

Kraftstoffanlage
Fuel System
Système d'alimentation
Sistema d'alimentazione

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PORSCHE

Workshop-Manual

914

914/6

DR.-ING. h. c. F. PORSCHE KG STUTTGART-ZUFFENHAUSEN

This publication contains the essential removal, installation and adjustment procedures for the Porsche 914-914/6 vehicles sold in the USA and Canada.

Components and procedures described in this manual are identical for both types unless differences are pointed out in the text.

It is assumed that the reader is familiar with basic automotive repair procedures. Special tools required in performing certain service operations are identified in the manual and recommended for use. Use of tools or procedures other than those recommended in this repair manual may be detrimental to the vehicle's safe operation as well as the safety of the person servicing the vehicle.

The Porsche 914 - 914/6 Workshop Manual is divided into 8 volumes. The volumes are subdivided into 10 Main Groups as follows:

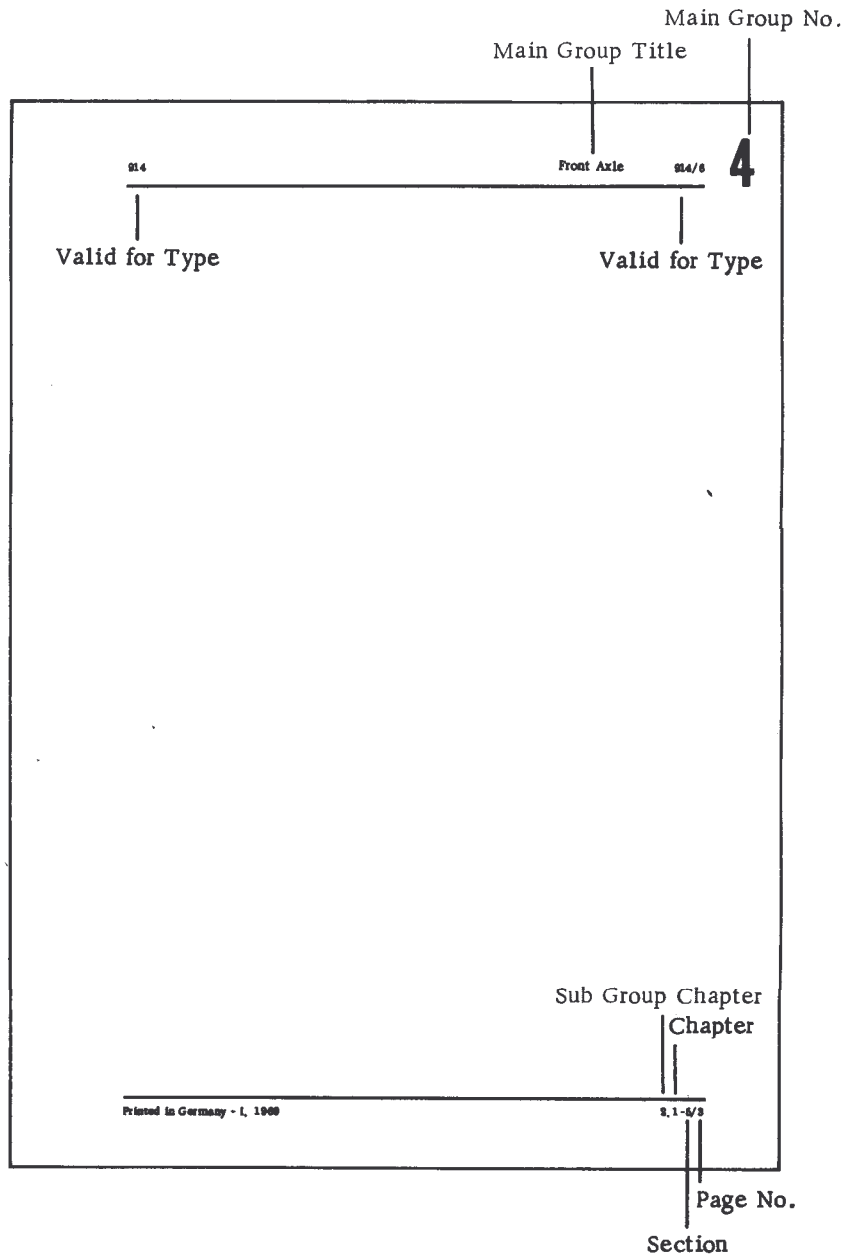
1st Volume	Engine and Clutch - 914	Main Group No. 1
2nd Volume	Fuel System - 914	Main Group No. 2
3rd Volume	Engine and Clutch - 914/6 Fuel System - 914/6	Main Group No. 1 Main Group No. 2
4th Volume	Transmission	Main Group No. 3
5th Volume	Front Axle Rear Axle	Main Group No. 4 Main Group No. 5
6th Volume	Brakes, Wheels, Tires Pedal System and Levers Maintenance, Specifications	Main Group No. 6 Main Group No. 7 Main Group No. 0
7th Volume	Body	Main Group No. 8
8th Volume	Electrical System	Main Group No. 9

The binders have a transparent plastic pocket on the spine into which the appropriate volume title can be inserted.

To find the individual repair operations, each main group is subdivided into "Chapters" and "Sections". Every main group is provided with a very detailed table of contents. Refer to example on next page.

The repair operations described in this Workshop Manual are based on the Type 914 vehicle. Repair operations which apply to Type 914/6 vehicles are described separately. The type vehicle to which the repair operation applies is given on the top left or right of the page.

When certain repair operations are similar for both type vehicles, the procedures are described together and the minor differences for the 914/6 emphasized by notes and remarks.



Technical Information

The "Technical Information" pages which are published from time to time should be filed in chronological order at the beginning of the respective Main Groups of the Workshop Manuals.

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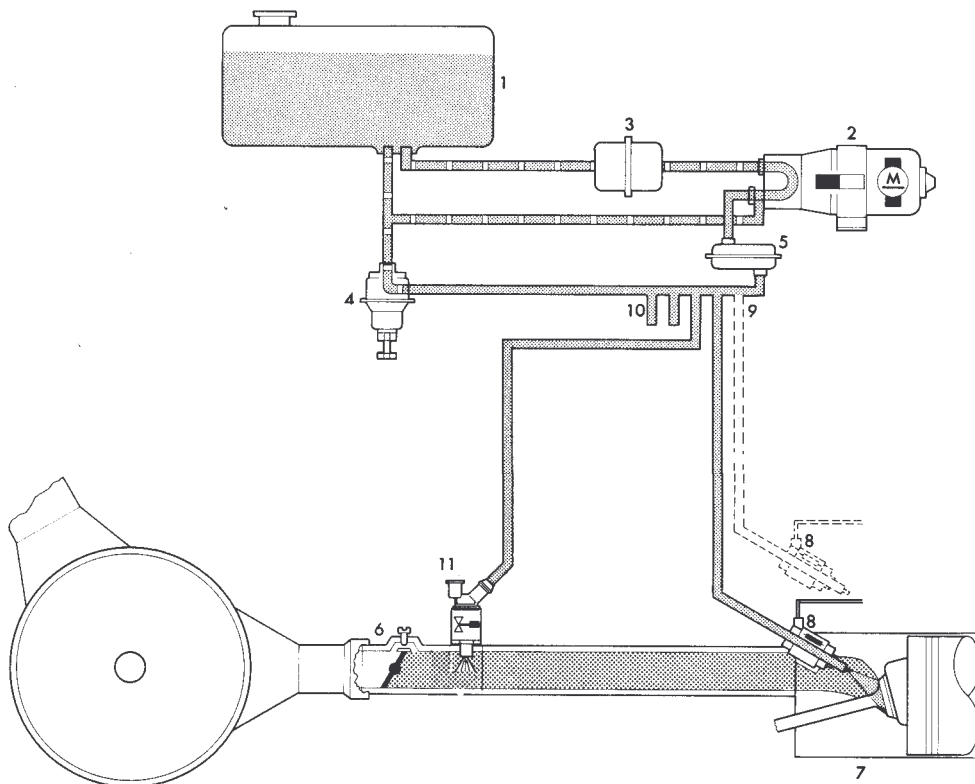
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FUEL SYSTEM

A pump draws fuel from the tank and forces it through a filter into the main line and individual fuel lines which are connected to the injectors. A pressure regulator, which maintains a constant fuel pressure, is located at the end of the main line.

Excess fuel is returned to the tank through a separate fuel line.

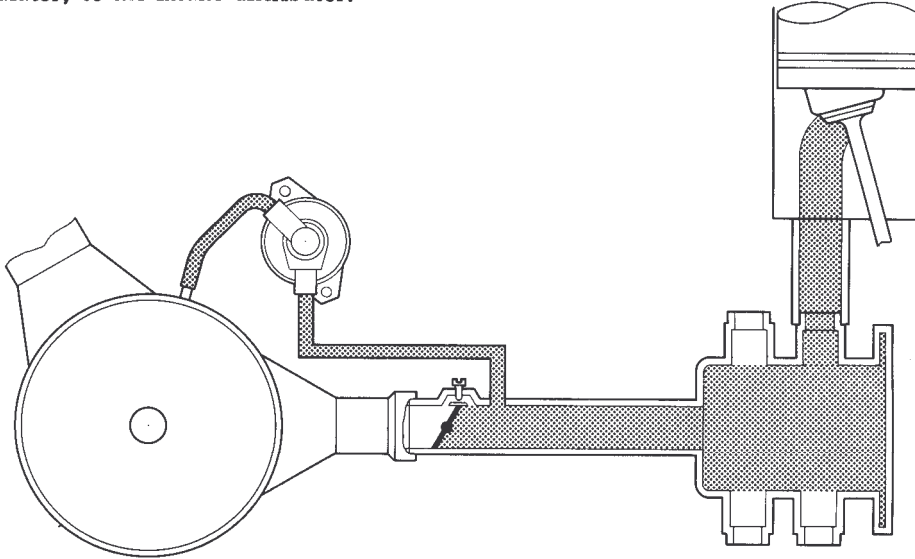
- | | |
|------------------------|--|
| 1 - Fuel tank | 6 - Air distributor and throttle valve |
| 2 - Fuel pump | 7 - Cylinder |
| 3 - Filter | 8 - Injector |
| 4 - Pressure regulator | 9/10 - Fuel distributor |
| 5 - Damper | 11 - Cold starting valve |



AIR INDUCTION SYSTEM

The idle air system consists of an air passage in the intake duct, terminating behind the throttle valve. An adjusting screw controls the idle air flow (see 3.1 - 1/1 for idle adjustment).

The warm-up air system consists of a separate air hose leading from the air cleaner, through the auxiliary air regulator, to the intake distributor.



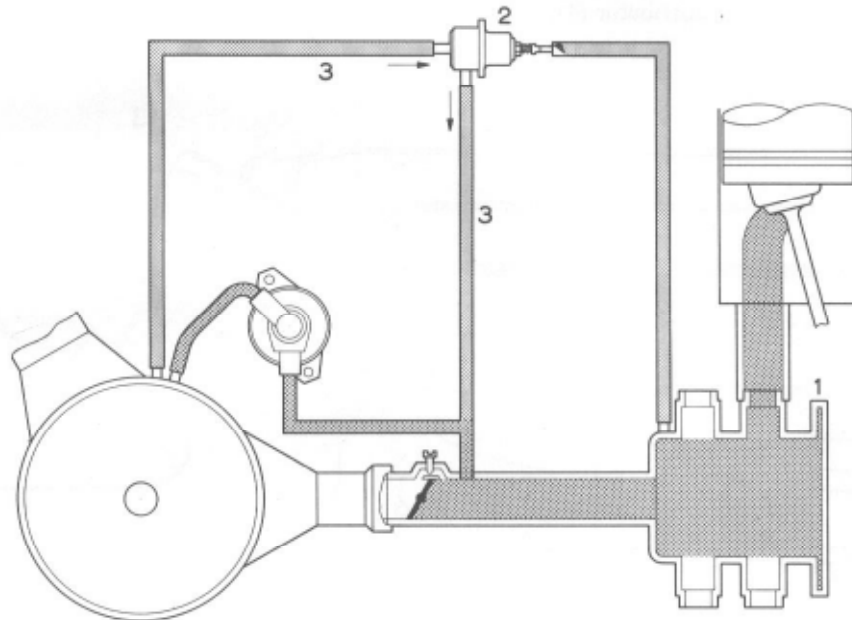
DECELERATION MIXTURE CONTROL SYSTEM

(914/1.7 from August 1971, 914/2.0)

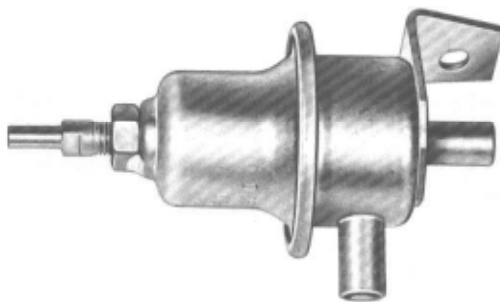
These vehicles have an air compensating system which supplies additional air at high engine speeds with throttle closed (overrun or coasting). This air is needed due to an air deficiency in the fuel/air mixture under such conditions. The supplemental air is fed into the intake distributor to effect low CO emissions during this driving phase as well.

OPERATION

When the engine runs at high rpm with the throttle closed (overrun), pressure in the intake distributor (1) is low in relation to the ambient air pressure. Under these conditions, the pneumatic valve (2) opens and allows air to flow from the air cleaner into the intake distributor through air hoses (3), resulting in a leaner combustion mixture.



Deceleration Mixture Control Valve

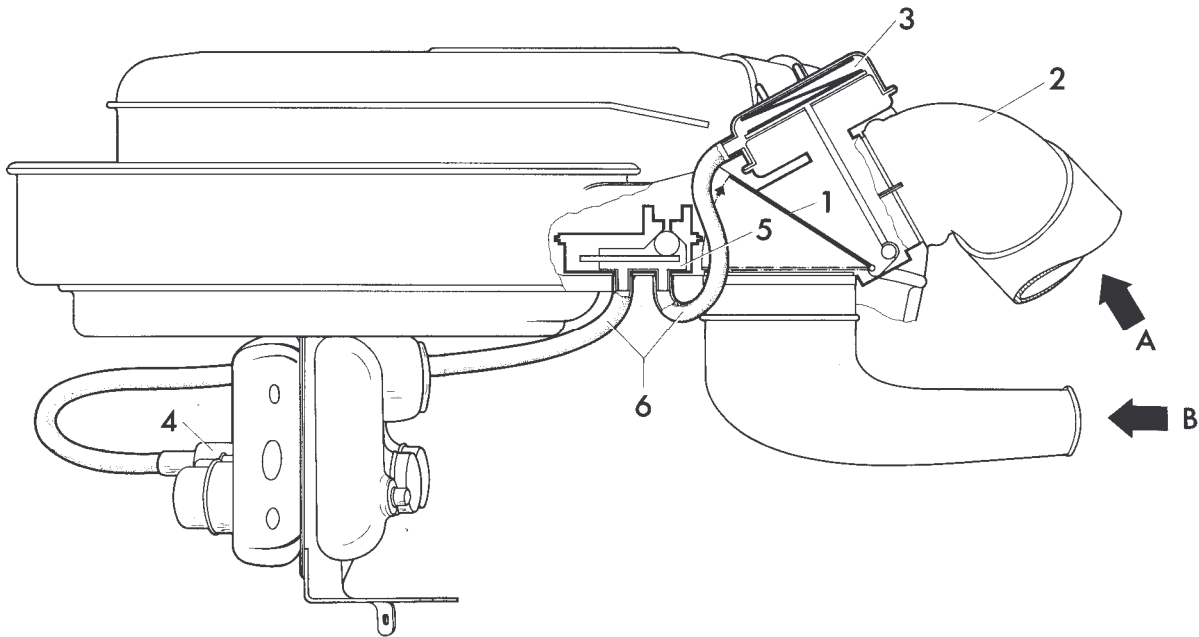


The valve is located at the pressure sensor bracket.

TEMPERATURE AND LOAD SENSITIVE INDUCTION AIR PREHEATING SYSTEM
(914/1.7 from August 1971 to August 1972)

Located in the intake duct (2) of the air filter assembly is a vacuum control unit (3) with its diaphragm connected directly to the control flap (1) by an actuating rod.

A thermostatically-controlled temperature regulator (5) is located in the line (6) which connects the vacuum unit with the intake distributor (4).



Operation:

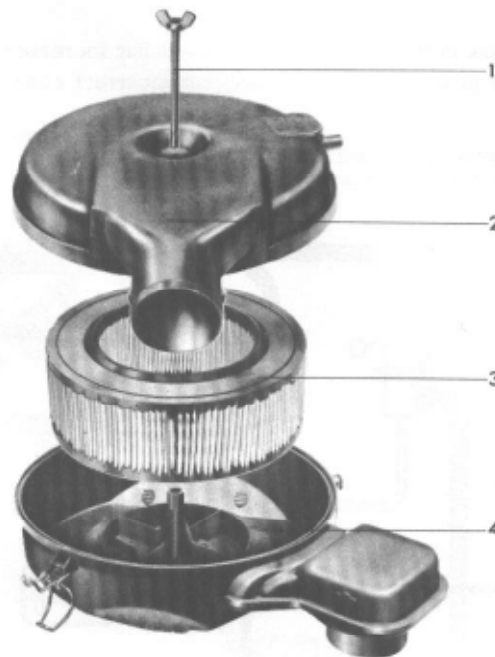
Load-Sensitive Control

When the engine is running with the throttle closed or only partly open, the high vacuum pulls the diaphragm in, opening the flap and allowing warm air to enter (A). When the throttle opens wider, the vacuum decreases and the diaphragm repositions the control flap to allow less warm air to enter the induction system until, at full throttle, the engine receives cold air only (B).

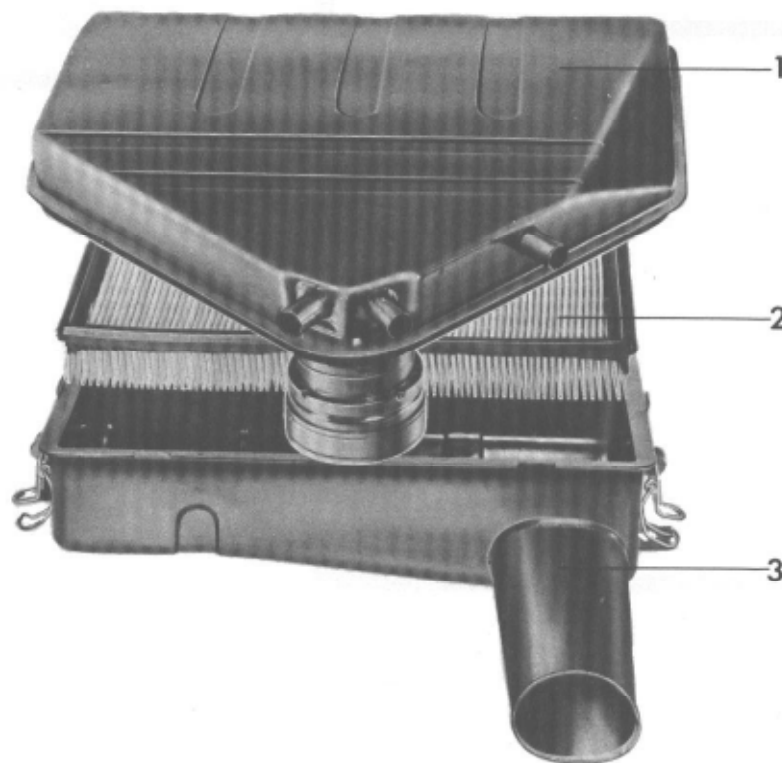
Temperature-Sensitive Control

A bimetal spring operates the temperature regulator which remains closed as long as the inducted air temperature remains below 45° C (113° F), allowing full vacuum control; warm air, taken at cylinder 1, is ducted to the intake duct and vacuum unit, and the warm air control flap. When the induction air temperature reaches 45° C (113° F), the valve in the temperature regulator opens and outside air is permitted to enter, causing a weakening of the prevailing vacuum condition. As a result, the control flap in the intake duct closes the warm air supply channel without regard to the throttle valve position. This permits a quicker adjustment of the induction air temperature to the continually changing operating conditions.

AIR CLEANER 914/1.7 from August 1972

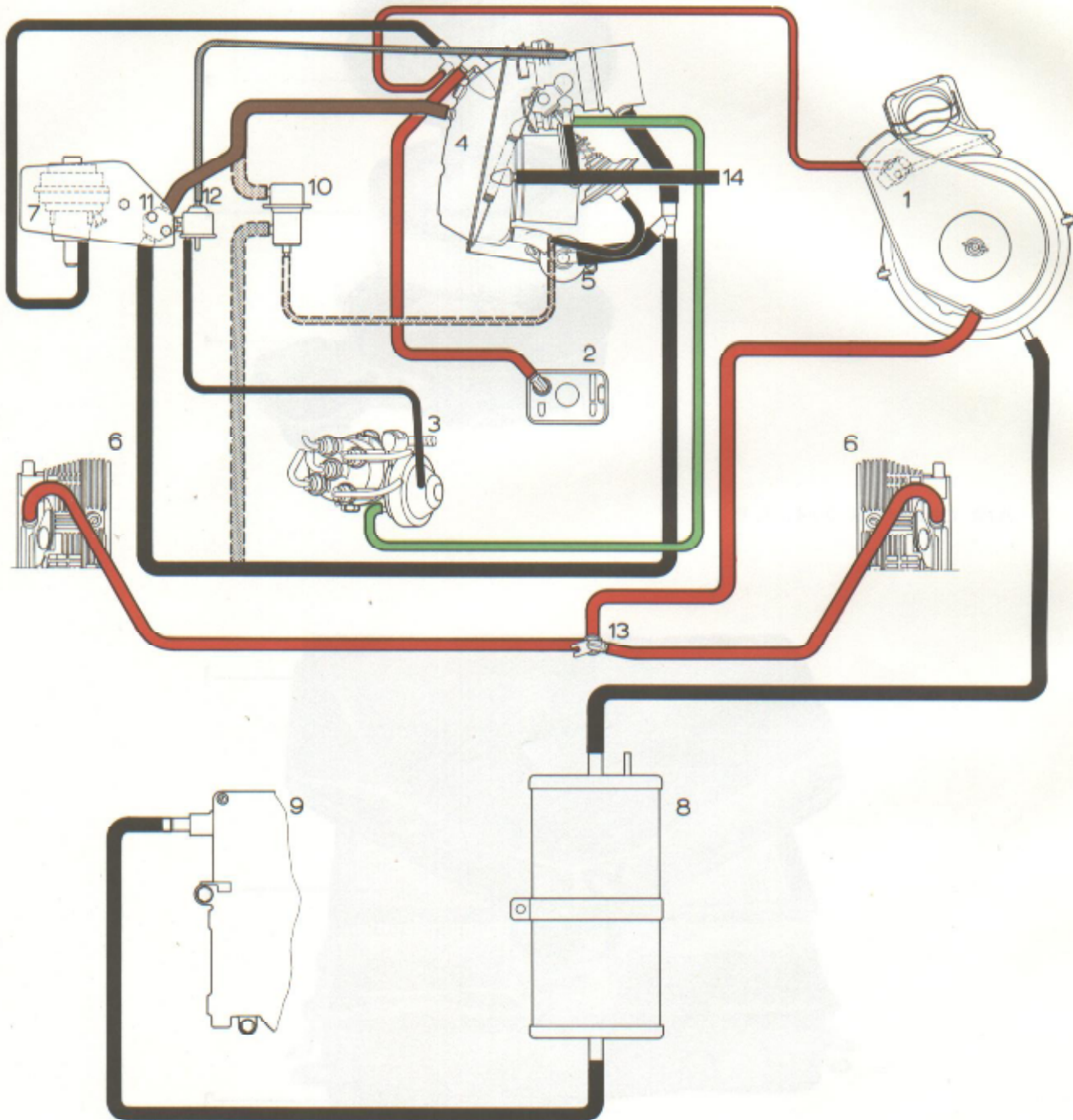


AIR CLEANER 914/2.0



HOSE ARRANGEMENT IN ENGINE COMPARTMENT (914/1.7 from August 1971)

The number of hoses in the engine compartment has increased due to the use of additional devices. The hoses are furnished in various colors to prevent incorrect connections.



- | | |
|-----------------------------|-----------------------------------|
| 1 - Oil bath air cleaner | 8 - Activated charcoal filter |
| 2 - Crankcase breather | 9 - Cooling fan housing |
| 3 - Ignition distributor | 10 - Pneumatic deceleration valve |
| 4 - Intake air distributor | 12 - (not used in type 914) |
| 5 - Auxiliary air regulator | 13 - Flashback valve |
| 6 - Cylinder head | 14 - (not used in type 914) |
| 7 - Pressure sensor | |

CONTROL UNIT

The control unit is the main part of the injection system. It is connected to the sensors located in various parts of the engine by a multiple point connector.

The most important components in the unit are both output stages known as the switching logic and timing stages.

Also located in the control unit are correcting stages for warm-up enrichment (WL), engine speed (DK), and acceleration enrichment (BA).

The pressure sensor and both trigger points in the distributor connect directly into the timing stage.

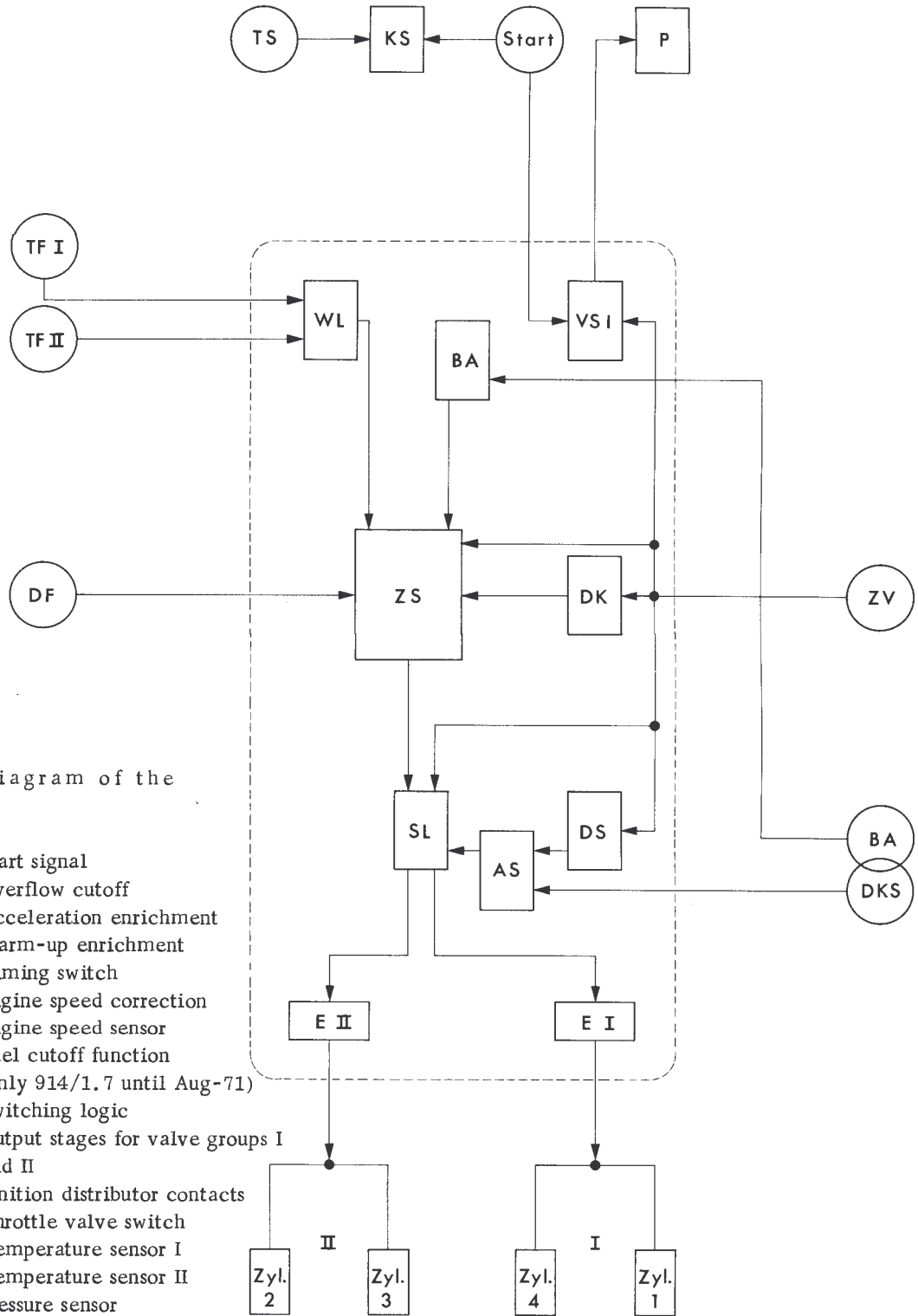
The control unit components mentioned above determine the fuel quantity.

The engine speed sensor (DS), working in conjunction with the fuel cutoff function (AS) and throttle valve switch (DKS), effects a complete cutoff of the fuel supply on overrun deceleration (only for 914/1.7 until August 1971).

In addition, the control unit has an overflow cutoff (VSI) which ensures that the fuel pump runs only when the starter is operated or the engine is running faster than 100 rpm.

The cold starting valve (KS) receives its control signals from outside the control unit.

Control signals for the necessary fuel supply during acceleration are sent to the control unit from two contact strips in the throttle valve switch.



Schematic Diagram of the Control Unit

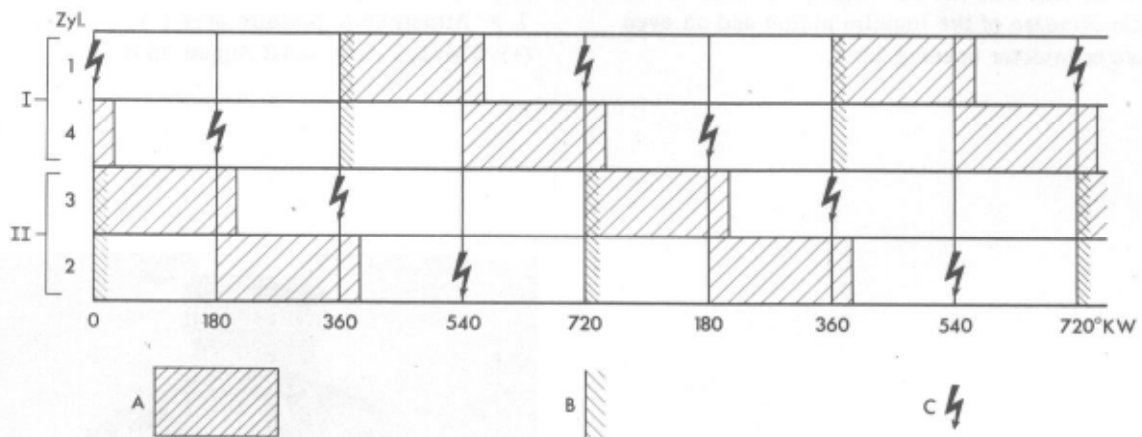
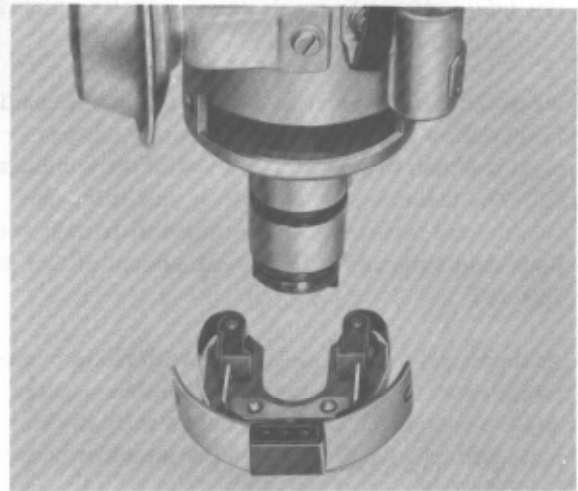
- St - Start signal
- VSi - Overflow cutoff
- BA - Acceleration enrichment
- WL - Warm-up enrichment
- Zs - Timing switch
- DK - Engine speed correction
- DS - Engine speed sensor
- AS - Fuel cutoff function (only 914/1.7 until Aug-71)
- SL - Switching logic
- EI, EII - Output stages for valve groups I and II
- Zv - Ignition distributor contacts
- DKS - Throttle valve switch
- TF I - Temperature sensor I
- TF II - Temperature sensor II
- DF - Pressure sensor
- Zyl 1-4 - Injectors for cylinders 1 thru 4
- KS - Cold starting valve
- TS - Thermostwitch
- P - Fuel pump

Injection Timing

Two sets of trigger contacts (spaced 180° apart) are located in the lower section of the ignition distributor. They determine when and into which pair of cylinders the fuel is to be injected.

The time span between the opening of the contacts supplies the control unit with the engine speed. A single-lobe cam on the distributor shaft alternately operates these contacts which are not adjustable.

The diagram shows the time sequence for intake valve opening, start of injection and ignition.



FUEL METERING

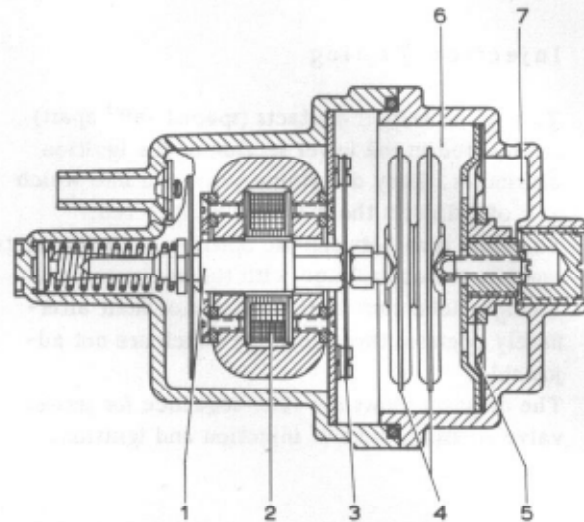
The quantity of fuel to be injected at any given time is controlled by the length of time the injectors are open. The intake manifold pressure and engine speed are the main factors for the electronic control. Further data, e.g. engine temperature and ambient temperature are also decisive to the operating condition of the engine. All these factors are transmitted to the control unit for the calculation of the correct amount of fuel. This information is converted into long or short impulses. The length of any particular impulse determines the length of time the injector is open and thereby the quantity of fuel injected.

The pressure sensor measures the pressure in the intake air distributor (engine load) and converts this information into an electrical impulse which is passed on to the control unit.

When the throttle valve is closed, the intake manifold pressure is low (6). The barometer units expand and push the armature (1) out of the windings (2). The inductance of the sender unit is low and the impulse period short. The injectors remain open for a short time and only a small amount of fuel is injected.

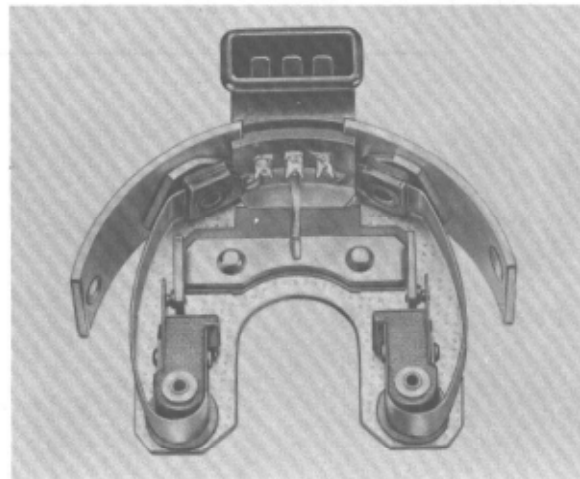
As the throttle valve opens, i. e. with rising manifold pressure, the barometer units are compressed and the inductance is high. Consequently the impulse period is lengthened and the injection quantity increased.

On transferring to full load the diaphragm (5) rests on the full load stop. The armature (1) travels further still into the windings. This results in a further increase of the impulse period and an even longer injector opening time.



- 1 - Armature
 - 2 - Coil winding
 - 3 - Leaf springs
 - 4 - Barometer units
 - 5 - Diaphragm for full load enrichment (+)
 - 6 - Manifold pressure area
 - 7 - Atmospheric pressure area (+)
- (+) 914/1.7 only, until August 1971

The trigger contacts in the ignition distributor, together with the pressure sensor, determine the basic amount of fuel to be delivered. Engine speed is transmitted to the control unit and changed into electrical values which affect the duration of injection.



METERING COMPENSATORS

The main metering system, which operates on the basis of intake manifold pressure and engine speed, is supplemented by the below listed compensators which are necessary to obtain proper engine performance

Cold starting valve
 Auxiliary air regulator
 Full throttle enrichment
 Fuel cutoff for overrun deceleration
 (914/1.7 only, until August 1971)

The following additional components are used for this purpose:

Temperature Sensor I in the intake distributor, and Temperature Sensor II in the cylinder head control the flow of supplemental air during warm-up.

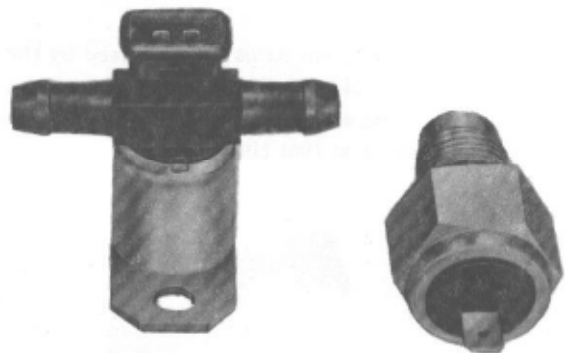


The temperature sensors are temperature-sensitive resistors whose ohmic value changes with changing temperature. The change in resistance affects the opening duration of the injectors.

Cold Starting Valve

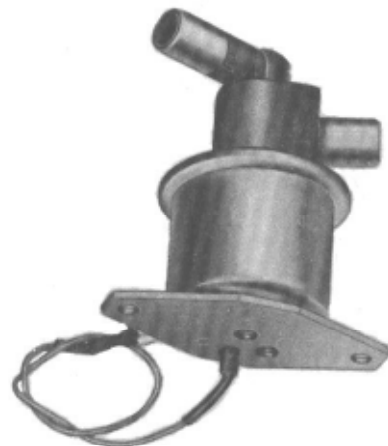
The Cold Starting Valve injects fuel into the intake distributor when the engine is started while cold.

A thermostat controls the cold starting valve.



Auxiliary Air Regulator

The engine needs supplemental air during warm-up. The flow of air is controlled by the auxiliary air regulator. A bimetal spring warms up when the engine is running and closes the air regulator.



Full Throttle Enrichment

The full-throttle enrichment system is controlled by the pressure sensor (see 0.1 - 1/10).

Acceleration Enrichment

The engine needs additional fuel during acceleration. When the throttle valve moves from the closed to the open position, a contact tab slides over two contact strips sending additional opening pulses to the injectors by way of the control unit.

Since the same contact strips are traversed by the contact tab when the throttle is being shut, a trailing contact (drag switch) has been included to interrupt the circuit at that time.

Fuel cutoff on Overrun Deceleration

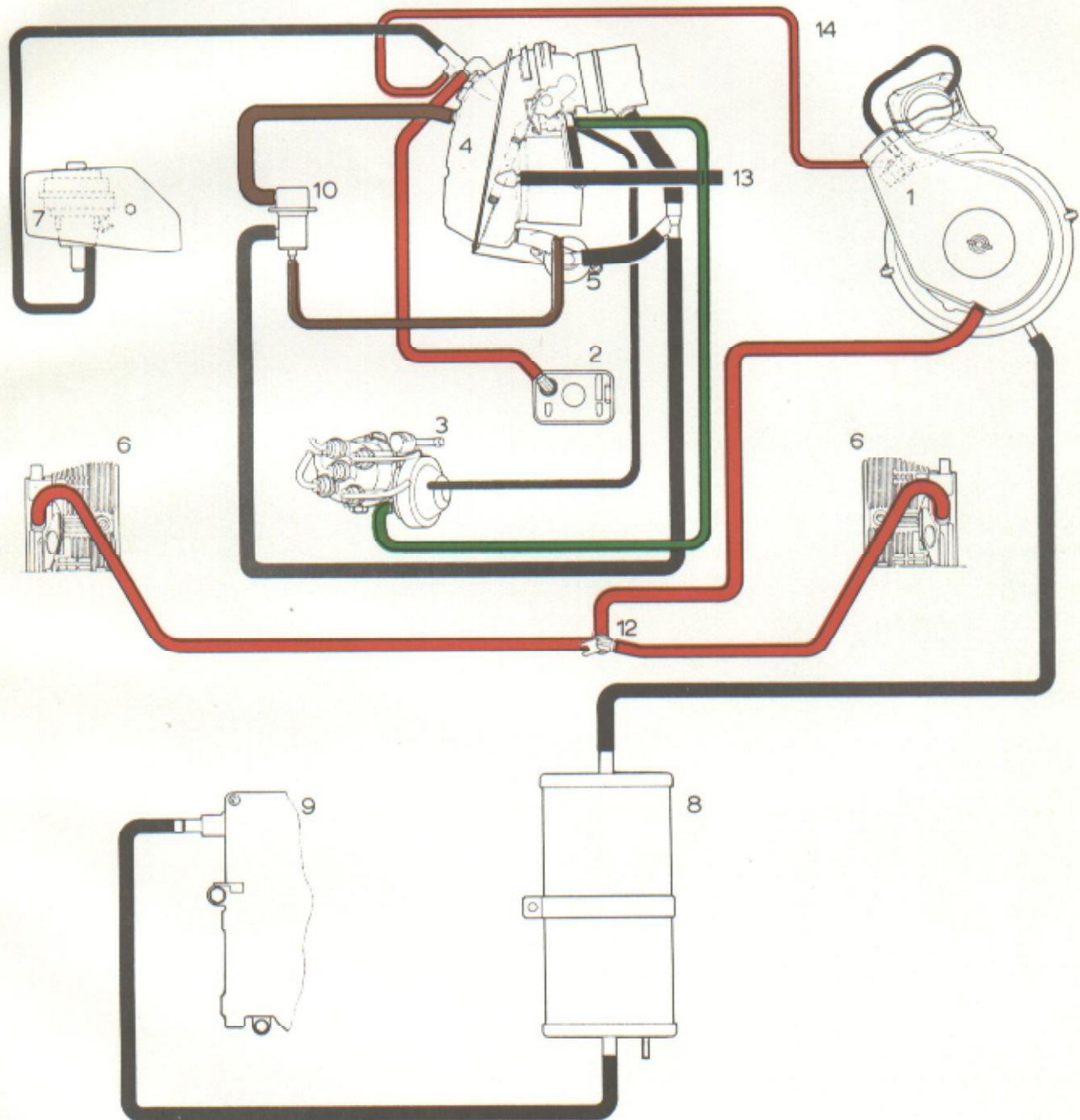
Very little or no fuel is needed on overrun deceleration (such as downgrade movement with closed throttle). This condition is characterised by closed throttle and higher engine speeds. The throttle valve switch cuts the fuel off when a certain engine speed is reached.

The 1.7 liter engines have no fuel cutoff provision from August 1971.



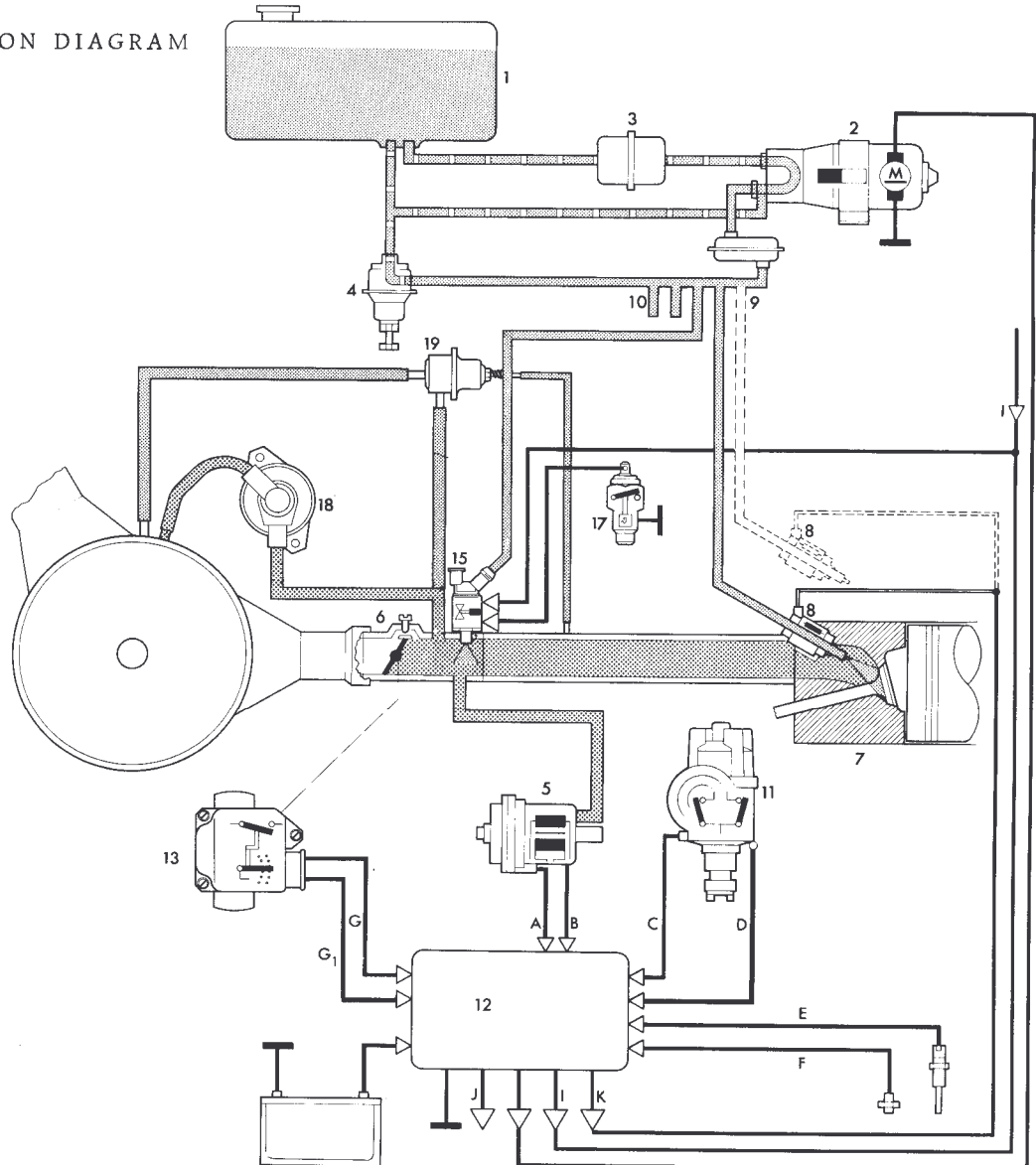
HOSES IN ENGINE COMPARTMENT

The hoses are of different colors to prevent faulty hook-ups.



- | | | | |
|---|-------------------------|----|------------------------------|
| 1 | Air cleaner | 8 | Activated charcoal filter |
| 2 | Oil breather | 9 | Cooling fan housing |
| 3 | Distributor | 10 | Pneumatic deceleration valve |
| 4 | Intake air distributor | 12 | Flashback valve |
| 5 | Auxiliary air regulator | 13 | (not used in Type 914) |
| 6 | Cylinder head | 14 | Preheated induction air |
| 7 | Pressure sensor | | |

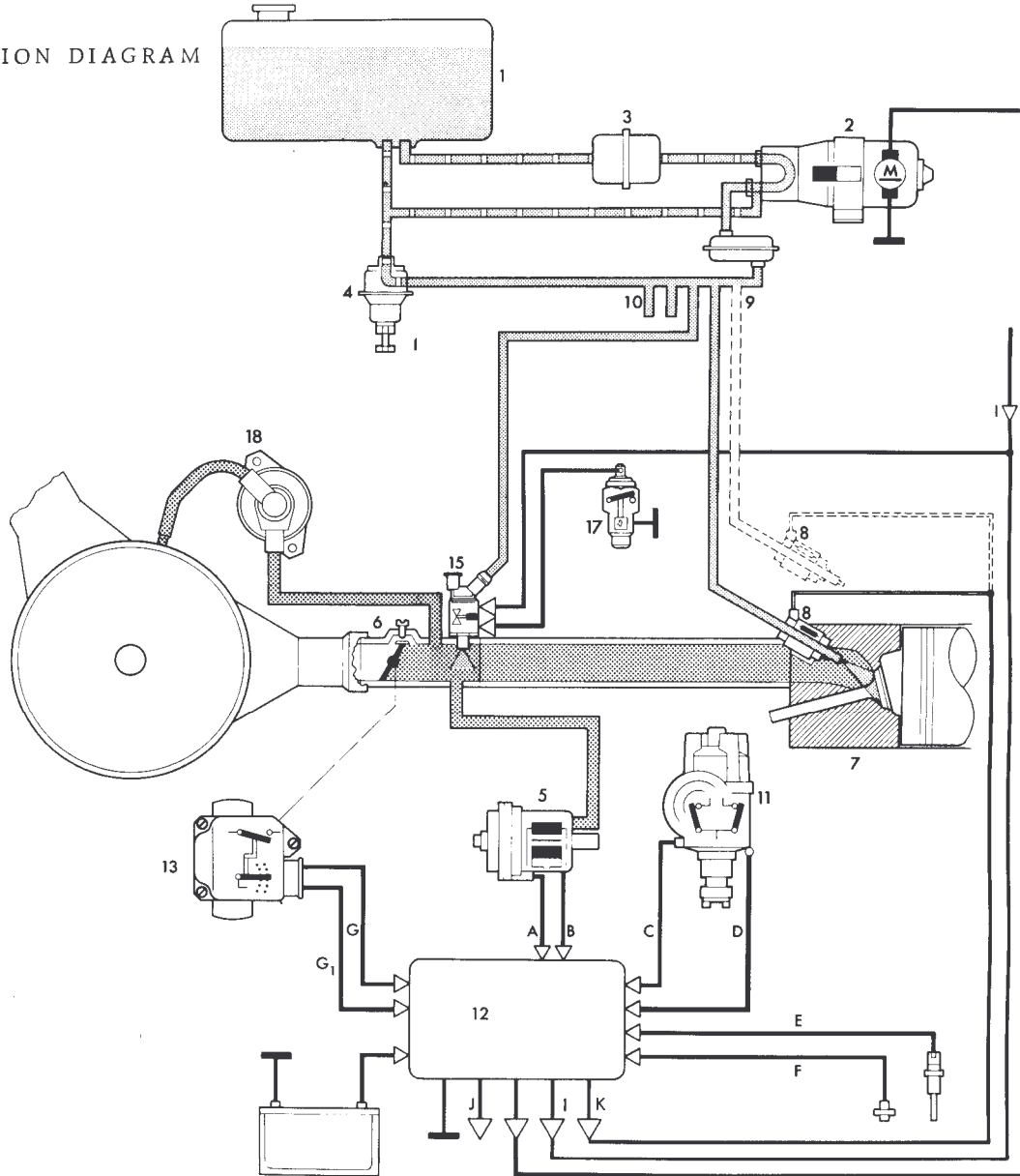
FUNCTION DIAGRAM



- 1 - Fuel tank
- 2 - Fuel pump
- 3 - Fuel filter
- 4 - Pressure regulator
- 5 - Pressure sensor
- 6 - Intake air distributor
- 7 - Cylinder head
- 8 - Injectors
- 9 - Fuel distributor
- 10 - Fuel distributor
- 11 - Ignition distributor with trigger contacts I and II
- 12 - Control unit
- 13 - Throttle valve switch with acceleration enrichment
- 15 - Cold starting valve
- 17 - Thermoswitch for cold starting valve
- 18 - Auxiliary air regulator

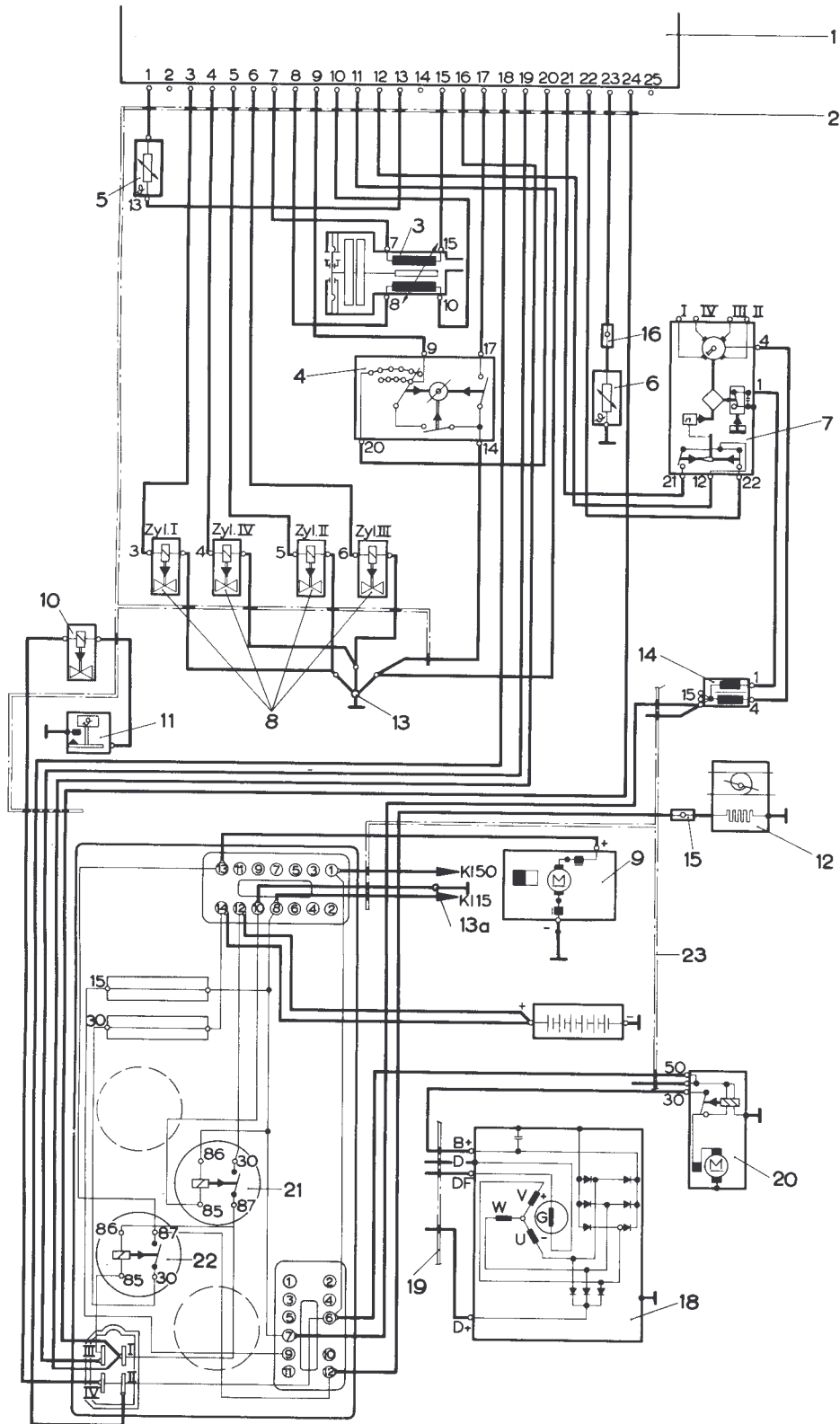
- A + B - from pressure sensor (load condition signal)
- C + D - from ignition distributor contacts (engine speed and release signals)
- E + F - from temperature sensors (warm up signal)
- G - from throttle valve switch (fuel cutoff on overrun deceleration)
- G 1 - acceleration enrichment
- I - from starter, terminal 50 solenoid (start enrichment signal)
- K - to injectors for cylinders 1 and 4
- J - to injectors for cylinders 2 and 3

FUNCTION DIAGRAM



- | | |
|--|---|
| <ul style="list-style-type: none"> 1 - Fuel tank 2 - Fuel pump 3 - Fuel filter 4 - Pressure regulator 5 - Pressure sensor 6 - Intake air distributor 7 - Cylinder head 8 - Injectors 9 - Fuel distributor 10 - Fuel distributor 11 - Ignition distributor with trigger contacts I and II 12 - Control unit 13 - Throttle valve switch with acceleration enrichment 15 - Cold starting valve 17 - Thermostwitch for cold starting valve 18 - Auxiliary air regulator 19 - Deceleration mixture control valve | <ul style="list-style-type: none"> A + B - from pressure sensor (load condition signal) C + D - from ignition distributor contacts (engine speed and release signals) E + F - from temperature sensors (warm-up signals) G - from throttle valve switch G 1 - acceleration enrichment I - to injectors for cylinders 1 and 4 II - to injectors for cylinders 2 and 3 |
|--|---|

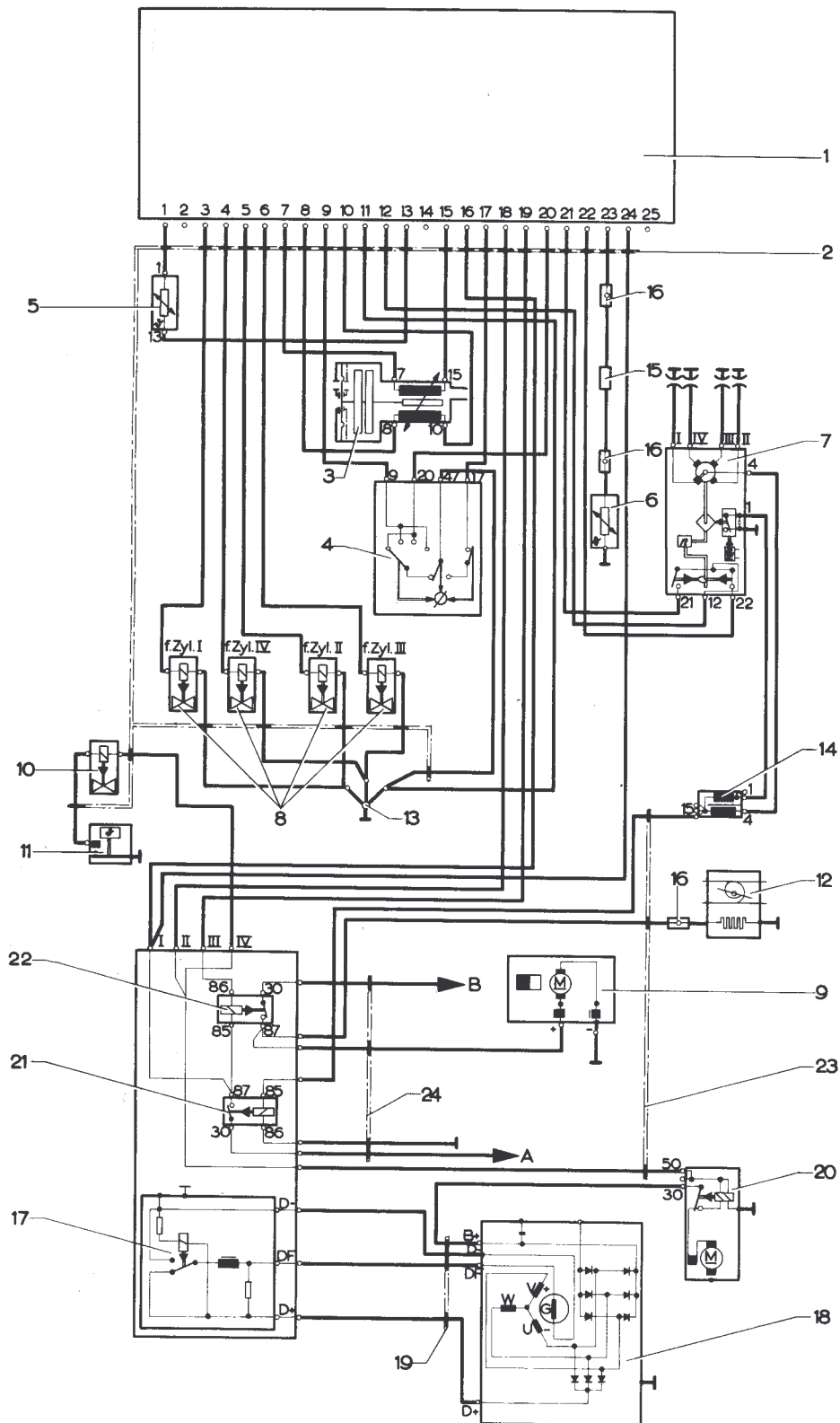
WIRING DIAGRAM 914/1.7 until August 1971



Legend:

- 1 - Control unit
 - 2 - Control unit harness
 - 3 - Pressure sensor
 - 4 - Throttle valve switch with acceleration enrichment
 - 5 - Temperature sensor I (intake air distributor)
 - 6 - Temperature sensor II (cylinder head)
 - 7 - Ignition distributor with trigger contacts
 - 8 - Injectors
 - 9 - Fuel pump
 - 10 - Cold starting valve
 - 11 - Thermostat for cold starting valve
 - 12 - Auxiliary air regulator
 - 13 - Ground connection (at engine housing)
 - 14 - Ignition coil
 - 15 - Connectors
 - 16 - Regulator for alternator
 - 17 - Alternator
 - 18 - Alternator harness
 - 19 - Starter
 - 20 - Voltage supply relay
 - 21 - Pump relay
 - 22 - Wires contained in main electrical harness
-

WIRING DIAGRAM 914/1.7 from August 1971, 914/2.0



Legend:

- 1 - Control unit
 - 2 - Control unit harness
 - 3 - Pressure sensor
 - 4 - Throttle valve switch with acceleration enrichment
 - 5 - Temperature sensor I (intake air distributor)
 - 6 - Temperature sensor II (cylinder head)
 - 7 - Ignition distributor with trigger contacts
 - 8 - Injectors
 - 9 - Fuel pump
 - 10 - Cold starting valve
 - 11 - Thermostat for cold starting valve
 - 12 - Auxiliary air regulator
 - 13 - Ground connection (at engine housing)
 - 14 - Ignition coil
 - 15 - Ballast resistor
 - 16 - Connector
 - 17 - Regulator for alternator
 - 18 - Alternator
 - 19 - Alternator harness
 - 20 - Starter
 - 21 - Voltage supply relay
 - 22 - Pump relay
 - 23 - Wires contained in main electrical harness
-

Effective 914/2.0	Control Unit (USA)		Pressure Sensor		Thermo- switch Prdctn/Spare	Temp. Sensor I Prdctn/Spare	Temp. Sensor II Prdctn:Spare	Throttle Valve Sw. Prdctn:Spare
	Production Part No.	Spare Part No.	Production Part No.	Spare Part No.				
August 69	022.906.021	022.906.021	022.906.051		311.906.161.A			
August 70	022.906.021.B	022.906.021.B					311.906.041.A	022.906.111.A
January 71	022.906.021.B	022.906.021.B	022.906.051.A	022.906.051.A 022.906.051.B 022.906.051.E				
May 71	022.906.021.B Yellow label	022.906.021.B Yellow label	022.906.051.B				022.906.041 Production 311.906.041.A	
August 71	022.906.021.E Brown label	022.906.021.E Brown label	022.906.051.E				Spare 022.906.111.B	
Remarks:	Do not use control units with blue yellow, and brown labels in conjunction with Temperature Sensor II, Part Number 022.906.041.A				Use thermostitch 311.906.021.A only in conjunction with control unit 022.906.021.		In cases of excessive fuel consumption, a limited number of Temperature Sensor II, Part Number 022.906.041.A is available.	

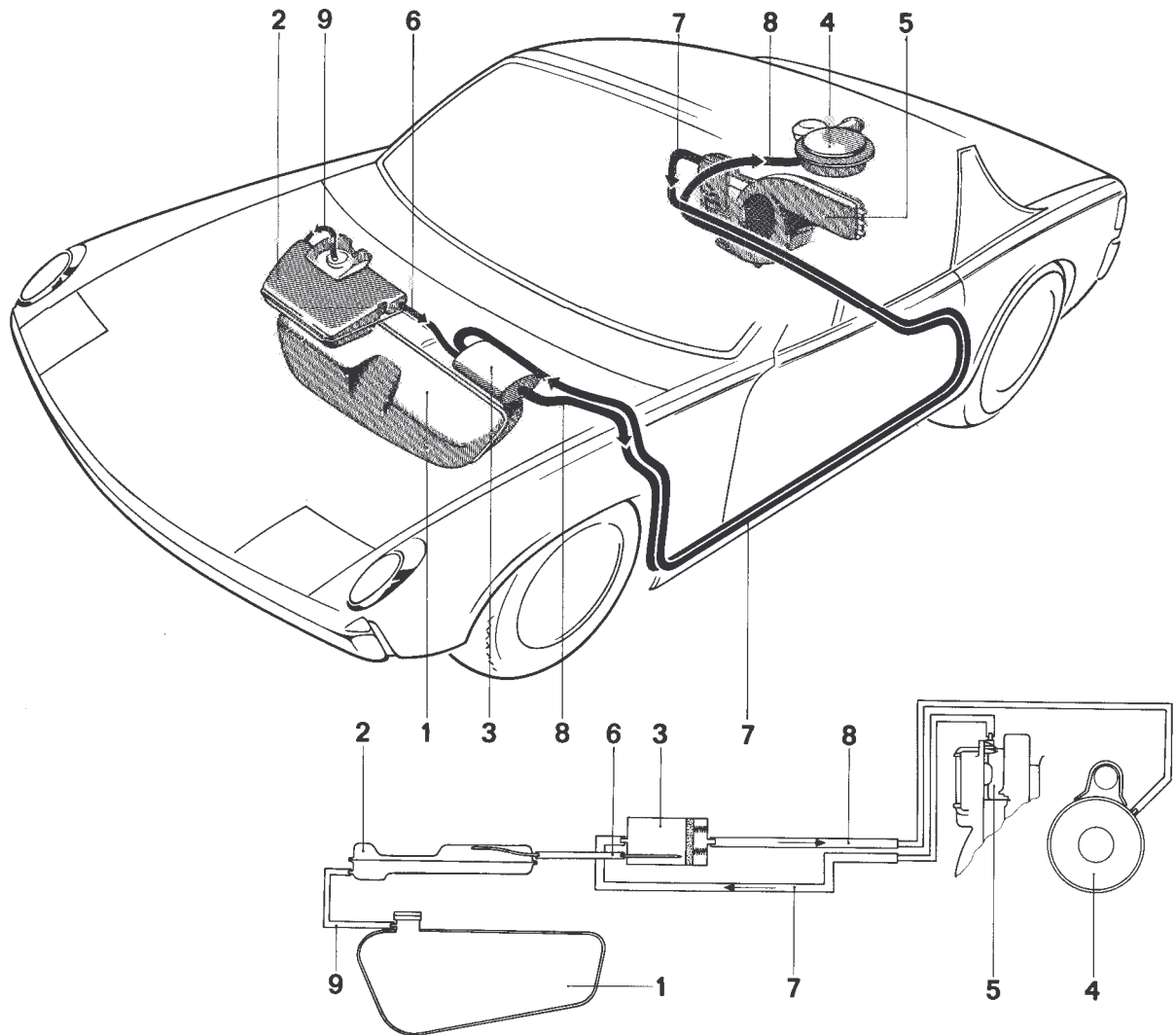
Effective 914/2.0	Control Unit (USA)		Pressure Sensor		Thermo- switch Prdctn/Spare	Temp. Sensor I Prdctn/Spare	Temp. Sensor II Prdctn/Spare	Throttle Valve Sw. Prdctn/Spare
	Production Part No.	Spare Part No.	Production Part No.	Spare Part No.				
August 72	022.906.021.E Brown label	022.906.021.E Brown label	022.906.051.C	022.906.051.C	311.906.161.C	311.906.081.A	022.906.041.A	039.906.111
August 73	039.906.021	039.906.021	039.906.051	039.906.051			022.906.041 Ballast resistor discontinued.	039.906.111A
August 74	039.906.021A	039.906.021A	039.906.051	039.906.051	022.906.163A	311.906.081A	022.906.041	039.906.111A

Introduction (914/1.8 AFC air flow controlled)	Control Units		Intake air sensor		Thermo-time Switch Production/ Spare Part No.	Auxiliary Air Regulator Production/ Spare Part No.	Temperature Sensor II Production/ Spare Part No.	Throttle Valve Switch Production/ Spare Part No.
	Production Part No.	Spare Part No.	Production Part No.	Spare Part No.				
November 73	022.906.021 G	022.906.021 G	022.906.301	022.906.301	022.906.163	022.906.045 A	311.906.041 A	022.906.111 D
August 74	473.906.021	473.906.021	473.906.301	473.906.301	043.906.163	022.906.045 A	022.906.041	022.906.111 D

FUEL EVAPORATIVE CONTROL SYSTEM

General

All Type 914/4 vehicles are equipped with a sealed fuel tank breather system incorporating an activated charcoal filter. This filter readily absorbs hydrocarbon fumes emitted by the fuel. When the engine is running, air is blown into the filter by the cooling fan. This flow of air separates the hydrocarbon fumes from the charcoal where they are immediately ducted into the air filter system. They are then mixed with the inducted air and burned in the engine.



- | | |
|--|---|
| 1 - Fuel tank | 7 - Hose from cooling air blower to activated charcoal filter |
| 2 - Expansion chamber | 8 - Hose from activated charcoal filter to air cleaner |
| 3 - Activated charcoal filter | 9 - Hose from fuel tank to expansion chamber |
| 4 - Air cleaner | |
| 5 - Cooling air blower | |
| 6 - Hose from expansion chamber to activated charcoal filter | |

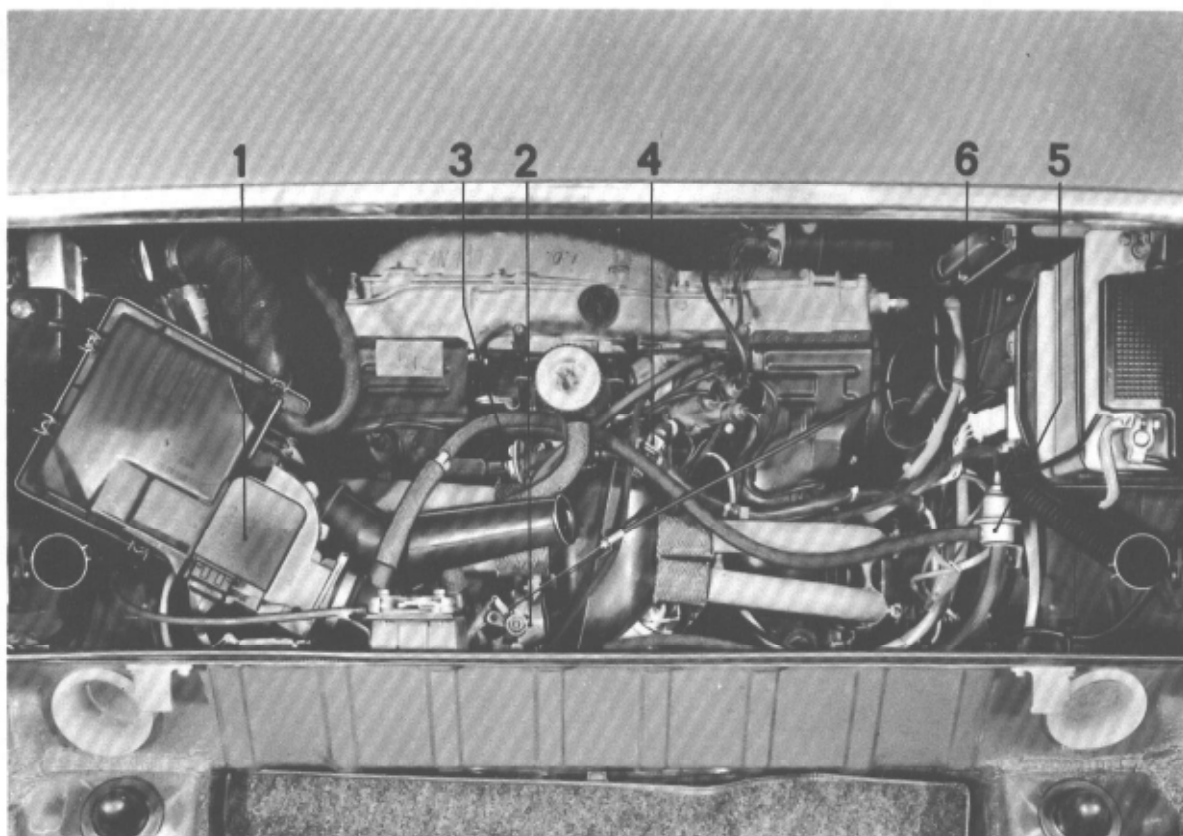
AFC ELECTRONIC FUEL INJECTION SYSTEM

The 1,8-liter engines are equipped with the AFC (air flow controlled) electronic fuel injection system.

The system operates on the basis of volume of air drawn in and has been so named.

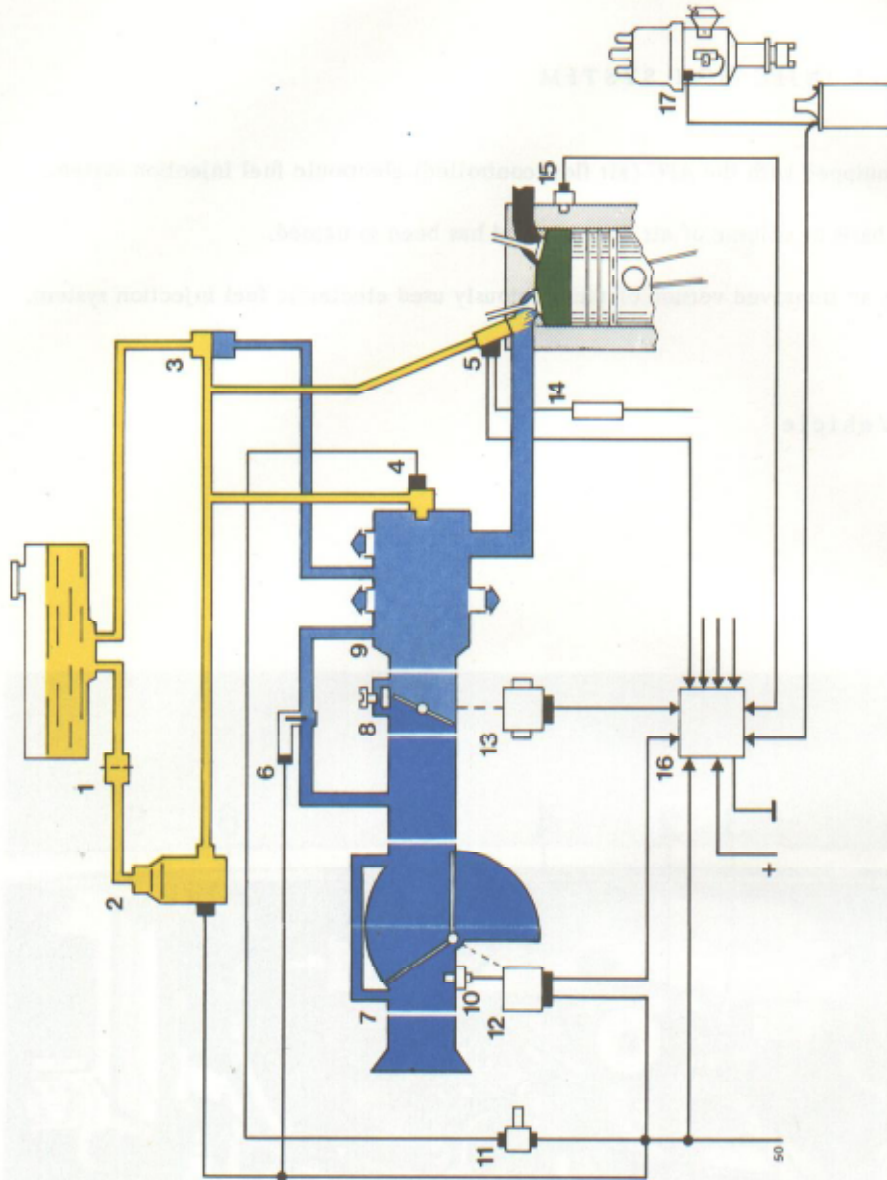
The AFC injection system is an improved version of the previously used electronic fuel injection system.

AFC components in Vehicle



- 1 Intake air sensor
- 2 Throttle valve housing
- 3 Auxiliary air regulator

- 4 Cold start valve
- 5 Pressure regulator
- 6 Control unit

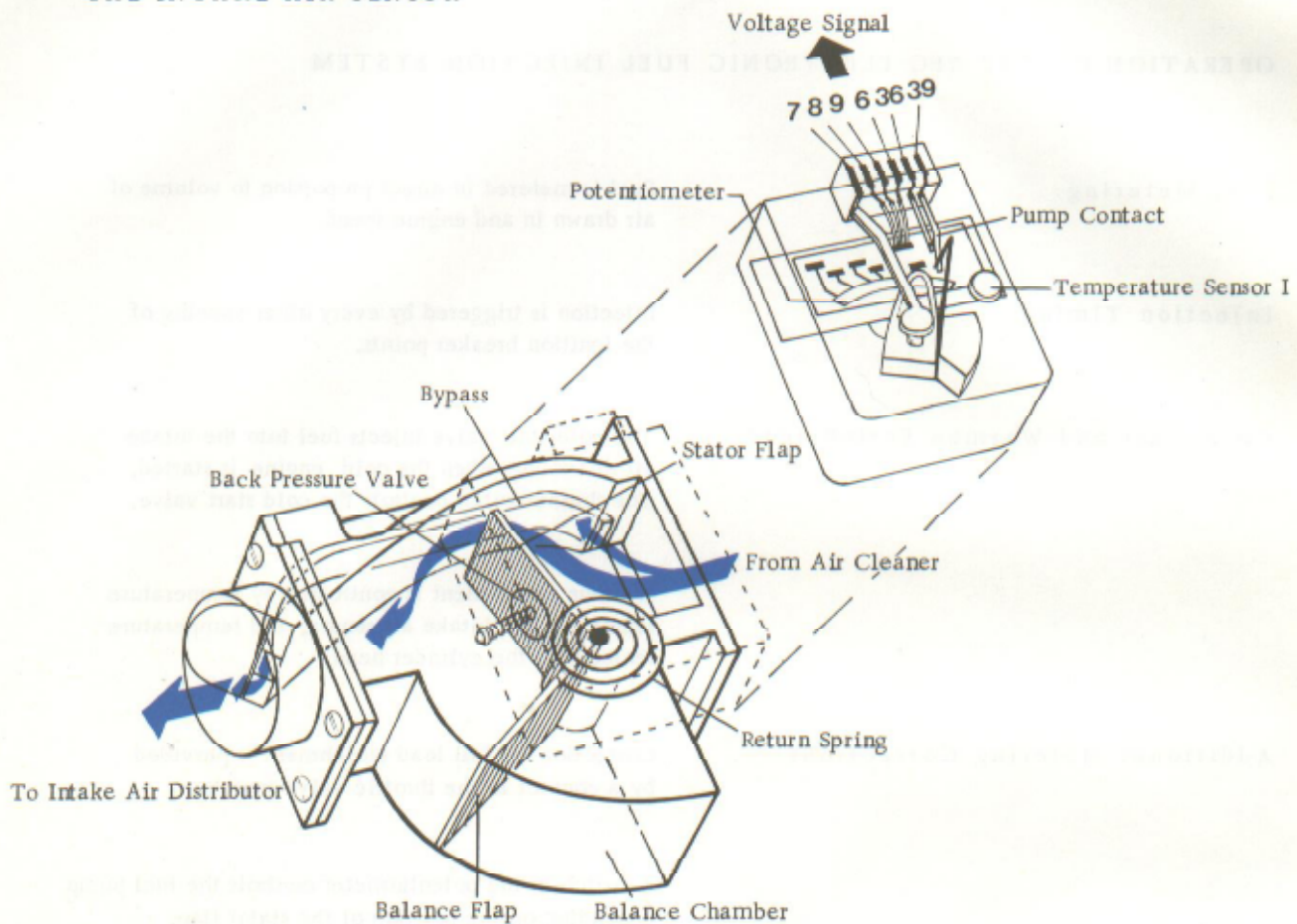


- 1** Fuel filter
- 2** Fuel pump
- 3** Pressure regulator
- 4** Cold start valve
- 5** Injector
- 6** Auxiliary air regulator
- 7** Intake air sensor
- 8** Throttle valve housing
- 9** Intake air distributor
- 10** Temperature sensor I
- 11** Thermo-time Switch
- 12** Potentiometer with fuel pump switch
- 13** Throttle valve switch
- 14** Resistor
- 15** Temperature sensor II
- 16** Control unit
- 17** Ignition contact breaker points

OPERATION OF THE AFC ELECTRONIC FUEL INJECTION SYSTEM

- Fuel Metering:** Fuel is metered in direct proportion to volume of air drawn in and engine speed.
- Injection Timing:** Injection is triggered by every other opening of the ignition breaker points.
- Cold Start and Warmup Enrichment:** The cold start valve injects fuel into the intake air distributor when the cold engine is started. The thermostich controls the cold start valve.
- Warmup enrichment is controlled by temperature sensor I in the intake air sensor, and temperature sensor II in the cylinder head.
- Additional Metering Corrections:** Correction for full load enrichment is provided by a contact in the throttle valve switch.
- A switch in the potentiometer controls the fuel pump depending on the position of the stator flap.

THE INTAKE AIR SENSOR



Operation

The intake air sensor provides the control unit with voltage signals. The signal depends on intake air volume and intake air temperature. It also controls the fuel pump.

The intake air flow moves the stator flap against the force of the return spring. As more air is drawn in, the stronger the air flow and the farther the stator flap is opened.

This rotary motion of the stator flap actuates a special potentiometer and thus varies the strength of the voltage signal which is sent to the control unit.

The balance flap dampens the oscillations of the stator flap.

A contact in the potentiometer operates the fuel pump when the stator flap is opened by the air flow.

Temperature sensor I is connected to the potentiometer and affects voltage signals sent to the control unit when temperature changes occur.

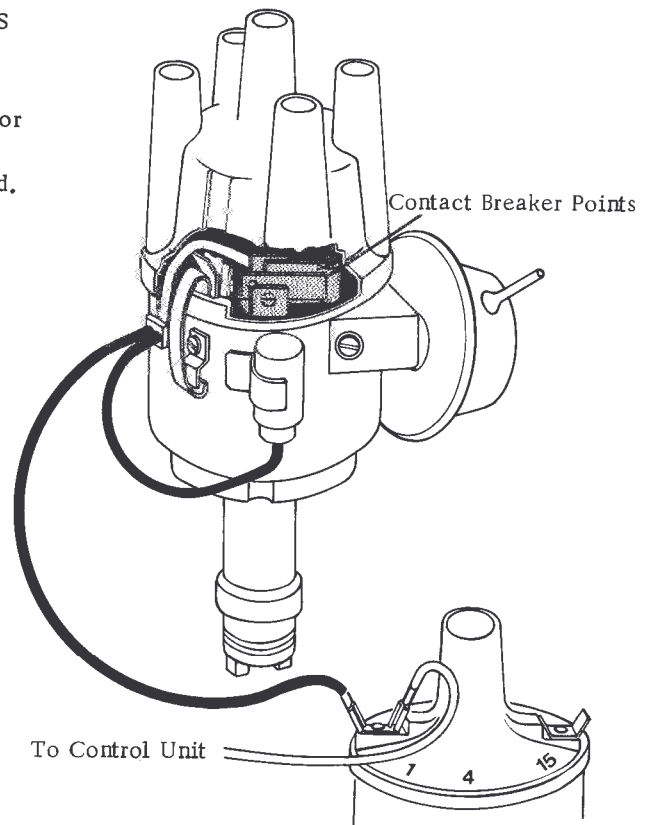
IGNITION CONTACT BREAKER POINTS

The contact breaker points in the ignition distributor provide the control unit with electrical pulses for triggering the injectors and indicating engine speed.

Operation

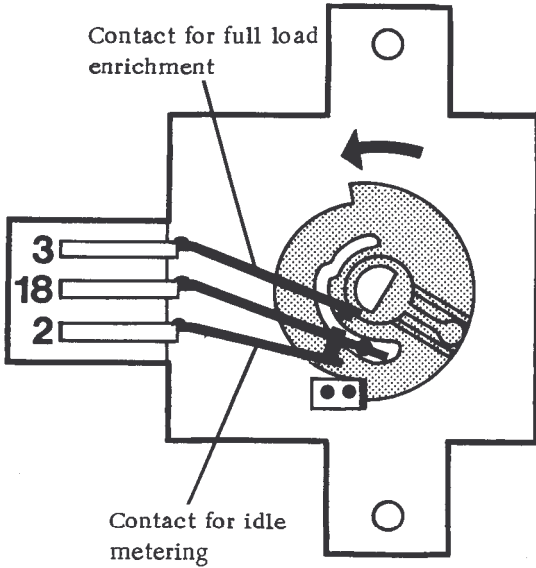
Impulses from the breaker points go to the control unit and are processed. At every second breaker point opening (equal to 1 crankshaft revolution), the control unit triggers all four injectors at the same time. However, only one-half the required fuel is delivered per injection. Consequently two injections occur during each power cycle (consisting of two crankshaft revolutions).

Engine speed information for the control unit is obtained electronically from the breaker point openings.



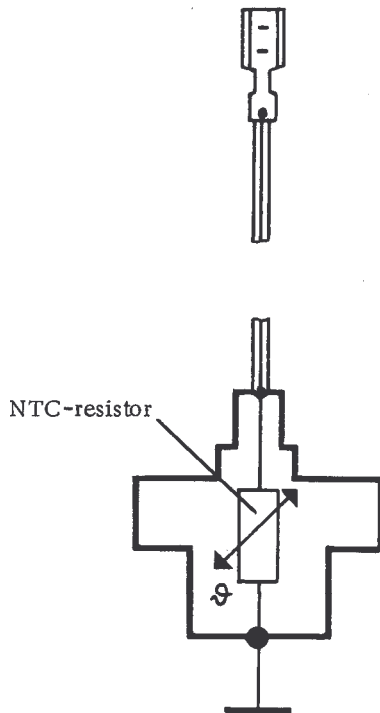
THROTTLE SWITCH

The throttle switch provides the control unit with a signal for full load enrichment.



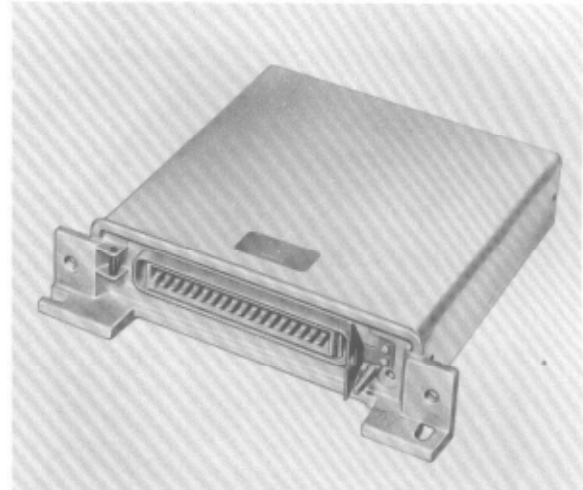
TEMPERATURE SENSOR II

Temperature sensor II, located in the cylinder head, provides the control unit with engine temperature information relating to start and warmup enrichment.



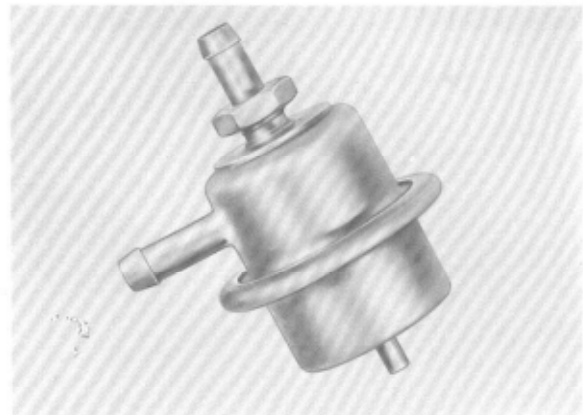
CONTROL UNIT

The control unit is, in fact, a computer. It processes the incoming signals pertaining to air volume, engine speed, temperature, and throttle position. From this information it determines the correct injection time for the injectors.



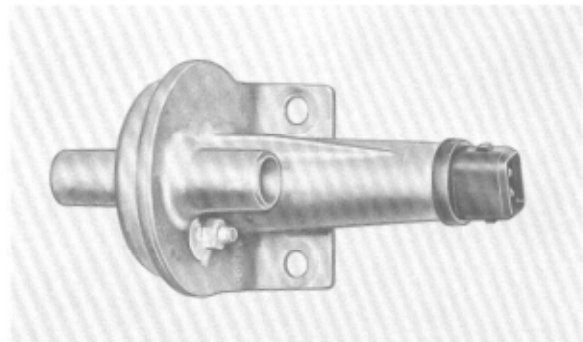
PRESSURE REGULATOR

The pressure regulator controls the fuel pressure in relation to intake air pressure. That is, it ensures that the pressure difference between fuel pressure and intake air pressure remains the same under all load conditions.



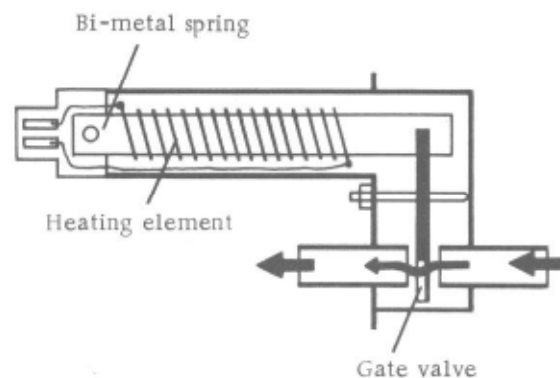
AUXILIARY AIR REGULATOR

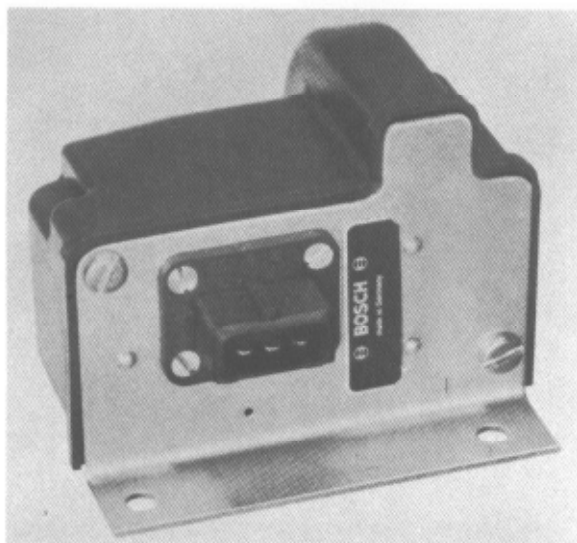
The warmup of a cold engine requires more fuel and more air. The auxiliary air regulator is fully open when the engine is cold. It permits entry of the required additional air.



OPERATION

The straight bi-metal spring is heated electrically. This causes the spring to deflect and closes the gate valve.



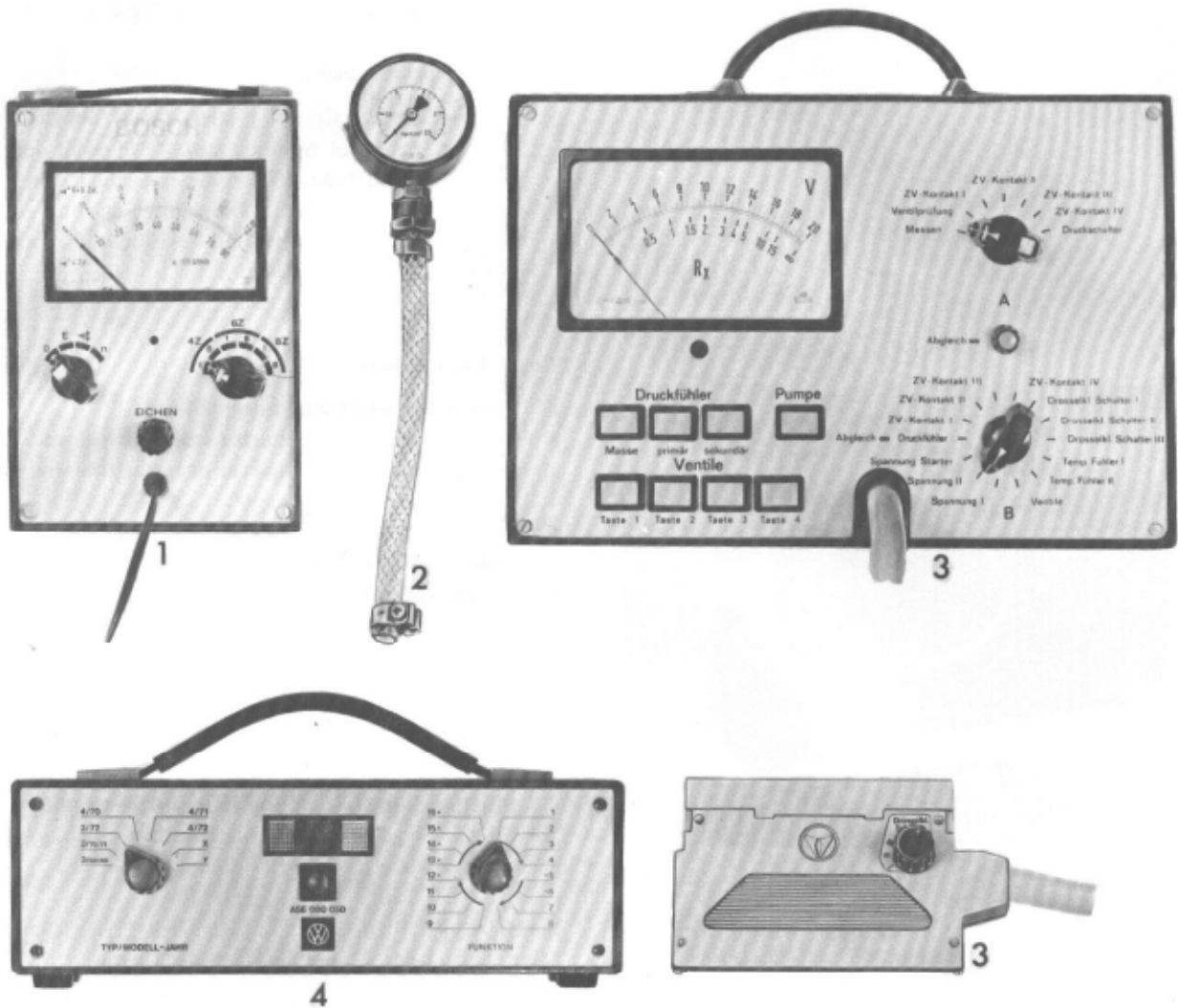


BAROMETRIC COMPENSATOR

The barometric compensator allows for decreasing air density with increasing altitude conditions. It prevents an overly rich mixture under such conditions.

This unit is an accessory and intended for supplemental installation on request. It should be installed in vehicles operating at altitudes in excess of 1,000 m above sea level to conserve fuel.

TEST EQUIPMENT



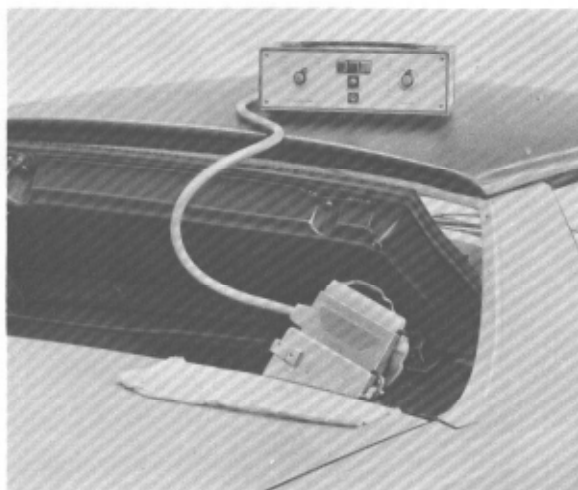
- 1 - Tachometer
- 2 - Pressure gauge
- 3 - EFAW 193 with adapter, or EFAW 238, respectively.
- 4 - VW 1218

The testers play the most important role in checking the fuel injection system. All sensors are checked with the testing equipment according to a specific checklist.

It is important to always check all points.

Before using the tester, adjust it first to the local altitude above sea level.

- 1) Remove plastic cap from back of tester
- 2) You will see a scale and a screw head. Set the red side of the slot (marked with a red paint dot) to the local altitude. The scale is expressed in feet (ft) and meters (m). The figures on the foot scale must be multiplied by 1000 and those on the meter scale by 100.



Test Procedure:

- 1 - Remove control unit from vehicle.
- 2 - Detach multiple connector from control unit.
- 3 - Plug in multiple connector of tester into control unit.
- 4 - Plug in multiple connector of control unit harness into tester.
- 5 - Turn type selector switch into position matching the vehicle under test.
- 6 - Turn function selector to Position 1.
- 7 - Detach wire from Terminal 1 in ignition coil.
- 8 - Switch the ignition on.
- 9 - Observe control lamps:
 - green = good, turn selector
 - yellow = initiate action (i.e., start engine)
 - red = bad, correct malfunction

Note exceptions!

(see trouble chart 1.1 - 2/11)

- 10 - Install control unit upon completion of test and reconnect wire to Terminal 1 in the ignition coil.

CHECKLIST FOR TESTERS EFAW 193 AND EFAW 238

1 - Electrical Test

Switch position in instrument: Switch A turned to TEST (Messen);
Switch B - see check

Test Step	EFAW 193 Tester		EFAW 238 Tester		Item measured:	Meter reads GOOD (rated value)
	Switch B position:	actuate:	Switch B position:	actuate:		
1	Voltage I	Switch ignition on and leave it on for entire duration of test procedure that follows.	Voltage I	Switch ignition on and leave it on for entire duration of test procedure that follows.	Power supply for control unit.	11-12.5 (11-12,5V)
2	Voltage II		Voltage II			
3	Starter voltage	Actuate starter	Starter voltage	Actuate starter	Voltage at Terminal 50 of solenoid switch.	9.5-12 (9,5-12V)
4	Adjustment	Adjust tester by turning selector to ∞			Instrument adjustment	∞
5	Pressure sensor		Pressure sensor	Align tester by turning button to ∞	Instrument adjustment	∞
		Press GROUND button		Press GROUND button	Resistance tween pressure sensor coils and ground (ground connection)	Resistance (∞ ohms)

CHECKING FUEL INJECTION SYSTEM

Meter reads BAD	Cause	Correction
No indication	No voltage at Terminal 85 + 30, Relay I. No ground at Relay I, Terminal 85. Open circuit between Terminal 87 in Relay I and Terminal 16 in control unit.	Check voltage at Terminal 15 in ignition coil. Check ground connection. Check Wire 16.
Under 11 volts	Excessive resistance in Wire 16/control unit, or in relay contacts.	Check wire. Replace Relay I.
Same as Step 1 except for checking wire connecting Terminal 24 and control unit.		
No voltage, starter runs	Open circuit between starter solenoid and control unit.	Check wire 18.
No voltage, starter does not run.	Open circuit.	Defective starter/ignition switch.
Under 9 volts	Weak battery. High voltage drop in wire connecting starter/ignition switch with Terminal 50 in starter solenoid.	Check wire for continuity (voltmeter).
Adjustment to ∞	If full indication cannot be reached with tester, vehicle battery voltage low.	See Steps 1 and 2.
Resistance	Short circuit to ground in connecting wire or pressure sensor.	Unplug connector from pressure sensor. Replace pressure sensor if indication is ∞ . If indication continues to be 0, then Wire 7, 8, 10, 15 is shorting. Replace wire harness.
Under ∞ but not 0	Insulation problem.	Same as 6, resistance 0.

Test Step	EFAW 193 Tester		EFAW 238 Tester		Item measured:	Meter reads GOOD (rated value)
	Switch B position:	actuate:	Switch B position:	actuate:		
6	Pressure sensor	Press PRIMARY button	Pressure sensor adjustment	Press PRIMARY button	Resistance of primary pressure sensor coil.	0.5-1.5 on the ohm scale (approx. 90 ohms)
		Press SECONDARY button		Press SECONDARY button	Resistance of secondary pressure sensor coil.	3 - 4 on the ohm scale (approx. 350 ohms)
8	Zv-Contact I	Briefly turn ignition distributor with starter.	Zv-Contact II	Briefly turn ignition distributor with starter.	Contact resistance in distributor Group I Group II	Alternating between 0 and ∞ (0 ohms/ ∞ ohms)
	Zv-Contact II		Zv-Contact II			
				Zv-contacts III and IV are not used in four cylinder engine.		
10	Throttle valve switch and adapter in throttle Valve Switch I position.	Open throttle slowly.	Throttle Valve Switch I.	Open throttle slowly.	Contacts in 1st contact track in throttle valve switch.	Alternates 10 times between 0 and ∞ (0/ ∞ ohms)
11	Same as 10 except adapter in Throttle Valve Sw I		Throttle Valve Switch I	Same as 10.	Same as 10.	Same as 10.
11a	Adapter switched to Throttle Valve Switch II	Close throttle valve.	Same as 11.	Close throttle valve.	Function of accelerator trailing contact.	When closing throttle, pointer must stop on ∞ (∞ ohms).

CHECKING FUEL INJECTION SYSTEM

Meter reads BAD	Cause	Correction
Resistance considerably less than 90 ohms	Defective insulation.	Remove connector from pressure sensor. If indication still ∞ ohms, replace pressure sensor.
0 resistance	Shorting to ground, or shorting primary coil.	
Resistance considerably greater than 90 ohms.	High contact resistance.	Check connector and connections for corrosion or breakage.
∞ ohms resistance	Broken line.	Connect jumper at connector, as shown in illustration. If indication still 0, replace pressure sensor. If ∞ , repair wire.
Same as 6 except that nominal value approx. 350 ohms.	Same as 6.	Same as 6. If ∞ resistance, connect jump wire across other terminals.
Resistance greater than 0 or less than ∞ ohms.	If the instrument needle does not alternate while "starting", or if it remains in one position (0 or ∞), replace contacts.	Replace contacts in ignition distributor (trigger contacts).
Needle remains on ∞ ; or it does not remain on ∞ when throttle is moved to closed position.	Defective throttle valve switch.	Replace.
0	Short circuit.	Detach connector from throttle valve switch. If indicator needle shows ∞ , replace throttle valve switch; otherwise replace wire harness.

Test Step	EFAW 193 Tester		EFAW 238 Tester		Item measured	Meter reads (rated value)
	Switch B position:	actuate:	Switch B position:	actuate:		
12 *	Same as 10, except adapter in Throttle Valve Switch III position	Throttle in idling position (closed)	Throttle Valve Switch III	Throttle in idling position (closed)	Contact resistance in throttle valve switch.	0 (∞ ohms)
		Throttle valve open more than 1°		Throttle valve open more than 1°		∞ (∞ ohms)
14	Temperature Sensor I		Temperature Sensor I		Temperature sensor resistance.	2 - 5 (approx. 300 ohms) very sensitive to temperature; value decreases with increasing temperature.
15	Temperature Sensor II (in cylinder head).		Temperature Sensor II (in cylinder head).		Temperature sensor resistance.	0.5-2.5 (approx. 2.500 ohms) very sensitive to temperature; value decreases with increasing temperature.
16	Injectors	Press button for Injector 1 Injector 2 Injector 3 Injector 4	Injectors	Press button for Injector 1 Injector 2 Injector 3 Injector 4	Resistance in injector, winding and wiring.	Approx. 2-3 (approx. 2.4 ohms)
<p>* Note: Do not perform steps 12 and 13 in 914/1.7 systems from August 1969 on.</p> <p>Visual check: Ensure that injectors are hooked up (grey caps in front, black caps in rear, as seen in direction of travel). Ensure that all covers are properly installed.</p>						

CHECKING FUEL INJECTION SYSTEM

Meter reads BAD	Cause	Connection
∞ resistance with throttle valve in idle position.	Maladjusted throttle valve switch or open circuit.	Check adjustment - remove connector, connect with jumper wire. If indication still ∞ , replace wire harness. Otherwise, replace throttle valve switch.
Resistance 0 ohms with throttle valve open more than 2°	Maladjusted throttle valve switch or shorted circuit.	Remove connector, If indication still is 0, adjust throttle valve switch, replace if necessary. Otherwise replace wire harness.
Resistance higher or lower than 350 ohms.	Rated value based on 20° C (68° F). Resistance higher when temperature lower. If reading not 0 or ∞ , sensor OK.	
∞ ohms	Open circuit	Connect jumper wire. If reading is 0, replace temperature sensor. Otherwise replace wire harness.
0 ohms	Short circuit.	Remove connector. If reading still same, wire is defective. If ∞ , replace sensor.
	Same as 14, except: Rated value 2.5 kilo-ohm. Instead of jumper wire: hold wire harness connector to ground.	
Resistance 0 ohms.	Short circuit in wiring or at injector.	Remove connector from respective injector. If still ∞ , replace injector. Otherwise replace wire harness.
Resistance ∞ ohms.	Open circuit in wiring or in injector windings.	Connect jumper wire across contacts in injector plug. If still ∞ , defect is in wire harness.
Rated value 2.4 ohms. Resistance is greater but not ∞ .	Injector ground connection is bad at crankcase, or flat connector not properly plugged in.	Provide good ground contact.
Resistance less than 2.4 ohms but not 0.	Short circuit in injector windings.	Replace.

II - Hydraulic Test (Applies to EFAW 193 and EFAW 238)

Checking Injectors

Preparation: Connect pressure gauge, switch ignition on.

Switch position in tester:

Switch A on Injector Testing
Switch B is of no consequence

Test Step	Actuate	Item measured:	Meter reads GOOD	Meter reads BAD
17	Depress PUMP button	Pressure in fuel line	1.96-2.04 bar (atm)	Under 1.96 or over 2.04 bar (atm).
	Remove two-pole connector from pump. Press PUMP button, check voltage in detached connector with a voltmeter.			12 volts 0
				If so --
				If not so --
If wire OK --				
18	Press PUMP button briefly.	Leakage in fuel system (on pressure side).	Fuel pump from August 1969: "Wet version" Pressure may drop to 1.2 bar (atm) then only very slowly.	Immediately upon releasing PUMP button, pressure falls below 1.0 bar (atm) or down to 0.
	Injector discharge test (collect spilled fuel). Press PUMP button.			More than 2 drops appear at a injector per minute.
	Remove pressure gauge, close connection with screw and gasket. Watch for leaks.			Discharge hole becomes wet but not more than 2 drops appear.
19	Depress PUMP button, actuate starter briefly.	Starting valve and thermostat: a- Ambient temperature near engine over $+5^{\circ} -5^{\circ} \text{C}$ ($41^{\circ} \text{F} - 41^{\circ} \text{F}$).	Pressure must not visibly drop.	Pressure drops steadily when starter is actuated.
	Connect thermostat connection to ground.		Pressure must drop.	Pressure does not drop when starter is actuated.
	Depress PUMP button, actuate starter briefly. Thermostat connected.	b- Ambient temperature near engine below $+5^{\circ} -5^{\circ} \text{C}$ ($41^{\circ} \text{F} - 41^{\circ} \text{F}$).	Pressure must drop slowly.	Pressure does not drop.

CHECKING FUEL INJECTION SYSTEM

Cause	Correction
Maladjusted pressure regulator.	Readjust: Replace pressure regulator if adjustment not possible.
Defective pump.	Replace.
Sound test, if pump relay working.	
Open circuit between main relay terminal 87 and pump relay terminal 86, or between pump relay terminal 85 and wire 19 in wire harness.	Check wire connector in engine compartment.
Defective pump relay.	Replace.
Leakage in pressure system between fuel pump and pressure regulator.	Block fuel main line ahead of the right group of injectors with a clip. If no pressure drop is then in evidence leak is in pressure line or pump; if pressure drop is in evidence, leakage is in main line connections to injectors or in pressure regulator. If necessary, repressurize the system several times for the test. Do not block line during pressure buildup. Check visually if connections (including pressure gauge) leak.
Defective Injector.	Replace.
Defective pressure regulator.	Replace.
Defective thermostwitch.	Replace.
Open circuit between line 31 (from starting valve) and terminal 50 in starter.	Check wire for continuity. If line is open, replace wire harness section, otherwise check cold starting valve as in test step 3. Coil resistance 4.2 ohms at 20°C (68°F).
Defective thermostwitch or cold starting valve.	Replace thermostwitch or cold starting valve, check according to "a".

III - Dynamic Test

(Applicable to EFAW 193 and EFAW 228 testers)

Testing with control unit and running engine

Preparation

NOTE:

Strictly follow the test steps. If the EFAW 193 tester and EFAW 243 adapter are used, switch A must in no case be turned to the position for injector TEST during the dynamic test since this would open all injectors.

Switch the ignition off. Connect control unit to the tester connector (wire harness section remains at the tester connector). Turn switch A in tester to position ZV-Contact I. Switch B is of no consequence. Start engine and run at idle speed.

Switch position: See check list for position of switch A.
Switch B is of no consequence.

Test Step	Position of Switch A (*)	Actuate	V-Scale Indication
20	ZV-Contact I	Run engine at idle speed (or somewhat higher).	approx. 18 (mean value)
21	Switch between ZV-Contact I and ZV-Contact II	Switch A	Difference between I and II must not be greater than about 3 points on the voltage scale.

(*) NOTE: Switch positions ZV-Contact III and IV don't apply to 4-cylinder engines.

Checklist for Tester VW 1218

Note:

If a BAD reading shows during the test, the problem must be corrected and the entire test sequence repeated.

Function Switch Position	Item Tested	Action when bulb lights up --	Condition GOOD when light is --	Condition BAD when light is --	Cause
1	"Power Supply"	--	green	No light.	Connector not firm in control unit or power supply relay defective.
	"Battery Voltage"	--		red	Insufficient voltage.
	"Injectors with Connector and Wires"	--		red + green	Open circuit or defective contacts.
2 *1)	"Temperature Sensor I with Connector and Wires"	--	green	continuous red	Open circuit or defective contacts.
	"Temperature Sensor II with Connector and Wires"	--		blinking red + green	
3	"Control Units and Injectors with Wire"	--	green	red	Defect in control unit or shorted injector or shorted injector wire.
4-11 *2)	"Control Unit"	--	green	red	Control unit defective.
12-13 *3)	"Pressure Sensor with Connector and Wire"	--	green	red	Pressure sensor or wire and connector defective.
14	"Wire from Starter Terminal 50 to Control Unit"	--	yellow	prior to start= red+yellow	Open circuit.
	"Distributor Trigger Contacts with Wire and Connector"	yellow: Actuate starter for approx 5 sec *4)	After start: green	After start= yellow	Defective ignition distributor contacts or the wire with connector, or defect in wire between starter terminal 50 and control unit.
15	"In vehicles up to 1969 model: "Pressure Switch"	--	green	yellow	Open circuit or defective contacts.
	"In vehicles from 1970 model: "Throttle Valve Switch Contact Tracks"	yellow: Open throttle fully.	Alternated between yellow and green	no alternation between yellow and green	Open circuit or defective contacts.
16	"In all Type 3 cars and Type 4 incl. 1971 model year: "Idle Contact" *6)	green *5): Open throttle	Alternates between green + yellow	no alternation between yellow + green	Open circuit/short circuit or defective contacts.
	"All Type 3 cars from 1972 model year: "Full Power Contact" *6)	green: Open throttle fully	Alternates green yellow + green	no alternation between green + yellow + green	
	"In all vehicles: "Fuel Pump Relay" and "Fuel Pump"(accoustically).	green *5): Press button in tester	Constant green	yellow lights up	Open circuit in the fuel pump relay control wire or defective relay.

If the test (made with tester) shows no malfunction, check fuel pump pressure next. After that thoroughly check all engine ignition system and valves).

CHECKING FUEL INJECTION SYSTEM

	Correction
-	Properly seat the connector in control unit or check power supply relay including connections. Replace relay if necessary.
	Recharge or replace battery.
-	Localize malfunction in switch position 3 (malfunctioning injector can be felt at connector). Then repeat test step 1 and check connector in the malfunctioning injector for firm seating. Light remains green= Remove connector from malfunctioning injector and short circuit it; light remains red and green= repair open circuit; green lights up= replace injector.
-	Check connector for firm seating. Light remains red= remove connector and short circuit it; remains red= repair open circuit; green lights up= replace temperature sensor.
-	Determine which injector is malfunctioning (can be felt at connector). Detach connector from the malfunctioning injector, actuate button in tester (release); thereupon green= replace injector; thereupon red= replace control unit; thereupon still red= repair open circuit in wire (reinstall original control unit!).
	Replace control unit.
a-	Check pressure sensor, including connections, and correct defects in connectors or wires, or replace pressure sensor.
	Repair open circuit (possibly the connecting wire at the starter fell off).
trig- con- green 1	Yellow + red when starting= Defective ignition distributor trigger contacts or wire and connector; yellow when starting= Shorted line between starter terminal 50 and control unit.
-	Check pressure switch, including connections, and either correct defect in connections or connectors, or replace pressure switch.
-	Check throttle valve switch, including connections, and either adjust throttle valve switch (see 3.1-1/1) or repair defect in connections or connectors, or replace Throttle valve switch.
e-	Check throttle valve switch, including connections, and either adjust the throttle valve switch (see 3.1-1/1) or correct the defect in lines or connectors, or replace throttle valve switch.
re- e-	Check fuel pump relay, including connections, and either correct the defect in lines or connectors, or replace fuel pump relay. If pump still not running, replace it.

Components which may be relevant to the complaint (such as the

Notes to trouble diagnosis chart:

Special tests are possible in function switch positions 2, 5, 6, 12, and 13, in addition to the test procedure outlined in the trouble chart.

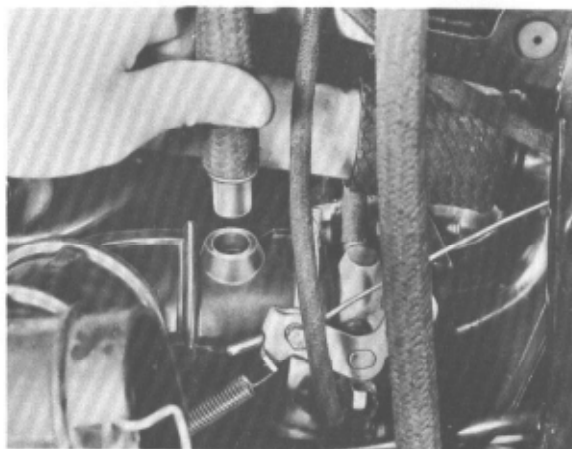
All switch positions relevant to special tests, as well as all switch positions which require certain action at the engine (such as opening the throttle), are identified with an asterisk (*) at the function switch as well as in the trouble chart; an exception is the special test in test step 2 where the test is not indicated at the function switch as a special test because this test can be accomplished only under particular test conditions.

- * 1) - If the problem is a starting difficulty in cold or hot engine, or when the engine tends to die upon starting, and providing that the normal test disclosed no malfunctions the following special test can be accomplished providing that the engine has cooled down to room temperature: Function switch in position 2.
Depress button in tester:
green light = both temperature sensors OK
yellow light = replace temperature sensor I due to (continuous) deviation from designed characteristic
yellow light = replace temperature sensor II due to (blinking) deviation from designed characteristic
- * 2) and * 3) - Only for vehicles with excessively high exhaust emission values:
test steps 5, 6, 12, and 13 have supplemental special tests:
- * 2) - Precision check of control unit:
Function switch in position 5 and 6, depress button in tester:
green light = function tested in control unit OK
red light = replace control unit
- * 3) - Precision check of pressure sensor:
Function switch in position 12 and 13, depress button in tester:
green light in both switch positions = pressure sensor OK
red light in one of the two positions = repeat test with a new pressure sensor
If the new pressure sensor causes the green light to light up in both switch positions of the special test, the pressure sensor installed in the engine is defective and must be replaced.
If the red light lights up in one of the two switch positions with the new pressure sensor installed, it is an indication that the pressure sensor in the engine is OK. The red light goes on, in such case, due to extreme testing conditions, such as a particularly high or low air pressure.
- * 4) - The ignition key must remain in the "on" position following the actuation of the starter since otherwise the test results of test step 14 will be eliminated.
- * 5) - In Type 4 cars with automatic transmission, from 1971 model on, first press back the actuating rod of the engine speed governor until the throttle valve rests against the stop.
- * 6) - Functioning of the exhaust gas recirculation must be checked only in the California version of the Type 3 cars with automatic transmission from 1972 model year, supplementing tests in test step 16:
When the throttle is opened, the exhaust gas recirculation valve (right side of engine compartment) must switch twice (can be heard) under the following conditions:
 1. Engine temperature over +18°C (65°F)
 2. Throttle valve switch test showed its condition to be GOOD.

CHECKING DECELERATION MIXTURE CONTROL SYSTEM

Checking Procedure

- 1 - Detach hose which connects the valve with air cleaner from air cleaner.
- 2 - Start engine and briefly raise engine speed to about 3000 rpm, then quickly shut throttle.
- 3 - Check at the end of hose (air cleaner connecting end) if air is being sucked in. If no suction can be noted, replace valve.



TROUBLESHOOTING CHART - Based on possibly occurring problems
(fuel injection system only)

NOTE:

This chart identifies only problems pertaining to the fuel injection system. However, before looking for the problem in the fuel injection system,

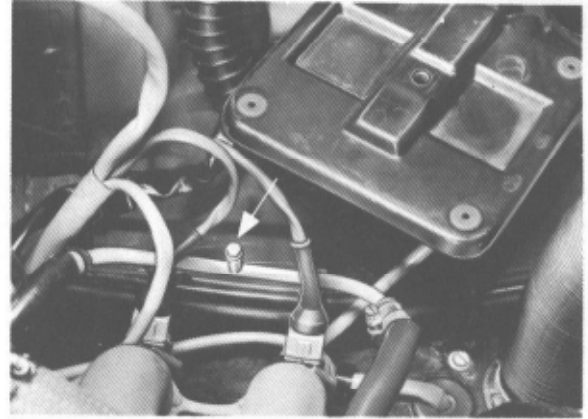
make sure that it is not possibly in another part of the engine, such as in the ignition system

Trouble	Cause	Correction
Engine does not start, fuel pump is not running.	Defective pump connections, pump relay or connections. Check pump connector for good condition.	Check if pump relay is functioning (switch ignition on and off, listen for relay noise). If necessary, use voltmeter.
	Pump relay receives no current at terminal 86 (12V) because main relay is not functioning or wire is defective.	Check with voltmeter. Repair open circuit.
	Pump relay shows 12 volts at terminal 86, but terminal 85 has no ground.	NOTE: Relay is active for only about 1-1 1/2 seconds after the ignition has been switched on. Check with voltmeter; relay is wired from ground through control unit. Do not connect terminal 85 to ground without first disconnecting wire 19 leading to the control unit, otherwise the control unit will be damaged. If no ground available to wire 19 (switch ignition on and off), replace control unit.
Engine does not start, fuel pump is running.	Connection from wire harness (wire 18) to starter terminal 50 is defective.	Check with tester with starter running.
	Operator's problem: Engine does not receive sufficient amount of air for starting. Cold start system defective.	Start with wide open throttle. Check thermostat and cold starting valve, possibly spark plugs as well, if overrich mixture is encountered (wet or carbon fouled spark plugs). See 1.1-2/7, test step 19.
	Open circuit in wire connection of temperature sensor.	Check wires. Replace temperature sensor.
	No pressure buildup in fuel main line (compressed fuel hose or defective pressure regulator).	Check pressure with gauge: 1.96-2.04 bar (1.96-2.04 atm) when starter is running. Replace pressure regulator if necessary.
	Defective diaphragm chamber in pressure sensor.	Replace pressure sensor.
Engine starts when cold but stops again.	Wire connector for trigger contacts in distributor not connected or wire broken.	Connect tester and go through test steps 8, 9, 10, 11, 11a (EFAW-tester) resp. 14 (VW1218). If necessary, replace wire harness or trigger contacts.
	Defective trigger contacts.	Replace.
	Also see "Engine does not start".	
	Defective pressure sensor.	Replace.

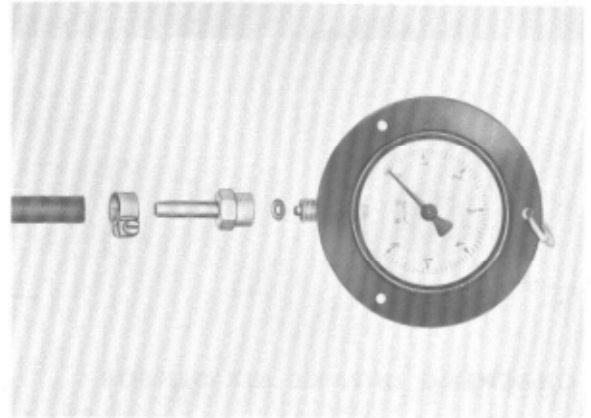
Trouble	Cause	Correction
Engine dies when car is in motion (usually preceded by misfire).	Trigger contacts have excessive resistance or are dirty.	Connect tester. If test steps 8 and 9 (EFAW-tester) or 14 (VW 1218 tester) show malfunctions, replace trigger contacts in distributor.
	Defective connectors.	Check.
Entire system malfunctioning. Pump relay failing occasionally.	Loose connection in power supply line of pump or control unit ground.	Check pump relay and associated wires with voltmeter (follow wiring diagram).
Engine running badly, one cylinder not working, exhaust trails white smoke.	Stuck injector.	Replace.
	Bad connection in injector winding or injector.	
Engine misfires due to causes other than the ignition system.	Loose connections, but also ground connections, in injectors (ground-related problems cause two injectors to malfunction).	Check connections, replace injectors if necessary .
	Corroded or loose ground connections in the electrical system.	Check ground connections for firm seating and attachment; battery ground strap, ground strap connecting transmission with frame, and regulator ground.
	Check if problem can be traced to the ignition system. Otherwise it may be periodic voltage drop (Voltage I and II) in control unit (loose connection also in multiple connector in control unit).	Check continuity in wires 16 and 24 with the aid of voltmeter.
Engine does not produce its full power.	Defective pressure sensor. Regulating flap for crankcase vacuum binding.	Replace. Free up.
Poor power output and poor power transition.	Insufficient injection quantity over the entire range due to fuel remnant deposits on injectors.	Replace injectors (injectors cannot be checked with shop tools).
Excessive fuel consumption.	Defective temperature sensor or high contact resistance.	Check connecting wires. Connect tester and go through steps 1-12 (EFAW-tester) or 1-13 (VW 1218 tester). Replace defective parts after possibly performing supplemental tests.
Considerable rpm surging during idling (between 1000 and 2000 rpm).	Leak between auxiliary air regulator and intake distributor.	Check.
	Leak at throttle valve housing.	Replace gasket between throttle valve housing and intake distributor, possibly reposition.
	Leak in connecting hoses between the intake distributor and intake manifolds.	Poorly seated hoses, possibly requiring replacement.
Uneven idling, very poor transition during acceleration.	Engine out of adjustment.	Check and readjust ignition timing, valve clearance, and idle speed.
	Mixed up injector groups.	Check if connectors are properly attached to ignition distributor and injectors.
	Loose vacuum hose connections.	Firmly connect vacuum hoses, replace if necessary.

CHECKING FUEL PRESSURE

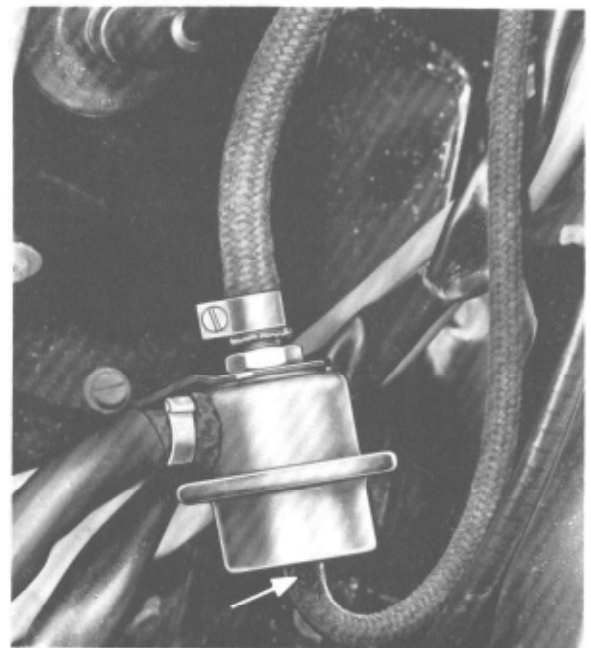
1. Remove intake air sensor and air cleaner assembly.
2. Remove plug from injector supply line.



3. Connect pressure gauge from P 378 set, utilizing an appropriate connector, or a similar pressure gauge to injector supply line.



4. Detach vacuum hose which connects air distributor and pressure regulator.





5. Connect plug to removed intake air sensor.
6. Turn ignition on.
7. Slightly open stator flap by hand until pump contacts close and read fuel pressure shown on pressure gauge.

Nominal value: $2,5 \pm 0,2$ bar ($35 \pm 1,4$ psi)
positive pressure with vacuum hose detached.

If reading is different, replace pressure regulator.

CHECKING INTAKE AIR SENSOR

1. Disconnect plug from intake air sensor.
2. Connect ohmmeter to terminals 6 and 9.
Nominal value: 200 - 400 ohms.
3. Connect ohmmeter to terminals 7 and 8.
Nominal value: 120 - 200 ohms.

If readings do not correspond, replace intake air sensor.

CHECKING THROTTLE SWITCH

1. Disconnect plug from throttle switch.
2. Connect ohmmeter to terminal 18 (middle contact) and 3 (rear contact seen in direction of travel).
3. Slowly open throttle by hand. The indicator must now move from ∞ (infinity) to 0 ohms. Replace unit if necessary.

CHECKING AUXILIARY AIR REGULATOR

1. Remove auxiliary air regulator.
2. Connect ohmmeter to both terminals in auxiliary air regulator and read indication. Nominal value: approx. 30 ohms
Replace unit if necessary.
3. Blow through with air. Passage must be open when engine is cold.
4. Connect battery voltage to both terminals of removed auxiliary air regulator. As temperature increases, opening in auxiliary air regulator must become smaller.
Replace unit if necessary.

CHECKING THERMOSWITCH

1. Disconnect plug from cold start valve.
2. Connect test buzzer or ohmmeter between both.
3. Both contacts must make connection when engine temperature is below approx. $+15^{\circ}\text{C}$ (59°F).
4. When engine temperature is above approx. 15°C (59°F), buzzer or ohmmeter must indicate an interruption in circuit.
Replace unit if necessary.

CHECKING COLD START VALVE

1. Connect pressure gauge to injector supply line.
2. Operate starter briefly to build up fuel pressure.
3. Disconnect plug from cold start valve.
4. Connect wires from terminal 15 of ignition coil and ground to cold start valve.
5. Observe pressure gauge; pressure must slowly decrease.
Replace unit if necessary.

CHECKING COLD START VALVE FOR LEAKS

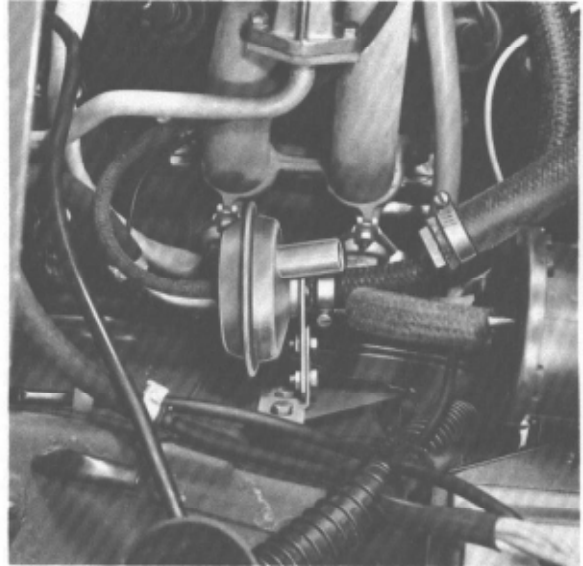
1. Disconnect plug from cold start valve.
2. Remove cold start valve from intake air distributor but leave it connected to injector fuel supply line.
3. Disconnect wire from terminal 1 at ignition coil.
4. Operate starter and observe cold start valve for leaks.
Replace unit if necessary.

CHECKING TEMPERATURE SENSOR II

1. Disconnect plug.
 2. Connect ohmmeter between temperature sensor and ground, read indication.
- Nominal value: 0,5 - 2,5 kilohms (very temperature sensitive, value decreases with increasing temperature).
- Guide value: approx. 2,5 kilohms when engine temperature is approx. 20° C (68° F).
- Replace unit if necessary.

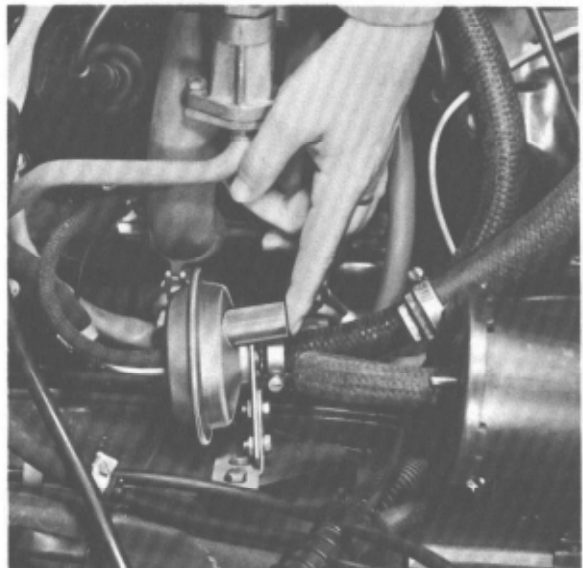
CHECKING DECELERATION VALVE (1.8 liter AFC FUEL INJECTION)

1. Disconnect intake air sensor hose at deceleration valve. Plug hose.



2. Start engine. Increase speed to 3000 rpm. Quickly close throttle.

3. Check if air is drawn in at valve hose connection. Replace valve if suction cannot be felt.



CHECKING CATALYTIC CONVERTER

The engine must be warm (oil temperature about $80^{\circ}\text{C}/176^{\circ}\text{F}$) to check the catalytic converter. Check immediately after reaching this temperature.

914/1,8 liter

1. Warm engine up to operating temperature (about $80^{\circ}\text{C}/176^{\circ}\text{F}$).
2. Connect CO tester according to manufacturer's instructions.

Caution

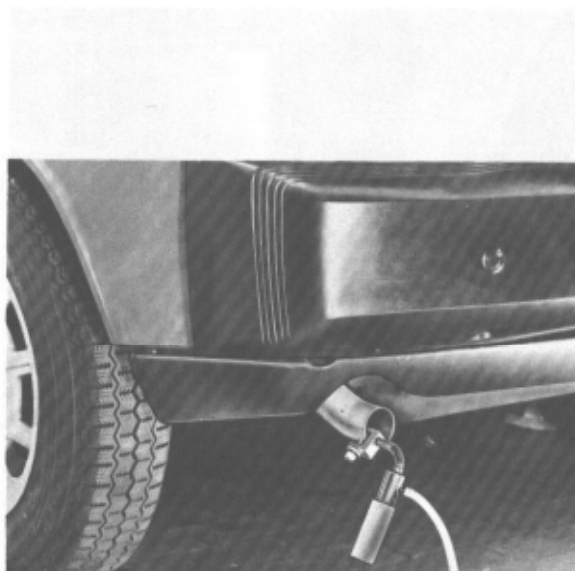
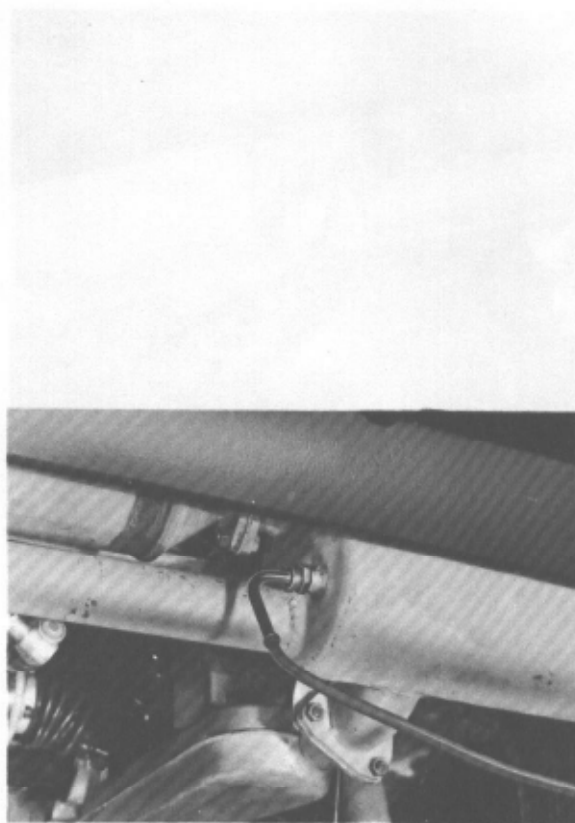
Connect the exhaust probe to test connection in front of catalytic converter. Exhaust gas probe VW 1311 or equivalent is recommended.

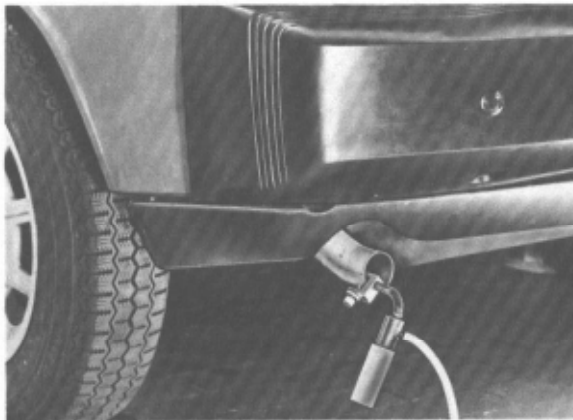
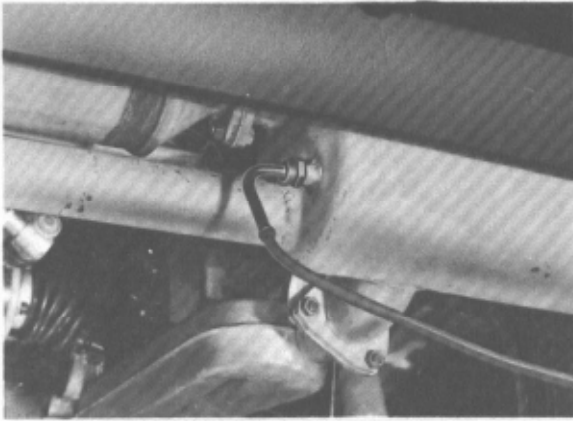
3. Let engine run at idle.
4. Take CO reading. If CO is not between 0,2 and 0,8 ‰, adjust idle speed first.
5. Connect exhaust probe to tailpipe of muffler and take CO reading.

Specifications: In front of catalytic converter (at test connection)
 CO = 0,2 - 0,8 ‰
 After catalytic converter (at tailpipe of muffler)
 CO = 0 - 0,4 ‰

Caution!

Specification after catalytic converter always has to be lower than in front of catalytic converter. If this condition is not present, the catalytic converter must be replaced.





914/2.0 liter

1. Warm engine up to operating temperature (about $80^{\circ}\text{C}/176^{\circ}\text{F}$).
2. Connect CO tester according to manufacturer's instructions.

Caution

Connect the exhaust probe to test connection in front of catalytic converter. Exhaust gas probe VW 1311 or equivalent is recommended.

3. Disconnect air injection hose at air pump. Plug hose.

4. Let engine run at idle.

5. Take CO reading. If CO is not between 1 and 3 %, adjust idle speed first.

6. Reconnect air injection hose at pump.

7. Connect exhaust probe at tailpipe of muffler and take CO reading.

Specifications: In front of catalytic converter (at test connection)

CO = 1 - 3 %

After catalytic converter (at tailpipe of muffler)

CO = 0 - 0,4 %

Caution!

Specification after catalytic converter always has to be lower than in front of catalytic converter. If this condition is not present, the catalytic converter must be replaced.

CHECKING EXHAUST GAS RECIRCULATION

1. Warm up engine and let it idle. The bypass line between the muffler and EGR valve will become hot. This is necessary to test EGR valve.

2. Increase engine speed to 4200 rpm. The exhaust gas line between the EGR valve and intake system must now be hot, too.

The exhaust gas line to the intake system might not become hot for the following reasons.

- a) EGR valve defective.
- b) EGR lines plugged.
- c) Vacuum bore in throttle valve housing plugged.
- d) Vacuum hose plugged or leaks.



CHECKING AIR INJECTION SYSTEM

1. Clean air pump filter with compressed air.

2. Check tension of air pump belt.
Max. depression: 10 mm.

3. Disconnect air injection hose at air pump.
Plug hose.



4. Connect CO tester according to manufacturer's instructions.

Caution

Connect the exhaust probe to test connection in front of catalytic converter. Exhaust gas probe VW 1311 or equivalent is recommended.



5. Adjust CO to 1 - 3 % at an idle speed of 850 - 950 rpm.

6. Reconnect hose to air pump.

7. CO must drop below 1 % at an idle speed of 850 - 950 rpm. There is a defect in the air injection system if the CO is higher than 1 %. (Assuming engine is in perfect working condition.)

Install a new air pump, if applicable.

CHECKING AND ADJUSTING CO CONCENTRATION IN EXHAUST GAS WITH THE AID OF AN EXHAUST EMISSION TESTER

Note:

Proper exhaust gas composition can be achieved only when the engine is in good condition, the valve clearance and ignition timing are properly adjusted, and there are no leaks in any of the muffler connections.

A - Preparing Tester

- 1 - Hook up CO tester according to its operating instructions. Make particular sure that the overflow tube of the condensate separator is filled to the edge with water when the pump is switched off (see arrow).

Observe the 15-minute warmup period of the tester. The POWER supply button (line voltage) should therefore be left in the on position throughout the day.

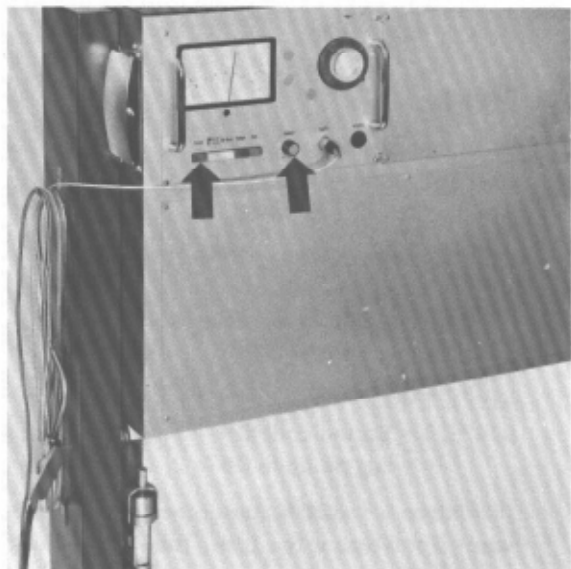
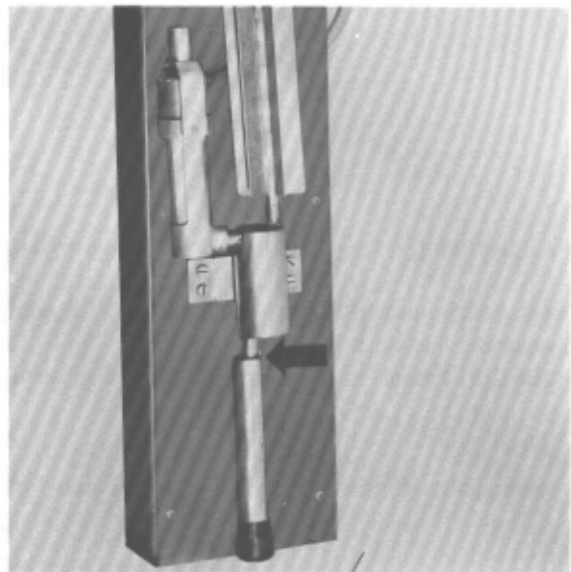
- 2 - When the tester is warmed up, depress TEST button. After about 30 seconds, turn the CALIBRATION selector to bring the scale indicator to the red-marked value of 4,5% CO (scale range is 10% CO).
Depress TEST button.

- 3 - Bring car with warmed-up engine to the work area.

- 4 - Insert oil temperature sensor in place of the oil dipstick.

- 5 - Connect tachometer to engine.

- 6 - Insert tester pickup tube at least 300 mm into the exhaust tail pipe.



B - Measuring and Adjusting

1 - Start engine

2 - Depress OIL TEMPERATURE button in CO tester to check if the oil temperature required for the test has been reached.

50°C - 70°C (122°F - 158°F)

3 - Depress PUMP button in CO tester.

4 - Check idle speed and readjust if necessary (see 3.1 - 1/1).

Nominal values: 914/1.7 = 850 ± 50 rpm
914/2.0 = 900 ± 50 rpm

5 - Check CO reading.

Note: Values prescribed by law must not be exceeded.

Note: If the values exceed the specified tolerances, adjust the CO content with the aid of the potentiometer, otherwise correct the deficiency by following the troubleshooting chart.

Adjusting CO with the Potentiometer

The control unit (Part No. 022 906 021 E) is equipped with a potentiometer for adjusting the CO content when the engine is idling.

The CO content must always be adjusted subsequent to the installation of a new control unit.

Note:

Prerequisite for this adjustment is proper valve clearance and ignition timing adjustment.

Adjustment

1 - Connect CO tester according to the manufacturer's instructions.

2 - Start engine.

Idling speed should be:

914/1.7 = 850 ± 50 rpm

914/2.0 = 900 ± 50 rpm

Oil temperature = 50 - 70°C (122-158°F)

3 - Turn potentiometer adjusting knob to adjust CO value.

914/1.7 = 2.0 - 1.0% CO *)

914/2.0 = Engine code GA = 1.5% CO max.

Engine code GB = 2.1% CO max.

If mixture is too rich, turn screw counter-clockwise; if mixture is too lean, turn screw clockwise.

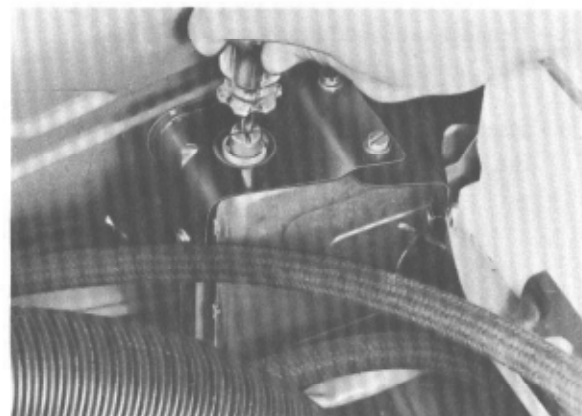
*) Aim for lower value, if possible

CO Emission Values - beginning with 1974 models

914/2.0

Engine code GA = 3% max.

Engine code GB = 3% max.



- 4 - Check idle rpm, readjust if necessary.
- 5 - Be sure to reinstall rubber cap on the adjusting knob in potentiometer to prevent entry of moisture into the control unit.

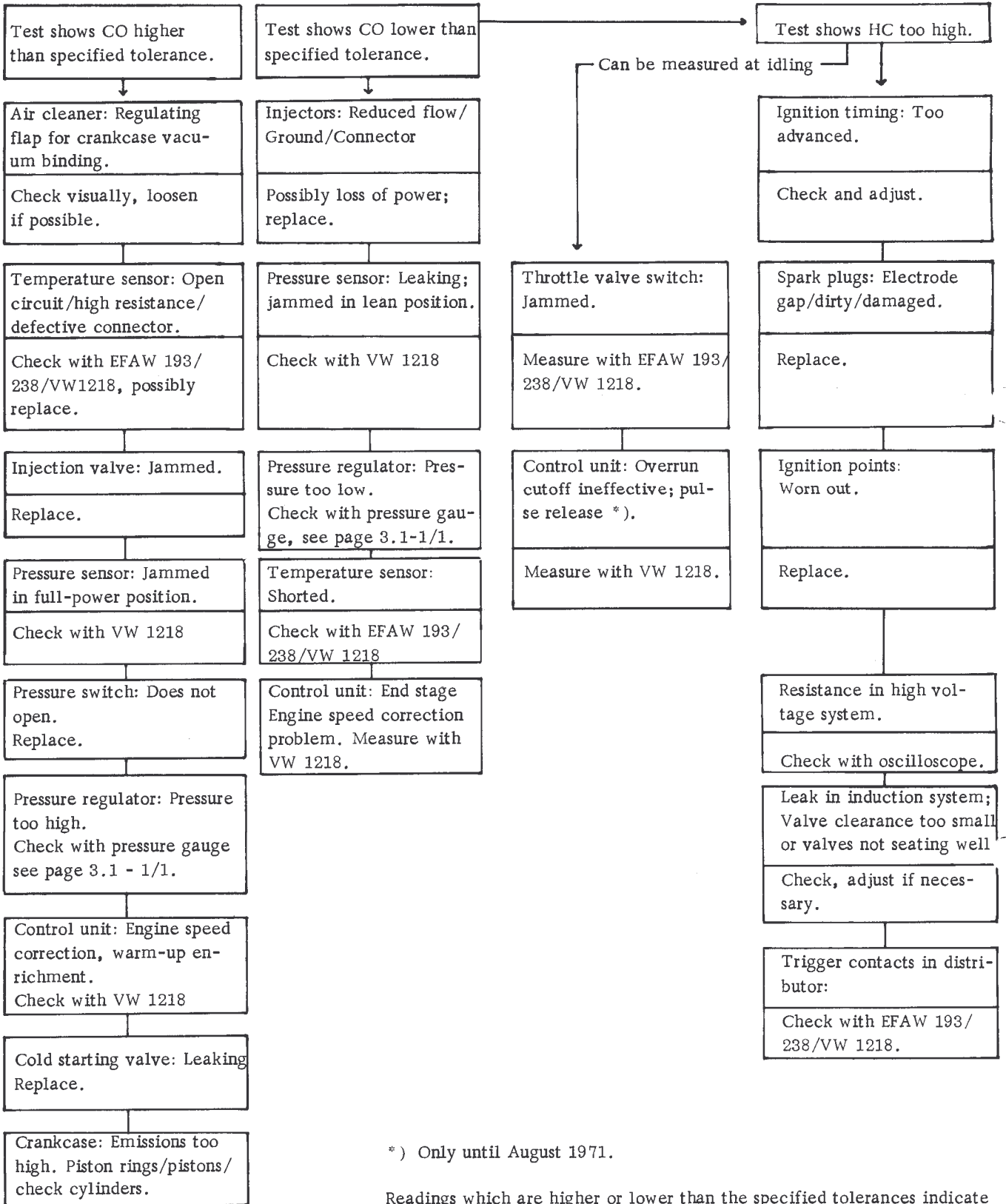
Note:

If the CO potentiometer does not react, check the throttle valve switch adjustment, readjusting if necessary.

If backfiring is noted on the overrun or if the idle speed surges, reset the potentiometer in clockwise direction until an acceptable idle performance is achieved.

Limits prescribed by law must not be exceeded.

TROUBLESHOOTING CHART

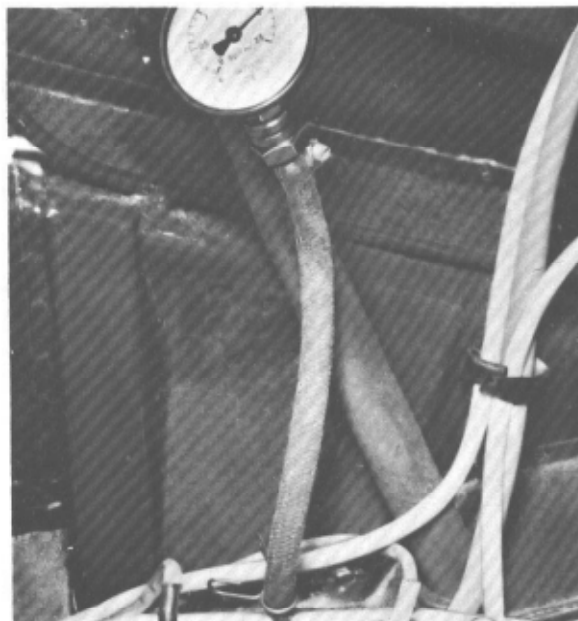


*) Only until August 1971.

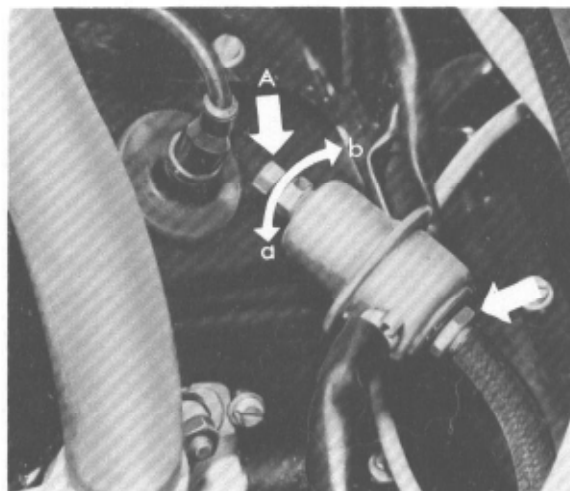
Readings which are higher or lower than the specified tolerances indicate a malfunction in the fuel system, ignition system, or engine. The chart shows such problem areas. Hydrocarbon (HC) emissions cannot be determined with normal shop equipment, however, such occurrences are included in the chart for information purposes.

Checking and Adjusting Pressure Regulator

- 1 - Connect pressure gauge.
- 2 - Switch the ignition on.
- 3 - Disconnect wire between ignition distributor and coil (disconnect at terminal 1).

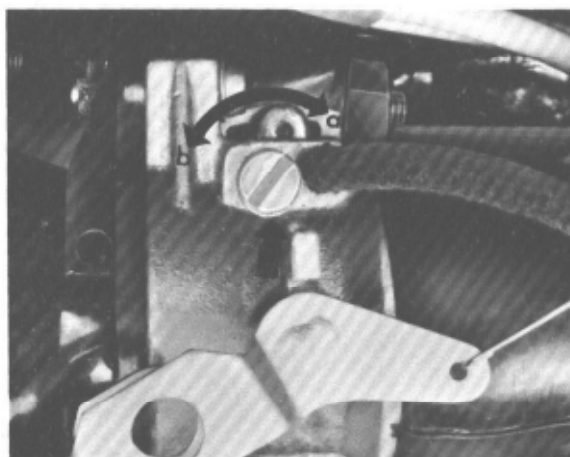


- 4 - Operate starter and observe pressure on pressure gauge.
Rated value = 1.96-2.04 bar (atm)
- 5 - Adjust pressure regulator only if the reading is above or below the rated value:
 - a - increase pressure
 - b - decrease pressure



Adjusting Idle Speed

- 1 - Remove air cleaner.
- 2 - Connect tachometer.
- 3 - Start engine and adjust speed to:
 - $914/1.7 = 850 \pm 50$ rpm
 - $914/2.0 = 900 \pm 50$ rpm
 - a - faster
 - b - slower



Adjusting Throttle Valve Switch with EFAW-Testers (914/1.7 until August 1971)

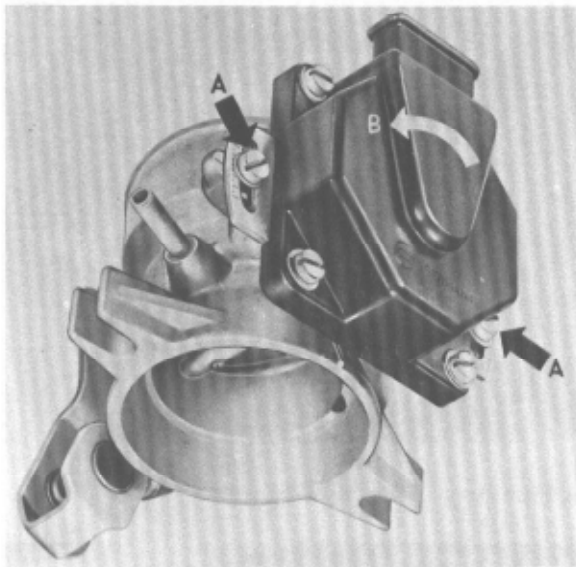
Throttle valve housing removed:

The throttle valve switch in Type 914/1.7 cars must be adjusted only if it was taken off or when it is found that not all of the 2 x 10 contacts of the acceleration enrichment system are in operation. For this reason it is necessary to proceed as follows:

- 1 - Preliminary check: Connect EFAW tester and adapter, or EFAW 238 (do not connect control unit).
- 2 - Switch the ignition on.

- 3 - Switch tester or adapter to THROTTLE VALVE SWITCH I.
- 4 - Slowly open throttle valve. The indicator needle of the tester must move 10 times from 0 ohms to ∞ ohms.
- 5 - Repeat the test, switch tester or adapter to THROTTLE VALVE SWITCH II.

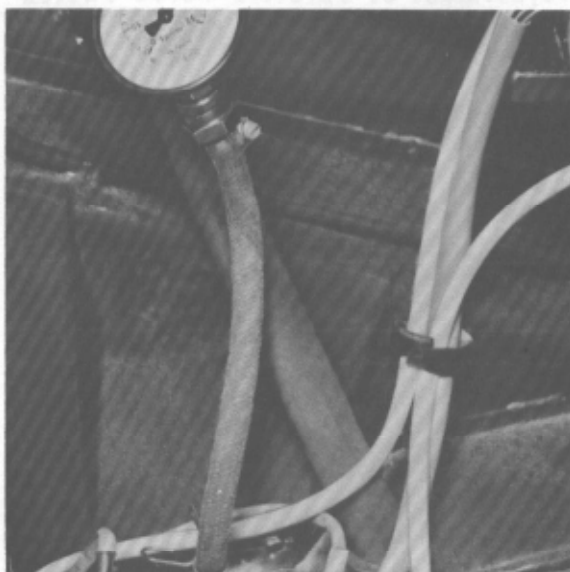
If the needle moves less than 10 times when testing under point 4 or 5, above, the throttle valve switch will have to be readjusted. This work requires the removal of the throttle valve housing.



- 1 - Loosen throttle valve switch retaining screws ("A" arrows).
- 2 - Close the throttle.
- 3 - Carefully turn the throttle valve switch to stop in direction of the arrow (B) and tighten retaining screws.
- 4 - Install throttle valve housing.

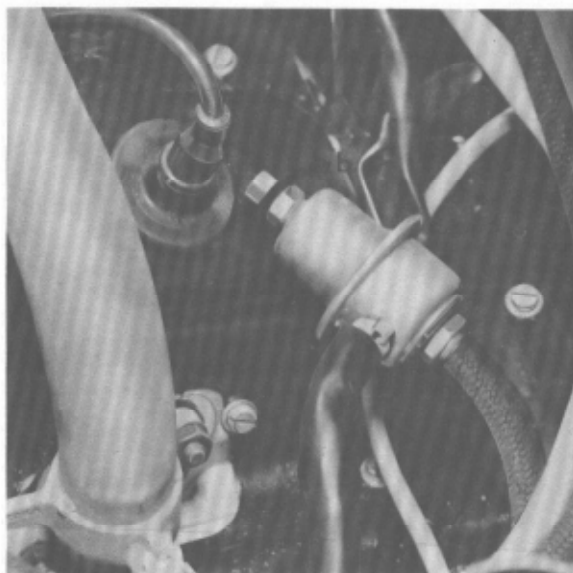
Checking and Adjustment of Pressure Regulator

- 1 - Connect pressure gauge
- 2 - Switch on ignition
- 3 - Pull off connecting cable between ignition distributor and ignition coil (pull off terminal 1)



- 4 - Operate starter and read pressure on pressure gauge, rated value: 2.0 kg/cm² (28.4 psi).
- 5 - Adjust pressure regulator only when rated value is exceeded or not attained;

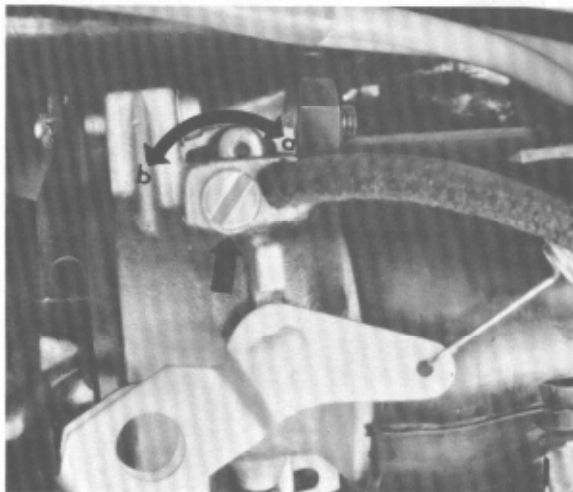
A Adjusting screw
 a) more
 b) less pressure



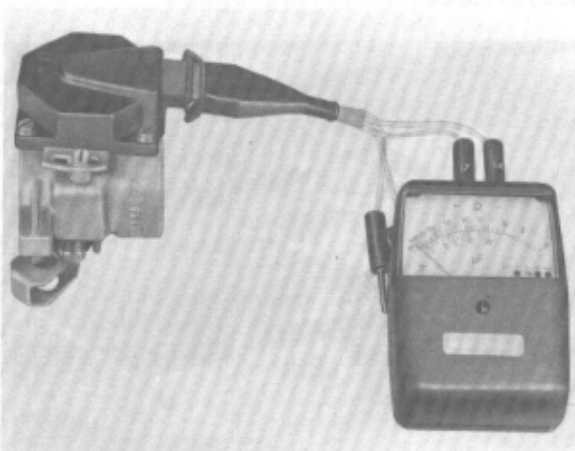
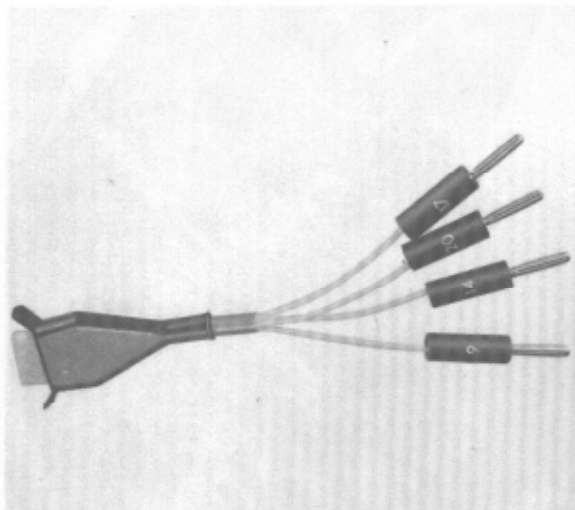
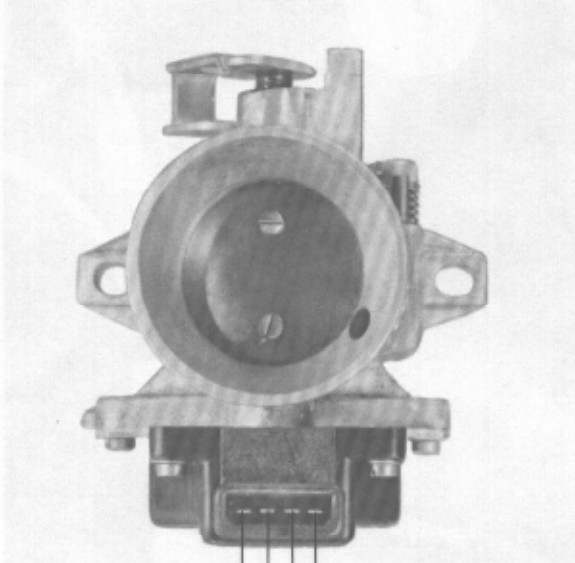
Adjustment of Idling Speed

- 1 - Remove air filter
- 2 - Connect revolution counter
- 3 - Start engine and set speed to 900 ± 5 rpm

a - faster
 b - slower



Adjustment of Throttle Valve Switch



The switch contact on the throttle valve switch should open when the throttle valve is turned by 2° out of its rest (closed) position.

- 1 - Connect tester or:
- 1 a - Connect ohmmeter to connections 14 and 17.
An adaptor is available for easier connection.

Adaptor

consisting of:

Plug connection 4-pole (cut off from a cable line for injection engine)

- 4 Banana plugs (conventional)

- 2 - Close throttle valve

- 3 - Turn throttle valve switch in direction of arrow A until ohmmeter indicates 0.

- 4 - Then turn by another 1 division mark = 2° .

- 5 - Tighten fastening screws.

Adjusting throttle valve switch with VW 1218 tester
(914/1.7 and 914/2.0)

- 1 - Connect the tester (see 1.1-1/2).
- 2 - Close throttle and keep in closed position.
- 3 - Loosen throttle valve switch and turn clockwise (counter-clockwise in 914/2.0) until yellow lamp lights up.
- 4 - Carefully turn throttle valve switch counter-clockwise (clockwise in 914/2.0) to the stop and tighten. The green lamp must be on.
- 5 - Throttle valve slightly open: Yellow light on.
Throttle valve closed: Green light on.

Adjusting throttle valve switch with EFAW testers
(914/1.7 and 914/2.0)

- 1 - Connect EFAW 193 tester with adapter, EFAW 238 switch "A" to "Testing" position. Turn switch "B" in EFAW 238 tester, or switch in adapter to "Throttle Valve Switch III" position.
- 2 - Switch the ignition on.
- 3 - Close throttle valve and keep in closed position.
- 4 - Loosen throttle valve switch and turn clockwise (counter-clockwise in 914/2.0) until the pointer in the tester shows "∞".
- 5 - Carefully turn throttle valve switch counter-clockwise (clockwise in 914/2.0) to the stop and tighten. The pointer in the tester must show "0".
- 6 - Recheck adjustment by actuating the throttle valve.

ADJUSTING IDLE - 2,0 LITER WITH AIR INJECTION - 1975 MODELS

1. Warm up engine to operating temperature (about 50 - 70°C, 122 - 158° F)

2. Connect CO tester according to manufacturer's instructions.

Caution

Connect the exhaust probe to test connection in front of catalytic converter. Exhaust gas probe VW 1311 or equivalent is recommended.

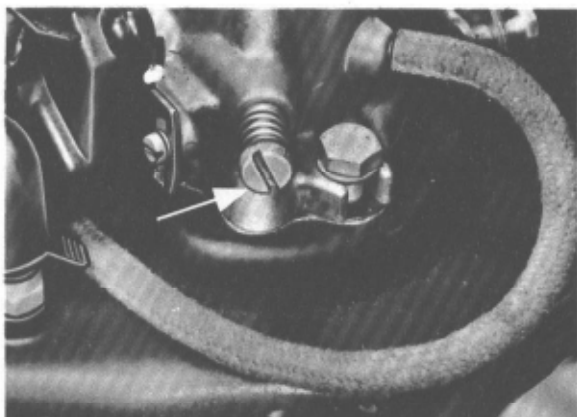


3. Disconnect air injection hose at air pump. Plug hose.

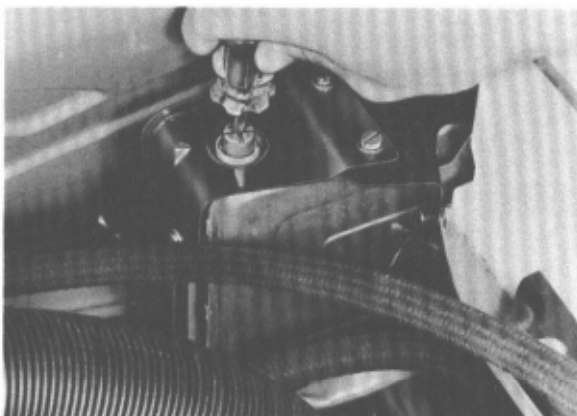


4. Disconnect hose from activated charcoal container at air filter.





5. Let engine run at idle and adjust idle speed to 850 - 950 rpm with idle air bypass screw on throttle valve housing.



6. Adjust CO to 1 - 3 % at adjusting knob of potentiometer.
Turn adjusting knob to left if mixture is too rich, or to right if mixture is too lean.

7. Recheck idle speed, correcting if necessary.
8. Reinstall rubber cap for potentiometer to prevent entry of moisture into control unit.
9. Reconnect air injection hose to pump.
10. Connect activated charcoal container hose to air filter.

ADJUSTING POTENTIOMETER IN CONTROL UNIT (CO EMISSIONS AT IDLE SPEED)

General

Beginning with the 1972 model, control units are supplied with a potentiometer for adjusting CO emissions.

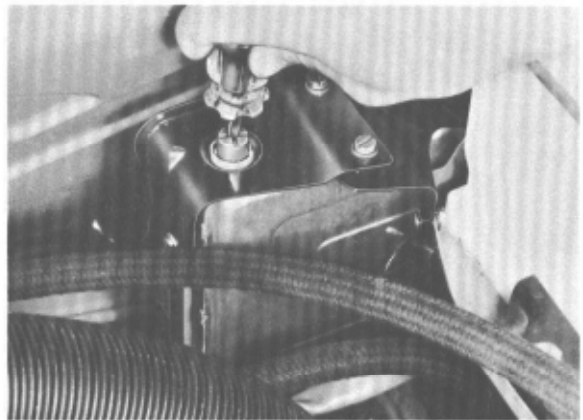
This control unit can be installed subsequently in all vehicles, although it is necessary to install the 311 905 161C thermostitch in vehicles up to chassis Nr. 4712900001. The potentiometer must always be readjusted following replacement of the control unit.

NOTE:

It is necessary to have proper valve clearance and exact ignition timing prior to adjusting the potentiometer.

ADJUSTMENT

1. Connect CO tester according to the manufacturer's instructions.
2. Start engine and adjust idle speed to 850-900 rpm (throttle valve must be closed). Oil temperature should be 50-70°C (122-158°F).
3. Turn adjusting knob in potentiometer until a maximum of 0,7% CO is attained. Turn adjusting screw counter-clockwise if mixture is too rich, and clockwise if it is too lean.



NOTE:

If backfiring on overrun or idle speed surging is noted, turn potentiometer clockwise until acceptable idling is achieved.

4. Check and adjust idle speed (850-900 rpm).

5. Be sure to reinstall rubber cap in potentiometer to prevent entry of moisture into the control unit.

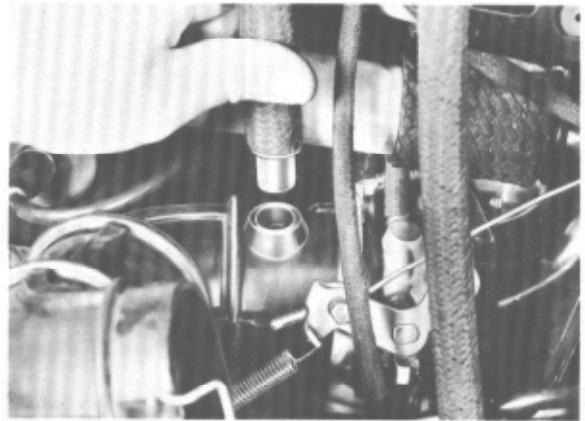
NOTE:

If the CO potentiometer does not react, check throttle valve adjustment and readjust, if necessary.

CHECKING PNEUMATIC DECELERATION VALVE**NOTE**

Check Pneumatic Deceleration Valve only when the valve is cold.

1. Disconnect hose between valve and air cleaner at the air cleaner end.
2. Start engine, raise engine speed briefly to approx. 3000 rpm, quickly shut the throttle.
3. Check at the end of hose (air filter connection) if air is being drawn in. If there is no suction, replace valve.



ADJUSTING IDLE - AFC FUEL INJECTION

1. Run engine to operating temperature (about 50 - 70°C, 122 - 158°F)

2. Connect CO tester according to manufacturer's instructions.

Caution

For 1975 models with catalytic converters, connect exhaust probe to test connection in front of catalytic converter. Exhaust gas probe VW 1311 or equivalent is recommended.



3. Disconnect hose from activated charcoal container at air filter.



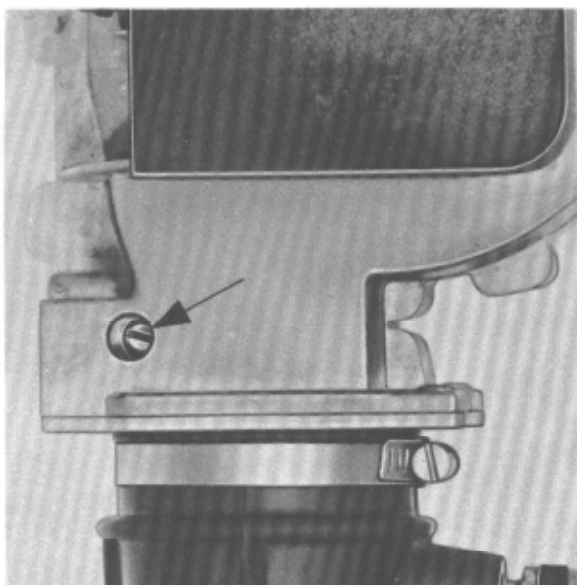
4. Turn idle air bypass screw on throttle valve housing until idle speed meets specifications of 800 - 900 rpm.

CO Specifications:

1974 Models = 2 to 3 %

1975 Models = 0.2 to 1.2 %





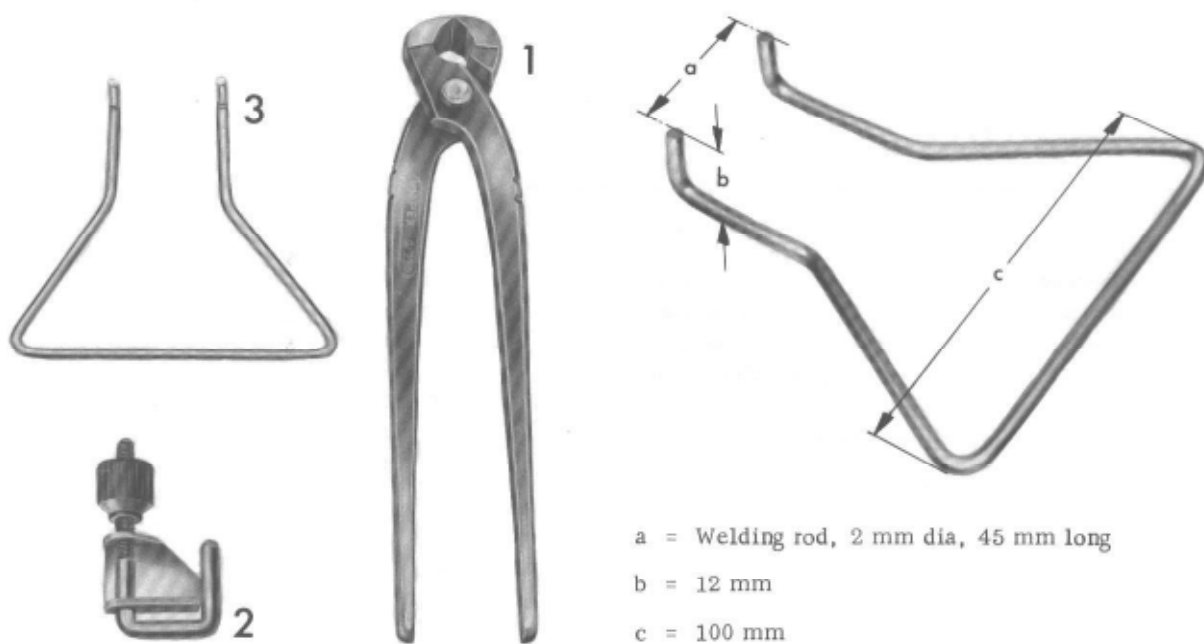
Caution

The exhaust gas CO is adjusted with the idle air bypass screw at the factory and sealed. It may only be altered if specifications cannot be met in spite of the engine being in perfect working condition.

The air intake system must be absolutely tight. No other air should be drawn in.

Use separate tachometer from testing equipment or similar.

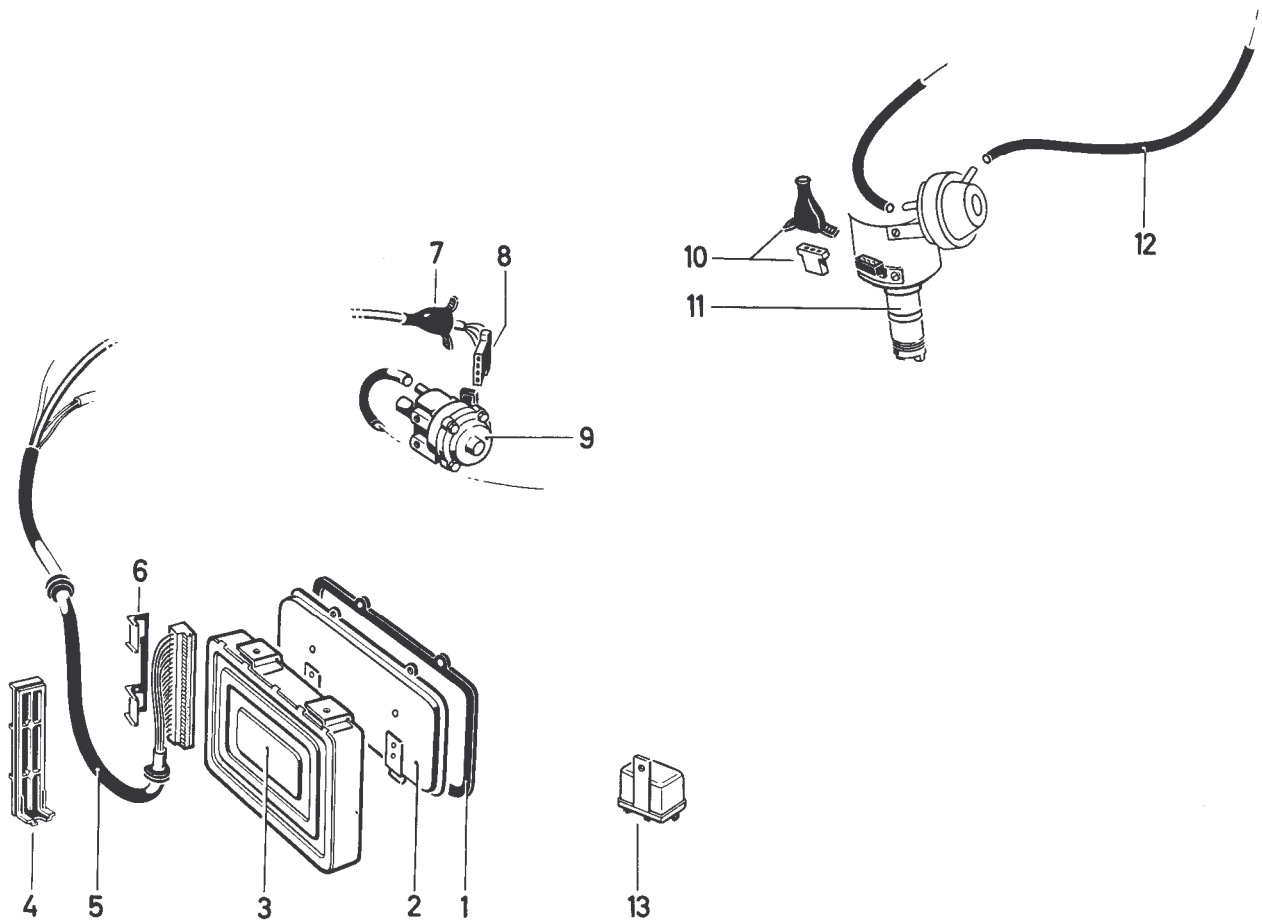
TOOLS



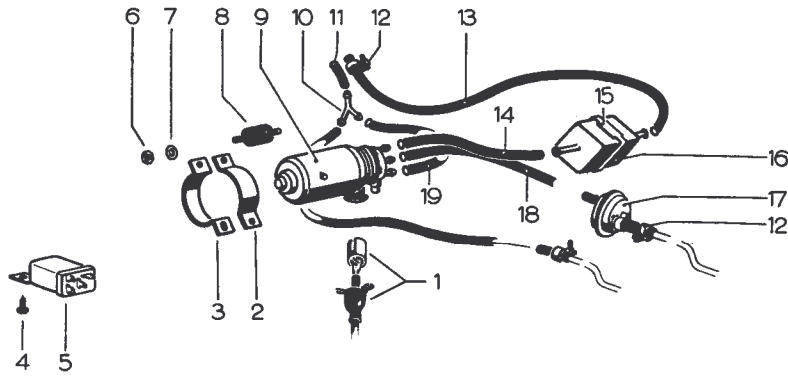
No.	Description	Special Tool	Remarks
1	JURID clamping pliers		
2	Hose clamp		
3	Hook		Locally manufactured

Note:

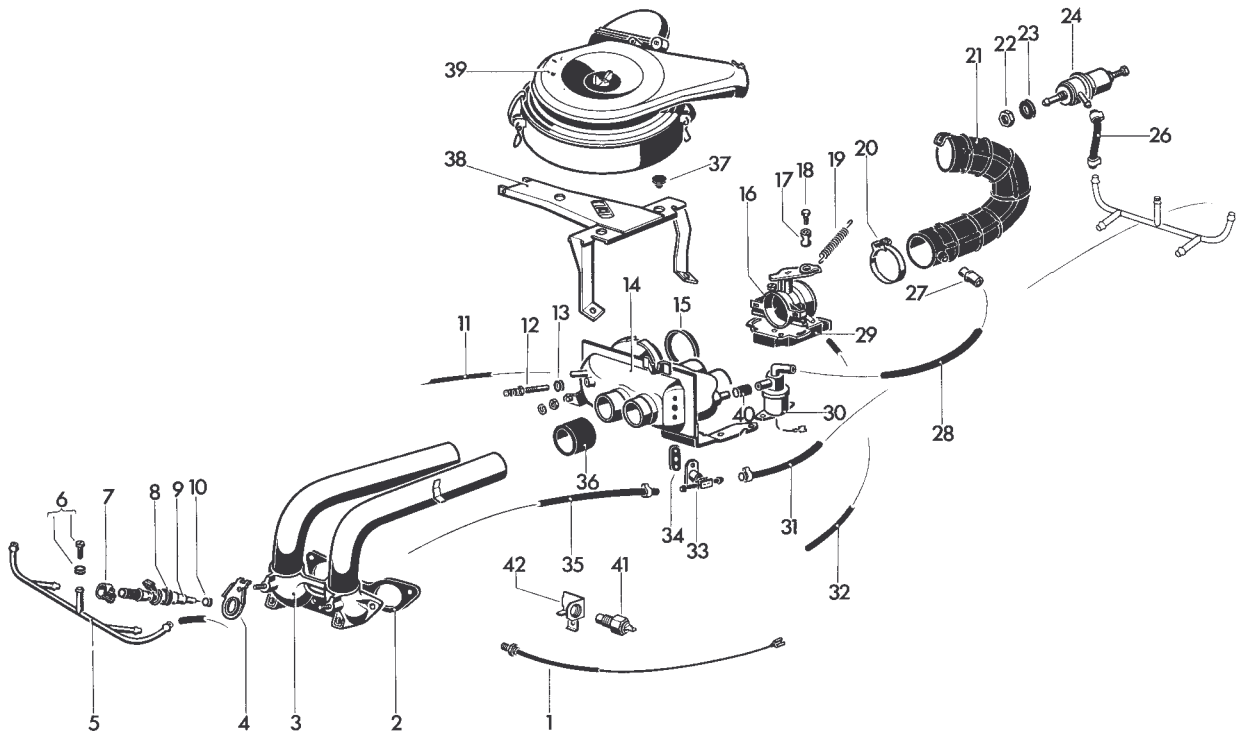
Disconnect the battery ground strap whenever an electrical short-circuit can occur in the course of the servicing procedure. This is a standing rule for all work performed on the fuel system.



No.	Description	Qty.	Note during		Remarks
			removal/disassembly	installation/reassembly	
1	Gasket	1		Check for damage.	
2	Cover	1			
3	Control unit	1			
4	Slide cover	1			
5	Wire harness for control unit	1		Check connector dust covers for firm seating.	
6	Handle	1			
7	Dust cover	1		Pull well over the ridge on connector housing.	
8	Connector housing	1		Work well around, without using force.	
9	Pressure sensor	1			
10	Connector housing with dust cover	1		Make sure that dust cover is well seated.	
11	Ignition distributor	1			
12	Hose, 600 mm	1			
13	Relay	2			

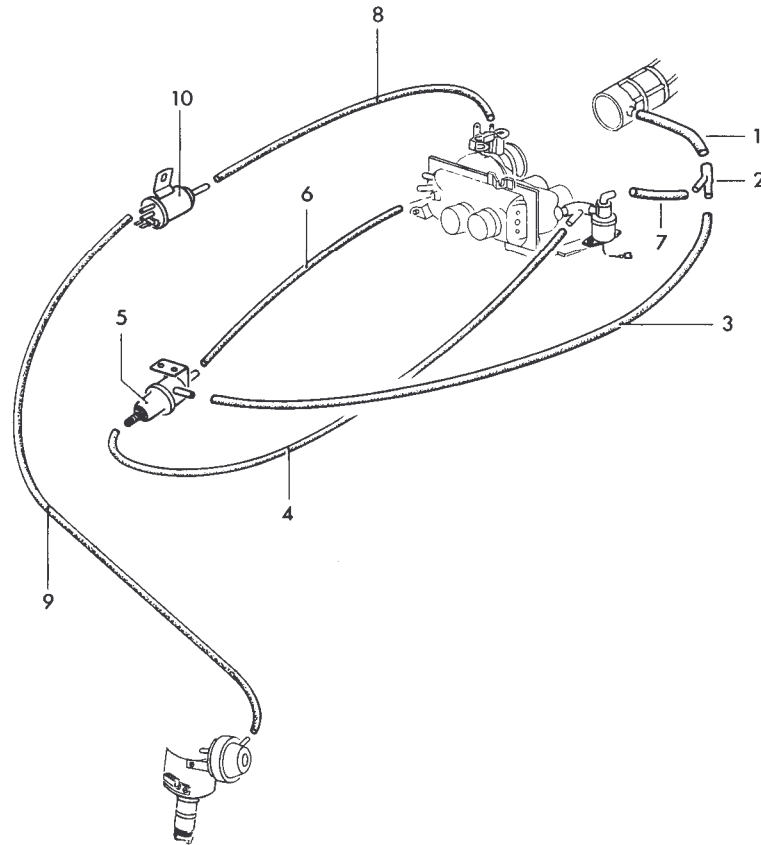


No.	Description	Qty.	Note during		Remarks
			removal/disassembly	installation/reassembly	
1	Fuel pump connector housing with dust cover.	1		Make sure that dust cover is well seated. If corrosion occurs, fill connector housing with multipurpose grease.	
2	Support clamp, lower part	1			
3	Support clamp, upper part	1			
4	Sheet metal screw B 4.8x9.5	1			
5	Relay	1			
6	Nut, M6	2			
7	Spring washer B6	2			
8	Rubber mount	2			
9	Fuel Pump	1			
10	Y-section	1			
11	Hose, 50 mm long	1			
12	Hose clamp, 13 mm dia.			Secure all hose connections.	
13	Hose, 400 mm long	1			
14	Hose, 235 mm long	1			
15	Clamp	1			
16	Fuel filter	1		Locate properly	
17	Damper	1			
18	Hose, 185 mm long	1			
19	Hose, 135 mm long	1			



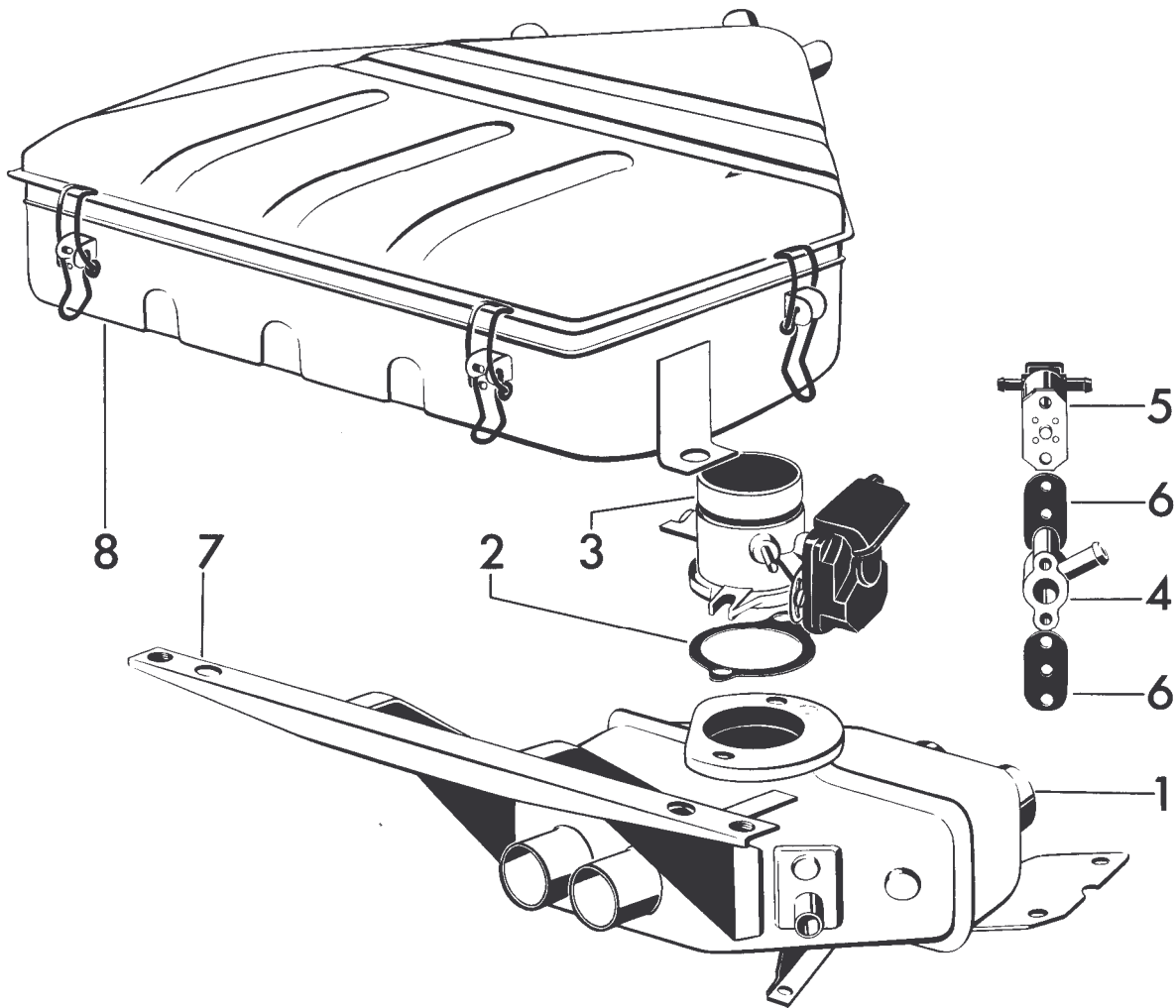
No.	Description	Qty.	Note during		Remarks
			removal/disassembly	installation/reassembly	
1	Temperature Sensor II	1			
2	Intake manifold gasket	2		Replace	
3	Intake manifold	2			
4	Injector bushing retainer	4			
5	Fuel line distributor	2			
6	Bolt M 4x8 with gasket	2			
7	Hose clamp, 13 mm dia.			Secure all hose connections.	
8	Injector bushing, outer	4			
9	Injector	4		Angular connecting hose	
10	Injector bushing, inner	4			
11	Hose, 600 mm long	1			
12	Temperature sensor I	1			
13	Gasket	1		Check for damage	
14	Air distributor	1		1.5 mm dia. restrictor in connector for automatic.	
15	Gasket for throttle valve housing.	1		Check for proper seating	

No.	Description	Qty.	Note during		Remarks
			removal/disassembly	installation/reassembly	
16	Throttle valve housing	1		1.5 mm dia. restrictor in connector for automatic	
17	Pivot stud	1			
18	Fillister screw	1			
19	Return spring	1		Note installed position	
20	Hose clamp	1			
21	Connecting duct for air filter	1			
22	Nut	1			
23	Insulating washer	1			
24	Pressure regulator	1			
25					
26	Hose, 210 mm long	1			
27	Intermediate piece	1			
28	Hose, 200 mm long	1			
29	Throttle valve switch	1			
30	Auxiliary air regulator	1			
31	Hose, 7.5 x 2.0				
32	Hose, 4.0 x 2.5				
33	Cold starting valve	1			
34	Gasket	1		Check for damage.	
35	Hose, 500 mm long	1			
36	Connecting hose	4		Check for proper seating.	
37	Rubber plug A8x1	1			
38	Air filter support	1			
39	Air filter	1			
40	Hose, 40 mm long	1			
41	Thermoswitch	1			
42	Thermoswitch bracket	1			



No.	Description	Qty.	Note during removal/disassembly	Note during installation/reassembly	Remarks
1	Hose, black 14x2.5x100 mm	1			
2	Y-junction	1			
3	Hose, black 9x3x600 mm	1			
4	Hose, brown 4.5x2.5x500 mm	1			
5	Deceleration mixture control valve, pneumatic	1			
6	Hose, brown 9x2.5x340 mm	1			
7	Hose, black 12x3.3	1			
8	Hose, grey 3.5x2x510 mm	1			
9	Hose, black 5x2.5x410 mm	1			
10	Two-way valve (for 914/1.7 from August 1971 to August 1972 only)	1			

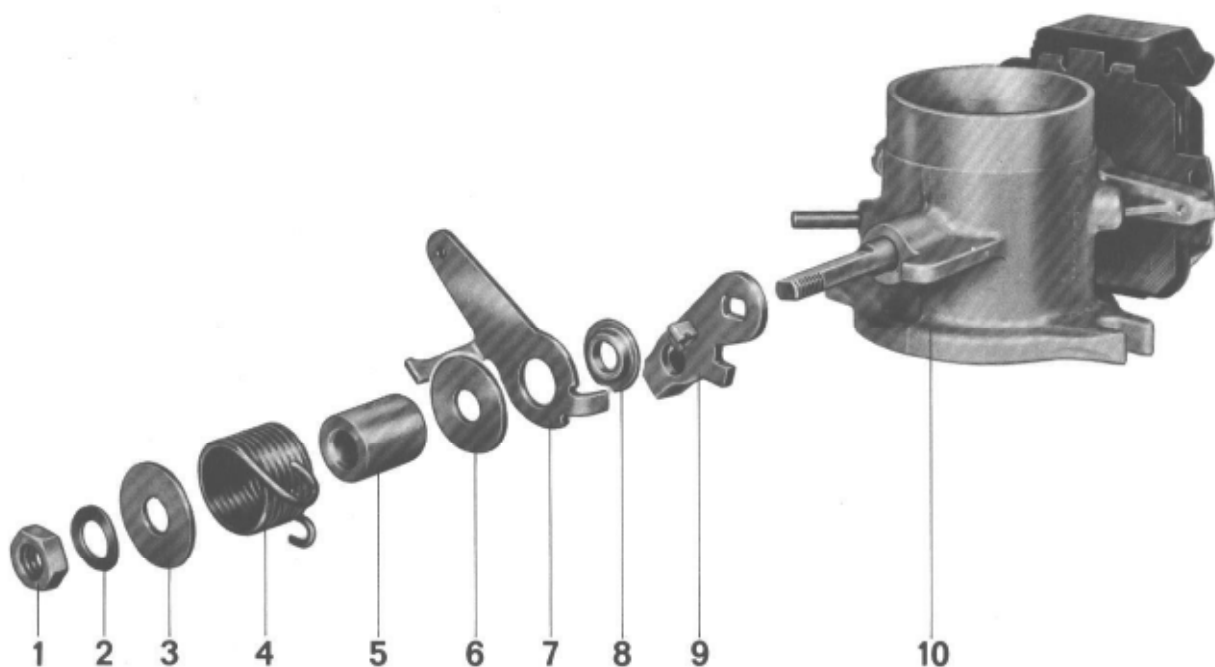
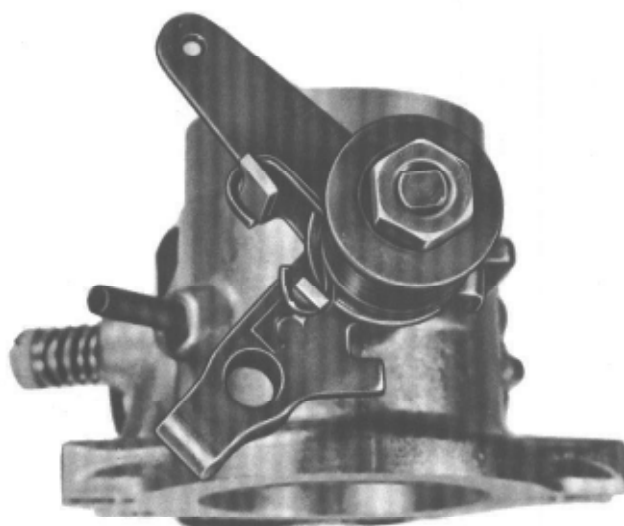
Modifications to 914/2.0 differing from 914/1.7



No.	Description	Qty.	Note during		Remarks
			removal/disassembly	installation/reassembly	
1	Intake air distributor	1			
2	Gasket for throttle valve housing	1			
3	Throttle valve housing	1			
4	Return spring	1			
5	Cold starting valve	1			
6	Gasket	1			
7	Air filter support	1			
8	Air filter	1			

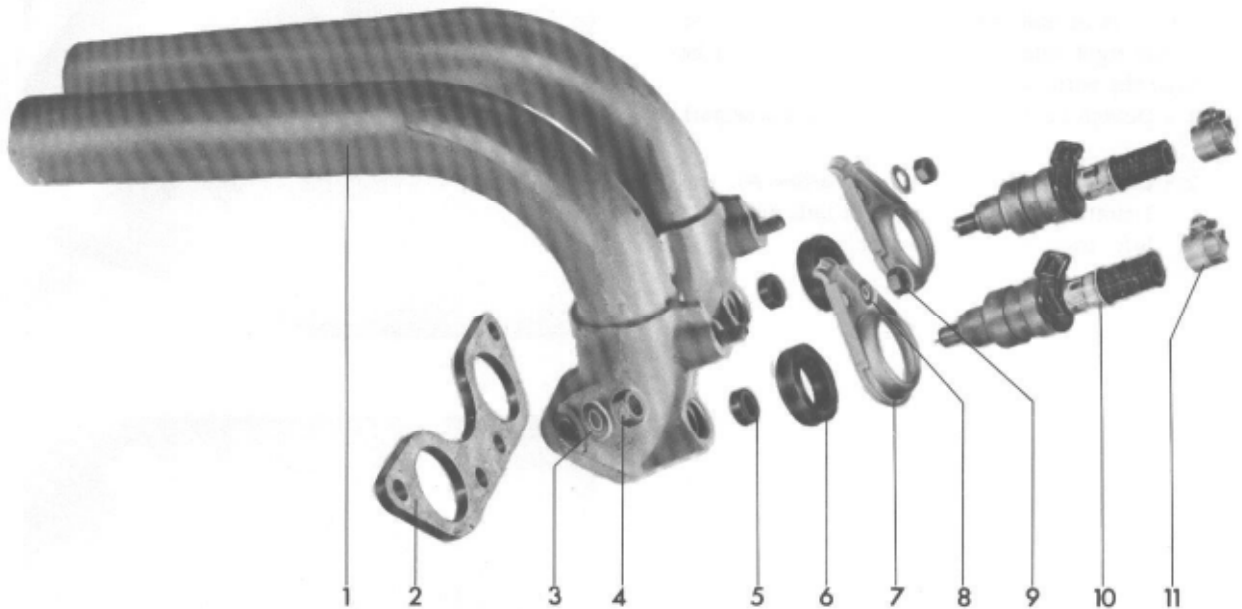
THROTTLE VALVE HOUSING WITH SUPPLEMENTAL RETURN SPRING

New regulations require the throttle valve in the intake air distributor to close automatically if the accelerator cable or return spring breaks or becomes detached. Therefore, a supplemental return spring is installed on the throttle valve shaft.



No.	Description	Qty.	Note during		Remarks
			removal/disassembly	installation/reassembly	
1	Nut	1			
2	Spring washer	1			
3	Washer	1			
4	Supplemental spring	1			
5	Sleeve	1			
6	Washer	1			
7	Return lever	1			
8	Spacer	1			
9	Lever	1			
10	Throttle valve housing with switch	1			

Removing and Installing Injectors



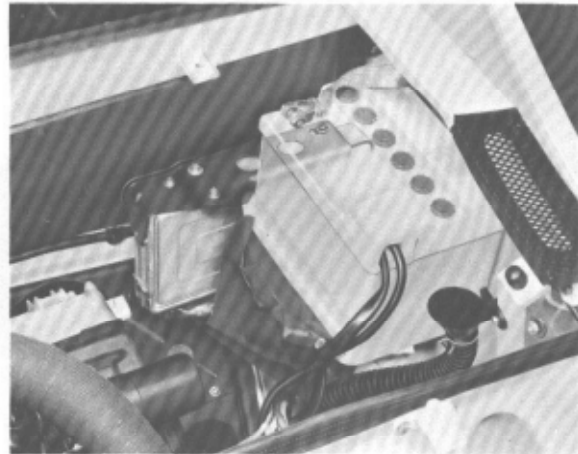
No.	Description	Qty.	Note during removal	Note during installation	Remarks
1	Intake manifold				
2	Gasket			914/1.7 and 914/2.0 are not interchangeable.	
3	Spring washer				
4	Intake manifold retaining nut			Tightening torque 5.9 Nm (0.6 kpm).	
5	Injector bushing, inner			Insert into intake manifold prior to installation of injector	
6	Injector bushing, outer			Slide onto the injector	
7	Injector bushing retainer			Slide onto the injector	
8	Spring washer				
9	Nut				
10	Injector		Replace defective injectors	Install connector in proper manner. Hose connection is angular in 914/2.0	
11	Hose clamp			Make sure it is well seated.	

Removing and Installing Control Unit

The control unit is bolted to a bracket located in the right side of the engine compartment behind the battery.

1 - Detach heating air duct in right lower part.

2 - Unscrew 2 Allen-head bolts (arrow A), and 1 slotted screw. Pull control unit out to the left, together with bracket.



3 - Unscrew bracket.

4 - Open wire clamp and pull slide cover out of control unit.

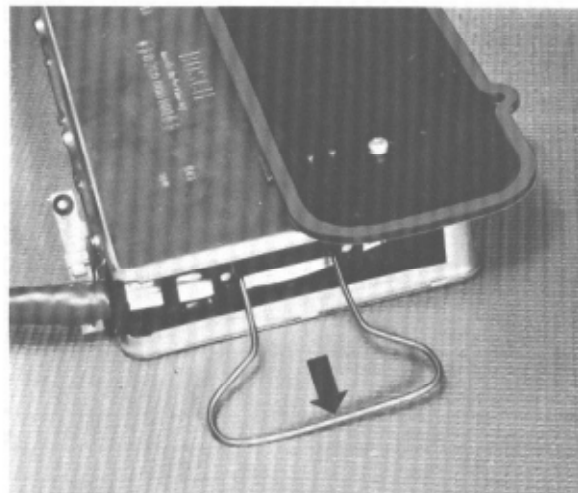


5 - If control unit has no handle, use a locally manufactured hook to pull it out.

- a = 45 mm
- b = 12 mm
- c = 100 mm
- d = 2 mm dia.

Installation

Install bracket and slotted screw first.



TEMPERATURE SENSOR I, REMOVE AND INSTALL

The temperature sensor I is screwed into intake air distributor at the left next to throttle valve switch.



Installation

1. Check protective rubber cap for damage and replace, if required.
2. Insert temperature sensor with new sealing ring and tighten as specified.
3. Fit cable plug and pull protective rubber cap properly over housing.

Removal

1. Remove protective rubber cap from plug housing and pull off cable plug.



2. Unscrew temperature sensor.

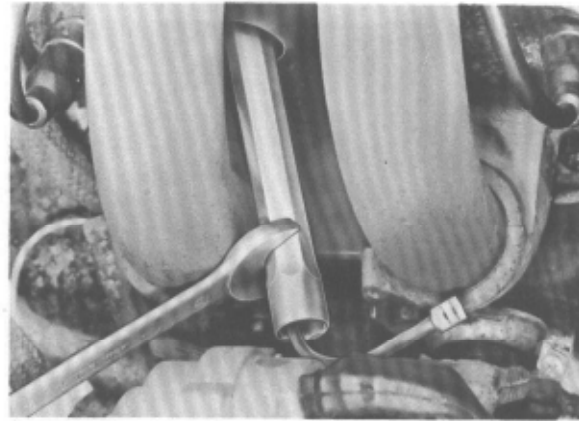
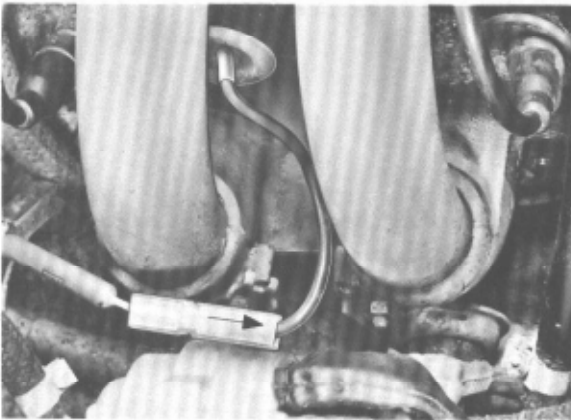
TEMPERATURE SENSOR II, REMOVE AND INSTALL

The temperature sensor II is screwed into cylinder head next to spark plug for No. 3 cylinder.

3. Unscrew temperature sensor with tubular socket wrench US/054 (approx. 150 mm long).

Removal

1. Separate wire between temperature sensor and connector.

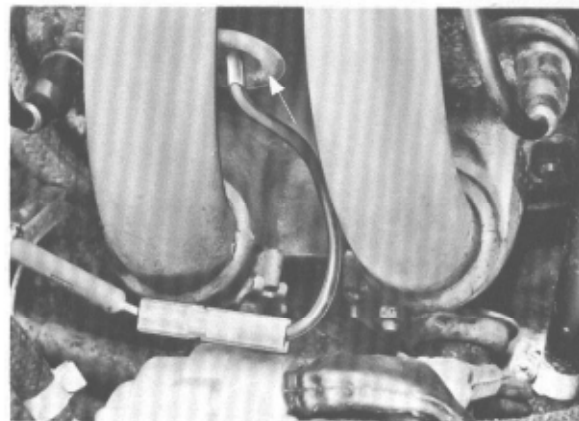
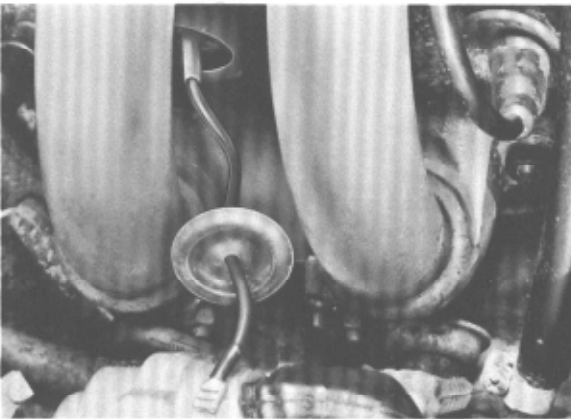


Installation

2. Remove rubber cap and pull off over wire.

1. Screw in temperature sensor.
Caution! Do not tighten excessively.

2. Mount rubber cap in correct position.

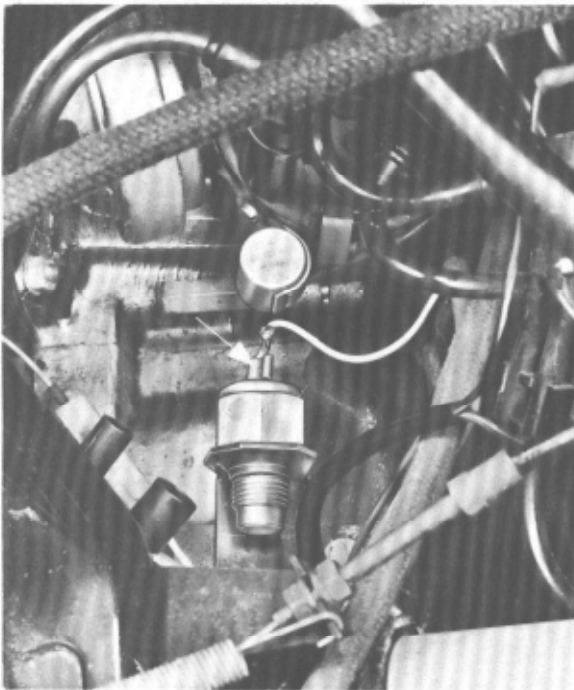


3. Reattach connector.

THERMOSTAT, REMOVE AND INSTALL

Removal

1. Pull off wire from thermostat.



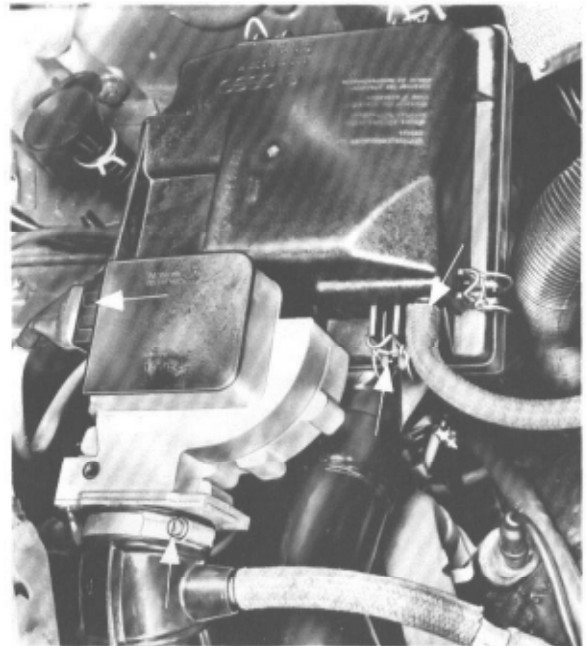
2. Unscrew thermostat. Do not bend mounting bracket.

For installation proceed in reverse order.

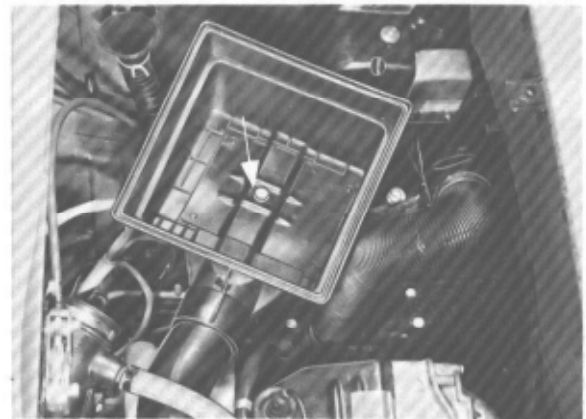
REMOVING AND INSTALLING INTAKE AIR SENSOR AND AIR CLEANER ASSEMBLY

Removal

1. Detach hose clamp, air cleaner retaining clips, electrical plug, and vent hose.



2. Loosen retaining screw in air cleaner base and remove it.



3. Remove retaining screws from intake air sensor and remove sensor from air cleaner upper assembly.

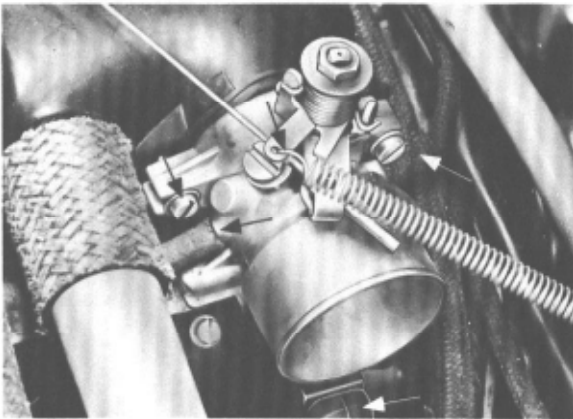
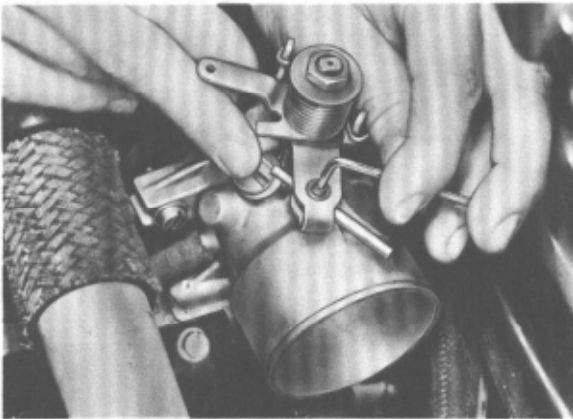
Installation

Check for proper location of rubber gasket between intake air sensor and air cleaner upper assembly.

REMOVING AND INSTALLING THROTTLE VALVE HOUSING

Removal

1. Detach and remove hose which connects intake air sensor with throttle valve housing.
2. Detach return spring, throttle linkage, vacuum hoses, and electrical plugs. Remove retaining screws and take throttle valve housing off.

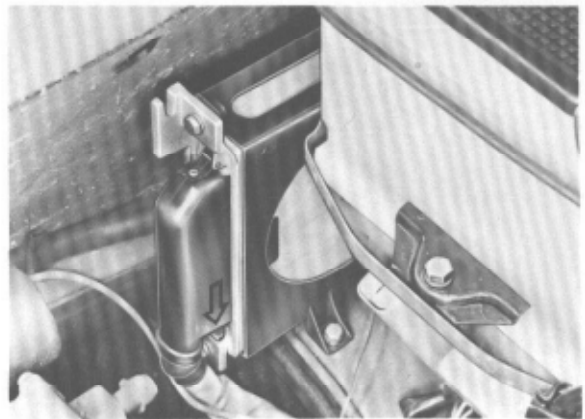


Note:

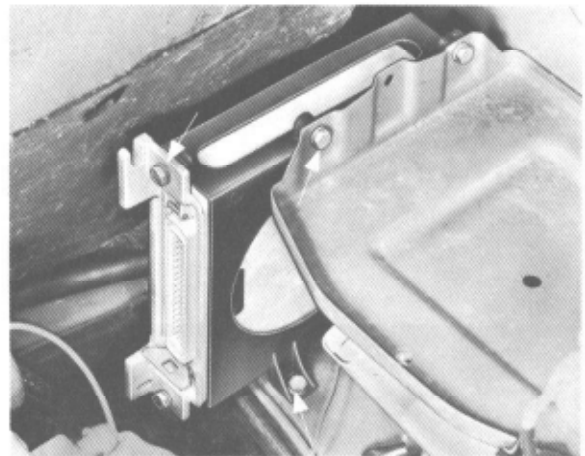
During installation check for proper location of gasket between intake air distributor and throttle valve housing. Do not overtighten screws.

REMOVING AND INSTALLING CONTROL UNIT**Removal**

1. Remove battery.
2. Depress spring clip and simultaneously pull plug out of socket until it unhooks from control unit,



3. Remove screws and take control unit out together with holder.

**Installation**

Swing plug into control unit and press into socket until spring clip catches it with an audible click,

REMOVING AND INSTALLING COLD START VALVE

Removal



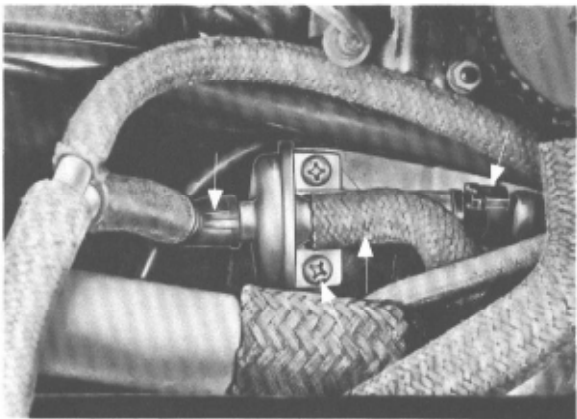
Disconnect electrical plug, fuel lines, and retaining screws. Remove cold start valve together with gasket.

Installation

1. Use new gasket.
2. Reconnect electrical plug (blue).

REMOVING AND INSTALLING AUXILIARY AIR REGULATOR

Removal



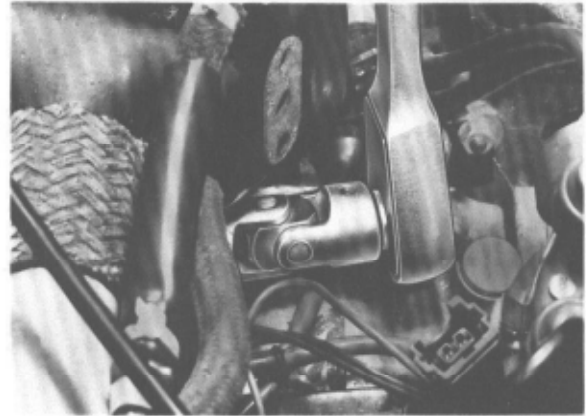
Disconnect hoses and electrical plug. Remove retaining screws. Take auxiliary air regulator out.

Installation

Reconnect electrical plug (black).

REMOVING AND INSTALLING THERMOSWITCH**Removal**

1. Take out cold start valve and lay aside.
2. Disconnect electrical plug from thermoswitch.
3. Unscrew thermoswitch with an appropriate tool.

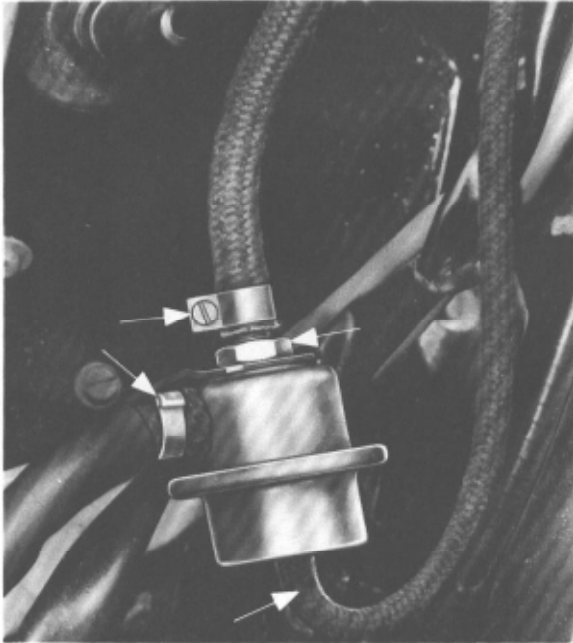
**Installation**

1. Be careful not to bend holder when tightening or loosening thermoswitch.
2. Install cold start valve together with a new gasket.
3. Reconnect electrical plug (brown connector).

REMOVING AND INSTALLING PRESSURE REGULATOR

Removal

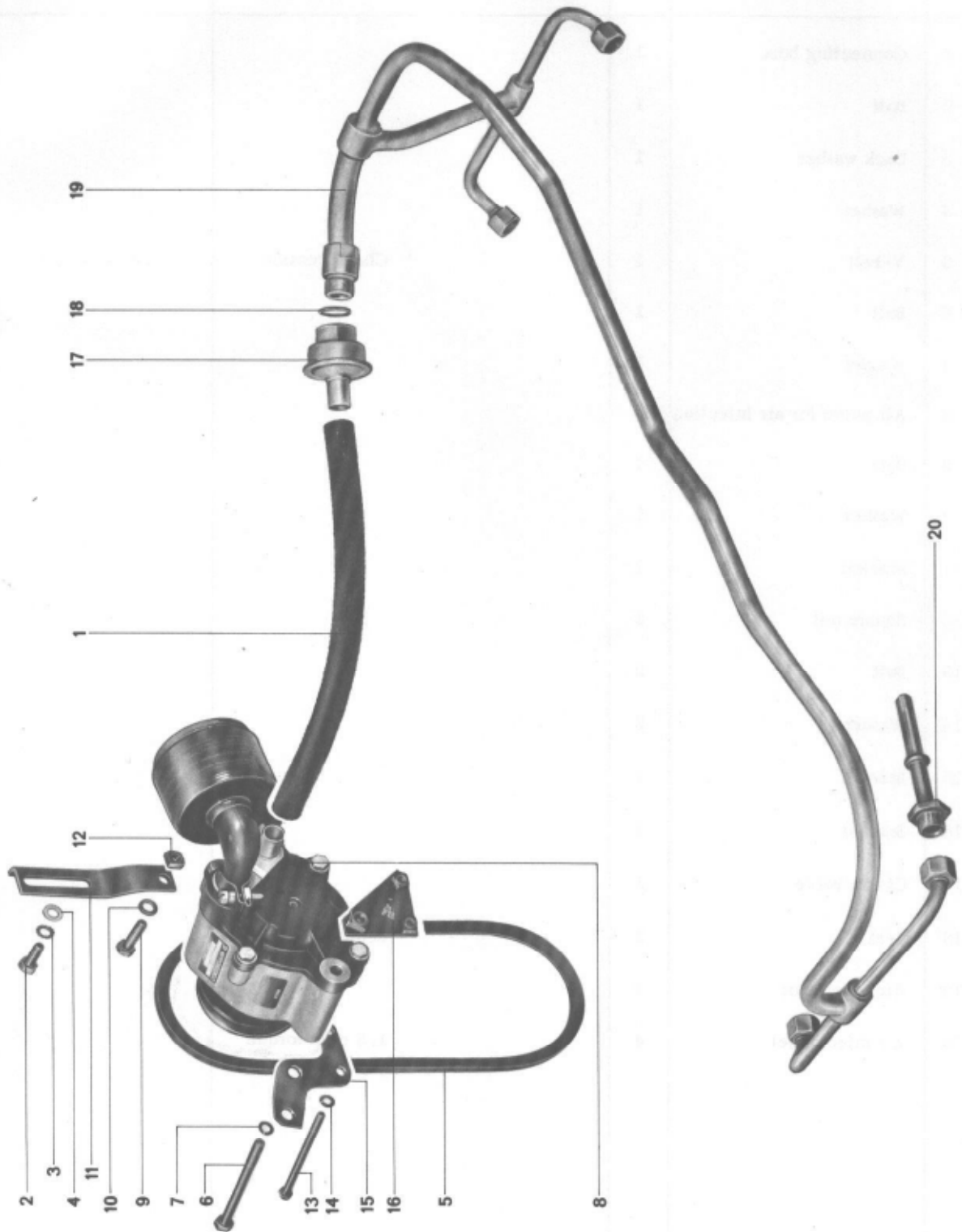
Disconnect fuel hoses, vacuum hose, and retaining nut. Remove pressure regulator from holder.



Note:

Be careful not to bend holder when loosening or tightening retaining nut.

DISASSEMBLING AND ASSEMBLING AIR INJECTION SYSTEM

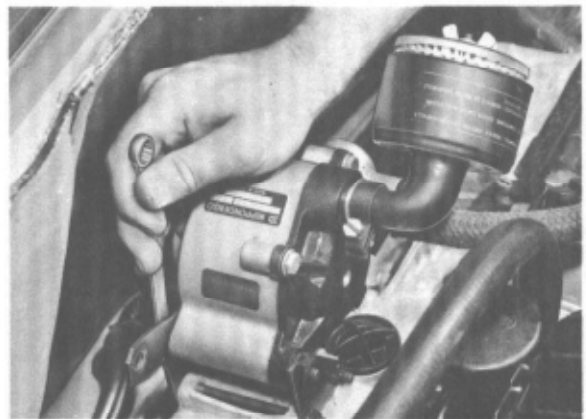
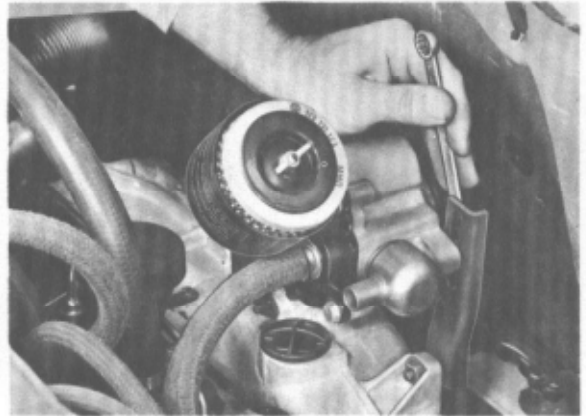


No.	Description	Qty.	Note when		Remarks
			removing	installing	
1	Connecting hose	1			
2	Bolt	1			
3	Lock washer	1			
4	Washer	1			
5	V-belt	1		Check tension	Page 4.4-1/3
6	Bolt	1			
7	Washer	1			
8	Air pump for air injection	1			
9	Bolt	1			
10	Washer	1			
11	Bracket	1			
12	Square nut	1			
13	Bolt	2			
14	Washer	2			
15	Bracket	1			
16	Bracket	1			
17	Check valve	1			
18	Seal	1		Replace	
19	Air distributor	1			
20	Air injector jet	4		1.5 mkp torque	

REMOVING AND INSTALLING AIR PUMP

Removing

1. Disconnect hose.
2. Take bolt and washer off of air pump bracket.
3. Swing air pump to right and remove V-belt.
4. Remove bolt and take pump out of bracket.



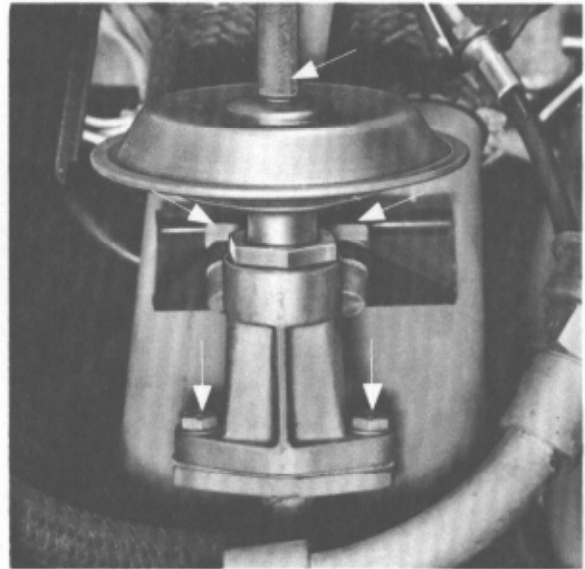
Installing

Tension V-belt.
The belt tension is adjusted by moving the air pump. It is correct if the belt can be pressed together in the middle with thumb pressure about 5 - 8 mm.

REMOVING AND INSTALLING EXHAUST GAS RECIRCULATION VALVE

Removing

1. Disconnect vacuum hose.
2. Remove mounting screws.
3. Slightly press down EGR line to muffler and remove valve.



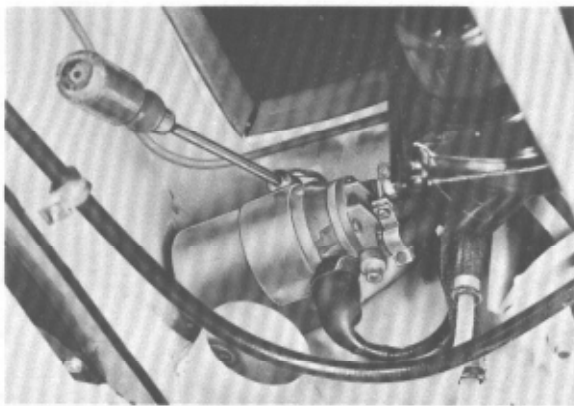
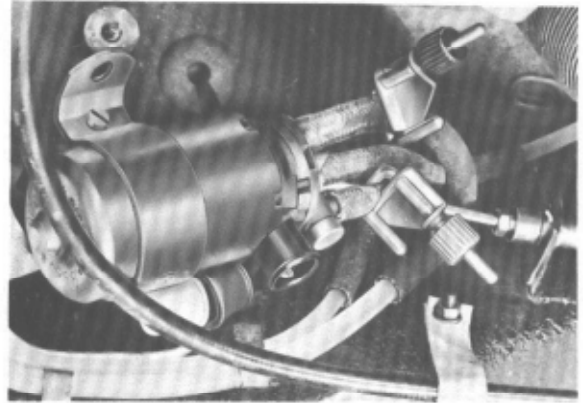
Installing

Install new gaskets.

REMOVING AND INSTALLING FUEL PUMP - FROM 1972 MODEL

Removal

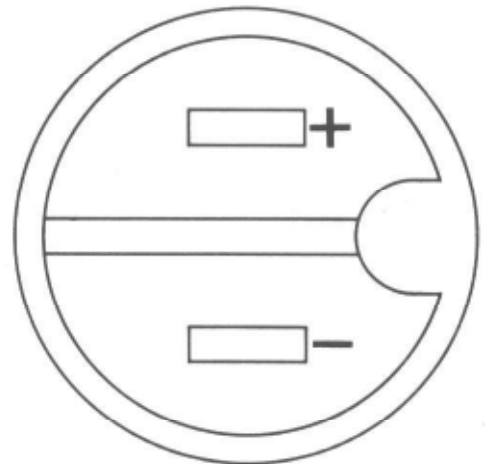
- 1 - Remove right heating air duct.
- 2 - Detach wire connector.
- 3 - Remove M6 retaining nuts from rubber mount.



Installation

- 1 - Check connector for corrosion, replace if necessary. Coat connector with VW-TL-735 lithium grease. Make sure that connection is made properly.

- 4 - Loosen hose clamps in fuel pressure, return, and suction hoses at the fuel pump.
- 5 - Clamp fuel hoses (suction "S", and return "R") shut with commercial hose clamps. Detach all fuel hoses, collecting all spilling fuel.



2 - Connect hoses as shown in the illustration.
Remove shut-off clamps.

3 - Make sure that dust cover is seated properly
on the wire connector.

4 - Check hose connections for leaks and firm
seating.

5 - Make sure that no fuel hose touches the
heating air duct or the body.

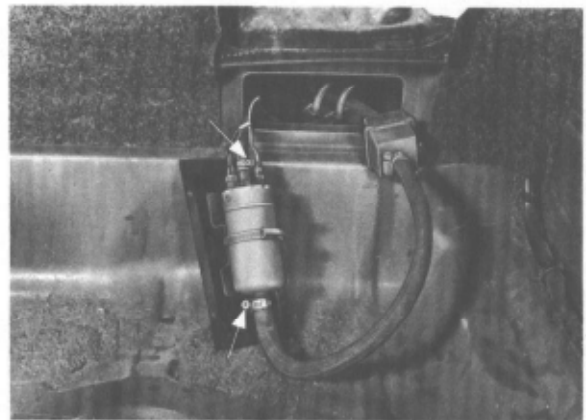
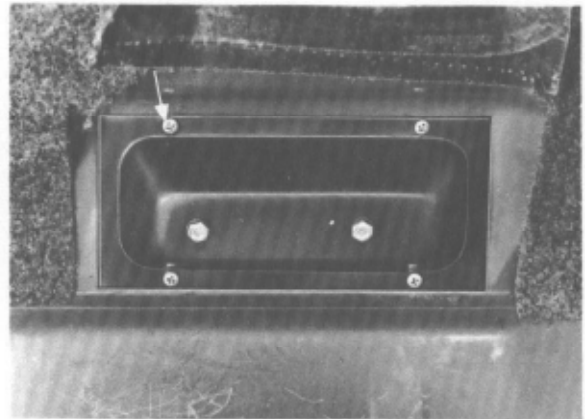
REMOVING AND INSTALLING FUEL PUMP

General Notes

The shape and location of fuel pumps for 1975 models have been modified. The fuel pump and fuel filter are located in the front section of the car, behind the panel to the fuel tank compartment.

Removing

1. Take mats and spare wheel out of luggage compartment.
2. Remove cover with console and fuel pump.
3. Disconnect fuel hoses at fuel pump. Pull off electric wires.
4. Dismantle fuel hoses at fuel pump.
5. Unscrew fuel pump at console.



Installing

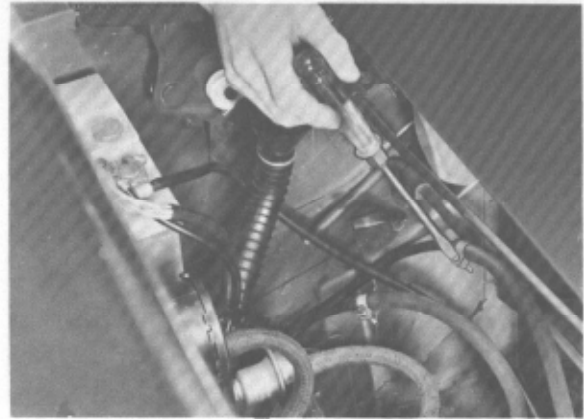
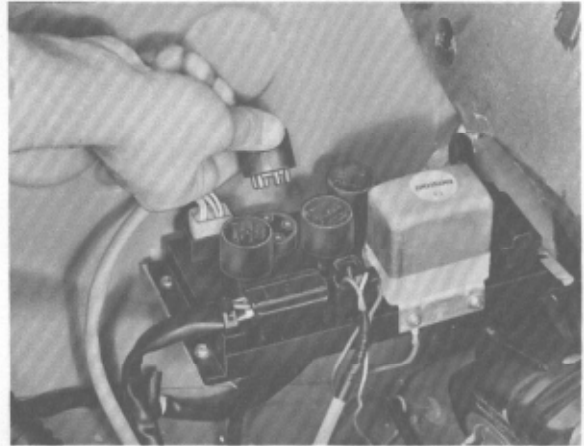
Make sure that hose connections at fuel pump are correct and tight.

ELECTRIC FUEL PUMP SPECIFICATIONS

Vehicle Type	1.7 l/MPC fuel injection 2.0 l/MPC fuel injection 1.8 l/AFC fuel injection	1975 Models 2.0 l/MPC fuel injection 1.8 l/AFC fuel injection
Part Number	311 906 091 C/D	043 906 091
Bosch Number	0580 463 009	0580 463 010
Voltage	12 V	12 V
Operating Pressure	2.4 kp/cm ²	2.5 kp/cm ²
Delivery Rate	min. 50 ltr/h	min. 62 ltr/h
1 kp/cm ² = 0.981 bar		

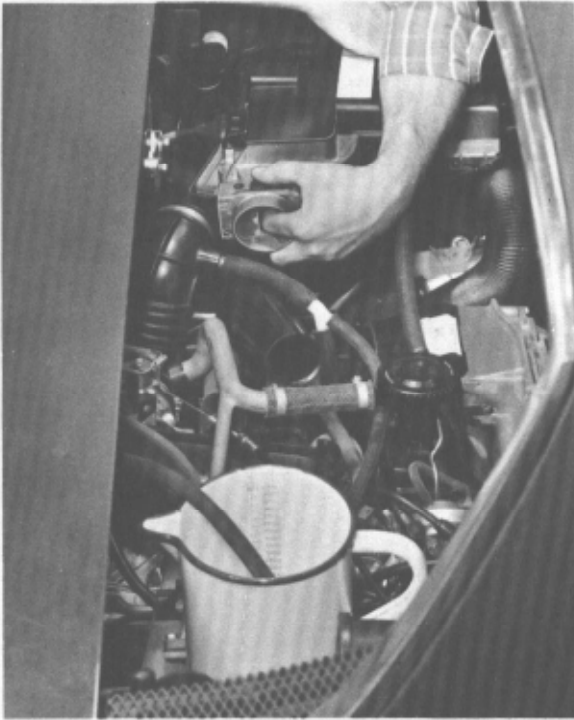
CHECKING FUEL PUMP DELIVERY RATE / 2.0 ltr MPC FUEL INJECTION

1. Disconnect battery ground strap.
2. Remove relay plate cover in engine compartment.
3. Bridge terminals 87 and 30 on one relay.
4. Install this test relay on the relay plate in place of original relay.
5. Detach fuel return line in engine compartment. Place end of fuel hose in a measuring glass (about 1000 cc).
6. Connect battery ground strap to run fuel pump. Pump fuel into measuring glass for about 30 seconds.
7. Disconnect battery ground strap after 30 seconds to stop pump.
8. Fuel pump delivery rate must be at least 0.5 liter.



If delivery rate does not meet minimum specifications, check current draw of fuel pump. Replace fuel pump if necessary.

CHECKING FUEL PUMP DELIVERY RATE / 1.8 ltr AFC FUEL INJECTION



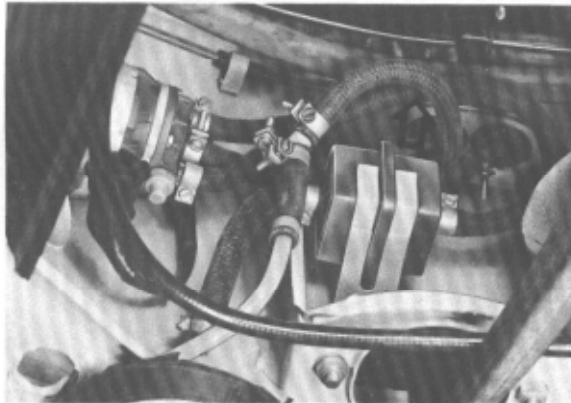
1. Disconnect fuel return line in engine compartment.
2. Place end of hose in a measuring glass (about 1000 cc).
3. Switch on ignition.
4. Remove intake air sensor with upper section of air filter.
5. Open stator plate by hand until pump contact is closed to run fuel pump. Let fuel pump into measuring glass for 30 seconds.
6. Release stator plate after 30 seconds to open pump contact and stop fuel pump.
7. The delivery rate must be at least 0.5 liter.

If delivery rate does not meet minimum specifications, check current draw of fuel pump. Replace fuel pump if necessary.

REMOVING AND INSTALLING FUEL FILTER - FROM 1972 MODEL

Removal

- 1 - Remove right heating air duct.
- 2 - Remove right hot air box from heat exchanger (do not detach heating control cable).
- 3 - Pull filter out upward.



- 4 - Clamp both hoses connected to the filter shut with the aid of shut-off clamps, and detach hoses.



Installation

Make sure during installation that the arrow molded into the filter body points in the direction of fuel flow. Push filter into its holder with care.

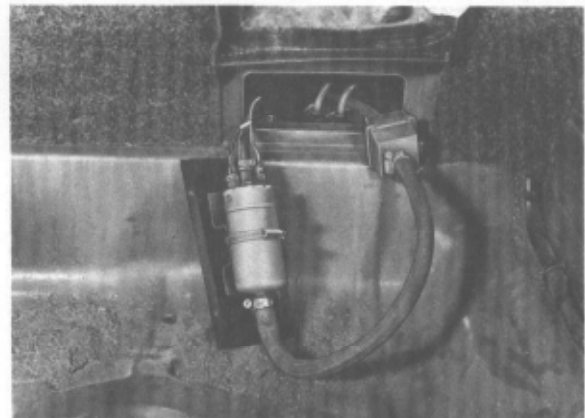
REMOVING AND INSTALLING FUEL FILTER

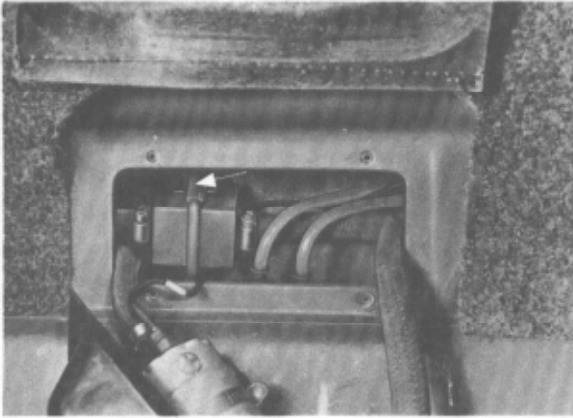
General Notes

The fuel filter of 1975 models is located in the front section of the car, behind the panel to the fuel tank compartment.

Removing

1. Remove mats and spare wheel from luggage compartment.
2. Remove cover with console and fuel pump.
3. Pull fuel filter forward off of holder.
4. Remove fuel filter line clamps and disconnect hoses.





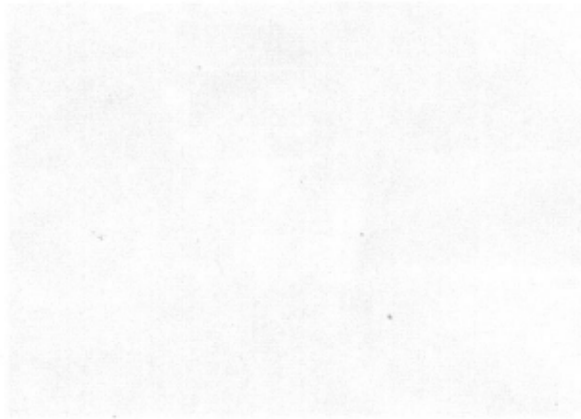
Installing

Place filter in holder, being careful not to damage filter.

Caution

The arrow on the filter must face in direction of flow.

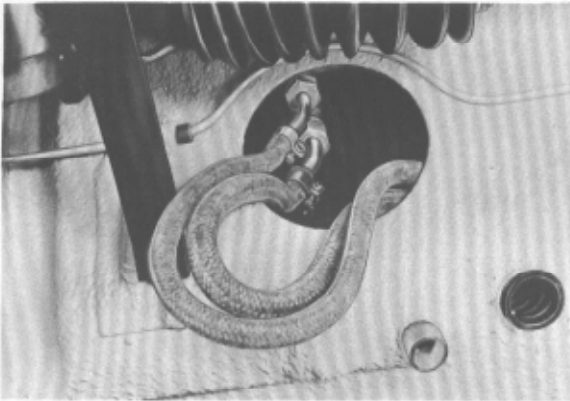
Make sure that fuel hose connections are correct and tight.



REMOVING AND INSTALLING FUEL TANK

Removal

- 1 - Remove gravel shield.
- 2 - Drain fuel by detaching fuel hoses under the fuel tank.



- 3 - Disconnect hoses from activated charcoal filter and expansion chamber.
- 4 - Detach expansion chamber from fuel tank. Detach fuel gauge connector from sending unit.



- 5 - Loosen mounting strap and pull tank out through the top.

Installation

Note:

Make sure that the fuel hoses are properly connected and firmly seated.