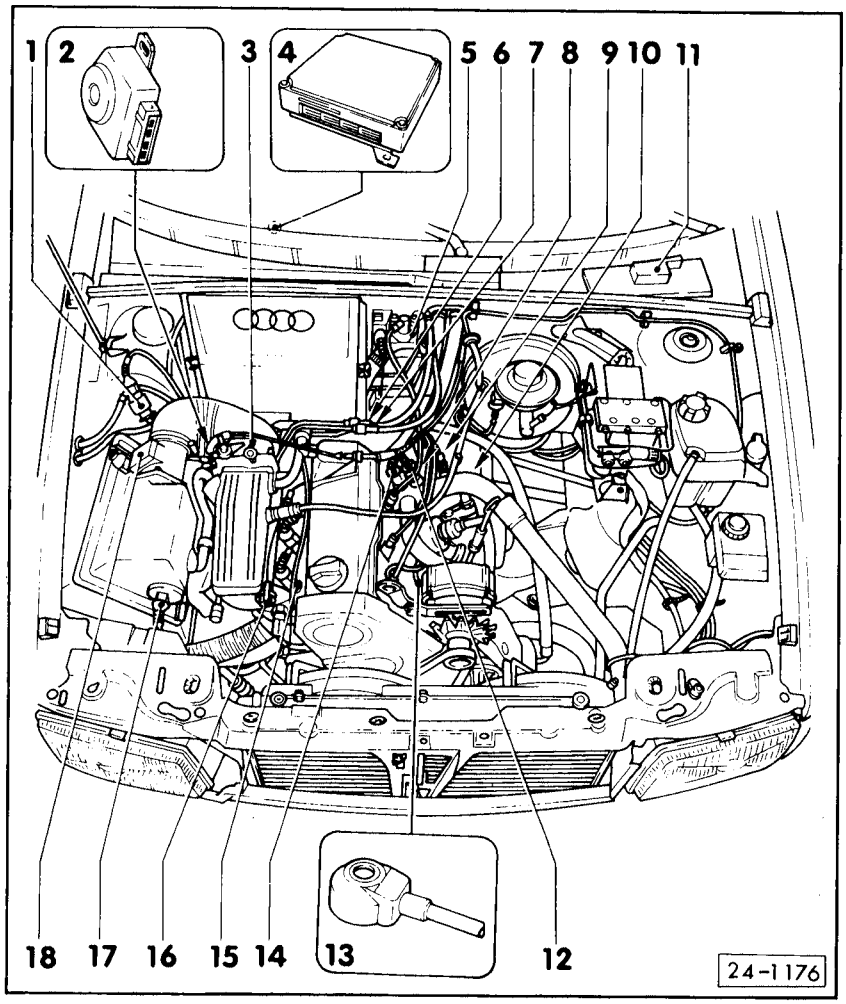
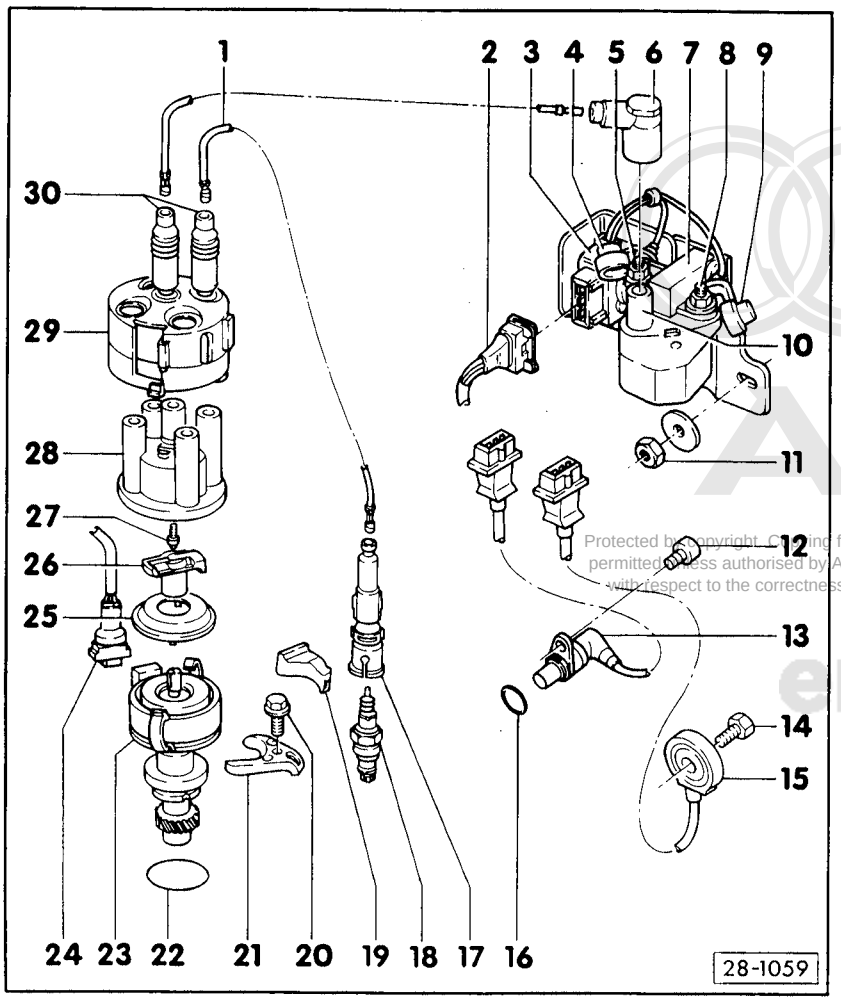


15 – Injectors –N30, –N31, –N32, –N33

16 – Fuel pressure regulator

17 – Idling speed stabilization valve –N71
- Testing ⇒ Final control diagnosis, Repair Group 01

18 – Air mass meter –G70 with intake air temperature sender –G42



Servicing ignition part

1 – Ignition cable
- Test for continuity

2 – Connector

3 – Output stage for ignition transformer –N70
- Testing ⇒ page 28–19

4 – Protective cap

5 – Terminal 1 (–)

6 – Interference suppression connector
- 0.6...1.4 kΩ

7 – Ignition transformer
- Primary resistance: 0.5...1.5 Ω (between terminals 1 and 15)
- Secondary resistance: 5...9 kΩ (between terminals 1 and 4)

8 – Terminal 15 (+)

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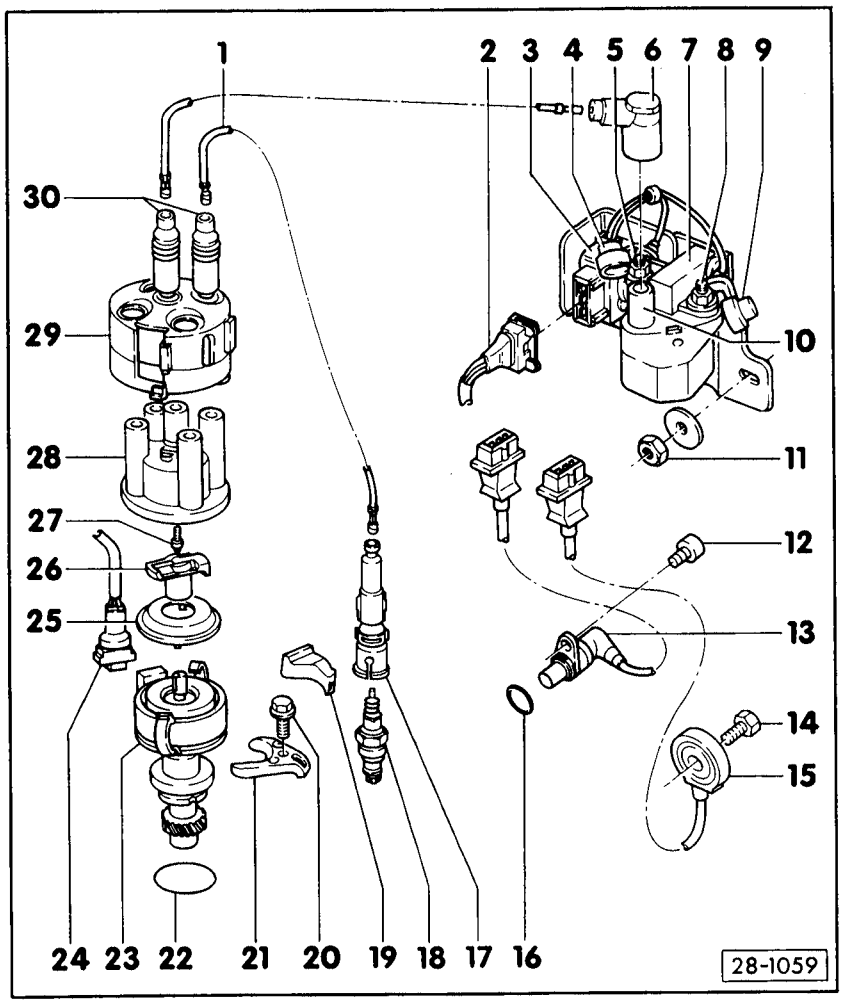


9 – **Protective cap**

10 – **Terminal 4**

11 – **10 Nm**

12 – **10 Nm**

13 – **Engine speed sender –G28**
- The reference mark signal is generated in this system by –G28

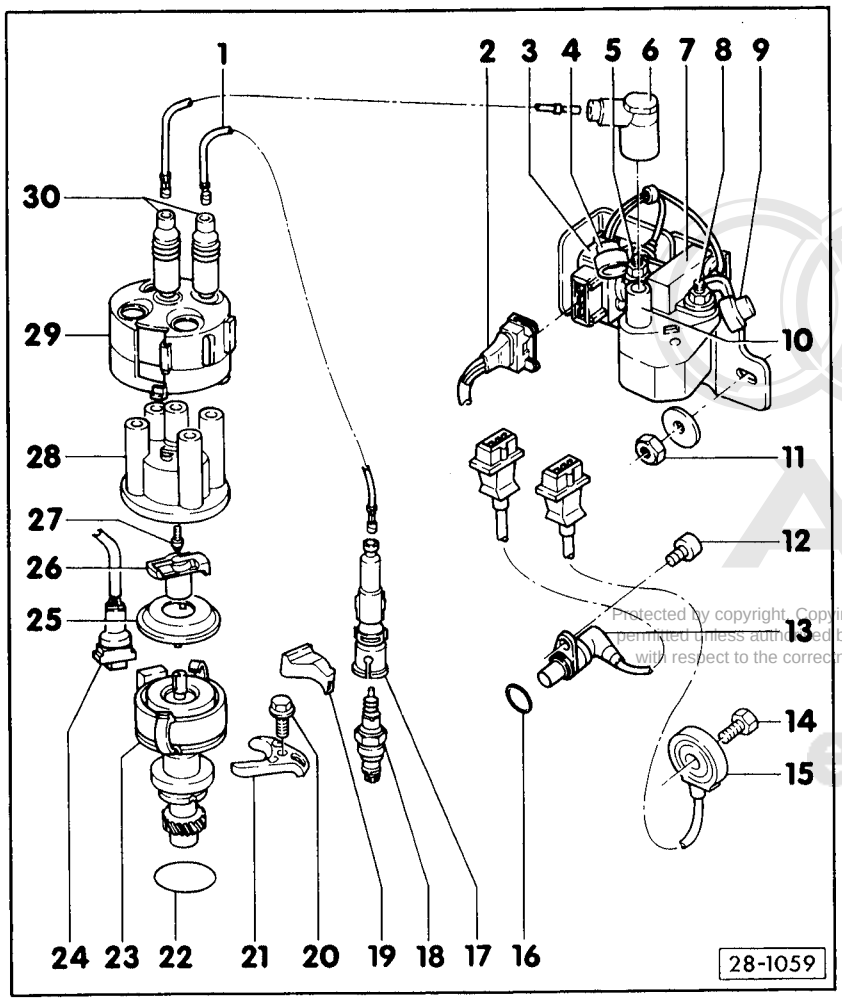
14 – **20 Nm**
- Tightening torque affects operation of knock sensor

15 – **Knock sensor –G61**

16 – **O-ring**

17 – **Spark plug connector**
- 4...6 kΩ

18 – **Spark plug**
- 30 Nm
- Type and electrode gap ⇒ page 28–8



19 – **Securing cap**

20 – **25 Nm**

21 – **Terminal**

22 – **O-ring**

23 – **Distributor**
- Installing ⇒ page 28–11
- Checking and adjusting basic setting of distributor ⇒ page 28–13
- Testing Hall sender ⇒ page 28–15

24 – **Connector**
- Press wire lock in order to unplug

25 – **Protective cap**

26 – **Distributor rotor arm**
- 0.6...1.4 kΩ

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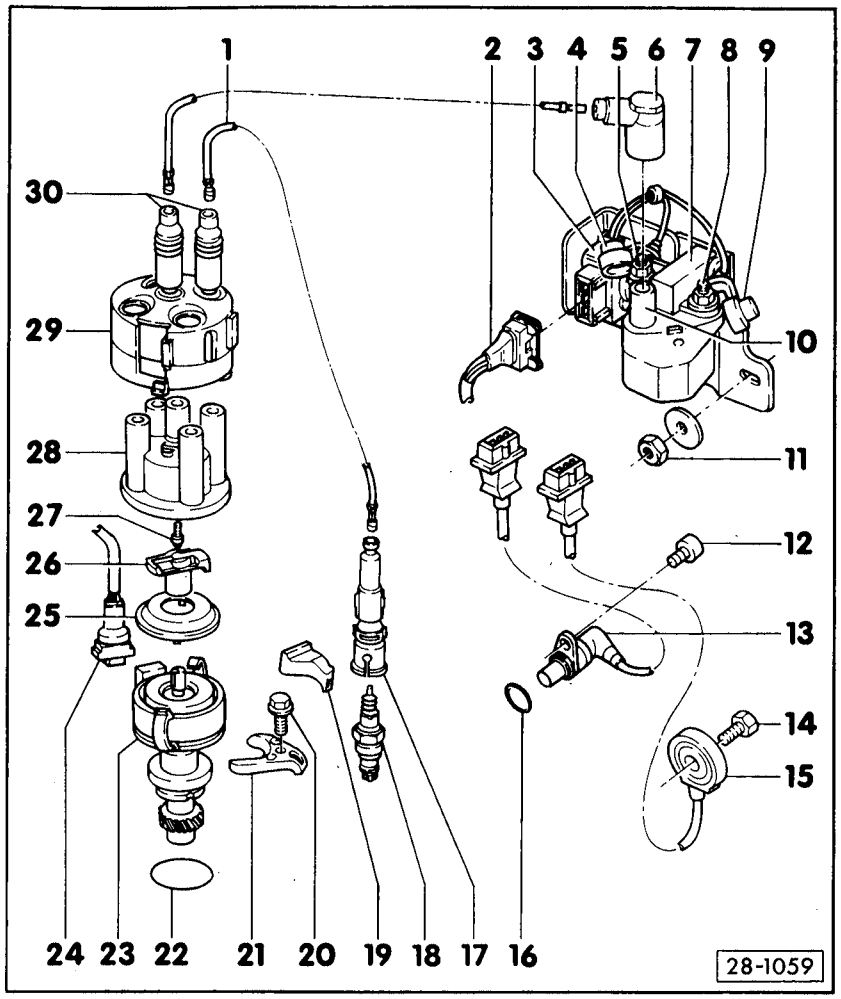

27 – **Carbon brush with spring**
- Check for signs of wear, damage and ease of movement

28 – **Distributor cap**
- Check for cracking, signs of leakage currents
- Check wear of contacts
- Clean before fitting on

29 – **Shield**
- For radio interference suppression

30 – **Interference suppression connector**
- 0.6...1.4 kΩ

Technical data

Engine code letters	ADA	
Idling speed*** • Idling speed not adjustable; is controlled by idling speed stabilization	800...900 rpm	
Engine speed governing • By shutting off injectors	6500 rpm	
Distributor basic setting* • Readout on V.A.G 1551 in function 04 "Basic setting", display group 17, display field 3	Test value	1...9
	Setting value	5 ± 1
Firing order	1 – 3 – 4 – 2	
Spark plugs	Tightening torque	30 Nm
	Part No.**	101 000 036 AA
	Manufacturer's designation**	BUR 6 ET
	Electrode gap	0.7...0.9
	Change interval	every 60000 km or every 3 years (which ever occurs first)

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*) Checking and adjusting distributor basic setting fi page 28–13
**) Current values fi "Exhaust and Idling Speed Test" binder
***) Idling speed fi Repair Group 24, Testing idling speed and CO content

Safety precautions

Pay attention to the following points in order to avoid injuries to persons and/or damage to the fuel injection and ignition system:

- Do not touch or disconnect ignition cables when the engine is running or at starting speed.
- Do not disconnect and connect cables of the ignition system – also not high-voltage cables and test equipment cables – unless the ignition is switched off.
- To operate the engine at starting speed without the engine starting (e.g. for testing compression), unplug connector from power output stage at ignition transformer and remove fuse for fuel pump.
- Starting assistance with quick-charger is only permitted up to 1 minute with a maximum voltage of 16.5 V.
- The ignition must be switched off when performing engine wash.
- Do not disconnect and connect battery unless the ignition is switched off otherwise the MPI control unit may be damaged.

- If a fault exists or is suspected in the ignition system, the vehicle must not be towed unless the connector at the power output stage is unplugged.
- Do not connect a capacitor to terminal 1 (–).
- Do not replace distributor rotor arm 1 kΩ (identification: R1) with a different type, also not for radio interference suppression.
- Always use the adapter cable set V.A.G 1594 for connecting test equipment.

Note:

If radio is fitted with anti-theft coding, determine coding before disconnecting the battery.

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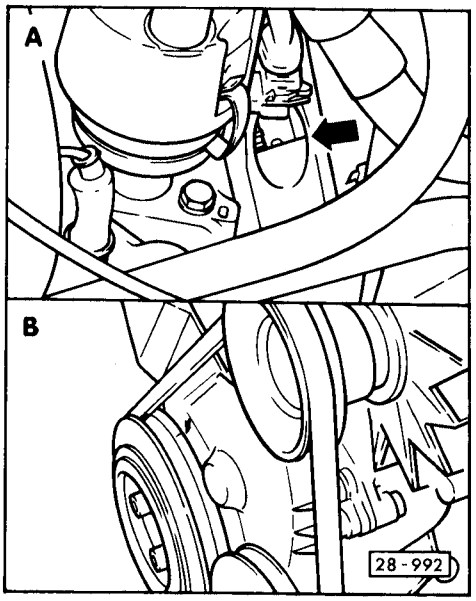


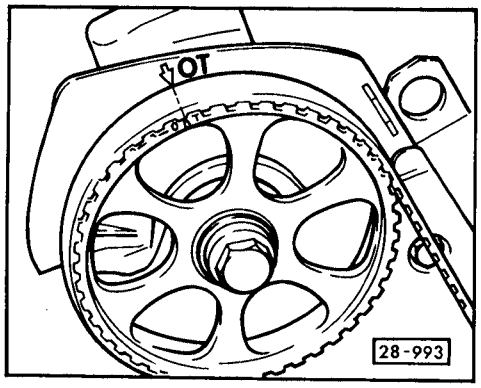
Installing distributor

A – Engine installed

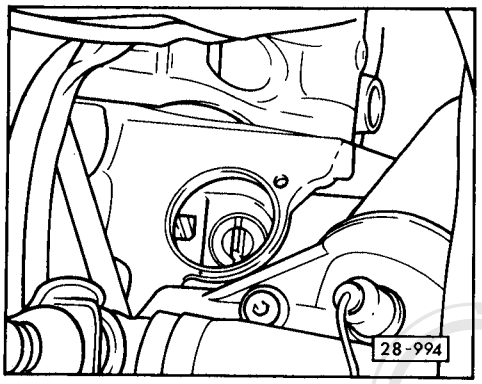
◄ – Position flywheel to TDC of cylinder 1.

B – Engine removed

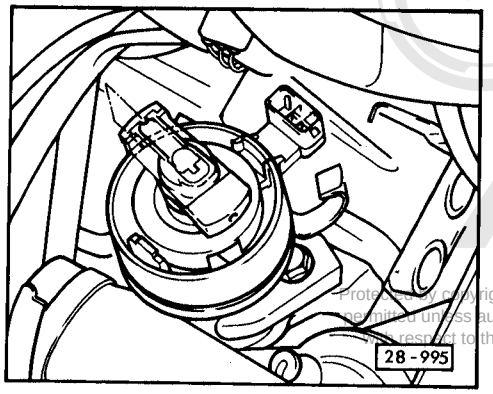
– Marking on vibration damper (belt pulley) must be aligned with arrow on toothed belt guard.



◄ – Marking on camshaft sprocket must be aligned with arrow on top toothed belt guard.



◄ – Position mounting stud of oil pump shaft parallel to crankshaft.



◄ – Position distributor rotor arm so that it is facing toward the marking for cylinder 1 on the distributor housing.

– Insert distributor.

– Clean distributor cap for fitting on; check for cracks, signs of leakage currents, replace if necessary.

Check and adjust basic setting of distributor ⇒ page 28–13.

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Checking and adjusting basic setting of distributor

– Interrogate fault memory and erase ⇒ Repair Group 01. No fault must be stored (rectify any faults, erase fault memory, switch off engine and start again, perform road test and once again interrogate fault memory as a check).

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

– Start basic setting of engine until the readout "Basic setting 17" appears in the display ⇒ Repair Group 01.

Basic setting	17		→
1	2	3	4

◄ Readout in display:

Wait before continuing with the test until the coolant temperature is at least 80°C.

– Check readout in display field 3.

Specifications: Test value: 5 ± 4
Setting value: 5 ± 1

The readout in display field 3 is set by turning the distributor.

Note:

If the readout is greater than 40 the distributor must be turned in the direction of larger readouts until the value 5 appears (numerical sequence: ...55, 56, 57, 58, 59, 0, 1, 2, 3, 4, 5, 6, 7,...).

– Press → key.

After performing basic setting of distributor, check idling speed and CO content ⇒ Repair Group 24.

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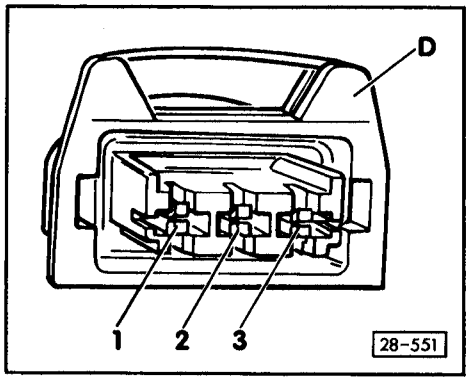


Testing Hall sender –G40

Testing voltage supply

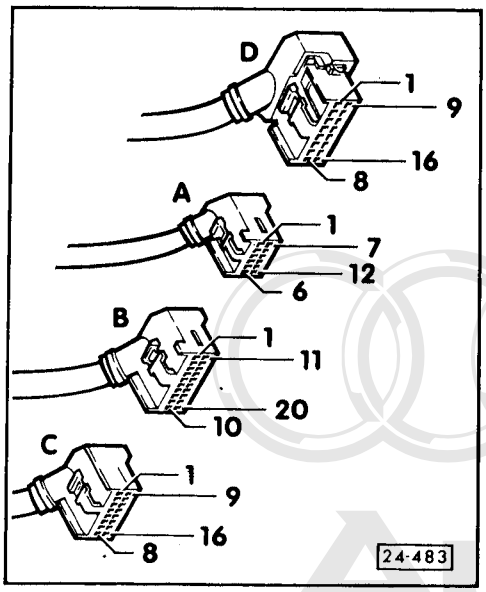
◄ – Unplug connector from Hall sender (at distributor) and connect hand-held multimeter V.A.G 1526 (voltage measurement) with auxiliary cables from V.A.G 1594 to the outer contacts 1 (earth) and 3 (positive) of connector –D–.

– Switch on ignition and test voltage supply for Hall sender from MPI control unit –J192.
Specification: at least 9 V.

– Switch off ignition.

– If the specification is not achieved, test wiring between Hall sender and MPI control unit for continuity or short circuit on the basis of the CFD (connect test box V.A.G 1598 with adapter cable V.A.G 1598/11 only to the engine wiring harness).

– Test earth cable from contact 1 of the connector for Hall sender to engine earth for continuity.
Specification: max. 1 Ω.



– Test positive cable from contact 3 of the connector for Hall sender to socket 7 for continuity.
Specification: max. 1 Ω.

– Test both cables for short circuit to each other.

◄ – Rectify any open circuit in the wiring or short circuit.

Contact at connector of Hall sender	Contact at connector –C–
3 (positive)	7
1 (earth)	Engine earth

– If neither an open circuit nor a short circuit exists, replace MPI control unit ⇒ Repair Group 01.

Testing operation

Test requirement:

Voltage supply of Hall sender in order; testing ⇒ page 28–15.

– Remove fuse for fuel pump (fuel pump must not run when starting engine otherwise catalytic converter may be damaged), then interrogate fault memory.

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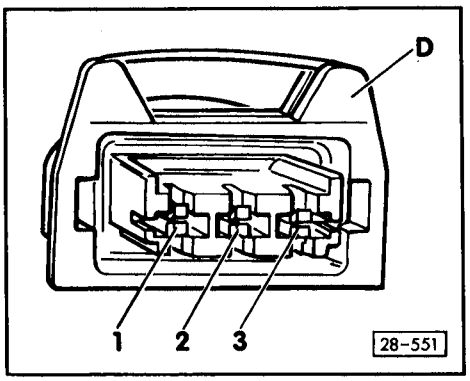
– Connect test box V.A.G 1598 with adapter cable V.A.G 1598/11 to the MPI control unit and wiring harness ⇒ Repair Group 01.

– Connect diode test lamp V.A.G 1527 to socket 8 (Hall sender signal) and 46 (positive).

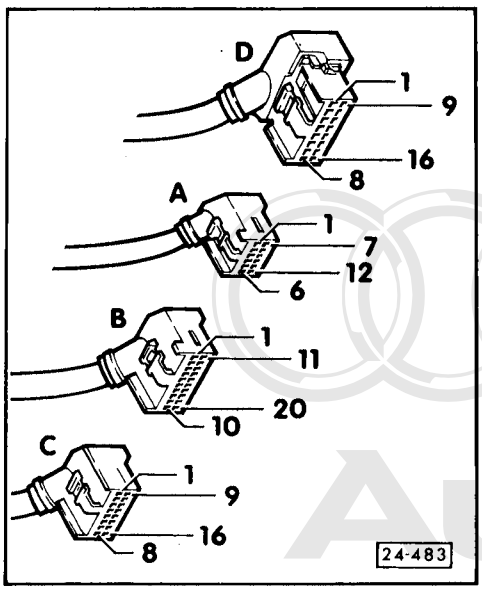
– Operate starter.
Specification: The diode test lamp must flash briefly during each second engine revolution.

– If the diode test lamp does not flash, switch off ignition and unplug 3-pin connector at Hall sender.



◄ – Test signal wire from contact 2 of connector for Hall sender to socket 8 for continuity.
Specification: max. 1 Ω.

– If the specification is not achieved, rectify open circuit or short circuit between the connector for Hall sender and ...



◄ – ... connector –C– at the MPI control unit.

Contact at connector of Hall sender	Contact at connector –C–
2 (signal)	8

– If neither an open circuit nor a short circuit exists, connect hand-held multimeter V.A.G 1526 to sockets 8 and 45 (earth).

– Switch on ignition.
Specification: at least 4 V.

– If the specification is not achieved, replace MPI control unit ⇒ Repair Group 01.

– If the specification is achieved, replace distributor.

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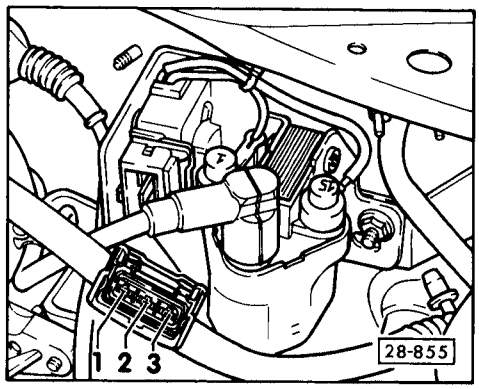
Testing output stage for ignition transformer

Test requirement:

Ignition transformer in order; testing ⇒ page 28–22.

Testing voltage supply

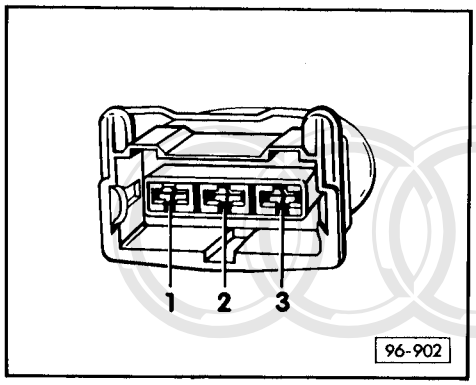


– Unplug connector from the power output stage –N70 and ignition cable from the transformer.

◄ – Connect hand-held multimeter V.A.G 1526 (voltage measurement) in turn between contact 1 (positive) and earth as well as between contact 3 (earth) and 1 (positive).

– Switch on ignition.
Specification: approx. battery voltage in each case.

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



Testing actuation

Test requirement:

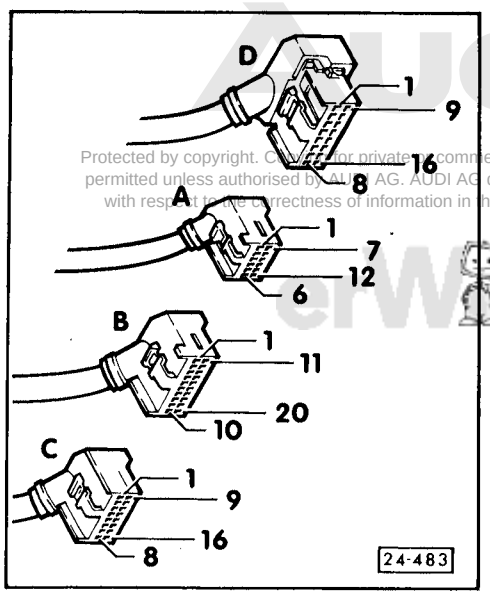
Hall sender –G40 in order; testing ⇒ page 28–15.

– Remove fuse for fuel pump (fuel pump must not run when engine is started otherwise catalytic converter may be damaged), then interrogate fault memory.

◄ – Connect diode test lamp V.A.G 1527 to contacts 2 (signal) and 3 (earth) of the connector.

– Operate starter.
Specification: The diode test lamp must flash.

– If the diode test lamp does not flash, test cable connection from the connector to the MPI control unit for continuity or short circuit on the basis of the CFD.



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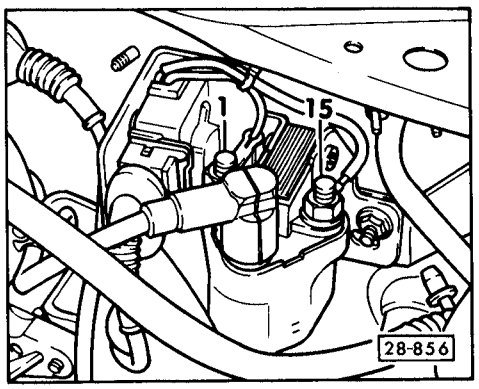
◄ – Rectify any open circuit in wiring or short circuit.

Contact at 3-pin connector of power output stage	Contact at connector –B–
2	17

– If no fault is found at the Hall sender and in the cable connection, replace MPI control unit ⇒ Repair Group 01.

– If the diode test lamp flashes, switch off ignition and plug in connector at the ignition transformer.



◄ – Connect diode test lamp to contacts 1 and 15 of the ignition transformer using auxiliary cables and clamps.

Note:

Do not touch the connection parts of the ignition transformer or the test cables when performing the following test.

– Operate starter.
Specification: The LEDs must flicker.

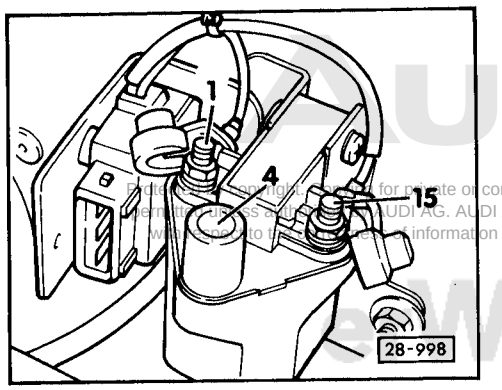
– If the LEDs do not flicker, replace power output stage –N70.

Testing ignition transformer –N

Note:

Check wiring between power output stage and ignition transformer for signs of corrosion or damage.

– Unplug connector from the power output stage and ignition cables from the ignition transformer.



◄ – Test primary resistance between terminals 1 and 15 using hand-held multimeter V.A.G 1526.
Specification: 0.5...1.5 Ω.

– Test secondary resistance between terminals 4 and 15 using hand-held multimeter V.A.G 1526.
Specification: 5...9 kΩ.

– If one of the specifications is not achieved, separate ignition transformer from power output stage.

– Repeat test.

– If one of the specifications is again not achieved, replace ignition transformer.

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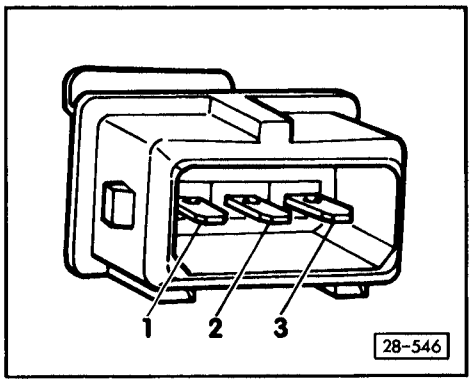
Testing engine speed sender –G28

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

– Before performing the test, check that the sender is correctly installed and tightly seated.

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



◄ – Connect hand-held multimeter V.A.G 1526 (resistance measurement) to contacts 1 and 2 of the connector in the connector holder.
Specification: approx. 1 kΩ.

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

– If the specification is achieved, connect hand-held multimeter to contacts 1 and 3 as well as 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 wiring between sender coupling and MPI control unit as follows:

– Connect test box V.A.G 1598 with adapter cable V.A.G 1598/11 to the wiring harness to the MPI control unit ⇒ Repair Group 01. (The connector at the control unit is not plugged in).

– Test screening of contact 3 of sender coupling to engine earth for continuity.
Specification: max. 1 Ω.

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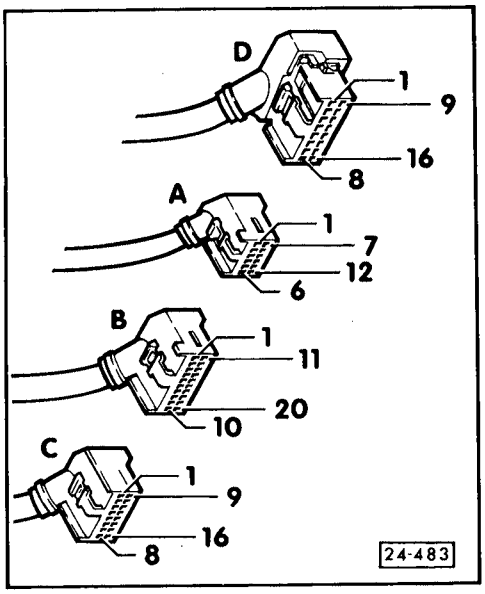
– Test earth cable from contact 1 of sender coupling to socket 4 of the test box for continuity.
Specification: max. 1 Ω.

– Test signal wire from contact 2 of the sender coupling to socket 5 of the test box for continuity.
Specification: max. 1 Ω.



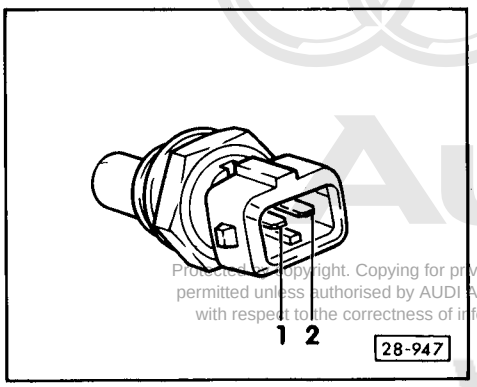
◄ – If the specifications are not achieved, rectify short circuit or open circuit in wiring.

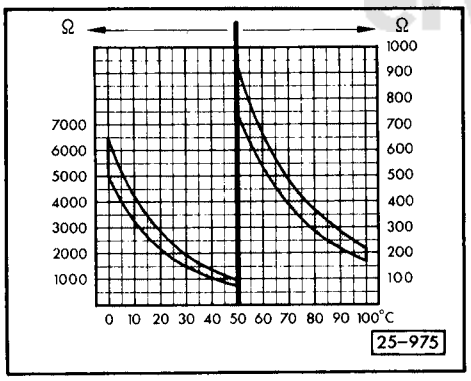
Contact at sender coupling	Contact at connector –C– or engine earth
1	4
2	5
3	Engine earth

– If no fault was found up until this point, check that sender gear on the crankshaft is tightly seated. The sender must be removed in order to check the sender gear.

– Slowly crank engine and check that sender gear is tight and rotates concentrically.

– If no fault has been found in all the tests performed up until this point, replace MPI control unit ⇒ Repair Group 01.





Testing coolant temperature sender –G62

Notes:

- *For the operational test of –G62 see also Reading measured value block, display group 01, display field 1.*
- *Fitting location of sender ⇒ page 28–1.*

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– Unplug connector at the sender.

◄ – Test resistance between contacts 1 and 2 of the sender.

◄ Specifications:

- at approx. 20°C coolant temperature: approx. 2.5 kΩ
- at approx. 80°C coolant temperature: approx. 330 Ω.

– If the specification is not achieved, replace sender.

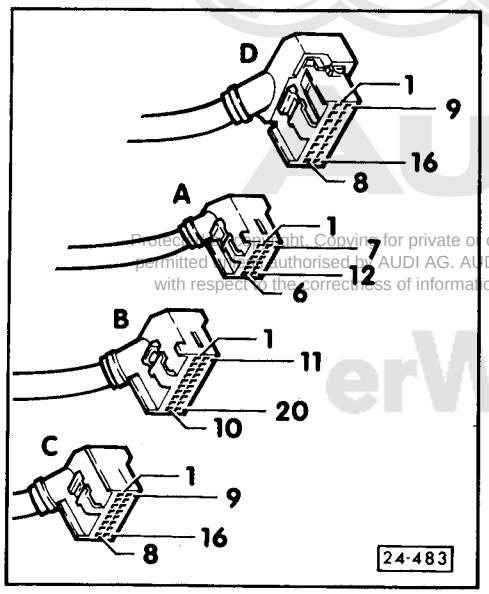
– If the specification is achieved, test wiring from sender to the MPI control unit as follows:

– Connect test box V.A.G 1598 with adapter cable V.A.G 1598/11 to the wiring harness to the MPI control unit ⇒ Repair Group 01. (The connector at the control unit is not plugged in.)

– Test earth cable from contact 2 of the connector to engine earth for continuity.
Specification: max. 1 Ω.

– Test signal wire from contact 1 of the connector to socket 15 of the test box for continuity.
Specification: max. 1 Ω.

– Test both cables for short circuit to each other.



◄ – If the specifications are not achieved, rectify short circuit or open circuit in wiring.

Contact at sender coupling	Contact at connector –C– or engine earth
1	15
2	Engine earth

– If neither an open circuit nor a short circuit exists and the coolant temperature sender is in order, replace MPI control unit ⇒ Repair Group 01.

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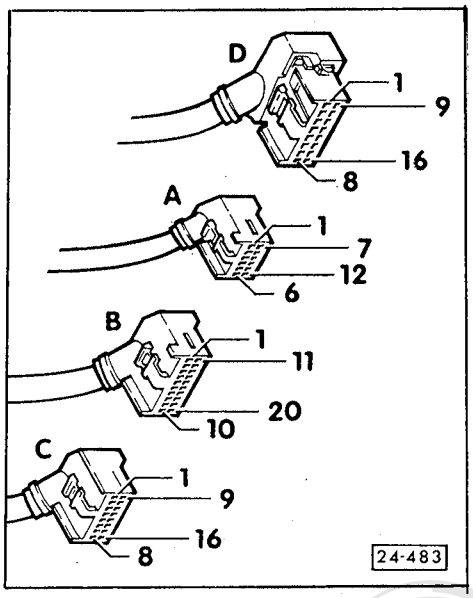
Testing voltage supply of MPI control unit

Note:

For testing the voltage supply of the MPI control unit see also Reading measured value block, display group 01, display field 4.

Test requirement:

Fuse for MPI control unit in order.



- Connect test box V.A.G 1598 with adapter cable V.A.G 1598/12 to the wiring harness to the MPI control unit ⇒ Repair Group 01. (The connector at the control unit is not plugged in.)
- Switch on ignition.
- Connect diode test lamp V.A.G 1527 to socket 8 (positive via ignition) and to earth.
- The diode test lamp must light up.
- If the diode test lamp does not light up, test for open circuit in wiring on the basis of the CFD and rectify if necessary.

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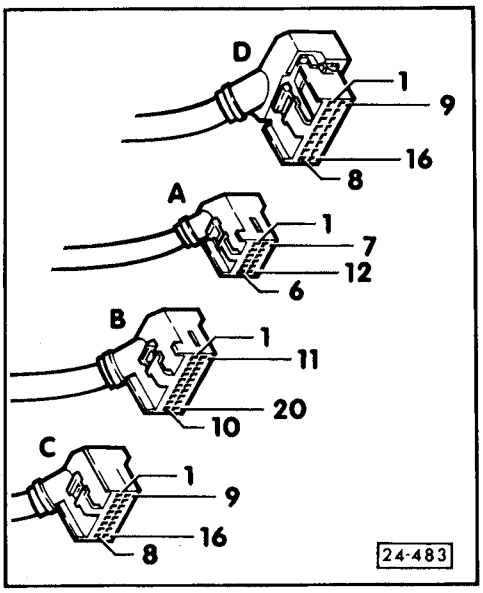
- If the diode test lamp V.A.G 1527 lights up, connect diode test lamp to socket 8 (positive via ignition) and in turn to sockets 1, 2, 3 and 16 (earth connections).
  Specification: The diode test lamp must light up in each case.
- If the diode test lamp does not light up, test cable connection between intake manifold and connector –D– on the basis of the CFD and rectify any open circuit in the wiring.

V.A.G 1598 socket	Contact at connector –D–
1	1
2	2
3	3
16	16

- Switch off ignition.
- Connect test box V.A.G 1598 with adapter cable V.A.G 1598/11 to the wiring harness to the MPI control unit ⇒ Repair Group 01. (The connectors at the control unit are not plugged in.)



– Connect diode test lamp V.A.G 1527 to socket 40 (permanent positive) and to engine earth.
Specification: The diode test lamp must light up.

◄ – If the diode test lamp does not light up, test cable connection between contact 20 of the connector –B– and the electrical centre on the basis of the CFD and rectify any open circuit.

Testing knock sensor –G61

Notes:

- *For operational test of knock sensor see also Reading measured value block, display group 13 and 14, respectively, display fields 2 and 3.*
- *The knock sensor itself cannot be tested electrically (Interrogate fault memory ⇒ Repair Group 01).*
- *It is essential to exactly adhere to the tightening torque of 20 Nm if the knock sensor is to operate properly.*
- *Check plug connection for signs of corrosion.*
- *Use only gold-plated contacts for repairing the contacts in the plug connection of the knock sensor.*

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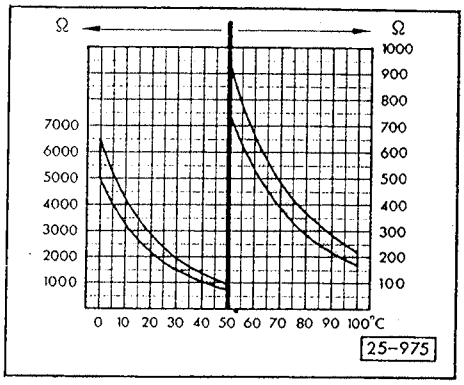
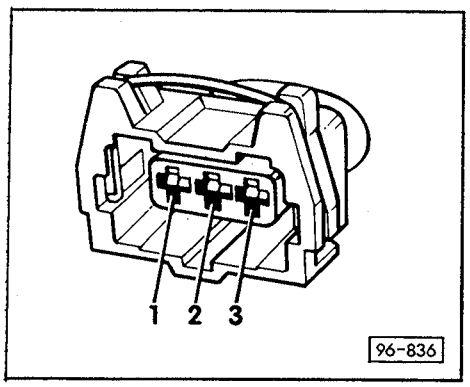


Testing knock sensor wiring

- Separate plug connection of the knock sensor in the engine compartment (fitting location of plug connection ⇒ page 28–1).

◄ – Test all three contacts at the connector of the knock sensor for short circuit to each other. There must not be any connection of the cables to each other.

- If a connection exists, replace knock sensor.



Testing cable connection to MPI control unit

- Connect test box V.A.G 1598 with adapter cable V.A.G 1598/11 to the wiring harness to the MPI control unit ⇒ Repair Group 01.

- Test wiring between knock sensor for continuity on the basis of the CFD.

◄ • Contact assignment of plug connection:
1 = Signal wire
2 = Earth cable
3 = Shielding

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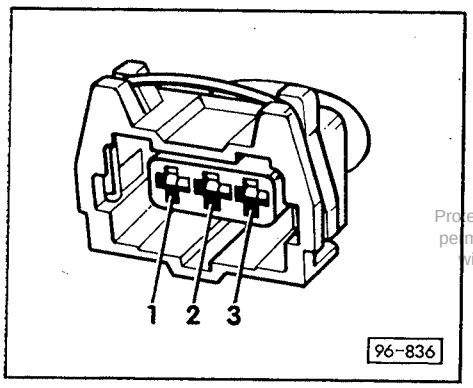
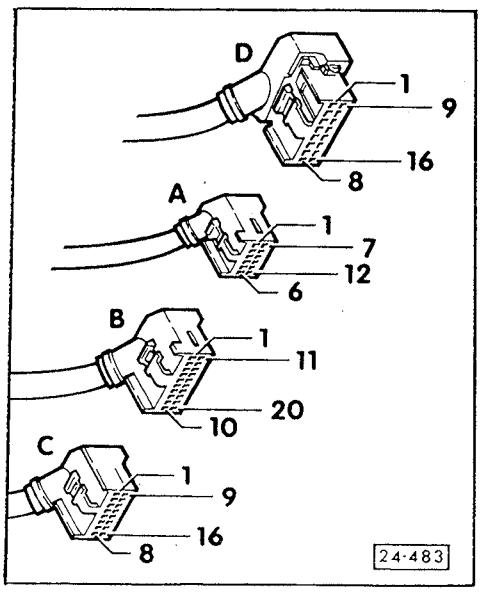


◄ – Test signal wire of knock sensor from contact 2 of the connector to socket 21 of the test box for continuity.
Specification: max. 1 Ω.

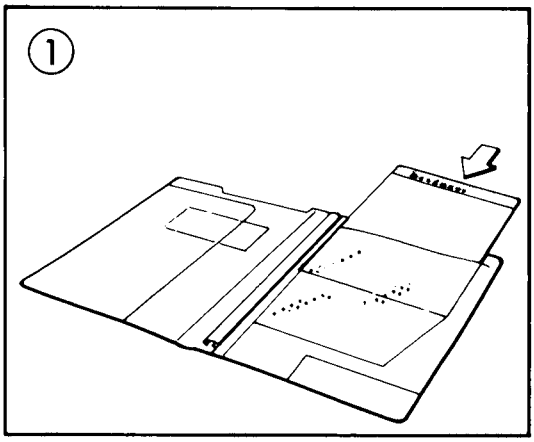
- Test earth cable of knock sensor from contact 1 of connector to socket 22 of the test box for continuity.
Specification: max. 1 Ω.

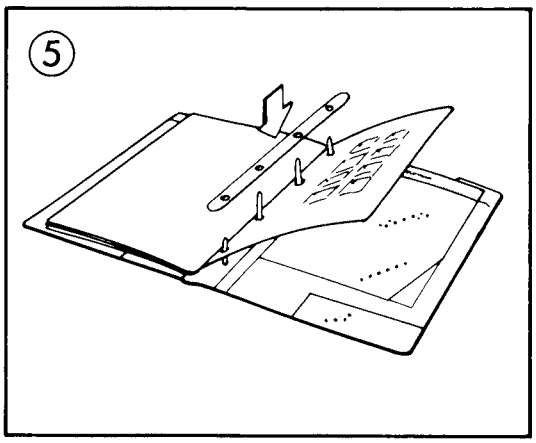
- Test shielding of knock sensor from contact 3 of the connector to socket 23 of the test box for continuity.
Specification: max. 1 Ω.

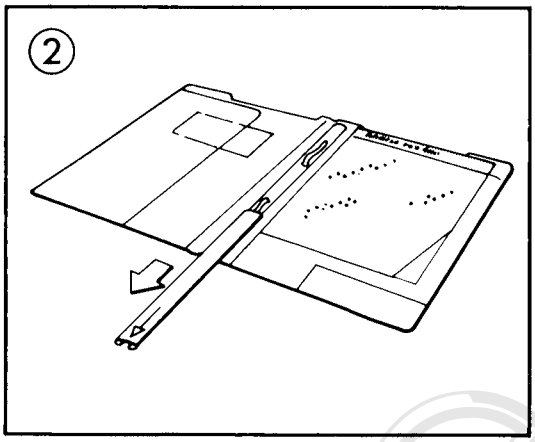


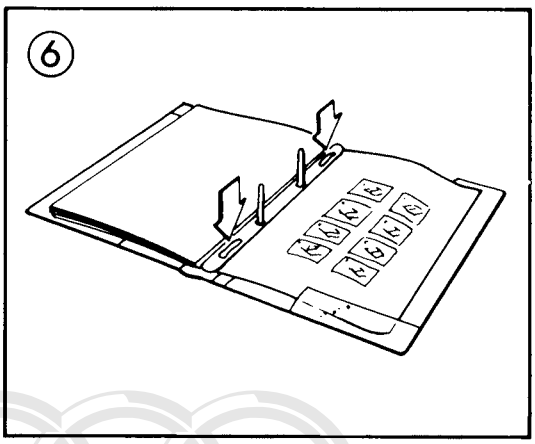
◄ – If the specifications are not achieved, rectify short circuit or open circuit in wiring.

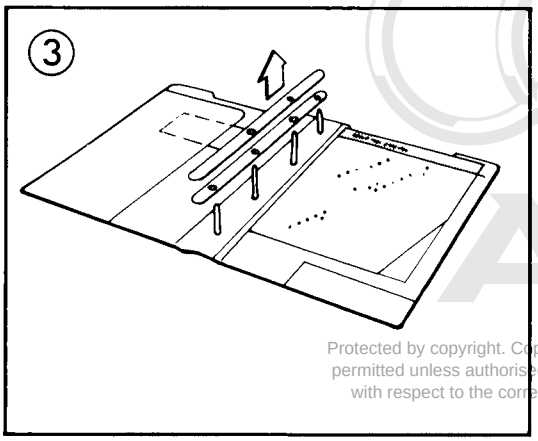
Blue sensor coupling, contact	Contact at connector –B–
1 (signal)	2
2 (earth)	1
3 (shielding)	3

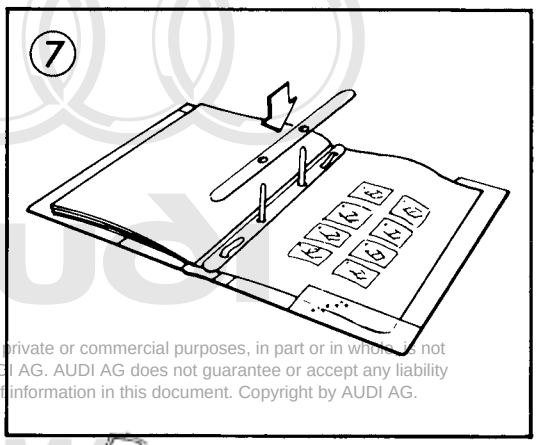
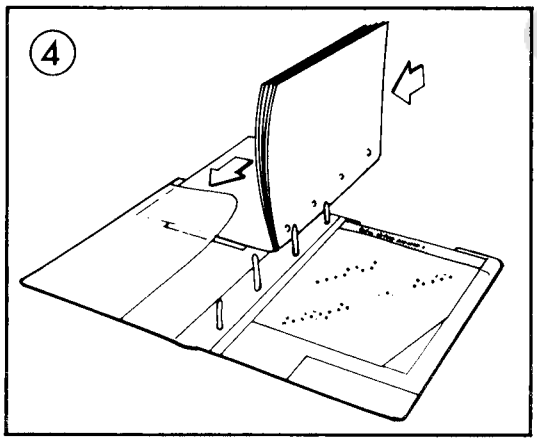
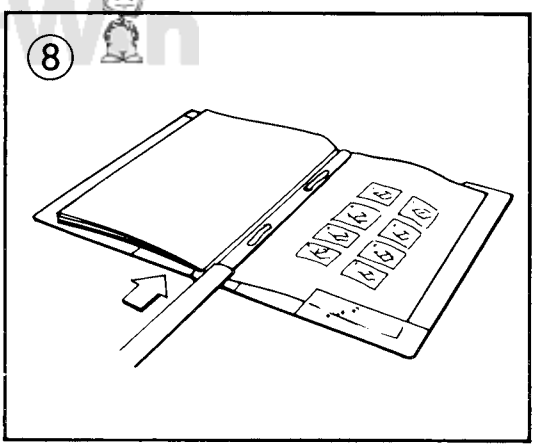








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