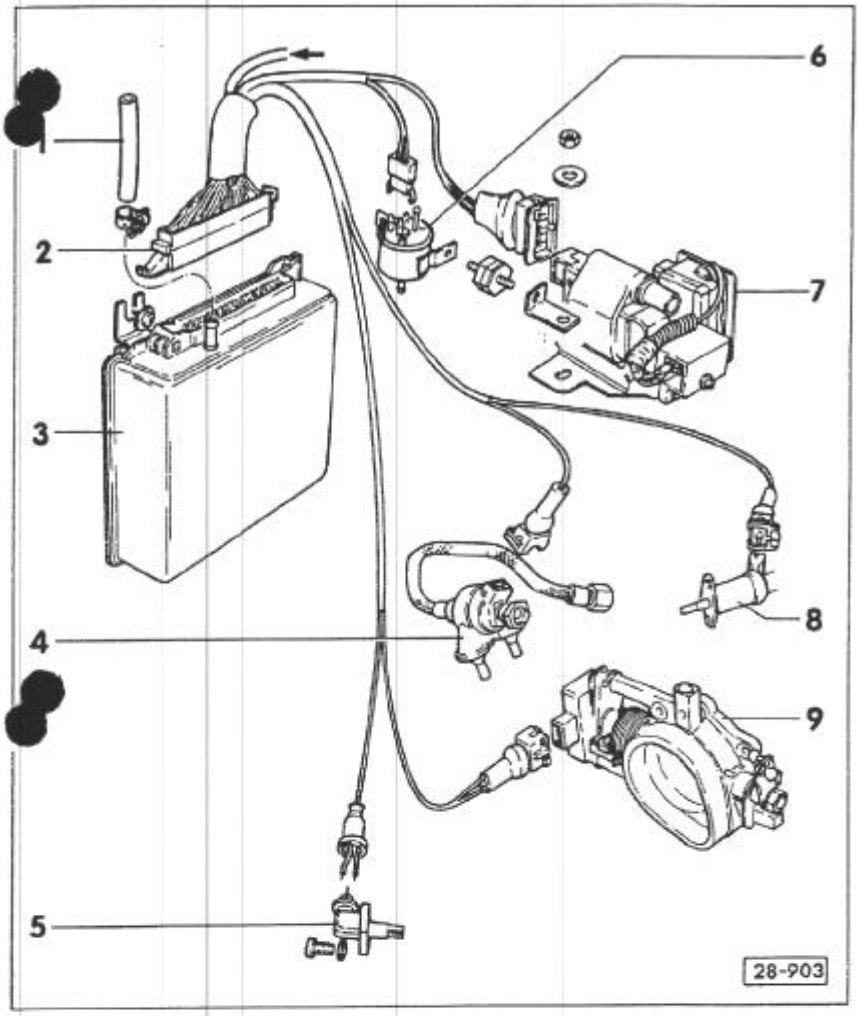


SERVICING FEI IGNITION SYSTEM

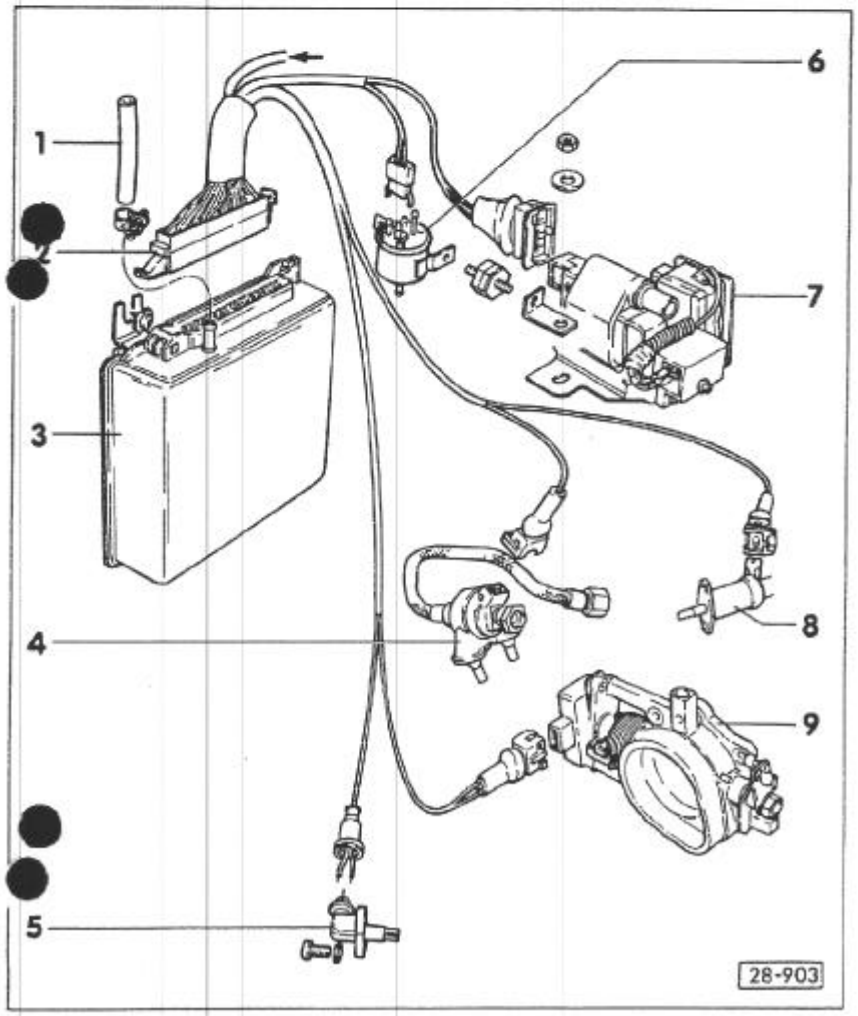
Notes:

- Settings, spark plugs - page 28-7
- Note safety measures - page 28-8
- Checking activation of rev counter - page 28-36
- Self-diagnosis and electrical testing Repair Group 01

> Attention!
>
> The FEI control unit is equipped with a fault memory. Before starting any repairs, interrogate the fault memory - Repair Group 01.

1 - Vacuum hose
- to intake manifold

2 - Connecting plug
- Disconnect and connect only with the ignition switched off



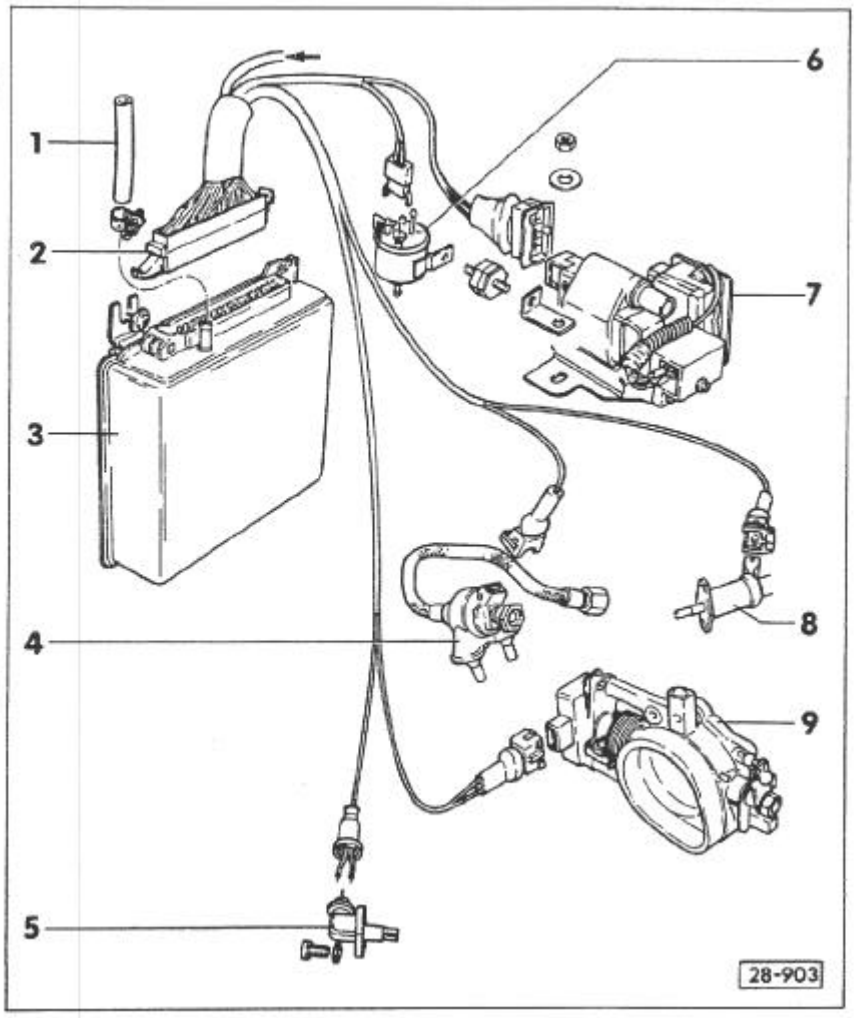
3 - FEI control unit -J88
- with fault memory, interrogating fault memory - Repair Group 01
- Checking voltage supply - page 28-32
- Location: Behind A pillar trim in front right footwell

4 - Frequency valve for Lambda regulation (control valve) -N7
- Checking operation - see Final control element diagnosis - Repair Group 01

5 - Sensor for intake air temperature -G42
- Checking - page 28-28

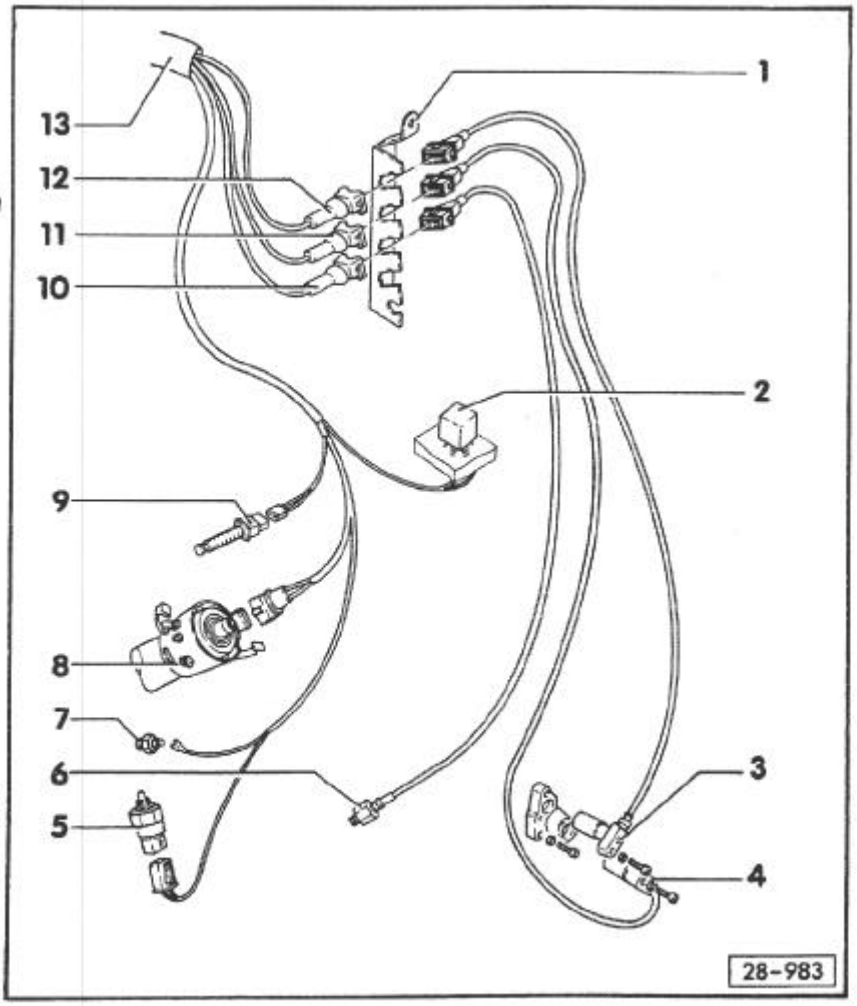
6 - Solenoid valve for boost pressure control -N75
- Checking operation - see Final control element diagnosis - Repair Group 01

7 - Ignition coil
- Checking - page 28-15



8 - Cold start valve -N17
- Checking - Repair Group 25
- Checking operation - see Final control element diagnosis - Repair Group 01

9 - Throttle valve housing
- with full throttle switch -F81 and idle switch -F60 - Checking and adjusting - Repair Group 25
- Basic adjustment of throttle valve - Repair Group 25



1 - Retainer for connecting plugs

2 - Fuel pump relay -J17
- Checking operation - see Final control element diagnosis - Repair Group 01

3 - Sender for ignition timing -G4
- Checking - page 28-20

4 - Sender for engine speed -G28
- Checking - page 28-23

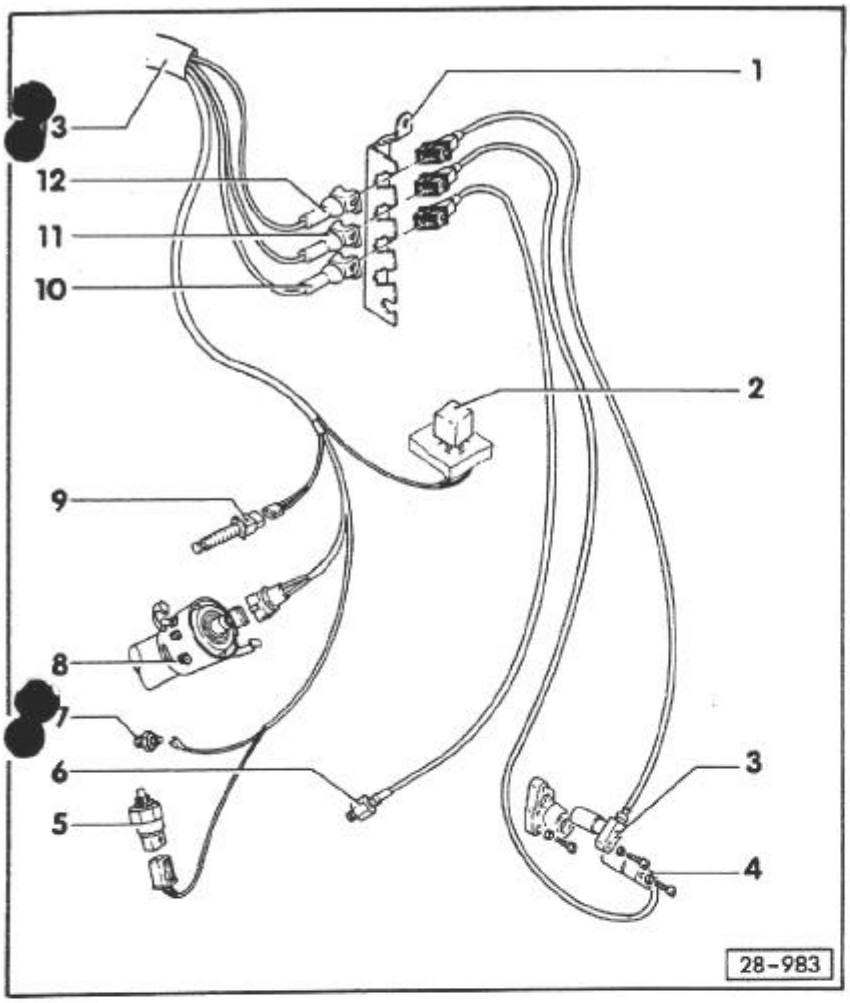
5 - Electronic thermoswitch -F76

6 - Knock sensor 1 -G61, 10 Nm
- Checking knock control - Repair Group 01

7 - Sender for coolant temperature -G62
- Checking - page 28-26

8 - Distributor
- Basic setting - page 28-9
- Checking Hall sender - page 28-11

9 - Brake light switch



10 - Connector, red
- for knock sensor 1 -G61

11 - Connector, grey
- for engine speed sender -G28

12 - Connector, black
- for ignition timing sender -G4

13 - Wiring loom to FEI control unit -J88

SETTING, SPARK PLUGS

Engine code letters		1B	2B
Distributor	Part No.	035 905 206 AF	
Ignition firing point		• not adjustable - checking basic setting - page 28-9	
Idling speed 1)	rpm	800 ± 50 2)	720 ± 50 2)
Sender for ignition timing	Resistance k Ω	1.0	
Sender for engine speed	Resistance k Ω	1.0	
Sender for coolant temperature	Resistance Ω	60 ... 1000	
Sender for intake air temperature	Resistance Ω	400 ... 700	
Ignition coil	Secondary resistance kΩ	5 ... 8	
	Primary resistance Ω	0.5 ... 1.5	
Rotor arm	Resistance k Ω	1,0	

1) Note testing and adjusting conditions - Repair Group 25
2) For current values see "Exhaust and idling test" binder

Engine code letters		1B	2B
Firing order		1-2-4-5-3	
Spark plugs Type	(Tightening torque 20 Nm) VW/Audi	101 000 005 AB 101 000 001 AC	
	Manufacturers designation	W 7 DTC 14 - 7 DTU	
Electrode gap	mm	0.8 + 0.1	

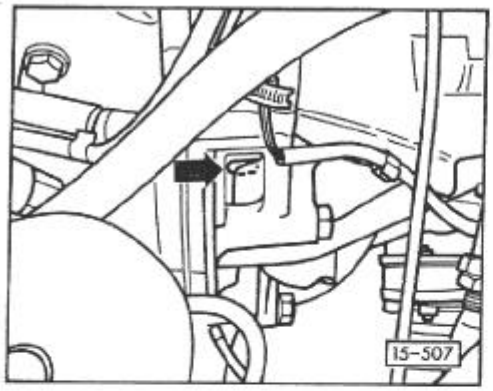
SAFETY MEASURES FOR FEI IGNITION SYSTEM

To avoid injury to persons and/or damage to the fully electronic ignition system the following must be noted when working on vehicles with a fully electronic ignition system:

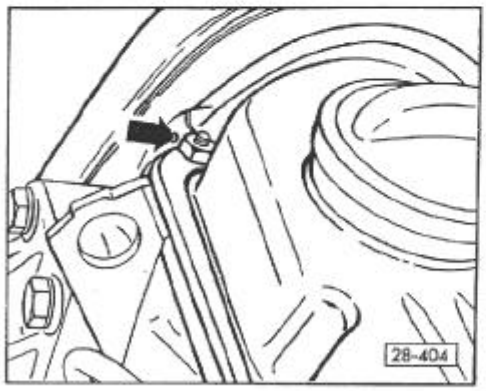
- Do not touch or pull off ignition leads when engine is running or turning at starter speed.
- Disconnect and connect ignition system leads - including test appliance leads - only when ignition is switched off.
- When engine is to be turned at starter speed without starting (e.g. when checking compression) pull plug off coil power stage.
- Do not connect suppression condensers to terminal 1 (-).
- Do not replace rotor arm 1 k Ω (Designation R1) with a different type, even for radio interference suppression.
- For interference suppression use only 1 kΩ resistors on the HT leads and 5 kΩ plug connectors.

DISTRIBUTOR BASIC SETTING

(setting only with engine not runnig)

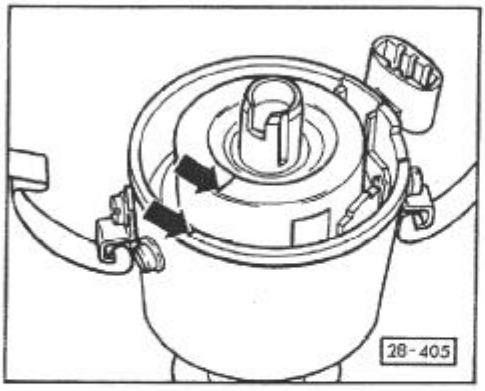


- Set crankshaft to TDC on cylinder No. 1 with special tool 2079.



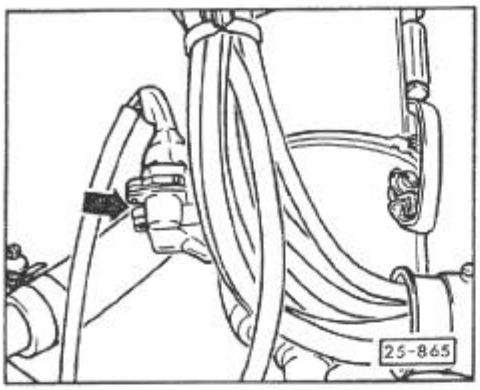
- Mark on camshaft sprocket must be aligned with the upper edge of gasket.

- Take cap off distributor.
- Take rotor arm and dust cap off.
- Loosen screw securing distributor.



- Turn distributor housing so that the mark on the rotor is in line with the mark on distributor housing.
- Secure distributor.

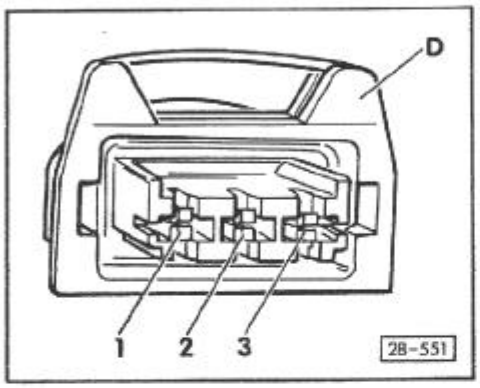
CHECKING HALL SENDER -G40



Attention!

To check the Hall sender, pull plug off coil power stage.

- Pull plug off Hall sender on distributor.



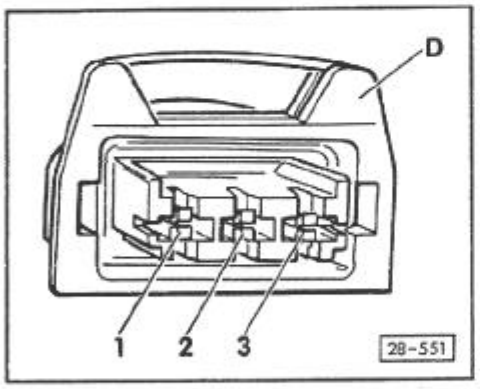
- Connect multimeter V.A.G 1526 to outer contacts 1 and 3 of plug (D) with leads from V.A.G 1594 to measure the voltage.
- Switch ignition on.

  Specified reading: At least 9 volts.

- Switch ignition off.

If the reading is not correct, locate and eliminate break in wiring with the aid of current flow diagram.

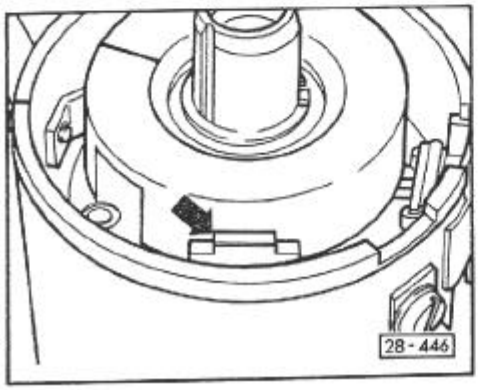
If the reading is correct, push back rubber boot on Hall sender plug.



- Connect multimeter between contacts 1 and 2 of Hall sender plug (D) with additional leads to measure the voltage.
- Put plug on Hall sender on distributor again.
- Switch ignition on.
- Take off distributor cap, rotor arm and dust cap.

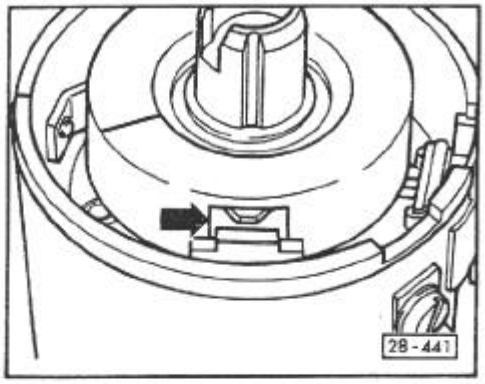
Caution!

The spring clips for the distributor cap must not fall into the sender system.



- Turn crankshaft with special tool 2079 until the window is outside the air gap.

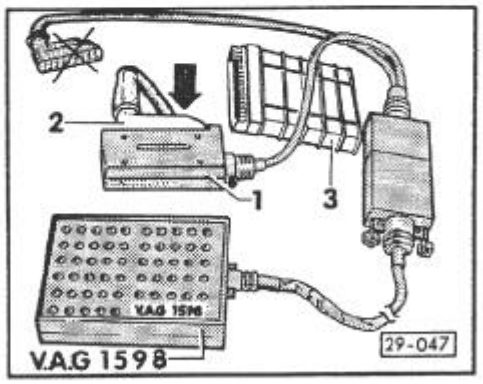
  Specified reading: at least 4 volts



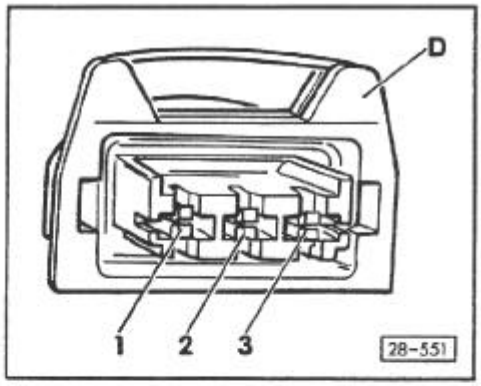
- Turn crankshaft with special tool 2079 until the window is fully in the air gap of Hall sender.

Specified reading: 0 ... 0.5 volts

- Switch ignition off.
- If reading is not correct, renew Hall sender.
- If reading is correct, check wiring between plug connector of Hall sender and plug on FEI control untit -J88 as follows:
- Remove FEI control unit and pull plug off with ignition switched off.
(The control unit is behind the A pillar trim in the right front footwell).



- Connect test box V.A.G 1598 to detached plug of FEI control unit -2- with adapter lead V.A.G 1598/7 -1-. The numbers of the plug contacts are identical with the numbers in the test box.
Fuses OK - see current flow diagram.



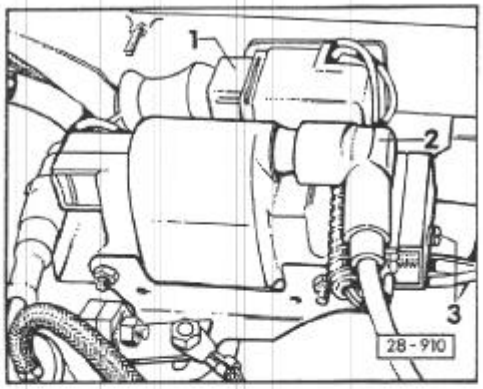
- With multimeter V.A.G 1526 and leads from V.A.G 1594 check resistance between wiring in Hall sender plug (D) and test box V.A.G 1598

Plug (D)	Test box
1	18
2	27
3	25

Specified reading: max. 1.0 Ω

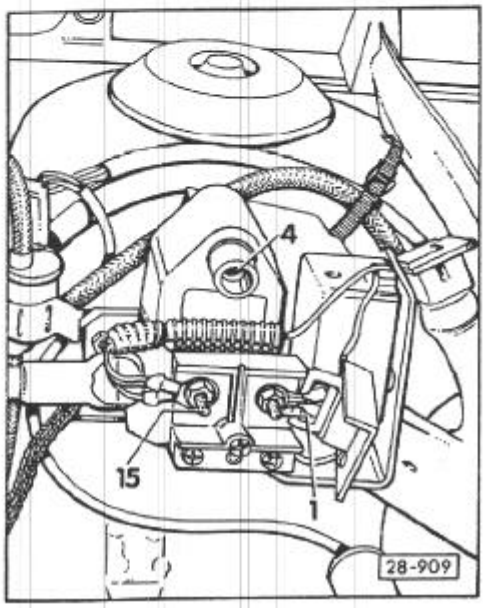
If reading is not correct, locate break in wiring with the aid of current flow diagram and eliminate it.

If the reading is correct, renew FEI control unit.



CHECKING COIL WITH POWER STAGE

- Pull plug -1- off coil power stage, remove screw -3-.



A - Checking secondary resistance

- Detach all connections from coil.
- Connect multimeter V.A.G 1526 between terminals 1 and 4 on coil with leads from V.A.G 1594 to measure resistance.

Specified reading: 5 ... 8 k Ω

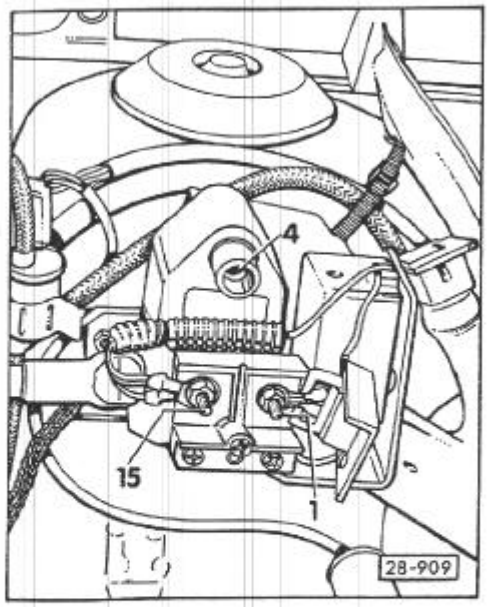
If reading is not correct, renew coil.

B - Checking primary resistance

- All connections detached from coil.
- Connect multimeter with additional leads between terminals 1 and 15 on coil to measure resistance.

Specified reading: 0.5 ... 1.5 Ω

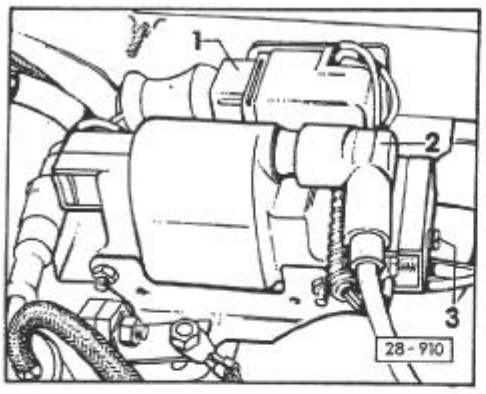
If reading is not correct, renew coil.



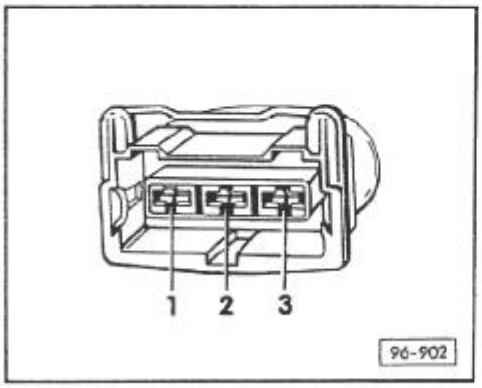
C - Checking activation of coil

Note:

Check wiring between power stage and coil and earth wire between power stage and engine for corrosion or damage.



- Pull plug off power stage -1- of coil and plug -2- off terminal 4 of coil, remove screw -3-.



- Connect multimeter V.A.G 1526 with leads from V.A.G 1594 to measure voltage between contact 1 and earth and then between contacts 1 and 3.

- Switch ignition on.

Specified reading: approx. battery voltage

If readings are not correct, locate break in wiring with the aid of the current flow diagram and eliminate it.

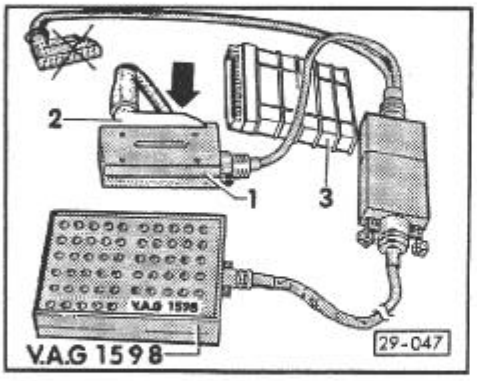
- Check between contacts 2 and 3 with multimeter and additional leads.

- Turn engine with the starter.

Specified reading: at least 0.2 volt

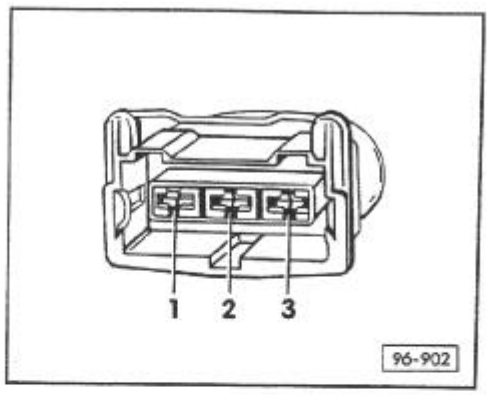
If the reading is not correct, check wiring between plug of power stage and plug of FEI control unit -J88 as follows:

- Remove FEI control unit and pull plug off with the ignition switched off.
(The control unit is behind the A pillar trim in the right front footwell).



- Connect test box V.A.G 1598 to detached plug of FEI control unit -2- with adapter leads V.A.G 1598/7 -1-. The numbers of the plug contacts are identical with the numbers in the test box.
Fuses OK - see current flow diagram.

- With multimeter V.A.G 1526 and leads from V.A.G 1595 check resistance between the wiring of the plug for coil power stage and the test box.



- Plug of power stage

Test box V.A.G 1598
22

Specified reading: max. 1.0 Ω

If the reading is not correct, locate break in wiring with the aid of current flow diagram and eliminate it.

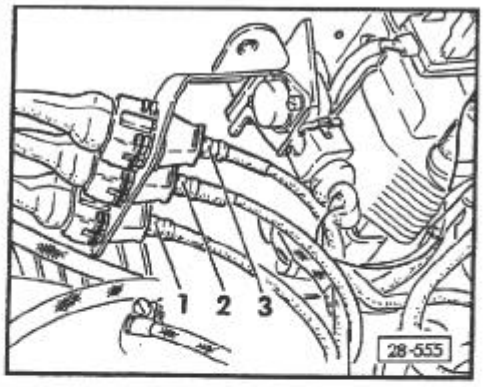
If the reading is correct, renew FEI control unit.

Note:

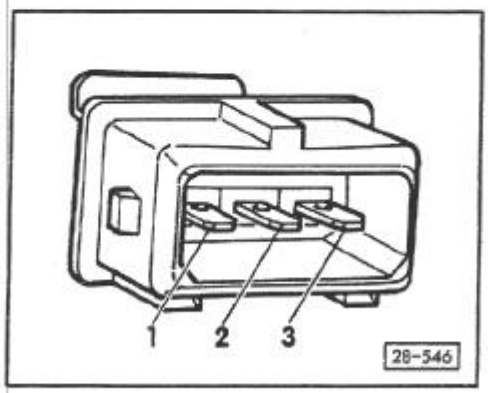
If all readings are correct when checking the coil with power stage but the engine still does not run (no ignition impulse), renew coil with power stage.

(The operation of the power stage cannot be checked).

CHECKING IGNITION TIMING SENDER -G4



- Separate connector -3- (black) at plenum chamber.

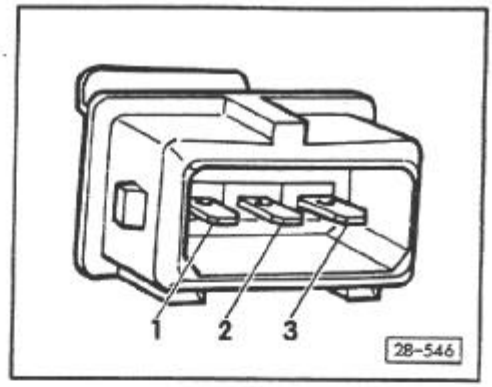


- Connect multimeter V.A.G 1526 between contacts 1 and 2 of plug with leads from V.A.G 1594 to measure the resistance.

Specified reading: approx. 1 k Ω

If the reading is not correct, renew sender for ignition timing

If the reading is correct, continue with check as follows:



- Connect multimeter with additional leads between

  - Contacts 1 and 3
  - Contacts 2 and 3

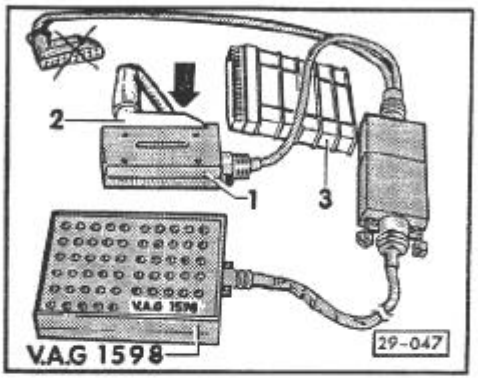
  of plug.

  Specified reading: ∞ Ω

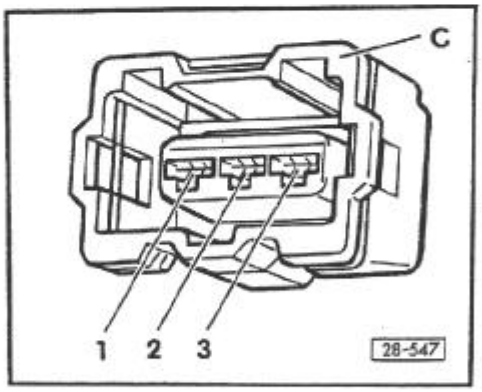
If the reading is not correct, renew sender for ignition timing.

If the reading is correct, check wiring between sender connector and plug on FEI control unit -J88 as follows:

- Remove FEI control unit and pull plug off with ignition switched off.
  (The control unit is behind the A pillar trim in the right front footwell).



- Connect test box V.A.G 1598 to detached plug of FEI control unit -2- with adapter lead V.A.G 1598/7 -1-. The numbers of the plug contacts are identical with the numbers in the test box.
  Fuses OK - see current flow diagram.



- With multimeter and additional leads measure resistance between wiring of plug connector (C) and the test box.

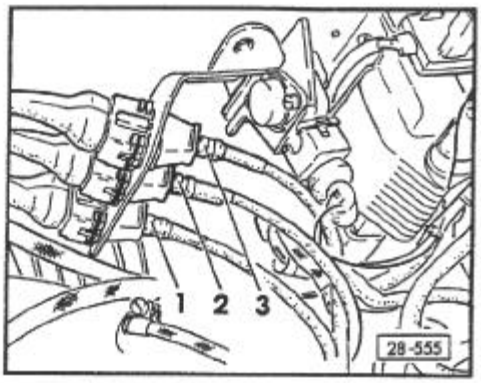
Plug connector (C)	Test box
1	13
2	12
3	12

Specified readings: max. 1.0 Ω

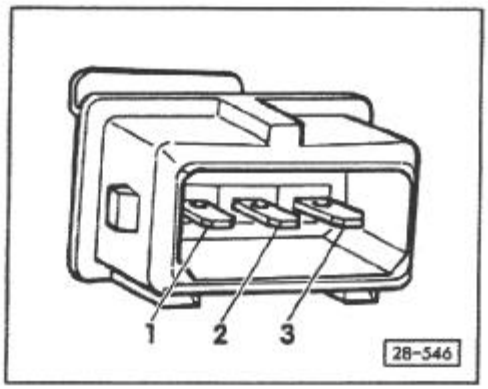
If the readings are not correct, locate break in wiring with the aid of current flow diagram and eliminate it.

If readings are correct, check gap between pin and sender for ignition timing - Repair Group 13.
If the gap is OK, renew FEI control unit.

CHECKING ENGINE SPEED SENDER -G28



- Separate connector -2- (grey) at plenum chamber.

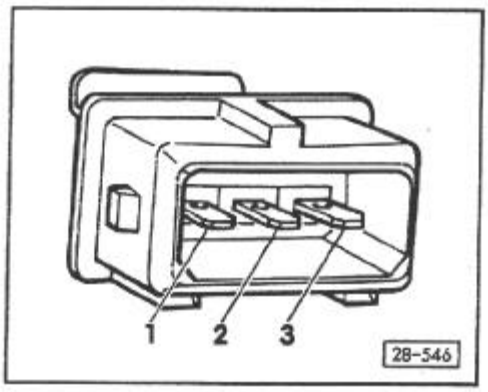


- Connect multimeter V.A.G 1526 between contacts 1 and 2 of plug with leads from V.A.G 1594 to measure the resistance.

  Specified reading: approx. 1 k Ω

If the reading is not correct, renew sender for engine speed.

If reading is correct, continue with check as follows:



- Connect multimeter with additional leads between

  - Contacts 1 and 3
  - Contacts 2 and 3

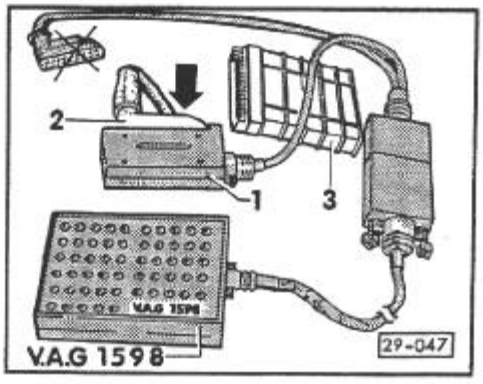
  of plug.

  Specified reading: ∞ Ω

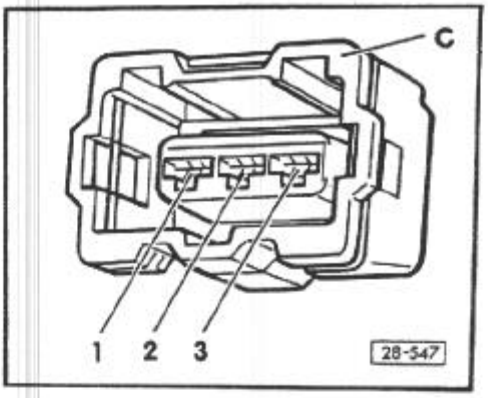
If reading is not correct, renew sender for engine speed.

If reading is correct, check wiring between sender connector and plug on FEI control unit -J88 as follows:

- Remove FEI control unit and pull plug off with ignition switched off.
  (The control unit is behind the A pillar trim in the right front footwell).



- Connect test box V.A.G 1598 to detached plug of FEI control unit -2- with adapter lead V.A.G 1598/7 -1-. The numbers of the plug contacts are identical with the numbers in the test box.
  Fuses OK - see current flow diagram.



- With multimeter and additional leads measure resistance between wiring of plug connector (C) and the test box.

Plug connector (C)	Test box
1	29
2	11
3	29

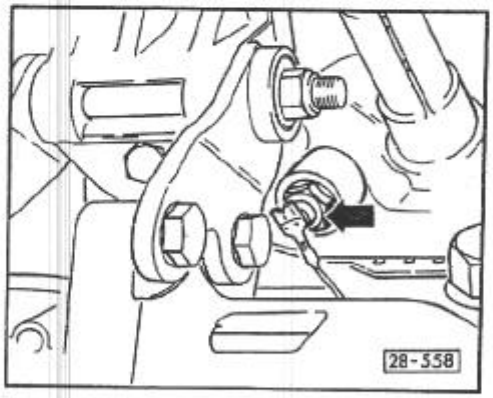
Specified reading: max. 1.0 Ω

If the readings are not correct, locate break in wiring with the aid of current flow diagram and eliminate it.

If the readings are correct, renew FEI control unit.

CHECKING COOLANT TEMPERATURE SENDER -G62

• Coolant temperature above 20° C



- Pull wire off sender for coolant temperature.

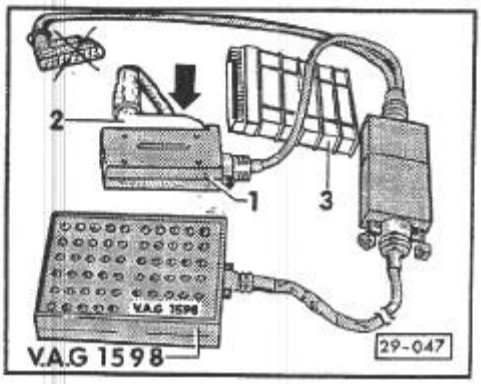
- Connect multimeter V.A.G 1526 between coolant temperature sender and earth with leads from V.A.G 1594 to measure the resistance.

Specified reading: 60 Ω ... 1 k Ω

If the reading is not correct, renew sender for coolant temperature.

If the reading is correct, check wire of coolant temperature sender as follows:

- Remove FEI control unit and pull plug off with ignition switched off.
(The control unit is behind the A pillar trim in the right front footwell).



- Connect test box V.A.G 1598 to detached plug of FEI control unit -2- with adapter lead V.A.G 1598/7 -1-. The numbers of the plug contacts are identical with the numbers in the test box.
Fuses OK - see current flow diagram.

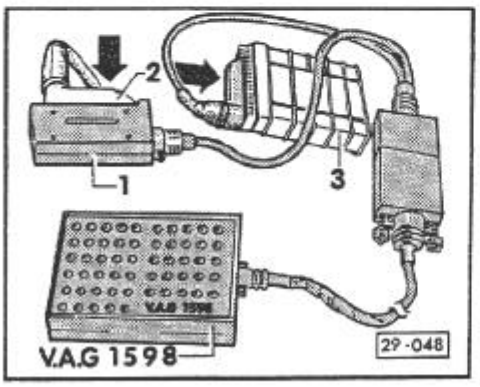
- Connect multimeter with additional leads between contact 10 in test box and the detached wire of sender for coolant temperature to measure the resistance.

Specified reading: max. 1.0 Ω

If the reading is not correct, locate break in wiring with the aid of current flow diagram and eliminate it.

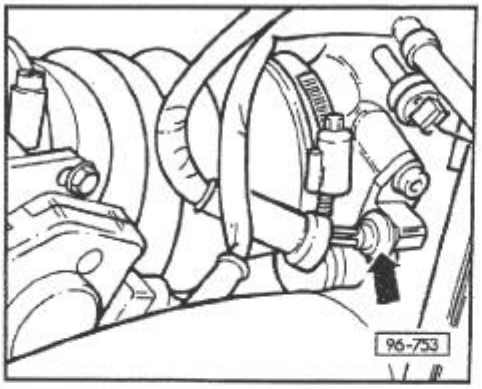
If the reading is correct but the Self-diagnosis (Repair Group 01) indicates flash code 2312 this can be caused by a sporadic interruption of the temperature signal. In this case continue check as follows:

- Engine cold
- Ignition switched off

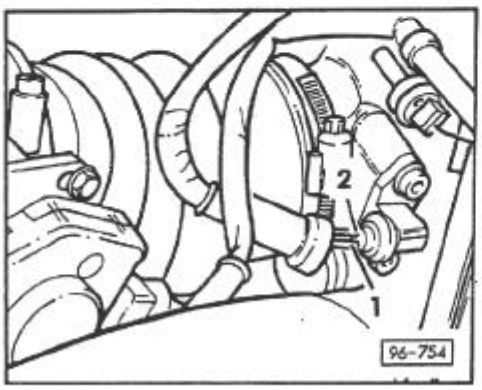


- Connect test box additionally to FEI control unit -3- with adapter lead.
- Connect multimeter with additional leads between contacts 10 and 18 in test box to measure resistance.
- Start engine and warm it up.
  The voltage indicated by the multimeter must drop uniformly during the warm-up phase.

CHECKING INTAKE AIR TEMPERATURE SENDER -G42



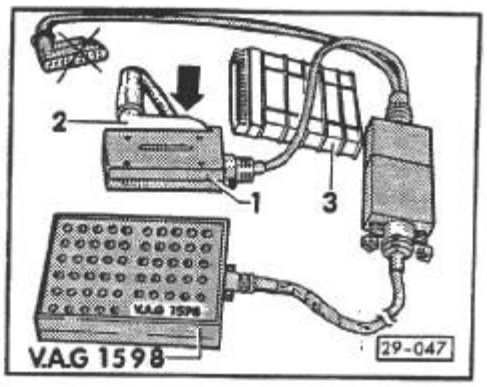
- Remove FEI control unit.
  Pull plug off FEI control unit with ignition switched off.
  (The control unit is behind the A pillar trim in the front right footwell).
- Push back protective cap on sender for intake air temperature.



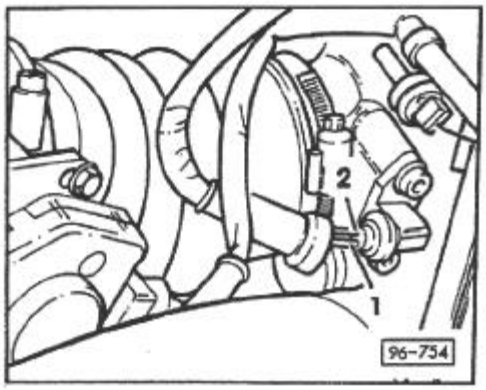
- Connect multimeter V.A.G 1526 with leads from V.A.G 1594 between contacts 1 and 2 of sender for intake air temperature to measure resistance.

Specified reading: 400 ... 700 Ω

If the reading is not correct, check wiring between sender for intake air temperature and plug on FEI control unit -J88 as follows:



- Connect test box V.A.G 1598 to detached plug of FEI control unit -2- with adapter lead V.A.G 1598/7 -1-. The numbers of the plug contacts are identical with the numbers in the test box.
Fuses OK - see current flow diagram.



- Connect multimeter with additional leads to conntact 24 in test box and alternately to contacts 1 and 2 of sender for intake air temperature to measure resistance.

Specified reading: max. 1.0 Ω or
400 ... 700 Ω

- Connect multimeter with additional leads to contact 18 in test box and alternately to contacts 1 and 2 of sender for intake air temperature.

Specified reading: max. 1.0 Ω or
400 ... 700 Ω

If one of the readings is not correct, cut wiring off at sender for intake air temperature and check the sender as follows:

- Connect multimeter with additional leads between contacts 1 and 2 of sender.

Specified reading: 400 ... 700 Ω

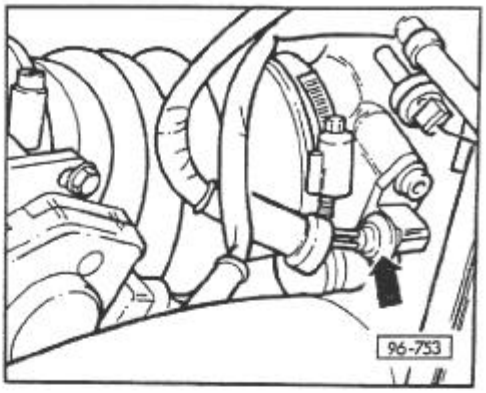
If the reading is correct, locate break or short circuit in wiring from FEI control unit to sender for intake air temperature with the aid of the current flow diagram and eliminate.

Note:

When the wires have been cut off the sender for intake air temperature should always be renewed.

If the readings are correct, renew the FEI control unit.

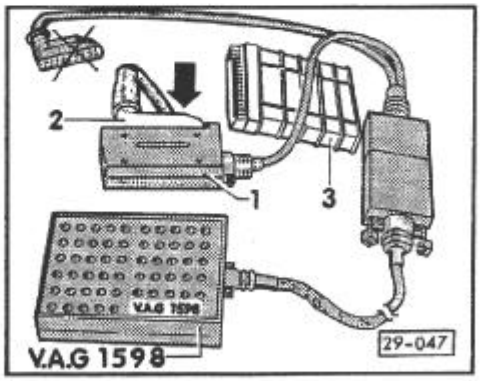
REMOVING AND INSTALLING SENDER FOR INTAKE AIR TEMPERATURE -G42



- Push back the protective cap on sender for intake air temperature.
- Cut wiring off the sender.
- Screw sender out.
- Install new sender and remove protective cap.
- Fit insulation and protective cap on the wiring.
- Install cable lugs on the stripped wires and solder to the contacts of the air intake temperature sender.
- Push insulation over soldered joints.
- Push protective cap on to sender for intake air temperature.

CHECKING VOLTAGE SUPPLY OF FEI CONTROL UNIT -J88

- Remove FEI control unit and pull plug off with ignition switched off.
(The control unit is behind the A pillar trim in the front right footwell).



- Connect test box V.A.G 1598 to detached plug of FEI control unit -2- with adapter lead V.A.G 1598/7 -1-. The numbers of the plug contacts are identical with the numbers in the test box.
Fuses OK - see current flow diagram.
- connect multimeter V.A.G 1526 with leads from V.A.G 1594 as follows to measure voltage:
  - between contacts 35 and 18
  - between contacts 35 and 9
- Switch ignition on.

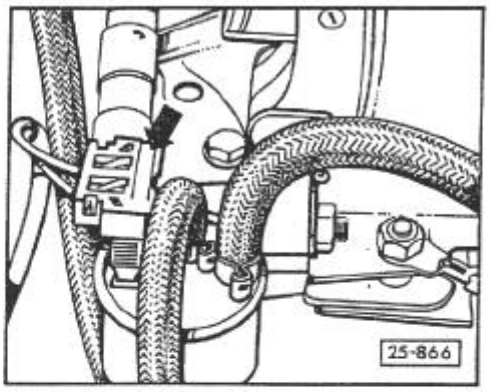
  Specified reading: approx. battery voltage

- Switch ignition off.

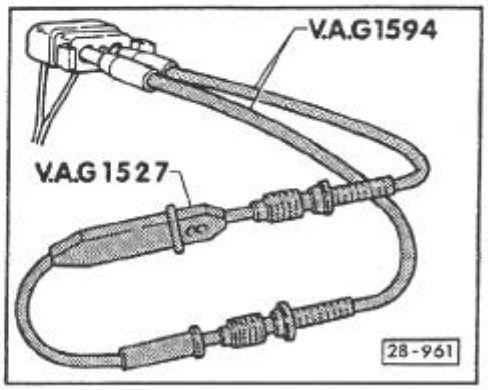
If the readings are not correct, locate break in wiring with the aid of current flow diagram and eliminate.

CHECKING TEMPERATURE SAFETY SWITCH

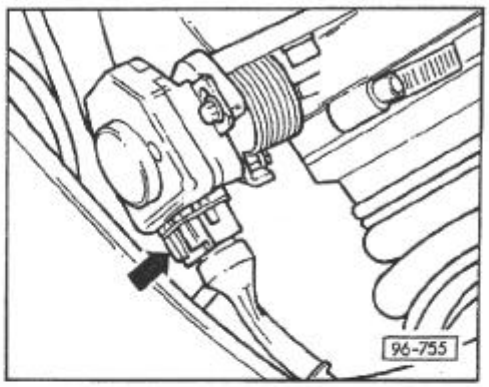
- Activation of solenoid valve for boost pressure control -N75 OK - see Repair Group 01.



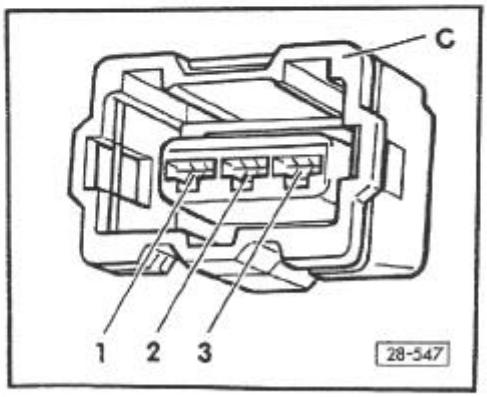
- Pull plug off solenoid valve for boost pressure control -N75.



- Connect diode test lamp V.A.G 1527 to plug contacts with leads from V.A.G 1594.
- Start engine and let it idle.



- Pull plug off idle and full throttle switch on throttle housing.



- With leads from V.A.G 1594 briefly connect (short circuit) contacts 2 and 3 in plug (C).

Specified result: Diode test lamp must flicker for about 2 seconds

If lamp does not flicker, renew electronic thermoswitch -F76.

If result is correct, remove leads between the contacts 2 and 3.