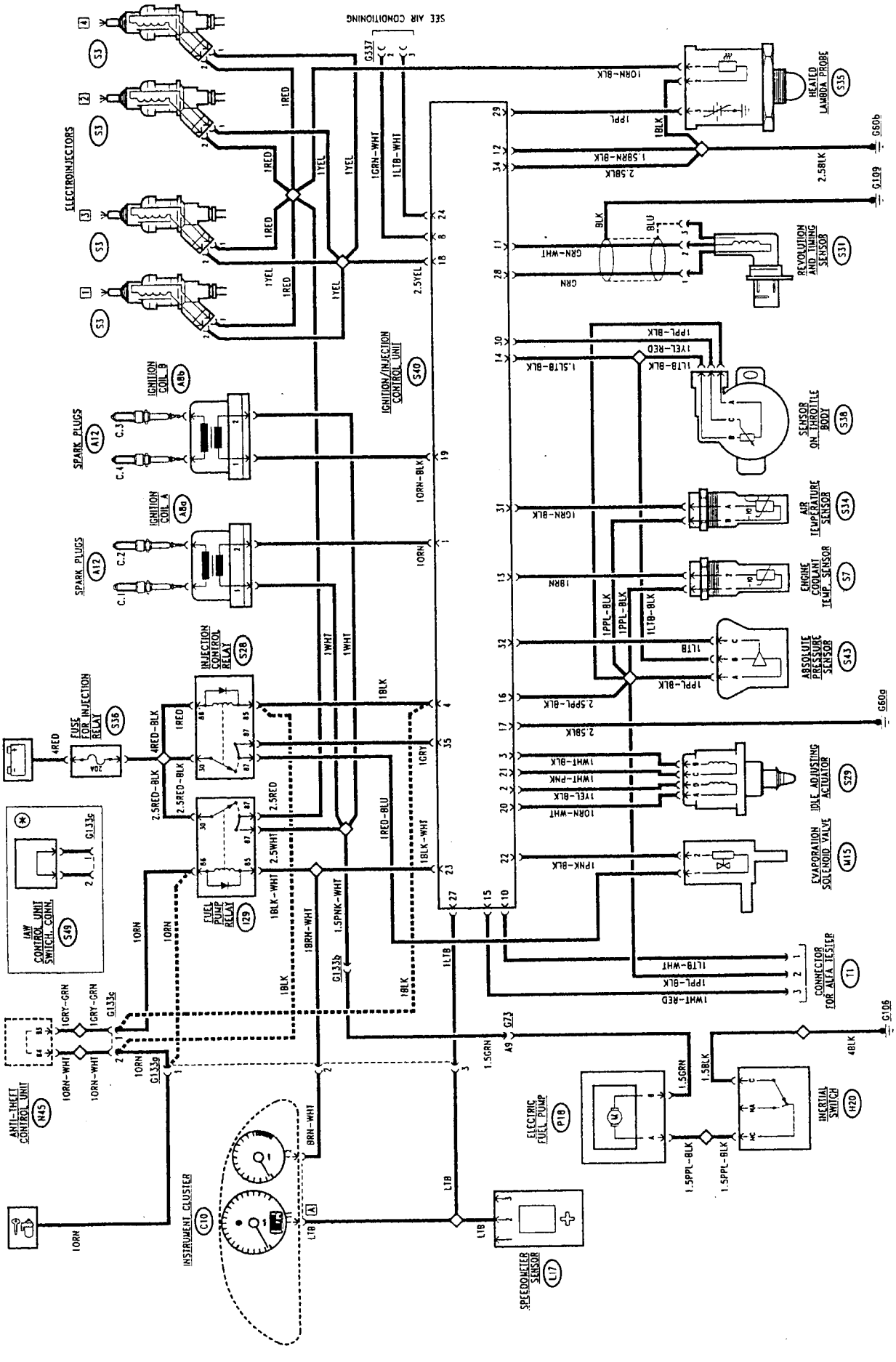
IAW INJECTION/IGNITION SYSTEM
- Boxer 1.3 Engine -

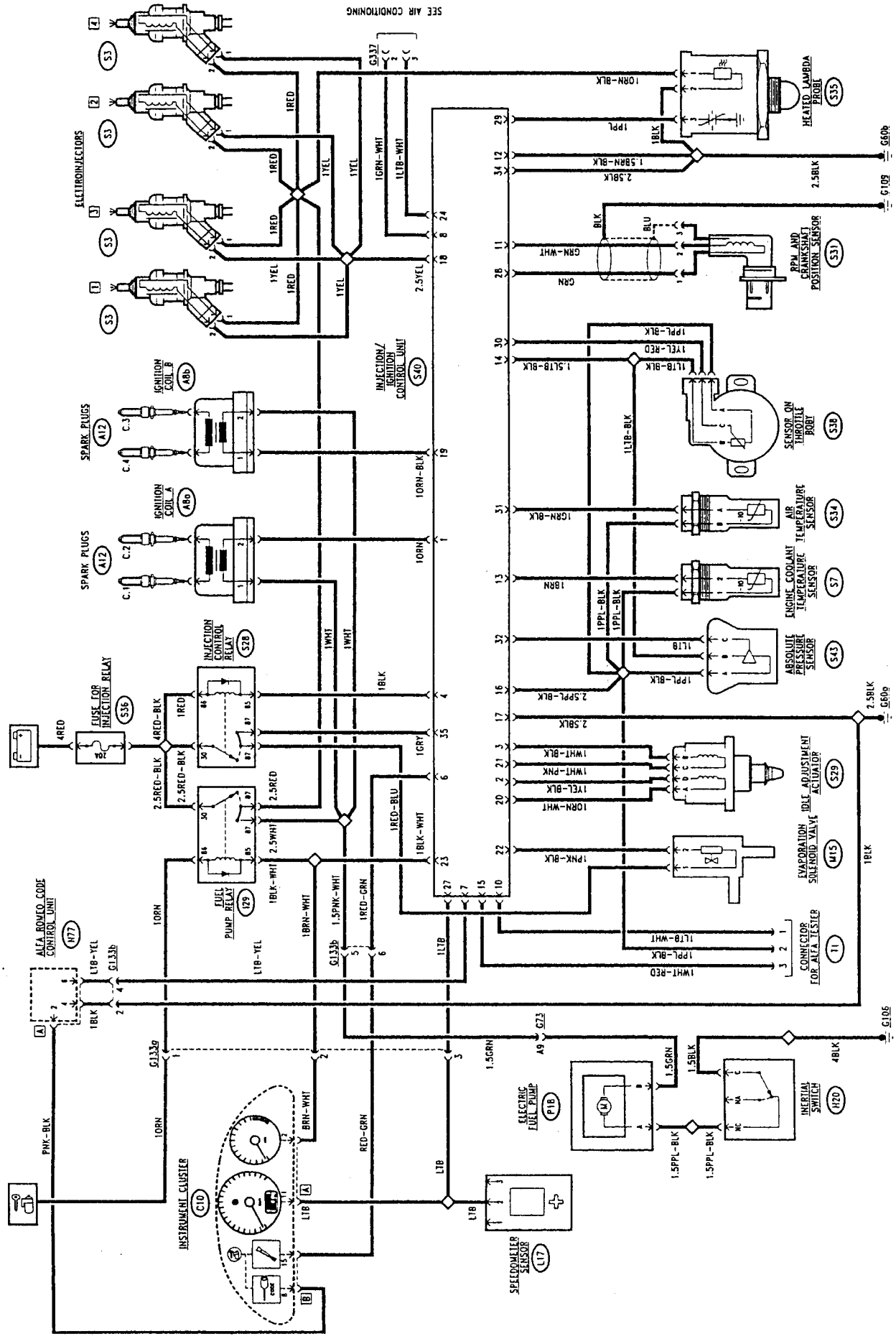
INDEX

WIRING DIAGRAM (for versions without ALFA ROMEO CODE)



– – – Temporary solution valid only for some vehicles not fitted with anti-theft system

WIRING DIAGRAM (for versions with ALFA ROMEO CODE)



GENERAL DESCRIPTION

The **I.A.W.** electronic control system - used here in the **8F.6B** version governs and controls all the operating parameters of the **Boxer 1.3** engine, optimising performance and consumption levels through response in real time to the different operating conditions. Indeed a single control unit controls injection and ignition. Injection is of the Multi- Point type with one injector per cylinder supplied at low pressure (2.5 bar) and governed by the control unit according to a defined logic. The calculation of the amount of air taken in is carried out by the control unit by indirect measurement, through the signals from the engine temperature and rpm sensors and from the air temperature and absolute pressure sensors: the amount of fuel to be injected is calculated on the basis of this value.

The ignition system adopted is electronic with "static distribution" (by semiconductors, without distributor, with two double output coils). The corresponding power modules are located inside the actual control unit. This solution, considerably improves reliability and reduces the number of high voltage cables and connections. Optimal ignition advance is determined by the control unit through a map stored in relation to the different operating parameters in order to optimise the need for full power, minimal consumption and minimal level of emissions at the exhaust.

For this reason the lambda probe is used which informs the control unit on the quantity of oxygen present at the exhaust, thereby making it possible to meter the air-fuel mixture correctly: when the mixture is "lean" the control unit increases the amount of fuel and when the mixture is "rich" the amount of fuel is decreased.

The control unit also controls operation at idle speed by governing a special regulator which adjusts the flow of air parallel to the throttle (by-pass).

Also the fuel vapour recirculation system is controlled by the control unit via the special solenoid valve which regulates the fuel vapour recovery canister allowing the vapours to return to the engine.
N.B. the simultaneous management of all these functions carried out by a single control unit makes it possible to adjust all the parameters in relation to the others in a completely interactive manner, in order to fully exploit the potential of all the functions. The system is also fitted with a "self-diagnosis" function which stores any faults, thereby ensuring that they can be quickly and effectively located connecting to the ALFA ROMEO Tester (see "Fault- finding").

WARNING: the IAW control unit is controlled by the ALFA ROMEO CODE system which enables the operation of it only after checking the secret memorised code (for further details see the "ALFA ROMEO CODE"section)

Operating logic

INJECTON: the control unit establishes the amount of fuel to be injected according to the result of the calculation of the quantity (in weight) of the intaken air: this calculation, known as the "intake air speed-density" type, is carried out with the information from the air temperature and pressure sensors and the engine rpm sensor. The control unit possesses a memorised map which provides an output value that operates the electroinjectors on the basis of the load detected and according to the optimal engine volumetric yield value: the parameter controlled is the opening time of the electroinjectors which is proportionate with the amount of ingoing fuel, as the pressure upstream of the injectors is kept constant by the special mechanical regulator.

Combustion control: through the oxygen sensor (or "lambda" probe) the control unit checks in real time the amount of oxygen at the exhaust, and therefore the correct air-fuel metering. The signal that the sensor sends to the control unit changes sharply when the composition of the mixture departs from lambda = 1 (optimum stoichiometric mixture). When the mixture is "lean" the control unit increases the amount of fuel, reducing it when the mixture is "rich": this way the engine operates as far as possible around the ideal lambda rating. Therefore, through this sensor it is possible to adjust engine carburetion precisely and retroactively. Together with the adoption of the catalytic silencer at the exhaust, this makes it possible to keep exhaust emissions within the limits specified by law. Moreover, the IAW system automatically compensates the altitude, as the changes in the density of the air directly "adjust" the delivery from the electroinjectors via the signal from the absolute air pressure sensor. The probe is heated by an electrical resistance so that it quickly reaches the correct operating temperature (appr. 300 °C).

IGNITION: one of the maps in the control unit calculates the ignition advance according to the load and rpm of the engine. Through the rpm and crankshaft position sensor, the control unit detects the exact position in relation to the TDC: this way, the pulse is sent to the spark plug concerned in exactly the moment in which it is needed. Ignition is static, with two coils, each of which supplies two different cylinders by simultaneously sending the pulse to the spark plug of one cylinder (useful spark) and to that of the other (lost spark). A power module for each coil - located inside the control unit, therefore inaccessible - supplies the necessary signal.

IDLE SPEED ADJUSTMENT: the dynamic adjustment of the engine idle speed is carried out through the special actuator fitted with a step motor which is operated by the contol unit and adjusts the quantity of air in the throttle by- pass. This device acts as a regulator for cutting in the various services (e.g. conditioner compressor): in fact, when the throttle is closed, this valve adjusts the by-pass gap compensa-

the load required by the services in order to ensure that idle speed is as constant as possible.
In order to keep this value constant as soon as the engine is started, it is also necessary to increase the amount of fuel injected: this is done by the control unit which is informed of this condition through the engine temperature sensor.

The system also controls the following functions:

Fuel pump control: the electric fuel pump is governed by the control unit according to a precise logic which warrants top levels of safety:

- when the ingition key is turned to MARCIA, the pump is supplied, but this supply is cut off after a certain length of time (variable between 0.5 and 10 seconds according to the temperature of the engine) if the engine has not been duly started.
- the pump is supplied continuously if the engine rpm signal remains; if this signal falls below a certain minimum threshold (e.g. in the event of an accident in which the engine stops) the pump is deactivated instantaneously.

Inertial switch: on this car the pump control system is integrated by the inertial switch device: this is an electromechanical switch which, in the event of heavy shocks, opens to cut off the circuit that connects the fuel pump to earth, thereby stopping the fuel pump instantaneously. This device is particularly important, integrating the safety offered by the logic of the control unit, especially if the car is hit from behind or in the case of other accidents that do not cause the engine to stop immediately.

Cold-starting control: during cold starting the control unit uses special advance and injection time ratings with an "automatic choke" function: this function follows a precise course in relation to the temperature of the engine and it ceases when the engine is warm. Moreover, in these conditions the idle speed control logic also changes.

Control of enrichment during acceleration: upon the need for acceleration the control unit increases injection in order to quickly reach the torque/power required. This function is detected by a rapid change of the density of the intaken air, of engine rpms and of the signal from the potentiometer located on the throttle which instantaneously informs the control unit of the need for acceleration.

Fuel cut-off during deceleration: with the throttle closed and an engine speed above a certain threshold (which may vary according to the engine temperature) the control unit de-activates fuel injection; this way the rpms decrease rapidly towards idle speed and fuel consumption, controlled to a greater degree, is considerably reduced.

Rpm limiting: the control unit automatically stops the injection of fuel when engine rpm reaches high rates, (nearing the "over-revving" threshold), thereby preventing the engine from operating under such critical situations.

Connection with the conditioner compressor: the control unit is connected with the air conditioning system so that the idle rpm can be adapted to the increased load each time the compressor cuts in. In addition, the control unit temporarily inhibits (appr. 10 seconds) the compressor if high power is required by the engine (throttle position above a certain threshold).

Connection with the ALFA ROMEO CODE system: the system is connected to the ALFA ROMEO CODE control unit from which it receives the operation consent signal via a special serial line:

Alarm system: if the car is not fitted with ALFA ROMEO CODE, but with the electronic anti- theft device, the I.A.W. control unit receives consent to operate from the anti-theft control unit via the signal which operates the fuel pump relay, which in turn supplies the control unit.

Components

The electronic control unit (**S40**) receives the signals from the sensors which "read" the operation of the engine and processes them according to a logic memorised inside in "maps" which correlate the various parameters with one another in the best way possible, and it operates the actuators so that the engine always operates with the highest possible regularity and yield. The "maps" are the result of thorough experimentation on the bench and on the road in order to determine the optimum values and they are stored in a permanent ROM memory programmed when the control unit is assembled and which cannot be altered.
The parameters are calculated at each turn of the crankshaft, thereby enabling response in "real time" to the operating conditions of the system. The control unit is also capable of adapting the signal sent to the actutators according to the supply voltage, as the response of the actuators differs if the voltage changes. This is a latest-generation electronic control unit formed of hybrid thick film circuits in HCMOS technology, specifically designed for automotive purposes and featuring high level of immunity to electrical disturbances, high calculating speed and low energy consumption rates in stand-by.

The ensors are the following:

- rpm and crankshaft position sensor (**S31**);
- engine temperature sensor (**S7**);
- intaken air temperature sensor (**S34**);
- absolute pressure sensor (**S43**);
- throttle position sensor (**S38**);
- heated lambda sensor (**S35**).

The actuators are the following:

- electroinjectors (**S3**);
- ignition coils (**A8a**; **A8b**);
- fuel pump (**P18**);
- idle speed adjustment actuator (**S9**);
- evaporative solenoid valve (**M15**).

The control unit is also connected with:

- the climate control unit,
- the ALFA ROMEO CODE control unit **(N77)** or the anti-theft control unit (**N45**),
- the instrument cluster **(C10)** to which it supplies the signal for the rev counter and the signal for turning on the failure warning light,
- the tachometric sensor **(L17)** from which it receives the car speed signal.

The system is completed by two relays: the fuel pump relay **(I29)** and the injection control relay **(S28)** which operate the fuel pump, the injectors, the coils and the other components of the system. The supply line is protected by wander fuse **(S36)**. The injection relay and fuses are located in the engine compartment next to the branch terminal board, while relay (**I29**) is located in the container of control unit (**S40**); only for some vechicles without alarm system is located in the engine bay next to the injection relay.
Lastly, there are three earth points: **(G60a)** and **(G60b)** on the engine and **(G109)** next to the control unit.
The connector **(T1)** used for the connection with the ALFA ROMEO Tester is located in the engine bay in an easily accessible position. For some vehicles it is located near the control unit.

FUNCTIONAL DESCRIPTION

Control unit **S40** controls and regulates the whole electronic ignition and injection system.

The direct supply for the whole system is protected by fuse **S36** (20A).

Via the coil of relay **S28** this supply reaches pin 4 of **S40** enabling the preservation of the memories, etc.

When the key is at MARCIA the control unit supplies the whole system: in fact the information that the key has been turned to MARCIA reaches pin 23 of **S40** via the coil of relay **I29**; consequently, an earth is sent by pin 4 which energizes relay **S28**.

Only version without ALFA ROMEO CODE: the signal "key to MARCIA" crosses the anti-theft control unit **N45**, which gives the necessary consent to operate the entire system.
If the anti-theft system is not installed, the connector of connection **G133c** is bridged with connector **S49**.

Relay **S28** supplies the control unit itself at pin 35, and solenoid valve **M15.**

The coil of the fuel pump relay **I29** is "turnkey" supplied by the control unit **S40** from pin 23; this is the rpm signal which is also sent to the instrument cluster **C10**. The relay supplies the electric fuel pump **P18**, and also the electroinjectors **S3**, the two coils **A8** and the lambda sensor **S35**.

Due to safety reasons, it is the control unit **S40** that controls the supply to the fuel pump; this takes place via the consent signal to relay **I29**, at pin 23, following the logic described previously.

The earth reaches the pump **P18** via the inertial switch **H20** which cuts off the circuit in the event of a crash.

The power earth is supplied at pin 17 and 34 of **S40**.

The control unit **S40** receives a number of signals from the different sensors, thereby keeping all the engine operating parameters under control.

Pin 14 of the control unit sends a stabilised voltage (5V) to numerous sensors, while an electronic earth signal is sent from pin 16.

The rpm sensor **S31** supplies information about the engine speed and defines the position of the crankshaft.

The sensor is of the inductive type and detects the engine rpm through the change in a magnetic field produced by the passage of the teeth of a "phonic" wheel fitted on the flywheel; the wheel has 60 teeth which make it possible to detect the engine speed; two of these teeth are missing, and this makes it possible to locate the passage from the T.D.C. of the two pairs of cylinders (1-2 and 3-4); it is connected with the control unit at pin 11 and pin 28; the two cables are screened. This way the control unit **S40**, distinguishes

the operating stroke of each cylinder and controls the synchronism of the engine.

The throttle position sensor **S38**, connected with the control unit **S40** at pins 14 and 16, through a potentiometer sends a signal to pin30 and is porportionate with the degree of opening of the throttle. In fact, the mobile section of the potentiometer is keyed directly onto the shaft that turns the throttle.

The air temperature sensor **S34** - located on the intake piping-, is connected to the control unit **S40** at pin 16, and supplies a signal at pin 31 proportionate with the temperature of the air measured with NTC thermistor (resistance which lowers with the temperature).

The engine temperature sensor **S7**, connected to the control unit **S40** at pin 16, supplies a signal at pin 13 proportionate with the temperature of the engine coolant, detected near the thermostat, by an NTC thermistor (resistance that lowers with the temperature).

The absolute pressure sensor **S43**, connected to the control unit **S40** at pin 14 and 16, generates a signal sent to pin 32 which is proportionate with the absolute pressure of the incoming air. This signal is generated by a Wheatstone bridge device followed by an amplifier which detects the deflections of a diaphragm that "feels" absolute vacuum on one side and the vacuum in the intake manifold on the other: in fact, these deflections change the resistances of the bridge, thus the output signal.

The heated lambda sensor **S35** supplies the control unit **S40** information about the correct composition of the air-fuel mixture detecting the concentration of oxygen in the ehaust gases; this takes place via the signal sent to pin 29 of the control unit **S40.**

The sensor is heated by a resistance to make sure that it operates correctly also when the engine is cold; the resistance is supplied by the fuel pump relay **I29**.

On the basis of the signals received and the calculations carried out, the control unit **S40** controls the opening of the injectors **S3** through pin 18. The injectors are supplied by relay **I29**.

Ignition is of the static type controlled directly by the control unit which automatically adjusts the spark advance. The power modules are located inside the control unit **S40** and they send the command signals from pins 1 and 19 to the coils **A8a** and **A8b**, supplied by relay **I29**.

The idle speed adjustment actuator **S29** makes a by-pass of the flow of air around the throttle through an electric step motor which controls a screw/lead screw reduction gear and a shutter that changes the passage of the air in the by-pass.
The step motor is controlled by the control unit **S40** in two stages (forward/backward) from pins 2, 3, 20 and 21.

The evaporative solenoid valve **M15**, sends the fuel vapours from the canister towards the engine according to a command from the control unit: this signal - of the duty cycle type - is sent from pin 22. The valve is supplied by relay **I29**.

The control unit **S40** is informed instant by instant of the engine through sensor **S31**: this information is sent to the rev counter on the instrument cluster **C10**, via the signal of pin 23.

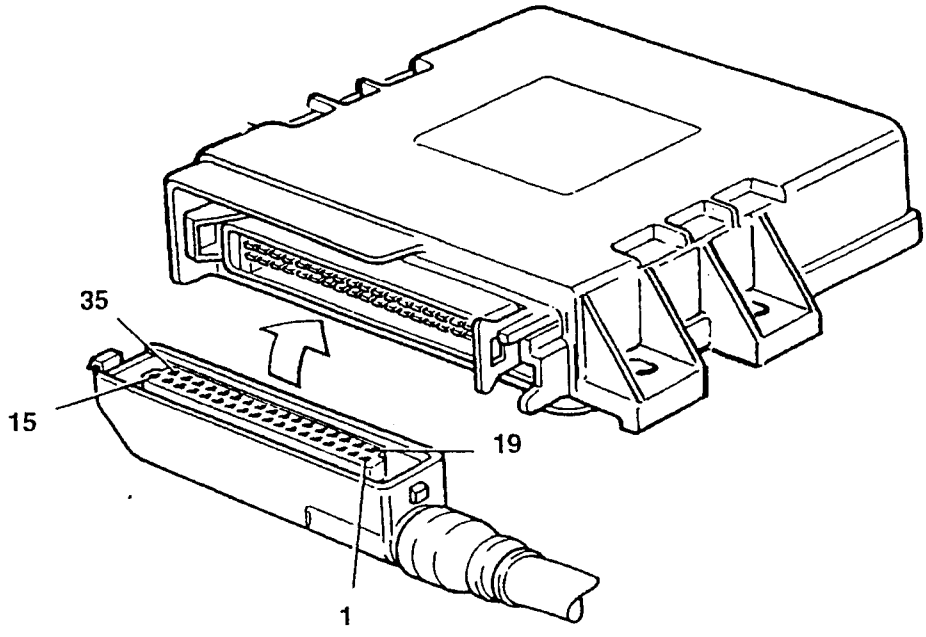
The detection of a failure by the control unit turns on the corresponding warning light on the instrument cluster by the signal from pin 6 of **S40**.

From sensor **L17**, the control unit receives, at pin 27, the car speed signal, used by the internal logic to optimise certain functions.

The control unit **S40** is connected with the air conditioning system via pins 8 and 24. This makes it possible to adapt the engine idle speed to the increase in power each time the compressor cuts in, or to cut it out if the engine needs full power. For further details see the "Heating and Ventilation" section.

The control unit **S40** is fitted with a self-diagnosis system which can be used connecting the ALFA ROMEO Tester to connector **T1**; here, the control unit sends the fault signals via the diagnosis line K -pin 15- and line L - pin 10-, while pin 16 supplies the electronic earth.

The connection with the ALFA ROMEO CODE contro unit is made with the special line leaving pin 7 of S40 For further details see the "ALFA ROMEO CODE' section.

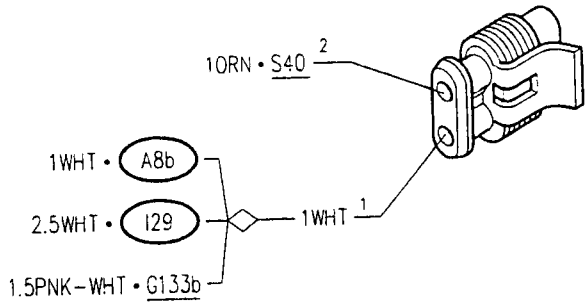


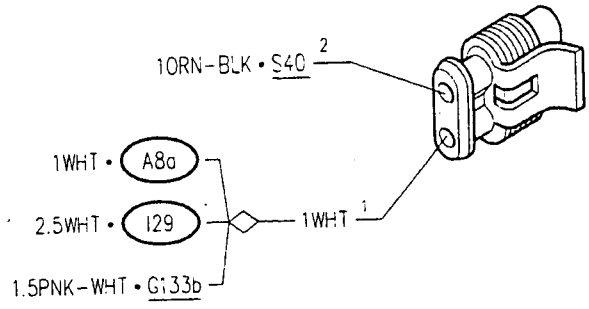
CONTROL UNIT PIN-OUTS

1. Ignition coil A control
2. Idle speed actuator output (phase B)
3. Idle speed actuator output (phase D)
4. Supply for control relay
5. N.C.
6. Signal for warning light on cluster.
7. Connection line with ALFA ROMEO CODE.
8. Signal requesting conditioner compressor cut-in
9. N.C.
10. Diagnosis line L
11. Rpm sensor signal
12. Earth for lambda sensor
13. Engine temperature signal
14. Reference voltage (5V) for sensors
15. Diagnosis line K
16. Electronic earth for sensors
17. Power earth
18. Electroinjector control
19. Ignition coil B control
20. Idle speed actuator output (phase A)
21. Idle speed actuator output (phase C)
22. Evaporative solenoid valve control
23. Pump relay - rev counter signal control
24. Conditioner compressor cut-in control
25. N.C.
26. N.C.
27. Car speed signal
28. Rpm sensor signal
29. Lambda sensor signal
30. Throttle position sensor
31. Intaken air temperature signal
32. Absolute pressure signal
33. N.C.
34. Power earth
35. Control unit supply

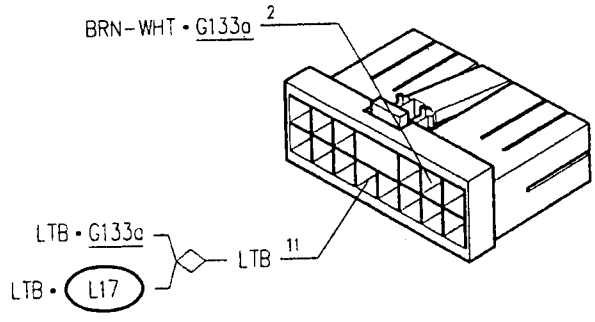
COMPONENTS AND CONNECTORS

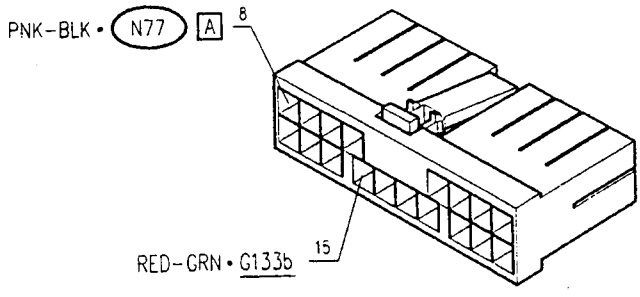
Ignition coil A	A8a	Ignition coil B	A8b



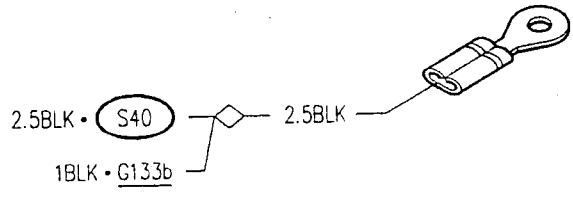


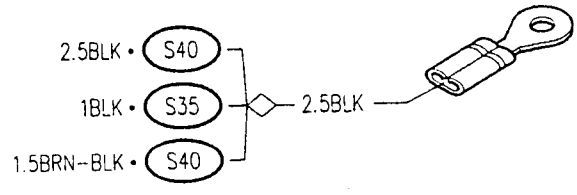
Instrument cluster	C10 A	Instrument cluster	C10 B



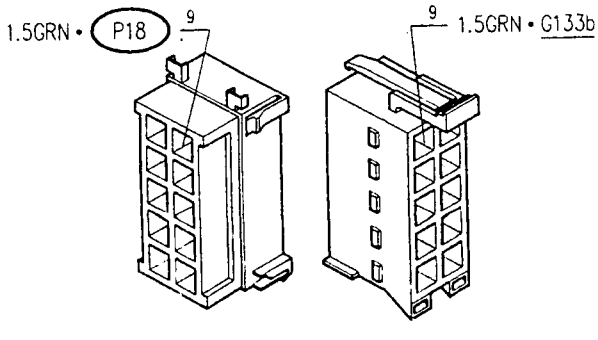


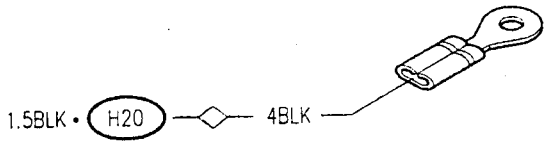
Injection wiring earth	G60a	Injection wiring earth	G60b





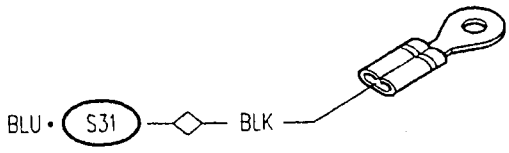
Connector for rear services	G73 A	Seat cross rail earth	G106



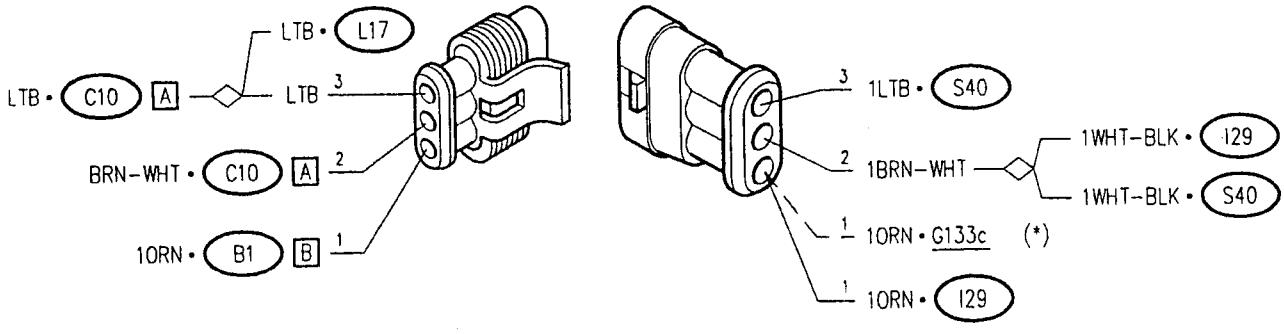


COMPONENTS AND CONNECTORS (cont.d)

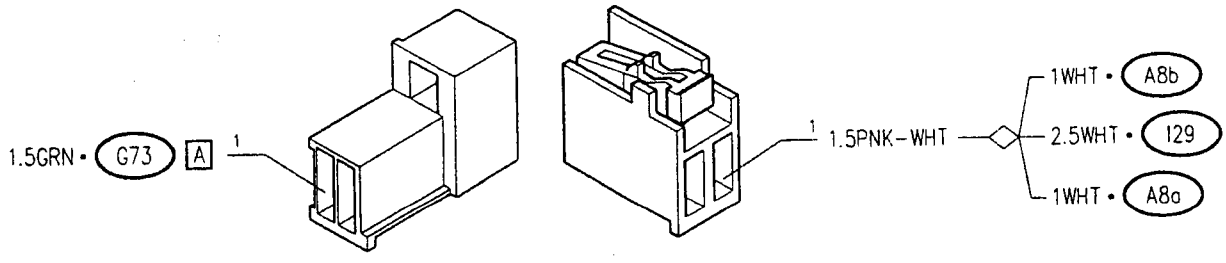
Injection wiring earth	G109



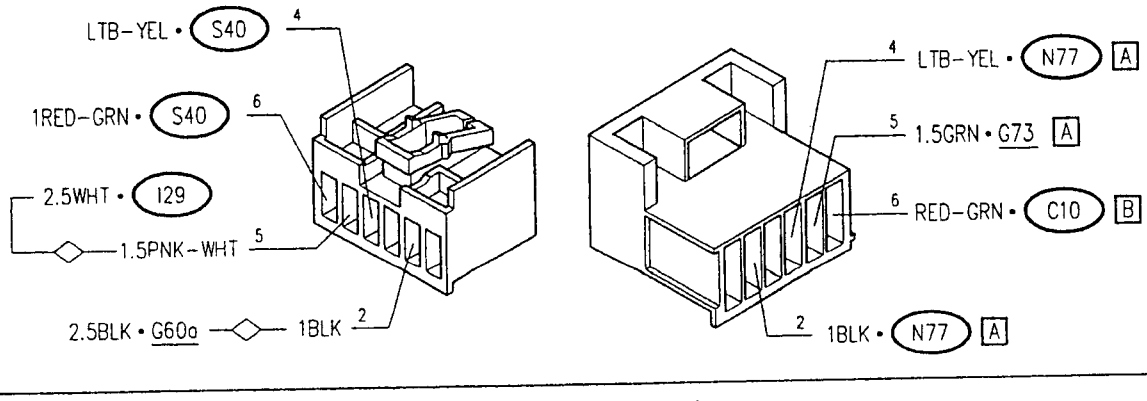
Electronic injection wiring connector A	G133a



Electronic injection wiring connector B (*)	G133b



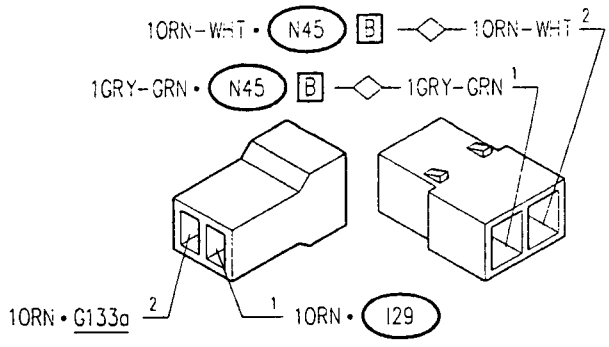
Electronic injection wiring connector B	G133b



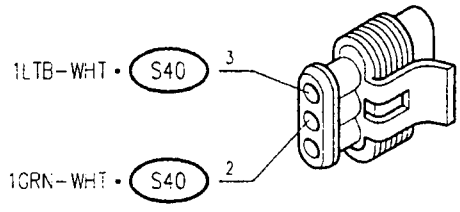
(*) for some vehicles without ALFA ROMEO CODE, but with anti-theft device

COMPONENTS AND CONNECTORS (cont.d)

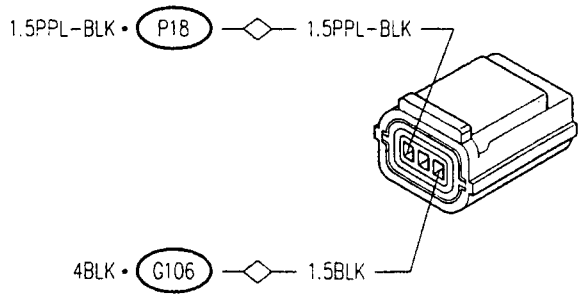
Electronic injection wiring connector C (*)	G133c



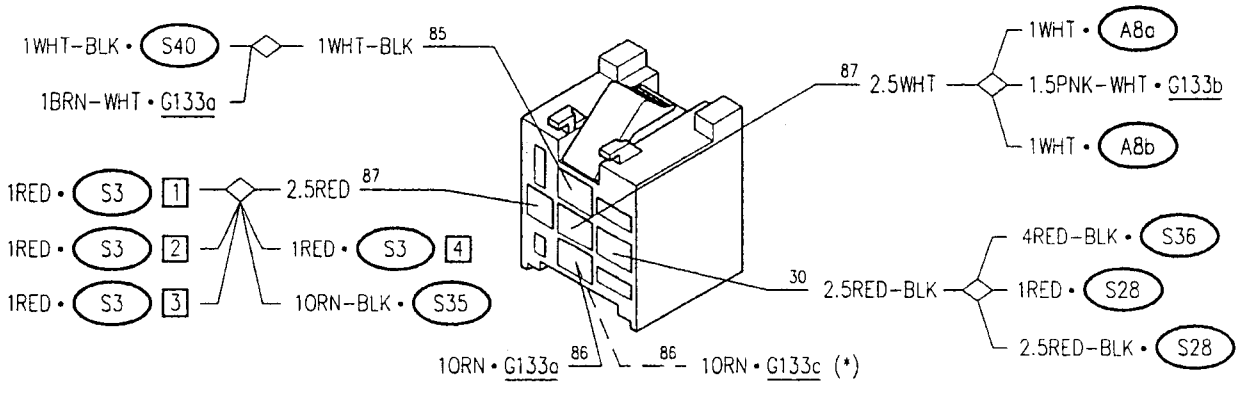
Conditioner system/ injection system connector	G337



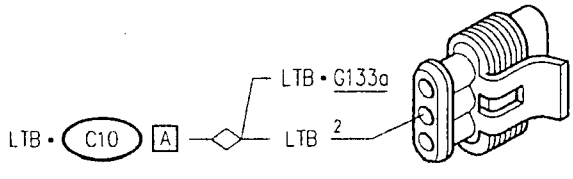
Inertial switch	H20



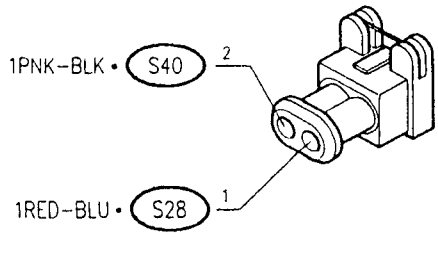
Fuel pump relay	I29



Speedometer sensor	L17



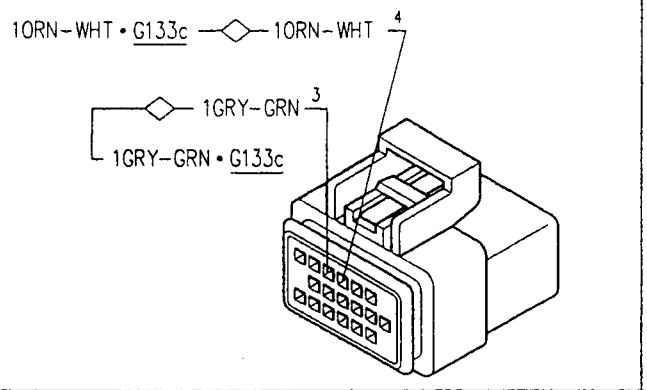
Evaporative solenoid valve	M15



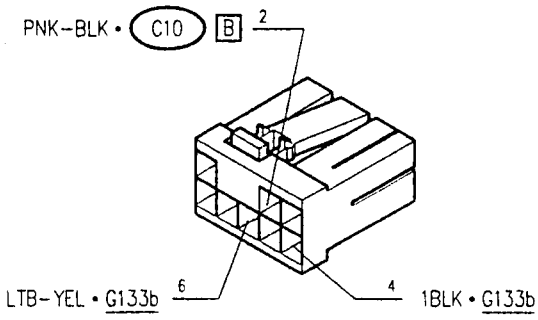
(*) for some vehicles without ALFA ROMEO CODE, but with anti-theft device

COMPONENTS AND CONNECTORS (cont.d)

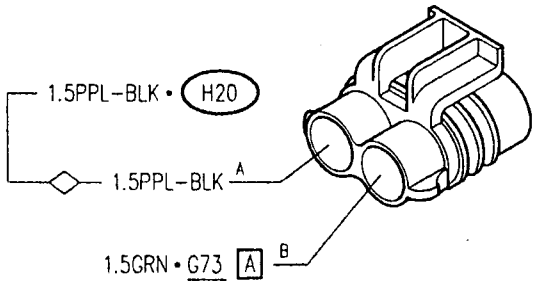
Anti-theft control unit (*) — N45 B



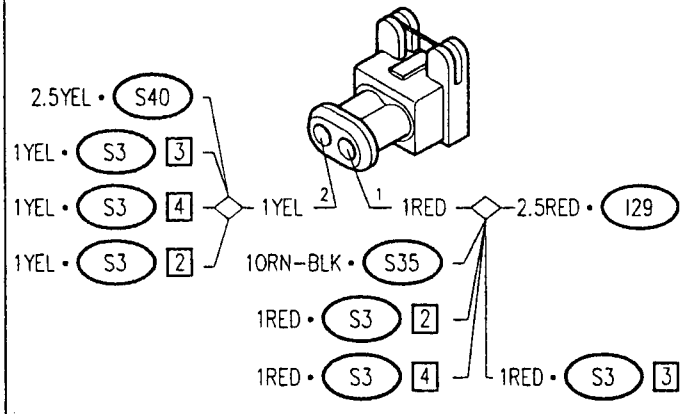
ALFA ROMEO CODE control unit — N77 A



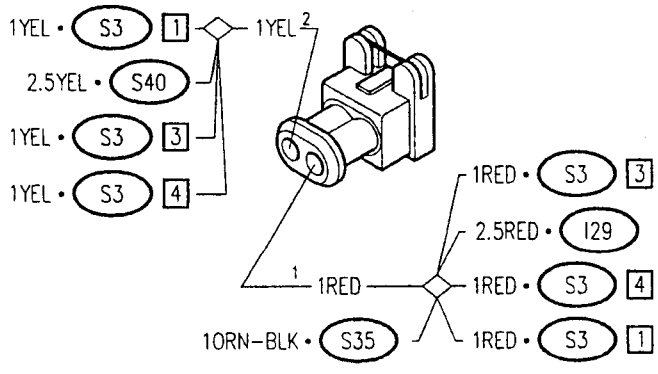
Electric fuel pump — P18



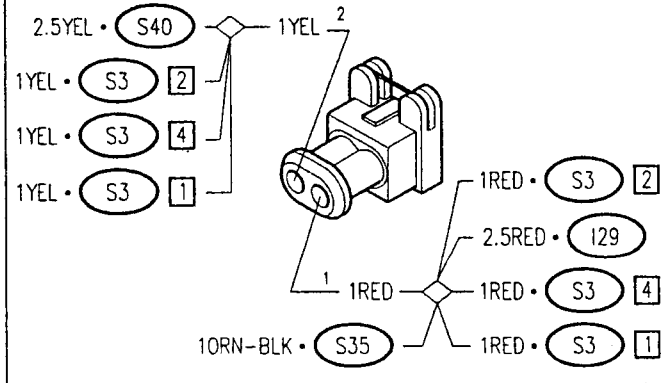
Electroinjector — S3 1



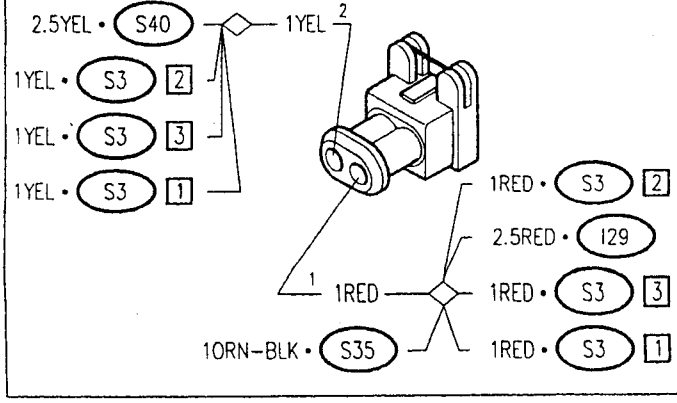
Electroinjector — S3 2



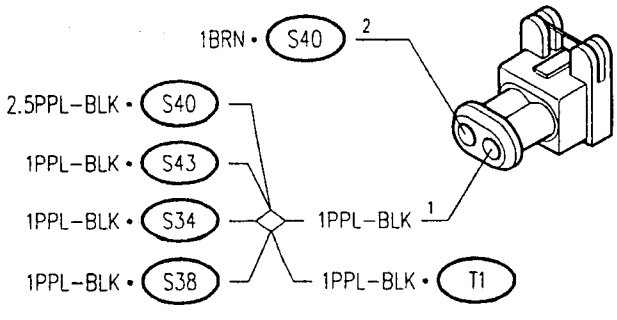
Electroinjector — S3 3



Electroinjector — S3 4



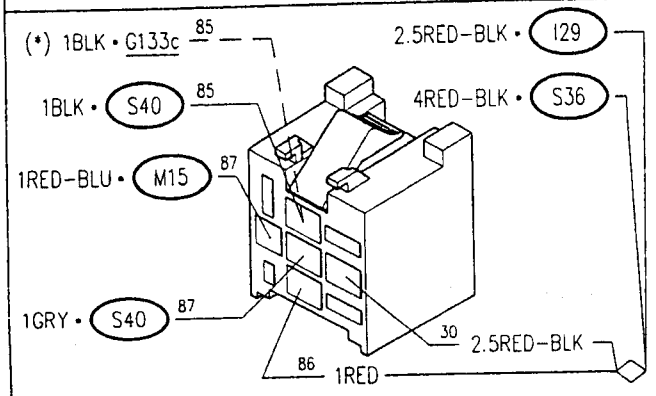
Engine temperature sensor — S7



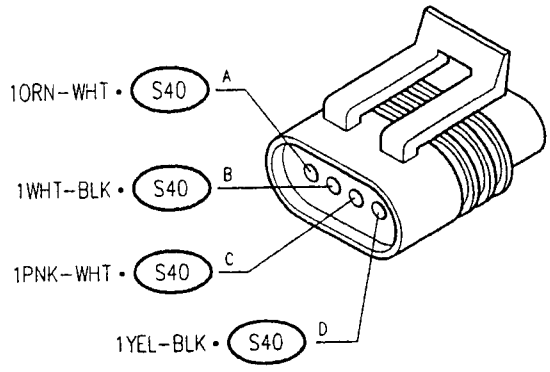
(*) for some vehicles without ALFA ROMEO CODE, but with anti-theft device

COMPONENTS AND CONNECTORS (cont.d)

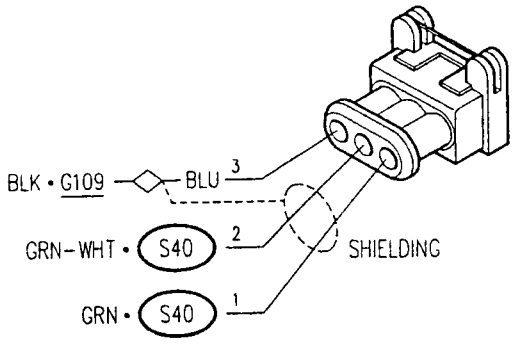
Injection control relay — S28



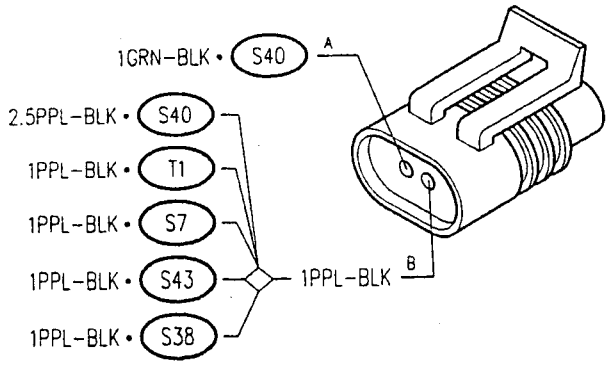
Idle speed adj. actuator — S29



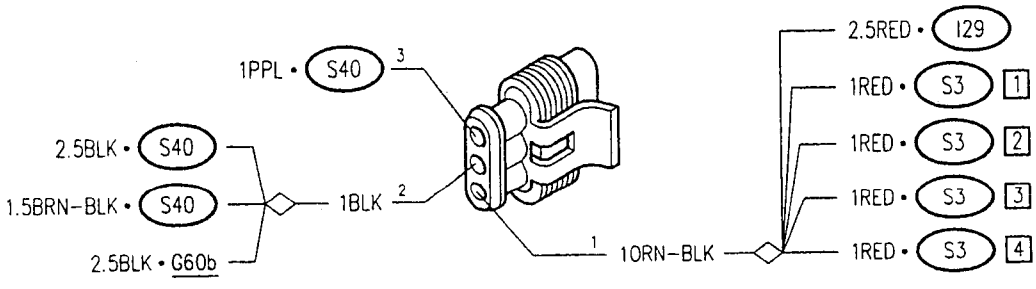
Rpm and crankshaft position sensor — S31



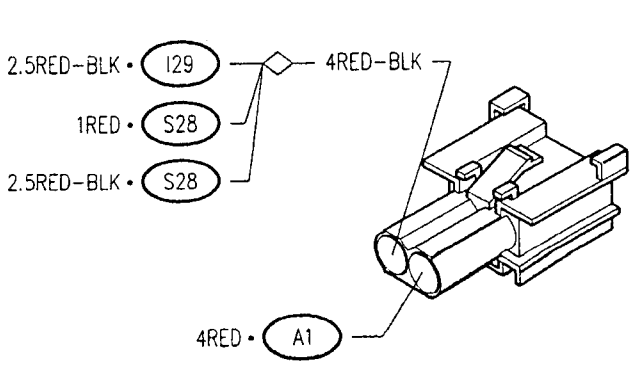
Air temperature sensor — S34



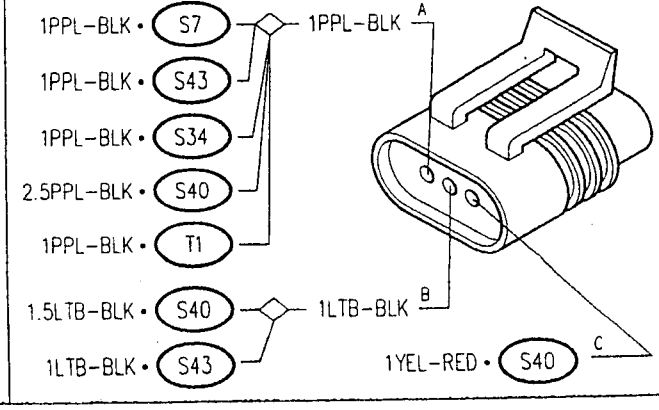
Heated lambda sensor — S35



Injection relay wander fuse — S36

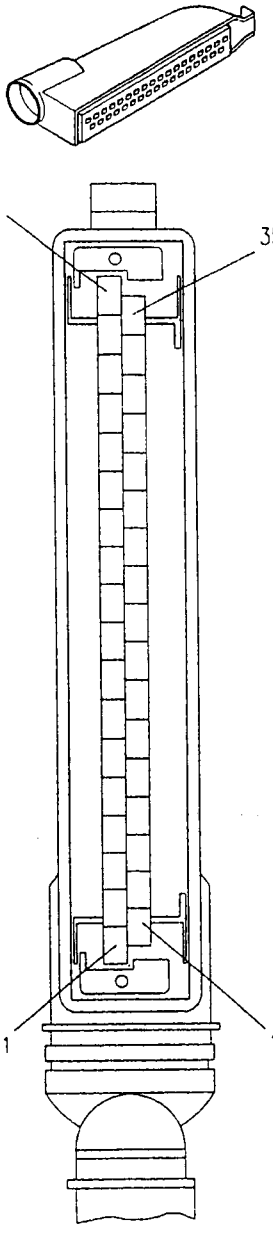


Sensor on throttle body — S38



COMPONENTS AND CONNECTORS (cont.d)

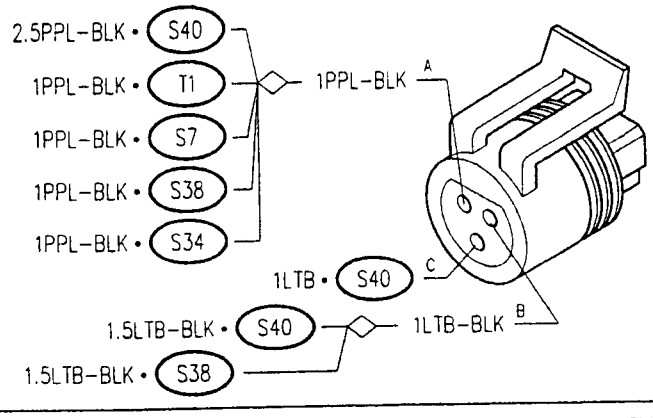
Injection/ignition control unit — S40

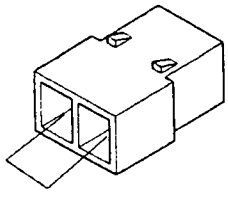


1 — 1ORN • A8a
2 — 1YEL-BLK • S29
3 — 1WHT-BLK • S29
4 — 1BLK • S28
6 — 1RED-GRN • G133b
7 — LTB-YEL • G133b
8 — 1GRN-WHT • G337
10 — 1LTB-WHT • T1
11 — GRN-WHT • S31
12 — 1.5BRN-BLK: 2.5BLK • S40; 1BLK • S35; 2.5BLK • G60b
13 — 1BRN • S7
14 — 1.5LTB-BLK: 1LTB-BLK • S43; 1LTB-BLK • S38
15 — 1WHT-RED • T1
16 — 2.5PPL-BLK: 1PPL-BLK • S7; 1PPL-BLK • S43; 1PPL-BLK • S38; 1PPL-BLK • S34; 1PPL-BLK • T1
17 — 2.5BLK • G60a
18 — 2.5YEL: 1YEL • S3 [1]; 1YEL • S3 [2]; 1YEL • S3 [3]; 1YEL • S3 [4]
19 — 1ORN-BLK • A8b
20 — 1ORN-WHT • S29
21 — 1PNK-WHT • S29
22 — 1PNK-BLK • M15
23 — 1WHT-BLK: 1WHT-BLK • I29; 1BRN-WHT • G133c
24 — 1LTB-WHT • G337
27 — 1LTB • G133a
28 — GRN • S31
29 — 1PPL • S35
30 — 1YEL-RED • S38
31 — 1GRN-BLK • S34
32 — 1LTB • S43
34 — 2.5BLK: 1.5BRN-BLK • S40; 1BLK • S35; 2.5BLK • G60b
35 — 1GRY • S28

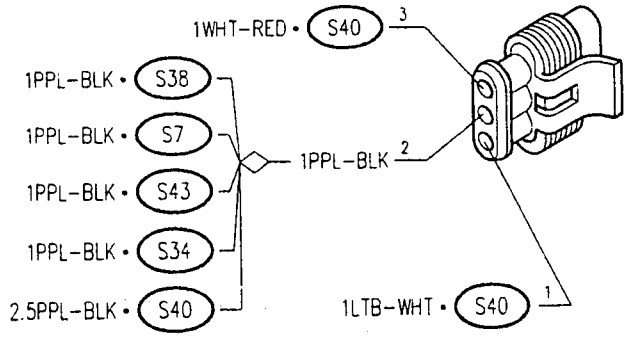
COMPONENTS AND CONNECTORS (cont.d)

Absolute pressure sensor	S43	IAW control unit switching connection IAW (**)	S49



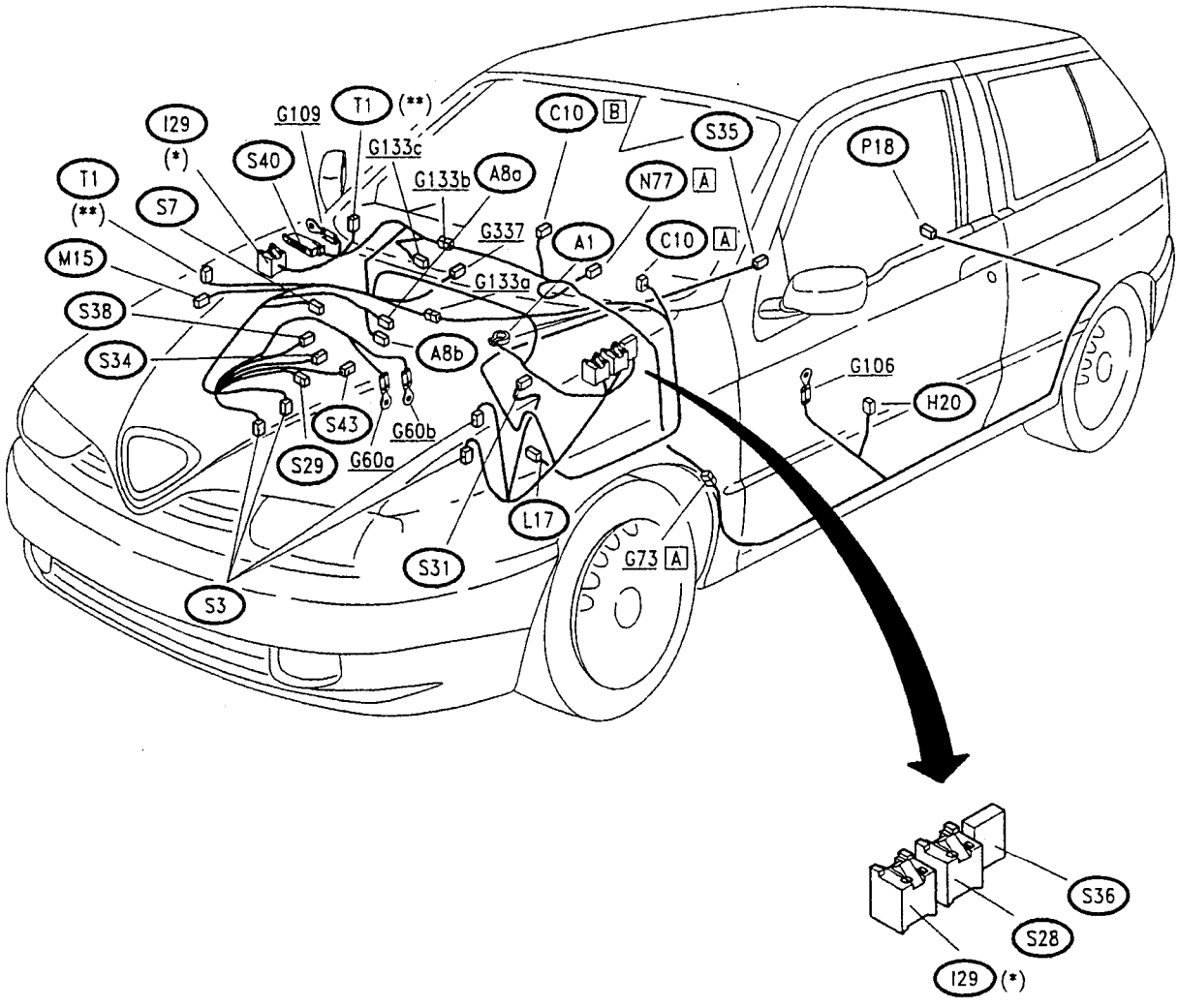


Connector for ALFA TESTER (IAW)	T1



(**) Only for certain cars without ALFA ROMEO CODE and without alarm system

LOCATION OF COMPONENTS



(*) Relay **I29** is, for some vehicles only, located in the engine bay next to relay **S28**: in all other cases it is located in the container of control unit **S40**.
(**) The connector **T1** is, for some vehicles only, located near the control unit **S40**; in all other cases it is located in the engine bay.

FAULT-FINDING

The control unit possesses a self-diagnosis system which continuously checks the signals leading from the different sensors with the limit values allowed, storing any faults. When such faults are detected the warning **light on the instrument** cluster is turned on. These faults may be easily located connecting to the ALFA ROMEO Tester.
In cars without ALFA ROMEO CODE: the warning light - if present - turns on for 3 seconds with the key at MARCIA: it stays on if a fault is present, otherwise it goes off (with faults during starting there are 3 seconds of "pause").
In cars with ALFA ROMEO CODE the procedure is the same, but the light stays on for 4 seconds.
The control unit has a permanent memory, namely it keeps the error indication even if the reason that caused it has ceased and if the ignition key has been turned to STOP; there is also a volatile memory which loses the error information as soon as its cause ceases. This makes it possible to locate errors of a sporadic nature more effectively.

Self-adaptation

The I.A.W. control unit is self-adapting
This means that it is capable of changing in time (and storing in the memory) a corrective factor of the injection time, which in turn affects the titration of the mixture. The control unit automatically carries out (in its own memory) the adaptations caused essentially by "ageing" of the engine, which in other systems, are carried out by the operator using the CO trimmer. **N.B.** Disconnecting the battery this information will be taken and once the control unit has been re-connected the control unit will start the above-mentioned adaptations from "scratch".

Recovery function

In the event of failures to the sensors the control unit, after turning on the warning light on the instrument cluster, replaces the value transmitted by the sensor with a so- called "recovery" value - contained in the actual memory of the control unit - the purpose of this is to make it possible to take the car to the nearest Service centre.

NOTE: This value is also transmitted to the Tester: therefore, during diagnosis it should be remembered that in the case of a failure the Tester signals the error of the sensor concerned and the display will show the recovery value.

Diagnosis using the ALFA TESTER

N.B. Before carrying out diagnosis with the Tester, carry out the preliminary check described below (**TEST A**).

The connection between the Tester and the electronic control unit must be carried out as follows:

1. Connect the ALFA Tester with adapter "ADAPTER ADT 101 A".
2. Power the Tester either through the cigar lighter socket or connecting it directly to the battery using the cable provided.
3. Connect the Tester socket to that of the control unit (the socket is to be found near the control unit itself).

The information the instrument can give comprises:

– display of the parameters;

– display of errors;

– active diagnosis.

Error clearing

Before ending diagnosis the contents of the "permanent" memory should be cleared by the Tester in the "Active Diagnosis" function.

In the failure to do so, the next time the Tester is connected, errors that have already been examined will be signalled.

The contents of the "permanent" memory may be cleared in the following ways:

– through the Tester in "Active Diagnosis".

– if the cause that determined the error is no longer present and the engine has been started 5 times (operating for no less than 20 minutes) with at least 2 minutes between one start and the next.

N.B.:
Disconnecting the control unit from the system; even for a very long time will not cancel the contents of the "permanent" memory.

Changing the control unit

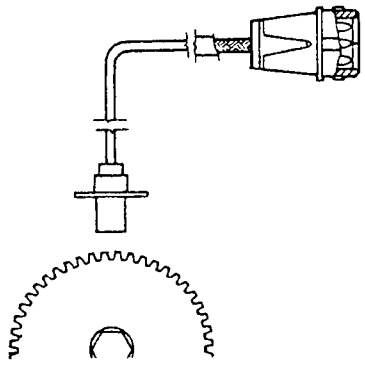
When **the control unit is changed**, displaying the lambda sensor parameter it is possible that the moving bar shows that the mixture titration has moved excessively towards the right or towards the left. If the **mixture is rich** the moving bar has moved towards the right of the display towards the "+" sign.
If the **mixture is lean**, the moving bar has moved to the left of the display towards the "-" sign.
Under normal operating conditions, the bar is between the two signs.

In this case, it is necessary to run a road test to allow the car to reach normal operating temperature and for the control unit (especially during stops with the engine idling) to intervene with the self-adapting function.

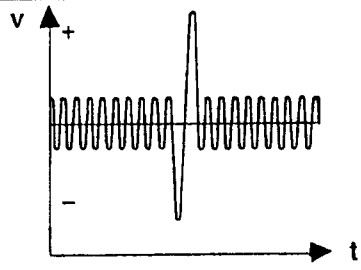
N.B.: This suggests that due care should also be taken when control units are exchanged between cars at the service centre!

CHECKING COMPONENTS

Rpm and crankshaft position sensor (S31)

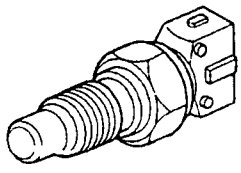


SPECIFICATIONS	
Coil resistance	680 Ω ± 10%
Inductance	295 mH ± 10 %
Gap between sensor and fly-wheel ring gear	0.25 ± 1.3 mm



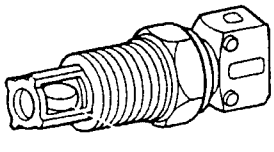
Output signal

Engine temperature sensor (S7)



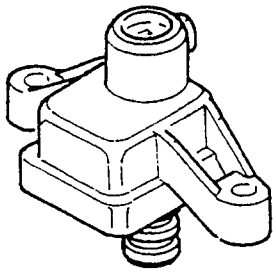
SPECIFICATIONS	
Temperature (°C)	Resistance (kΩ)
- 40	100.950
- 20	29.121
0	9.750
+ 20	3.747
+ 40	1.693
+ 60	0.798
+ 80	0.377

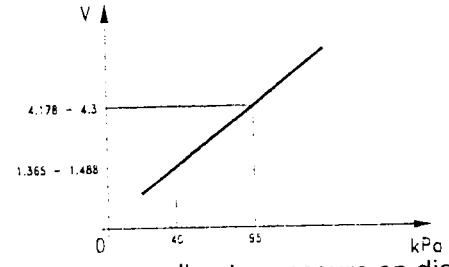
Intaken air temperature sensor (S34)



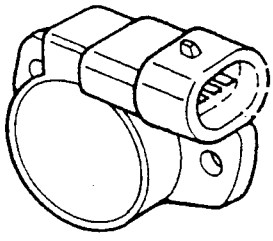
SPECIFICATIONS	
Temperature (°C)	Resistance (Ω)
+ 100	181.10 ± 7.5
+ 128	82.13 ± 3.17

Absolute pressure sensor (S43)

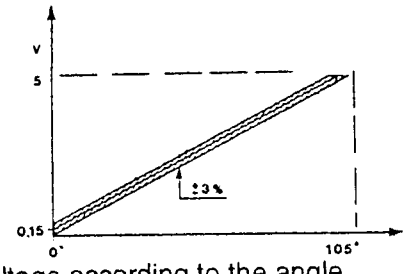


SPECIFICATIONS

Output voltage according to pressure on diaphragm

Throttle position sensor (S38)

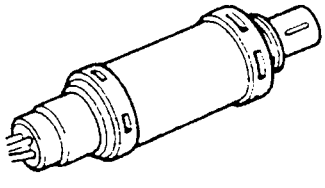


SPECIFICATIONS	
Useful electric angle	105 ± 2°
Mechanical angle	110 ± 4°
Resistance of the track	1200 Ω ± 20%
Temperature operating field	-30°C ÷ +125°C



Output voltage according to the angle

Lambda sensor (S35)

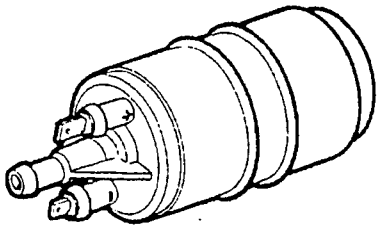


SPECIFICATIONS	
Heating resistance	3 Ω

Electroinjectors (S3)

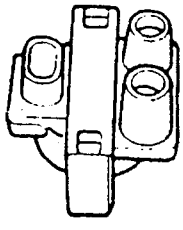
SPECIFICATIONS	
Winding resistance	14.5 Ω
Supply voltage	14 Volt
Minimum supply time	2.0 msec at 14 V
Operating temperature	-40 °C ÷ +120 °C

Fuel pump (P18)



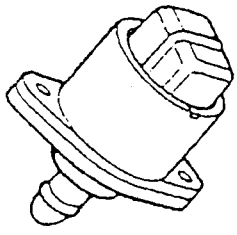
SPECIFICATIONS	
Flow rate	≥ 120 l/h
Pressure	4 bar
Nominal voltage	12 V

Ignition coils (A8a) (A8b)



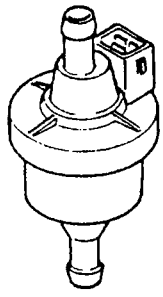
SPECIFICATIONS	
Primary resistance	550 mΩ ± 10%
Secondary resistance	7.4 kΩ ± 10%

Idle speed adjustment actuator (S29)



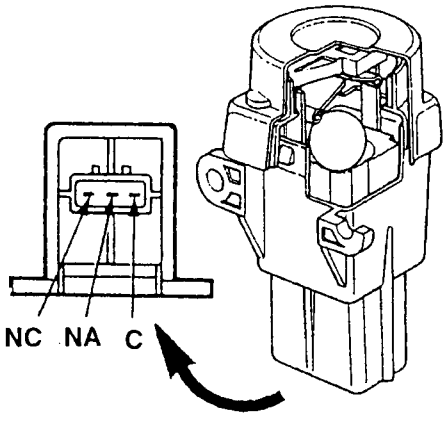
SPECIFICATIONS	
Resistance of windings	53Ω ± 10% a 20°C
Operating temperature	-40°C ÷ +85°C

Evaporative solenoid valve (M15)



SPECIFICATIONS	
Air flow rate	Min. 0.08 m^3/h Max. 3.0 m^3/h
Duty-cycle signal	12 V; 10 Hz
Ohmic resistance of the winding	45 Ω ± 1 %
When not energized the solenoid valve is normally open	

Inertial switch (H20)



SPECIFICATIONS
Check the continuity between pins NC and C: this continuity is interrupted in the event of a shock; the contact is closed again by pressing the special button

PRELIMINARY CHECK OF THE IAW SYSTEM — TEST A

NOTE: Firstly check that the ALFA ROMEO CODE system is working properly as it may have cut off the supply to the system (see the "ALFA ROMEO CODE" section, or, if the ALFA ROMEO CODE system is not installed, check the connection with the alarm system).

TEST PROCEDURE	RESULT	CORRECTIVE ACTION
A1 CHECK FUSE – Check that fuse **S36** is intact	OK ▶ ~~OK~~ ▶	Carry out **step A2** Change the fuse (20A)
A2 CHECK VOLTAGE – Check for 12 V at pin 30 of relay **I29** and at pins 30 and 86 of relay **S28**	OK ▶ ~~OK~~ ▶	Carry out **step A3** Restore the wiring between the battery **A1**, fuse **S36** and relays **S28** & **I29**
A3 CHECK VOLTAGE – With the key turned, check for 12 V at pin 86 of relay **I29**	OK ▶ ~~OK~~ ▶	Carry out **step A4** Restore the wiring between the ignition switch **B1** and relay **I29**
A4 CHECK RELAYS – Check that relays **I29** and **S28** are working properly	OK ▶ ~~OK~~ ▶	Carry out **step A5** Change any faulty relays
A5 CHECK CONTROL UNIT SUPPLY – With the key turned, check for 12 V at pin 35 of the control unit **S40** and appr. 0 V (very low voltage) at pin 4 and 23 of **S40**	OK ▶ ~~OK~~ ▶	Carry out **step A6** Restore the wiring between the control unit **S40** and the relays
A6 CHECK EARTH – Check for an earth at pin 17 and 34 of **S40**	OK ▶ ~~OK~~ ▶	**CONTINUE DIAGNOSIS USING THE ALFA TESTER** Restore the wiring between **S40** and earth **G60a**, or **G60b**