Audi 80 1992 ➢

Mono-Motronic injection and ignition system (4-cyl.) 07.92 ➢									
Engine ID	ABM	ABT							

Edition 07.1992

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

Audi 80 1992 ➢

Mono-Motronic injection and ignition system (4-cyl.) 07. 92 ➢

Repair Group

01 - Self-diagnosis

24 - Mixture preparation, Injection

28 - Ignition system

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Technical information should always be available to the foremen and mechanics, because their careful and constant adherence to the instructions is essential to ensure vehicle road-worthiness and safety. In addition, the normal basic safety precautions for working on motor vehicles must, as a matter of course, be observed.

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01 - Self-diagnosis

1 - Mono-Motronic self-diagnosis

1.1 - Mono-Motronic self-diagnosis

1.2 - List of control units

Control unit no.	Index	for
8A0 907 311 8A0 907 311 8A0 907 311 8A0 997.311	B E AN AV	- 2.0 l engine (code letters: ABT) - Lambda probe with Lambda-probe heating
8A0 907 311 8A0 907 311	C F	- 1.6 l engine (code letters: ABM) - Lambda probe with no Lambda-probe heating

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1.3 - Technical data of self-diagnosis

Features

- Data are transmitted between control unit and vehicle diagnostic, testing and information system VAS 5051/ fault reader V.A.G 1551 in "Rapid data transfer" mode.
- The fault memory is designed as a non-volatile memory but is dependent on power supply. Disconnecting the permanent positive supply erases the fault memory of the engine control unit.

1.4 - Safety precautions

Pay attention to the following if testers and measuring instruments have to be used in the course of a test drive on vehicles fitted with front passenger's airbag.

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

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

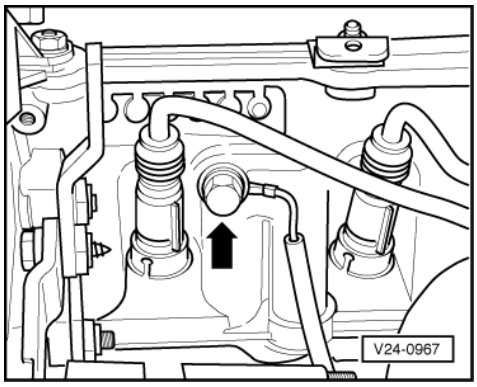
Test requirements:

- Vehicle supply voltage OK

- Fuses for engine OK

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

- Fuel-pump relay -J17 OK; checking => Page 57
- Earth connections checked

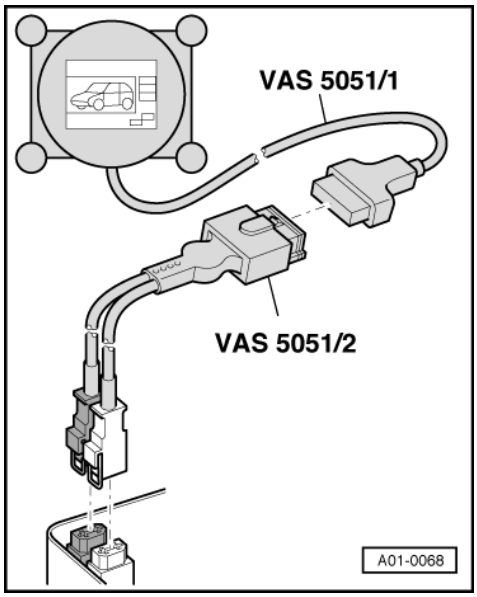


- Prior to fault memory interrogation, final control diagnosis, engine basic setting, wiring check and component replacement, check following earth connections for corrosion and poor contact:

- -> Earth attachment point on left of cylinder head -arrow-
- Battery earth strap and earth strap between plenum chamber and gearbox

- Repair faulty earth connections.

- Detach cover from relay plate with fuse box in plenum chamber.



- -> Use diagnostic wire VAS 5051/1 and diagnostic adapter VAS 5051/2 to connect up vehicle diagnostic, testing and information system VAS 5051. Alternatively, use can be made ofdiagnostic wire V.A.G 1551/1 to connect up fault reader V.A.G 1551.

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Attention:
Heed safety precautions => Page 1 .

Note:

The following description refers solely to implementation of self-diagnosis using fault reader V.A.G 1551.

Proceed in line with equipment operating instructions if use is made of vehicle diagnostic, testing and information system VAS 5051.

- With ignition switched off, attach black connector to black diagnostic connection.

-> Indicated on display:

```
V.A.G SELF-DIAGNOSIS      HELP
1 - Rapid data transfer 1)
2 - Flash code output1)
```

1) Displayed alternately

Note:

If display remains blank, check power supply for black diagnostic connector => Page 23 .

- Attach white connector to white diagnostic connection (blue connector is not used).

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

- Switch on ignition.

or

- Start engine.
- Switch on printer of fault reader by pressing Print key. Lamp in key must light.
- Press key 1 for "Rapid data transfer".

-> Indicated on display:

```
Rapid data transfer      HELP
Enter address word XX
```

Note:

Address word 00 implements automatic test sequence, i.e. the fault memories of all vehicle systems with self-diagnosis capability are interrogated by way of rapid data transfer.

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

-> Fault reader V.A.G 1551 displays control unit identification, e.g.:

```
443907311C     2.0 l     R4     Mono
D21
Code 01
```

Control unit identification (example)

- 8A0 907 311 B	Part No.; Assignment => Parts List
- 2.0l	Engine capacity
- R4	Engine design (4-cyl. in-line engine)
- Mono	Mono-Motronic injection and ignition system
- D21	Data level (software version) of control unit
- Code 01	Control unit code

Note:

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

- Press ⇒key.

-> Indicated on display (function selection):

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

Notes:

- Control unit identification can be displayed again after entering function "01" for "Interrogating control unit version" and providing confirmation with Q key.

```
Rapid data transfer     HELP
No control unit response
```

-> Indicated on display:

- Press HELP key for printout of possible causes of trouble.

```
Rapid data transfer     HELP
K-wire not switched to earth
```

Check wiring of white diagnostic connector => Page 23 .

```
Rapid data transfer     HELP
K-wire not switched to positive
```

Vehicles with Mono-Motronic self-diagnosis only: Check earth connections of engine control unit => Page 118 .

```
Rapid data transfer
Fault in communication link
```

-> If adjacent display appears at the start of or during the program, faults have occurred and data exchange between fault reader V.A.G 1551 and engine control unit is no longer possible.

- After eliminating possible causes of trouble, enter "01" again for address word "Engine electronics" => Page 1 .

Available functions

Vehicle diagnostic, testing and information system VAS 5051 / fault reader V.A.G 1551		Ignition on, engine stopped	Engine idling	Vehicle in operation	Page
Address words					
01	Engine electronics	yes	yes	yes	1
00	Automatic test sequence	yes	yes	yes	3
Functions					
01	Interrogating control unit version	yes	yes	yes	4
02	Interrogating fault memory	no	yes	yes	4
03	Final control diagnosis	yes	no	no	12
04	Basic setting	no	yes	no	13
05	Erasing fault memory	yes	yes	yes	4
06	End of output	yes	yes	yes	6
08	Reading measured value block	yes	yes	yes	15

2 - Interrogating and erasing fault memory

2.1 - Interrogating and erasing fault memory

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- Connect vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "address word" 01 => Page 1 .
Engine should be idling.

Note:

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

-> Indicated on display:

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

- Enter "02" for "Interrogating fault memory" function and confirm with Q key.

-> Indicated on display:

```
No faults detected
```

- Press ⇒key.

Note:

In the event of problems not detected by self-diagnosis:

=> Binder "Fault-finding, Engine"

or

-> Indicated on display:

```
X faults detected
```

The stored faults are consecutively displayed and printed out, provided that printer is on.

Note:

If printer is not on, press ⇒ key for display of next fault.

- Use fault table to locate and eliminate faults printed out => Page 6 .
- Press ⇒key.

-> Indicated on display:

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

- Enter "05" for "Erasing fault memory" function and confirm with Q key.

Notes:

-> Indicated on display:

```
Attention:
Fault memory not interrogated
```

Sequence of operations not precisely observed.

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- Interrogate fault memory.

Fault memory is also not erased under the following conditions:

- Ignition switched off following fault memory interrogation
- Static fault not rectified

-> Indicated on display:

```
Rapid data transfer
Fault memory erased
```

- Press ⇒key.

- Interrogate fault memory again after performing repair work.

Note:

This erases faults stored during fault elimination e.g. on account of connectors being unplugged.

- Perform test drive. Conditions:
  - Duration at least 5 minutes
  - Coolant temperature at least 80 ° C
  - Engine speed greater than 3000 rpm
  - Accelerator briefly floored
- Enter "00" for address word "Automatic test sequence" and confirm with Q key.

Note:

If connector was unplugged from engine control unit during fault rectification on vehicles with automatic gearbox, gearbox control unit fault memory must also be interrogated and erased. Fault "Engine/gearbox electrical connection: Open circuit" will have been stored in gearbox control unit.

End of output

-> Indicated on display:

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

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

-> Indicated on display:

```
Rapid data transfer      HELP
Enter address word XX
```

- Switch off ignition and unplug diagnostic connector.

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2.2 - Fault table

Notes:

- The fault table is arranged according to the 5-digit fault codes on the left.
- Before replacing components found to be defective, use current flow diagram to check wiring and connectors to these components as well as earth connections. This is particularly important if faults are output as being "sporadic" (SP).
- If engine is switched off between performing test drive and interrogating fault memory, all stored faults are displayed as being "sporadic". If faults only occur intermittently or if fault memory is not erased after fault elimination, such faults are displayed as being "sporadic faults". This is indicated by "/SP" on right of V.A.G 1551 display.
- Sporadic faults are faults which only occur intermittently .

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
00282 Throttle valve positioner -V60 Implausible signal	- Open circuit in wiring		- Eliminate open circuit in wiring => "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
	- Throttle valve positioner defective		- Check throttle valve positioner => Page 78
	- Signal output in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 44

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
00515 Hall sender -G40 No signal	- Power supply/earth supply for -G40 defective - Open circuit or short to earth in signal wire between -G40 and engine control unit	- Engine will not start	- Eliminate open circuit in wiring or short circuit => "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder
	- -G40 defective		- Check -G40 =>Page 120
	- Signal input in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 44

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Note:

If ignition is switched on without starting engine, fault code 00515 "Hall sender -G40 no signal" is output. Fault can be ignored in this status.

This fault must be heeded following unsuccessful attempt at starting (engine will not start) without subsequently switching off ignition.

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
00516 Idling switch -F60 Open circuit/short to positive	- Throttle valve sticking - -F60 defective	- Idling-speed control switches to open-loop control	- Check idling-speed switch => Page 83
	- Throttle cable setting - Floor covering pressing on accelerator pedal		- Adjust throttle cable => Fuel Supply System - Petrol Engines; Repair Group 20; Servicing Accelerator Mechanism; Adjusting Throttle Cable Servicing Accelerator Mechanism; Adjusting Throttle Cable
	- Open circuit in wiring or short to positive between -F60 and engine control unit Continued ▾		- Eliminate open circuit in wiring or short circuit => "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
00516	(Fault 00516 continued)		

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
Idling switch -F60 Short to earth	- Short to earth between - -F60 and engine control unit	- Idling-speed control switches to open-loop control - Idling speed not in specified range	- Eliminate short circuit => "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder
	- Moisture in connector of -F60 - -F60 defective		- Check idling-speed switch => Page 83
	- Signal input in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 44

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Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
00518 Throttle valve potentiometer -G69 Implausible signal Open circuit/short to earth	- Moisture/corrosion in connector at -G69 - -G69 defective	- Loss of power - Engine running problems	- Check throttle valve potentiometer => Page 74
Open circuit/short to positive	- Power supply for -G69 defective - Open circuit or short to earth/positive in signal wire between -G69 and engine control unit - Earth supply for -G69 defective		- Eliminate open circuit in wiring or short circuit => "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder
	- Signal input in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 44

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
00522 Coolant temperature sender -G62 Implausible signal	- Short to earth in wiring between -G62 and engine control unit	- Cold starting problems at very low temperatures - Engine running problems during warm-up	- Read measured value block, display group 001 => Page 17
	- -G62 defective		- Check -G62 =>Page 115
	- Signal input in engine control unit defective (control unit defective) Continued ▾		- Replace engine control unit =>Page 44

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
00522 Coolant temperature sender -G62	(Fault 00522 continued)		

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
Short to earth Open circuit/short to positive	- Short to earth/open circuit or short to positive in wiring between -G62 and engine control unit	- Cold starting problems at very low temperatures - Engine running problems during warm-up	- Read measured value block, display group 001 => Page 17 Eliminate short circuit or open circuit in wiring => "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder
	- -G62 defective		- Check -G62 =>Page 115
	- Signal input in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 44

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
00523 Intake-air temperature sender -G42 Short to earth Open circuit/short to positive	- Short to earth/open circuit/short to positive in wiring between -G42 and engine control unit	- Reduced power	- Read measured value block, display group 002 => Page 19 Eliminate short circuit or open circuit in wiring => "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder
	- -G42 defective		- Check -G42 =>Page 112
	- Signal input in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 44

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
00525 Lambda probe -G39 No signal	- Open circuit in wiring between -G39 and engine control unit	- Emission values not OK - Lambda control switches to open-loop control	- Eliminate open circuit in wiring => "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder
	- No Lambda probe heater -Z19 function - Fuse S25 defective - Heating resistor in -G39 defective - Open circuit/short circuit in wire for Lambda probe heater -Z19		- Read measured value block, Display group 000, Display zones 5 and 6 =>Page 66

Continued ▼

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Note:

Vehicles with engine code ABM feature an unheated Lambda probe.

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
00525 Lambda probe -G39 No signal	(Fault 00525 continued) - -G39 defective	- Emission values not OK - Lambda control switches to open-loop control	- Check Lambda control =>Page 63
	- Signal input in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 44
Short to positive	- Short to positive in Lambda probe signal wire		- Check Lambda control =>Page 63
Short to earth	- Short to earth/screen in Lambda probe signal wire		- Eliminate short circuit => "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
00537 Lambda control Control limit exceeded	- Fuse S25 defective	- CO upstream of catalytic converter less than 0.3 % by vol.	- Read measured value block, Display group 000, Display zones 5 and 6 =>Page 17
	- Fuel tank empty, min. 10 l		- Fill tank with fuel
	- Fuel system pressure too low		- Check fuel system pressure => Page 48
	- Unmetered air between throttle valve and engine (hose connections at air cleaner may be leaking)		- Check intake system for leaks (unmetered air) => Page 62
	- Leaks in exhaust system as far as catalytic converter Continued ▼		- Eliminate leakage

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
00537 Lambda control Control limit not reached	(Fault 00537 continued) - Spark plugs, spark plug connector, ignition cables, distributor cap or distributor rotor defective	- CO upstream of catalytic converter greater than - 1.2 % by vol.	- Perform visual inspection
	- Fuel system pressure too high	- Soot deposits on spark plugs - Excessive consumption	- Check fuel system pressure => Page 48
	- Activated charcoal filter solenoid valve -N80 leaking, permanently open	- Formation of black smoke	- Check activated charcoal filter solenoid valve -N80 => Page 70

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Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
	- Lambda probe defective		- Check Lambda control =>Page 63
	- Injector not closing		- Check injector => Page 52

Notes:

- Following fault rectification, erase learned values by unplugging connector at engine control unit 30 s after switching off ignition.
- Vehicles with engine code ABM feature an unheated Lambda probe.

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
00561 Mixture adaptation			
Adaption limit not reached	- Fuel pressure regulator defective	- Increased fuel consumption - CO upstream of catalytic converter greater than - 1.2 % by vol.	- Check system pressure => Page 48
	- Spark plug failure	- Formation of black smoke - Soot deposits on spark plugs	- Perform visual inspection
Adaption limit exceeded	- Fuel pressure regulator defective	- Rough idling - Jolting	- Check system pressure => Page 48
	- Unmetered air between throttle valve and engine (hose connections at air cleaner may be leaking)		- Check intake system for leaks (unmetered air) => Page 62
	- Leaks in exhaust system as far as catalytic converter		- Eliminate leakage

Note:

Following fault rectification, erase learned values by unplugging connector at engine control unit 30 s after switching off ignition.

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Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
00670 Throttle valve positioner sender - G127			
No signal	- Open circuit in wiring	- Load change jolts	- Eliminate open circuit in wiring => "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder
	- Throttle valve positioner sender defective		- Check throttle valve positioner sender => Page 81
	- Signal input in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 44

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
65535 Control unit defective	- Earth connections to engine control unit	- Engine will not start	- Check earth connections => "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder
	- Engine control unit defective		- Replace engine control unit =>Page 44

3 - Final control diagnosis

3.1 - Final control diagnosis

Notes:

- Final control diagnosis can only be performed with engine stopped and ignition switched on.
- Final control diagnosis is terminated if engine is started or an engine speed pulse is detected.
- During final control diagnosis the individual control elements are actuated until ⇒ key is pressed to select next control element.
- The control elements are checked acoustically or by means of touch.
- Before repeating final control diagnosis without briefly running engine, switch off ignition for approx. 20 seconds.

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

Actuation sequence
1 Throttle valve positioner -V60
2 Intake manifold preheating relay -J81
3 Activated charcoal filter solenoid valve -N80

Test requirements:

- Fuses for engine OK

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

- Fuel-pump relay -J17 OK; checking => Page 57

Test sequence

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- Connect vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "address word" 01 => Page 1.
  Engine must not be running.

-> Indicated on display:

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

- Enter "03" for "Final control diagnosis" function and confirm with Q key.

Actuation of throttle valve positioner

-> Indicated on display:

```
Final control diagnosis
Throttle valve positioner -V60
```

Stem of throttle valve positioner assumes basic position (moves to rear).

- Press ⇒key.

Stem of throttle valve positioner is extended and retracted until next control element is selected by pressing ⇒ key.

If throttle valve positioner does not move:

- Check actuation of throttle valve positioner -V60 => Page 79 .

Actuation of intake manifold preheating relay

- Press ⇒key.

-> Indicated on display:

```
Final control diagnosis
Intake manifold preheating relay -J81
```

Relay is actuated intermittently (clicks) until ⇒ key is pressed to select next control element.

If relay does not click:

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- Check actuation of intake manifold preheating relay -J81 => Page 90 .

Actuation of activated charcoal filter solenoid valve

- Press ⇒key.

-> Indicated on display:

```
Final control diagnosis
Activated charcoal filter solenoid valve
-N80
```

Valve is actuated (clicks) until ⇒ key is pressed to terminate final control diagnosis.

If valve does not click:

- Check activated charcoal filter solenoid valve -N80 => Page 70 .
- Press ⇒key.

-> Indicated on display (function selection):

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

Note:

Switch off ignition for approx. 20 s before re-selecting function 03 "Final control diagnosis".

4 - Basic setting

4.1 - Basic setting

With the engine stopped, the basic setting function can be used to implement the following operation:

- Full extension of throttle valve positioner

With the engine running, the basic setting function can be used to implement the following operations:

- Blocking of digital idling-speed stabilisation
- Closing of ACF valve

Test requirements:

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

Sequence of operations

- Connect vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "address word" 01 => Page 1 .
  Ignition must be on or engine must be idling.

-> Indicated on display:

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

- Enter "04" for "Starting basic setting" function and confirm with Q key.

-> Indicated on display:

```
Basic setting     Q
Enter display group number XXX
```

- Enter "001" for "Display group number 001" and confirm with Q key.

-> Indicated on display:
(1...4 = display zones)

```
System in basic setting     1
     1     2     3     4
```

Notes:

- Provided that printer is switched on, current display can be printed out on record slip.
- Display group number 000 does not provide any meaningful displays and is therefore not to be selected.

5 - Encoding control unit

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5.1 - Encoding control unit

Notes:

```
8A0907311B     2.0 l     R4     Mono     D21
Code 01
```

-> On entering self-diagnosis function, 2-digit engine control unit code must be displayed.

- Code is entered by manufacturer in wiring harness at engine control unit connector.

Vehicles with manual gearbox:

Code 01	
Contact	Connected to
12	Earth
32	Not connected
40	Not connected

Vehicles with automatic gearbox:

Code 02	
Contact	Connected to
12	Terminal 20 of automatic gearbox control unit (gear signal)
32	Not connected
40	Positive terminal 15

All models:

If control unit identification displays a code which does not correspond to the vehicle concerned:

- Check circuitry.

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

- If incorrect connection is found, use current flow diagram to repair (appropriately configure) wiring harness.
- If no incorrect connection is found, replace engine control unit
  => Page 44 .

6 - Reading measured value block

6.1 - Reading measured value block

Test requirements:

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

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Sequence of operations

- Connect vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "address word" 01 => Page 1 .
  Engine must be idling.

-> Indicated on display:

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

- Switch on printer of fault reader by pressing Print key. Lamp in key must light.
- Enter "08" for "Reading measured value block" function and confirm with Q key.

-> Indicated on display:

```
Reading measured value block     Q
Enter display group number XXX
```

- Enter desired display group number =>List of display groups, Page 16 .
- Confirm entry with Q key.

-> Indicated on display for display group 000:

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

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

```
Reading measured value block     1
1     2     3     4
```

Notes:

- The measured values are presented in decimal form for display group number 000.
- Provided that printer is switched on, current display can be printed out on record slip.
- Proceed as follows to switch to a different display group:

Display group	V.A.G 1551	VAS 5051
Up	Press key 3	Press s key
Down	Press key 1	Press t key

- Press ⇒ key if readings match specifications in all display zones.

6.2 - List of display groups

Display group number	Indicated on display	Designation
000	Reading measured value block 1 2 3 4 5 6 7 8 9 10	1 = Ignore 2 = Ignore 3 = Ignore 4 = Ignore 5 = Lambda control value 6 = Lambda probe voltage 7 = Ignore 8 = Ignore 9 = Ignore 10 = Ignore

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Display group number	Indicated on display	Designation
001	Reading measured value block 1 1 2 3 4	1 = Engine speed 2 = Coolant temperature 3 = Lambda control 4 = Operating status
002	Reading measured value block 2 1 2 3 4	1 = Engine speed 2 = Injection period 3 = Engine control-unit power supply 4 = Intake-air temperature
003	Reading measured value block 3 1 2 3 4	1 = Engine speed 2 = Injection period 3 = Throttle valve angle

Display group number	Indicated on display	Designation
		4 = Ignition timing

Display group number	Indicated on display	Designation
004	Reading measured value block 4 1 2 3 4	1 = Engine speed 2 = Engine load 3 = Vehicle-speed signal 4 = Engine load operating status
005	Reading measured value block 5 1 2 3 4	1 = Engine speed 2 = Activated charcoal filter solenoid valve duty cycle 3 = Lambda control 4 = Mixture correction

Display group 000

Reading measured value block ⇒ 1 2 3 4 5 6 7 8 9 10	Indicated on display	Specification	Corresponds to
	Display can be ignored		
	Display can be ignored		
	Display can be ignored		
	Display can be ignored		
	Lambda probe voltage	0 ... 31 or 224 ... 255	
	Lambda control value ▪ Fluctuating (mean value 128)	98 ...158	
	Display can be ignored		
	Display can be ignored		
	Display can be ignored		
	Display can be ignored		

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Display group 001

Reading measured value block 1 ⇒ ... rpm .. ° C .... V XXXXXXXX	Indicated on display
	Operating status => Page 19
	Lambda control value ▪ Fluctuating (mean value 1.0 V)
	Coolant temperature
	Engine speed (idling speed) ▪ 750 ... 1000 rpm OK

Test table: Display group 001

Display zone	Display on V.A.G 1551	Cause of trouble	Fault remedy
1	Greater than 1000 rpm	- Throttle valve potentiometer -G69 - Defective	- Check throttle valve potentiometer -G69 =>Page 74
		- Intake system drawing in large quantities of unmetered air	- Check intake system for leaks (unmetered air) => Page 62
		- Throttle cable setting	- Adjust throttle cable => Fuel Supply System - Petrol Engines; Repair Group 20; Servicing accelerator mechanism Servicing accelerator mechanism
	Less than 750 rpm	- Loads switched on, e.g. air conditioner on; steering wheel on full lock; selector lever of automatic gearbox not set to "P" or "N"	- Switch off all electr. loads Move steering wheel to centre position Move selector lever to position "P" or "N"

Display zone	Display on V.A.G 1551	Cause of trouble	Fault remedy
2	Less than 85 °C 1)	- Engine too cold	- Perform test drive if necessary
		- Coolant temperature sender/wiring to engine control unit	- Interrogate fault memory =>Page 115
	Greater than 110 °C 1)	- Radiator dirty	- Clean radiator
		- No radiator fan function	- Check operation
		- Thermostat defective	- Check thermostat
		- Coolant temperature sender/wiring to engine control unit	- Interrogate fault memory =>Page 115
3 Continuation ▼	Deviation from tolerance range	- Intake system drawing in large quantities of unmetered air	- Check intake system for leaks (unmetered air) => Page 62
		- Coolant temperature sender/wiring to engine control unit	- Interrogate fault memory =>Page 115

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1) Vehicle at operating temperature

Display zone	Display on V.A.G 1551	Cause of trouble	Fault remedy
3	Deviation from tolerance range	- Activated charcoal filter solenoid valve -N80 defective	- Perform final control diagnosis => Page 70
		- Lambda probe -G39 defective	- Interrogate fault memory =>Page 65
		- Lambda probe heater -Z19 defective	- Check Lambda probe heater -Z19 => Page 66
		- Fuel system pressure too low/too high	- Check fuel pressure regulator and holding pressure => Page 48
	At constant value	- Open circuit in wiring or short to positive/earth caused by: - Lambda probe -G39 - Lambda probe wiring - Engine control unit	- Check Lambda probe -G39 =>Page 65

Significance of 8-digit operating status

X X X X X X X X	
	Gear (vehicles with automatic gearbox) ▪ 0 = Not engaged ▪ 1 = Engaged
	Ignition timing retardation with automatic gearbox ▪ 0 = Active (gear selection) ▪ 1 = Not active (no gear selection) or vehicle with manual gearbox
	No significance
	Air conditioner ▪ 0 = Off ▪ 1 = On
	Air-conditioner compressor ▪ 0 = Off ▪ 1 = On
	No significance
	Idling-speed switch ▪ 0 = Open ▪ 1 = Closed
	No significance

Display group 002

Reading measured value block 2 ⇒ ... rpm	... ms	 V	.. ° C	◂ Indicated on display
				Intake-air temperature ▪ No specification; governed by ambient temperature
				Engine control-unit power supply ▪ 10.8 ... 14.0 V OK
				Injection period (ignore)
				Engine speed (idling speed) ▪ 700 ... 1000 rpm OK

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Test table: Display group 002

Display zone	Display on V.A.G 1551	Cause of trouble	Fault remedy
1	... rpm	Engine speed => Display group 001, display zone 1	
3	Less than 10.8 V	- Alternator defective, very low battery charge	- Check voltage, charge battery
		- Heavy load on electrical system shortly after starting due to high charging current and ancillaries	- Increase engine speed slightly for several minutes and switch off ancillaries
		- Contact resistance in power supply/earth connection for engine control unit	- Check power supply to engine control unit => Page 118

Display zone	Display on V.A.G 1551	Cause of trouble	Fault remedy
	Greater than 14.0 V	- Voltage regulator at alternator defective	- Check voltage, replace regulator if necessary
4	Great deviation from ambient temperature	- Intake-air temperature sender -G42 defective - Fault in wiring between intake-air temperature sender -G42 and engine control unit	- Interrogate fault memory =>Page 112

Display group 003

Reading measured value block 3 ⇒ ◂ Indicated on display

... rpm .. % ... <° ... ° before TDC

... ° before TDC: Ignition timing (ignore; not to be used for adjusting ignition)

... <°: Throttle valve angle
- Idling speed: 0.0 ... 2.0 <° OK
- Full load: Greater than 75 <° OK

.. %: Engine load (ignore)

... rpm: Engine speed => Display group 001, display zone 1

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Test table: Display group 003

Display zone	Display on V.A.G 1551	Cause of trouble	Fault remedy
1	... rpm	Engine speed => Display group 001, display zone 1	
3	At idle greater than 2 <°	- Throttle valve potentiometer -G69 defective	- Interrogate fault memory =>Page 74
		- Throttle cable setting	- Adjust throttle cable => Fuel Supply System - Petrol Engines; Repair Group 20; Servicing accelerator mechanism Servicing accelerator mechanism
		- Throttle valve sticking	- Eliminate cause
	At full throttle less than 75 <°	- Throttle valve potentiometer -G69 defective	- Interrogate fault memory =>Page 74
		- Throttle cable setting	- Adjust throttle cable => Fuel Supply System - Petrol Engines; Repair Group 20; Servicing accelerator mechanism Servicing accelerator mechanism

Note on display zone 3:

For checking at full throttle, switch engine off and ignition on.

Display group 004

Reading measured value block 4 ⇒ ◂ Indicated on display

... rpm .. % .. XXXXXXXX

Engine load operating status=>Page 21

Vehicle-speed signal
- Stationary: 0
- Driving as of 4 kmh: Greater than 4

Engine load (ignore)

Engine speed => Display group 001, display zone 1

Test table: Display group 004

Display zone	Display on V.A.G 1551	Cause of trouble	Fault remedy
1	... rpm	Engine speed => Display group 001, display zone 1	
3	No change in value on accelerating vehicle from a standstill	- Fault in wiring between dash panel insert and engine control unit	- Check wiring => "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder
		- Open circuit in wiring or short circuit between speedometer sender -G22/ - road speed sender -G68 and engine control unit	- Check wiring => "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder
		- Speedometer sender -G22/road speed sender -G68	- Check speedometer sender -G22/ road speed sender -G68 => Page 95

Note:

If value in display zone 3 does not change on transition from stationary to driving, start by checking whether speedometer display is OK.

Significance of 8-digit display "Engine load operating status"

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X X X X X X X X

Overrun shutoff (XXXXXXX1)

Idling speed (XXXXXX1X)

No significance

Full throttle (XXXX1XXX)

Acceleration enrichment/deceleration leaning (XXX1XXXX)

No significance

No significance

No significance

Note:

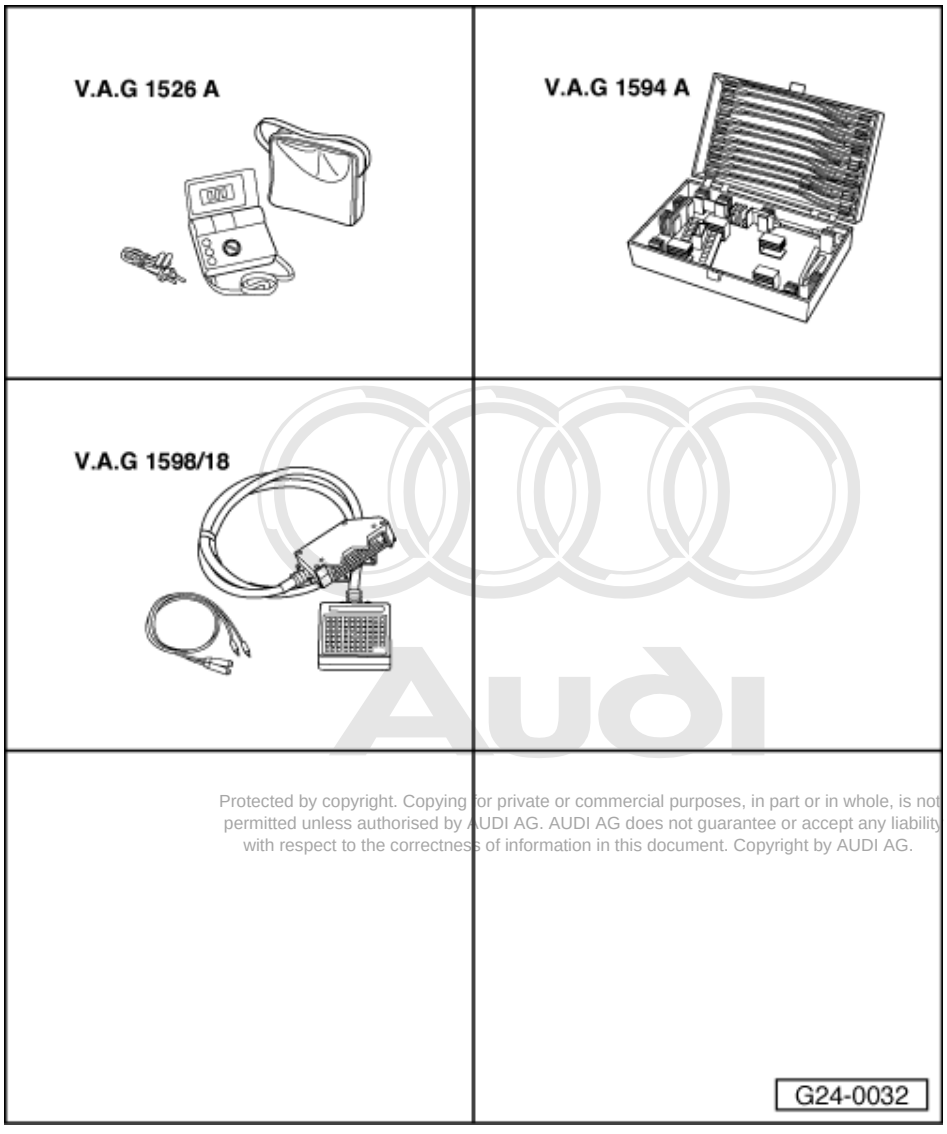
The engine load operating statuses may also be summated.

Display group 005

Reading measured value block 5 ⇒				◂ Indicated on display
rpm	%	...	closed	
			Mixture correction (ignore)	
			Lambda control value => Display group 001, display zone 3	
		Activated charcoal filter solenoid valve -N80 duty cycle (ignore)		
	Engine speed => Display group 001, display zone 1			

7 - Checking wiring of diagnostic connectors

7.1 - Checking wiring of diagnostic connectors



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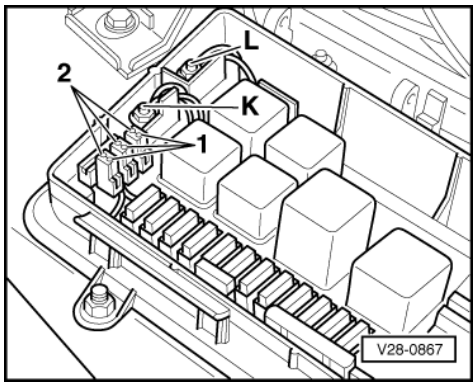
Special tools and workshop equipment required

- V.A.G 1526 A
- V.A.G 1594 A
- V.A.G 1598/18

Attention: Switch off ignition before checking wiring.

7.2 - Checking power supply for "black" diagnostic connector



-> Installation position of diagnostic connectors: In relay plate with fuse box in plenum chamber

Contact assignment for "black" diagnostic connector:

1 - Earth
2 - Terminal 30 (fused via fuse 21)

- Connect up multimeter for voltage measurement as follows.

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

- Specification: approx. battery voltage in each case

If readings do not match specifications:

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

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

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

Note:

This check must be performed if one of the following displays appears on the connected fault reader V.A.G 1551.

-> Indicated on display:

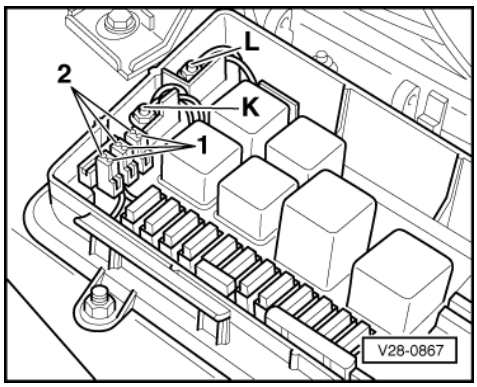
```
Rapid data transfer
Fault in communication link
```

or

```
Rapid data transfer     HELP
K-wire not switched to earth
```

or

```
Rapid data transfer     HELP
K-wire not switched to positive
```



-> Installation position of diagnostic connectors and wiring junctions K and L: In relay plate with fuse box in plenum chamber

Checking K-wire - vehicles with no immobilizer

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

Notes:

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

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- If wires of the same colour are connected to wiring junction K, use test box V.A.G 1598/18 (resistance measurement) to establish wire.

In this case proceed as follows for fault-finding purposes:

- Consecutively disconnect wires of other vehicle systems with self-diagnosis from wiring junction K.
- After unplugging connector to one vehicle system in each case, switch on ignition and then enter address word "01" for engine electronics again.

If engine control unit identification is then displayed:

- After switching on ignition, enter address word "00" for automatic test sequence to establish the control unit to which the disconnected wire determined belongs.
- Check diagnostic wire of disconnected control unit/replace control unit.

If control unit identification is still not displayed:

- Remove engine control unit and engage it in service position
  => Page 44 .
- With ignition switched off, connect test box V.A.G 1598/18 to engine control unit connector => Page 43 .

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

White diagnostic connector Contact	Wiring junction	Test box V.A.G 1598/18 Socket
2	K	29

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

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

Checking K-wire - vehicles with immobilizer

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

Wiring junction	White diagnostic connector	Immobilizer control unit		Engine control unit
	Contact	IN	OUT	Contact
K	2	10	9	29

- Switch on ignition, press keys 2 and 5 for address word "Immobilizer" and confirm entry with Q key.

-> If immobilizer control unit identification appears on display of connected fault reader V.A.G 1551:

```
8D0953234 IMMO AUZ9Z0R4010830 D66
Code 00000     WSC 00000
```

- Continue with test A => Page 25 .

If immobilizer control unit identification is not displayed:

- Continue with test B => Page 25 .

Test A

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

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

- Use cable link to jumper contacts 9 and 10 in connector.
- Switch on ignition, press keys 0 and 1 for address word "Engine electronics" and confirm entry with Q key.

If engine control unit identification is displayed:

- Replace immobilizer control unit.

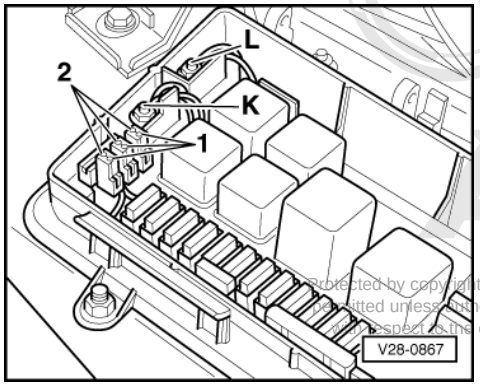
If engine control unit identification is not displayed:

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

Test B

- Switch off ignition.

Note:



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

- Disconnect all wires of vehicle systems with self-diagnosis from wiring junction K.
- Establish K-wire for immobilizer control unit -J362 and engine control unit and connect to wiring junction K.
- Switch on ignition and enter address word 25 for "Immobilizer" again.

-> If immobilizer control unit identification appears on display of connected fault reader V.A.G 1551:

```
8D0953234 IMMO AUZ9Z0R4010830 D66
Code 00000     WSC 00000
```

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

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

If immobilizer control unit identification is not displayed:

- Unplug connector at immobilizer control unit -J362.

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

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

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

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

24 - Mixture preparation, Injection

1 - Servicing Mono-Motronic injection system

1.1 - Servicing Mono-Motronic injection system

1.2 - Safety precautions

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

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

- Never touch/disconnect ignition cables with engine running or at cranking speed.
- Always switch off ignition before disconnecting and connecting injection and ignition system wires (also applies to measuring instrument leads).
- If engine is to be operated at cranking speed without it starting (e.g. compression test), unplug connector from output stage for ignition coil and connector at injection unit. Interrogate fault memory on completion of work.

- Boost starting with rapid charger is only permitted for up to 1 minute at a maximum of 16.5 V.
- Always switch off ignition before washing engine.
- Always switch off ignition before disconnecting and connecting battery so as not to damage engine control unit.
- For connection of measuring instruments (e.g. voltage tester V.A.G 1527 B, portable multimeter V.A.G 1526 A), always make use of adapter set V.A.G 1594 A.

Pay attention to the following if testers and measuring instruments have to be used in the course of a test drive on vehicles fitted with front passenger's airbag.

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

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1.3 - Rules for cleanliness

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

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

Protect against dirt and damp.
Only connect when dry.

1.4 - Technical data

Engine codes		ABT (2.0 l / 66 kW engine)	ABM (1.6 l / 52 kW engine)
Engine control unit	Part no.	=>Parts List	
	Speed governing	6400 rpm	
Idling speed	Not adjustable	750 ... 1000 rpm 1)	800 ... 1000 rpm 1)
Fuel pressure	At idling speed	0.8 ... 1.2 bar	
Holding pressure	After 5 minutes	min. 0.5 bar	
Injector	Resistance	1.2 ... 1.6 ω	

1) Current values:

=> Exhaust emission test binder

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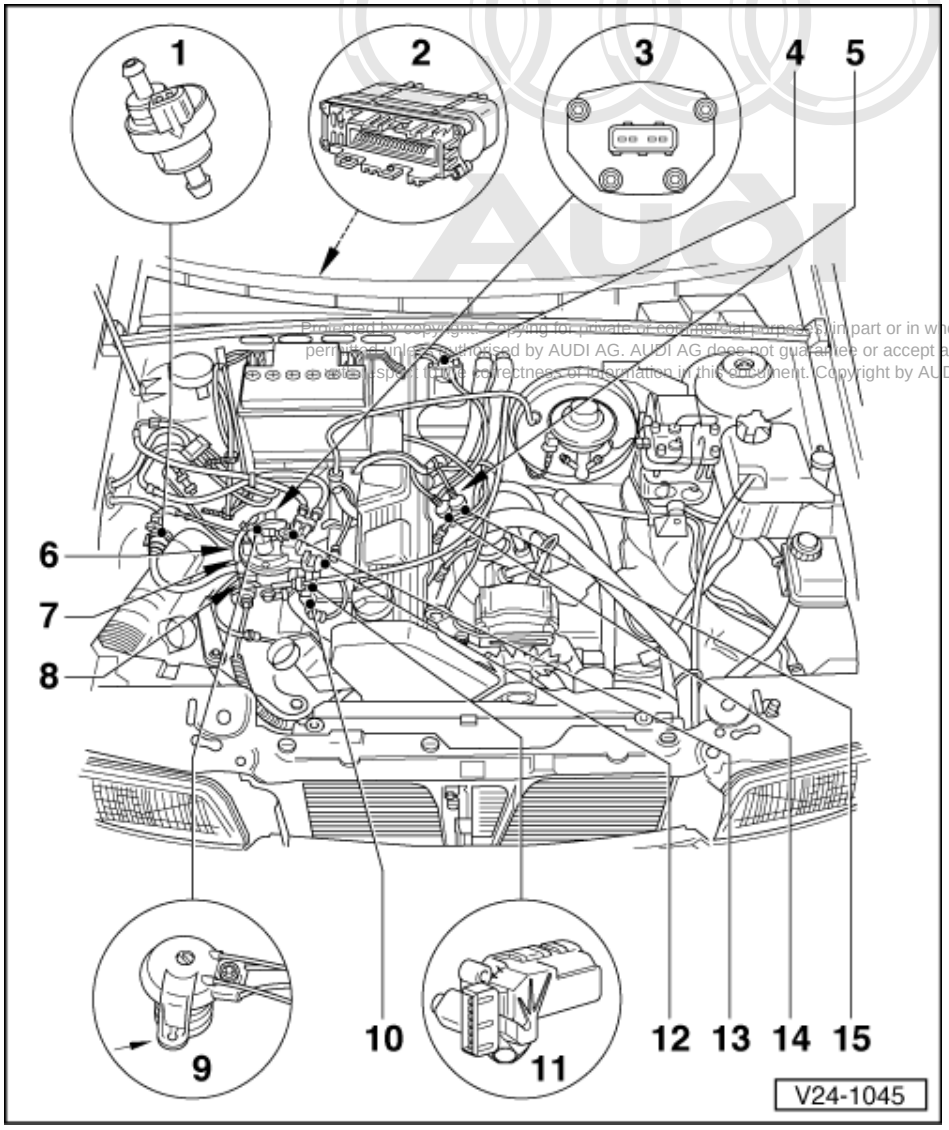
1.5 - Exploded view of fitting locations



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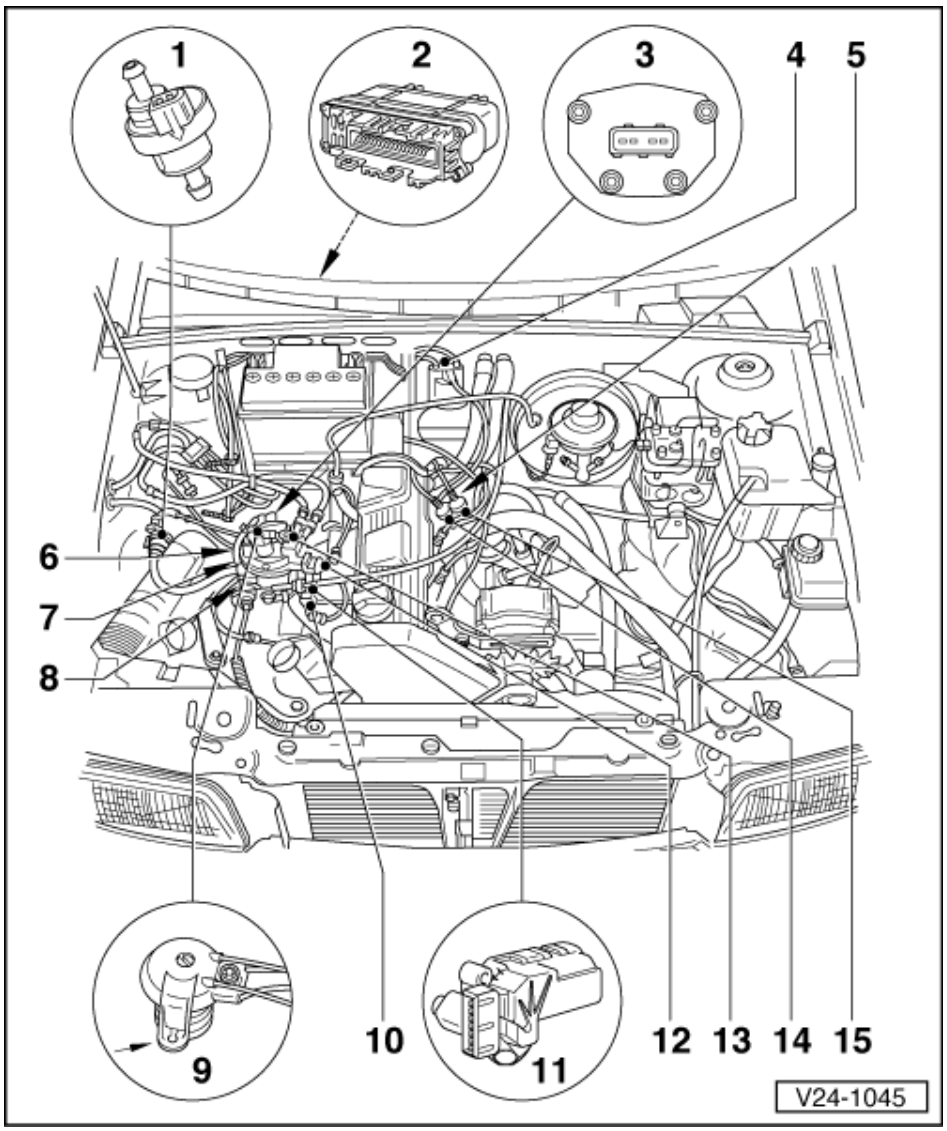
1 Activated charcoal filter solenoid valve -N80

2 Mono-Motronic control unit -J257
- Between bulkhead and air duct in passenger's footwell

3 Throttle valve potentiometer -G69
- 5-pin for vehicles with manual gearbox
- 7-pin for vehicles with automatic gearbox

4 Ignition transformer -N152
- With output stage for ignition transformer

5 Ignition distributor -O
- With Hall sender -G40



6 Connector

- For Lambda probe -G39 and Lambda probe heater -Z19

7 Lambda probe -G39 and Lambda probe heater -Z19

- Vehicles with engine code ABM feature an unheated Lambda probe

8 Intake-manifold preheating heater element -N51

9 Injector -N30

- With intake-air temperature sender -G42 -arrow-

10 Connector

- For throttle valve positioner -V60, idling switch -F60 and throttle valve positioner sender -G127

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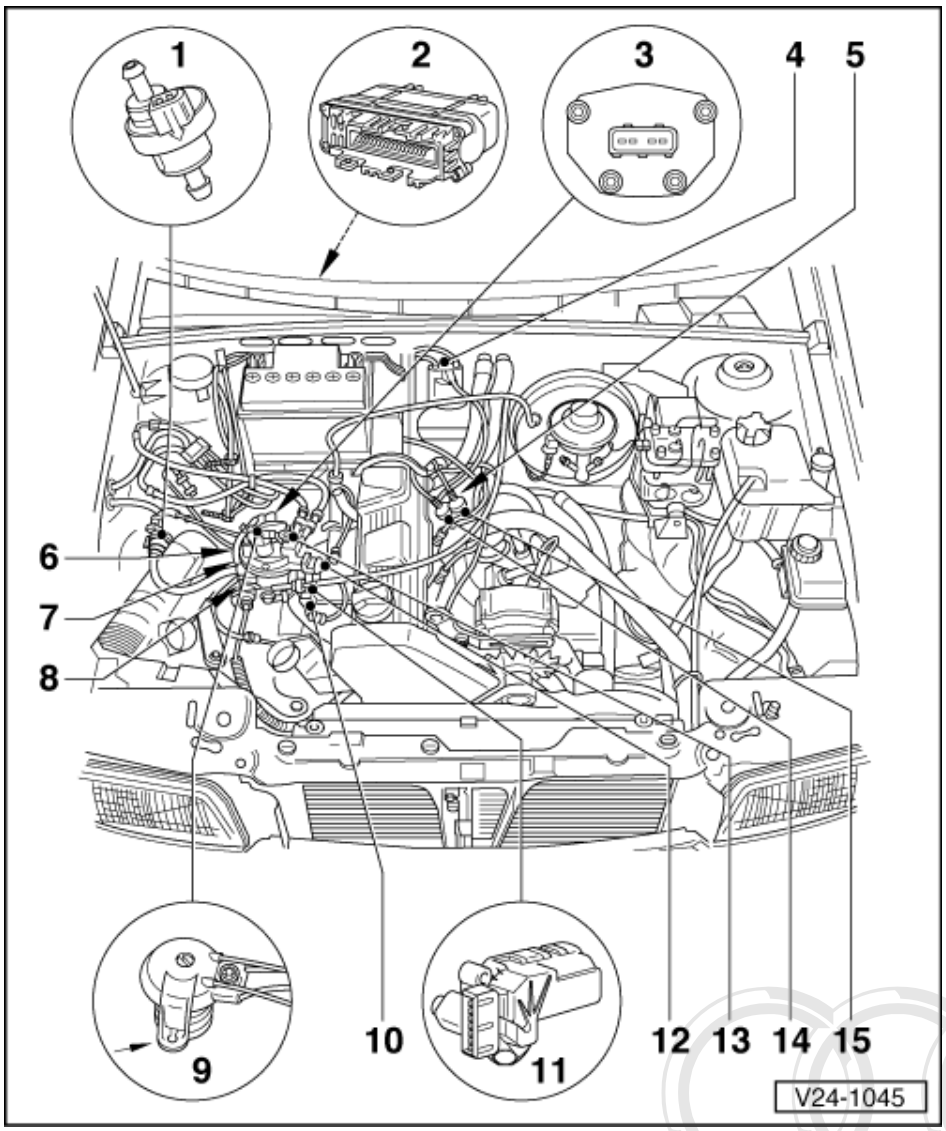

11 Throttle valve positioner -V60

- With idling switch -F60 and throttle valve positioner sender -G127

12 Connector

- For injector -N30 and intake-air temperature sender -G42

13 Fuel pressure regulator

14 Coolant temperature sender -G2

- With coolant-temperature warning switch (overheating) -F14

15 Coolant temperature sender -G62

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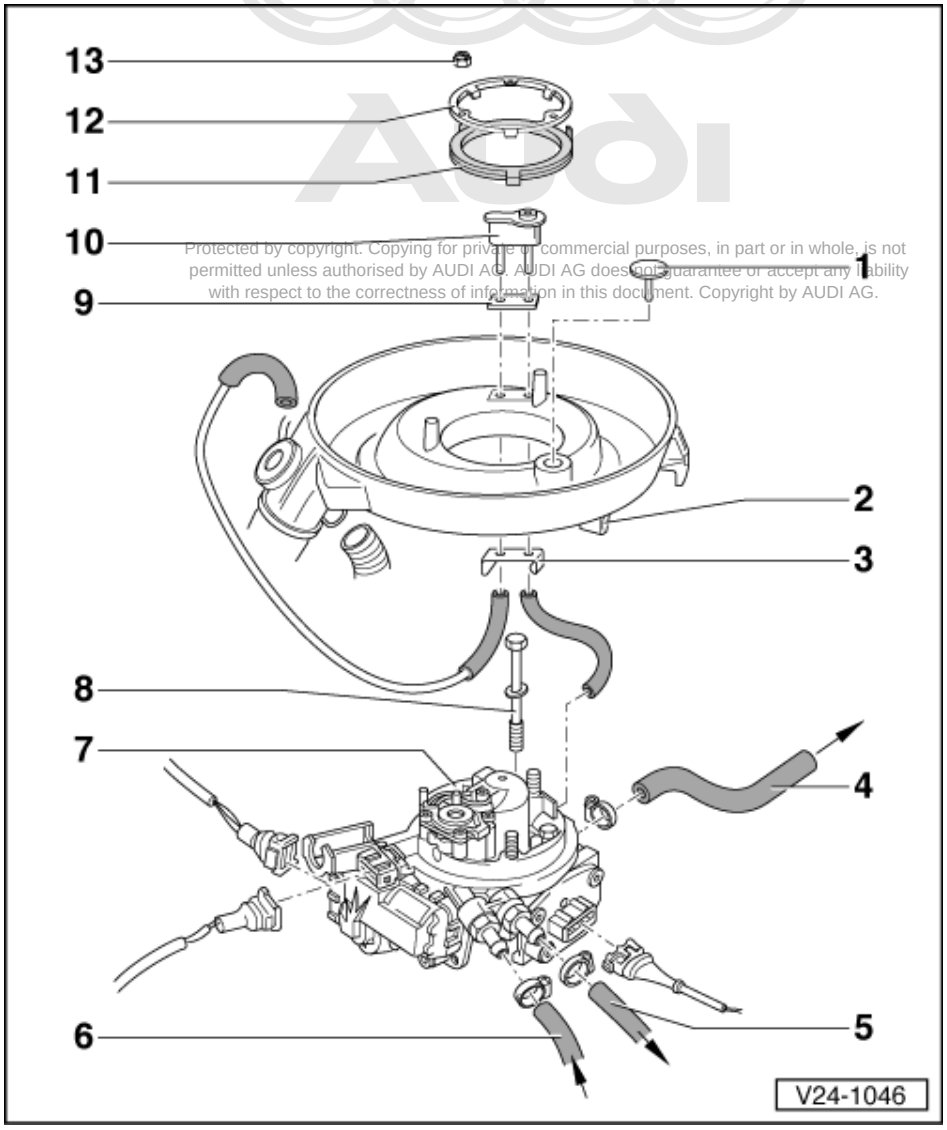
1.6 - Removing and installing injection system components



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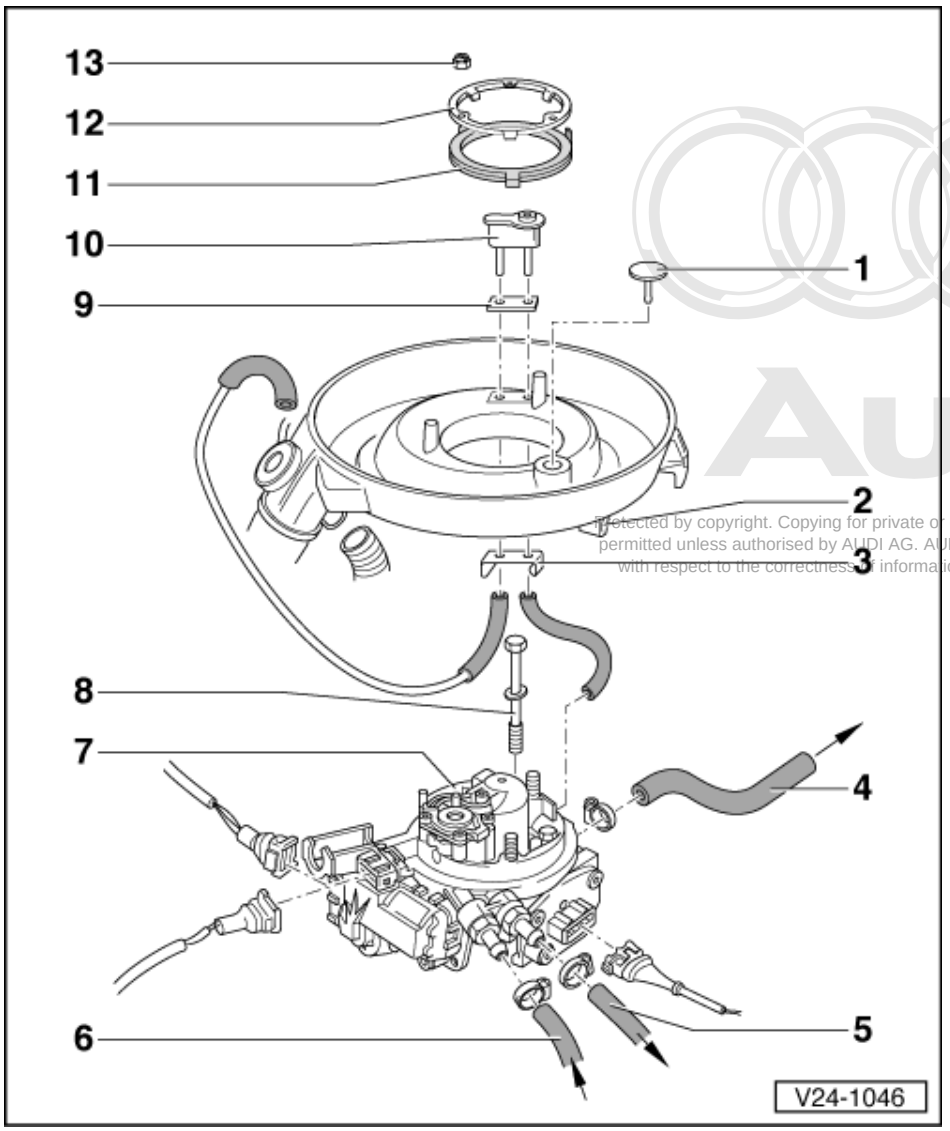
Part I

1 Mushroom valve
2 Connection
- For crankcase breather

3 Locking plate
4 To activated charcoal filter solenoid valve -N80
5 Fuel return pipe
6 Fuel supply pipe
7 Injection unit
- Servicing top part => Page 37
- Servicing bottom part => Page 40



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8 10 Nm

9 Gasket

10 Temperature regulator

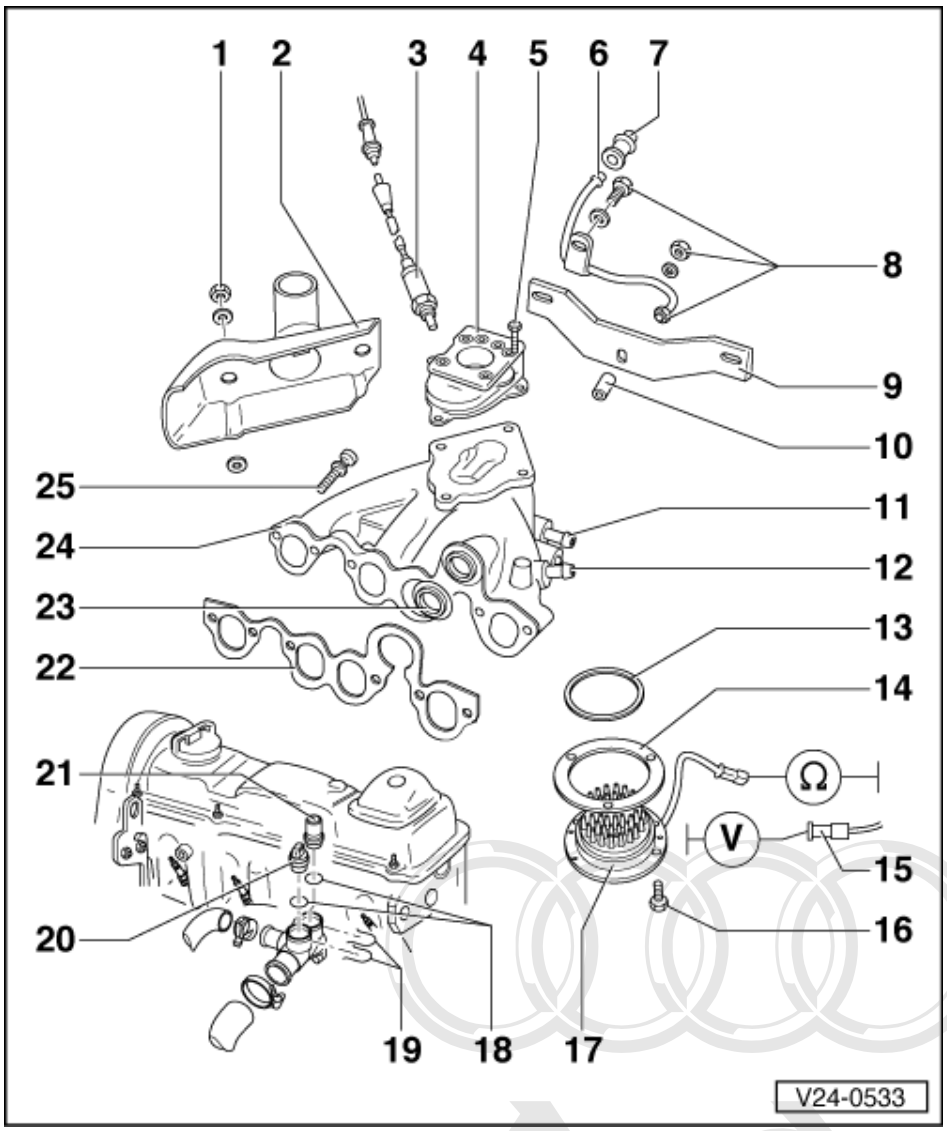
- Installation position: Brass hose connection faces vacuum unit at air cleaner
- Checking intake-air preheating
  => Page 86

11 Sealing ring

12 Holder

- For bottom part of air cleaner

13 10 Nm



Part II

1 20 Nm
2 Hot-air baffle
3 Lambda probe, 55 Nm
- Fitting location: In exhaust manifold
- Grease thread only with hot bolt paste G 052 112 A3; paste must not be allowed to come into contact with slits in probe body

4 Flange
5 13 Nm
- Secure with locking plate beneath throttle lever

6 CO measurement pipe
7 Cap

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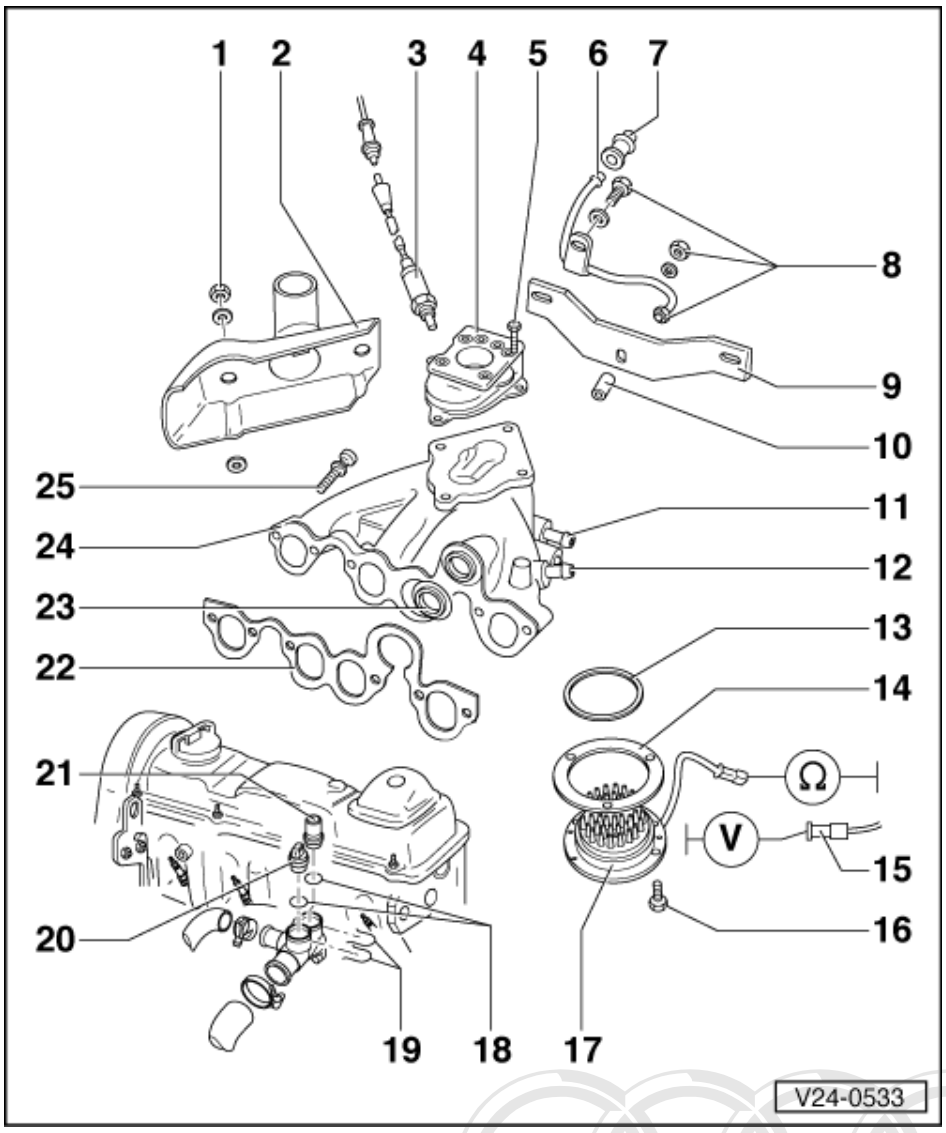

8 20 Nm
9 Support
- For intake manifold

10 Spacer sleeve
11 To coolant pipe
12 Vacuum connection
13 O-ring
- Replace

14 Gasket
15 Connector
- For intake-manifold preheating heater element -N51

16 10 Nm
17 Intake-manifold preheating heater element -N51

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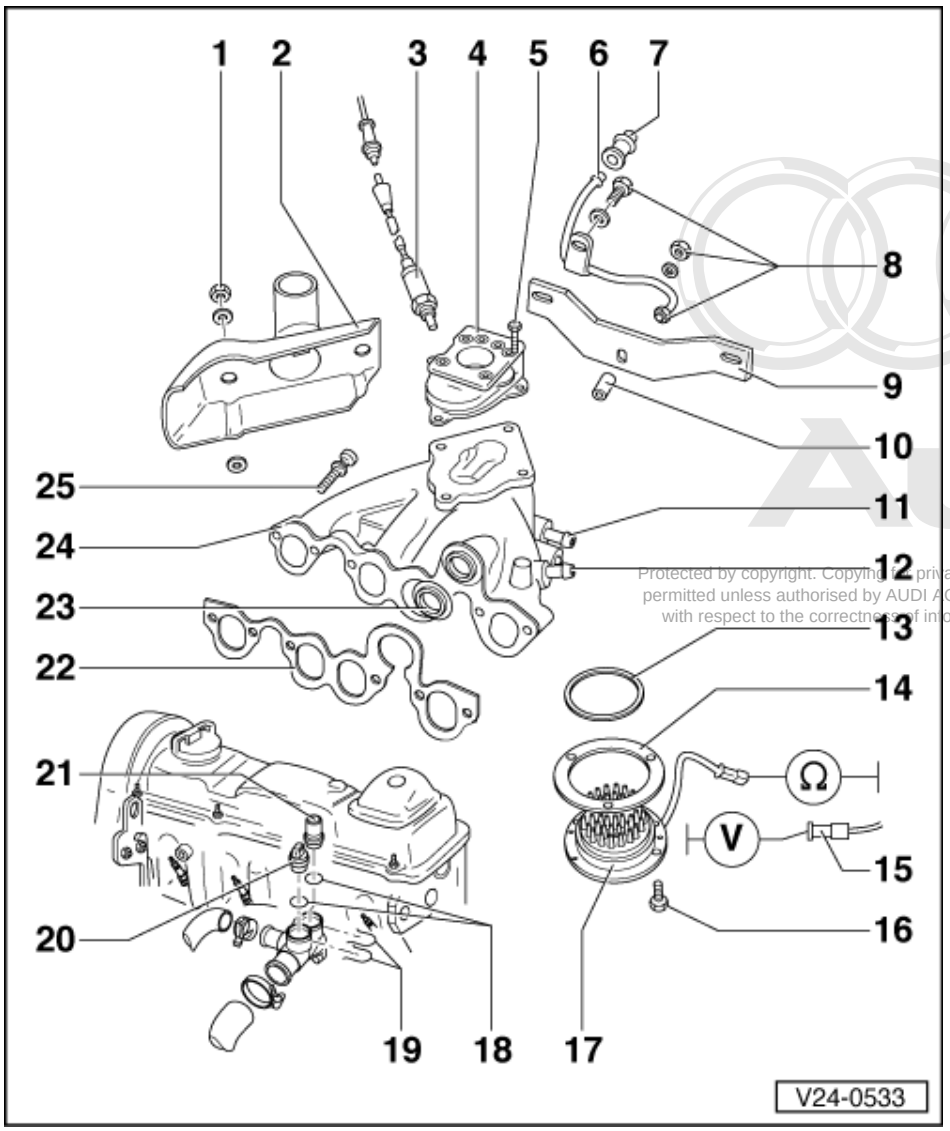

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18 O-ring
- Replace

19 Clip

20 Coolant temperature sender -G62
- Specifications =>Page 115

21 Coolant temperature sender -G2
- With coolant-temperature warning switch (overheating) -F14

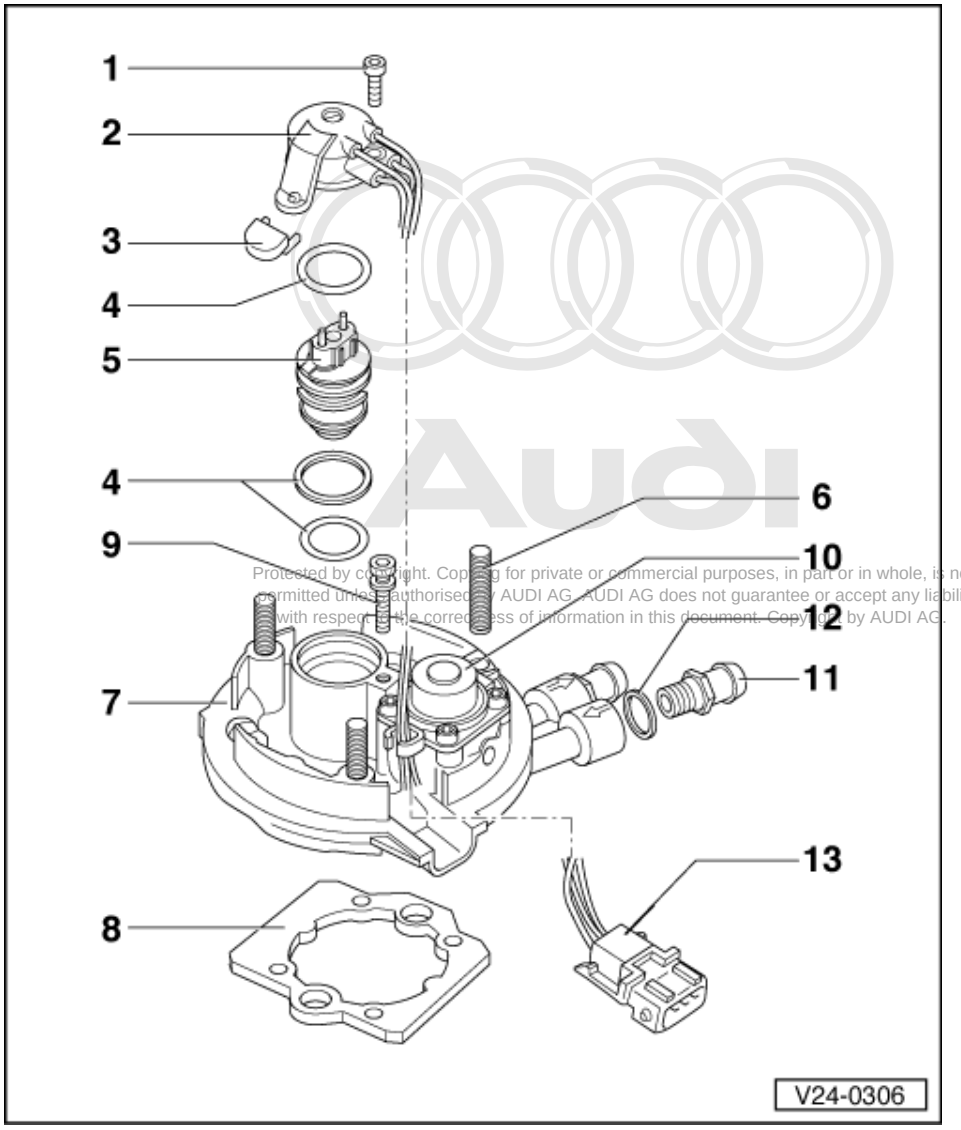
22 Gasket
- Replace

23 Sealing ring
- Replace

24 Intake manifold

25 25 Nm

1.7 - Servicing top part of injection unit



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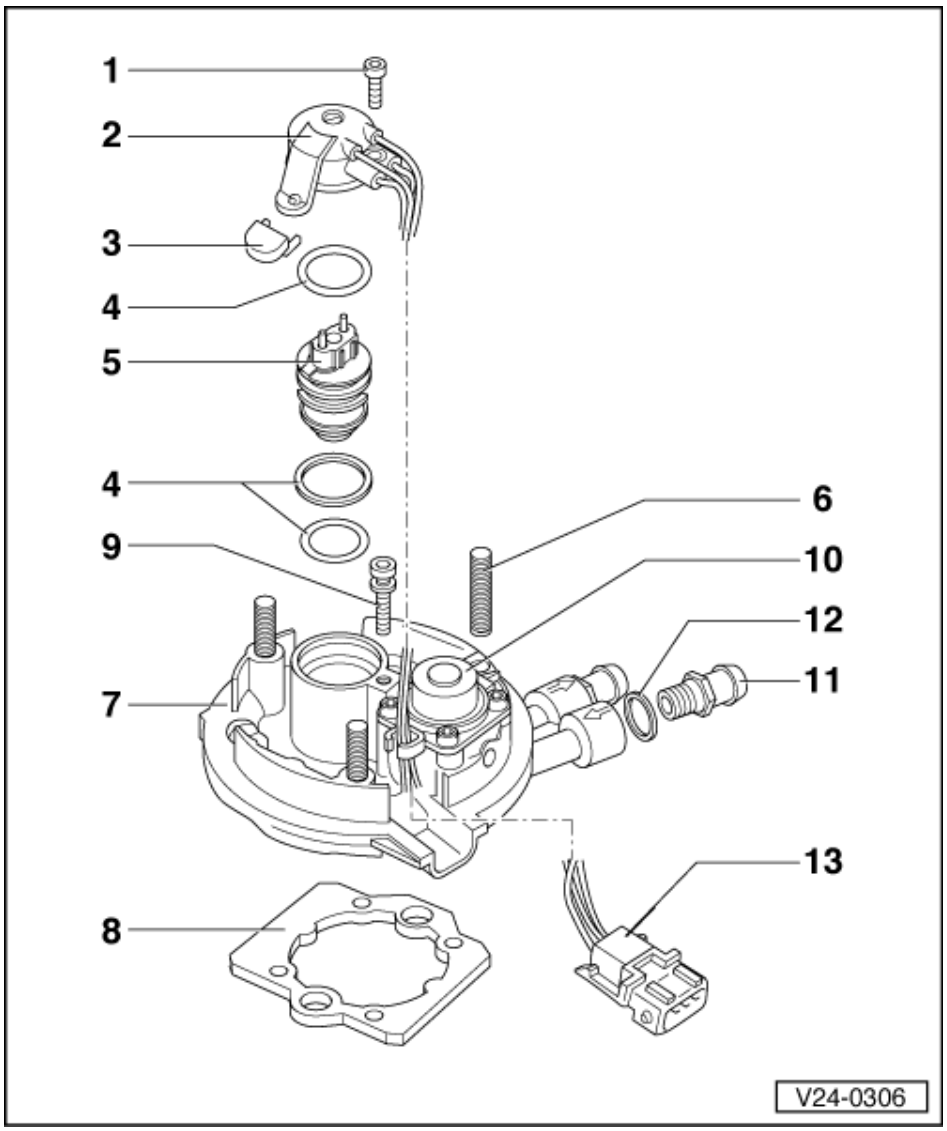
1 5 Nm
- Apply locking fluid D 000 600 A2 when fitting

2 Holder
- For injector
- With intake-air temperature sender -G42

3 Protective cap
- Only fitted on replacement part as transportation protection for intake-air temperature sender; must be removed after assembly

4 O-ring
- Replace



5 Injector -N30
- Checking =>Page 52
- Checking overrun shutoff =>Page 56

6 6 Nm
- Apply locking fluid D 000 600 A2 when fitting

7 Top part of injection unit

8 Gasket
- Pay attention to installation position
- Replace if damaged

9 6 Nm
- Apply locking fluid D 000 600 A2 when fitting

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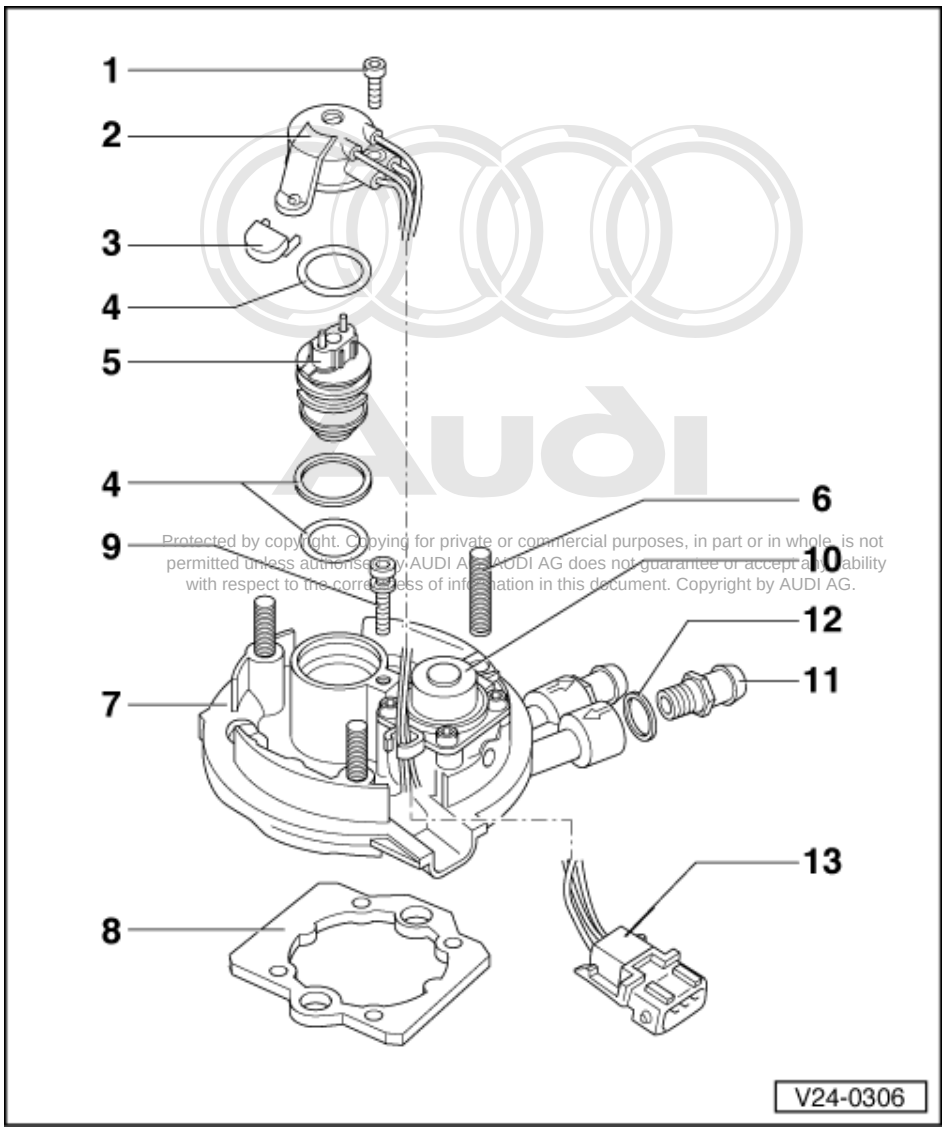

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10 Fuel pressure regulator

- Checking system pressure, fuel pressure regulator and holding pressure => Page 48
- Replace entire top part of injection unit if pressure regulator is defective

11 Screw connection

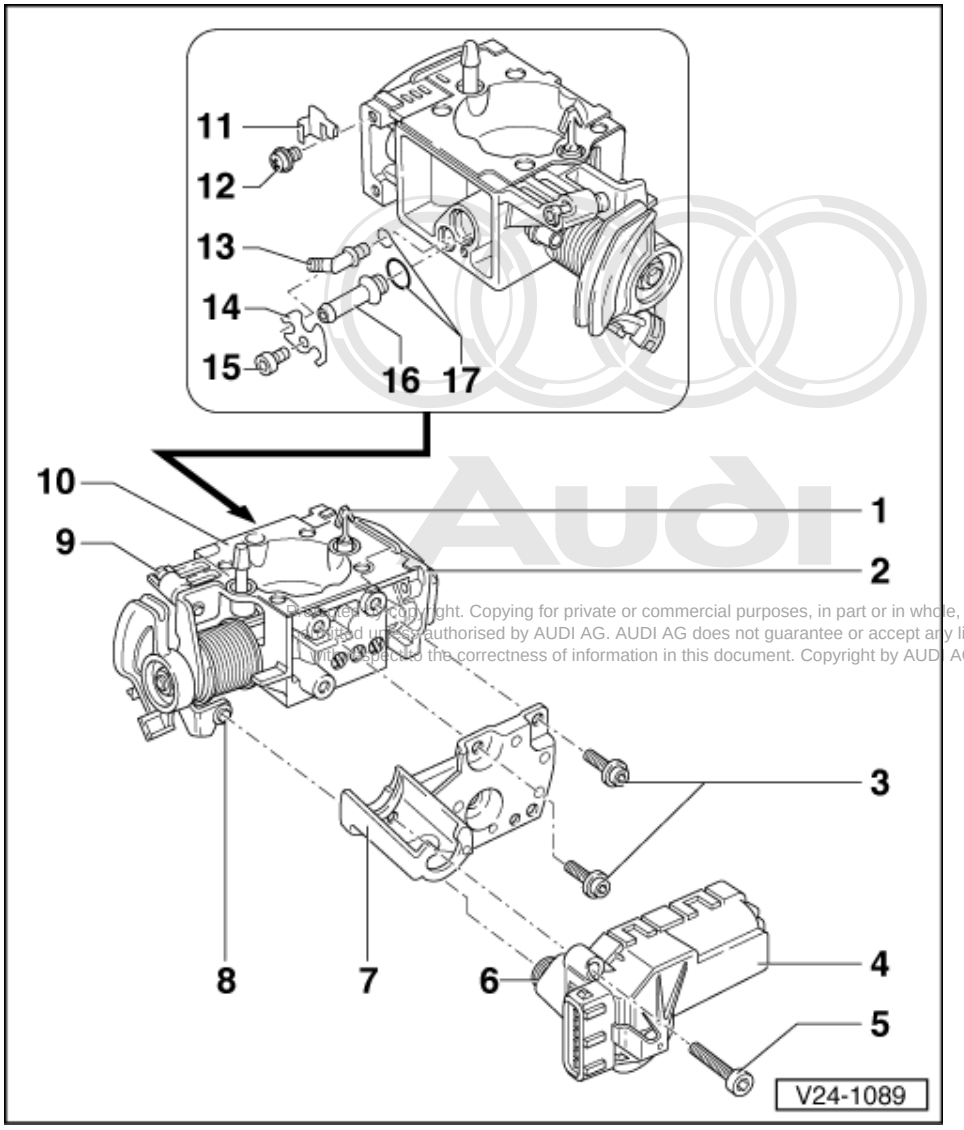
12 Sealing ring

- Replace

13 Connector

- Disengage retainer tabs to remove

1.8 - Servicing bottom part of injection unit



Audi
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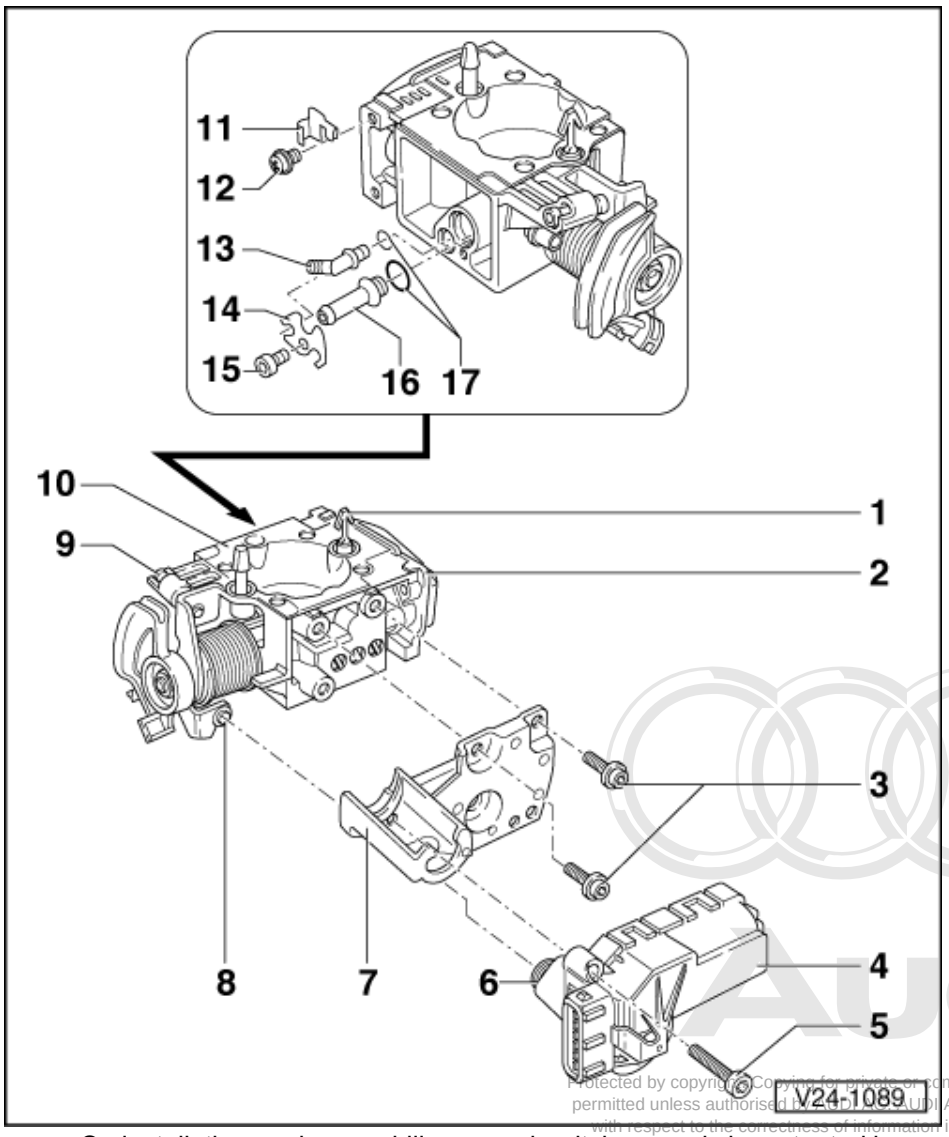
1 Securing clip
- For top part of injection unit

2 Throttle valve potentiometer -G69
- Not to be adjusted
- Checking => Page 74
- If defective: Replace bottom part of injection unit

3 6 Nm

4 Throttle valve positioner -V60
- With throttle valve positioner sender -G127
- Checking operation => Final control diagnosis, Page 12
- Checking throttle valve positioner -V60 => Page 78
- Checking throttle valve positioner sender -G127 =>Page 81



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- On installation, make sure idling-speed switch can only be actuated by way of plastic reed of switch with stop bolt -item 8 -
  If necessary, unfasten and align holder -item 7 -

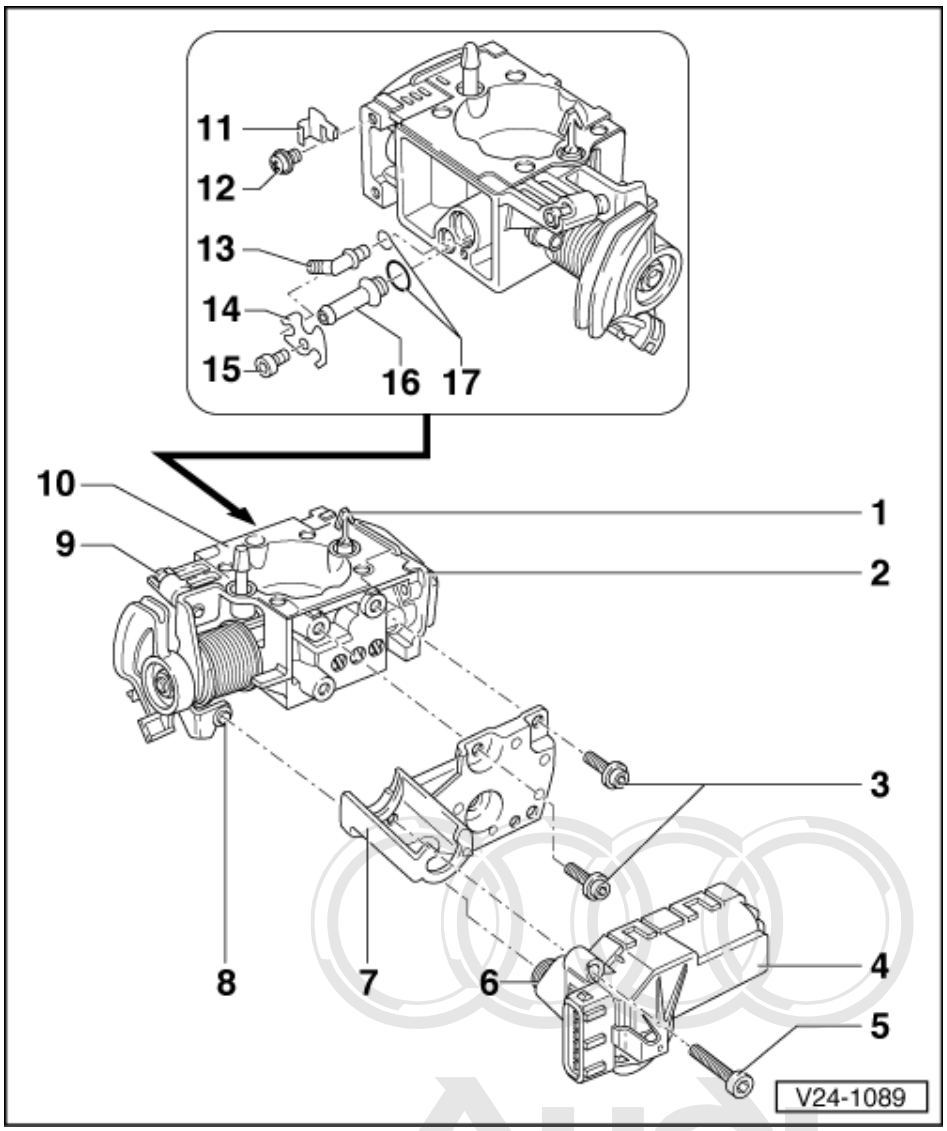
5 6 Nm

6 **Idling switch -F60**
- Checking =>Page 83

7 **Holder**
- With throttle cable support bracket

8 **Stop bolt**
- For idling switch -F60
- Checking and adjusting clearance for -F60 =>Page 83

9 **Throttle valve stop bolt**
- Secured at factory; not to be adjusted



10 Bottom part of injection unit

- Vehicles with manual/automatic gearbox feature different methods of throttle valve actuation

11 Holder

- For connector of intake-manifold preheating heater element -N51

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12 6 Nm

13 Vacuum connection

- For temperature regulator

14 Holder

15 3 Nm

16 Vacuum connection

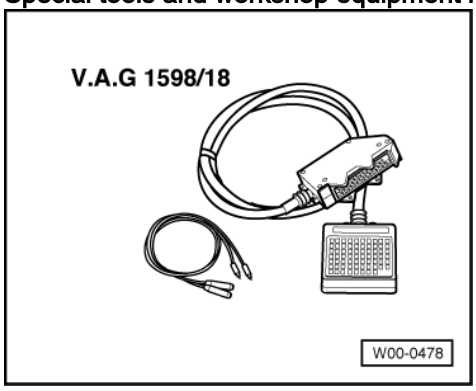
- For ACF system

17 O-ring

- Replace if damaged

1.9 - Wiring and component check using test box V.A.G 1598/18

Special tools and workshop equipment required



- Test box V.A.G 1598/18

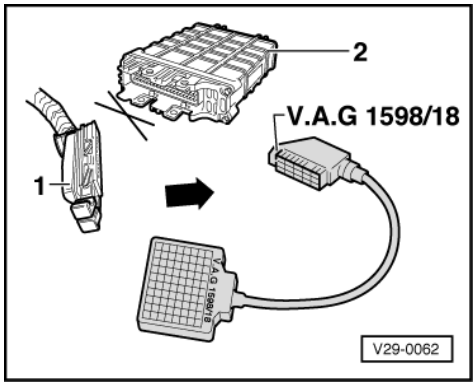
Notes:

- Connector of engine control unit is only to be unplugged or attached 30 seconds after switching off ignition.
- Test box V.A.G 1598/18 is not to be connected during diagnosis using fault reader V.A.G 1551.
- Use test leads from adapter set V.A.G 1594 A for connecting testers to test box.

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

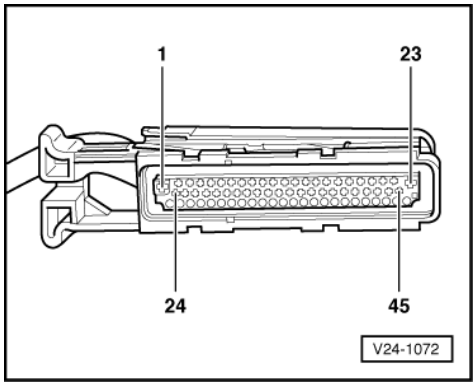
- Switch off ignition.
- Remove engine control unit and engage it in service position => Page 44 .

- Disconnect control-unit plug after releasing clip.



- -> With ignition switched off, connect test box V.A.G 1598/18 to connector -1- only (not to control unit -2-).

Notes:



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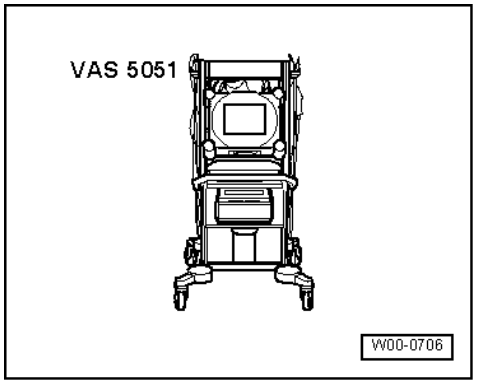
- -> Contact assignment at connector of engine control unit.
- Contact assignment is identical to socket assignment of test box V.A.G 1598/18.

- Perform testing as described in appropriate repair operations.

1.10 - Replacing engine control unit

Fitting location => Exploded view of fitting locations - Page 29

Special tools and workshop equipment required



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

  or

- V.A.G 1551 with V.A.G 1551/1

Removing

- Connect vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "address word" 01 => Page 1 .
  Ignition must be on.

-> Fault reader V.A.G 1551 displays control unit identification, e.g.:

```
8A0907311B     2.0 l     R4     Mono
D21
Code 01
```

- Always start by displaying control unit identification and printing it out => Page 3 .
- Compare code to encoding alternatives => Page 14 .

- Switch off ignition.

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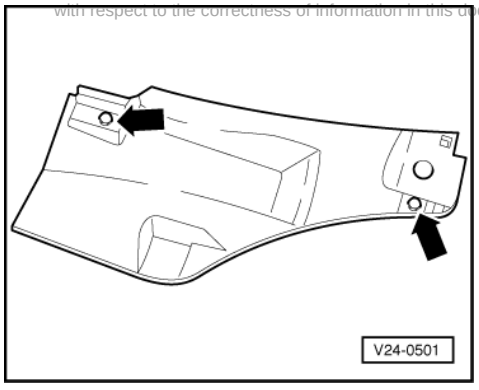
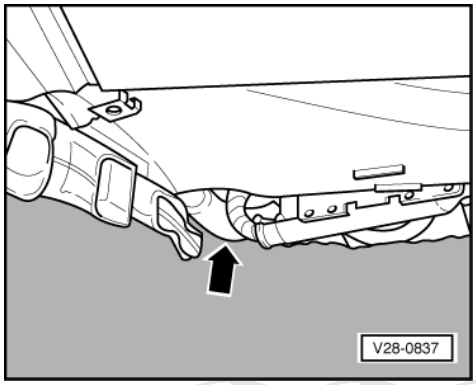
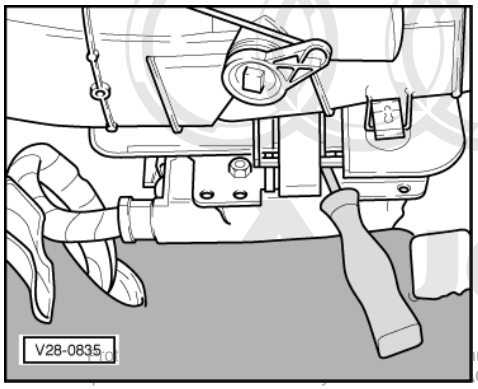


- -> Remove cover beneath glove box -arrows-.
- Unscrew plastic clip for cover.



- -> Pull off condensate hose -arrow- on vehicles with air conditioner.



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- -> Insert screwdriver next to retainer between control-unit mounting plate and plastic slot.
- Turn screwdriver if necessary to disengage retainer tabs at mounting plate above retainer from plastic slot recess.
- Pull down control unit slightly and remove screwdriver.
- Pull down control unit 3 ... 4 cm. In this position, control unit engages in a second recess (service position).
- Disconnect control-unit plug after releasing clip.

Notes:

- Connector of engine control unit is only to be unplugged or attached 30 seconds after switching off ignition.
- In service position, test box V.A.G 1598/18 can be connected for measurement and test purposes to engine wiring harness.

Note:

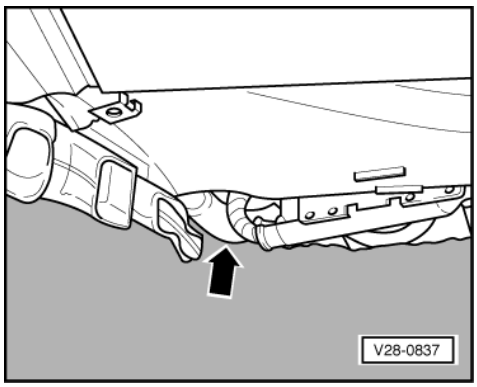
The following operations are only necessary if the control unit is to be completely removed.

- Unfasten catch as described and carefully pull control unit downwards out of slot.
- To remove control unit on vehicles with air conditioner, carefully press detached condensate drain hose aside so that side flange of control unit does not damage drain hose.

Installing

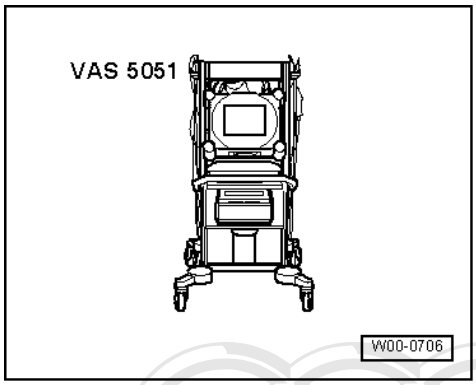
Notes:

- Connector of engine control unit is only to be unplugged or attached 30 seconds after switching off ignition.



- -> On vehicles with air conditioner, check whether condensate drain hose -arrow- has been connected before installing cover beneath glove box.

1.11 - Checking idling speed

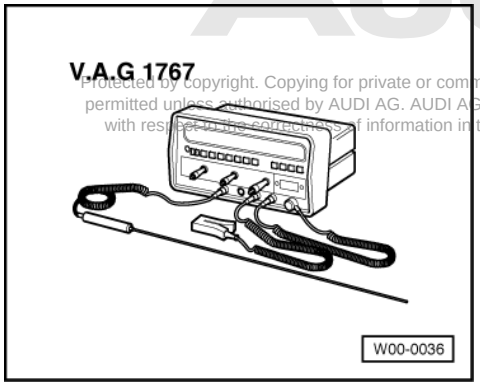


Special tools and workshop equipment required

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

  or

- V.A.G 1551 with V.A.G 1551/1



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- V.A.G 1767

  or

- V.A.G 1367 with V.A.G 1367/8

Notes:

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

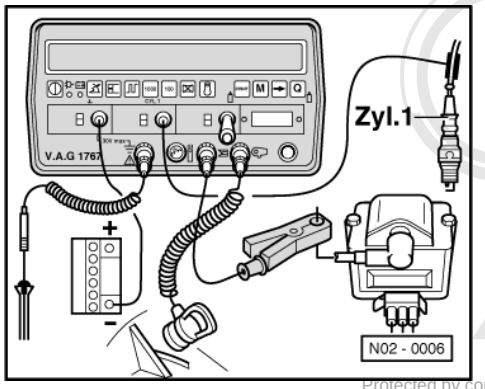
Test requirements:

- No leaks in exhaust system
- Electr. loads switched off (radiator fan must not run during test)
- Throttle cable correctly adjusted

=> Fuel Supply System - Petrol Engines; Repair Group 20; Servicing accelerator mechanisn; Adjusting throttle cable Servicing accelerator mechanisn Adjusting throttle cable

- Vehicles with automatic gearbox: Selector lever set to P or N
- Air conditioner switched off
- Coolant temperature at least 80 °C

Test sequence



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- -> With ignition switched off, connect up ignition tester V.A.G 1767 (or V.A.G 1367).

=> Operating instructions

Notes:

- Take particular care to ensure that TDC sender of ignition tester V.A.G 1367 is fully inserted in gearbox housing.
- Ignition point is displayed directly on V.A.G 1767 (or V.A.G 1367). There is no need to aim timing light at ignition point notches.
- Incorrect measurements may occur with ignition tester V.A.G 1767 if triggering probe is slightly open (e.g. excessive tension on helical cable).

- Connect vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "address word" 01 => Page 1 .
  Engine must be idling.
- Interrogate fault memory => Page 4 . There must not be any faults stored. If necessary, eliminate fault, erase fault memory, switch off and re-start engine, perform test drive and re-interrogate fault memory as a check.

- Leave engine idling.

```
System in basic setting     1
    1     2     3     4
```

-> Start basic setting, Display group 001, engine idling =>Page 13 .

Note:

The displays on the fault reader V.A.G 1551 have no significance for the tests described and can therefore be ignored.

- Read off ignition point on ignition tester V.A.G 1767 (or V.A.G 1367).
  - Test specification: 4 ... 8° before TDC

Note:

If ignition point displayed is outside tolerance, it must be adjusted prior to checking idling speed whilst system is still set to "Basic setting 1".

- Adjust ignition point by turning ignition distributor.
  -Setting 6 ±1° before TDC

If reading matches specification:

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

If reading does not match specification:

- Interrogate fault memory again =>Page 4 .

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

- Check idling-speed switch =>Page 83 .
- Check vacuum connections (unmetered air) => Page 98 .
- Check intake system for leaks (unmetered air) => Page 62 .
- Perform final control diagnosis => Page 12 .

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

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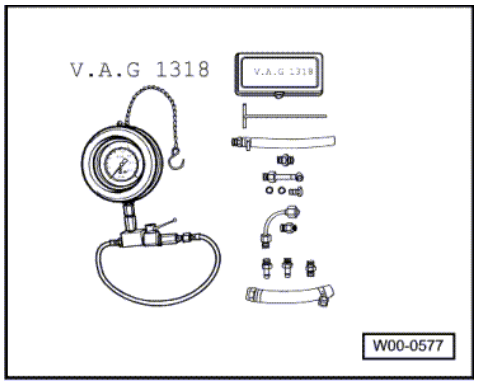
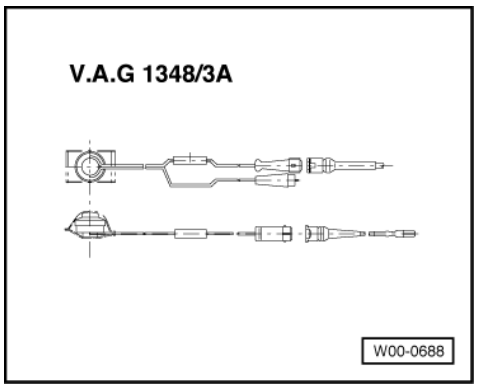
Special tools and workshop equipment required



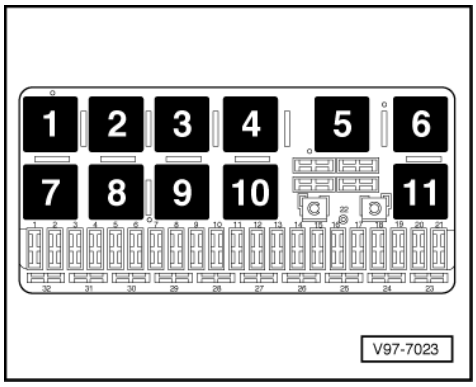
- V.A.G 1318 with V.A.G 1318/11 and V.A.G 1318/23



- V.A.G 1348/3A with V.A.G 1348/3-2

Test requirements:

- Battery voltage at least 11 V
- Fuel-pump relay -J17 OK; checking => Page 57



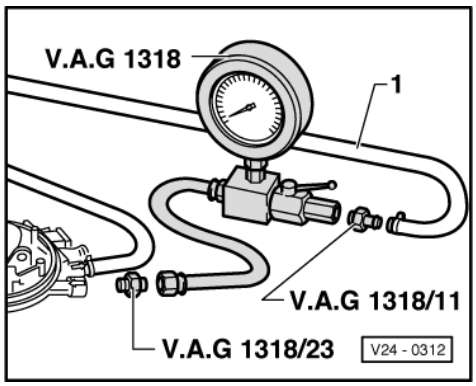
- -> Fuse S13 OK (in fuse box)
- Fuel pump OK; checking

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

- Fuel filter OK

Checking system pressure and fuel pressure regulator

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



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- -> Connect up pressure gauge V.A.G 1318 with test adapters 1318/11 and 1318/23 between fuel supply and injection units; move lever on pressure gauge to -open- position (lever in direction of flow).

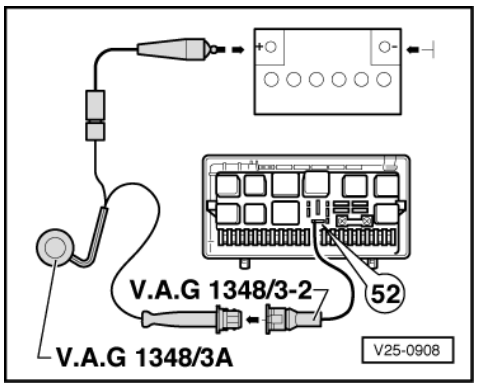
Note:

Connection of test adapter 1318/23 to injection unit involves screwing out connection piece of fuel supply pipe.

- Start engine and leave it idling.

Note:

If engine does not start:



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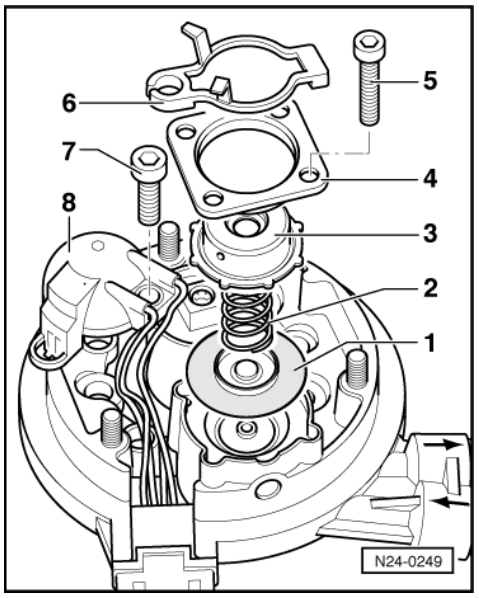
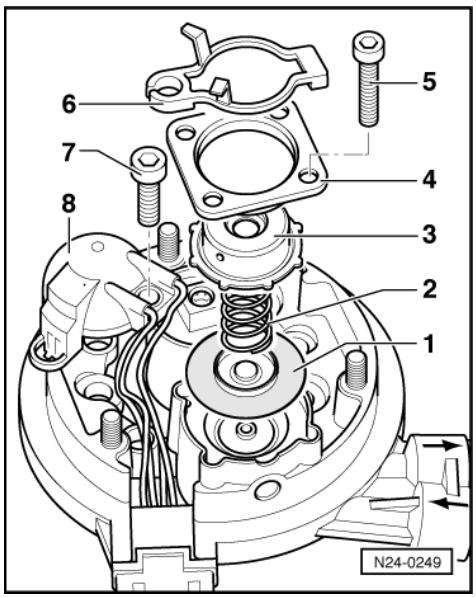
- -> Pull fuel-pump relay -J17 out of relay plate with fuse box, position 10.
- Connect remote control V.A.G 1348/3 A with adapter lead V.A.G 1348/3-2 to contact 52, position 10 of relay plate and battery positive (+).
- Actuate remote control.

- Measure fuel pressure.
  - Specification: 0.8 ... 1.2 bar
- If reading does not match specification, check fuel pump/supply pipe for damage (e.g. crushing) and replace if necessary.
- If specification is exceeded, check return pipe for damage (e.g. crushing) and replace if necessary.

If pipes are OK, dismantle and clean fuel pressure regulator.



- -> Remove intake-air temperature sender -8- and unclip cable guide -6-.
- Clean individual components of pressure regulator and top part of injection unit.



- -> Insert diaphragm -1- in top part of injection unit as shown.
- Insert spring -2- and compress it with top part of pressure regulator -3-.
- Carefully screw on retaining ring -4- using bolts -5- (tightening torque: 1.5 Nm).
- Fit intake-air temperature sender -8- and tighten bolt -7- to 5 Nm.
- Clip on cable guide -6-.
- Repeat pressure regulator test.

If reading still does not match specification:

- Replace top part of injection unit.

Note:

Top part of injection unit and fuel pressure regulator components are matched. Individual pressure regulator components are therefore not to be replaced. It is only permissible to dismantle the pressure regulator for cleaning purposes. Replace entire top part of injection unit if pressure regulator is defective.

Checking holding pressure

Test requirement:

- Fuel filter OK

- Start engine and leave it idling.
- Switch off ignition.
- Measure fuel pressure after a waiting time of 5 minutes.
  - Specification: min. 0.5 bar

If holding pressure drops below specification:

- Check pipe connections, O-rings at injector and injector itself for leaks.
- Check fuel pump non-return valve.

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

If no fault is found:

- Replace top part of injection unit.

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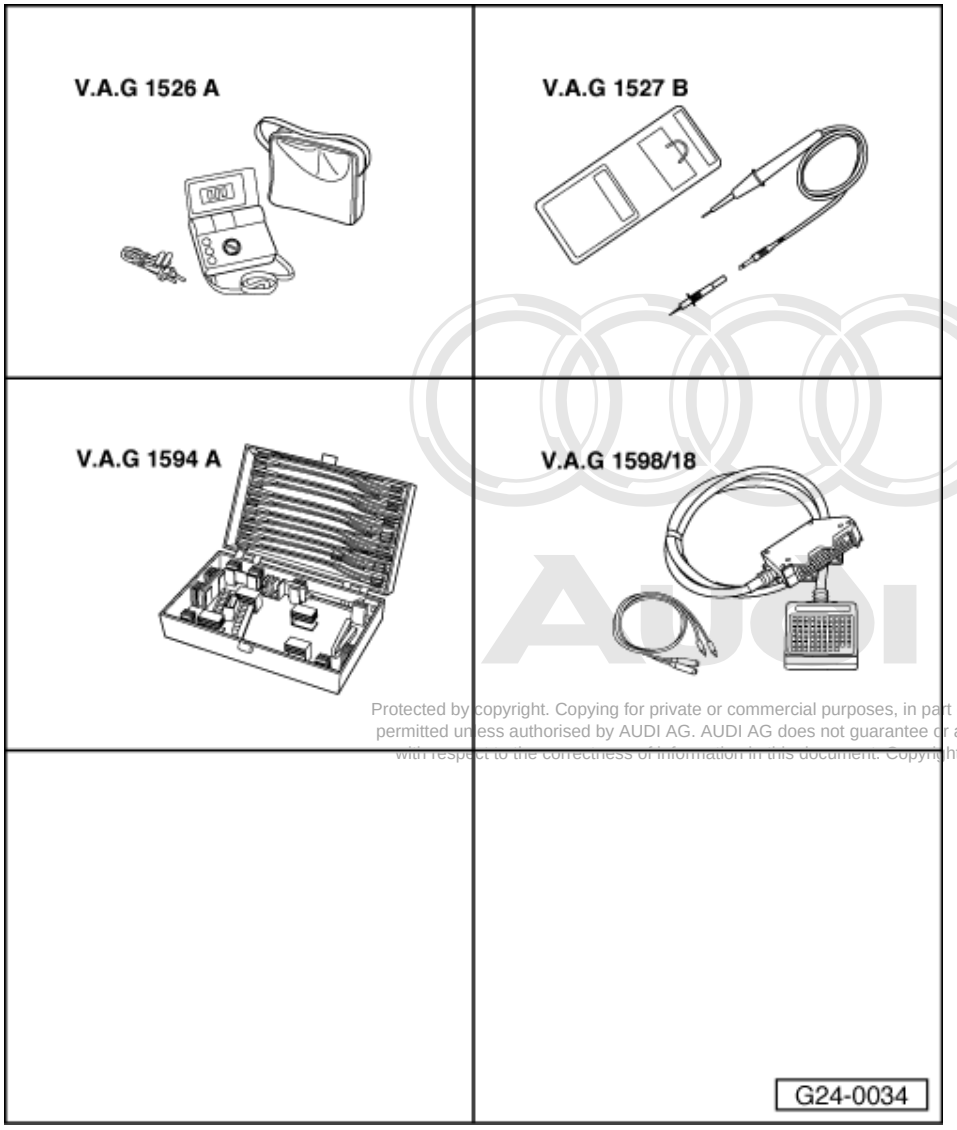
1.13 - Checking injector



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Special tools and workshop equipment required

- V.A.G 1526 A
- V.A.G 1527 B
- V.A.G 1594 A
- V.A.G 1598/18

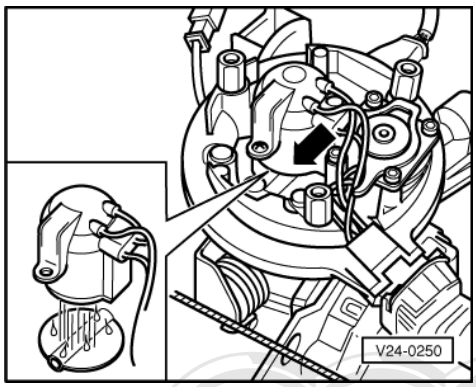
Test requirements:

- Coolant temperature at least 80 °C
- Fuel-pump relay -J17 OK; checking => Page 57
- Fuel pump OK; checking

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

Checking operation

- Detach air cleaner cover.



- -> Start engine and let it idle or operate starter if engine will not start.
  - Spray pattern must be visible on throttle valve

If spray pattern is not visible:

- Check fuel pressure regulator => Page 48 .
- Check actuation => Page 55 .

Leak test

- Leave engine idling.
- Switch off ignition.
- Check injector for leaks (visual inspection).
  - Max. 1...2 droplets per minute may emerge

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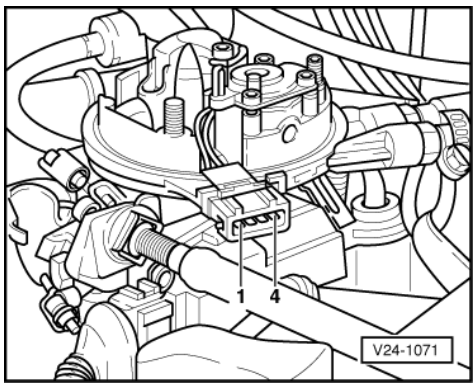
Checking internal resistance

- Detach air cleaner.
- Unplug connector at injection unit.



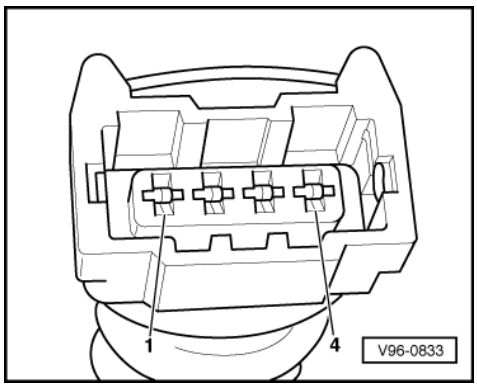
- -> Connect up multimeter for resistance measurement between contacts 2 and 3.
  - Specification: 1.2 ... 1.6 ω (at ambient temperature)

If reading does not match specification:

- Replace injector.

Checking power supply

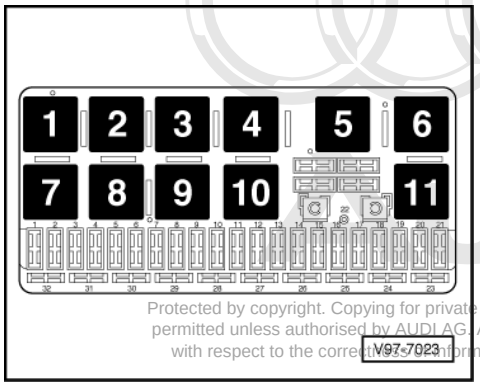
Injector is supplied with power via 3 ωresistance wire directly from fuel-pump relay -J17.



- Unplug connector at injection unit.
- -> Connect up voltage tester V.A.G 1527 B as follows.

Connector Contact	Measure to
2	Engine earth

- Briefly operate starter.
  - LED must light



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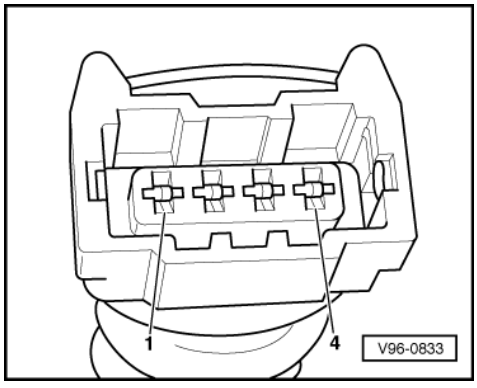
If LED does not light:

- Check wiring (resistance wire) between contact 2 and fuel-pump relay.
- -> Pull out auxiliary fuse S25.



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

Connector Contact	Measure to
2	Front contact of fuse S25

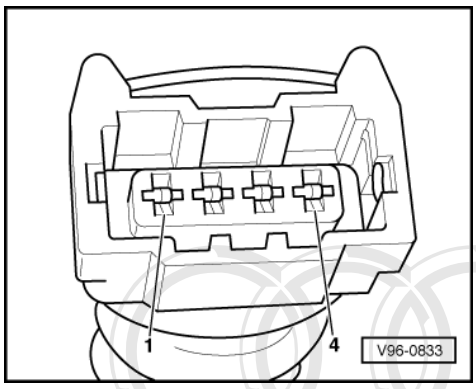
- Specification: 3 ... 4 ω
If necessary, eliminate open circuit/short circuit in resistance wire.

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

Checking actuation

Test requirement:

- Valve internal resistance OK



- Unplug connector at injection unit.
- -> Connect up voltage tester V.A.G 1527 B between contacts 2 and 3.
- Briefly operate starter.
  - LED must flash

If LED does not flash:

- With ignition switched off, connect test box V.A.G 1598/18 to engine control unit connector => Page 43 .

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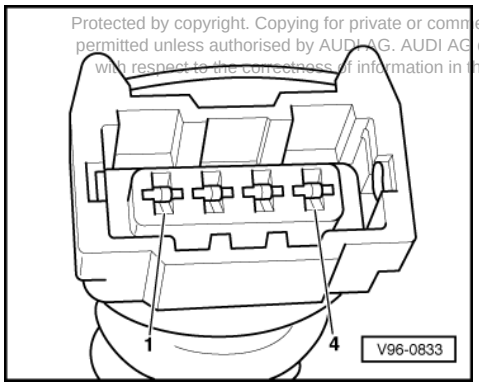


- -> Connect up multimeter for resistance measurement as follows.

Connector Contact	Test box V.A.G 1598/18 Socket
3	7

- Specification: 3 ... 4 ω
If necessary, eliminate open circuit/short circuit in resistance wire.

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

- If wiring is OK and there is no actuation, replace engine control unit => Page 44 .

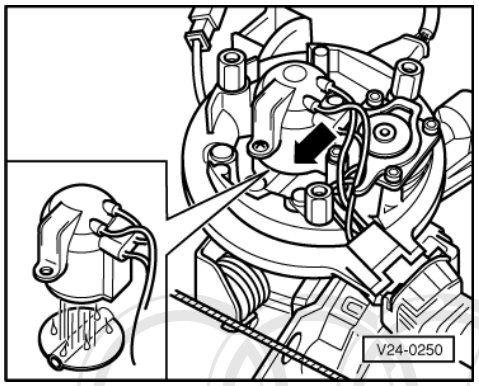
1.14 - Checking overrun shutoff

Test requirements:

- Coolant temperature at least 80 °C
- Coolant temperature sender OK
- Idling-speed switch OK

Test sequence

- Detach air cleaner cover.
- Start engine and leave it idling.



- -> Observe spray pattern of injector -arrow-.
- Increase engine speed to in excess of 3000 rpm and abruptly release accelerator mechanism whilst observing injector.
  - Spray pattern must be briefly interrupted

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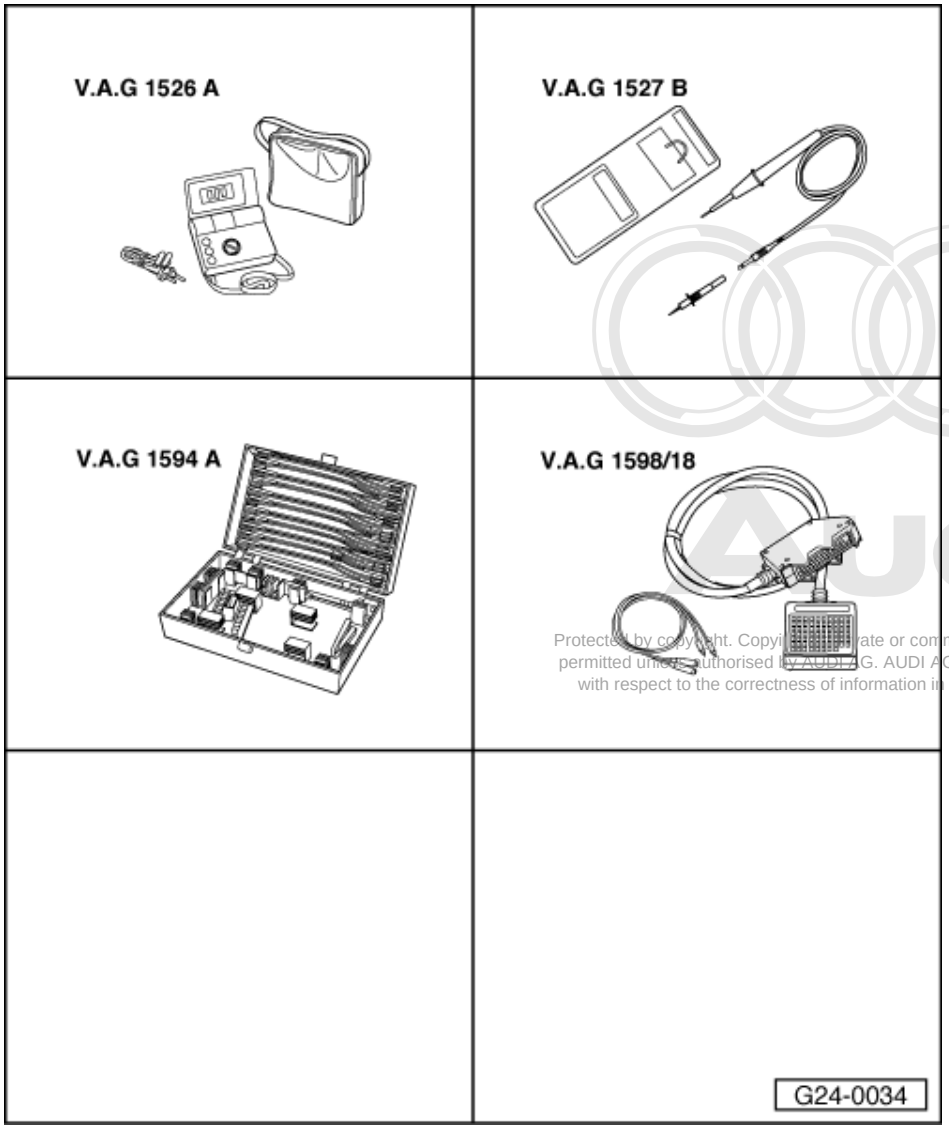
1.15 - Checking fuel-pump relay -J17 and actuation



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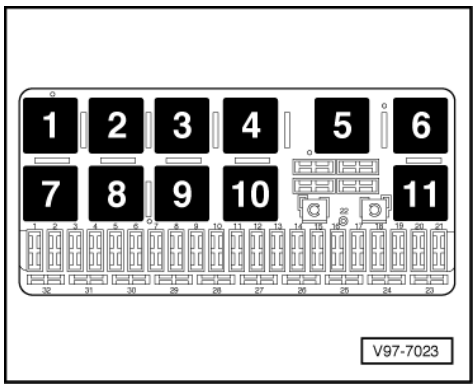
Special tools and workshop equipment required

- V.A.G 1526 A
- V.A.G 1527 B
- V.A.G 1594 A
- V.A.G 1598/18



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

Note:

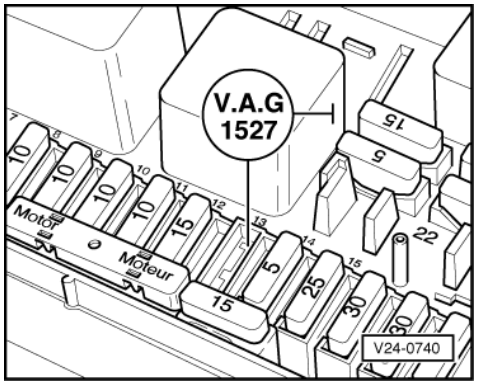
-> Fitting location of fuel-pump relay: On relay plate with fuse box in plenum chamber, position 10

Test requirement:

- Battery voltage at least 11 V

Checking operation of fuel-pump relay

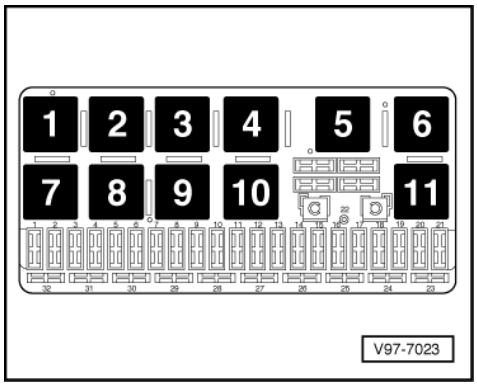
- Detach cover from relay plate with fuse box in plenum chamber.



- -> Pull out fuse S13.
- Connect up voltage tester V.A.G 1527 B as follows.

Fuse S13	Measure to
Rear contact	Engine earth

- Briefly operate starter.



- -> Energisation of fuel-pump relay (on relay plate with fuse box in plenum chamber, position 10) must be heard and felt; LED must light

If relay is not energised:

- Check actuation => Page 60 .

If relay is energised but LED does not light:

- Pull off fuel-pump relay.

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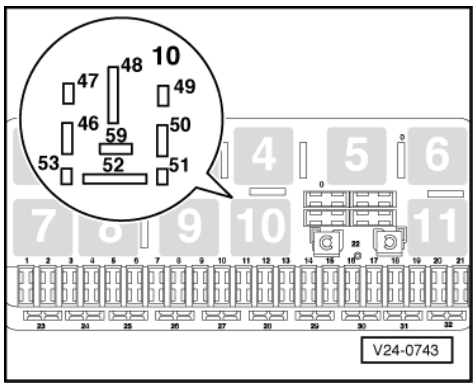


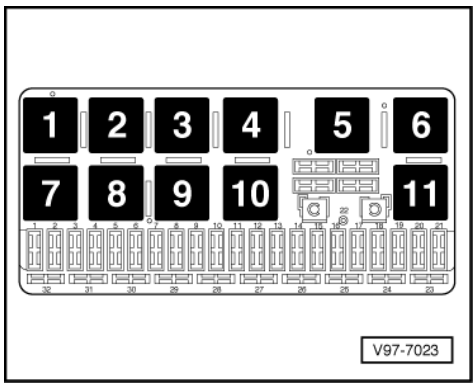
- -> Use current flow d iagram to check for open circuit in the following connection.

Relay plate, position 10 Contact	Fuse
52	S13

- Replace relay plate if necessary.

If connection is OK:

- Replace fuel-pump relay -J17.
- Re-insert fuel-pump relay and fuse S13.



- -> Pull out auxiliary fuse S25.
- Connect up voltage tester V.A.G 1527 B with test leads from V.A.G 1594 A between earth and one of the two contacts for fuse S25.
- Briefly operate starter.
  - Energisation of fuel-pump relay (on relay plate with fuse box in plenum chamber, position 10) must be heard and felt; LED must light

If relay is not energised:

- Check actuation => Page 60 .

If relay is energised but LED does not light:

- Repeat test at other contact for fuse S25.

If LED still does not light:

- Pull off fuel-pump relay.

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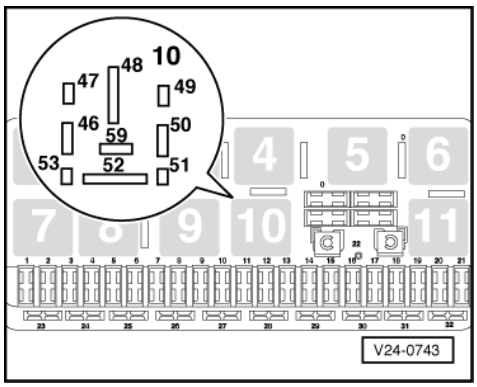

- -> Use current flow diagram to check for open circuit in the following wiring.

Relay plate, position 10 Contact	Fuse
59	S25

Note:

In certain current flow diagrams, contact 59 is shown as being contact 58.

- Eliminate open circuit in wiring if necessary.

If wiring is OK:

- Replace fuel-pump relay -J17.
- Re-insert auxiliary fuse S25.

Checking power supply and actuation of fuel-pump relay

- Detach cover from relay plate with fuse box in plenum chamber.
- Pull off fuel-pump relay.

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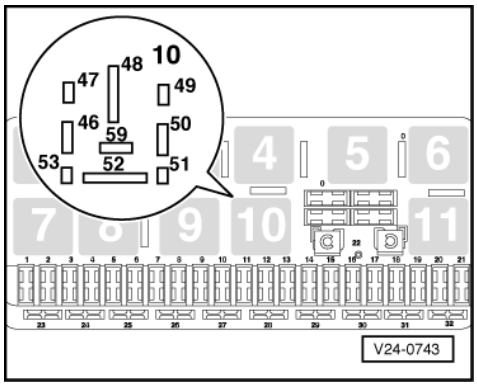
Checking power supply

- Switch on ignition.



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

Relay plate, position 10 Contact	Specification
46 + 50	approx. battery voltage

Relay plate, position 10 Contact	Specification
48 + 50	approx. battery voltage

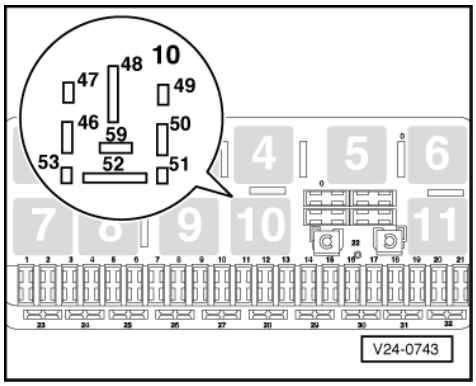
- Switch off ignition.

If readings do not match specifications:

- Check wiring.

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

Checking actuation



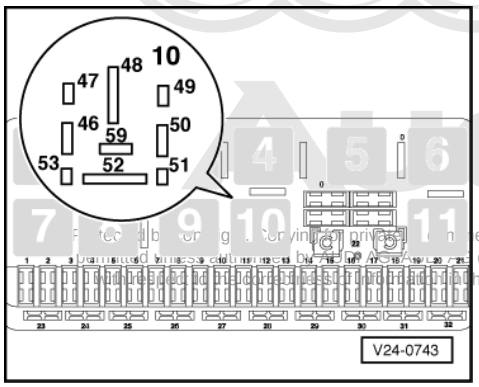
- -> Connect up voltage tester V.A.G 1527 B as follows.

Relay plate, position 10	
Contact	Contact
46	47

- Switch on ignition.
  - LED must light for approx. 1 second
- Operate starter.
  - LED must light constantly during starting

If LED does not light:

- With ignition switched off, connect test box V.A.G 1598/18 to engine control unit connector => Page 43 .



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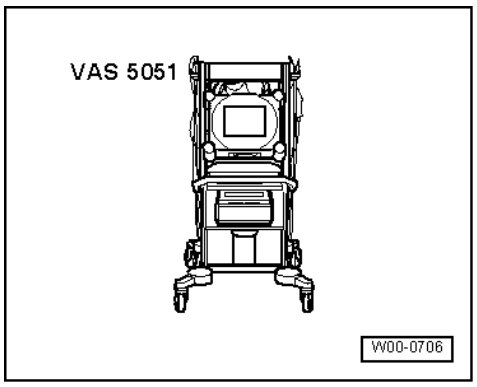
- -> Check for open circuit and short to earth/positive in the following wiring.

Relay plate, position 10 Contact	Test box V.A.G 1598/18 Socket
47	25

- If necessary, eliminate open circuit in wiring/short circuit.
- If there is no open circuit and LED is constantly lit, replace engine control unit => Page 44 .
- Replace fuel-pump relay if actuation and wiring are OK.

1.16 - Checking intake system for leaks (unmetered air)

Special tools and workshop equipment required



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

  or

- V.A.G 1551 with V.A.G 1551/1
- Engine leak detector spray G 001 800 A1

Notes:

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

Test sequence

```
Reading measured value block 1
     1     2     3     4
```

-> Read measured value block, Display group 001 => Page 17 .
- Note engine speed in display zone 1.
- Systematically apply engine leak detector spray to intake system components.

If display does not change:

- Press ⇒key.

-> Indicated on display (function selection):

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

If value decreases:

- Press ⇒key.
- Enter "06" for "End output" function and confirm with Q key.
- Switch off ignition.
- Check sprayed section of intake system for leaks and rectify fault.

2 - Checking Lambda control

2.1 - Checking Lambda control

Notes:

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

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

0.7...1.1 V.

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

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

On account of the steep voltage step change, the Lambda control cannot maintain the ideal mixture composition (corresponding to λ = 1.0)

at a constant level. The control constantly fluctuates between the two statuses "slightly too lean" and "slightly too rich".

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

- Slits or holes in probe head clogged
- Thermal overloading of probe
- Contact resistance in signal wire
- Probe too cold, no probe heating function
- Lambda control off (fault detected in injection system by control unit => Interrogate fault memory)
- Probe damaged by contact spray or the like (on account of thermal fluctuations and capillary action, contact spray is drawn through the fine cavities in the wires into the probe)
- Probe damaged by silicone vapours (the use of sealants containing silicone causes traces of silicone constituents to be drawn in by the engine; these are not burnt and damage the Lambda probe)

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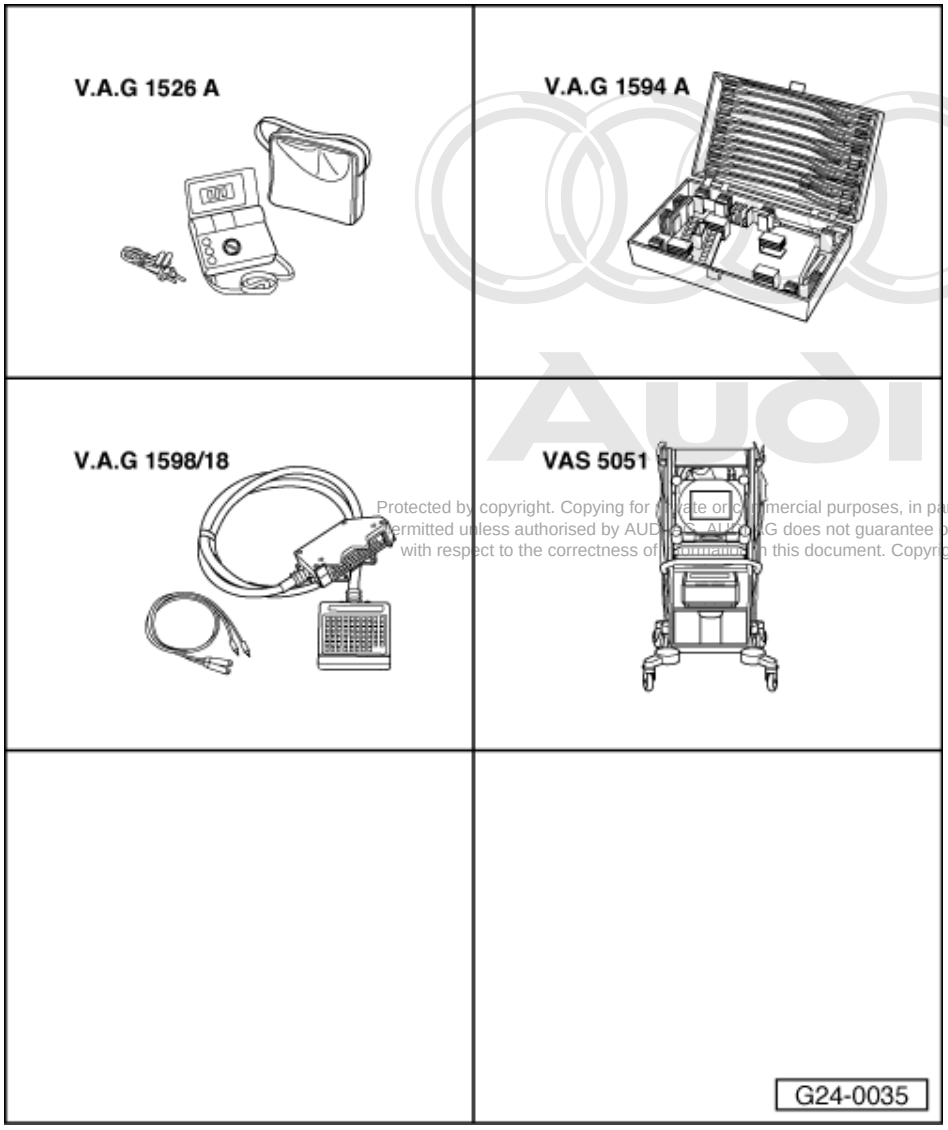
2.2 - Checking Lambda probe -G39 and Lambda control



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Special tools and workshop equipment required

- V.A.G 1526 A
- V.A.G 1594 A
- V.A.G 1598/18
- VAS 5051 with VAS 5051/1 and VAS 5051/2

or

- V.A.G 1551 with V.A.G 1551/1

Test sequence

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

-> Read measured value block, Display group 000, engine idling
=>Page 16 .

- Read off value in display zone 5 (Lambda control value).
  - Specification: Fluctuating between 98 and 158 (mean value 128)
- A constant display value indicates open circuit in signal wire (check wiring => Page 66).

- Read off value in display zone 6 (Lambda probe voltage).
  - Specification: Fluctuating between 0 ... 31 or 224 ... 255
- If specification is exceeded or not reached, fuel system pressure is too high or too low (checking => Page 48), there is a leak in the exhaust system between engine and Lambda probe or the vacuum hose has dropped off.

If readings do not match specifications:

- Check Lambda probe => Page 65 .

Checking wiring

- Connect up multimeter for voltage measurement between connector of signal wire to engine control unit and engine earth.
- Switch on ignition.
  - Specification: 450 ± 50 mV

If reading does not match specification:

- With ignition switched off, connect test box V.A.G 1598/18 to engine control unit connector => Page 43 .
- Check for open circuit and short to earth in the following wiring.

Signal wire	Test box V.A.G 1598/18 Socket
Lambda probe -G39	38

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

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

Checking Lambda probe

- Unplug connector for signal wire of Lambda probe => item 30 .
- Connect up multimeter for resistance measurement between signal wire and engine earth.
  - Specification: ∞ Ω

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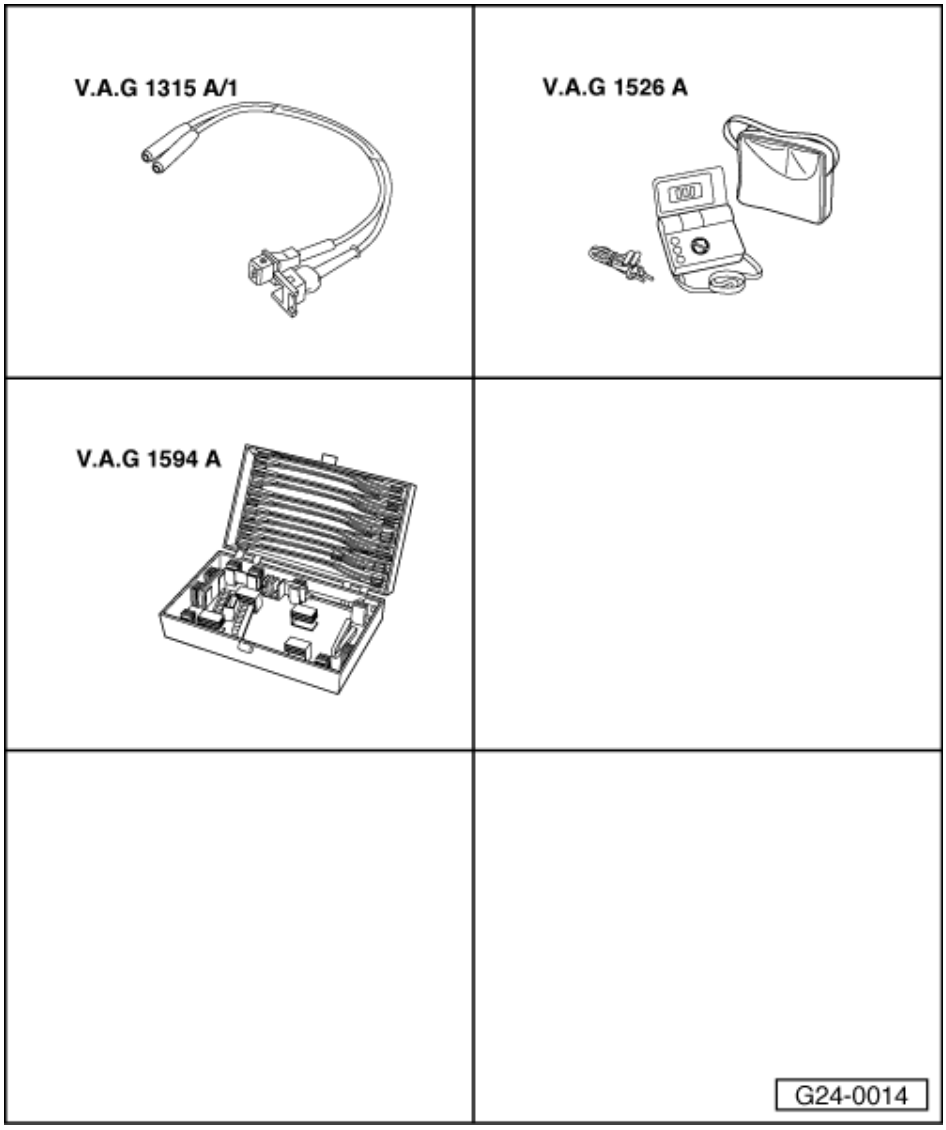
If reading does not match specification:

- Replace Lambda probe.

If reading matches specification:

- Connect up multimeter for voltage measurement between connector of signal wire to engine control unit and engine earth.
- Switch on ignition.
  - Specification: 400 ± 50 mV

2.3 - Checking Lambda probe heater -Z19



Special tools and workshop equipment required

- V.A.G 1315 A/1
- V.A.G 1526 A
- V.A.G 1594 A

Note:

Vehicles with engine code ABM feature an unheated Lambda probe.

Test requirements:

- Fuel-pump relay -J17 OK; checking => Page 57
- Engine cold

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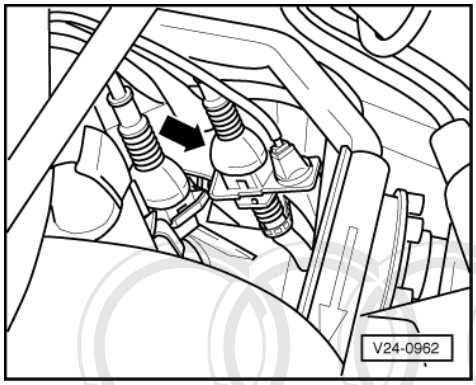
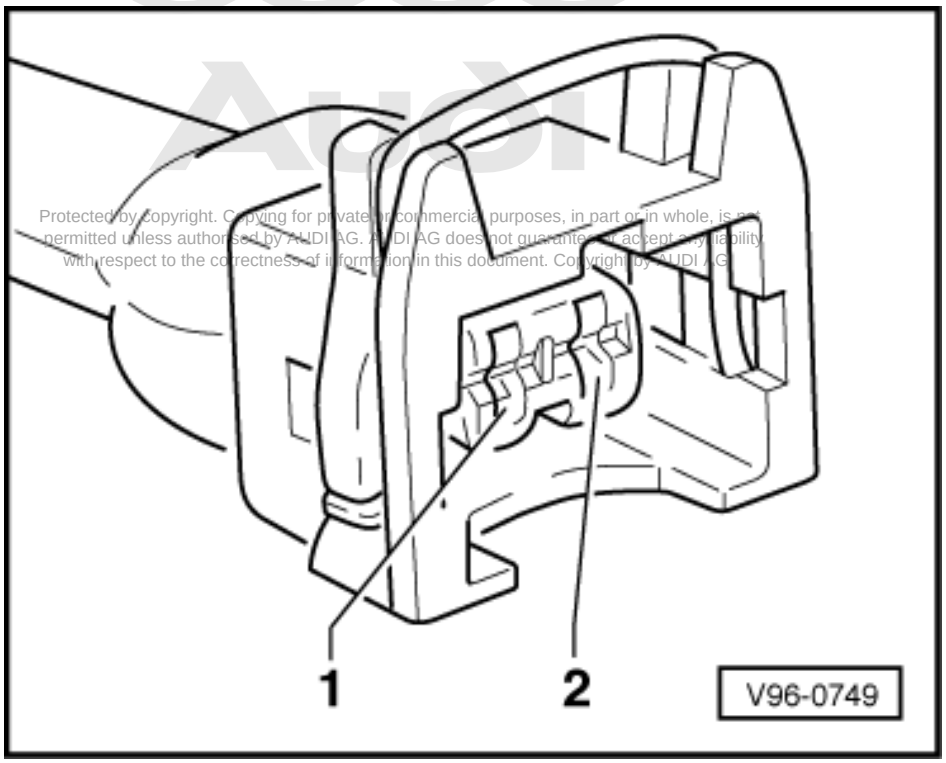
Test sequence



- -> Unplug connector -arrow- for Lambda probe heating.



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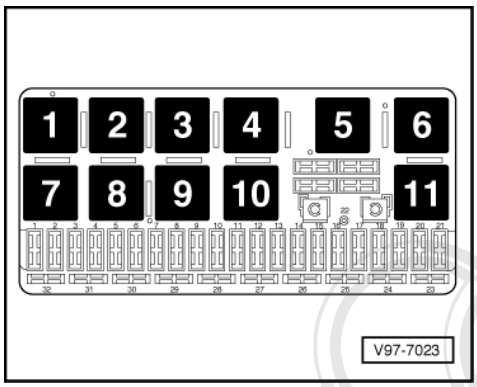
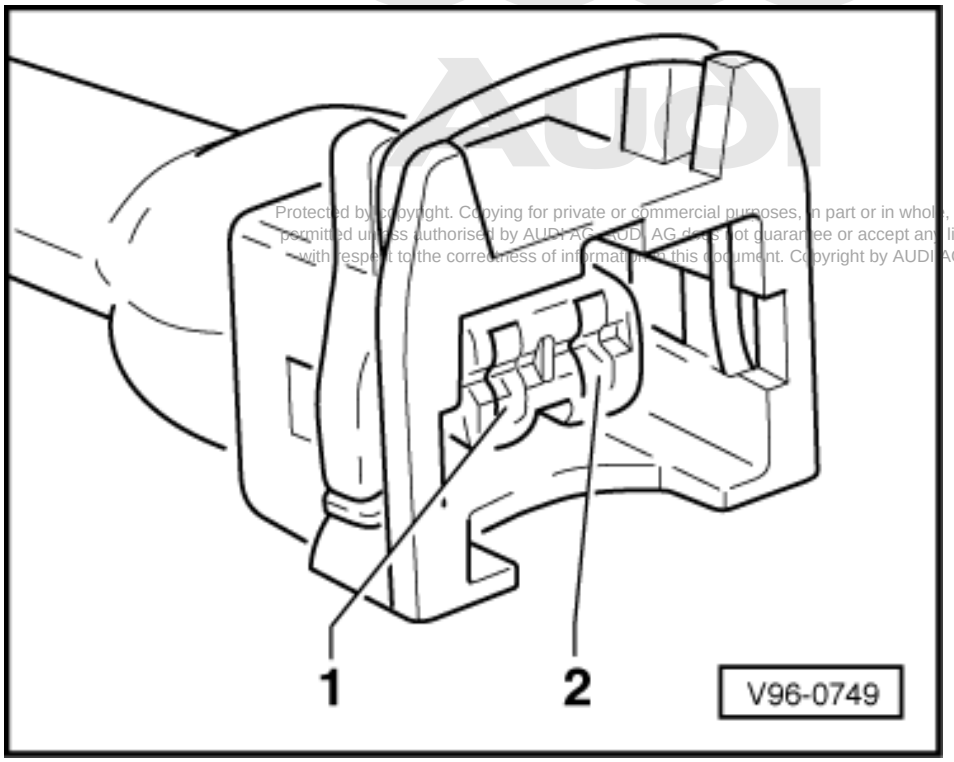
- -> Connect up multimeter for voltage measurement between contacts 1 and 2.
- Start engine.
  - Specification: approx. battery voltage

If reading does not match specification:

- Perform the following checks marked with a dot.



- -> Check fuse S25.



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- -> Check for open circuit in wiring between contact 2 of connector and fuse in fuse box (check contact assignment if necessary).

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

- Check for open circuit in wiring between contact 1 and earth connection 1 in front right wiring harness.
- Check fuel-pump relay => Page 57 .

If reading matches specification:

- Connect auxiliary test lead V.A.G 1315 A/1 to 2-pin connector.
- Switch multimeter to 10 A measuring range (connect test lead to 10 A connection).
- Start engine and leave it idling.
  - Specification: 0.5 ... 3.0 A

Note:

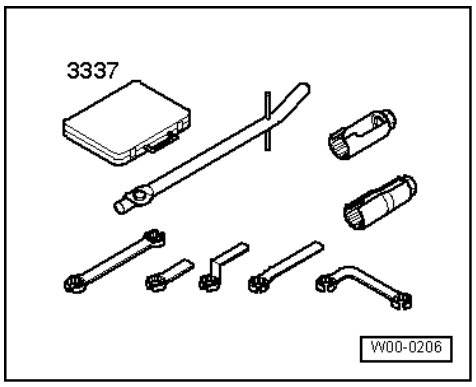
Current input decreases as Lambda probe becomes warmer.

If reading does not match specification:

- Replace Lambda probe.

2.4 - Removing and installing Lambda probe

Special tools and workshop equipment required



- Ring spanner set for Lambda probe 3337
- Hot bolt paste G 052 112 A3

Sequence of operations

- Unplug connector for Lambda probe => item 30 .
- Unfasten cable ties.
- Use special tool 3337 to screw out Lambda probe.

Pay attention to the following on installation:

Notes:

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

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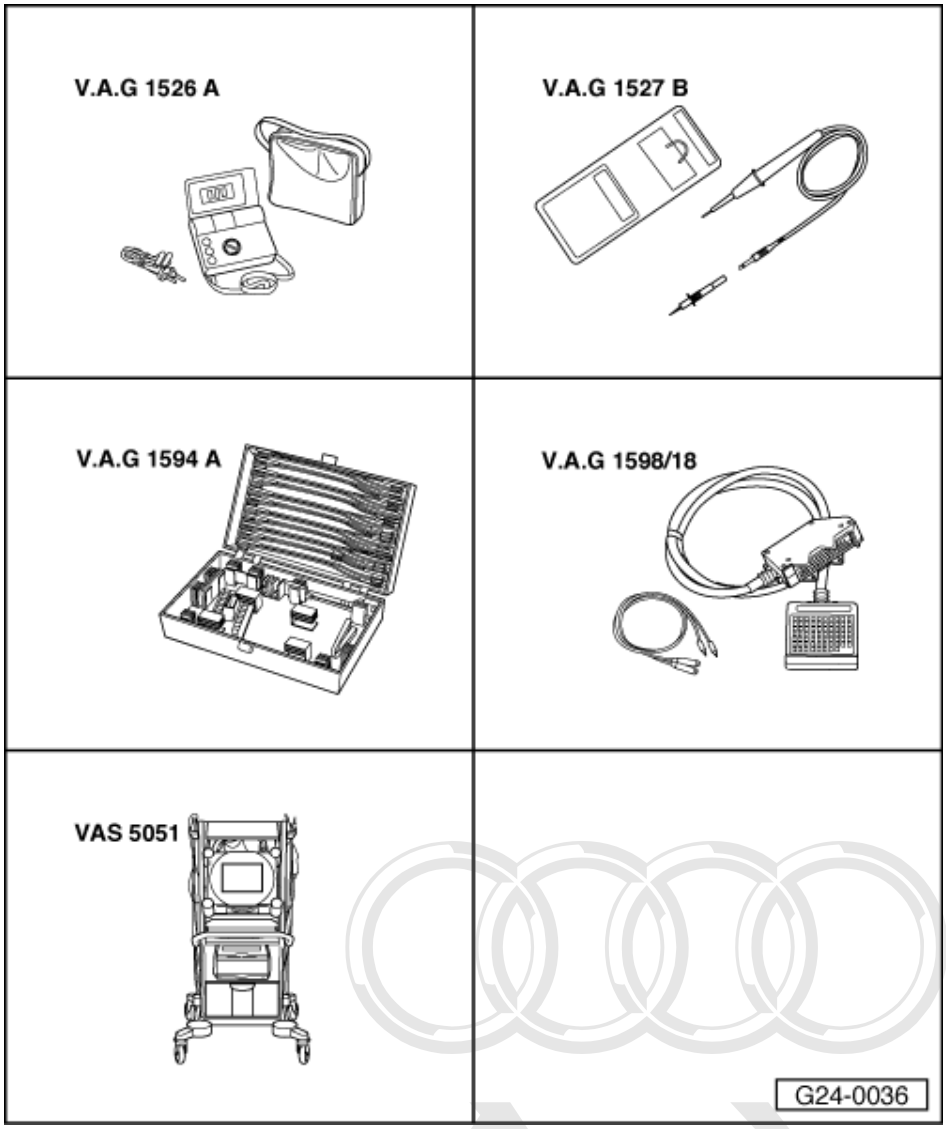
3 - Checking fuel tank breather system

3.1 - Checking fuel tank breather system



3.2 - Checking activated charcoal filter solenoid valve -N80

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Special tools and workshop equipment required

- V.A.G 1526 A
- V.A.G 1527 B
- V.A.G 1594 A
- V.A.G 1598/18
- VAS 5051 with VAS 5051/1 and VAS 5051/2

or

- V.A.G 1551 with V.A.G 1551/1

Fitting location => Exploded view of fitting locations - Page 29

Note:

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

Leak test

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

- Pull hoses off ACF valve; leave connector attached.
- Connect test hose to one connection of ACF valve.
- Start final control diagnosis =>Page 12 and actuate activated charcoal filter solenoid valve -N80.

-> Indicated on display:

```
Final control diagnosis
Activated charcoal filter solenoid valve
-N80
```

Valve must click...
...and must open and close (can be checked by blowing into test hose).

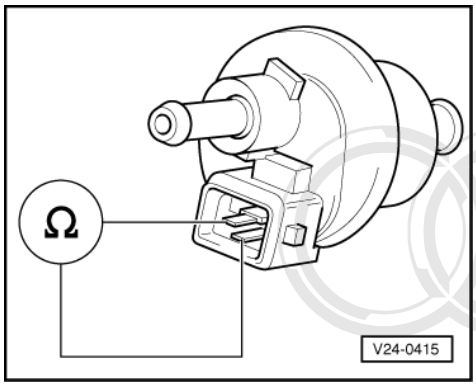
If valve does not open and close properly:

- Replace activated charcoal filter solenoid valve -N80.

If valve does not click:

- Check internal resistance of ACF valve.

Checking internal resistance



- Unplug connector at ACF valve.
- -> Connect multimeter to valve for resistance measurement.
  - Specification: 35 ... 55 ω (at ambient temperature)

If reading does not match specification:

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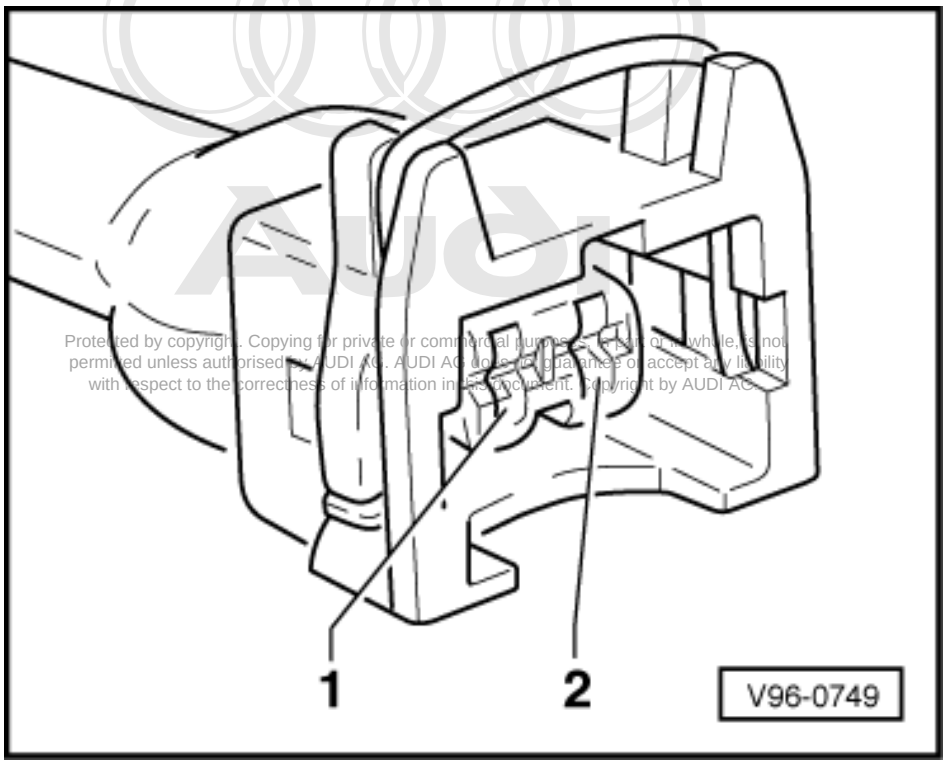
- Replace ACF valve.

Checking power supply

- Unplug connector at ACF valve.



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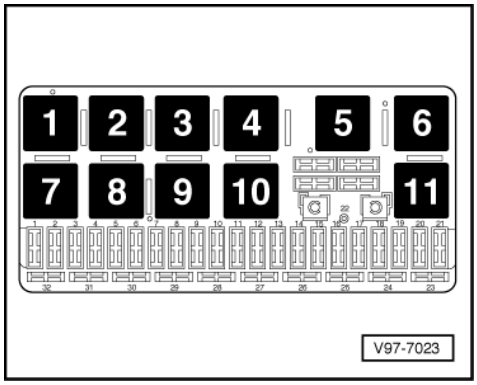
- -> Connect up voltage tester V.A.G 1527 B as follows.

Connector Wire colour	Measure to
Red/black	Engine earth

- Switch on ignition.
  - LED must light

If LED does not light:

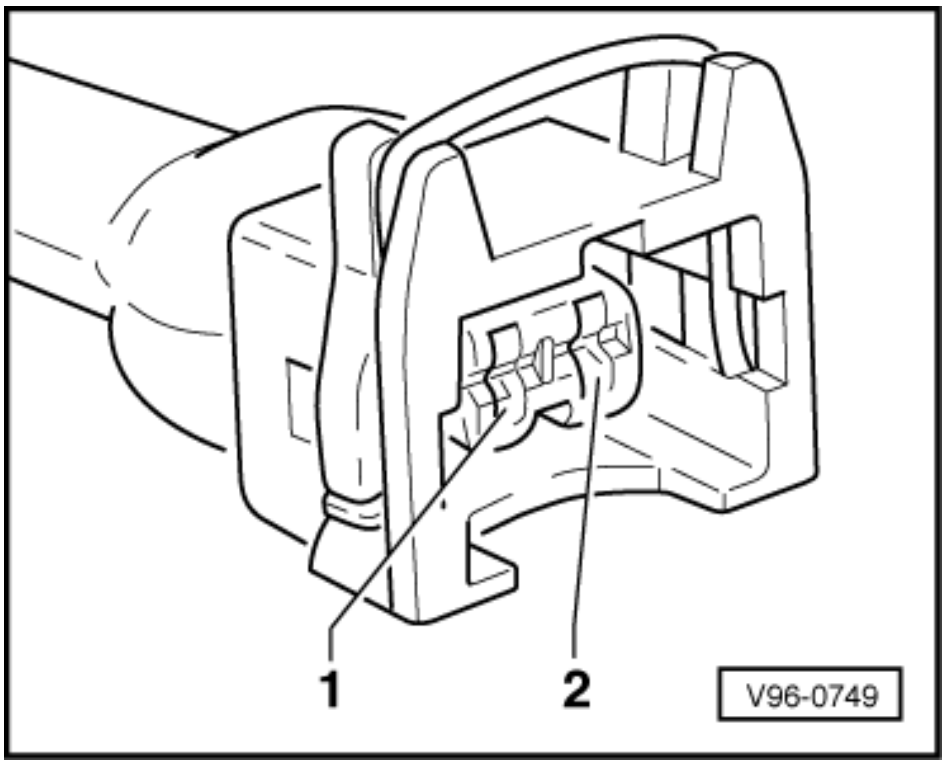
- Perform the following checks marked with a dot.



- -> Check fuse S21 (in fuse box).
- Check for open circuit in connector wire to fuse in fuse box.

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

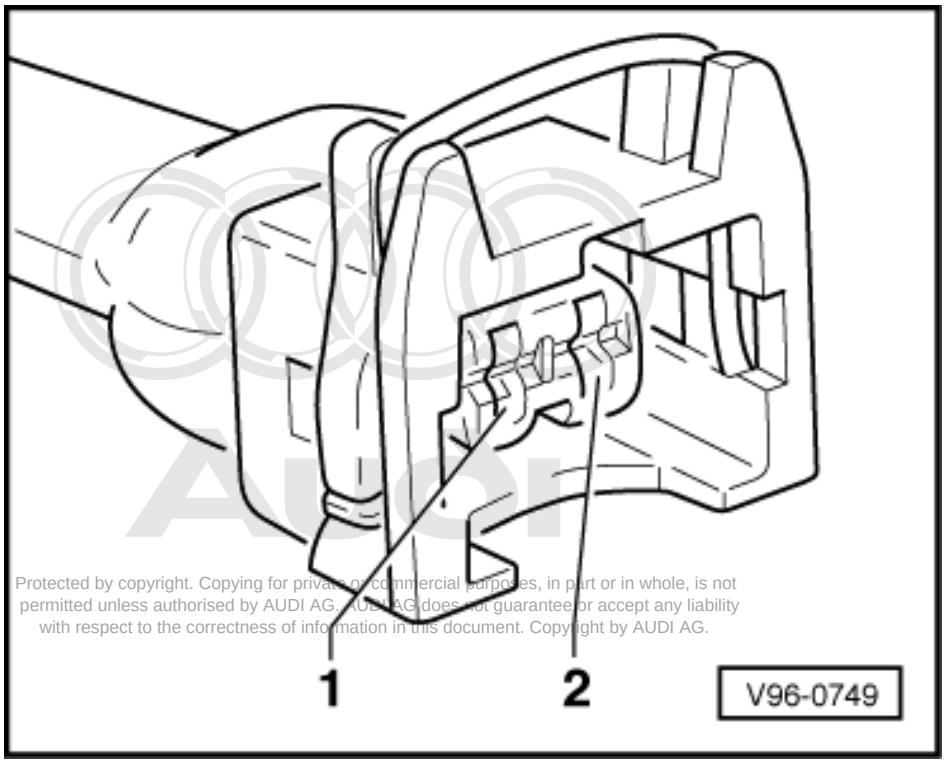
Checking actuation



- -> Connect up voltage tester V.A.G 1527 B between contacts 1 and 2.
- Start final control diagnosis =>Page 12 and actuate activated charcoal filter solenoid valve -N80.
  - LED must flash

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

- With ignition switched off, connect test box V.A.G 1598/18 to engine control unit connector => Page 43 .



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

Connector Wire colour	Test box V.A.G 1598/18 Socket
Brown/black	3

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

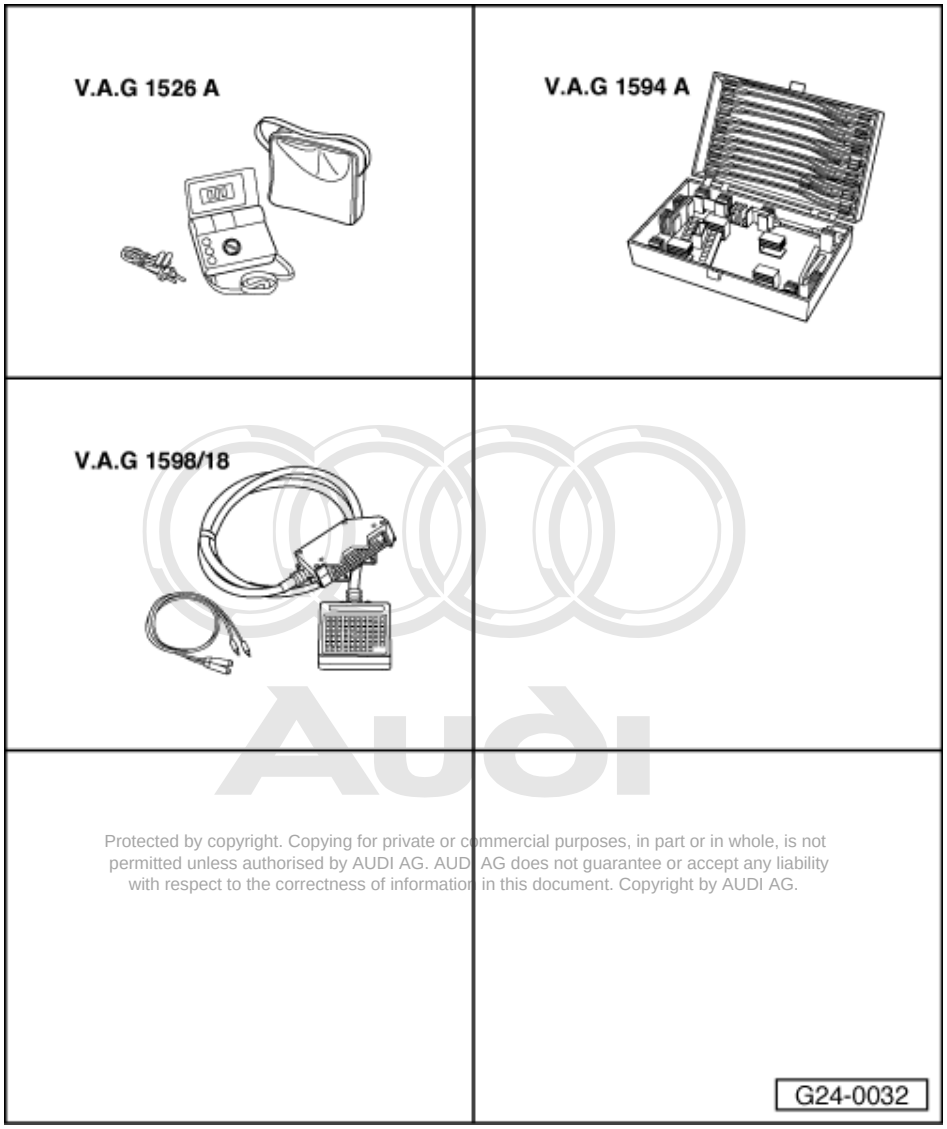
=> "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder

If no fault is found:

- Replace engine control unit => Page 44 .

4 - Checking throttle valve potentiometer -G69

4.1 - Checking throttle valve potentiometer -G69



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Special tools and workshop equipment required

- V.A.G 1526 A
- V.A.G 1594 A
- V.A.G 1598/18

Note:

The throttle valve potentiometer -G69 provides the engine control unit with information on the throttle valve position.

Checking internal resistance

- Detach air cleaner.
- Unplug connector at throttle valve potentiometer.

Vehicles with manual gearbox:

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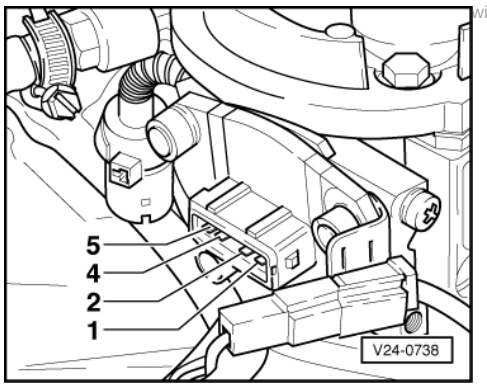
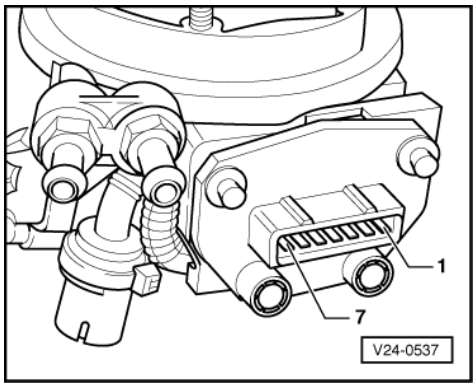


- -> Connect up multimeter for resistance measurement as follows.

Contact	Test condition	Specification
1 + 5	-	0.52 ... 1.3 kω
1 + 2	Open throttle valve as far as1/4open position	Increasing 0.6 ... 3.5 kω
1 + 4	Open throttle valve as far as1/4open position	Constant approx. 0.6 kω
	Open throttle valve from1/4open to full throttle position	Increasing 0.6 ... 6.6 kω

Vehicles with automatic gearbox:



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

Contact	Test condition	Specification
1 + 7	-	0.52 ... 1.3 kω

Contact	Test condition	Specification
1 + 2	Open throttle valve as far as1/4open position	Increasing 0.6 ... 3.5 kω
1 + 6	Open throttle valve as far as 1/4 open position	Constant approx. 0.6 kω
	Open throttle valve from 1/4 open to full throttle position	Increasing 0.6 ... 6.6 kω

All models:

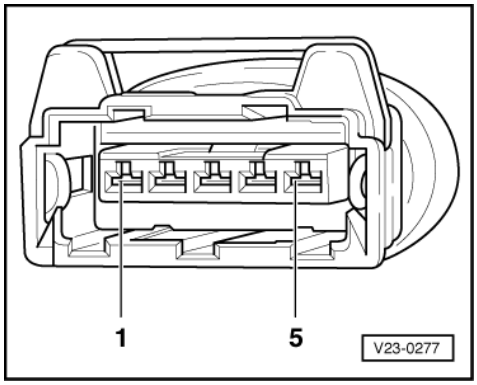
If a reading does not match specification:

- Replace throttle valve potentiometer.

Checking wiring

- With ignition switched off, connect test box V.A.G 1598/18 to engine control unit connector => Page 43 .

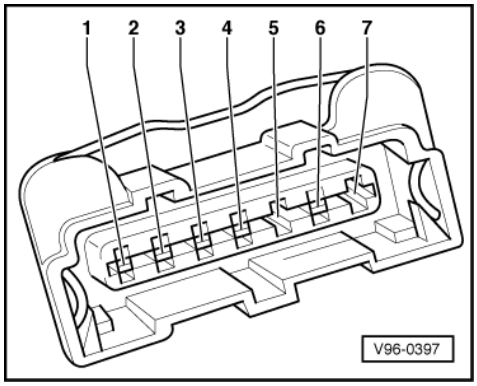
Vehicles with manual gearbox:



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

Connector Contact	Test box V.A.G 1598/18 Socket
1	17
2	41
4	18
5	14

Vehicles with automatic gearbox:



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

Connector Contact	Test box V.A.G 1598/18 Socket
1	17
2	41
6	18
7	14

All models:

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

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

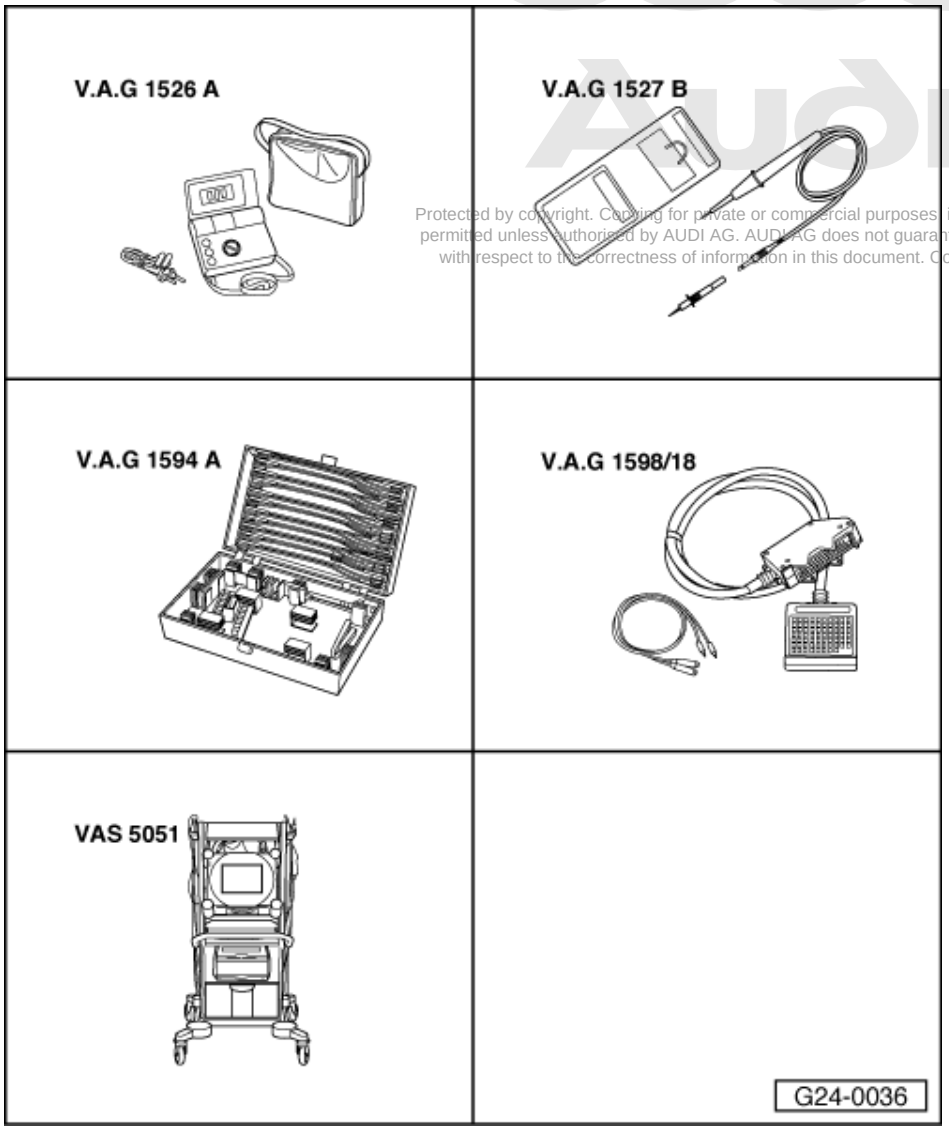
Note:

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

If wiring is OK:

- Replace engine control unit => Page 44 .

4.2 - Checking throttle valve positioner -V60



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Special tools and workshop equipment required

- V.A.G 1526 A
- V.A.G 1527 B
- V.A.G 1594 A
- V.A.G 1598/18
- VAS 5051 with VAS 5051/1 and VAS 5051/2

or

- V.A.G 1551 with V.A.G 1551/1

Note:

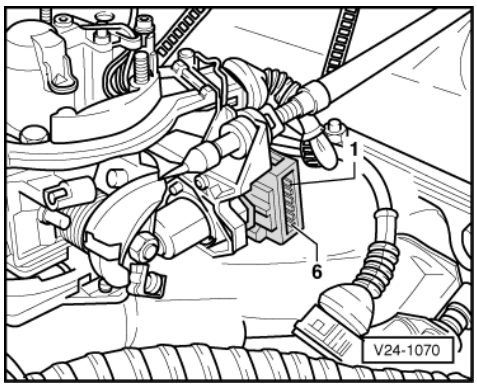
The throttle valve positioner -V60 is an electric motor. When engine is idling, it actuates throttle valve by way of a gear drive for idling-speed control.

If throttle valve positioner does not react during final control diagnosis:

Checking internal resistance

- Detach air cleaner.
- Unplug connector at throttle valve positioner.

Vehicles with manual gearbox:



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- -> Connect up multimeter for resistance measurement between contacts 1 and 6.

Vehicles with automatic gearbox:

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

All models:

- Specification: 3 ... 200 ω

If reading does not match specification:

- Replace throttle valve positioner.

Note:

After replacing throttle valve positioner -V60, adjust idling switch -F60 => Page 85 .

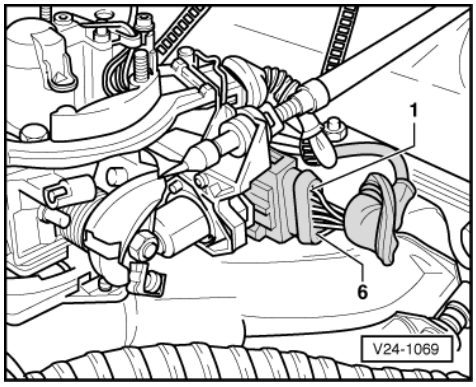
Checking actuation

Test requirement:

- Idling-speed switch OK

- Push back rubber grommet of connector for throttle valve positioner but leave connector attached.

Vehicles with manual gearbox:



- -> Connect up voltage tester V.A.G 1527 B between contacts 1 and 6.

Vehicles with automatic gearbox:

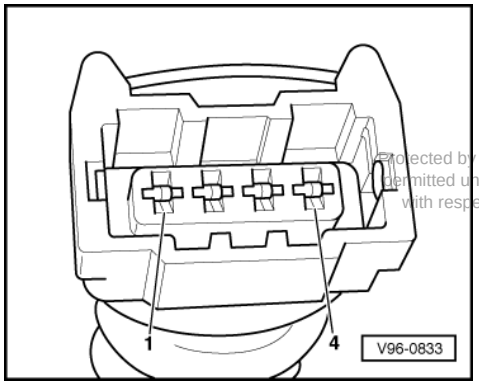
- Connect up voltage tester V.A.G 1527 B between contacts 1 and 2.

All models:

- Start final control diagnosis => Page 12 and actuate throttle valve positioner -V60.
  - LED must flash

If LED does not flash:

- With ignition switched off, connect test box V.A.G 1598/18 to engine control unit connector => Page 43 .



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

Vehicles with manual gearbox:

Connector Contact	Test box V.A.G 1598/18 Socket
1	26
6	2

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Vehicles with automatic gearbox:

Connector Contact	Test box V.A.G 1598/18 Socket
1	26
2	2

All models:

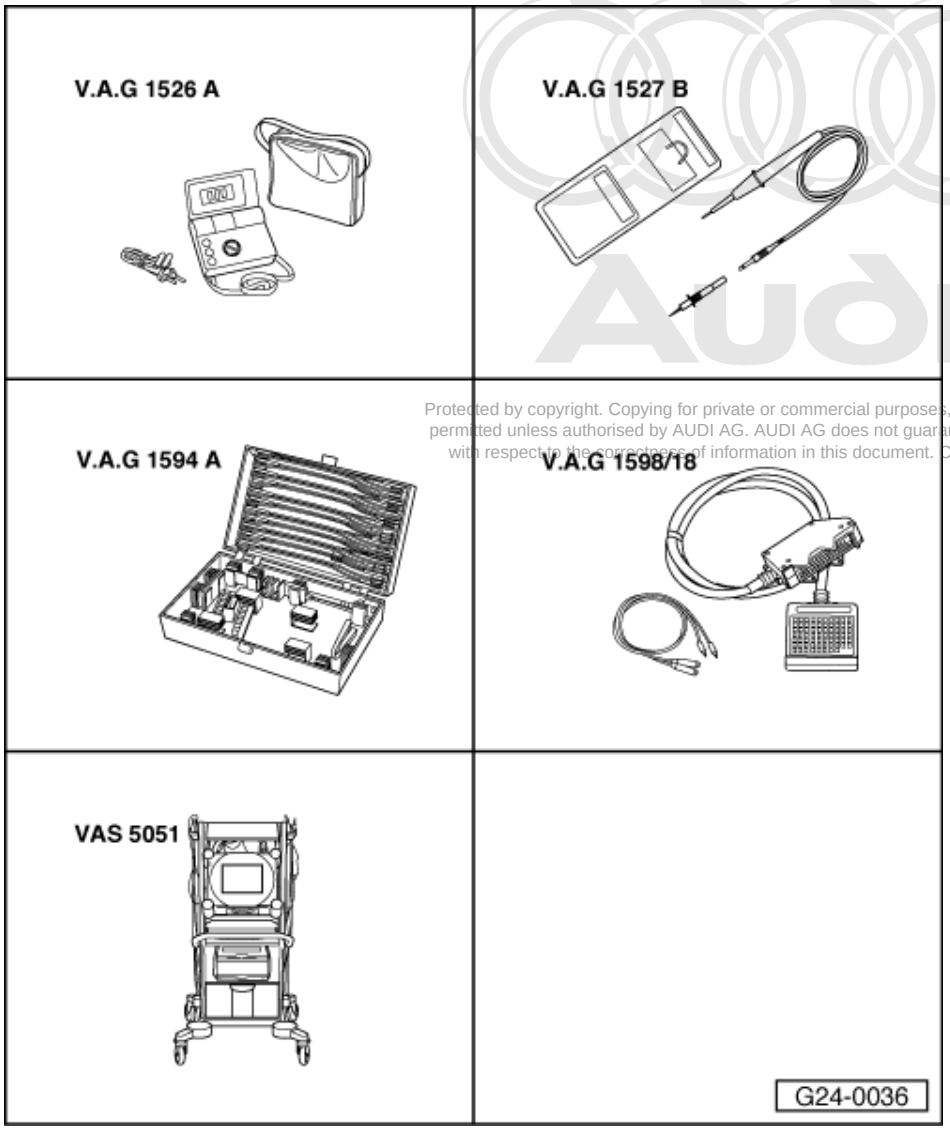
- If necessary, eliminate open circuit in wiring/short circuit.

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

If wiring is OK:

- Replace engine control unit => Page 44 .

4.3 - Checking throttle valve positioner sender -G127



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Special tools and workshop equipment required

- V.A.G 1526 A
- V.A.G 1527 B
- V.A.G 1594 A
- V.A.G 1598/18
- VAS 5051 with VAS 5051/1 and VAS 5051/2

or

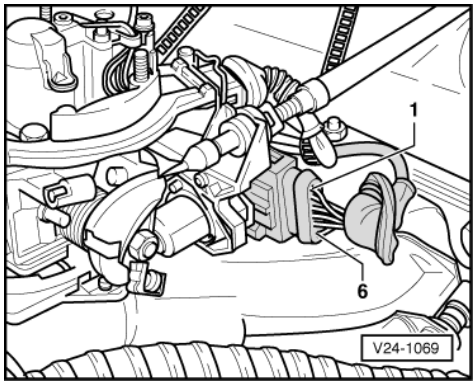
- V.A.G 1551 with V.A.G 1551/1

Notes:

- Throttle valve positioner sender -G127 is only featured by vehicles with manual gearbox.
- After replacing throttle valve positioner sender -G127, adjust idling switch -F60 => Page 85 .

Test sequence

- Push back protective cap at connector.

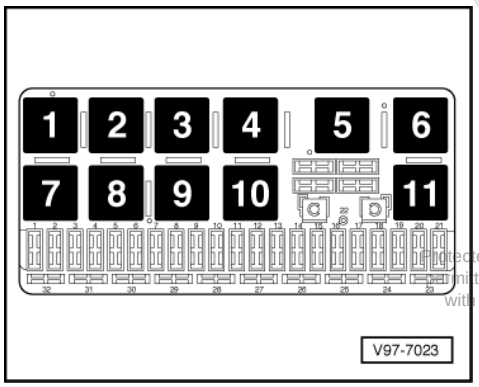


- -> Connect up voltage tester V.A.G 1527 B between contacts 2 and 4.
- Start final control diagnosis => Page 12 and actuate throttle valve positioner -V60.
  - LED must flash

If LED does not flash:

- Check wiring.

Checking wiring



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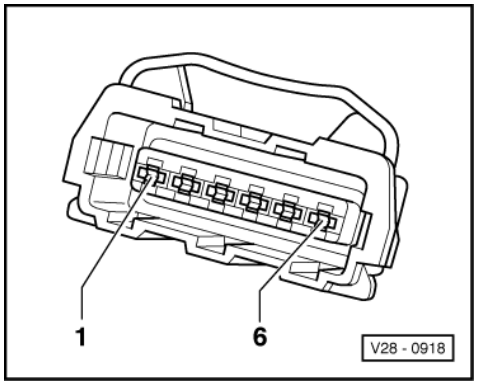
Test requirement:

- -> Fuse S28 OK (in fuse box)

- Switch off ignition.
- Unplug connector.



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

Connector Contact	Measure to
4	Battery positive

- Specification: approx. battery voltage

Connector Contact	Measure to
3	Engine earth

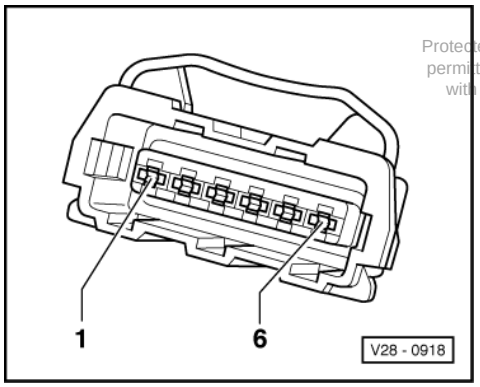
- Switch on ignition.
  - Specification: approx. battery voltage

If reading does not match specification:

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

If no fault is found in wiring:

- With ignition switched off, connect test box V.A.G 1598/18 to engine control unit connector => Page 43 .



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

Connector Contact	Test box V.A.G 1598/18 Socket
2	16

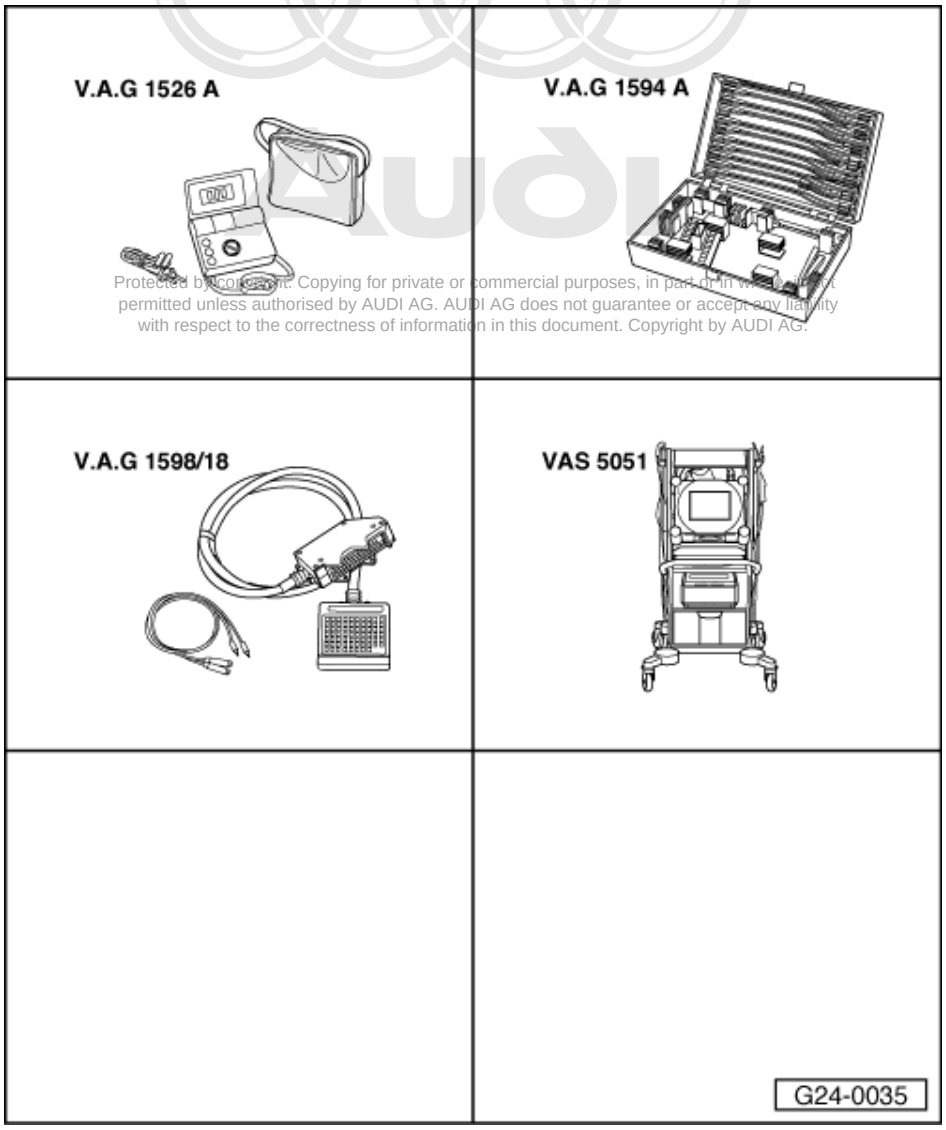
- If necessary, eliminate open circuit in wiring/short circuit.

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

If wiring is OK and there is no actuation:

- Replace engine control unit => Page 44 .

4.4 - Checking and adjusting idling switch -F60



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Special tools and workshop equipment required

- V.A.G 1526 A
- V.A.G 1594 A
- V.A.G 1598/18
- VAS 5051 with VAS 5051/1 and VAS 5051/2

  or

- V.A.G 1551 with V.A.G 1551/1

Note:

Idling-speed switch is located in throttle valve positioner -V60.

Test requirement:

- Throttle cable setting OK

Checking operation

```
Reading measured value block 1
     1     2     3     4
```

-> Read measured value block, Display group 001 => Page 17 .
- Check display in zone 4.
  - Specification: X1XXXXXX

Note:

Switching inputs at locations marked "X" can be ignored for test purposes.

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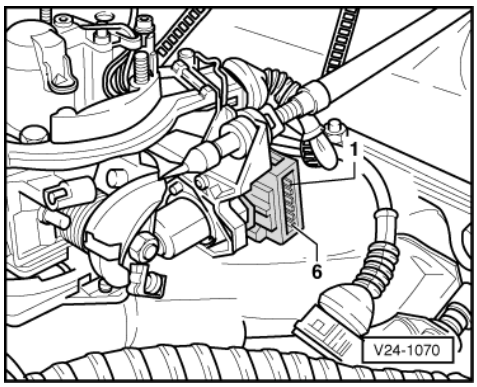
- Open throttle valve slightly.
  - Specification: X0XXXXXX

If display is not as described:

- Check wiring.

Checking wiring

- Unplug connector at idling-speed switch.
- With ignition switched off, connect test box V.A.G 1598/18 to engine control unit connector => Page 43 .



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

Vehicles with manual gearbox:

Connector Contact	Test box V.A.G 1598/18 Socket
5	10

Vehicles with automatic gearbox:

Connector Contact	Test box V.A.G 1598/18 Socket
3	10

All models:

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

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

If no fault is found in wiring:

- Replace idling-speed switch.

Adjusting idling-speed switch

Notes:

- Adjustment is only necessary on replacing throttle valve positioner or bottom part of injection unit.
- Idling switch -F60 can only be adjusted with throttle valve positioner fully extended.

- Detach air cleaner.

```
System in basic setting     1
    1     2     3     4
```

-> Start basic setting, display group 001, ignition on =>Page 13 .
- Full extension of throttle valve positioner
- Push back protective cap at connector.

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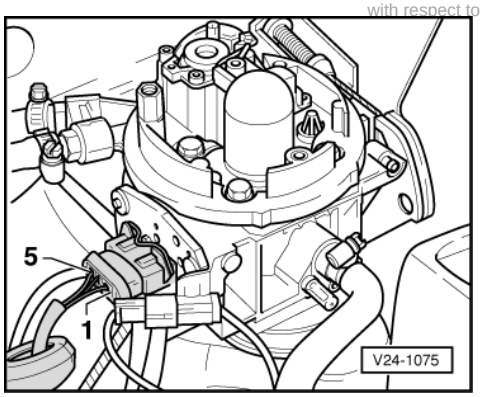
Vehicles with manual gearbox:



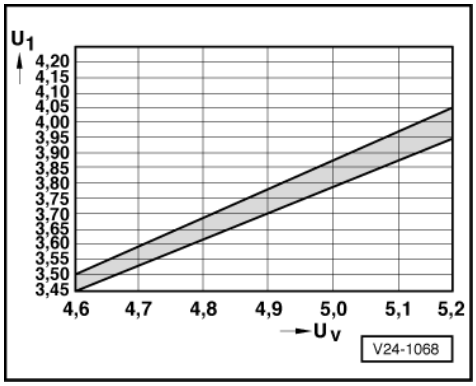
- -> Connect up multimeter for voltage measurement between contacts 1 and 5.

Vehicles with automatic gearbox:

- Connect up multimeter for voltage measurement between contacts 1 and 7.

All models:

- Switch on ignition.
- Read supply voltage (UV) off multimeter and note down value.
- Connect up multimeter for voltage measurement between contacts 1 and 2.

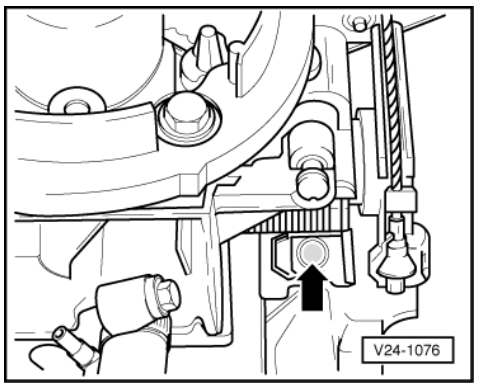


- Read potentiometer voltage (U1) off multimeter and note down value.

UV - -> Supply voltage between contacts 1 + 5 (vehicles with manual gearbox) or 1 + 7 (vehicles with automatic gearbox)
U1 - Potentiometer voltage between contacts 1 + 2 (all models)

- Compare potentiometer voltage (U1) allowing for supply voltage (UV).

If potentiometer voltage is below tolerance limit:



- -> Screw in stop bolt -arrow-.

If potentiometer voltage is above tolerance limit:

- Screw out stop bolt.

If adjustment cannot be made:

- Replace bottom part of injection unit.

If readings match specifications:

- Press ⇒key.
  - Throttle valve positioner must be retracted to its initial position
- Secure stop bolt with locking fluid.

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5 - Checking intake air preheating

5.1 - Checking intake air preheating

Test requirement:

- Engine cold (intake air temperature less than + 35 °C)

Test sequence

- Detach air cleaner cover and take out filter element.
- Check position and freedom of movement of control flap in air cleaner housing.
  - Control flap must seal off warm-air connection
- Start engine and leave it idling.
  - Control flap must seal off cold-air connection

If control flap does not react as described:

- Pull off vacuum pipes at temperature regulator and connect them together.
  - Vacuum unit is defective if warm-air connection remains sealed off

- Temperature regulator is defective if control flap now seals off cold-air connection

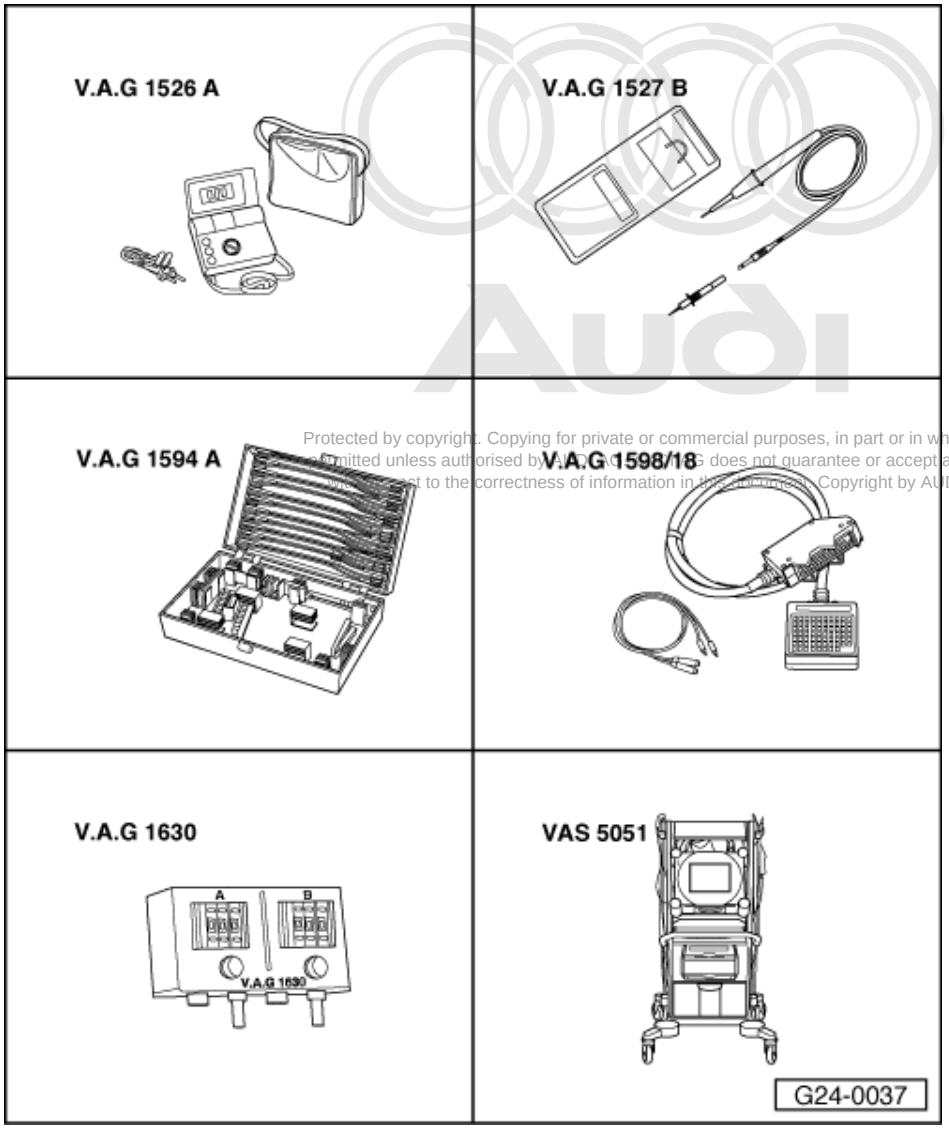
Note:

When the engine is running, the position of the control flap is governed by the temperature of the temperature regulator.

Temperature	Position
Less than 35 °C	Temperature regulator open
	Cold-air connection sealed off
Greater than 45 °C	Temperature regulator closed
	Warm-air connection sealed off

6 - Checking intake-manifold preheating

6.1 - Checking intake-manifold preheating



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Special tools and workshop equipment required

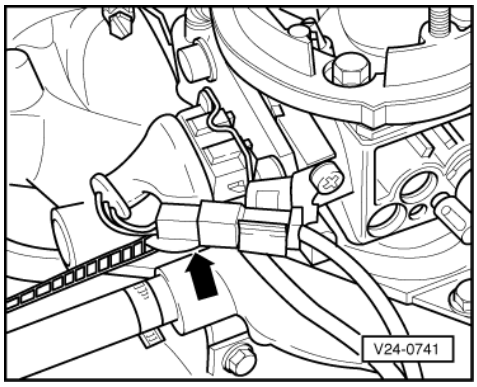
- V.A.G 1526 A
- V.A.G 1527 B
- V.A.G 1594 A
- V.A.G 1598/18
- V.A.G 1630
- VAS 5051 with VAS 5051/1 and VAS 5051/2

or

- V.A.G 1551 with V.A.G 1551/1

6.2 - Checking intake-manifold preheating heater element -N51

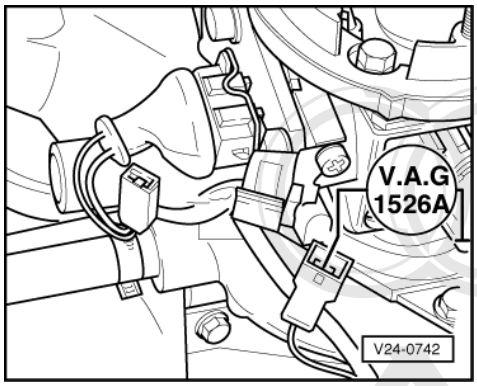
Test requirement:



- Engine cold

Test sequence

- -> Take connector of intake-manifold preheating heater element -arrow- out of holder.
- Unplug connector.



- -> Connect up multimeter for resistance measurement between connector and engine earth.
  - Specification: 0.25 ... 0.50 ω (at ambient temperature)

If reading does not match specification:

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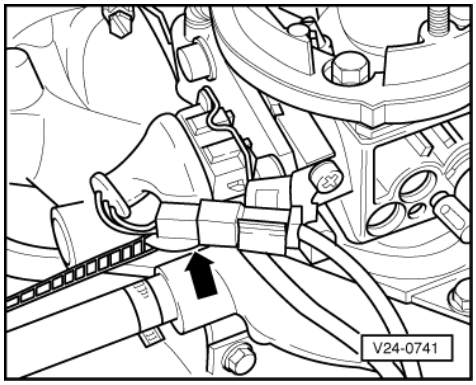
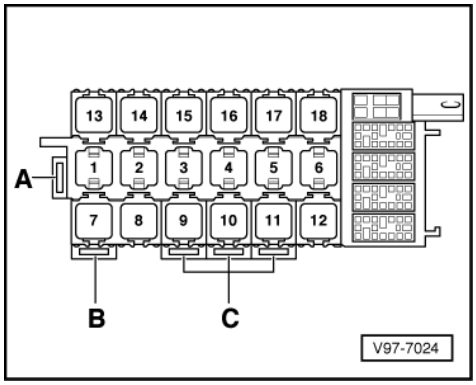
- Replace intake-manifold preheating heater element.

6.3 - Checking intake-manifold preheating relay -J81



- -> Take connector of intake-manifold preheating heater element -arrow- out of holder.
- Unplug connector.
- Connect up voltage tester V.A.G 1527 B between white connector and engine earth.
- Start final control diagnosis => Page 12 and actuate intake-manifold preheating relay -J81.



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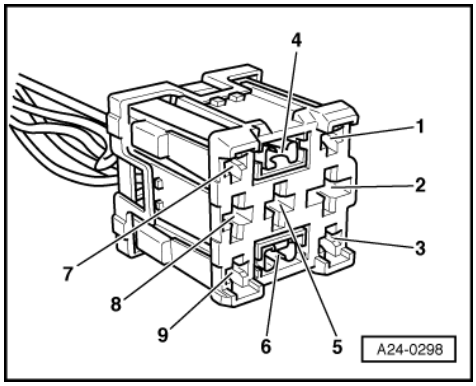
- -> Intake-manifold preheating relay (in auxiliary relay carrier at front beneath dash panel on left, position 14) must click and LED must flash

A - If relay does not click:
- Check power supply of intake-manifold preheating relay=> Page 89 .
- Check actuation of intake-manifold preheating relay => Page 90 .
- Check signal processing in engine control unit =>Page 91 .

B - If relay clicks, but LED does not flash:
- Check power supply wire of intake-manifold preheating heater element =>Page 92 .

Checking power supply of intake-manifold preheating relay
- Pull off intake-manifold preheating relay.



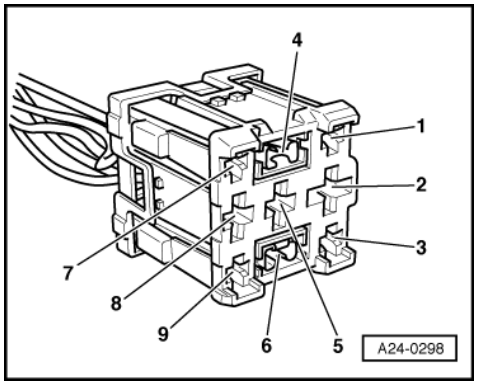
- -> Connect up multimeter for voltage measurement as follows.

Auxiliary relay carrier at front beneath dash panel on left, position 14 Contact	Measure to
2	Engine earth

  - Specification: approx. battery voltage

If reading does not match specification:

- Use current flow diagram to check wiring.



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

Auxiliary relay carrier at front beneath dash panel on left, position 14 Contact	Measure to
6	Engine earth

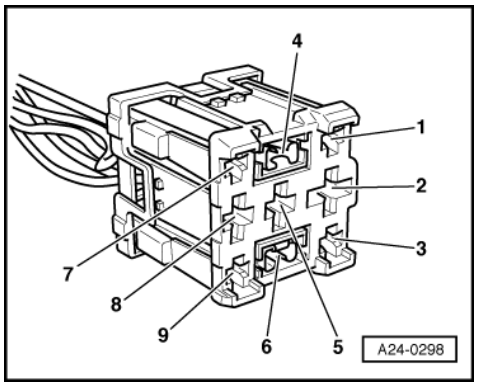
- Switch on ignition.
  - Specification: approx. battery voltage

If reading does not match specification:

- Use current flow diagram to check wiring.

Checking actuation of intake-manifold preheating relay

- Switch off ignition.
- Pull off intake-manifold preheating relay.



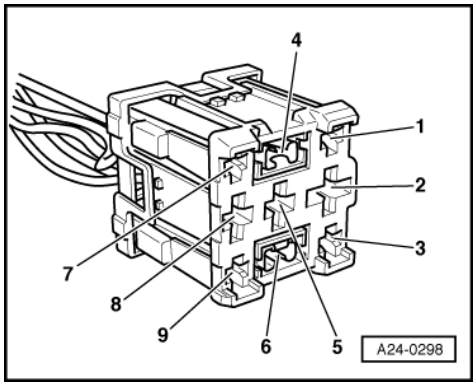
- -> Connect up voltage tester V.A.G 1527 B as follows.

Auxiliary relay carrier at front beneath dash panel on left, position 14 Contact	Measure to
4	Battery positive

- Start final control diagnosis => Page 12 and actuate intake-manifold preheating relay -J81.
  - LED must flash

If LED does not flash:

- With ignition switched off, connect test box V.A.G 1598/18 to engine control unit connector => Page 43 .



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

Auxiliary relay carrier at front beneath dash panel on left, position 14 Contact	Test box V.A.G 1598/18 Socket
4	28

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

If no fault is found:

- Replace intake-manifold preheating relay -J81.

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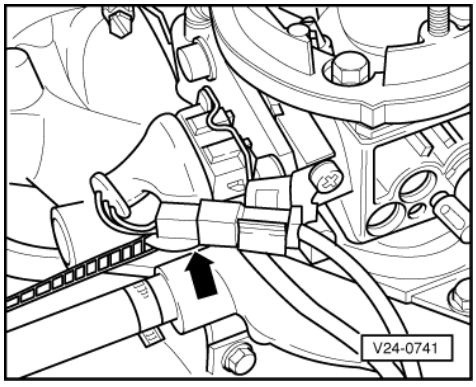
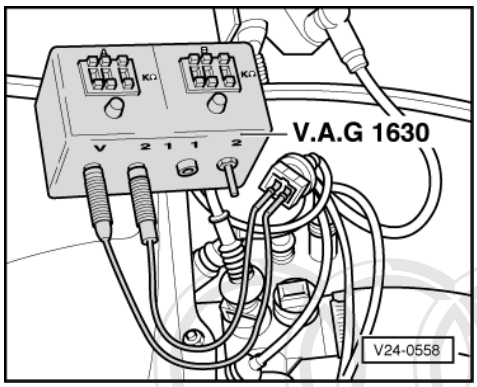
Checking signal processing in engine control unit



- -> Take connector of intake-manifold preheating heater element -arrow- out of holder.
- Unplug connector.
- Connect up multimeter for voltage measurement between white connector and engine earth.

- Unplug connector at coolant temperature sender.



- -> Connect side A of digital potentiometer V.A.G 1630 to unplugged connector of coolant temperature sender.
- Set side A of V.A.G 1630 to 1.5 kω .
- Start engine and leave it idling.
  - Specification: approx. battery voltage
- Set side A of V.A.G 1630 to 0.4 kω .
  - Specification: 0 V

If readings do not match specifications and no faults have been found as yet:

- Replace engine control unit => Page 44 .

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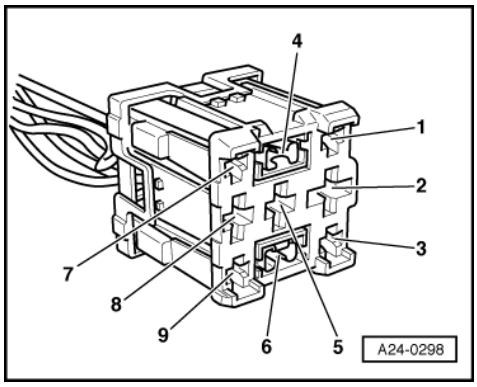
Checking power supply wire of intake-manifold preheating heater element -N51



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

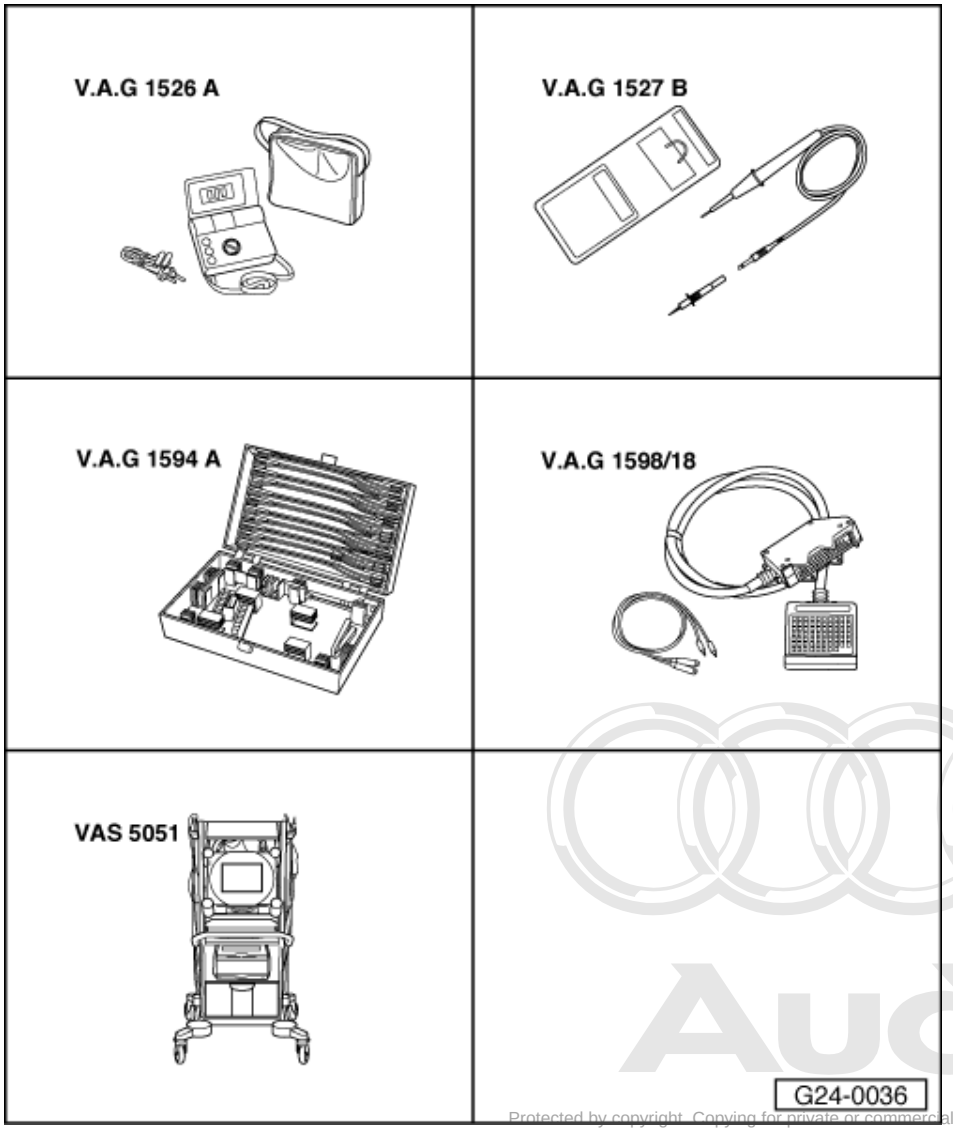
Auxiliary relay carrier at front beneath dash panel on left, position 14 Contact	Connector
8	white

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

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

7 - Checking additional signals

7.1 - Checking additional signals



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Special tools and workshop equipment required

- V.A.G 1526 A
- V.A.G 1527 B
- V.A.G 1594 A
- V.A.G 1598/18
- VAS 5051 with VAS 5051/1 and VAS 5051/2

  or

- V.A.G 1551 with V.A.G 1551/1

7.2 - Checking speed increase for air conditioner

Note:

The signal from the air conditioner increases the pilot control value for idling-speed stabilisation to keep idling-speed stabilisation in control mid-range.

Test sequence

```
Reading measured value block 1
     1     2     3     4
```

-> Read measured value block, Display group 001 => Page 17 .

- Check display in zone 4.
  - Specification: XXXX0XXXX

Note:

Switching inputs at locations marked "X" can be ignored for test purposes.

- Switch on air conditioner.
  - Specification: XXXX1XXX

If display is not as described:

- With ignition switched off, connect test box V.A.G 1598/18 to engine control unit connector => Page 43 .

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

Test box V.A.G 1598/18 Socket	Air-conditioner switch -E30 Contact
33	=> "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder

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

=> Heating, Air Conditioner; Repair Group 87; Air Conditioner; Servicing components of manually controlled air conditioner Air Conditioner Servicing components of manually controlled air conditioner

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7.3 - Checking air-conditioner compressor shutoff

Note:

On accelerating from a standstill/low vehicle speed, air-conditioner compressor is switched off for approx. 12 seconds by engine control unit. If accelerator pedal is released sooner, time decreases to min.

3 seconds.

Test requirements:

- No faults stored in fault memory
- Vehicles with automatic gearbox: Selector lever set to P or N
- Engine idling
- Vehicle at ambient temperature (more than +15 °C)
- Air conditioner OK

Test sequence

```
Reading measured value block 1
    1     2     3     4
```

-> Read measured value block, Display group 001 => Page 17 .
- Switch on air conditioner.
- Check display in zone 4.
  - Specification: XXX1XXXX

Note:

Switching inputs at locations marked "X" can be ignored for test purposes.

- Give short burst of full throttle; engine does not have to reach maximum speed.
  - Specification: XXX0XXXXX

If display is not as described:

- With ignition switched off, connect test box V.A.G 1598/18 to engine control unit connector => Page 43 .
- Check for open circuit and short to earth/positive in the following wiring.

Test box V.A.G 1598/18 Socket	Magnetic coupling control unit -J153 Contact
35	=> "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder

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

=> Heating, Air Conditioner; Repair Group 87; Air Conditioner; Servicing components of manually controlled air conditioner Air Conditioner Servicing components of manually controlled air conditioner

7.4 - Checking engine-speed signal

Notes:

- Rev counter in dash panel insert is actuated by engine control unit.
- Checking engine-speed signal:

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

7.5 - Checking vehicle-speed signal

Note:

The vehicle-speed signal is generated by the speedometer sender

-G22 (at the gearbox) and conditioned in the dash panel insert.

Test requirement:

- Speedometer function and display OK

Test sequence

Attention:
Attach fault reader to rear seat and operate it from there. Pay attention to safety precautions => Page 27 .

```
Reading measured value block 4
     1     2     3     4
```

-> Read measured value block, Display group 004 => Page 20 .
- Perform test drive.

Note:

Display zone 3 does not indicate vehicle speed, but rather a vehicle-speed signal.

- Observe display in zone 3 on starting off.
  - Specification at up to 4 km/h: 0
  - Specification when driving at 4 ... 7 km/h: 4
  - Specification when driving at more than 7 km/h: Greater than 7

If display is not as described:

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- With ignition switched off, connect test box V.A.G 1598/18 to engine control unit connector => Page 43 .

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

Test box V.A.G 1598/18 Socket	Dash panel insert Contact
36	=> "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder

- If necessary, eliminate open circuit in wiring/short circuit.
- If wiring is OK, continue fault-finding in accordance with fault-finding program "Checking vehicle-speed signal".

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

7.6 - Checking gear signal

Note:

This signal enables the engine control unit to detect the selector lever position with an automatic gearbox. If gear is engaged (selector lever set to R / D / 3 / 2 / 1) idling speed is lowered by approx. 50 rpm to reduce tendency of vehicle to creep.

Test requirement:

- Control unit encoding OK => Page 14

Test sequence

```
Reading measured value block 1
     1     2     3     4
```

-> Read measured value block, Display group 001 => Page 17 .
- Check display in zone 4.
- Set selector lever to P or N.
  - Specification: XXXXXXX0

Note:

Switching inputs at locations marked "X" can be ignored for test purposes.

- Press foot brake and engage gear.
  - Specification: XXXXXXX1

If display is not as described:

- With ignition switched off, connect test box V.A.G 1598/18 to engine control unit connector => Page 43 .
- Check for open circuit and short to earth/positive in the following wiring.

Test box V.A.G 1598/18 Socket	Selector lever lock control unit -J221 Contact
12	=> "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder

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

If wiring is OK:

- Establish defect in selector lever lock control unit -J221/in automatic gearbox control unit.

7.7 - Checking ignition timing retardation on changing gear

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Notes:

- The following test is only to be performed if fault "Engine/gearbox, electrical connection" is displayed in fault memory of automatic gearbox control unit.
- This signal briefly retards the ignition timing on changing gear to reduce gearshift jolt.

Test requirement:

- Control unit encoding OK => Page 14

Test sequence

Attention:
Attach fault reader to rear seat and operate it from there. Pay attention to safety precautions => Page 27 .

```
Reading measured value block 1
     1     2     3     4
```

-> Read measured value block, Display group 001 => Page 17 .

- Check display in zone 4.
  - Specification: XXXXXX1X

Note:

Switching inputs at locations marked "X" can be ignored for test purposes.

- Perform test drive.
  - Specification: On changing gear, display must briefly switch to XXXXXX0X

If display is not as described:

- With ignition switched off, connect test box V.A.G 1598/18 to engine control unit connector => Page 43 .

Test box V.A.G 1598/18 Socket	Automatic gearbox control unit Contact
34	=> "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder

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

If wiring is OK:
- Establish defect in automatic gearbox control unit.

8 - Vacuum diagram

8.1 - Vacuum diagram

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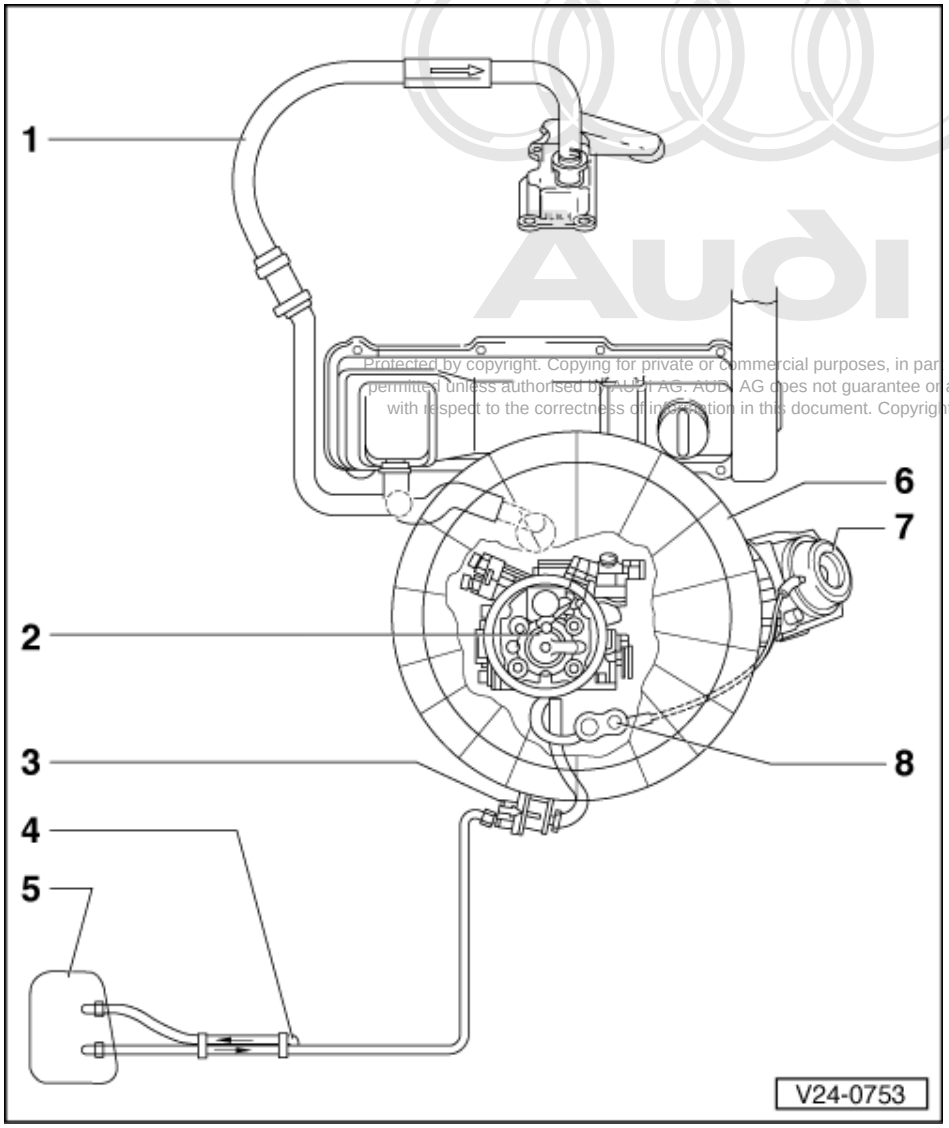

1 Crankcase breather
2 Injection unit
3 Activated charcoal filter solenoid valve -N80
4 Fuel pipe
- From fuel tank

5 Activated charcoal filter

6 Air cleaner

7 Vacuum unit
- For intake-air preheating

8 Temperature regulator
- For intake-air preheating
- Installation position: Brass hose connection faces vacuum unit for intake-air preheating
- Checking intake-air preheating
  => Page 86

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28 - Ignition system

1 - Checking ignition system

1.1 - Checking ignition system

1.2 - Safety precautions

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

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

- Vehicles with a definite or suspected fault in the ignition system are only to be towed after unplugging connector at output stage.
- Never connect capacitor to terminal 1 (-).
- 1 kω ignition distributor rotor (identification: R1) is never to be replaced with a different rotor (including radio interference suppression).
- For connection of measuring instruments (e.g. voltage tester V.A.G 1527 B, portable multimeter V.A.G 1526 A), always make use of adapter set V.A.G 1594 A.

1.3 - Technical data

Engine codes			ABT (2.0 l / 66 kW engine)	ABM (1.6 l / 52 kW engine)
Ignition point 1)	Test specification	° before TDC	4 ... 8	
	Setting	° before TDC	6 ± 1	
	Engine speed	rpm	750 ... 1000	800 ... 1000
Firing order			1-3-4-2	
Spark plugs 2)	Tightening torque	Nm	30	

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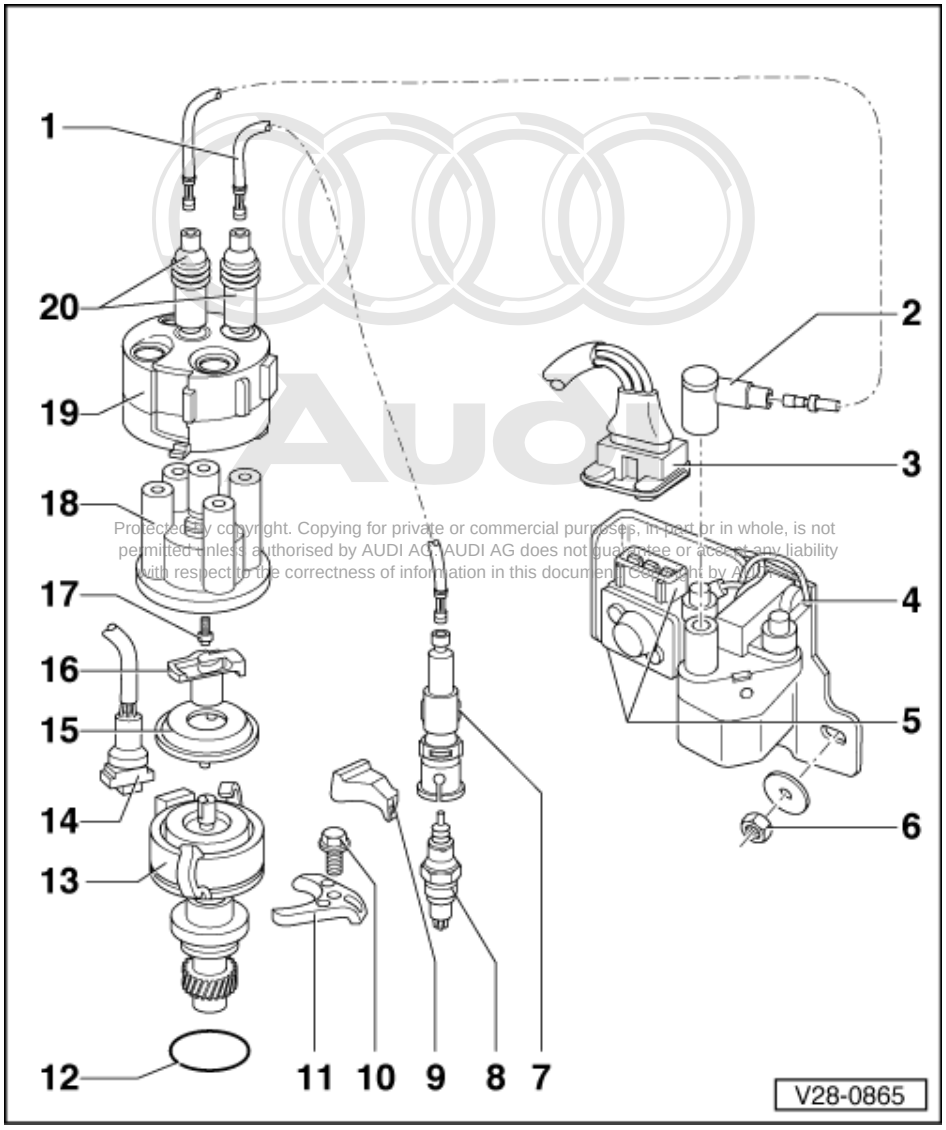
1) Engine-oil temperature at least 80 ° C

2) Current values:

=> Exhaust emission test binder

1.4 - Servicing ignition system



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1 Ignition cable
- Check for continuity

2 Interference suppression connector
- 0.6...1.4 kω

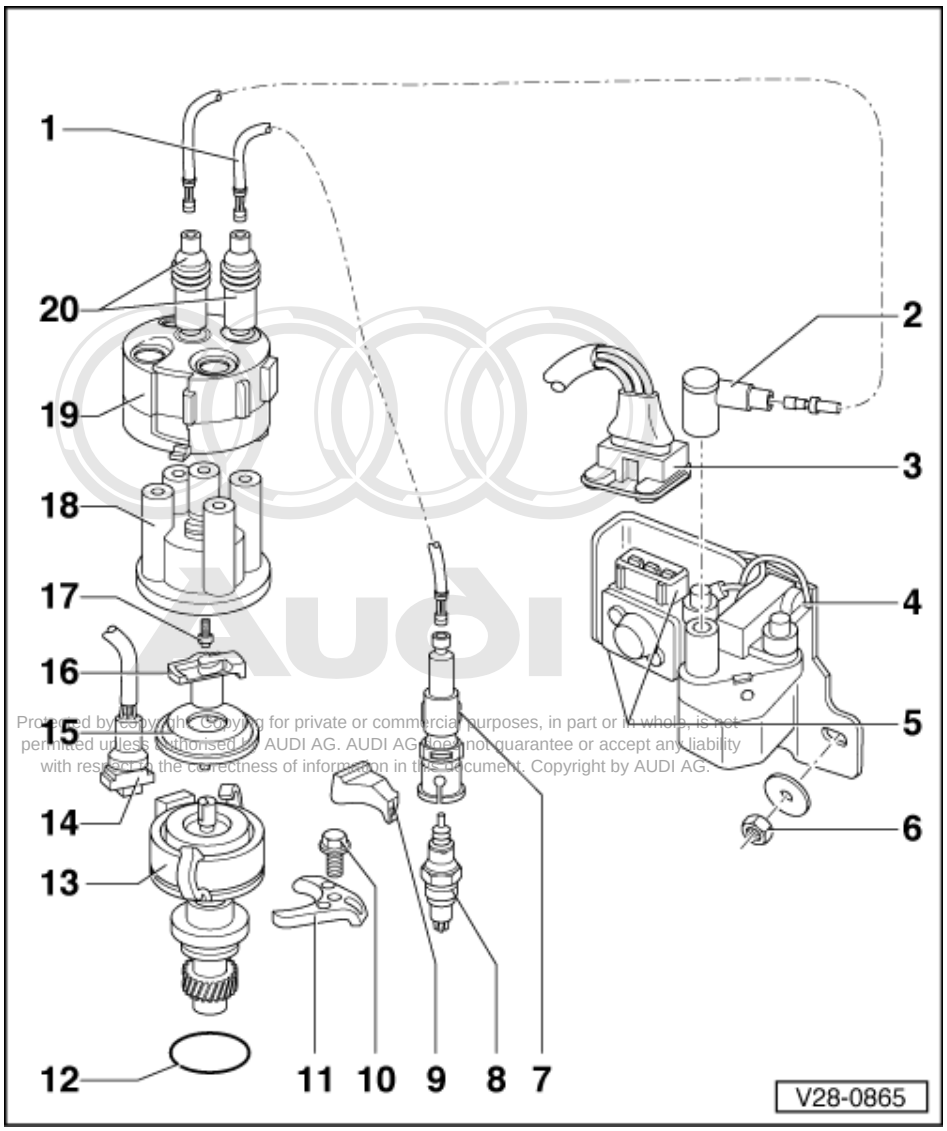
3 3-pin connector
- Press wire clip to unplug

4 Ignition transformer -N152
- Checking => Page 107

5 Output stage for ignition transformer
- Checking => Page 109

6 10 Nm

7 Spark plug connector
- 4...6 kω



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8 Spark plug, 30 Nm

- Type and spark gap

=> Exhaust emission test binder

9 Securing cap

10 25 Nm

11 Clamp

12 O-ring

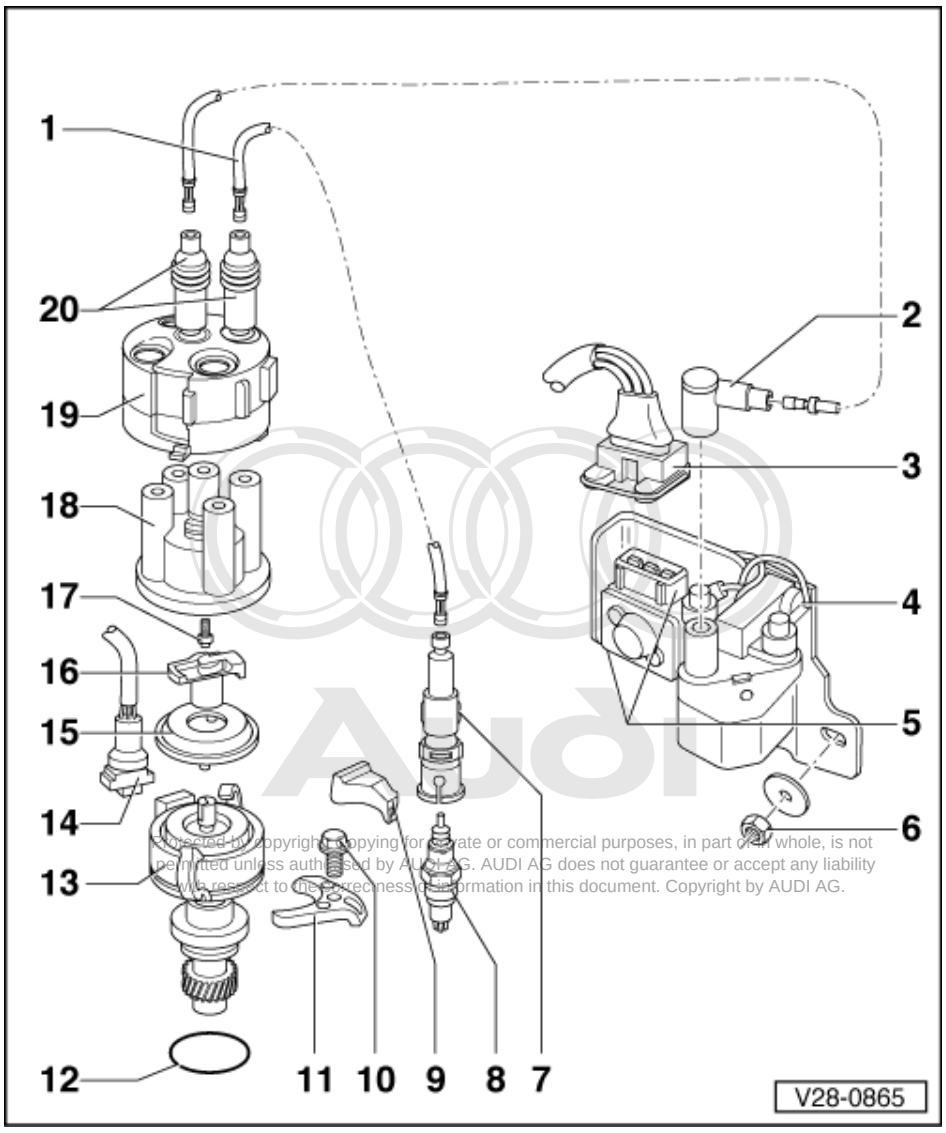
- Replace if damaged

13 Ignition distributor

- Installing =>Page 104
- Checking and adjusting ignition point => Page 105
- Checking Hall sender => Page 120

14 3-pin connector

- Press wire clip to unplug



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15 Dust cap

16 Ignition distributor rotor

- 0.6...1.4 kω

17 Carbon brush with spring

- Check for wear, damage and freedom of movement

18 Distributor cap

- Watch out for cracks and traces of leakage current
- Check contact wear
- Clean before fitting

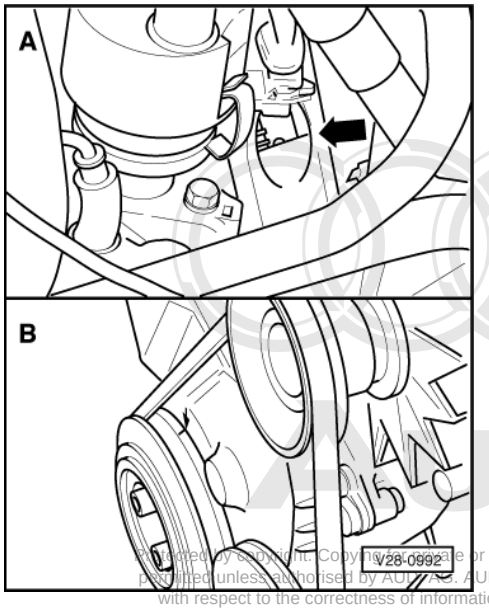
19 Screen

- For radio interference suppression

20 Interference suppression connector

- 0.6...1.4 kω

1.5 - Installing ignition distributor



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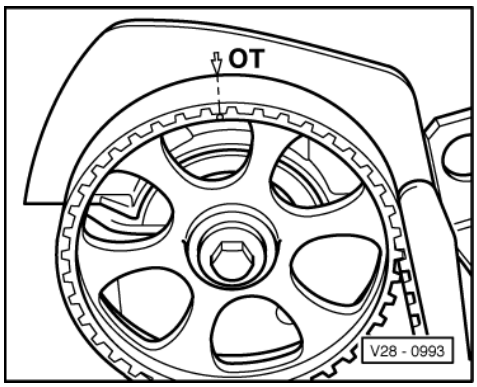
A - Engine in position:

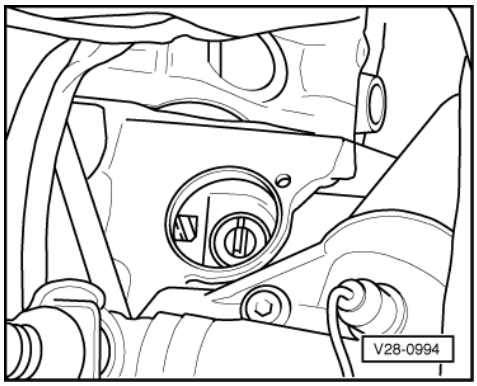
- -> Set flywheel/drive plate to no. 1 cylinder TDC -arrow-.

B - Engine removed:

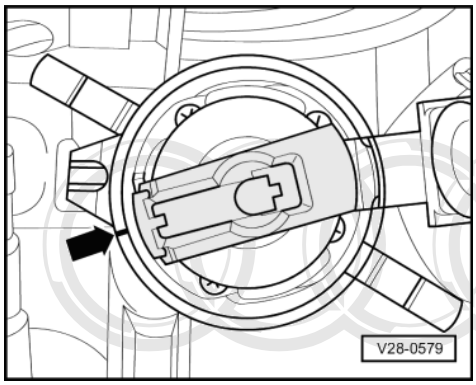
- Mark on vibration damper (pulley) must coincide with arrow on toothed belt guard.



- -> Mark on camshaft sprocket must coincide with arrow on upper toothed belt guard.



- -> Position locating lug of oil pump shaft in parallel with crankshaft.



- -> Position distributor rotor such that it faces mark for no. 1 cylinder at distributor housing.
- Insert ignition distributor.
- Clean ignition distributor cap before fitting, watch out for cracks and traces of leakage current and replace if necessary.
- Check and adjust ignition point => Page 105 .

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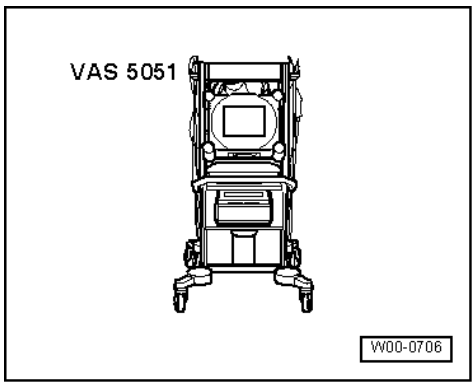
1.6 - Checking and adjusting ignition point

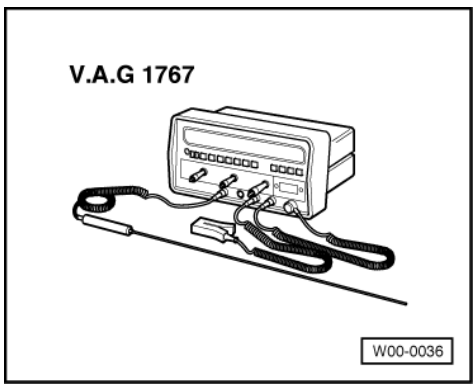
Special tools and workshop equipment required



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

or

- V.A.G 1551 with V.A.G 1551/1



- V.A.G 1767

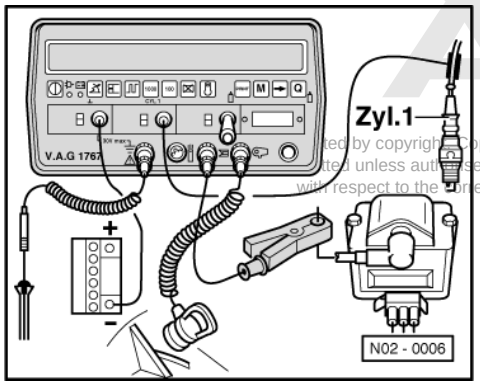
or

- V.A.G 1367 with V.A.G 1367/8

Note:

Ignition point is only to be adjusted if a deviation is found when checking idling speed => Page 46 .

Test sequence



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- -> With ignition switched off, connect up ignition tester V.A.G 1767 (or V.A.G 1367).

=> Operating instructions

Notes:

- Take particular care to ensure that TDC sender of ignition tester V.A.G 1367 is fully inserted in gearbox housing.
- Ignition point is displayed directly on V.A.G 1767 (or V.A.G 1367). There is no need to aim timing light at ignition point notches.
- Incorrect measurements may occur with ignition tester V.A.G 1767 if triggering probe is slightly open (e.g. excessive tension on helical cable).

- Interrogate and erase fault memory => Page 4 .

```
System in basic setting     1
     1     2     3     4
```

-> Start basic setting,Display group 001, engine idling =>Page 13 .

Note:

The displays on the fault reader V.A.G 1551 have no significance for the tests described and can therefore be ignored.

- Read off ignition point on ignition tester V.A.G 1767 (or V.A.G 1367).
  - Test specification: 4 ... 8° before TDC

Note:

If ignition point displayed is outside tolerance, it must be adjusted prior to checking idling speed whilst system is still set to "Basic setting 1".

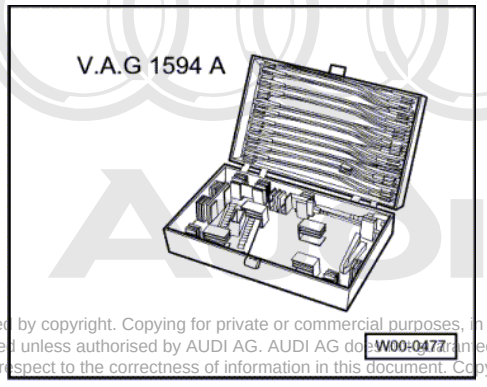
- Adjust ignition point by turning ignition distributor.
  -Setting 6 ±1° before TDC

- Press ⇒key.
- Briefly increase engine speed to 2500 rpm.
- Leave engine idling.
  - Ignition point may fluctuate in range 2 ... 10 ° before TDC
- After adjusting ignition point, check idling speed => Page 46 .

1.7 - Checking ignition transformer-N152

Special tools and workshop equipment required

- V.A.G 1526 A



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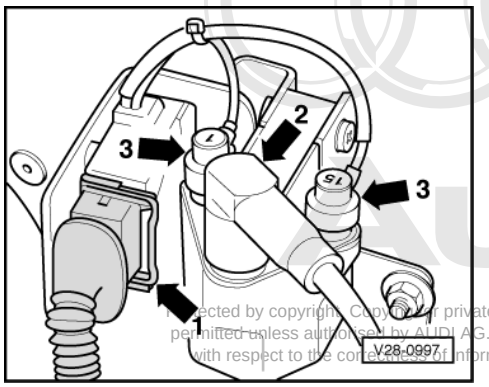
- V.A.G 1594 A

Notes:

- Check for corrosion/damage in wiring between output stage and ignition transformer.



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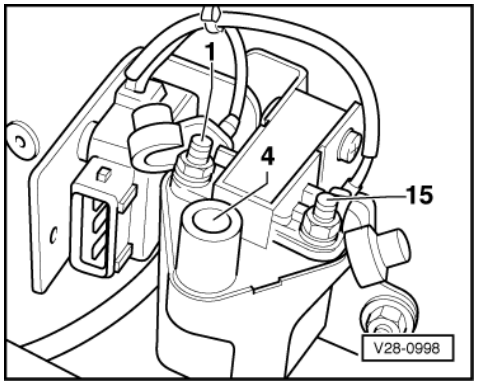
◆ Checking output stage for ignition transformer => Page 109 .

Test sequence

- -> Unplug connector -arrow 1- from output stage and main ignition cable -arrow 2- from ignition transformer.

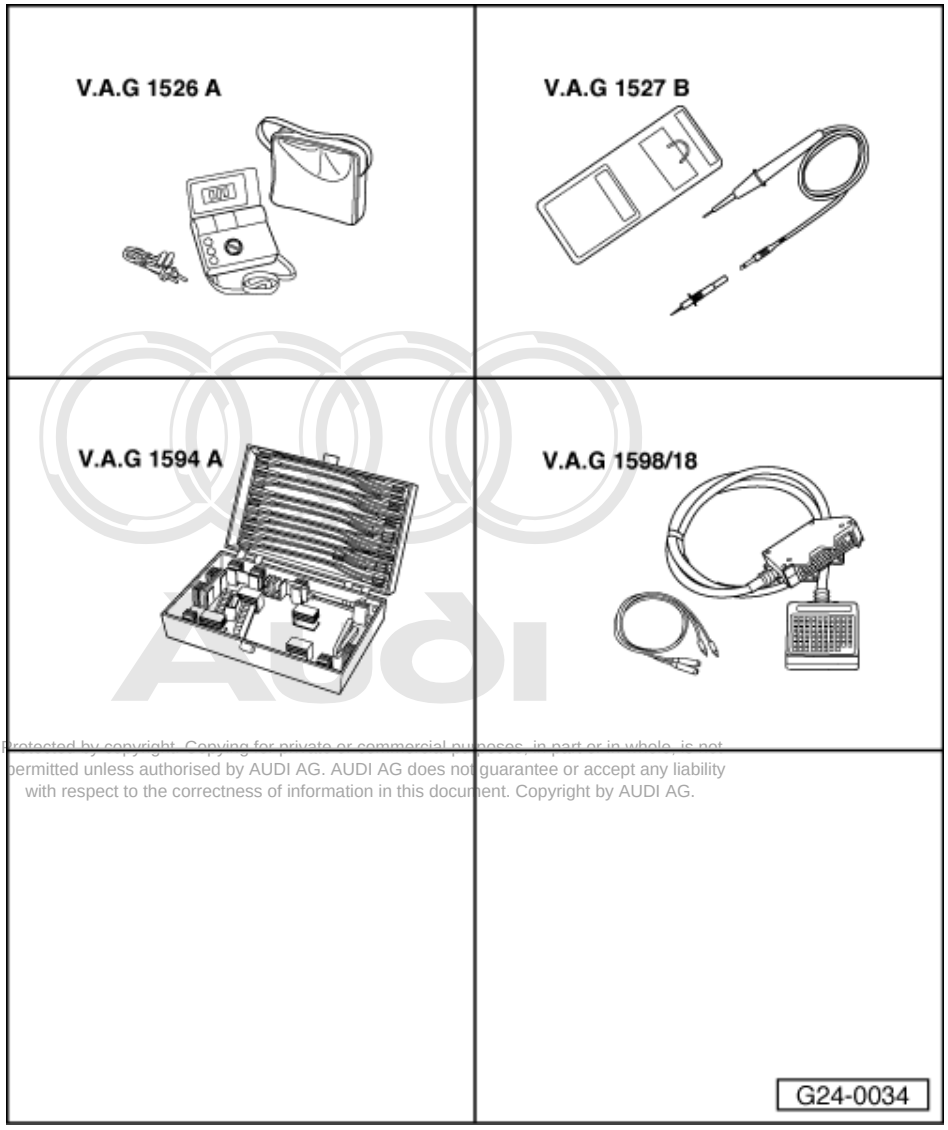


- -> Check primary resistance with portable multimeter V.A.G 1526 A between terminals 1 and 15.
  - Specification: 0.5 ... 1.5 ω
- Check secondary resistance with portable multimeter between terminals 4 and 15.
  - Specification: 5 ... 9 kω

If a reading does not match specification:

- Replace ignition transformer.

1.8 - Checking output stage for ignition transformer



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Special tools and workshop equipment required

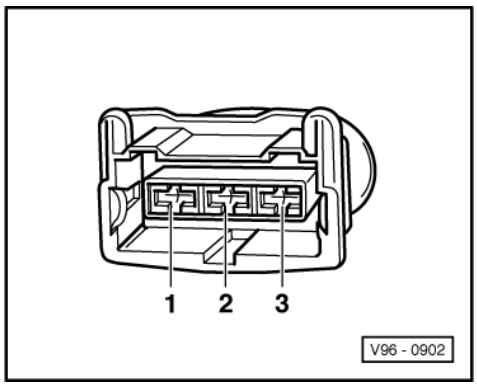
- V.A.G 1526 A
- V.A.G 1527 B
- V.A.G 1594 A
- V.A.G 1598/18

Test requirement:

- Ignition transformer OK; checking => Page 107

Checking power supply

- Unplug connector -item 101 at output stage.



- -> Connect up multimeter for voltage measurement between contacts 1 (positive) and 3 (earth).
- Switch on ignition.
  - Specification: approx. battery voltage

If reading does not match specification:

- Connect up multimeter for voltage measurement as follows.

Connector Contact	Measure to
1 (positive)	Engine earth
3 (earth)	Battery positive

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

If readings do not match specifications:

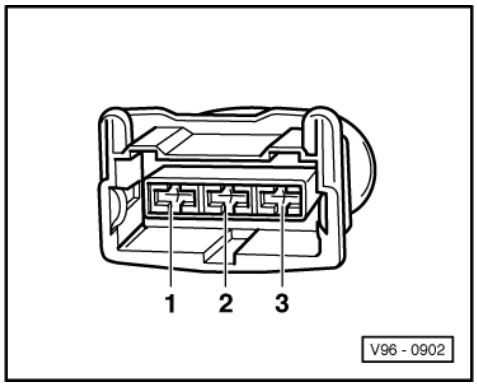
- Use current flow diagram to eliminate open circuit in wiring.

Checking actuation

Test requirement:

- Hall sender OK; checking => Page 120

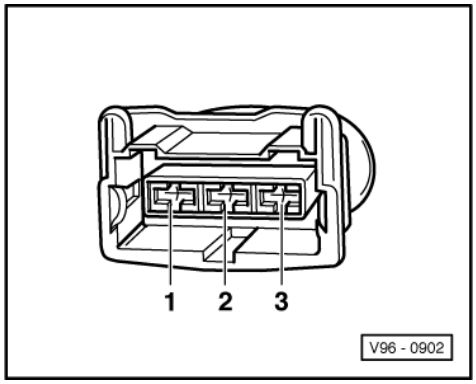
- Unplug connector at injection unit to prevent catalytic converter damage.
- Unplug connector -item 101 at output stage.



- -> Connect up voltage tester V.A.G 1527 B between contacts 1 and 2.
- Briefly operate starter.
  - LED must flash

If LED does not flash:

- With ignition switched off, connect test box V.A.G 1598/18 to engine control unit connector => Page 43 .



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

Connector Contact	Test box V.A.G 1598/18 Socket
2	24

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

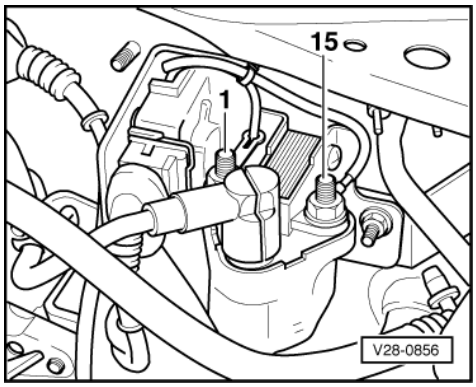
=> "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder

If wiring is OK:

- Replace engine control unit => Page 44 .

If power supply and actuation are OK:

- Switch off ignition.
- Re-attach connector and ignition cable at ignition transformer.



- -> Connect voltage tester V.A.G 1527 B with test leads and terminals to contacts 1 and 15 at ignition transformer.

Attention:
When performing following test, avoid contact with connecting elements of ignition transformer and test leads.

- Operate starter.
  - LEDs must flash

If LEDs do not flash:

- Replace output stage with ignition transformer.

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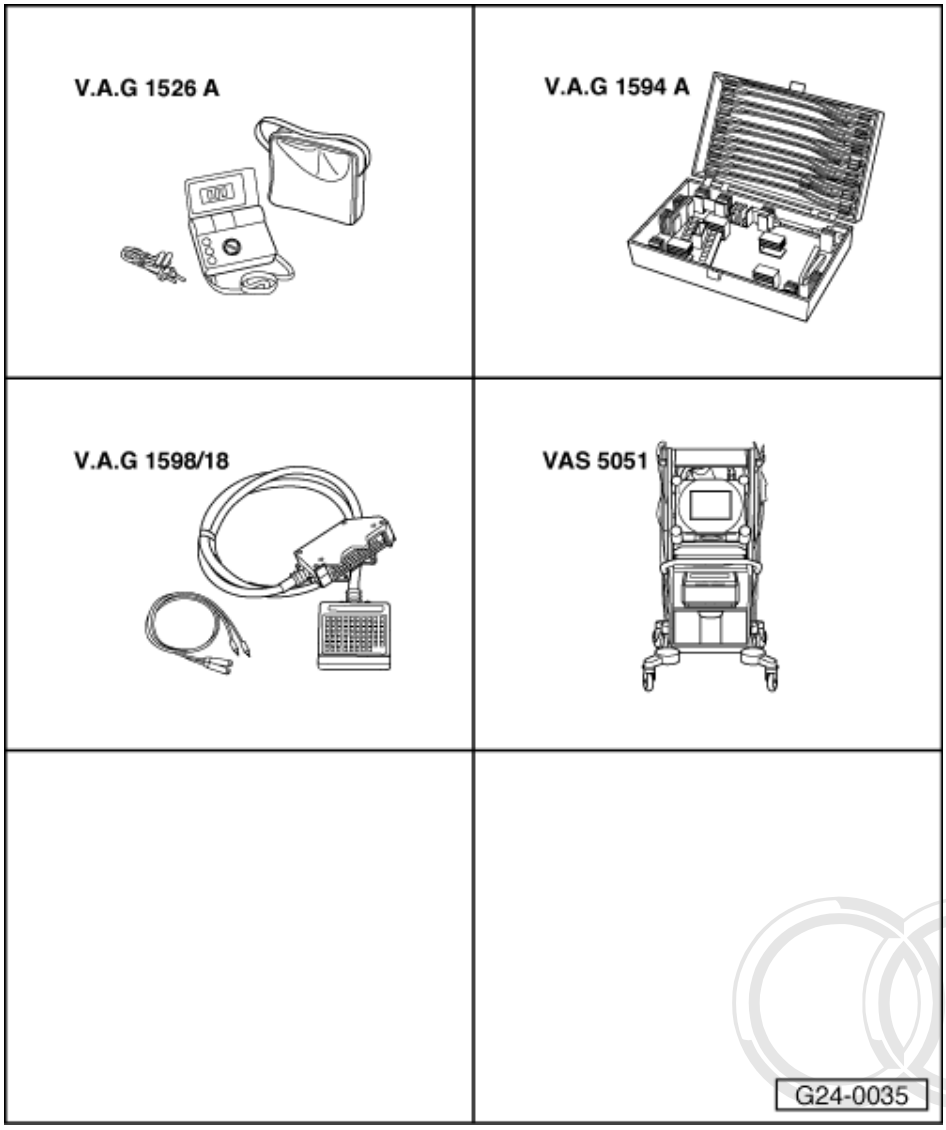
1.9 - Checking intake-air temperature sender -G42



Special tools and workshop equipment required

- V.A.G 1526 A
- V.A.G 1594 A
- V.A.G 1598/18
- VAS 5051 with VAS 5051/1

or

- V.A.G 1551 with V.A.G 1551/3 A
- Refrigerant spray (commercially available)

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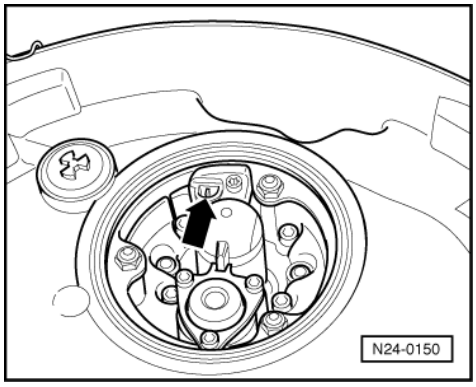
Test sequence

```
Reading measured value block 2
     1     2     3     4
```

-> Read measured value block, Display group 002, ignition on => Page 19 .

- Note value in display zone 4 (intake-air temperature).

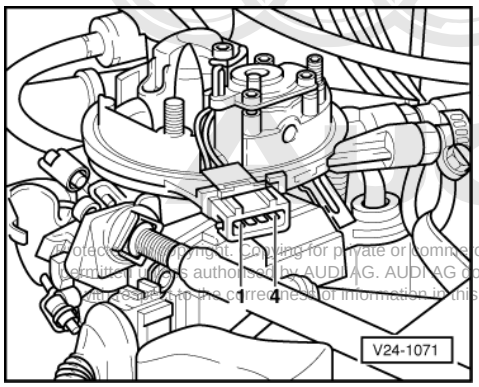
- Detach air cleaner cover.



- -> Spray intake-air temperature sender -G42 -arrow- with refrigerant spray.
- Check display in zone 4.
  - Specification: Temperature value must decrease

If value displayed in zone 4 does not change:

Checking internal resistance



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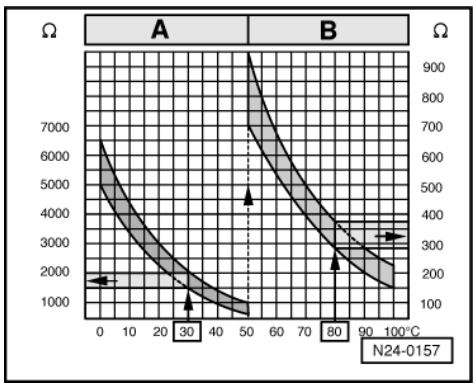
- Unplug connector at injection unit.
- -> Connect up multimeter for resistance measurement between contacts 1 and 4.

Ranges A and B indicate resistance values for temperature ranges 0...50 °C and 50...100 °C respectively.



-> Specimen readings:

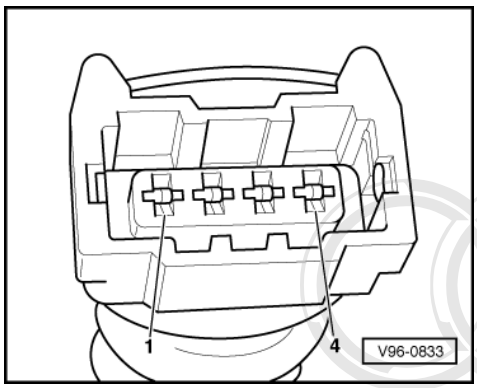
- 30 °C corresponds to a resistance of 1500...2000 ω
- 80 °C corresponds to a resistance of 275...375 ω

If readings do not match specifications:

- Replace intake-air temperature sender.

Checking wiring

- With ignition switched off, connect test box V.A.G 1598/18 to engine control unit connector => Page 43 .



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

Connector Contact	Test box V.A.G 1598/18 Socket
1	43
4	17

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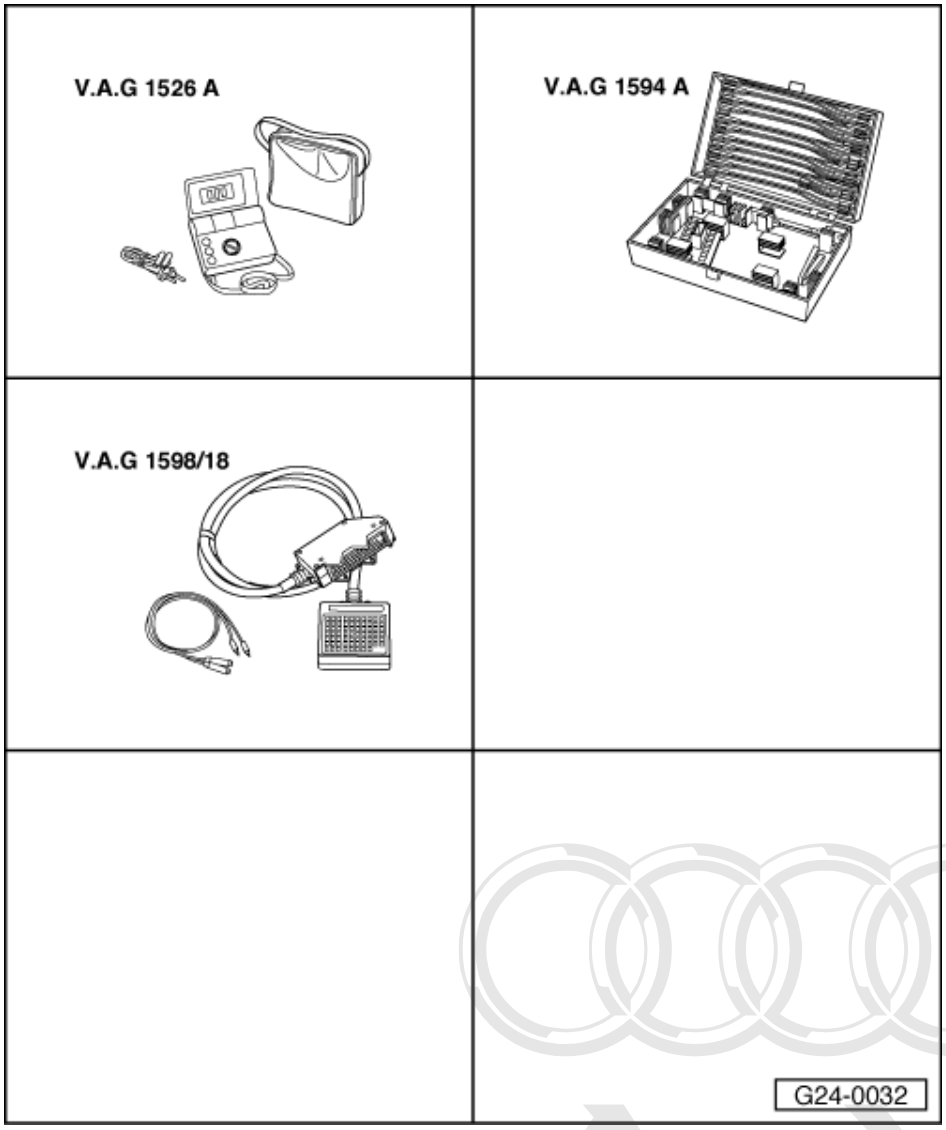
- If necessary, eliminate open circuit in wiring/short circuit.

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

If no fault is found:

- Replace engine control unit => Page 44 .

1.10 - Checking coolant temperature sender -G62



Special tools and workshop equipment required

- V.A.G 1526 A
- V.A.G 1594 A
- V.A.G 1598/18

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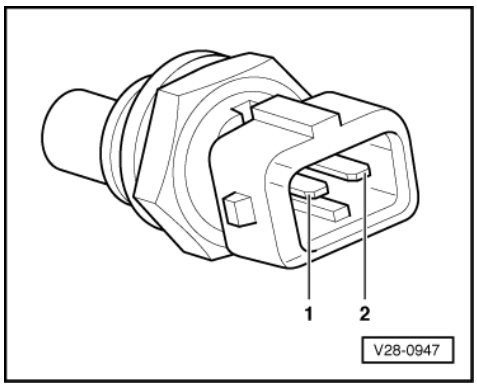
Fitting location => Exploded view of fitting locations - Page 29

Note:

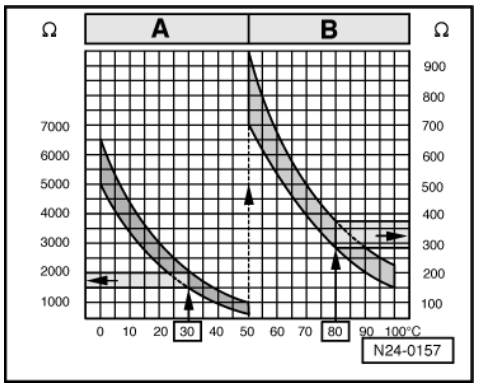
Checking operation => Read measured value block, Display group 001, Page 17 .



Checking internal resistance

- Unplug connector at coolant temperature sender.
- -> Connect up multimeter for resistance measurement between contacts 1 and 2 at sender.

Ranges A and B indicate resistance values for temperature ranges 0...50 °C and 50...100 °C respectively.



-> Specimen readings:

- 30 °C corresponds to a resistance of 1500...2000 ω
- 80 °C corresponds to a resistance of 275...375 ω

If readings do not match specifications:

- Replace coolant temperature sender.

Checking wiring

- With ignition switched off, connect test box V.A.G 1598/18 to engine control unit connector => Page 43 .

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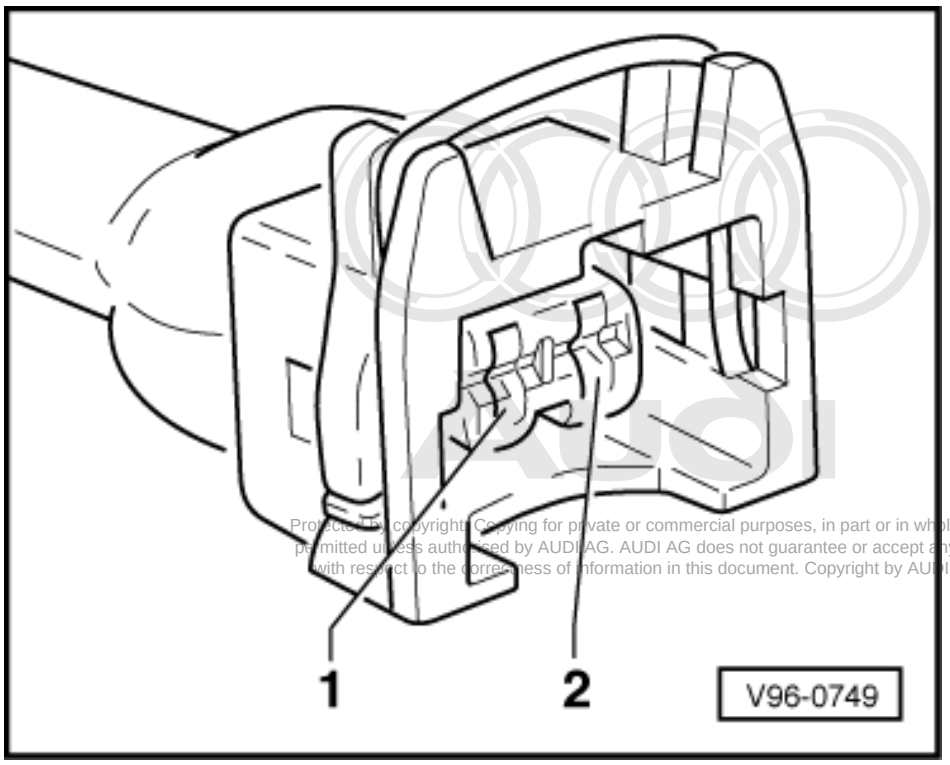

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- -> Check for open circuit and short to earth/positive in the following wiring.

Connector Contact	Test box V.A.G 1598/18 Socket
1	42
2	17

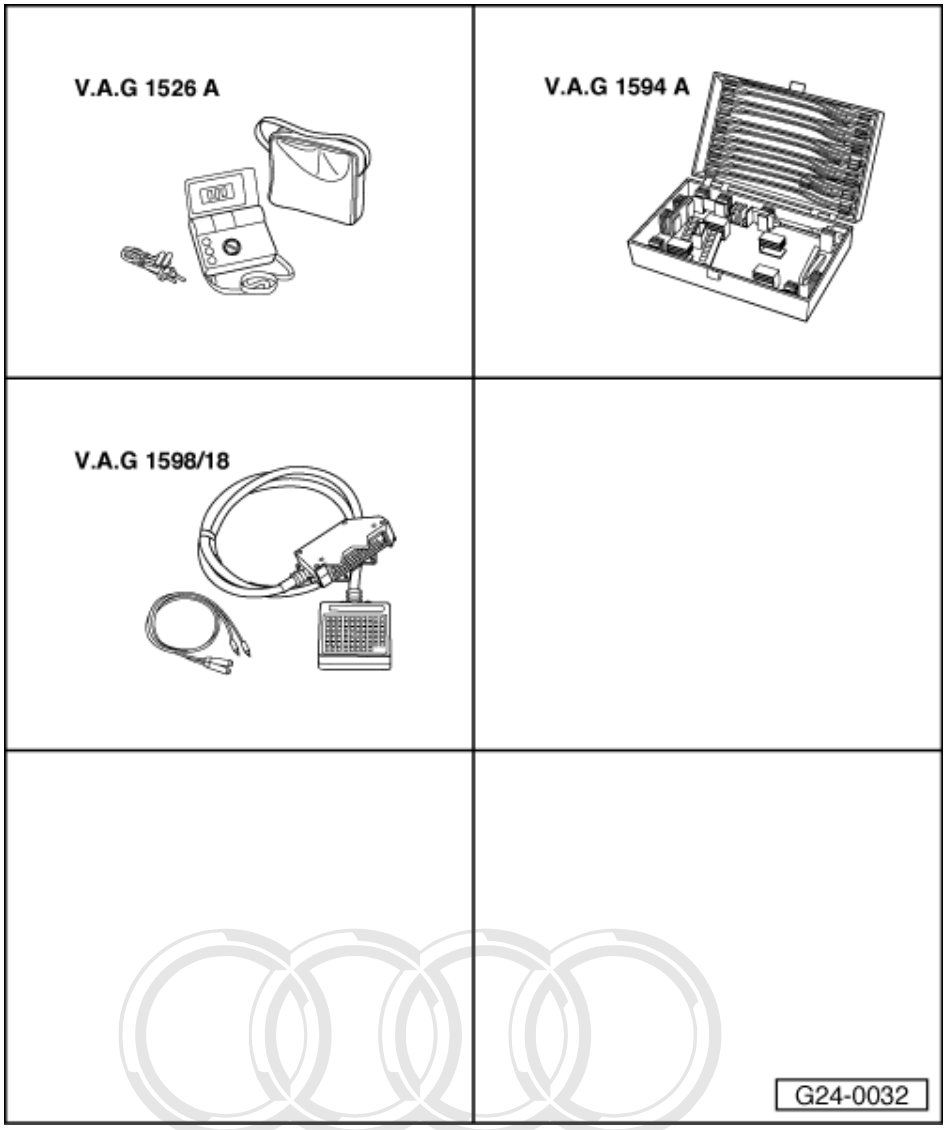
- If necessary, eliminate open circuit in wiring/short circuit.

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

If no fault is found:

- Replace engine control unit => Page 44 .

1.11 - Checking control unit power supply



Special tools and workshop equipment required

- V.A.G 1526 A
- V.A.G 1594 A
- V.A.G 1598/18

Fitting location => Exploded view of fitting locations - Page 29

Test requirements:

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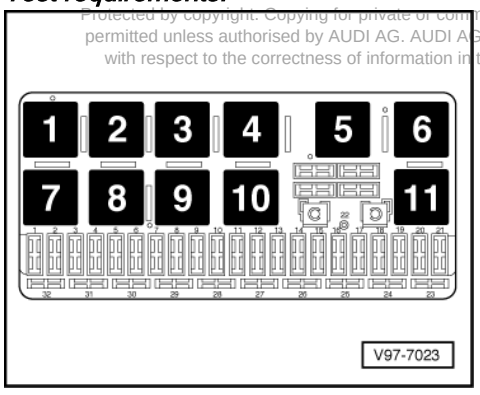

- -> Fuse S27 OK (in fuse box)
- Battery voltage at least 11 V
- Alternator OK

Test sequence

Notes:

- Engine control unit is supplied with positive voltage via contact 23 (terminal 15) and contact 21 (terminal 30).
- Earth supply for engine control unit is provided by way of contacts 1, 12, 20 and on vehicles ‣ 07.93 additionally via contact 15.

- With ignition switched off, connect test box V.A.G 1598/18 to engine control unit connector => Page 43 .

- Connect up multimeter for voltage measurement as follows.

Test box V.A.G 1598/18 Socket	Measure to
1	Battery positive
12	Battery positive
15	Battery positive
20	Battery positive
21	Engine earth

- Specification: approx. battery voltage in each case

Connect up multimeter for voltage measurement as follows.

Test box V.A.G 1598/18 Socket	Measure to
23	Engine earth

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

If a reading does not match specification:

- Check wiring.

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

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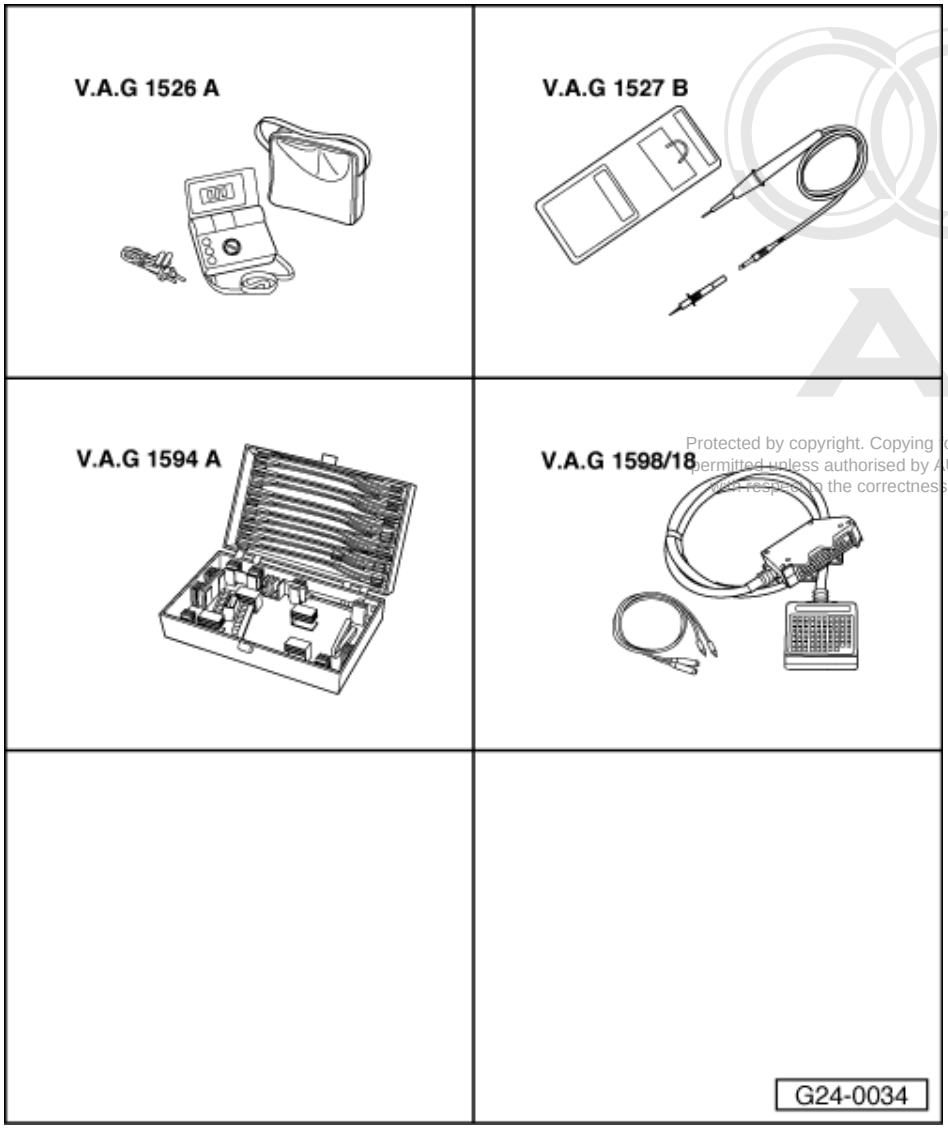
1.12 - Checking Hall sender -G40



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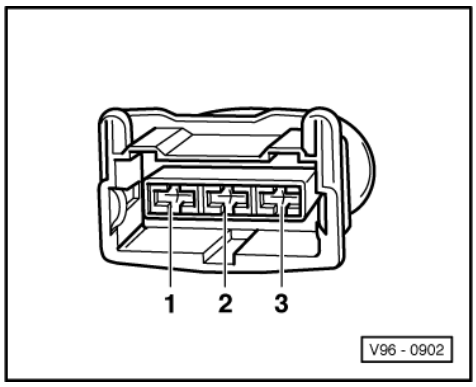
Special tools and workshop equipment required

- V.A.G 1526 A
- V.A.G 1527 B
- V.A.G 1594 A
- V.A.G 1598/18

Fitting location => Exploded view of fitting locations - Page 29

Test sequence

- Unplug connector at injection unit.
- Unplug connector -item 101 at output stage.



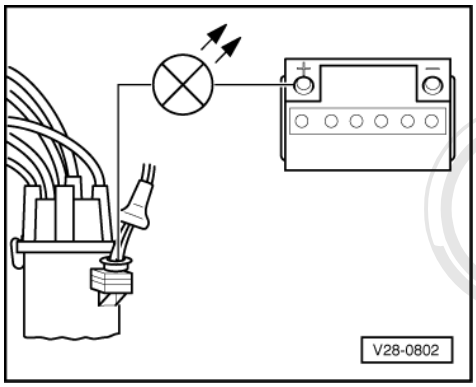
- -> Connect up voltage tester V.A.G 1527 B as follows.

Connector Contact	Measure to
2 (signal)	Engine earth

- Briefly operate starter.
  - LED must flash

If LED does not flash:

- Push back rubber grommet of Hall sender connector but leave connector attached.



- -> Connect up voltage tester V.A.G 1527 B between contact 2 (Hall sender signal) and battery positive.

Note:

Pin assignment is marked on back of connector.

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- Briefly operate starter.
  - LED must flash

Note:

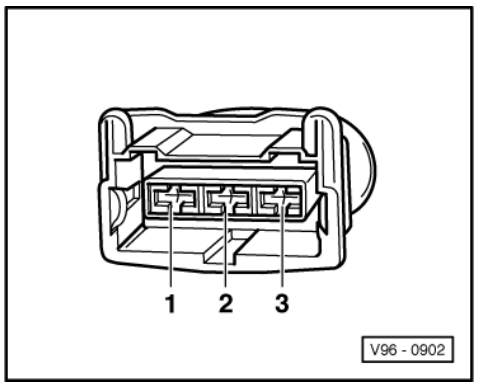
Voltage testers with a low current input do not go out completely between actuation of engine control unit, but rather continue to glow slightly and become distinctly brighter on actuation.

If LED does not flash:

- Check power supply for Hall sender => Page 122 .

If LED now flashes:

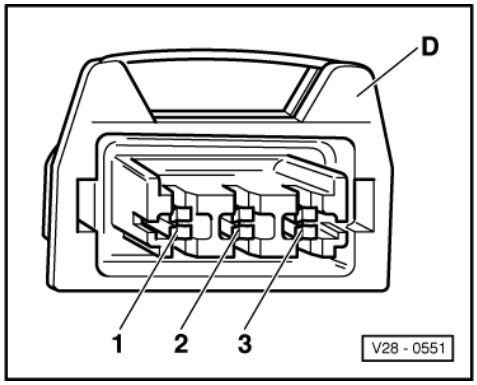
- With ignition switched off, connect test box V.A.G 1598/18 to engine control unit connector => Page 43 .



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

Connector of output stage Contact	Test box V.A.G 1598/18 Socket
2	24

- Unplug connector at Hall sender.



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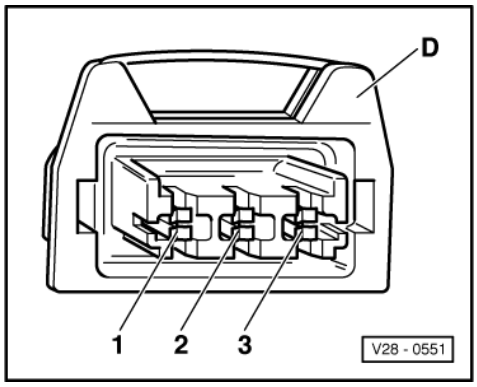
- -> Check for open circuit and short to earth/positive in the following wiring.

Connector of Hall sender Contact	Test box V.A.G 1598/18 Socket
2	13

If no fault is found in wiring:
- Replace engine control unit => Page 44 .

Checking power supply
- Unplug connector of Hall sender at ignition distributor.



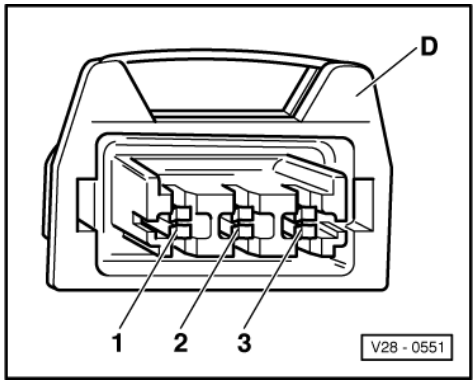
- -> Connect up multimeter for voltage measurement to contacts 3 (positive) and 1 (earth).
- Switch on ignition.
  - Specification: min. 9 V

If reading matches specification, but LED does not flash:

- Replace Hall sender.

If reading does not match specification:

- With ignition switched off, connect test box V.A.G 1598/18 to engine control unit connector => Page 43 .



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

Connector Contact	Measure to
3 (positive)	Test box V.A.G 1598/18 Socket 8
1 (earth)	Engine earth

If no fault is found in wiring:

- Replace engine control unit => Page 44 .

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