

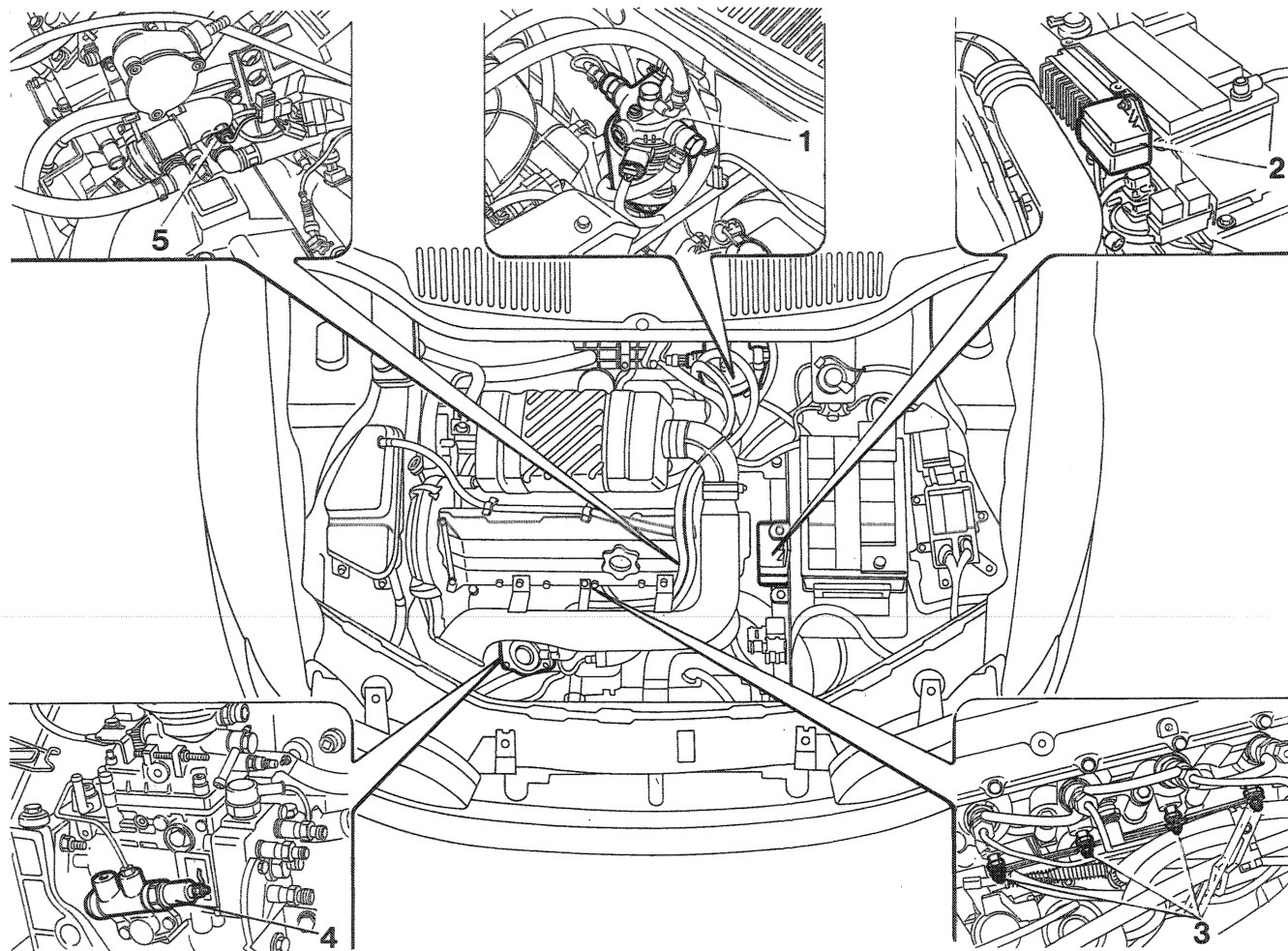
PUNTO eMANUAL

Electrical Equipment

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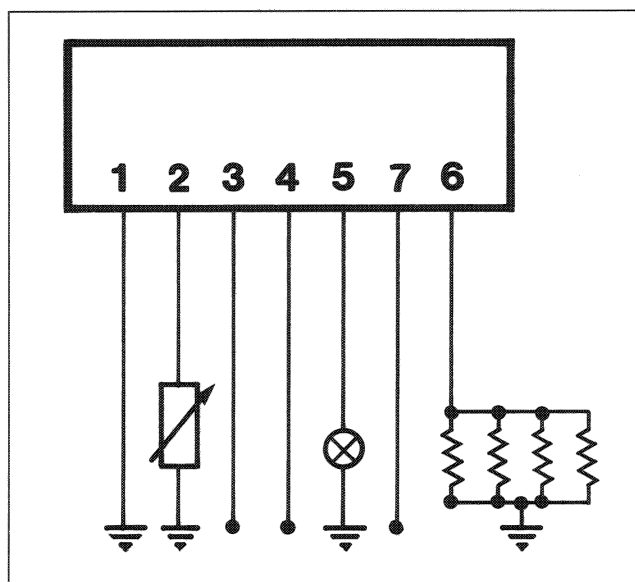
LOCATION OF COMPONENTS ON CAR



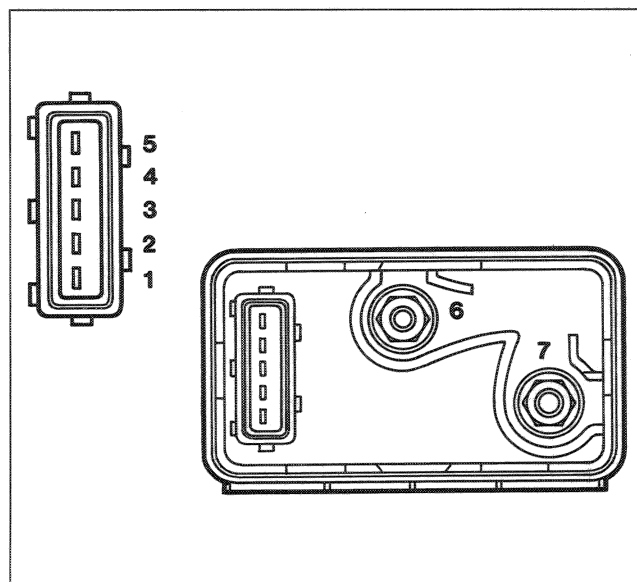
P3M122L07

1. Heated fuel filter and device for detecting presence of water in fuel
2. Plug preheating control unit
3. Heater plugs
4. Device for automatic injection advance under cold conditions (KSB)
5. Thermal switch for automatic injection advance under cold conditions (KSB)

PREHEATING CONTROL UNIT



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P3M123L02

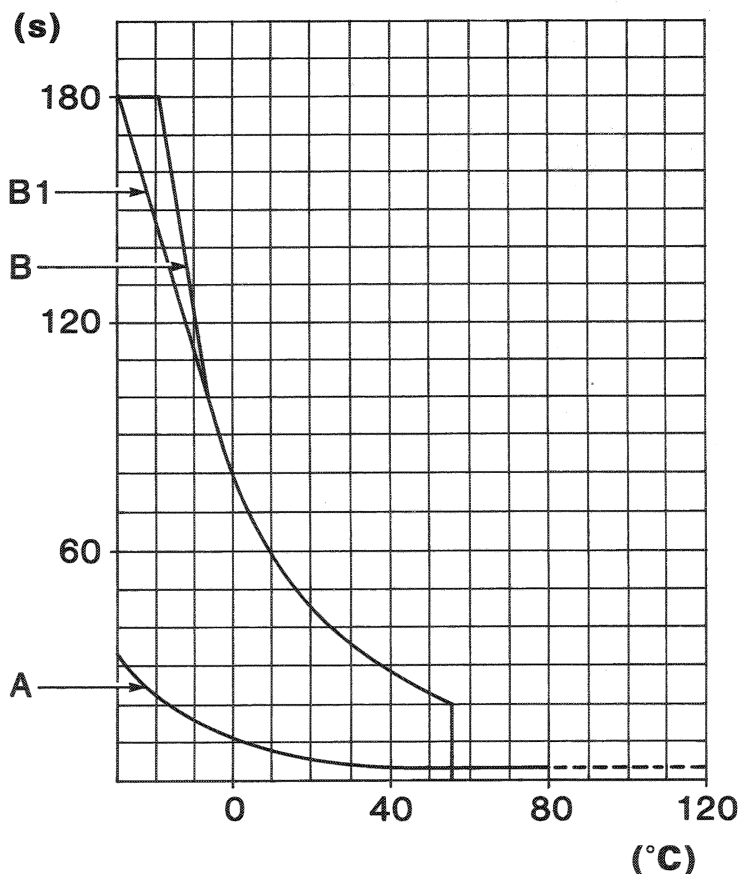
WIRING DIAGRAM

Connections	
1.	Earth
2.	Thermal switch (NTC)
3.	Ignition switch (+15)
4.	Ignition switch (+50)
5.	Warning light on dashboard
6.	Heater plugs
7.	Direct positive from battery (+30)

- The graph in the figure shows three curves:
- Curve A shows the PREHEATING times in accordance with the engine coolant temperature; the plugs are supplied and the warning lamp on the instrument panel is on.
- Curve B shows the POST-HEATING times; these are counted from the time when the engine is started.
- Curve B1 is an alternative to curve B and is the only permitted solution.
- At the end of the POST-HEATING phase, the device switches itself off.

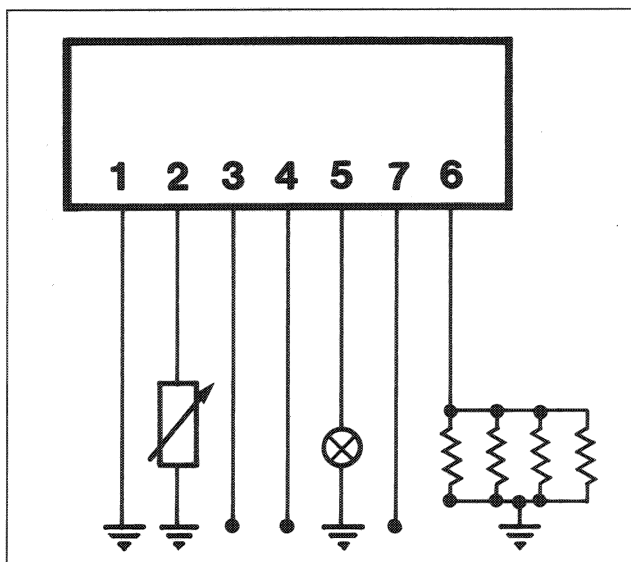
There are some precautions:

1. Preheating must not be interrupted if the engine coolant temperature is less than 80 °C.
2. The maintenance time (plugs supplied and instrument panel warning light off) is 10 seconds. It is counted from the moment when the warning light on the instrument panel is switched off.



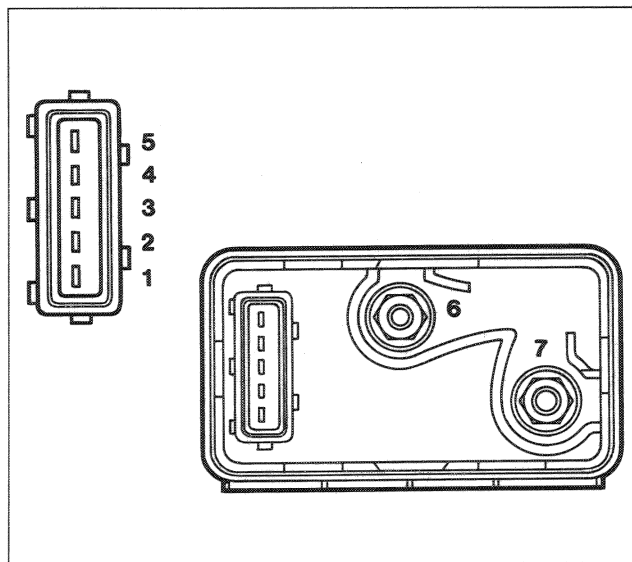
P3M123L03

PRE-HEATING CONTROL UNIT



P3M123L01

WIRING DIAGRAM



P3M123L02

Connections

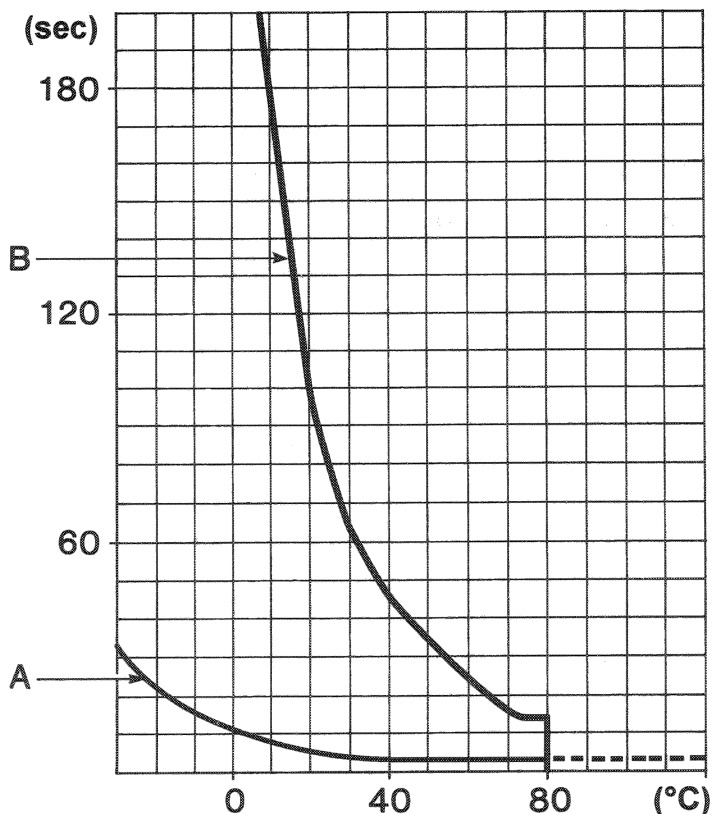
1. Earth
2. Thermal switch (NTC)
3. Ignition switch (+15)
4. Ignition switch (+50)
5. Warning light in dashboard
6. Heater plugs
7. Direct positive from battery (+30)

The graph shows two curves:

- Curve A indicates the PRE-HEATING times depending on the temperature of the engine coolant; the heater plugs are supplied and the warning light in the instrument panel is on.
- Curve B indicates the POST-HEATING times starting from the moment the engine is started; the heater plugs are supplied and the warning light in the instrument panel is off.
- The POST-HEATING stage also corresponds to a diagnostic function with which it is possible to signal faults with the coolant temperature sensor or the appropriate circuit by a warning light flashing in the instrument panel for 60 seconds.
- At the end of the POST-HEATING stage the device switches itself off.



The pre-heating should not be interrupted for engine coolant temperatures of below 80°C. The maintenance time (heater plugs supplied and warning light in instrument panel off) is 10 seconds from the moment the warning light in the instrument panel goes out.



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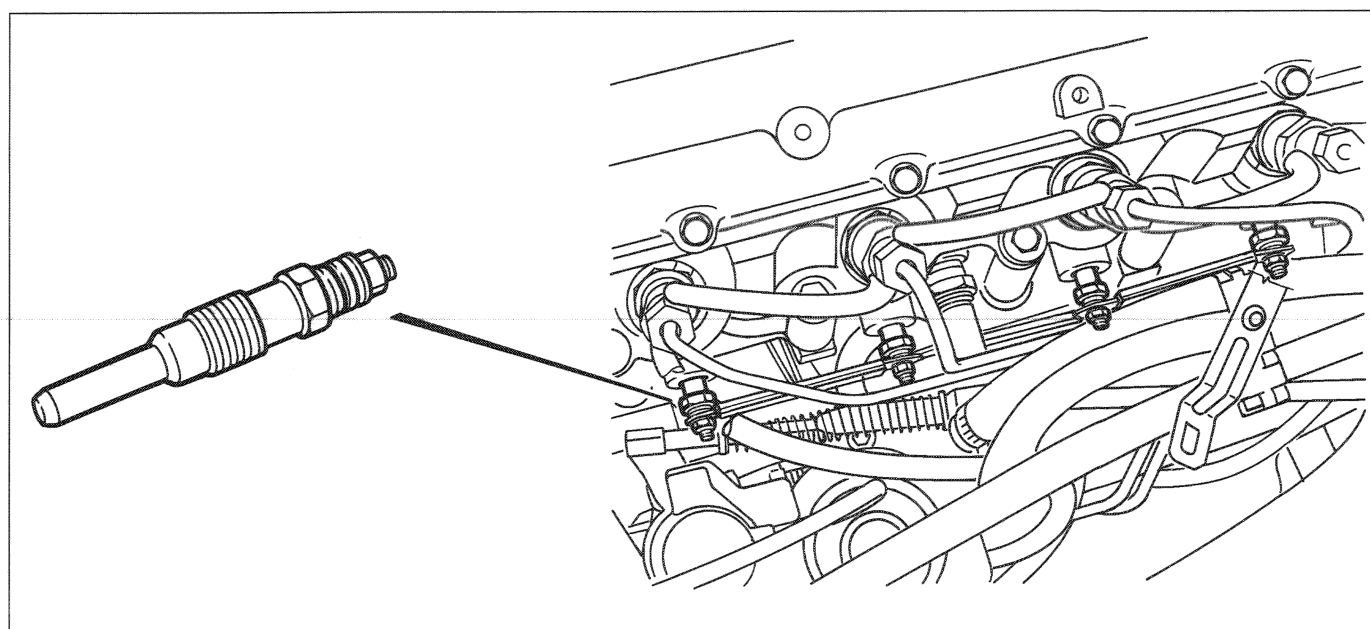
HEATER PLUGS

In the case of difficult starting, check that all the plugs are functioning correctly. Each plug should be checked for electrical continuity ($\Omega=0.6$ at 20°C by means of a digital ohmmeter).

It is best to carry out this check with the plugs fitted to the cylinder head, since a faulty plug may not appear to be faulty when dismantled from its location, because when dismantled the deforming effect caused by the assembly pressure is absent. Also check that the engine cut-off solenoid on the fuel injection pump is not short-circuited, broken or disconnected.

NOTE Remember that starting problems may be caused by worn seals on the engine, a faulty starter motor or a discharged or badly connected battery.

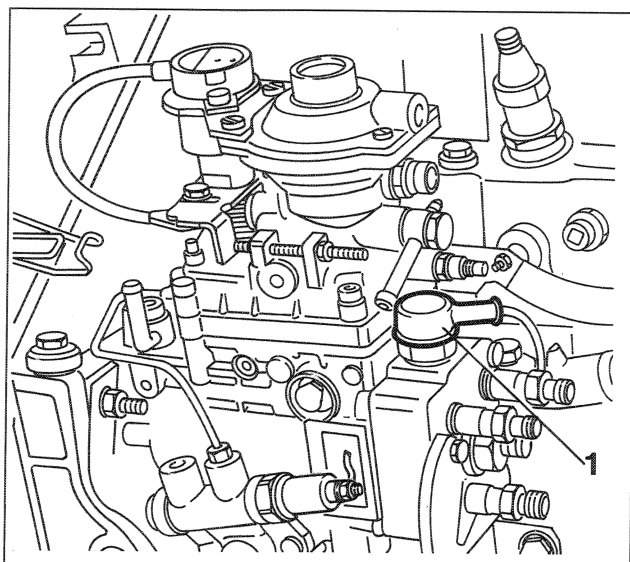
The plug consists of two resistive filaments: one for heating and one for stabilization. The heater plugs have different operating temperatures: in particular, they must reach a temperature of 850°C in the first 7 seconds of operation, they must reach a temperature of 1000°C after 9 seconds and they must stabilize at a temperature of about 900°C after 180 seconds.



P3M124L01

DIAGNOSING MAIN OPERATING FAULTS ON THE PLUG PREHEATING SYSTEM

Fault	Cause	Remedy
The wait-to-start warning lamp does not come on	Warning lamp bulb blown Connecting cable between warning lamp and pin 5 on control unit broken	Replace bulb Clean the corroded cable ends or replace the cable
Engine starts with difficulty	Control unit faulty, causing excessively short preheating times	Replace control unit
Engine does not start	Electronic control unit not connected to earth	Check that pin 1 of the control unit is connected to earth
	One or more faulty plugs	Replace the faulty plugs
	Circuit between ignition switch and pin 3 (+15) of control unit broken	Repair the connection
	Circuit between ignition switch and engine cut-off solenoid on fuel injection pump broken	Repair the connection
	Ignition switch faulty	Replace the ignition switch



P3M125L01

ENGINE CUT-OFF SOLENOID

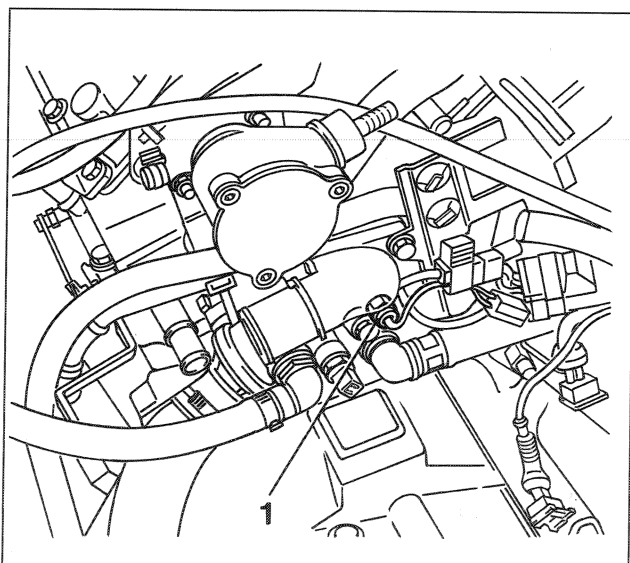
Checking operation of engine cut-off solenoid (on fuel injection pump)

- Switch the ignition on (MAR position) in order to energize the engine cut-off solenoid on the fuel injection pump.

The noise of the solenoid being triggered should be heard from the engine compartment. If not, check the operation of the solenoid and if it is satisfactory, check for a break in the connecting cable between the ignition switch and the engine cut-off solenoid (see wiring diagram).

1. Engine cut-off solenoid

DEVICE FOR AUTOMATIC ADVANCE UNDER COLD CONDITIONS (K.S.B.)



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Components

The electrical components of this device are:

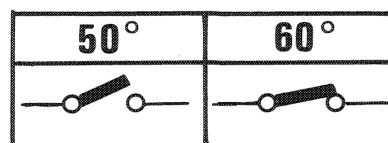
- A thermal switch (1) located **on the thermostat** for the engine coolant;
- a wax thermal bulb (2).

Operation

- The purpose of this device is to advance the point of fuel injection in order to ensure regular operation of the engine under cold conditions, by acting on the injection pump's internal advance mechanism by means of the transfer pressure.

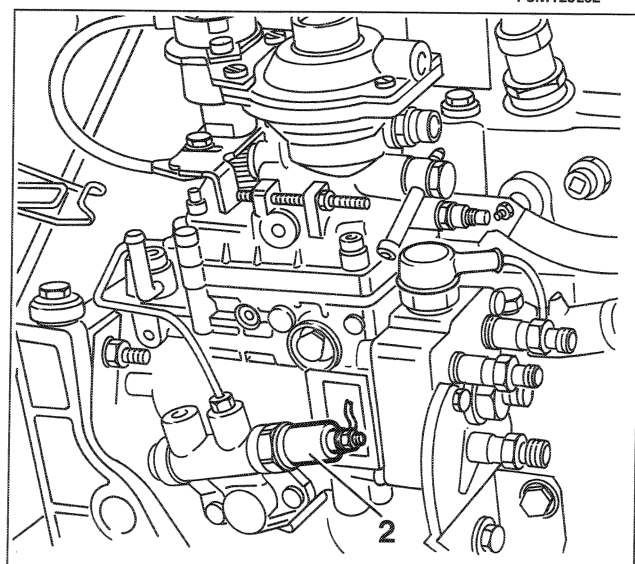
This is cancelled when the engine coolant reaches a temperature of about 60 °C. At this temperature, the wax bulb (2), which is supplied by the thermal switch (1), begins to warm up. The wax it contains expands, pushing out a rod which in turn pushes a ball valve.

This valve opens, discharging the fuel injection pump's transfer pressure, so restoring the normal operating advance values (see "Fuel system" section).



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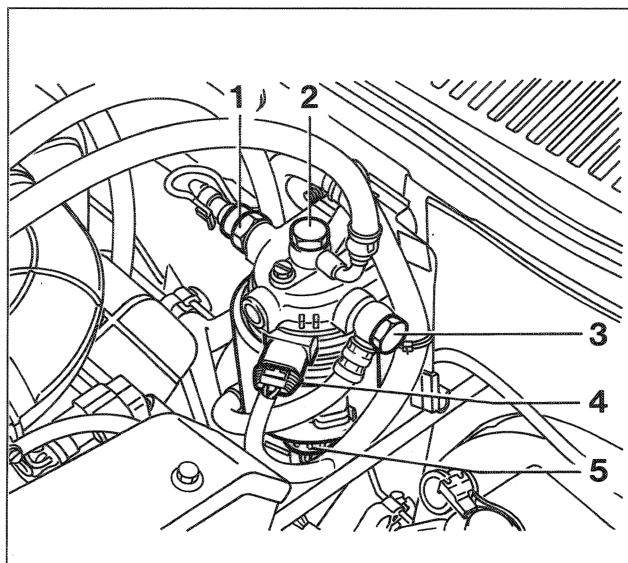
1. Thermal switch
2. Wax bulb



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DEVICE FOR HEATING FUEL AND DEVICE FOR DETECTING PRESENCE OF WATER IN FUEL FILTER



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Filter element complete with device for heating fuel and device for detecting presence of water in filter

1. Thermal switch
2. Fuel outlet
3. Fuel inlet
4. Fuel heating module
5. Water in fuel sensor

Description and operation of fuel heating device

The components of this device are:

- a thermal switch (2) located on the fuel filter mounting;
- a fuel heating module (4) on which a P.T.C. (Positive Temperature Coefficient) variable resistor is mounted;
- a relay for supplying the variable resistor.

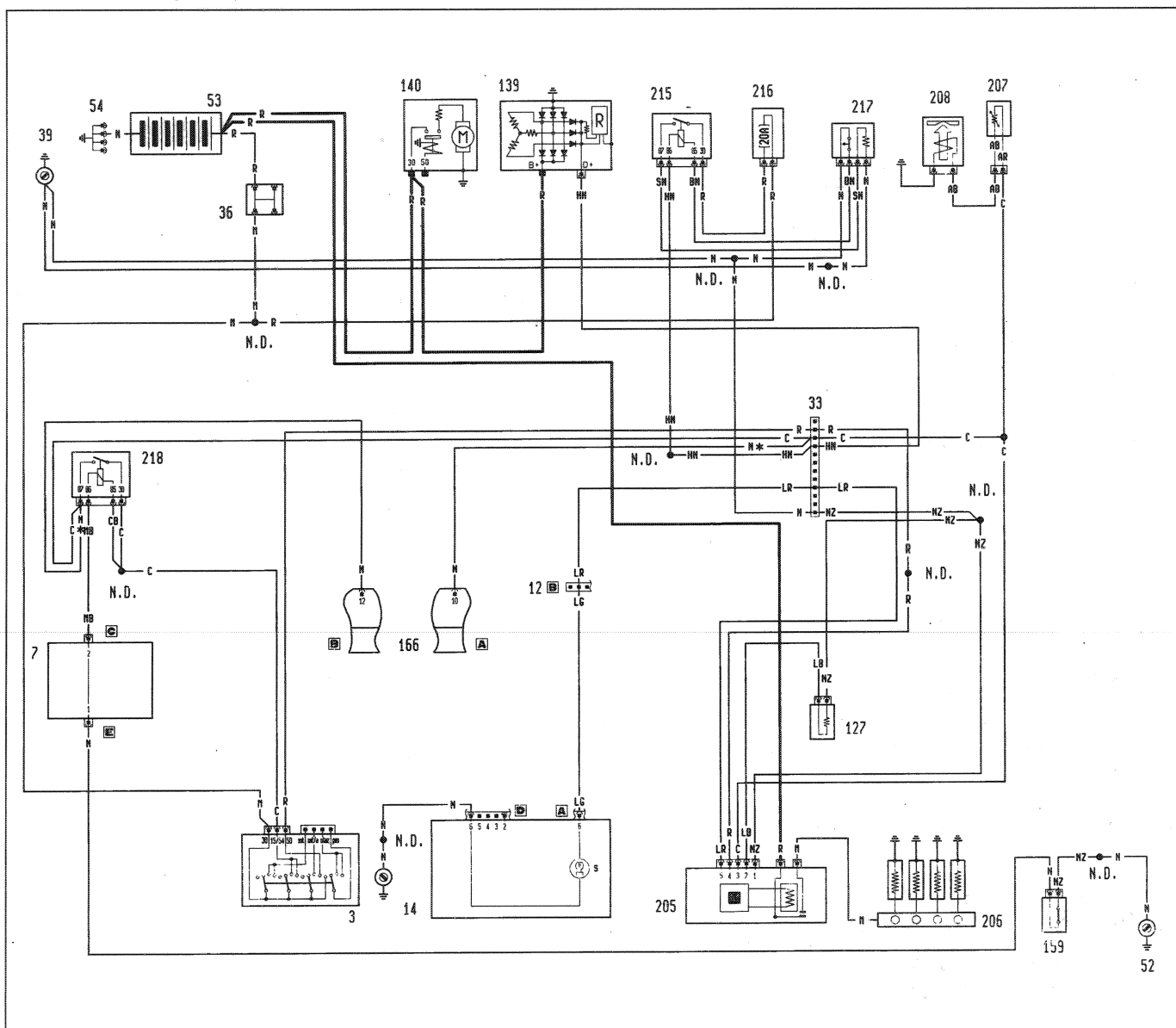
This device is activated when the engine is running at a temperature of below -3°C and not over 5°C .

When the engine has started, the alternator delivers current from terminal +D which is connected not only to the low battery charge warning light, but also to the energizer of the P.T.C. supply relay.

The relay's energization circuit is earthed in series with the contacts of the thermal switch (2), which are closed if the external temperature is below -3°C and open if the temperature exceeds 5°C .

This device therefore remains activated at temperature of below -3°C and not above $+5^{\circ}\text{C}$.

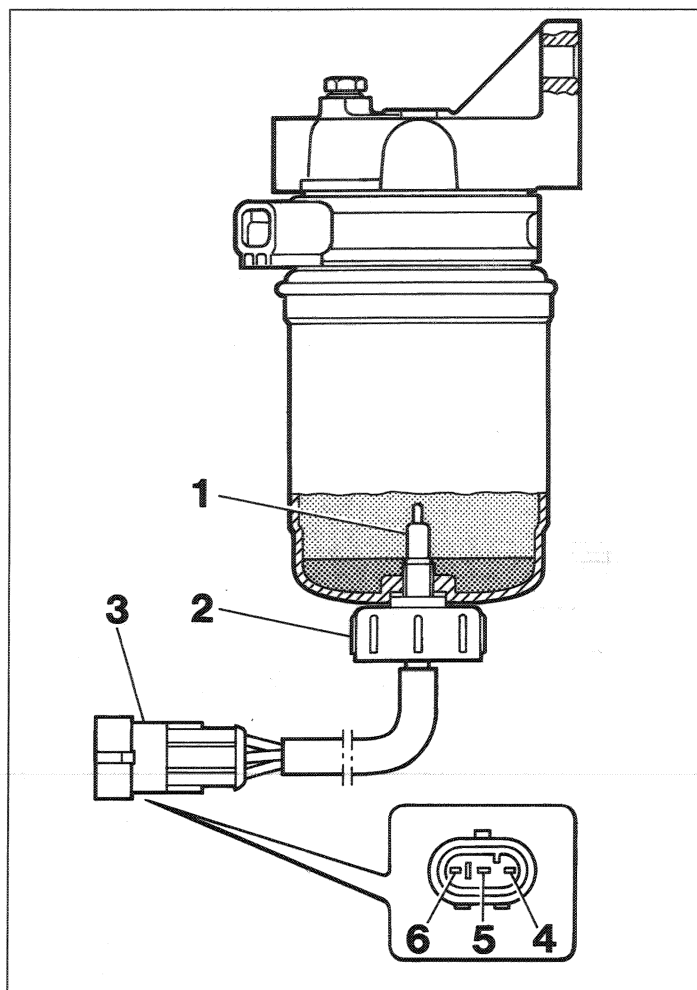
General wiring diagram



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- | | |
|---|--|
| 3. Ignition switch | 205. Plug preheating electronic control unit |
| 7. Junction unit | 206. Heater plugs |
| 12. Dashboard cables/front cables connections | 207. Water temperature sensor for K.S.B. |
| 14. Instrument panel | 208. K.S.B. solenoid |
| S. Heating plug warning light | 215. Relay controlling heated fuel filter device |
| 33. Front cables connection | 216. 20A fuse protecting heated fuel filter |
| 36. Connector block | 217. Heated fuel filter device (P.T.C.) |
| 39. Front left earth | 218. Fuel injection system control relay |
| 52. Rear right earth | |
| 53. Battery | |
| 54. Battery earth | |
| 127. Water temperature sensor | |
| 139. Alternator | |
| 140. Starter motor | |
| 159. Inertial switch | |
| 166. Anti-theft electronic control unit | |

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P3M128L14

Diagram of electronic device for detecting presence of water in fuel filter

1. Sensor driving module controlling detection device
2. Electronic module controlling warning lamp of the device
3. Connector for supplying the electronic module
4. Earth pin on battery earth node
5. Warning light supply pin
6. Electronic module supply pin

The purpose of the device illustrated is to indicate, by means of the warning lamp on the instrument panel, the presence of a certain quantity of condensed water in the fuel filter before this can cause interruptions (which are difficult to diagnose) in engine operation.

It exploits the higher conductivity and greater specific gravity of water compared with fuel.

Operation

If the condensed water that may be present in the fuel collects at the bottom of the fuel filter in sufficient quantity to touch the sensor (1), there is a considerable change in electrical conductivity between the sensor (1) and the vehicle's earth.

The sensor (1) is normally insulated from the filter whereas it is connected to the vehicle's earth through its mounting. When the connection between the sensor (1) and filter consists only of fuel, the electrical conductivity between these two is virtually nil; when the connection instead consists of water, the electrical conductivity between sensor and filter becomes very high.

This causes the operation of the electronic module (2) which is connected to the sensor (1) incorporated in the fuel filter's bleed knob.

Under these conditions, the voltage coming from the ignition switch (+15), switched to the ON (MARCIA) position, is enabled, by the electronic module's intervention, to pass between pins 6 and 4 of the connector 3 in order to reach the warning light and cause it to come on.

Draining the condensate

Without removing the filter cartridge, under the screw plug (2) with integrated electronic module a few turns and retighten it when fuel with no water emerges. Take care not to damage it while handling the plug.

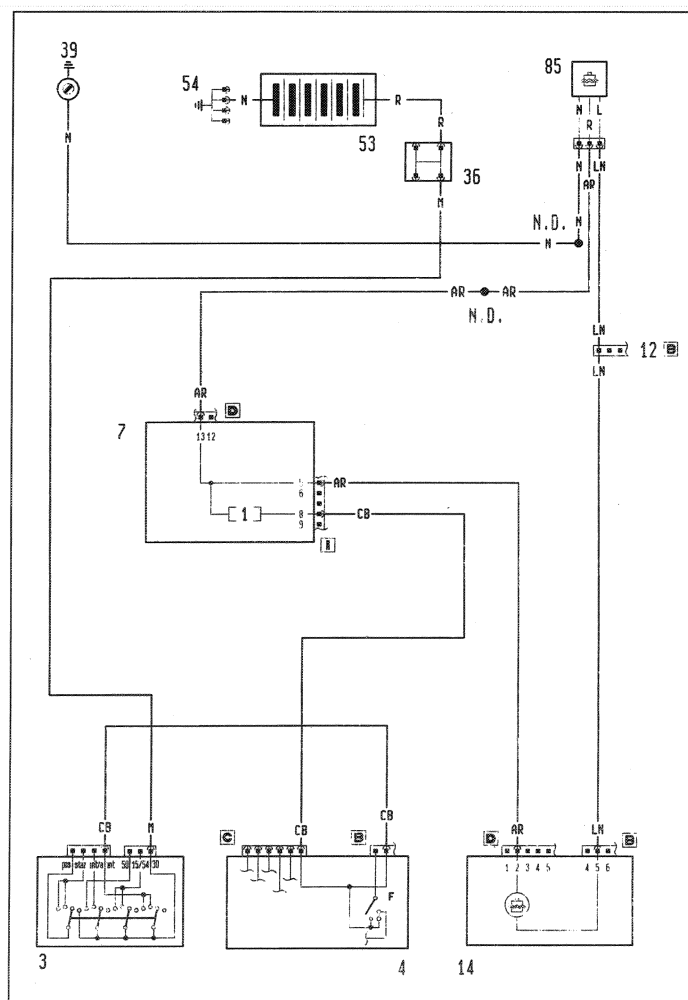


When the filter cartridge is replaced, make sure to reuse the screw plug with the new cartridge.

DIAGNOSING MAIN OPERATING FAULTS IN THE DEVICE FOR DETECTING PRESENCE OF WATER IN FUEL FILTER

Fault	Cause	Remedy
Warning light does not come on	Warning lamp blown or not connected to the control module Cable between warning light and electronic module broken Bulb not connected to earth in the instrument panel Module's earth cable not connected or is broken Electronic control module faulty	Replace the blown bulb in the instrument panel or connect the cable Repair the cable Repair the earth Repair the connection Replace the electronic control module assembly
Warning light stays on	Sensor short-circuited with fuel filter Electronic control unit faulty	Replace the electronic module assembly Replace the sensor-electronic control unit assembly

DIAGRAM OF ELECTRICAL SYSTEM



- 3. Ignition switch
- 4. Stalk unit
 - B Horn button
 - C Hazard warning lights switch
- 7. Junction unit
- 12. Dashboard cables/front cables connection
- 14. Instrument panel
 - Water in fuel filter warning light
- 36. Connector block
- 39. Front left earth
- 53. Battery
- 54. Battery earth
- 85. Sensor for indicating presence of water in fuel filter

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