

# Chapter 4 Part F:






## Fuel and exhaust systems - Digifant fuel injection

The following information is a revision of, or supplementary to, that contained in Part B of this Chapter

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### Degrees of difficulty

<b>Easy</b> , suitable for novice with little experience 	<b>Fairly easy</b> , suitable for beginner with some experience 	<b>Fairly difficult</b> , suitable for competent DIY mechanic 	<b>Difficult</b> , suitable for experienced DIY mechanic 	<b>Very difficult</b> , suitable for expert DIY or professional 
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### Specifications

#### Injection system

Type	Digifant
Application	1.8 litre (codes PBX and PF) engine
System pressure at idle:	
On	Approximately 2.5 bar
Off	Approximately 3.0 bar
Idle speed	800 ± 50 rpm
CO content %	1.0 ± 0.5
Holding pressure (System off for 10 minutes)	2.0 bar minimum

#### Torque wrench settings

	Nm	lbf ft
Throttle valve housing	20	15
Inlet manifold	25	19
Fuel pressure regulator	15	11
Injector insert	20	15

#### 1 General information and precautions

##### General information

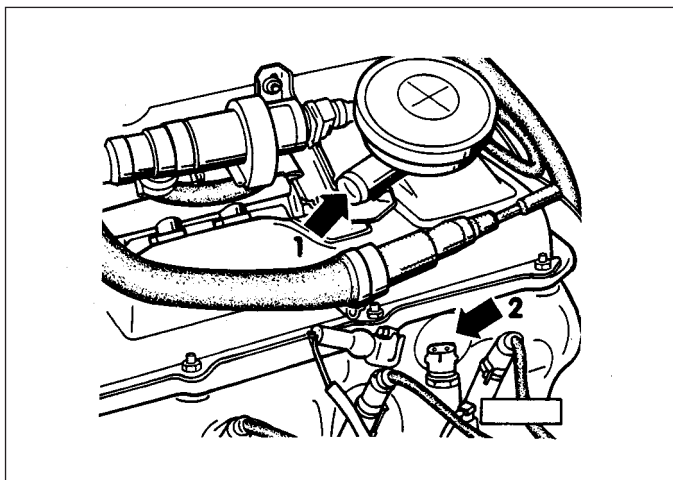
The Digifant fuel injection system is fitted to the 1.8 litre (codes PB and PF) engine and is a fully electronic and computerised version of the K-Jetronic system described in Part B of this Chapter.

The main components include a computerised control unit, electronic injectors and various sensors to monitor engine temperature and speed, induction air flow and throttle position. The control unit determines the opening period of the injectors and also continuously adjusts ignition timing according to engine speed, load and temperature.

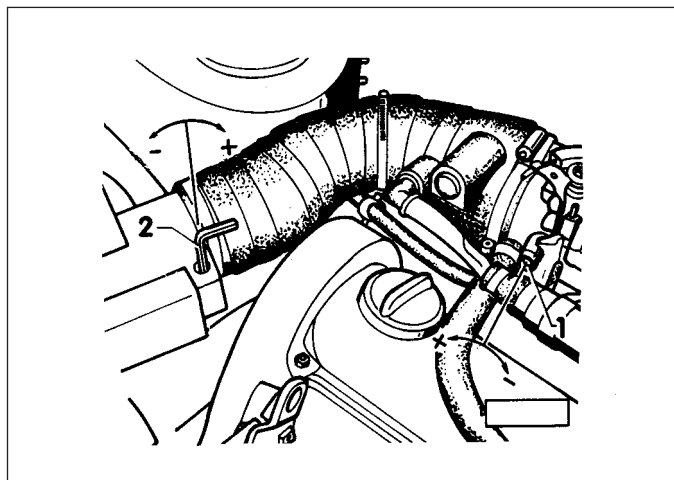
##### Precautions

Refer to Sections 1 and 2 in Part B of this Chapter whilst noting the following:

- Take extra care to prevent dust and dirt entering system components
- Do not use compressed air or fluffy cloths for cleaning
- Switch off the ignition before disconnecting any component wiring or when washing the engine
- Boost-charging the battery is only permissible for one minute at 16.5 volts maximum
- Disconnect both battery leads before carrying out any electric welding



2.6 Crankcase ventilation pressure regulating valve (1) and temperature sender (2)



2.7 Idle speed adjusting screw (1) and mixture (CO content) adjusting screw (2)

## 2 Idle speed and mixture (CO content) - adjustment



1 Run the engine until the oil temperature is at least 80°C. This should correspond to normal operating temperature.

2 Switch off all electrical components, including the air conditioning, where fitted. Note that the radiator fan must be stationary during adjustment.

3 For accurate adjustment, the throttle valve switch and idling stabilisation control valve must be functioning correctly and the ignition timing must be correct.

4 With the engine stopped, connect a tachometer to the engine. Plug one of the exhaust tailpipes and position the probe of an exhaust gas analyser in the remaining pipe.

5 Disconnect the crankcase ventilation hose from the pressure regulating valve on the valve cover and plug the hose.

6 Run the engine at idle speed. After approximately one minute, disconnect the wire from the temperature sender (see illustration) and quickly increase the engine speed to 3000 rpm three times.

7 With the engine idling, check the idle speed and CO content. If necessary, adjust the screws (see illustration). The CO adjustment screw is fitted with a tamperproof plug at the factory. This plug should be prised out before making an adjustment.

8 Reconnect the temperature sender wire and again quickly increase the engine speed to 3000 rpm three times. With the engine idling, the idle speed and CO content should be as specified. If necessary, make any small corrections required.

9 Fit a new tamperproof plug.

10 Reconnect the crankcase ventilation hose. Note that if this increases the CO content, do not alter the adjustment. The cause is fuel dilution of the engine oil due to frequent stop/start use. A long fast drive

should reduce the CO content to the correct level. Alternatively, an oil change will achieve the same objective.

## 3 Idle speed stabilisation system - testing



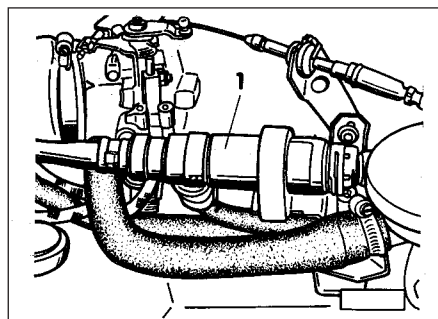
1 Check that the stabilisation control valve buzzes when the ignition is switched on. If not, use an ohmmeter to check the continuity of the valve after pulling off the connector (see illustration).

2 Run the engine until the oil temperature is at least 80°C. This should correspond to normal operating temperature.

3 Connect a multi-meter to the stabilisation control valve in series with the existing wiring.

4 All electrical components must be switched off during the test and power steering (where fitted) centralised.

5 Run the engine at idle speed. After approximately one minute, quickly increase the engine speed to 3000 rpm three times. At idling speed, the control current should be approximately 420 ± 30 mA and fluctuating. With the temperature sender plug disconnected, the current should be approximately 420 ± 30 mA but constant.



3.1 Idle speed stabilisation control valve (1)

## 4 Automatic air cleaner temperature control - testing



1 Disconnect the hose from the vacuum unit then remove the air cleaner cover and element.

2 Check that the flap in the lower body is closing the warm air inlet.

3 Suck on the vacuum hose and check that the flap moves freely to close the cold air inlet.

4 Flap operation may be checked with the engine idling by extending the vacuum hose and positioning a thermometer by the temperature regulator. Below 20°C, the cold air inlet must be closed. Above 30°C, the warm air inlet must be closed. Between 20°C and 30°C, the flap should be positioned midway so that both inlets are open.

5 Refit the air cleaner element and cover, then reconnect the hose.

## 5 Throttle valve switches - testing and adjustment

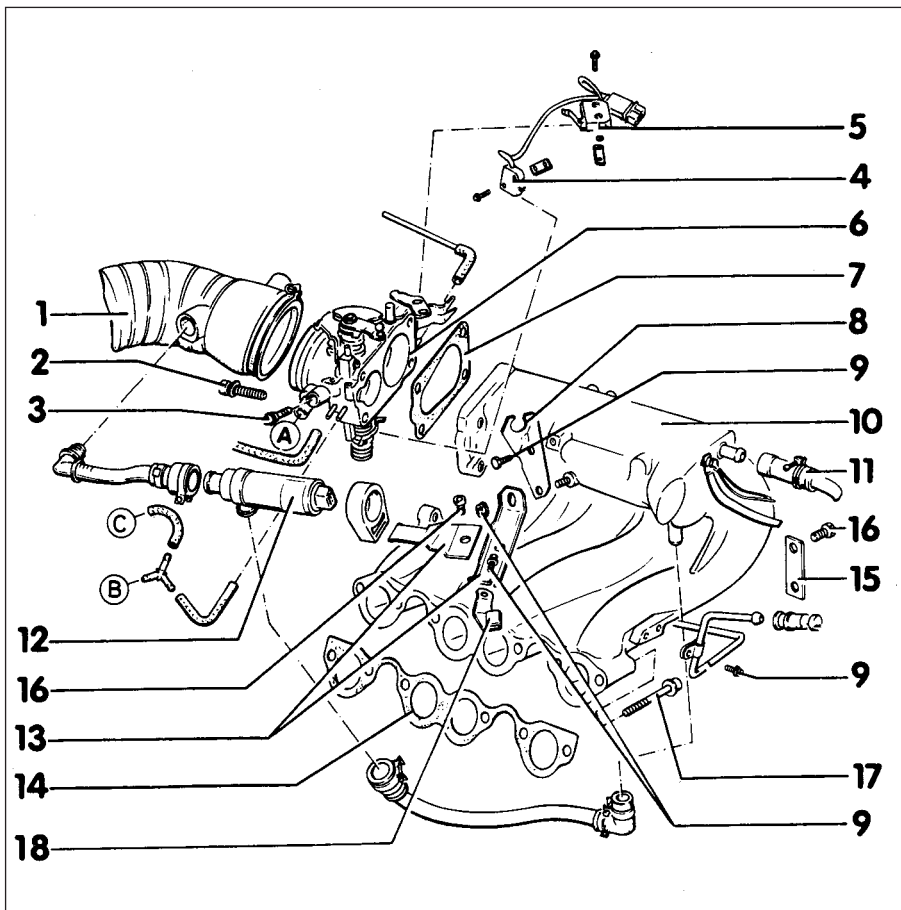


1 There are two throttle valve switches. Switch 1 monitors the throttle valve closed position and switch 2 monitors the throttle valve fully open position (see illustration).

2 Disconnect the supply plug from switch 2 and check that approximately 5 volts is available across the two terminals with the ignition switched on. If not, check the wiring from the control unit.

3 Connect an ohmmeter across the terminals of switch 2, then slowly open the throttle valve until the switch points close. The gap at the throttle lever stop must be 0.20 to 0.60 mm when the points close. If necessary, adjust the position of switch 1.

4 A piece of card marked with 10° is required to check switch 2. Attach the card to the first stage throttle valve shaft.



5.1 Throttle valve housing components

- |   |                           |   |
|---|---------------------------|---|
| A Front crankcase ventilation valve                   | 1 Air inlet hose          | 11 Vacuum hose to brake servo unit        |
| B Vacuum hose connection from fuel pressure regulator | 2 Bolt                    | 12 Idle speed stabilisation control valve |
| C Vacuum hose from air cleaner temperature regulator  | 3 Idle speed adjustment   | 13 Support                                |
|   | 4 Throttle valve switch 1 | 14 Gasket                                 |
|   | 5 Throttle valve switch 2 | 15 Support                                |
|   | 6 Throttle valve housing  | 16 Bolt                                   |
|   | 7 Gasket                  | 17 Bolt                                   |
|   | 8 Bracket                 | 18 Bracket                                |
|   | 9 Bolt                    |   |
|   | 10 Inlet manifold         |   |

5 Fully open the throttle and align a datum with 0° on the card. Close the throttle by approximately 20°, then slowly open it until switch 2 points close. This should occur at 10° ± 2° before full throttle. If necessary, adjust the position of switch 2. Note that the throttle valve lever roller must contact the sloping part of switch 2.

### 6 Throttle stop - adjustment



1 Throttle stop adjustment is initially set at the factory and should not be tampered with. However, if it is accidentally disturbed, proceed as follows.

2 Back off the adjustment screw until a gap exists between the carrier lever and stop lever (see illustration).

3 Turn the adjustment screw until the two levers just make contact, then continue to turn it a further half-turn. Tighten the locknut.

4 After making an adjustment, readjust the throttle valve switches, and the idle speed and mixture.

### 7 Fuel pressure regulator - testing



A pressure gauge and adapter is required for this test. As these will not normally be available to the home mechanic, it is recommended that a VW dealer carry out the test.

### 8 Fuel injectors - testing



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1 Refer to Part B of this Chapter, Section 13, paragraphs 1 to 3, but in addition, carry out the following electrical tests (see illustration).  
2 Disconnect the wiring plug from the conduit next to the injectors and connect an ohmmeter across the terminals on the conduit. The resistance of all four injectors should be 3.7 to 5.0 ohms. If any number of injectors are open-circuited, then the resistance will be as follows:

One injector open-circuited - 5.0 to 6.7 ohms  
Two injectors open-circuited - 7.5 to 10.0 ohms

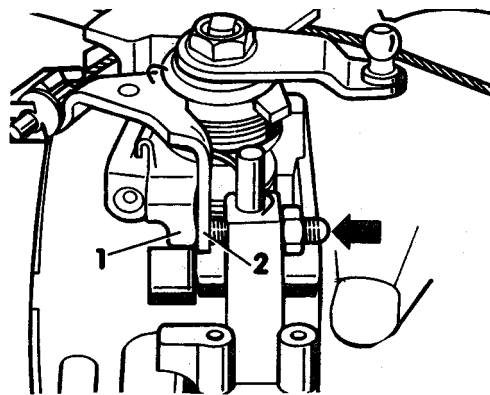
Three injectors open-circuited - 15.0 to 20.0 ohms

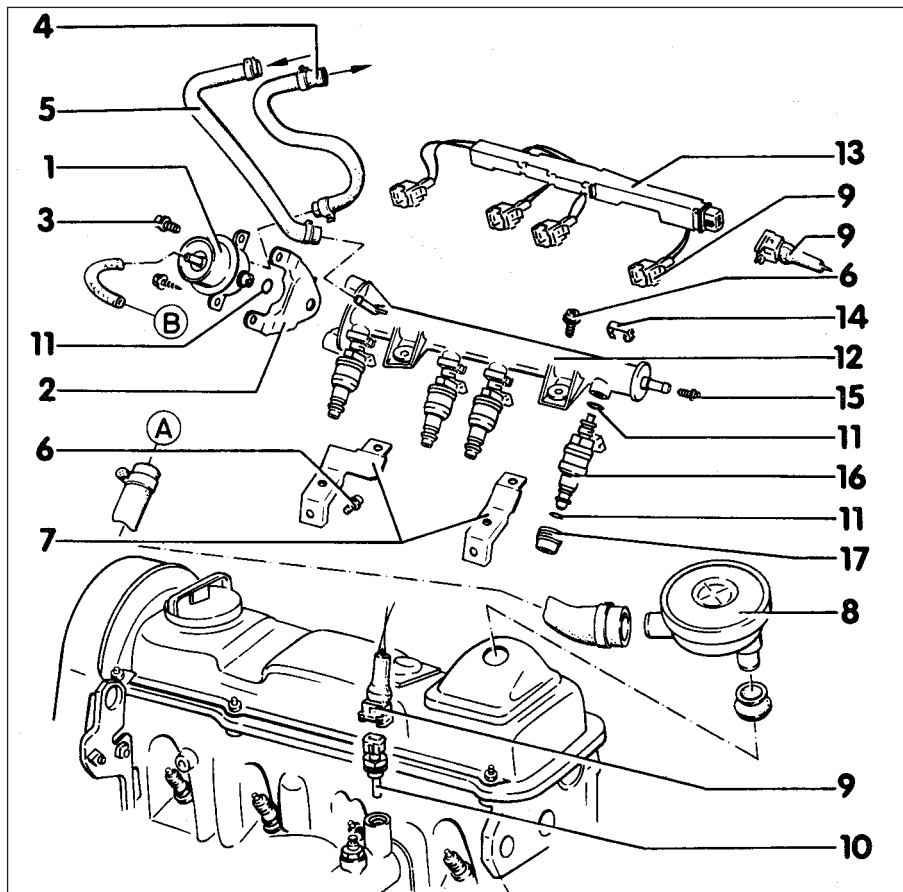
3 If necessary, prise off the conduit and check that each individual injector has a resistance of 15.0 to 20.0 ohms.

4 Checking the injector spray patterns cannot be performed as described in Part B of this Chapter, due to the position of the fuel distributor. However, the injectors may be removed together with the fuel distributor and wiring conduit, and the engine turned on the starter for a few seconds. Use a suitable container to catch the fuel.

### 6.2 Throttle stop adjustment

- 1 Carrier lever    2 Stop lever  
Arrow indicates adjustment screw





8.1 Fuel injectors and pressure regulator components

- |                               |  |                     |
|-------------------------------|--|---------------------|
| A Crankcase, ventilation hose | 5 Fuel supply hose (black)                       | 11 O-ring           |
| B Vacuum hose                 | 6 Bolt   | 12 Fuel distributor |
| 1 Fuel pressure regulator     | 7 Bracket  | 13 Wiring conduit   |
| 2 Bracket                     | 8 Crankcase ventilation pressure regulator valve | 14 Clip             |
| 3 Bolt                        | 9 Connector                                      | 15 Plug             |
| 4 Fuel return hose (blue)     | 10 Temperature sender                            | 16 Injector         |
|                               |  | 17 Insert           |

### 9 Airflow meter - testing



- 1 Disconnect the wiring plug from the airflow meter (see illustration).
- 2 Connect an ohmmeter between terminals 1 and 4 and check that the resistance of the inlet air temperature sender is as shown (see illustration) according to the ambient air temperature.
- 3 Connect the ohmmeter between terminals 3 and 4 and check that the resistance of the potentiometer is between 0.5 and 1.0 K ohms.
- 4 Connect the ohmmeter between terminals 2

and 3 and check that the resistance fluctuates as the airflow meter plate is moved.

### 10 Control unit - testing



The control unit is located on the left-hand side of the bulkhead. The ignition must always be switched off before disconnecting the plug.

It is not possible to test the control unit without using the VW test appliances. If a fault is suspected, the unit should be taken to a VW dealer.

### 11 Overrun cut-off and full throttle enrichment - testing



- 1 Run the engine until the oil temperature is at least 80°C (normal operating temperature) then let the engine idle.
- 2 Manually close the full throttle valve switch 2 and hold it closed.
- 3 Open the throttle until the engine speed is approximately 2000 rpm. Check that the engine speed surges, indicating that the overrun cut-off is functioning.
- 4 If the engine does not surge, disconnect the wiring from the temperature sender and connect a bridging wire between the two contacts on the plug.
- 5 Repeat the procedure in paragraphs 2 and 3. If the engine now surges, the temperature sender is proved faulty. However, if it still refuses to surge, check the associated wiring and throttle valve switch 2.
- 6 If no fault is found, renew the control unit.

### 12 Fuel pumps - testing

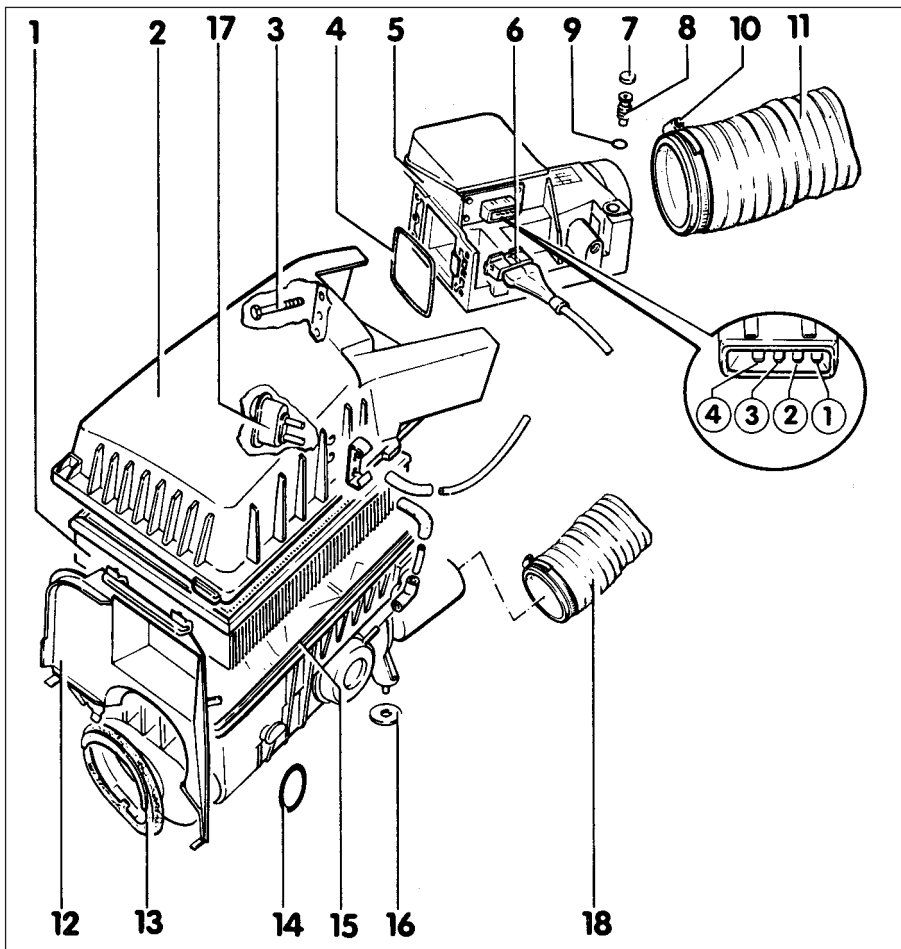


#### Pre mid 1989

- 1 The main fuel pump is located in the accumulator housing beneath the rear of the vehicle. An additional lift pump is located in the fuel tank, together with the fuel gauge sender (see illustration).
- 2 With the engine stopped, have an assistant switch on the ignition. It should be possible to hear both pumps running for a short period. If not, check fuse 5 for continuity and also check all wiring connections.
- 3 With the ignition on, disconnect each wire connector from the pumps and check that there is a 12 volt supply by using a voltmeter.
- 4 Should there be no voltage at the pumps with the ignition switched on, the fuel pump relay (No 2 on fusebox) may be faulty. This is best checked by substituting a new relay.

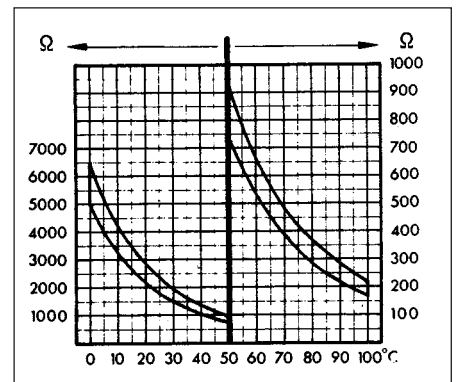
#### From mid 1989

- 5 From mid 1989, certain models fitted with the Digifant system are fitted with a single fuel pump in the fuel tank rather than the previous arrangement described above. The pump can be tested in the same manner as that described for the previously fitted "in-tank" dual pump.
- 6 The fuel pump can be removed in a similar manner to that described for the fuel gauge sender unit in Part A of this Chapter, Section 8.



9.1 Airflow meter components

- |   |                          |
|---|--------------------------|
| 1 Air cleaner element                   | 9 O-ring                 |
| 2 Cover                                 | 10 Clip                  |
| 3 Bolt                                  | 11 Air inlet hose        |
| 4 Seal                                  | 12 Plate                 |
| 5 Airflow meter                         | 13 Seal                  |
| 6 Connector                             | 14 Retaining ring        |
| 7 Tamperproof plug                      | 15 Air cleaner body      |
| 8 Mixture (CO content) adjustment screw | 16 Rubber washer         |
|   | 17 Temperature regulator |
|   | 18 Warm air hose         |



9.2 Inlet air temperature sender resistance graph

12.1 Fuel pump and filter components

- 1 Bracket
- 2 Rubber mounting
- 3 Nut
- 4 Fuel supply to fuel distributor
- 5 Fuel filter
- 6 Pump accumulator
- 7 Strainer
- 8 Fuel pump
- 9 O-ring
- 10 Retainer
- 11 From fuel lift pump in fuel tank
- 12 Return to fuel tank
- 13 Return from pressure regulator
- 14 Adapter

