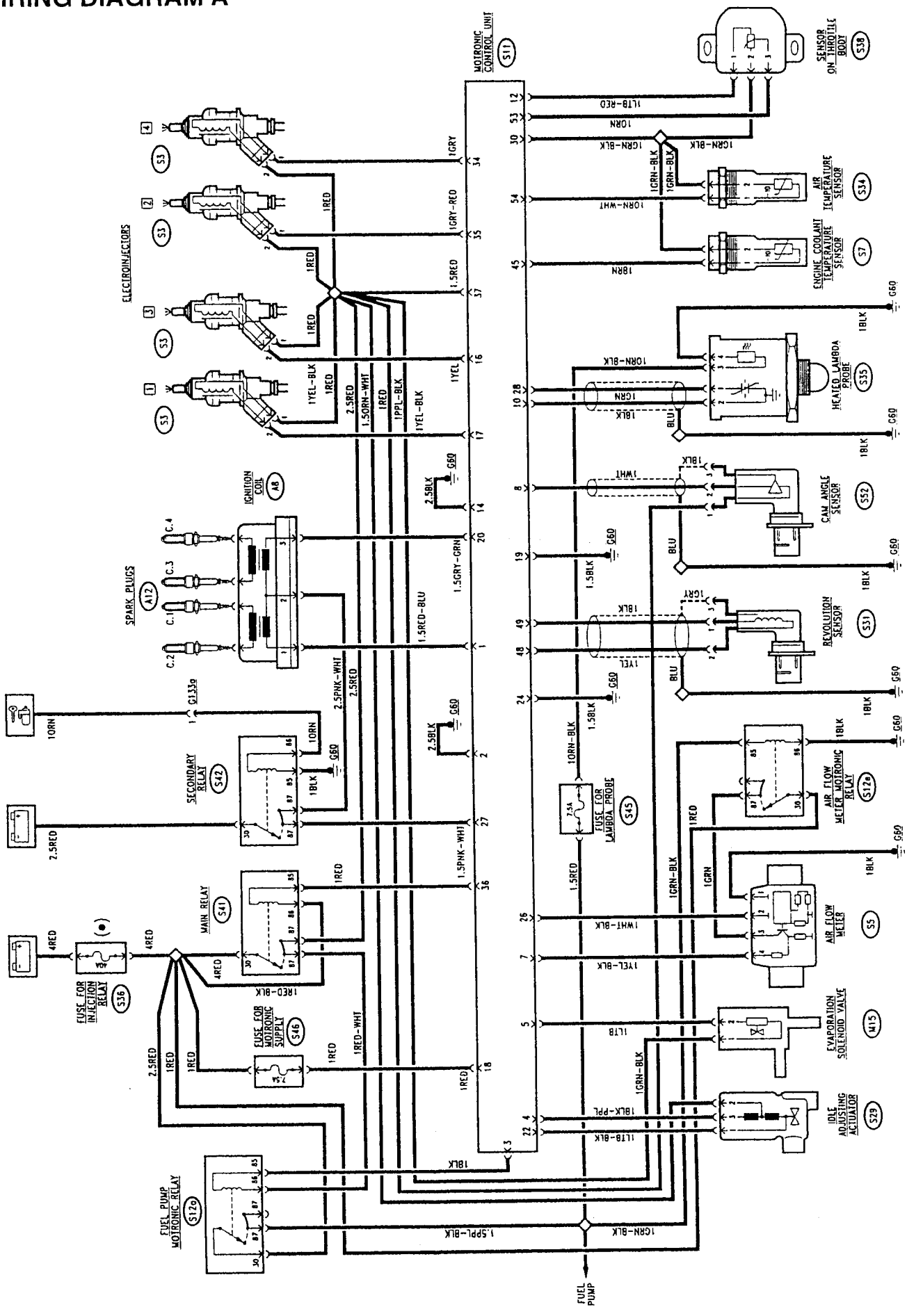
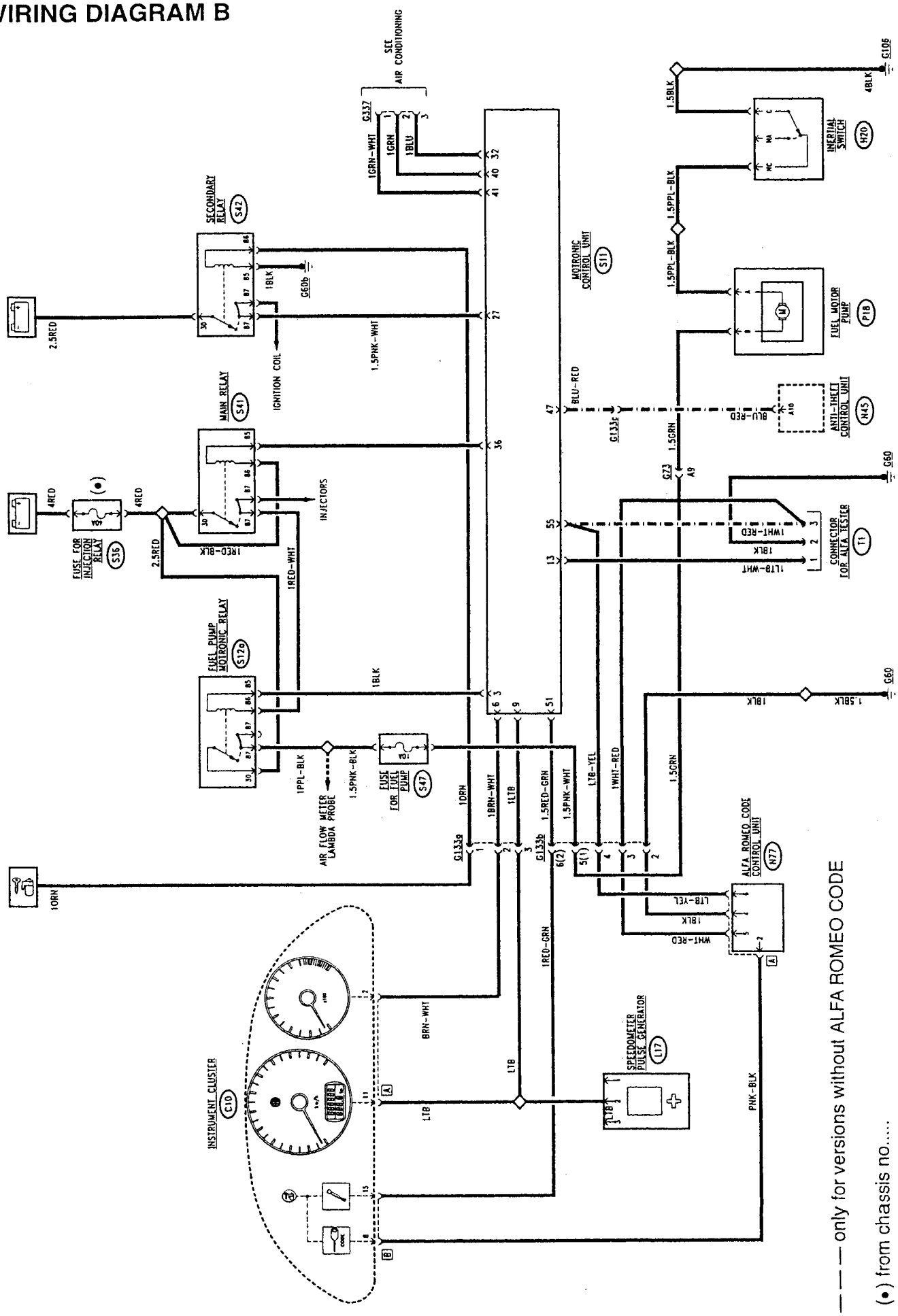
INJECTION/IGNITION SYSTEM
MOTRONIC M2.10.3
- Boxer 1.7 16v Engine -

INDEX

WIRING DIAGRAM A



WIRING DIAGRAM B



GENERAL DESCRIPTION

An electronic control system supervises and regulates all the parameters of the engine, optimising performance and consumption levels through response in real time to the different operating conditions.
This is the M 2.10.3 version of the proven and reliable BOSCH MOTRONIC.
Compared with the previous versions this new M 2.10.3 system adopts a control unit - with 55 pins - with advanced design and production technology, it also possesses many possibilities for inserting auxiliary functions.

WARNING: the MOTRONIC M2.10.3 control unit is controlled by the ALFA ROMEO CODE system which enables the operation of it only after cheking the secret memorised code (for further details see "ALFA ROMEO CODE")

FUNCTIONS OF THE SYSTEM

Sequential and timed injection (S.E.F.I.)

With this control unit injection is sequential and timed for each cylinder: the injection instant (delivery of fuel into the intake manifolds through the opening of the injectors) is not simultaneous for all the cylinders, but takes place for each cylinder in correspondence with the optimal point of injection, calculated by the control unit according to special maps according to the load, speed and temperature of the engine).
NOTE: the instant considered in the processing of the maps is that of the start of injection.

Static ignition

An ignition system has been adopted with "static distribution" (with semi-conductors, without distributor). This solution makes it possible to eliminate rotary components; in addition, it does not produce external sparks thus reducing the risk of interferences; lastly it reduces the number of high voltage cables and connectors.
Static ignition takes place through two coils, according to the "lost spark" logic: this solution exploits the different pressures and environments existing contemporaneously in a pair of cylinders: when one of the cylinders approaches the bursting stroke, with a mixture of air and fuel, the corresponding cylinder is at the end of the exhaust stroke in the presence of exhaust gas.
he voltage needed to strike the arc between the spark plug electrodes is high (appr. 10 kV) in the cylinder in the bursting stroke, while in the exhaust stroke, this voltage is extremely low (appr. 500 V).
The instant in which the control unit removes the command to one of the power stages, the passage of current in one of the primary circuits of the coil is cut off, thereby generating on the secondary, by induction, a rise in the voltage (up to 30 kV loadless).
While the high voltage rises, one side of the secondary circuit of the coil is closed to earth by the "lost spark" which strikes with appr. 500 V on the spark plug in the cylinder in the exhaust stroke. This makes it possible to raise the voltage on the spark plug connected to the other side of the secondary circuit which is in contact with the mixture in the cylinder, thereby causing its combustion.

Metering the air flow rate

The air flow meter has been newly designed and it is of the "heated film" type: the operating principle is based on a heated plate which is inserted in the intake manifold.

The film plate is kept at a constant temperature appr. 120°C) by a heating resistance placed in contact with it.
The mass of air flowing through the manifold tends to withdraw heat from the plate: therefore, to keep its temperature constant, a certain current needs to flow through the heating resistance: this current, suitably measured, is proportionate with the mass of flowing air.

N.B. This air flow meter measures directly the mass of air (and not the volume as in the previous versions with "floating port", thereby eliminating problems of temperature, altitude, pressure, etc).
This new air flow meter does not incorporate the intaken air temperature sensor which is separate, to be found just downstream of the air flow meter.

Cylinder detection

Following the sequential and timed injection system, a timing sensor has been introduced (cam angle sensor): this makes it possible to detect which cylinder is in the bursting stroke when the engine is started, in order to be able to start the correct injection sequence.
The sensor is formed of a Hall-effect device by which the voltage signal sent to the control unit "lowers" suddenly when the tooth machined on the camshaft passes in front of the actual sensor; therefore a signal is sent every two turns of the crankshaft.

Fuel pump

The complex control logic of the fuel pump carried out by the control unit immediately cuts off the supply to the engine as soon as the engine stops.
Moreover, the pump will not operate with the key engaged and the engine not running.

In this car, this logic is integrated - in order to further higher the standards of safety - by the **inertial switch** device: this is an electromechanical switch which, in the event of heavy shocks, opens to cut off the circuit that takes the earth to the fuel pump, which stops instantaneously. This device is particularly importan' as an integration of the safety guaranteed by the logic of the control unit, especially if the car is hit from

behind or in the case of other accidents in which the engine does not stop immediately.

OPERATING LOGIC

– Identification of the "operating point":

the "point of operation of the engine" is located through two sensors: the rpm sensor informs the control unit of the speed of rotation of the engine; the air flow meter supplies the value of the mass of air actually entering the cylinders, defining the instantaneous volumetric yield of the engine.

– Adjustment of injection times (quantity of fuel):

the control unit controls the injectors very quickly and precisely, calculating the opening time on the basis of engine load (rpm and air flow), also taking into account the battery voltage and the temperature of the engine. Injection is "sequential", i.e. the injectors are opened in correspondence of the exhaust stroke of the corresponding cylinder

– Ignition adjustment (calculation of advances):

the control unit calculates the advance on the basis of the engine load (rpm and air flow); the value is also corrected according to the temperature of the intaken air and that of the engine: ignition is "static" as described previously.

– Cold starting control:

during cold starts the control unit uses special advance values and injection times.

When a determinate temperature/rpm ratio is reached, the control unit resumes normal operating conditions.

– Control of enrichment during acceleration:

upon the need for acceleration, the control unit increases injection in order to reach the required load as quickly as possible.
This function takes place through the potentiometer located on the throttle which instantaneously informs the control unit of the need to accelerate.

– Fuel cut-off during deceleration:

with the throttle closed and an engine speed above a certain threshold, the control unit de-activates fuel injection; this way the rpms decrease rapidly towards idle speed reducing the speed and fuel consumption. The threshold values varies according to the temperature of the engine and the speed of the car.

– Control of idle speed:

the adjustment of the engine idle speed is carried out through the special actuator which acts on 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 compensating the load required by the services in order to ensure that idle speed is as constant as possible.

– Maximum Rpm limiting:

above a certain threshold the control unit automatically stops the injection of fuel preventing the engine from "over-revving".

– Combustion control -lambda probe-:

the oxygen sensor (or "lambda" probe) informs the control unit of the amount of oxygen at the exhaust, and therefore the correct air-fuel metering.
The optimum mixture is obtained when the lambda coefficient = 1 (optimum stoichiometric mixture). The electric signal sent by the probe to the control unit changes abruptly when the composition of the mixture departs from lambda = 1. 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.
The signal from the lambda probe is processed inside the control unit by a special integrator which prevents sudden "oscillations".
The probe is heated by an electrical resistance so that it quickly reaches the correct operating temperature (appr. 300 °C).
Through this probe it is also possible to adjust engine carburetion precisely and among other items, this makes it possible to meet emission limit regulations.

– Fuel vapour recovery:

the fuel vapours collected from the various points of the supply circuit in a special active carbon canister are ducted to the engine where they are burnt: this takes place through a solenoid valve which is opened by the control unit only when the engine is in a condition that allows correct combustion without adversely affecting the operation of the engine: in fact the control unit compensates this amount of fuel by reducing delivery to the injectors.

– Connection with the conditioner compressor:

the control unit is connected with the air conditioning system and controls the cutting in of the compressor according to the operating conditions of the engine.

As the conditioner absorbs a considerable amount of power, the control unit:

- adapts the engine idle speed each time the compressor cuts in; if the engine speed falls below 700, the compressor is cut out;
- in the case of the need for power (high speed - above 6000 rpm - or full load - max. throttle opening the compressor is cut out momentaneously.
- it prevents the compressor from cutting in when the engine is started until normal operating conditions are reached.
- **Connection with ALFA ROMEO CODE:** on cars fitted with the ALFA ROMEO CODE, as soon as the Motonic control unit receivers the "key at MARCIA" signal, it "asks" this system for consent to start the engine: this consent only takes place if the "ALFA ROMEO CODE" control unit recognises the code of the key engaged in the ignition swich as correct. This dialogue between the two control units takes place on diagnosis line K already used for the Alfa Romeo Tester.
- **Connection with the anti-theft device (on cars without ALFA ROMEO CODE):**

if the car is fitted with the electronic anti-theft device, the Motronic control unit receives consent to operate from the anti-theft control unit via a special signal: if this signal is "low" -earth- the control unit operates normally. If the signal becomes "high" - appr. 12 V - the control unit is deactivated and the engine will not start.

COMPONENTS

The electronic control unit receives the signals leading from the **sensors** which "read" the operation of the engine, it processes them according to a logic stored inside in "maps" which correlate the different parameters in the best way possible and it operates the **actuators** accordingly so that the engine always works with the highest level of regularity and yield.

The control sensors are the following:

- engine temperature sensor (**S7**);
- air temperature sensor (**S34**);
- sensor on throttle body (**S38**);
- rpm sensor (**S31**);
- cam angle sensor (**S52**);
- heated lambda sensor (**S35**)
- air flow meter (**S5**);

The actuators controlled by the system are the following:

- electroinjectors (**S3**);
- ignition coil (**A8**);
- fuel pump (**P18**);
- idle speed adjustment actuator (**S29**);
- vapour recovery solenoid valve (**M15**) .

The control unit is also connected with:

- the heating and ventilation system,
- The ALFA ROMEO CODE control unit **(N77)** or the alarm control unit **(N 45)**
- the instrument cluster **(C10)** to which it sends the signal for the rev counter, while it receives the car speed signal.
- sensor **L17** from which it receives the car speed signal.

The system is completed by four relays: the first three - the main relay (**S41**), secondary relay **S42** and fuel pump relay **S12a** operate the fuel pump, the injectors, the coils and the other components of the system, while the fourth - the air flow meter relay (**S12e**) - supplies the air flow meter.

The whole system is supplied by the line of fuse **S36** (40A) (only from chassis no. ...).

The supply line is protected by a wander fuse (**S46**), while special fuses protect the pump (**S47**), and the resistance of the lambda probe (**S45**).

Lastly there is an earth point (**G60**) on the engine.

The connector **T1** used for the connection with 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

The Motronic control unit **S11** controls and adjusts the entire electronic ignition and injection system.

The control unit is supplied at pin 18 directly by the battery through fuse **S46** (7.5A). At pin 37 it receives the supply from the main relay **S41**, while at pin 27 it receives the "key-operated" supply from the secondary relay **S42**.
Pins 2, 14, 19 and 24 are earthed and serve as reference respectively for the ignition, the injectors, electronic screening and the final power stages.

Two relays control the entire system:

The main relay **S41**, acts as supply relay for the whole system; it is energized by a control signal - earth - leading from pin 36 of the control unit and consequently sends the supply (12V) to pin 37 of the control unit itself, to the fuel pump relay **S12a**, to the vapour recovery solenoid valve **M15**, to the idle speed actuator **S29**, to the cam angle sensor **S52** and lastly to the injectors **S3**.
The secondary relay **S42**, energized by the "key-operated" supply, supplies the control unit at pin 27 and the primary windings of the coil **A8a**.

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The fuel pump relay **S12a**, supplied by the main relay **S41**, is energized by a control signal - earth - leading from pin 3 of the control unit **S11**. Consequently, the relay supplies the resistance of the lambda probe **S35**, the air flow meter relay **S12e**, and of course the fuel pump **P18**; this supply line is protected by a special fuse **S47** (10A).

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

The control unit **S11** receives numerous signals from the different sensores, thereby keeping all the engine operating parameters under control.

Through a frequency signal sent to pins 48 and 49 of the control unit, the rpm sensor **S31** supplies information about the engine rpm: the two above-mentioned signals are very low in intensity and are therefore suitably screened.

The sensor is inductive and detects the number of revolutions of the engine through the change in a magnetic field produced by the passage of the teeth of a "phonic" wheel (60 teeth) fitted on the flywheel.

The cam angle sensor **S52** (timing sensor), supplied at 12 V at pin 1, and connected to earth pin 3, sends a signal from pin 2 in frequency corresponding to the phase at pin 8 of the control unit itself.
The sensor comprises a Hall effect device due to which the voltage signal sent to the control unit "lowers" abruptly when the tooth machined on the camshaft passes in front of the sensor.

The heated lambda sensor **S35** supplies the control unit information about the correct composition of the air-fuel mixture detecting the concentration of oxygen in the exhaust gas; this takes place through the signal sent to pin 28 of the control unit, while pin 10 supplies the reference earth; these two signals are very low in intensity and are therefore suitably screened.
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 **S12a** and it is protected by a specific fuse **S45** (7.5A).

The throttle body sensor **S38**, is connected with the control unit at pins 12 and 30, and generates a signal through a potentiometer which is sent to pin 53 and is proportionate with the degree of opening of the throttle itself.

The engine temperature sensor **S7**, connected to the reference earth at pin 30, supplies a signal to pin 45 proportionate with the temperature of the engine coolant, detected with an NTC material (resistance that lowers with the temperature).

The intaken air temperature sensor **S34**, connected to the reference earth at pin 30, supplies a signal at pin 54 that is proportionate with the temperature of the air in the intake box, detected with an NTC material (resistance that lowers with the temperature). The air flow meter **S5**, is supplied by the special relay **S12e**: from pin 26 of the control unit it receives the reference earth, while it sends a signal proportionate with the air flow to pin 7.

The air flow meter is of the "heated film" type: a diaphragm is interposed in a measurement channel, through which the intake air flows: this diaphragm is kept at a constant temperature by a heating resistance;the **mass** of air that crosses the measurement chanel tends to withdraw heat from the diaphragm, therefore, in order to maintain its temperature constant, a certain amount of current must flow through the resistance: this current, appropriately measured, is proportionate with the mass of air flowing in the channel.

Relay **S12e**, supplied directly with 12 V, is energized by the fuel pump relay **S12a** and thus supplies the meter **S5** itself.

On the basis of the signals received from the sensors and of the calculations carried out the control unit **S11** controls the opening of the single injectors **S3** through special signals - of the duty-cycle type - pins 17 (cyl. 1), 35 (cyl. 2), 16 (cyl. 3) and 34 (cyl. 4). The injectors receive consent (12V) to open from the main relay **S41**.

The static ignition system is controlled by the control unit directly which automatically adjusts the advance. N.B. the power modules which generate the high voltage pulses are located inside the control unit. The control signals (earth) lead from the control unit (pin 1 and 20) for the primary windings of the coil **A8,** while the secondary winding sends the pulse to the spark plugs **A12**.
The primary windings of the coil **A8** are supplied at 12 V ("key-operated") by relay **S42**.

The power modules inside the control unit are connected to earth via pin 2.

The idle speed adjustment actuator **S29** forms a by-pass line for the flow of air; this comprises two windings: one opens and the other closes a valve that adjusts the gap of the by- pass section; a safety spring establishes a mean opening value in the event of a failure to this device; the actuator, supplied by the main relay, **S41**, is controlled by the control unit through the duty-cycle signals from pin 22 (opening) and 4 (closing).

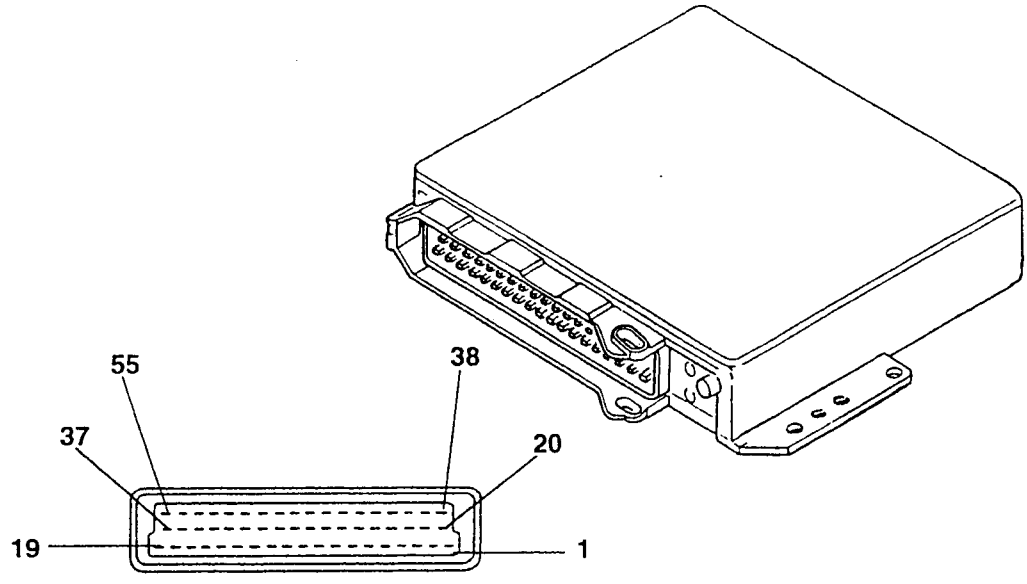
The vapour recovery solenoid valve **M15** allows the passage of the vapours towards the engine intake where they are added to the mixture entering the combustion chamber; this valve, supplied by the main relay **S41**, is opened by the control unit when the engine is under load through a duty cycle signal from pin 5.

The tachometric signal (car speed) reaches the control unit at pin 9 via sensor **L17**; while from pin 6 the

control unit sends a "pulse" signal to the cluster which is proportionate with the number of revolutions of the engine; the signal for the warning light on the instrument cluster **C10** leaves from pin 51.
The control unit **S11** is connected with the air conditioning system through pins 32, 40 and 41.
This makes it possible to adapt the engine idle speed to the increased power each time the compressor cuts in, or to cut it out in the case of high speed or engine loads. For further details see the "Heating and ventilation" section.

The control unit **S11** is connected from pin 55 with the ALFA ROMEO CODE control unit **N77** via the diagnosis line K; this way if it does not detect a correct "key code" it does not give consent to the Motronic control unit which does not begin the normal operating stage (for further details see the "ALFA ROMEO CODE" section).

Only for versions without ALFA ROMEO CODE:
From pin 47 the control unit **S11** is connected with the anti- theft control unit **N45** from which it receives the necessary consent to operate the entire system: an earth signal enables normal operation; a voltage or a.c. signal inhibits the operation of the entire control unit.
The control unit possesses a self-diagnosis system which can be used through connection to the ALFA ROMEO Tester at connector **T1**; the tester receives the fault signals from the control unit through thediagnosis lines L - pin 13 -and K - pin 55 -, while the earth leads from **G60** (line K is also used by the ALFA ROMEO CODE control unit).

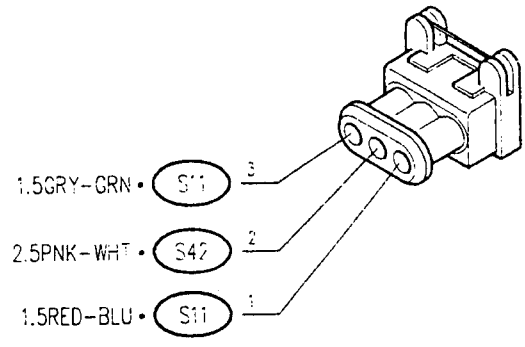


CONTROL UNIT PIN-OUTS

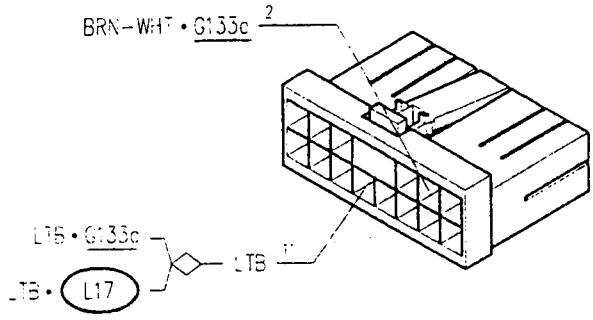
1. Ignition coil control - cyl. 2 and 3 - (from internal final stage)
2. Earth for ignition
3. Fuel pump control relay
4. Idle speed actuator control - opening
5. Evaporative solenoid valve control
6. Rev counter signal
7. Air flow meter signal
8. Timing signal
9. Car speed signal
10. Lambda probe signal
11. N.C.
12. Stabilised voltage (5V) for throttle sensor
13. Diagnosis line L
14. Earth for injectors
15. N.C.
16. Injector cyl. 3
17. Injector cyl. 1
18. Direct supply
19. Electronic screening earth
20. Ignition coil control - cyl. 1 and 4 - (from internal final stage)
21. N.C.
22. Idle speed actuator control - closing
23. N.C.
24. Earth for final stages
25. N.C.
26. Air flow meter earth
27. "key-operated" supply, from secondary relay
28. Lambda probe signal
29. N.C.
30. Electronic earth for sensors
31. N.C.
32. Air conditioner compressor relay control
33. N.C.
34. Injector cyl. 4
35. Injector cyl. 3
36. Main relay control
37. Supply from main relay
38. N.C.
39. N.C.
40. Request to cut in compressor
41. Request to cut out conditioning system
42. N.C.
43. N.C.
44. N.C.
45. Engine temperature signal
46. N.C.
47. Switch for anti-theft (for cars without ALFA ROMEO CODE)
48. Rpm sensor signal
49. Rpm sensor signal
50. N.C.
51. Signal for warning light on instrument cluster
52. N.C.
53. Throttle position signal
54. Intaken air temperature signal
55. Diagnosis line K (via ALFA ROMEO CODE control unit)

COMPONENTS AND CONNECTORS

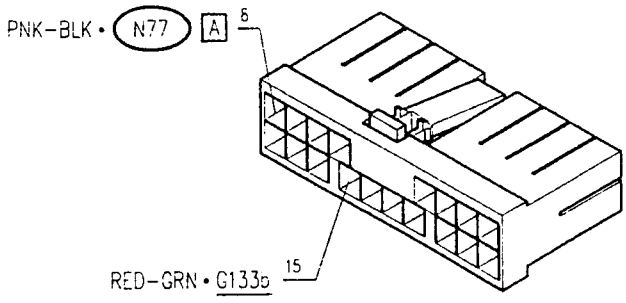
Ignition coil	A8



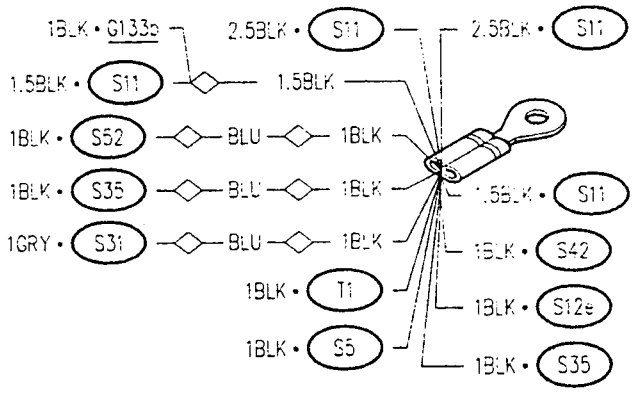
Instrument cluster	C10 A



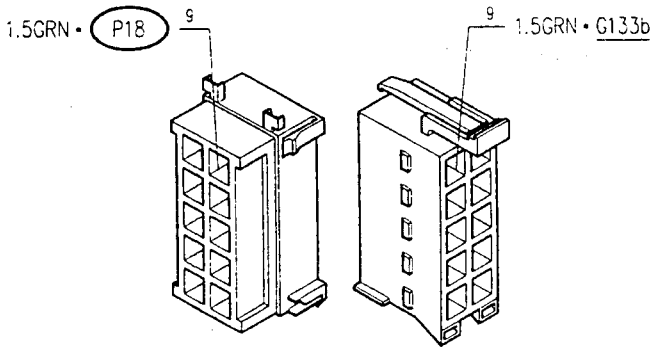
Instrument cluster	C10 B



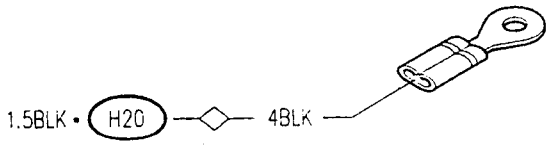
Injection wiring earth	G60



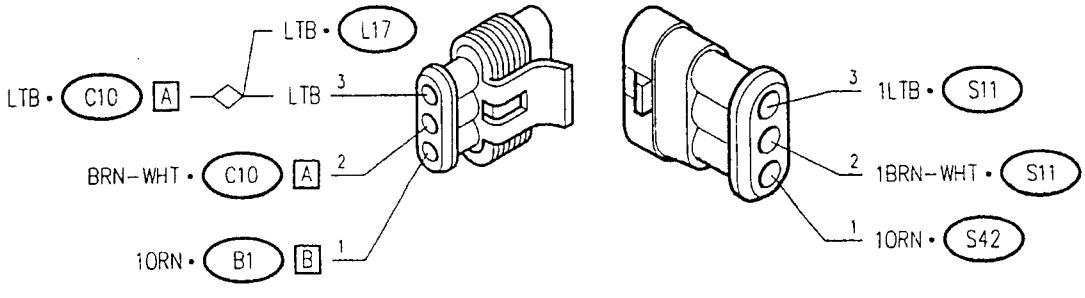
Rear services connector	G73 A



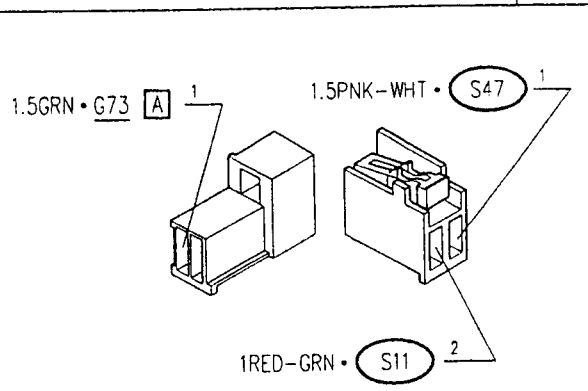
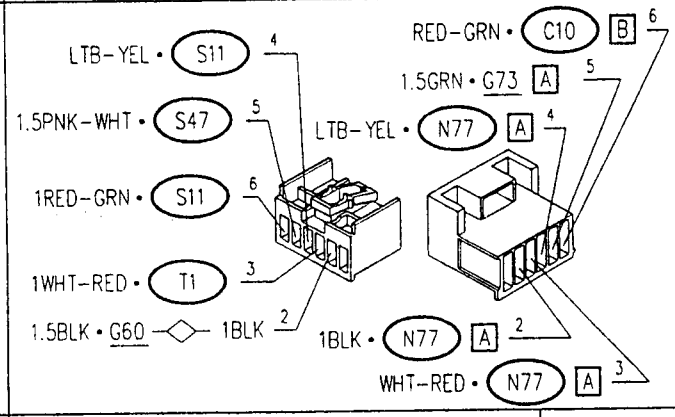
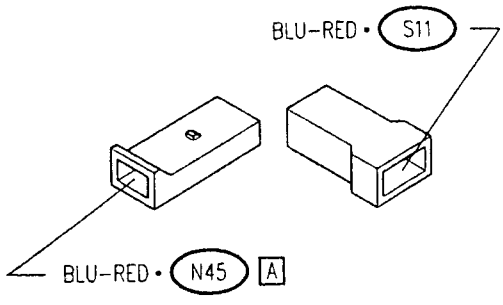
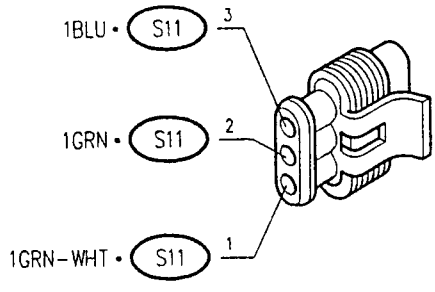
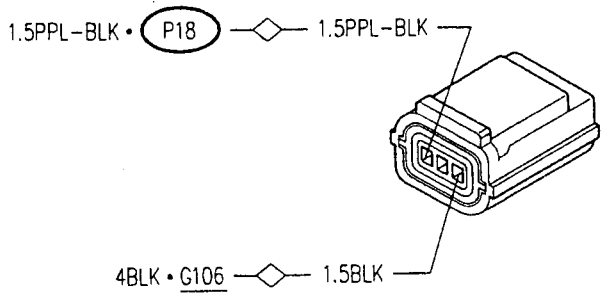
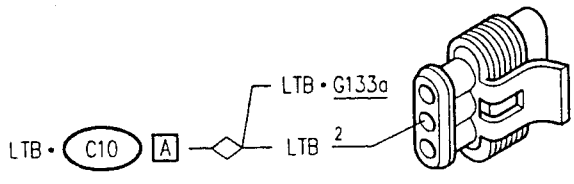
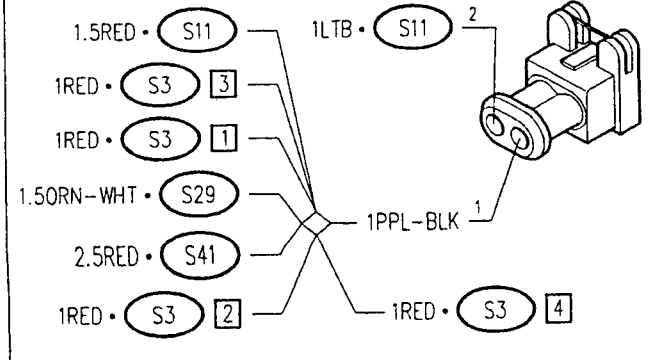
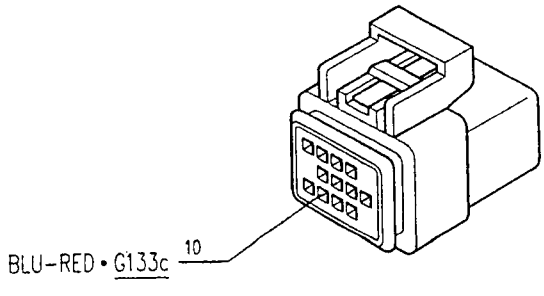
Seat crossrail earth	G106



Electronic injection wiring connector A	G133a

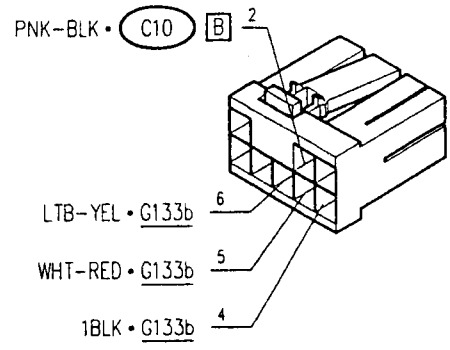
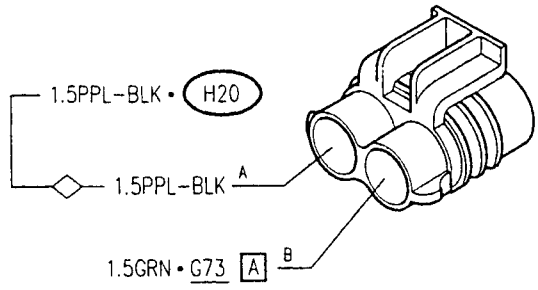
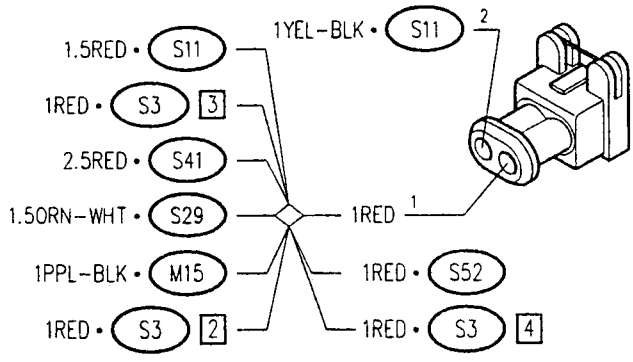
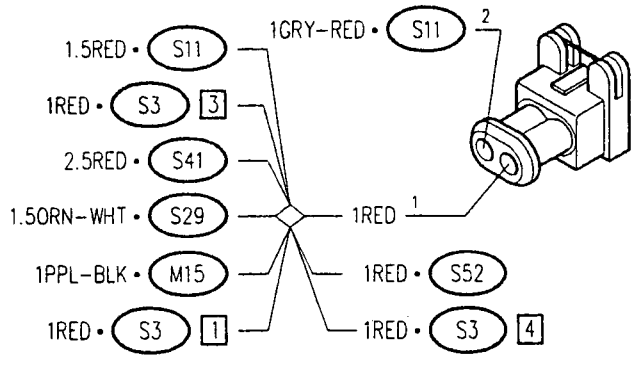
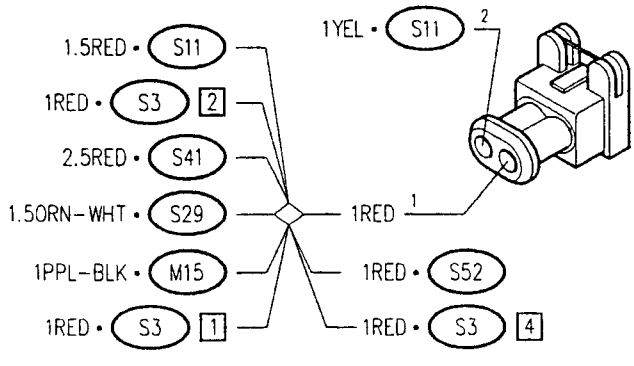
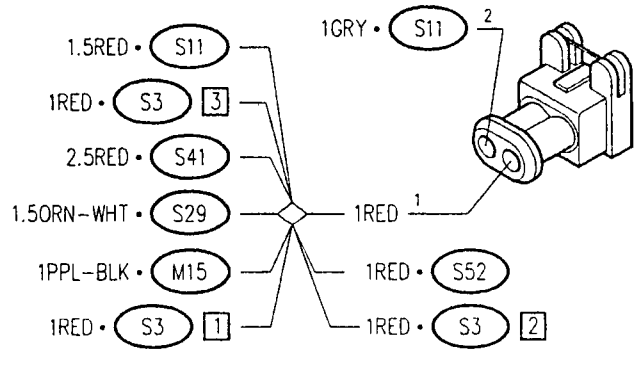
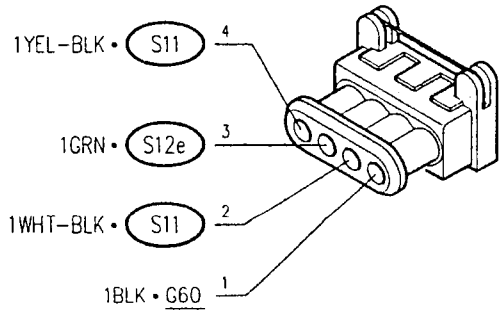
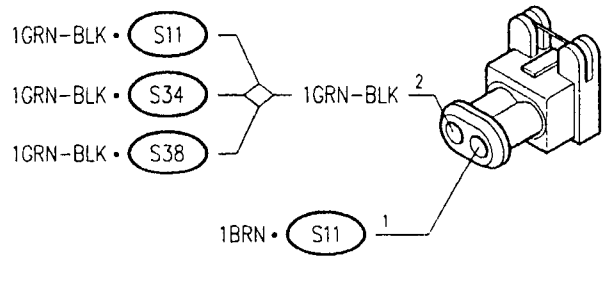


COMPONENTS AND CONNECTORS (cont.d

Electronic injection wiring connector B (*) G133b	Connector for electronic injection wiring B G133b
	
Electronic injection wiring connector C (*) G133c	**Conditioner/injection system connector G337**
	
Inertial switch H20	**Tachometric sensor L17**
	
Evaporative solenoid valve M15	**Anti-theft control unit (*) N45 A**
	

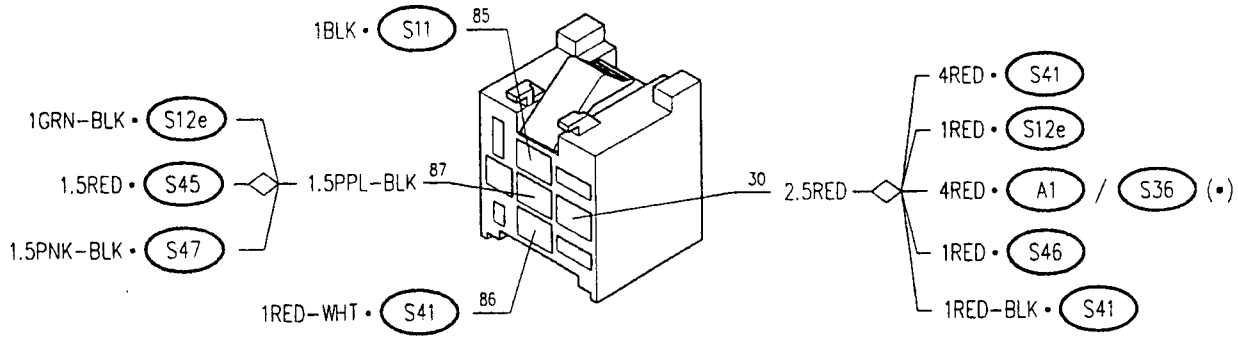
(*)only for versions without ALFA ROMEO CODE

COMPONENTS AND CONNECTORS (cont.d)

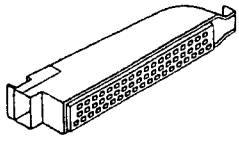
ALFA ROMEO CODE control unit (N77) [A]	Electric fuel pump (P18)
	
Electroinjector (S3) [1]	**Electroinjector (S3) [2]**
	
Electroinjector (S3) [3]	**Electroinjector (S3) [4]**
	
Air flow meter (S5)	**Engine temperature sensor (S7)**
	

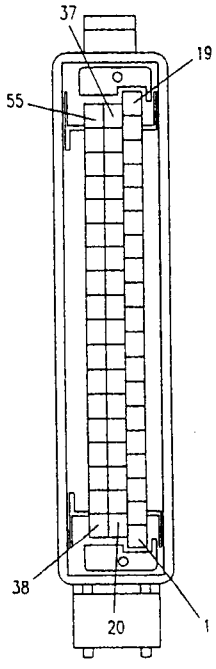
COMPONENTS AND CONNECTORS (cont.d)

Fuel pump Motronic relay — S12a



Motronic control unit — S11





1 1.5RED-BLU • A8
2 2.5BLK • G60
3 1BLK • S12a
4 1BLK-PPL • S29
5 1LTB • M15
6 1BRN-WHT • G133a
7 1YEL-BLK • S5
8 1WHT • S52
9 1LTB • G133a
10 1BLK • S35
12 1LTB-RED • S38
13 1LTB-WHT • T1
14 2.5BLK • G60
16 1YEL • S3 [3]
17 1YEL-BLK • S3 [1]
18 1RED • S46
19 1.5BLK • G60
20 1.5GRY-GRN • A8
22 1LTB-BLK • S29
24 1.5BLK • G60
26 1WHT-BLK • S5
27 1.5PNK-WHT • S42
28 1GRN • S35
30 1GRN-BLK — 1GRN-BLK • S34 / 1GRN-BLK • S38 / 1GRN-BLK • S7

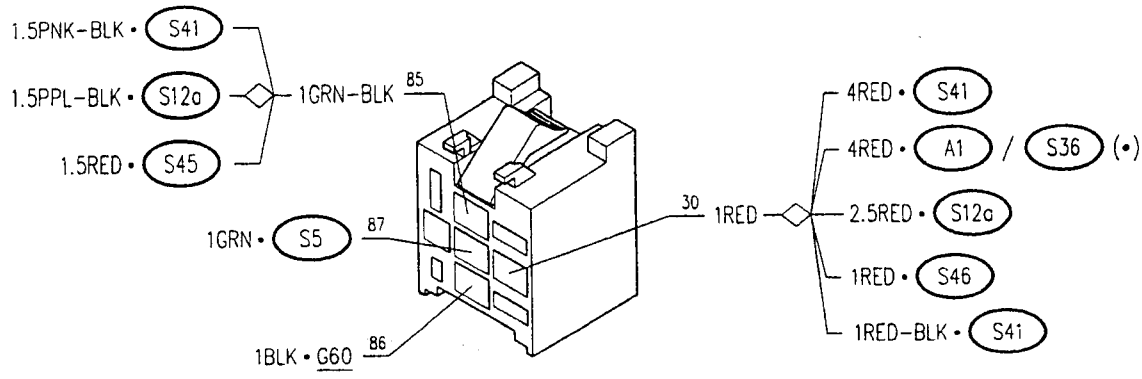
32 1BLU • G337
34 1GRY • S3 [4]
35 1GRY-RED • S3 [2]
36 1RED • S41
37 1.5RED — 1RED • S3 [3] / 1RED • S3 [1] / 1.5ORN-WHT • S29 / 1PPL-BLK • M15 / 2.5RED • S41 / 1RED • S52 / 1RED • S3 [2] / 1RED • S3 [4]
40 1GRN • G337
41 1GRN-WHT • G337
45 1BRN • S7
47 BLU-RED • G133c (*)
48 1YEL • S31
49 1BLK • S31
51 1RED-GRN • G133b
53 1ORN • S38
54 1ORN-WHT • S34
55 LTB-YEL • G133b
(1WHT-RED) • T1 (*)

(*)only for versions without ALFA ROMEO CODE

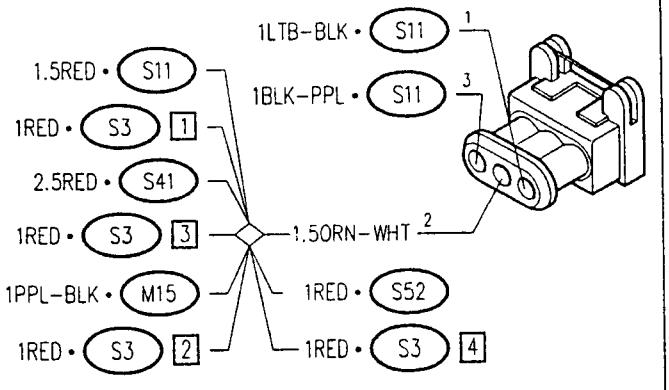
(•) from chassis no.....

COMPONENTS AND CONNECTORS (cont.d)

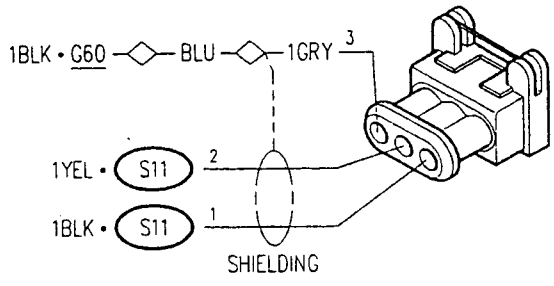
Air flow meter relay — S12e



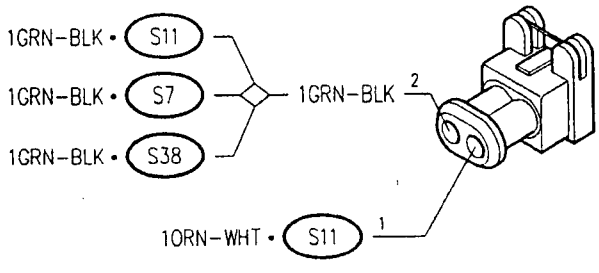
Idle speed adjustment actuator — S29



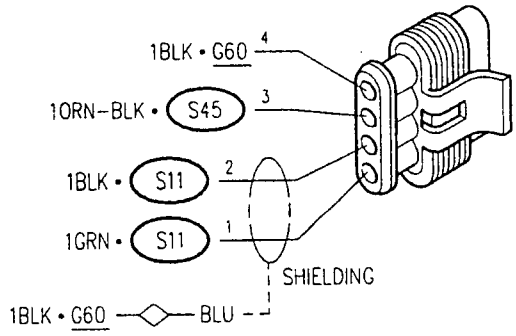
Rpm and crankshaft position sensor — S31



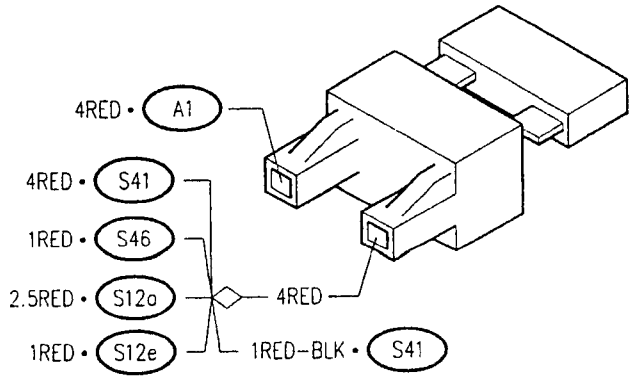
Air temperature sensor — S34



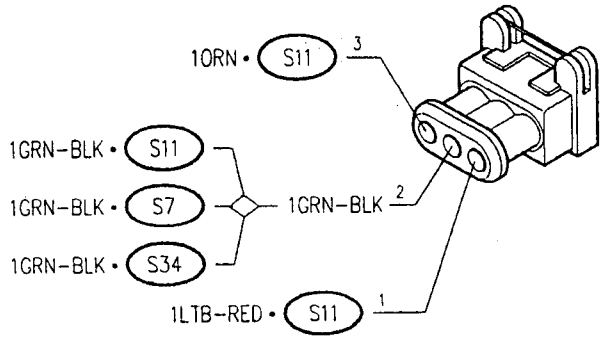
Heated lambda probe — S35



Fuse for injection relay (•) — S36



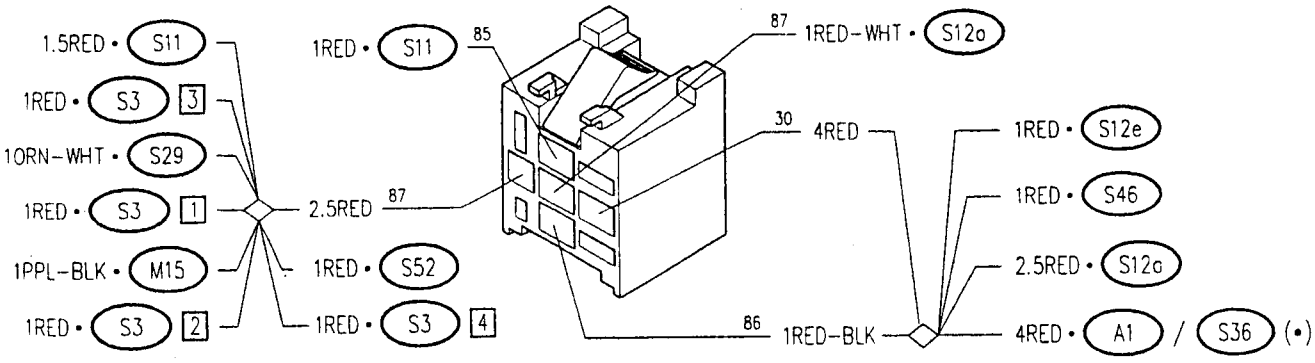
Sensor on throttle body — S38



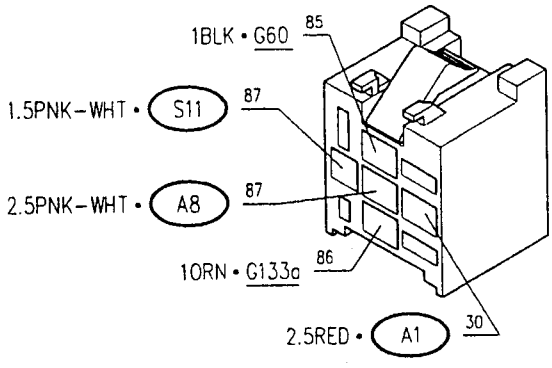
(•) from chassis no.....

COMPONENTS AND CONNECTORS (cont.d)

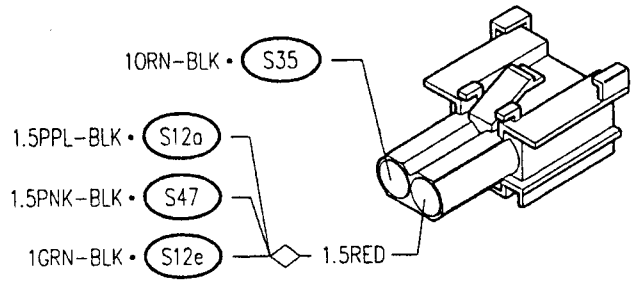
Main relay — S41



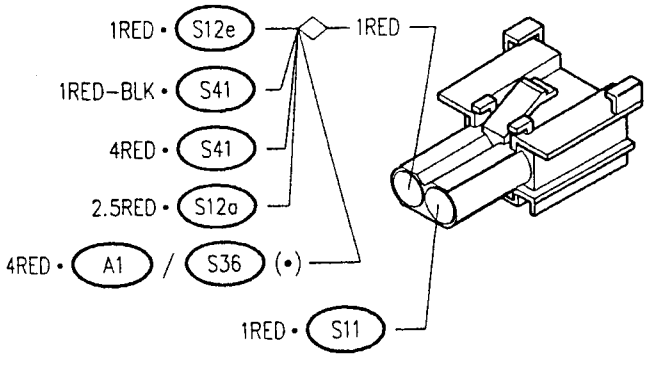
Secondary relay — S42



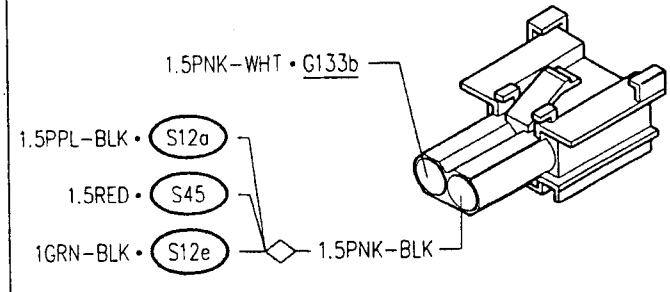
Lambda probe wander fuse — S45



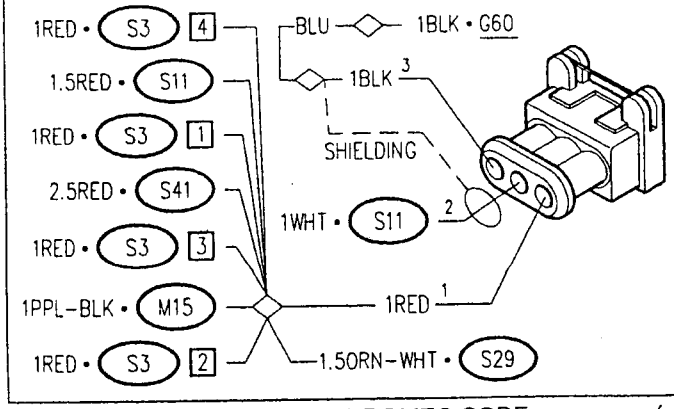
Motronic supply wander fuse — S46



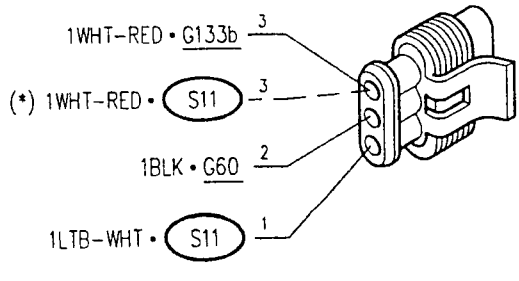
Fuel pump wander fuse — S47



Cam angle sensor — S52



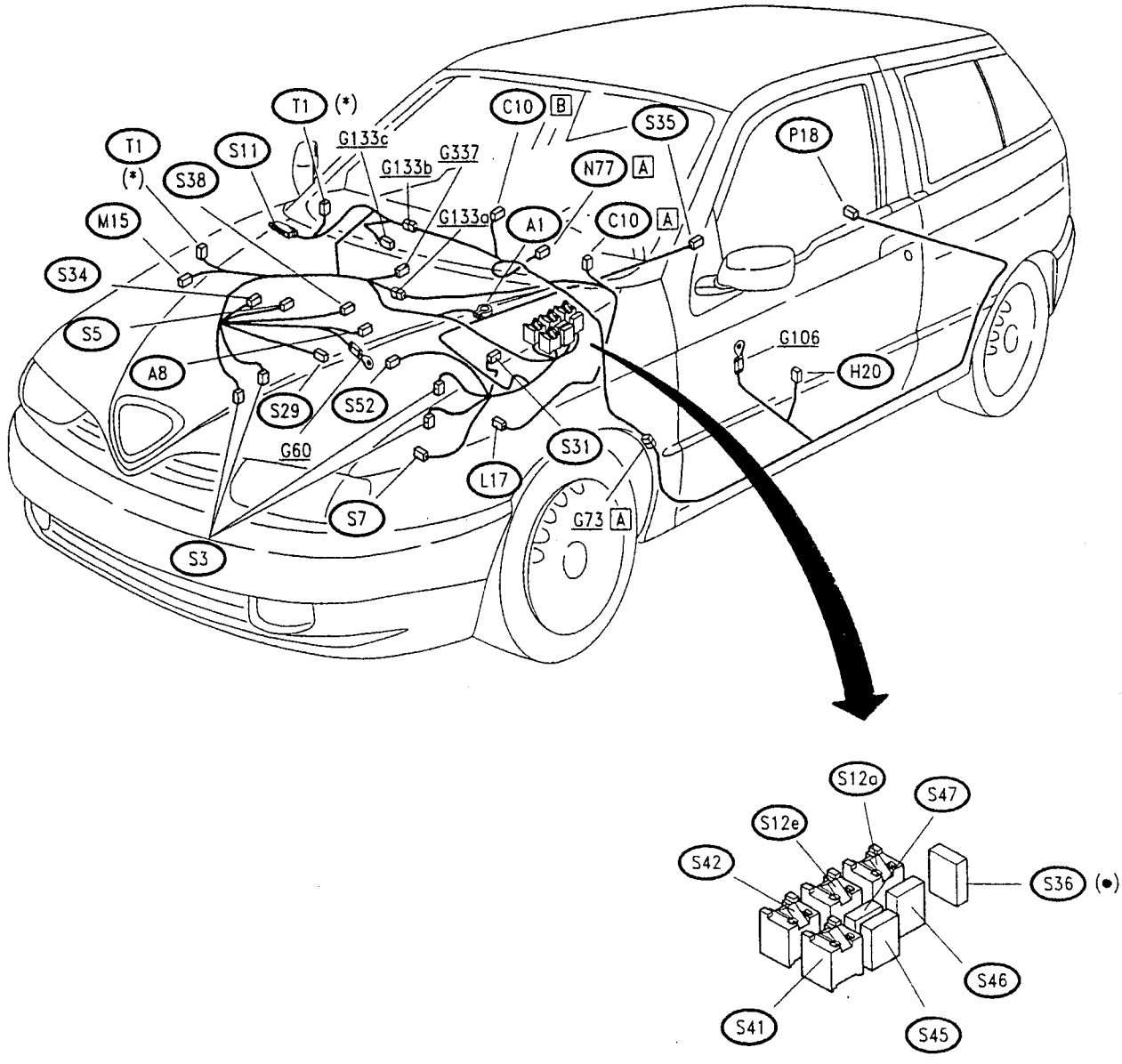
Connector for ALFA TESTER (Motronic) — T1



(*)only for versions without ALFA ROMEO CODE

(•) from chassis no.....

LOCATION OF COMPONENTS



(*) The connector **T1** is, for some vehicles only, located near the control unit **S11**; in all other cases it is locate in the engine bay.

(•) from chassis no.....

FAULT-FINDING

The control unit is fitted with a **self-diagnosis**, which continuously checks the signals from the different sensors for plausibility and compares them with the limit values allowed: if these limits are exceeded, the system detects a fault and stores it in the memory, and also turns on the special **warning light on the instrument cluster.**
With the key at MARCIA, the warning light turns on and stays on until the engine has been started, then it goes off. If it stays on, this means that a fault has been memorised.
For certain parameters, the abnormal values are replaced by suitable mean values to make it possible for the car to "limp" to a Service Centre. These are known as "recovery" values. They depend on other signals that are not failing and are defined each time by the operating logic of the control unit.

The self-diagnosis system also enables quick and effective fault-finding connecting to the ALFA ROMEO Tester, through which all the errors stored may be "read". It is also possible to check the operating parameters recorded by the control unit and command the turning on of the single actuators to check whether they are working properly.

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. Power the Tester either through the cigar lighter socket or connecting it directly to the battery using the cable provided.
2. 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.

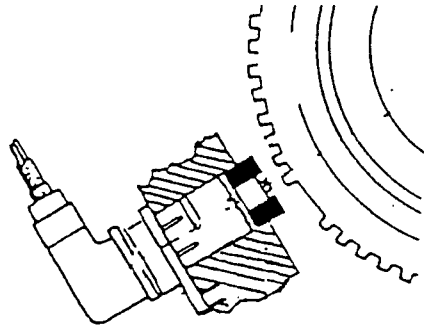
The contents of the "permanent" memory can be cleared as follows:

- using the Tester in Active Diagnosis
- if the cause that determined the error is no longer present and the engine has been started 10 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 the "permanent" memory is deleted.

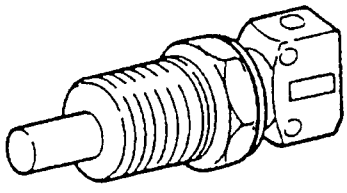
CHECKING COMPONENTS

Rpm sensor (S31)



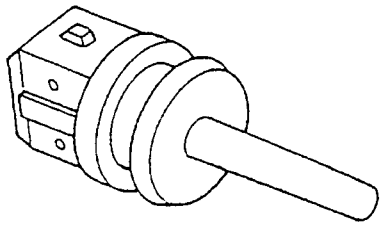
SPECIFICATIONS	
Sensor winding resistance 20 °C	486 ÷ 594 Ω
Gap between sensor and fly-wheel ring gear	0.25 ± 1.3 mm

Engine temperature sensor (S7)



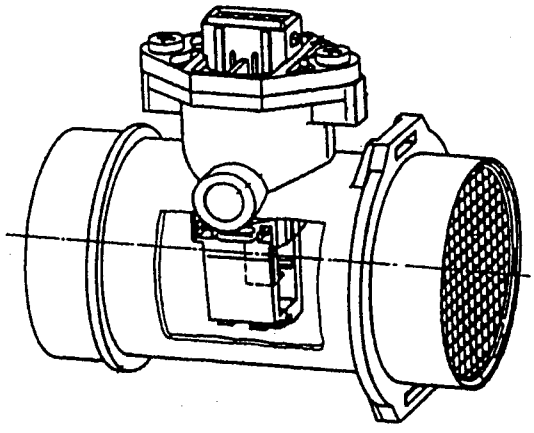
SPECIFICATIONS	
Temperature (°C)	Resistance (Ω)
- 10°C	8100 ÷ 10770 Ω
+ 20°C	2280 ÷ 2720 Ω
+ 80°C	292 ÷ 362 Ω

Intaken air temperature sensor (S34)

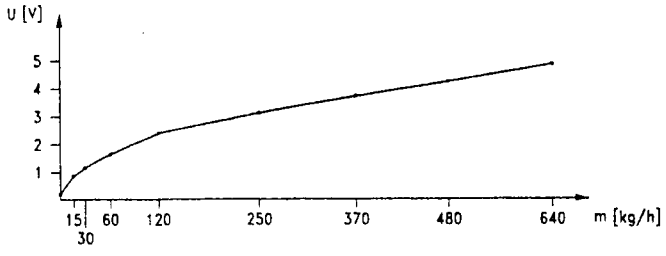


SPECIFICATIONS	
Temperature (°C)	Resistance (Ω)
- 10°C	8100 ÷ 10770 Ω
+ 20°C	2280 ÷ 2720 Ω
+ 80°C	292 ÷ 362 Ω

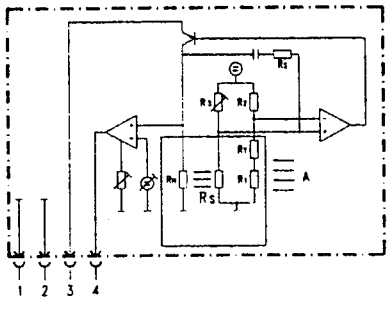
Air flow meter (S5)



SPECIFICATIONS	
Current that crosses the diaphragm:	
flow rate (kg/h)	current (A)
0 640	≤ 0.25 ≤ 0.80

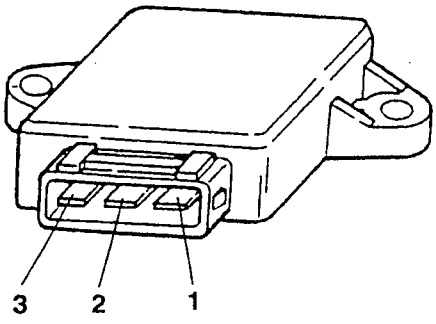


Characteristic curve of sensor
m = flow rate
U = voltage between pins 4 and 2



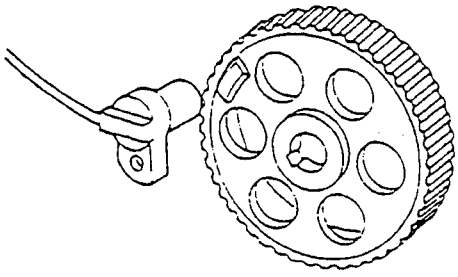
pin 1 - Earth
pin 2 - Reference earth
pin 3 - 12 V supply
pin 4 - Measurement signal
A = air
Rs = hot film sensor

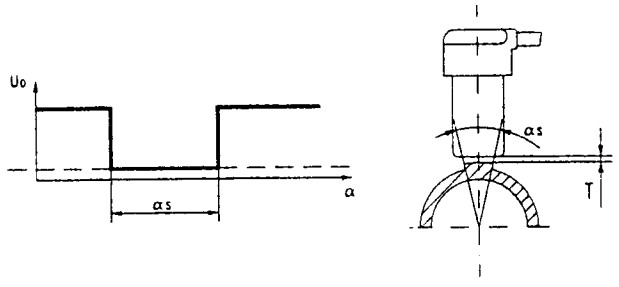
Throttle position sensor (S38)

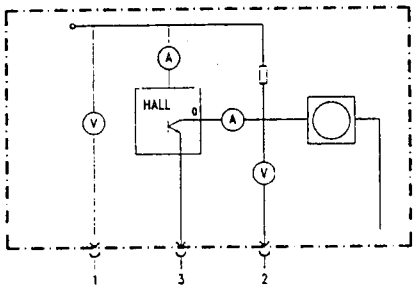


SPECIFICATIONS	
Resistance between terminals:	
1 - 2 (fixed)	≃ 2 kΩ
1 - 3 (throttle closed)	≃ 1 kΩ
1 - 3 (throttle completely open)	≃ 2.7 kΩ

Cam angle sensor (S52)

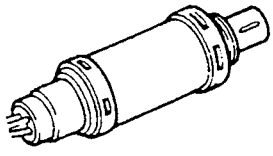


SPECIFICATIONS
The voltage signal "lowers" sharply when the tooth machined on the camshaft passes in front of the sensor itself:

Gap T = 0.1 ÷ 1.5 mm



pin 1 - Supply
pin 2 - Output signal
pin 3 - Earth

Lambda probe (S35)

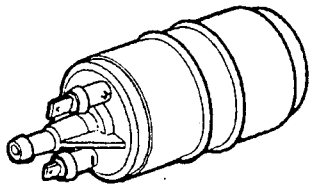


SPECIFICATIONS	
Heating resistance	3 Ω

Electroinjectors (S3)

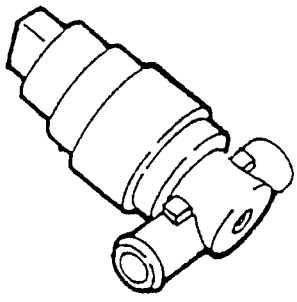
SPECIFICATIONS	
Winding resistance	16 ± 0.5 Ω

Fuel pump (P18)



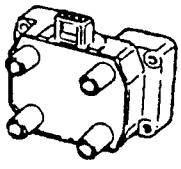
SPECIFICATIONS	
Flow rate	≥120 l/h
Pressure	4 bar
Nominal voltage	12V

Idle speed adjustment actuator (S29)



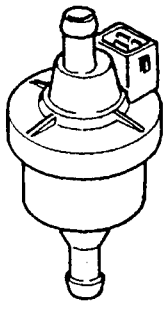
SPECIFICATIONS	
Resistance between terminals:	
1 - 3	~ 24 Ω
1 - 2	~ 12 Ω
2 - 3	~ 12 Ω

Ignition coil (A8)



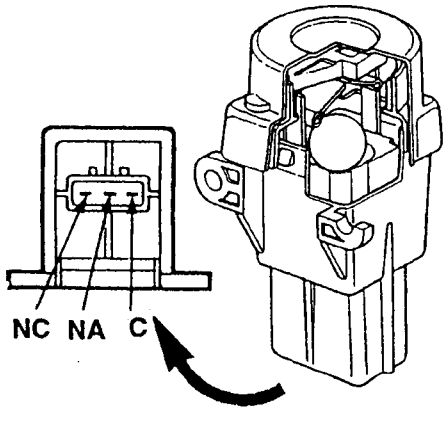
SPECIFICATIONS	
Primary resistance	0.5 Ω
Secondary resistance	13.3 Ω

Evaporative solenoid valve (M15)



SPECIFICATIONS	
Duty-cycle signal	12 V; 10 Hz
Ohmic resistance of the winding	45 Ω ± 1 %
When not energized the solenoid valve is normally closed	

Inertial switch (H20)



SPECIFICATIONS
Check the continuity between pins NC and C: this continuity is cut off in the event of a crash; the contact is re- connected by pressing the special pushbutton

PRELIMINARY CHECK OF THE BOSCH M2.10 SYSTEM — TEST A

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

TEST PROCEDURE	RESULT	CORRECTIVE ACTION
A1 CHECK FUSE – Check intactness of fuses **S45**, **S46** and **S47**	OK ▶ ~~OK~~ ▶	Carry out **step A2** Change fuses **S45**: 7.5A **S46**: 7.5A **S47** : 10A
A2 CHECK VOLTAGE – Check for 12 V at pin 30 of relays **S41, S42, S12a** and **S12e** and also at pin 86 of **S41**	OK ▶ ~~OK~~ ▶	Carry out **step A3** Restore the wiring between the battery **A1** and relays **S41, S42, S12a** and **S12e**
A3 CHECK VOLTAGE – With the key turned, check for 12 V at pin 86 of relay **S42** and at pin 86 of **S12a**	OK ▶ ~~OK~~ ▶	Carry out step A4 Restore the wiring between the ignition switch **B1** and relay **S42** and between **S41** and **S12**
A4 CHECK RELAYS – Check the correct operation of relays **S41**, **S42** and **S12a**	OK ▶ ~~OK~~ ▶	Carry out **step A5** Change any faulty relays
A5 CHECK CONTROL UNIT SUPPLY – Check for 12 V at pin 18 of control unit **S11**; with the key turned 12 V also at pins 27 and 37 of **S11** and appr. 0 V (very low voltage) at pin 3 and 36 of **S11**	OK ▶ ~~OK~~ ▶	Carry out **step A6** Restore the wiring between the control unit **S11** and the relays and between the control unit and fuse **S46**
A6 CHECK EARTH – Check for an earth at pins 19 and 24. Also check for an earth at pin 85 of **S42** and at pin 86 of **S41**	OK ▶ ~~OK~~ ▶	**CONTINUE DIAGNOSIS USING THE ALFA ROMEO TESTER** Restore the wiring between **S11** and the relays and earth **G60**