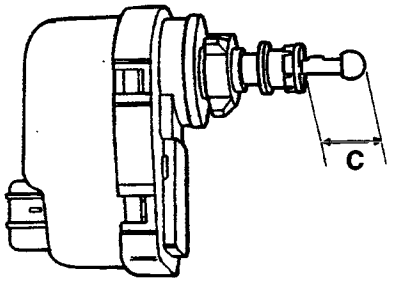
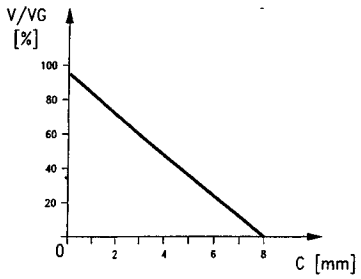
FAULTFINDING TABLE

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

CHECKING COMPONENTS

RH/LH hedlamp adjustment motor P35a P35b





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

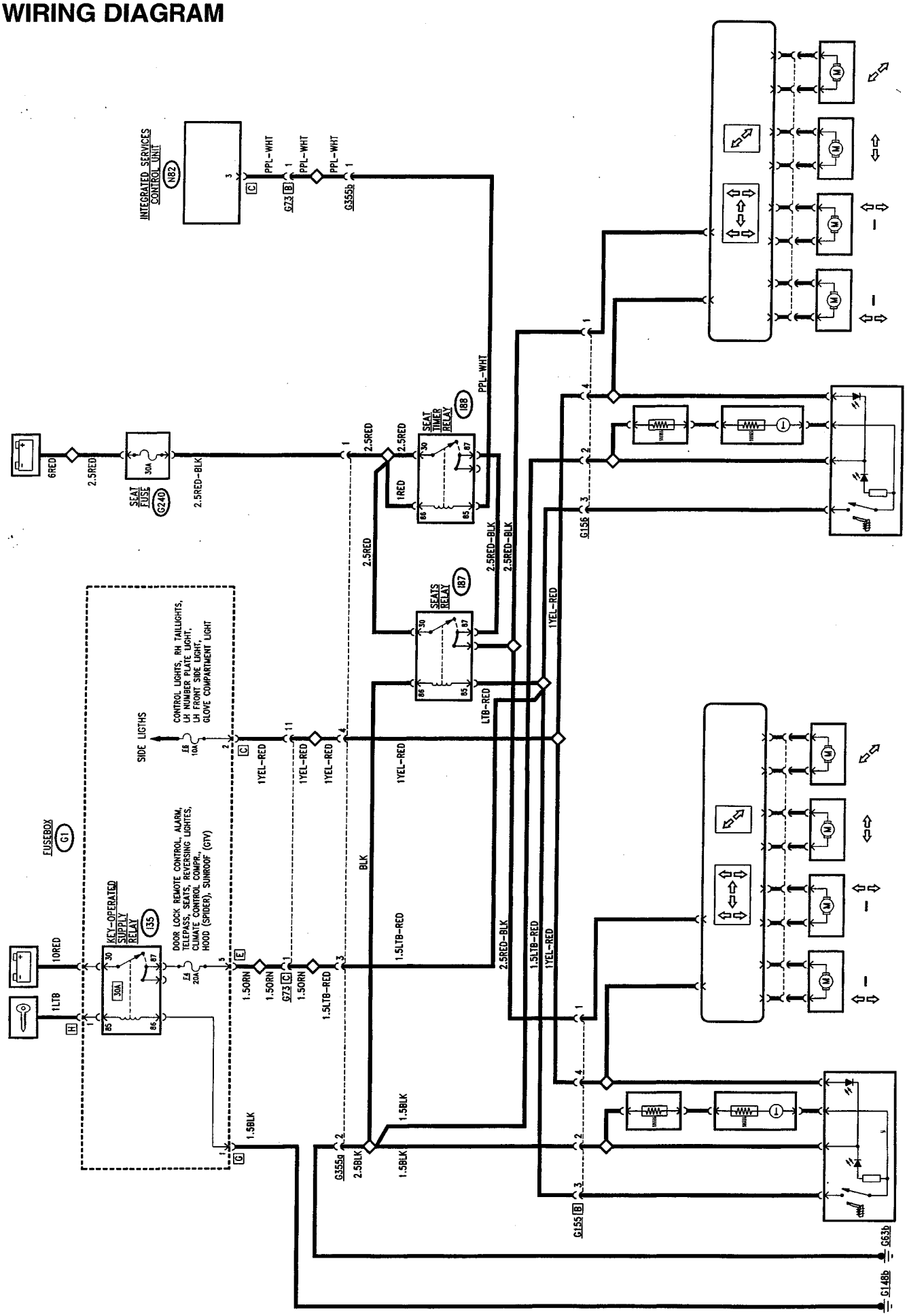
V = voltage between pin 56b and pin 31 (12V)

VG = voltage between pin G and pin 31

ADJUSTABLE AND HEATED SEATS (GTV only)

INDEX

WIRING DIAGRAM



GENERAL DESCRIPTION

The seats are available, on request, with a special heating system (which consists of two heater elements located in the cushion and the backrest): this makes it possible to heat the seat and dispense with the inconvenience of it being cold in the passenger compartment in countries with harsh climates for example when the vehicle is left outside for long periods in cold weather.

The heating device, located on each seat, consists of two resistors operated by a switch at the side of the actual seat.

Once a certain temperature has been reached, the heating stops automatically, thanks to a thermal contact inside the actual device. An LED signals that the heating is on.

Electrically adjustable seats are available on request. Four motors make it possible to adjusting the sliding of the seat, the angle of the backrest and the height of the seat (one motor adjusts the height at the front, another that at the rear).

The motors can be operated with the ignition switched ON, or with the ignition switched OFF, for about 3 minutes after one of the doors is opened.

The control switches are at the side of the actual seat, ergonomically grouped in a single joystick.

The following can be adjusted through these controls:

– the lengthwise movement of the seat;

– height adjustment;

– front rocker movement;

– rear rocker movement;

– backrest angle.

NOTA BENE:
The folding over of the backrest and the adjustment of the rigidity of the lumbar area are carried out through the manuale and not the electrical control.

FUNCTIONAL DESCRIPTION

The supply for the electrical adjustment of the seats comes from the line for the specific fuse **G240**, supplied directly by the battery.

The supply and the earth reach an electronic device, located in the seat, which controls the operation of the system and, according to a joystick, the four motors.

This supply is controlled by two relays: the first **I87** allows the supply of the controls with the ignition switched ON, via the line for fuse **F4** of **G1**; the second relay **I88**, on the other hand, supplies the controls even when the ignition is switched off, when commanded by the services control unit (pin C3 of **N82**) even with the doors open, according to the timing described previously (the same timing signal as the courtesy lights is involved).

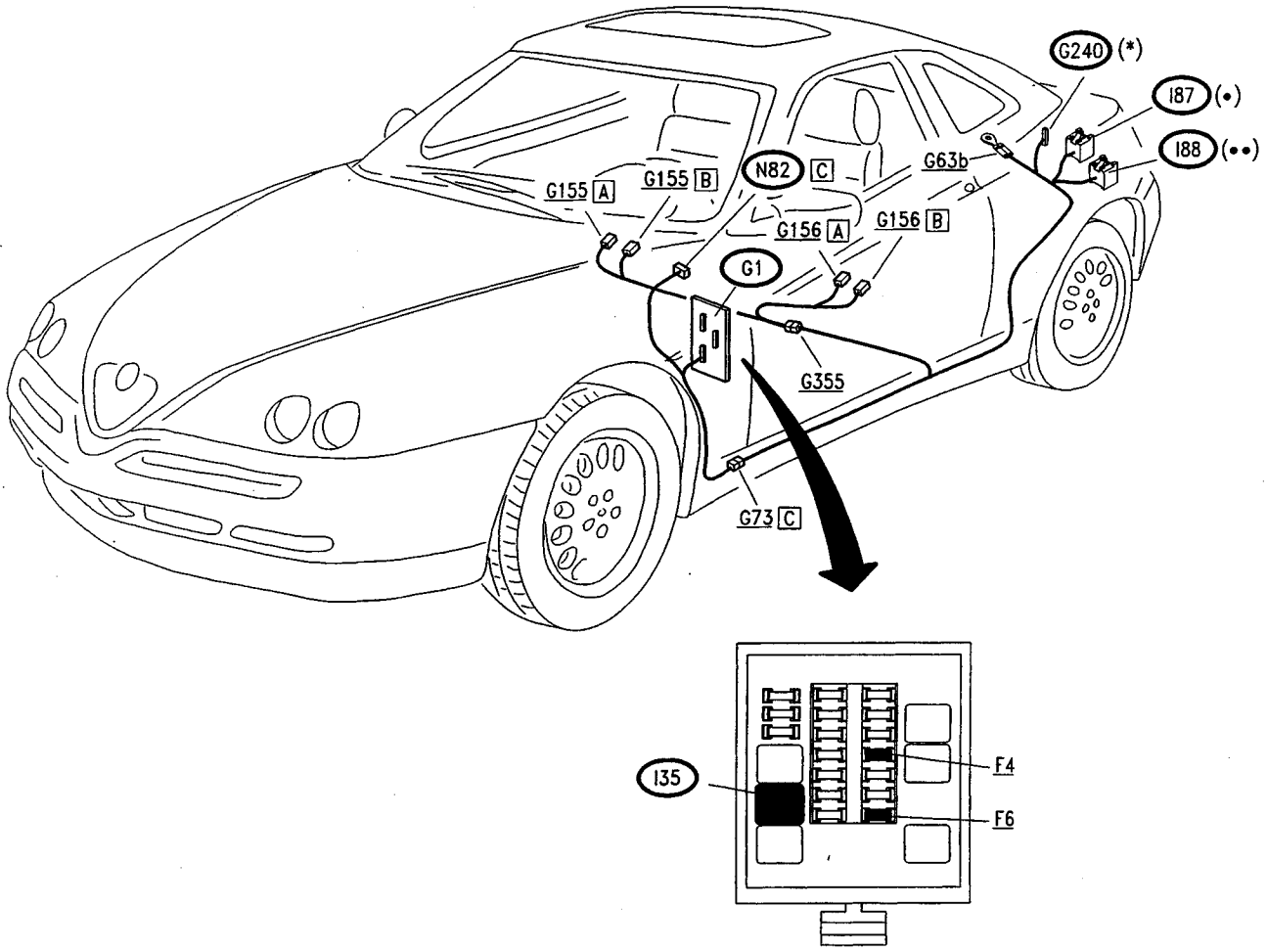
The supply for the heating of the seat is controlled by the ignition by the line for fuse **F4** of the fuse box **G1**.

When the switch on the seat is pressed this supplies the resistances for the heaters in the cushion and the backrest, connected in series, until a thermal contact disconnects the resistances when the temperature exceeds a certain limit.

With the resistances on, an LED signals the operation of the device.

Both the movement controls and the heating button are lit up when the side lights are on, via the line for fuse **F6** of **G1**.

COMPONENT LOCATION



(•) Red socket
(••) Black socket

(*) Red fuse carrier

TELEPASS SET-UP

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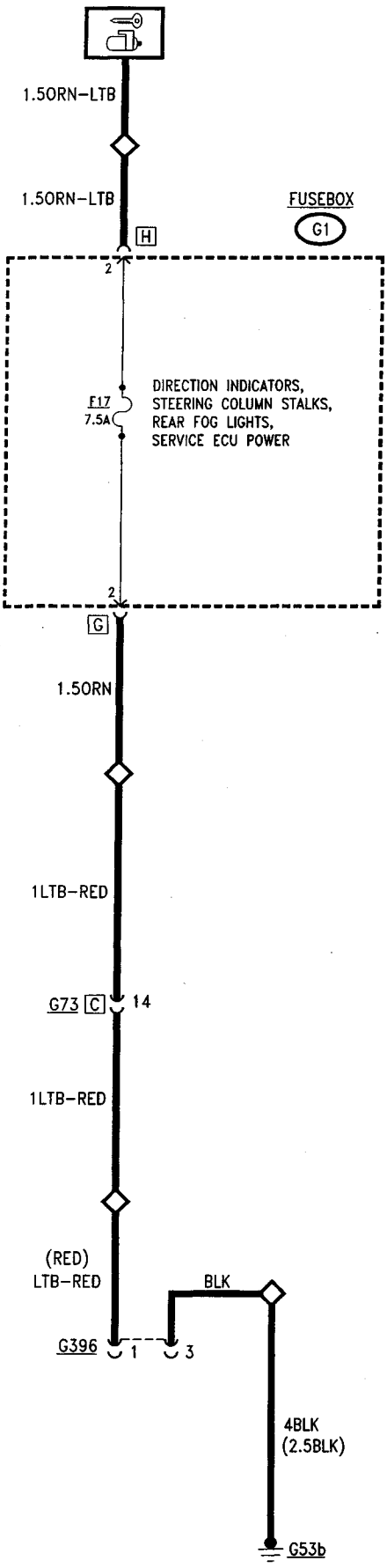
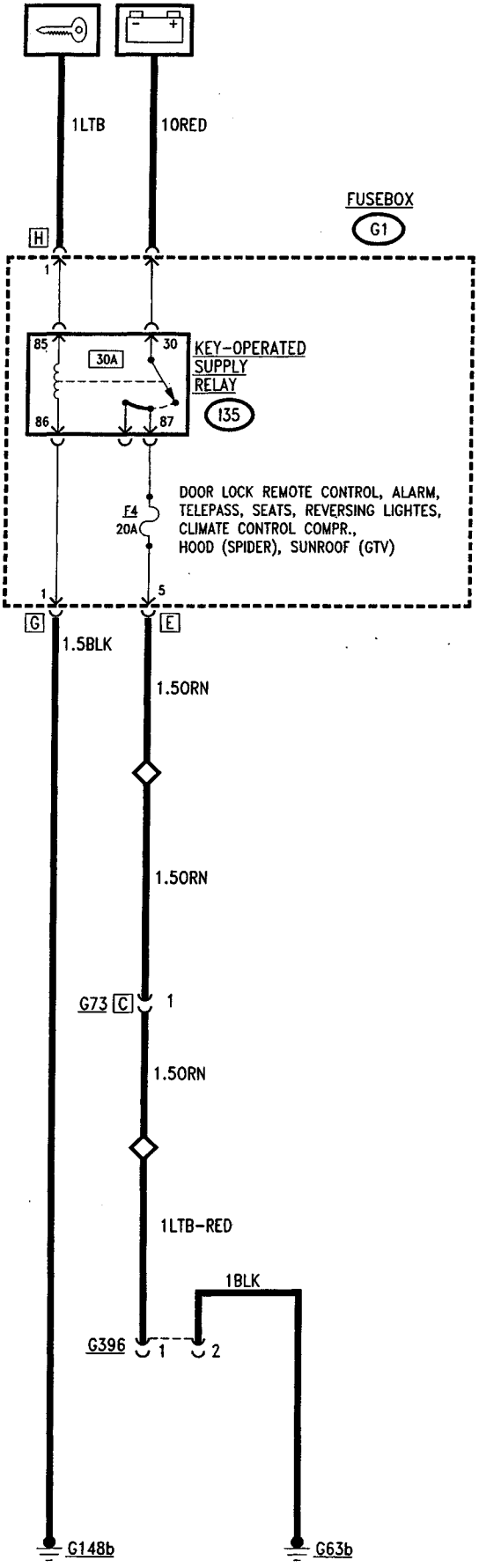
WIRING DIAGRAM



up to November '99



from November '99

GENERAL DESCRIPTION

A specific set-up system is offered for fitting a "TELEPASS" device (*Italian Market only*).

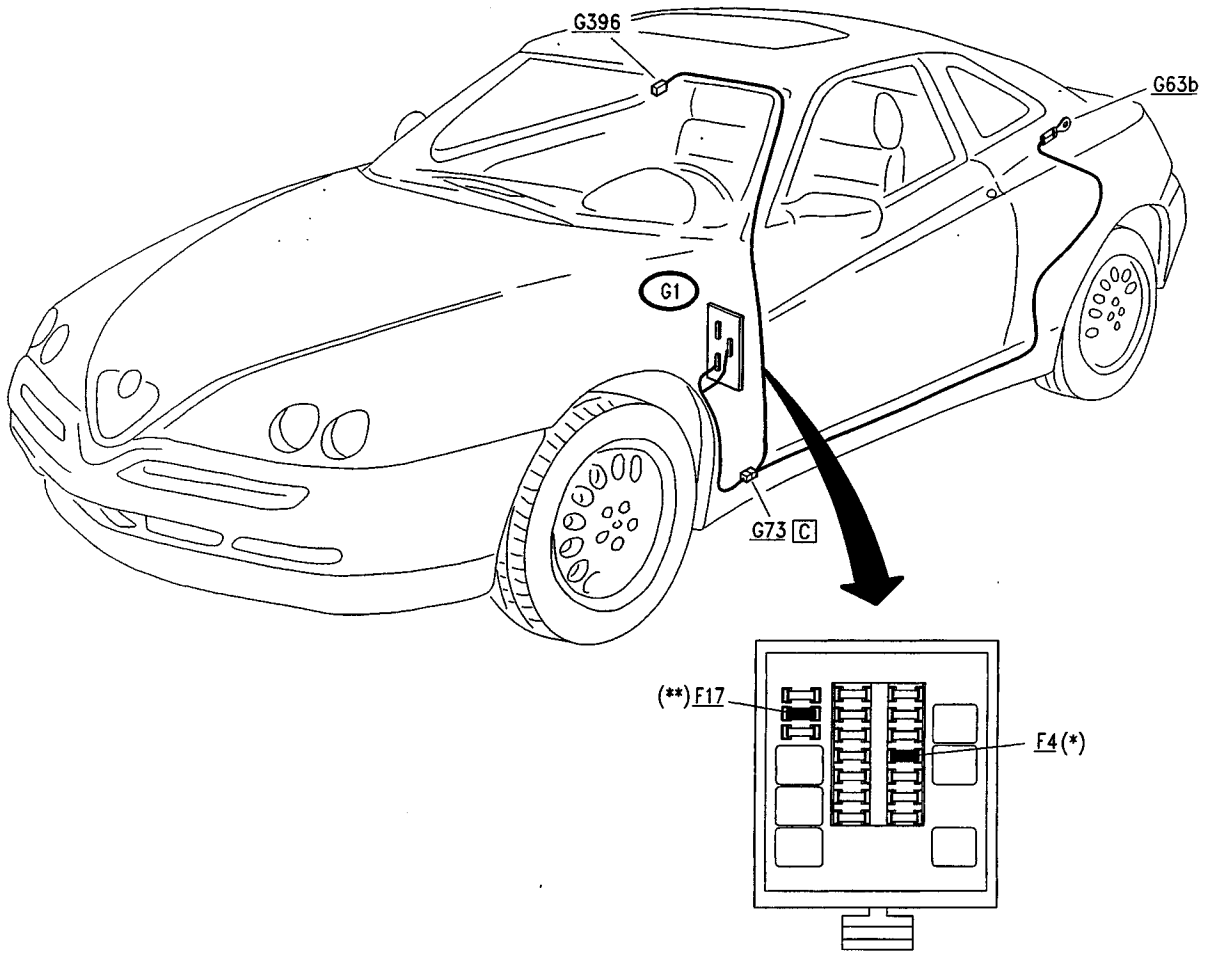
TELEPASS is an electronic system which allows to pay motorway tolls without stopping at the booths. The device fitted in the vehicle interfaces with the reception devices located in the specific toll booth, thanks to a sound impulse. The vehicle drives thought the booth slowly but without need to stop.

The set-up system consists of a specific internal rear view mirror which houses an electronic device and respective wiring. The device is powered when the key is at MAR.

FUNCTIONAL DESCRIPTION

The TELEPASS device connection **G396** is ignition switch powered (pin 1) via fuse **F17** (**F4** from November '99) in fusebox **G1**. Connection **G63b** (pin 3) is connected to earth.

COMPONENT LOCATION



(**) up to November '99
(*) from November '99

RADIO TELEPHONE SET-UP

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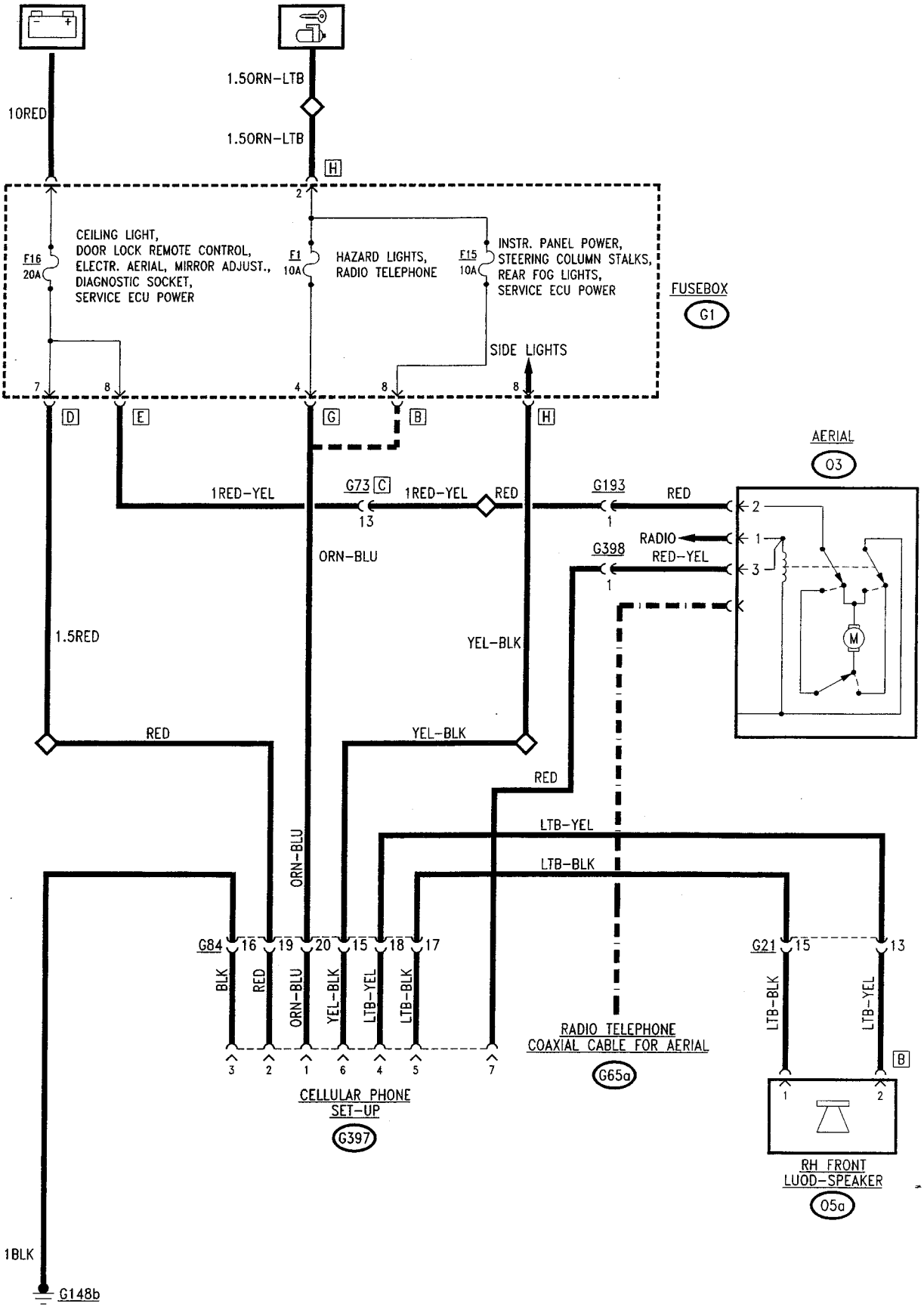
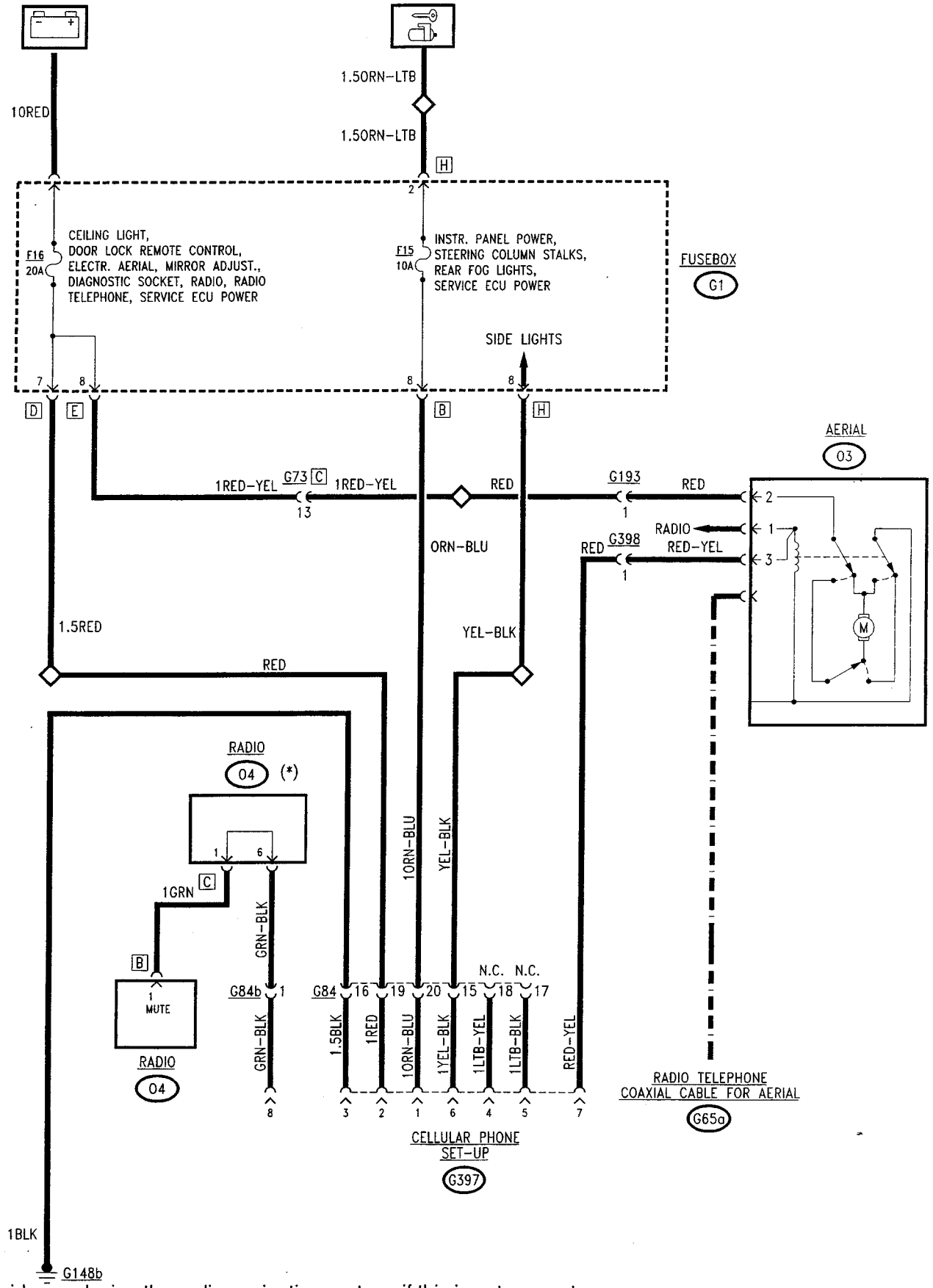
WIRING DIAGRAM (up to May 2000)



– – – from November '99

WIRING DIAGRAM (starting from June 2000)



(*) bridge replacing the radio navigation system, if this is not present.

GENERAL DESCRIPTION

The vehicle may be equipped with an optional cellular phone set-up system.

The set-up system consists of:

– a specific co-axial cable connected to the rear part of the existing aerial;

– a free-hands speaker on the passenger side door. It is the sound system speaker with two connections: one for the sound system and the other for the cellular phone "free-hands" function;

NOTE: The hands free speaker will only be fitted **until May 2000**.
Starting from June 2000 the small speaker in the special hands free kit must be fitted.

– power connection to recharge the cellular phone. It is located on the central unit and doubles as a cellular phone stand;

– aerial, radio, speaker and power connection wires.

The cellular phone connection is powered by directly and via the ignition switch. Where fitted, the cellular phone may be lit when the side/taillights are on.

NOTE: The microphone for the hands-free function is not with the preparation in that it comes with the kit for connecting the telephone and should be placed in position.

Starting from June 2000, the small speaker should also be positioned later on.

FUNCTIONAL DESCRIPTION

Connector **G397** is powered directly from the battery (pin 2) via fuse **F16** in fusebox **G1**.

It is powered via the ignition switch (pin 1) via fuse **F1** (**F15** from November '99) in fusebox **G1**.

Pin 6 is powered with the side/taillights are on. Connector **G397** pin 3 is connected to earth. Pins 4 and 5 output the signal (up to May 2000) to speaker **O5a** connector B (connector A is for the sound system).

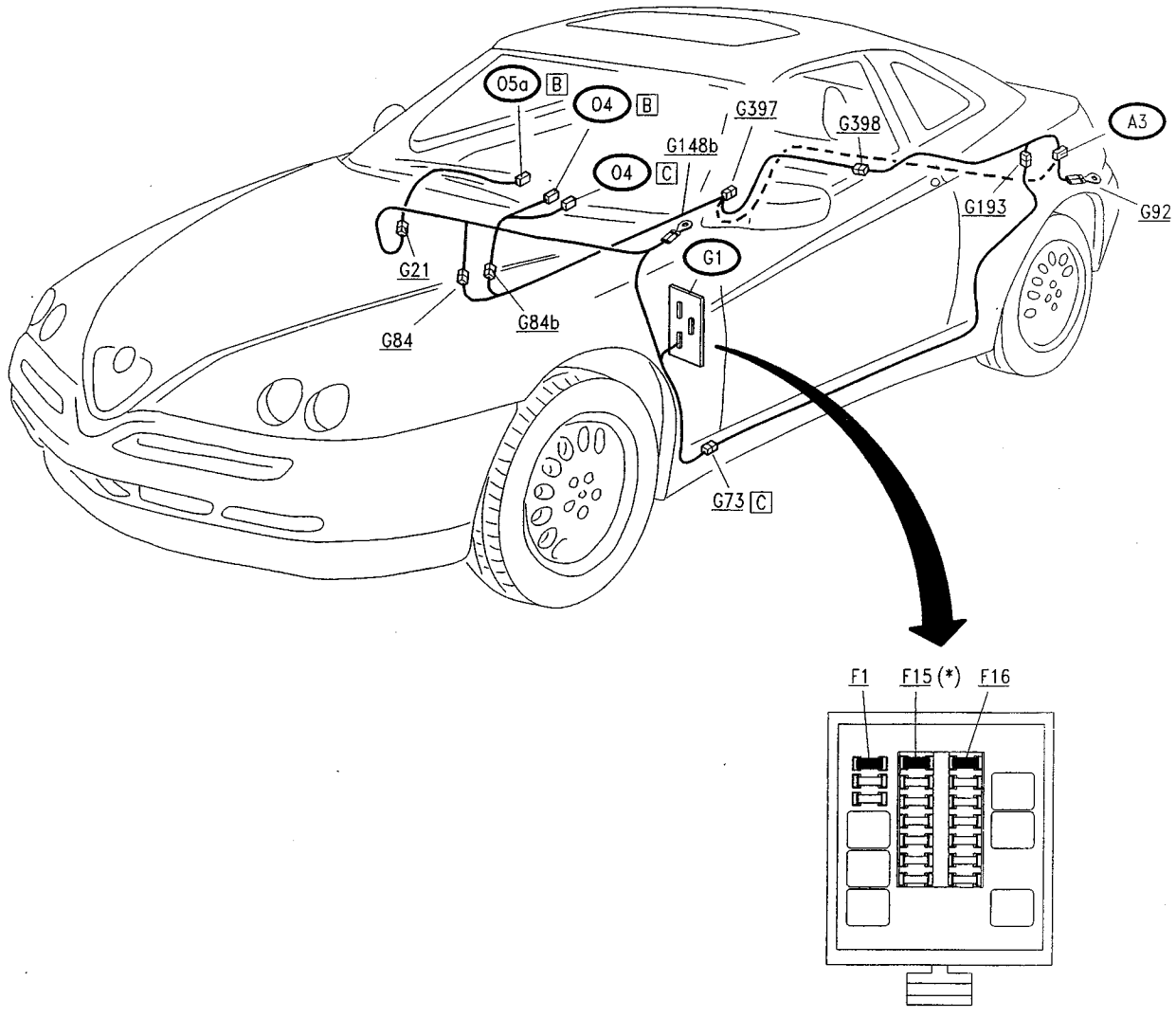
Pin 8 is connected to the radio **O4** (MUTE function).

Finally, pin 7 is connected to aerial **O3** to which it sends a signal to the electrical aerial motor to extend it fully.

When the signal ceases, the motor is controlled in reverse so that the aerial fully retracts. Aerial **A3** is powered via fuse **F16** in **G1**.

The aerial is connected by means of the specific telephone shielded wire **G65a**.

COMPONENT LOCATION



(*) from November '99

– – – aerial co-axial cable

AIRBAGS AND PRETENSIONERS

INDEX

AIRBAG AND PRETENSIONER SAFETY SYSTEM

This vehicle is equipped with an electronic safety system that, in the event of impact, triggers one or both airbags and the two seat belt pretensioners.

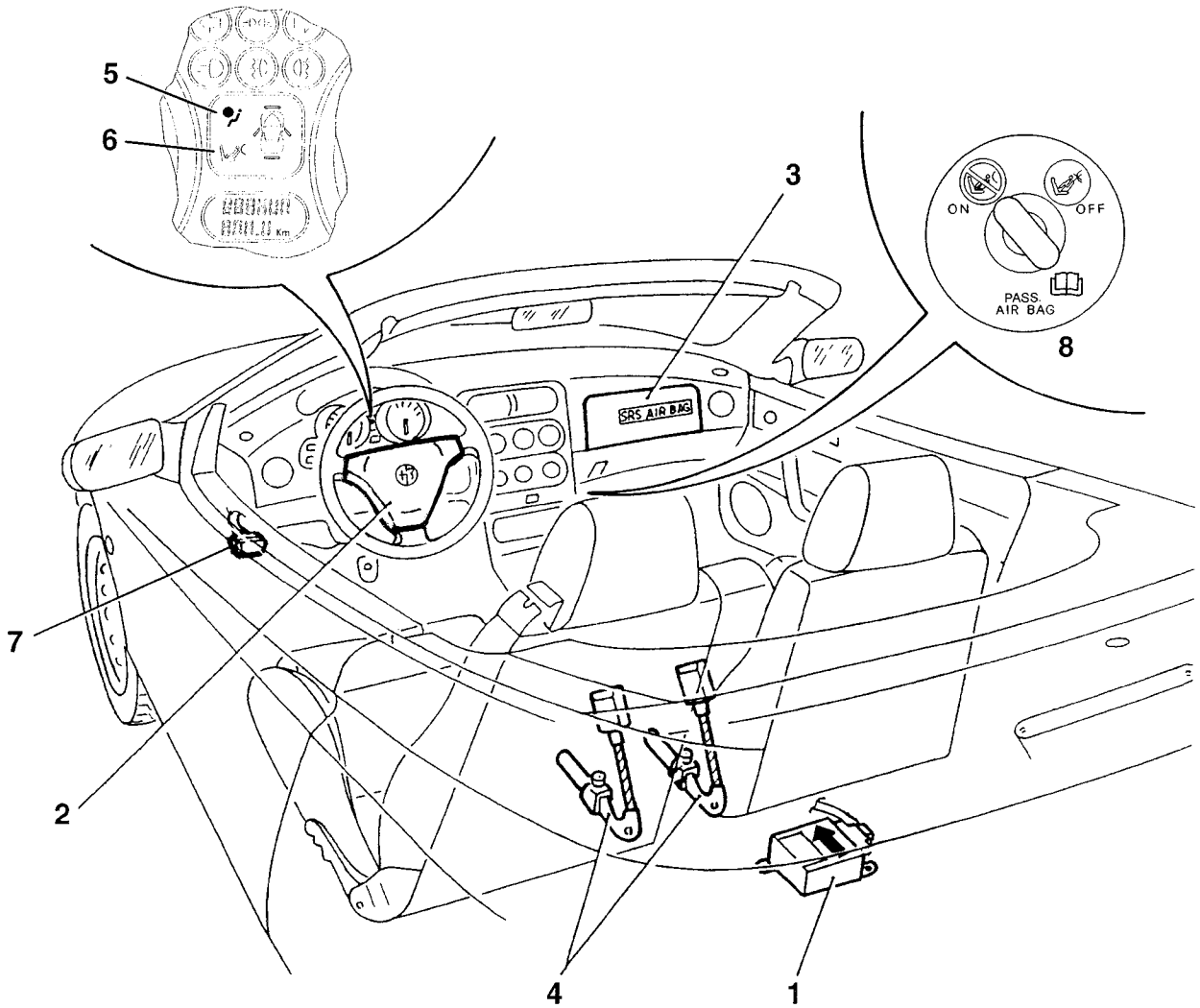
The **AIRBAG** is a passive safety device consisting of one or two bags controlled by an ECU which inflate in the event of frontal impact between the bodies of the front seats passengers and the front structures of the passenger compartment.

The seat belt **PRETENSIONER** is a pyrotechnic device included in the seat belt buckle which, in the event of frontal impact, recovers the inevitable lengthening of the belts due to the action of body weight holding the passenger's body against the seat back.

The complete system consists of the following parts:

1. ECU.
2. Driver side airbag module.
3. Passenger side airbag module.
4. Seat belt pretensioners.
5. System failures dashboard warning light
6. Passenger side airbag deactivated warning light.
7. Combined diagnostic connector.
8. Passenger side airbag deactivation switch.

The ECU is equipped with suitably calibrated deceleration sensors to identify an impact and two electric detonators to trigger the reaction of a chemical compound producing nitrogen.



This gas inflates the two synthetic fabric bag located respectively in the centre of the steering wheel and in a slot on the dashboard in front of the front passenger seat. At the same time the ECU activates the pretensioners to lock the lengthening of the seat belts by means of a small piston triggered by a gas generator that pulls back the buckle steel fastening cable.

SAFETY RULES TO FOLLOW FOR INTERVENTIONS ON VEHICLES EQUIPPED WITH THE AIRBAG SYSTEMS

The following regulations MUST BE STRICTLY APPLIED during all interventions in vehicles equipped with airbag systems.

PRELIMINARY RULES

It should also be noted that the airbag modules are devices to be handled with care. The use, transportation and storage are governed by the procedures for the handling of these components illustrated below.

Before commencing the following:

- body-work repairs;
- welding;
- work requiring the removal of airbag modules or the ECU.

- remove the key from the ignition switch
- always disconnect the battery, that is: disconnect the two terminals from the respective poles and insulate them carefully with insulating tape.
- disconnect the ECU connector and wait at least **10 minutes** after disconnecting the battery.

If one of the inflation devices is removed, carefully follow the procedure illustrated below:

1. Wait at least **10 minutes** after removing the battery before disassembling the module.
2. Remove the fixing screws.
3. Remove the connector from the inflation devices socket
4. Place the devices with the cover facing upwards, in a metal cabinet locked with key. This cabinet, only intended for this purpose, must not be used for any reason for the storage of other material, especially flammable material. The cabinet must be suitable for housing pyrotechnic loads (knock-proof metal cabinet with grids to allow natural internal ventilation) and must bear labels as per current legal regulations (DANGER OF EXPLOSION - PROHIBITED USE OF NAKED FLAME - ACCESS PROHIBITED TO UNAUTHORISED PERSONNEL).

- All the connectors used and wired to the airbags feature a short circuit clip. The airbag units cannot be activated until they are connected to a suitable power supply, via the respective connector.

A system component that did not trigger in the event of an accident is to be considered still "active". Therefore components that have not exploded due to faults or because their guarantee has expired or that require replacement for other reasons must be returned to the respective centre using the procedure described below.

The assembly and dismantling of safety system components must ONLY be carried out by skilled and authorised technical personnel. If the following precautions are not carefully attained to, the result could be unwanted activation of the system, personal injury or unnecessary repairs to the system.
IT IS ABSOLUTELY PROHIBITED TO DISMANTLE AIRBAG COMPONENT PARTS.

All system components were specifically designed to operate on specific vehicle makes and types. Therefore, the airbags cannot be adapted, reused or installed on other vehicles than they were designed and manufactured for.

Any attempt to reuse, adapt or install the systems on different types of vehicles could cause serious or fatal injury to the vehicle passengers in the event of an accident.

Airbag replacement (due to fault or expired warranty period)

In the event of airbag module replacement due to fault or expired warranty period proceed as follows:

1. Remove the adhesive label from the new module, place it in the specific ledger with the vehicle data (chassis number, registration date, model etc.) and add the serial number of the old module. The ledger with the recorded data must be filed for any future checks.
2. Before sticking the new label on top of the old one, punch the month and the year ten years on from the one in which the module is assembled (e.g. 2007 corresponds to 1997)
3. Connect the module to relative connector.
4. Insert the airbag module in its seat. Check the correct positioning of the connection cable and fix the screws to the specified torque.

ECU replacement

The ECU must ALWAYS be replaced in the event of an impact involving complete system activation (airbags and pretensioners).

Never attempt to reuse the ECU in any way.

Also in the event of ECU replacement, the adhesive label must be removed and placed in the aforesaid ledger. After performing interventions, check the system with an ALFA ROMEO Tester.

INTERVENTIONS AFTER AN ACCIDENT

If any safety system component is damaged as a result of an accident, it MUST be replaced. Do not attempt to repair the ECU, the clock contact or the airbag modules.

ACCIDENTS WITH OR WITHOUT AIRBAG ACTIVATION

Certain system components must be examined both in the case in which the system was activated and in the case in which the system was NOT activated. These components are:

- Steering wheel column;
- Steering wheel supports column;
- ECU and modules anchorage points;
- Clock contact;
- Dashboard (in the passenger side airbag module area).

Distorted, broken or bent component must be replaced.

ACCIDENTS WITH AIRBAG ACTIVATION

Some system components must be replaced if the vehicle has undergone a frontal impact involving complete or partial system activation. In the event of partial activation (pretensioner only), these components are:

- Pretensioners
- ECU (only after third activation of the pretensioners)

In the case of total activation (airbags and pretensioners), these components are:

- Airbag Modules
- Pretensioners
- ECU.

The wiring and connectors must be examined to identify any signs of burning, melting of external insulation or damage due to excessive heat. Any signs of damage to the clock contract, ECU anchorage point or airbag modules requires replacement of damaged components.

Painting

There are no special safety regulations to be followed for painting with subsequent oven drying, since the modules have been designed to be protected from damage when heating the external surfaces of the vehicle and using normal procedures for drying of paint.

It is prohibited to use naked flames near the modules. All the ECU (including the airbag control system) must however always be removed when their temperature in certain environments could reach or exceed 85°C.

HEALTH HAZARDS

The precautions to be followed when handling the **active airbag modules** are as follows:

- use polyethylene protective gloves and safety goggles;
- after touching the triggered airbags, wash your hands and any parts of the body that have been exposed with soap and water.

Effects of overexposure

There is no potential danger of exposure to propellants, since the system is completely sealed. The mixture of propellants is solid, therefore inhalation is impossible even in the event of breakage of the gas generator cartridge. In the event of gas leakage, there is no danger to human health. However, avoid contact with the skin and do not swallow the propellant.

In the case of:

- Contact with the skin: wash immediately with soap and water.
- Contact with eyes: wash eyes immediately under running water for at least 15 minutes.
- Inhalation: carry injured person immediately out in to fresh air.
- Swallowing: if conscious make the person vomit.

In all these conditions always also call for medical help.

SAFETY REGULATIONS FOR HANDLING AIRBAG MODULES

In normal conditions, the driver side and passenger side airbags are triggered by electronic ignition during the impact. The gas that develops in these conditions is not toxic. It is important that the personnel performing interventions on the device assembled on the vehicles strictly attain to the safety regulations listed below.

The personnel operating on the devices must be suitably trained.

- In operations for the removal and the replacement of open (exploded) airbags move only one module at a time and use gloves and glasses when removing.
- Always place the airbag module with the opening slot and pre-breakage groove facing upwards. Never place anything over this slot.
- At the end of the operations, wash hands carefully with neutral soap and if any residual dust from the device comes in contact with the eyes, rinse immediately plenty of running water.
- Whenever handling the airbags, never work from the front seats without deactivating the system by disconnecting the two cables from the battery and waiting for **10 minutes**
- The metal components of an airbag immediately after explosion are extremely hot. Do not touch these components for **20 minutes** from the moment in which the airbag was triggered
- Do not power the airbag unless specified for installation and maintenance.
- Do not carry out repairs to airbag modules. Send all the faulty modules to the supplier.
- Do not subject the airbag module to heat, for example by welding, drilling, punching, mechanical work cycles, etc.
- Never install airbag units that have fallen or that show signs of any type of damage on vehicles.
- It is prohibited to store airbag modules with inflammable or explosive material.
- The gas generators must never come into contact with acids, grease or heavy metals. Contact with these substances could cause the formation of poisonous, toxic gas or explosive compounds.

Spare parts must be stored in their original packing and their temporary storage must be as per the procedure applied for storage of airbag modules detached from a vehicle and not activated, that is in any situation a suitably adapted metal cabinet locked with key must be used, (knock-proof metal cabinet with grid to allow natural internal air flow). The cabinet must be equipped with relative notices (DANGER OF EXPLOSION - PROHIBITED TO USE NAKED FLAME - ACCESS PROHIBITED ACCESS TO UNAUTHORISED PERSONNEL).

SCRAPPING OF AIRBAG MODULES

The airbag modules assembled in the vehicle must not be scrapped with the vehicle but removed previously.

The airbag units must be activated before being scrapped.

In the case in which, during an accident the airbag module was not triggered, the device must be considered as still charged. All non-exploded material MUST NOT BE ACTIVATED, but must be sent to a specialised centre - for ITALY to GECMA of Chivasso - indicating the following message on the consignment note: "AIR BAG DEVICE CONTAINING PYROTECHNIC CHARGE TO BE DEACTIVATED"

For FOREIGN MARKETS, current local laws must be applied."

Devices must be dispatched in the same packets/packing in which the spare parts were received and in the case in which these are not available the packing can be requested from the SPARE PARTS department. Obviously when the airbag devices are replaced the original packing must be kept for dispatch of the non-activated device.

WARNING: If the procedures stipulated herein are not applied this could result in incorrect activation of the airbag and personal injury. Non activated airbags must NOT be disposed of through normal waste disposal procedures.

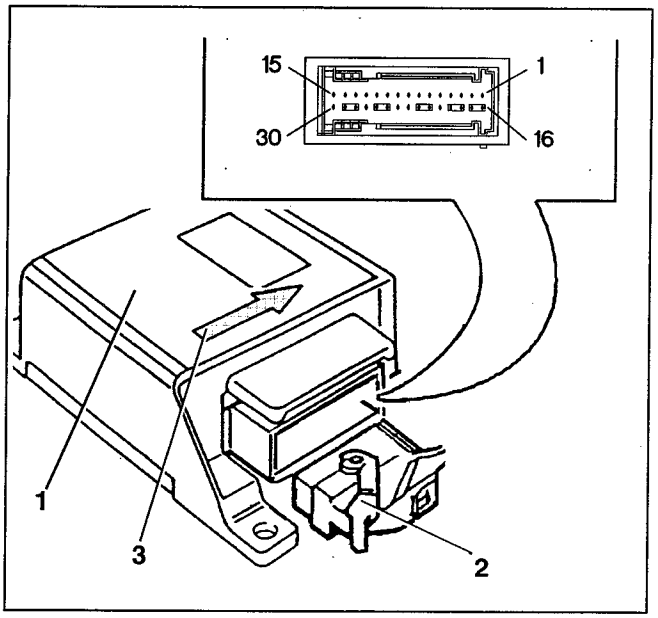
Ordering procedure

When required, the devices must be requested each time from the Volvera Spare Parts After Sales Dept. only via a depannage procedure, since the Network should not stock these parts. In any case, for the relative internal movement and entry and exit register must be kept, recording the modules identification numbers and the vehicle data (chassis number, registration date, model, etc.)

ECU

The ECU (1) is located in the rear central part of the vehicle and fixed rigidly to the floor. It is equipped with a 10 pin connector (2) used for connection to the electric system. It is powered by 12 V with key turned to MAR. The ECU must be located so that the arrow (3) engraved on the label is facing the direction of movement of the motor vehicle. This position must be strictly followed, since it establishes the direction in which the acceleration sensor reads the negative acceleration values to establish the condition of impact and thus triggering 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.



ECU PIN-OUT

1.Driver side airbag (-)
2.Driver side airbag (+)
3.Passenger side airbag (-)
4.Passenger side airbag (+)
5.Signal (-) for passenger airbag switch
6.Passenger side pretensioner (+)
7.Passenger side pretensioner (-)
8.Diagnostic line ground
9.Diagnostic line
10.Driver side pretensioner (+)
11.Driver side pretensioner (-)
12.Spare
13.Failure warning light
14.ECU Ground
15.ECU power supply (+15)
16. Driver side airbag jumper (-)
17. Driver side airbag jumper (+)
18. Passenger side airbag jumper (-)
19. Passenger side airbag jumper (+)
20. Passenger airbag deactivated warning light
21. Passenger side pretensioner jumper (+)
22. Passenger side pretensioner jumper (-)
23. Check ground (no passenger airbag)
24. Passenger airbag indicator switch (+)
25. Driver side pretensioner jumper (+)
26. Driver side pretensioner jumper (-)
27. Spare
28. Failure warning light jumper
29. ECU ground jumper
30. Spare

Power buffer

The ECU is powered at 12 V with key at MAR, but it is however capable of still running for approximately **100 msec** after power failure. This is possible thanks to the presence of a buffer battery which accumulates sufficient electric power to generate the airbag trigger signal. System operation is, therefore, guaranteed even in the case in which the impact causes system power failure (e.g. damage or breakage of the battery, breakage of power supply cables, etc.).

Failure memory

While the vehicle is running, the ECU carries out a continuous system diagnosis, 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).

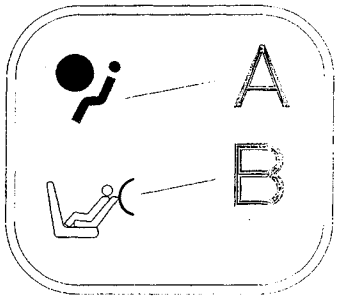
Impact memory

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.

Deactivation of Passenger airbag

The passenger side airbag can be deactivated voluntarily or temporarily by means of the vehicle key. The control switch is located on the side cabinet panel on passenger side and activates (ON) or deactivates (OFF) the passenger side airbag. In this case, the ECU excludes passenger side airbag activation but enables normal operation of the respective pretensioner. This ensures that if a passenger is on board and the switch has been left OFF by mistake, the airbag will not be triggered but at least the pretensioner will operate normally. When the key on OFF, the ECU will also activate the respective "Passenger side air bag deactivated" warning light on the instrument panel.

Airbag warning light



A - System failure warning light

The airbag led located on the vehicle dashboard is powered via the ignition switch in MAR and is connected to ground via the ECU.

At start-up, the warning light comes on for approximately 4 seconds (initial test phase). If it does NOT light up or does NOT go out after 4 seconds, there is a failure in the airbag system. If the ECU, during the self-tests run to check the correct operation of the complete system, identifies a failure, it commands the immediate lighting up of airbag warning light. Once this failure has been signalled, the warning light remains on until the fault has been repaired and deleted from the failure memory.

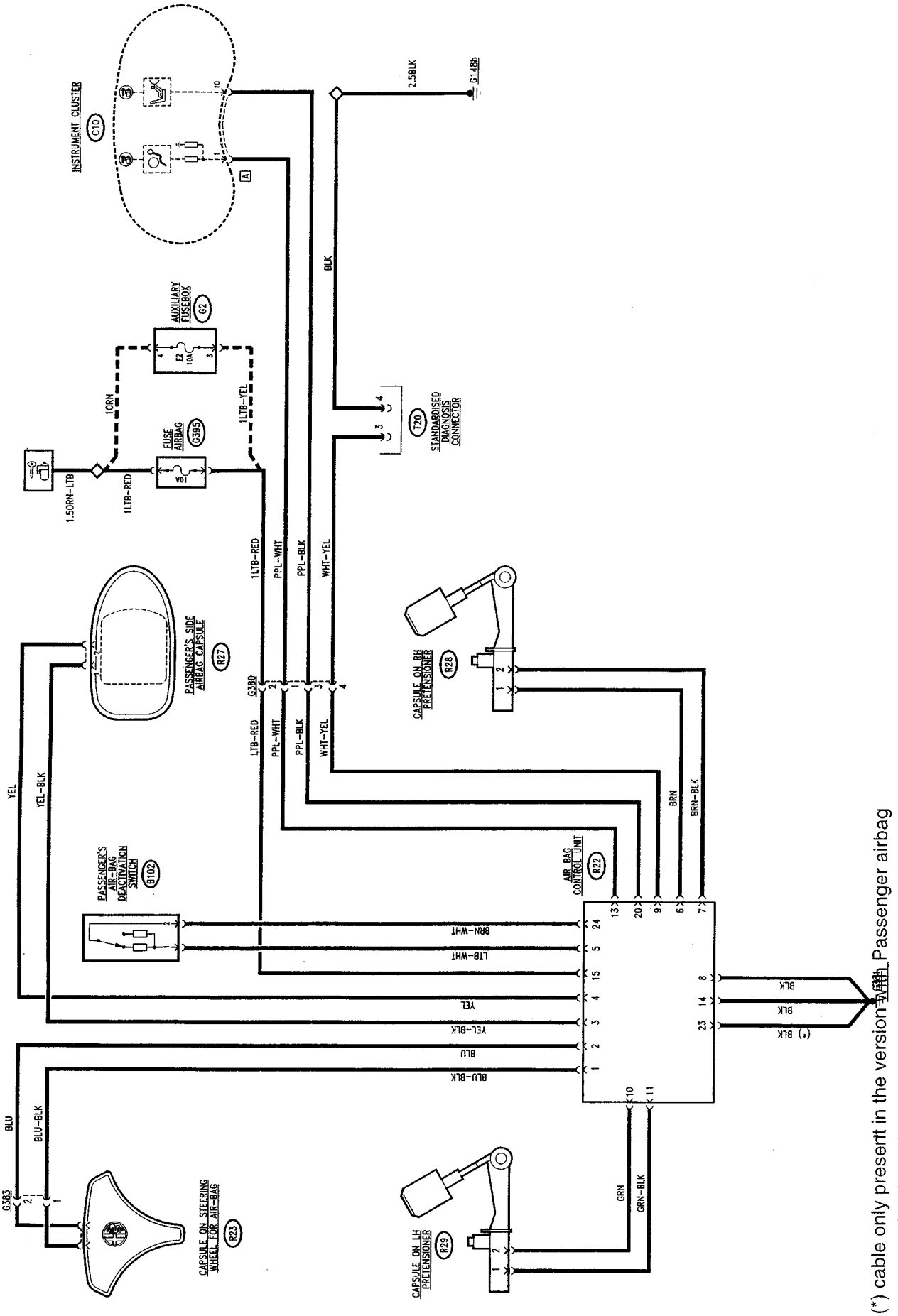
The warning light is "intelligent". It lights up when a fault is detected in the system and also when open circuit or short-circuit to earth is detected in the circuit connecting the warning light to the respective ECU, thanks to an internal pilot circuit which checks correct connection.

B - Passenger airbag deactivated warning light

On start-up (key to MAR) the dark yellow "passenger side airbag deactivated" warning light comes on for approximately 4 seconds;

- if the passenger side airbag manual deactivation switch key is on OFF, the warning light will remain on;
- however if the key is turned to ON, the warning light will flash for another 4 seconds and go out.

WIRING DIAGRAM



FUNCTIONAL DESCRIPTION

The ECU **R22** pin 15 is "ignition switch" powered. The circuit is protected by free fuse **G395** (10A), (starting from October 2000, via fuse F2 (10A) of the additional fuse box **G2**) whereas pin 8 and pin 14 are connected to ground to a specific point **G381** located near the ECU.

NOTE: Pin 23 is connected to ground in the complete version whereas it is "open" in the version without Passenger airbag, to provide this information to the ECU.

The system includes two bags, one located in driving seat position **R23** (at the centre of the steering wheel) and one in the dashboard in front of the passenger seat **R27,** and the two pretensioners modules **R28** and **R29** located respectively on the seats passenger side and driver side.

The ECU **R22** continuously runs a system test checking continuity in circuits and components while the vehicle is running. The ECU identifies a severe impact thanks to the two internal sensors(one piezoelectric and one mechanical) and activates two modules sending a voltage via the two signals from pins 3 and 4 to the passenger module and from pins 1 and 2 to the driver module.

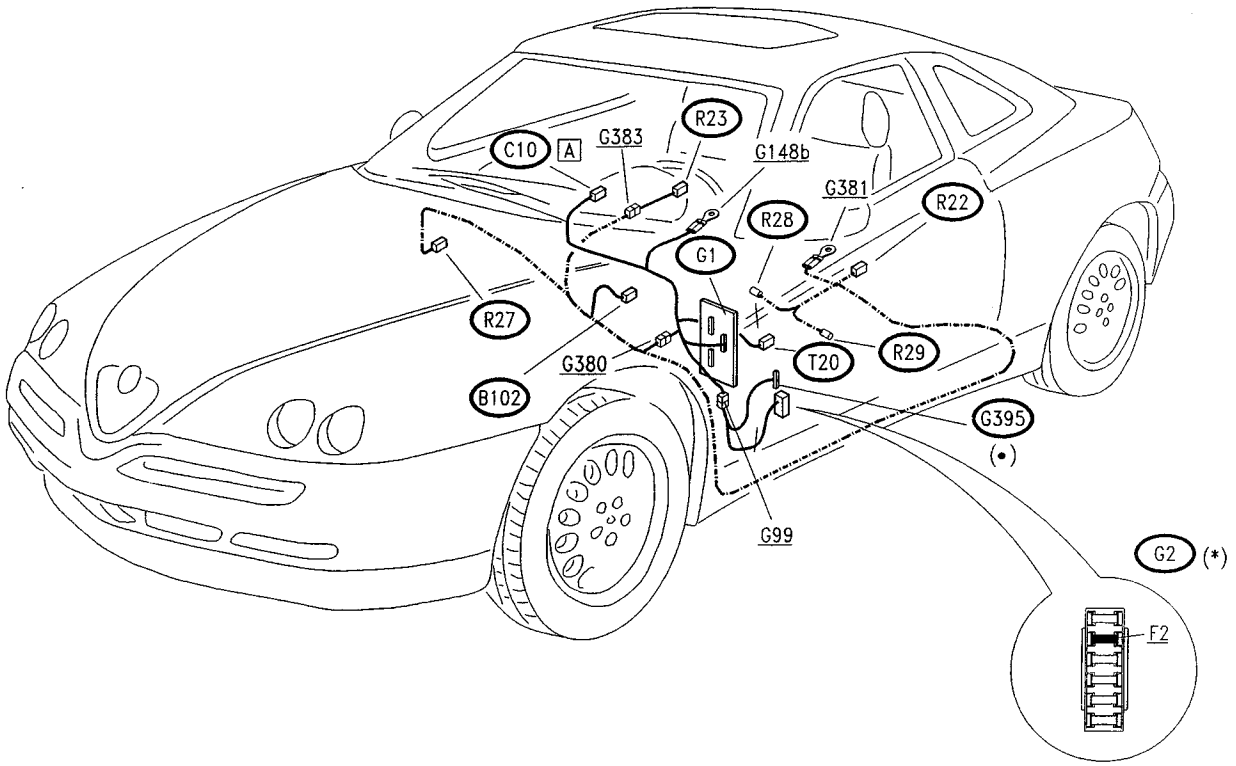
The passenger side module activation can be excluded via the respective key switch **B102** connected to **R22** pins 5 and 24.

Two signals are sent in the same manner for the pretensioners from pins 6 and 7 for the passenger side and from pins 10 and 11 from the driver side.

When a failure or breakdown of the system is identified, the type of failure is memorised and consequently the airbag warning light **C10** located on the dashboard lights up, thus informing the user of system failure (signal output from pin 13 of **R22**). However a signal output from pin 20 lights up the passenger airbag deactivation warning light on **C10**.

Finally, the combined socket **T20** connects the ECU **R22** to the diagnostic tool, via the line from **R22** pin 9.

LOCATION OF COMPONENTS



---- Specific cable for Air Bag, with yellow sheath
(•) Red fuseholder
(*) Starting from October 2000

SYSTEM TEST

While the vehicle is running, the ECU panel carries out a self-test, checking the airbag system and memorising any failures. As soon as a failure is detected, it is memorised and the "Airbag" warning light on the dashboard is lit.

Using diagnostic tools

The failures memorised in the ECU can be analysed by means of suitable diagnostic tools (Examiner etc.) The failures memorised in the ECU can be deleted after the fault has been repaired by means of the 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.

SUNROOF (GTV only)

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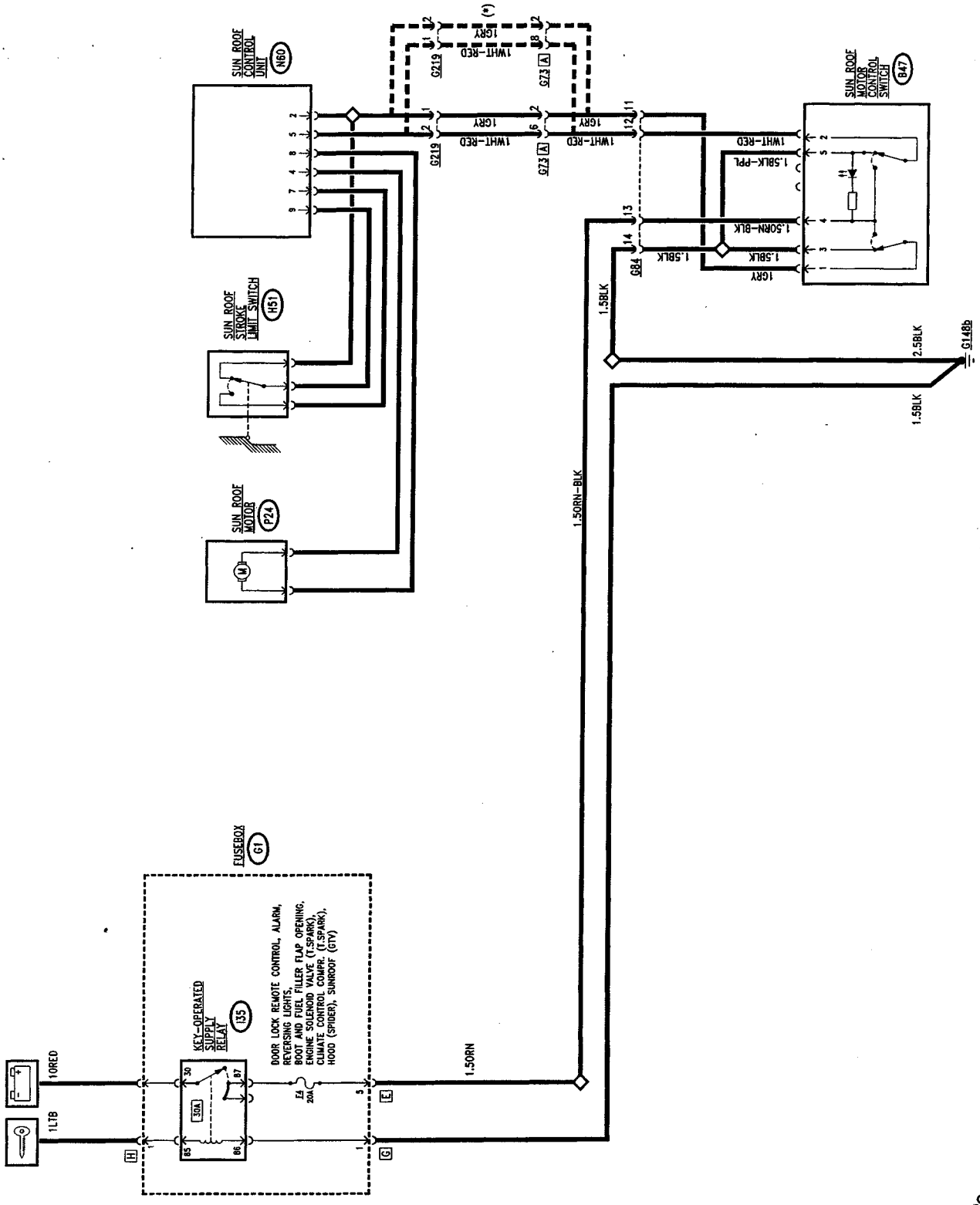
WIRING DIAGRAM



(*) from November '99

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 control system is ignition switch powered via relay **I35** located in fusebox **G1**. The line is protected by fuse **F4** in **G1**. The system is ignition switch powered only to switch **B47** pin 4. Pins 5 and 3 are 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;

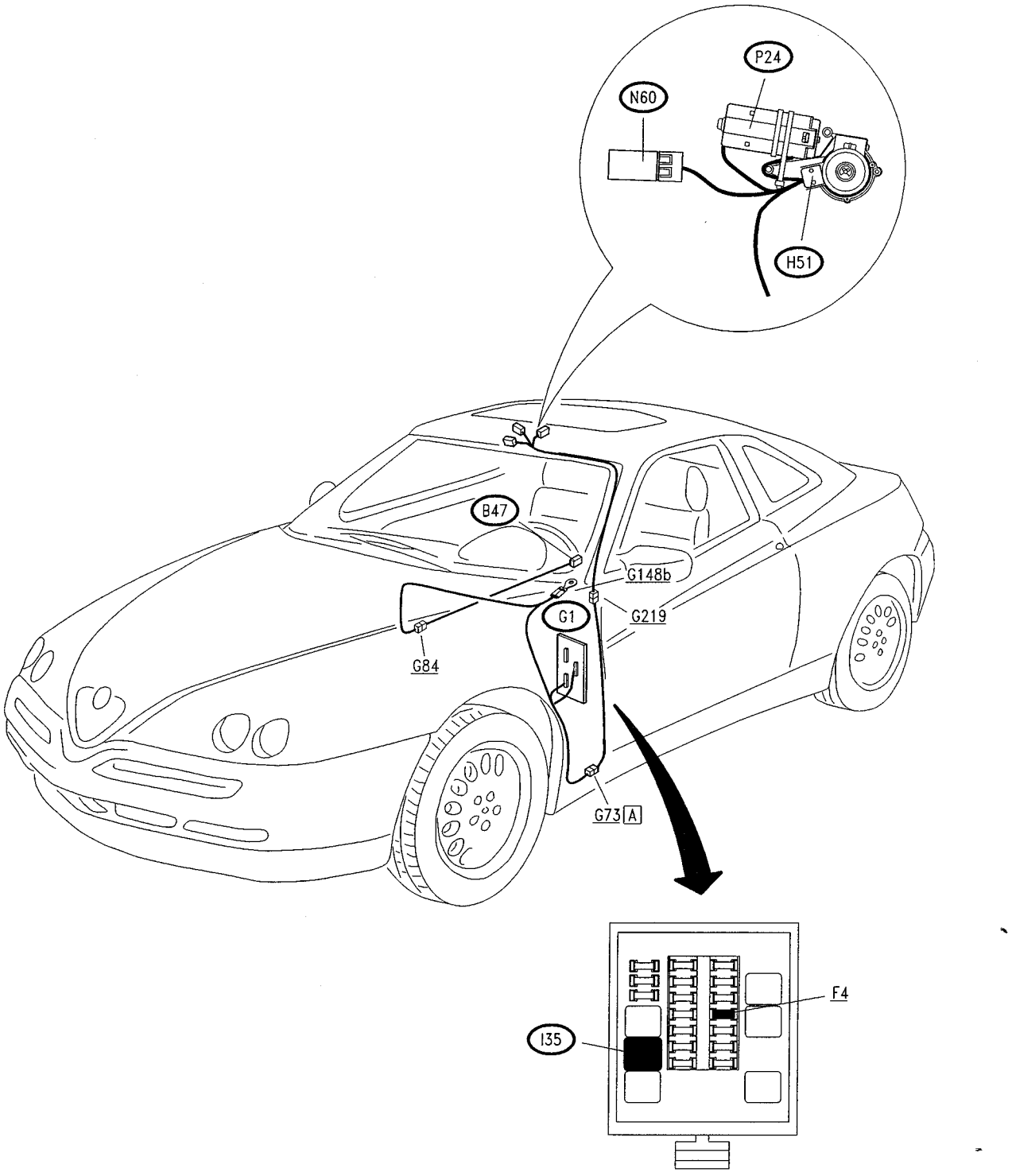
– pins 4 and 8 connect with the motor **P24** operating it in the two directions sending alternately 12 V and earth signals.

FAULTFINDING TABLE

Fault	Component to be checked				
	F4	(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



AUTOMATIC AIR-CONDITIONER

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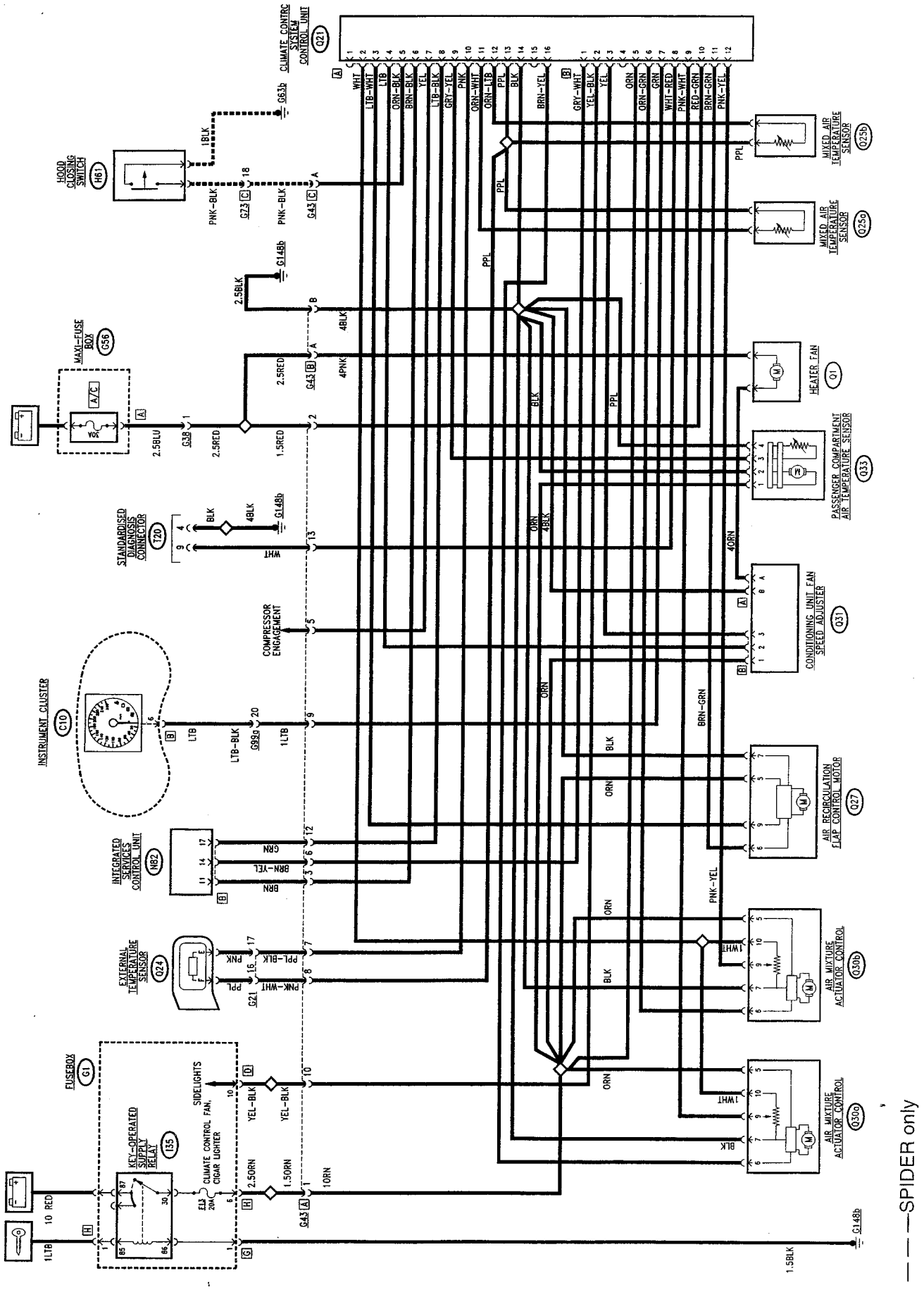
AUTOMATIC AIR-CONDITIONER

Wiring diagram



General description

An automatic system control the passenger compartment climate, temperature and ventilation, by re-circulating and directing air flows. A specific ECU handles the operation of the system by controlling:

– air temperature at vents;

– fan speed;

– compressor activation (air cooling circuit);

– air re-circulation activation;

– "rapid demisting" function;

The ECU sets the above mentioned parameters to bring the temperature of the passenger compartment to that required. The system controls are located outside the container housing the ECU. The ECU acquires information on internal and external temperature via the relative sensors.

According to the calculations, the ECU sets the air intake speed into the passenger compartment by means of the fan motor and the air temperature by means of a mixing actuator. It also handles the internal air re-circulation function by means of a specific actuator.

If the conditions require, the ECU also controls the air cooling and drying circuit by activating the climate control compressor.

Functional description

The climate control ECU **Q21** is ignition switch powered (INT/A) to connector B pin 5 via the line protected by fuse box **G1** fuse **F13**; the same line also powers all the system actuators.

The direct power supply from the battery (maxifuse A/C of **G56B**) goes to connector B pin 10.

The control lighting power supply with the side lights ON reaches connector B pin 2 from the side lights line.

Q21 connector A pin 14 is connected to ground.

Q21 connector B pin 7 receives the tachometer signal originating from instrument **C10**.

The external temperature sensor **Q24** is located on the right hand door rear-view mirror; the sensor is powered by 5 V from **Q21** connector A pin 13 and sends the signal to connector A pin 10.

ECU **Q21** is also connected to sensors **Q25b** (lower mixed air), **Q25a** (upper mixed air) and **Q35** (passenger compartment air) powered by 5 V from pin 13 of the connector and send signals to **Q21** connector A pins 11, 10, 9, respectively.

Sensor **Q35** is equipped with an ignition switch powered ventilation motor to ensure the temperature reading is not affected by stagnant and hotter air inside the dashboard.

The climate control system has three actuators for the re-circulation (**Q27**), mixing (**Q30b**) and the direction of air (**Q30a**).

The re-circulation actuator **Q27** is controlled by the ECU **Q21** connector B pin 11, and outputs a feedback current to **Q21** connector A pin 3.

The mixing actuator **Q30b** is controlled by ECU **Q21** connector B pin 6; the potentiometer is powered from connector A pin 2 and sends a feedback signal to connector B pin 12.

The distribution actuator **Q30a** is controlled by the ECU **Q21** connector A pin 16; the potentiometer is powered from connector A pin 2 and sends a feedback signal to connector B pin 9.

Electronic adjuster **Q31** activates the electric fans at different speeds; it inputs a control signal from the ECU (connector B pin 3) and converts it into a variable voltage signal that controls the fan. This voltage control is stabilised so that it is independent from the battery voltage variations. The adjuster is ignition switch operated (INT/A) via the same line that powers the ECU **Q21**.

The electric fan **Q1** is powered directly from battery via the maxifuse A/C line **G56B**, whereas it is driven at the different speeds by the signal originating from electronic adjuster **Q31.**

ECU **Q21** features a self-test system which can be accessed via connector **T20** receiving signals from connector B pin 8 via the diagnostic line.

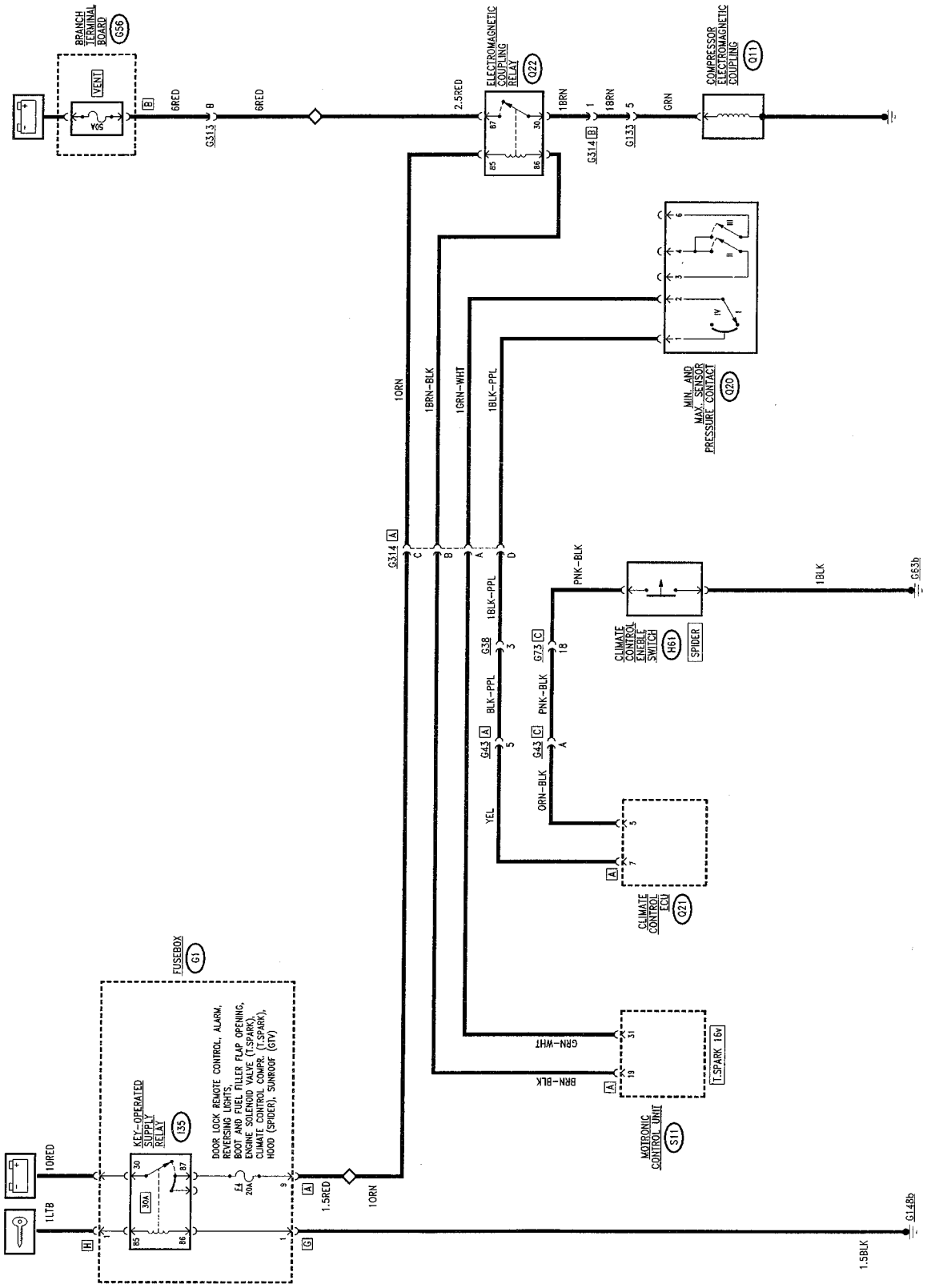
The heated rear window, the respective LED and of the "rapid demisting" function controls are sent to the integrated utilites ECU **N82** by connector B pin 1, and connector A pins 6 and 8, respectively. It should be noted that the climate control ECU only "hosts" the control button and the respective LED but does not act in any way on the rear window activation logic (see "Heated rear window").

Connector A pin 7 controls the compressor insertion as specified in the following diagram.

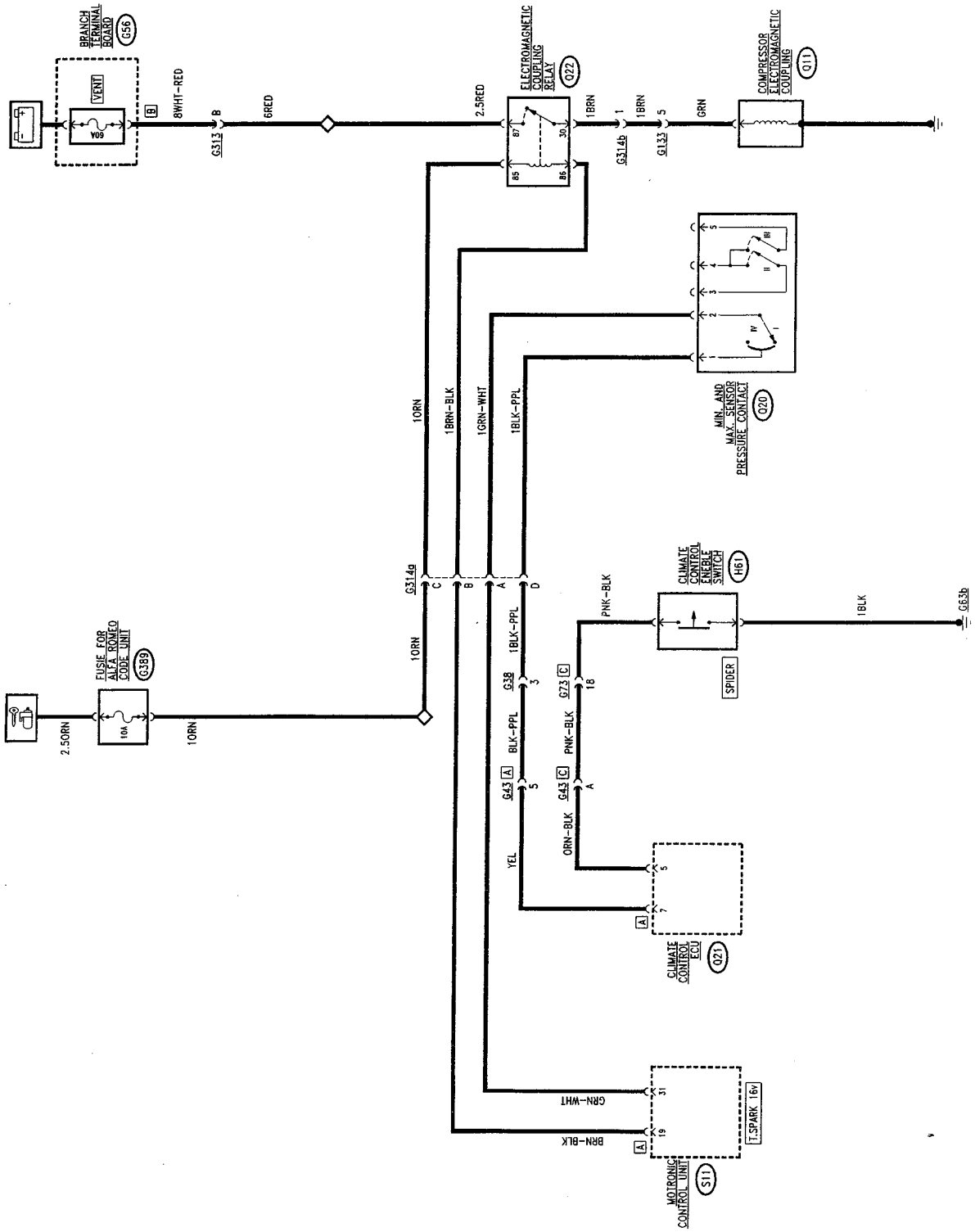
NOTE: (Spider only) this operation is inhibited by a signal from the open top switch **H61**.

COMPRESSOR OPERATION

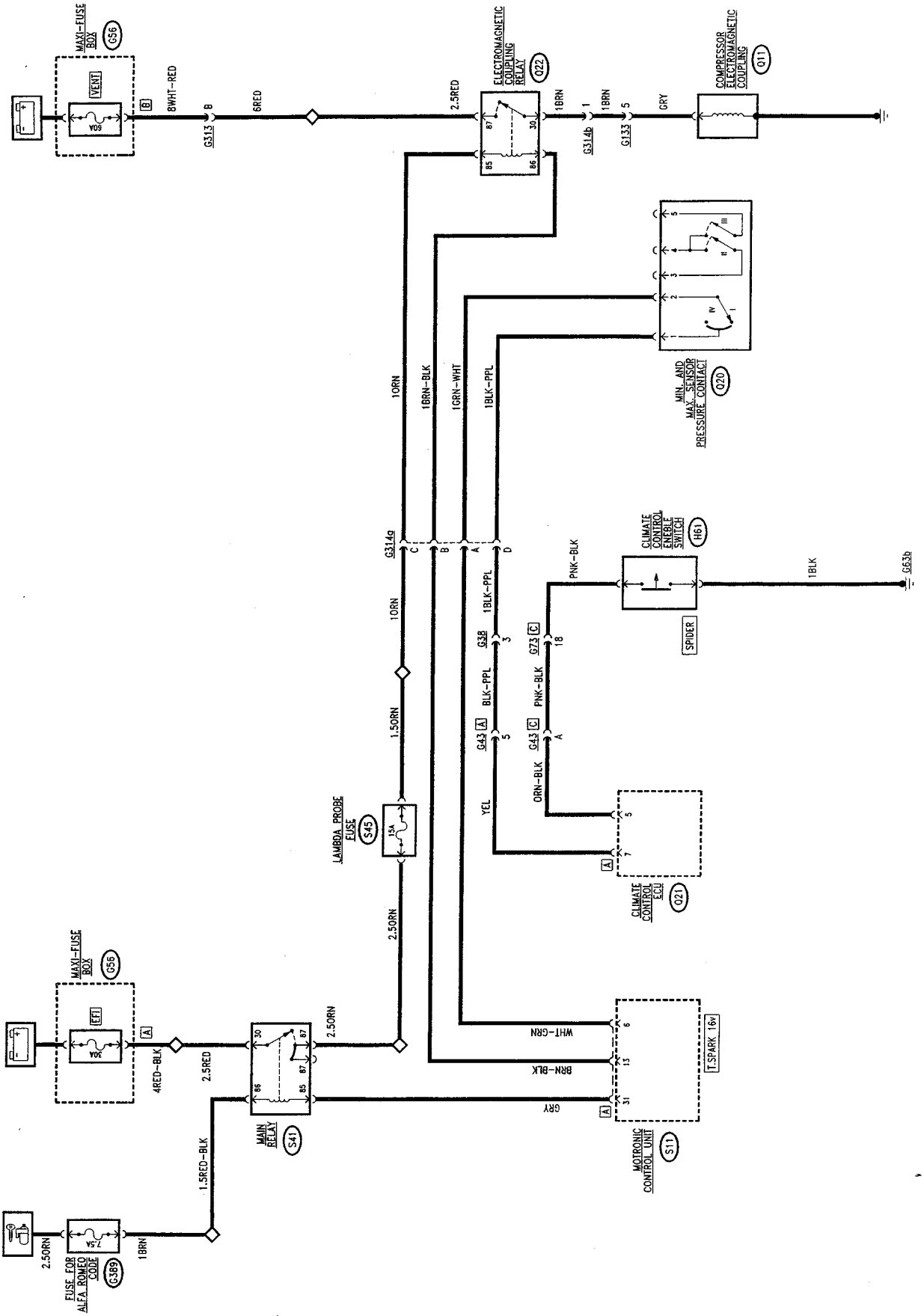
Wiring diagram (T.SPARK 16V engines)



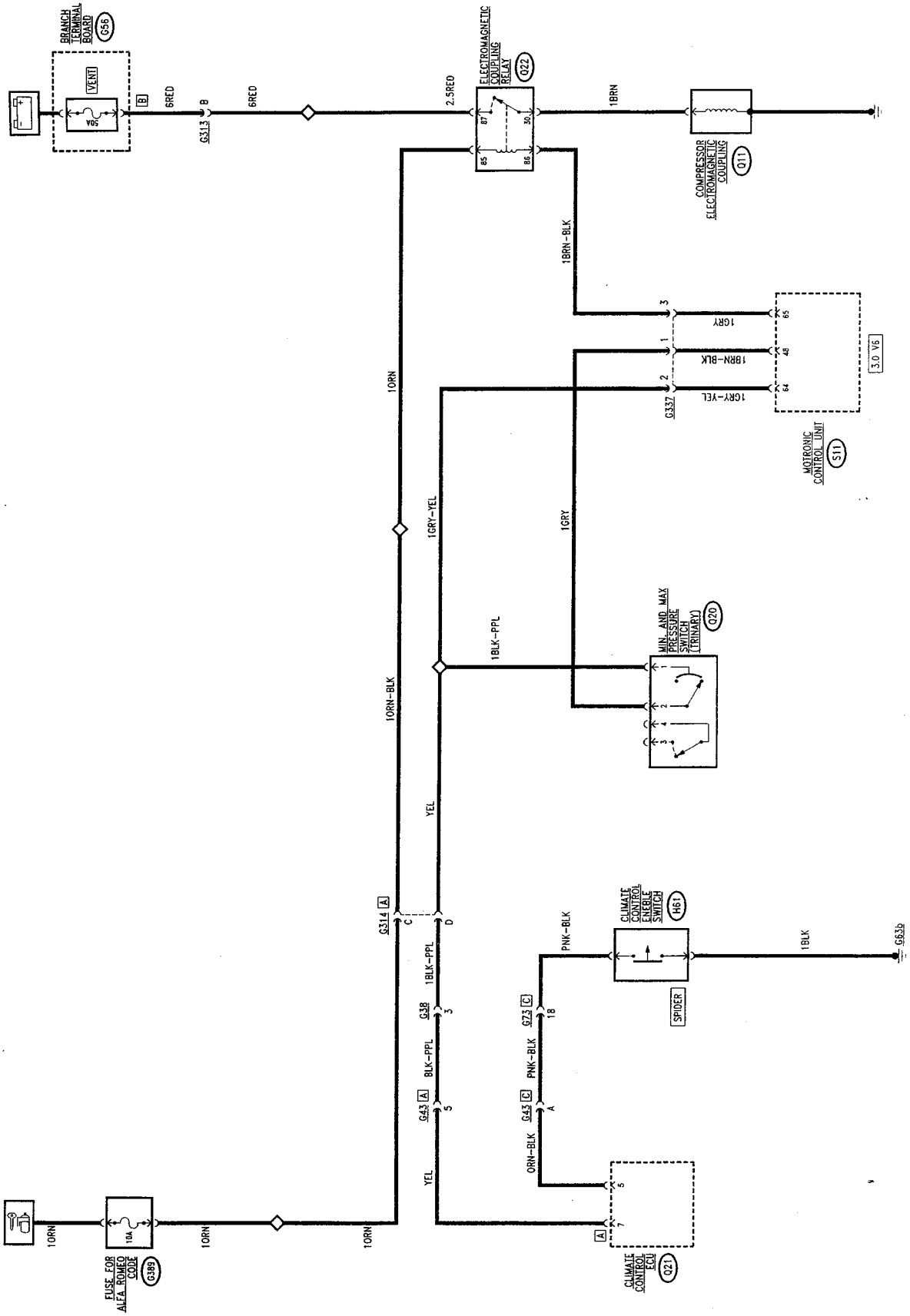
Wiring diagram (T.SPARK 16V engines) (starting from November '99)



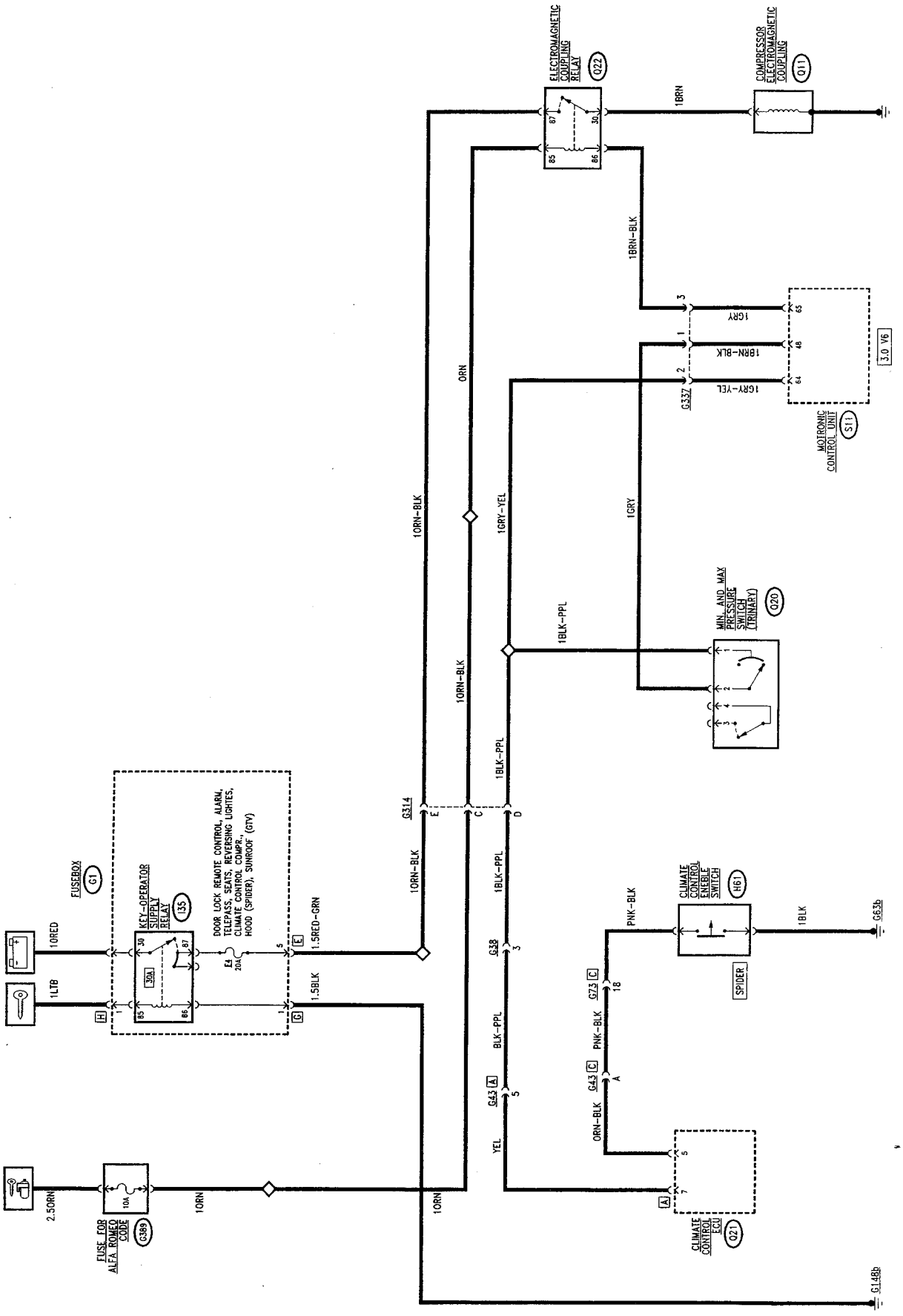
Wiring diagram (T.SPARK 16V engines starting from October 2000)



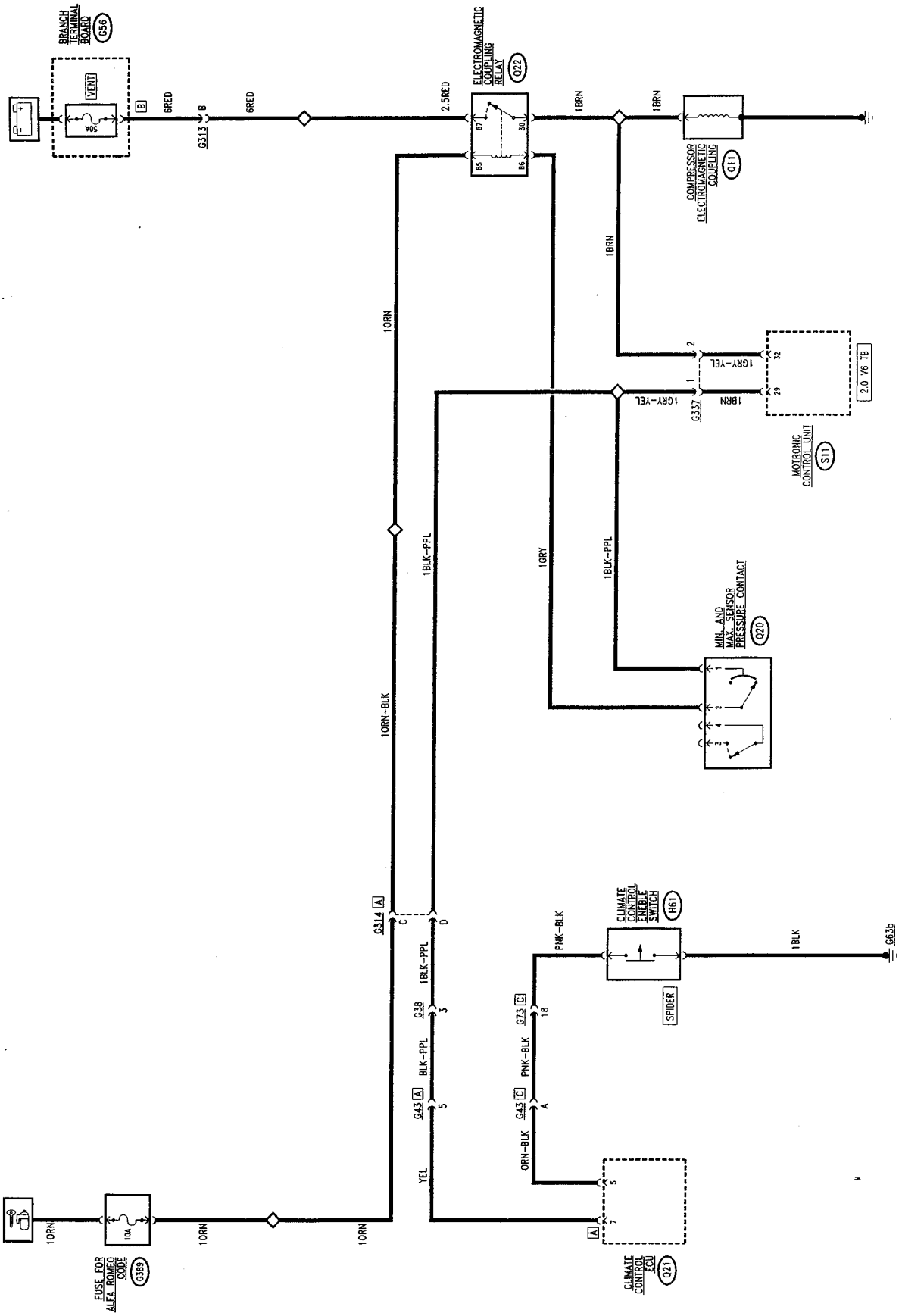
Wiring diagram (3.0 V6 engine)



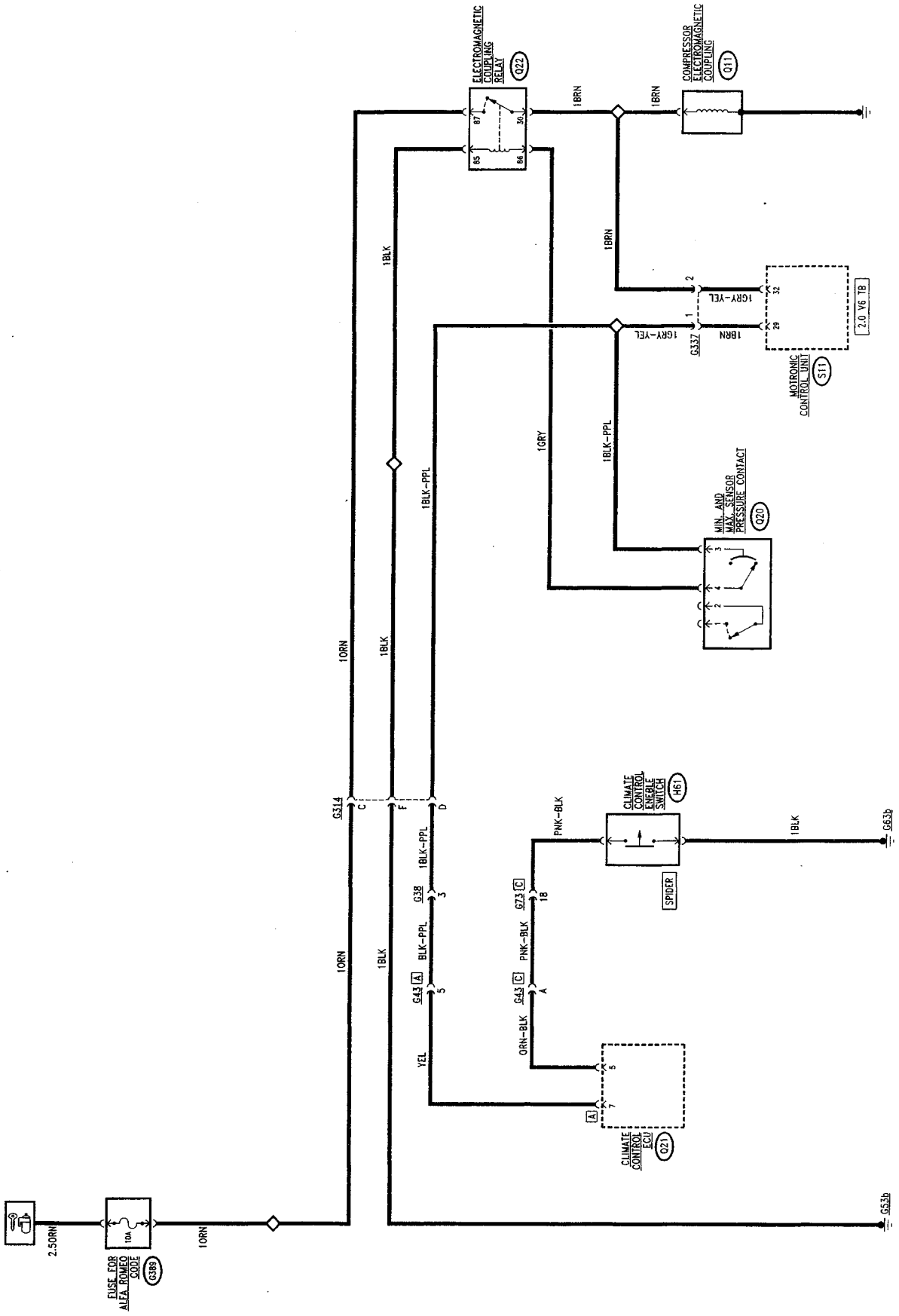
Wiring diagram (3.0 V6 engine) (from November '99)



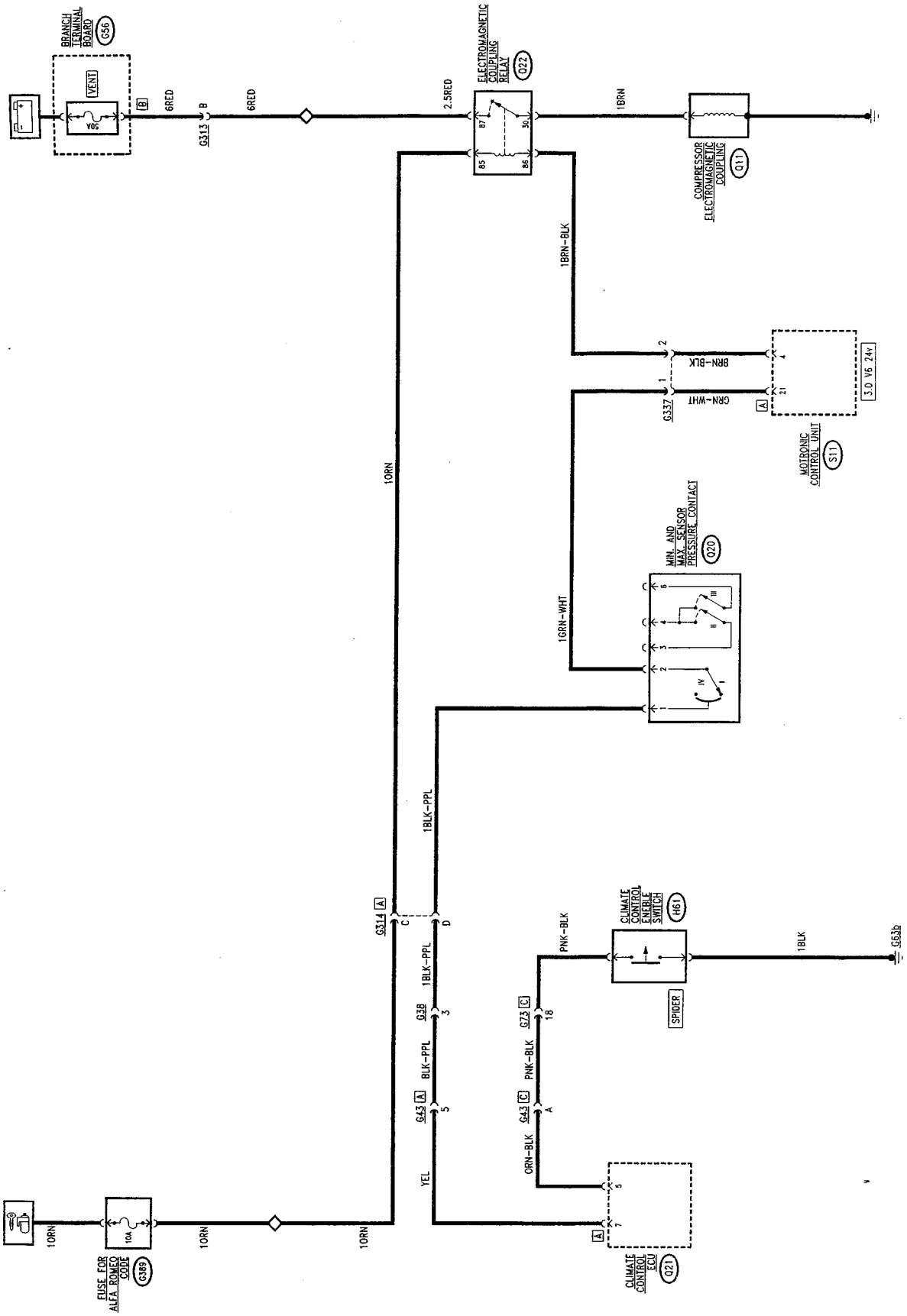
Wiring diagram (2.0 V6 TB engine)



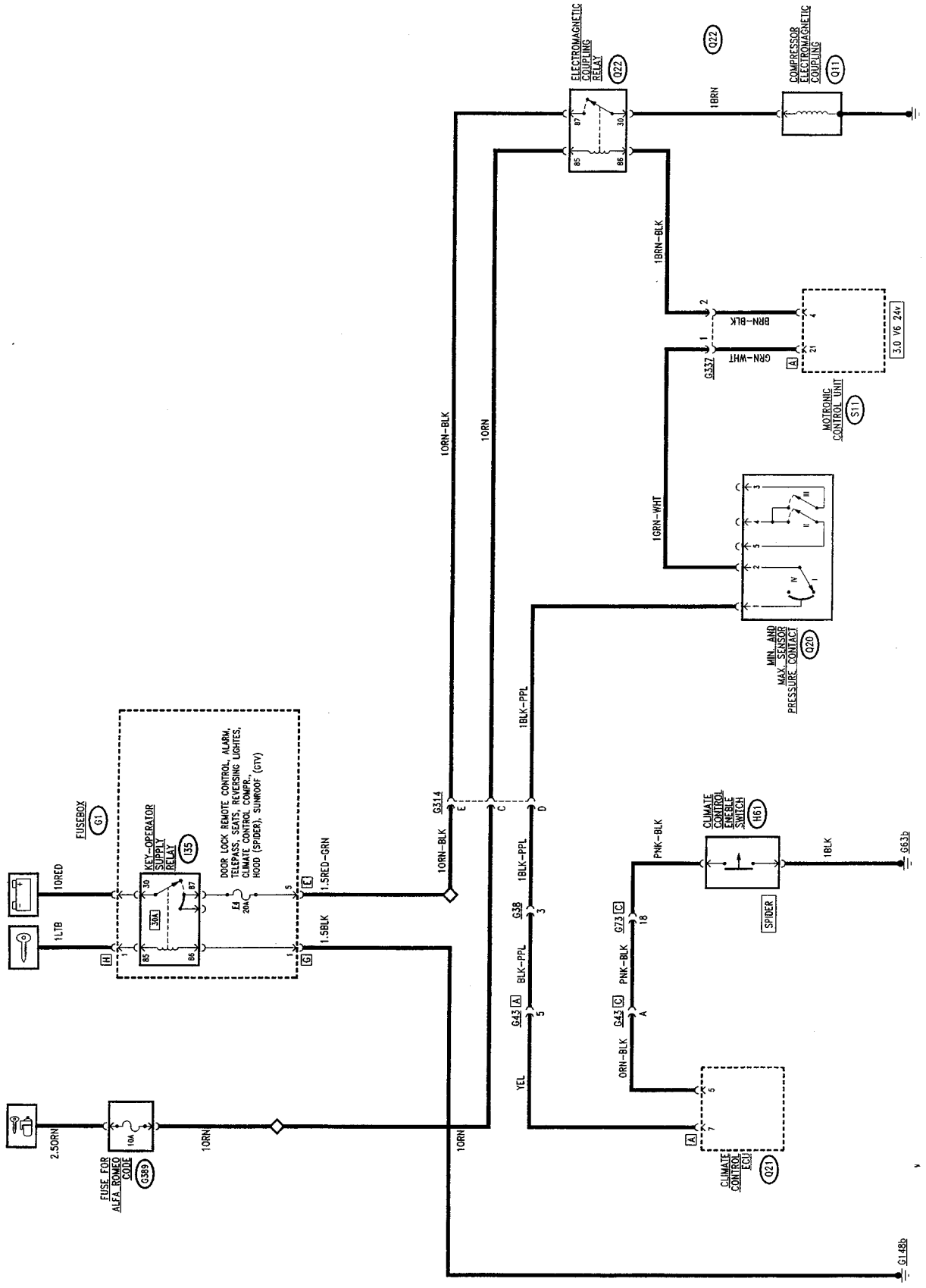
Wiring diagram (2.0 V6 TB engine) (from November '99)



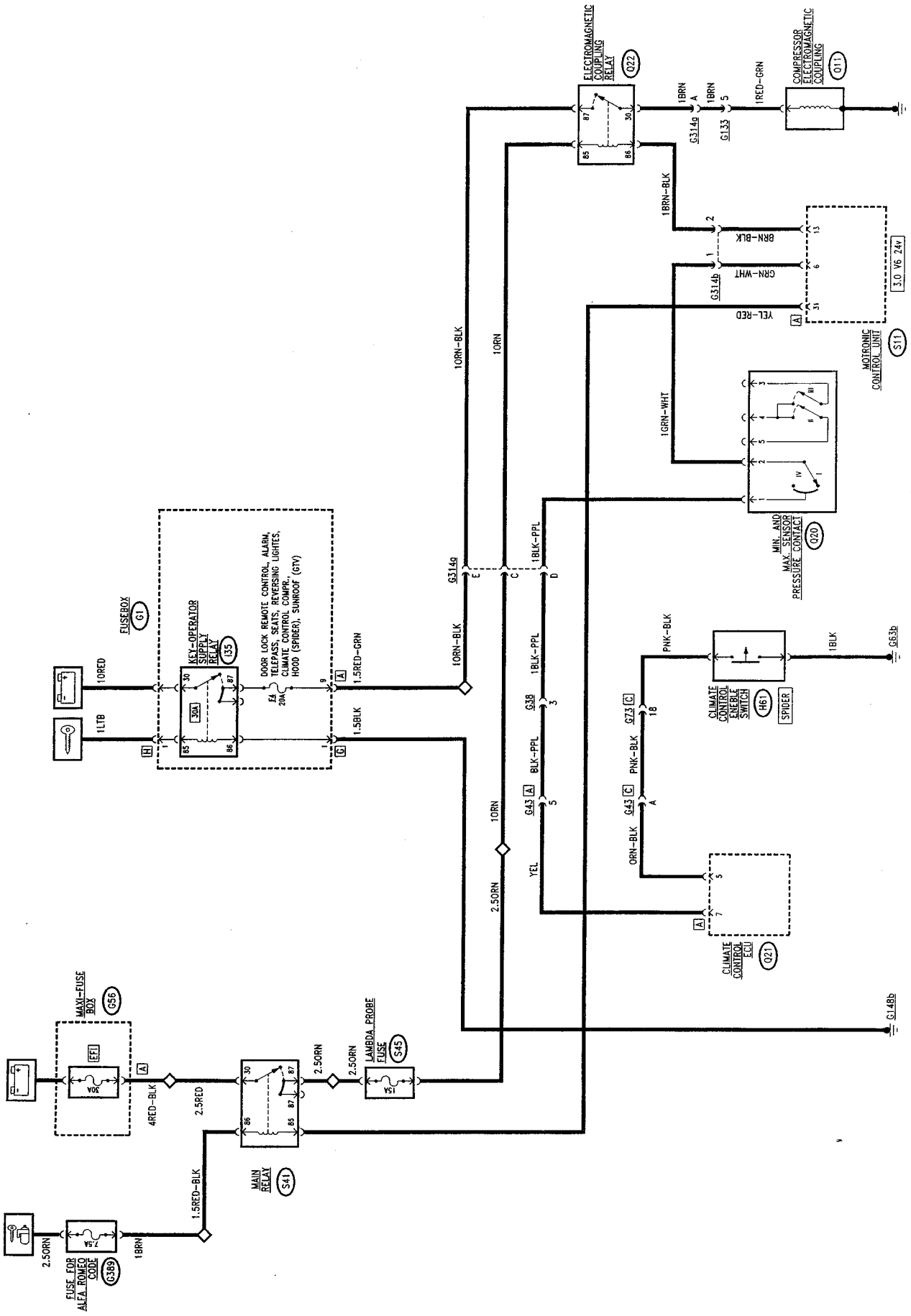
Wiring diagram (3.0 V6 24V engine)



Wiring diagram (3.0 V6 24V engine) (starting from November '99)



Wiring diagram (3.0 V6 24V engine starting from October 2000)



Functional description

The electromagnetic joint which operates compressor **Q11** is controlled via relay **Q22**.

This is energized by a supply controlled by the ignition protected by fuse **F4** housed in fuse box **G1** or by fuse **G389** (10A) (see wiring diagrams for various engine types).

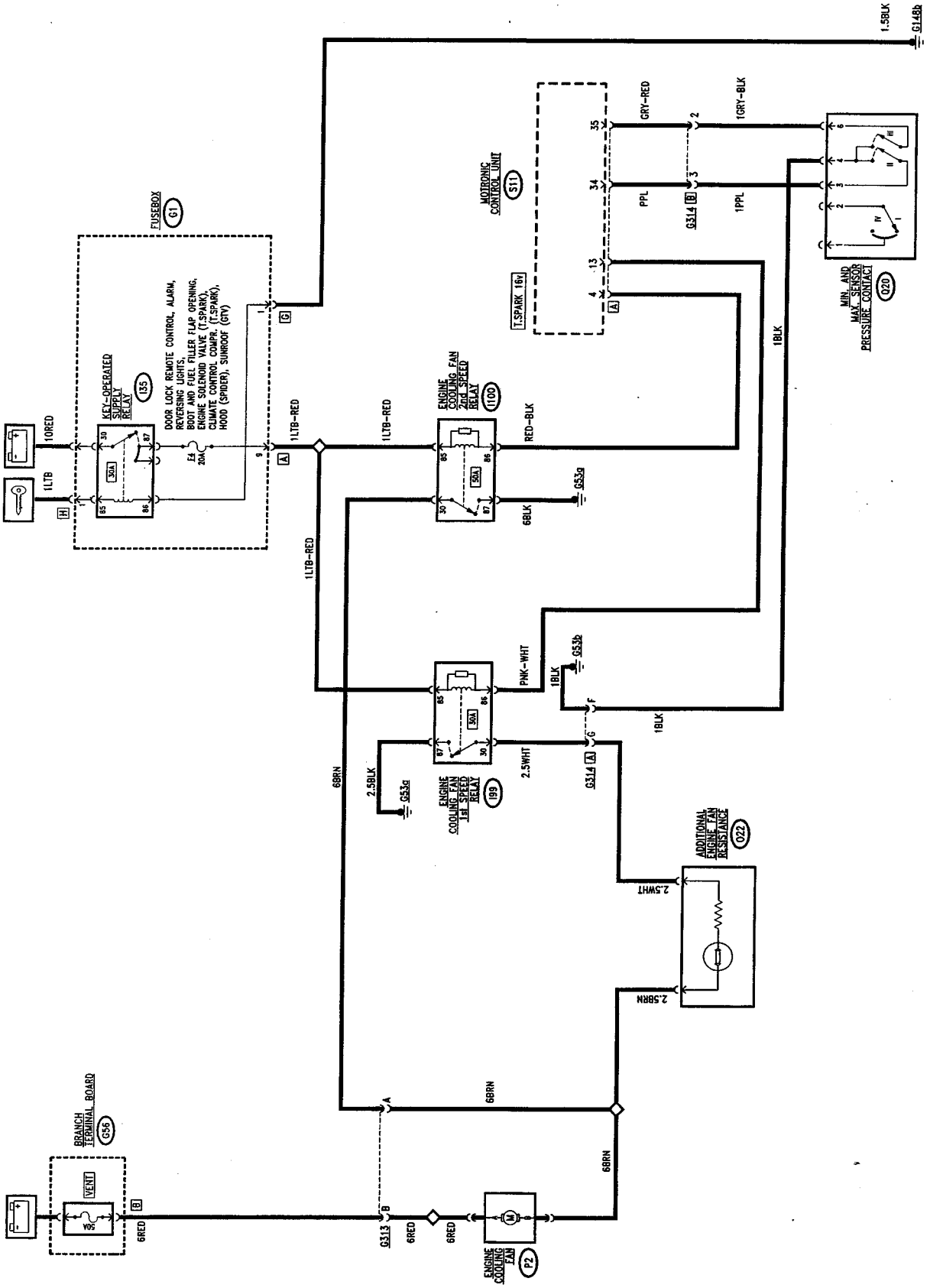
Starting from October 2000 (EURO 3 versions) this supply arrives from the line for fuse **S45**, supplied by the relay **S41** after the go ahead from the injection control unit **S11**.

Up to November '99 and from November '99, for the T.SPARK only, the power line will arrive directly from the battery (protected by the special VENT fuse in the MAXI FUSE box **G56**).

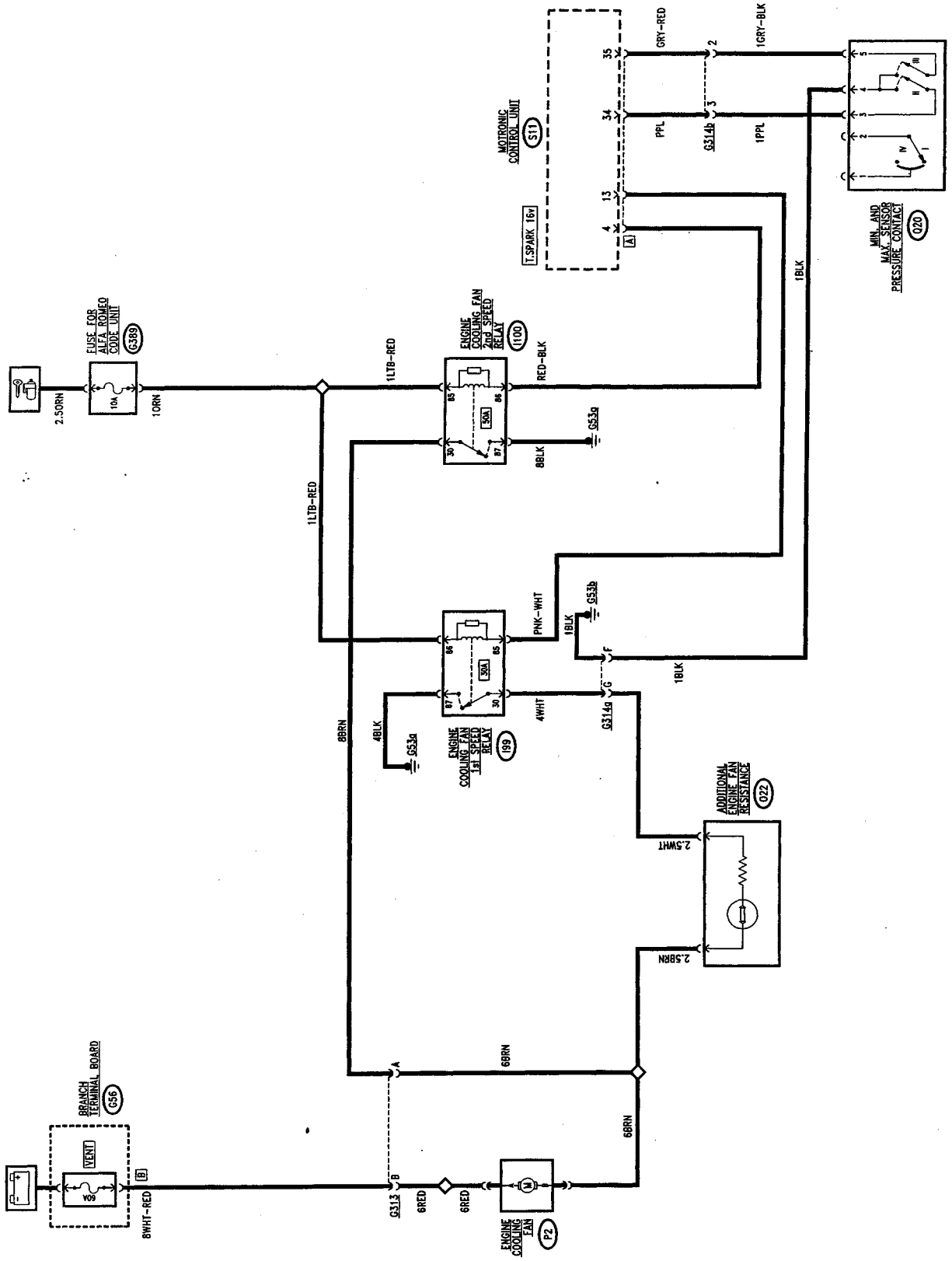
The relay is controlled by an earth signal from injection ECU **S11**. This enables compressor operation if the signal is received from climate control ECU **Q21**, which - in turn - must have been enabled by the hood closed switch **H61** (Spider only). This signal also crosses pressure switch **Q20** which cuts compressor operation if the pressure is either too high or too low.

ENGINE COOLING FANS CONTROL

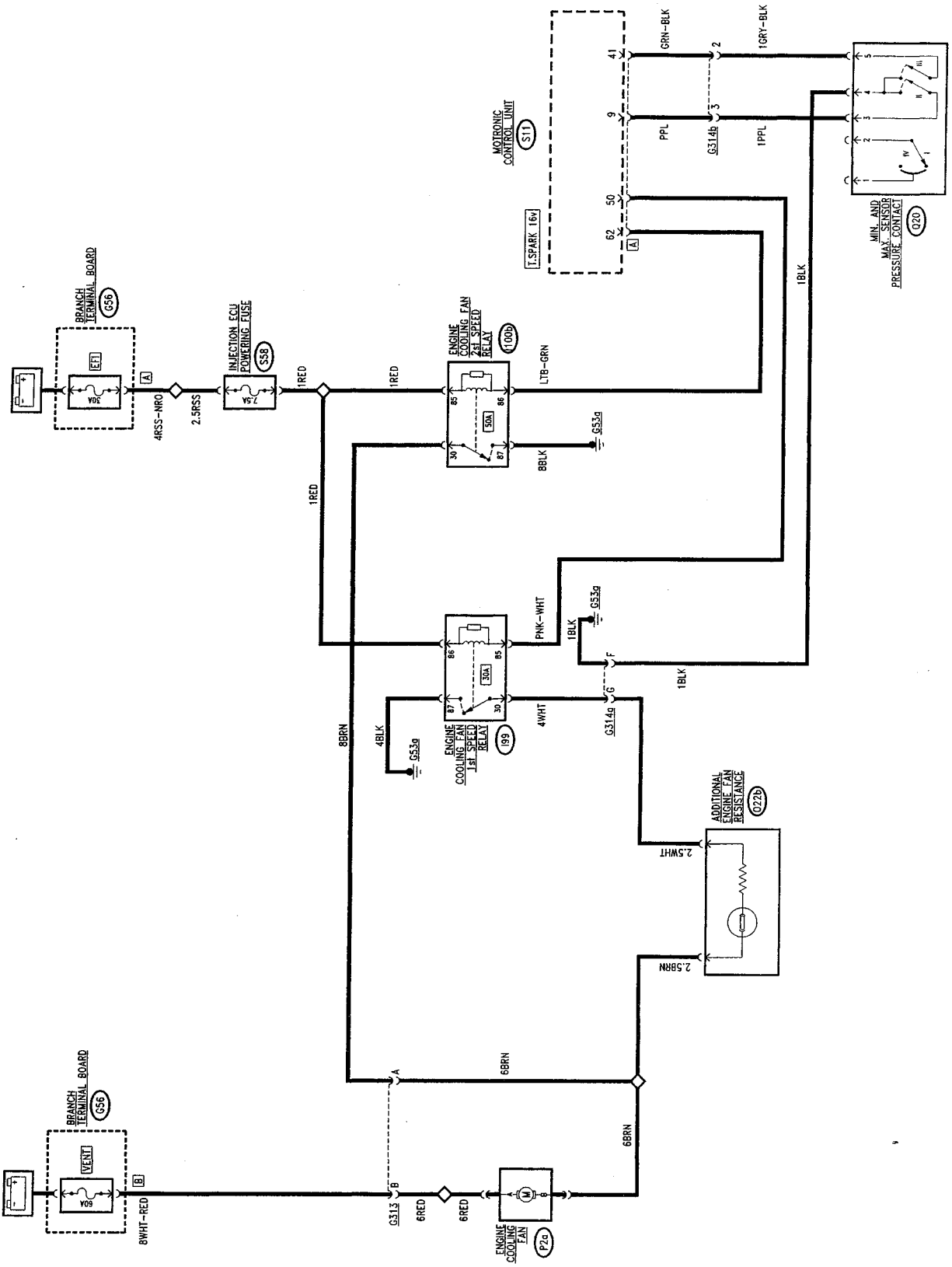
Wiring diagram (T.SPARK 16V engines)



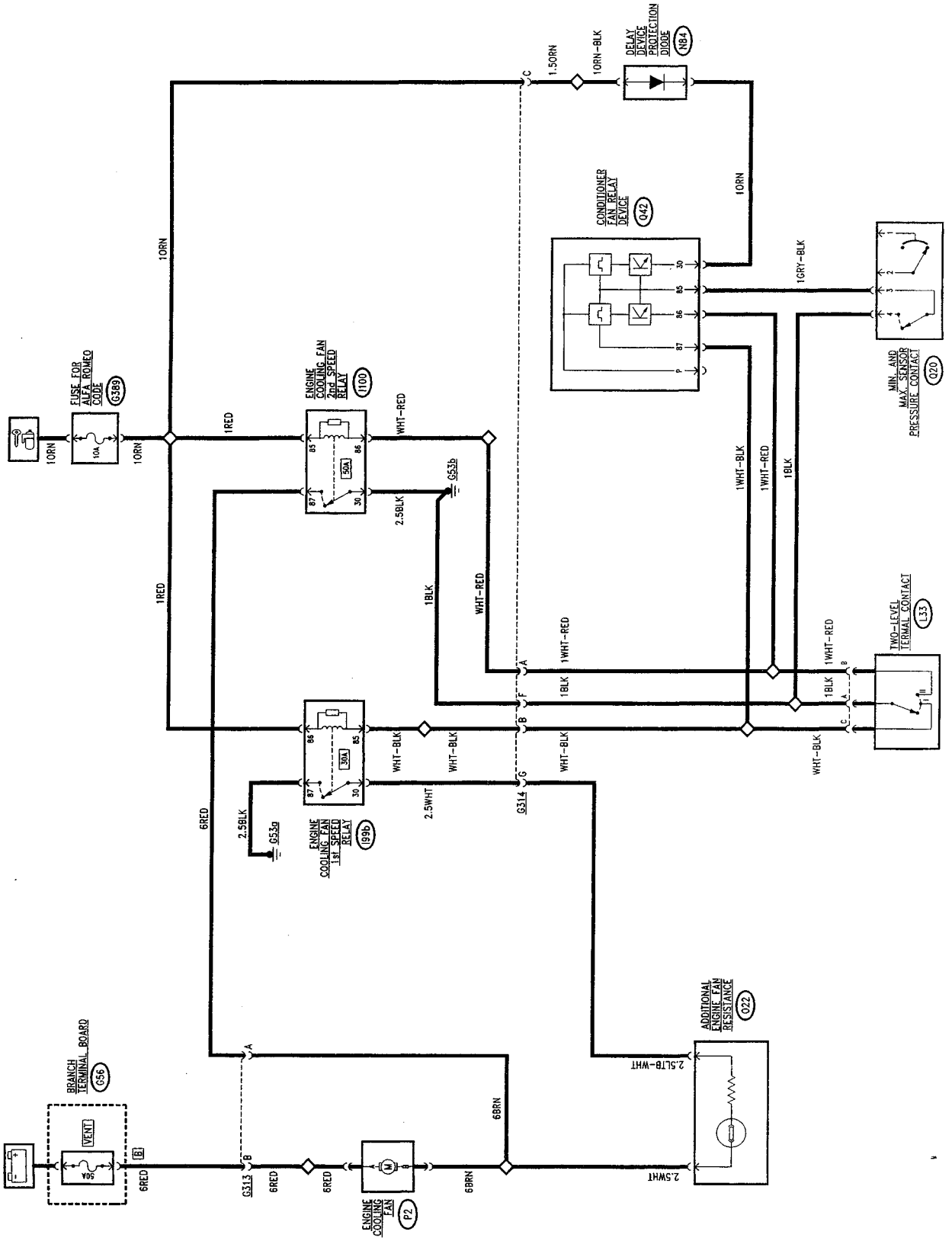
Wiring diagram (T.SPARK 16V engines) (from November '99)



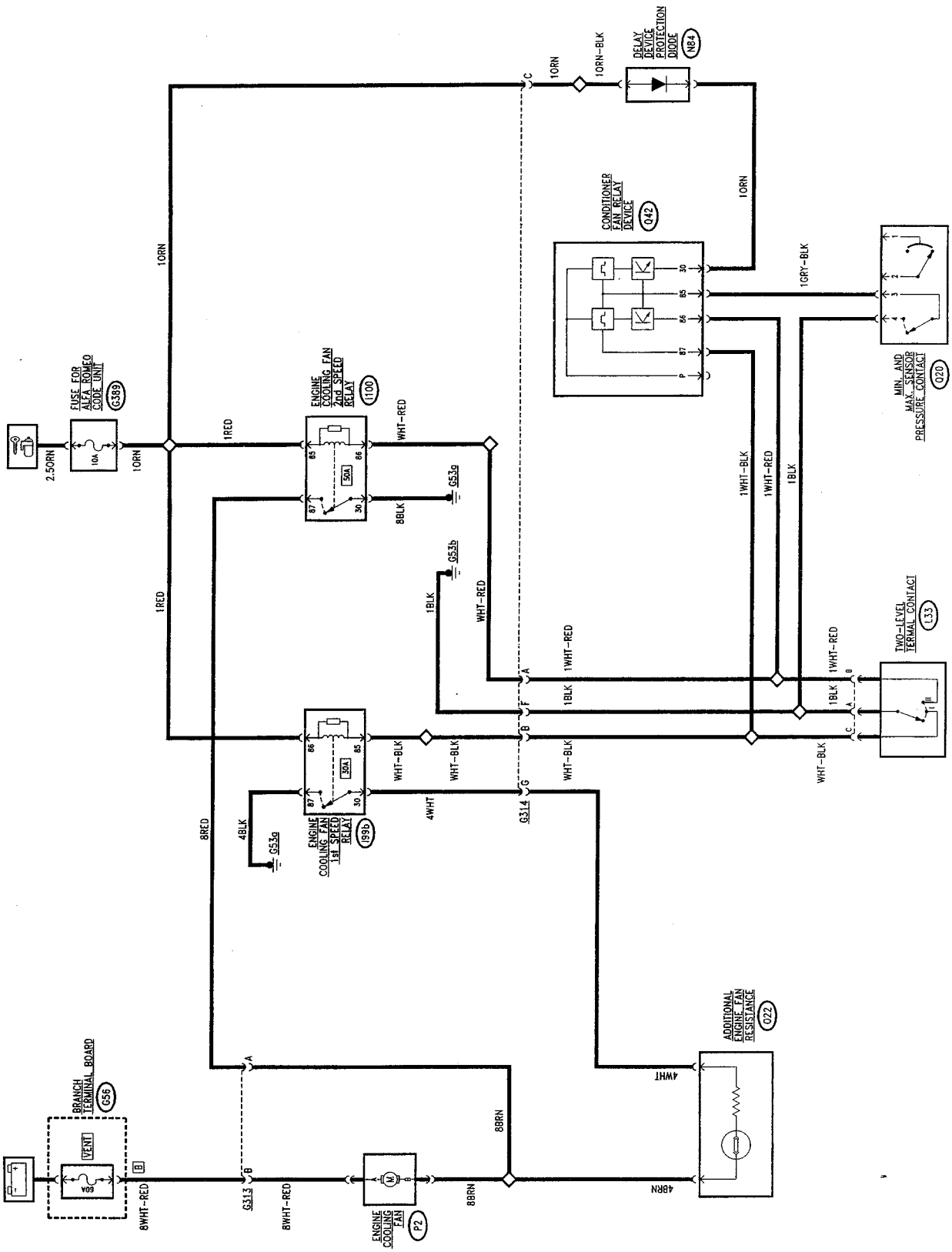
Wiring diagram (T.SPARK 16V engines - starting from October 2000)



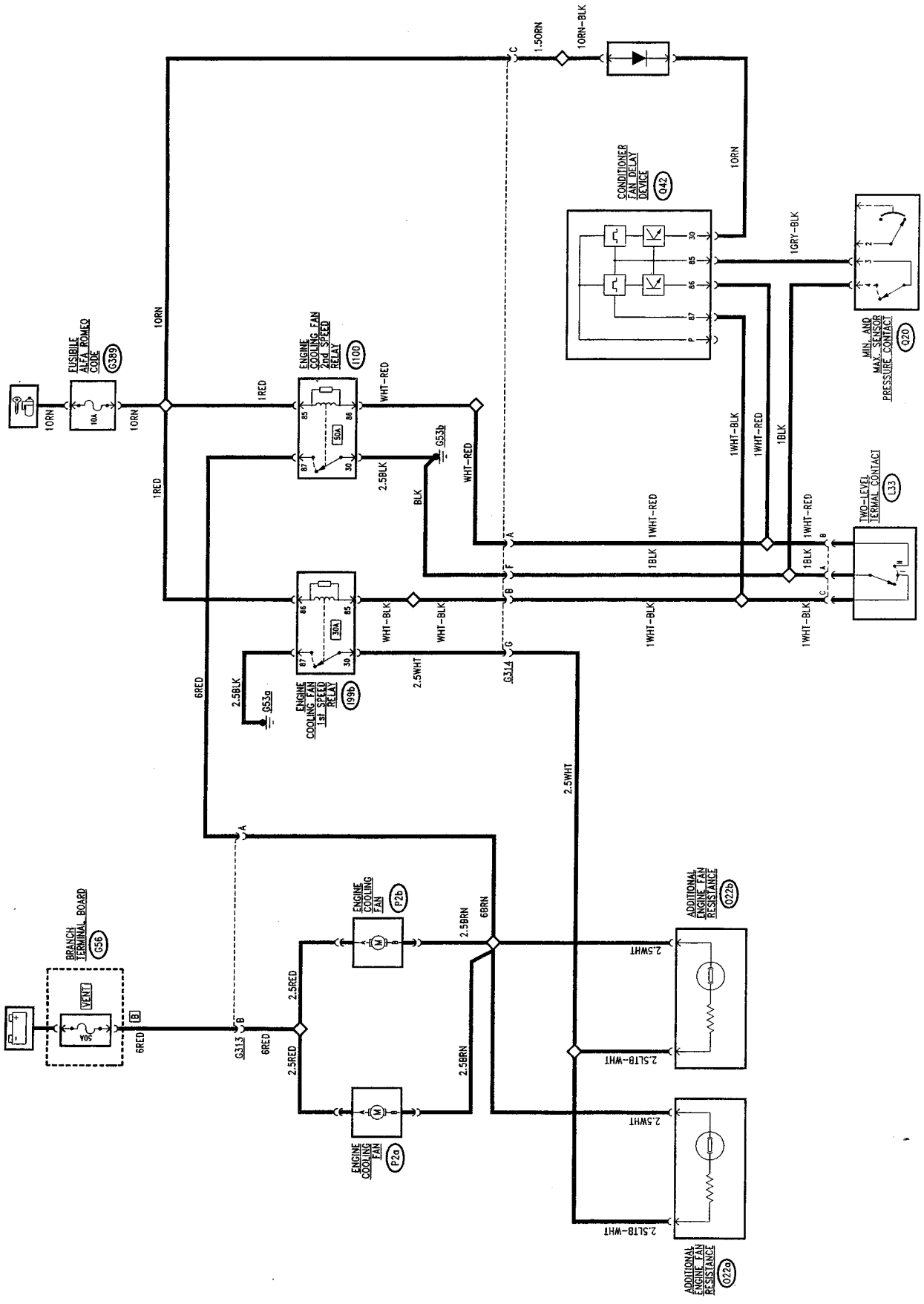
Wiring diagram (3.0 V6 engine)



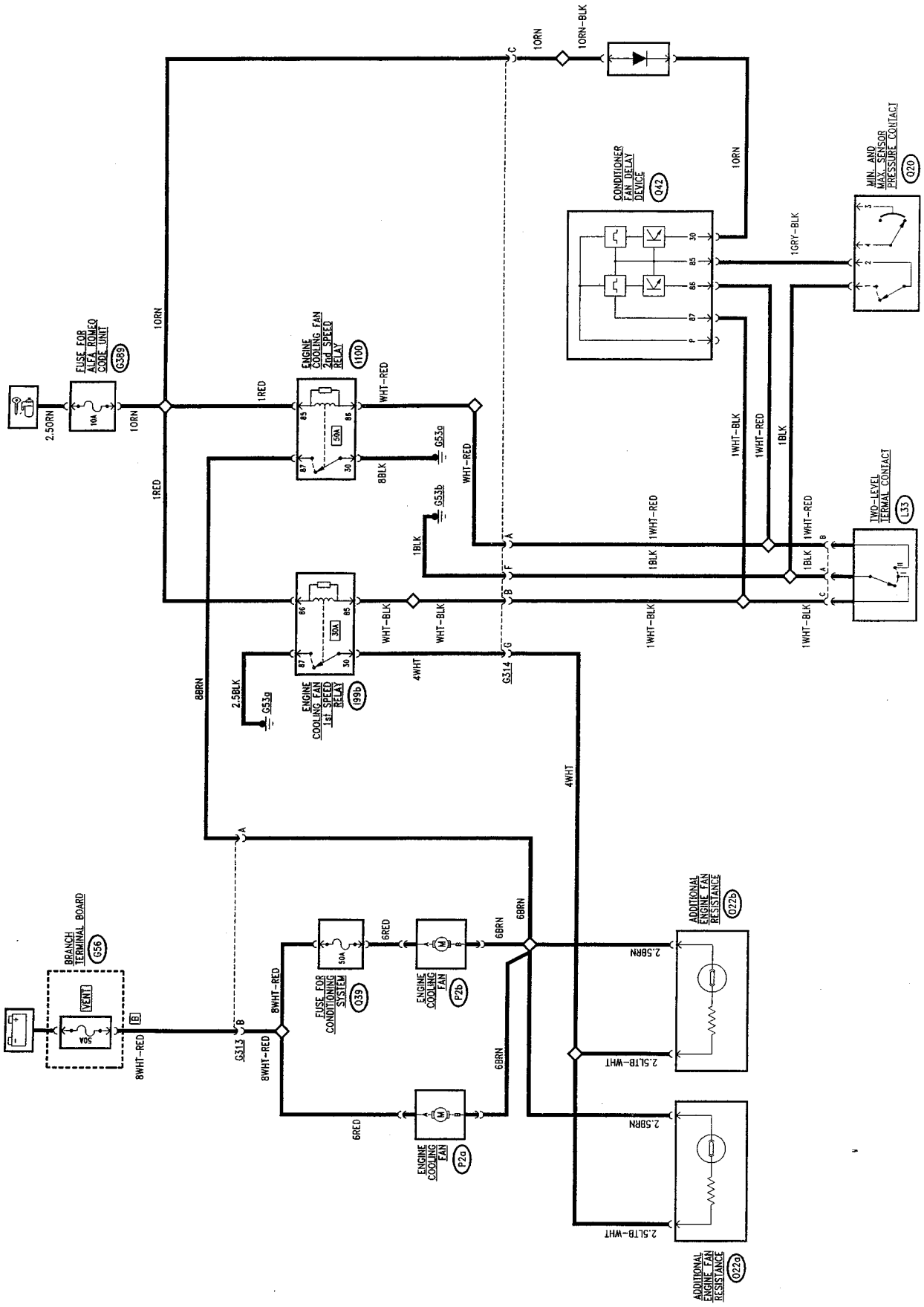
Wiring diagram (3.0 V6 engine) (from November '99)



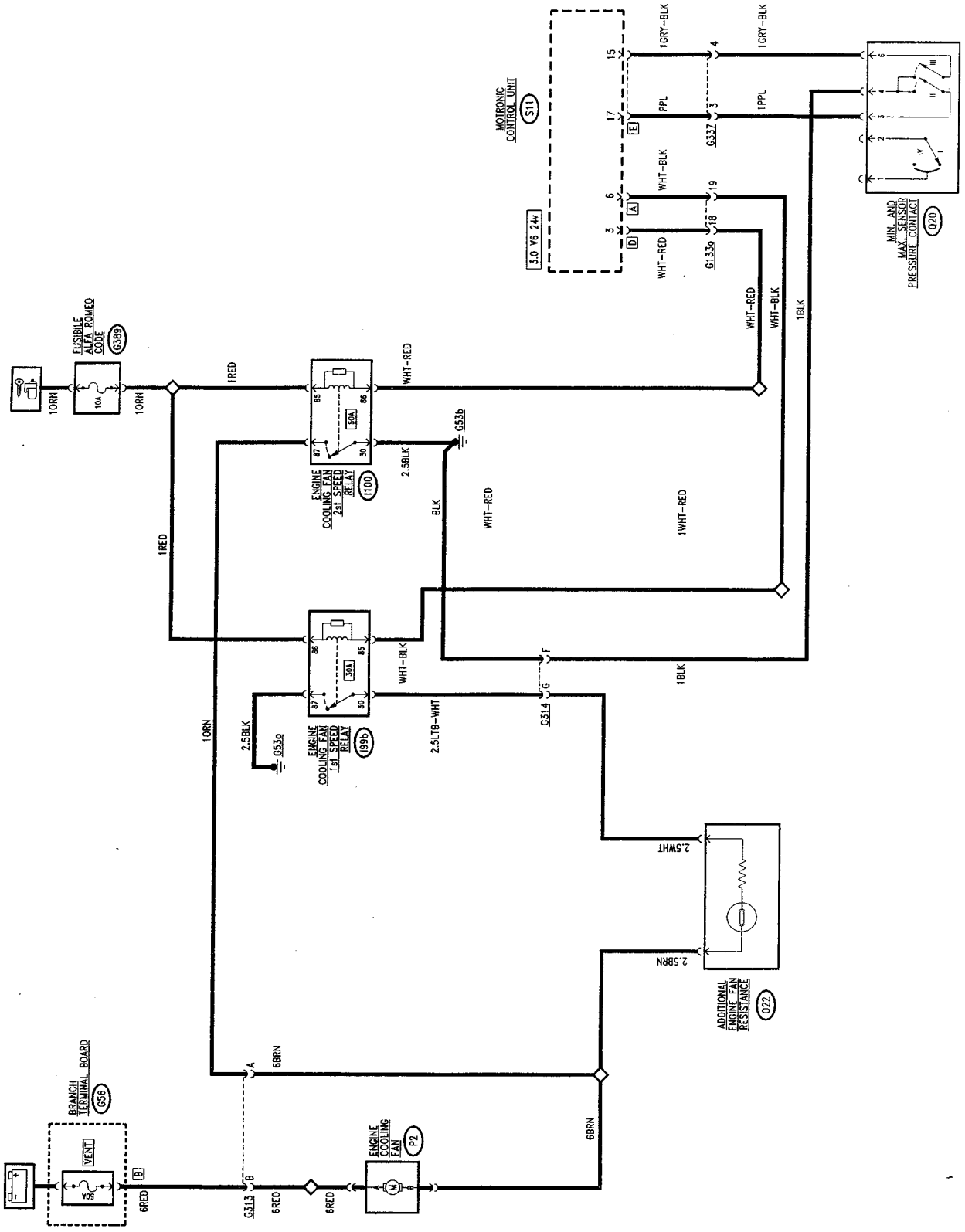
Wiring diagram (2.0 V6 TB engine)



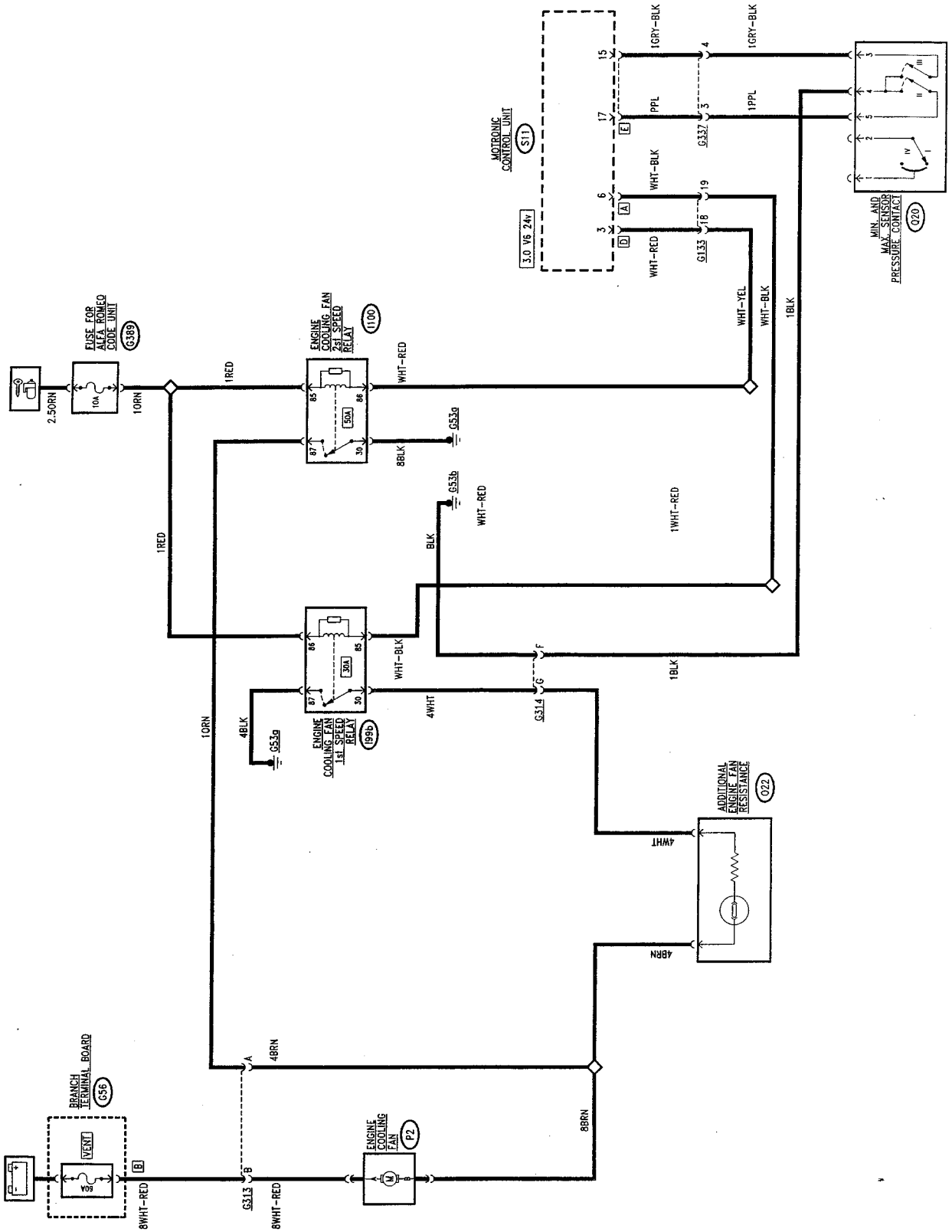
Wiring diagram (2.0 V6 TB engine) (from November '99)



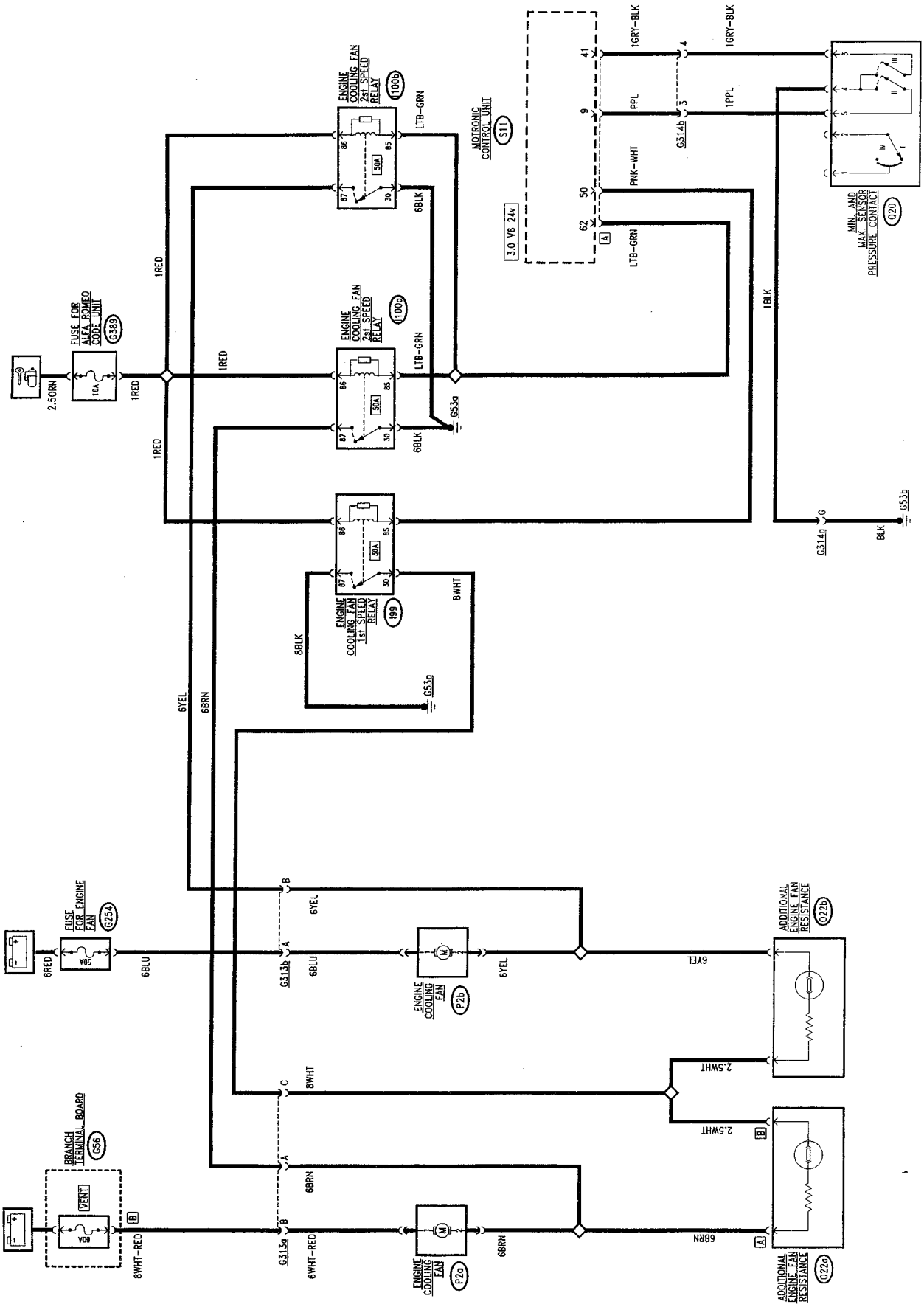
Wiring diagram (3.0 V6 24V engine)



Wiring diagram (3.0 V6 24V engine) (starting from November '99)



Wiring diagram (3.0 V6 24V engine - starting from October 2000)



Functional description

(TS 16V and 3.0 V6 24V engines up to September 2000)

Fan **P2** ensures the required engine radiator and climate control system condenser cooling ventilation. The fan is constantly power by the battery via the line protected by MAXI FUSE VENT in **G56**. It is operated directly by an earth signal (2nd speed) or via additional resistance **O22** (1st speed) and is fitted with a safety thermostat.

The injection ECU controls the engine coolant and climate control fluid cooling fan. For this reason, the traditional thermostat switch located on the basis of the radiator has been eliminated. According to the engine temperature - measured by the ECU by means of a specific sensor - the fan is operated at two speeds: a "low" signal (earth) controls first speed relay **I99** and another "low" signal (earth) controls the second speed relay **I100**. The two relays are ignition switch powered via fuse **F4** in **G1** (T.SPARK) (only up to November '99) or individual fuse **G389** or **S58**.

Also pressure switch **Q20** sends specific fan operation signals to the ECU if the coolant pressure in the circuit exceeds the following threshold:

- over approximately 15 bar, first speed operation signal is send;
- over approximately 20 bar, second speed operation signal is send.

(3.0 V6 24V engine - from October 2000)

Two electric fans **P2a** and **P2b** guarantee the ventilation for cooling the engine radiator and the air conditioning system condenser.

NOTA BENE: the two fans are in parallel and are therefore always operated together, according to the same logic.

The fans are always supplied by the battery voltage via the line protected by the VENT MAXIFUSE of **G56** and maxifuse **G254**; they are therefore activated by an earth control signal: this signal arrives directly (2nd speed) or via the additional resistance **O22a** or **O22b** (1st speed), equipped with a safety fuse.

The injection control unit manages the fan for cooling the engine coolant and the air conditioning system coolant.

This dispenses with the thermal contact usually positioned on the radiator. According to the temperature of the engine, measured by the control unit using a special sensor, the two fan speeds are controlled: a "low" (earth) signal which controls the relay for the first speed **I99** and another "low" (earth) signal which controls the two relays for the second speed **I100a** and **J100b**, one for each fan.

The three relays are supplied by the line for fuse **S58**.

The pressure switch Q20 sends special signals to the control unit for engaging the fans if the pressure of the coolant in the circuit goes beyond certain levels:

- beyond about 15 bar a signal is sent for engaging the 1st speed;
- beyond about 20 bar a signal is sent for the 2nd speed.

(2.0 V6 TB engines)

Two fans **P2a** and **P2b** ensure the required engine radiator and climate control system condenser cooling ventilation.

IMPORTANT: The two fans are in parallel and are always operated together according to the same logic.

The two fans are always supplied at the battery voltage: the line is protected by the VENT MAXIFUSE of **G56** and, from November '99, by fuse **Q39**; they are therefore activated by an earth signal: this signal arrives directly (2nd speed) or through the additional resistances **O22a** and **O22b** (1st speed), fitted with a safety thermal fuse.

Delay device **Q42** controls the gradual operation of the fans at the two speeds also by means of relays **I99b** and **I100**. The delay device works according to the following logic:

Ignition switch voltage (line protected by individual fuse **G389**) powers delay device **Q42** coil and electronic devices (pin 30) and relays **I99b** and **I100**. The delay device **Q42** coil is energised by an earth signal (pin 85) from trinary pressure switch **Q20**. This immediately sends an earth signal (pin 87) which energises relay I99b and sends the earth signal to the two engine cooling fans **P2a** and **P2b** via additional resistance **O22a** and **O22b**: 1st speed.

After approximately 8-12 seconds, if the trinary signal persists, the delay device operates the fans at second speed: in fact, if the earth signal to pin 30 is cut, an earth signal is sent from pin 86 which energises relay **I100** and sends an earth signal directly to the two engine cooling fans P2a and P2b: 2nd speed. When the pressure switch signal ceases, the two fans are switched off.

The two fans are operated at the two different speeds also by the two level thermostat switch **L33** which checks the engine radiator coolant temperature. When a first level is reached, relay **I99a** is energised and sends an earth signal to the two engine cooling fans **P2a** and **P2b** via resistance **O22a** and **O22b**: 1st speed.

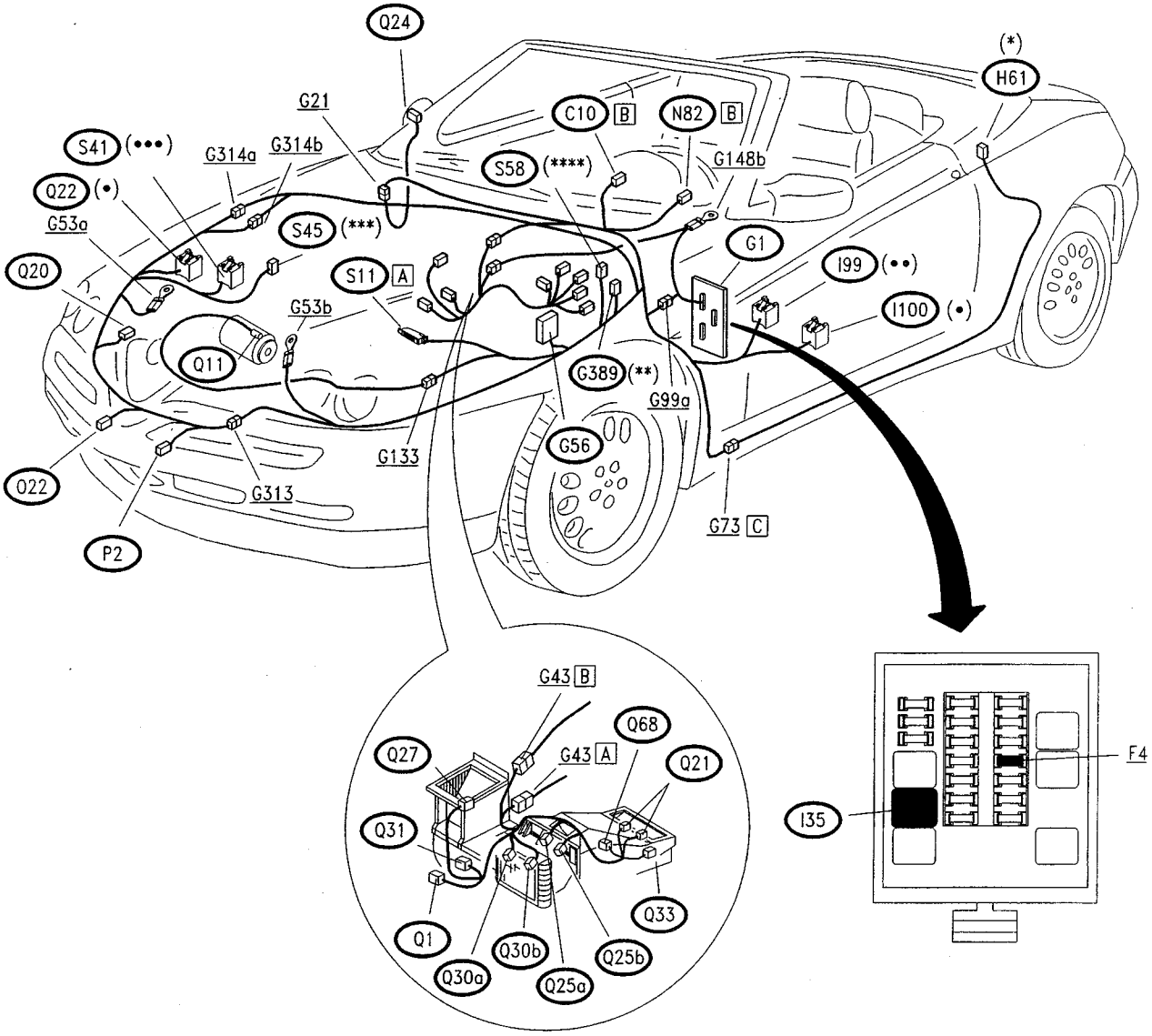
When the second temperature level is reached, relay I100 is energised and sends the earth signal directly to the engine cooling fans **P2a** e **P2b**: 2nd speed.

(3.0 V6 engines)

A single fan **P2** ensures the required engine radiator and climate control system condenser cooling ventilation.

The remaining logic is identical to that described for 2.0 V6 TB engines.

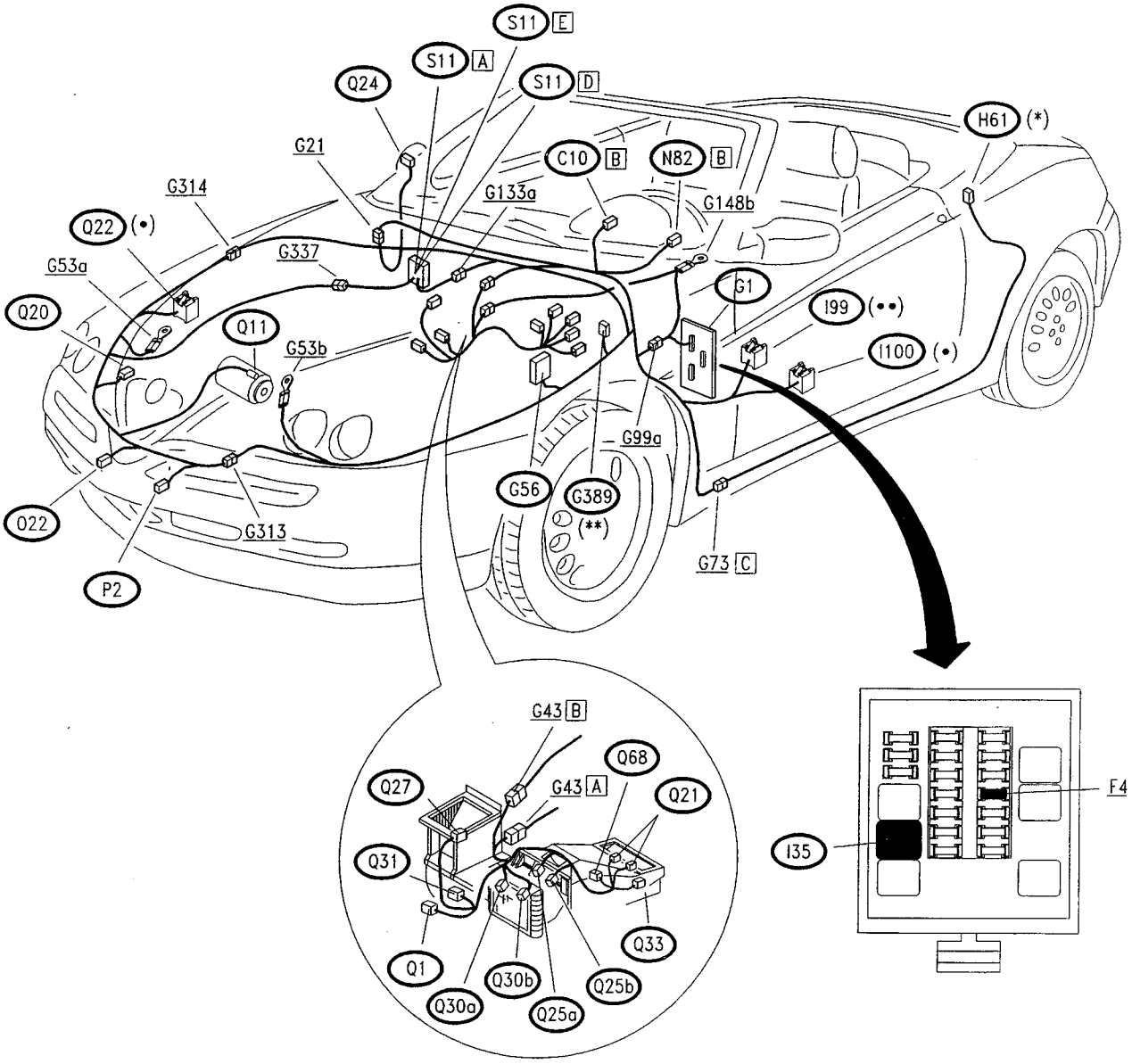
LOCATION OF COMPONENTS (T.SPARK 16V engines)



(*) Only SPIDER
(**) Red fuseholder
(***) Blue fuseholder
(****) Brown fuseholder

(•) Black Base
(••) Yellow Base
(•••) Red Base

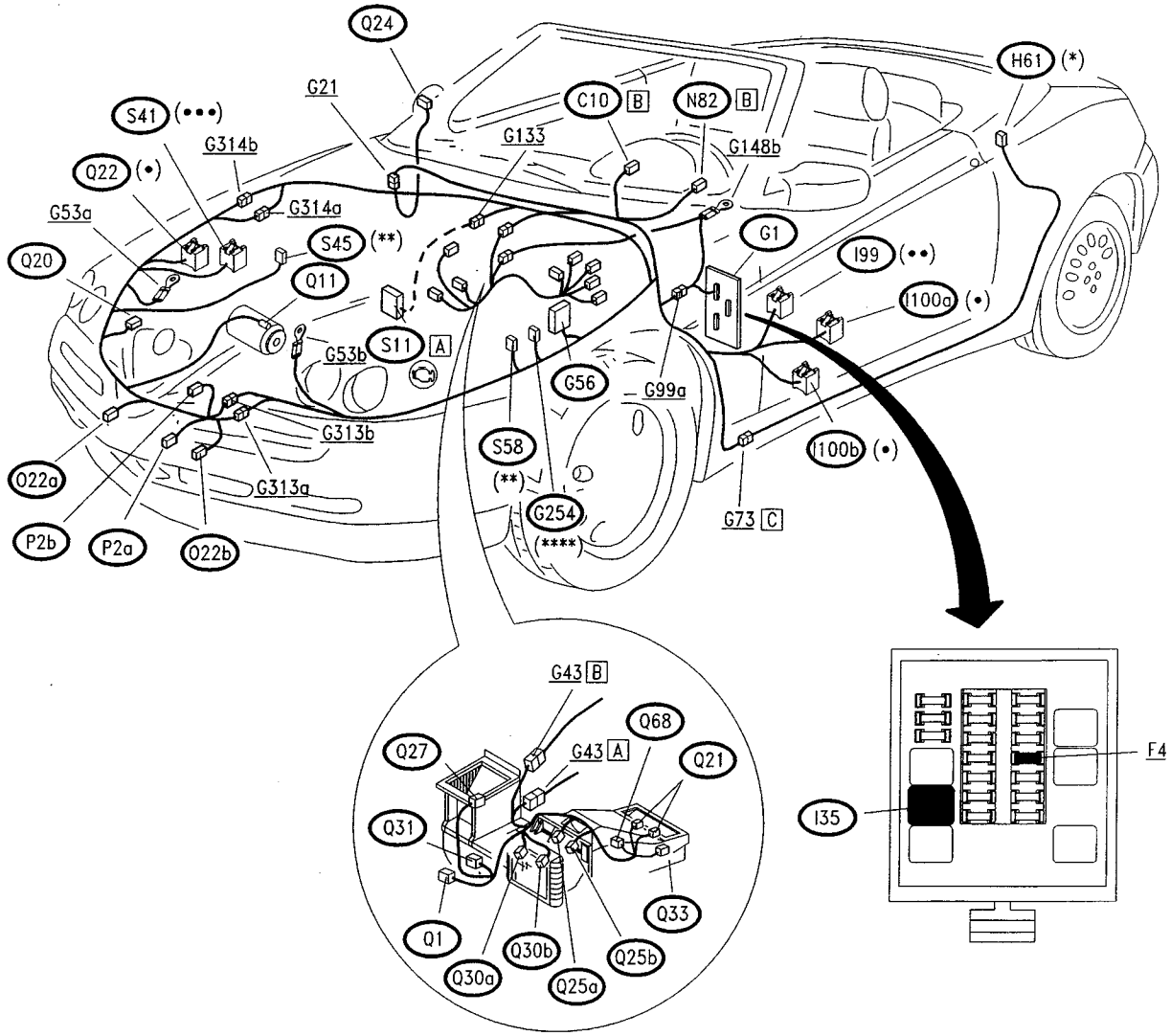
LOCATION OF COMPONENTS (3.0 V6 24V engine - up to September 2000)



(*) Only SPIDER
(**) Red Fuseholder

(•) Black Base
(••) Yellow Base

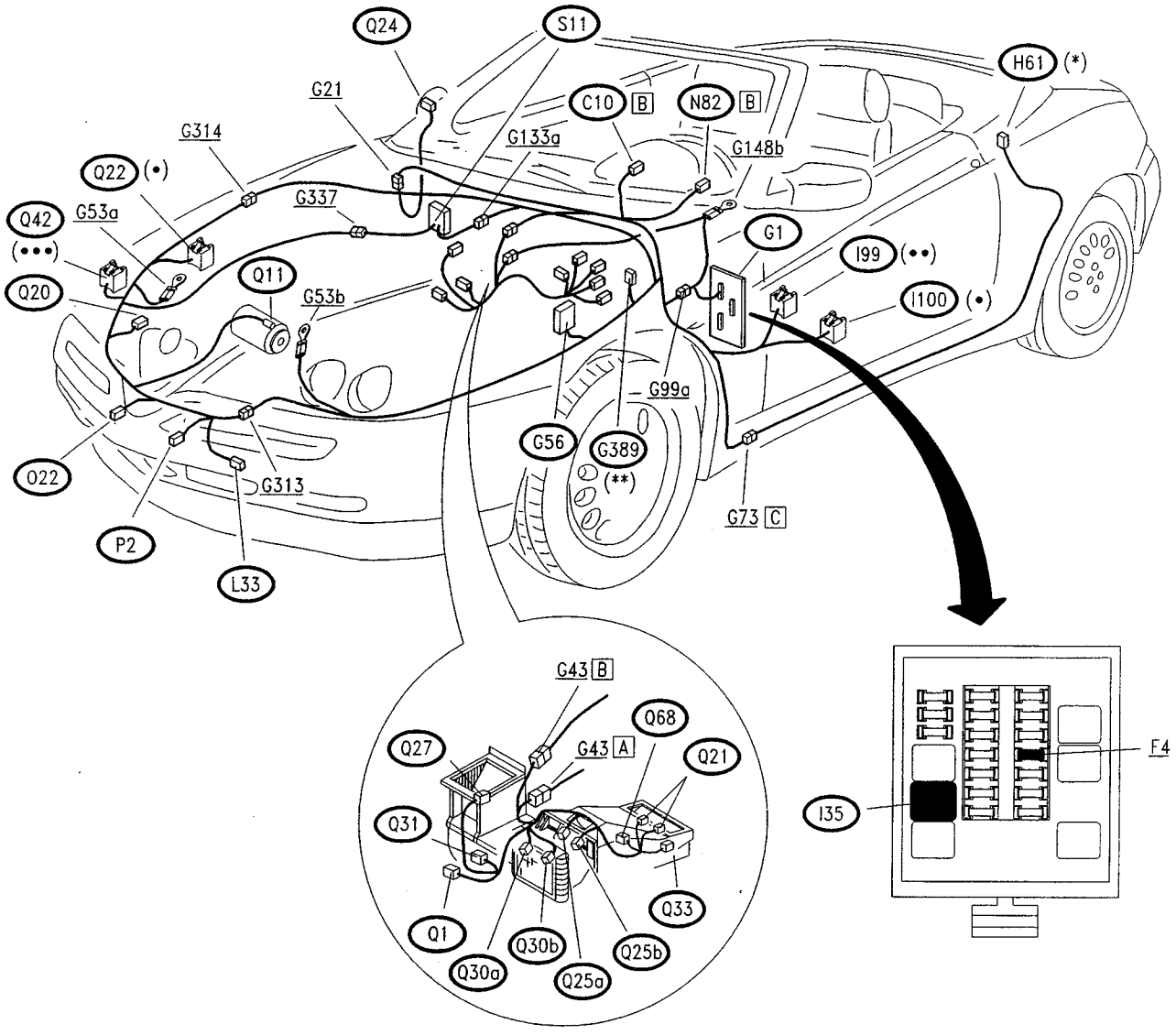
LOCATION OF COMPONENTS (3.0 V6 24V engine - starting from October 2000)



(*) Only SPIDER
(**) Red fuseholder
(***) Brown fuseholder
(****) Black fuseholder

(•) Black Base
(••) Yellow Base
(•••) Red Base

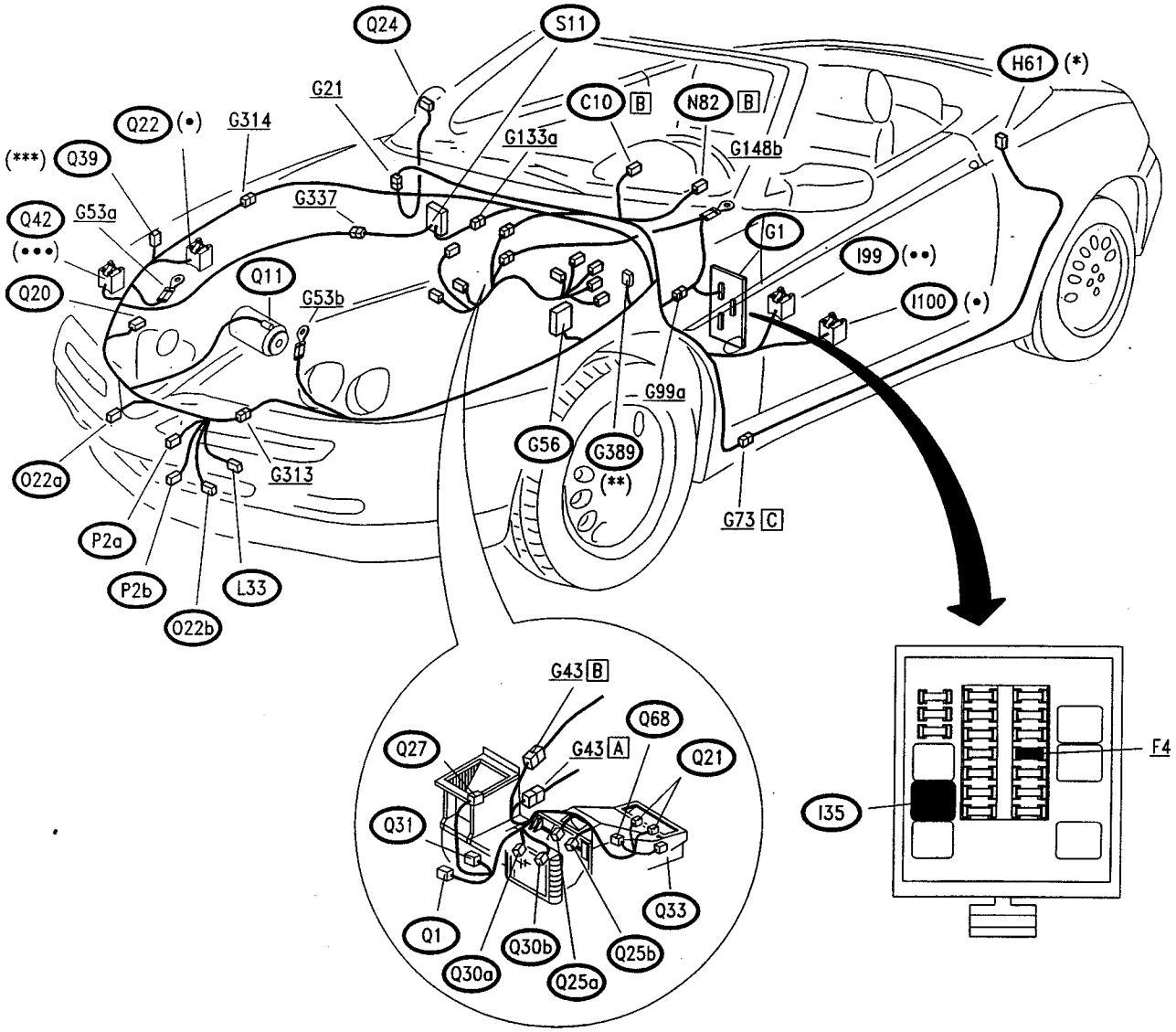
LOCATION OF COMPONENTS (3.0 V6 engine)



(*) Only SPIDER
(**) Red Fuseholder

(•) Black Base
(••) Yellow Base
(•••) White Base

LOCATION OF COMPONENTS (2.0 V6 TB engine)



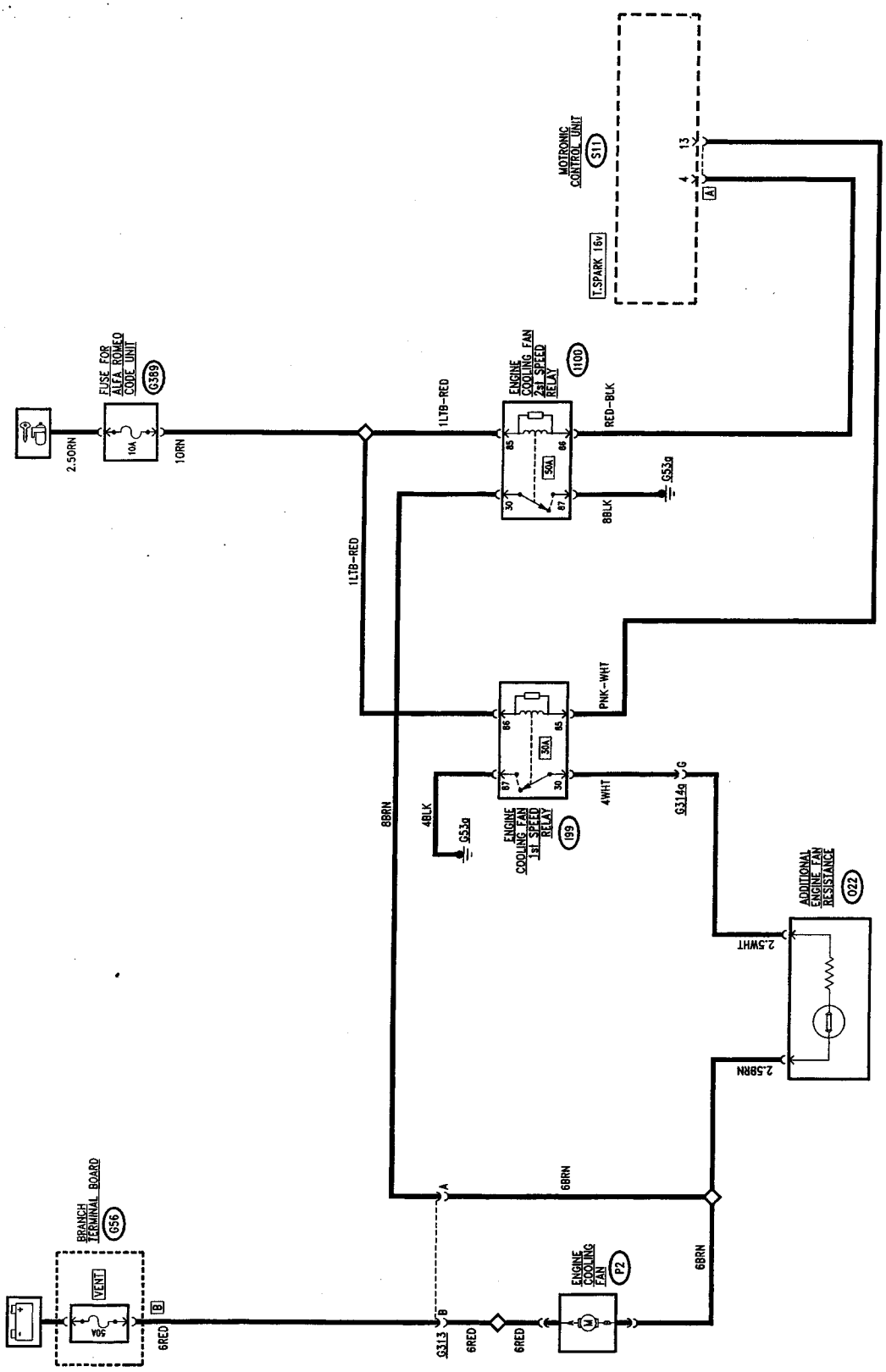
(*) Only SPIDER
(**) Red Fuseholder
(***) Black Fuseholder (from November '99)

(•) Black Base
(••) Yellow Base
(•••) White Base

ENGINE COOLING
(versions with heater)

INDEX

WIRING DIAGRAM (2.0 TS 16v)



GENERAL DESCRIPTION

A fan makes it possible to increase the dissipation of heat by the engine coolant radiator, thanks to the injection control unit which manages the temperature of the coolant and operates the fan at two different speeds: the first is implemented at an initial coolant temperature level; the second speed is engaged at a higher temperature.

N.B. This wiring diagram only refers to vehicles with heaters: for vehicles equipped with air conditioning, see the "engine cooling fan/s" electrical circuit illustrated in the "Air Conditioning" section.

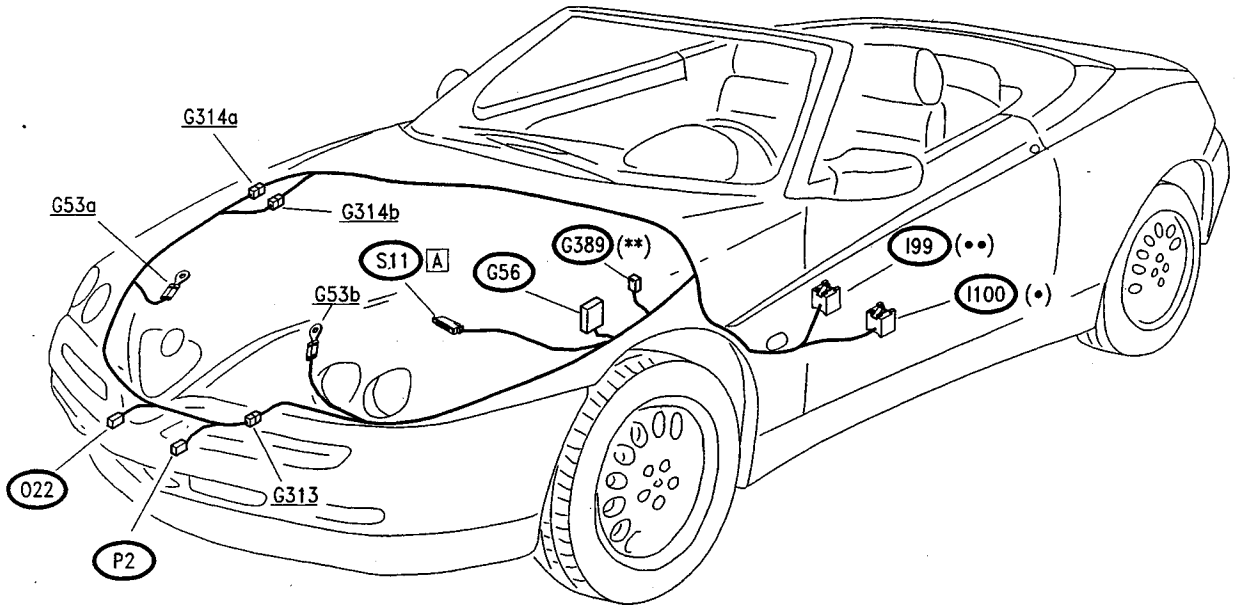
FUNCTIONAL DESCRIPTION

The fan **P2** receives a supply at the battery voltage via the line protected by the VENT MAXIFUSE for **G56** and is therefore operated through an earth at the opposite terminal: if this mass arrives directly from the relay **I100** the 2nd speed is activated; when it arrives from the relay **I99** and passes through the additional resistor **O22**, then the 1st speed is activated.

The fan operates at two different speeds, thanks to an additional resistor, protected internally by a thermal fuse which interrupts the electrical circuit if the temperature exceeds around 126°C.

The injection/ignition control unit **S11** manages the operation of the cooling fan for the engine coolant: according to the temperature of the engine, detected by the control unit via a special sensor, the two fan speeds are operated: a "low" (earth) signal comes out of pin A13 which operates the first speed relay **I99** and a low (earth) signal comes out of pin A4 which controls the relay for the second speed **I100**; the supply for both relays is controlled by the ignition from the line for fuse **G389.**

LOCATION OF COMPONENTS



(**)Red fuse carrier

(•) Yellow socket
(••) Black socket

ALFA ROMEO CODE

INDEX

(*) See prevision information (Spider-Gtv '97)

OPERATION: Anti-theft strategy

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

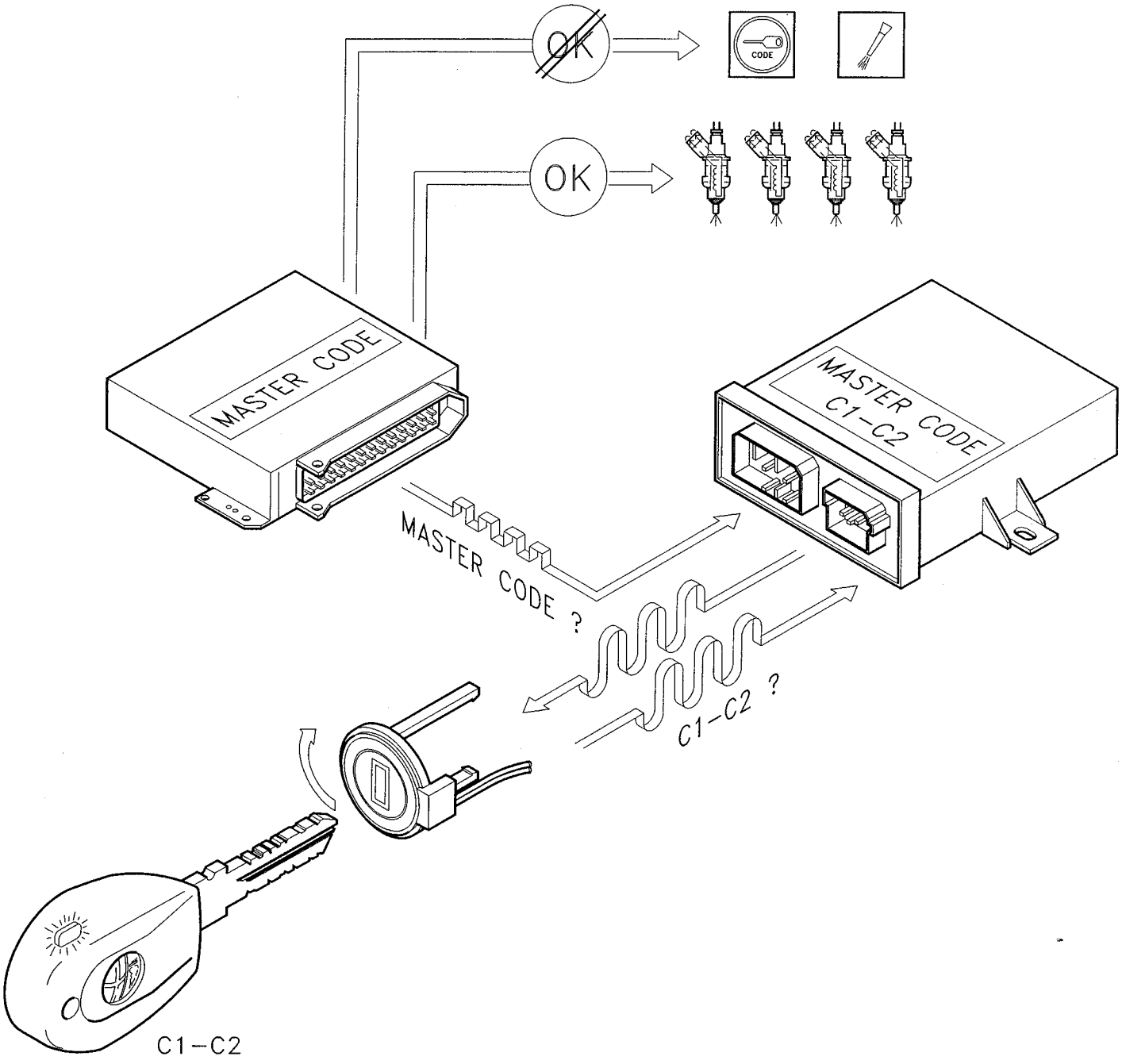
The C.C.E. checks that the code of the key engaged in the ignition lock corresponds to one of the codes contained in its memory.

If the key corresponds to one of the memorised codes:

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

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

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



C1, C2 = key codes

Interaction between key and C.C.E.

When the C.C.E. detects the engagement of the key it sends a signal to the ends of the aerial thereby generating an electromagnetic field.

This way the Transponder coil is inductively connected and it receives the energy to supply the integrated circuit to which it is connected.

At this point the integrated circuit transmits the code.

Sharing of the serial line of the diagnosis functions and the ALFA ROMEO CODE system

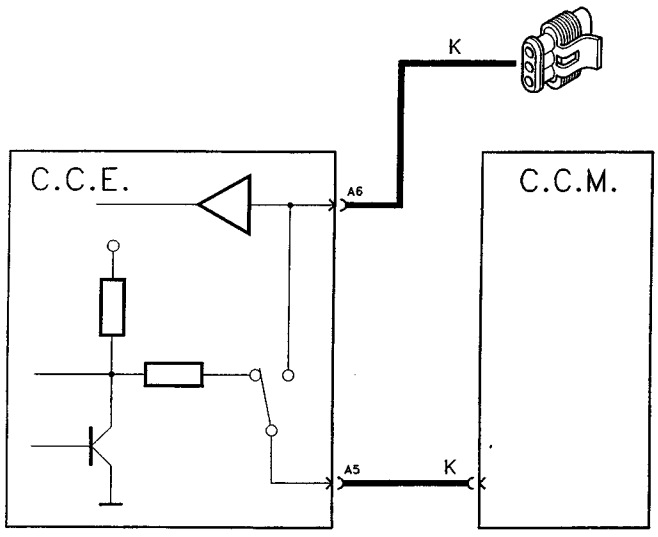
(M3.7 injection - 3.0 V6 engine and ML41 - 2.0 V6 TB engine)

Inside the C.C.E. there is a shunt relay which has the purpose of enabling dialogue between the C.C.M. and the Alfa Tester or the C.C.E. itself.

Pin A5 is usually dedicated to dialogue between the C.C.E. and the C.C.M (see illustration).

Line K of the diagnosis socket is connected to the C.C.E. at pin A6.

The shunt relay is normally in such a position as to allow dialogue between the C.C.E. and the C.C.M (default position).



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

- There is not activity on the serial line between the C.C.E. and the C.C.M.
- A low level (of voltage) is present on pin A6 for a time of between 500ms and 5s (a low level for over 5s is considered as a short circuit towards earth)

The relay returns to the default position when there is no activity on pin A6 for over 30s.

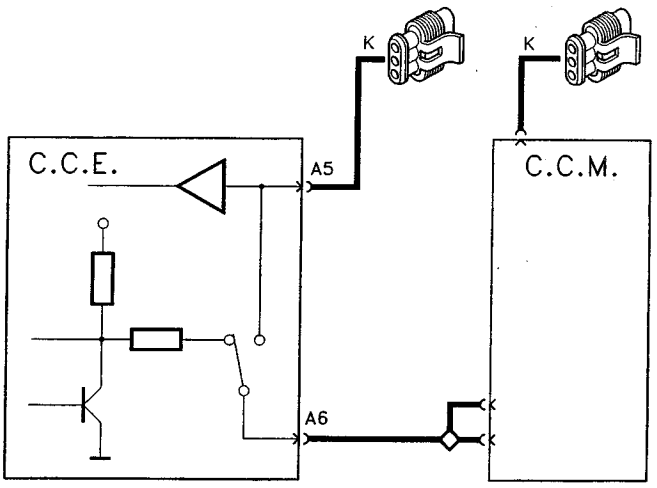
When the control unit detects that the Alfa Tester has been engaged, it turns on the ALFA ROMEO CODE warning light to indicate correct switching of the relay.

Dedicated serial line between C.C.E. and C.C.M.

(ME2.1 injection - 3.0 V6 24V and M1.5.5 engines - TS 16v engine)

Some injection control units have a special provision for a serial line for dialogue between the C.C.M. and the C.C.E., using pin A6 of the C.C.E. (see diagram). Line K of the diagnosis socket is connected separately to the C.C.E. and to the C.C.M.

Diagnosis line K is enabled by the C.C.M. only at the end of dialogue between the C.C.M. and the C.C.E.



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

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

A) Checking the code

C.C.E. memorised C.C.M. memorised:

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

1. It sends the MASTER CODE (crypted), enabling the C.C.M. to start the car

2. It sends a code which inhibits starting the engine (if the key engaged has not been memorised, or it is a key without Transponder, aerial failure, etc.)

3. It does not answer (C.C.E. failure)

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

B) Memorising the codes

These operations concern the system when at least one control unit (C.C.E. or C.C.M) is brand new. The following instances may arise:

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

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

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

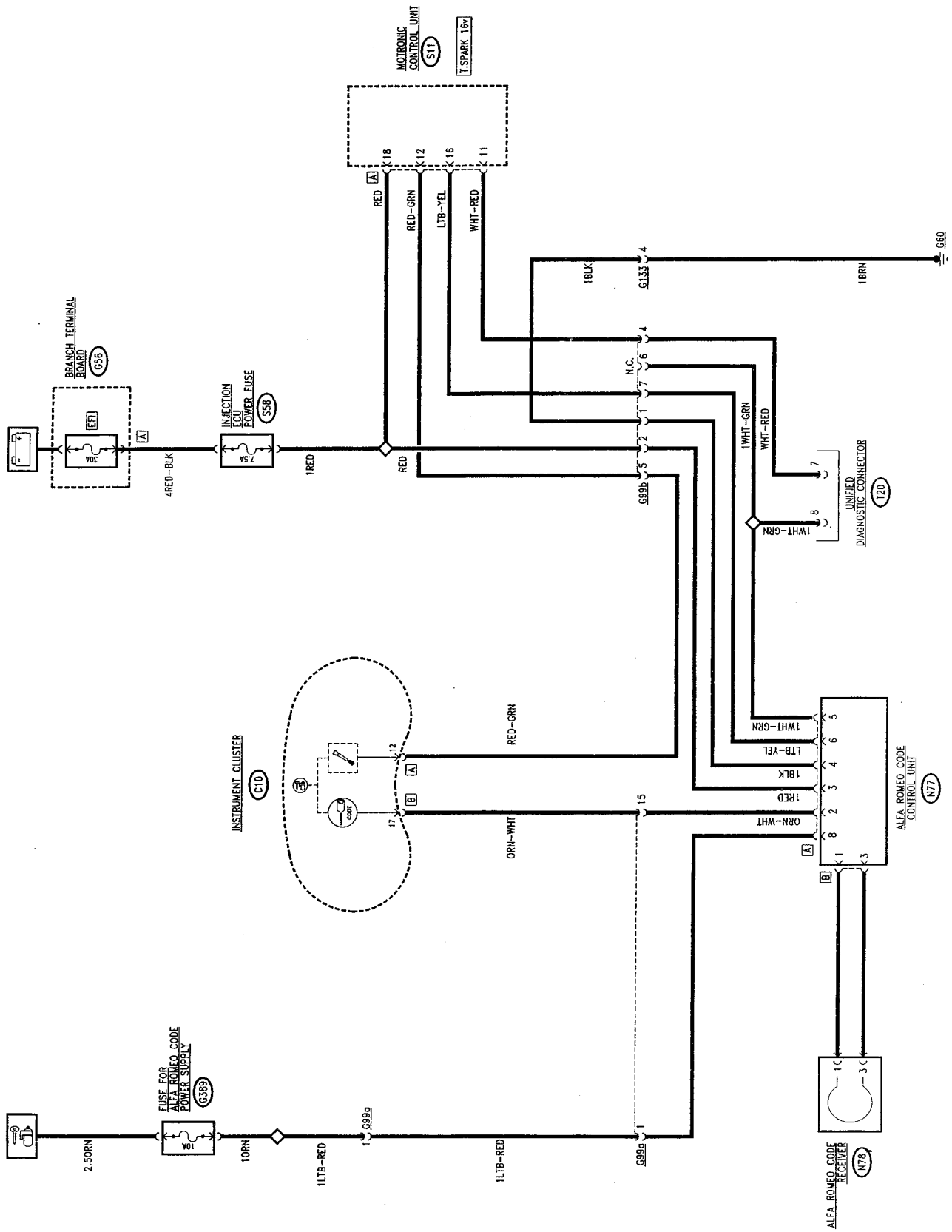
When the ignition key has been turned to MARCIA the C.C.M. will ask the C.C.E. for the MASTER CODE to memorise it; the C.C.E. sends the MASTER CODE only if it has recognised a key among those memorised in the ignition lock: from this moment the MASTER CODE is memorised in the C.C.M. which is thus indissolubly linked with the car.

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

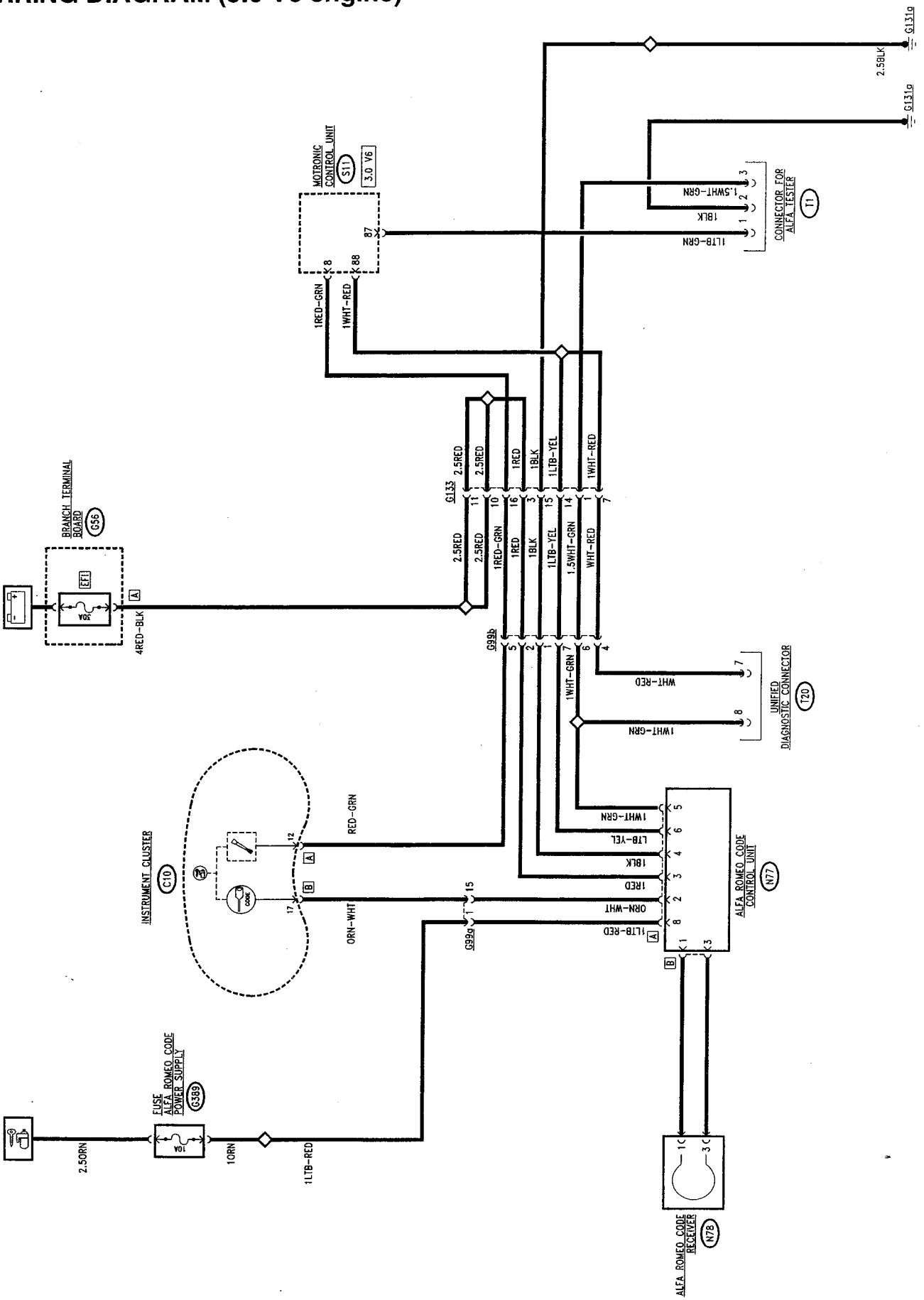
When the ignition key has been turned to MARCIA the C.C.M. asks for the MASTER CODE to be enabled for starting. As the C.C.E. is brand new, it answers sending the universal code, only if it reads a code correctly in the Transponder. (It might be a key without Transponder or with a key with the Tramsponder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

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

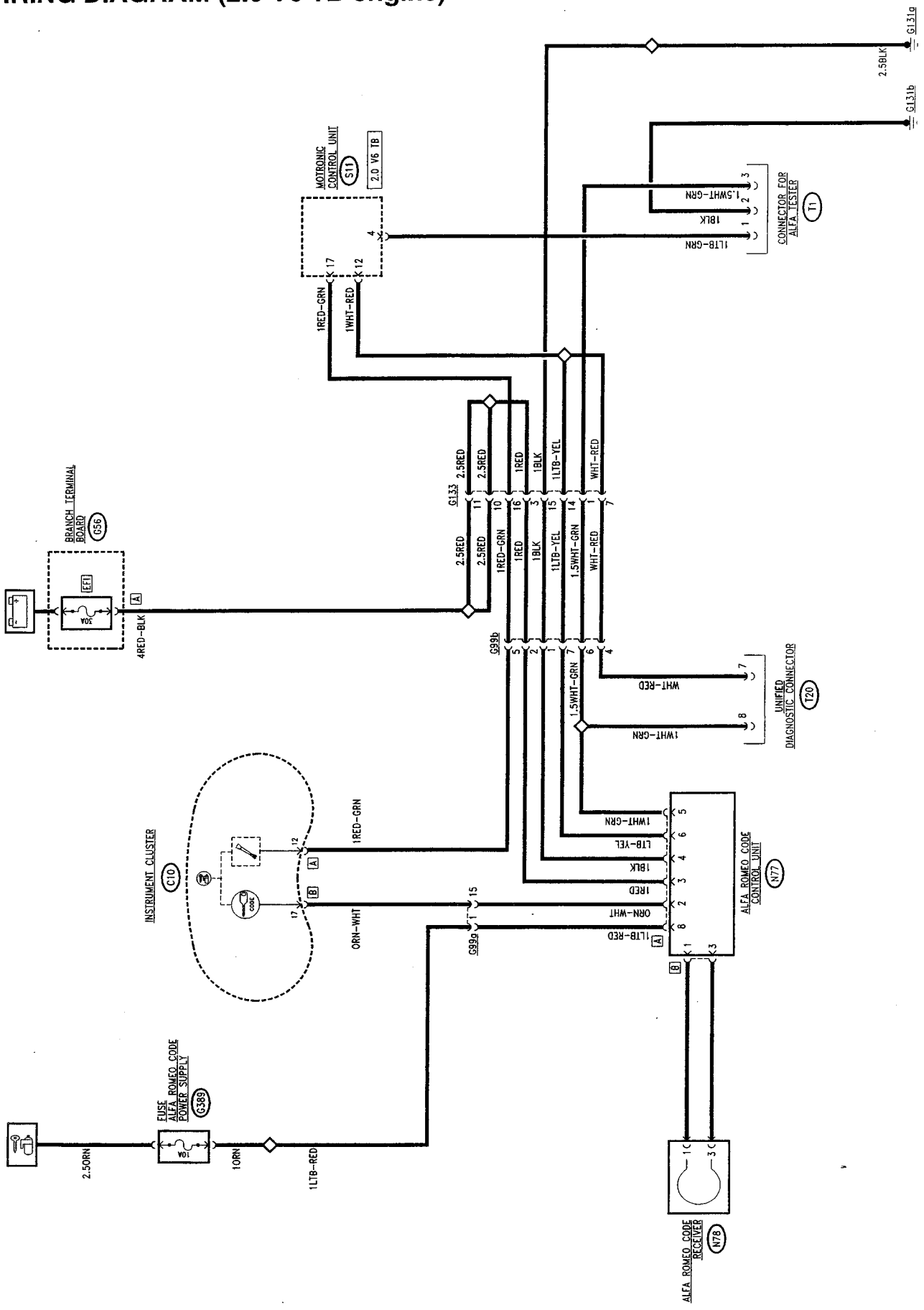
WIRING DIAGRAM (T.SPARK engine - up to September 2000)



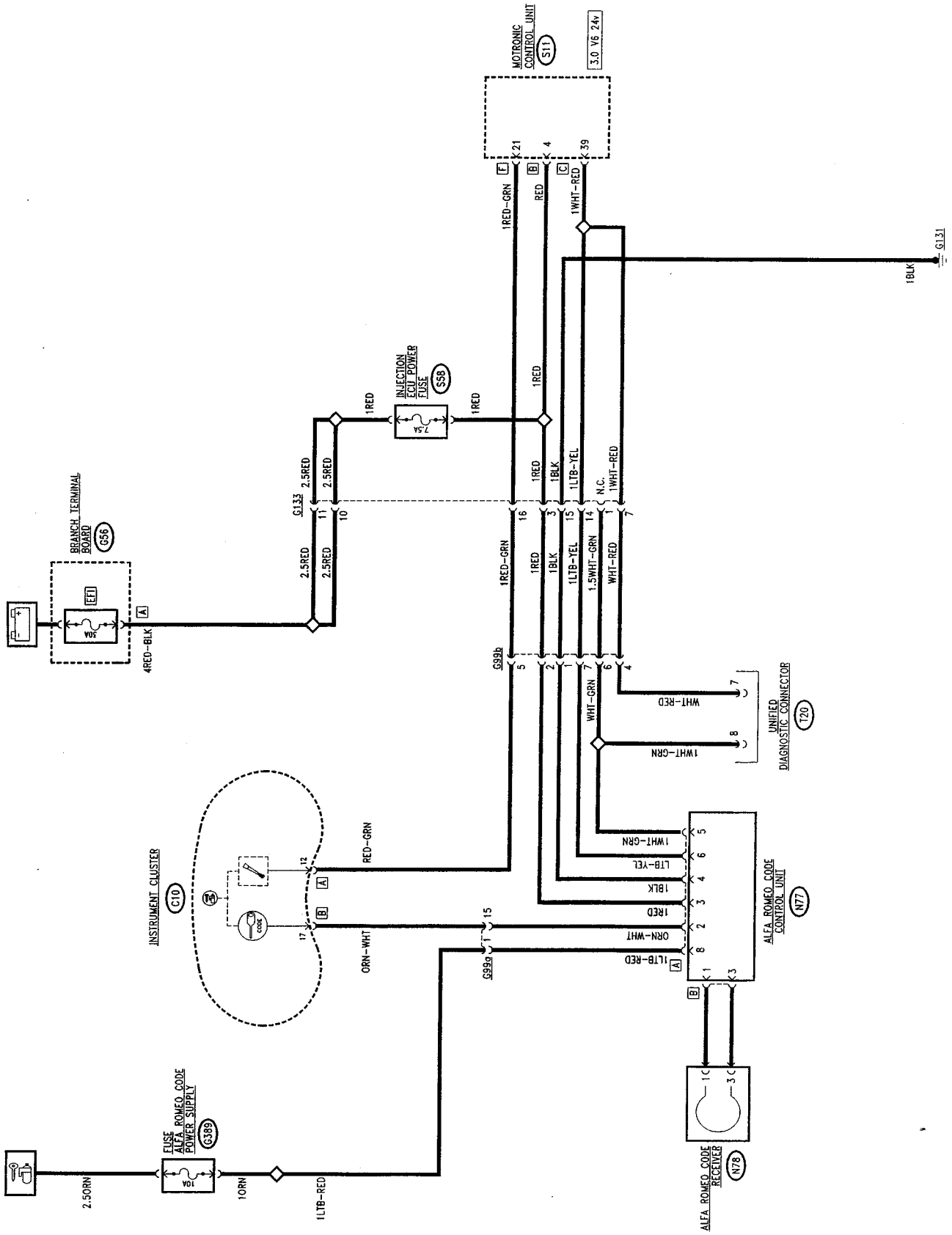
WIRING DIAGRAM (3.0 V6 engine)



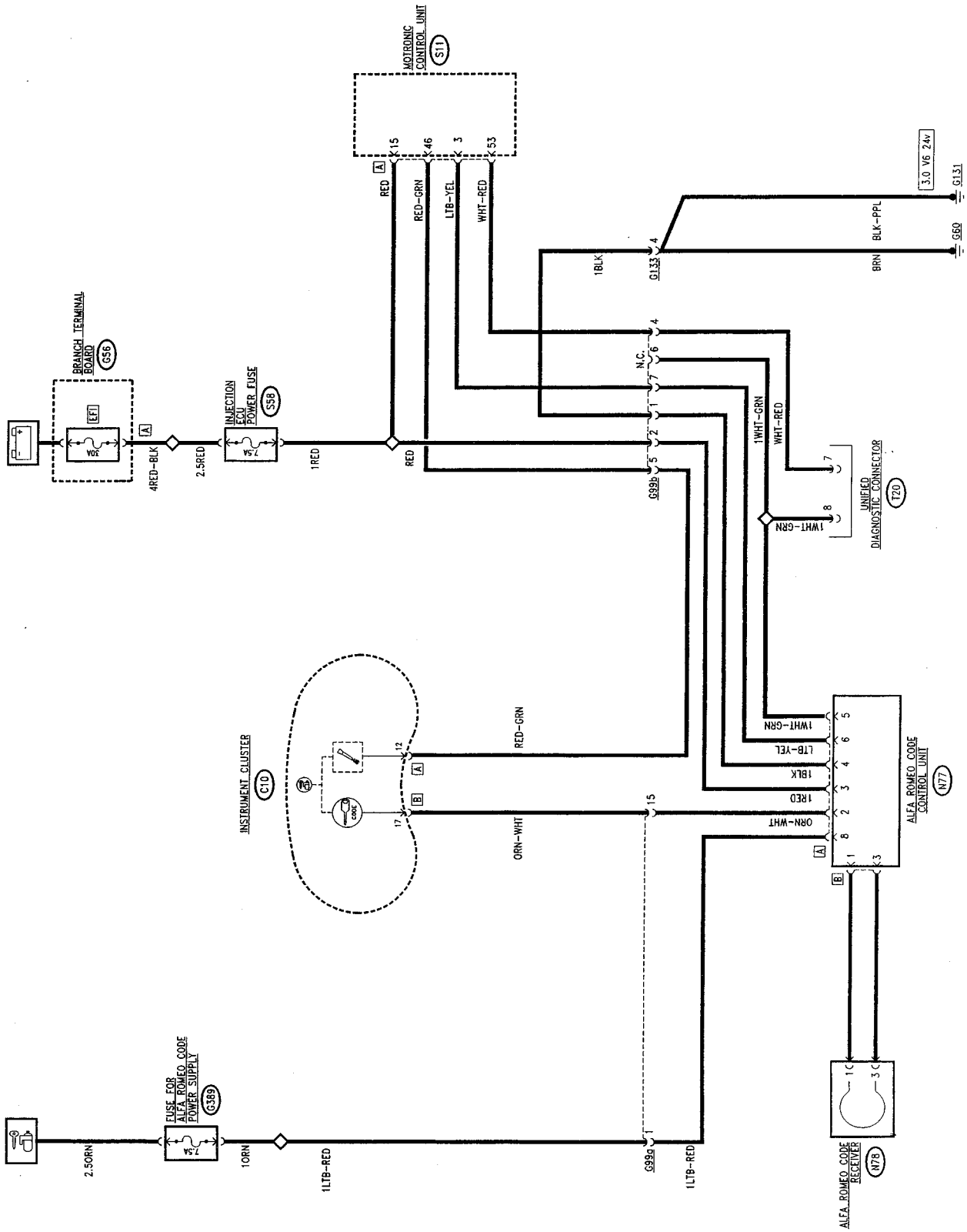
WIRING DIAGRAM (2.0 V6 TB engine)



WIRING DIAGRAM (3.0 V6 24V engine up to September 2000)



WIRING DIAGRAM (T.SPARK and 3.0 V6 24V - EURO 3 engine)



FUNCTIONAL DESCRIPTION

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

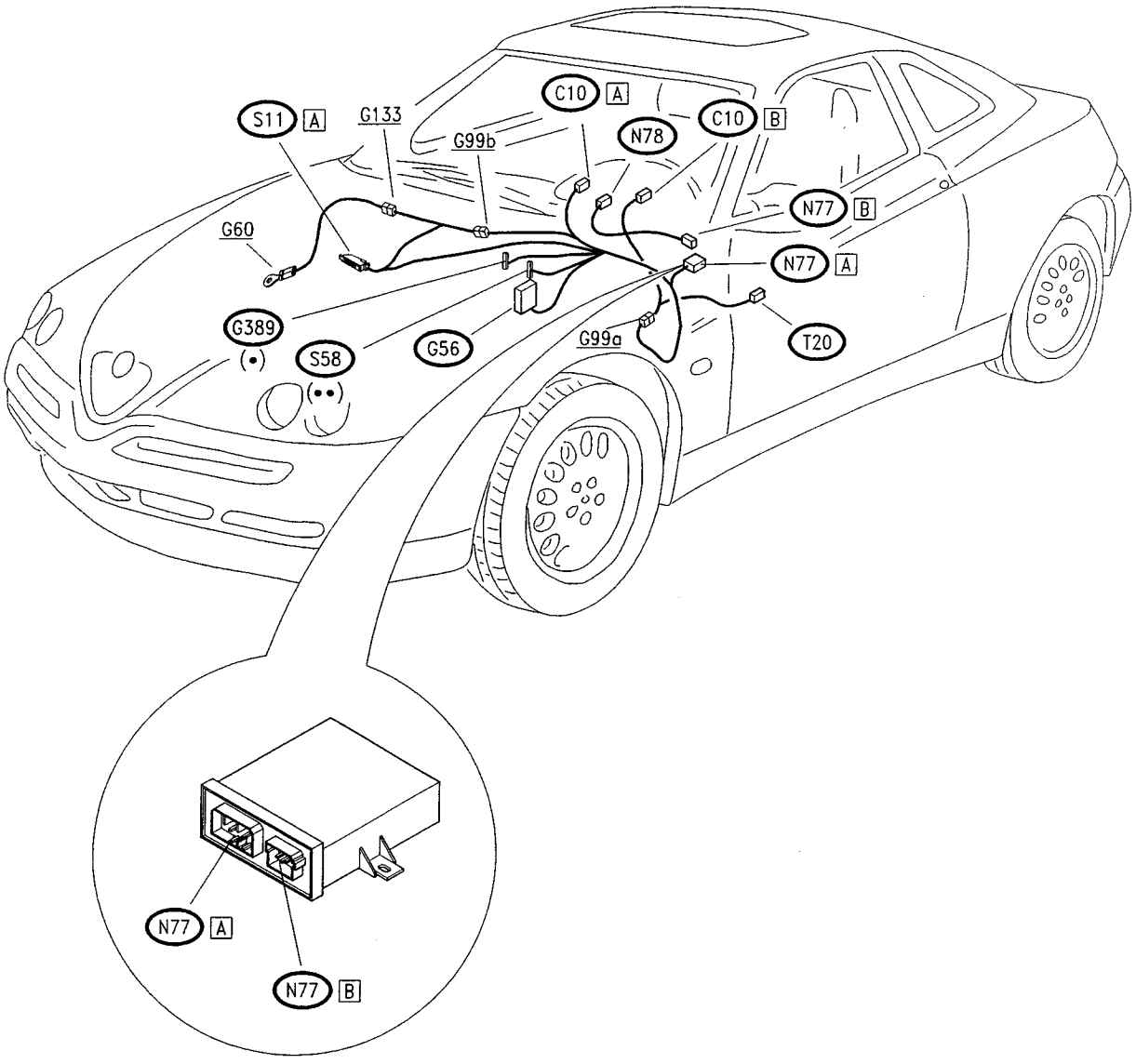
Through connector A it is connected to the Motronic control unit **S11** and to the other systems: at pin 8 it receives the "key-operated" supply through the line of wander fuse **G389**, while pin 3 is directly powered via MAXI FUSE EFI in fusebox **G56** and pin 4 is connected to earth.

The connection line with the ALFA ROMEO CODE warning light on the dashboard leads from pin 2.

Pin 6 manages the communication between the ALFA ROMEO CODE control unit **N77** and the Motronic control unit **S11**. Pin 5, on the other hand, manages the communication by "intercepting" diagnostic line K of the diagnostic connector.

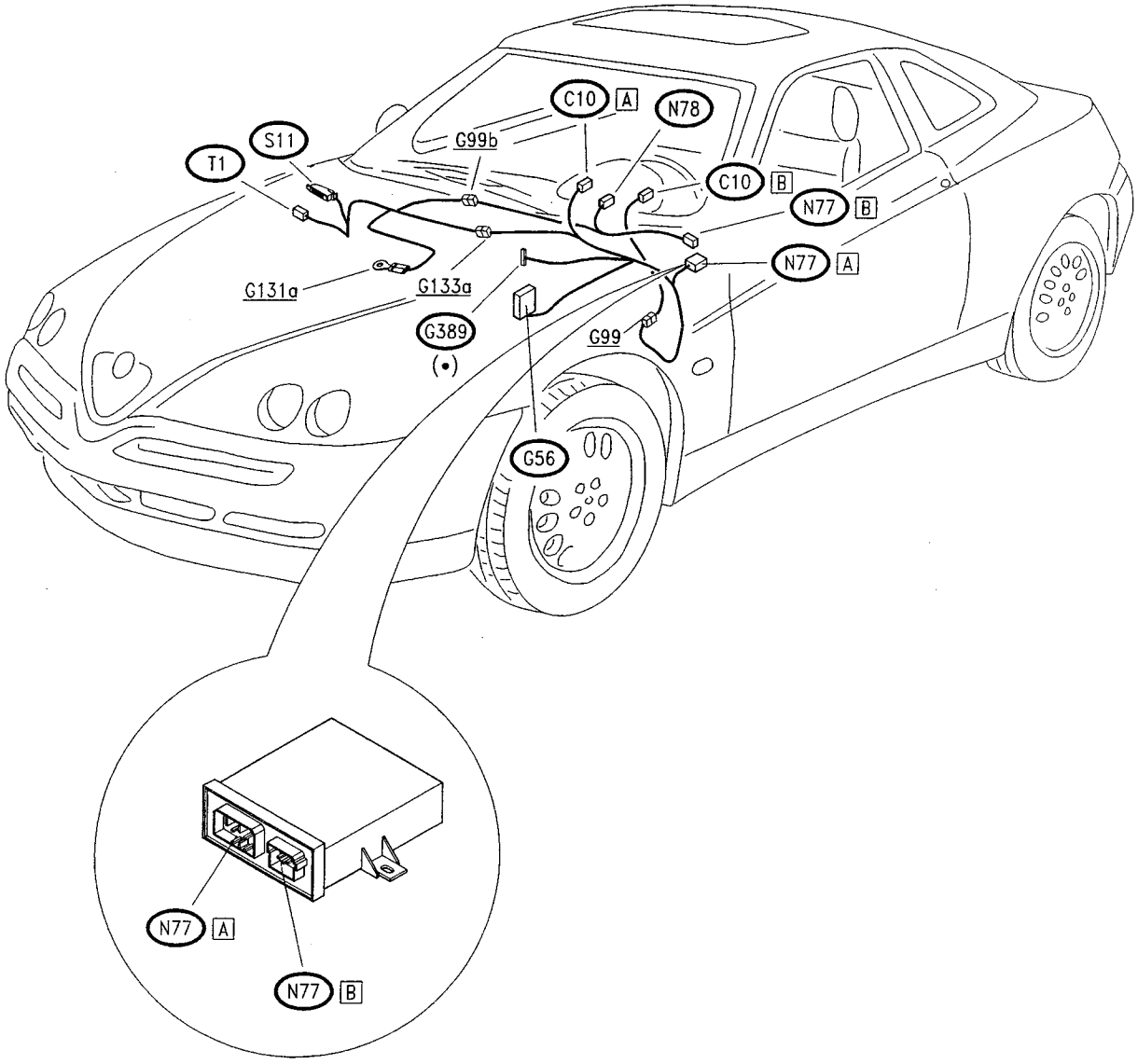
Pin 5, on the other hand, manages the diagnostic line K in contact with the diagnostic connector **T20**.

LOCATION OF COMPONENTS (T.SPARK 16V engine)



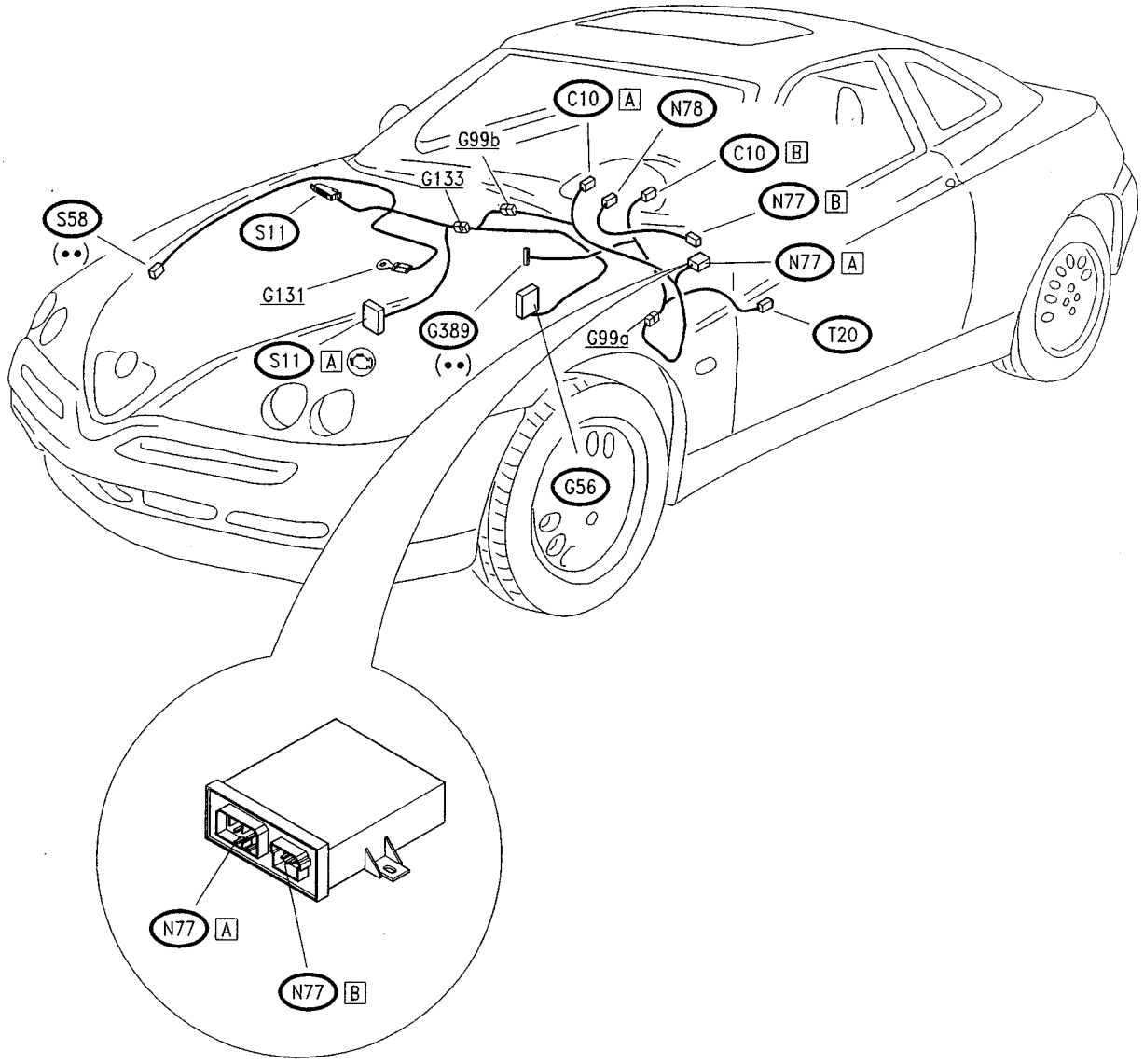
(•) Red fuseholder
(••) Brown fuseholder

LOCATION OF COMPONENTS (3.0 V6 and 2.0 V6 TB engine)



(•) Red fuseholder

LOCATION OF COMPONENTS (3.0 V6 24V engine)



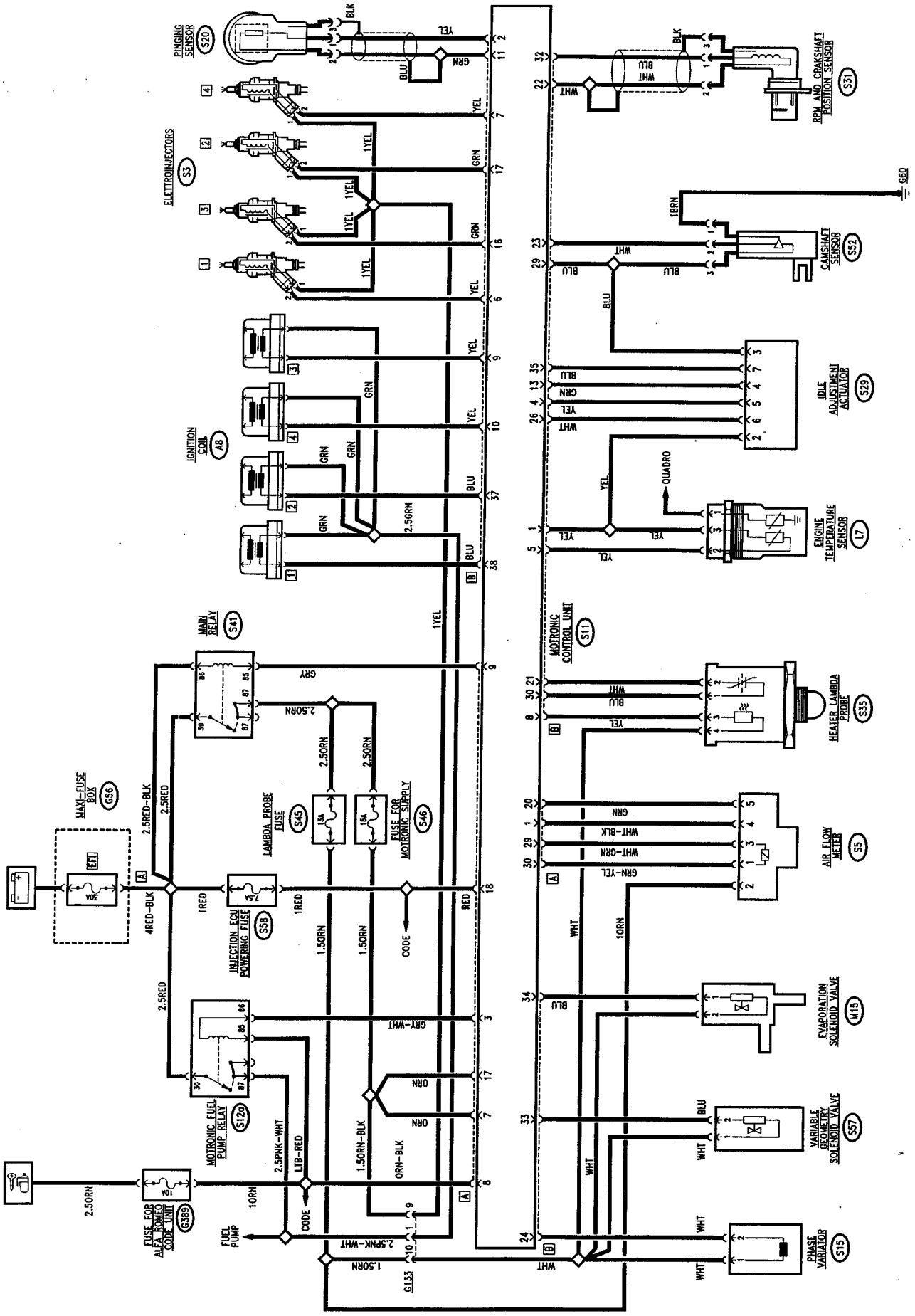
(*) Starting from October 2000
(••) Brown fuseholder

INJECTION/IGNITION SYSTEM
MOTRONIC M1.5.5
- T.SPARK 16v engines

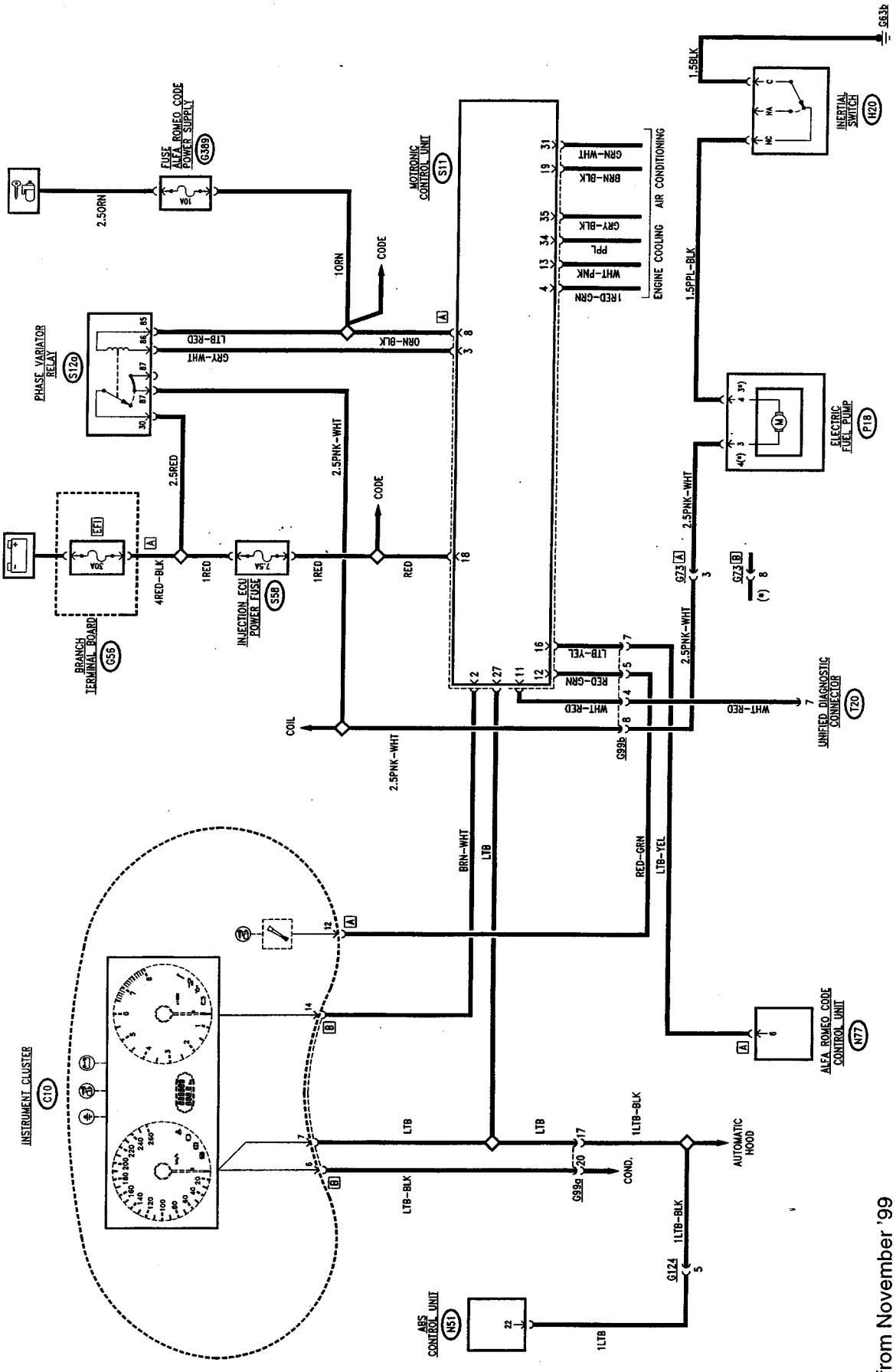
INDEX

WARNING:
The new MOTRONIC M1.5.5 version replaces the previous MOTRONIC M2.10.4 MODEL YEAR '98

WIRING DIAGRAM A



WIRING DIAGRAM B



GENERAL DESCRIPTION

An electronic control system supervises and controls all the motor parameters, improving features and consumption by a real time response to the various operating conditions. The system is handled by a single ECU that controls both the double ignition (static and lost spark) and the injection (phased).
According to the signals received from the numerous sensors, the ECU commands the actuators connected to it, handling the following systems:

– fuel supply;

– air supply;

– engine cooling;

– catalytic exhaust;

– re-circulation of fuel fumes.

The ECU also checks the electric hydraulic phase variation, device only used in T. SPARK motors. This version is characterised by the use of a variable geometric suction system, handled by the injection ECU according to the operating conditions of the motor.

Bosch Motronic M1.5.5 is an integrated system:

– digital electronic ignition and inductive discharge;

– static distribution;

– sequential phased type electronic injection (1-3-4-2).

The ECU, in normal idling conditions, checks:

– ignition instance;

– air capacity;

with the advantage of maintaining regular engine ratio according to the variation of environmental parameters and applied loads. The ECU checks and handles injection so that the stoichiometric (air/fuel) ratio is always at optimum level. The essential conditions that must always be satisfied in preparing the air - fuel mix for efficient operation of controlled ignition engines are mainly:

– the "dosage" (air/fuel ratio) must be maintained as constant as possible close to the stoichiometric value, so as to guarantee the required combustion speed, avoiding waste of fuel.

– the "homogeneity" of the mixture, composed of petrol fumes, distributed as finely and uniformly as possible in the air.

The information that the ECU processes to control the best dosage, is received via electric signals issued by:

– air flow meter with integrated air temperature sensor, for the exact quantity of intake air.

– rev sensor generating an alternate mono-phase signal with a frequency indicating the engine revs.

– throttle position potentiometer (built into the constant idling actuator) to identify minimum, partial and full load conditions.

– lambda sensor to identify of the oxygen content in exhaust gas.

This static inductive discharge ignition system (i.e. without a High Voltage distributor) with power modules located inside the injection ECU.
The system features a single coil for each spark plug (MONOCOIL). The advantages of this solution are:

– less electric discharge;

– constant discharge on each spark plug.

A map saved in the ECU contains the optimal parameters for advanced ignition (for piston stroke) that the engine can use according to the required engine ratio and load.

The ECU corrects the spark advance mainly according to:

– engine coolant temperature

– air intake temperature

– detonation

– throttle position

The information that the ECU processes for driving the single coil is received via electric signals issued by:

– air flow meter with built-in air temperature gauge for the exact quantity of intake air

– Rev counter generating an alternate mono phase signal according to the frequency of engine revs.

– detonation meter (on the rear part of the base between the 2nd and 3rd piston) for identifying the detonating piston and, therefore, correcting spark advance

– throttle position sensor (built into the constant idling actuator) to identify minimum, partial and full load conditions.

FUNCTIONAL DESCRIPTION

The engine ECU **S11** controls and adjusts the complete electronic injection and ignition system. The direct power supply of the system arrives from the line battery via maxifuse EFI in **G56A**.
The ignition switch power supply arrives from the insulated line via free fuse **S58**.
ECU **S11** is powered directly from the battery to connector A pin 18, via the insulated line from fuse **G389**. The ignition switch power supply reaches connector A pin 8.
Main relay **S41** controls the complete system: this is triggered by a control signal (Ground) from ECU **S11** connector A pin 9 the and powers:

- ECU **S11** connector A pins 7 and 17 and injectors **S3** via the insulated line of fuse **S46**;
- air flow meter **S5**, fuel fume re-circulation solenoid valve **M15**, variable geometry solenoid valve **S57**, phase variator actuator **S15** and lambda sensor **S35**; (all these lines are protected by fuse **S45**).

The fuel pump relay **S12a** is ignition switch powered via free fuse **S58**. This is activated by a control signal (Ground) from ECU **S11** connector A pin 3 and powers electric fuel pump **P18**, connected to ground via inertia switch **H20**, that in the event of impact cuts off the circuit and prevents fuel leaks. It also powers ignition coil **A8**.

The engine ECU **S11** receives the signals from the various sensors, thus maintaining all the operating parameters of the engine under control.

The rev counter **S31** provides, via a frequency signal in sent to ECU **S11** connector B pins 22 and 32, information relative to the engine ratio: these are two very low intensity signals and are, therefore, suitable screened.

The phase sensor (cam angle **S52**) is powered by ECU **S11** connector B pin 29 and sends a frequency signal corresponding to the phase to ECU **S11** connector B pin 23.

The engine temperature transmitter **L7** receives a reference ground signal from ECU **S11** connector B pin 1 and provides a proportional signal to the temperature of the engine coolant to ECU **S11** connector B pin 5. The same transmitter also provides the dashboard signal for the gauge (see "Dashboard").

The heated lambda sensor **S35** provides ECU **S11** with information on the correct composition of the air-fuel mixture: the signal is sent to **S11** connector B pin 30, whilst pin 21 provides the reference ground. Sensor **S35** is heated by a resistor, so as to guarantee the correct operation even when cold. The resistor is powered by relay **S41** and receives a ground signal from ECU **S11** connector B pin 8.

Pulse sensor **S20** provides, via a frequency signal sent to ECU **S11** connector B pin 2, information on the detonation conditions: it receives a reference ground signal from connector B pin 11. These are very low intensity signals and, therefore, suitably screened.

The air flow meter **S5** (powered by relay **S41**) receives the reference voltage from ECU connector A pin 1 and sends a proportional signal to the air flow to connector A pin 20. An air temperature sensor is also connected inside **S5**: the reference ground of the sensor is provided by **S11** connector A pin 29, whereas the air temperature signal reaches connector A pin 30.

ECU **S11** controls the opening of the individual injectors **S3**, via specific duty-cycle signals - sent from **S11** connector B pins 6 (cyl. 1), 17 (cyl. 2), 16 (cyl. 3) e 7 (cyl. 4).

Injectors **S3** receive the opening enable power from main relay **S41**.

ECU **S11** also controls coils **A8** via control signals (ground) for primary coils, whereas the secondary coils send the impulse to the spark plugs from pins 38 and 10 of connector B for the piston pairs 1-4 and from pins 9 and 37 of connector B of **S11** for pistons 2-3.

The primary coils **A8** receive the enable power from fuel pump relay **S12a**.

Idling actuator **S29** adjusts the air flow to minimum via the throttle. This receives power supply and the reference ground from ECU **S11** connector B pins 1 and 29: connector B pins 4 and 13 connect to the potentiometer reading the throttle position; connector B pins 26 and 35 control the throttle actuator.

The fuel fumes re-circulation solenoid valve **M15** transfers of fuel fumes towards the engine suction fan, where they are added to the mixture that enters the combustion chamber. Valve **M15**, powered via main relay **S41**, is opened by the ECU when the engine is on load via a duty-cycle type signal by **S11** connector B pin 34.

Variable geometry control solenoid valve **S57** is driven by ECU **S11** pin 33 connector B and powered via relay **S41**.

Phase variator **S15** mechanically controls the phasing on intake: it is commanded by ECU **S11** connector B pin 24.

ECU **S11** is connected to the ALFA ROMEO CODE ECU at pin 6 of **N77** via connector A pin 16.

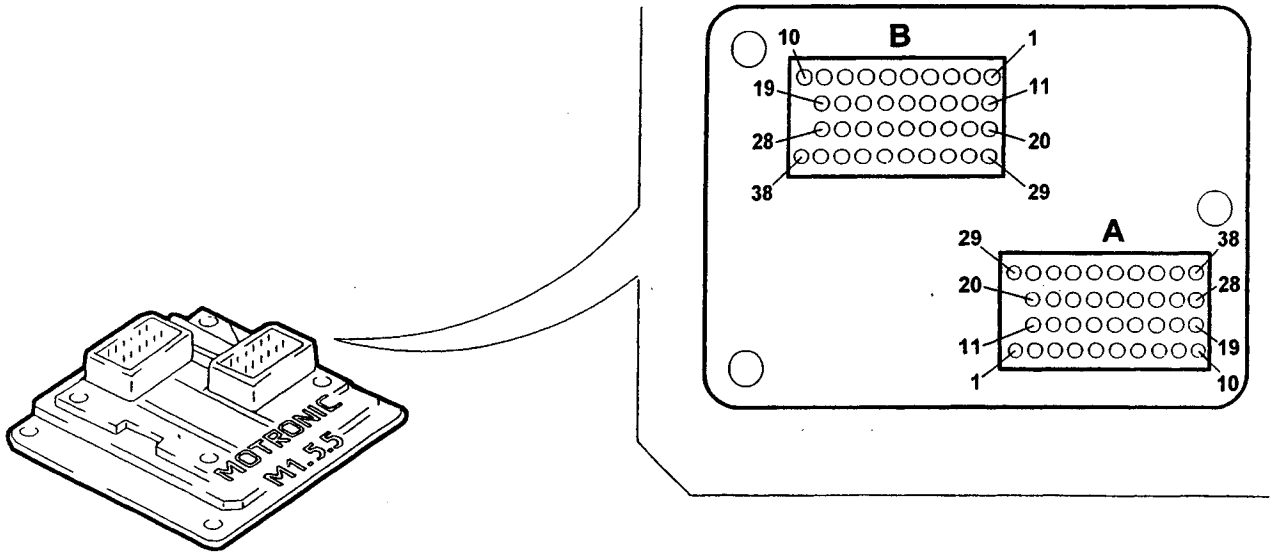
The ECU is equipped with a self-test system which can be connected to via the combined diagnostic socket **T20**: this receives the signals from ECU **S11** connector A pin 11 via the specific diagnostic line. The self-test system also generates the "injection failure" signal, for warning light **C10** on dashboard, output from ECU **S11** connector A pin 12.

The tachometer signal (vehicle speed) reaches ECU **S11** connector A pin 27 from ABS ECU **N51** (via dashboard **C10**).

ECU **S11** sends a signal proportional to the number of engine revolutions to dashboard **C10** from pin 2.

ECU **S11** is connected to the climate control system via connector A pins 19 and 31. This allows the adjust engine ratio to increases of load when the compressor is started, and to deactivate the compressor at high speed or high engine load (see "Automatic climate control")

The ECU also checks the engine cooling system: pins 4, 13, 34 and 35 of connector A control the respective electronic fans.



ECU pin-out

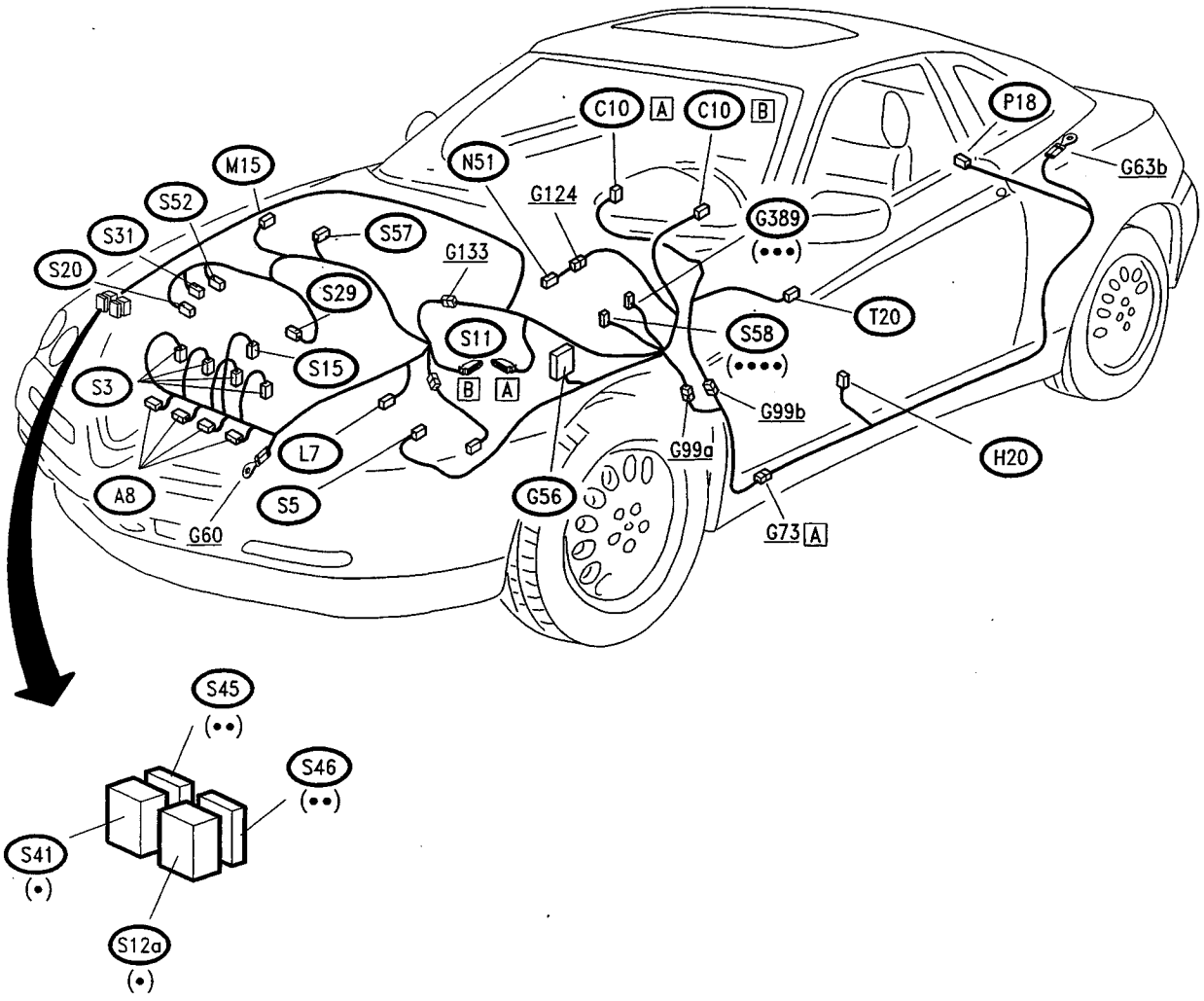
Connector A

1. Power (flow meter)
2. Rev counter signal
3. Fuel pump relay
4. 2nd electric cooling fan speed relay control
5. Spare
6. Spare
7. Main relay power
8. Ignition switch power
9. Main relay control
10. Spare
11. Diagnosis connection (K line)
12. "e.i. failure" led
13. 1st electric cooling fan speed relay control
14. Spare
15. Spare
16. Alfa Romeo connection CODE
17. Main relay power
18. Direct power (battery)
19. Climate control compressor relay
20. Flow meter signal
21. Spare
22. Spare
23. Spare
24. Spare
25. Spare
26. Spare
27. Tachometer signal
28. Spare
29. Sensor ground
30. Air temperature sensor signal
31. Climate control switch request (from pressure switch)
32. Spare
33. Spare
34. 1st speed electric fan insertion request
35. 2nd speed electric fan insertion
36. Spare
37. Spare
38. Spare

Connector B

1. Sensors ground
2. Detonation sensor signal
3. Spare
4. Throttle position potentiometer signal
5. Coolant temperature signal sensor
6. Cyl. 1 electric injector control
7. Cyl. 4 electric injector control
8. Lambda sensor heating signal
9. Cyl. 3 ignition coil control
10. Cyl. 4 ignition coil control
11. Detonation sensor signal
12. Spare
13. Throttle potentiometer signal
14. Spare
15. Spare
16. Cyl. 3 electric injector control
17. Cyl. 2 electric injector control
18. Spare
19. Spare
20. Spare
21. Lambda sensor reference ground
22. Engine revs sensor signal
23. Phase sensor signal
24. Phase variator actuator control
25. Spare
26. Throttle actuator control
27. Spare
28. Spare
29. Sensor power
30. Lambda sensor
31. Spare
32. Engine rev sensor signal
33. Intake manifold solenoid valve control
34. Fuel re-circulation solenoid valve control
35. Throttle actuator control
36. Spare
37. Cyl. 2 ignition coil control
38. Cyl. 1 coil ignition control

LOCATION OF COMPONENTS

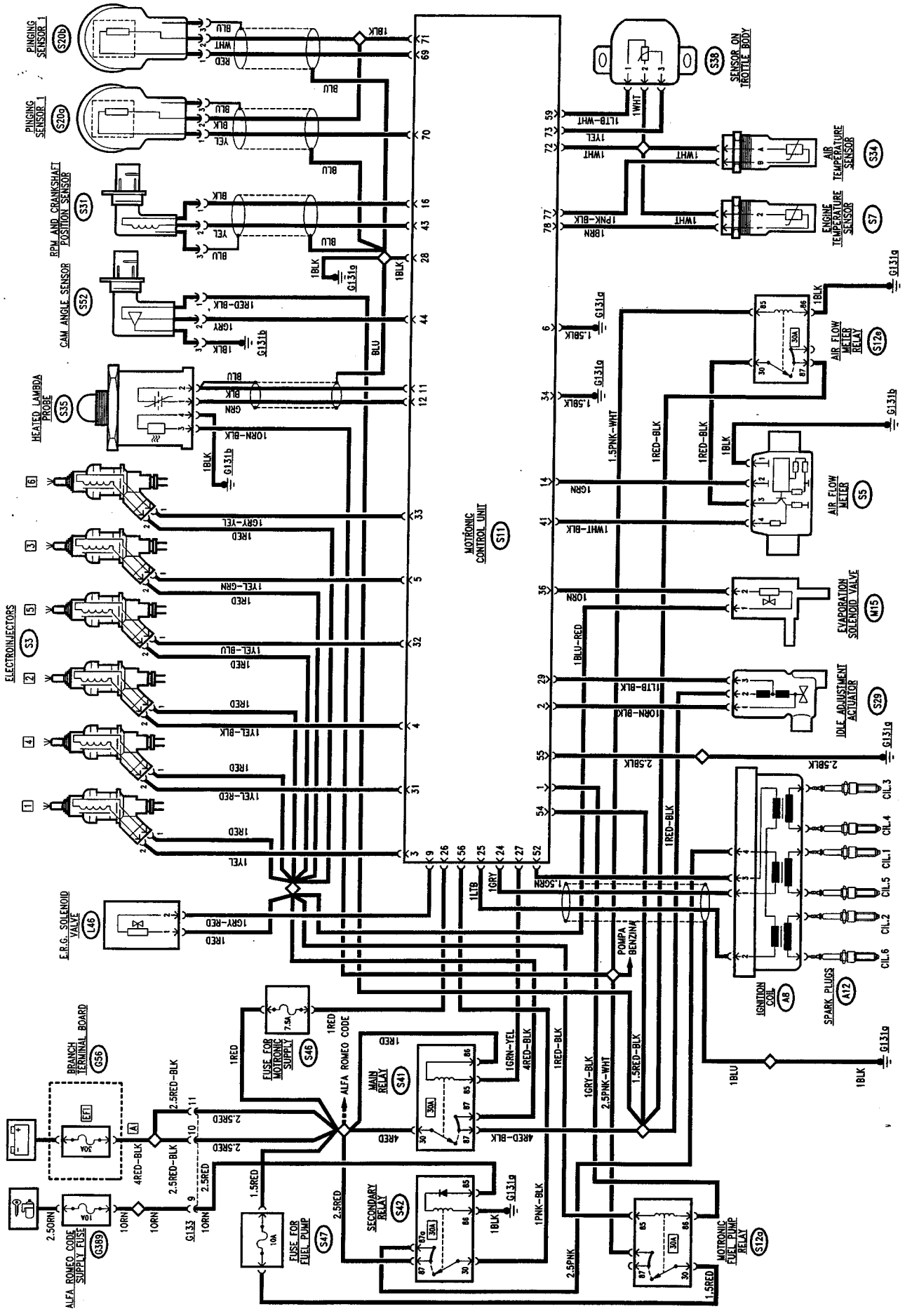


(•) Black Base
(••) Blue Fuseholder
(•••) Red Fuseholder
(••••) Brown Fuseholder

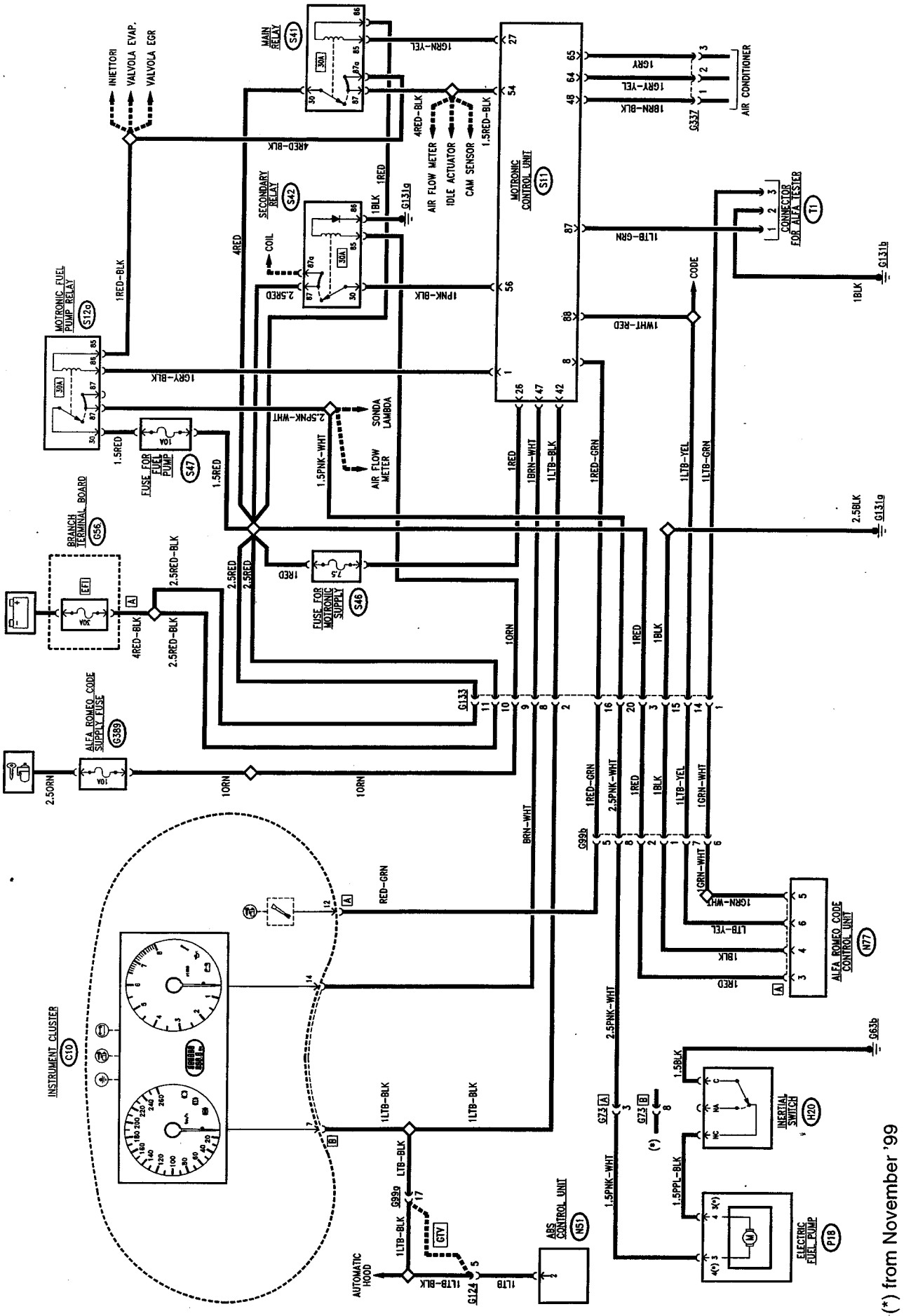
INJECTION/IGNITION SYSTEM - BOSCH MOTRONIC M3.7 3.0 V6 Engine:

INDEX

WIRING DIAGRAM A



WIRING DIAGRAM B



GENERAL DESCRIPTION

An electronic control system supervises and regulates all the parameters of the engine, optimising performance and consumption levels through response in real time to the different operating conditions: this sophisticated latest generation system comprises a single control unit which controls both ignition (static with lost spark) and injection (timed).

This is the M 3.7 version of the proven and reliable BOSCH MOTRONIC system.

Compared with the previous versions this new M 3.7 system adopts a control unit - with 88 pins - with advanced design and production technology, it also possesses many possibilities for inserting auxiliary functions.

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

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

- mixture titration
- the carburetion parameters according to the command of the evaporative solenoid valve
- an adaptive programme for idle speed control.

FUNCTIONAL DESCRIPTION

The Motronic control unit **S11** controls and adjusts the entire electronic ignition and injection system; all system power is protected by MAXI FUSE EFI in MAXI FUSE box **G56**.

The control unit is supplied at pin 26 directly by the battery through fuse **S46** (7.5A). At pin 54 it receives the supply from the main relay **S41**, while at pin 56 it receives the "key- operated" supply from the secondary relay **S42**.

Pins 55, 6, 28 and 34 are earthed and serve as reference respectively for the ignition, the injectors, electronic screening and the final power stages.

Two relays control the entire system:

The main relay **S41**, acts as supply relay for the whole system; it is energized by a control signal - earth - leading from pin 27 of the control unit and consequently sends the supply (12V) to pin 54 of the control unit itself, to the fuel pump relay **S12a**, to the air-flow meter relay **S12a** to the vapour recovery solenoid valve **M15**, to the idle speed actuator **S29**, to the cam angle sensor **S52**, to the EGR solenoid valve **L46** and lastly to the injectors **S3**.

The secondary relay **S42**, energized by the "key-operated" between the fuse **G389** - supply, supplies the control unit at pin 56 and the primary windings of the coil **A8**.

The fuel pump relay **S12a**, supplied by the main relay **S41**, is energized by a control signal - earth - leading from pin 1 of the control unit **S11**. Consequently, the relay supplies the resistance of the lambda probe **S35**, the air flow meter relay **S12e**, and of course the fuel pump **P18**; this supply line is protected by a special fuse **S47** (10A).

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

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

Through a frequency signal sent to pins 43 and 16 of the control unit, the rpm sensor **S31** supplies information about the engine rpm; the two above-mentioned signals are very low in intensity and are therefore suitably screened.

The sensor is inductive and detects the number of revolutions of the engine through the change in a magnetic field produced by the passage of the teeth of a "phonic" wheel (60-2 teeth) fitted on the crankshaft.

The cam angle sensor **S52** (timing sensor), is supplied at 12 V by the main relay **S41**, and sends a signal in frequency corresponding to the phase to pin 44 of the control unit itself.
The sensor comprises a Hall effect device due to which the voltage signal sent to the control unit "lowers" abruptly when the tooth machined on the camshaft passes in front of the sensor.

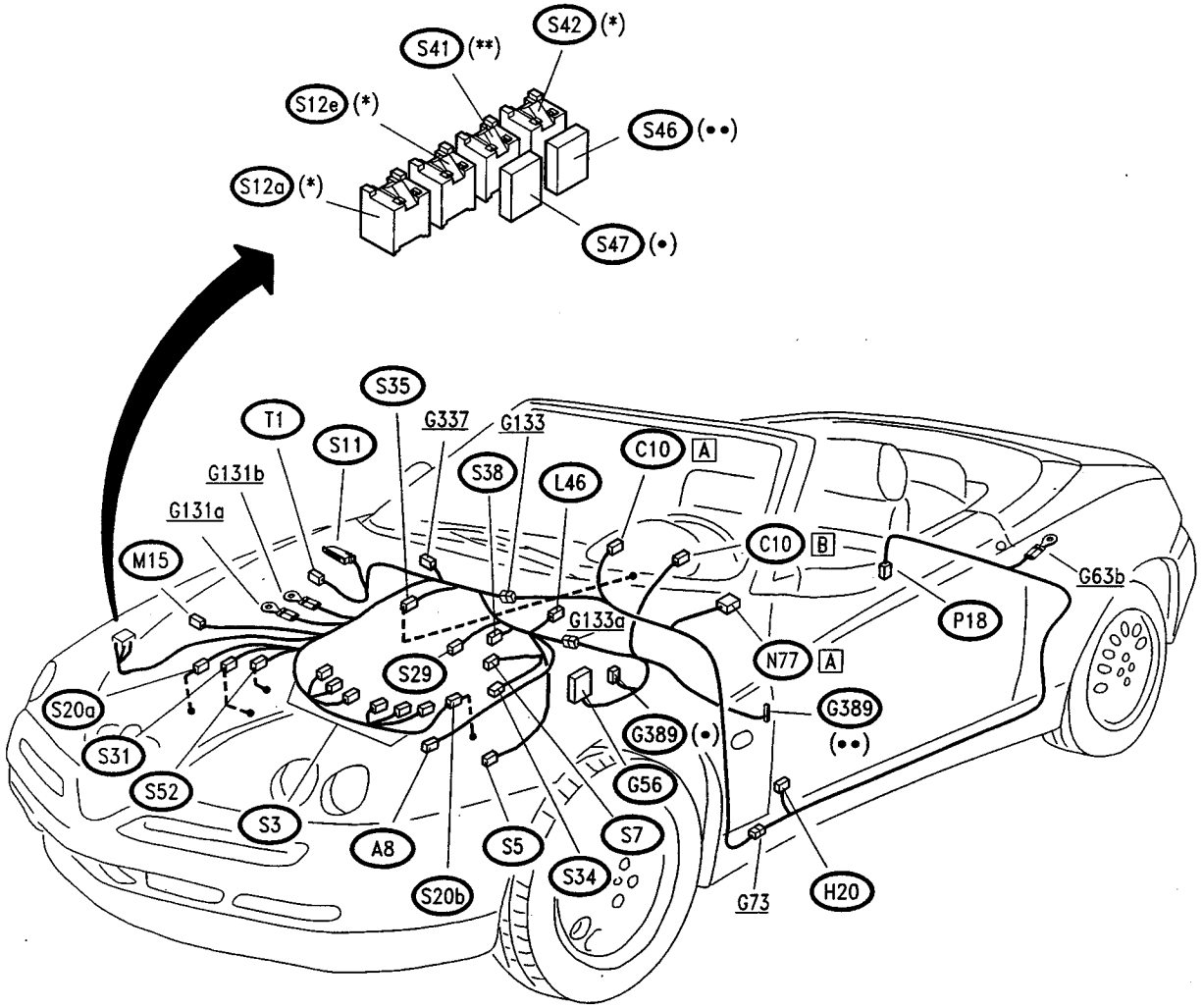
The heated lambda sensor **S35** supplies the control unit information about the correct composition of the air-fuel mixture detecting the concentration of oxygen in the exhaust gas; this takes place through the signal sent to pin 12 of the control unit, while pin 11 supplies the reference earth; The sensor is heated by a resistance to make sure that it operates correctly also when the engine is cold; the resistance is supplied by the fuel pump relay **S12a.**

The throttle body sensor **S38**, is supplied by the control unit from pins 59 and 72 and through a potentiometer it sends a signal to pin 73 which is proportionate with the degree of opening of the throttle itself.

The engine temperature sensor **S7**, connected to the electronic earth at pin 72, supplies a signal to pin 78 proportionate with the temperature of the engine coolant, detected with an NTC material (resistance that lowers with the temperature).

The intaken air temperature sensor **S34**, connected to the electronic earth at pin 72, supplies a signal at pin 77 that is proportionate with the temperature of the

LOCATION OF COMPONENTS



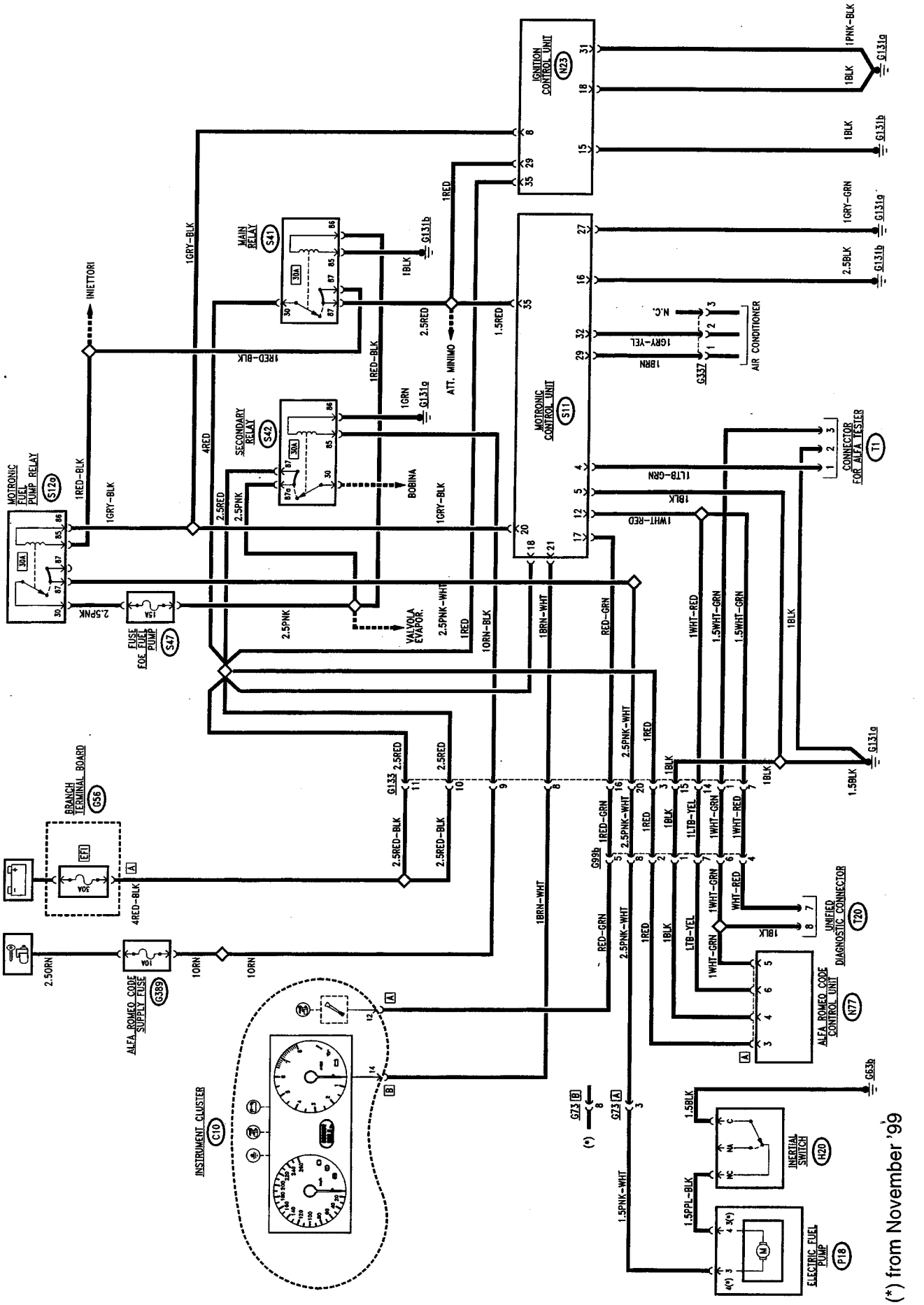
(•) Red fuseholder
(••) Brown fuseholder

(*) Black base
(**) Grey base

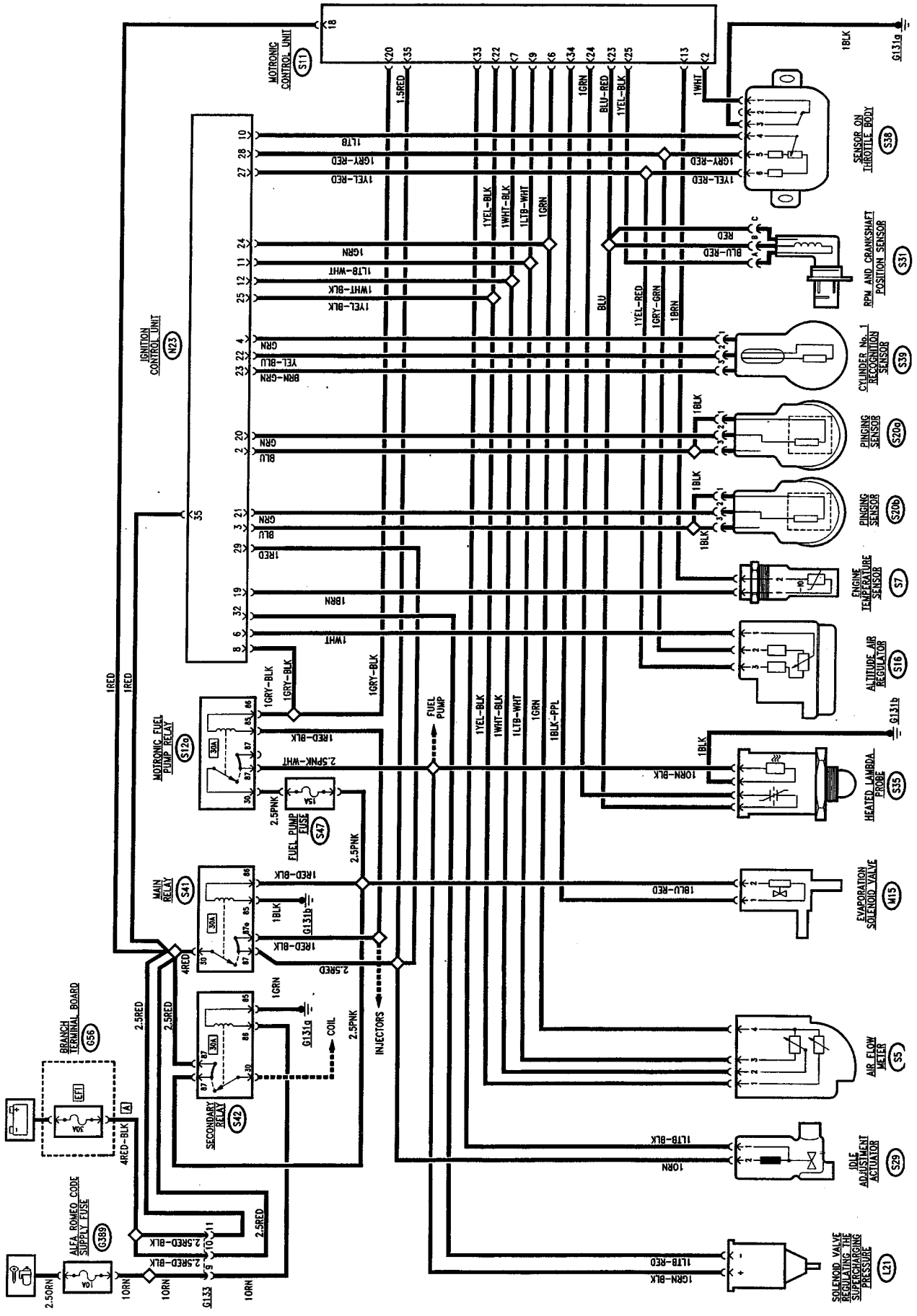
INJECTION/IGNITION SYSTEM - MOTRONIC ML4.1 / EZ212K 2.0 V6 TB Engine:

INDEX

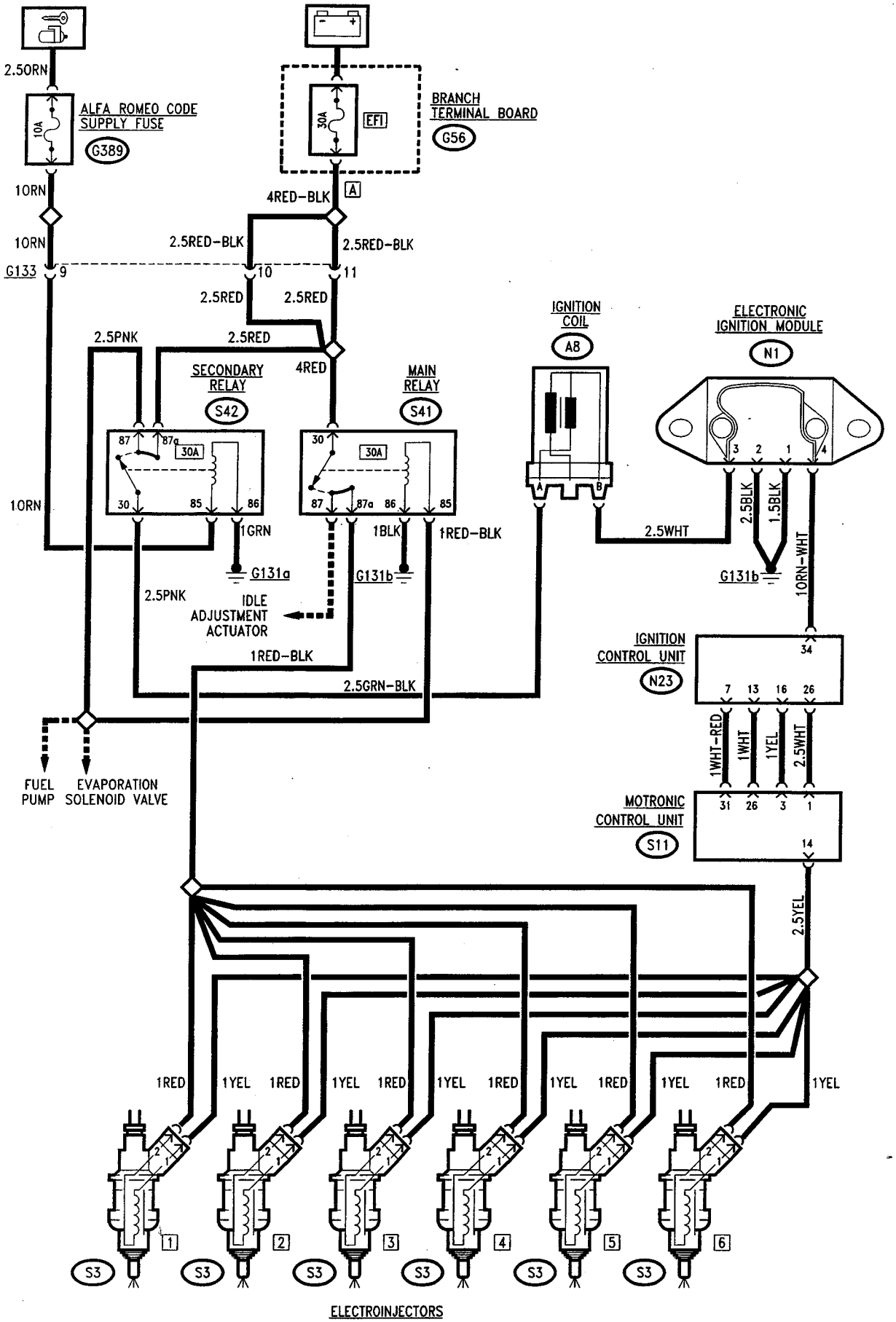
WIRING DIAGRAM A



WIRING DIAGRAM B



WIRING DIAGRAM C



GENERAL DESCRIPTION

In this system the ignition and injection functions are operated by two control units, the Motronic ML4.1 and EZ212K both made by BOSCH. The experience acquired and the continuous research developed in this sector have made it possible to bring forward an up-dated, fine-tuned system, simplifying and reducing as far as possible the data detection sensors and making the control actuators more precise and powerful. In order to optimise the performance of the vehicle during acceleration and at top speeds, in the EZ212K control unit, a new OVERBOOST function control has been implemented which makes it possible to increase the supercharging pressure according to a certain logic, while the ML4.1 control unit determines the necessary fuel enrichment.

SYSTEM FUNCTIONS

The system functions are essentially the following:

– injection times adjustment;

– spark advance adjustment;

– cold starting control;

– control of enrichment during acceleration;

– fuel cut-off during deceleration;

– constant idle speed control;

– maximum rpm limiting;

– evaporative solenoid valve control;

– lambda probe control;

– CONNECTION WITH THE alfa romeo code system.

– self-diagnosis.

FUNCTIONAL DESCRIPTION

The engine is supplied with a Motronic ML4.1 injection and ignition system controlled by control unit **S11**. The control unit **S11** which manages the injection time and the firing of the spark plugs in relation to the engine rpm and load, the intake air temperature and the temperature of the engine. The ignition signal and the spark advance supplied by the ML4.1 control unit is optimised for each cylinder by another control unit EZ212K (**N23**) on the basis of the signals received from the pinging, engine temperature and throttle angle sensors.

All power lines are protected by fuse EFI (30A) in MAXI FUSE box **G56**. The ignition switch power line is protected by fuse **G389** (10A).

The control unit **S11** is supplied at pin 18 directly from the battery via fuse **S36**. At pin 35 it receives the "key-operated" supply from the main relay **S41**.

Pins 5, 16 and 27 are earthed.

ECU **N23** pin 35 is directly powered by the battery via MAXI FUSE EFI in MAXI FUSE box **G56**. At pin 29 it receives the "key-operated" supply from the main relay **S41**.

Pins 15, 18 and 31 are earthed.

The control unit **S11** activates the electric fuel pump through relay **S12a**: this relay is energized when pin 20 of the control unit is connected to earth; the relay supply line is protected by a special fuse **S47** (15A).

In addition, the earth to the pump **P18** passes through the inertial switch **H20** which cuts off the circuit in the event of a crash.

The control unit **S11** calculates and controls the opening time of the electroinjectors **S3** (pin 14) on the basis of the internal programme and the information received from the different sensors.

The engine speed is supplied at pin 23 and 25 of the control unit **S11** from the rpm and timing sensor **S31**: this sensor is inductive and detects the changes in the magnetic field caused by the teeth (suitably positioned) of a phonic wheel integral with the crankshaft.

The sensor on the throttle body with potentiometer **S38** makes it possible to inform the injection control unit **S11** (pin 2) on the idle speed condition (from 0 to 1 degree of throttle opening); it also informs the ignition control unit **N23** on the throttle position angle operated by the accelerator (slider of potentiometer of **S38** connected to pin 10 of **N23**).

This parameter is used to change the spark advance.

The engine coolant temperature sensor **S7** is an NTC (Negative Temperature Coefficient) resistance which supplies control unit **S11** (pin 13) and control unit **N23** (pin 19) information about the engine temperature.

The air-flow meter **S5** measures the flow rate of the air admitted to the engine and supplies control unit **S11** (pin 7) and control unit **N23** (pin 12) a signal which enables correct metering of the fuel. The signal is generated by a potentiometer which transmits a voltage to the control units corresponding to the angle of a mobile port.

The air temperature sensor (NTC) located inside the air-flow meter **S5** measures the intake air temperature (pin 22 of **S11** and pin 25 of **N23**).

The electroinjectors **S3** are operated in parallel by the control unit **S11** via pin 14 from relay **S41** on the basis of all the parameters received from control unit **S11**.

When the throttle is closed or only slightly open, control unit **S11** (pin 33) commands a flow of air through the constant idle speed actuator **S29** which acts as a throttle body by-pass line. The constant idle speed actuator S29 is controlled by a part of the programme of control unit **S11** and it is used to main-

tain idle speed at a constant rate under all operating conditions of the engine.

The ignition control system is integrated in control unit **S11** and makes it possible to adjust the spark through a memorised programme.

The command signal is sent from pin 1 of **S11** to control unit **N23** (pin 26). Control unit **N23** allows adjustment of the spark advance optimising the yield of each cylinder through information on the magnitude of vibrations of the actual cylinder leading from the two pinging sensors **S20a** and **S20b** (pin 20 and 21). The recognition of the cylinder in question is obtained through the magnetic sensor **S39** (pin 22 and 23) fitted on the exhaust camshaft. Account is also taken of the altitude at which the engine is operating via sensor **S16** (pin 6).

The output of the control unit **N23** (pin 34) is sent to a power module **N1** and from this (pin 3) to the ignition coil **A8**.

The evaporative valve **M15**, supplied at +12V, is opened by control unit **S11** only when the ignition key is at MARCIA and the engine is under load; conversely, it is closed when the engine is cold or running at idle speed (command from pin 34).

The pre-heated lambda probe **S35**, placed in contact with the exhaust gas, generates an electric signal, the rating of which depends on the concentration of residual oxygen in the actual exhaust gas. This signal is characterised by an abrupt change when the air-fuel mixture is less than perfect. When the voltage of the signal of the probe **S35** is low, the control unit detects that the mixture is lean and slightly increases the fuel injected. When the voltage of the signal at pin 24 of **S11** is high, the control unit detects that the mixture is rich and slightly reduces the fuel injected. The heated lambda probe **S35** is heated by a resistance supplied by relay **S12a** only when the ignition key is in the MARCIA position.

When the air conditioning system is activated a 12V current is applied at pin 29 and 32 of control unit **S11**. Control unit **S11** then adjusts the engine idle speed taking account of the new need for power due to the cutting in of the air conditioner.

In the case of a heavy need for power, the injection control unit **S11** makes it possible to modulate the opening of the wastegate valve through a Pierburg valve **L21**.

From pin 21 the control unit **S11** sends a "pulse" signal proportionate with the engine rpm to the instrument cluster **C10**; the signal for the diagnosis "Check Engine" warning light on the instrument cluster **C10** leads from pin 17.

Control unit **S11** is connected by pin 12 with the ALFA ROMEO CODE control unit **N77** through diagnosis line K; this way if the ALFA ROMEO CODE does not detect a correct "key code" it will not give consent to the Motronic control unit which will not start the engine.

Control unit **S11** possesses a self-diagnosis system which can be used connecting with the ALFA ROMEO Tester at connector **T1**; it receives the fault signals of the control unit through diagnosis lines L - pin 4 and K - pin 12 (the K line also crosses the ALFA ROMEO CODE system).