INDEX

MOTRONIC MP3.1 SYSTEM

GENERAL DESCRIPTION

Injection is of the pressure/speed type and the four injectors are simultaneously controlled.
The system is of the closed circuit type to obtain the highest resolution efficiency of the pollutants through an oxygen probe (lambda) and a trivalent catalyzer. The quantity of fuel injected is controlled by the opening times of the electroinjectors. This time is established with a calculation based on the information supplied by the various sensors.
During normal operation (stable r.p.m.) the opening times of the injectors depends on the level of engine loading (measured by the pressure sensor and corrected on the basis of the air temperature) and on the rotational speed of the engine (measured by the r.p.m. sensor). These two conditions define the quantity of intake air. The injection time refers to a base map which takes into account all the operating conditions of the engine and is corrected on the basis of the thermal state of the engine shown by the water temperature and by the operating conditions like the altimetric pressure, battery voltage, variations in loading on the lambda probe etc.
Engine r.p.m. and the absolute pressure in the intake manifold also make it possible to calculate the optimal **ignition advance** for each engine condition.
The r.p.m and the temperature of the engine coolant are used to keep the **minimum rotational speed** constant when the engine is warming and when the various electrical accessories are switched on.
The idle speed actuator, installed on the intake box, regulates the quantity of air taken in by the engine in order to ensure that the idle speed stabilizes at the value established by the control unit.

COMPONENTS

The electronic control unit **S11** receives the signals coming from the sensors which "read" the engine operation, it processes them in accordance with a logic stored in "maps" which correlate the various parameters and activates the actuators as a consequence so that the engine operates with the maximum performance and regularity.
The sensors are:
- engine coolant temperature sensor (**S7**);
- air temperature sensor (**S34**);
- throttle body sensor with potentiometer (**S38**);
- engine r.p.m. and timing sensor (**S31**);
- oxygen sensor (heated lambda probe) (**S35**);
- absolute pressure sensor (inside the control unit).

The actuators controlled by the system are:
- electroinjectors (**S3**),
- ignition coil (**A8**) with power module (**N21**);
- fuel pump (**P18**);
- Constant idle speed actuator (**S29**);
- evaporation solenoid valve (**M15**).

FUNCTIONAL DESCRIPTION

The Motronic control unit **S11** controls the entire electronic ignition and injection system.
The control unit is directly supplied through pin 18 with battery voltage via fuse **S46 (8A)**.
The Motronic relay with diode **S12b**, activated with the "key in the MAR position" signal supplies the control unit (pin 35), pin 86 of the Motronic fuel pump relay **S12a**, the evaporation solenoid valve **M15**, the constant idle speed actuator **S29** and the electroinjectors **S3**.
The electric fuel pump **P18** is controlled by a relay **S12a**, which is supplied by the "key in the MAR position" signal and controlled by the control unit when the engine reaches 20- 25 r.p.m.; the power supply to the pump is protected by relay **S47 (15A)**.
The control unit **S11**receives numerous signals from the various sensors thus keeping all the parameters governing engine operation under control.
The engine r.p.m. and timing sensor **S31** supplies information about the engine r.p.m. and timing via the signals sent to pins 23 and 25 of the control unit. These signals are extremely low in intensity and are therefore suitably shielded.
This induction type sensor measures the engine r.p.m. through the variations in the magnetic field produced by the passage of the teeth on a phonic wheel fixed to the flywheel. The phonic wheel has 58 teeth as two are missing which makes it possible to identify the timing.
The throttle body sensor with potentiometer **S38**, supplied by

pins 6 (-) and 9 (+5V) of the control unit generates a signal via the potentiometer, which is sent to pin 3 and which is proportional to the angle of aperture of the throttle valve itself.

The engine coolant temperature sensor **S7** supplies a signal from 0 to 5V to pin 13 which is proportional to the temperature of the engine coolant, measured with a NTC material (resistance which decreases as the temperature increases).

The air temperature sensor **S34** supplies a signal from 0 to 5V to pin 22 which is proportional to the temperature of the air taken in by the manifold detected by the NTC material.

The heated lambda probe **S35** supplies the control unit with information regarding the correct composition of the air-fuel mixture measuring the concentration of the oxygen in the exhaust gas. This is carried out by the signal sent to pin 8 of the control unit with an earth reference to pin 24. The two wires are suitable shielded.

The probe is heated by a resistance which ensures its correct operation even when cold. The resistance is supplied by the fuel pump relay **S12a** and is protected by a fuse **S45** (**8A**).

Depending on the signals received from the sensors and and the calculations made, the control unit **S11** controls the aperture of the electroinjectors **S3** via pin 14. The electroinjectors receive 12V from the relay **S12b**.

Ignition, of the static type is controlled directly and automatically by the control unit. A negative signal is sent from pins 1 and 2 of the control unit to the power module **N21**, which generates the impulses sent to the main winding of the coil **A8** and from this, transformed into high voltage, to the spark plugs **A12**.

There are two double output coils grouped in group **A8**, and each is connected to two spark plugs, The main windings are supplied with a "Key in the MAR position" signal and the secondary winding sends the inpulse to the spark plugs **A12**.

The constant idle speed actuator **S29** forms an air flow by-pass line. It is composed of two windings: one of which opens and closes the box which regulates the aperture of the by-pass. A safety spring fixes the average value in the event of an anomaly affecting the device. The actuator is controlled by the control unit through signals of pins 33 and 34.

The evaporation solenoid valve **M15** allows the fuel vapours to pass to the engine intake where they are added to the mixture entering the combustion chamber. It is opened by the control unit when the engine is labouring through a signal from pin 31.

The control unit supplies the dashboard rev counter signal vial pin 21.

The control unit is connected by pins 29 and 32 to the air conditioning system in order to adjust the engine idle speed to the increase in power each time this component is engaged.

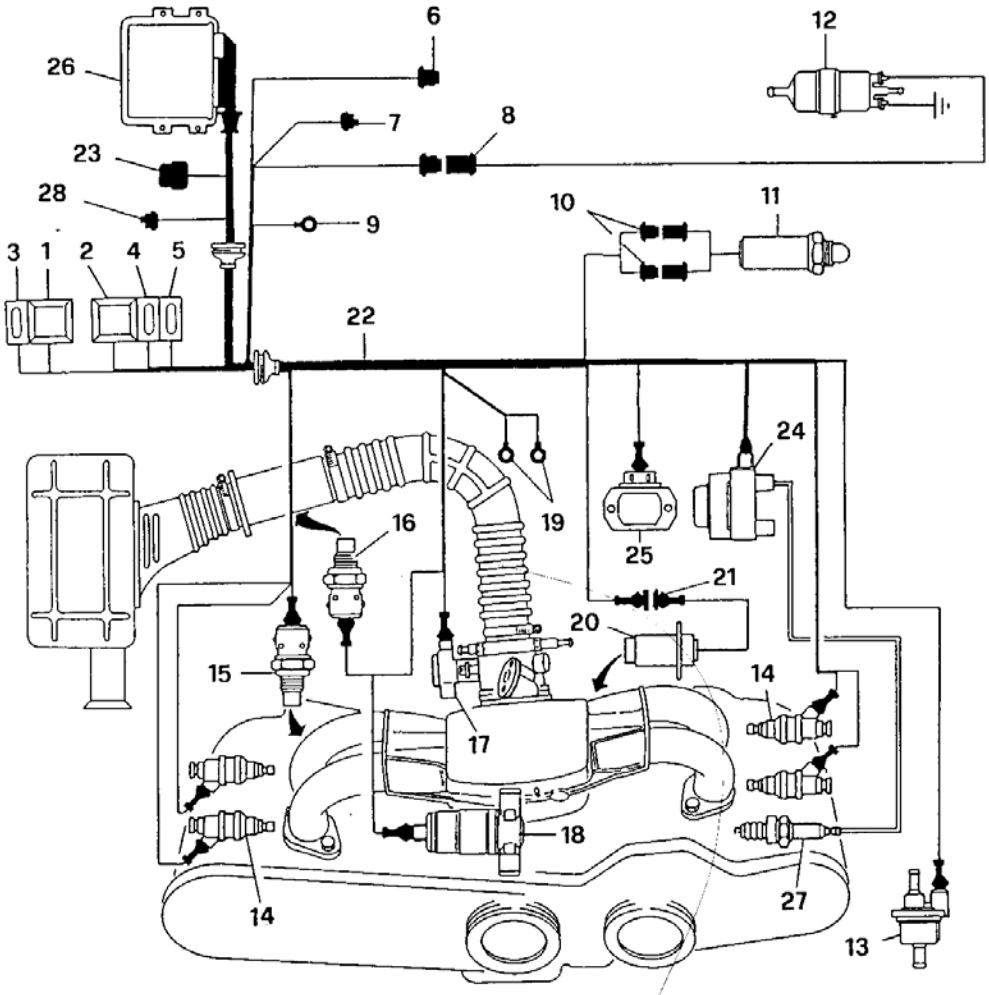
Pin 29 receives 12V each time the engagement of the compressor requested while pin pin 32 receives this voltage only when the compressor actually comes on.

The control unit is equipped with a self diagnosis system which can be used by connecting it serially to the ALFA ROMEO TESTER via connector **T1**. It is composed of three pins (A - B - C) connected respectively to pin 4 of the control unit **S11**, to earth **G66** and to pin 12 of the control unit **S11**.

The same control unit is used on engines of different cubic capacities and a special switch **S49**, connected to the control unit at pin 10 enables it to be set for the desired engine if the control unit is replaced.

- contact closed = 1.7 IE engine
- contact open = 1.5 IE engine

WIRING DIAGRAM



1. *Motronic relay with diode*
2. *Petrol pump Motronic relay*
3. *Motronic power supply wander fuse*
4. *Fuel pump wander fuse*
5. *Lambda probe wander fuse*
6. *Electric fan wiring for condensers connection*
7. *Rev counter signal connection*
8. *Dashboard wiring connection*
9. *Battery (+)*
10. *Connection for lambda probe*
11. *Heated lambda probe*
12. *Electric fuel pump*
13. *Evaporation solenoid valve*
14. *Electroinjectors*
15. *Water temperature sensor*
16. *Air temperature sensor*
17. *Sensor on throttle body with potentiometer*
18. *Constant idle speed actuator*
19. *Centralized earths*
20. *Engine r.p.m. and timing sensor*
21. *Engine r.p.m. and timing sensor connection*
22. *Electronic injection wiring*
23. *Connection for ALFA ROMEO TESTER*
24. *Ignition coil*
25. *Power module*
26. *Ignition and injection control unit (ECU)*
27. *Spark plugs*
28. *Switch connection for 1.5 - 1.7 engines*

FAULT DIAGNOSIS THROUGH SELF-DIAGNOSIS

The MP3.1 Motronic system employs two different self-diagnosis procedures which make it possible to identify most of the more common faults encountered when the vehicle is used.

- procedure employing the **ALFA ROMEO TESTER** (see separate publications);
- procedure employing the **FLASHING CODE.**

A fault diagnosis is given below which employs the FLASHING CODE system. Each malfunction is identified according to the composition of the anomaly code.

However this diagnosis does not recognize all the malfunctions which may affect the system.

Supplementary tests are therefore given to be carried out on those components which are not controlled by the flashing code.

Each test should be considered separately and must only be carried out to check the affected component.

TEST A searches for the causes of an interruption or reduction in the power supply affecting the entire system.

TEST L carries out a global check of the system and starts from an anomaly signalled by the user: problems with starting.

FLASHING CODE

The diagnosis procedure is carried out with the appropriate equipment in accordance with the diagram in Fig. 1 and is divided into two parts.

"a" DISPLAY OF ERRORS MEMORIZED BY THE ELECTRONIC CONTROL UNIT

"b" CONTROL OF A FEW ACTUATORS PRESENT IN THE SYSTEM (ACTIVE DIAGNOSIS).

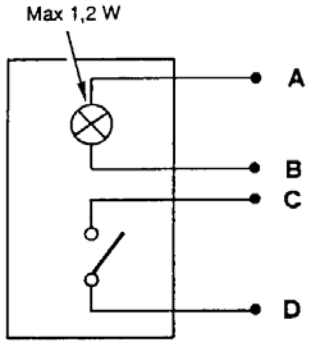


Fig. 1

A *+ Battery*
B *Pin 17 control unit S11*
C *Pin 4 control unit S11*
D *Earth*

Procedure "a" - DISPLAY OF ERRORS MEMORIZED BY THE ELECTRONIC CONTROL UNIT

The MOTRONIC MP3.1 control unit can supply a list of the errors memorized when the vehicle was in motion when requested by the operator. This is obtained by the control (flashing) of the warning light contained on the display apparatus.

Each error code is formed by four blocks. The first information block is composed of brief flashes lasting 0.5 seconds (0.5 seconds on and 0.5 seconds off). The number of flashed must be counted.

At the end of this first block divided by a pause of 2.5 secs. the second block will begin and so on for the third and fourth blocks.

Obviously for each of the four blocks it is necessary to count the number of flashes which will give the number of the four digits which will form the anomaly code to be looked for on the attached table.

The procedure must be carried out as described below.

- Connect the connectors of the display as shown in fig. 1.
- Turn the ignition key to the MAR position.
- Activate the diagnosis by pressing the button for a period of between 2.5 and 10 seconds. The bulb will flash continuously indicating that the dialogue with the control unit has been activated.
- Press the button for 2.5 to 10 seconds. If no error has been detected the bulb will flash continuously. If an error has been detected the bulb will flash emitting the code of the relative malfunction.
- Press the button again fro 2.5 to 10 seconds to check whether there are any further errors. If the bulb flashes continuously no other error is contained other than those already signalled.

NOTE: The control unit's memory can be reset by disconnecting the negative cable from the battery.

Procedure "b" - CONTROL OF A FEW ACTUATORS PRESENT IN THE SYSTEM

The MOTRONIC MP3.1 electronic control unit can, when instructed to do so by the operator, control some of the actuators present in the system.

The control of these actuators can only be carried out when the ignition key has been inserted and the engine is off.

The organs which can be controlled are ordered in accordance with the following sequence:

1. Electroinjectors **S3** (1-4-1-1)
2. Constant idle speed actuator **S29** (1-4-1-2)
3. Evaporation solenoid valve **M15** (1-4-1-3)

The procedure must be carried out as described below.

- Connect the connectors of the display apparatus as shown in Fig. 1.

- Press and hold down the button on the apparatus before turning the ignition key to the MAR position.
- Hold the button down for between 2.5 and 5 seconds after the key has been turned to the MAR position.
- A few seconds after releasing the button the electroinjector impulse check will begin. At the same time as the device is being checked the bulb, through a flashing code, will indicate the actuator being controlled.
- Press the button again to pass on to the next actuator.

NOTE: If there is no dialogue with the control unit, check:
- the battery voltage (12V)
- the control unit power supply (pin 18 and pin 35)
- that the display is correctly connected as shown in the diagram.

FAULT DIAGNOSIS TABLE

CODE	MALFUNCTION	SEE TEST
1-2-5-1	Control unit	Replace the control unit **S11**
1-2-1-1	Battery voltage	**A**
1-2-2-1	Intake pressure sensor	Check for the correct sealing of the air vacuum system from intake box to the control unit via the plenum chamber Replace the control unit **S11**
1-2-1-6	Sensor on throttle body with potentiometer	**B**
1-2-1-4	Engine temperature sensor	**C**
1-2-2-5	Air temperature sensor	**D**
1-2-2-6	Control unit final phase group	Replace the control unit **S11**
1-2-2-2	Double opening idle speed coil	**E**
1-2-3-3	Double closing idle speed - coil	**E**
1-2-2-4	Heated lambda probe	**F**
1-2-2-3	Limit of adjustment	**G**
1-2-5-7	Reference notch outside of the measurement window	Check the phonic wheel for damage, the correct value of the air gap between sensor and phonic wheel and the correct attachment of the sensor
	Engine r.p.m. and timing sensor	**H**
	Electric fuel pump	**I**

(continued)

CODE	MALFUNCTION	SEE TEST
1-4-1-2 (*)	Constant idle speed actuator	E
1-4-1-3 (*)	Evaporation solenoid valve	J
1-4-1-1 (*)	Electroinjectors	K
	Irregular ignition	L
	Connections to conditioner	M

(*) Displayed code identifying the actuator controlled in accordance with the active diagnosis

FAULT DIAGNOSIS

NO SUPPLY TO SYSTEM	TEST A

TEST PHASE	RESULT	REMEDY
A1 CHECK BATTERY VOLTAGE – Check that the battery voltage is 12V.	OK ▶ ~~OK~~ ▶	Carry out **step A2** Restore the correct voltage by recharging or replacing the battery. **A1**. **NOTE**: if the battery voltage falls below 12V, even if only slightly, the electronic systems may also be negatively influenced.
A2 CHECK FUSE – Check for damage of wander fuse **S46**.	OK ▶ ~~OK~~ ▶	Carry out **step A3** Replace the fuse (**8A**).
A3 CHECK VOLTAGE – Check for 12V at pin 18 of control unit **S11**.	OK ▶ ~~OK~~ ▶	Carry out **step A4** Restore the wiring between pin 18 of **S11** and the battery **A1**, across the wander fuse **S46** (R1,5).
A4 CHECK EARTH – Check that pins 5 and 6 of control unit **S11** are earthed (0V).	OK ▶ ~~OK~~ ▶	Carry out **step A5** Restore the wiring between the pins under examination and earth **G66** (N1,5 e N2,5).

(continues)

NO SUPPLY TO SYSTEM	TEST A

TEST PHASE	RESULT	REMEDY
A5 CHECK VOLTAGE – With ignition key in "MAR" position, Check for 12V at pin 35 of control unit **S11**.	OK ▶	The system is correctly supplied. if anomalies persist, replace the control unit **S11**.
	~~OK~~ ▶	Carry out **step A6**
A6 CHECK VOLTAGE – With ignition key in "MAR" position, Check for 12V at pin 87 of relay **S12b**.	OK ▶	Restore wiring between pin 35 of **S11** and pin 87 of **S12b**, across the solder (VB1,5 and RN4).
	~~OK~~ ▶	Carry out **step A7**
A7 CHECK VOLTAGE – Check for 12V at pin 30 of relay **S12b**.	OK ▶	Carry out **step A8**
	~~OK~~ ▶	Restore wiring between the battery **A1** and pin 30 of **S12b** (R4).

(continues)

NO SUPPLY TO SYSTEM	TEST A

TEST PHASE	RESULT	REMEDY
A8 CHECK VOLTAGE – With ignition key in "MAR" position, Check for 12V at pin 86 of relay **S12b**.	OK ▶ ~~OK~~ ▶	Carry out **step A12** Carry out **step A9**
A9 CHECK VOLTAGE – With ignition key in "MAR" position, Check for 12V at pin A of connection **G329**.	OK ▶ ~~OK~~ ▶	Restore wiring between pin 86 of **S12b** and pin A of **G329**, across the solder (SN1 and S2,5). Carry out **step A10**
A10 CHECK VOLTAGE – With ignition key in "MAR" position, Check for 12V at pin 7 of connection **J** of **G95**	OK ▶ ~~OK~~ ▶	Restore wiring between pin A of **G329** and pin 7 of connection **J** of **G95** (S1,5). Carry out **step A11**
A11 CHECK IGNITION BLOCK – With ignition key in "MAR" position, Check for 12V at pin 2 of ignition block **B1**.	OK ▶ ~~OK~~ ▶	Restore wiring between pin 2 of connection **H** of **G95** and ignition switch **B1**, across the solder (M1,5 and M2,5). Substitute ignition block **B1**.

(continues)

NO SUPPLY TO SYSTEM	TEST A

TEST PHASE	RESULT	REMEDY
A12 CHECK EARTH – With ignition key in "MAR" position, check for an earth (0V) to pin 85 of **S12b**.	OK ▶	Restore wiring between pin 85 of **S12b** and earth **G66** (N1).
	~~OK~~ ▶	Carry out **step A13**
A13 CHECK RELAY – Check for correct operation of relay **S12b.**	OK ▶	The system is correctly supplied. if anomalies persist, replace the control unit **S11**.
	~~OK~~ ▶	Substitute the relay if faulty.

End of test A

CHECK SENSOR ON THROTTLE BODY WITH POTENTIOMETER	TEST B

TEST PHASE	RESULT	REMEDY
B1 CHECK VOLTAGE – Check for 5V between pins 1 and 2 of **S38**.	OK ▶ ~~OK~~ ▶	Carry out **step B2** Carry out **step B3**
B2 CHECK VOLTAGE – Check that the voltage between pins 2 and 3 of **S38** varies with continuity as the degree of aperture of the throttle valve varies from 0 to 5V.	OK ▶ ~~OK~~ ▶	Carry out **step B5** Substitute the throttle sensor **S38**.
B3 CHECK CONTINUITY – Check for continuity between pin 2 of **S38** and pin 6 of control unit **S11** and insulation of cable under examination in relation to: • pin 1 and 3 of **S38**; • earth (0V); • power supply (12V).	OK ▶ ~~OK~~ ▶	Carry out **step B4** Restore wiring between pin 2 of **S38** and pin 6 of control unit **S11**, across the solder (BN1) or/and insulation of cable under examination.

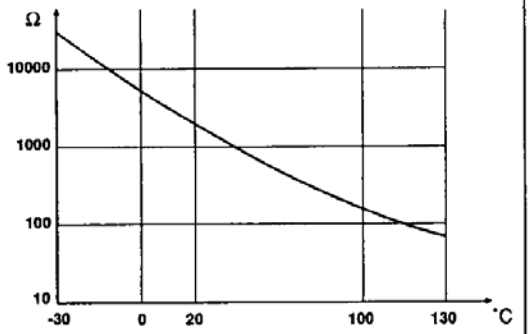
(continues)

CHECK SENSOR ON THROTTLE BODY WITH POTENTIOMETER	TEST B

TEST PHASE	RESULT	REMEDY
B4 CHECK CONTINUITY		
– Check for continuity between pin 1 of **S38** and pin 9 of control unit **S11** and insulation of cable under examination in relation to: • pin 2 and 3 of **S38**; • earth (0V); • power supply (12V).	OK ▶ ~~OK~~ ▶	Substitute the control unit **S11**. Restore wiring between pin 1 of **S38** and pin 9 of control unit **S11** (AG1) and/or insulation of cable under examination
B5 CHECK CONTINUITY		
– Check for continuity between pin 3 of **S38** and pin 3 of control unit **S11** and insulation of cable under examination in relation to: • pin 1 and 2 of **S38**; • earth (0V); • power supply (12V).	OK ▶ ~~OK~~ ▶	The sensor under examination functions correctly: check the control unit **S11** or other components. Restore wiring between pin 3 of **S38** and pin 3 of control unit **S11** (G1) or/and insulation of cable under examination.

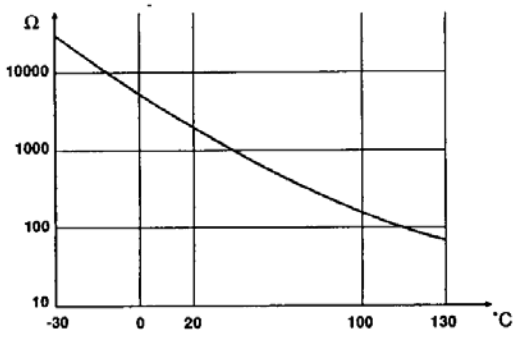
End of test B

CHECK ENGINE TEMPERATURE SENSOR	TEST C

TEST PHASE	RESULT	REMEDY
C1 CHECK SENSOR – Check that the resistance value at the ends of **S7** varies with the temperature in accordance with the graph (e.g. carry out a test at ambient temperature and one around 100 °C).  	OK ▶ ~~OK~~ ▶	Carry out **step C2** Substitute the engine temperature sensor **S7**.
C2 CHECK CONTINUITY – Check for continuity between pin 1 of **S7** and pin 13 of control unit **S11** and insulation of cable under examination in relation to: • earth (0V); • power supply (12V).	OK ▶ ~~OK~~ ▶	Carry out **step C3** Restore wiring between pin 1 of **S7** and pin 13 of control unit **S11** (M1) or/and insulation of cable under examination.
C3 CHECK CONTINUITY – Check for continuity between pin 2 of **S7** and pin 6 of control unit **S11** and insulation of cable under examination in relation to: • earth (0V); • power supply (12V).	OK ▶ ~~OK~~ ▶	The sensor under examination functions correctly: check the control unit **S11** or other components. Restore wiring between pin 2 of **S7** and pin 6 of control unit **S11**, across the solder (BN1) or/and insulation of cable under examination.

End of test C

CHECK AIR TEMPERATURE SENSOR	TEST D

TEST PHASE	RESULT	REMEDY
D1 CHECK SENSOR – Check that the resistance value at the ends of **S34** varies with the temperature in accordance with the graph (e.g. carry out a test at ambient temperature and one around 100 °C).  	OK ▶ ~~OK~~ ▶	Carry out **step D2** Substitute the air temperature sensor **S34**.
D2 CHECK CONTINUITY – Check for continuity between pin 1 of **S34** and pin 22 of control unit **S11** and insulation of cable under examination in relation to: • earth (0V); • power supply (12V).	OK ▶ ~~OK~~ ▶	Carry out **step D3** Restore wiring between pin 1 of **S34** and pin 22 of control unit **S11** (MB1) and/or insulation of cable under examination.
D3 CHECK CONTINUITY – Check for continuity between pin 2 of **S34** and pin 6 of control unit **S11** and insulation of cable under examination in relation to: • earth (0V); • power supply (12V).	OK ▶ ~~OK~~ ▶	The sensor under examination functions correctly: check the control unit **S11** or other components. Restore wiring between pin 2 of **S34** and pin 6 of control unit **S11**, across the solder (BN1) or/and insulation of cable under examination.

End of test D

CHECK CONSTANT IDLE SPEED ACTUATOR	TEST E

TEST PHASE	RESULT	REMEDY
E1 CHECK ACTUATOR – Check the impedence value: • of approximately 20 Ω between pins 2 and 3 of **S29**; • of approximately 40 Ω between pins 1 and 3 of **S29**.	OK ▶ ~~OK~~ ▶	Carry out **step E2** Substitute constant idle speed actuator **S29**.
E2 CHECK VOLTAGE – With ignition key in "MAR" position, Check for 12V at pin 2 of **S29**.	OK ▶ ~~OK~~ ▶	Carry out **step E3** Restore wiring between pin 2 of **S29** and pin 87 of relay **S12b**, across the solder (CB1 and C1,5).
E3 CHECK CONTINUITY – Check for continuity between pin 3 of **S29** and pin 33 of control unit **S11**.	OK ▶ ~~OK~~ ▶	Carry out **step E4** Restore wiring between pin 3 of **S29** and pin 33 of control unit **S11** (CN1).
E4 CHECK CONTINUITY – Check for continuity between pin 1 of **S29** and pin 34 of control unit **S11**.	OK ▶ ~~OK~~ ▶	The idle speed actuator under examination functions correctly: check the control unit **S11** or other components. Restore wiring between pin 1 of **S29** and pin 34 of control unit **S11** (AN1).

End of test E

CHECK HEATED LAMBDA PROBE	TEST F

TEST PHASE	RESULT	REMEDY
F1 CHECK CONTINUITY – Check for continuity between pin 8 of control unit **S11** and pin 1 of connector **B** of **S35**.	OK ▶ ~~OK~~ ▶	Carry out **step F2** Restore wiring between pin 8 of **S11** and pin 1 of connector **B** of **S35** (V).
F2 CHECK CONTINUITY – Check for continuity between pin 24 of **S11** and pin 2 of connector **B** of **S35**.	OK ▶ ~~OK~~ ▶	Carry out **step F3** Restore wiring between pin 24 of **S11** and pin 2 of connector **B** of **S35** (N). Also check the condition of the shielding braids, which must be earthed.
F3 CHECK INSULATION – Check insulation of cable from pin 8 of **S11** to pin 1 of connector **B** of **S35** in relation to both: • earth (0V); • power supply (12V).	OK ▶ ~~OK~~ ▶	Carry out **step F4** Restore insulation of cable from pin 8 of **S11** to pin 1 of connector **B** of **S35** in relation to: • earth (0V); • power supply (12V).

(continues)

CHECK HEATED LAMBDA PROBE	TEST F

TEST PHASE	RESULT	REMEDY
F4 CHECK INSULATION – Check insulation of cable from pin 24 of **S11** to pin 2 of connector **B** of **S35** in relation to power supply (12V).	OK ▶ ~~OK~~ ▶	Carry out **step F5** Restore insulation of cable from pin 24 of **S11** to pin 2 of connector **B** of **S35** in relation to power supply (12V).
F5 CHECK FUSE – Check for damage to wander fuse **S45**.	OK ▶ ~~OK~~ ▶	Carry out **step F6** Substitute the fuse (**8A**).
F6 CHECK PROBE RESISTANCE – Check that between the ends of probe resistance **S35** (pin 1 and 2 of connector **A**) there is a resistance of approx. 3 Ω.	OK ▶ ~~OK~~ ▶	Carry out **step F7** Substitute the probe **S35**.

(continues)

CHECK HEATED LAMBDA PROBE	TEST F

TEST PHASE	RESULT	REMEDY
F7 CHECK VOLTAGE – With engine running, Check for 12V at pin 1 of connector **A** of probe **S35**.	OK ▶ ~~OK~~ ▶	Carry out **step F8** Restore wiring between pin 1 of connector **A** of **S45** and pin 87 of relay **S12a**, across the fuse **S45** (CN1).
F8 CHECK EARTH – Check that pin 2 of connector **A** of probe **S35** is earthed (0V).	OK ▶ ~~OK~~ ▶	The lambda probe under examination functions correctly: check the control unit **S11** or other components. Restore wiring between pin 2 of connector **A** of **S35** and earth **G66** (N1).

End of test F

CHECK HEATED LAMBDA PROBE	TEST G

TEST PHASE	RESULT	REMEDY
G1 CHECK CONTINUITY – Check continuity between pin 8 of control unit **S11** and pin 1 of connector **B** of **S35**.	OK ▶ ~~OK~~ ▶	Carry out **step G2** Restore wiring pin 8 of **S11** pin 1 of connector **B** of **S35** (V).
G2 CHECK CONTINUITY – Check for continuity between pin 24 of **S11** and pin 2 of connector **B** of **S35**.	OK ▶ ~~OK~~ ▶	Carry out **step G3** Restore wiring between pin 24 of **S11** and pin 2 of connector **B** of **S35** (N). Also check the condition of the shielding braids, which must be earthed.
G3 CHECK INSULATION – Check insulation of cable from pin 8 of **S11** to pin 1 of connector **B** of **S35** in relation to both: • earth (0V); • power supply (12V).	OK ▶ ~~OK~~ ▶	Carry out **step G4** Restore insulation of cable from pin 8 of **S11** to pin 1 of connector **B** of **S35** in relation to: • earth (0V); • power supply (12V).

(continues)

CHECK HEATED LAMBDA PROBE	TEST G

TEST PHASE	RESULT	REMEDY
G4 CHECK INSULATION – Check insulation of cable from pin 24 of **S11** to pin 2 of connector **B** of **S35** in relation to power supply (12V).	OK ▶ ~~OK~~ ▶	Carry out **step G5** Restore insulation of cable from pin 24 of **S11** to pin 2 of connector **B** of **S35** in relation to power supply (12V).
G5 CHECK FUSE – Check for damage to wander fuse **S45**.	OK ▶ ~~OK~~ ▶	Carry out **step G6** Substitute the fuse (**8A**).
G6 CHECK PROBE RESISTANCE – Check that between the ends of probe resistance **S35** (pin 1 and 2 of connector **A**) there is a resistance of approximately 3Ω.	OK ▶ ~~OK~~ ▶	Carry out **step G7** Substitute the probe **S35**.
G7 CHECK VOLTAGE – With engine running, Check for 12V at pin 1 of connector **A** of probe **S35**.	OK ▶ ~~OK~~ ▶	Carry out **step G8** Restore wiring between pin 1 of connector **A** of **S45** and pin 87 of relay **S12a**, across the fuse **S45** (CN1).

(continues)

CHECK HEATED LAMBDA PROBE	TEST G

TEST PHASE		RESULT	REMEDY
G8	CHECK EARTH		
– Check that pin 2 of connector **A** of probe **S35** is earthed (0V).		OK ▶	Carry out **step G9**
		~~OK~~ ▶	Restore wiring between pin 2 of connector **A** of **S35** and earth **G66** (N1).
G9	CHECK AIR SUPPLY		
– Check for damage to air intake duct and air cleaner.		OK ▶	Carry out **step G10**
		~~OK~~ ▶	Clean or replace the affected parts.
G10	CHECK SPARK PLUGS AND ELECTROINJECTORS		
– Check for damage to spark plugs **A12** and electroinjectors **S3** (see **TEST K**).		OK ▶	The lambda probe under examination functions correctly: check the control unit **S11** or other components.
		~~OK~~ ▶	Clean or replace the affected parts.

End of test G

CHECK R.P.M. AND TIMING SENSOR	TEST H

TEST PHASE	RESULT	REMEDY
H1 CHECK AIR GAP – Check that the air gap between the sensor and phonic wheel is correct (see "REPAIR INSTRUCTIONS - ENGINES", group 04, microfiche 15/15).	OK ▶ ~~OK~~ ▶	Carry out **step H2** Restore the correct air gap value.
H2 CHECK SENSOR – With engine running, check for a variable frequency signal between pins 1 and 2 of sensor **S31**. This signal varies with the engine r.p.m.	OK ▶ ~~OK~~ ▶	Carry out **step H3** Substitute the sensor **S31**.
H3 CHECK OPERATION – Check for continuity between: • pin 2 of **S31** and pin 23 of control unit **S11**; • pin 1 of **S31** and pin 25 of control unit **S11**.	OK ▶ ~~OK~~ ▶	The r.p.m. and timing sensor under examination functions correctly: check the control unit **S11** or other components. Restore wiring between: • pin 2 of **S31** and pin 23 of control unit **S11** (G); • pin 1 of **S31** and pin 25 of control unit **S11** (N); Also check the condition of the shielding braids, which must be earthed.

End of test H

ELECTRIC FUEL PUMP	TEST I

TEST PHASE	RESULT	REMEDY
I1 CHECK FUSE – Check for damage to wander fuse **S47**.	OK ▶ ~~OK~~ ▶	Carry out **step I2** Substitute the fuse (**15A**).
I2 CHECK VOLTAGE – With engine running Check for 12V at pin 87 of relay **S12a**.	OK ▶ ~~OK~~ ▶	Carry out **step I3** Carry out **step I6**
I3 CHECK VOLTAGE – With engine running, Check for 12V at pin B of **G329**.	OK ▶ ~~OK~~ ▶	Carry out **step I4** Restore wiring between pin B of **G329** and pin 87 of **S12a**, across the fuse **S47** (SB1,5).
I4 CHECK VOLTAGE – With engine running, Check for 12V at pin + of fuel pump **P18**.	OK ▶ ~~OK~~ ▶	Carry out **step I5** Restore wiring between pin + of **P18** and pin B of **G329**, across pin 4 of connector **G73c** (SB1,5).

(continues)

CHECK ELECTRIC FUEL PUMP	TEST I

TEST PHASE	RESULT	REMEDY
I5 CHECK EARTH – With engine running, check that pin - of fuel pump **P18** is earthed (0V).	OK ▶	The fuel pump **P18** is correctly supplied. If it is not working, replace it.
	~~OK~~ ▶	Restore wiring between pin - of **P18** and earth **G185** (N1,5).
I6 CHECK VOLTAGE – With ignition key in "MAR" position, Check for 12V at pin 86 of relay **S12a**.	OK ▶	Carry out **step I8**
	~~OK~~ ▶	Carry out **step I7**
I7 CHECK VOLTAGE – With ignition key in "MAR" position, Check for 12V at pin 87 of relay **S12b**.	OK ▶	Restore wiring between pin 87 of **S12b** and pin 86 of **S12a**, across the solder (C1,5 and R21).
	~~OK~~ ▶	Carry out **step A7** of **TEST A**.
I8 CHECK VOLTAGE – With ignition key in "MAR" position, Check for 12V at pin 30 of relay **S12a**.	OK ▶	Carry out **step I10**
	~~OK~~ ▶	Carry out **step I9**

(continues)

CHECK ELECTRIC FUEL PUMP	TEST I

TEST PHASE	RESULT	REMEDY
I9 CHECK VOLTAGE – With ignition key in "MAR" position, Check for 12V at pin A of connection **G329**.	OK ▶ ~~OK~~ ▶	Restore wiring between pin A of **G329** and pin 30 of **S12a**, across the solder (S2,5 and SN2,5). Carry out **step A10** of **TEST A**.
I10 CHECK EARTH – With engine running, check for an earth signal (0V) to pin 85 of **S12a**.	OK ▶ ~~OK~~ ▶	Substitute the relay **S12a**. Carry out **step I11**
I11 CHECK EARTH – With engine running check for an earth signal (0V) to pin 20 of control unit **S11**.	OK ▶ ~~OK~~ ▶	Restore wiring between pin 20 of **S11** and pin 85 of **S12a** (HN1). Check and if necessary replace the control unit **S11**.

End of test I

CHECK EVAPORATION SOLENOID VALVE	TEST J

TEST PHASE	RESULT	REMEDY
J1 CHECK SOLENOID VALVE – When engine is warm, rev the engine and check 0V to pin 1 of solenoid valve **M15**.	OK ▶ ~~OK~~ ▶	Carry out **step J2** Carry out **step J3**
J2 CHECK VOLTAGE – With engine running, Check for 12V at pin 2 of **M15**.	OK ▶ ~~OK~~ ▶	Substitute solenoid valve **M15**. Restore wiring between pin 2 of **M15** and pin 87 of **S12b**, across connection **G288** and the solder (RL1 and C1,5).
J3 CHECK CONTINUITY – Check for continuity between pin 1 of **M15** and pin 31 of control unit **S11**.	OK ▶ ~~OK~~ ▶	The vapour recovery solenoid valve under examination functions correctly: check the control unit **S11** or other components. Restore wiring between pin 1 of **M15** and pin 31 of control unit **S11**, across connection **G288** (No1 and C1).

End of test J

CHECK ELECTROINJECTORS	TEST K

TEST PHASE	RESULT	REMEDY
K1 CHECK ELECTROINJECTORS – Check for damage to and correct mechanical operation of electroinjectors **S3** (see "REPAIR INSTRUCTIONS - ENGINES", group 04). Also check that the resistance value at the ends of an electroinjector **S3** is approximately 16 ± 0,5Ω.	OK ▶ ~~OK~~ ▶	Carry out **step K2** Substitute the faulty electroinjectors.
K2 CHECK VOLTAGE – With engine running, check 12V at pins 1 of the electroinjectors **S3**.	OK ▶ ~~OK~~ ▶	Carry out **step K3** Restore wiring between pin 1 of the electroinjectors and pin 87 of **S12b**, across the solder (R1 and RN4).
K3 CHECK CONTINUITY – Check for continuity between pin 2 of the electroinjectors **S3** and pin 14 of control unit **S11**.	OK ▶ ~~OK~~ ▶	The electroinjectors under examination are working correctly: check the control unit **S11** or other components. Restore wiring between pin 2 of the electroinjectors **S3** and pin 14 of control unit **S11**, across the solder (GN1 and GN2,5).

End of test K

IRREGULAR IGNITION	TEST L

TEST PHASE	RESULT	REMEDY
L1 CHECK SPARK PLUGS – Visually check the state of the spark plugs. – Check that spark strikes normally by unscrewing the spark plug and, without disconnecting it from the cable, connect it to earth (after first removing the relative electroinjector connector).	OK ▶ ~~OK~~ ▶	Carry out **step L2** Substitute faulty spark plugs **A12** .
L2 CHECK CABLES – Check that the cables connecting the coils and spark plugs are not damaged – Check for a total resistance between coil and spark plug (including supressors) of approx. 6 kΩ.	OK ▶ ~~OK~~ ▶	Carry out **step L3** Substitute the faulty cables or supressors.
L3 CHECK COILS – Check the resistances of the coil circuits **A8**: • main (pin 2-1 and pin 2-3) approximately 0.5 Ω • secondary approximately 14 kΩ	OK ▶ ~~OK~~ ▶	Carry out **step L4** Substitute the coil **A8**.
L4 CHECK VOLTAGE – With ignition key in "MAR" position Check for 12V at pin 2 of coil **A8**.	OK ▶ ~~OK~~ ▶	Carry out **step L6** Carry out **step L5**

(continues)

IRREGULAR IGNITION	TEST L

TEST PHASE	RESULT	REMEDY
L5 CHECK VOLTAGE – With ignition key in "MAR" position. Check for 12V at pin A of connection **G329**.	OK ▶ ~~OK~~ ▶	Restore wiring between pin 2 of **A8** and pin A of **G329**, across the solder (VN2,5 and S2,5). Carry out **step A10** of **TEST A**
L6 CHECK CONTINUITY – Check for continuity between: • pin 1 of **A8** and pin 1 of **N21**; • pin 3 of **A8** and pin 6 of **N21**.	OK ▶ ~~OK~~ ▶	Carry out **step L7** Restore wiring between: • pin 1 of **A8** and pin 1 of **N21** (G1,5); • pin 3 of **A8** and pin 6 of **N21** (B1,5).
L7 CHECK CONTINUITY – Check for continuity between the module **N21** and the control unit **S11** and between the module **N21** and earth **G66**: • pin 7 of **N21** and pin 2 of **S11**; • pin 2 of **N21** and pin 1 of **S11**; • pin 4 of **N21** and earth **G66** (N2,5).	OK ▶ ~~OK~~ ▶	Substitute the electronic module **N21**. Restore wiring between: • pin 7 of **N21** and pin 2 of **S11** (SB1); • pin 2 of **N21** and pin 1 of **S11** (HV1); • pin 4 of **N21** and earth **G66** (N2,5).

End of test L

CHECK CONNECTIONS TO CONDITIONER	TEST M

TEST PHASE	RESULT	REMEDY
M1 CHECK VOLTAGE – Start the engine and activate the compressor electromagnetic coupling (for example, by requesting a cold temperature) and check for 12V at pin 29 of control unit **S11**.	OK ▶ ~~OK~~ ▶	Carry out **step M3** Carry out **step M2**
M2 CHECK VOLTAGE – Check for 12V at pin 85 of relay **Q55**.	OK ▶ ~~OK~~ ▶	Restore wiring between pin 29 of **S11** and pin 85 of **Q55**, across la connection **G330** (HG1 and HG). Check vehicle wiring in relation to air conditioning system.
M3 CHECK VOLTAGE – Disengage the compressor electromagnetic coupling and check 0V (earth) to pin 29 of control unit **S11**.	OK ▶ ~~OK~~ ▶	Carry out **step M5** Carry out **step M4**
M4 CHECK VOLTAGE – Check 0V (earth) to pin 85 of relay **Q55**.	OK ▶ ~~OK~~ ▶	Restore wiring between pin 29 of **S11** and pin 85 of **Q55**, across la connection **G330** (HG1 and HG) Check vehicle wiring In relation to air conditioning system.

(continues)

CHECK CONNECTIONS TO CONDITIONER	TEST M

TEST PHASE	RESULT	REMEDY
M5 CHECK VOLTAGE – Start the engine and activate the compressor electromagnetic coupling (for example, by requesting a cold temperature) and check for 12V at pin 32 of control unit **S11**.	OK ▶ ~~OK~~ ▶	Carry out **step M7** Carry out **step M6**
M6 CHECK VOLTAGE – Check for 12V at pin 87 of relay **Q55**.	OK ▶ ~~OK~~ ▶	Restore wiring between pin 32 of **S11** and pin 87 of **Q55**, across la connection **G330** (VB1 and VB). Check vehicle wiring in relation to air conditioning system.
M7 CHECK VOLTAGE – Disengage the compressor electromagnetic coupling and check 0V (earth) to pin 32 of control unit **S11**	OK ▶ ~~OK~~ ▶	La control unit is correctly supplied by compressor request (pin 29) and engagement (pin 32) signals. Check parameters of control unit if necessary. Carry out **step M8**

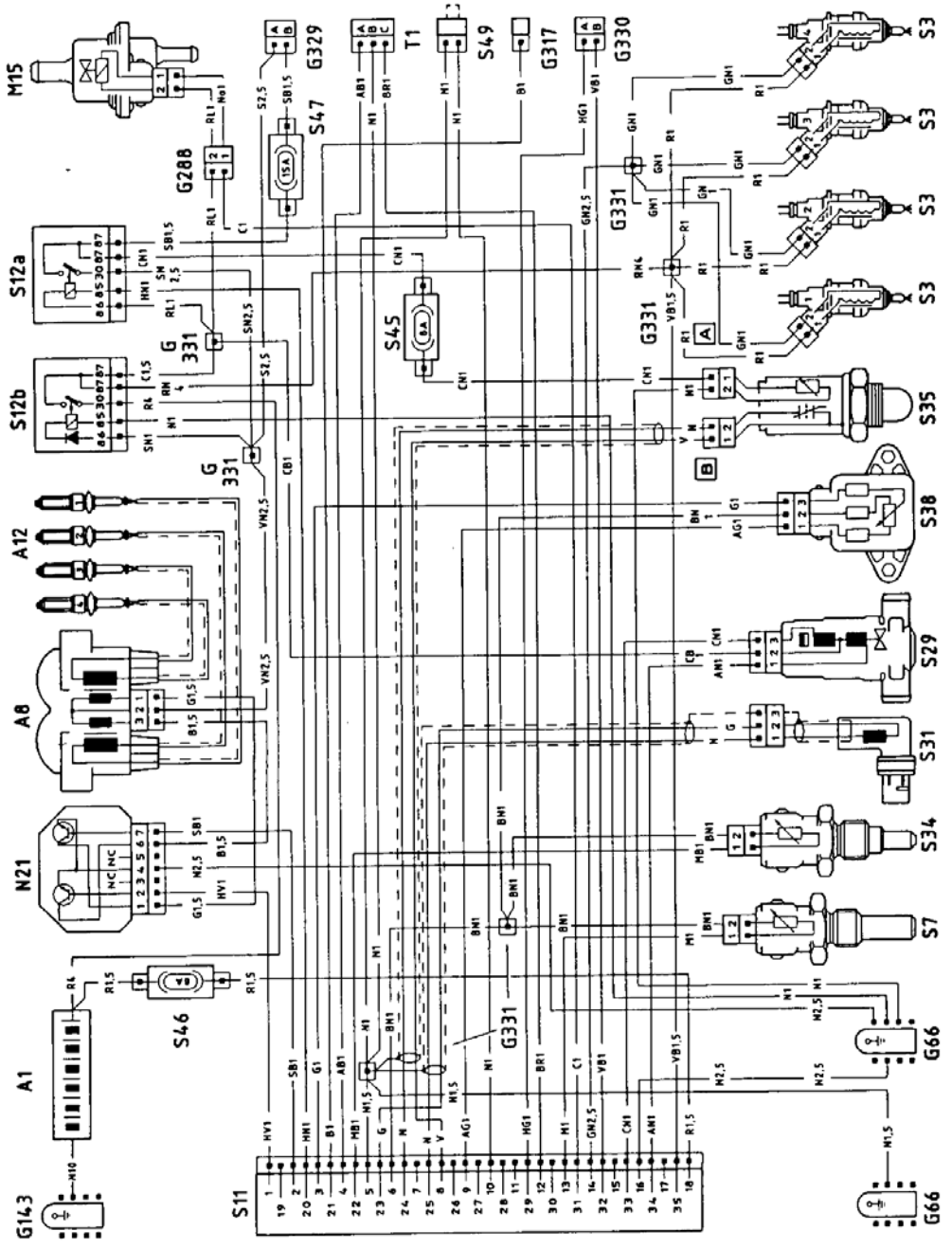
(continues)

CHECK CONNECTIONS TO CONDITIONER	TEST M

TEST PHASE	RESULT	REMEDY
M8 CHECK VOLTAGE		
– Check 0V (earth) to pin 87 of relay **Q55**.	OK ▶	Restore wiring between pin 32 of **S11** and pin 87 of **Q55**, across la connection **G330** (VB1 and VB).
	~~OK~~ ▶	Check vehicle wiring in relation to air conditioning system.

End of test M

WIRING DIAGRAM
(diagram A)



WIRING DIAGRAM
(diagram B)