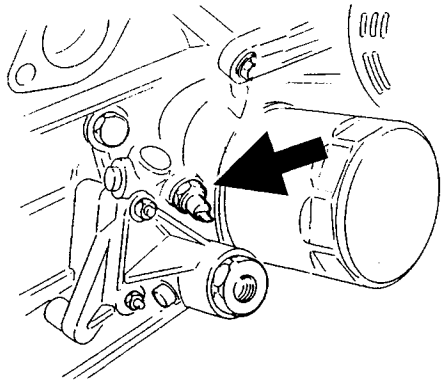
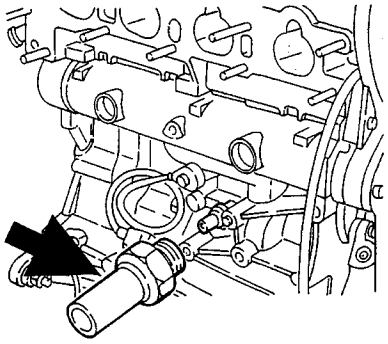
Min. engine oil pressure contact (L2)

3.0 V6
3.0 24v
2.0 TB

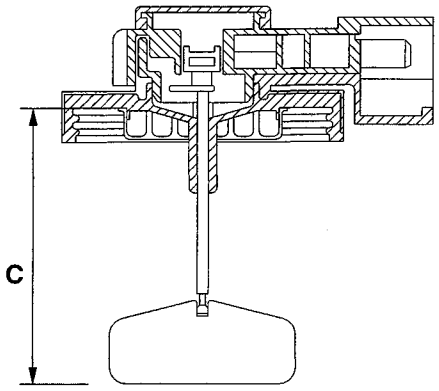


2.0 T.S. 16v



SPECIFICATIONS		
	3.0 V6-3.0 V6 24v 2.0 TB	**2.0 T.S. 16v**
Conntact closes (pressure falliing)	0.15÷0.35 bar	0.2÷0.5 bar
Contact opens (pressure rising)	0.15÷0.35 bar	0.2÷0.5 bar

Min. brake fluid level switch (H17)



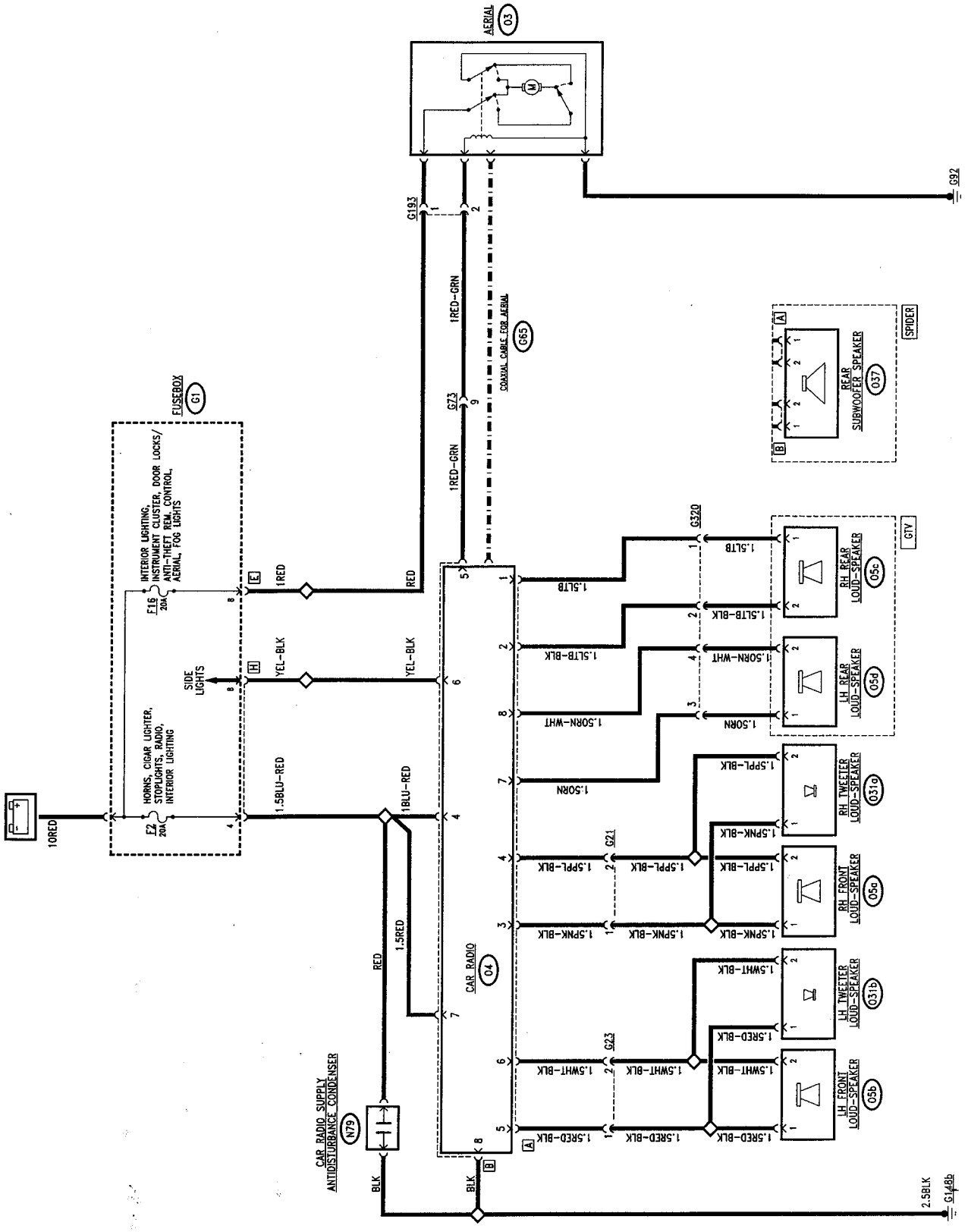
SPECIFICATIONS
The float closes the contact if dimension **C** (see figure) exceeds 40 ± 1 mm.

NOTE: to check operation of the switch simply press lightly on the upper end of the cover: this way the contact closes and it is possible to check whether the warning light is working properly

CAR RADIO

INDEX

WIRING DIAGRAM



GENERAL DESCRIPTION

The car is fitted with a provision for the installation of **a car radio system complete with loud speakers.**

The system includes all the **wirings** necessary, already connected to the "base" wiring loom of the car, with **two** 130x180mm **front loudspeakers with 2 separate tweeters**, and **two** 165 mm, two-way **rear loudspeakers** (GTV) or a single 165 mm **rear sub-woofer loudspeaker** (SPIDER).
The front speakers are located at the sides in the lower sections of the doors, with the tweeters on the pillar and the rear ones are on the shelf behind the seat (GTV) or in the centre behind the console (SPIDER).

The **electric aerial** is extended by a motor operated when the radio is switched on; it is located on the lefthand side of the boot lid and is connected with the radio by a coaxial cable.

The pre-installed supply for the radio is both key-operated and direct from the battery; this also makes it possible to memorise tuning, safety codes, etc. in the radio set.

In order to ensure very high sound quality under all conditions of use, a number of **anti-disturbance suppressors** have been fitted: this enables "electronic silencing" of the electric services that might interfere on the radio circuit:

– a suppressor in the boot lock;

– an aluminium sheet on the bonnet sound-deadening, earthed with a suitable braid;

– two condensers on the radio power supply.

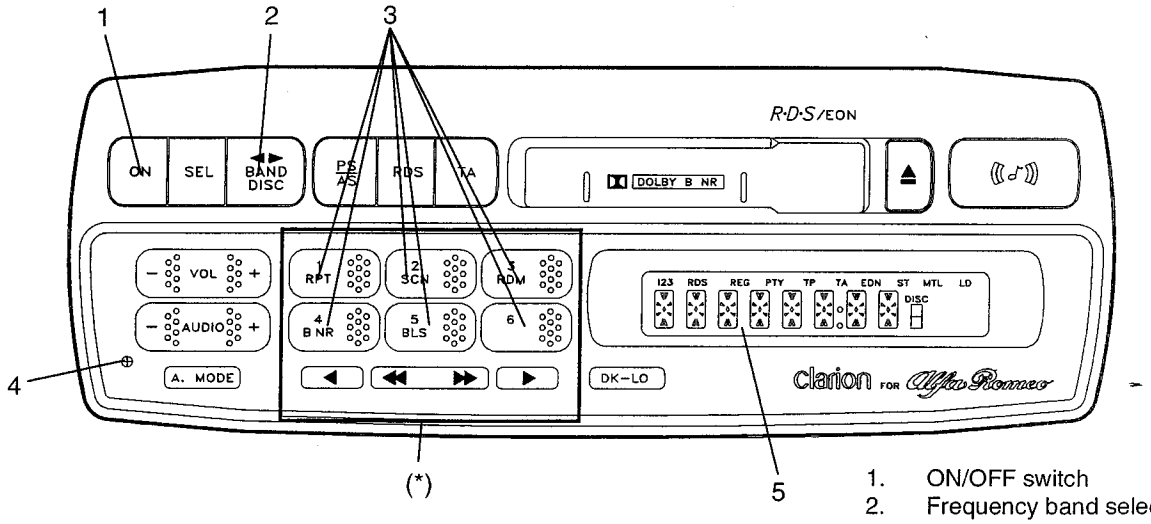
As an optional extra the car can also fitted with a **fixed radio :** this system is composed of a **CLARION** radio with RDS coding, cassette player and CD loading control.

The radio has a removable front panel, as protection against theft and an internal antitheft code for further security.

FUNCTIONAL DESCRIPTION

The radio **O4** is supplied directly by the battery voltage via fuse **F2** of fusebox **G1**, at pin 4 of connector B (supply for memorising, etc.), while pin 7 receives the key-operated supply from fuse **F15** of **G1** (operation of the set - only up to chassis no.___ -).
Pin 8 of connector B is earthed.
Pin 6 receives the "sidelights on" signal used for lighting the radio controls.
The cables with the signals to the speakers leave from connector A of **O4.**
The aerial **A3** is connected to the radio by the special screened coaxial cable **G65**.
A signal also leaves pin 5 of connector B of **O4** which operates the motor of the electric aerial and extends it completely; when the radio signal ceases, the motor is operated in the reverse direction and the aerial is retracted completely.
The aerial **A3** is powered via the line of fuse **F16** of **G1**.
The suppressor **N79** is inserted on the radio supply.
Other suppressors are to be found near the services that would be more likely to interfere on the radio circuit.

CLARION RADIO



1. ON/OFF switch
2. Frequency band selector
3. Pre-select buttons
4. Antitheft led
5. Display

(*) Removable control panel

Antitheft system

The radio is fitted with a removable control panel (*) which must be removed when leaving the car to make the system unusable: removing the panel, the supply to the whole radio system is cut off and restored automatically when the panel is put back on again.

For further protection the set has a built-in anti-theft system with a secret code.

This system makes the set inoperative if for some reason it has been cut off: for example also if the battery is disconnected.

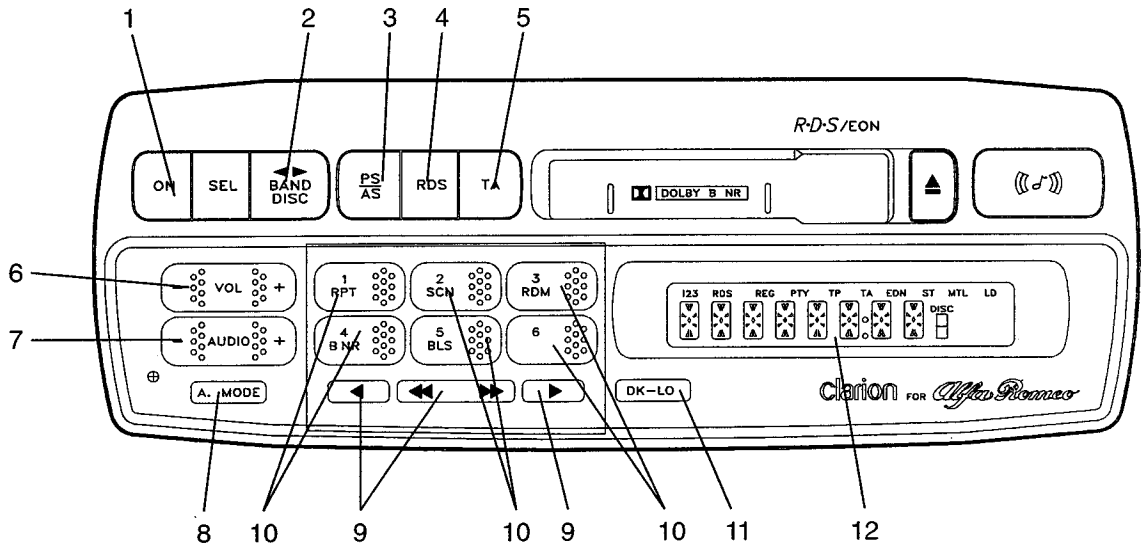
To make the radio work again it is necessary to enter the secret code given on the Customer Card, as follows:

- press the ON/OFF switch (1): the display will show the prompt "CODE IN";
- enter the secret code using the pre-select buttons (3); the number entered will be shown on the display;
- if the **number is correct** the radio turns on (the display will show the radio frequency);
- if the **number is wrong** the number itself stays on the display; press the BAND button (2) for at least 3 seconds and repeat the operation.

N.B. After three incorrect entries the radio will remain blocked for one hour; after a subsequent attempt it will be necessary to wait another hour and so on).

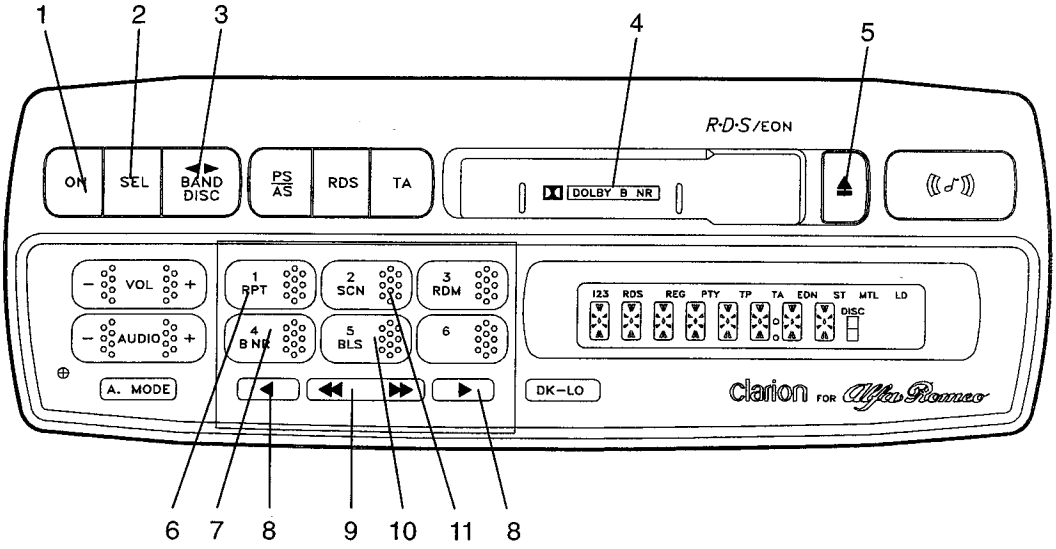
The antitheft indicator (4) signals the presence of this system when the car is not running.

OPERATION OF THE RADIO:



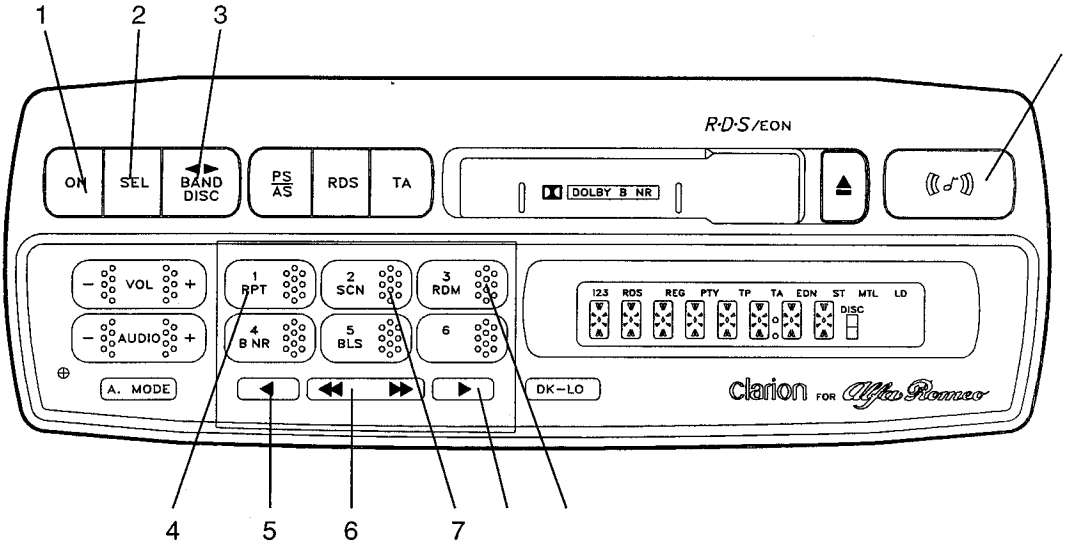
1. ON/OFF switch
2. Band selector
3. Preselector button, scan/automatic memorising off
4. RDS button
5. TA button (Traffic Announcements)
6. Volume adjustment buttons
7. Sound adjustment buttons
8. Sound mode selector switch
9. Tuner buttons
10. Pre-selector buttons
11. DX-LO tuner button
12. Display

MAGNETIC TAPE PLAYER OPERATION:



1. ON/OFF switch
2. Mode selector switch
3. Player switch
4. Cassette lid
5. Eject button
6. Repeat switch
7. Dolby switch
8. Fast forward buttons
9. APC buttons
10. Empty tape skip button
11. Tape scan switch

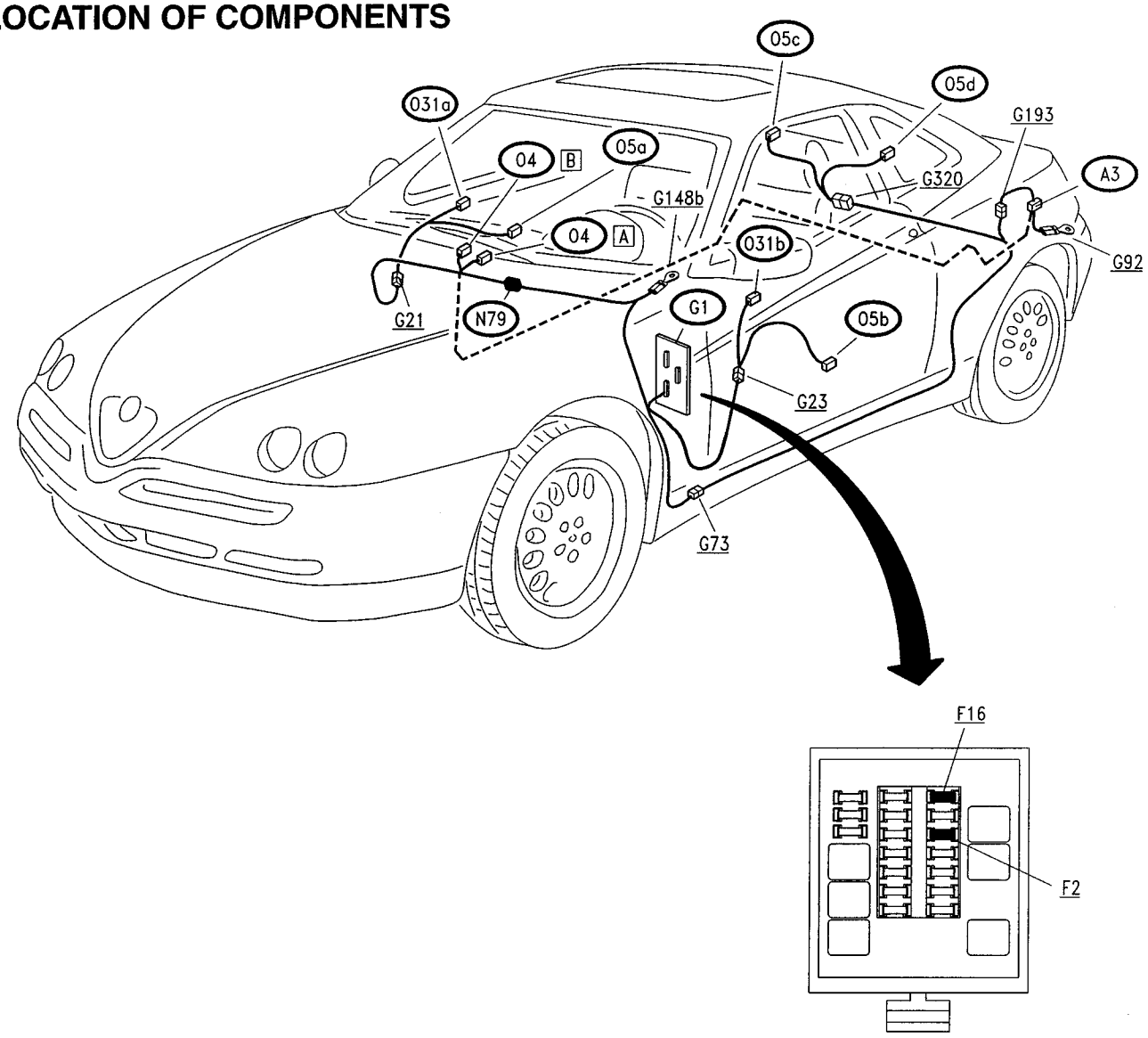
CD CHANGE OPERATION:

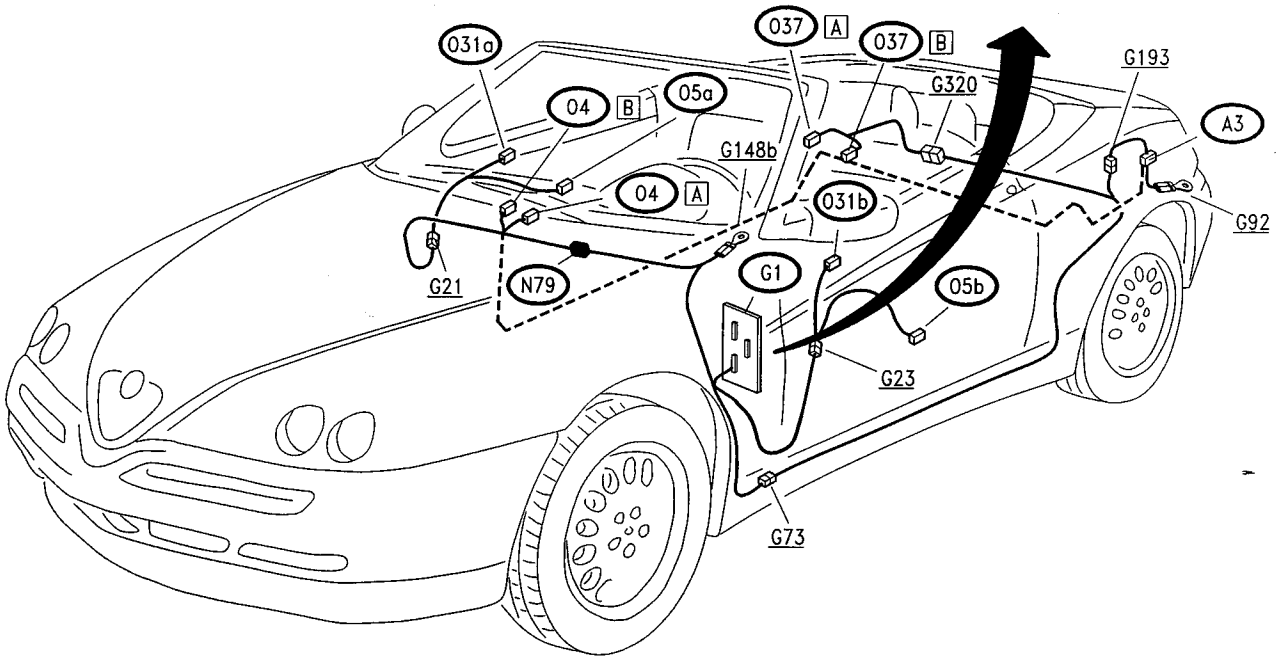


1. ON/OFF switch
2. CD mode selector switch
3. CD selector
4. Repeat switch
5. Fast rewind buttons
6. Track selector buttons
7. Scan switch
8. Random switch
9. Sound timbre switch

WARNING!
The CD CHANGE system contains a laser system and is classified as a "CLASS 1 LASER PRODUCT". For correct use of the set, the Owner's Manual should be read carefully. Do not open the casing to avoid direct exposure to laser beams.
THE USE OF CONTROLS OR ADJUSTMENTS OR THE APPLICATION OF PROCEDURES OTHER THAN THOSE SPECIFIED IN THE OWNER'S MANUAL MAY RESULT IN EXPOSURE TO HARMFUL RADIATIONS.

LOCATION OF COMPONENTS





– – – – coaxial aerial cable

FAULTFINDING TABLE

Fault	Component to be checked									
	F16	F2	O4	O5a-O31a	O5b-O31b	O5c	O5d	O37	G65	A3
Radio power failure		•	•							
Poor reception			•						•	•
Aerial sticks in	•		•							•
Front speaker/RH tweeter not working			•	•						
Front speaker/LH tweeter not working			•		•					
RH rear speaker not working (GTV)			•			•				
LH rear speaker not working (GTV)			•				•			
Rear speaker not working (SPIDER)			•					•		
Interference from other electric services (•)			•						•	

(•) If the system hisses or other signals indicating interferences, check that the connection to the wiring loom is correct and that the suppressor condensers **N79** locate near the radio and **N53** near the boot lock are working properly; also check that the sound deadening on the bonnet is fastened correctly.

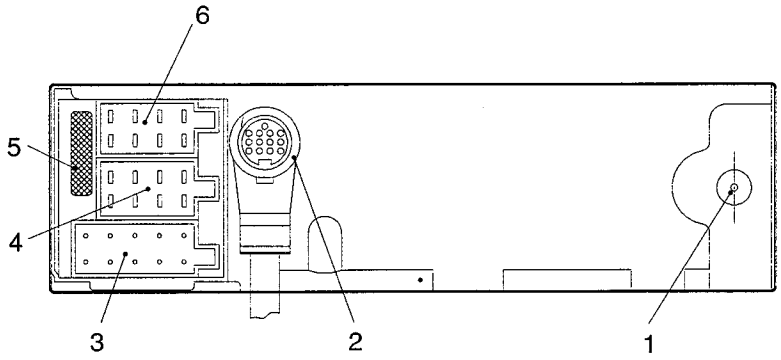
CHECKING COMPONENTS

CAR RADIO (O4)

Further details on the features and operation of the radio are given in the "INSTRUCTIONS FOR USE" provided with it.

Also in the event of malfunctions of certain specific functions of the radio, consult the "INSTRUCTIONS FOR USE". Additionally:

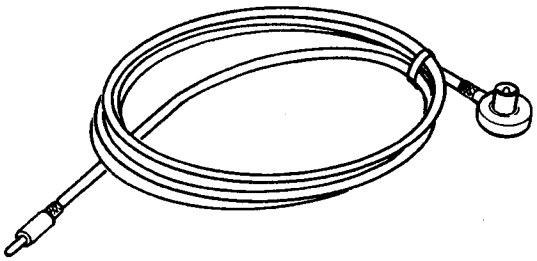
- Also check that the additional fuse (10A) on the back of the radio is intact (pos. 5 of illustration); change it if necessary.
- In the event of hissing noises or other signs of malfunctioning of the system due to interferences, check that the anti-disturbance condensers **N79** near the radio, and **N53** in the boot lock are correctly connected and working properly.



rear view of connectors side:

1 - aerial coaxial cable connection socket **G65**
2 - connector for connecting C.D. player
3 - unconnected connector
4 - connector (O4) [A]
5 - additional fuse (10A)
6 - connector (O4) [B]

Coaxial aerial cable (G65)



SPECIFICATIONS	
Characteristic impedance	150 Ω ÷ 10%
Resistance of internal wire	≤ 1 Ω/m
Total capacity (measured on the plug-radio side)	50 ÷ 90 pF

DOOR LOCKING SYSTEM

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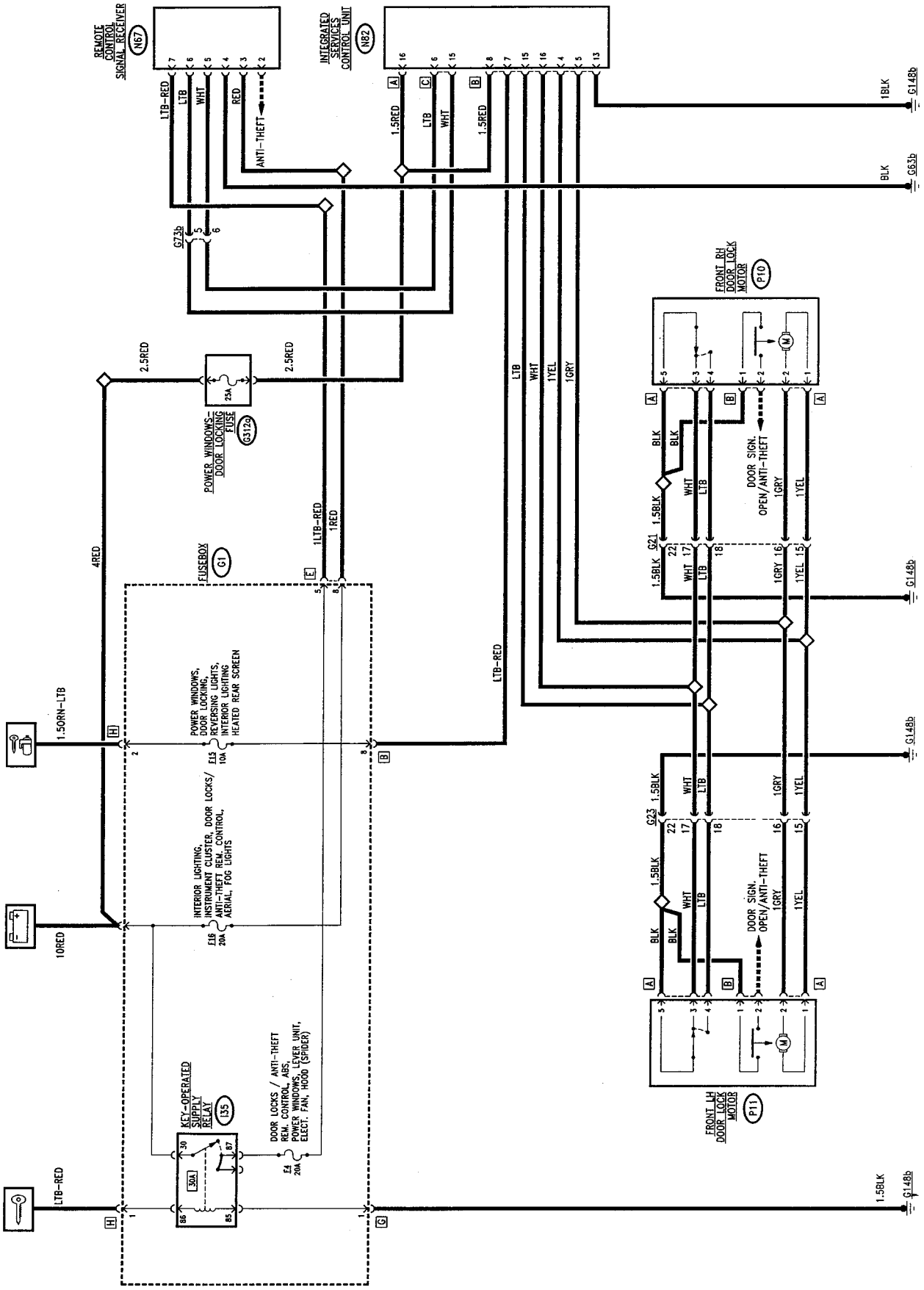
WIRING DIAGRAM



GENERAL DESCRIPTION

The door locking device is controlled by the integrated electronic control unit **N82** which checks and controls the door locks; each of these comprises a gear motor for locking/releasing the lock, a control switch and a door open signalling switch. The latter is used by the Instrument Cluste (see "Instrument Cluster") and by the alarm system (see "Alarm System").
The gear motors are both operated simultaneously from inside through the knobs or from outside using the key.

NOTA: the control unit logic includes a series of check and safety operations:

- each time they are operated, it reads the position of the switches. If this position does not match the one corresponding to the action carried out, a repulsion is activated; if it does correspond to the action carried out everything remains regular. Repulsion takes place both after a locking or releasing manoeuvre;
- the moment the motors are controlled to close and the operation is not performed correctly - i.e. the controls disagree - or a door is open (only for locking) the circuit performs the opposite manouevre to try to re-align the locks;
- if the control unit detects more consecutive and complete lock/release manoeuvres - at least 8 within 20 seconds - the system cuts in operating the manoeuvre limiting device, i.e. the system is inhibited in the release position for 30 seconds;
- if the battery voltage falls below 9 V, the system stops working.

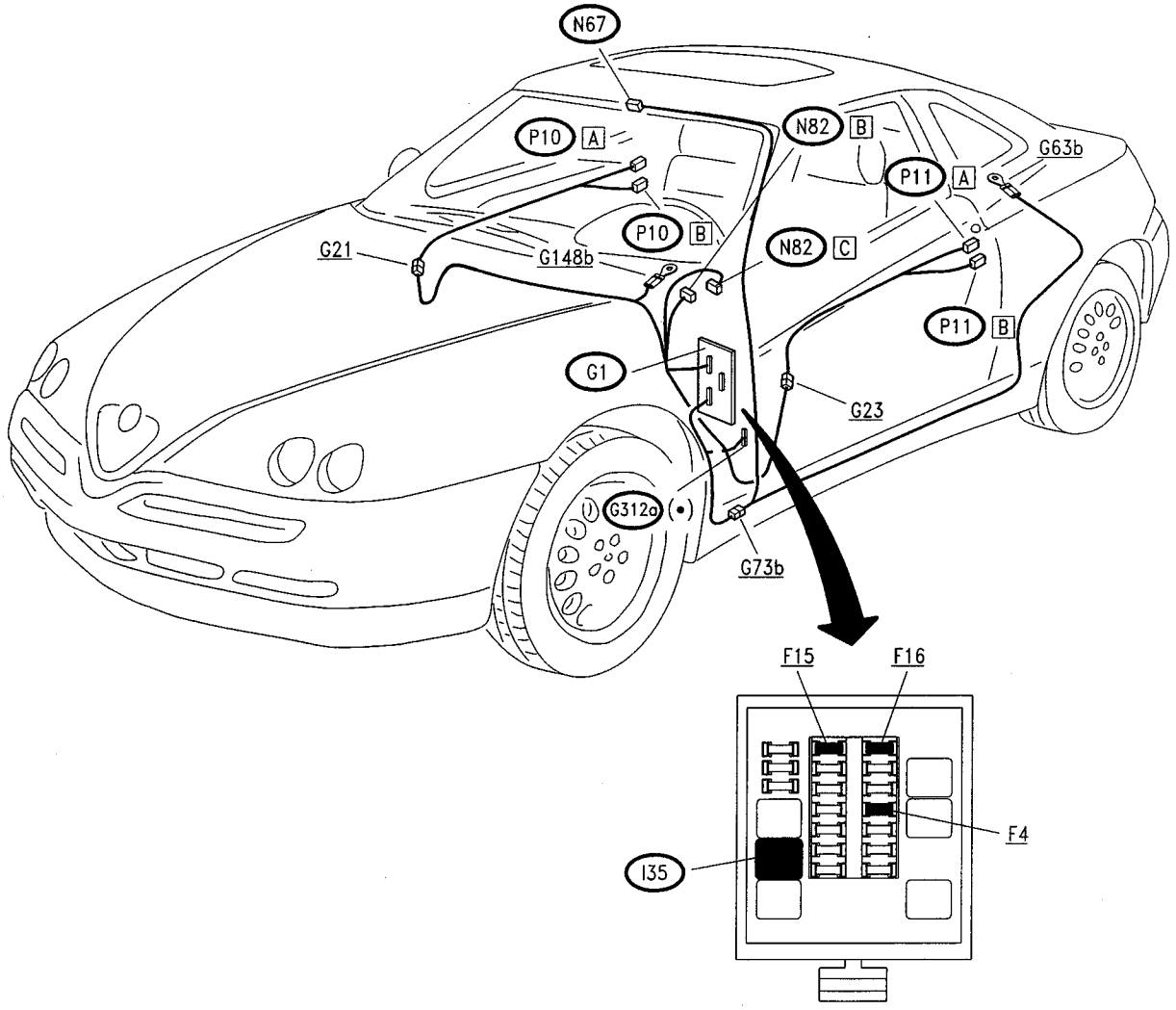
FUNCTIONAL DESCRIPTION

The control unit **N82** is located next to the fusebox **G1**.

It is supplied by battery voltage at pin B8 via fuse **G312a** while it is connected to earth at pin B13.
At pins B15 and B18 it receives an earth signal which represents the lock or release control from the switches of the front right **P10** and left **P11** door locking devices, or it receives similar signals from the remote control signal receiver **N67**: pin C6 and C15.

The control unit logic performs the checks mentioned previously and sends the lock signal (pin B5 12V and B6 earth) or unlocking signal (pin B6 12V and B5 earth) simultaneously to the door locking device gearmotors **P10** and **P11**.

LOCATION OF COMPONENTS



(•) white fuseholder

FAULT-FINDING TABLE

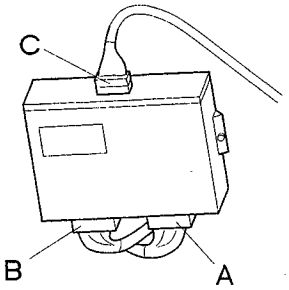
WARNING: The control unit safety logic envisages that, **in the event of a mechanical fault** on one of the door locking devices integrated with the lock, the **lock itself stays open**. In the unlikely event that the doors remain closed and locked, it is still possible to open the locks manually : using the key from outside or raising the knobs from inside.

N.B.: the cut off of the supply does not "release" closed doors!! Only when the supply is resumed, will closed doors open.

Fault	Component to be checked							
	(G312a)	F15	F4	F16	(N82)	(P10)	(P11)	(N67)
Entire door locking system	•	•			•			
Door locking remote control does not work			•	•				•
LH front door							•	
RH front door						•		

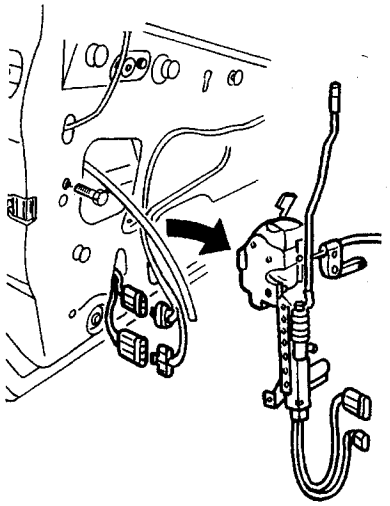
CHECK COMPONENTS

Integrated services control unit (N82)



Check the device **TEST A**

Door locking gear motor (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
lock control	continuity is interrupted between pin 5 and 3 and is established between pin 5 and 4 of connector A
release control	continuity is interrupted between pin 5 and 4 and is established between pin 5 and 3 of connector A
motor operation	applying 12V between pins 1 and 2 of connector A

CHECK SERVICES CONTROL UNIT (N82) - DOOR LOCKING FUNCTION	TEST A

TEST PROCEDURE	RESULT	CORRECTIVE ACTION
A1 CHECK VOLTAGE – Check for 12V at pins A16 and B8 of **N82**	OK ▶	Carry out **step A2**
	~~OK~~ ▶	Check fuse **G312a**
A2 CHECK VOLTAGE – With the key at MARCIA, check for 12V at pin B7 of **N82**	OK ▶	Carry out **step A3**
	~~OK~~ ▶	Check fuse **F15** of **G1**
A3 CHECK EARTH – Check that pin B13 of **N82** is at earth	OK ▶	Carry out **step A4**
	~~OK~~ ▶	Restore the wiring between **N82** connector B and earth **G148b**
A4 CHECK LOCK/RELEASE CONTROL SIGNAL – Operate the door lock or release using the key and check for the passage of an earth signal from pin B15 to pin B16 of **N82** or vice versa In the same way operate lock and release with the remote control at pins C6 and C15	OK ▶	Carry out **step A5**
	~~OK~~ ▶	Restore the wiring between **N82** and the door lock motor (**P10** RH or **P11** LH) or replace the latter
A5 CHECK LOCKING/RELEASING ACTION – Operate the door lock and release and check for 12V between pins 7 B4 and B5 of **N82**	OK ▶	THE CONTROL UNIT **N82** IS WORKING PROPERLY: Check the door lock motor **P10** or **P11** and the associated connections
	~~OK~~ ▶	Replace the control unit **N82**

LUGGAGE COMPARTMENT AND FUEL FLAP OPENING CONTROL

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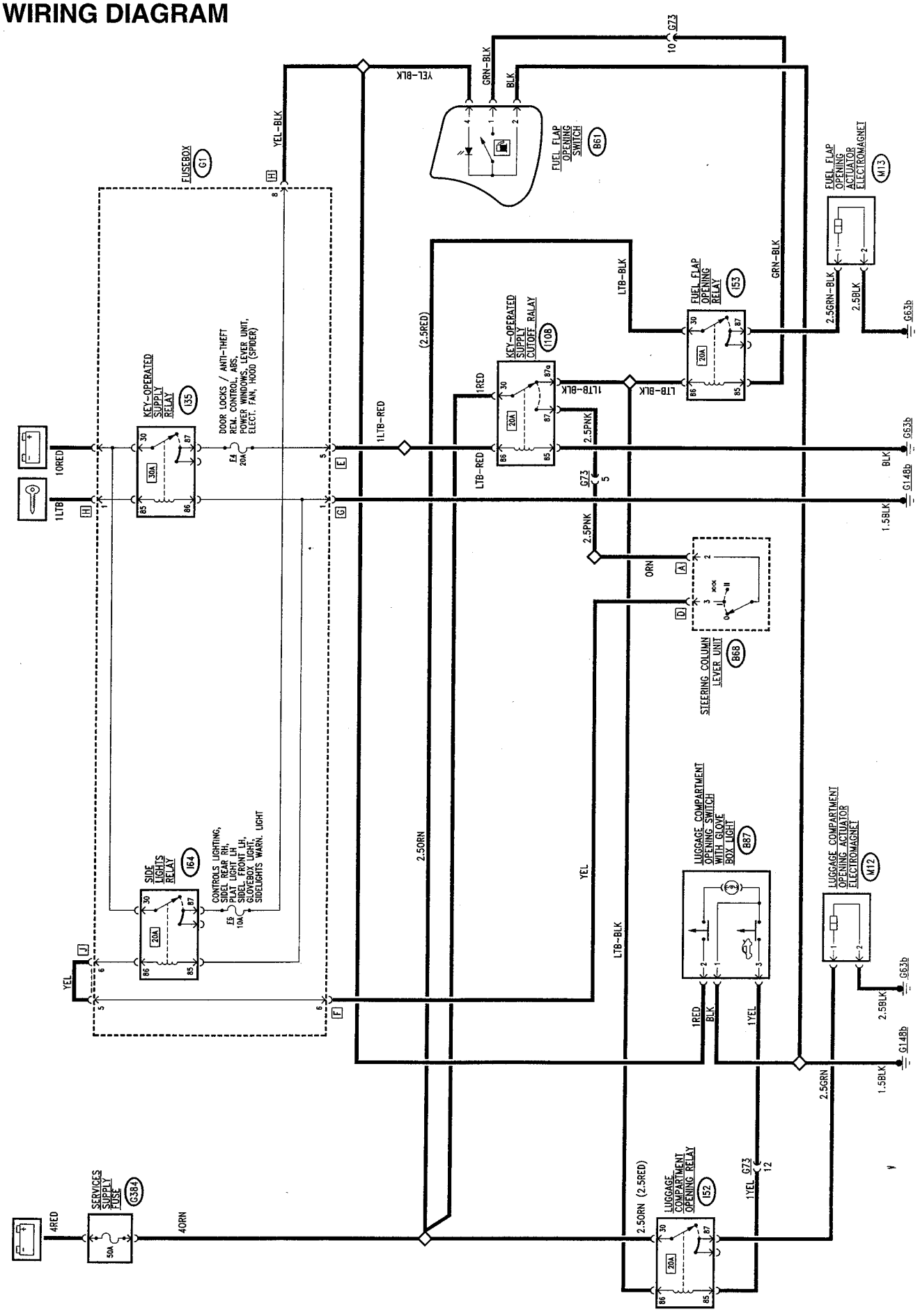
WIRING DIAGRAM



GENERAL DESCRIPTION

In addition to using the key in the rear lock, the **luggage compartment** can also be opened from inside the car through an electrical control.
The switch that opens the lock by an electromagnetic control is to be found in the glove box.
This box is lit when the sidelights are on by a light on this switch when it is opened.

This device only works with the ignition key at STOP, otherwise the lock must be opened manually.

The **fuel flap** is opened by an electrical control by the switch on the dashboard which operates the corresponding electromagnet.

This device too, only operates with the ignition key at STOP.

The two relays which operate the devices, the supply fuse and the "key-operated cut out" are located in the rear compartment.

FUNCTIONAL DESCRIPTION

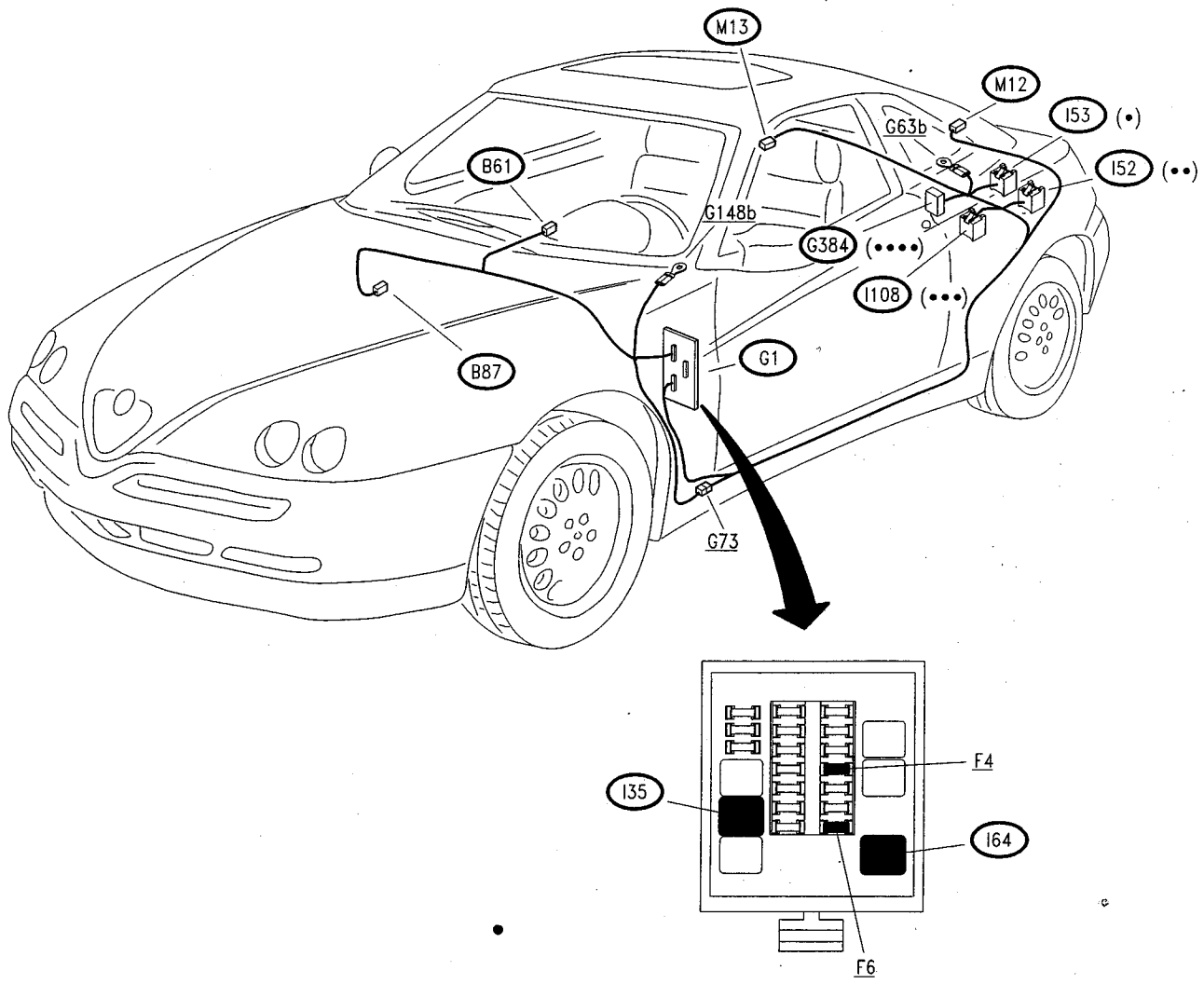
The boot opening electromagnet **M12** is controlled by relay switch **I52**: this is supplied on the power line by battery voltage via floating fuse **G384** and on the energizing line by relay switch **I108**: this switch sends the supply to relay **I52** and to the other release devices if it does not "receive" the signal that the key is at "MARCIA"; in fact, when the key is turned it cuts off the supply; the command signal - earth signal to energize relay **I52** - leads from the special switch **B87** located in the glove box; the energized relay supplies electromagnet **M12** which triggers the boot lock.
The switch in **C16** is illuminated when the side lights are on.

NOTE: switch **B87** incorporates a pushbutton which turns on a light when the glovebox is opened; the supply for this light leads from fuse **F6** of **G1**, sidelights line

The fuel flap opening electromagnet **M13** is controlled by relay **I53** in the same way as described for the luggage compartment opening.

The control switch **B61** is to be found on the dashboard and it is illuminated when the side lights are on.

LOCATION OF COMPONENTS



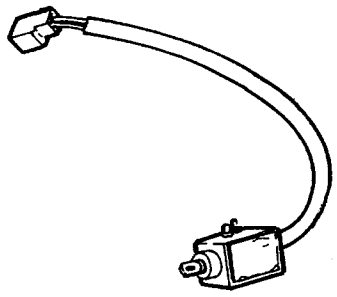
(•) White base
(••) Green base
(•••) Blue base
(••••) Black fuseholder

FAULTFINDING TABLE

Failure	Component to be checked								
	F6	G384	M12	M13	I52	I53	B87	B67	I108
Boot opening control		•	•		•		•		•
Fuel flap opening control		•		•		•		•	•
Fuel flap opening switch lighting (with sidelights on)								•	
Glove box lighting (with glove box open)	•						•		

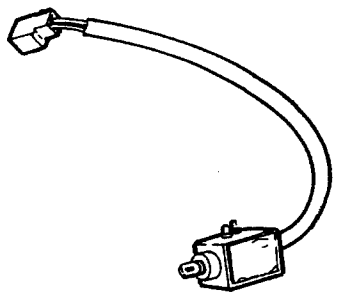
CHECK COMPONENTS

Boot opening electromagnet M12



SPECIFICATIONS	
Nominal voltage	12V
Absorbed current	31A
Magnetic core stroke	7 ± 0.5 mm

Fuel flap opening electromagnet M13

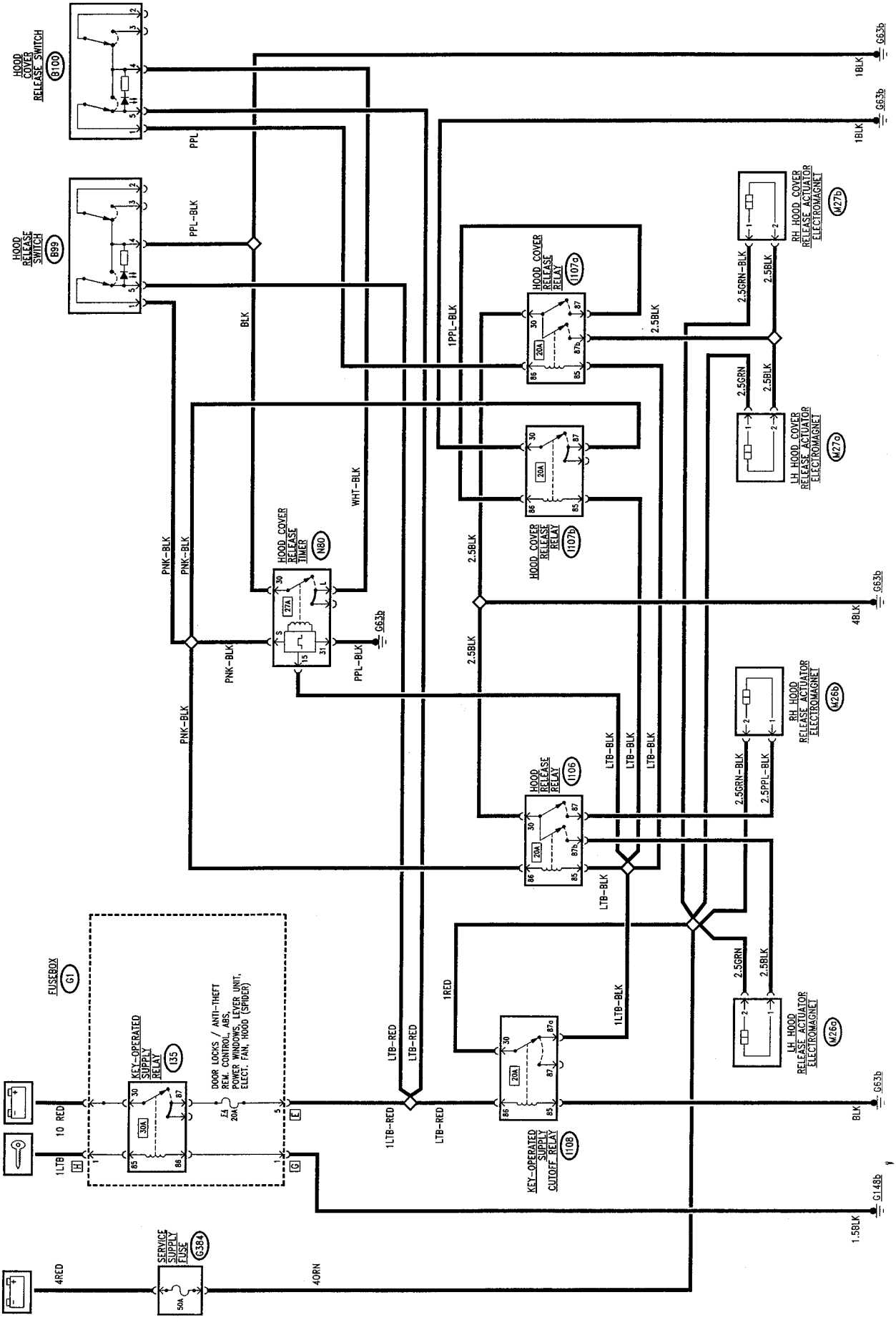


SPECIFICATIONS	
Nominal voltage	12V
Absorbed current	31A
Magnetic core stroke	7 ± 0.5 mm

HOOD (SPIDER only)

INDEX

WIRING DIAGRAM



GENERAL DESCRIPTION

In the SPIDER, opening/closing the hood is facilitated by two electrical actuators: the first one releases the hood at the rear when it is closed; the second one opens the hood cover so that the hood can be folded in or taken out.

For each of these functions a special switch commands one or more relays which in turn operate a pair of release actuators. The switches are located on the rear side panel behind the driver's seat.

N.B. Both devices can be operated only with the ignition key removed or in the STOP position.
The hood cover can only be released after the hood has been released.

All the operating relays, the supply fuse and the "key-operated cutout" relay are to be found in the boot.

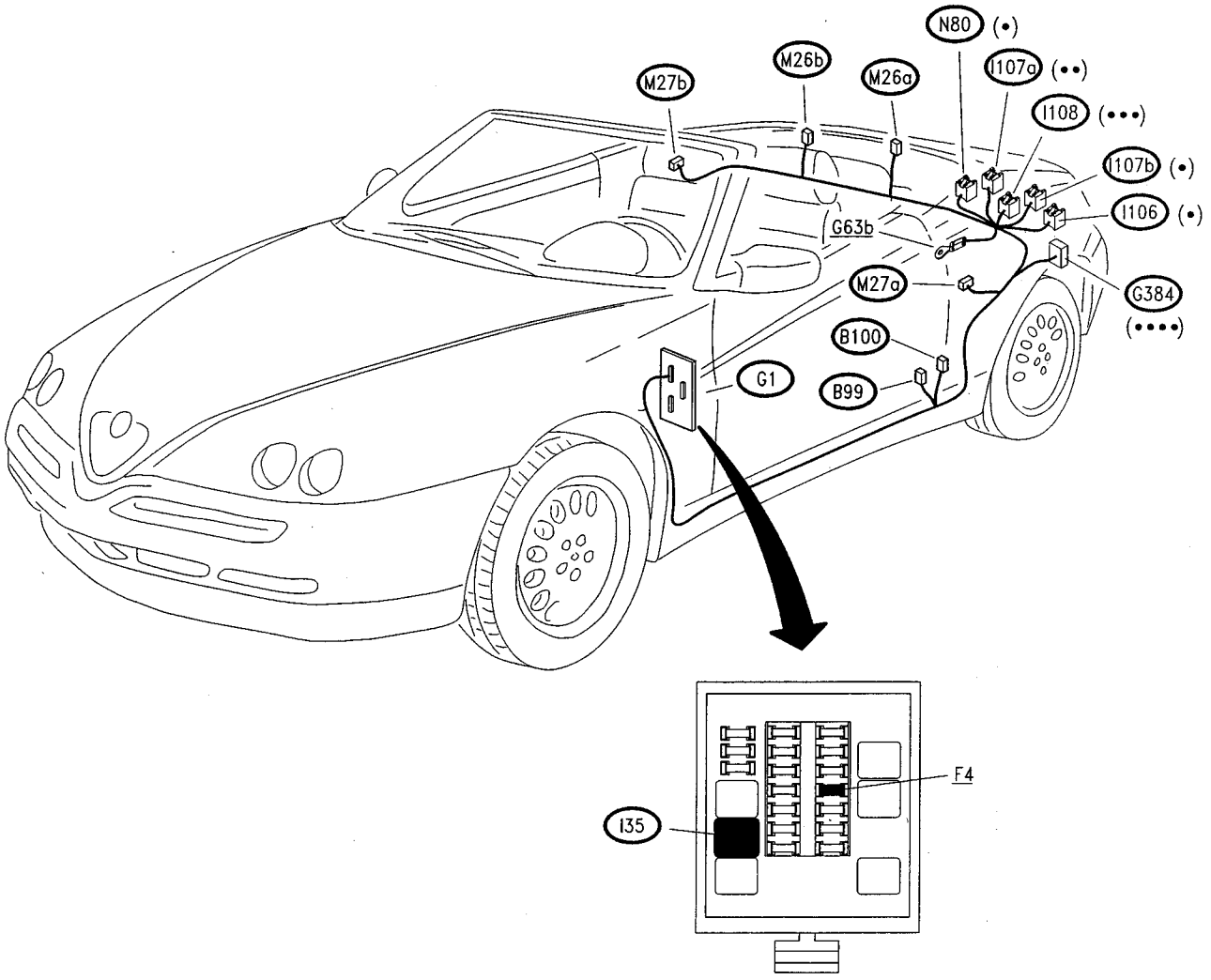
FUNCTIONAL DESCRIPTION

The electromagnets **M26a** and **M26b** which operate the release of the hood are powered with battery voltage via wander fuse **G384**; the earth signal is received from the corresponding relay **I106**, which has the energizing line leading from relay **I108** - this is a shunt which sends the power to **I106** and the other relays only when it "feels" the signal of the key turned to "MARCIA"; in fact when the key is turned this supply cuts out. The signal that energizes relay **I106** leads from switch **B99** behind the driver's seat: the energized relay supplies the two electromagnets **M26a** and **M26b** which release the rear fastening of the hood.

The hood cover is only released when the hood has been released previously: this takes place via the timer **N80** and the two relays **I107a** and I107b. The "hood release" control signal energizes timer **N80** (pin S) which for appr. 20 minutes sends an earth signal to switch **B100** which is active only in this case. This is the only possible way to send a control signal to energize relay **I107a** which sends an earth signal to the two electromagnets **M27a** and **M27b** which release the fastening of the hood cover - the two electromagnets are powered with battery voltage via wander fuse **G384** -.
The energizing line for relay **I107a**, like **I107b** leads from relay **I108,** therefore, their supply is cut out when the key is turned.
Simultaneously another earth signal - **I107a** has a double contact - is sent, via the other relay **I107b**, to pin S of timer **N80**, to cut out timing.

Switch **B99** is lit with the key at MARCIA, while switch **B100** only lights up when it can be pressed.

LOCATION OF COMPONENTS



(•) Black base
(••) Red base
(•••) Blue base
(••••) Black fuseholder

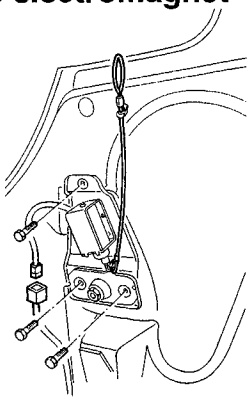
FAULTFINDING TABLE

Fault	Component to be checked										
	G384	M26a	M26b	M27a	M27b	I106	I107a	I107b	B99	B100	N80
Hood release control	•	•	•			•			•		
Hood cover release control (*)	•			•	•		•	•		•	•
Release switches lighting (**)									•	•	

(*) N.B. this function can only be operated after releasing the hood.
(**) Switch B100 is only illuminated when hood cover releasing is possible (after the hood has been locked).

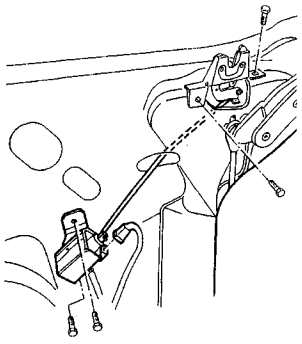
CHECK COMPONENTS

Hood release electromagnet M26a M26b



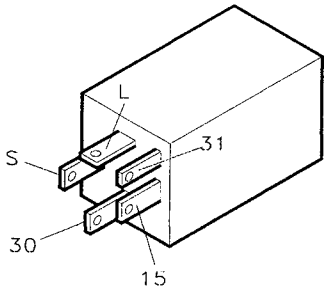
SPECIFICATIONS	
Nominal voltage	12V
Absorbed current	31A
Magnetic core stroke	10 ± 0.5 mm

Hood cover release electromagnet M27a M27b



SPECIFICATIONS	
Nominal voltage	12V
Absorbed current	31A
Magnetic core stroke	7 ± 0.5 mm

Hood cover release timer N80



Check the device: see **TEST A**

CHECK HOOD COVER RELEASE TIMER (N80)	TEST A

TEST PROCEDURE	RESULT	CORRECTIVE ACTION
A1 CHECK VOLTAGE – Disconnect device **N80** and check on the base for 0V at pins 30 and 31; with the ignition key at MARCIA, 12V between pins 15 and 30	OK ▶	Carry out **step A2**
	~~OK~~ ▶	Check floating fuse **G384** and relay **I108**. Restore the wiring between **N80** and earth **G63b**
A2 CHECK COMMAND SIGNAL – Operate switch **B99** and check for an earth at pin S of **N80**	OK ▶	Insert device **N80** on the base and continue with **step A3**
	~~OK~~ ▶	Restore the wiring between **B99** and **N80**, and between **B99** and earth **G63b**
A3 CHECK HOOD COVER OPERATION – Operate switch **B99** and check for 12V at pin L of **N80**	OK ▶	DEVICE **N80** IS WORKING PROPERLY. Check the other components of the system and their connections
	~~OK~~ ▶	CHANGE DEVICE **N80**

AUTOMATICALLY-OPERATED HOOD (SPIDER only)

INDEX

INTRODUCTION

The entire electrohydraulic system is governed by a specific electronic control unit.

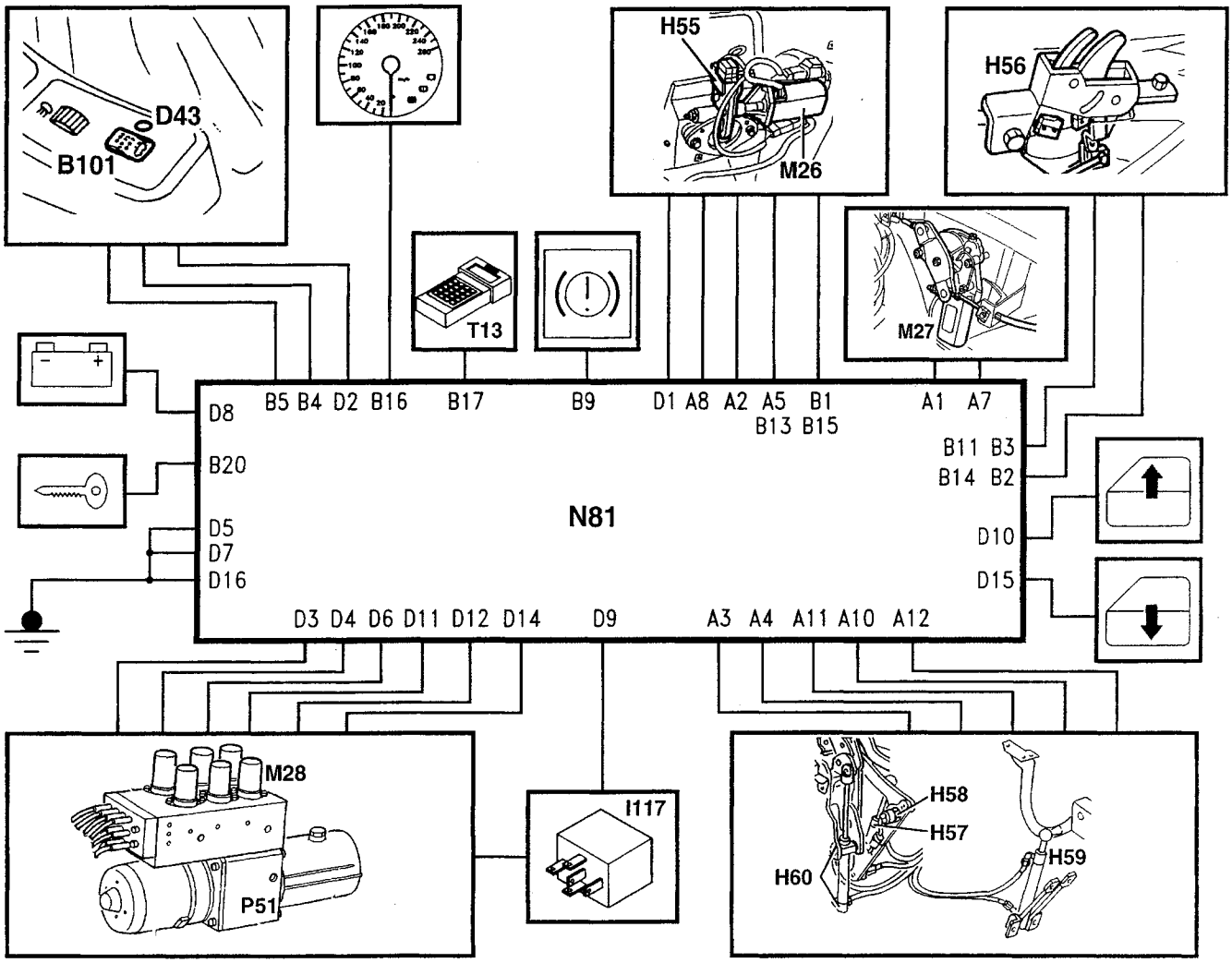
The control unit receives the position signals from the sensors (switched) located on the locks of the hood and of the hood cover and on the hood operating cylinders.

It also receives the consent signals to operate the system: key at MARCIA, handbrake engaged and car speed.

On the basis of the memorised logic and the command signal leading from the control button, the control unit controls the solenoid valves of the hydraulic system and the electric locks.

Other output signals are sent to the led and to the diagnosis connector.

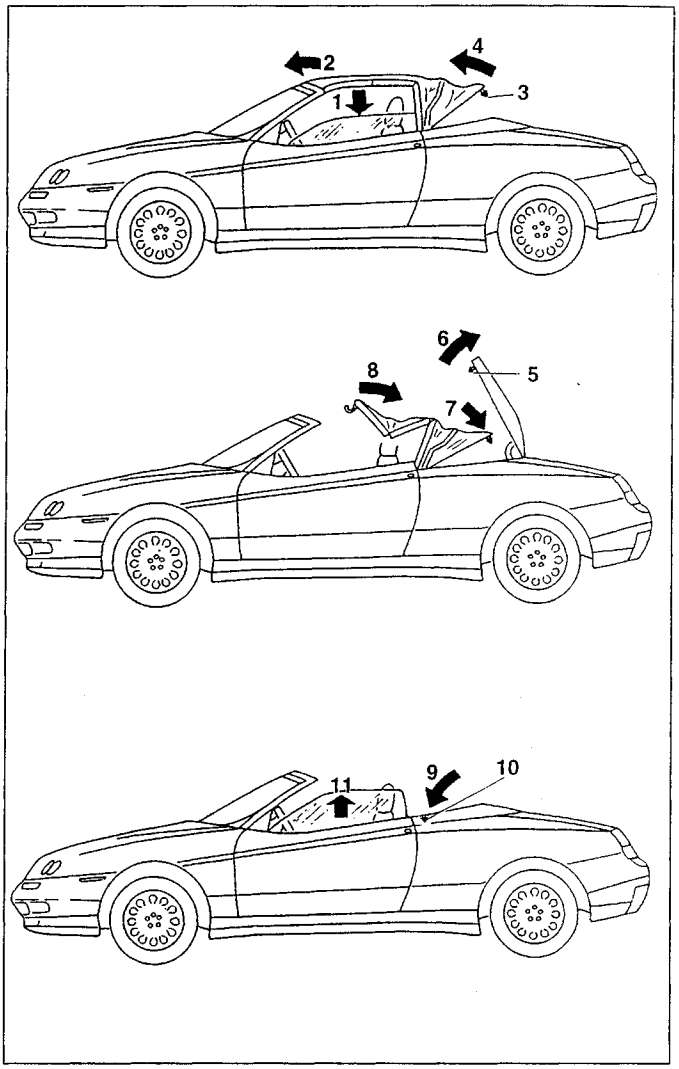
The figure below summarizes the flow of signals going in and out of the control unit.



NOTE: *the components are identified by the code used in the wiring diagrams*

B101 *Automatic hood control switch*
D43 *Signalling led for automatic hood*
H55a *RH hood closing switch*
H55b *LH hood closing switch*
H56a *RH hood cover closing switch*
H56b *LH hood cover closing switch*
H57 *5th arc raised switch*
H58 *Intermediate 5th arc switch*
H59 *Hood cover raised switch*
H60 *Hood position switch*
I117 *Automatic hood electric pump relay*
M26a *LH hood release actuator*
M26b *RH hood release actuator*
M27 *Hood cover release actuator*
M28 *Automatic hood solenoid valves*
N81 *Automatic hood control unit*
P51 *Automatic hood control pump*
T13 *Diagnosis connector for Alfa Romeo Tester*

Operating logic carried out by the control unit



OPENING CYCLE:

1. lowering of the windows

the windows are lowered for appr. 1 second.

2. hood closing

the hood closing solenoid valves (no.4) and the electric pump ae operated; the solenoid valve remains active also at the signal from "hood closed" switch;

3. opening of 5th arc locks

the release relay of the two locks is activated until the signal of the "5th arc lowered" switch is received. The hood closing solenoid valve (no.4) remains active to keep the hood in position;

4. 5th arc raising

the 5th arc raising solenoid valve (no.6) is actvated: after 0.6 seconds from the signal from the "5th arc raised" switch operations continue with step 5;

5. hood cover lock opening

the 5th arc raising solenoid valve (no. 6) remains active, and the hood cover lock release relay is activated: when the signal is received from the "hood cover release" switch the relay remains active for another 0.2 seconds;

6. hood cover opening

the 5th arc raising solenoid valve (no. 6) remains active while the hood cover opening solenoid valve (no. 1) is also activated: at the signal from the "hood cover raised" switch operations continue with the next step;

7. 5th arc lowering

the hood cover opening solenoid valve (no. 1) remains activated while the 5th arc lowering solenoid (no. 5) is also activated and then deactivated after 0.2 seconds from the signal from the "intermediate 5th arc" switch.

8. hood opening

the hood cover opening solenoid valve (no.1) remains activated while the hood opening solenoid valve (no. 4) is also activated; at the signal from the "hood open" switch the hood cover opening solenoid valve is deactivated, and after 0.5 seconds operations continue with step 9.

9. hood cover closing

the hood cover closing solenoid valve (no. 2) is activated: at the signal from the "hood cover closed" switch the electric pump is deactivated, while the solenoid valve remains active;

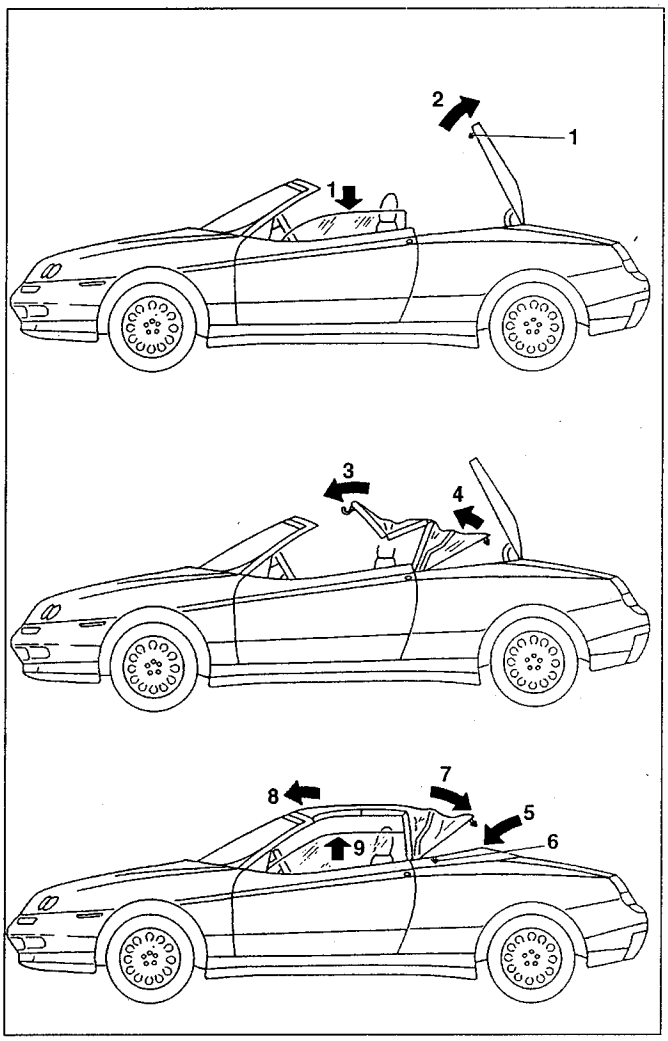
10. hood cover lock closing

the hood cover lock closing relay is activated: when the signal from the "hood cover lock closed" switches is received the relay remains active for another 0.2 seconds;

11. window closing

as soon as the hood cover is closed again, the windows are highered for a maximum of 12 seconds.
Releasing the system operation button during this last operation the windows stop.

CLOSING CYCLE



1. hood cover lock opening and lowering of the windows

the hood cover lock release relay is activated: when the signal is received from the "hood cover release" switches the relay remains active for another 0.2 seconds.
Simultaneously the windows are lowered for appr. 1 second;

2. hood cover opening

the hood cover opening solenoid valve (no. 1) is activated: after 0.5 seconds from the signal from the "hood cover raised" switch operations continue with step 3;

3. hood closing

The hood cover opening solenoid valve (no. 1) remains activated while also the hood closing solenoid valve (no. 3) is activated and then deactivated at the signal from the "hood closed" switch;

4. 5th arc raising

The hood cover opening solenoid valve (no. 1) remains activated while the 5th arc raising solenoid valve (no. 6) is also activated; at the signal from the "5th arc raised" switch the hood cover opening solenoid valve is deactivated, and after 1 second operations continue with step 5;

5. hood cover closing

the 5th arc raising solenoid valve (no. 6) remains active while the hood cover closing solenoid valve (no. 2) is activated until receiving the signal from the "hood cover closed" switch;

6. hood cover lock closing

the hood cover lock closing relay is activated: when the signal is received from the "hood cover lock closed" switches the relay remains active for another 0.2 seconds.

7. 5th arc lowering and locks closing

the hood opening and closing solenoid valves (no. 3 and 4) are activated to keep the hood in position; at the signal from the "intermediate 5th arc" switch the relay for closing the two locks is activated remaining active for 0.5 seconds from the signal of the "5th arc locks closed" switches.
The 5th arc lowering solenoid valve (no. 5) is also activated and then deactivated after 1 second from the signal from the "5th arc closed" switch

8. facilitated front catching

the hood opening solenoid valve (no. 4) is deactivated to lower the pressure in the hood cylinders, thereby facilitating manual catching of the hood to the windscreen.
At this point the led goes off, while the hood closing solenoid valve (no. 3) remains active for another 20 seconds;

9. windows closing

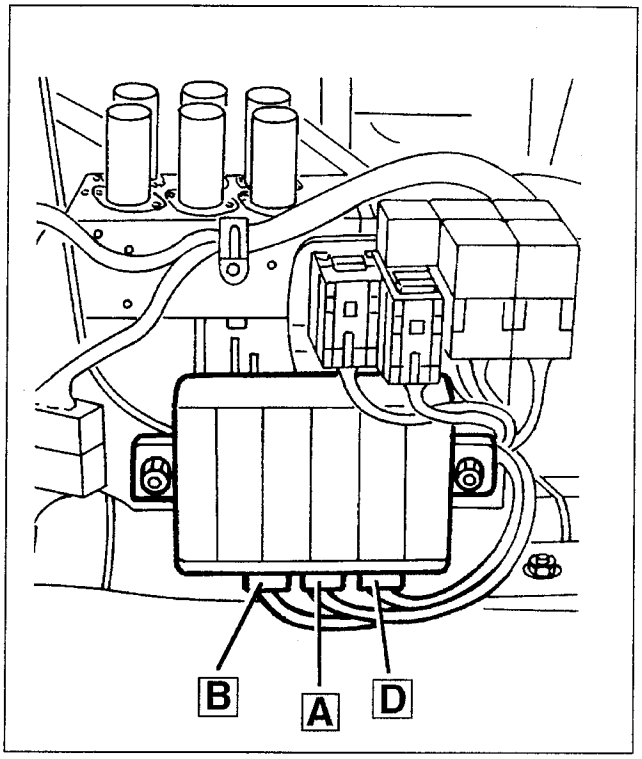
pressing the button again - within 25 seconds - the windows are highered for a maximum of 12 seconds.

Releasing the system operating button during this operation the windows stop.

Electronic control unit (N81)

The electronic control unit is housed in the rear console of the passenger compartment next to the electrohydraulic unit:

CONTROL UNIT PIN-OUTS:



connector A

1 hood cover release command
2 RH hood closing command
3 hood position switch signal (lowered)
4 hood position switch signal (raised)
5 LH hood closing switch signal (approached)
7 hood cover closing command
8 hood release command
10 5th arc intermediate switch signal
11 5th arc raised switch signal
12 hood cover raised switch signal connector B:

connector B

1 LH hood closing switch signal (locked)
2 RH hood cover closing switch signal (approached)
3 LH hood cover closing switch signal (locked)
4 command signal from switch (closing)
5 command signal from switch (opening)
9 handbrake engaged signal
11 RH hood cover closing switch signal (locked)
13 RH hood closing switch switch signal (locked)
14 LH hood cover closing switch signal (approached)
15 RH hood closing switch signal (approached)
16 tachometric signal
17 diagnosis line K
20 key-operated supply

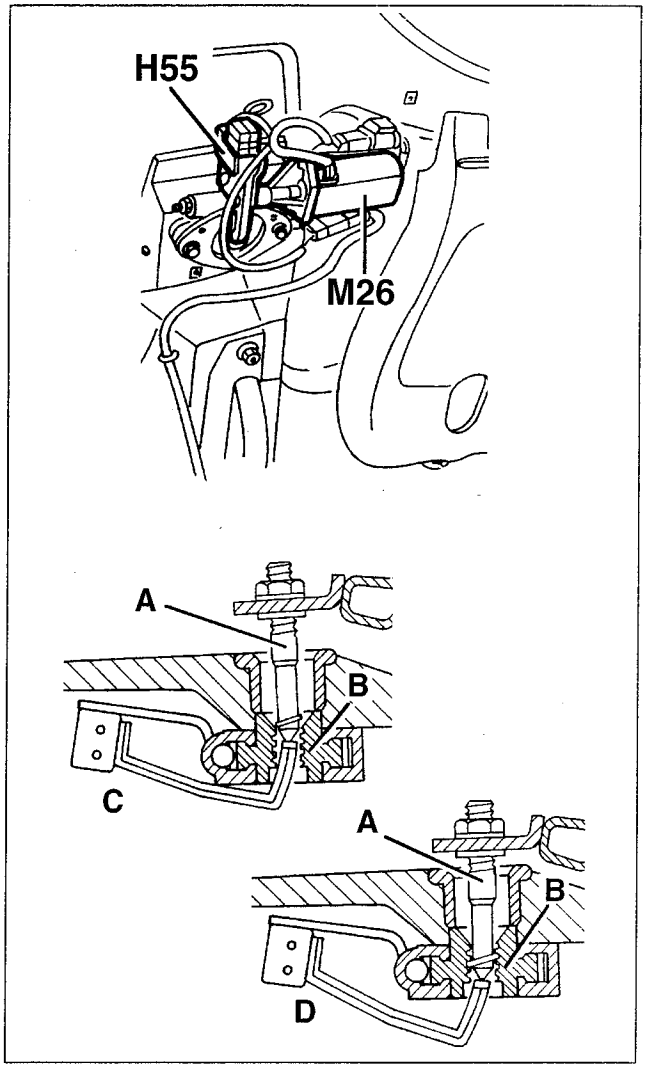
connector D

1 LH hood closing command
2 luminous led signal
3 command for solenoid valve no. 6 (5th arc raising)
4 command for solenoid valve no. 2 (hood cover closing)
5 earth
6 command for solenoid valve no. 1 (hood cover opening)
7 earth
8 direct supply
9 pump relay command
10 power window rising command
11 command for solenoid valve no. 3 (hood opening)
12 command for solenoid valve no. 4 (hood closing)
14 command for solenoid valve no. 5 (5th arc lowering)
15 power window lowering command
16 earth

Hood locks

The two locks that lock the 5th arc of the hood on the hood cover are formed of a threaded pin (A) which engages on a lead screw (B) operated by a motor. (**M26a/b**)

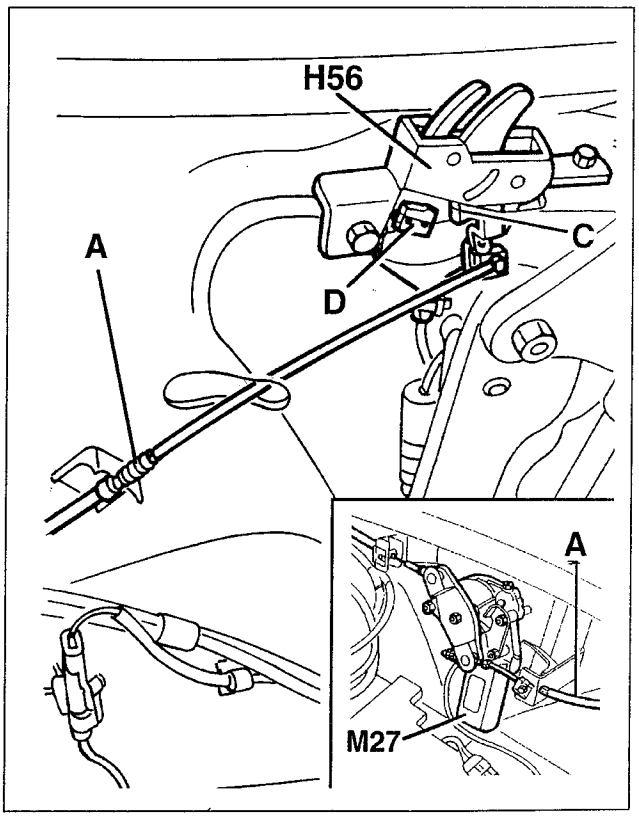
On the lock there is a microswitch (**H55a/b**) with two contacts: the first (C) signals the "approach" of the 5th arc pin to the lead screw, while the second (D) signals the clamping of the lock.



Hood cover locks

The two hood cover locks are controlled by the centre gear motor (**M27**) through cables (A).

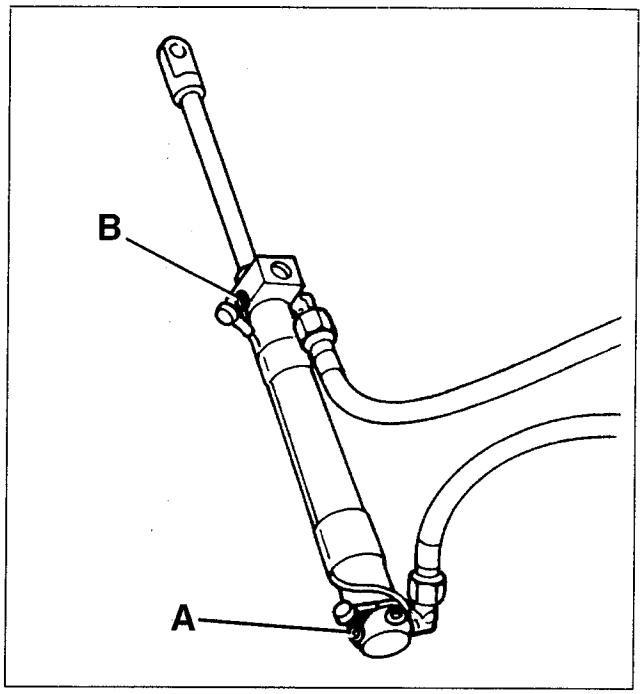
Also on these locks there is a microswitch (**H56a/b**) with two contacts: the first (C) signals the "approach" of the hood cover to the lock, while the second (D) signals the clamping of the lock.



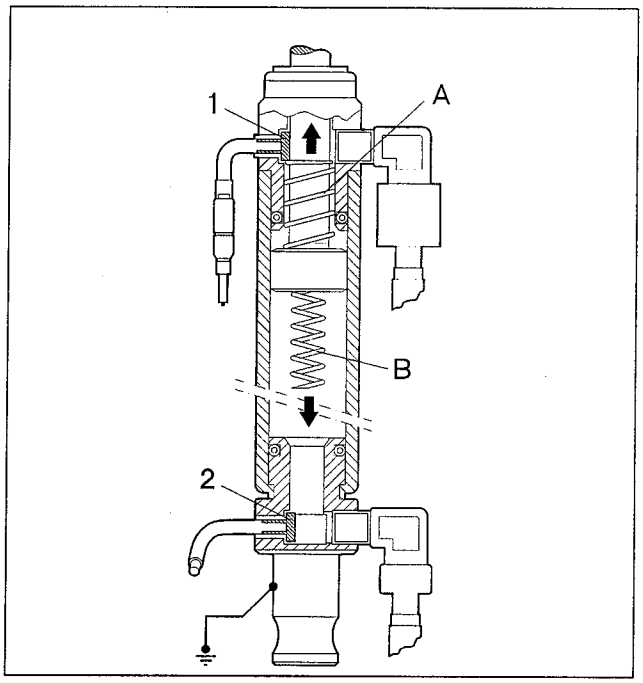
Switches on cylinders

On the operating cylinders of the **left hand side** there are four switches, namely:

- 5th arc raised switch (**H57**), on the 5th arc cylinder;
- hood cover raised switch (**H59**), on the hood cover cylinder;
- hood position switch (**H60**) on the hood cylinder: this comprises two contacts : the first (A) signals that the hood is lowered, the second (B) that the hood is raised.

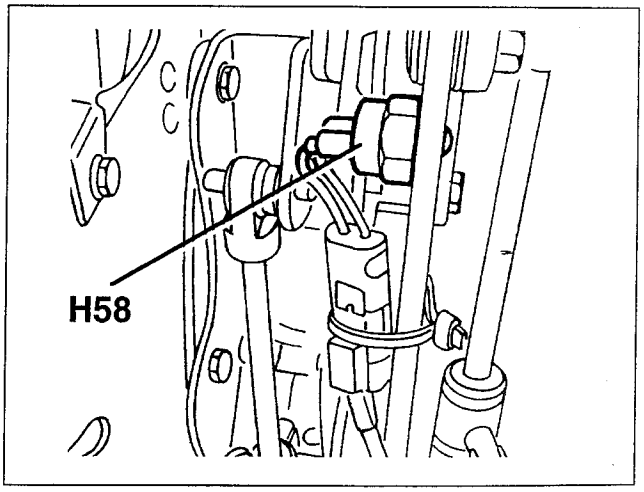


These four switches comprise an electric contact (1) which connects to earth via the spring (A) with the PISTON RAISED or (only for the hood cylinder) an electric contact (2) which connects to earth via spring (B) with the PISTON LOWERED.



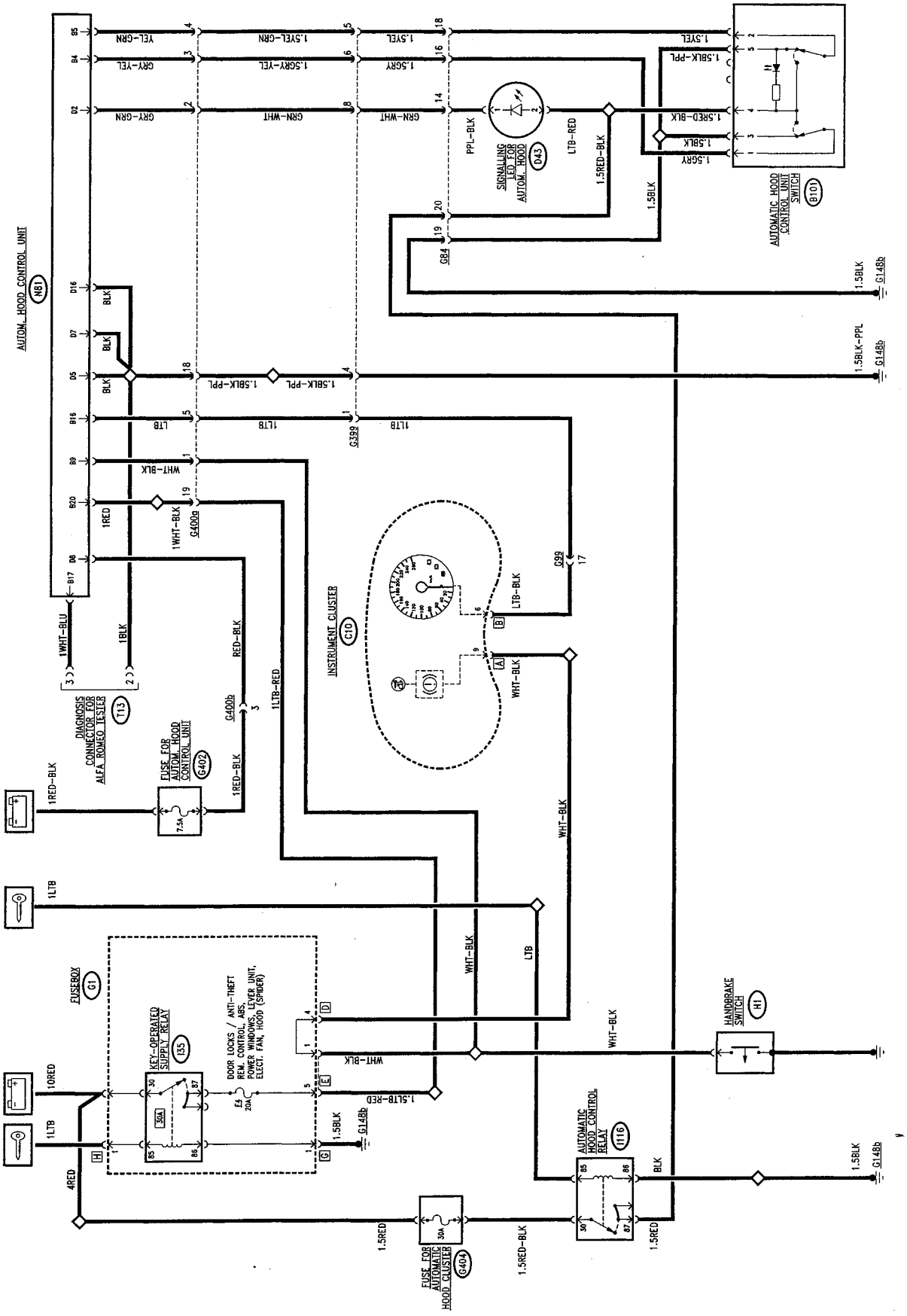
Intermediate 5th arc switch

This is a ball contact (**H58**) which connects to earth when the frame of the 5th arc takes a precise position during the closing of the 5th arc itself: this allows the control unit to operate the motors of the pins of the 5th arc locks a few seconds before the 5th arc is completely closed in order to obtain improved "catching" between the pin and the lock.

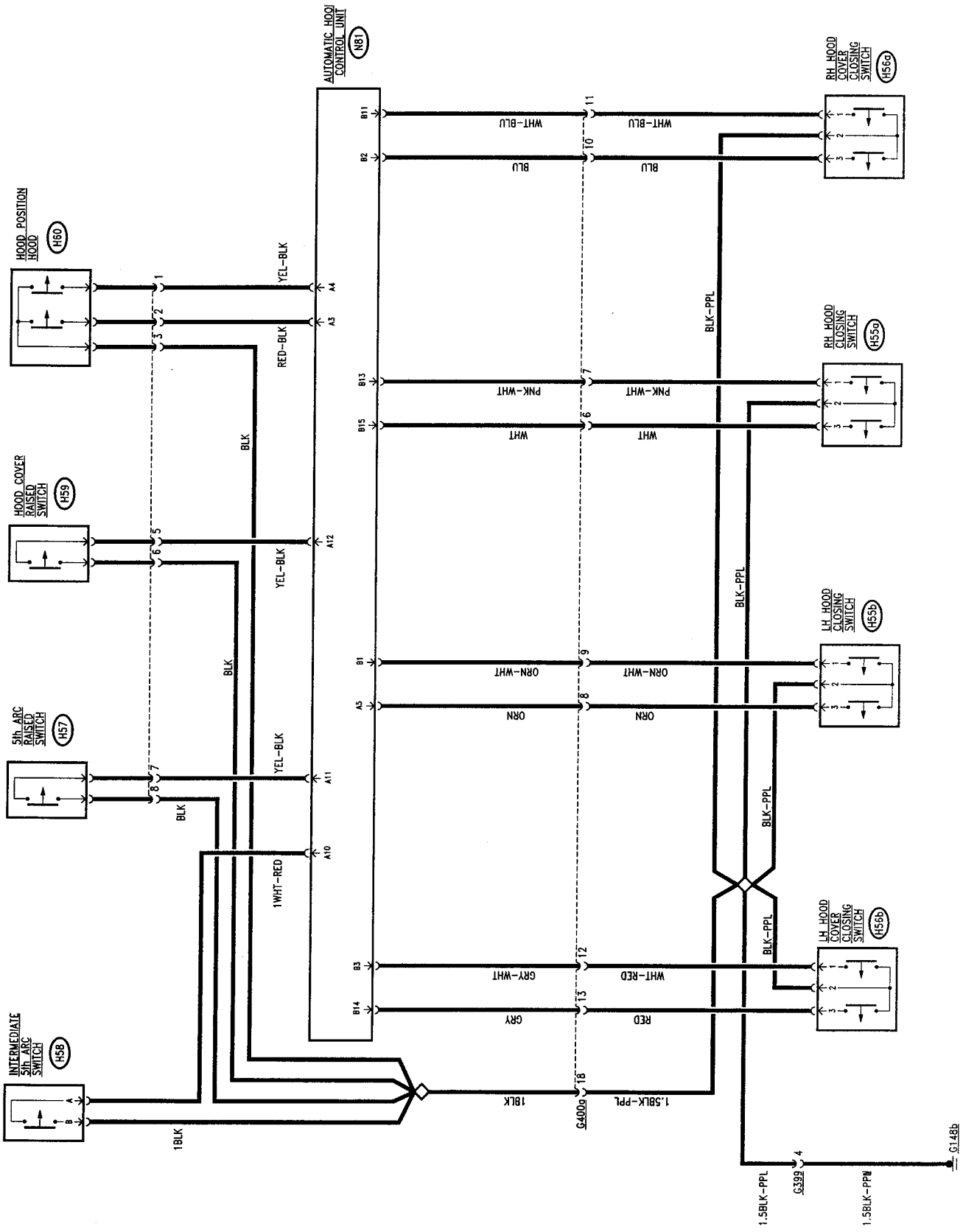


WIRING DIAGRAMS

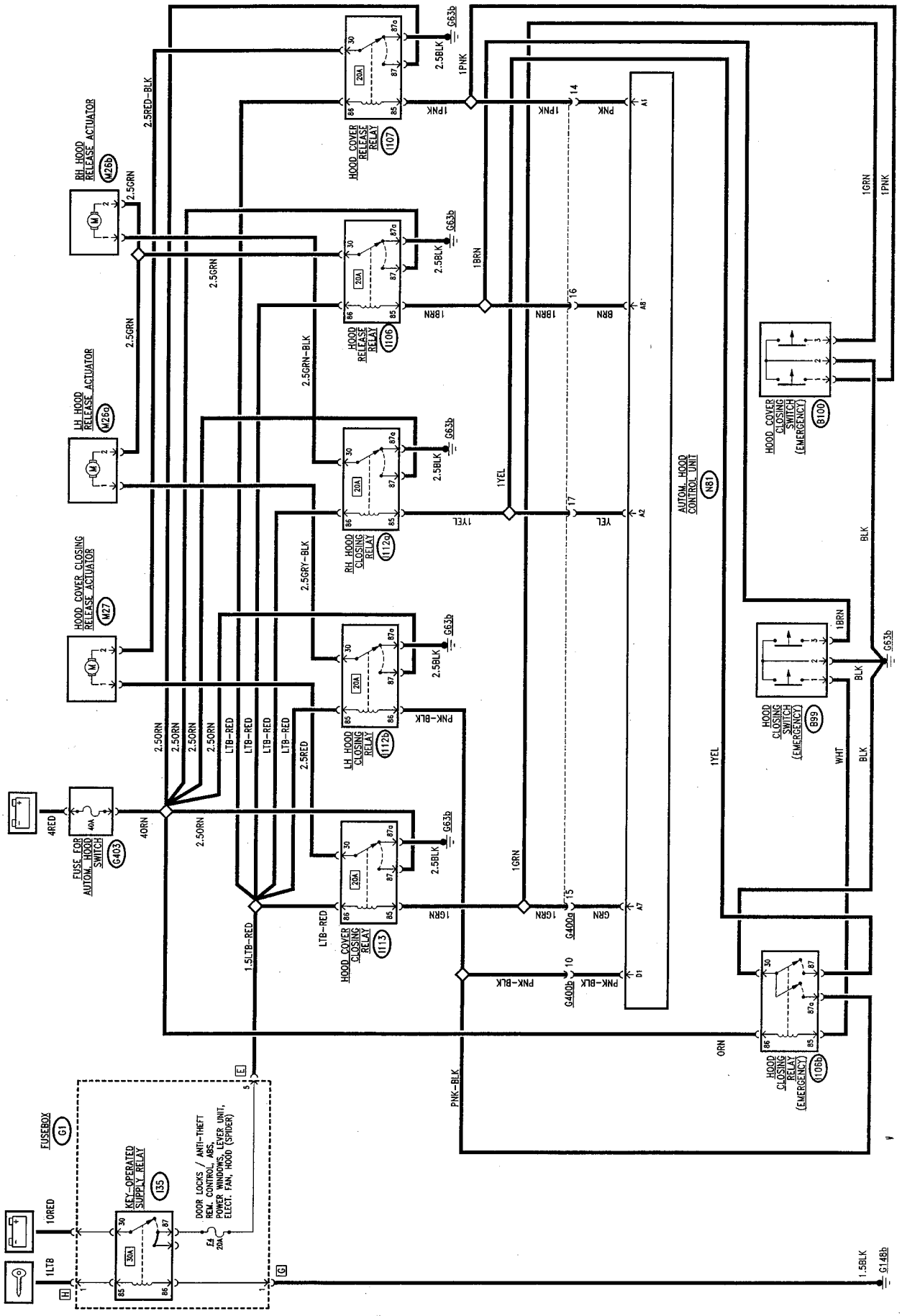
1. CONTROL UNIT AND CONSENT SIGNALS



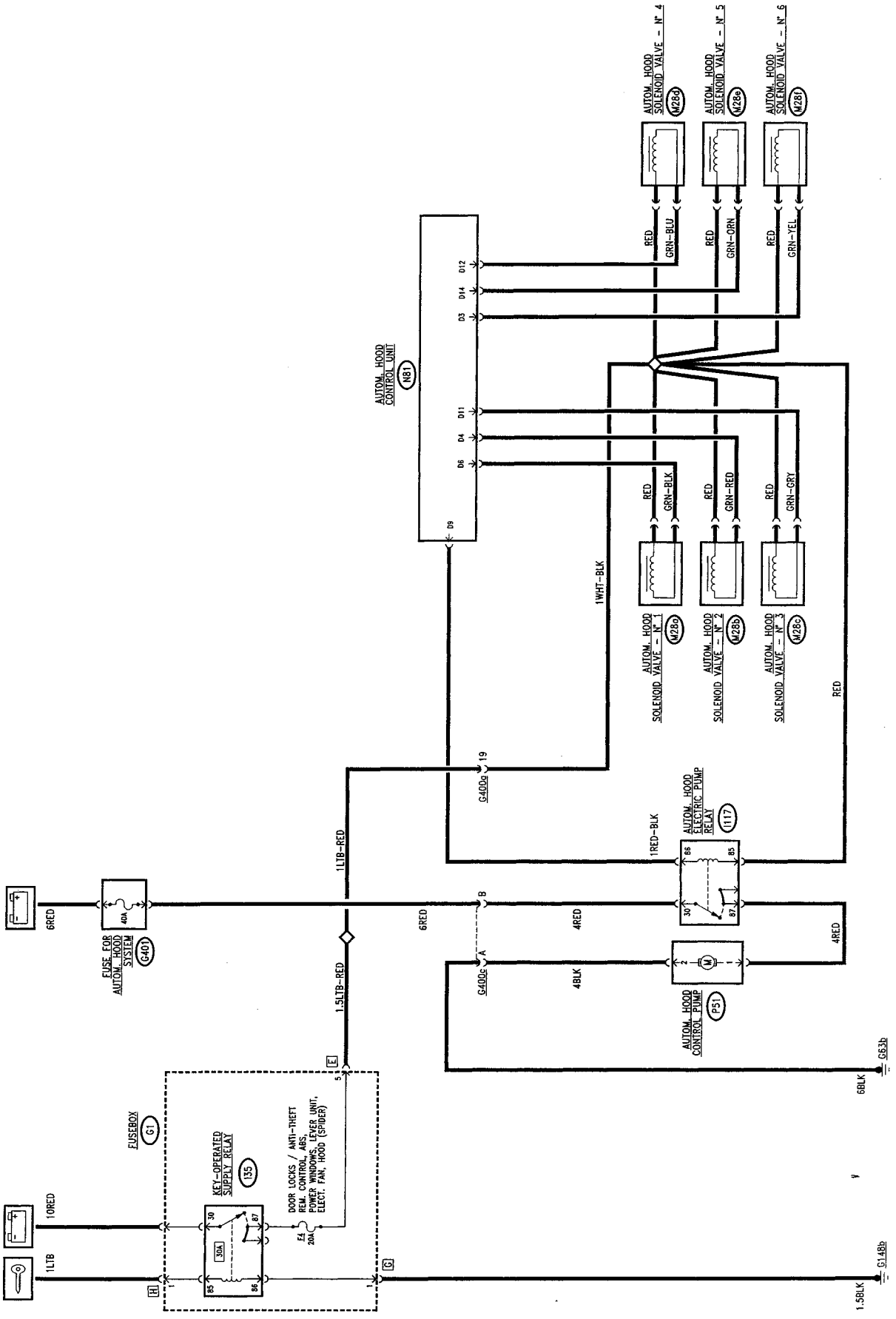
2. CONTROL SWITCHES



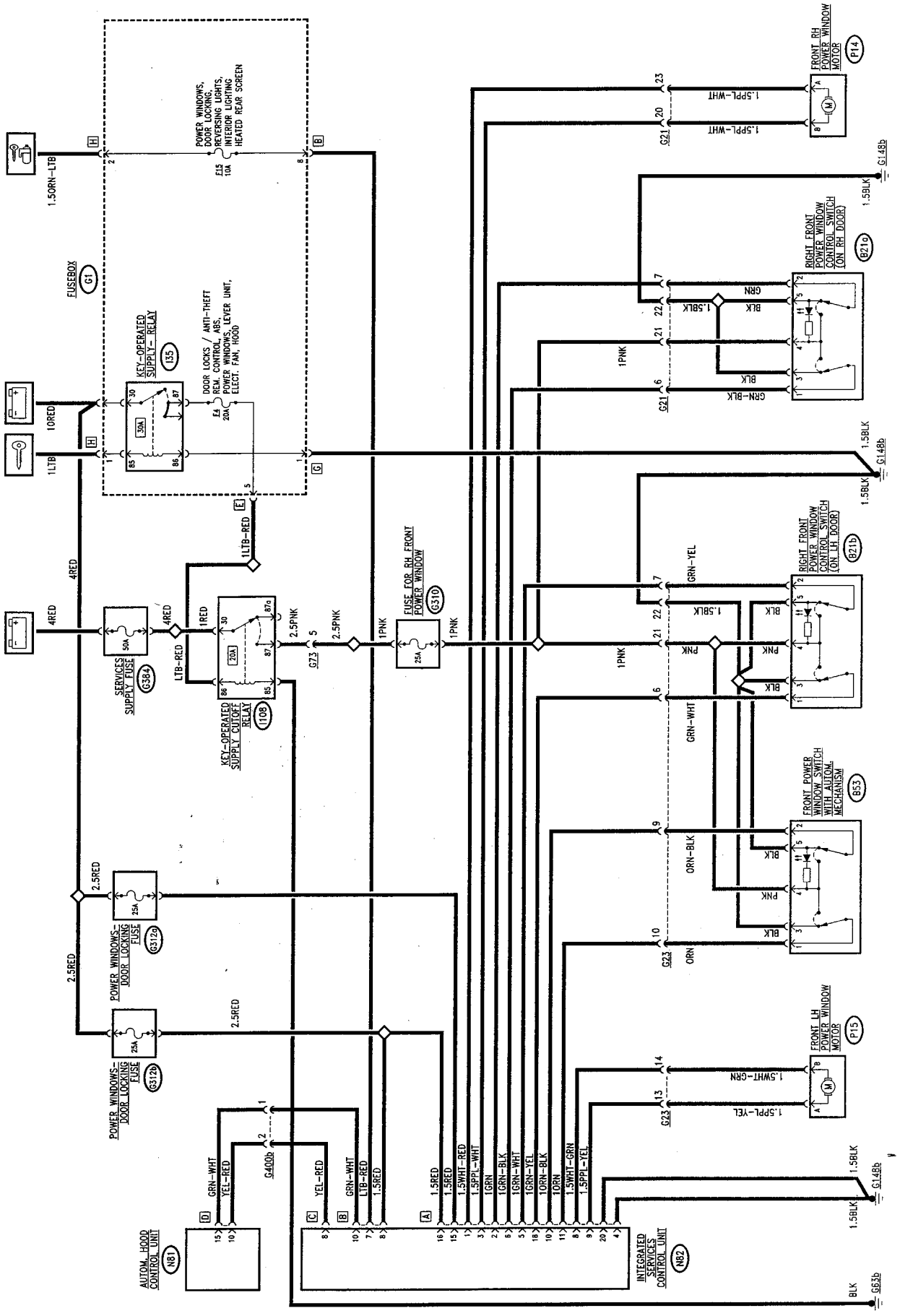
3. OPERATION OF LOCKS



4. HYDRAULIC SYSTEM CONTROL



5. POWER WINDOWS CONTROL



FUNCTIONAL DESCRIPTION

The electronic control unit **N81** controls the entire electrohydraulic system that automatically opens/closes the hood.

The control unit **N81** is supplied with 12V direct at pin D8 through the line protected by fuse **G402** (7.5A), and with "key-operated" 12V at pin B20 through the line of fuse **F4** of fusebox **G1**; pins D5, D7 and D16 are earthed.

Operation of the hood takes place pressing the special button **B101**, to be found on the centre tunnel. A 12V and an earth signal is sent alternately to indicate opening and closing: 12V to pin B4 (hood closing) and 12 V to pin B5 (hood opening); the 12V reach the "key-operated" switch through the hood control relay **I116** and fuse **G404** (30A).

Next to the button there is a luminous led **D43** supplied with "key-operated" 12V like button **B101**, and turned on by the control unit, from pin D2, to indicate that the system is working correctly or the occurrence of faults.

The control unit receives a series of consent signals from the switches and from the other systems of the car.

The "handbrake engaged" signal reaches pin B9 : this is the same signal that switch **H1** sends to the warning light on the instrument cluster **C10.**; pin B16 receives the tachometric signal picked up especially from the cluster **C10.**

Two sets of switches are located on the locks of the hood and hood cover and on the hood operating cylinders.

NOTE : all the switches are N.O. and, if they are closed, they send an earth signal to the control unit.

The switches on the lock of the left-hand hood **H55b** and the right-hand hood **H55a** send two earth signals: one indicates that the hood has approached the lock (signals to pin A5 and B15), the other that the lock is actually closed (signals at pin B1 and B13).

In the same way for the locks of the left-hand **H56b** and right-hand hood cover **H56a**, "approach" signals are sent to pin B14 and B2 and the closing ones to pin B3 and B11.

The hood cover raised switch **H59** is to be found on the left control cylinder and it signals the control unit - pin A12 - the maximum raising position.

The double hood position switch **H60** is located on the left control cylinder and signals the control unit the hood maximum raising position - pin A4 - and the maximum lowering position - pin A3.

The 5th arc raised switch **H57** is located on the left control cylinder and signals the control unit - pin A11 - the maximum raising position of the 5th arc.

The 5th arc intermediate switch **H58** (ball contact) is located on the control linkage in such a position as to signal the control unit - pin A10 - that the 5th arc is lowering so as to operate the lock motors.

As a result of the information received by the sensors, the control unit commands the locking and releasing of the locks of the hood and hood cover, and adjusts, through an electric pump and six solenoid valves, the hydraulic hood raising and lowering system.

The two hood locks (right and left) are controlled by two motors **M26a** and **M26b** which close or open the lock as the 12V/earth supply at the two terminals varies: this takes place via the hood release relay **I106** and the two hood closing relays **I112a** and **I112b**.

These are diverters which are energised by the "key-operated" line of fuse **F4** of fusebox **G1** and by a command signal leading from the control unit **N81**: respectively from pin A2 for closing the RH lock, D1 for closing the LH lock, and A8 for releasing the hood: if energised the relay reverses the supply on the motors, the direct supply of which leads from a special fuse **G403** (40A).

In the same way the hood cover lock - only one, in the central position - is controlled by motor **M27** which closes or opens the lock as the 12V/earth supply at the terminals varies: this takes place via the hood cover release relay **I107** and locking relay **I113**. These are diverters energised by the "key-operated" of fuse **F4** of fusebox **G1** and by a command signal leading from the control unit **N81**: respectively from pin A7 for closing the lock and A1 for releasing: if energised the relay reverses the supply on the motors, the direct supply of which leads from a special fuse **G403** (40A).

Two emergency switches make it possible to manually operate the hood, locking and releasing the locks. Switch **B100** corresponding to the hood cover lock sends an earth signal to the release relay **I107** or to the locking one **I113** in the same way as takes place through the control unit during automatic operation. Switch **B99** corresponding to the hood lock sends an earth signal to the release relay **I106** orto the locking relay **I112a** and **I112b**.

The control unit also controls the operation of the hydraulic circuit that controls the six pistons for raising/lowering the hood cover, 5th arc and the hood itself.

The electric pump **P51** pressurises the hydraulic operating fluid when it is supplied by the control unit **N81** via the power relay **I117**; this is supplied by the line of fuse **G401** (40A) and energised with the "key-operated" supply and by command signal of the control unit - pin D9.

The six solenoid valves which also receive the "key-operated" supply are controlled directly by the control unit:

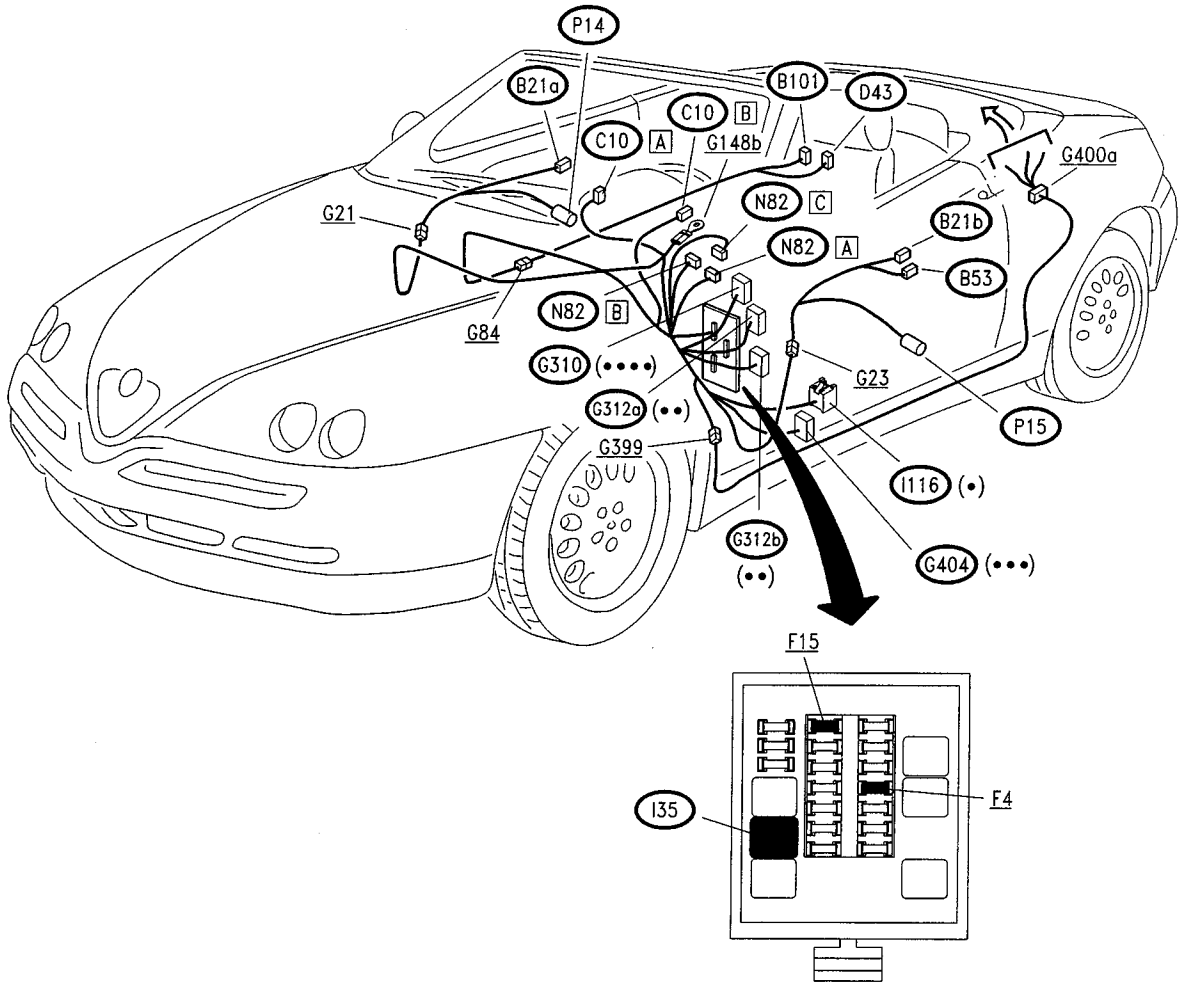
- pin D6 controls solenoid valve no. 1 **M28a** (hood cover opening)
- pin D4 controls solenoid valve no. 2 **M28b** (hood cover closing)
- pin D11 controls solenoid valve no. 3 **M28c** (hood closing)
- pin D12 controls solenoid valve no. 4 **M28d** (hood opening)
- pin D14 controls solenoid valve no. 5 **M28e** (5th arc lowering)
- pin D3 controls solenoid valve no. 6 **M28f** (5th arc raising)

During hood opening/closing, the control unit **N81** also controls raising or lowering of the door windows. This takes place through the services control unit **N82** which controls the ordinary operation of the power windows, the control unit signal for lowering the windows - pin D15 - reaches pin C8 of **N82**, which operates the motors **P15** and **P14** (for further details, see the "Power Windows" section).

In the same way the control unit signal for raising the windows - pin D10 - reaches pin B10 of **N82** which controls motors **P15** and **P14**.

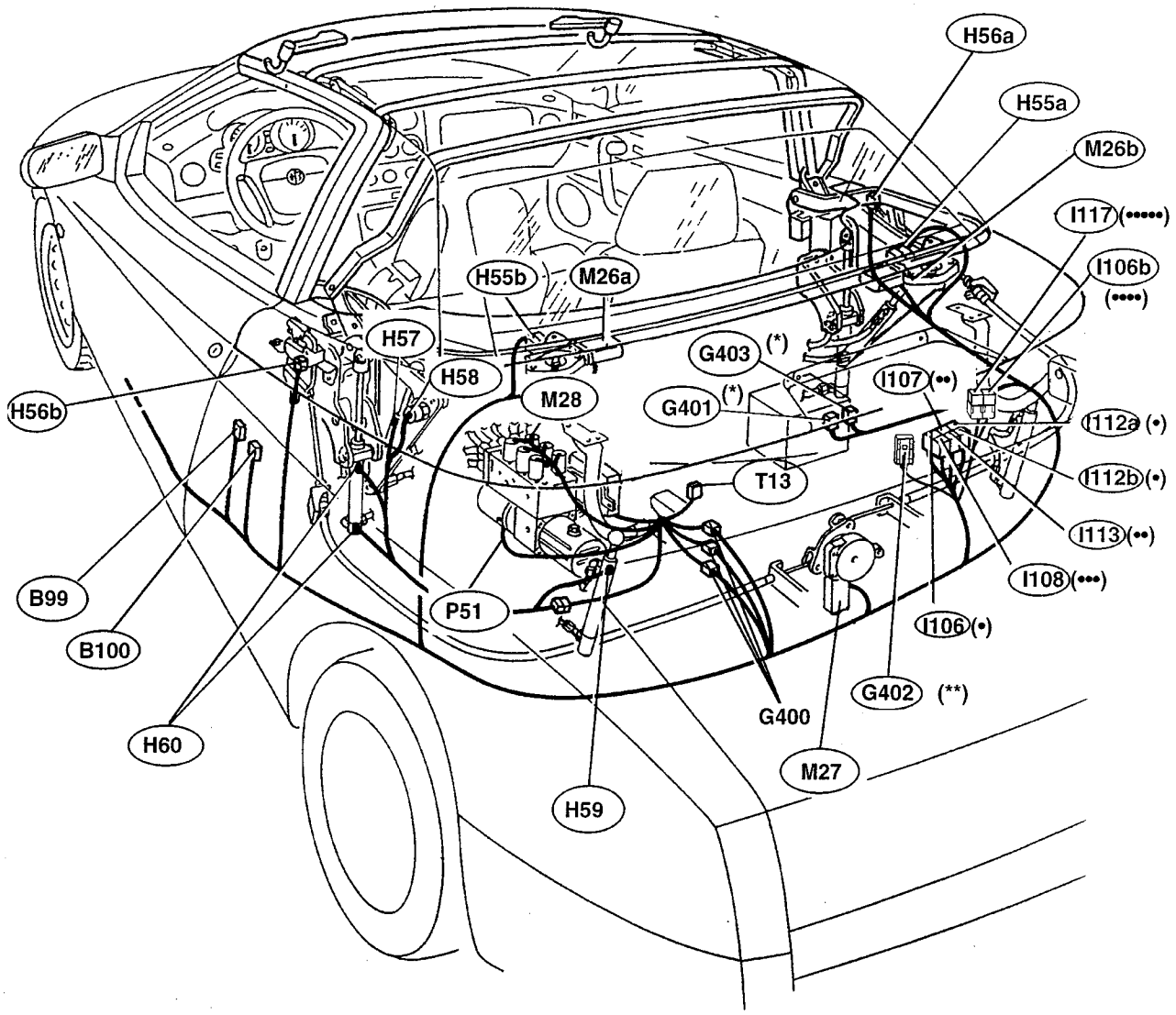
The control unit **N81** memorises any faults detected during operation: this information may be read using the ALFA ROMEO TESTER connected with the diagnosis socket **T13**, and the outgoing signal - line K - from pin B17 of the control unit itself.

LOCATION OF COMPONENTS (1/2)



(•) Red base
(••) White fuse holder
(•••) Green fuse holder
(••••)Brown fuse holder

LOCATION OF COMPONENTS (2/2)



(•) Red base
(••) Brown base
(•••) Blue base
(••••) Grey base
(•••••) Black base

(*) Black fuse holder
(**) Brown fuse holder

FAULT FINDING

INITIAL TEST: turning the ignition key to MARCIA, the control unit carries out a self-diagnosis test of the entire system. If the result of this test is positive, the led at the side of the control button flashes for 1.5 seconds then goes off: conversely, if faults are detected, the led flashes for 10 seconds

- If the **led starts to flash**, this means that the system has memorised an operating fault. Try again moving the key to STOP and back to MARCIA, then proceed with Fault-finding as described in the following pages.

- If the **led flashes only with the button pressed**, this means that a manoeuvre error has been detected. For instance the handbrake has not been engaged.

- If the **led flashes upon completion of the operation**, or stays on permanently, this means that the hood is not correctly locked (open or closed).

The errors memorised may be "read" using the ALFA ROMEO TESTER connected to the diagnosis socket with the outgoing signal - line K - of the control unit itself.

When the control unit detects an error, the system is blocked and sets to "PAUSE":
this means that all the solenoid valves are supplied, while the pump is stopped: this way the hydraulic pistons are locked and the hood stops in the position in which it was. This lasts only 5 minutes (to avoid draining the battery), after which the valves are de-activated, but the led stays on.

In this case it is necessary to release the control button, press it again, or move the key to STOP, then back to MARCIA and press the button again.

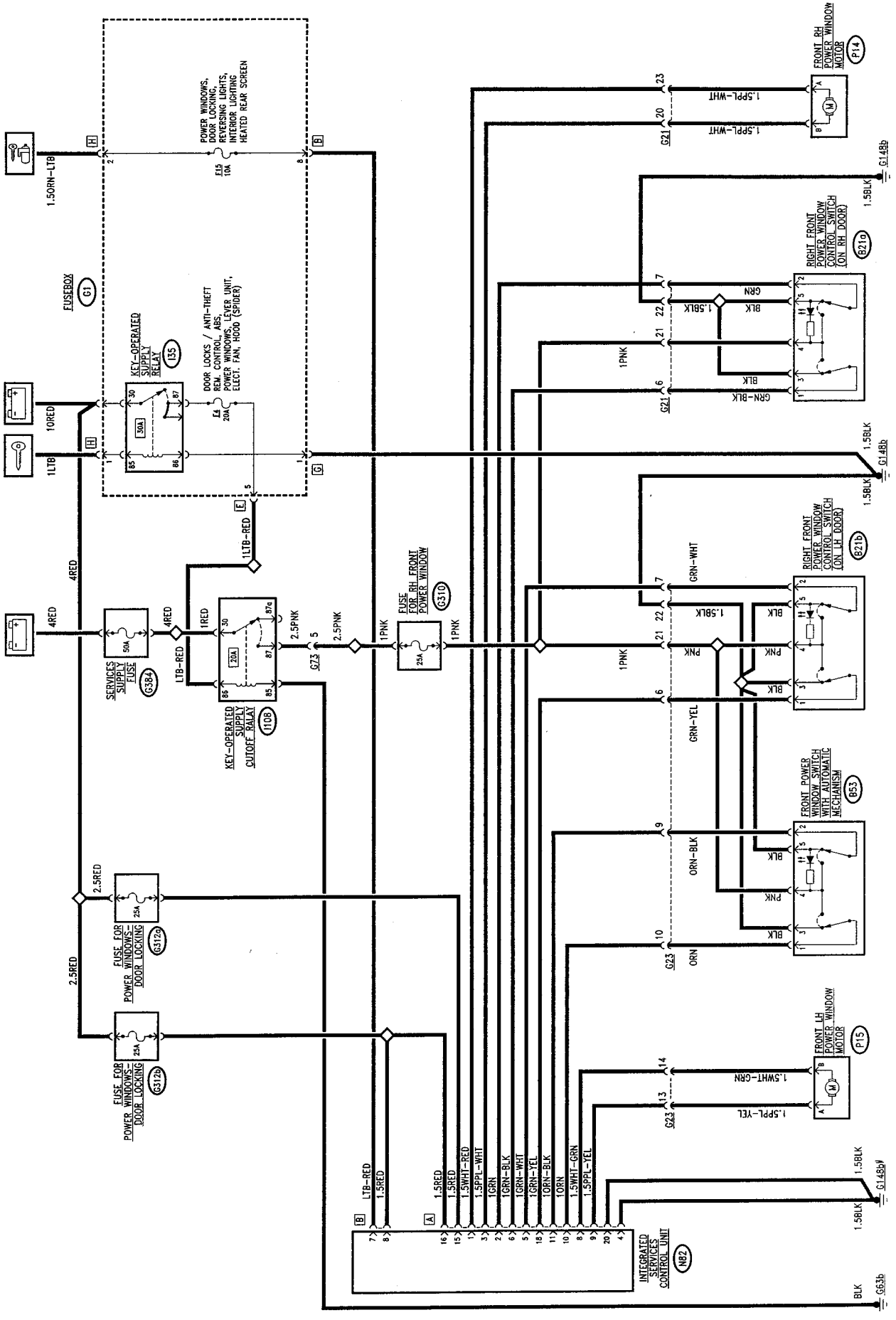
Types of detectable errors:

- **sequence performance times too long**: each step of the operating sequences has a maximum available time: upon exceeding this limit the control unit detects an error and flashes the led;
- **input signal not consistent**: as the whole sequence is pre-programmed, the control unit detects an abnormal signal, i.e. unforeseen: for example certain signals must not change during a certain step of the sequence: in this case the control unit detects an error and flashes the led;
- **short circuit on output signals:** any short circuits or overloads on the outputs are detected: in this case it is necessary to move the key to STOP and then back to MARCIA: if the led flashes for 10 seconds and then goes off, the fault persists and it is necessary to carry out the fault-finding procedure using the ALFA ROMEO TESTER.
- **open circuit on output signals:** any open circuits or breaks on the outputs are detected: in this case the control unit detects an error and flashes the led;

POWER WINDOWS

INDEX

WIRING DIAGRAM



GENERAL DESCRIPTION

Operation of the power windows is controlled by the integrated services control unit which operates them according to the following logic:

The driver's window is raised and lowered automatically, while the passenger's window is only lowered.
Operation is manual when the button activating time is between 60 and 300 milliseconds.
Conversely, operation is automatic when the activating time is over 300 milliseconds.
Pressing the button in the opposite direction stops the window.

This operating logic works with the "key-operated" supply.

Safety systems

The stopping of the power windows (turning off the engine electrical supply) is determined by reaching the glass upper or lower limit switch, or if an obstacle is in the way blocking the window itself. This is adjusted through the engine direct current control which is self-adaptive.

The electronic control unit acts as follows:

- in the event of an interruption of the motor control signal during operation, the control unit de- energises the system in a max. time of 500 milliseconds: this interruption is detected when the current absorbed by the power window motor, controlled in current, becomes lower than approx. 0.8 A;
- if there is a fault on the control buttons (short circuit, or buttons remained pressed) when the control unit is activated, operation of the corresponding control is disabled, until the fault disappears (or the button is released) for more than 60 milliseconds.

FUNCTIONAL DESCRIPTION

The control unit **N82** is supplied directly at pins B8, A15 and A16 through wander fuses **G312a** and **G312b**, located next to the fusebox.
The "key-operated" enable signal reaches pin B7 through fuse **F15** of **G1**.

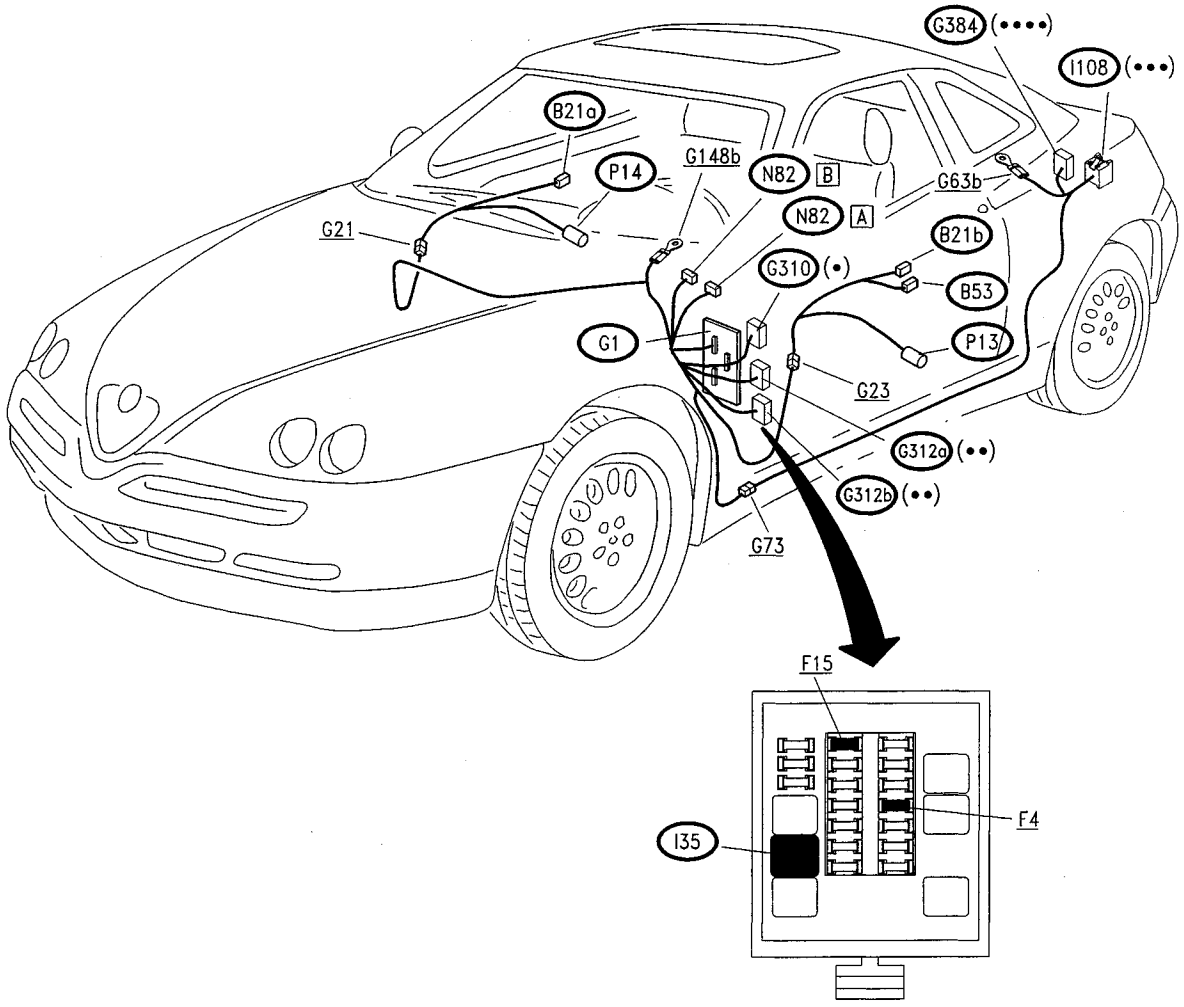
Driver's window

Pins A10 and A11 respectively receive the control signals for raising and lowering leading from the control switch of the left window **B53**.
In fact, this double switch sends an earth to the control unit from the part in which the contact has been closed (pin 1 = up; pin 2 = down).
The operating signals (up or down) leave pins A8 and A9 of **N82** for the left window motor **P15**: 12 V and earth are inverted to change the direction of rotation
Pin A20 is connected to earth.

Passenger's window

Pin A5 and A18 receive the control signals respectively for lowering and raising leading from the control switch of the right window **B21b**.
So do pins A6 and A2 from switch **B21a.**
The operating signals (up or down) leave pins A1 and A3 of **N82** for the right window motor **P14**: 12 V and earth are inverted to change the direction of rotation
Pin A4 is connected to earth.

LOCATION OF COMPONENTS



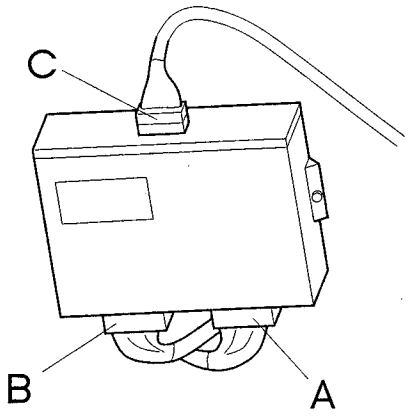
(•) Brown fuseholder
(••) White fuseholder
(•••) Blue base
(••••) Black fuseholder

FAULT-FINDING TABLE

Fault	Component to be checked									
	G310	G312a	G312b	F15	P14	P15	N82	B53	B21a	B21b
LH power window, under all circumstances		•		•		•	•	•		
LH power window., automatic operation	•	•					•			
RH power window	•	•			•		•		•	•

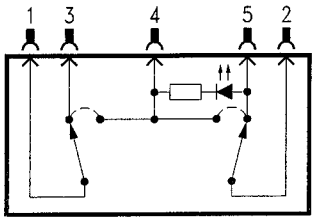
CHECK COMPONENTS

Integrated services control unit (N82)



Check power window function **test A**

Power window switches (B21a) (B21b) (B53)



SPECIFICATIONS
Check operation: **at rest**: continuity between pins 3 and 1 and between pins 2 and 5, a.c. between the other pins operating button for **raising**: continuity between pins 4 and 1; a.c. between the other pins operating button for **lowering**: continuity between pins 4 and 2, a.c. between the other pins -

CHECK SERVICES CONTROL UNIT (N82) - POWER WINDOW FUNCTION	TEST A

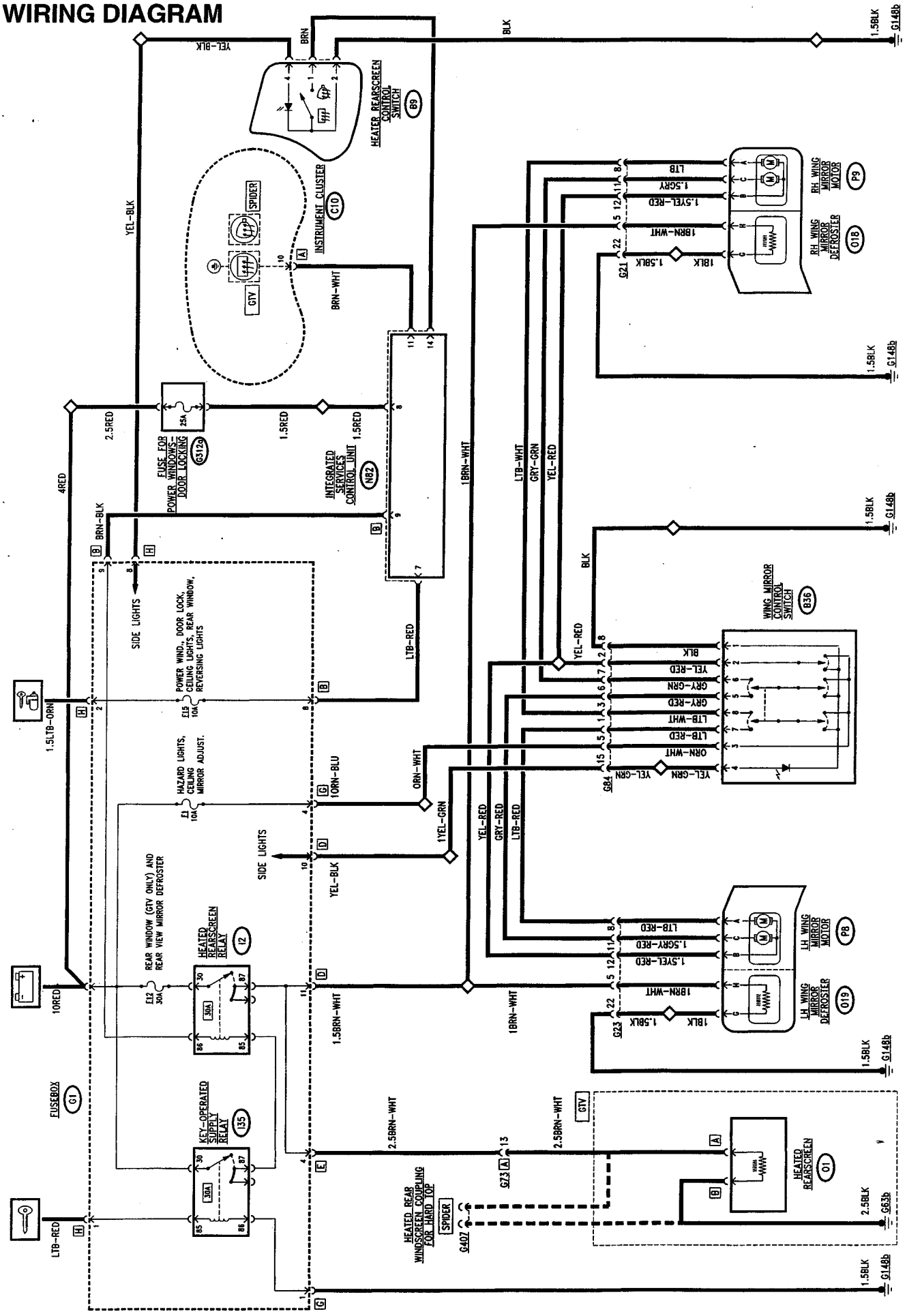
Work with the component with the connectors fitted, working from the casble input side

TEST PROCEDURE	RESULT	CORRECTIVE ACTION
A1 CHECK VOLTAGE – Check for 12V at pins A15, A16, B8 of **N82**	OK ▶ ~~OK~~ ▶	Carry out **step A2** Check wander fuse **G312** and **G132b**. Restore the wiring between **N82**, connector B and C and the above-mentioned fuses
A2 CHECK EARTH – Check that pins A20 and A4 of **N82** are earthed	OK ▶ ~~OK~~ ▶	Carry out **step A3** Restore the wiring between **N82** connector A and earth **G148b**
A3 CHECK VOLTAGE – With the key at MARCIA, check for 12V at pin B7 of **N82**	OK ▶ ~~OK~~ ▶	Carry out **step A3** Check fuse **F15** of **G1**. Restore the wiring between **N82** connector B and **G1**
A4 CHECK MANUAL OPERATION – Pressing the switch of the driver's power window **B53,** check for 12V between pins A8 and A9 of **N82**; this voltage ceases when the button is released	OK ▶ ~~OK~~ ▶	Carry out **step A5** Carry out **step A4**
A5 CHECK MANUAL OPERATION – Pressing the switch **B53**, check for a voltage of 12V between pins A10 and A11 of **N82**	OK ▶ ~~OK~~ ▶	Replace device **N38** Restore the wiring between **N82** and switch **B53**, or replace the latter
A6 CHECK AUTOMATIC OPERATION – With the key at MARCIA, pressing switch **B53** check: • for 12V direct current between pins A8 and A9 if the button is pressed for less than 300 ms • no voltage if the button is pressed for less than 60 ms • 12V direct current until the window closes if the button is pressed for more than 300 ms	OK ▶ ~~OK~~ ▶	CONTROL UNIT **N82** IS WORKING PROPERLY. Check the connections with the other components Change the control unit **N82**

HEATED REARSCREEN AND WING MIRROR DEFROSTING AND ADJUSTMENT

INDEX

WIRING DIAGRAM



GENERAL DESCRIPTION

Defrosting

The rearscreen **(GTV only)** 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 panel which controls the heated rearscreen relay.

This device is operated by pressing the corresponding switch on the dashboard; this action is adjusted by the integrated services control unit **N82** according to the following logic:

- with the key at MAR; the engagement signal leads from the switch on the dashboard.
- The supply ceases if the key is turned to STOP or turned off; or if the signal to turn off is received from the switch on the dashboard.
- If neither of these two signals are received, the timer keeps the resistances supplied for 20 MINUTES, but with a particular control logic:
- the supply remains PERMANENT during the first 10 MINUTES;
- then during the FOLLOWING 10 MINUTES the supply is cut off if the battery voltage falls below 11.6V (and it is restored if the voltage rises and exceeds 13V).

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

For SPIDERS with a Hard Top, there is a special socket for connecting the rear windscreen incorporated in the actual Hard Top, located on the left panel.

Actuation of the heated rearscreen also turns on the wing mirror defrosting function.

N.B. The ideogram in the switch and on the warning light is different for the GTV which also includes the rearscreen and for the SPIDER which involves the wind mirrors only.

Wing mirror adjustment

The two wing mirrors are adjusted through the 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 selector makes it possible to switch from one to the other.

FUNCTIONAL DESCRIPTION

Defrosting

The line of fuse **F12** of fusebox **G1** supplies the heated rearscreen relay **I2**, the coil of which receives the "key-operated" supply, and is energised by an earth signal from the control unit **N82** - pin 9.

The control unit receives - pin B14 - the command of switch **B9** or .

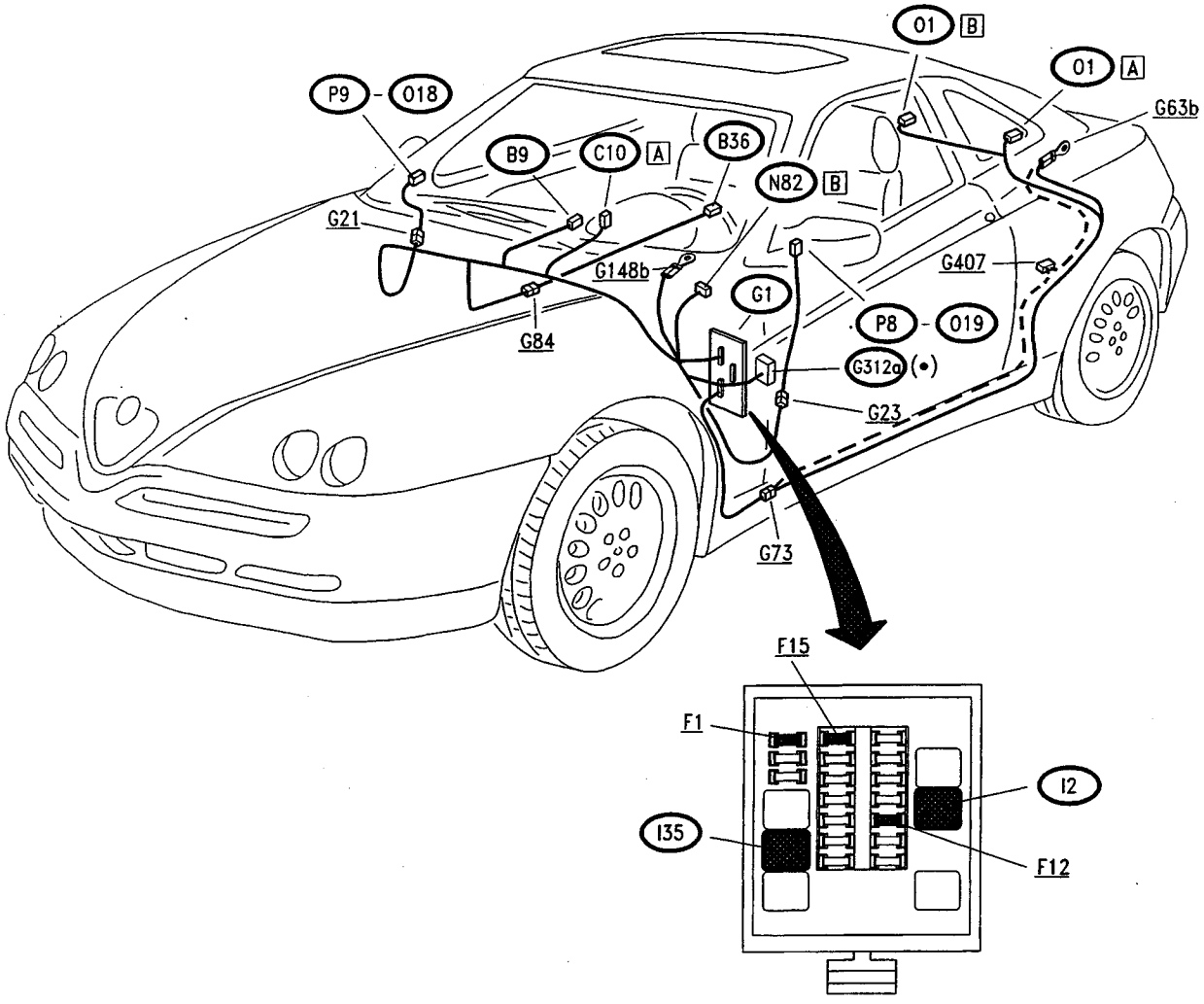
When the contact of relay switch **I2** closes the battery voltage supplies the line, which reaches the rearscreen heating **O1** (GTV only) and the resistances of the wing mirrors **O19** (left) and **O18** (right).

A signal from control unit - pin B11 - 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 mirrors in the mirrors **P8** (left) and **P9** (right).
The switch is supplied with direct voltage - pin 3 - which crosses fuse **F1** of the fusebox **G1**; pin 1 is earthed.
Operating switch **B36** in one direction or in the other one of the motors receives positive and earth, in addition to the shared signal - pin 2, thereby determining the direction of rotation. Depending on the position of the selector, the right-hand motor **P9** (signals from pins 6 and 8 of **B36**) or the left-hand motor **P8** (signals from pins 5 and 7 of **B36**) is connected; the switch is illuminated by a led which is turned on when the sidelights are on (pin 4).

LOCATION OF COMPONENTS



– – – Spider with "Hard Top"
(•) white fuseholder

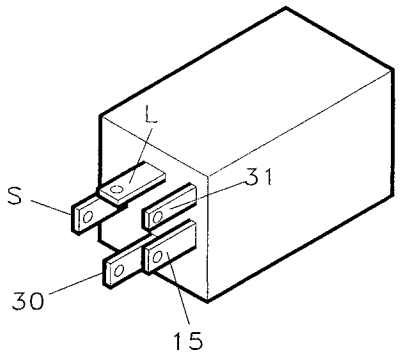
FAULTFINDING TABLE

Failure	Component to be checked													
	G312a	F15	F12	I2	B9	O1	O19	O18	C10 (1)	F1	P8	P9	B36	N82
Defrosting, under all circumstances	•	•	•	•	•									•
Rearscreen defrosting (GTV only)						•								•
LH wing mirror defrosting							•							
RH wing mirror defrosting								•						
Rearscreen warning light									•					
Wing mirror adjustment, under all circumstances										•			•	
LH wing mirror adjustment											•		•	
RH wing mirror adjustment												•	•	

(1) The instrument cluster **C10** cannot be repaired. Therefore, in the event of a failure it is not possible to change the single warning light and a new, complete cluster must be fitted.

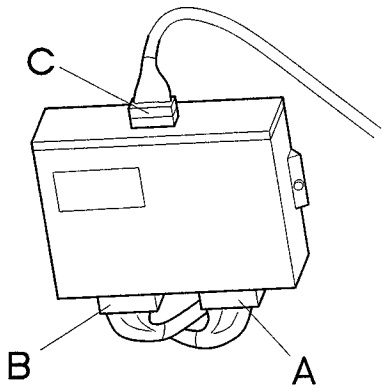
CHECKING COMPONENTS

Heated rearscreen relay (I2)



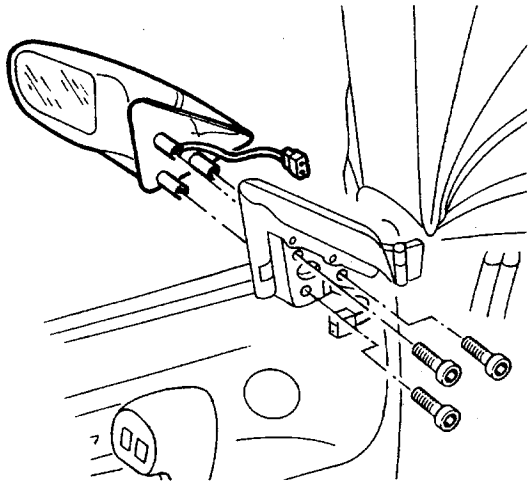
check device: see **test A**

Integrated services control unit N82



Check the heated rearscreen functions **test B**

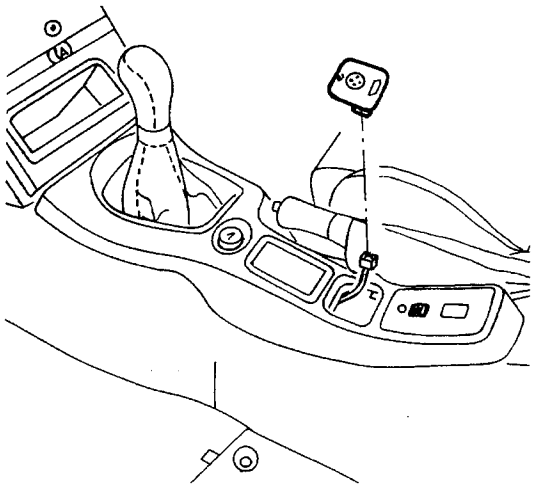
Wing mirror (O18-P9) (O19-P8)



SPECIFICATIONS	
Defrosting resistance (between pins G and H of the connector)	10 Ω

SPECIFICATIONS	
rotation upwards	12V at pin C, earth at pin B
rotation downwards	12V at pin B, earth at pin C
rotation rightwards	12V at pin B, earth at pin A
rotation leftwards	12V at pin A, earth at pin B

Double wing mirror control switch (B36)



Checking the device: see **test C**

CHECK REARSCREEN RELAY (I2) — TEST A

TEST PROCEDURE	RESULT	CORRECTIVE ACTION
A1 CHECK VOLTAGE – Disconnect device **I2** and check on the base of fusebox **G1** for: 12V between pins 30 and 31. With the key at MARCIA: check for 12V between pins 15 and 31	OK ▶	Carry out **step A2**
	OK ▶	Check fuse **F12** of **G1**. If necessary check relay **I35**
A2 CHECK CONTROL SIGNAL – Insert rearscreen defrosting: check earth at pin S of **I2**	OK ▶	Insert device **I2** on the base of **G1** and continue with **step A3**
	OK ▶	Restore the wiring between **G1** and switch **B9**
A3 CHECK DEFROSTING CONTROL – Insert rearscreen defrosting: check 12V between pin 1 and 6 of connector G of **G1**: this voltage disappears after 20 minutes	OK ▶	DEVICE **I2** WORKS PROPERLY. Check other components.
	OK ▶	Replace relay **I2**

CHECK SERVICES CONTROL UNIT (N82) - REARSCREEN FUNCTION — TEST B

TEST PROCEDURE	RESULT	CORRECTIVE ACTION
B1 CHECK VOLTAGE – Check for 12V at pin B8 of **N82**	OK ▶	Carry out **step B2**
	OK ▶	Check fuse **G312a**
B2 CHECK VOLTAGE – With the key at MARCIA, check for 12V at pin B7 of **N82**	OK ▶	Carry out **step B3**
	OK ▶	Check fuse **F15** of **G1**
B3 CHECK THE REARSCREEN ACTIVATION SIGNAL – Operate the rearscreen heating and check for an earth sgnal from pin B14 of **N82**	OK ▶	Carry out **step B4**
	OK ▶	restore the wiring between **N82** and switch **B9**
B4 CHECK REARSCREEN TIMER SIGNAL – With the key at MARCIA, operate the rearscreen and check for an earth signal from pin B7 of **N82**	OK ▶	The control unit **N82** is working normally. Check the connections with other components.
	OK ▶	Restore the wiring between **N82** and **G1**

CHECKING DOUBLE WING MIRROR CONTROL SWITCH (B36) — TEST C

TEST PROCEDURE	RESULT	CORRECTIVE ACTION
C1 CHECK VOLTAGE – Check for 12V between pins 1 and 3 of **B36**	OK ▶	Carry out **step C2**
	~~OK~~ ▶	Check fuse **F15** (15A). Restore the wiring between **B36** and fusebox **G1** and earth **G148b**.
C2 CHECK VOLTAGE – With the side lights on, check for 12V at pin 4 of **B36**	OK ▶	Carry out **step C3**
	~~OK~~ ▶	Check that the side lights are working properly; also check the wiring between **B36** and **G1**
C3 CHECK VOLTAGE – Set the selector to the position for operating the **left** mirror and check: - 12V between pins A and B of mirror **P9** moving the switch rightward and leftward - 12V between pins B and C of mirror **P9** moving the switch upwards and downwards In the same way, moving the **right** mirror check: - 12V between pins A and B of mirror **P8** moving the switch leftward and rightward - 12V between pins B and C of mirror **P8** moving the switch upward and downward	OK ▶	THE SWITCH IS WORKING CORRECTLY. Check the connection with the other components
	~~OK~~ ▶	Carry out **step C4**
C4 CHECK VOLTAGE – Set the selector to the position for operating the **left** mirror and check on **B36** for: - 12V between pins 7 and 2 moving the switch leftward and rightward - 12V between pins 5 and 2 moving the switch upward and downward In the same way, operating the **right** mirror check for: - 12V between pins 8 and 2 moving the switch leftward and rightward - 12V between pins 6 and 2 moving the switch upward and downward	OK ▶	Restore the wiring between **B36** and **P9** (RH) or **P8** (LH), or change one of the two motors
	~~OK~~ ▶	Change switch **B36**

HEADLAMP AIMING DEVICE

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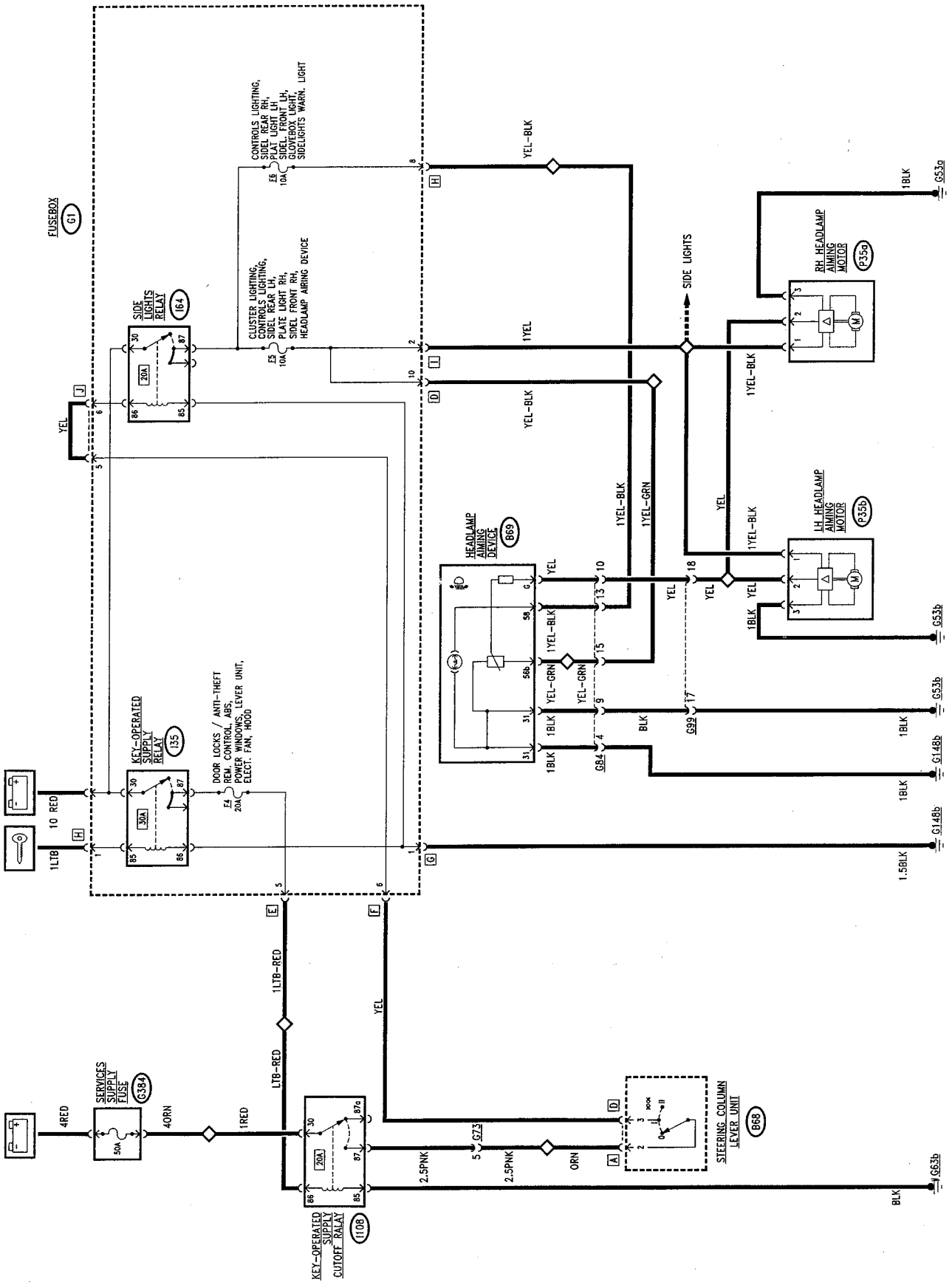
WIRING DIAGRAM



GENERAL DESCRIPTION

The car offers the possibility to adjust the headlight beam in relation to the load directly from the driver's seat.
In this way the problem or invonveniences caused by incorrect headlamp aiming is avoided and the delicate task of direct lamp adjustment is simplified (this is not substituted by the electrical device but integrated with it).

The adjustment device consists of a motor fitted on each of the two headlamps which suitably slopes them to lower the beam when the car is heavily loaded and raise it when the load is lightened.
The driver operates the system directly by turning a knob on the the centre console, which allows four positions to be chosen according to the following table:

Position of knob	Load conditions
0	driver only or driver and passenger on front seat
1	all seats occupied
2	all seats occupied plus load in luggage compartment (until reaching max.allowed load on rear axle)
3	driver plus load in luggage compartment until reaching max. allowed load on rear axle)

The system can be operated only when the side lights are on; it is completely de-activated when they are off.

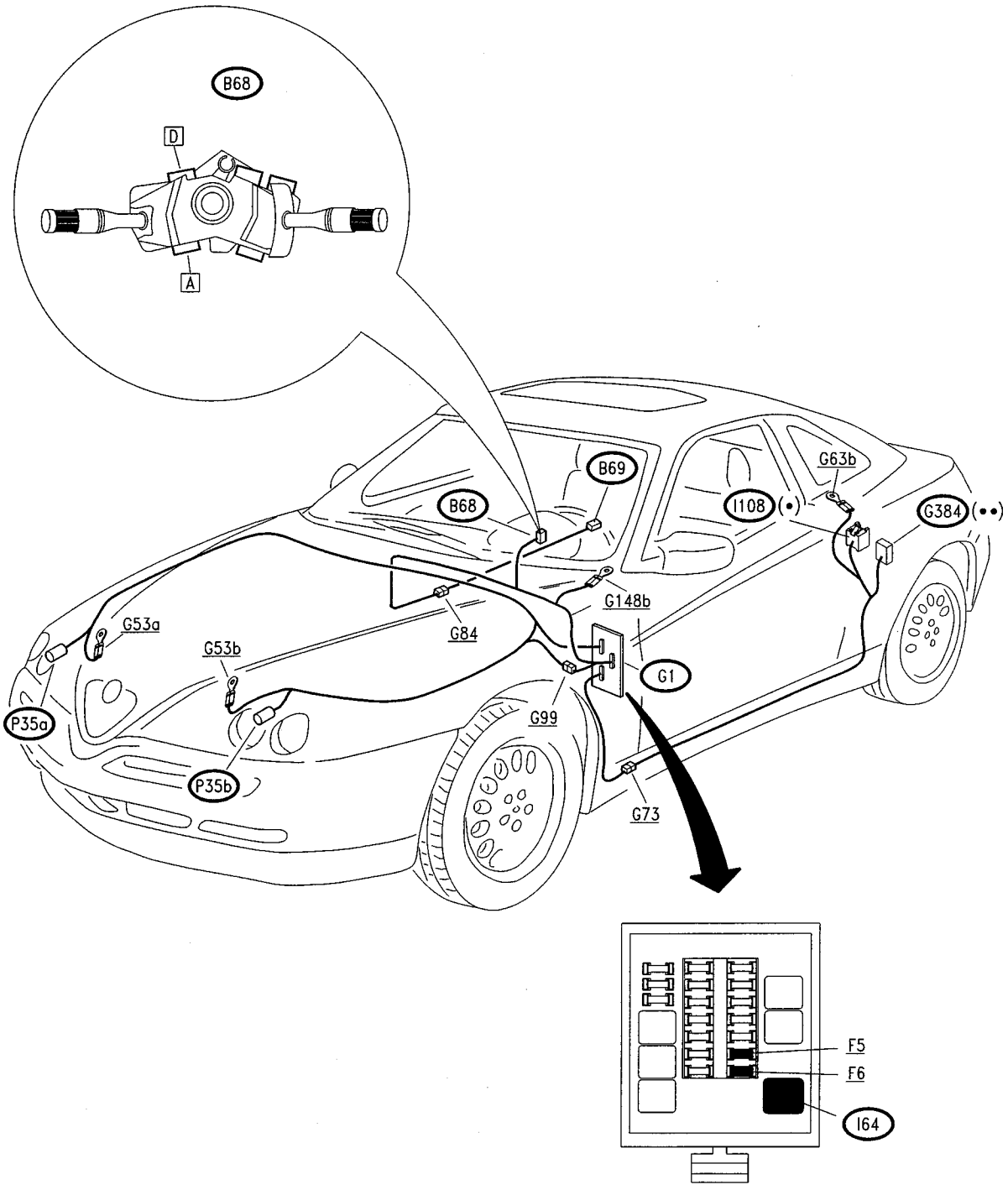
NOTE: for safety reasons the system is designed so that in the event of a failure it cannot be moved to a higher position than the one it is already at.

FUNCTIONAL DESCRIPTION

The headlamp aiming device **B69** is supplied at pin 56b by a line leading from the side lights circuit from fuse **F5**: this line receives voltage only when the side lights are on.
The same supply (pin 58) turns on the led inside device **B69** itself which illuminates the ideogram identifying the function.
Pins 31 of device **B69** are earthed, while the adjustment signal obtained by pressing the four-position selection knob leads from pin G. This signal varies the output voltage through a potentiometer (100% voltage at position "0"; with voltage decreasing for the successive positions).

Motors **P35a** and **P35b** are formed by a motor in the strict sense of the word controlled by a transducer and an electronic control unit which establishes the stroke on the basis of the voltage of the adjustment signal reaching pins 2, from device **B69**.
The devices are supplied at pins 1, by the same line as fuse **F5**, while pins 3 are earthed.

LOCATION OF COMPONENTS



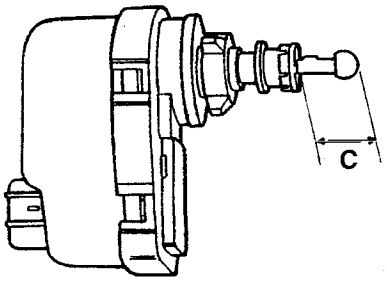
(•) Blue base
(••) Black fuseholder

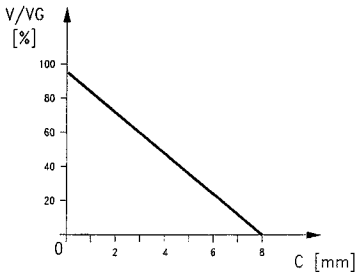
FAULTFINDING TABLE

Failure	Component to be checked				
	F5	F6	P35a	P35b	B69
Complete adjustment	•				•
RH headlamp aiming device			•		
LH headlamp aiming device				•	
Control device lighting		•			•

CHECKING COMPONENTS

RH/LH hedlamp adjustment motor (P35a) (P35b)



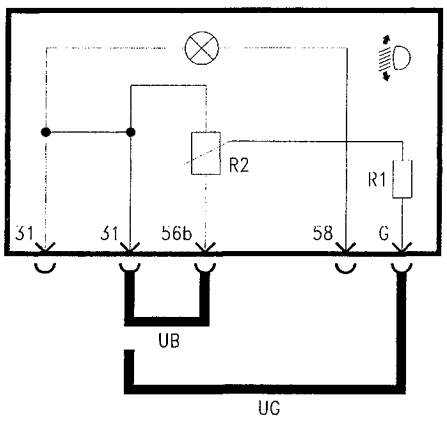


Operating diagram: course of stroke C in relation to the voltage V/VG

V = voltage between pin 56b and pin 31 (12V)

VG = voltage between pin G and pin 31

Headlamp aiming device (B69)



SPECIFICATIONS	
R1	390 Ω ± 2%
R2	4.7 kΩ

Knob position	Voltage between terminals G and 31 (UG)
0	94.9% UB ± 3%
1	88.3% UB ± 7%
2	82.7% UB ± 7%
3	75.1% UB ± 7%
4	51.2% UB ± 7%

(UB: voltage between pins 31 and 56b = 12V)

SAFETY SYSTEM AIR BAG AND PRETENSIONERS

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SAFETY SYSTEM AIR BAG AND PRETENSIONERS

This car is fitted with an electronic safety system which, in the event of an impact, operates one or two Air Bags and two safety belt pretensioners.

The **AIR BAG** is a passive safety device formed of one or two cushions which automatically inflate between the body of the occupants of the front seats of the vehicle and the front structures of the passenger compartment, in the event of a head- on crash.

The safety belts **PRETENSIONER** is a pyrotechnic device integrated in the safety belt buckle, which operates in the event of a head-on collision taking up the inevitable slack in the belts caused by the action of the weight of the body or its adherence to the seat back.

The system as a whole comprises the following components:

1. Electronic control unit.

2 .Driver's side Air Bag module.

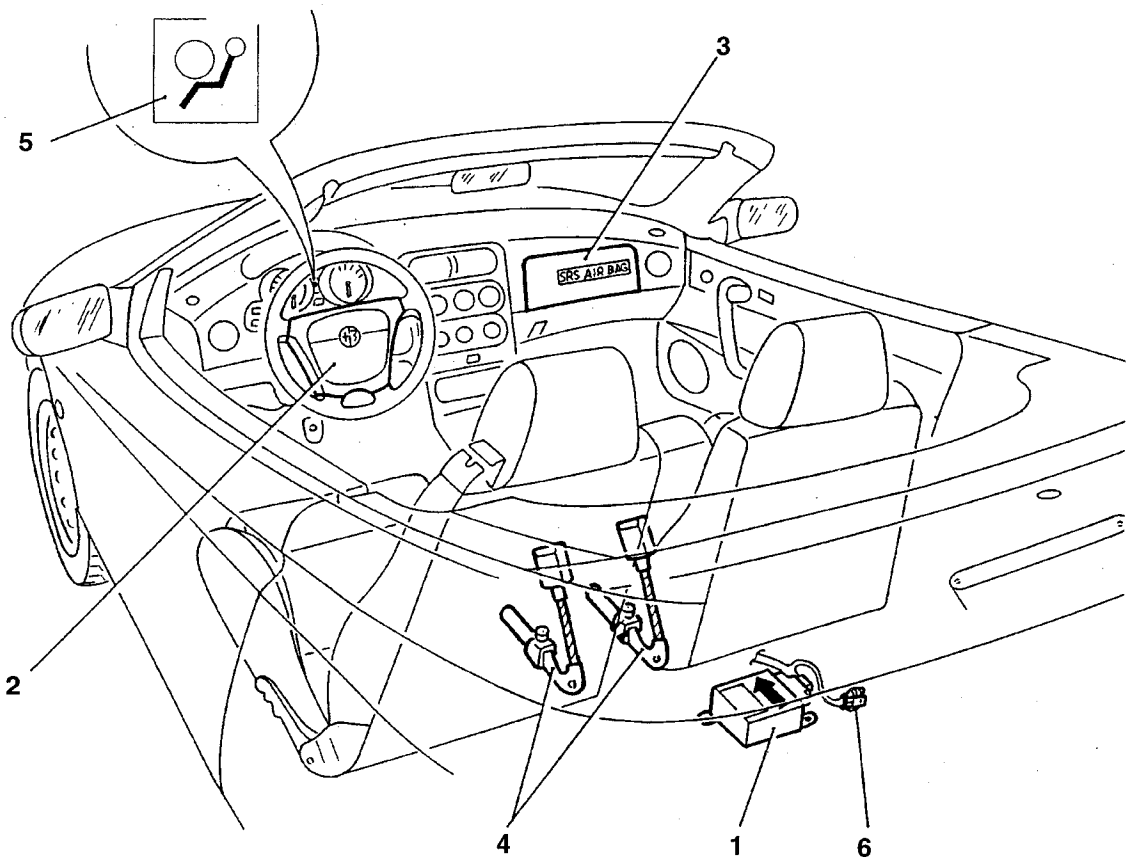
3. Passenger's side Air Bag Module.

4. Safety belt pretensioners.

5. Warning light on the instrument cluster that indicates any faults and the diagnosis code

6. Connector for the ALFA TESTER.

The electronic control unit is equipped with suitably calibrated deceleration sensors, through which it detects a collision situation and triggers the reaction of a chemical compound which produces nitrogen



through two electric detonators. The gas inflates the two synthetic fibre cushions respectively housed at the centre of the steering wheel and in a compartment of the dashboard in front of the passenger.

Simultaneously, the control unit triggers the pretensioners which prevent the belts from unreeling by a piston operated by a gas generator which pulls the steel cable fastening the buckle.

SAFETY RULES TO BE FOLLOWED FOR OPERATIONS ON CARS FITTED WITH AIR BAG SYSTEM

Below we are giving some rules which MUST BE STRICTLY ADHERED TO during any type of operation concerning vehicles fitted with Air Bag safety systems.

PRELIMINARY RULES

You are reminded that Air Bag modules should be handled with care. The use, transport and storage of them are ruled by the following procedures for handling these components.

Before starting to carry out:

- body repair work;
- welding operations;
- work requiring the removal of Air Bag modules or the control unit.

- remove the key from the ignition switch
- always disconnect the battery, i.e.: disconnect the two terminals from their posts and isolate them taping carefully.
- disconnect the control unit connector waiting at least 10 minutes after disconnecting the battery.

When removing one of the inflating devices, closely follow the procedure given below:

1. Wait for at least 10 minutes after disconnecting the battery before starting to disassemble the module.
2. Slacken the fastening screws.
3. Disconnect the coupling of the inflation devices
4. Store the devices with the cover upwards in a key-locked metal cabinet. This cabinet, to be used only for this purpose, must never be used for storing any other type of material, especially if inflammable. The cabinet must possess all the requisites foreseen for containing pyrotechnical charges (shockproof metal cabinet with air vents to allow natural ventilation inside) and it must be labelled according to the laws in force (DANGER EXPLOSIVES - USE OF NAKED FLAMES PROHIBITED - DO NOT OPEN UNLESS DULY AUTHORISED).

- All the connectors used and wired on Air Bag modules contain a short circuit clip, until the moment in which the Air Bag modules are connected to a suitable power source through the appropriate connector there is no possibility of unduly activating the units.

A component of the system that was not activated during an accident is to be considered still "active" therefore unexploded components due to faults or guarantee expiry or other causes which make their replacement necessary must be returned to the special centre following the procedure described below

Assembly and disassembly of components of the safety system must be carried out SOLELY by competent, authorised technical staff.
The failure to abide by the instructions herein may involve undesired activation of the system, personal injury or unneccessary system repairs.
IT IS STRICTLY PROHIBITED TO DISASSEMBLE THE COMPONENTS OF AIR BAG MODULES.

All the system components have been designed specifically to work on a car of specific make and model, therefore Air Bags cannot be adapted, re-used or installed on other vehicles, but only on those for which they were designed and produced.

Any attempt to re-use, adapt or install an Air Bag on a different model may cause serious or lethal harm to the occupants of the vehicle in the event of an accident.

Changing the Air Bag (owing to a fault or expiry of the terms of guarantee)

When replacing an Air Bag module due to a fault or expiry of the terms of guarantee it is necessary to:

1. Remove the sticker label from the new module, stick it in the special file with the vehicle data (chassis no., date of registration, model, etc.) and add the serial number of the old module. The file with the recorded data must be kept for any inspections over time.
2. Before glueing the label it should be perforated in correspondence with the month and the ten years following the year in which the module is fitted (e.g. 1997 will correspond to 2007).
3. Connect the module to the special connector.
4. Fit the Air Bag module in its housing checking the correct arrangement of the connection cable and fasten the screws to the specified torque.

Control unit replacement

The electronic control unit must ALWAYS be replaced in the event of a crash involving activation of the complete system (Air Bag and pretensioners)

⚠ Never attempt to re-use the electronic control unit.

Also in the case of control unit replacement, it is necessary to remove the sticky label and stick it in the above-mentioned special file holder.

After working on the system it must be checked using the ALFA ROMEO Tester.

OPERATIONS AFTER AN ACCIDENT

Should any component of the safety system be damaged after an accident, it MUST be replaced.

Do not attempt to repair the control unit, clock spring contact and Air Bag modules.

ACCIDENTS WITH OR WITHOUT AIR BAG ACTIVATION

Some system components should be inspected whether the system has been activated or NOT. These components are:

- Steering column;
- Steering column supports;
- Control unit and modules anchorage area;
- Clock spring contact;
- Dashboard (in the area of the passenger's Air Bag).

The presence of distortion, breaks and flexing necessarily involves replacement of the component.

ACCIDENTS WITH ACTIVATION OF AIR BAGS

Some system components must be replaced if the car has suffered a head-on crash involving total or partial system activation

In the event of partial activation (only pretensioners), these components are:

- Pretensioners
- Electronic control unit (only after the third activation of the pretensioners)

In the event of total activation (Air Bag and pretensioners), these components are:

- Air Bag modules
- Pretensioners
- Electronic control unit.

As far as the wiring and connectors are concerned, these should be checked for any signs of burns, melting of the outer insulation or damage due to excessive heat.

Any signs of damage on the clock spring contact and electronic control unit and Air Bag module anchorage areas necessarily involve replacement of the damaged components.

Painting work

There are no particular safety instructions to be followed for painting work followed by oven drying since the modules have been designed in such a way that heating the outside surfaces of the car using normal paint drying systems will not damage them.

⚠ The use of naked flames near modules is prohibited.
All the electronic control units (including the one for the Air Bag system) should in any case be removed if their temperature in certain environments may reach or exceed 85°C.

HEALTH HAZARDS

The precautions to be taken when handling activated Air Bags are the following:

- wear protective polyethylene gloves and safety glasses;
- after touching triggered Air Bags, wash your hands and any exposed parts of the body with soap and water.

Effects of over exposure

There is no potential harm in exposure to the propellent as the system is completely sealed.

The mixture of propellents is in the solid state, therefore inhalation is impossible also in the case of breakage of the gas generator cartridge.

Should any gas leak, there is no danger for human health.

At all events avoid contact with the skin and do not swallow the propellent.

- Contact with the skin: wash immediately with soap and water.
- Contact with the eyes: Wash the eyes immediately under running water for at least 15 minutes.

– Inhalation: take the person involved outdoors immediately.

– Swallowing: induce vomit if the person is conscious.

Under all these circumstances always call a doctor.

SAFETY RULES FOR HANDLING AIR BAG MODULES

Under normal conditions the driver's and passenger's Air Bag are activated by the action of an electronic ignition device during the crash. The gas developed under these conditions is harmless.

Personnel carrying out operations on the device fitted on the car must strictly adhere to the following rules of safety.

Personnel working on the devices must be appropriately trained.

– During open (exploded) Air Bag removing and replacement operations handle only one module at a time and when removing wear gloves and glasses.

– Always rest the Air Bag module with the opening lid and the pre-breakage groove upwards. Never place anything above this lid.

– At the end of operations always wash the hands carefully with neutral soap and in the event of contact of residual powder with the eyes rinse immediatly with plenty of running water.

– In all versions with Air Bag it is prohibited to work from the front seats without firstly rendering the system inoperational by disconnecting the two battery cables and waiting for 10 minutes.

– The metal components of an Air Bag that has just exploded are very hot. Avoid touching these components for 20 minutes from the time in which the Air Bag was activated.

– Do not power the Air Bag module with electricity unless as specified for installation and servicing.

– Do not carry out repairs on Air Bag modules. Send all faulty modules to the manufacturer. - Do not subject the Air Bag module to heat for example by welding, hammering, drilling, mechanical machining, etc.

– Never install on cars Air Bag units that have fallen or reveal signs of any type of damage whatsoever.

– It is prohibited to keep Air Bag modules together with inflammable materials or fuel.

– The gas generators must not come into contact with acids, greases and heavy metals: contact with these substances may cause the formation of poisonous, harmful gas or explosive compounds.

Any storage of spare parts must be carried out in the original packing and temporary storage should follow the same procedure as an Air Bag removed from the car and not activated, i.e. in any case a key-locked metal cabinet specially for this purpose must be used (shockproof metal cabinet with vents to allow natural ventilation inside).
The cabinet must have warning notices (DANGER EXPLOSIVES - DO NOT USE NAKED FLAMES - ONLY TO BE OPENED BY AUTHORISED PERSONNEL).

SCRAPPING AIR BAG MODULES

Air Bag modules fitted on the car must not be scrapped with the vehicle, they must be removed.

Air Bag units must be deployed before scrapping.

If an Air Bag module has not been deployed during a crash the device is to be considered still charged. All unexploded material MUST NOT BE DEPLOYED, it should be sent to a specialised centre - for ITALY to GECMA, Chivasso - stating "AIR BAG CONTAINING PYROTECHNICAL CHARGE TO BE DEPLOYED" on the delivery note.

For FOREIGN MARKETS, observe current local laws.

The devices must be shipped in the wrapping/packing with which the spare parts were received and if this is no longer available it is possible to ask the Spares Division for the packing only.

Of course, when replacing Air Bag devices, the original packing should be kept intact to be able to return the undeployed device.

WARNING: The failure to follow the procedures listed here may cause undue triggering of Air Bag units and personal injury. Undeployed Air Bag units must NOT be disposed of through the usual refuse disposal channels.

Ordering procedure

In the case of need, the devices are to be requested individually from Direzione Post-vendita Ricambi-Volvera only through the "depannage" procedure as the Network must not keep these parts in stock. At all events, for in-house handling an in-out register should be kept recording the unit serial numbers and vehicle data (chassis no., date of registration, model, etc.)

CONTROL UNIT

The electronic control unit (1) is located in the centre rear of the car, and it is fastened rigidly to the floor.

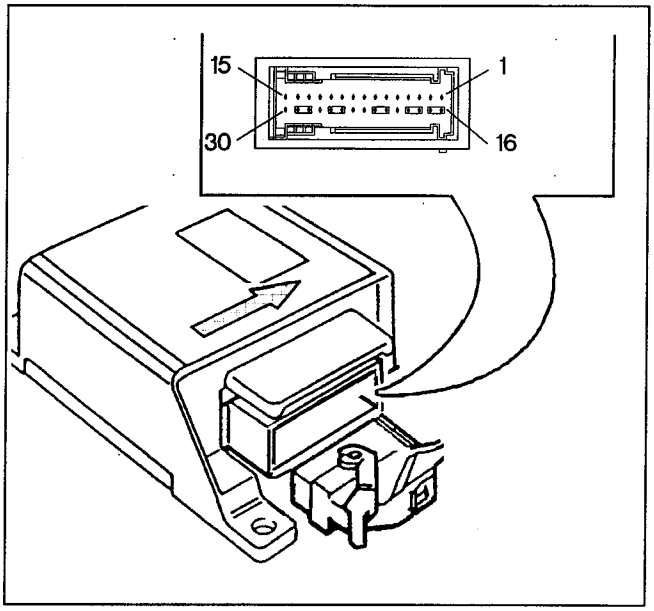
It has a 10 pin connector (2) used for connection to the electric system.
It is supplied at 12 V with the ignition key at MARCIA. Activation of the Air Bags is still ensured for appr. 100 msec after a power failure due to a crash; this has been made possible due to a buffer condenser contained in the circuits which accumulates electricity.

This guarantees operation of the Air Bag also in the event of a crash causing a lowering of the voltage in the system (eg. battery damage or breakage, supply cables cut off, etc.).

The control unit must be directed with the arrow (3), stamped on the sticker, in the direction of TRAVEL of the vehicle.

This is absolutely necessary, because it determines the direction in which the acceleration sensor reads the negative acceleration value to define the crash condition and thus operate the system.

The ECU is equipped with an accelerometer sensor. The sensor signal is processed by a microprocessor and detects the severity of an impact. The ECU, consequently, triggers the pretensioners and the airbags. A second safety sensor enables airbag triggering.



CONTROL UNIT PIN-OUT

1. Driver's Air Bag (-)
2. Driver's Air Bag (+)
3. Passenger's Air Bag (-)
4. Passenger's Air Bag (+)
5. N.C.
6. Passenger's pretensioner (+)
7. Passenger's pretensioner (-)
8. Line L for Tester
9. Line K for Tester
10. Driver's pretensioner (+)
11. Driver's pretensioner (-)
12. N.C.
13. Warning light (fault and diagnosis)
14. Control unit earth
15. Control unit supply (+15)
16. Bridge for driver's Air Bag (-)
17. Bridge for driver's Air Bag (+)
18. Bridge for passenger's Air Bag (-)
19. Bridge for passenger's Air Bag (+)
20. N.C.
21. Bridge for passenger's pretensioner (+)
22. Bridge for passenger's pretensioner (-)
23. N.C.
24. N.C.
25. Bridge for driver's pretensioner (+)
26. Bridge for driver's pretensioner (-)
27. N.C.
28. Bridge for warning light
29. Bridge for control unit earth
30. N.C.

Failure memory

While the vehicle is running, the ECU carries out a continuous system test, checking the continuity in the circuits and the components.

All identified faults are memorised and the "Airbag failure" warning light simultaneously lights up on the instrument panel.

The failure memory can be consulted during Servicing by connecting a diagnostic tool to the built-in diagnostic socket (refer to following specifications).

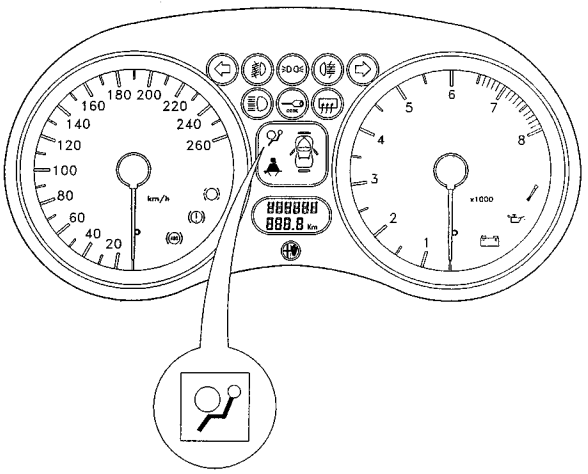
Impact memory

As stated, the ECU microprocessor applies complex control and calculation algorithms to the accelerometer sensor signal and identifies the level of severity of an impact. According to the level of severity and when enabled by the safety sensor, the ECU sends a trigger signal to the pretensioners and to the airbags.

The trigger sequence is memorised in a specific impact memory containing the information regarding trigger thresholds and safety sensor enables.

Air Bag fault warning light

The Air Bag warning light located in the instrument cluster of the car is powered when the ignition switch is turned to the MARCIA position and it earthed via the electronic control unit.



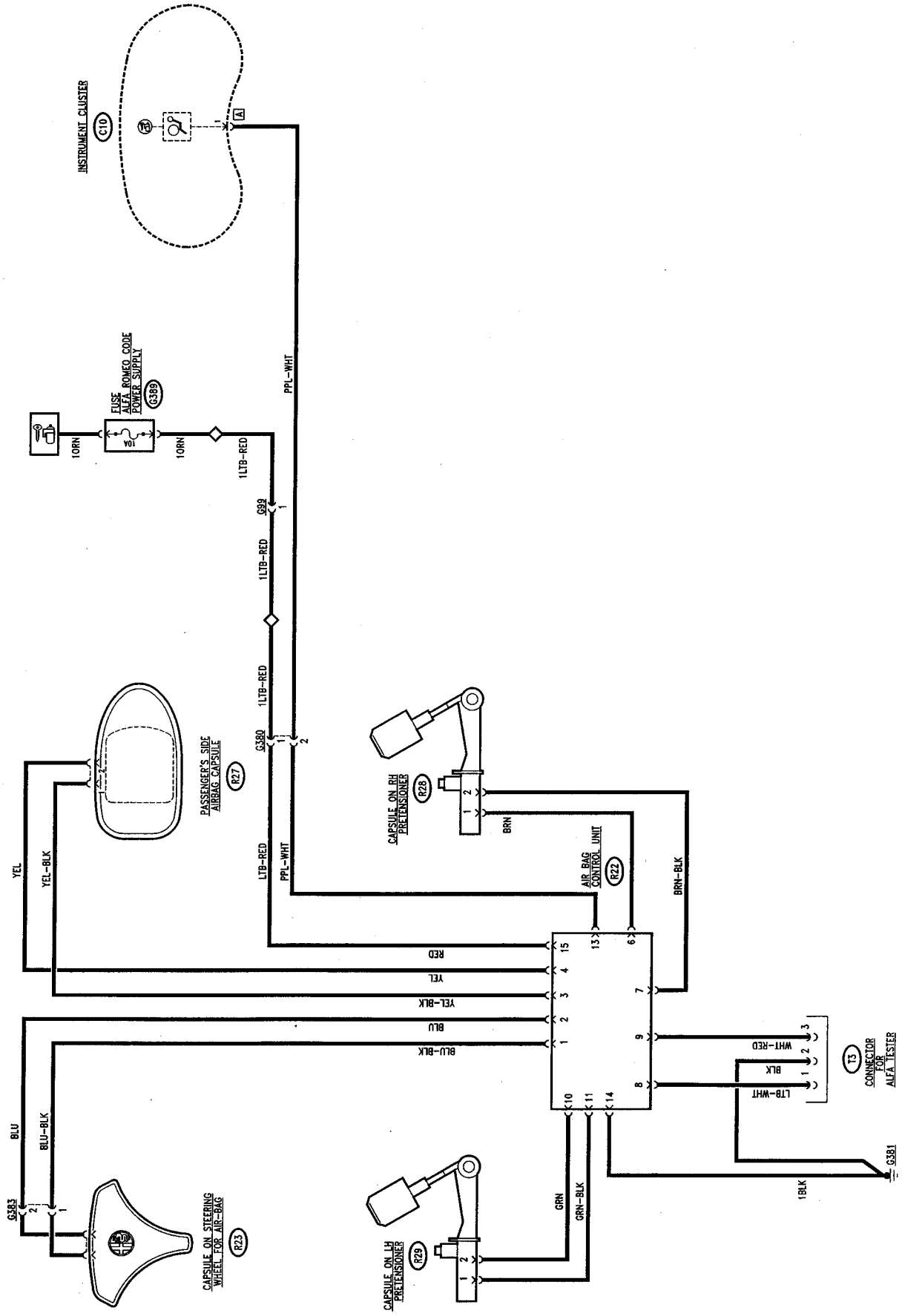
It lights up for about 4 seconds when the vehicle is started (initial test phase).

If the light does NOT light or does NOT go out after 4 seconds, then there is a fault in the Air Bag system.

If the electronic control unit detects a fault during self-diagnosis tests it will immediately light up the Air Bag warning light.

Once a fault has been signalled, the warning light will remain on until the fault has been repaired and cancelled in the fault memory.

WIRING DIAGRAM



FUNCTIONAL DESCRIPTION

The control unit **R22** receives the "key-operated" supply at pin 15, with the circuit protected by wander fuse **G389** (10A), while pin 14 is connected to earth on the specific point **G381** connected near the control unit.

The system comprises two cushions, one for the driver **R23** (at the centre of the steering wheel) and one in the dashboard in front of the passenger **R27** and the two pretensioner modules **R28** and **R29** located on the passenger's and driver's seats respectively.

While the car is travelling, the control unit **R22** continuously diagnoses the system checking the continuity of the circuts and components.

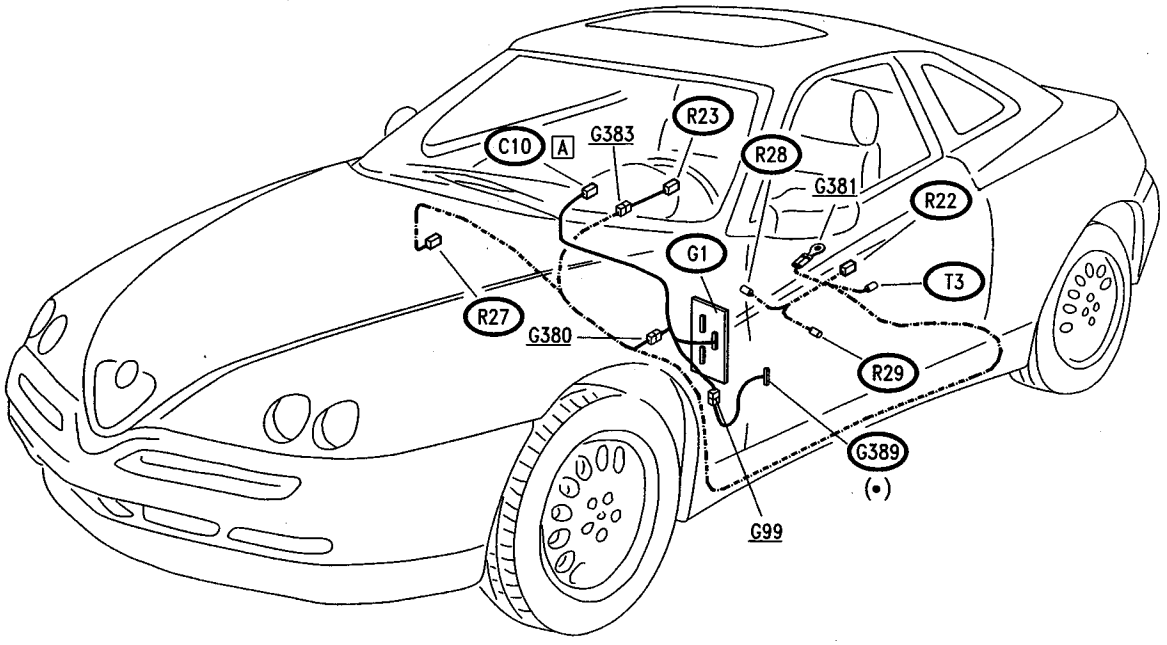
If a crash is detected by the two internal sensors (one piezoelectrical and one mechanical), the control unit commands activation of the two modules sending a current via two signals from pin 3 and 4 for the passenger's module and from pin 1 and 2 for the module on the steering wheel.

In the same way, for the pretensioners, two signals are sent from pin 6 and 7 for the passenger's side and from pin 10 and 11 for the driver's side.

When a system fault or malfunction is detected, the type of fault is memorised and the Air Bag warning light on the instrument cluster **C10** is turned on to alert the driver of the presence of a system fault.

Lastly, connector **T3** allows connection to the ALFA TESTER via pin 8 (line L) and 9 (line K).

LOCATION OF COMPONENTS



---- Specific cable for Air Bag, with yellow sheath
(•) Red fuseholder

SYSTEM DIAGNOSIS

The ECU carries out a continuous self-test on the airbag system while the vehicle is running. Identified failures are memorised and the ECU lights up the "Airbag" warning light on the dashboard.

ALFA TESTER Diagnosis

The failures memorised in the ECU can be analysed by means of an ALFA ROMEO TESTER or other diagnostic tool. The failures memorised in the ECU can be deleted after the fault has been repaired by means of the ALFA ROMEO TESTER or other diagnostic tool. Impacts triggering the complete system (airbag and pretensioners) cannot be deleted from the ECU memory. In this case the ECU must always be replaced. The "Airbag" warning light located on the instrument panel will remain on until the memory is deleted. If only the pretensioners have been triggered, the memory can be deleted twice. The ECU has to be replaced only when the pretensioners are triggered for the third time.

To measure module line continuity during tests, disconnect the modules from the wiring system and replace them with the relative simulation resistors.

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TO PAGE 16
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SUNROOF (GTV only)

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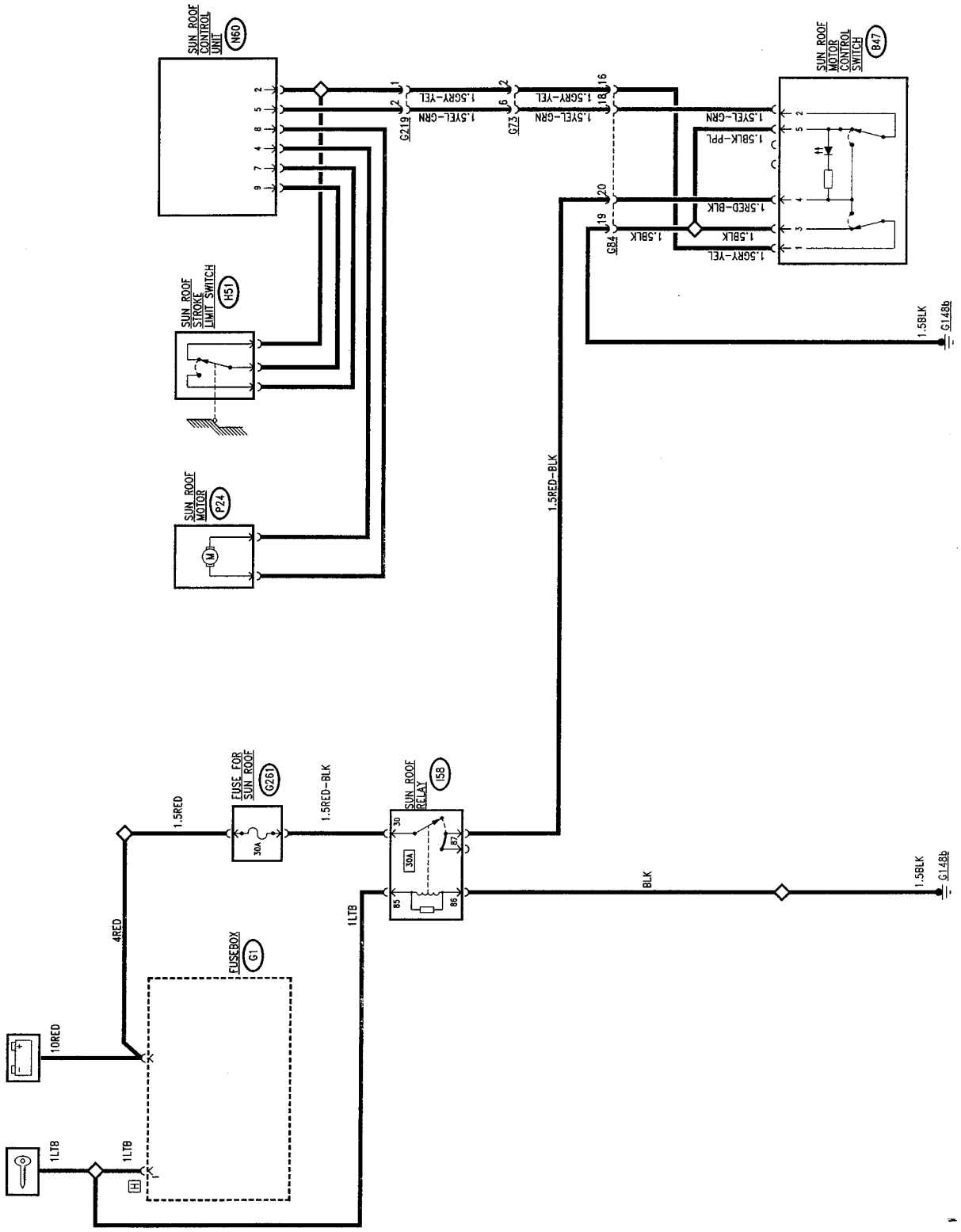
WIRING DIAGRAM



GENERAL DESCRIPTION

The sliding roof offers extra ventilation for the passenger compartment in warm weather and, when necessary, quick air changing, thereby increasing passenger comfort.
The mobile part of the roof comprises a glass pane and an interior sliding blind which is concealed in the roof panel trim.
A double switch, located next to the front ceiling light, operates a motor in two different ways: in the first, the motor raises the panel to the "quarter light" position, in the second, it opens the actual panel (for further details see GROUP 70 - "BODY-SUNROOF").
The whole system is controlled electronically by a control unit which regulates the various functions.
The sunroof can only be operated with the ignition key engaged.

FUNCTIONAL DESCRIPTION

The sunroof opening control system is powered by a special relay **I58**, located near the fusebox **G1**. The line is protected by wander fuse **G261**; system supply only takes place via the key-operated supply at pin 4 of the control switch **B47**, while pin 5 of the latter is connected to earth.

The system is a single functional unit comprising :

– control unit **N60**;

– motor **P24**;

– stroke limit contact **H51**.

The control switch **B47** is located on the tunnel console.

The control unit **N60** receives the operating signals from switch **B47** and controls the motor **P24** accordingly, taking account of any signal leading from the microswitch **H51**.

The system works according to the following logic:

– switch **B47** controls opening/closing of the sunroof: pin 4 of the same switch is supplied at 12 V: the pressing of the pushbutton in one direction controls sunroof opening, closing the contact on pin 2, thereby sending 12 V to pin 5 of the control unit; pressing in the opposite direction controls closing of the sunroof, closing the contact on pin 1, sending 12 V to pin 2 of the control unit;

– Pins 2 and 5 receive the control signals from switch **B47**; pins 9 and 7 are connected with the "zero" microswitch **H51** the contact of which is closed when the sunroof is in the "compass" position and open in all the other positions;

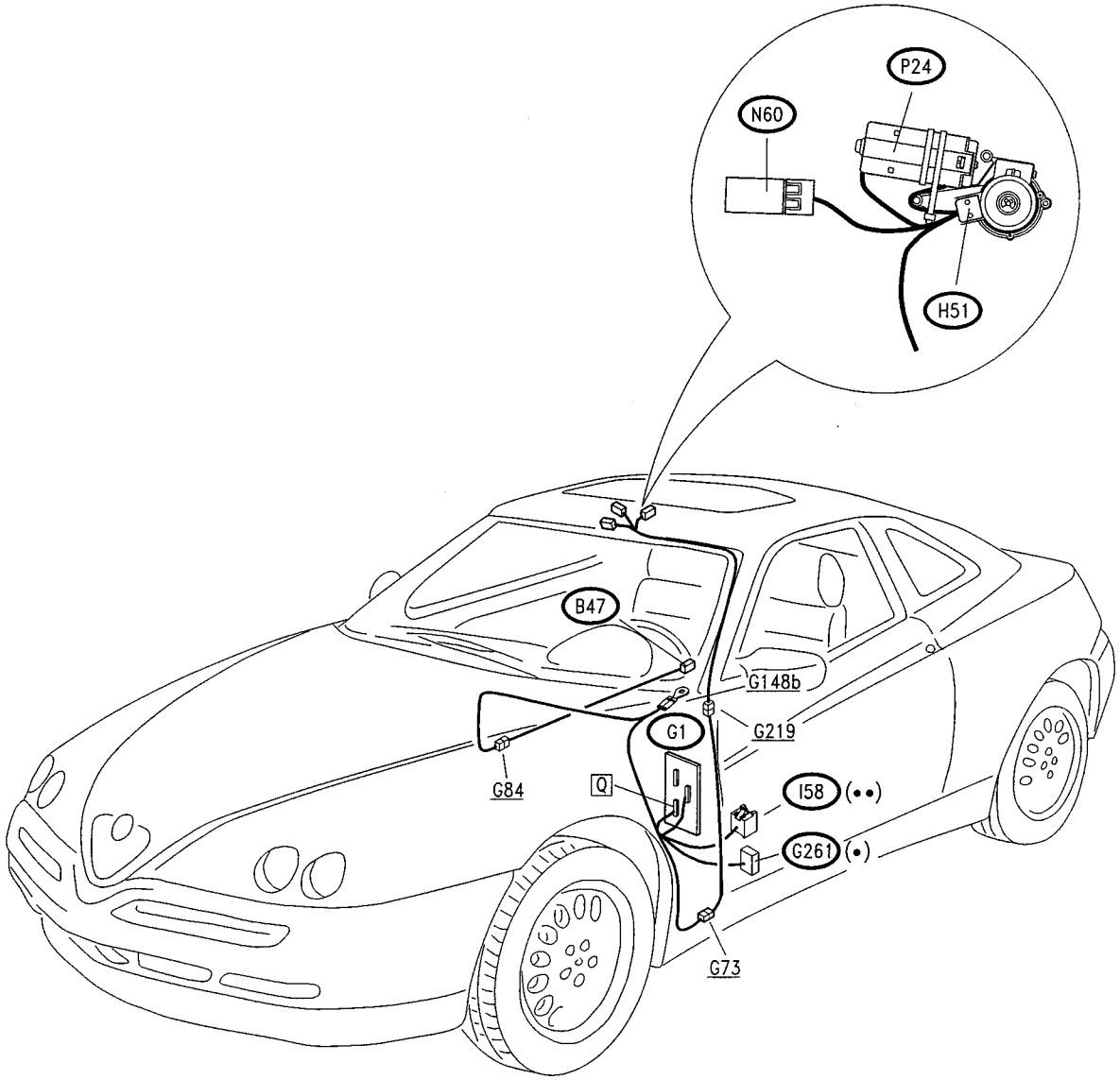
– pins 4 and 8 connect with the motor **P24** operating it in the two directions sending alternately 12 V and earth signals.

FAULTFINDING TABLE

Fault	Component to be checked					
	G261	I58	N60	P24 (1)	B47	H51 (1)
Sunroof fails to operate	•	•	•	•	•	
Sunroof fails to close properly			•			•

(1) N.B.: **P24** and **H51** are together in a single sunroof control unit **N60** which must be changed completely in the event of a failure to a component.

LOCATION OF COMPONENTS



(•) Green fuseholder
(••) Red base

HEATING AND VENTILATION SYSTEM: HEATER

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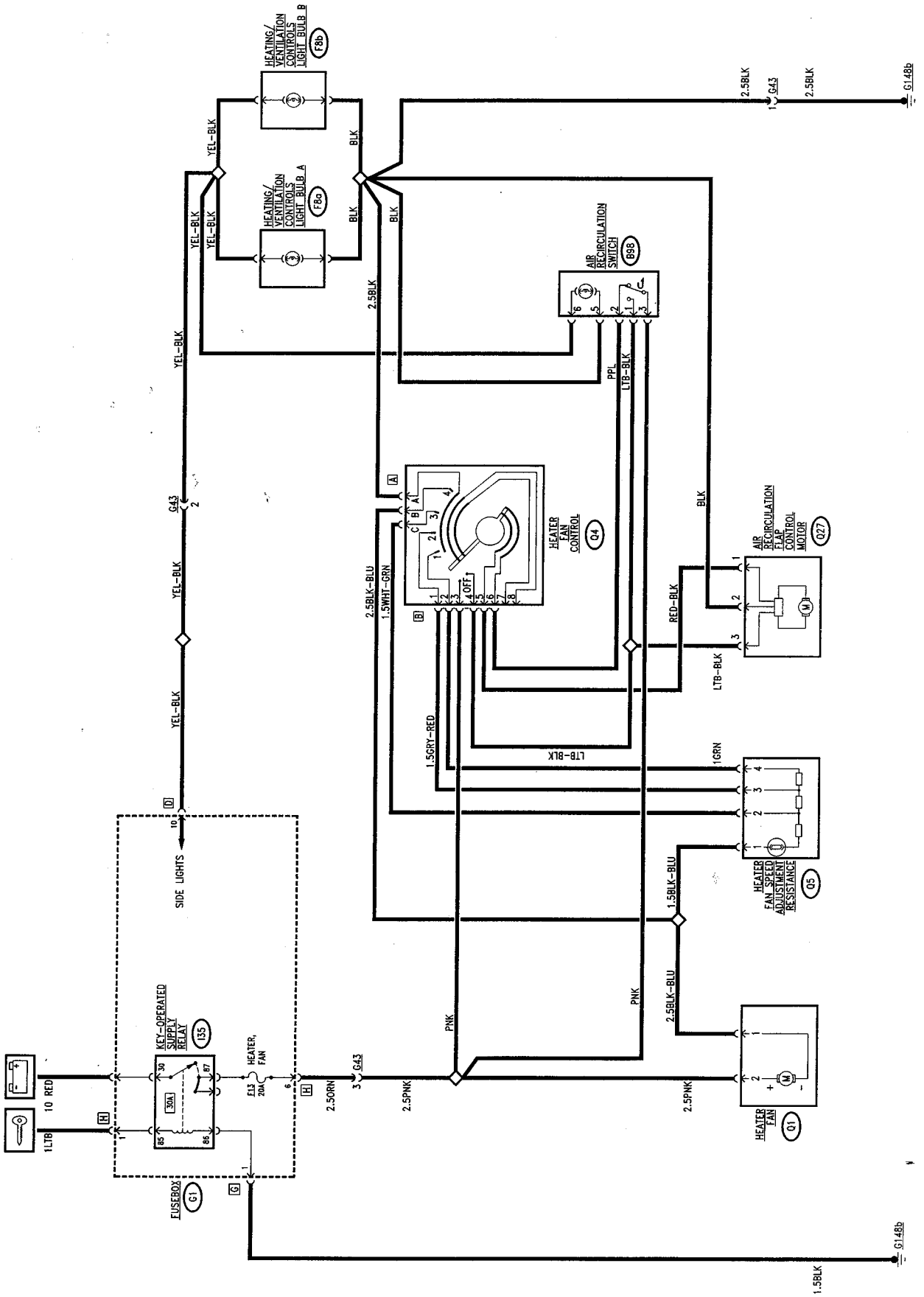
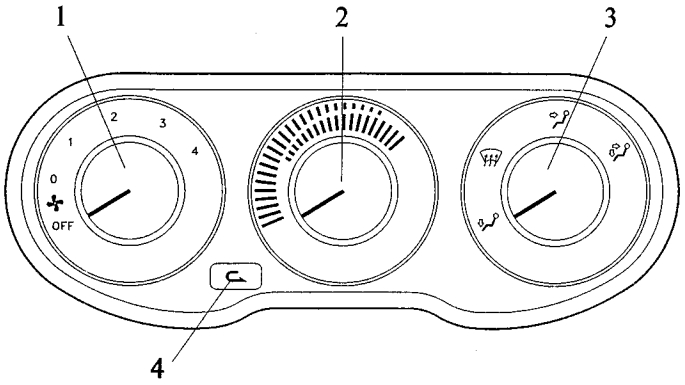
WIRING DIAGRAM



GENERAL DESCRIPTION

Climate control through the heater is controlled by three knobs of the control unit located on the panel: these controls act on the heater- distributor -air flow unit as follows:



- the left-hand knob (1) mechanically operates the ports which adjust the flow of air:
  - OFF: air inlet shut off
  - 0: inlet of outside air without fan (dynamic air)
  - from 1 to 4: a switch is operated which turns on the fan through a four-speed regulator. The regulator and corresponding resistor are fitted on the air flow unit near the fan.

NOTE:the heater can only be turned on with the ignition key engaged.

- the centre knob (2) - mechanically operates the mixing port between warm air (red) and cold air (blue): when turned completely to the left, it shuts off the radiator closing a special tap.
  NOTE: the radiator comprises a heat exchanger which exploits the engine coolant fluid to warm the air sent to the passenger compartment: in fact it is supplied by a special pipe of the engine cooling circuit.
- the right-hand knob (3) adjusts the distribution of the flow acting, still by a mechanical transmission, on the distribution ports, sending air into the passenger compartment in the directions shown schematically on the ideograms.
- the recirculation function takes place pressing push-button (4) which acts on a motor that moves a flap: this closes the outside air duct, simultaneously opening that of the air recirulating from inside the passenger compartment.

The recirculation function makes it possible to withdraw the air to be treated from inside the passenger compartment, shutting off the flow of outside air which under certain circumstances might be unwanted: bad smells, smoke, unventilated tunnels, etc.

NOTE: remember that the only functions controlled electrically are:

- fan control and speed adjustment;
- operating the "recirculation" function while the others are controlled mechanically.

FUNCTIONAL DESCRIPTION

Fan:

The heating and ventilation fan **Q1** is supplied with battery voltage via the key-operated services relay **I35** - located in fusebox **G1** -; in addition to the relay, the supply line also crosses fuse **F13** of fusebox **G1**.
The fan motor **Q1** is operated with an earth signal from the control knob **Q4**. This signal crosses the speed regulator **Q5**, comprising three resistances in series, the crossing of which determines the four different speeds, depending on the signal from the knob **Q4**: from pin 2 of connector B (1st speed), from pin 1 of connector B (2nd speed), from pin C of connector A (3rd speed) and lastly from pin B of connector A (4th speed) with a direct signal that does not cross the regulator **Q5**.
The regulator **Q5** has a built-in thermal safety fuse which deactivates the circuit if the temperature exceeds 98°C.

Recirculation:

The recirculation function is carried out by operating motor **Q27** according to the following supply logic:

- pin 2 of **Q27** always at earth;
- 12 V at pin 3 of **Q27**: the motor turns engaging the recirculation function;
- 12 V at pin 1 of **Q27**: the motor turns shutting off recirculation;

The function is turned on through switch **B98**, but with switch **Q4** at "0", "1", etc...:

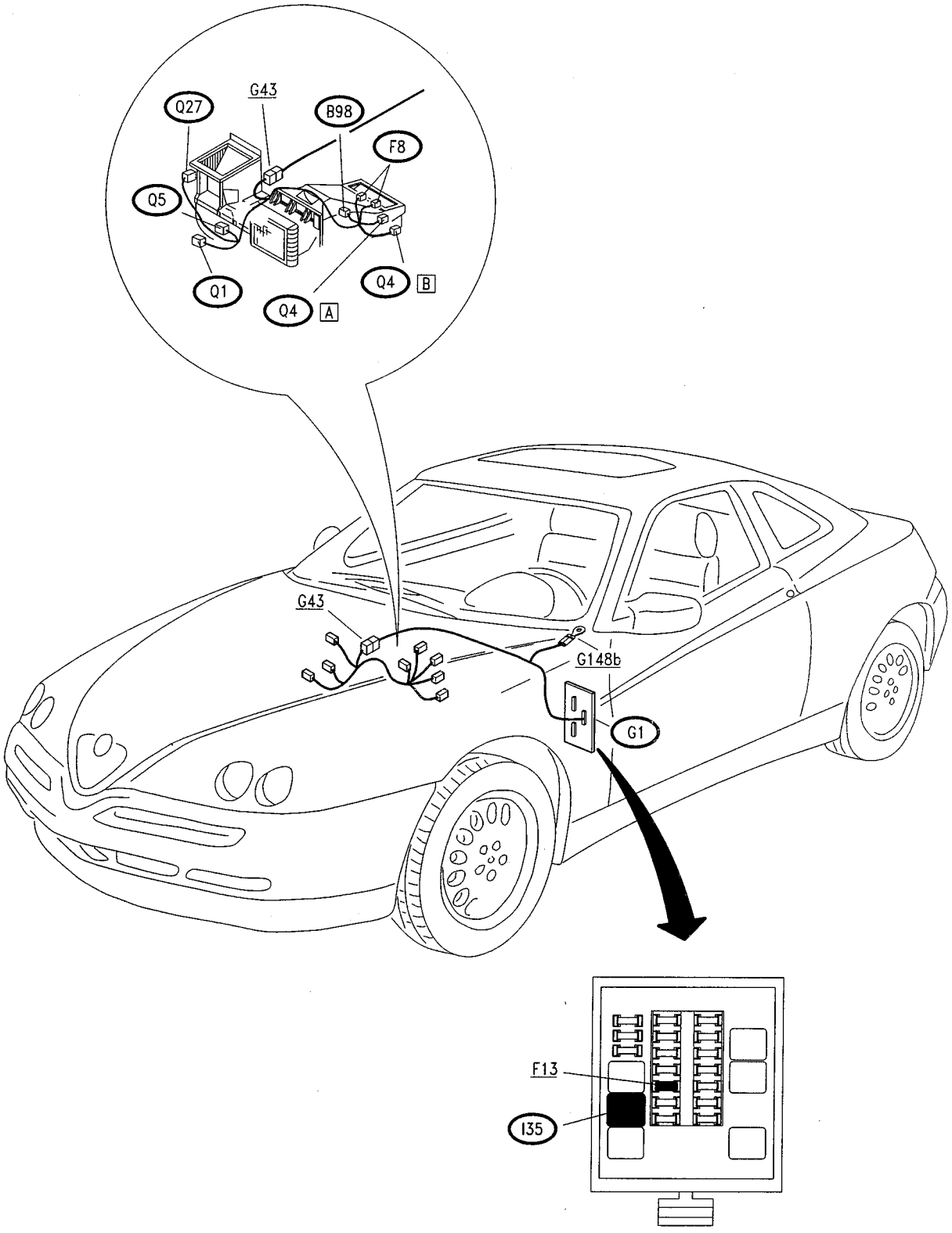
- switch **B98** not pressed: recirculation not engaged;
- switch **B98** pressed: recirculation engaged.

N.B.: With switch **Q4** at "OFF" recirculation is still activated, regardless of the position of switch **B98**

Controls lighting:

Lights **F8a** and **F8b**, inside the control panel together with the leds next to switch **B98** are supplied by the sidelights circuit - connector D of fusebox **G1**.

LOCATION OF COMPONENTS



FAULT-FINDING TABLE

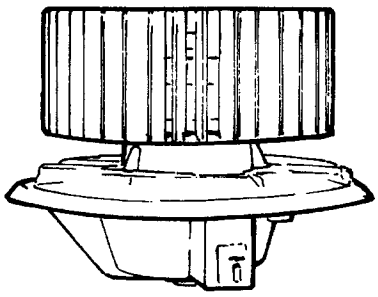
NOTE: air distribution to the passenger compartment and air heating/cooling are controlled mechanically. Therefore for failures such as the lack of heating/ventilation, incorrect air distribution, etc...., see Group 50 "HEATING AND VENTILATION"

Fault	Component to be checked							
	F13	Q1	Q5	Q4	Q27	B98	F8a (1)	F8b (1)
Fan engagement	•	•		•				
Fan engagement at different speeds			•	•				
Recirculation function				•	•	•		
Control panel lighting							•	•

(1) it is possible to change individual bulbs with their bulb holder.

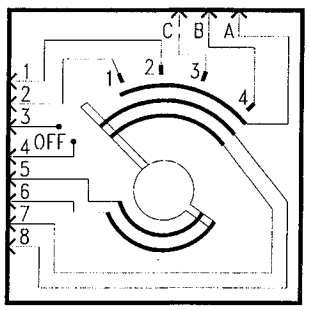
CHECKING COMPONENTS

Heater fan Q1



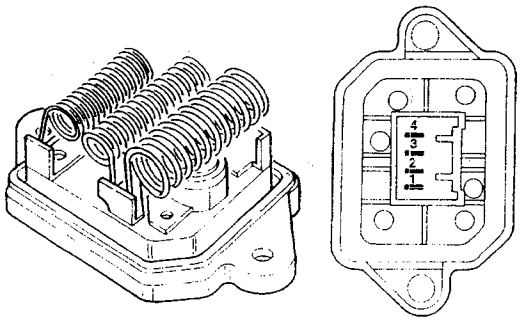
SPECIFICATIONS	
Nominal voltage	12V
Speed at 12V/25°C in free air with impeller and support	3400 $^{+200}_{-100}$ rpm
Power yielded at 12V/25°C at above-mentioned speed	90 W
Motor direction of rotation	leftwards impeller side

Heating/ventilation fan control Q4



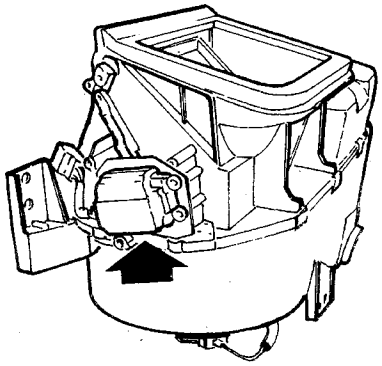
Check the contacts corresponding to the different positions of the knob.

Heating/ventilation fan speed adjustment resistance (Q5)



SPECIFICATIONS		
Piece crossed	Total resistance	Fan speed
4-1 3-1 2-1 none	3.55 Ω 1.35 Ω 0.35 Ω -	1st 2nd 3rd 4th
Thermal fuse cut in temperature		98°C

Recirculation flap control motor (Q27)



SPECIFICATIONS
12 V at pin 1 and 0 V at pin 2 = **counterclockwise** rotation of output shaft
12 V at pin 3 and 0 V at pin 2 = **clockwise** rotation of output shaft

HEATING AND VENTILATION: AIR CONDITIONER

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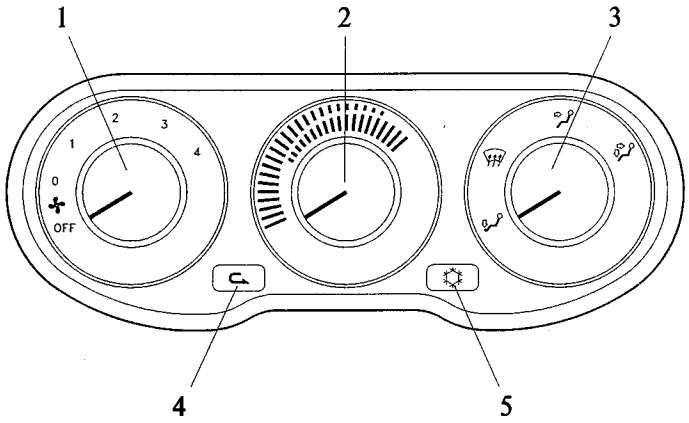
GENERAL DESCRIPTION

The system with manually operated air conditioner integrates the simple though functional heater producing cold and dehumidified air obtained by turning on the compressor and the cooling system.



The control unit located on the dashboard comprises three knobs and two pushbuttons:

- through a flexible drive the left-hand knob (1) mechanically operates the opening of the ports which adjust the flow of air:
  - OFF: air inlet shut off
  - 0: inlet of outside air without fan (dynamic air)
  - from 1 to 4: a switch is operated electronically which turns on the electric fan through a four-speed regulator. The regulator and the corresponding resistor are fitted on the duct near the fan.
    NOTE: the fan may only be turned on with the ignition key engaged.
- the centre knob (2) mechanically operates the mixing port between hot air (red) and cold air (blue); when turned completely to the left it cuts off the radiator closing a special tap.
  NOTE: the radiator comprises a heat exchanger which exploits the engine coolant to release the heat to the air which is sent to the passenger compartment: in fact it is supplied by a special hose of the engine cooling circuit.
- the right-hand knob (3) adjusts the air flow distribution acting mechanically on the distribution ports directing air to the passenger compartment as schematically shown on the ideograms.
- the special pushbutton (4) turns on the "recirculation" function by operating a motor which closes the outside air duct port, simultaneously opening the one for recirculating air from inside the passenger compartment.
  (The recirculation function makes it possible to withdraw the air to be treated from inside the passenger compartment, thereby shutting off the flow of air from outside which under certain circumstances might be unwanted: bad smells, smoke, unventilated tunnels, etc...)
- pushbutton (5) turns on the cooling system which produces cold and dehumidified air.

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;

NOTE:
For 6 cylinder engines (3.0, 3.0 24V and 2.0 TB) **a variable displacement compressor** is used and for the 2.0 T.S. engine one with **variable flow rates**: both these "variable load" configurations make 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 standstill, 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 presure switch (trinary) (only for 6 cylinder engines): which controls the safety and correct operation of the fluid circuit:

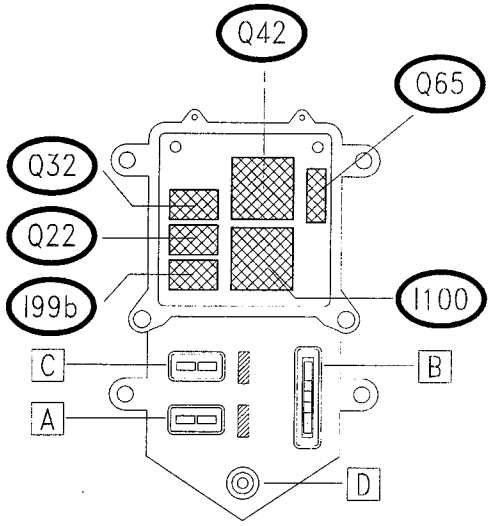
- it turns on the radiator fan when necessary (eg. if the car is at a standstill) thereby preventing an increase of pressure at the condenser (cut in at appr. 15 bar);
- it stops the compressor, de-energizing the electromagnetic joint, if the pressure reaches very high, thus dangerous, values (above appr. 28 bar), or very low values to ensure correct operating conditions (below appr. 2.45 bar);

minimum pressure switch (defroster) - 2.0 T.S. 16v engine only - : 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.

For the **2.0 T.S. 16v engine** a **4-level pressure switch is used**, which engages the fan at two different speeds the 4 levels cut in at:

- level 1 = minimum pressure for compressor engagement.
- level 2 = pressure requiring engagement of the 1st speed of the fans.
- level 3 = pressure requiring engagement of the second speed of the fans.
- level 4 = maximum pressure for compressor engagement.



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) or 4-level (about 15 and 20 bar).

• 6 cylinder engines

The engine fans are firstly turned on at first speed, then through a timer they gradually pass to second speed avoiding sudden actuations and overloads at the relay contacts.

The delay device works according to the following logic:

- The first speed is turned on with a signal from the pressure switch on the cooling fluid circuit: after appr. 8-12 seconds, if this signal persists, the delaying device operates the second speed.
- When the signal from the pressure switch ceases, the second speed is turned off immediately and the delaying device operates the first speed for appr. 1 second more.

• 2.0 TS 16v

The injection/ignition control unit directly manages engagement of the fans at the two different speeds.

Fuses and relays:

• 3.0 V6 and 2.0 TB

There is a box (**Q41**) in the engine compartment at the passenger's side which contains the relays and fuses associated with the air conditioning system:

- cooling fan delaying device (**Q42**);
- compressor electromagnetic joint relay (**Q22**);
- additional compressor relay (**Q32**);
- 1st fan speed relay (**I99b**);
- 2nd fan speed relay (**I100**);
- floating 7.5A fuse (**Q65**);

There are also wander fuses for supplying the engine fan - 30A (**Q39**) and 50A (**G254**) they are to be found next to the fuses and relays of the electronic ignition/injection system, and the floating fuse for supplying the heating and cooling fan **G255** (30A), and relay **I99a**, on the bracket next to the fusebox.

• 2.0 TS 16v and 3.0 V6 24v

The fuses and relays are grouped in the engine compartment, next to those of the ignition/injection unit:

- relay **Q22**;
- relay **Q32**;
- 50A fuse: **G254**

or under the dashboard on the bracket next to the fusebox:

- relay **I99**;
- relay **I100**;

30A fuse: **G255** (2.0 TS 16v) and **Q39** (3.0 V6 24v).

For further details concerning this system, refer to Group 50 "HEATING AND VENTILATION".

FAN AND RECIRCULATION CONTROL

Fan:

The heater and ventilation fan **Q1** is through relay **Q15** and the line leading from fuse **G255** (**Q39** for engine 3.0 V6 24v); the relay is energized with the "key-engaged" signal with the line that crosses the key-operated services relay **I35** and fuse **F13** of fusebox **G1.**

The motor of fan **Q1** is operated with an earth signal leading from the control knob **Q4**. This signal crosses the speed regulator **Q5**, which is formed of three resistances in series and which determine the four different speeds depending on the signal from knob **Q4**: from pin 2 of connector B (1st speed), from pin 1 of connector B (2nd speed), from pin C of connector A (3rd speed) and lastly from pin B of connector A (4th speed) with a direct signal that does not cross the regulator **Q5**.

NOTE : the regulator **Q5** has a built-in thermometric safety switch which de-activates the circuit if a temperature of 90±5°C is exceeded due to excess voltage (it closes again when the temperature falls by appr. 10°C).

First fan speed with the compressor operating:

With control **Q4** in the "0" position the fan **Q1** is stopped but it is is operated at first speed if the compressor is turned on: in this case a special relay **Q69** controls the fan supply at first speed. In fact, this switch is energized by the same signal (12V) that turns the compressor on (from switch **Q68** through pins 7 and 8 of connector B of knob **Q4**) and sends a signal to the regulator **Q5** in correspondence of the 1st speed.

Recirculation:

The recirculation function is achieved by actuating motor **Q27**, according to the following supply logic:

- pin 2 of **Q27** always earthed;
- 12 V at pin 3 of **Q27**: the motor turns operating recirculation;
- 12 V at pin 1 of **Q27**: the motor turns shutting off recirculation.

Turning on takes place through switch **Q68** but with switch **Q4** on "0", "1", etc...:

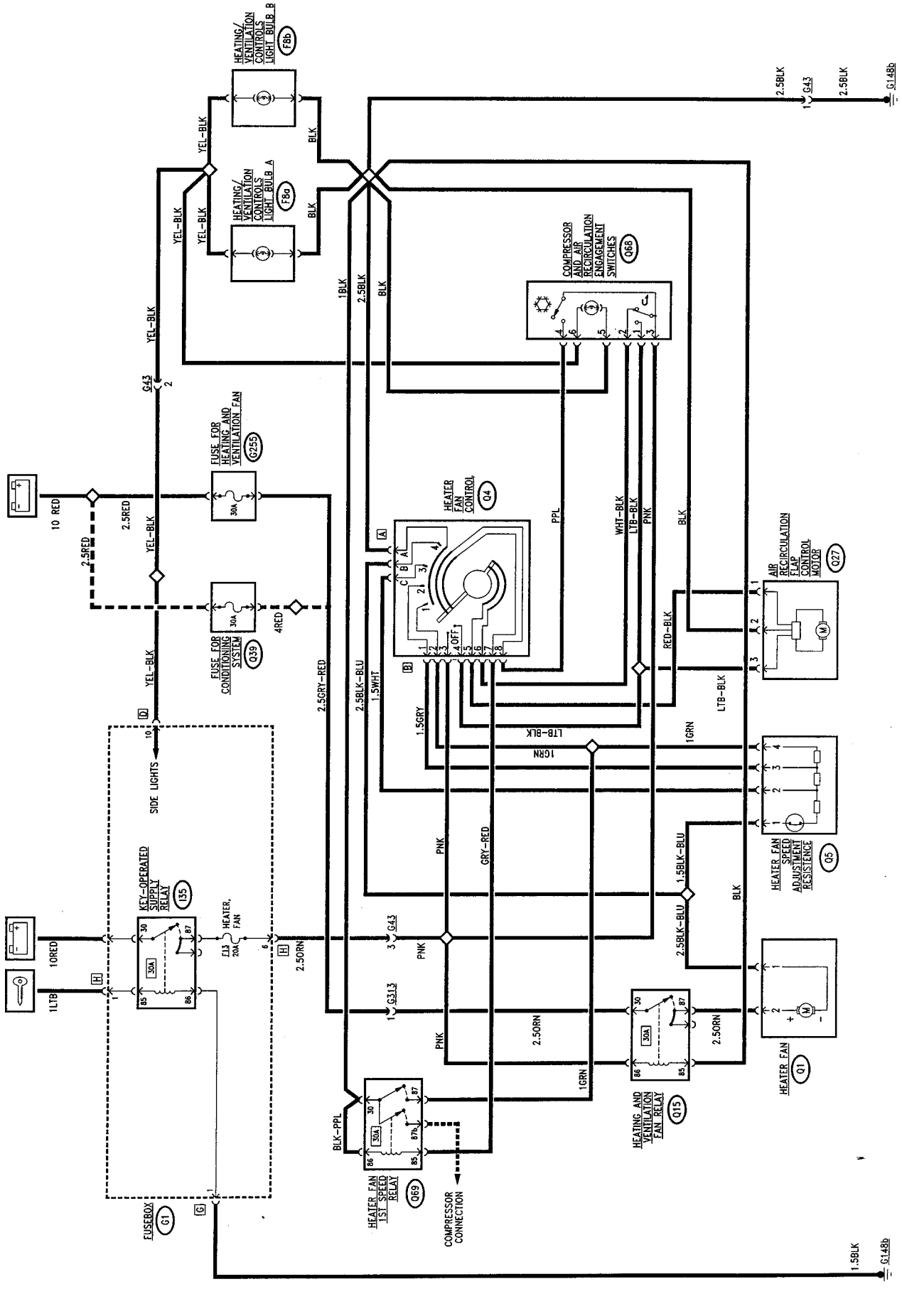
- switch **Q68** not pressed: recirculation not turned on;
- switch **Q68** pressed: recirculation turned on.

N.B.: With switch **Q4** at "OFF" recirculation is operational regardless of the position of switch **Q68**.

Controls lighting:

Lights **F8a** and **F8b**, located inside the control panel, together with the led next to switch **Q68** are supplied by the side lights circuit - connector D of fusebox **G1**.

Wiring diagram



COMPRESSOR CONNECTION

(3.0 V6 engine)

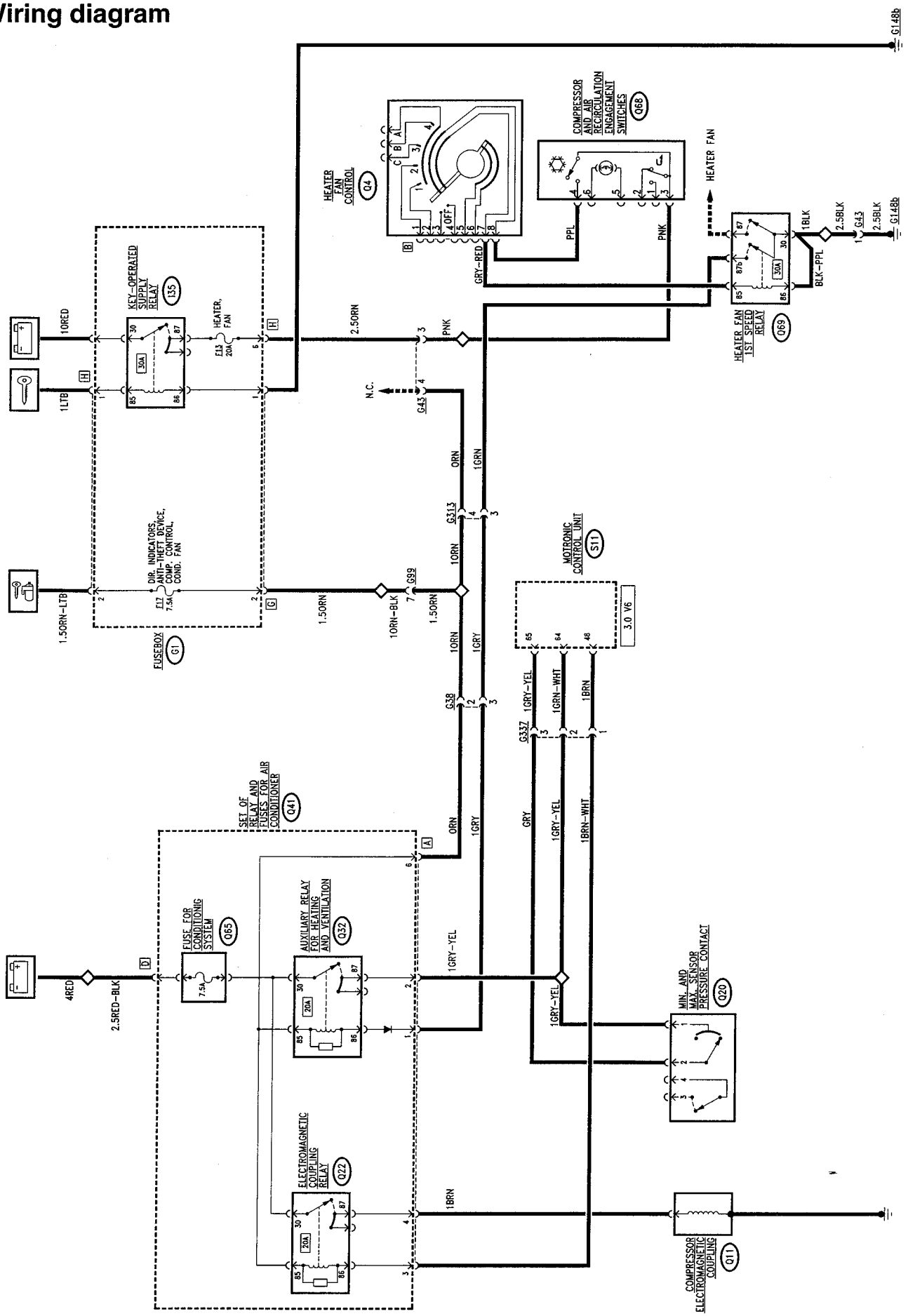
The electromagnetic joint which operates the compressor **Q11** is controlled by relays **Q22 and Q32**, to be found in the set of relays and fuses **Q41**.

Relays **Q22** and **Q32**, have the coil supplied from the ignition switch (line protected by fuse **F17** of **G1**); their power line is supplied by battery voltage through fuse **Q65** (7.5A), also located in group **Q41**.

Relay **Q22** is energized and consequently supplies 12V to the electromagnetic joint **Q11**, according to the following logic:

- Relay **Q32** is energized by an earth signal leading from relay **Q69**, which is in turn energized with a positive signal leading from the compressor operating switch **Q68**; this signal crosses the control knob **Q4** which interrupts it when the knob itself is in the "OFF" position: in fact, in this condition, the compressor cannot be turned on. It should be remembered that the same signal controls the first speed of the fan contemporaneously ("Fan and Recirculation Control").
- relay **Q32** consequently sends two signals to the Motronic **S11** control unit: a direct signal to "request compressor engagement" - pin 64 - and a second signal that crosses the minimum and maximum pressure switch (trinary) **Q20** which cuts in if the pressure of the cooling system is too high or too low: in this case the signal does not reach the control unit - pin 65 - and the control unit does not request compressor engagement.
- the control unit "refers" the command signal - pin 48 - to relay **Q22** which is energized and supplies joint **Q11** which turns on the compressor, but only when the internal logic has ascertained determinate conditions (for example the compressor does not turn on in the event of the engine requiring full power, etc...)

Wiring diagram



COMPRESSOR CONNECTION

(2.0 V6 TB engine)

The electromagnetic joint which operates the compressor **Q11** is controlled by relays **Q22 and Q32**, to be found in the set of relays and fuses **Q41**.

Relays **Q22** and **Q32**, have the coil supplied from the ignition switch (line protected by fuse **F17** of **G1**); their power line is supplied by battery voltage through fuse **Q65** (7.5A), also located in group **Q41.**

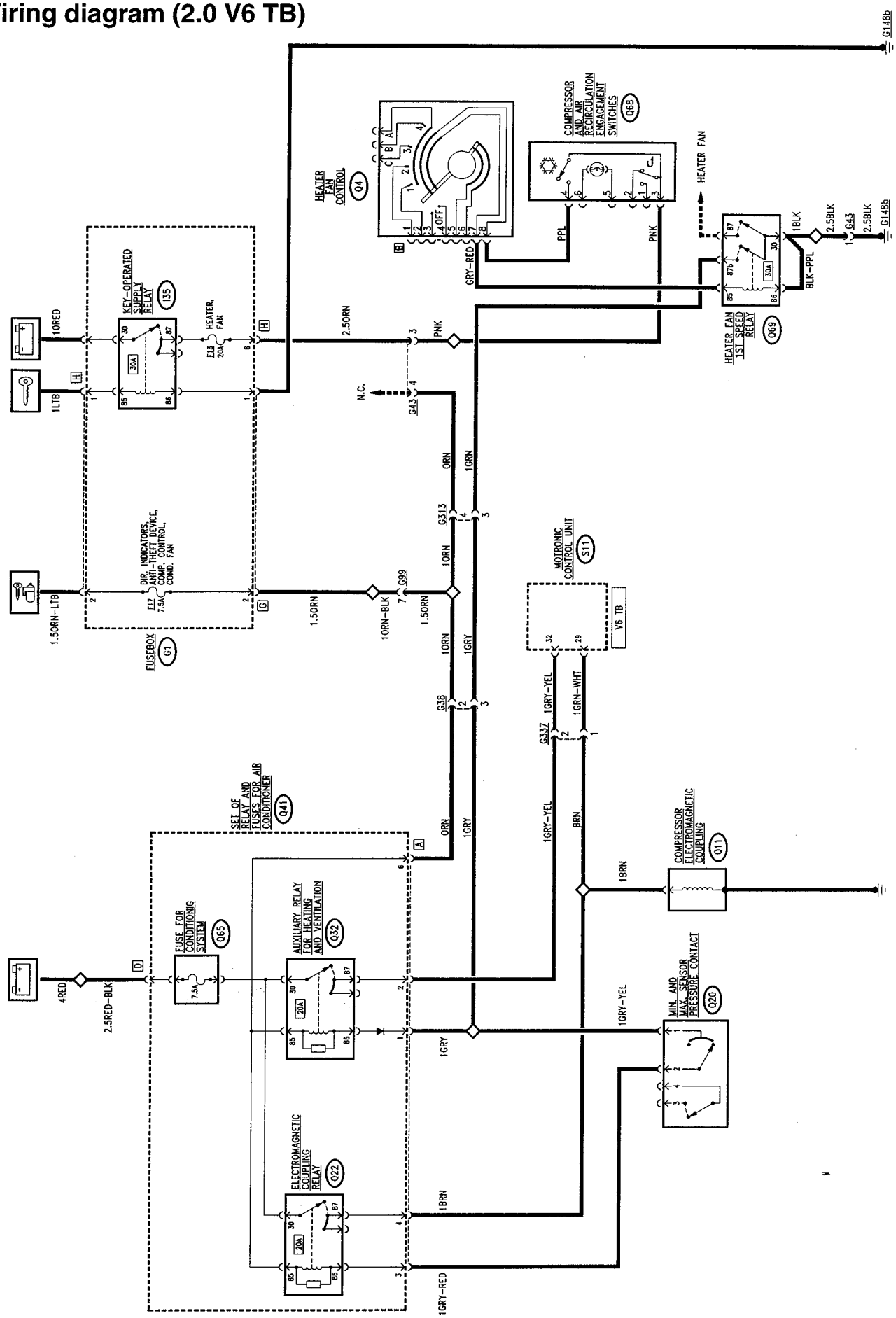
Relay **Q22** is energized and consequently supplies 12V to the electromagnetic joint **Q11** by an earth signal leading from relay **Q69**, which is in turn energized with a positive signal leading from the compressor operating switch **Q68**; this signal crosses the control knob **Q4** which interrupts it when the knob itself is in the "OFF" position: in fact, in this condition, the compressor cannot be turned on. It should be remembered that the same signal controls the first speed of the fan contemporaneously ("Fan and Recirculation Control").

This signal crosses the minimum and maximum pressure switch (trinary) **Q20** which intervene if the pressure in the cooling system is too high or too low: in this case the signal does not reach the control unit and does not command the turning on of the compressor.

The signal "compressor engagement "from pin 87 of **Q22** to **Q11** reach Motronic control unit **S11** - pin 29.

The other relay **Q32** is energized by a control signal from relay **Q62** and send a "request compressor engagement to Motronic control unit **S11** - pin 32 - witch controls consequently the engine rpm.

Wiring diagram (2.0 V6 TB)



COMPRESSOR ENGAGEMENT

(3.0 V6 24v engine)

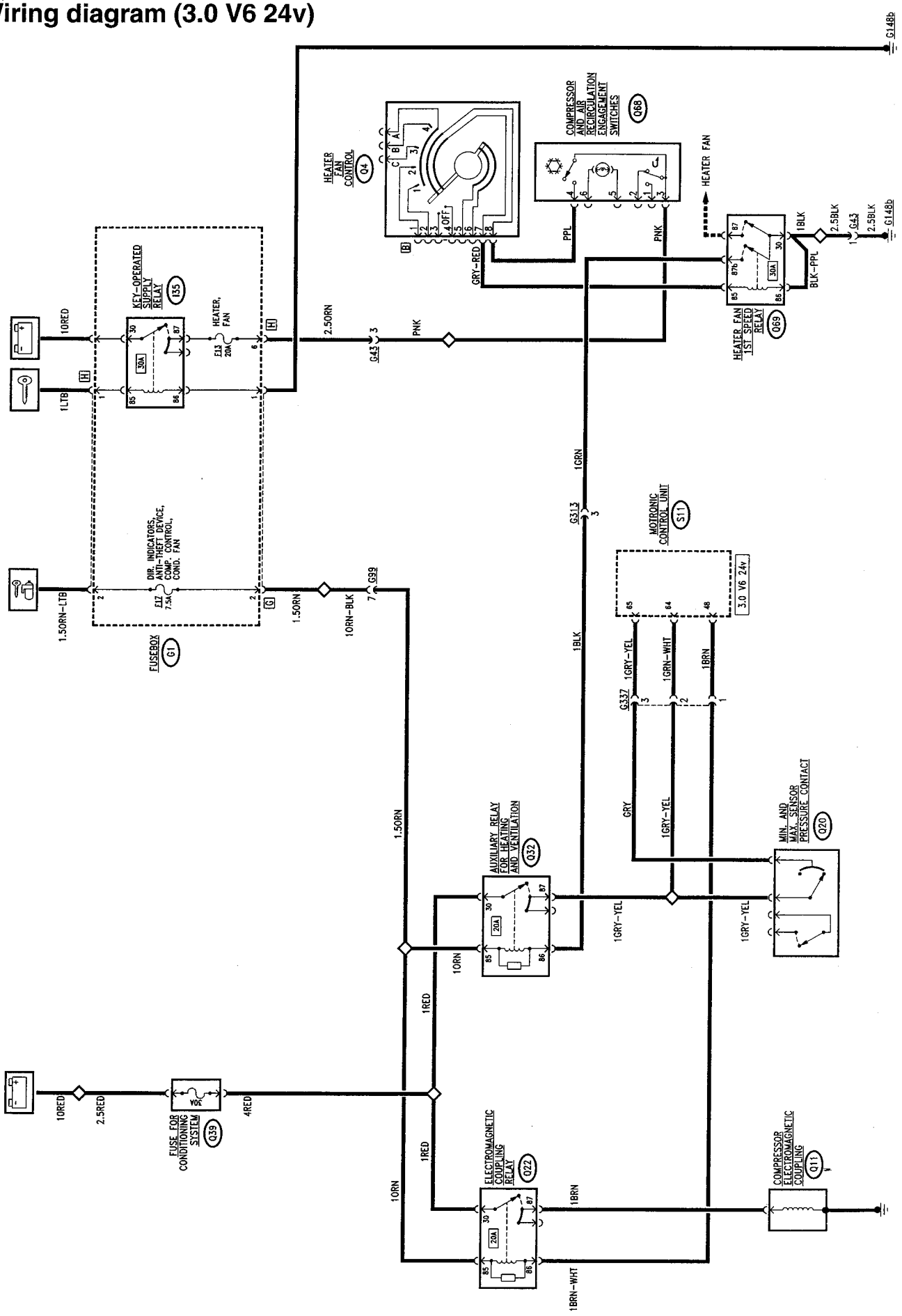
The electromagnetic joint that operates the compressor **Q11** is controlled by relays **Q22** and **Q32**.

The coil of relays **Q22** and **Q32** receive the key-operated supply (line protected by fuse **F17** of **G1**); their power line is supplied with battery voltage through fuse **Q39** (30A).

Relay **Q22** is energised, consequently it supplies 12V current to the electromagnetic joint **Q11**, according to the following logic:

- relay **Q32** is energised by an earth signal leading from **Q69**, which is in turn energised with a positive signal leading from the compressor engagement switch **Q68**; this signal crosses the control knob **Q4** which cuts it off when the knob is at "OFF": in fact in this condition, the compressor cannot be engaged. The same signal simultaneously controls fan engagement at 1st speed ("Fan and Recirculation Control")
- relay **Q32** consequently sends two signals to the Motronic control unit **S11**: a direct signal to "request compressor engagement" - pin 64 - and a second signal that crosses the minimum and maximum pressure switch (trinary) **Q20** which cuts in in the event of high or low pressure in the cooling system: in this case the signal does not reach the control unit - pin 65 - which does not command the compressor
- The control unit "refers" the command signal - pin 48 - at relay **Q22** which is energised and supplies the joint **Q11** which thus engages the compressor, but only when the internal logic has checked determinate conditions (e.g. the compressor is not engaged in the event of the need for full power at the engine, etc..)

Wiring diagram (3.0 V6 24v)



COMPRESSOR ENGAGEMENT

(2.0 T.S. 16v engine)

The electromagnetic joint that operates the compressor **Q11** is controlled by relays **Q22** and **Q32** located next to he relays and fuses of the injection/ignition unit.

The coil of relays **Q22** and **Q32** receive the key-operated supply (line protected by fuse **F17** of **G1**); their power line is supplied by battery voltage.

Relay **Q22** is energised and therefore supplies 12V current to the electromagnetic joint **Q11**, according to the following logic managed by the M2.10.4 injection-ignition control unit, which is connected with the air conditioning system through:

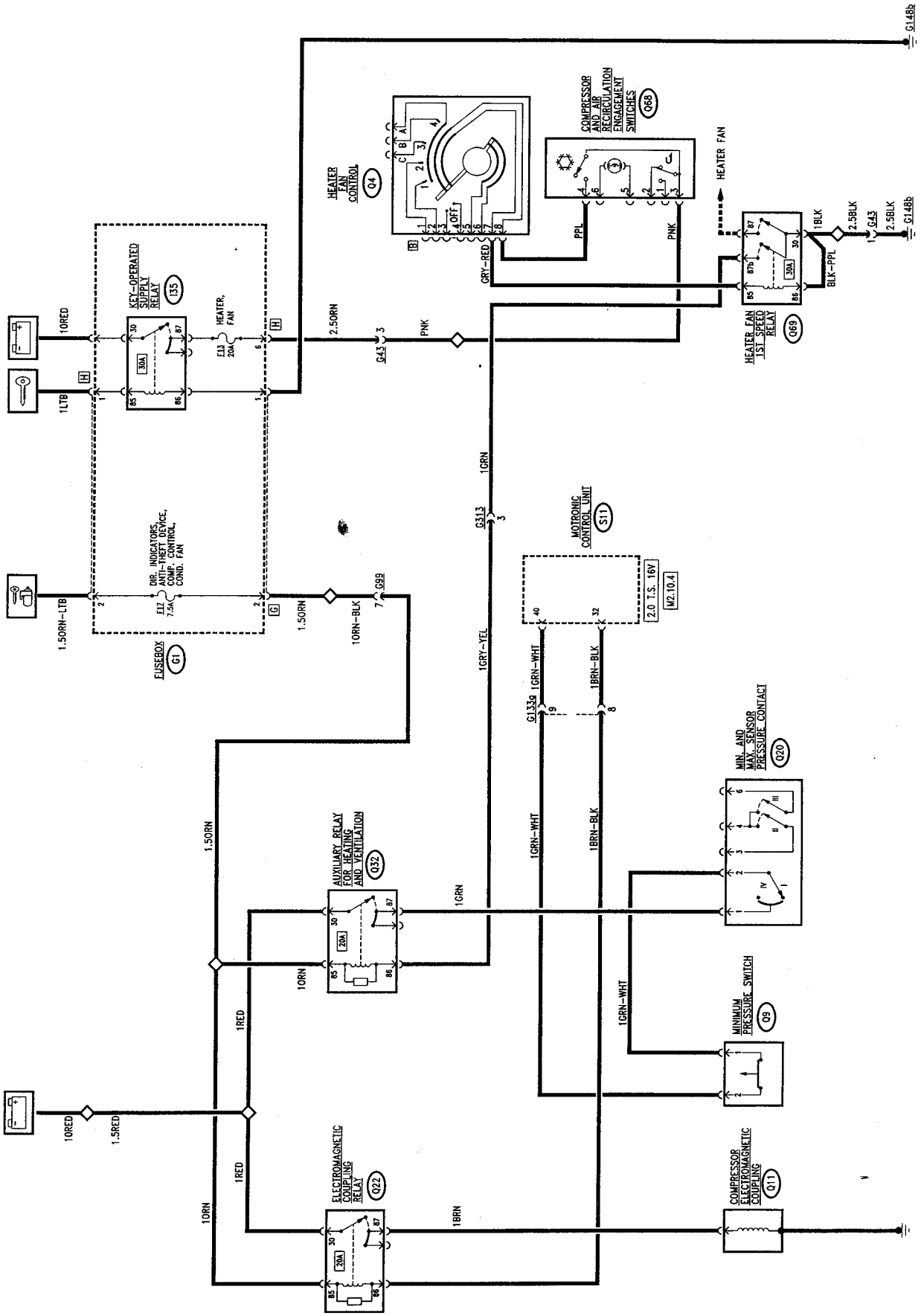
- pin 40 which receives the signal requesting engagement of the system itself from the the conditioner circuit;
- pin 32 from which a "low" (earth) signal leads which commands relay **Q22** for engaging the air conditioner compressor **Q11**.

A special logic enables this engagement, as follows:

- it adapts idle speed to compensate the increased absorbed power resulting from engagement of the compressor;
- in the event of the need for high power at the engine (high throttle opening speed), full load or high engine temperature, it momentarily disengages the compressor.

Relay **Q32** is energised by an earth signal leading from relay **Q69** which is in turn energised by a positive signal leading from the compressor engagement switch **Q68**; this signal crosses the control knob **Q4** which interrupts it when the knob is at "OFF"; in fact, in this position, the compressor cannot be engaged. The same signal simultaneously controls compressor engagement at 1st speed ("Fan and Recirculation Control"); relay **Q32** sends a signal to the Motronic control unit **S11**: to "request compressor engagement" - pin 40 - which crosses the minimum pressure switch (antifrost) **Q9** and pressure switch **Q20** which cut in if the pressure of the cooling system is too high or too low: in the case the signal does not reach he control unit which does not engage the compressor.

Wiring diagram (2.0 TS 16v engine)



ENGINE COOLING FANS CONTROL

3.0 V6 and 2.0 V6 TB engine

Two fans **P2a** and **P2b** warrant the necessary ventilation of the cooling air for the engine and air conditioning system condenser.

N.B.: the two fans are set in parallel and they are always operated together, following the same logic.

The two fans are always supplied by battery voltage: the first one (**P2a**) has the line protected by floating fuse **G254**; the second one (**P2b**) is protected by floating fuse **Q39** (30A); they are therefore operated by an earth signal: this signal arrives directly (2nd speed) or through the additional resistances **O22** and **022b** (1st speed) fitted with a thermal safety fuse.

The delaying device **Q42**, in group **Q41**, controls the gradual turning on of the fans which are operated at two different speeds also via two relays **I99b** and **I100**, also part of group **Q41**.

The delaying device works according to the following logic:

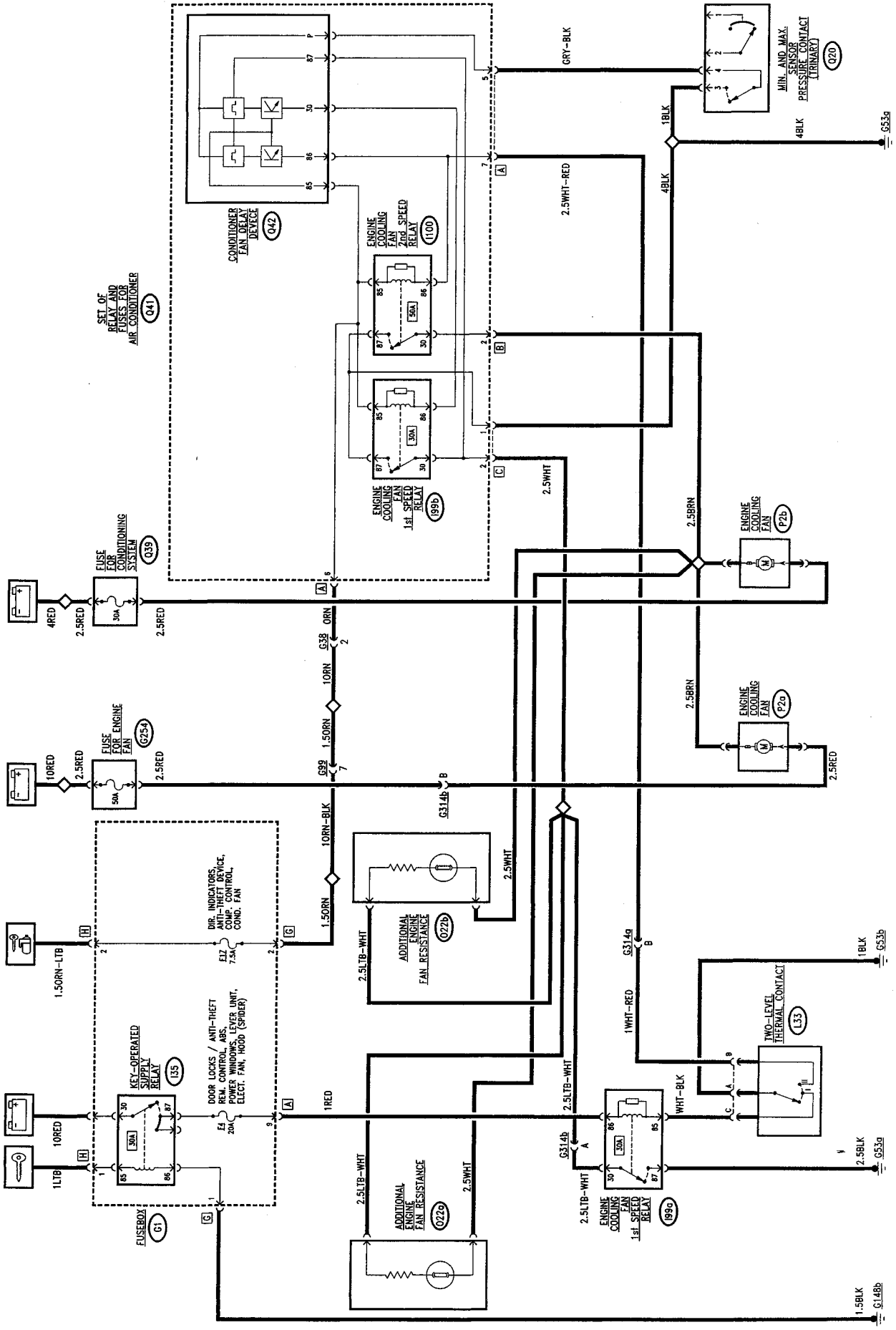
The "key-operated" voltage (line protected by fuse **F17** of **G1**) supplies the coil and electronic devices of the delaying device **Q42** -pin 85, and relays **I99b** and **I100**; the coil of delaying device **Q42** is energized by an earth signal -pin P- which leads from the trinary pressure switch **Q20**: this causes an earth signal to be sent immediately - pin 30 - to energize relay **I99b** which sends the earth to the two engine cooling fans **P2a e P2b** through the additional resistances **O22a** and **022b**: 1st speed.

After appr. 8-12 seconds, if the signal from the trinary persists, the delaying device operates the second speed: in fact, the earth signal from pin 30 is cut off and another signal leaves pin 86 which goes to energize relay **I100** which sends the earth signal directly to the two engine cooling fans **P2a e P2b:** 2nd speed. When the signal from the pressure switch ceases the fans turn off.

The two fans are operated at the two different speeds also by the two-level thermal contact **L33** which controls the temperature of the coolant in the engine radiator: when a first level is reached, relay **I99a** is energized, which is located on the bracket next to fusebox **G1** - which sends the earth signal to the two engine cooling fans **P2a** and **P2b** through resistances **O22a** and **022b**: 1st speed. Relay **I99a** receives the "key-operated" supply from the line protected by fuse **F4** of **G1**.

If the second temperature level is reached, relay **I100** is energized, which is located in group **Q41**, and this sends the earth signal directly to the two engine cooling fans **P2a and P2b**: 2nd speed.

Wiring diagram (3.0 V6 and 2.0 V6 TB engine)



ENGINE COOLING FAN CONTROL

(3.0 V6 24v engine)

Two fans **P2a** and **P2b** ensure the necessary ventilation of the cooling air for the engine radiator and air conditioning system condenser.

N.B.: the two fans are in parallel, therefore they are operated together, always following the same logic.

The two fans are always supplied by battery voltage, through the line protected by wander fuse **G254**; they are operated by an earth command signal: this signal arrives directly (2nd speed) or through the additional resistances **O22a** and **O22b** (1st speed), fitted with a thermal safety fuse.

The delaying device **Q42** controls the gradual engagement of the fans which are operated at two different speeds, also via two relays **I99b** and **I100**, the three devices are located on the auxiliary bracket next to the fusebox.

The delaying device works according to the following logic:

The "key-operated" voltage (line protected by fuse **F17** of **G1**) supplies the coil and the electronic devices of the delaying device **Q42** -pin 85, and relay **I99**; the coil of the delaying device **Q42** is energised by an earth signal -pin P- which leads from the trinary pressure switch **Q20**: this causes the immediate sending of an earth signal - pin 30 - to energise relay **I99** which sends the earth command to the two ngine cooling fans **P2a** and **P2b** through the additional resistances **O22a** and **O22b**: 1st speed.

After appr. 12 seconds, if the signal from the trinary persists, the delaying device operates the second speed: in fact, the earth signal is cut off from pin 30 and a signal leaves pin 86, which energises **I100** which sends the earth command directly to the two engine cooling fans **P2a** and **P2b**: 2nd speed.
When the signal from the pressure switch ceases, the fans are disengaged.

The two fans are operated at the two different speeds also by the two-level thermal contact **L33** which controls the temperature of the coolant in the engine radiator: when a first level is reached, relay **I99** is energised which sends the earth command to the two engine cooling fans **P2a and P2b** via resistances **O22a** and **O22b**: 1st speed. Relay **I100** is supplied by the line protected by fuse **Q39** (30A).

If the second temperature level is reached, relay **I100** is energised which sends the earth command directly to the two engine cooling fans **P2a and P2b**: 2nd speed.