

# CHECK PANEL

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**GENERAL DESCRIPTION**

The vehicle efficiency check device, the "Check Panel", continually verifies the correct operation of the most important electrical systems, particularly those connected with safety.

A display immediately alerts the driver if a malfunction or anomaly is detected in one of the controlled systems and the relative warn-light then comes on. When the ignition key is engaged an initial check of the controlled systems is carried out.

**OPERATING LOGIC**

The Check Panel device is formed by:

- a display C16, located in the centre of the dashboard;
  - an electronic control unit N59, located in the fusebox G1;
  - a series of sensors which measure the controlled values.
- The operations are based on the capability of determining certain conditions of certain electrical functions:
- inappropriate electrical charge

- anomalous opening or closing of a circuit.

These functions are carried out, for a few of the controlled systems, by the electronic control unit N59, while the other signals reach the display C16 straight from the sensors.

The controlled systems are the following:

- insufficient windscreen washer fluid indicator;
- insufficient engine oil level indicator;
- insufficient engine coolant indicator;
- stop-light malfunction indicator;
- rear fog light malfunction indicator;
- sidelights malfunction indicator;
- number plate light malfunction indicator;
- door open indicator.

A digital clock with relative buttons for adjustment and setting are also incorporated in the display.

**POWER SUPPLY AND CLOCK**

**Functional Description**

The display C16 is supplied by battery voltage via fuse F16 (10A) of fusebox G1 which is connected to pin 5 of connector D of the display itself.

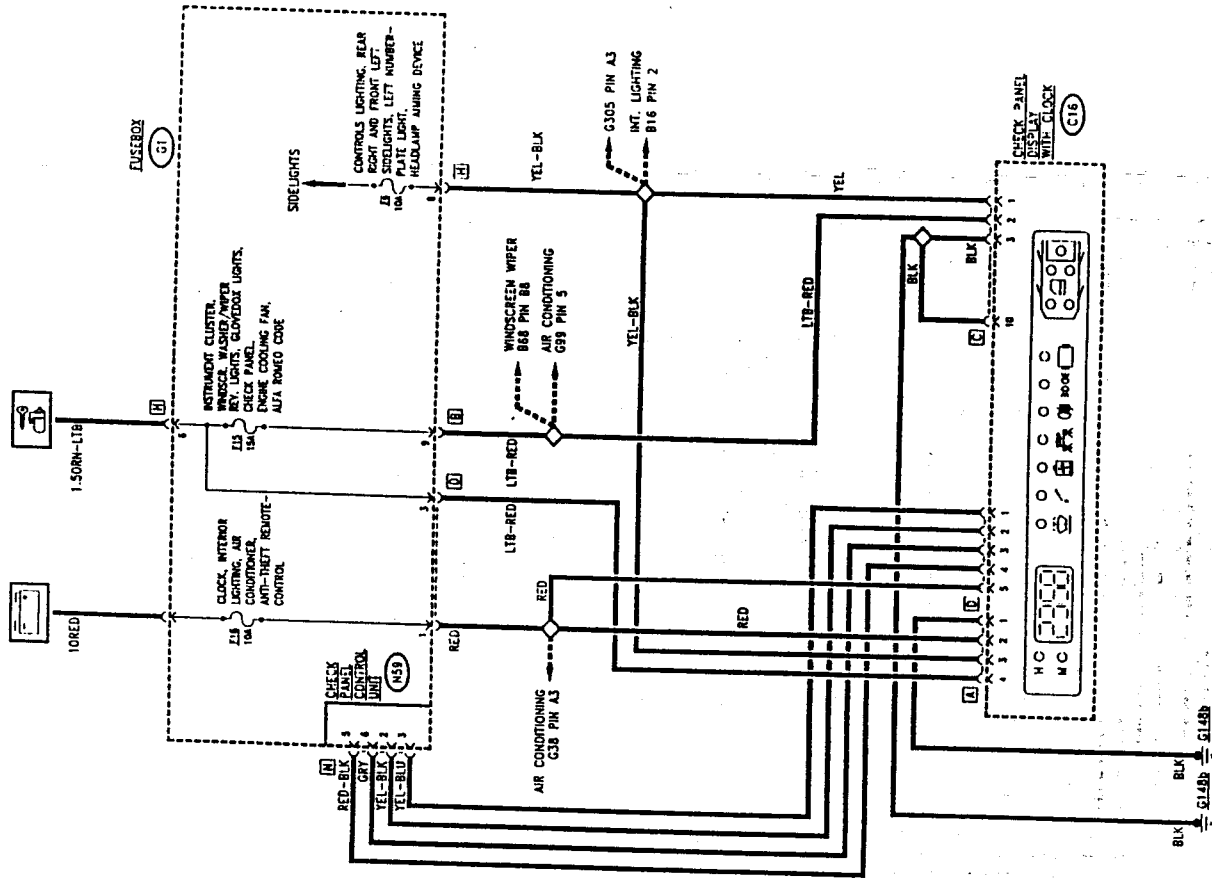
Pins 1,2,3,4 of connector D connect the display to the control unit N59.

Pin 1 of connector C receives a power supply signal from the sidelights circuit - fuse F6 (10A) which, when the lights are on, lights up the ideograms on the display.

Pin 2 is turn-key supplied via fuse F15 (15A) in fusebox G1, while pin 3 and pin 10 are grounded.

The clock is also directly supplied by battery voltage through fuse F16 of fusebox G1, to pin 2 of connector A. Pin 1 of the connector is grounded while pin 4 reaches the turn-key supply which lights up the digits of the clock itself. a sidelights signal reaches pin 3 which lowers the light intensity of the display.

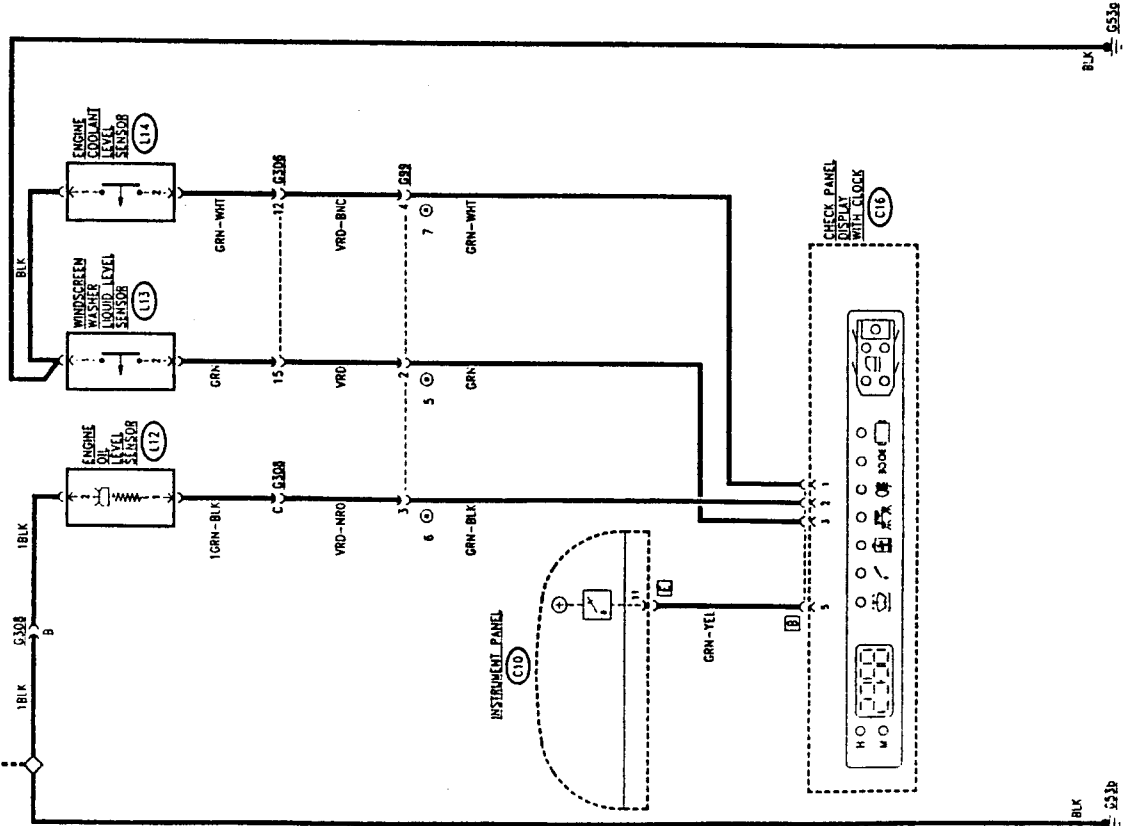
Wiring Diagram



### LEVELS CHECK

#### Wiring Diagram

HEADL. ALIGN. CONTROL DEVICE  
B69 PM 31



### Functional Description

Three special sensors, with a ground signal sent directly to display C16, alert the driver that the level of some of the fluids is insufficient.

The engine coolant level sensor L14 is located in the relative reservoir. It is formed by a float which, when the level of the liquid falls, closes a contact of a hermetically sealed switch and sends a ground signal to display C16, at pin 1 of connector B.

The windscreen washer liquid sensor L13, also located in the relative reservoir, like sensor L14, is composed of a

contact which is closed by a float and sends a ground signal to pin 3 of connector B of display C16.

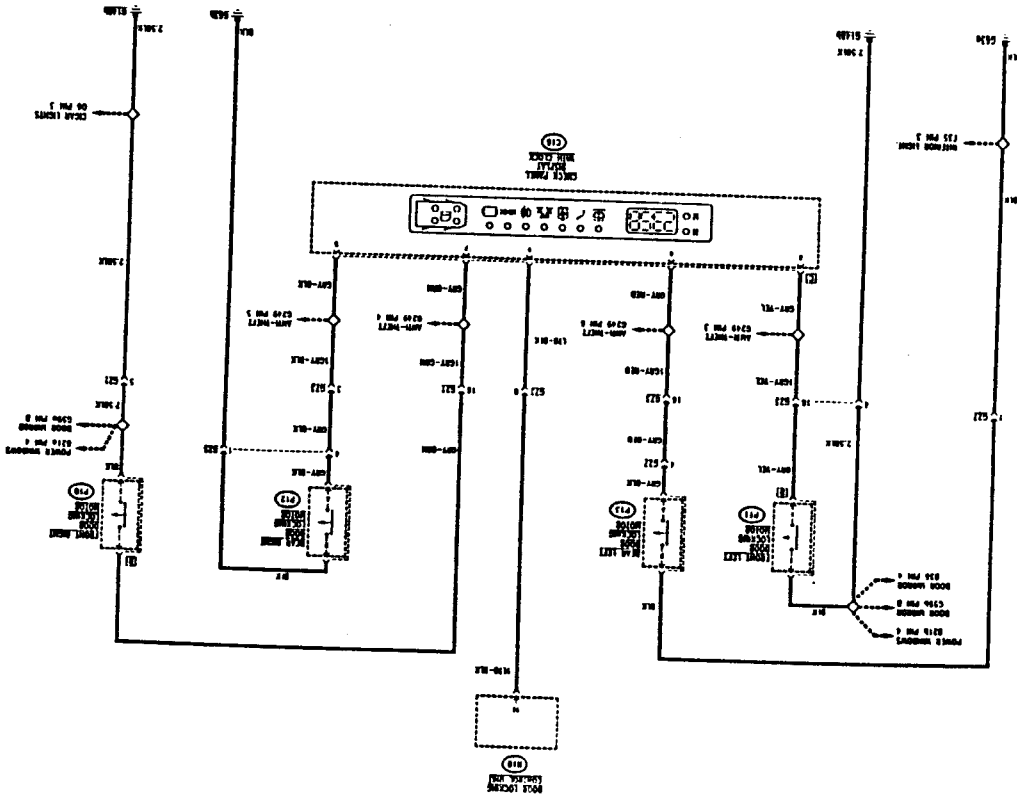
The engine oil level sensor L12 is located at the tip of a rod immersed in the sump oil. It is composed of a pair of contacts located at the ends of a bimetal strip which is heated by a resistance. The heat generated is normally dissipated by the oil and the contacts stay closed; when the oil level falls the heat causes the circuit to open and interrupts the signal sent to pin 2 of connector B of display C16.

**NOTE:** The signal is analyzed by the Check Panel device only when the engine is started

The same signal is sent by pin 5 to pin 11 of connector E of the instrument panel C10 to light up the "Engine oil minimum level" warning lamp. **NOTE:** The intervention logic ensures that even a brief signal is sent to the instrument panel to switch on the warning lamp, while the led on the Check Panel stays on continuously only when the signal persists.

DOOR OPEN INDICATOR

Wiring Diagram



Functional Description

The door/locking device - P10, P11, P12, P13 - located on each door near the locks, also contains a microswitch which closes when the door itself is open, and

sends a ground signal to the display C16 at pins 5, 6, 7 and 8 of connector C.

The same signal is also sent to the alarm system (see "Alarm").

pin 9 is connected to the ceiling lamp liner N10 which signals the opening of one of the doors which starts the timing of the lights (see "Interior lighting").

**LIGHTS CHECK**

**Functional Description**

**Check Panel control unit**  
The Check Panel N59 processes the various signals and sends them to the display C16 through the lines that exit pins 2, 3, 5 and 6 of connector N of the fusebox G1 where the control unit N59 is located.

The control unit is turn-key supplied via fuse F15 (15A) to pin 5 of connector O of G1, while a ground reaches the control unit from pin 1 of the connector.

The control unit checks the electrical charge in the controlled circuits by way of a shunt ("SH1", "SH2"...) inserted in the circuits of fusebox G1 on the lines carrying the signals to be checked by the control unit N59.

In the following three charts the control unit N59 connections are illustrated along with the various controlled functions:

**Stop light check**

The control unit N59 is connected to the two contacts of the stop light switch H3 via pins 9 and 12 of connector H in G1 and to the stop lamps via pins 9 and 10 of connector C.

The control unit carries out two distinct checks through this signal:

- the first (only carried out when the brake pedal is depressed) checks for a possible anomaly in a single bulb or relative circuit, and the correct operation of the "working" contacts (N.O.) of switch H3 (see "Stop-Lights");
- the second (continuous operation) controls the supply to the circuit (fuse F2 of fusebox G1) and the correct operation of the contacts "at rest" (N.C.) of switch H3 (see "Stop-Lights").

In both cases, if an anomaly is discovered, the control unit sends a signal to pin 4 of connector D of C16 to light up the relative warning lamp.

**Rear fog lights check**

Control unit N59 is connected to the rear fog light power supply - fuse F11 and relay I25, both in the fusebox G1 - and to the rear fog lamp through pins 3 and 6 of connector C in fusebox G1 (see "Rear and Front Foglamps").

Through these signals the control unit checks for a possible malfunction of a single bulb or a failure in the power supply to fuse F11. If an anomaly is detected, the control unit sends a signal

to pin 3 of connector D of C16 and lights up the relative warning lamp.

**Numberplate lights and sidelights check**

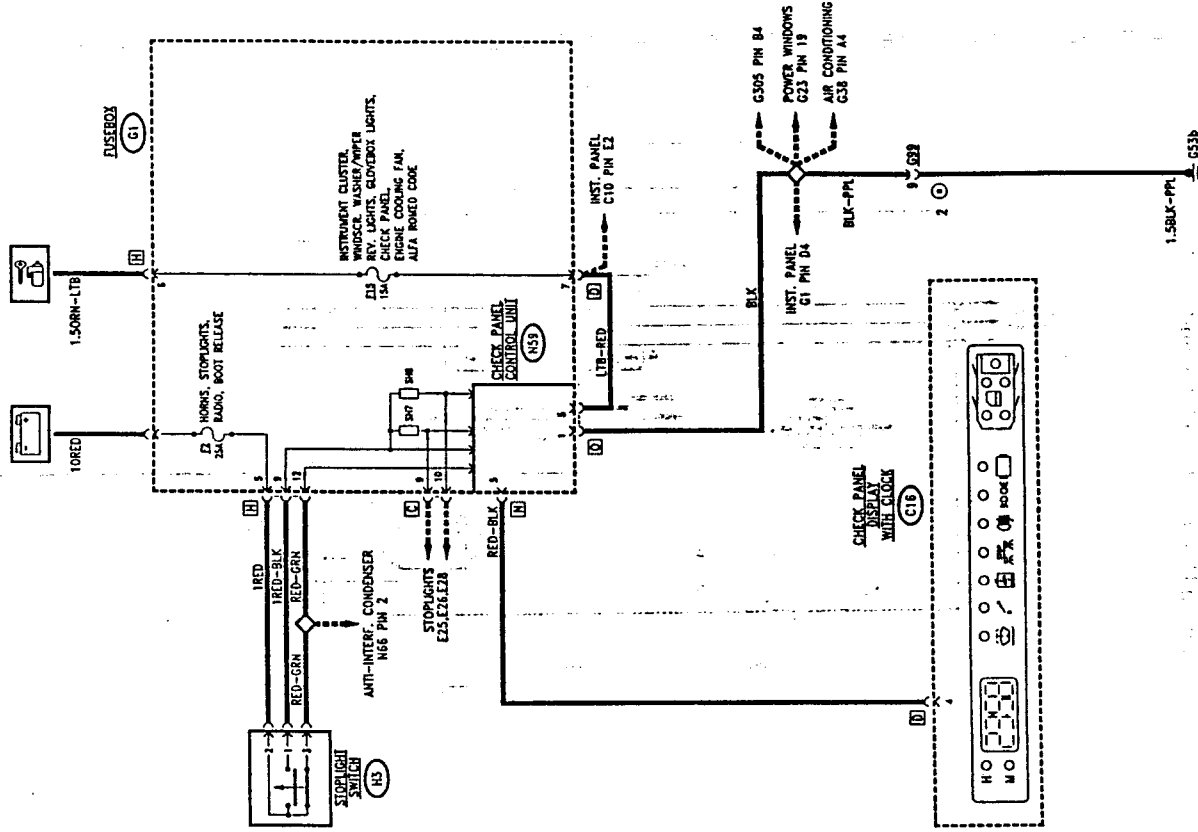
Control unit N59 is connected to the sidelights power supply - fuses F5 and F6 and relay I64 located in fusebox G1 - and also to the sidelights bulbs both front and rear via pins 2 and 3 of connector I of G1 and pins 1 and 2 of connector C of G1, and to the numberplate lights through pin 11 and 12 of connector C of G1 (see "Sidelights").

Through this signal the control unit checks for a possible malfunction of a single bulb or an interruption in the power supply to fuses F5 and F6.

If an anomaly is detected, the control unit sends two signals to connector D of C16 (pin 1 for numberplate lights and pin 2 for the sidelights) to illuminate the relative warning lamps.

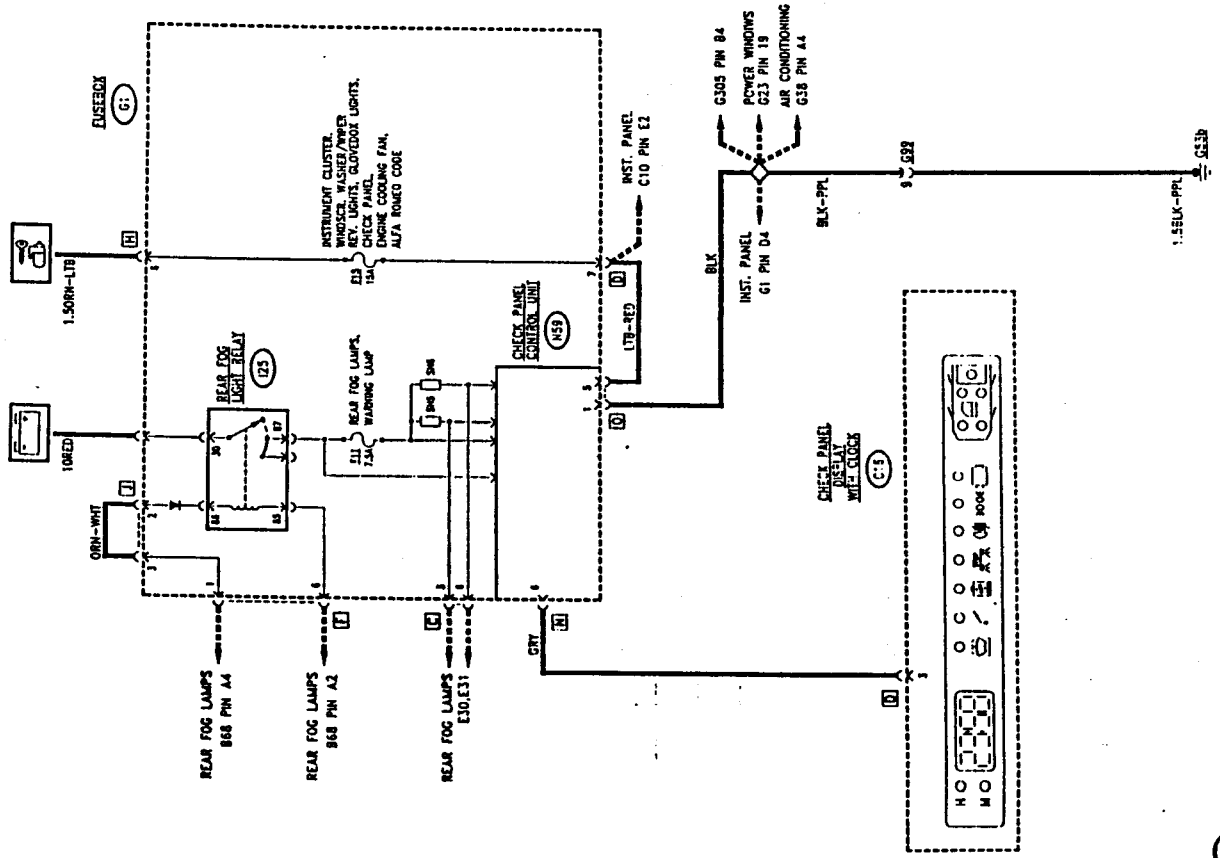
**NOTE:** the simultaneous interruption of both fuse F5 and fuse F6 is not signalled: in this event though, as the sidelights are completely out, the relative "sidelights on" warning lamp on the instrument panel C10 will be out.

**Wiring Diagram Stop Lights Check**

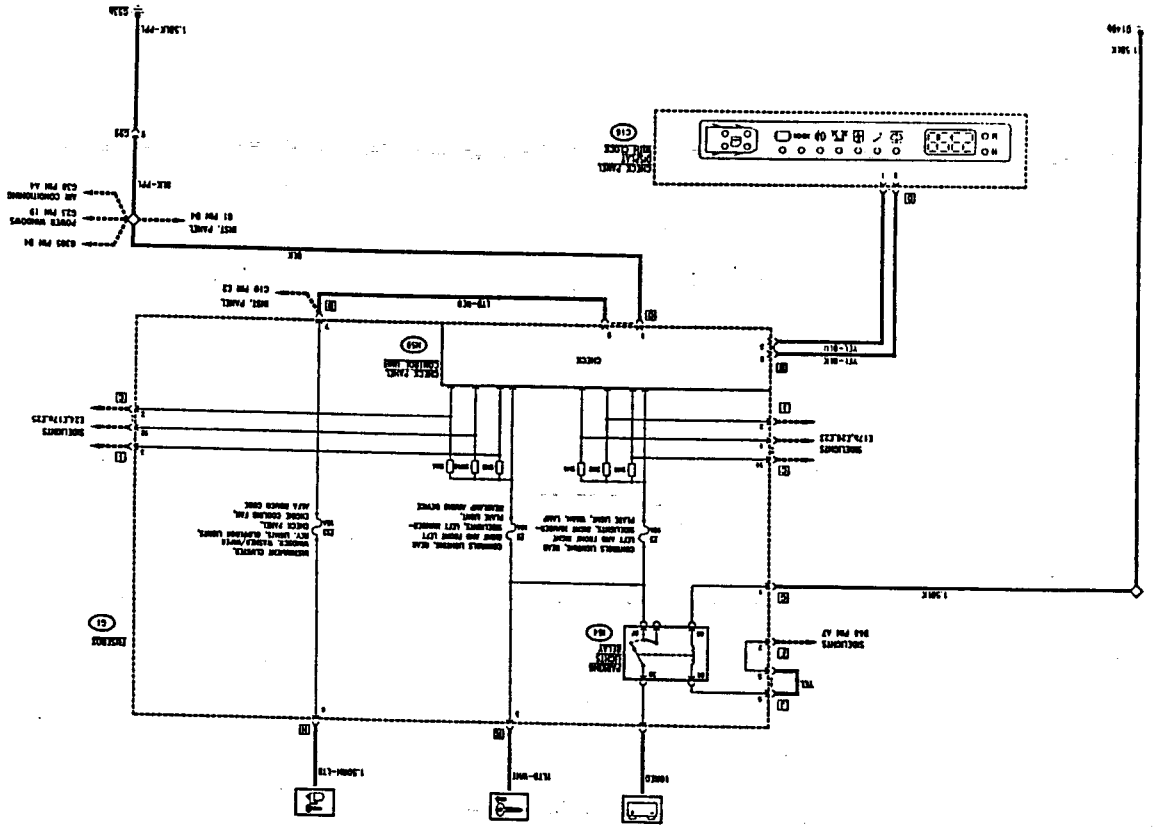


Variant for models 1.6 - 1.8 - 2.0 m.y. '96

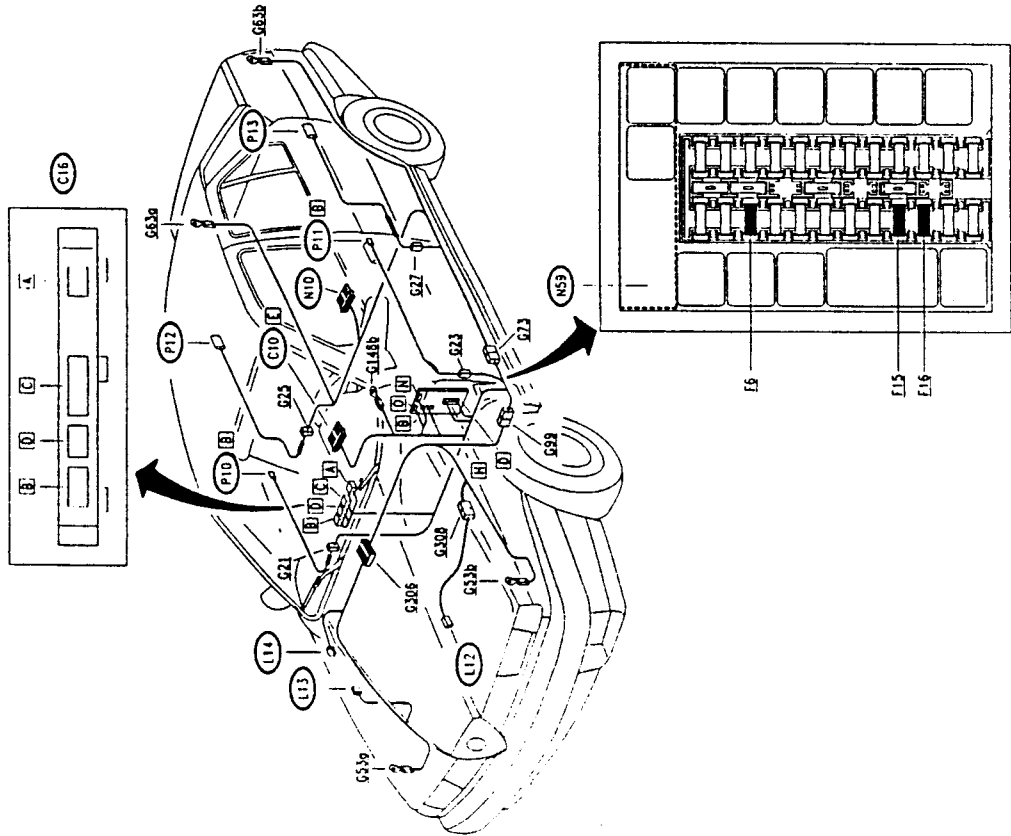
Wiring Diagram Rear Fog Lights Check



Wiring Diagram Numberplate Lights and Sidelights Check



LOCATION OF COMPONENTS

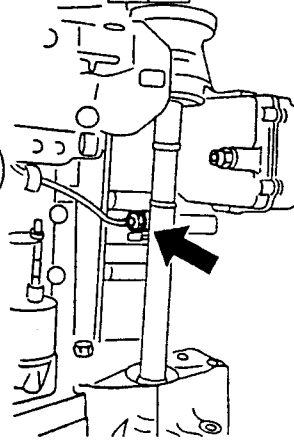


TROUBLESHOOTING TABLE

Malfunction	Component to be checked										
	E6	E15	E16	C16	N59	P10	P11	P12	P13	P14	C10
Display out											
Clock											
Display not lit up.											
Front RH door open											
Front LH door open											
Rear RH door open											
Rear LH door open											
Water level											
Oil level											
Windscreen washer fluid level											
Stop lights check											
Rear fog lamps check											
Numberplate lights and sidelights check											

CHECKING COMPONENTS

Engine oil level sensor **L12**



Windscreen washer fluid level sensor **L13**

Engine coolant fluid level sensor control **L14**

NOTE:

To check whether these sensors are working properly, it is sufficient to restore the correct level in the reservoir and then remove the sensor with the wiring connected. If the led on the Check Panel turns on, the sensor is working properly.

SPECIFICATIONS

Resistance between pins 1 and 2

12 Ω ± 5%

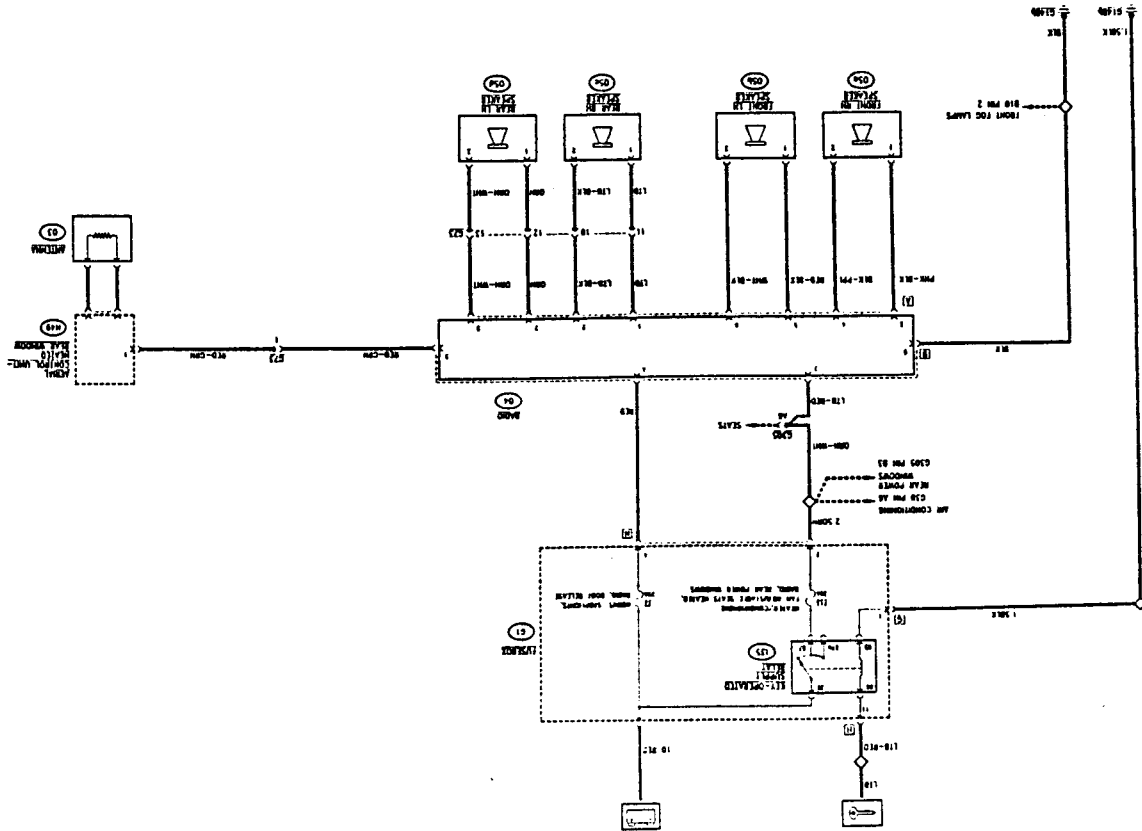
# RADIO SYSTEM

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WIRING DIAGRAM



GENERAL DESCRIPTION

The car is pre-wired for the installation of a radio system complete with four speakers.

The radio is removable and available in different models - installed in the car by the Service Network -; the car is fitted with 20 W front speakers 100 mm in diameter and separate tweeter, and 30 W, 165 mm, two-way rear speakers.

The front speakers are located at the sides on the upper part of the dashboard, while the rear ones are on the parcel shelf.

Through a suitable electronic device, the aerial is integrated in the rear screen and it is connected by coaxial cable with the radio itself; this ensures high control of the signals without outside drillings.

The radio circuit receives the key-operated supply; direct supply from the battery is also foreseen which makes it possible to memorise tuning, security codes, etc. in the radio set.

On the wiring a number of devices have been inserted to offer electronic silencing of all the electric devices that might interfere on the radio circuit, for example

the stop lights (condenser N66); two earth braids have been fitted on the bonnet and boot lids to further screen the radio system.

In addition upon request a fixed radio directly installed on the vehicle during production is available.

This is a PHILIPS DC 731 radio with RDS decoder and cassette player; the radio has a removable front panel, to protect against theft and an internal "security code" for further safety.

All the details about the features of the radio and how it works are given in the "INSTRUCTIONS FOR USE" supplied with the radio itself.

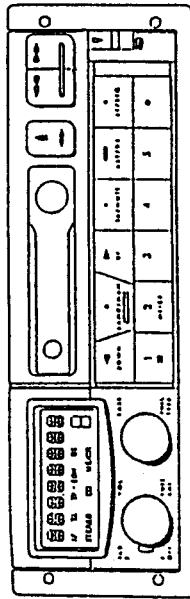
FUNCTIONAL DESCRIPTION

The radio O4 is supplied directly by battery voltage (supply for memorising, etc.) through fuse F2 (25A) of fusebox G1, at pin 4 of connector B; pin 8 is earthed. It also receives the key-operated supply (operation of the set) at pin 7 of connector B via the "key-operated" relay JS5 and fuse F13 (30A) of fusebox G1.

The cables with the signals lead from connector B to the four speakers O5.

Pin 5 of connector A is connected with the aerial-rear screen control unit N49, which is connected with the aerial A3 integrated in the rear screen.

The aerial is also connected with the radio via the special coaxial cable.







**CHECKING COMPONENTS**

Also check that the additional fuse is intact (10A) to be found on the back of the radio (pos. 2 of figure); change it if necessary.

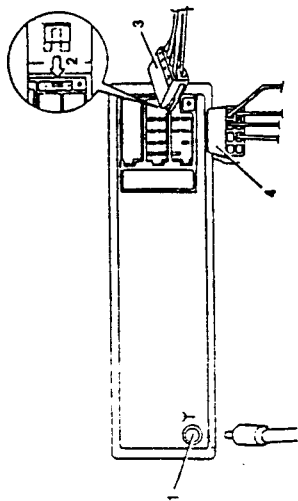
In the event of rustling or other signals of malfunctioning of the system due to interferences, check that the connection to the wiring is correct and that the anti-disturbance condenser N66 is working properly and also that the earth braids on the bonnet and boot lids are correctly fastened.

**Radio O4**

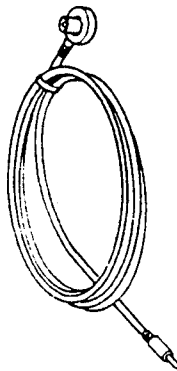
In the event of the malfunctioning of certain specific functions of the radio itself, refer to the "INSTRUCTIONS FOR USE". Additionally:

rear view of connector side:

- 1 - aerial coaxial cable socket
- 2 - additional fuse (10A)
- 3 - connector O4 A
- 4 - connector O4 B



Aerial coaxial cable



SPECIFICATIONS TECNICHE	
Nominal impedance	142 Ω ± 10%
Total capacity	32 pF/m ± 10%

**CIGAR LIGHTER**

**INDEX**

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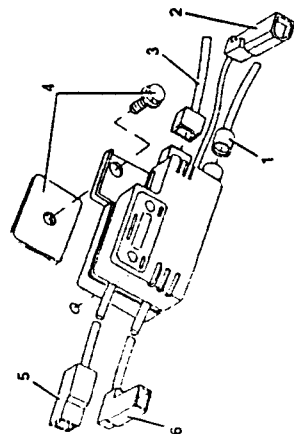
GENERAL DESCRIPTION . . . . . 16-3

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LOCATION OF COMPONENTS . . . . . 16-4

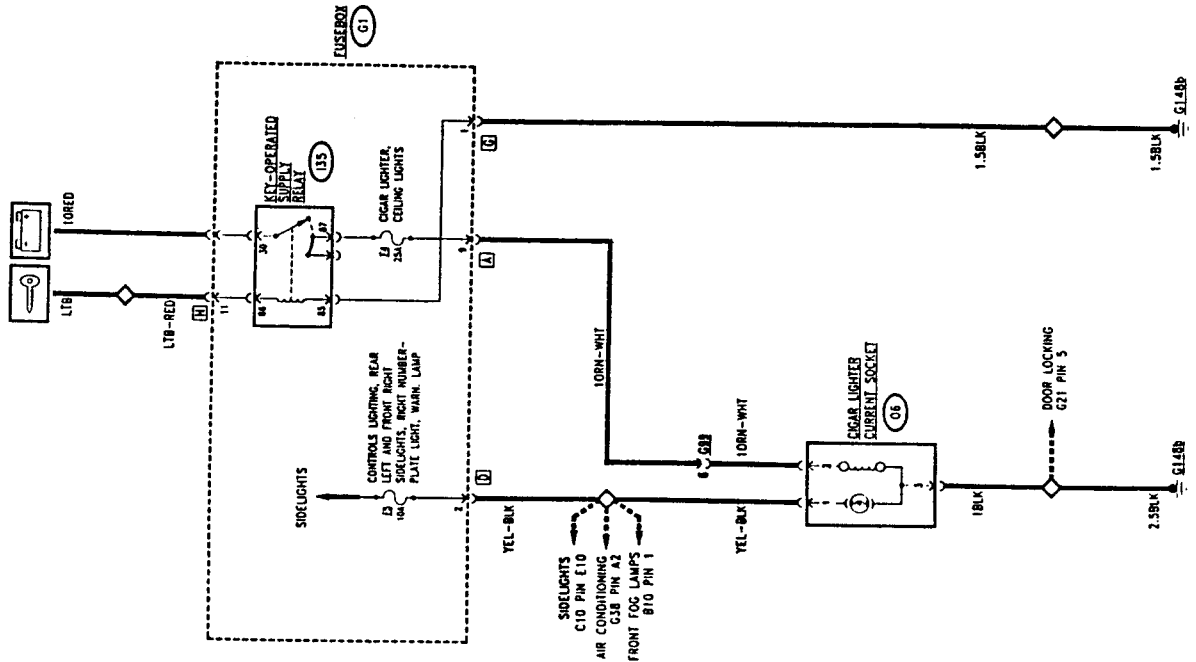
Aerial-rearscreen control unit (N49)



Check the correct connections of the control unit:

- 1 - Coaxial cable
- 2 - Supply connector (N49 A)
- 3 - Defroster connector (O1 A) (see "Heated rearscreen")
- 4 - Earth fastening screw
- 5 - Connection with aerial - FM SIGNAL and defroster output (see "Heated rearscreen")
- 6 - Connection with aerial - AM SIGNAL

WIRING DIAGRAM



GENERAL DESCRIPTION

The car offers the occupants three ashtrays: one at the centre of the dashboard for the front seats, and two for the rear seats on the doors.

Inside the front ashtray (illuminated inside when the side lights are on) there is the "cigar lighter" resistance which is turned on pressing it into its socket: after a few seconds it pops out, ready for use, automatically.

This socket is of the standard type and it may also be used for connecting other

instruments or appliances (provided that they operate at 12V).

**N.B.:** The socket is fitted with a thermal protection device: in the event of connections with high energy absorption devices, this protection "cuts out".

The socket is continuously supplied and may be used at any time even when the ignition key is disengaged.

FUNCTIONAL DESCRIPTION

The connection socket for the cigar lighter resistance O6 is supplied directly by "key-operated" current through fuse F4 (25A) of fusebox G1, which protects the circuit.

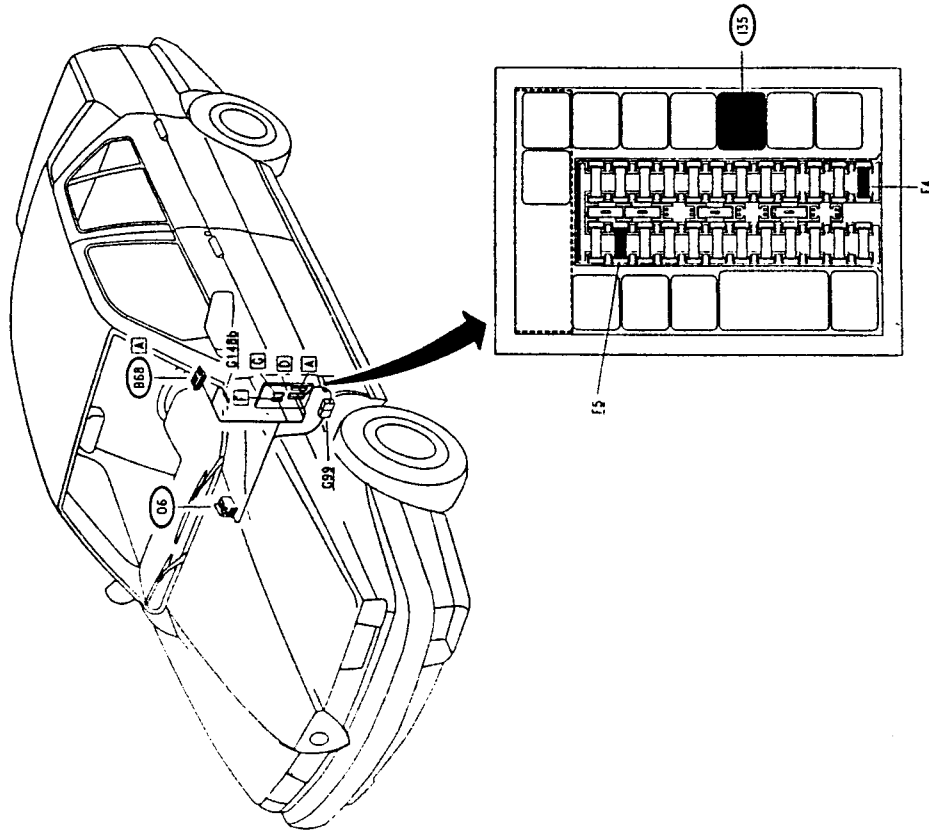
The front ashtray light bulb O6 is turned on when the side lights are on: in fact it is supplied via fuse F5 (10A) to be found in fusebox G1

TROUBLESHOOTING TABLE

Fault	Component to be checked	
	E5	E4
Cigar lighter - current socket		•
Ashtray light	•	

(\*) If the current socket thermal protection device cuts in, it may be replaced at least 5 times before ending to replace the complete socket.

LOCATION OF COMPONENTS



HORNS

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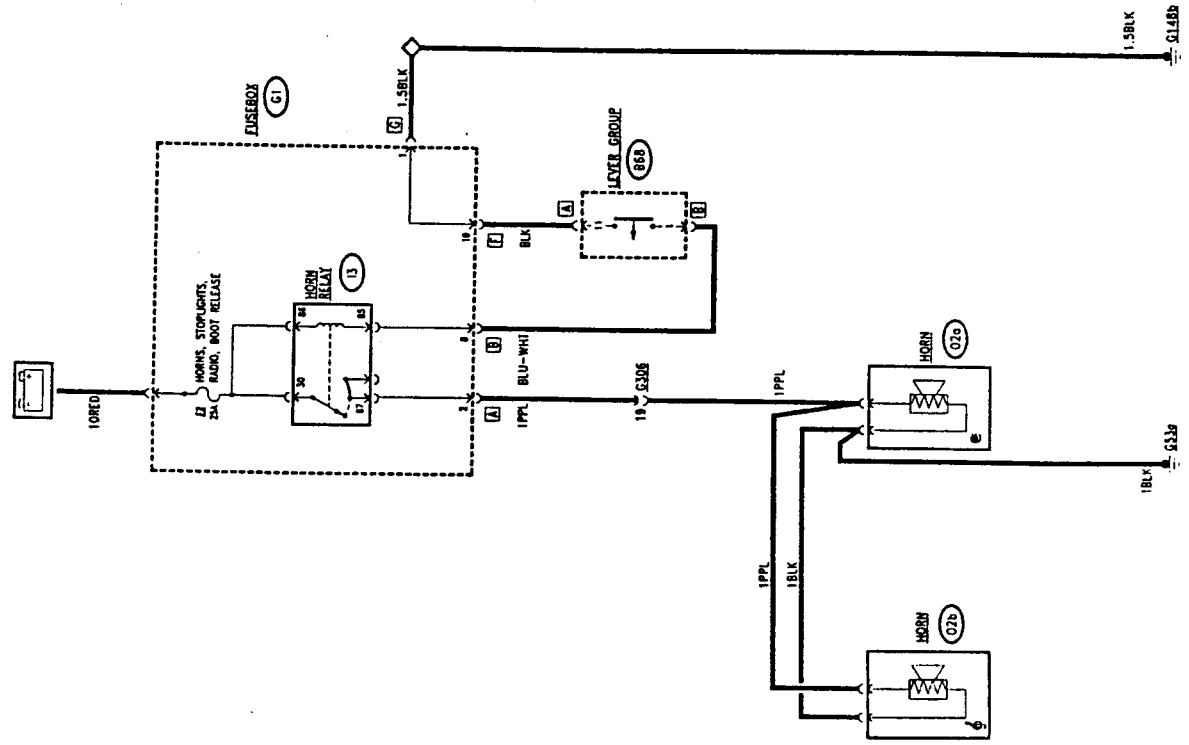
FUNCTIONAL DESCRIPTION . . . . . 17-3

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WIRING DIAGRAM



GENERAL DESCRIPTION

The vehicle is equipped with an acoustic warning system formed by two horns of different tone; one with a high tone and one with a low tone. The two horns are activated simultaneously.

The horns are activated in the traditional way by pressing the button located in the centre of the steering wheel.

For obvious reasons of safety, the horns can be sounded at any moment, even when the ignition key is disengaged.

FUNCTIONAL DESCRIPTION

The horn relay 13, located in fusebox G1, is supplied by battery voltage through fuse F2 (25A), in G1.

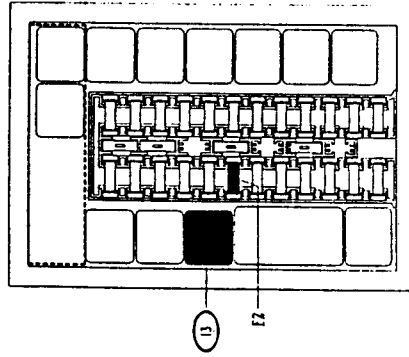
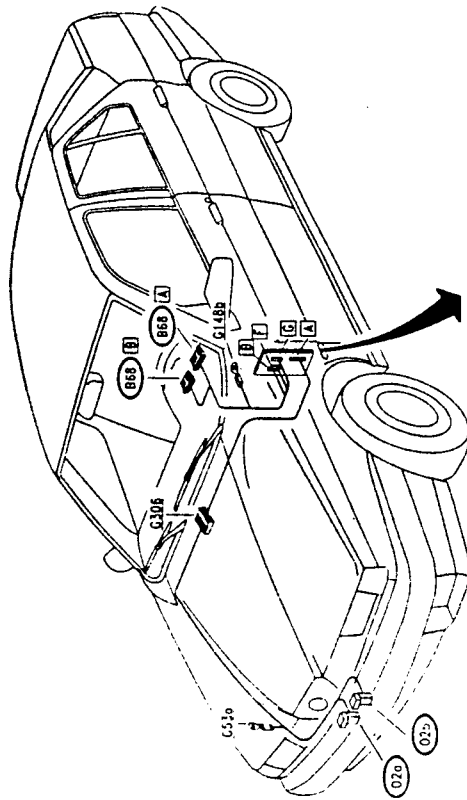
The coil of the relay 13 is excited by an ground signal originating from the switch connected to the lever group B68.

In this way the supply is sent from the relay to the horns O2a e O2b, which are already grounded.

TROUBLESHOOTING TABLE

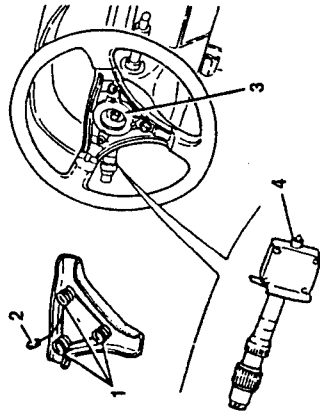
Malfunction	Component to be checked		
	F2	O2	13
Horns not working	•	•	•
Horns working badly (out of tune)		•	

LOCATION OF COMPONENTS



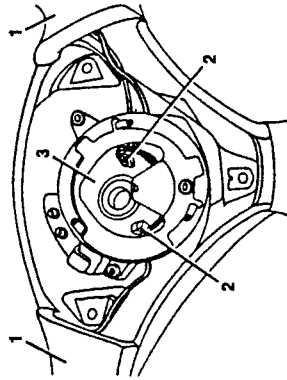
CHECKING COMPONENTS

Horns control (in **B66**)  
Versions without airbag



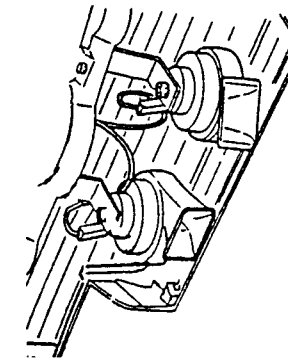
The three springs (1) on the steering wheel cover connect the earth plate (3) to earth through the special connection (2); the plate is in turn connected with contact (4) on the lever unit B66.

Versions with airbag



In cars with Air Bag the horn buttons (1) are connected by connectors (2) to the adapter (3) located on the steering wheel, through which the control switch is pressed as on the versions without Air Bag.  
N.B. When removing the Air Bag extreme care should be taken: following the safety instructions given in "155 - INSTRUCTIONS FOR REPAIR - SUPPLEMENT" (PA496800000000).

Horns **O2**



SPECIFICATIONS	
Nominal voltage rating	12V
Current absorbed	< 10A (the pair)
Total horn sound level	106 + 118 dB a 2m
Sound level in band 1800 + 3550 Hz	≥ 105 dB a 2m
Horn sound level L-H	≥ 108 dB a 2m
Fundamental frequency type H	480 + 530 Hz
Fundamental frequency type L	380 + 430 Hz

# WINDSCREEN WASHERS/WIPERS - HEAD- LIGHT WASHERS

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P1 directly as a control signal; the motor P1 is then connected to earth and supplied with the same line as the intermittent device N14. In fact it comprises the actual gear motor, and stroke limit contacts and the supply relay.

The signal from pin 6 (intermittent speed) reaches the intermittent device N14 (pin TNT) and from here it is then sent to the motor P1.

Operating the switch (ring) of the intermittent device of the steering column lever unit B68 either none, one or two resistances R are inserted on the same line, thereby obtaining the three intermittent speeds.

When operated, the windscreen washer (and headlamp washer switch of the steering column lever unit B68 sends two signals from pin 2 and from pin 5 which reach the intermittent device N14 (pin P) and the pump for operating the windscreen wiper for 3-4 sec., through the windscreen washer pump P19; a control signal is also sent to the headlamp washer timer N12 (pin S).

The timer N12 is supplied directly by battery voltage via the special fuse G312 (20A).

When, in addition to the control signal from the steering column lever unit, it also receives the consent signal from the side lights on - pin 56 - the relay inside N12 is energized which supplies the headlamp washer pump P20 with appr. half-second pulses.

the pressure reduces.

A timer operates the headlamp washer pump with a succession of pulses which last for appr. half a second.

**NOTE:** operating the windscreen washer (and headlamp washer) without detergent fluid in the reservoir can damage the pump.

The entire system is regulated by an intermittent windscreen wiper device which controls the windscreen wiper motor, windscreen washer pump and headlamp washer device (timer and pump).

The windscreen wiper and washer can be operated with the ignition key engaged, as mentioned previously, for the headlamp washer, the sidelights must also be on.

### GENERAL DESCRIPTION

With the lever on the righthand side of the steering wheel it is possible to engage the different functions of the windscreen washer/wiper and headlamp washer system.

The windscreen wiper device can work continuously and intermittently at different speeds: moving the lever upwards and keeping it in this position selects continuous operation (75 strokes/min) which is disengaged when the lever is released; moving the lever downwards firstly operates intermittent operation, then continuous operation; these remain engaged until the lever is pushed upwards again.

With the lever in the rest position, through the special ring switch it is possible to select the different lengths of the intermittent functions (appr. 45, 25 and 10 strokes/min).

The windscreen washer is engaged slightly pulling the lever: this way the windscreen washer pump, and simultaneously the windscreen wiper is operated for a 3-4 seconds or until the lever is released.

When the sidelights are on, the same controls also automatically operate the headlamp washer: this is an electro-pneumatic device in which a pump sends the washer fluid to a telescopic nozzle which, pushed by the pressure, pops out of the bumper and sprays a powerful jet onto the headlamp, then retracing as

the pressure reduces.

A timer operates the headlamp washer pump with a succession of pulses which last for appr. half a second.

**NOTE:** operating the windscreen washer (and headlamp washer) without detergent fluid in the reservoir can damage the pump.

The entire system is regulated by an intermittent windscreen wiper device which controls the windscreen wiper motor, windscreen washer pump and headlamp washer device (timer and pump).

The windscreen wiper and washer can be operated with the ignition key engaged, as mentioned previously, for the headlamp washer, the sidelights must also be on.

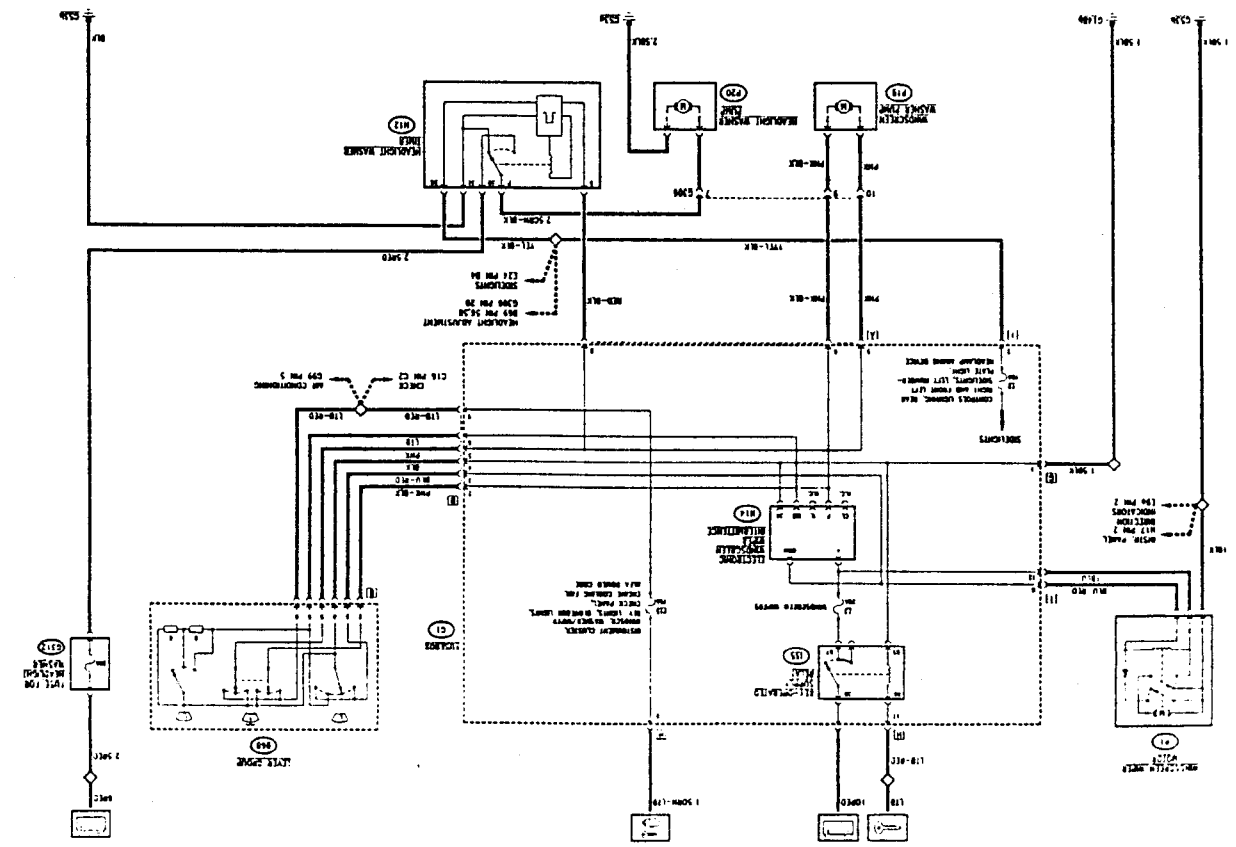
### FUNCTIONAL DESCRIPTION

The windscreen wiper intermittent device N14, located in fusebox G1, is supplied by key-operated voltage through relay I35 and fuse F3 (20A), also of G1.

When the windscreen wiper switch of the steering column lever unit B68 is operated, it sends two different signals according to the function selected: from pin 3 for the continuous speed and from pin 6 for intermittent operation.

The signal from pin 3 (continuous speed) reaches the intermittent device N14 (pin COM) and the windscreen wiper motor

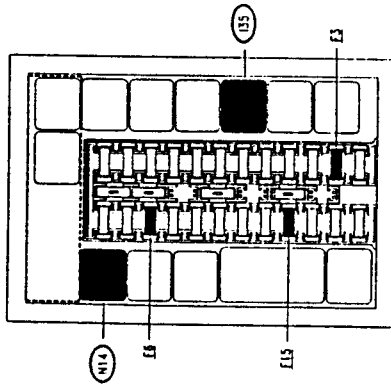
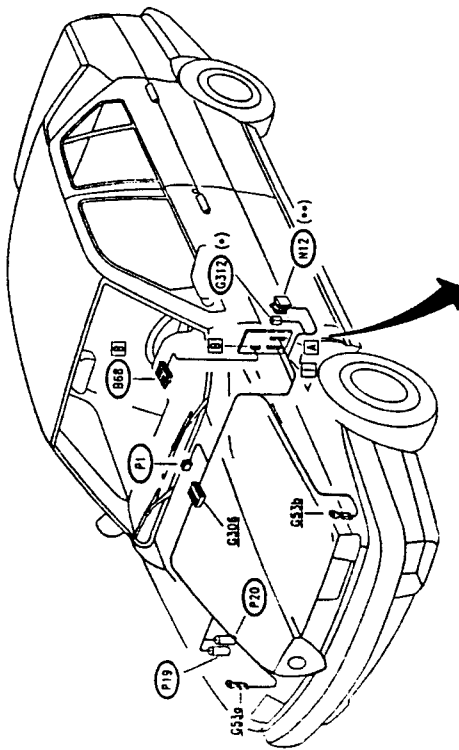
### WIRING DIAGRAM



### FAULT-FINDING TABLE

Fault	Component to be checked									
	E6	E3	P1	N14	B68	E15	P19	G312	N12	P20
Windscreen wiper (continuous)		*		*						
Windscreen wiper intermittent		*		*						
Windscreen washer				*						*
Headlight washer	*								*	*

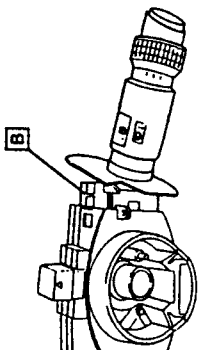
LOCATION OF COMPONENTS



(•) Yellow fuseholder  
 (•••) Black base

CHECKING COMPONENTS

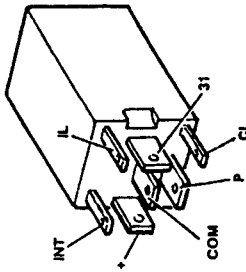
Steering column lever unit (B68)



Check operation of intermittent device: resistance between pins B4 and B6 according to the position of the ring

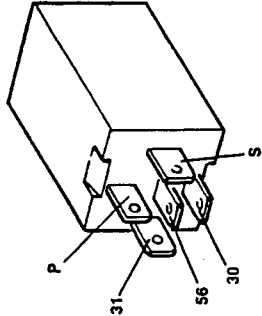
Position	Resistance [kΩ]	Speed [cycles/min]
•••	-	45
••	- 1.3	20
◁	- 4.7	20

Windscreen wiper electronic intermittent device (N14)



Checking the device: see TEST A

Headlamp washer timer (N12)



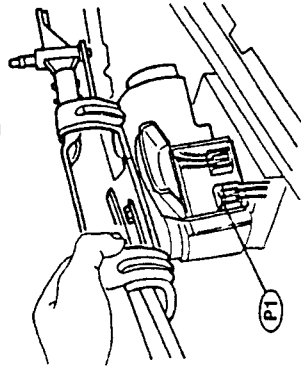
Checking the device: see TEST B

# HEATED REAR WINDOW - HEATED ADJUSTABLE REAR-VIEW MIRRORS

## INDEX

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GENERAL DESCRIPTION . . . . .	19-3
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Windscreen wiper motor (P1)



SPECIFICATIONS

with 12V at pin 2 and earth at pin 3:  
applying an earth at pin 1 the motor operates continuously

CHECK WINDSCREEN WIPER ELECTRONIC INTERMITTENCE DEVICE (N14) TEST A

TEST PROCEDURE	RESULT	CORRECTIVE ACTION
A1 CHECK VOLTAGE - Disconnect device N14 and check on the corresponding base of fusebox G1: with the key at MARCIA, check for 12V at pin 4 of N14	OK <del>OK</del>	Carry out step A2 Check fuse F3 (20A) and relay R5 of fusebox G1
CHECK EARTH - Check for 0V at pin 31 of N14	OK <del>OK</del>	Carry out step A3 Check that box G1 is earthed: from pin 1 of connector G to earth G148b
A3 CHECK WINDSCREEN WIPER INTERMITTENCE SIGNAL - Operate the different windscreen wiper intermittent speeds using the ring switch on the lever unit B68 and check: - 0 Ω between pin INT and pin 31 at N14 for max. speed - 1.3 kΩ between pin INT and pin 31 at N14 for intermediate speed - 6 kΩ between pin INT and pin 31 at N14 for min. speed	OK <del>OK</del>	Carry out step A4 Check the wiring between N14 (G1) and steering column lever unit B68, or change the latter
A4 CHECK WINDSCREEN WASHER SIGNAL - Operate the windscreen washer and check for 12V at pin P of N14	OK <del>OK</del>	Carry out step A5 Check fuse F15 (15A) of G1 or the wiring between N14 (G1) and steering column lever unit B68, or change the latter

(continues)

CHECK WINDSCREEN WIPER ELECTRONIC INTERMITTENCE DEVICE (N14) TEST A

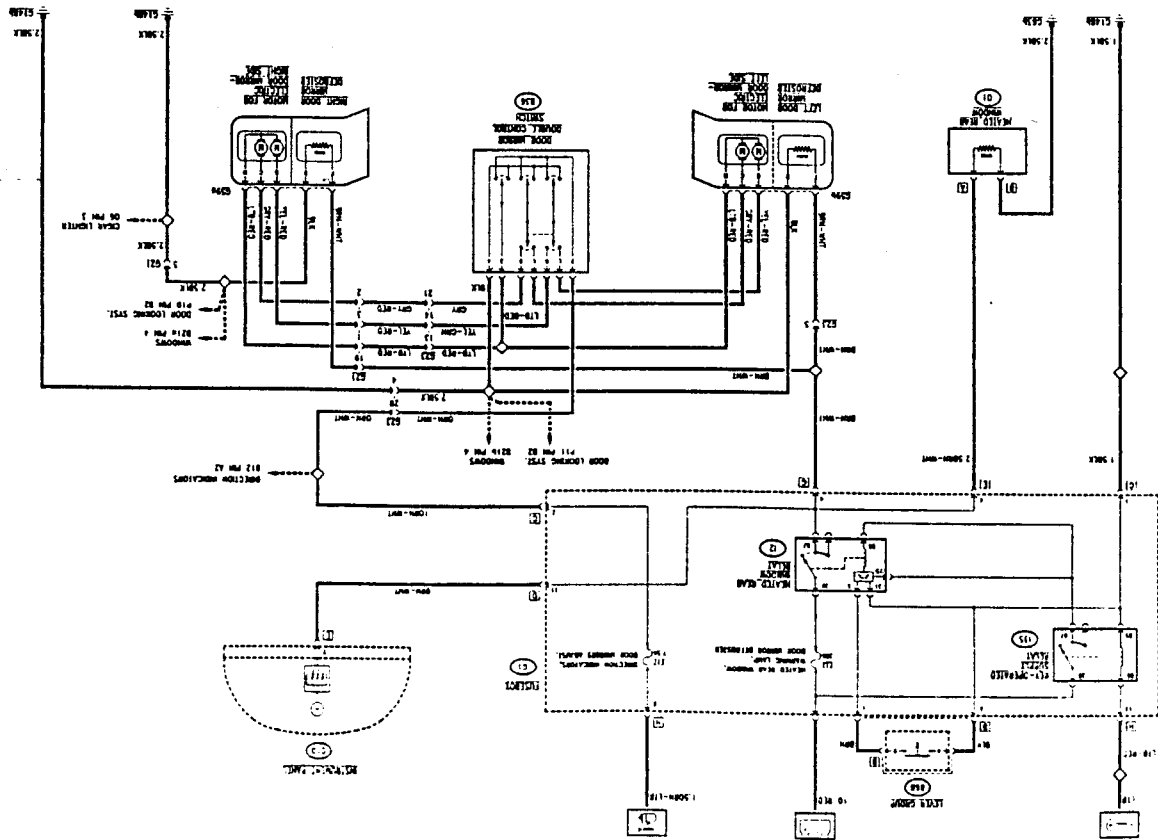
TEST PROCEDURE	RESULT	CORRECTIVE ACTION
A5 CHECK WINDSCREEN WIPER INTERMITTENT OPERATION - Operate the different windscreen wiper intermittent speeds using the ring switch on the lever unit B68 and check for a cyclic signal at pin 8 of connector 1 of fusebox G1: - 45 c/dcl per minute for max. speed - 25 c/dcl per minute for intermediate speed - 15 c/dcl per minute for min. speed	OK <del>OK</del>	Carry out step A6 Change device N14
A6 CHECK OPERATION OF WINDSCREEN WIPER FOR WINDSCREEN WASHER - Operating the windscreen washer, check for a continuous signal at pin 8 of connector 1 of G1 for appr. 4 seconds	OK <del>OK</del>	DEVICE N14 IS WORKING PROPERLY. Check the connections with the other components  Change device N14

CHECK HEADLAMP WASHER TIMER (N12) TEST B

Test with the component assembled on its connector working from the cable inlet side

TEST PROCEDURE	RESULT	CORRECTIVE ACTION
B1 CHECK VOLTAGE - Check for 12V between pins 30 and 31 of N12	OK <del>OK</del>	Carry out step B2  Check fuse G312 (20A). Restore the wiring between N12 and G312, and between N12 and earth G53b
B2 CHECK VOLTAGE - Check, with the sidelights on, for 12V at pin 56 of N12	OK <del>OK</del>	Carry out step B3  Check that the sidelights are working properly, in particular fuse F6 (10A); also check the wiring between N12 and G1
B3 CHECK VOLTAGE - Operating the windscreen washer with the sidelights on, check for 12V at pin S of N12	OK <del>OK</del>	Carry out step B4  Restore the wiring between N12 and G1 or check that the windscreen washer is working properly
B4 CHECK HEADLAMP WASHER CONTROL - Operating the windscreen washer with the sidelights on, check for 12V at pin P of N12 for appr. 0.5 seconds	OK <del>OK</del>	DEVICE N12 IS WORKING PROPERLY. Check the connections with the other components  Change device N12

WIRING DIAGRAM



GENERAL DESCRIPTION

Rearscreen heating and wing mirror defrosting

The rearscreen and wing mirrors incorporate a wire that heats the surfaces it contacts when it is crossed by current, thereby quickly demisting and/or defrosting them.

The device is actuated by pressing the corresponding switch on the steering column lever unit: the resistances are de-activated automatically (after 20 minutes from the first time of activation and 10 minutes after the subsequent ones) due to a timer incorporated in the rearscreen heating switch.

A warning light on the instrument cluster indicates when the device is operating.

Wing mirror adjustment

The two wing mirrors are adjusted through the special switch that operates two electric motors in each of the two mirrors (one motor turns the mirror on a horizontal axis, the other on a vertical axis).

A single switch operates both the left-hand and right-hand mirrors, as a select-

tor makes it possible to switch from one to the other.

FUNCTIONAL DESCRIPTION

Rearscreen heating and wing mirror defrosting.

The key-operated supply relay 135 supplies the coil of the rearscreen heating relay switch 12 and the timer inserted inside: the coil is energized by an earth signal leading from the timer when it receives (pin S) the control signal from the switch on the steering column lever unit B68.

Both relay 135 and 12 are to be found in fusebox G1.

When the contact of relay switch 12 closes the battery voltage supplies the line, which is protected by fuse F12 (30A) of G1 and reaches the rearscreen heating O1 and the resistances of the wing mirrors (connectors G59a and G59b).

The supply for the rearscreen heating O1 crosses control unit N49 which also controls the aerial incorporated in the

rearscreen (see "Radio System"). After 20 minutes from when the switch on the steering column lever unit B68 (10 minutes for the next times it is operated), the timer de-energizes the coil of 12, thereby disconnecting all the circuits. The same rearscreen supply signal is also sent to the instrument cluster C10 to turn on the corresponding warning light.

Wing mirror adjustment

The double switch B36 controls the two electric motors in the mirrors G59b (left) and G59a (right).

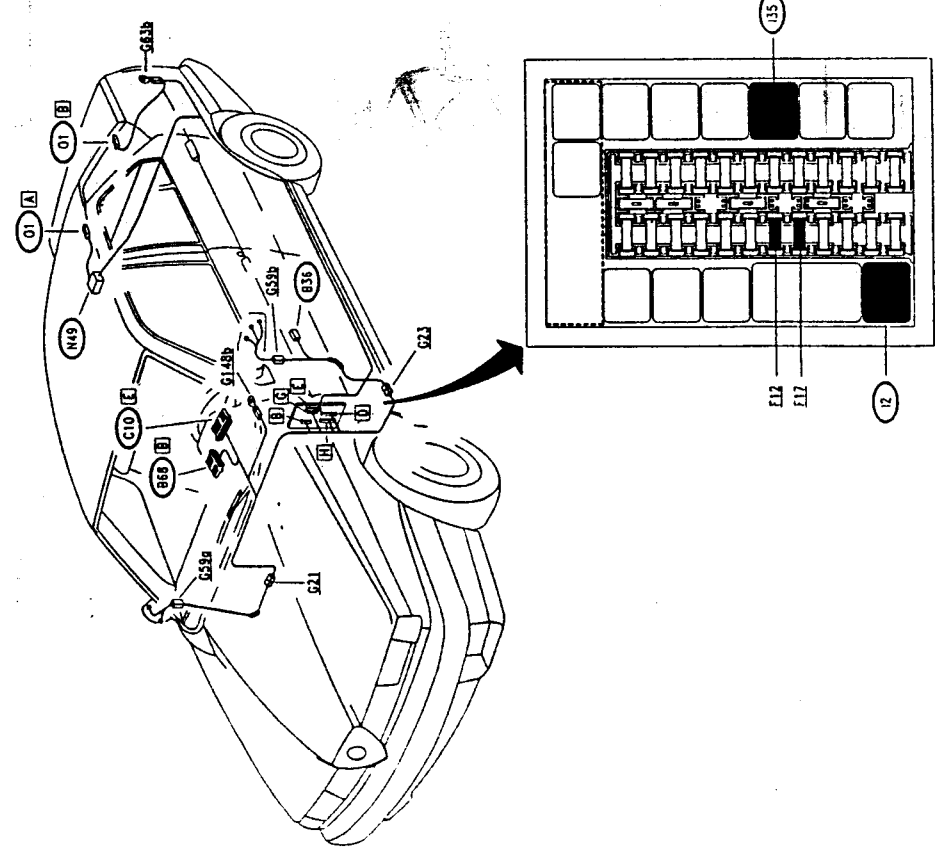
The switch is supplied with "key-operated" voltage which crosses fuse F1 (7.5A) of the fusebox G1.

Operating the switch in one direction or in the other one of the motors receives positive and earth thereby determining the direction of rotation. Depending on the position of the selector, the right-hand motors (signals from pins R of B36) or the left-hand motors (signals from pin L of B36) are connected.

FAULT-FINDING TABLE

Fault	Component to be checked						
	F12	(12)	(B68)	(O1)	(C10)	E17	G59a G59b G36
Defrosting	•	•	•				
Rearscreen				•			
LH wing mirror (defrosting)						•	
RH wing mirror (defrosting)						•	
Rearscreen warning light					•		
Wing mirror adjustment							•
LH wing mirror (adjustment)							•
RH wing mirror (adjustment)							•

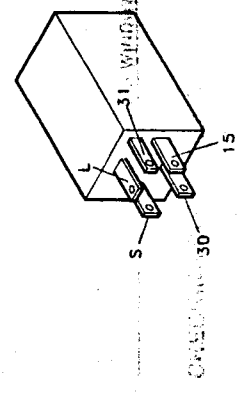
LOCATION OF COMPONENTS



PA4978E116V000

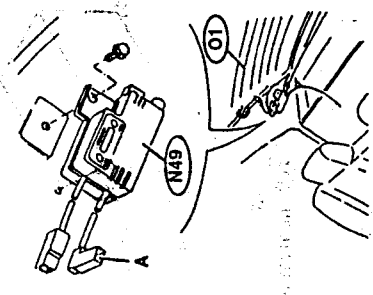
CHECKING COMPONENTS

Rearscreen heating relay (I2)



Checking the device: see test A

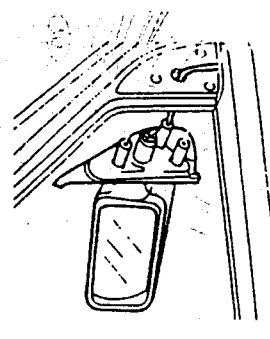
Heated rearscreen (O1)



SPECIFICATIONS	
Max. absorbed current	-20 A

NOTE: the supply (12V) for the rearscreen takes place through the aerial-rearscreen control unit N49 - connector A; the earth is connected directly to G63b

Wing mirrors G59a, G59b



SPECIFICATIONS	
Defrosting resistance (between pins F and B of connector)	4 Ω

SPECIFICATIONS	
Mirror adjustment motors	
rotation upwards	12V at pin C, earth at pin H
rotation downwards	12V at pin H, earth at pin C
rotation to the right	12V at pin H, earth at pin G
rotation to the left	12V at pin G, earth at pin H

NOTE: the left mirror also contains the outside air temperature sensor (pins D and E) (see "Climate control")

PA4978E116V001

1-1995

CHECK REARSCREEN RELAY (I2)		TEST A
TEST PROCEDURE	RESULT	CORRECTIVE ACTION
<p>A1 CHECK VOLTAGE</p> <p>Disconnect device I2 and check on the base of fusebox G1: for 12V between pins 30 and 31. With the key at MARCIA, for 12V between pins 15 and 31</p>	<p>OK <input checked="" type="checkbox"/></p> <p>OK <input checked="" type="checkbox"/></p>	<p>Carry out step A2</p> <p>Check fuse F12 (30A) of G1. If necessary check relay I35</p>
<p>A2 CHECK CONTROL SIGNAL</p> <p>Engage defrosting, and check for an earth at pin S of I2</p>	<p>OK <input checked="" type="checkbox"/></p> <p>OK <input checked="" type="checkbox"/></p>	<p>Insert device I2 on the base of G1 and continue with step A3</p> <p>Restore the wiring between G1 and the switch of steering column lever unit B68 or replace the latter</p>
<p>A3 CHECK OPERATION OF DEFROSTING</p> <p>Engage defrosting, and check for 12V between pins 1 and 6 of connector G of G1: this voltage ceases after 20 minutes</p>	<p>OK <input checked="" type="checkbox"/></p> <p>OK <input checked="" type="checkbox"/></p>	<p>DEVICE I2 IS WORKING PROPERLY. Check the other system components or their connections</p> <p>CHANGE DEVICE I2</p>

## BOOT RELEASE CONTROL

### INDEX

WIRING DIAGRAM . . . . . 20-2

GENERAL DESCRIPTION . . . . . 20-3

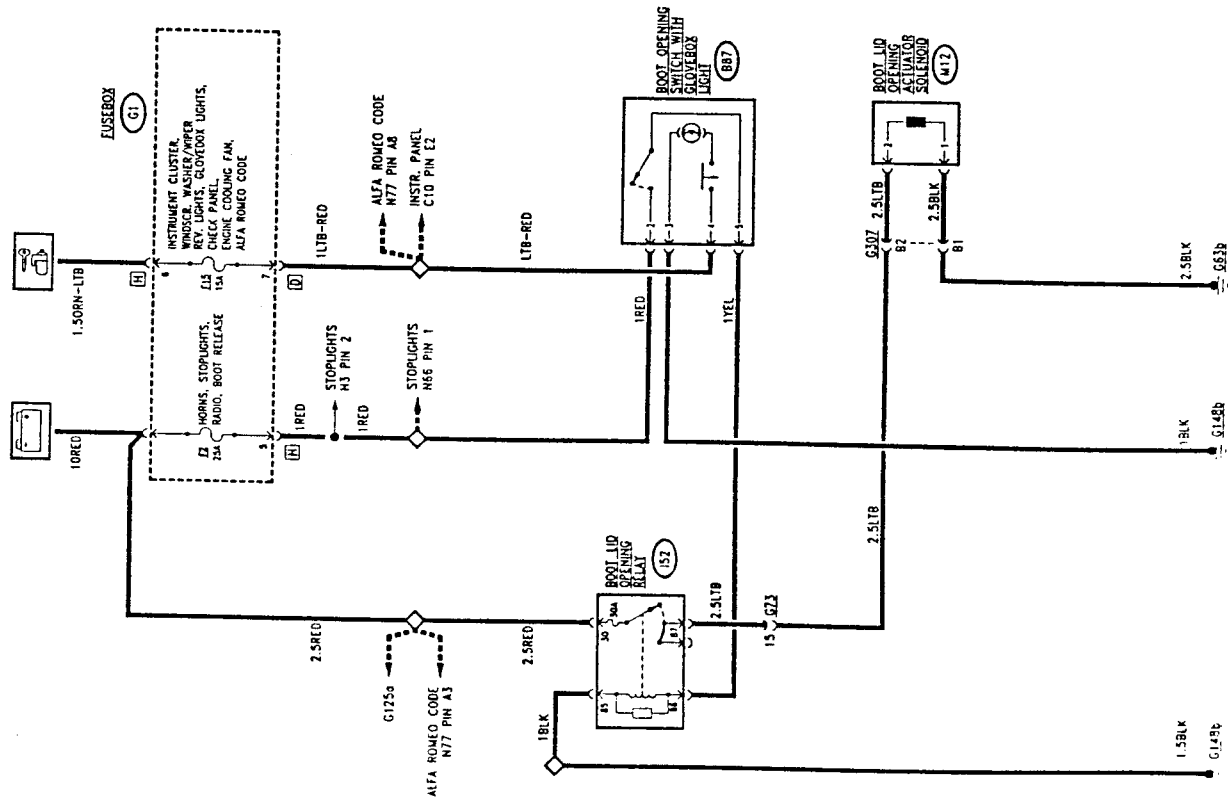
FUNCTIONAL DESCRIPTION . . . . . 20-3

TROUBLESHOOTING TABLE . . . . . 20-3

LOCATION OF COMPONENTS . . . . . 20-4

CHECKING COMPONENTS . . . . . 20-5

WIRING DIAGRAM



GENERAL DESCRIPTION

The boot lid can be opened either from outside the vehicle by inserting the key into the rear lock, or from inside the vehicle by an electric control. For safety reasons the switch which controls the opening of the boot lid lock through a solenoid, is located inside the glovebox on the dashboard. When the glovebox is opened, if the key is in the MARCIA position, a light automatically comes on which illuminates it and enables the switch to be easily located.

FUNCTIONAL DESCRIPTION

The boot lid opening relay IS2 controls the system. The relay is powered directly by the battery through the circuits of fusebox G1. The coil is grounded on one side and is excited by a positive signal originating from the boot opening switch BB7. The battery voltage, after passing fuse F2 (25A) of G1 is transmitted on closure of the contact of switch BB7, to the coil of relay IS2. The relay IS2, protected by a fuse (30A) sends voltage to the boot lid opening actuator solenoid M12 which opens the

lock.

Another contact of switch BB7 closes automatically when the glovebox is opened and illuminates the glovebox light incorporated in switch BB7 using the same supply routed through fuse F15 (15A).

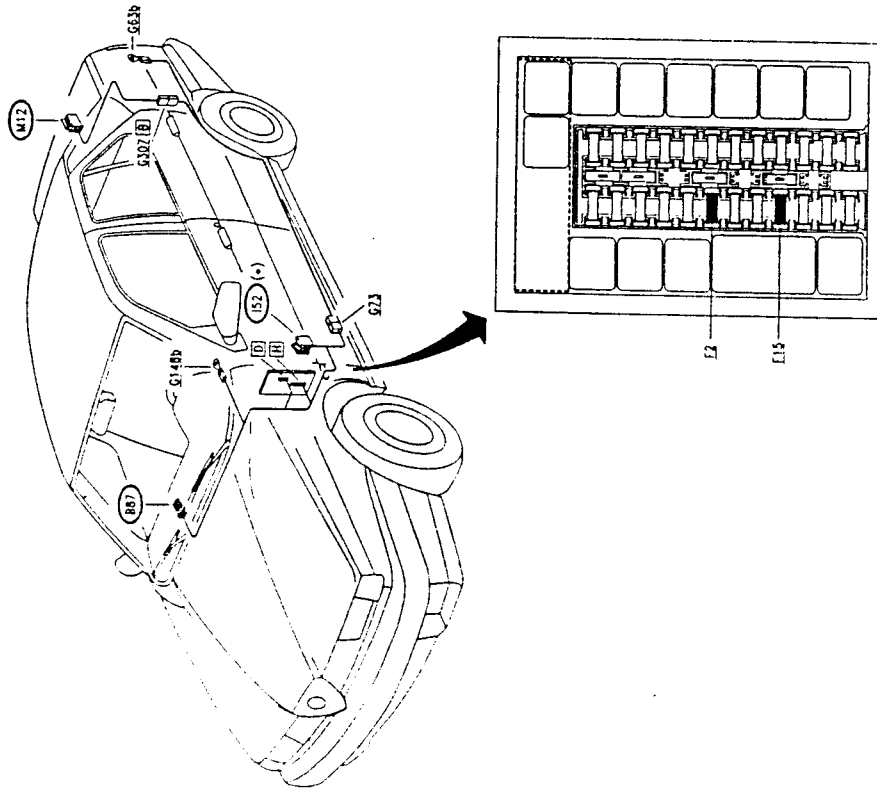
The anti-interference condenser N66 is connected to the power supply of switch BB7.

TROUBLESHOOTING TABLE

Malfunction	Component to be checked		
	E15	E2	IS2 (M12) (BB7)
Boot opening device not working		•	•
Glovebox lamp not working	•		•

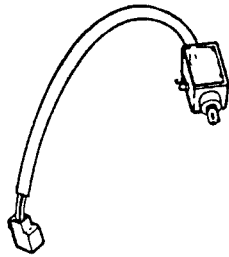


LOCATION OF COMPONENTS



CHECKING COMPONENTS

Luggage compartment opening electromagnet (M12)



SPECIFICATIONS	
Nominal voltage	12V
Absorbed current	31A
Magnetic core stroke	10 ± 0.5 mm

# DOOR LOCKING SYSTEM

## INDEX

WIRING DIAGRAM . . . . . 21-2

GENERAL DESCRIPTION . . . . . 21-3

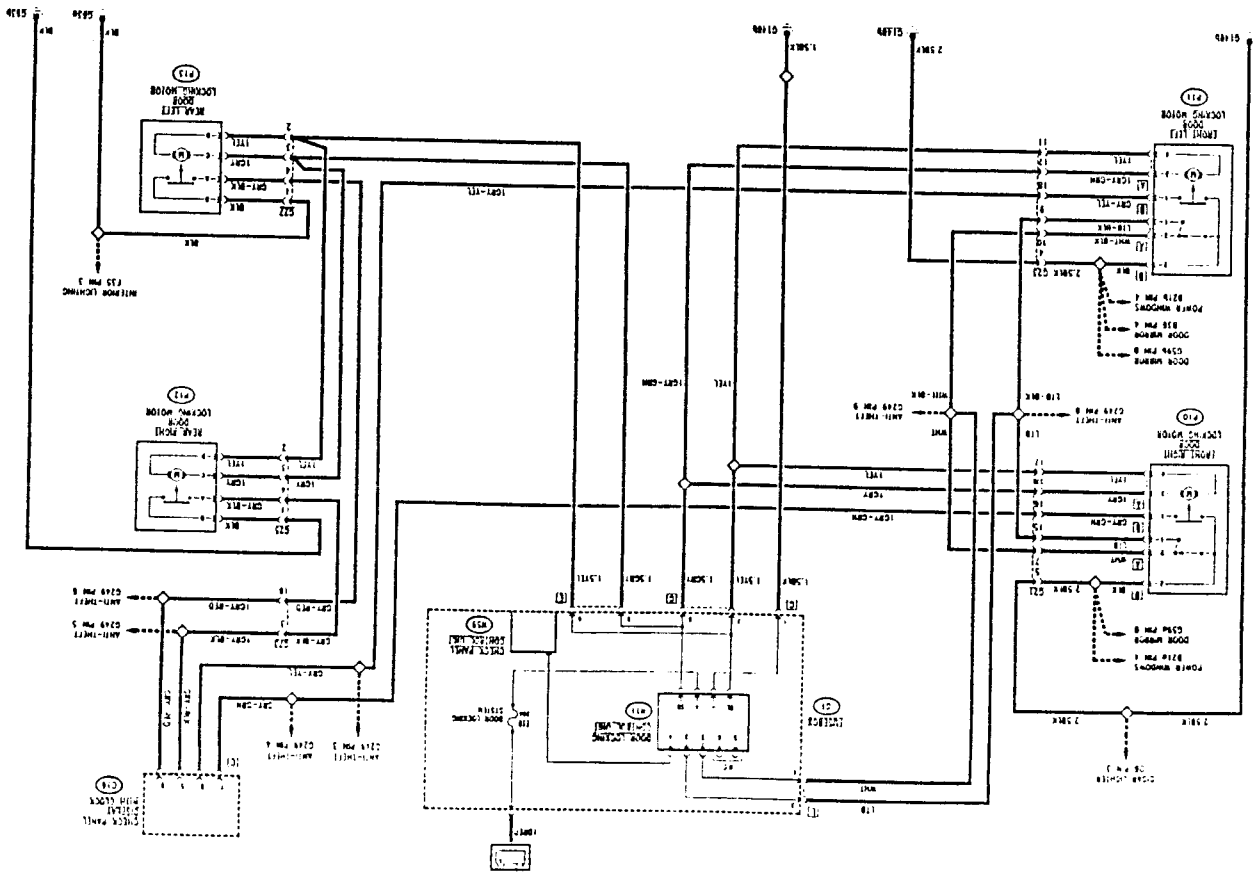
FUNCTIONAL DESCRIPTION . . . . . 21-3

FAULT FINDING TABLE . . . . . 21-3

LOCATION OF COMPONENTS . . . . . 21-4

CHECKING COMPONENTS . . . . . 21-5

WIRING DIAGRAM



GENERAL DESCRIPTION

The door locking system comprises an electronic control unit which controls and commands the door locks: each lock comprises a gear motor for locking/releasing the door lock, a control switch (connected to the electric circuit only for the front doors) and a switch signalling that the door is open. The logic of the control unit does not allow the locking/release of the locks if a "door open" signal is received via the Check Panel (see "Check Panel").

The correct closing of the four doors enables operation of all four gear motors simultaneously, operating the control switches either using the inside knobs or from outside using the key.

The control unit logic comprises a series of check and security operations:

- if the power supply is cut off, the locked doors are not released: the doors will only open when the supply has been restored;
- if the supply collapse is low (< 9.5 V), the locks are not operated;

FUNCTIONAL DESCRIPTION

The door lock control unit N11 is located in fusebox G1. It is supplied by the battery voltage through the special fuse F18 (20A) and it is connected to earth. It receives an earth signal at pins 2 and 3 which represents the locking or release command leading from the control switches of the right front lock P10 and the left one P11:

The logic of the control unit N11 checks that there are no doors open: i.e. pin 4 must not receive a signal leading from the Check Panel control unit N59. The display C16 gathers all the signals from the door open signalling switches of the four door locking devices P10 - right front-, P11 - left front-, P12 - right rear- and P13 - left rear- (also see "Check Panel").

If all the doors are shut properly the control unit sends the locking signal (pin BL) or releasing signal (pin SB) simultaneously to the four door lock gear motors P10, P11, P12 and P13.

- during locking, if one of the control switches is mechanically impeded, this function is cut off;

- if a failure causes the supply to the door motors to last for over 4 seconds, this supply is cut off;

- if several opening/closing commands are received by the control unit in quick succession from the key, only the last one to be sent will be considered;

- in the event of contrary commands (e.g. one with the key and one with the inside knob) the control unit will oscillate; oscillation ends after 8 consecutive commands.

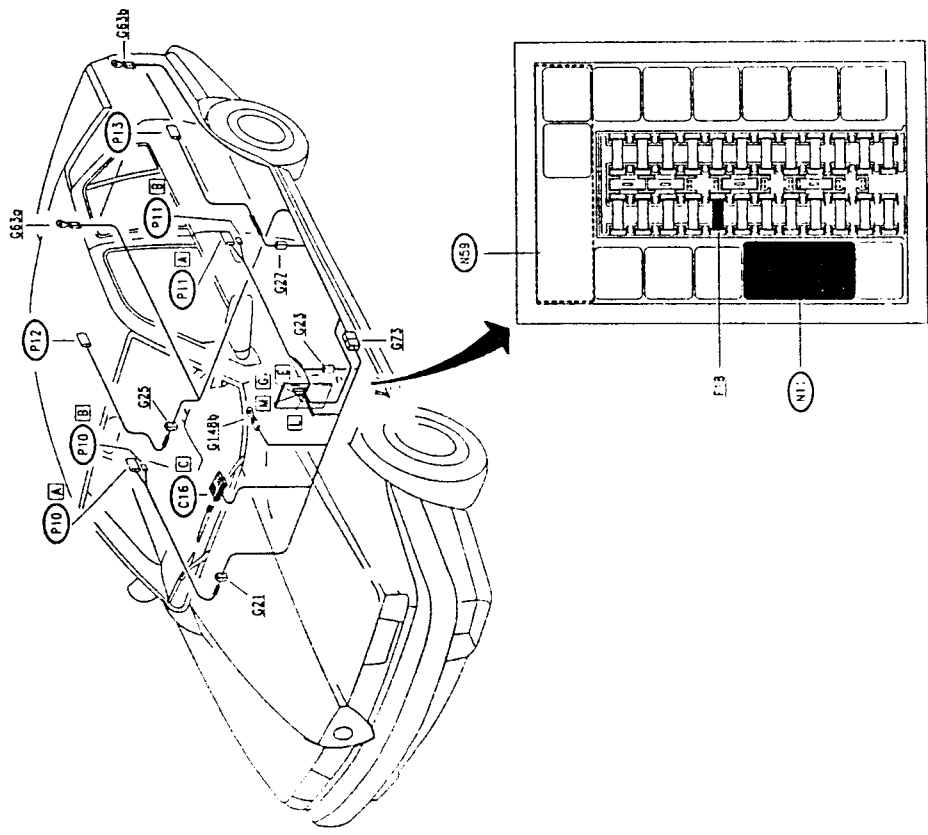
N.B.: In the versions with alarm system the door locking device is also operated via the remote control which works in the same way as manual locking/releasing. For further details see "Alarm system".

NOTE: for safety reasons the switches of the rear doors are mechanical only (and work locking only the corresponding door) and do not operate as electric lock/release control.

FAULT FINDING TABLE

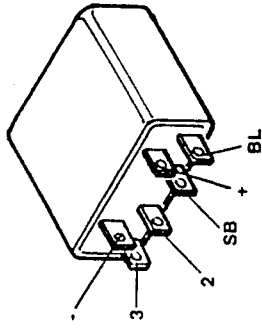
Fault	Component to be checked					
	E18	(N11)	(P10)	(P11)	(P12)	(P13)
Door locking device not working	•					
LH front door open				•		
RH front door open						•
LH rear door open						
RH rear door open						
LH front motor		•				
RH front motor						•
LH rear motor		•				
RH rear motor						•

LOCATION OF COMPONENTS



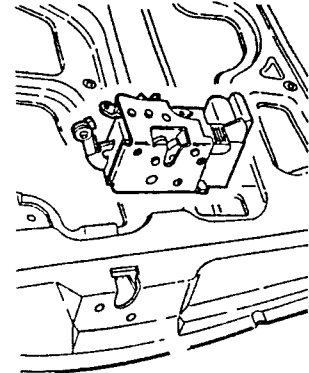
CHECKING COMPONENTS

Door locking control unit (N11)



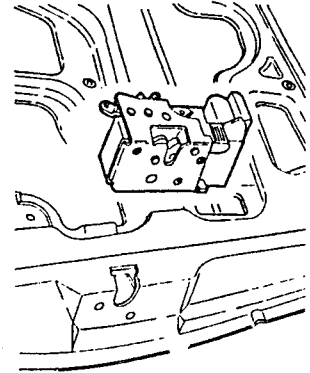
Check device: TEST A

Front door locking gear motors (P10) - (P11)



SPECIFICATIONS	
door closed	continuity between pin 1 and 2 of connector B
door open	a. c. between pin 1 and 2 of connector B
locking control	cuts off continuity between pin B2 and A2 and establishes it between pin B2 and A1
release control	cuts off continuity between pin B2 and A1 and establishes it between pin B2 and A2
motor operation	applying 12V between pin 3 and 4 of connector A

Rear door locking motors (P12) - (P13)



SPECIFICATIONS	
door closed	continuity between pin A and D
door open	a. c. between pin A and D
motor operation	applying 12V between pin B and C

CHECK DOOR LOCKING CONTROL UNIT (N11) TEST A

TEST PROCEDURE	RESULT	CORRECTIVE ACTION
<p>A1 CHECK VOLTAGE</p> <p>Disconnect device N11 and check on the base of fusebox G1 for 12V between the + and - pins of N11</p>	<p>OK <input type="checkbox"/></p> <p><del>OK</del> <input checked="" type="checkbox"/></p>	<p>Carry out step A2</p> <p>Check fuse F18 (20 A) of fusebox G1. Check that G1 is earthed from pin 1 of connector G towards earth G14Bb</p>
<p>A2 CHECK LOCK/RELEASE CONTROL SIGNAL</p> <p>Operate the door lock or release, check for the passage of an earth from pin 2 to pin 3 of N11 or vice versa</p>	<p>OK <input type="checkbox"/></p> <p><del>OK</del> <input checked="" type="checkbox"/></p>	<p>Insert device N11 on the base of G1 and continue with step A3</p> <p>Restore the wiring between N11 (G1) and the door lock motors (P10, P11, P12 or P13) or replace one of the latter</p>
<p>A3 CHECK OPERATION OF LOCK/RELEASE</p> <p>Operate the door lock or release and check for 12V between pin 7 and 8 of connector G of fusebox G1</p>	<p>OK <input type="checkbox"/></p> <p><del>OK</del> <input checked="" type="checkbox"/></p>	<p>DEVICE N11 IS WORKING PROPERLY:</p> <p>Check the door lock motors P10, P11, P12 or P13 and their connections</p> <p>Change device N11</p>

# ANTI-THEFT DEVICE

## INDEX

WIRING DIAGRAM . . . . . 21A-2

GENERAL DESCRIPTION . . . . . 21A-4

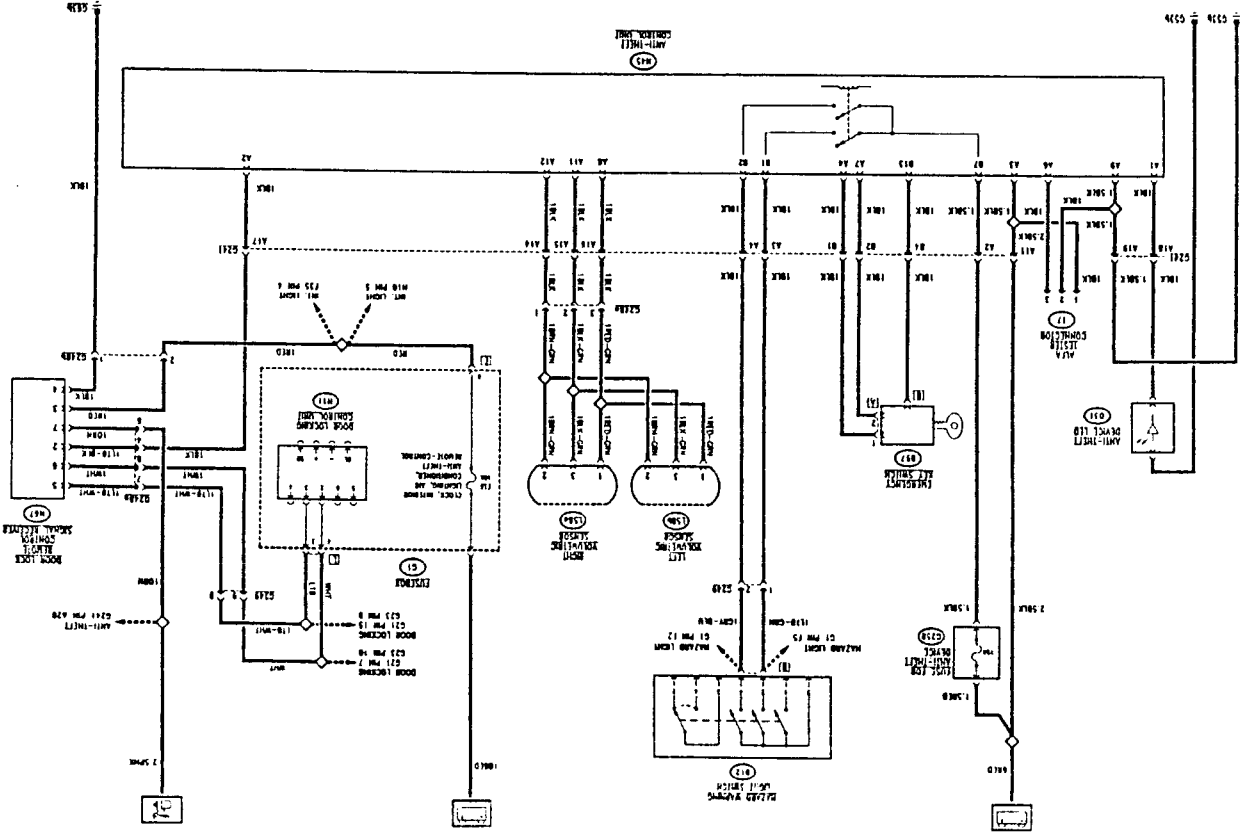
OPERATION . . . . . 21A-5

FUNCTIONAL DESCRIPTION . . . . . 21A-9

LOCATION OF COMPONENTS . . . . . 21A-10

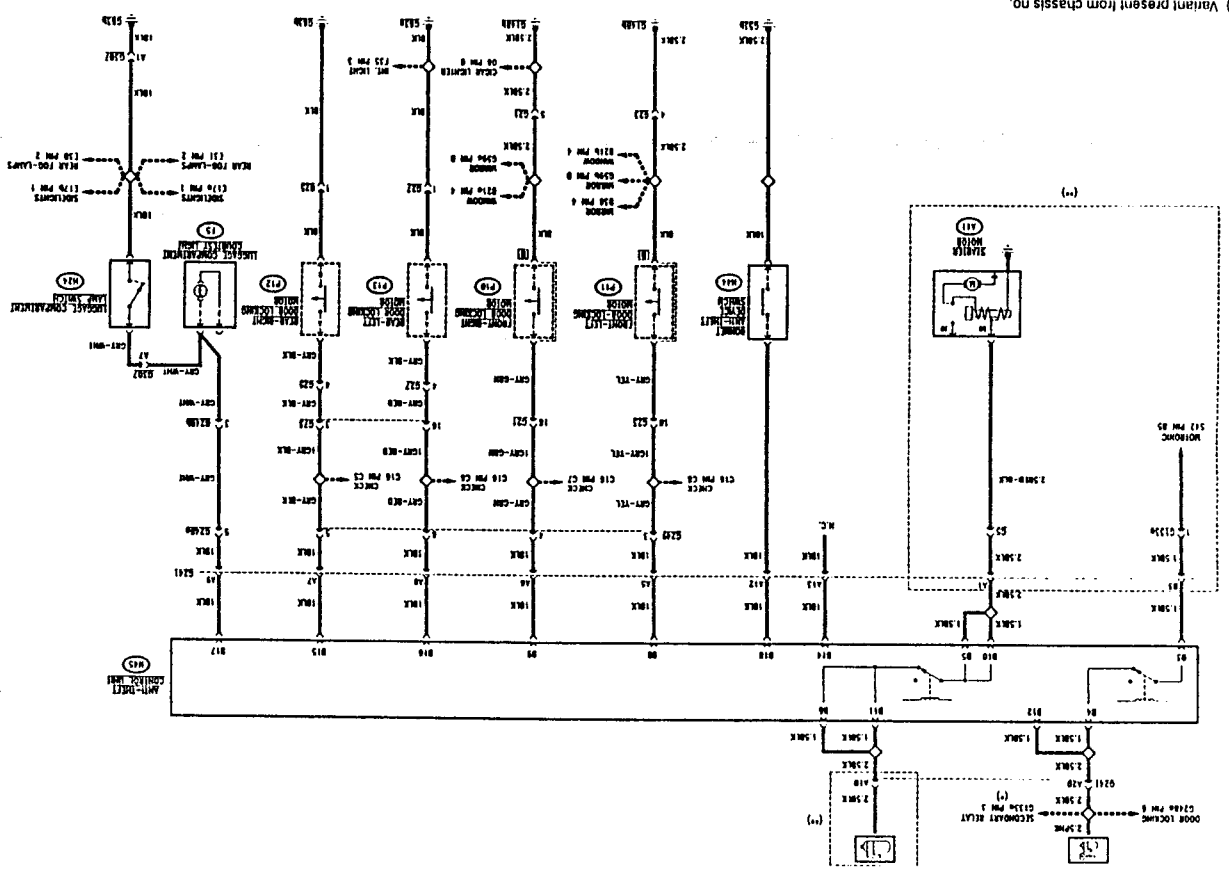
FAULT-FINDING . . . . . 21A-11

WIRING DIAGRAM A



N 9 All the wires located in the luggage compartment are BLACK (BLK) in order to decrease the risk of tampering if the luggage compartment is opened without triggering the switch (H44)

WIRING DIAGRAM B



N 10 All the wires located in the luggage compartment are BLACK (BLK) in order to decrease the risk of tampering if the luggage compartment is opened without triggering the switch (H44)

(\*) Variant present from chassis no. (\*\*) Variant present up to chassis no.

**GENERAL DESCRIPTION**

As an optional the vehicle can be set for the installation of an anti theft device coupled with the remote controlled centralized locking system.

The device used is of the perimeter/volumetric (V.A.S.) type fitted with a single compact unit which includes the electronic control unit and the siren. The system is "universal" as it offers the possibility of using the remote control, to set the control unit according to the requirements of the various countries (acoustic level and exclusion of flashing of hazard warning lights).

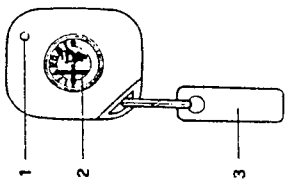
**NOTE: THE V.A.S. ALARM SYSTEM IS, FOR THIS VERSION, COMBINED WITH THE ALFA ROMEO CODE SYSTEM: THIS WAY DOUBLE PROTECTION FOR ENGINE STARTING IS GIVEN:**

**- INHIBITING OF THE IGNITION/INJECTION CONTROL UNIT (ALFA ROMEO CODE);**

**- IGNITION/INJECTION CONTROL UNIT SUPPLY CUT OFF (V.A.S.).**

The transmitter, protected by a rubber shock-proof shell is composed of a printed circuit and an infrared emitter. It is battery powered (2 3 V lithium batteries) and each time the relative button is pressed it sends and infrared beam in the direction in which it is pointed.

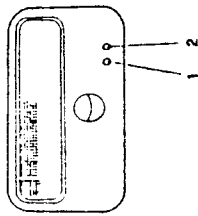
It is an infrared device and continually transmits the code number for the entire time during which the button is pressed. A led comes on each time a signal is emitted.



**Transmitter**

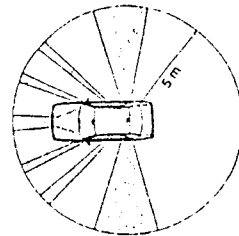
- 1 - Led
- 2 - Command button
- 3 - Plaque showing transmitter code

The receiver, built into the rear roof light is an electronic device which captures the infrared signal through a protruding dome on the receiver itself. A led will also come on on the receiver when the signal is received while a button permits the memorization of the secret access code. The particular shape of the dome enables the signal to be captured through 360 degrees as long as the transmitter is no more than 5 metres from the receiver (see shaded area in diagram).



**Receiver**

- 1 - Store button
- 2 - Led

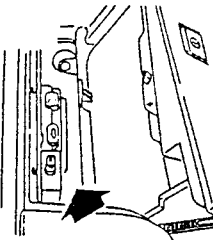


Shadow areas and operating radius of remote control

The electronic control unit also includes a siren of the compact type and is located under the front left-hand wing behind the lokan.

The siren operates with different intensity depending on the programming for the various countries (see indication given below).

The emergency key used to deactivate the system is located in an easily accessible position: in the glovebox next to the glovebox light itself.

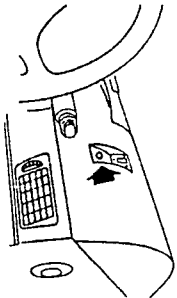


The same switches used for the door locking system are used to control the doors and boot (see "Door locking systems").

The bonnet is covered by a switch. All the switches signal the "open" state of the doors or bonnet/boot controlled (closed = earth signal to control unit).

The two volumetric sensors make it possible to increase the surveillance ensuring that the vehicle is not broken into. These are located above the rear doors, one operating as a transmitter and the other as a receiver. The ultrasound beam which is emitted from the first (that on the left) must be captured in its entirety by the second (on the right-hand side) otherwise an alarm signal is sent to the electronic control unit.

The systems led (red, of the high efficiency type) is located on the dashboard to the left of the steering wheel and signals the state of the system and any anomalies (see description below).



deactivated, leaving the alarm system activated as it is still supplied by the car battery.

With the key at "OFF" the surveillance of the cable cutting/battery disconnection is no longer activated.

Set this key to "OFF" and disconnect the battery cable if the vehicle is left unused for long periods (over 1 month).

**"SURVEILLANCE" MODE**

During the "surveillance" mode (car closed and alarm activated) the dissuasion led flashes at 0.8 Hz. In this conditions, the system;

- checks the doors, bonnet and tailgate;
- checks that the battery is connected and that the leads are intact;
- checks that the ignition key is not being tampered with;
- checks movements inside the passenger compartment (volumetric sensors);
- cuts off the supply to the starter motor (provided that the key is turned to MARCIA) and deactivates the engine electronic control unit.

**ALARM MODE**

The system enters the alarm mode when one of the surveillance sensors detects an abnormal situation.

The alarm mode can trigger a warning system to the outside (activation of the siren and blinkers, with times varying according to the versions/markets). There are other countermeasures such as: cutting off the engine supply (Motronic control unit supply) and starter motor supply cut off.

The alarm ceases:

**OPERATION**

**ENABLING/DISABLING**

It is only possible to enable the alarm when the ignition key is in the STOP position.

ENABLING is possible by pressing the button on the transmitter.

DISABLING is obtained by pressing the same button once again.

To obtain the most efficient switching, press the button until a visual and acoustic signal are noted (feed-back).

**N.B. The system is protected against unauthorised recording of the secret code.**

**Enabling**

Press the button whilst pointing the transmitter towards the receiver dome. Acoustic and optical signals will be noted (for the markets/versions foreseen).

**Disabling**

Press the button pointing the transmitter towards the receiver dome.

Also for disabling acoustic and optical signals will be noted (for the markets/versions foreseen).

**COMPLETE DEACTIVATION OF THE SYSTEM**

If the batteries of the transmitter are flat or the system is not working properly, the alarm system can be deactivated using the emergency key on the control unit. When the car is delivered this emergency key must be in the "ON" position. Turning the key to "OFF" the system is deactivated completely. In the specific version for some markets, only the batteries inside the control unit/siren are

- with a command from the transmitter (deactivation);

- 25 min. after the last activation of the alarm mode;

- by turning the emergency key. (N.B.: in this case the alarm activated condition is stored in the control unit memory).

**SELF-DIAGNOSIS**

**UPON ACTIVATION** the system carries out self-diagnosis (indicated by the flashing of the LED at 4 Hz). If a fault is found, the LED will identify it through a special flashing code as shown in table 1.

Table 1: Selfdiagnosis signals

Type of flashing	Meaning
8 Hz, duration 2,5 sec.	Door/bonnet/tailgate left open or faulty switch
Fixed light, duration 2,5 sec.	Faulty volumetric sensors
16 Hz, duration 2,5 sec.	Fault in electronic control unit

When a door or bonnet/tailgate is found to be open/faulty or when a fault is detected on the volumetric sensors, the corresponding sensor is cut off by the surveillance mode and a beep signal is given one second after they are reactivated.

**WHEN THE ALARM IS DISABLED** the dissuasion LED flashes to indicate which of the sensors triggered an alarm during surveillance (see table 2).

**N.B.:** the signal is cancelled turning the ignition key to MARCIA

Table 2: Signals indicating alarms

N. Flashes*	Component with alarm
1 Flash	Right front door
2 Flashes	Left front door
3 Flashes	Rh door rear
4 Flashes	LH rear door
5 Flashes	Volumetric sensors
6 Flashes	Bonnet
7 Flashes	Tailgate
8 Flashes	Key-operated supply cut off
9 Flashes	Battery supply cut off
10 Flashes	At least 3 causes of alarm contempo- raneously

(\*) If there is more than one, the alarm codes are presented in sequence.

The flashes last for 0.5 sec. with an interval of 1.5 sec. between them.

In addition to the automatic SELF-DIAGNOSIS described here, it is also possible to check the system by MANUAL DIAGNOSIS (see "FAULT-FINDING").

**INHIBITING THE INTERIOR SURVEILLANCE SYSTEM**

It is possible to inhibit interior surveillance in one of the following ways:

- a) in close sequence (prior to enabling the alarm system): starting from the MARCIA position, move the key to STOP. MARCIA. STOP

Confirmation of the inhibition of the interior surveillance system is given by the

lighting up of the dissuasion LED for appr. 2 sec.

- b) starting from the key in the MARCIA position, press the button on the receiver (for less than 0.5 sec.) no longer than 8 sec. before turning the key to STOP. Confirmation that the interior surveillance system is deactivated is given by the lighting up of the LED on the ceiling light for appr. 2 sec.

The next time the key is turned to MARCIA the interior surveillance system is re-enabled

**WARNING:** It will be possible to turn the key to MARCIA for a maximum of 30 sec. without re-enabling the interior surveillance system (for example to allow the closing of electric windows which may have been left open accidentally).

**SELF-ENABLING (only for certain Markets)**

The self-enabling system ensures that the alarm system is partially enabled automatically after a certain period of time - 4 minutes - from when the car is left by the driver.

This takes place under the following two conditions:

- ignition key moved from MARCIA to STOP;
- opening followed by closing of the driver's door.

The surveillance system operates in the same way as when activated by the remote control with the exception of the following points:

- the doors are not locked;
  - interior surveillance is not activated.
- The opening of the driver's door before the delay time for self-enabling - 4 minutes - stops and resets the counter: the closing of the door will make the counter resume from the beginning.

In order to regain possession of the car, the owner must disable the system via the remote control, which must be pressed twice in two separate phases:

- the first press activates the alarm system completely;
- the second one deactivates the alarm system and opens the doors.

**PROGRAMMING THE TRANSMITTER**

Upon leaving the factory, the receiver contains a "UNIVERSAL" code which can be controlled by a "UNIVERSAL" transmitter for inspection and moving the car in the factory. On delivery it is therefore necessary to reprogramme the receiver with the transmitter code so that only the owner will have authorised use of the vehicle.

There are two possible programming modes:

- a) before entering the password: **SIMPLIFIED PROGRAMMING;**
  - b) after entering the password: **PROTECTED PROGRAMMING;**
- The memorising of a transmitter must be carried out with:
- the alarm system deactivated (by remote control); the warning led on the panel must be off;
  - the emergency key at "ON";
  - the ignition key at STOP

Each transmitter has a label with a four-figure number to protect the system from unauthorised programming (protected programming) which must be removed by the customer on delivery of the vehicle and kept in a safe place.

towards the receiver, but at least 20 cm. from it: the led of transmitter A, must flash no more than once;

- 3. LED C lights continuously indicating that the code has been memorised: at this point the operator can release button D to end programming.

In the 3 sec. following the release of the button, it is possible to programme the country code to suit the country in which the car will be used.

This is performed by pressing in quick succession the button of the receiver D, as shown in table 3.

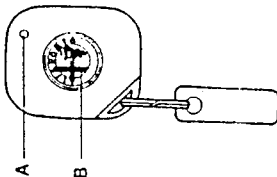
If the button is not pressed, the country code defaults to E.C. In the event of further memory storage operations, the last one remains in the memory.

If the procedure has been carried out correctly, the LED on receiver C will flash 6 times, indicating that the code has been memorised on both the ceiling light receiver and in the control unit, if not, LED C will flash 18 times and it will be necessary to repeat the entire procedure starting from point 1 of simplified programming, after checking the correct connection between the control unit and the ceiling lamp

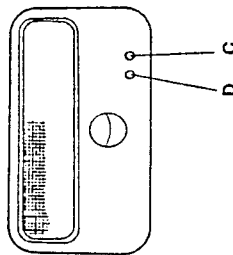
Table 3: Country Codes

No. of presses	Country
1	ITALY
2	GERMANY (*)
3	FRANCE
4	SWITZERLAND
5	UNITED KINGDOM
6	HOLLAND
7	USA
8	EEC
9 / 10	Others

(\*) Not used in this country, because in this country a specific control unit with a special operating logic is foreseen.



Transmitter  
A - Luminous led  
B - Control button



Receiver  
C - Luminous led  
D - memorising button

**SIMPLIFIED PROGRAMMING**

Simplified programming is for use when no remote controller data has previously been entered in the memory and the system needs to accept all transmitters, i.e. when the memory has not yet been "locked" by protected programming.

In this programming mode as many codes as required are recognised, but only the last four are memorised.

Proceed as follows:

- 1. press button D on the ceiling light: LED C flashes;
- NOTE:** if the led does NOT flash, check that the alarm system is de-activated or that the receiver on the ceiling lamp is correctly powered.

- 2. keeping the receiver button D pushed, press the transmitter button B, point it

As it is not easy to carry out this procedure in such a short time as 3 seconds, a different procedure for entering the Country code is recommended. To do this, proceed as follows:

- open the bonnet;
- turn the ignition key from MARCIA to STOP: within 15 seconds the bonnet button must be pressed 7 times in quick succession in less than 10 seconds; 5 beeps will indicate entry in MANUAL DIAGNOSIS (see FAULT-FINDING). During these 5 beeps press the bonnet switch once again. A last long beep will signal the acceptance of this new operation;

- keep the button pressed throughout the duration of the long beep. The latter signals entry into the country programming mode, thus the possibility to enter the country code;

- release the switch and press it within 10 seconds the number of times mentioned in table 3 to select the operating mode of the country required (each press will have a feedback beep).

N.B. To enter another remote control repeat the operations from point 1 of simplified programming, provided that the memory has been "locked" as described below.

**PROTECTED PROGRAMMING**

To prevent unauthorised persons from entering their own code, it is necessary to protect ("lock") the memory; this operation takes place automatically after 256 activations/reactions of the alarm system, or by entering the password (locking the memory manually).



**Locking the memory manually**

Protected programming can be entered by the Owner by entering the Password (four digit code on the transmitter label) before 256 activations (deactivations) for example on a new car during pre-delivery when all the codes of the remote controls given to the Customer have been entered).

To enter the Password:

1. Press the button on receiver D for appr. 2 seconds, LED C will flash for the whole time in which the button is pressed
2. Release button D after appr. 2 seconds LED C will flash once indicating the possibility to enter the first digit of the password
3. Press the button of the receiver D the number of times corresponding to the first figure of the password (for example if the Password is 5 2 0 3 press 5 times). Each time the button is pressed LED C lights up briefly to confirm;
4. After appr. 2 seconds from the last press on button D (the fifth in the example) LED C will flash again to ask for the next figure.
5. Proceed as described above for all the other figures

**NOTE:**

When the password (see example) contains a "0" there is no need to press button D, simply wait for the request for confirmation of entry indicated by the next flash

When the four figures of the Password have been entered, the LED on the receiver C can behave as follows:

- it does not light up: this means that the Password has been entered correctly and that it belongs to one of the codes of the remote controls memorised

- it stays on continuously for several seconds meaning that the password has not been entered correctly or it

does not correspond to any of the remote controls memorised. In this case, when LED C goes off, the correct Password should be entered beginning from point 1.

With the correct entry of the password the memory is "locked".

From now onwards, if attempts are made to memorise a new remote control, after transmitting the new code, LED C on the ceiling light will stop flashing to indicate that the operation is unsuccessful.

In this case, to enter the code of the new remote control the memory has to be "re-opened" by the following procedure:

**Memory opening**

When the memory has been "locked" further remote control codes are entered by "manual memory opening".

The memory is opened as follows:

1. press the button on receiver D for appr. 2 seconds; LED C will flash for the whole time in which the button is pressed;
2. Release button D; after appr. 2 seconds LED C will flash once indicating the possibility to enter the first digit of the password
3. Press the button of the receiver D the number of times corresponding to the first figure of the password (for example if the Password is 5 2 0 3, press 5 times). Each time button D is pressed LED C lights up briefly to confirm;
4. After appr. 2 seconds from the last press on button D (the fifth in the example) LED C will flash again to ask for the next figure.
5. Proceed as described above for all the other figures

After appr. 2 seconds from the last press on button D (the fifth in the example) LED will flash again to ask for the next figure.

Proceed as described above for all the other figures. It should be noted that when the password (see example) contains a "0" there is no need to press the button, simply wait for the next request. When the Password has been entered, the LED C can behave as follows:

- it stays on continuously meaning that the password has not been entered

tered correctly or it is not present in the memory. Repeat the memory opening operations (with the correct password) from point 1;

- it starts flashing: this means that the password has been entered correctly (memory opening) and that it belongs to one of the remote control codes memorised.

At this point to memorise the code of the new transmitter proceed as described at point 1 of "Simplified programming". When the new remote control has been entered the memory returns to the "locked" mode.

**N.B.:** The alarm system is activated/deactivated only by the code of the last transmitter memorised correctly (with the key at "ON").

In fact this code is memorised contemporaneously by both the receiver and the alarm control unit.

Any transmitters memorised previously in the receiver, though they have different codes, utilise the code of the last transmitter memorised to control the theft alarm. If previously the receiver and alarm system were regularly controlled by a transmitter and subsequently another transmitter is memorised with the alarm system key at "OFF", the code of this subsequent transmitter is memorised by the receiver, which regularly operates central door locking, while the code of the first transmitter remains in the control unit. Under these conditions, the alarm system can no longer be controlled by the transmitter, which can only operate door opening/closing.

Simply setting the alarm system key to "ON" and memorising another new transmitter, the problem remains unsolved, as the system can duly memorise a new code only if this has been memorised with the alarm system key at "ON" and in succession after the first transmitter. It is necessary to "open the memory" (as described previously) with the first transmitter, and then correctly enter the other transmitters.

- it stays on continuously meaning that the password has not been entered

**WARNING:** It should be noted that each single component of the anti-theft system installed on the car becomes an integral part of it and must not be altered or tested on other cars, even if of the same model.

Therefore, never exchange control units and/or receivers between two vehicles. If a control unit is replaced, the memorising procedure must be repeated "re-opening" the memory. If a receiver (ceiling lamp) is changed, simplified programming must be carried out followed by protected programming.

**FUNCTIONAL DESCRIPTION**

The anti-theft system is controlled by the electronic control unit N45 which is integrated with the siren.

The control unit is powered directly by the battery at pin A3 and crosses fuse G258 (15A) at pin B7. The key-activated supply reaches pins B4 and B12.

Pin A9 is earthed (G59b).

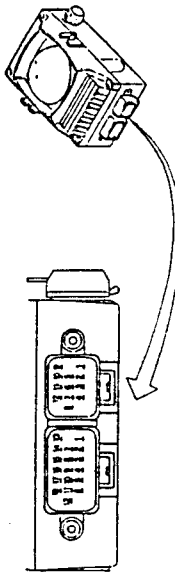
The system activation signal comes from receiver N67 to pin A2 of the control unit.

Through the receiver N67 the opening/closing of the doors using the door locking control unit M11 in fusebox G1 is activated (for greater detail see "Door locking devices").

The control unit controls the closing of the doors and bonnet/boot through the door switches P11, P10, P13, P12 (these are the same as those for the door locking device) which send an earth to pins B8, B9, B16 and B15. The bonnet is controlled by the switch H44 which is connected to pin B18 and the boot by switch H24 (which lights the luggage compartment light - see "Interior lighting") which is connected to pin B17.

The two volumetric sensors L58a (right, which acts as a receiver) and L58b (left, transmitter) receive power supply and earth from pins A8 and A11 of the control unit while the alarm signal returns to pin A12.

In addition to closing the doors, carried out directly by the receiver N67, the control unit activates the "blinker" (flashing of the hazard warning lights) sending a



- CONTROL UNIT PIN-OUTS**
- A1 Signalling led command
  - A2 Serial line connecting with receiver (ceiling lamp)
  - A3 Direct supply
  - A4 Emergency key-OFF
  - A5 N.C.
  - A6 Diagnosis line K
  - A7 Emergency key-ON
  - A8 Volumetric sensors supply
  - A9 Control unit earth
  - A10 N.C.
  - A11 Volumetric sensors earth
  - A12 Volumetric sensors signal

- B1 RH direction indicator command
- B2 LH direction indicator command
- B3 Injection supply consent
- B4 "Key-operated supply for injection
- B5 Starter motor supply
- B6 STARTING signal from ignition switch
- B7 Blinker supply
- B8 LH front door open signal
- B9 RH front door open signal
- B10 Starter motor supply switch
- B11 STARTING signal from ignition switch
- B12 "Key-operated" supply

- B13 Emergency key supply
- B14 N.C.
- B15 RH rear door open signal
- B16 LH rear door open signal
- B17 Boot open signal
- B18 Bonnet closed signal

signal to switch B12 through which these lights are activated manually: from pin B1 for the right-hand lights and from pin B2 for the left-hand lights.

Pin A1 of the control unit sends a 12V signal to the lec D31 when the conditions require it.

The emergency key B97 makes it possible to disengage the system immediately by connection to the control unit: the common power supply starts from pin B13 and returns to pin A7 when the key is in the ON position and to pin A4 when the key is in the OFF position.

The anti-theft system intercepts the "key to starting position" signal (pins B6 and B11) which is passed on to the starter motor A11 (from pin B5 to pin B10) only if the system is in subject to an alarm.

In the event of an alarm the power supply to the electronic injection control unit S11 are cut off. This power supply (12V) is sent from pin B3 to S11.

The system can be connected to the Alfa Romeo Tester through connector T7. The diagnosis signal - line K - leaves pin A6 of the control unit.

**WARNING:** It should be noted that each single component of the anti-theft system installed on the car becomes an integral part of it and must not be altered or tested on other cars, even if of the same model. Therefore, never exchange control units and/or receivers between two vehicles. If a control unit is replaced, the memorising procedure must be repeated "re-opening" the memory. If a receiver (ceiling lamp) is changed, simplified programming must be carried out followed by protected programming.

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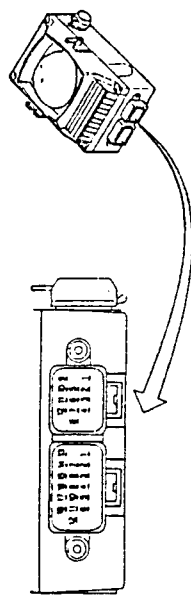
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The two volumetric sensors L58a (right, which acts as a receiver) and L58b (left, transmitter) receive power supply and earth from pins A8 and A11 of the control unit while the alarm signal returns to pin A12.

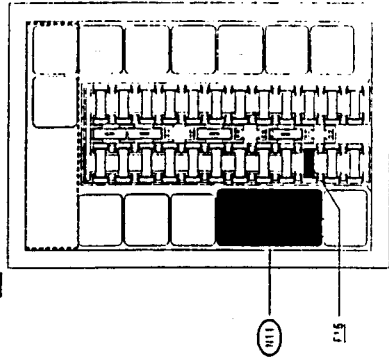
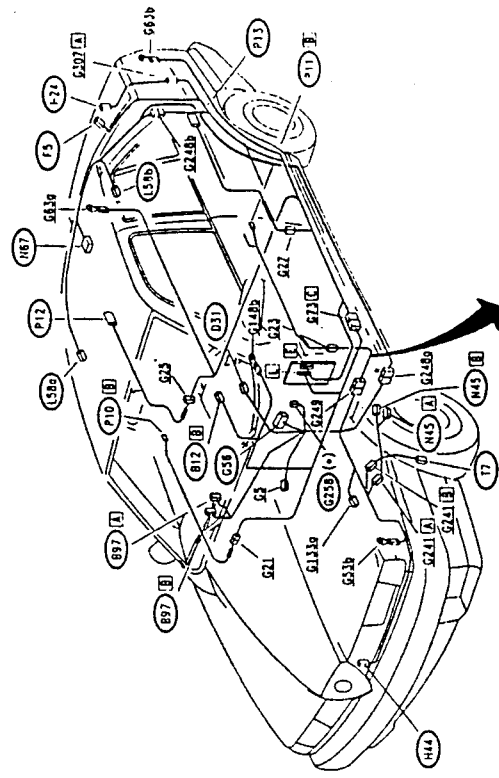
In addition to closing the doors, carried out directly by the receiver N67, the control unit activates the "blinker" (flashing of the hazard warning lights) sending a



**CONTROL UNIT PIN-OUTS**

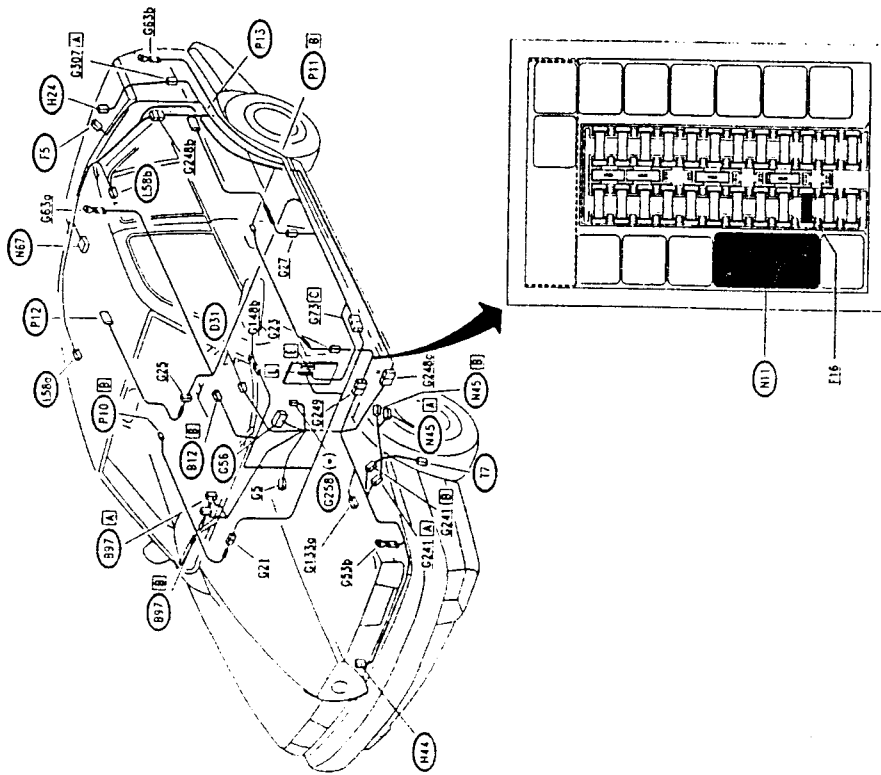
- A1 Signaling led command
- A2 Serial line connecting with receiver (ceiling lamp)
- A3 Direct supply
- A4 Emergency key-OFF
- A5 N.C.
- A6 Diagnosis line K
- A7 Emergency key-ON
- A8 Volumetric sensors supply
- A9 Control unit earth
- A10 N.C.
- A11 Volumetric sensors earth
- A12 Volumetric sensors signal
- B1 RH direction indicator command
- B2 LH direction indicator command
- B3 Injection supply consent
- B4 "Key-operated" supply for injection
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- B6 STARTING signal from ignition switch
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- B8 LH front door open signal
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- B10 Starter motor supply
- B11 STARTING signal from ignition switch
- B12 "Key-operated" supply
- B13 Emergency key supply
- B14 N.C.
- B15 RH rear door open signal
- B16 LH rear door open signal
- B17 Boot open signal
- B18 Bonnet closed signal

**LOCATION OF COMPONENTS**



(\*) Blue fusebox  
 N.B.: All the wires located in the luggage compartment are BLACK (BLK) in order to decrease the risk of tampering if the coc: is opened without triggering the alarm (H44)

LOCATION OF COMPONENTS



\*) Blue fusebox  
 F16 All the wires located in the luggage compartment are BLACK (BLK) in order to decrease the risk of lamping if the boot is opened without triggering the alarm (H44)

FAULT-FINDING

When the system is activated and deactivated it automatically carries out SELF-DIAGNOSIS which reveals certain possible faults by flashing the led as shown below:

ACTIVATION:

Type of led flashing	Meaning	Test procedure
8 Hz, duration 2.5 sec.	Door/bonnet/taillgate left open or faulty switch	Check that doors and bonnets are correctly shut. Activate and deactivate the system. Count the number of flashes of the led and proceed as described in the next table
Fixed light, duration 2.5 sec.	Faulty volumetric sensors.	Check and if necessary change the sensors L58a and L58b
16 Hz, duration 2.5 sec.	Fault in the control unit electronics	Change the control unit N45
No flash	Fault of led	B

DEACTIVATION:

No. of Flashes of led	Component with alarm	Test to be carried out
1 Flash	RH front door	C
2 Flashes	LH front door	D
3 Flashes	RH rear door	E
4 Flashes	LH rear door	F
5 Flashes	Volumetric sensors	G
6 Flashes	Bonnet	H
7 Flashes	Taillgate	I
8 Flashes	Key-operated supply cut off	A
9 Flashes	Battery supply cut off	A
10 Flashes	At least 3 causes of alarm contemporaneously	Repeat activation/deactivation of the system. If necessary, carry out all the above-mentioned tests.

Lastly, other tests are suggested by failures which can be noted directly and pointed out by the customer

Fault	Test to be carried out
Siren not working	Change the control unit N45
Emergency key not working	J
Warning light not working	B
Anti-theft fails to activate the blinkers(*)	K
Anti-theft fails to activate the door locking device	L
Remote control fails to operate	M
Anti-theft blocks the engine completely (**)	N
Anti-theft blocks the starter motor completely(**)	P

(\*) not foreseen for all Markets.

(\*\*) Also see the section "ALFA ROMEO CODE"

**MANUAL DIAGNOSIS**

It is possible to carry out MANUAL DIAGNOSIS, opening the bonnet and turning the ignition key from MARCIA to STOP: within 15 seconds the bonnet pushbutton must be pressed 7 times in rapid succession in less than 10 seconds; 5 beeps will then be heard signalling the start of manual diagnosis. After 10 seconds the blinkers will flash once (500 ms).

Entering this mode, the self-diagnosis procedure of the volumetric sensors connected to the control unit is started automatically. If the test result is positive the direction indicators will flash 3 times and 3 beeps will be heard from the control unit. After this first check, trigger the various switches of the doors, bonnet and tailgate: each triggering will correspond to a brief flash of the direction indicators and by a beep, accompanied by a flash of the warning LED. When the ignition switch is turned to MARCIA the siren will sound briefly (500 msec.) and the blinkers will flash (2.5 sec.).

This last operation concludes the manual diagnosis procedure. It is also possible to exit MANUAL DIAGNOSIS by not triggering any sensor for 30 seconds: exit from manual diagnosis will be signalled by the turning on of the direction indicators for appr. 2.5 seconds and a beep.

**FAULT-FINDING USING THE ALFA ROMEO TESTER**

In addition to the above, it is also possible to quickly locate any faults connecting to the control unit through the Alfa Romeo Tester using the special cartridge.

N.B.: Beforehand, carry out TEST A.

PRELIMINARY CONTROL UNIT CHECK (N45)		CORRECTIVE ACTION	TEST A
TEST PROCEDURE		RESULT	
A1	CHECK FUSES - Check the intactness of fuse F16 of fusebox G1	OK <del>OK</del>	Carry out step A2 Change fuse F16
A2	CHECK VOLTAGE - Check for 12 V at pin A3 of control unit N45	OK <del>OK</del>	Carry out step A3 Restore the wiring between pin A3 of N45 and the branch terminal board
A3	CHECK VOLTAGE - With the ignition key turned, check for 12 V at pin B12 of control unit N45	OK <del>OK</del>	Carry out step A4 Restore the wiring between pin B12 of N45 and the ignition switch
A4	CHECK EARTH - Check that pin A9 of control unit N45 is earthed (0 V)	OK <del>OK</del>	Carry out step A5 Restore the wiring between pin A9 of N45 and earth G53b
A5	CHECK SERIAL CONNECTION - Check the continuity of the connection between pin A2 of N45 and pin 2 of receiver N67	OK <del>OK</del>	Carry out step A6 Restore the wiring between N67 and N45
A6	CHECK CONTINUITY - Check the continuity of the cables: - between pin A6 of N45 and pin 3 of diagnosis connector T7 - between pin 2 of T7 and earth G53b	OK <del>OK</del>	CONNECT TO THE DIAGNOSIS SOCKET T7 AND CONTINUE OPERATIONS WITH THE ALFA TESTER, OR FOLLOW THE INSTRUCTIONS OF THE LED THAT SIGNALS THE RESULTS OF SYSTEM SELF-DIAGNOSIS Restore the wiring between T7, N45 and G53b

CHECK WARNING LED (D31) TEST B

TEST PROCEDURE	RESULT	CORRECTIVE ACTION
<p>B1   CHECK LED</p> <p>Disconnect led D31 and check that it is working (applying for example, 5 V at the terminals)</p>	<p>OK</p> <p><del>OK</del></p>	<p>Carry out step B2</p> <p>Change the led D31</p>
<p>B2   CHECK CONTINUITY</p> <p>Check continuity between one of the terminals of led D31 and earth G56b the other terminal of led D31 and pin A1 of control unit N45</p>	<p>OK</p> <p><del>OK</del></p>	<p>Change the control unit N45</p> <p>Restore the wiring between: - D31 and earth G53b - D31 and pin A1 of N45</p>

CHECK RH FRONT DOOR CONTACT (P10) TEST C

TEST PROCEDURE	RESULT	CORRECTIVE ACTION
<p>C1   CHECK DOOR LOCKING DEVICE</p> <p>Check that the door locking device is working properly, with regard to the RH front door</p>	<p>OK</p> <p><del>OK</del></p>	<p>Carry out step C2</p> <p>Follow the instructions in FAULT-FINDING in the section "DOOR LOCKING SYSTEM"</p>
<p>C2   CHECK EARTH</p> <p>With the door open, check for 0 V (earth at pin B9 of anti-theft control unit N45)</p>	<p>OK</p> <p><del>OK</del></p>	<p>Change the control unit N45</p> <p>Restore the wiring between pin B9 of control unit N45 and door lock P10</p>

CHECK LH FRONT DOOR CONTACT (P11) TEST D

TEST PROCEDURE	RESULT	CORRECTIVE ACTION
<p>D1   CHECK DOOR LOCKING DEVICE</p> <p>Check that the door locking device is working properly, with regard to the LH front door</p>	<p>OK</p> <p><del>OK</del></p>	<p>Carry out step D2</p> <p>Follow the instructions given in FAULT-FINDING of the "DOOR LOCKING DEVICE" section</p>
<p>D2   CHECK EARTH</p> <p>With the door open, check for 0 V (earth at pin B8 of the anti-theft control unit N45)</p>	<p>OK</p> <p><del>OK</del></p>	<p>Change the control unit N45</p> <p>Restore the wiring between pin B8 of control unit N45 and the door lock P11</p>

CHECK RH REAR DOOR CONTACT (P12) TEST E

TEST PROCEDURE	RESULT	CORRECTIVE ACTION
<p>E1   CHECK DOOR LOCKING DEVICE</p> <p>Check that the door locking device is working properly, with regard to the rear RH door</p>	<p>OK</p> <p><del>OK</del></p>	<p>Carry out step E2</p> <p>Follow the instructions in FAULT-FINDING in the section "DOOR LOCKING SYSTEM"</p>
<p>E2   CHECK EARTH</p> <p>With the door open, check for 0 V (earth at pin B15 of anti-theft control unit N45)</p>	<p>OK</p> <p><del>OK</del></p>	<p>Change the control unit N45</p> <p>Restore the wiring between pin B15 of control unit N45 and door lock P12</p>

CHECK LH REAR DOOR CONTACT (P13)		TEST F
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TEST PROCEDURE	RESULT	CORRECTIVE ACTION
<b>F1 CHECK DOOR LOCKING DEVICE</b> - Check that the door locking device is working properly, with regard to the LH rear door	OK	Carry out step F2
	OK	Follow the instructions given in "FAULT-FINDING of the 'DOOR LOCKING DEVICE'" section
<b>F2 CHECK EARTH</b> - With the door open, check for 0 V (earth) at pin B16 of the anti-theft control unit N45	OK	Change the control unit N45
	OK	Restore the wiring between pin B16 of control unit N45 and the door lock P13

CHECK VOLUMETRIC SENSORS (L58a) (L58b)		TEST G
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TEST PROCEDURE	RESULT	CORRECTIVE ACTION
<b>G1 CHECK CONTINUITY</b> - Check for continuity between sensors and control unit: - Between pin A8 of N45 and sensors L58a and L58b - Between pin A11 of N45 and sensors L58a and L58b - Between pin A12 of N45 and sensors L58a and L58b	OK	Carry out step G2
	OK	Restore wiring between: - pin A8 of N45 and pin 1 of L58a and L58b - pin A11 of N45 and pin 3 of L58a and L58b - pin A12 of N45 and pin 2 of L58a and L58b (*)
<b>G2 CHECK SENSORS</b> - When the system is operating, take the signals between sensors L58a and L58b and the control unit N45 (and G, intercept them on the connector (field open) G241 A located in the engine bay, but with the contact H44 closed). Check the connector G241 A for: - 12 V at pin A16 - C/V at pin A15 - 12 V at pin A14 (which becomes 0 V of any movement is detected in the passenger compartment, alarm signals)	OK	Replace the control unit N45
	OK	Replace one of the two sensors L58a or L58b

(\*) The sensor L58b (LH) acts as a TRANSMITTER while L58a (RH) acts as a RECEIVER of ultrasound; for this reason the cable from pin 2 of L58b to pin A12 of control unit N45 IS NOT NORMALLY USED.  
**N.B.** - The two sensors are wrongly fitted - i.e. and transmitter on the right and receiver on the left - the system will still function! In this case the other cable will be used

CHECK BONNET CONTACT (H44)		TEST H
----------------------------	--	--------

TEST PROCEDURE	RESULT	CORRECTIVE ACTION
<b>H1 CHECK CONTACT</b> - Check the correct fastening of contact H44 and of the striker on the bonnet	OK	Carry out step H2
	OK	Fix or change contact H44 or the corresponding striker
<b>H2 CHECK EARTH</b> - With the bonnet closed (switch pressed), check for an earth on both terminals of switch H44	OK	Carry out step H3
	OK	Restore the wiring between H44 and earth G53a
<b>H3 CHECK EARTH</b> - With the bonnet closed, check for 0 V (earth) at pin B18 of anti-theft control unit N45; opening the bonnet (releasing the switch) the signal becomes approx. 12 V	OK	Change the control unit N45
	OK	Restore the wiring between switch H44 and pin B18 of control unit N45

CHECK TAILGATE CONTACT (H24)		TEST I
------------------------------	--	--------

TEST PROCEDURE	RESULT	CORRECTIVE ACTION
<b>I1 CHECK LUGGAGE COMPARTMENT LIGHT</b> - Check that the light turns on when the tailgate is opened F5	OK	Carry out step H2
	OK	Follow the instructions given in "FAULT-FINDING in the 'CEILING LIGHTS'" section
<b>I2 CHECK EARTH</b> - With the tailgate open, check for 0 V (earth) at pin B17 of anti-theft control unit N45	OK	Change the control unit N45
	OK	Restore the wiring between contact H24 and pin B17 of control unit N45

THE EMERGENCY KEY DOES NOT WORK

TEST J

TEST PROCEDURE	RESULT	CORRECTIVE ACTION
<p>J1 CHECK SWITCH</p> <p>Check for correct operation of switch B97 in the OFF position the contact between pins A1 and B is closed</p> <p>in the ON position the contact between pins A2 and B is closed</p>	<p>OK</p> <p><del>OK</del></p>	<p>Carry out step J2</p> <p>Replace switch B97</p>
<p>J2 CHECK CONTINUITY</p> <p>Check for continuity between</p> <ul style="list-style-type: none"> <li>pin A1 of B97 and pin A4 of N45</li> <li>pin A2 of B97 and pin A7 of N45</li> <li>pin B of B97 and pin B13 of N45</li> </ul>	<p>OK</p> <p><del>OK</del></p>	<p>Replace the control unit N45</p> <p>Restore wiring between:</p> <ul style="list-style-type: none"> <li>pin A1 of B97 and pin A4 of N45</li> <li>pin A2 of B97 and pin A7 of N45</li> <li>pin B of B97 and pin B13 of N45</li> </ul>

THE ANTI-THEFT SYSTEM DOES NOT FLASH THE BLINKERS

TEST K

TEST PROCEDURE	RESULT	CORRECTIVE ACTION
<p>K1 CHECK OPERATION OF BLINKERS</p> <p>Check that the hazard warning lights (blinkers) are working properly when activated manually</p>	<p>OK</p> <p><del>OK</del></p>	<p>Carry out step K2</p> <p>Follow the instructions in FAULT-FINDING OF THE "DIRECTION INDICATORS AND HAZARD WARNING LIGHTS" section</p>
<p>K2 CHECK VOLTAGE</p> <p>Check for 12V at pin B7 of N45</p>	<p>OK</p> <p><del>OK</del></p>	<p>Carry out step K3</p> <p>Restore the wiring between N45 and G1</p>
<p>K3 CHECK CONTINUITY</p> <p>Check continuity between</p> <ul style="list-style-type: none"> <li>pin B1 of control unit N45 and B2 of B12</li> <li>pin B2 of N45 and B4 of B12</li> </ul>	<p>OK</p> <p><del>OK</del></p>	<p>Change the control unit N45</p> <p>Restore any faulty wiring</p>

THE ANTI-THEFT FAILS TO OPERATE THE DOOR LOCKS

TEST L

TEST PROCEDURE	RESULT	CORRECTIVE ACTION
<p>L1 CHECK OPERATION OF THE DOOR LOCKING DEVICE</p> <p>Check that the door locking device is working properly engaging the key in the door locks</p>	<p>OK</p> <p><del>OK</del></p>	<p>Carry out step L2</p> <p>Follow the instructions in FAULT-FINDING OF THE "DOOR LOCKING DEVICE" section</p>
<p>L2 CHECK CONTINUITY</p> <p>Check the continuity of the cables between fusebox G1 - pin 3 and 4 of connector L - and receiver N67 - pin 5 and 6 respectively</p>	<p>OK</p> <p><del>OK</del></p>	<p>Check the connection between receiver N67 and the anti-theft control unit N45 (pin A2)</p> <p>Restore the wiring</p>

REMOTE CONTROL NOT WORKING

TEST M

TEST PROCEDURE	RESULT	CORRECTIVE ACTION
<p>M1 CHECK REMOTE CONTROL</p> <p>Check that the remote control is working properly: pressing the button the led should turn on</p>	<p>OK</p> <p><del>OK</del></p>	<p>Carry out step M2</p> <p>Check the transmitter batteries. If necessary change the transmitter. N.B. in this case it will be necessary to reprogramme the whole system (see "Programming the transmitter")</p>
<p>M2 CHECK RECEIVER</p> <p>Check that the receiver is working properly: pressing the button of the transmitter suitably pointed at the receiver N67 the receiver led should light up to indicate that the signal has been received</p>	<p>OK</p> <p><del>OK</del></p>	<p>Carry out step M3</p> <p>Change the transmitter N67 located in the front ceiling light</p>
<p>M3 CHECK FUSE</p> <p>Check the intactness of fuse F16 of fusebox G1</p>	<p>OK</p> <p><del>OK</del></p>	<p>Carry out step M4</p> <p>Change the fuse F16 (10A)</p>
<p>M4 CHECK VOLTAGE</p> <p>Check for 12 V "direct" at pin 3 of N67 and 12 V "key-operated" at pin 7 of N67</p>	<p>OK</p> <p><del>OK</del></p>	<p>Carry out step M5</p> <p>Restore the wiring between N67 and fusebox G1 and ignition switch</p>
<p>M5 CHECK EARTH</p> <p>Check that pin 4 of N67 is earthed</p>	<p>OK</p> <p><del>OK</del></p>	<p>Change the receiver N67</p> <p>Restore the connection between N67 and earth G63b</p>

THE ANTI-THEFT BLOCKS THE ENGINE COMPLETELY (\*) TEST N

WARNING - PRELIMINARILY ALSO CHECK THAT THE "ALFA ROMEO CODE" SYSTEM IS WORKING PROPERLY WHICH ALSO INHIBITS THE INJECTION/IGNITION CONTROL UNIT S11.

TEST PROCEDURE		RESULT	CORRECTIVE ACTION
N1	CHECK VOLTAGE -- With the ignition key at MARCIA, check for 12 V at pin B4 of control unit N45	OK	Carry out step N2
N2	CHECK VOLTAGE -- With the ignition key at MARCIA, and anti-theft deactivated check for 12 V at pin B3 of control unit N45	OK	Restore the wiring between pin B4 of N45 and the ignition switch B1
		OK	Restore the wiring between pin B3 of N45 and and the injection/injection control unit S11
		OK	Change the control unit N45

THE ANTI-THEFT BLOCKS THE STARTER MOTOR COMPLETELY (\*) TEST P

TEST PROCEDURE		RESULT	CORRECTIVE ACTION
P1	CHECK VOLTAGE -- With the key at START, check for 12V at pin B6 of control unit N45	OK	Carry out step P2
P2	CHECK VOLTAGE -- With the key turned to START and the anti-theft deactivated, check for 12 V at pin B5 di N45	OK	Restore the wiring between pin B6 of N45 and the ignition switch B1
		OK	Check that the starter motor A11 is working properly with the corresponding supply cables: see the section "STARTING AND RECHARGING"
		OK	Change the control unit N45

(\*) Procedure valid up to chassis no.

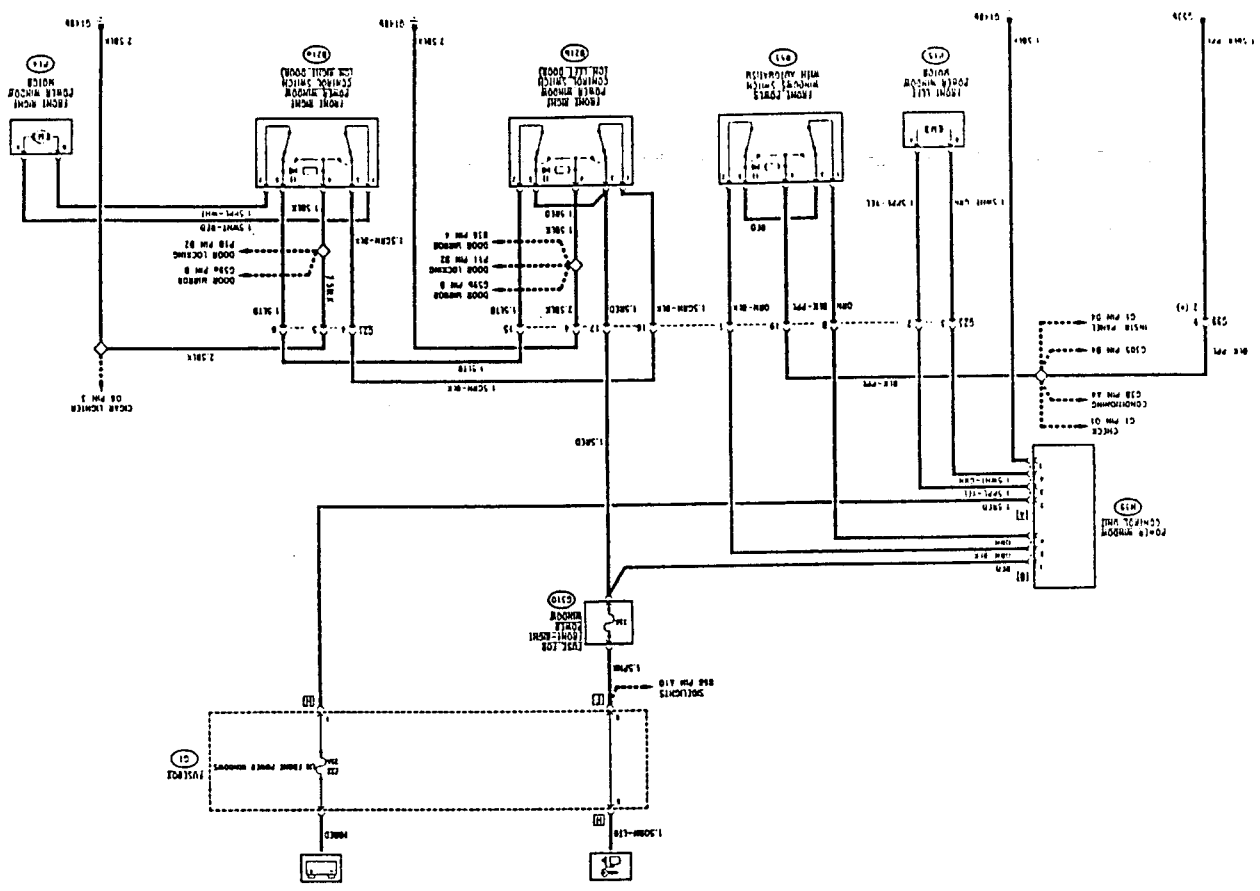


# FRONT POWER WINDOWS

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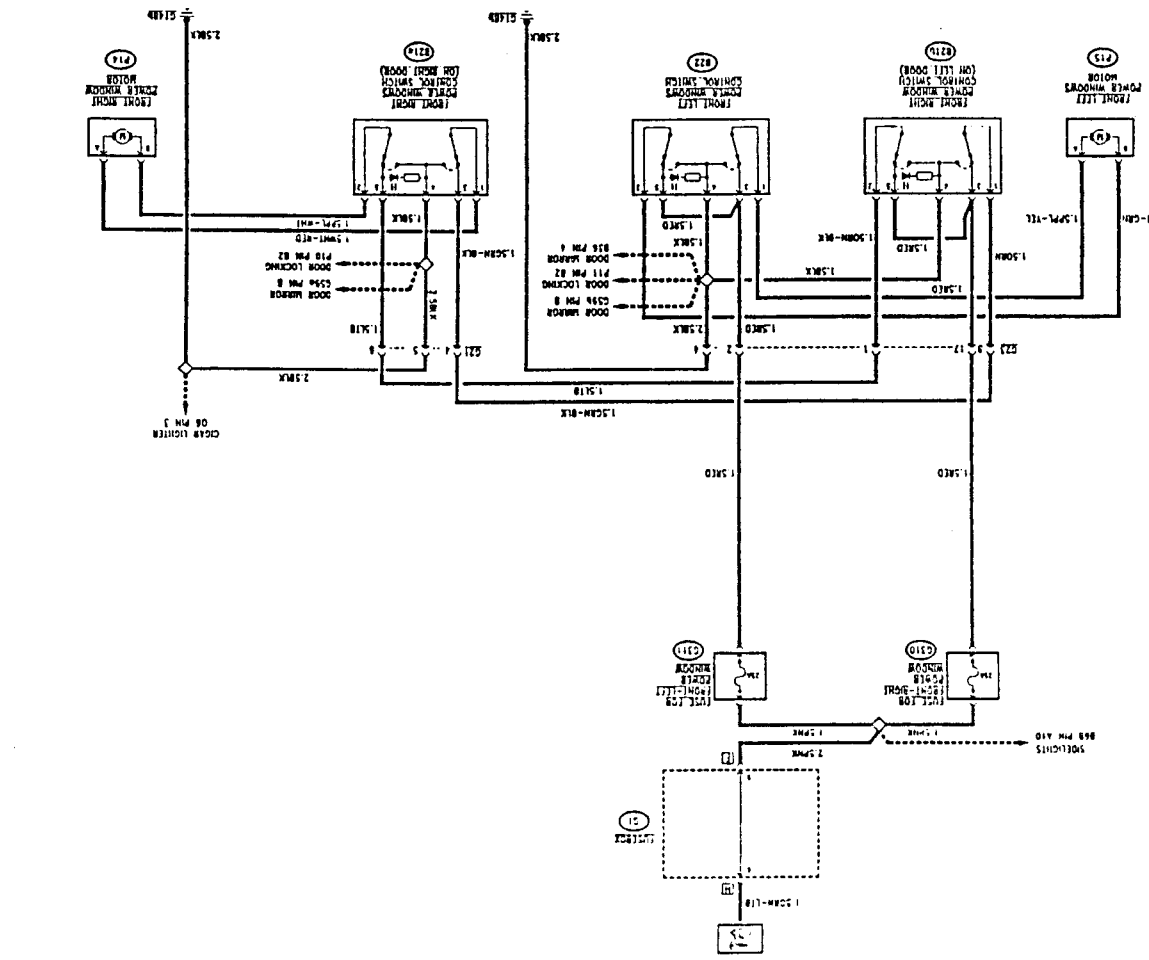
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WIRING DIAGRAM (versions with automatic control)



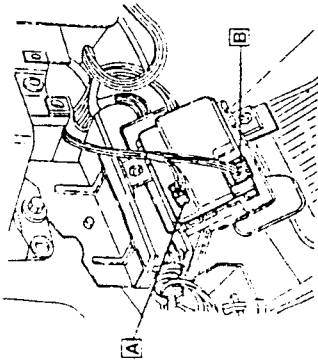
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WIRING DIGRAM (versions with manual control)



CHECKING COMPONENTS

Power window control unit (N38) (\*\*)

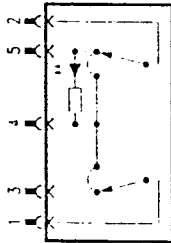


Checking the device: test A

Power window switches (B21a) (B21b) (B22) (\*) (B53) (\*\*)

**SPECIFICATIONS**

Check operation:  
 at rest: continuity between pins 3 and 1 and between pins 2 and 5, a.c. between the other pins  
 pressing up button: continuity between pins 4 and 1; a.c. between the other pins  
 pressing down button: continuity between pins 4 and 2, a.c. between the other pins



(\*) Versions with manual control  
 (\*\*). Versions with automatic control

CHECK POWER WINDOW CONTROL UNIT (N38) (\*\*)

TEST A

Test the component with connectors assembled, working from cable inlet side

TEST PROCEDURE		RESULT	CORRECTIVE ACTION
A1	CHECK VOLTAGE	OK	Carry out step A2
	- Check for 12V between pins 2 and 1 of connector A of N38	OK	Check fuse F22 (25A). Restore the wiring between N38A and G1 and between N38A and earth G148b
A2	CHECK VOLTAGE	OK	Carry out step A3
	- With the key at MARCIA, check for 12V between pin 1 of connector B and pin 1 of connector A of N38	OK	Check wander fuse G310 (25A). Restore the wiring between N38 B and G310
A3	CHECK MANUAL OPERATION	OK	Carry out step A5
	- Operating the switch of the driver's side front window B53, check for 12V between pins 3 and 4 of connector A of N38; this voltage ceases as the action on the pushbutton ceases	OK	Carry out step A4
A4	CHECK MANUAL OPERATION	OK	Change device N38
	- Operating switch B53, check for 12V between pins 3 and 4 of connector B of N38	OK	Restore the wiring between N38 B and switch B53, or replace the latter
A5	CHECK AUTOMATIC OPERATION	OK	DEVICE N38 IS WORKING PROPERLY. Check the connections with the other components
	- With the key at MARCIA, operating switch B53 check for: • 12V d.c. between pins 3 and 4 of connector A if the button is pressed for less than 300 ms • no voltage if the button is pressed for less than 50 ms • 12V d.c. between pins 3 and 4 of connector A keeping the button pressed	OK	Change device N38

(\*\*): Versions with automatic control

**GENERAL DESCRIPTION**

The electric mechanism that operates the left-hand window may be one of two types depending on the version:

- manual control
  - automatic control.
- The manual control is of the conventional type (with the push-button pressed the window lowers or higher), while the automatic control is driven by a control unit that operates the system according to the following logic:

- pressing one of the two buttons and keeping it pressed, the window opens or closes normally until the pushbutton is released;
- a short pulse (below appr. 300 ms.) operates the motor which automatically stops when the stop limit is reached (window open or closed completely);
- an even shorter pulse (less than appr. 50 ms.) is considered by the control unit as an accidental shock and no action will result.

The electrical mechanism that operates the right front window is of the conventional type: when the button is pressed the window rises or drops; it is fitted with two control switches: one on the right-hand door and one on the left-hand door. All the power windows work with the "key-operated" supply.

**FUNCTIONAL DESCRIPTION (versions with manual control)**

The system receives the "key-operated" supply via fuses G310 (25A) and G311 (25A) which respectively protect the right front power window and the left front power window.

Operation of the left power window is controlled by a double switch B22 which, upon receiving the "key-operated" supply at pin 3 and 5, supplies a consent signal for highering and lowering, via pin 1 and 2. In fact, they send an earth (withdrawn from pin 4 of the switch) to the motor, P15 from the part in which the contact has been closed, thereby determining the direction of rotation of the motor.

Conversely, the operation of the right-hand motor is controlled directly by one of the two switches B21 (B21a located on the right-hand door, B21b on the left) which are connected in series. The "key-operated" supply passes through fuse G310 (25A), the earth from G148b.

The righthand window motor P14 is operated by the double switch B21 in one direction or the other depending on the origin of the positive or negative signals.

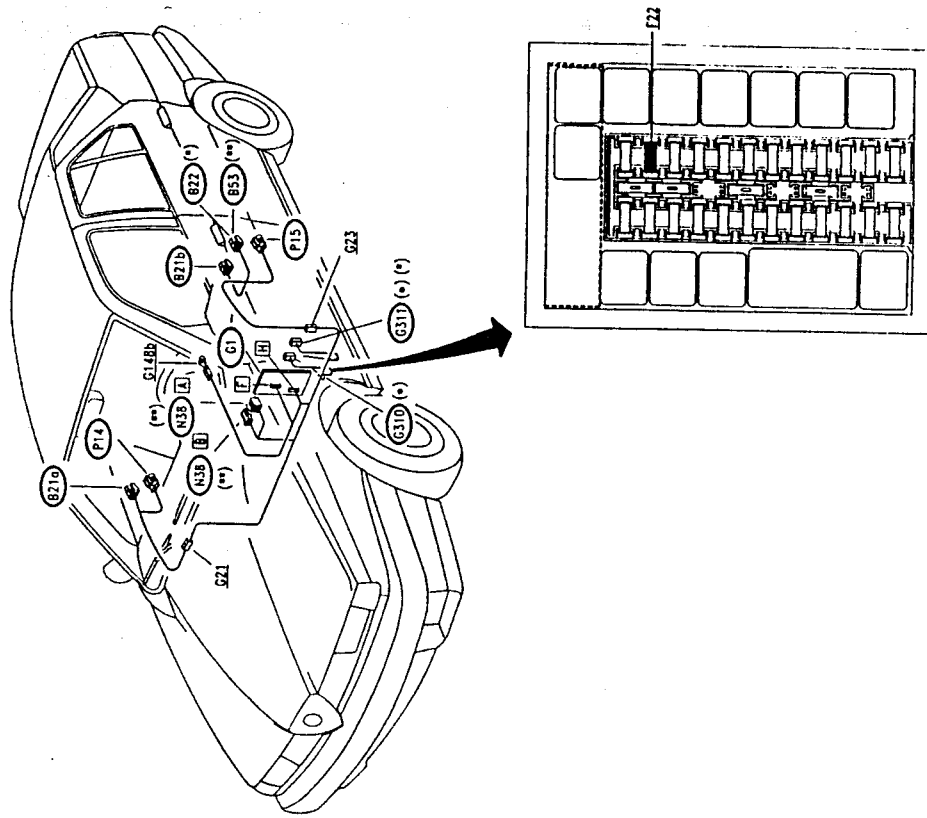
**TROUBLESHOOTING TABLE**

Fault	Component to be checked									
	G310 (*)	G311 (*)	F22 (**)	P14	P15	N38 (**)	B22 (*)	B53 (*)	B21a	B21b
LH power window, under all circumstances	• (**)	•	•	•	•	•	•	•	•	•
LH power window, automatic operation	•		•							
RH power window										•

(\*) Versions with manual control (\*\*) Versions with automatic control



**LOCATION OF COMPONENTS**



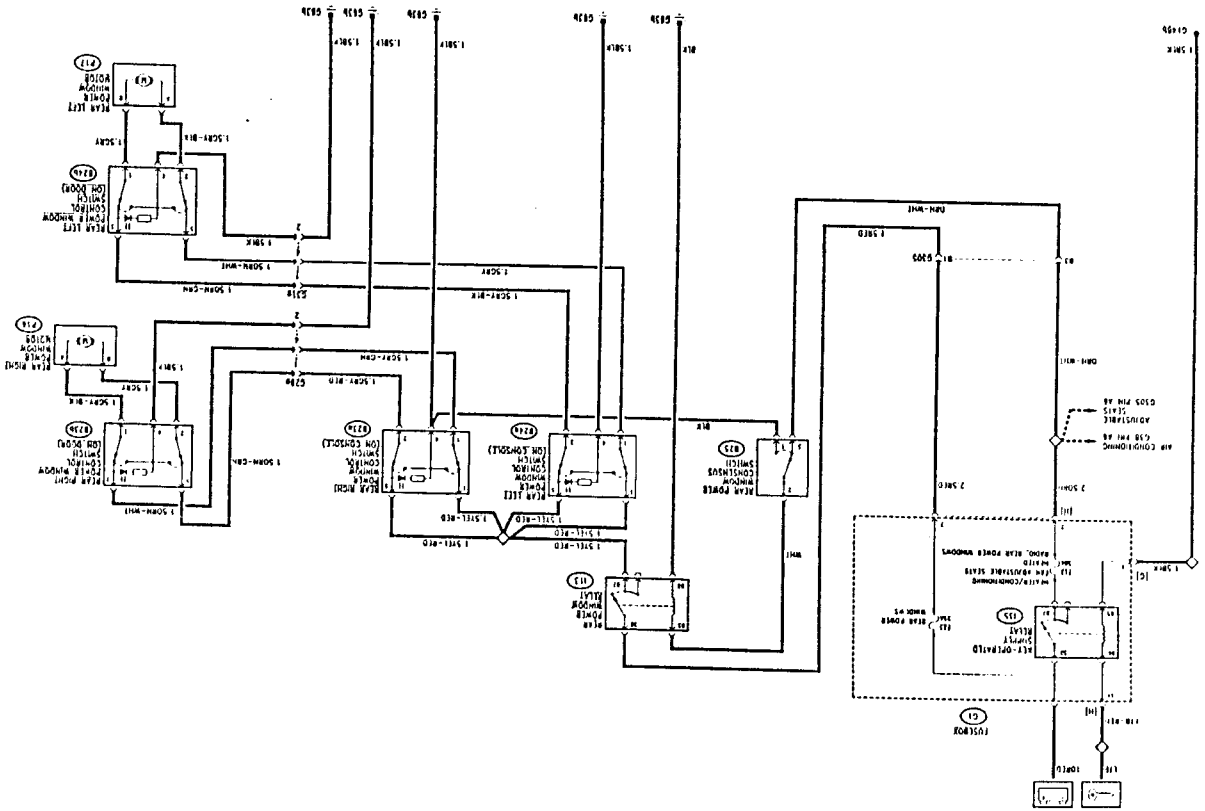
(•) white fuse holder (\*) Versions with manual control (\*\*) Versions with automatic control

## REAR POWER WINDOWS

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WIRING DIAGRAM



GENERAL DESCRIPTION

The electric mechanism which actuates the rear power windows is of the traditional type (when a button is pressed the window is raised or lowered) with two control switches for each window; one on the relative door and one on the central console operable from the front seats.

For safety reasons a consensus switch, located on the central console, makes it possible to cut off the power supply to all the switches.

Operation of the rear power windows is only possible when the ignition key is inserted.

FUNCTIONAL DESCRIPTION

The rear power windows relay 113 supplies and controls the entire system.

The coil of the relay is excited by a key-operated signal coming from the relay-operated supply relay 135 and by fuse F13 (20A) in fusebox G1; this supply passes via the rear power windows consensus safety switch B25: when actuated, this removes the excitation from the coil of 113, and interrupts the power supply to the circuit.

When the coil of the relay is excited, the switches are supplied with voltage from the battery through F23 (25A) of fusebox G1.

Each window can be controlled by two different switches: one located on the central console (B23a right and B24a left), and one located on the relative door (B23b right and B24b left). Each pair of switches is connected in series.

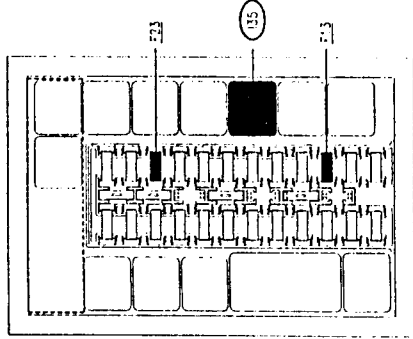
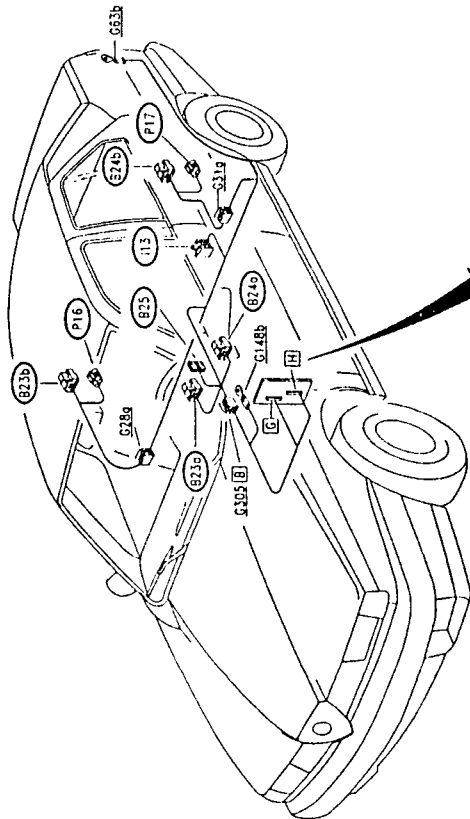
The power supply reaches the switches from relay 113 and the ground from G63b.

The double switches supplied by motors P16 and P17, send supply and ground, inverting the signals depending on the contact which has been closed and in this way determining the direction of rotation of the motor.

TROUBLESHOOTING TABLE

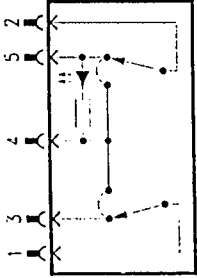
Malfunction	Component to be checked					
	F13	E23	B23	B24	B25	P17
Rear power windows	•	•	•	•	•	
Rear left power window			•			
Rear right power window				•		•

LOCATION OF COMPONENTS



CHECKING COMPONENTS

Power window switches (B23a) (B23b) (B24a) (B24b)



SPECIFICATIONS

Check operation:  
 at rest: continuity between pins 3 and 1 and between pins 2 and 5, a.c. between the other pins  
 pressing up button: continuity between pins 4 and 1; a.c. between the other pins  
 pressing down button: continuity between pins 4 and 2, a.c. between the other pins

# ADJUSTABLE HEATED SEATING

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**GENERAL DESCRIPTION**

The front seats are actuated with an electrically operated mechanism enabling both driver and passenger to adjust the seats to the best position for driving and for comfort.

In addition, a heater (composed of two pads located in the cushion and in the backrest) makes it possible to warm the seats, eliminating the disadvantages which, in areas with a harsh climate, are caused by when the inside of the vehicle is cold after it has been left in the open for long periods.

The system of seat regulation is formed by three groups of electric motors which operate respectively on the runners for longitudinal regulation, the height adjustment mechanism and the tilt mechanism for the backrest.

These motors are actuated by special switches and the entire system is managed by a control unit which protects the circuits of the motors themselves and controls the operation (engagement, stop limit etc.). The control unit is located under the rear seat.

The system of seat warming is formed

by two resistors actuated by a switch and a relay; heating is interrupted automatically once a certain temperature is reached.

All the switches which control a seat are located on the seat itself one on each side. The switches are illuminated.

**FUNCTIONAL DESCRIPTION**

The seating control unit N58 is supplied by the battery through fuse F21 (30A), and is connected to ground G63b; it receives a key-operated supply signal through the key-operated supply relay B35 and fuse F13 (30A) in fusebox G1.

The control unit N58 "manages" the operation of the three seat regulation groups for each seat, each group composed of two parallel electric motors (P30, P6 and P28 for the right-hand seat and P5, P7 and P29 for the left hand seat).

The motors are actuated by their respective switches (B63, B29 and B52 for the right-hand seat and B27, B28 and B54 for the left-hand seat), controlled by

the control unit N58. The switches are of the double control type: sending two signals to the motors, inverting positive and negative in order to change the direction of travel.

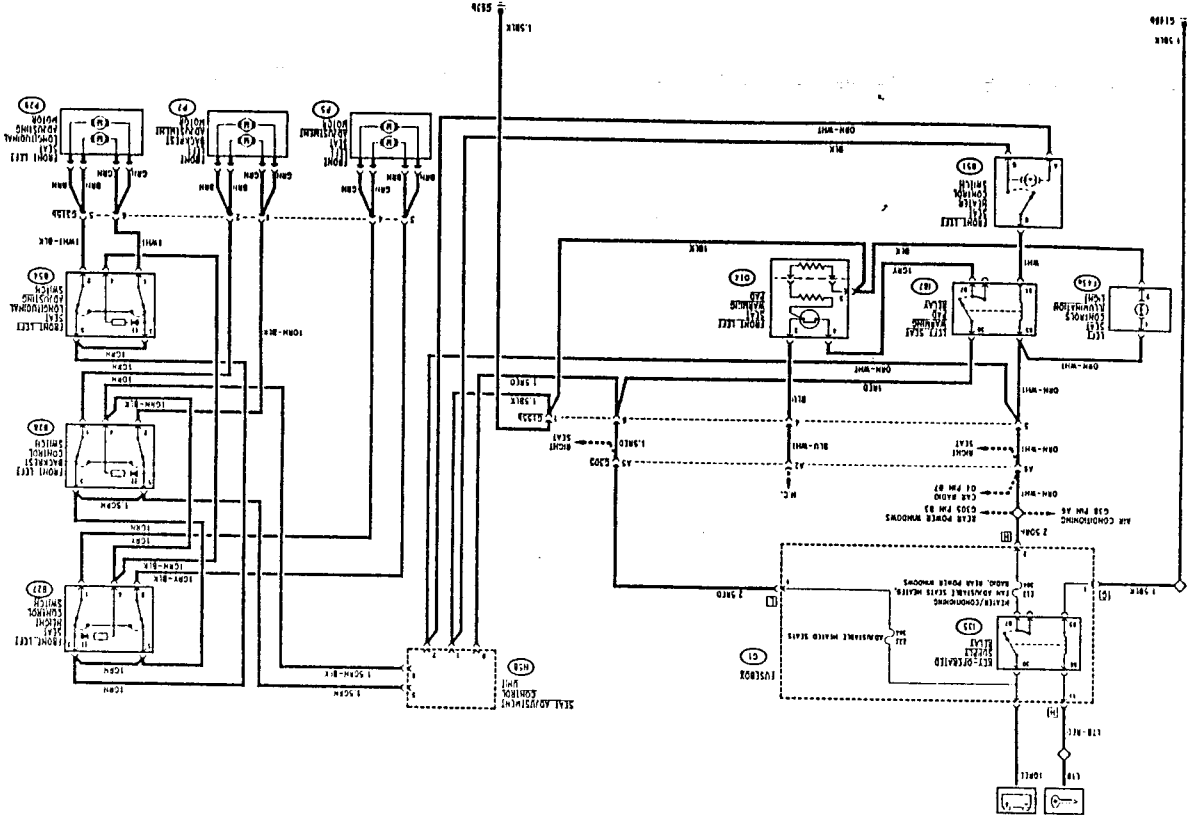
The seat warming pad relays B88 (right) and B87 (left) are turn-key supplied through key-operated supply relay B5 and fuse F13 (30A), both located in fusebox G1.

The warming pad resistance O17 (right-hand seat) and O14 (left-hand seat), connected to ground, are supplied respectively by battery voltage. This is excited by switches B62 (right) and B51 (left) which, when closed, send a ground signal to the relative coil.

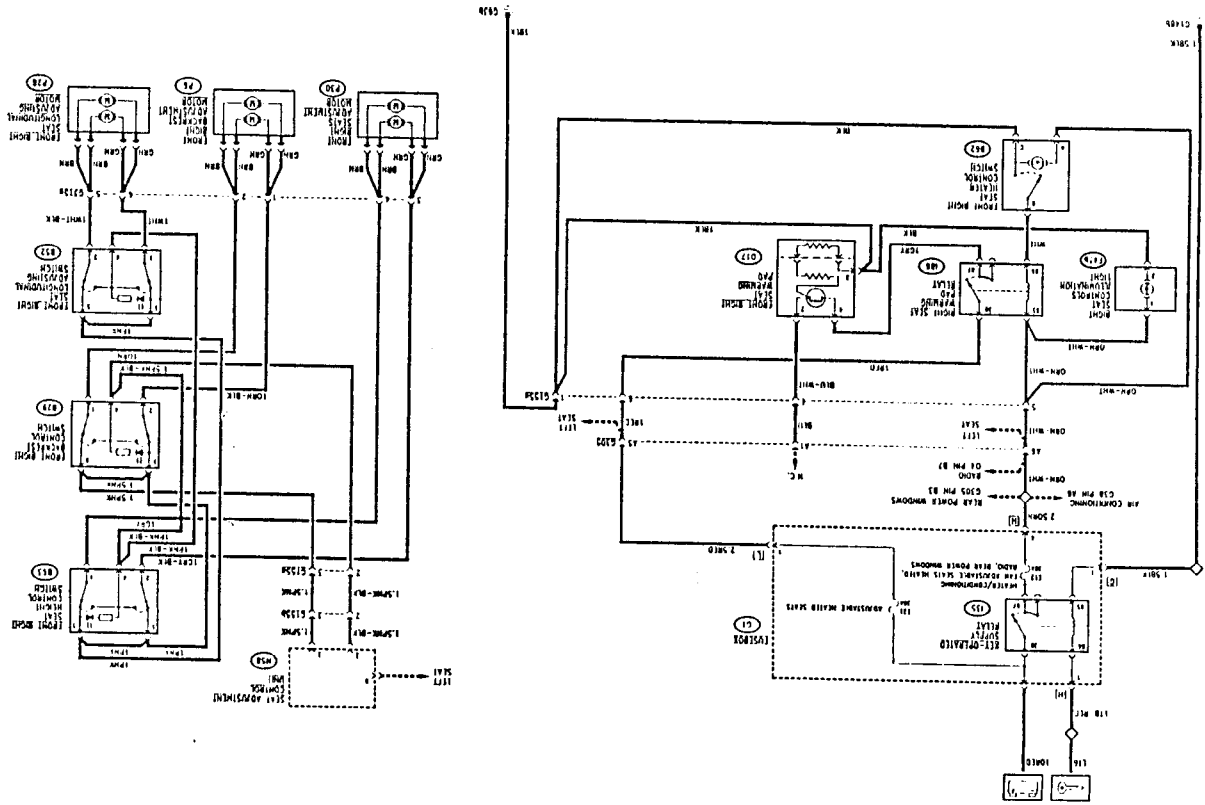
A thermal switch inside the warming pads automatically deactivates the resistances when a temperature of approximately 26°C is reached.

Two lamps light up the seat controls F43 and those inside switches B62 and B51 are turn-key supplied, and light up the ideograms indicating the functions of the various switches.

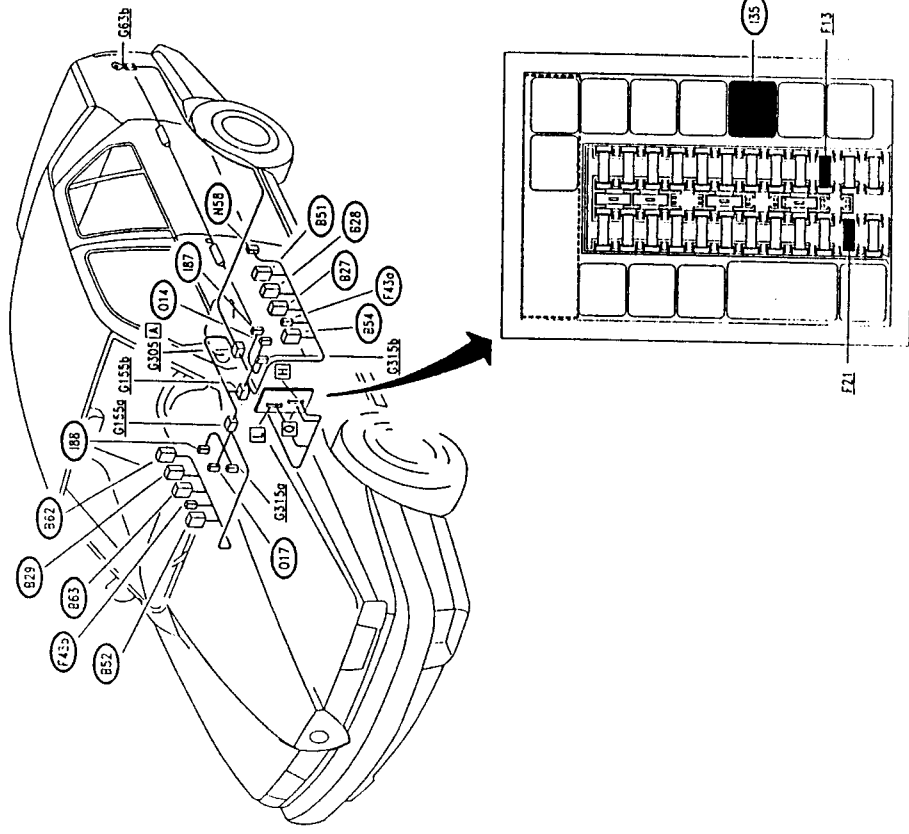
Wiring Diagram Left-hand Seat



Wiring Diagram Right-hand Seat



LOCATION OF COMPONENTS



TROUBLESHOOTING TABLE

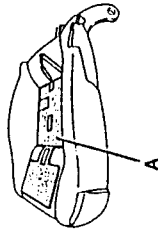
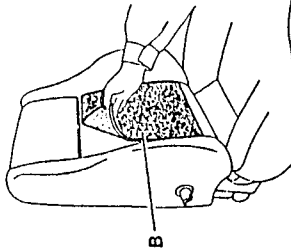
Malfunction	Component to be checked															
	E21	N58	B53	B29	B52	P30	P6	P28	B27	B28	B54	P5	P7	P29	E13	
Seat adjustment (both seats)	•															
RH seat longitudinal adj.					•											
RH seat backrest adj.						•										
RH seat height adj.																
LH seat longitudinal adj.																•
LH seat backrest adj.																•
LH seat height adj.																

(continues)

Malfunction	Component to be checked									
	E21	E13	B88	O17	B87	O14	F43a	F43b	B51	B62
RH seat heating			•	•	•					•
LH seat heating			•	•	•					•
RH seat adj. control lighting										
RH seat adj. control lighting										
RH seat heating control lighting										•
LH seat heating control lighting										•

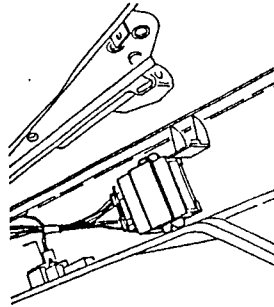
CHECKING COMPONENTS

Seat heating device (O14) - (O17)



SPECIFICATIONS	
Cushion resistance (A)	1.2 Ω
Seat back resistance (B)	0.9 Ω
Thermal contact cut-in temperature	26.5 ± 3°C

Seat control unit (N58)



Check the device: test A

CHECK SEAT CONTROL UNIT (N58)		TEST A
TEST PROCEDURE	RESULT	CORRECTIVE ACTION
<b>A1</b>   CHECK VOLTAGE - Check for 12V between pin 1 and 8 of N58	OK <del>OK</del>	Carry out step A2  Check fuse F21 (30A) Restore the wiring between G1 and N58, and earth G63B
<b>A2</b>   CHECK VOLTAGE - With the key at MARCIA, check for 12V between pin 1 and 7 of N58	OK <del>OK</del>	Carry out step A2  Check fuse F13 (30A) Restore the wiring between G1 and N58
<b>A3</b>   CHECK THE RH SEAT CONTROLS - With the key at MARCIA, check for 12V at pin 2 of N58 and for 0V at pin 3	OK <del>OK</del>	Carry out step A4  Change device N58
<b>A4</b>   CHECK THE LH SEAT CONTROLS - With the key at MARCIA, check for 12V at pin 5 of N58 and for 0V at pin 6	OK <del>OK</del>	DEVICE N58 IS WORKING PROPERLY. Check the other components of the system.  Change device N58

# SUNROOF

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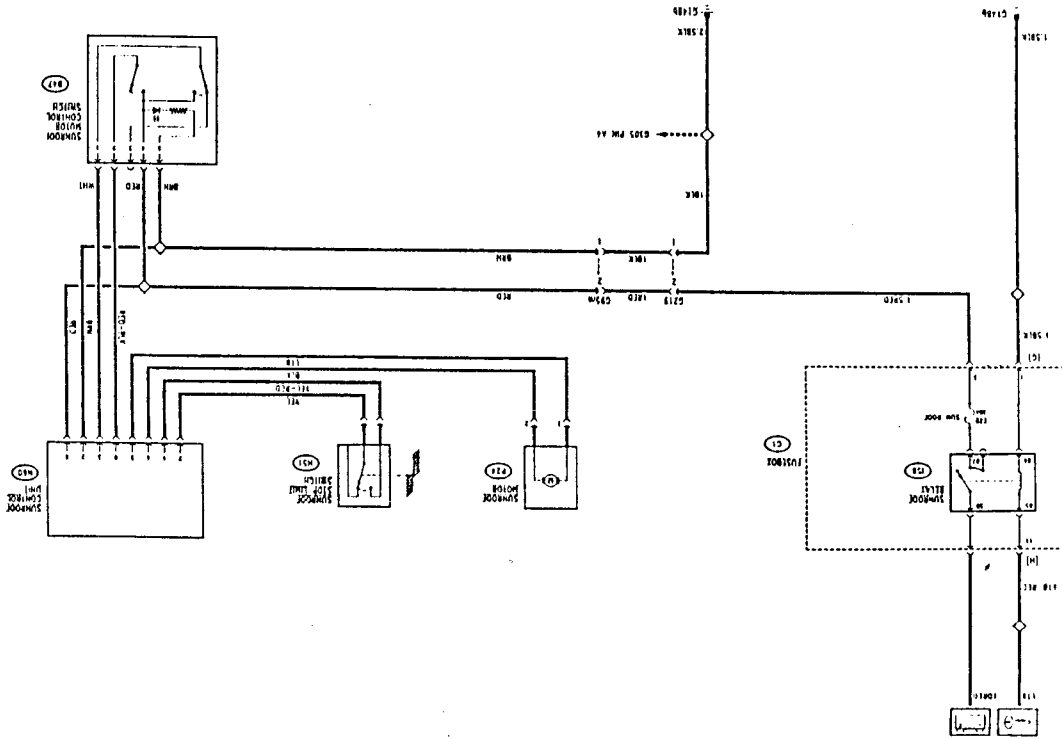
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FUNCTIONAL DESCRIPTION . . . . . 25-3

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LOCATION OF COMPONENTS . . . . . 25-4

WIRING DIAGRAM



FUNCTIONAL DESCRIPTION

The sunroof's command system is supplied by relay I58 located in fusebox G1, with a line protected by fuse F20 (30A); in this way the system is only activated when the ignition key is engaged at pin 2 of the connection GS5m. Pin 1 of this connection supplies the reference earth.

- The system is composed of a single functional unit composed of:
- control unit N60;
  - command switch B47;
  - motor P24;
  - stop limit contact H51.

The control unit N60 receives the activation signal from switch B47 and commands the motor P24, taking any stop limit signals originating from switch H51 into account.

The system operates according to the following logic:

The switch B47 commands the opening or closing of the sunroof. Pin 4 of the switch is supplied with 12V. When the

sliding roof permits an additional ventilation of the passenger compartment during warm weather and when necessary will guarantee a rapid air recirculation, and therefore increase passenger comfort.

The mobile part of the roof is composed of a plexiglass panel and an interior sliding blind which enters the space between roof and interior roof panel. A double switch located near the central front roof light activates an electric motor which operates in two different ways: in the first, the motor raises the panel to the "quarter light" position and in the second opens the panel while at the same time drawing back the blind.

When the roof is subsequently closed, the blind, which can also be manually operated, is "accompanied" for a short stretch of the advancing panel (for greater details refer to "REPAIR MANUAL-BODY", Group 75)

The entire system is electronically controlled by a control unit which regulates the various functions. The roof can only be opened when the ignition key is inserted.

button is activated in one direction it controls the opening of the roof closing the contact on pin 2 delivering 12 V to pin 8 of the control unit. If the switch is operated in the opposite direction the roof is closed, closing the contact on pin 1 and sending 12 V to pin 3 of the control unit.

Control unit N60 is supplied with 12V at pin 6 while pin 2 is earthed.

Pins 3 and 8 receive command signals from the switch B47; pins 1 and 7 are connected with the stop limit switch H51 in which the contact is closed when the roof is completely closed. It opens as soon as the motor is activated.

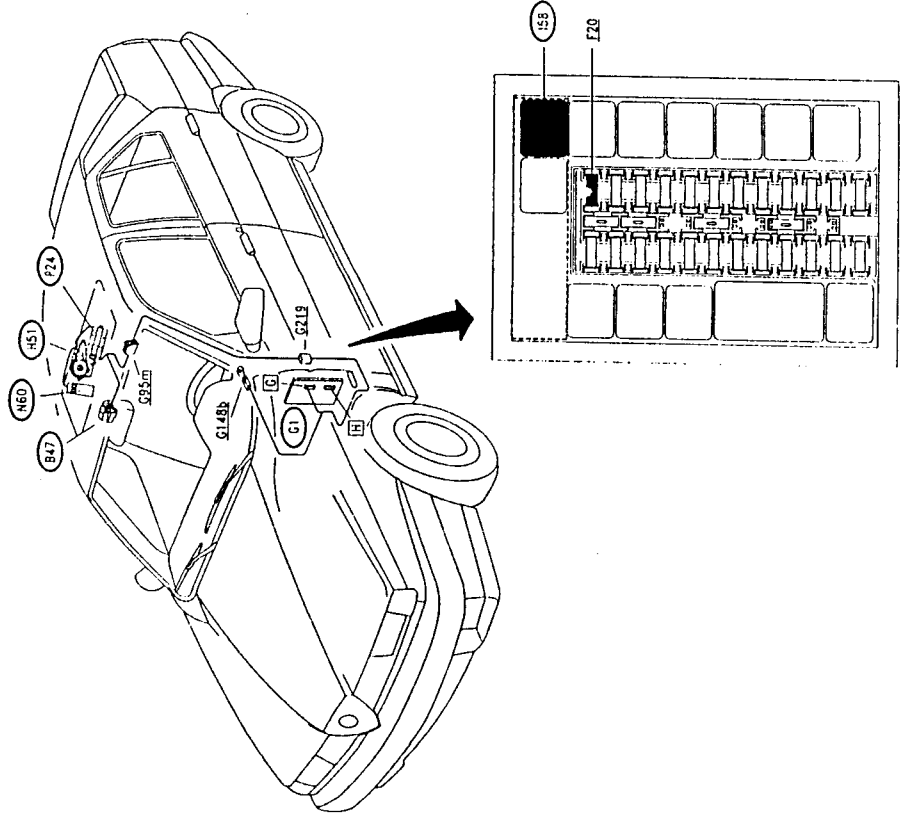
Pins 4 and 5 are connected to motor P24 activating it in the two directions sending 12V and earth to pins 1 and 2.

TROUBLESHOOTING TABLE

Malfunction	Component to be checked					
	F20	I58	N60	P24	B47	H51
Sunroof not working	•	•	•	•	•	•
Sunroof does not close correctly			•			•

(\*) N.B.: P24 and H51 are grouped together in a single sunroof command unit N60

LOCATION OF COMPONENTS



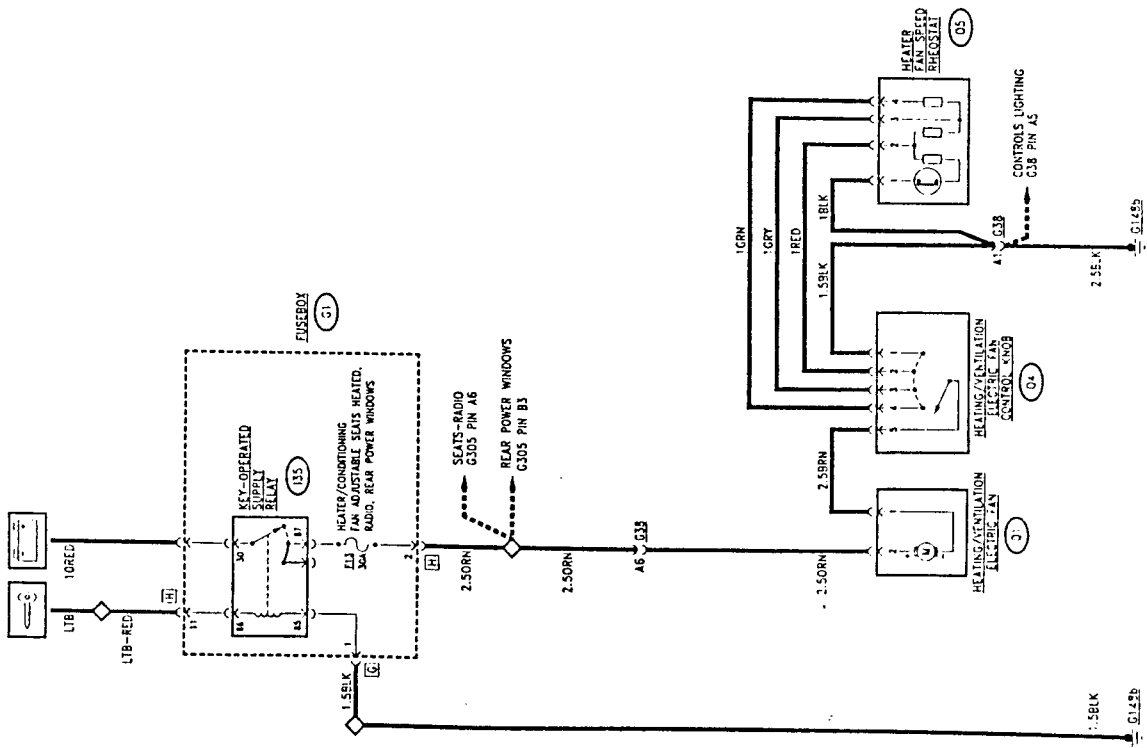
# HEATING-VENTILATION AND AIR CONDITIONING

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MANUALLY CONTROLLED HEATER

Wiring Diagram



General Description

Heating and ventilation using the manually regulated heater is controlled by acting on the three knobs of the control assembly located on the dashboard; these controls act on the heater distributor-conveyor group as described below:

The first knob from the left, by way of a flexible transmission, mechanically controls first the opening of the vent which regulates the flow of air, and then the rotation of the knob controls a switch which engages the regulated four-speed electric fan.

NOTE: The electric fan can only be operated when the ignition key is engaged.

The central control knob mechanically controls the warm/cold air mixing vent; if it is rotated fully to the left it cuts

out the heater by closing a specific tap. NOTE: the heater is composed of a heat exchanger which exploits the engine cooling liquid in order to heat the air directed towards the passenger compartment; it is supplied through the engine cooling system piping.

The right-hand knob regulates the distribution of the air flow, again through a mechanical transmission, to the distribution vents sending air to the passenger compartment following the directions depicted by the ideograms.

Functional Description

NOTE: only the speed of the electric fan is controlled electrically.

The heating-ventilation electric fan Q1 is powered by battery voltage through the key-operated services relay I35 located

in fusebox G1. Its coil is excited by voltage coming from the ignition block with the key engaged; after passing the relay, the battery voltage also passes fuse F13 (30A) in fusebox G1. The electric fan motor Q1 is operated by an ground signal coming from the control knob Q4; this ground crosses the fan speed rheostat Q5, which is formed by three resistances in series and which determine the four different speeds of the electric motor. The rheostat Q5 is incorporated in a thermometric safety switch which deactivates the circuit if a temperature of 90±5°C is exceeded.

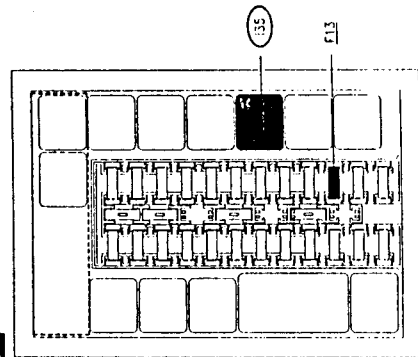
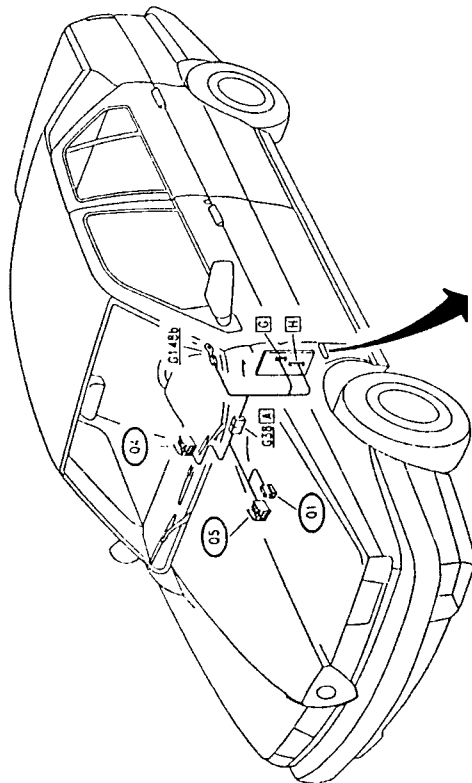
NOTE: to illuminate the controls refer to the section "Internal Lighting".

Troubleshooting Table

Malfunction	Component to be checked			
	E13	Q1	Q4	Q5
Fan does not cut in	•	•		
The fan does not cut in at the correct speed				•

NOTE: Air distribution within the passenger compartment and the heating/cooling of the air are mechanically controlled. For this reason, if anomalies should occur, e.g. heating/cooling not working, incorrect air distribution etc., refer to "155 - REPAIR MANUAL-BODY", Group 80 - Air conditioning.

Location of Components

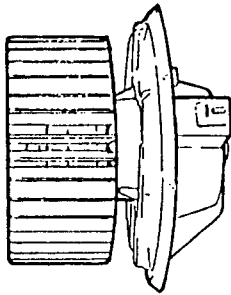


55

F13

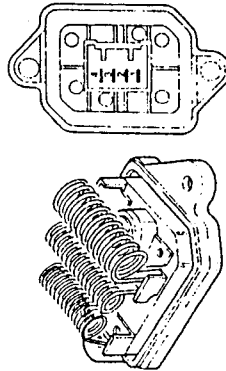
Checking Components

Heating and ventilation fan Q1



SPECIFICATIONS	
Nominal voltage	12V
Speed at 12V/25°C in free air with impeller and support	3400 $\pm$ 200 rpm
Power output at 12V/25°C at the above speed	90 W
Direction of motor rotation	leftwards impeller side

Heating & ventilation fan speed adjustment coil Q5



SPECIFICATIONS		
Section crossed	Total resistance	fan speed
4-1	2.9 $\Omega$	1st
3-1	0.8 $\Omega$	2nd
2-1	0.3 $\Omega$	3rd
none		4th
Thermal contact cut-in temperature		90 $\pm$ 5°C



## AUTOMATIC HEATING/VENTILATION SYSTEM WITH AIR CONDITIONER

### Description

The control panel located on the dashboard is the front part of the electronic unit which automatically regulates the operation of the system.

Once the desired temperature has been set, the control system can either be left to automatic operation (AUTO button) or certain parameters, e.g. air flow, can be modified; in this way the system automatically carries out all the functions necessary to bring the passenger compartment to the temperature selected by the occupants of the vehicle through the button (TEMP) and shown on the relative display.

The electronic system carries out this regulation through information received from temperature sensors (outside, inside and mixture air), and controlled by the actuators which move the vents of the air conveyor-distributors (air intake, mixing and distribution); it also actuates the heater if the air needs to be heated or the cooling system compressor if the air needs to be cooled.

In addition, the compressor cut-in signal is "filtered" by the electronic ignition and injection system's control unit (see "Motoric ignition and injection system") for the necessary permit.

The heating-ventilation system control unit also receives the speedometer signal from the relative sensor through which the logic system considers or ignores certain temperature values (e.g. a progressive increase in the outside air temperature will not be considered at speeds lower than 30 km/hr).

The system memorizes the last temperature setting, even if the ignition key is not engaged, and re-sets it again the next time the vehicle is started.

The temperature selected is not always reached immediately; regulation time depends mainly on the difference between the actual temperature and the

one which has been set; the various functions are optimized however, by the operation of the control unit, e.g., recirculation, speed of air flow etc., in order to reduce the time to a minimum.

The control unit is equipped with a self-diagnosis system which memorizes faults or malfunctions in the event of anomalous variations in the detected parameters. The self-diagnosis function can be selected through the connector for the ALFA ROMEO Tester, but also directly from the control panel by carrying out the operations given below in order (see Troubleshooting).

### Control panel

The following are the buttons and display functions on the panel:

- temperature display; indicates the set (requested) temperature (in °C) or the temperature of the outside air depending on the position (pressed or not) of the small key on the right-hand side of the display; the outside temperature is indicated by the letters "EXT"
- increase/decrease buttons for temperature selection.

- display: indicates the speed of the electric fan (i.e. the flow of air into the passenger compartment)

- increase/decrease buttons for manual air flow adjustment

- "AUTO" button: switches the management of the system over to the electronic control unit so that the selected temperature is reached as quickly as possible

- "ECON" button: shuts-off the air conditioning compressor; in this case the desired temperature may not be reached as the air will no longer be cooled; this function though, when necessary, makes it possible to avoid draining power from the engine.

- recirculation button: the system only treats air which is drawn from inside the passenger compartment and is not mixed with air from the outside.

- "OFF" button: the system is completely deactivated.

- air flow buttons: make it possible to direct air flow in specific directions as shown in the relative ideograms; windshield demisting, air flow directed forward, directed forward and towards the floor, directed towards the floor only.

### Air conveyor-distributor

Both the heater (which heats the air by transferring it from the engine coolant) and the evaporator (which cools the air subtracting heat to the freon in the cooling system) are located in the air conveyor-distributor.

The vents regulating air flow are electrically controlled by actuators: air distribution motor, warm/cold air mixing motor and air recirculation vent control motor.

The air recirculation vent control motor is a simple motor with only two positions (open/closed). The first two actuators are coupled with a potentiometer through which the angles of rotation of the vent are adjusted; specific types of air distribution within the passenger compartment correspond to specific angles of the vent.

The electric fan which sends a flow of air to the passenger compartment is regulated by an electronic vanator which is also fixed to the conveyor and constantly varies the speed; the device supplies the control unit with information regarding the operating temperature. A protecting thermocontact intervenes when the temperature reaches the point where it may damage the device itself.

In addition, two mixed air temperature sensors are located on the conveyor: one lower and one upper. These are NTC elements (resistance decreases when the temperature rises) which send a signal to the control unit which is proportional to the temperature of the air passing them.

Another two sensors provide signals which are proportional to the air temperature: the outside air temperature, located in the lower part of the left-hand door mirror, and the passenger compart-

ment air temperature sensor located behind a moulding on the dashboard; this sensor is automatically ventilated by a motor.

### Air cooling system:

This is a closed loop system in which a fluid condenses and evaporates removing the heat from the air in the evaporator. It mainly comprises:

the compressor, operated by the crankshaft through a belt; it is turned on and off through an electromagnetic joint operated by the conditioning system (as described below) and controlled by the compressor is controlled by the engine electronic management system which adapts the idle speed if the compressor is operated, or prevents it from being turned on under circumstances in which the absorption of power would adversely affect the performance of the vehicle;

For T.S. 16x engines a variable displacement compressor is used, which makes it possible to meet the different needs of cold air without turning the electromagnetic joint on and off continuously; in fact, when the need is high, the compressor will move to the maximum load configuration and vice-versa for minimal requirements.

condenser, fitted in front of the engine coolant radiator; if the car is at a stand-

still, the air needed for heat exchange is supplied operating the engine radiator fan;

evaporator, exchanger which cools the air, located in the air duct-distributor;

accumulator/drier, which separates the fluid in the liquid state from the gas and also acts as a storage tank and filter for any foreign particles;

expansion valve, which suitably lowers the fluid pressure and temperature, quickening the passage from liquid to vapour;

three-level pressure switch (trinary) which controls the safety and correct operation of the fluid circuit

- it turns on the radiator fan when necessary (eg. if the car is at a standstill) thereby preventing an increase of pressure at the condenser (cut in at appr. 15 bar);

- it stops the compressor, de-energizing the electromagnetic joint, if the pressure reaches very high, thus dangerous, values (above appr. 28 bar), or very low values to ensure correct operating conditions (below appr. 2.45 bar);

minimum pressure switch (defroster): this disconnects the compressor when the pressure is too low (<1.8 bar) to prevent the danger of the evaporator

"frosting". It also protects the compressor from sharp pressure falls, caused for example by leaks in the circuit.

### Engine fan control

When the car is travelling at low speed the cooling action of the dynamic air on the condenser is reduced and it is necessary to turn on the two fans which cool the engine radiator and the actual condenser. This is done by the trinary pressure switch which cuts in preventing an increase of the pressure at the condenser (over 15.2 bar).

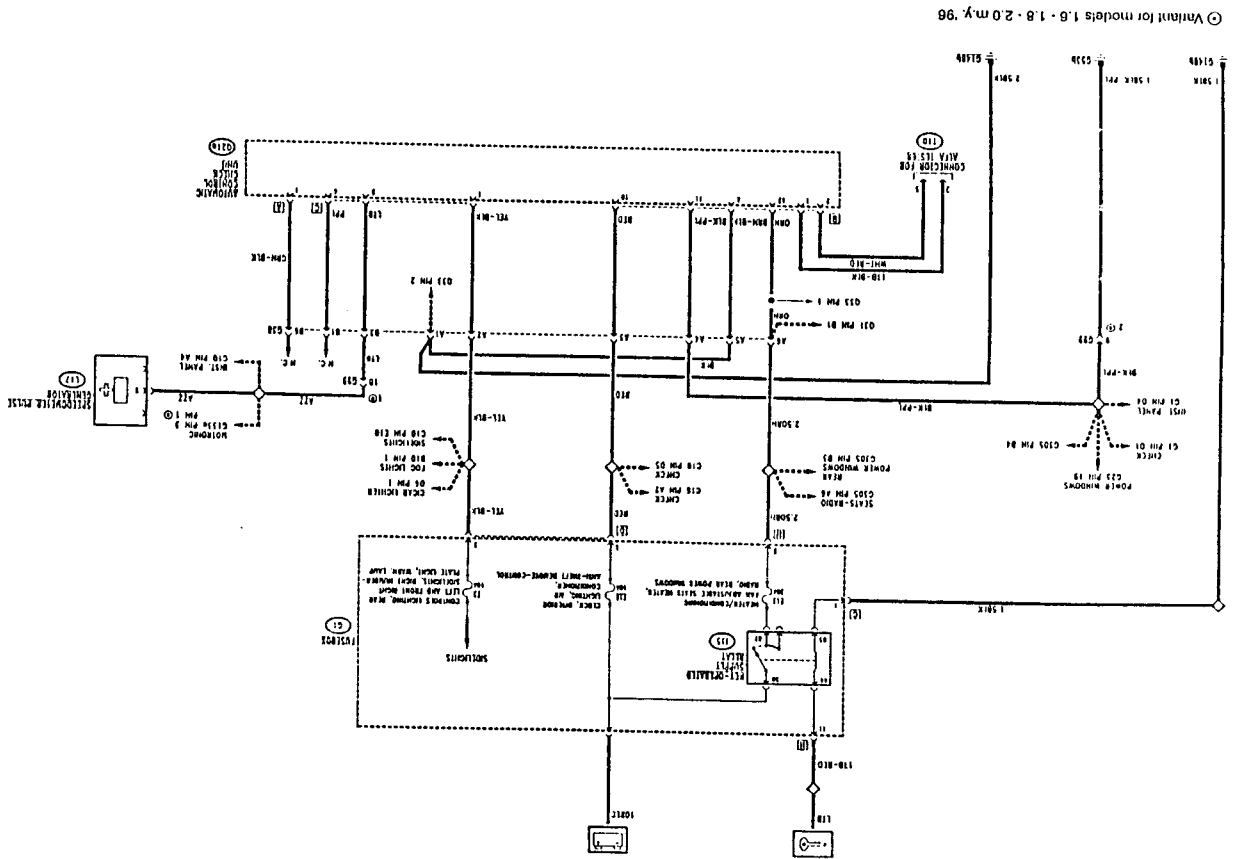
For greater details regarding the components of the system refer to "MECHANICAL GROUPS", Group 80, "HEATING AND VENTILATION".

### WARNING:

The wiring diagram relative to the automatic heater-ventilator with conditioner has been subdivided into six parts for ease of consultation:

- control unit: supply and diagnosis;
- temperature sensors;
- vent actuators;
- interior electric fan;
- compressor control;
- engine electric fan control.

Control unit: supply and diagnosis  
Wiring Diagram



Functional Description

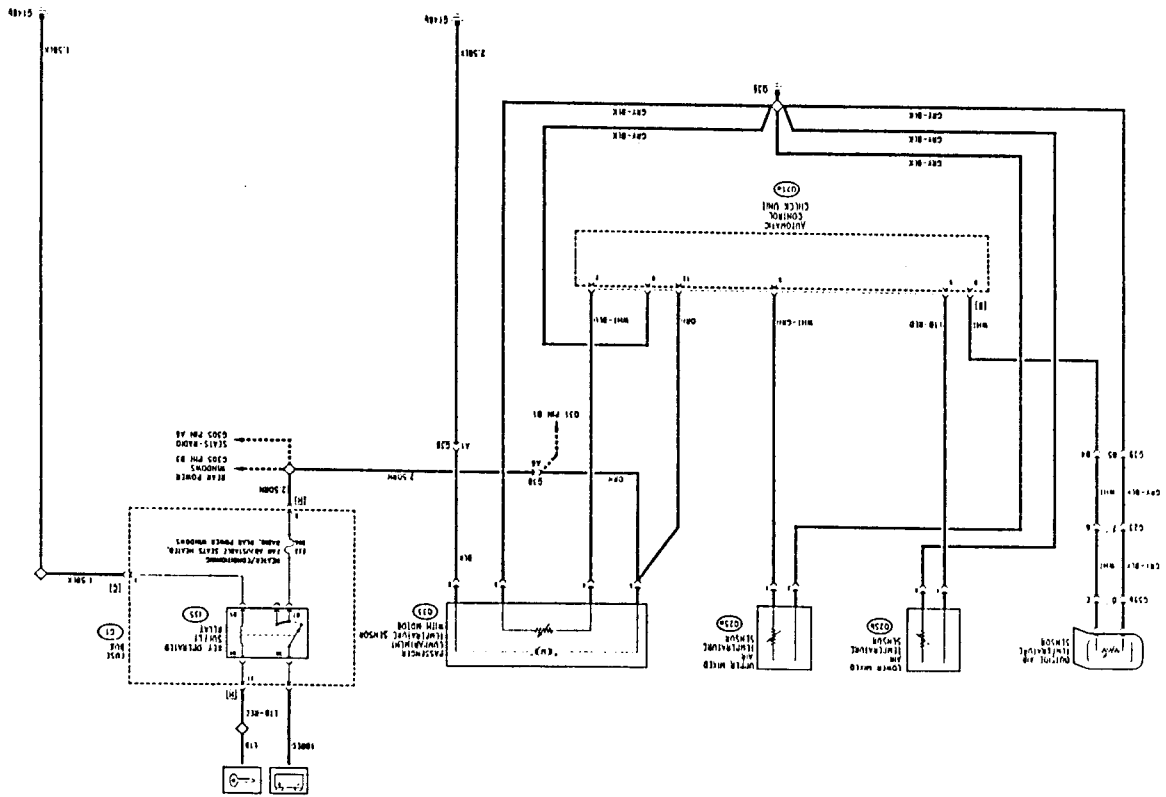
The electronic control unit Q21a, by way of the sensors and actuators connected to it, controls and regulates the flow of air into the passenger compartment adjusting the temperature to the set value. The power supply reaches the control unit Q21a:

- directly, with battery voltage to pin 10 of connector B after passing fuse F16 (10A) in fusebox G1 (power supply to internal memory etc.).
- with Key-operated supply to pin 12 of connector B, through relay R35 and fuse F13 (30A) in fusebox G1 (supply of "power").

The control panel - the front part of the control unit itself - is lit when the side-

lights are on via the line which supplies pin one of connector C of Q21a. The speedometer signal reaches pin 5 of connector C from the relative sensor L17. Pins 1 and 2 of connector B send two signals to connector T10 for the ALFA ROMEO Tester, which are used to "read" the self-diagnosis of the system.

Temperature Sensors  
Wiring Diagram



Functional Description

Information regarding air temperature at various points of the system is sent to the control unit Q21a by four sensors. The outside air temperature sensor, located in the left wing mirror - connector G59b - sends the proportionate signal a signal which is proportional to the temperature at pin 8 of connector B. The upper and lower mixed air temperature sensors, Q25a and Q25b, are connected at connector B, to pins 5 and 9 respectively. The passenger compartment temperature sensor Q33 sends the temperature signal to pin 7 of connector B; this sensor has an incorporated ventilation motor supplied by the same line which coming from relay I35 and fuse F13 (30A) in fusebox G1, supplies the control unit Q21a. Pin 5 of connector B supplies the "return earth" for the sensors.

perature at pin 8 of connector B. The upper and lower mixed air temperature sensors, Q25a and Q25b, are connected at connector B, to pins 5 and 9 respectively. The passenger compartment temperature sensor Q33 sends the temperature signal to pin 7 of connector B; this sensor has an incorporated ventilation motor supplied by the same line which coming from relay I35 and fuse F13 (30A) in fusebox G1, supplies the control unit Q21a. Pin 5 of connector B supplies the "return earth" for the sensors.

plied by pin 7 of connector A and is directly connected to ground. It sends the regulation signal to pin 2 of connector A.

The air recirculation vent control motor (regulation) receives power from pin 9 of connector A and ground from pin 10 of connector A of control unit Q21a.

pins 5 and 6 respectively; the relative adjustment potentiometer is supplied by the control unit by pin 7 of connector A and is directly connected to ground. It sends the regulation signal to pin 8, connector A of control unit Q21a.

Similarly the warm and cold air mixing motor Q30b receives its power supply and ground at pins 3 and 4 of connector A; the adjustment potentiometer is supplied by the control unit by pin 5 of connector A.

**Functional Description**

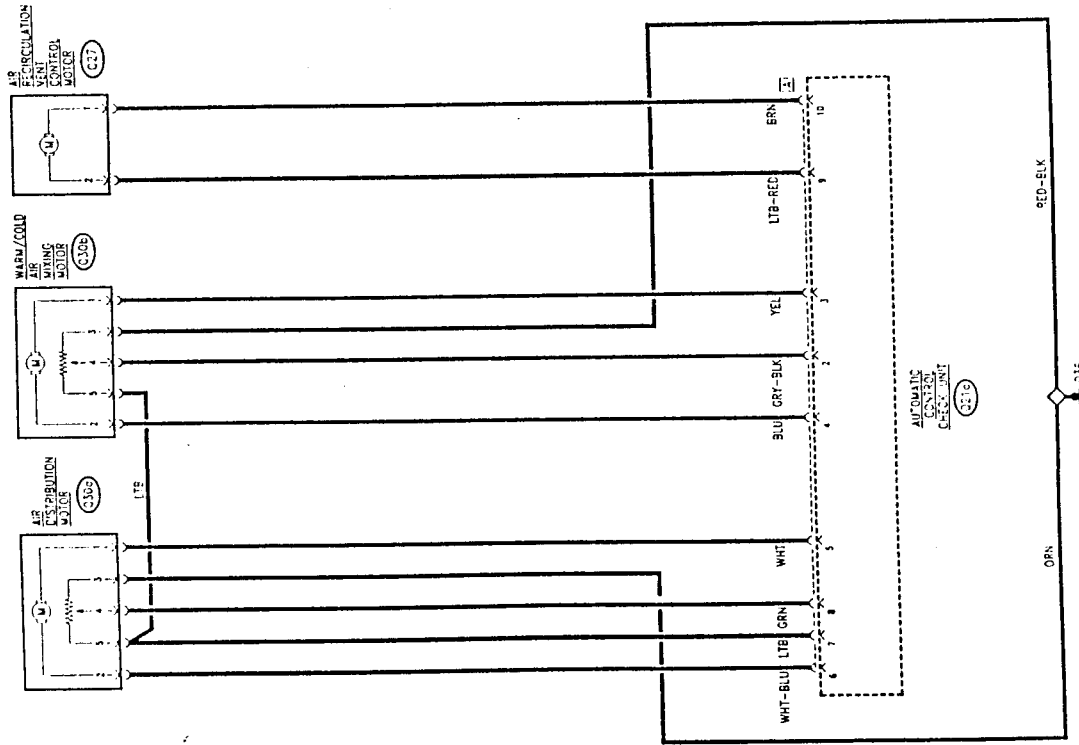
The vent actuators operate according to the indications supplied by the control unit in order to optimize the air flow in accordance with calculations carried out by the internal logic of the control unit itself.

The air distribution motor Q30a receives power supply and ground directly from the control unit Q21a, at connector A at

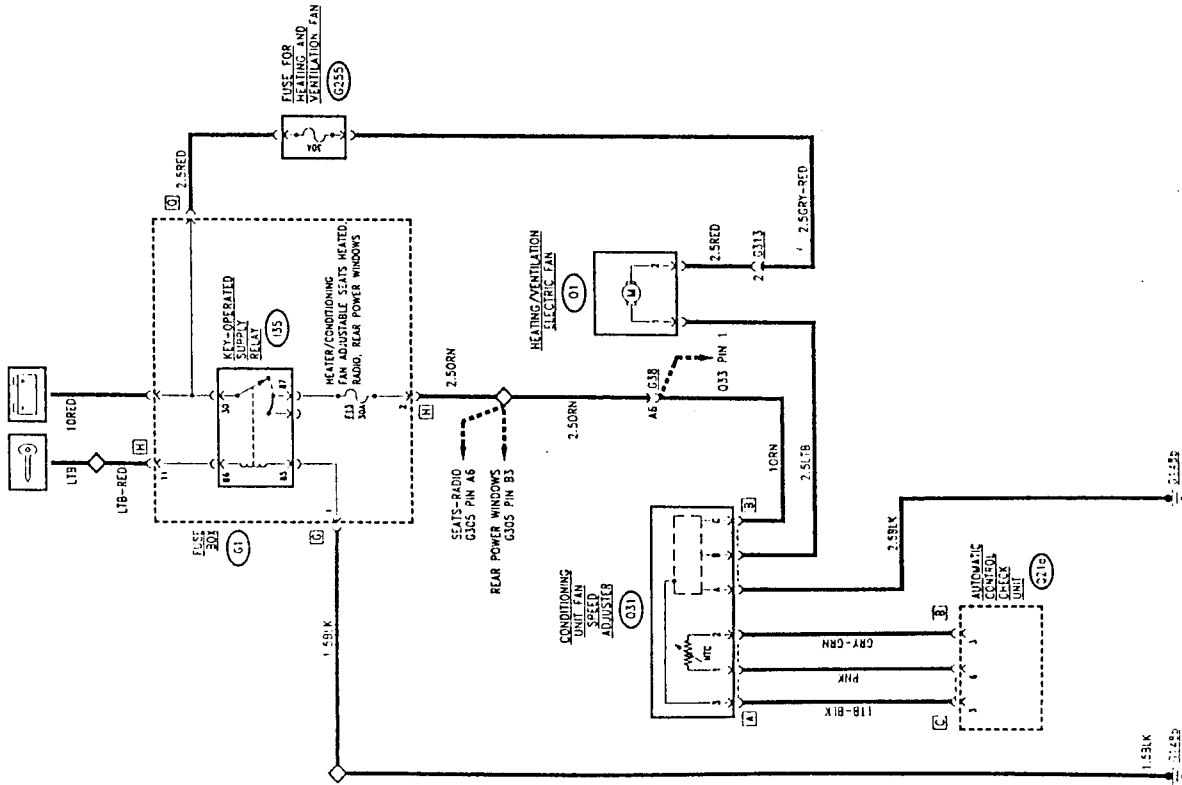
pins 3 and 4 respectively. The adjustment potentiometer is supplied by the control unit by pin 5 of connector A. The air mixing motor Q30b receives power supply and ground at pins 3 and 4 of connector A. The adjustment potentiometer is supplied by the control unit by pin 5 of connector A.

The air recirculation vent control motor (regulation) receives power from pin 9 of connector A and ground from pin 10 of connector A of control unit Q21a.

**Vent Actuators  
Wiring Diagram**



**Interior Electric Fan**  
Wiring Diagram



**Functional Description**

The air conditioner electric fan speed adjuster Q31 is supplied by the line coming from relay I35 and fuse F13 (30A) in fusebox G1; it is connected to ground and to the control unit Q21a by the signal at pin 3 of the control unit connector; it

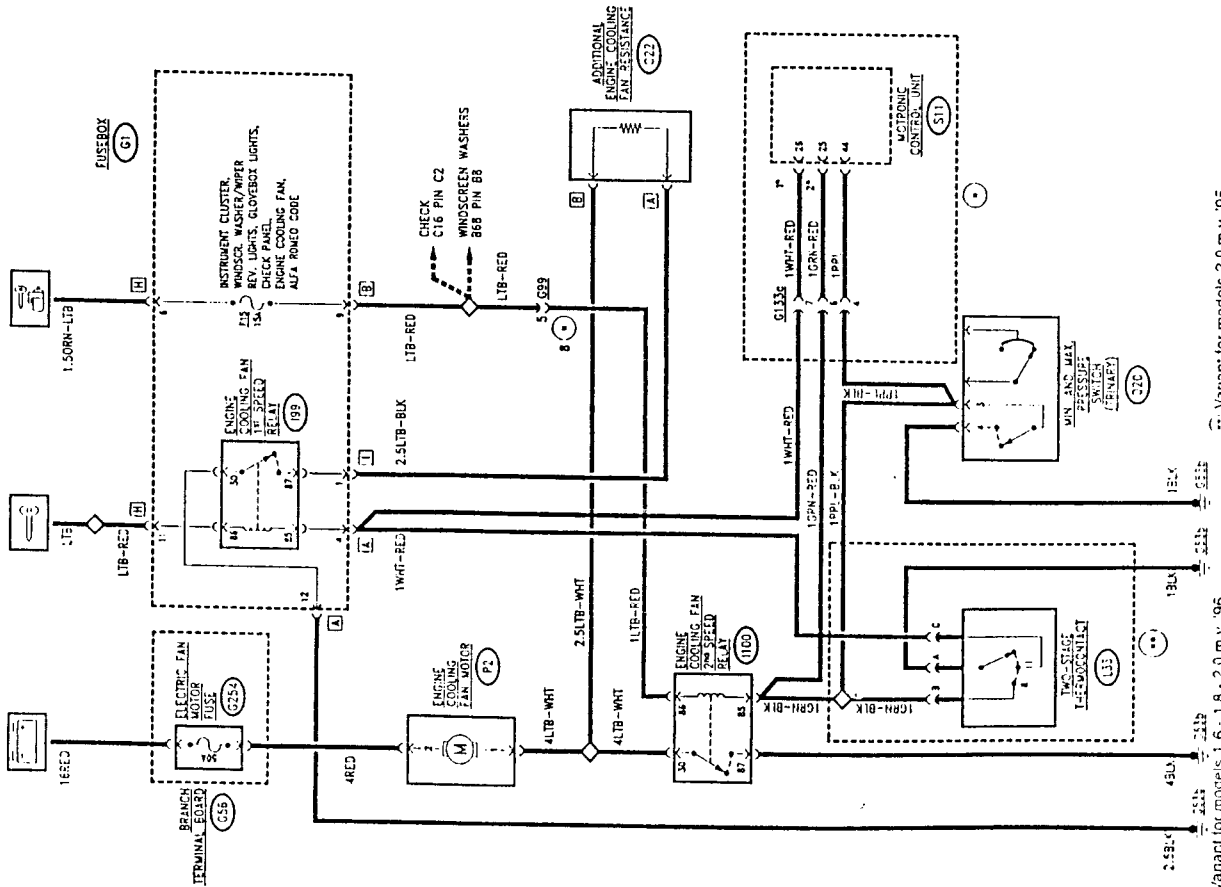
is also connected to the heating-ventilation electric fan Q1 to which it sends an earth signal which adjusts the speed. The incorporated temperature sensor is connected to the control unit Q21a at pin 6 of connector C and pin 3 of connector B.

The fan Q1 is supplied directly by battery voltage through wanoer fuse G255 (30A), located on the bracket outside fusebox G1.



Engine Electric Fan Control

Wiring Diagram



Variant for models 1.6 - 1.8 - 2.0 m.y. '96

Variant for models 2.0 m.y. '95

Functional Description

(Models 2.0 m.y. '95)

The two relays I99 and I100 control the engagement of the fan to improve the cooling of the air conditioner condenser. Fan P2 is supplied with battery voltage through a special fuse G254 (50A).

The 1st speed relay I99 also receives the "key-operated" supply and is energized by the earth signal of the 1st contact of the thermal contact L33; this way a power earth is sent to fan P2, through the additional resistance O22: operation at 1st speed.

The 2nd speed relay I100 receives the "key-operated" supply from the line of fuse F15 (15A) of G1; it is energized by the earth signal of the 2nd contact of L33; this way the power earth is sent directly to the fan P2: operation at 2nd speed.

Functional Description

(Models 1.6 - 1.8 - 2.0 m.y. '96)

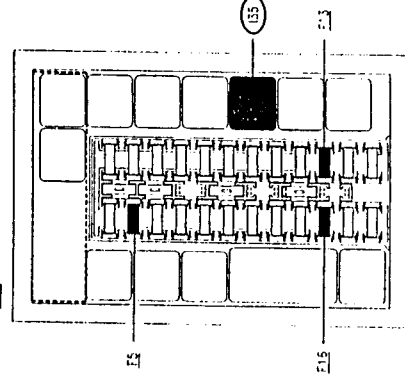
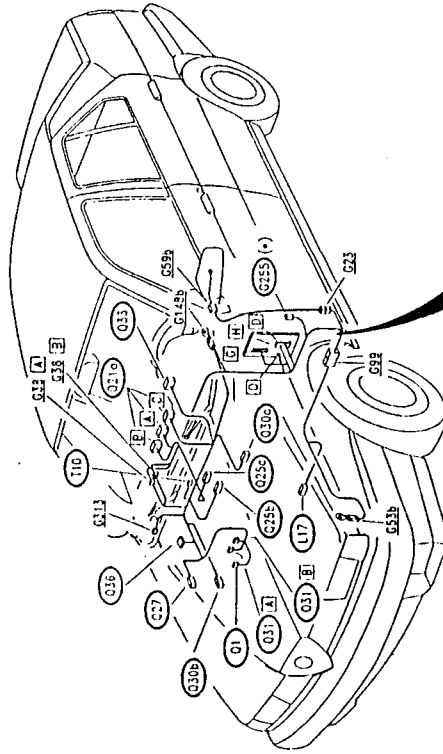
The two relays I99 and I100 control the engagement of the fan to improve the cooling of the air conditioner condenser. Fan P2 is supplied with battery voltage through a special fuse G254 (50A).

The 1st speed relay I99 receives the "key-operated" supply and is energized by the earth signal leading from the Motronic control unit S11; this way a power earth is sent to the fan P2, through the additional resistance O22: operation at 1st speed.

The 2nd speed relay I100 receives the "key-operated" supply from the line of fuse F15 (15A) of G1; it is energized by the earth signal leading from the Motronic control unit S11; this way a power earth is sent directly to fan P2: operation at 2nd speed.

Location of Components

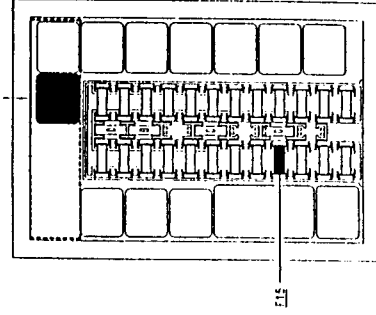
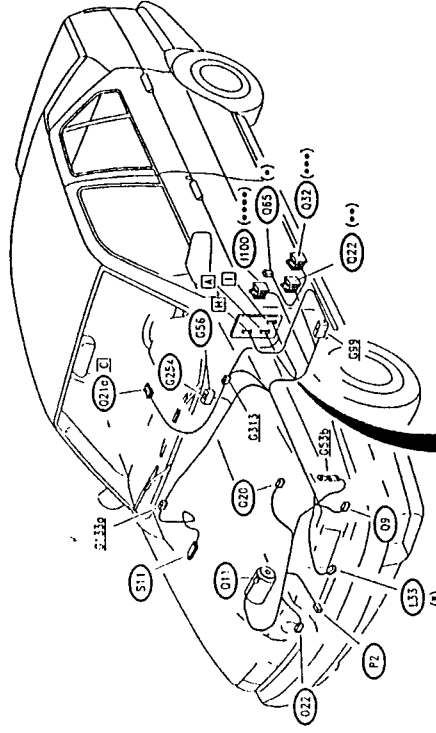
(AUTOMATIC HEATING/VENTILATION)



(\*) green fusebox

Location of Components

(HEATING/VENTILATION SYSTEM)



- (\*) variant for models 2.0 m.y. '95
- (\*) red fusebox
- (\*\*) grey base
- (\*\*\*) grey base (Models 2.0 m.y. '95;
- purple base (Models 1.6 - 1.8 - 2.0 m.y. '95)
- (\*\*\*\*) black base



**Fault-finding Table**

NOTE: In order to make it easier to understand, the fault-finding table for the air conditioner has been subdivided into three sections which refer to the three functions also described separately in the wiring diagrams:

- Automatic climate control (control unit)
- Compressor control
- Engine fan/s control

**Automatic climate control (Control Unit)**

On the next pages see:

- Fault signalling during operation;
- Self-diagnosis on board;
- Memorizing check.

**Compressor control**

Fault	Component to be checked							
	Q65	Q11	Q20	Q9	Q22	Q32	S11	Q21a
Compressor cutting in (in all circumstances)	•	•			•			
Compressor cutting in (only in certain circumstances) (*)			•	•			•	•

(\*) You are reminded that the compressor is cut out by the system logic under the following conditions:

- coolant fluid pressure > 28 bar appr.;
- coolant fluid pressure < 2.5 bar appr. (circuit drained);
- coolant temperature > 160°C;

This is also determined by the logic of the ignition/injection control unit (see the corresponding sections).  
 (\*\*) also see the next TEST I.

**Engine cooling fan control**

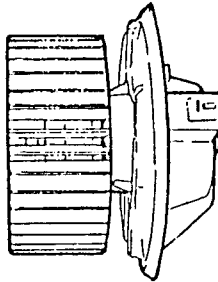
Fault	Component to be checked							
	Q23a	F15	P2	Q22	L33	Q20	Q19	Q100
Fan cutting in (in all circumstances)	•		•		(*)			
Fan cutting in at two different speeds (only one speed working) (**)		•		•			•	•
Fan cutting in due to high engine temp. (at two speeds) (**)					•			
Fan cutting in due to high coolant fluid pressure (at two speeds) (**)								•

(\*) Specific for models 2.0 m.y. '95

(\*\*) You are reminded that for models 1.6 - 1.8 - 2.0 m.y. '96 this operation is also determined by the logic of the ignition/injection control unit.

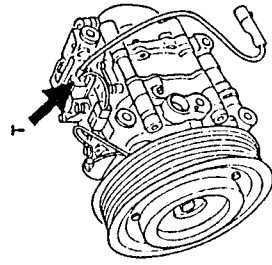
**Checking Components**

**Heating and ventilation fan Q1**



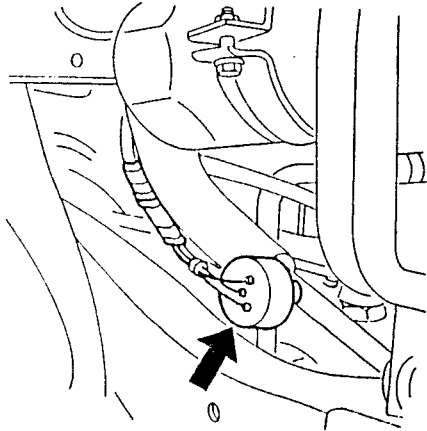
SPECIFICATIONS	
Nominal voltage	12V
Speed at 12V/25°C in free air with impeller and support	3700 ± 100 rpm
Direction of motor rotation	leftwards impeller side

**Compressor electromagnetic joint Q11**



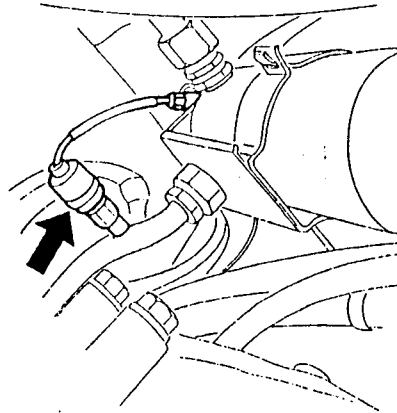
SPECIFICATIONS	
Supply voltage	12 V
absorbed current	2.2 A
<b>Compressor cutout thermal contact (T)</b>	
contact opens	> 160°C
contact closes	< 140°C

Minimum and maximum pressure switch (trinary) **Q20**



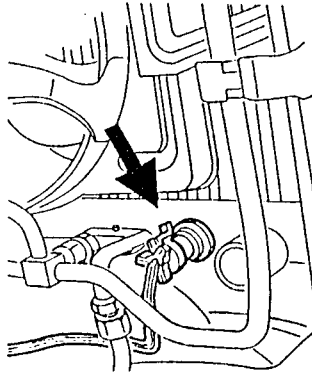
SPECIFICATIONS	
1. level: contact opens contact closes	2.45 ± 0.25 bar 2.60 ± 0.34 bar
2. level: contact closes contact opens	15.2 ± 0.98 bar 11.28 ± 1.99 bar
3. level: contact opens contact closes	28 $\frac{+3}{-4}$ bar 22 $\frac{-4}{-3}$ bar

Minimum pressure switch (antifrost) **Q9**



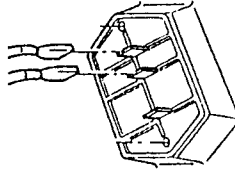
SPECIFICATIONS	
Contact opening pressure	1.7 ± 0.2 bar
Contact closing pressure	3.4 ± 0.5

Two-level thermal contact **L33** (Specific for models 2.0 m.y. '95)



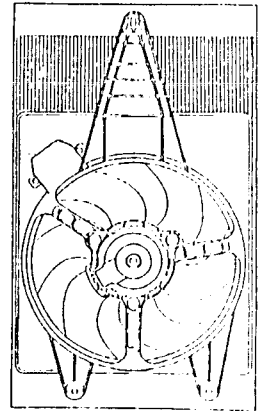
SPECIFICATIONS	
1. level: contact closes contact opens	92 ± 2°C 87 ± 2°C
2. level: contact closes contact opens	97 ± 2°C 92 ± 2°C

Fan resistance **Q22**



SPECIFICATIONS	
resistance	0.18Ω ± 10%
thermal fuse cut in	<100 °C

Cooling fan **P2**



SPECIFICATIONS	
Nominal voltage	12V
Max. current absorption	25A
Speed at 12V in free air with duct	2350 ± 150 rpm (minimum)
Motor direction of rotation (shown on duct)	rightwards (impeller side)

**Automatic Climate**

**Control Unit**

**Signalling of anomalies during operation**

During the automatic operation of the system ("AUTO" button) some important anomalies are signalled through an appropriate error code, which appears on the upper display (TEMP).

In this case proceed to the fault diagnosis following the indications given in the following table.

CODE	ANOMALY	CORRECTIVE ACTION
E1	- Short circuit to ground of variator sensor Q31 - Temperature sensor in Q31 disconnected - Interruption in the regulator Q31 power supply	Carry out test G and H; if necessary replace the variator Q31
E2	- Temperature sensor in Q31 > -110°C	Carry out test H; if necessary replace the electric fan Q1
E3	Sensor in Q31 in contact closed to supply	Carry out test G; if necessary replace the variator Q31.

**On-board Self-diagnosis**

The following automatic diagnosis makes it possible to check the correct functioning of the conditioning system rapidly and without operations on the vehicle. In the event of an anomaly, the function makes it possible to identify the relevant component immediately.

In accordance with the operations below, the following are checked in this sequence:

1. the control unit Q21a
2. Control unit control keys
3. sensors (Q33, Q24, Q25a, Q25b, L17, Q31)
4. actuators (Q1, Q31, Q30a, Q30b, Q11, Q27)

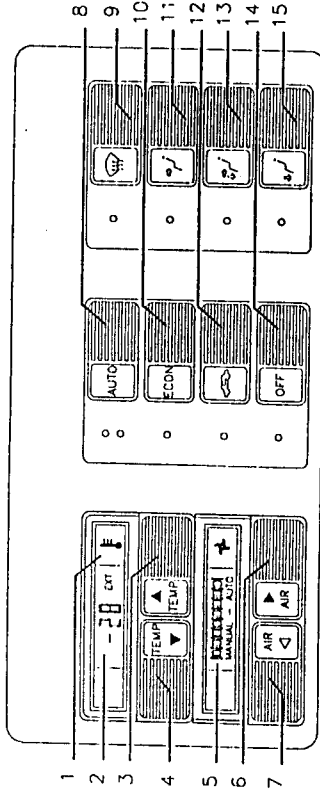
The codes which may appear on the upper "TEMP" display are ordered as shown in the chart below from a minimum value of 0 to a maximum value of FF (e.g. C5 is "larger" than 8F and "smaller" than 07).

0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F	20	21	22	23	
24	25	26	27	28	29	2A	2B	2C	2D	2E	2F	30	31	32	33	34	35	36	37	38	39	3A	3B	3C	3D	3E	3F	40	41	42	43	44	45	46	47	
48	49	4A	4B	4C	4D	4E	4F	50	51	52	53	54	55	56	57	58	59	5A	5B	5C	5D	5E	5F	60	61	62	63	64	65	66	67	68	69	6A	6B	
6C	6D	6E	6F	70	71	72	73	74	75	76	77	78	79	7A	7B	7C	7D	7E	7F	80	81	82	83	84	85	86	87	88	89	8A	8B	8C	8D	8E	8F	
90	91	92	93	94	95	96	97	98	99	9A	9B	9C	9D	9E	9F	A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	AA	AB	AC	AD	AE	AF	B0	B1	B2	B3	
B4	B5	B6	B7	B8	B9	BA	BB	BC	BD	BE	BF	C0	C1	C2	C3	C4	C5	C6	C7	C8	C9	CA	CB	CC	CD	CE	CF	D0	D1	D2	D3	D4	D5	D6	D7	
D8	D9	DA	DB	DC	DD	DE	DF	E0	E1	E2	E3	E4	E5	E6	E7	E8	E9	EA	EB	EC	ED	EE	EF	F0	F1	F2	F3	F4	F5	F6	F7	F8	F9	FA	FB	
FC	FD	FE	FF																																	

For a preliminary identification of the control unit refer to the initialization procedure (password) of the ALFA ROMEO tester (see relative Publications).

If the display values do not correspond to those required, replace the indicated parts or carry out the tests described below.

NOTE: the keys and the display of the control unit panel Q21a are hereafter identified as in the diagram:



1. Key "EXT"
2. Display "TEMP+"
3. Key "TEMP+"
4. Key "TEMP-"
5. Display "AIR+"
6. Key "AIR+"
7. Key "AIR-"
8. Key "AUTO+"
9. Key "DEF"
10. Key "ECON"
11. Key "VENT"
12. Key "RIC"
13. Key "B-LEVEL"
14. Key "OFF"
15. Key "FLOOR"

**MEMORY CHECK**

The automatic diagnosis makes it possible to check the capacity to memorize the temperature set by the control unit Q21a

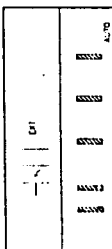
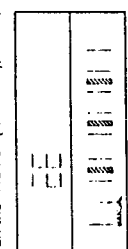

Operate as follows:

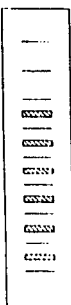
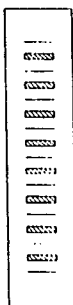
- Rotate the ignition key to the "RUN" position
- Press the "AUTO" key

settings should now be operational once again and no changes should have occurred: temperature set to "Hi", fan at maximum speed, air flow with recirculation and a certain distribution. If the settings are not stored replace the control unit Q21a

- Press the "TEMP+" a few times, until the identification code "Hi" appears on the upper display (TEMP)
- Press the "AIR+" key until the fan reaches maximum speed and eight bars appear on the lower display (AIR)
- Press the "RIC" key and one of the right-hand keys (air distribution) the one set automatically.
- Rotate the key to the "STOP" position; a few moments later rotate it to the "RUN" position: the previously stored

Troubleshooting Table by means of Self-diagnosis

STEP	SEE TEST																										
<p>Execute, strictly following the sequence, the operations relevant to the procedure phases.</p> <p><b>1. Phase: control unit check</b></p> <p>1. Rotate the ignition key to the "RUN" position at the same time holding the "AUTO" key down; the indications shown in the diagram should appear on the display and the leds on the "AUTO" (upper led), ECON, "OFF", "DEF", and "BI-LEVEL" buttons should light up.</p>  <p>2. Push the "RIC" button; the indications shown in the diagram should appear on the on the two displays, and the leds on the "AUTO" (lower led), "RIC", "VENT", and "FLOOR" buttons should light up.</p>  <p>Pressing the "RIC" key again will return the system to the state shown in the preceding diagram</p> <p>N.B.: if no indication appears, check the power supply</p> <p><b>2. Phase: keyboard check</b></p> <p>1. Press the "AUTO" key; four bars should appear on the lower display (AIR)</p>  <p>2. Press the various keys in succession and check that the letters and numbers shown in the table appear on the upper display (TEMP) for each one: N.B.: do not press the "AUTO" key; this will advance the system to the next phase!</p> <table border="1" data-bbox="1101 1837 1420 2131"> <thead> <tr> <th>KEY</th> <th>IDENTIFICATION CODE</th> </tr> </thead> <tbody> <tr><td>EXT</td><td>E</td></tr> <tr><td>TEMP+</td><td>6</td></tr> <tr><td>TEMP-</td><td>5</td></tr> <tr><td>AIR+</td><td>2</td></tr> <tr><td>AIR-</td><td>1</td></tr> <tr><td>ECON</td><td>4</td></tr> <tr><td>RIC</td><td>d</td></tr> <tr><td>OFF</td><td>7</td></tr> <tr><td>DEF</td><td>9</td></tr> <tr><td>VENT</td><td>b</td></tr> <tr><td>BI-LEVEL</td><td>c</td></tr> <tr><td>FLOOR</td><td>A</td></tr> </tbody> </table>	KEY	IDENTIFICATION CODE	EXT	E	TEMP+	6	TEMP-	5	AIR+	2	AIR-	1	ECON	4	RIC	d	OFF	7	DEF	9	VENT	b	BI-LEVEL	c	FLOOR	A	<p>If the indications on the display and the leds does not correspond to the above, replace control unit Q21a</p> <p><b>TEST A</b></p> <p>If the indications on the display and the leds does not correspond to the above, replace control unit Q21a</p>
KEY	IDENTIFICATION CODE																										
EXT	E																										
TEMP+	6																										
TEMP-	5																										
AIR+	2																										
AIR-	1																										
ECON	4																										
RIC	d																										
OFF	7																										
DEF	9																										
VENT	b																										
BI-LEVEL	c																										
FLOOR	A																										

STEP	SEE TEST
<p><b>3. Phase: sensor check</b></p> <p>NOTE: all of the following tests should be carried out when the vehicle is in the workshop (external temperature and internal temperature of the vehicle stabilized between 10 and 30°C)</p> <p>1. Press the "AUTO" key; six bars should appear on the lower display (AIR)</p>  <p>2. Press the "AIR-" key; the temperature reading inside the passenger compartment should appear on the upper display (TEMP). If not, check the sensor Q33</p> <p>3. Press the "AIR+" key; the outside air temperature reading should appear on the upper display (TEMP). If not, check the sensor Q24</p> <p>4. Press the "TEMP-" key and then the "TEMP+" key; the mixed air temperature readings sent to the upper and lower parts of the passenger compartment should appear on the upper display (TEMP) If not, check the sensors Q25a and Q25b</p> <p>5. Press the "OFF" key for at least 2 seconds; as the vehicle is stationary, the value 0 should appear on the upper display (TEMP). (The value 1 appears if the vehicle were running at a minimum speed of 30 km/h) If not check the speedometer sensor connection L17</p> <p>6. Press the "RIC" key; a value representing the position of the air distribution vents should appear on the upper display (TEMP) (see point 10 of phase 4)</p> <p>7. Press the "VENT" key; a code will appear, based on the functioning of the electronic regulator, on the upper display (TEMP). Any other code apart from "00" or "FF" guarantees the correct operation. If not, check the regulator Q31</p> <p><b>4. Phase: actuator check</b></p> <p>1. Press the "AUTO" key; eight bars should appear on the lower display (AIR)</p>  <p>2. Repeatedly press the "AIR+" key; each time it is pressed, the electric fan should be heard to gradually increase in speed, and 26 identification codes should appear in sequence on the upper display (TEMP) starting from value "C" until value "3F" (see code sequence chart) If not, check the fan Q1 and relative regulator Q31</p> <p>3. Repeatedly press the "AIR-" key; each time it is pressed, the electric fan should be heard to gradually decrease in speed, and 26 identification codes should appear in sequence on the upper display (TEMP) starting from value "3F" until value "C" (see code sequence chart) If not, check the fan Q1 and relative regulator Q31</p>	<p><b>TEST B</b></p> <p><b>TEST C</b></p> <p><b>TEST D and E</b></p> <p><b>TEST F</b></p> <p><b>TEST G</b></p> <p><b>TEST H</b></p> <p><b>TEST H</b></p>

STEP	SEE TEST										
<p>4. Press the "ECON" key a few times: the compressor electromagnetic coupling engagement relay should be activated and deactivated and at the same time the relative leds should light up and go out. If not, check correct cut-in of compressor Q11</p> <p>5. Press the "TEMP-" key; a sequence of identification codes should appear on the upper display (TEMP) up to a value limit of "32" (max cold) If not, check motors Q30a and Q30b</p> <p>6. Press the "EXT" key; a sequence of identification codes should appear on the upper display (TEMP) up to a value limit of "7a" or "7b" (mixing flap open, vent intermediate position) If not, check motors Q30a and Q30b</p> <p>7. Press the "TEMP+" key; a sequence of identification codes should appear on the upper display (TEMP) up to a value limit of "C2" (max. hot) If not, check motors Q30a and Q30b</p> <p>8. Press the "RIC" key; air recirculation within the passenger compartment should be activated and the relative led should light up If not, check motor Q27</p> <p>9. Press the "RIC" key again; outside air intake should be activated and the relative led should go out If not, check motor Q27</p> <p>10. Press the "DEF", "VENT", "BI-LEVEL", "FLOOR" keys in sequence. Each time a different key is pressed the relative led should come on on the upper display (TEMP) and a sequence of identification codes should appear which stop when they identify a certain position of the air distribution vents, as illustrated:</p> <table border="1" data-bbox="813 1882 973 2154"> <thead> <tr> <th>KEY</th> <th>CODE</th> </tr> </thead> <tbody> <tr> <td>DEF</td> <td>≥ C5 (*)</td> </tr> <tr> <td>VENT</td> <td>S2E (*)</td> </tr> <tr> <td>BI-LEVEL</td> <td>5C</td> </tr> <tr> <td>FLOOR</td> <td>8F</td> </tr> </tbody> </table>	KEY	CODE	DEF	≥ C5 (*)	VENT	S2E (*)	BI-LEVEL	5C	FLOOR	8F	<p>TEST I</p> <p>TEST J and K</p> <p>TEST J and K</p> <p>TEST J and K</p> <p>TEST L</p> <p>TEST L</p> <p>TEST M</p>
KEY	CODE										
DEF	≥ C5 (*)										
VENT	S2E (*)										
BI-LEVEL	5C										
FLOOR	8F										

(\*) See code sequence chart  
If these codes do not appear correctly, check the motor Q30a

**NOTE:**  
The self-diagnosis terminates with this last operation: to return the system to normal operation, press the "AUTO" key.  
If all the indications correspond, the system is functioning correctly; if not, carry out the tests which follow in order: to identify the anomaly and restore correct operation

CHECK CONTROL UNIT POWER SUPPLY		TEST A
TEST PROCEDURE	RESULT	CORRECTIVE ACTION
<p>A1 CHECK FUSE</p> <p>- Check for damage of fuse F13 in fusebox G1</p>	<p>OK</p> <p>OK</p>	<p>Carry out step A2</p> <p>Replace the fuse (30A)</p>
<p>A2 CHECK FUSE</p> <p>- Check for damage of fuse F16 in fusebox G1</p>	<p>OK</p> <p>OK</p>	<p>Carry out step A3</p> <p>Replace the fuse (10A)</p>
<p>A3 CHECK VOLTAGE</p> <p>- Verify 12V at pin B10 of control unit Q21a</p>	<p>OK</p> <p>OK</p>	<p>Carry out step A4</p> <p>Restore wiring between G1 and Q21a</p>
<p>A4 CHECK VOLTAGE</p> <p>- With ignition key engaged, verify 12V at pin B12 of control unit Q21a</p>	<p>OK</p> <p>OK</p>	<p>Carry out step A5</p> <p>Restore wiring between G1 and Q21a</p>
<p>A5 CHECK GROUND</p> <p>- Check that pins B4 and B11 of control unit Q21a are grounded (0V)</p>	<p>OK</p> <p>OK</p>	<p>Carry out step A6</p> <p>Restore wiring between: Q21a and ground G148b Q21a and ground G53b</p>
<p>A6 CHECK VOLTAGE</p> <p>- With sidelights on, verify 12V at pin C1 of control unit Q21a</p>	<p>OK</p> <p>OK</p>	<p>If the displays and leds do not come on, replace the control unit Q21a</p> <p>Restore wiring between G1 and Q21a</p>

CHECK PASSENGER COMPARTMENT TEMPERATURE SENSOR		TEST B
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TEST PROCEDURE	RESULT	CORRECTIVE ACTION
<b>B8</b> CHECK GROUND - Check that pin 3 of sensor Q33 is grounded (0V)	OK	Check and if necessary replace control unit Q21a
	<del>OK</del>	Restore wiring between of Q33 and ground Q36
<b>B9</b> SELF-DIAGNOSIS (SHORT CIRCUIT CHECK) - Disconnect sensor Q33. "G" displayed	OK	Replace sensor Q33
	<del>OK</del>	("45" displayed) Carry out step B10
<b>B10</b> CHECK VOLTAGE - Check for voltage (> 0V) at pin 4 of sensor Q33	OK	Check and if necessary replace control unit Q21a
	<del>OK</del>	Restore wiring between Q33 and control unit Q21a

CHECK OUTSIDE TEMPERATURE SENSOR		TEST C
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TEST PROCEDURE	RESULT	CORRECTIVE ACTION
<b>C1</b> SELF-DIAGNOSIS - During the self-diagnosis procedure an incorrect outside temperature value appears (even if plausible)	OK	Replace sensor located in the door mirror - connector G59b
	<del>OK</del>	Carry out step C2
<b>C2</b> SELF-DIAGNOSIS - During the self-test "29" will be displayed	OK	Carry out step C4
	<del>OK</del>	Carry out step C3
<b>C3</b> SELF-DIAGNOSIS - During the self-test "49" will be displayed	OK	Carry out step C7
	<del>OK</del>	Carry out step C4
<b>C4</b> SELF-DIAGNOSIS (CHECK SENSOR) - Disconnect connector G59b and bridge pins E and D: "29" displayed	OK	Carry out step C5
	<del>OK</del>	("49" displayed) Replace sensor located in the door mirror

(continues)

CHECK PASSENGER COMPARTMENT TEMPERATURE SENSOR		TEST B
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TEST PROCEDURE	RESULT	CORRECTIVE ACTION
<b>B1</b> SELF-DIAGNOSIS - During the self-diagnosis procedure an incorrect passenger compartment temperature value appears (even if plausible)	OK	Carry out step B4
	<del>OK</del>	Carry out step B2
<b>B2</b> SELF-DIAGNOSIS - During the self-test "06" will be displayed	OK	Carry out step B6
	<del>OK</del>	Carry out step B3
<b>B3</b> SELF-DIAGNOSIS - During the self-test "45" will be displayed	OK	Carry out step B9
	<del>OK</del>	Carry out step B4
<b>B4</b> CHECK VOLTAGE - Verify 12 V at pin 1 of sensor Q33	OK	Carry out step B5
	<del>OK</del>	Restore wiring between Q33 and G1
<b>B5</b> CHECK GROUND - Check that pin 2 of sensor Q33 is grounded (0V)	OK	Replace sensor Q33
	<del>OK</del>	Restore wiring between Q33 and ground G148b
<b>B6</b> SELF-DIAGNOSIS (CHECK SENSOR) - Disconnect sensor Q33 and bridge pins 3 and 4: "G" is displayed	OK	Carry out step B7
	<del>OK</del>	("45" displayed) Replace sensor Q33
<b>B7</b> CHECK CONTINUITY - Check continuity between pin 4 of Q33 and pin B7 of control unit Q21a	OK	Carry out step B8
	<del>OK</del>	Restore wiring between Q33 and control unit Q21a

(continues)

CHECK MIXED AIR TEMPERATURE SENSOR (LOWER)			TEST E
TEST PROCEDURE	RESULT	CORRECTIVE ACTION	
<b>E1</b>   SELF-DIAGNOSIS - During the self-diagnosis procedure an incorrect lower heater/conveyor group mixed air temperature value appears (even if plausible)	OK	Replace sensor Q25b	
	<del>OK</del>	Carry out step E2	
<b>E2</b>   SELF-DIAGNOSIS - During the self-test "0" will be displayed	OK	Carry out step E4	
	<del>OK</del>	Carry out step E3	
<b>E3</b>   SELF-DIAGNOSIS - During the self-test "79" will be displayed	OK	Carry out step E7	
	<del>OK</del>	Carry out step E4	
<b>E4</b>   SELF-DIAGNOSIS (CHECK SENSOR) - Disconnect sensor Q25b and bridge pins 1 and 2; "0" displayed	OK	Carry out step E5	
	<del>OK</del>	("79" displayed) Replace sensor Q25b	
<b>E5</b>   CHECK CONTINUITY - Check continuity between pin 1 of Q25b and pin B9 of control unit Q21a	OK	Carry out step E6	
	<del>OK</del>	Restore wiring between Q25b and control unit Q21a	
<b>E6</b>   CHECK GROUND - Check that pin 2 of sensor Q25b is grounded (0V)	OK	Check and if necessary replace control unit Q21a	
	<del>OK</del>	Restore wiring between Q25b and ground Q36	
<b>E7</b>   SELF-DIAGNOSIS (SHORT CIRCUIT CHECK) - Disconnect sensor Q25b; "0" displayed	OK	Replace sensor Q25b	
	<del>OK</del>	("79" displayed) Carry out step E8	
<b>E8</b>   CHECK VCLTAGE - Check for voltage (> 0V) at pin 1 of sensor Q25b	OK	Check and if necessary replace control unit Q21a	
	<del>OK</del>	Restore wiring between Q25b and control unit Q21a	

CHECK SPEEDOMETER SIGNAL			TEST F
TEST PROCEDURE	RESULT	CORRECTIVE ACTION	
<b>F1</b>   CHECK SPEEDOMETER - On instrument panel C10 check for correct functioning of speedometer	OK	Carry out step F2	
	<del>OK</del>	Refer to the troubleshooting relative to the speedometer in the section "Instrument Panel"	
<b>F2</b>   CHECK SENSOR - Check the speedometer signal operating as follows: • connect pins 3 and 1 of sensor L17 to 12V and ground respectively • insert the shaft of an electric motor in the sensor • varying the speed of the electric motor, check that there is a variation in the frequency of the signal (between 1 and 7.5 V) reaching pin C5 of control unit Q21a	OK	Check and if necessary replace control unit Q21a	
	<del>OK</del>	Restore wiring between L17 and Q21a	

CHECK TEMPERATURE SENSOR IN THE SPEED VARIATOR DEVICE			TEST G
TEST PROCEDURE	RESULT	CORRECTIVE ACTION	
<b>G1</b>   SELF-DIAGNOSIS - During the self-diagnosis procedure an incorrect air temperature around the electric fan appears (even if plausible)	OK	Replace the regulator Q31	
	<del>OK</del>	Carry out step G2	
<b>G2</b>   SELF-DIAGNOSIS - During the self-test "0" will be displayed	OK	Carry out step G4	
	<del>OK</del>	Carry out step G3	
<b>G3</b>   SELF-DIAGNOSIS - During the self-test "FF" will be displayed	OK	Carry out step G7	
	<del>OK</del>	Carry out step G4	
<b>G4</b>   SELF-DIAGNOSIS (CHECK SENSOR) - Disconnect the regulator Q31 and bridge pins A1 and A2; "0" displayed	OK	Carry out step G5	
	<del>OK</del>	("FF" displayed) Replace the regulator Q31	

(continues)

CHECK MIXED AIR TEMPERATURE SENSOR (UPPER) TEST D

TEST PROCEDURE		RESULT	CORRECTIVE ACTION
D3	SELF-DIAGNOSIS - During the self-test "79" will be displayed	OK	Carry out step D7
		OK	Carry out step D4
D4	SELF-DIAGNOSIS (CHECK SENSOR) - Disconnect sensor Q25a and bridge pins 1 and 2: "0" displayed	OK	Carry out step D5
		OK	("79" displayed) Replace sensor Q25a
D5	CHECK CONTINUITY - Check continuity between pin 1 of Q25a and pin B5 of control unit Q21a	OK	Carry out step D6
		OK	Restore wiring between Q25a and control unit Q21a
D6	CHECK GROUND - Check that pin 2 of sensor Q25a is grounded (0V)	OK	Check and if necessary replace control unit Q21a
		OK	Restore wiring between Q25a and ground Q36
D7	SELF-DIAGNOSIS (SHORT CIRCUIT CHECK) - Disconnect sensor Q25a: "0" displayed	OK	Replace sensor Q25a
		OK	("79" displayed) Carry out step D8
D8	CHECK VOLTAGE - Check for voltage (> 0V) at pin 1 of sensor Q25a	OK	Check and if necessary replace control unit Q21a
		OK	Restore wiring between Q25a and control unit Q21a

CHECK OUTSIDE TEMPERATURE SENSOR TEST C

TEST PROCEDURE		RESULT	CORRECTIVE ACTION
C5	CHECK CONTINUITY - Check continuity between pin E of G59b and pin B8 of control unit Q21a	OK	Carry out step C6
		OK	Restore wiring between G59b and control unit Q21a
C6	CHECK GROUND - Check that pin D of G59b is grounded (0V)	OK	Check and if necessary replace control unit Q21a
		OK	Restore wiring between G59b and ground Q36
C7	SELF-DIAGNOSIS (SHORT CIRCUIT CHECK) - Disconnect sensor - connector G59b: "29" displayed	OK	Replace sensor located in the door mirror
		OK	("49" displayed) Carry out step C8
C8	CHECK VOLTAGE - Check for voltage (> 0V) at pin E of G59b	OK	Check and if necessary replace control unit Q21a
		OK	Restore wiring between G59b and control unit Q21a

CHECK MIXED AIR TEMPERATURE SENSOR (UPPER) TEST D

TEST PROCEDURE		RESULT	CORRECTIVE ACTION
D1	SELF-DIAGNOSIS - During the self-diagnosis procedure an incorrect upper heater/conveyor group mixed air temperature value appears (even if plausible)	OK	Replace sensor Q25a
		OK	Carry out step D2
D2	SELF-DIAGNOSIS - During the self-test "0" will be displayed	OK	Carry out step D4
		OK	Carry out step D3

(continues)



CHECK COMPRESSOR ACTUATING SIGNAL

TEST I

TEST PROCEDURE	RESULT	CORRECTIVE ACTION
<p><b>I1</b>   CHECK GROUND SIGNAL</p> <p>- Actuating the compressor (e.g. requesting a very cold temperature... - N.B. the "ECON" key must not be pressed) check for a ground signal (0V) in output from pin C2 of control unit Q21a</p>	<p>OK</p> <p><del>OK</del></p>	<p>Carry out step I2</p> <p>Check and if necessary replace control unit Q21a</p>
<p><b>I2</b>   CHECK GROUND SIGNAL</p> <p>- Actuating the compressor (e.g. requesting a very cold temperature) check for and ground signal (0V) at pin 85 of relay Q32</p>	<p>OK</p> <p><del>OK</del></p>	<p>Check and if necessary replace the compressor or the electromagnetic joint connector Q11. Operation of the compressor is cut off by the system logic in the following conditions:</p> <ul style="list-style-type: none"> <li>- coolant fluid pressure appr. 28 bar;</li> <li>- coolant fluid pressure appr. &lt;2.5 bar (circuit discharged);</li> <li>- coolant fluid temperature 160°C;</li> </ul> <p>additionally this operation is determined also by the logic of the ignition/injection control unit (see section "Motronic")</p> <p>Restore wiring between Q21a and Q32</p>

CHECK AIR DISTRIBUTION MOTOR

TEST J

TEST PROCEDURE	RESULT	CORRECTIVE ACTION
<p><b>J1</b>   CHECK VOLTAGE</p> <p>- Actuate the motor (e.g. requesting air directed towards feet - "FLOOR" key) and verify 12 V between pins 1 and 2 of motor Q30a N.B.: the voltage is inverted when the motor changes direction</p>	<p>OK</p> <p><del>OK</del></p>	<p>Carry out step J3</p> <p>Carry out step J2</p>
<p><b>J2</b>   CHECK VOLTAGE</p> <p>- Actuate the motor (e.g. requesting air directed towards feet - "FLOOR" key) and verify 12 V between pins A5 and A6 of control unit Q21a</p>	<p>OK</p> <p><del>OK</del></p>	<p>Restore wiring between Q30a and Q21a</p> <p>Check and if necessary replace control unit Q21a</p>
<p><b>J3</b>   CHECK GROUND</p> <p>- Check that pin 3 of motor Q30a is grounded (0V)</p>	<p>OK</p> <p><del>OK</del></p>	<p>Carry out step J4</p> <p>Restore wiring between Q30a and ground Q36</p>
<p><b>J4</b>   CHECK VOLTAGE</p> <p>- Actuate the motor (e.g. requesting air directed towards feet - "FLOOR" key) and check that the voltage between pins 4 and 5 of the motor Q30a varies when the vent moves</p>	<p>OK</p> <p><del>OK</del></p>	<p>Carry out step J5</p> <p>Replace motor Q30a</p>
<p><b>J5</b>   CHECK VOLTAGE</p> <p>- Actuate the motor (e.g. requesting air directed towards feet - "FLOOR" key) and check that the voltage between pins A7 and A8 of control unit Q21a varies when the distribution vent moves</p>	<p>OK</p> <p><del>OK</del></p>	<p>Check and if necessary replace control unit Q21a</p> <p>Restore wiring between Q30a and Q21a</p>

CHECK TEMPERATURE SENSOR IN THE SPEED VARIATOR DEVICE TEST G

TEST PROCEDURE	RESULT	CORRECTIVE ACTION
<b>G5</b> CHECK CONTINUITY - Check continuity between pin A1 of Q31 and pin C5 of control unit Q21a	OK OK	Carry out step G6 Restore wiring between Q31 and control unit Q21a
<b>G6</b> CHECK CONTINUITY - Check continuity between pin A2 of Q31 and pin B3 of control unit Q21a	OK OK	Check and if necessary replace control unit Q21a Restore wiring between Q31 and control unit Q21a
<b>G7</b> SELF-DIAGNOSIS (SHORT CIRCUIT CHECK) - Disconnect the regulator Q31: "FF" displayed	OK OK	Replace the regulator Q31 ("FF" displayed) Carry out step G8
<b>G8</b> CHECK VOLTAGE - Check for voltage (0V) between pins A1 and A2 of regulator Q31	OK OK	Check and if necessary replace control unit Q21a Restore wiring between Q31 and control unit Q21a

CHECK ELECTRIC FAN WITH RELATIVE SPEED REGULATOR TEST H

NOTE: if the no part of the conditioner is working, first refer to test A; if it is only the fan which is not working, carry out the following test H.

TEST PROCEDURE	RESULT	CORRECTIVE ACTION
<b>H1</b> CHECK FUSE - Check for damage of fuse F13 in fusebox G1	OK OK	Carry out step H2 Replace the fuse (30A)
<b>H2</b> CHECK FUSE - Check for damage of wander fuse G255	OK OK	Carry out step H3 Replace the fuse (30 A)

(continues)

CHECK ELECTRIC FAN WITH RELATIVE SPEED REGULATOR TEST H

TEST PROCEDURE	RESULT	CORRECTIVE ACTION
<b>H3</b> CHECK VOLTAGE - Verify 12V at pin 2 of electric fan Q1	OK OK	Carry out step H4 Restore wiring between Q1 and fusebox G1
<b>H4</b> CHECK VOLTAGE - With ignition key engaged, verify 12V at pin BC of regulator Q31	OK OK	Carry out step H5 Restore wiring between G1 and Q31
<b>H5</b> CHECK GROUND - Check that pin BA of regulator Q31 is grounded (0V)	OK OK	Carry out step H6 Restore wiring between Q31 and ground G148b
<b>H6</b> CHECK VOLTAGE - Engage the electric fan and check for voltage (between 0 and 5 V) at pin A3 of regulator Q31	OK OK	Carry out step H8 Carry out step H7
<b>H7</b> CHECK VOLTAGE - Engage the electric fan and check for voltage (between 0 and 5 V) in output from pin C3 of control unit Q21a	OK OK	Restore wiring between Q31 and Q21a Check and if necessary replace control unit Q21a
<b>H8</b> CHECK GROUND SIGNAL - Engage the electric fan and check that the output signal decreases when the speed increases (0V at max speed) from pin BB of regulator Q31	OK OK	Carry out step H9 Replace regulator Q31
<b>H9</b> CHECK GROUND SIGNAL - Engage the electric fan and check that the output signal decreases when the speed increases (0V at max speed) at pin 1 of electric fan Q1	OK OK	Replace electric fan Q1 Restore wiring between Q31 and Q1

CHECK AIR MIXING MOTOR		TEST K
TEST PROCEDURE		CORRECTIVE ACTION
K1   CHECK VOLTAGE	- Actuate the motor (e.g. requesting very cold or very hot air) and verify 12 V between pins 1 and 2 of the motor Q30b N.B.: voltage is inverted when the motor changes direction	<p>OK ▲ Carry out step K3</p> <p><del>OK</del> ▲ Carry out step K2</p>
	K2   CHECK VOLTAGE	<p>OK ▲ Restore wiring between Q30b and Q21a</p> <p><del>OK</del> ▲ Check and if necessary replace control unit Q21a</p>
K3   CHECK GROUND	- Check that pin 3 of motor Q30b is grounded (0V)	<p>OK ▲ Carry out step K4</p> <p><del>OK</del> ▲ Restore wiring between Q30b and ground Q36</p>
	K4   CHECK VOLTAGE	<p>OK ▲ Carry out step K5</p> <p><del>OK</del> ▲ Replace motor Q30b</p>
K5   CHECK VOLTAGE	- Actuate the motor (e.g. requesting very cold or very hot air) and check that the voltage between pins 4 and 5 of motor Q30b, varies when the air mixing vent move	<p>OK ▲ Check and if necessary replace control unit Q21a</p> <p><del>OK</del> ▲ Restore wiring between Q30b and Q21a</p>
	- Actuate the motor (e.g. requesting very cold or very hot air) and check that the voltage between pins A7 and A2 of control unit Q21a, varies when the air mixing vents move	

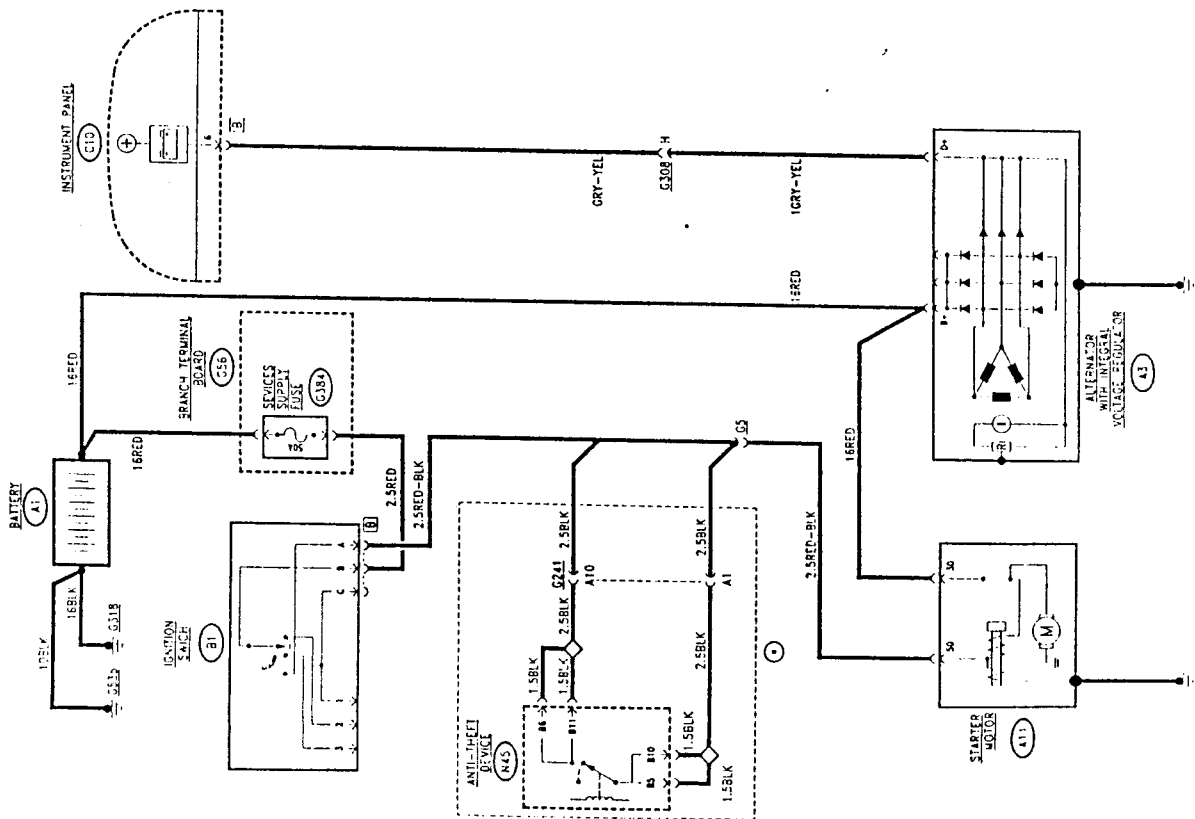
CHECK AIR RECIRCULATION MOTOR		TEST L									
TEST PROCEDURE		CORRECTIVE ACTION									
L1   CHECK VOLTAGE	- Operate the motor (opening or closing the recirculation function) and verify 12 V between pins 1 and 2 of motor Q27 N.B.: voltage is inverted when the motor changes direction	<p>OK ▲ Replace motor Q27</p> <p><del>OK</del> ▲ Carry out step L2</p>									
	L2   CHECK VOLTAGE	<p>OK ▲ Restore wiring between Q27 and Q21a</p> <p><del>OK</del> ▲ Check and if necessary replace control unit Q21a</p>									
CHECK POSITION OF AIR DISTRIBUTION MOTOR VENTS		TEST M									
TEST PROCEDURE		CORRECTIVE ACTION									
M1   SELF-DIAGNOSIS	- During the self-diagnosis procedure identification codes appear which differ by one unit from those indicated in the table corresponding to the various types of air distribution:	<p>OK ▲ Act on the regulator and setting screws of the motor position transducers (see "REPAIR MANUAL-BODY", Group 80 - Air conditioning)</p> <p><del>OK</del> ▲ Carry out step M2</p>									
	<table border="1"> <thead> <tr> <th>KEY</th> <th>IDENTIFICATION CODE</th> </tr> </thead> <tbody> <tr> <td>DEF VENT</td> <td>05</td> </tr> <tr> <td>BI-LEVEL</td> <td>26</td> </tr> <tr> <td>FLOOR</td> <td>62</td> </tr> <tr> <td></td> <td>94</td> </tr> </tbody> </table>	KEY	IDENTIFICATION CODE	DEF VENT	05	BI-LEVEL	26	FLOOR	62		94
KEY	IDENTIFICATION CODE										
DEF VENT	05										
BI-LEVEL	26										
FLOOR	62										
	94										
M2   SELF-DIAGNOSIS	- During the self-diagnosis procedure identification codes appear which differ greatly from those indicated in the preceeding table	<p>OK ▲ Replace motor Q30a</p> <p><del>OK</del> ▲ Check motor connections (see test J)</p>									

# STARTING AND CHARGING

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WIRING DIAGRAM



(1) Variation for vehicles with anti-theft device

current which generates a magnetic field which induces an alternating current on the stator. This is then transformed into direct current by a bridge rectifier with diodes and sent to recharge the battery.

A voltage regulator incorporated in the alternator makes it possible to maintain a constant delivery of voltage (approx. 12 V) for all the fields of variation in loading and engine r.p.m.

FUNCTIONAL DESCRIPTION

When the ignition key is turned in switch B1 to the STARTING position, it activates the coils of the solenoid (pin 50) of the starter motor A11 and with the voltage coming from the battery A1 (pin 30) supplies the actual starter motor, thus starting the engine.

**NOTE:** In vehicles equipped with an anti-theft device the power supply to the

starter motor (ignition key in the STARTING position) crosses the anti-theft device control unit N45 which cuts off this power supply when the alarm is on.

The DC current generated by the alternator A3 - pin B+ - is sent to the battery A1 passing through motor A11.

All the power supply lines of the various electrical systems on the vehicle start from the branch terminal board G56 connected to the + terminal of the battery A1 (see "Power supply").

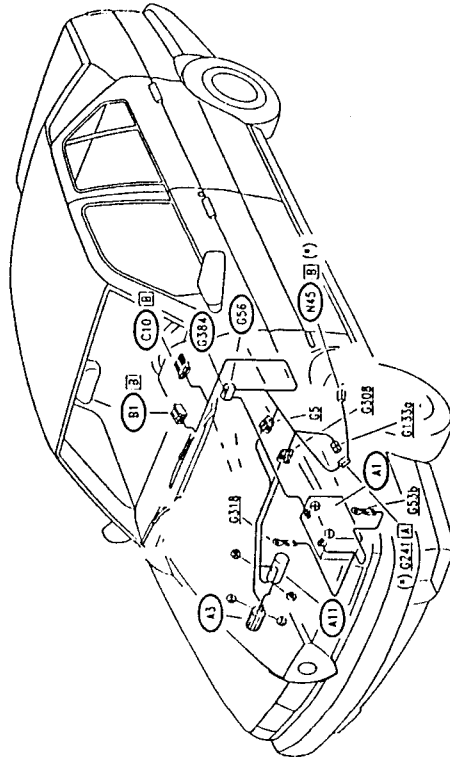
When the alternator does not turn and therefore the battery is not being recharged, an earth signal is sent -pin D+ - to the instrument panel C10 and illuminates the relative warning light. When the engine is started this signal becomes 12V and the warning light goes out.

FAULT-FINDING TABLE

Fault	Component to be checked						
	A1	B1	A11	A3	C10	I10	
Engine starting (1)	•	•	•	•			•
Engine recharging	•			•			•
Charging warning light							•

(1) Check that the anti-theft device is working properly (see anti-theft device" section) which might have cut off the supply to the starter motor.

LOCATION OF COMPONENTS



CHECKING COMPONENTS

Ignition switch (B1)

Check the internal connections as shown below:

Reed identification codes	POSITION OF KEY			
	PARKING	key removable	STOP key not removable	RUN key not removable

Starter motor (A11)

If necessary, see the starter motor specifications and overhauling in GROUP 05 of "155 - INSTRUCTIONS FOR REPAIR - ENGINE".

Alternator (A3)

If necessary, see the alternator specifications and overhauling in GROUP 05 of "155 - INSTRUCTIONS FOR REPAIR - ENGINE".

Battery (A1)

If necessary, see the battery specifications and overhauling in GROUP 05 of "155 - INSTRUCTIONS FOR REPAIR - ENGINE".

(\*) Variant for vehicles with anti-theft device

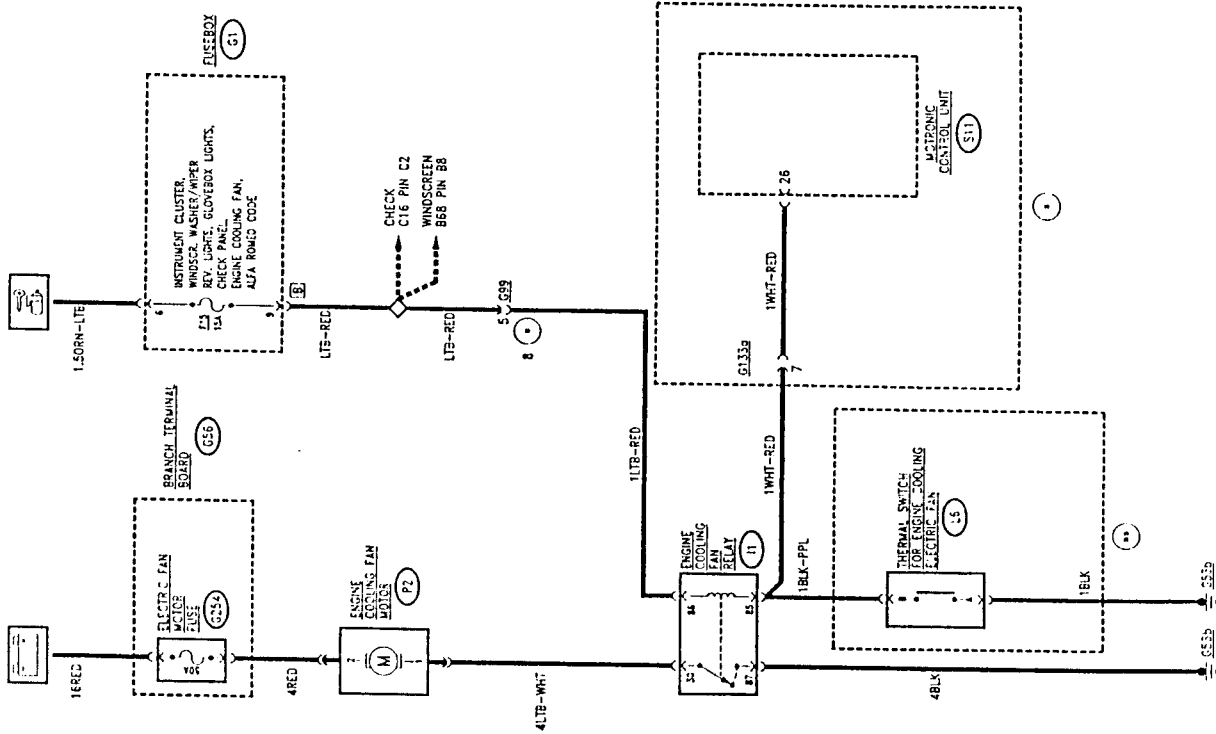
# ENGINE COOLING

(versions without air conditioner)

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WIRING DIAGRAM



Variant for models 1.6 - 1.8 - 2.0 m.y. '96

Variant for models 2.0 m.y. '95

GENERAL DESCRIPTION

A fan helps the radiator to disperse the heat of the engine coolant. In fact, a thermometric switch detects when the coolant temperature is too high and turns on the fan.

**NOTE:** The versions with automatic climate control with air conditioner are fitted with a fan with two different speeds: the first one is operated when the conditioner compressor is engaged when the car is stationary or at a first level of temperature of the coolant; the second is operated at a higher temperature.

N.B. The corresponding wiring diagram is given in the section "Climate control - engine fan control".

FUNCTIONAL DESCRIPTION

(Models 2.0 m.y. '95)

The fan P2 is supplied with battery voltage via fuse G254 (50A). The relay I1 which controls the fan receives the "key-operated" supply from the line of fuse F15 (15A) of fusebox G1, and it is energized by an earth signal leading from the thermal contact L6 which closes when the temperature of the coolant reaches 92°C; this way relay I1 sends an earth signal to the motor which operates the fan P2. When the temperature falls below 87°C the contact opens, the relay is de-energized and the fan stops.

FUNCTIONAL DESCRIPTION

(Models 1.6-1.8-2.0 m.y. '96)

The fan P2 is supplied with battery voltage via fuse G254 (50A). Relay I1 which controls the fan receives the "key-operated" supply from the line of fuse F15 (15A) of fusebox G1, and is energized by an earth signal leading from the control unit S11 when the engine temperature sensor S7 of the injection system detects an excessive coolant fluid temperature. This way, relay I1, sends an earth to fan P2 thereby operating it. When the temperature falls below a certain value, the control unit de-energises the relay and the fan stops. Control unit S11 makes it possible to adapt the engine idle speed to the increased load caused by the cutting in of the fan.

FAULT-FINDING TABLE

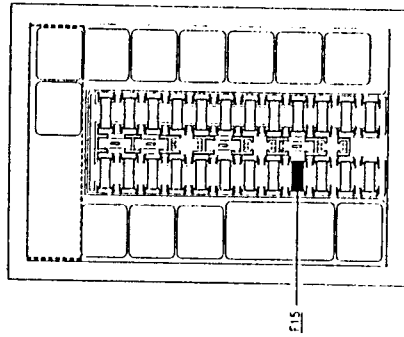
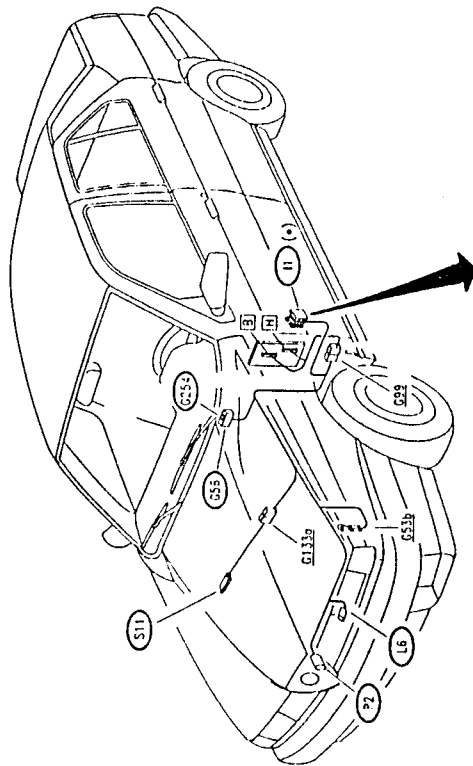
Fault	Component to be checked			
	G254	F15	I1	L6 (*)
The fan fails to start (under all circumstances)	•	•	•	•
The fan fails to start (though the coolant temperature is high) (**)				•

(\*) Specific for models 2.0 m.y. '95

(\*\*) You are reminded that for models 1.6 - 1.8 - 2.0 m.y. '96 this operation is also determined by the logic of the ignition/injection control unit S11



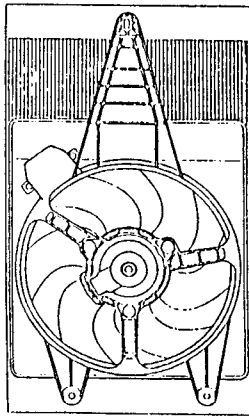
LOCATION OF COMPONENTS



(\*) black base

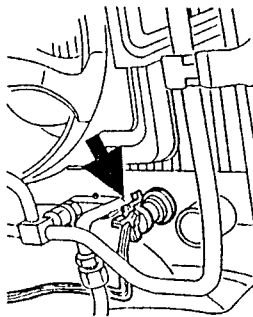
CHECKING COMPONENTS

Cooling fan (P2)



SPECIFICATIONS	
Nominal voltage	12V
Max. current absorption	25A
Speed at 12V in free air in duct	2350 ± 150 rpm. (minimum)
Direction of rotation of motor (shown on duct)	right-handed (impeller side)

Fan Thermal contact (L6) (Specific for models 2.0 m.y. '95)



SPECIFICATIONS	
contact closes	92 ± 2°C
contact opens	87 ± 2°C

ALFA ROMEO CODE 

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**GENERAL DESCRIPTION**

The car is fitted with an electronic code system (ALFA ROMEO CODE) which inhibits the control of the engine operated by the ignition keys.

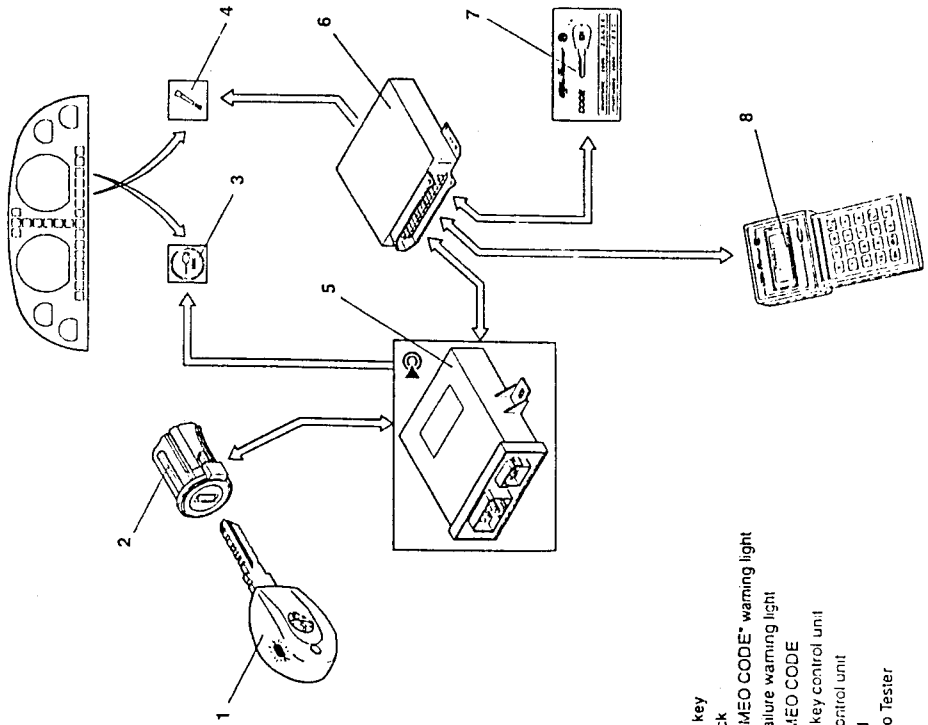
Turning the key to the MARCIA position the Engine Control System Control unit (C.C.M.) requests the code from the Control unit of the ALFA ROMEO CODE system - Electronic Key Control Unit (C.C.E.). Once it has received the code, it compares it with the code in its mem-

ory (MASTER CODE). If the comparison of the code received with the one memorised is positive the C.C.M. proceeds with normal electronic engine management (starting, ignition, injection, etc.).

If not, (wrong code, various faults, etc.) the C.C.M. does not carry out engine management and the car will not start. The C.C.M. offers the possibility to start the car without having received the MASTER CODE by the emergency procedures using the Code Card or the Alfa Tester (see recovery procedures). The code transmitted to the engine con-

trol system control unit (allowing over 4 billion combinations) is computed by an algorithm which makes each transmission between C.C.M. and C.C.E. different from the previous one. (variable, crypted code).

If the code has not been recognised correctly the ALFA ROMEO CODE warning light stays on, together with the injection system failure warning light.



- 1. Electronic key
- 2. Ignition lock
- 3. "ALFA ROMEO CODE" warning light
- 4. Injection failure warning light
- 5. ALFA ROMEO CODE Electronic key control unit
- 6. Injection control unit
- 7. Code Card
- 8. Alfa Romeo Tester

- The C.C.E. contains the codes of the two main keys and the MASTER CODE (code of the master key)

- The C.C.M. only contains the MASTER CODE

It is very important to keep the MASTER key most carefully, since its code is memorised, through a special specific procedure (described later), in the electronic injection control unit, therefore the two control units are linked indissolubly.

If the MASTER key goes astray or is damaged, further memorising procedures of new keys will not be possible; without the MASTER key in the event of a failure to the C.C.E. it will be necessary to change the C.C.E. and the C.C.M.

The user is advised to keep the MASTER key in a safe place outside the car. In fact, it serves as an "access key" for memorising further codes (keys). The MASTER key should only be used when needing to memorise new keys.

The Transponder inside the key comprises a minute integrated circuit (which contains the code), and a coil (which supplies the integrated circuit and transmits the code).

In the main keys, the Transponder is inserted in an accessible manner, while the MASTER key has the possibility to transfer the component to another MASTER key, if the need arises (for example if the ignition lock needs replacing).

The MASTER key is proof of the ownership of the car: it must therefore be pres-

**DESCRIPTION OF COMPONENTS**

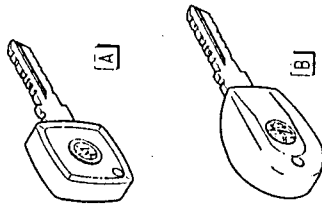
The system comprises the following components:

**Keys**

The following are supplied:

- An electronic key A: "MASTER" key
- Two main electronic keys B (with Alfa Romeo badge)

The keys contain an electronic circuit called Transponder, which contains the code which characterises them; this is transmitted to the Electronic key control unit (C.C.E.) when the key is turned to the MARCIA position. Each electronic key possesses its own code, which must be memorised by the system's electronic control unit.

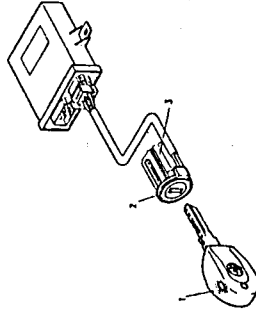


The cars are produced with the codes of the keys supplied with them, already memorised, as described below:

ent (together with the Code Card), when the car is sold.

**Aerial**

The aerial is a loop coil which is wound round the ignition lock and is connected to the C.C.E. by a specific connector (see figure). The purpose of the aerial is firstly to supply the transponder so that it can send the code and secondly to receive the Transponder signal.



- 1. Transponder
- 2. Aerial
- 3. Ignition lock

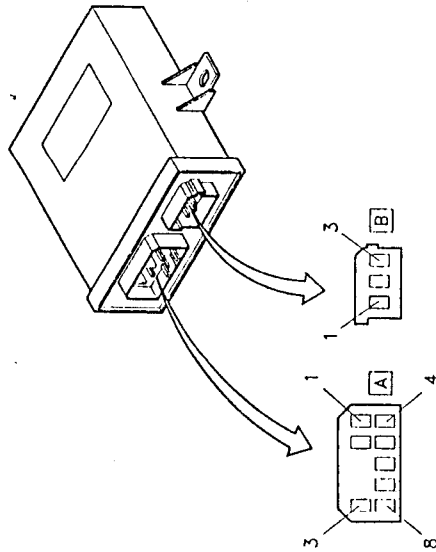
**Electronic Key Control unit (C.C.E.)**

The C.C.E. is located above the fuse box; it is interfaced with the car via two connectors: B (3-way) and A (8-way) and it has the following functions:

- It detects rotation of the key in the ignition switch to the MARCIA position

- It emits an electromagnetic field to give power and activate the Transponder of the key
- It receives and computes the secret code sent by the key
- It manages the serial line (one wire) with the Motronic injection control unit
- It manages the special diagnosis warning light on the instrument cluster

- It memorises up to 8 secret codes, one of which is the MASTER CODE
- It recognises connection with the Alfa Tester and allows the use of the serial line for diagnosis



**CONNECTOR A**

- pin 1: N.C.
- pin 2: warning light signal
- pin 3: direct supply
- pin 4: earth
- pin 5: diagnosis line K
- pin 6: serial line towards the C.C.M.
- pin 7: signal for outside relay (N.C.)
- pin 8: key-operated supply

**CONNECTOR B**

- pin 1: aerial signal
- pin 2: N.C.
- pin 3: aerial earth

Code Card using the accelerator pedal.

- Control of the diagnosis warning light (injection failure warning light)

Two cards are supplied.  
NOTE: Clearly this emergency procedure only takes account of the electronic code associated with the keys, and not the mechanical parts shared with other cars.

The Code Card should not be kept in the car, but it should be kept at hand because through the code, it will be possible to start the car without the ALFA ROMEO CODE (see the specific recovery procedure).

The Code Card, as well as the ELECTRONIC CODE ("E. CODE"), contains the mechanical code of the keys ("M. CODE"); through this code it is possible to request other keys suited to the ignition switch and to be memorised in the C.C.E.

On the back there are two special spaces for applying the labels of the transmitters supplied with the optional alarm system (V.A.S. alarm).

NB. Also the V.A.S. antitheft/alarm system inhibits the supply of the C.C.M. (see "Alarm").

**Engine Control System Control Unit (C.C.M.) with software (programme) for ALFA ROMEO CODE :**

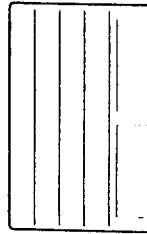
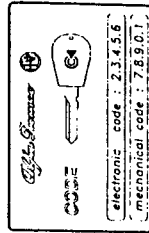
The engine control system control units adopted on these cars are provided with functions for management of the ALFA ROMEO CODE electronic key; these functions, which are activated when the key is turned, are the following:

- Permanent memorising of the MASTER key code (MASTER CODE) by a specific procedure carried out during production testing or when the C.C.M. is changed.
- Request of the MASTER key code to the C.C.E.
- Recognition of the MASTER CODE and engine control enabling (starting the car)
- Recognition of the message (transmitted by the C.C.E.) warning that an unauthorised key has been inserted (the car will not start).
- Recovery function via the Alfa Romeo Tester (it is necessary to know the ELECTRONIC CODE written on the Code Card)
- Recovery function by entering the ELECTRONIC CODE written on the

**Code Card (card with secret code)**

This is a memo card the size of a credit card which is supplied with the car. (see illustration).

It contains a five-digit code (ELECTRONIC CODE) which makes it possible to start the engine (recovery



**OPERATION: Anti-theft strategy**

Each time the ignition key is turned to MARCIA the following main operations are carried out in sequence: The injection control unit asks the C.C.E. for the MASTER CODE (the one of the MASTER key memorised previously).

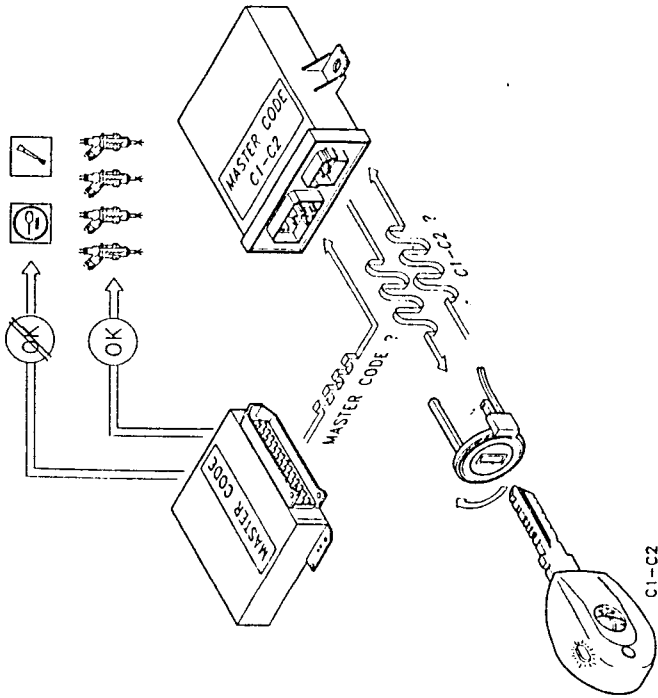
The C.C.E. checks that the code of the key engaged in the ignition lock corresponds to one of the codes contained in its memory.

If the key corresponds to one of the memorised codes:

the C.C.E. sending the MASTER CODE to the injection control unit, enables starting (see illustration).

If the code of the key engaged in the ignition lock does not correspond to one of those memorised:

The C.C.E. informs the injection control unit that an extraneous key has been engaged and starting will not be enabled (see illustration) this situation will be indicated by the turning on of the electronic injection system failure warning light and the ALFA ROMEO CODE warning light.



C1, C2 = key codes

When diagnosis begins connecting with the Alfa Tester (turning the ignition key to MARCIA) the C.C.E., after ending dialogue with the C.C.M. recognises the request for diagnosis and pilots the relay to connect pin A5 and A6 to one another, thereby enabling dialogue between the tester and the C.C.M. The C.C.E. enables connection with the Alfa Tester only when the following conditions occur contemporaneously:

- There is not activity on the serial line between the C.C.E. and the C.C.M.

- A low level (of voltage) is present on pin A5 for a time of between 500ms and 5s (a low level for over 5s is considered as a short circuit towards earth)

The relay returns to the default position when there is no activity on pin A5 for over 30s.

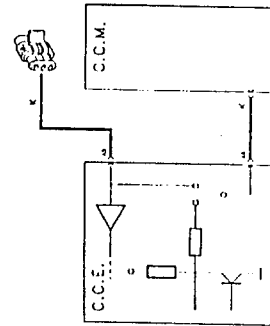
When the control unit detects that the Alfa Tester has been engaged, it turns on the ALFA ROMEO CODE warning light to indicate correct switching of the relay.

**Dedicated serial line between C.C.E. and C.C.M. (Specific for models 1.6 - 1.8 - 2.0 m.y. '96)**

Some injection control units have a special serial line for dialogue between the C.C.M. and the C.C.E., using pin A6 of the C.C.E. (see figure).

Line K of the diagnosis socket is NOT connected to the C.C.E. at pin A5, but goes directly from the C.C.M. to the Tester.

The diagnosis line K is enabled by the C.C.M. only at the end of conversation between the C.C.M. and the C.C.E.



PA-4978E116V002

**Dialogue between C.C.E. and C.C.M.**

As mentioned previously, the C.C.E. and C.C.M. "dialogue" via a serial line formed of a single cable. The serial line is two-way, this means that the information travels sequentially from the C.C.M. to the C.C.E. and vice-versa. The information exchanged between the two control units may concern the following operating conditions:

**A) Checking the code C.C.E. memorised C.C.M. memorised:**

Each time the key is turned to MARCIA (also during starting) the C.C.M., before starting engine management, asks the C.C.E. for the MASTER CODE. The C.C.E. can answer in one of the following three ways:

1. It sends the MASTER CODE (encrypted), enabling the C.C.M. to start the car
2. It sends a code which inhibits starting the engine (if the key engaged has not been memorised, or it is a key without Transponder, aerial failure, etc.)
3. It does not answer (C.C.E. failure)

The function is governed by a programme which takes account of all the variables that might be present in the system.

**B) Memorising the codes**

These operations concern the system when at least one control unit (C.C.E. or C.C.M.) is brand new.

The following instances may arise:

C.C.E. brand new and C.C.M. brand new:

When both the control units are brand new (C.C.E. and C.C.M.) the C.C.E. answers the request of the injection control unit, sending a universal code crypted by an algorithm. This condition is indicated by a characteristic flash (1.6 Hz) of the warning light: this only takes place if the C.C.E. has detected the presence of a Transponder. Conversely, if the aerial is broken or disconnected or there is no Transponder in the key, the C.C.E. will not answer).  
In this situation the system is not protected yet, and it is ready to start the key memorising procedure.

C.C.E. memorised and C.C.M. brand new:

When the ignition key has been turned to MARCIA the C.C.M. will ask the C.C.E. for the MASTER CODE to memorise it: the C.C.E. sends the MASTER CODE only if it has recognised a key among those memorised in the ignition

lock: from this moment the MASTER CODE is memorised in the C.C.M. which is thus indissolubly linked with the car.

C.C.E. brand new and C.C.M. with MASTER CODE memorised:

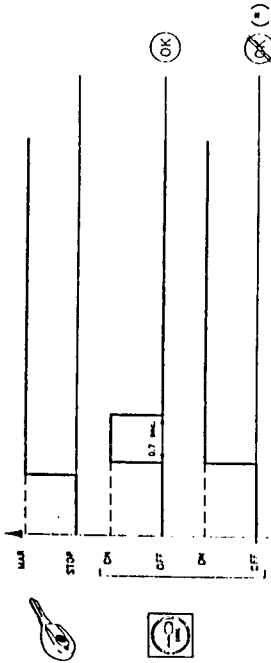
When the ignition key has been turned to MARCIA the C.C.M. asks for the MASTER CODE to be enabled for starting. As the C.C.E. is brand new, it answers sending the universal code, only if it reads a code correctly in the Transponder. (It might be a key without Transponder or with a key with the Transponder not working or the aerial might be disconnected or damaged, etc.).

The C.C.M. prevents the engine from being started as it does not recognise the universal code: it is necessary to memorise the keys in the C.C.E. MAKING SURE THAT THE MASTER KEYS IS THE ONE WHICH OPENS AND CLOSES THE PROCEDURE (see programming).

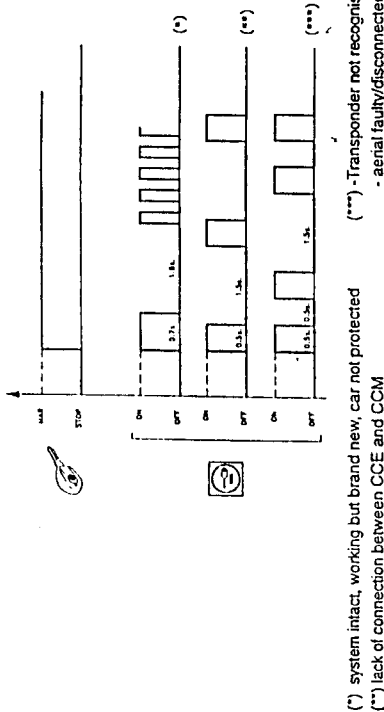
### Piloting times of the ALFA ROMEO CODE warning light

The diagnosis warning light on the instrument panel is controlled by the C.C.E. to inform the user and workshops of the system status. There are two types of characteristic flashing:

1. When the keys have already been memorised (see illustration) it indicates the correct operation of the system or a problem;
2. When the system is still brand new the flash (1.6 Hz after 2.5 seconds) means that the system is intact and working, the car is not protected until a key memorising procedure has been carried out, other faults detected are also indicated (see illustration)



- (\*) - Transponder not recognised/absent/faulty
- (P) - lack of connection between C.C.E. and C.C.M
- (OK) - re-memorising not carried out correctly



- (\*) system intact, working but brand new, car not protected
- (\*\*) lack of connection between COE and CCM
- (\*\*\*) Transponder not recognised/absent/faulty
- (P) aerial faulty/disconnected

**WARNING!** If the ALFA ROMEO CODE warning light turns on momentarily while travelling or starting the car, this does not necessarily mean a system failure, but, in certain cases, it means a condition that can be interpreted as an attempt to manipulate the vehicle by a thief.  
Should this occur, to correctly check the car, turn the engine off and move the key to STOP; then turn the key back to MARCIA: the warning light should turn on and off in less than one second.  
If it stays on after this procedure, repeat the operation, leaving the key at STOP for more than 30 seconds. If the warning light still stays on when the key is in the MARCIA Position, carry out diagnosis on the ALFA ROMEO CODE system.

### PROGRAMMING THE KEYS

The system is capable of memorising up to 7 keys plus the MASTER KEY. Correct memorising needs two keys plus the MASTER key.

During production testing the keys were memorised and the system is tested and working. If the need arises, for servicing reasons, to replace faulty components or there is the need for more keys than those supplied, the key memorising procedure must be carried out. There are two types of ways to memorise the keys:

- Memorising procedure, with a brand new system (C.C.E. and C.C.M. new).
- Re-memorising procedure, which is carried out under the following circumstances:

- the addition of other keys besides those already memorised in the C.C.E.

- if it is absolutely necessary to change the ignition lock. In this circumstance, in fact, it is possible to keep the only the Transponder of the MASTER key of the old set of keys, which, once inserted in the new key (see specific procedure) makes it possible to memorise the other keys provided with the new ignition lock.

- changing the C.C.E.

### MEMORISING

Before starting to programme the keys, it is necessary to check whether the system is brand new or if any keys have been memorised: this can be done by displaying the indications of the diagnosis warning light or connecting to the

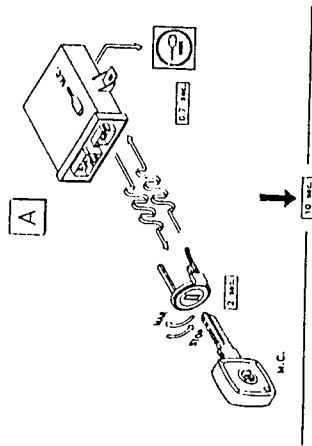
Alfa Tester. The use of a faulty or already memorised C.C.E. would in fact involve the irreversible memorising of an incorrect code in the C.C.M. which it will no longer be possible to use in future on other cars.

The memorising procedure is divided into two strictly consecutive phases:

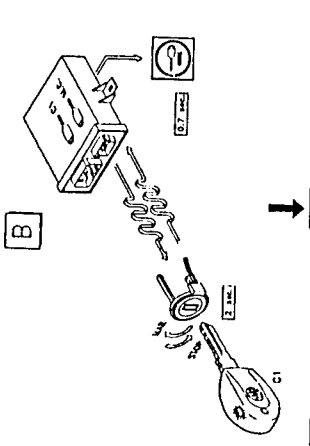
1. Memorising the keys inside the C.C.E.
2. Memorising the MASTER CODE in the engine control system control unit (if brand new)  
This is carried out only when the first one has been carried out with a positive result, turning the key to MARCIA.

**MEMORISING PROCEDURE WITH BRAND NEW SYSTEM**

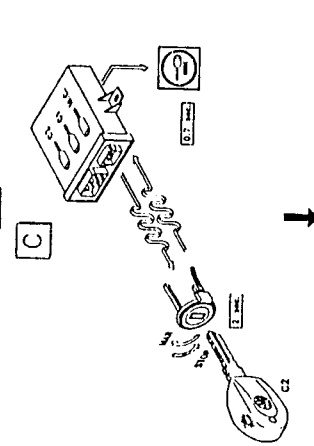
**A** Insert the **MASTER** key in the ignition lock. Turn the **MASTER** key to **MARCIA** and move it back to **STOP** as soon as the **ALFA ROMEO CODE** warning light goes off.



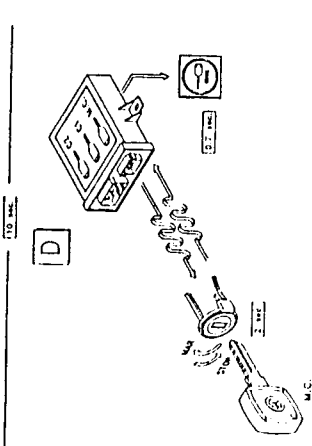
**B** Within 10 seconds: Remove the **MASTER** key from the ignition lock, insert a main key in the lock. Turn the key to **MARCIA**. As soon as the **ALFA ROMEO CODE** warning light goes out, turn the key to the **STOP** position.



**C** Within 10 seconds: Remove the key from the ignition lock, insert a second main key in the lock. Turn the key to **MARCIA**. As soon as the **ALFA ROMEO CODE** warning light goes out, turn the key to the **STOP** position.



**D** Within 10 seconds: Remove the key from the ignition lock, insert the **MASTER** key in the ignition lock again. Turn the key to **MARCIA**. As soon as the **ALFA ROMEO CODE** warning light goes out, move it back to the **STOP** position.

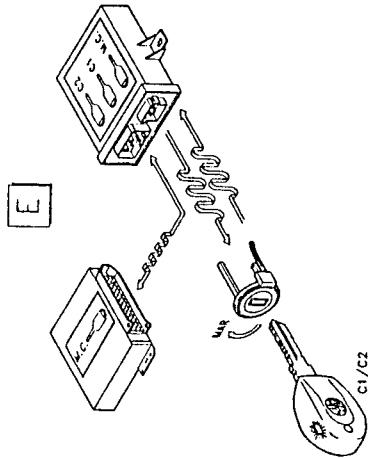


M.C. = MASTER CODE C1, C2 = key codes

code has been memorised in the injection control unit. Conversely, if the warning light flashes again (1.6 Hz), it means that the memorising procedure has not been carried out correctly.

At this point the keys are memorised in the C.C.E.

**E** Insert any one of the memorised keys and turn it to **MARCIA**: the **ALFA ROMEO CODE** warning light will turn off and go out after 0.7 seconds. Wait for 2 seconds: if the **ALFA ROMEO CODE** warning light stays off, that means that the key memorising procedure has been carried out correctly, and the **MASTER** key



M.C. = MASTER CODE C1, C2 = key codes

If, for any reason and in any moment, you think you have mistaken the procedure:

- Move the key to **MARCIA** for more than 2 seconds or move the key to **STOP** for more than 10 seconds.
- Repeat the procedure from the start inserting all the keys.

As may be deduced, during the procedure the key should never be kept at **MARCIA** for over 2 seconds, while it should never be kept at **STOP** for over 10 seconds.

Each time the key is turned to **MARCIA**, the warning light turns on (0.7 s), indicating the correct sequence of the procedure.

The above-mentioned procedure includes three keys: the **MASTER** key and two main keys.

Up to seven main keys may be inserted, using more keys between two insertions of the **MASTER** key. The **MASTER** key must always be inserted for the first and last time during programming.

The procedure is interrupted if the following situations occur:

- The same key is inserted twice consecutively
- The same key is inserted twice or more times between two insertions of the **MASTER** key
- A key stays at **MARCIA** for more than 2 seconds
- A key is kept at **STOP** (during the procedure) for more than 10 seconds

**KEY RE-MEMORISING PROCEDURE**

This procedure is similar to the previous one, and consists in inserting the main keys between two insertions of the MASTER Key.

During the sequence the new main keys and the old ones are inserted.

If the main keys memorised previously are not inserted, their code will be erased from the memory of the control unit.

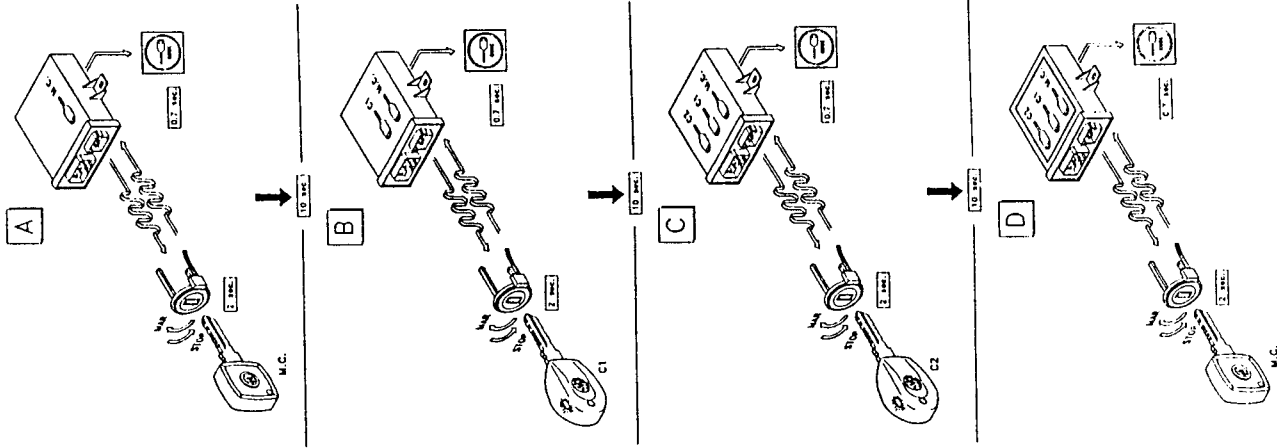
**A** insert the MASTER key in the ignition lock  
Turn the MASTER key to MARCIA and move it back to STOP as soon as the ALFA ROMEO CODE warning light goes out.

**B** Within 10 seconds:  
Remove the MASTER key from the ignition lock, insert a main key (known or new) in the lock. Turn the key to MARCIA: when the ALFA ROMEO CODE warning light goes out, turn the key to the STOP position.

**C** Within 10 seconds:  
Insert a second main key (known or new) in the ignition lock  
Turn the key to MARCIA: when the ALFA ROMEO CODE warning light goes out, turn the key to the STOP position.

**D** Within 10 seconds:  
Remove the key from the ignition lock, insert the MASTER key in the lock again  
Turn the key to MARCIA and when the ALFA ROMEO CODE warning light goes out, move it back to the STOP position.

M.C. = MASTER CODE C1, C2 = key codes



PA4978E116V000

If, for any reason and in any moment, you think you have mistaken the procedure:

- Move the key to MARCIA for more than 2 seconds or move the key to STOP for more than 10 seconds.
- Repeat the procedure from the start inserting all the keys...

As may be deduced, during the procedure the key should never be kept at MARCIA for over 2 seconds, while it should never be kept at STOP for over 10 seconds.

Each time the key is turned to MARCIA, the warning light turns on (0.7 s), indicating the correct sequence of the procedure.

The above-mentioned procedure includes three keys: the MASTER key and two main keys.

Up to seven main keys may be inserted, using more keys between two insertions of the MASTER key. The MASTER key must always be inserted for the first and last time during programming.

The procedure is interrupted if the following situations occur:

- The same key is inserted twice consecutively
- The same key is inserted twice or more times between two insertions of the MASTER key
- A key stays at MARCIA for more than 2 seconds
- A key is kept at STOP (during the procedure) for more than 10 seconds

**Memorising the MASTER CODE in the C.C.M. (if the latter is changed):**

This operation takes place turning the key to MARCIA after having memorised all the keys in the C.C.E.

Warning:

- Once the codes have been programmed, the C.C.E. is capable of

transferring the MASTER CODE to the injection control unit (which stores it permanently), each time the key is turned to MARCIA.

- Do not use brand new C.C.M.s to check that the system is working properly.
- Do not swap C.C.M.s among cars.

**Memorising with brand new C.C.E. and memorised C.C.M.:**

This function is carried out following the normal memorising procedure, as if the whole system were brand new; the MASTER Key must be the same with which the injection control unit was memorised previously.

**WARNINGS:**

- Before starting the procedure make sure that the C.C.E. is truly brand new. The use of a faulty or already memorised C.C.E. will cause the irreversible memorisation of a wrong code in the C.C.M., which will no longer be able to be used in future on other cars.

**WARNING:**

If the ALFA ROMEO CODE warning light stays on during re-memorisation, it means that the procedure has not been carried out correctly and it has been interrupted.

Repeat the re-memorising procedure from the start.

- If the ALFA ROMEO CODE warning light stays on when the MASTER key has been inserted twice consecutively, this does not mean a malfunctioning, but that the re-memorising procedure has been opened (key at MARCIA) and interrupted (second key at MARCIA). To resume the correct operation of the warning light, move the key to STOP.

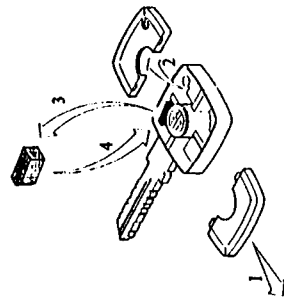
**TRANSPONDER TRANSFER PROCEDURE**

When needing to change the ignition lock or a door lock, for example, it is possible to transfer the Transponder from MASTER key to another: this way the memory of the Electronic Key Control Unit (C.C.E.) can be "re-opened" to memorise the new main keys (with new locks). Otherwise it would be necessary to change both the C.C.E. and the Master Key Control Unit (C.C.M.) as it would be impossible to re-open the memory of the latter using another Transponder.

To transfer a Transponder, proceed as follows:

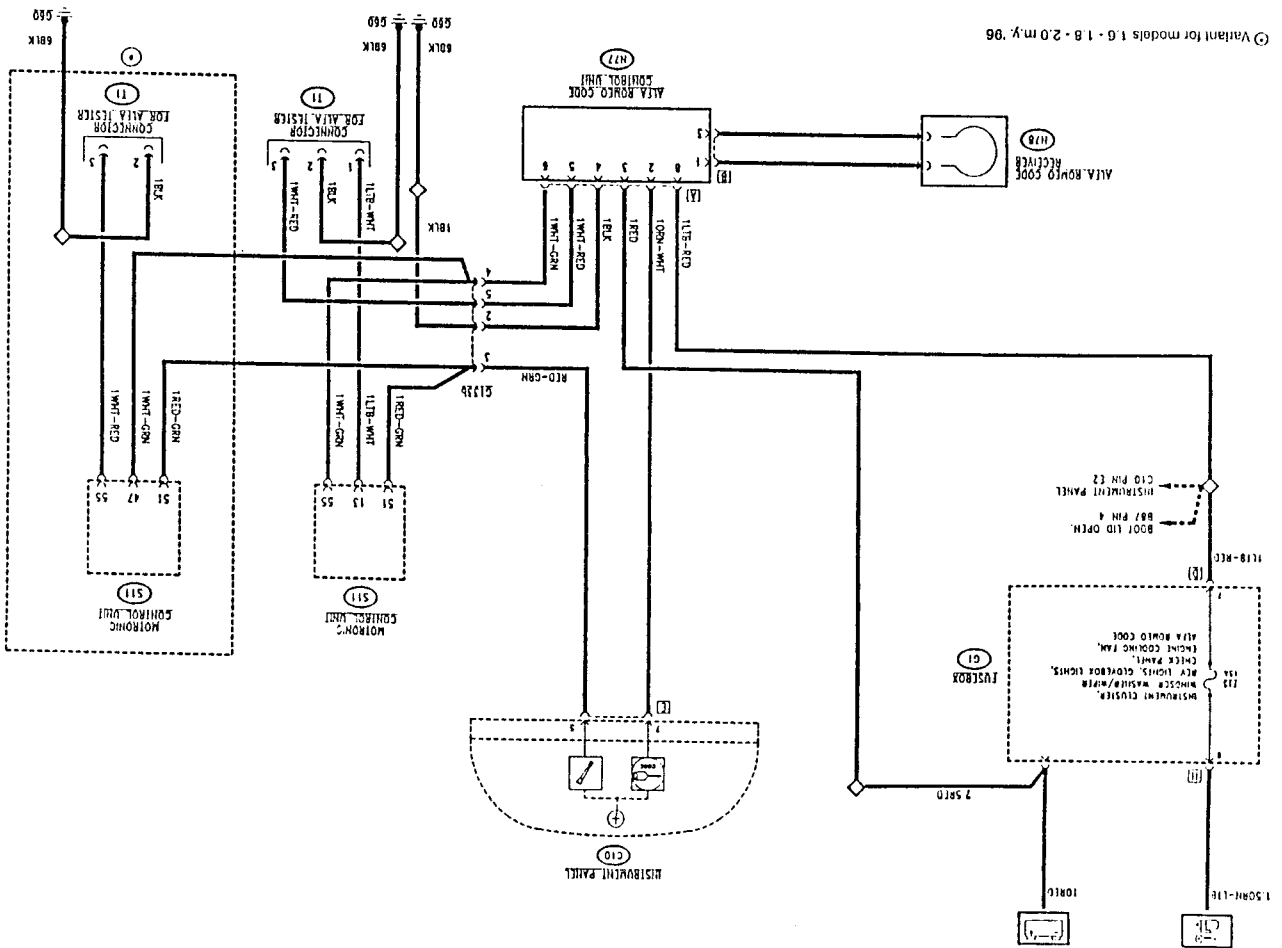
1. Open the MASTER key removing the mobile part.
2. Lift the other part, acting on the two notches. Operate carefully in order to avoid damages to the key.
3. Remove the Transponder taking care not to damage it.
4. Insert the Transponder in another MASTER key.

N.B.: The Transponder rests in place in the key and is not restrained.





WIRING DIAGRAM



Variant for models 1.6 - 1.8 - 2.0 m.y. '96

FUNCTIONAL DESCRIPTION

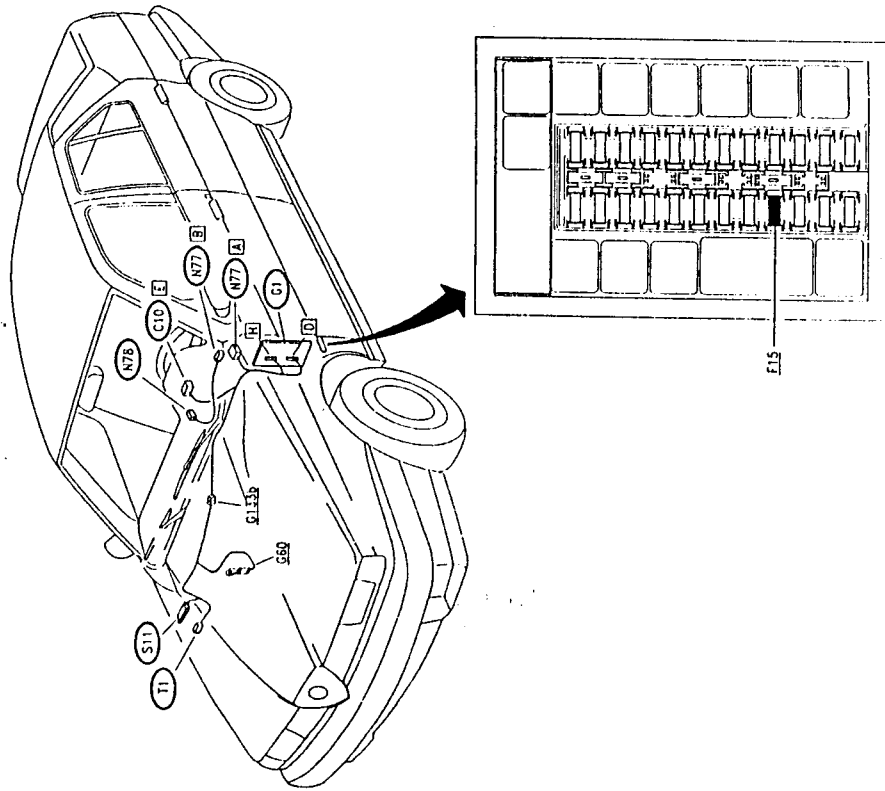
Through connector A it is connected to the Motronic control unit S11 and to the other systems; at pin 8 it receives the "key-operated" supply via the line of fuse F15 (15A) of G1, while at pin 3 it receives the direct supply via the branch terminal block and pin 4 is at earth. The connection line with the ALFA ROMEO CODE warning light on the instrument panel C10 leaves from pin 2.

The ALFA ROMEO CODE control unit N77, to be found next to the fusebox G1, is connected via connector B to a special pair of cables to the receiver N78, consisting in a coaxial aerial with the ignition switch.

Models 2.0 m.y. '95  
Pins 5 and 6 manage communication between the ALFA ROMEO CODE control unit N77 and the Motronic control unit S11; this communication takes place "cutting off" the diagnosis line K which leads from S11 to the diagnosis connector T1.

Models 1.6 - 1.8 - 2.0 m.y. '96  
Pin 6 handles communication between the ALFA ROMEO CODE control unit N77 and the Motronic control unit S11 through the special connection serial line.

LOCATION OF COMPONENTS



DIAGNOSIS

The C.C.E. cannot be tested directly via the Alfa Tester.

To the injection control unit, which already possesses a sophisticated self-diagnosis, the possibility has been added to test and display the more important functions of the ALFA ROMEO CODE.

Dialogue between the C.C.M. and the Alfa Tester begins when the key has been turned to MARCIA and when communication between the C.C.M. and the C.C.E. has ended.

The information, concerning the ALFA ROMEO CODE, supplied to the Alfa Tester, may belong to two different environments:

**Errors: generally displayed by the tester with priority depending on the importance.**

There is a counter inside the control unit, which is activated when an error is stored and it decreases each time the error is no longer present; when the

counter reaches zero, the control unit erases the error from the memory.

Therefore, the error memorised can be distinguished as PRESENT or not PRESENT.

The errors memorised are:

- Serial line not active, code not received or time-out: this error indicates that the control units (C.C.E. and C.C.M.) have not succeeded in communicating and the probable causes can be line interrupted or short-circuited or some problem on the actual control units (or with brand new system - faulty or disconnected aerial or faulty or lacking Transponder).

- Received incorrect code: the injection control unit has received from the C.C.E. a code that does not correspond to its memorised MASTER CODE; the probable cause can be an exchange of the injection control unit or the use of another main key during re-memorisation.

- Incorrect code in the C.C.E.: this means that a key unknown to the control unit has been inserted and starting of the car has not been allowed.

Parameters:

This is the environment of the Tester after connection with the C.C.M. (if no errors are present).

This environment is used to display the engineering parameters which define the status of a system.

The parameters are the following:

- brand new C.C.M.
- Starting inhibition procedure; (an un-memorised key has been inserted, the C.C.M. has not been enabled to start by the C.C.E.)
- brand new C.C.E. connected correctly

### RECOVERY PROCEDURES

The emergency procedures should be carried out, when it is not possible to start the engine with the keys available.

This procedure requires the possession of the Code Card; with the corresponding ELECTRONIC CODE (5-figure code written on the card). The procedure, carried out either with the Alfa Tester or with the accelerator pedal, consists in entering the ELECTRONIC CODE directly in the injection control unit.

This procedure makes it possible to start the engine only once; the procedure must be repeated to start the engine again (or a "known" key must be inserted, i.e. already memorised in the control unit).

### Emergency starting procedure (using the accelerator pedal)

This procedure should be carried out using the accelerator pedal and carefully watching the indications of the injection control unit warning light.

- Turn the key to MARCIA
- Press the accelerator pedal and keep it pressed until the warning light goes out.
- When the warning light goes out release the accelerator pedal.

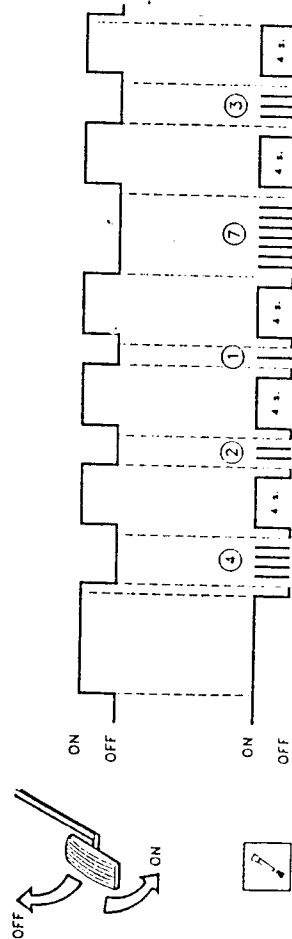
- At this point the warning light begins to flash; after the number of flashes corresponding to the first number of the code on the Code Card (ELECTRONIC CODE) depress the accelerator pedal completely.

- The warning light turns on and stays on for 4 seconds then it goes out.

- When the warning light goes out, release the accelerator pedal
- The warning light starts to flash again; after the number of flashes corresponding to the second number of the ELECTRONIC CODE, press the accelerator fully home again.
- Proceed in the same way for the other numbers of the ELECTRONIC CODE.
- Also after the last number, keep the accelerator pressed until the warning light goes out (appr. 4 seconds)
- Release the accelerator pedal.

If the warning light flashes quickly, it means that the operation has been carried out correctly, thus the car can be started: if the warning light stays on, the code has not been entered correctly, move the key to STOP and back to MARCIA again, and repeat the procedure.

EXAMPLE: ELECTRONIC CODE = \*42173\*



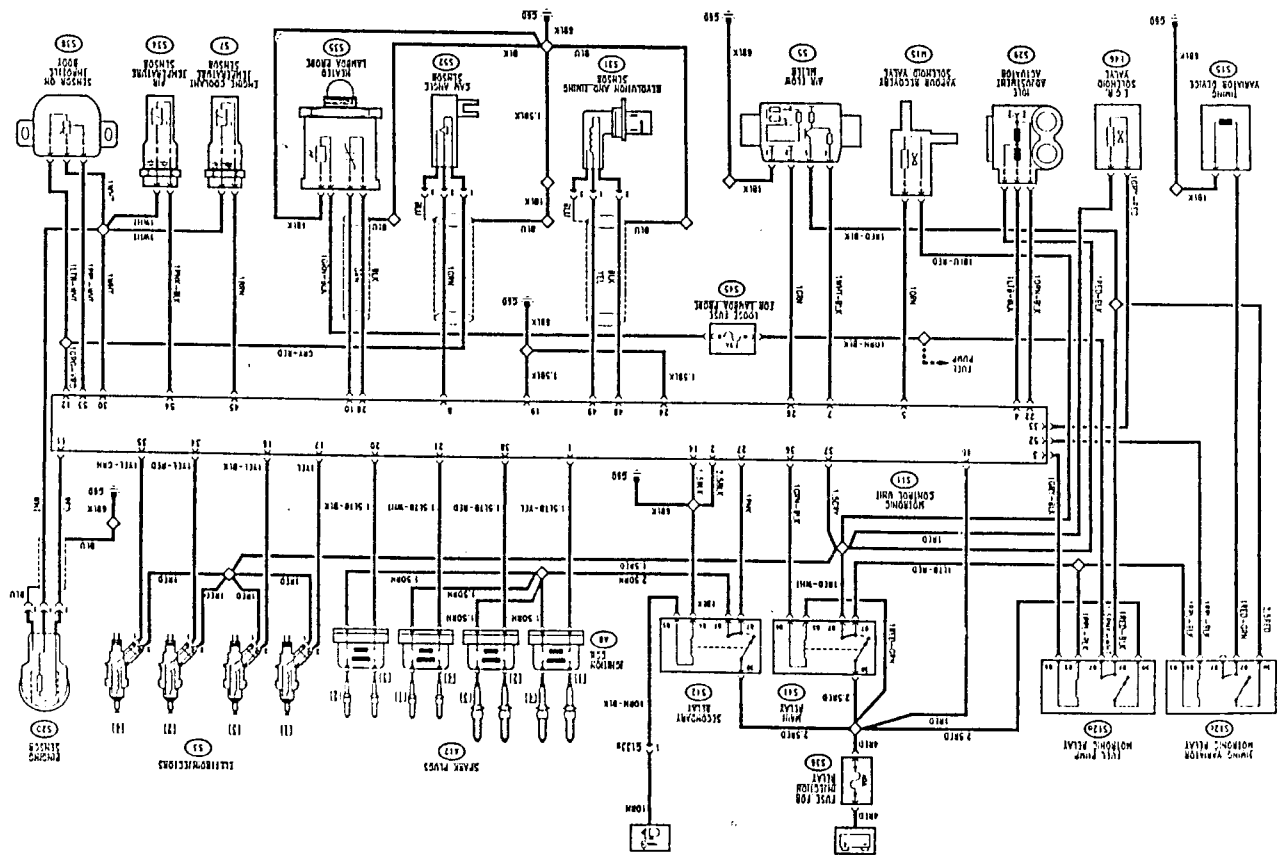
NOTE : If this procedure is not activated correctly, check the throttle potentiometer and the corresponding wiring, and also the throttle itself (throttle stroke without obstacles or sticking); also check the supply to the C.C.M.

## CONTROL SYSTEM - BOSCH MOTRONIC M2.10.3 Models 2.0 T. Spark 16V (Version '95)

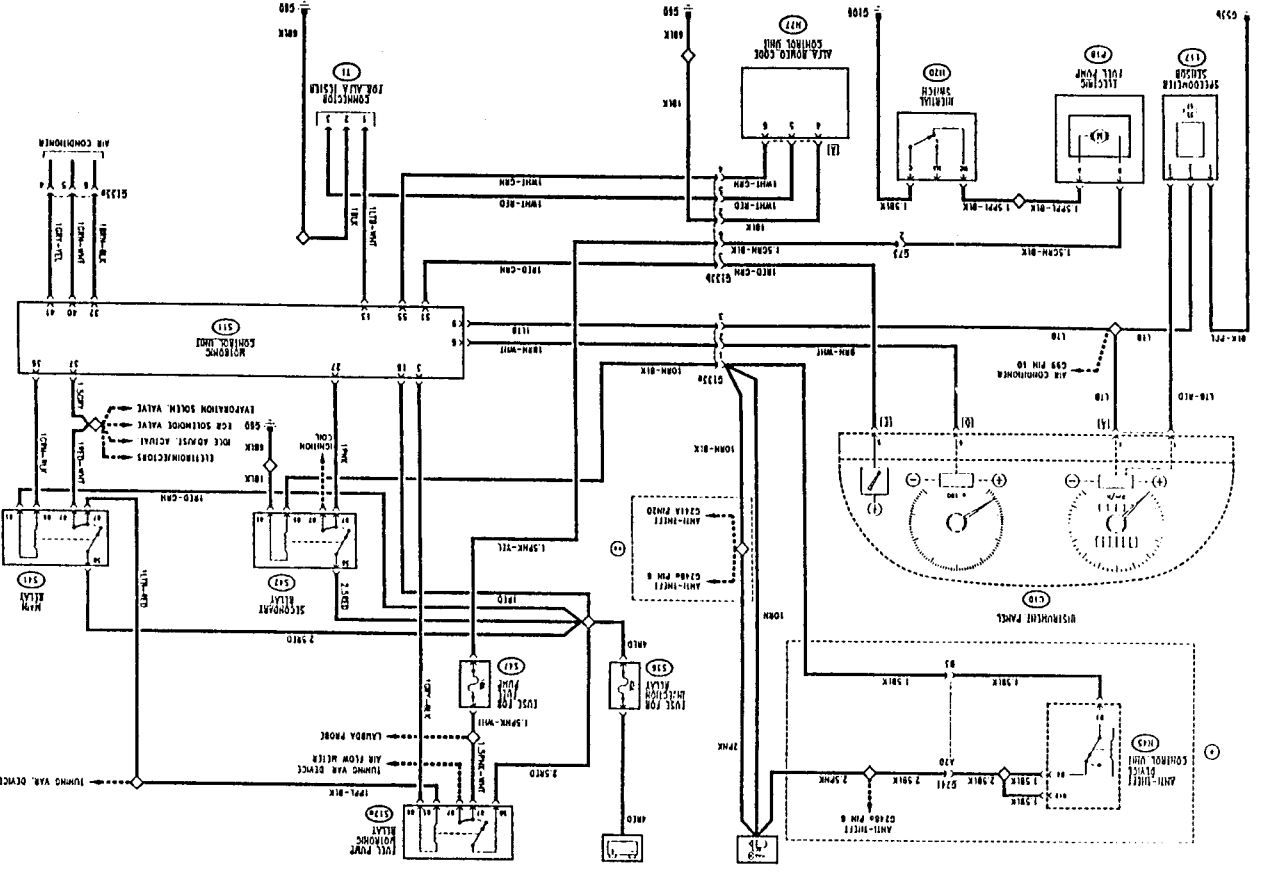
### INDEX

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WIRING DIAGRAM A



WIRING DIAGRAM B



(\*) Variant for cars with theft alarm present from chassis no. ...

## 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 sophisticated latest generation system consists of a single control unit which controls both ignition (static with lost spark) and injection (timed).

This is the M 2.10.3 version of the proven and reliable BOSCH MOTRONIC system.

Compared with the previous versions this new M 2.10.3 system adopts a central unit - with 55 pins - with advanced design and production technology, it also possesses many possibilities for insuring auxiliary functions.

As a result of the use of new sensors and revision of the control programmes, the system makes it possible to achieve considerable improvements in terms of consumption and emission levels and vehicle handling.

Another feature of this system is self-adaptation, i.e. the capability to recognise the changes that take place in the engine and to compensate them, according to functions which mainly correct

— the mixture ratio

— the carburetion parameters according to the command of the evaporative solenoid valve

— an adaptive programme for idle speed control.

## FUNCTIONS OF THE SYSTEM

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

With this control unit, fuel injection is sequential and timed for each cylinder: the injection instant (delivery of fuel into the intake manifolds by the opening of the injectors) is not simultaneous for all the cylinders, but takes place for each cylinder in correspondence with the op-

timal point of injection, calculated by the control unit according to special maps depending on the load, speed and temperature of the engine.

**NOTE:** the instant considered in the design of the maps is that of the start of injection (the cylinder is in the exhaust stroke - intake valve still closed).

### Static ignition

An electronic ignition system has been adopted with "static distributor" (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; as the power modules for controlling the primary windings of the coil are inside the control unit. Static ignition takes place through four coils, according to the so-called "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.

In a 4-cylinder in line engine, the paired cylinders are 1/4 and 2/3.

The solution adopted for this engine (T.SPARK and 16 valves) has required the adoption of a larger "central" spark plug and a smaller "side" spark plug.

Each of the four coils supply the spark plug of the cylinder below and simultaneously that of the paired cylinder.

**NOTE:**

This way it is impossible to invert the spark plug cables during servicing operations.

spark to the corresponding pair of cylinders.

### Fuel pump

The complex control logic of the fuel pump carried out by the control unit (mainly based on the rpm signal) immediately cuts off the supply to the pump 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 important as an integration of the safety unit, especially if the car is hit from behind or in the case of other accidents in which the engine does not stop immediately.

### Timing variator

This T.SPARK 16 valve engine is fitted with an electro-mechanical-hydraulic timing variator which is connected to the camshaft and controls and adjusts intake timing (advance) in such a way that a larger amount of air is taken in. This device is activated by the control unit only after exceeding a determinate rpm and engine load to avoid adversely affecting correct operation of the engine at low speeds.

### Percentage of exhaust gas recirculation

Nox (nitric oxide) is developed at high temperatures in the combustion chambers. To reduce these emissions an E.G.R.

(Exhaust Gas Recirculation) system is accepted which by recirculating part of the exhaust gases, lowers the temperature, thus the Nox produced, in the combustion chambers. In fact, part of the exhaust gas is withdrawn through the special EGR Valve and re-admitted to the intake box where it is mixed with the inhaled air and burnt again in the engine. The EGR valve is modulated by a solenoid valve controlled by the injection control unit and, as a result of the type of control, in addition to reducing the amount of Nox, consumption levels are also reduced.

The percentage of exhaust gas to be returned to the engine is established by the control unit taking account of a specific characteristic curve which depends on the load, speed and temperature of the engine.

## OPERATING LOGIC

— Identification of the "operating point":

the "point of operation of the engine" is located mainly 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 intake 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 unit 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 cut-off threshold value 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 fitted directly on the throttle body which acts on the throttle by-pass: 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 therefore possible to adjust engine carburetion precisely. Among other items, this makes it possible to meet emission limit regulations.

### - Timing variator control:

The electro-mechanical/hydraulic timing variator, connected to the camshaft, controls and adjusts the intake timing according to the load and rpm of the engine. This device is activated by the control unit at higher engine operating speeds (above 1,500 rpm and with load above 30%).

### - Knocking control:

Through a knock sensor the control unit is informed if any "pinging" or "knocking" occurs and it corrects the spark advance "delaying" it accordingly; a further correction also takes account of the air temperature, in fact, when the temperature of the intake air is high, pinging is more accentuated.

N.B. The intake air temperature sensor to be found just downstream of the air-flow meter, is not used to calculate the engine load but to control the knocking parameters.

### - 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.

### - E.G.R. valve control

The percentage of exhaust gas to be returned to the engine is determined by the control unit taking account of a specific characteristic curve which depends on the engine load and speed: recirculation is only activated when the engine speed is between 2500 and 4000 rpm, also in relation to the temperature of the engine (higher recirculation percentage with high temperatures).

### - Connection with the air conditioner compressor:

The control unit is connected with the air conditioner compressor and it cuts in the compressor in relation to operation of the engine. As this service absorbs a considerable amount of power, the control unit:

- adapts the engine idle speed each time the compressor is engaged; if the speed falls below the idle speed rate, the compressor is cut off;
- in the event of the need for high power, over 6000 rpm (high throttle opening speed), or full load, or high engine temperature (above 117°C), the compressor is momentarily disengaged;
- when the engine is started it prevents the compressor from being engaged until normal operating conditions are reached.

### - Connection with ALFA ROMEO CODE system:

On cars fitted with the ALFA ROMEO CODE system, as soon as the Motronic control unit receives the signal that the key has been turned to MARCIA, it "asks" the above-mentioned system for consent to start the engine: this consent is given only if the ALFRA ROMEO CODE control unit recognizes the code of the key engaged in the ignition switch as correct. This dialogue between the two control units takes place on diagnosis line K already used for the Alfa Romeo Tester.

## FUNCTIONAL DESCRIPTION

- cam angle sensor (S52);
- heated lambda sensor (S35)
- air-flow meter (S5);
- knock sensor (S20);

The actuators are the following:

- electroinjectors (S3);
- ignition coils (A8);
- fuel pump (P18);
- idle adjustment actuator (S29);
- vapour recovery solenoid valve (M15);
- E.G.R. solenoid valve (L46);
- timing variator (S15).

The control unit is also connected with:

- the climate control unit;
- the ALFA ROMEO CODE control unit (N77);
- the instrument cluster (C10) to which it supplies the signal for turning on the diagnosis warning light and for the rev counter;
- the tachometric 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 the fuel pump relay S12a operate the fuel pump, the injectors, the coils and the other components of the system, while the fourth - the limiting variator relay (S12c) - supplies the timing variator solenoid.

The supply line for the entire system is protected by fuse S36; other special fuses protect the pump (S47), and the lambda probe resistance (S45). Lastly, there is an earth point (S60) on the engine.

Connector T1 enables connection with the ALFA ROMEO Tester: this is located in the engine compartment in an accessible position.

- engine temperature sensor (S7);
- air temperature sensor (S34);
- sensor on throttle body (S38);
- rpm sensor (S31);

The control unit possesses a self-diagnosis system, which continuously monitors the plausibility of the signals from the various sensors and compares them with the limits allowed: if these limits are exceeded, the system detects a fault and turns on the corresponding warning light on the instrument cluster. The warning light turns on when the engine is started to indicate the initial test of the entire system (appr. 4 seconds), it then turns off if no errors have been memorised: otherwise it stays on.

For certain parameters, the control unit replaces the abnormal values with suitable ones so that the car can "limp" to a point of the Service Network.

These "recovery" values depend on the other correct signals and they are defined individually by the control unit operating logic.

The self-diagnosis system also enables quick and effective location of faults connecting with the ALFA ROMEO Tester (see "Fault finding"), through which all the errors memorised can be displayed. It is also possible to check the operating parameters recorded by the control unit and operate the single actuators to check whether they are working properly.

## COMPONENTS

The electronic control unit receives the signals leading from the sensors which measure the engine operating parameters. 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 sensors are the following:

The Motronic control unit S11 controls and adjusts the entire electronic ignition and injection system; all the system supplies are protected by fuse S36 (40A).

The control unit is supplied at pin 18 directly by the battery through fuse S36. 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 timing variator relay S12c, to the vapour recovery solenoid valve M15, to the idle speed actuator S29, to the EGR solenoid valve L46 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 coils A8.

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 S5 that of the timing variator S12c 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 sensors, 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 (60-2 teeth) fitted on the crankshaft.

The cam angle sensor S52 (timing sensor), supplied at 5 V by pin 12 of the control unit, and sends a signal in frequency corresponding to the phase to pin 8 of the control unit itself; these two signals are very low in intensity and are therefore suitably screened.

The sensor comprises a Hall effect device due to which the voltage signal sent to the control unit "lowers" abruptly when the hollow 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 10 of the control unit, while pin 28 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 supplied by the control unit from pins 12 and 30 and through a potentiometer it sends a signal to pin 53 which is proportionate with the degree of opening of the throttle itself.

The engine temperature sensor S7, connected to the electronic 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 in-taken air temperature sensor S34, connected to the electronic earth at pin 30, supplies a signal at pin 54 that is proportionate with the temperature of the air entering the intake box, detected with an NTC material (resistance that lowers with the temperature).

The knock sensor S20, through a frequency signal sent to pin 11 of the control unit, supplies information about the knocking conditions, while an electronic earth leads from pin 30; these two signals are very low in intensity and are therefore suitably screened.

The sensor comprises a piezoelectric plate which detects the vibrations produced when the engine is running, exploiting a particular characteristic of piezoelectric materials which generate an output voltage when subjected to mechanical stresses; this voltage is filtered and analysed by the control unit which corrects the ignition parameters accordingly.

The air flow meter S5, is supplied by the relay S12a; 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 channel 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.

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), 34 (cyl. 2), 16 (cyl. 3) and 35 (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) for the primary windings of the coils A8 lead from the control unit, while the secondary winding sends the pulse to the spark plugs A12: from pins 1 and 21 for cylinders 1- 4 and from pins 28 and 30 for cylinders 5-3.

The primary windings of the coils 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; it is controlled by the control unit through the duty-cycle signals of pins 22 (closing) and 4 (opening).

The vapour recovery solenoid valve M15 allows the passage of the fuel vapour towards the engine intake where they are added to the mixture entering the combustion chamber; this valve, supplied by the main relay S41, is operated 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 "Check Engine" warning light on the cluster C10 leads 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 "Climate control" section.

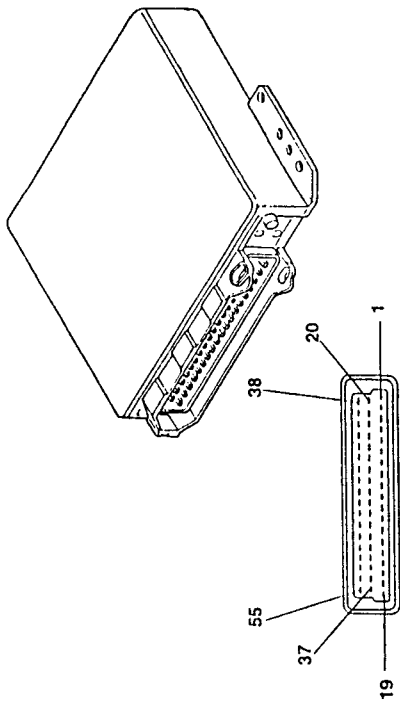
The control unit S11 is connected by pin 55 with the ALFA ROMEO CODE control unit N77 via the diagnosis line K; if the ALFA ROMEO CODE system does not recognise a correct "key code" it will not

enable the Motronic control unit to start the engine.

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 the diagnosis 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).

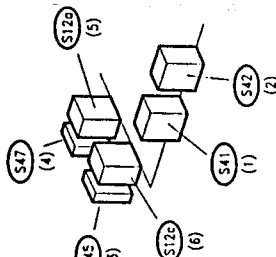
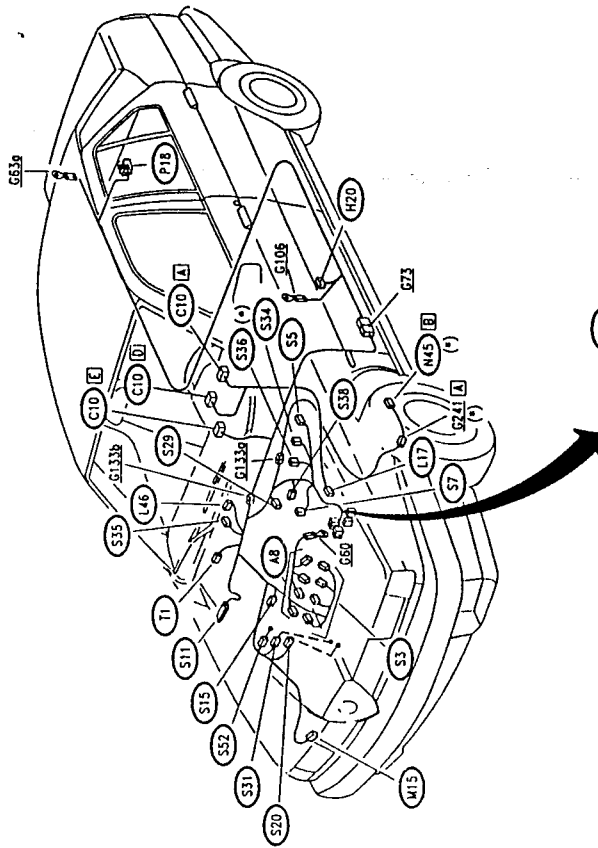
In the versions with alarm system, the key-operated supply of the system pin 85 of relay S42 - does not arrive directly from the ignition switch, but "crosses" the alarm system control unit N45 for the necessary consent (for further details, see section "Alarm").

LOCATION OF COMPONENTS



CONTROL UNIT PIN-OUTS

- |   |   |
|---|---|
| 1. Ignition coil control - cyl. 1 and 4 -       | 30. Electronic earth for sensors                |
| 2. Earth for ignition                           | 31. N.C.  |
| 3. Fuel pump relay control                      | 32. Conditioner compressor relay control        |
| 4. Idle actuator control - opening              | 33. E.G.R. solenoid valve control               |
| 5. Evaporative solenoid valve control           | 34. Injector cyl. 2                             |
| 6. Rev counter signal                           | 35. Injector cyl. 4                             |
| 7. Air flow meter signal                        | 36. Main relay control                          |
| 8. Timing signal                                | 37. Supply from main relay                      |
| 9. Car speed signal                             | 38. Cyl. 2 and 3 ignition coil control          |
| 10. Lambda probe signal                         | 39. N.C.  |
| 11. Knock sensor signal                         | 40. Conditioning system control                 |
| 12. Stabilized voltage (5V) for sensors         | 41. Compressor cut-in request                   |
| 13. Diagnosis line L                            | 42. N.C.  |
| 14. Earth for injectors                         | 43. N.C.  |
| 15. N.C.  | 44. N.C.  |
| 16. Cyl. 3 injector                             | 45. Engine temperature signal                   |
| 17. Cyl. 1 injector                             | 46. N.C.  |
| 18. Direct supply                               | 47. N.C.  |
| 19. Electronic screening earth                  | 48. Signal for rpm sensor                       |
| 20. Ignition coil control - cyl. 3 and 2        | 49. Rpm sensor signal                           |
| 21. Ignition coil control - cyl. 4 and 1        | 50. N.C.  |
| 22. Idle speed actuator control - closing       | 51. "Check Engine" warning light                |
| 23. N.C.  | 52. Timing variator control                     |
| 24. Earth for final stages                      | 53. Throttle position signal                    |
| 25. N.C.  | 54. Inlet air temperature signal                |
| 26. Air-flow meter earth                        | 55. Diagnosis line K (also for ALFA ROMEO CODE) |
| 27. "Key-operated" supply, from secondary relay |   |
| 28. Lambda probe earth                          |   |
| 29. N.C.  |   |

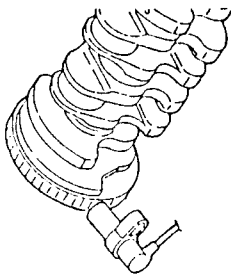


- (\*) Black fuseholder
- (1) Black base
- (2) Black base
- (3) Brown fuseholder
- (4) Red fuseholder
- (5) Black base
- (6) Black base



CHECKING COMPONENTS

Rpm sensor (S31)



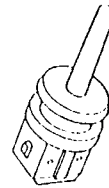
SPECIFICATIONS	
Sensor winding resistance 20 °C	486 - 594 Ω
Gap between sensor and phonic wheel	0.5 ± 1.5 mm

Engine temperature sensor (S7)



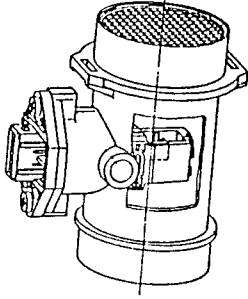
SPECIFICATIONS	
Temperature (°C)	Resistance (Ω)
- 10°C	8100 ± 10770 Ω
+ 20°C	2280 ± 2720 Ω
+ 80°C	292 ± 362 Ω

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

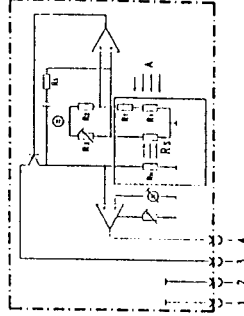
Air flow meter (S5)



SPECIFICATIONS	
Current that crosses the diaphragm:	
flow rate (kg/h)	current (A)
0	≤ 0.25
6-40	≤ 0.80

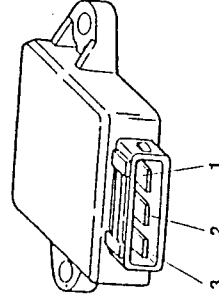
  

Characteristic curve of sensor  
 m = flow rate  
 U = voltage between pins 4 and 2



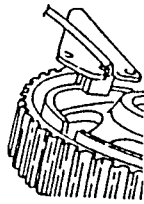
pin 1 - Earth  
 pin 2 - Reference earth  
 pin 3 - 12 V supply  
 pin 4 - Measurement signal  
 A = air  
 Rs = hot film sensor

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

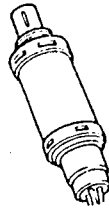
Cam angle sensor (S52)



**SPECIFICATIONS**

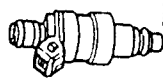
The voltage signal "lowers" sharply when the hollow magnetron passes in front of the sensor itself:

Lambda probe (S35)



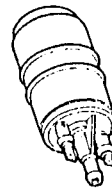
<b>SPECIFICATIONS</b>	
Heating resistance	3 Ω

Electroinjectors (S3)



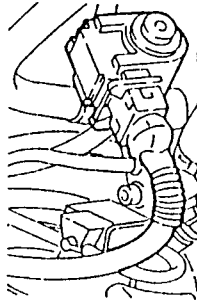
<b>SPECIFICATIONS</b>	
Winding resistance	15.9 ± 0.35 Ω

Fuel pump (P18)



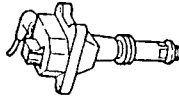
<b>SPECIFICATIONS</b>	
Flow rate	≥120 l/h
Pressure	4 bar
Nominal voltage	12V

Idle speed adjustment actuator (S29)



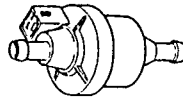
<b>SPECIFICATIONS</b>	
Resistance between terminals:	
1 - 3	- 33 Ω
1 - 2	- 17.5 Ω
2 - 3	- 15.5 Ω

Ignition coils (AB)



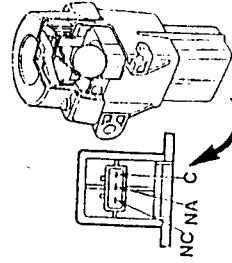
<b>SPECIFICATIONS</b>	
Primary resistance	0.3 Ω ± 12%
Secondary resistance	7 kΩ ± 12%

Evaporative solenoid valve (M15)



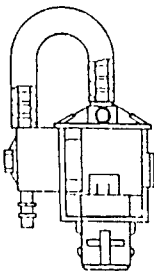
<b>SPECIFICATIONS</b>	
Duty-cycle signal	12 V; 10 Hz
Ohmic resistance of the winding	26 ± 4 Ω
When not energized the solenoid valve is normally closed	

Inertial switch (H20)



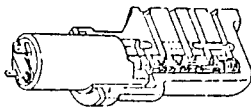
<b>SPECIFICATIONS</b>	
Check the continuity between pins NC and C: this continuity is cut off in the event of a crash; the contact is re-connected by pressing the special pushbutton	

E.G.R. Solenoid valve (L46)



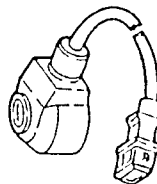
SPECIFICATIONS	
Duty cycle signal	12V, 15.3 Hz
Ohmic resistance of winding (at 20°C)	26.6 ± 1.4 Ω

Timing variator (S15)



SPECIFICATIONS	
Resistance between the two terminals	~ 10 Ω
Max. absorption at 13.5 V	1.34 A

Knock sensor (S20)



SPECIFICATIONS		
Resonance frequency	> 20 kHz	
Impedance	≥ 1 MΩ	
Vibration allowed	for long periods	≤ 80 g
	for short periods	≤ 400 g

PRELIMINARY CHECK OF THE BOSCH M2.10 SYSTEM

TEST A

NOTE: Check beforehand that the ALFA ROMEO CODE is working properly which might have cut off the supply to the system!

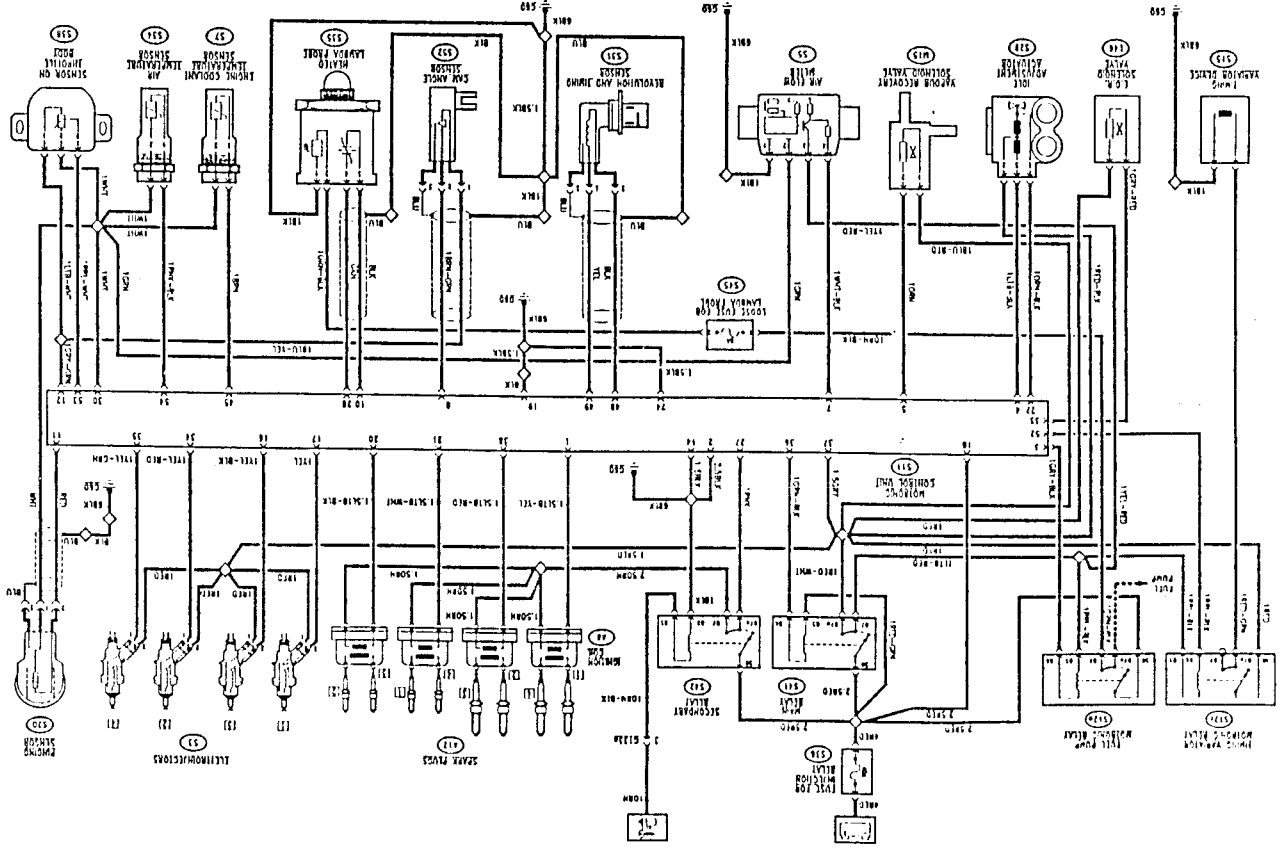
TEST PROCEDURE	RESULT	CORRECTIVE ACTION
<b>A1 CHECK FUSE</b> - Check intaciness of fuses S36 and S47	OK OK	Carry out step A2  Change fuses S36: 40A S47: 10A
<b>A2 CHECK VOLTAGE</b> - Check for 12 V at pin 30 of relays S41, S42 and S12a and also at pin 86 of S41	OK OK	Carry out step A3  Restore the wiring between the battery A1 and relays S41, S42 and S12a
<b>A3 CHECK VOLTAGE</b> - With the key turned, check for 12 V at pin 85 of relay S42	OK OK	Carry out step A4  Restore the wiring between the ignition switch B1 and relay S42 <b>WARNING:</b> in cars with alarm: check that this system is working properly (See section "Alarm"). Check the wiring between the alarm control unit N45 and S42
<b>A4 CHECK RELAYS</b> - Check the correct operation of relays S41, S42 and S12a	OK OK	Carry out step A5  Change any faulty relays
<b>A5 CHECK CONTROL UNIT SUPPLY</b> - 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 S36
<b>A6 CHECK EARTH</b> - Check for an earth at pins 19 and 24. Also check for an earth at pin 86 of S42	OK OK	<b>CONTINUE DIAGNOSIS USING THE ALFA ROMEO TESTER</b>  Restore the wiring between S11 and the relays and earth G60

**CONTROL SYSTEM -  
BOSCH MOTRONIC M2.10.4  
Models 1.6 - 1.8 - 2.0 T. Spark 16V (Version '96)**

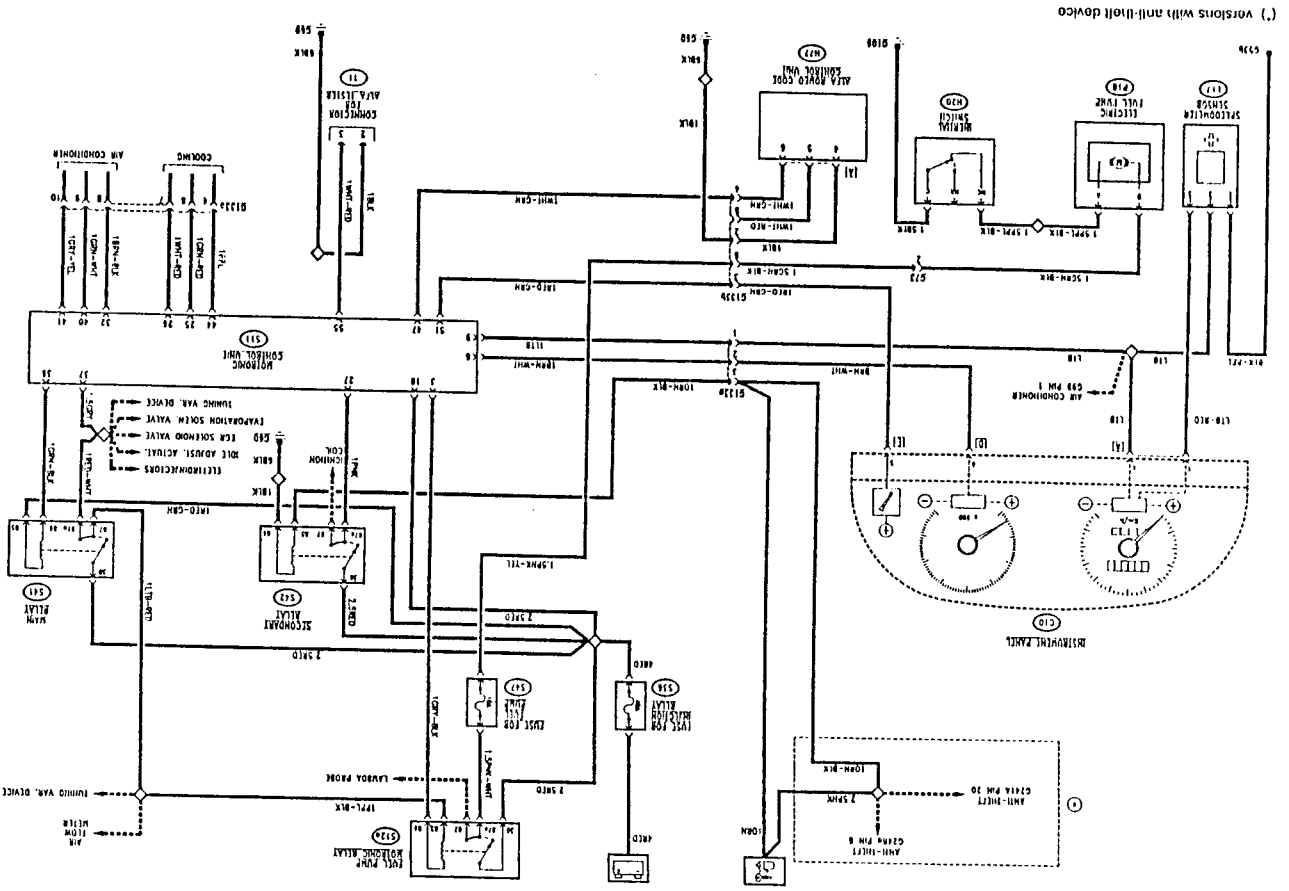
**INDEX**

WIRING DIAGRAM . . . . . 29C-2  
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FUNCTIONAL DESCRIPTION . . . . . 29C-7  
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CHECKING COMPONENTS . . . . . 29C-12

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 sophisticated latest generation system consists of a single control unit which controls both ignition (static with lost spark) and injection (timed).

This is the M 2.10.4 version of the proven and reliable BOSCH MOTRONIC system.

Compared with the previous versions this new M 2.10.4 system adopts a control unit - with 55 pins - with advanced design and production technology, it also possesses many possibilities for inserting auxiliary functions.

As a result of the use of new sensors and revision of the control programmes, the system makes it possible to achieve considerable improvements in terms of consumption and emission levels and vehicle handling.

Another feature of this system is self-adaptation, i.e. the capability to recognise the changes that take place in the engine and to compensate them, according to functions which mainly correct

- the mixture titration

- the carburetion parameters according to the command of the evaporative solenoid valve

- an adaptive programme for idle speed control.

## FUNCTIONS OF THE SYSTEM

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

With this control unit, fuel injection is sequential and timed for each cylinder: the injection instant (delivery of fuel into the intake manifolds by the opening of the injectors) is not simultaneous for all the cylinders, but takes place for each cylinder in correspondence with the op-

### Metering the air flow rate

The air flow meter adopted is of a more modern design known as the "hot film" type.

Outside, the air-flow meter looks like a part of duct between the intake manifold and the air cleaner.

Inside the air-flow meter there is an electronic circuit and a plate that is crossed by the air which passes into the duct. The film plate is kept at a constant temperature (appr. 120°C over the temperature of the incoming air) 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 air-flow meter does not incorporate the intake air temperature sensor, which is separate and to be found just upstream of the actual 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, which sharply lowers the voltage signal sent to the control unit when the tooth machined on the camshaft pulley passes in front of the sensor: therefore a signal is sent every two turns of the crankshaft.

Conversely, the rpm sensor sends a reference signal for each turn of the engine and each subsequent tooth of the phonic

wheel informs the control unit of an increase of the angular position of the crankshaft, so that injection is sent correctly to the suitable cylinder, and the spark to the corresponding pair of cylinders.

### Fuel pump

The complex control logic of the fuel pump carried out by the control unit (mainly based on the rpm signal) immediately cuts off the supply to the pump 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 important 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.

### Timing variator

This T.SPARK 16 valve engine is fitted with an electro-mechanical-hydraulic timing variator which is connected to the camshaft and controls and adjusts intake timing (advance) in such a way that a larger amount of air is taken in. This device is activated by the control unit only after exceeding a determinate rpm and engine load to avoid adversely affecting correct operation of the engine at low speeds.

### Exhaust gas recirculation

NOx (nitric oxides) are generated by the high temperatures in the combustion chamber.

To reduce these emissions an E.G.R. (Exhaust Gas Recirculation) system is

adopted which by recirculating part of the exhaust gases, lowers the temperature, thus the NOx produced, in the combustion chambers. In fact, part of the exhaust gas is withdrawn through the special EGR Valve and re-admitted to the intake box where it is mixed with the inhaled air and burnt again in the engine.

The EGR valve is modulated by a solenoid valve controlled by the injection control unit, and owing to the type of control it is possible to optimise fuel consumption, in addition to reducing NOx.

The percentage of exhaust gas to be returned to the engine is established by the control unit taking account of a specific characteristic curve which depends on the load, speed and temperature of the engine.

## OPERATING LOGIC

- Identification of the "operating point":

The "engine catching point" is located mainly 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 and timed", 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 intake

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 rpm falls rapidly towards idle speed, thereby reducing speed and fuel consumption. The cut-off threshold value 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 fitted directly on the throttle body which acts on the throttle by-pass. This also acts as a regulator for the cutting in of the various services (eg. 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.

The system also commands the turning on of the radiator cooling fans, if necessary, compensating the engine idle speed.

#### - 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 value.

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 therefore possible to adjust engine carburetion precisely. Among other items, this makes it possible to meet emission limit regulations.

#### - Timing variator control:

The electro-mechanical-hydraulic timing variator, connected to the camshaft, controls and adjusts the intake timing according to the load and rpm of the engine. This device is activated by the control unit at higher engine operating speeds (above 1.600 rpm and with load above 30%).

#### - Knocking control:

Through a knock sensor the control unit is informed if any ping or "knocking" occurs and it corrects the spark advance "delaying" it accordingly.

#### - 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.

#### - E.G.R. valve control:

The percentage of exhaust gas to be returned to the engine is determined by the control unit taking account of a specific characteristic curve which depends on the engine load and speed: recirculation is only activated when the engine speed is between 2500 and 4000 rpm, also in relation to the temperature of the engine (higher recirculation percentage with high temperatures).

#### - Connection with the air conditioner compressor:

the control unit is connected with the air conditioner compressor and it cuts in the compressor in relation to operation of the engine. As this service absorbs a considerable amount of power, the control unit:

- adapts the engine idle speed each time the compressor is engaged; if the speed falls below the idle speed rate, the compressor is cut off;

- in the event of the need for high power, over 6000 rpm (high throttle opening speed), or full load, or high engine temperature (above 117°C), the compressor is momentarily disengaged;

- when the engine is started it prevents the compressor from being engaged until normal operating conditions are reached.

#### - Connection with the radiator cooling fan:

in this version the cooling fan control thermal contact on the radiator has been eliminated. The command to the fan for 1st and 2nd speed is supplied by the injection control unit, in relation to the temperature measured by the engine coolant temperature sensor of the MOTRONIC system.

#### - CODE system:

On cars fitted with "electronic key" (ALFA ROMEO CODE), as soon as the Motronic control unit receives the signal that the key is at "MARCIA", it "asks" the ALFA ROMEO CODE system for consent to start the engine; this consent is given only if the ALFA ROMEO CODE control unit recognizes the code of the key engaged in the ignition switch as correct. This dialogue between the two control units takes place on diagnosis line K already used for the Alfa Romeo Tester.

#### - Self-diagnosis:

The control unit possesses a diagnosis system, which continuously monitors the plausibility of the signals from the various sensors and compares them with the limits allowed; if these limits are exceeded, the system detects a fault and turns on the corresponding warning light on the instrument cluster.

The warning light turns on when the engine is started to indicate the initial test of the entire system (appr. 4 seconds), it then turns off if no errors have been memorised; otherwise it stays on.

For certain parameters, the control unit replaces the abnormal values with suitable ones so that the car can "limp" to a point of the Service Network.

These "recovery" values depend on the other correct signals and they are defined individually by the control unit operating logic.

The self-diagnosis system also enables quick and effective location of faults connecting with the ALFA ROMEO Tester (see "Fault-finding"), through which all the errors memorised can be displayed. It is also possible to check the operating parameters recorded by the control unit and operate the single actuators to check whether they are working properly.

#### COMPONENTS

The electronic control unit receives the signals leading from the sensors which measure the engine operating parameters. 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 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);
- knock sensor (S20);

The actuators are the following:

- electroinjectors (S3);
- ignition coils (A8);
- fuel pump (P18);
- idle adjustment actuator (S29);
- vapour recovery solenoid valve (M15);
- E.G.R. solenoid valve (L46);
- timing variator (S15).

The control unit is also connected with:

- the climate control unit;

- the cooling system, to which it sends the command to engage the fan;

- the ALFA ROMEO CODE control unit (N77);

- the instrument cluster (C10) to which it supplies the signal for turning on the diagnosis warning light and for the rev counter;

- the tachometric 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 the fuel pump relay S12a operate the fuel pump, the injectors, the coils and the other components of the system, while the fourth - the timing variator relay (S12c) - supplies the timing variator solenoid.

The supply line for the entire system is protected by fuse S36; other special fuses protect the pump (S47), and the lambda probe resistance (S45).

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

Connector T1 enables connection with the ALFA ROMEO Tester; this is located in the engine compartment in an accessible position.

#### FUNCTIONAL DESCRIPTION

The Motronic control unit S11 controls and adjusts the entire electronic ignition and injection system; all the system supplies are protected by fuse S36 (40A).

The control unit is supplied at pin 18 directly by the battery through fuse S36. 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 switch S41, acts as supply relay for the whole system; it is energised by a command signal - earth - leading from pin 36 of the control unit, as a result it sends the supply (12V) to pin 37 of the control unit, to the fuel pump relay S12a, timing variator relay S12c, fuel vapour solenoid valve M15, idle actuator S29, EGR solenoid valve L46, air flow meter S5 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 coils A8.

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 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 sensors, 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 (60-2 teeth) fitted on the crankshaft.

The cam angle sensor S52 (timing sensor), supplied at 5 V by pin 12 of the control unit, and sends a signal in frequency corresponding to the phase to pin 8 of the control unit itself; these two signals are very low in intensity and are therefore suitably screened.

The sensor comprises a Hall effect device due to which the voltage signal sent to the control unit "lowers" abruptly when the hollow 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 (8A).

The throttle body sensor S38, is supplied by the control unit from pins 12 and 30 and through a potentiometer it sends a signal to pin 53 which is proportionate with the degree of opening of the throttle itself.

The engine temperature sensor S7, connected to the electronic 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 inlaken air temperature sensor S34, connected to the electronic earth at pin 30, supplies a signal at pin 34 that is proportionate with the temperature of the air entering the intake box, selected with an NTC material (resistance that lowers with the temperature).

The knock sensor S20, through a frequency signal sent to pin 11 of the control unit, supplies information about the knocking conditions, while an electronic earth leads from pin 30; these two signals are very low in intensity; and are therefore suitably screened.

The sensor comprises a piezoelectric plate which detects the vibrations produced when the engine is running, exploiting a particular characteristic of pie-

zoelectric materials which generate an output voltage when subjected to mechanical stresses; this voltage is filtered and analysed by the control unit which corrects the ignition parameters accordingly.

The air flow meter S5, is supplied by the relay S41; from pin 30 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 channel 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.

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), 34 (cyl. 2), 16 (cyl. 3) and 35 (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.

From this lead the command signals (earth) for the main windings of the coils A8, while the secondary sends the pulse to the spark plugs A12; from pin 1 and 21 for cylinders 1-4 and from pin 38 and 20 for cylinders 2-3.

The primary windings of the coils 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, and this comprises two windings: one opens and the other closes a valve that adjusts the gap of the by-pass section; it is controlled by the control unit through the duty-cycle signals of pins 22 (closing) and 4 (opening).

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

The E.G.R. solenoid valve L46, controlled by the control unit, operates the actual E.G.R. valve modulating its opening; the latter is a vacuum-operated diaphragm valve; the electro-pneumatic valve works by changing this vacuum which is withdrawn from the same "takeoff" used for the servobrake.

The solenoid valve is controlled from pin 33 of the control unit while it is supplied at 12 V by main relay S41.

The timing variator S15 mechanically controls timing advance at the intake; it is operated by the corresponding relay S12c; this relay is supplied by relay S41 and it is energized via a negative signal from the control unit (pin 52), thus supplying the timing variator S15; this signal operates the actuator which controls the flow of oil in the hydraulic unit of the device that adjusts camshaft rotation.

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 "Check Engine" warning light on the cluster C10 leads 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 "Climate control" section.

The control unit S11 controls and adjusts the system for engaging the engine water cooling fan P2.

Pins 26 and 25 send the command re-engage the first and second fanspeed, while pin 44 receives from the binary Q20 consent (earth) for engaging the second speed, which is "relayed" via pin 25.

This is necessary when the car is at a

standstill to enhance thermal exchange at the condenser, thereby avoiding a pressure build up in the system.

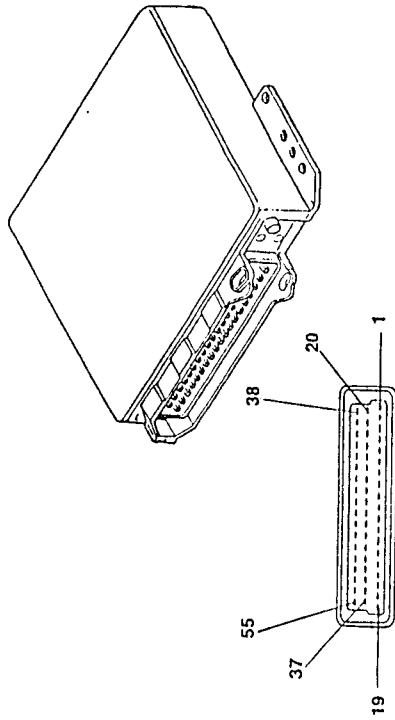
The control unit S11 is connected from pin 47 with the ALFA ROMEO CODE control unit N77 through a serial line; if the ALFA ROMEO CODE system does not recognise a correct "key code" it will not enable the Motronic control unit to start the engine.

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 the diagnosis line K - pin 55 -, while the earth leads from G60.

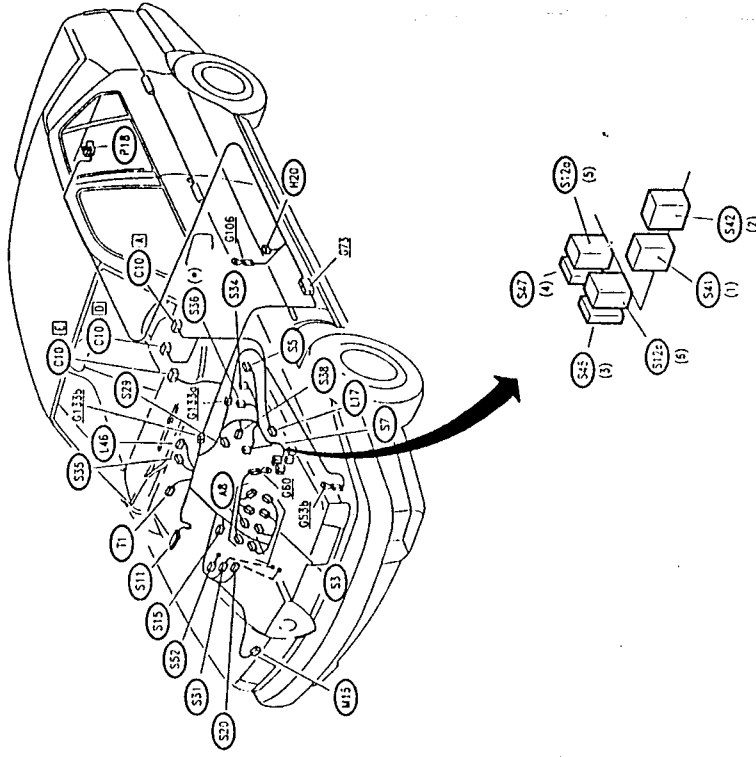


LOCATION OF COMPONENTS



CONTROL UNIT PIN-OUTS

- 1. Ignition coil control - cyl. 1 and 4 \*
- 2. Earth for ignition
- 3. Fuel pump relay control
- 4. Idle 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 earth
- 11. Knock sensor signal
- 12. Stabilized voltage (5V) for sensors
- 13. N.C.
- 14. Earth for injectors
- 15. N.C.
- 16. Cyl. 3 injector
- 17. Cyl. 1 injector
- 18. Direct supply
- 19. Electronic screening earth
- 20. Ignition coil control - cyl. 3 and 2
- 21. Ignition coil control - cyl. 4 and 1
- 22. Idle speed actuator control - closing
- 23. N.C.
- 24. Earth for final stages
- 25. Fan 2nd speed command
- 26. Fan 1st speed command
- 27. "Key-operated" supply, from secondary relay
- 28. Lambda probe signal
- 29. N.C.
- 30. Electronic earth for sensors
- 31. N.C.
- 32. Conditioner compressor relay control
- 33. E.G.R. solenoid valve control
- 34. Injector cyl. 2
- 35. Injector cyl. 4
- 36. Main relay control
- 37. Supply from main relay
- 38. Cyl. 2 and 3 ignition coil control
- 39. N.C.
- 40. Conditioning system control
- 41. Compressor cut-in request
- 42. N.C.
- 43. N.C.
- 44. Trinary signal
- 45. Engine temperature signal
- 46. N.C.
- 47. Connection line with ALFA ROMEO CODE
- 48. Signal for rpm sensor
- 49. Rpm sensor signal
- 50. N.C.
- 51. "Check Engine" warning light
- 52. Timing vanator control
- 53. Throttle position signal
- 54. Intaken air temperature signal
- 55. Diagnosis line K



- (\*) Black fuseholder
- (1) Black base
- (2) Black base
- (3) Brown fuseholder
- (4) Red fuseholder
- (5) Black base
- (6) Black base

## CHECKING COMPONENTS

See Models 2.0 T. SPARK 16V (Version '95) with the exception of the following.

PRELIMINARY CHECK OF THE BOSCH M2.10 SYSTEM	TEST A
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NOTE: Check beforehand that the ALFA ROMEO CODE is working properly which might have cut off the supply to the system!

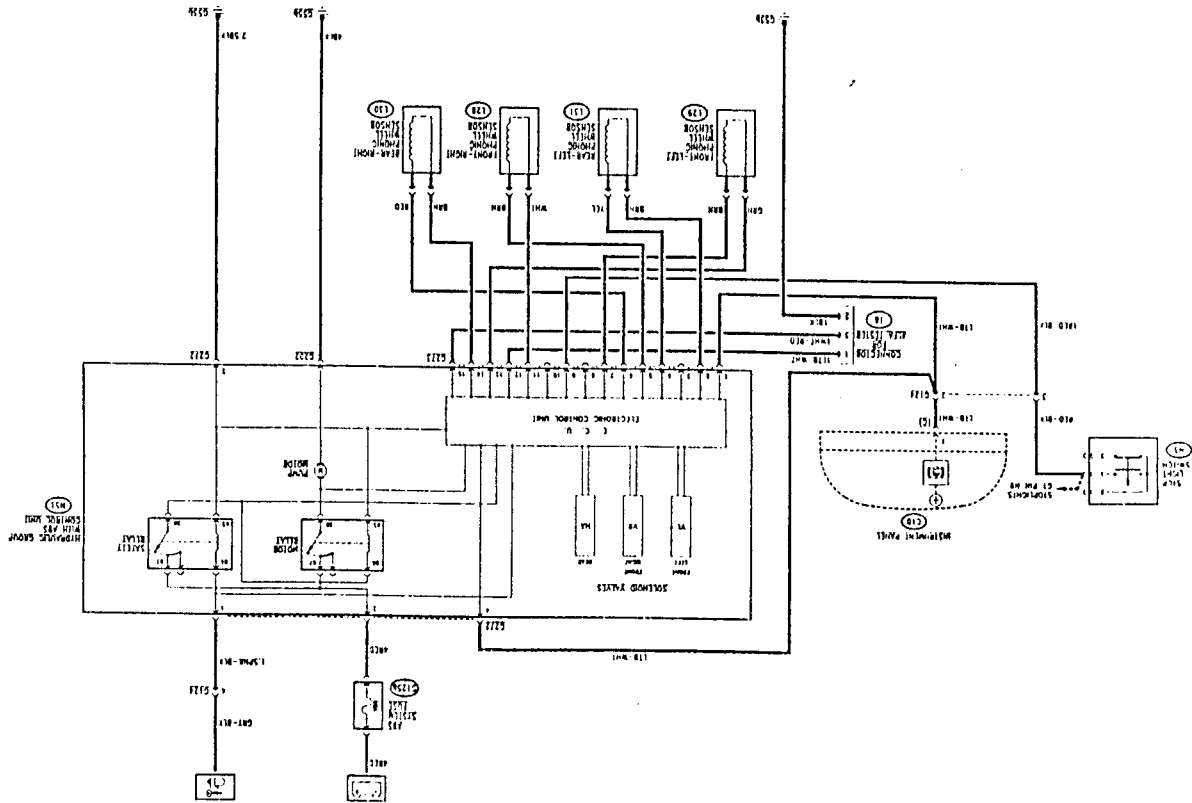
TEST PROCEDURE	RESULT	CORRECTIVE ACTION
<b>A1</b> CHECK FUSE - Check intactness of fuses S36 and S47	OK <del>OK</del>	Carry out step A2  Change fuses S36: 40A S47: 10A
<b>A2</b> CHECK VOLTAGE - Check for 12 V at pin 30 of relays S41, S42 and S12a and also at pin 86 of S41	OK <del>OK</del>	Carry out step A3  Restore the wiring between the battery A1 and relays S41, S42 and S12a
<b>A3</b> CHECK VOLTAGE - With the key turned, check for 12 V at pin 85 of relay S42	OK <del>OK</del>	Carry out step A4  Restore the wiring between the ignition switch B1 and relay S42
<b>A4</b> CHECK RELAYS - Check the correct operation of relays S41, S42 and S12a	OK <del>OK</del>	Carry out step A5  Change any faulty relays
<b>A5</b> 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 approx. 0 V (very low voltage) at pin 3 and 36 of S11	OK <del>OK</del>	Carry out step A6  Restore the wiring between the control unit S11 and the relays and between the control unit and fuse S36
<b>A6</b> CHECK EARTH - Check for an earth at pins 19 and 24. Also check for an earth at pin 86 of S42	OK <del>OK</del>	CONTINUE DIAGNOSIS USING THE ALFA ROMEO TESTER  Restore the wiring between S11 and the relays and earth G60

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## ABS SYSTEM

WIRING DIAGRAM



GENERAL DESCRIPTION

The vehicle is equipped with an electronic system to prevent the wheels of the vehicle from locking (ABS).

This system regulates the braking pressure transmitted to the wheels, preventing loss of road-holding under all tyre and road conditions.

The system has been designed to intervene, and not substitute, the normal mechanical braking system, guaranteeing a high degree of safety in the event of a braking anomaly. The intervention is carried out on the same brake fluid found in traditional mechanical circuits. Four sensors located on the four wheels communicate the speed of the wheels to the control unit, showing up locking situations affecting the wheels, skidding and loss of road-holding.

In these situations, the control unit actuates solenoid valves which regulate the pressure in the hydraulic circuit, eliminating wheel locking and restoring road-holding which means that braking distance is reduced to a minimum without loss of steering control.

There are only three solenoid regulating valves in this version of the system: one for each of the two front wheels and one common to both the rear wheels which are regulated in parallel by a sequential control valve.

The system is composed of:

- four magnetic induction sensors which measure wheel speed L28; L29; L30; L31.
- an integrated hydraulic/electronic control unit N51, where the following components are located:
  - electronic control module

FUNCTIONAL DESCRIPTION

The key-operated supply powers the coil of the safety relay via pin 1 of connector G272. The safety relay is located inside control unit N51, which supplies the electronic module and the engine relay coil with battery voltage, coming from pin 2 of G272 - through the line of wander fuse G125b (60A). Following a command from the electronic module, this actuates the pump motor.

The electronic module and the relays are connected to ground via pin 3 of connector G272, while the pump is grounded through connector G202. Inside the control unit, the module is connected to the three regulating solenoid valves while externally it is connected via connector G273, to the four sensors L28 - L29 - L30 - L31 which signal the speed of the individual wheels, and to the brake switch H3. The consensus signal from the brake switch prevents the system from intervening when the brake pedal is not depressed.

When the control unit detects a problem via the self-diagnosis function, it sends a signal to the instrument panel C10 which then lights up the "ABS malfunction" warning lamp: this signal is deleted upon the malfunctioning of the electronic module - pin 1 of connector G273 - or of the hydraulic control - pin 4 of G272.

The diagnosis connector T8, can be used to connect the control unit to the ALFA ROMEO Tester or to permit "reading" of the flashing code (see Troubleshooting).

- three solenoid valves
- brake fluid pump
- safety relay
- pump control relay
- self-diagnosis connector T8
- brake switch H3 (the same switch which also lights up the stop lights) which signals the braking state to the system.

The ABS system includes a self-diagnosis system which continually monitors all the components and the operating parameters of the system. In the event of a malfunction or fault the system automatically cuts itself out leaving the traditional servo-assisted braking system operational; this is communicated to the driver by way of the warning lamp located on the instrument panel.

Connecting up to the diagnosis connector (T8) located near the control unit, it is possible to use the signals of the flashing code to rapidly identify the faulty component (see Troubleshooting). The connector T8 can also be used to connect the ALFA ROMEO Tester system.

The "ABS malfunction" warning lamp also comes on when the vehicle is started and will go out after a few seconds, thus signalling to the driver that the initial system testing has been carried out and no anomaly found.

**TROUBLESHOOTING USING THE SELF-DIAGNOSIS FUNCTION**

The self-diagnosis function with which this system is equipped makes a rapid identification of the faulty components possible by following the indications given by a FLASHING CODE which is actuated in the following way:

- connect the line of pin 1, connector T8 to ground (LTB- WHHT)
- provide power to the ABS control unit N51 (key-operated supply)
- read the sequence of impulses which appear on the "ABS malfunction" warning light located on the instrument panel C10:
- code "12" will appear three times to indicate correct operation: if this does not occur, carry out test A

- the codes of the stored errors will appear (each repeated three times): carry out the test indicated in the following table
- code "12" will appear another three times to indicate the end of the sequence

**NOTE:** To reset the stored codes, disconnect the line of pin 1, connector T8 and actuate the ignition switch 20 times (or use the ALFA ROMEO Tester)

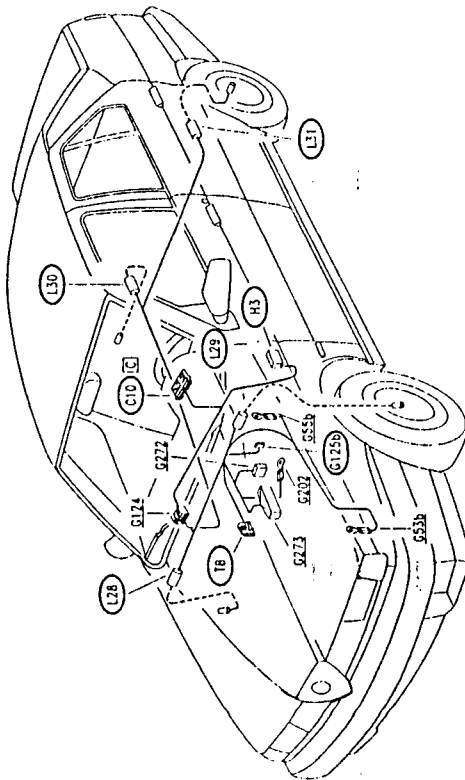
**TROUBLESHOOTING TABLE**

CODE	MALFUNCTION	SEE TEST
12 No code 16	Beginning and end of diagnosis diagnosis Faulty front left solenoid valve (VL)	<p><b>A</b> Check solenoid valve impedance (1.5-2.5 Ω) and the connections between control unit and solenoid valve; if necessary replace the solenoid valve</p> <p>Check solenoid valve impedance (1.5-2.5 Ω) and the connections between control unit and solenoid valve; if necessary replace the solenoid valve</p> <p>Check solenoid valve impedance (1.5-2.5 Ω) and the connections between control unit and solenoid valve; if necessary replace the solenoid valve</p> <p><b>B</b> Replace the affected phonic wheel (see "REPAIR MANUAL-MECHANICAL UNITS" - Group 22)</p> <p><b>C</b></p> <p><b>D</b> Check sensor impedance (approximately 1 KΩ); replace it if necessary. Carry out successive test E.</p> <p><b>E</b> Check sensor impedance (approximately 1 KΩ); replace it if necessary. Carry out successive test F.</p> <p><b>F</b> Check sensor impedance (approximately 1 KΩ); replace it if necessary. Carry out successive test G.</p> <p><b>G</b> Check sensor impedance (approximately 1 KΩ); replace it if necessary. Carry out successive test H.</p> <p><b>H</b></p> <p><b>I</b> Replace the control unit, located in N51</p>
17	Faulty front right solenoid valve (VR)	
18	Faulty rear (HA) solenoid valve	
19	Faulty safety relay	
25	Incorrect number of teeth on phonic wheel	
35	Faulty pump motor	
37	Faulty brake switch (H3)	
39	Faulty front left sensor (L29)	
41	Front left sensor (L29) not connected	
42	Faulty front right sensor (L28)	
43	Front right sensor (L28) not connected	
44	Faulty rear left sensor (L31)	
45	Rear left sensor (L31) not connected	
46	Faulty rear right sensor (L30)	
47	Rear right sensor (L30) not connected	
48	Insufficient voltage	
55	Faulty electronic control unit	

**AUTOMATIC CHECKING UPON IGNITION:**

when the vehicle is started the "ABS malfunction" warning lamp located on the instrument panel will come on for approximately 2 secs., and will then go out indicating that the system is operating correctly. If the lamp stays on, carry out diagnosis using the flashing code as shown above. If the warning lamp does not come on, carry out test A.

**LOCATION OF COMPONENTS**



FAULT DIAGNOSIS

GENERAL SYSTEM MALFUNCTION		TEST A	
TEST STEP	RESULT	CORRECTIVE ACTION	
A1   CHECK RELAY - Check the safety relay (in group N51)	OK <del>OK</del>	Carry out step A2 Replace the relay if faulty	
A2   CHECK VOLTAGE - Check for 12 V at pin 2 of G272	OK <del>OK</del>	Carry out step A3 Check fuse G125b (60A). restore wiring between pin 2 of G272 and G125b	
A3   CHECK VOLTAGE - Engage the ignition key and check for 12 V at pin 1 of G272	OK <del>OK</del>	carry out step A4 Restore wiring between pin 1 of G272 and ignition block B1	
A4   CHECK GROUND - Check that G202 is grounded	OK <del>OK</del>	carry out step A5 Restore wiring between G202 and ground G55b	
A5   CHECK GROUND - Check that pin 3 of G272 is grounded	OK <del>OK</del>	carry out step A6 Restore wiring between pin 3 of G272 and ground G53b	
A6   CHECK CONTINUITY - Check continuity between pin 12 of G273 and pin 1 of connector TB	OK <del>OK</del>	carry out step A7 Restore wiring between pin 12 of G273 and connector TB	

(continues)

GENERAL SYSTEM MALFUNCTION

TEST A

TEST STEP	RESULT	CORRECTIVE ACTION
A7   CHECK GROUND SIGNAL - Engage the ignition key and check, for a few seconds 0V at pin C2 of instrument panel C10	OK <del>OK</del>	Replace the "ABS malfunction" warning light on instrument panel C10 Carry out step A8
A8   CHECK GROUND SIGNAL - Engage the ignition key and check, for a few seconds 0V at pin 1 of G273	OK <del>OK</del>	Restore wiring between pin 1 of G273 and C10 Replace the electronic control unit contained in N51

FAULTY SAFETY RELAY

TEST B

TEST STEP	RESULT	CORRECTIVE ACTION
B1   CHECK RELAY - Check for correct operation of safety relay, (in group N51)	OK <del>OK</del>	carry out step B2 Replace the relay
B2   CHECK VOLTAGE - Check for 12 V at pin B7 of safety relay	OK <del>OK</del>	carry out step B3 In this case there are probably some interruptions in the connection between pin 2 of G272 and pin B7 of the safety relay. Replace the group N51
B3   CHECK VOLTAGE - Engage the ignition key and check for 12 V at pin B6 of safety relay	OK <del>OK</del>	carry out step B4 In this case there are probably interruptions between pin 1 of G272 and pin B6 of safety relay. Replace group N51
B4   CHECK VOLTAGE - Engage the ignition key and check for 12V at pin B6 of engine relay	OK <del>OK</del>	Replace the engine relay (see also test C) Replace group N51

FAULTY ENGINE PUMP		TEST C
TEST STEP	RESULT	CORRECTIVE ACTION
C1 CHECK RELAY - Check for correct operation of the engine relay (in group N51)	OK	carry out step C2
	<del>OK</del>	Replace the relay, contained in N51
C2 CHECK VOLTAGE - Check for 12 V at pin 87 of engine relay	OK	carry out step C3
	<del>OK</del>	In this case there are probably interruptions between pin 2 of G272 and pin 87 of engine relay. Replace group N51
C3 CHECK VOLTAGE - Engage the ignition key and check for 12 V at pin 86 of engine relay	OK	carry out step C4
	<del>OK</del>	Check safety relay (see test B). Otherwise there are probably interruptions in the connection between pin 30 of safety relay and pin 86 of engine relay. Replace group N51
C4 CHECK GROUND - Check that the eye G202 is grounded	OK	carry out step C5
	<del>OK</del>	Restore wiring between G202 and ground G55b
C5 CHECK GROUND - Check for 0 V at pin (-) of engine pump	OK	carry out step C6
	<del>OK</del>	In this case there are probably interruptions between pin (-) of engine pump and G202. Replace group N51
C6 CHECK PUMP - Bridge pins 30 and 87 of engine relay. Check that the engine pump functions normally	OK	If necessary check the hydraulic brake circuit. (see "1.55 - REPAIR MANUAL" - MECHANICAL GROUPS - Group 22)
	<del>OK</del>	Replace group N51, together with engine pumps

FAULTY BRAKE SWITCH		TEST D
TEST STEP	RESULT	CORRECTIVE ACTION
D1 CHECK BRAKE LIGHTS - Check for correct operation of the brake lights	OK	carry out step D2
	<del>OK</del>	Replace the stop light switch H3, or follow the indications given in the section "Stop lights".
D2 CHECK VOLTAGE - With pedal pressed, check for 12V at pin 9 of G273	OK	Check and if necessary replace the electronic control unit contained in N51
	<del>OK</del>	Restore wiring between G273 and H3

FRONT LEFT-HAND SENSOR NOT CONNECTED		TEST E
TEST STEP	RESULT	CORRECTIVE ACTION
E1 CHECK FOR OPEN CIRCUIT - Engage the ignition key and check for open circuit between pins 7 and 13 of G273	OK	carry out step E2
	<del>OK</del>	carry out step E3
E2 CHECK CONTINUITY - Disconnect sensor L29 and check continuity between sensor and pin 7 of G273, and between sensor and pin 13 of G273	OK	Check and if necessary replace the sensor L29.
	<del>OK</del>	Restore wiring between sensor L29 and pin 7 and 13 of G273
E3 CHECK CIRCUIT OPEN - Disconnect sensor L29 and check for circuit open between pins 7 and 13 of G273 (wiring side)	OK	Check and if necessary replace sensor L29.
	<del>OK</del>	Restore the wiring eliminating the short-circuit between the BRN and GRN cables connecting L29 with G273

FRONT RIGHT-HAND SENSOR NOT CONNECTED		TEST F
TEST STEP	RESULT	CORRECTIVE ACTION
<b>F1</b> CHECK CIRCUIT OPEN - Engage the ignition key and check for circuit open between pins 5 and 11 of G273	OK <del>OK</del>	carry out step F2 carry out step F3
<b>F2</b> CHECK CONTINUITY - Disconnect the sensor L28 and check for continuity between the sensor and pin 5 of G273, and between sensor and pin 11 of G273	OK <del>OK</del>	Check and if necessary replace sensor L28. Restore wiring between sensor L28 and pin 5 and 11 of G273
<b>F3</b> CHECK FOR CIRCUIT OPEN - Disconnect the sensor L28 and check for circuit open between pins 5 and 11 of G273 (wiring side)	OK <del>OK</del>	Check and if necessary replace sensor L28. Restore the wiring eliminating the short circuit between the BRN WHT cables connecting L28 with G273

REAR LEFT-HAND SENSOR NOT CONNECTED		TEST G
TEST STEP	RESULT	CORRECTIVE ACTION
<b>G1</b> CHECK CIRCUIT OPEN - Engage the ignition key and check for circuit open between pins 4 and 2 of G273	OK <del>OK</del>	carry out step G2 carry out step G3
<b>G2</b> CHECK CONTINUITY - Disconnect the sensor L31 and check continuity between the sensor and pin 4 of G273, and between the sensor and pin 2 of G273	OK <del>OK</del>	Check and if necessary replace sensor L31. Restore wiring between sensor L31 and pin 2 and 4 of G273
<b>G3</b> CHECK CIRCUIT OPEN - Disconnect the sensor L31 and check for circuit open between pins 4 and 2 of G273 (wiring side)	OK <del>OK</del>	Check and if necessary replace sensor L31. Restore the wiring eliminating the short-circuit between the BRN and YEL cables connecting L31 con G273

REAR RIGHT-HAND SENSOR NOT CONNECTED		TEST H
TEST STEP	RESULT	CORRECTIVE ACTION
<b>H1</b> CHECK CIRCUIT OPEN - Engage the ignition key and check for circuit open between pins 6 and 14 of G273	OK <del>OK</del>	carry out step H2 carry out step H3
<b>H2</b> CHECK CONTINUITY - Disconnect the sensor L30 and check continuity between the sensor and pin 6 of G273, and between the sensor and pin 14 of G273	OK <del>OK</del>	Check and if necessary replace sensor L30. Restore wiring between sensor L30 and pin 6 and 14 of G273
<b>H3</b> CHECK CIRCUIT OPEN - Disconnect the sensor L28 and check for circuit open between pins 6 and 14 of G273 (wiring side)	OK <del>OK</del>	Check and if necessary replace sensor L30. Restore the wiring eliminating the short-circuit between the BRN and RED cables connecting L30 con G273

INSUFFICIENT POWER SUPPLY VOLTAGE		TEST I
TEST STEP	RESULT	CORRECTIVE ACTION
<b>I1</b> CHECK VOLTAGE - Check that the battery voltage is 12V	OK <del>OK</del>	carry out step I2 Restore the correct voltage recharging or replacing the battery A1 NOTE: if the voltage in the battery falls, below 12 V, even if only slightly this and other electronic systems could be negatively affected
<b>I2</b> CHECK FUSE - Check fuse G125b (60A)	OK <del>OK</del>	carry out step I3 Restore wiring between pin 2 of G272 and G125b
<b>I3</b> CHECK VOLTAGE - With ignition key engaged, check for a voltage of 12 V at pin 1 of G272	OK <del>OK</del>	Check the state of the connector. Check and if necessary replace the electronic control unit contained in N51 Restore wiring between pin 1 of G272 and the ignition switch B1

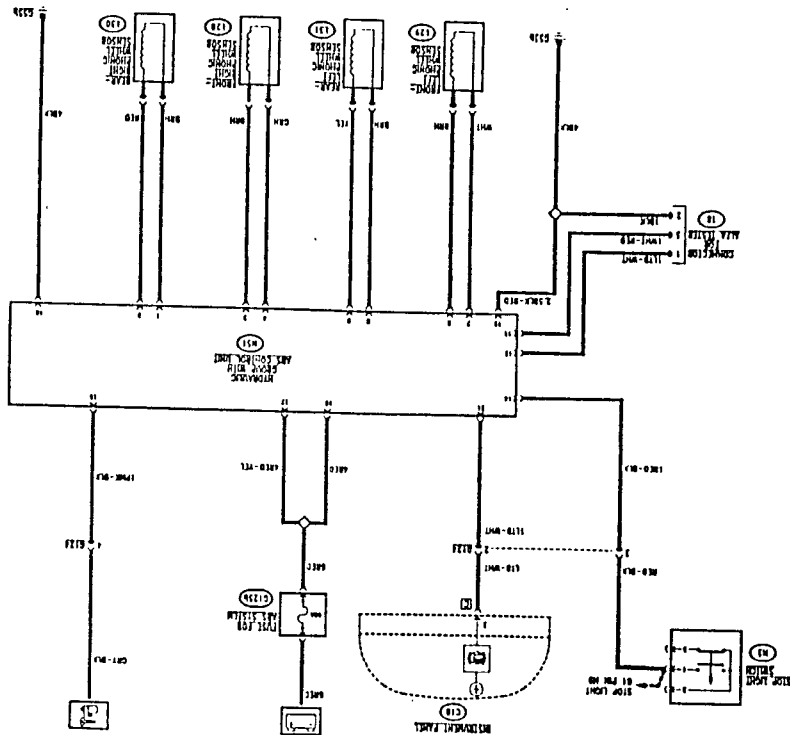
## ABS SYSTEM (BOSCH ABS 5.3)

### INDEX

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WIRING DIAGRAM



GENERAL DESCRIPTION

The electronic wheel anti-lock system (BOSCH ABS 5.3) adjusts the braking pressure transmitted to the wheels preventing loss of road-holding under all tyre and road conditions.

The system has been designed to integrate, and not replace, the normal mechanical braking system, guaranteeing a high degree of safety in the event of a failure: in fact it operates on the same brake fluid as the conventional mechanical circuit.

Four sensors, located on the four wheels, inform the electronic control unit of the speed of each wheel continuously, thereby recording locking situations affecting the wheels, skidding and loss of grip.

In these situations, the control unit suitably operates the solenoid valves that modulate the pressure in the hydraulic circuit, eliminating wheel locking and bringing the car back to the limit of road-holding, which means that the braking distance is reduced to a minimum, without losing control of steering.

The adjustment solenoid valves are, in this version of the system, two (one for pressure charging and one for relief) for each wheel.

For further details on the hydraulic operation of the system see GROUP 1-BRAKES.

Components

The system comprises:

- four magnetic induction sensors which read the speed of the wheels: L28, L29, L30, L31.
- the integrated electronic and hydraulic control unit N51, which houses the following:
  - the electronic control module (CPU)
  - the eight solenoid valves
  - two brake fluid pumps with corresponding motor
  - two damping accumulators and two reservoirs
  - a safety valve

- the connector for self-diagnosis T8
- the brake switch H3 (the same that turns on the stop lights) which signals the system the braking condition.

The ABS includes a self-diagnosis system which continually monitors all the system parameters and components: in the event of a failure or fault, the system cuts itself off automatically leaving the conventional servo-assisted mechanical braking system operational: the driver is alerted of this situation by a special warning light on the instrument cluster (C10).

Suitably connecting to the diagnosis connector (T8) located next to the control unit, it is possible to use the signals of the flashing code to quickly locate the faulty component (see "Fault-finding").

The connector T8 can also be used to connect to the ALFA ROMEO Tester system.

FUNCTIONAL DESCRIPTION

System supply:

The key-operated voltage supplies pin 15 of the ABS control unit N51, the battery voltage reaches pin 17 and 18 of the same N51 from the line protected by fuse G125b (60A).

The electronic control unit is connected to earth via pin 19 of N51, while the pump is via pin 16.

Sensors and solenoid valves:

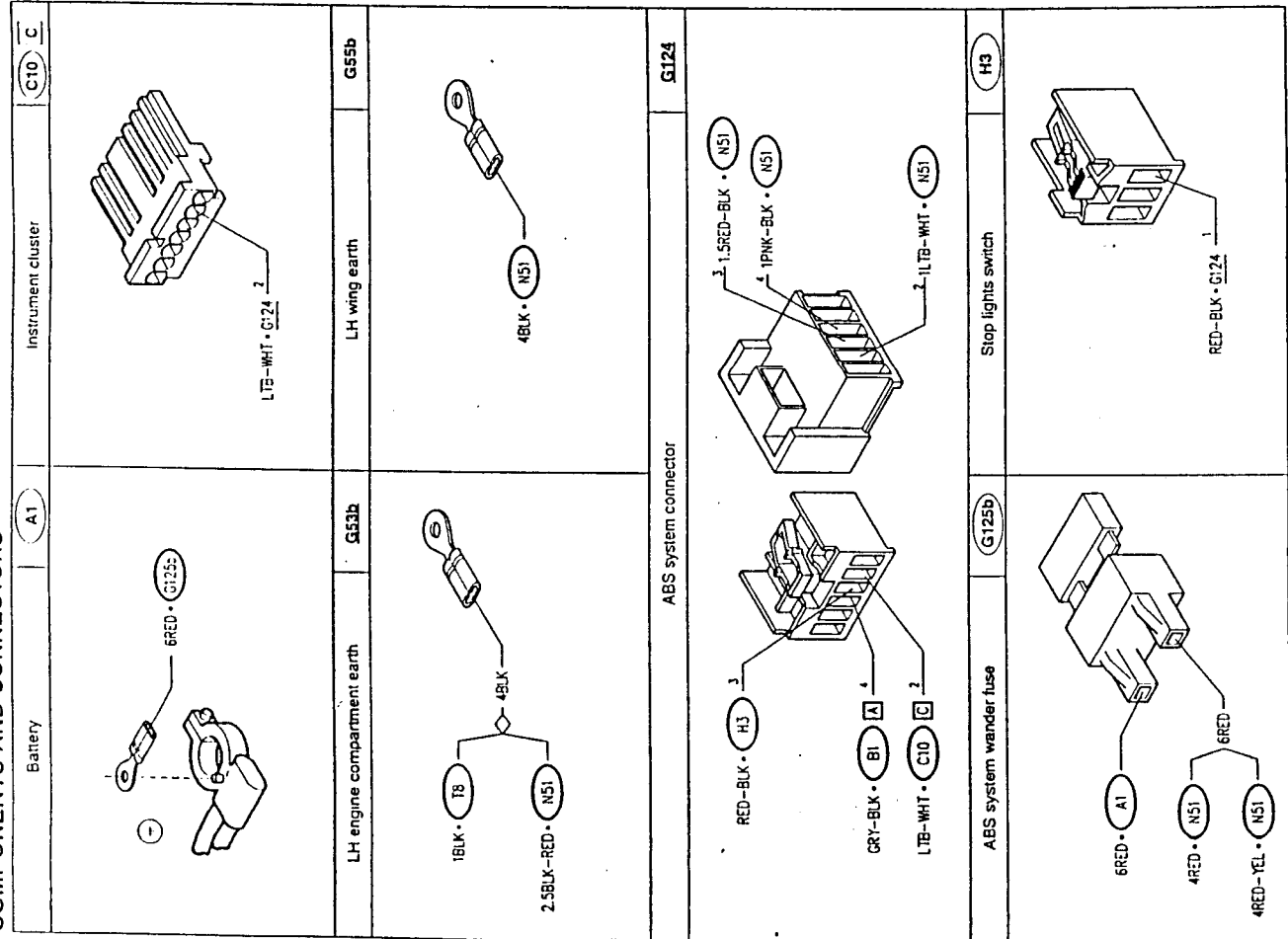
Directly inside the control unit N51, the module is connected with the adjustment solenoid valves, which modulate the pressure on the brakes of the four wheels; outside, it is connected with the four sensors L28 - L29 - L30 - L31 (pin 1-2, 3-4, 6-7 and 8-9) which signal the speed of the single wheels, and with the brake switch H3 (pin 14), which sends a consent signal: in fact the ABS system cannot come into operation if the brake pedal is not pressed.

Self-diagnosis:

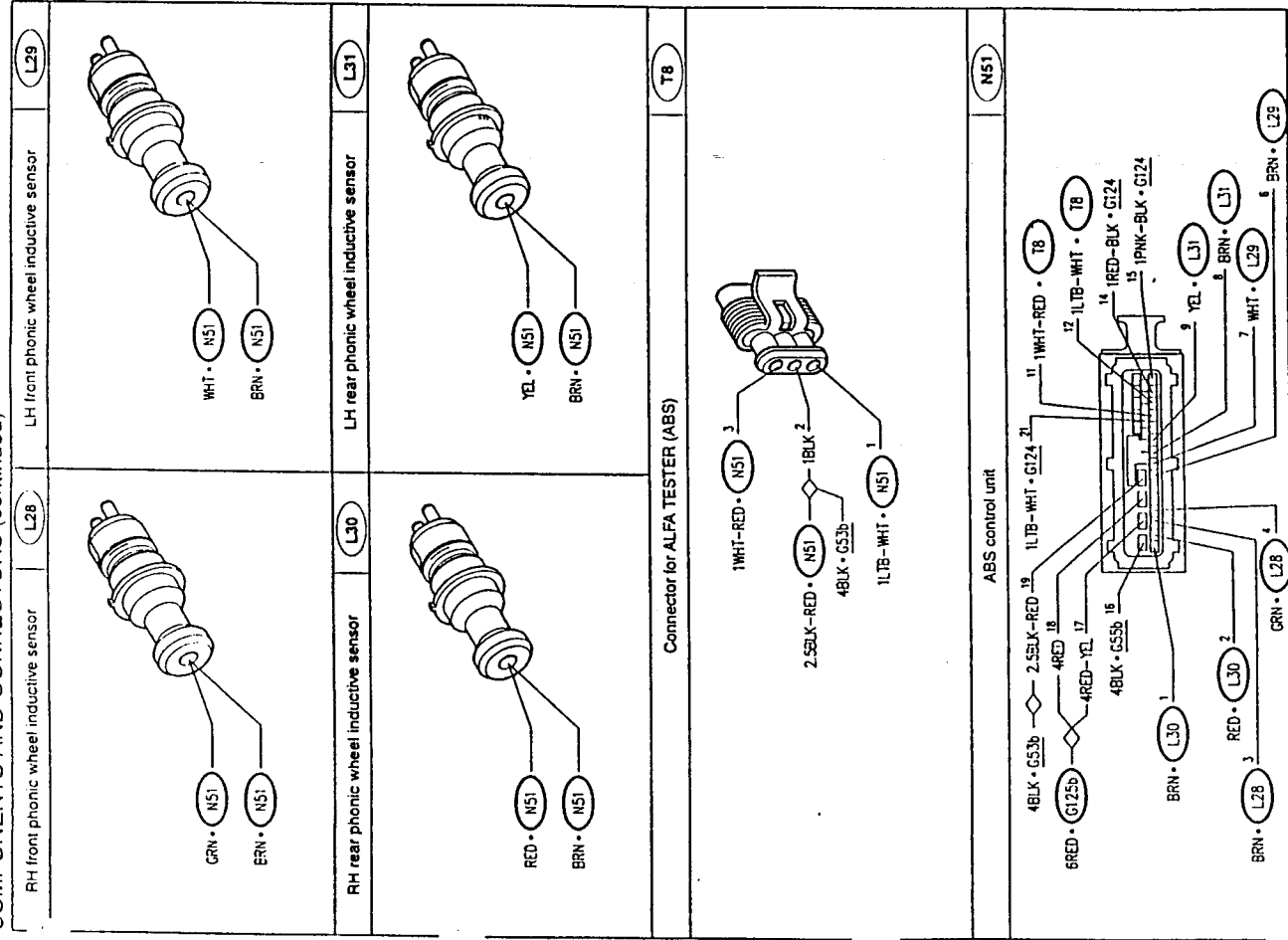
When the control unit detects problems through the self-diagnosis function, it sends a signal to the instrument cluster C10 which turns on the ABS warning light: this signal is sent to pin 21.

The diagnosis connector T8 connected to pin 11, 12 and 19 allows connection of the control unit with the ALFA ROMEO Tester or "reading" of the flashing code (see "Fault-finding").

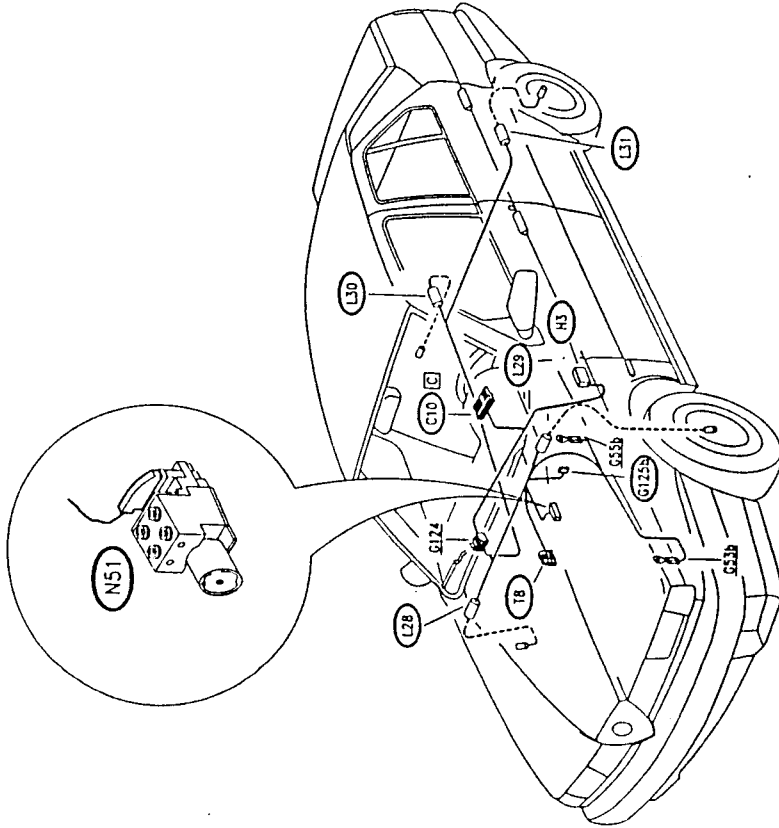
COMPONENTS AND CONNECTORS



COMPONENTS AND CONNECTORS (continued)



LOCATION OF COMPONENTS



FAULT-FINDING

**AUTOMATIC CHECK UPON IGNITION:** when the car is started the "ABS warning light" on the instrument cluster turns on for appr. 2 secs., then it goes off meaning that the system is working properly. If the warning light stays on, carry out diagnosis using the flashing code, as mentioned previously.

If the warning light does not turn on, carry out test H.

**Fault-Finding using the Flashing Code**

The self-diagnosis system with which the system is fitted, makes it possible to quickly locate a faulty component following the instructions of a **FLASHING CODE**, which is activated as follows:

- earth the line of pin 1 of connector T8 (LIGHT BLUE-WHITE cable)

- power the ABS control unit N51 (turning the ignition key to MARCIA)

Read the sequence of flashes on the "ABS warning light" on the instrument cluster C10:

- after appr. 3 seconds for three times code "12" appears, meaning correct operation: if this does not occur, carry out test H

**Fault-finding using the Alfa Romeo Tester**

**N.B.** Before carrying out diagnosis with the Tester, perform the preliminary check described later (TEST A); if the warning light is not working properly also carry out TEST H.

The connection between the TESTER and the control unit must be made as follows:

1. Supply the TESTER either through the cigar lighter socket or connecting directly to the battery using the special lead.

2. Connect the TESTER socket to the control unit (the socket is near the control unit).

The instrument can give the following information:

- parameter display;
- error display;
- active diagnosis.

**Activation of diagnosis**

Diagnostic conversation is started with the engine stopped and the ignition key at MARCIA.

- after another 3 seconds appr. the codes of the errors memorised appear (each repeated three times) at appr. 3 sec. intervals (see table on following page)

- at the end, code "12" appears for another three times, indicating the end of the sequence

- of disconnecting pin 1 of T8, after 2 seconds the system resumes normal operation.

**NOTE:** Resetting the memorised code is obtained by of disconnecting the line of pin 1 of T8 and engaging the ignition switch 20 times (or using the ALFA ROMEO Tester)

PRELIMINARY SYSTEM CHECK

TEST A

TEST PROCEDURE	RESULT	CORRECTIVE ACTION
<b>A1 CHECK FUSE</b> - Check the intactness of wander fuse G125b	OK	Carry out step A2
	OK	Replace the fuse G125b (60A)
<b>A2 CHECK VOLTAGE</b> - Check for 12 V at pin 17 and 18 of N51	OK	Carry out step A3
	OK	Restore the wiring between pin 17 and 18 of N51 and fuse G125b
<b>A3 CHECK VOLTAGE</b> - Turn the ignition key and check for 12 V at pin 15 of N51	OK	Carry out step A4
	OK	Restore the wiring between pin 15 of N51 and the ignition switch
<b>A4 CHECK EARTH</b> - Check that pin 16 of N51 is earthed	OK	Carry out step A5
	OK	Restore the wiring between pin 16 of N51 and earth G55b
<b>A5 CHECK EARTH</b> - Check that pin 19 of N51 is earthed	OK	CONTINUE DIAGNOSIS USING THE ALFA ROMEO TESTER OR FLASHING CODE
	OK	Restore the wiring between pin 19 of N51 and earth G53b

Flashing code table

NOTE: The error code is formed of two digits and is displayed by a number of flashes equaling the first digit followed by a 1 second pause and then a number of flashes equaling the second digit.

CODICE	DESCRIPTION	CORRECTIVE ACTION
12	Start and end of procedure	
No code	Control unit or diagnosis function fault	Carry out test A
16	Faulty LH front load solenoid valve	Replace the solenoid valve
17	Faulty RH front load solenoid valve	Replace the solenoid valve
19	Faulty solenoid valve supply relay	Replace the control unit internal relay
25	Damaged phonic wheel (regardless of which)	Replace the phonic wheel (see GROUP 22)
26	Faulty LH rear load solenoid valve	Replace the solenoid valve
27	Faulty RH rear load solenoid valve	Replace the solenoid valve
28	Faulty LH front relief solenoid valve	Replace the solenoid valve
29	Faulty RH front relief solenoid valve	Replace the solenoid valve
31	Faulty LH rear relief solenoid valve	Replace the solenoid valve
32	Faulty RH rear relief solenoid valve	Replace the solenoid valve
35	Faulty recovery pump	Replace the electric pump integrated in the control unit
37	Inefficient brake pedal switch	Carry out test B
39	LH front wheel speed sensor absent	Carry out test C
41	LH front wheel speed sensor discontinuous or irregular	Carry out test C
42	RH front wheel speed sensor absent	Carry out test D
43	RH front wheel speed sensor discontinuous or irregular	Carry out test D
44	LH rear wheel speed sensor absent	Carry out test E
45	LH rear wheel speed sensor signal discontinuous or irregular	Carry out test E
46	RH rear wheel speed sensor absent	Carry out test E
47	RH rear wheel speed sensor signal discontinuous or irregular	Carry out test F
48	Low battery voltage	Carry out test F
55	Faulty electronic control unit	Carry out test G
56	Flashing code activation procedure fault	Replace the electronic control unit
74	Inefficient warning light wiring on instrument cluster	Carry out test A
		Carry out test M

FAULTY BRAKE SWITCH		TEST B
TEST PROCEDURE	RESULT	CORRECTIVE ACTION
<b>B1</b> CHECK STOP LIGHTS - Check that the stop lights are working properly	OK	Carry out step B2
	<del>OK</del>	Replace the stop light switch H3, or proceed as described in the "STOP LIGHTS" section
<b>B2</b> CHECK VOLTAGE - With the pedal pressed, check for 12 V at pin 14 of N51	OK	Check and if necessary replace the electronic control unit N51
	<del>OK</del>	Restore the wiring between pin 14 of N51 and H3

**LH FRONT SENSOR NOT CONNECTED** TEST C

TEST PROCEDURE	RESULT	CORRECTIVE ACTION
<b>C1</b> CHECK OPEN CIRCUIT - Turn the key and check for an open circuit between pin 7 and 6 of N51	OK	Carry out step C2
	<del>OK</del>	Carry out step C3
<b>C2</b> CHECK CONTINUITY - Disconnect sensor L29 and check continuity between the sensor and pin 7 of N51, and between the sensor and pin 6 of N51	OK	Check and if necessary replace sensor L29.
	<del>OK</del>	Restore the wiring between L29 and N51
<b>C3</b> CHECK OPEN CIRCUIT - Disconnect sensor L29 and check for an open circuit between pin 7 and 6 of N51 (wiring side)	OK	Check and if necessary replace sensor L29.
	<del>OK</del>	Restore the wiring eliminating the short circuit between the cables connecting L29 with N51

RH FRONT SENSOR NOT CONNECTED		TEST D
TEST PROCEDURE	RESULT	CORRECTIVE ACTION
<b>D1</b> CHECK OPEN CIRCUIT - Turn the key and check for an open circuit between pin 4 and 3 of N51	OK	Carry out step D2
	<del>OK</del>	Carry out step D3
<b>D2</b> CHECK CONTINUITY - Disconnect sensor L28 and check for continuity between the sensor and pin 4 of N51, and between the sensor and pin 3 of N51	OK	Check and if necessary replace sensor L28.
	<del>OK</del>	Restore the wiring between L28 and N51
<b>D3</b> CHECK OPEN CIRCUIT - Disconnect sensor L28 and check for an open circuit between pin 4 and 3 of N51 (wiring side)	OK	Check and if necessary replace sensor L28.
	<del>OK</del>	Restore the wiring eliminating the short circuit between the cables connecting L28 with N51

**LH REAR SENSOR NOT CONNECTED** TEST E

TEST PROCEDURE	RESULT	CORRECTIVE ACTION
<b>E1</b> CHECK OPEN CIRCUIT - Turn the key and check for an open circuit between pin 8 and 9 of N51	OK	Carry out step E2
	<del>OK</del>	Carry out step E3
<b>E2</b> CHECK CONTINUITY - Disconnect sensor L31 and check continuity between the sensor and pin 8 of N51, and between the sensor and pin 9 of N51	OK	Check and if necessary replace sensor L31.
	<del>OK</del>	Restore the wiring between L31 and N51
<b>E3</b> CHECK OPEN CIRCUIT - Disconnect sensor L31 and check for an open circuit between pin 8 and 9 of N51 (wiring side)	OK	Check and if necessary replace sensor L31.
	<del>OK</del>	Restore the wiring eliminating the short circuit between the cables connecting L31 with N51

"ABS" WARNING LIGHT NOT WORKING		TEST H
TEST PROCEDURE		CORRECTIVE ACTION
H1	CHECK CONTINUITY - Check continuity between pin 12 of N51 and pin 1 of connector T8 and between pin 11 of N51 and pin 3 of T8	OK Carry out step H2 <del>OK</del> Restore the wiring between N51 and connector T8
H2	CHECK EARTH SIGNAL - Turn the ignition key and for a few seconds, check for 0V at pin C2 of the instrument cluster C10	OK Replace the ABS warning light bulb on the instrument cluster C10 <del>OK</del> Carry out step H3
H3	CHECK EARTH SIGNAL - Turn the key and for a few seconds, check for 0V at pin 21 of N51	OK Restore the wiring between N51 and C10 <del>OK</del> Replace the electronic control unit N51

RH REAR SENSOR NOT CONNECTED		TEST F
TEST PROCEDURE		CORRECTIVE ACTION
F1	CHECK OPEN CIRCUIT - Turn the key and check for an open circuit between pin 1 and 2 of N51	OK Carry out step F2 <del>OK</del> Carry out step F3
F2	CHECK CONTINUITY - Disconnect sensor L30 and check continuity between the sensor and pin 1 of N51, and between the sensor and pin 2 of N51	OK Check and if necessary replace sensor L30. <del>OK</del> Restore the wiring between L30 and N51
F3	CHECK OPEN CIRCUIT - Disconnect sensor L28 and check for an open circuit between pin 1 and 2 of N51 (wiring side)	OK Check and if necessary replace sensor L30. <del>OK</del> Restore the wiring eliminating the short circuit between the cables connecting L30 con N51

INSUFFICIENT SUPPLY VOLTAGE		TEST G
TEST PROCEDURE		CORRECTIVE ACTION
G1	CHECK VOLTAGE - Check that the battery voltage is 12V	OK Carry out step G2 <del>OK</del> Restore the correct voltage charging or changing the battery A1
G2	CHECK VOLTAGE - Check for a voltage of 12 V at pin 17 and 18 of N51	OK Carry out step G3 <del>OK</del> Restore the wiring between pin 17 and 18 of N51 and the battery A1, via fuse G125b
G3	CHECK VOLTAGE - With the ignition key turned, check for 12 V at pin 15 of N51	OK CONTINUE DIAGNOSIS USING THE ALFA ROMEO TESTER <del>OK</del> Restore the wiring between pin 15 of N51 and the ignition switch B1

## COMPONENTS KEY (\*)

<b>A STARTING - RECHARGING</b>		B67	Controlled damping suspension control panel
A1	Battery	B68	Lever group
A3	Alternator, with integral voltage regulator	B69	Headlight alignment control device
A8	Ignition coil	B87	Boot opening switch with glovebox light
A8a	Ignition coil A	B97	Emergency switch for anti-theft device
A8b	Ignition coil B		
A11	Starter motor	<b>C INSTRUMENTS</b>	
A12	Spark plugs	C10	Instrument panel
A13	Glow plugs	C16	Check panel display with clock
		<b>D WARNING LIGHTS</b>	
<b>B MANUAL ELECTRICAL CONTROLS</b>		D31	Anti-theft device led indicator
B1	Ignition switch		
B10	Fog light control switch	<b>E EXTERNAL LIGHTS</b>	
B12	Hazard warning lights control switch	E9a	Left direction indicator light bulb
B16	Instrument panel lighting rheostat	E9b	Right direction indicator light bulb
B21a	Front right power window control switch (on right door)	E10a	Left fog light bulb
B21b	Front right power window control switch (on left door)	E10b	Right fog light bulb
B22	Front left power window control switch	E17a	Left numberplate light bulb
B23a	Rear right power window control switch (on console)	E17b	Right numberplate light bulb
B23b	Rear right power window control switch (on door)	E23	Front right optical unit
B24a	Rear left power window control switch (on console)	E24	Front left optical unit
B24b	Rear left power window control switch (on door)	E25	Right tail light (fixed part)
B25	Rear power window consensus switch	E26	Left tail light (fixed part)
B27	Front left seat height control switch	E30	Central rear right fog-light/reversing light
B28	Front left backrest control switch	E31	Central rear left fog-light/reversing light
B29	Front right backrest control switch		
B36	Door mirror double control switch	<b>F INTERIOR LIGHTS</b>	
B47	Sunroof motor control switch	F3	Passenger compartment courtesy light
B51	Front left seat heater control switch	F5	Luggage compartment courtesy light
B52	Front right seat longitudinal adjusting switch	F8	Heating-ventilation controls light bulb
B53	Front power window switch with automatism	F8a	Heater/ventilation controls lighting lamp a
B54	Front left seat longitudinal adjusting switch		
B62	Front right seat heater control switch		
B63	Front right seat height control switch		

(\*) This key refers to all 155 models and versions

F8b	Heater/ventilation controls lighting lamp b	G155b	Left seat adjustment wiring connection
F16	Ignition switch light	G193	Preset connection for electric aerial
F35	Central courtesy light with passenger compartment lighting controls	G195	Preset connection for rear-left loud-speaker
F43a	Left seat controls illumination light	G196	Preset connection for rear-right loud-speaker
F43b	Right seat controls illumination light	G202	ABS system ground connector
G	<b>FUSEBOX - CONNECTORS - GROUNDS</b>	G217	Preset connection for front-left loud-speaker
G1	Fusebox	G218	Preset connection for front-right loud-speaker
G5	Multiple connector	G219	Connector for sunroof
G8	Single connector	G240	Fuse for front seats
G21	Connector for front right door wiring	G241	Anti-theft device wiring connection
G23	Connector for front left door wiring	G247	Fuse for rear power windows
G25	Connector for rear right door wiring	G248	Dashboard wiring connection for anti-theft device
G27	Connector for rear left door wiring	G249	Rear wiring connection for anti-theft device
G28a	Connector between rear right door wiring and power window switch	G254a	Electric fan motor fuse
G30	Connector for door lock	G255	Electric fan motor fuse
G31a	Connector between rear left door wiring and power window switch	G258	Air conditioning electric fan motor fuse
G38	Connector for air conditioner wiring	G272	Connector for ABS hydraulic group
G53a	Engine compartment ground - right side	G273	Connector for ABS control unit
G53b	Engine compartment ground - left side	G280	Radio wiring intermediate connector
G55b	LH side panel ground	G281	Luggage compartment lighting connector
G56	Branch terminal board	G305	Connector for rear power windows and seat adjustment
G59a	Right connector for electric door mirror	G306	Engine wiring / right engine wiring connection
G59b	Left connector for electric door mirror	G307	Rear wiring / luggage compartment wiring connection
G60	Injection wiring ground	G308	Engine sensors coupling
G60a	Injection wiring ground	G309a	Controlled damping suspension A connection
G60b	Injection wiring ground	G309b	Controlled damping suspension B connection
G61	Ignition coil connection	G310	Fuse for front-right power window
G62	Clutch pedal switch connection	G311	Fuse for front-left power window
G63a	Rear right ground	G312	Fuse for headlight washer
G63b	Rear left ground	G313	Connector for air conditioner supplementary wiring
G66	Motronic wiring ground	G314a	Engine / air conditioner wiring A connection
G73	Connector for rear services	G314b	Engine / air conditioner wiring B connection
G95m	Connector for sunroof	G314c	Engine / air conditioner wiring C connection
G99	Dashboard/engine connection	G315a	Connection for right seat-adjustment motors
G106	Seat cross rail ground	G315b	Connection for left seat-adjustment motors
G107	Connector for fuel pump	G318	Ground on gearbox
G109	Injection wiring ground	G333	Engine oil level wiring-engine wiring connection
G124	Connector for ABS system	G334	Fuse for DIM-DIP device
G125a	Loose fuse for ABS system	G334	Fuel level sender connection
G125b	Loose fuse for ABS system	G365	Engine stop solenoid connection
G133a	Electronic injection wiring A connection	G384	Services supply fuse
G133b	Electronic injection wiring B connection	G386	ALFA ROMEO CODE connection
G133c	Electronic injection wiring C connection	G393a	General supply fuse
G148a	Under-dashboard ground - right side	G393b	General supply fuse
G148b	Under-dashboard ground - left side	H	<b>SWITCHES</b>
G155a	Right seat adjustment wiring connection	H1	Handbrake switch
		H2	Reversing light switch

H3	Stop light switch	L13	Windscreen washer liquid level sensor
H10	Front-left brake pad switch	L14	Engine coolant level sensor
H17	Brake fluid minimum level switch	L16	Rev counter sensor
H20	Inertial switch	L17	Speedometer pulse generator
H21	Clutch pedal switch	L22	Knock sensor
H24	Luggage compartment lamp switch	L28	Front-right phonic wheel sensor
H44	Anti-theft device switch in engine bay	L29	Front-left phonic wheel sensor
H51	Sunroof stop limit switch	L30	Rear-right phonic wheel sensor
H54	Full load switch	L31	Rear-left phonic wheel sensor
		L33	Two-stage thermocontact
		L36	Max. turbo pressure sensor
I	<b>RELAYS</b>	L40	Sleering angle sensor
I1	Engine cooling fan relay	L41	Brake fluid pressure switch for controlled damping suspension
I1a	Engine cooling fan relay	L44	Motor oil temperature sender
I1b	Engine cooling fan relay	L45	K.S.B. water temperature sensor
I2	Heated rear window relay	L46	E.G.F.R. solenoid valve
I3	Hom relay	L49	Sensor on accelerator pedal
I13	Rear power window relay	L58a	Volumetric sensor for right-hand anti-theft device
I17	Fog-light relay	L58b	Volumetric sensor for left-hand anti-theft device
I25	Rear fog light relay	L50	Fuel filter water sensor
I28	Relay for hazard warning lights	M	<b>SOLENOIDS - SOLENOID VALVES</b>
I29	Fuel pump relay	M5	Engine stop electromagnet
I35	Key-operated supply relay	M12	Boot lid opening actuator solenoid
I44	Fuel pre-heating device relay	M15	Vapour recovery solenoid valve
I49	Dipped beam headlight relay	M16	Over-boost solenoid valve
I50	Main beam headlight relay	M17	Front-right shock absorber solenoid valve
I52	Boot lid opening relay	M18	Front-left shock absorber solenoid valve
I57	ABS system electronic relay	M19	Rear-right shock absorber solenoid valve
I58	Sunroof relay	M20	Rear-left shock absorber solenoid valve
I64	Sidelights relay	N	<b>ELECTRONIC DEVICES- INTERMITTENCES - TIMERS</b>
I65	Fog-light consensus relay	N1	Electronic ignition module
I67	Day-light exclusion relay	N1a	Electronic ignition A module
I68	Supplementary engine cooling fan relay	N1b	Electronic ignition B module
I71	Relay for controlled damping suspension	N6	Glow plug warming timer
I87	Left seat warming pad relay	N10	Courtesy light timer
I88	Right seat warming pad relay	N11	Door locking control unit
I91	DIM-DIP engagement relay	N12	Headlight washer timer
I99	Engine cooling fan 1st speed relay	N13	Hazard warning lights and direction indicators intermit- tence
I100	Engine cooling fan 2nd speed relay	N14	Electronic windscreen wiper intermittence
		N27	ABS system electronic control unit
L	<b>SENDERS</b>	N28	ABS system brake fluid pump device
L2	Engine oil minimum pressure switch	N31	Fuel pre-heating device
L5	Engine coolant max. temperature warning lamp thermal switch	N38	Power window control unit
L6	Thermal switch for engine cooling electric fan	N45	Anti-theft device control unit
L7	Engine coolant temperature sender		
L8	Oil pressure gauge sender		
L9	Fuel level gauge sender		
L10	Sender for engine coolant temperature gauge and max. temperature warning lamp contact		
L12	Engine oil level sensor		



N46 Electronic control unit for controlled damping suspension  
 N47 Accelerometer  
 N49 Axial control unit - Heated rear window  
 N51 Hydraulic group with ABS control unit  
 N53 Luggage compartment light radio anti-interference condenser  
 N58 Seat adjustment control unit  
 N59 Check Panel control unit  
 N60 Sunroof control unit  
 N61 Controlled damping suspension control unit condenser  
 N62 ABS longitudinal accelerometer  
 N63 ABS transversal accelerometer  
 N66 Stop light radio anti-interference condenser  
 N67 Remote control signal receiver  
 N77 ALFA ROMEO CODE control unit  
 N78 ALFA ROMEO CODE receiver

**O ANCILLARY EQUIPMENT**

O1 Heated rear window  
 O2 Horn  
 O3 Antenna  
 O4 Radio  
 O5 Loud-speaker  
 O5a Front RH loud-speaker  
 O5b Front LH loud-speaker  
 O5c Rear RH loud-speaker  
 O5d Rear LH loud-speaker  
 O6 Cigar lighter  
 O14 Front-left seat warming pad  
 O17 Front-right seat warming pad  
 O18 Right door mirror defroster  
 O19 Left door mirror defroster  
 O22 Additional engine cooling fan resistance  
 O22a Additional engine cooling fan resistance  
 O22b Additional engine cooling fan resistance  
 O27 K.S.B. device  
 O28 DIM-DIP resistance

**P ELECTRIC MOTORS**

P1 Windscreen wiper motor  
 P2 Engine motor cooling fan  
 P2a Engine cooling fan motor  
 P2b Engine cooling fan motor  
 P5 Front-left seat adjustment motor  
 P6 Front-right backrest adjustment motor  
 P7 Front-left backrest adjustment motor

P8 Motor for electric door mirror - left side  
 P9 Motor for electric door mirror - right side  
 P10 Front-right door locking motor  
 P11 Front-left door locking motor  
 P12 Rear-right door locking motor  
 P13 Rear-left door locking motor  
 P14 Front-right power window motor  
 P15 Front-left power window motor  
 P16 Rear-right power window motor  
 P17 Rear-left power window motor  
 P18 Fuel motor pump  
 P19 Windscreen washer pump  
 P20 Headlight washer pump  
 P24 Sunroof motor  
 P28 Front-right seat longitudinal adjusting motor  
 P29 Front-left seat longitudinal adjusting motor  
 P30 Front-right seat adjustment motor  
 P35a Right headlight alignment adjustment motor  
 P35b Left headlight alignment adjustment motor

**Q HEATER/VENTILATION - AIR CONDITIONING**

Q1 Heating/ventilation electric fan  
 Q4 Heating/ventilation electric fan control knob  
 Q5 Heater fan speed rheostat  
 Q9 Minimum pressure switch  
 Q11 Compressor electromagnetic coupling  
 Q12 Compressor electromagnetic joint cut-off thermal contact  
 Q14 Supplementary conditioner fan relay  
 Q15 Heating/ventilation electric fan relay  
 Q20 Min. and max. pressure switch (Tertiary)  
 Q21a Automatic control check unit  
 Q22 Electromagnetic coupling control relay  
 Q24 Outside air temperature sensor  
 Q25a Upper mixed air temperature sensor  
 Q25b Lower mixed air temperature sensor  
 Q27 Air recirculation vent control motor  
 Q30a Air distribution motor  
 Q30b Warm/cold air mixing motor  
 Q31 Conditioning unit fan speed adjuster  
 Q32 Heater/ventilation auxiliary relay  
 Q33 Passenger compartment temperature sensor with motor  
 Q35 Loose fuse for air-conditioning system - 40 A  
 Q36 Air conditioning system ground  
 Q39a Loose fuse for air-conditioning system - 30 A  
 Q39b Loose fuse for air-conditioning system - 30 A  
 Q40 Loose fuse for air-conditioning system - 15 A  
 Q41 Air conditioning relay and fuses assembly  
 Q42 Air conditioning fan delaying device

Q43 Loose fuse for conditioning system - 50 A  
 Q65 Loose fuse for air-conditioning system  
 Q66 Loose fuse for air-conditioning system - 3A  
 Q67 Compressor disengagement control unit  
 Q68 Compressor-air recirculation engagement switches  
 Q69 Heating-ventilation electric fan 1st speed relay

**R SAFETY DEVICES**  
 R9 Switch on seat belts

**S ELECTRONIC INJECTION**  
 S1 Injection control unit  
 S3 Electroninjectors  
 S5 Air flow meter  
 S7 Engine coolant temperature sensor  
 S9 Air supplement solenoid valve (idle)  
 S11 Motronic control unit  
 S12a Fuel pump Motronic relay  
 S12b Motronic relay with diode  
 S12c Timing variator Motronic relay  
 S12d Auxiliary Motronic relay  
 S13 Timing sensor  
 S15 Timing variator device  
 S20 Pinging sensor  
 S24 Connection for electroninjectors  
 S28 Injection control relay

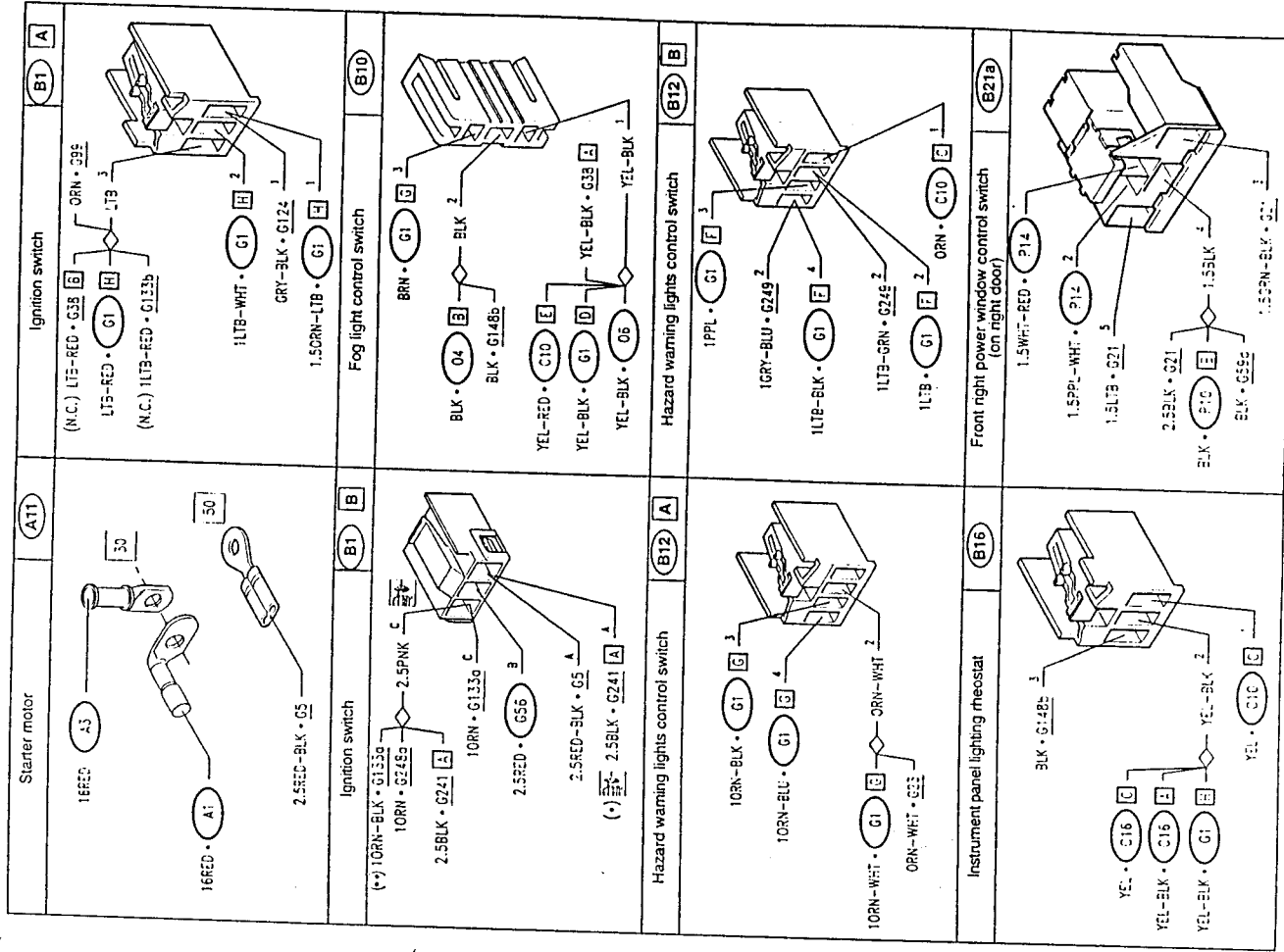
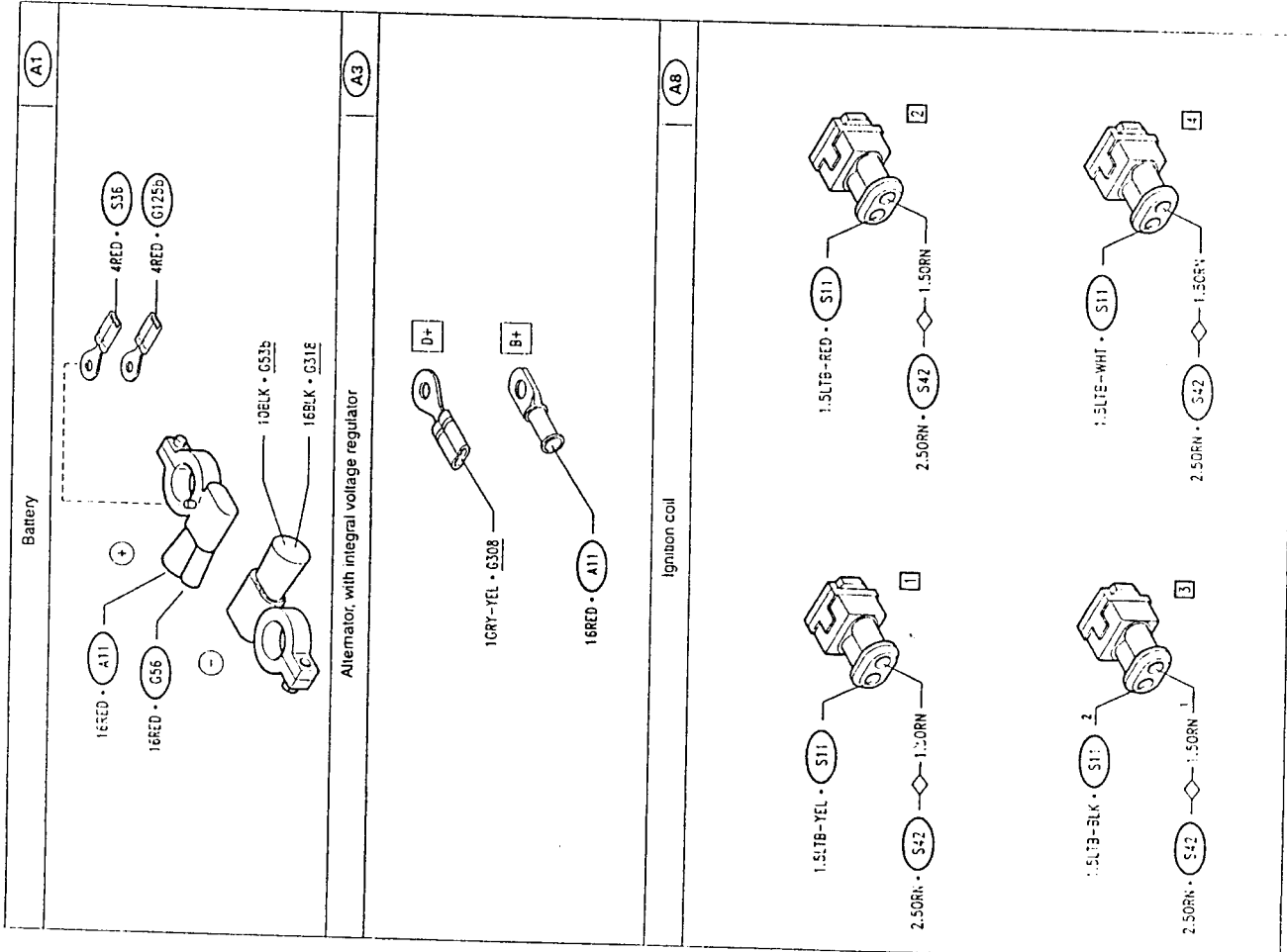
**T DIAGNOSIS**  
 T1 Connector for ALFA TESTER (Motronic and ALFA ROMEO CODE)  
 T7 Connector for ALFA TESTER (Anti-theft)  
 T8 Connector for ALFA TESTER (ABS)  
 T10 Connector for ALFA TESTER (Air conditioning)

COMPONENTS AND CONNECTORS



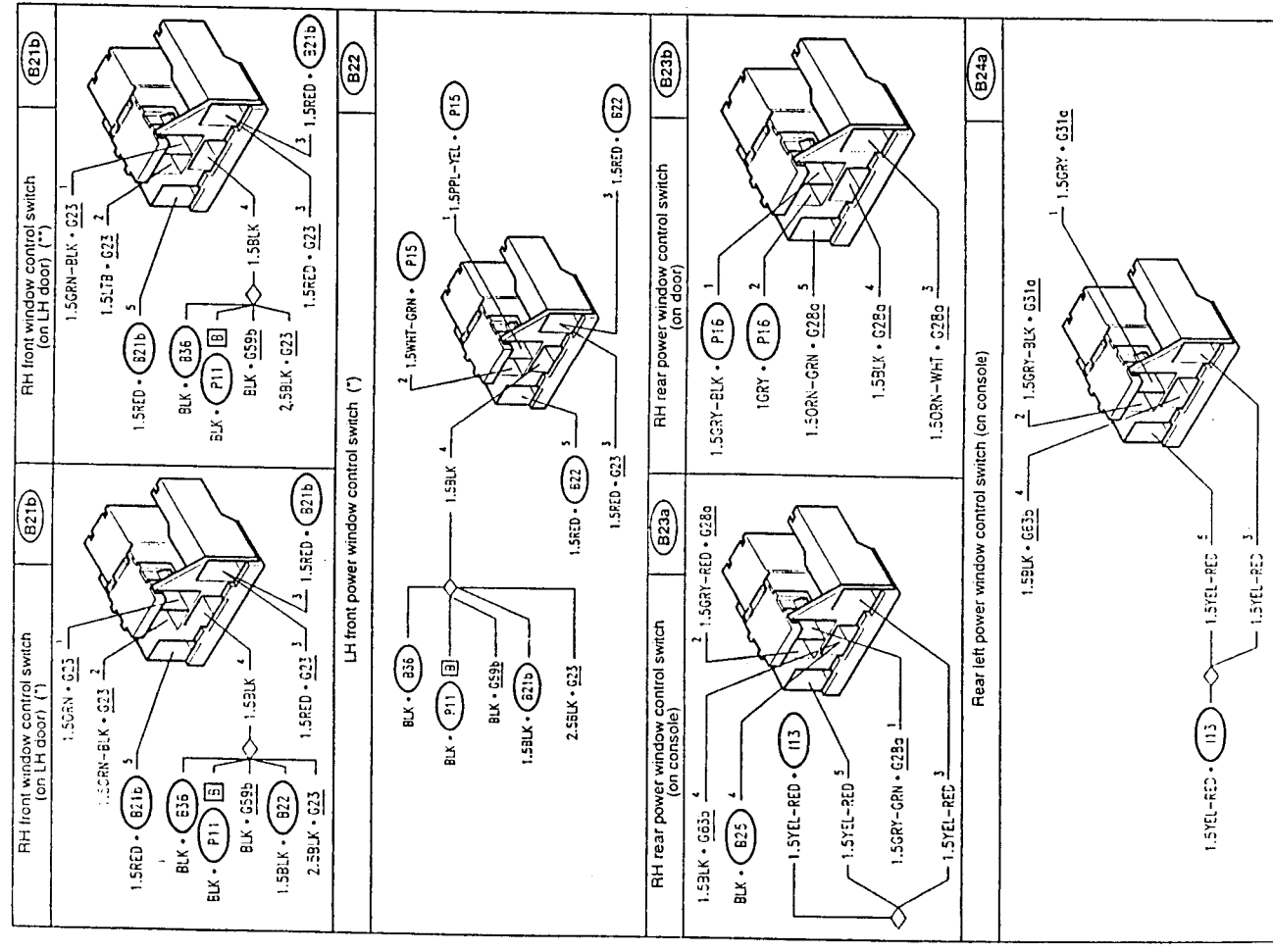
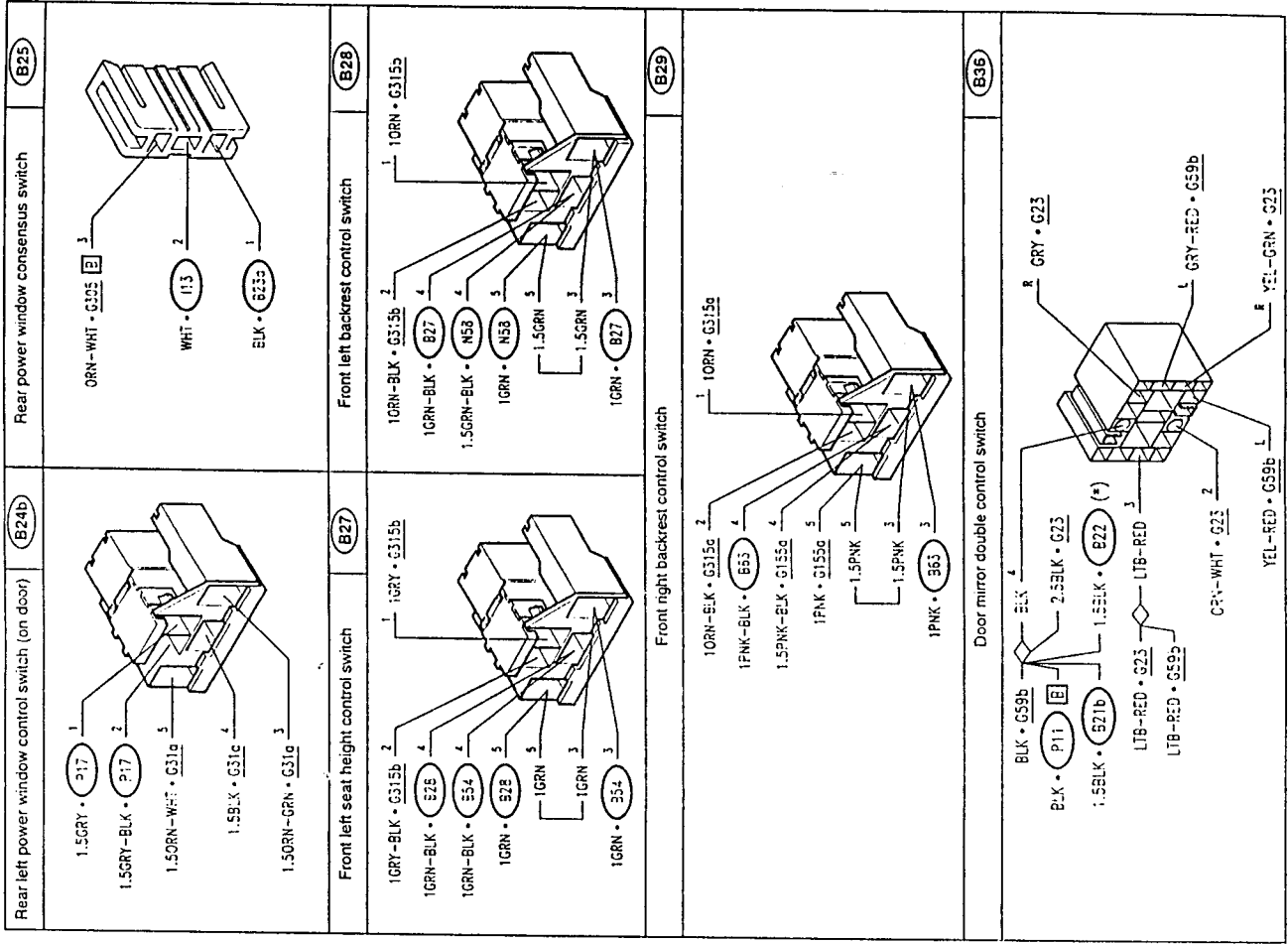
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12-1994



(\*) Variant present up to chassis no.

(\*\*) Variant present from chassis no.

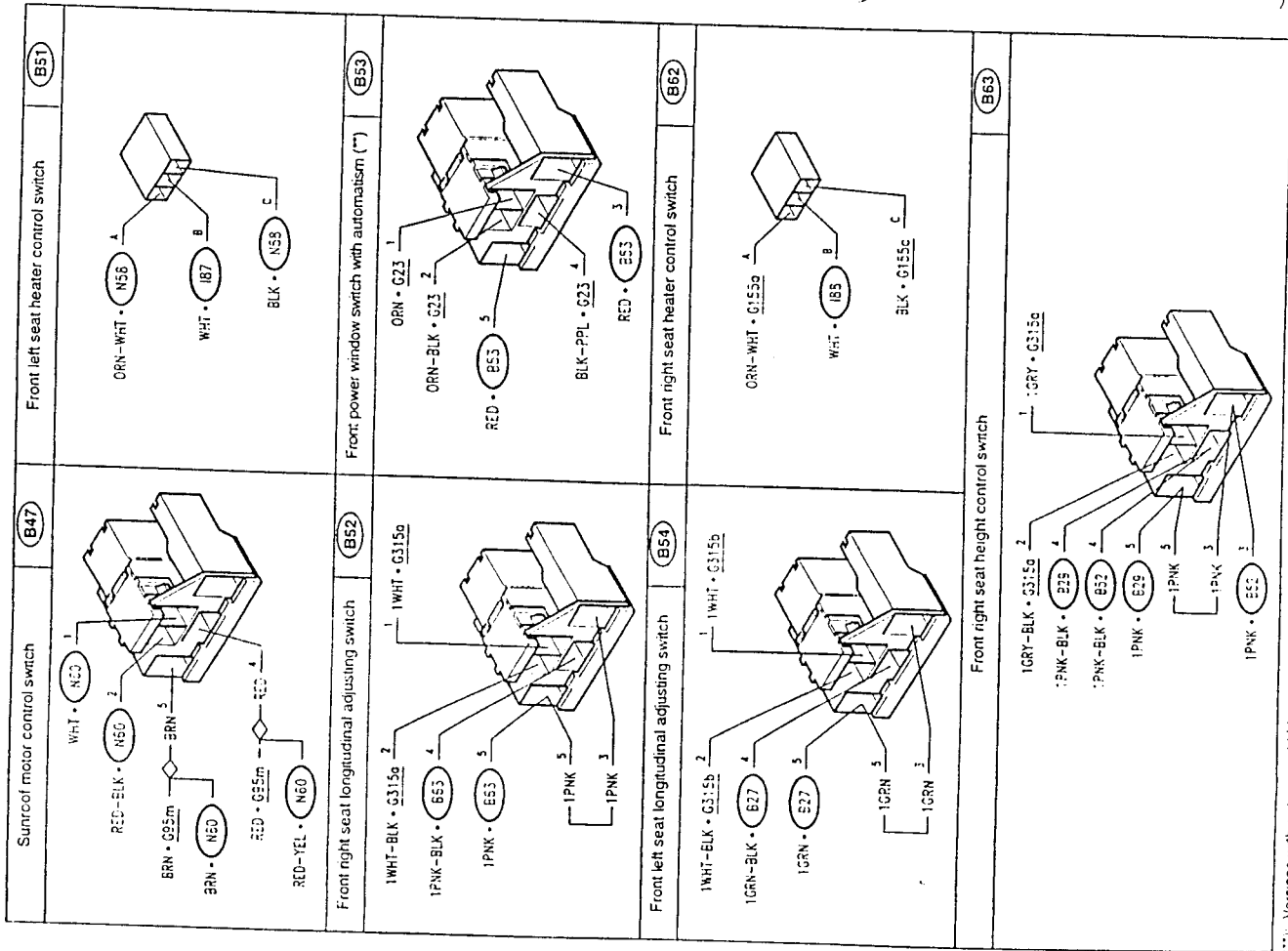


(\*) Versions with manual LH front power window control

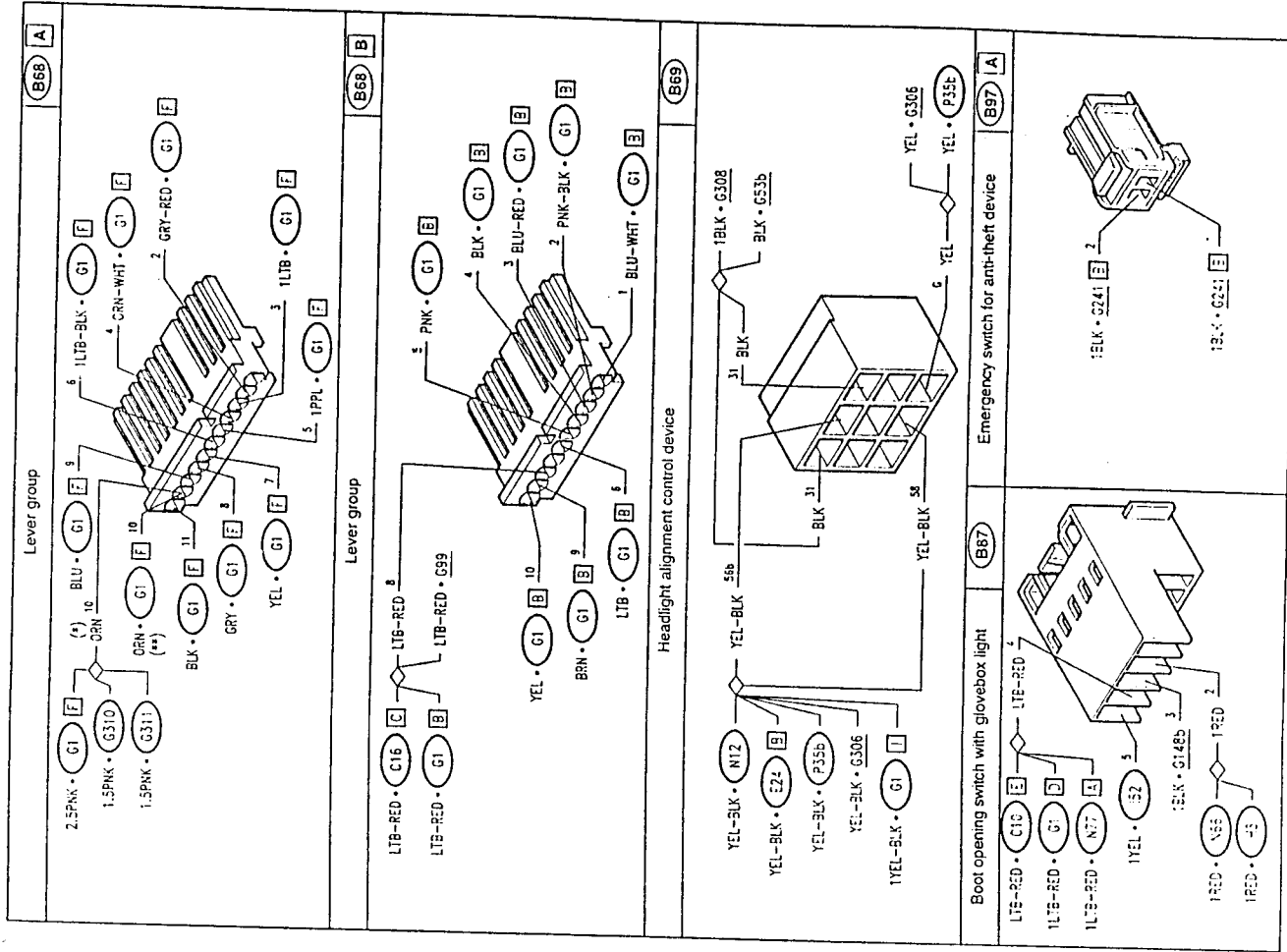
(\*\*) Versions with automatic LH front power window control

(\*) Versions with manual LH front power window control

(\*\*) Versions with automatic LH front power window control

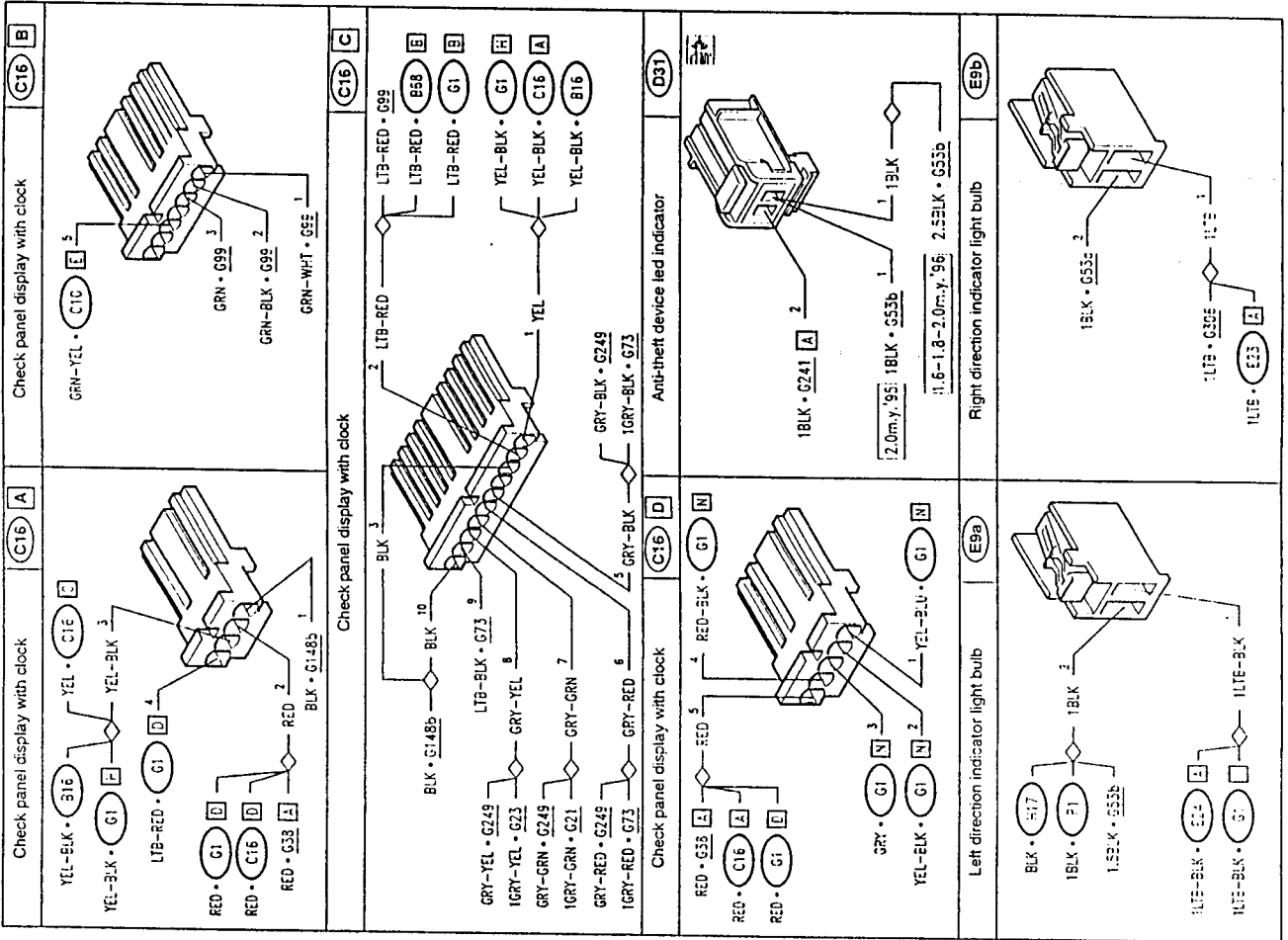
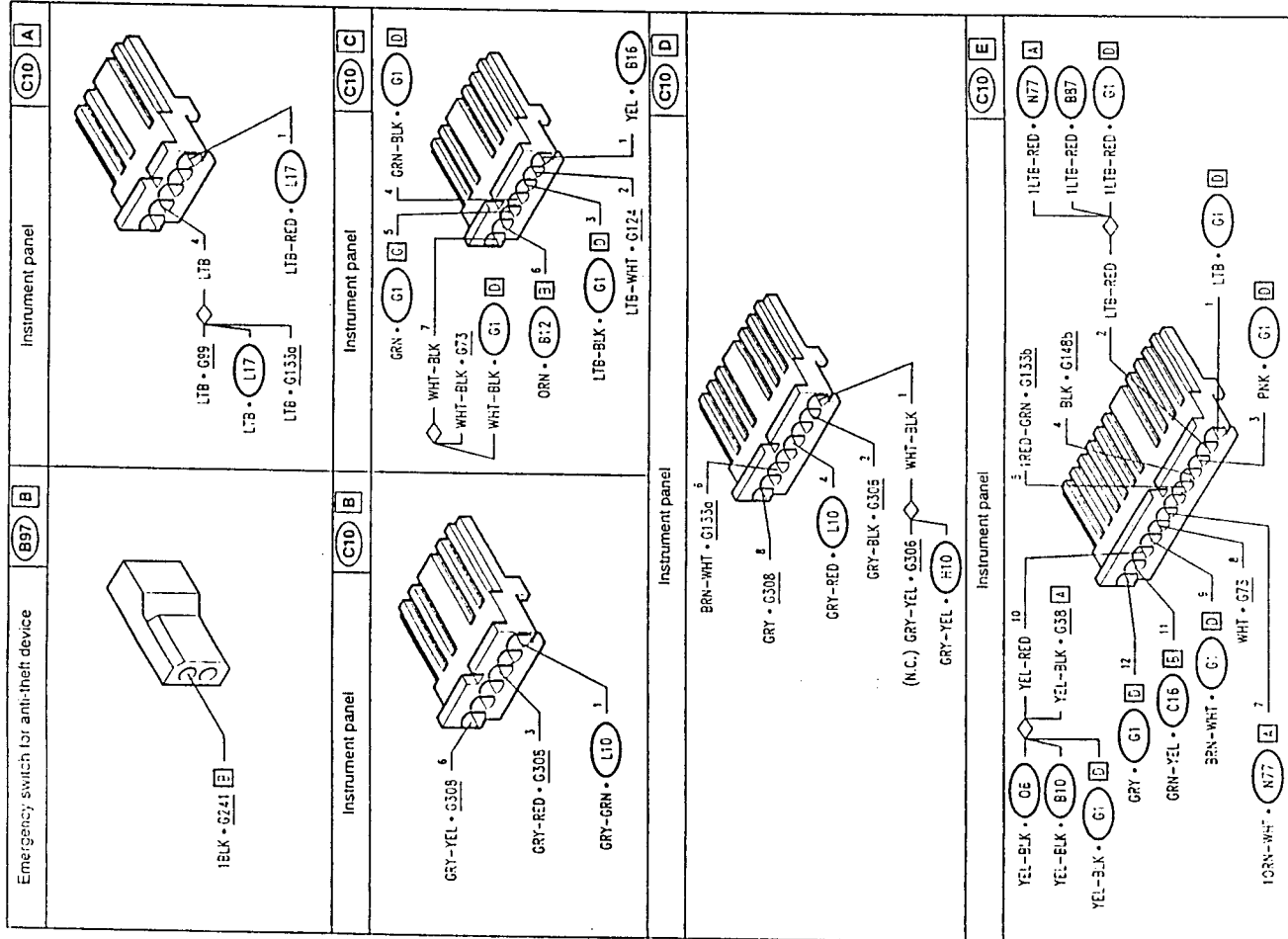


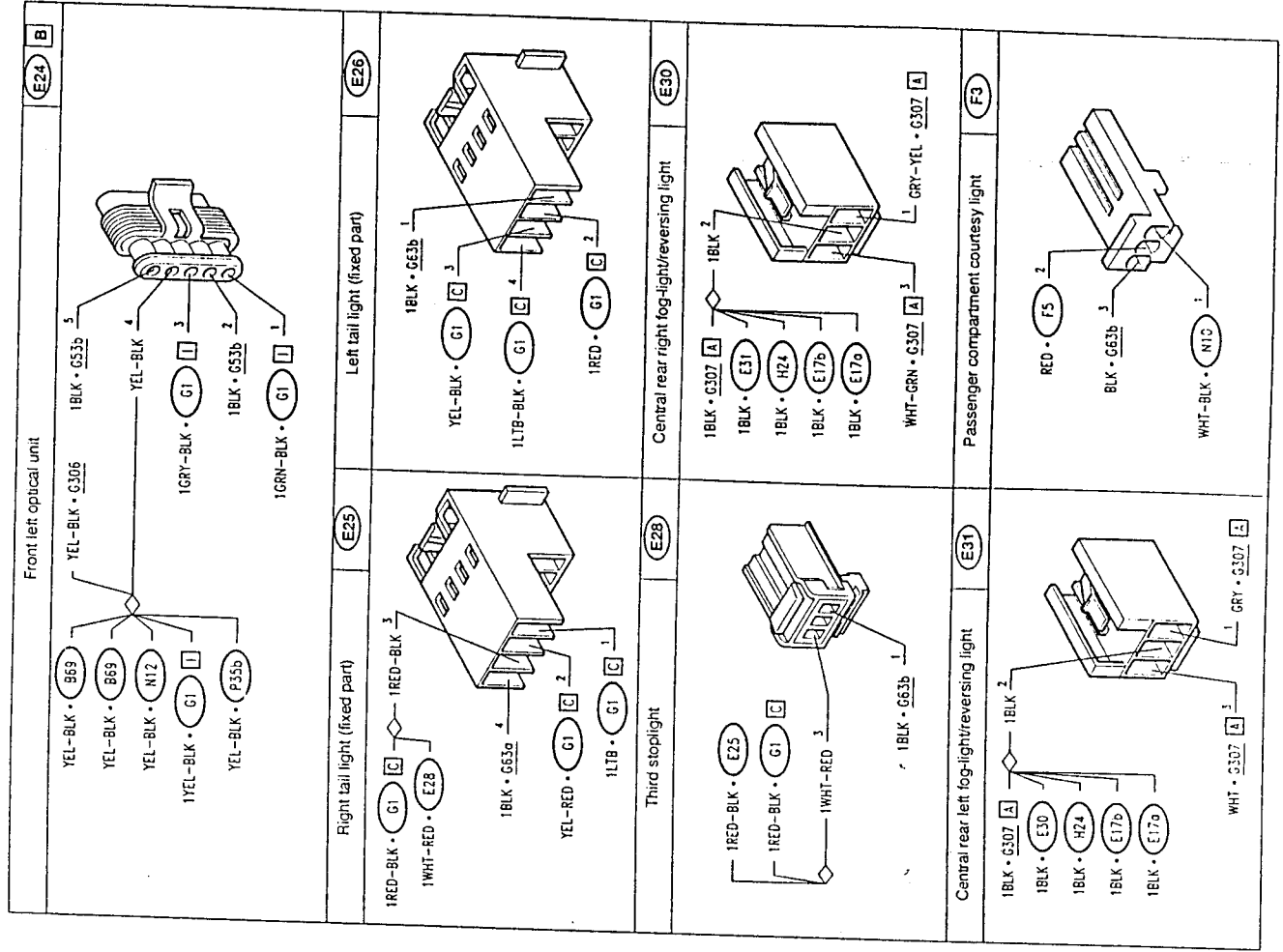
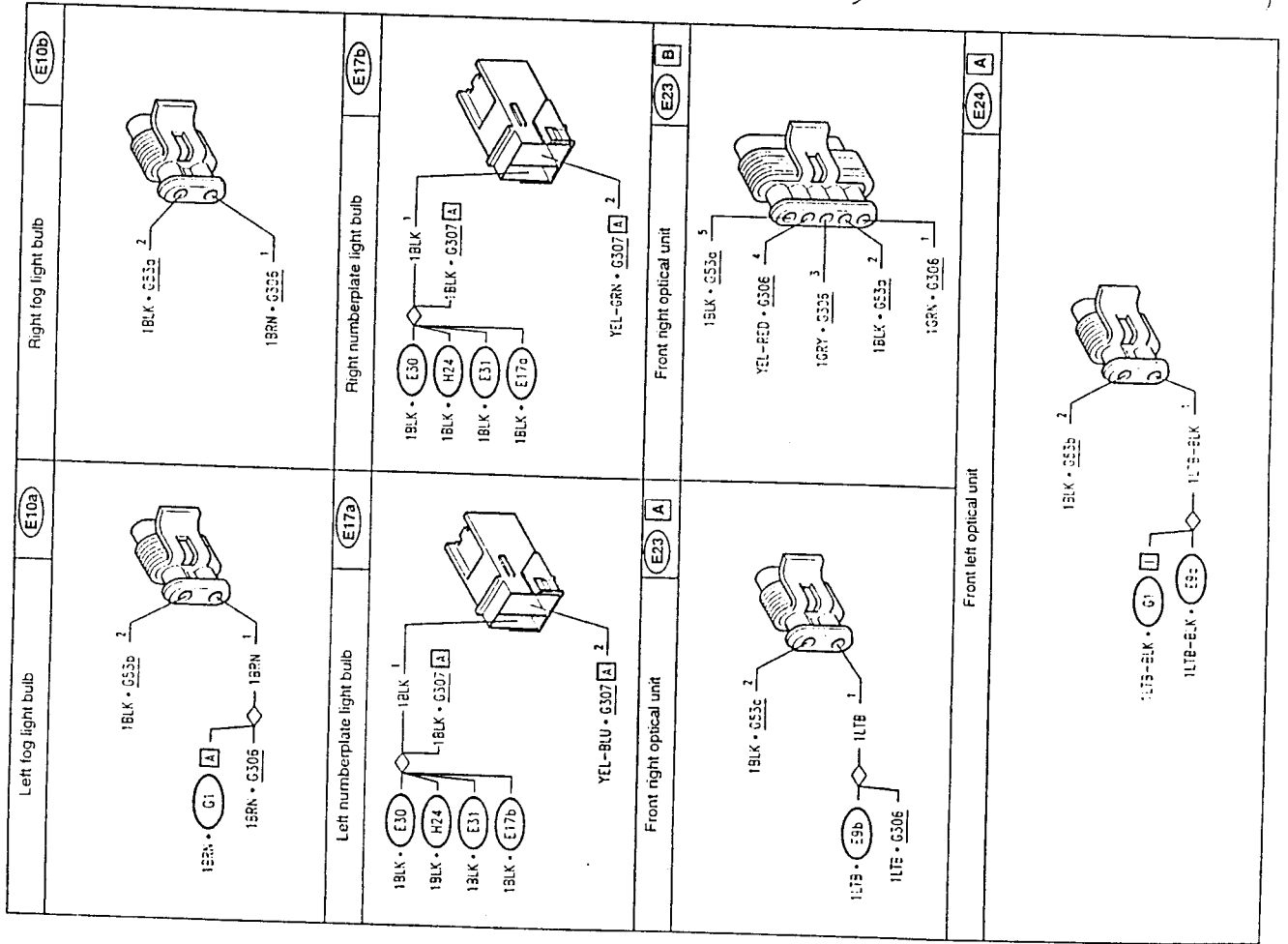
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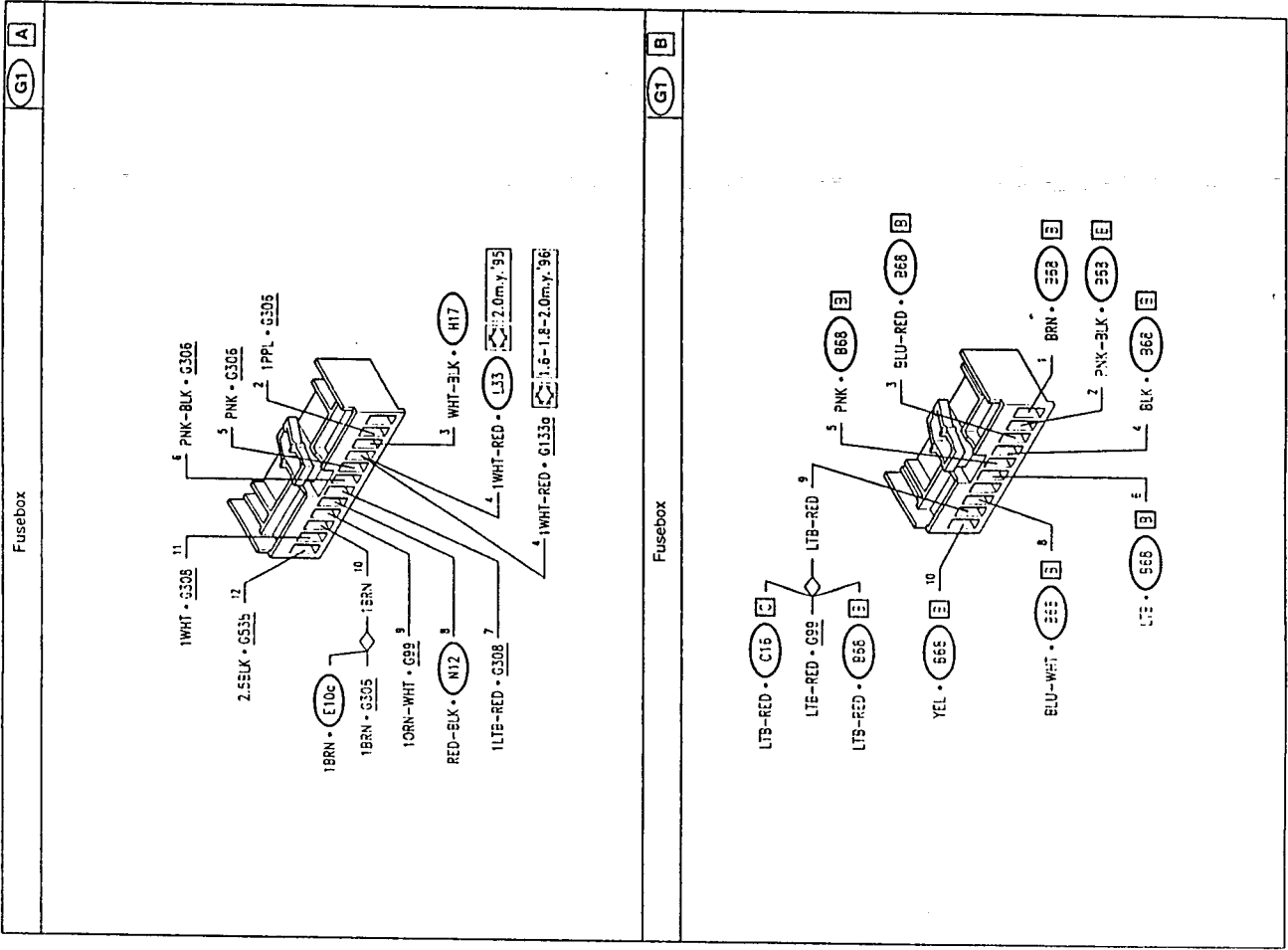
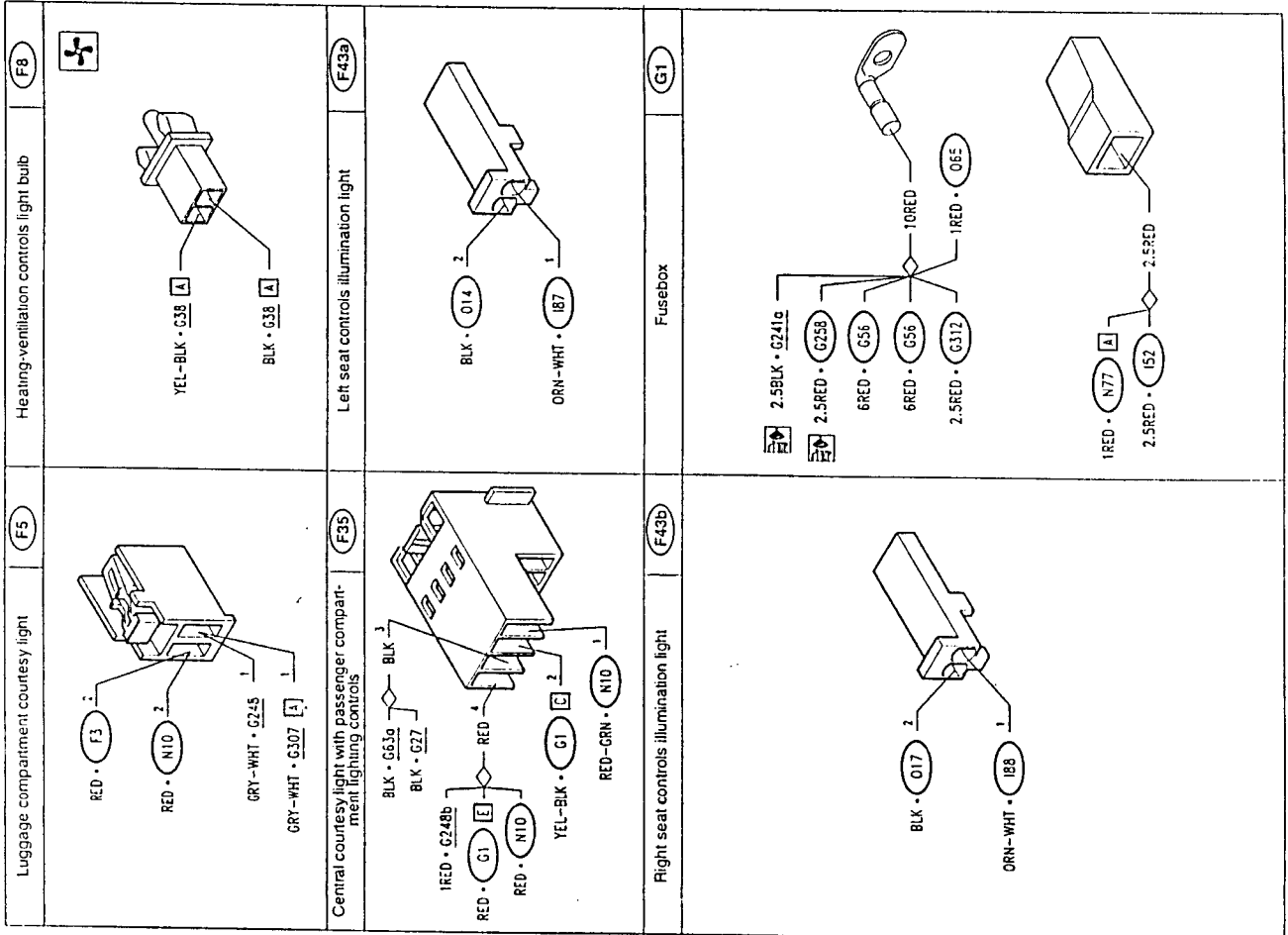


(\*): Versions with manual LH front power window control

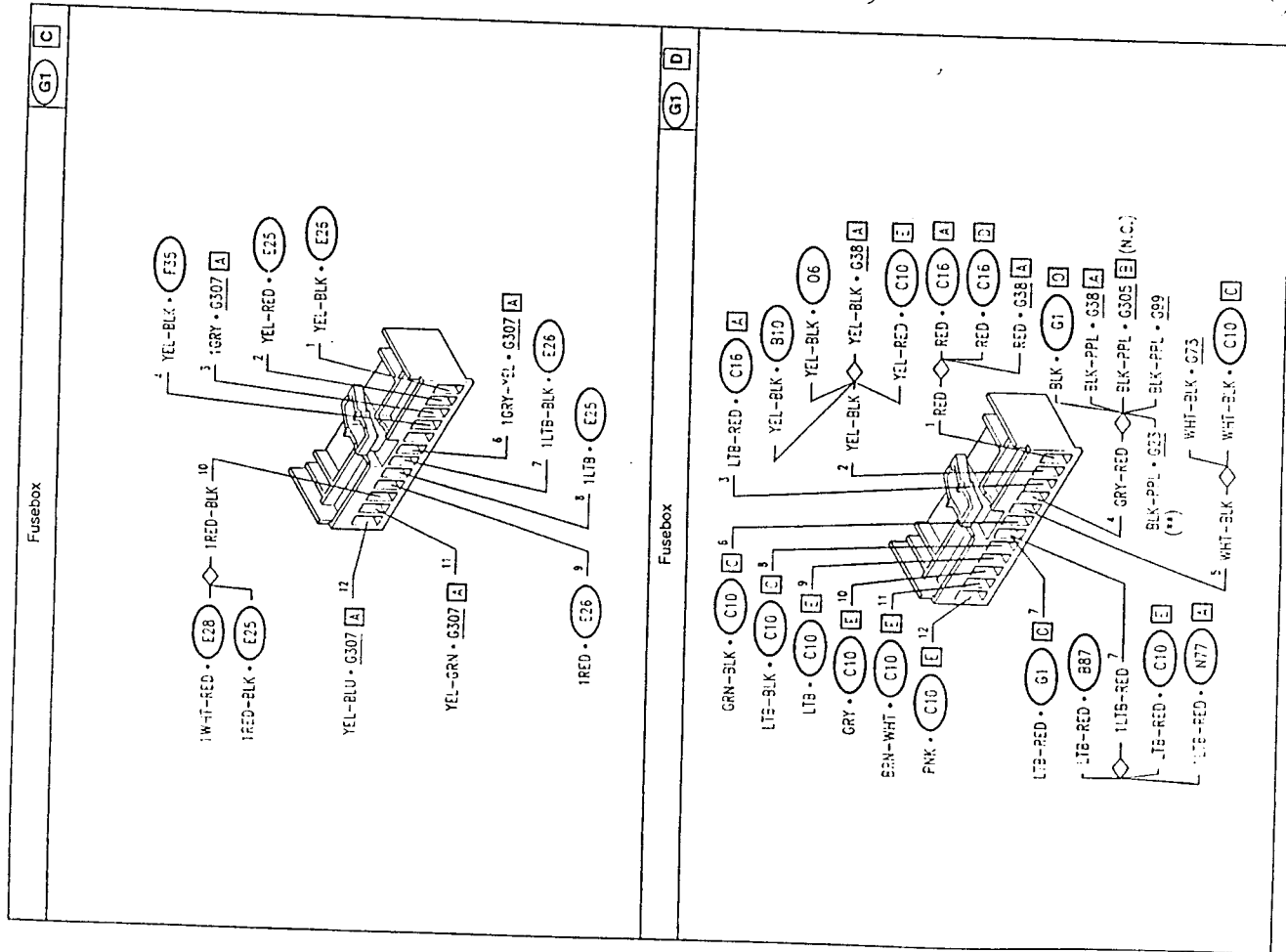
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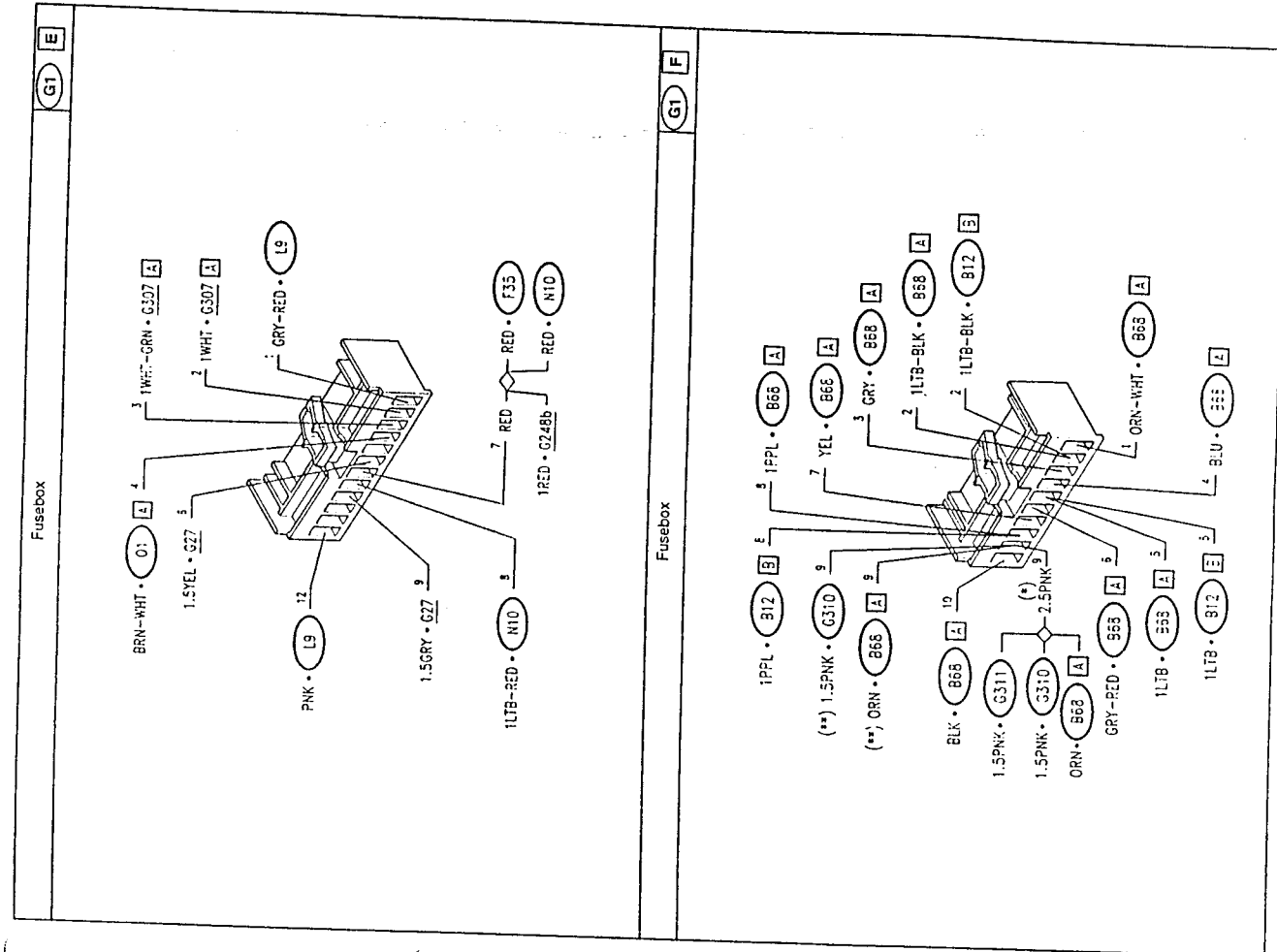






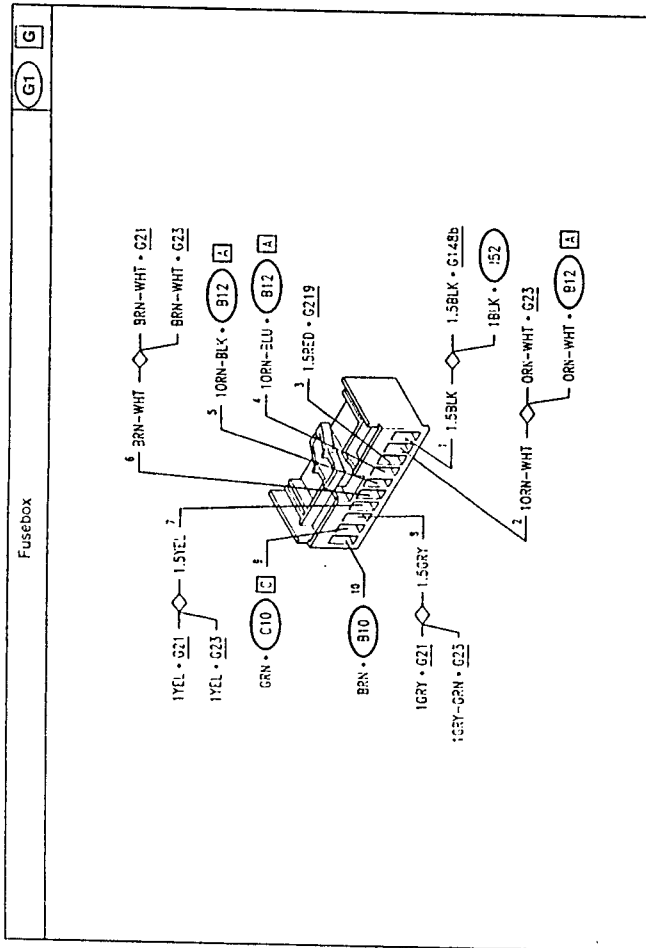


(\*\*): Versions with automatic LH front power window control



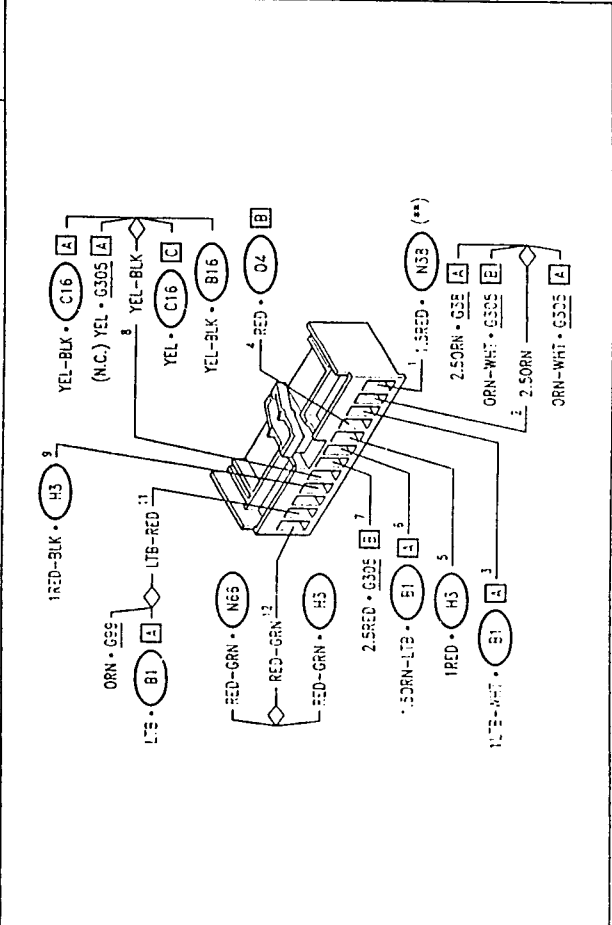
(\*): Versions with manual LH front power window control

(\*\*): Versions with automatic LH front power window control

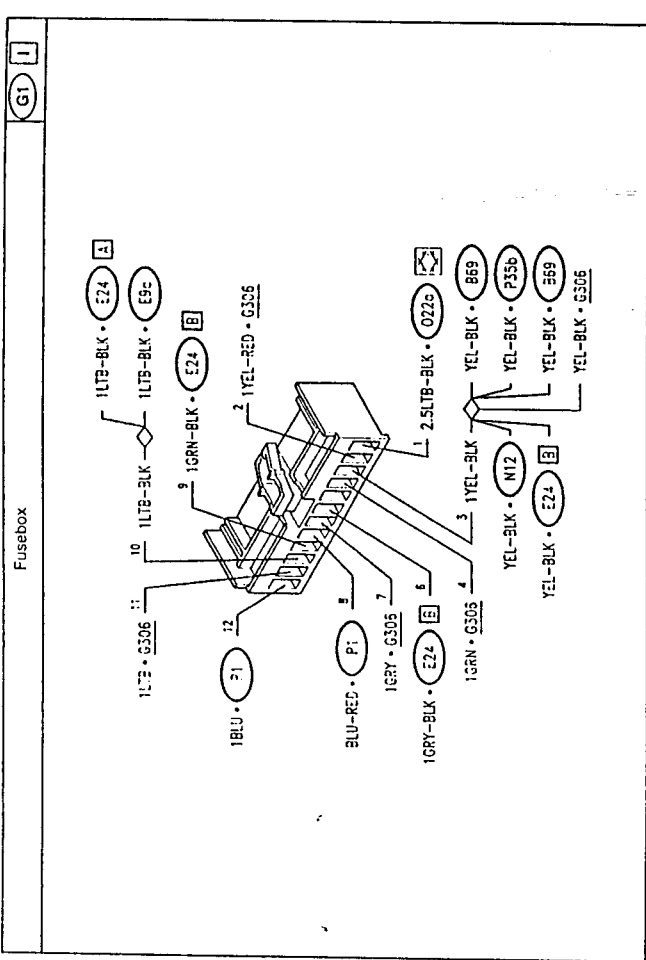


G1 H

Fusebox

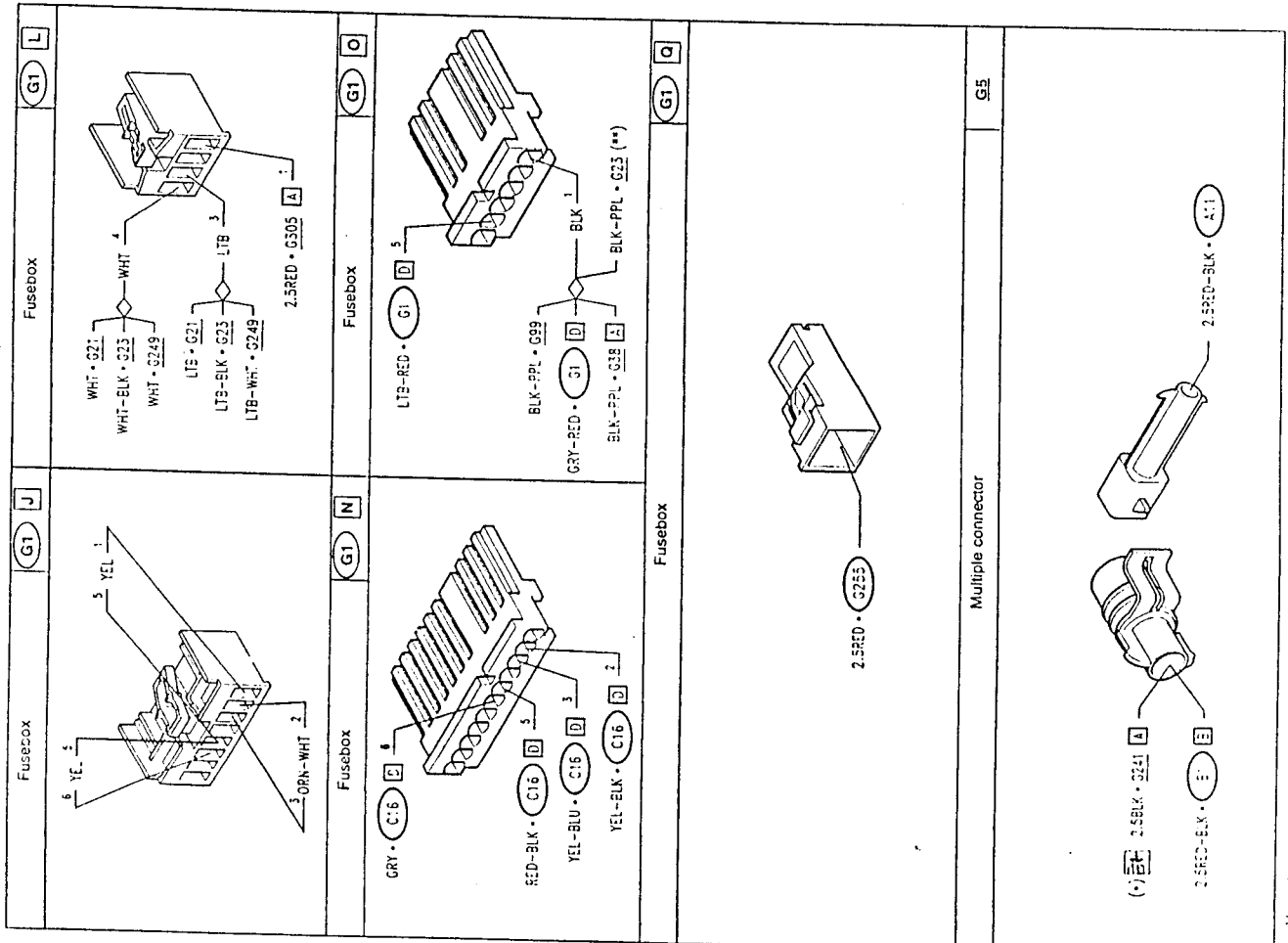


(\*\*) Versions with automatic L-H front power window control



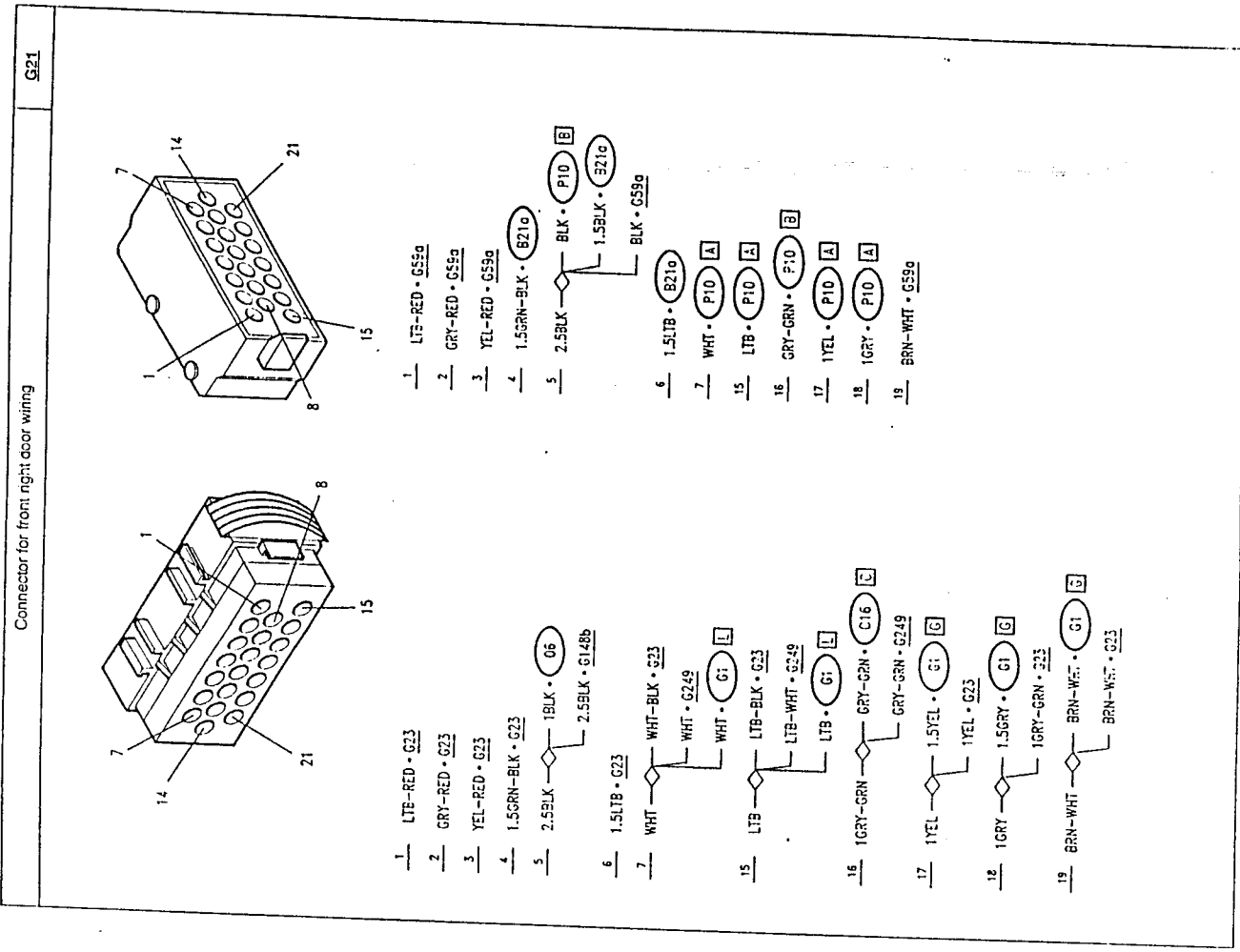
G1 I

Fusebox



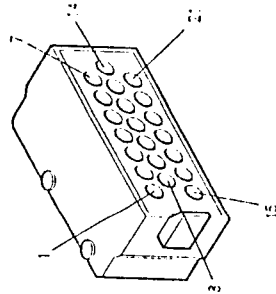
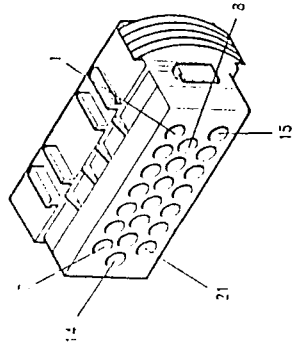
... Vanant present up to chassis no.

(\*\*): Versions with automatic LH front power window control



Connector for front left door wiring (vehicle side)

G23



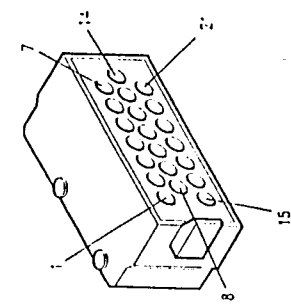
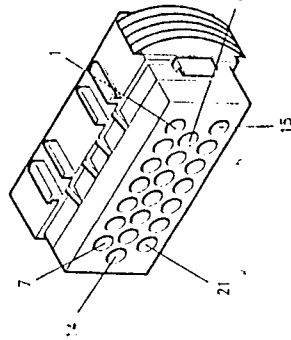
- 1 1.5LTS • G21 (\*)
- 2 CRN-BLK • N33 [E] (\*\*)
- 3 1.5RED • G311 (\*)
- 4 1.5PPL-YEL • N33 [E] (\*\*)
- 5 1.5WHT-GRN • N33 [E] (\*\*)
- 6 2.5BLK • G148b
- 7 SRN-WHT • SRN-WHT • G21
- 8 WHT • G38 [E]
- 9 GRY-BLK • G38 [E]
- 10 1.5GRN-BLK • G21 (\*)
- 11 ORN • N33 [E] (\*\*)
- 12 LTS-BLK • LTS • G21
- 13 LTS-WHT • G249
- 14 WHT • G21
- 15 WHT • G249
- 16 WHT • G1
- 17 1.5YEL • 1.5YEL • G21
- 18 1.5GRN • G1
- 19 1.5GRN-BLK • G21 (\*)
- 20 1.5RED • G310
- 21 GRY-YEL • GRY-YEL • G249
- 22 1.5GRY • G1 [G]

(\*) Versions with manual LH front power window control

(\*\*) Versions with automatic LH front power window control

Connector for front left door wiring (door side)

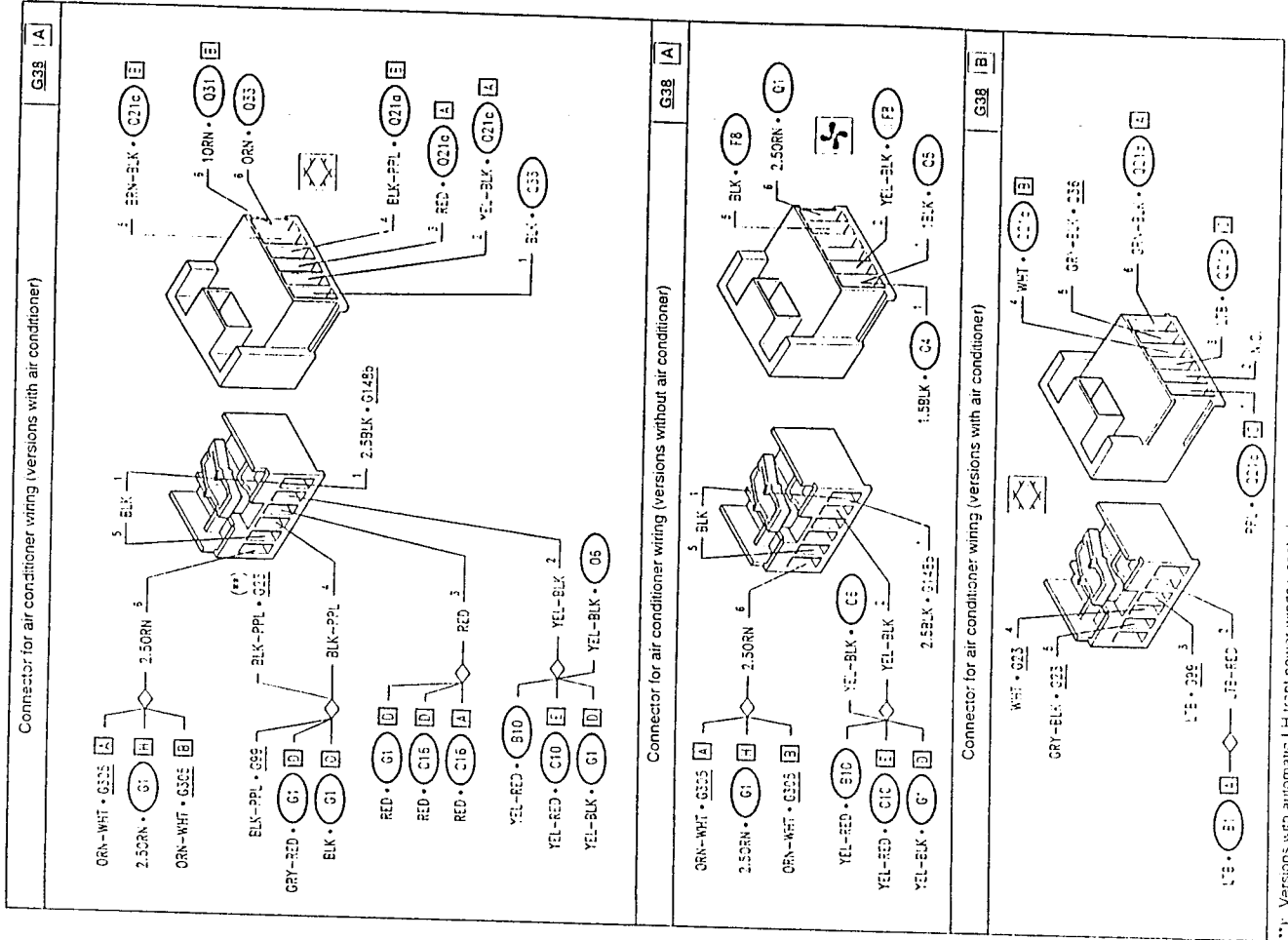
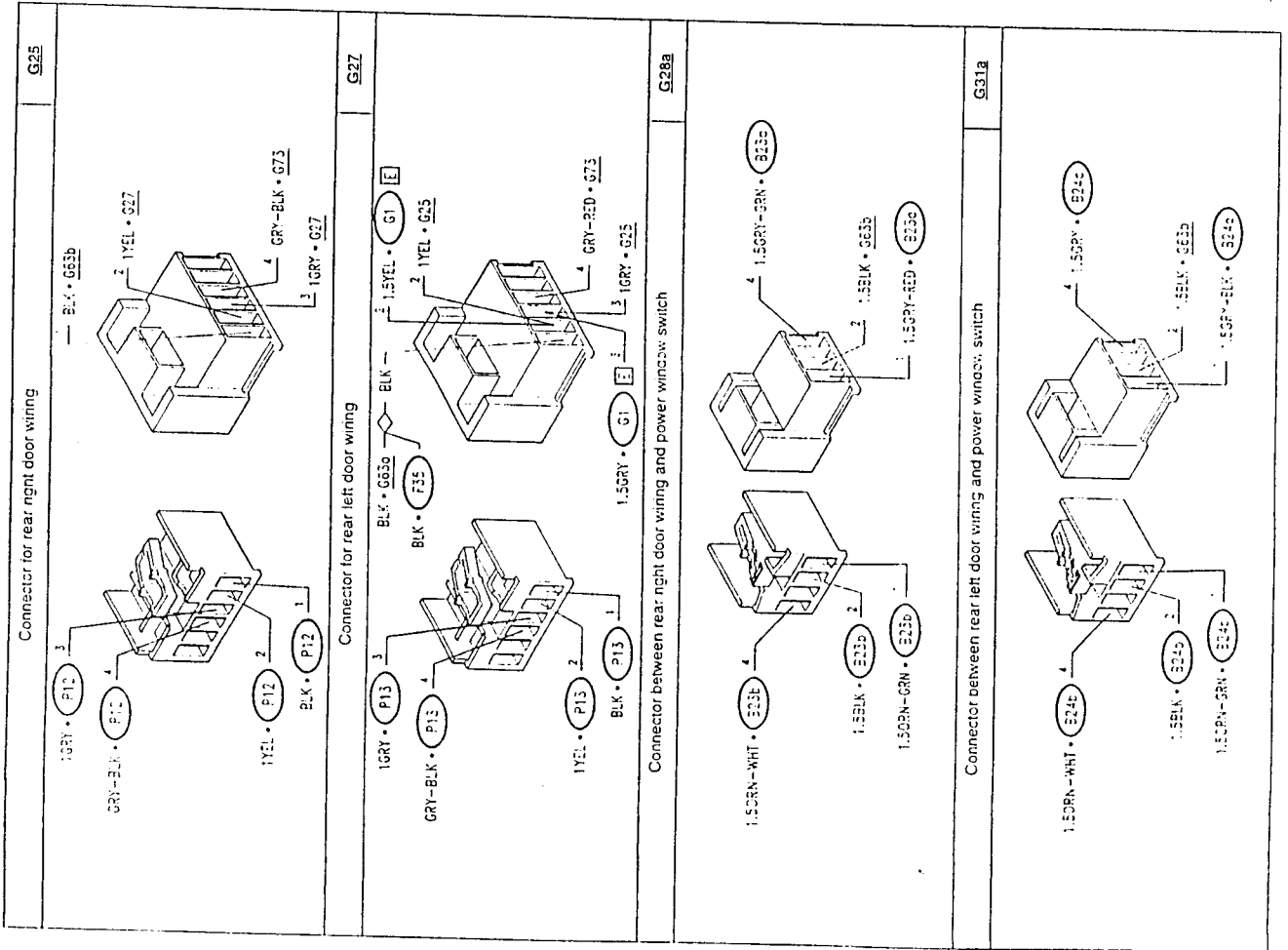
G23



- 1 1.5GRN-BLK • G21b (\*)
- 2 CRN-BLK • G53 (\*\*)
- 3 1.5RED • G22 (\*)
- 4 1.5PPL-YEL • P15 (\*\*)
- 5 1.5WHT-GRN • P15 (\*\*)
- 6 2.5BLK • 1.5BLK • G21b
- 7 SRN-WHT • G55b
- 8 WHT • G59b
- 9 SRN-BLK • G59b
- 10 1.5GRN • G21b (\*)
- 11 CRN • B53 (\*\*)
- 12 1.5GRN-BLK • P11 [A]
- 13 WHT-BLK • P11 [A]
- 14 1.5YEL • P11 [A]
- 15 1.5GRN-GRN • P11 [A]
- 16 1.5GRN-BLK • G21b (\*\*)
- 17 1.5RED • G21b
- 18 GRY-YEL • P11 [E]
- 19 BLK-PPL • G53 (\*\*)
- 20 ORN-WHT • G53
- 21 GRY • G53
- 22 1.5BLK • G22 (\*)
- 23 1.5GRY • G21
- 24 YEL-GRN • B53
- 25 1.5LTS • G21b (\*\*)
- 26 1.5GRN-BLK • G21b (\*\*)
- 27 1.5RED • G21b
- 28 GRY-YEL • P11 [E]
- 29 BLK-PPL • G53 (\*\*)
- 30 ORN-WHT • G53
- 31 GRY • G53

(\*) Versions with manual LH front power window control

(\*\*) Versions with automatic LH front power window control



(\*\*) Versions with automatic LH (left) power window control

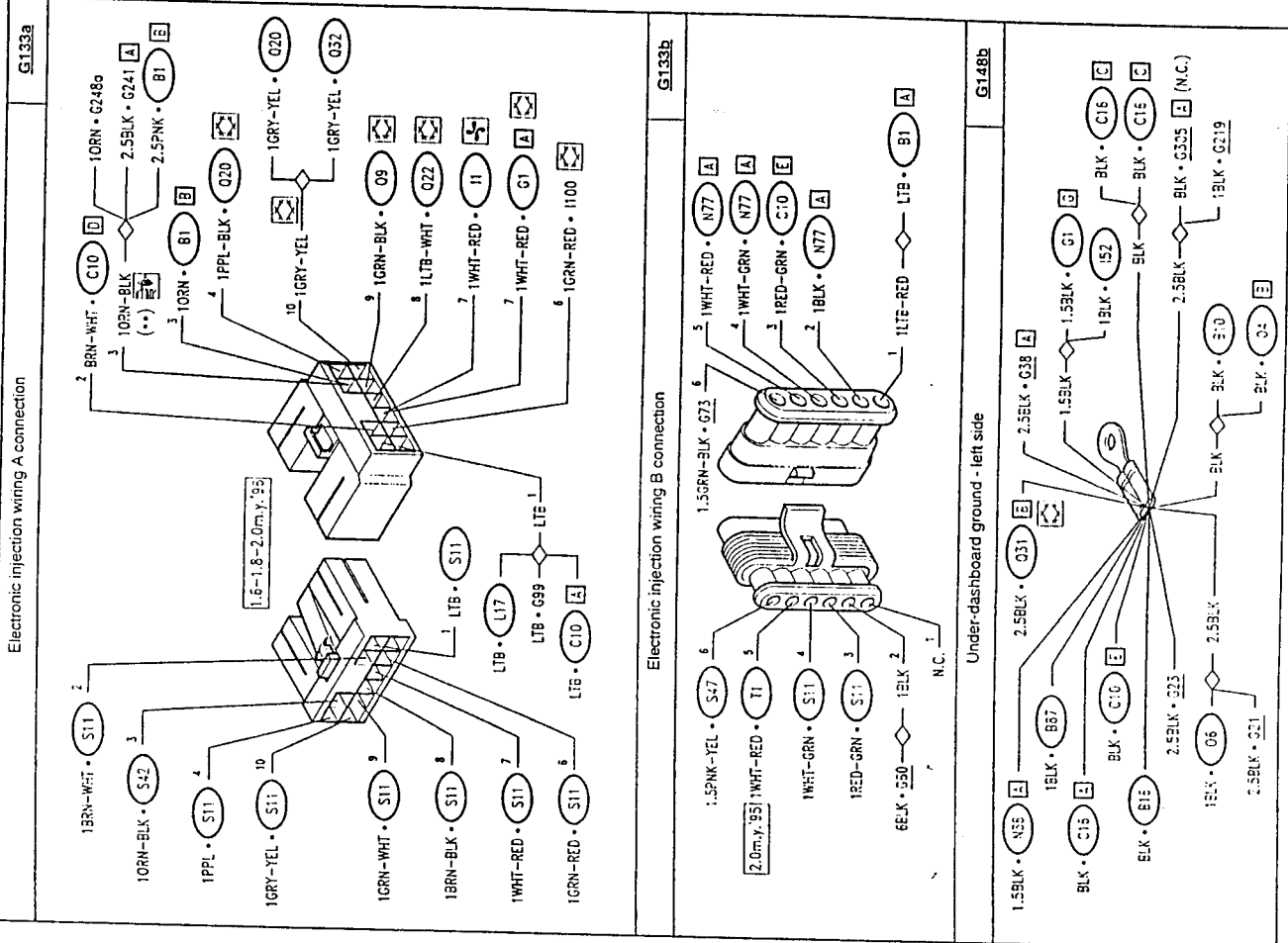








# WHITE



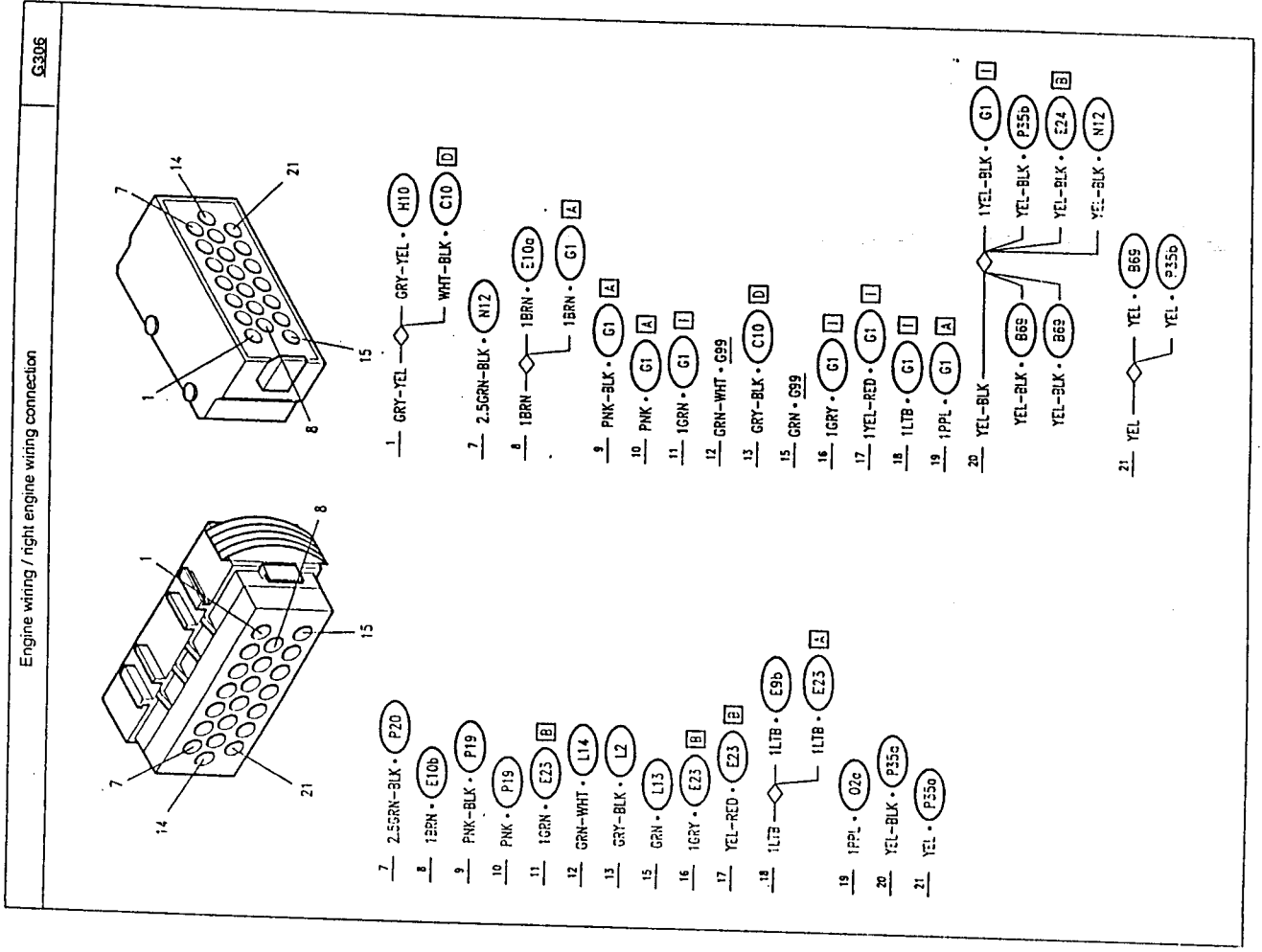
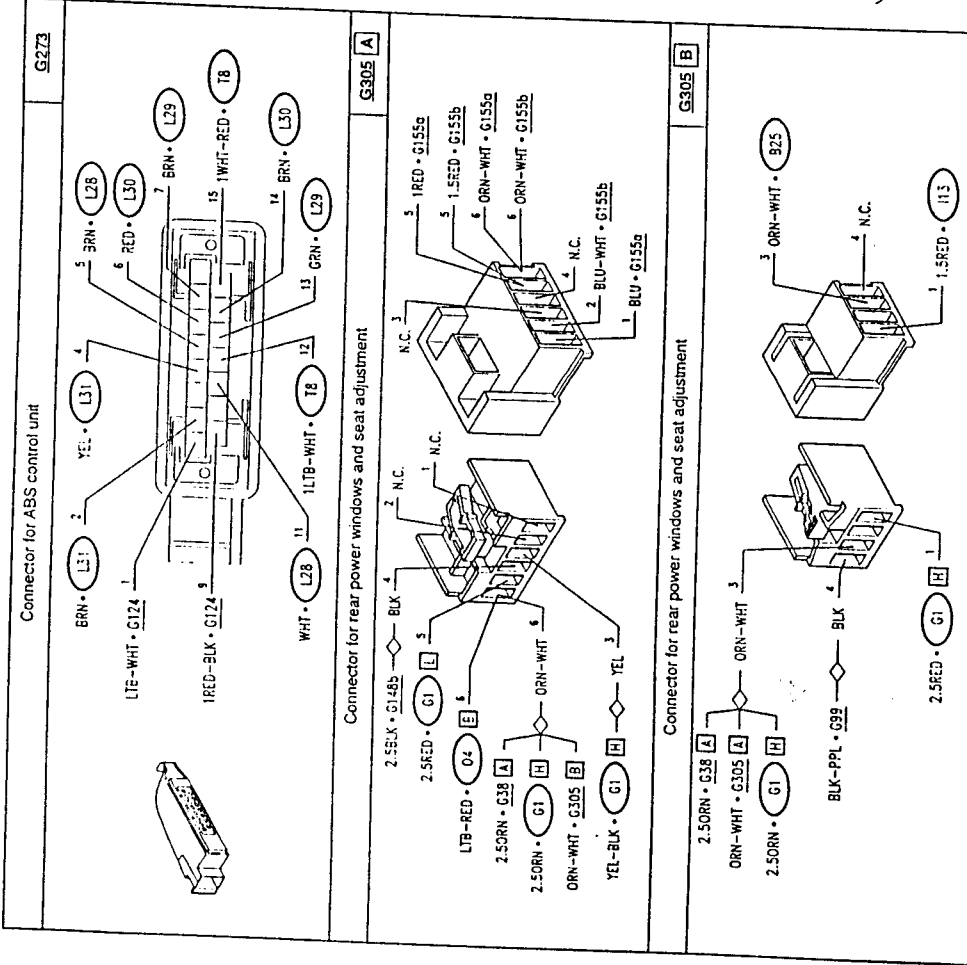
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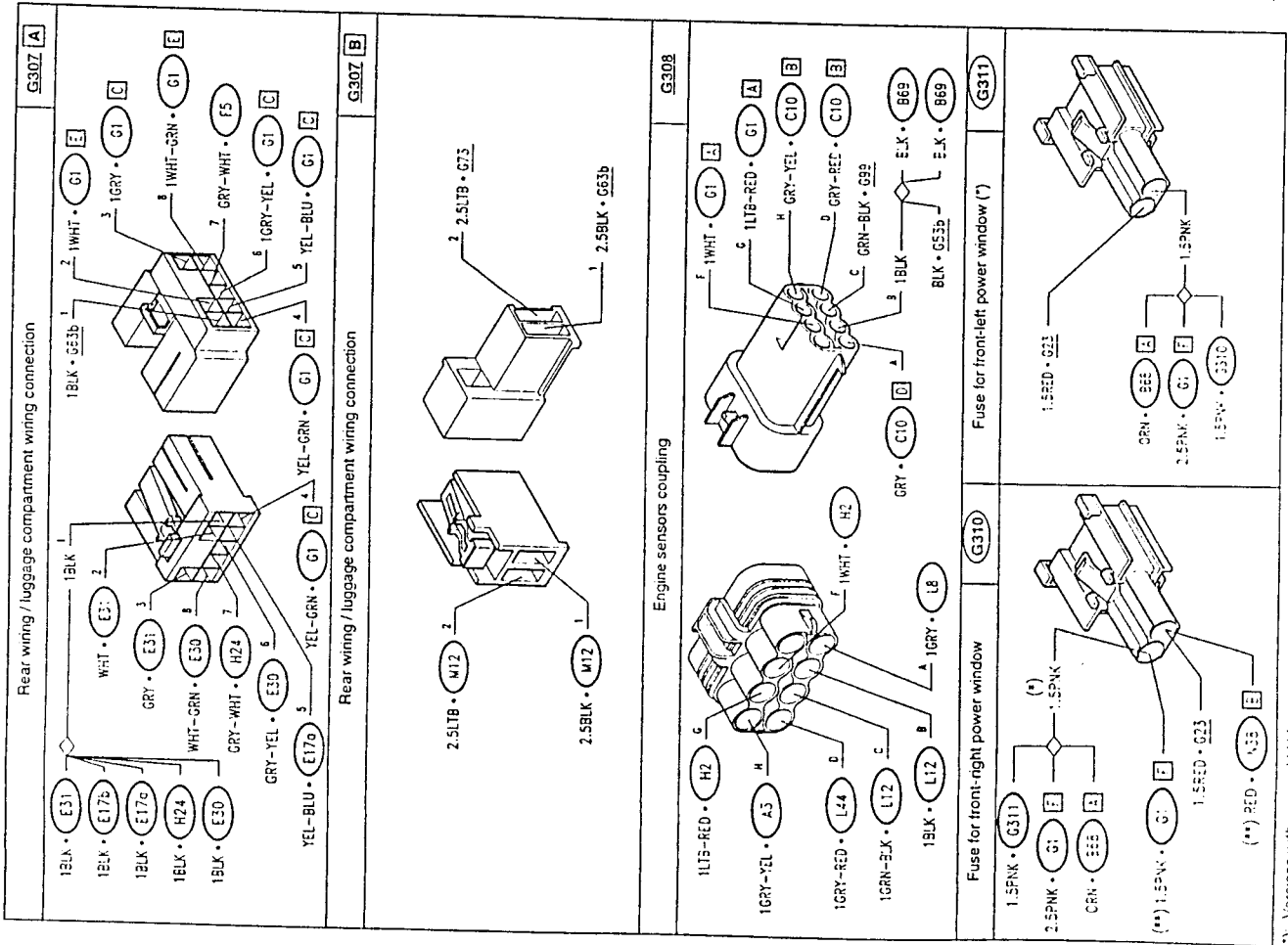
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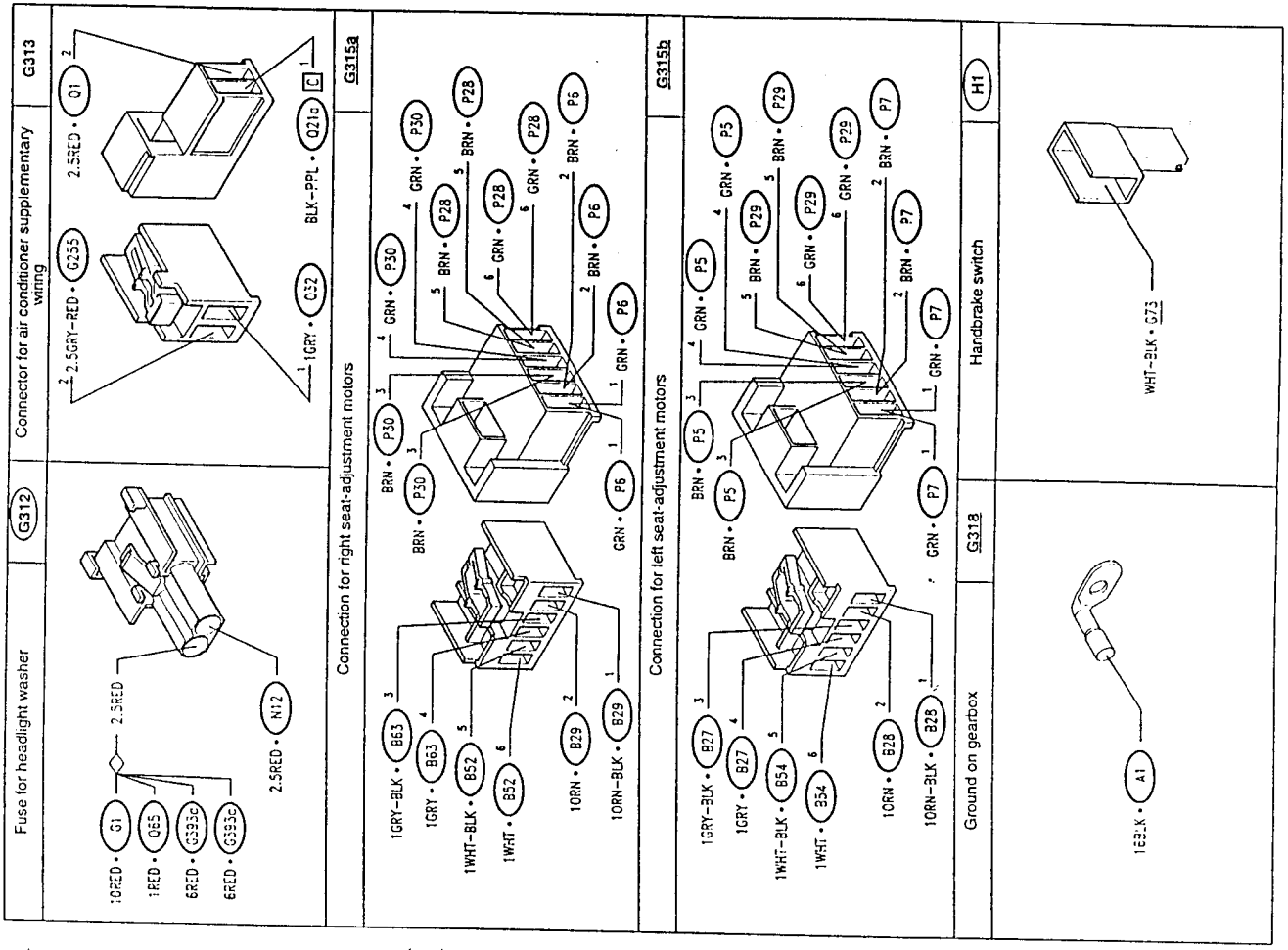


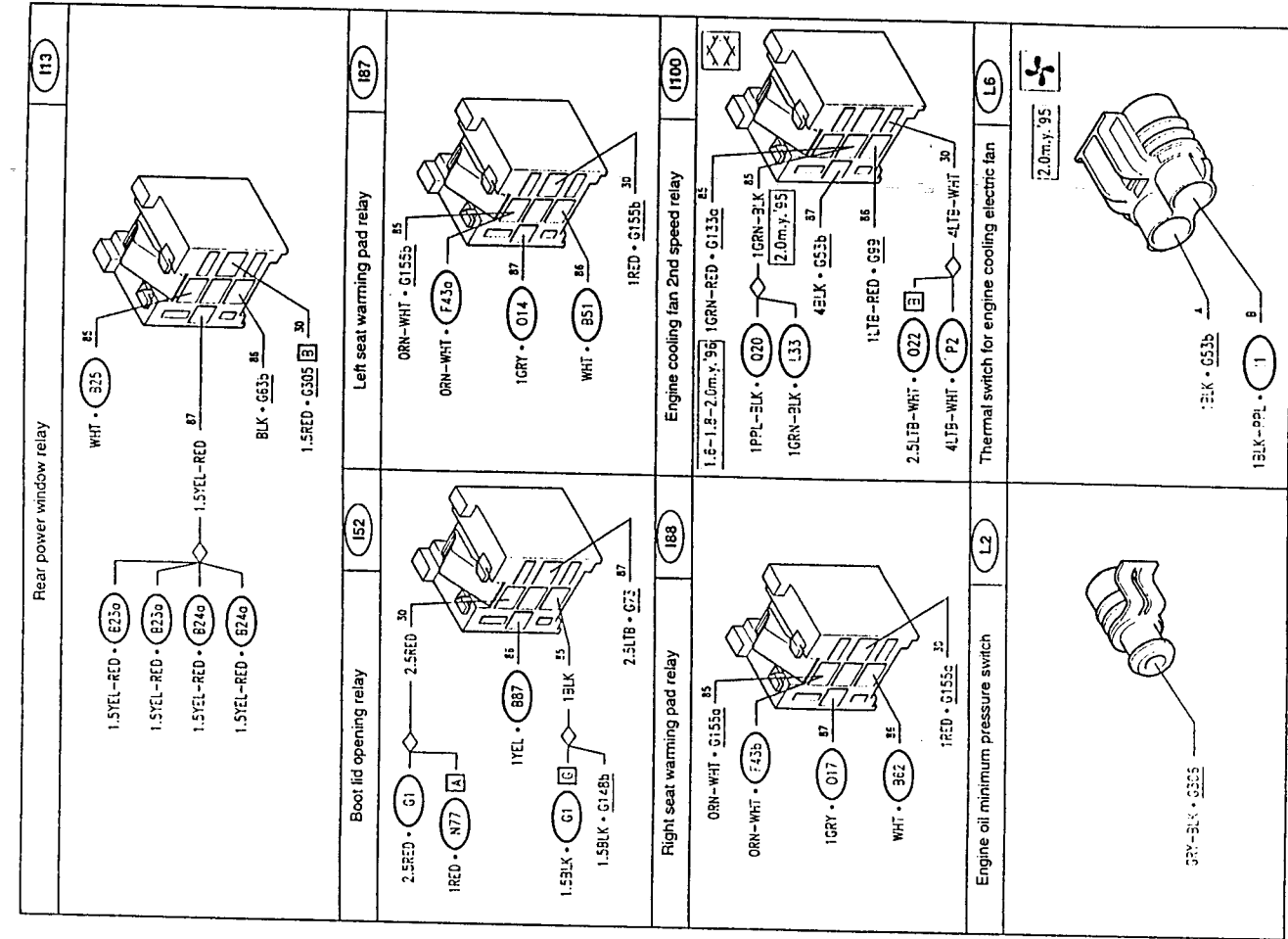
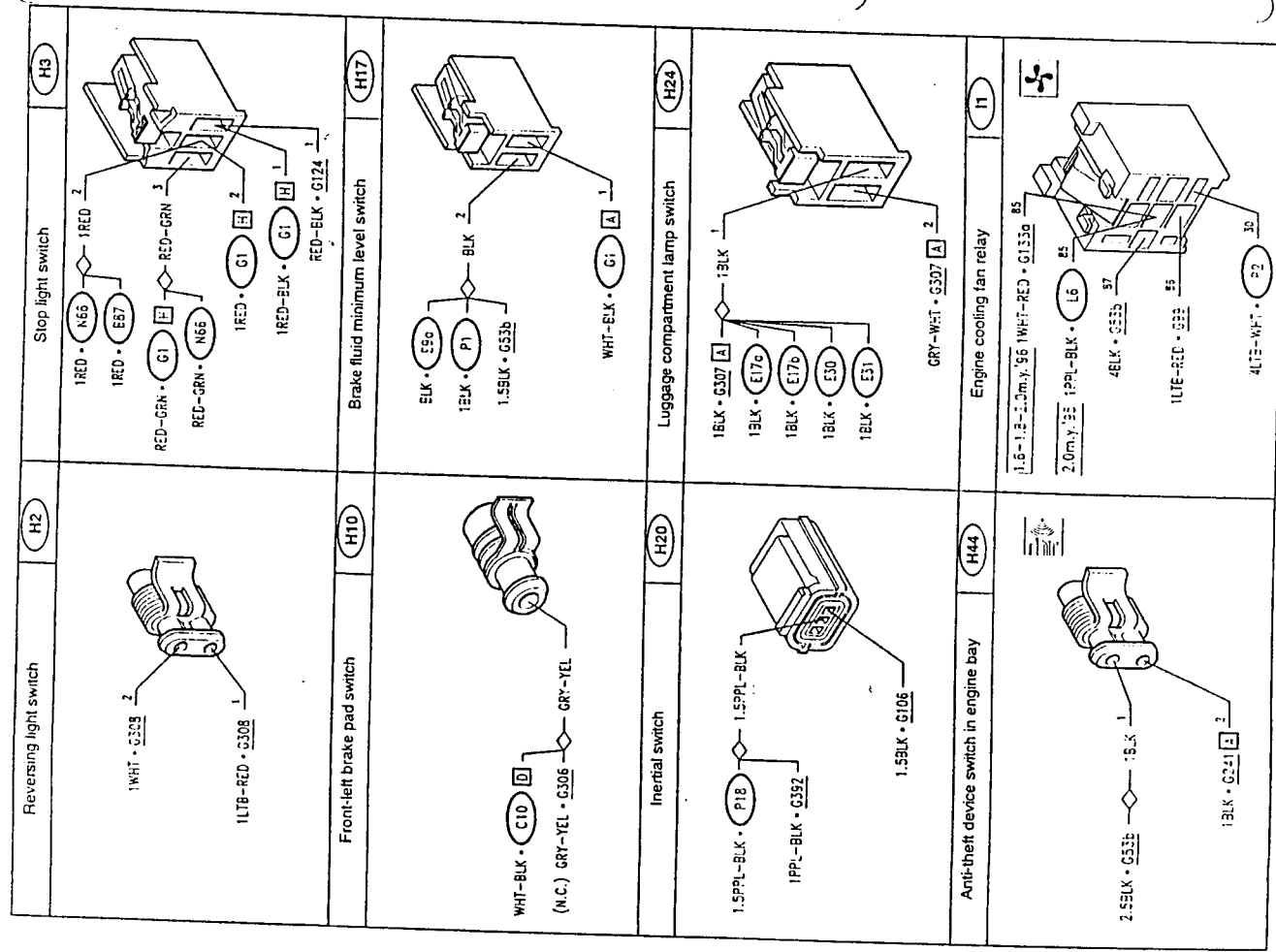


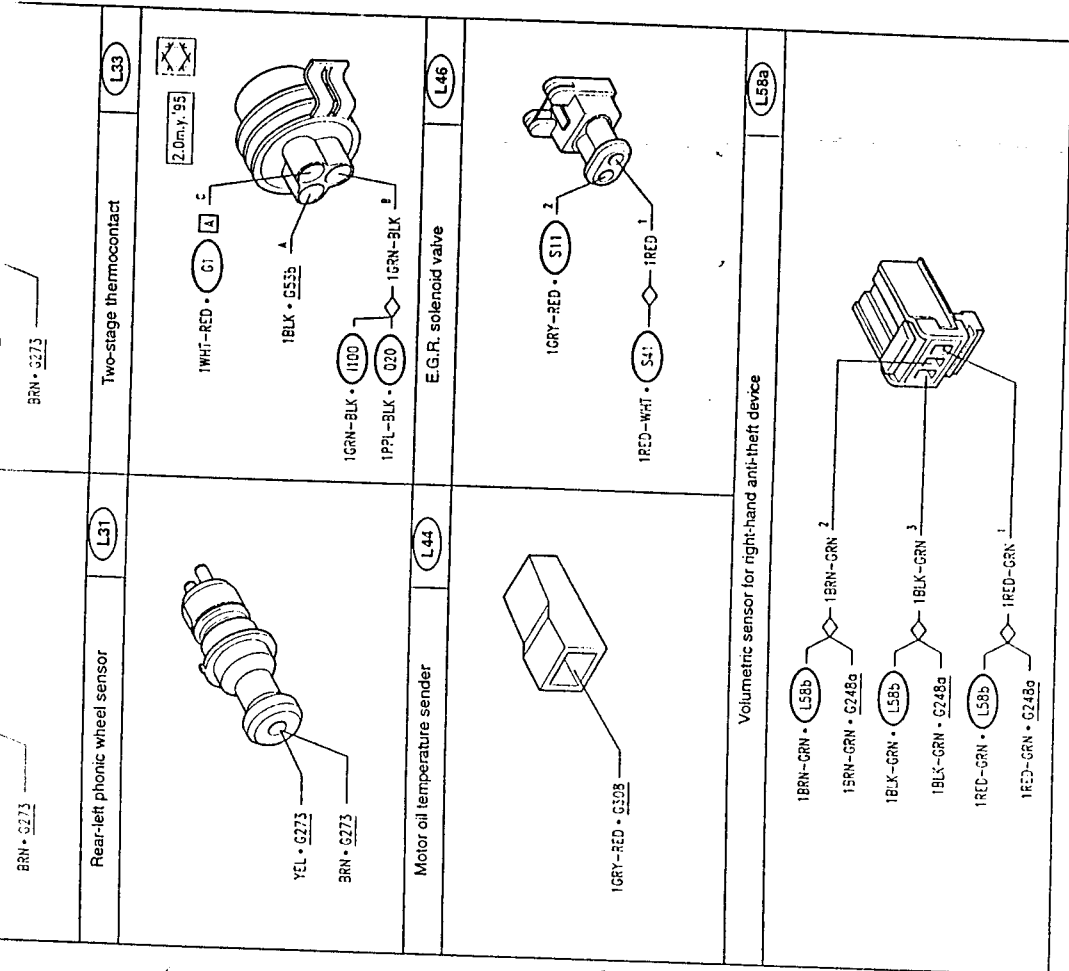


(\*) Versions with manual LH front power window control

(\*) Versions with automatic LH front power window control

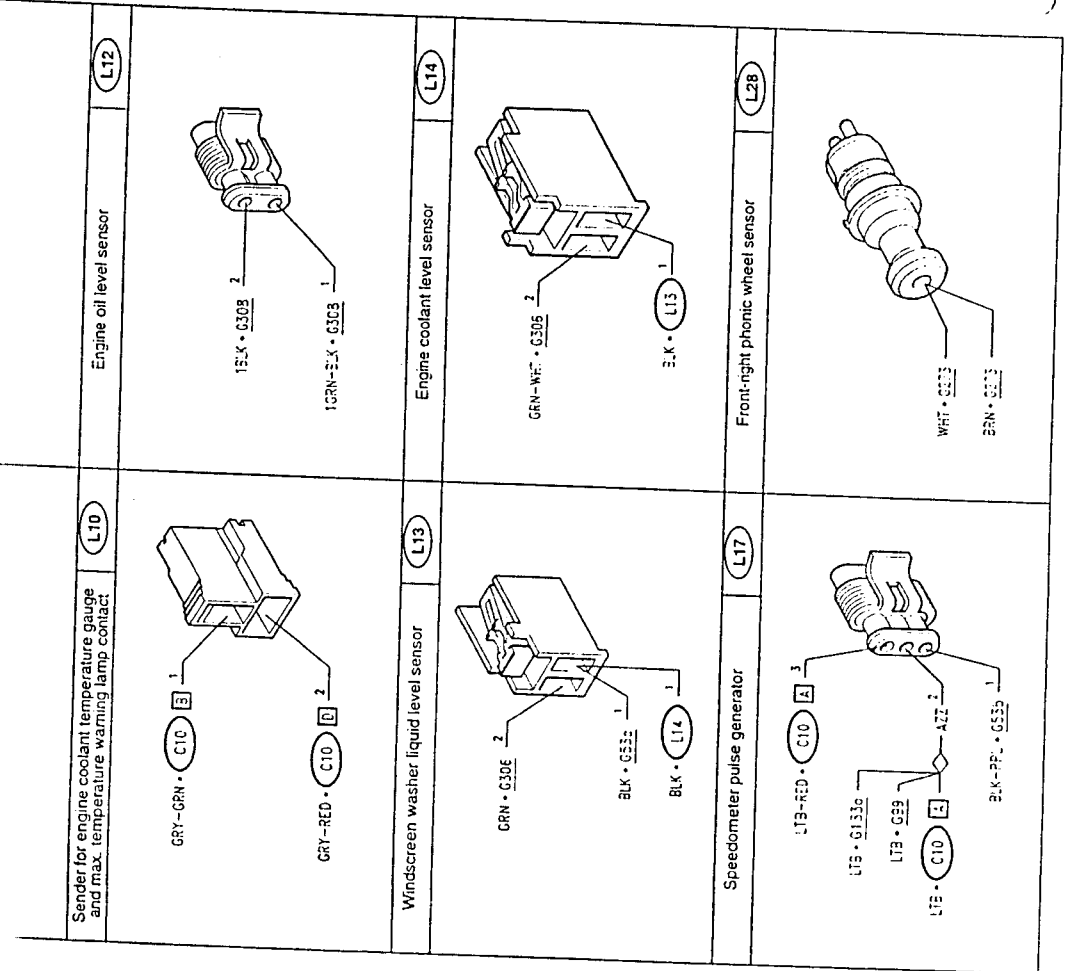






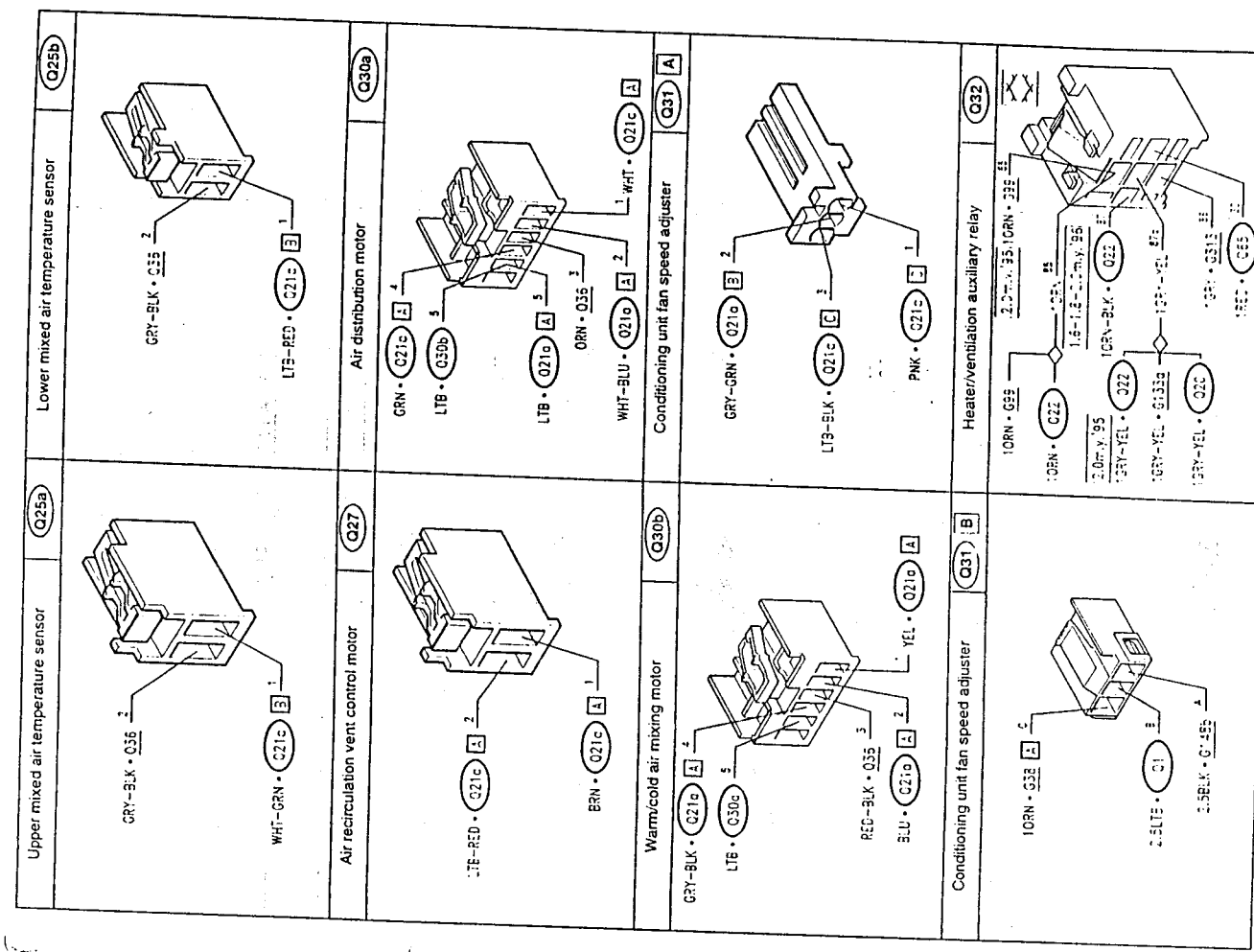
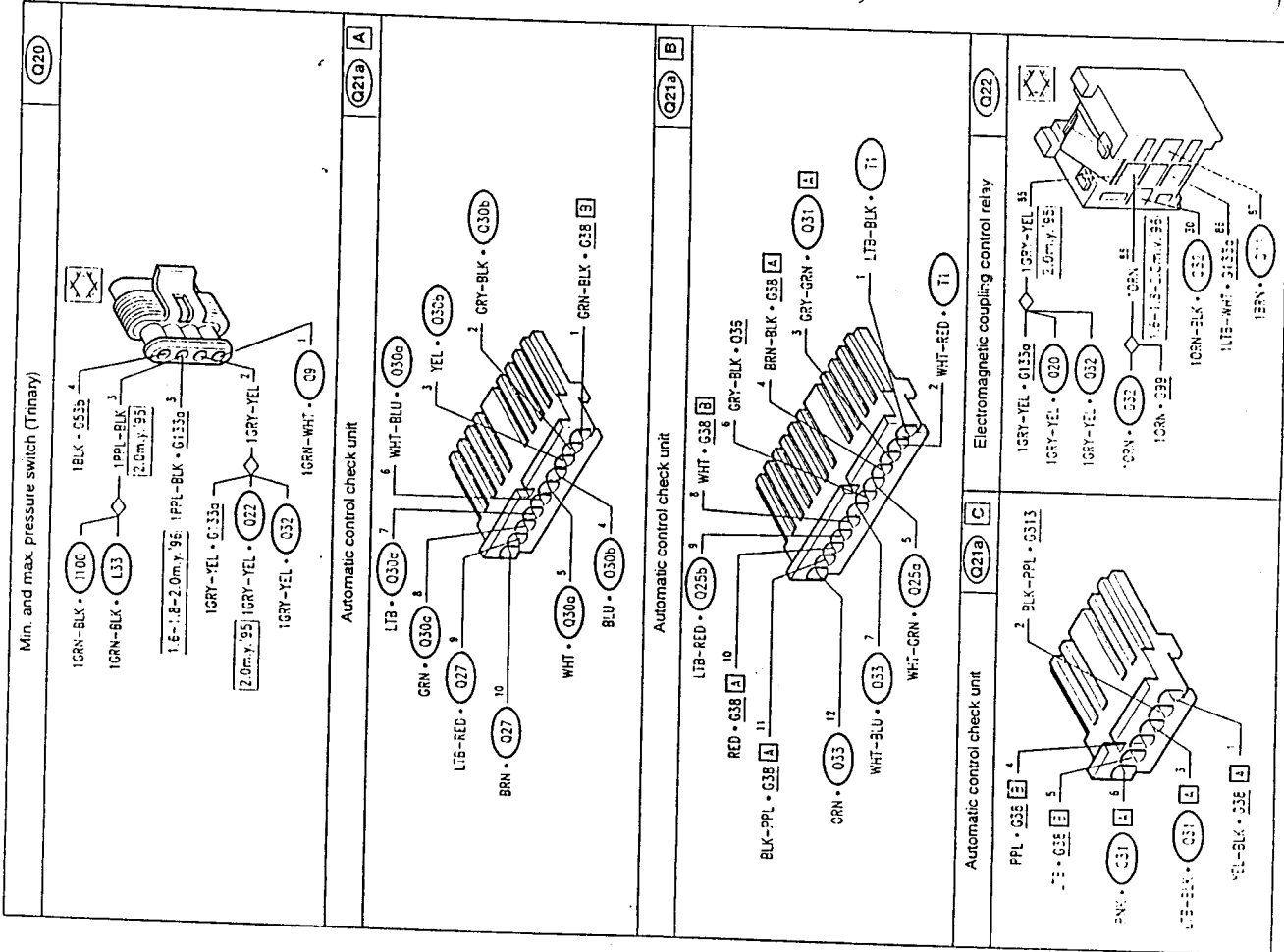
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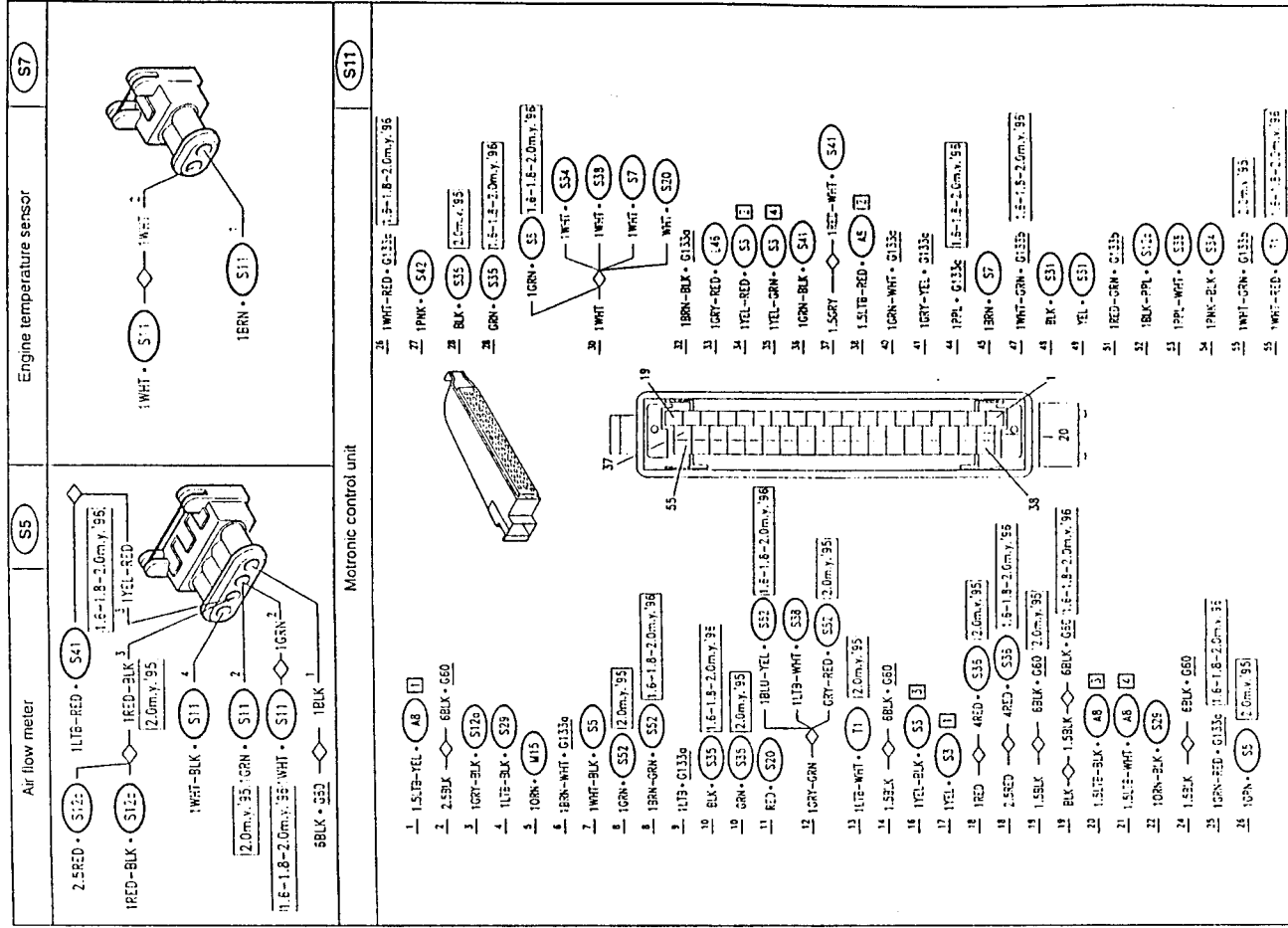
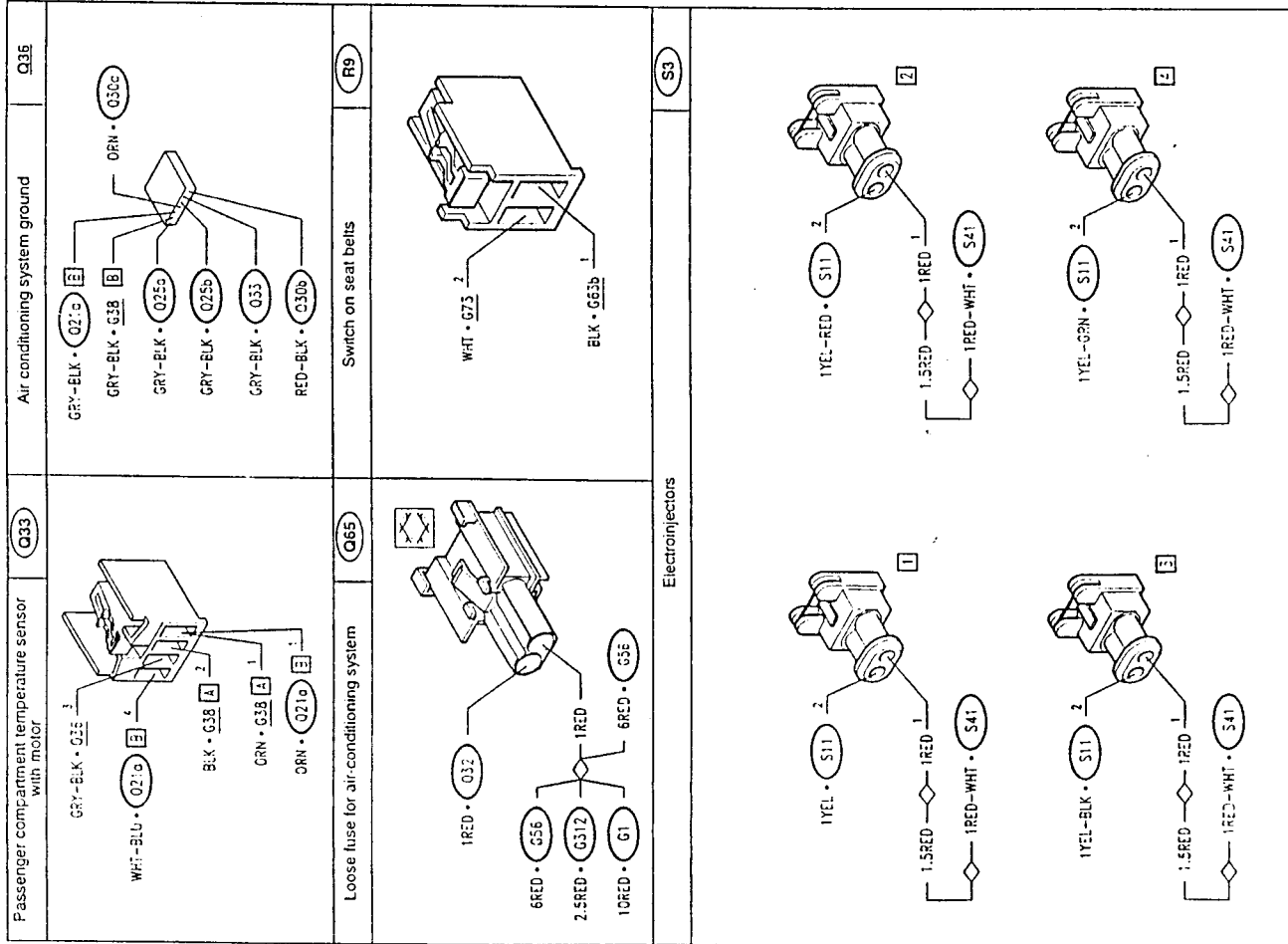


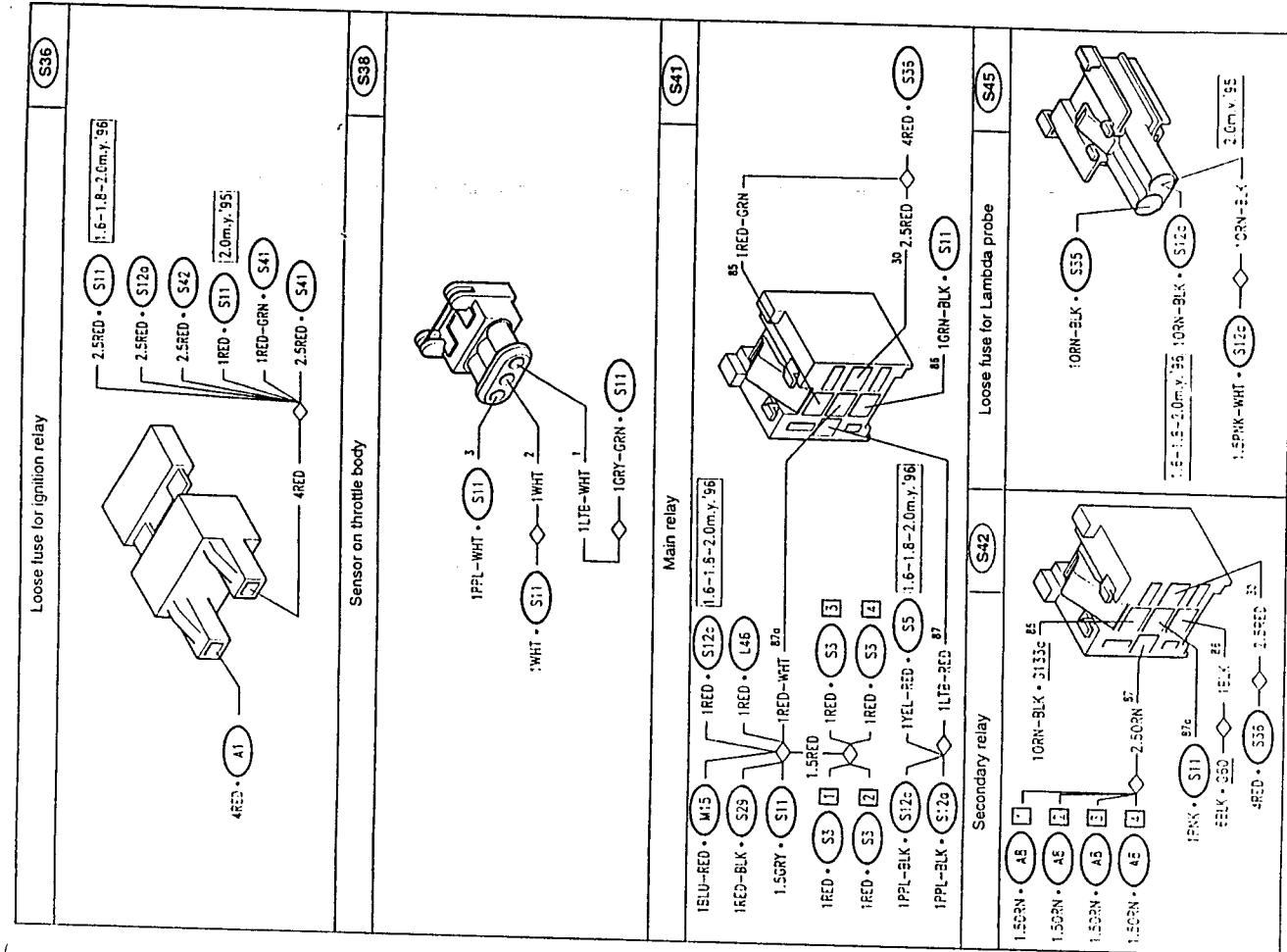
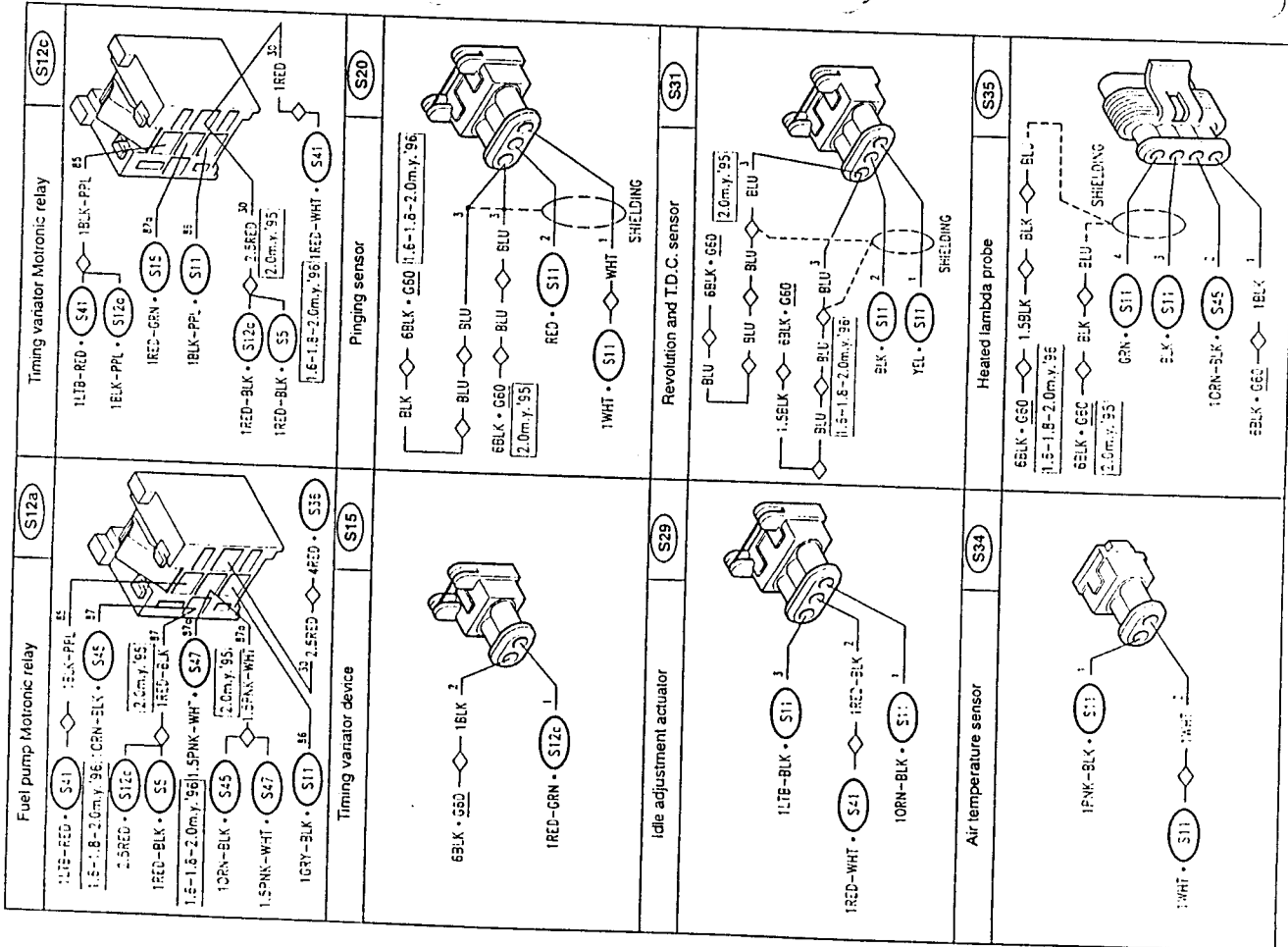
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<p>Loose fuse for fuel pump</p>	<p>Cam angle sensor</p>
<p>Connector for ALFA TESTER (Moltronic and ALFA ROMEO CODE)</p>	<p>Connector for ALFA TESTER (Anti-theft)</p>
<p>Connector for ALFA TESTER (ABS)</p>	<p>Connector for ALFA TESTER (Air conditioning)</p>



**SERVICE**

**DIREZIONE POST-VENDITA**  
**SERVIZI ASSISTENZIALI**  
Viale Alfa Romeo 20020 Arese (MI)  
Fiat Auto S.p.A.

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