

# 1. Description of System

280 E, 280 CE

## 1.1. Fuel system

### 250 CE up to 12.70

Fuel is drawn by the fuel pump ② from the tank ① via the suction side of a header tank ②④ and forced into the pressure line via the filter ③ and a diaphragm-type damper ②③.

The pressure regulator ④ installed between the injection valves limits the fuel pressure to 2 kgf/cm<sup>2</sup> (28.5 psi). The solenoid-operated injection valves ⑧ as well as the start valve ⑪ are connected to the pressure line by means of the fuel distributor pipes ⑨. From the pressure regulator the excess fuel can flow back to the tank through the return line and the header tank (pressure regulator). The return line coming from the pump also leads into this line. A relief valve is fitted in the fuel pump which opens if, due to a fault in the pressure system, the pressure reaches a value much above that required (about 4 kgf/cm<sup>2</sup> (57 psi)). A check valve in the pressure connection of the fuel pump prevents a complete loss of pressure in the fuel line when the pump is switched off.

### 250 CE as from 12.70

Modified fuel pump with pressure connection in different position.

### 250 CE as from 1.71

Modified fuel pump and different filter as in 2.8 l.

Fuel is drawn by the fuel pump ② from the tank ① via the header tank ②④ and forced into the pressure line via the filter ③ and a diaphragm-type damper ②③. The pressure regulator ④ installed between the injection valves limits the fuel pressure to 2 kgf/cm<sup>2</sup> (28.5 psi). The solenoid-operated injection valves ⑧ as well as the start valve ⑪ are connected to the pressure line by means of the fuel distributor pipes ⑨. From the pressure regulator the excess fuel can flow back to the tank through the return line and the header tank (pressure regulator). The return line coming from the pump also leads into this line. A relief valve is fitted in the fuel pump which opens if, due to a fault in the pressure system, the pressure reaches a value much above that required (about 4 kgf/cm<sup>2</sup> (57 psi)). A check valve in the pressure connection of the fuel pump prevents a complete loss of pressure in the fuel line when the pump is switched off.

A relief valve in the pump permits excessive fuel to flow back into the pump suction side if, for instance, due to a fault in the pressure system, the pressure exceeds approx. 5 kgf/cm<sup>2</sup>. In the pressure connection is a non-return valve which prevents the pressure dropping off completely when the pump is switched off.

- ① Fuel tank
- ② Fuel pump
- ③ Fuel filter
- ④ Pressure regulator
- ⑧ Injection valves
- ⑨ Fuel distributor pipe
- ⑪ Start valve
- ②③ Diaphragm-type damper
- ②④ Header tank

Fig.1 280 E, 280 CE

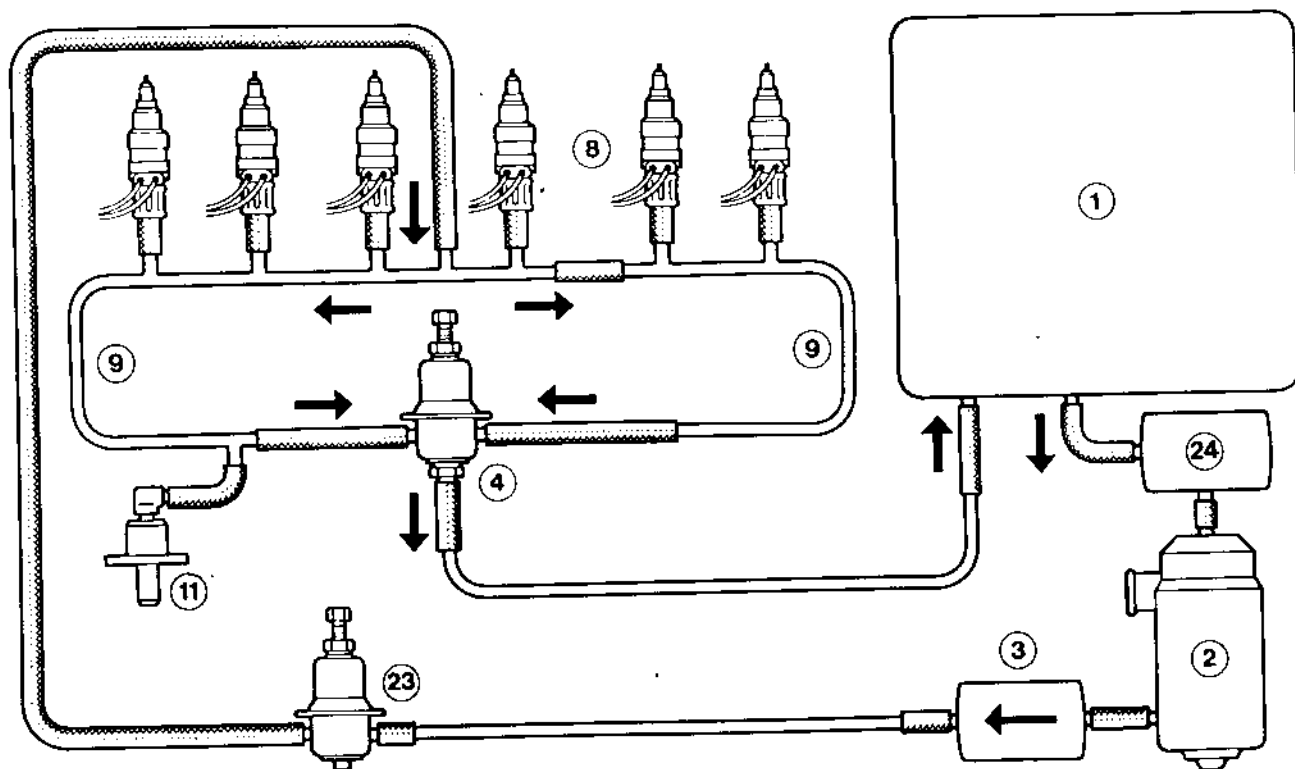
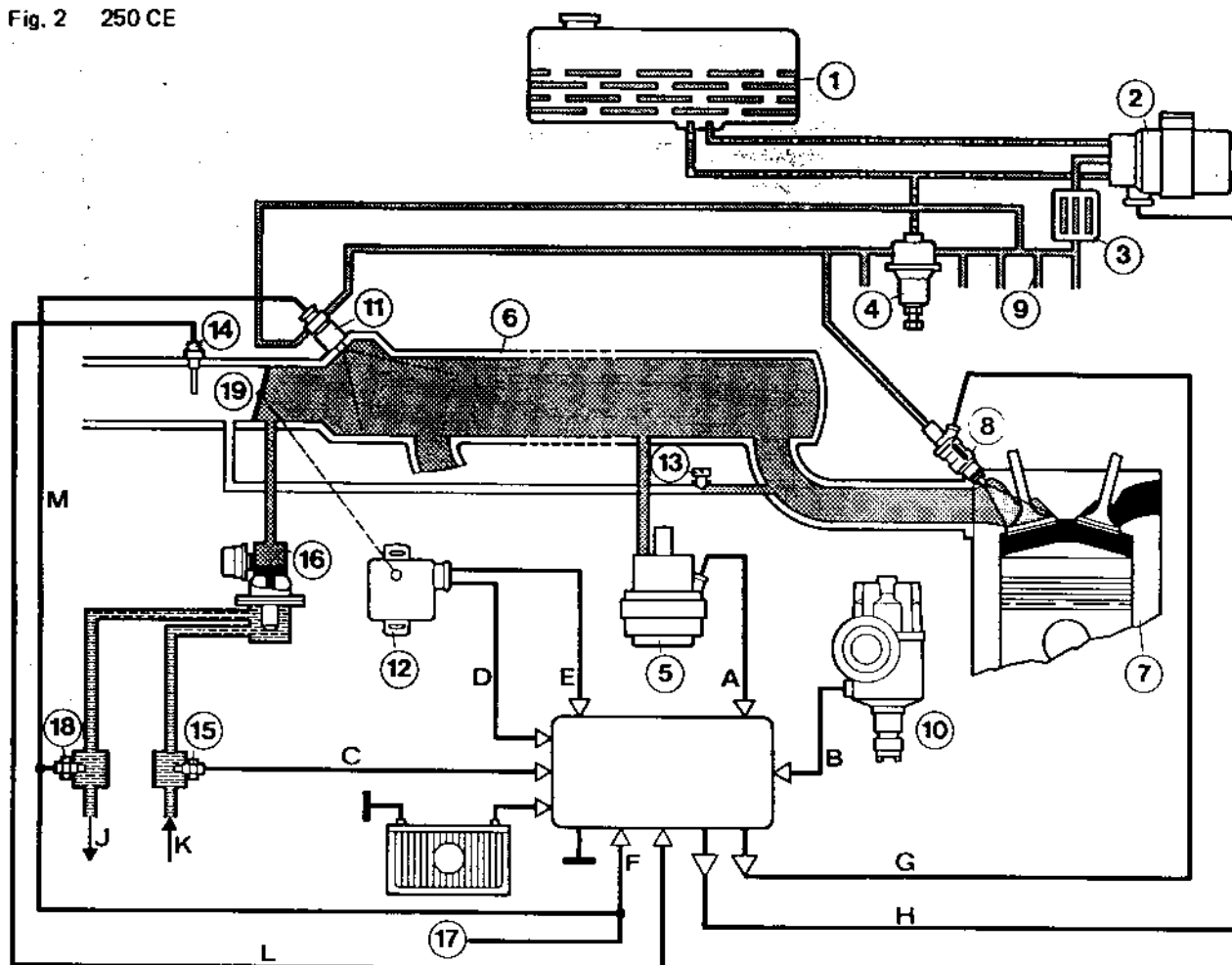


Fig. 2 250 CE



## 1.2. Air system

The 6 engine cylinders are supplied with air through 6 individual intake manifolds which are connected to one common inlet duct. The pressure sensor and the vacuum advance for the ignition distributor are also connected to the common inlet duct.

An air throttle valve, which is operated by a linkage from the accelerator pedal, is fitted at the mouth of the common inlet duct. Air is drawn into the common inlet duct through the air filter.

When driving, the air flow into the common inlet duct is controlled by the air throttle valve. When idling the air throttle valve is completely closed. The idling air can only enter the individual induction pipes directly at the cylinder head through a by-pass air pipe. The idle speed is set by altering the cross-section of the by-pass pipe.

Adjustment of the idle speed should only take place when the engine is warm, approx. 80° C (175° F) coolant temperature. This will ensure that the auxiliary-air valve is closed. Furthermore, if the engine is not fully warmed-up, an additional air flow is required for smooth running. This is controlled by the auxiliary-air valve (16). It alters the effective cross-sectional area of the auxiliary air pipe depending on the coolant temperature. The position of the valve is dependent on an element made of expanding material which projects into the coolant system. At -20° C (-4° F), the valve is open and at +70° C (+158° F) it is closed.

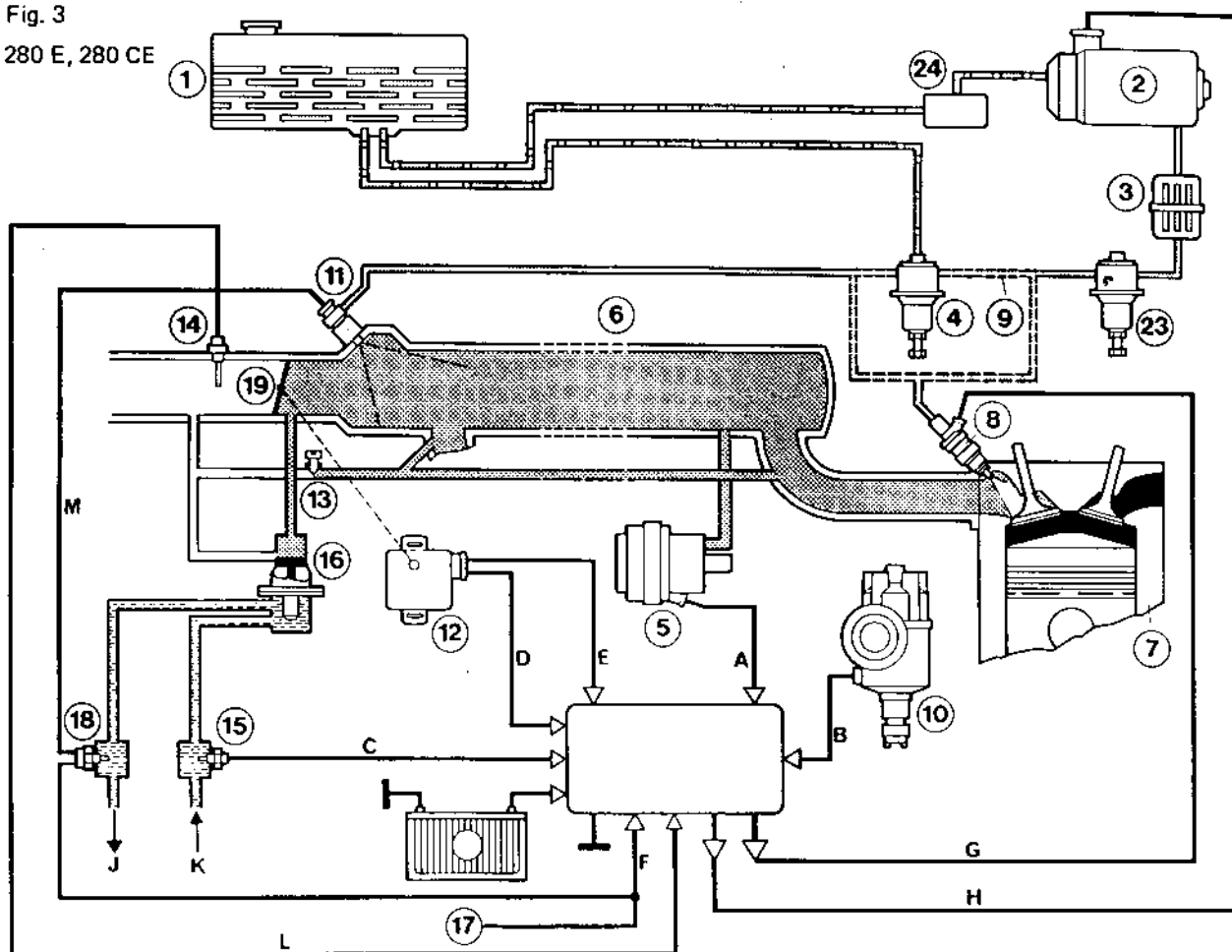
## 1.3. Principles of operation

### Key to schematic of system

- ① Fuel tank
- ② Fuel pump
- ③ Fuel filter
- ④ Pressure regulator
- ⑤ Pressure sensor
- ⑥ Common inlet duct
- ⑦ Cylinder
- ⑧ Injection valves
- ⑨ Fuel distributor pipes to the 6 injection valves
- ⑩ Ignition distributor with trigger contacts
- ⑪ Start valve
- ⑫ Throttle valve switch with temporary enrichment device
- ⑬ Idle adjustment screw
- ⑭ Temperature sensor I (intake air)
- ⑮ Temperature sensor II (coolant)
- ⑯ Auxiliary-air valve
- ⑰ from starting motor terminal 50
- ⑱ Thermo-time switch
- ⑲ Air throttle valve

Fig. 3

280 E, 280 CE



## Information for the electronic control unit (ECU)

Information	Signal
A Pressure sensor	Load condition of the engine
B Trigger contacts of ignition distributor	Speed, triggering signal for start of injection
C Temperature sensor II (coolant)	Warm-up
D+E Throttle valve switch	Switching off the fuel supply during overrun and temporary enrichment
F Starting motor terminal 50 and thermo-time switch approx. +35° C (+95° F)	Cold start enrichment
L Temperature sensor I (intake air)	Correction of injected quantity dependent on air pressure in the intake manifold
G To injection valves	
H To fuel pump	
M From thermo-time switch to start valve	
J+K Coolant circuit to the auxiliary-air valve	

## Key to schematic of system

- ① Fuel tank
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- ③ Fuel filter
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- ⑧ Injection valves
- ⑨ Fuel-distribution pipe to the injection valves
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- ⑭ Temperature sensor I (intake air)
- ⑮ Temperature sensor II (coolant)
- ⑯ Auxiliary-air valve
- ⑰ from starting motor terminal 50
- ⑱ Thermo-time switch
- ⑲ Air throttle valve
- ⑳ Diaphragm-type damper
- ㉑ Header tank

Due to the fuel pressure of 2 kgf/cm<sup>2</sup> (28.5 psi), fuel is injected into the engine during the time for which the injection valve is open. The nozzle duct of the injection valve is accurately calibrated. Since the fuel pressure is kept constant, the injected quantity of fuel is dependent only upon the length of time for which the injection valve is open.

The duration of injection is "computed" by the ECU. The information processed by the ECU comes from the individual sensors on the engine. This is done in the following manner:

The moment when the fuel is injected is controlled by the distributor contacts (trigger contacts I and II) according to the position of the cam shaft, (B). These contacts are installed under the centrifugal advance mechanism in the distributor and are maintenance-free. The duration of injection (fuel quantity) is governed basically by two factors: by the engine speed and the load condition of the engine. The engine speed is relayed to the ECU by the distributor trigger contacts I and II. The load condition is determined by measuring the absolute pressure in the inlet manifold. This pressure is converted to an electrical impulse and relayed to the ECU by the pressure sensor ③, which is connected to the common inlet duct ⑥ by a hose (A).

The ECU processes this information and gives a signal for the injection valves to be open for a longer or shorter period of time (G). The ECU thus allows a varying amount of fuel to be passed through the solenoid-operated injection valves depending on engine load and speed. This is how the "basic quantity" of fuel is governed.

In addition to the "basic quantity" of fuel, an accurately metered amount of fuel is injected additionally when starting at low ambient temperatures, when warming-up, during acceleration and at full load.

The start valve ⑪ injects fuel into the common inlet duct dependent on temperature and for a certain length of time (thermo-time switch in the coolant), for as long

as the starting motor is operated and at a coolant temperature up to approx. +35° C (95° F).

This additional quantity of fuel from the start valve gives a considerably better start performance to the engine. The control unit receives the signal "warm-up" (C) from the temperature sensor II ⑤ in the coolant circuit. The temperature sensor I ④ in the intake manifold corrects the injected fuel quantity dependent on air pressure.

The throttle valve switch ② has two functions. First it signals "overrun" (D) (braking with the engine); in this condition no fuel should be injected. This operational condition is characterized by a closed air throttle valve and increased engine speed. The air throttle valve switches off the fuel supply when coasting in gear at a speed over 1,700 rev/min. If, during overrun, the speed drops to 1,000 rev/min, the fuel supply is switched on again so that a smooth change-over to idling operation is guaranteed. When the engine is cold, the speed limits are raised by approximately 200 rev/min to equalize the higher frictional resistance.

The second function of the throttle valve switch is to give the ECU the information "more fuel" (E) when the accelerator is depressed. This means that for the temporary enrichment, a certain accurately metered quantity of fuel is injected in addition to the normal amount of fuel.

#### 280 E, 280 CE:

The full-load quantity is no longer controlled from the pressure sensor but from a full-load contact in the throttle valve switch.

The pressure sensor is equipped with altitude correction which, with increasing altitude, enriches the air/fuel mixture. This is necessary for vehicles which are adjusted to run lean, because with increasing altitude the volumetric efficiency increases and the fuel pressure at the injection valve decreases.

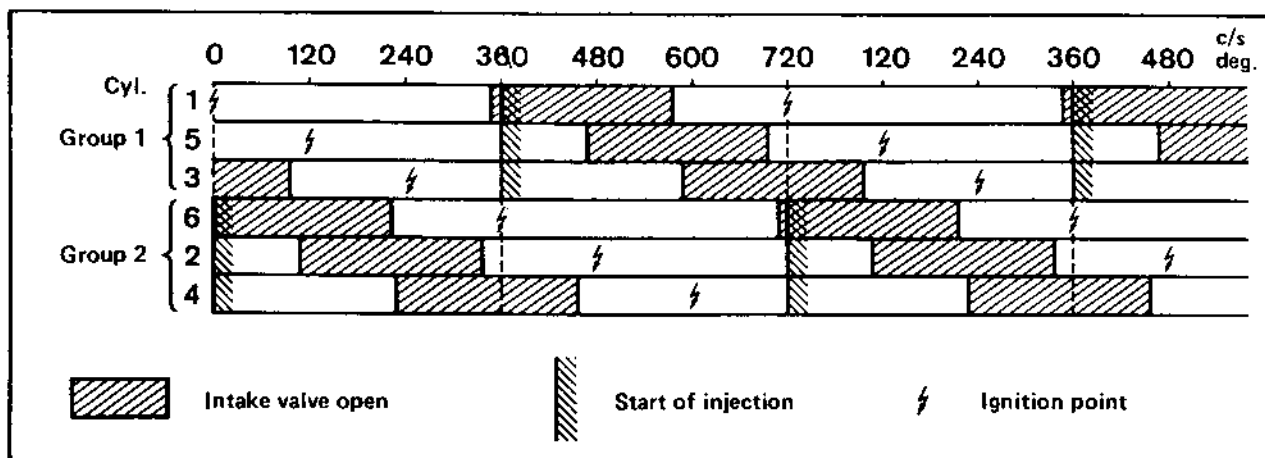


Fig. 4

The injection valves ⑧ are controlled electrically by signals from the ECU (Group 1: Cyl. 1-5-3, Group 2: Cyl. 6-2-4).

The 3 injection valves of one group inject simultaneously. Whereas the injection valves for cylinders 1 and 6 inject during the induction stroke, the remaining injection valves inject onto the inlet valves of the respective cylinders. The fuel is stored at the inlet valves until they open and it is carried into the combustion chamber with the air stream.

#### 1.4. Electronic controls 250 CE

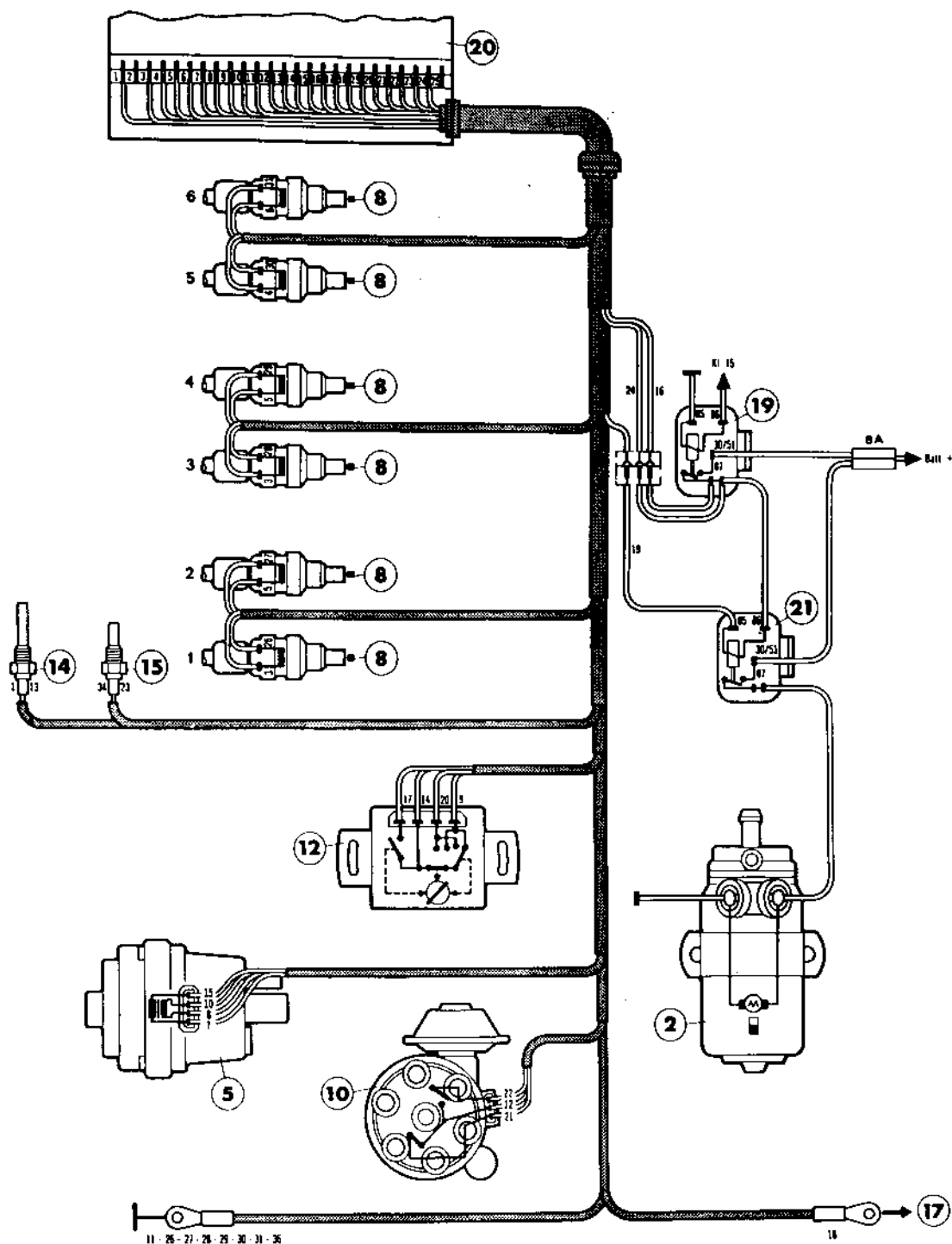


Fig. 5

### Description

- ② Fuel pump
- ⑤ Pressure sensor
- ⑧ Solenoid-operated injection valves
- ⑩ Ignition distributor with trigger contacts
- ⑫ Throttle valve switch
- ⑭ Temperature sensor I (intake air)
- ⑮ Temperature sensor II (coolant)
- ⑰ From starting motor terminal 50
- ⑲ Main relay
- ⑳ Electronic control unit (ECU)
- ㉑ Pump relay

When the ignition is switched on, the ECU 20 receives its operating voltage directly from the battery via the main relay 19. The fuel pump is controlled by the pump relay 21. The pump relay only works either when the starting motor is operated (terminal 50) or when the engine speed exceeds 200 rev/min. This feature ensures that the combustion chamber cannot be filled with fuel should an injection valve become defective.

A time switch installed in the ECU allows the fuel pump to run for approximately one second after the ignition is switched on, in order to build up the fuel pressure at once.

# Description of the cable runs for 250 CE

Cable No.	From	To	Cable No.	Cable No.	From	To	Cable No.
1	ECU	temperature sensor I (air)	1	20	ECU	throttle valve switch	20
2	not used			21	ECU	ignition distributor (trigger contact)	21
3	ECU	injection valve, cyl. 1	32*	22	ECU	ignition distributor (trigger contact)	22
		injection valve, cyl. 3	33*	23	ECU	temperature sensor II (coolant)	23
4	ECU	injection valve, cyl. 5	4	24	ECU	main relay, terminal 87	24
5	ECU	injection valve, cyl. 2	34*	25	not used		
		injection valve, cyl. 4	35*	26	injection valve, cyl. 1	vehicle ground	26 <sup>1)</sup>
6	ECU	injection valve, cyl. 6	6	27	injection valve, cyl. 2	vehicle ground	27 <sup>1)</sup>
7	ECU	pressure sensor	7	28	injection valve, cyl. 3	vehicle ground	28 <sup>1)</sup>
8	ECU	pressure sensor	8	29	injection valve, cyl. 4	vehicle ground	29 <sup>1)</sup>
9	ECU	throttle valve switch	9	30	injection valve, cyl. 5	vehicle ground	30 <sup>1)</sup>
10	ECU	pressure sensor	10	31	injection valve, cyl. 6	vehicle ground	31 <sup>1)</sup>
11	ECU	vehicle ground	11 <sup>1)</sup>	32	injection valve, cyl. 1	ECU	3*
12	ECU	ignition distributor	12	33	injection valve, cyl. 3	ECU	3*
13	ECU	temperature sensor I (air)	13	34	injection valve, cyl. 2	ECU	5*
14	ECU	throttle valve switch	14	35	injection valve, cyl. 4	ECU	5*
15	ECU	pressure sensor	15	36	temperature sensor II (coolant)	vehicle ground	36 <sup>1)</sup>
16	ECU	main relay, terminal 87	16				
17	ECU	throttle valve switch	17				
18	ECU	starting motor, terminal 50	18				
19	ECU	pump relay, terminal 85	19				

\* These wires come from a common cable inside the cable harness

<sup>1)</sup> These cables have a common ground connection

## Electronic controls 2.8 l

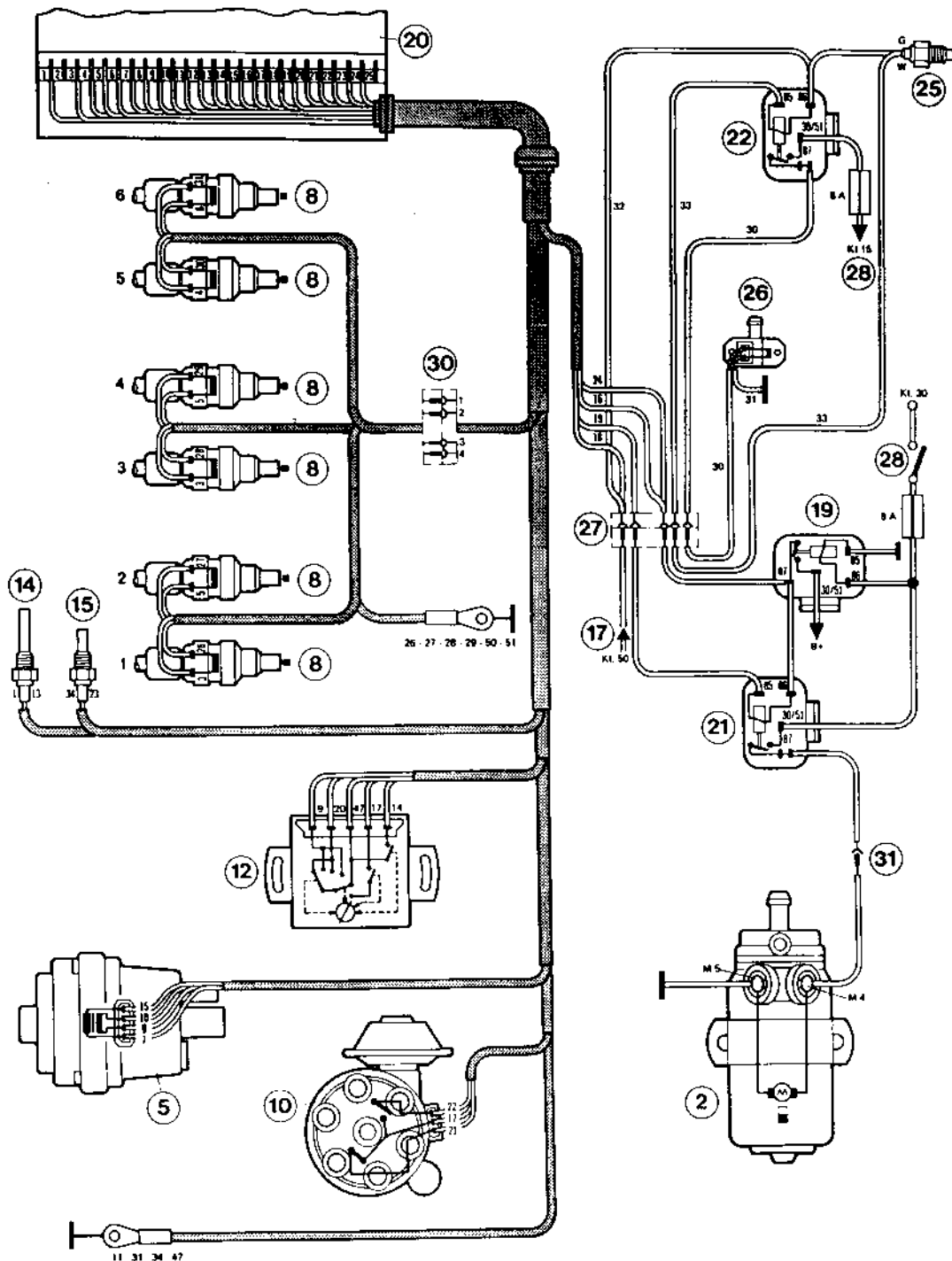


Fig. 6

### Description

- ② Fuel pump
- ③ Pressure sensor with altitude correction
- ⑧ Solenoid-operated injection valves
- ⑩ Ignition distributor with trigger contacts
- ⑫ Air throttle valve switch
- ⑭ Temperature sensor I (intake air)
- ⑮ Temperature sensor II (coolant)
- ⑰ from starting motor terminal 50
- ⑲ Main relay
- ⑳ Electronic control unit (ECU)
- ㉑ Pump relay
- ㉒ Relay for start valve
- ㉓ Thermo-time switch
- ㉔ Start valve
- ㉕ Adapter 2 (connection to vehicle cable set)
- ㉖ Ignition starting switch
- ㉗ Adapter 1 for injection valves:  
Plug no. 1 leads to cyl. 1 and 3  
Plug no. 2 leads to cyl. 2 and 4  
Plug no. 3 leads to cyl. 5  
Plug no. 4 leads to cyl. 6
- ㉘ Connector from tail lamp cable set

# Description of the cable runs for 2,8 l

Cable No.	From	To	Colour
1	ECU	temperature sensor I (air)	blue
2	not used		
3	ECU	injection valve, cyl. 1	green <sup>2)</sup>
		injection valve, cyl. 3	green/red <sup>2)</sup>
4	ECU	injection valve, cyl. 5	grey <sup>2)</sup>
5	ECU	injection valve, cyl. 2	yellow <sup>2)</sup>
		injection valve, cyl. 4	yellow/red <sup>2)</sup>
6	ECU	injection valve, cyl. 6	white <sup>4)</sup>
7	ECU	pressure sensor	grey/green
8	ECU	pressure sensor	grey/blue
9	ECU	throttle valve switch	red/green
10	ECU	pressure sensor	grey/red
11 <sup>4)</sup>	ECU	vehicle ground	brown
12	ECU	ignition distributor	yellow/black
13	ECU	temperature sensor I (air)	blue/black
14	ECU	throttle valve switch	red
15	ECU	pressure sensor	grey/black
16	ECU	main relay, terminal 87	black <sup>3)</sup>
17	ECU	throttle valve switch	red/yellow
18	ECU	starting motor, terminal 50	lilac
19	ECU	pump relay, terminal 85	brown/white
20	ECU	throttle valve switch	red/white
21	ECU	ignition distributor (trigger contact)	yellow/red
22	ECU	ignition distributor (trigger contact)	yellow/blue
23	ECU	temperature sensor II (coolant)	blue/white
24	ECU	main relay, terminal 87	black
25	not used		
26 <sup>1)</sup>	injection valve, cyl. 1	vehicle ground	brown
27 <sup>1)</sup>	injection valve, cyl. 2	vehicle ground	brown
28 <sup>1)</sup>	injection valve, cyl. 3	vehicle ground	brown
29 <sup>1)</sup>	injection valve, cyl. 4	vehicle ground	brown

Cable No.	From	To	Colour
30	start valve, cyl. 5	relay for start valve terminal 87	black/pink/white
31 <sup>4)</sup>	start valve, cyl. 6	vehicle ground	brown
32	thermo-time switch, terminal G	starting motor, terminal 50	pink/blue
33	thermo-time switch, terminal W	relay for start valve terminal 85	pink
34 <sup>4)</sup>	temperature sensor II (coolant)	vehicle ground	brown
47 <sup>4)</sup>	throttle valve switch	vehicle ground	brown
50 <sup>1)</sup>	injection valve, cyl. 5	vehicle ground	brown
51 <sup>1)</sup>	injection valve, cyl. 6	vehicle ground	brown

\* These wires come from a common cable inside the cable harness

<sup>1)</sup> These cables have a common ground connection

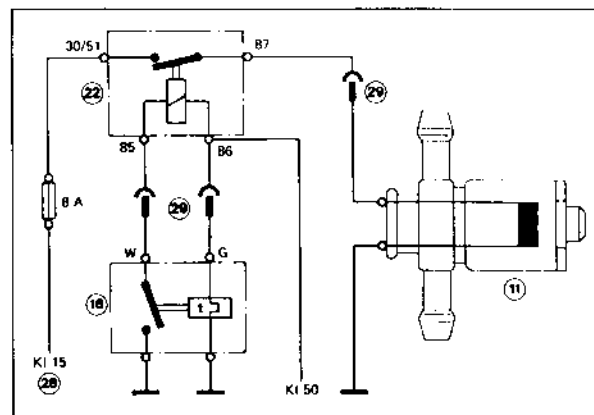
<sup>2)</sup> Via adapter 1

<sup>3)</sup> Via adapter 2

<sup>4)</sup> These cables have a common ground connection.

## 1.5. Electrical wiring of start valve

The start relay terminal 86 and the thermo-time switch terminal G are connected in circuit by starting motor terminal 50 via the backup light switch connector. Via terminal W of the thermo-time switch, terminal 85 of the start relay is connected to ground. Terminal 30/51 of the start relay is connected in circuit by terminal 15 via fuse no. 4 of the main fuse box. The start valve is connected to terminal 87 of the start relay and to ground.



- ⑪ Start valve
- ⑱ Thermo-time switch
- ⑳ Start relay
- ㉘ Ignition starting switch
- ㉙ Adapter 2

Fig. 7



## 2. Test Equipment and Tools

Tester EFAW 228 (A) S 10 for testing the system in the vehicle 0 681 500 001  
 0 681 500 009)  
 Dwell-tach tester  
 Stroboscopic timing light  
 Vacuum tester  
 Tester trolley for carrying the testers,  
 e. g. EFAW 172 A 0 681 169 084  
 Extractor hook for removing the wiring harness plug  
 from the ECU, to be self-made. (Fig. 8)

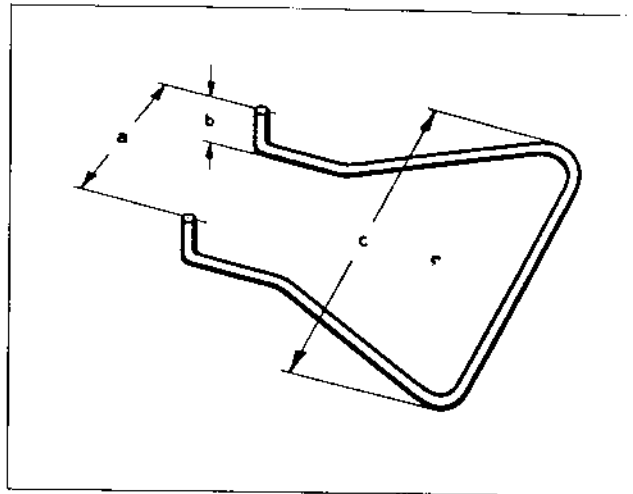
a = 45 mm (1 3/4")  
 b = 12 mm (15/32")  
 c = approx. 100 mm (3 15/16")  
 material: welding wire, 3 mm (1/8") dia.

Special hook for lifting the spring clip fastening the ECU  
 (application see figure 11), to be self-made. (Fig. 9)

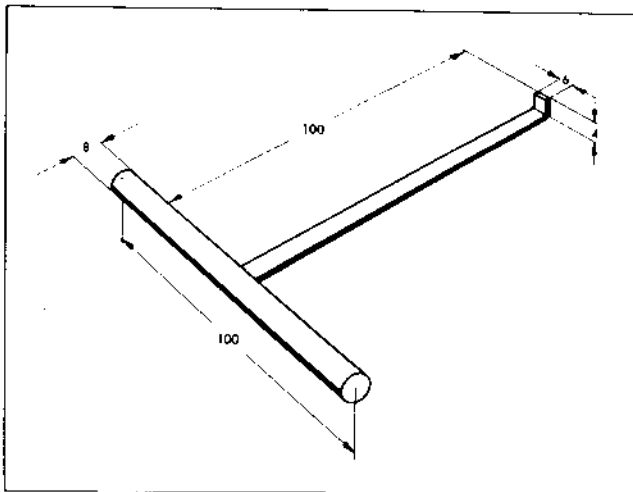
Material: round steel bar 8 mm (5/16") dia.  
 spring steel 6 x 1 mm (15/16 x 3/16")  
 Braze the two steel parts together.

3 clampers for closing off the fuel hoses, to be obtained  
 from Matra-Werke GmbH, D 6 Frankfurt/Main, Diesel-  
 straÙe 30, Part Number W 157.

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## 3. Testing the Gasoline Injection System with Tester EFAW 228 (A) S 10

With the tester EFAW 228 (A) S 10 all the sensors as well as the fuel pump and the injection valves are tested according to the set program. It is important that all points be checked.

All the steps described in the following must be carried out with the ignition switched off!

250 CE, 280 E, 280 CE:

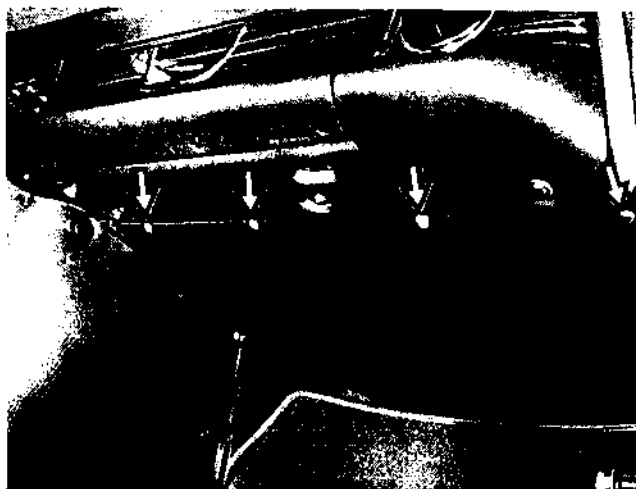
Removing the ECU

The ECU is mounted below the glove compartment.

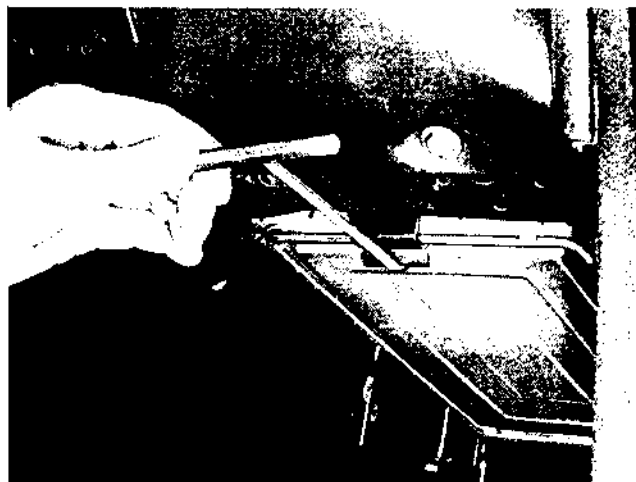
Loosen the panelling (see arrows) and remove it. (Fig. 10)

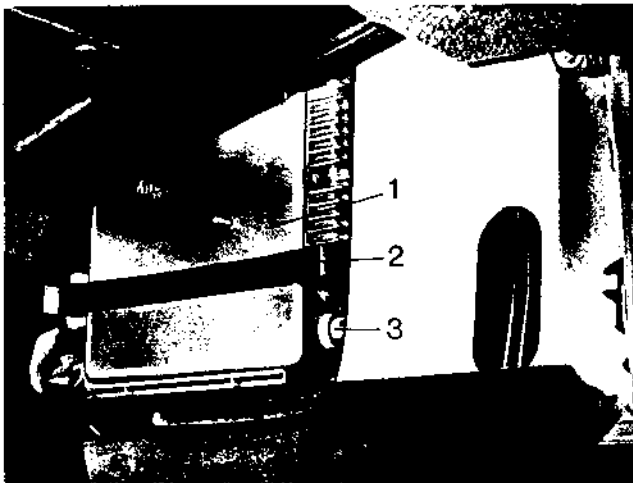
Pull the spring clip forward with the special hook and take the ECU out from its mounting. (Fig. 11)

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11



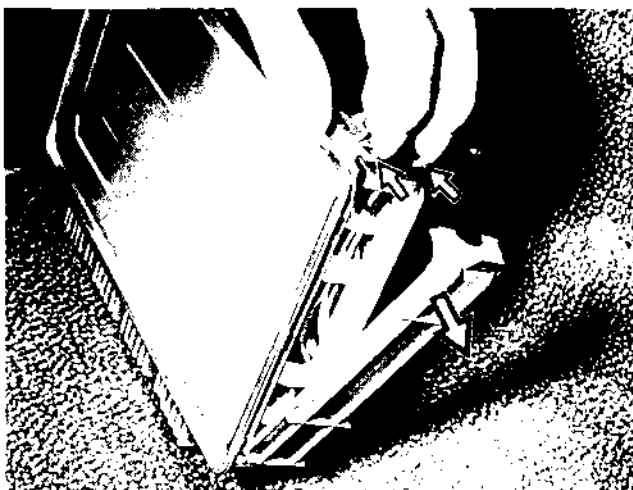


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## 280 SE:

The ECU is mounted under the glove compartment and is accessible once the bulkhead covering has been removed.

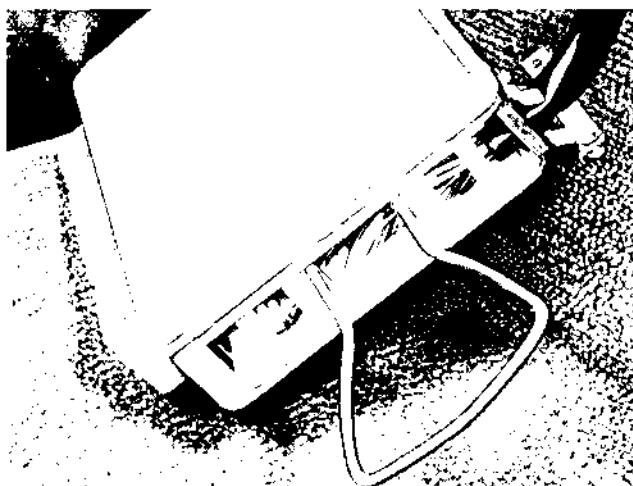
- 1 ECU
- 2 Spring clip
- 3 Potentiometer



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## For all types:

Open the strain relief clamp with a Phillips head screw driver and push off the cover. To achieve this the two fixings must be pushed back (arrows). (Fig. 12)

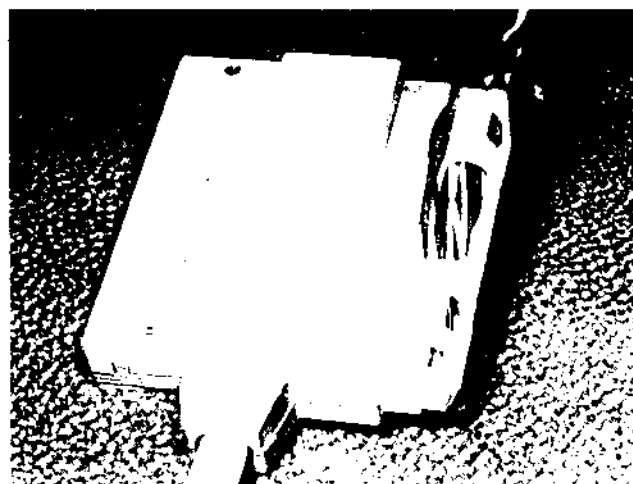


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Carefully pull the wiring harness plug out of the ECU with the extractor hook (to be self-made as shown in fig. 8). (Fig. 13)

Connect the wiring harness plug to the multi-pole plug on the tester EFAW 228 (A) S 10. ECU not connected. (Fig. 14)

Testing of the system is carried out according to Test Specifications VDT-W-280/1004 B.



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## When refitting, the ECU, observe the following:

Push the wiring harness plug carefully into the ECU (the plug can only be connected in one direction). Carefully push the rubber grommet on the wiring harness into the recess on the ECU.

Put the cover and the strain relief clamp back in place. Refit the ECU in its mounting and push the spring clip over the ECU. Refit panelling.

## 4. Trouble-shooting chart

for defects (gasoline injection system only). Prerequisite is that the ignition system and the engine are in satisfactory condition.

Trouble	Cause	Remedy
Engine will not start. Pump not running.	1. Fuse in main fuse box blown. Cables to pump or pump relay, or cables on pump relay defective. 2. Check pump connections.	Renew 8 amp fuse. Check whether pump relay energizes (switch ignition on and off and listen for audible action of relay), if necessary test with voltmeter.
	No voltage at terminal 86 of pump relay (12 V), because main relay not operating or cable defective.	Eliminate any open circuit.
	Voltage present at terminal 86 of pump relay but no ground connection at terminal 85.	Pump operates for approx. 1—2 secs. after switching on ignition. Check with voltmeter; ground for terminal 85 is made by ECU. Replace ECU.
	Open circuit in cable from pump relay terminal 87 to + connection of pump.	Eliminate open circuit. (Check plug connection.)
Engine will not start. Pump runs.	Connection from wiring harness (cable 18) to starting motor terminal 50 defective.	Check with EFAW 228 (A) S 10.
	Pressure sensor cable not connected or open circuit.	Push on pressure sensor cable, or repair.
	Open circuit in cable connection at temperature sensor II (coolant).	Check cables, if necessary replace temperature sensor.
	No pressure building up in fuel ring main (pipe compressed or pressure regulator defective).	Check pressure with gauge; if necessary replace pressure regulator.
Engine will start cold, but stalls.	Cable connector for trigger contacts not pushed on at ignition distributor, or open circuit in cable.	If necessary, connect tester EFAW 228 (A) S 10 and localize the fault; exchange trigger contacts or wiring harness.
	Trigger contacts defective.	Replace.
	See also "Engine will not start".	
	Pressure sensor defective.	Replace.
Engine cuts out when driving (usually preceded by misfiring)	1. Trigger contacts have excessive contact resistance or are dirty. 2. Plug loose. 3. No fuel pressure. 4. Ignition contacts defective.	1. Replace trigger contacts. 2. Check. 3. Measure pressure. Determine cause. 4. Check ignition.
Engine runs irregularly, one cylinder not firing, exhaust white.	One injection valve sticking.	Replace.
	Connection to injection valve or injection valve coil not in order.	Check connections, replace injection valve. Test with tester EFAW 228 (A) S 10.

Trouble	Cause	Remedy
Engine misfiring but not caused by ignition system.	Loose connections, main ground cable has poor connection to body.	Check connections, tighten up ground connection.
Engine not reaching full power.	Fuel pressure too low.	Check pressure regulator.
	Pressure sensor defective.	Replace.
	Air throttle valve does not open sufficiently. Full-load contact not closing.	Check air throttle valve according to section 5.3.
Fuel consumption too high	"Information" sensors or the ECU not functioning correctly or the electrical connections have too high contact resistances.	Test the system according to section 3.
	Air throttle valve switch III incorrectly adjusted.	Adjust with tester EFAW 228 (A) S 10.
	Fuel pressure incorrect.	Check pressure regulator, if necessary replace.
Engine hunts excessively at idle (between 1,000 and 1,700 rpm).	Hose between auxiliary-air valve and suction tube detached or defective.	Push hose into position or replace.
	Air throttle valve stop incorrectly adjusted (too wide open).	Readjust air throttle valve stop.
	Idle speed set too high.	Adjust idle speed.
Engine misfires when accelerating.	Temporary enrichment device in throttle valve switch not functioning or plug incorrectly connected.	Check throttle valve switch tester EFAW 228 (A) S 10).
Too high idling speed. Idling speed cannot be adjusted.	1. Idling air system leaks.	1. Check idling air system.
	2. Small rubber seal ring under the injection valve leaks.	2. Replace rubber seal ring.
	3. Air throttle valve adjustment incorrect.	3. Readjust air throttle valve.

## 5. Removing, Installing and Adjusting the Individual Major Components in the System

Grip the sides of the plugs when pulling them out, never pull on the cable. When reconnecting the plugs onto the individual components, take care that the rubber caps are correctly pushed over the plugs.

**Disconnect the battery**

### 5.1. Pressure sensor

#### 250 CE:

The pressure sensor is screwed to the right wheelhouse plate. (Fig. 15)

#### 280 E, 280 CE:

The pressure sensor is screwed to the left wheelhouse plate. (Fig. 16)

Open hose clamp (arrow Fig. 15) of the pressure line and remove hose.

Pull out the four-pole plug.

Loosen the three fixing screws (arrow Fig. 15 with a 10 mm (3/8")) socket wrench and remove.

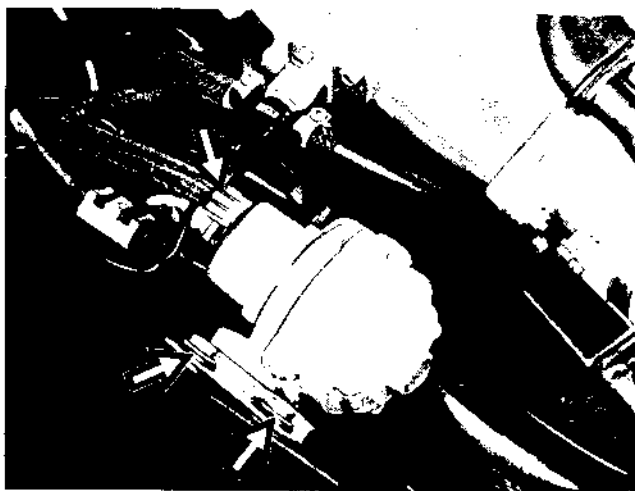
#### Note for installation:

The protection sleeve on the hose connection of a new pressure sensor must only be removed immediately before pushing on the pressure hose.

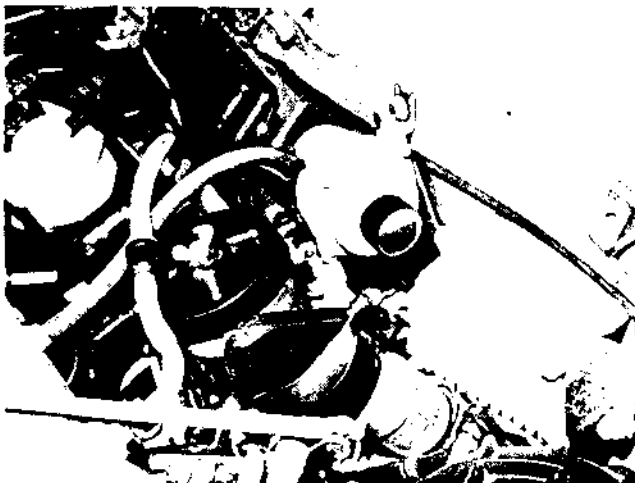
**Danger of dirt!**

Replacement hose **must** be of the same length as the original hose.

15



16



### 5.2. Adjusting the air throttle valve and regulating linkage

Disconnect the connection rod (1) from the venturi assembly. Check that the air throttle valve can close completely without sticking.

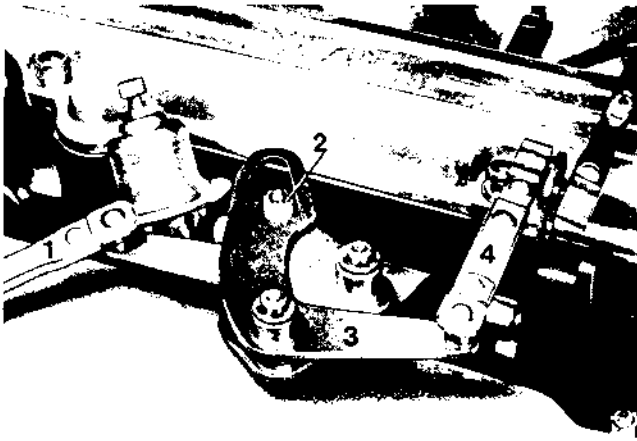
#### Adjusting the air throttle valve

The adjusting screw (arrow in Fig. 17) is set at the works so that a hair's breadth gap remains between the air throttle valve and the bore. This prevents the air throttle valve damaging the bore or sticking. The adjusting screw is locked with paint and should not be tampered with.

If it is necessary to alter the setting, proceed as follows: Screw in the adjusting screw until it just contacts the stop lever. Move the stop lever several times letting it be snapped back by the spring. Screw in the adjusting screw another turn and tighten the hexagonal nut. Check the hair's breadth gap between air throttle valve and the bore.

17



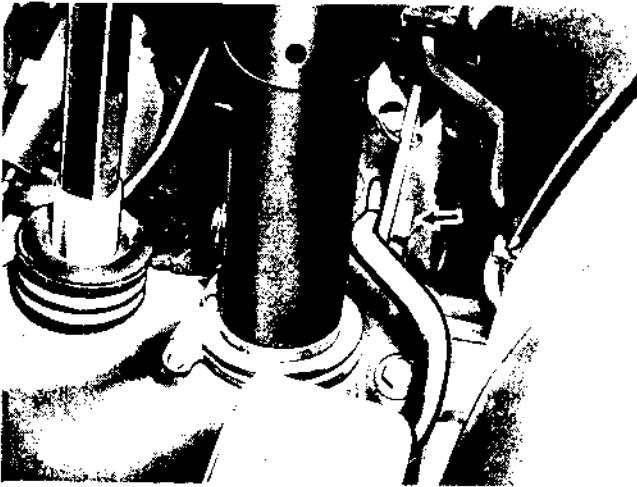


18

Reconnect the connection rod ①, ensure stress-free seating. Check that the roller ② in the fulcrum lever ③ is seated stress-free up against the end-stop and that in the case of automatic transmissions the control lever ④ is well tightened. If necessary adjust the connection rod ①. (Fig. 18)

### 5.3. Adjusting the full-throttle stop

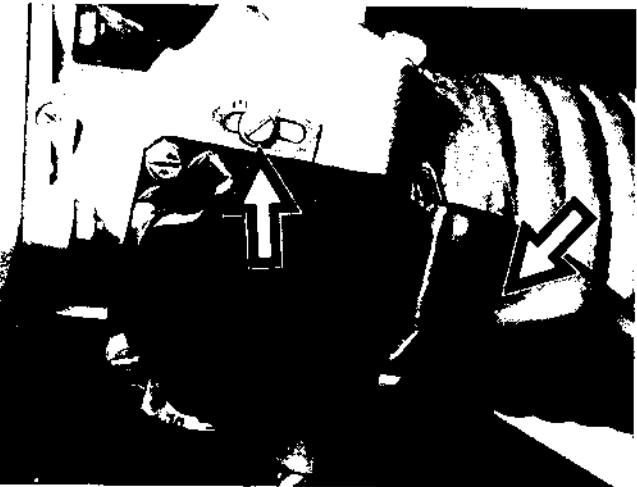
Check the full-throttle stop with the engine switched off. Fully depress the accelerator pedal from the passenger compartment. Both the accelerator pedal and the throttle valve lever (2 in Fig. 17) must seat up against the full-throttle stop (3 in Fig. 17). If necessary reset the regulating lever in the passenger compartment after loosening the fastening screw (arrow Fig. 19). After each adjustment the position of the air throttle valve at idle is to be checked.



19

### 5.4. Throttle valve switch (Fig. 20)

The throttle valve switch is mounted directly on the side of the air throttle assembly. For removal pull out plug, loosen both fixing screws and draw the switch off the throttle shaft.



20

Adjusting the throttle valve switch: (Fig. 21)

The throttle valve switch must operate just when the air throttle valve has opened  $1^\circ$  from its closed position. To facilitate the adjustment, graduations have been stamped into the base plate of the air throttle valve switch (one graduation mark =  $2^\circ$ ).

These graduations face an orientation marking on the intake manifold.

When adjusting, proceed as follows:

Connect tester EFAW 228 (A) S 10 as described in paragraph 3; turn switch "A" to the "measure" position; turn switch "B" to "throttle valve 3".

Slide switch onto air throttle assembly and tighten the two fixing screws slightly. Reconnect the four-pole plug and turn on the ignition. Rotate the switch until the needle on the instrument moves from " $\infty$ " position to "0". Now turn the switch approximately half a graduation ( $1^\circ$ ) clockwise and tighten the fixing screws. Finally, check the adjustment by operating the air throttle valve.

**Throttle valve switch with stop:**

Loosen the fastening screws until it is possible to turn the throttle valve switch.

Rotate the throttle valve switch carefully anticlockwise until an internal stop can be felt.

Tighten the fastening screws.



21

### 5.5. Pressure regulator (Fig. 22)

The pressure regulator is installed in the fuel ring main to the injection valves at the right of the cylinder head cover for 2.5 l, and at the left for 2.8 l.

Removing the pressure regulator in 250 CE.

Loosen the fuel line to cylinders 5 and 6 and pull out the injection valve connections. Loosen all hose connections on the pressure regulator and pull out the regulator in direction of "cylinder 6". Collect any outflowing fuel.

22



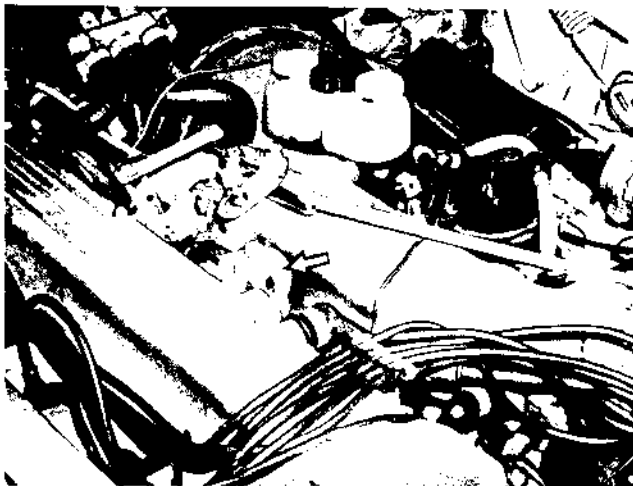
#### Removing pressure regulator 280 E, 280 CE:

Using hose clamps, clamp-off the fuel hose at the pressure regulator (arrow).

Unscrew pressure regulator at the resilient mounting or mounting plate. Loosen the hose connections and pull out the pressure regulator. Collect any fuel that runs out.

On refitting, ensure that hose connections are perfect.

23



#### Adjusting the pressure regulator: (Fig. 24)

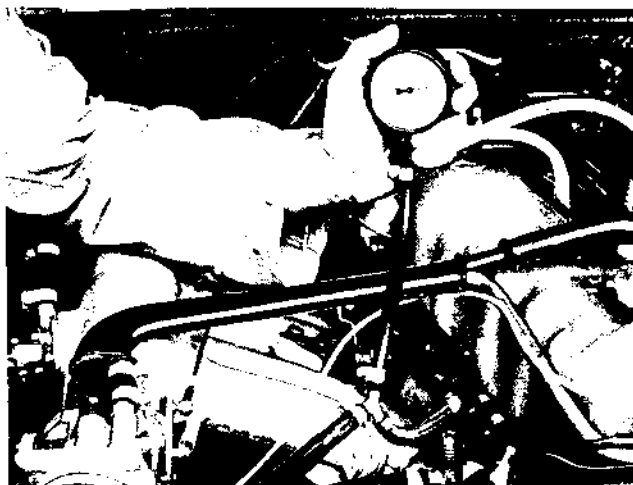
The setting of the pressure regulator (and hence the fuel pressure) has a considerable influence on fuel consumption and composition of the exhaust gases.

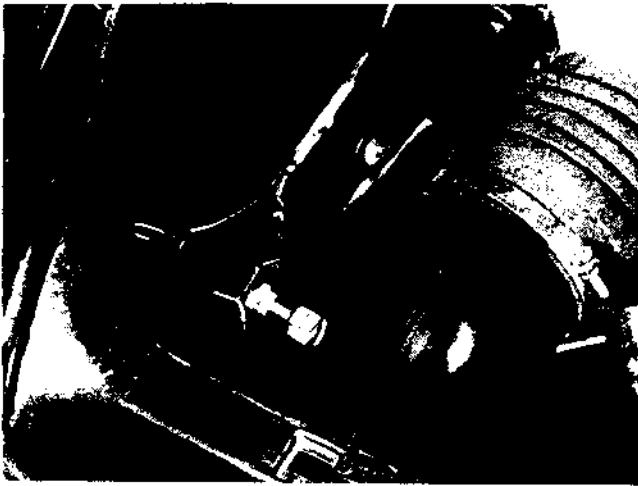
For this reason the setting should be altered only if the pressure measured varies from the check value of  $2.0 - 2.2 \text{ kgf/cm}^2$  (28.5 - 31.4 psi).

Connect the pressure gauge in the fuel line between cylinders 1 and 2 (branch to the start valve). Start the engine and run at idle speed or control the fuel pump from the tester EFAW 228 (A) S 10.

Loosen the lock nut on the pressure regulator and set the pressure to  $2.0 + 0.05 \text{ kgf/cm}^2$  (28.5 + 0.7 psi), using the hexagon screw. Then tighten the lock nut again.

24





25

## 5.6. Temperature sensor I (intake air)

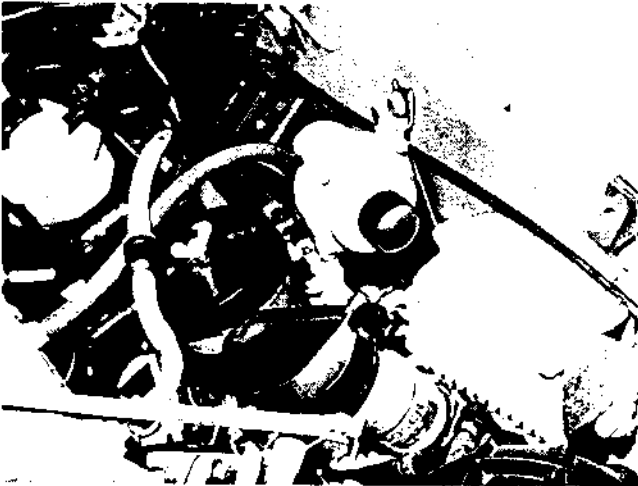
Temperature sensor I is screwed into the elbow of the air filter cover.

Fig. 25 applies to 250 CE

Fig. 26 applies to 280 E, 280 CE

Remove the sensor with a 13 mm (1/2") open jaw wrench.

When refitting take care that the sensor is not screwed in too tight.



26



27

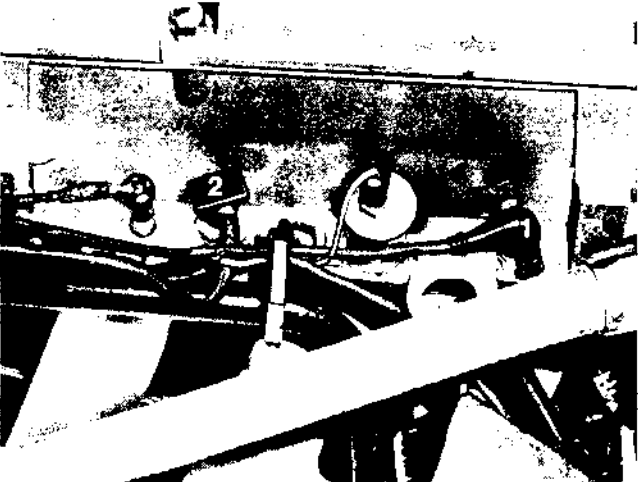
## 5.7. Temperature sensor II (coolant)

250 CE: (Fig. 27)

The temperature sensor II is screwed into the thermostat housing.

280 E, 280 CE: (Fig. 28)

The temperature sensor II is screwed into the right side of the engine block (1 in Fig. 28).



28

Before removing temperature sensor II, the pressure in the coolant system must be released by unscrewing the radiator cap.

Then retighten the cap.

Disconnect electrical plug connection and screw out the sensor with a 13 mm (1/2 in) open jaw wrench.

When refitting the temperature sensor, the seal ring (arrow) must always be renewed.

If necessary, top-up coolant.



### 5.8. Auxiliary-air valve (Fig. 29)

The auxiliary-air valve and the thermo-time switch are in a special housing.

**Removing the auxiliary-air valve:**

Release coolant-system pressure as described in 5.7.

Take off the spark plug connectors from cylinders 3

and 4. Loosen the air hose on the valve and pull off.

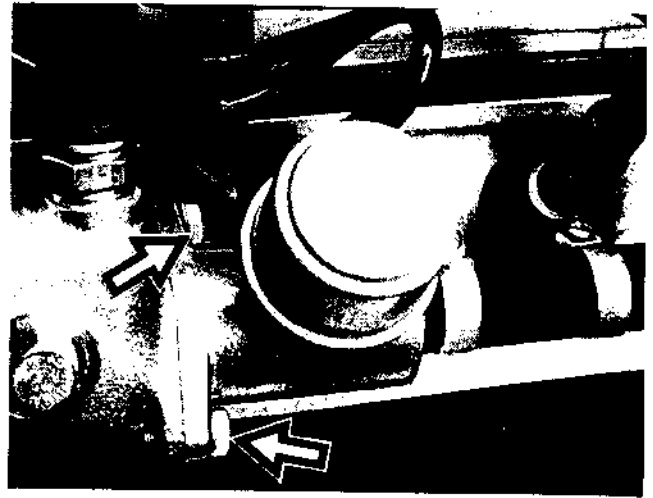
Unscrew the air filter from the valve. Loosen the fixing screws and remove the auxiliary-air valve.

**Hints for installation:**

When refitting the valve, the sealing ring between the valve and the housing must always be renewed.

Clean the air filter before screwing it onto the valve.

29



280 E, 280 CE: (Fig. 30 and 31)

The auxiliary-air valve (1) is screwed directly onto the crankcase. Auxiliary air is taken from the air filter via a plastic hose.

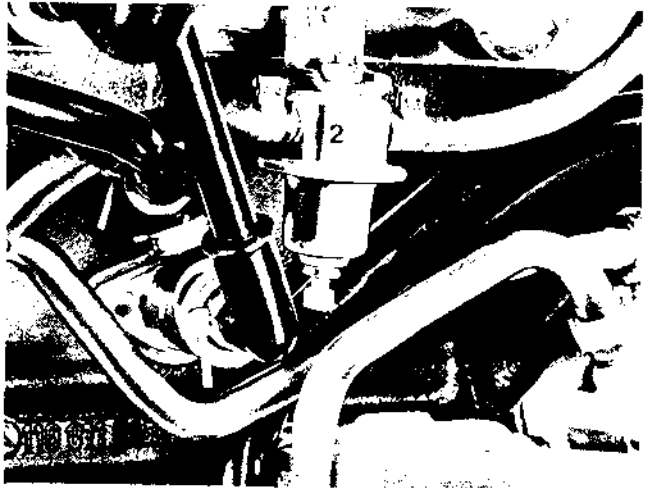
**Removing the auxiliary-air valve:**

Drain the coolant from the cold engine. The valve is best removed from below using an angled hexagon socket wrench or a socket wrench with ratchet. (Fig. 31)

**Hint for installation:**

When refitting the valve the seal ring between it and the housing must be renewed.

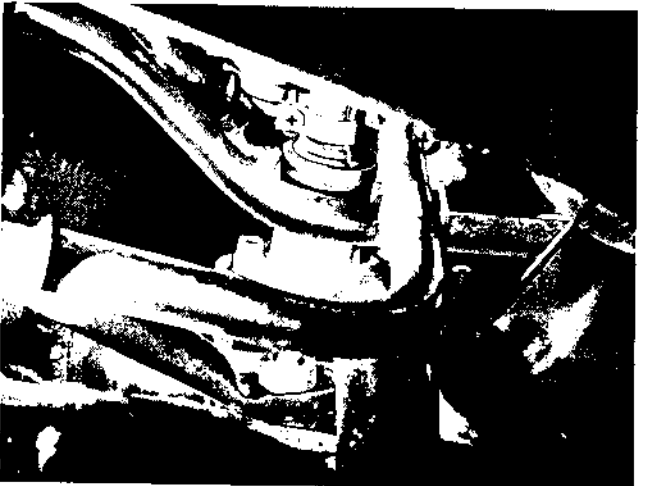
30

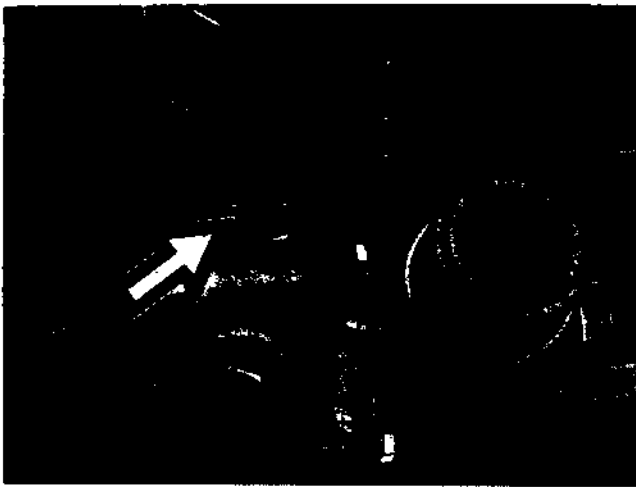


### 5.9. Diaphragm-type damper

The diaphragm type damper (2) is fitted in the fuel return line next to the auxiliary air valve. (Fig. 30)

31



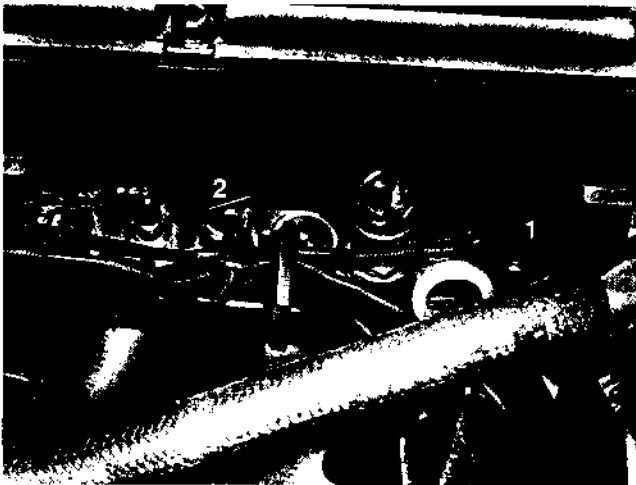


32

### 5.10. Thermo-time switch (Fig. 32)

#### 250 CE:

The thermo-time switch is screwed into a separate housing at the left of the auxiliary-air valve.



33

#### 280 E, 280 CE: (Fig. 33)

The thermo-time switch is screwed into the right side of the engine block. (2 in Fig. 33)

Before removing the switch, release coolant-system pressure as described in 5.7.

Loosen the switch slightly by means of a 19 mm (3/4") open jaw wrench, then disconnect cables.

When fitting a new thermo-time switch, the seal ring (arrow) must always be renewed.



34

### 5.11. Injection valves (Fig. 34)

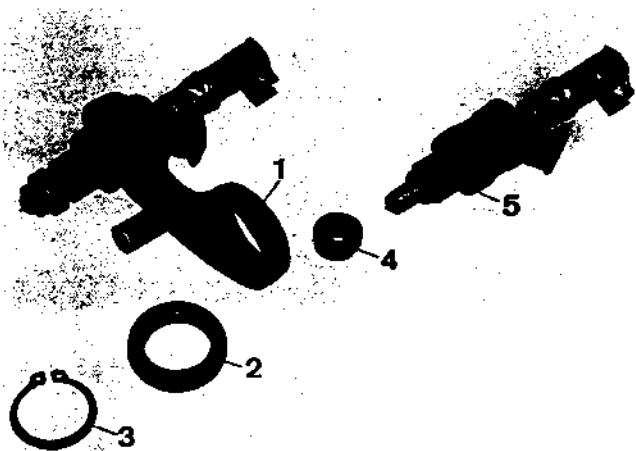
The injection valves are installed in the intake duct of the individual cylinders directly before the intake valves. They are fastened in pairs by means of a goggle-like holder.

#### Removing the injection valves

Pull off the 2-pole plugs from the injection valves.

Remove the fuel lines from all the injection valves.

Loosen the hexagon nut of the goggle-like holder of the injection valve pair to be removed with a 10 mm (3/8") socket wrench and pull out the injection valves by pairs together with their holder.



35

#### Installing the injection valves: (Fig. 35)

Place both injection valves in the holder (1) and slide the large rubber ring (2) onto the valve body (5) from the needle valve end. Make certain that the rubber ring is in the right position!

Secure the valve body by retainer (3) (Seeger ring). Slip rubber sealing ring (4) onto nozzle body.

Always use new seal rings. Insert holder with the injection valve pair and screw tight.

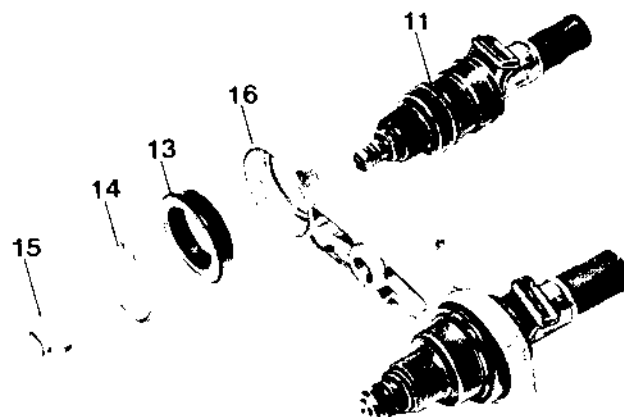
Do not damage the needle valve when reinstalling.

Connect fuel line.

Connect the plugs and push the rubber caps over the plug housings.

250 CE as from mid-1971, 280 E, 280 CE: (Fig. 36)

- ⑪ Injection valve
- ⑬ Rubber ring
- ⑭ Retainer
- ⑮ Insulating cap
- ⑯ Injection valve holder



### 5.12. Start valve (Fig. 37)

The start valve is fitted onto the common inlet duct.

#### Removal:

Pull off the two-pole plug.

Close off the fuel line on both sides of the start valve with clampers. Loosen hose clamps and carefully pull the fuel line off the valve.

Unscrew fastening screws with a 5 mm (13/64") socket wrench and take off the valve.

#### Installation:

Always renew the seal rings.

36



### 5.13. Fuel filter

250 CE: (Fig. 38)

The fuel filter is installed in the fuel line behind the pump (pressure side) and mounted above the left-hand engine support.

280 E, 280 CE:

The fuel filter is fastened to the frame bottom, together with the fuel pump, in front of the fuel tank. (Fig. 39)  
See also 5.14. Fuel pump.

The filter must be replaced every 25.000 miles.

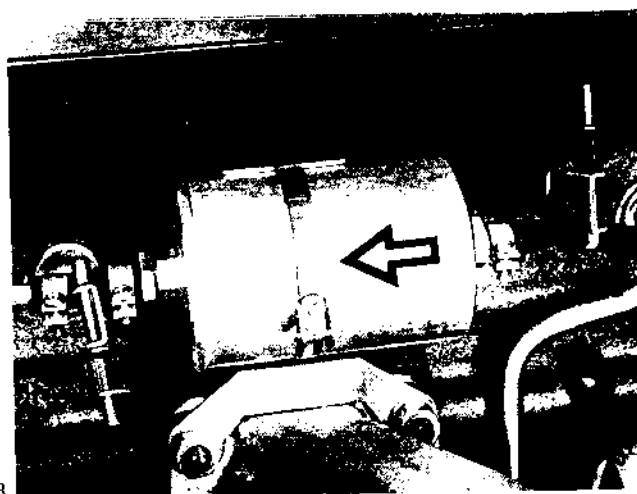
Close off the fuel hoses on both sides of the filter with clampers. Open the hose clamps and remove the filter bowl.

Collect any fuel that escapes.

When refitting the filter, check the direction of flow (see arrow on filterbowl).

The old fitting can be screwed into replacement filters.  
Use new seal ring.

37



38

### 5.14. Fuel Pump

250 CE:

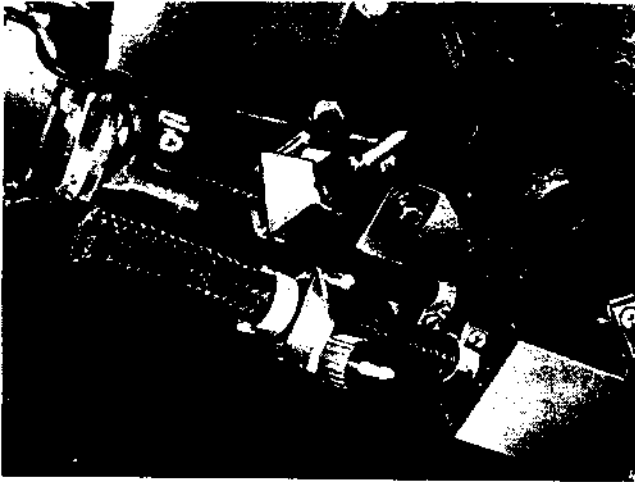
The fuel pump is fastened to the frame bottom between fuel tank and differential.

280 E, 280 CE:

The fuel pump is fastened to the frame bottom, together with the fuel filter, in front of the fuel tank.



39



#### Removing the pump:

Unscrew the protection plate from the pump. Close off the hoses from the pump with claspers.  
Loosen hose clamps on pump and pull off the hoses.  
Disconnect electric cables.

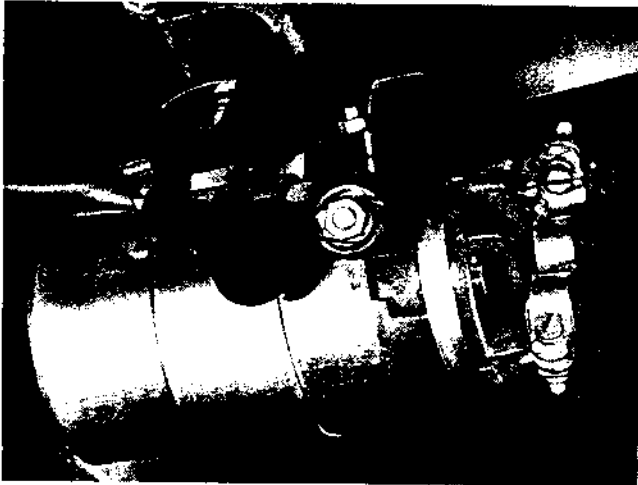
#### 250 CE:

Unscrew fastening nuts of pump with an 8 mm (5/16") open jaw wrench. Take off the pump.

#### 280 E, 280 CE:

Clamp off the fuel hose at the filter between it and the fuel pump (arrow in Fig. 39), and pull off hose.  
The 3 resilient mountings must be unscrewed when removing the pump mounting (e. g. 1 in Fig. 39). The fuel filter and the fuel pump can be replaced individually after undoing the fastening screws (2 and 3 in Fig. 39). When fitting fuel pump ensure that the suction fitting is at the lowest point. Tighten the bottom fastening screw (2) first.

40



41

#### For all types:

#### Installing the fuel pump:

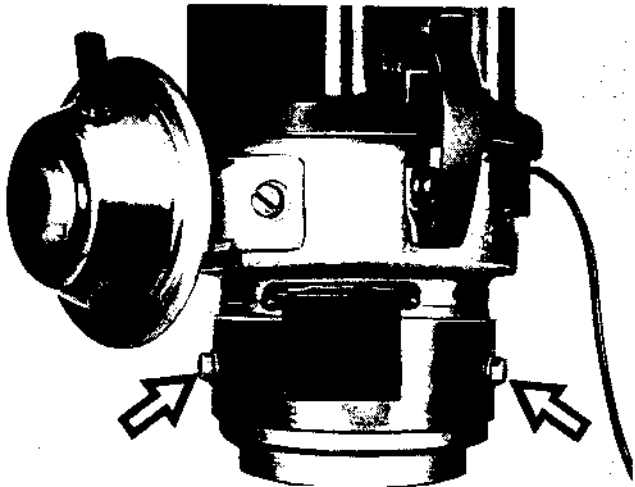
When refitting the pump, make certain that all hose connections are made tight.

**Do not interchange electric connections!**

M 4 screw connection = plus

M 5 screw connection = minus

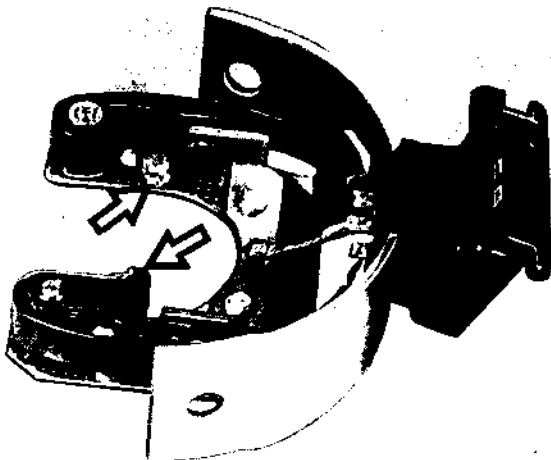
Pull rubber caps carefully over the terminals!



42

#### 5.15. Ignition distributor trigger contacts (Fig. 42)

To exchange the holder with the trigger contacts, the ignition distributor should first be removed. The two trigger contacts are mounted on a holder in the lower part of the distributor. Loosen the two screws (arrow) of the holder and pull out.



43

Before fitting a new holder the sliding heels of the breaker lever should be lubricated with Ft 1 v 4 grease. It is not possible to readjust the contacts. (Fig. 43)

## 5.16. Ignition, idle speed and CO-concentration adjustment

### Ignition adjustment:

#### 250 CE:

Initial ignition timing adjustment with test lamp =

6° BTDC

Initial ignition timing adjustment with stroboscopic timing light = 8° BTDC

Initial ignition timing adjustment (at starting speed without vacuum)

Ignition timing 4,500 rev/min without vacuum =

30° BTDC

#### 2.8 l:

Dwell angle:

Used contacts 34–40° at idle.

New contacts 34±1° at idle.

Initial ignition timing adjustment at starting speed, without vacuum, with stroboscopic timing light:

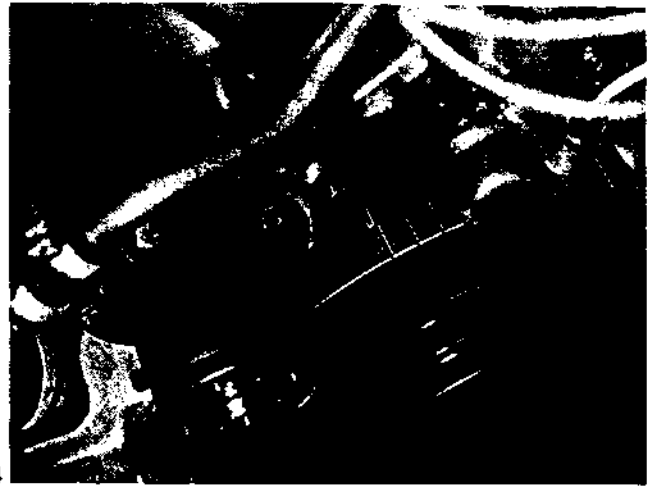
12° BTDC.

Ignition timing:

at  $n = 4.500$  rev/min without vacuum = 34° BTDC

Timing marks on the belt pulley.

Fixed index timing mark: Pointer on the engine block (Fig. 44)



### Idle speed and CO-concentration adjustment

#### 250 CE without potentiometer:

The idle speed is altered by variations in the by-pass. The idle adjustment screw is on cylinder 1 (knurled screw).

(Fig. 45) Adjustment of the idle speed should only be carried out when the engine has reached operating temperature (80° C = 176° F coolant temperature). It should be set to 750 rev/min.

Vehicles with automatic transmission:

Selector lever position N or P 750 . . . 800 rev/min.

#### 250 CE with potentiometer, 2.8 l:

The idling adjustment sets the correct air/fuel ratio, while having regard to the idle speed and the composition of the exhaust gases.



### Measuring instruments required:

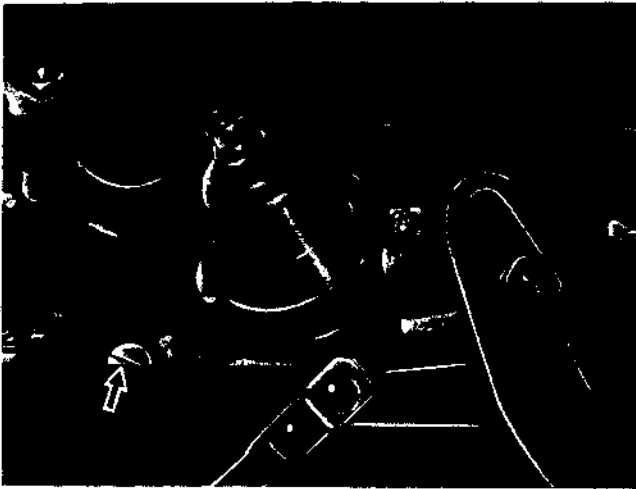
1 revolution counter

1 carbon monoxide analyzer

Prerequisite for idling adjustment:

the engine must have reached operating temperature (approx. 80° C = 176° F coolant temperature).

Switch off air conditioner.



46

#### Adjusting values:

##### 250 CE with potentiometer:

Idle speed: 750 . . . 800 rev/min

CO-concentration at idle: 2.0 to 3.5 %

##### 2.8 l:

Idle speed: 750 . . . 800 rev/min

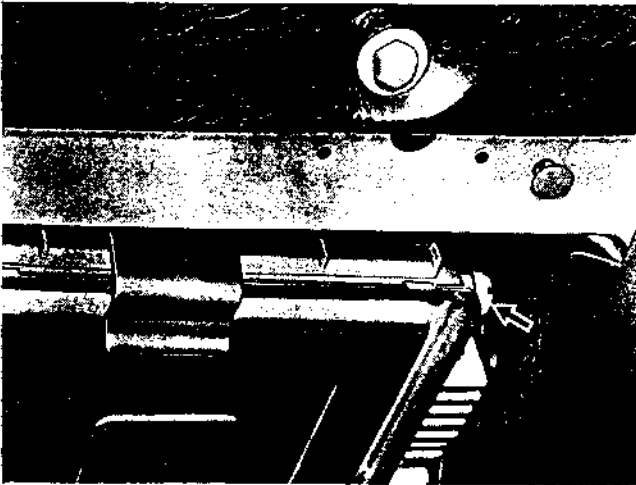
CO-concentration at idle: up to 3.5 %

The same values are valid for vehicles with automatic transmission (selector lever at N or P)

#### For all types:

The idle speed may only be adjusted by means of the idle adjustment screw, which is situated under the pressure sensor (arrow in Fig. 46).

By turning the screw clockwise the quantity of air for idling is lessened and the speed drops. The quantity of air increases and the speed rises when the adjustment screw is turned counter clockwise.



47

The potentiometer on the ECU (arrow in fig. 47 and 48) is provided only for adjusting the air/fuel ratio in order to obtain a better exhaust gas CO-level.

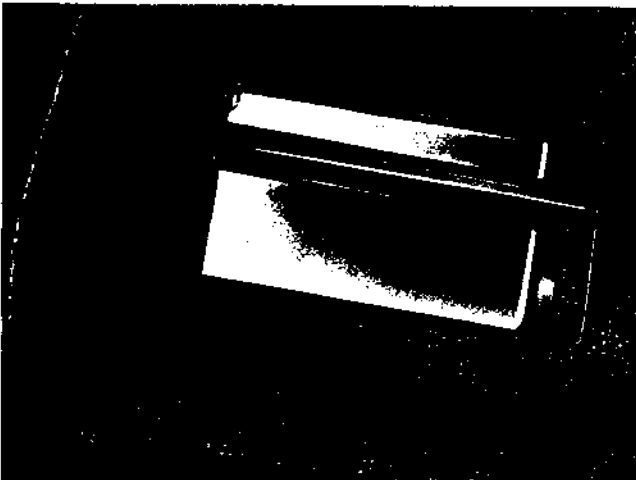
The exhaust gas composition can be adjusted with the potentiometer on the ECU:

Turning to the left (counter-clockwise) = leaner

Turning to the right (clockwise) = richer

Any resulting speed changes should be corrected by means of the idle adjustment screw.

If the CO content of the exhaust gas cannot be altered by turning the potentiometer, the air throttle valve and throttle valve switch settings must be checked according to sections 5.2. and 5.4. and corrected if necessary.



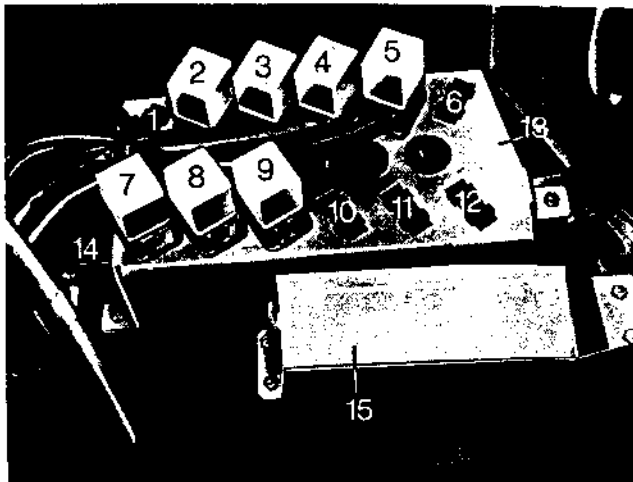
48

## 5.17. Main relay, pump relay and relay for start valve

280 E, 280 CE: (Fig. 49)

- 1 Relay for magnetic clutch of the air conditioner
- 2 Relay for auxiliary blower
- 3 Relay for window winder
- 4 general: Additional relay for window winder, or in USA: relay for headlamp washer system
- 5 Relay for fanfare horns
- 6 Relay for skid-control system
- 7 Main relay
- 8 Pump relay
- 9 Relay for start valve
- 10 general: Relay for headlamp washer system, or in USA: Relay for safety-belt warning system
- 11 Relay for headlamp flasher
- 12 Relay for skid-control system
- 13 Relay holder
- 15 ECU holder

49



280 SE:

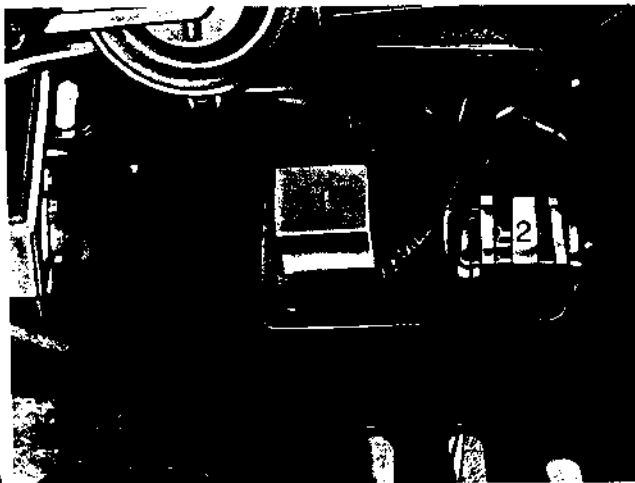
The main relay (1 in Fig. 50) is fitted below the glove compartment behind the bulkhead covering in the passenger compartment.

**Pump relay, relay for start valve and fuses** are housed in a box on the left side of the engine compartment (Fig. 51).

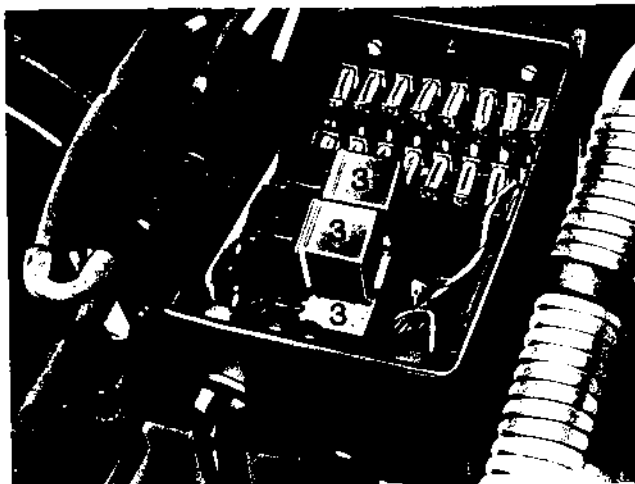
The position of the relay (3) can vary from vehicle to vehicle; but the code numbers on the cables next to the connector inside the box are binding.

Code number 1 = pump relay  
Code number 2 = relay for start valve  
further special-purpose relays

50



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## 6. Service Parts and Fast-moving Parts

### for the Electronically Controlled Gasoline Injection System

Service parts which have no Bosch part number are only obtainable from the Daimler-Benz Service Organisation.

#### 250 CE

Designation	Item	Bosch Part Number	Daimler-Benz Part Number	Qty. per Vehicle
ECU complete	1	0 280 001 002 as from 12.69 0 280 001 004 as from 1.71 0 280 001 006 <sup>1)</sup> (Sweden as from 10.70)	000 545 03 32 000 545 17 32 000 545 20 32	1 1 1
End cover for ECU	2	2 285 506 001	—	1
Cable harness assembly, complete	3	1 284 423 002	114 540 04 09	1
Grip on 25-pole plug		1 282 386 001	000 546 06 43	1
2-pole plug only, for injection valves, and temperature sensors		1 284 485 002	004 545 48 28	8
Rubber cap for 2-pole plug		1 280 703 001	000 546 11 35	8
3-pole plug only, on distributor		1 284 485 010	004 545 49 28	1
Rubber cap for 3-pole plug		1 280 703 006	000 546 12 35	1
4-pole plug housing only, for pressure sensor and throttle valve switch		1 284 485 004	004 545 50 28	2
Rubber cap for 4-pole plug		1 280 703 003	000 546 13 35	2
Receptacles 2.8 mm (1/8 in)		1 284 478 003	000 546 69 40	27
2-pole plug (pin terminal)		1 284 481 001	002 545 24 28	1
Holder with trigger contacts		1 230 090 005	—	1
Pressure sensor incl. mounting	5	0 280 100 006 as from 1.71 0 280 100 025 <sup>1)</sup>	001 542 91 17 002 542 22 17	1 1
Hose for connecting pressure sensor to intake air distributor approximately 250 mm long	6	—	114 476 03 26	1
Throttle valve switch	7	0 280 120 004 as from 2.71 0 280 120 014 <sup>1)</sup> 0 280 120 035 <sup>1)</sup>	002 545 80 24 003 545 49 24	1 1
Temperature sensor I (intake air)	8	0 280 130 006	001 542 88 17	1
Temperature sensor II (coolant)	9	0 280 130 009 as from 3.70 0 280 130 014 <sup>1)</sup>	001 542 87 17 002 542 21 17	1 1
Seal ring for above		—	007 603 01 01 00	1

<sup>1)</sup> Supersedes preceding type(s)

\* Use AMP crimper No. 574 860.

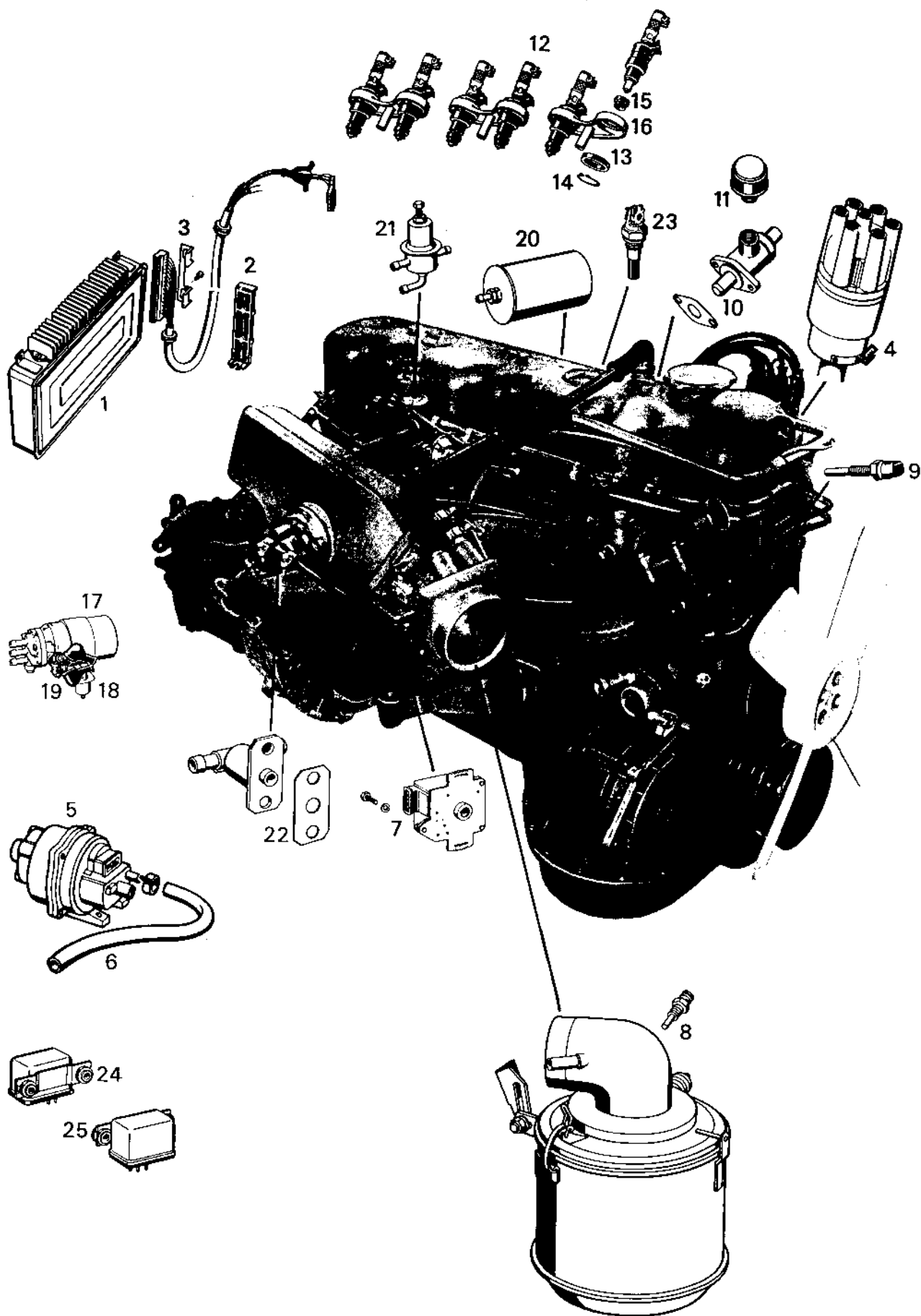


Designation	Item	Bosch Part Number	Daimler-Benz Part Number	Qty. per Vehicle
Auxiliary-air valve	10	0 280 140 004	000 141 02 25	1
Gasket for above		—	114 203 00 80	1
Filter for auxiliary air-valve	11	0 457 103 002	000 075 07 32	1
Injection valve	12	0 280 150 004 as from 5.71 0 280 150 014 <sup>1)</sup> 0 280 150 045 <sup>1)</sup>	000 078 14 23 000 078 17 23	6 6
Rubber ring for injection valve	13	—	116 078 00 73	6
Retainer (Seeger ring)	14	—	000 471 02 40	6
Rubber seal ring for injection valve	15	—	114 078 01 73	6
Injection valve holder	16	—	114 070 00 40	3
Fuel pump	17	0 580 970 002 as from 12.70 0 580 970 004 <sup>1)</sup> as from 1.71 0 580 464 005 <sup>3)</sup>	001 091 56 01 001 091 74 01 001 091 71 01	1 1 1
Rubber-bonded metal buffer for fuel fuel pump	18	—	114 328 05 81	2 (3)
Water protection cap for pump terminals	19	1 020 558 000	000 091 03 23	2
Fuel filter	20	0 450 903 001 as from 1.71 0 450 903 004 <sup>1)</sup>	000 092 71 01 000 092 76 01	1 1
Straight fitting		—	001 997 90 72	1
Angled fitting				
Ring-type steel or brass nipple		1 903 385 009 1 903 385 038	107 470 02 79	1
Hollow screw		2 911 201 703		
Seal ring for the fittings		2 916 710 609	007 603 014 102	1
Pressure regulator	21	0 280 160 003	000 078 01 89	1
Start valve	22	0 280 170 004 as from 12.71 0 280 170 021	000 071 31 37 000 071 35 37	1 1
Gasket for above		—	114 141 01 80	1
Thermo-time switch	23	0 280 130 200	001 545 92 24	1
Main or pump relays	24	0 332 008 002	000 542 87 19	2
Start relay	25	0 332 008 001	000 542 58 19	1
Diaphragm-type damper		0 280 161 002 <sup>2)</sup>	000 078 00 92	1

<sup>1)</sup> Supersedes preceding type(s)

<sup>2)</sup> Supersedes 0 280 161 001

<sup>3)</sup> No supersession for preceding type(s)



## 2.81

Designation	Item	Bosch Part Number	Daimler-Benz Part Number	Qty. per Vehicle
ECU complete	1	0 280 001 008 0 280 001 015 <sup>2)</sup>	000 545 54 32	1
End cover for ECU	2	2 285 506 001	—	1
Cable harness for ECGI	3	—	114 540 20 09	1
Cable harness for injection valves		—	114 540 21 09	1
Grip on 25-pole plug		1 282 386 001	000 546 06 43	1
2-pole plug only, for injection valves, temperature sensors and start valve		1 284 485 002	004 545 48 28	9
Rubber cap for injection valve		1 280 703 007	000 546 15 35	6
Rubber cap for temperature sensor and start valve		—	000 546 20 35	3
3-pole plug only, on ignition distributor		1 284 485 010	004 545 76 28	1
Rubber cap for 3-pole plug		1 280 703 006	000 546 14 35	1
4-pole plug housing only, for pressure sensor		1 284 485 004	004 545 50 28	1
Rubber cap for 4-pole plug		1 280 703 003	000 546 13 35	1
5-pole plug housing only, for throttle valve switch		1 284 482 004	005 545 08 28	1
Rubber cap for 5-pole plug		1 280 703 009	000 546 17 35	1
Receptacles 2.8 mm (1/8 in)*		1 284 478 003	000 546 69 40	30
Plug for thermo-time switch		—	005 545 56 28	1
Adaptor 1 (4-pole)				
Plug housing		—	004 545 88 28	1
Female connector		—	004 545 86 28	1
Adaptor 2 (6-pole)				
Plug housing		—	005 545 49 28	1
Female housing		—	002 545 44 28	1
2-pole plug (pin terminal)		1 237 330 235	001 156 21 01	1
Holder with trigger contacts		1 230 090 005 1 230 090 015 as from 8.74	—	1
Pressure sensor incl. mounting	5	0 280 100 111	002 542 33 17	1
Hose for connecting pressure sensor to intake air distributor	6	—	114 997 18 82	1
Throttle valve switch	7	0 280 120 029	003 545 66 24	1

\* Use AMP crimper no. 574 860

<sup>2)</sup> With fastening bolts

Designation	Item	Bosch Part Number	Daimler-Benz Part Number	Qty. per Vehicle
Temperature sensor I (intake air)	8	0 280 130 006	001 542 88 17	1
Temperature sensor II (coolant)	9	0 280 130 014	002 542 21 17	1
Seal ring for above		—	007 603 01 01 01	1
Auxiliary-air valve	10	0 280 140 027	000 141 04 25	1
Gasket for above		—	114 203 00 80	1
Injection valve	11	0 280 150 014 0 280 150 023 0 280 150 035 <sup>3)</sup>	000 078 17 23	6
Rubber ring for injection valve	13	—	116 078 00 73	6
Retainer (Seeger ring)	14	—	000 471 02 40 00	6
Rubber seal ring for injection valve	15	—	116 078 01 73	6
Injection valve holder	16	—	130 078 03 41	3
Fuel pump	17	0 580 464 005	001 091 71 01	1
Rubber-bonded metal buffer for fuel pump		—	114 328 05 81	3
Pump and filter holder		—	107 470 00 81	1
Water protection cap for pump terminals		1 020 558 000	000 091 03 23	2
Fuel filter	20	0 450 903 004	000 092 76 01	1
Angled fitting: Ring-type steel or brass nipple Hollow screw		1 903 385 009 1 903 385 038 2 911 201 703	107 470 02 79	1
Sealring		2 916 710 609	007 603 014 102	1
Pressure regulator	21	0 280 160 007	000 078 03 89	1
Start valve	22	0 280 170 023	000 071 33 37	1
Gasket for above		—	114 141 01 80	1
Thermo-time switch	23	VDO		1
Main. pump and start relays		0 332 205 001	001 542 02 19	3
Diaphragm-type damper	26	0 280 161 002 <sup>1)</sup>	000 078 02 92	1

<sup>1)</sup> Substitute for 0 280 161 001

<sup>3)</sup> Supersedes preceding type

