

Workshop Manual

Audi 100 1983 ►, Audi 200 1984 ►

Engine Code letters	HX	JY	KF	KG	KH	KP	KU	MC
	RT*	SL	WC	WU				
Booklet ^K Jetronic / ignition system *(see over leaf)								

Edition 07.89



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Repair Group Index to Workshop Manual

Audi 100 1983 ►, Audi 200 1984 ►

Please note: the technical supplements given here start at page 262

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

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SELF-DIAGNOSIS
=====

Engine code letters: JY, KG, KH

TEST CONDITIONS

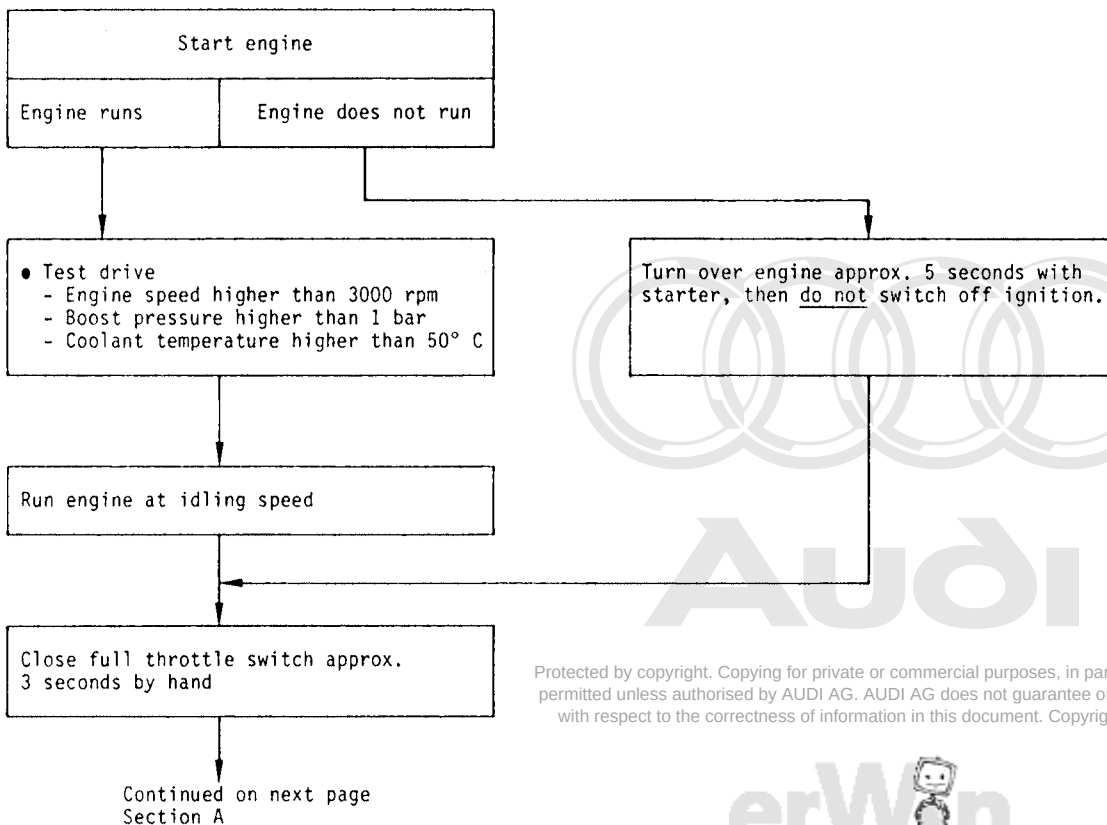
- Earth connections on engine OK.
- Fault lamp and rev counter OK.
 - Check rev counter control - page 28-98.
- Brake lights OK.
- Throttle valve switch (Idling switch -F 60- and full throttle switch -F 81-) in "Operation and Adjustment" OK - checking:
 - Engine code letters: JY, KG - page 25-145,
 - Engine code letters: KH - page 25-151.

RECALLING FAULT MEMORY WITH REV. COUNTER AND FAULT LAMP

Note:

After ignition is switched off, fault must be caused again by a test drive and stored in memory in order to be indicated on rev counter and fault lamp in the dash panel insert with engine running before ignition is switched off.

01-1

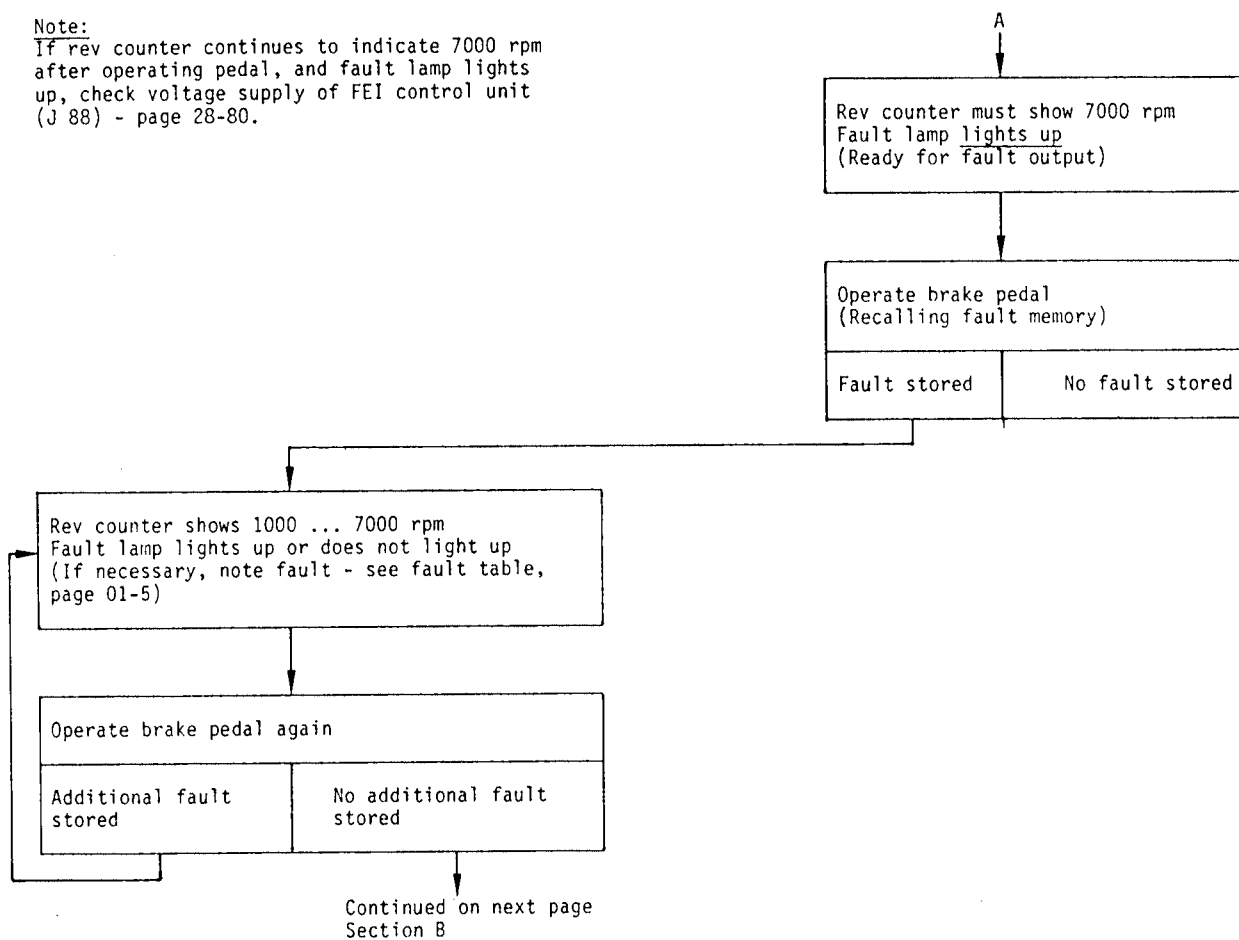


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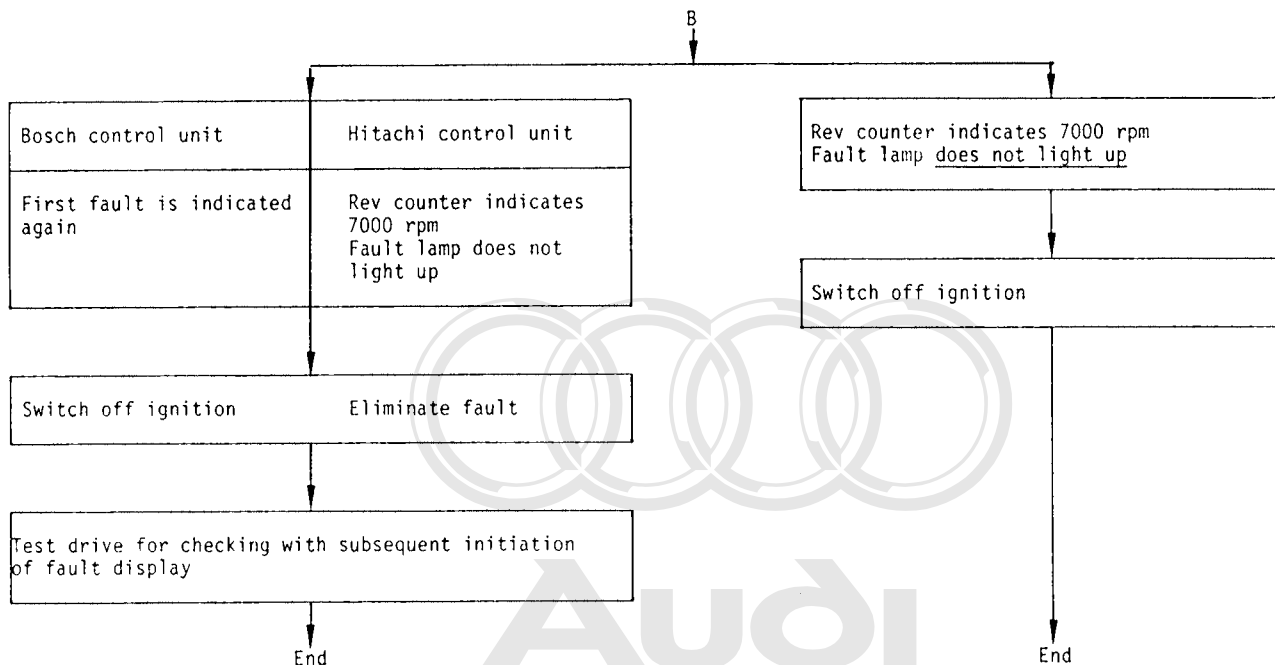


01-2

Note:
If rev counter continues to indicate 7000 rpm after operating pedal, and fault lamp lights up, check voltage supply of FEI control unit (J 88) - page 28-80.



01-3



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Important
If several faults have been found, order for fault finding and elimination must correspond to order of fault indication, and another test drive with subsequent fault output must follow each corrected fault.

FAULT TABLE

● If defective components are found, also check leads to components for short circuits and breaks using current flow diagram.

<u>Fault display</u>		<u>Fault source</u>	<u>Fault cause</u>	<u>Fault elimination</u>
Rev counter	Fault lamp			
1000 rpm	Does not light up	Engine speed sender (G 28)	- Metal shavings on G 28 - Retaining base loose on G 28 - Distance from G 28 to starter ring is greater than 1.25 mm - Broken teeth on starter ring	- Check distance from flywheel/ drive plate to engine speed sender - Repair Group 13
			- 3-pin connector of F 28 reversed - Break in wiring or short circuit between G 28 and FEI control unit (J 88)	- Check engine speed sender - page 28-84
1000 rpm	Lights up	Engine pinks/knocks	- Compression pressure too high	- Check compression pressure - Repair Group 15
			- Valve clearance too small or hydraulic bucket tappets defective	- Adjust valve clearance or check hydraulic bucket tappets - Repair Group 15
			- Dump valve of exhaust gas turbocharger	- Check - Repair Group 21
			- Octane number of fuel too low	- Use prescribed fuel

01-5

<u>Fault display</u>		<u>Fault source</u>	<u>Fault cause</u>	<u>Fault elimination</u>
Rev counter	Fault lamp			
1000 rpm	Lights up	Knock control (knock sensor -G 61-)	- G 61 loose (defective)	- Tightening torque 10 Nm
			- Break in wiring or short circuit between G 61 and FEI control unit (J 88)	- Locate and eliminate break in wiring or short circuit using current flow diagram
			- Knock control module in FEI control unit (J 88)	- Renew FEI control unit
2000 rpm	Does not light up	Firing point sender (G 4)	- Retaining base on G 4 loose - Distance from G 4 to pin on starter ring greater than 1.25 mm - Pin on flywheel bent or broken	- Check distance from pin to firing point sender - Repair Group 13
			- 3-pin connector on G 4 reversed - Break in wiring or short circuit between G 4 and FEI control unit (J 88)	- Check firing point sender - page 28-82
			- Distributor adjusted incorrectly	- Check basic setting of distributor - page 28-74
2000 rpm	Lights up	Knock sensor (G 61)	- G 61 defective	- Renew knock sensor (G 61)
3000 rpm	Does not light up	Hall sender (G 40)	- Break in wiring or short circuit in sender lead - G 40 defective	- Check Hall sender (G 40) - page 28-76
			- Distributor adjusted incorrectly	- Check basic setting of distributor - page 28-74

01-6

Fault display Rev counter Fault lamp		Fault source	Fault cause	Fault elimination
3000 rpm	Lights up	Intake air temperature sender (G 42)	- Break in wiring or short circuit in sender lead - G 42 defective	- Check intake air temperature sender (G 42) - page 28-88
4000 rpm or 6000 rpm	Does not light up	Vacuum hose from intake manifold to FEI control unit (J 88)	- Vacuum hose on intake manifold or on FEI control unit has fallen off, is pinched off, cracked or defective	- Check vacuum hose, installation - see vacuum connections - Repair Group 25
		Idling switch (G 60)	- Throttle cable adjustment	- Checking - Repair Group 20
			- Adjustment or mechanical sticking of F 60 - Break in wiring or short circuit in sender lead	- Checking and adjusting - Repair Group 25
4000 rpm	Lights up	Coolant temperature sensor (G 62)	- Break in wiring on short circuit in sender lead - G 62 defective	- Checking coolant temperature sensor - page 28-87
5000 rpm	Does not light up	Intake manifold pressure sender (G 71)	- G 71 in FEI control unit (J 88) defective	- Replace FEI control unit (J 88)
7000 rpm	Does not light up	All stored faults indicated or no faults stored	-	-

01-7

SELF-DIAGNOSIS =====

Engine code letters: MC with one knock sensor

FEI control unit (J 88) is equipped with self-diagnosis. If malfunctions occur in monitored sensors or components, these are stored in fault memory with a description of fault type.

After evaluation of the data, the FEI control unit differentiates between 13 different faults (see Fault Table on page 01-35). Fault memory is erased by switching off ignition.

In addition, FEI control unit is equipped with a final control element diagnosis for 5 final control elements.

Note:

- Final control element diagnosis can only be carried out if engine is not running.
- On the other hand, recalling of the fault memory should be carried out with engine running, if possible.

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01-8

Note:

- Fault reader V.A.G 1551 can be operated in following modes:
 - 1 - Rapid data transmission
 - 2 - Flash code output
 - 3 - Self-testing
 - 4 - Dealership identifier
- Operating modes 3 (self-testing) and 4 (dealership identifier) only concern fault reader and are described in operating instructions for V.A.G 1551.
- With the control unit described here, only the flash code output is possible.

TEST CONDITIONS

- Voltage supply of FEI control unit OK - checking - page 28-142.
 - Fuel pump OK - checking - Repair Group 20.
 - Fuel pump relay OK - checking - page 01-79
 - Fuses OK - see current flow diagram
 - Earth connections between engine compartment, intake manifold, ignition coil power stage and bolted-on parts OK.
 - Air conditioner switched off.
- Engines up to model year 88
- Fault lamp in dash panel insert OK.

01-9

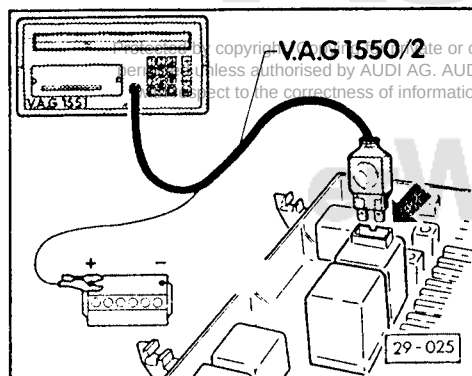
A - RECALLING FAULT MEMORY WITH FAULT READER
V.A.G 1551 IN OPERATING MODE 2 - FLASH CODE OUTPUT

- Observe test conditions - page 01-09
- Carry out test drive of at least 5 minutes.
During this
- coolant temperature must reach at least 80° C,
 - engine speed must be increased to above 3000 rpm,
 - boost pressure must rise to above 1 bar,
 - accelerator pedal must be depressed all the way for a short period.
- Run engine at idle.

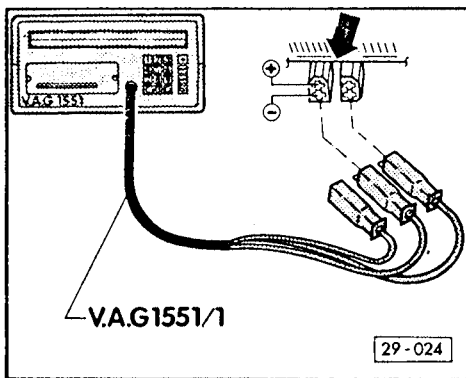
Note:

If engine does not start, operate starter approx. 5 seconds without switching off ignition afterwards.

- Up to model year 88
- Remove fuse box/relay plate cover.
- ➡ - Connect fault reader V.A.G 1551 with lead V.A.G 1550/2 to vehicle battery (+) or to B+ on alternator and on fuel pump relay. 



01-10



V.A.G - SELF-DIAGNOSIS HELP
 1 - Rapid data transmission*
 2 - Flash code output*

- From model year 89
- Connect fault reader V.A.G 1551 to diagnosis plugs in driver's side footwell with diagnosis lead V.A.G 1551/1 as follows.
- - Connect V.A.G 1551/1 black plug (voltage supply) to diagnosis plug (black) and white plug (diagnosis lead) to diagnosis plug (brown). Blue diagnosis plug of V.A.G 1551/1 is not required.
- Connect plug with white marking to "brown" connector for recalling fault memory.

➤ Display indicates:

* Appears alternately

Note:

- Additional operating information can be recalled with Help button of V.A.G 1551-
- ➡ button continues program flow.
- Switch on printer with Print button (operating lamp in button lights up).

01-11

- Press button 2 for "flash code output" operating mode.

➤ Display indicates:

Initiate flash code output
 with "➡" button

- Briefly press ➡ button.
 Stored faults or flash codes are indicated on display and printed by printer.

Note:

➤ If printer is not ready for operation, press ➡ button until

Flash code: 0 0 0 0
 Output END

appears on display or last fault is indicated. Note flash code.

- Switch off ignition. Locate and eliminate fault using fault table - page 01-35.

- After eliminating fault, carry out another test drive of at least 5 minutes and recall fault memory again.

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B - FINAL CONTROL ELEMENT DIAGNOSIS WITH FAULT READER V.A.G 1551 IN OPERATING MODE 2 - FLASH CODE OUTPUT

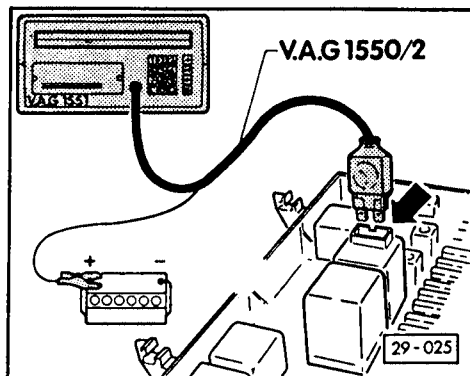
Note:

- Final control element diagnosis can only be carried out if engine is not running.
- During final control element diagnosis, cold start valve (N 17) is only activated for 10 seconds.
- Final control element diagnosis is terminated if engine is started or rpm pulse is detected
- Operation of final control elements is checked acoustically or by sense of touch during final control element diagnosis. For this, immediate area around vehicle must be quiet.
- Control sequence - page 01-16.

- Switch off ignition.

• Up to model year 88

- Remove fuse box/relay plate cover.

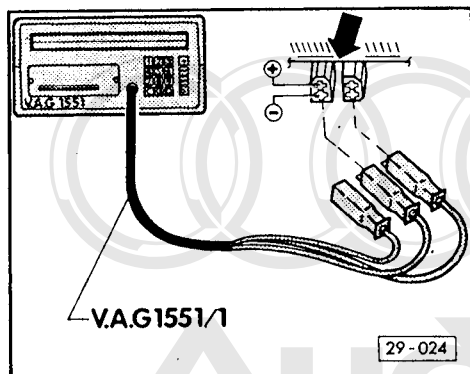


- ◀ - Connect fault reader V.A.G 1551 with lead V.A.G 1550/2 to vehicle battery (+) or to B+ on alternator and on fuel pump relay -arrow-.

01-13

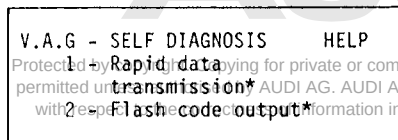
• From model year 89

- Connect fault reader V.A.G 1551 to diagnosis plugs in driver's side footwell with diagnosis lead V.A.G 1551/1 as follows.



- ◀ - Connect V.A.G 1551/1 black plug (voltage supply) to diagnosis plug (black) and white plug (diagnosis lead) to diagnosis plug (brown). Blue diagnosis plug of V.A.G 1551/1 is not required.

◀ Display indicates:



* Appears alternately

01-14

- Switch on printer with Print button (operating lamp in button lights up).
- Press button 2 for operating mode "flash code output".

Initiate flash code output
with "→" button

◀ Display indicates:

Permanent short circuit to earth
on stimulus lead

- ◀ - Press → button until permanent short-circuit to earth on stimulus lead appears on display.

- Switch on ignition.
- Briefly press → button.

◀ Display indicates:

Flash code: 4 4 3 3
Fuel pump relay - J 17

Fuel pump relay must operate and fuel pump must run.

If fuel pump relay does not operate, check control signal
- page 01-79.

Note:

After checking fuel pump relay (J 17), pull out fuse No. 13.

01-15

- By pressing → button all final control elements are activated consecutively in following order.

Note:

Individual final control elements, with exception of cold start valve (N 17), are activated (click) until unit is switched to next final control element by pressing → button.

- After checking last final control element, activated charcoal filter system solenoid valve 1 (N 80), reinstall fuse No. 13.
- Switch off ignition.

Control sequence:

Flash code	Final control element
4 4 3 3	Fuel pump relay (J 17)
4 4 4 1	Frequency valve for Lambda regulation (N 7)
4 4 4 2	Solenoid valve for boost pressure control (N 75)
4 4 4 3	Cold start valve (N 17)
4 3 4 3	Activated charcoal filter system solenoid valve 1 (N 80)

Note:

- Final control element operation is checked acoustically or by sense of touch during final control element diagnosis.
- Except for fuel pump relay (J 17), all other final control elements click.
- If one or the valves does not click, check valve and control signal - pages 01-79 to 01-87.

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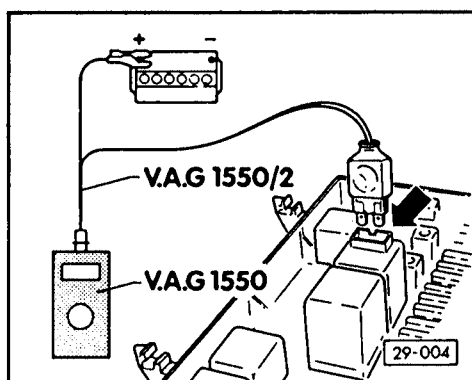
01-16

C - RECALLING FAULT MEMORY WITH FAULT READER V.A.G 1550

- Observe test conditions - page 01-09
- Carry out test drive of at least 5 minutes.
During this
 - coolant temperature must reach at least 80° C,
 - engine speed must be increased to above 3000 rpm,
 - boost pressure must rise to above 1 bar,
 - accelerator pedal must be briefly depressed all the way.
- Run engine at idle.

Note:

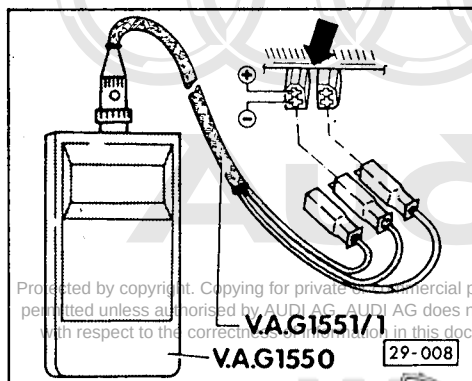
If engine does not start, operate starter approx. 5 seconds without switching off ignition afterwards.



01-17

- Up to model year 88
- Remove fuse box/relay plate cover.

- ▶ - Connect fault reader V.A.G 1551 with lead V.A.G 1550/2 to vehicle battery (+) or to B+ on alternator and on fuel pump relay -arrow-.



- From model year 89
- Connect fault reader V.A.G 1550 to diagnosis plugs in driver's side footwell with diagnosis lead V.A.G 1551/1 as follows.
- ▶ - Connect V.A.G 1551/1 black plug (voltage supply) to diagnosis plug (black) and white plug (diagnosis lead) to diagnosis plug (brown). Blue diagnosis plug of V.A.G 1551/1 is not required.
- Connect plug with white marking to "brown" connector for recalling fault memory.

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Briefly press button on fault reader, read off flash code and note.

Note:

- 20 sec. after operating button of fault reader, fault or flash code is indicated as 4-figure number, then acoustic signal is emitted. After signal, next fault or flash code can be recalled by briefly depressing button.
- If flash code 4 4 4 4 is shown, no fault is stored and test is completed.

Otherwise:

- Press button briefly again. Read off flash code and note.

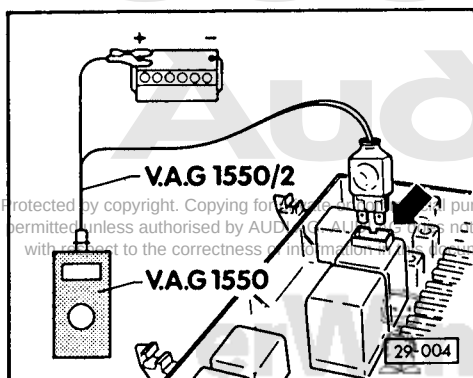
- As several faults can be stored, repeat test until flash code 0 0 0 0 (fault output END) appears.
- Switch off ignition. Eliminate fault using fault table - page 01-35.
- After eliminating fault, carry out another road test of at least 5 minutes and recall fault memory again.

D - FINAL CONTROL ELEMENT DIAGNOSIS WITH FAULT READER V.A.G 1550

Note:

- Final control element diagnosis can only be carried out if engine is not running.
 - During final control element diagnosis, cold start valve (N 17) is only activated for 10 seconds.
 - Final control element diagnosis is terminated if engine is started or rpm pulse is detected.
 - Operation of final control elements is checked acoustically or by sense of touch during final control element diagnosis. For this, immediate area around vehicle must be quiet.
 - Control signal sequence - page 01-22.
- Switch off ignition.

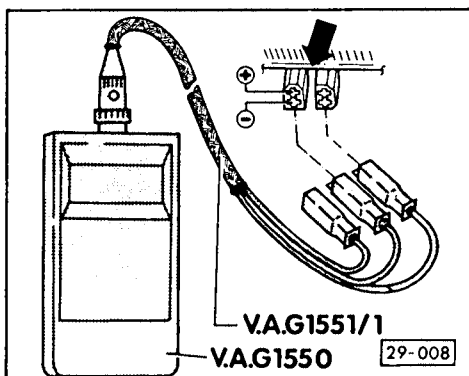
01-19



- Up to model year 88

- Remove cover of fuse box/relay plate

- ◀ - Connect fault reader V.A.G 1550 with lead V.A.G 1550/2 to vehicle battery (+) or to B+ on alternator and on fuel pump relay -arrow-.



- From model year 89

- Connect fault reader V.A.G 1550 to diagnosis plugs in driver's side footwell with diagnosis lead V.A.G 1551/1 as follows.

- ◀ - Connect V.A.G 1551/1 black plug (voltage supply) to diagnosis plug (black) and white plug (diagnosis lead) to diagnosis plug (brown). Blue diagnosis plug of V.A.G 1551/1 is not required.

01-20

- With ignition switched off, press button on fault reader until display - - - goes out briefly.

- Switch on ignition.

- Briefly press button on fault reader again.

Fuel pump relay must operate and fuel pump must run.

If fuel pump relay does not operate, check control signal - page 01-79.

Note:

After checking fuel pump relay (J 17), pull out fuse No. 13.

- By briefly pressing button on fault reader all final control elements are activated consecutively in following order - page 01-22.

Note:

Individual final control elements, with exception of cold start valve (N 17), are activated (click) until unit is switched to next final control element by pressing button on fault reader.

- After checking last final control element, activated charcoal filter system solenoid valve 1 (N 80), reinstall fuse No. 13.

- Switch off ignition.

01-21

Control sequence:

Flash code	Final control element
4 4 3 3	Fuel pump relay (J 17)
4 4 4 1	Frequency valve for Lambda regulation (N 7)
4 4 4 2	Solenoid valve for boost pressure control (N 75)
4 4 4 3	Cold start valve (N 17)
4 3 4 3	Activated charcoal filter system solenoid valve 1 (N 80)

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Note:

- Final control element operation is checked acoustically or by sense of touch during final control diagnosis.
- Except for fuel pump relay (J 17), all other final control elements click.
- If one of the valves does not click, check valve and control signal - pages 01-79 to 01-87.

01-22

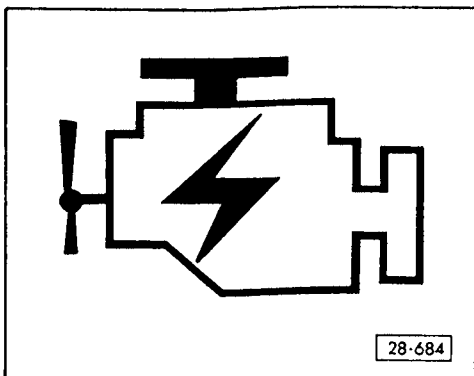
E - RECALLING FAULT MEMORY WITH FUSE AND FAULT LAMP OR WITH DIODE TEST LAMP V.A.G 1527 AND AUXILIARY LEADS FROM V.A.G 1594

Note:

- Final control element diagnosis can only be carried out if engine is not running.
- On the other hand, fault memory should be recalled with engine running, if possible. Otherwise turn over engine with starter for approx. 5 seconds without switching off ignition afterwards.

Reading flashing code

- Up to model year 88:



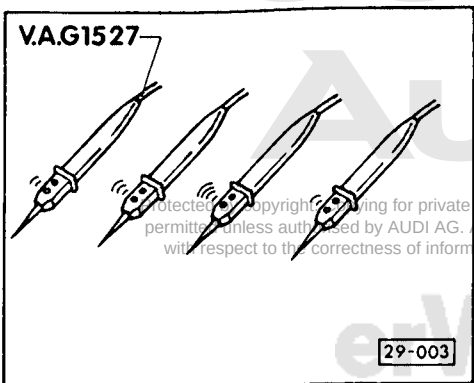
- Reading flash code on fault lamp in dash panel insert.

If ignition is switched on, fault lamp must light up.

If no fault is present which could lead to engine damage, fault lamp goes out after engine is started.

When recalling fault memory, fault lamp must flash.

01-23



- From model year 89:

- Reading flash code with diode test lamp V.A.G 1527

When recalling fault memory, faults can be read with flash code. During final control element diagnosis, respective final control unit is indicated with flash code.

- Each flash code consists of 4 flashing pulse groups of max. 4 flashing pulses. Between each flashing pulse there is a pause (fault lamp or diode test lamp off) of approx. 2.5 seconds.



By adding together individual flashing pulses within flashing pulse groups (each flashing pulse group results in a figure between 1 and 4), differing flashing codes are read with fault lamp or diode test lamp V.A.G 1527.

For fault elimination, all possible flash codes are listed in fault table on page 01-35.

For flash codes of final control element diagnosis, see control sequence - page 01-34.

During fault memory recall and final control diagnosis, display of various flashing codes runs as follows.

After start signal (fault lamp or diode test lamp on) and subsequent pause (fault lamp or diode test lamp off) of 2.5 seconds respectively, transmission of flashing pulses within 4 flashing pulse groups of respective flash codes follows.

01-24

After transmission of 4th flashing pulse group, pause of approx. 2.5 seconds follows. Then start signal of respective flash code is repeated until next memory location or next component is called up during final control element diagnosis.

Recalling fault memory with fuse and fault lamp (in dash panel insert)

- Up to model year 88

Note:

Recalling fault memory with diode test lamp V.A.G 1527 and auxiliary leads from V.A.G 1594 (from model year 89) - page 01-27.

- Observe test conditions - page 01-09

- Carry out test drive of at least 5 minutes.

During this

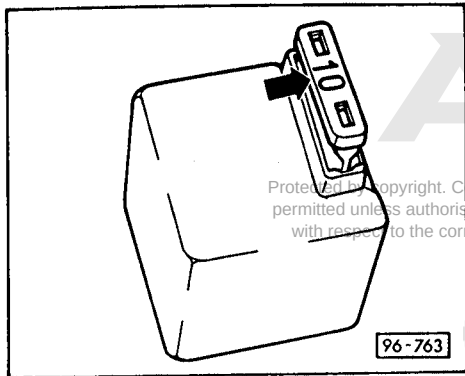
- coolant temperature must reach at least 80° C,
- engine speed must be increased to above 3000 rpm,
- boost pressure must rise to above 1 bar,
- accelerator pedal must be briefly depressed all the way.

- Run engine at idle.

Note:

If engine does not start, operate starter approx. 5 seconds without switching off ignition afterwards.

01-25



- ▶ - Link contacts on fuel pump relay (J 17) for at least 4 seconds with fuse.

Lighting up of fault lamp in dash panel insert must change into flashing after fuse is removed.

- Count and note flashing pulses.

Note:

- Respective flash code is repeated until unit is switched to next memory location of fault memory by linking contacts on fuel pump relay again. Flash code fault table - see page 01-35.
- If flash code 4 4 4 4 is shown, no fault is stored and test is completed.

Otherwise:

- Link contacts on fuel pump relay again, count and note flashing pulses.
- Since several faults can be stored, repeat test until flash code 0 0 0 0 (fault output END) appears.
- Switch on ignition, eliminate faults using fault table - page 01-35.
- After eliminating faults carry out another test drive of at least 5 minutes and recall fault memory again.

01-26

Recalling fault memory with diode test lamp V.A.G 1527 and auxiliary leads from V.A.G 1594

- From model year 89

Note:

Recalling fault memory with fuse and fault lamp (in dash panel insert) (up to model year 88) - page 01-25.

- Observe test conditions - page 01-09

- Carry out test drive of at least 5 minutes.

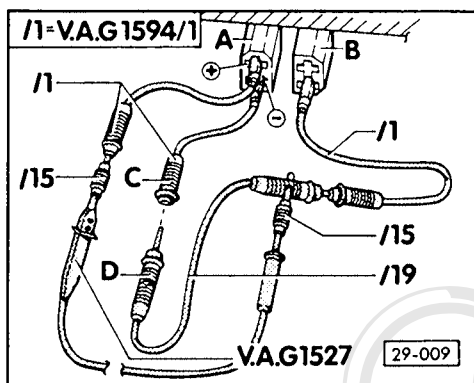
During this

- coolant temperature must reach at least 80° C,
- engine speed must be increased to above 3000 rpm,
- boost pressure must rise to above 1 bar,
- accelerator pedal must be briefly depressed all the way.

- Run engine at idle.

Note:

If engine does not start, operate starter approx. 5 seconds without switching off ignition afterwards.

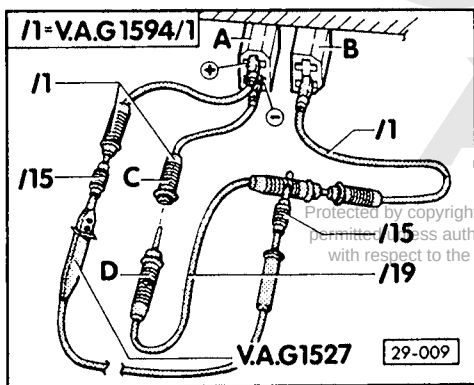


- ◀ - Connect diode test lamp V.A.G 1527 with auxiliary leads from V.A.G 1594 to diagnosis plugs -A- and -B-.

Note:

Contact 2 (+) of black diagnosis plug -A- (voltage supply) is fused via fuse 21. Contact 1 is earthed. Only contact -1- is occupied in brown diagnosis plug -B- (see current flow diagram).

01-27



- ◀ - Connect plugs -C- (earth) and -D- for at least 4 seconds, then disconnect again.

Lighting up of diode test lamp must change to flashing.

- Count and note flashing pulses.

Note:

- Respective flash code is repeated until unit is switched to next memory location of fault memory by connecting plugs -C- and -D- for at least 4 seconds and separating again. Flash code fault table - see page 01-35.
- If flash code 4 4 4 4 is shown, no fault is stored and test is completed.

Otherwise:

- Reconnect plugs -C- and -D- for at least 4 seconds and separate again. Count and note flashing pulses.

- Since several faults can be stored, repeat test until flash code 0 0 0 0 (fault output END) appears.
- Switch off ignition. Eliminate faults using fault table - page 01-35.
- After eliminating faults carry out another test drive of at least 5 minutes and recall fault memory again.

01-29

F - FINAL CONTROL ELEMENT DIAGNOSIS WITH FUSE AND FAULT LAMP OR DIODE TEST LAMP V.A.G 1527 AND AUXILIARY LEADS FROM V.A.G 1594

Note:

- Final control element diagnosis can only be carried out if engine is not running.
- During final control element diagnosis, cold start valve (N 17) is only activated for 10 seconds.
- Final control element diagnosis is terminated if engine is started or rpm pulse is detected.
- Operation of final control elements is checked acoustically or by sense of touch during final control element diagnosis. For this, immediate area around the vehicle must be quiet.
- Reading flash code with fault lamp or diode test lamp - page 01-23.
- Control sequence - page 01-34.

Final control element diagnosis with fuse and fault lamp (in dash panel insert)

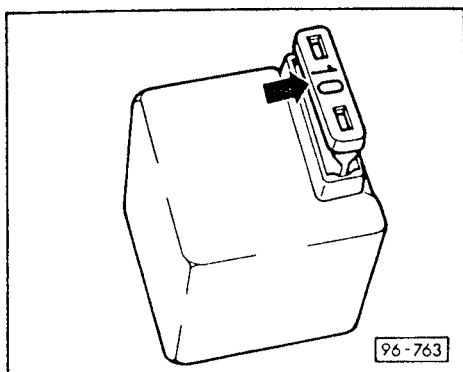
- Up to model year 88

Note:

- Final control element diagnosis with diode test lamp V.A.G 1527 and auxiliary leads from V.A.G 1594 (from model year 89) - page 01-32.
- After initiating final control diagnosis, fault lamp indicates which final control element is currently being activated by FEI control unit.

- Switch on ignition.

- ◀ - Link contacts on fuel pump relay (J 17) for at least 4 seconds with fuse.

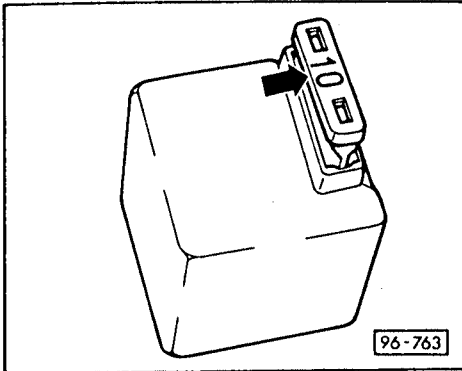


Fuel pump relay must operate and fuel pump must run.

If fuel pump relay does not operate, check control signal
- page 01-79.

Note:

After checking fuel pump relay (J 17), pull out fuse No. 13.



- ◀ - Then link contacts on fuel pump relay again for at least 4 seconds with fuse.
- By linking contacts on fuel pump relay, all final control elements are activated consecutively in control sequence - see page 01-34.

Note:

Individual final control elements, with exception of the cold start valve (N 17), are activated (click) until unit is switched to the next final control element by pressing button on fault reader.

- After checking last final control element, activated charcoal filter system solenoid valve 1 (N 80), reinstall fuse No. 13.
- Switch off ignition.

01-31

Final control element diagnosis with diode test lamp V.A.G 1527 and auxiliary leads from V.A.G 1594

- From model year 89

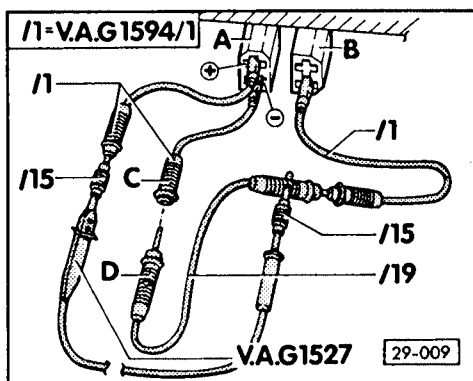
Note:

- Final control element diagnosis with fuse and fault lamp (up to model year 88) - page 01-30.
- After initiating final control element diagnosis, LED of diode test lamp V.A.G 1527 indicates which final control element is currently being controlled by FEI control unit.

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Important

Four seconds after plug -C- (earth) has been connected to plug -D-, final control elements (components) are activated. Respective flash code is not indicated with LED of diode test lamp V.A.G 1527 until after plugs -C- and -D- are separated.

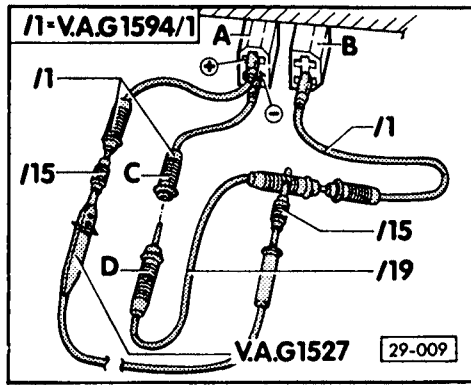


- ◀ - Connect diode test lamp V.A.G 1527 with auxiliary leads from V.A.G 1594 to diagnosis plugs -A- and -B-.

Note:

Contact 2 (+) of black diagnosis plug -A- (voltage supply) is fused via fuse 21. Contact 1 is earthed. Only contact -1- is occupied in brown diagnosis plug -B- (see current flow diagram).

01-32



◀ - Connect plug -C- (earth) to plug -D-.

- Switch on ignition.

- After approx. 4 seconds, disconnect plug -C- from -D- again.

Fuel pump relay must operate and fuel pump must run.

If fuel pump does not operate, check control signal - page 01-79.

Note:

After testing fuel pump relay (J 17) pull out fuse No. 13.

- Then reconnect plug -C- to plug -D- for at least 4 seconds.

- By connecting plug -C- and -D- all final control elements are activated consecutively in control sequence - see page 01-34.

Note:

Individual final control elements, except for cold start valve (N 17), are activated (click) until unit is switched to next final control element by connecting plugs -C- and -D-.

- After checking last final control element, activated charcoal filter system solenoid valve 1 (N 80), reinstall fuse No. 13.

- Switch off ignition.

01-33

Control sequence:

Flash code	Final control element
4 4 3 3	Fuel pump relay (J 17)
4 4 4 1	Frequency valve for Lambda regulation (N 7)
4 4 4 2	Solenoid valve for boost pressure control (N 75)
4 4 4 3	Cold start valve (N 17)
4 3 4 3	Activated charcoal filter system solenoid valve 1 (N 80)

Note:

- Operation of final control elements is checked acoustically or by sense of touch during final control diagnosis.
- Except for fuel pump relay (J 17), all other final control elements click.
- If one of the valves does not click, check valve and control signal - pages 01-79 to 01-87.

01-34

FAULT TABLE

- All possible faults which can be detected by FEI control unit (J 88) are listed below.
- If defective components are found, also check leads to components for short circuit and breaks in wiring using current flow diagram.
- Before eliminating fault or replacing components, check earth connection of FEI control unit (J 88) using current flow diagram (checking voltage supply - page 28-142), and check earth points on engine for corrosion and damage.

Flash code	Fault source	Fault cause	Effects	Fault elimination
1 1 1 1	FEI control unit (J 88) defective	Computer in FEI control unit (J 88)		Renew FEI control unit (J 88)
2 1 1 1	Engine speed sender (G 28)	- Metal particles on G 28 - Retaining base on G 28 loose - Distance from G 28 to starter ring greater than 1.25 mm - Broken teeth on starter ring	- Engine does not start - Ignition failure - Engine stalls	- Check distance from flywheel/ drive plate to engine speed sender - Repair Group 13
		- Break in wiring or short circuit between 3-pin plug in engine compartment and G 28 - 3-pin connector from G 28 and firing point sender (G 4) reversed - G 28 defective - Input for G 28 in FEI control unit (J 88) defective (FEI control unit defective)	- Engine does not start	- Check engine speed sender (G 28) - page 28-132

01-35

Flash code	Fault source	Fault cause	Effects	Fault elimination
2 1 1 2	Firing point sender (G 4)	- Retaining base of G 4 loose - Distance from G 4 to pin on starter ring greater than 1.25 mm - Pin on flywheel bent or broken	- Fault before engine start-up: engine does not start	- Check distance from pin to firing point sender - Repair Group 13
		- Break in wiring or short circuit between 3-pin plug in engine compartment and G 4 - 3-pin connector from G 4 and engine speed sender (G 28) reversed - G 4 defective - Break in wiring or short circuit between FEI control unit (J 88) and G 4 - Input for G 4 in FEI control unit (J 88) defective (FEI control unit defective)	- Fault after engine start-up: flashing code 2 1 1 2 is stored	- Check firing point sender (G 4) - page 28-129
2 1 1 3	Hall sender (G 40)	- No supply voltage for G 40 from J 88 - No earth for G 40 - Break in signal lead to J 88 or signal lead short circuited to earth - Short circuit between contact 25 and 27 on J 88 - Break in wiring between 3-pin connector in engine compartment and J 88 - G 40 defective - Input for G 40 in J 88 defective (J 88 defective)	- Fault before engine start-up: engine does not start	- Check Hall sender (G 40) - page 28-117
		- Position of G 4 pin		- See flash code 2 1 1 2
		- Toothed belt jumped	- Fault before engine start-up: flashing code 2 1 1 3 stored	- Checking - Repair Group 13
		- Adjustment of G 40		- Basic setting for ignition distributor - page 28-114
				- Checking - page 28-117

Flash code	Fault source	Fault cause	Effects	Fault elimination
2 1 2 1	Idling switch (G 60)	- Throttle cable adjustment	- Idling speed not within specified range	- Check throttle cable adjustment - Repair Group 20
		- Adjustment of F 60 - Break in wiring or short circuit in idling switch or in cable - Mechanical sticking of idling switch		- Check and adjusting idling switch (F 60) - page 25-157
2 1 2 3	Full throttle switch (F 81)	- Adjustment of F 81 - Short circuit or break in wiring in full throttle switch - Mechanical sticking of full throttle switch - Checking and adjusting full throttle switch (F 81) - page 25-157		- Check and adjust full throttle switch (F 81) - page 25-157
2 1 4 1	First knock control	- Poor fuel quality, less than 91 RON	- Slight loss of power - Slightly increased fuel consumption - Top speed is not reached	- Use prescribed fuel
		- Abnormal engine noises (auxiliary components loose)	- Engine runs unevenly	- Check security auxiliary components and engine mounts
		- Break in wiring of screening for knock sensor (G 61)		- Locate and eliminate break in wiring using current flow diagram
		- Knock control module in FEI control unit J 88 (J 88 defective)	- Higher fuel consumption - Lack of power	- Renew FEI control unit (J 88)

01-37

Flash code	Fault source	Fault cause	Effects	Fault elimination
2 1 4 2	Knock sensor -1- (G 61)	- G 61 loose	- Higher fuel consumption - Lack of power	- Tightening torque 10 Nm
		- Break in wiring or short circuit between G 61 and FEI control unit (J 88)		- Locate and eliminate break in wiring or short circuit using current flow diagram
		- G 61 defective		- Renew knock sensor (G 61)
		- Input for G 61 in FEI control unit defective (J 88 defective)		- Renew FEI control unit (J 88)
2 2 2 1	Intake manifold pressure	- Vacuum hose between intake manifold and FEI control unit (J 88) has fallen off, is cracked or defective	- No boost pressure control - No acceleration enrichment	- Check vacuum hose - page 25-228
2 2 2 2	Intake manifold pressure sender (G 71)	- Intake manifold pressure sender (G 71) in FEI control unit (J 88) defective	- No boost pressure control - No acceleration enrichment	- Renew FEI control unit (J 88)
2 3 1 2	Coolant temperature sender (G 62)	- Break in wiring or short circuit in sender lead - G 62 defective	- Cold starting difficulties at very low temperatures - Engine runs unevenly in warm-up phase	- Check coolant temperature sender (G 62) - page 28-136

01-38

Flash code	Fault source	Fault cause	Effects	Fault elimination
2 3 2 2	Intake air temperature sender (G 42)	- Break in wiring or short circuit in sender lead - G 42 defective		- Check intake air temperature sender (G 42) - page 28-137
2 3 4 2	Lambda probe (G 39)	- Break in wiring to FEI control unit (J 88) - Probe heating does not function - Fuse No. 28 (probe heating) defective - Heating element in probe heating defective - Incorrect connection of probe heating (earth) - Short circuit in signal lead to screening	- CO content not OK - Increased fuel consumption - Spark plugs become sooty - CO content before catalyst greater than 3 % vol.	- Check Lambda system - page 28-93
4 4 4 4	No fault detected	• If malfunction is present, fault <u>not</u> detected with self-diagnosis		- Continue fault finding with malfunction tables, binder "Fault Finding - Engine"
0 0 0 0	Output end			

01-39

SELF-DIAGNOSIS =====

Engine code letters: MC with two knock sensors

FEI control unit (J 88) is equipped with self-diagnosis. If malfunctions arise in monitored sensors or components, these are stored with information on fault type in fault memory.

FEI control unit differentiates after data evaluation between 17 different faults (see fault table, page 01-60) and stores these until fault memory is cleared.

In addition, FEI control unit is equipped with final control element diagnosis for 6 final control elements.

Note:

- Final control element diagnosis can only be carried out if engine is not running.
- On the other hand, recalling of fault memory should be carried out with engine running, if possible.

Self-diagnosis is not limited to storing, recalling, clearing and final control element diagnosis, but offers other application possibilities with basic setting, control unit identification and coding.

Possibilities of self-diagnosis can only be completely exploited by using the fault reader V.A.G 1551.



Note:

- Fault reader V.A.G 1551 can be operated in following modes:
 - 1 - Rapid data transmission
 - 2 - Flash code output
 - 3 - Self-testing
 - 4 - Dealership identifier
- Should fault reader V.A.G 1551 not be available, recalling fault memory, final control element diagnosis and clearing fault memory with flash code output on diode test lamp V.A.G 1527 is described as a temporary solution.
- Operating modes 3 (self-testing) and 4 (dealership identifier) concern only fault reader and are described in operating instructions of V.A.G 1551.

TEST CONDITIONS

- Voltage supply of FEI control unit OK - checking - page 28-142.
- Fuel pump OK - checking - Repair Group 20.
- Fuel pump relay OK - checking - page 01-96.
- Fuses 13, 21 and 28 OK.
- Earth connection on engine (intake manifold) OK.
- Air conditioner switched off.

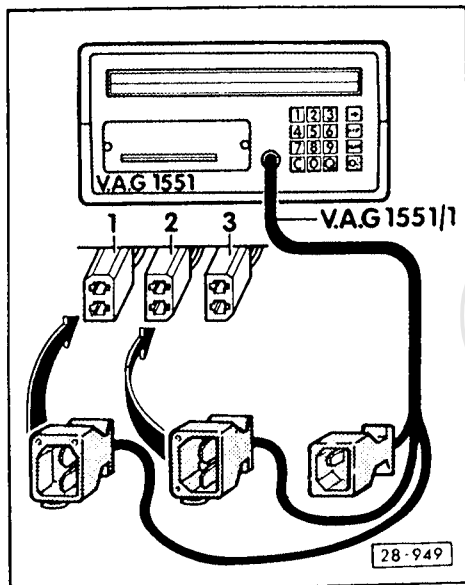
01-41

A - RECALLING AND CLEARING FAULT MEMORY WITH FAULT READER V.A.G 1551 IN OPERATING MODE 1 - RAPID DATA TRANSMISSION

- Observe test conditions - page 01-41

Note:

Fault memory can only be cleared after completed recall.



- Switch off ignition.

- Connect fault reader with diagnosis lead V.A.G 1551/1 to diagnosis plugs in driver's side footwell as follows.

▶ - Plug black plug of V.A.G 1551/1 (voltage supply positive from fuse 21) into diagnosis plug -1- (black) and white plug (diagnosis lead) into diagnosis plug -2- (brown). Blue diagnosis plug of V.A.G 1551/1 is not required.

V.A.G - SELF-DIAGNOSIS	HELP
1 - Rapid data transmission*	
2 - Flashing code output*	

▶ Display indicates:

* Appears alternately

01-42

Note:

- Additional operating information can be recalled with HELP button of V.A.G 1551.
-  button serves to advance program sequence.
- Run engine, or turn over engine with starter for at least 5 seconds without switching off ignition afterwards.
- Switch on printer with Print button (operating lamp in button lights up).
- Press button 1 for "rapid data transmission" operating mode.

Rapid data transmission Enter address word XX	HELP
--	------

➤ Display indicates:

01-43

- Press buttons 0 and 1.
(Address word "engine electronics" is entered with 01).

Rapid data transmission 01 Engine electronics	Q
--	---

➤ Display indicates:

- Acknowledge input with Q button.

89390740 A ENGINE Coding HS/BU	
---	---

- Control unit identification and coding appear on display, for example:
 - Different codes - page 01-70.

Control unit does not answer! HELP

➤ Appears on display:

- By pressing HELP button a list of possible fault causes can be printed out.
- After eliminating possible fault causes, enter address word 01 for "engine electronics" again and acknowledge with Q button.
- Press  button.

Rapid data transmission Select function XX	HELP
---	------

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01-44

Note:

After HELP button is pressed, list of possible functions is printed out.

- Press buttons 0 and 2 and acknowledge input with Q button. (Function "recall fault memory" is selected with 02).

Rapid data transmission Q
Recall 02 fault memory

◀ Display indicates:

- Acknowledge input with Q button.

◀ Number of stored faults or "no fault detected" is indicated on display.

- Press  button.

Stored faults are displayed consecutively and printed out - fault table - page 01-60.

- After display and printing of last fault press  button.

Note:

If a malfunction is present and has not been recognized by self-diagnosis, carry out additional fault finding using fault table from "Fault Finding - Engine" binder.

X faults detected!

or

No faults detected!

01-45

Note:

- If, for example, ignition has been switched off or engine has been run between recalling fault memory and clearing fault memory, fault memory will not be cleared.

Rapid data transmission HELP
Select function XX

◀ Display indicates:

- Press buttons 0 and 5.
(Fault memory is cleared with 05).

Rapid data transmission Q
05 - clear fault memory

◀ Display indicates:

- Acknowledge input with Q button.

Important
Fault memory was not recalled

◀ Appears on display:

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01-46

Rapid data transmission
Fault memory cleared!

➤ If fault memory is cleared, display indicates:

- Eliminate printed faults using fault table - page 01-60.

Note:

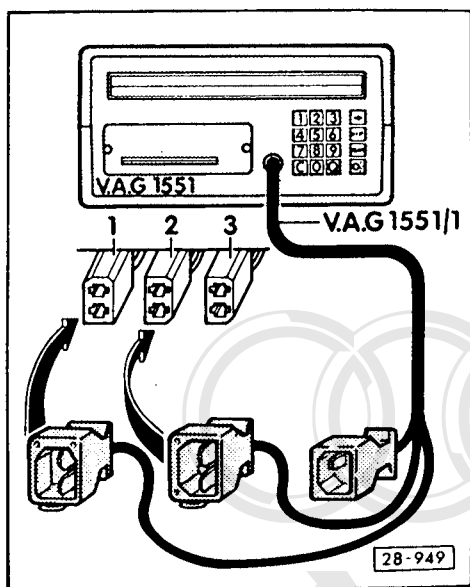
After eliminating faults indicated by fault reader, a test drive of at least 5 minutes must be carried out and fault memory recalled again.

B - FINAL CONTROL ELEMENT DIAGNOSIS WITH FAULT READER V.A.G 1551 IN OPERATING MODE 1 - RAPID DATA TRANSMISSION

Note:

- Final control element diagnosis can only be carried out if engine is not running.
- During final control element diagnosis, cold start valve (N 17) is only activated 10 seconds.
- Final control element diagnosis is terminated if engine is started or rpm pulse is detected.
- Operation of final control elements is checked acoustically or by sense of touch during final control element diagnosis. For this, it must be quiet in immediate area around vehicle.
- Control sequence - page 01-51.

01-47



- Switch off ignition.

- Connect fault reader to diagnosis plugs in driver's side footwell with diagnosis lead V.A.G 1551/1 as follows.

- - Connect black plug of V.A.G 1551/1 (voltage supply positive from fuse 21) to diagnosis plug -1- (black) and white plug (diagnosis lead) to diagnosis plug -2- (brown). Blue diagnosis plug of V.A.G 1551/1 is not required.

➤ Display indicates:

V.A.G - SELF-DIAGNOSIS HELP
1 - Rapid data transmission*
2 - Flashing code output*

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- Switch on ignition.

- Switch on printer with Print button (operating lamp in button lights up).

- Press button 1 for "rapid data transmission" operating mode.

01-48

Rapid data transmission HELP
Enter address word XX

◀ Display indicates:

- Press buttons 0 and 1.
(Enter address word "engine electronics" with 01).

Rapid data transmission Q
01 engine electronics

◀ Display indicates

- Acknowledge input with Q button.

893907404 A ENGINE Code
Code HS/BU ➡

- ◀ Control unit identification and coding appears on display, for example:
 - Different codes - page 01-70.

Control unit does not answer!
HELP

◀ Appears on display:

- See page 01-44.

Rapid data transmission HELP
Select function XX

◀ Display indicates:

- Press ➡ button.

01-49

Note:

After HELP button is pressed, table of possible functions is printed out.

- Press buttons 0 and 3 and acknowledge with Q button.
("Final control element diagnosis" function is selected with 03).

Display indicates:

Final control element diagnosis
Fuel pump relay J 17 ➡

Fuel pump relay must operate and fuel pump must run.

If fuel pump relay does not operate, check control - page 01-96.

Note:

After checking fuel pump relay (J 17) pull out fuse No. 13.

- By pressing ➡ button all final control elements are activated consecutively in sequence listed on next page.

Note:

Individual final control elements, except for cold start valve (N 17), are activated (click) until unit is switched to next final control unit by pressing ➡ button.

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- After checking last final control element (activated charcoal filter system solenoid valve 2 - N 115), install fuse No. 13 again.
- This valve is activated until final control element diagnosis is terminated by pressing  button.
- If function 03 "final control element diagnosis" is then selected again, final control element diagnosis can be repeated.

Control sequence:

Fuel pump relay (J 17)
 Frequency valve for Lambda regulation (N 7)
 Solenoid valve for boost pressure control (N 75)
 Cold start valve (N 17)
 Activated charcoal filter system solenoid valve 1 (N 80)
 Activated charcoal filter system solenoid valve 2 (N 115)

Note:

- Operation of final control elements is checked acoustically or by sense of touch during final control element diagnosis.
- Except for fuel pump relay (J 17), all other final control elements click.
- If one of the valves does not click, check valve or control signal - pages 01-96 to 01-106.

01-51

C - RECALLING AND CLEARING FAULT MEMORY WITH DIODE TEST LAMP V.A.G 1527 AND AUXILIARY LEADS FROM V.A.G 1594

Operation

Self-diagnosis of FEI control unit monitors signals of electrically controlled engine components. If malfunctions arise in these they are stored in PM (dynamic permanent memory) and can be displayed with fault reader V.A.G 1551 in operating mode 1 "rapid data transmission".

- As a temporary solution, recalling and clearing fault memory and final control element diagnosis can be carried out with diode test lamp V.A.G 1527 and auxiliary leads from V.A.G 1594 as described below.

Note:

- Final control element diagnosis can only be carried out if engine is switched off.
- On the other hand, fault memory should be recalled with engine running, if possible. Otherwise turn over engine with starter without switching off ignition afterwards.
- Fault memory can only be cleared after final control element diagnosis has been carried out.

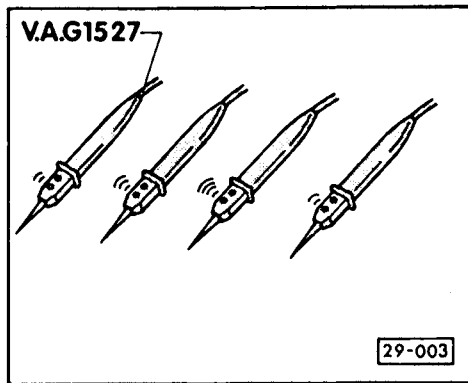
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01-52

Reading flash code with LED of diode test lamp V.A.G 1527

When recalling fault memory, faults can be read with flash code. During final control element diagnosis, respective final control unit is indicated with flashing code.



- Each flash code consists of 4 flashing pulse groups of max. 4 flashing pulses. Between each flashing pulse there is a pause (fault lamp or diode test lamp off) of approx. 2.5 sec.

By adding together individual flashing pulses within flashing pulse groups (each flashing pulse group results in a figure between 1 and 4), differing flash codes are read with fault lamp or diode test lamp V.A.G 1527.

For fault elimination, all possible flash codes are listed in fault table on page 01-60.

For flash codes of final control element diagnosis, see control sequence - page 01-59.

During fault memory recall and final control diagnosis, display of various flashing codes runs as follows.

After starting signal (LED on) and subsequent pause (LED off) of 2.5 sec. respectively, transmission of flash pulses within 4 flashing pulse groups of respective flashing codes follows.

01-53

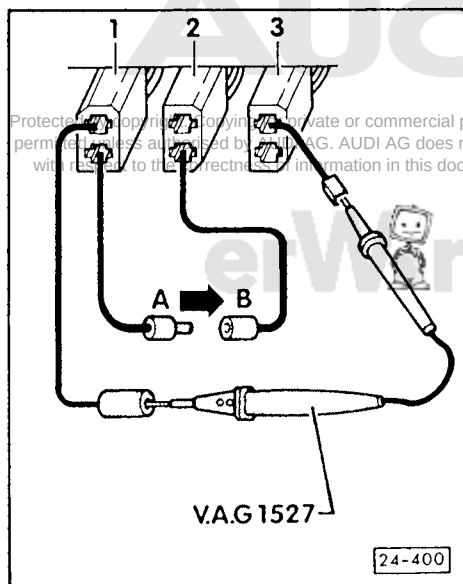
Pause of approx. 2.5 sec. follows transmission of 4th flashing pulse group. Then start signal of respective flash code is repeated until next memory location or next component is called up during final control element diagnosis.

Recalling fault memory with flash code display on LED of diode test lamp V.A.G 1527

- Observe test conditions - page 01-41.

Important

Note shape of diagnosis plug housing.



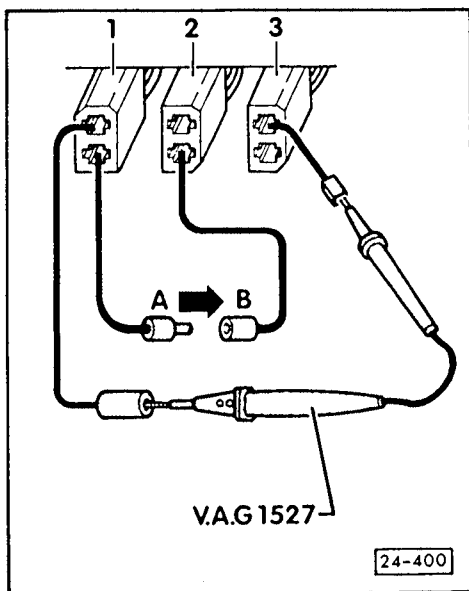
- Connect diode test lamp V.A.G 1527 to diagnosis plugs in driver's side footwell with auxiliary leads from V.A.G 1594 as follows.

Connect diode test lamp V.A.G 1527 between occupied contact of blue diagnosis plug -3- and rear contact of black diagnosis plug -1- with auxiliary leads from V.A.G 1594.

- Connect auxiliary leads from V.A.G 1594 to front contact of black and of brown diagnosis plugs -1- and -2-.

- Run engine or turn over engine with starter for at least 5 seconds without switching off ignition afterwards.

01-54



- Connect plug -A- (earth) to -B- for at least 4 seconds
LED of diode test lamp must light up.

Otherwise:

Check connections of diode test lamp or locate and eliminate break in wiring from diagnosis plugs to FEI control unit (J 88) using current flow diagram.

- Disconnect plugs -A- and -B-.

Lighting up of LED must change to flashing.

- Count flashing pulses of diode test lamp and note flash code.
- Connect plug -A- to -B- for at least 4 seconds and separate again.
- Count flashing pulses of diode test lamp and note flashing code.
- Repeat this procedure until flash code 0 0 0 0 is indicated by flashing of LED at intervals of 2.5 seconds.

Note:

- For fault finding go through noted flash codes using fault table - page 01-60.
- Clear fault memory - see final control element diagnosis with diode test lamp V.A.G 1527 and auxiliary leads from V.A.G 1594 - page 01-56.

01-55

D - FINAL CONTROL ELEMENT DIAGNOSIS WITH DIODE TEST LAMP V.A.G 1527 AND AUXILIARY LEADS FROM V.A.G 1594

Note:

- Final control element diagnosis can only be carried out with engine switched off.
- During final control element diagnosis, cold start valve (N 17) is only activated for 10 seconds.
- Final control element diagnosis is terminated if engine is started or rpm pulse is detected.
- Operation of final control elements is checked acoustically and by sense of touch during final control element diagnosis. For this, immediate area around vehicle must be quiet.
- Reading flash code from LED of diode test lamp - page 01-53.

Initiating final control element diagnosis with diode test lamp V.A.G 1527 and auxiliary leads from V.A.G 1594

- Fuse No. 21 OK.

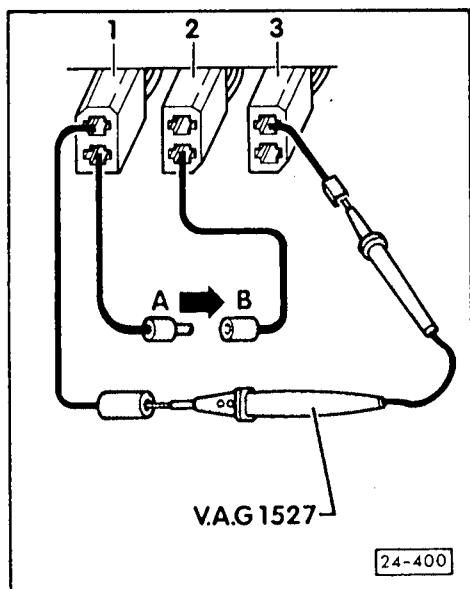
Important

Note shape of diagnosis plug housing.

- Connect diode test lamp V.A.G 1527 to diagnosis plugs in driver's side footwell with auxiliary leads from V.A.G 1594 as follows.

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- ▶ - Connect diode test lamp V.A.G 1527 between occupied contact of blue diagnosis plug -3- and rear contact of black diagnosis plug -1- with auxiliary leads from V.A.G 1594.
- Connect auxiliary leads from V.A.G 1594 to front contact of black and of brown diagnosis plugs -1- and -2-.
- Connect plug -A- (earth) to -B-.
- Switch on ignition.

Diode test lamp must light up.

Otherwise:

Check connection of diode test lamp or locate and eliminate break in wiring from diagnosis plugs to FEI control unit (J 88) using current flow diagram.

- After approx. 4 seconds separate plug -A- from -B-.

Lighting up of diode test lamp must change to flash.

- Count flashing pulses of diode test lamp and note flashing codes - see control sequence - page 01-59.

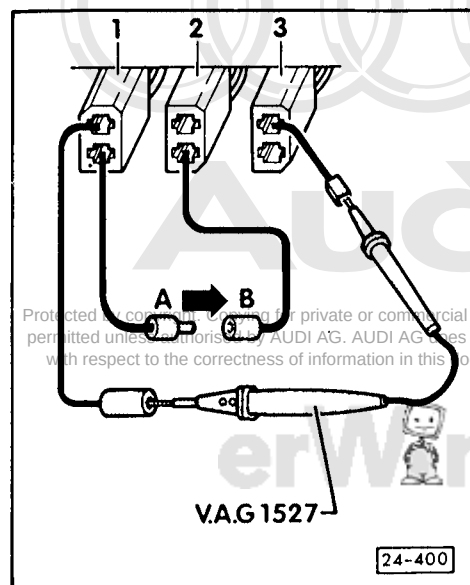
Fuel pump relay (J 17) must operate and fuel pump must run.

If fuel pump relay does not operate, check control signal - page 01-96.

01-57

Note:

After checking fuel pump relay (J 17) pull out fuse No. 13.



- ▶ - Then connect plug -A- to -B- for at least 4 seconds and separate again.
- Check all six final control elements consecutively in this way - see control sequence, page 01-59.
- Repeat this procedure until flash code 0 0 0 0 is indicated by flashing of LED at intervals of 2.5 seconds, reconnect fuse No 13.
- If plug -A- is connected to -B- again for at least 4 seconds and then separated, fault memory of FEI control unit is cleared.

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01-58

Control sequence:

Flash code	Final control element
4 4 3 3	Fuel pump relay (J 17)
4 4 4 1	Frequency valve for Lambda regulation (N 7)
4 4 4 2	Solenoid valve for boost pressure control (N 75)
4 4 4 3	Cold start valve (N 17)
4 3 4 3	Activated charcoal filter system solenoid valve 1 (N 80)
4 3 3 1	Activated charcoal filter system solenoid valve 2 (N 115)

Note:

- Operation of final control elements is checked acoustically or by sense of touch during final control diagnosis.
- Except for fuel pump relay (J 17), all other final control elements click.
- If one of valves does not click, check valve and control signal - pages 01-96 to 01-106.

01-59

FAULT TABLE

- All possible faults which can be recognized by the FEI control unit (J 88) and indicated with V.A.G 1551 or with LED of diode test lamp V.A.G 1527 are listed below.
- If defective components are found, also check leads to components for short circuit and break in wiring using current flow diagram.
- Before eliminating fault or renewing components, check earth connection of FEI control unit (J 88) - page 01-91, test steps 1 and 2, and check earth points on engine for corrosion and damage.

Flash code and display on V.A.G 1551	Fault cause	Effects	Fault elimination
1 1 1 1 Control unit defective	- Microprocessor in FEI control unit (J 88)		- Renew FEI control unit (J 88)
2 1 1 1 Engine speed sender (G 28) * Signal no change	- Metal particles on G 28 - Retaining base on G 28 loose - Distance from G 28 to starter ring greater than 1.25 mm - Broken teeth on starter ring	- Engine does not start - Misfiring - Engine stalls	- Check distance from flywheel/drive plate to engine speed sender - Repair Group 13
	- Break in wiring or short circuit between 3-pin plug in engine compartment and G 28 - 3-pin connector from G 28 and firing point sender (G 4) reversed - G 28 defective - Input for G 28 in FEI control unit (J 88) defective (FEI control unit defective)	- Engine does not start	- Check engine speed sender (G 28) - page 28-132

* One of these display is indicated in addition to component concerned or info.

Flash code and display on V.A.G 1551	Fault cause	Effects	Fault elimination
2 1 1 2 Firing point sender (G 4) * Signal no change	- Retaining base of G 4 loose - Distance from G 4 to pin on starter ring greater than 1.25 mm - Pin on flywheel bent or broken	- Fault before engine start-up: engine does not start	- Check distance from pin to firing point sender - Repair Group 13
	- Break in wiring or short circuit between 3-pin plug in engine compartment and G 4 - 3-pin connector from G 4 and engine speed sender (G 28) reversed - G 4 defective - Break in wiring or short circuit between FEI control (J 88) and G 4 - Input for G 4 in FEI control unit (J 88) defective (FEI control unit defective)	- Fault after engine start-up: flash code 2 1 1 2 is stored - Engine does not start	- Check firing point sender (G 4) - page 28-129

* One of these displays is indicated in addition to component concerned or info.

01-61

Flash code and display on V.A.G 1551	Fault cause	Effects	Fault elimination
2 1 1 3 Hall sender (G 40) * Signal to positive	- No voltage supply for G 40 from J 88 - No earth for G 40 - Break in signal lead to J 88 or short circuit to earth of signal lead - Short circuit between contact 25 and 27 on J 88 - Break in wiring between 3-pin connector in engine compartment and J 88 - G 40 defective - Input for G 40 in J 88 defective (J 88 defective)	- Fault before engine start-up: engine does not start - Fault after engine start-up: flash code 2 1 1 3 is stored	- Check Hall sender (G 40) - page 28-117
	- Pin position of G 4		- See flash code 2 1 1 2
	* Signal to negative		- Check - Repair Group 13 - Check basic distributor setting - page 28-116
	- Adjustment of G 40		- Check - page 28-117

* One of these displays is indicated in addition to component concerned or info.

Note on flash code 2 1 1 3:

If fault is indicated as sporadic fault, ignore fault display!

01-62

Flash code and display on V.A.G 1551	Fault cause	Effects	Fault elimination
2 1 2 1 Idling switch (F 60) * Signal to positive	- Throttle cable adjustment	- Idling control switches to control unit	- Check throttle cable adjustment - Repair Group 20
	- Adjustment of F 60 - Break in wiring or short circuit in idling switch or in wiring - Mechanical sticking of idling switch	- Idling speed does not lie within specified range	- Check and adjust idling switch (F 60) - page 25-157
2 1 2 3 Full throttle switch (F 81) * Signal to positive	- Adjustment of F 81 - Break in wiring or short circuit in full throttle switch - Mechanical sticking of full throttle switch		- Check and adjust full throttle switch (F 81) - page 25-157
2 1 4 1 First knock control, max. limit exceeded * Mechanical fault	- Poor fuel quality, less than 91 RON	- Slight loss of power - Slightly increased fuel consumption - Top speed is not attained	- Use fuel with at least 91 RON
	- Abnormal engine noises (auxiliary components loose)	- Engine runs unevenly	- Check security of auxiliary components and engine amounts
	- Break in wiring of G 61 screening		- Locate and eliminate break in wiring using current flow diagram
	- Knock control module in FEI control unit J 88 (J 88 defective)	- High fuel consumption - Lack of power	- Renew FEI control unit (J 88)

* One of these displays is indicated in addition to component concerned or info.

Note on flash codes 2141 and 2143:

Retarding of spark angle by knock control is done in cylinders 1 and 2 by the first knock control and in cylinders 3, 4 and 5 by second knock control.

01-63

Flash code and display on V.A.G 1551	Fault cause	Effects	Fault elimination
2 1 4 2 Knock sensor 1 (G 61) Red marking * Signal no change	- G 61 loose (red on cyl. 2)	- High fuel consumption - Lack of power	- Tightening torque - 10 Nm
	- Break in wiring or short circuit between G 61 and FEI control unit (J 88)		- Locate and eliminate break in wiring or short circuit current flow diagram
	- G 61 defective		- Renew knock sensor 1 (G 61)
	- Input for G 61 in FEI control unit (J 88) defective (J 88 defective)		- Renew FEI control unit (J 88)
2 1 4 3 Second knock control * Mechanical fault	- Poor quality fuel, lower than 91 RON	- Slight loss of power - Slightly increased fuel consumption - Top speed not attained	- Use fuel with at least 91 RON
	- Abnormal engine noises (auxiliary components loose)	- Engine runs unevenly	- Check security of auxiliary components and engine mounts
	- Break in wiring of G 66 screening		- Locate and eliminate break in wiring using current flow diagram
	- Knock control module in FEI control unit (J 88) (J 88 defective)	- High fuel consumption - Lack of power	- Renew FEI control unit (J 88)

* One of these displays is indicated in addition to component concerned or info.

See "Note on flash code 2 1 4 3" - page 01-63.

01-64

Flash code and display on V.A.G 1551	Fault cause	Effects	Fault elimination
2 1 4 4 Knock sensor 2 (G 66) white marking * Signal no change	- G 66 loose (white on cyl. 4)	- High fuel consumption - Lack of power	- Tightening torque 10 Nm
	- Break in wiring or short circuit between G 66 and FEI control unit (J 88)		- Locate and eliminate break in wiring or short circuit using current flow diagram
	- G 66 defective		- Renew knock sensor 2 (G 66)
	- Input for G 66 in FEI control unit (J 88) defective (FEI control unit defective)		- Renew FEI control unit (J 88)
2 2 1 4 Max. engine speed exceeded (info)	- Engine speed too high, engine was overrevved	- Fuel pump relay (J 17) is switched off by FEI control unit (J 88)	- Inform customer
2 2 2 1 Intake manifold pressure (info) * Signal no change	- Vacuum hose between intake manifold and FEI control unit (J 88) has fallen off, is cracked or defective	- No boost pressure control - No acceleration enrichment	- Check vacuum hose - page 25-235
2 2 2 2 Intake manifold pressure sender (G 71) * Signal outside of tolerance	- Intake manifold pressure sender (G 71) in FEI control unit (J 88) defective	- No boost pressure control - No acceleration enrichment	- Renew FEI control unit (J 88)

* One of these display is indicated in addition to component concerned or info.

01-65

Flash code and display on V.A.G 1551	Fault cause	Effects	Fault elimination
2 2 2 4 Max. boost pressure exceeded (info)	- Dump valve defective - Hose between dump valve and solenoid valve for boost pressure control (N 75) has fallen off, is cracked or defective	- Fuel pump relay (J 17) is switched off by FEI control unit (J 88)	- Check boost pressure - Repair Group 21 - Check hose - page 25-235
2 3 1 2 Coolant temperature sender (G 62) * Signal at - * Signal at +	- Break in wiring or short circuit in sender lead - G 62 defective	Cold start difficulties at very low temperatures - Motor runs unevenly in warm-up phase	- Check coolant temperature sender (G 62) - page 28-136
2 3 2 2 Intake manifold temperature sender (G 42) * Signal at - * Signal at +	- Break in wiring or short circuit in sender lead - G 42 defective		- Check intake manifold temperature (G 42) - page 28-137
2 3 4 2 Lambda probe (G 39) * Signal no change	- Break in wiring to FEI control unit (J 88) - Probe heating does not function - Fuse No. 28 (probe heating) defective - Heating element in probe heating defective - Probe heating wiring (earth) - Short circuit in signal lead to screening	- CO content not OK - Increased fuel consumption - Spark plugs become sooty - CO content before catalyst greater than 3 % vol.	- Check Lambda regulation - page 25-103
4 4 4 4 No fault detected	• If malfunction is present, fault not detected by self-diagnosis	- Continue fault finding using malfunction tables. "Fault Finding - Engine" binder	
0 0 0 0 Output end			

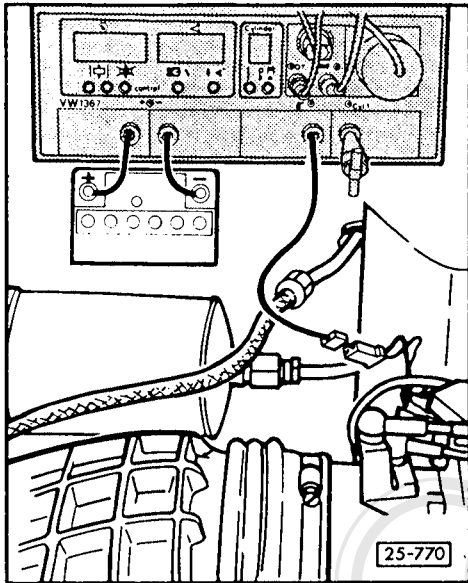
* One of these display is indicated in addition to component concerned or info.

01-66

Note:

Checking Lambda system without fault reader V.A.G 1551
- page 25-100.

- Engine oil temperature must be at least 80° C.
- Idling adjustment OK.
- No leaks in exhaust system between cylinder head and catalyst.
- Connect tester V.A.G 1367 according to operating instructions with ignition switched off.



- ◀ - Connect test cable (green) to Lambda test plug (blue/black).
- Press % button on tester.
- Start engine and run at idling speed for at least 5 minutes. This ensures that operating temperature of Lambda probe is reached.
- Recall fault memory - page 01-42.

01-67

- Initiate function 04 "basic setting" on V.A.G 1551, select and acknowledge input with Q button.

System at basic setting

◀ Display indicates:

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Watch duty cycle on tester V.A.G 1367.

Specified value: 50 % duty cycle constant at speed below 2000 rpm

If specified value is not attained, check lead - page 01-69.

If specified value is attained, press → button on V.A.G 1551.

Rapid data transmission HELP
Select function XX

◀ Display indicates:

- Initiate function 06 "end output" on V.A.G 1551, select and acknowledge input with Q button.

Rapid data transmission
Enter address word XX

◀ Display indicates:

- Watch duty cycle on tester V.A.G 1367.
Specified value: 25 ... 65 % duty cycle must fluctuate

If specified value is not attained, check lead as follows:

- Remove FEI control unit and disconnect connector plug with ignition switched off. Connect test box V.A.G 1598 between FEI control unit and disconnected connector plug of FEI control unit with adapter lead V.A.G 1598/7. Contact numbers of connector plug are identical to test box numbers.
Electrical fuses 13, 21 and 28 OK.
- Check continuity between lead of Lambda test plug (blue/black) and contact 8 of test box with hand multimeter V.A.G 1526 and auxiliary leads from V.A.G 1594.

Specified value: max. 0.5 Ω .

If specified value is attained, renew FEI control unit.

If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

01-69

CODE VARIANTS OF FEI CONTROL UNIT (J 88) AND OF CONTROL UNIT FOR IDLING SPEED STABILIZATION (J 142)

Abbreviations:

- AT = Automatic gearbox
- HS = Manual gearbox
- CA = California and Japan
- BU = not California, not Japan

Respective code variants are implemented with corresponding wiring of 6-pin coding plug near to FEI control unit, see following table:
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HS / CA Contacts 1, 3 and 5 in coding plug are linked.

AT / CA Contacts 1, 3, 4 and 5 in coding plug are linked.

HS / BU Contacts 1 and 5 in coding plug are linked.

AT / BU Contacts 1, 4 and 5 in coding plug are linked.

SELF-DIAGNOSIS

=====

Engine code letters: SL

OPERATION OF FULLY ELECTRONIC IGNITION SYSTEM (FEI)

As in TCI-H ignition system, ignition spark is controlled by components listed below.
Ignition coil, ignition distributor with Hall sender, TCI-H switch unit, leads, plugs and spark plugs.

Deviations from TCI-H ignition system:

- Hall sender voltage supply from FEI control unit via plug contacts 7 (-) and 15 (+).
- Signal from Hall sender carried via plug contacts 9 and 12 of FEI control unit to TCI-H switch unit, contact 6.

FEI control unit processes the sender signal and calculates optimal firing point for respective operating conditions based on programmed ignition map.

FEI control unit is informed by knock sensor, Hall sender, throttle valve switch and pressure sensor in FEI control unit as to respective operating conditions of engine.

Pressure sensor gives information about current load condition through evaluation of intake manifold pressure.

FEI is equipped with a fault memory. Malfunctions are only stored in fault memory with ignition switched off. Fault memory is cleared by switching off ignition.

01-71

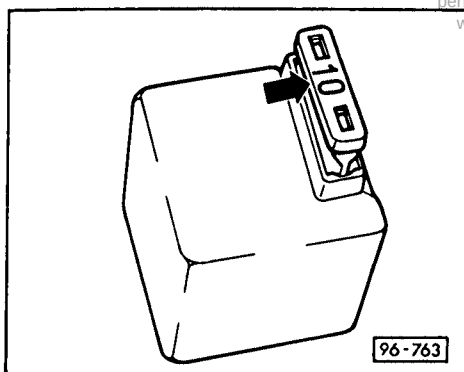
If a malfunction arises which may lead to engine damage, this fault is additionally indicated by lighting up of fault lamp in dash panel insert (up to model year 88), or with diode test lamp V.A.G 1527 (from model year 89).

FLASH CODE FOR FAULT DISPLAY

A - Recalling fault memory with fuse and fault lamp (in dash panel insert)

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• Up to model year 88



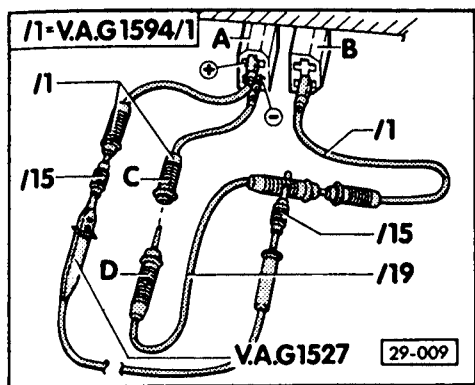
- Faults stored in FEI fault memory are indicated by flashing of fault lamp in dash panel insert with various flash sequences (intervals) after linking of contacts on fuel pump relay (at least 4 seconds) with a fuse. If no fault is stored, fault lamp goes out when engine has briefly reached a speed of 3000 rpm after starting. After fuse is removed, continuous lighting-up of fault lamp changes to flash sequence which repeats every 2.5 seconds.

- Recalling fault memory - page 01-74.

01-72

B - Recalling fault memory with diode test lamp V.A.G 1527

- From model year 89



- ◀ - Connect diode test lamp V.A.G 1527 to diagnosis plugs -A- and -B- with auxiliary leads from V.A.G 1594.

Note:

Contact 2 (positive) of black diagnosis plug -A- (voltage supply) is fused via fuse 21. Contact 1 is connected to earth. In brown diagnosis plug -B-, only contact -1- is occupied (see current flow diagram).

Faults stored in FEI fault memory are indicated with various flash sequences (intervals) of diode test lamp after connection (at least 4 seconds) and disconnection of plugs -D- and -C-.

If no fault is stored, diode test lamp goes out. After separation of plugs -D- and -C-, constant lighting up of LED changes to flash sequence which repeats every 2.5 seconds.

- Recalling fault memory - page 01-74.

01-73

RECALLING FAULT MEMORY

Test step 1

Knock sensor, vacuum hose/pressure sensor, FEI control unit, fault lamp (up to model year 88) or diagnosis plug (from model year 89)

- Switch on ignition.

- Specified value:
- Up to model year 88
Fault lamp in dash panel insert must light up
 - From model year 89
Diode test lamp must light up

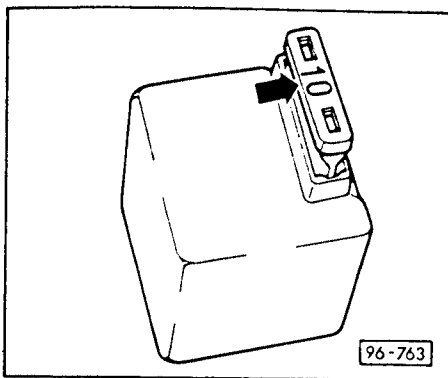
If specified value is not attained, locate and eliminate break in wiring using current flow diagram, and check fault lamp and connection of diode test lamp, if necessary.

- Start engine and briefly increase speed to above 3000 rpm.

- Specified value:
- Up to model year 88
Fault lamp goes out
 - From model year 89
Diode test lamp goes out

If specified value is attained, test step 1 is completed and no fault is stored.

01-74



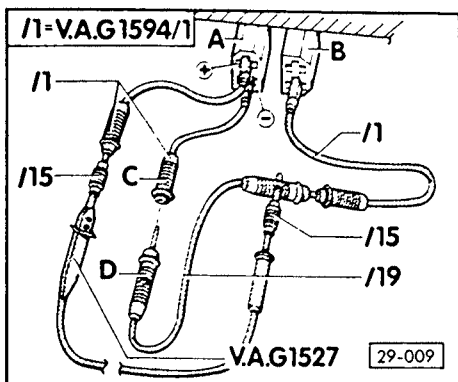
If specified value is not attained, a fault is stored.

- Up to model year 88

- ▶ - Link contacts on fuel pump relay (relay location 10) for at least 4 seconds with fuse.
- After fuse is removed constant lighting-up of fault lamp must change to flash sequence.

- From model year 89

- ▶ - Connect plug -C- (earth) to plug -D- for at least 4 seconds and separate again.
- After separation of connector constant lighting-up of LED must change to flash sequence.



01-75

Two flashes at intervals means:

- Fault at knock sensor (G 61); Tightening torque of 10 Nm not observed, check wiring using current flow diagram, or knock sensor defective.
- FEI control unit (J 88) defective.

Three flashes at intervals means:

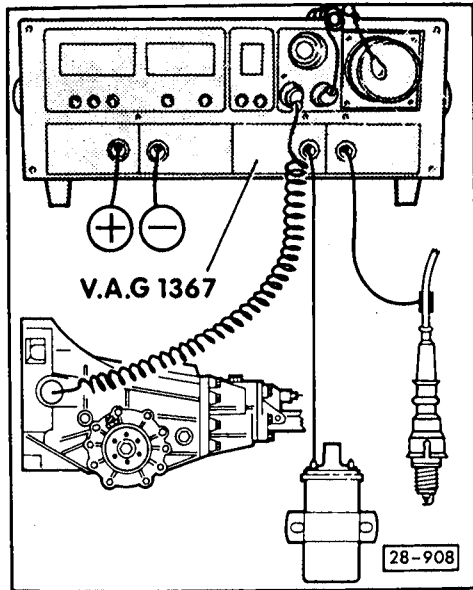
- Vacuum hose on intake manifold or on FEI control unit has fallen off, is pinched, cracked or defective.
- FEI control unit (J 88) defective.

Note:

- If fault lamp or diode test lamp does not change to flash sequence after fuse is removed or connector is separated, but continues to light up constantly, carry out test step II.
- If test step II is OK and fault lamp or diode test lamp continues to light up, check wiring to fault lamp or to diagnosis plugs and FEI control unit using current flow diagram.

Test step II
(Ignition timing advanced)

- Test step I (knock sensor) OK.



- ◀ - Connect tester V.A.G 1367 for ignition firing point and rpm with ignition switched off.

Important

Make sure that TDC sender is pushed into gearbox up to stop.

- Start engine and run at idling speed.
- Note indicated firing point.
- With engine running disconnect vacuum hose from FEI control unit and increase speed to 3000 rpm.
- Read and note firing point at 3000 rpm.
- Firing point measured at idling speed must be subtracted from firing point (3000 rpm).

Calculated advance value must be

Manual gearbox: 6 ... 10°
Automatic gearbox: 18 ... 22°.

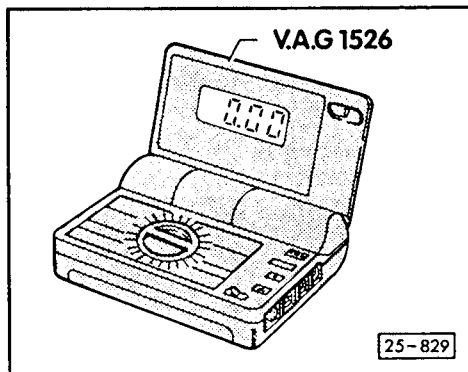
Otherwise:

Renew FEI control unit (J 88).

01-77

ELECTRICAL TESTING
=====

Engine code letters: MC with one knock sensor



Note:

- ◀ • Use hand multimeter V.A.G 1526, diode test lamp V.A.G 1527 and auxiliary leads from V.A.G 1594 for checking.
- If measured values deviate from specified values, locate and eliminate faults using current flow diagram. Check wiring and connections before replacing respective components.

Important

In order to avoid destroying electronic components, respective measuring range must be switched on before connection of test leads.

TEST CONDITIONS

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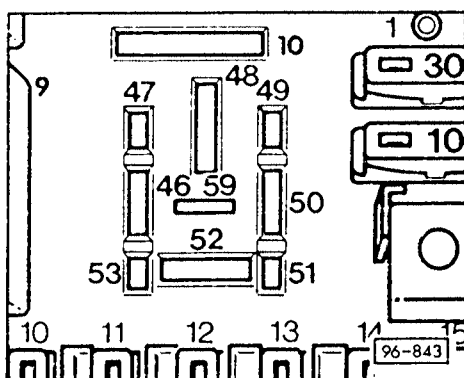
Note:

Removing FEI control unit - page 28-101.

01-78

CHECKING CONTROL OF FUEL PUMP RELAY (J 17)

- Remove fuse box/relay plate cover.
- Pull fuel pump relay (J 17) out of relay plate.



- ▶ - Connect hand multimeter V.A.G 1526 for voltage measurement with auxiliary leads from V.A.G 1594:

- Between contacts 46 and 50
- Between contacts 48 and 50

- Switch on ignition.

Specified value: approx. battery voltage

If specified values are not attained, locate and eliminate break in wiring using current flow diagram.

- Connect hand multimeter between contacts 46 and 47.

- Briefly operate starter.

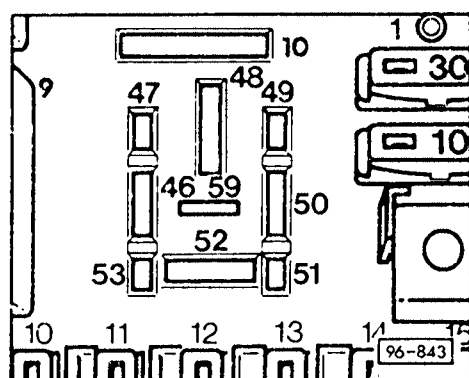
Specified value: approx. 9.5 volts

If specified value is achieved, renew fuel pump relay.

If specified value is not achieved, check wiring as follows:

01-79

- Remove FEI control unit and pull off plug connector with ignition switched off. Connect test box V.A.G 1598 between FEI control unit and disconnected connector plug of FEI control unit with adapter-lead V.A.G 1598/7. Contact numbers of connector plug are identical to test box numbers. Electrical fuses OK - see current flow diagram.



- ▶ - Check continuity between relay socket 10 and test box with hand multimeter.

Test box	Relay socket 10
21	47
31	49

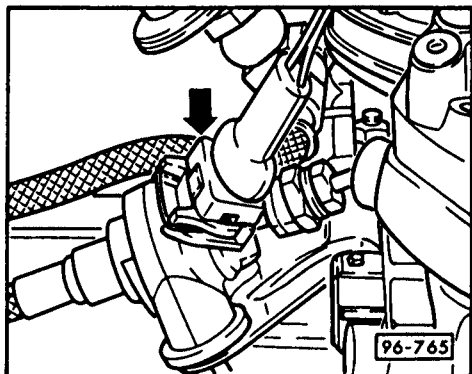
Specified value: max. 0.5 Ω

If specified values are not attained, locate and eliminate break in wiring using current flow diagram.

If specified values are attained, renew FEI control unit.

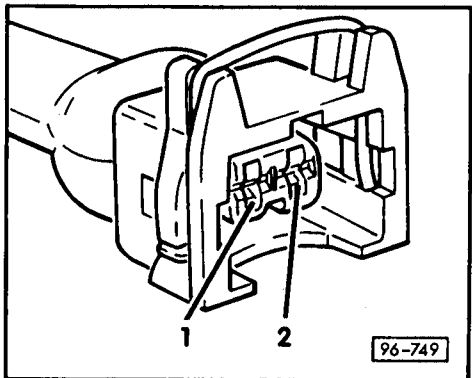
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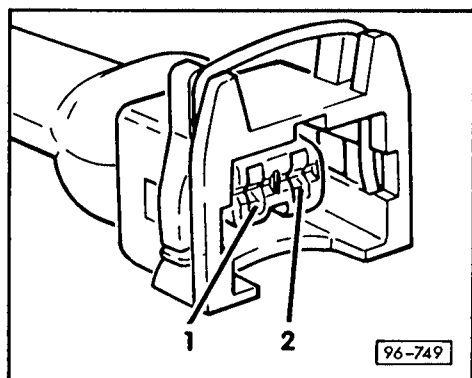
CHECKING CONTROL OF FREQUENCY VALVE FOR LAMBDA REGULATION (N 7)

- ◀ - Disconnect plug from frequency valve for Lambda regulation (N 7).



- ◀ - Connect diode test lamp V.A.G 1527 to plug contacts 1 and 2 with auxiliary leads from V.A.G 1594.
- Carry out final control element diagnosis up to activation of frequency valve for Lambda regulation (flash code 4 4 4 1)
 - see self-diagnosis.
- LED lights up, renew frequency valve.

01-81



- ◀ - LED does not light up, connect hand multimeter V.A.G 1526 for voltage measurement between plug contact 1 and earth with auxiliary leads from V.A.G 1594.

Specified value: approx. battery voltage

If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

If specified value is attained, check wiring as follows:

- Remove FEI control unit and pull off connector plug with ignition switched off. Connect test box V.A.G 1598 between FEI control unit and disconnected connector plug of FEI control unit with adapter lead V.A.G 1598/7. Contact numbers of connector plug are identical to test box numbers.
- Check continuity between plug contact 2 and test box contact 8 with hand multimeter.

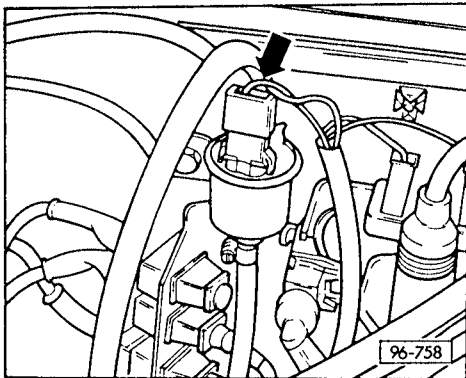
Specified value: approx. 10 Ω

If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

If specified value is attained, renew FEI control unit.

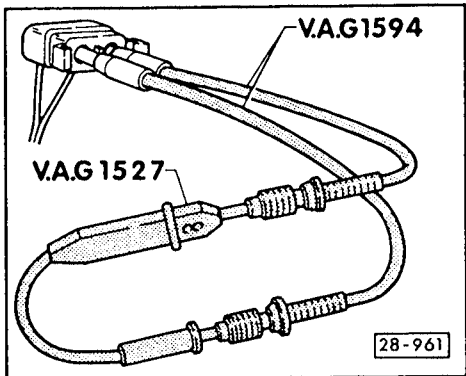
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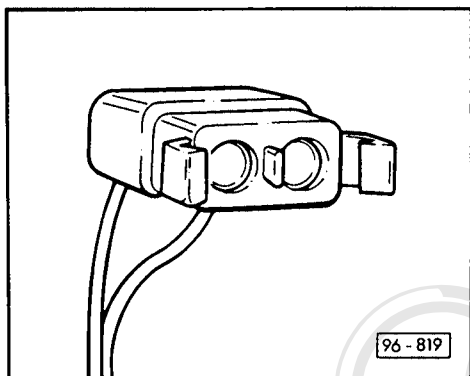
CHECKING CONTROL OF SOLENOID VALVE FOR BOOST PRESSURE CONTROL (N 75)

- ▶ - Pull plug off solenoid valve for boost pressure control (N 75).



- ▶ - Connect diode test lamp V.A.G 1527 to plug contacts with auxiliary leads from V.A.G 1594.
- Carry out final control element diagnosis up to activation of solenoid valve for boost pressure control (flash code 4 4 4 2) - see self-diagnosis.
- LED flashes, renew solenoid valve for boost pressure control.

01-83



- ▶ - LED does not flash, connect hand multimeter V.A.G 1526 for voltage measurement between plug lead (blue/black) of solenoid valve for boost pressure control and earth with auxiliary leads from V.A.G 1594.

Specified value: approx. battery voltage

If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

If specified value is attained, check wiring as follows:

- Remove FEI control unit and pull off connector plug with ignition switched off. Connect test box V.A.G 1598 between FEI control unit and disconnected connector plug of FEI control unit with adapter lead V.A.G 1598/7. Contact numbers of connector plug are identical to test box numbers.
- Check continuity between test box contact 19 and plug lead (green/yellow) of solenoid valve for boost pressure control with hand multimeter.

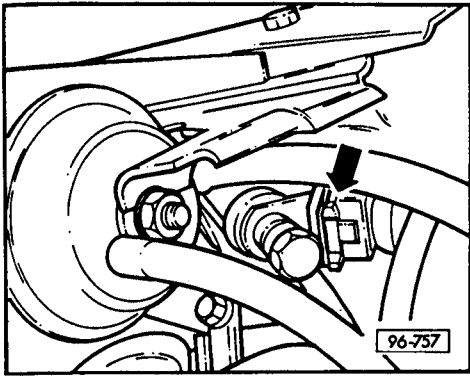
Specified value: approx. 0.5 Ω

If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

If specified value is attained, renew FEI control unit.

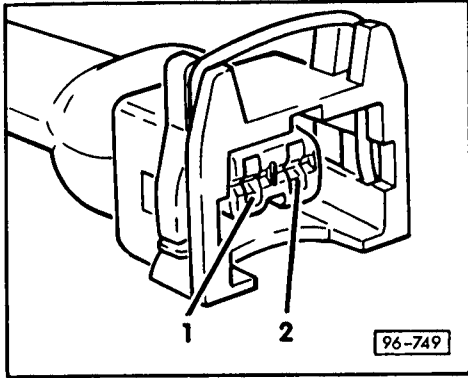
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CHECKING CONTROL OF COLD START VALVE (N 17)

- ◀ - Disconnect plug from cold start valve (N 17).



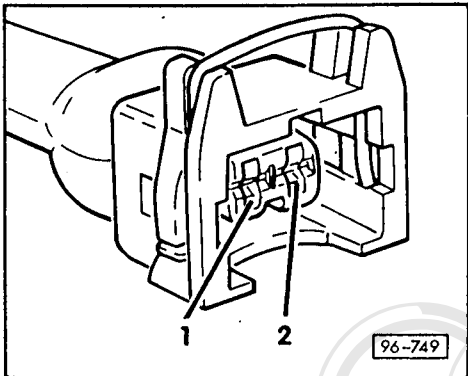
- ◀ - Connect diode test lamp V.A.G 1527 to plug contacts 1 and 2 with auxiliary leads from V.A.G 1594.

Note:

Cold start valve is only activated for approx. 10 seconds. This avoids over-enrichment of engine. Final control element diagnosis must be repeated for new check.

- Carry out final control element diagnosis up to activation of cold start valve (flash code 4 4 4 3) - see self-diagnosis.
- LED flashes, renew cold start valve.

01-85



- ◀ - LED does not flash, connect hand multimeter V.A.G 1526 for voltage measurement, between plug contact 2 and earth with auxiliary leads from V.A.G 1594.

Specified value: approx. battery voltage

If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

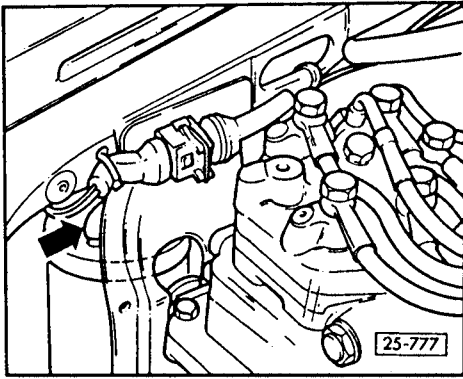
If specified value is attained, check wiring as follows:

- Remove FEI control unit and pull off connector plug with ignition switched off. Connect test box V.A.G 1598 between FEI control unit and disconnected connector plug of FEI control unit with adapter lead V.A.G 1598/7. Contact numbers of connector plug are identical to test box numbers.
- Check continuity between plug contact 1 of cold start valve and test box contact 1 with hand multimeter.

Specified value: approx. 0.5 Ω

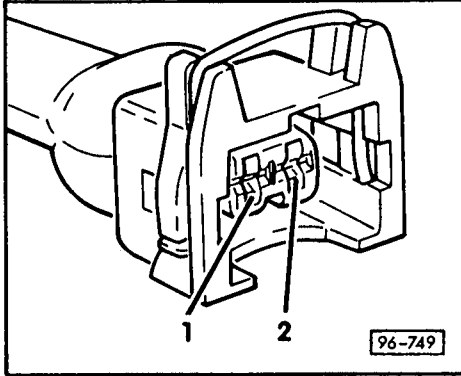
If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

If specified value is attained, renew FEI control unit.



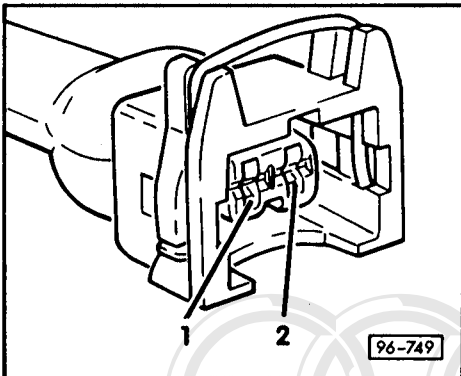
CHECKING CONTROL OF ACTIVATED CHARCOAL FILTER SYSTEM SOLENOID VALVE 1 (N 80)

- ◀ - Disconnect connector to activated charcoal filter system solenoid valve 1 (N 80) in right wheel housing.



- ◀ - Connect diode test lamp V.A.G 1527 to plug contacts 1 and 2 with auxiliary leads from V.A.G 1594.
- Carry out final control element diagnosis up to activation of solenoid valve 1 (flash code 4 3 4 3) - see self-diagnosis.
- LED flashes, renew solenoid valve 1.

01-87



- ◀ - LED does not flash, connect hand multimeter V.A.G 1526 for voltage measurement between plug contact 1 and earth with auxiliary leads from V.A.G 1594.

Specified value: approx. battery voltage

If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

If specified value is attained, check wiring as follows:

- Remove FEI control unit and pull off connector plug with ignition switched off. Connect test box V.A.G 1598 between FEI control unit and disconnected connector plug of FEI control unit with adapter lead V.A.G 1598/7. Contact numbers of connector plug are identical to test box numbers.

- Check continuity between plug contact 2 of solenoid valve 1 and test box contact 3 with hand multimeter.

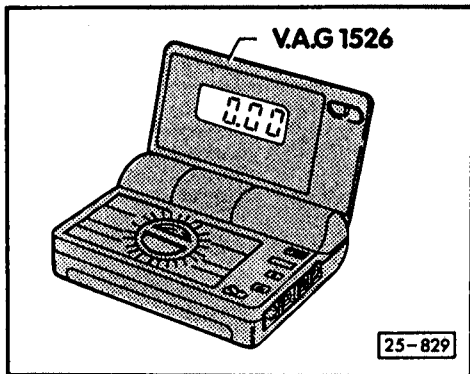
Specified value: approx. 0.5 Ω

If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

If specified value is attained, renew FEI control unit.

ELECTRICAL TESTING

Engine code letters: MC with two knock sensors



Note:

- Use hand multimeter V.A.G 1526, diode test lamp V.A.G 1527 and auxiliary leads from V.A.G 1594 for checking.
- If measured values deviate from specified values, locate and eliminate faults using current flow diagram. Check wiring and connections before replacing respective components.

Important

In order to avoid destroying electronic components, respective measuring range must be switched on before connection of test leads.

TEST CONDITIONS

- Battery voltage OK.
- Fuses: 13, 21 and 28 OK.
- Earth connection on engine (intake manifold) OK.

01-89

CHECKING COMPONENTS OF FULLY ELECTRONIC IGNITION (FEI) WITH TEST BOX V.A.G 1598

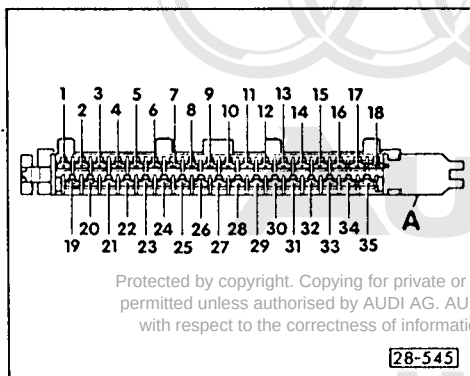
Note:

Recalling memory and carrying out final control element diagnosis is done before electrical check - see self-diagnosis.

- Remove FEI control unit - page 28-105

Important

Only disconnect and connect plug of FEI control unit with ignition switched off.



- Connect test box V.A.G 1598 between FEI control unit and disconnected connector plug of control unit (A) with adapter lead V.A.G 1598/7.

Note:

- Contact numbers on connector plug are identical to test box socket numbers.
- Use auxiliary leads from V.A.G 1594 to connect to test box contacts.
- Hand multimeter V.A.G 1526 and diode test lamp V.A.G 1527 are required for checking.

01-90

Test table for FEI ignition system

- Connector plug contact numbers - Fig. 28-545, page 01-90.
- Test box V.A.G 1598 connected between FEI control unit and connector plug with adapter lead 1598/7.

- Switch on <u>DC voltage</u> measuring range -V-					
Test step	Connector sockets Test box V.A.G 1598	What is checked	• Test conditions - Additional work	Specified values	Specified values are <u>not</u> attained
1	9 + 33	Voltage supply for FEI control unit (J 88) 9 = Earth connection to intake manifold 33 = Positive connection from fuse No. 21	• Ignition switched off	Approx. battery voltage	Locate and eliminate break in wiring using current flow diagram
2	18 + 35	Voltage supply for FEI control unit (J 88) 18 = Earth connection 35 = Positive connection	- Ignition switched on	Approx. battery voltage	Locate and eliminate break in wiring using current flow diagram
3	18 + 20	Idling switch (F 60)	• Ignition switched on • Throttle valve in idling position	Approx. battery voltage	Idling switch incorrectly adjusted, check - page 25-157
4	18 + 26	Full throttle switch (F 81)	• Ignition switched on - Operate throttle valve up to full throttle position	Approx. battery voltage	Locate and eliminate break in wiring using current flow diagram

01-91

- Switch on <u>DC voltage</u> measuring range -V-					
Test step	Connector sockets Test box V.A.G 1598	What is checked	• Test conditions - Additional work	Specified values	Specified values are <u>not</u> attained
5	23 + 33	Activated charcoal filter system solenoid valve 2 (N 115)	- Start engine and run at speed above 1500 rpm	Approx. battery voltage	FEI control unit (J 88) defective
6	4 + 35	Overrun cut-off valve (N 65)	- Start engine and run at idling speed - Increase engine speed to approx. 2000 rpm, close throttle valve suddenly	Up to approx. 1200 rpm approx. battery voltage must be present	Locate and eliminate break in wiring using current flow diagram
- Connect diode test lamp V.A.G 1527 in place of hand multimeter					
7	3 + 33	Activated charcoal filter system solenoid valve 1 (N 80)	- Start engine and run at idling speed	LED of diode test lamp must flash approx. 40 seconds	FEI control unit (J 88) defective

01-92

CHECKING CONTROL OF CONTROL UNIT FOR IDLING SPEED STABILIZATION (J 142)

Test conditions:

- Battery voltage OK.
- Earth connection on intake manifold OK.

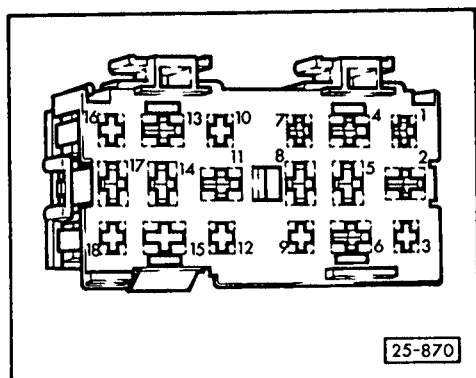
Note:

Hand multimeter V.A.G 1526 with auxiliary leads from V.A.G 1594 and diode test lamp V.A.G 1527 are to be used for checking.

Important

Control unit for idling speed stabilization is under A-pillar trim in left footwell on relay locations 19 and 29, accessible by removing lower instrument panel trim and A-pillar trim.

- Check control at relay socket as follows:



► Connections or contact assignment of relay socket for control unit for idling speed stabilization (J 142).

01-93

Test table for idling speed stabilization to control unit

- Connections or contact assignment - Fig. 25-870, page 01-93.

- Set <u>DC voltage</u> measuring range -V-				
Test step	Contacts in relay socket	Function tested	• Test conditions - Additional work	Specified values
1	14 + 5	Terminal 15 voltage supply	• Ignition switched on	Approx. battery voltage
2	8 + 5	Idling switch (F 60)	• Ignition switched on • Throttle valve in idling position • Idling switch closed	Approx. battery voltage
3	8 + 5	Idling switch (F 60)	• Ignition switched on - Operate idling switch with throttle valve lever or accelerator pedal (open)	0 volts
- Connect diode test lamp V.A.G 1527 in place of hand multimeter				
4	17 + 5	Speed signal from FEI control unit (J 88)	- Connect diode test lamp V.A.G 1527 between contacts 17 + 5 - Operate starter	- Diode test lamp must flicker
5	17 + 5	Speedometer sender (G 22)	- Connect diode test lamp between contacts 7 + 5 • Switch on ignition	- Diode test lamp must light up

01-94

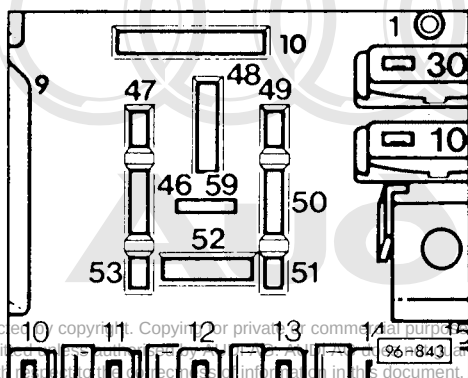
- Switch on measuring range: <u>resistance measurement</u> - Ω -				
Test step	Contacts in relay socket	Function tested	• Test conditions - Additional work	Specified values
6	13 + 5	Temperature sensor (N 10) or temperature sensor for idling speed stabilization (G 87)	---	Engine cold (approx. 20° C) - approx. 800 ... 1000 Ω Engine oil temperature approx. 80° C - approx. 70 ... 150 Ω
7	11 + 4	Idling speed stabilization valve (N 71)	• Idling speed stabilization valve OK Checking - page 25-77 and connected (plug connected)	3 ... 8 Ω
For vehicles with air conditioner only				
- Switch on <u>DC voltage</u> measuring range -V-				
8	6 + 5	Positive from air conditioner magnetic clutch (N 25)	• Ignition switched on • Air conditioner on • Operating mode AUTO • Fan HI • Temperature setting HI	Approx. battery voltage

- If specified values are not attained, check wiring to components using current flow diagram.
- If no break in wiring or short circuits to components are found, renew corresponding components and repeat check.
- If, despite malfunction, all specified values are attained, renew idling speed stabilization control unit (J 142).

01-95

CHECKING CONTROL OF FUEL PUMP RELAY (J 17)

- Remove fuse box/relay plate cover.
- Pull fuel pump relay (J 17) out of relay plate 10.



- Connect hand multimeter V.A.G 1526 for voltage measurement with auxiliary leads from V.A.G 1594 as follows:

- Between contacts 46 and 50
- Between contacts 48 and 50

- Switch on ignition.

Specified value: approx. battery voltage

If specified values are not attained, locate and eliminate break in wiring using current flow diagram.

- Connect hand multimeter between contacts 46 and 47.

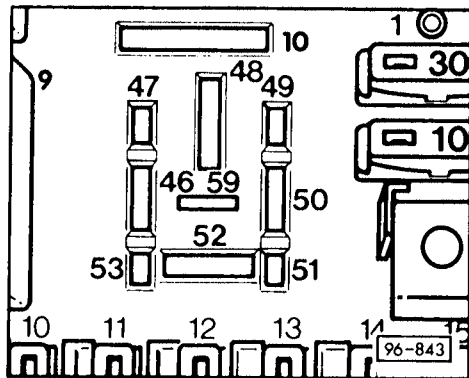
- Briefly operate starter.

Specified value: approx. 9.5 volts

If specified value is attained, renew fuel pump relay.

If specified value is not attained, check leads as follows:

- Remove FEI control unit and pull off connector plug with ignition switched off. Connect test box V.A.G 1598 between FEI control unit and disconnected connector plug of FEI control unit with adapter lead V.A.G 1598/7. Contact numbers of connector plug are identical to test box numbers. Electrical fuses 13, 21 and 28 OK



- Check continuity between relay socket 10 and test box with hand multimeter.

Test box	Relay socket 10
21	47
31	49

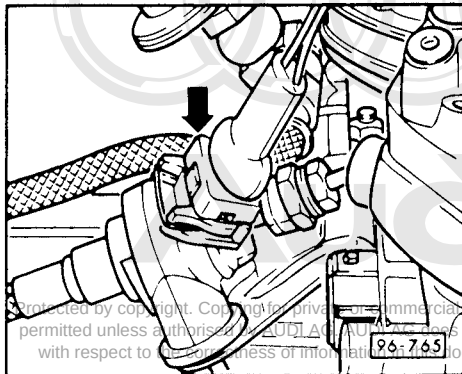
Specified value: max. 0.5 Ω

If specified values are not attained, locate and eliminate break in wiring using current flow diagram.

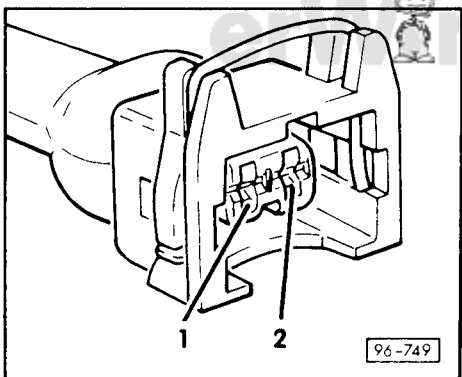
If specified values are attained, renew FEI control unit.

91-97

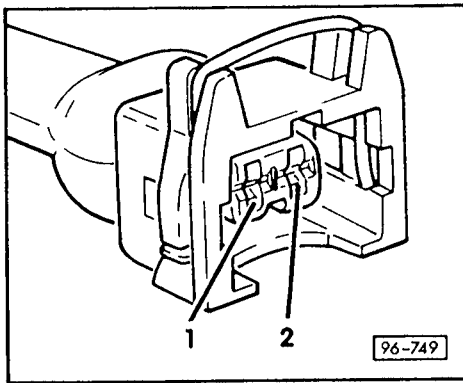
CHECKING CONTROL OF FREQUENCY VALVE FOR LAMBDA REGULATION (N 7)



- Disconnect plug from frequency valve for Lambda regulation (N 7).



- Connect diode test lamp V.A.G 1527 to contacts 1 and 2 of plug with auxiliary leads from V.A.G 1594.
- Carry out final control element diagnosis up to activation of frequency valve for Lambda regulation (flash code 4 4 4 1)
 - see self-diagnosis.
- LED lights up, renew frequency valve.



- LED does not light up, connect hand multimeter V.A.G 1526 for voltage measurement between plug contact 1 and earth with auxiliary leads from V.A.G 1594.

Specified value: approx. battery voltage

If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

If specified value is attained, check lead as follows:

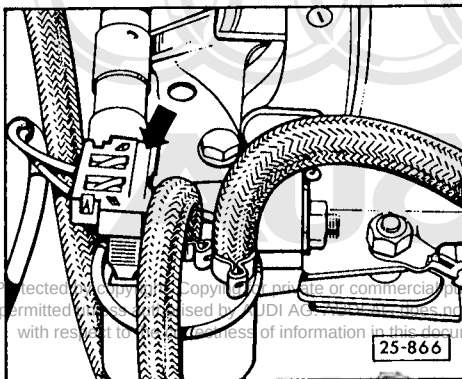
- Remove FEI control unit and pull off connector plug with ignition switched off. Connect test box V.A.G 1598 between FEI control unit and disconnected connector plug of FEI control unit with adapter lead V.A.G 1598/7. Contact numbers of connector plug are identical to test box numbers. Electrical fuses 13, 21 and 28 OK
- Check continuity between plug contact 2 and test box contact 8 with hand multimeter.

Specified value: approx. 10 Ω

If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

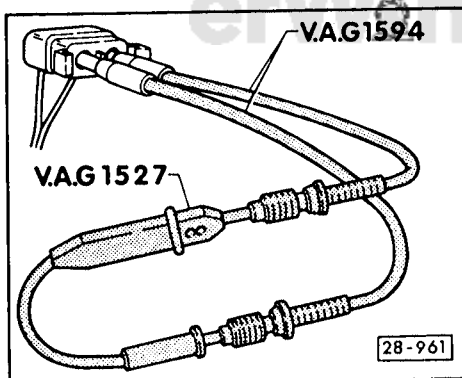
If specified value is attained, renew FEI control unit.

01-99



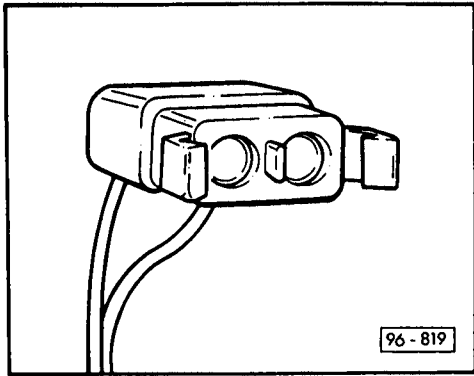
CHECKING CONTROL OF SOLENOID VALVE FOR BOOST PRESSURE CONTROL (N 75)

- Disconnect plug from solenoid valve for boost pressure control (N 75).



- Connect diode test lamp V.A.G 1527 to plug contacts with auxiliary leads from V.A.G 1594.
- Carry out final control element diagnosis up to activation of solenoid valve for boost pressure control (flash code 4 4 4 2) - see self-diagnosis.
- LED flashes, renew solenoid valve for boost pressure control

01-100



- ◀ - LED does not light up, connect hand multimeter V.A.G 1526 for voltage measurement between plug lead (blue/black) of solenoid valve for boost pressure control and earth with auxiliary leads from V.A.G 1594.

Specified value: approx. battery voltage

If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

If specified value is attained, check lead as follows:

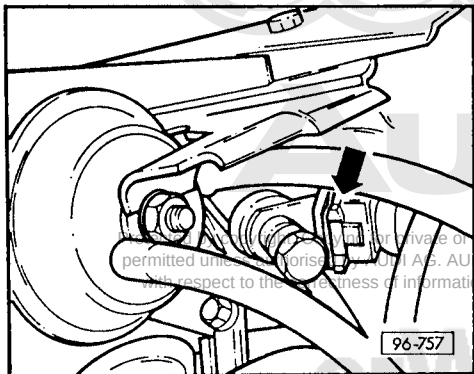
- Remove FEI control unit and pull off connector plug with ignition switched off. Connect test box V.A.G 1598 between FEI control unit and disconnected connector plug of FEI control unit with adapter lead V.A.G 1598/7. Contact numbers of connector plug are identical to test box numbers. Electrical fuses 13, 21 and 28 OK
- Check continuity between test box contact 19 and plug lead (green/yellow) of solenoid valve for boost pressure control with hand multimeter.

Specified value: approx. 0.5 Ω

If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

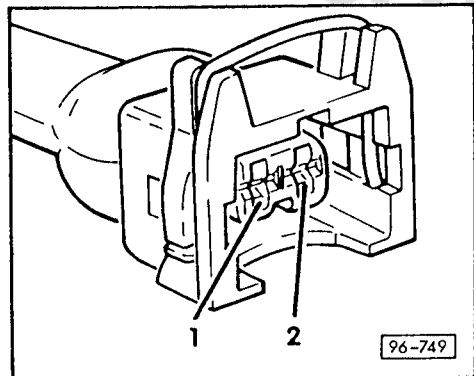
If specified value is attained, renew FEI control unit.

01-101



CHECKING CONTROL OF COLD START VALVE (N 17)

- ◀ - Disconnect plug from cold start valve (N 17).



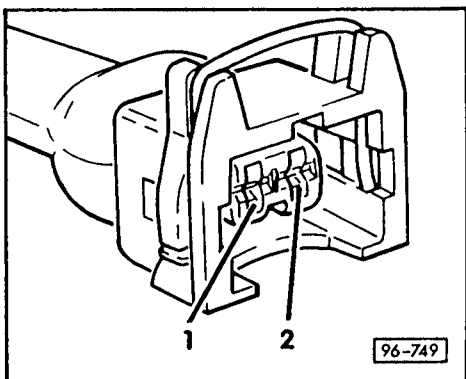
- ◀ - Connect diode test lamp V.A.G 1527 to plug contacts 1 and 2 with auxiliary leads from V.A.G 1594.

Note:

Cold start valve is only activated for approx. 10 seconds This avoids over-enrichment of engine. Final control element diagnosis must be repeated for new check.

- Carry out final control element diagnosis up to activation of cold start valve (flash code 4 4 4 3) - see self-diagnosis.
- LED flashes, renew cold start valve.

01-102



- ▶ - LED does not light up, connect hand multimeter V.A.G 1526 for voltage measurement between plug contact 2 and earth with auxiliary leads from V.A.G 1594.

Specified value: approx. battery voltage

If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

If specified value is attained, check lead as follows:

- Remove FEI control unit and pull off connector plug with ignition switched off. Connect test box V.A.G 1598 between FEI control unit and disconnected connector plug of FEI control unit with adapter lead V.A.G 1598/7. Contact numbers of connector plug are identical to test box numbers. Electrical fuses 13, 21 and 28 OK.
- Check continuity between plug contact 1 of cold start valve and test box contact 1 with hand multimeter.

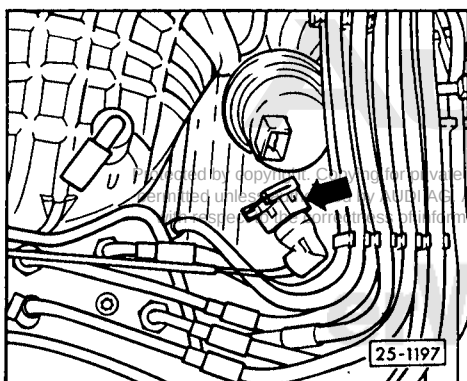
Specified value: approx. 0.5 Ω

If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

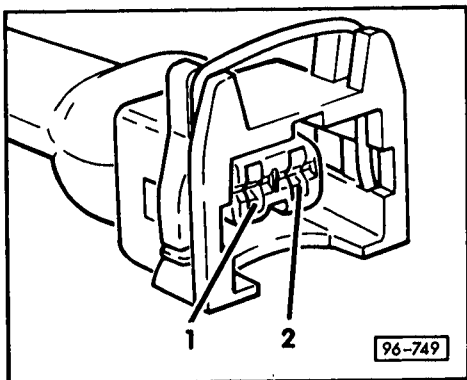
If specified value is attained, renew FEI control unit.

01-103

CHECKING CONTROL OF ACTIVATED CHARCOAL FILTER SYSTEM SOLENOID VALVE 1 (N 80)

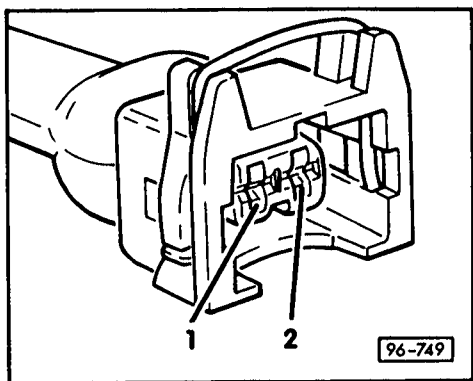


- ▶ Disconnect plug from solenoid valve 1 (N 80).



- ▶ - Connect diode test lamp V.A.G 1527 to plug contacts 1 and 2 with auxiliary leads from V.A.G 1594.
- Carry out final control element diagnosis up to activation of solenoid valve 1 (flash code 4 3 4 3) - see self-diagnosis.
- LED flashes, renew solenoid valve 1.

01-104



- ◀ - LED does not light up, connect hand multimeter V.A.G 1526 for voltage measurement between plug contact 1 and earth with auxiliary leads from V.A.G 1594.

Specified value: approx. battery voltage

If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

If specified value is attained, check lead as follows:

- Remove FEI control unit and pull off connector plug with ignition switched off. Connect test box V.A.G 1598 between FEI control unit and disconnected connector plug of FEI control unit with adapter lead V.A.G 1598/7. Contact numbers of connector plug are identical to test box numbers. Electrical fuses 13, 21 and 28 OK.
- Check continuity between plug contact 2 of solenoid valve 1 and test box contact 3 with hand multimeter.

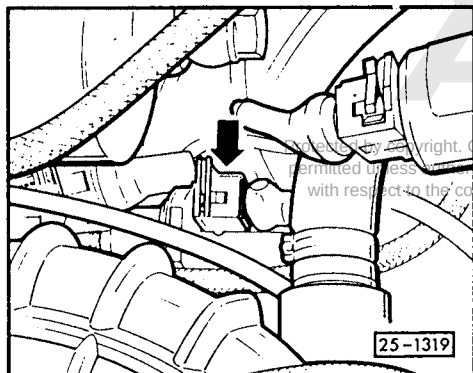
Specified value: approx. 0.5 Ω

If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

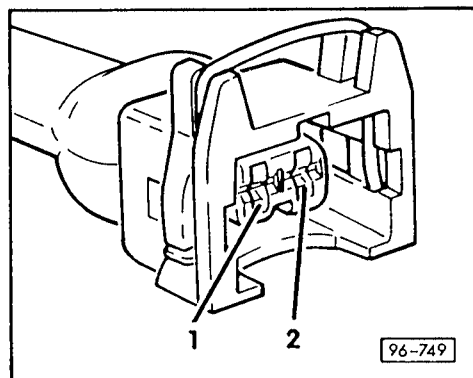
If specified value is attained, renew FEI control unit.

01-105

CHECKING CONTROL OF ACTIVATED CHARCOAL FILTER SYSTEM SOLENOID VALVE 2 (N 115)

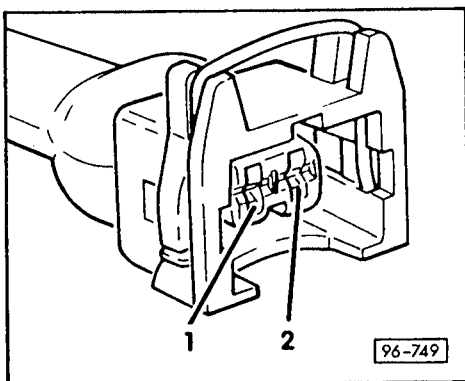


- ◀ - Disconnect plug from solenoid valve 2 (N 115).



- ◀ - Connect diode test lamp V.A.G 1527 to plug contacts 1 and 2 with auxiliary leads from V.A.G 1594.
- Carry out final control element diagnosis up to activation of solenoid valve 2 (flash code 4 3 3 1) - see self-diagnosis.
- LED flashes, renew solenoid valve 2.

01-106



- LED does not flash, connect hand multimeter V.A.G 1526 for voltage measurement between plug contact 1 and earth with auxiliary leads from V.A.G 1594.

Specified value: approx. battery voltage

If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

If specified value is attained, check wiring as follows:

- Remove FEI control unit and pull off connector plug with ignition switched off. Connect test box V.A.G 1598 between FEI control unit and disconnected connector plug of FEI control unit with adapter lead V.A.G 1598/7. Contact numbers of connector plug are identical to test box numbers. Electrical fuses 13, 21 and 28 OK.

- Check continuity between plug contact 2 of solenoid valve 2 and test box contact 23 with hand multimeter.

Specified value: approx. 0.5 Ω

If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

If specified value is attained, renew FEI control unit.

01-107

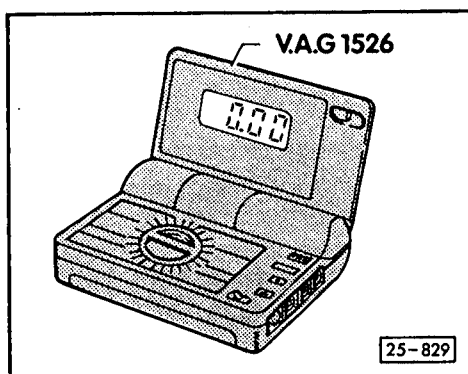
ELECTRICAL TESTING

Engine code letters: SL

(On disconnected connector plug from FEI control unit)

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Fault memory must be recalled before electrical check - page 01-71.



Note:

- Use hand multimeter V.A.G 1526 and auxiliary leads from V.A.G 1594 for check.
- If measured values deviate from specified values, locate and eliminate faults using current flow diagram. Check wiring and connections before replacing respective components.

Important

In order to avoid destroying electronic components, respective measuring range must be switched on before connecting test leads.

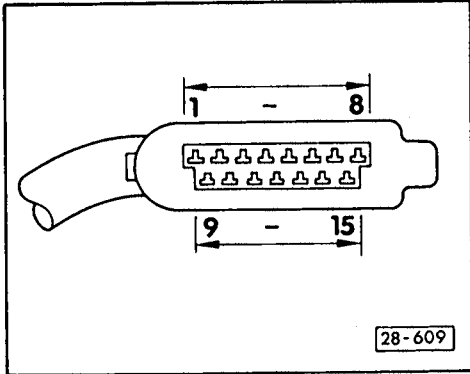
01-108

TEST CONDITIONS

- Battery voltage OK.
 - Fuse No. 24 OK.
 - Earth connection on engine (intake manifold) OK.
- Remove FEI control unit - page 28-42.

Important

Only disconnect and connect connector plug of FEI control unit with ignition switched off.



- ◀ - Connect test box V.A.G 1598 to connector plug of FEI control unit (socket for control unit remains free) with adapter lead V.A.G 1598/1.

Note:

Connector plug contact numbers are identical to test box socket numbers.

Important

When checking leads between FEI control unit and fuel pump relay (J 17) do not apply voltage to respective contacts.

01-109

TEST TABLE FOR FEI IGNITION SYSTEM

- o Contact numbers in connector plug - Fig. 28-609, page 01-109.
o Test box V.A.G 1598 only connected to wiring loom with adapter lead V.A.G 1598/1 (control unit socket remains free).

- Switch on DC voltage measuring range -V-					
Test step	Connector sockets Test box V.A.G 1598	What is checked	• Test conditions - Additional work	Specified values	Specified values are <u>not</u> attained
1	3 + 5	Voltage supply for FEI control unit (J 88) 3 = Earth connection to intake manifold 5 = Positive connection from fuse No. 24	• Ignition switched on	Approx. battery voltage	Check earth connection to intake manifold and/or fuse No. 24, or locate and eliminate break in wiring using current flow diagram
2	3 + 6	Throttle valve switch	• Ignition switched on • Ignition switched on - Operate throttle valve lever	Approx. battery voltage 0 volts	Locate and eliminate break in wiring using current flow diagram Throttle valve switch incorrectly adjusted - check - page 25-154
3	3 + 10	Lead 10 to fuel pump relay (J 17) terminal 47 T	• Ignition switched on	Approx. battery voltage	Locate and eliminate break in wiring using current flow diagram
4	5 + 4	Lead 4 to fuel pump relay (J 17) terminal 49 La and to fault lamp (model year 88)	• Ignition switched on - Link contacts on fuel pump relay with fuse	Approx. battery voltage	Locate and eliminate break in wiring using current flow diagram

01-110

- Switch on measuring range: <u>resistance measurement</u> - -					
Test step	Connector sockets Test box V.A.G 1598	What is checked	- Test conditions - Additional work	Specified values	Specified values are <u>not</u> attained
5	12 + contact 6 from connector plug of TCI-H switch unit	Lead, Hall signal	- Disconnect plug from TCI-H switch unit (N 41)	Max. 0.5 Ω	Locate and eliminate break in wiring using current flow diagram
6	13 + 14	Lead to knock sensor (G 61)	- Separate connector to knock sensor (in engine compartment) and link on left outer contacts	Max. 0.5 Ω	Locate and eliminate break in wiring using current flow diagram
7	7 + 15	Voltage supply lead of Hall sender (G 40)	- Disconnect plug from Hall sender and link outer contacts	Max. 0.5 Ω	Locate and eliminate break in wiring using current flow diagram
8	7 + 9	Hall signal lead to FEI control unit	- Plug from Hall sender disconnected - Link centre lead to outer lead (red/yellow)	Max. 0.5 Ω	Locate and eliminate break in wiring using current flow diagram
9	3 + 1	Lead from temperature sensor (N 10) to FEI control unit	- Disconnect 2-pin plug from temperature sensor and link contacts	Max. 0.5 Ω	Locate and eliminate break in wiring using current flow diagram



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erWin 

SERVICING K-JETRONIC FUEL INJECTION
=====
SYSTEM
=====

TABLE OF FITTING LOCATIONS

Engine code letters: MC with two knock sensors

Note:
Table of fitting locations only applies to engine with code letters MC and two sensors - see Fig. 1.

- 1- Connector, black
● For firing point sender (G 4)
- 2- Connector, grey
● For engine speed sender (G 28)
- 3- Connector, red
● For knock sensor 1 (G 61)
- 4- Connector, black
● For Lambda probe heating
- 5- Connector
● For Lambda probe (G 39)
- 6- Solenoid valve for boost pressure control (N 75)
- 7- Firing point sender (G 4)

25-1425

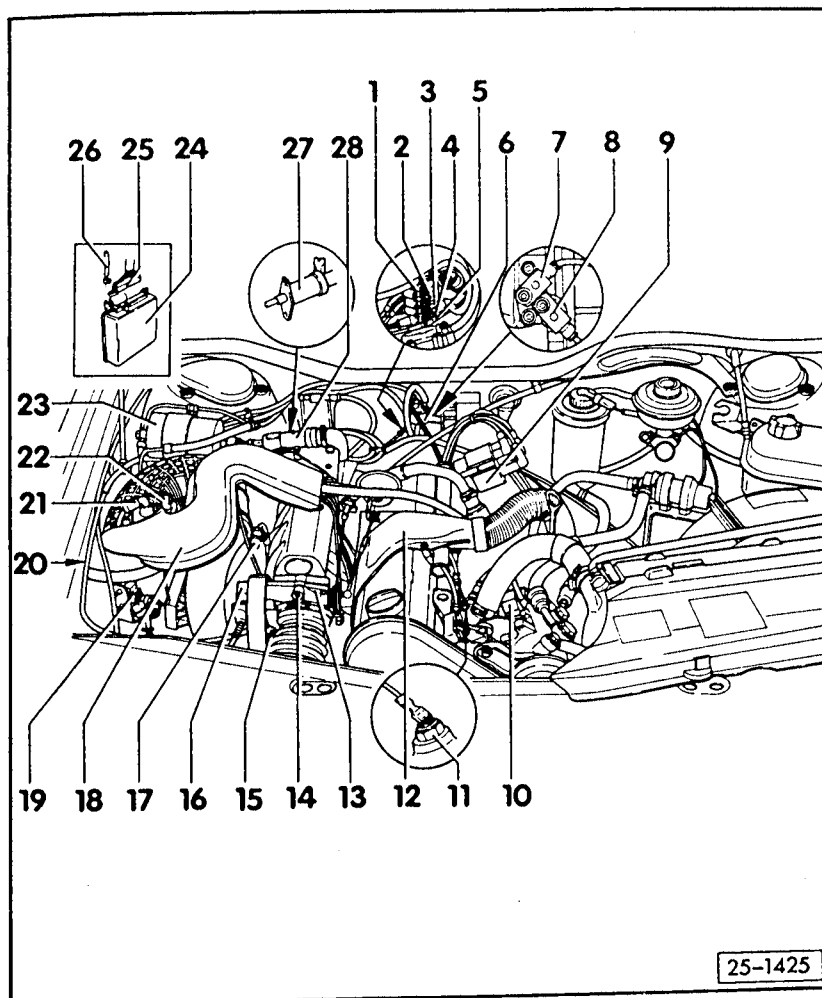
25-1

Engine code letters: MC with two knock sensors

- 8- Engine speed sender (G 28)
- 9- Ignition distributor with Hall sender (G 40)
● Checking Hall sender - Repair Group 28
- 10- Warm-up valve (N 9)
- 11- Temperature sensor for idle stabilization (N 10)
- 12- Air duct
● for injector cooling
- 13- Throttle housing
- 14- Idling speed adjusting screw
- 15- Throttle damper
- 16- Throttle valve switch (F 60 and F 81)
- 17- Sealing cap
● For CO measuring tube
- 18- Cover
● For fuel lines

25-1425

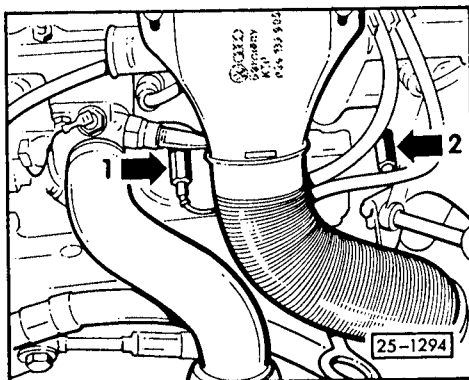
25-2



Engine code letters: MC with two knock sensors

- 19- Frequency valve for Lambda regulation (N 7)
- 20- Overrun cut-off valve (N 65)
- 21- Sealing cap
 - On angle piece of air intake elbow
 - Remove for testing idling speed and CO content
- 22- Activated charcoal filter system solenoid valve 1 (N 80)
- 23- Fuel filter
 - Watch installation position - arrow on fuel filter indicates direction of flow
- 24- FEI control unit (J 88)
 - Fitting location: passenger side, behind lower A-pillar trim
- 25- Connector plug
 - Disconnect and connect only with ignition switched off
- 26- Vacuum line
 - To intake manifold
- 27- Cold start valve (N 17)
- 28- Idling speed stabilization valve (N 71)

25-3



◀ Fig. 1 Identification of reworked engine with code letters MC

Reworked engine can be recognised by the two knock sensors.

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2- Mixture control unit
 • Renew gasket between mixture control unit and air filter housing -6-

4- Overrun cut-off valve (N 65)

- All engines except with code letters KH and RT
- Removing and installing parts of overrun cut-off - page 25-168

8- Air cleaner element
 • Installation position: segments horizontal



9- Thermostat
 • Adjustable up to model year 87
 - Fig. 1

12- Intake hose

- Only for engine code letters KF
- For warm air
- To exhaust manifold

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25-6

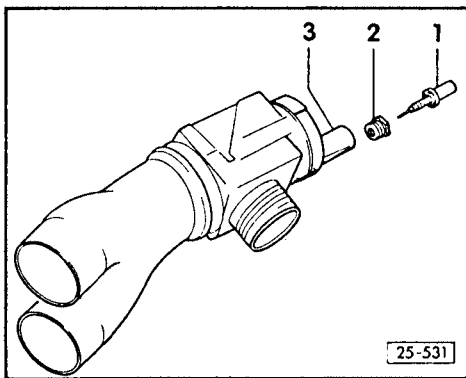


Fig. 1 Adjusting thermostat

- Up to model year 87
- Screw new thermostat -1- approx. 3 turns into connecting piece -2-.
- Screw connecting piece with thermostat into control box -3-.
- Lay control box with thermostat approx. 2 minutes in warm water (20° C).
- Screw in thermostat until control plate just cuts off cold air supply.
- Secure thermostat with sealing paint.

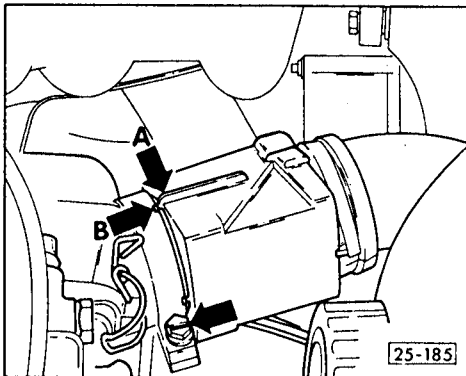


Fig. 2 Installing control box

- Insert control box into air cleaner cover.
- Fin -A- on control box must align with groove -B- on air cleaner cover.

25-7

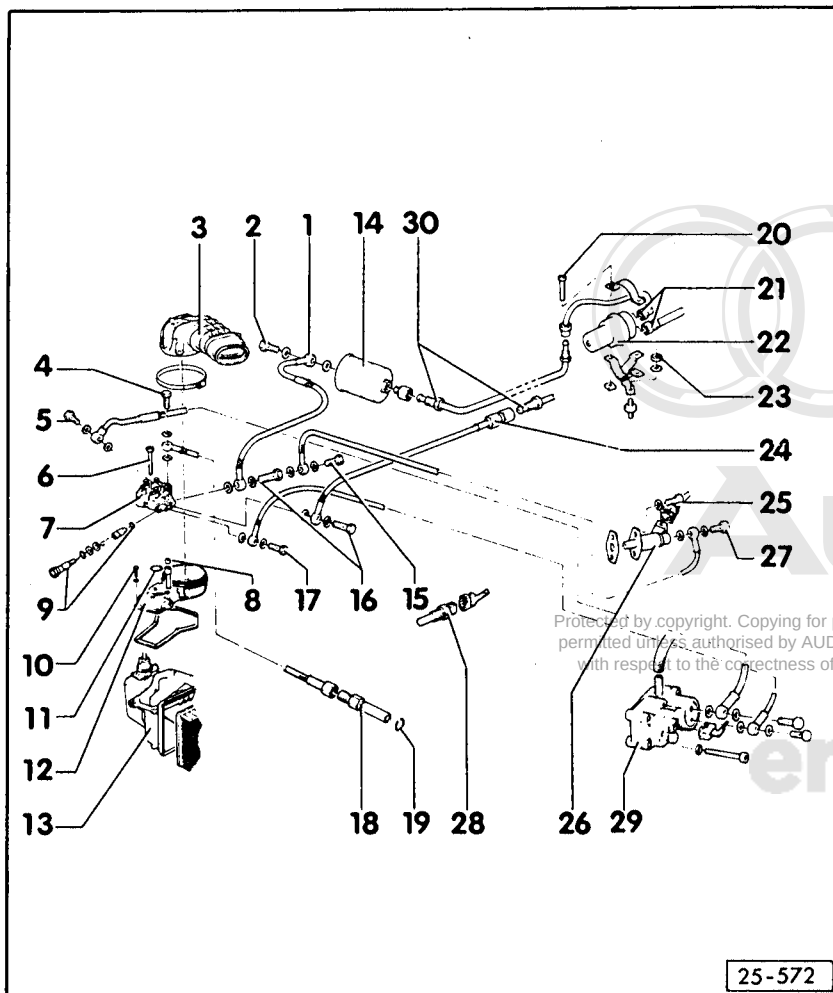
SERVICING FUEL SYSTEM

- Technical Data - from page 25-19
- Observe safety measures - page 25-43
- Observe rules for cleanliness - page 25-44
- Connecting pressure tester - page 25-45
- Connecting remote control - page 25-45
- Checking warm-up valve (control pressure) - page 25-187
- Checking system pressure - page 25-190
- Checking holding pressure - page 25-192
- Basic throttle valve setting - page 25-206
- Vacuum connections from page 25-207

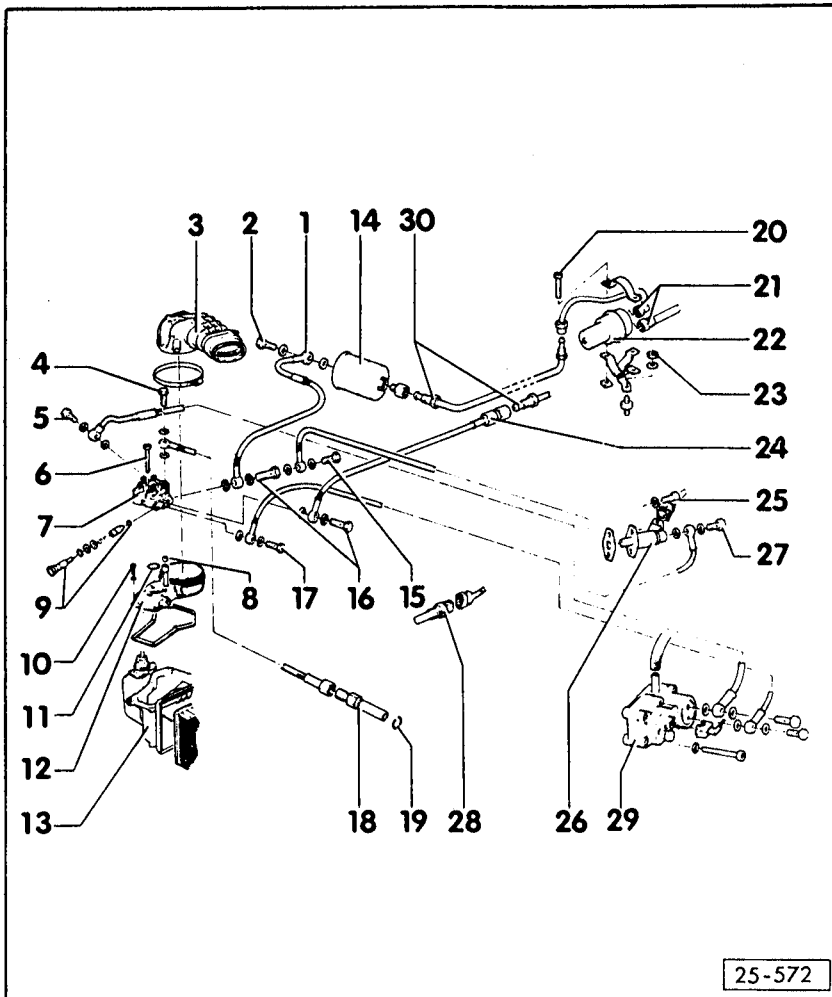
Note:

- Always replace gaskets and seals during assembly work.
- Hose connections are secured with either screw or spring clips.
- Always replace spring clips with screw clips.
- A voltage of at least 11.5 V is required for proper operation of electrical components.

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25-8



1- Fuel supply line

2- 25 Nm

3- Air intake elbow

4- 10 Nm

- Low-pressure system
 - Injection lines are secured to fuel metering distributor with unionbolts
- High-pressure system
 - Injection lines are secured to fuel metering distributor with union nuts

5- 25 Nm

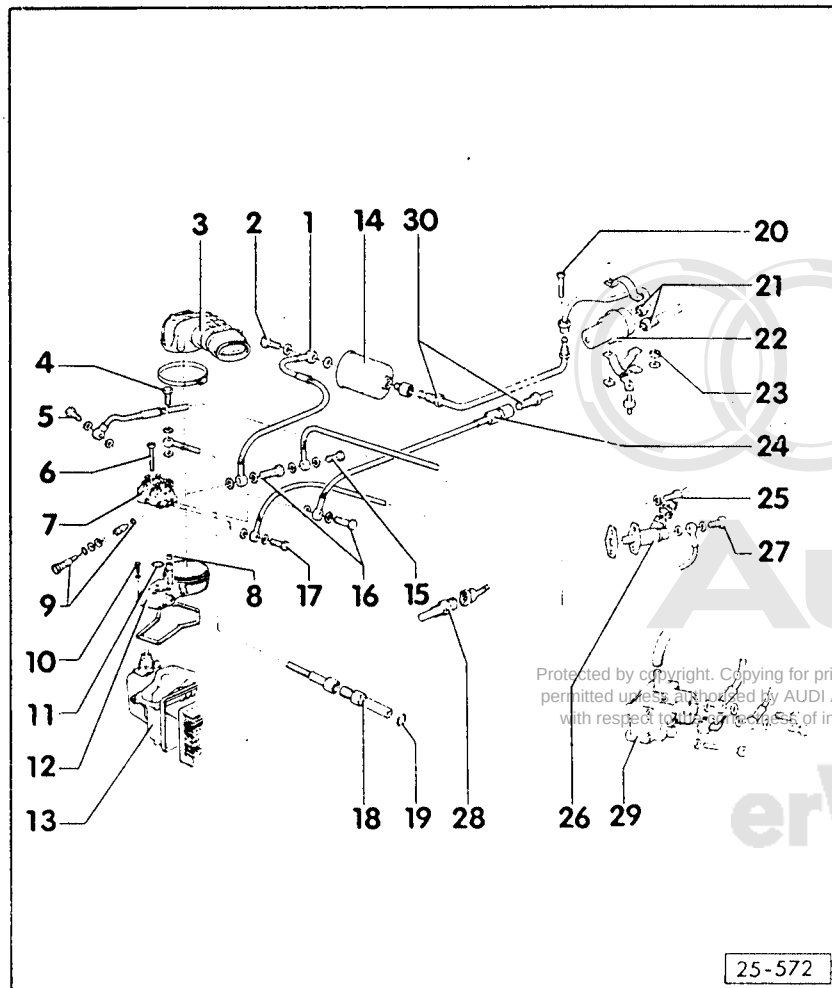
6- 3.5 Nm

- Secure with sealing paint after tightening.

7- Fuel metering distributor

- Checking - see comparative testing of injection system:
 - Engines with low-pressure system - page 25-193
 - Engines with high-pressure system - page 25-198
- Removing and installing - page 25-115
- After removal:
 - Low-pressure system:
 - Checking rest position of control plate - page 25-120
 - High-pressure system:
 - Checking rest position and free travel of air-flow meter plate - page 25-122
 - Removing and installing control plunger - page 25-126

25-9



8- Sealing plug

- Remove before CO adjustment
- Adjusting CO content:
 - Engine code letters HX, JY, KF, KG, KP, KU, WC - page 25-46
 - Engine code letters KH, MC, WU - page 25-54
 - Engine code letters RT, SL - page 25-63

9- Fuel pressure regulator/relief valve, 20 Nm

- On engines with low-pressure system
- Checking system pressure - page 25-190
- Renewing - page 25-116

10- 3.5 Nm

11- O-ring

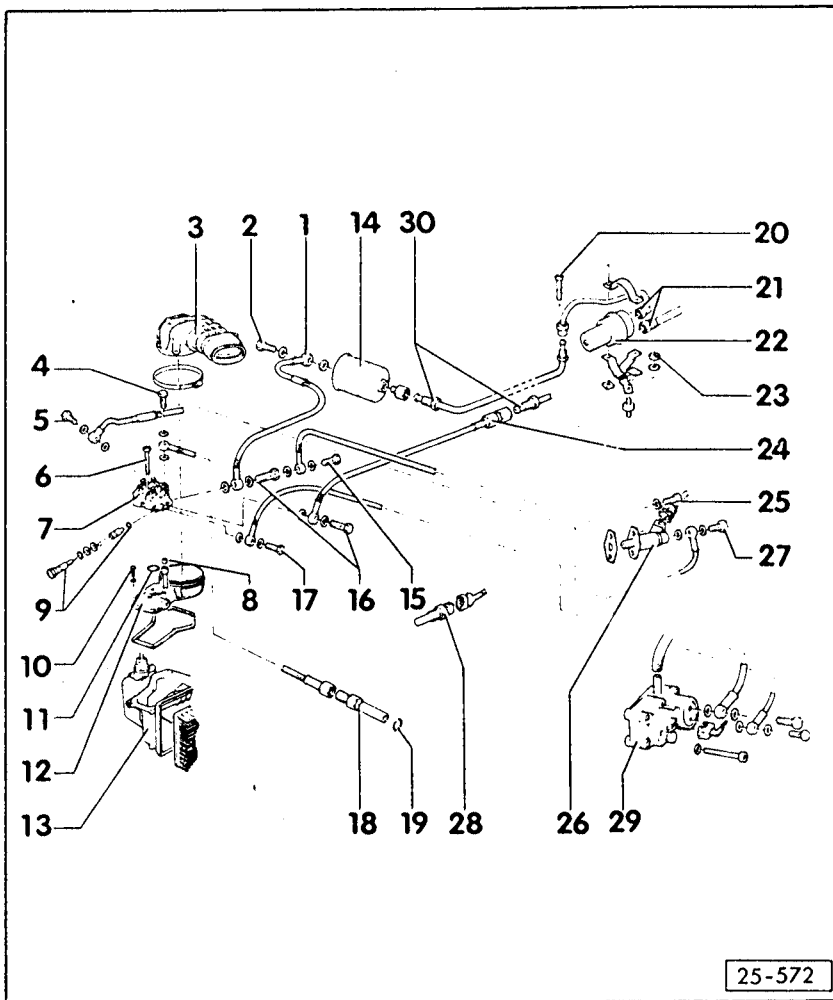
- Renew

12- Air flow meter

- Removing and installing - page 25-117
- Checking adjusting lever and control plunger - page 25-119
- After installation:
 - Low-pressure system:
 - Checking rest position of air-flow meter plate - page 25-120
 - High-pressure system:
 - Checking rest position and free travel of air-flow meter plate - page 25-122

13- Air cleaner housing

25-10



14- Fuel filter

- Installation position: arrow on filter indicates direction of flow

15- 10 Nm

16- 25 Nm

17- 10 Nm

18- Injector

- Checking - see comparative testing of injection capacity: Engines with low-pressure system - page 25-193
- Engines with high-pressure system - page 25-198
- Check breaking pressure with: injector tester V.A.G 1349 - Specified values: Technical Data, from page 25-19
- Checking air-shrouded injectors for leaks - page 25-202

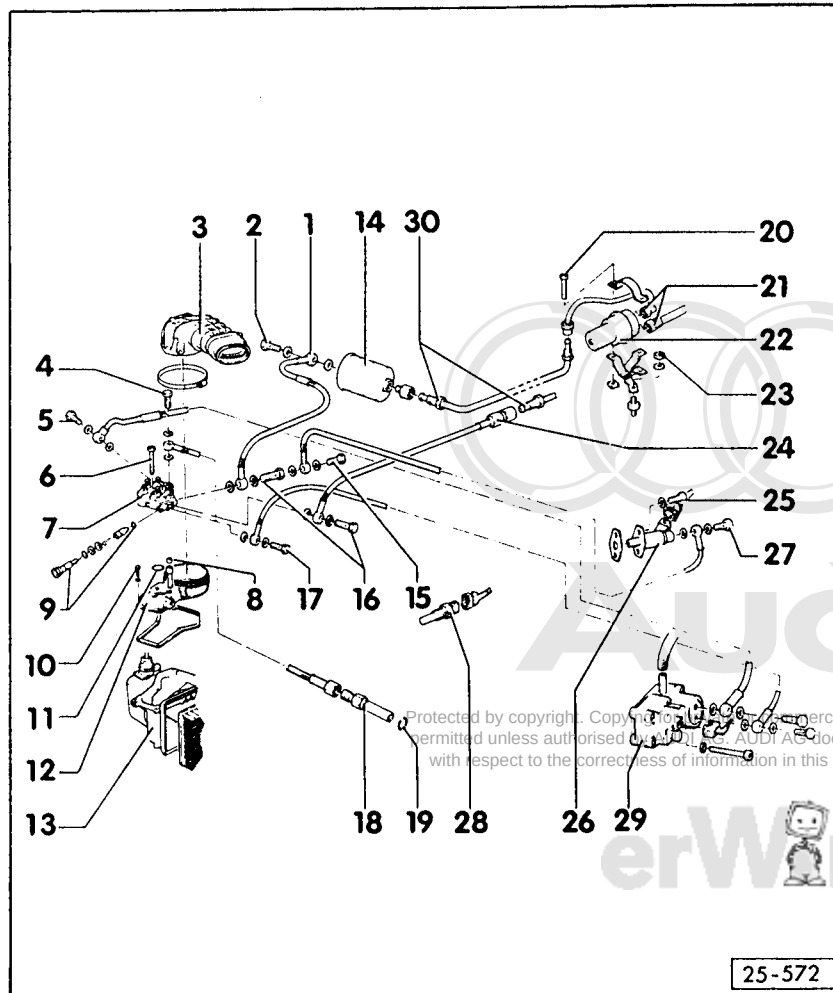
19- O-ring

- Note version
- Moisten with petrol before installing
- Checking air-shrouded injectors and inserts for leaks - page 25-202

20- 35 Nm

21- 20 Nm

25-11



22- Pressure reservoir

- Marking: Part No.
- Watch installation position

23- 10 Nm

24- Fuel return line

- To fuel tank

25- 10 Nm

26- Cold start valve (N 17)

- Checking:
 - All engines except for code letters MC - page 25-128
 - Engines with code letters MC - page 25-131
- Injector - Technical Data from page 25-19

27- 10 Nm

28- Thermostat (F 26) 30 Nm

- Not for engines with code letters MC
- Checking - page 25-128

29- Warm-up valve (N 9)

- Checking - page 25-187
- Measure control pressure
 - cold, warm

30- 25 Nm

25-12

Engine code letters: KH, WU

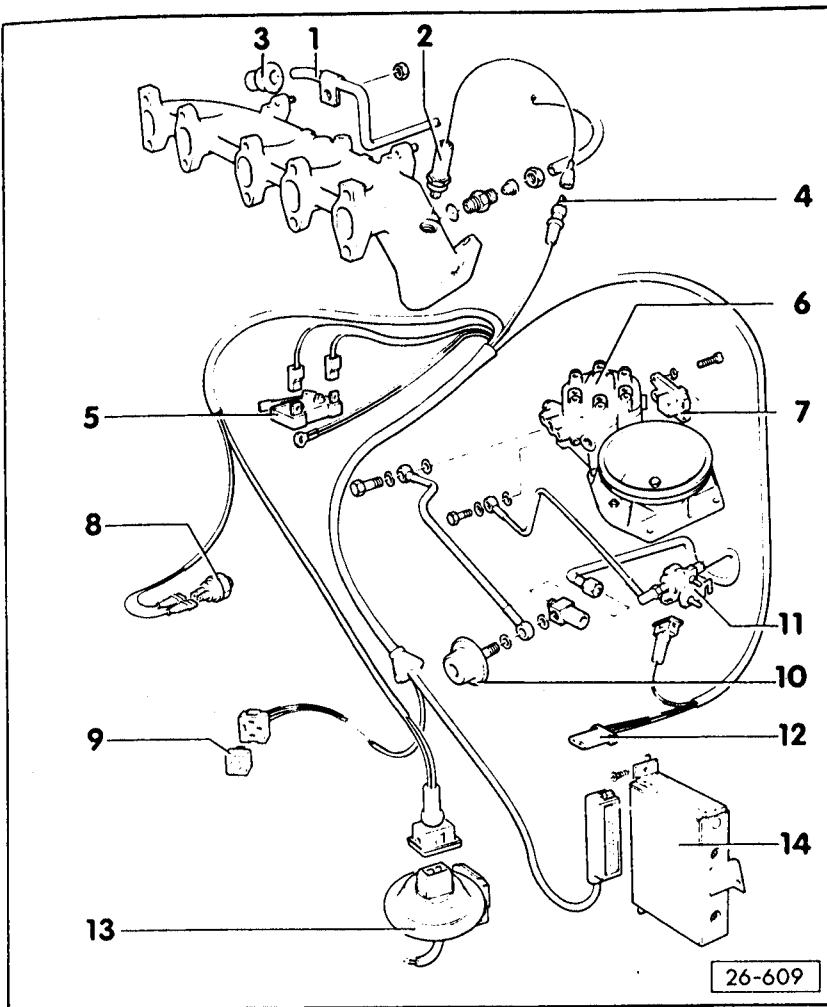
- Checking Lambda system:
 - Engine code letters KH - page 25-85
 - Engine code letters WU - page 25-107

1- CO measuring tube

- 2- Lambda probe (G 39), 50 Nm
- Grease only threads with G 5, G 5 must not get onto slotted area of probe body
 - Checking:
 - Engine code letters KH - page 25-85
 - Engine code letters WU - page 25-107

3- Sealing plug

4- Lambda probe connector



26-609

25-13

Engine code letters: KH, WU

5- Full throttle switch

- Checking:
 - Engine code letters KH - page 25-151
 - Engine code letters WU - page 25-162

6- Fuel metering distributor

7- Potentiometer

- For economizer

8- Idle stabilization thermost switch (F 74)

- Model year 83/84
- From model year 85
- Temperature sensor (N 10)
- Checking - page 25-83

9- Relay

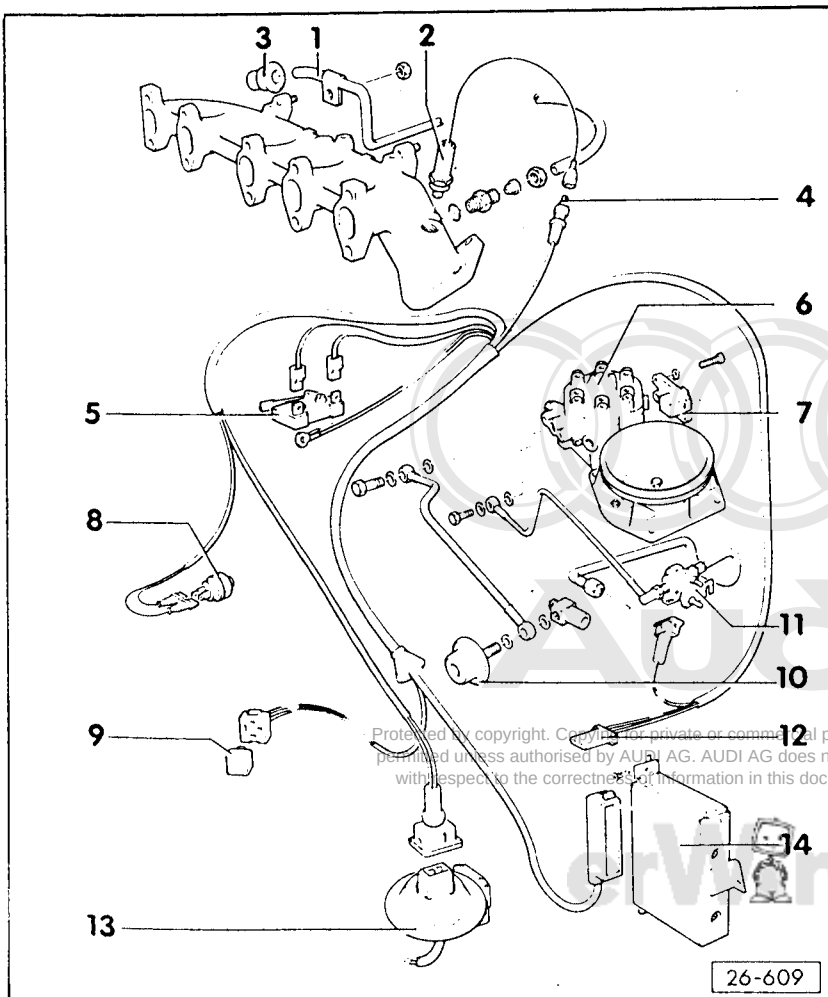
- On additional plate under left cover

10- Pressure damper

- Watch installation position

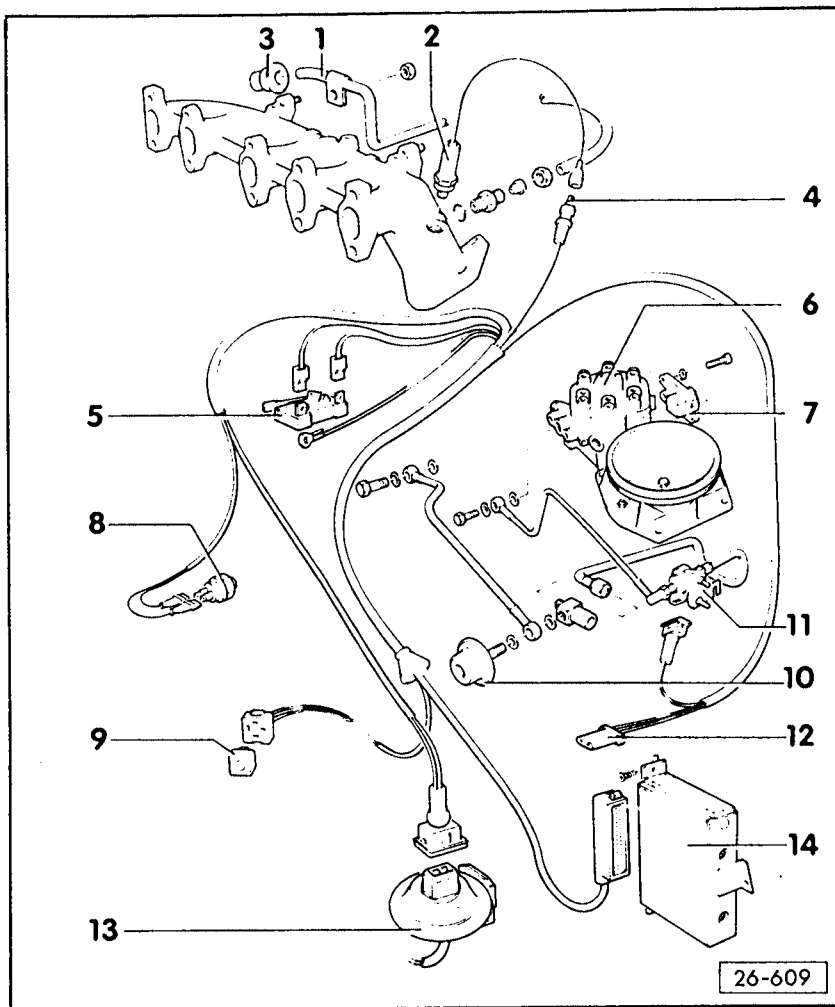
11- Frequency valve for Lambda regulation (N 7)

- Checking:
 - Engine code letters KH - page 25-85
 - Engine code letters WU - page 25-107



26-609

25-14



Engine code letters: KH, WU

12- Duty cycle test connection

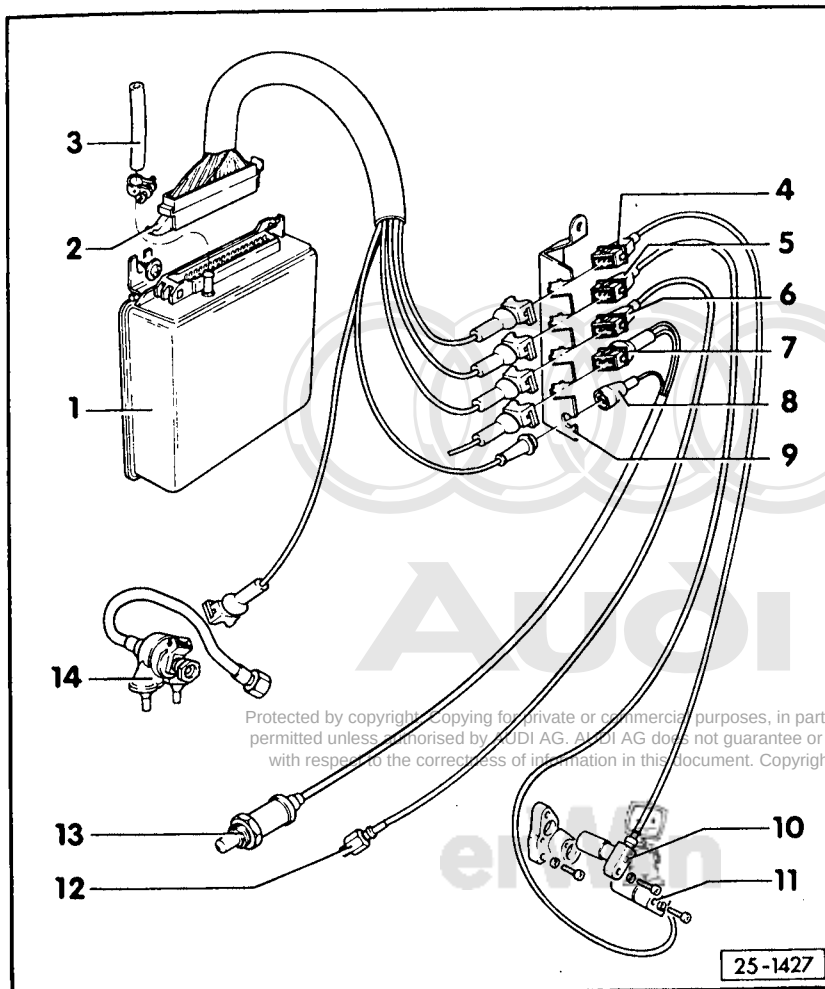
13- Diaphragm pressure switch

- Not on all engines
- For cold acceleration enrichment
- Checking - page 25-134

14- Control unit

- Disconnect or connect plug only with ignition switched off
- Checking - see "Checking Lambda System":
 - Engine code letters KH - page 25-85
 - Engine code letters WU - page 25-107
- Fitting location: passenger side behind lower A-pillar trim

25-15



SERVICING LAMBDA REGULATION

Engine code letters: MC

• Checking Lambda system:

- Engine code letters MC with one knock sensor - page 25-93
- Engine code letters MC with two knock sensors - page 25-100

• Checking Lambda regulation:

- Engine code letters MC with two knock sensors - page 25-103

1- FEI control unit (J 88)

- Checking - Repair Group 01
- Fitting location: passenger side behind lower A pillar trim

2- Connector plug

- Disconnect and connect only with ignition switched off

3- Vacuum hose

- To intake manifold

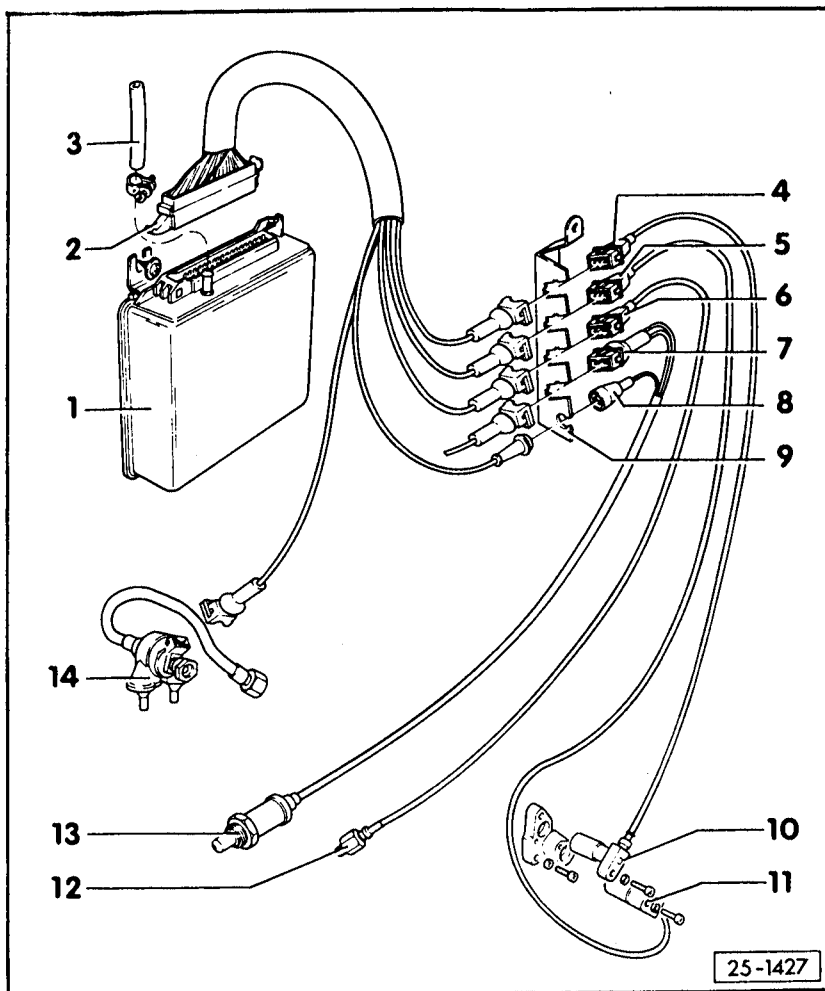
4- Connector, black

- For firing point sender (G 4)

5- Connector, grey

- For engine speed sender (G 28)

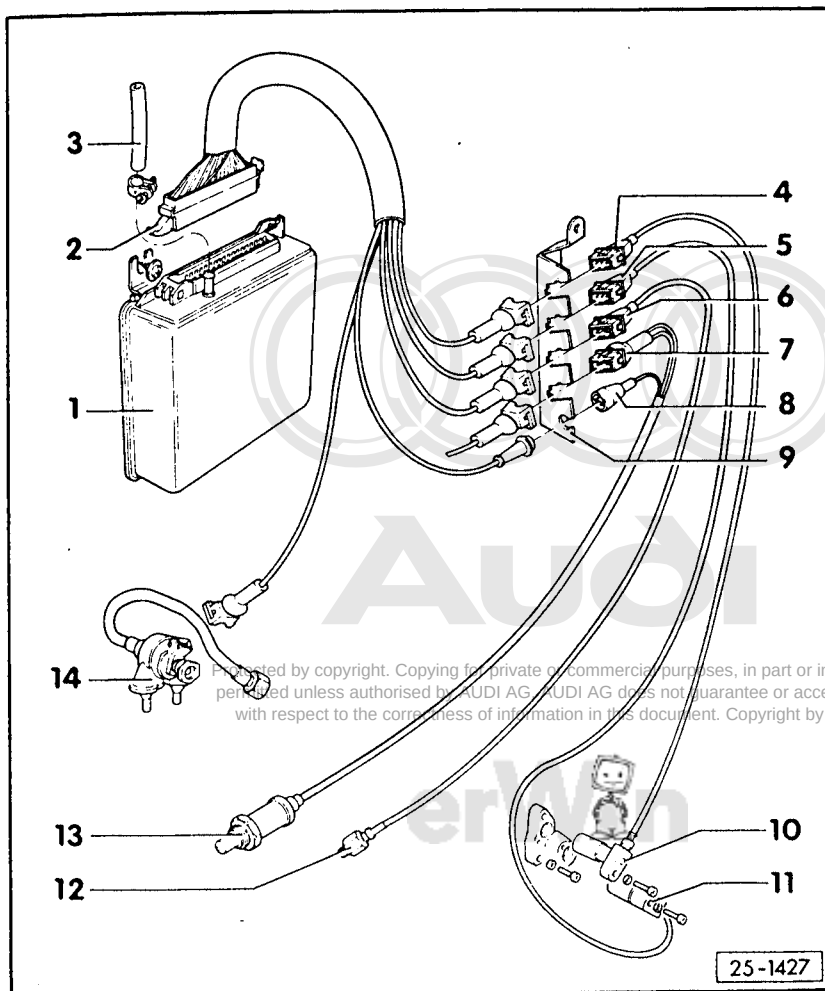
25-16



Engine code letters: MC

- 6- Connector, red
 - For knock sensor 1 (G 61)
- 7- Connector, black
 - For Lambda probe heating
 - For engines with one knock sensor: connector on mixture control unit
- 8- Connector
 - For Lambda probe (G 39)
 - For engines with one knock sensor: connector on air intake elbow
- 9- Bracket for connectors
- 10- Firing point sender (G 4)
 - Checking - Repair Group 28

25-17



Engine code letters: MC

- 11- Engine speed sender (G 28)
 - Checking - Repair Group 28
- 12- Knock sensor 1 (G 61), 10 Nm
 - Checking - Repair Group 01
- 13- Lambda probe (G 39), 50 Nm
 - Only grease threads with G 5, G 5 must not get onto slotted area of probe body
- 14- Frequency valve for Lambda regulation (N 7)
 - Checking control - Repair Group 01

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25-18

TECHNICAL DATA

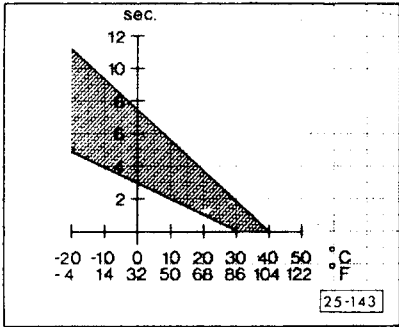
Engine code letters		HX	KF
<u>Production</u>	from to	08.84 12.87	08.82 08.84
<u>Idling speed *)</u> ● Idling speed 800 ± 50 rpm results from correct control current adjustment with idling adjustment screw			
Specified value	mA	430 ± 30	470 ± 30
<u>CO content *)</u>	% vol.	1.0 ± 0.5	0.5 ± 0.2
<u>Engine speed limitation</u> ● Cut-out speed	rpm	6300 ... 6900	6300 ... 6900
<u>Control pressure</u> <u>Engine cold:</u> ● Plug disconnected from warm-up valve ● Vacuum hose remains connected at ambient temperature:		► 06.86 07.86 ►	
20°	bar	1.3...1.7	1.3 ... 1.7
25°	bar	1.6...2.0	1.6 ... 2.0
30°	bar	1.9...2.4	1.9 ... 2.4

*) Observe test and adjustment conditions - page 25-46

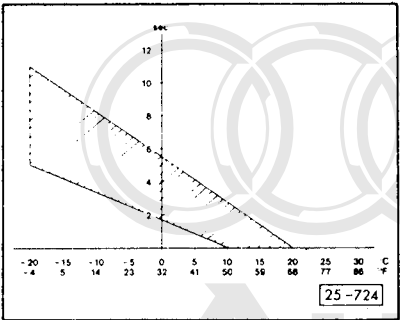
25-19

Engine code letters		HX	KF
<u>Control pressure</u> <u>Engine warm:</u> ● Engine oil temperature 50...70°C ● Vacuum hose on warm-up valve		► 06.86 07.86 ►	
Connected	bar	3.4...3.8	3.4...3.8
Disconnected	bar	2.75...3.05	2.75...3.05
<u>System pressure</u> ● Pressure gauge valve closed		► 06.86 07.86 ►	
	bar	4.7...5.4	4.7...5.4
<u>Holding pressure</u> ● After 10 minutes	at least bar	2.6	2.6
● After 20 minutes	at least bar	2.4	2.4
<u>Cut-out pressure</u> ● After 5 seconds	max. bar	3.0	3.0
<u>Fuel pump</u> ● Feed rate		Repair Group 20	Repair Group 20

25-20

Engine code letters	HX		KF
<u>Injectors</u>	► 06.86	07.86 ►	
Breaking pressure bar	3.0 ... 4.1	4.3 ... 4.6	3.0 ... 4.1
Injection capacity tolerance within one set			
<u>Idling measurement (1st detent)</u> - For 20 ml fuel quantity max.	3.0	2.5	3.0
<u>Full throttle measurement (2nd detent)</u> - For 80 ml fuel quantity max.	8.0	8.0	8.0
	◀ <u>Thermo time switch</u> ► 06.86 - Switch-on time - seconds		<u>Thermo time switch</u> Switch-on time seconds - see Fig. 25-143
	◀ <u>Cold start valve</u> ► 06.86 - seconds - Then pulsing injection		<u>Cold start valve</u> - Injection time - seconds - see Fig. 25-143 - Then pulsing injection

25-21

Engine code letters	HX		KF
	◀ <u>Thermo time switch</u> ► 07.86 - Switch-on time - seconds		<u>Thermo time switch</u> Page 25-21, Fig. 25-143
	◀ <u>Cold start valve</u> ► 07.86 - Injection time - seconds - Then pulsing injection		<u>Cold start valve</u> Page 25-21, Fig. 25-143

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<u>Engine code letters</u>		JY	KG
<u>Production</u>	From to	08.83 07.87	08.83 01.88
<u>Idling speed *)</u> • Idling speed 800 ± 50 rpm results from correct control current adjustment with idling adjustment screw Specified value mA		430 ± 30	430 ± 30
<u>CO content *)</u> % vol.		1.4 ± 0.3	2.0 ± 0.5
<u>Engine speed limitation</u> • Cut-out speed rpm		6300 ... 6900	6300 ... 6900
<u>Control pressure</u> <u>Engine cold:</u> • Plug disconnected from warm-up valve • Vacuum hose remains connected at ambient temperature: 20° bar 25° bar 30° bar		0.8...1.4 1.0...1.4 1.4...1.7	0.8...1.4 1.0...1.4 1.4...1.7
<u>Engine warm:</u> • Engine oil temperature 50...70° C • Vacuum hose on warm-up valve Connected bar		3.4...3.8	3.4...3.8
Disconnected bar		2.75...3.05	2.75...3.05

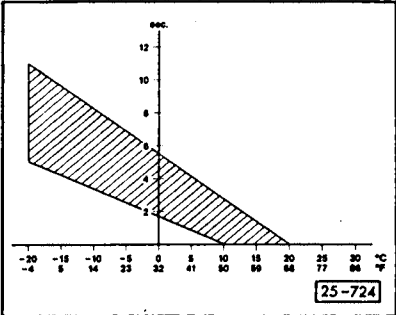
*) Observe test and adjustment conditions - page 25-46

25-23

<u>Engine code letters</u>		JY		KG	
<u>System pressure</u> • Pressure gauge valve closed bar		► 02.85	03.85 ►	► 02.85	03.85 ►
		4.7...5.4	5.8...6.4	4.7...5.4	5.8...6.4
<u>Holding pressure</u> • After 10 minutes at least bar		2.5	3.4	2.5	3.4
• After 20 minutes at least bar		2.4	3.3	2.4	3.3
<u>Cut-out pressure</u> • After 5 seconds max. bar		3.0	3.2	3.0	3.2
<u>Fuel pump</u> • Feed rate		Repair Group 20		Repair Group 20	
<u>Injectors</u> Breaking pressure bar		► 02.85	03.85 ►	► 02.85	03.85 ►
		3.0 ... 4.1	4.3...4.6*)	3.0...4.1	4.3...4.6 *)
• Injection capacity tolerance within one set <u>Idling measurement (1st detent)</u> - For 20 ml fuel quantity max.		3.0		2.0	
<u>Full throttle measurement (2nd detent)</u> - For 80 ml fuel quantity max.		8.0		8.0	

*) Dispersion within one set - 0.6 bar

25-24

Engine code letters	JY	KG
	<u>Thermo time switch</u> • Switch-on time - seconds	
	<u>Cold start valve</u> • Injection time - seconds • Then pulsing injection	

25-25

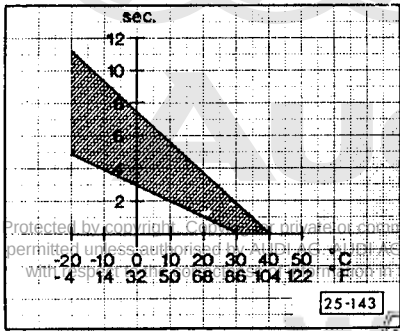
Engine code letters		KH		WU	
Production		From	08.83		08.82
		to	07.86		07.84
Idling speed *)				► 1983 1984 ►	
• Idling speed 800 ± 50 rpm results from correct control current adjustment with idling adjustment screw					
Specified value		mA	430 ± 30		470 ± 30 430 ± 30
Duty cycle					
Test value (fluctuating)		%	25 ... 65		25 ... 65
Adjustment value (fluctuating)		%	50 ± 8		50 ± 8
CO content *)		% vol	0.3...1.2		0.3...1.2
* Serves only for checking					
Engine speed limitation					
• Cut-out speed		rpm	6300 ... 6900		6300 ... 6900
Control pressure					
Engine cold:					
• Plug disconnected from warm-up valve at ambient temperature		° C	20 25 30		20 25 30
		bar ± 0.25		bar ± 0.25	
Sea level approx. 950 mbar		1.5 1.7 1.9		1.75 2.05 2.35	
1600 m above sea level approx. 840 mbar		1.7 2.1 2.5		1.95 2.35 2.75	
Engine warm:					
• Engine oil temperature 50 ... 70° C		bar		bar	
Sea level approx. 950 mbar		3.4 ... 3.8		3.4 ... 3.8	
1600 m above sea level approx. 840 mbar		4.2 ... 4.6		4.2 ... 4.6	

*) Observe test and adjustment conditions - page 25-54

25-26

<u>Engine code letters</u>	KH	WU
<u>System pressure</u> ● Pressure gauge valve closed bar	5.1...5.8	4.7...5.4
<u>Holding pressure</u> ● After 10 minutes at least bar	2.6	2.6
● After 20 minutes at least bar	2.4	2.4
<u>Cut-out pressure</u> ● After 5 seconds max. bar	3.0	3.0
<u>Fuel pump</u> ● Feed rate	Repair Group 20	Repair Group 20
<u>Injectors</u> Breaking pressure bar	3.0...4.1	3.0...4.1
● Injection capacity tolerance within one set Idling measurement (1st detent) - For 20 ml fuel quantity max.	3.0	3.0
Full throttle measurement (2nd detent) - For 80 ml fuel quantity max.	8.0	8.0

25-27

<u>Engine code letters</u>	KH	WU
	<u>Thermo time switch</u> ● Switch-on time - seconds	<u>Cold start valve</u> ● Injection time - seconds ● Then pulsing injection

25-28

Engine code letters		KP	KU
Production	from to	08.84 12.87	08.84 -
<u>Idling speed *)</u> • Idling speed 800 + 50 rpm results from correct control current adjustment with idling adjustment screw Specified value mA		430 ± 30	470 ± 30
<u>CO content *)</u> With catalyst Vol. %		0.8 ± 0.4	0.5 ± 0.2
without catalyst Vol. %		1.0 ± 0.5	1.0 ± 0.5
<u>Engine speed limitation</u> • Cut-out speed rpm		6300 ... 6900	6300 ... 6900
<u>Control pressure</u> <u>Engine cold:</u> • Plug disconnected from warm-up valve • Vacuum hose remains connected at ambient temperature: 20° bar 25° bar 30° bar		1.3...1.8 1.5...2.2 1.9...2.4	1.3...1.8 1.5...2.2 1.9...2.4

*) Observe test and adjustment conditions - page 25-46

25-29

<u>Engine code letters</u>		KP		KU	
<u>Control pressure</u>					
<u>Engine warm:</u>					
● Pressure gauge valve open					
● Engine oil temperature 50 ... 70° C					
● Vacuum hose on warm-up valve					
Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.					
Connected bar		4.05...4.35	4.1...4.3	4.05...4.35	4.1...4.3
Disconnected bar		2.75...3.05	2.65...2.95	2.75...3.05	2.65...2.95
<u>System pressure</u>					
● Pressure gauge valve closed					
bar		4.7...5.4	5.6...6.0	4.7...5.4	5.6...6.0
<u>Holding pressure</u>					
● After 10 minutes at least bar		2.6	3.4	2.6	3.4
● After 20 minutes at least bar		2.4	3.3	2.4	3.3
<u>Cut-out pressure</u>					
● After 5 seconds max. bar		3.0	3.2	3.0	3.2
<u>Fuel pump</u>					
● Feed rate		Repair Group 20		Repair Group 20	

25-30

Engine code letters	KP		KU	
<u>Injectors</u>	► 06.86	07.86 ►	► 06.86	07.86 ►
Breaking pressure bar	3.0...4.1	4.3...4.6	3.0...4.1	4.3...4.6
Injection capacity tolerance within one set				
Idling measurement (1st detent) - For 80 ml fuel quantity max.	3.0	2.5	3.0	2.5
Full throttle measurement (2nd detent) - For 80 ml fuel quantity max.	8.0	8.0	8.0	8.0

25-31

Engine code letters	KP	KU
25-143	Thermo time switch • ► 06.86 • Switch-on time - seconds Cold start valve • ► 06.86 • Injection time - seconds • Then pulsing injection	
25-724	Thermo time switch • 07.86 ► • Switch-on time - seconds Cold start valve • 07.86 ► • Injection time - seconds • Then pulsing injection	

25-32

<u>Engine code letters</u>		MC
<u>Production</u>	From To	08.85 -
<u>Idling speed *)</u> • Idling speed 800 ± 50 rpm or 720 ± 50 rpm on vehicles with automatic gearbox. Results from correct control current adjustment with idling adjustment screw Specified value mA 430 ± 30		
<u>Duty cycle</u>		
	Test value (fluctuating) %	25 ... 65
	Adjustment value (fluctuating) %	50 ± 8
<u>CO content *)</u> * serves only for checking	Vol. %	0.3 ... 1.2
<u>Engine speed limitation</u> • Cut-out speed	rpm	6300 ... 6900

*) Observe test and adjustment conditions - page 25-54

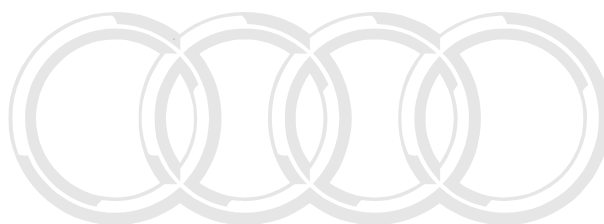


25-33

<u>Engine code letters</u>		MC
<u>Control pressure</u> <u>Engine cold:</u> • Plug disconnected from warm-up valve at ambient temperature: 20° C bar 1.5 ... 1.8 25° C bar 1.6 ... 2.1 30° C bar 1.8 ... 2.3		
<u>Engine warm:</u> • Engine oil temperature 50 ... 70° C 3.4 ... 3.8		
<u>System pressure</u> • Pressure gauge valve closed	bar	5.8 ... 6.6
<u>Holding pressure</u> • After 10 minutes at least bar		3.0
• After 20 minutes at least bar		2.8
<u>Cut-out pressure</u> • After 5 seconds max. bar		3.2
<u>Fuel pump</u> • Feed rate		Repair Group 20

25-34

<u>Engine code letters</u>	MC
<u>Injectors</u>	
Breaking pressure bar	4.3 ... 4.6
Injection capacity tolerance within one set	
<u>Idling measurement</u> (1st locking detent) - For 20 ml fuel quantity max.	3.0
<u>Full throttle measurement</u> (2nd detent) - For 80 ml fuel quantity max.	8.0
<u>Cold start valve</u>	
Injection time at cold start temperature	
- 30° C seconds	10
0° C seconds	3
20° C seconds	1
35° C seconds	0



25-35

<u>Engine code letters</u>	RT*)	SL
<u>Production</u> from to	01.88 -	02.86 12.87
<u>Idling speed **)</u> Idling speed 800 + 50 rpm results from correct control current adjustment with idling adjustment screw	Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.	
Specified value	430 ± 30	430 ± 30
<u>CO content **)</u> Vol.%	1.0 ± 0.2	1.0 ± 0.5
<u>Engine speed limitation</u> Cut-out speed	6300 ... 6900 rpm	6300 ... 6900
<u>Throttle valve switch</u> Measured with feeler gauge at throttle valve lever		
Switch-on point before idling stop mm	0.15 ... 0.5	0.15 ... 0.5

*) Engines with code letters RT are equipped with both K and KE-Jetronic. Engines with code letters RT and KE-Jetronic - see Repair Manual: KE-Jetronic/Ignition system.

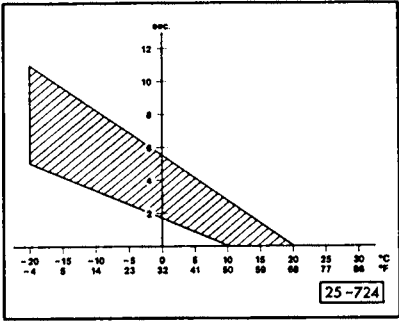
**) Observe test and adjustment conditions - page 25-63

Engine code letters	RT	SL
<u>Control pressure</u> <u>Engine cold:</u> ● Plug disconnected from warm-up valve ● Vacuum hose remains connected Temperature of warm-up valve 20° C bar	1.55 ... 1.75	1.55 ... 1.75
<u>Engine warm:</u> ● Engine oil temperature 50 ... 70° C ● Plug on warm-up valve connected after 1.5 ... 5.0 minutes ● Vacuum hose on warm-up valve Connected bar	4.1 ... 4.3	4.1 ... 4.3
Disconnected bar	2.65 ... 2.95	2.65 ... 2.95
<u>System pressure</u> ● Pressure gauge valve closed bar	5.4 ... 6.2	5.6 ... 6.0
<u>Holding pressure</u> ● After 10 minutes at least bar	3.4	3.4
● After 20 minutes at least bar	3.3	3.3

25-37

Engine code letters	RT	SL
<u>Cut-out pressure</u> ● After 5 seconds max. bar	3.2	3.2
<u>Fuel pump</u> ● Feed rate	Repair Group 20	Repair Group 20
<u>Injectors</u> Breaking pressure bar	4.3 ... 4.6	4.3 ... 4.6
● Injection capacity tolerance within one set <u>Idling measurement (1st detent)</u> - For 20 ml fuel quantity max.	2.5	2.5
<u>Full throttle measurement (2nd detent)</u> - For 80 ml fuel quantity max.	8.0	8.0

25-38

Engine code letters	RT	SL
	<u>Thermo time switch</u> • Switch-on time - seconds	
	<u>Cold start valve</u> • Injection time - seconds • Then pulsing injection	

25-39

Engine code letters	WC	
<u>Production</u>	from to	08.82 07.84
<u>Idling speed *)</u> • Idling speed 800 ± 50 rpm results correct control current adjustment with idling adjustment screw Specified value $\blacktriangleright$ 1983 mA Specified value 1984 $\blacktriangleright$ mA		470 ± 30 430 ± 30
<u>CO content *)</u> with catalyst	Vol. %	0.5 ± 0.2
without catalyst	Vol. %	1.0 ± 0.5
<u>Engine speed limitation</u> • Cut-out speed	rpm	6300 ... 6900
<u>Control pressure</u> <u>Engine cold:</u> • Plug disconnected from warm-up valve • Vacuum hose remains connected at ambient temperature	bar	$1.3 \dots 1.8$ $1.5 \dots 2.2$ $1.9 \dots 2.4$
	20° C	bar
	25° C	bar
	30° C	bar

*) Observe test and adjustment conditions - page 25-46

25-40

<u>Engine code letters</u>	WC
<u>Control pressure</u> <u>Engine warm:</u> • Engine oil temperature 50 ... 70° C • Vacuum hose on warm-up valve	
connected bar	4.05 ... 4.35
disconnected bar	2.75 ... 3.05
<u>System pressure</u> • Pressure gauge valve closed	bar 4.7 ... 5.4
<u>Holding pressure</u> • After 10 minutes at least bar	2.6
• After 20 minutes at least bar	2.4
<u>Cut-out pressure</u> • After 5 seconds max. bar	3.0
<u>Fuel pump</u> • Feed rate	Repair Group 20

25-41

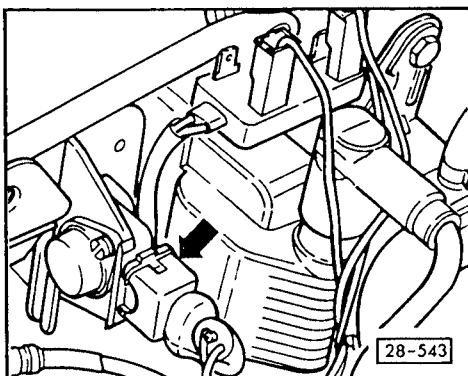
<u>Engine code letters</u>	WC
<u>Injectors</u> Breaking pressure bar	3.0 ... 4.1
• Injection capacity tolerance within one set	
<u>Idle measurement (1st locking detent)</u> - For 20 ml fuel quantity max.	3.0
<u>Full throttle measurement (2nd detent)</u> - For 80 ml fuel quantity max.	8.0
	<u>Thermo time switch</u> • Switch-on time - seconds
	<u>Cold start valve</u> • Injections time - seconds • Then pulsing injection

25-42

SAFETY MEASURES

In order to avoid injury to persons and/or irreparable damage to ignition and injection systems, the following must be observed:

- Disconnect and connect ignition and injection system leads - and tester leads - only with ignition switched off.
- If engine is to be operated at starter speed without starting (e.g. for compression pressure check):



- On vehicles with power stage on ignition coil, disconnect power stage plug.
- On vehicles without power stage on ignition coil, disconnect high voltage lead from ignition coil on distributor and earth with auxiliary lead from V.A.G 1594.
- Starting aid with quick charger is only permissible for up to 1 minute with max. 16.5 volts.
- Engine is only to be washed with ignition switched off.
- During arc and spot welding battery must be completely disconnected.
- Vehicles with a defective ignition system, or where this is suspected, may only be towed with plug on the TCI-H switch unit disconnected.

25-43

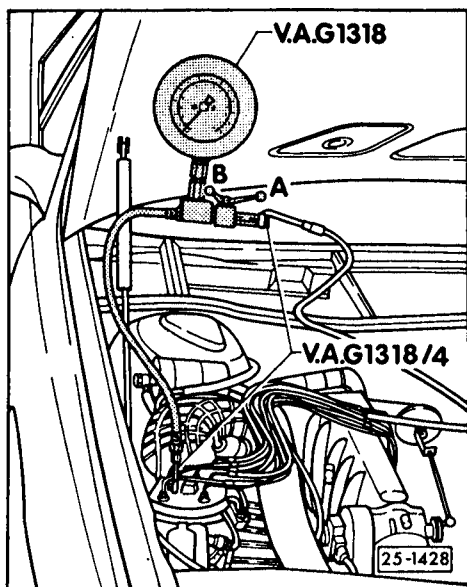
RULES FOR CLEANLINESS

Important

When working on the fuel system the following "5 rules" for cleanliness should be adhered to:

- 1 - Thoroughly clean connections and the adjacent areas before disconnecting.
- 2 - Place parts on a clean surface and cover them up with foil or paper. Do not use fluffy cloths!
- 3 - Opened components should be covered carefully or sealed if repair cannot be completed immediately.
- 4 - Use only clean parts.
 - Unpack parts immediately prior to installation.
 - Do not use parts which have been lying about unpacked (e.g. in toolbox etc.)
- 5 - When system is open:
 - Do not use compressed air if avoidable.
 - Avoid moving vehicle when possible.

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CONNECTING PRESSURE TESTER V.A.G 1318 WITH ADAPTER V.A.G 1318/4

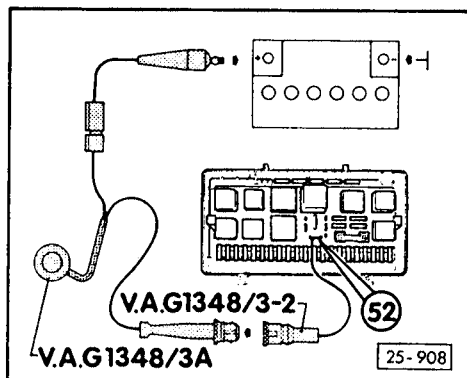
- Always use new O-rings.
- ◀ - Connect pressure tester with adapter between fuel metering distributor -1- and control pressure line of warm-up valve -2- (large connection).
- Cut-off lever position:
 - A - open
 - B - closed

Important

In order to protect against fuel spray, cover connections with cleaning rag when disconnecting fuel lines.

CONNECTING REMOTE CONTROL V.A.G 1348/3A WITH ADAPTER LEAD V.A.G 1348/3-2

- Fuse No. 13 OK.
- Pull fuel pump relay (J 17) out of relay plate (relay position 10).
- ◀ - Connect plug of adapter lead to contact -52-.
- Connect clip terminal to battery (+) or to B+ on alternator.



25-45

CHECKING AND ADJUSTING IDLING SPEED OR IDLE STABILIZATION AND CO CONTENT

Engine code letters: HX, JY, KF, KG, KP, KU, WC

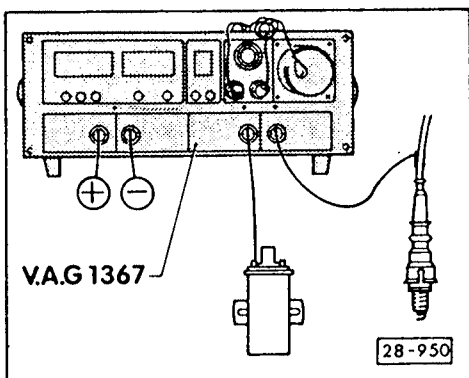
Test and adjustment conditions:

- Engine oil temperature at least 80° C.
 - Radiator fan must not be running.
 - Electrical components switched off.
 - Air conditioner switched off.
 - Thermostat or temperature sensor OK.
 - Exhaust system must not be leaking.
 - Throttle valve switch (idling switch) OK.
- Operating check:
When disconnecting and connecting plug for throttle valve switch (idling switch), firing point and idling speed must change.
- If injector lines were loosened or renewed, engine must be revved up to 3000 rpm several times and run at idle for at least 2 minutes before checking.
 - Throttle valve in idling position.
 - Ignition firing point OK, checking - Repair Group 28.
- Vehicles with automatic gearbox
- Throttle cable adjustment OK, checking - Repair Group 20.

25-46

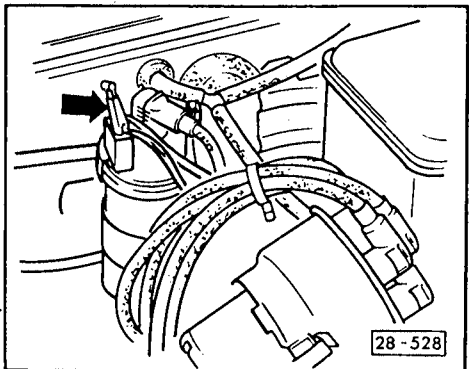
Note:

Idling speed and idling speed stabilization must be checked together. If idling speed deviates from adjusted control current (mA), idling speed stabilization must be checked.



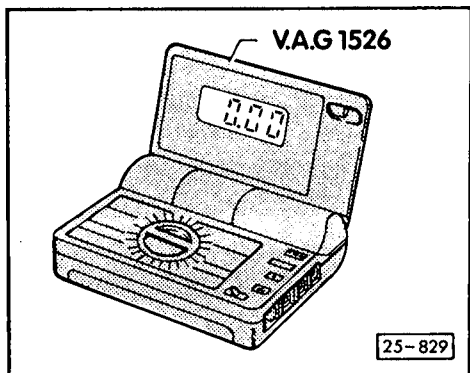
Connecting testers

- Connect tester V.A.G 1367 for speed measurement according to operating instructions with ignition switched off.



- Use auxiliary clip for connection to terminal 1 of ignition coil.

25-47



- Connect hand multimeter V.A.G 1526 to idling speed stabilization valve (N 17) for measuring control current (mA) with additional test lead and auxiliary leads from V.A.G 1594.

- Model year 83
Additional test lead V.A.G 1315A/1
- From model year 84
Additional test lead V.A.G 1315A/2

Measuring control current

- Start engine and run it at idling speed.
- Read control current on hand multimeter.

Specified values:

Engine code letters	Control current in mA
HX	430 + 30
JY	430 ± 30
KF	470 + 30
KG	430 ± 30
KP	430 ± 30
KU	430 ± 30
WC 1983	470 + 30
WC 1984	430 ± 30

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- If necessary, specified value can be corrected with idling speed adjustment screw.

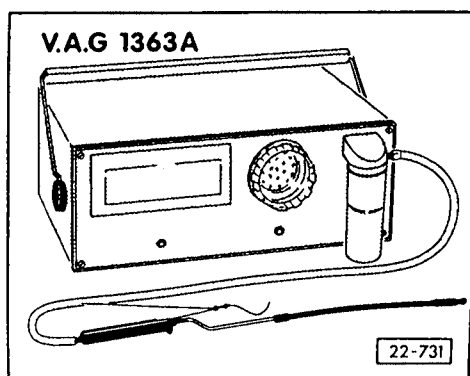
After adjusting idling speed stabilization, idling speed is

800 ± 50 rpm with manual gearbox

870 ± 50 rpm with automatic gearbox

If specified values are not achieved, check idling speed stabilization - page 25-70

25-49

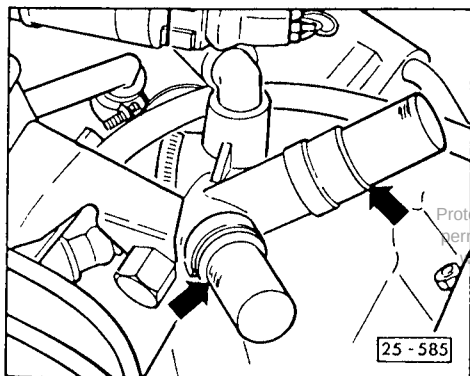


Checking and adjusting CO content

- ◀ - Connect tester V.A.G 1363 according to operating instructions.
- Connect CO probe to exhaust system tailpipe.

Note:

On engines with CO measuring tube, tester V.A.G 1363 is connected so that hose is seated firmly over CO measuring tube and no exhaust gas leaks can result.



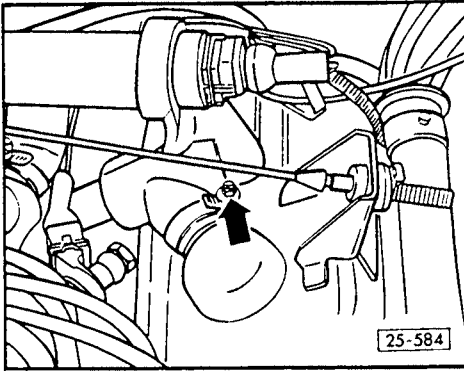
- ◀ Vehicles with exhaust-gas turbocharger

- Both hoses of crankcase ventilation system are disconnected and plugged for adjusting CO content.

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25-50



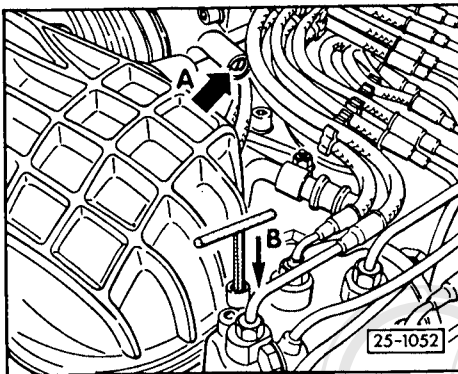
◀ Vehicles without exhaust-gas turbocharger

- For adjusting CO content, hose of crankcase ventilation system is disconnected and positioned so that only fresh air is sucked in.
- Start engine and run it at idle.
- Check CO content.

Specified values:

Engine code letters	CO content in % vol.
HX	1.0 ± 0.5
JY	1.4 ± 0.3
KF	0.5 ± 0.2
KG	2.0 ± 0.5
KP with catalyst	0.8 ± 0.4
KP without catalyst	1.0 ± 0.5
KU with catalyst	0.5 ± 0.2
KU without catalyst	1.0 ± 0.5
WC with catalyst	0.5 ± 0.2
WC without catalyst	1.0 ± 0.5

25-51



- ◀ - If CO content is outside the tolerance, adjust CO content with adjusting key P 377 -B- with CO adjusting screw.

To adjust, remove sealing cap for CO adjusting screw:

- Switch off ignition.
- Punch sealing cap of CO adjustment hole in the centre.
- With 2.5 mm $\varnothing$ drill, drill a 3.5 ... 4.0 mm deep hole in sealing plug.
- Remove metal chips.
- Screw in 3.0 mm $\varnothing$ sheet metal screw.
- Pull out sealing plug with pliers.

Important

During CO adjustment, do not press down or lift up adjusting screw with adjusting key.
Do not operate throttle with adjusting key in position (danger of bending).
Immediately remove adjusting key after each adjustment and briefly operate throttle.

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- Start engine and run at it idle.
- Adjust CO content with adjusting key.

Note:

- When adjusting, mean value should be aimed for.
- Always adjust CO content from decrease to increase.

Clockwise - CO content increases
Counterclockwise - CO content decreases

After adjusting CO content, adjustment of idling speed stabilization must be checked and, if necessary, corrected to specified value.

- Secure CO adjusting screw with new sealing cap.

Note:

After idling adjustment, hoses for crankcase ventiation system must be reconnected. If control current and CO content now change, this is not due to incorrect adjustment, but results from enrichment from crankcase caused by oil dilution through mainly short-distance driving. Petrol content in oil is reduced by a brisk, long-distance drive and control current/CO content return to normal. This can also be done at short notice with an oil change.

25-53

CHECKING AND ADJUSTING IDLING SPEED OR IDLE STABILIZATION AND CO CONTENT

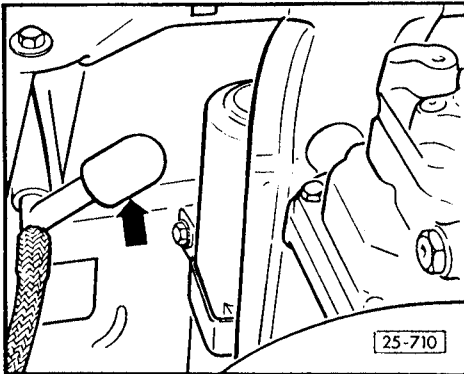
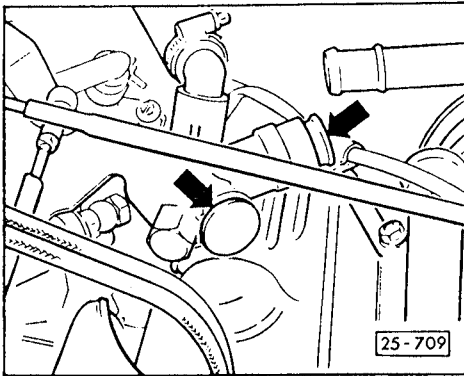
Engine code letters: KH, MC, WU

Test and adjustment conditions:

- Engine oil temperature at least 80° C.
- Radiator fan must not be running.
- Electrical components switched off.
- Air conditione switched off.
- Thermo switch or temperature sensor OK.
- Exhaust system must not be leaking.
- Throttle valve switch (idling switch) OK.
- Operating check:
When disconnecting and connecting plug for throttle valve switch (idling switch), firing point and idling speed must change.
- If injector lines were loosened or renewed, engine must be rewed up to 3000 rpm several times and run at idle for at least 2 minutes before checking.
- Throttle valve in idling position.
- On engines with code letters WU, ignition timing OK, checking - Repair Group 28
- Vehicles with automatic gearbox
- Throttle cable adjustment OK, checking - Repair Group 20.

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Note:

- Idling speed (CO content) must be checked and adjusted together.
- Measuring of CO content serves only as a check.

• Engine code letters KH, WU and MC with one knock sensor:

- ◄ - Disconnect crankcase ventilation hoses from cylinder head cover and plug.

Vehicles with exhaust-gas turbocharger:

- ◄ - Remove sealing cap -arrow- from T-piece in hose to activated charcoal filter.

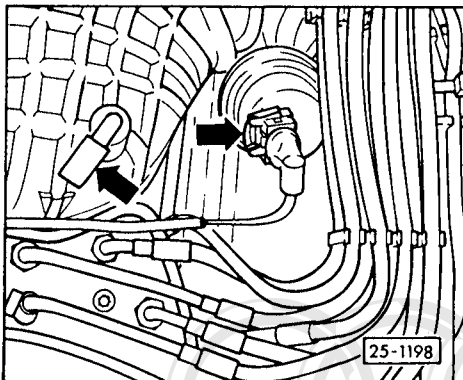
Vehicles without exhaust-gas turbocharger:

- Disconnect hose from activated charcoal filter to air intake elbow and leave open.

Note:

Angle piece must remain in air intake elbow, since it has a calibrated hole.

25-55



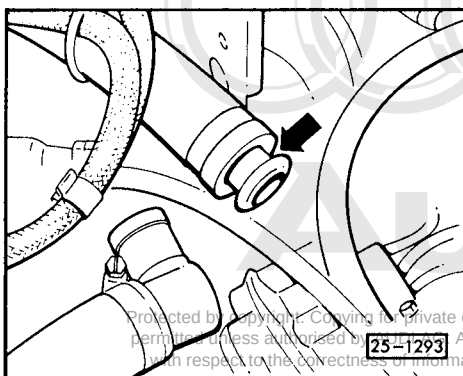
• Engine code letters MC with two knock sensors:

- ◄ - Disconnect plug from activated charcoal filter system solenoid valve 1 (N 80).
- Disconnect plug on angle piece of air intake elbow.

Note:

Angle piece must remain in air intake elbow, since it has a calibrated hole.

- Remove sealing cap on CO measuring tube.

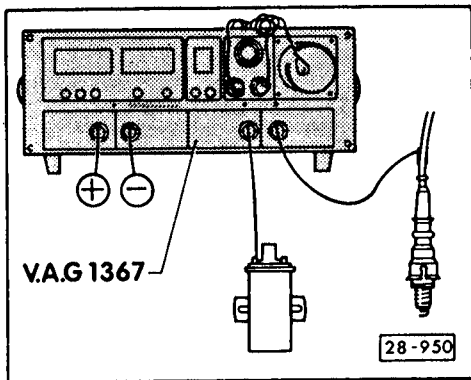


- ◄ - Disconnect crankcase ventilation hose between air intake elbow and cylinder head cover and plug with sealing cap of CO measuring tube.

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25-56

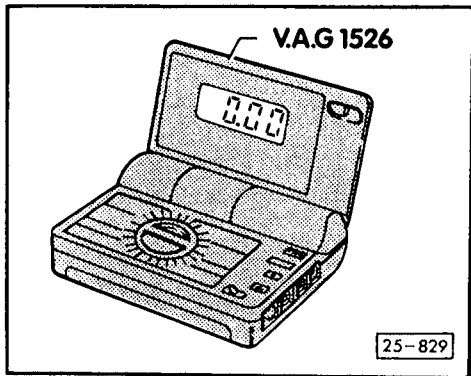


Connecting tester

- Connect tester V.A.G 136 for testing idling speed according to operating instructions with ignition switched off.

Note:

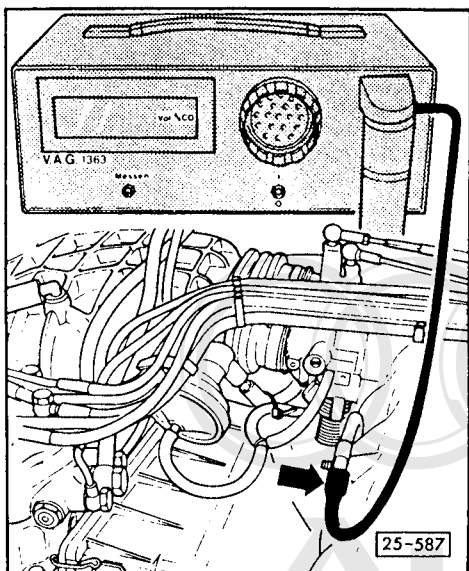
For connection to terminal 1, ignition coil cover must be removed on engines with code letters MC and two knock sensors.



- Connect hand multimeter V.A.G 1526 to idling speed stabilization valve for current measurement (mA) with additional test lead and auxiliary leads from V.A.G 1594.

- Model year 83
Additional test lead V.A.G 1315A/1
- From model year 84
Additional test lead V.A.G 1315A/2

25-57



- Connect tester V.A.G 1363 for CO measurement according to operating instructions.

Note:

Hose must be firmly seated on measuring tube so that no exhaust gas leaks can occur.

Checking and adjusting control current (idling speed) and idling speed stabilization

- Start engine and run it at idle.
Read display on hand multimeter.

Specified values:

Engine code letters	Specified values in mA
KH	430 ± 30
MC	430 ± 30
WU $\blacktriangleright$ 1983	470 ± 30
WU 1984 $\blacktriangleright$	430 ± 30

If necessary, specified value can be corrected with idling speed adjustment screw.

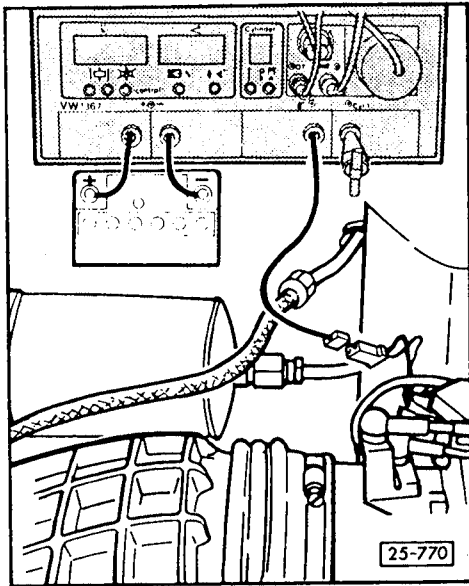
Protected by copyright. Copying for private or commercial use without permission is prohibited. After adjusting idling speed stabilization, idling speed is permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this manual. Manual gearboxes: 800 $\pm$ 50 rpm

Automatic gearboxes: 720 $\pm$ 50 rpm.

If these values are not attained, check idling speed stabilization:

- Engine code letters: KH, WU and MC with one knock sensor
- page 25-70
- Engine code letters: MC with two knock sensors - page 25-77

25-58



- ▶ - Measure duty cycle (dwell angle) with tester V.A.G 1367.
- Disconnect tester cable from contact 1 of ignition coil and connect to blue/white cable of Lambda test connection.
- Disconnect terminal clamp from ignition lead (cylinder 1).
- Press % button on tester.
- Start engine and run it at idle.

Note:

Ignore visible speed display on tester.

- Check duty cycle (dwell angle display).

Specified value: 25 % ... 65 %
Display must fluctuate

CO content:

Specified value: 0.3 ... 1.2 % vol.
(with Lambda probe connected)

25-59

Note:

If CO content is more than 1.2 % vol. at a duty cycle of 25 ... 65 %, following malfunctions may be present:

- Ignition system not OK
(checking and servicing - Repair Group 28).
- Leaky exhaust system (repair leaks or renew parts - Repair Group 26).
- Fuel metering distributor defective (unequal injection quantities at idle).
(Checking and servicing - comparative testing of injection capacity:
 - Engines with low-pressure system - page 25-193
 - Engines with high-pressure system - page 25-198

If duty cycle is less than 25 % or more than 65 %, duty cycle must be adjusted with CO adjusting screw.

- Switch off ignition.
- Remove air intake elbow from metering distributor.
- Punch sealing plug of CO adjusting hole in the centre.
- Drill hole approx. 3.5 ... 4.0 mm deep into plug with 2.5 mm Ø drill.
- Remove metal chips.
- Screw in a 3.0 mm Ø sheet metal screw.

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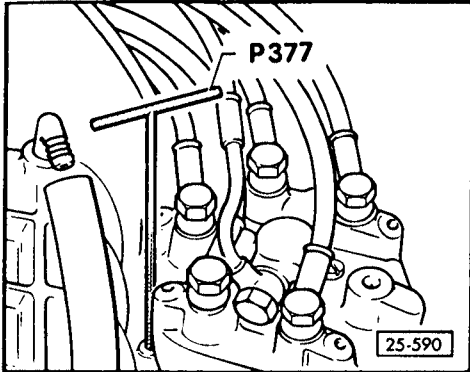


25-60

- Pull out sealing plug with pliers.
- Connect air intake elbow.
- Start engine and run it at idle.

Important

During CO adjustment, do not press down or lift up adjusting screw with adjusting key.
Do not operate throttle with adjusting key in position (danger of bending).
 Immediately remove adjusting key after each adjustment and briefly operate throttle.



- ◀ - Adjust duty cycle with CO adjusting screw using adjusting key P 377.

Clockwise - Duty cycle smaller
 Counterclockwise - Duty cycle larger

Specified value: $50 \pm 8 \%$
 Display must fluctuate

- Check idling speed after adjusting duty cycle, correct to specified value if necessary.
- Switch off ignition.
- Secure CO adjusting screw with new sealing plug.

25-61

Note:

Duty cycle may fall below specified value when crankcase ventilation hoses are reconnected.

This is not due to incorrect adjustment, but results from enrichment from crankcase caused by oil dilution through mainly short-distance driving.

Brisk, long-distance driving will reduce fuel content in engine oil and cycle returns to normal. At short notice this can also be done with a 30-minute high-speed drive or with an oil change if one was due anyway.



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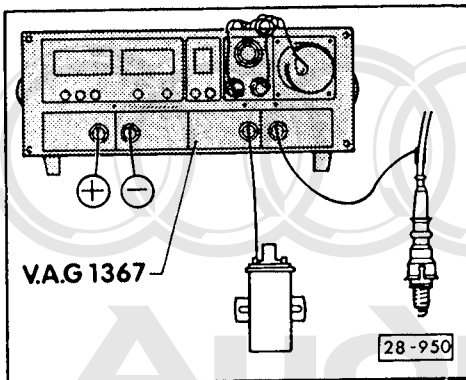
25-62

Engine code letters: RT, SL

Test and adjustment conditions:

- Engine oil temperature at least 80° C.
 - Radiator fan must not be running.
 - Electrical components switched off.
 - Air conditioner switched off.
 - Temperature sensor OK.
 - Exhaust system must not be leaking.
 - Throttle valve switch (idling switch) OK.
- Operating check:
When disconnecting and connecting plug for throttle valve switch (idling switch), firing point and idling speed must change.
- If injector lines were loosened or replaced, engine must be rewed up to 3000 rpm several times and run at idle for at least 2 minutes before checking.
 - Throttle valve in idling position.
 - Ignition firing point OK, checking - Repair Group 28
 - Vehicles with automatic gearbox
 - Throttle cable adjustment OK, checking - Repair Group 20.

25-63

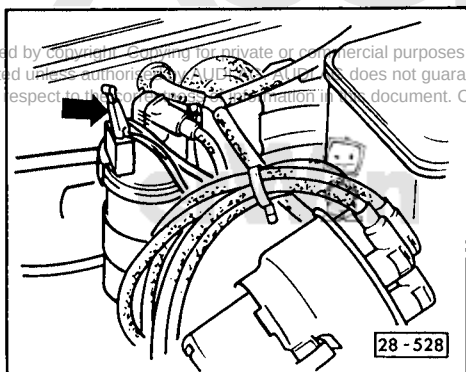


Note:

Idling speed and idling speed stabilization must be checked together. If idling speed deviates from adjusted control current (mA), idling speed stabilization must be checked.

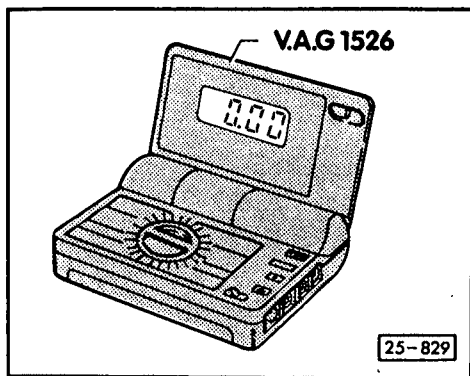
Connecting testers

- Connect tester V.A.G 1367 for speed measurement according to operating instructions with ignition switched off.

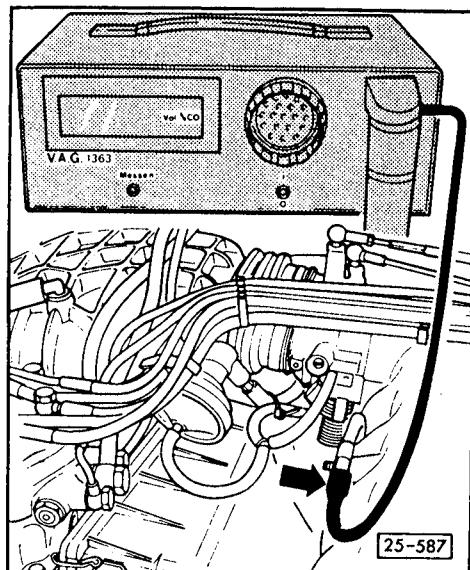


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Use auxiliary clip for connection to terminal 1 of ignition coil.



- ◄ - Connect hand multimeter V.A.G 1526 to idling speed stabilization valve (N 71) for measuring control current (mA) with additional test lead V.A.G 1315A/2 and auxiliary leads from V.A.G 1594.

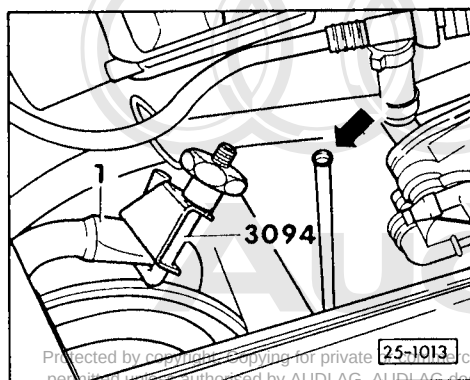


- ◄ - Connect tester V.A.G 1363 for CO measurement according to operating instructions.

Note:

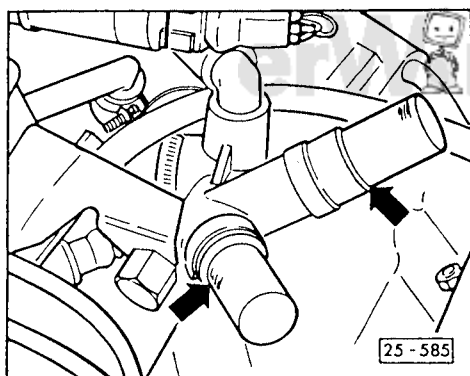
- Hose must be firmly seated on measuring tube so that no exhaust gas leaks result.
- On engines without CO measuring tube, CO probe of V.A.G 1363 is connected in exhaust tailpipe.

25-65



- Engine code letters RT

- ◄ - Pinch together crankcase ventilation hose -1- and pull out oil dipstick. To avoid oil splashes, lay cleaning rag on guide tube, if necessary.



- Engine code letters SL

- ◄ - Pull off crankcase ventilation hoses at cylinder head cover and plug.

25-66

Checking and adjusting control current (idling speed) and CO content

- Start engine and run it at idle.

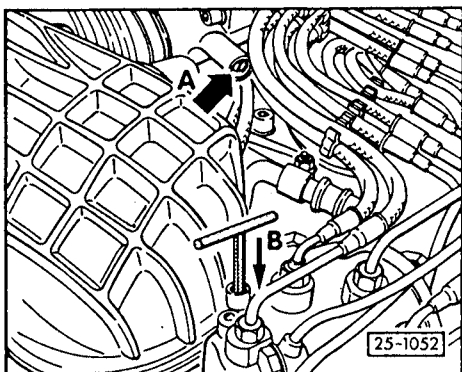
Specified values:

- Engine code letters RT

Control current = 430 ± 30 mA
CO content = 1.0 ± 0.2 % vol.

- Engine code letters SL

Control current = 430 ± 30 mA
CO content = 1.0 ± 0.5 % vol.



- ◀ - If necessary, correct by turning adjusting screws

-A- for control current
-B- for CO content

alternately.

Clockwise = CO content higher
Counterclockwise = CO content lower

To adjust, remove sealing plug for CO adjusting screw:

- Switch off ignition.
- Punch sealing plug of CO adjusting hole in the centre.

25-67

- With 2.5 mm $\varnothing$ drill, drill a 3.5 ... 4.0 mm deep hole in sealing plug.
- Remove metal chips.
- Screw in a 3.0 mm $\varnothing$ sheet metal screw.
- Pull out sealing plug with pliers.

Important

During CO adjustment, do not press down or lift up adjusting screw with adjusting key.
Do not operate throttle with adjusting key in position (danger of bending).
Immediately remove adjusting key after each adjustment and briefly operate throttle.

- Start engine and run it at idle.
- Adjust control current and CO content by alternately turning adjusting screws.

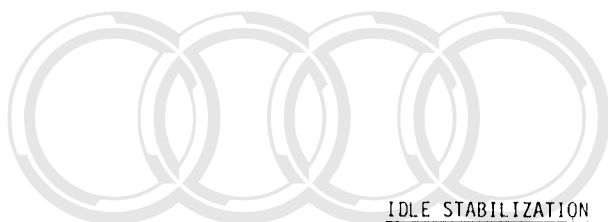
When control current adjustment is correct, an idling speed of 800 ± 50 rpm results.

If specified values are not attained, check idle stabilization
- page 25-70.

- Secure CO adjusting screw with new sealing plug.

Note:

After adjustment, crankcase ventilation hoses must be reconnected. If CO content now changes, this is not due to incorrect adjustment, but results from enrichment from crankcase caused by oil dilution from mainly short-distance driving. Brisk, long-distance driving will reduce fuel content in oil and CO content returns to normal. As short notice this can be done with an oil change.



25-69

All engines except engine code letters MC with two knock sensors.

Components:

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Control unit for idling speed stabilization (J 142) (in relay plate socket 11 and 12).

From 1/88 control unit is located behind A-pillar trim in left footwell.

Idling speed stabilization valve (N 71) (in line between air intake elbow and intake manifold).

Thermoswitch (F 74) (on cylinder head, front left) or temperature sensor (N 10).

Idling switch (F 60) (on throttle valve below).

Operation:

An electro-magnetic idling speed stabilization valve is installed in place of auxiliary air valve. Idling speed stabilisation valve serves to hold idling speed constant. This idling speed stabilization valve is controlled by an electronic control unit.

Idling switch on throttle valve (idling position), thermoswitch or temperature sensor (coolant temperature), terminal 1 of ignition coil (engine speed) and air conditioner compressor supply control unit with required information.

Via control unit, thermoswitch or temperature sensor ensures that engine runs at increased idling speed during warm-up phase.

If engine speed deviates from speed dictated by design of control unit, idling speed stabilization valve is opened or closed more or less. Idling speed is stabilized by this additional air which is guided around throttle valve.

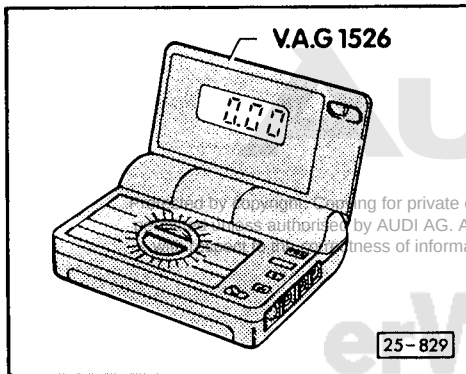
Checking idling speed stabilization

Important

Leads which concern idling speed stabilization may only be disconnected or connected with ignition switched off.

- Engine warm; oil temperature at least 80° C.
- Throttle valve in idling position.
- All electrical components switched off.
- Air conditioner switched off.
- Pressure tester not connected.
- If injector lines have been loosened or exchanged, engine must be rewed up to 3000 rpm several times and allowed to run at idle for at least 2 minutes before checking.

25-71



- ◀ - Connect hand multimeter V.A.G 1526 to idling speed stabilization valve for current measurement (mA) with additional test lead and auxiliary leads from V.A.G 1594 with ignition switched off.

- Model year 83
Additional test lead V.A.G 1315A/1

- From model year 84
Additional test lead V.A.G 1315A/2

- Start engine and run it at idle.

Specified value:

Model year 83 470 ± 30 mA

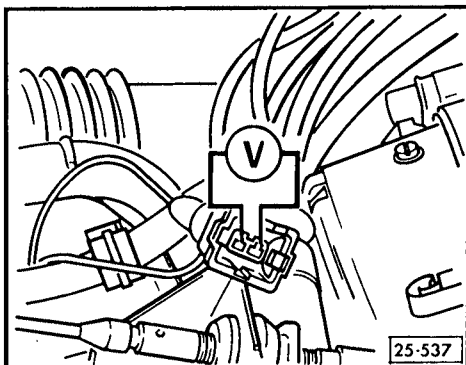
From model year 84 430 ± 30 mA

If these values are not attained, check idling speed stabilization valve, thermoswitch or temperature sensor and throttle valve switch, or locate and eliminate break in wiring using current flow diagram.

Checking idling speed stabilization valve

- Model year 83

- ◀ - Disconnect plug on idling speed stabilization valve (N 71) and connect hand multimeter V.A.G 1526 with auxiliary leads from V.A.G 1594 for voltage measurement.



25-72

- Switch on ignition.

Specified value: approx. battery voltage

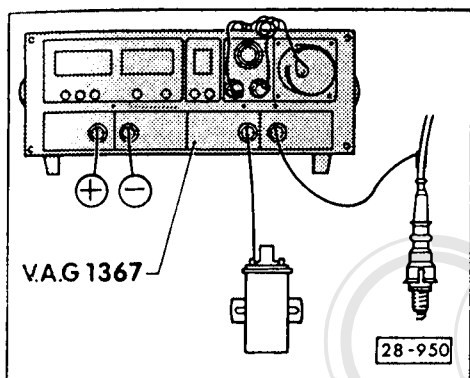
If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

- Connect plug to idling speed stabilization valve.
- Start engine and run at it idle.
Idling speed stabilization valve (N 71) must vibrate and hum.
- Otherwise replace idling speed stabilization valve.

Checking idling speed stabilization valve

- From model year 84

- Connect hand multimeter V.A.G 1526 to idling speed stabilization valve for current measurement (mA) with additional test lead V.A.G 1315A/2 and auxiliary leads from V.A.G 1594.



- ◀ - Connect tester V.A.G 1367 for engine speed measurement according to operating instructions.

25-73

- Switch on ignition.

Specified value: 550 ± 25 mA

If approx. 430 mA was measured: locate and eliminate break in wiring from control unit to terminal 1 of ignition coil using current flow diagram.

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If 0 mA was measured:

- Locate and eliminate break in wiring from control unit for idling speed stabilization (J 142) to thermoswitch (F 74) or temperature sensor (N 10) using current flow diagram. Checking thermoswitch or temperature sensor - page 25-83.
- Break in wiring or short circuit in leads from control unit to idling speed stabilization valve (N 71), or idling speed stabilization valve defective.
- Control unit for idling speed stabilization (J 142) defective.

- Switch off ignition.

25-74

Vehicles with air conditioner

- Run engine.
- Switch on air conditioner.
 - Model year 83/84:
Idling speed must increase from 800 rpm to 900 rpm.
 - From model year 85:
Idling speed must increase from 800 rpm to 920 rpm.
- If speed does not increase, locate and eliminate break in wiring from control unit to air conditioner compressor using current flow diagram.
- Switch off air conditioner.

-
- From model year 85:
 - Increase engine speed to 2000 rpm and hold constant.
Note current value (mA).



25-75

- Switch on air conditioner.
 - With compressor running and at constant 2000 rpm, noted value must increase suddenly by approx. 80 mA.
 - If the value does not increase, locate and eliminate break in wiring from control unit to air conditioner compressor using current flow diagram.

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IDLING SPEED STABILIZATION

Engine code letters: MC with two knock sensors

Operation:

Control unit for idling speed stabilization (J 142) receives data from:

- Speed sender (G 22)
- Idling switch (F 60)
- Temperature sensor (N 10)
- Speed signal from FEI control unit (J 88) for electronic ignition system FEI

In addition, control unit receives data via coding inputs:

On control unit	On control unit base
A	10
B	1

Appropriate coding is carried out with 6-pin coding plug next to FEI control unit.

Coding input A: On earth, idling speed at 720 rpm
A: Not coded, idling speed 800 rpm
B: On earth, influences exhaust gas
B: Not in use, influences load change.

Coding (see current flow diagram) may not be changed.

25-77

On vehicles with air conditioning, control unit for idling speed stabilization also receives data from air conditioner magnetic clutch (N 25).

Control unit for idling speed stabilization analyses this data and controls idling speed via idling speed stabilization valve depending on data received.

If speed data is not received, control unit switches to emergency operation in which control current of idling speed stabilization valve is held at a constant value of approx. 470 mA, regardless of idling speed.

When air conditioner compressor is switched on, control current is increased by 50 ... 60 mA.

Checking idling speed stabilization

- Speedometer and rev counter in dash panel insert OK
- Battery voltage at least 11 volts
- Engine oil temperature at least 80° C
- Radiator fan must have run once before checking
- Temperature sensor (N 10) OK
- Throttle valve in idling position
- All electrical components switched off
(Radiator fan must not run during checking or adjustment)
- Air conditioner OK
- Air conditioner switched off
- Pressure tester not connected

Note:

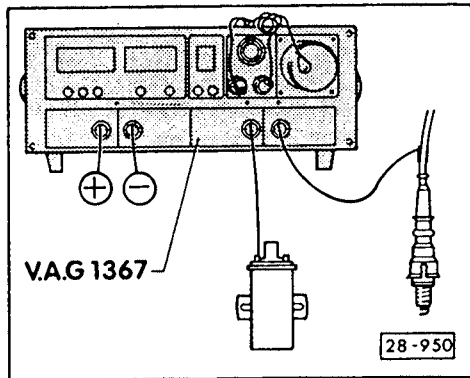
Hand multimeter V.A.G 1526 with auxiliary leads from V.A.G 1594 is to be used for checking.

Important

Hand multimeter must be connected before ignition is switched on, since leads between idling speed stabilization valve and control unit may not be interrupted. All test values refer to hand multimeter V.A.G 1526.

- If injector lines have been loosened or exchanged, engine speed must be rewed up to 3000 rpm several times and allowed to run at idle for at least 2 minutes before checking.

- Switch off ignition.



- ▶ - Connect tester V.A.G 1367 for idling speed measurement according to operating instructions.
- Connect auxiliary test lead V.A.G 1315A/2 to idling speed stabilization valve.

25-79

- Connect hand multimeter to auxiliary test lead V.A.G 1315A/2 with auxiliary leads from V.A.G 1594 and set to direct current measuring range 2 A.

- Switch on ignition.

Specified value: 440 ... 500 mA

- If specified value is attained, start engine and run it at idle.
- If 0 mA is indicated, switch off ignition and switch on again after approx. 5 seconds.

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- Check resistance between two contacts of idling speed stabilization valve.

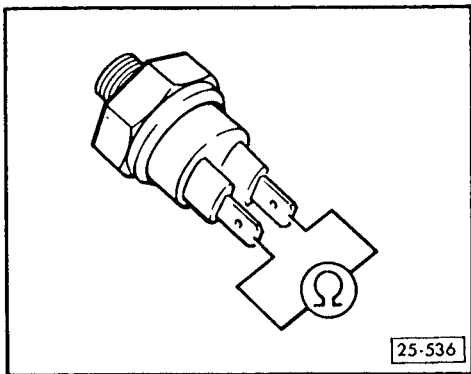
Specified value: 3 ... 8 Ω

- If specified value is not attained, renew idling speed stabilization valve.
- If specified value is attained, check wiring between plug of idling speed stabilization valve and relay socket of control unit for idling speed stabilization using current flow diagram.
- If no break in wiring is found, check activation of control unit for idling speed stabilization - Repair Group 01.

CHECKING IDLING SPEED STABILIZATION THERMOSWITCH (F 74)

• Model year 83/84

- Pull connector off thermoswitch.



- ◀ - Connect hand multimeter V.A.G 1526 to thermoswitch for resistance measurement (if necessary, use auxiliary leads from V.A.G 1594).

Specified values: Below 20° C = 0 Ω
Above 40° C = ∞ Ω

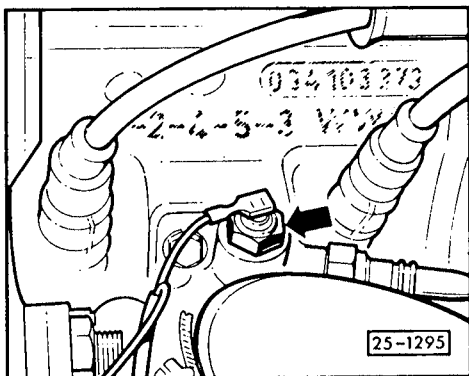
If specified values are not attained, renew thermoswitch.

CHECKING TEMPERATURE SENSOR (N 10) FOR IDLING SPEED STABILIZATION

o From model year 85

Note:

Engine code letters: SL - page 25-84



- ◀ - Pull connector off temperature sensor.

- Check resistance at temperature sensor with hand multimeter V.A.G 1526 (if necessary, use auxiliary leads from V.A.G 1594).

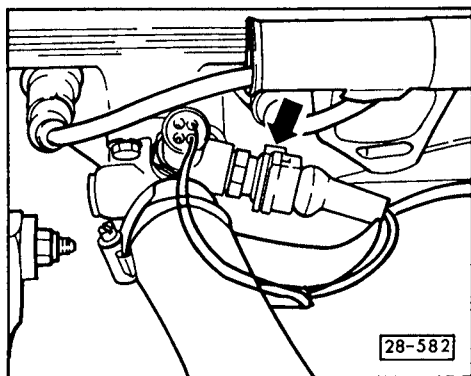
Specified values: at -20° C approx. 6000 Ω
at 20° C approx. 1000 Ω
at 80° C approx. 130 Ω

If specified values are not attained, renew temperature sensor.

25-83

CHECKING TEMPERATURE SENSOR (N 10) FOR IDLING SPEED STABILIZATION

Engine code letters: SL



- ◀ - Disconnect plug from temperature sensor.

- Connect hand multimeter V.A.G 1526 to temperature sensor for resistance testing with auxiliary leads from V.A.G 1594.

Specified value: 200 Ω ... 2.5 kΩ

Note:

Resistance becomes smaller with increasing engine temperature.

- If specified value is not attained, renew temperature sensor.

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- Connect hand multimeter for voltage measurement between contacts of disconnected plug with auxiliary leads from V.A.G 1594.

- Switch on ignition.

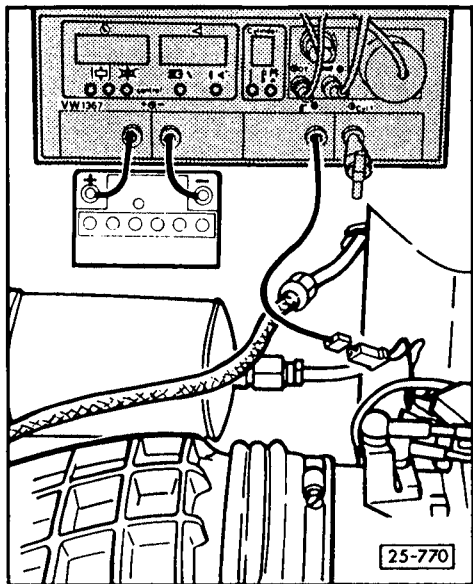
Specified value: approx. 5 volts

- If specified value is not attained, locate and eliminate break in wiring using current flow diagram, and if necessary replace FEI control unit.

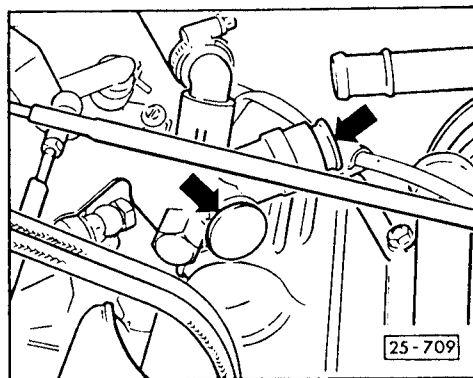
CHECKING LAMBDA SYSTEM

Engine code letters: KH

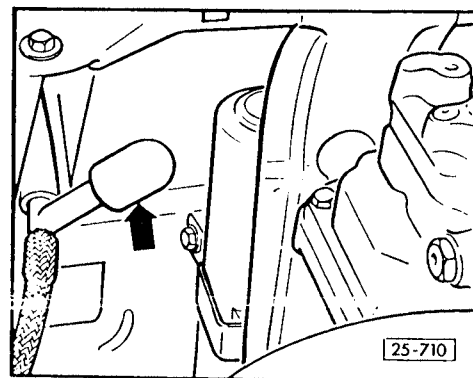
- Engine oil temperature at least 80° C.
 - Idling adjustment OK.
 - No leaks in exhaust system between cylinder head and catalyst.
 - Lambda probe remains connected during test.
- Connect tester V.A.G 1367 according to operating instructions with ignition switched off.
- ◀ - Connect test lead (green) with Lambda test plug.
- Press % button on tester.



25-85



- ◀ - Disconnect crankcase ventilation hoses from cylinder head cover and plug.



- ◀ - Remove sealing cap -arrow- from T-piece in hose to activated charcoal filter.

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Note: respect to the correctness of information in this document. Copyright by AUDI AG. Angle piece must remain in air intake elbow, since it has a calibrated hole.

25-86

A - Checking Lambda probe (G 39)

- Start engine and run it at idle for 5 minutes. This ensures that operating temperature of Lambda probe is reached.
- Increase speed to approx. 3000 rpm and observe duty cycle on tester V.A.G 1367.
- Duty cycle must fluctuate. If duty cycle is constant and control unit with wiring is OK, renew Lambda probe.

Note:

After renewing Lambda probe, check idling speed or idling speed stabilization and CO content and adjust if necessary - page 25-54.

25-87

Enrichment control:

- Operate full throttle switch (F 81) and read duty cycle on tester V.A.G 1367.

Specified value: approx. 50 %

- Bring engine speed up to approx. 2000 rpm (idling switch closed). Read duty cycle on tester V.A.G 1367.

Specified value: approx. 70 %

If specified values are not attained, renew FEI control unit.

- Switch off ignition.
- Disconnect tester V.A.G 1367.
- After removing plugs, connect crankcase ventilation hoses to cylinder head cover.
- Install sealing cap on T-piece from hose to activated charcoal filter.

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Note:

Duty cycle may fall below specified value with crankcase ventilation hose connected.

This is not due to incorrect adjustment, but results from enrichment from crankcase caused by oil dilution from mainly short-distance driving.

Brisk, long-distance driving will reduce fuel content in engine oil and duty cycle returns to normal. This can be done at short notice with an oil change.

B - Checking frequency valve for Lambda regulation (N 7)

- Start engine.

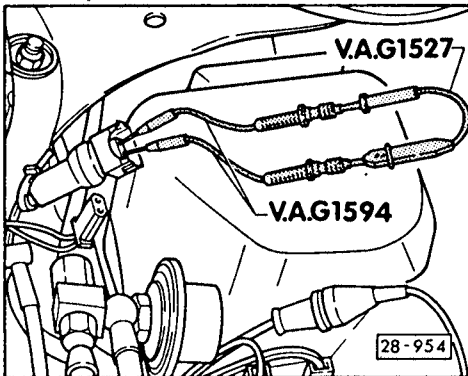
● Frequency valve must be heard and felt to tick.

Otherwise:

- Disconnect plug from frequency valve.

- Disconnect plug from power stage of ignition coil.

25-89



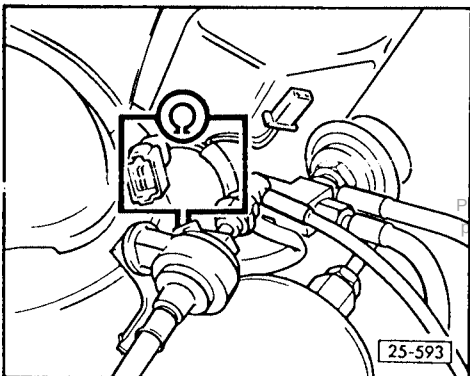
◀ - Connect diode test lamp V.A.G 1527 between plug contacts with auxiliary leads from V.A.G 1594.

- Turn over engine with starter.

LED must light up.

If LED does not light up, locate and eliminate break in wiring using current flow diagram.

If no break in wiring is found, renew FEI control unit.



◀ - Connect hand multimeter V.A.G 1526 to frequency valve for resistance measurement with auxiliary leads from V.A.G 1594.

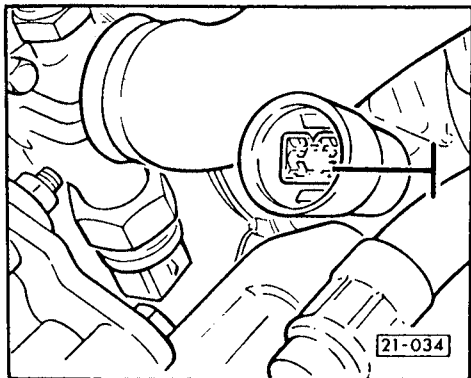
Specified value: 2 ... 3 Ω

If specified value is not attained, renew frequency valve.

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25-90



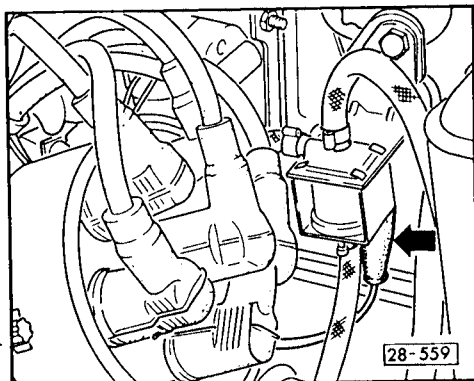
C - Checking two-way valve

- Disconnect plug from electronic thermoswitch.
- Switch on ignition.

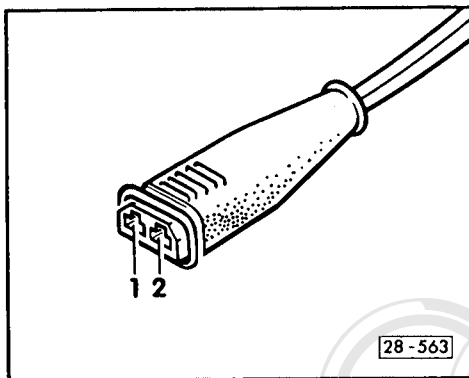
- ◀ - Briefly earth plug contact with auxiliary lead from V.A.G 1594.
- Two-way valve must heard and felt to click.

Otherwise:

- ◀ - Disconnect plug from two-way valve.



25-91



- ◀ - Connect hand multimeter V.A.G 1526 between contact -1- (green/violet) and earth with auxiliary leads.

Specified value: approx. battery voltage

- Remove FEI control unit and disconnect connector plug with ignition switched off.
Connect test box V.A.G 1598 between FEI control unit and disconnected plug of FEI control unit with adapter cable V.A.G 1998/7. Contact numbers on connector plug of FEI control unit are identical to numbers of test box V.A.G 1598.
Electrical fuses OK - see current flow diagram.

- Check continuity between plug contact -2- (blue/black) of two-way valve and test box contact 19 with hand multimeter and auxiliary leads from V.A.G 1594.

Specified value: max. 0.5 Ω

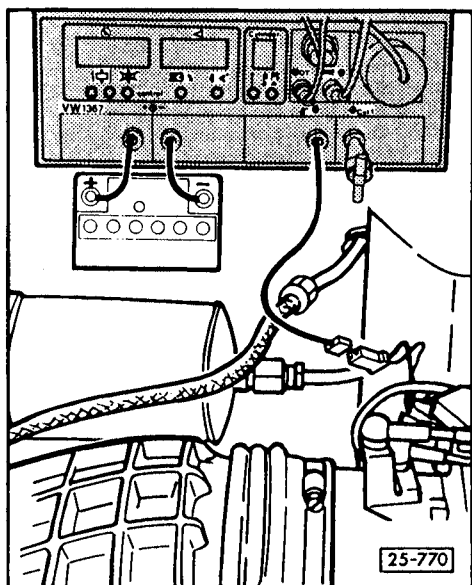
If specified value is not attained, locate and eliminate bread in wiring using current flow diagram.

If specified value is attained, renew two-way valve.

CHECKING LAMBDA SYSTEM

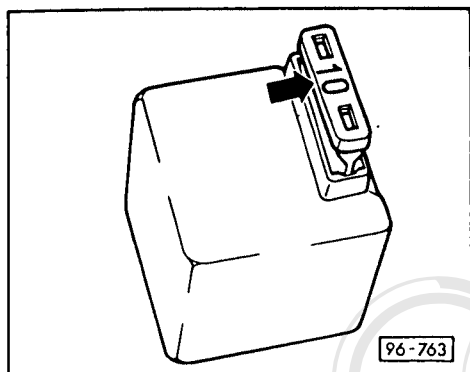
Engine code letters: MC with one knock sensor

- Engine oil temperature at least 80° C.
 - Idling adjustment OK.
 - No leaks in exhaust system between cylinder head and catalyst.
 - Lambda probe remains connected during test.
- Connect tester V.A.G 1367 according to operating instructions with ignition switched off.



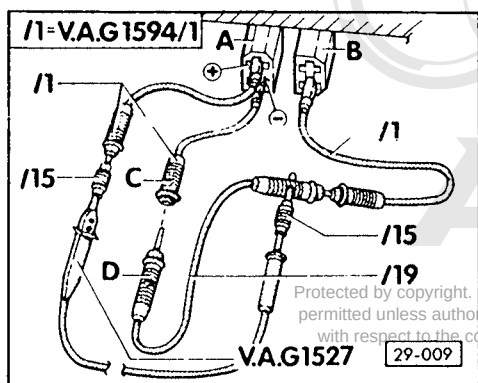
- ▶ - Connect test lead (green) with measuring lead V.A.G 1367/5 and Lambda test plug.
- Press % button on tester.
- Start engine and run at idle for 5 minutes. This ensures that operating temperature of Lambda probe is reached.

25-93



- Up to model year 88

- ▶ - Link contacts on fuel pump relay (J 17), relay location 10 in fuse box/relay plate, for at least 4 seconds with fuse.



- From model year 89

- ▶ - Connect plug -C- (earth) to plug -D- for at least 4 seconds and separate again.

Note:

Two diagnosis plugs -A- and -B- are located at front of driver's side footwell on heater channel.

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25-94

- Watch duty cycle on tester V.A.G 1367.

Specified value: 50 % duty cycle constant at speed below 2000 rpm

If specified value is attained, increase engine speed briefly to above 2000 rpm.

- Watch duty cycle on tester V.A.G 1367.

Specified value: 25 ... 65 % duty cycle must fluctuate

If specified value is not attained, check wiring as follows:

- Remove FEI control unit and disconnect connector plug with ignition switched off.
Connect test box. V.A.G 1598 between FEI control unit and disconnected plug of FEI control unit with adapter cable V.A.G 1598/7. Contact numbers on connector plug of FEI control unit are identical to numbers of test box V.A.G 1598.
Electrical fuses OK - see current flow diagram.

25-95

- Check continuity between lead of Lambda test plug (black/blue) and test box contact 8 with hand multimeter V.A.G 1526 and auxiliary leads from V.A.G 1594.

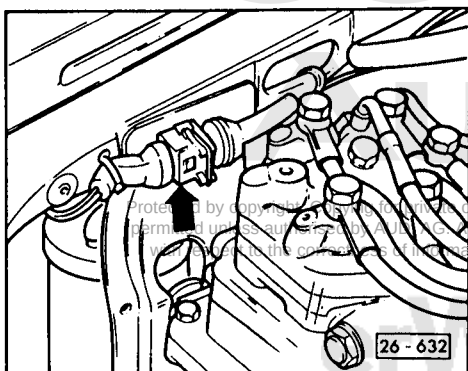
Specified value: max. 0.5 Ω

If specified value is attained, renew FEI control unit.

If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

Checking Lambda probe heating

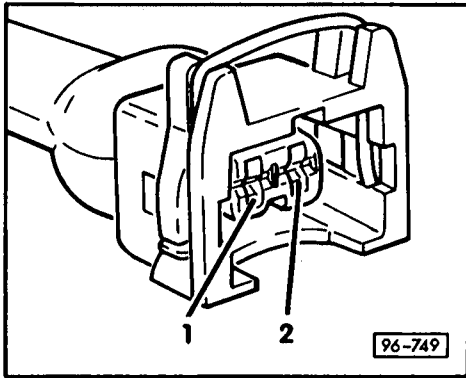
- ◀ - Separate connector of Lambda probe heating.



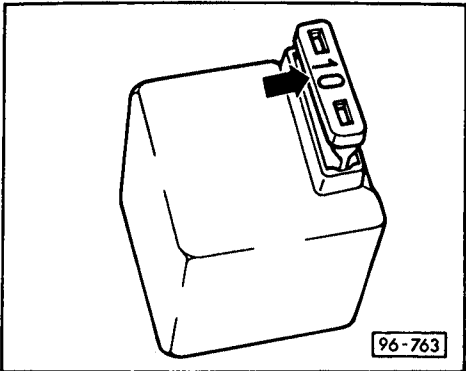
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25-96



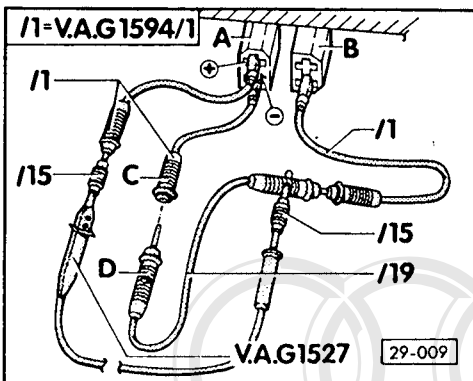
- ◄ - Connect hand multimeter V.A.G 1526 for voltage measurement between contact 1 and 2 of plug to FEI control unit with auxiliary leads from V.A.G 1594.
- Switch on ignition.



- Up to model year 88

- ◄ - Link contact on fuel pump relay (J 17) with fuse for at least 4 seconds.

25-97



- From model year 89

- ◄ - Connect plug -C- (earth) to plug -D- for at least 4 seconds and separate again.

Note:

Both diagnosis plugs -A- and -B- are located at front of driver's side footwell on heater channel.

- Read specified value on hand multimeter.

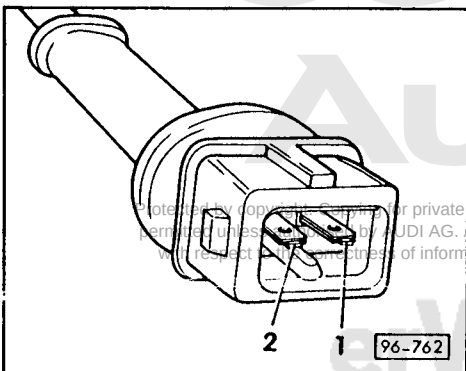
Specified value: approx. battery voltage

If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

If specified value is attained:

- ◄ - Connect hand multimeter V.A.G 1526 to plug to Lambda probe heating for resistance measurement with auxiliary leads from V.A.G 1594.

Specified value: 3 ... 15 Ω



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If specified value is not attained, renew Lambda probe (G 39).

Note:

- After renewing Lambda probe, check idling speed or idling speed stabilization and CO content, adjusting if necessary
 - page 25-54.
- Check control of frequency valve for Lambda regulation (N 7)
 - Repair Group 01.

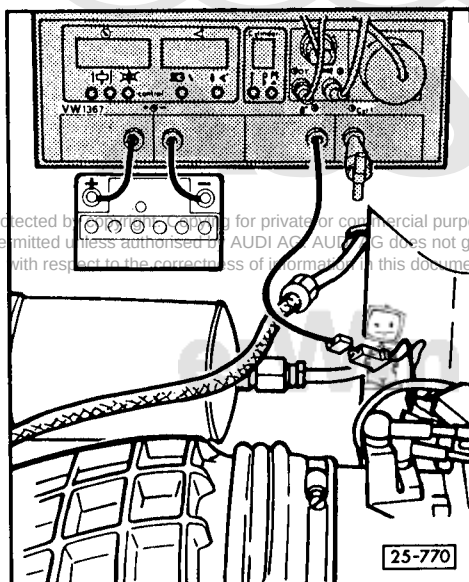
25-99

CHECKING LAMBDA SYSTEM

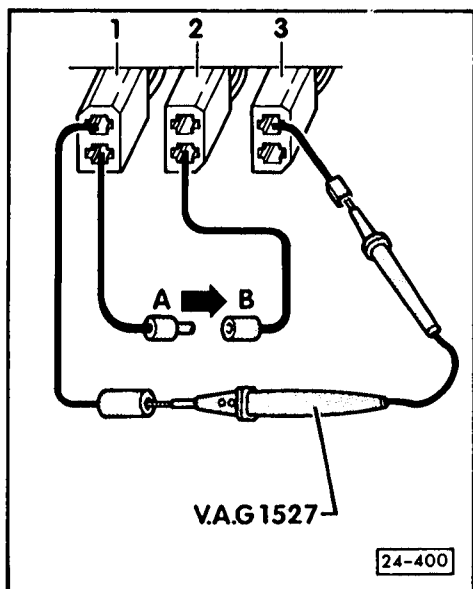
Engine code letters: MC with two knock sensors

Note:

- Checking Lambda system with fault reader V.A.G 1551
 - Repair Group 01.
- Check of Lambda system is only to be carried out as follows if no fault reader V.A.G 1551 is available.
- Engine oil temperature at least 80° C.
- Idling adjustment OK.
- No leaks in exhaust system between cylinder head and catalyst.
- Lambda probe remains connected during testing.
- Connect tester V.A.G 1367 according to operating instructions with ignition switched off.
- Connect test cable (green) to Lambda test plug (blue/black).
- Press % button on tester.



25-100



- Connect diode test lamp V.A.G 1527 between rear contacts of black diagnosis plug -1- and of blue diagnosis plug -3- with auxiliary leads from V.A.G 1594.
- Connect auxiliary leads from V.A.G 1594 to front contacts of both diagnosis plugs -1- and -2-.
- Start engine and run at idle for 5 minutes. This ensures that operating temperature of Lambda probe is reached.
- Connect plug -A- to -B-.
- Watch duty cycle on tester V.A.G 1367.

Specified value: 50 % duty cycle constant at speed below 2000 rpm

If specified value is attained, separate plugs -A- and -B- again.

- Briefly increase engine speed to above 2000 rpm.

25-101

- Watch duty cycle on tester V.A.G 1367.

Specified value: 25 ... 65 % duty cycle must fluctuate

If specified value is not attained, check wiring as follows:

- Remove FEI control unit and disconnect connector plug with ignition switched off. Connect test box V.A.G 1598 between FEI control unit and disconnected plug of FEI control unit with adapter cable V.A.G 1598/7. Contact numbers on connector plug of FEI control unit are identical to numbers of test box V.A.G 1598. Electrical fuses 13, 21 and 28 OK.
- Check continuity between lead of Lambda test plug (black/blue) and test box contacts 8 with hand multimeter V.A.G 1526 and auxiliary leads from V.A.G 1594.

Specified value: max. 0.5 Ω

If specified value is attained, renew FEI control unit.

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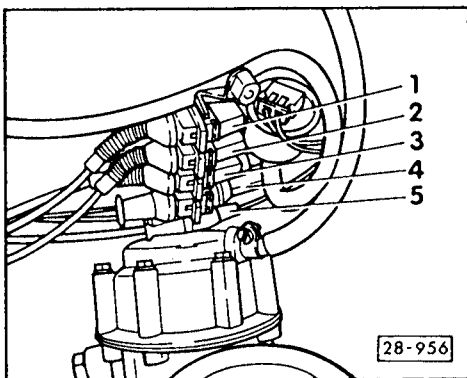
If specified value is not attained, locate and eliminate break in wiring using current flow diagram.



25-102

CHECKING LAMBDA REGULATION

Engine code letters: MC with two knock sensors.



- ◀ - Separate connector of Lambda probe -5- (G 39) at bracket.
- Connect hand multimeter V.A.G 1526 between plug to FEI control unit and engine earth for voltage measurement with auxiliary leads from V.A.G 1594.
- Switch on ignition.

Specified value: 400 ± 50 mV

If specified value is not attained, check lead as follows:

- Remove FEI control unit and disconnect connector plug with ignition switched off. Connect test box V.A.G 1598 between FEI control unit and disconnected plug of FEI control unit with adapter cable V.A.G 1598/7. Contact numbers on connector plug of FEI control unit are identical to numbers of test box V.A.G 1598. Electrical fuses 13, 21 and 28 OK.

25-103

- Check continuity between Lambda probe plug and test box contact 30 with hand multimeter V.A.G 1526 and auxiliary leads from V.A.G 1594.

Specified value: max. 0.5Ω

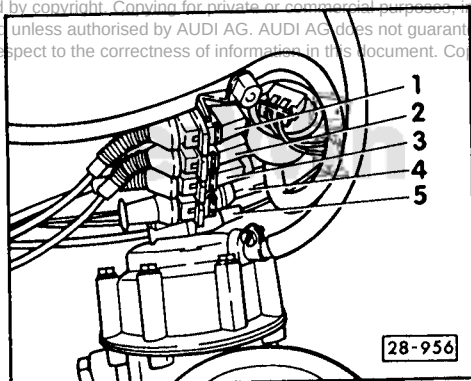
If specified value is attained, renew FEI control unit.

If specified value is not attained, locate and eliminate break in wiring using current flow diagram.



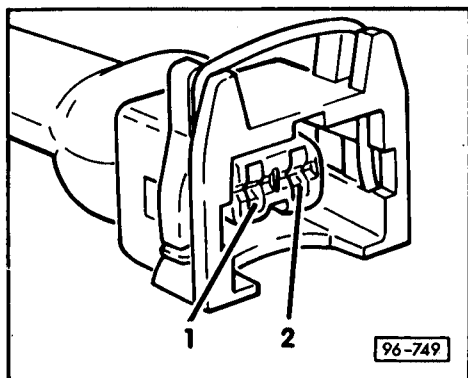
Checking Lambda probe heating

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- ◀ - Separate connector of Lambda probe heating -4- at bracket.

25-104



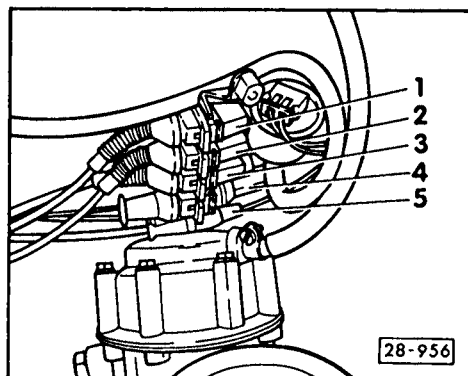
- ◄ - Connect hand multimeter V.A.G 1526 between contacts 1 and 2 of plug to FEI control unit for voltage measurement with auxiliary lead from V.A.G 1594.

- Run engine.

Specified value: approx. battery voltage

- Switch off ignition.

If specified value is not attained, locate and eliminate break in wiring using current flow diagram.



If specified value is attained:

- ◄ - Switch hand multimeter to current measurement with adapter lead V.A.G 1315A/1 and auxiliary leads in connector of Lambda probe heating -4-.

- Switch hand multimeter to 10 A.

- Switch on ignition.

Specified value: 0.5 ... 3.0 A

25-105

If specified value is not attained, renew Lambda probe (G 39).

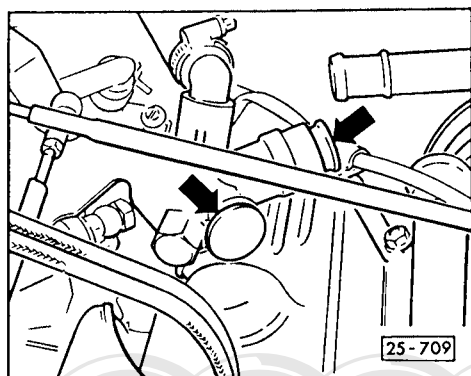
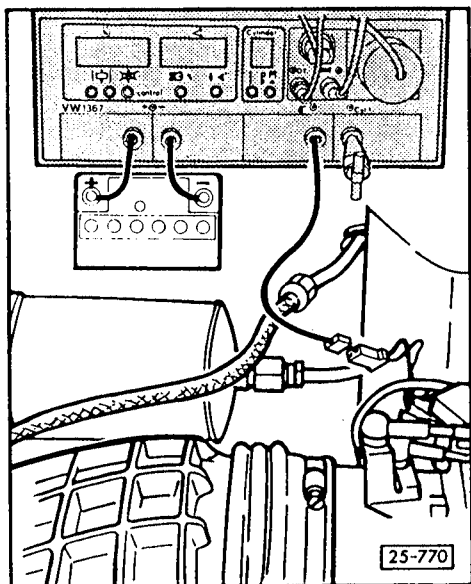
Note:

- Current decreases with increasing heating of Lambda probe.
- After replacing lambda probe, check idling speed or idling speed stabilization and CO content and adjust if necessary - page 25-54.
- Check control of frequency valve for Lambda regulation (N 7) - Repair Group 01.

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25-106



CHECKING LAMBDA SYSTEM

Engine code letters: WU

- Engine oil temperature at least 80° C.
- Idling adjustment OK.
- No leaks in exhaust system between cylinder head and catalyst.
- Connect tester V.A.G 1367 according to operating instructions with ignition switched off.
- ◀ - Connect test cable (green) to Lambda test plug (blue/white).
- Press % button on tester.
- Disconnect HT lead from ignition coil at ignition distributor and earth with auxiliary lead from V.A.G 1594.
- Connect remote control - page 25-45.
- ◀ - Disconnect crankcase ventilation hoses from cylinder head and plug.
- Disconnect hose from activated charcoal filter to air intake elbow and leave open.

25-107

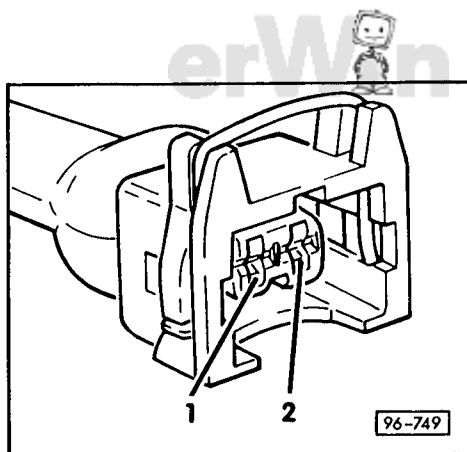
A - Checking frequency valve (N 7)

- Switch on ignition.
- Operate remote control switch.
- Frequency valve must be heard and felt to tick.
If it does, check Lambda control unit - page 25-109.

Otherwise:

- Disconnect plug from frequency valve.

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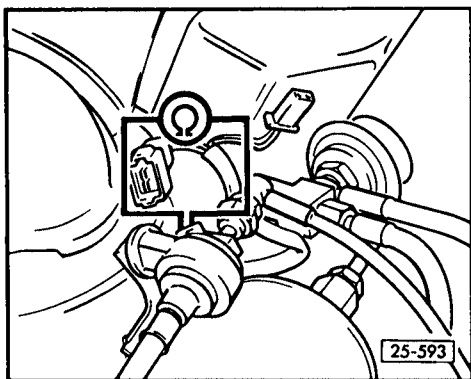


- ◀ - Connect hand multimeter V.A.G 1526 to connector plug, contacts 1 and 2, for voltage measurement with auxiliary leads from V.A.G 1594.
- Operate remote control switch.

Specified value: approx. battery voltage

If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

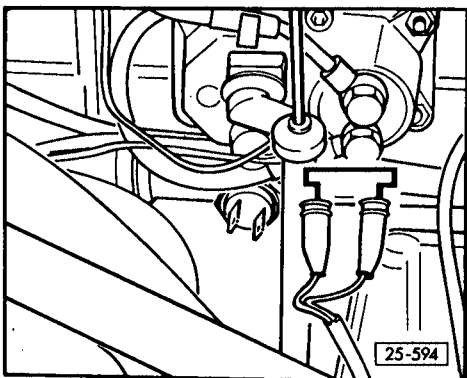
If specified value is attained, renew Lambda control unit.



- Connect hand multimeter V.A.G 1526 to frequency valve for resistance measurement with auxiliary leads from V.A.G 1594.

Specified value: 2 ... 3 Ω

If specified value is not attained, renew frequency valve.



B - Checking Lambda control unit

- Disconnect plug from temperature switch and link plug-in contacts with auxiliary leads from V.A.G 1594.

- Operate remote control. Read duty cycle on tester V.A.G 1367.

Specified value: approx. 65 %

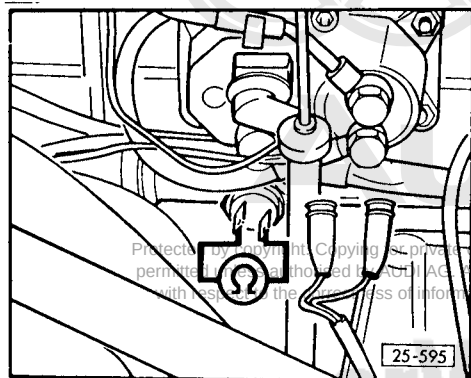
- Remove link.

Specified value: approx. 50 %

If specified values are not attained, locate and eliminate break in wiring using current flow diagram.

If wiring is OK, renew Lambda control unit.

25-109

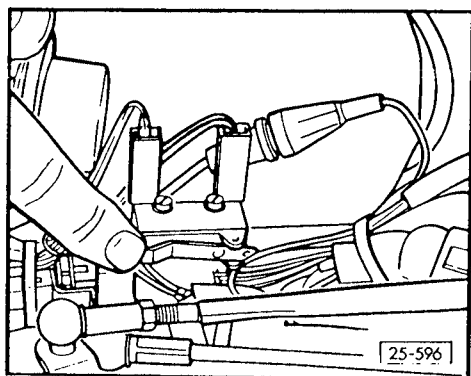


- Connect hand multimeter V.A.G 1526 to temperature switch for resistance measurement with auxiliary leads from V.A.G 1594.

Specified value: Above 25° C = $\infty \Omega$
Below 20° C = 0 Ω

- If specified values are not attained, renew temperature switch.

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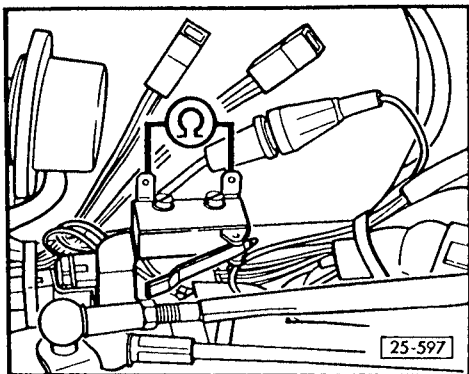
- Operate full throttle switch (F 81) and read duty cycle on tester V.A.G 1367.

Specified value: approx. 65 %

If specified value is attained, continue with system check.

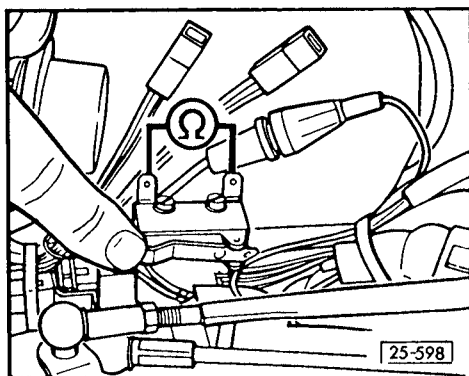
If specified value is not attained, carry out following tests:

- Check wiring using current flow diagram.
- Disconnect wiring from full throttle switch.



- ◄ - Connect hand multimeter V.A.G 1526 to full throttle switch for resistance measurement with auxiliary leads from V.A.G 1594.

Specified value: $\infty \Omega$



- ◄ - Operate full throttle switch:

Specified value: 0Ω

If specified values are not attained, renew full throttle switch.

-
- Operate starter and read duty cycle on tester V.A.G 1367.

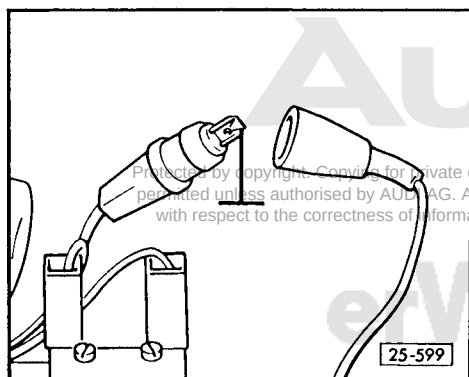
Specified value: 80 %

If specified value is not attained, locate and eliminate break in wiring using current flow diagram, replace relay if necessary.

If no break in wiring is found, renew Lambda control unit.

25-111

Enrichment control:



- With engine cold, disconnect plug from Lambda temperature switch.

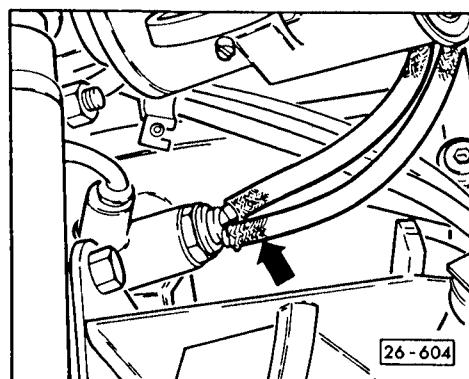
- ◄ - Separate connector of Lambda probe (G 39) and connect plug to earth.

- Operate remote control and read duty cycle on tester V.A.G 1367.

Specified value: above 87 %

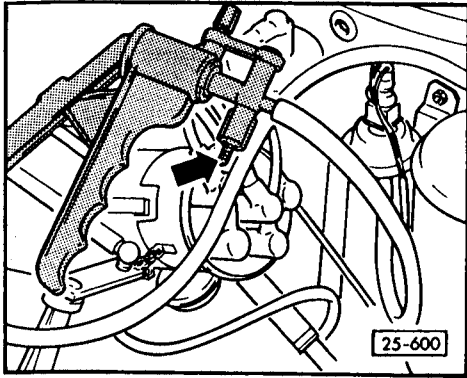
If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

If no break in wiring is found, renew Lambda control unit.



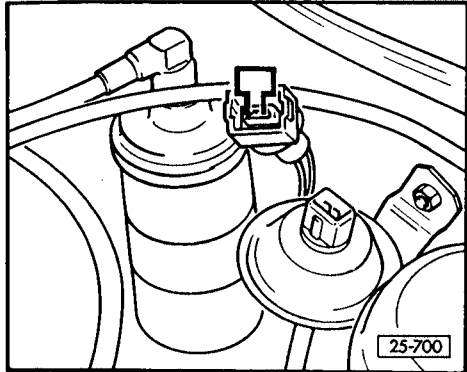
- ◄ - Disconnect hose with yellow marking from pneumatic valve.
- Link plug of Lambda temperature plug.

25-112



- - Connect vacuum pump V.A.G 1390 to disconnected hose and operate pump.
- Operate remote control.
- Reduce vacuum by pressing ventilation control.
- Duty cycle on tester V.A.G 1367 must suddenly increase from 65 % to 80 % and drop off again.

Otherwise:



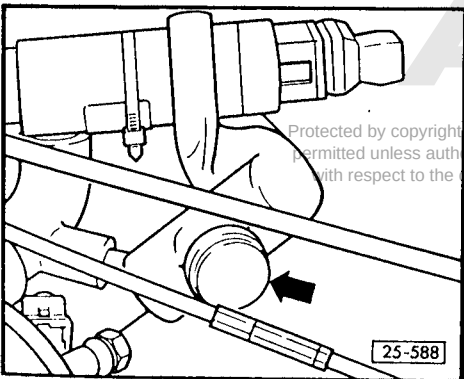
- - Disconnect plug from diaphragm pressure switch (F 93) and link with auxiliary leads from V.A.G 1594.
- Duty cycle on tester V.A.G 1367 must constantly indicate approx. 80 %.

If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

If no break in wiring is found, renew Lambda control unit.

25-113

C - Checking Lambda probe (G 39)



- Disconnect plug from Lambda temperature switch.
- - Disconnect ventilation hose from cylinder head cover and plug.
- Reconnect Lambda probe connector.
- Reconnect HT lead to ignition distributor.
- Disconnect remote control and install fuel pump relay.
- Start engine and run at idle for 5 minutes. This ensures that operating temperature of Lambda probe is reached.
- Increase speed to approx. 3000 rpm and watch % display on tester V.A.G 1367.
- Duty cycle must fluctuate. If duty cycle is constant and control unit with wiring is OK, renew Lambda probe.

Note:

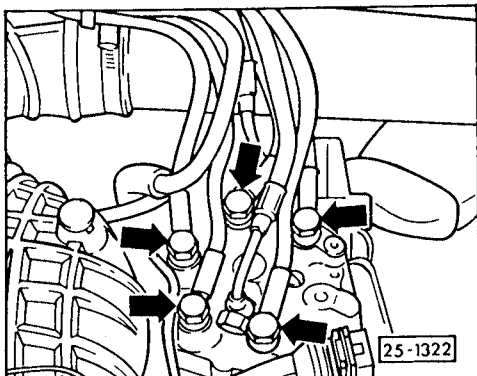
After renewing probe, check idling speed or idling speed stabilization and CO content, and adjust if necessary
- page 25-54.

REMOVING AND INSTALLING FUEL METERING DISTRIBUTOR

- To decrease pressure, loosen control pressure line on warm-up valve (large connection).

Important

Danger of spraying when loosening control pressure line!
- Lay cleaning rag on connection.



- ◀ - Clean fuel lines in connection area and unscrew.

Note:

- On engines with high-pressure system, injector lines are secured on fuel metering distributor with union nuts.
 - On engines with low-pressure system, injector lines are secured on fuel metering distributor with union bolts.
- Always renew seals of union bolts.

- Unscrew securing bolts and remove fuel metering distributor.
- Renew O-ring between fuel metering distributor and air flow meter.

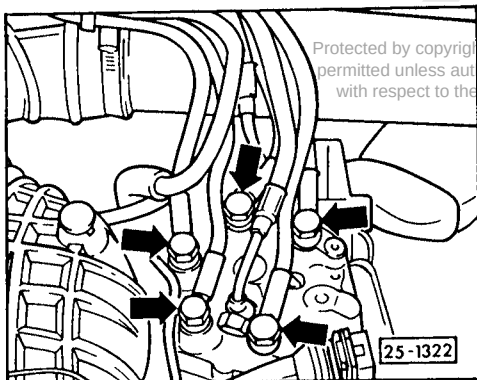
After installing fuel metering distributor:

- On engines with low-pressure system
 - Check rest position of air-flow meter plate
 - page 25-120
- On engines with high-pressure design
 - Check rest position and free travel of air-flow meter plate
 - page 25-122

25-115

RENEWING O-RINGS OF FUEL PRESSURE REGULATOR/RELIEF VALVE

Engines with low-pressure system



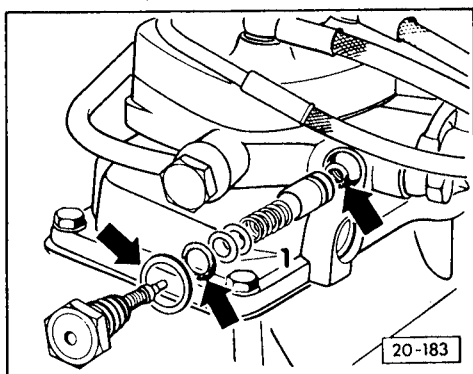
Note:

- ◀ On engines with low-pressure system, injector lines are secured on fuel metering distributor with union bolts.

- To reduce pressure, loosen control pressure line on warm-up valve (large connection).

Important

Danger of fuel spraying when loosening control pressure line! - Lay cleaning rag on connection.



- ◀ - Remove fuel pressure regulator/relief valve.

Important

Do not change factory-installed shims -1-.

- After installing fuel pressure regulator/relief valve, check system pressure - page 25-190.

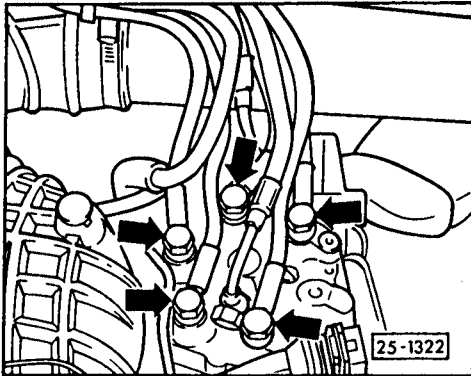
25-116

REMOVING AND INSTALLING AIR FLOW METER

- To decrease pressure, loosen control pressure line on warm-up valve (large connection).

Important

Danger of fuel spraying when loosening control pressure line! - Lay cleaning rag on connection.



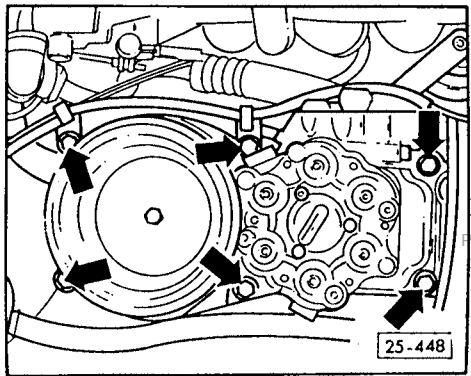
- ◀ - Clean fuel lines in connection area and unscrew.

Note:

- On engines with high-pressure system, injector lines are secured on fuel metering distributor with union nuts.
- On engines with low-pressure system, injector lines are secured on fuel metering distributor with union bolts. Always renew seals of union bolts.

- Remove air intake elbow.

25-117



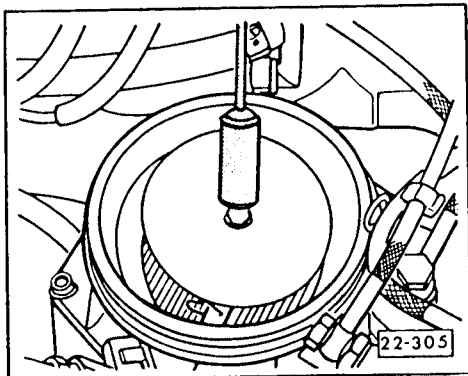
- ◀ - Detach entire air flow meter with fuel metering distributor from air cleaner housing.
- Detach fuel metering distributor from air flow meter.
- Renew O-ring between air flow meter and fuel metering distributor, and gasket between air flow meter and air cleaner housing.

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After installing air flow meter:

- On engines with low-pressure system
 - Check rest position of air-flow meter plate
 - page 25-120
- On engines with high-pressure system
 - Check rest position and free travel of air-flow meter plate
 - page 25-122
 - If air flow meter has been replaced, carry out basic adjustment of adjusting lever - page 25-125

CHECKING ADJUSTING LEVER AND CONTROL PLUNGER



- Operate starter or remote control V.A.G 1349/3A for approx. 10 sec.

- ◀ - Lift adjusting lever via air-flow meter plate - lever must have uniform resistance over entire distance.

Note:

On engines with high-pressure system (injector lines are secured on fuel metering distributor with union nuts) air cleaner cover must be removed and air-flow meter plate lifted from below.

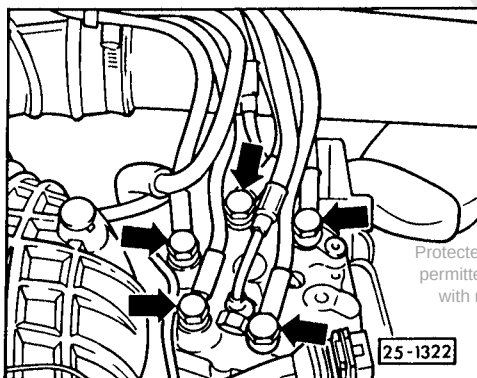
- During rapid downward movement, no resistance should be felt. If necessary, renew air flow meter.

- If throttle lever can only be moved upward with difficulty, but can be easily moved downward, control plunger is sticking - renew fuel metering distributor.

- If adjusting lever can only be moved up and down with difficulty, air flow meter must be renewed.

25-119

CHECKING AND ADJUSTING REST POSITION OF AIR-FLOW METER PLATE



Engines with low-pressure design

Note:

- ◀ On engines with low-pressure design, injector lines are secured on fuel metering distributor with hollow bolts.

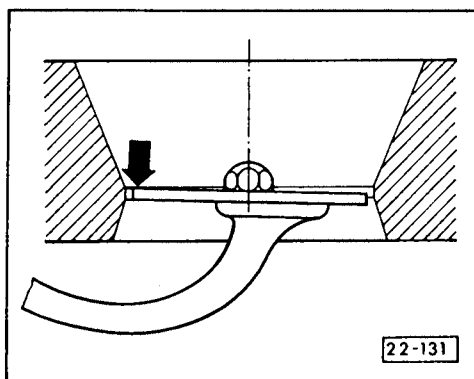
• Engine oil temperature at least 50° C.

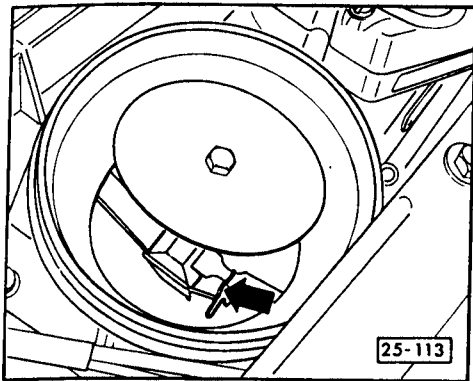
- Operate starter or remote control V.A.G 1348/3A for approx. 10 sec.

- Remove air intake elbow.

Checking rest position

- ◀ - Upper edge of air-flow meter plate must be at position marked with arrow (beginning of venturi cone) flush with beginning of cone.





Adjusting rest position

- Lift air-flow meter plate.
- - Adjust position of air-flow meter plate by bending retaining wire clip.

Important

- Do not damage venturi of air flow meter.
- Do not bend leaf spring.

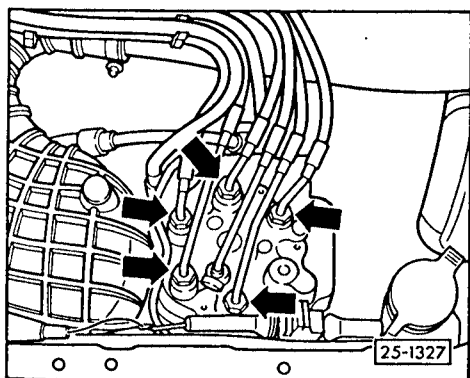
25-121

CHECKING AND ADJUSTING REST POSITION AND FREE TRAVEL OF AIR-FLOW METER PLATE

Engines with high-pressure system

Note:

- On engines with-pressure system, injection lines are secured to fuel metering distributor with union nuts.

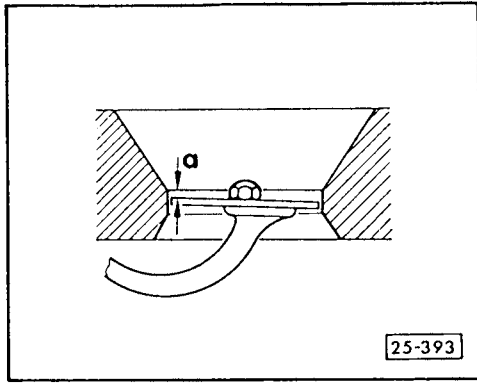


Important

Stickers or dimensions with values 1.9 + 0.2 mm or 1.9 + 0.5 mm no longer apply.

- Engine oil temperature at least 50° C.
- Operate starter or remote control, V.A.G 1348/3A for approx. 10 seconds.
- Remove air intake elbow.

25-122



Checking rest position

- ◄ - Upper edge of air-flow meter plate must be distance -a- below venturi cone edge.

$$a = 1.9 + 1.1 \text{ mm}$$

Adjusting rest position

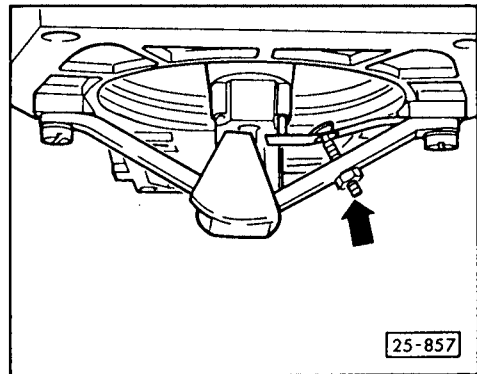
- Remove air cleaner cover and element.

- ◄ - Adjust position of air-flow meter plate with adjusting screw -arrow- so that upper edge of air-flow meter plate is distance -a- below venturi cone edge.

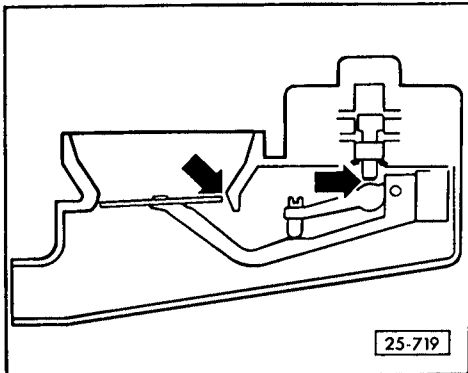
$$a = 1.9 + 1.1 \text{ mm}$$

Note:

On engines without adjusting screw, adjust position of air-flow meter plate with retaining wire clip.



25-123



Checking free travel of air-flow meter plate

- ◄ Free travel is play between control plunger and throttle lever (right arrow), measured on side of air-flow meter plate next to metering distributor (left arrow).

- Operate starter or remote control V.A.G 1348/3A for approx. 10 seconds.
- Slightly lift air-flow meter plate until resistance is felt.

Free travel:

- Min. - play can be felt
- Max. - up to venturi cone edge = 2.1 mm

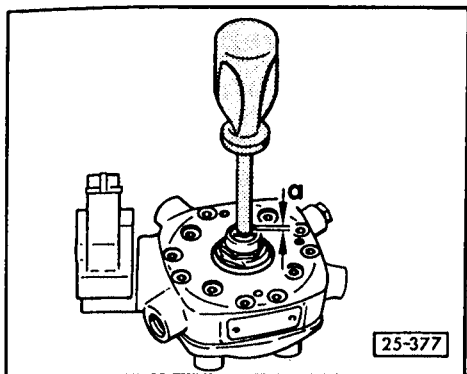
If free travel is not OK:

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Adjusting free travel on fuel metering distributor

For example, with Hazet tool 2566.



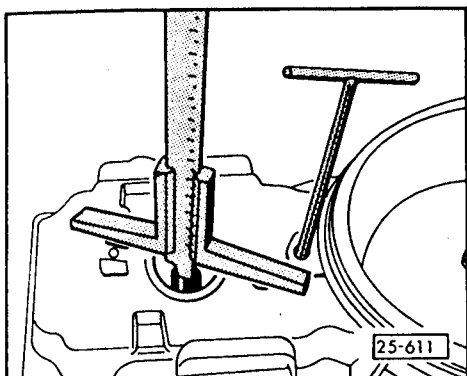
- ▶ - Adjust free travel of air-flow meter plate with limit screw for control plunger.
(Change distance "a")
 - Screwing in = free travel greater
 - Screwing out = free travel smaller
 - 1/4 turn = approx. 1.3 mm on air-flow meter plate
- After adjusting free travel, check idling speed or idling speed stabilization and CO content, adjusting if necessary.

ADJUSTING LEVER BASIC SETTING

Engines with high-pressure system

Note:

- Identifying marks - page 25-122
- Basic adjustment of throttle valve is only to be carried out when replacing fuel metering distributor or air-flow meter.



- ▶ - Check distance between contact surfaces for fuel metering distributor on air flow meter and adjusting lever roller. If necessary, adjust with CO adjusting screw.

Specified value: 21.3 ± 0.1 mm *

- *) This value loses its validity after adjustment of CO content (control current) to specified value.

25-125

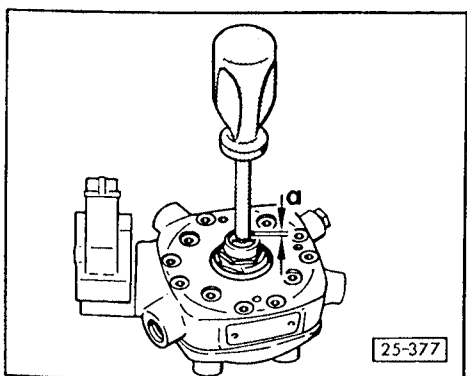
REMOVING AND INSTALLING CONTROL PLUNGER

Engines with high-pressure system

- Remove fuel metering distributor - page 25-115

Note:

Remove and install control plunger with tool, e.g. Hazet 2566



- ▶ - Before limit screw for control plunger is unscrewed:
 - Mark position of limit screw with a scribe.
 - Measure and note distance -a- between limit screw and upper edge of nut
- Clean control plunger with petrol before installing.
- Check limit screw O-ring for damage, replacing if necessary (small dia. of O-ring to control plunger).
- Screw limit screw in to noted distance -a-.

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25-126

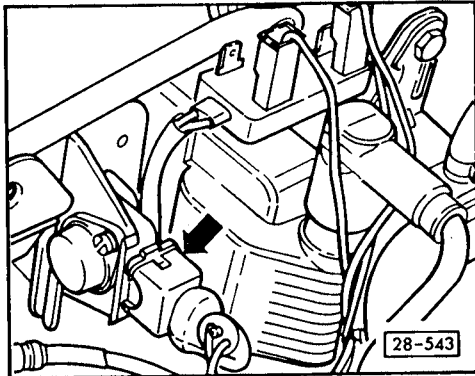
- Check rest position and free travel of air-flow meter plate
- page 25-122.

Note:

Mechanical cleaning of control plunger is not permitted. If plunger shows heavy scoring, or cannot be made to move freely by cleaning with clean white spirit, entire fuel metering distributor must be replaced.

25-127

CHECKING COLD START VALVE (N 17) AND THERMO TIME SWITCH (F 26)



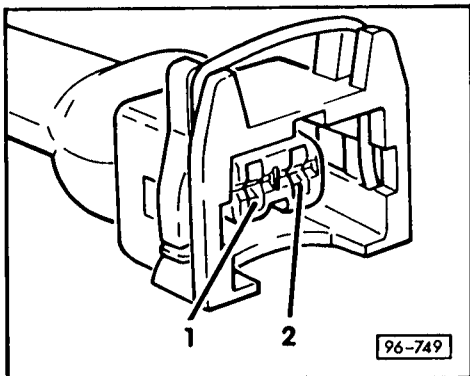
All engines except with engine code letters MC

On vehicles without power stage, disconnect ignition coil HT lead from ignition coil at distributor and earth with auxiliary leads from V.A.G 1594.

- On vehicles with power stage, disconnect power stage plug at ignition coil.

Checking control of cold start valve

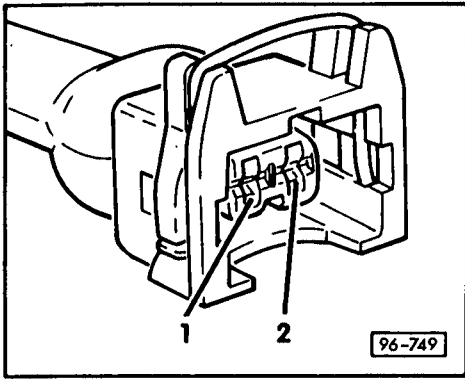
- Disconnect plug on cold start valve and connect diode test lamp V.A.G 1527 to plug contacts 1 and 2 with auxiliary leads from V.A.G 1594.



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25-128



- Disconnect plug from thermo time switch (F 26).

- ▶ - Earth contact -1- (blue/black lead to terminal W of thermo time switch) with auxiliary lead from V.A.G 1594.

Important!

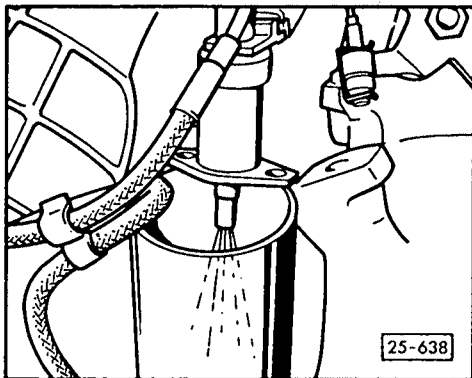
Do not earth contact -2- (green/white lead to terminal G of thermo time switch - see current flow diagram) - danger of short circuit.

- Operate starter. LED must light up. If necessary, locate and eliminate break in wiring using current flow diagram.

Checking cold start valve (N 17)

- Disconnect plug from thermo time switch and earth contact -1- (to terminal W of thermo time switch) with auxiliary lead from V.A.G 1594.
- Connect plug on cold start valve.

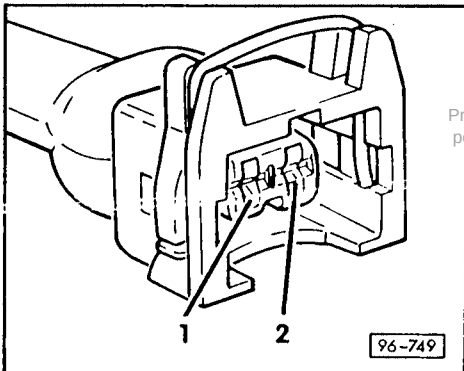
25-129



- ▶ - Remove cold start valve and hold over measuring glass.
- Operate starter. Cold start valve must spray down in symmetrical cone.
- Dry off jet of cold start valve.
- Cold start valve must not drip within one minute. Outside of valve may also not become moist.

Checking thermo time switch (F 26)

- Coolant temperature:
 - Below 15° C (15° C temperature switch)
 - Below 30° C (30° C temperature switch)
 see diagram - Technical Data.
- If necessary, remove thermo time switch and cool down (e.g. in cold water). Earth removed switch during test.



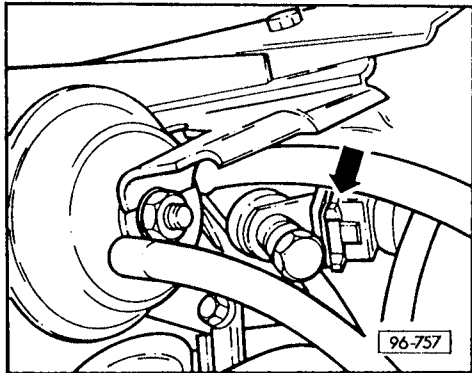
- ▶ - Disconnect plug on cold start valve (N 17) and connect diode test lamp V.A.G 1527 to plug contact 1 and 2 with auxiliary leads from V.A.G 1594. Operate starter for approx. 10 seconds. LED must light up for 1... 8 seconds. For duration of first lighting up see diagram - Technical Data.

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25-130

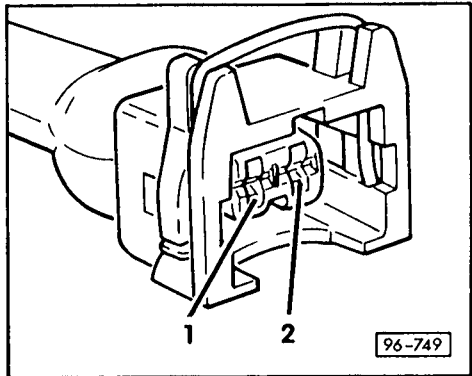
CHECKING COLD START VALVE (N 17)



Engine code letters: MC

Checking control of cold start valve

- ◀ - Disconnect plug from cold start valve



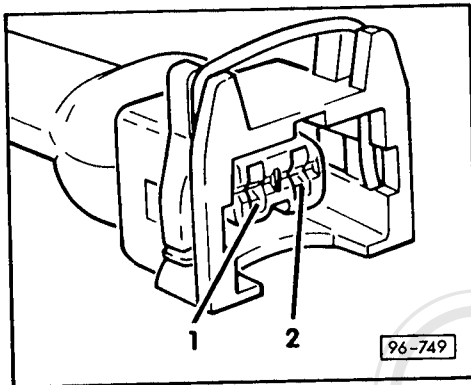
- ◀ - Connect diode test lamp V.A.G 1527 to plug contacts 1 and 2 with auxiliary leads from V.A.G 1594.

Note:

Cold start valve is only activated for approx. 10 seconds. This prevents flooding of engine. Final control element diagnosis must be repeated for new check.

- Carry out final control element diagnosis - Repair Group 01 - during activation of cold start valve (flash code 4443) diode test lamp must flash.
- If diode test lamp flashes, renew cold start valve.

25-131



- ◀ - If diode test lamp does not flash, connect hand multimeter V.A.G 1526 between plug contact 2 and earth with auxiliary leads from V.A.G 1594.

Specified value: approx. battery voltage

If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

If specified value is attained, check wiring as follows:

- Remove FEI control unit and disconnect connector plug with ignition switched off. Connect test box V.A.G 1598 between FEI control unit and disconnected connector plug of FEI control unit with adapter cable V.A.G 1598/7. Connector plug contact numbers are identical to test box numbers. Electrical fuses 13, 21 and 28 OK.
- Check continuity between contact 1 and cold start valve plug and test box contact 1 with hand multimeter V.A.G 1526 and auxiliary leads from V.A.G 1594.

Specified value: max. 0.5 Ω .

If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

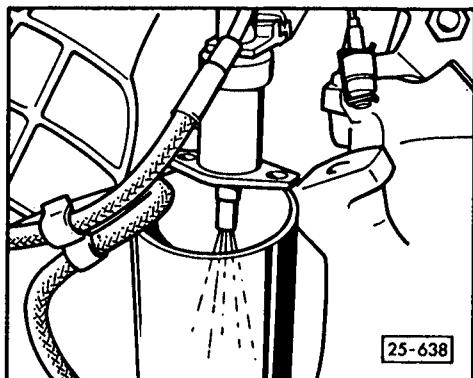
If specified value is attained, renew FEI control unit.

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Checking cold start valve

- Plug connected on cold start valve and on FEI control unit.



- ◀ - Remove cold start valve and hold in measuring glass.

Note:

Cold start valve is only activated for approx. 10 seconds. This prevents engine flooding. Final control element diagnosis must be repeated for new check.

- Carry out final control element diagnosis - Repair Group 01. Cold start valve must spray down in symmetrical cone during activation.
- Dry off jet of cold start valve.
- Cold start valve may not drip within one minute, and outside of valve must also not become damp.

25-133

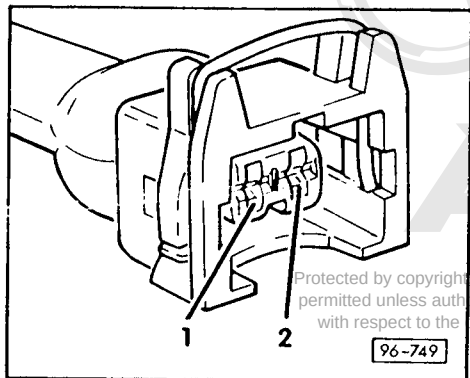
CHECKING COLD ACCELERATION ENRICHMENT

All engines except with engine code letters MC

Note:

Cold acceleration enrichment only operates if thermo time switch (F 26), diaphragm pressure switch (F 93) and throttle valve switch are closed.

- Cold start valve OK.
- Disconnect plug on cold start valve (N 17) and connect diode test lamp V.A.G 1527 to plug with auxiliary leads from V.A.G 1594.
- Disconnect plug from thermo time switch.
- ◀ - Earth contact 1 (blue/black lead to terminal W of thermo time switch) with auxiliary lead from V.A.G 1594.



Important!

Do not earth contact 2 (green/white lead to terminal G of thermotime switch - see current flow diagram) - danger of short circuit.

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Start engine and run it at idle. LED must not light up.



25-134

- Increase speed by quickly opening throttle valve.

LED must briefly (approx. 0.4 second) light up.

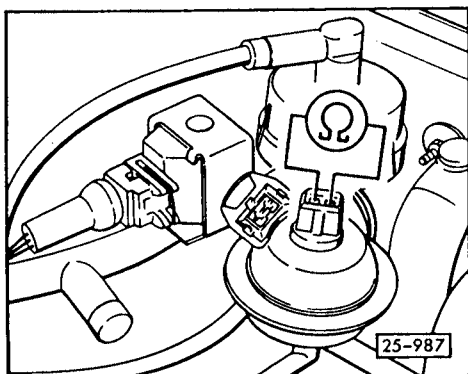
Otherwise:

- Check throttle valve switch.
- Check diaphragm pressure switch and thermo-pneumatic valve.

If necessary, locate and eliminate break in wiring using current flow diagram.

CHECKING DIAPHRAGM PRESSURE SWITCH (F 93) AND THERMO-PNEUMATIC VALVE

Not on all engines - see vacuum connections



Checking diaphragm pressure switch (F 93)

- Disconnect plug from diaphragm pressure switch.
- Start engine and run it at idle.
- Measure resistance between contacts with hand multimeter V.A.G 1526 and auxiliary leads from V.A.G 1594.

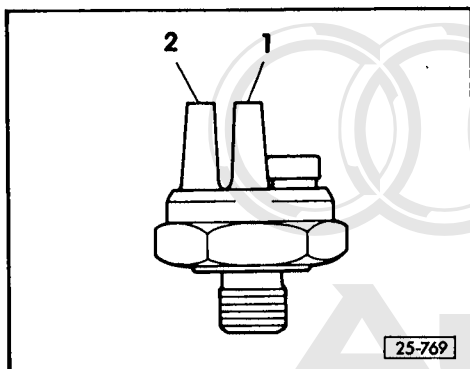
Specified value: $\infty \Omega$

25-135

- Increase speed by quickly opening throttle valve.
- Resistance must drop briefly and increase again to $\infty \Omega$

Checking thermo-pneumatic valve

- Remove thermo-pneumatic valve and cool it down to approx. 10° C.



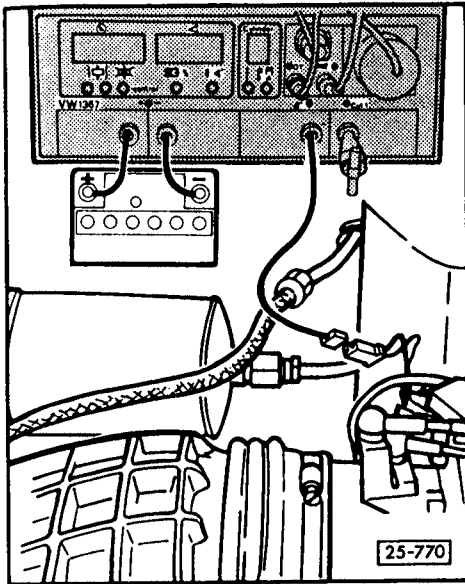
- Connect vacuum pump V.A.G 1390 to centre connection -1- of thermo-pneumatic valve.
- Plug outer connection -2-.
- Operate vacuum pump.
- Open outer connection -2-.

Vacuum must (audibly) decrease.

If vacuum does not decrease, renew thermo-pneumatic valve.

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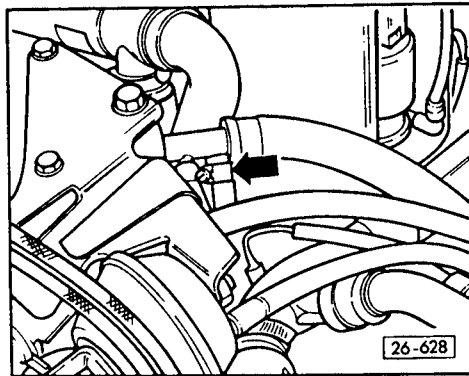




CHECKING FULL THROTTLE AND STARTING ENRICHMENT

Engine code letters: MC

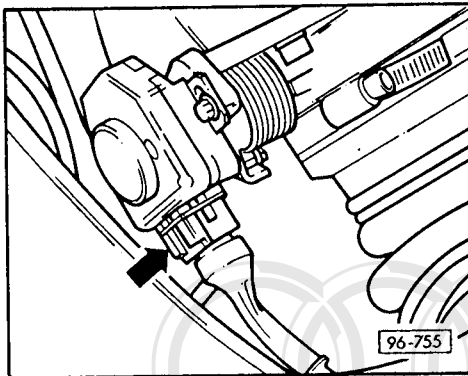
- Connect tester V.A.G 1367 for checking duty cycle according to operating instructions with ignition switched off.
- ◀ - Connect test cable (green) to test lead V.A.G 1367/5 and Lambda test plug (blue/black).
- Press % button on tester.



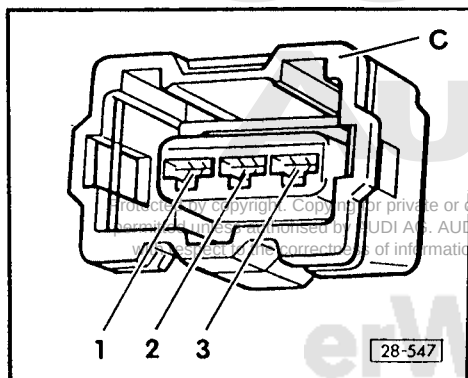
Checking full throttle enrichment

- ◀ - Disconnect vacuum hose to FEI control unit.

25-137



- ◀ - Disconnect plug for idling and full throttle switch on throttle valve housing.
- Start engine and run it at idle.

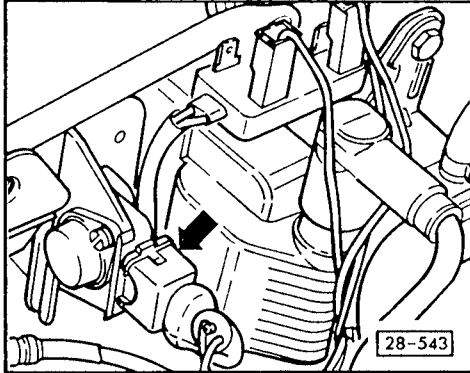


- ◀ - Link plug (C) contacts 2 and 3 with auxiliary leads from V.A.G 1594 and read duty cycle on tester V.A.G 1367.

Specified value: 60 ... 65 %

Checking starting enrichment - engine cold

- Coolant temperature below 20° C.
- Coolant temperature sender (G 62) OK, checking - Repair Group 28.
- Tester V.A.G 1367 connected for checking duty cycle.



- ◄ - Disconnect plug from ignition coil power stage.
- Operate starter and read duty cycle on tester V.A.G 1367.

Specified value: approx. 80 % constant

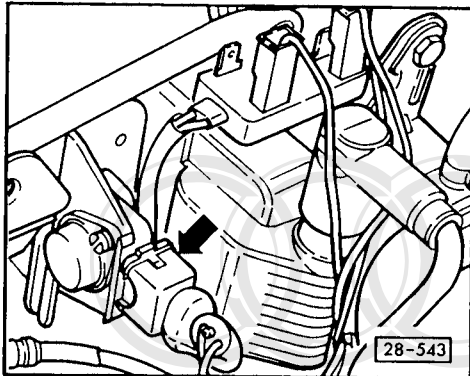
If specified value is not attained, renew FEI control unit.

If specified value is attained, check cold start valve or idling speed stabilization if cold starting difficulties arise.

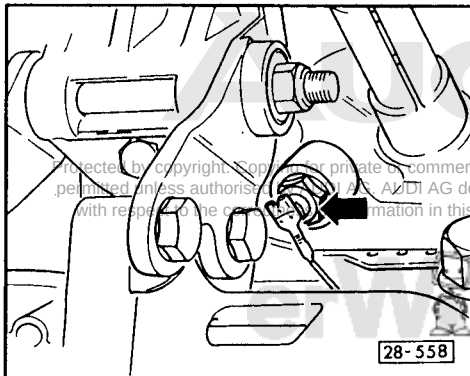
25-139

Checking starting enrichment - engine warm

- Coolant temperature sender (G 62) OK, checking - Repair Group 28.
- Tester V.A.G 1367 connected for checking duty cycle.



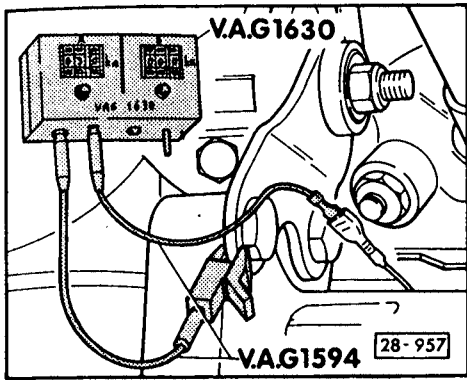
- ◄ - Disconnect plug from ignition coil power stage.



- ◄ - Disconnect lead from coolant temperature sender (G 62).

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25-140



- ◄ - Connect digital potentiometer V.A.G 1630 to disconnected plug and earth (-) with auxiliary leads from V.A.G 1594.
- Adjust side -A- of digital potentiometer to 3.0 kΩ.
- Turn over engine with starter and read duty cycle on tester V.A.G 1367.

Specified value: approx. 80 % constant

If specified value is not attained, renew FEI control unit.

If specified value is attained, check cold start valve or idling speed stabilization if cold starting difficulties arise.

25-141

CHECKING AND ADJUSTING THROTTLE VALVE SWITCH

Engine code letters: HX, KF, KP, WC

Checking voltage supply

- Disconnect plug from throttle valve switch.
- ◄ - Connect hand multimeter V.A.G 1526 for voltage measurement between contact 2 of disconnected plug (B) and earth with auxiliary leads from V.A.G 1594.
- Switch on ignition

Specified value: approx. battery voltage

If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

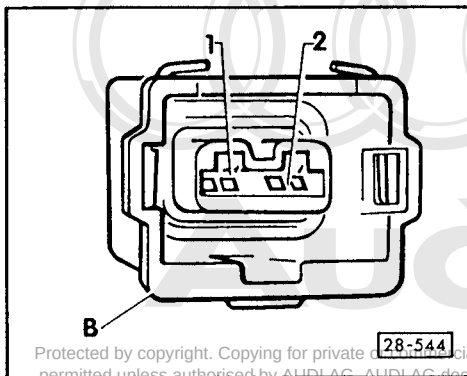
Checking and adjusting throttle valve switch (F 25)

- Basic setting of throttle valve OK.

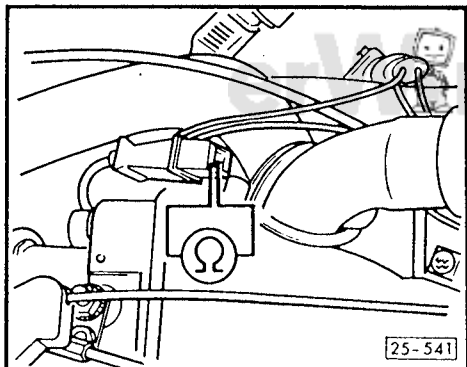
- Ignition switched off.

- ◄ - Connect hand multimeter V.A.G 1526 to plug of throttle valve switch for resistance measurement with auxiliary leads from V.A.G 1594.

Specified value: 0Ω



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25-142

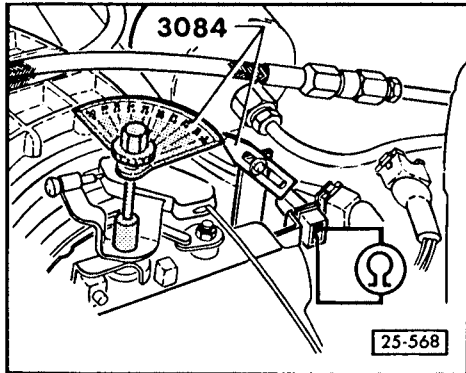
- Slowly open throttle valve until throttle valve switch switches,

Specified value: $\infty \Omega$

- In this position, throttle valve must be opened

approx. 1 ... 2.5°.

If specified values are not attained, adjust or replace throttle valve switch.



- ◀ - Secure pointer for protractor 3084 on throttle valve lever.
- Secure degree plate on throttle valve shaft (1st stage), remove securing nut for throttle valve shaft, if necessary.
- Set degree plate to 0°.
- Open throttle valve approx. 20° and slowly close again in direction of idling position.

Specified value: 2.5 ... 1° before idling position, or when throttle reaches stop, hand multimeter must indicate continuity (0Ω).

25-143

If specified value is not attained, adjust or replace throttle valve switch.

Note:

- To adjust throttle valve switch, throttle valve housing must be removed.
- Adjustment is made by moving throttle valve switch on throttle valve housing, whereby hand multimeter is connected to monitor adjustment. After adjustment, repeat measurement.
- If specified value is not attained, renew throttle valve switch.
- If all specified values are OK and idling speed stabilization does not function, control unit on relay plate must be renewed.



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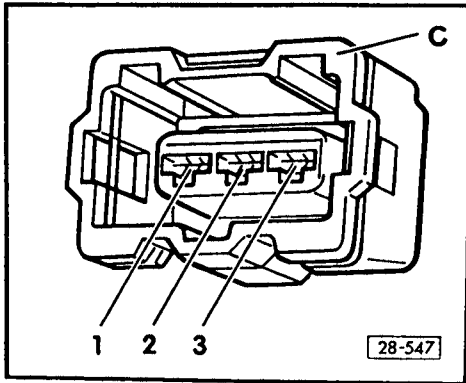
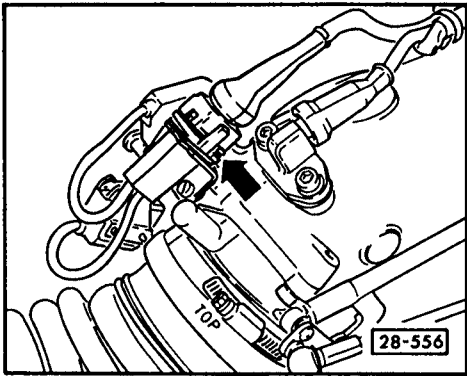
25-144

CHECKING AND ADJUSTING THROTTLE VALVE SWITCH

Engine code letters: KG, JY

Checking voltage supply for idling switch (F 60 and full throttle switch F 81)

- - Disconnect plug for idling and full throttle switch on throttle valve housing.



- - Connect hand multimeter V.A.G 1526 between contact 2 of disconnected plug (C) and earth with auxiliary leads from V.A.G 1594 to measure voltage.

- Switch on ignition

Specified value: approx. battery voltage

If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

25-145

Checking and adjusting idling switch (F 60)

- Basic setting of throttle valve OK.
- Ignition switched off.

- - Connect hand multimeter V.A.G 1526 between contact 1 and 2 for resistance measurement with auxiliary leads from V.A.G 1594.

Specified value: 0Ω

- Slowly open throttle valve until idling switch switches.

Specified value: $\infty\Omega$

- In this position, throttle valve must be opened

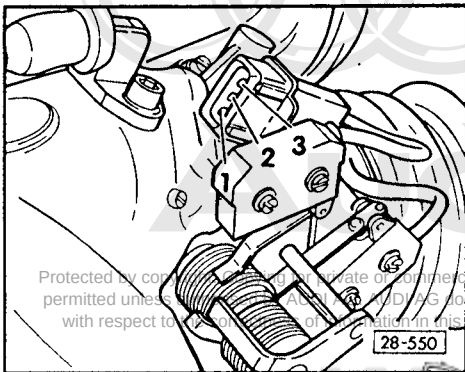
approx. 1 2.5° .

If specified values are not attained, adjust idling switch.

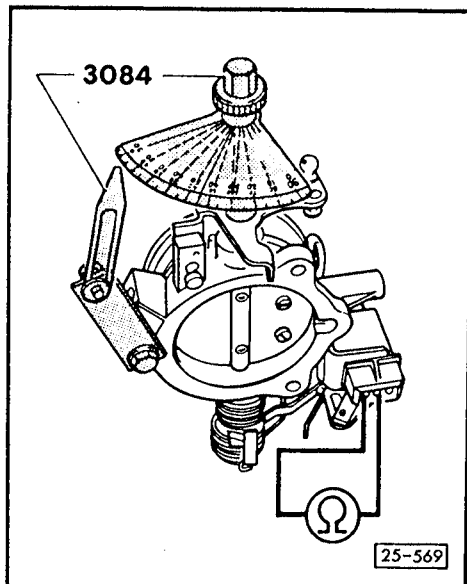
- Repeat measurement.

If specified values are not attained again, renew idling switch.

If specified values are attained, check full throttle switch.



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Note:

To adjust idling switch, throttle valve housing must be removed.

- ◀ - Secure pointer for protractor 3084 on throttle valve housing.
- Secure degree plate on throttle valve shaft, remove securing nut for throttle valve lever, if necessary.
- Connect hand multimeter V.A.G 1526 to both contacts of idling switch with auxiliary leads from V.A.G 1594 to measure resistance.
- Set degree plate to 0°.
- Open throttle valve approx. 20° and slowly close again in direction of idling position.

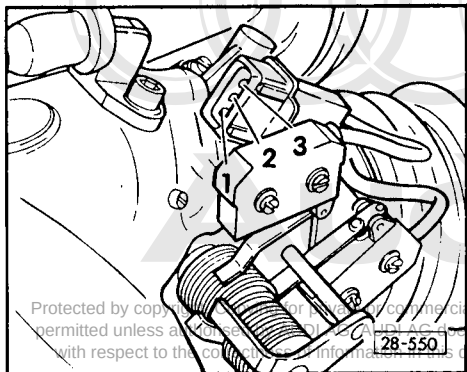
Specified value: 2.5 ... 1° before idling position, or when throttle reaches stop, hand multimeter must indicate continuity (0Ω).

If specified value is not attained, adjust or renew idling switch.

Note:

Adjustment is made by moving idling switch on throttle valve housing, whereby hand multimeter is connected to monitor adjustment.

25-147



Checking and adjusting full throttle switch (F 81)

- ◀ - Connect hand multimeter V.A.G 1526 between contacts 2 and 3 for resistance measurement with auxiliary leads from V.A.G 1594.

Specified value: ∞Ω

- Operate switch with throttle valve lever.

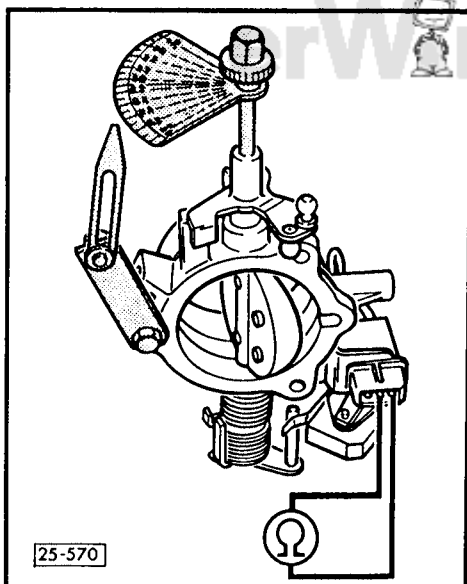
Specified value: 0Ω

If specified values are not attained, check for break in wiring to full throttle switch, or renew full throttle switch.

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Note:

To adjust idling switch, throttle valve housing must be removed.



- ◀ - Secure pointer for protractor 3084 on throttle valve housing.
- Secure degree plate on throttle valve shaft, remove securing nut for throttle valve lever, if necessary.
- Connect hand multimeter V.A.G 1526 to both contacts of idling switch with auxiliary leads from V.A.G 1594 to measure resistance.
- Set degree plate to 0°.

25-148

- Slowly open throttle valve.

Specified value: 50 ... 55° after idling position of throttle valve, hand multimeter must indicate continuity (0 Ω).

If specified value is not attained, adjust or renew full throttle switch.

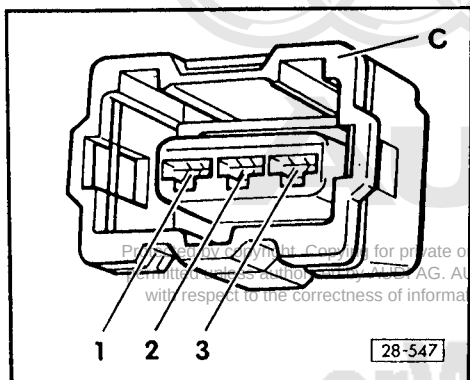
Note:

Adjustment is made by moving idling switch on throttle valve housing, whereby hand multimeter is connected to monitor adjustment.

Checking for break in wiring to FEI control unit

- Remove FEI control unit and disconnect connector plug with ignition switched off.
Connect test box V.A.G 1598 between FEI control unit and disconnected connector plug of FEI control unit with adapter cable V.A.G 1598/7. Connector plug contact numbers are identical to test box numbers.
Electrical fuses OK - see current flow diagram.

25-149



- Check continuity between contacts of plug connection (C) on throttle valve housing and test box connections with hand multimeter V.A.G 1526 and auxiliary leads from V.A.G 1594:

Plug connector (C)	Test box
1	20
3	26

Specified values: max. 0.5 Ω .

If specified values are not attained, locate and eliminate break in wiring using current flow diagram.

If specified values are attained, renew FEI control unit.

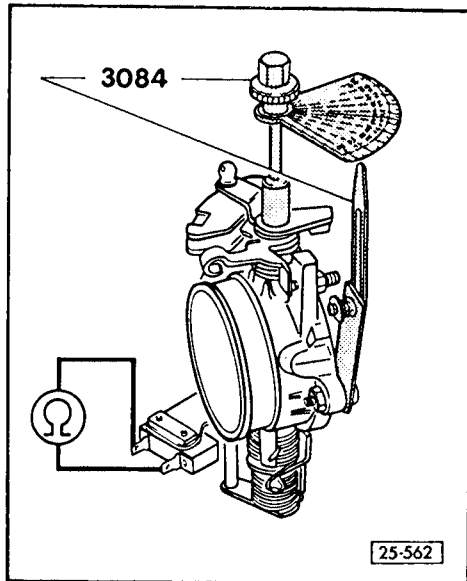
Engine code letters: KH

Note:

To check and adjust throttle valve switch, throttle valve housing must be removed.

Checking and adjusting idling switch (F 60)

- Basic setting of throttle valve OK.
- ◄ - Secure pointer for protractor 3084 on throttle valve housing.
- Secure degree plate on throttle valve shaft, remove securing nut for throttle valve lever, if necessary.
- Connect hand multimeter V.A.G 1526 to both contacts of idling switch with auxiliary leads from V.A.G 1594.
- Set degree plate to 0°.



25-151

- Open throttle valve approx. 20° and slowly close again in direction of idling position.

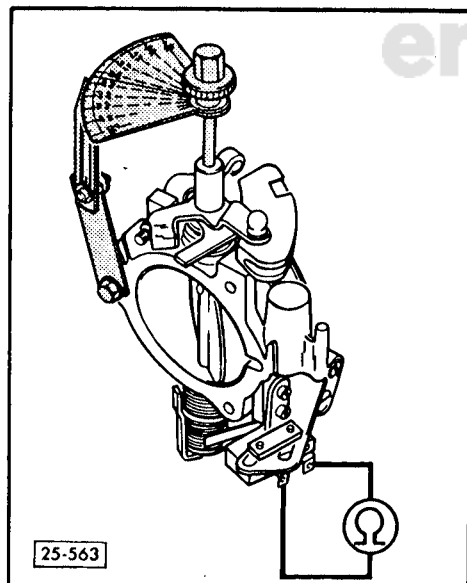
Specified value: 4 ... 2° before idling position, or when throttle reaches stop, hand multimeter must indicate continuity (0Ω)

If specified value is not attained, adjust or renew idling switch.

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Note:

Adjustment is made by moving idling switch on throttle valve housing, whereby hand multimeter remains connected to monitor adjustment.



Checking and adjusting full throttle switch (F 81)

- Degree plate and pointer for protractor 3084 are secured on throttle valve housing and throttle valve shaft respectively.
- ◄ - Connect hand multimeter V.A.G 1526 to both contacts of full throttle switch for resistance measurement with auxiliary leads from V.A.G 1594.
- Set degree plate to 0°.

25-152

- Slowly open throttle valve.

Specified value: 53 ... 63° after idling position of throttle valve, hand multimeter must indicate continuity (0 Ω).

If specified value is not attained, adjust or renew full throttle switch.

If specified values are attained, but malfunction of throttle valve switch is still detected, locate and eliminate break in wiring using current flow diagram.

Note:

Adjustment is made by moving full throttle switch on throttle valve housing, whereby hand multimeter remains connected for monitoring.



25-153

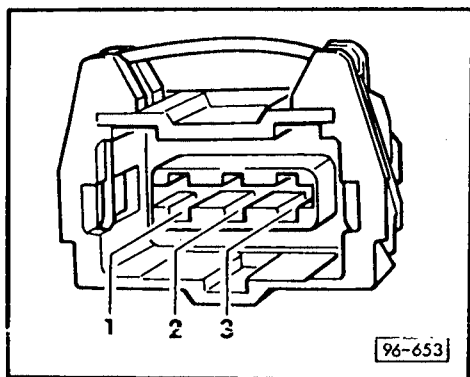
CHECKING AND ADJUSTING THROTTLE VALVE SWITCH

Engine code letters: KU, RT, SL

Checking voltage supply for throttle valve switch

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Disconnect plug for throttle valve switch on throttle valve housing.



- ◀ - Connect hand multimeter V.A.G 1526 between contact 2 of disconnected plug and earth for voltage measurement with auxiliary leads from V.A.G 1594.
- Switch on ignition.

Specified value: approx. battery voltage

If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

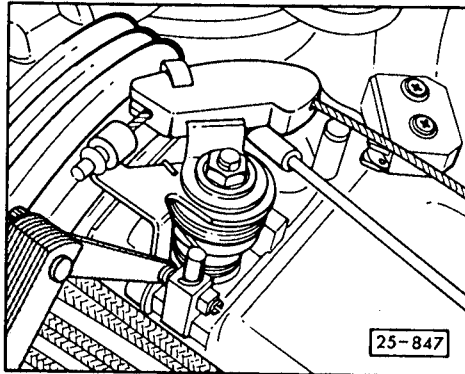
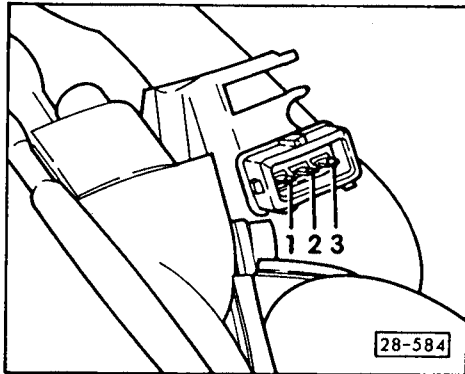
Checking throttle valve switch

- Basic setting of throttle valve switch OK.

- Ignition switched off.

- - Connect hand multimeter V.A.G 1526 between contacts 1 and 2 for resistance measurement with auxiliary leads from V.A.G 1594.

Specified value: $\infty \Omega$



- - Clamp 0.5 mm feeler gauge blade between throttle valve stop and adjusting screw.

Specified value: 0Ω

- Connect hand multimeter between contacts 2 and 3.

Specified values: $\infty \Omega$ Feeler gauge in position
 0Ω Feeler gauge not in position

If specified values are not attained, adjust throttle valve switch.

25-155

Adjusting throttle valve switch

Note:

To adjust throttle valve switch, throttle valve housing must be removed.

- - Connect hand multimeter V.A.G 1526 between contacts 2 and 3 for resistance measurement with auxiliary leads from V.A.G 1594.

- Loosen securing screws of throttle valve switch and move switch in slotted holes so that switch is operated when 0.5 mm feeler gauge blade is pushed in.

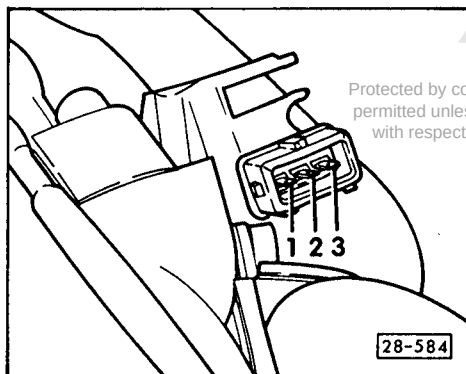
Specified values: $\infty \Omega$ Feeler gauge in position
 0Ω Feeler gauge not in position

- Connect hand multimeter between contacts 1 and 2.

Specified values: 0Ω Feeler gauge in position
 $\infty \Omega$ Feeler gauge not in position

If specified values are not attained, renew and adjust throttle valve switch.

If specified values are attained, tighten securing screws and secure with sealing paint.



25-156

CHECKING AND ADJUSTING THROTTLE VALVE SWITCH

Engine code letters: MC

Note:

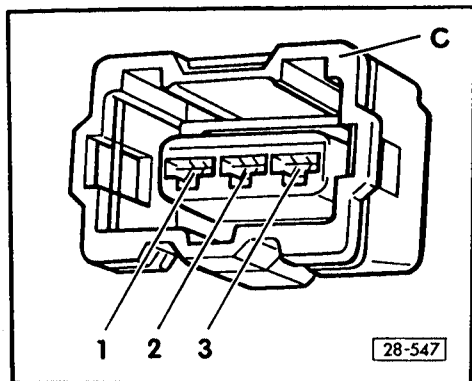
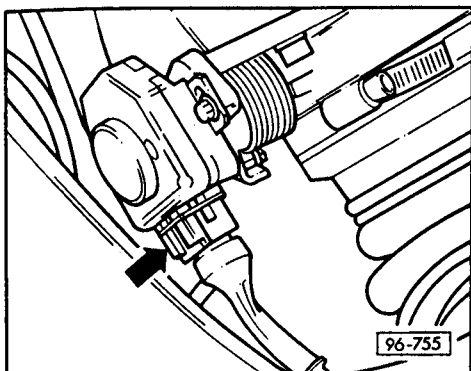
Checking and adjusting are the same for engines with and without throttle damper on throttle valve housing.

Checking voltage supply for idling switch (F 60) and full throttle switch (F 81)

- ▶ - Disconnect plug for idling and full throttle switches on throttle valve housing.
- ▶ - Connect hand multimeter V.A.G 1526 between contact 2 of disconnected plug (C) and earth for voltage measurement with auxiliary leads from V.A.G 1594.
- Switch on ignition.

Specified value: approx. battery voltage

If specified value is not attained, locate and eliminate break in wiring using current flow diagram.



25-157

Checking and adjusting idling switch (F 60)

- Basic setting of throttle valve OK.

- Ignition switched off.

- ▶ - Connect hand multimeter V.A.G 1526 between contacts 1 and 2 for resistance measurement with auxiliary leads from V.A.G 1594.

Specified value: 0Ω

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- ▶ - Slowly open throttle valve until idling switch switches.

Specified value: $\infty \Omega$

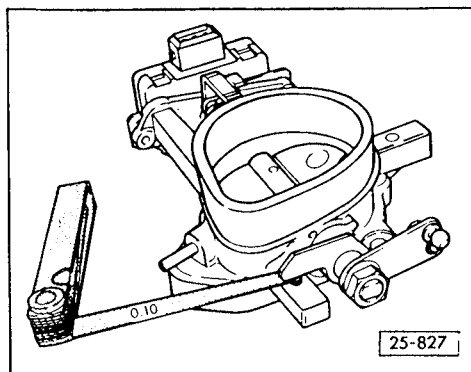
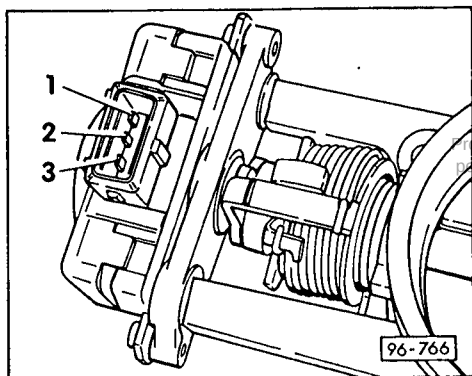
- In this position, there must be play between throttle valve stop and lever of

approx. 0.1 mm.

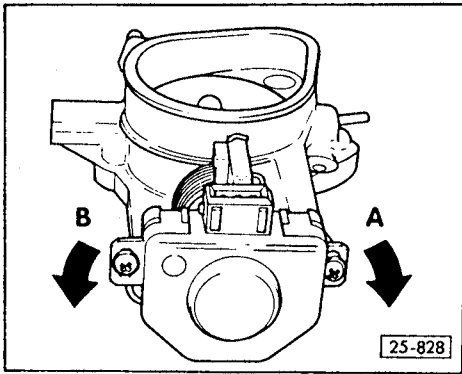
If specified values are not attained, adjust idling switch.

Note:

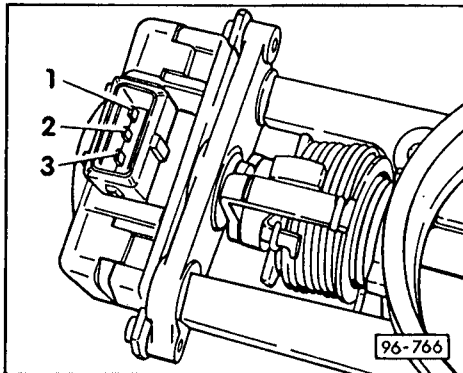
To adjust idling switch, throttle valve housing must be removed.



25-158



- ◀ - Loosen securing screws of idling switch.
 - Turn idling switch to right (A) and then in opposite direction (B) until hand multimeter indicates 0Ω .
 - Retighten securing screws.
 - Repeat measurement.
- If specified values are not attained, renew idling switch.
- If specified values are attained, check full throttle switch.



Checking full throttle switch (F 81)

- ◀ - Connect hand multimeter V.A.G 1526 between contacts 2 and 3 for resistance measurement with auxiliary leads from V.A.G 1594.
- Specified value: $\infty \Omega$
- Operate switch with throttle valve lever.
- Specified value: approx. 0Ω

25-159

If specified values are not attained, adjust idling switch.

Note:

Full throttle switch cannot be adjusted.
After adjustment of idling switch, correct adjustment of full throttle switch automatically results.

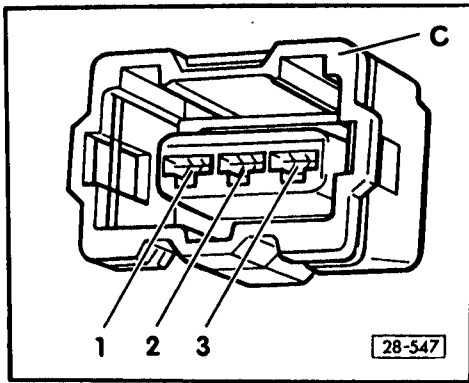
- Repeat measurement.

If specified values are not attained again, renew full throttle switch.

If specified values are attained, check leads between plug connector and plug on tester as follows.

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- Remove FEI control unit and disconnect connector plug with ignition switched off.
- Connect test box V.A.G 1598 between FEI control unit and disconnected connector plug of FEI control unit with adapter cable V.A.G 1598/7. Connector plug contact numbers are identical to test box numbers.
- Electrical fuses OK - see current flow diagram.



- Check continuity between contacts of plug connection (C) on throttle valve housing and test box connections with hand multimeter V.A.G 1526 and auxiliary leads from V.A.G 1594:

Plug connector (C)	Test box
1	20
3	26

Specified values: max. 0.5Ω

If specified values are not attained, locate and eliminate break in wiring using current flow diagram.

If specified values are attained, renew FEI control unit.

25-161

CHECKING AND ADJUSTING THROTTLE VALVE SWITCH

Engine code letters: WU

Checking and adjusting idling switch (F 60)

- Basic setting of throttle valve OK.

- Secure pointer for protractor 3084 on throttle valve housing.
- Secure degree plate on throttle valve shaft (1st stage), remove securing nut for throttle valve lever, if necessary.

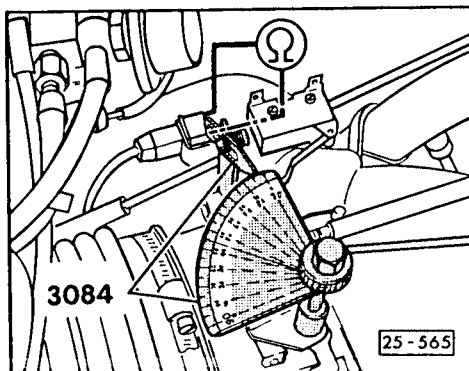
- Disconnect idling switch plug.

Connect hand multimeter V.A.G 1526 to both contacts of idling switch with auxiliary leads from V.A.G 1594.

- Set degree plate to 0° .

- Open throttle valve approx. 20° and slowly close again in direction of idling position.

Specified value: $2.5 \dots 1^\circ$ before idling position, or when throttle reaches stop, hand multimeter must indicate continuity (0Ω).

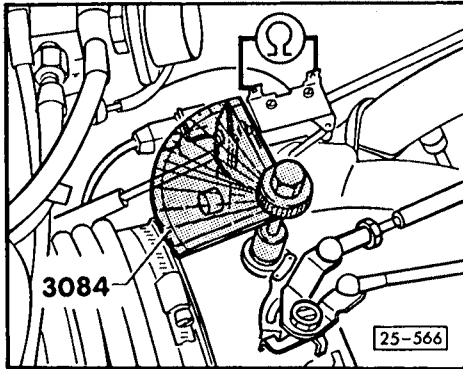


25-162

If specified value is not attained, adjust or renew idling switch.

Note:

- To adjust throttle valve switch, throttle housing part must be removed.
- Adjustment is made by moving throttle valve switch on throttle valve housing, whereby hand multimeter is connected to monitor adjustment. After adjustment repeat measurement.
- If specified value is not attained, renew idling switch.



Checking and adjusting full throttle switch (F 81)

- ◀ - Secure pointer for protractor 3084 to throttle valve part.
- Secure degree plate on throttle valve shaft (2nd stage), remove securing nut for throttle valve lever, if necessary.
- Disconnect plug from full throttle switch.
- Connect hand multimeter V.A.G 1526 to both contacts of full throttle switch for resistance measurement with auxiliary leads from V.A.G 1594.
- Set degree plate to 0°.

25-163

- Slowly open throttle valve.

Specified value: 61 ... 71° after idling position of throttle valve, hand multimeter must indicate continuity (0 Ω)

If specified value is not attained, adjust or renew full throttle switch.

Note:

- Adjustment is made by moving full throttle switch on throttle valve housing, whereby hand multimeter remains connected for monitoring. After adjusting repeat measurement.
- If specified value is not attained, renew full throttle switch.

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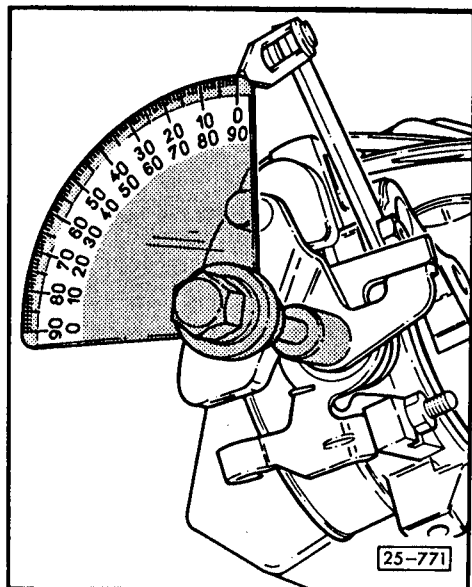
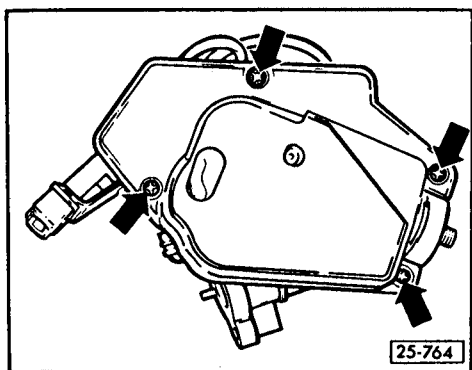


CHECKING AND ADJUSTING THROTTLE DAMPER ON THROTTLE VALVE HOUSING

Engine code letters: JY, KG

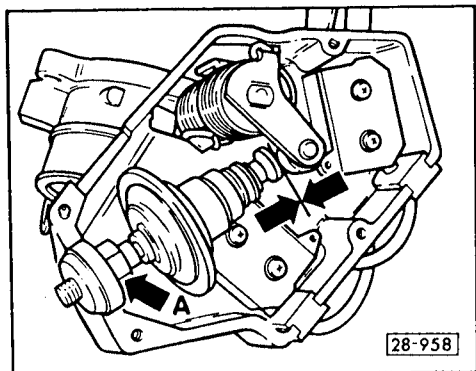
Note:

To adjust throttle damper, throttle valve housing must be removed.



- ◀ - Unscrew protective cap.
- ◀ - Secure pointer for protractor 3084 to throttle valve housing.
- Secure degree plate on throttle valve shaft, remove securing nut for throttle lever, if necessary.
- Set degree plate to 0°.

25-165



- ◀ - Open throttle valve 12 ... 14°. Throttle damper must just lift from throttle valve shaft roller.

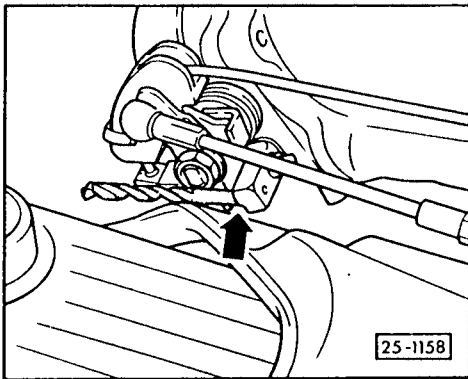
Otherwise:

- Loosen lock nut -A- and turn throttle damper until it no longer touches roller.

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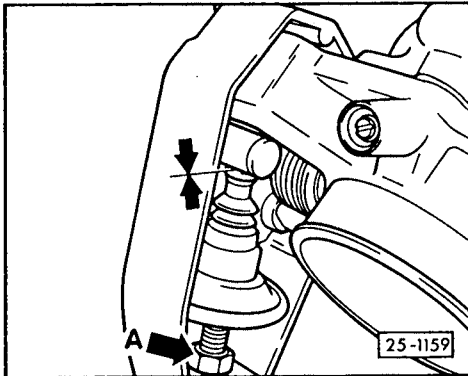
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erWin



Engine code letters: MC

- Remove connecting hose between charge air cooler and throttle valve housing.
- Open throttle valve.
- ◀ - Clamp 5 mm drill between stop and throttle linkage lever -arrow-.



- ◀ - Throttle damper must just lift from throttle valve shaft roller.

Otherwise:

- Loosen lock nut -A- and turn throttle damper until it no longer touches roller.

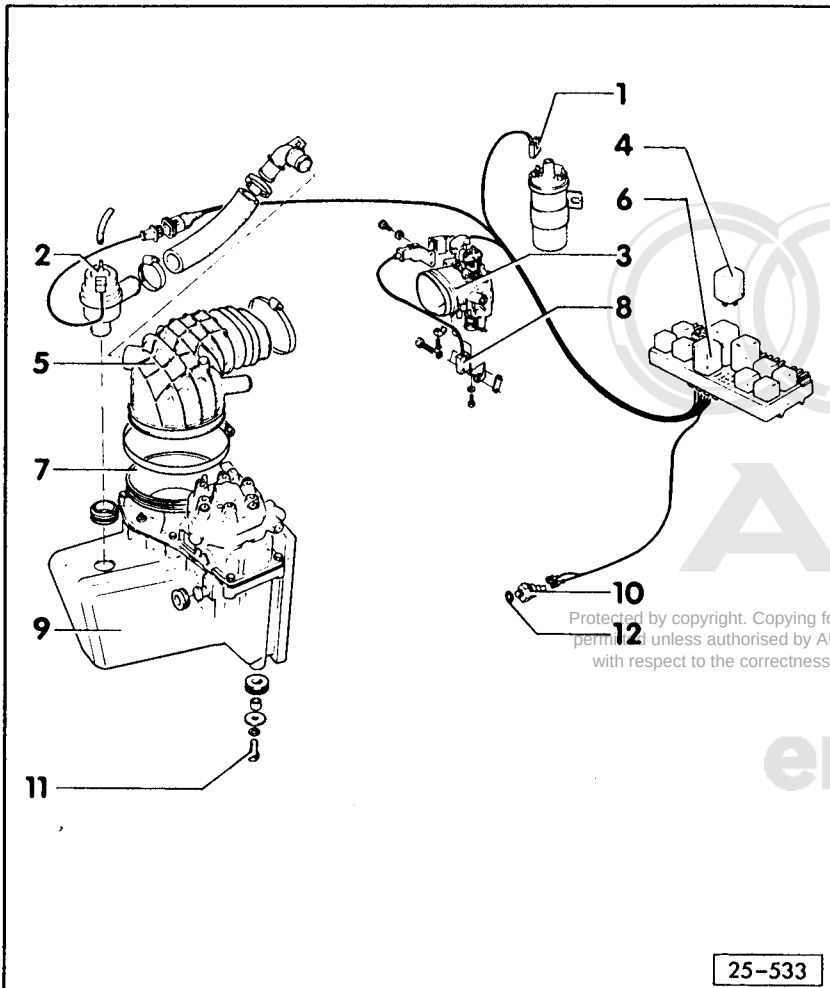
25-167

REMOVING AND INSTALLING PARTS OF OVERRUN FUEL CUT-OFF

All engines except with code letters KH,RT

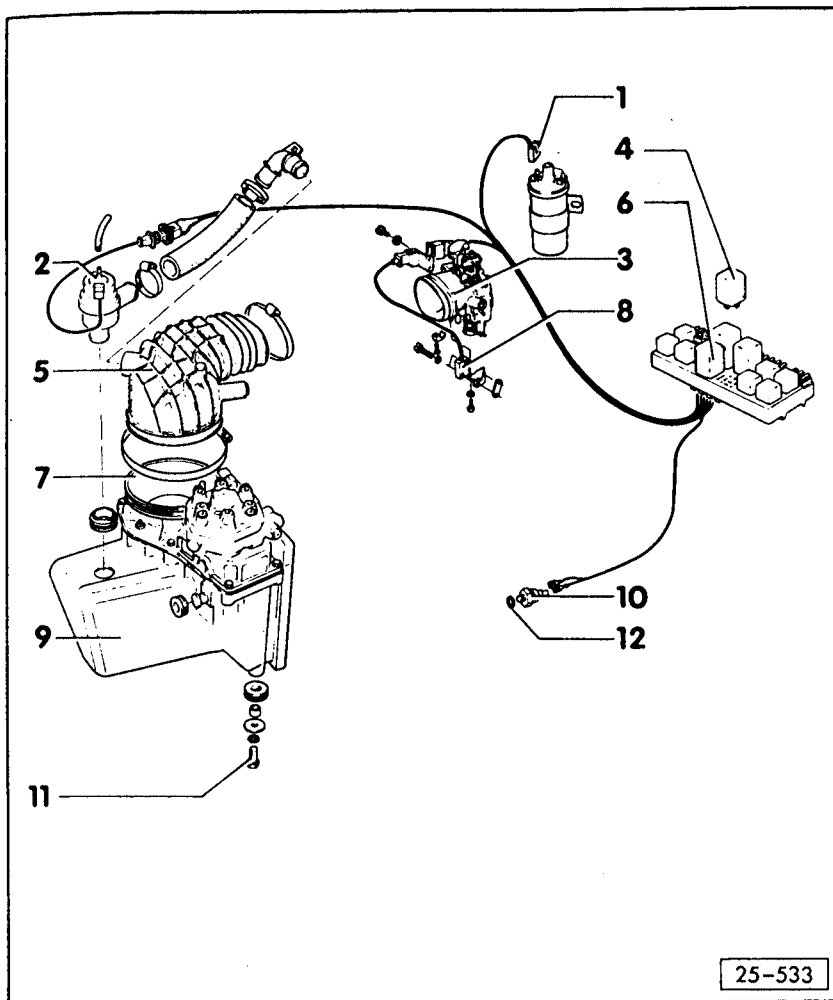
- Checking overrun fuel cut-off:
 - Engine code letters HX, KF, KP, KU, SL, WC, WU - page 25-172
 - Engine code letters JY, KG - page 25-178
 - Engine code letters MC - page 25-182

- 1- Ignition coil terminal 1
- 2- Overrun cut-off valve (N 65)
- 3- Throttle valve housing
- 4- Control unit for overrun cut-off
- 5- Air intake elbow
- 6- Fuse box/relay plate
- 7- Mixture control unit
- 8- Throttle cable
- 9- Throttle valve housing
- 10- Ignition coil terminal 2
- 11- Air intake elbow
- 12- Mixture control unit



25-533

25-168



25-533

25-169

8- Idling switch (F 60)

9- Air cleaner housing

10- Thermoswitch (F 74) or temperature sensor (N 10)

• Checking - page 25-83

11- 20 Nm

12- O-ring

• Renew

OVERRUN FUEL CUT-OFF

No power is demanded from engine in overrun operation. Fuel supplied during this operating phase is not required and can be saved.

Components:

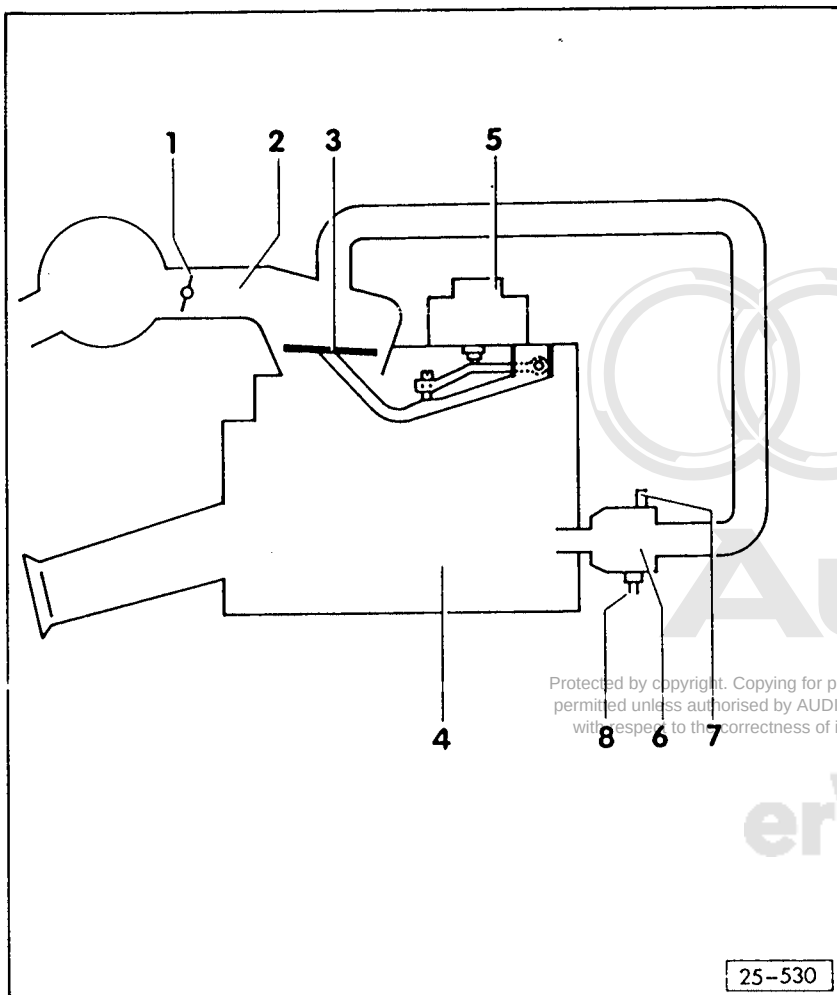
- Control unit (in fuse box/relay plate, socket No. 3)
- Overrun cut-off valve (on air cleaner housing, behind fuel metering distributor)
- Temperature switch (on cylinder head, front left)
- Switch (on throttle valve, underneath)

Operation:

Fuel supply is switched off in overrun operation when:

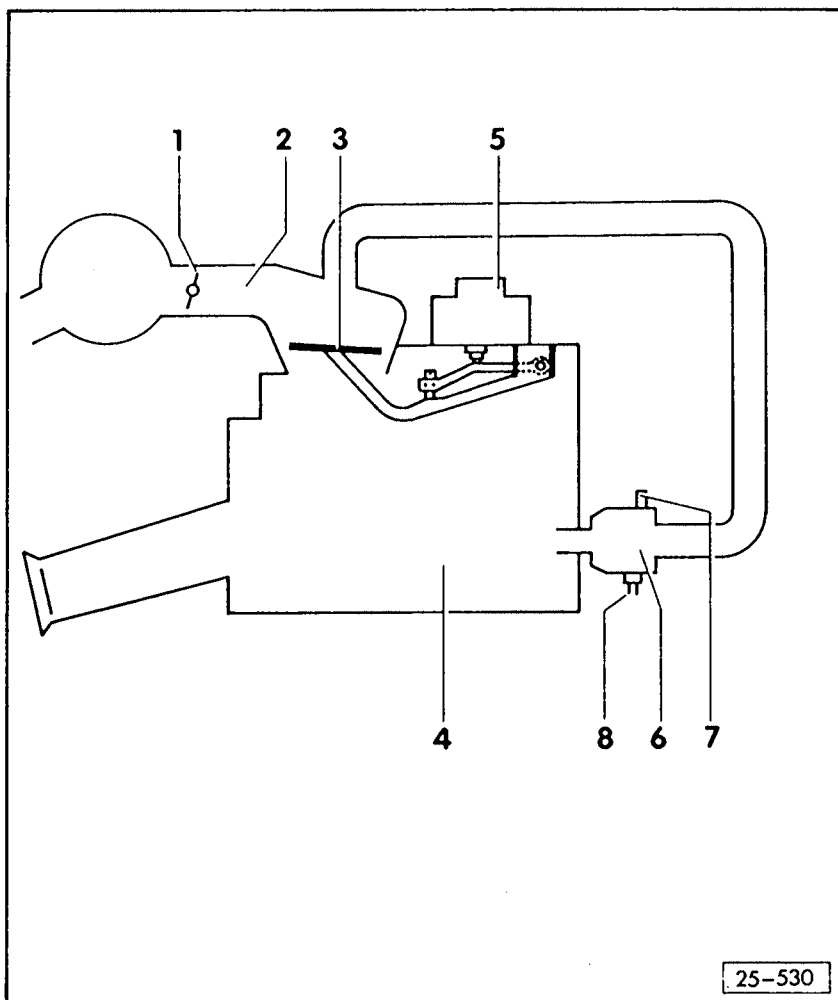
- Coolant temperature is above 30° C
- Engine speed is above 1400 rpm
- Throttle valve is in idling position

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25-530

25-170



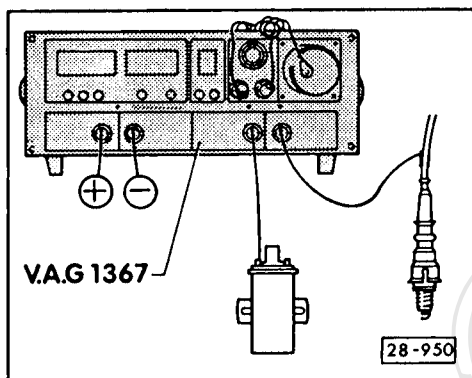
In this operating condition, overrun cut-off valve is controlled by control unit and opened with vacuum. This causes air-flow meter plate to be bypassed with additional air. The plate sinks to the rest position.

If engine speed drops below 1200 rpm, control unit receives speed signal via ignition coil terminal 1. Overrun cut-off valve closes and thus causes air flow meter plate to rise.

- 1- Throttle valve
- 2- Air intake elbow
- 3- Air-flow meter plate
- 4- Air cleaner
- 5- Fuel metering distributor
- 6- Overrun cut-off valve (N 65)
- 7- Vacuum connection
 - See vacuum connections - from page 25-207
- 8- Electrical connection to control unit

25-171

CHECKING OVERRUN CUT-OFF



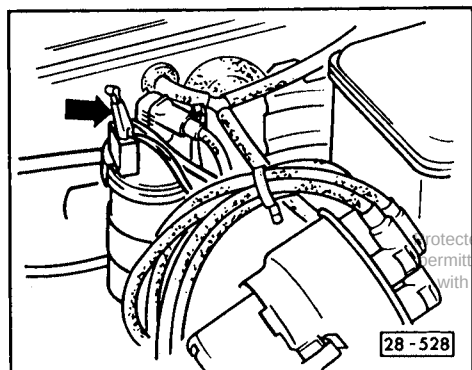
Engine code letters: HX, KF, KP, KU, SL, WC, WU

- Up to model year 84

Note:
From model year 85 - page 25-175

- Engine cold

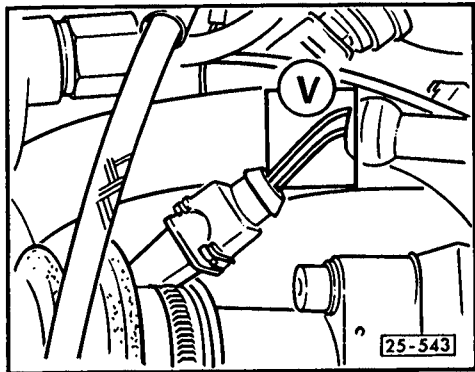
- ▶ - Connect tester V.A.G 1367 for speed measurement according to operating instructions with ignition switched off.
- ▶ - Use auxiliary clip for connection to ignition coil terminal 1.



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erWin

25-172



- Push back rubber grommet of connector to overrun cut-off valve (N 65).
- - Connect hand multimeter V.A.G 1526 to both plug contacts for voltage measurement with auxiliary leads from V.A.G 1594.
- Start engine and run it at idle.

Specified value: 0 volts

If specified value is not attained, locate and eliminate break in wiring using current flow diagram, or check thermoswitch - page 25-83

- Slightly open throttle valve, throttle valve switch must click.

Otherwise adjust throttle valve switch.

- Engine oil temperature at least 50° C.
- Increase engine speed to above 2000 rpm.

25-173

- Close throttle valve suddenly.

Specified value: approx. battery voltage

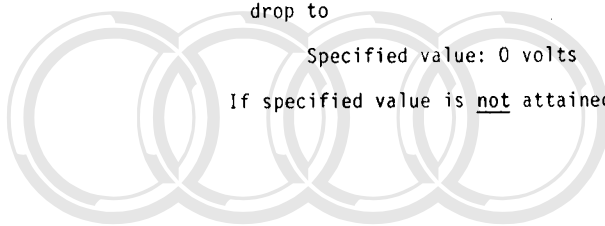
If specified value is not attained, adjust throttle valve switch or locate and eliminate break in wiring using current flow diagram.

- Increase engine speed again to above 2000 rpm.
- Close throttle valve suddenly.

If engine speed drops below 1200 rpm, indicated voltage must drop to

Specified value: 0 volts

If specified value is not attained, renew control unit.



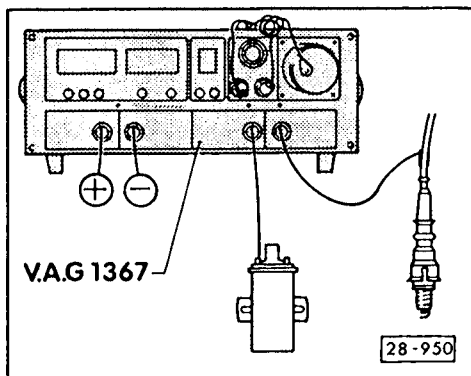
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25-174

CHECKING OVERRUN CUT-OFF



Engine code letters: HX, KF, KP, KU, SL, WC, WU

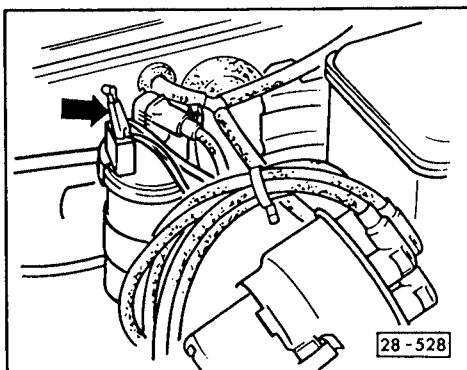
- From model year 85

Note:

Up to model year 84 - page 25-172

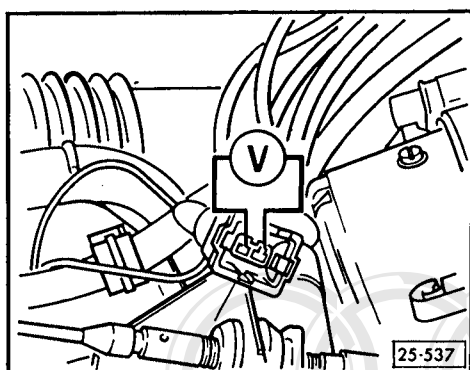
- Engine oil temperature at least 50° C

- ◀ - Connect tester V.A.G 1367 for speed measurement according to operating instructions with ignition switched off.



- ◀ - Use auxiliary clip for connection to ignition coil terminal 1.

25-175



- Separate connector on overrun cut-off valve (N 65).

- ◀ - Connect hand multimeter V.A.G 1526 to both plug contacts for voltage measurement with auxiliary leads from V.A.G 1594.

Specified value: 0 volts

- Start engine and increase engine speed to above 2000 rpm
- Close throttle valve suddenly

Specified value: approx. battery voltage

If engine speed falls below 1200 rpm, indicated voltage must drop to

Specified value: 0 volts

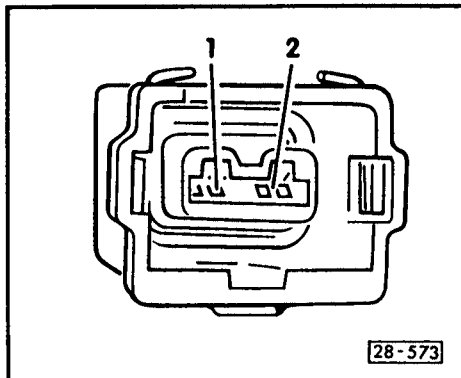
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25-176

If specified values are not attained:

- a. Locate and eliminate break in wiring using current flow diagram
- b. Check and adjust idling switch (F 60)
- c. Check temperature sensor (N 10) - page 25-83



◀ - Check connector pin assignment on plug of overrun cut-off valve (N 65)

- Contact 1 = negative
- Contact 2 = positive

Connector pin assignment OK:

- Renew control unit

Connector pin assignment not OK:

- Correct connector pin assignment
- Renew control unit and overrun cut-off valve (N 65).

25-177

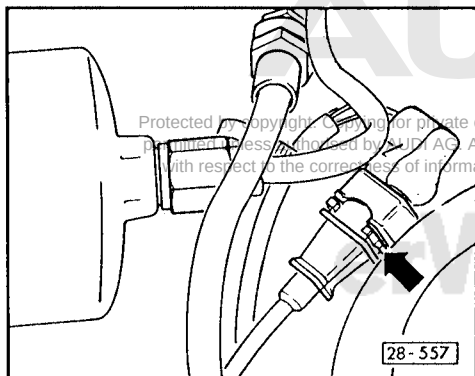
CHECKING OVERRUN CUT-OFF

Engine code letters: JY, KG

- Only vehicles with manual gearbox
 - Coolant temperature at least 50° C
 - Vacuum hose connected to overrun cut-off valve
- Start engine and increase engine speed to above 2000 rpm
- Close throttle valve suddenly
- Air intake elbow must briefly noticeably contract

Otherwise:

- Switch off ignition

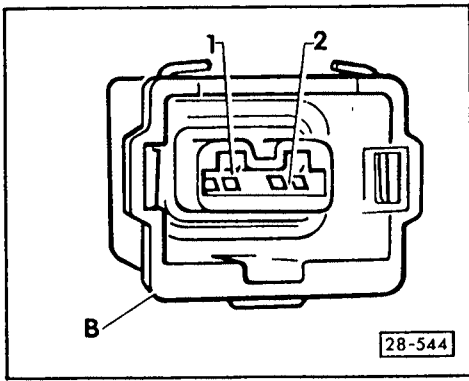


◀ - Separate connector on overrun cut-off valve (N 65)

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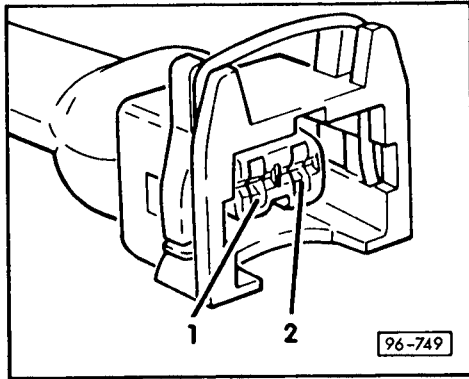


25-178



- Up to model year 84

- ◄ - Connect hand multimeter V.A.G 1526 between contacts 1 and 2 of plug (B) for voltage measurement with auxiliary leads from V.A.G 1594.



- From model year 85

- ◄ - Connect hand multimeter V.A.G 1526 between plug contacts 1 and 2 for voltage measurement with auxiliary leads from V.A.G 1594.

- Start engine and increase engine speed to above 2000 rpm.

- Close throttle valve suddenly

Specified value: approx. battery voltage

25-179

If specified value is attained, renew overrun cut-off valve.

If specified value is not attained, check idling switch.

- Increase engine speed again to above 2000 rpm.

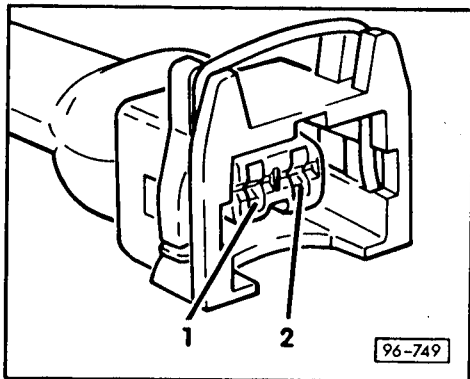
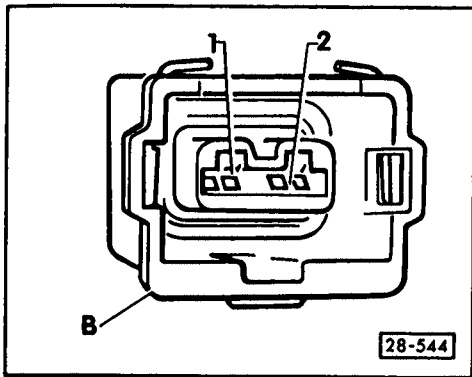
Specified value: approx. battery voltage

If specified value is not attained again, check wiring as follows:

- Remove FEI control unit and disconnect connector plug with ignition switched off.
Connect test box V.A.G 1598 between FEI control unit and disconnected connector plug of FEI control unit with adapter lead V.A.G 1598/7. Connector plug contact numbers are identical to test box numbers.
Electrical fuses OK - see current flow diagram.

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- Up to model year 84

- ▶ - Check continuity between contact 1 of plug (B) and test box contact 14 with hand multimeter and auxiliary leads.

- From model year 85

- ▶ - Check continuity between plug contact 2 and test box contact 14 with hand multimeter and auxiliary leads.

Specified value: max. 0.5Ω

If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

If specified value is attained, renew FEI control unit.

25-181

CHECKING OVERRUN CUT-OFF

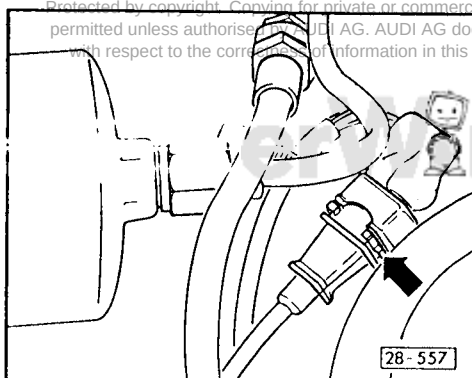
Engine code letters: MC

- Vehicles with manual gearbox only
- Coolant temperature at least 50°C
- Vacuum hose connected to overrun cut-off valve
- Start engine and increase engine speed to above 2000 rpm.
- Close throttle valve suddenly.
- Air intake elbow must briefly noticeably contract.

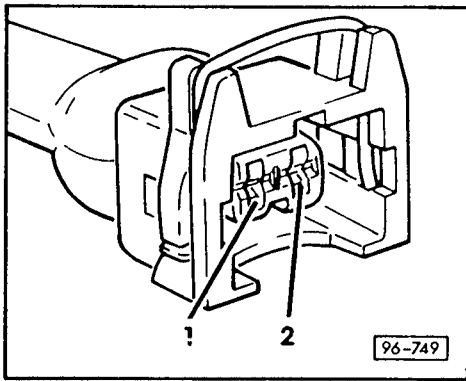
Otherwise:

- Switch off ignition.

- ▶ - Separate connector on overrun cut-off valve (N 65).



25-182



- ◀ - Connect hand multimeter V.A.G 1526 between plug contacts 1 and 2 for voltage measurement with auxiliary leads from V.A.G 1594.

- Increase engine speed to above 2000 rpm and close throttle valve suddenly.

Specified value: approx. battery voltage

If specified value is attained, renew overrun cut-off valve.

If specified value is not attained, check idling switch.

- Increase engine speed again to above 2000 rpm.

Specified value: approx. battery voltage

If specified value is not attained again, locate and eliminate break in wiring using current flow diagram.

25-183

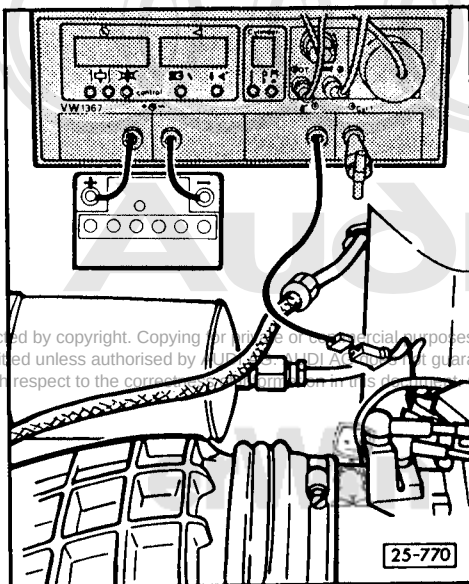
Checking overrun cut-off pulse to FEI control unit

- Overrun cut-off valve (N 65) OK.

- Connect tester V.A.G 1367 according to operating instructions with ignition switched off.

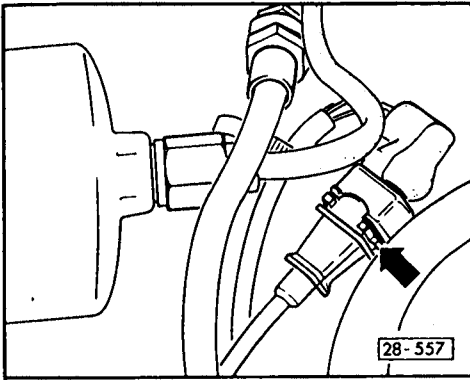
- ◀ - Connect test cable (green) to test lead V.A.G 1367/5 and Lambda test plug (blue/black).

- Press % button on tester.

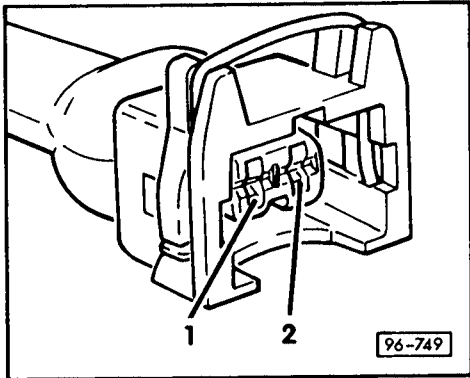


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25-184



- ▶ - Separate connector on overrun cut-off valve.
- Run engine at idle.



- ▶ - Earth plug contact 2 with auxiliary leads from V.A.G 1594.
- Specified value: 40 % Lambda duty cycle

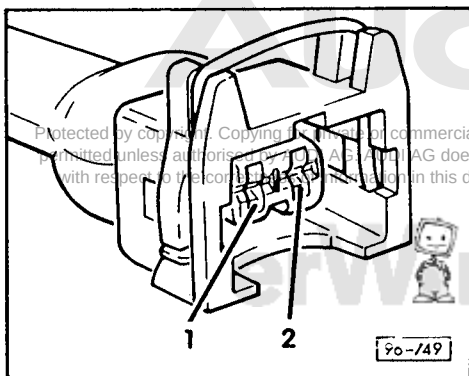
Note:

Regardless of speed, Lambda duty cycle must be 40 %.

If specified value is not attained, check wiring as follows:

25-185

- Remove FEI control unit and disconnect connector plug with ignition switched off.
- Connect test box V.A.G 1598 between FEI control unit and disconnected connector plug of FEI control unit with adapter lead V.A.G 1598/7. Connector plug contact numbers are identical to test box numbers.
- Electrical fuses OK - see current flow diagram.



- ▶ - Check continuity between plug contact 2 and test box contact 4 with hand multimeter and auxiliary leads.

Specified value: max. 0.5 Ω

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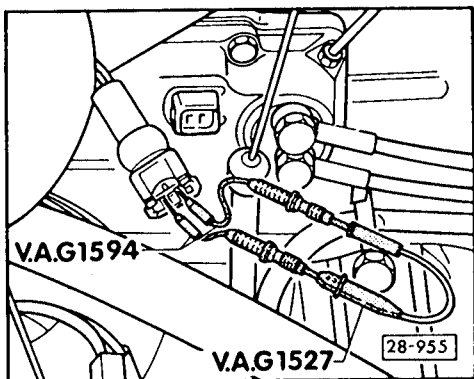
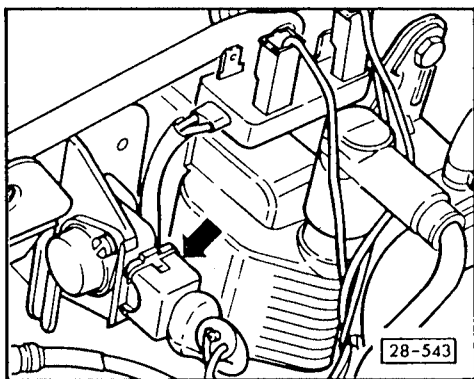
If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

If specified value is attained, renew FEI control unit.

25-186

CHECKING WARM-UP VALVE (N 9)

Checking voltage supply



- Engine cold / ambient temperature approx. 20 ... 30° C
- On vehicles without power stage on ignition coil, disconnect HT lead from ignition coil on ignition distributor and earth with auxiliary leads from V.A.G 1594.
- ◄ - On vehicles with power stage on ignition coil, disconnect power stage plug.
- Disconnect plug from warm-up valve.
- ◄ - Connect diode test lamp V.A.G 1527 to plug with auxiliary leads from V.A.G 1594.
- Operate starter. LED must light up. If necessary, locate and eliminate break in wiring using current flow diagram.

25-187

Checking control pressure - engine cold

- Engine cold / ambient temperature approx. 20 ... 30° C
- Plug disconnected from warm-up valve (N 9)
- On vehicles without power stage on ignition coil, connect HT lead from ignition coil on ignition distributor.
- On vehicles with power stage on ignition coil, connect power stage plug.
- Connect pressure gauge V.A.G 1318 with adapter V.A.G 1318/4 - see page 25-45.
- Open cut-off lever on pressure gauge (lever in flow direction).
- Start engine and run at it idle.

Important!
Run engine max. 1 minute.

- Control pressure must adjust to specified value immediately after starting.
- Specified values - see Technical Data.

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Checking control pressure - engine warm

- Open cutoff lever on pressure gauge.
- Engine running at idle.
- Connect plug on warm-up valve.
- After 2.5 ... 5.0 minutes control pressure must increase to specified value.
- Specified value - see Technical Data.

25-189

CHECKING SYSTEM PRESSURE

System pressure should not be checked until fuel feed rate and fuel filter have been checked - see Repair Group 20.

- Plug on warm-up valve connected.
- Connect pressure gauge V.A.G 1318 with adapter V.A.G 1318/4
 - see page 25-45.
- Close cut-off lever on pressure gauge (lever at right angle to flow direction)
- Start engine, run at idle and read system pressure on pressure gauge.
- Specified value - see Technical Data.

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25-190

If specified value is not attained, the following malfunctions may be present:

System pressure too low:

- Fuel line pinched, blocked or leaking
- Fuel filter blocked
- Pressure reservoir leaking
- Fuel pump feed rate too low, check - Repair Group 20
- Fuel metering distributor defective.

System pressure too high:

- Return line blocked or pinched
- Fuel metering distributor defective.



25-191

CHECKING HOLDING PRESSURE

- Engine oil temperature at least 50° C.
- System pressure OK.
- Connect pressure gauge V.A.G 1318 with adapter V.A.G 1318/4 - see page 25-45.

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- Open cut-off lever on pressure gauge (lever in flow direction).

- Start engine and run at idle until control pressure is indicated.

- Specified value - see Technical Data.

- Switch off ignition.

- Observe pressure drop on gauge.

- Specified value - see Technical Data.

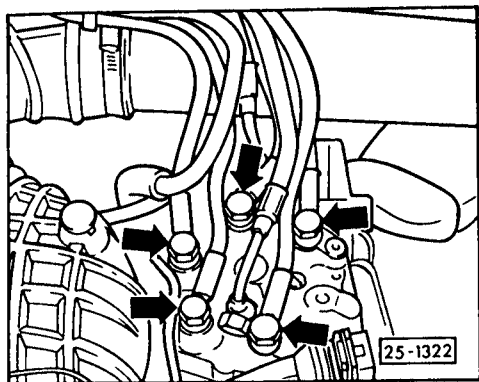
If specified values are not attained:

- Check fuel pump non-return valve and lines to fuel metering distributor for leaks - Repair Group 20.
- Check cold start valve, injectors, fuel metering distributor and line connections for leaks.



25-192

Engines with low-pressure system



Note:

- On engines with low-pressure system, injection lines are secured on fuel metering distributor with union bolts.

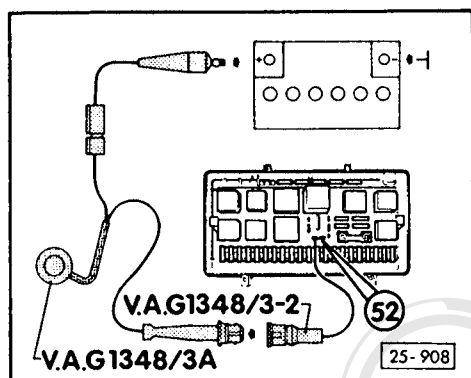
Checking spraying pattern and for leaks

- Fuse No. 13 OK.

- Pull fuel pump relay out of relay plate (relay location 10).

- Connect remote control V.A.G 1348/3A to contact 52 with adapter lead V.A.G 1348/3-2.

- Connect clip terminal to battery (+) or B+ on alternator.

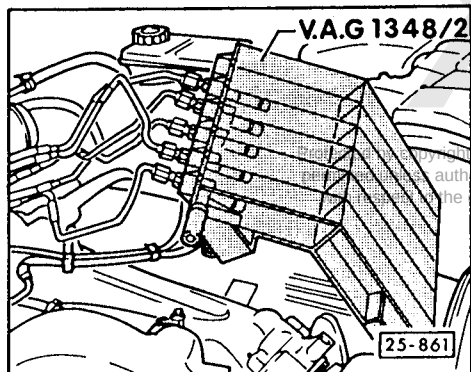


25-193

- Remove air duct for jet cooling.

- Pull injectors out of seat.

- Push injectors into test device V.A.G 1348/2. Position fuel lines without kinking. If necessary, unclip lines.



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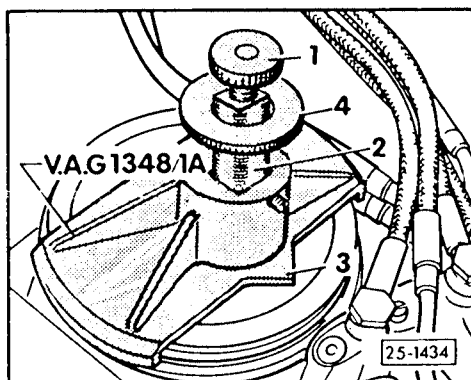


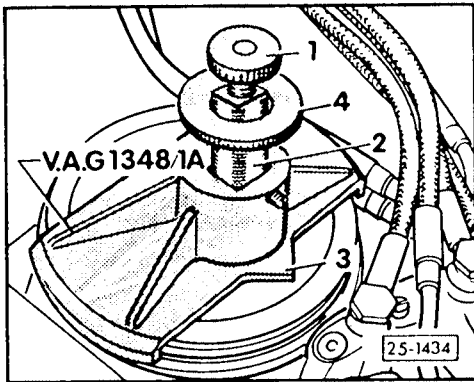
- Screw adjusting screw -1- and knurled nut -4- of setting device V.A.G 1348/1A up to upper end position. Pull slide -2- upward. Position adjusting device on edge of air flow meter so that tip -3- points towards fuel metering distributor.

- Push in slide -2- up to stop.

- Hold air-flow meter plate in rest position by hand.

- Screw in adjusting screw -1- until magnetic foot rests on securing bolt of air-flow meter plate.





- ▶ - Pull slide -2- of adjusting device all the way up.
- Operate remote control switch.
- Injectors must spray down with cone-shaped stream.
- Return air-flow meter plate to rest position.
- Dry off injector jets.
- Operate remote control for approx. 2 minutes.
- During these two minutes injectors must not drip.
- Empty measuring device V.A.G 1348/2 (injectors can be left inserted during this).

Checking injection tolerance - idle

- Pull slide -2- of adjusting device into first detent position.
- Operate remote control until
20 ml fuel
is reached on scale of one measuring glass.

25-195

- Injectors must spray down with cone-shaped stream.
If spray of an injector is not cone-shaped, briefly lift air-flow meter plate completely up and repeat test.
- Compare fuel quantity of injectors with each other (hold measuring device horizontal).

- Permissible deviation between all injectors

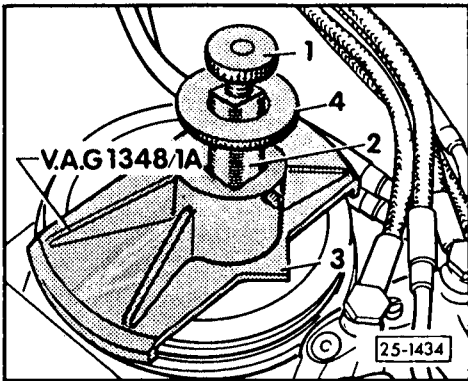
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Specified value - see Technical Data

- If deviation is greater, exchange injectors (those with largest and smallest injection quantity) with each other.
- Empty measuring device.
- Repeat test of injection tolerance.
- If differing injection quantity moves with injector, injector is defective and must be replaced.
- If different injection quantity is unchanged for the same cylinder, injector line (pinched) or fuel metering distributor is defective.

Checking injection tolerance - full throttle

- Measuring device must be emptied before measuring full throttle quantity.
(Injectors can be left inserted during this).



- ▶ - Pull slide -2- of adjusting device into second detent position.
- Carry out test as described for idling measurement, however:
 - Operate remote control until 80 ml fuel is reached on scale of one measuring glass.
 - Permissible deviation between all injectors
max. 8.0 ml

25-197

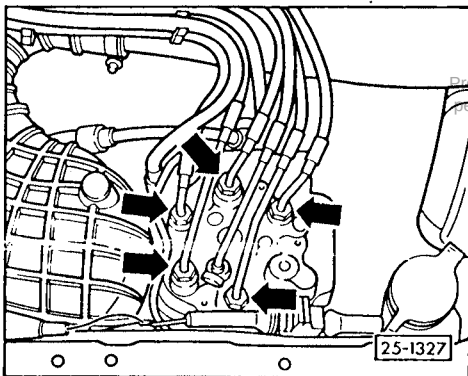
COMPARATIVE MEASUREMENT OF INJECTION QUANTITY

Engines with high-pressure system

Note:

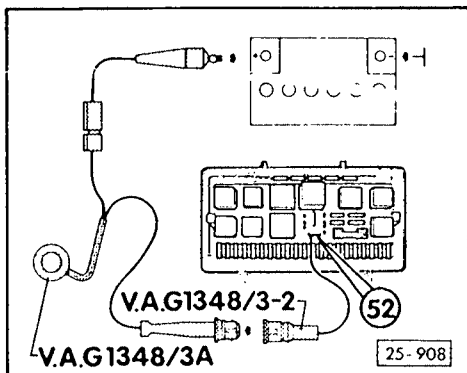
- ▶ - On engines with high-pressure system, injector lines are secured on fuel metering distributor with union nuts.

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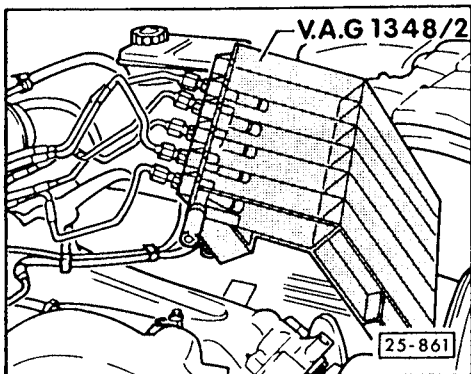


Checking spraying pattern and for leaks

- Fuse No. 13 OK.
- Pull fuel pump relay out of relay plate (relay location 10).
- ▶ - Connect remote control V.A.G 1348/3A to contact 52 with adapter lead V.A.G 1348/3-2.
- Connect clip terminal to battery (+) or to B+ on alternator.



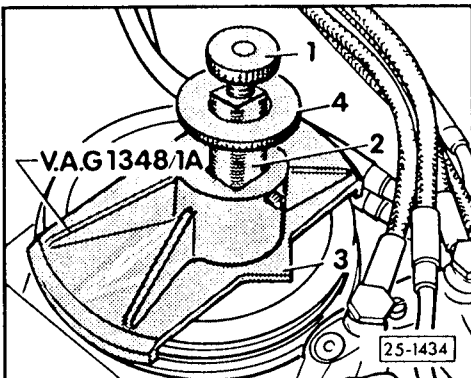
25-198



- Remove air duct for jet cooling.

- Pull injectors out of seat.

- ▶ - Push injectors into test device V.A.G 1348/2. Position fuel lines without kinking. If necessary, unclip lines.



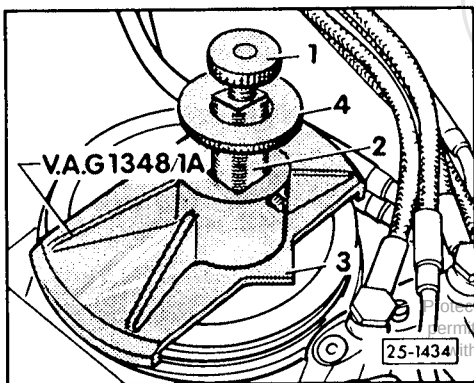
- ▶ - Screw adjusting screw -1- and knurled nut -4- of setting device V.A.G 1348/1A up to upper end position. Pull slide -2- upward. Position adjusting device on edge of air flow meter so that tip -3- points towards fuel metering distributor.

- Push in slide -2- up to stop.

- Hold air-flow meter plate in rest position by hand.

- Screw in adjusting screw -1- until magnetic foot rests on securing bolt of air-flow meter plate.

25-199



- ▶ - Pull slide -2- of adjusting device all the way up.

- Operate remote control switch.

• Injectors must spray down with cone-shaped stream.

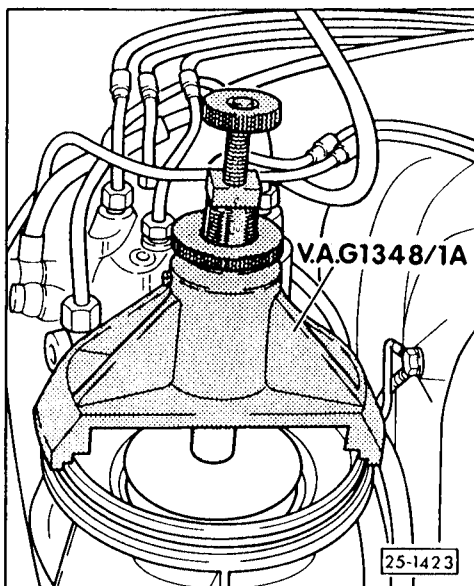
- Return air-flow meter plate to rest position.

- Dry off injector jets.

- Operate remote control for approx. 2 minutes.

• Within these two minutes injectors must not drip.

- Empty measuring device V.A.G 1348/2 (injectors can be left inserted during this).



Checking injection tolerance - idle

- ▶ - Turn knurled nut -4- downward 15 mm.

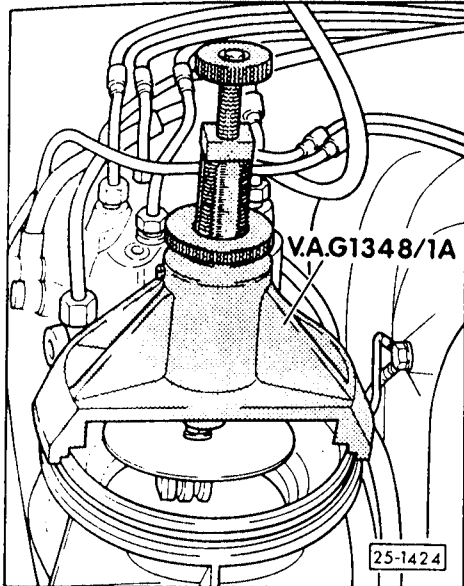
- Operate remote control 20 seconds.

- Compare fuel quantity of injectors with each other (hold measuring device horizontally).

• Permissible deviation between all injectors

Specified value - see Technical Data

- If deviation is greater, exchange injectors (those with largest and smallest injection quantity) with each other.
- Empty measuring device.
- Repeat test of injection tolerance.
- If differing injection quantity moves with injector, injector is defective and must be replaced.
- If different injection quantity is unchanged for the same cylinders, injector line (pinched) or fuel metering distributor is defective.



Checking injection tolerance - full throttle

- Empty measuring device.
- ◀ - Screw knurled nut -4- 30 mm downward.
- Operate remote control 20 seconds.
- Permissible deviation between all injectors:
max. 8.0 ml

25-201

CHECKING FOR LEAKS IN AIR-SHROUDED INJECTORS AND INSERTS

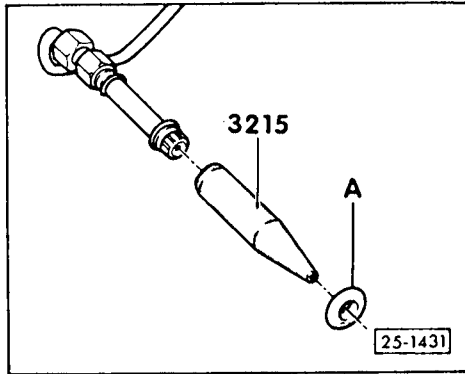
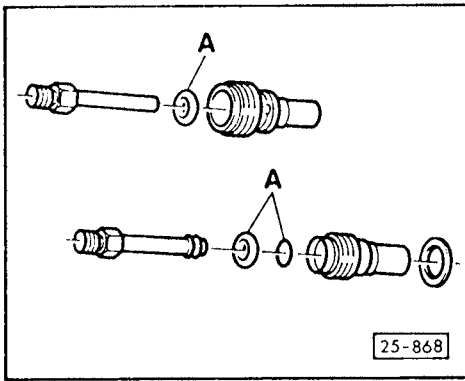
- Disconnect hose to air-shrouded injectors at T-piece or at intake manifold.
- Reduce compressed air to 1 bar with pressure reducer.
- Remove injector cooling air duct.
- Spray injectors and inserts with non-flammable leak-finding spray.
- Pressurize hose to air-shrouded injectors with compressed air pistol.

If bubbles appear between cylinder head and insert -

see page 25-204.

If bubbles appear between insert and injector, proceed as follows:





- Pull injector out of seat.

Important!
Make sure that fuel lines are not kinked.

◄ - Remove O-rings.

• Up to model year 85

Above version with one O-ring

• From model year 85

Lower version with two O-rings

◄ - Moisten large O-ring -A- (green) with petrol and slide onto special tool 3215.

- Push special tool 3215 onto injector and slide O-ring until it clicks into rear ring groove of injector.

- Install small O-ring in front O-ring groove of injector.

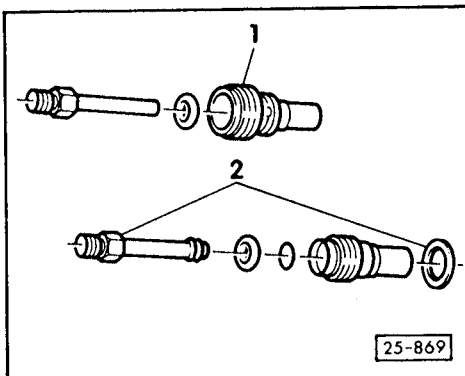
25-203

Bubble formation between cylinder head and insert

- Pull injector out of seat.

Important!
Make sure fuel lines are not kinked.

- Unscrew insert with Allen key.



Note:

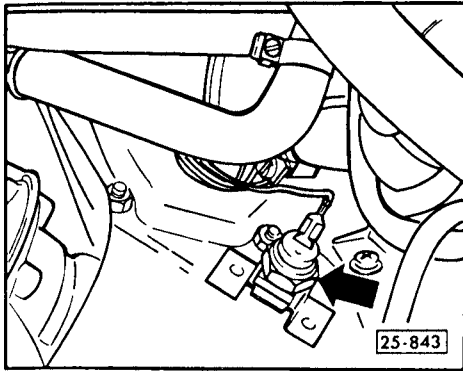
• Loose or leaky one-piece inserts must be replaced with two-piece inserts (mixed installation is permissible).

◄ • If two-piece insert is installed in place of one-piece plastic insert (1), corresponding injector (2) must also be renewed.

- Clean insert threads and moisten with bolt locking compound AMV 154 100.

- Screw in insert by hand and tighten to 20 Nm.

25-204



CHECKING OPERATION OF INJECTOR COOLING FAN

- - Disconnect lead from thermoswitch and earth.

If injector cooling fan does not run, locate and eliminate break in wiring using current flow diagram.

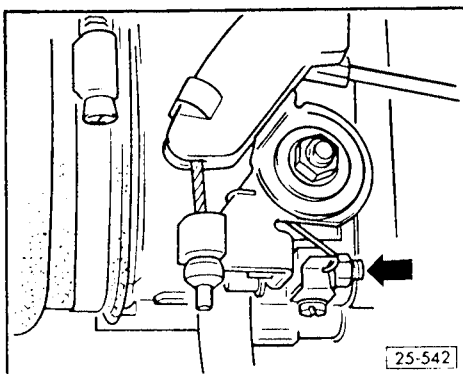
If injector cooling fan runs, renew thermoswitch.

25-205

THROTTLE VALVE BASIC SETTING

Note:

Limit screw is set at factory and must not be moved. If screw is accidentally turned, adjust as described below.



- - Unscrew limit screw -arrow- until gap is present between screw and stop.
- Screw in limit screw until it touches stop.

Note:

In order to exactly determine contact point of limit screw, place a piece of thin paper between limit screw and stop. Determine stop point by constantly sliding paper back and forth while screwing in limit screw.

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- Screw in additional 1/2 turn from this point. copyright by AUDI AG.

- Check idling speed stabilization or idling speed and CO content and adjust if necessary.

25-206

VACUUM CONNECTIONS

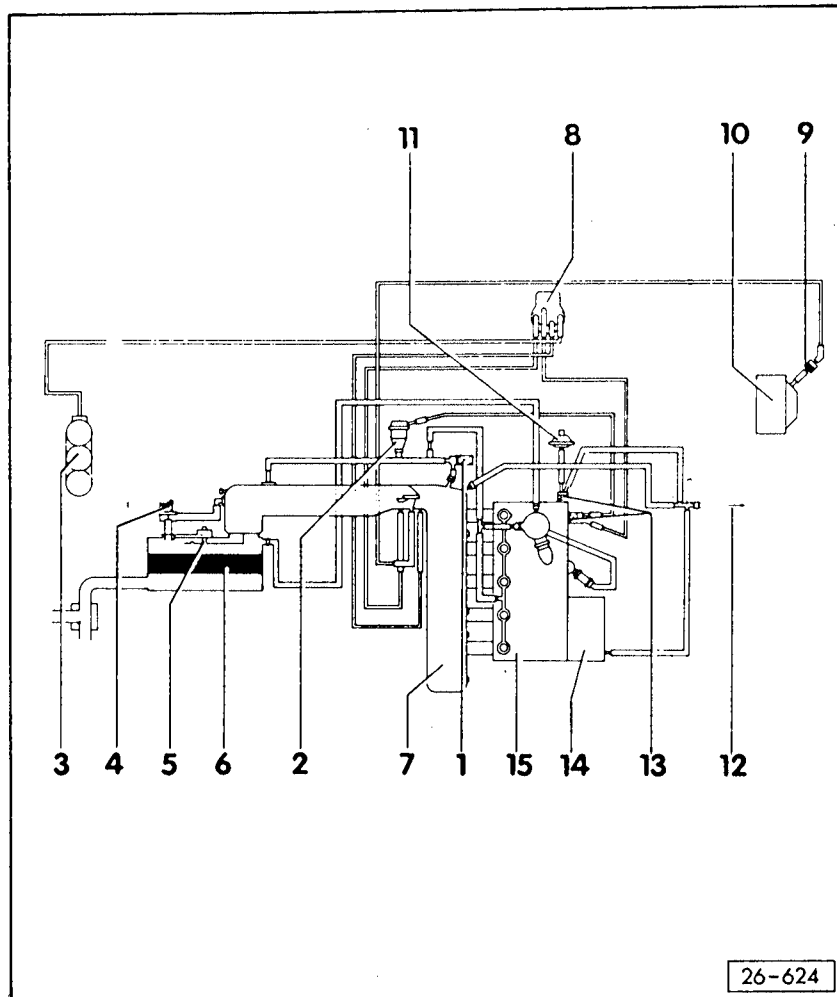
Engine code letters: HX

Note:

- Vacuum connections on Quattro - page 25-209

- - - Vehicles with manual gearbox only

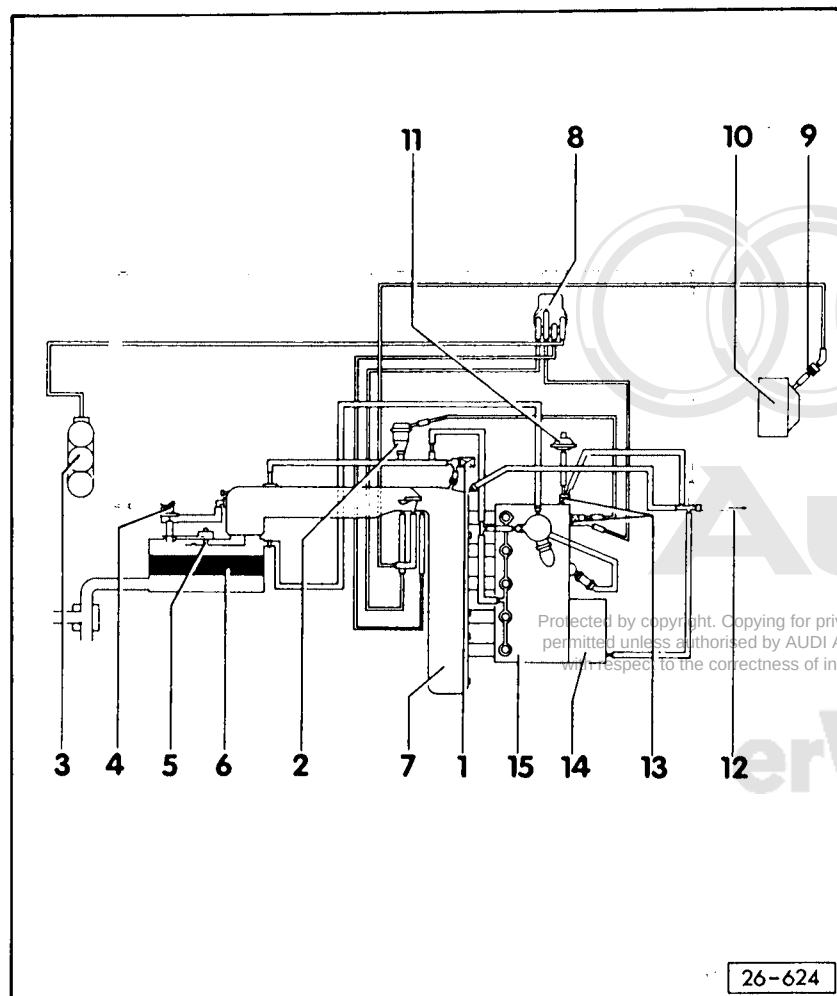
- 1- Idling speed stabilization valve (N 71)
 - Checking - page 25-70
- 2- Exhaust gas recirculation (EGR) valve
 - Checking - Repair Group 26
- 3- Vacuum reservoir
- 4- Overrun cut-off valve (N 65)
 - On vehicles with manual gearbox only
 - Checking - page 25-172
- 5- Mixture control unit
- 6- Air cleaner
- 7- Intake manifold
- 8- Vacuum booster
 - Checking - Repair Group 26



25-207

Engine code letters: HX

- 9- Non-return valve
- 10- Ignition distributor advance unit
 - Checking - Repair Group 28
- 11- Diaphragm pressure switch (F 93)
 - Checking - page 25-135
- 12- To air conditioner
- 13- Thermo-pneumatic valve
 - Checking - page 25-135
- 14- Warm-up valve (N 9)
 - Checking - page 25-187
- 15- Cylinder head



25-208

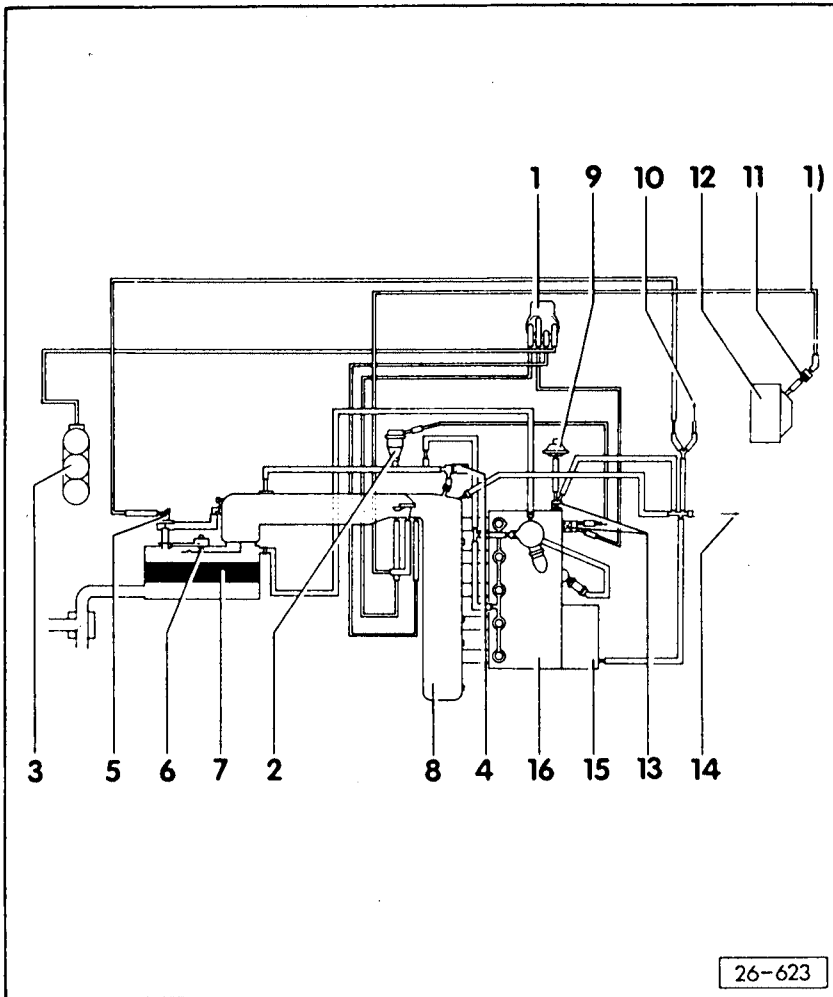
VACUUM CONNECTIONS

Engine code letters: HX

• Only on Quattro

- 1) From model year 86 (Sweden/Switzerland) vacuum line between intake manifold and ignition distributor was dropped from Ch. No. 44 FA 109 236. Corresponding connections are sealed with rubber caps. Due to this measure, mixture regulator, marked with blue paint dot, must be installed.

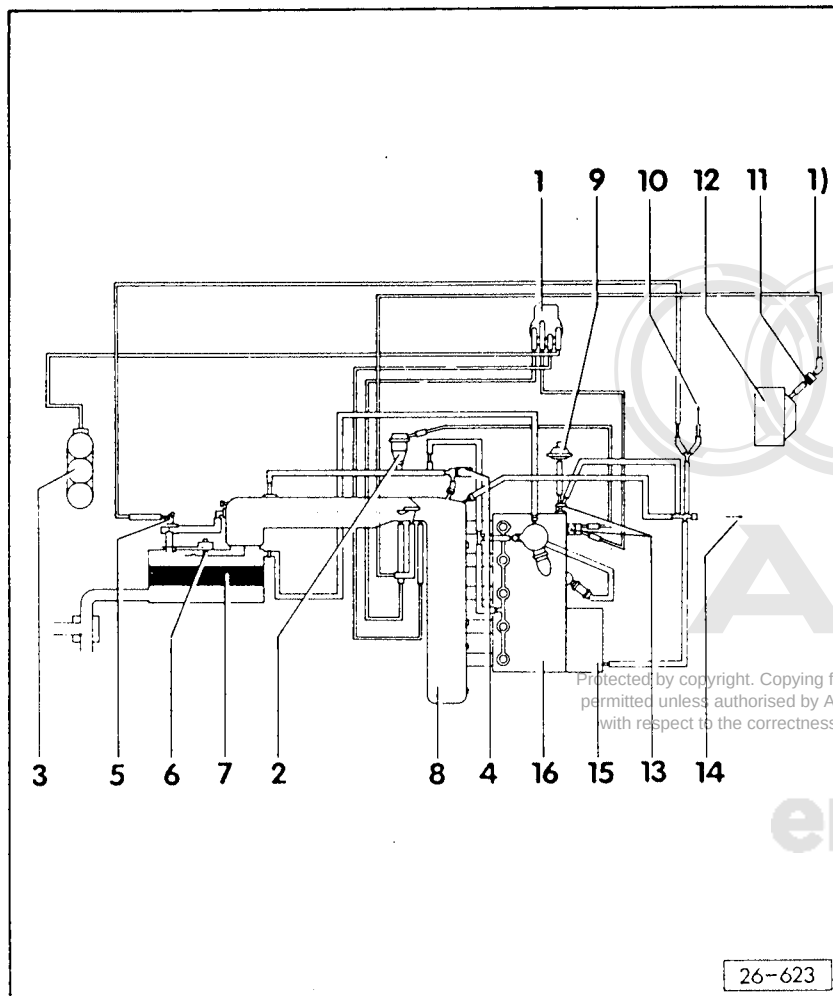
- 1- Vacuum booster
• Checking - Repair Group 26
- 2- Exhaust gas return valve
• Checking - Repair Group 26
- 3- Vacuum reservoir
- 4- Idling speed stabilization valve (N 71)
• Checking - page 25-70
- 5- Overrun cut-off valve (N 65)
• On vehicles with manual gearbox only
• Checking - page 25-172



25-209

Engine code letters: HX

- 6- Mixture control unit
- 7- Air cleaner
- 8- Intake manifold
- 9- Diaphragm pressure switch (F 93)
• Checking - page 25-135
- 10- To differential lock
- 11- Non-return valve
- 12- Ignition distributor-advance unit
• Checking - Repair Group 28
- 13- Thermo-pneumatic valve
• Checking - page 25-135
- 14- To air conditioner
- 15- Warm-up valve (N 9)
• Checking - page 25-187
- 16- Cylinder head



25-210

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VACUUM CONNECTIONS

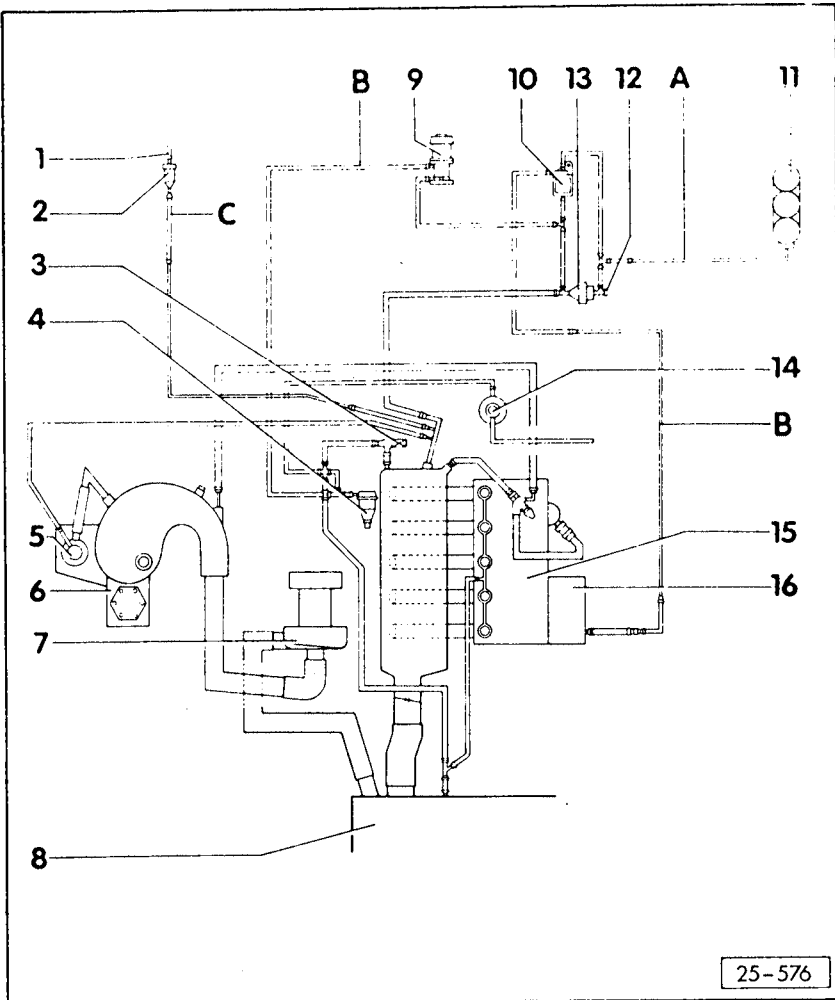
Engine code letters: JY

Note:

Vacuum line colour coding

A = white
B = black
C = green

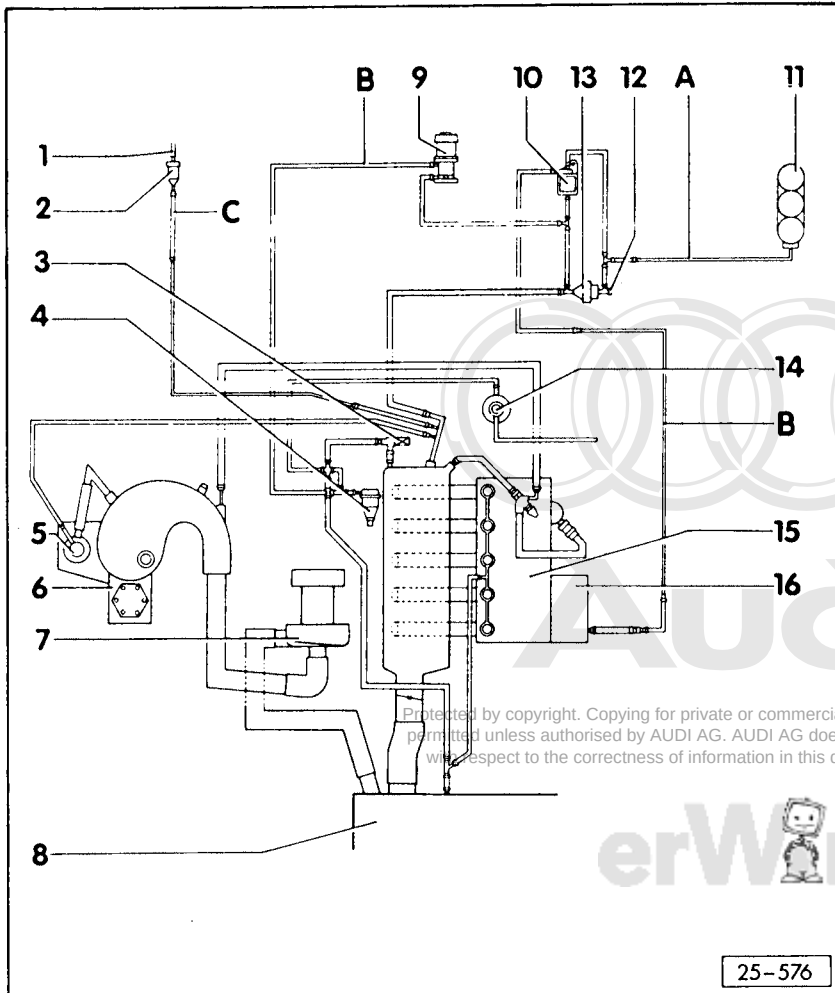
- 1- To FEI control unit (J 88)
- 2- Pressure damper
• Watch installation position
- 3- Idling speed stabilization valve (N 71)
• Checking - page 25-70
- 4- EGR valve (N 18)
• Checking - Repair Group 26
• Checking control - Repair Group 28
- 5- Overrun cut-off valve (N 65)
• On vehicles with manual gearbox only
• Checking - page 25-178
- 6- Mixture control unit
- 7- Exhaust gas turbocharger
• Removing and installing, checking - Repair Group 21



25-211

Engine code letters: JY

- 8- Charge air cooler
• Removing and installing - Repair Group 21
- 9- Vacuum control valve for EGR
- 10- Two-way valve
- 11- Vacuum reservoir
- 12- To air conditioner
- 13- Non-return valve
- 14- Dump valve
• Removing and installing, checking - Repair Group 21
- 15- Cylinder head
- 16- Warm-up valve (N 9)
• Checking - page 25-187



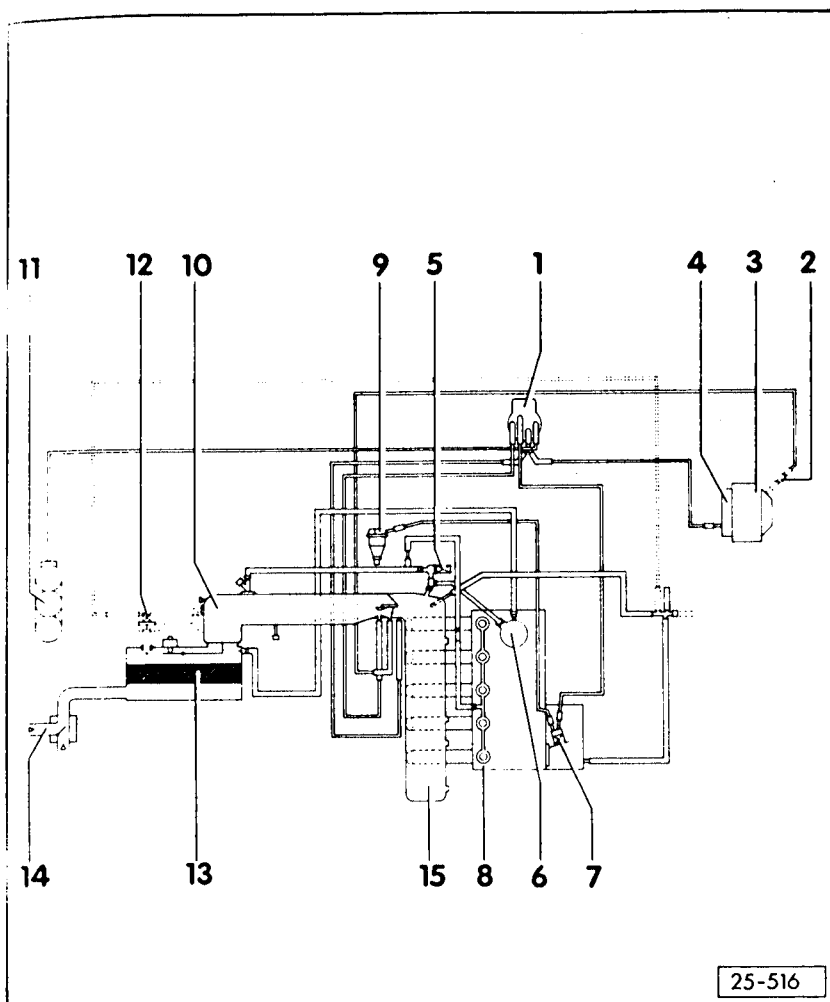
25-212

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VACUUM CONNECTIONS

Engine code letters: KF

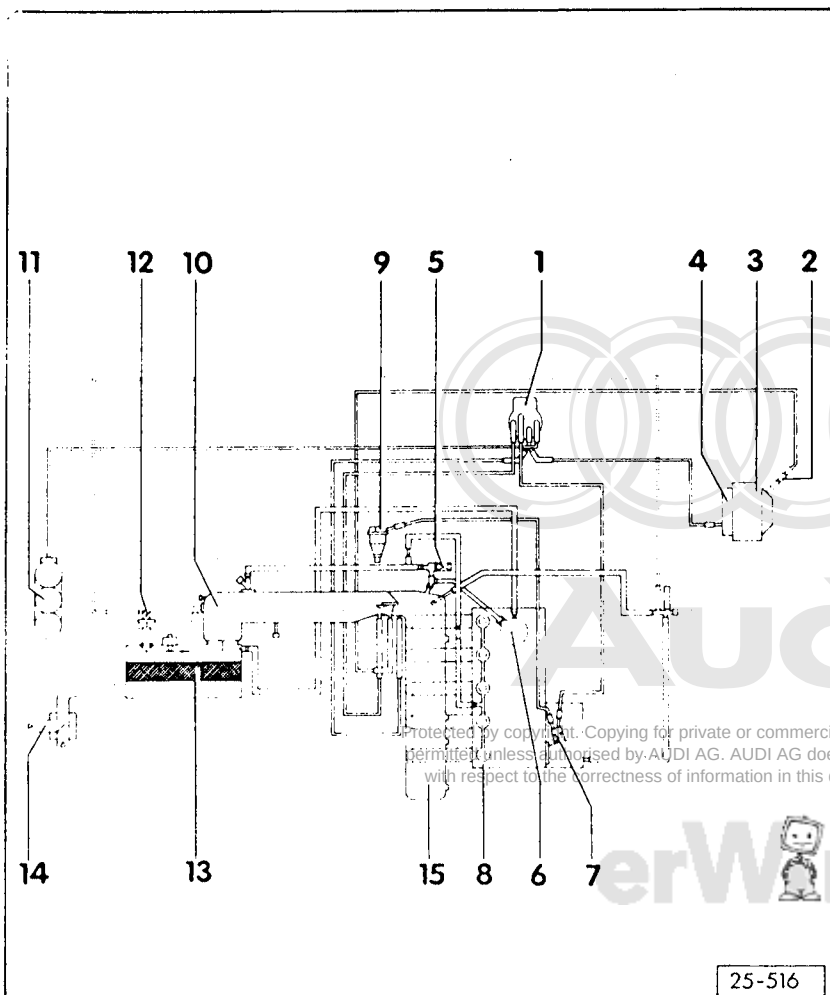
- 1- Vacuum booster
● Checking - Repair Group 26
- 2- Gearchange indicator switch
- 3- Vacuum advance unit
● Checking - Repair Group 28
- 4- Vacuum retard unit
● Checking - Repair Group 28
- 5- Idling speed stabilization valve (N 71)
● Checking - page 25-70
- 6- Crankcase ventilation
- 7- Thermo-pneumatic valve
● Checking - Repair Group 26
- 8- Cylinder head



25-213

Engine code letters: KF

- 9- EGR valve
● Checking - Repair Group 26
- 10- Air intake elbow
- 11- Vacuum reservoir
- 12- Overrun cut-off valve (N 65)
● On vehicles with manual gearbox only
● Checking - page 25-172
- 13- Air cleaner
- 14- Control box with thermostat
- 15- Intake manifold



25-214

VACUUM CONNECTIONS

Engine code letters: KG

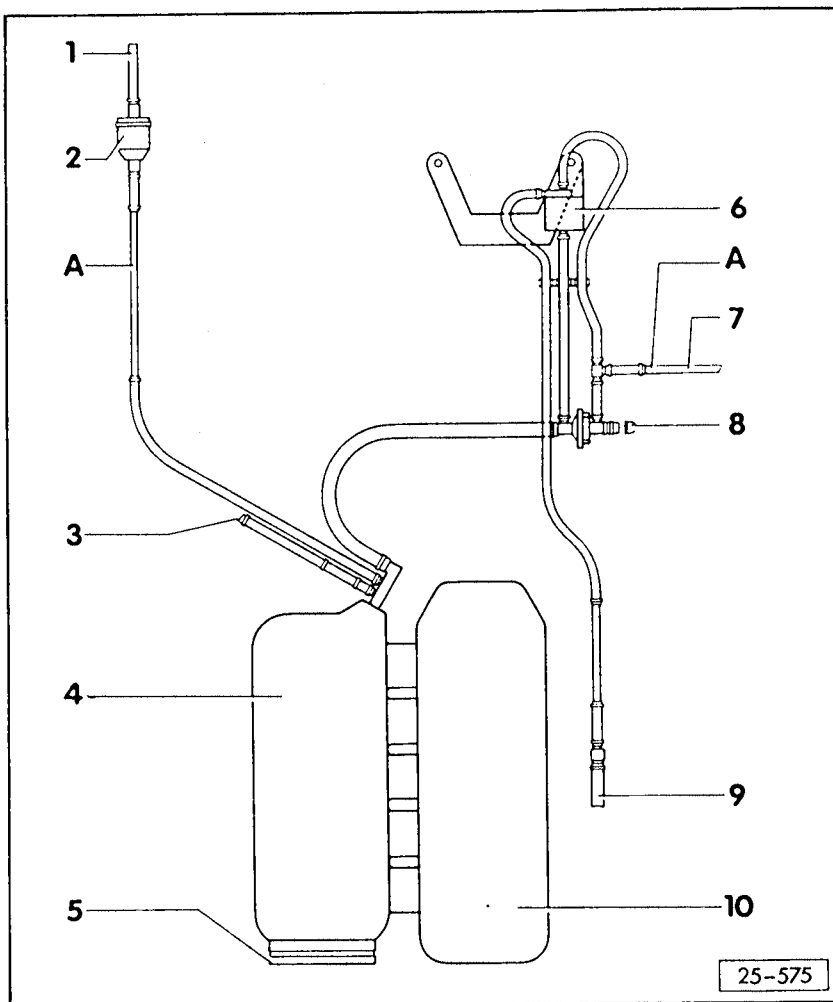
Note:

Vacuum line colour coding

A = green

B = white

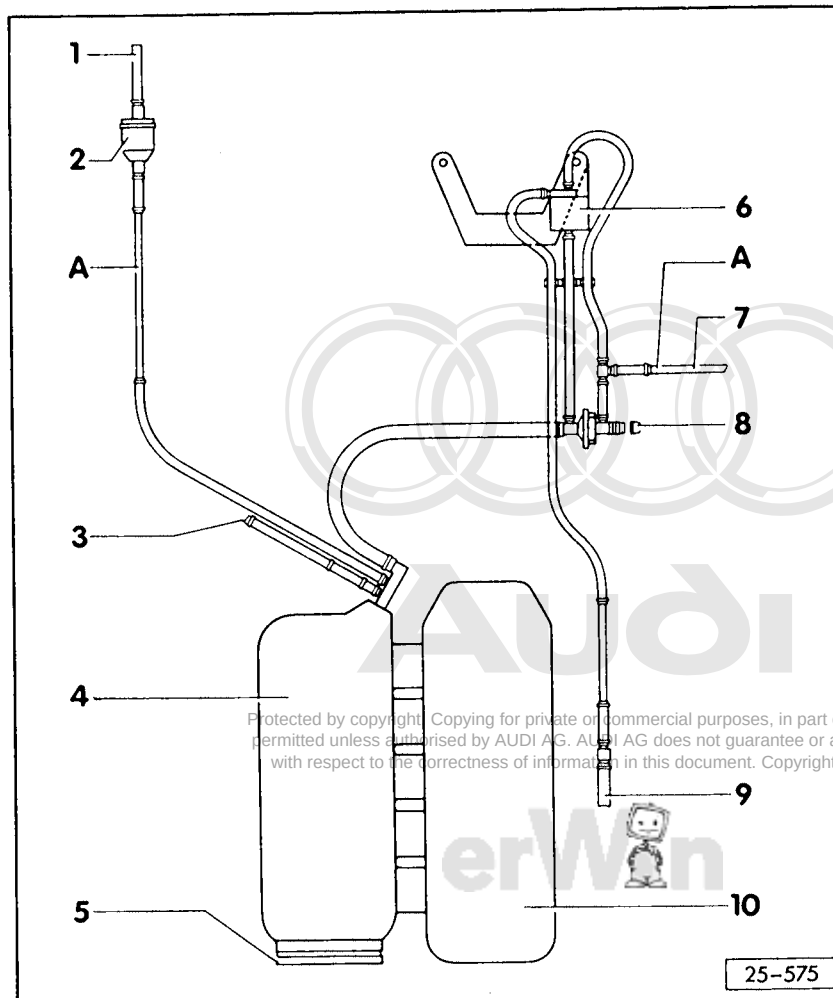
- 1- To FEI control unit (J 88)
- 2- Pressure damper
 - Watch installation position
- 3- To overrun cut-off valve (N 65)
 - Checking overrun cut-off - page 25-178
- 4- Intake manifold
- 5- Throttle valve housing
- 6- Two-way valve for full throttle enrichment
- 7- To vacuum reservoir
- 8- To air conditioner



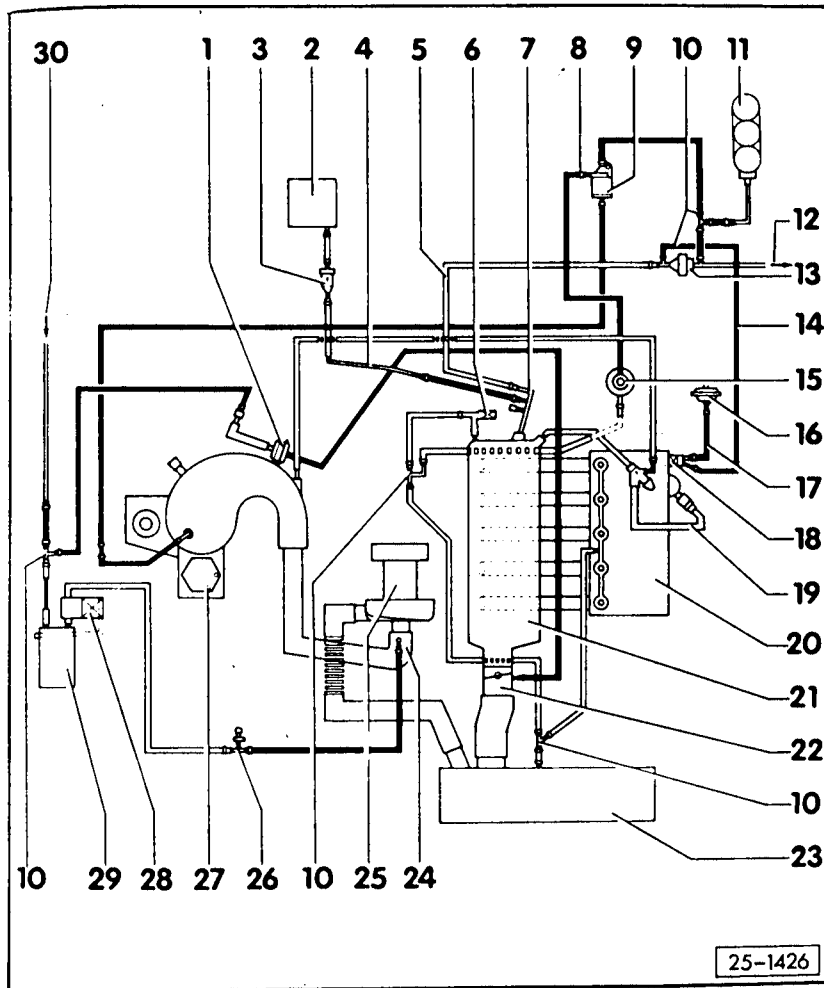
25-215

Engine code letters: KG

- 9- To warm-up valve (N 9)
 - Checking warm-up valve - page 25-187
- 10- Cylinder head



25-216

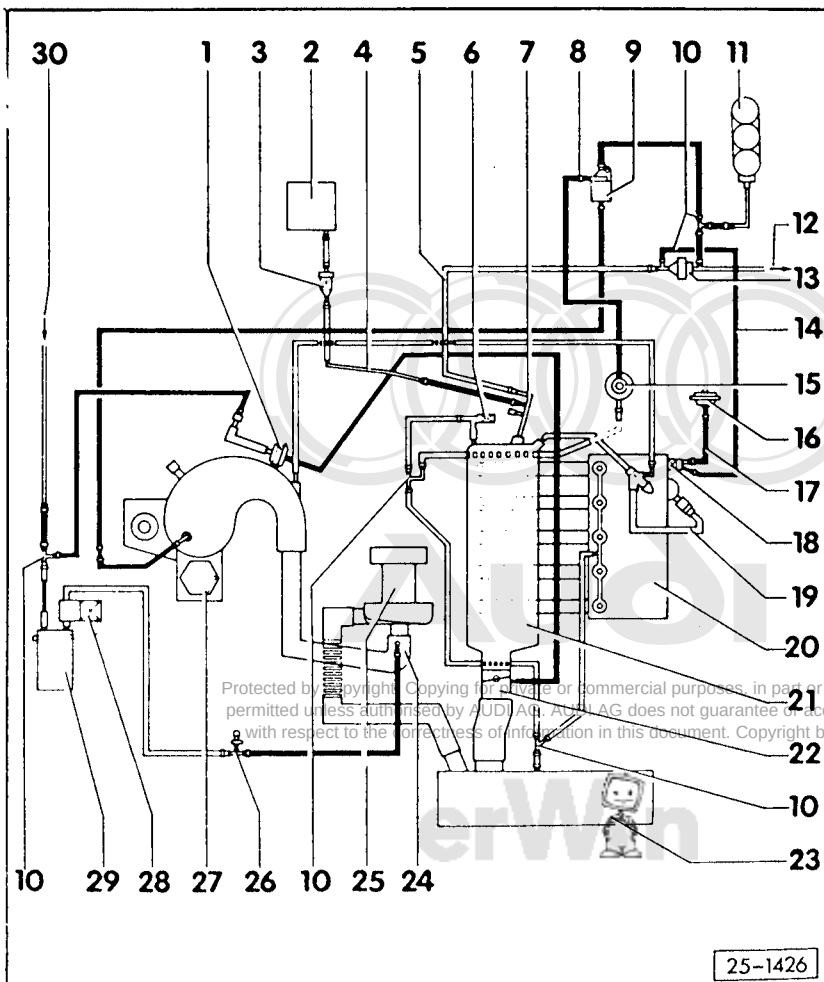


VACUUM CONNECTIONS

Engine code letters: KH

- 1- Cut-off valve for activated charcoal filter
• Checking - page 25-221
- 2- FEI control unit (J 88)
- 3- Pressure damper
• Watch installation position
- 4- Vacuum line
- 5- Vacuum line
• From vacuum connection -7- to non-return valve -13-
- 6- Idling speed stabilization valve (N 71)
• Checking - page 25-70
- 7- Vacuum connection
• With three connections
- 8- Vacuum line

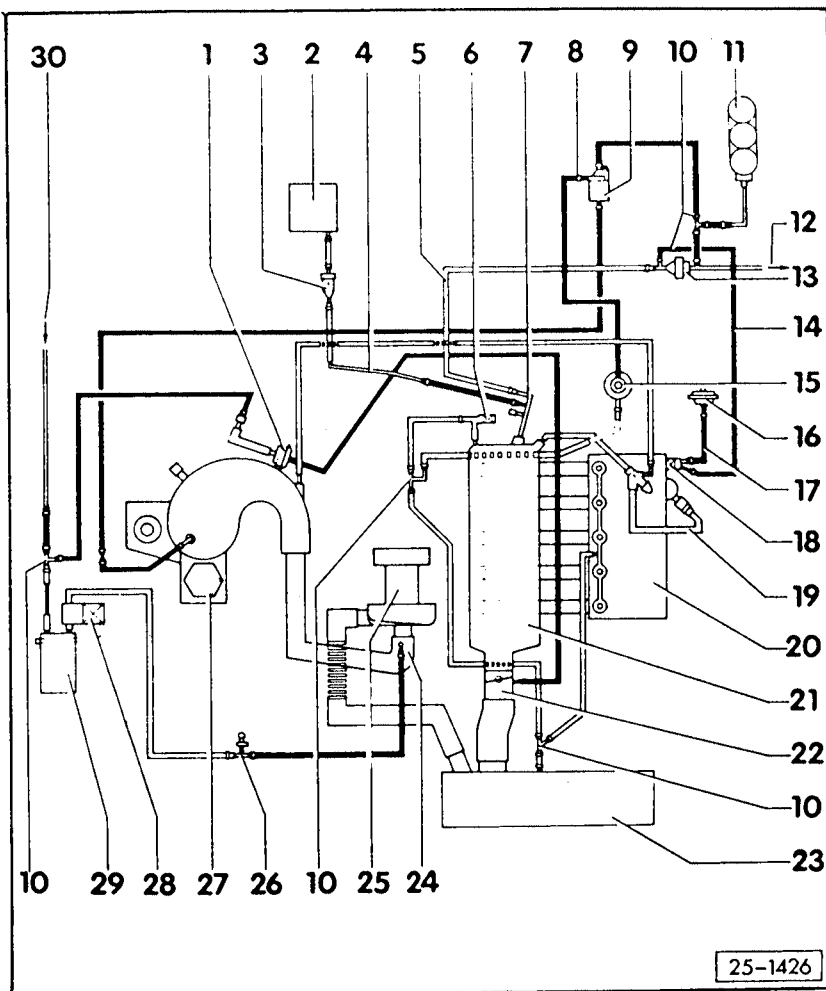
25-217



Engine code letters: KH

- 9- Two-way valve
- 10- T-piece
- 11- Vacuum reservoir
- 12- To differential lock and air conditioner
- 13- Non-return valve
- 14- Vacuum line
• Engines with diaphragm pressure switch -16- only
- 15- Dump valve
• Checking - Repair Group 21
- 16- Diaphragm pressure switch (F 93)
• Not on all engines
• Checking - page 25-135
- 17- Vacuum line
• Not on engines with diaphragm pressure switch -16-
- 18- Thermo-pneumatic valve
• Checking - page 25-135
• Only on engines with diaphragm pressure switch -16-

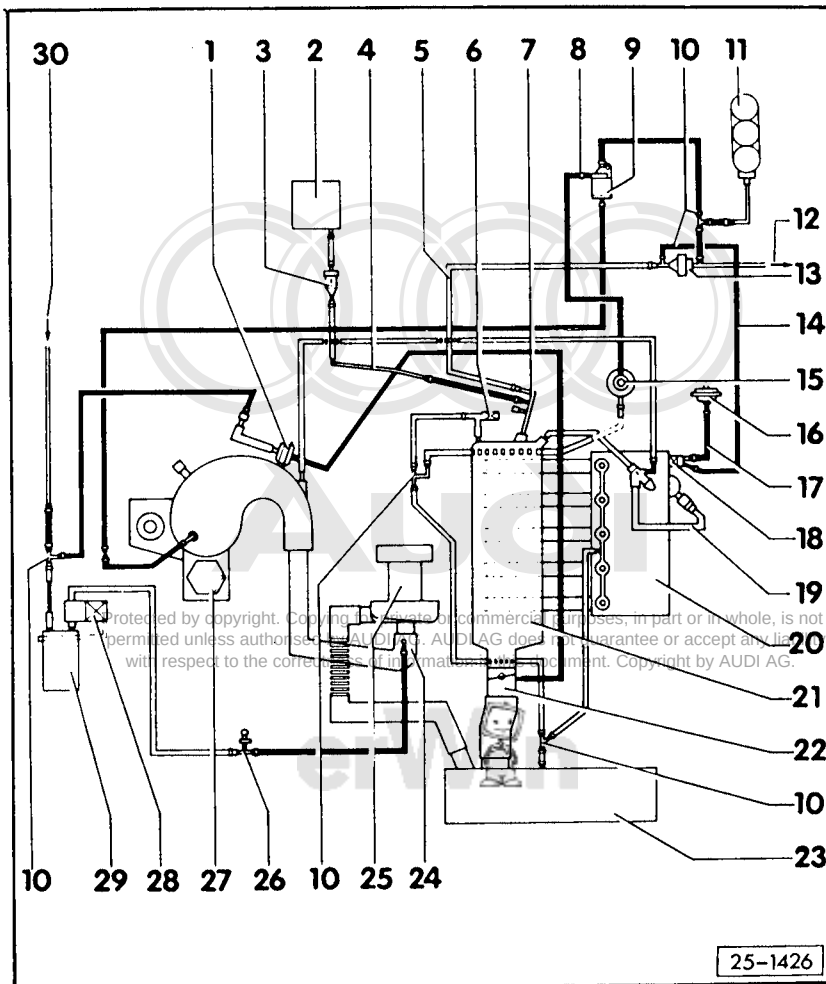
25-218



Engine code letters: KH

- 19- Crankcase ventilation
- 20- Cylinder head
- 21- Intake manifold
- 22- Throttle valve housing
- 23- Charge air cooler
 - Removing and installing - Repair Group 21
- 24- Hose elbow for exhaust gas turbocharger
- 25- Exhaust gas turbocharger
 - Removing and installing, checking - Repair Group 21
- 26- Ventilation connection
- 27- Mixture control unit

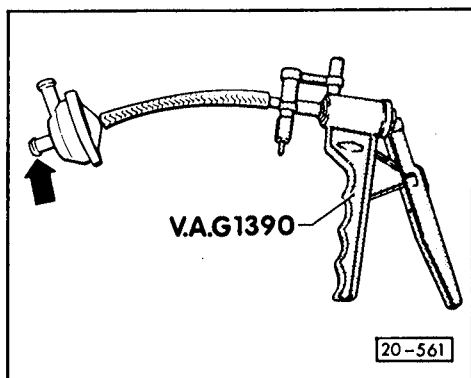
25-219



Engine code letters: KH

- 28- Activated charcoal filter system solenoid valve
 - Checking - page 25-221
- 29- Activated charcoal filter
- 30- From fuel filter

25-220



Checking cut-off valve for activated charcoal filter

- ▶ - Connect vacuum pump to small connection
- Blow into large opening (arrow)
 - No throughflow, valve closed
- Operate vacuum pump
 - Throughflow, valve open
- Renew defective valve.

Checking solenoid valve for activated charcoal filter

Note:

Solenoid valve for activated charcoal filter is located directly on activated charcoal filter.

- Switch on ignition

Solenoid valve must hum/vibrate

- Switch off ignition

If no humming/vibration detected:

- Disconnect plug from solenoid valve.

25-221

- Connect hand multimeter V.A.G 1526 to disconnected plug for voltage measurement with auxiliary leads from V.A.G 1594.
- Switch on ignition

Specified value: approx. battery voltage

If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

If specified value is attained, renew solenoid valve for activated charcoal filter.



Audi

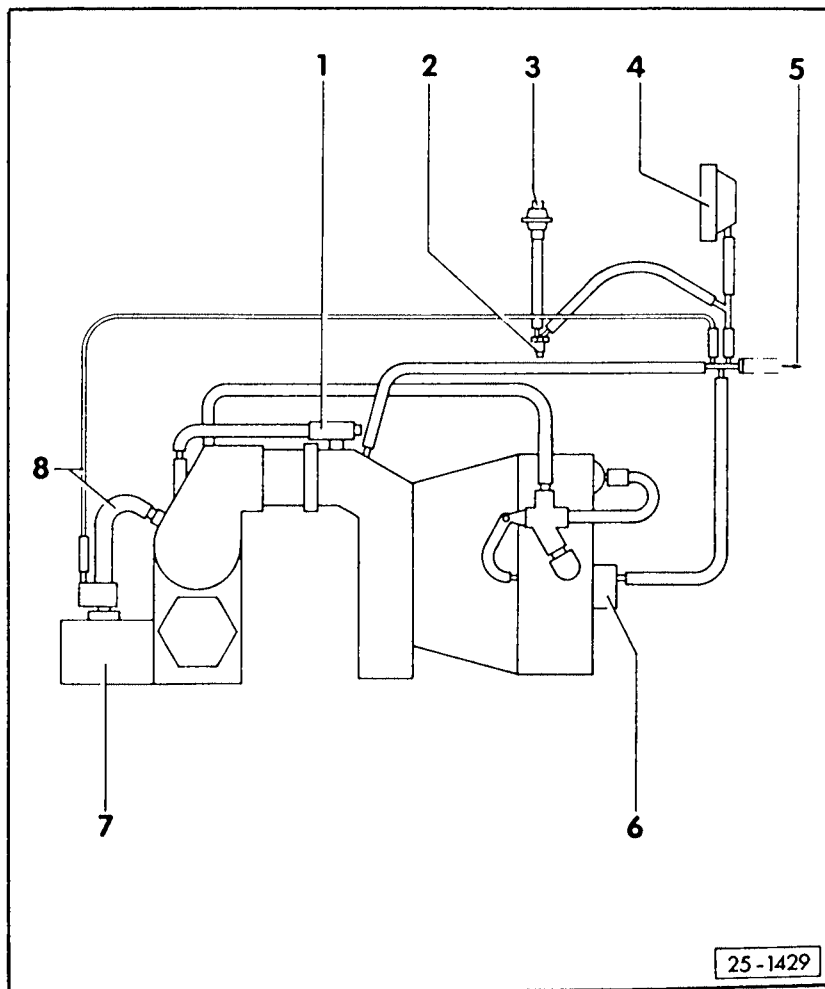
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erWin 

VACUUM CONNECTIONS

Engine code letters: KP

- 1- Idling speed stabilization valve (N 71)
• Checking - page 25-70
- 2- Thermo-pneumatic valve for diaphragm pressure switch 18 ... 28°C
• Checking - page 25-135
- 3- Diaphragm pressure switch
• Checking - page 25-135
- 4- Ignition distributor advance unit
• Checking - Repair Group 28
- 5- To air conditioner
- 6- Warm-up valve (N 9)
• Checking - page 25-187
- 7- Overrun cut-off valve (N 65)
• On manual gearbox only
• Checking - page 25-172
- 8- On manual gearbox only



25-223

VACUUM CONNECTIONS

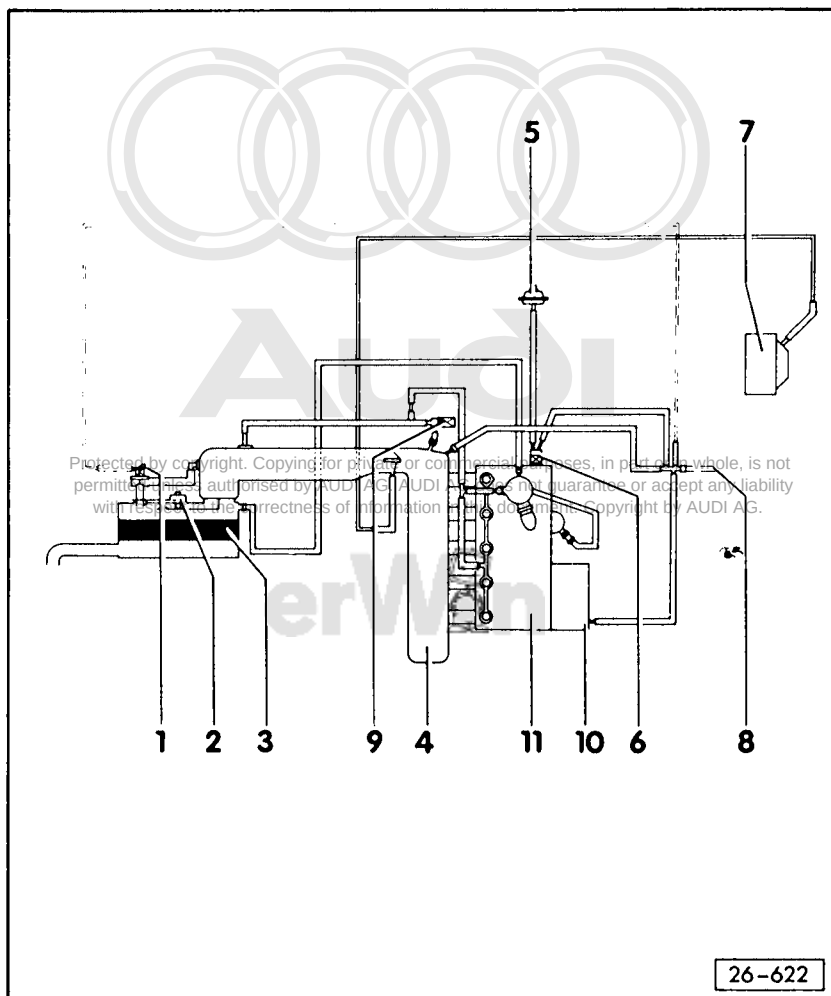
Engine code letters: KU

Note:

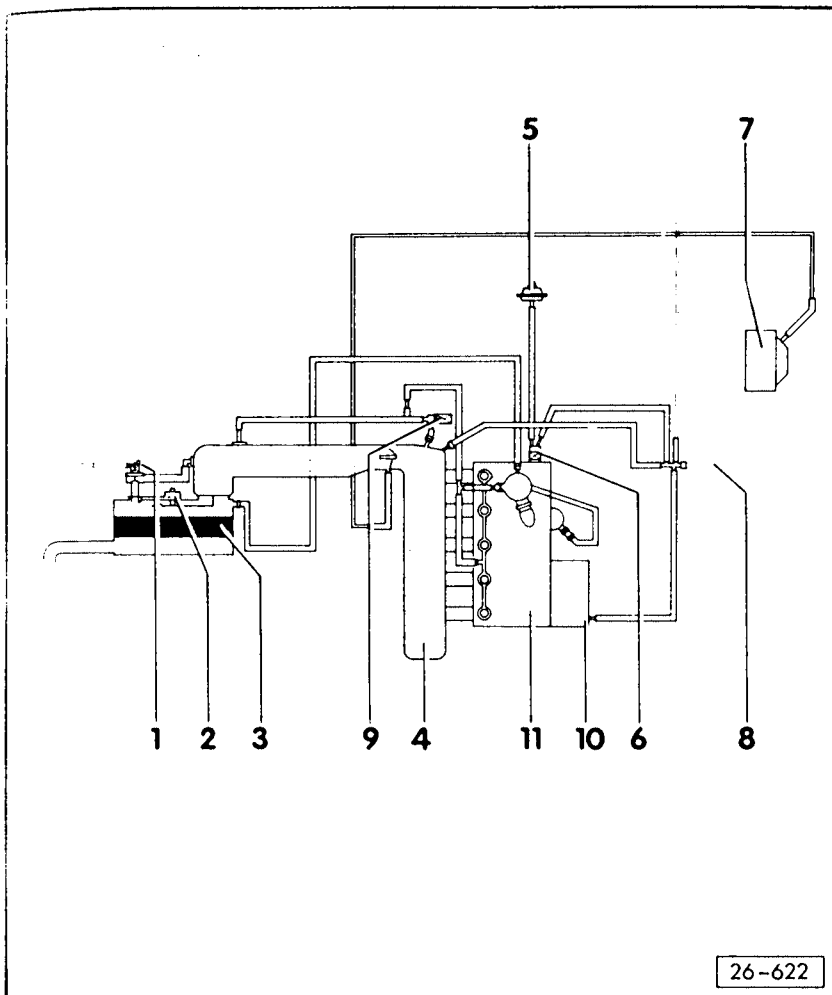
- Vacuum connections on Quattro - page 25-226

- - - Vehicles with manual transmission only
-.-.- Vehicles with air conditioner only

- 1- Overrun cut-off valve (N 65)
• On manual gearbox only
• Checking - page 25-172
- 2- Mixture regulator
- 3- Air cleaner
- 4- Intake manifold
- 5- Diaphragm pressure switch
• Checking - page 25-135
- 6- Thermo-pneumatic valve
• Checking - page 25-135
- 7- Ignition distributor advance unit
• Checking - Repair Group 28



25-224



Engine code letters: KU

8- To air conditioner

9- Idling speed stabilization valve
(N 71)

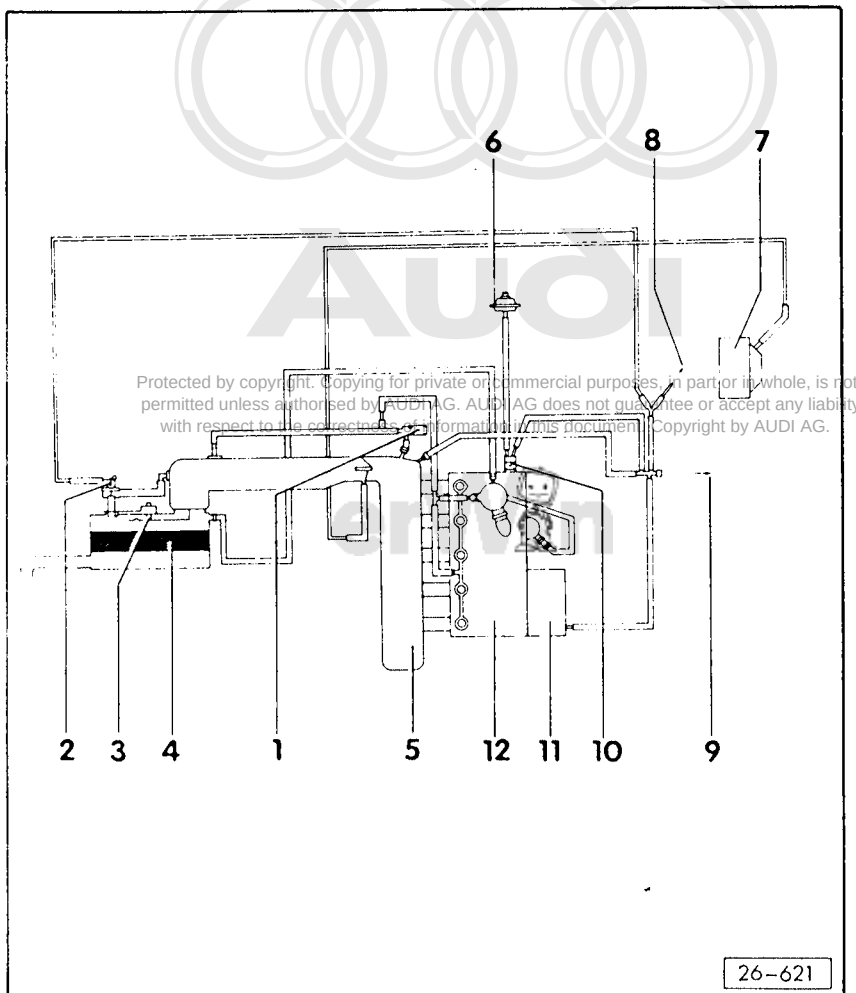
• Checking - page 25-70

10- Warm-up valve (N 9)

• Checking - page 25-187

11- Cylinder head

25-225



VACUUM CONNECTIONS

Engine code letters: KU

• On Quattro only

1- Idling speed stabilization valve
(N 71)

• Checking - page 25-70

2- Overrun cut-off valve (N 65)

• With air conditioner only

• Checking - page 25-172

3- Mixture regulator

4- Air cleaner

5- Intake manifold

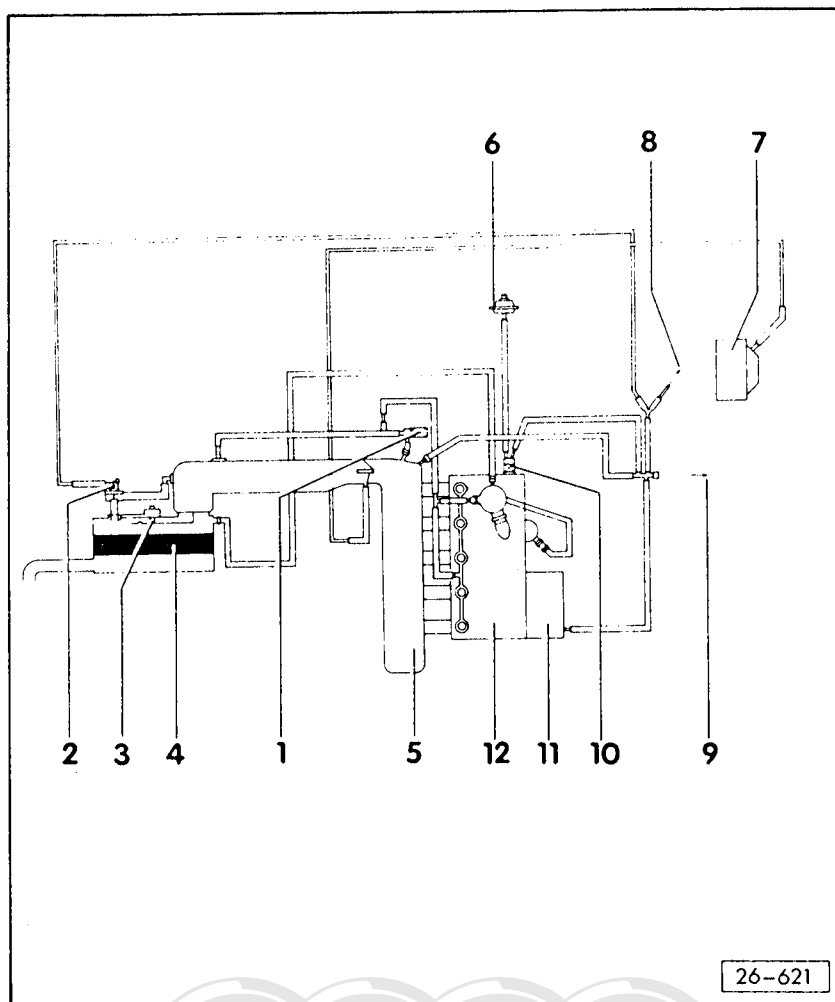
6- Diaphragm pressure switch

• Checking - page 25-135

7- Ignition distributor - advance unit

• Checking - Repair Group 28

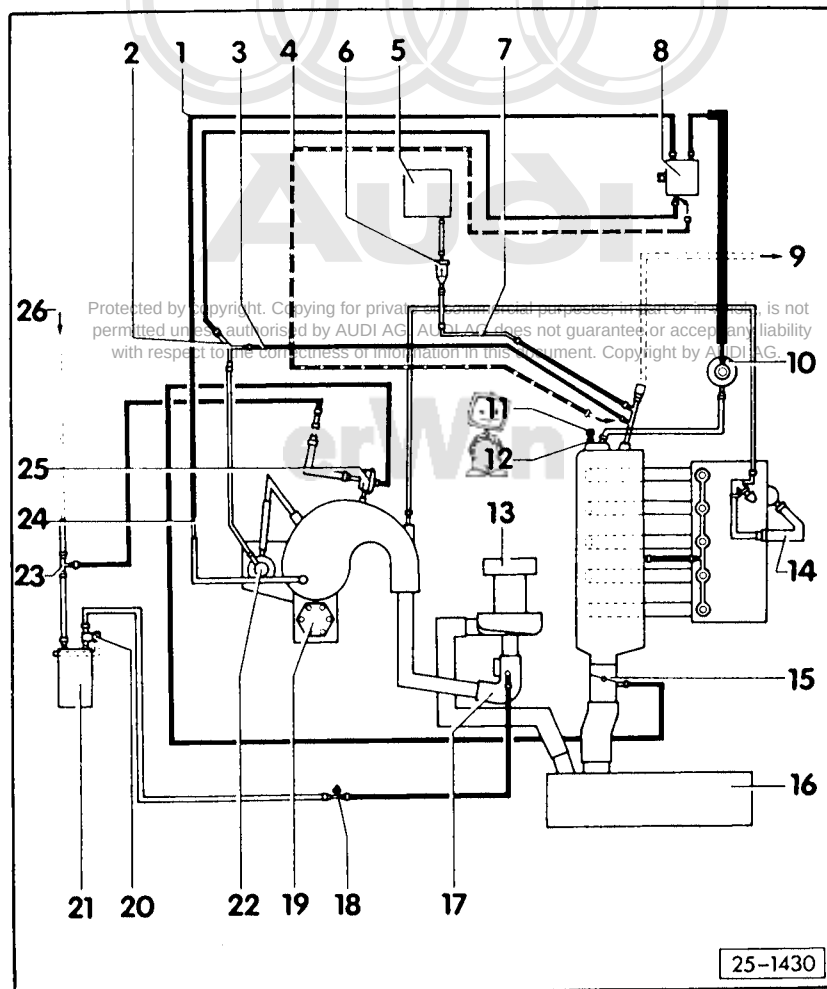
25-226



Engine code letters: KU

- 8- To differential lock
- 9- To air conditioner
- 10- Thermo-pneumatic valve
 - Checking - page 25-135
- 11- Warm-up valve (N 9)
 - Checking - page 25-187
- 12- Cylinder head

25-227



VACUUM CONNECTIONS

Engine code letters: MC with one knock sensor

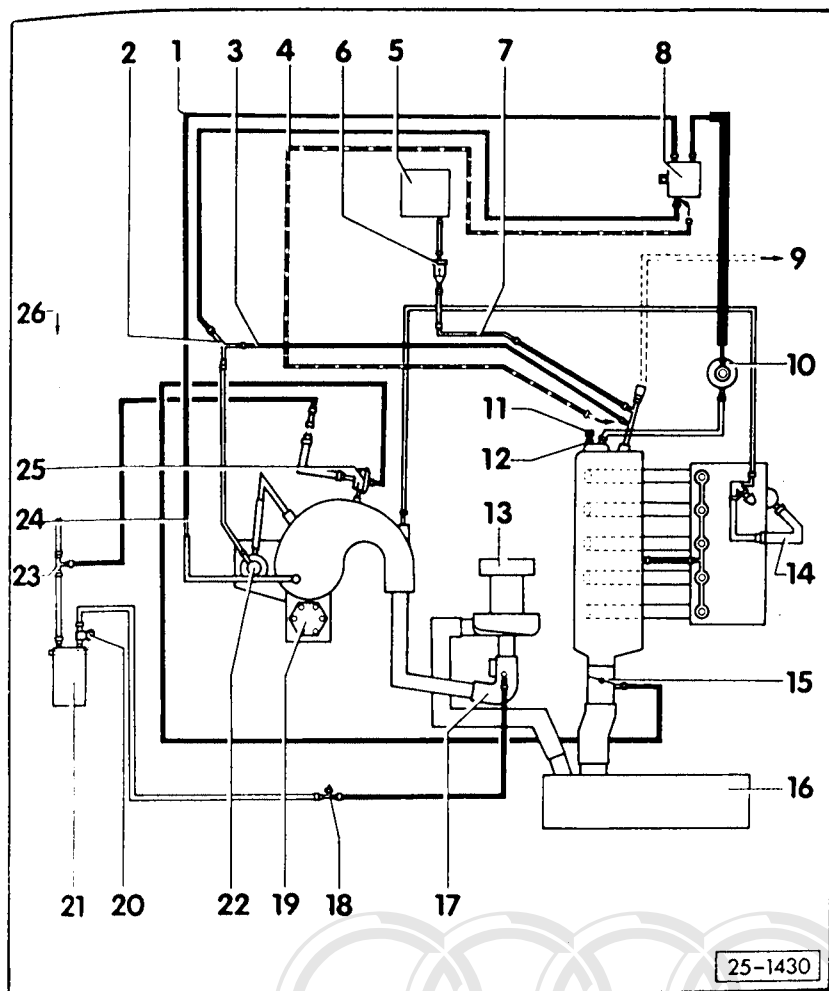
- Up to model year 85

Note:

- From model year 86 - page 25-231

- 1- Vacuum line
 - On manual gearbox only
- 2- T-piece
 - On manual gearbox only
- 3- Vacuum line
 - On manual gearbox only
- 4- Vacuum line
 - On automatic gearbox only
- 5- FEI control unit (J 88)
- 6- Pressure damper
 - Watch installation position
- 7- Vacuum line
 - Green
 - Runs in wiring loom to pressure damper -6-

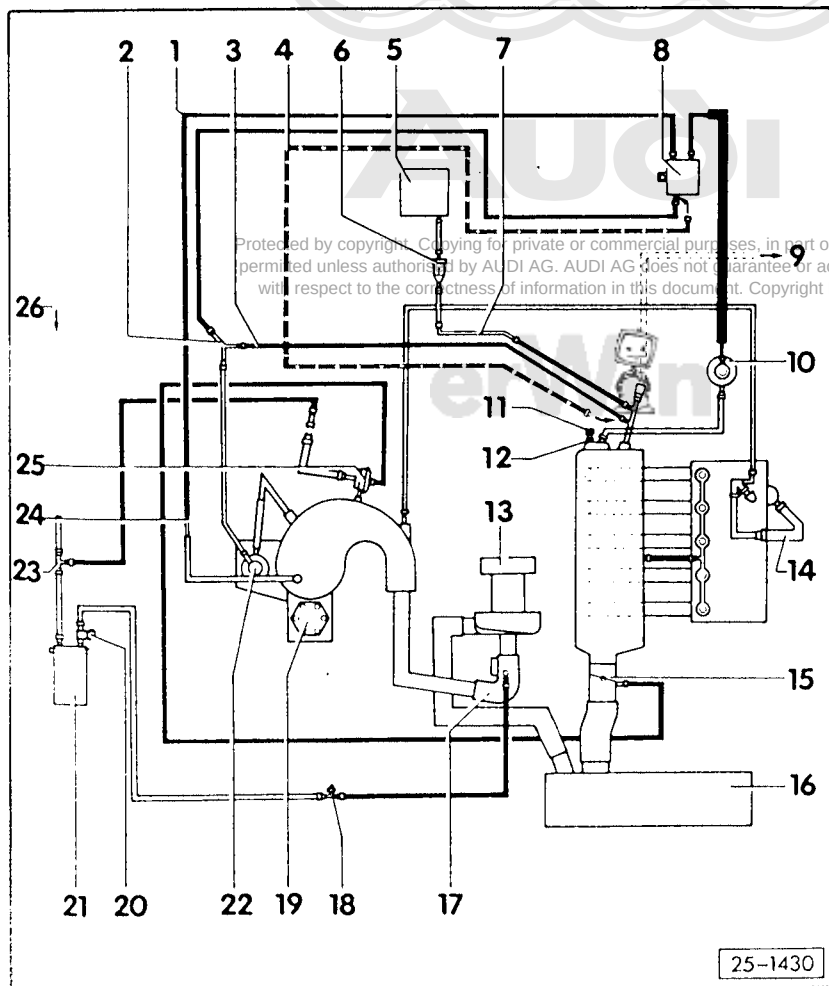
25-228



Engine code letters: MC with one knock sensor

- 8- Solenoid valve for boost pressure control (N 75)
• Checking control - Repair Group 01
- 9- To differential lock and air conditioner
- 10- Dump valve
• Checking - Repair Group 21
- 11- Dummy plug
- 12- Vacuum connection
- 13- Exhaust gas turbocharger
• Removing and installing, checking - Repair Group 21
- 14- Crankcase ventilation
- 15- Throttle valve housing
- 16- Charge air cooler
• Removing and installing - Repair Group 21
- 17- Hose elbow of exhaust gas turbocharger

25-229



Engine code letters: MC with one knock sensor

- 18- Ventilation connection
- 19- Mixture control unit
- 20- Activated charcoal filter system solenoid valve 1 (N 80)
• Checking control - Repair Group 01
- 21- Activated charcoal filter
- 22- Overrun cut-off valve (N 65)
• On manual gearbox only
• Checking - page 25-182
- 23- T-piece
- 24- Reduction piece
- 25- Cut-off valve for activated charcoal filter
• Checking - page 25-234 - Fig. 1
- 26- From fuel tank

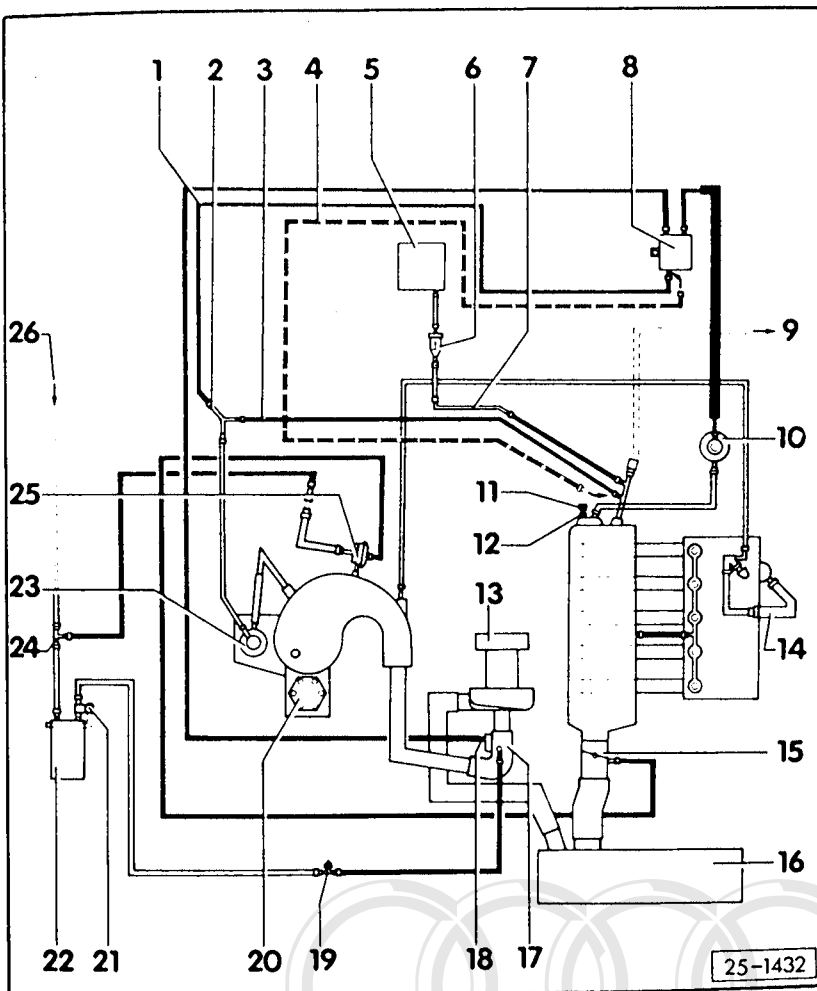
25-230

VACUUM CONNECTIONS

Engine code letters: MC with one knock sensor

- From model year 86

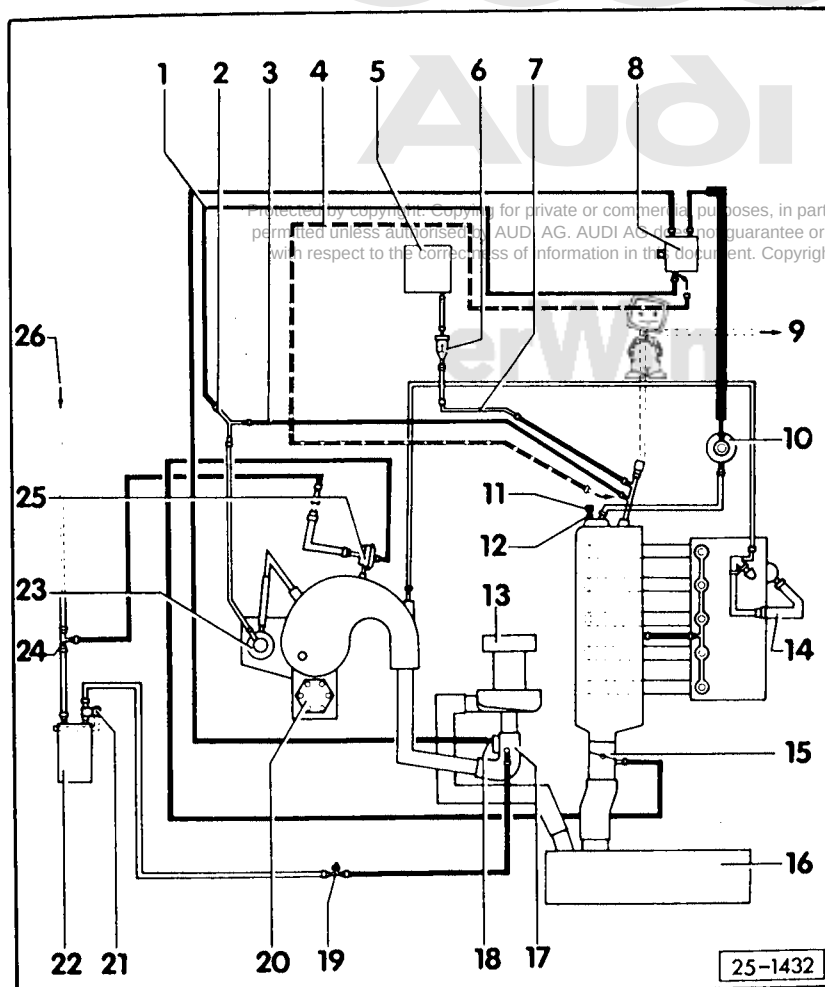
- 1- Vacuum line
 - On manual gearbox only
- 2- T-piece
 - On manual gearbox only
- 3- Vacuum line
 - On manual gearbox only
- 4- Vacuum line
 - On automatic gearbox only
- 5- FEI control unit (J 88)
- 6- Pressure damper
 - Watch installation position
- 7- Vacuum line
 - Green
 - Runs in wiring loom to pressure damper -6-



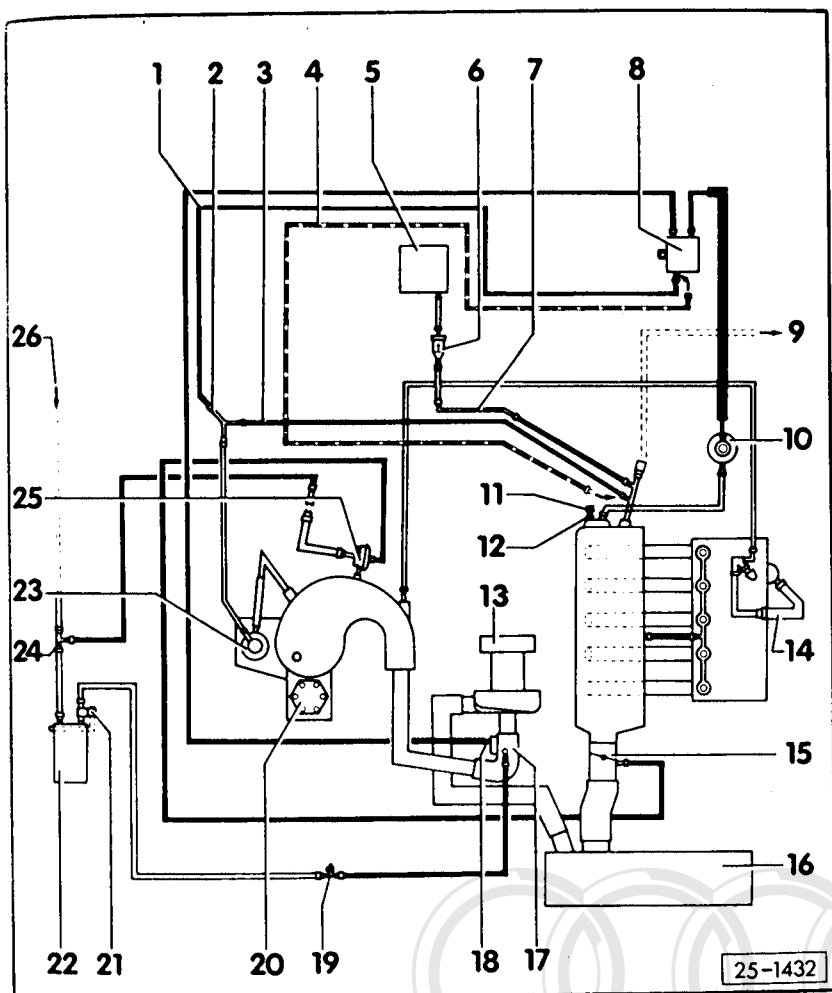
25-231

Engine code letters: MC with one knock sensor

- 8- Solenoid valve for boost pressure control (N 75)
 - Checking control - Repair Group 01
- 9- To differential lock and air conditioner
- 10- Dump valve
 - Checking - Repair Group 21
- 11- Dummy plug
- 12- Vacuum connection
- 13- Exhaust gas turbocharger
 - Removing and installing, checking - Repair Group 21
- 14- Crankcase ventilation
- 15- Throttle valve housing
- 16- Charge air cooler
 - Removing and installing - Repair Group 21
- 17- Hose elbow of exhaust gas turbocharger



25-232



Engine code letters: MC with one knock sensor

- 18- Reducing piece
- 19- Ventilation connection
- 20- Mixture control unit
- 21- Activated charcoal filter system
solenoid valve 1 (N 80)
• Checking control - Repair Group 01
- 22- Activated charcoal filter
- 23- Overrun cut-off valve (N 65)
• Checking - page 25-182
- 24- T-piece
- 25- Cut-off valve for activated charcoal filter
• Checking - page 25-234 - Fig. 1
- 26- From fuel tank

25-233

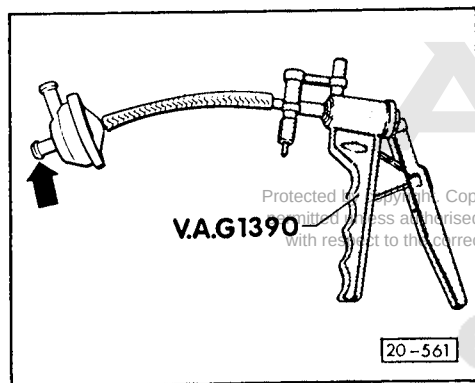


Fig. 1 Checking cut-off valve for activated charcoal filter

- Connect vacuum pump to small connection.
- Blow into large opening (arrow).
• No throughflow, valve closed.
- Operate vacuum pump.
• Throughflow, valve open.
- Renew defective valve.

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VACUUM CONNECTIONS

Engine code letters: MC with two knock sensors

- 1- FEI control unit (J 88)
- 2- Ventilation line from fuel tank
- 3- Activated charcoal filter system solenoid valve 2 (N 115)
 - Checking - page 25-237
 - Checking control - Repair Group 01
- 4- Overrun cut-off valve (N 65)
 - On manual gearbox only
 - Checking - page 25-187
- 5- Sealing cap
 - Remove to check CO content
- 6- Activated charcoal filter
- 7- Activated charcoal filter system solenoid valve 1 (N 80)
 - Checking - page 25-237
 - Checking control - Repair Group 01
- 8- Reducing piece with restrictor

25--1196

25-235

Engine code letters: MC with two knock sensors

- 9- Solenoid valve for boost pressure control (N 75)
 - Checking control - Repair Group 01
- 10- Pressure damper
 - Watch installation position
- 11- To air conditioner
- 12- Dump valve
 - Checking - Repair Group 21
- 13- Crankcase ventilation
- 14- Air-shrouded injectors
- 15- Intake manifold
- 16- Exhaust gas turbocharger
 - Removing and installing, checking - Repair Group 21
- 17- Charge air cooler
 - Removing and installing - Repair Group 21

25--1196

25-236

Checking operation of solenoid valves 1 and 2 for activated charcoal filter

A - Activated charcoal filter system solenoid valve 1 (N 80)

- Start engine and run it at idle

- After 30 seconds solenoid valve begins to cycle with audible clicking.

If cycling (clicking) is not audible:

- ▶ - Disconnect connector from solenoid valve 1 and connect diode test lamp V.A.G 1527 to plug with auxiliary leads from V.A.G 1594.

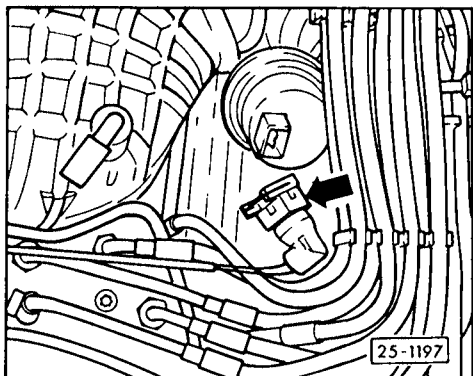
LED must flash.

If LED flashes, renew solenoid valve 1.

If LED does not flash, locate and eliminate break in wiring using current flow diagram.

Note:

Solenoid valve 1 (N 80) can also be checked with final control element diagnosis - Repair Group 01.



25-237

B - Activated charcoal filter system solenoid valve 2 (N 115)

- ▶ - Pull connector plug off solenoid valve 2 and connect diode test lamp V.A.G 1527 to plug with auxiliary leads from V.A.G 1594.

- Start engine and run at it idle.

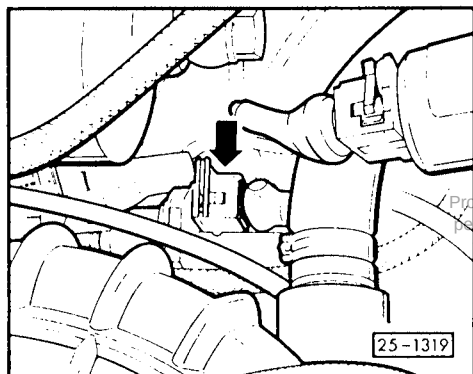
- Increase engine speed to above 1500 rpm.

LED must light up.

If LED does not light up, locate and eliminate break in wiring using current flow diagram.

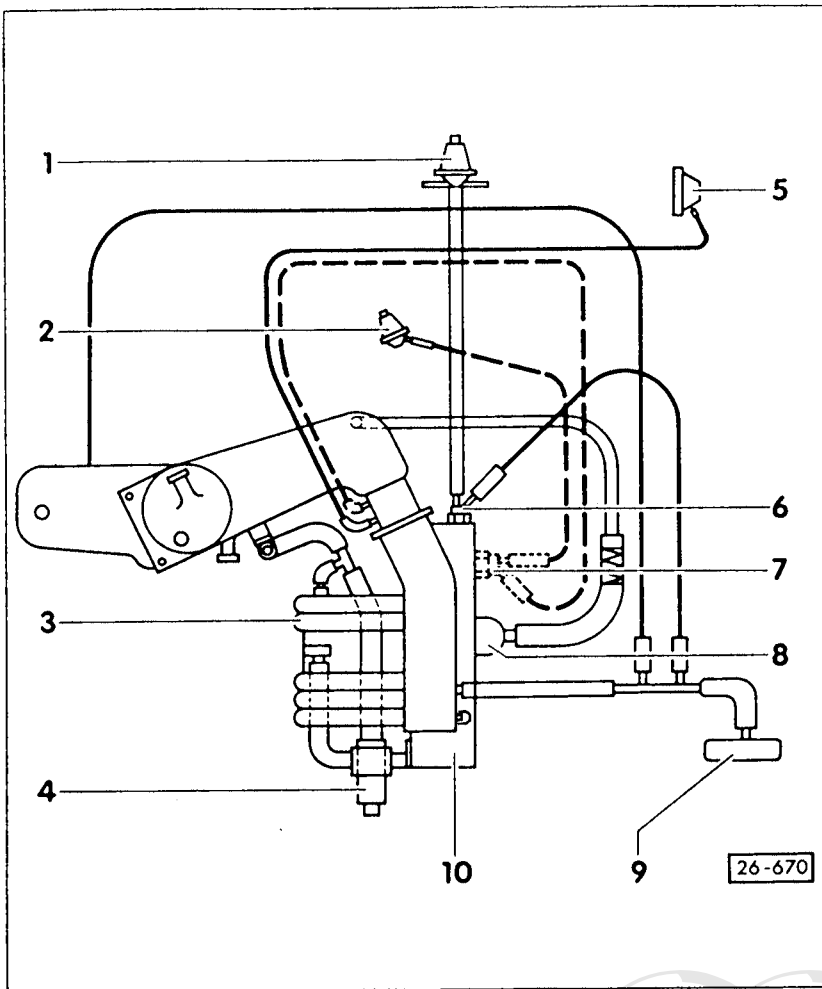
Note:

Solenoid valve 2 (N 115) can also be checked with final control element diagnosis - Repair Group 01.



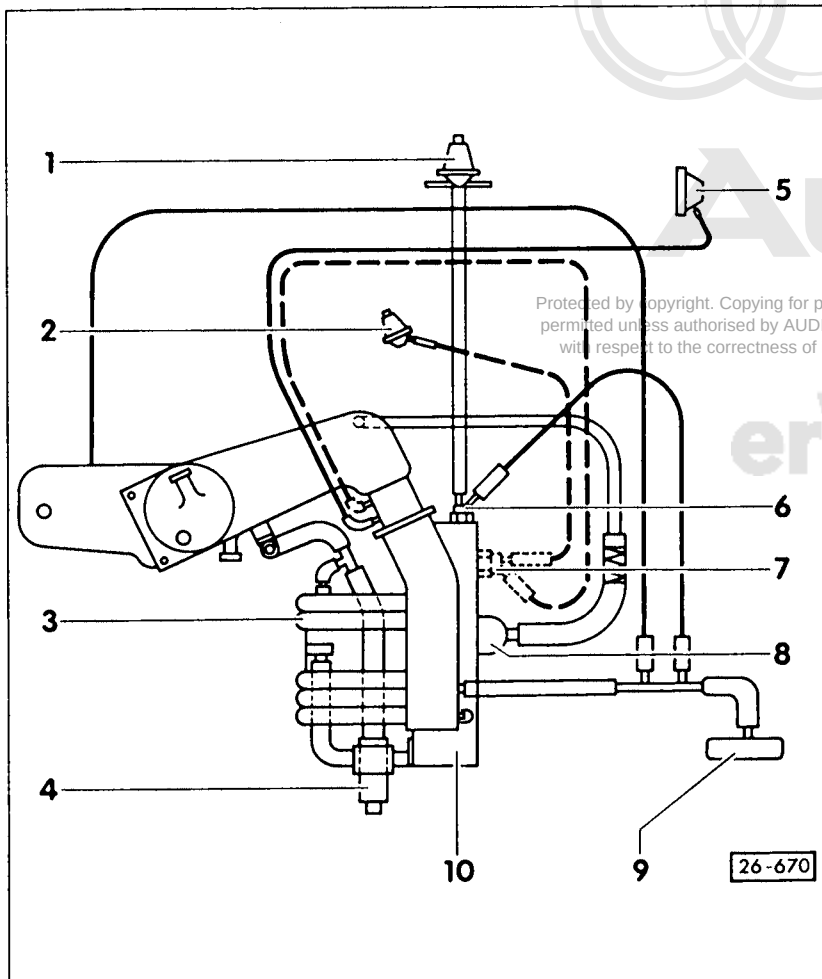
VACUUM CONNECTIONS

Engine code letters: RT



- 1- Diaphragm pressure switch
 - Checking - page 25-135
- 2- EGR valve
 - Checking - Repair Group 26
 - On automatic gearbox only
- 3- Intake manifold
- 4- Idling speed stabilization valve (N 71)
 - Checking - page 25-70
- 5- Ignition distributor - advance unit
 - Checking - Repair Group 28
- 6- Thermo-pneumatic valve
 - For diaphragm pressure switch -1-
 - Checking - page 25-135

25-239



Engine code letters: RT

- 7- Thermo-pneumatic valve
 - Checking - Repair Group 26
 - With automatic gearbox only
- 8- Crankcase ventilation
- 9- Warm-up valve (N 9)
 - Checking - page 25-187
- 10- Cylinder head

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25-240

VACUUM CONNECTIONS

Engine code letters: SL

--- On vehicles with air conditioner only

1- Overrun cut-off valve (N 65)
 • With manual gearbox only
 • Checking - page 25-172

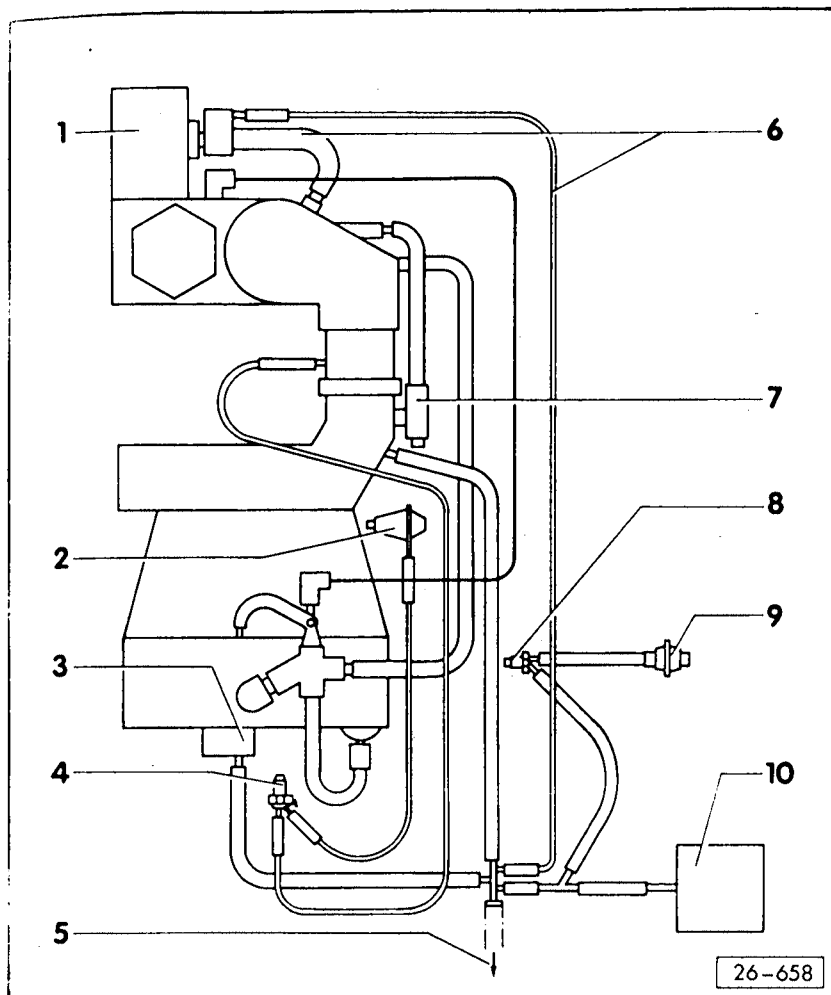
2- EGR valve
 • Checking - Repair Group 26

3- Warm-up valve (N 9)
 • Checking - page 25-187

4- Thermo-pneumatic valve
 • Checking - Repair Group 26

5- To air conditioner

6- With manual gearbox only



25-241

Engine code letters: SL

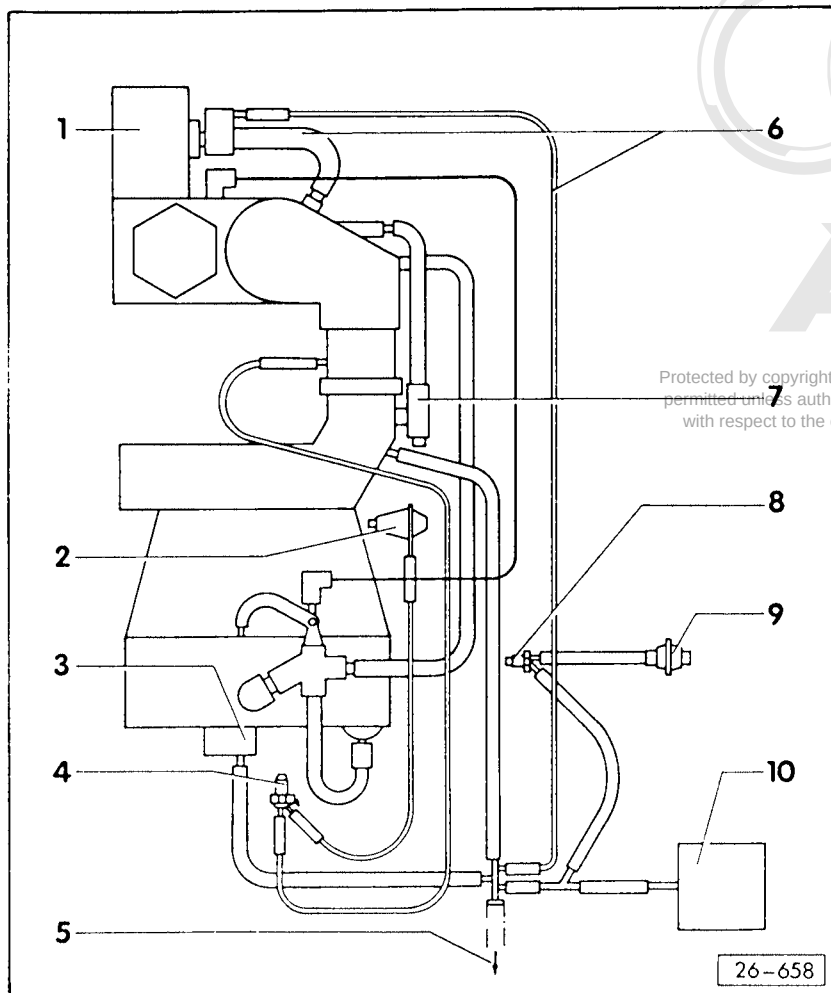
7- Idling speed stabilization valve (N 71)
 • Checking - page 25-70

8- Thermo-pneumatic valve, 18...28°C
 • For diaphragm pressure switch -9-
 • Checking - page 25-135

9- Diaphragm pressure switch
 • Checking - page 25-135

10- FEI control unit (J 88)

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25-242

VACUUM CONNECTION

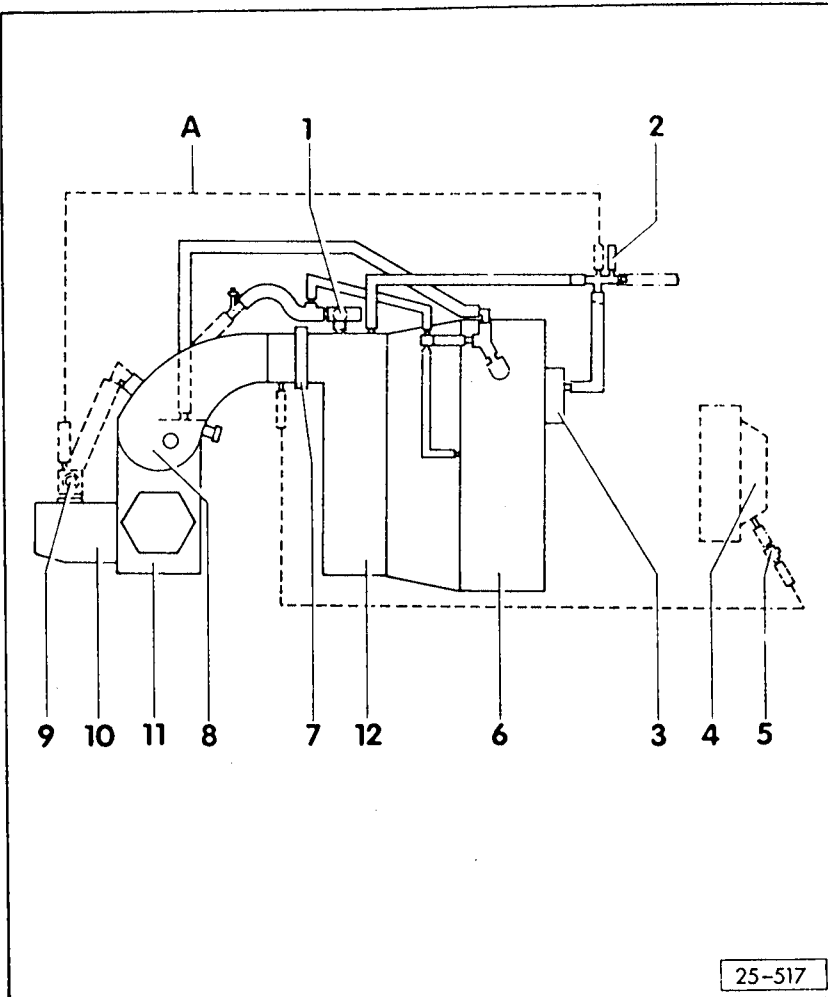
Engine code letters: WC

Note:

Vacuum line colour coding
A = brown

- - - With manual gearbox only
- . - . - With air conditioner only

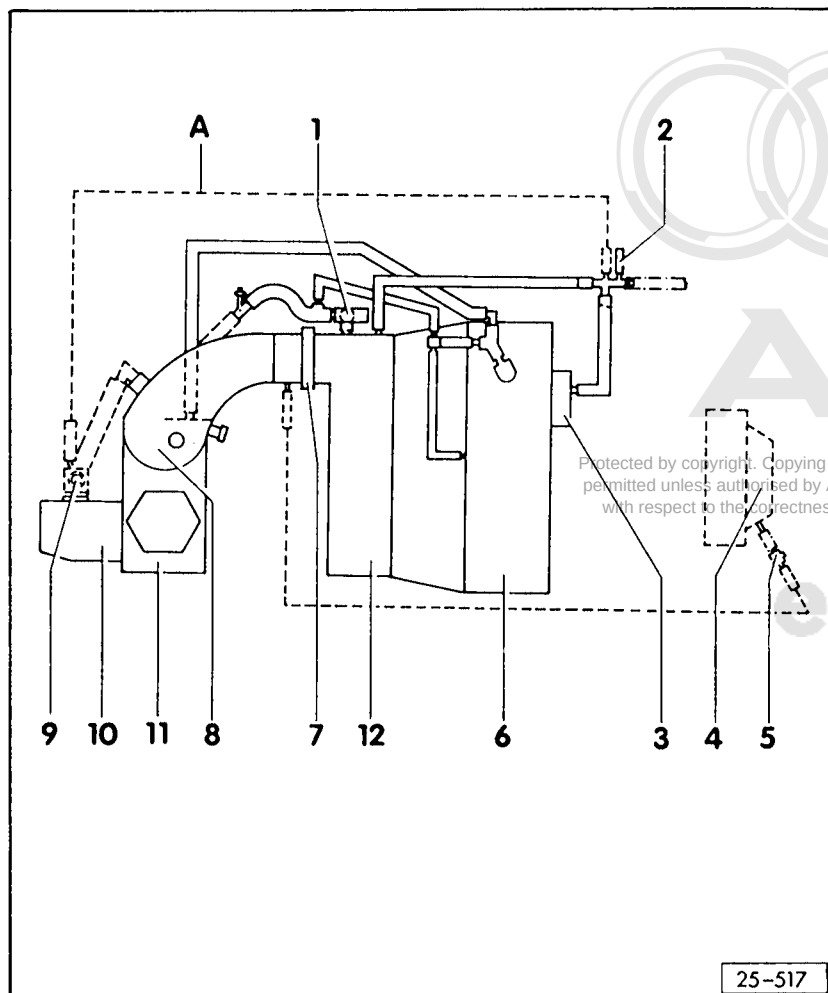
- 1- Idling speed stabilization valve
(N 71)
● Checking - page 25-70
- 2- To econometer
- 3- Warm-up valve (N 9)
● Checking - page 25-187
- 4- Ignition distributor - advance unit
● Checking - Repair Group 28
- 5- Vacuum switch for gear change indicator
- 6- Cylinder head



25-243

Engine code letters: WC

- 7- Throttle valve housing
- 8- Air intake elbow
- 9- Overrun cut-off valve (N 65)
● Checking - page 25-172
- 10- Air cleaner
- 11- Mixture control unit
- 12- Intake manifold



25-244

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Engine code letters: HX, KF, KP, KU,
RT, WC, WU

Transistorised ignition system with Hall sender

Notes:

- Adjustment data, spark plugs
 - from page 28-8
- Ignition distributor data
 - from page 28-12
- Observe safety measures
 - page 28-16

1- TCI-H switch unit (N 41)

- Checking - page 28-37
- Fitting location:
 - Model year 83
 - In plenum chamber, left
 - From model year 84
 - Driver's side behind A-pillar trim

2- Heat sink



28-1



3- Terminal 1 (-)

4- Terminal 4

5- Ignition lead

- 0.8 ... 1.2 kΩ
- Checking ignition lead terminal 4
- see Fig. 1
- Watch version - see Fig. 2

6- Ignition coil

- Primary resistance:
0.5 ... 0.8 Ω
(between terminals 1 and 15)
- Secondary resistance:
2.4 ... 3.5 k Ω
(between terminals 4 and 15)

7- Screening

8- Terminal 15 (+)

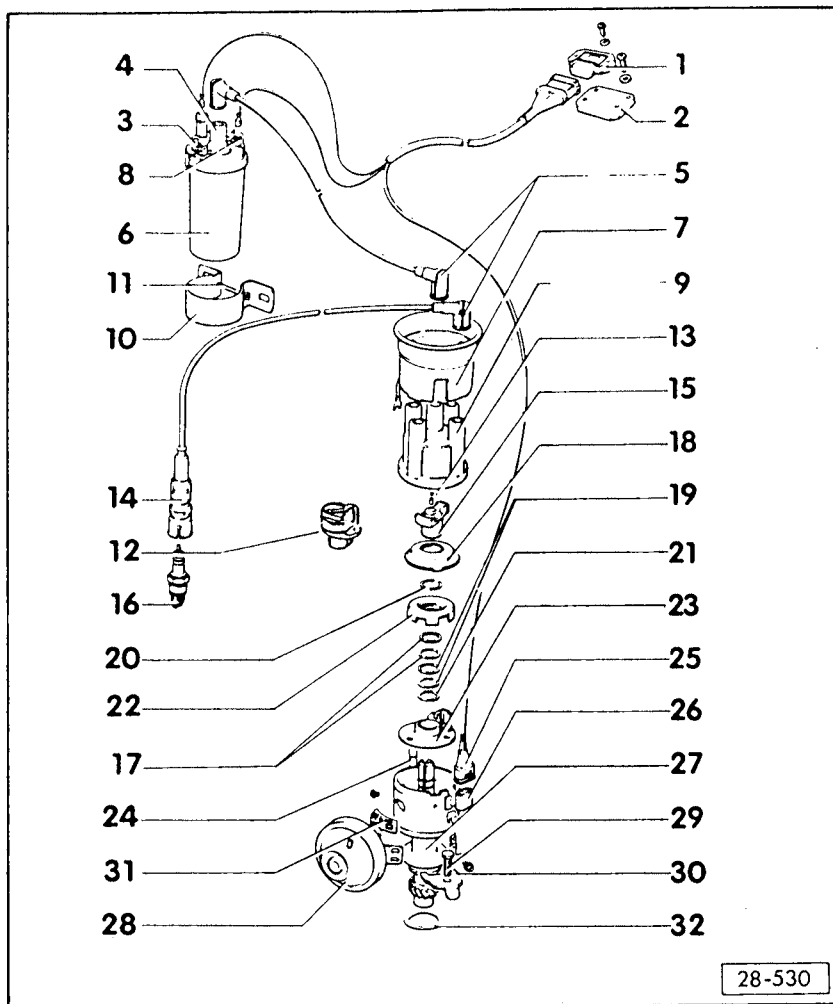
9- Distributor cap

- Loosen earth cable before removing.
- Check for cracks and signs of cracking.
- Check contacts for wear.
- Clean before reinstalling.

21 • Loosen earth cable before removing.
22 • Check for cracks and signs of
23 tracking.

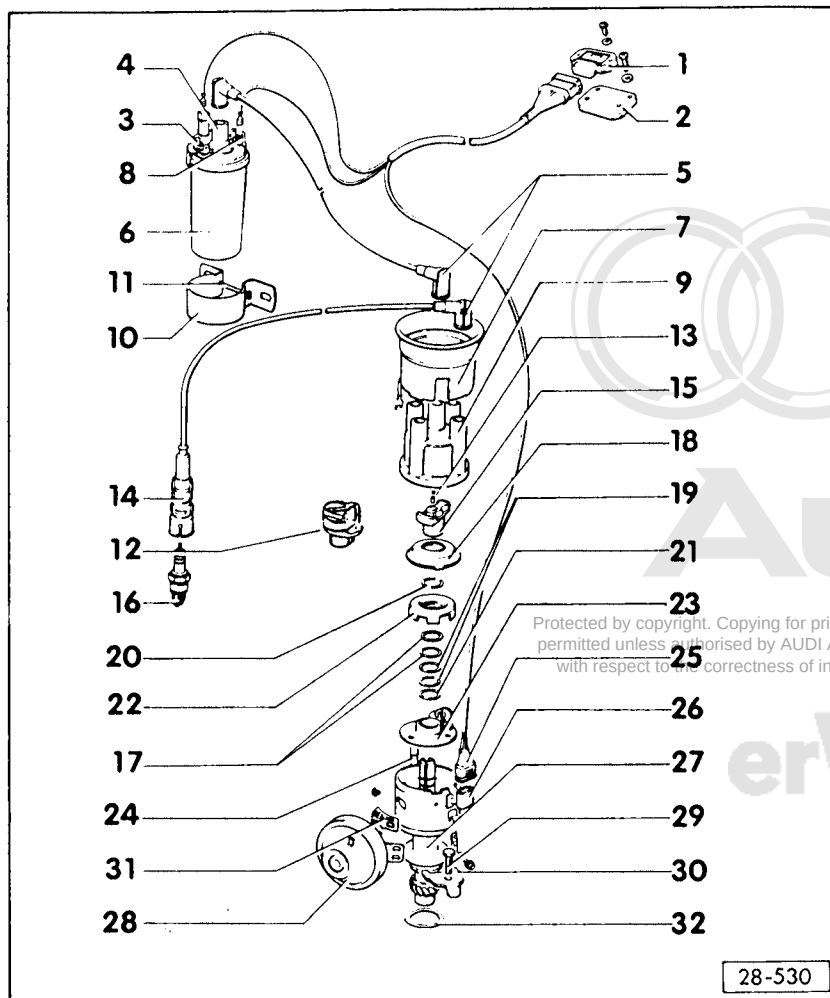


28-2



- 10- Bracket
- 11- 10 Nm
- 12- Rotor arm with speed limiter
 - Marking: R1
 - approx. 1 k Ω
- 13- Carbon brush with spring
 - Check for wear and freedom of movement
- 14- Spark plug connector
 - 4 ... 6 k Ω
- 15- Rotor arm without speed limiter
 - Marking: R1
 - approx. 1 k Ω
- 16- Spark plug, 20 Nm
 - Type and electrode gap - see adjustment data, spark plugs - from page 28-8

28-3

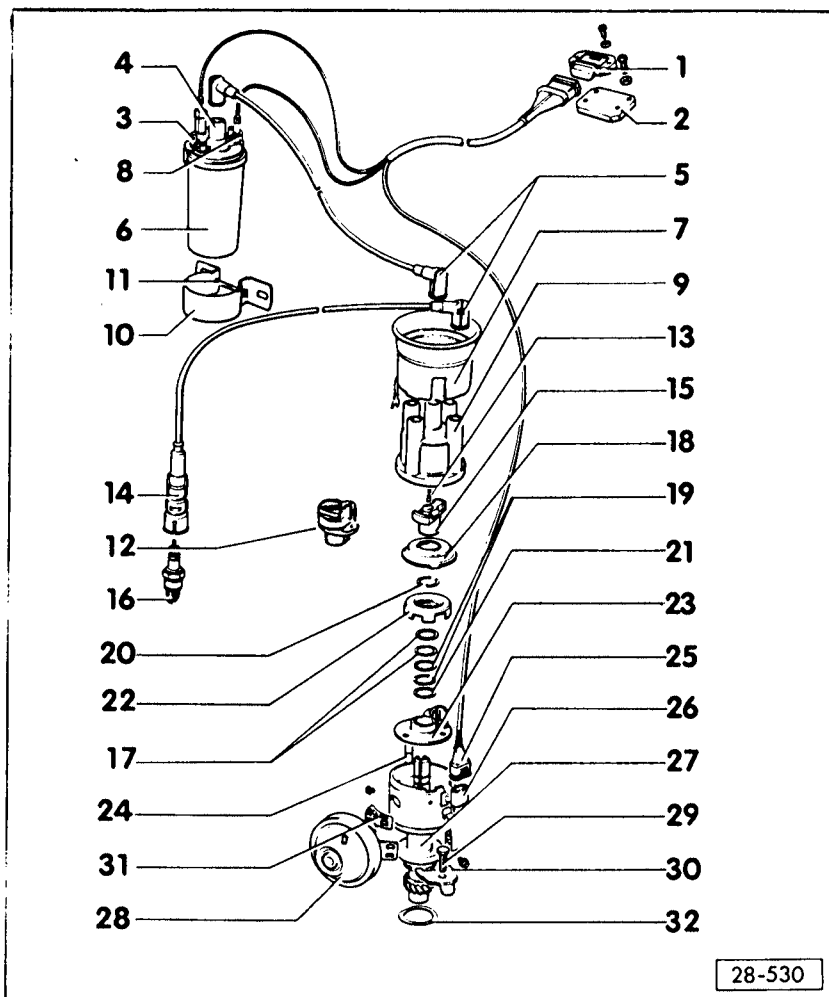


- 17- Spring washer
- 18- Dust cap
- 19- Circlip
- 20- Locking clip
- 21- Shim(s)
 - Adjust Hall sender with shims until without play, but can be turned easily.
- 22- Rotor
 - Remove with puller 3163
 - Note: Check rotor for ease of movement after installation by turning distributor shaft. Renew rotor if bent.
- 23- Ignition vane switch

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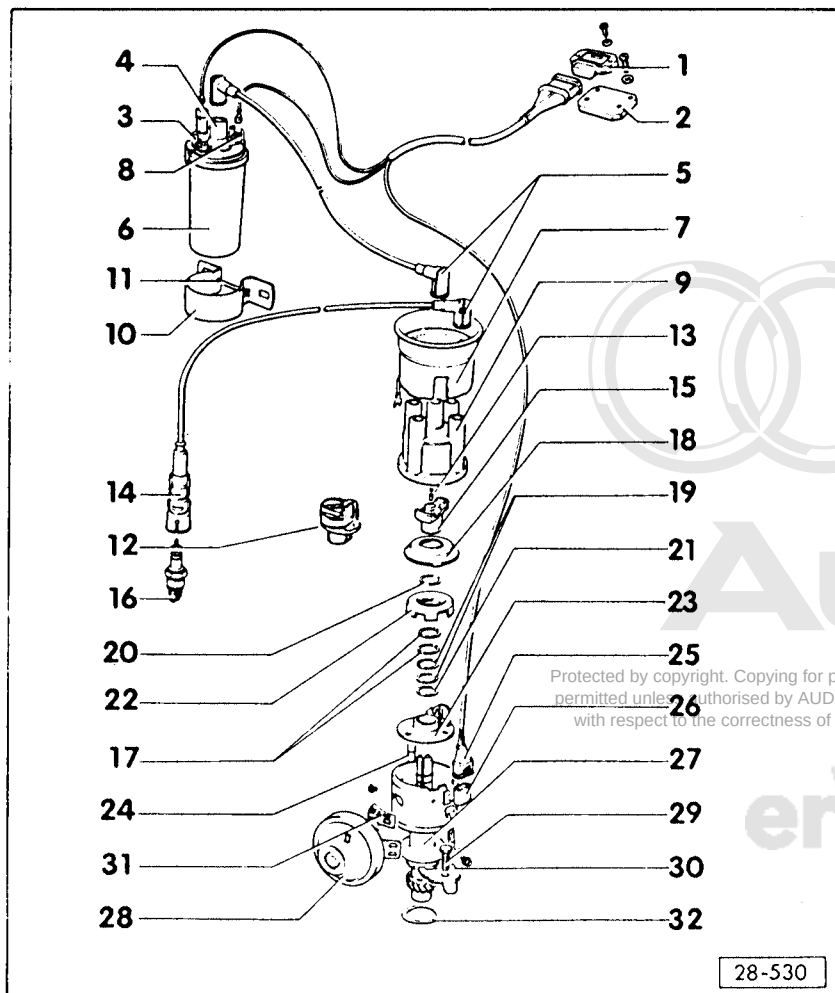
28-530

28-4



- 24- Spring clip
 - Must not lean inward when dust cap is removed (danger of damage to rotor).
- 25- Connector plug
- 26- Hall sender (G 40)
 - Checking - page 28-37
- 27- Ignition distributor
 - Installing - page 28-18
 - Checking - page 28-24
 - Adjusting ignition firing point - page 28-20
- 28- Vacuum unit
 - Checking for leaks:
 - Engine code letters HX, KF, KP, KU, WC, WU - page 28-29
 - Engine code letters RT - page 28-31
 - Checking advance:
 - Engine code letters HX, KF, KP, KU, WC, WU - page 28-32
 - Engine code letters RT - page 28-34
 - Checking retard:
 - Engine code letters KF - page 28-36

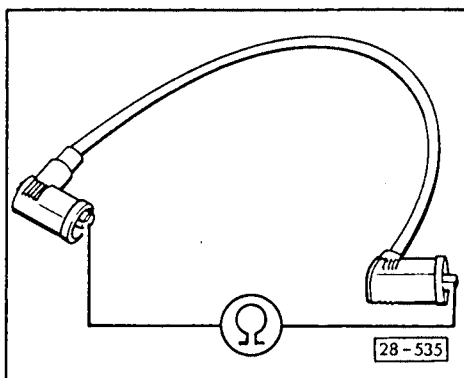
28-5



- 29- 25 Nm
- 30- Clamp
- 31- Guide
- 32- Gasket
 - Renew

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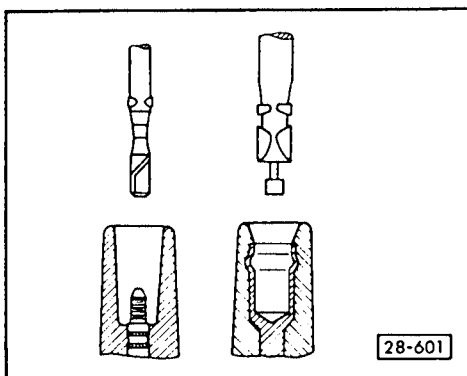
28-6



◀ Fig. 1 Checking ignition lead terminal 4

- Connect hand multimeter V.A.G 1526 to ignition lead for resistance measurement with auxiliary leads from V.A.G 1594.

Specified value: approx. 2 kΩ



◀ Fig. 2 Ignition leads with M4 connectors

- From model year 85

Connections in distributor cap, ignition coil, spark plug and screen plug have been changed accordingly.

Note:

Components in new (M4) and old versions are not interchangeable. If leads must be exchanged, it is necessary to completely re-equip with respective version.

28-7

ADJUSTMENT DATA, SPARK PLUGS

<u>Engine code letters</u>		HX	KF
<u>Ignition distributor</u>	Part No.	034 905 205 B	035 905 205 AE
<u>Ignition firing point *)</u>	Test value	4 ... 8 before TDC	1 ... 5° after TDC
	Adjustment value	6 ± 1 before TDC	3 ± 1° after TDC
<u>Engine speed *)</u>	rpm	800 ± 50	800 ± 50
<u>Vacuum hose</u>		Connected	Connected
<u>Firing order</u>		1-2-4-5-3	1-2-4-5-3
<u>Spark plug</u> Type	(Tightening torque 20 Nm) VW/Audi	101 000 005 AA 101 000 001 AB	N 017 811 555
<u>Manufacturer's designation</u>		W. 6 DTC 14-6 DTU	W. 6 DTC 14-6 DTU N. 7 YC
<u>Electrode gap</u>	mm	0.7 ... 0.9	0.8 ... 0.9

*) Observe test and adjustment conditions - page 28-20.

28-8

Engine code letters		KP		KU	
Ignition distributor	Part No.	035 905 206 AE		034 905 205 G	
Ignition firing point *)		With catalyst	Without catalyst**)	With catalyst	Without catalyst**)
	Test value	8...10° before TDC	16...20° before TDC	8...10° before TDC	16...20° before TDC
	Adjustment value	10 - 1° before TDC	18 + 1° before TDC	10 - 1° before TDC	18 + 1° before TDC
Engine speed *)	rpm	800 ± 50		800 ± 50	
Vacuum hose		Connected		Connected	
Firing order		1-2-4-5-3		1-2-4-5-3	
Spark plug	(Tightening torque 20 Nm)			► 09.87	10.87 ►
Type	VW/Audi	101 000 005 AB 101 000 001 AC		N 017-811 555	101 000 005 AA 101 000 001 AB
	Manufacturer's designation	W 7 DTC 14-7 DTU		W 6 DC 14-6 DU N 7 YC	W 6 DTC 14-6 DTU
Electrode gap	mm	0.7 ... 0.9		0.7 ... 0.9	

*) Observe test and adjustment conditions - page 28-20.

**) When using unleaded premium fuel, RON 95: test value 8 .. 10° before TDC, adjusting value 10 - 2° before TDC.

28-9

Engine code letters		RT	
Ignition distributor	Part No.	034 905 206	
Ignition firing point *)			
	Test value	16 ... 20° before TDC	
	Adjustment value	18 ± 1° before TDC	
Engine speed *)	rpm	800 ± 50	
Vacuum hose		Connected	
Firing order		1-2-4-5-3	
Spark plug	(Tightening torque 20 Nm)		
Type	VW/Audi	101 000 005 AB 101 000 001 AC	
	Manufacturer's designation	W 7 DTC 14-7 DTU	
Electrode gap	mm	0.7 ... 0.9	

*) Observe test and adjustment conditions - page 28-20.

28-10

<u>Engine code letters</u>		WC		WU
<u>Ignition distributor</u>		Manual gearbox	Automatic gearbox	035 905 205 AM
Part No.		035 905 205 AC	035 905 205 AB	
<u>Ignition firing point *)</u>		with catalyst	Without catalyst**)	4...8° before TDC
Test value		8...10° before TDC	16...10° before TDC	
Adjustment value		10 - 2° before TDC	18 + 1° before TDC	
<u>Engine speed *)</u>		rpm		800 ± 50
<u>Vacuum hose</u>		Manual gearbox	Automatic gearbox	Connected
		Connected	-	
<u>Firing order</u>		1-2-4-5-3		1-2-4-5-3
<u>Spark plug</u> Type		(Tightening torque 20 Nm) VW/Audi 101 000 005 AC 101 000 001 AA		N 017 811 033
Manufacturer's designation		W 5 DTC 14-5 DTU		WR 7 DS
<u>Electrode gap</u>		mm		0.7 ... 0.8

*) Observe test and adjustment conditions - page 28-20.

***) When using unleaded premium fuel, RON 95: test value 8 .. 10° before TDC, adjusting value 10 - 2° before TDC.

28-11

DISTRIBUTOR DATA

<u>Engine code letters</u>	HX	KF	KP
<u>Part number</u>	034 905 205 B	035 902 205 AE	035 905 206 AE
<u>Centrifugal advance *)</u> Begin rpm	900 ... 1100	1000 ... 1200	1000 ... 1200
rpm degrees	1500 5 ... 9	1800 10 ... 15	1500 5 ... 9
rpm degrees	3500 18 ... 22	2500 17 ... 22	2500 16 ... 21
rpm degrees	4600 19 ... 25	3200 22 ... 26	5500 20 ... 26
rpm degrees	5000 20 ... 28	- -	- -
End rpm degrees	6600 24 ... 28	6200 23 ... 28	6500 22 ... 28

*) Indicated speed = engine speed



Engine code letters		HX	KF	KP
<u>Vaccum advance</u>				
Begin	mbar	120 ... 170	260 ... 320	120 ... 150
	mmHg	90 ... 125	190 ... 240	90 ... 110
End	mbar	200 ... 220	350 ... 380	240 ... 260
	mmHg	150 ... 165	260 ... 290	180 ... 195
	degrees	4 ... 8	4 ... 8	11 ... 13
<u>Vacuum retard</u>				
Begin	mbar	-	110 ... 240	-
	mmHg	-	80 ... 180	-
Ende	mbar	-	270 ... 360	-
	mmHg	-	200 ... 260	-
	degrees	-	8 ... 10	-

28-13

Engine code letters		KU	RT	WC	
<u>Part number</u>		034 905 205 G	034 905 206	Manual gearbox 035 905 205 AC	Automatic gearbox 035 905 205 AB
<u>Centrifugal advance *)</u>					
Begin	rpm	1600 ... 1900	1100 ... 1300	900 ... 1200	900 ... 1200
	rpm	2200	1600	1800	2300
	degrees	3 ... 8	5 ... 9	4 ... 8	8 ... 13
	rpm	2900	2600 ... 3800	2600	3600
	degrees	6 ... 10	11 ... 15	10 ... 14	10 ... 12
End	rpm	3900	-	5400	5300
	degrees	6 ... 10	-	11 ... 16	11 ... 16
	rpm	5100	-	-	-
	degrees	8 ... 14	-	-	-
	rpm	6100	5600	6000	6600
	degrees	12 ... 16	18 ... 22	12 ... 17	13 ... 19
<u>Vacuum advance</u>					
Begin	mbar	100 ... 180	120 ... 190	160 ... 240	-
	mmHg	75 ... 135	90 ... 143	120 ... 180	-
End	mbar	340 ... 400	380 ... 420	340 ... 380	-
	mmHg	260 ... 300	285 ... 315	250 ... 280	-
	degrees	13 ... 16	12 ... 14	8 ... 12	-

*) Indicated speed = engine speed

28-14

Engine code letters	WU	
Part number	035 902 205 AM	
Centrifugal advance *)		
Begin rpm	1200 ... 1400	
rpm degrees	1700 7 ... 13	
rpm degrees	2200 15 ... 20	
rpm degrees	2800 18 ... 22	
rpm degrees	4000 18 ... 22	
End rpm degrees	5500 21 ... 26	
Vacuum advance		
Begin mbar mmHg	100 ... 160 75 ... 120	
End mbar mmHg degrees	240 ... 260 180 ... 195 10 ... 14	

*) Indicated speed = engine speed

28-15

SAFETY MEASURES FOR TCI-H IGNITION SYSTEM

In order to avoid injury to persons and/or irreparable damage to TCI-H system, observe the following when working on vehicles with a TCI-H system.

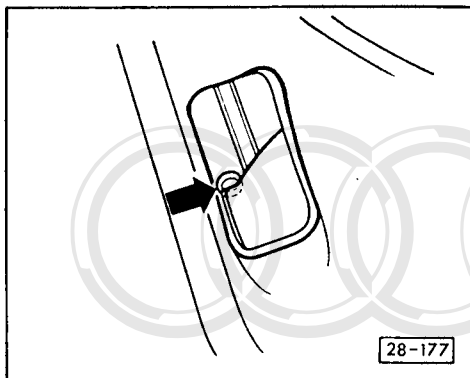
- Only disconnect and connect ignition system leads - including HTleads and tester leads - with ignition switched off.
- If engine is to be turned over at starting speed, without starting (e. g. during compression pressure testing), disconnect HT lead from ignition coil on ignition distributor and earth with auxiliary lead from V.A.G 1594.
- Starting help with quick charger is only permissible for up to 1 minute at max. 16.5. volts.
- Only wash engine with ignition switched off.
- Battery must be completely disconnected during arc and spot welding.
- Vehicles with defective ignition system, or where this is suspected, may only be towed with plug on TCI-H switch unit disconnected.

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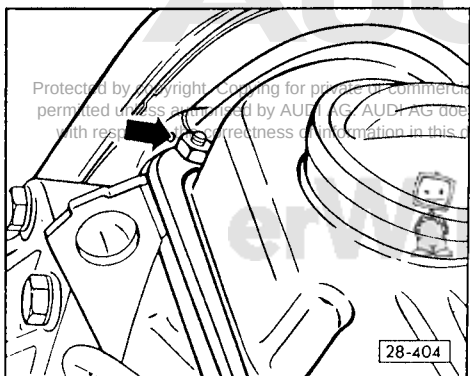
- Do not connect condensers to terminal 1 (-).
- Do not replace rotor arm 1 k Ω (marking: R1) with another type, even for radio interference suppression.
- For interference suppression, suppression connectors with 1 k Ω and plug connectors with 5 k Ω must be used.

28-17



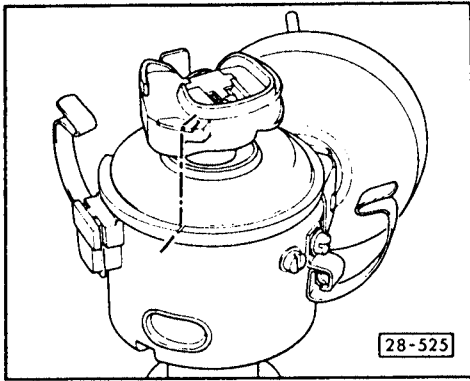
INSTALLING IGNITION DISTRIBUTOR

- ◀ - Position crankshaft at cylinder 1 TDC with special tool 2079.

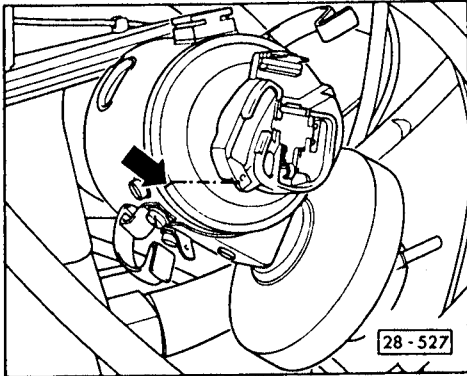


- ◀ - Marking -arrow- on camshaft sprocket must align with upper gasket edge.

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- Position rotor arm so that it points to marking for cylinder 1 on distributor housing.

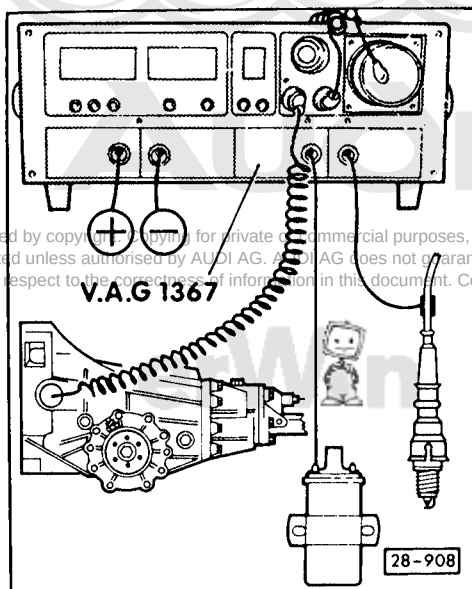


- Install distributor. With distributor installed, rotor arm must point to marking for cylinder 1 on distributor housing. Turn distributor to marking if necessary and tighten (25 Nm).
- Clean distributor cap before installing, check for cracks and signs of tracking, and renew if necessary.
- Adjust ignition firing point - page 28-20.

28-19

ADJUSTING IGNITION FIRING POINT

- Engine oil temperature at least 80° C.
- Vacuum hose on ignition distributor remains connected.
- Air conditioner switched off (ECON button depressed).

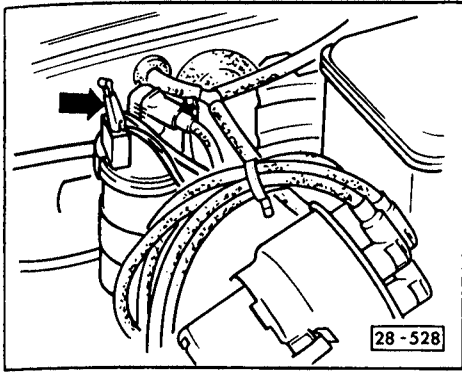


- Connect tester V.A.G 1367 for ignition firing point and engine speed with ignition switched off.

Important

When testing ignition firing point with TDC sender, make sure that TDC sender is inserted up to stop into gearbox casing.

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- ◀ - Use auxiliary clip for connection to ignition coil terminal 1.
- Start engine and run at it idle.
- Check idling speed and adjust if necessary - Repair Group 25.

With TDC sender

Ignition firing point is directly indicated on tester.

With stroboscope

- Point stroboscope at timing mark.
 - Marking must align with reference edge on clutch bell housing.
-

28-21



Test values:

Engine code letters	Test value
HX	4 ... 8° before TDC
KF	1 ... 5° after TDC
KP with catalyst	8 ... 10° before TDC
KP without catalyst *)	16 ... 20° before TDC
KU with catalyst	8 ... 10° before TDC
KU without catalyst *)	16 ... 20° before TDC
RT	16 ... 20° before TDC
WC with catalyst	8 ... 10° before TDC
WC without catalyst *)	16 ... 20° before TDC
WU	4 ... 8° before TDC

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*) When using unleaded premium fuel, RON 95: test value 8 ... 10° before TDC.

- If necessary, adjust ignition firing point by turning distributor.

Note:

Radiator fan must not run during adjustment.

28-22

Adjustment values:

Engine code letters	Adjustment value
HX	$6 \pm 1^\circ$ before TDC
KF	$3 \pm 1^\circ$ after TDC
KP with catalyst	$10 - 1^\circ$ before TDC
KP without catalyst *)	$18 \pm 1^\circ$ before TDC
KU with catalyst	$10 - 1^\circ$ before TDC
KU without catalyst *)	$18 \pm 1^\circ$ before TDC
RT	$18 \pm 1^\circ$ before TDC
WC with catalyst	$10 - 2^\circ$ before TDC
WC without catalyst *)	$18 \pm 1^\circ$ before TDC
WU	$6 \pm 1^\circ$ before TDC

*) When using unleaded premium fuel, RON 95: adjusting value $10 - 2^\circ$ before TDC.

- If necessary, correct idling speed adjustment -
Repair Group 25

28-23

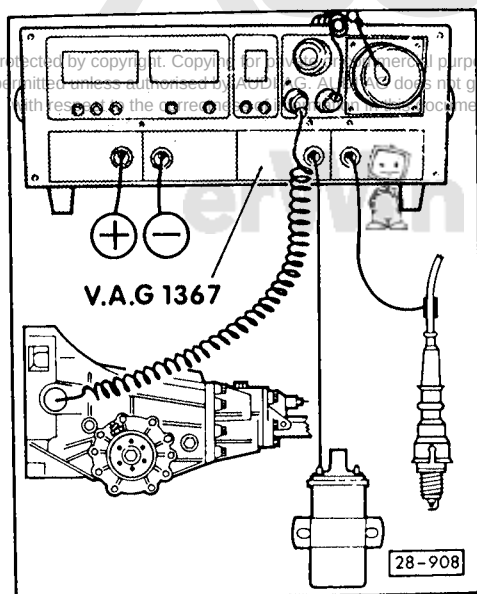
CHECKING IGNITION DISTRIBUTOR

- Engine oil temperature at least 80°C .
- Air conditioner switched off.

A - Checking centrifugal advance with TDC sender

(Specified values - see distributor data)

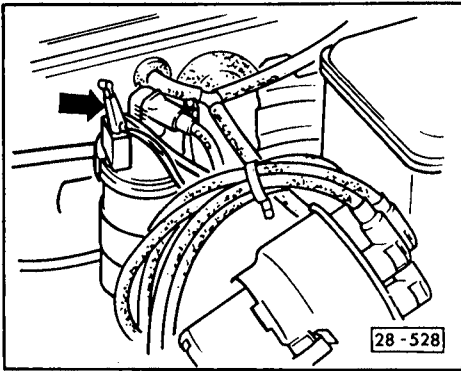
- ◀ - Connect tester V.A.G 1367 for ignition firing point and engine speed according to operating instructions with ignition switched off.



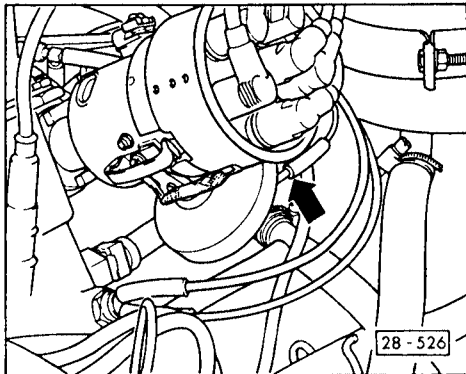
Important

Make especially sure that TDC sender of tester is inserted up to stop into gearbox casing.

28-24



- ◄ - Use auxiliary clip for connection to ignition coil terminal 1.
- Start engine and run at it idle.
- Check ignition firing point, adjust if necessary - page 28-20.



- ◄ - Disconnect vacuum hose from distributor vacuum unit.
- On vehicles with vacuum retard unit, also disconnect vacuum hose on retard unit and plug on intake manifold side.

28-25

- Adjust engine speed to idling speed - Repair Group 25.
- Indicated advance value = note basic value on tester.
- Slowly increase speed. Start of advance is indicated by higher degree number.
- Compare speed with advance begin test value.
- Adjust engine speed to next test speed.

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- Read advance value on tester.

- Calculate centrifugal advance value:

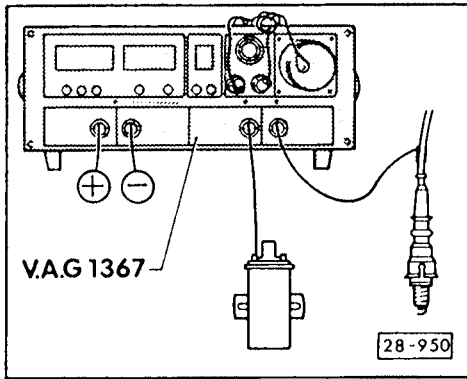
Advance value read minus basic value

= Centrifugal advance value
=====

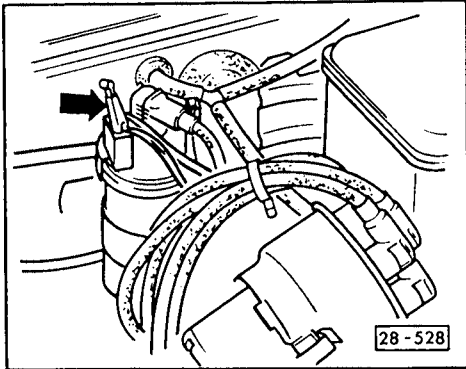
- Compare calculated centrifugal advance value with specified value (see distributor data). If specified value is not attained, renew ignition distributor.
- Repeat test at other test speeds.

B - Checking centrifugal advance with stroboscope lamp

(Specified values - see distributor data)

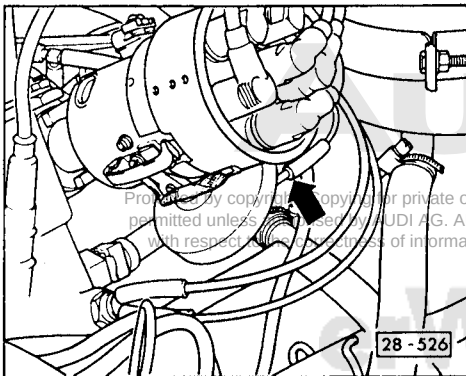


- ◄ - Connect tester V.A.G 1367 for ignition firing point and engine speed according to operating instructions with ignition switched off.



- ◄ - Use auxiliary clip for connection to ignition coil terminal 1.
- Start engine and run it at idle.
- Check ignition firing point and adjust if necessary
- page 28-20.

28-27



- ◄ - Disconnect vacuum hose from distributor vacuum unit.
 - On vehicles with vacuum retard unit, also disconnect vacuum hose on retard unit and plug on intake manifold side.
- Adjust engine speed to idling speed - Repair Group 25.
- "Bring back notch" to timing mark.
- Indicated advance value = note basic value on tester.
- Slowly increase speed. Start of advance is indicated by mark moving away.
- Compare speed with advance begin test value.

- Increase engine speed to next test speed, "bring back notch" to timing mark and read advance value.

Indicated advance value minus basic value

= Centrifugal advance value

=====

- If centrifugal advance value does not correspond to specified value, renew ignition distributor.
- Repeat test at other test speeds.
- If necessary, adjust idling speed.

C - Checking vacuum unit for leaks

Engine code letters: HX, KF, KP, KU, WC, WU

- Engine code letters RT - page 28-31.

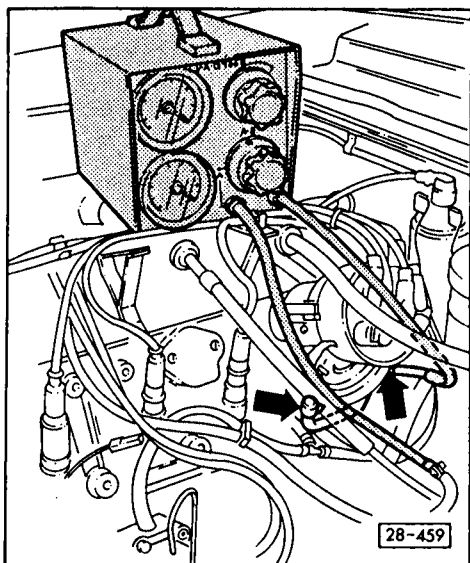
Vacuum advance unit

- ◀ - Connect vacuum tester V.A.G 1368 between throttle valve housing and vacuum "advance" unit.
- Switch vacuum tester to throughflow (A-B).
- Close ventilation valve.
- Start engine and run it at idle.
- Select engine speed so that vacuum pressure indicated on tester is higher than advance end test value - see distributor data.

Note:

If no vacuum pressure is indicated on tester, vacuum outlet in throttle valve housing is blocked or vacuum hose is leaky or has fallen off, check - see "Vacuum Connections", Repair Group 25.

- Switch tester so that vacuum is held on the vacuum side (B). Vacuum may decrease by max. 10 % within 1 minute. Otherwise renew vacuum unit.



28-29

Vacuum retard unit

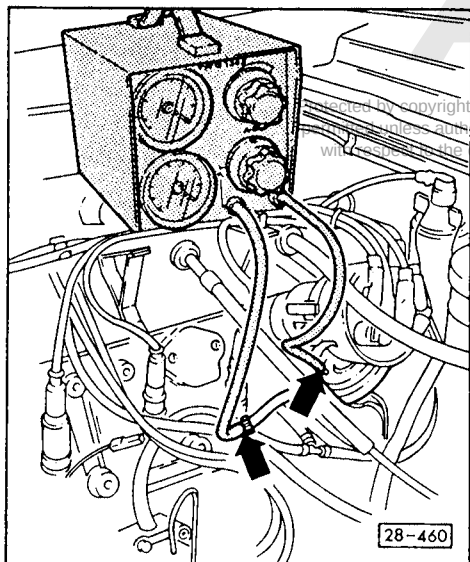
Engine code letters: KF

- ◀ - Connect vacuum tester between throttle valve housing and vacuum retard unit.
- Switch vacuum tester to throughflow (A-B).
- Close ventilation valve.
- Start engine and run it at idle.
- Disconnect vacuum hose of vacuum advance unit.
- Switch tester so that vacuum is held on vacuum unit side (B).
- Select engine speed so that vacuum indicated on tester is higher than advance end test value - see distributor data.

Note:

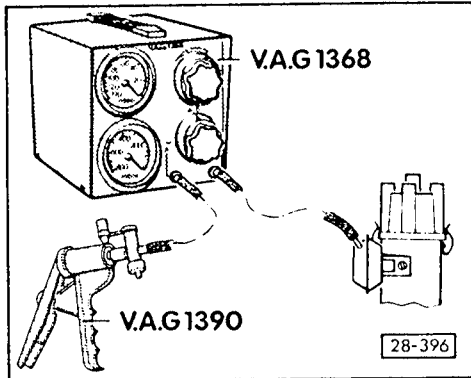
If no vacuum pressure is indicated on tester, vacuum outlet in throttle valve housing is blocked, or vacuum hose is leaky or has fallen off, check - see "Vacuum Connections", Repair Group 25.

- Switch tester so that vacuum is held on vacuum side (B). Vacuum may decrease by max. 10 % within 1 minute. Otherwise renew vacuum unit.



28-30

C - Checking vacuum unit for leaks



Engine code letters: RT

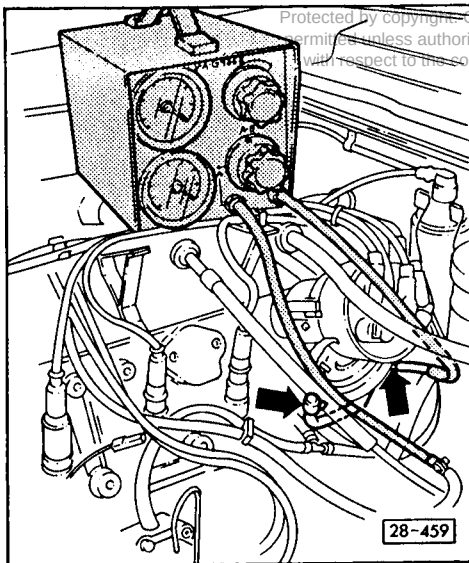
- - Connect vacuum tester V.A.G 1368 and vacuum pump V.A.G 1390 to vacuum advance unit.
- Switch tester to throughflow.
- Produce vacuum of approx. 500 mbar with vacuum pump.
- Switch tester so that vacuum is held on vacuum unit side.
- Set vacuum on tester to 450 mbar.
Vacuum may decrease by max. 10 % within 1 minute.
Otherwise vacuum unit or hose is leaking.

28-31

D - Checking vacuum advance

Engine code letters: HX, KF, KP, KU, WC, WU

- Engine code letters RT - page 28-34



- Specified values - see distributor data
- - Connect vacuum tester between throttle valve housing and vacuum advance unit.
- Switch tester to throughflow (A-B).
- Close ventilation valve.
- Connect tester V.A.G 1367 for ignition firing point and engine speed, or stroboscope, according to operating instructions with ignition switched off.

Important

When testing with TDC sender, make sure that TDC sender of tester is inserted up to stop into gearbox casing.

- Testing with

TDC sender

Note indicated advance value = basic value

Stroboscope

"Bring back notch" to timing mark and note indicated advance value = basic value

Select engine speed so that vacuum indicated on vacuum tester is higher than advance end test value.

- Switch tester so that vacuum is held on vacuum unit side (B).
- Set vacuum on tester to advance end test value.
- Read advance value and calculate vacuum adjustment.

Read advance value minus
basic value

=====

= Vacuum advance value

- Compare calculated vacuum advance value with specified value.
- Adjust vacuum on tester to advance begin test value.
- Read advance value and calculate vacuum advance.

Indicated advance value minus
basic value

=====

= Vacuum advance value

- Compare calculated vacuum advance value with specified value.
- If specified values are not attained, renew vacuum unit.

28-33

D - Checking vacuum advance advance

Engine code letters: RT

- Specified values - see distributor data

- Connect tester V.A.G 1367 for ignition firing point and engine speed, or stroboscope according to operating instructions with ignition switched off.

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- ▶ - Connect vacuum tester and vacuum pump to vacuum advance unit.

- Switch tester to throughflow.
- Start engine and run it at idle.
- Testing with

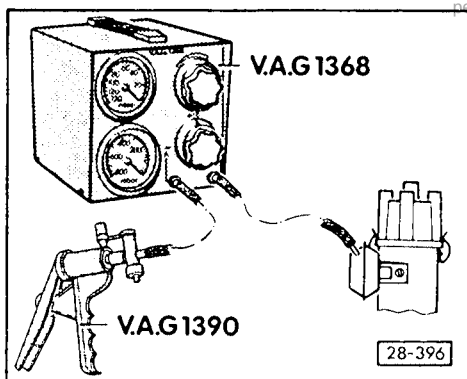
TDC sender

Stroboscope

Note indicated
advance value =
basic value

"Bring back notch" to
timing mark and note
indicated advance
value = basic value

- Produce vacuum with vacuum pump until firing point begins to move away.



- Read vacuum value and compare with advance begin test value.
- Further increase vacuum up to advance end test value.
- If necessary, reduce speed to approx. 800 rpm.

Testing with TDC sender:

- Read advance value and calculate vacuum advance.

Indicated advance value minus
basic value

= Vacuum advance value
=====

Testing with stroboscope:

- "Bring back notch" to timing mark.

Indicated advance value minus
basic value

= Vacuum advance value
=====

-
- Increase vacuum further. Firing point must not move away any further.

28-35

E - Checking vacuum retard

Engine code letters: KF

- Specified values - see distributor data:
- - Connect vacuum tester between throttle valve part and vacuum retard unit.
- Switch tester to throughflow (A-B).

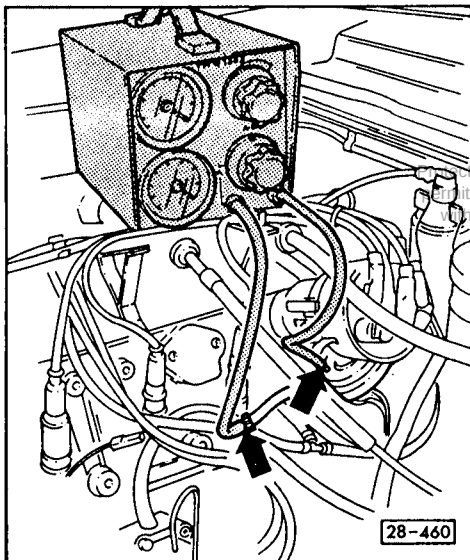
Close ventilation valve.
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Testing with stroboscope

- "Bring back notch" to timing mark.

-
- Read retard value on tester.

If specified value is not attained, renew vacuum unit.



CHECKING TCI-H SWITCH UNIT AND HALL SENDER

- As the internal resistance of tester and ambient temperature strongly influence test values, hand multimeter V.A.G 1526 should be used for checking.
- Specified values given are valid for ambient temperature of 0° ... 40° C.
- If measured values deviate from specified values, check for break in wiring using current flow diagram before renewing components.

Important

In order to avoid irreparable damage to electronic components, respective measuring range must be switched on before connecting test leads.

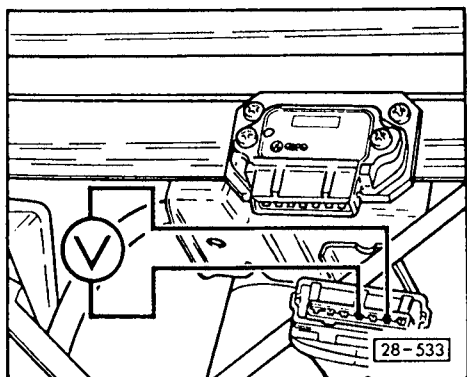
28-37

A - Checking TCI-H switch unit (N 41)

- Ignition coil OK.
- Disconnect plug from TCI-H switch unit with ignition switched off.

Note:

From model year 84, TCI-H switch unit is located in passenger compartment on driver's side, left under carpet trim.



- ◀ - Connect hand multimeter V.A.G 1526 between plug contacts 4 and 2 for voltage measurement with auxiliary leads from V.A.G 1594.

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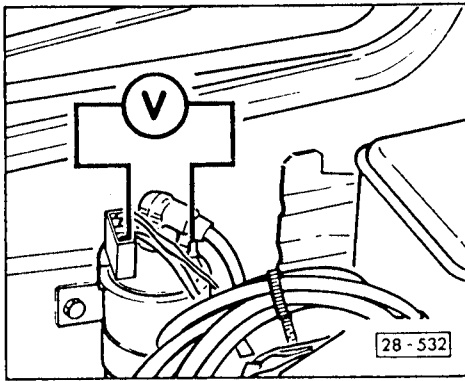
- Switch on ignition.

Specified value: approx. battery voltage

Otherwise locate break in wiring using current flow diagram.

- Switch off ignition.
- Reconnect plug on TCI-H switch unit.
- Disconnect plug on Hall sender (distributor) by pressing wire clip.

28-38



- ◀ - Connect hand multimeter between terminal 1 (-) and terminal 15 (+) of coil for voltage measurement with auxiliary leads.

- Switch on ignition.

Specified value: at least 2 volts, must drop to 0 after 1 ... 2 seconds.

Otherwise:

Renew TCI-H switch unit and check whether sealing compound has escaped from coil. Renew if necessary.

- Briefly earth centre lead of connector on distributor.

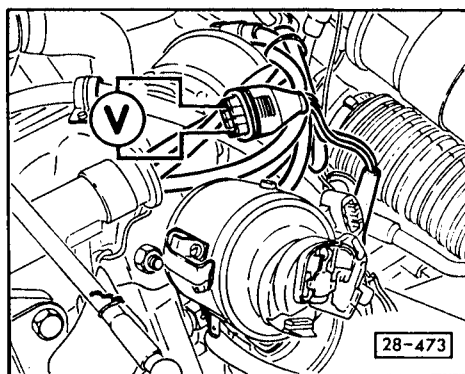
Indicated voltage must briefly increase to at least 2 volts.

Otherwise:

Locate and eliminate break in centre lead using current flow diagram, or renew TCI-H switch unit.

- Switch off ignition.

28-39



- ◀ - Connect hand multimeter to outer plug contacts of Hall sender (distributor) with auxiliary leads for voltage measurement.

- Switch on ignition.

Specified value: at least 5 volts

If specified value is not attained, locate and eliminate break in wiring between Hall sender plug and TCI-H switch unit using current flow diagram.

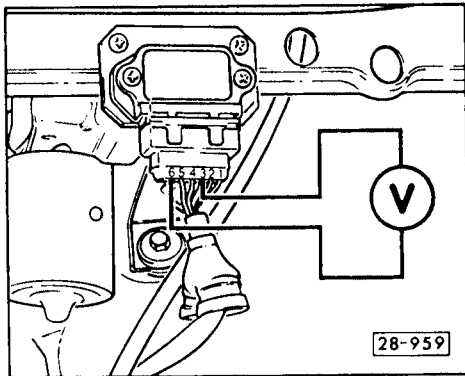
If specified values are attained and there is still a malfunction, renew TCI-H switch unit.

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B - Checking Hall sender (G 40)

- TCI-H switch unit OK.
- Ignition coil OK.
- Lead between TCI-H switch unit and distributor OK.
- Plug and connections on distributor, Hall sender and TCI-H switch unit OK.
- Disconnect HT lead from coil on distributor and earth with auxiliary lead from V.A.G 1594.
- Pull off rubber grommet on connector plug of TCI-H switch unit.



- ➔ - Connect hand multimeter between contacts 6 and 3 on connected plug of TCI-H switch unit with auxiliary leads for voltage measurement.
- Switch on ignition.
- Slowly turn engine by hand in normal direction of rotation while watching multimeter display.

Specified value: Alternating between 0 and at least 2 volts

Otherwise:
Hall sender defective (renew).

28-41

SERVICING FEI IGNITION SYSTEM

Engine code letters: SL

Fully electronic ignition system

Note:

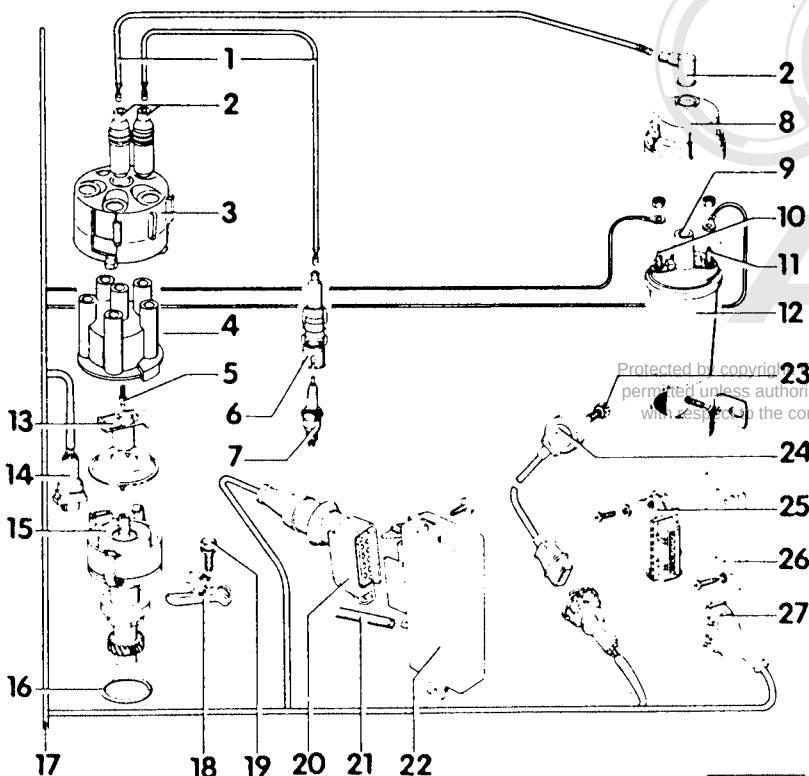
- Adjustment data, spark plugs
 - page 28-48
- Observe safety measures
 - page 28-49
- Self-diagnosis and electrical testing - Repair Group 01

1- Ignition lead
• Check for continuity

2- Suppression connector
• 0.6 commercial 1.4 kΩ

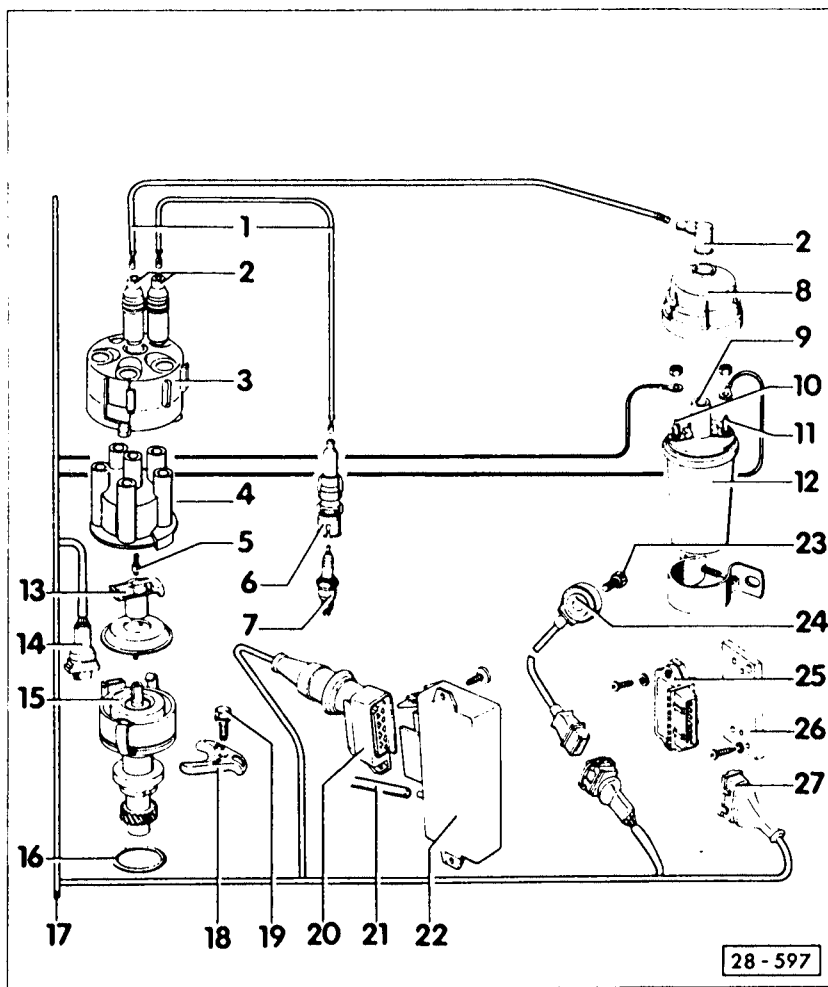
3- Screening
• With radio suppression

4- Distributor cap
• Check for cracks and signs of tracking
• Check contact wear
• Clean before reinstalling



28-597

28-42

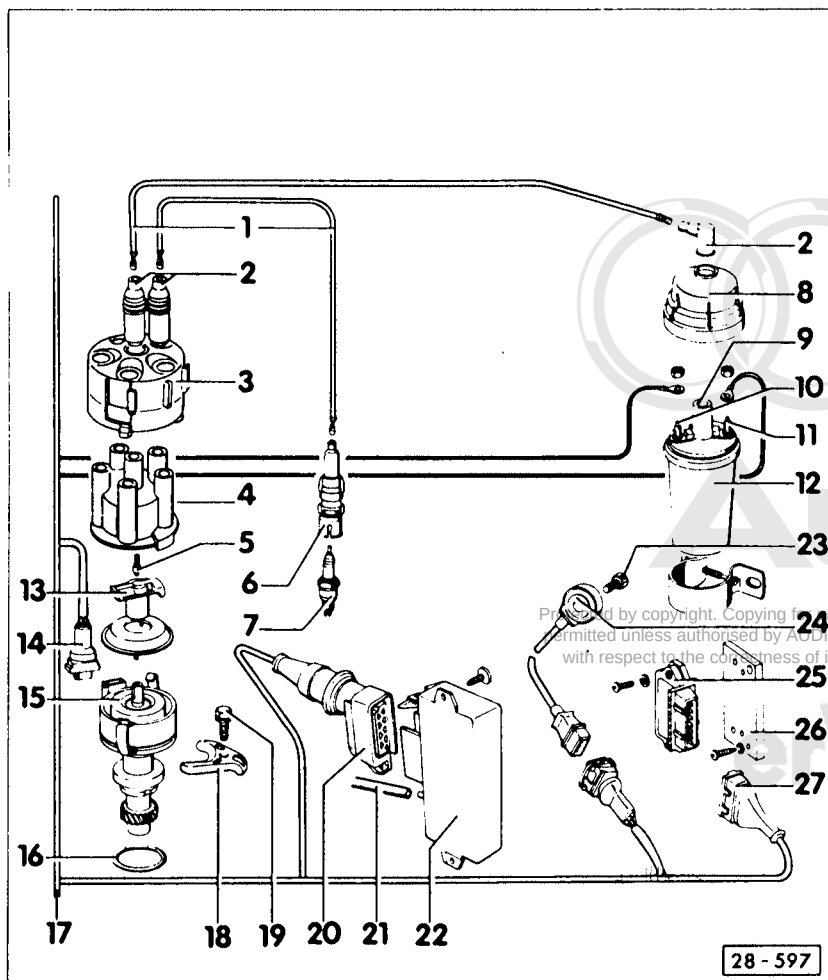


28-597

Engine code letters: SL

- 5- Carbon brush with spring
 - Check for wear, damage and ease of movement
- 6- Spark plug connector
 - 4 ... 6 kΩ
- 7- Spark plug, 20 Nm
 - Type and electrode gap - page 28-48
- 8- Protective cap
- 9- Terminal 4
- 10- Terminal 1 (-)
- 11- Terminal 15 (+)
- 12- Ignition coil
 - Primary resistance: 0.5 ... 0.8 Ω (between terminal 1 and 15)
 - Secondary resistance: 2.4 ... 3.5 kΩ (between terminal 4 and 15)

28-43

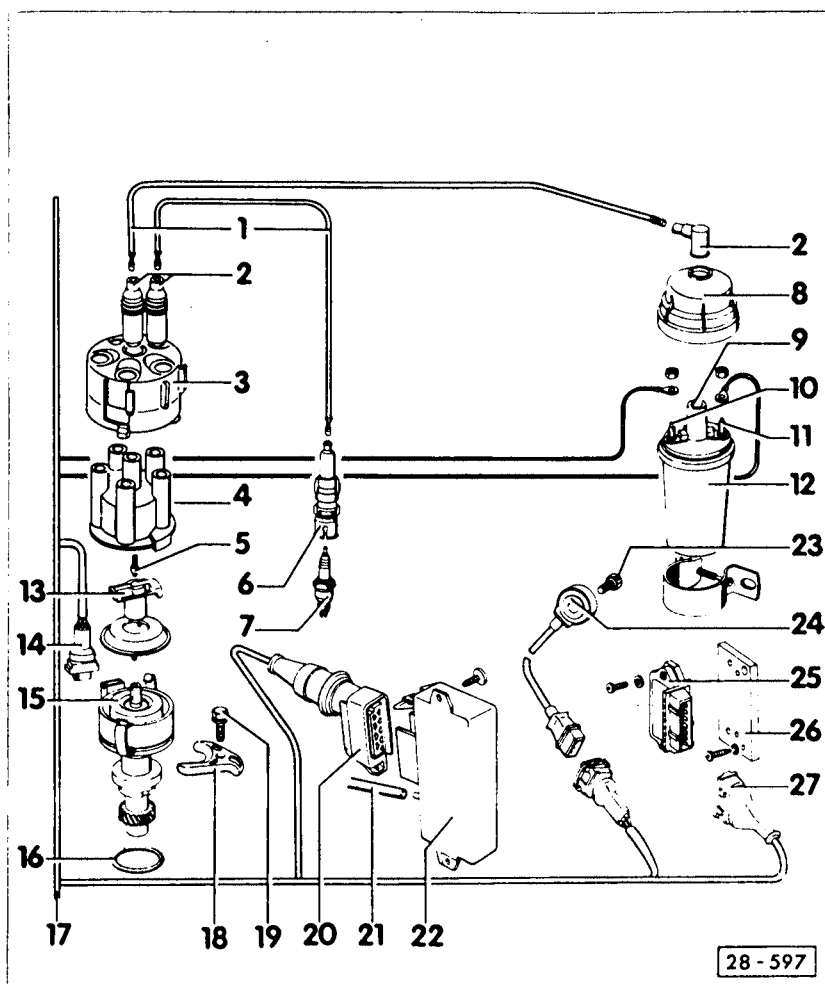


28-597

Engine code letters: SL

- 13- Rotor arm
 - Marking: R1
 - 0.6 ... 1.4 kΩ
- 14- Connector plug
 - To remove, press spring clip
- 15- Ignition distributor
 - Installing - page 28-51
 - Adjusting ignition firing point - page 28-53
 - Checking ignition advance - page 28-55
 - Checking Hall sender - page 28-56
- 16- O-ring
- 17- Wiring loom for:
 - Ignition system
 - K-Jetronic
- 18- Clamp
- 19- 25 Nm
- 20- Connector plug
 - Disconnect and connect only with ignition switched off
 - Checking electrical connections - Repair Group 01

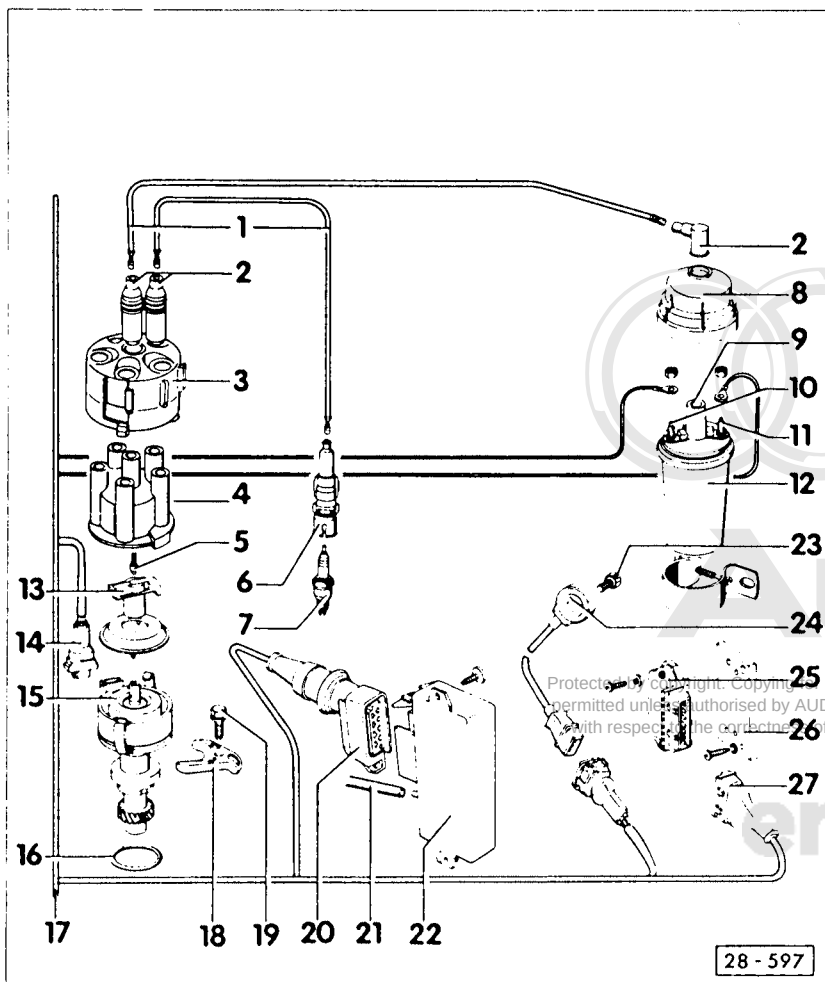
28-44



Engine code letters: SL

- 21- Vacuum line
 - See vacuum connections
 - Repair Group 25
- 22- FEI control unit (J 88)
 - Checking - Repair Group 01
 - Fitting location: behind A-pillar trim in footwell, front left
 - Removing - see Fig. 1
- 23- 10 Nm
 - Tightening torque influences knock sensor operation
- 24- Knock sensor (G 61)
 - On engine block
 - Checking - Repair Group 01
- 25- TCI-H switch unit (N 41)
 - Checking - page 28-56
 - Fitting location: behind A-pillar trim in footwell, front left
 - Removing - see Fig. 2

28-45



Engine code letters: SL

- 26- Heat sink
- 27- Connector plug
 - To disconnect, press wire clip
 - 1 to coil terminal 1
 - 2 to battery (-)
 - 4 to coil terminal 15
 - 6 to FEI control unit terminal 12

28-46

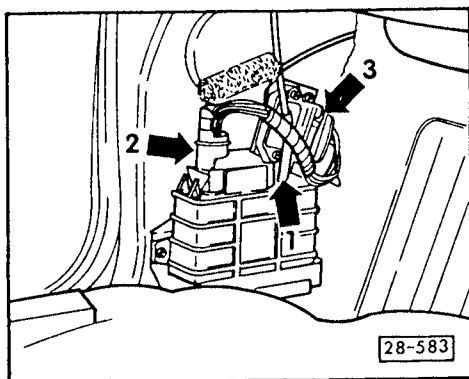


Fig. 1 Removing FEI control unit (J 88)

- Remove control unit cover on left of driver's side footwell.
- Disconnect plug -2- and vacuum hose -1- from FEI control unit with ignition switched off.
- Detach FEI control unit.

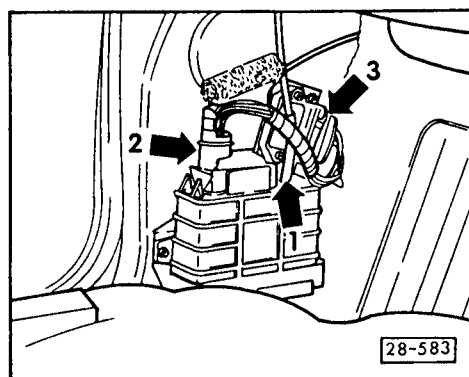


Fig. 2 Removing TCI-H switch unit (N 41)

- Remove cover on left in driver's side footwell.
- Disconnect plug -3- from TCI-H switch unit.
- Detach TCI- switch unit.

28-47

ADJUSTMENT DATA, SPARK PLUGS

Engine code letters		SL	
Distributor	Part No.	034 905 205 H	
Firing point *)	Test value	Manual gearbox	Automatic gearbox
		16 ... 20° before TDC	4 ... 8° before TDC
Spark control *)	Adjustment value	Manual gearbox	Automatic gearbox
		18 + 1° before TDC	6 + 1° before TDC
Timing advance **)	rpm	800 ± 50	
	rpm	Manual gearbox	Automatic gearbox
		3000	3000
	degrees	Manual gearbox	Automatic gearbox
		6 ... 10° + Firing point	18 ... 22 ° + Firing point
Firing order		1-2-4-5-3	
Spark plugs	(Tightening torque 20 Nm)	101 000 005 AB	
Type	VW/Audi	101 000 001 AC	
Manufacturer's designation		W 7 DTG	
Electrode gap		0.7 ... 0.9	

*) Observe test and adjustment conditions - page 28-53.

**) Disconnect vacuum hose for FEI control unit with engine running.

SAFETY MEASURES FOR FEI IGNITION SYSTEM

In order to avoid injury to persons and/or irreparable damage to fully electronic ignition system, observe the following when working on vehicles with fully electronic ignition systems:

- Do not touch or disconnect ignition cables when engine is either running or turning at starting speed.
- Only disconnect and connect ignition system leads - including HT leads and tester leads - with ignition switched off.
- If engine is to be turned over at starting speed without starting (e. g. during compression pressure testing), disconnect HT lead from ignition coil on ignition distributor and earth with auxiliary lead from V.A.G 1594.
- Starting help with quick charger is only permissible for up to 1 minute at max. 16.5. volts.
- Only wash engine with ignition switched off.
- Battery must be completely disconnected during arc and spot welding.

28-49

- Vehicles with defective ignition system, or where this is suspected, may only be towed with plug on TCI-H switch unit disconnected.
- Do not connect condensers to terminal 1 (-).
- Do not replace rotor arm 1 k Ω (marking: R1) with another type, even for radio interference suppression.
- For interference suppression, suppression connectors with 1 k Ω and plug connectors with 5 k Ω must be used.

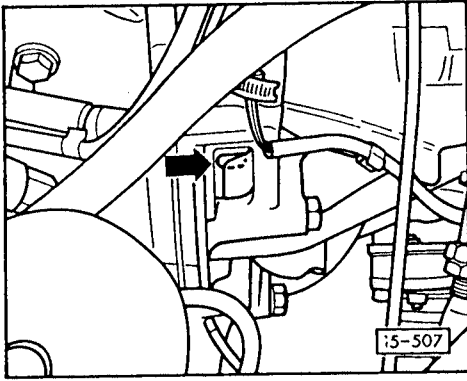


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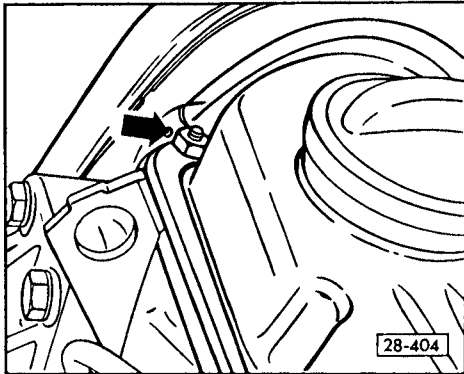


28-50

INSTALLING IGNITION DISTRIBUTOR

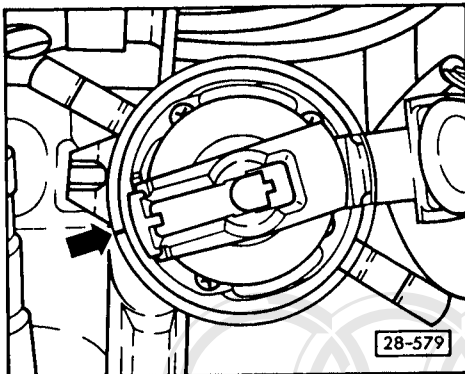


- ◀ - Position crankshaft at cylinder 1 TDC with special tool 2079.



- ◀ - Marking -arrow- on camshaft must align with upper gasket edge.

28-51



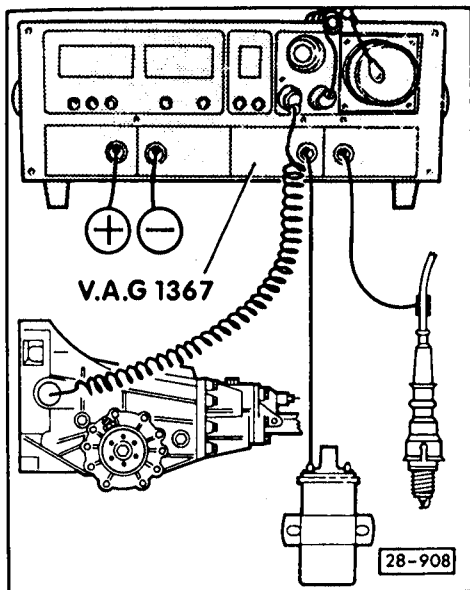
- ◀ - Position rotor arm so that it points to marking for cylinder 1 on distributor housing.
- Install distributor. With distributor installed, rotor arm must point to marking for cylinder 1 on distributor housing. Turn distributor to marking if necessary and tighten (25 Nm).
- Clean distributor cap before installing, check for cracks and signs of tracking, and renew if necessary.
- Adjust ignition firing point - page 28-53.

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ADJUSTING FIRING POINT

- Engine oil temperature at least 80° C.
- Throttle valve in idling position.
- Air conditioner switched off.
- ◀ - Connect tester V.A.G 1367 for firing point and engine speed according to operating instructions with ignition switched off.



Important

Make sure that TDC sender is inserted up to stop in gearbox.

- Start engine and run it at idle.

Note:

- Firing point is directly indicated on tester.
- Radiator fan must not run during adjustment.

28-53

- Check firing point and adjust if necessary by turning distributor.

Test values:

With manual gearbox	16 ... 20° before TDC
With automatic gearbox	4 ... 8° before TDC

Adjustment values:

With manual gearbox	18 $\pm$ 1° before TDC
With automatic gearbox	6 $\pm$ 1° before TDC

- If necessary, correct idling speed adjustment - Repair Group 25.



Audi

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erWin

28-54

CHECKING TIMING ADVANCE

- Knock sensor OK (checking, see Self-Diagnosis, Repair Group 01)
- Connect tester V.A.G 1367 for firing point and engine speed according to operating instructions with ignition switched off.

Important

Make sure that TDC sender is inserted up to stop in gearbox.

- Start engine and run it at idle.
- Note indicated firing point basic value.
- With engine running, disconnect vacuum hose from FEI control unit and increase speed to 3000 rpm.
- Read firing point and subtract basic value.

Calculated adjustment value must be

Manual gearbox: 6 ... 10°
Automatic gearbox: 18 ... 22°.

Otherwise:

Renew FEI control unit (J 88).

28-55

CHECKING HALL SENDER AND TCI-H SWITCH UNIT

- As the internal resistance of tester and ambient temperature strongly influence test values, hand multimeter V.A.G 1526 should be used for checking.
- Specified values given are valid for an ambient temperature of 0° ... 40° C.

Important

In order to avoid irreparable damage to electronic components, respective measuring range must be switched on before connecting test leads.

A - Checking Hall sender (G 40)

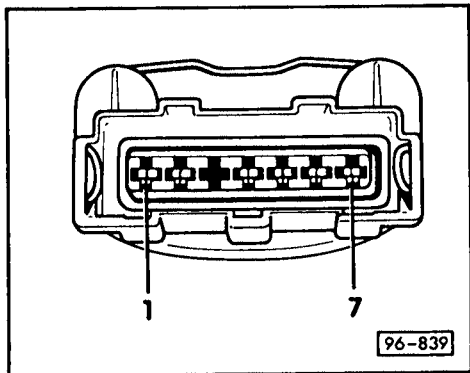
(Checking only necessary if ignition spark not present)

Important

To check Hall sender, disconnect HT lead from coil on distributor and earth with auxiliary lead from V.A.G 1594.

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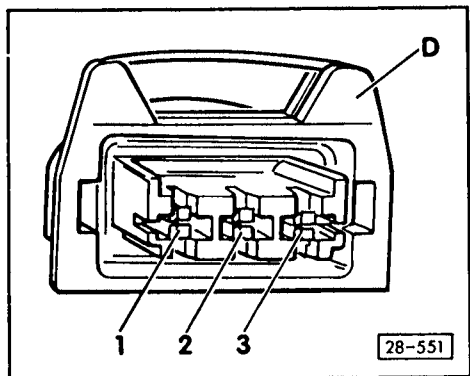




- Disconnect plug from TCI-H switch unit (N 41).
 - ◀ - Connect diode test lamp V.A.G 1527 between plug contacts 4 and 6 with auxiliary leads from V.A.G 1594.
 - Operate starter and check signal from Hall sender.
- If LED flickers, Hall sender is OK and check is completed.

Otherwise:

- Disconnect plug from Hall sender (on distributor) by pressing wire clip.



- ◀ - Connect hand multimeter V.A.G 1526 between contacts 1 and 3 of plug (D) for voltage measurement with auxiliary leads from V.A.G 1594.

- Switch on ignition.

Specified value: at least 9 volts

28-57

If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

Wiring OK, renew FEI control unit.

- Pull rubber grommet off Hall sender plug and connect plug to Hall sender connection.
- Connect diode test lamp V.A.G 1527 between plug contact 2 and coil terminal 15 with auxiliary leads from V.A.G 1594.
- Operate starter and check signal from Hall sender.

LED must flash (flicker)

If specified value is not attained, renew distributor.

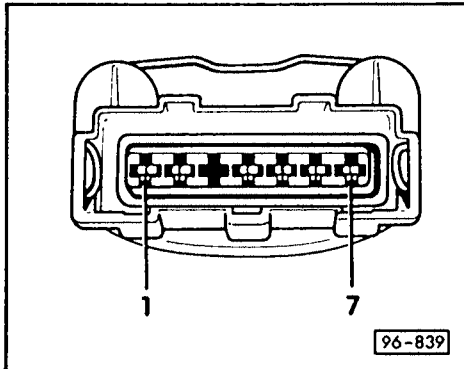
If specified value is attained, check wiring between contact 2 of Hall sender plug and contact 9 of FEI control unit, and between contact 6 of TCI-H switch unit and contact 12 of FEI control unit using current flow diagram.

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B - Checking TCI-H switch unit (N 41)

- Hall sender OK.
- Coil OK.
- Disconnect plug from TCI-H switch unit.



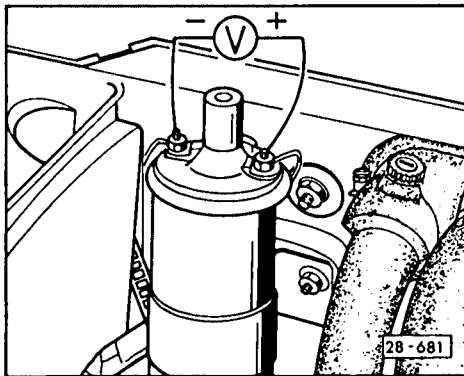
- ◀ - Connect hand multimeter V.A.G 1526 between contacts 2 and 4 for voltage measurement with auxiliary leads from V.A.G 1594.
- Switch on ignition.

Specified value: approx. battery voltage

Otherwise:

Locate and eliminate break in wiring using current flow diagram.

- Switch off ignition.
- Connect plug on TCI-H switch unit.
- Disconnect plug on Hall sender (on distributor) by pressing wire clip.



- ◀ - Connect hand multimeter to terminal 1 (-) and terminal 15 (+) with auxiliary leads for voltage measurement.

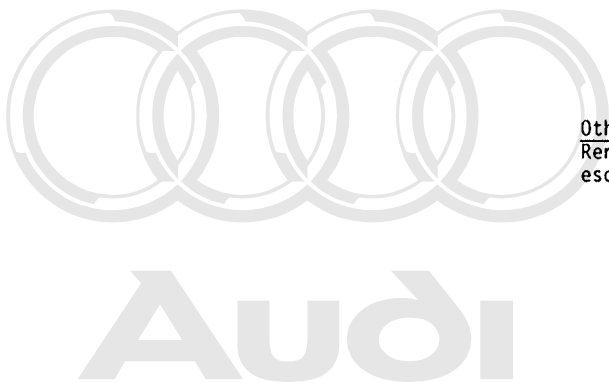
28-59

- Switch on ignition.

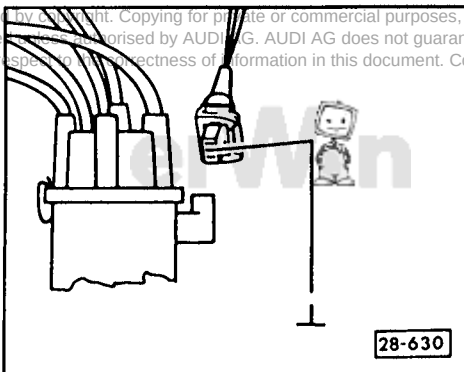
Specified value: at least 2 volts, must drop to 0 after 1 ... 2 seconds

Otherwise:

Renew TCI-H switch unit and check whether sealing compound has escaped from coil. Renew if necessary.



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- ◀ - Briefly earth centre lead of disconnected plug for Hall sender.

Indicated voltage must briefly increase to at least 2 volts.

Otherwise:

Renew TCI-H switch unit.

- Connect plug to Hall sender connection.

28-60

SERVICING FEI IGNITION SYSTEM

Engine code letters: JY, KG, KH

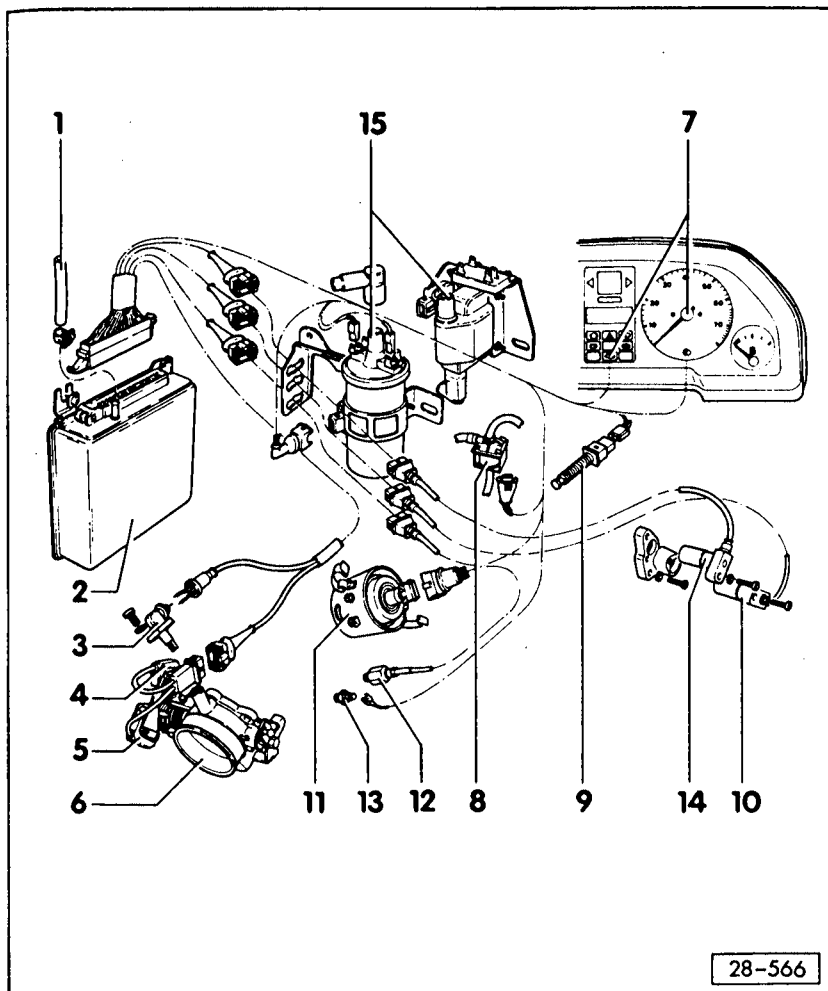
Fully electronic ignition system

Note:

- Adjustment data, spark plugs
 - page 28-65
- Observe safety measures
 - page 28-67
- Self-diagnosis and electrical testing - Repair Group 01
- Engine with code letters KH is equipped with regulated catalyst. Checking Lambda regulation
 - Repair Group 25.

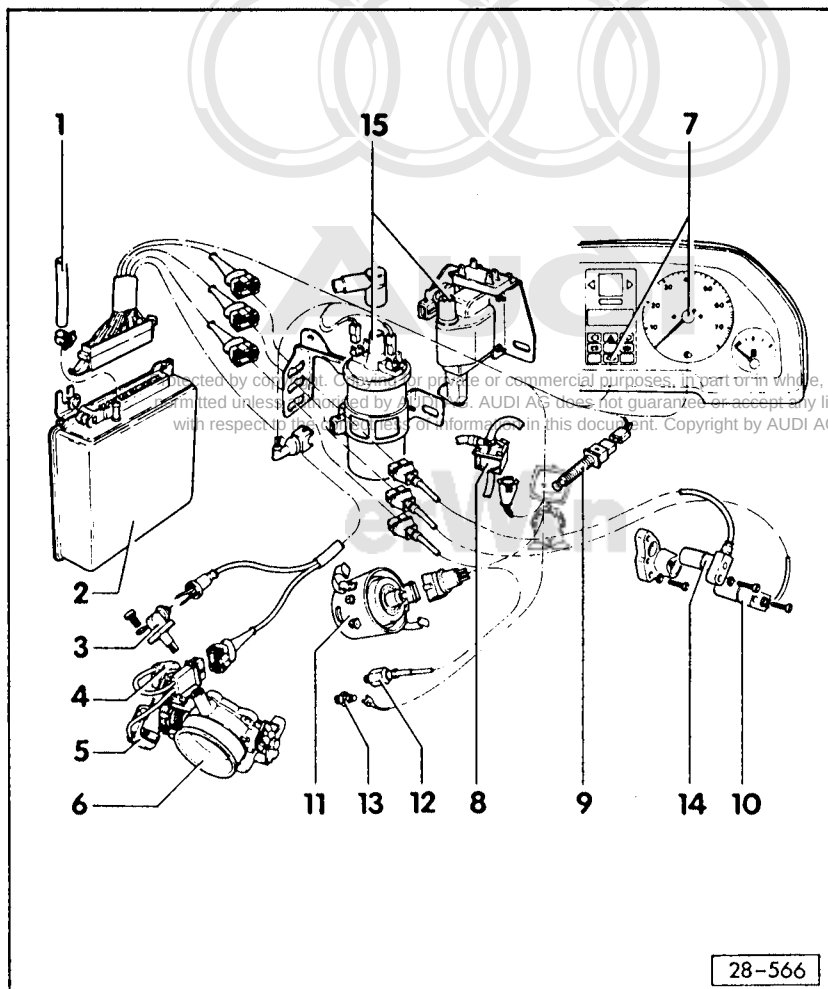
Important

- FEI control unit is equipped with fault memory. Recall fault memory before making repairs.
- Only use hand multimeter V.A.G 1526 and auxiliary leads from V.A.G 1594 for checking FEI ignition system.



28-566

28-61

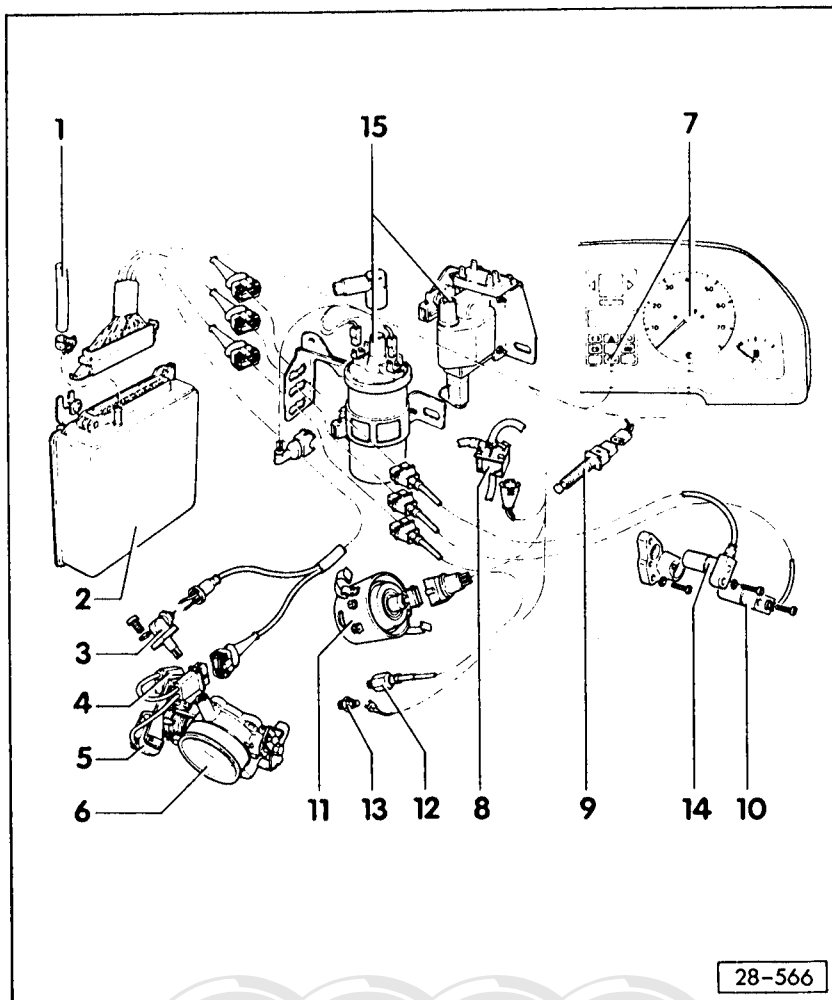


28-566

Engine code letters: JY, KG, KH

- 1- Vacuum hose
 - To intake manifold
- 2- FEI control unit (J 88)
 - Checking voltage supply
 - page 28-80
 - Fitting location: Passenger side behind lower A-pillar trim
 - Disconnect or connect connector plug only with ignition switched off
- 3- Intake air temperature sender (G 42)
 - Checking - page 28-88
 - Removing and installing
 - page 28-91
- 4- Idling switch (F 60)
 - Checking - Repair Group 25
- 5- Full throttle switch (F 81)
 - Checking - Repair Group 25
- 6- Throttle valve housing
 - Throttle valve basic setting
 - Repair Group 25

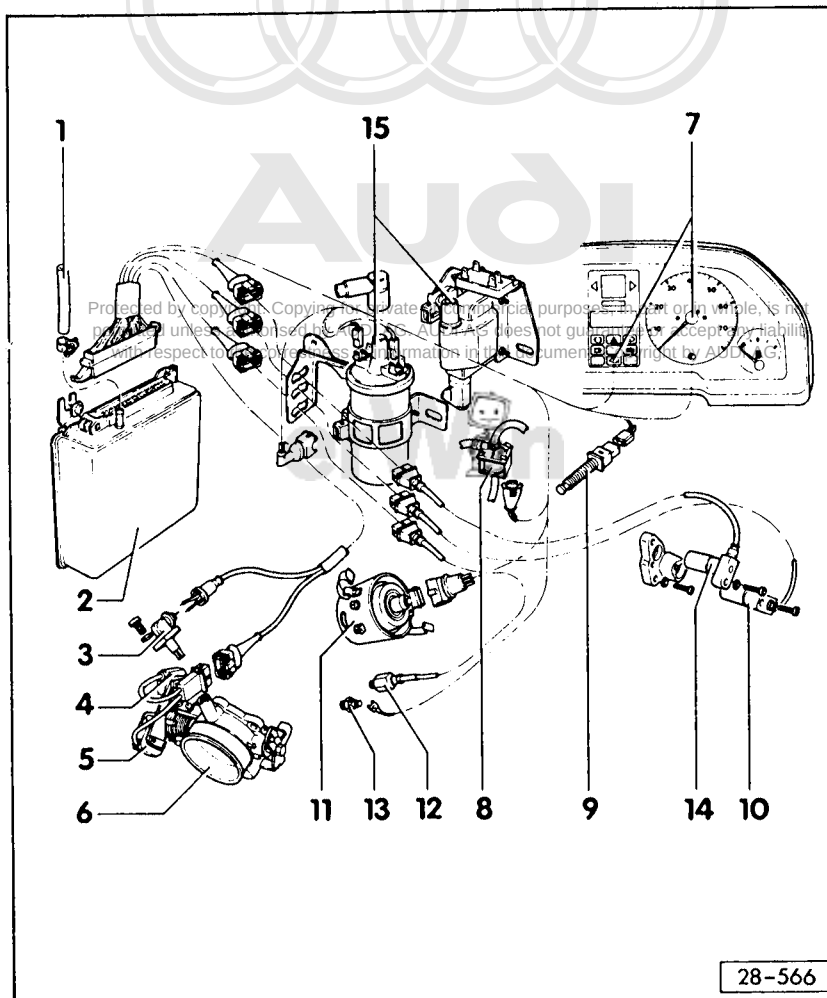
28-62



Engine code letters: JY, KG, KH

- 7- Fault display
 - With fault lamp in dash panel insert and rev counter
 - Recalling fault memory - Repair Group 01
- 8- Two-way valve (N 54)
 - Checking - page 28-96
- 9- Brake light switch
- 10- Engine speed sender (G 28)
 - Checking - page 28-84
- 11- Distributor
 - Basic setting - page 28-74
 - Checking Hall sender (G 40) - page 28-76
- 12- Knock sensor (G 61)
 - Tightening torque 10 Nm
 - Marking on connector: red

28-63



Engine code letters: JY, KG, KH

- 13- Coolant temperature sender (G 62)
 - Checking - page 28-87
- 14- Firing point sender (G 4)
 - Checking - page 28-82
 - Marking on connector: black
- 15- Ignition coil
 - Checking - page 28-69

28-64

ADJUSTMENT DATA, SPARK PLUGS

Engine code letters		JY	KG	KH
Distributor	Part No.	035 902 205 AJ		
Firing point		● Not adjustable - check basic setting - page 28-74		
Engine speed	rpm	800 ± 50		
Firing point sender	Resistance kΩ	1.0		
Engine speed sender	Resistance kΩ	1.0		
Intake air temp. sender	Resistance Ω	400 ... 700		
Coil Type 1	Secondary resistance kΩ	5 ... 8		
	Primary resistance Ω	0.5 ... 1.5		
Typ 2	Secondary resistance kΩ	5 ... 8		
	Primary resistance Ω	0.5 ... 1.5		
Rotor arm	Resistance kΩ	1.0		
Firing order		1-2-4-5-3		

28-65

Engine code letters		JY	KG	KH
Spark plugs (tightening torque 20 Nm)		► 07.85	08.85 ► 07.86	08.86 ►
Type	VW Audi	101 000 005 AC 101 000 001 AA	101 000 005 AA 101 000 001 AB	101 000 005 AB 101 000 001 AC
Manufacturer's designation		W 5 DTC 14-5 DTU	W 6 DTC 14-6 DTU	W 7 DTC 14-7 DTU
Electrode gap	mm	0.7 ... 0.9		0.7 ... 0.8

SAFETY MEASURES FOR FEI IGNITION SYSTEM

In order to avoid injury to persons and/or irreparable damage to fully electronic ignition system, observe the following when working on vehicles with fully electronic systems:

- Do not touch or disconnect ignition cables when engine is either running or turning at starting speed.
- Only disconnect and connect ignition system leads - including HT leads and tester leads - with ignition switched off.
- Do not connect suppression condenser to terminal 1 (-).
- Starting help with quick charger possible for up to 15 seconds with max. 16.5 volts. A pause of at least 1 minute is necessary after each starting attempt.
- If engine is to be operated at starting speed without starting (e. g. during compression pressure check), disconnect plug from coil power stage.
- Coil may not be replaced with ordinary coil.
- Battery must be completely disconnected during arc and spot welding.



28-67

- If heated to more than 80° C (e. g. during painting or steam cleaning) engine may not be started immediately after heating phase.

- Only wash engine with engine switched off.
- Do not disconnect battery with engine running.

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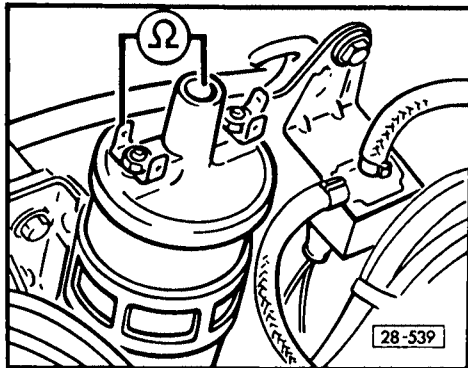
- Secondary side of coil must be suppressed with at least 2 k Ω whereby rotor arm must have 1 k Ω .
- Do not apply voltage to control unit to simulate output signal.



CHECKING COIL WITH POWER STAGE

Note:

Coil versions 1 or 2 are installed.



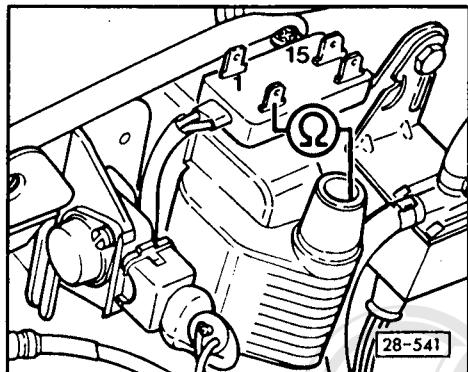
A - Checking secondary resistance

Version 1

- Pull off all connections on coil.
- Connect hand multimeter V.A.G 1526 between coil terminals 1 and 4 with auxiliary leads from V.A.G 1594 for resistance measurement.

Specified value: 5 ... 8 k Ω

If specified value is not attained, renew coil.



Version 2

- Pull off all connections on coil.
- Connect hand multimeter V.A.G 1526 between coil terminals 1 and 4 with auxiliary leads from V.A.G 1594 for resistance measurement.

Specified value: 5 ... 8 k Ω

If specified value is not attained, renew coil.

28-69

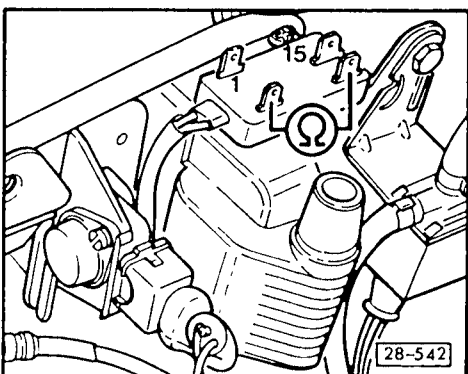
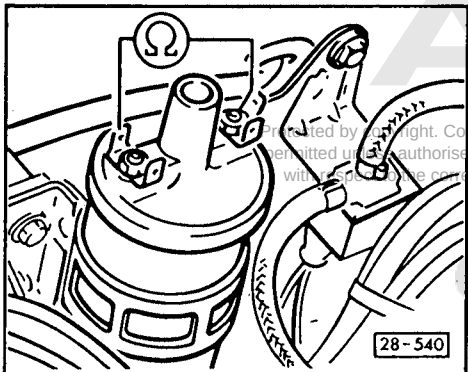
B - Checking primary resistance

Version 1

- Pull off all connections on coil.
- Connect hand multimeter between coil terminals 1 and 15 with auxiliary leads for resistance measurement.

Specified value: 0.5 ... 1.5 Ω

If specified value is not attained, renew coil.



Version 2

- Pull off all connections on coil.
- Connect hand multimeter between coil terminals 1 and 15 with auxiliary leads for resistance measurement.

Specified value: 0.5 ... 1.5 Ω

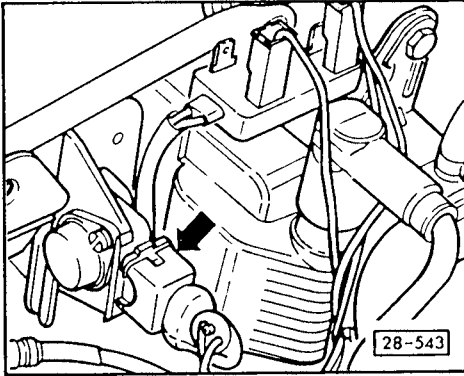
If specified value is not attained, renew coil.

28-70

C - Checking coil control

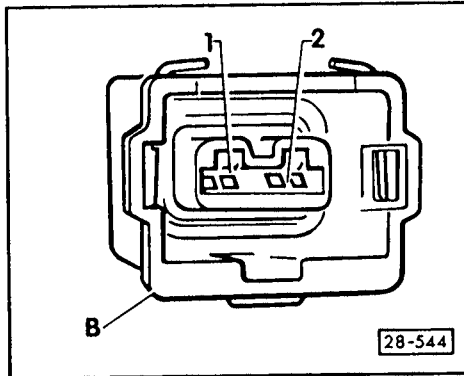
Note:

Check connection lead (blue) from coil terminal 1 to power stage for corrosion and damage.



- Pull terminal 4 lead out of distributor and earth with auxiliary leads from V.A.G 1594.

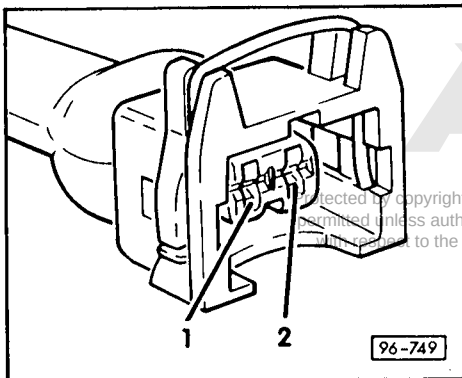
- ◀ - Disconnect plug from power stage.



- Model year 84

- ◀ - Connect hand multimeter V.A.G 1526 between contact 2 of disconnected plug (B) (green/white lead) and earth with auxiliary leads from V.A.G 1594 for voltage measurement.
- Earth contact 1 of disconnected plug with auxiliary lead.

28-71



- From model year 85

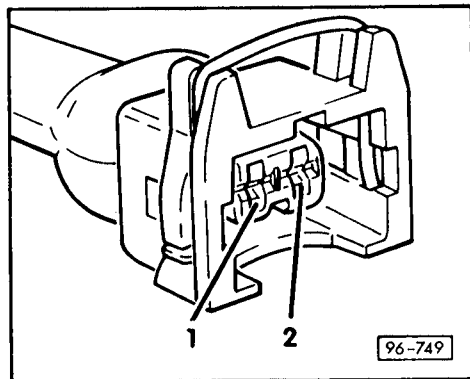
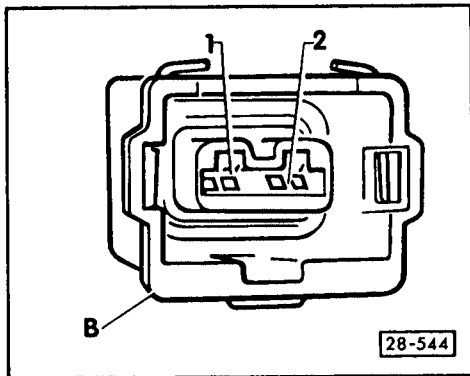
- ◀ - Connect hand multimeter V.A.G 1526 between contact 1 of disconnected plug (green/white lead) and earth with auxiliary leads from V.A.G 1594 for voltage measurement.
- Earth contact 2 of disconnected plug with auxiliary lead.

Turn over engine with starter.

Specified value: at least 0.2 volts

If specified value is not attained, check lead between power stage plug and plug on FEI control unit (J 88) as follows:

- Remove FEI control unit and pull off connector plug with ignition switched off.
- Connect test box V.A.G 1598 between FEI control unit and disconnected connector plug of FEI control unit with adapter lead V.A.G 1598/7. Connector plug contact numbers are identical to test box numbers.
- Electrical fuses OK - see current flow diagram.



• Model year 84

- Check resistance between leads of plug for coil power stage and test box V.A.G 1598 with hand multimeter V.A.G 1526 and auxiliary leads from V.A.G 1594.

Power stage plug	Test box V.A.G 1598
1	2
2	22

• From model year 85

- Check resistance between leads of plug for coil power stage and test box V.A.G 1598 with hand multimeter V.A.G 1526 and auxiliary leads from V.A.G 1594.

Power stage plug	Test box V.A.G 1598
1	22
2	2

Specified values: max. 0.5Ω

If specified values are not attained, locate and eliminate break in wiring using current flow diagram.

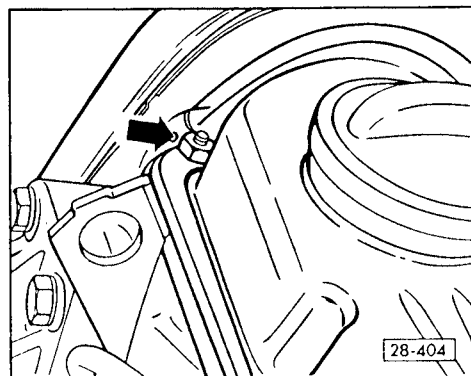
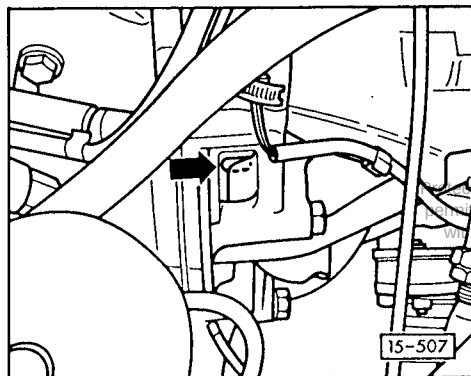
If specified values are attained, renew FEI control unit.

28-73

BASIC SETTING FOR DISTRIBUTOR

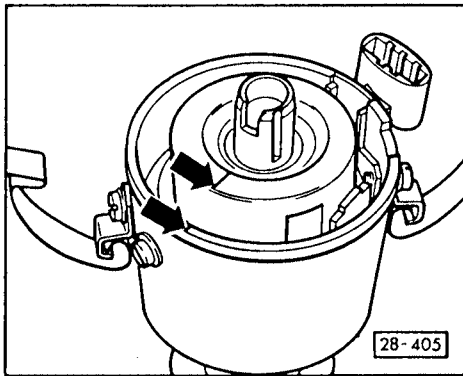
(Adjustment only with engine stopped)

- Set crankshaft to TDC cylinder 1 with special tool 2079.



- Camshaft sprocket marking must align with upper gasket edge.

- Remove distributor cap.
- Remove rotor arm and dust cap.
- Loosen distributor retaining clamp.



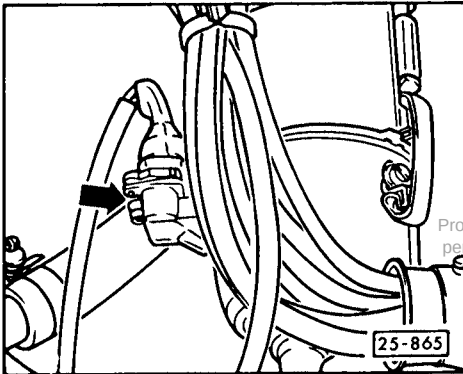
- ◀ - Turn distributor housing so that marking on rotor is aligned with marking on distributor housing.
- Secure distributor.

28-75

CHECKING HALL SENDER (G 40)

Important

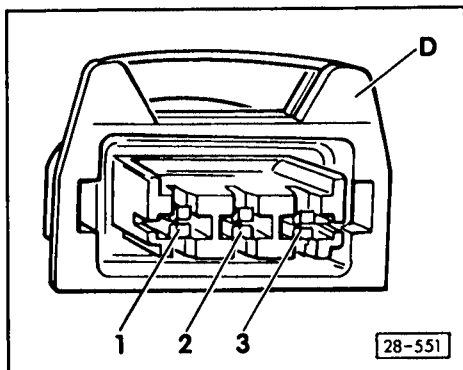
To check Hall sender, disconnect plug from coil power stage.



- ◀ - Disconnect Hall sender plug on distributor.

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erWin



- ◀ - Connect hand multimeter V.A.G 1526 to outer contacts 1 and 3 of plug D for voltage measurement with auxiliary leads from V.A.G 1594.

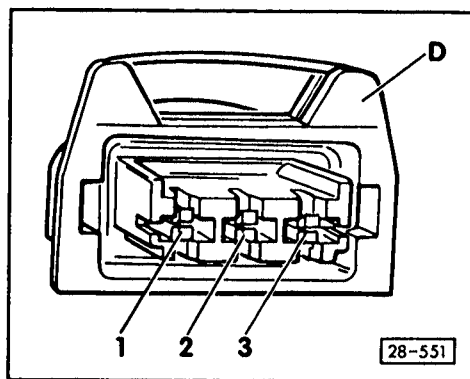
- Switch on ignition.

Specified value: at least 9 volts

- Switch off ignition.

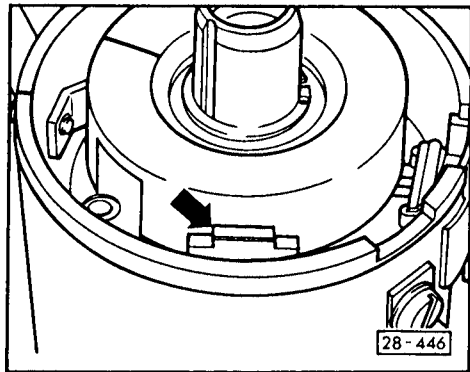
If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

If specified value is attained, push back rubber grommet on Hall sender plug.



- ◀ - Connect hand multimeter between contacts 1 and 2 on plug D of Hall sender with auxiliary leads for voltage measurement.
- Reconnect plug to Hall sender on distributor.
- Switch on ignition.
- Remove distributor cap, rotor arm and dust cap.

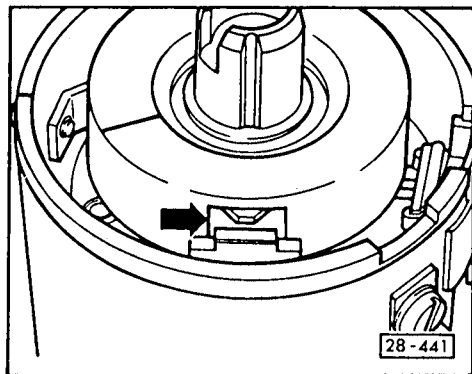
Important
Spring clip for distributor cap must not fall into sender system.



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

Specified value: at least 4 volts

28-77



- ◀ - Turn crankshaft with special tool 2079 until window is positioned completely within air gap.

Specified value: 0 ... 0.5 volts

- Switch off ignition.

If specified value is not attained, renew Hall sender or distributor.

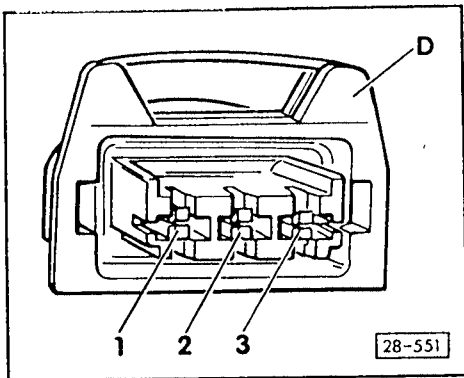
If specified value is attained, check wiring between plug connector of Hall sender and plug on FEI control unit (J 88) as follows:

- Remove FEI control unit and pull off connector plug with ignition switched off.

Connect test box V.A.G 1598 between FEI control unit and disconnected connector plug of FEI control unit with adapter lead V.A.G 1598/7. Connector plug contact numbers are identical to test box numbers.

Electrical fuses OK - see current flow diagram.

- Check resistance between leads of plug for Hall sender D and test box V.A.G 1598 with hand multimeter V.A.G 1526 and auxiliary leads from V.A.G 1594.



◀ Plug (D)

Test box

1
2
3

4
27
25

Specified values: max. 0.5Ω

If specified values are not attained, locate and eliminate break in wiring using current flow diagram.

If specified values are attained, renew FEI control unit.

28-79

CHECKING VOLTAGE SUPPLY OF FEI CONTROL UNIT (J 88)

- Remove FEI control unit and pull off connector plug with ignition switched off.
Connect test box V.A.G 1598 between FEI control unit and disconnected connector plug of FEI control unit with adapter lead V.A.G 1598/7. Connector plug contact numbers are identical to test box numbers.
Electrical fuses OK - see current flow diagram.
- Connect hand multimeter V.A.G 1526 with auxiliary leads from V.A.G 1594 for voltage measurement as follows:
 - Between contact 35 and 18
 - Between contact 35 and 9
- Switch on ignition.

Specified values: approx. battery voltage

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Switch off ignition.

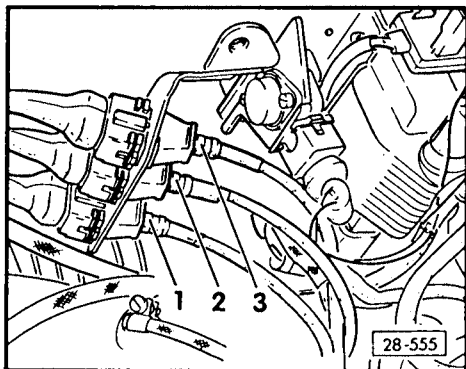
If specified values are not attained, locate and eliminate break in wiring using current flow diagram.

- Connect hand multimeter between test box contacts 32 and 9 with auxiliary leads.
- Switch on ignition.
- Operate brake pedal.

Specified value: approx. battery voltage

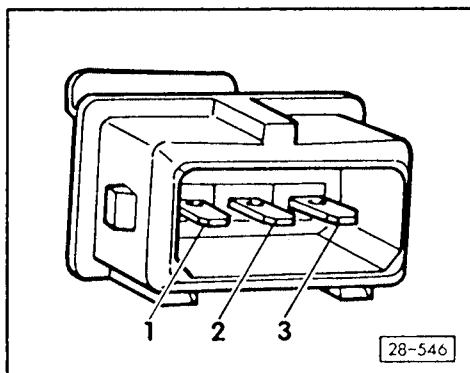
If specified values are not attained, locate and eliminate break in wiring using current flow diagram or renew brake light switch.

28-81



CHECKING FIRING POINT SENDER (G 4)

- ◀ - Separate connector 1 (black) on plenum chamber.



- ◀ - Connect hand multimeter V.A.G 1526 between plug contacts 1 and 2 with auxiliary leads from V.A.G 1594 for resistance measurement.

Protected by ~~Specified value; approx. 1 k Ω~~ purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability ~~If specified value is not attained, renew firing point sender.~~

If specified value is attained, continue test as follows:

- Connect hand multimeter between
 - o contacts 1 and 3
 - o contacts 2 and 3
 of plug with auxiliary leads.

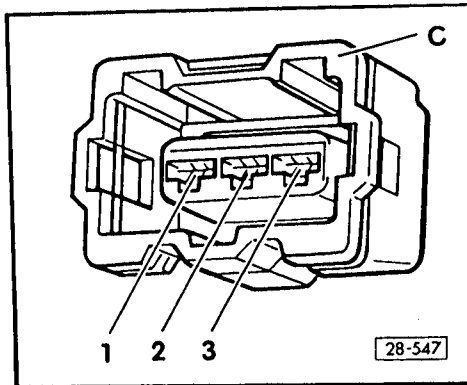
Specified values: $\infty \Omega$

28-82

If specified value is not attained, renew firing point sender.

If specified value is attained, check leads between sender connection and plug on FEI control unit (J 88) as follows:

- Remove FEI control unit and pull off connector plug with ignition switched off.
Connect test box V.A.G 1598 between FEI control unit and disconnected connector plug of FEI control unit with adapter lead V.A.G 1598/7. Connector plug contact numbers are identical to test box numbers.
Electrical fuses OK - see current flow diagram.



- ◀ - Check resistance between leads of sender plug (C) and test box with hand multimeter and auxiliary leads.

Sender plug (C)	Test box
1	13
2	12
3	28

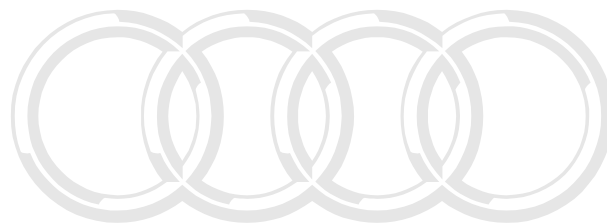
Specified values: max. 0.5 Ω

28-83

If specified values are not attained, locate and eliminate break in wiring using current flow diagram.

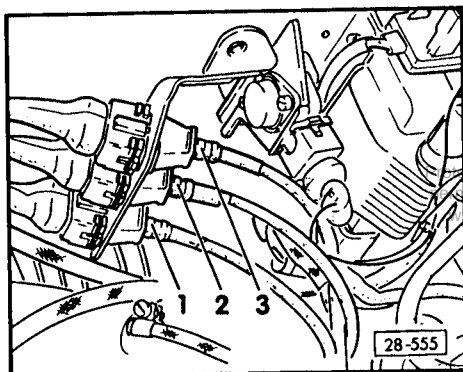
If specified values are attained, check distance from pin to firing point sender - Repair Group 13.

If distance is OK, renew FEI control unit.



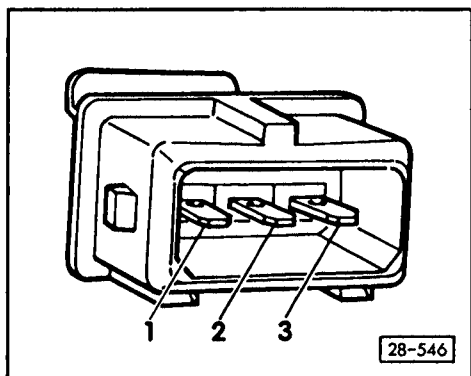
CHECKING ENGINE SPEED SENDER (G 28)

- ◀ - Separate connector 2 (grey) on plenum chamber.



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- ◀ - Connect hand multimeter V.A.G 1526 between plug contacts 1 and 2 with auxiliary leads from V.A.G 1594 for resistance measurement.

Specified value: approx. 1 k Ω

If specified value is not attained, renew engine speed sender.

If specified value is attained, continue test as follows:

- Connect hand multimeter between
 - contacts 1 and 3
 - contacts 2 and 3
 of plug with auxiliary leads.

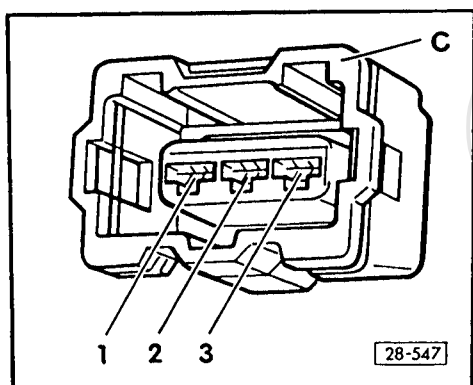
Specified values: $\infty \Omega$

If specified values are not attained, renew engine speed sender.

If specified values are attained, check leads between sender plug and plug on FEI control unit (J 88) as follows.

28-85

- Remove FEI control unit and pull off connector plug with ignition switched off. Connect test box V.A.G 1598 between FEI control unit and disconnected connector plug of FEI control unit with adapter lead V.A.G 1598/7. Connector plug contact numbers are identical to test box numbers. Electrical fuses OK - see current flow diagram.



- ◀ - Check resistance between leads of sender plug (C) and test box with hand multimeter and auxiliary leads.

Sender plug (C)	Test box
1	20
2	11
3	28

Specified values: max. 0.5 Ω

If specified values are not attained, locate and eliminate break in wiring using current flow diagram.

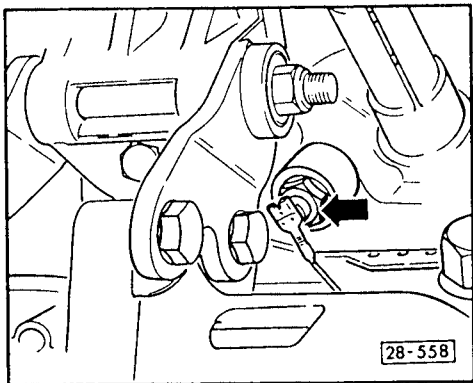
If specified values are attained, renew FEI control unit.

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28-86

CHECKING COOLANT TEMPERATURE SENDER (G 62)



- Coolant temperature above 20° C

- ◀ - Disconnect lead on coolant temperature sender.
- Connect hand multimeter V.A.G 1526 between coolant temperature sender and earth with auxiliary leads from V.A.G 1594 for resistance measurement.

Specified value: 60Ω... 1 kΩ

If specified value is not attained, renew coolant temperature sender.

If specified value is attained, check lead of coolant temperature sender as follows.

- Remove FEI control unit and pull off connector plug with ignition switched off. Connect test box V.A.G 1598 between FEI control unit and disconnected connector plug of FEI control unit with adapter lead V.A.G 1598/7. Connector plug contact numbers are identical to test box numbers. Electrical fuses OK - see current flow diagram.

28-87

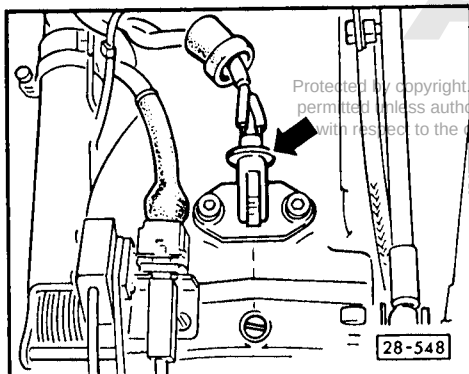
- Connect hand multimeter between test box contact 10 and disconnected lead of coolant temperature sender with auxiliary leads for resistance measurement.

Specified value: max. 0.5Ω

If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

If specified value is attained, renew FEI control unit.

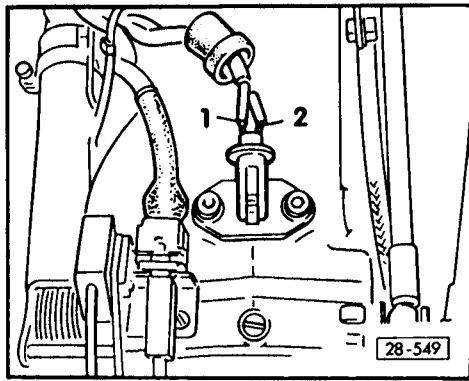
CHECKING INTAKE AIR TEMPERATURE SENDER (G 42)



- Remove FEI control unit. Disconnect plug from FEI control unit with ignition switched off.
- ◀ - Push back protective cap on intake air temperature sender.

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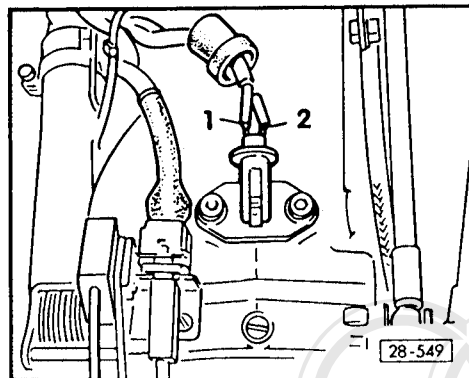
- Connect hand multimeter V.A.G 1526 between contacts 1 and 2 of intake air temperature sender with auxiliary leads from V.A.G 1594 for resistance measurement.

Specified value: 400 ... 700 Ω

If specified value is not attained, check leads between intake air temperature sender and plug on FEI control unit (J 88) as follows:

- Connect test box V.A.G 1598 between FEI control unit and disconnected connector plug with adapter lead V.A.G 1598/7 with ignition switched off. Connector plug contact numbers are identical to test box numbers. Electrical fuses OK - see current flow diagram.

28-89



- Connect hand multimeter to test box contact 23 and alternately to contacts 1 and 2 of intake air temperature sender with auxiliary leads for resistance measurement.

Specified values: max. 0.5 Ω or
400 ... 700 Ω

- Connect hand multimeter to test box contact 24 and alternately to contacts 1 and 2 of the intake air temperature sender with auxiliary leads.

Specified values: max. 0.5 Ω or
400 ... 700 Ω

If one of the specified values is not attained, cut off leads on intake air temperature sender and check sender as follows:

- Connect hand multimeter between contacts 1 and 2 of intake air temperature sender with auxiliary leads.

Specified value: 400 ... 700 Ω

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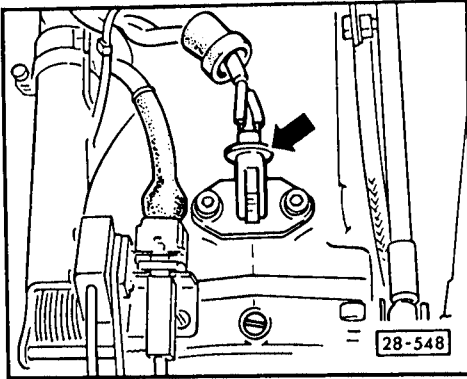
28-90

If specified value is attained, locate and eliminate break in wiring or short circuit in lead from FEI control unit to intake air temperature sender using current flow diagram.

Note:

After separating leads, intake air temperature sender must always be renewed.

If specified values are attained, renew FEI control unit.



REMOVING AND INSTALLING INTAKE AIR TEMPERATURE SENDER (G 42)

- ◄ - Slide back protective cap on intake air temperature sender.
- Separate leads from intake air temperature sender.
- Detach intake air temperature sender.

28-91

- Install new intake air temperature sender and remove protective cap.
- Pull insulating rubber and protective cap onto leads.
- Install cable lug on stripped leads and solder onto contacts of intake air temperature sender.
- Slide insulating rubber over soldered joints.
- Slide protective cap over intake air temperature sender.



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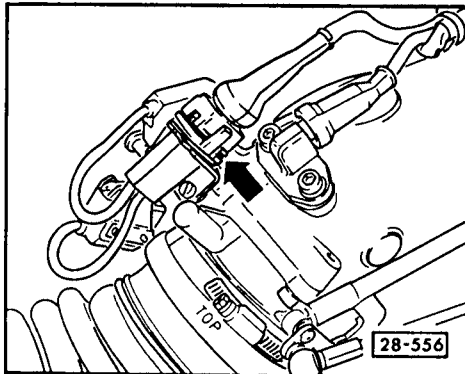
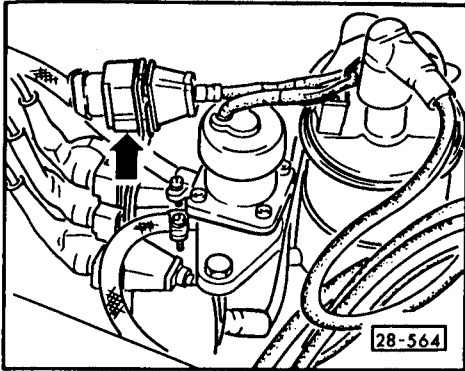
28-92

CHECKING EGR VALVE CONTROL (N 18)

Engine code letters: JY

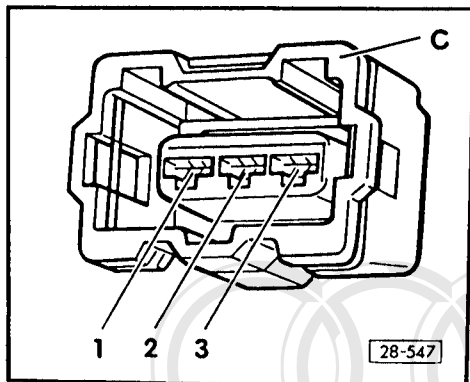
- Coolant temperature at least 80° C

- ◄ - Disconnect plug from EGR valve.



- ◄ - Disconnect plug for idling and full throttle switch on throttle valve housing.
- Disconnect vacuum hose from FEI control unit.

28-93



- ◄ - Connect hand multimeter V.A.G 1526 to plug (C) of EGR valve between contacts 1 and 3 with auxiliary leads from V.A.G 1594 for voltage measurement.

- Start engine and run at a speed of 1500 ... 2000 rpm.

Specified value: approx. battery voltage

- Switch off ignition.

If specified value is attained, check EGR valve

- Repair Group 26.

If specified value is not attained, connect hand multimeter between contact 3 (blue/black lead) of plug (C) and earth with auxiliary leads for voltage measurement.

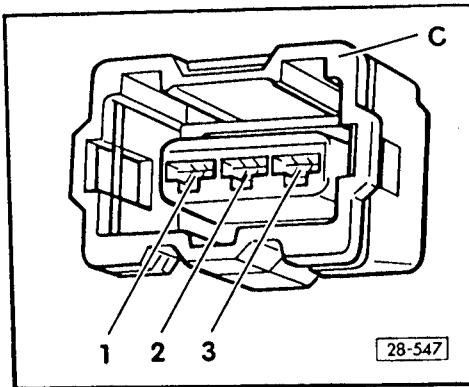
- Switch on ignition.

Specified value: approx. battery voltage

If specified value is not attained, locate and eliminate break in wiring using flow diagram.

If specified value is attained, check lead as follows:

- Remove FEI control unit and pull off connector plug with ignition switched off.
Connect test box V.A.G 1598 between FEI control unit and disconnected connector plug of FEI control unit with adapter lead V.A.G 1598/7. Connector plug contact numbers are identical to test box numbers.
Electrical fuses OK - see current flow diagram.



- ◀ - Test continuity between contact 1 (yellow/brown lead) of plug (C) and test box contact 3 with hand multimeter and auxiliary leads.

Specified value: max. 0.5 Ω

If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

If specified value is attained, renew FEI control unit.

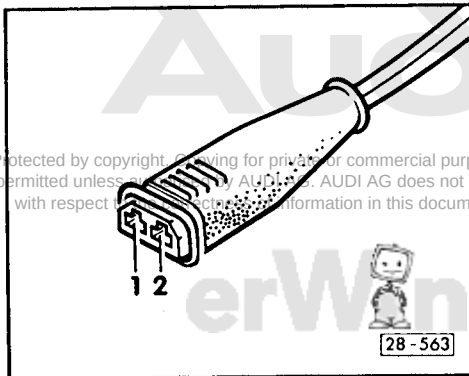
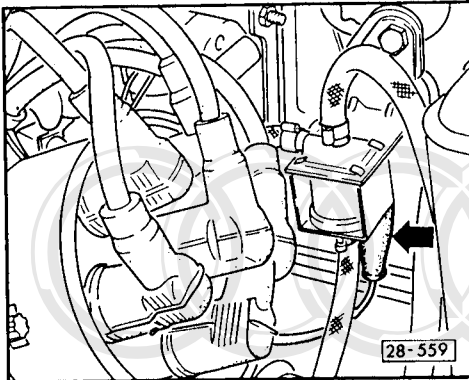
28-95

CHECKING TWO-WAY VALVE (N 54) CONTROL

- Engine oil temperature at least 80° C
- Start engine and run it at idle.
- Operate full throttle switch by hand - two-way valve must audibly switch.

If two-way valve does not switch:

- ◀ - Disconnect plug from two-way valve.



- ◀ - Connect hand multimeter V.A.G 1526 between plug contacts 1 and 2 with auxiliary leads from V.A.G 1594 for voltage measurement.

Specified value: approx. battery voltage

If specified value is not attained:

- Switch off ignition.
- Connect hand multimeter between plug contact 1 (blue/black lead) and earth with auxiliary leads.

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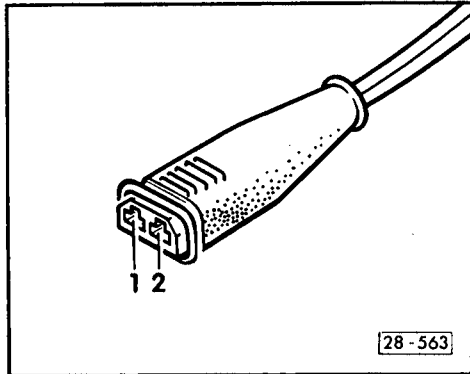
- Switch on ignition.

Specified value: approx. voltage

If specified value is not attained, locate and eliminate break in wiring using flow diagram.

If specified value is attained, check lead as follows:

- Remove FEI control unit and pull off connector plug with ignition switched off.
Connect test box V.A.G 1598 between FEI control unit and disconnected connector plug of FEI control unit with adapter lead V.A.G 1598/7. Connector plug contact numbers are identical to test box numbers.
Electrical fuses OK - see current flow diagram.



- Check continuity between contact 2 (yellow/black lead) and test box contact 8 with hand multimeter and auxiliary leads.

Specified value: max. 0.5Ω

If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

If specified value is attained, renew FEI control unit.

28-97

CHECKING REV COUNTER CONTROL

- Remove FEI control unit and pull off connector plug with ignition switched off.
Connect test box V.A.G 1598 between FEI control unit and disconnected connector plug of FEI control unit with adapter lead V.A.G 1598/7. Connector plug contact numbers are identical to test box numbers.
Electrical fuses OK - see current flow diagram.

- Connect diode test lamp V.A.G 1527 between contact 7 and contact 18 (earth) of test box with auxiliary leads from V.A.G 1594.

- Start engine and run it at idle.

- Diode test lamp must light up or flash.

If diode test lamp does not light up or flash, renew FEI control unit.

If diode test lamp lights up or flashes, but rev counter in vehicle does not indicate speed, check lead between test box contact 7 and plug connector of rev counter in dash panel insert using current flow diagram.

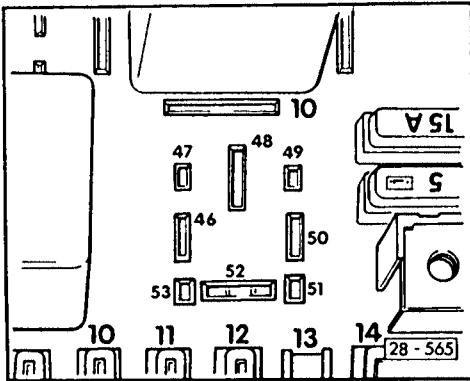
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28-98

CHECKING FUEL PUMP RELAY (J 17) CONTROL

- Remove fuse box/relay plate cover.
- Pull fuel pump relay (J 17) out of relay socket 10 on relay plate.



- ◀ - Connect hand multimeter V.A.G 1526 between contacts 46 and 47 of relay plate with auxiliary leads from V.A.G 1594 for voltage measurement.

- Briefly operate starter.

Specified value: approx. 9.5 volts

If specified value is attained, check fuel pump relay and fuel pump - Repair Group 20.

If specified value is not attained, connect hand multimeter between contact 46 and earth with auxiliary leads.

- Switch on ignition.

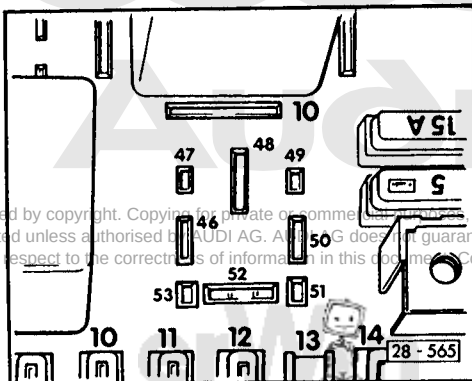
Specified value: approx. battery voltage

If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

28-99

If specified value is attained, check lead as follows:

- Remove FEI control unit and pull off connector plug with ignition switched off. Connect test box V.A.G 1598 between FEI control unit and disconnected connector plug of FEI control unit with adapter lead V.A.G 1598/7. Connector plug contact numbers are identical to test box numbers. Electrical fuses OK - see current flow diagram.



- ◀ - Check continuity between relay plate contact 47 and test box contact 21 with hand multimeter and auxiliary leads.

Specified value: max. 0.5Ω

If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

If specified value is attained, renew FEI control unit.

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SERVICING FEI IGNITION SYSTEM

=====

Engine code letters: MC with
one knock sensor

Fully electronic ignition system

Note:

- Engine with code letters MC has been reworked, and thus fully electronic ignition system has also changed. Reworked engine can be recognized by two knock sensors. Servicing FEI ignition system of reworked engine - page 28-105.
- Adjustment data, spark plugs - page 28-110
- Observe safety measures - page 28-112
- Self-diagnosis and electrical testing - Repair Group 01

Important

- FEI control unit is equipped with fault memory. Recall fault memory before making repairs - Repair Group 01.
- For checking FEI control system only use hand multimeter V.A.G 1526 and auxiliary leads from V.A.G 1594 or diode test lamp V.A.G 1527.

28-575

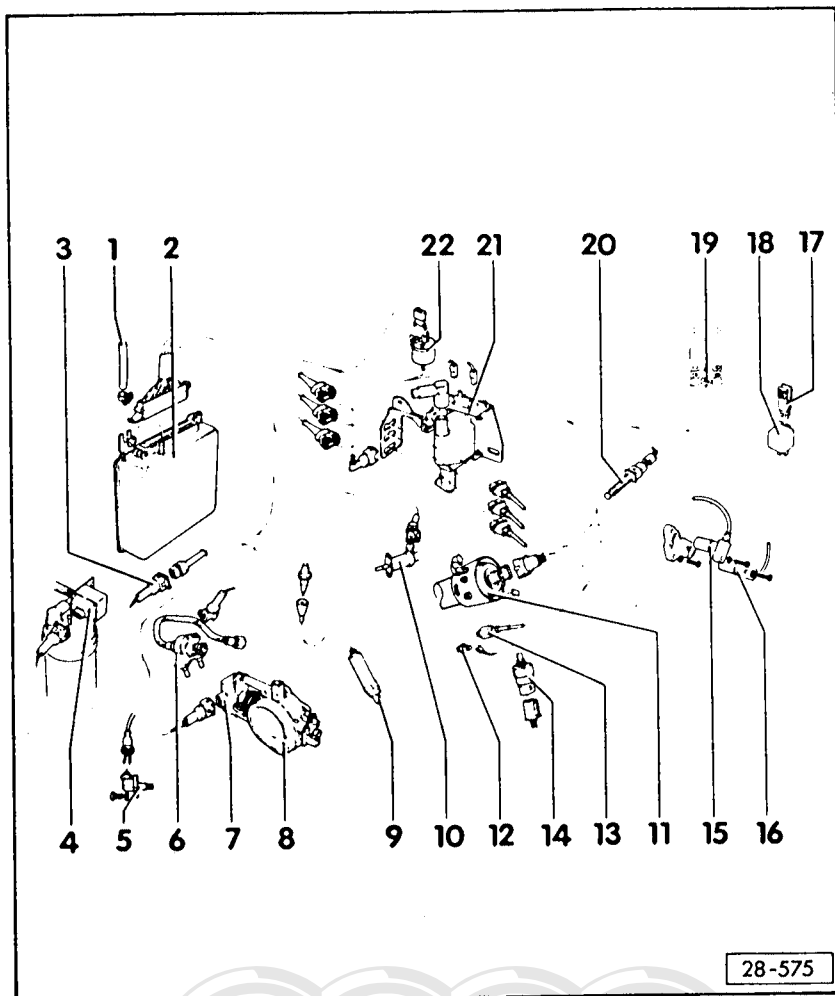
28-101

Engine code letters: MC with one knock sensor

- Vacuum hose
 - To intake manifold
- FEI control unit (J 88)
 - Checking - Repair Group 01
 - Fitting location: Passenger's side behind trim on lower A-pillar
 - Disconnect or connect plug only with ignition switched off
- Connector for Lambda probe heating
- Activated charcoal filter system solenoid valve 1 (N 80)
 - Checking control - Repair Group 01
- Intake air temperature sender (G 42)
 - Checking - page 28-137
 - Removing and installing - page 28-141
- Frequency valve for Lambda regulation (N 7)
 - Checking control - Repair Group 01
- Throttle valve switch 1 and 2
 - 1 - idling switch (F 60)
 - 2 - full throttle switch (F 81)
 - Checking - Repair Group 25

28-575

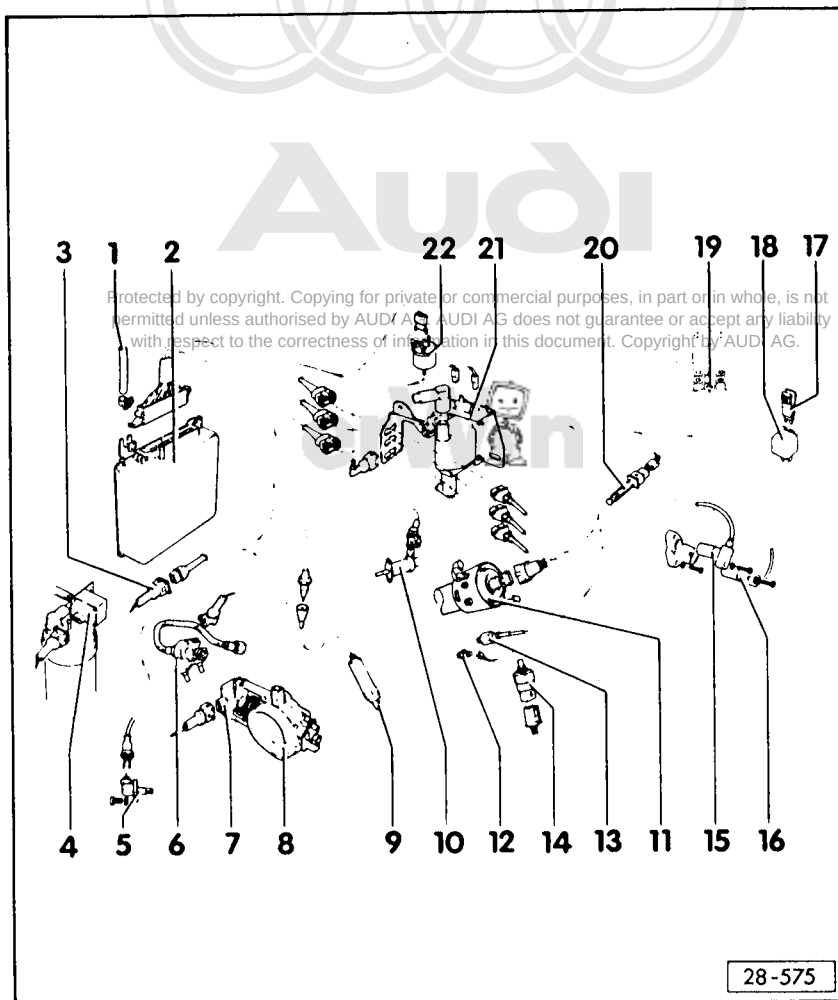
28-102



Engine code letters: MC with one knock sensor

- 8- Throttle valve housing
 - Throttle valve basic setting
 - Repair Group 25
- 9- Lambda probe (G 39) 50 Nm
 - Checking - Repair Group 25
- 10- Cold start valve (N 17)
 - Checking - Repair Group 25
 - Checking control - Repair Group 01
- 11- Ignition distributor
 - Basic setting - page 28-114
 - Checking Hall sender - page 28-117
- 12- Coolant temperature sender (G 62)
 - Checking - page 28-136
- 13- Knock sensor (G 61)
 - Tightening torque 10 Nm
 - Marking on connector: red
 - Checking - Repair Group 01
- 14- Electronic thermoswitch (F 76)
- 15- Firing point sender (G 4)
 - Checking - page 28-129

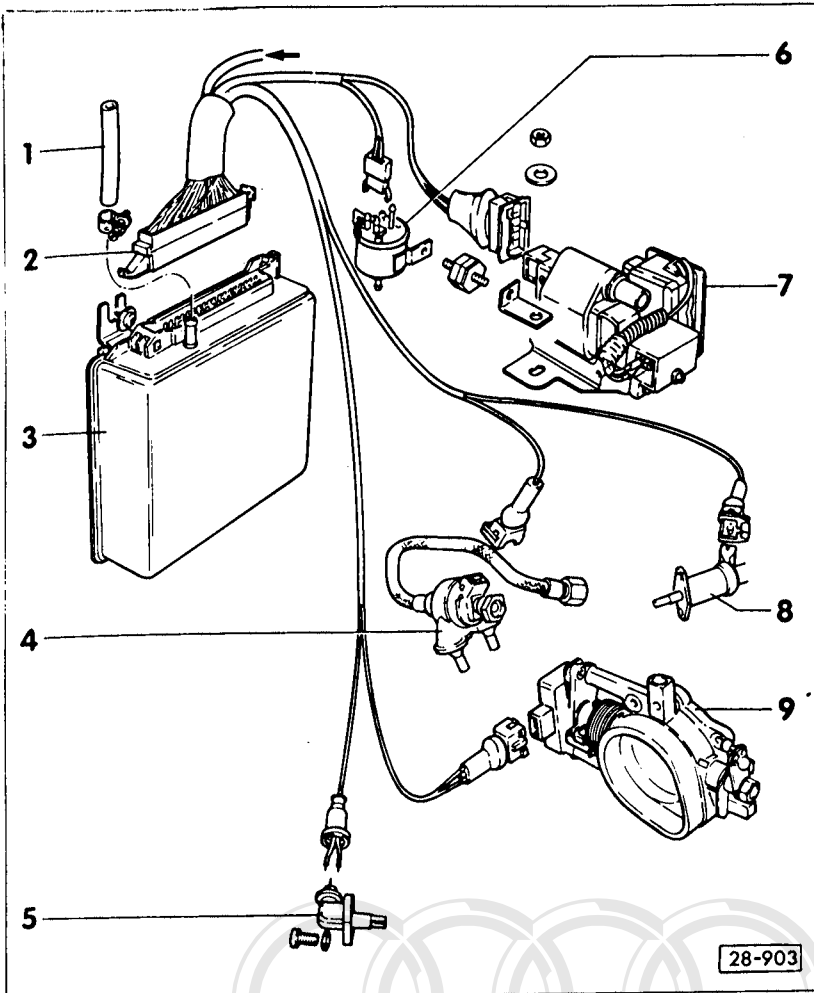
28-103



Engine code letters: MC with one knock sensor

- 16- Engine speed sender (G 28)
 - Checking - page 28-132
- 17- Fuse for initiating fault display
 - Up to model year 88
 - Recalling fault memory - Repair Group 01
- 18- Fuel pump relay (J 17)
 - Checking control - Repair Group 01
- 19- Fault lamp for self-diagnosis
 - In dash panel insert
 - 7/88 connection for self-diagnosis: on fuel pump relay
 - 8/88 connection for self-diagnosis: in driver's side footwell, front
- 20- Brake light switch
- 21- Ignition coil
 - Checking - page 28-121
- 22- Solenoid valve for boost pressure control (N 75)
 - Checking solenoid valve control
 - Repair Group 01

28-104



Engine code letters: MC with two knock sensors

Fully electronic ignition system

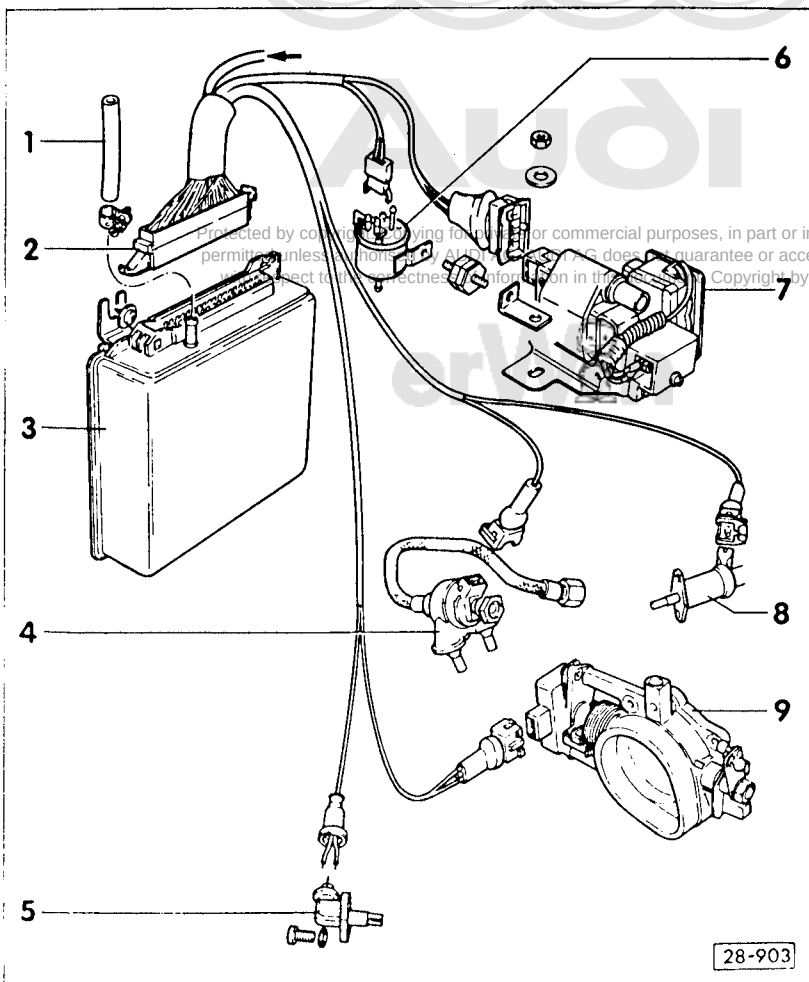
Note:

- Reworked engine can be recognized by two knock sensors.
- Servicing FEI ignition system, engines with code letters MC and one knock sensor - page 28-101.
- Adjustment data, spark plugs - page 28-110
- Observe safety measures - page 28-112
- Self-diagnosis and electrical testing - Repair Group 01

Important

- FEI control unit is equipped with fault memory. Recall fault memory before making repairs - Repair Group 01.
- For checking FEI control system only use hand multimeter V.A.G 1526 and auxiliary leads from V.A.G 1594 or diode test lamp V.A.G 1527.

28-105



Engine code letters: MC with two knock sensors

1- Vacuum hose

- To intake manifold

2- Connector plug

- Disconnect and connect only with ignition switched off

3- FEI control unit (J 88)

- Checking - Repair Group 01
- Fitting location: Passenger's side behind trim of lower A-pillar

4- Frequency valve for Lambda regulation (N 7)

- Checking control - Repair Group 01

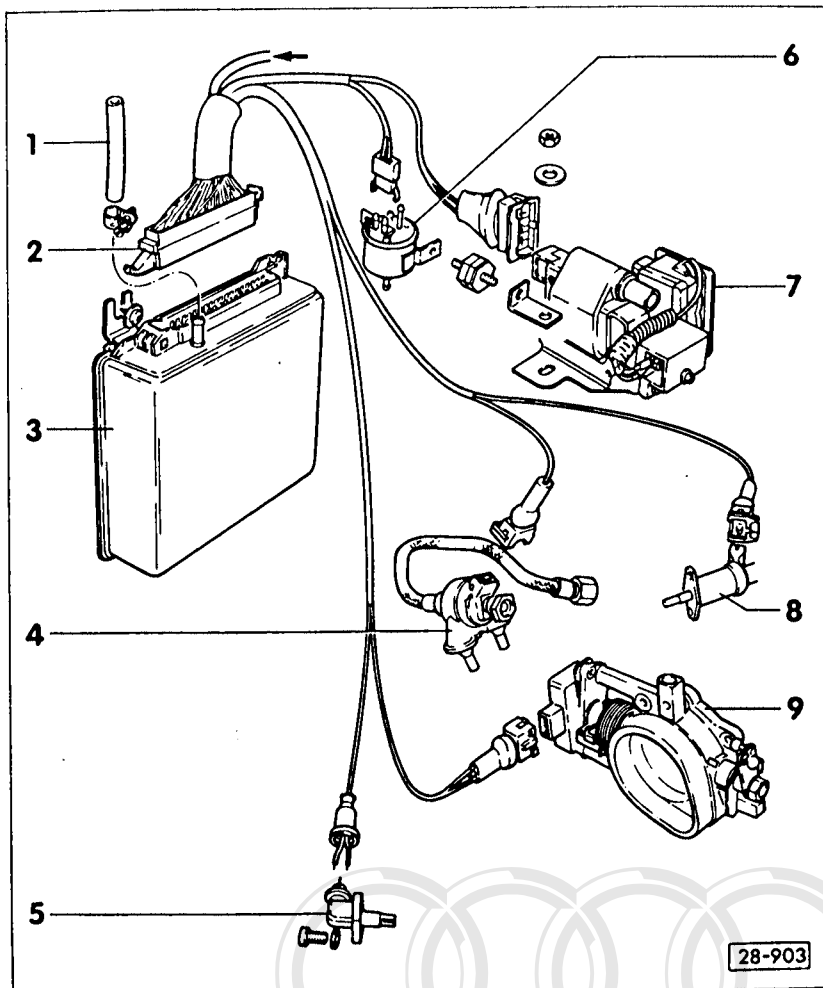
5- Intake air temperature sender (G 42)

- Checking - page 28-137

6- Solenoid valve for boost pressure control (N 75)

- Checking solenoid valve control - Repair Group 01

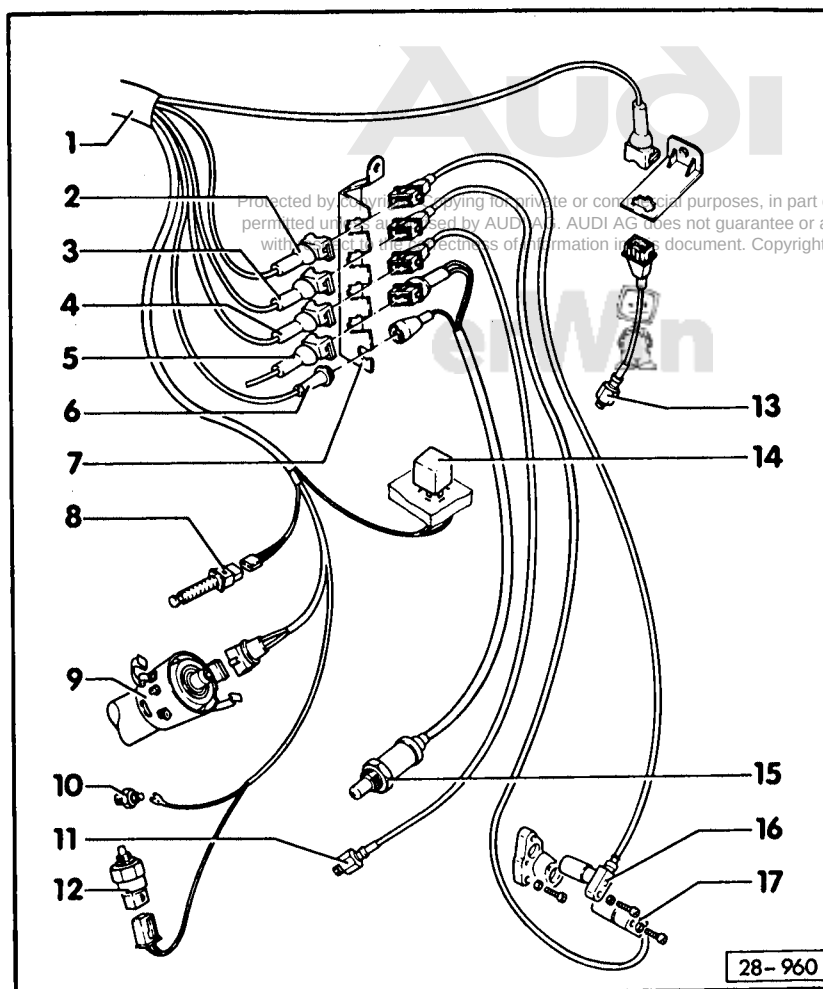
28-106



Engine code letters: MC with two knock sensors

- 7- Ignition coil
 - Checking - page 28-124
- 8- Cold start valve (N 17)
 - Checking - Repair Group 25
 - Checking control - Repair Group 01
- 9- Throttle valve housing
 - With full throttle switch (F 81) and idling switch (F 60) - checking - Repair Group 25
 - Throttle valve basic setting - Repair Group 25

28-107

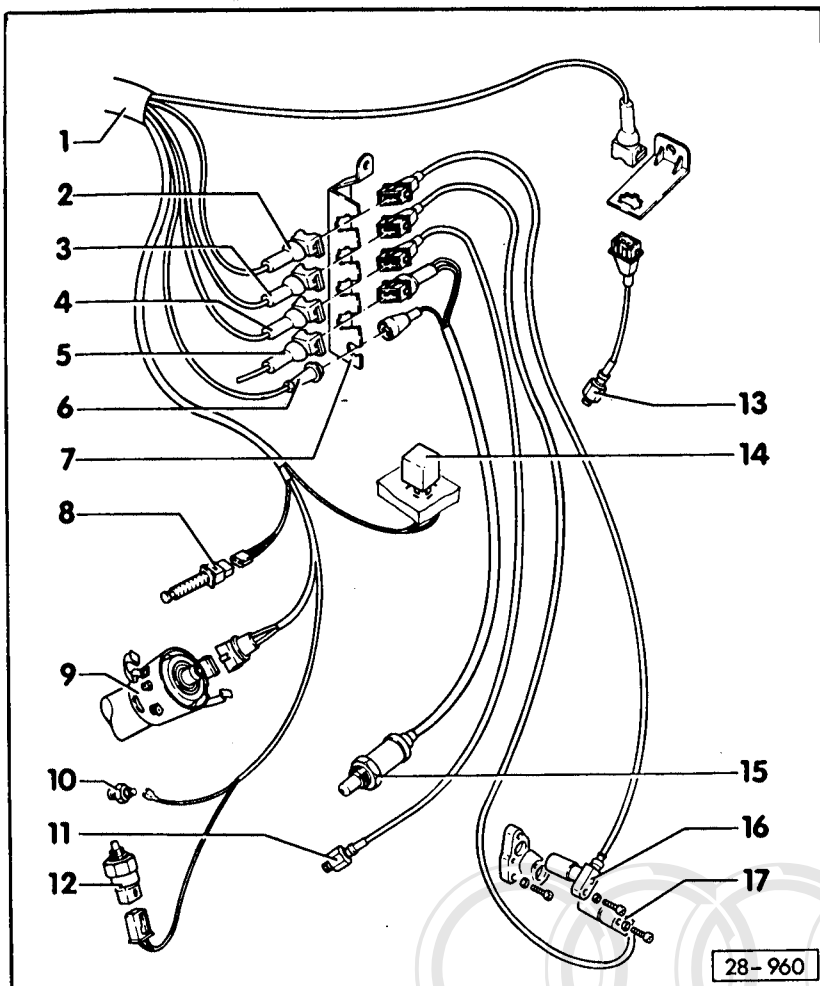


SERVICING FEI IGNITION SYSTEM Part II

Engine code letters: MC with two knock sensors

- 1- Wiring loom to FEI control unit (J 88)
- 2- Connector, black
 - For firing point sender (G 4)
- 3- Connector, grey
 - For engine speed sender (G 28)
- 4- Connector, grey
 - For knock sensor 1 (G 61)
- 5- Connector, black
 - For Lambda probe heating
- 6- Connector
 - For Lambda probe (G 39)
- 7- Bracket for connectors
- 8- Brake light switch
- 9- Ignition distributor
 - Basic setting - page 28-114
 - Checking Hall sender - page 28-117

28-108



Engine code letters: MC with two knock sensors

- 10- Coolant temperature sender (G 62)
● Checking - page 28-136
- 11- Knock sensor 1 (G 61) 10 Nm
● Checking - Repair Group 01
- 12- Electronic thermoswitch (F 76)
- 13- Knock sensor 2 (G 66), 10 Nm
● Checking - Repair Group 01
- 14- Fuel pump relay (J 17)
● Checking control - Repair Group 01
- 15- Lambda probe (J 39) 50 Nm
● Checking - Repair Group 25
- 16- Firing point sender (G 4)
● Checking - page 28-129
- 17- Engine speed sender (G 28)
● Checking - page 28-132

28-109

ADJUSTMENT DATA, SPARK PLUGS

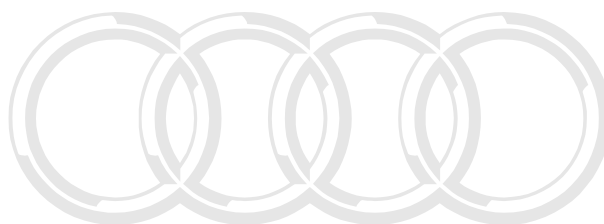
Engine code letters		MC
<u>Distributor</u>	Part No. 035 905 206 AF Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.	
<u>Firing point</u>	● Not adjustable - check basic setting - page 28-114	
<u>Engine speed *)</u>	Manual gearbox rpm	800 ± 50
	Automatic gearbox rpm	720 ± 50
<u>Firing point sender</u>	Resistance kΩ	1.0
<u>Engine speed sender</u>	Resistance kΩ	1.0
<u>Intake air temperature sender</u>	Resistance Ω	400 ... 700
<u>Coil</u>	Secondary resistance kΩ	5 ... 8
	Primary resistance Ω	0.5 ... 1.5
<u>Rotor arm</u>	Resistance Ω	1,0
<u>Firing order</u>		1-2-4-5-3

*) Observe test and adjustment conditions - Repair Group 25

28-110

Engine code letters	MC
Spark plugs Type	(Tightening torque 20 Nm) VW/Audi 101 000 005 AB 101 000 001 AC
Manufacturer's designation	W 7 DTC 14 - 7 DTU
Electrode gap	mm 0.7 ... 0.9 *)

*) On engine with two knock sensors - 0.8 + 0.1 mm



28-111

SAFETY MEASURES FOR FEI IGNITION SYSTEM

In order to avoid injury to persons and/or irreparable damage to fully electronic ignition system, observe the following when working on vehicles with fully electronic systems:

- Do not touch or disconnect ignition cables when engine is either running or turning at starting speed.
- Only disconnect and connect ignition system leads - including HT leads and tester leads - with ignition switched off.
- Do not connect suppression condenser to terminal 1 (-).
- Starting help with quick charger possible for up to 15 seconds with max. 16.5 volts. A pause of at least 1 minute is necessary after each starting attempt.
- If engine is to be operated at starting speed without starting (e. g. during compression pressure check), disconnect plug from coil power stage.
- Coil may not be replaced with an ordinary coil.
- Battery must be completely disconnected during arc and spot welding.

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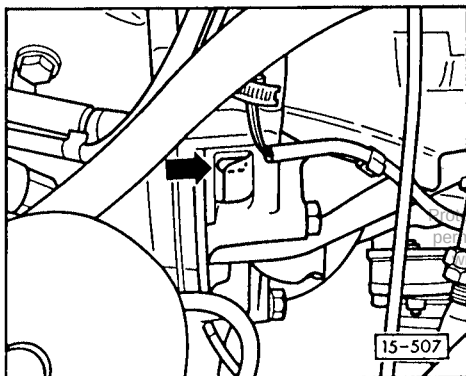
- If heated to more than 80° C (e. g. during painting or steam cleaning) engine may not be started immediately after heating phase.
- Only wash engine with engine switched off.
- Do not disconnect battery with engine running.
- Secondary side of coil must be suppressed with at least 2 k Ω whereby rotor arm must have 1 k Ω .
- Do not apply voltage to control unit to simulate output signal.

28-113

DISTRIBUTOR BASIC SETTING

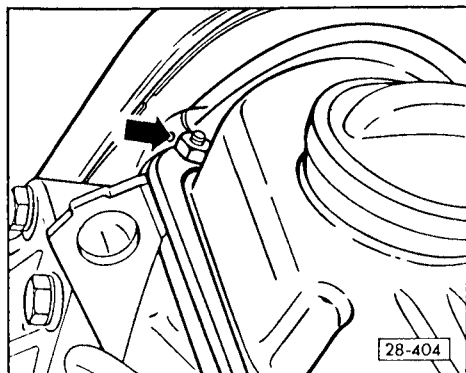
(Adjustment only with engine stopped)

- ◀ - Set crankshaft to TDC cylinder 1 with special tool 2079.



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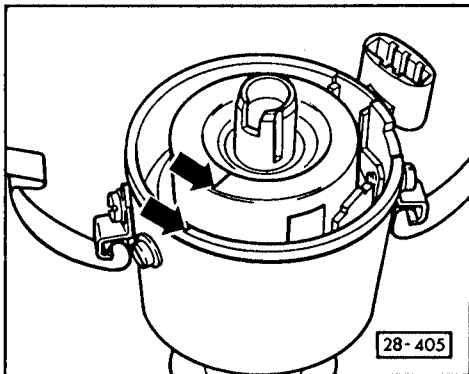
erWin



- ◀ - Camshaft sprocket marking must align with upper gasket edge.

28-114

- Remove distributor cap.
- Remove rotor arm and dust cap.
- Loosen distributor retaining clamp.



- - Rotate distributor housing so that marking on rotor aligns with marking on distributor housing.
- Secure distributor.
- Check distributor basic setting, on engines with two knock sensors - page 28-116.

28-115

CHECKING DISTRIBUTOR BASIC SETTING

Engine code letters: MC with two knock sensors

- Only after setting distributor basic setting

- - Connect diode test lamp V.A.G 1527 between contacts of black diagnosis plug -1- and blue diagnosis plug -3- with auxiliary leads from V.A.G 1594.

- Connect auxiliary leads from V.A.G 1594 to front contacts of two diagnosis plugs -1- and -2-.

- Connect plug (A) to (B).

- Start engine and run it at idle.

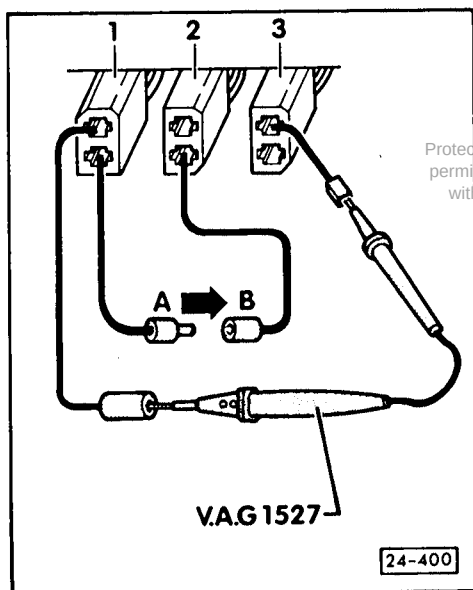
- After approx. 4 seconds separate plugs (A) and (B) again.

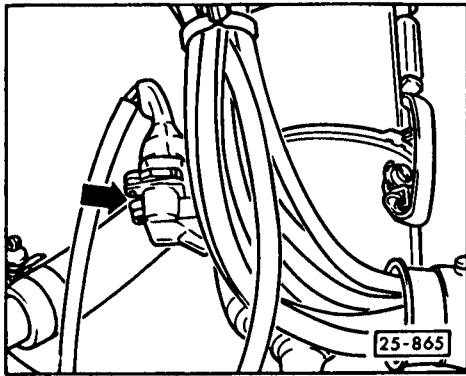
Specified value: Diode test lamp must no longer light up or flash.

Note:

If diode test lamp lights up or flashes, turn distributor housing so that diode test lamp goes out with engine running.

- Secure distributor.

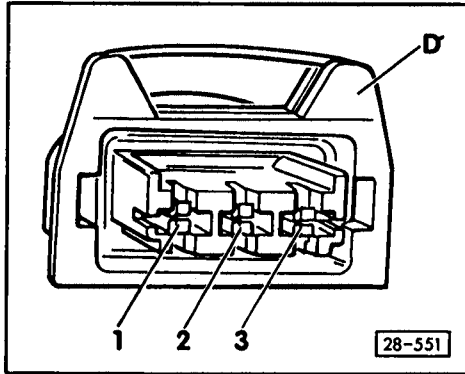




CHECKING HALL SENDER (G 40)

Important
To test Hall sender, disconnect plug from coil power stage.

- ◀ - Disconnect Hall sender plug on distributor.



- ◀ - Connect hand multimeter V.A.G 1526 to outer contacts 1 and 3 of plug (D) with auxiliary leads from V.A.G 1594 for voltage measurement.

- Switch on ignition.

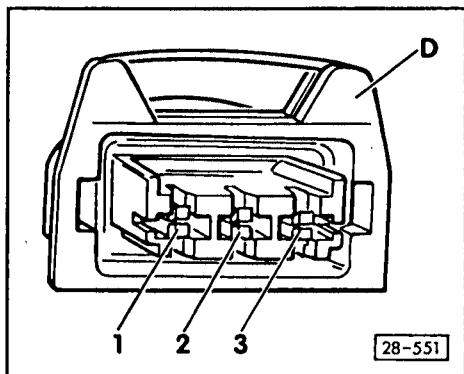
Specified value: at least 9 volts

- Switch off ignition.

If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

If specified value is attained, push back rubber grommet on Hall sender plug.

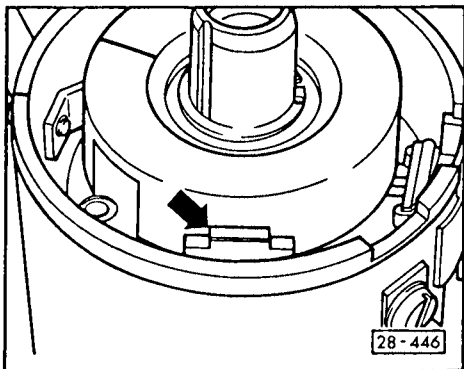
28-117



- ◀ - Connect hand multimeter between contacts 1 and 2 on plug (D) with auxiliary leads for voltage measurement.
- Reconnect plug to Hall sender on distributor.
- Switch on ignition.
- Remove distributor cap, rotor arm and dust cap.

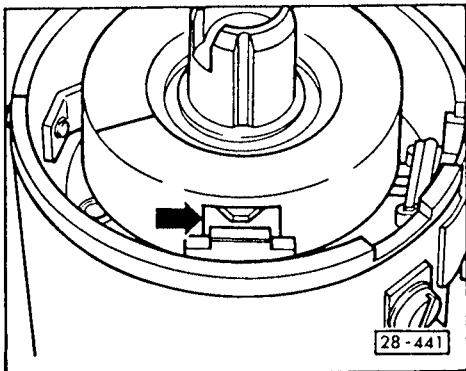
Important
Distributor cap spring clip must not fall into sender system.

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

Specified value: at least 4 volts



- ◀ - Turn crankshaft with special tool 2079 until window is positioned completely within air gap.

Specified value: 0 ... 0.5 volts

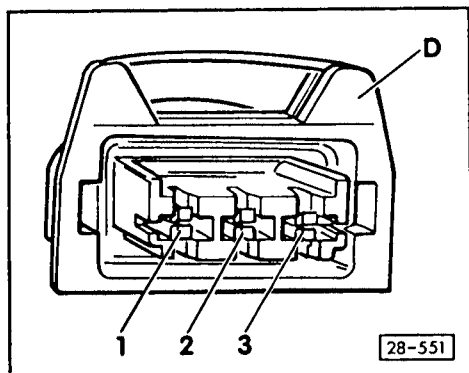
- Switch off ignition.

If specified value is not attained, renew Hall sender.

If specified value is attained, check leads between Hall sender connector and plug on FEI control unit (J 88) as follows:

- Remove FEI control unit and pull off connector plug with ignition switched off. Connect test box V.A.G 1598 between FEI control unit and disconnected connector plug of FEI control unit with adapter lead V.A.G 1598/7. Connector plug contact numbers are identical to test box numbers. Electrical fuses OK - see current flow diagram.
- Check resistance between leads of plug for Hall sender D and test box V.A.G 1598 with hand multimeter V.A.G 1526 and auxiliary leads from V.A.G 1594.

28-119



Plug (D)	Test box
1	23
2	27
3	25

Specified values: max. 0.5 Ω

If specified values are not attained, locate and eliminate break in wiring using current flow diagram.

If specified values are attained, renew FEI control unit.

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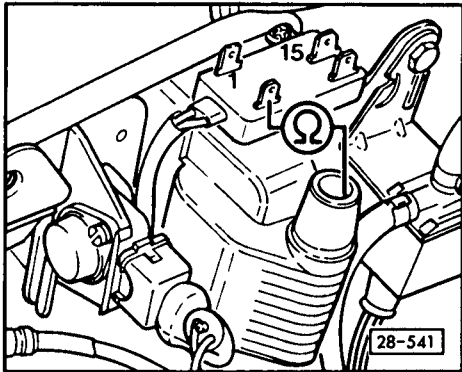


CHECKING COIL WITH POWER STAGE

Engine code letters: MC with one knock sensor

Note:

Engine code letters MC with two knock sensors - page 28-124.



A - Checking secondary resistance

- Pull off all connections on coil.

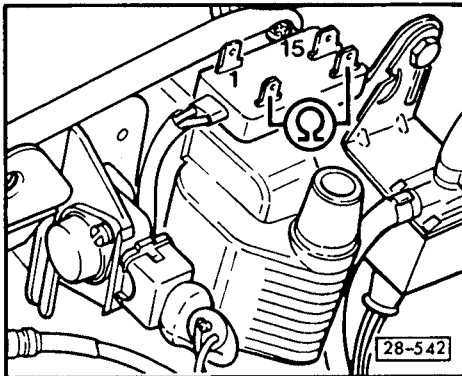
- Connect hand multimeter V.A.G 1526 between coil terminals 1 and 4 with auxiliary leads from V.A.G 1594 for resistance measurement.

Specified value: 5 ... 8 k Ω

If specified value is not attained, renew coil.

B - Checking primary resistance

- Pull off all connections on coil.



- Connect hand multimeter between coil terminals 1 and 15 with auxiliary leads for resistance measurement.

Specified value: 0.5 ... 1.5 Ω

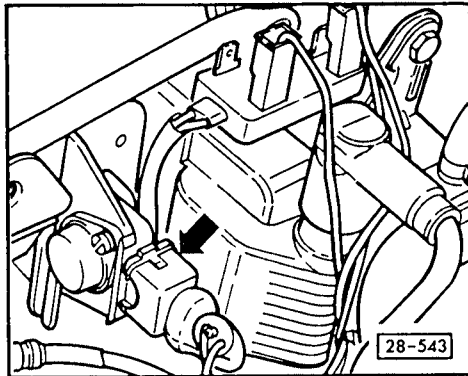
If specified value is not attained, renew coil.

28-121

C - Checking coil control

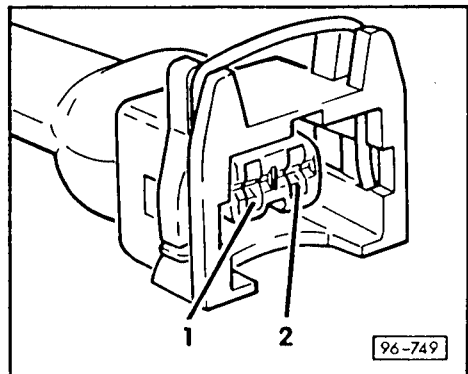
Note:

Check connection lead (blue) from coil terminal 1 to power stage for corrosion and damage to insulation.



- Pull terminal 4 lead out of distributor and earth with auxiliary leads from V.A.G 1594.

- Disconnect plug from power stage.



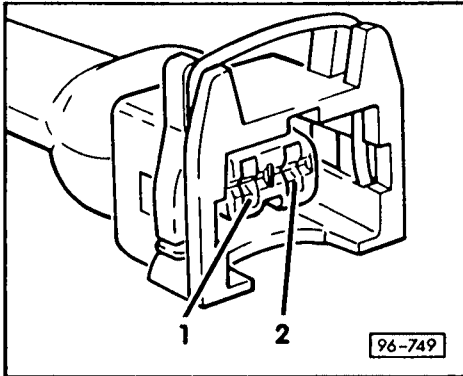
- Connect hand multimeter V.A.G 1526 between contact 1 of disconnected plug (green/white lead) and earth with auxiliary leads from V.A.G 1594 for voltage measurement.
- Earth contact 2 of disconnected plug with auxiliary lead.

- Turn over engine with starter

Specified value: at least 0.2 volts

If specified value is not attained, check leads between power stage plug and plug on FEI control unit (J 88) as follows:

- Remove FEI control unit and pull off connector plug with ignition switched off.
Connect test box V.A.G 1598 between FEI control unit and disconnected connector plug of FEI control unit with adapter lead V.A.G 1598/7. Connector plug contact numbers are identical to test box numbers.
Electrical fuses OK - see current flow diagram.
- Check resistance between leads of plug for coil power stage and test box V.A.G 1598 with hand multimeter V.A.G 1526 and auxiliary leads from V.A.G 1594.



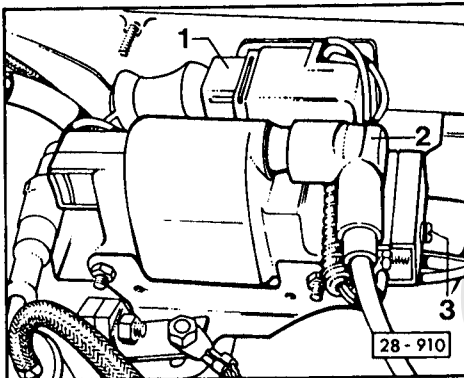
Power stage plug	Test box V.A.G 1598
1	22
2	2

Specified values: max. 0.5Ω

If specified values are not attained, locate and eliminate break in wiring using current flow diagram.

If specified values are attained, renew FEI control unit.

28-123



CHECKING COIL WITH POWER STAGE

Engine code letters: MC with two knock sensors

Note:
Engine code letters MC with one knock sensor - page 28-121.

- Disconnect plug -1- from coil power stage and remove screw -3-.

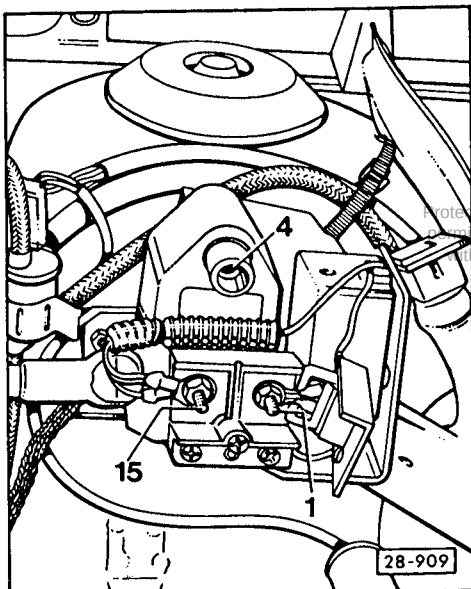
A - Checking secondary resistance

- Pull off or unscrew all connections on coil.

- Connect hand multimeter V.A.G 1526 between coil terminals 1 and 4 with auxiliary leads from V.A.G 1594 for resistance measurement.

Specified value: 5 ... 8 k Ω

If specified value is not attained, renew coil.



28-124

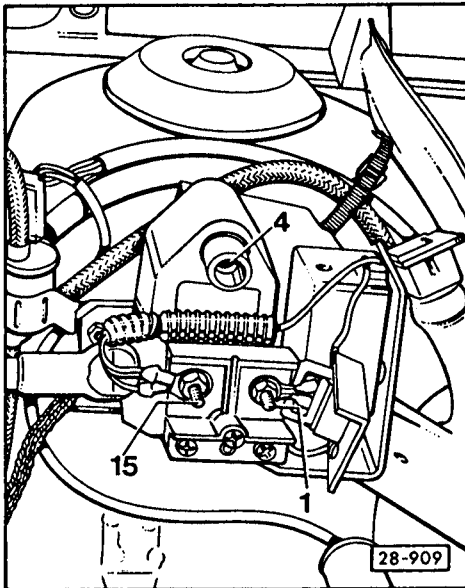
B - Checking primary resistance

- Pull off or unscrew all connections on coil.

- ◀ - Connect hand multimeter between coil terminals 1 and 15 with auxiliary leads for resistance measurement.

Specified value: 0.5 ... 1.5 Ω

If specified value is not attained, renew coil.



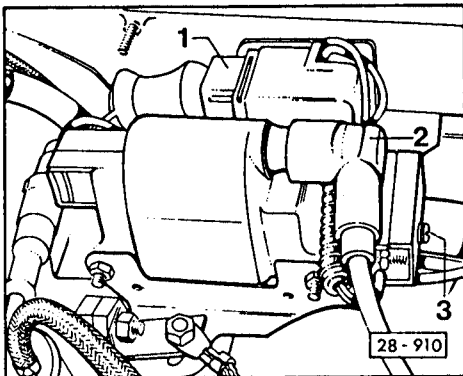
28-125

C - Checking coil control

Note:

Check connection leads between power stage and coil, and earthing strap between power stage and engine for corrosion and damage.

- ◀ - Disconnect plug -1- from coil power stage and plug -2- from coil terminal 4 and remove screw -3-.

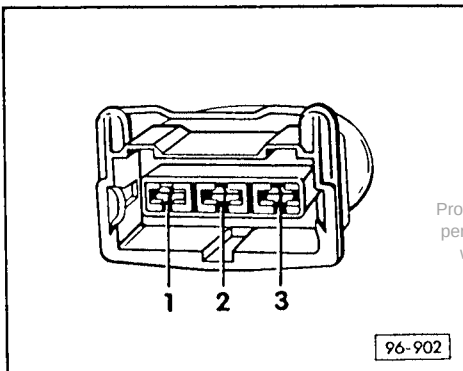


- ◀ - Connect hand multimeter V.A.G 1526 consecutively between contact 1 and earth, and between contacts 1 and 3 with auxiliary leads from V.A.G 1594 for voltage measurement.
- Switch on ignition.

Specified value: approx. battery voltage

If specified values are not attained, locate and eliminate break in wiring using current flow diagram.

- Connect hand multimeter between contacts 2 and 3 with auxiliary leads.



28-126

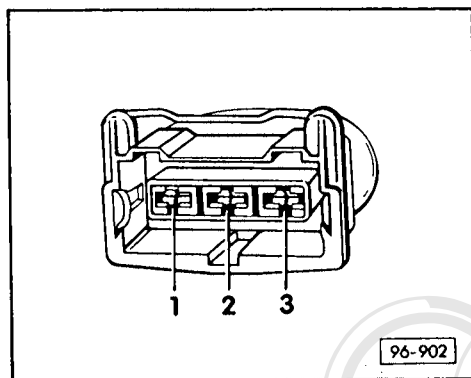
- Turn over engine with starter.

Specified value: at least 0.2 volts

If specified value is not attained, check leads between power stage plug and plug on FEI control unit (J 88) as follows:

- Remove FEI control unit and pull off connector plug with ignition switched off.
Connect test box V.A.G 1598 between FEI control unit and disconnected connector plug of FEI control unit with adapter lead V.A.G 1598/7. Connector plug contact numbers are identical to test box numbers.
Electrical fuses 13, 21 and 28 OK - see current flow diagram.
- Check resistance between leads of plug for coil power stage and test box V.A.G 1598 with hand multimeter V.A.G 1526 and auxiliary leads from V.A.G 1594.

28-127



Power stage plug	Test box V.A.G 1598
2	16

Specified value: max. 0.5 Ω

If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

If specified value is attained, renew FEI control unit.

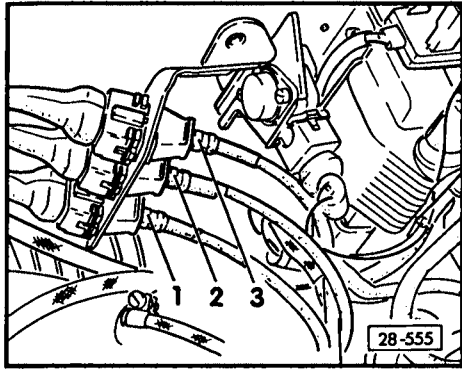
Note:
If all specified values are attained when checking coil with power stage and engine still does not run (no ignition pulse), renew coil with power stage.
(Operation of power stage cannot be checked.)

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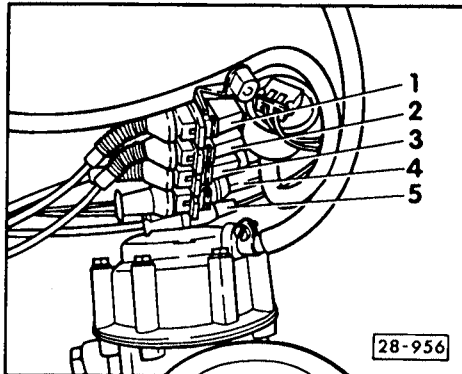


28-128

CHECKING FIRING POINT SENDER (G 4)

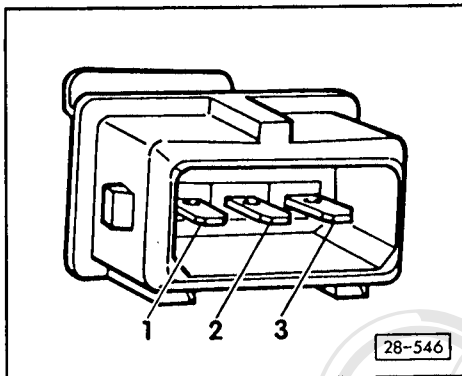


- Engine code letters MC with one knock sensor
- ◀ - Separate connector 1 (black) at plenum chamber.



- Engine code letters MC with two knock sensors
- ◀ - Separate connector 1 (black) at plenum chamber.

28-129



- ◀ - Connect hand multimeter V.A.G 1526 between plug contacts 1 and 2 with auxiliary leads from V.A.G 1594 for resistance measurement.

Specified value: approx. 1 k Ω

If specified value is not attained, renew firing point sender.

If specified value is attained, continue check as follows:

- Connect hand multimeter between

- contacts 1 and 3
- contacts 2 and 3

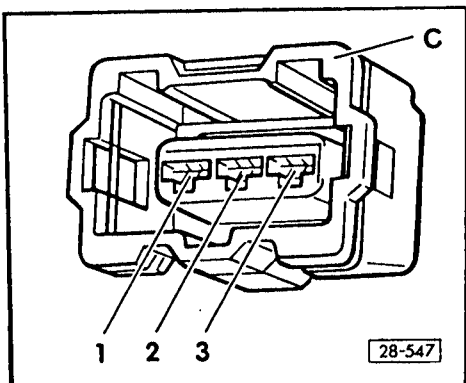
of plug with auxiliary leads.

Specified value: $\infty \Omega$

If specified value is not attained, renew firing point sender.

If specified value is attained, check leads between sender connection and plug on FEI control unit (J 88) as follows:

- Remove FEI control unit and pull off connector plug with ignition switched off.
Connect test box V.A.G 1598 between FEI control unit and disconnected connector plug of FEI control unit with adapter lead V.A.G 1598/7. Connector plug contact numbers are identical to test box numbers.
Electrical fuses OK - see current flow diagram.



- ◀ - Check resistance between leads of sender connection (C) and test box with hand multimeter and auxiliary leads.

- Engine code letters MC with one knock sensor

Sender plug (C)	Test box
1	13
2	12
3	28

- Engine code letters MC with two knock sensors

Sender plug (C)	Test box
1	13
2	12
3	12

Specified values: max. 0.5Ω

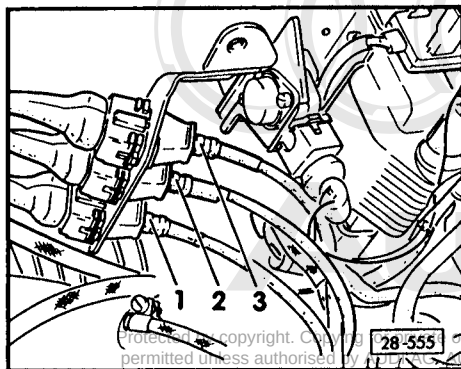
28-131

If specified values are not attained, locate and eliminate break in wiring using current flow diagram.

If specified values are attained, check distance from pin to firing point sender - Repair Group 13.
If distance is OK, renew FEI control unit.

CHECKING ENGINE SPEED SENDER (G 28)

- Engine code letters MC with one knock sensor.

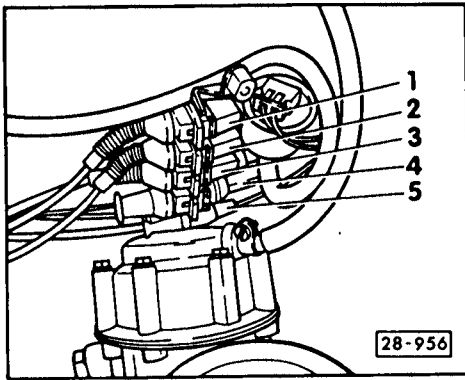


- ◀ - Separate connector 2 (grey) at plenum chamber.

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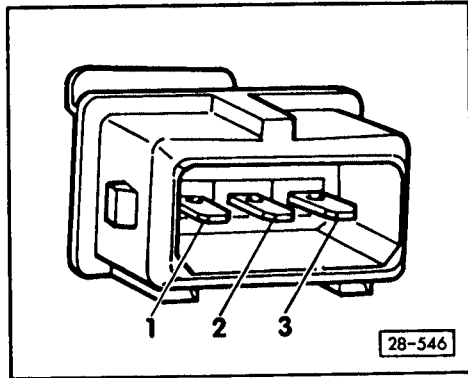


28-132



● Engine code letters MC with two knock sensors.

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



◄ - Connect hand multimeter V.A.G 1526 between plug contacts 1 and 2 with auxiliary leads from V.A.G 1594 for resistance measurement.

Specified value: approx. 1 k Ω

If specified value is not attained, renew firing point sender.

If specified value is attained, continue check as follows:

28-133

- Connect hand multimeter between

- contacts 1 and 3
- contacts 2 and 3

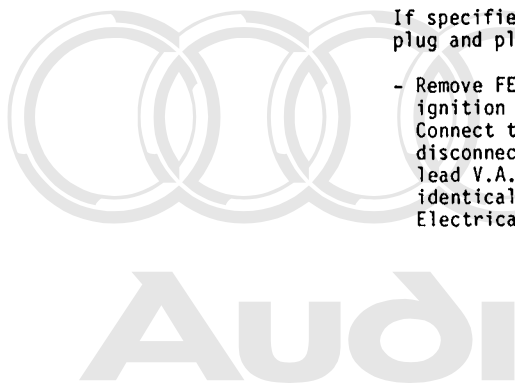
of plug with auxiliary leads.

Specified value: $\infty \Omega$

If specified value is not attained, renew engine speed sender.

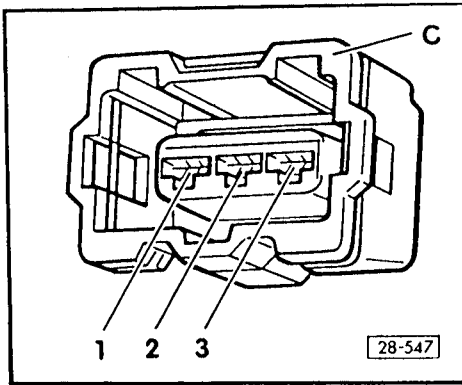
If specified value is attained, check leads between sender plug and plug on FEI control unit (J 88) as follows:

- Remove FEI control unit and pull off connector plug with ignition switched off. Connect test box V.A.G 1598 between FEI control unit and disconnected connector plug of FEI control unit with adapter lead V.A.G 1598/7. Connector plug contact numbers are identical to test box numbers. Electrical fuses OK - see current flow diagram.



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- ▶ - Check resistance between leads of sender connection (C) and test box with hand multimeter and auxiliary leads.

- Engine code letters MC with one knock sensor

Sender plug (C)	Test box
1	29
2	11
3	28

- Engine code letters MC with two knock sensors

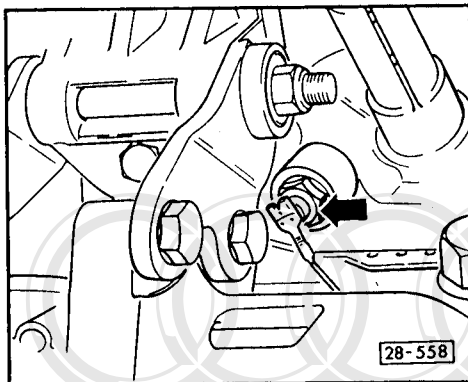
Sender plug (C)	Test box
1	29
2	11
3	29

Specified values: max. 0.5Ω

If specified values are not attained, locate and eliminate break in wiring using current flow diagram.

If specified values are attained, renew FEI control unit.

28-135



CHECKING COOLANT TEMPERATURE SENDER (G 62)

- Coolant temperature above 20°C
- ▶ - Disconnect lead on coolant temperature sender.
- Connect hand multimeter V.A.G 1526 between coolant temperature sender and earth with auxiliary leads from V.A.G 1594 for resistance measurement.

Specified value: $60\Omega \dots 1\text{ k}\Omega$

If specified value is not attained, renew coolant temperature sender.

If specified value is attained, check lead of coolant temperature sender as follows:

- Remove FEI control unit and pull off connector plug with ignition switched off. Connect test box V.A.G 1598 between FEI control unit and disconnected connector plug of FEI control unit with adapter lead V.A.G 1598/7. Connector plug contact numbers are identical to test box numbers. Electrical fuses OK - see current flow diagram.

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28-136

- Connect hand multimeter between test box contact 10 and disconnected lead of coolant temperature sender with auxiliary leads for resistance measurement.

Specified value: max. 0.5Ω

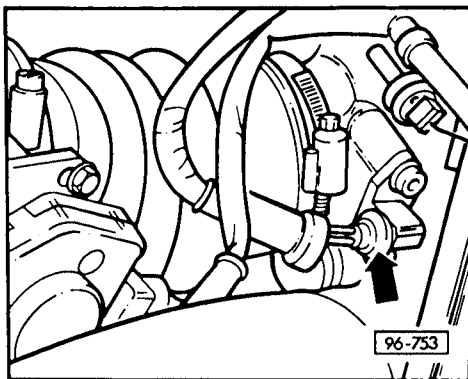
If specified value is not attained, locate and eliminate break in wiring using current flow diagram.

If specified value is attained, renew FEI control unit.

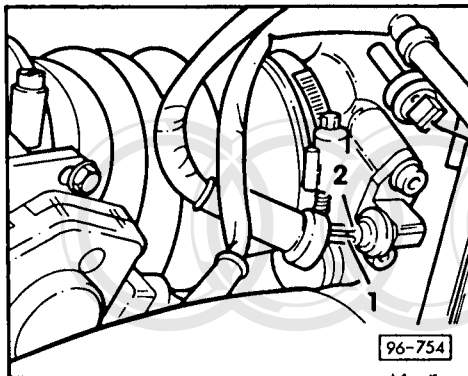
CHECKING INTAKE AIR TEMPERATURE SENDER (G 42)

- Remove FEI control unit.
Disconnect plug from FEI control unit with ignition switched off.

- ◀ - Push back protective cap on intake air temperature sender.



28-137

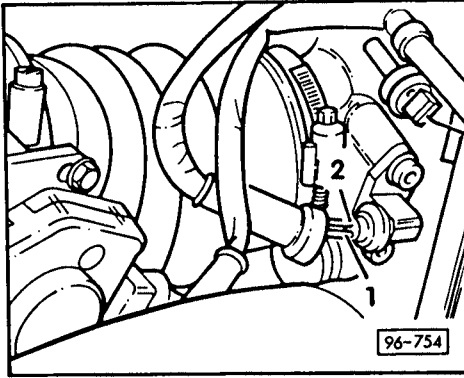


- ◀ - Connect hand multimeter V.A.G 1526 between contacts 1 and 2 of intake air temperature sender with auxiliary leads from V.A.G 1594 for resistance measurement.

Specified value: 400 ... 700 Ω

If specified value is not attained, check leads between intake air temperature sender and plug on FEI control unit (J 88) as follows:

- Connect test box V.A.G 1598 between FEI control unit and disconnected connector plug with adapter lead V.A.G 1598/7 with ignition switched off.
Connector plug contact numbers are identical to test box numbers.
Electrical fuses OK - see current flow diagram.



● Engine code letters MC with one knock sensor

- - Connect hand multimeter to test box contact 23 and alternately to contacts 1 and 2 of intake air temperature sender with auxiliary leads for resistance measurement.

Specified values: max. 0.5 Ω or
400 ... 700 Ω

- Connect hand multimeter to test box contact 24 and alternately to contacts 1 and 2 of intake air temperature sender with auxiliary leads.

Specified values: max. 0.5 Ω or
400 ... 700 Ω

● Engine code letters MC with two knock sensors

- Connect hand multimeter to test box contact 23 and alternately to contacts 1 and 2 of intake air temperature sender with auxiliary leads for resistance measurement.

Specified values: max. 0.5 Ω or
400 ... 700 Ω

28-139

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

Specified values: max. 0.5 Ω or
400 ... 700 Ω

If one of specified values is not attained, cut off leads on intake air temperature sender and check sender as follows:

- Connect hand multimeter between contacts 1 and 2 of intake air temperature sender with auxiliary leads.

Specified value: 400 ... 700 Ω

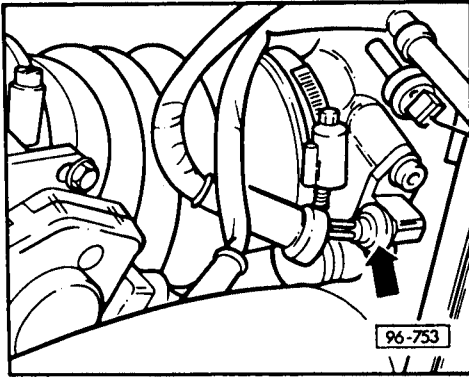
If specified value is attained, locate and eliminate break in wiring or short circuit in lead from FEI control unit to intake air temperature sender using current flow diagram.

Note:
After leads are cut off, intake air temperature sender must always be renewed.

If specified values are attained, renew FEI control unit.

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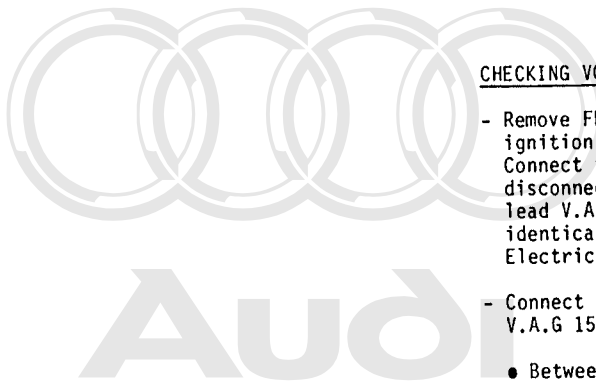




REMOVING AND INSTALLING INTAKE AIR TEMPERATURE SENDER (G 42)

- - Push back protective cap on intake air temperature sender.
- Separate leads from intake air temperature sender.
- Unscrew intake air temperature sender.
- Install new intake air temperature sender and remove protective cap.
- Install insulating rubber and protective cap on leads.
- Install cable lug on stripped leads and solder onto contacts of intake air temperature sender.
- Slide insulating rubber over soldered joints.
- Slide protective cap onto intake air temperature sender.

28-141



CHECKING VOLTAGE SUPPLY OF FEI CONTROL UNIT (J 88)

- Remove FEI control unit and pull off connector plug with ignition switched off.
Connect test box V.A.G 1598 between FEI control unit and disconnected connector plug of FEI control unit with adapter lead V.A.G 1598/7. Connector plug contact numbers are identical to test box numbers.
Electrical fuses OK - see current flow diagram.
- Connect hand multimeter V.A.G 1526 with auxiliary leads from V.A.G 1594 for voltage measurement as follows:
 - Between contact 35 and 18
 - Between contact 35 and 9

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- Switch on ignition.

Specified values: approx. battery voltage

- Switch off ignition.

If specified values are not attained, locate and eliminate break in wiring using current flow diagram.



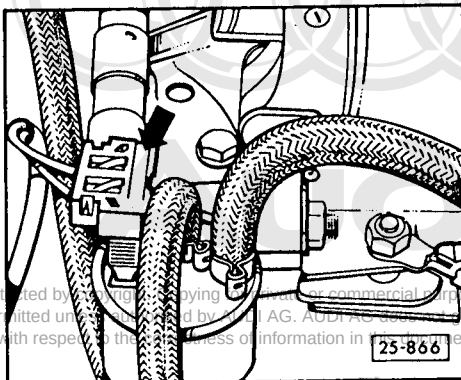
28-142

- Connect hand multimeter between test box contacts 32 and 9 with auxiliary leads.
- Switch on ignition.
- Operate brake pedal.

Specified value: approx. battery voltage

If specified value is not attained, locate and eliminate break in wiring using current flow diagram or renew brake light switch.

28-143

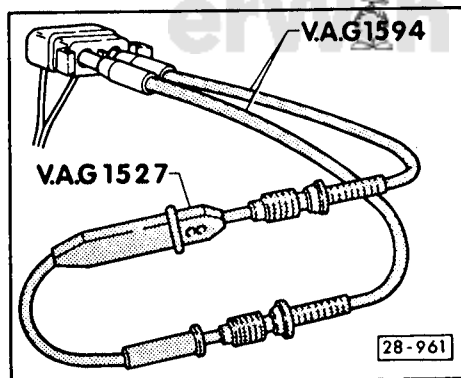


CHECKING TEMPERATURE SAFETY SWITCH

- Control of solenoid valve for boost pressure control (N 75) OK
- see Repair Group 01.

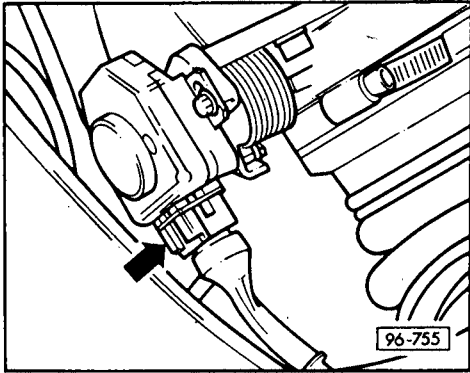
- ◀ - Disconnect plug from solenoid valve for boost pressure control (N 75).

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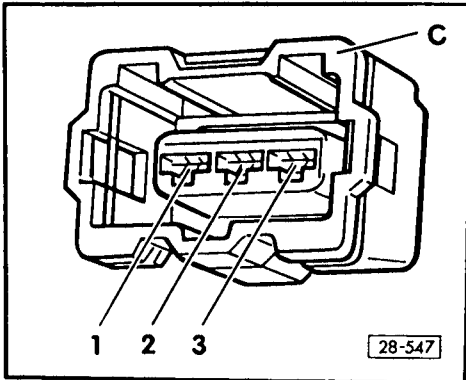


- ◀ - Connect diode test lamp V.A.G 1527 to plug contacts with auxiliary leads from V.A.G 1594.
- Start engine and run it at idle.

28-144



- ◀ - Disconnect plug for idling and full throttle switch on throttle valve housing.



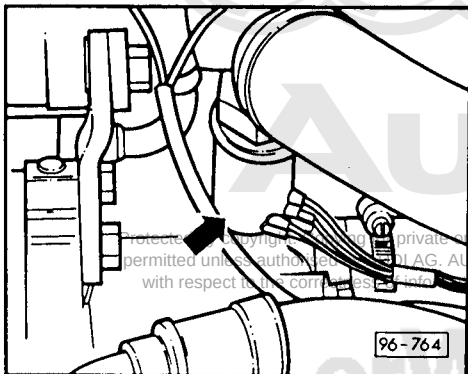
- ◀ - Briefly link (short circuit) contacts 2 and 3 of plug (C) with auxiliary leads from V.A.G 1594.

Specified value: Diode test lamp must flicker approx. 2 seconds

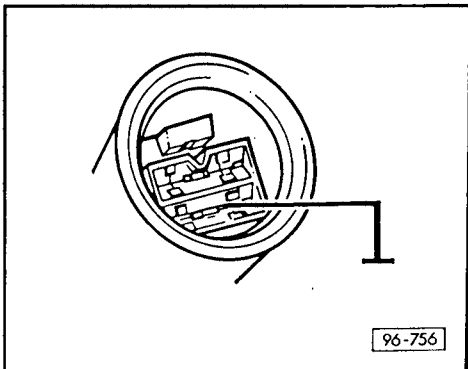
If specified value is not attained, renew electronic thermoswitch (F 76).

If specified value is attained, remove auxiliary leads between contacts 2 and 3.

28-145

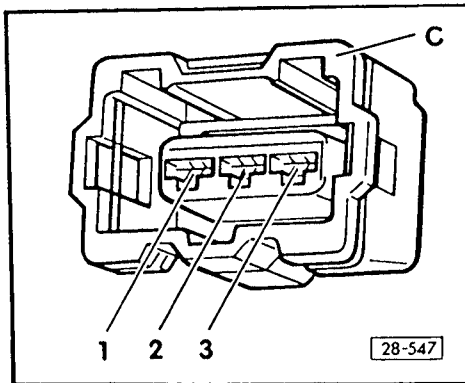


- ◀ - Disconnect plug from electronic thermoswitch (F 76).



- ◀ - Earth plug contact with auxiliary leads.

28-146



- Link contacts 2 and 3 of plug for idling and full throttle switch with auxiliary leads.

Specified value: LED may neither light up nor flash

- If specified value is not attained, check lead between electronic thermoswitch and FEI control unit (J 88) using current flow diagram.



28-147

CHECKING REV COUNTER CONTROL

- Remove FEI control unit and pull off connector plug with ignition switched off. Connect test box V.A.G 1598 between FEI control unit and disconnected connector plug of FEI control unit with adapter lead V.A.G 1598/7. Connector plug contact numbers are identical to test box numbers. Electrical fuses OK - see current flow diagram.

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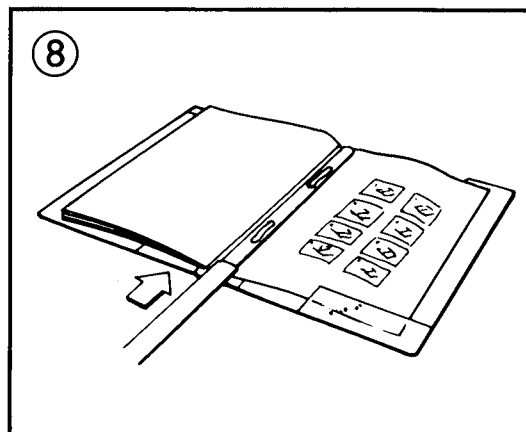
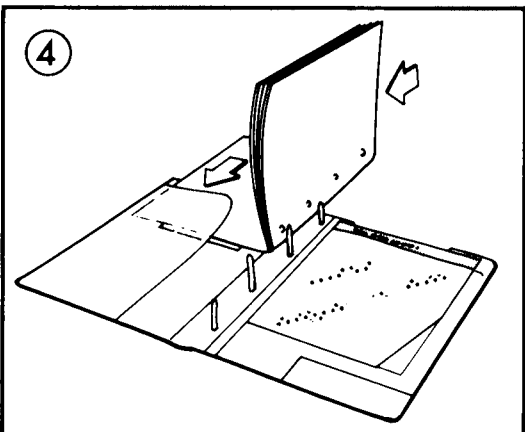
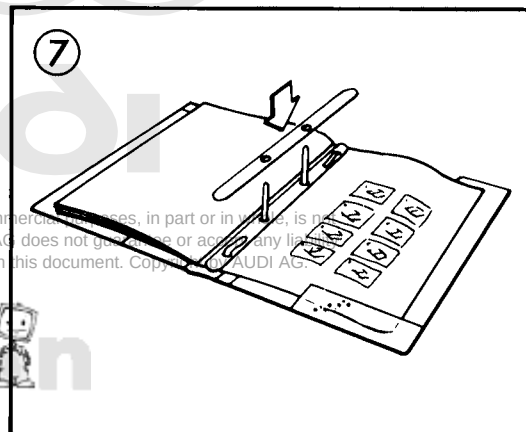
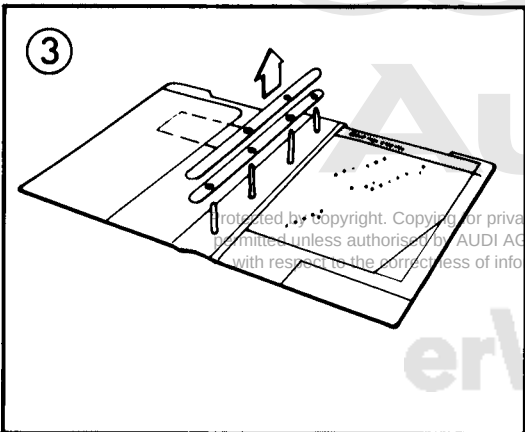
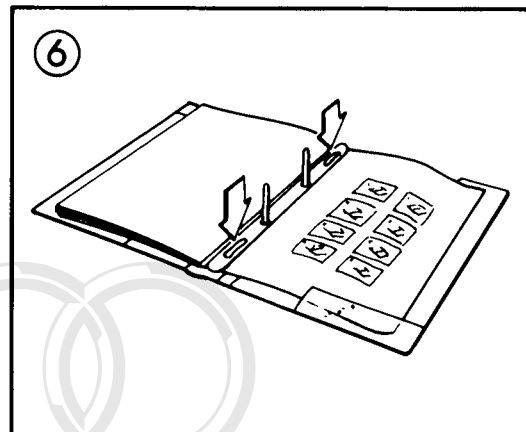
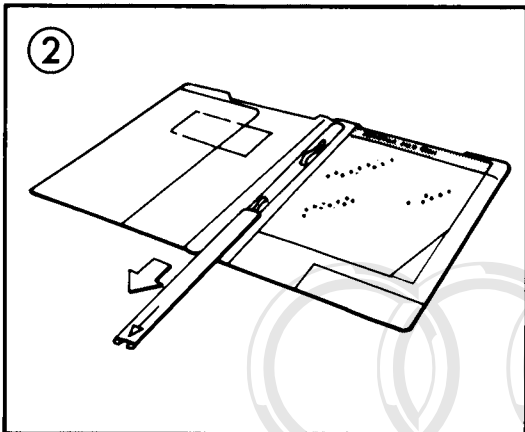
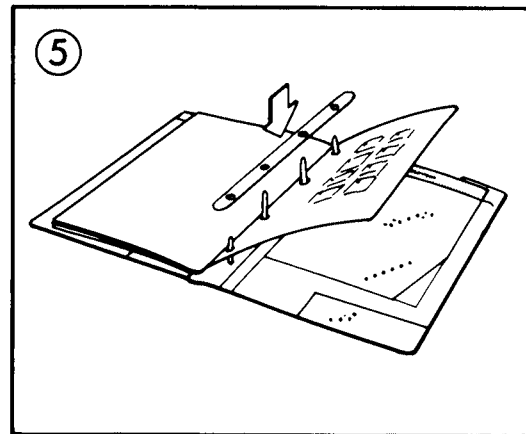
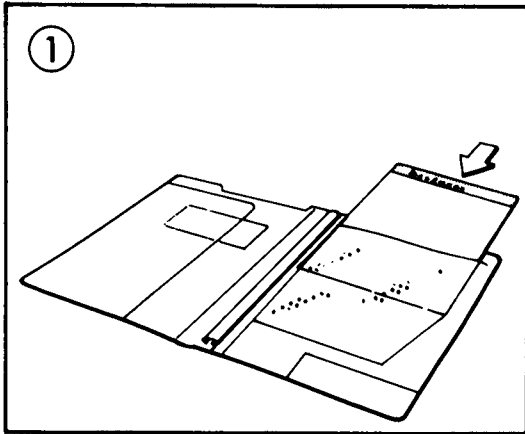
- Connect diode test lamp V.A.G 1527 between test box contacts 7 and 18 (earth) with auxiliary leads from V.A.G 1594.

- Start engine and run it at idle.
- Diode test lamp must light up or flash.

If diode test lamp does not light up or flash, renew FEI control unit.

If diode test lamp lights up or flashes, but rev counter in vehicle does not indicate engine speed, check leads between test box contact 7 and plug connector of rev counter in dash panel insert using current flow diagram.





V.A.G Service.

Workshop Bulletin to Workshop Manual

Audi 100 1983 ►, Audi 200 1984 ►

Engine
Code letters

HX

JY

KF

KG

KH

KP

KU

MC

RT

SL

WC

WU

Booklet

K-Jetronic/Ignition system

Edition 07.89

Mark Repair Group Index Column 01

with Bulletin No. **2**

Models affected: Engine code letters MC

Subject

Bulletin
page

Booklet
from page

B - FINAL CONTROL ELEMENT DIAGNOSIS WITH FAULT

READER V.A.G 1551 IN OPERATING MODE 2- FLASH

CODE OUTPUT

1

01-13

Change the "Note" at the bottom right of page
01-15 by hand as follows:

Note:

After checking fuel pump relay (-J17), pull out
fuse No. 13.

Replace fuse No. 13 before testing the cold start
valve (-N17) and pull out fuse No. 13 again
immediately after testing the cold start valve (-N17).

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