Electronic Fuel Injection

Air Flow Controlled

Service Training

This brochure tells you all about the new Electronic Fuel Injection System that is controlled by intake air flow.

All components are described and their function thoroughly explained.

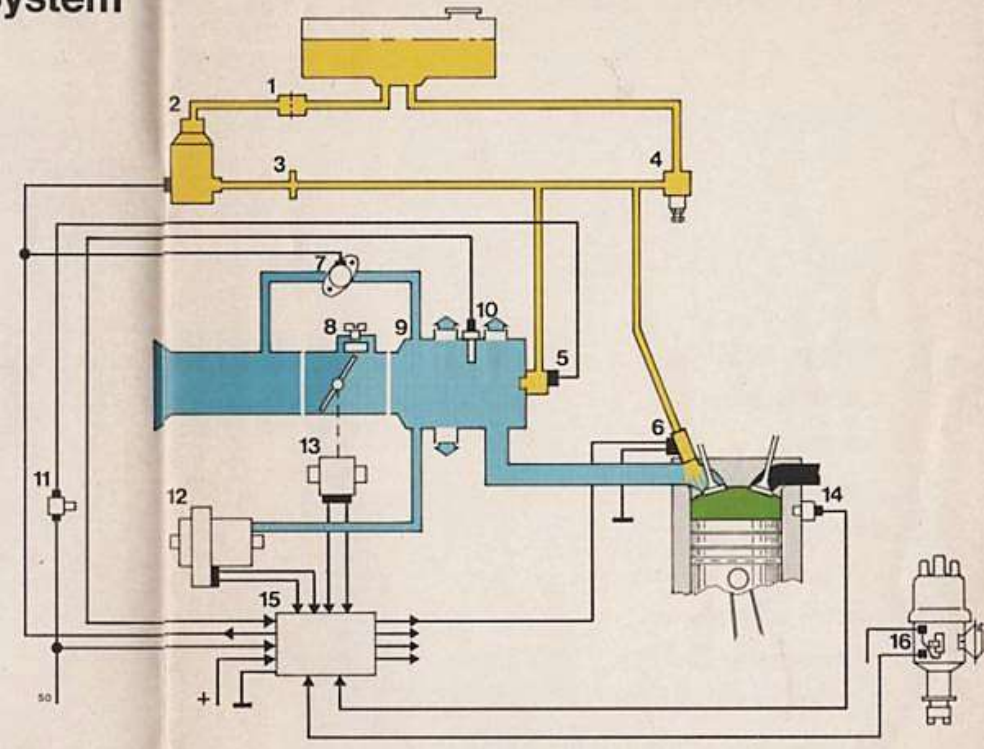
Your knowledge of the present Electronic Fuel Injection System will help you to understand the new system.

How to maintain and repair this system is explained in detail in the Workshop Manual.

The Present

Electronic Fuel Injection System

On this **system**, the volume of fuel is based on **intake manifold pressure.**



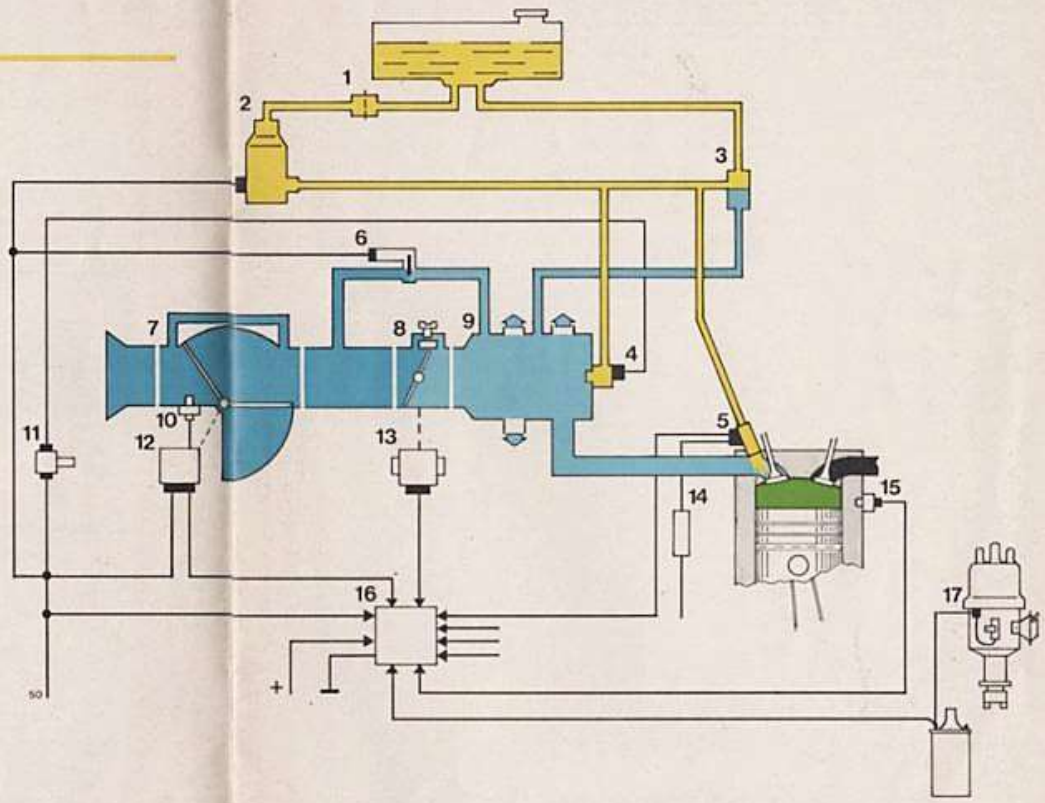
1 Fuel Filter
2 Fuel Pump
3 Fuel Damper
4 Pressure Regulator
5 Cold-Start Valve
6 Injector
7 Auxiliary Air Regulator
8 Throttle Valve Housing
9 Intake Air Distributor
10 Temperature Sensor I
11 Thermo-Time Switch
12 Pressure Sensor with Full Load Enrichment
13 Throttle Switch with Acceleration Enrichment
14 Temperature Sensor II
15 Control Unit
16 Trigger Contacts

This system, sucessfully applied during the past years was further developed for 1974.

The New Electronic Fuel Injection System

On the new **system,** the volume of fuel is based on the actual **amount of air** used for combustion.

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



Details of this new system follows.

Why A New System?

To improve performance by minimizing:

Variations in combustion chamber filling caused by loadchanges related to engine rpm.

Variations in combustion chamber filling caused by wear, deposits or faulty valve adjustments.

Variations in exhaust back-pressure caused by the addition of emission control devices.

How The New System Works

Basic Fuel Metering:

The volume of fuel is dependent on the volume of intake air and engine revolution.

Injection Cycle:

Injection is triggered by every other opening of the ignition contact breaker points.

Cold-Start and Warm-Up Enrichment:

The cold-start device remains the same.
Warm-up enrichment is controlled by temperature sensor I in the intake air sensor and temperature sensor II on the cylinder head.

Additional Sensing:

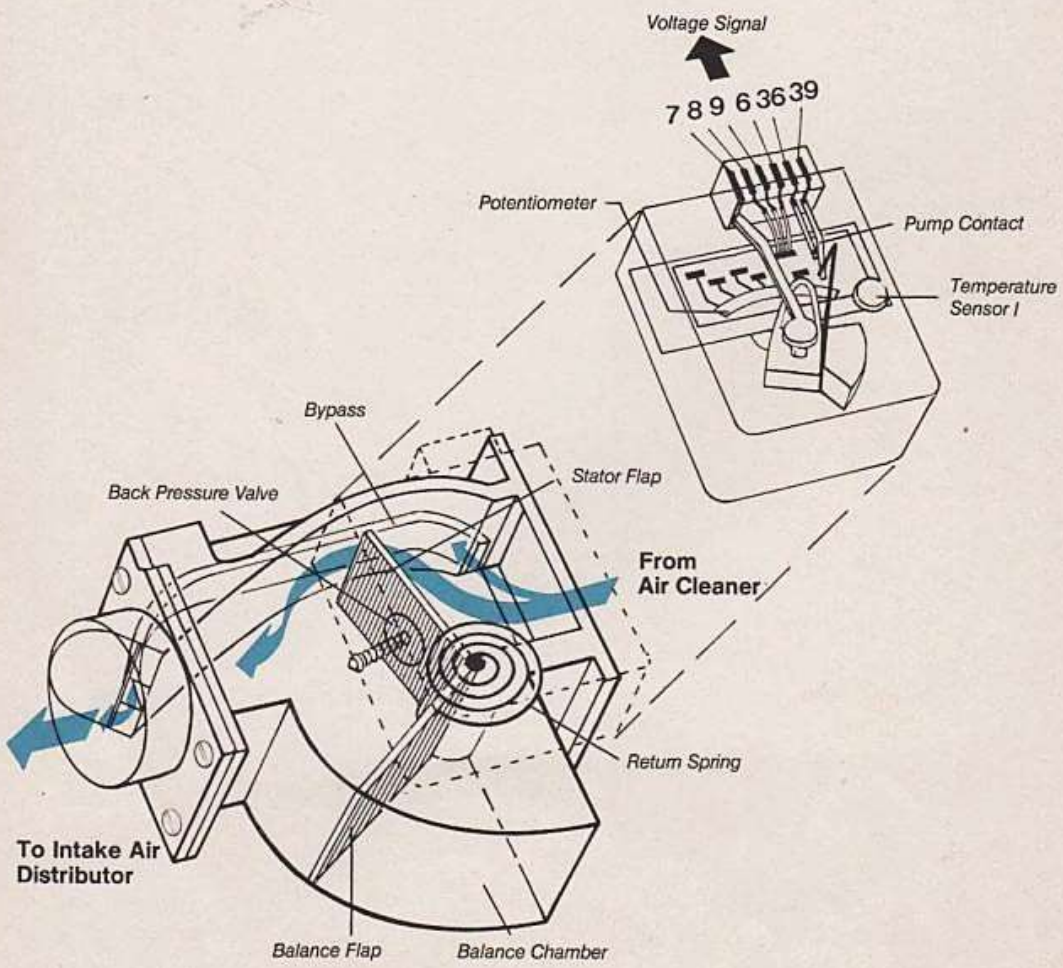
Acceleration enrichment is no longer needed since the intake air sensor takes this into consideration.

Correction for full load enrichment is provided by a contact in the throttle valve switch.

A switch inside the potentiometer controls the fuel pump depending on the position of the stator flap.

The Intake Air Sensor

The intake air sensor provides the control unit with voltage signals depending upon **intake air volume** and **temperature.** It also controls the fuel pump.



What Has Changed?

The intake air sensor now controls the metering of fuel for the engine.

How Does It Work?

The flow of intake air moves the stator flap. The stator flap turns a potentiometer which sends a voltage signal to the control unit. The balance flap dampens the movement of the stator flap.

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

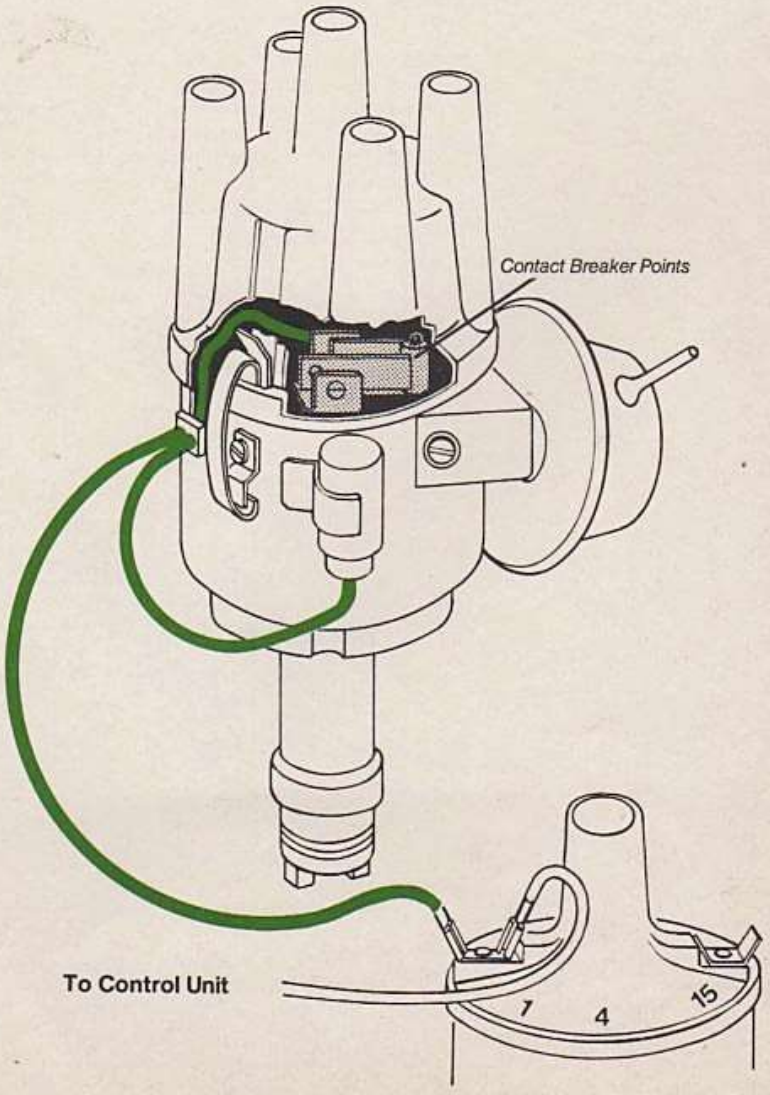
Temperature sensor I is connected to the potentiometer and influences voltage signals to the control unit depending on air temperature.

How Is It Tested?

Disconnected the plug from the intake air sensor.
Take an ohm reading between contacts No. 6 and No. 9. The reading should be between 200-400 ohms.
Take an ohm reading between contacts No. 7 and No. 8. The reading should be between 120-200 ohms.

The Ignition Contact Breaker Points

The contact breaker points in the ignition distributor provides signals to the control unit for **triggering the injectors** as well as counting **engine revolutions.**



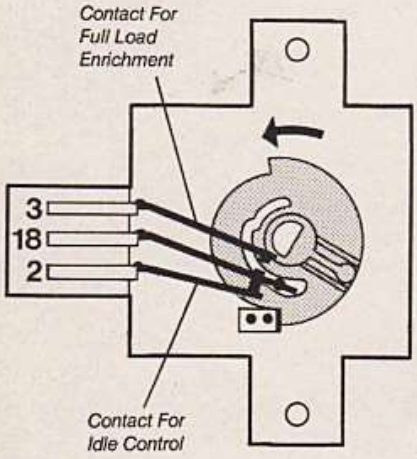
What Has Changed? The ignition contact breaker points trigger all four injectors at the same time. They also provide the control unit with signals for counting engine revolutions.

How Does It Work? Because all four injections are triggered at the same time, two cylinders receive fuel for combustion while on or near their intake cycle. The other two cylinders in a sense „store" the fuel in the intake manifold until their intake cycle begins.

How Is It Tested? With a dwell meter.

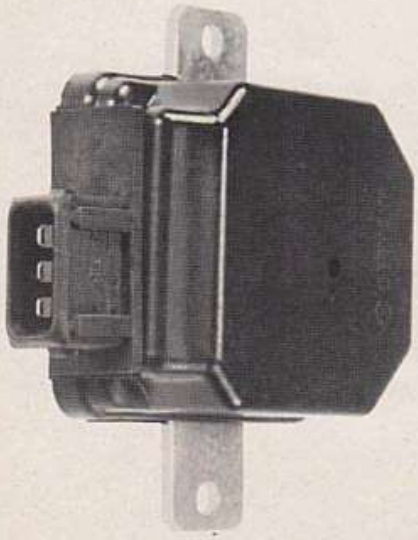
The Throttle Switch

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



What Has Changed?

The drag switch and contact for idle control has been eliminated. Only the contact for full load enrichment remains connected. Adjusting of the throttle switch is no longer necessary.



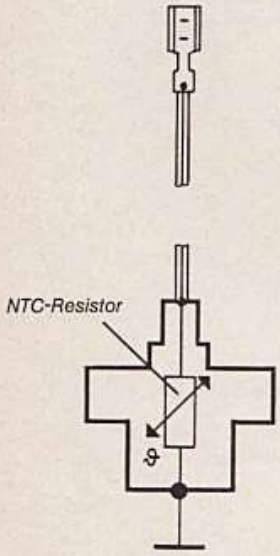
How Is It Tested?

Disconnect the plug from the throttle switch.
Take an ohm reading between contact No. 3 and No. 18.
With the throttle closed the ohm meter should read infinitely.
Open the throttle slowly, the ohm meter should deflect to 0 ohms.

Temperature Sensors I and II

Temperature sensor I is now in the intake air sensor.
It senses intake air temperature via the potentiometer and provides this information to the control unit.

Temperature sensor II in the cylinder head provides the control unit with engine temperature information related to **starting** and **warm-up enrichment.**

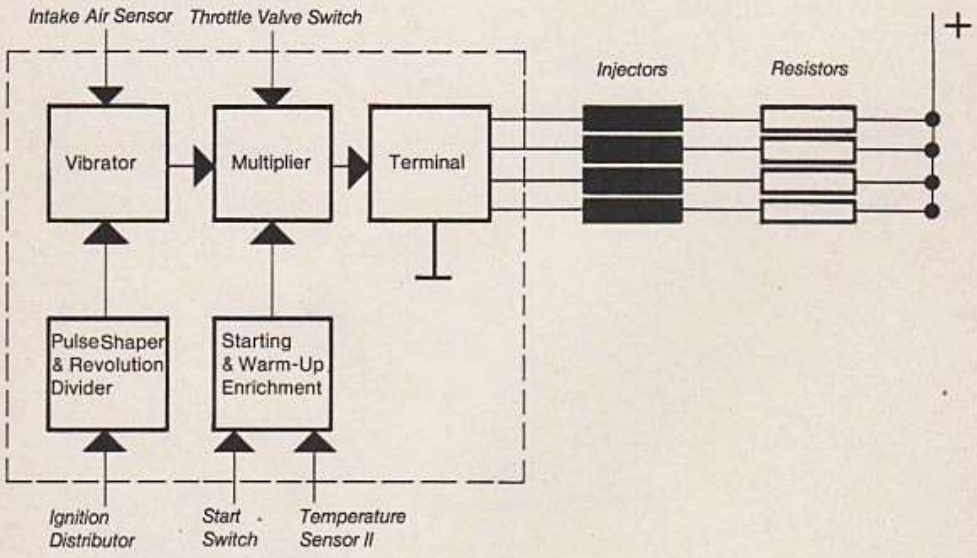


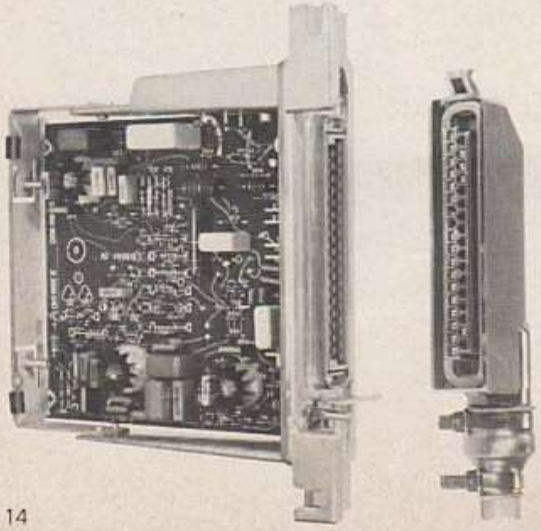
How Is It Tested?

Connect an ohm meter between temperature sensor II and ground.
The ohm reading should be 2500 ohms at 68° F.

The Control Unit

The control unit is an electronic computer. It receives incoming signals regarding air volume, engine revolutions, temperature and throttle position. From this information the computer calculates the correct **injection time** for the injectors.





What Has Changed?

The electronic control unit now contains printed circuit boards and integrated circuitry. It contains only 80 components compared to the approximate 300 components in the present system.
The multiple connector plug is easier to connect and disconnect.
It now levers into position and is held by a spring clip.

How Does It Work?

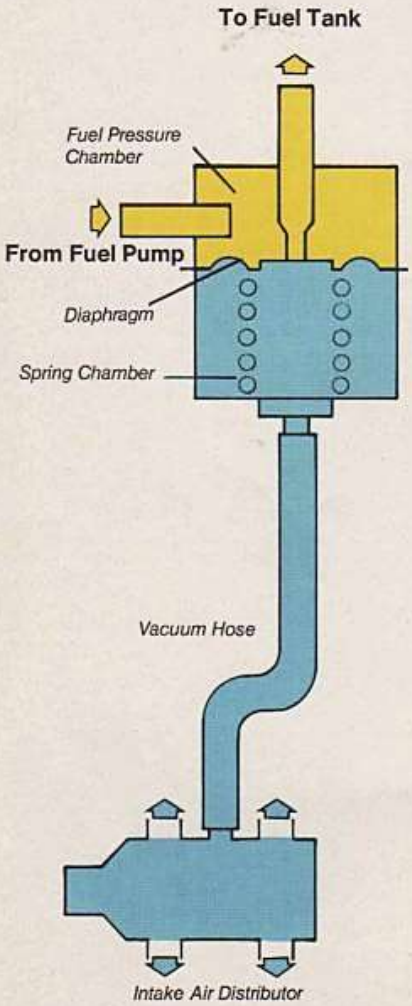
Voltage signals from the intake air sensor and time intervals from the distributor points are used to calculate the amount of air and fuel required for each cylinder. Corrections, such as mixture enrichment during full load, starting and warm-up influence the injection time.

How Is It Tested?

Details are provided in the Trouble Shooting Guide Electronic Fuel Injection (air flow controlled).

Pressure Regulator

The pressure regulator controls the fuel pressure in the fuel system.



What Has Changed?

The spring chamber of the pressure regulator is now connected with the intake air distributor by a vacuum hose.
Adjustment of the pressure regulator is no longer necessary.

How Does It Work?

Fuel enters the pressure regulator and exerts pressure against the spring loaded diaphragm.
Excess pressure on the diaphragm opens the fuel return line to the tank.
This action maintains a pressure of approximately 35 psi in the fuel line to the injectors.

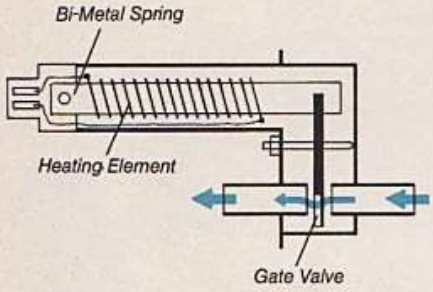
A vacuum hose connects the spring chamber with the intake air distributor.
Manifold vacuum influences fuel pressure to the injectors depending on engine load.

How Is It Tested?

Connect a pressure gauge to the fuel line.
Disconnect the vacuum hose from the pressure regulator.
With the engine running, the gauge should read approximately 35 psi.
Reconnect the vacuum hose to the pressure regulator, the gauge should drop to approximately 28 psi.

Auxiliary Air Regulator

The auxiliary air regulator provides **additional air** and consequently more fuel during engine warm-up.



What Has Changed?

The design has been simplified and the unit is smaller in size.

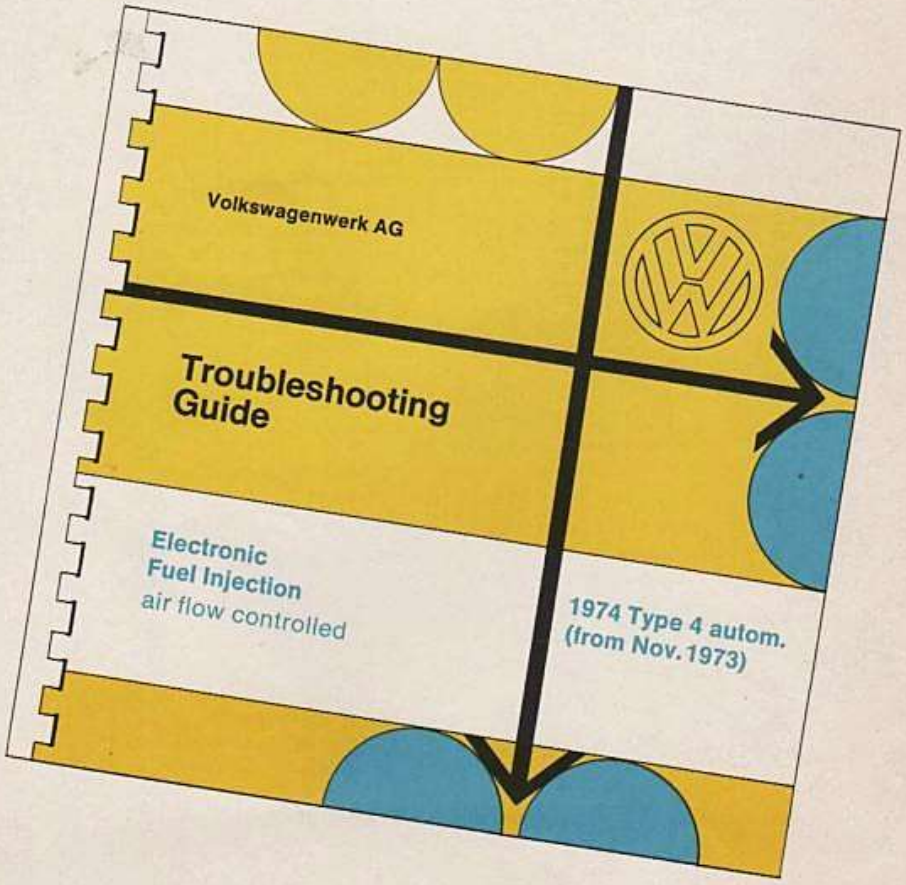
How Does It Work?

A gate valve in the auxiliary air regulator is open to provide more air when the engine is cold.
When the engine is started a heating element around a bi-metal spring begins to warm up.
Heat deflects the bi-metal spring and closes the gate valve cutting off additional air.

How Is It Tested?

Disconnect the plug from the auxiliary air regulator.
Take an ohm reading between the two contacts.
The reading should be 30 ohms.

A **Trouble Shooting Guide,**
Electronic Fuel Injection
(air flow controlled)
is also available.



Always refer to Workshop Manuals,
Bulletins und Circulars for
subsequent information.

Notes

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