

WORKSHOP MANUAL

Volume
3

F355

Ferrari Servizio Assistenza Tecnica

F355

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CONTROLS - DRIVING INSTRUCTIONS

H

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CONTROLS AND INSTRUMENTS

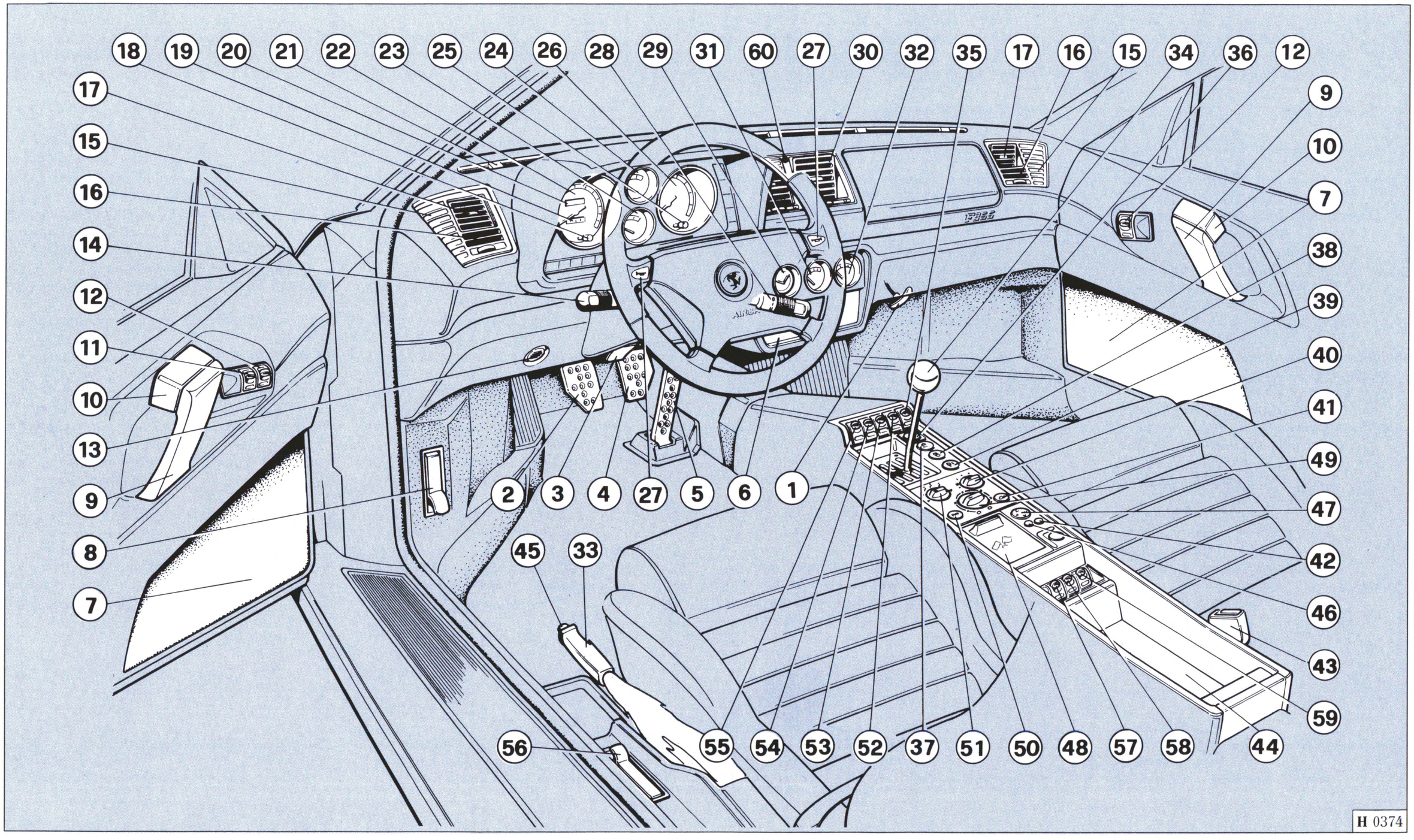

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Fig. 1 - Controls and instruments

1 - Emergency bonnet release.
2 - Clutch pedal.
3 - Steering column adjustment release lever.

4 - Brake pedal.
5 - Accelerator pedal.
6 - Radio slot.
7 - Loudspeaker (woofer).
8 - Bonnet release lever.
9 - Door grip.
10 - Door release lever.
11 - LH electric window switch.
12 - RH electric window switch.

13 - Interior temperature sensor.
14 - Combination direction indicator and light switch lever
15 - Loudspeaker (tweeter).
16 - Air conditioning side vent.
17 - Side window ventilation vent.
18 - Trip counter reset (use only when stationary) (**For USA**).
19 - Trip counter (**Not for USA**).

19 - Trip counter (**For USA**).

20 - Odometer (**Not for USA**).
20 - Odometer (**For USA**).
21 - Screen demister vent.
22 - Electronic speedometer.
23 - Water temperature gauge.
24 - Oil pressure gauge.
25 - Instrument panel light rheostat.

26 - Electric rev. counter.
27 - Horn button.
28 - Windscreen wiper/washer lever.

29 - Clock.
30 - Air conditioning main vent.
31 - Fuel gauge.
32 - Engine oil temperature gauge.
33 - Parking brake lever.
34 - Gear lever.
35 - Central door locking unlock push-button (use only when stationary).
36 - Hazard warning light switch.

37 - Roof light switch.

38 - Fuel filler release switch.

39 - Parking lights switch.
40 - Ventilation regulator knob.

41 - Recirculation push-button.

42 - RH mirror adjustment selector.

43 - Seat belt release button.
44 - Glove compartment.
45 - Handbrake release push-button.

46 - LH mirror adjustment selector.

47 - Mirror adjustment control.
48 - Ashtray.
49 - Ventilation temperature control knob.

50 - Air conditioning On/Off push-button.

51 - Ventilation regulator knob.
52 - Central door locking lock push-button (use only when stationary).
53 - Rear heated window and outiside mirror demisting switch (**For berlinetta and GTS**).

53 - Outiside mirror demisting switch (**For spider**).
54 - Rear fog light switch (**For USA**).
54 - Fog light switch (**Not for USA**).

55 - Shock absorber mode switch.

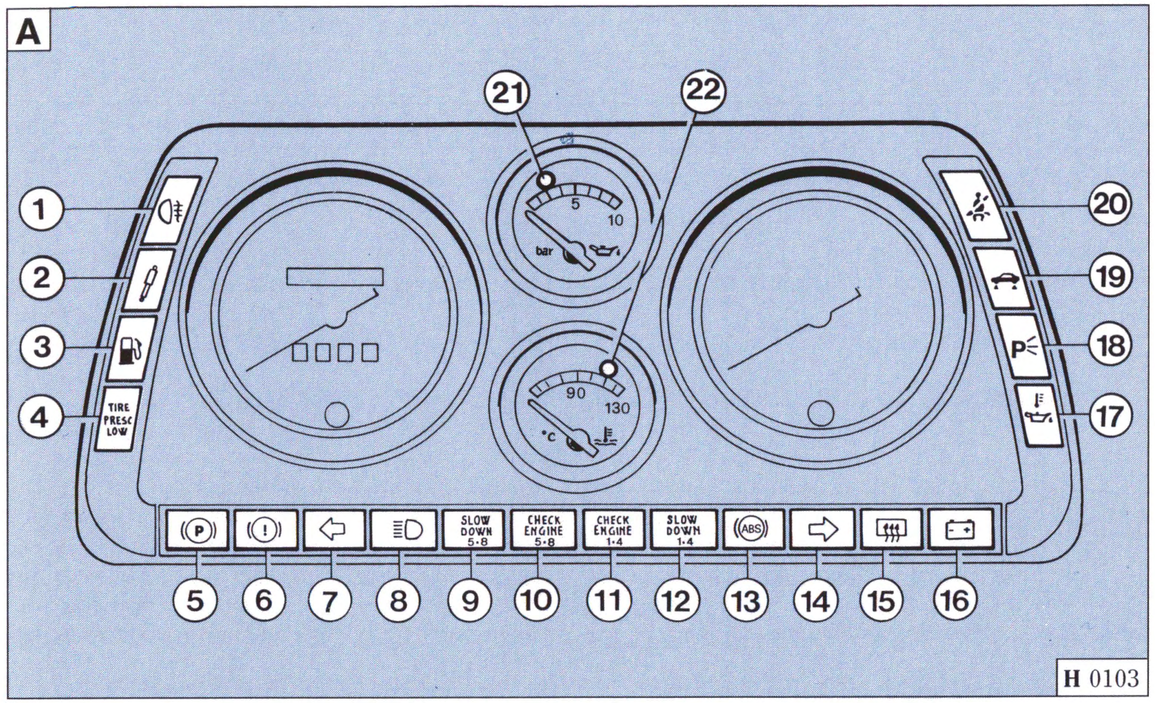
56 - Engine cover release lever.
57 - Left seat control switch (**For spider**).

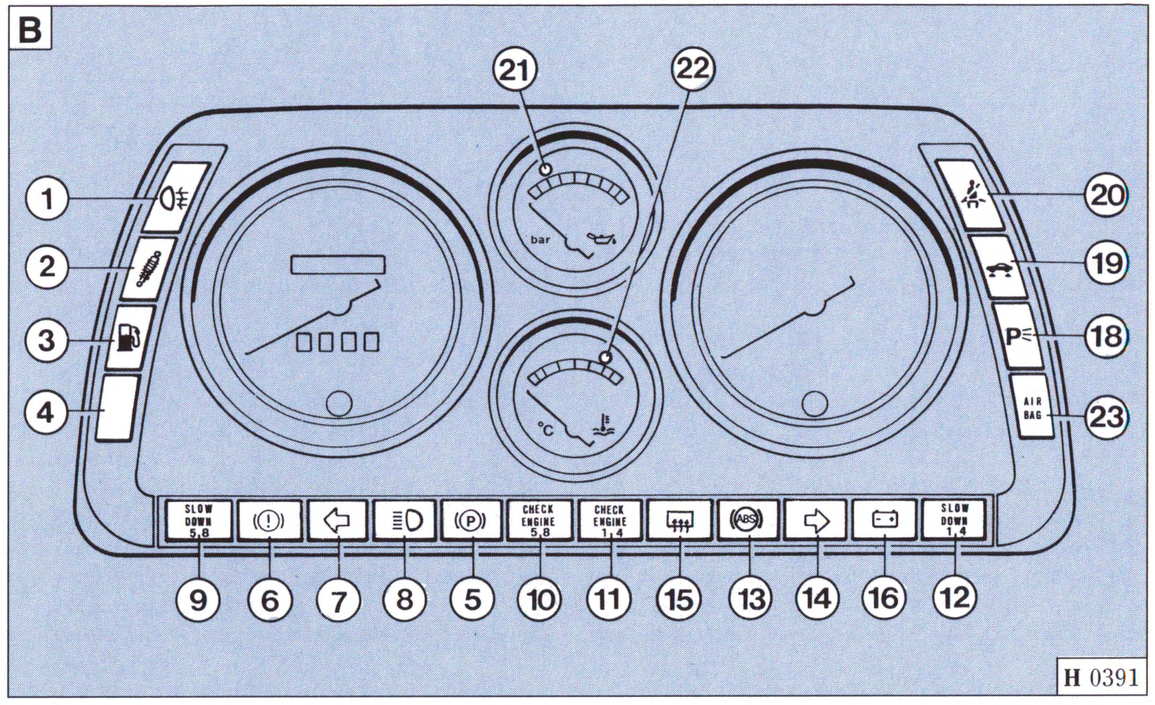
58 - Soft top control switch (**For spider**).

59 - Right seat control switch (**For spider**).

60 - Alarm LED.

WARNING LIGHTS





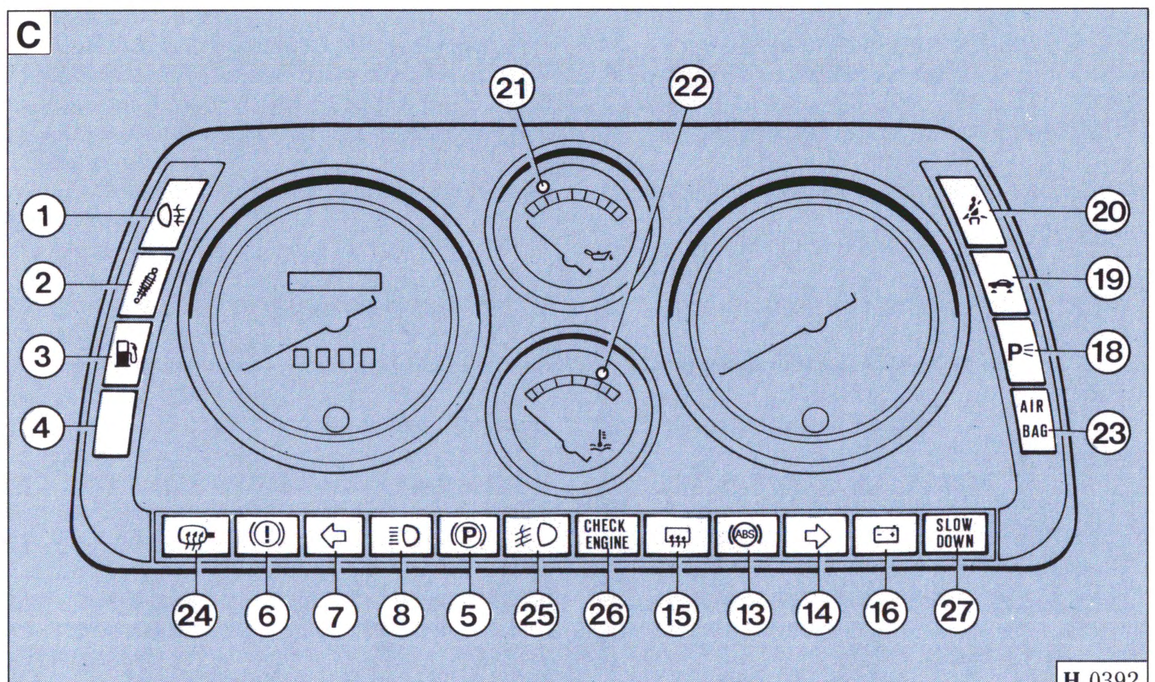


Fig. 2 - Warning lights

A - Car with Motronic 2.7;
B - Car with Airbag;
C - Car with Motronic 5.2.

1 - Free **(For USA)**.
1 - Rear fof light indicator (amber) **(Not for USA)**.

2 - Comfort suspension setting indicator (amber).
3 - Fuel reserve warning light (amber).
4 - Free.
5 - Hand brake warning light (red).
6 - Brake malfunction warning light (red).
7 - Left direction indicator (green).

8 - High beam indicator (blue).
9 - Bank 5/8 "Slow Down" warning light (red).
10 - Bank 5/8 "Check Engine" warning light (amber).
11 - Bank 1/4 "Slow Down" warning light (red).
12 - Bank 1/4 "Check Engine" warning light (amber).
13 - "ABS" warning light (amber).
14 - Right direction indicator (green).

15 - Rear heated window and outiside mirror demisting warning light (amber) **(For berlinetta and GTS)**.
16 - Alternator warning light (red).
17 - Oil temperature warning light (red).
18 - Parking light indicator (green).
19 - Shock absorber malfunction warning light (amber).
20 - Seat belt warning light (red).
21 - Oil pressure warning light (red).
22 - Water temperature warning light (red).
23 - "Airbag" warning light (red).
24 - Heated exterior mirror indicator (amber) **(For spider)**.
25 - Fog light indicator (green).
26 - "Check Engine" warning light (amber).
27 - "Slow Down" warning light (red).

ADJUSTING THE CLOCK

Setting the time

Press knob **A** in to set the time.

– Press and release the knob to move the clock on one minute at a time.

– Press and hold the knob for over 3 seconds to advance the clock hands quickly.

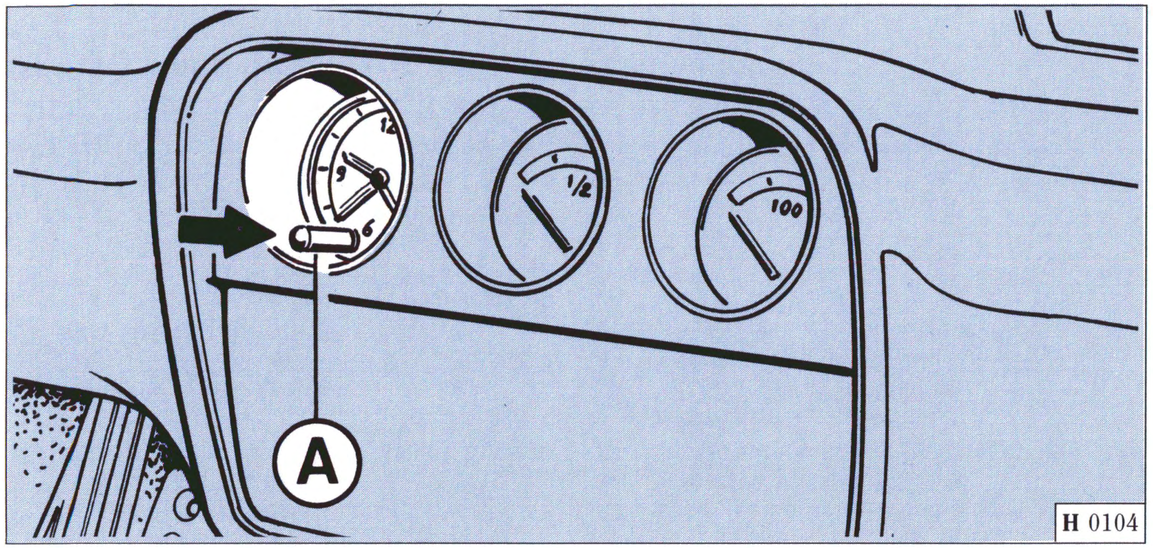


Fig. 3 - The analog clock.

ELECTRICAL CONTROLS

Light switch lever

With the ignition key in the **"II"** position, the combination light switch operates as follows:

- **Position 0**

Pull the lever towards steering wheel to flash the day flasher light.

- **Position 1**

Turn the knob to position **1** to illuminate the instrument panel and switch on the front and rear sidelights and number plate lights.

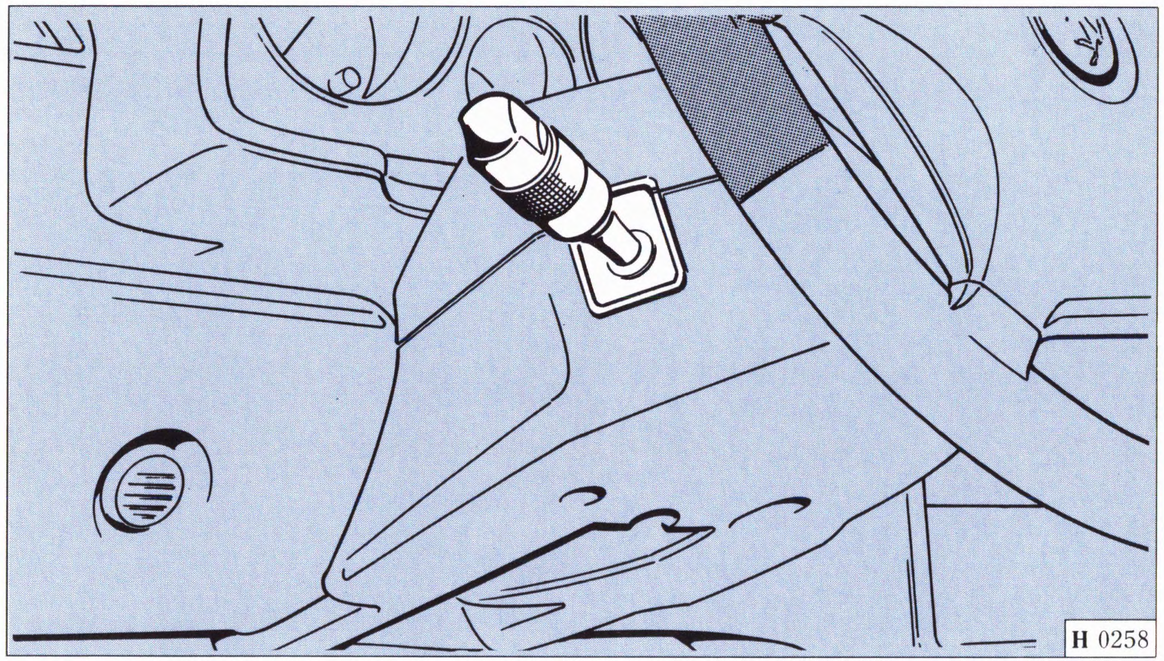
- **Position 2**

Turn the knob to position **2** to raise the retractable headlights and turn on the low beams.

With the knob in position **2**, you can still pull the lever towards the steering wheel to flash the high beams. The high beam indicator (**8**, Fig. **2**) on the instrument panel will light until you release the lever.

- **Position 3**

Push the lever forwards to switch on the high beams and the high beam indicator (**8**, Fig. **2**) on the instrument panel.



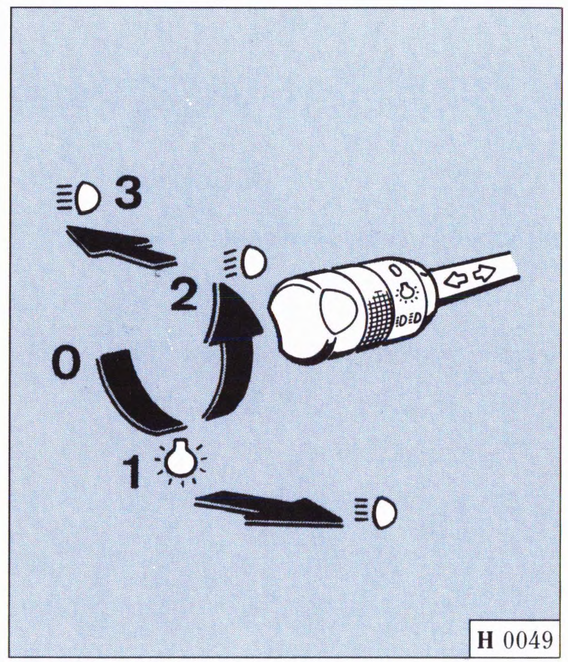


Fig. 4 - Light switch lever.

Direction indicator lever

- **D** - right turn.
- **S** - left turn.

The turn signal lights are self-cancelling.

The turn indicators (**7** and **14**, Fig. **2**) on the instrument panel confirm the functioning of the external turn signal light.

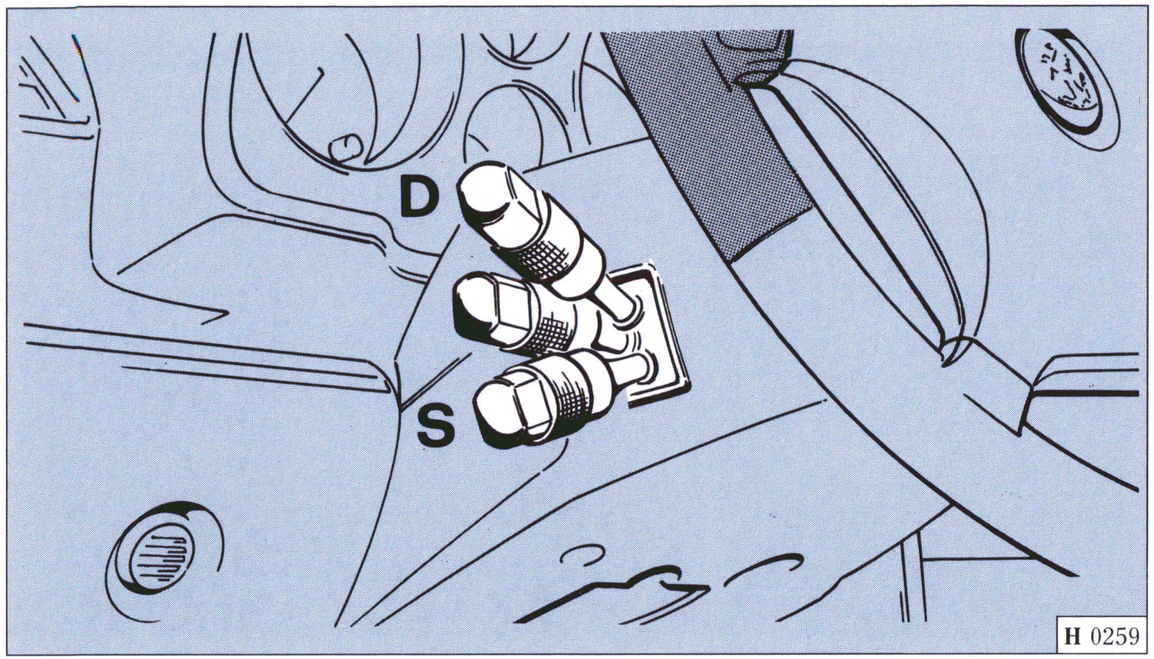


Fig. 5 - Turn signal lever.

Hazard warning lights

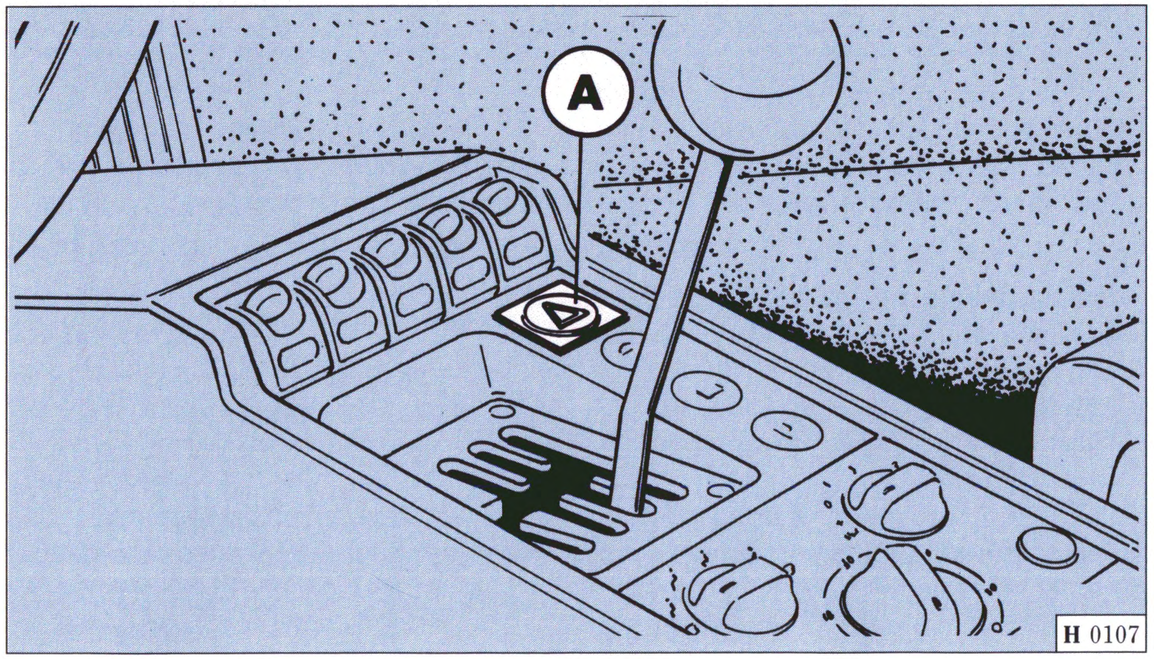


Fig. 6 - Hazard warning lights button.

Press button **A** (Fig. **6**) to operate the hazard warning lights. All the direction indicators and the instrument panel turn indicators (**7** and **14** Fig. **2**) flash. The hazard warning lights can be switched on regardless of ignition key position.

Press button **A** again to switch the hazard warning lights off.

Windscreen wiper/washer lever

With the ignition key in the **"II"** position, the windscreen wiper/washer lever operates as follows:

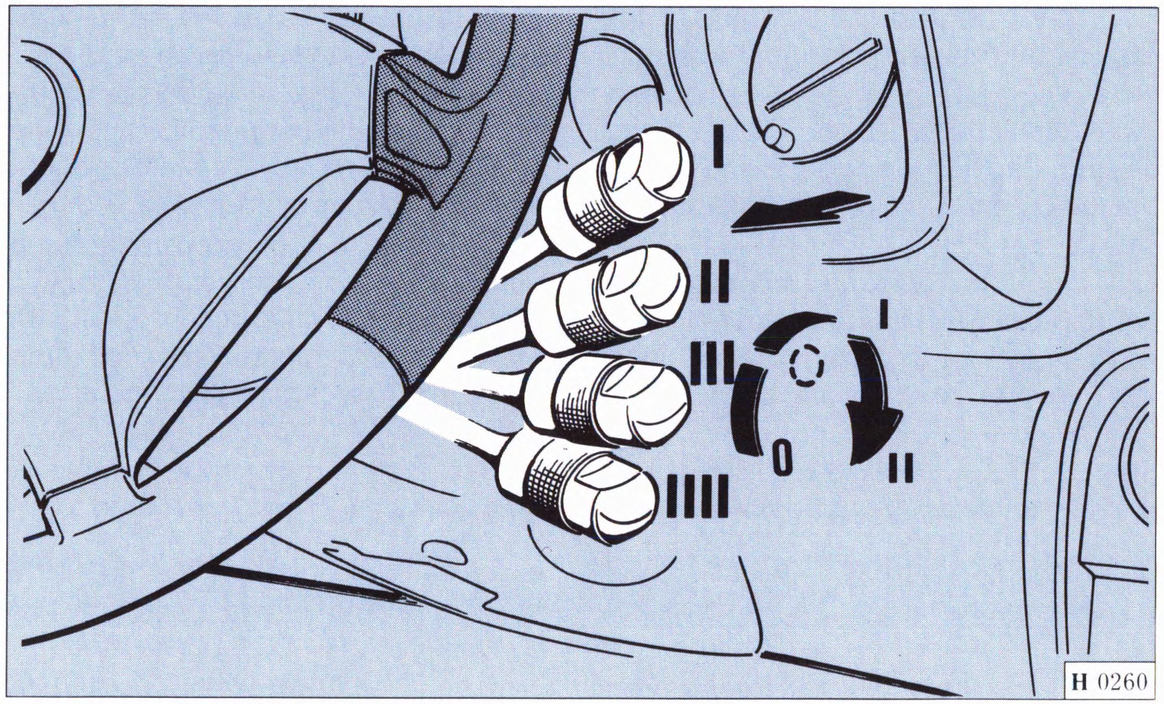


Fig. 7 - Windscreen wiper/washer lever.

I - Wipers off
II - Wipers intermittent
III - Continuous wipe (slow)
IIII - Continuous wipe (fast)

With the lever in position **II** (intermittent), you can increase wipe frequency

by turning the knob on the end of the lever.

With the lever in position **I**, pull it towards the steering to operate the windhieldwasher.

The wash spray stops as soon as you release the lever.

The wash function also operates the wipers for a few strokes.

Running in

Do not exceed 5,000 rpm for the first 600 miles (1,000 km).

Change the engine oil and oil filter during the first free service and subsequently at the intervals specified in the Maintenance Schedule.

After starting a cold engine, do not exceed 4,000 rpm until the engine warms up (i.e. until the coolant reaches a temperature of 150 ÷ 160°F (65 ÷ 70°C).

Do not maintain high engine speeds for prolonged periods of time.

Perform the following checks before using the car:

– check the coolant level in the expansion tank;
– check the oil level in the oil tank and top up if it is below half way between the "Min" and "Max" marks;
– check tyre pressures and tire wear;

– check the level of the brake and clutch fluids in the corresponding reservoirs.

It is good practice to perform these checks every 500 miles (800 km) in any case.

Opening and closing the doors

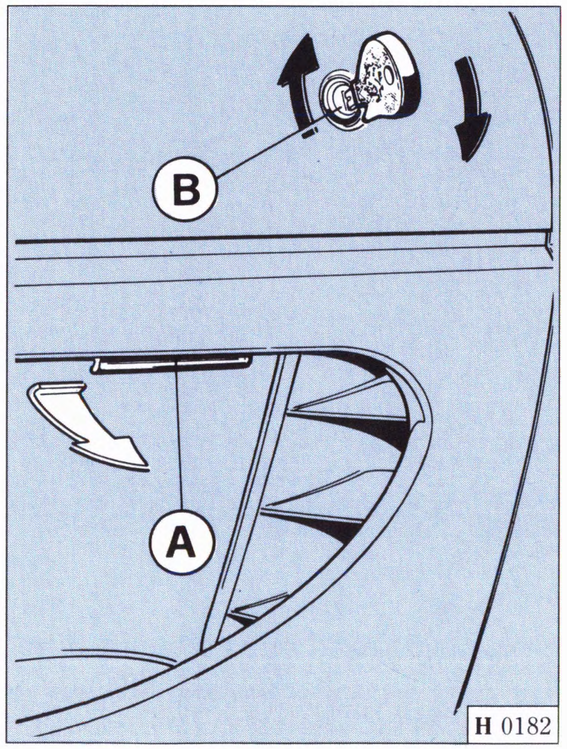
From the outside

The doors can be unlocked and locked from the outside (either side) using the key lock. (Never press the locking button **E** with the door open).

Both key locks are connected to the electric central locking system so that both doors are unlocked simultaneously.

From the inside

Press the central locking lock push-button **G** to lock the doors from the inside, but do so only with both doors closed.



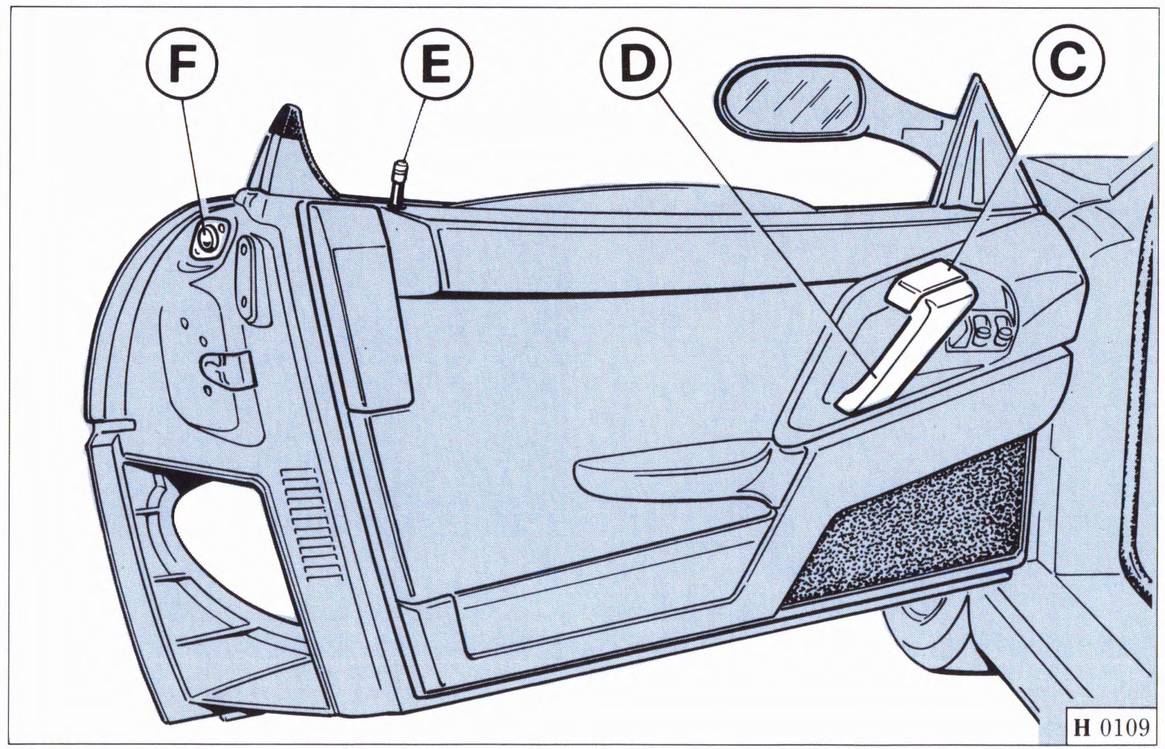


Fig. 8 - Door opening
A - Door handle; **B** - Door lock; **C** - Internal door release lever; **D** - Arm rest and door grip; **E** - Door locking button; **F** - Open door safety light.

Press the unlock push-button **H** to unlock them.

Pull door release lever (**C**, Fig. **8**) to open the door from the inside.

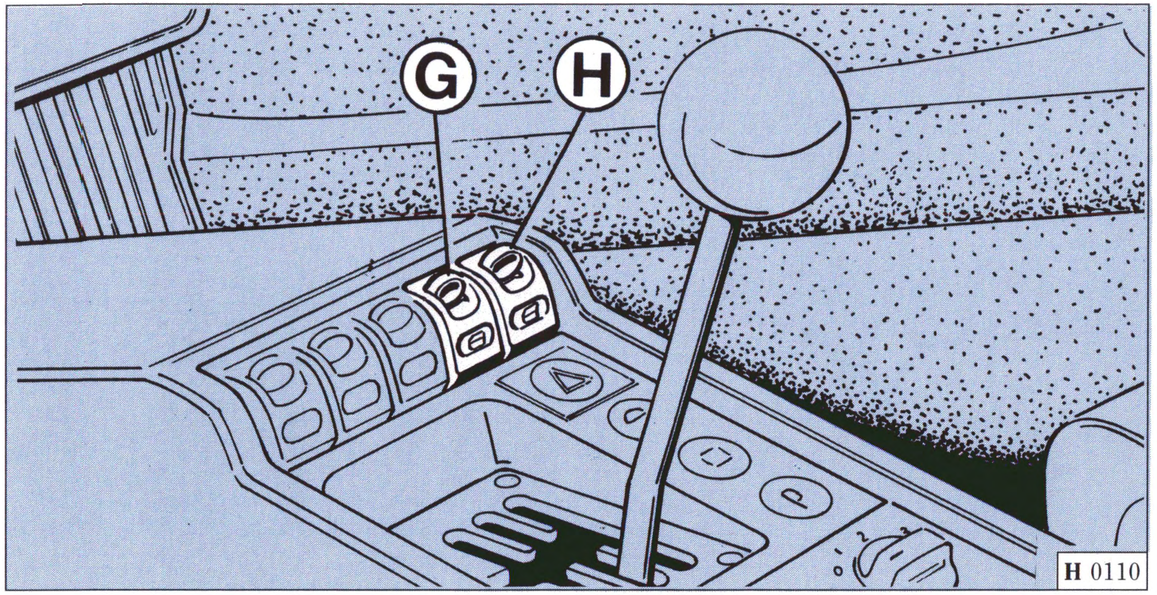


Fig. 9 - Central door locking push-buttons

G - Lock push-button;
H - Unlock push-button.

IGNITION SWITCH AND STEERING LOCK

Key positions

0 - Steering lock on

- The key can be removed.
- The steering lock is engaged as soon as the key is drawn out, even partially.
- The parking lights and hazard warning lights can be switched on.
- Turn the steering wheel gently in both directions while turning the ignition key to unlock the steering.

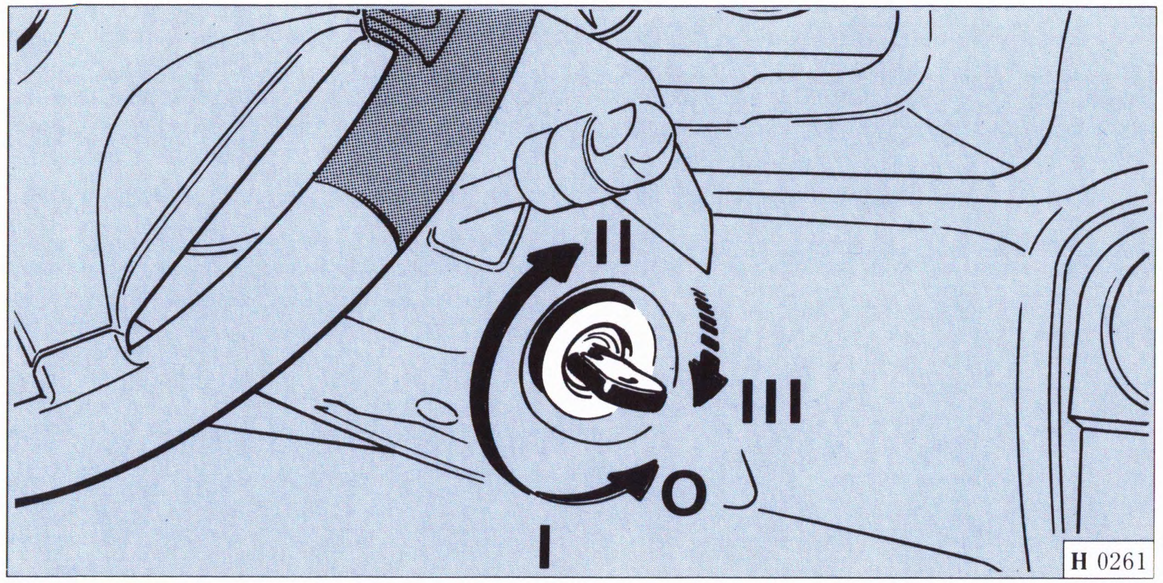


Fig. 10 - Ignition key and steering lock.

- Turn the key to position **I** to power up the ABS system, pressurise the braking system, and energise the alternator.

II - Ignition on

The ignition system and all other electrical systems are energized.

III - Start

Note: remove the ignition key unless the car is stationary!

The steering wheel will lock at the first maneuvre!

ALARM SYSTEM

General features

Your car alarm is operated by a radio-frequency wireless control and it can immobilize the engine and send an alarm signal in case of a theft attempt.

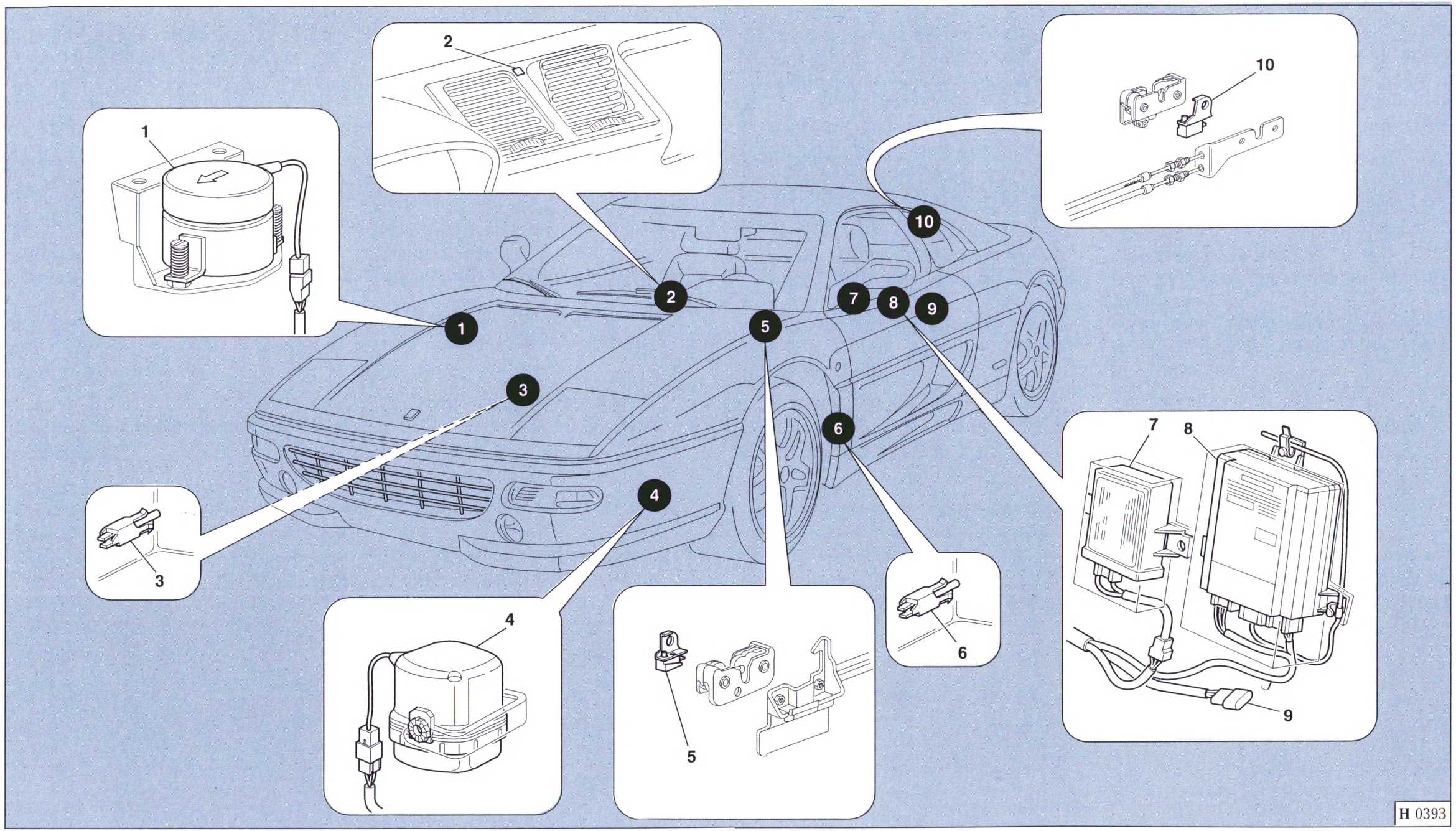


Fig. 11 - Alarm system parts

1 - Lifting preventing switch; **2** - LED; **3** - Right door switch; **4** - Siren; **5** - Bonnet switch; **6** - Left door switch; **7** - Interface ECU to the Motronic system; **8** - ECU for alarm system; **9** - Diagnosis socket; **10** - Engine compartment switch.

ALARM PARTS

– Alarm system ECU.
– Interface ECU for Motronic system.

Note: the ECUs are protected by sealed metallic sheet panels with rivets; in this way the minimum access time required by the insurance companies can be respected.

– Motronic ECU.
– Lifting preventing sensor: mercury switch, fed at 12 V.
– Siren: fed at 12 V with inner electronics and back-up battery for intervention in case of disabling with "armed" system.

– Door switches.
– Bonnet and hood switches.
– Starting relay.
– LED.
– Wireless control.

DIAGNOSIS

The system can make a self-diagnosis both on sensors/actuators and on theft attempts; a general fault code is displayed by the indicator light flashing (see page **H22**).

Connecting the SD-1 to the diagnosis socket (**9**, Fig. **11**), placed under the sheet panel on the driver's seat back, a passive guided diagnosis can be started, for identifying a possible malfunctioning of the system and for the required replacement/repair of the faulty part.

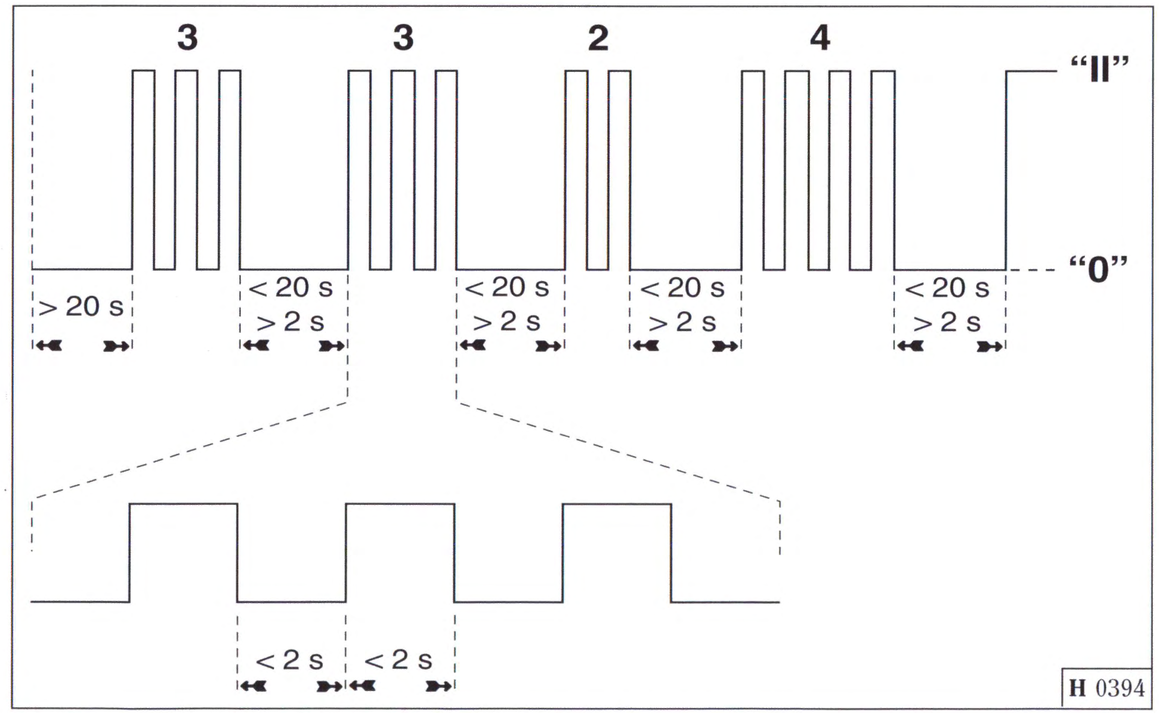
"PIN code"

Each system is associated to a secret code, the so-called ***"PIN code"*** (or **P**ersonal **I**dentification **N**umber) that is handed over to the customer with the car and it is reserved.
The customer must keep this code safe and confidential.

Through the ***"PIN code"*** you can disarm the whole system without the wireless control, using the ignition key, as described here below:

a. make sure that the ignition key has been left in ***"0"*** position for more than 20 seconds.

b. Digit the first number of the ***"PIN code"*** putting the ignition key in position ***"II"*** - ***"0"*** as many times as the concerned number.



***E.g.*:**
– first number = 3 ➙ 3 cycles ***"II"*** - ***"0"***.

– For the 0 *(zero)*, make 10 cycles.

Fig. 12 - Example with *"PIN code"* no. 3324.

Note: during this operation, the key shouldn't be left in position ***"II"*** - ***"0"*** for more than 2 seconds.

c. Leave the ignition key in position ***"0"*** from 2 to 20 seconds.

d. Repeat the steps **b.** and **c.** for the remaining three numbers.

Note: if the entered code isn't correct, wait at least 20 seconds with the ignition key in position ***"0"*** before repeating the whole procedure.

Operation

The system can be in the following conditions:

1. Disarmed and mobilized

2. Immobilized

3. Armed and immobilized

1. Disarmed and mobilized

In this condition, the system is *disabled* (***inactive***), the doors are unlocked and the car can be started.

This condition is reached by disabling the system through the wireless control, or - in case of emergency - through the ***"PIN code"***.

The system confirms this situation through two short beeps of the siren and flashes of the direction lights (in the countries where it's allowed).

2. Immobilized

This condition can be obtained:

– 60 seconds after removing the starting key and opening one of the doors (the 60 seconds start from the door opening).
– 120 seconds after the system disarming through wireless control, if the engine hasn't been started.

In this condition, the car engine cannot be started, the starter and the ignition/ injection system are disabled and the LED flashes.

To start the engine, press the wireless control before turning the ignition key to the position ***"II"***.

3. Armed (alarm enabled and car immobilized)

When *"armed"*, the system puts the car in the following conditions:

– engine immobilization;
– doors locked and control of the input signals (the alarm system protects the opening of doors, hood and bonnet, and avoids the car lifting in case of theft through towing). The LED flashes.

This condition can be obtained as follows:

a. using the wireless control, after switching the engine off and closing doors, hood and bonnet. The time required for the system arming through the wireless control amounts to 5 seconds (stabilization time).

b. Through the *"auto-arming"* function.

Note: the system confirms the completed activation through a short beep of the siren and flashes of the direction lights (in the countries where it's allowed).

If the alarm *ISN'T* armed correctly and the doors / hood and bonnet aren't completely closed, the system signals it through five short beeps of the siren and flashes of the direction lights, enabling the alarm anyway.

Auto-arming

To prevent the possibility of leaving the car open/disarmed involuntarily, the system *"auto-arms"* in two subsequent steps:

– immobilization after 120 seconds;

– arming after further 180 seconds.

The auto-arming is made only after *"disarming"* the car and if no access is touched (doors / hood and bonnet).

AUXILIARY FUNCTIONS

Panic function

A peculiar feature of the system is its use in case of help or danger.

Pressing the wireless control continuously for 3 seconds, the car enables the siren and the flashes of the direction lights, to signal that the car owner is in a dangerous situation.

The sequence is stopped by pressed the wireless control push button for 3 seconds.

Alarm system signals

a. system *"armed"* correctly	1 flash + 1 siren beep
b. system *"disarmed"* correctly	2 flashes + 2 siren beeps
c. system not *"armed"* correctly due to an incorrect access (open doors / bonnet and hood / faulty switches)	1 + 4 flashes + siren beeps
d. disarming after a theft attempt (the system signals that one of the accesses has been forced and the siren has beeped)	3 flashes + siren beeps
e. alarm in case of theft	5 cycles by 30" of the direction lights + siren beeps, with stops by 5 seconds, then only direction light flash up to at most 5 minutes (in Switzerland only 1 cycle is allowed).
f. alarm ***"0 - II"*** (momentary forcing of one access)	1 cycle by 30" of flash + siren beep

"LED"

– Every time that the ignition key is put in position ***"II"***, the LED is on for 6 seconds, then it goes off in case of no failure (self-diagnosis).

– If an anomaly is found (bonnet and hood or doors open), the LED, after the 6 seconds, goes off and then lights up continuously.
– If the system is immobilized or armed, the LED flashes for the first 20 seconds quickly and then it flashes slowly and steadily.

– When the system is *"disarmed"*, the LED flashes quickly when the wireless control is operated, then it goes off.

Dome lamp

It lights up for 10 seconds when the system is *"disarmed"*.

Important remarks

The wirelles control operates within a range of about 5 m. If the system doesn't reply, approach to the car and operate as follows:

1. Press the wireless control push button controlling the LED. If it flashes quickly while the push button is pressed, the wireless control is ***"OK"***, otherwise check the batteries and replace them if necessary. The wireless control batteries must be changed regularly - about every 6 months.

2. If the wireless control is ***"OK"*** and the system doesn't reply yet, make the re-synchronization procedure pressing the wireless control push button for three consecutive times, within 10 seconds.

Car towing in case of accident or breakdown

Note: the car should never be transported when the alarm system is *"armed"*.

If instead the alarm system is *"armed"*, use the wireless control to *"disarm"* the system, then open and close one door. Through this operation, the alarm system becomes *"immobilized"*.

GENERAL REMARKS

While handing over the car, it is equipped with two ignition keys and 3 wireless controls (1 red master + 2 black slaves). The customer must keep in a safe place the wireless controls (1 red and 1 black), the unused key and the label with the ***"PIN code"***.

- Loss of one key

The Customer can ask for a duplicate to the Concessionaire/Importer, giving the number shown on the plastic label attached to the key.

- Loss of one or more wireless controls

In this case, the Customer must ask to a Ferrari Concessionaire/Importer for the new wireless control kit (1 master + 2 slaves) and the label with the new ***"PIN CODE"***.

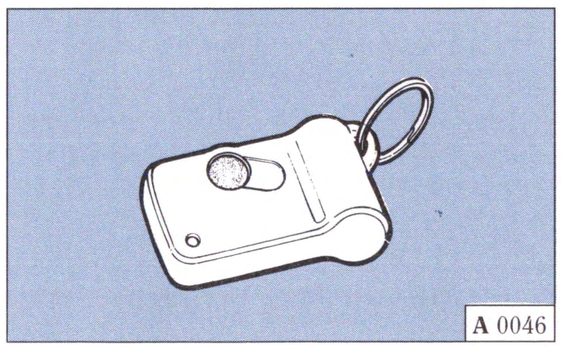


Fig. 13 - Alarm wirelles control.

Therefore, for storing the new wireless controls, operate as follows:

pre-arrange the ECU for the self-learning; this condition is achieved by entering the "pin code" as previously described and, after the last digit, waiting from > 2 seconds and < 20 seconds, make 10 "**ON**" - "**OFFs**" (digit 0); at the tenth "**ON**" the LED starts flashing.

Leave the key in "**ON**" and press the new master wireless control (this procedure stores the new "pin code" in the ECU; the latter will be handed over to the customer in a crypted way, with the new wireless controls). Press then the two slaves (one after the other) and check if the three new wireless controls operate correctly. Return the old wireless controls to Ferrari.

Technical data

1) Siren absorption: 3.5 mA (the siren is self-fed by a 7.2 V NC battery); in case of disconnection of the car battery, with operating system, the siren makes one complete alarm cycle and charges again immediately when the car Ta battery is connected again. The siren dialogues with the alarm system ECU every 2 ÷ 3 seconds, on a serial line, through a 4-digit code and it cannot be enabled and disabled differently. It should be assembled with the cone facing downwards, with an angle of 30°, for water drainage.

2) Lifting preventing sensor absorption: 6.0 mA (the sensor resets in any car position and sends an enabling signal when the stored position is changed with the system enabled).

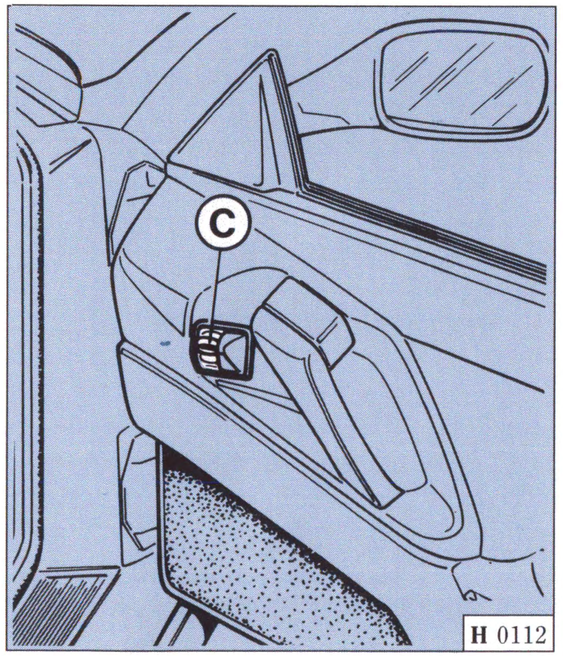
3) Disabled system total absorption: 10.0 mA.
4) Enabled system total absorption: 15.0 mA.
5) Total car absorption at a standstill: 35 ÷ 40 mA (the battery loses 50% of the charge in about 30-40 days - in case of long car inactivity, it's advisable to wait until the alarm system is immobilized and disconnect the battery).

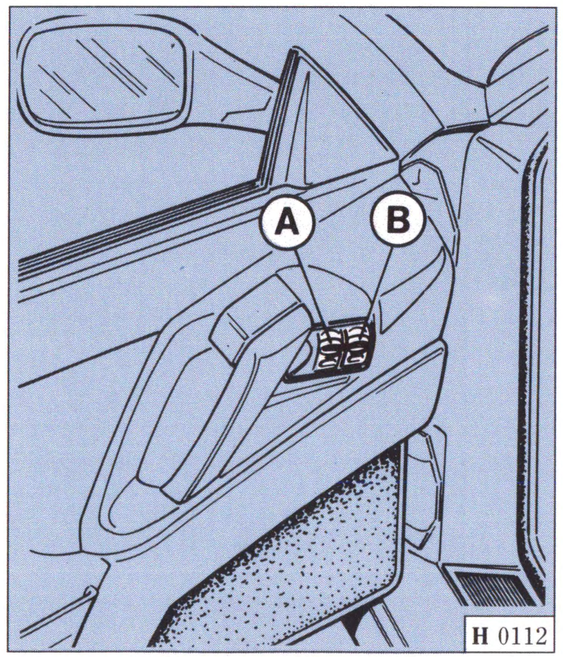
ELECTRIC WINDOW CONTROL SWITCHES

Note: the window control switches are only active when the ignition is ***ON***.

LH window switch

- Press switch **A** (Fig. **14**) to operate the LH window.
- There is no need to hold the switch. Lifting and lowering movements continue automatically.





Note: to lift or lower the window to a specific position, hold the switch down and release it when the window reaches the position you want.

Fig. 14 - Window control switches
A - LH window switch. **B** - RH window switch. **C** - RH window switch (RH door).

- You can stop window movement at any point by pressing switch **A** again.

- Switch **B** enables the RH window to be operated from the left seat.

RH window switch

- The RH window can be operated by means of switch **B** (on the LH door) or switch **C** (on the RH door) (See Fig. **14**).
- Switch **C** requires continuous presure to maintain window movement.

- Simply release switch **C** to stop the window.

Note: when you remove the ignition key, you can continue to operate the windows for a further 2 minutes with the door open.
After 2 minutes, the window control unit is deactivated to avoid discharging the battery.

WARNING

Always remove the ignition key when leaving the car in order to avoid risk to passengers remaining in the car who may accidentally operate the window switches.

STARTING THE ENGINE

Starting a cold engine

Make sure that the gearshift lever is in neutral.

Depress the clutch pedal and turn the key to position **III** to start the engine.

Do not press the accelerator pedal.

Release the key as soon as the engine fires. The key automatically returns to position **II**.

If the engine fails to start or stalls, return the key to position **0** and repeat the procedure.

Avoid full acceleration until oil temperature reaches about 150° ÷ 160°F (65° ÷ 70°C).

Starting a hot engine

Proceed as instructed for a cold engine.

If the engine fails to start after a few attempts, perform the following checks.

1 - Check that cranking speed is sufficient. The battery could be discharged or the oil could be too thick or too cold.

2 - Check the ignition system (damp spark plugs, coil problems, etc.).

3 - Check for electrical short circuits and bad connections.

4 - Check the fuel pump fuses.

DRIVING INSTRUCTIONS

- Depress the clutch pedal fully and engage 1st gear.

- Fully release the parking brake.

- Slowly release the clutch pedal and gradually accelerate.

- Change up through the gears as required.

- **To engage reverse gear, press the lever downwards before moving it forward.**

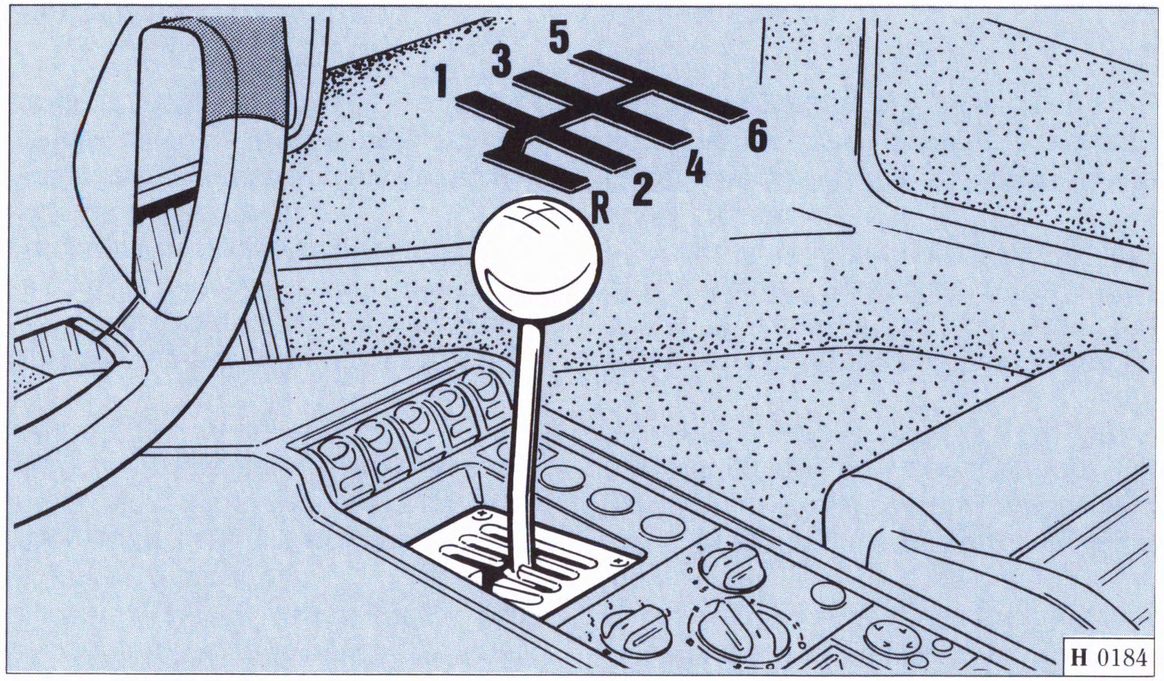


Fig. 15 - Gearshift lever and gear gating.

Driving precautions

Never drive with the rev counter in the red, even downhill with no load on the engine.

When the rev counter pointer approaches the red sector, take care not

to exceed maximum permitted engine speed.

Under normal driving conditions, all the red warning lights on the instrument panel should be off. If any warning light comes on, it indicates a malfunction in the corresponding system.

Check the instrument panel regularly to ensure that all systems are functioning correctly.

Continuing to drive with a red warning light on can cause serious damage and malfunctioning, and can permanently reduce the performance of your car.

Note: never turn the engine off to coast downhill. Under these conditions the brake system hydraulics rapidly lose pressure and braking efficiency is seriously limited.

Note: after using the engine to its full performance, leave it idle for a few minutes to cool down before switching it off.

Parking the car

If you have to park on a slope, apply the parking brake fully and engage 1st gear, regardless of whether it is facing uphill or downhill.

1st gear has the lowest transmission ratio of all the gear and therefore provides the most effective engine brake.

Warning! Catalytic converters can reach extremely high temperatures. Do not park the car over flammable materials such as dry grass, pine needles, and leaves, etc., which could be ignited by the heat released.

SEATS
(For berlinetta and GTS)

Note: never adjust the driving seat while the car is in motion. You could lose control.

Both seats can be adjusted fore and aft. Pull up lever **A** and slide the seat in the direction required.

Turn knob **B** in the direction required to adjust backrest angle.

The seats are fitted with height-adjustable headrests **C**.

Pull lever **D** up to tilt the backrest forward.

The driver's seat also features posture adjustments.

- Knob **E** adjusts the firmness of the lateral backrest supports.

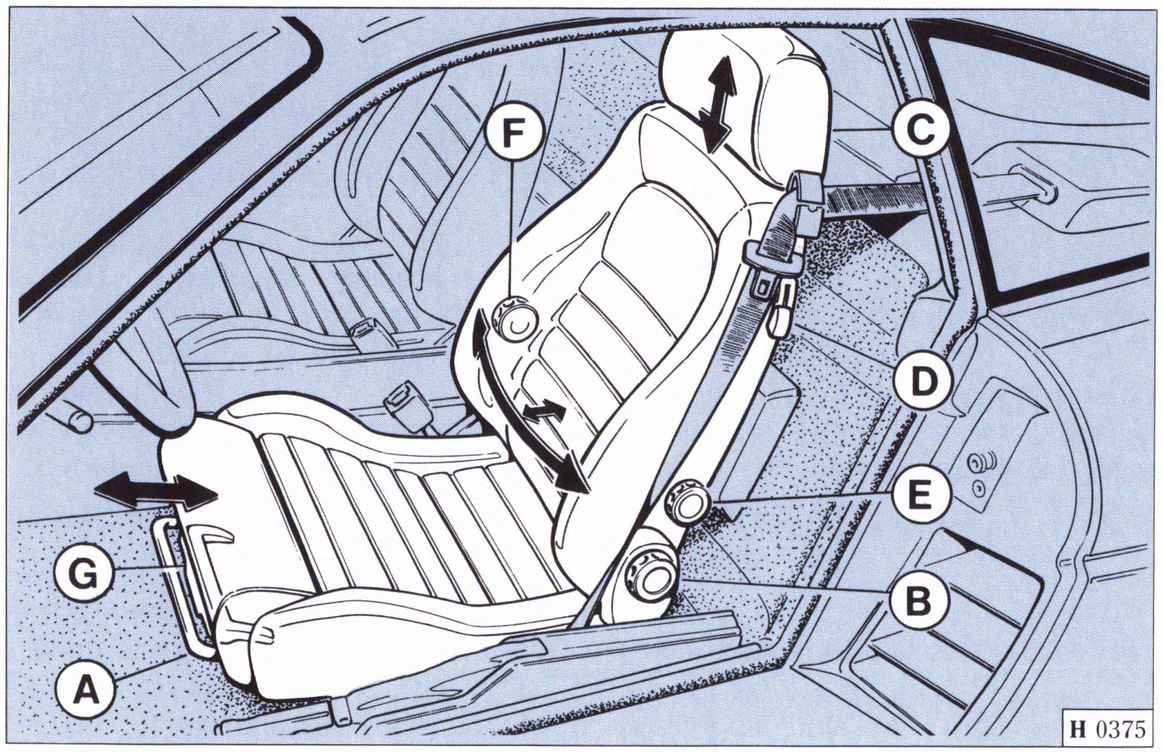


Fig. 16 - The "Comfort" seat.

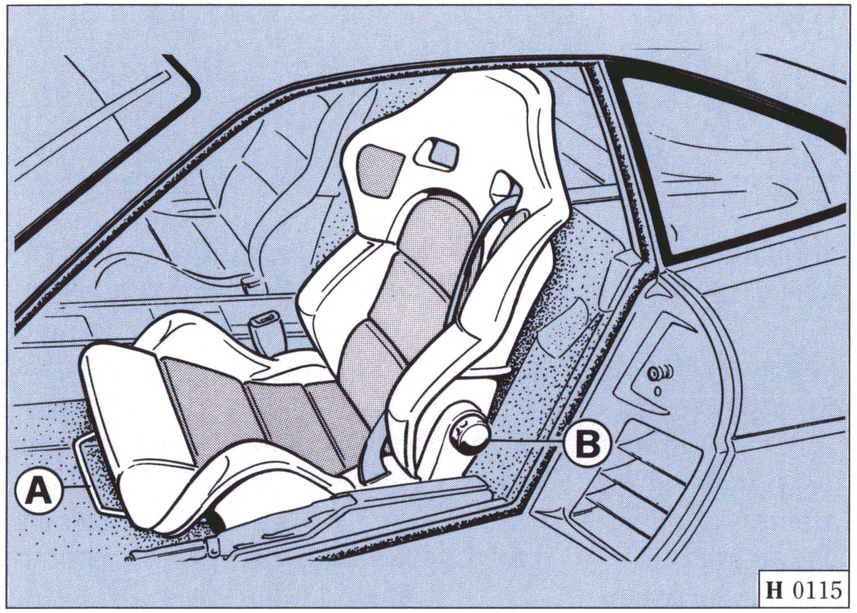
- Knob **F** adjusts the firmness of the lumbar support.

Lever **G** permits adjustment of the seat cushion.

(Optional) "Sport" seats

Special wrap-around seats are avaliable as optionals. These seats are made in Kevlar and carbon, and are upholstered in black leather and red fabric.

Fore and after adjustment is provided by lever **A**.



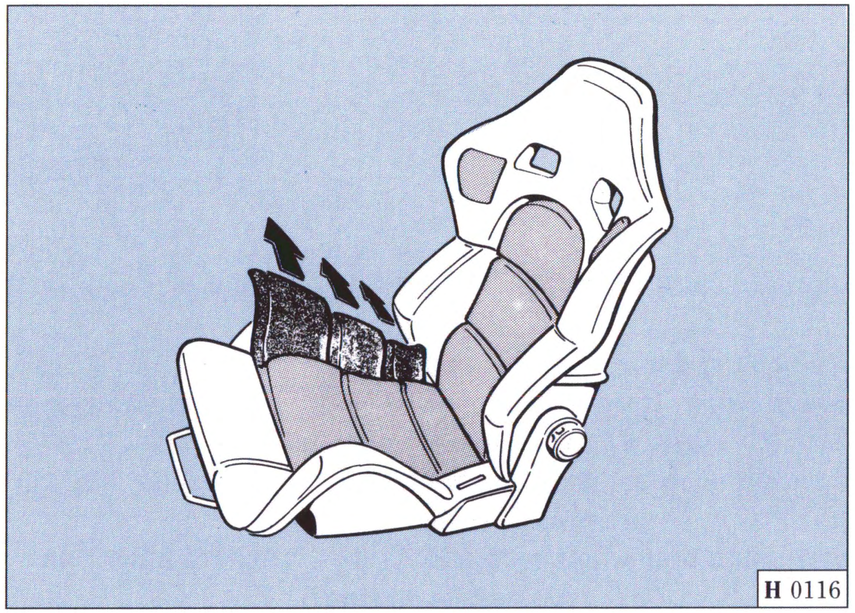


Fig. 17 - The "Sport" seat.

Fig. 18 - Driving height adjustment.

Backrest adjustment

Turn knob **B** in the direction required to obtain the most comfortable backrest angle.

Driving height adjustment

You can adjust driving height by removing one or more cushion strips from the side of the seat as shown in Fig. **18**.

SEATS
(For spider)

Note: never adjust the driving seat while the car is in motion. You could lose control of the car.

For a customized adjustment of the seat longitudinal position, use the suitable switches **A** and **B** (Fig. **20**) placed in the central tunnel.

Action lever **C** to adjust backrest angle.

The seats are fitted with height-adjustable headrests **D**.

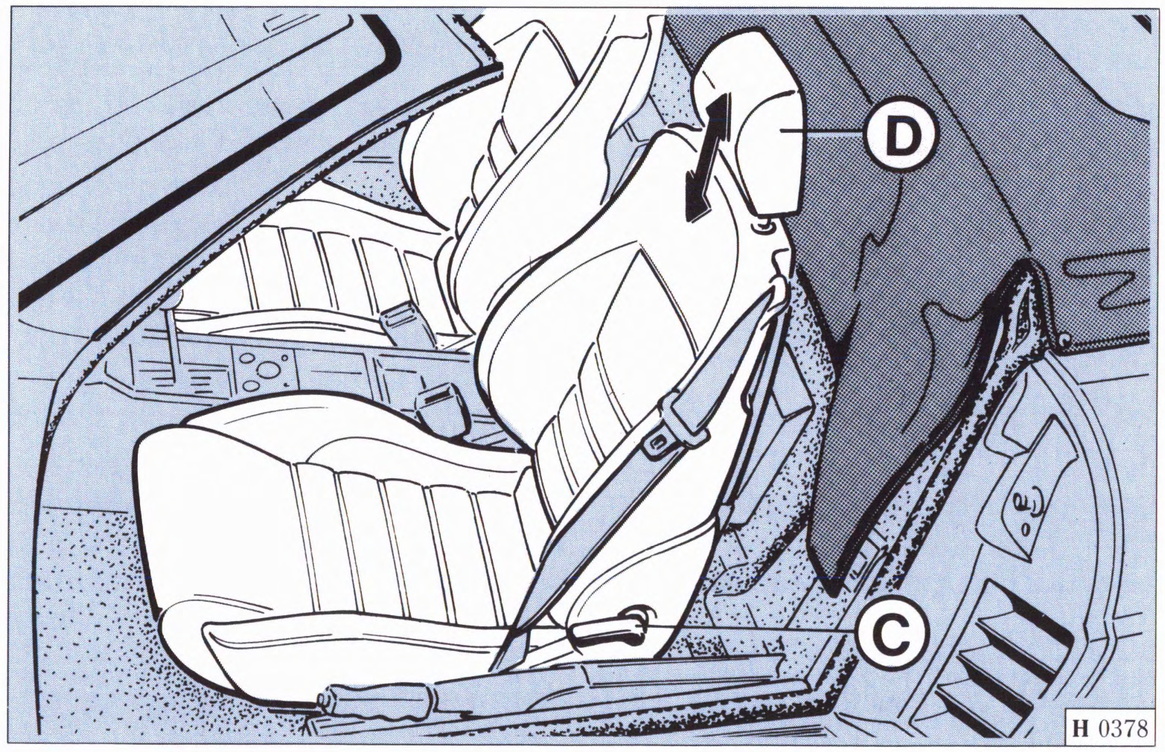


Fig. 19 - Seat.

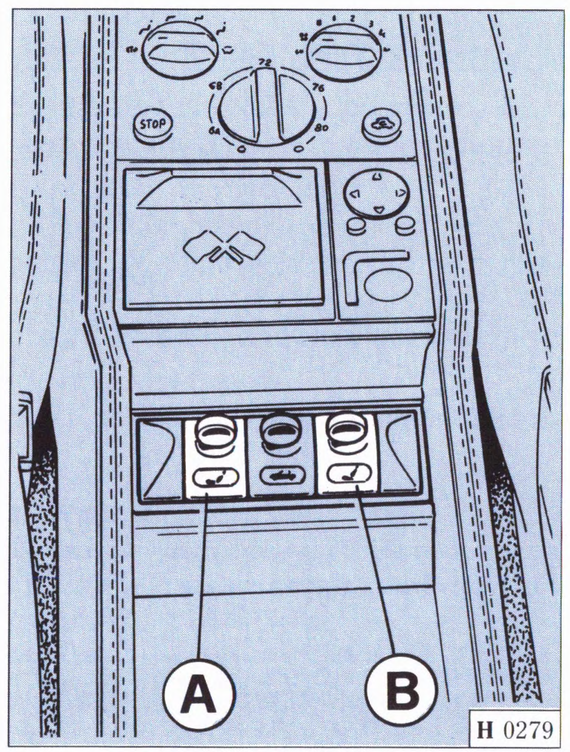


Fig. 20 - Switches for seat adjustment
A - Driver's side switch.
B - Passenger's side switch.

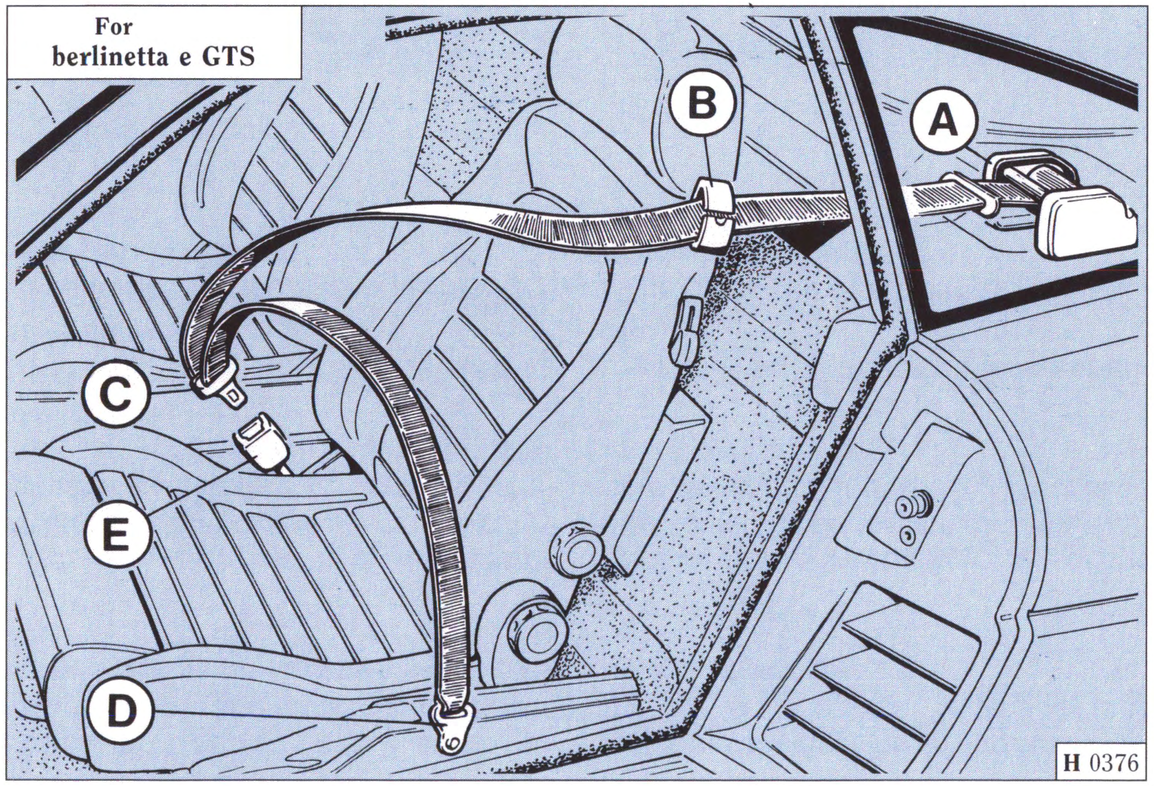
SEAT BELTS

Note:
always wear your seat belt when driving.

The seat belts (Fig. **21**) are inertia reel belts with three anchor points.

The belt leaves the inertia reel **A** and passes through guide **B** which keeps it correctly aligned. Fastener **D** is positioned so that the belt restrains the chest and lap.

The inertia reel system allows ample freedom of movement under normal



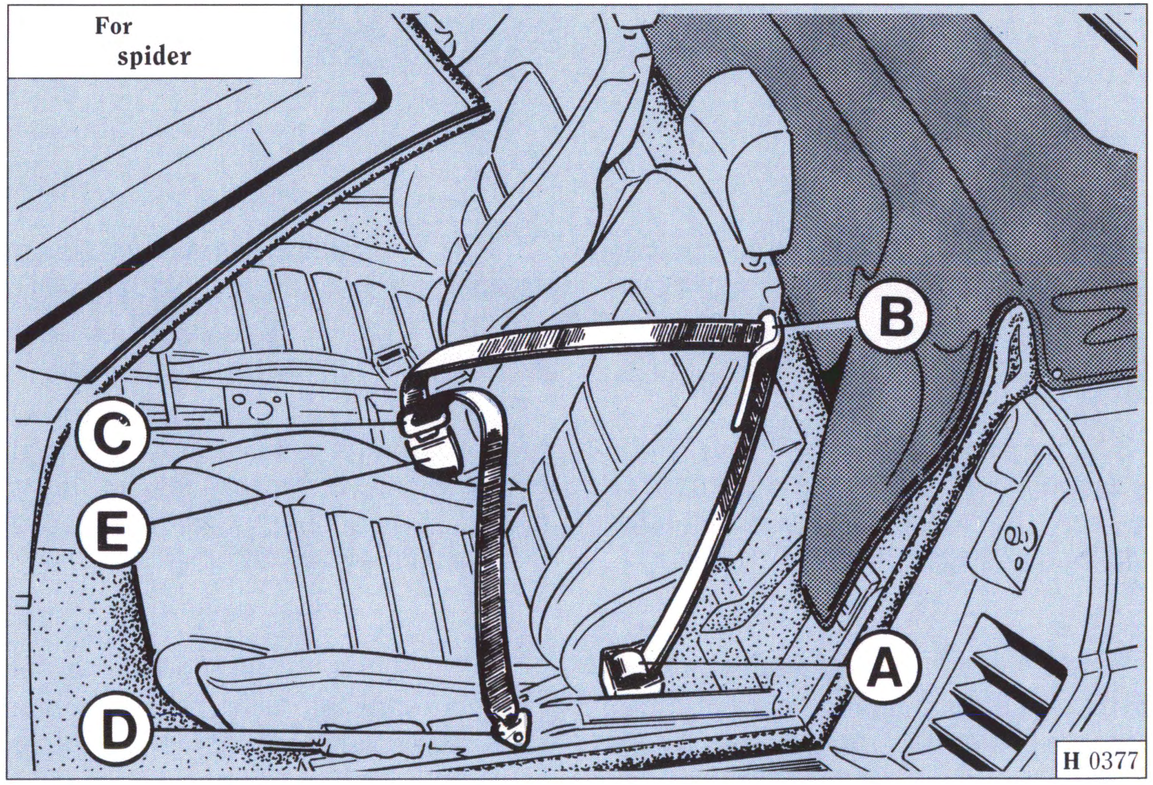


Fig. 21 - Seat belts

A - Inertia reel; **B** - Guide; **C** - Fastener; **D** - Anchor point; **E** - Catch.

driving conditions but locks instantly in the event of violent braking or a collision.

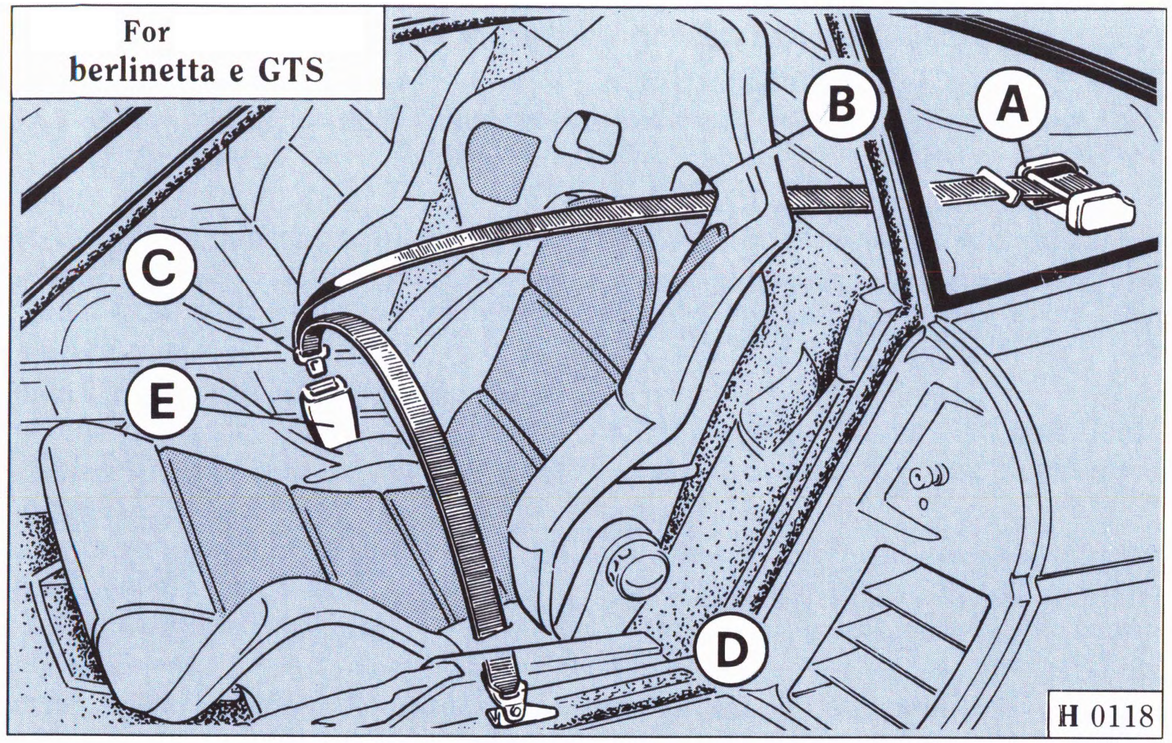


Fig. 22 - Seat belts on "Sport" seats

A - Inertia reel;
B - Guide;
C - Fastener;
D - Anchor point;
E - Catch.

Instructions

Fasten your seat belts before you start the engine and move off, but after making any necessary adjustments to your seat.

To fasten your seat belt, pull the belt over your shoulder and pass it over your chest and lap before pushing fastener **C** into the locking unit **E**.

Do not pull the belt out of the retractor too quickly or the reel will lock.

If the reel does lock, feed the belt a little way back in and then pull it out again, more slowly.

To remove your seat belt, simply press the button marked “Press” on the locking unit **E**.

WARNINGS

The seat belts are designed for use by one adult at a time. Never put a seat belt around a child sitting on a passenger’s lap.

Make sure that you are properly seated, upright, and have your back firmly against the backrest before adjusting the position of your seat belt.

Occasionally check that the anchor bolts are tight and that the belts themselves are in good condition.

If your car is involved in an accident, have the seat belts worn at the time replaced even if they appear undamaged.

You can wash seat belts by hand using warm water and a mild detergent.

Rinse and dry thoroughly away from direct sunlight. Do not use strong detergents or dyes, and avoid all chemical agents which could weaken the fabric.

You can clean the retractors with dry, clean, compressed air.

Do not make any modifications or fit accessories to the seat belts or anchor points. Consult an authorized Ferrari Service Center if in doubt.

Child restraints

Ferrari places great emphasis on the safety of all passengers, including children.

For a child restraint (infant seat, etc...) to provide adequate protection, it must be suitable for the height, weight and age of the child who is to wear it.

Read the instructions provided with the child restraint carefully to make sure that it is suitable for the child in question and for this vehicle.

Note:
unsuitable or incorrectly installed child restraints can increase the risk of injury to child in a crash.

IMPORTANT

The Airbag modules on driver's and passenger's side must be replaced ten years after their installation, (see notice **C**), even if the car hasn't had any collision.

The seat belt and children's restraint systems shouldn't be modified in any way.

AIRBAG SYSTEM

The airbags is a safety passive system designed to protect the upper body of the driver and/or passenger in a crash.

The airbag operation system is based on an electronic crash sensor, suitably calibrated, controlling the car deceleration on the longitudinal axis. Thus, the airbag doesn't operate in case of side shocks having a degree by ± 30°.

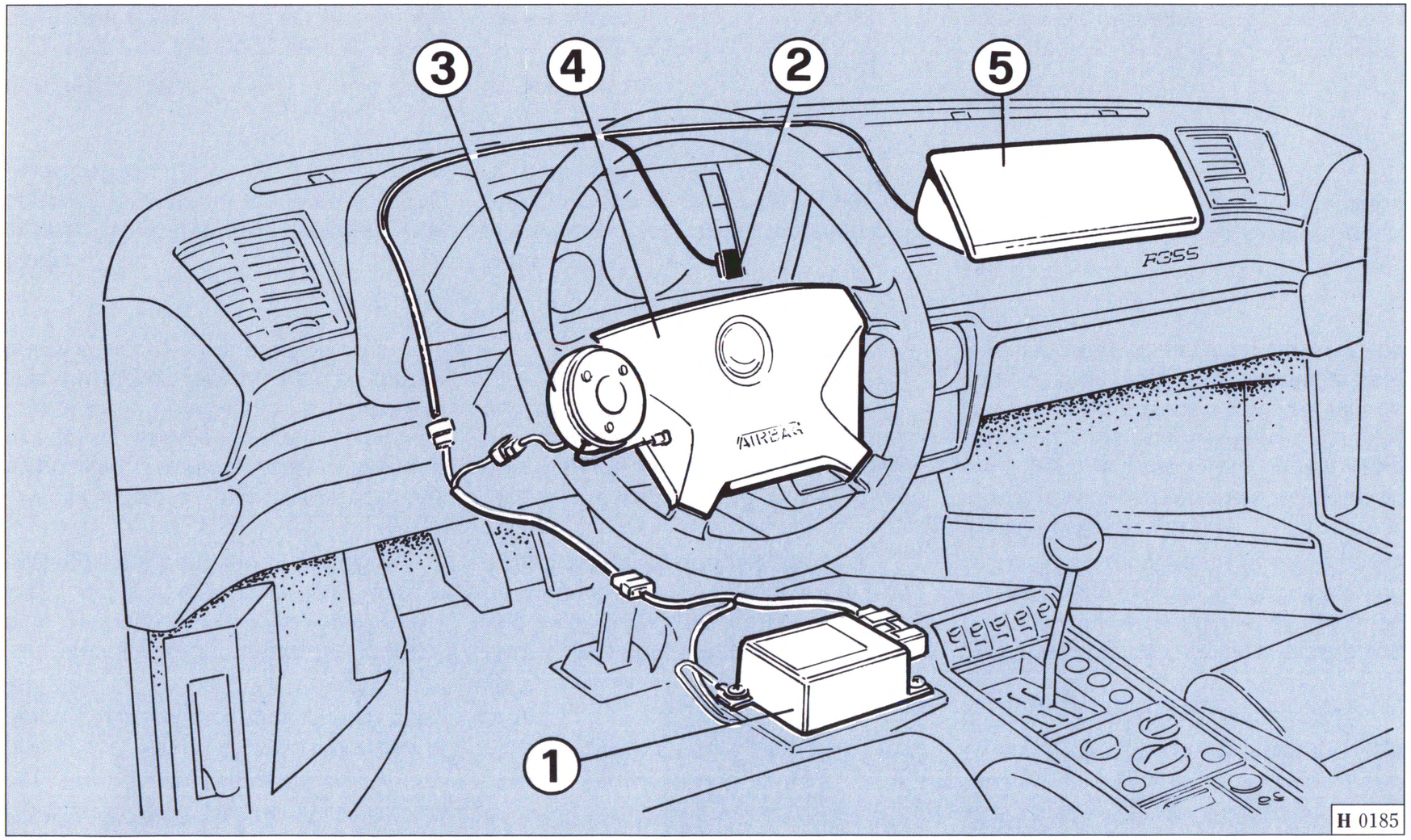


Fig. 23 - Airbag system components

1 - Electronic control unit (ECU);
2 - Warning light;
3 - Spiral-shaped contact;
4 - Driver's side airbag;
5 - Passenger's side airbag.

In a crash, the electronic control unit (ECU) inflates the airbags. As they inflate, the airbags break their covers and expand to prevent the driver and/or passenger from being thrown forward and striking the dashboard. Airbags take only a fraction of a second to inflate.

The airbags then deflate again immediately.

Airbag warning light

The airbag warning light comes on for about 4 seconds to test functioning whenever the ignition, key is put in position **"II"**.

If the airbag warning light comes on during normal drive, a malfunction system has been detected.

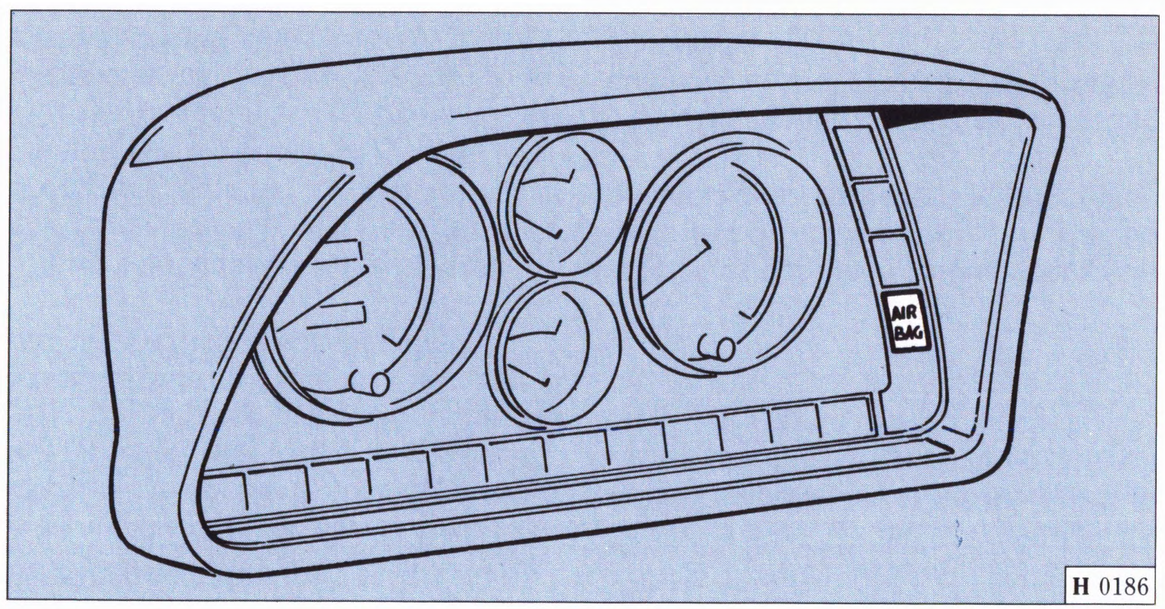


Fig. 24 - Airbag warning light.

DIAGNOSIS

Being a safety system, the airbag individual components cannot be repaired.

To detect the faulty component, use the SD-1 system, then replace it.

After this operation, make a complete cycle (as described in the SD-1 aided procedure) to print the performed test.

This document is valid as a system certification and it should be properly conserved.

"Lamp Check" activation and fault code cancelling

The Lamp Check is activated by short-circuiting the pin no. 1 of the diagnosis socket connector (Fig. **25**) towards earth for a time between 1 and 5 seconds. For each request, an individual fault is detected at a time.

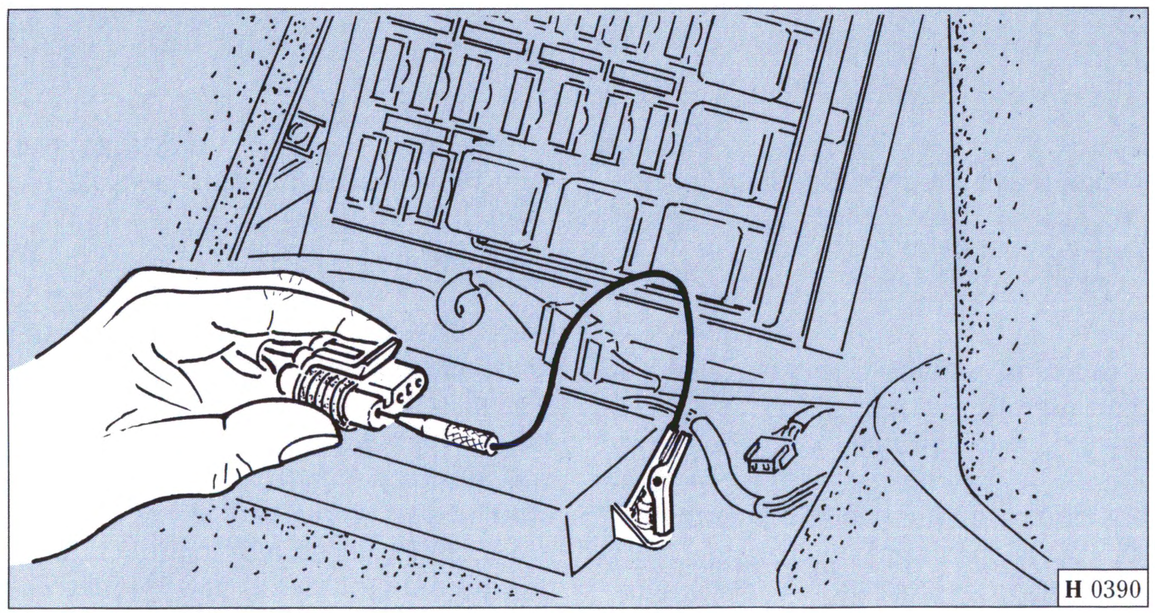


Fig. 25 - Jumper on diagnosis socket.

Lamp Check	Fault
1	*None (the lamp switches on for about 4 seconds, when the ignition key is put in position "**II**").*
2	*Faulty sensor.*
3	*Airbag starting circuit short-circuited towards battery +.*
4	*Airbag starting circuit short-circuited towards ground +.*

Lamp Check	Fault
5	*Wrong driver's side airbag resistance.*
6	*Wrong passenger's side airbag resistance.*
7	*Low battery voltage.*
8	*Faulty warning light or circuits.*
9	*Stored crash data.*

After the last fault, the first one is shown again.

The faults can be cancelled (apart from fault no. 9) by short-circuiting the pin no. 1 of the diagnosis socket connector towards earth for a time between 5 and 10 seconds.

If the fault no. 2 (ECU inner failure) disappears, the sensor resets.

CAUTION

Airbags are inflated by gases and fumes produced by rapid combustion. These fumes are NOT harmful, as they are

suitably cooled and filtered.

Some combustion residues, when placed in touch with halogenous liquids or substances (moisture, gasoline, etc...) can generate toxic substances, therefore, for more safety, comply with the following precautions:

- wear safety goggles while handling closed airbag modules;

- always lay the airbag module with the opening cover upwards;

- do not place anything on the opening cover of an airbag module;

- always carry the airbag module with the opening cover facing the side opposite your body;
- do not adapt, install, or use again the airbag system or parts of it, on a car different from the one for which they were planned and produced;

- store the airbag modules, closed and integer, in a cool, dry, closed and protected area;
- always wear rubber gloves and protecting goggles while handling airbag modules open after the inflation. The airbag surface can contain sodium hydroxide or hydrozoic acid (generated by the reaction between combustion residues and liquids such as moisture, gasoline, etc...), that could even be lethal;

WARNING!

Do not attempt to make any repair on the airbag modules.



Never carry the airbag module tensioning its cables.





Do not power the airbag module with a voltage other than the specified one.

Never weld, braze, drill, hammer or heat the airbag module.



- let the system cool for about 20 minutes, before operating on the inflating system, if an airbag system operates;
- store the faulty or not-opened units (e.g. faulty blowing system) far from acids, halogens, hard metals and salts;

- do not operate on the airbag harness; in case of failure, replace the whole harness;

- while restoring burnt cars, check the efficiency of the electrical system through the SD-1, using the sample resistances, before connecting against the airbag modules;

Do not apply any label or treat the steering-wheel and the padded panel placed on the passenger's side dashboard.

After a crash and if the airbags have inflated, all the system parts must be replaced.

Note: NEVER leave the airbag modules at temperatures over 150°C (300°F), as the explosion is due to the current high temperature rather than to current itself.

AIRBAG MODULE ASSEMBLY

In case of replacement of the ECU and/or of the airbag modules, proceed as follows:

1 install on the passenger's side airbag module the right and left fastening brackets through the suitable screws.

Note: for tightening the airbag module fastening screws, use the Ferrari tool code no. **95971523** (Fig. **26**) or the **TORX T30** and **T40** wrenches (Fig. **27**) available on the market.

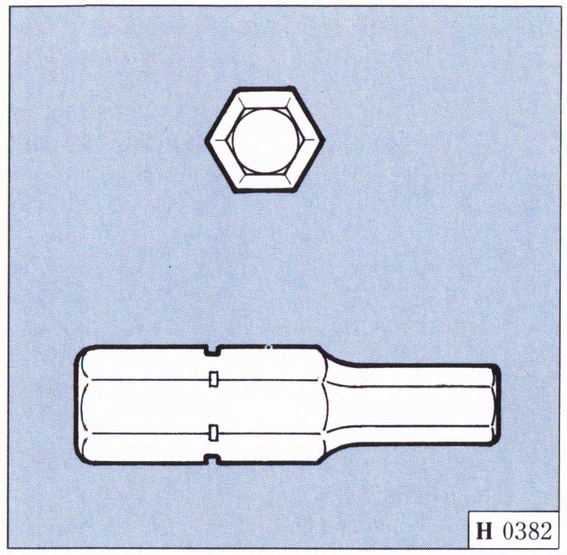


Fig. 26 - Ferrari tool code no. 95971523.

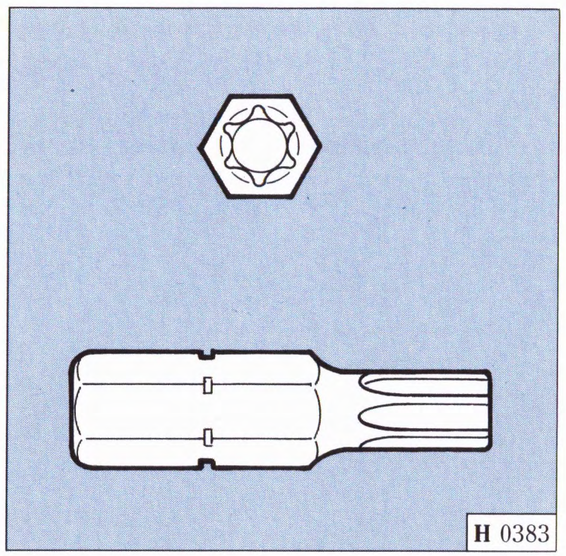


Fig. 27 - TORX T30 and T40 wrenches.

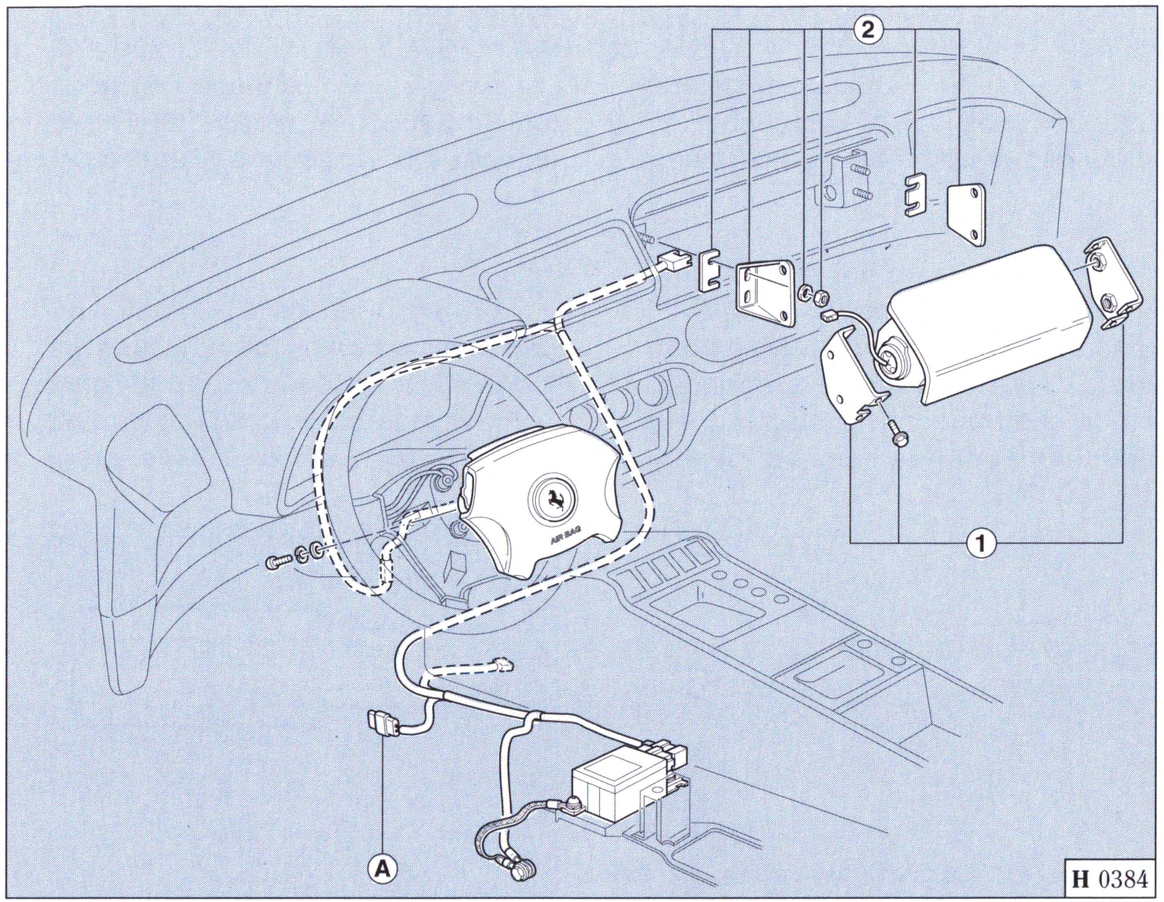
2 Fasten the right and left intermediate brackets to the stud bolts of the dashboard support using, where necessary, the relevant shims; apply a layer of Loctite and tighten the nuts at a torque by 24 Nm.

3 Fasten the driver's side airbag module connector to the spiral-shaped contact connector.

4 Assemble the driver's side module on the steering-wheel and, using a torque wrench, tighten the screws to 10 Nm, then apply a layer of yellow paint for self-check.

5 Fasten the passenger's side module connector to the yellow cable connector.

6 Fasten the module to previously assembled intermediate brackets, tightening the screws to 18 Nm through a torque wrench. Then, apply a layer of yellow paint for self-check.



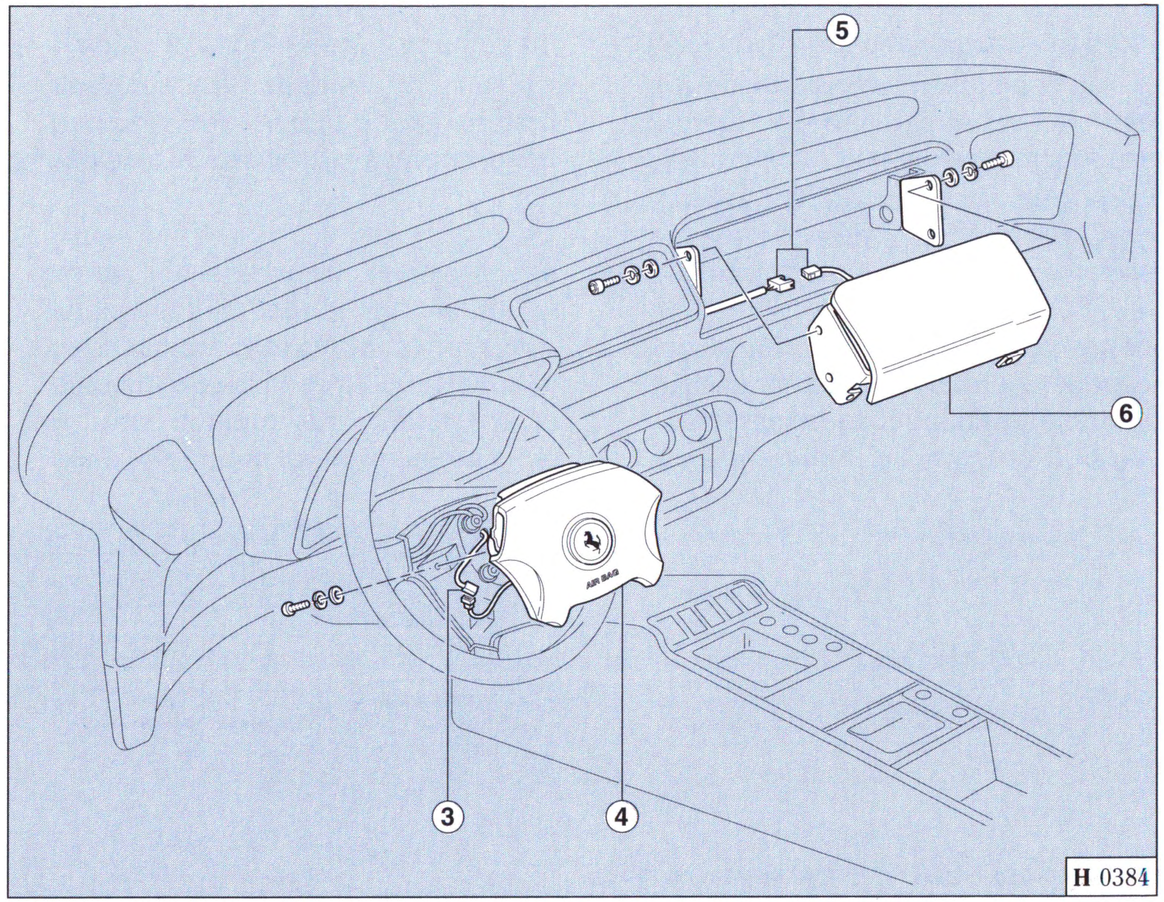


Fig. 28 - Airbag module assembly
A - Socket for SD-1.

CAUTION
After the assembly of the new parts, make a check cycle using the socket **A** (Fig. **28**) for the SD-1, then make a printing for the test result.

For a correct identification of the ECU and/or the modules, put the bar codes

of the parts on the printed sheet and send it to Ferrari.

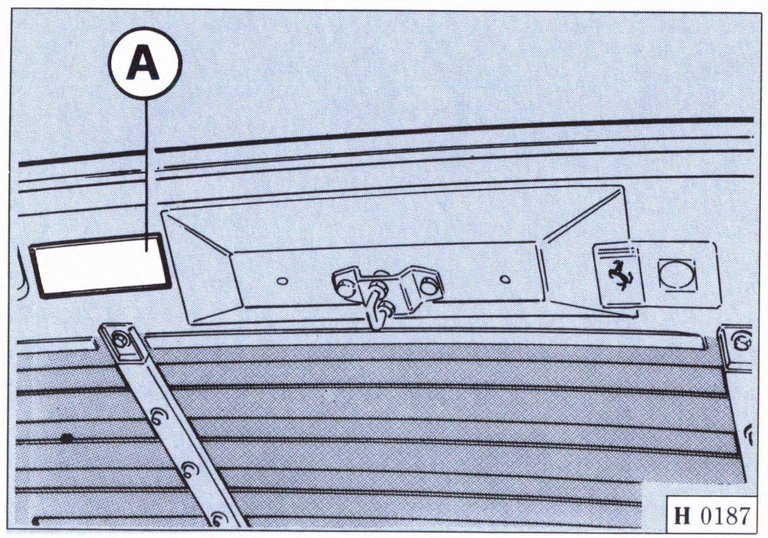
IMPORTANT

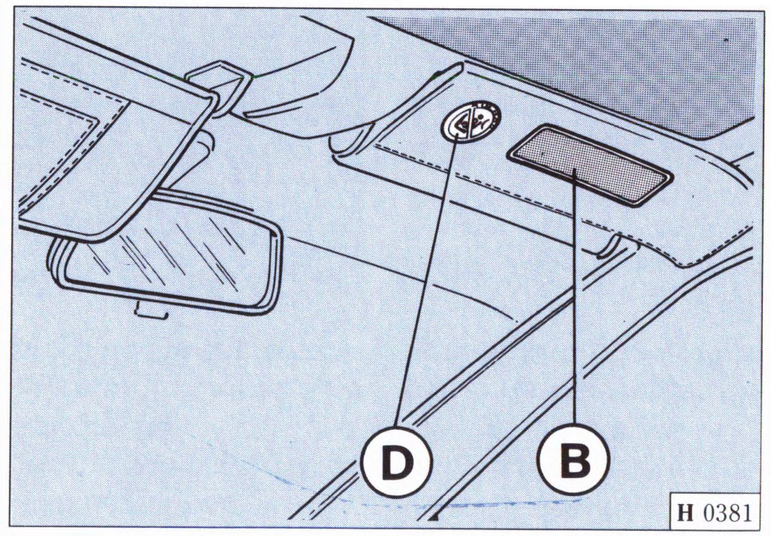
The Airbag modules on driver's and passenger's side must be replaced ten years after their installation, (see notice **C**), even if the car hasn't had any collision.

In case of cars equipped with passenger's Airbag, children's restraint system shouldn't be installed on the passenger's seat.

In the countries where law regulations require it, children under 12 can travel only on rear seats.

In case of crash with airbag inflation, dispose of the exploded modules as harmful waste, according to the regulations in force in the relevant country.





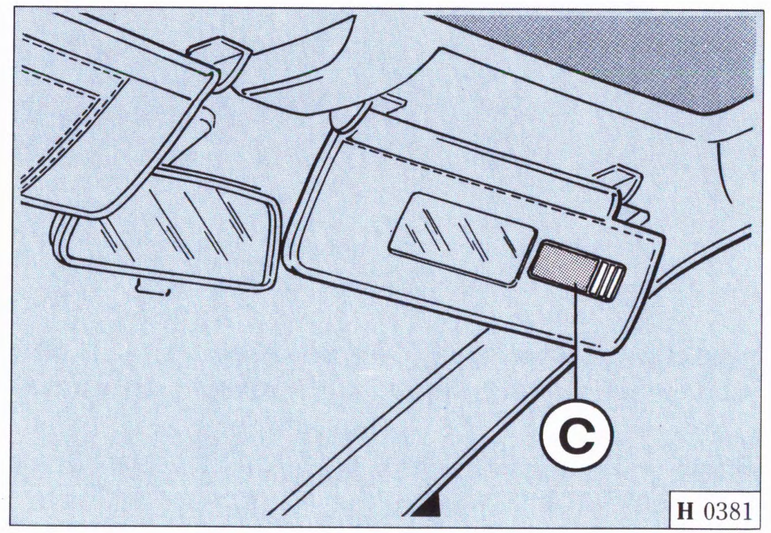


Fig. 29 - Airbag safety notices

A - Notice in engine compartment; **B** - Notice on sun visor (outside); **C** - Notice on sun visor (inside); **D** - Notice for children's restraint system on passenger's seat (**Not for USA**).

ADJUSTABLE STEERING COLUMN

Pull lever **A** under the steering wheel to release the column. The steering wheel can be adjusted in height.

Re-lock the column with lever **A** on completion of adjustment.

Note: never attempt to adjust the steering column while the car is moving!

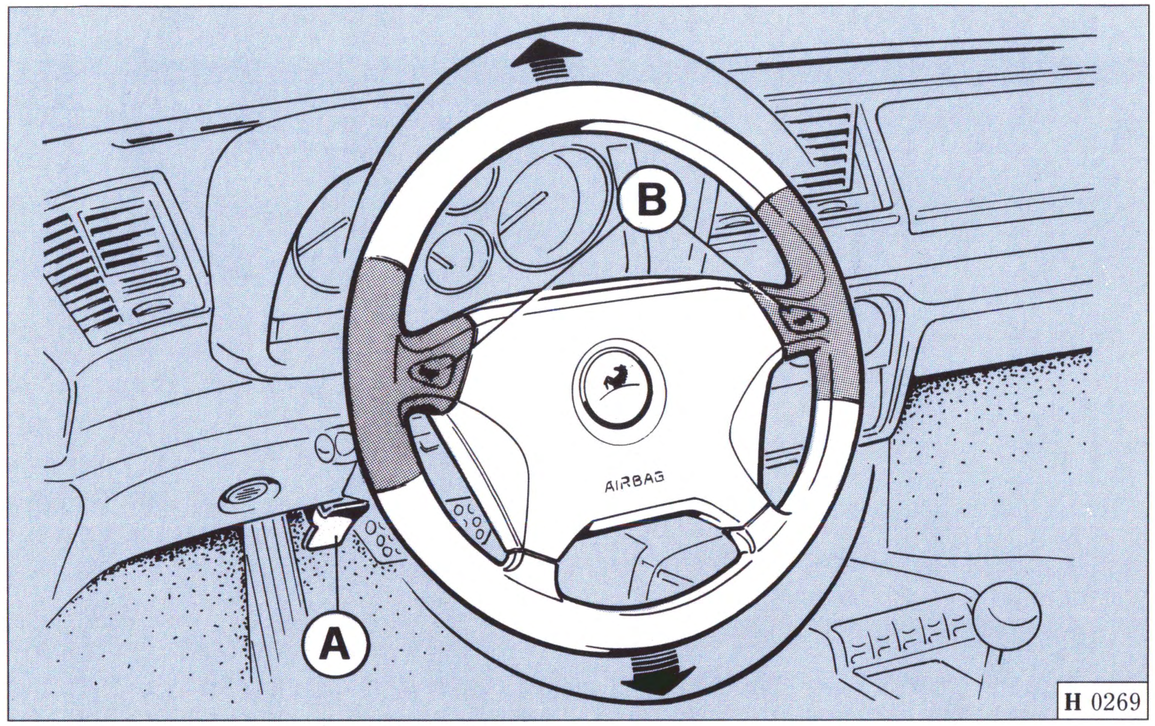


Fig. 30 - Adjustable steering column
A - Lever for column locking/release;
B - Horn.

To use the horn, press next to the small horns drawn on the steering wheel upper spokes.

REAR VIEW MIRRORS

Internal rear view mirror

The rear view mirror is fully adjustable. Operate lever **A** to switch the mirror between the normal and anti-glare positions.

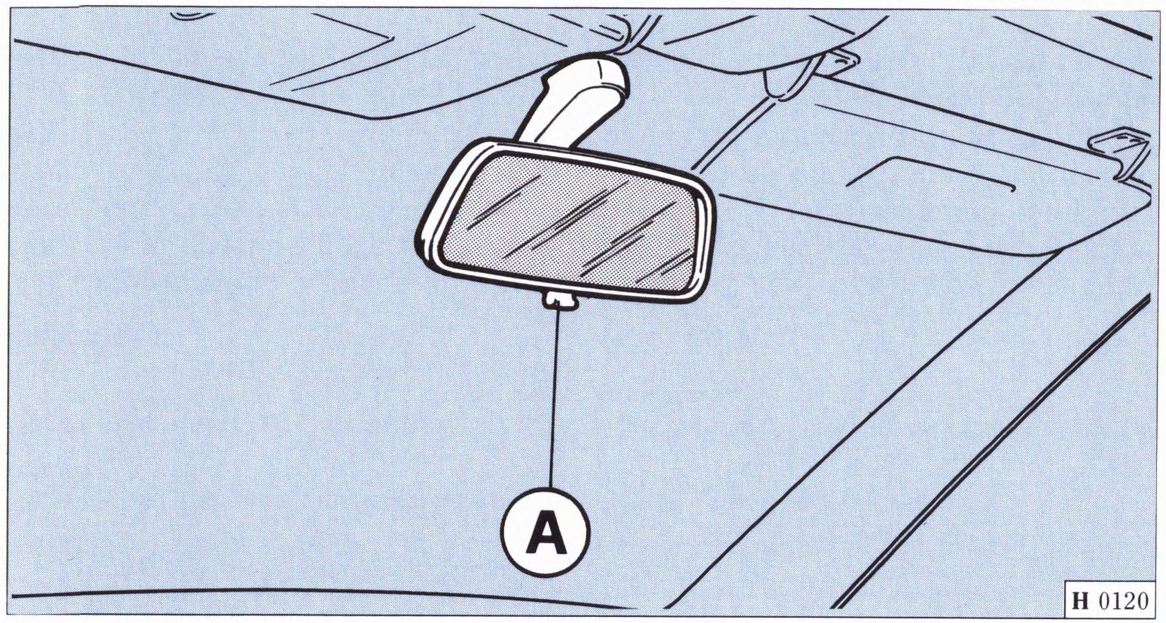


Fig. 31 - Internal rear view mirror.

Door mirrors

The door mirrors can be adjusted using the controls on the center console (Fig. **33**).

Press push-button **A** to adjust the driver door mirror. Press push-button **B** to adjust the passenger door mirror.

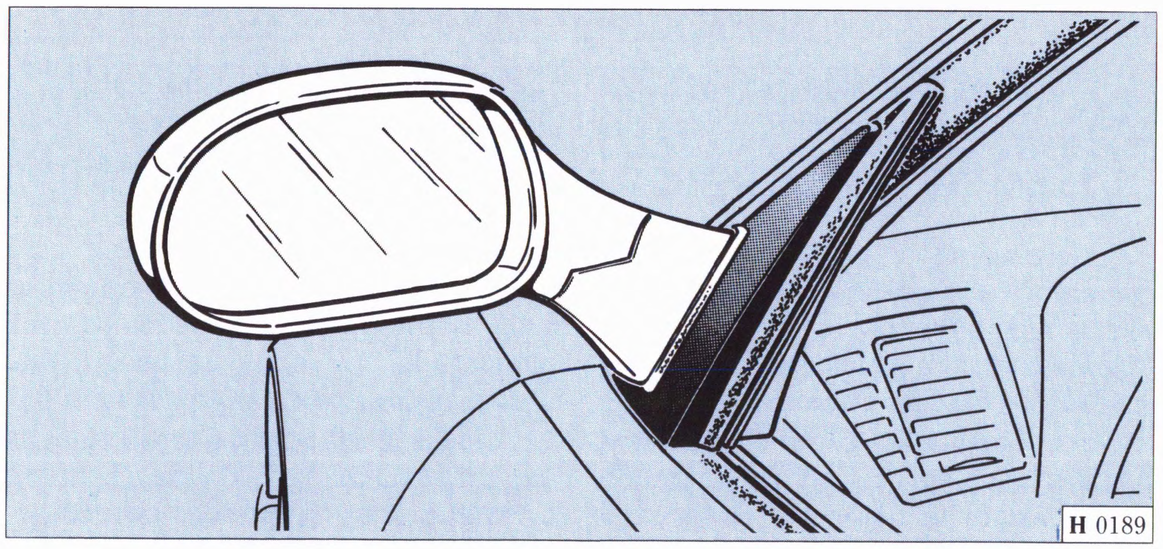


Fig. 32 - Door mirror.

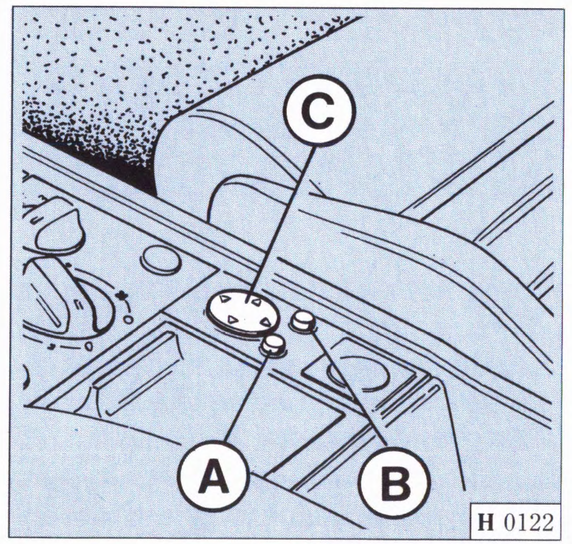
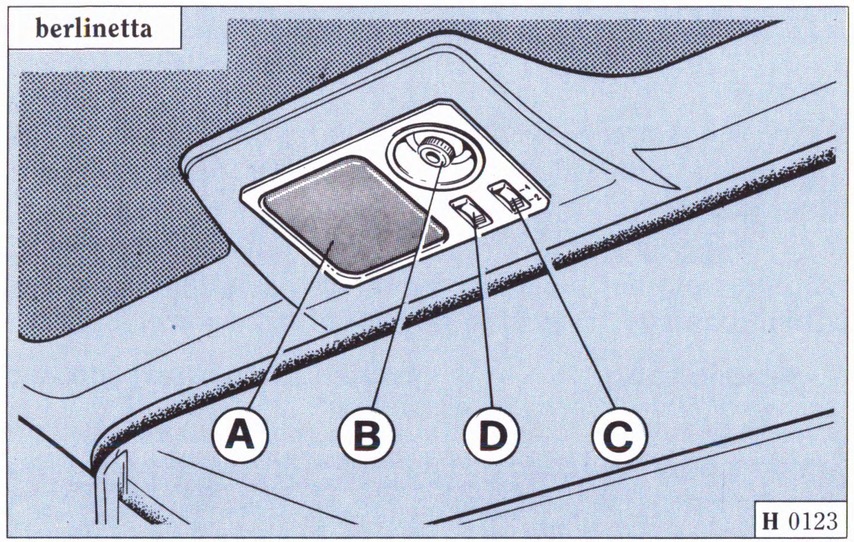


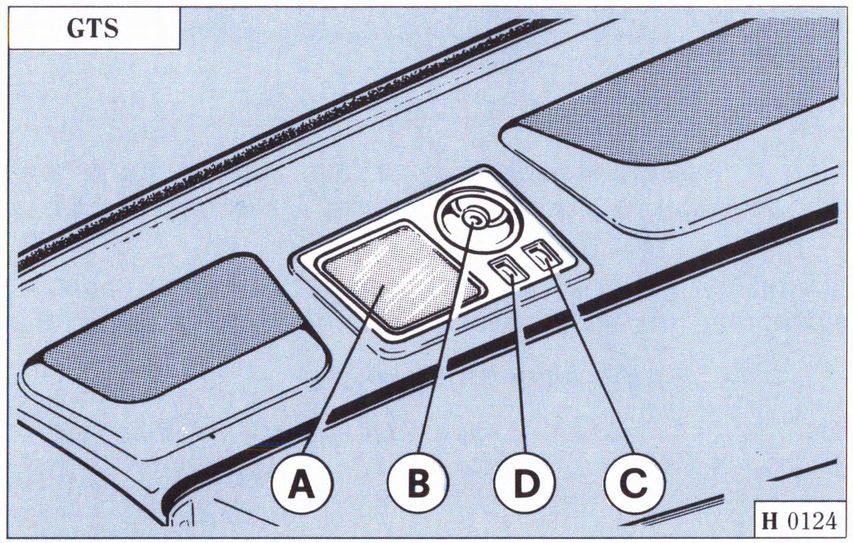
Fig. 33 - Door mirror controls.

To adjust the selected mirror, press control switch **C** in the direction in which you want to move the mirror.

The door mirrors are equipped with heating elements for defrosting and defogging. These are switched on automatically whenever the rear window defroster/ defogger (**53**, Fig. **1**) is switched on.

INTERIOR LIGHTS (For berlinetta and GTS)





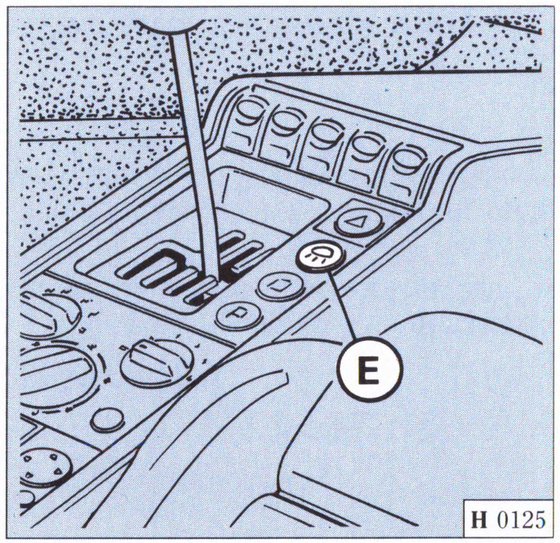


Fig. 34 - Roof light console.

Fig. 35 - Roof light push-button on central console.

Roof light

The roof light **A** operates as an automatic courtesy light when either of the doors is opened. You can turn the roof light on and off with the doors closed by means of switch **D** (Figs. **34**).

You can also operate the roof light by means of push-button **E** on the central console (Fig. **35**).

After the doors are closed, the roof light stays on until the engine is started, or for a set time of 10 seconds.

Map reading lamp

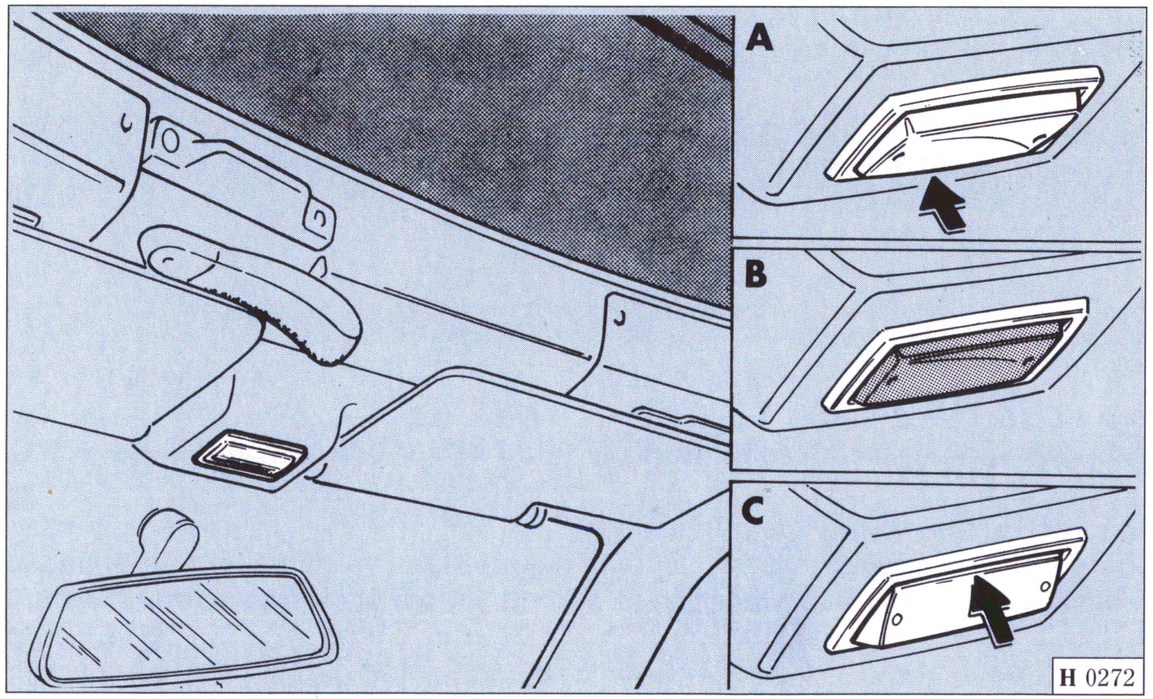
Press switch **C** to turn the map reading lamp on and off.

You can swivel the lamp **B** in the direction you require.

INTERIOR LIGHT (For spider)

Interior light

When the interior light is in position **A**, it illuminates automatically with the opening of one of the doors.



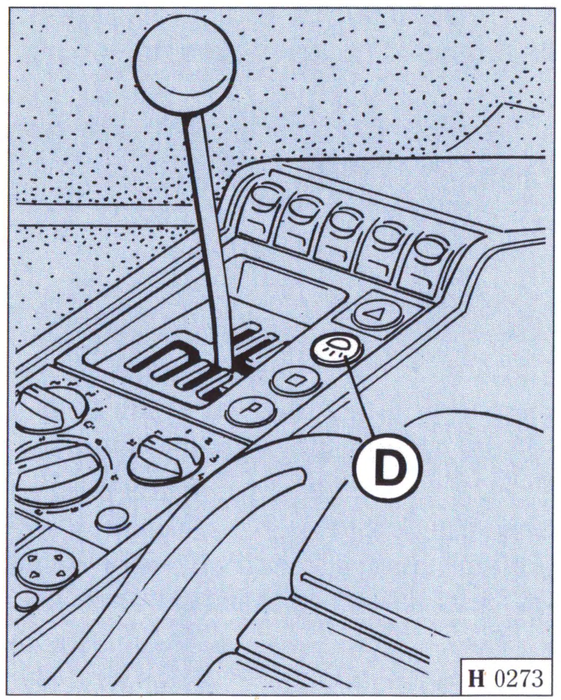


Fig. 36 - Interior light.

Fig. 37 - Roof light push-button.

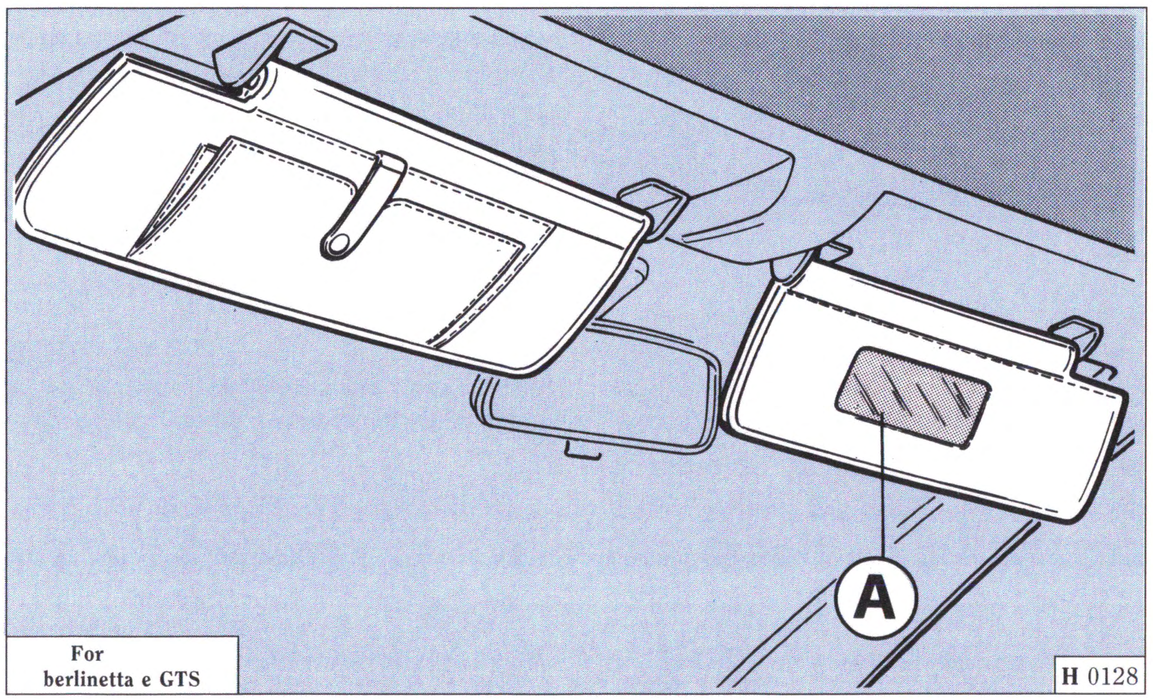
In **B** position, the light is always off.

In addition, when the doors are closed, the light can be switched on by pushing the transparent glass in **C** position.

The roof light is switched on also pressing the push button **D** (Fig. **37**) on the central tunnel.

SUN VISORS

The passenger sun visor is equipped with a courtesy mirror **A**.



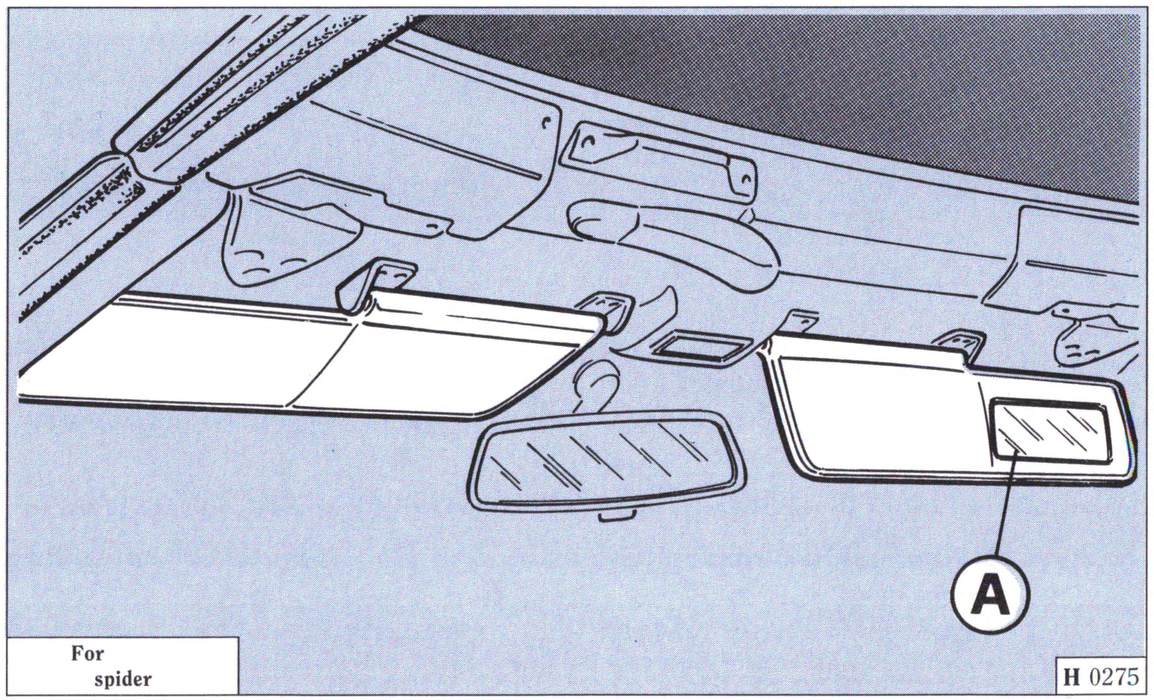


Fig. 38 - Sun visors.

ASHTRAY

The ashtray and cigarette lighter are located on the central console (Fig. **39**).

To use the cigarette lighter **A** (Fig. **39**) press it all the way down and wait for it to spring back up before removing it.

Note: the emergency lamp supplied with the toolkit can be connected to the cigarette lighter socket.

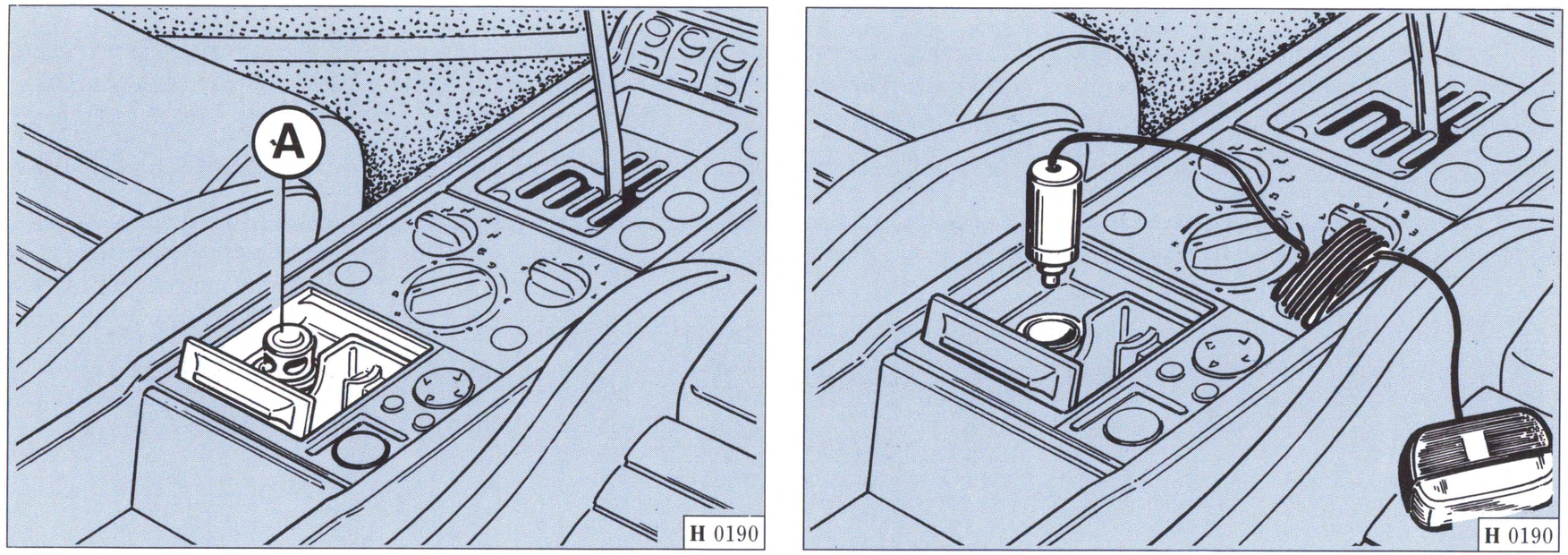


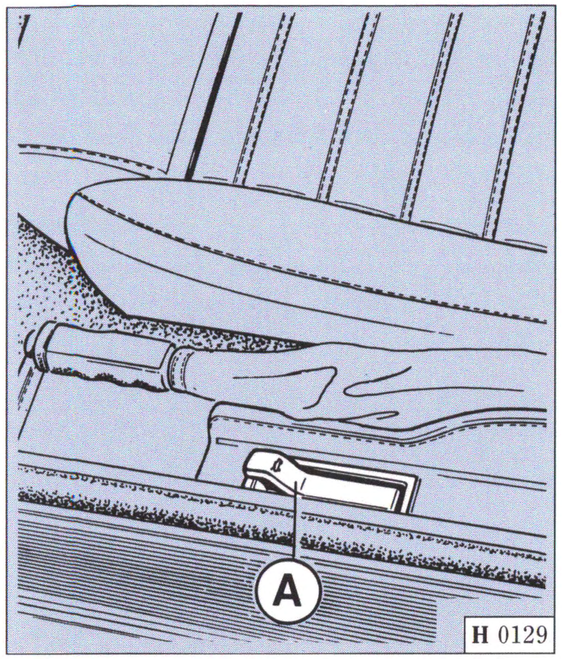
Fig. 39 - Ashtray and cigarette lighter
A - Cigarette lighter;
B - Emergency lamp.

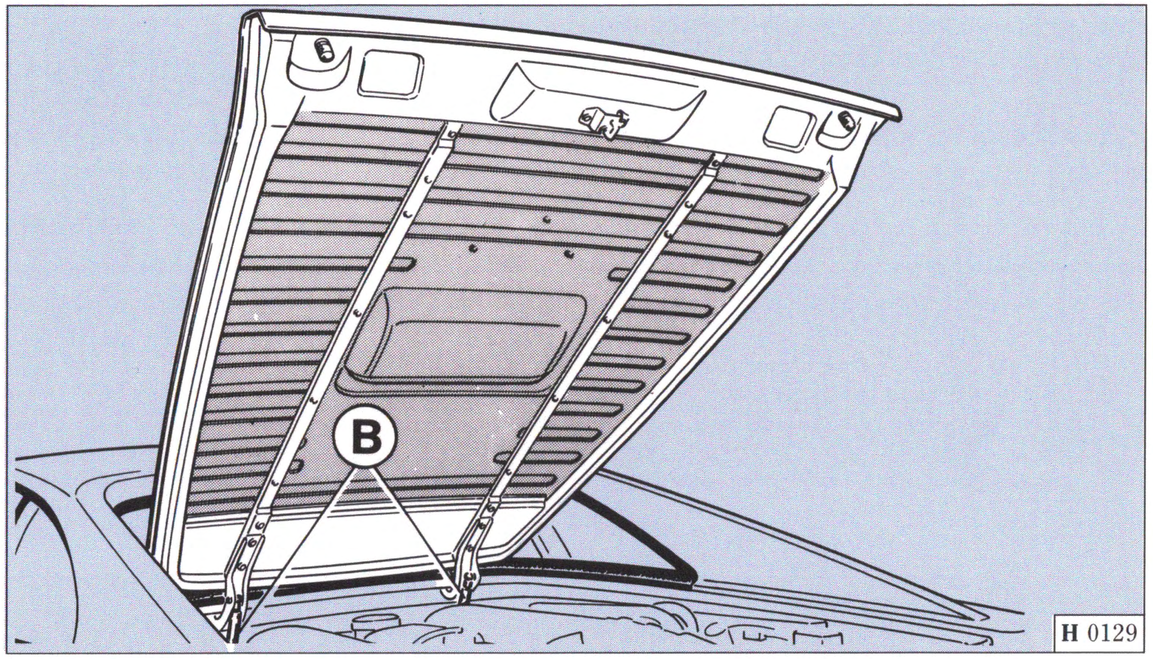
ENGINE COVER

Opening

To release the engine cover, pull release handle **A** (Fig. **40**) alongside the parking brake.

The engine cover is held open by two gas dampers **B** (Fig. **40**).





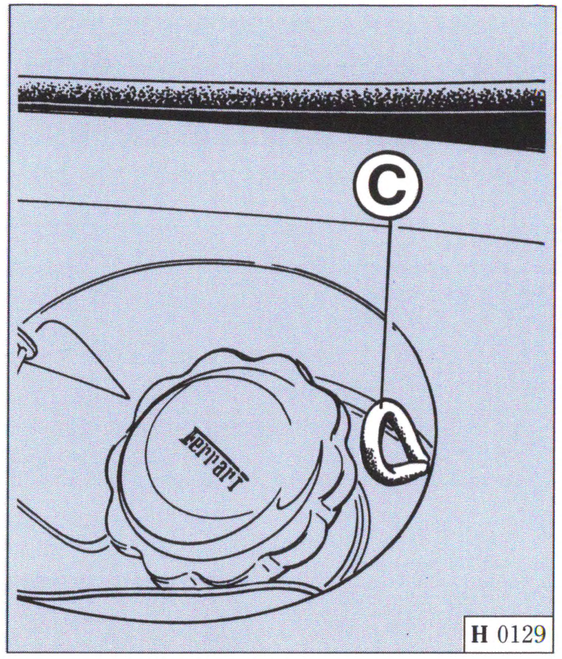


Fig. 40 - Engine cover

A - Engine cover release lever; **B** - Engine cover damper; **C** - Emergency engine cover release.

Emergency engine cover opening

If the main release lever **A** fails to operate, pull the emergency release ring **C** located inside the fuel filler compartment.

BONNET

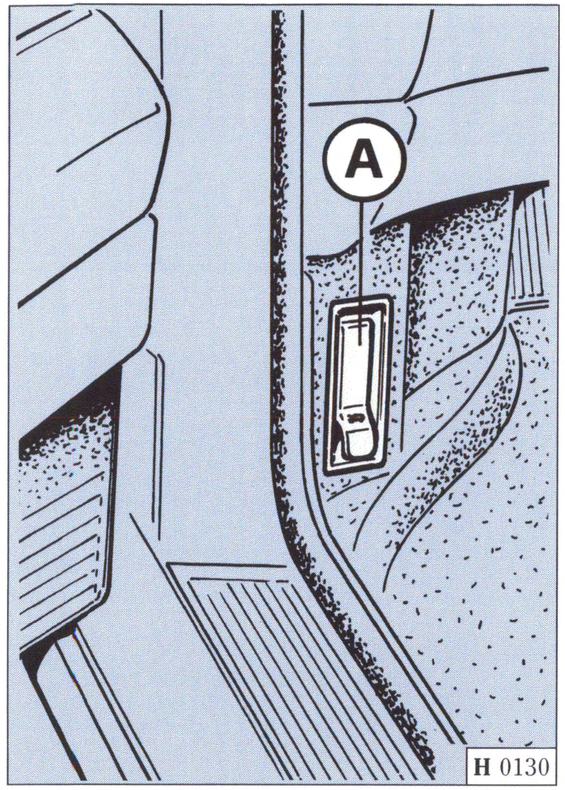
Opening

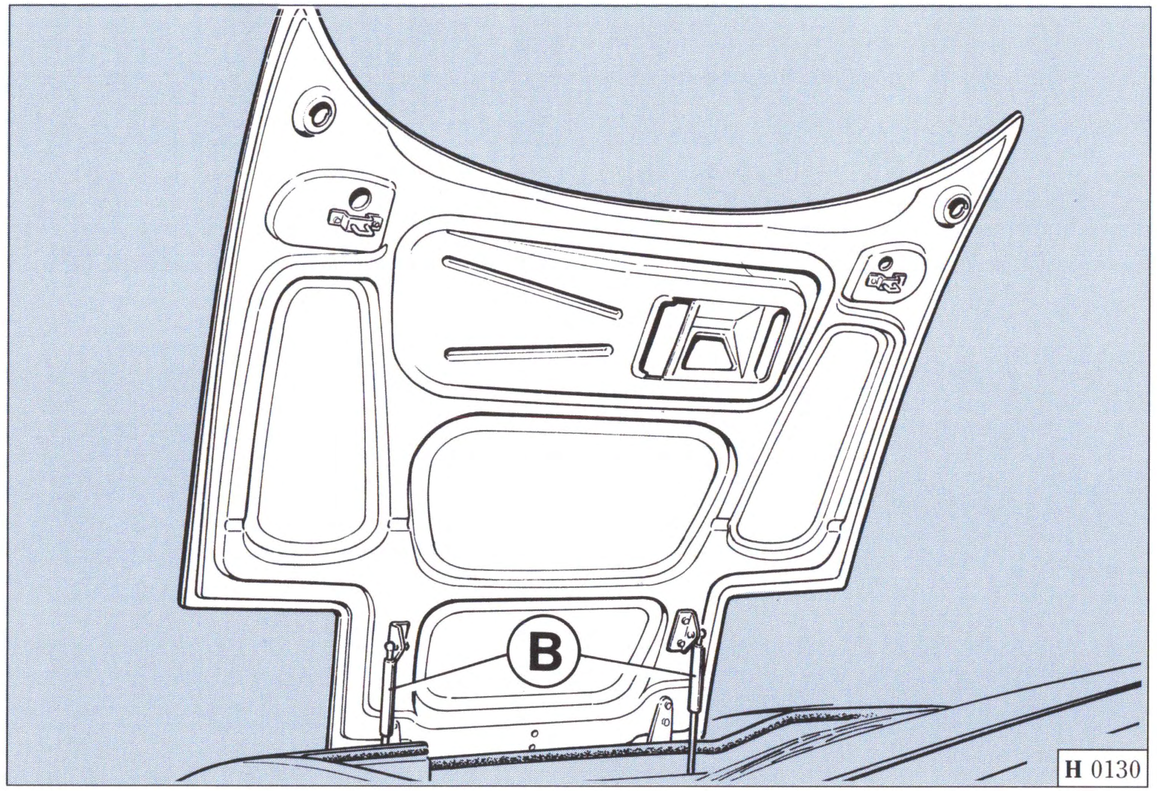
Pull lever **A** (Fig. **41**) to release the bonnet.

The bonnet is held open by two dampers **B** (Fig. **41**).

Emergency bonnet opening

If the main bonnet release lever **A** fails to operate, pull the emergency release lever **C** (Fig. **41**) under the dashboard on the passenger's side.





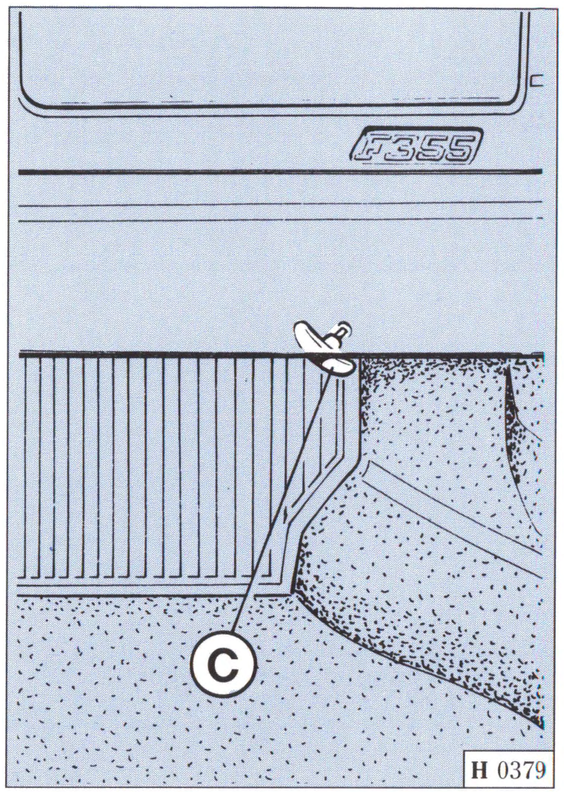


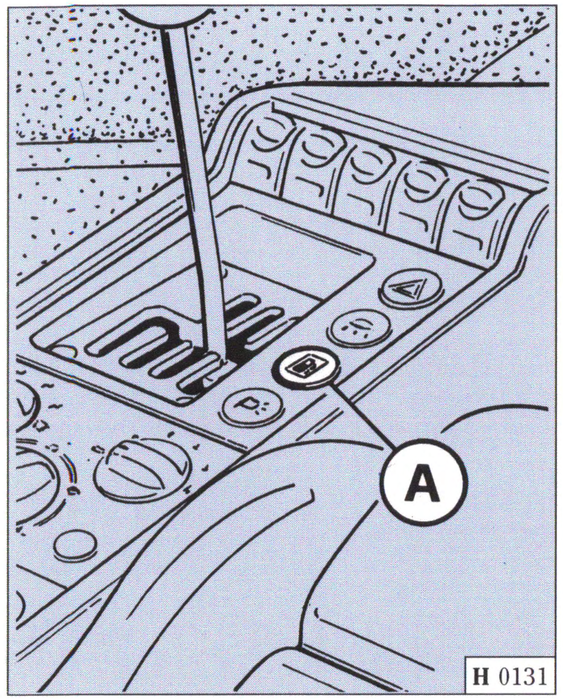
Fig. 41 - Bonnet

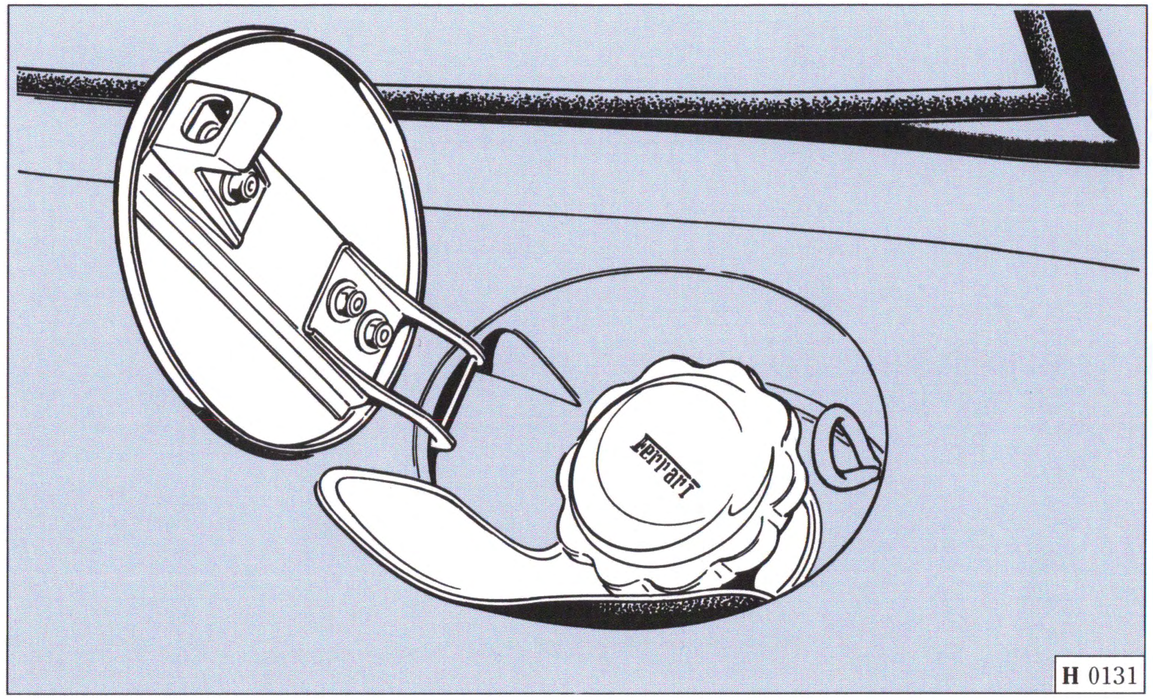
A - Bonnet release lever; **B** - Bonnet dampers; **C** - Emergency bonnet release lever.

FUEL FILLER CAP

To open the filler cap cover, press button **A** (Fig. **42**) on the central console.

If the electrical opening mechanism fails, pull lever **A** (Fig. **42**) located in the engine compartment over the LH shock absorber.





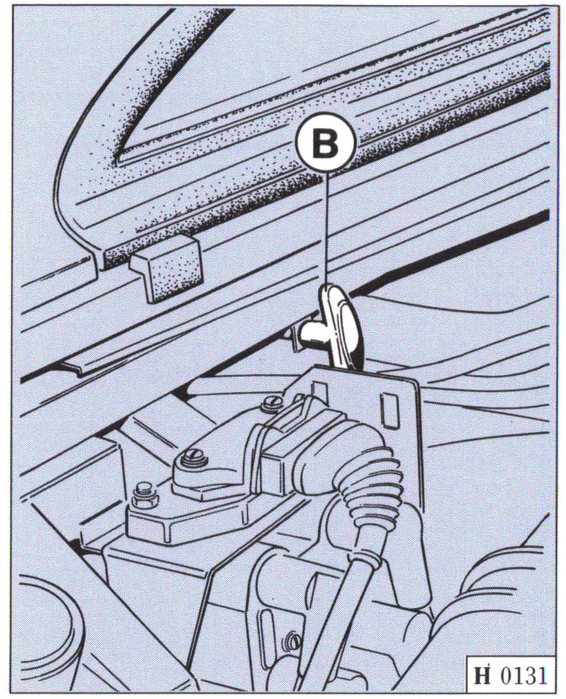


Fig. 42 - Fuel filler cap

A - Fuel filler cover release button; **B** - Fuel filler cover emergency release.

TOWING EYE-BOLT

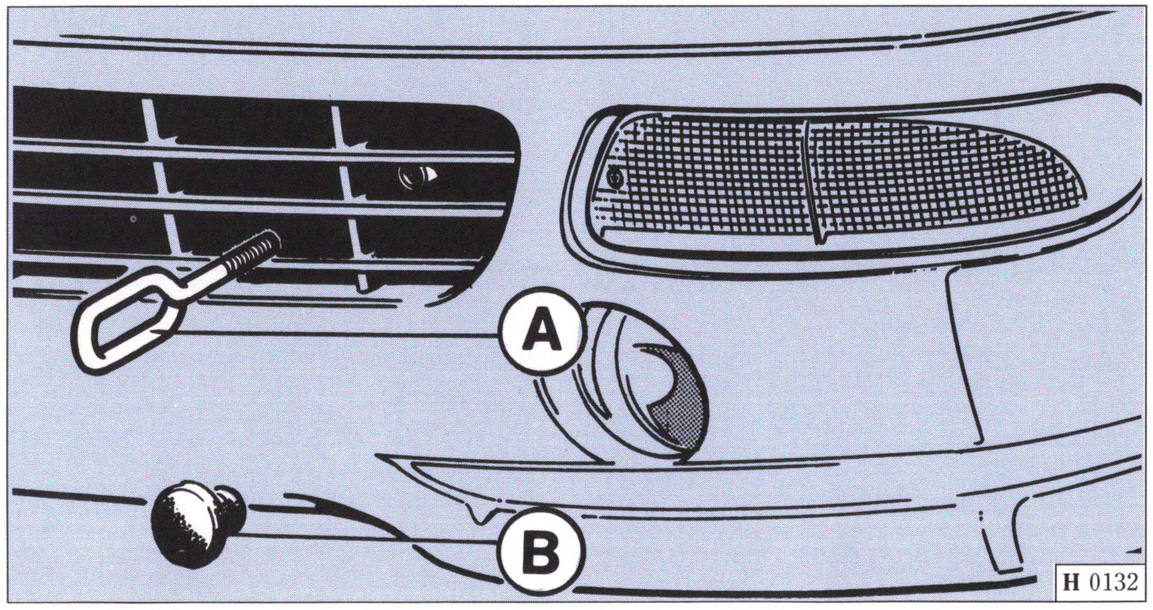


Fig. 43 - Towing eye-bolt.

A - Eye-bolt;
B - Protective cap.

The mounting for the towing eye-bolt is located at the front left of the car. Remove the protective cap **B** before screwing in the eye-bolt **A**.

The eye-bolt is included in the tool kit.

ROOF PANEL (For GTS)

Pull levers **A** down to release the roof panel.

Store the roof panel in the compartment behind the seats and secure it with cover **B**.

To replace the roof panel, engage pins **C** in their seats, and then engage and lock levers **A**.

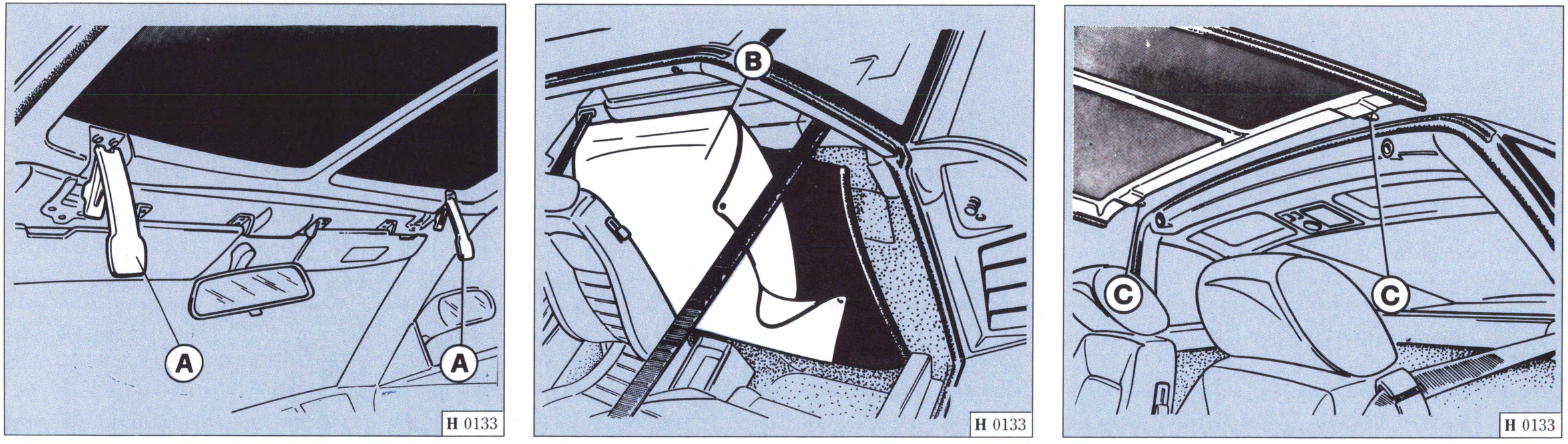


Fig. 44- Removing and replacing the roof panel.

SOFT TOP
(For spider)

Top opening

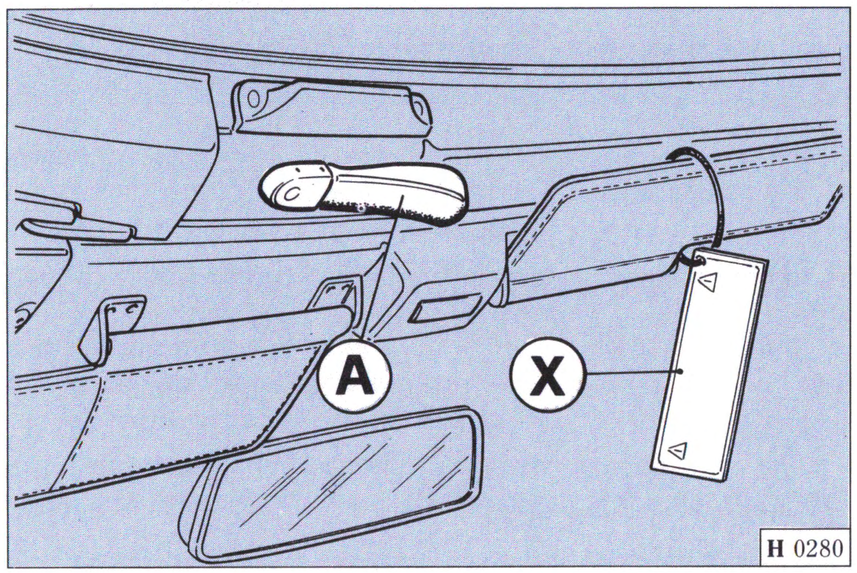
The necessary conditions for the top operation are the following:

- closed doors;
- key in position **"II"**;

note: it is advisable to open/close the soft top with the engine on, so that the battery does not discharge;

- parking brake engaged.

The first operation to be executed is the mechanical release of the top by the lever **A** (Fig. **45**)



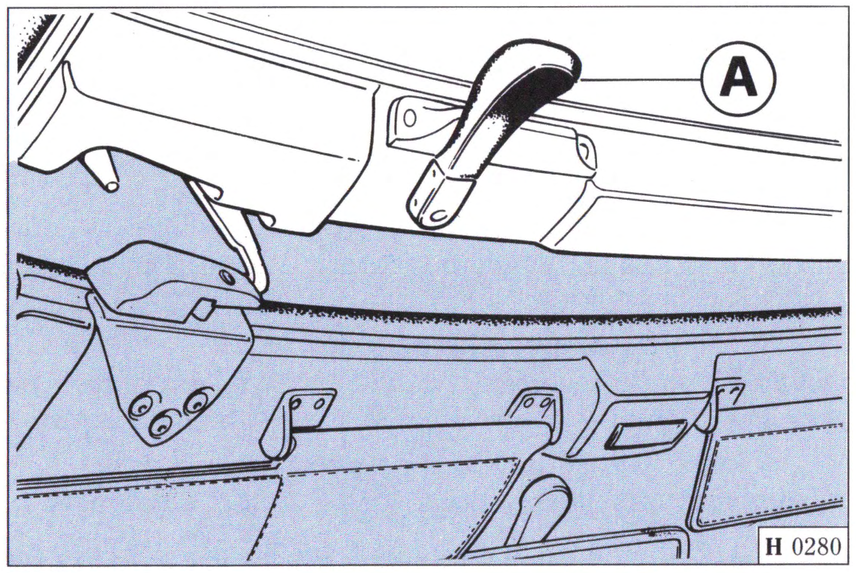


Fig. 45 - Soft top opening handle
A - Handle;
X - Caution notice.

Cette manoeuvre entraîne le dégagement du micro-interrupteur **S9** dans la gâche sur la traverse du pare-brise; ce qui permet au boîtier de commande des lève-glaces de baisser les glaces latérales jusqu'à au seuil prédéterminé (environ 5 cm) et de dégager les micro-interrupteurs **S10** et **S11** placés à l'intérieur des portes.

After the mechanical release, the top cross member must be moved backward by hand up to the activation of a sound signal, releasing the microswitch **S12** (Fig. **48**).

At this point press the top opening push button **B** (Fig. **47**) placed in the central tunnel.

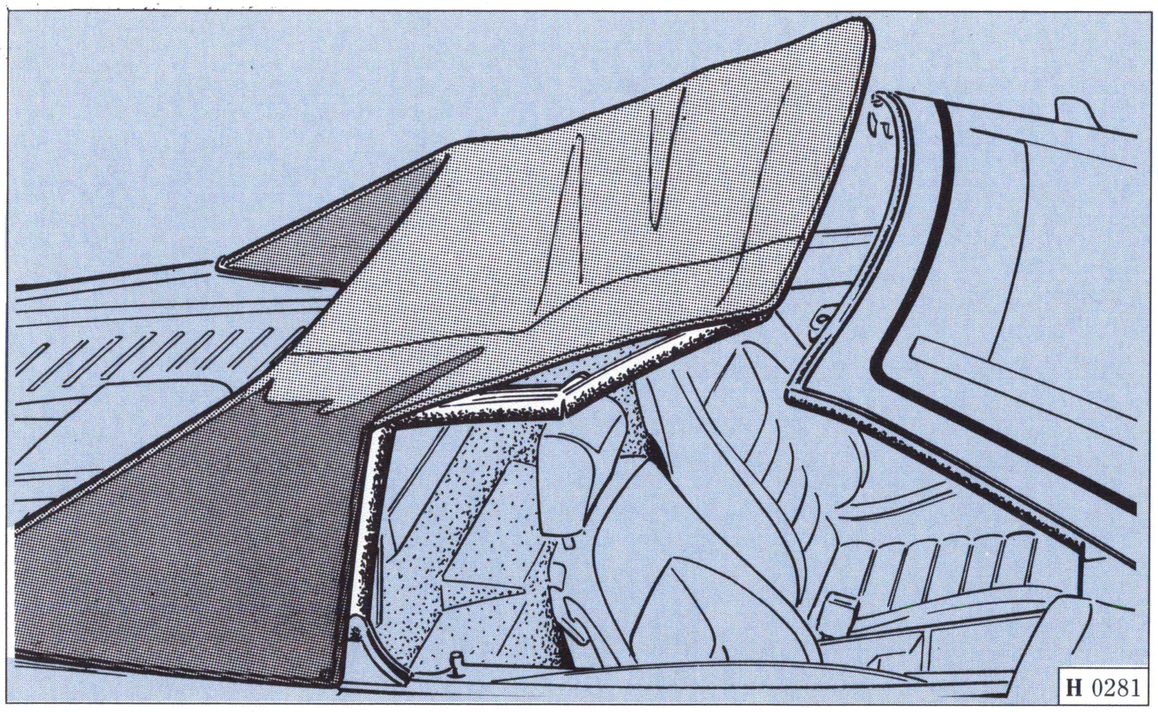


Fig. 46 - Beep position.

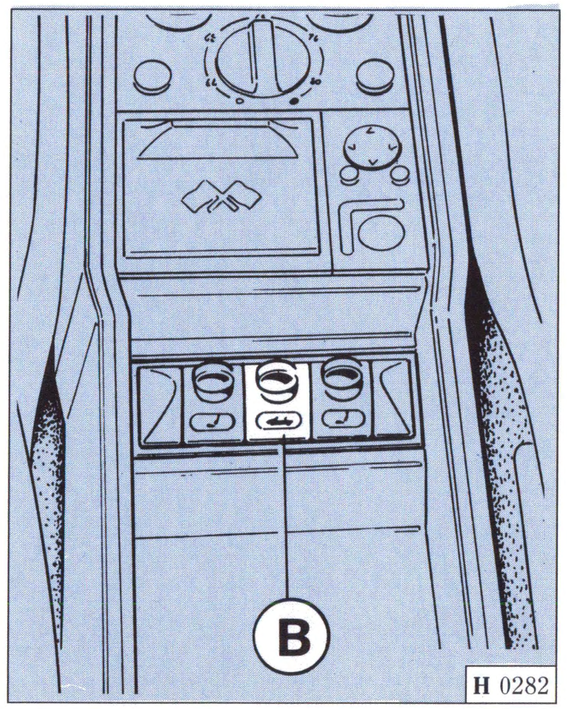


Fig. 47 - Push button soft top movement
B - Soft top opening/closing push button.

Before starting the top opening sequence, the control unit checks the following parameters:

- closed doors (by the microswitch on the doors **S16** and **S7** (Fig. **48**);

- key in position **"II"** (through the +15 which arrives at the control unit);

- parking brake engaged by the microswitch **S8** which controls the warning light on the dashboard (Fig. **48**);

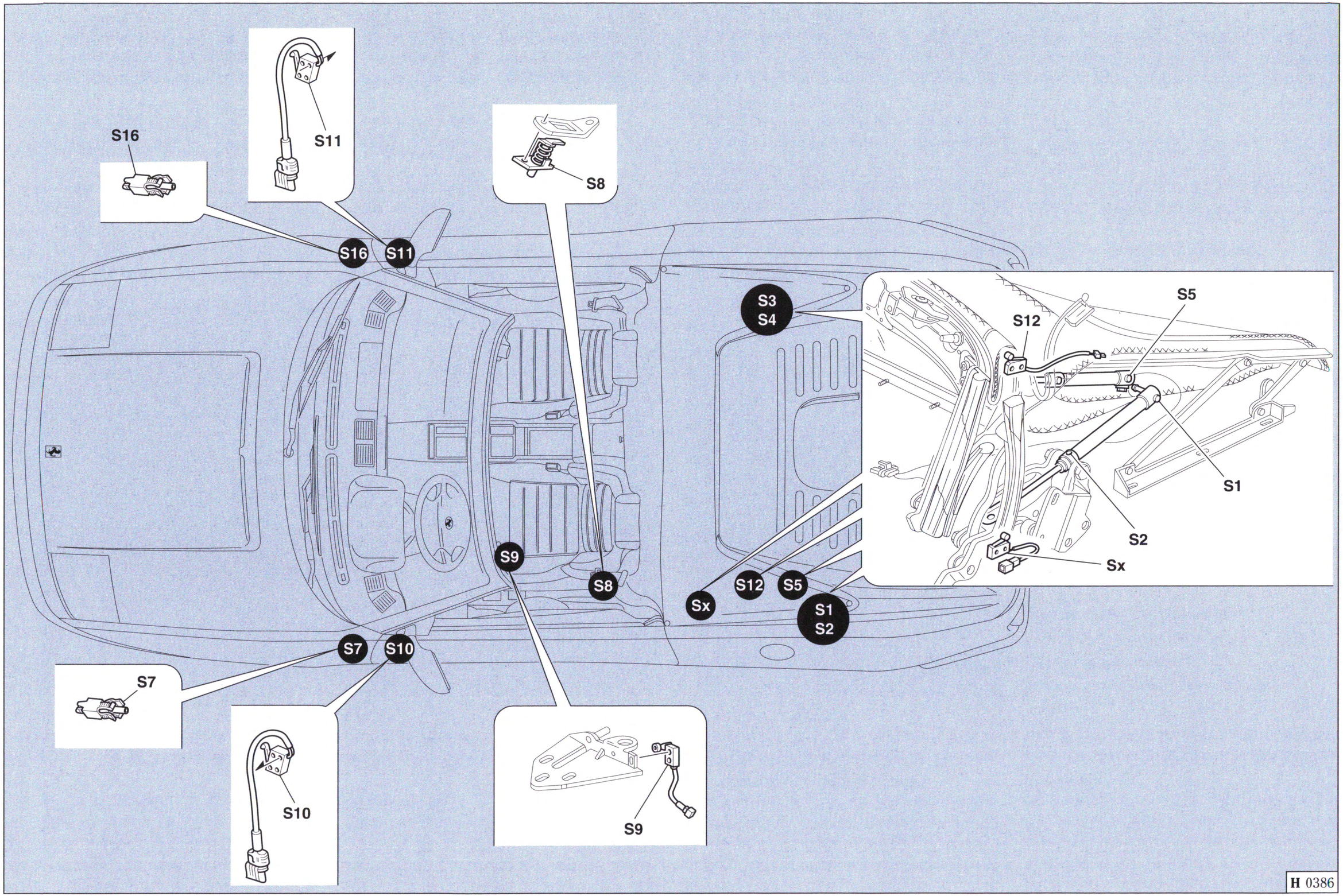

S16
S11
S8
S16
S11
S3
S4
S5
S12
S1
S2
Sx
S12
S5
S1
S2
Sx
S9
S8
S7
S10
S7
S10
S9

Fig. 48 - Microswitch arrangement for soft top system

S1 - Microswitch for opening on left piston;

S2 - Microswitch for closing on left piston;

S3 - Microswitch for opening on right piston;

S4 - Microswitch for closing on right piston;

S5 - Microswitch on left additional piston;

S7 - Left door switch;
S8 - Hand brake switch;
S9 - Microswitch on the windshield cross member (left side);
S10 - Right door microswitch
S11 - Left door microswitch
S12 - Soft top movement microswitch;
S16 - Right door switch;
Sx - Soft top movement microswitch.

- released top (by the microswitch **S9** introduced in the left striker plate on the windshield cross member);

- windows at the pre-set threshold by the microswitches placed in the inner part of the doors (Fig. **48**);

- buzzer activated by the microswitch **S12** placed in the rear left upper part of the top (Fig. **48**).

If the parameter check is positive, the opening sequence begins with the seat forward movement up to the safety pre-set threshold (140 mm from the rear limit switch for the driver's seat and 180 mm for the passenger's seat).

When the seats are in the correct position, the hydraulic pump is activated when opening.

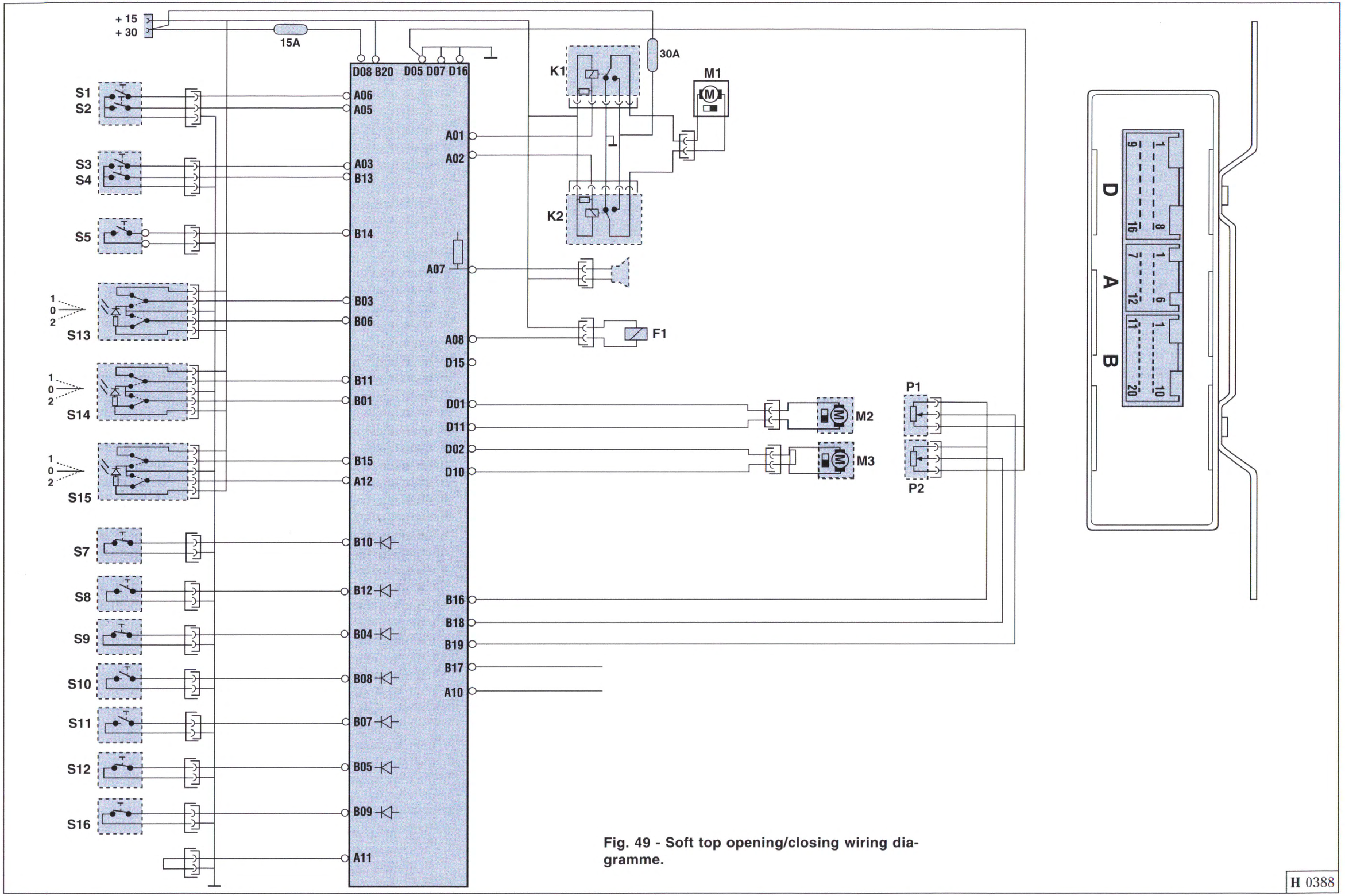


Fig. 49 - Soft top opening/closing wiring diagramme.

1	2	Description
A01	H/R	Top closing (relay)
A02	B/R	Top opening (relay)
A03	G/N	Left piston in extension
A05	H	Right piston in compression
A06	G	Right piston in extension
A07	N/Z	Buzzer
A08	N/R	Solenoid valve control (F1)
A12	G/L	Push button for right seat backward
B01	L/G	Left seat push button backward
B03	V/G	Push button (top opening)
B04	V	Switch for fixed top
B05	M/V	Top manual retraction switch
B06	Z	Push button (top closing)
B07	S	Left window switch
B08	S/N	Right window switch
B09	M/B	Left door switch
B10	B/N	Right door switch

1	2	Description
B11	L/R	Left seat push button (forward)
B12	C/N	Hand brake switch
B13	H/N	Left piston in compression
B14	C/L	Left secondary piston in extension
B15	H/V	Right seat push button (forward)
B16	H/G	Seat position sensor power supply
B17	N/B	Serial line K
B18	N/L	Right seat position sensor
B19	H/L	Left seat position sensor
B20	V/B	Positive (+15)
D01	L/N	Left seat forward (mot)
D02	L	Right seat forward (mot)
D05	N	Negative
D07	N	Negative
D08	R	Positive (+30)
D10	B	Right seat backward (mot)
D11	B/N	Left seat backward (mot)
D16	N	Negative

1 = Pin **2 = Colour**

The control unit will cut off the control to the pump after 1 second since the extension limit switches of the main pistons have been activated **S1** and **S3** (Fig. **48**).
At this point the seats are moved again in their previous position (which has been stored at the beginning of the manoeuvre).

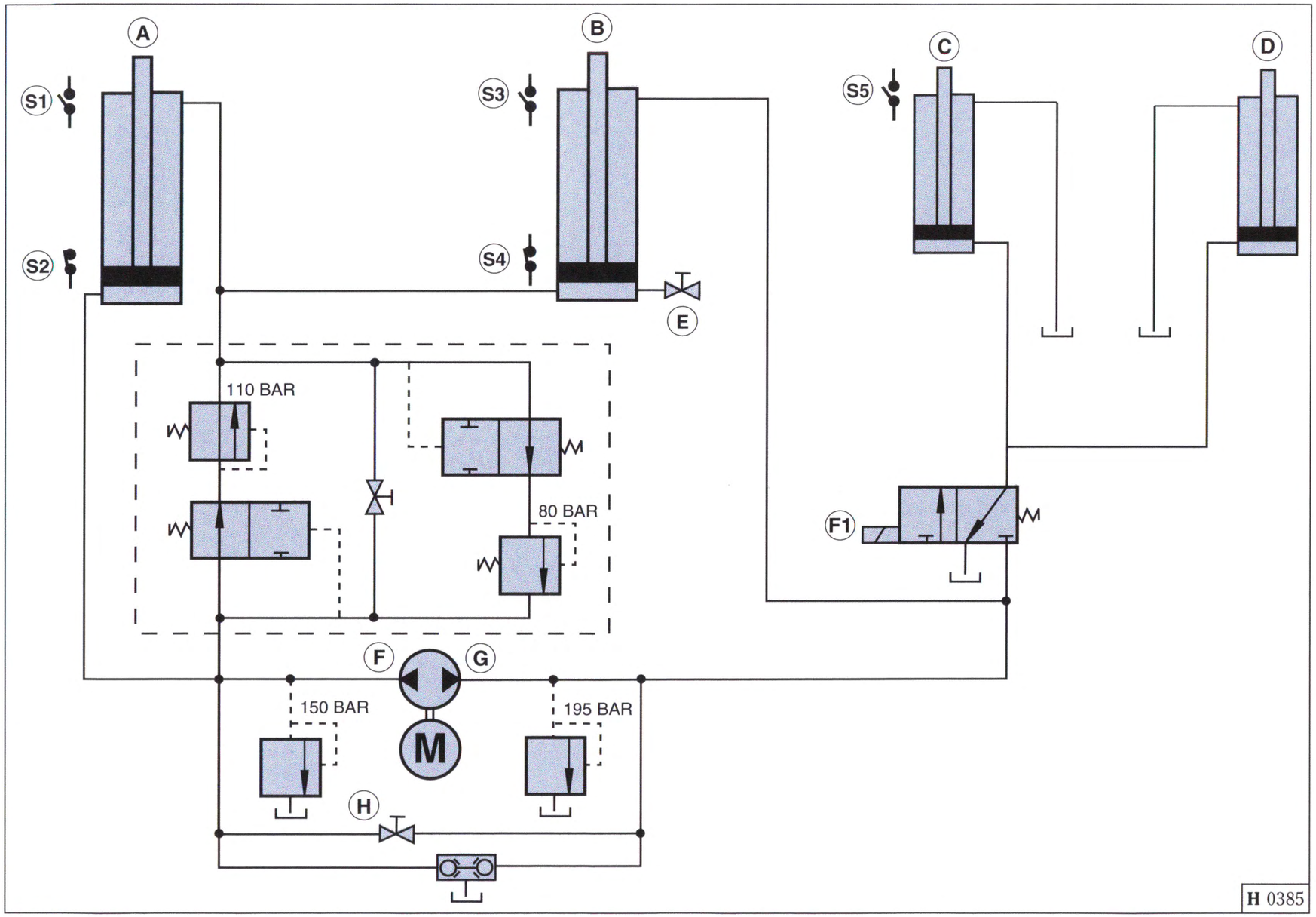


Fig. 50 - Soft top hydraulic diagramme

A - Right main cylinder for soft top lifting/lowering; **B** - Left main cylinder for soft top lifting/lowering; **C** - Left additional cylinder for soft top retraction; **D** - Right additional cylinder for soft top retraction; **E** - Drain valve; **F** - Open (push); **G** - Closed (pull); **H** - Discharge valve; **F1** - Solenoid valve.

Notes:

a) When the top is released, the windows go down to the pre-set threshold; then the window function is disenabled; when the top is completely open, a microswitch placed near the slide in the left rotation plate is activated, which is connected only to the window control unit and allows the movement of the windows to be enabled again by the push buttons (Fig. **14**).

b) To avoid interferences between the seat head rest and the cross member of the open top, in the top opening phase an automatic limitation of the rear limit switch of the seats has been introduced at 25 mm for the driver's seat and at 40 mm for the passenger's seat (measures concerning the rear limit switch); i.e. if at the beginning of the manoeuvre the seats are more retracted than the above mentioned limits, their stored position at the end of the manoeuvre will be (automatically) limited to the mentioned sizes. However, it is always possible to move the seats back by the switches after the automatic top opening sequence.

Top closing manoeuvre

The necessary conditions for the top operation are the following:

- closed doors;
- key in position "**II**";
- parking brake engaged.

The first operation to be executed is the pressing of the top closing push button (Fig. **47**).

Before starting the top closing sequence, the control unit checks the following parameters:

- closed doors by the microswitches **S16** and **S7** (Fig. **48**) on the doors;

- key turned ON (through the +15 which arrives at the control unit);

- parking brake engaged (by the microswitch which controls the warning light on the dashboard) (Fig. **48**).

If the parameter check is positive, the closing sequence begins with the seat forward movement up to the safety pre-set threshold (140 mm from the rear limit switch for the driver's seat and 180 mm for the passenger's seat).

When the seats are in the correct position, the hydraulic pump is activated when closing.

Two procedures are activated as soon as the top moves:

a) the microswitch placed near the slide in the left rotation plate is released and allows the window control unit to let the side windows go down till the pre-set threshold (about 5 cm);

b) from now on the control unit waits 3 ÷ 4 seconds before checking if the windows are down, keeping the pump closing control active.

If, for any reason, one or either windows cannot go down, the control unit

locks the pump and activates the buzzer for the error signalling; if the windows are down, the control unit activates the control for the solenoid valve **F1** (Fig. **50**) after 1 second since the limit switches of the main piston compression have been activated **S2** and **S4** (Fig. **48**).

This allows the oil hydraulic pressure to be diverted towards the additional pistons to close the top upper part.

The control unit will cut off the control to the pump after 1 second since the extension limit switch of the left additional piston has been activated (**S5**).

At this point the seats are moved back in their previous position (which has been stored at the beginning of the manoeuvre).

After the hydraulic closing phase has ended, the top front cross member must be manually fixed and locked by the lever **A** (Fig. **45**).

The top fixing activates the microswitch **S12** in the left striker plate on the windshield cross member which enables the manual activation of the side windows, by the switches.

Enabling condition for the window movement

The window function is controlled by the window control unit by the switch **S9** (connected in parallel with the top control unit) and by the switch **Sx** (only connected to the window control unit) placed near the slide of the left rotation plate.

The operation logics complies with the following table:

S9 (NO)	Sx (NC)	
0	**0**	*open top*
0	**1**	*intermediate phase*
1	**0**	*(both switches activated)*
1	**1**	*closed top*

Notes:

- **S(n)** = switch number
- **0** = open circuit
- **1** = closed circuit
- **NO** = normally open contact (switch not pressed)
- **NC** = normally closed contact
- Window switches connected in parallel with window ECU

- In the top activation the engine should be on
- Pump motor absorption 25A
- Seat motor absorption about 3A
- Seat motor with thermal lock
- Seat max. stroke 230 mm
- Max. working pressure when opening 150 bar
- Max. working pressure when closing 195 bar
- Max. pipe working temperature 80°C

- During any workshop intervention with system component replacement, execute the self-learning of the seats by SD-1.

- At every complete cycle (opening-closing) if there is no oil or too much oil in the circuit, the system can recover 1 cm^3 corresponding to 0.3 mm.

Opening/closing in case of failure

In case of failure of the standard opening/closing, the soft top can be placed in the wished position using the suitable switches, placed under the protection plug on the sheet panel **C** between the seats (Fig. **52**).

The device operates with the ignition key in position **"II"** and with parking brake engaged.

Such device can be used if the pistons are not aligned, due to a hardening of the structure joints. To re-align the system operate as follows:

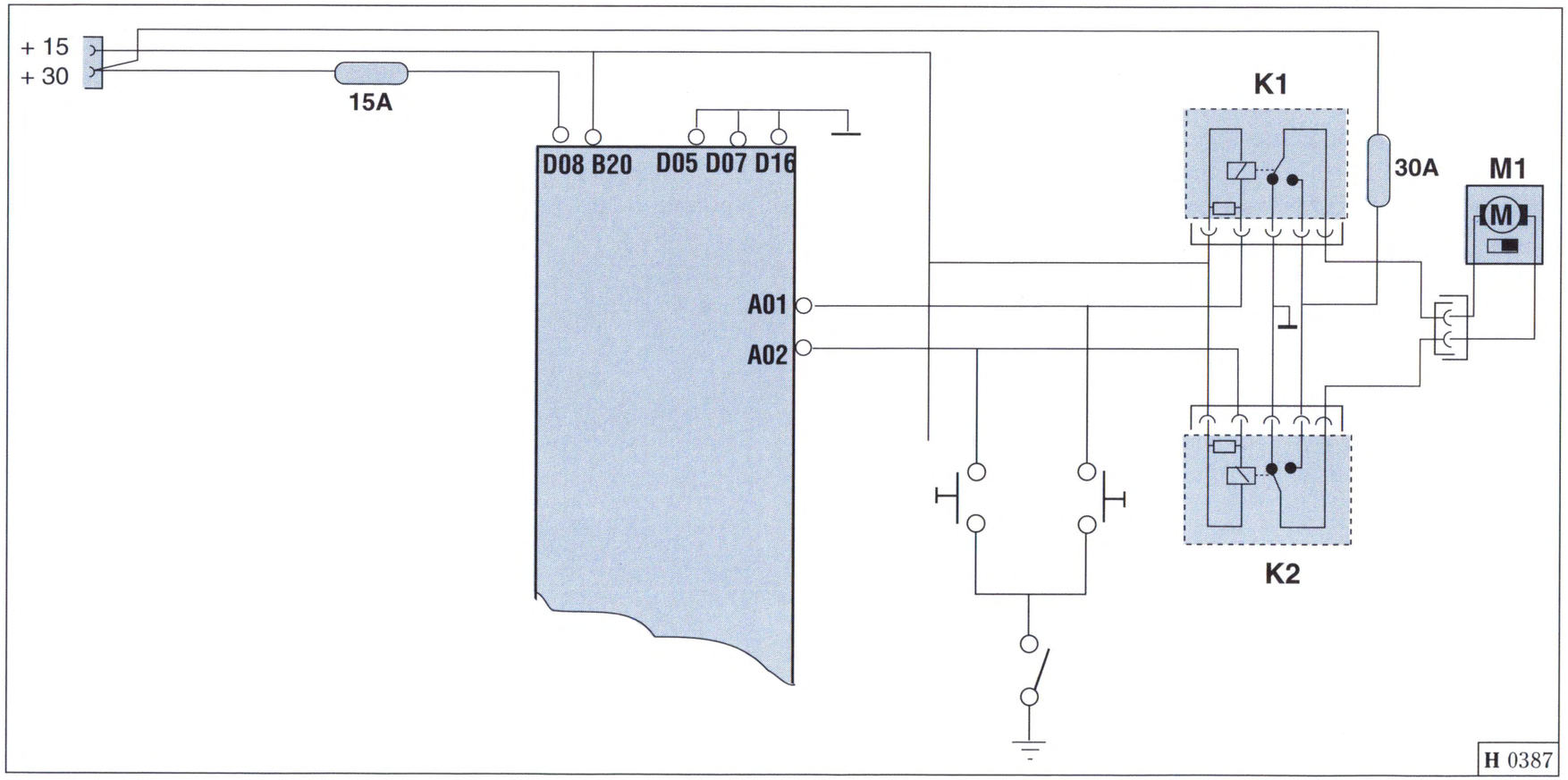
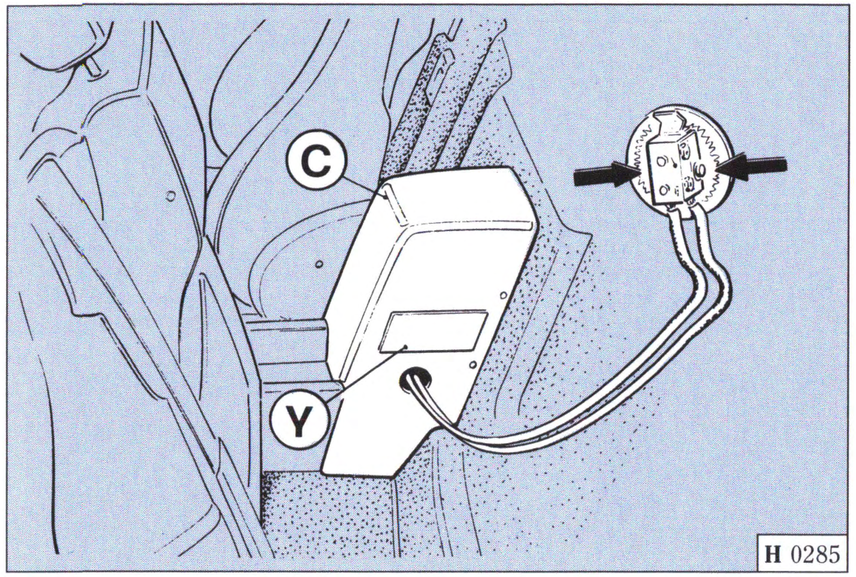


Fig. 51 - Wiring diagramme for soft top emergency opening.



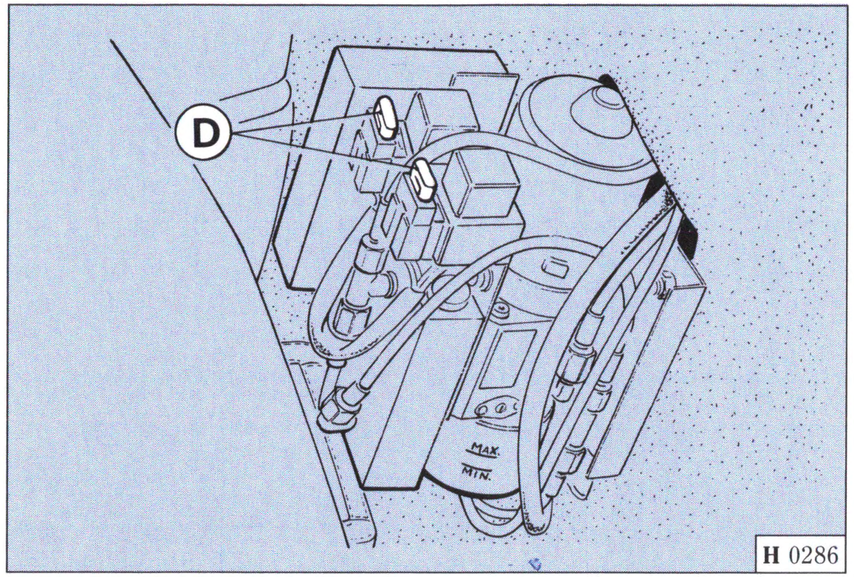


Fig. 52 - Emergency switches
C - Protection; **Y** - Emergency procedure notice.

Fig. 53 - Fuse position.

a) disconnect the main pistons from the plates;
b) use the emergency microswitches to make the main pistons cycle in extension and in compression; in this way the balancing valves recover the possible disalignment;

c) move the structure manually to remove any hardening;
d) lubricate the joints;
e) re-assemble the whole.

Manual emergency closing

If the failure persists, the top can be closed using the suitable emergency tools placed in the tool kit (Fig. **54**), proceeding as follows:

– using the screwdriver **E** rotate the screw **F** by two turns (Fig. **54**), that can be reached through the hole on the sheet panel **C**, to drain the system pressure;

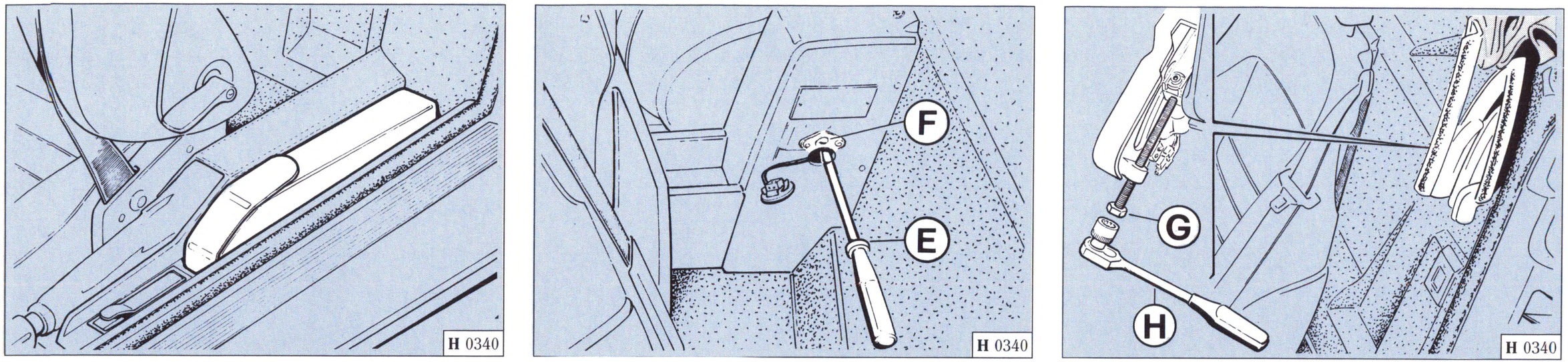


Fig. 54 - Emergency kit

E - Screwdriver; **F** - Screw; **G** - Bolt; **H** - Ratchet wrench.

– introduce, screwing it by hand, the bolt **G** in the suitable hole (Fig. **54**);

– using the ratchet wrench **H** turn the bolt until getting the complete closing.

H

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- Engine switching on **H81**
- Car starting **H82**

- Upshifting **H85**

- Downshifting **H86**
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- "Sport" mode **H91**

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INSTRUMENT AND CONTROL PANEL

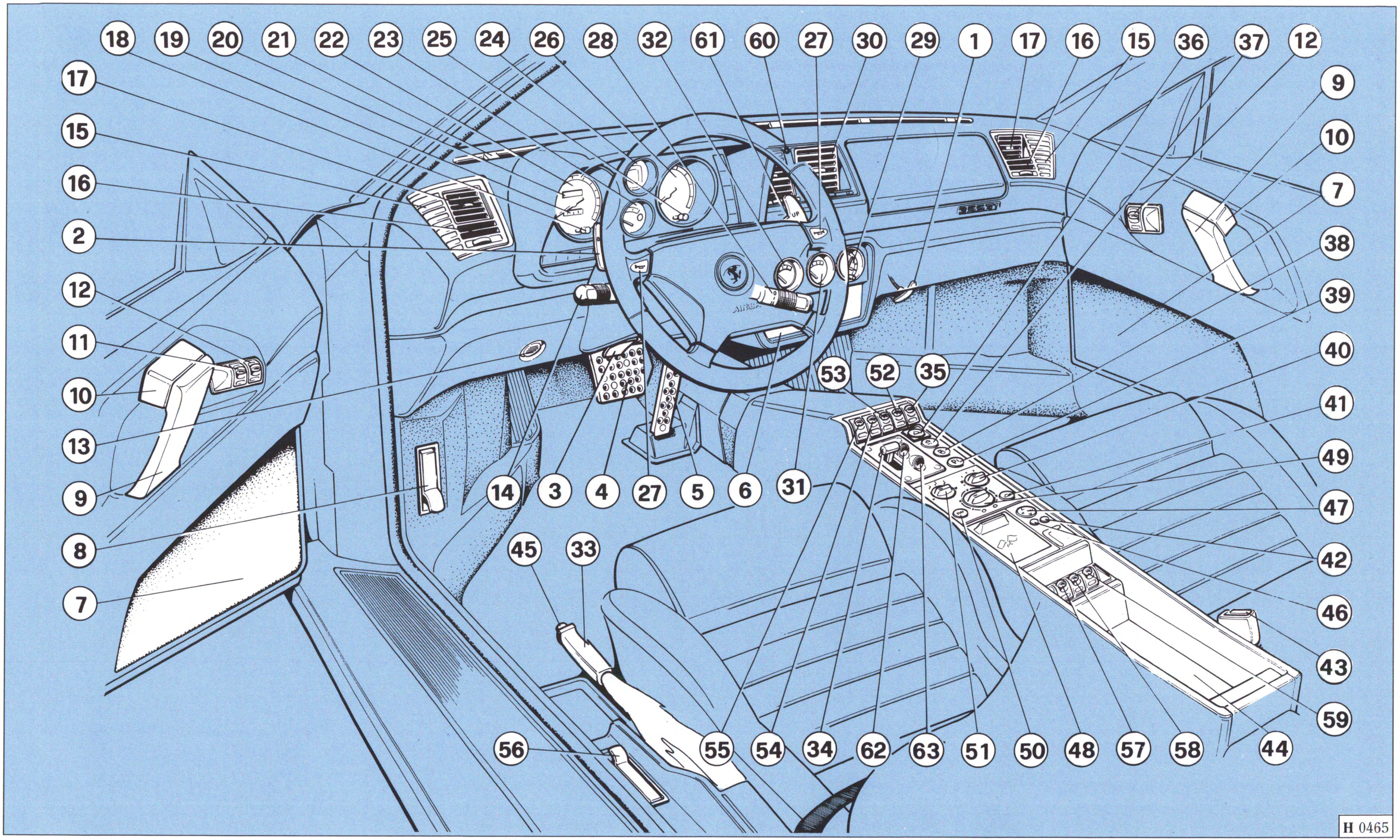

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Fig. 56 - Controls and instruments

1 - Emergency bonnet release.
2 - Downshifting lever.

3 - Steering column adjustment release lever.

4 - Brake pedal.
5 - Accelerator pedal.
6 - Radio slot.
7 - Loudspeaker (woofer).
8 - Bonnet release lever.
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10 - Door release lever.
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12 - Passenger's side electric window switch.

13 - Interior temperature sensor.
14 - Combination direction indicator and light switch lever.
15 - Loudspeaker (tweeter).
16 - Air conditioning side vent.
17 - Side window ventilation vent.
18 - Trip counter reset.
19 - Trip counter.
20 - Odometer.
21 - Screen demister vent.
22 - Electronic speedometer.
23 - Water temperature gauge.
24 - Gear display.
25 - Instrument panel light rheostat.

26 - Electric rev. counter.
27 - Horn button.
28 - Windscreen wiper/washer lever.

29 - Clock.
30 - Air conditioning main vent.
31 - Fuel gauge.
32 - Engine oil pressure gauge.
33 - Parking brake lever.
34 - Reverse lever.
35 - Door release push button.
36 - Hazard warning light switch with indicator.

37 - Rear dome lamp switch.
38 - Fuel filler release switch.

39 - Parking light switch.
40 - Ventilation regulator knob.

41 - Recirculation push button.

42 - RH outside mirror adjustment selector.

43 - Seat belt release button.

44 - Glove compartment.
45 - Handbrake release push-button.

46 - LH outside mirror adjustment selector.

47 - Mirror adjustment control.
48 - Ashtray.
49 - Ventilation temperature control knob.

50 - Air conditioning and ventilation On/Off push-button.
51 - Ventilation regulator knob.
52 - Door locking push button (only with closed door).
53 - Rear heated window and outside mirror demisting switch (**For berlinetta and GTS**).

53 - Outiside mirror demisting switch (**For spider**).
54 - Fog light switch.
55 - Shock absorber mode switch.

56 - Engine cover release lever.
57 - Left seat control switch (**For spider**).

58 - Soft top control switch (**For spider**).

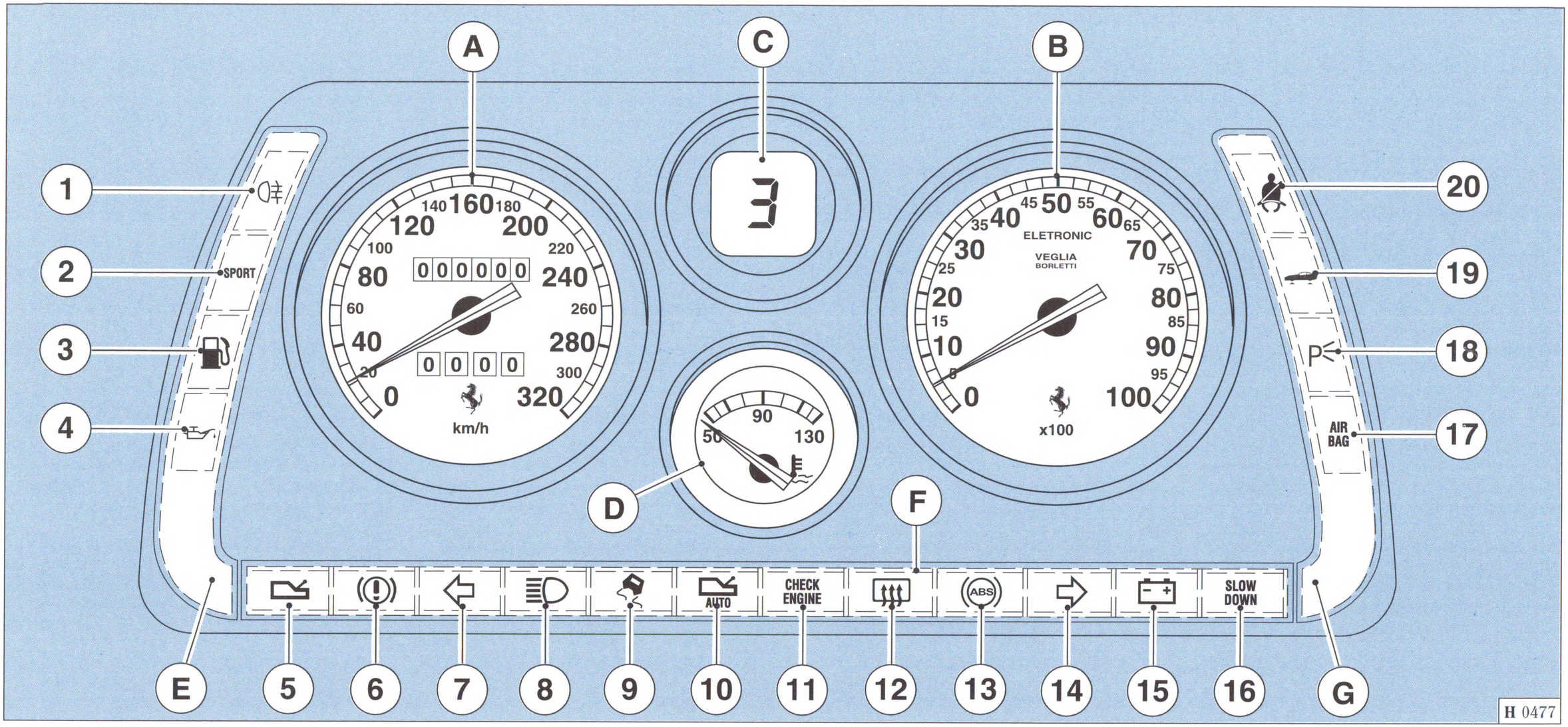
59 - Right seat control switch (**For spider**).

60 - Alarm LED.
61 - Upshifting lever.

62 - Push button for “Auto” function engagement.

63 - Push button for “Low friction” function engagement.

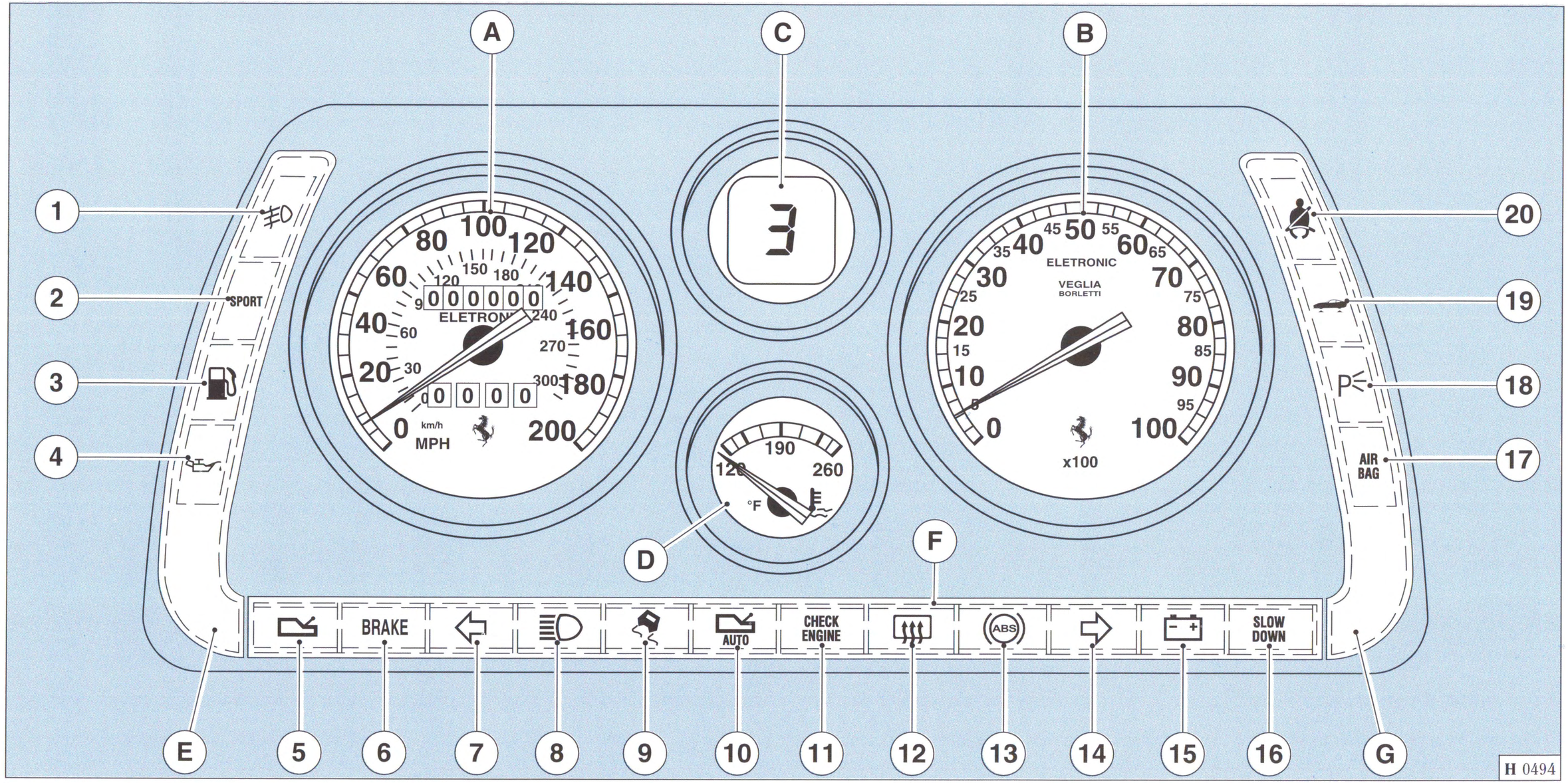
INSTRUMENT PANEL



NOT FOR US VERSION

Fig. 57

A - Electronic speedometer; **B** - Electronic revolution counter; **C** - Gear display; **D** - Water temperature warning light; **E** - Warning light display, left side; **F** - Warning light display, center; **G** - Warning light display, right side.



FOR US VERSION

Fig. 57/A

A - Electronic speedometer; **B** - Electronic revolution counter; **C** - Gear display; **D** - Water temperature warning light; **E** - Warning light display, left side; **F** - Warning light display, center; **G** - Warning light display, right side.

1 - Rear fog light indicator (green) **Not for US**.

1 - Fog light indicator (green) **For US**.

2 - Car "SPORT" setting warning light (amber).

3 - Fuel reserve warning light (amber).
4 - Min. engine oil pressure warning light (red).

5 - Gearbox failure warning light (red).
6 - Brake oil level, brake pad wear and parking brake warning light (red).

7 - Left direction indicator (green).

8 - High beam indicator (blue).
9 - "Low friction" warning light (amber).
10 - Automatic gearbox warning light (amber).

11 - "Check Engine" warning light (amber).
12 - Rear heated window and outiside mirror demisting warning light (amber) **For berlinetta and GTS.**
12 - Outside mirror demisting warning light (amber) **For Spider**.
13 - "ABS" warning light (amber).
14 - Right direction indicator (green).

15 - Alternator warning light (red).
16 - "Slow Down" warning light (red).
17 - "Airbag" warning light (red).
18 - Parking light indicator (green).
19 - Shock absorber failure warning light (amber).
20 - Released seat belt warning light (red).

"F1 GEARBOX"

SYSTEM SWITCHING ON

Putting the ignition key in position **"II"** all the gearbox display segments are enabled and switched on (Fig. **58**); the relevant failure warning light switches off if - after a few seconds - no failures will be detected.

The display shows the engaged gear.

It can also happen that:

the failure warning light flashes for a short interval (20÷30 sec.), then switches off; the system has completed the ***"start-up"*** step and has been started correctly. **During this step, no control is accepted.**

If the warning light flashes and doesn't switch off, switch the system off and on again.

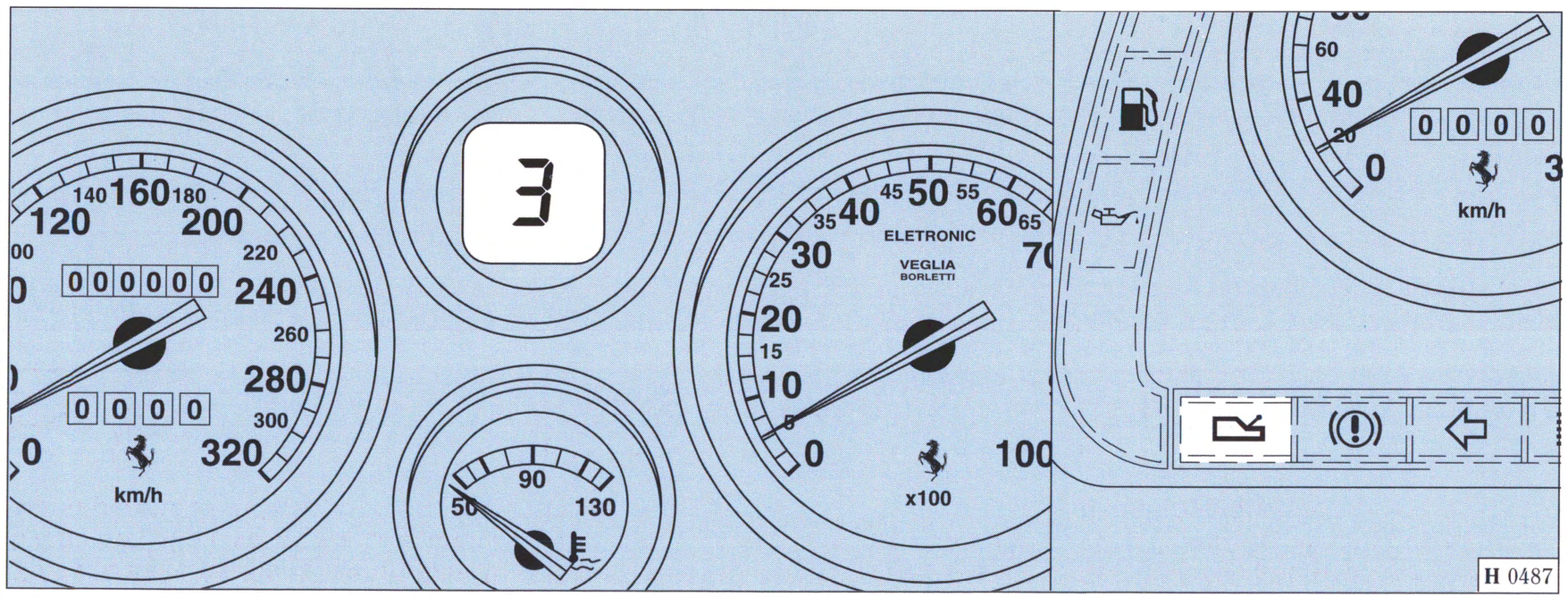


Fig. 58 - Gearbox display and failure warning light.

If the failure persists, check the oil level and if there are some hydraulic leaks.



The warning light is permanently on: the system is faulty and a buzzer operates when the ignition key is placed in position **"II"**.

OPERATION WITH ENGINE OFF

After the **"System switching on"** step, the display will show the engaged gear:

N (neutral)
R (reverse)
1 (first gear)
2 (second gear), etc...

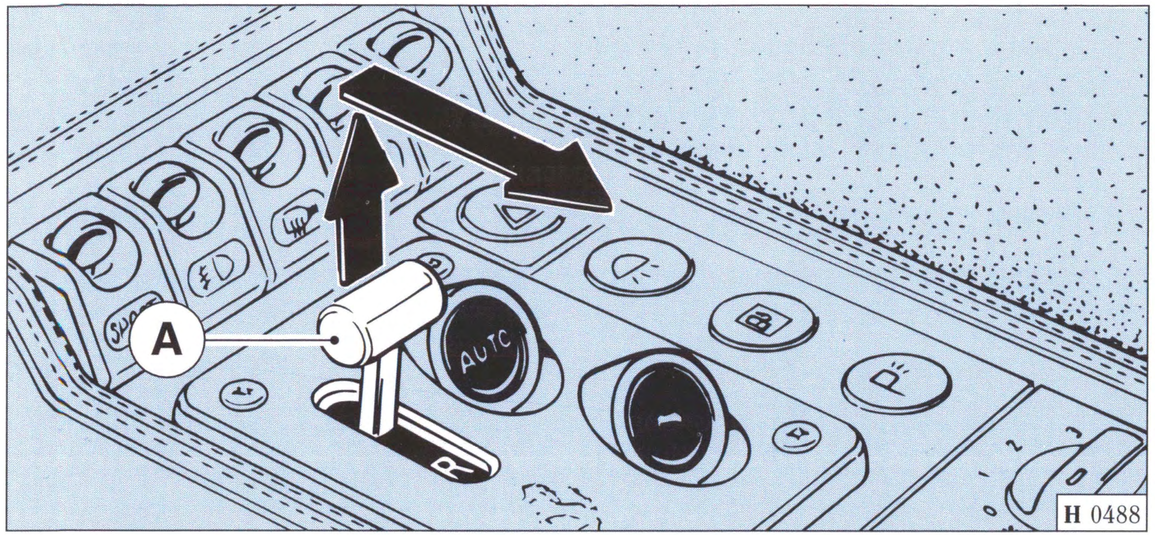
If the displayed data flashes (it may happed with **"N"** as well), the gear isn't engaged perfectly; set **"N"**, then the wished gear.



If the display shows a hyphen, the system is faulty.

When the engine is off, all the gears can be engaged and you can ask for **"N"** (neutral); holding the brake pedal depressed, proceed as follows:

- **"N" (neutral):** pull both levers under the steering wheel.
- **"R" (reverse):** lift and pull backwards the lever **A** (Fig. **58**).



WARNING
Pull the lever **"A"** backwards and hold it until the display shows **"R"**.

Fig. 59 - Reverse lever.

- **Gear upshifting:** pull the **"UP"** lever towards the steering wheel.

- **Gear downshifting:** pull the **"DOWN"** lever towards the steering wheel.

Release immediately the "UP", "DOWN" and "R" levers after the gear shifting request; a prolonged move would cause the failure warning light and the buzzer to operate.

Do not operate the system when the engine is off, otherwise the battery would be discharged.

ENGINE SWITCHING ON

The engine can be switched on only when the gearbox is in neutral and thus, before starting the engine, check if the **"N"** writing is displayed, without flashing; otherwise, pull both levers towards the steering wheel to engage the neutral.

Check if the alarm system is disconnected and then start the engine, turning the ignition key to the position **"III"**; when the engine starts, release the key: it goes back to the **"II"** position automatically.
If the engine doesn't start, after putting the key in position **"0"**, wait until the gearbox display switches off and then repeat the whole procedure.

Hold the brake pedal depressed while starting the engine.

CAR STARTING

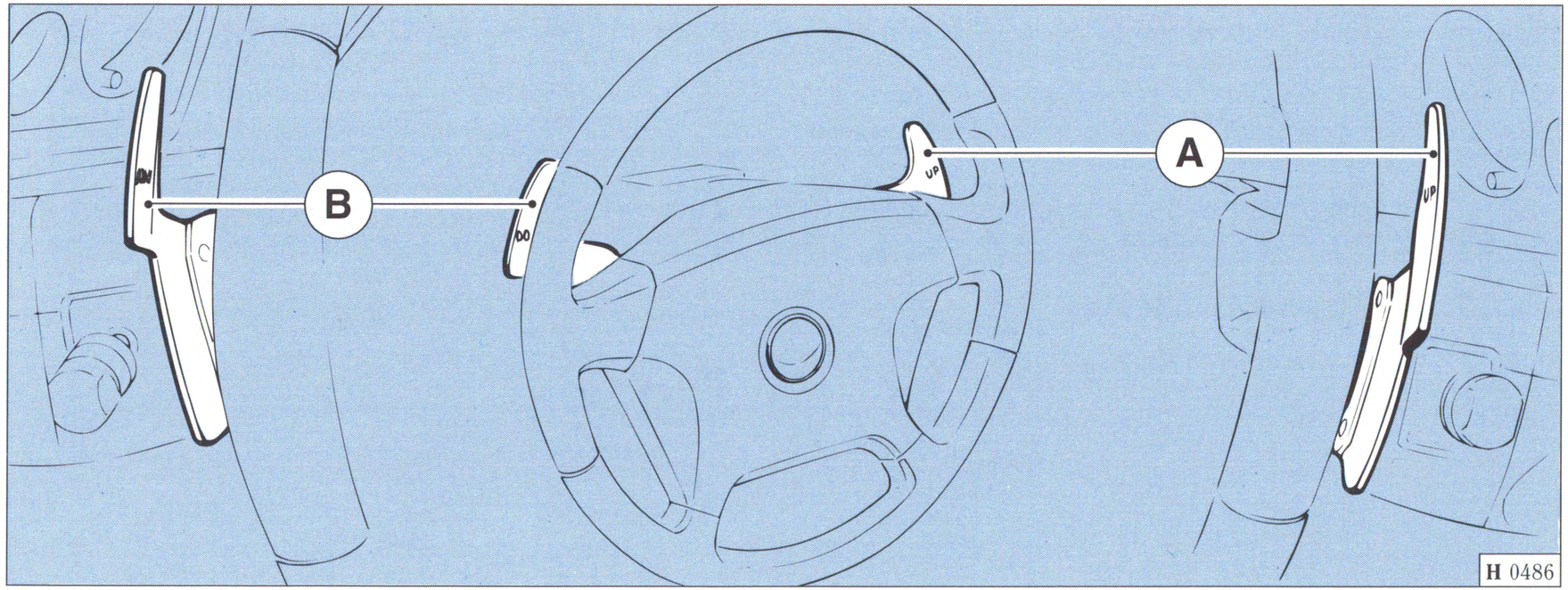


Fig. 60 - Gearbox control levers
A - "UP" lever;
B - "DOWN" lever.

When the engine is on, the car is stationary and the brake pedal is depressed, pull the right lever **"UP"** towards the steering wheel to engage the first gear.

Release the brake pedal and press the accelerator pedal to start.

If you wish a more "modulated" start, pressing the brake pedal, from **"N"** push the **"UP"** lever twice so that the car can start in second.

For a quicker start (possible only in first), just press the accelerator pedal more quickly.

When the engine is on and the car is stationary, you can pass directly from the first or second gear to the **"R"** (reverse) through the lever **A** (Fig. **59**) and from the reverse to the first gear pulling the lever **"UP"** towards the steering wheel.
If, during the passage from **"R"** to first, the system automatically engages the second, this means that the first gear is stuck. It isn't a failure, rather an first gear is stuck. It isn't a failure, rather an operation logic. For the same reasons of gear shifting fromfirst to reverse, if a gear sticks, the system automatically engages **"N"**.

During long stops, whit engine running, the gearbox should be left in **"N"**.

If, for example downhill, the car moves in neutral, when "UP" is required, the engaged gear will correspond to the car speed.

For safety reasons, the system starts the sound alarm and goes to **"N"** automatically when - with car at a standstill,

engine on and engaged gear - the following conditions occur:

- you do not press the brake or accelerator pedal for more than 4 seconds;

- the brake pedal is pressed for over 10 minutes;
- the door is opened without pressing the brake or accelerator pedal;

- the engine hood is opened.



The buzzer operates even, during the pick-up step, a clutch overheating occurs.

In this case, you should “force” the starting completion, starting without any delay or stopping by the brake pedal, releasing the accelerator pedal.

IMPORTANT

a) When the car is at a standstill, with one gear engaged, always hold the brake pedal depressed until you decide to start.

b) Do not “modulate” the accelerator pedal during starts.

c) Use the second gear when you require a higher control on the car car manoeuvres at very slow speed.

d) Set a reverse movement only when the car has come to a complete stop and the brake pedal is pressed.

e) It is advisable to ask **“N”** while shifting from reverse to first gear.

f) If you park the car uphill, do not use the “starting” step to hold the car, rather

use the brake and depress the accelerator pedal only when you decide to start again.

g) If you depress fully the accelerator pedal very quickly, a "performing" start occurs, with remarkable skidding of the driving wheels even in case of good friction.

UPSHIFTING

Use the right **"UP"** lever even without releasing the accelerator pedal.

The **"Upshifting"** request isn't accepted if the required gear engagement forces the engine at low speeds or if an **"Upshifting"** is in process due to runaway speeds.

A quicker gear shifting is made if the request occurs with fully depressed accelerator pedal and engine at over 5,500 rpm.

It is anyway advisable:

a) to shift gears without releasing the accelerator pedal, if it is depressed;

b) to wait until a gear shifting is completed before asking for the next one, avoiding multiple requests in fast succession.

"UP" for runaway speeds

The system engages a highest gear "automatically" if, when the accelerator pedal

is pressed, the engine reaches a speed next to the "runaway" speed. This condition doesn't occur when the system is in "**Sport**" mode.

DOWNSHIFTING

Use the left "**DOWN**" lever even without releasing the accelerator pedal.

The "**Downshifting**" request isn't accepted if the required gear engagement forces the engine over a given rpm (see table), depending on the required gear, or if a "**Downshifting**" is in process due to low engine speeds.

Required gear	Downshifting max. rpm
First	6000 rpm
Second	8400 rpm
Third	8400 rpm
Fourth	8400 rpm
Fifth	8400 rpm

Caution: if the gear doesn't engage after a gear shifting request, the system can engage a gear longer than the required one or shift the gearbox to neutral.

It is anyway advisable:

a) To shift gears without releasing the accelerator pedal, if it is depressed.

b) In case of a "**Downshifting**" request for an overtaking with a high acceleration, to press the accelerator pedal just right before using the lever.

c) To wait until a gear shifting is completed before asking for the next one, avoiding multiple requests in fast succession.

"DOWNSHIFTING" for low engine speeds

- The system downshifts "automatically" if the engine goes under a minimum set speed by 1,300 rpm.

- The downshifting control by the lever is ignored if a gear shifting for low engine speed is in process.

REQUEST FOR "N" (neutral)

If necessary, you can ask **"N"** at any speed.

If then you ask for an upshifting, the system engages the most suitable gear for the car current speed.

CAR STOPPING

When the car stops, the system automatically engages the first gear (unless you required the **"N"** beforehand).

When the car is at a standstill and the engine is running, hold the brake pedal pressed until you decide to start again.

ENGINE AND SYSTEM STOPPING

The engine can be stopped, putting the key in position **"0"**, both with the gerabox in **"N"**, and with a gear engaged (first, second or reverse).

After turning the key and switching the engine off, the display is still on for a few seconds; if the gearbox is in **"N"**, a buzzer operates.



DO NOT LEAVE the car when the gearbox is in "N", rather engage one gear (first or reverse), check if the display flashes and engage the hand brake. Do not get off the car while it's running.

DO NOT remove the key while the car is running: the system (and thus the display) is active but operates in an anomalous way until the car stops; further on, the steering wheel will lock at the first steering manoeuvre.



In this case, the failure warning light switches on and, before starting again, the system (and thus the display) must be switched off and the **"Switching on"** step must be repeated.

It is anyway advisable:

a) To switch the engine and the system off holding the brake pedal depressed.

b) Do not ask for a gear engagement while the system is being switched off.

OTHER SYSTEM FUNCTIONS

"Low friction" mode

It can be used in case of slippery roadbed (snow, ice) and is enabled (or disabled) through the switch **A**. The relevant indicator on the instrument panel switches on (Fig. **61**).

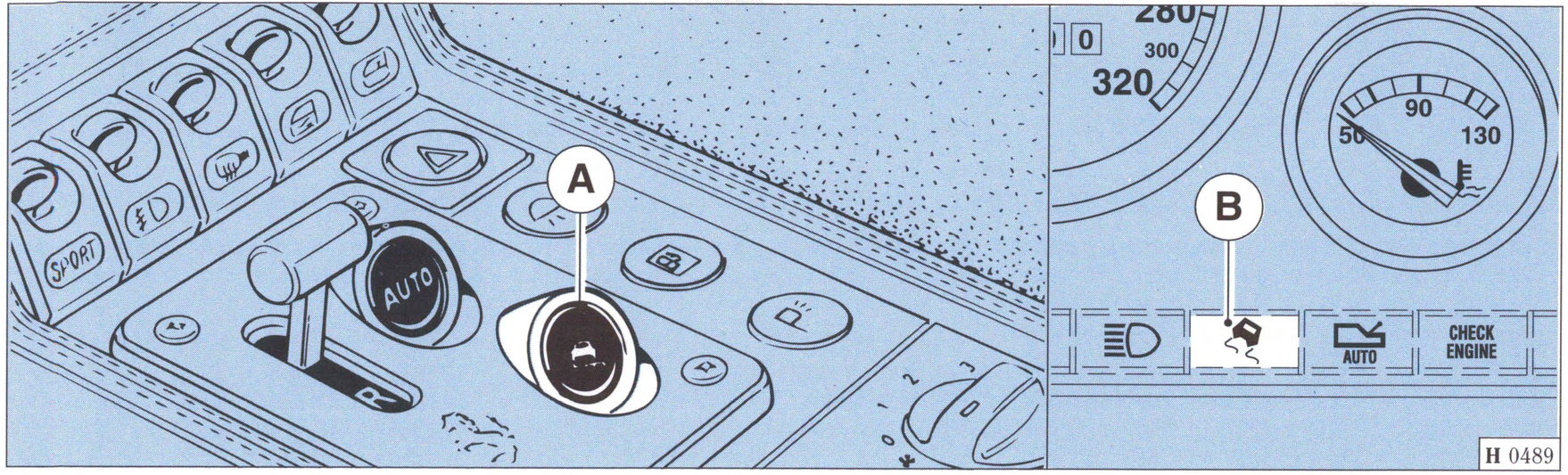


Fig. 61 - "Low Friction" mode
A - Switch;
B - Indicator.

In **"low friction"** mode the system uses the second gear instead of the first; thus, when the car is stopped and the engine is on, from neutral or reverse, asking an **"Upshifting"** or when the car stops, the second gear is automatically engaged.

When the second gear is engaged, the **"DOWN"** request by the lever is ignored.

While running, the system automatically upshift if the engine reaches pre-set engine speed (2.700 rpm).

The **"Low friction"** mode prevails on the other functions (**"Automatic"** and **"Sport"**).

WARNING!

The "downshifting" request from the sixth to the fifth gear is accepted only if the fifth gear engine rpm is lower than 2,700 rpm.

As the "Low friction" can be enabled at any time and the system limits the engine rotation speed at 2,700 rpm at

all gears apart from sixth, involuntary "upshiftings" could occur.

It is anyway advisable: to release the other working methods (**"Automatic"** and **"Sport"**) before selecting the **"Low friction"** mode.

"Automatic gear shifting" mode

It is enabled (or disabled) by the switch **A** (Fig. **62**); the **"Automatic"** indicator on the instrument panel switches on and the system automatically adapts the **"UP"** or **"DOWN"** gears depending on the car speed, on the engine speed and on the torque/power request made by the driver.

WARNING! **The "Automatic Gear shifting" mode prevails on the "Sport"** one: thus, if you operate the **"Automatic"** push button while in **"Sport"**, even if the **"Sport"** indicator

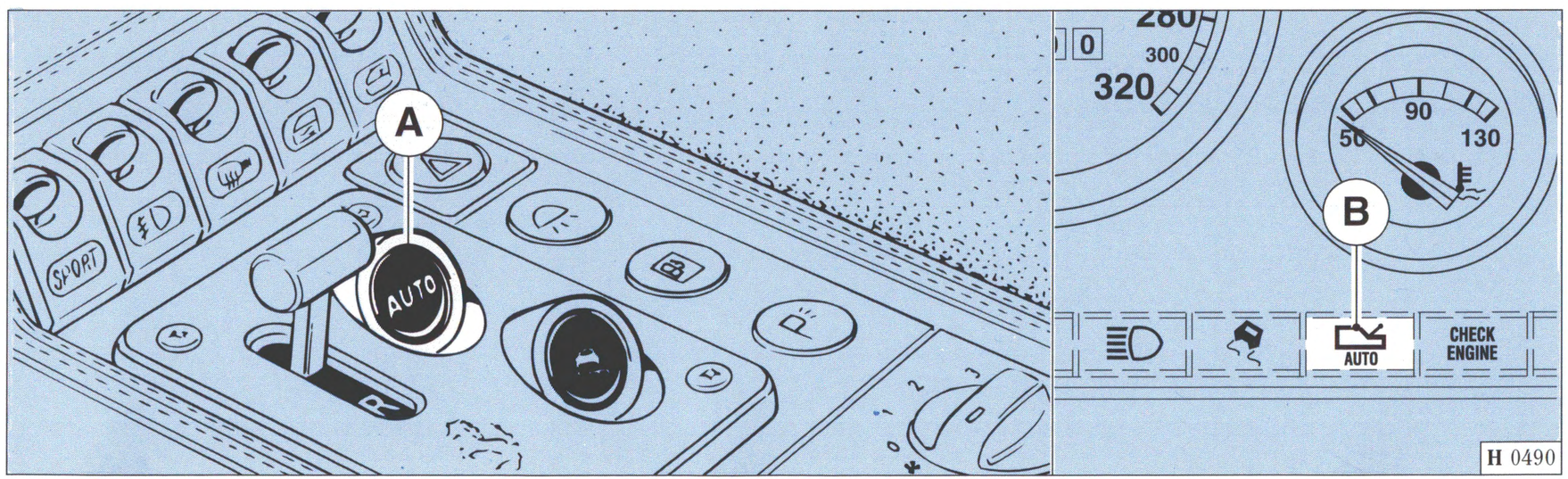


Fig. 62 - "Automatic gearbox" mode
A - Switch;
B - Indicator.

is on, the **"Automatic"** indicator switches on as well, and the system will operate in **"Automatic Gear shifting mode"**, keeping the suspensions in **"Sport"** position.

You can go back to the **"Normal"** mode (or **"Sport"**, if it was enabled) both asking for a gear shifting or holding the push button **A** pressed until the **"Automatic"** indicator switches off.

When the car is stopped, the request of "N", first or Reverse doesn't force the change from **"Automatic"** to **"Normal"**.

It is advisable: to release the other working modes before selecting the **"Automatic"** mode.

"SPORT" mode

It is enabled by the switch **A** (Fig. **63**); the relevant **"Sport"** indicator on the instrument panel switches on.

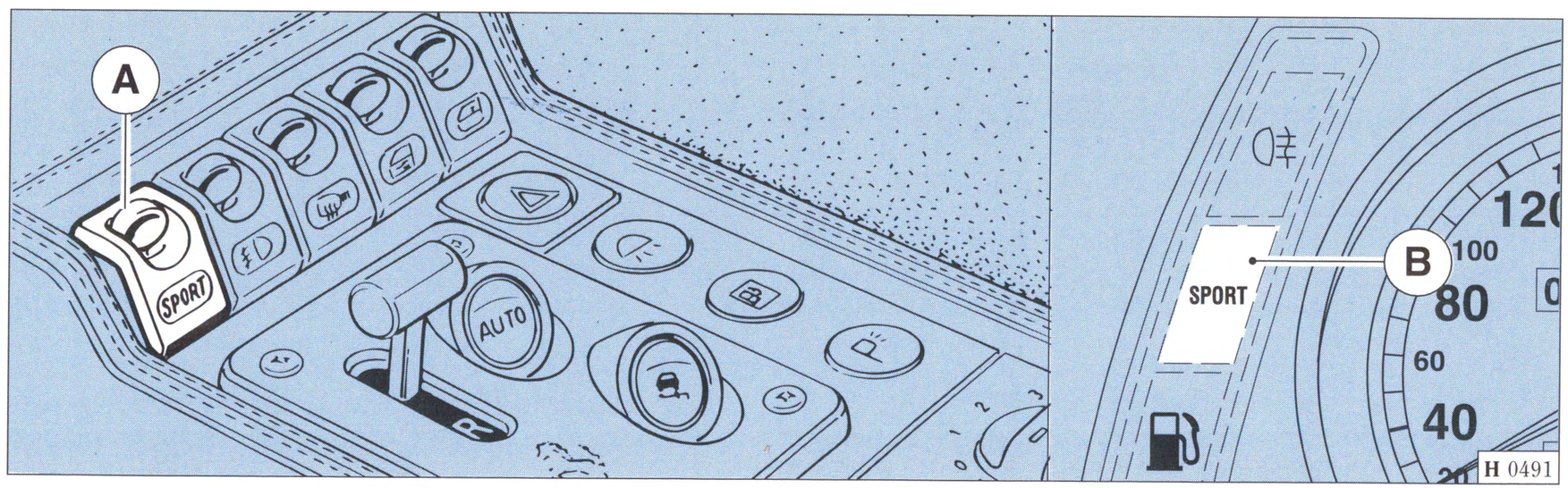


Fig. 63 - "Sport" mode
A - Switch;
B - Indicator.

To go back from the **"Sport"** mode to the **"Normal"** one, operate the same switch.

As the **"Sport"** mode doesn't prevail on the **"Low friction"** and **"Automatic"** modes, if they are active when the **"Sport"** mode is enabled, the system ignores this control, even if the relevant indicator switches on.



The "Sport" mode is featured by stiffer suspensions and quicker gear shifting with respect to the "Normal" mode.

The gear shifting is "faster" if the accelerator pedal is fully depressed and the engine is over 7,000 rpm; in such conditions, on a dry road, the driving wheels could skid (especially at low gears).

The downshifting with released accelerator pedal has a braking effect next to the driving wheel skidding limit on dry asphalt.



Do not use the "Sport" mode on roads with low or medium friction (e.g. in case of ice, snow or on wet roads) as, during gear shifting, the driving wheels could skid. Thus, an extreme use of the car in "Sport" mode is advisable only on tracks.

It is advisable: to release all the peculiar operation modes (**"Low friction"**, **"Automatic"**) before selecting the **"Sport"** mode.

Sound and failure signals



The failure warning light comes on while a buzzer operates.



In case of failure, in some cases the system could also go on operating with degraded mode and - in case of severe damages to the engagement and/or selection potentiometers and/or revolution incoherence - it could limit the gear acceptance to first, second gear and reverse.

Apart from the case of failures, the warning light switches on at "Power On" and stays on during all the system check period (for a few seconds, see paragraph "**System switching on**").



A buzzer operates also in the following cases:

a) the engine is switched off, but the gearbox is in Neutral (see paragraph "**Engine and system stopping**").

b) The engine is running, the car is stationary, a gear is engaged and one door opens without pressing the brake or the accelerator (in this case, the system signals the alarm condition and releases the gear as well; see paragraph "**Car starting**").

c) The engine is running, the car is stationary, one gear is engaged and the engine hood opens (in this case, the system signals the alarm condition and releases the gear as well; see paragraph "**Car starting**").

d) The engine is running, the car is stationary, one gear is engaged and the accelerator or brake pedal isn't pressed for over 10 seconds (in this case, the system signals the alarm condition and releases the gear as well; see paragraph **"Car starting"**).

e) If the engine is running, the car is stationary and one gear is engaged for over 2 minutes (in this case, the system signals the alarm condition and releases the gear as well; see paragraph **"Car starting"**).

f) If, during pick-up, the clutch over-heats (see paragraph **"Car starting"**).

Warning light control

If the "Low friction" and/or "Automatic" warning lights switch on, without any malfunction or without any request made to the system, check the correct operation of the display.

The warning light switching-on request is sent to the TCU by the display control unit, through a serial line and the display, on its turn, switches on the warning lights on the instrument panel.

To diagnose possible malfunctions of the display, check the supply and the inputs/outputs of the instrument, complying with the sketch in Fig. **64**.

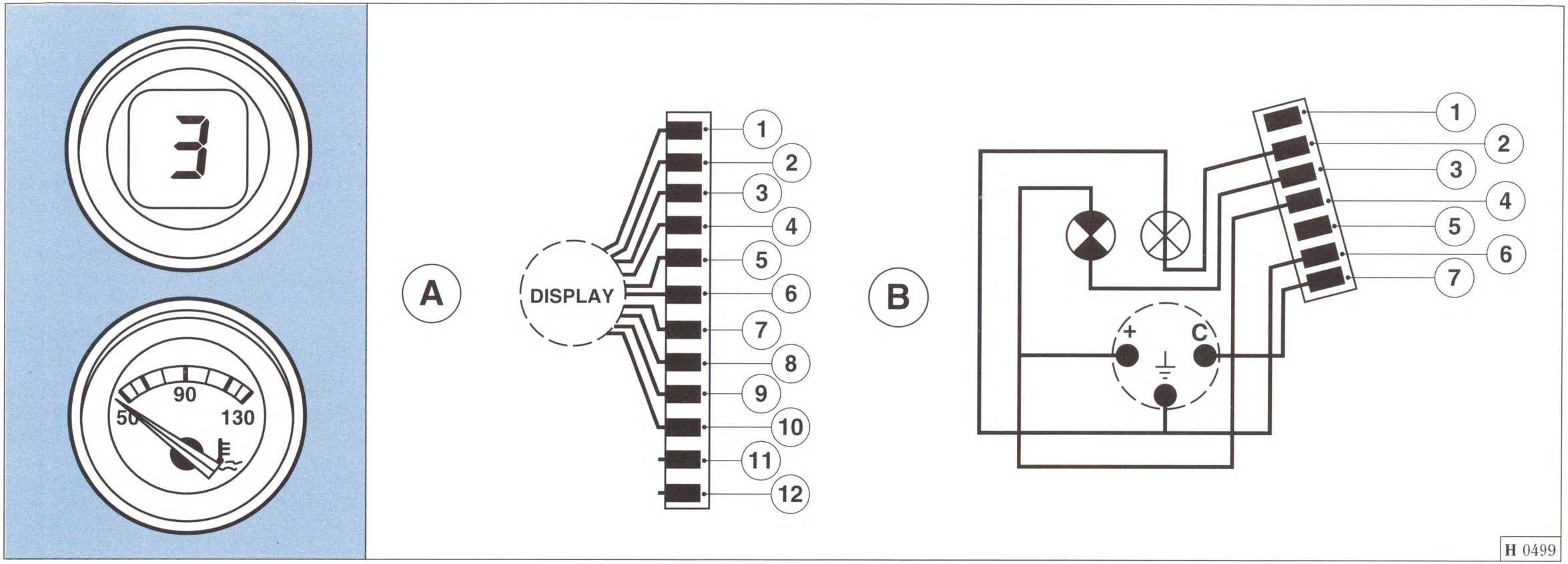


Fig. 64

A - Display connector

1 - + supply;
2 - +12V;
3 - Ground;
4 - + position lights;
5 - Gearbox serial input;
6 - “Low friction” gearbox warning light control;
7 - “Automatic” gearbox warning light control;
8 - Gearbox failure warning light control;

9 - Light rheostat input;
10 - Reserve input;
11 - Free;
12 - Free.

B - Water temperature gauge connector

1 - Free;
2 - Lighting;
3 - Water thermometer warning light;
4 - +12V;
5 - Free;
6 - Ground;
7 - Water thermometer control.

Failure to the control lever assembly

In case of failure to the control lever assembly (including the possible mechanical sticking with subsequent continuous control holding for over 10 seconds), the system signals the alarm with the buzzer and the warning light and selects the Automatic Mode automatically.

If the failure persists, any gear shifting control is ignored, including neutral and reverse.

In this case, if the car is stationary and the engine is switched off (obviously with engaged gear), the engine can be started again with engaged first gear only if the brake pedal is depressed during the request of ignition through the key.

If the failure occurs when the gearbox is in neutral, just switch the engine on (if it is off), do not press the accelerator pedal so that the engine turns at idling speed and press the brake pedal: the system engages the first gear.

Caution:

a) do not pull the levers too long, as the system would interpret this as a failure to the levers themselves.

b) If the driver's door or the engine hood are opened when the engine is running, like during standard operation, the system releases the gear; in these conditions, to engage the gear again while the engine is running, close the door again and press the brake pedal.

F355

October '94

AIR CONDITIONING

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CONTENTS

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- Functional logic I10
- Operation of air conditioning system I14
- Conditioner system components I17
- Temperature control system components I27
- Maintenance I29
- Functional checks I32
- Compressor drive belt tension I36

AIR CONDITIONING SYSTEM

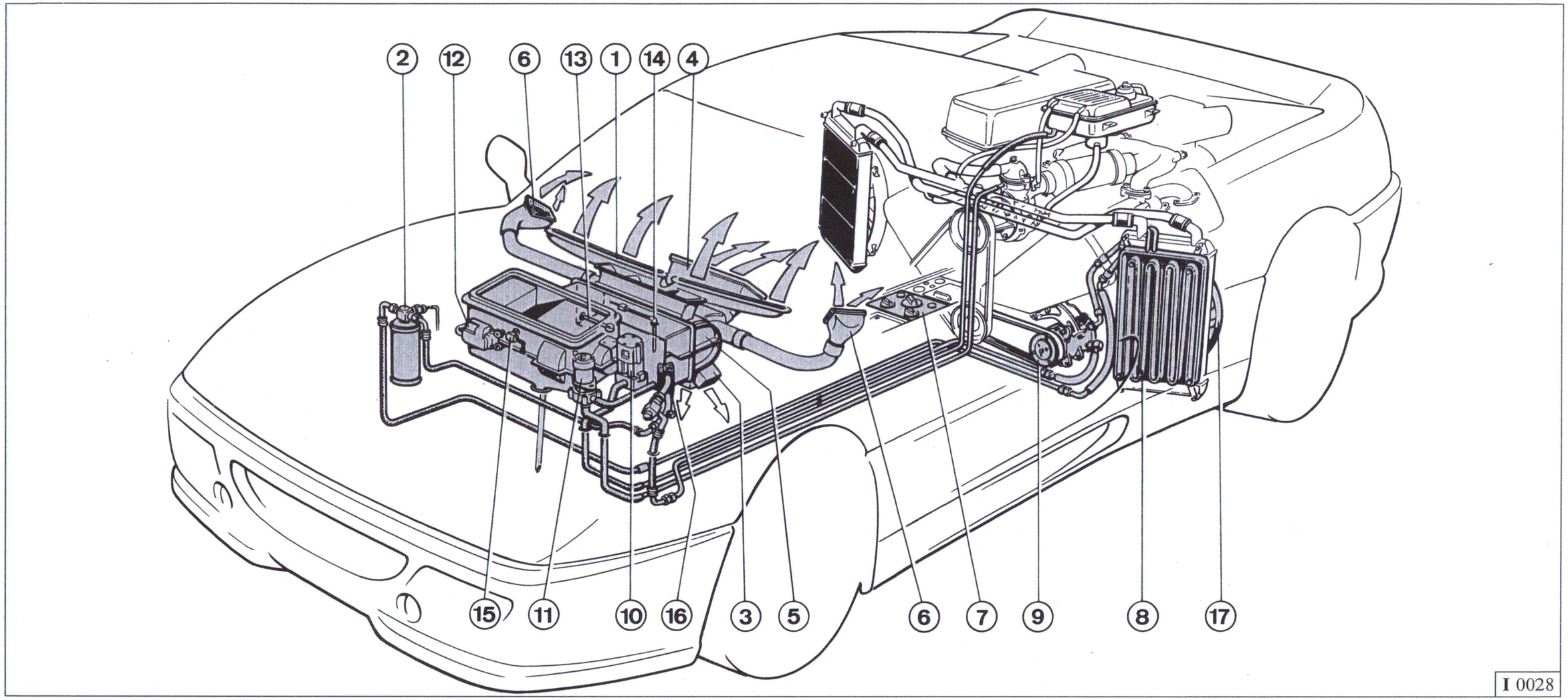


Fig. 1 - Air conditioner

1 - Windscreen demisting/defrosting vent; **2** - Dehydration filtre; **3** - Floor vent; **4** - Main air conditioning vent; **5** - Evaporator/heater unit; **6** - Side air conditioning vent; **7** - Electronic control unit (ECU); **8** - Condensor; **9** - Compressor; **10** - Heater control valve; **11** - Heater water pump. **12** - Outside air/recirculation flap motor; **13** - Conditioned air temperature sensor; **14** - Evaporator temperature sensor; **15** - Outside air temperature sensor; **16** - Expansion valve; **17** - Electric blower fan;

Description

• The climate control system consists of a Borletti heating/cooling unit controlled by a microprocessor ECU.
The system functions automatically and maintains a constant internal cabin temperature regardless of changes or differences in the ambient temperature, and controls the temperature,distribution and quantity of airflow.

• In addition, the system will maintain automatic control irrespective of whether external or recirculated air is being used, and independent of ambient conditions.

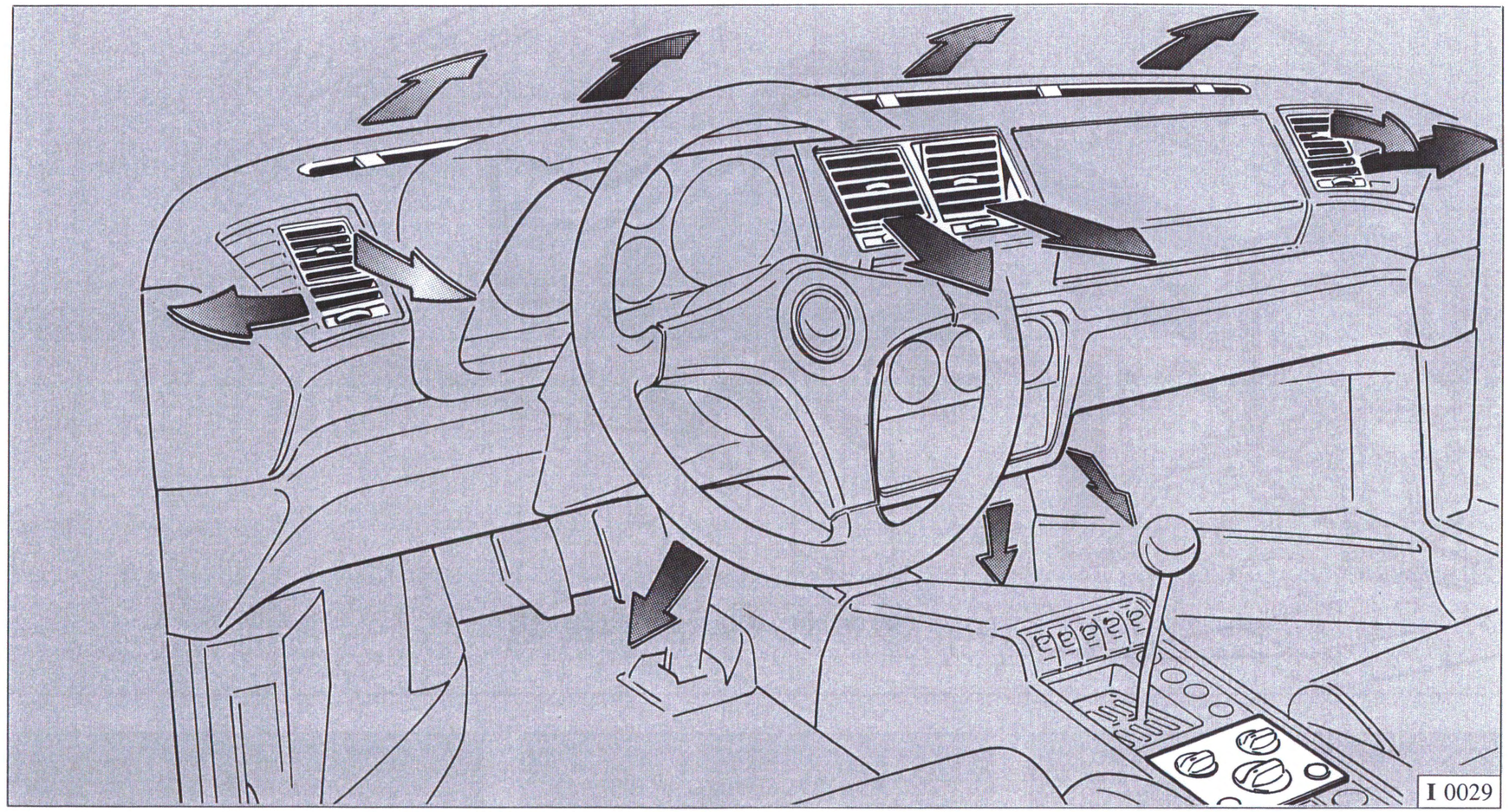


Fig. 2 - Car internal ventilation.

• The heater and evaporator are combined in one unit and provide:

• air blending;
• defrosting.

OPERATING THE CONTROLS

• The electronic control unit selects the modes by means of the controls shown in Fig. **3**:

"STOP" Button Released (Fig. 3 no. 1)

• The climate control system will operate in either the automatic or manual mode.

"STOP" Button Pressed

• The climate control system is deactivated.

• The air conditioner compressor is de-activated and the water control valve is activated (closed).

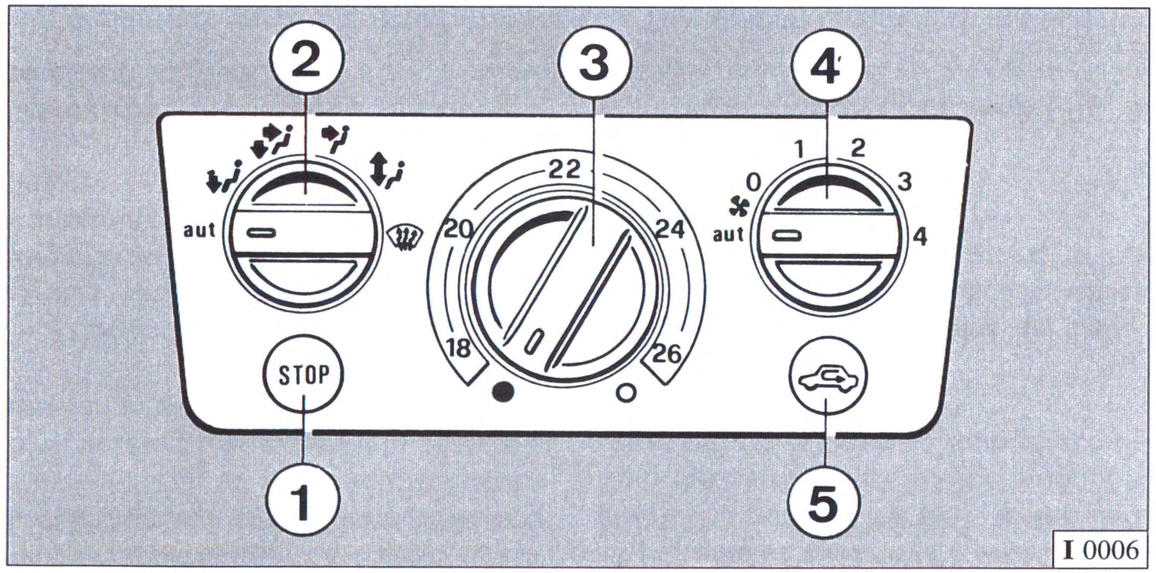


Fig. 3 - Climate Controls Panel

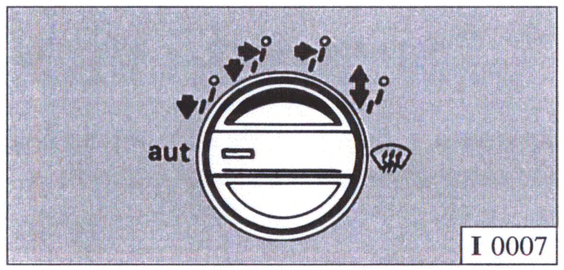
1 - "STOP" button;
2 - Air distribution selection knob;
3 - Temperature selection knob;
4 - Fan speed selection knob;
5 - Button for external air or recirculated air.

• If the selection knobs **2** and **4** are in the AUTO position the air is distributed from the central outlets, and since the fan is off, only "dynamic" ram effect air is distributed.

• Rotating knob **2** enables air distribution to be varied automatically, whilst knob **4** enables the air speed to be varied manually.

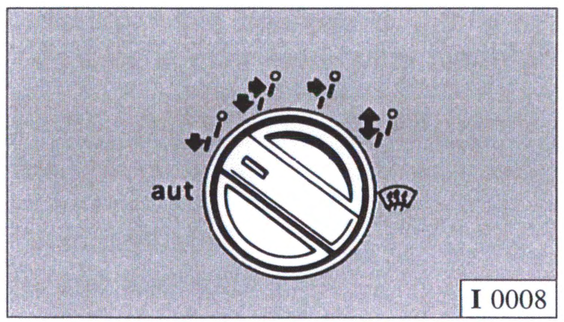
Air distribution control knob (Fig. 3 no. 2)

• The air distribution from the various outlets in the vehicle may be controlled either in automatic or manual mode according to the symbols on the control panel:



Automatic

• The air distribution is controlled by the electronic control unit according to the ambient conditions and the present temperature.



Manual

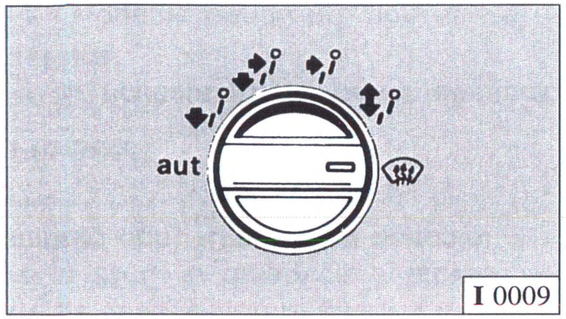
• By positioning the control knob in one of the four described positions, the discharged air is distributed as follows:

• to the floor vents;

• to the floor and central vents;

• to the central vents;

• to the windscreen and to the floor vents.

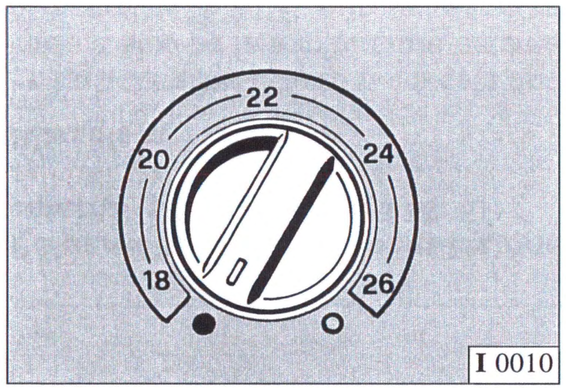


Defroster

• When the selection knob is placed in the defroster position, all of the discharged air is to the windscreen.

Note: the defroster starts operating if the control knob **4**, Fig. **3** is in **"AUT"**.

Temperature control knob (Fig. 3 no. 3)

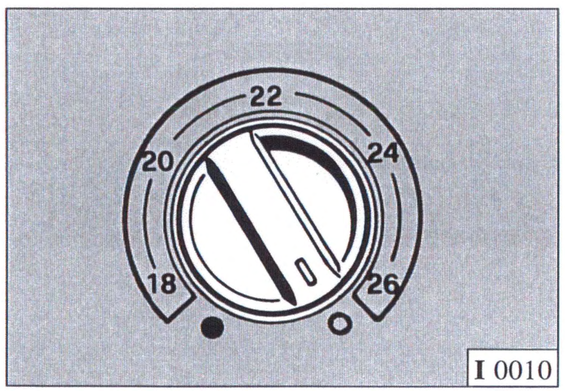


Blue Dot: maximum cold

• The A.C. compressor is switched permanently on and the heater control valve is energised (closed).

• Intermediate Positions: a mixture of warm air and conditioned air is provided activating the compressor and the water valve in order to maintain the temperature that has been selected.

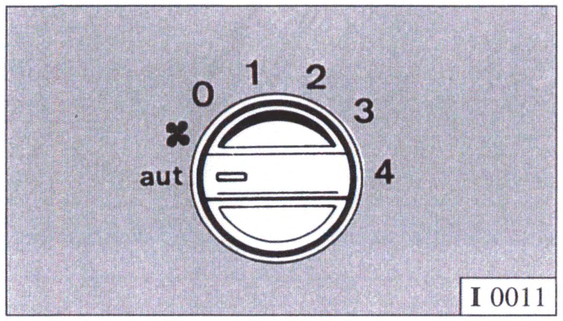
• The selectable temperature range is from 64 to 78°F (18 to 26°C).



Red dot: maximum heat

• The hot water valve is always de-activated (open) and the compressor is enabled for de-humidifying.

Fan speed selection knob (Fig. 3 no. 4)



Automatic

- The ECU automatically selects the correct fan speed necessary to reach the preset temperature most rapidly.

- In the automatic setting the ECU can select from eight possible fan speed.

Manual

- In the manual mode it is possible to select one of four fan speeds by using the knob.

External ventilation exclusion (recirculation) button (Fig. 3 no. 5)

Released

- The ECU uses recirculated internal air only if the external ambient temperature is higher than 70°F (21°C) and the internal temperature (TTV) is lower than 77°F (25°C).
- If outside air temperature exceeds 77°F (25°C), a timer automatically selects external air to provide a change of air every 20 minutes. If outside air temperature is less than 77°F (25°C), the timer selects external air every 10 minutes.

Depressed

- Internal (passenger compartment) air is recirculated.
- In this condition the internal air is not changed.

• A variation in the position of the temperature selector knob will cause a variation in the temperature of the discharged air from the outlets. this difference will diminish as the system reaches the pre-set temperature.

• When the system has attained the pre-set temperature setting, a temperature variation of ± 35°F (± 2°C) is maintained at the drivers head.

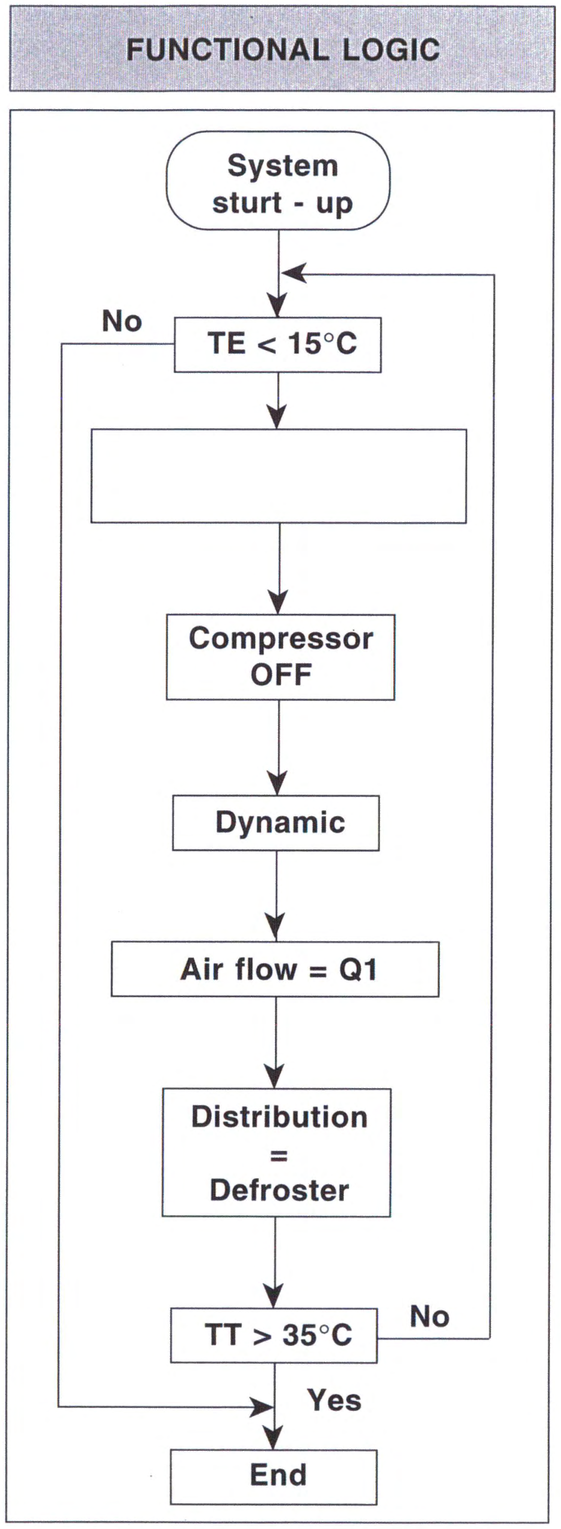


Fig. 4 - Start up transient diagram.

Regulation logic

• The Electronic Climate Control system (E.C.C.) manages the temperature control of the vehicle by regulating the following functions:

— the water valve which controls the flow of hot water to the heat exchanger.
— The fan speed,by means of an electronic control device (PWR).

— The engagement of the electromagnetic coupling of the compressor.
— The air distribution system.
— The air recirculation flap.

• Naturally the choices made by the user take priority over the optimised conditions selected by the system.

Start up transients

• To improve the comfort levels in the vehicle, and to prevent the user being subjected to a flow of un-heated air during the cold season; a start-up procedure has been defined.

• The procedure is illustrated in the flow-chart Fig. **4**; and shows that the transitional procedure will not be carried out only if **TE > 59° F (15°C)**.

• The system will be held in conditions of maximum heat as long as the temperature of the treated air does not reach 95°F (35°C), following which the system will begin the regulation phase.

The mathematical model

• The term TTV is used to indicate the value of the temperature which must be achieved at the outlets of the cli-

mate control assembly in order that the vehicle will remain in the condition requested by the user.

• This value has been calculated by the following energy balance equation:

— where the term **K1 (8/Q) (TR-TE-6)** represents the thermal dispersion in the vehicle;
— **K2 (8/Q) (TR - TA)** is an increase factor which is rescinded when the transition is ended.
— **K3** finally, is a function of **(TO - TA)** where the theoretical increase in ambient temperature is taken into account.

TTV = TA + K1 (8/Q) (TR - TE - 6) + K2 (8/Q) (TR - TA) + K3 (8/Q) (TO - TA)

The control of the heater-evaporator sub system

• The value TTV calculated from a thermo-dynamic model is used to control the circuit which closes a water electrovalve.

• An appropriate algorithm calculates the value of the duty cycle to apply to the valve in a way which enables a certain precision to be employed when called for by the mathematical model.

• If the **TTV < (TE - 57°F)** in dynamic mode, or **TTV < (TA - 57°F)** in recirculation mode, the system regulates the temperature at the outlets only by using a cycle of the compressor.

• To make an adjustment using the valve, the **TTV** must be **> (TE - 7)** in dynamic mode, or **> (TA - 7)** in recirculation mode.

Control of the fan

• The rotational velocity of the fan is calculated by different methods depend-

ing on whether it is in the heating phase **(TE ≤ TR)** or in the conditioning phase **(TE > TR)**.

• When the user decides to change the speed of the fan manually, it will change the **TTV** calculation.

• If the user decides to switch off the fan, it will force the disengagement of the compressor to prevent icing of the evaporator.

Control of the compressor

• The engagement of the compressor drive is actuated by the microcomputer using a hysteresis where when the temperature is greater than 39,2°F (4°C), regulation is rising; and 35,6°F (2°C) regulation is falling.

• To prevent icing of the evaporator, the E.C.C. system will take control when two conditions exist: if the evaporator temperature is higher than 37,4°F (3°C), regulation is rising; if 33,8°F (1°C) then regulation is falling if the fan is functioning.

• Take note of the presence of a control which ensures the engagement of the compressor drive for at least 3 seconds in every 30 minutes of engine functioning in order to prevent compressor lubrication problems during the winter season.

Distribution

• The automatic distribution function is read as Temperature Treated Volume (TTV).

Recirculation

• The automatic recirculation function depends on the **TE** and **the conditions both requested and in the cabin**. Only on these terms will the system operate the recirculate function.

OPERATING PRINCIPLES OF THE AIR CONDITIONING SYSTEM

• Cooling gas (R134A) is drawn by compressor **23** and it is sent to condenser **20** at a pressure depending on the external temperature.

• In the condenser, the coolant temperature decreases and the coolant condenses, becoming liquid.

• The dehydrator filter **15** eliminates all traces of moisture due to water vapour condensation in the system, and acts as a reservoir for the coolant liquid.

• From the dehydrator filter, the coolant flows through the expansion valve, which controls the coolant flow to the evaporator and causes a pressure drop.

• Once the coolant has reached the evaporator, it vaporises thus becoming gaseous at low pressure (1.5 ÷ 2 bar) and at low temperature -41 ± 41°F (-5 ± 5°C). During this time it absorbs heat from the air flowing through the automatic climate control unit.

• When it leaves the evaporator, the coolant is again sucked by the compressor and fed back into the cycle.

	System performances			
	System air delivery (on the car)			m^3/h 350
	Evaporator			Kw 3,8
	Condenser			Kw 4,53
	Heater			Kw 6,5

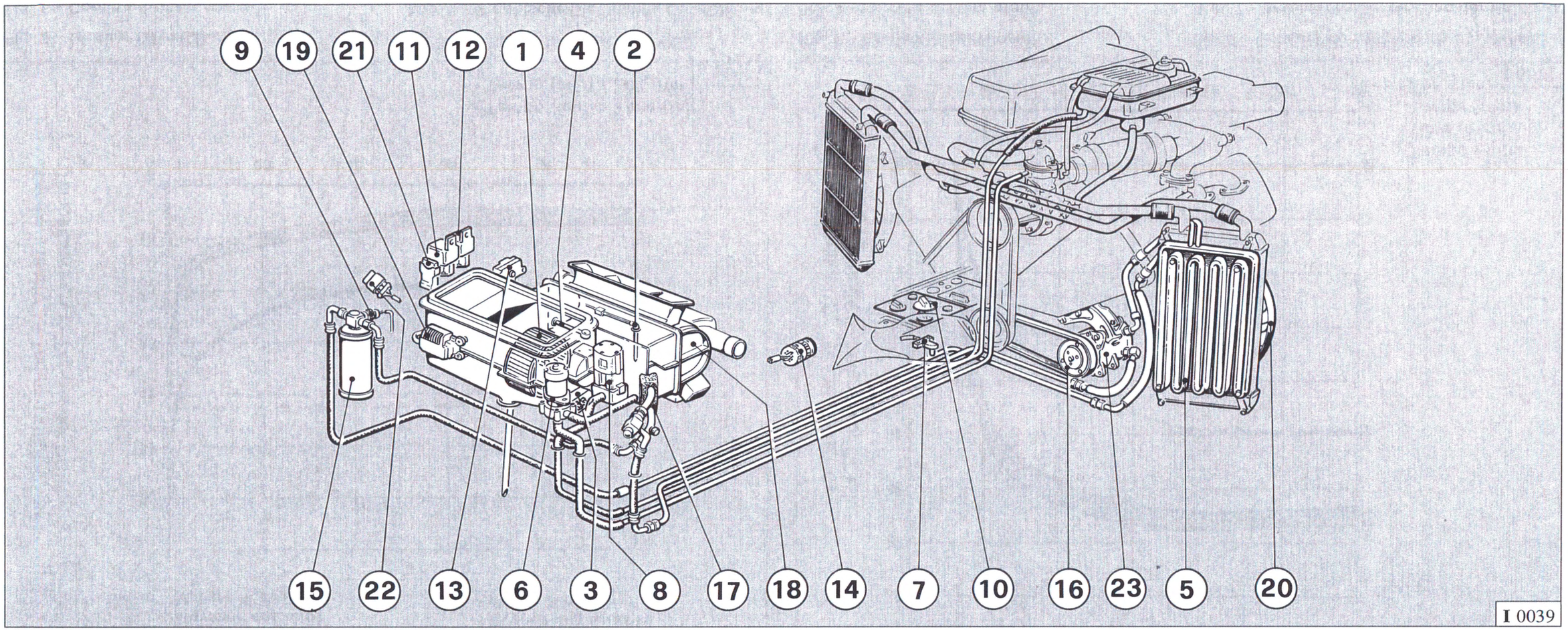


Fig. 5 - Components of the temperature control system

1 - Fan in the cooler-heater unit; 2 - Evaporator temperature sensor; 3 - Power module for fan control; 4 - Cooled-heated (treated) air temperature sensor; 5 - Condenser; 6 - Electric water pump for heating; 7 - Outside temperature sensor; 8 - Valve for heating water with electric motor; 9 - MIN/MAX pressure switch and control switch for the condenser fan; 10 - Electronic control unit; 11 - Cooler-heater unit fan control relay;12 - Compressor control relay; 13 - Motor for the air distribution control; 14 - Passenger compartment temperature sensor; 15 - Drier receiver; 16 - Electromagnetic clutch; 17 - Expansion valve; 18 - Cooler-heater unit; 19 - Motor flap for fresh air/ recirculation air; 20 - Condenser electric fan; 21 - Temperature control system fuse; 22 - Connector for SD-1 system; 23 - Compressor.

Note: the graphs on Fig. **6** and **7** can be obtained at the following conditions;

Cooling system graph: Max. ventilation; Max. cold required; Ventilation distribution; Recycling.

Heating syetm graph: Max. ventilation; Air flow to the footwells; Max. hot required.

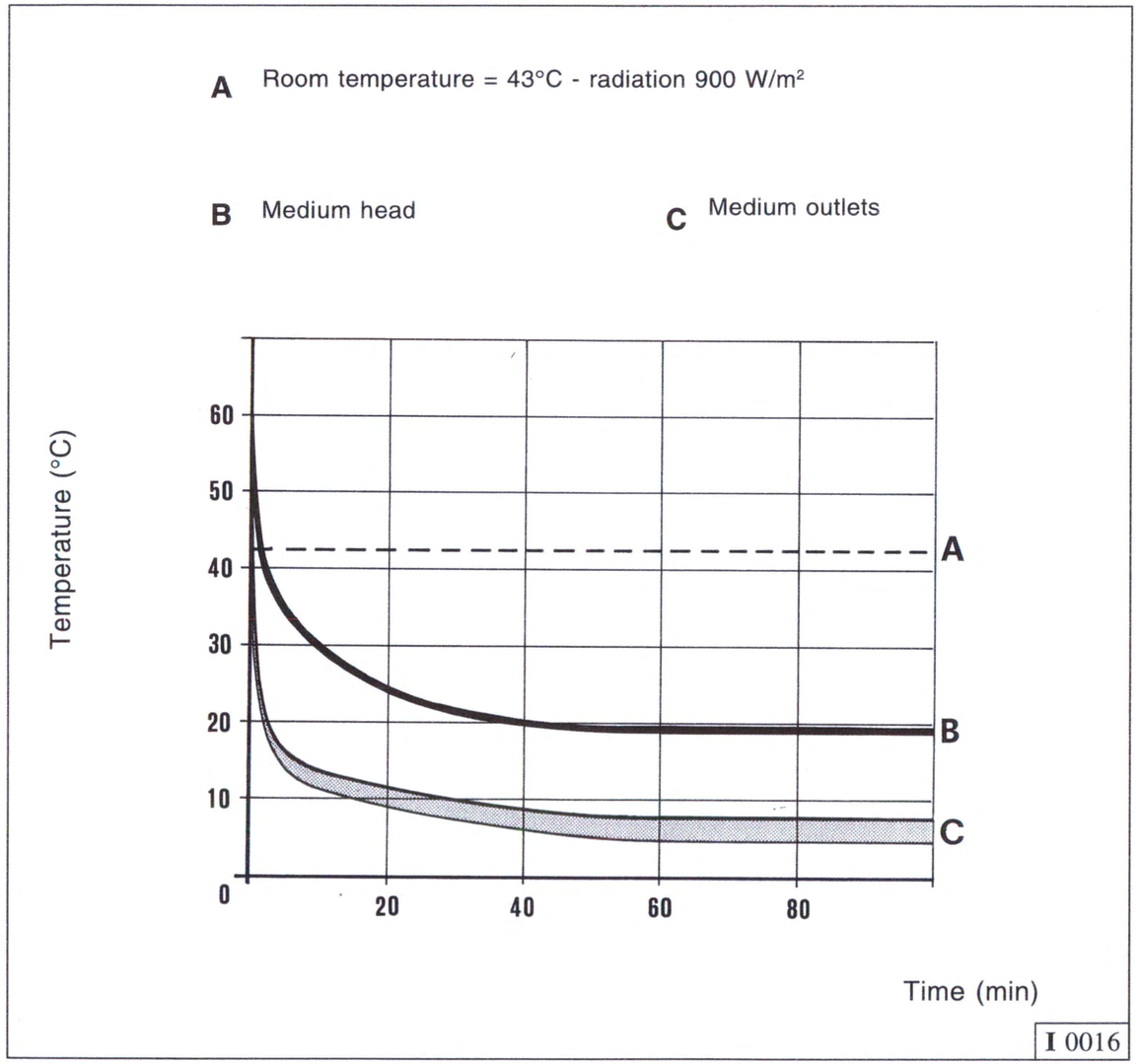


Fig. 6 - Cooling system graph.

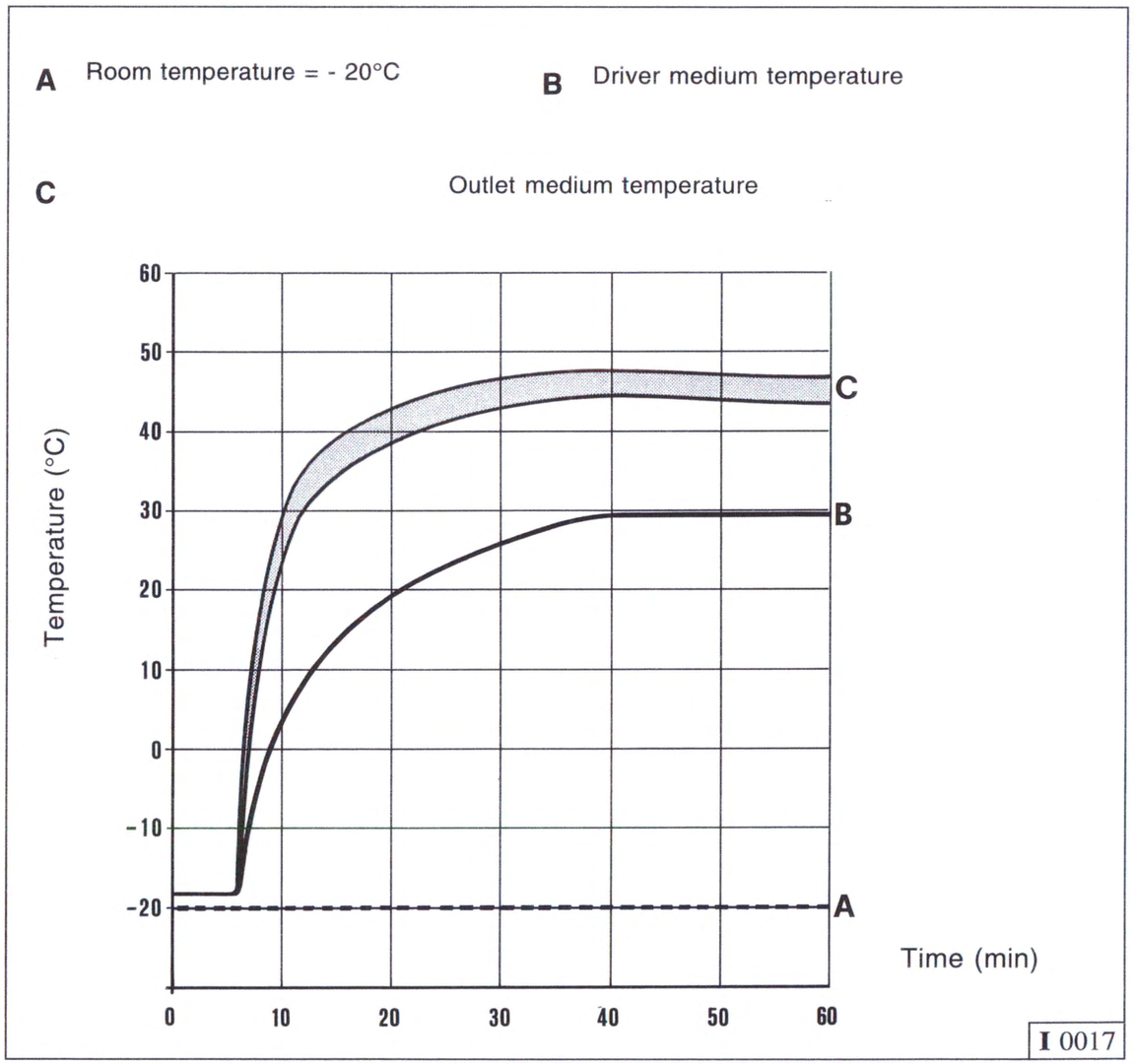


Fig. 7 - Heating system graph.

CONDITIONING SYSTEM COMPONENTS

Heater / evaporator

• It is a "Borletti" system, including: heater, evaporator, air inlet fan, flaps and devices for adjusting air distribution inside the car.
It's the same used on 348s, with some improvements such as the increase of air delivery to the different inlets, the reduction of flow to footwell and the replacement of the expansion valve and relevant fastening fittings.

Compressor

Features		
Type	Sanden	SD 7H15
Cylinder	no	7
Bore	mm	29,3
Stroke	mm	32.8
Cubic capacity	cm^3	154.9
Max. permitted	rpm	6000
Oil quantity	cc	135
Coolant		R134 A
Weight without clutch	kg	4.6

• A seven-cylinder Sanden compressor is driven by a belt through an electromagnetic clutch.

• When fitting the compressor, make sure it functions correctly by checking that the pulley is correctly aligned, the compressor is accurately coupled to the engine brackets, and the belt and nuts are tightened to the prescribed values.

• The working principle can be summed up as follows, referring to the next description.

• The cam rotor causes the control disc to turn, with a roller bearing between them.

• During rotation the connecting rods, hinged to the control disc, translate movement due to their inclination.

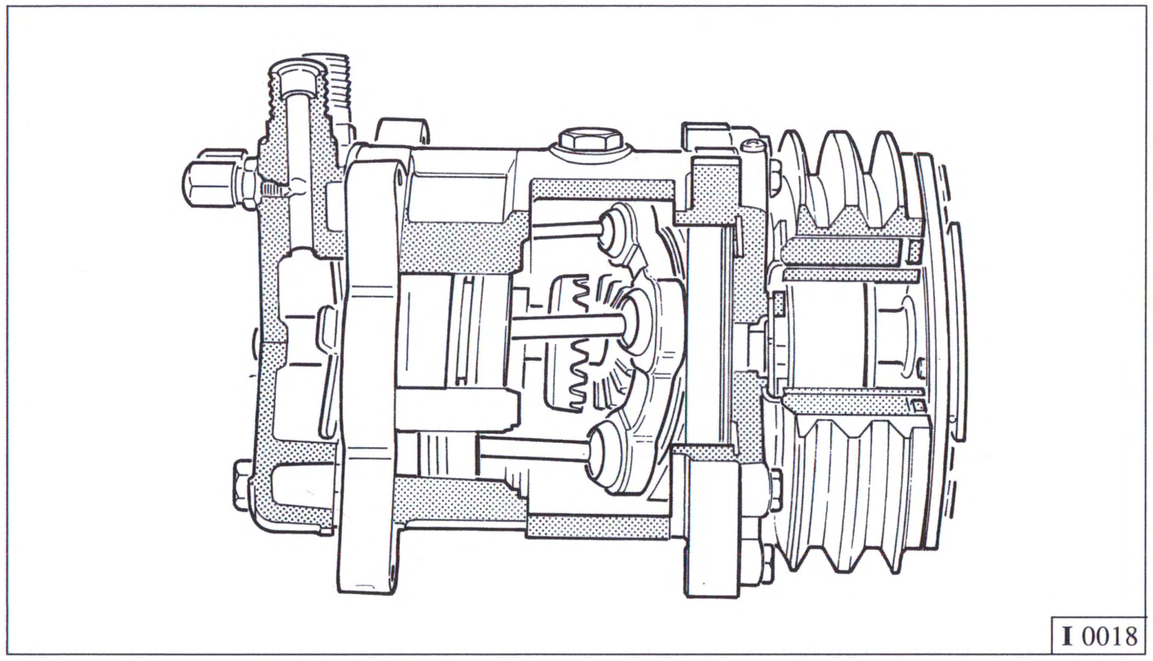


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Fig. 8 - Compressor.

• In this way each piston has an axial and alternate displacement.

• The drive gear ensures an axial movement of the control disc.

• On the head a 7-lobe double reed valve achieves an automatic intake and exhaust step on the different cylinders.

Oil level check

• Check the compressor oil level every time a leak is found in the system.

• Check the level also before refilling with coolant during the periodical maintenance (at least once a year).

Note: use only the prescribed oil, (for the specifications, see Sect. **A**) not more than 135 cc; when the system is empty, top up with further 20 cc of oil.

• The oil level in the compressor can be checked only when the system is completely empty.

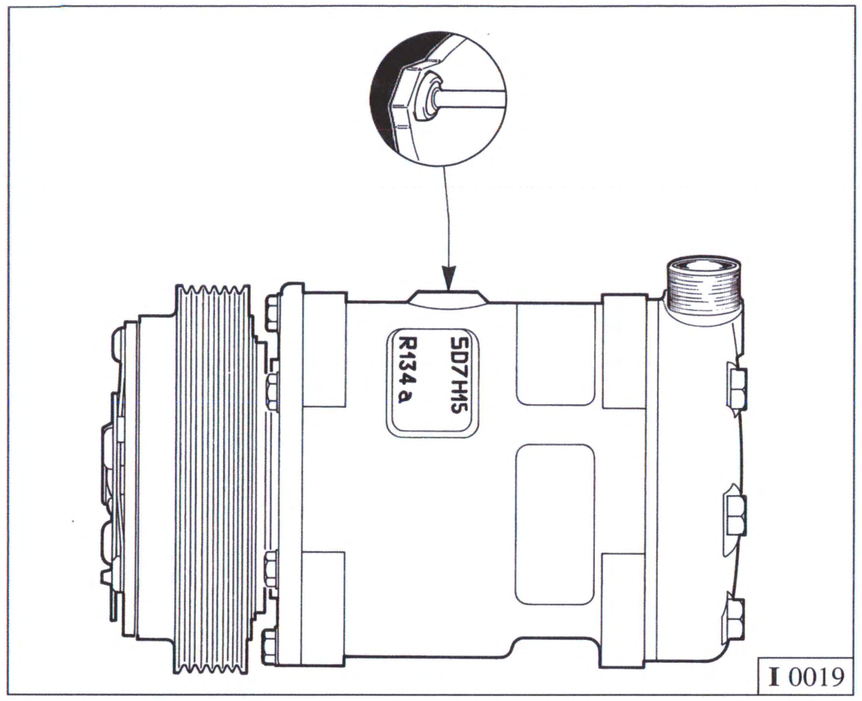
• Whenever the system needs charging, pour in the same oil quantity kept by the machine during the discharge process.

Note: the compressor oil check can be made only on bench.

1 - Loosen the filler plug slowly in order to discharge the pressure from the compressor crankcase.

2 - Look through the filler hole and rotate the clutch until the inner parts correspond to Fig. **9**. This step is necessary in order to be able to insert the dipstick into the compressor.

3 - Insert the dipstick as shown in Fig. **10**.



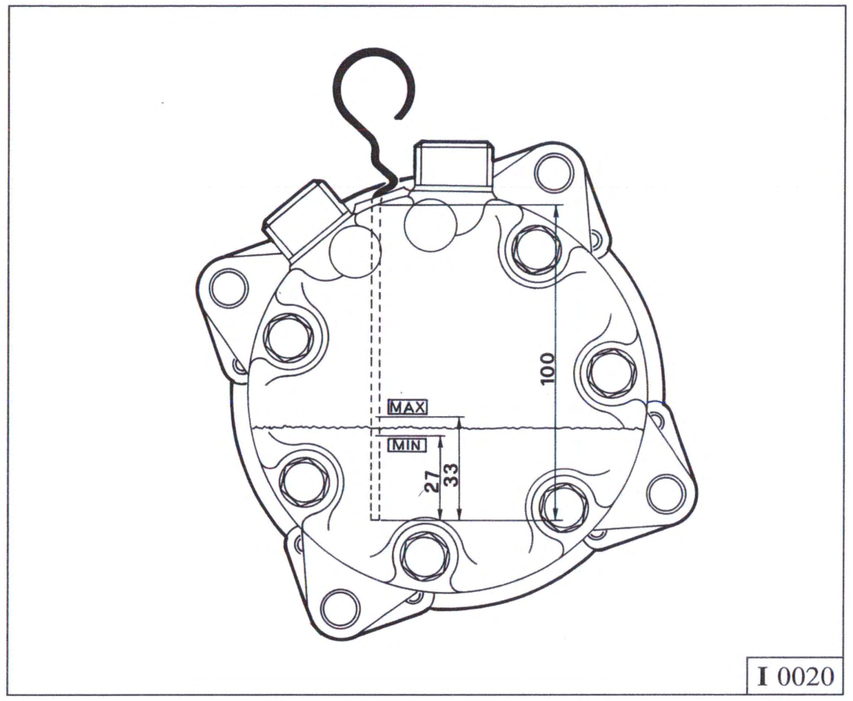


Fig. 9 - Control disc position for oil level check.

Fig. 10 - Dipstick for oil level check.

4 - Check that the oil level is between the max. and min. value (27 ÷ 33 mm from the dipstick lower end).

5 - Screw the plug again at a tightening torque of 8 ÷ 12 Nm, checking the gasket and contact surface conditions.

Note: use only the prescribed coolant (for the specifications, see sect. **A**). Avoid using products that may damage hoses, or products to be used at different temperature and pressure conditions.

Electromagnetic clutch

- The compressor is fitted with an electromagnetic clutch which is driven by the engine via a V-belt.

	Features			
	Supply voltage			12V
	Resistance			Ω 2,8 ÷ 3,3
	Voltage			A 3,6 ÷ 4,2
	Disc-pulley clearance			mm 0,4 ÷ 0,8

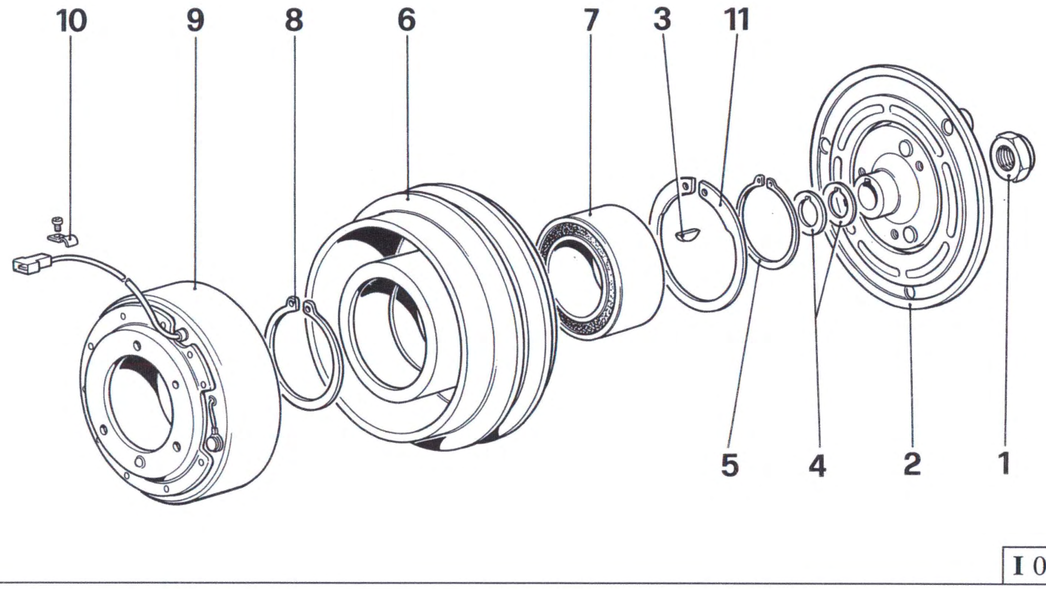


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Fig. 11 - Electromagnetic clutch

1- Nut; **2** - Front disc; **3** - Spline; **4** - Clearance adjustment shims; **5**- Spring ring; **6**- Pulley; **7**- Bearing; **8**- Spring ring; **9**- Magnetic coil; **10**- Electric cable fixing clamp.

• When the clutch is engaged, electromagnet **9** is energised and drives disc **2** against pulley **6**.

• Due to the friction occuring between the two surfaces, the pulley rotates the disc and consequently the compressor shaft.

• If the voltage is below 12V, check:

— Battery voltage;
— Wiring integrity;
— Ground contact.

Clutch pulley removal

1 - Loosen the front disc **2** fixing nut **1**, then remove the disc through a puller in the treaded holes **3**.

2 - Remove the spline **3** from the compressor shaft.

3 - Remove the stop spring ring **5** from the bearing inner race **7**.

4 - Remove the pulley with the bearing through a puller.

5 - Disassemble the magnetic coil **9** after removing the spring ring **8** and the electric cable fixing clamp.

Valve for heating water (fig. 5 No. 8)

- This valve shuts off the warm water flow through the heater by means of a closing device operated by an electric motor; the valve can be adjusted in any position between the opened and the completely closed positions.
- The water flow in the heater is therefore regulated by the electronic control unit with an impulse cycle of variable length and frequency, moving the valve in the position which is required and detected by the ECU by means of a 4.7 KΩ potentiometer internal to the motor.

Electric water pump for heating (fig.5 No. 6)

- This pump operation keeps the water flow into the heater, also when the engine

is at idle position.

• It is controlled by the ECU and its operation is related both to the heater valve position and to the external temperature (summer or winter time). The current supplied to the pump is normally 350÷500 mA and 2,5A at most when the rotor is locked.

Dehydrator filter

• The filter is located in the front luggage compartment.

• Through an inspection window **4** on the outlet pipe the condition of the coolant can be inspected.

• If colourless liquid can be seen flowing through, the coolant has the right condition for smooth running of the system.

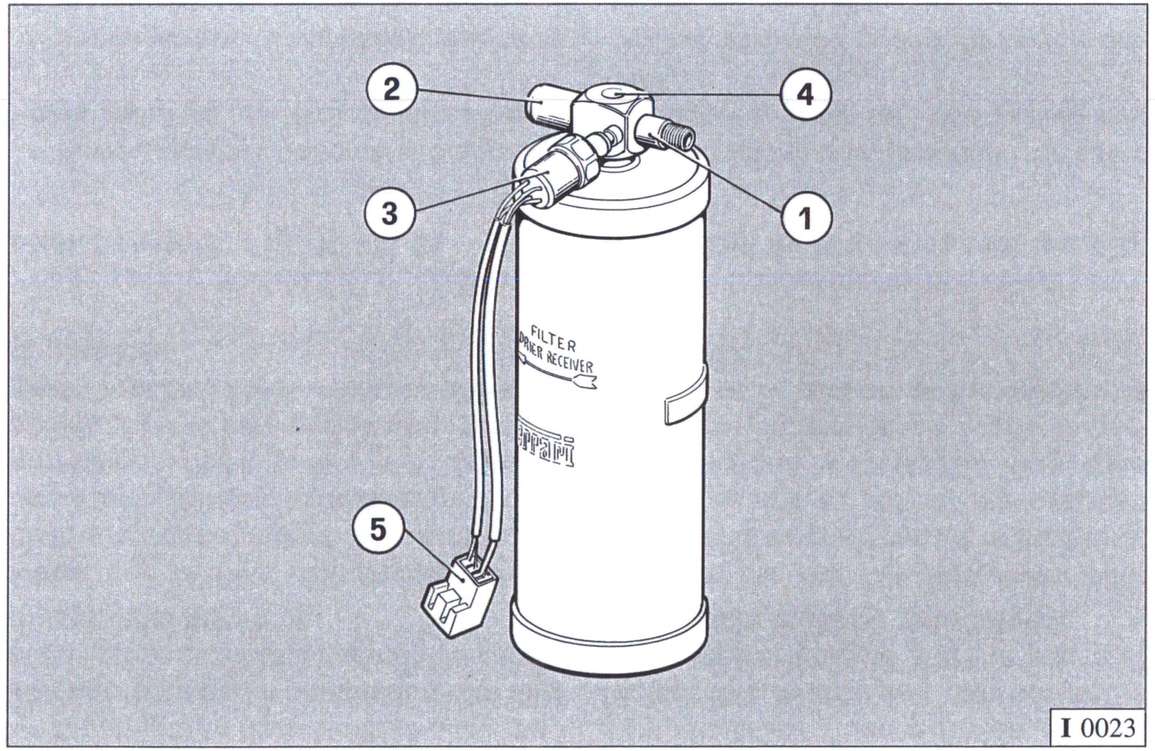


Fig. 12 - Dehydrator filter

1 - Coolant inlet (from the condenser outlet, high pressure);
2 - Coolant outlet (towards the inlet on the expansion valve);
3 - Pressure switches;
4 - Inspection window;
5 - Electric connector.

• If, however foam bubbles are detected, this means that the coolant is not completely liquid and the cause of this trouble must be determined.

Note: to prevent the dehydrator filter from being clogged by dirt or moisture, it is advisable to protect the exposed pipe sections with plastic stop caps whenever maintenance work is performed or a section of the system is replaced.

MIN/MAX pressure switches and control switch for the condenser fan (Fig. 12 re. 3)

• The switches are located in the same component fitted on the dehydrator filter.

• The MIN/MAX pressure switch disengages the electromagnetic clutch of the compressor either in order to prevent overpressure in the hydraulic system, when the pressure exceeds 28 bar or when the coolant pressure drops below 2,5 bar, in order to prevent the system operating when it is empty.

• If the coolant pressure exceeds 15 bar, the pressure switch turns on the fan to cool the condenser.

Expansion valve (Fig. 13)

• The expansion valve reduces the pressure of the liquid coolant and regulates its flow to the evaporator.

• Opening of the valve is regulated by ball **2**, which is operated by the expansion or by the contraction of liquid **1** through the pin **5**, the liquid being sensitive to the temperature of the coolant leaving the evaporator.

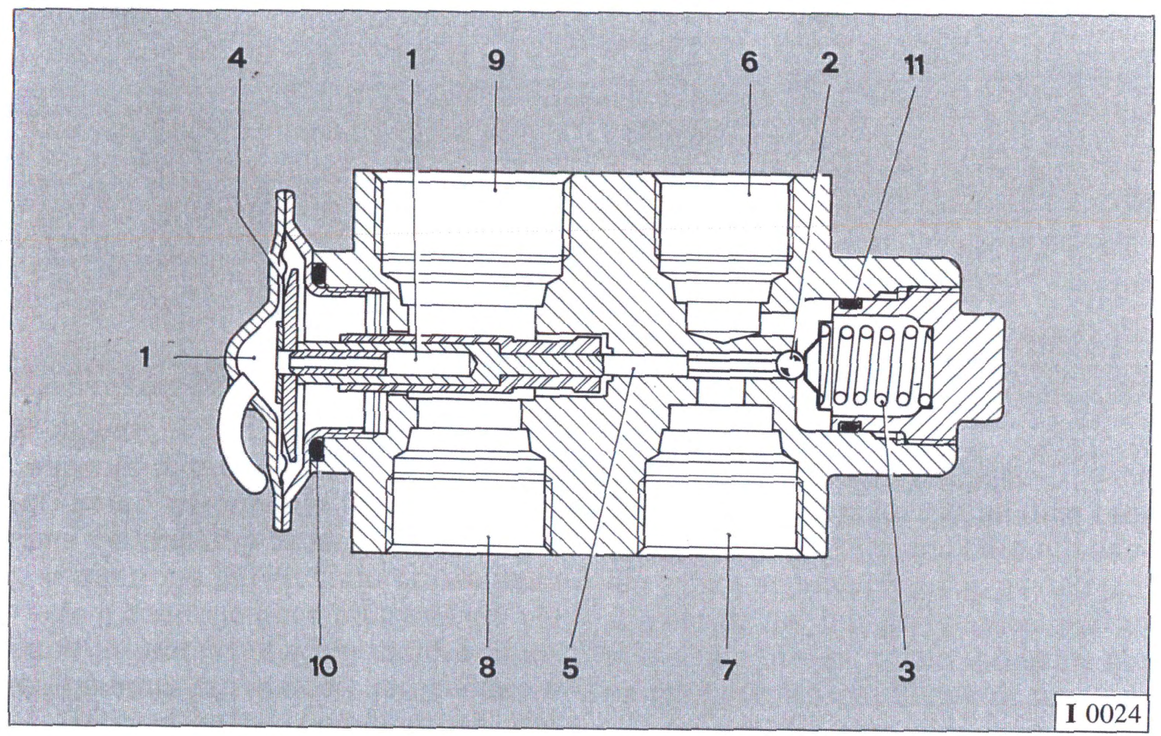


Fig. 13 - Expansion valve

1 - Heat-sensitive liquid; **2** - Ball; **3** - Reaction spring; **4** - Diaphragm; **5** - Pin; **6** - Coolant inlet (from the dehydrator filter); **7** - Coolant outlet (towards the evaporator inlet); **8** - Coolant inlet (from the evaporator outlet); **9** - Coolant outlet (towards the compressor, low pressure); **10** - Seal ring; **11** - Seal ring.

• If the output temperature of the evaporator rises, ball **2** is pushed by the expanding liquid, the valve is opened, and the flow of coolant to the evaporator itself is increased.

Note:
when the valve is replaced, the correct connections must be established again as shown in Fig. **13**.

Motor for air distribution control (fig.5 No. 13)

• This motor is controlled by the ECU to choose the air distribution to the outlets. It is provided with a 2 KΩ potentiometer which informs the ECU about the motor position. The current supplied is normally about 200 mA and about 0,5A when the rotor is blocked.

Motor flap outside air/circulation air (fig. 5 No. 19)

- This motor is controlled by the ECU allowing the external air or the passenger compartment internal air to circulate through the cooler-heater unit.
- The current supplied is normally about 200 mA and about 0,5A when the rotor is blocked.

Fan speed control unit (fig.5 No.3)

- A power module controls the fan speed varying the voltage of the fan motor. The module is divided into 2 sections, one is for low current control, the other for power control, see fig. 14.
- The unit gives the information about its temperature by means of the voltage of the pin No. 5 and regulates the voltage at the pin No. 2 according to the signal sended by the ECU (pin No. 6). Internally the NTC temperature sensor is responsible for the thermal protection of the power module.

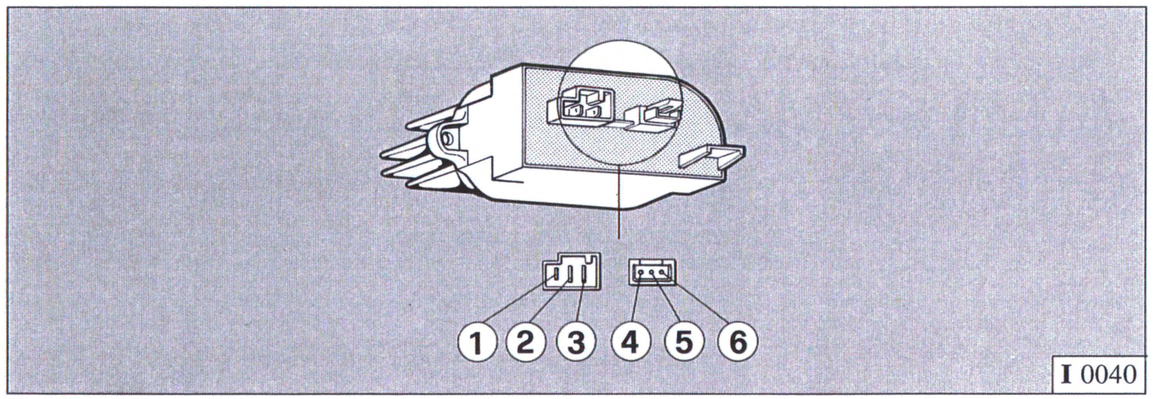


Fig. 14 - Fan speed control unit

1 - 12 V supply; 2 - Fan speed control ; 3 - Power ground; 4 - Electronic ground; 5 - Output from temperature sensor; 6 - ECU control signal.

TEMPERATURE CONTROL SYSTEM COMPONENTS

Control unit

• The most important input signal in the control unit is the temperature set by means of the knobs (fig. 3, No. 3) and desired for the passenger compartment.

• The control unit compares this signal with the value determined by the passenger compartment temperature sensor (fig. 5, No. 14) and activates the motor for the control of the heating water valve and/or the electromagnetic clutch on the compressor

• The operating cycles of these two components vary in length and frequency according to the difference between the set and the measured temperatures.

• The defrosting sensor and both sensors for treated air operate as auxiliary controls to optimize the system operation.

Sensors

• The sensors are NTC type: their resistance changes according to the temperature variations, i.e. decreases when the temperature increases, and increases when the temperature decreases.

— **Cooled-heated air temperature sensor (B - fig. 17)**

This sensor acts on the electronic control unit to modify the operating cycle of the valve for heating water (fig. 5, no. 4) when the temperature of the air leaving the cooler-heater unit changes.

L

CONTENTS

- Specifications **L3**
- Circuits energised by the ignition key **L3**
- Battery **L4**
- Re-acquiring engine control parameters **L14**
- Headlamps **L15**
- Front lights **L17**
- Rear lights **L23**
- Bulbs **L25**
- Fuse and relay boxes **L27**
- Wiring diagram **L32**

SPECIFICATIONS

• Voltage	**12 Volt**
• Battery	**12V L3 70 Ah 400A** **12V 70 Ah 420 A**
• Alternator	**Nippondenso 140 A**
• Starter motor	**Nippondenso**

CIRCUITS ENERGISED BY THE IGNITION KEY

- Starter motor.
- Windscreen wiper/washer.

- Brake lights.
- Direction indicators.
- Day flashing lights.
- Rear fog lights.
- Reversing lights.
- Glove box courtesy light.
- Ignition.
- Injection.
- Electric fuel pumps.
- Air conditioning.
- Instruments (except clock).
- Motors for water/oil radiator fans.

- Heated rear window and mirror defrosting.
- External rear view mirror adjustments.
- Suspension setting control system.

- ABS system.
- Exhaust temperature control circuit.

BATTERY

The battery is located on the right side of the luggage compartment. Remove the five fixing screws and lift off the battery cover (Fig. **1**) to access the battery.
The batteries that are currently fitted to Ferrari cars are maintenance-free type.

Battery specifications are as follows:

	FIAMM	MARELLI
voltage:	12V	12V
capacity:	70Ah	70Ah
pick up current:	420A	400A

Their capacities are more than sufficient to supply the original electrical services fitted to the car.

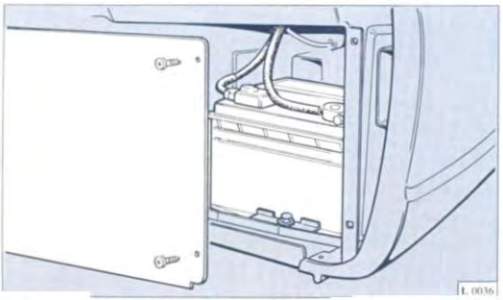


Fig. 1 - Location of the battery.

When additional electrical devices are fitted (anti theft device, telephone etc.), the power uptake increases and special maintenance is required. The battery must be recharged at intervals as described below.

A suitable battery detaching switch (Fig. **3**) has been added as well, for disconnecting the electrical system battery in case of long vehicle inactivity.

On the other hand it must be noted that the battery runs down with an inner discharge voltage of about 7 mA.

Therefore, if the vehicle isn't used for long periods, the battery must be recharged at intervals not exceeding 3 months.

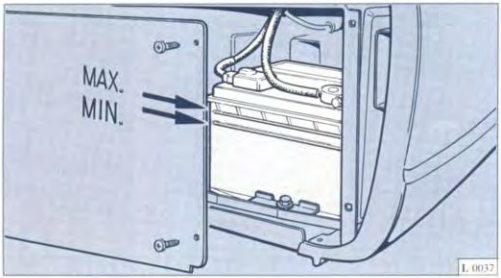


Fig. 2 - Battery electrolyte "Min" and "Max" marks.

Checking electrical system power absorption

To check power absorption of services connected directly to the battery positive pole in milliamps, proceed as follows:

a - keep the ignition key in "stop" position.

b - Disconnect the battery positive pole.

c - Using a Beckman type T11 OB digital multimeter adjusted to measure currents up to 200 milliamps, connect the terminals between the clamp previously disassembled and the battery positive cable.

d - After a few seconds, the display will show a current value that represents the power absorption in milliamps of the services connected permanently to the battery.



Fig. 3 - Battery disconnector.

Power absorption is the factor used to determine the battery maintenance programme (see "Recharging interval" section).

Maintenance-free battery

At the prescribed intervals, at least once a year, check that the terminals and the clamps are absolutely clean and securely fastened.

Check the appearance of the outer case to ensure it is not damaged. Disconnect the battery in case of prolonged periods of inactivity, through the suitable switch placed in the engine compartment (Fig. **3**).

Check the electrolyte level at regular intervals or in case of difficult starting. Under normal circustances it should be between the max and min level.

The battery, which is maintenance free, does not require topping-off under normal operating conditions.

Under particular circumstances, such as very high annual mileage or high operating temperatures, the user can top off with distilled water, if necessary. **Never add sulphuric acid.**

In case of frequent need of topping off with water, check the vehicle's electrical system: the battery is functioning under overloaded conditions and will quickly be impaired.

Also check the electrical system whenever the battery tends to discharge.

Note: if your battery runs flat and you have to start the engine with jump leads from an auxiliary battery or recharge the flat battery from a stabilized battery charger, use connector **C**, in the engine compartment (Fig. **4**) to connect the jump leads.

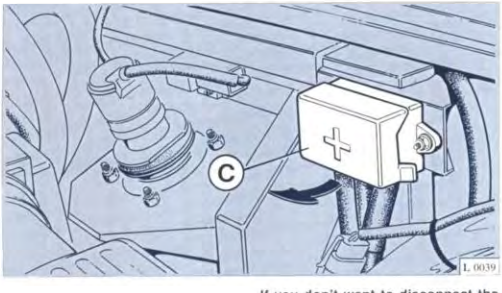


Fig. 4 - Battery recharging unit.

If you don't want to disconnect the battery in order to maintain certain functions such as the storage of the car radio stations, anti-theft devices etc., you have to charge the battery at least once a month.

It is advisable to disconnect the battery if the car is not used for an extended period. In any case, carefully follow the recommendations in the "Recharging intervals" section.

Checking battery charge

If the battery shows signs of inefficiency, measure the charge as shown below.

The battery must be at **ambient temperature (59 ÷ 77°F) and unused for at least 3 hours,** i.e it must not be connected to the services even though they take up only a few milliamps.

In order to get the battery in this condition the battery datching switch can be used. (Fig. **3**).
Using a suitably adjusted Beckman T11OB multimeter, measure the voltage at the battery poles to hundredths of a volt.

According to the measured voltage, the battery conditions are as follows:

– if recharging is necessary, it should be carried out following the instructions described in this manual.
After recharging, it is necessary to make sure that the battery retains the charge by carrying out a test under charge.
This test requires a battery tester which can measure currents of 200 ÷ 300 ampere.

Test the battery in the following way:
a -connect the battery tester to the battery terminals.
b -Measure the temperature of the battery.

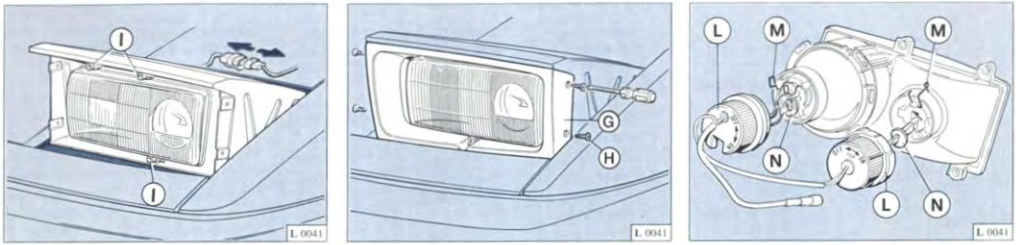


Fig. 7 - Replacing front bulbs

G - Headlamp cover;
H - Screw;
I - Headlamp retaining clips;
L - Plastic bulb cover;
M - Bulb retaining spring;
N - Bulb.

– Remove the bulb retaining spring **M** and replace the bulb **N**. Re-assemble in the reverse order.

Note:
Do not touch the glass of the bulb with your fingers. Wipe the bulb clean with a cloth damped in alcohol if you accidentally handle it.

Headlamp beam adjustment

Turn the adjusters shown in Fig. **8** to adjust beam alignment.

If the measured voltage is less than 12.5 V, recharge the battery as described below.

Note that after charging, the voltage at the poles is not a good indication of the charge due to stratification of the electrolyte inside the battery.

This effect occurs when the electrolyte has not yet become evenly mixed.

Recharging the battery

The battery must be at ambient temperature (**59 ÷ 77°F**).
Charging times increase at lower temperatures.
Set the battery charger to 12 V and connect it to the clamps on the battery.

Measure the voltage at the battery poles using a multimeter.
For the safeguarding of the electric components installed on the vehicle, stabilized battery charger should be used. If battery chargers or fast start-up systems are used, where the outlet voltage has a high residual ripple, the battery should be disconnected from the electrical system and then charged.

The maximum time necessary for the battery to begin to accept a measurable charging current is given below for the measured voltage.

Voltage	Maximum time
16.0 or more	4 hours
14.0 ÷ 15.9	8 hours
13.9 or less	16 hours

Check the reading on the ammeter connected to the battery at intervals to establish the time when charging begins.

If the charging current is still not measurable after the recommended charging times, the battery must be considered irreparably damaged.

The recharging current and time may be established as follows:

– for 66 to 70 Ah batteries, maintain a current of **6.6 ÷ 7.0 A for a maximum of 12 hours** or **3.3 ÷ 3.5 A for a maximum of 24 hours.**

During recharging, the battery temperature must **not exceed 125°F (52°C).** The charging current must be reduced if this limit is reached.

Assessing charge: check battery charge as described previously.

Recharging intervals

Car inactive and battery connected

The battery must be recharged if left inactive for a long time.

Observe the recharging intervals given in the table below for system power absorption described in the section: **Checking electrical system power absorption.**

Absorption (mA)	Interval (days)
< 40	30
40 ÷ 60	25
60 ÷ 80	20
80 ÷ 100	15

Car inactive and battery disconnected / Battery in store

If the battery is stored, i.e. the car is parked with the battery disconnected, it should be recharged at least every three months.

The place where the car is parked or stored should also be dry and kept at a temperature of about 77°F.
The temperature should not rise to more than 86°F because the battery loses charge more quickly as the ambient temperature increases.

Other warnings

When battery charge is less than 75%, recharge the battery using a standard charger.

If a charger that goes off automatically is used, ensure that the **voltage regulator begins recharging at battery voltages less than 12.55 ÷ 12.60 V.**

If in doubt, ask the instrument supplier to adjust the regular setting.

If the battery is left down for an extended period of time, this may prove so permanently damaged that it cannot be recharged.

The extent of the permanent damage depends on the time period for which and the temperature at which the battery was left when down.

To prevent damage to the battery and recharging problems, **cars unused for longer than 30 days must have their battery earth leads disconnected to prevent constant current loss.**

If this is not possible, the battery must be recharged by carefully following the instructions in the section on: **Recharging intervals / car inactive and battery.**

RE-ACQUIRING ENGINE CONTROL PARAMETERS

Whenever the battery is disconnected, or whenever power is disconnected from the engine ECU, the ECU loses all self-learned operating parameters. The ECU needs to relearn these parameters before the vehicle can be used again.

To re-acquire these parameters, leave the engine run for about 10 minutes under the following conditions:

1 - Car stationary, engine idling.

2 - Engine at normal operating temperature.
3 - All electrical power users (lights, windscreen wipers, etc.) swit-ched off.
4 - Air conditioning switched off.

This simple expedient enables the engine ECU to re-acquire the necessary control parameters, thus preventing engine problems like stalling when idling, and flooding in nose-to-tail queues, etc..

HEADLAMPS

Adjusting the headlamps

We recommend that you have the headlamps adjusted at an authorized Ferrari Service Centre.

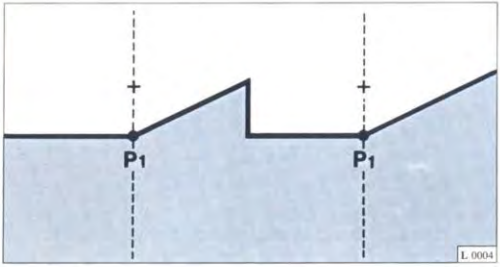


Fig. 5 - Aligning the headlamps.

If you decide to adjust the headlamps yourself, proceed as follows:

- Park the unladen car with correctly inflated tyres on level ground immediately facing a white screen in the shade.

- Mark two crosses on the screen at the points corresponding to the centres of the dipped beam section of the headlamps.
- Reverse the car 10 metres (66 ft.) from the screen and switch on the dipped beams. The dipped beam reference points P1-P1 should be located below the crosses at a distance of at least 1/10th of the height of the crosses from the ground.

These measurements comply with Italian regulations.

Always check and comply with the regulations in force in your own country.

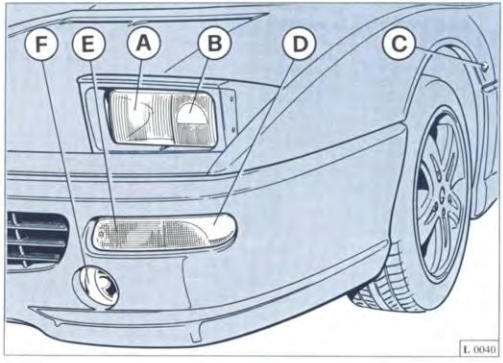


Fig. 6 - Front lights

A - Main beam headlamps;
B - Dipped headlamps;
C - Side direction indicator;
D - Front direction indicator;
E - Side light;
F - Daytime flasher light.

Replacing bulbs (Fig. 7)

Proceed as follows to replace bulbs:

- Remove screws **H** and lift off the headlamp cover **G**.
- Disconnect the headlamp connector.
- Remove the headlamp assembly from retaining clips **I**.
- Twist off the plastic bulb cover **L** which is held in place by a bayonette fitting.

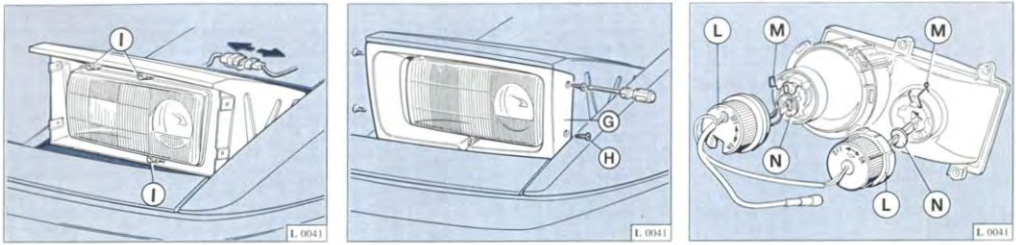


Fig. 7 - Replacing front bulbs

G - Headlamp cover;
H - Screw;
I - Headlamp retaining clips;
L - Plastic bulb cover;
M - Bulb retaining spring;
N - Bulb.

– Remove the bulb retaining spring **M** and replace the bulb **N**. Re-assemble in the reverse order.

Note:
Do not touch the glass of the bulb with your fingers. Wipe the bulb clean with a cloth damped in alcohol if you accidentally handle it.

Headlamp beam adjustment

Turn the adjusters shown in Fig. **8** to adjust beam alignment.

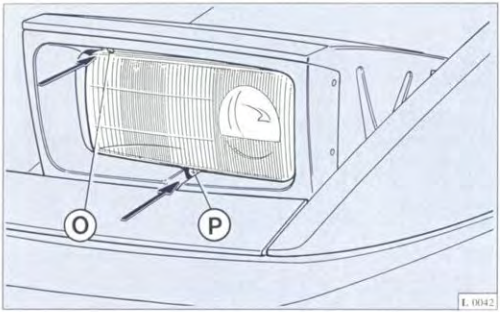


Fig. 8 - Headlamp beam adjusters
O - Horizontal alignment adjuster;
P - Vertical alignment adjuster.

Emergency headlamp raising device (Fig. 9)

If the electric headlamp motors fail, proceed as follows:

- Disconnect the battery at the battery disconnector (Fig. **3**).
- Turn knob **Q** (Fig. **9**) until the headlamps are fully raised.

Note:
have the light system inspected and repaired as soon as possible by an authorized Ferrari Service Centre.

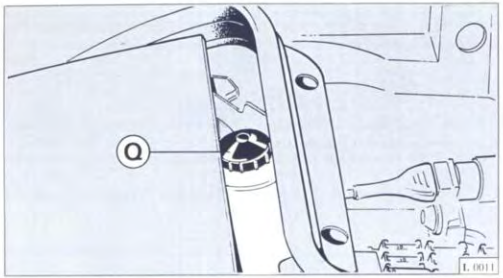
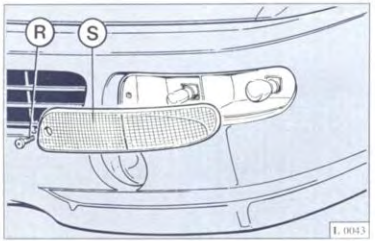


Fig. 9 - Location of headlamp lifting mechanism
Q - Knob.

Replacing side light and direction indicator bulbs (Fig. 10)

Unscrew the lens retaining screws **R** and lift off the lens **S** to gain access to the side light and direction indicator bulbs.



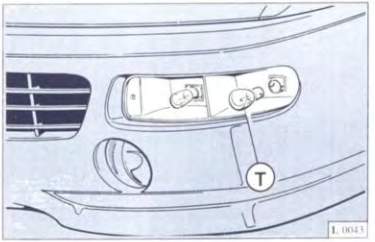


Fig. 10 - Side lights and direction indicators
R - Screw; **S** - Lens; **T** - Bulb.

Twist out bayonet fit bulb **T**.

Fit a new bulb and replace the lens.

Replacing daytime flasher bulbs (Fig. 11)

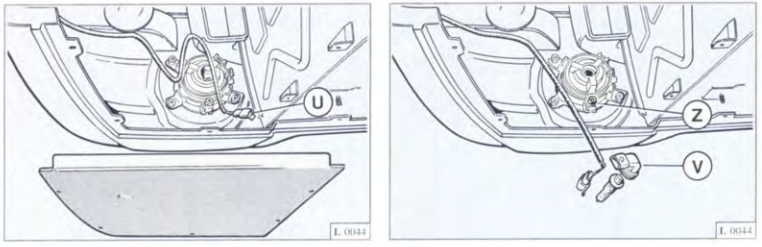


Fig. 11 - Replacing flasher bulbs
U - Connector; **V** - Bulb holder; **Z** - Alignment adjuster

Proceed as follows to access the daytime flasher units:

- remove the side underbody panel;
- disconnect connector **U** from bulb holder **V**;
- turn the bulb holder anti-clockwise to extract it;
- twist the bayonet fitting bulb anti-clockwise to remove it from the holder;

– twist the bulb holder clockwise while pressing it into its seat to replace it. Re-connect connector **U**.

Note:
do not touch the glass of the halogen bulb with your fingers. Wipe it clean with a cloth damped in alcohol if you accidentally handle it.

Note:
flasher beam alignment can be adjusted by means of screw **Z**.

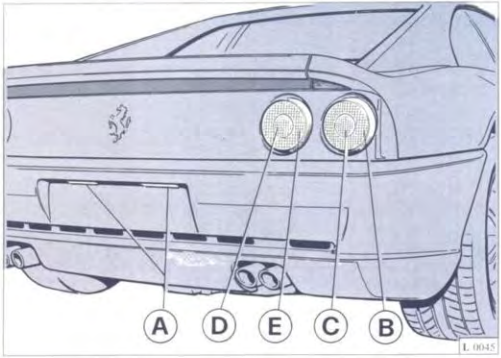


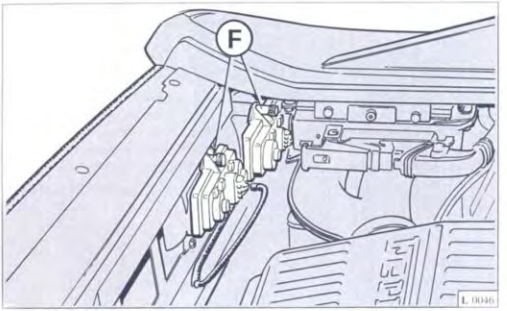
Fig. 12 - Rear lights

A - Number plate lights;
B - Tail and brake light;
C - Direction indicator light;
D - Reversing light;
E - Rear fog light.

Replacing bulbs (Fig. 13)

Proceed as follows to replace rear light bulbs:

- unscrew the screw **F** securing the relevant bulb holder to the light cluster;
- remove bulb holder **G**;
- twist bulb **H** out anti-clockwise;
- fit the new bulb and replace the bulb holder.



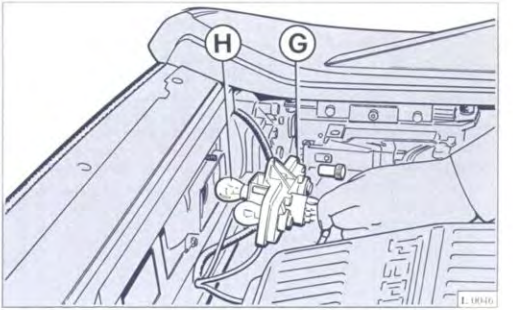


Fig. 13 - Replacing rear bulbs

F - Screw;
G - Bulb holder;
H - Bulb.

BULBS

Use	Type	Wattage (12 V)
Main beam - Dipped beam - Daytime flasher lights	**Halogen**	H1-55 W
Rear tail, brake, and fog lights	**Round**	5/21 W
Rear direction indicators - Reversing lights	**Round**	21 W
Front direction indicators	**Round**	PY 21 W
Courtesy lights	**Cylindrical**	10 W
Number plate lights - Front side lights - Map reading light	**Round**	5 W
Luggage compartment courtesy light	**Cylindrical**	5 W
Side direction indicators	**Tubular**	4 W
Door edge lights	**Tubular**	3 W
Instrument panel lights - Fuel reserve warning light - Fuel filler open warning light - Oil pressure warning light - Brake failure warning light - Handbrake warning light - Lights on indicator - Main beam indicator - Direction indicator lights - Hazard warning lights indicator - Fog lights indicator - Rear fog lights indicator - Heated rear window indicator - Parking lights indicator - Bank 1/4 "Slow-Down" warning light - Bank 5/8 "Slow-Down" warning light - Seat belt warning light - Alternator warning light - Bank 1/4 "Check Engine" warning light - Bank 5/8 "Check Engine" warning light - Comfort suspension indicator - ABS off warning light - Coolant temperature warning light - Engine oil temperature warning light - Low tyre pressure warning light - Suspension malfunction warning light	**Solid glass**	2 W

Note: When replacing bulbs, make sure that the replacements are of exactly the same rating and that they carry the ECE or DIN type approval mark.

FUSE AND RELAY BOXES

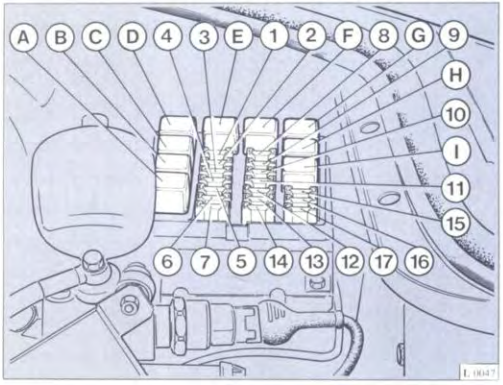


Fig. 14 - Luggage compartment fuse and relay box.

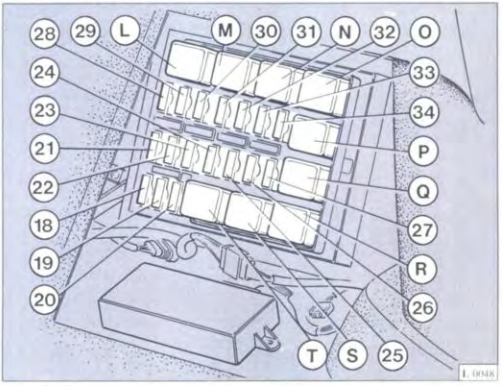


Fig. 15 - Floor fuse and relay box.

FUSES

			Luggage compartment fuses		
1	A7,5		Headlamp motor control ler.		
2	A7,5		RH headlamp motor.		

3	A7,5		LH headlamp motor.		
4	A20		Radio.		
5	A15		Hazard warning lights.		
6	A10		RH daytime flasher.		
7	A10		LH daytime flasher.		
8	A15		LH fog lamp.		
9	A10		RH fog lamp.		
10	A10		RH main beam.		
11	A10		LH main beam.		
12	A7,5		Instrument panel and number plate lights.		
13	A7,5		RH side lights / parking lights.		
14	A7,5		LH side lights / parking lights.		
15	A15		LH dipped beam.		
16	A15		RH dipped beam.		
17	A25		Horn.		
			Floor unit fuses		
18	A15		Fuel filler release.		
19	A10		Cigarette lighter and parking lights.		
20	A30		RH radiator fan.		
21	A15		LH fuel pump.		

22	A10		LH oxygen probe.		
23	A15		RH fuel pump.		
24	A30		LH radiator fan.		
25	A10		A.C. system.		
26	A15		Direction indicators and reversing lights.		
27	A15		Windscreen wipers and brakelights.		
28	A20		RH electric window.		
29	A20		LH electric window.		
30	A10		Roof lights and central locking.		
31	A10		RH oxygen probe.		
32	A10		Bank 1/4 injection ECU.		
33	A10		Bank 5/8 injection ECU.		
34	A15		Injection air pump.		

RELAYS

			Luggage compartment fuse & relay box		
A	BOSCH 0 332 209 159		Flasher.		
B	BOSCH 0 332 209 159		LH headlamp motor.		
C	BOSCH 0 332 209 159		RH headlamp motor.		
D	BOSCH 0 332 209 159		Headlamp motor controller.		
E	BOSCH 0 332 015 013		Main beam.		
F	BOSCH 0 332 015 013		Side and tail lights.		
G	BOSCH 0 332 019 103		Fog lights.		
H	BOSCH 0 332 019 103		Dipped beam.		
I	BOSCH 0 332 019 103		Horn.		
			Floor fuse and relay box		
L	BOSCH 0 332 014 140		RH bank injector ECU.		
M	BOSCH 0 332 014 140		RH fuel pump.		

N	BOSCH 0 332 015 013		Injection air pump.		
O	BOSCH 0 332 014 140		LH bank injector ECU.		
P	BOSCH 0 332 014 140		LH fuel pump.		
Q	BOSCH 0 332 019 103		Fuel filler release.		
R	BOSCH 0 332 019 103		Circuits energised by ignition key.		
S	BOSCH 0 332 019 103		LH radiator fan.		
T	BOSCH 0 332 019 103		RH radiator fan.		

WIRING DIAGRAM

Fig. 1 - Ignition - injection Cylinders 1/4 ..... **L33**

Fig. 2 - Ignition - injection Cylinders 7/12 ..... **L34**

Fig. 3 - Injection system ignition, start-up and connection **L35**

Fig. 4 - ABS system **L36**

Fig. 5 - Instruments and hand-brake; ABS system connection **L37**

Fig. 6 - Cooling circuit and A/C system **L38**

Fig. 7 - Suspension control system **L39**

Fig. 8 - External, direction and emergency lights **L40**

Fig. 9 - Mirrors, door lock, rear heated window, radio pre-setting **L41**

Fig. 10 - Window control switch, windscreen wiper, internal lights and lights on doors **L42**

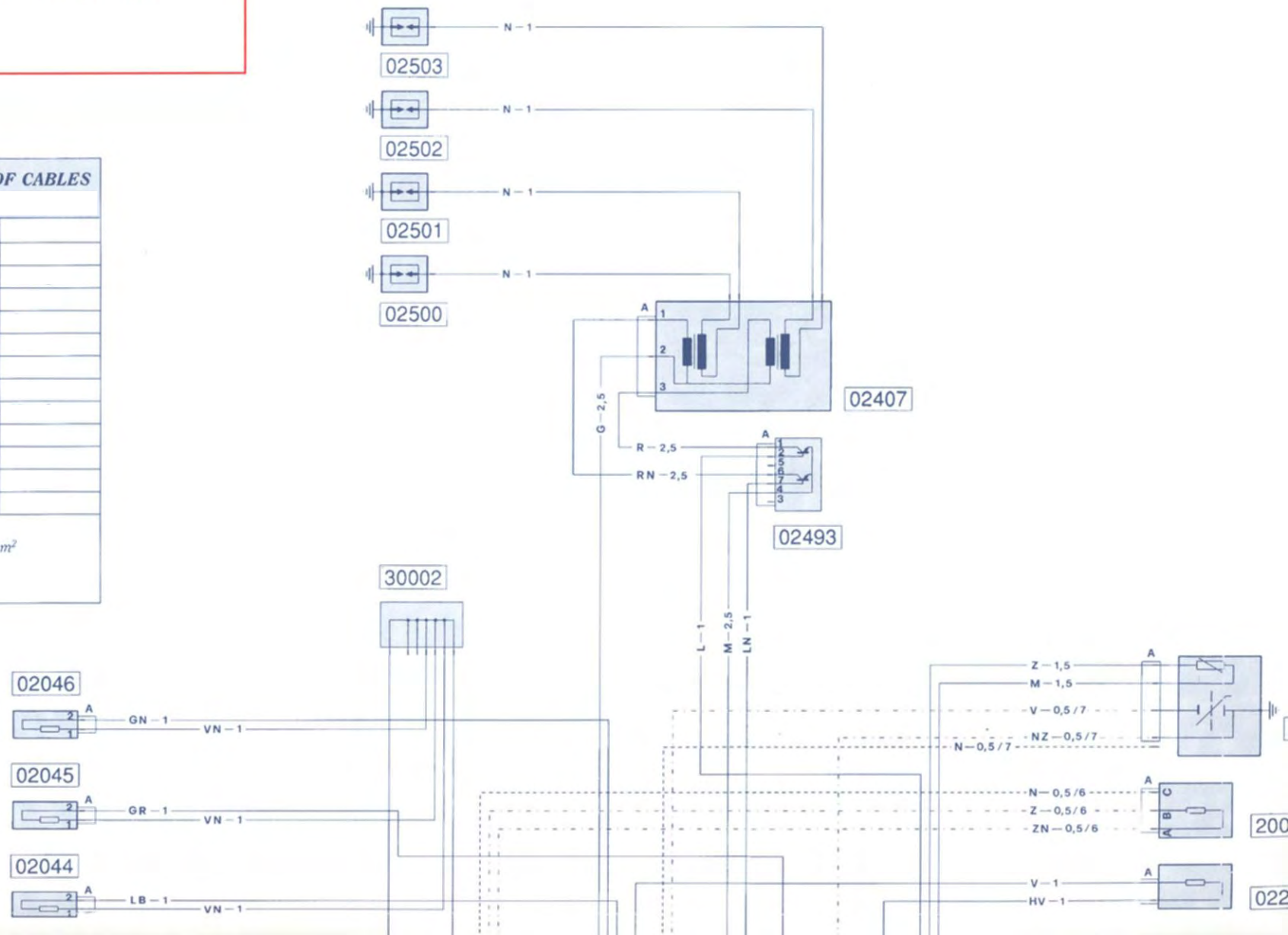
List of component (English) L44

TOP L/H 1994 F355

Variants for USA Version

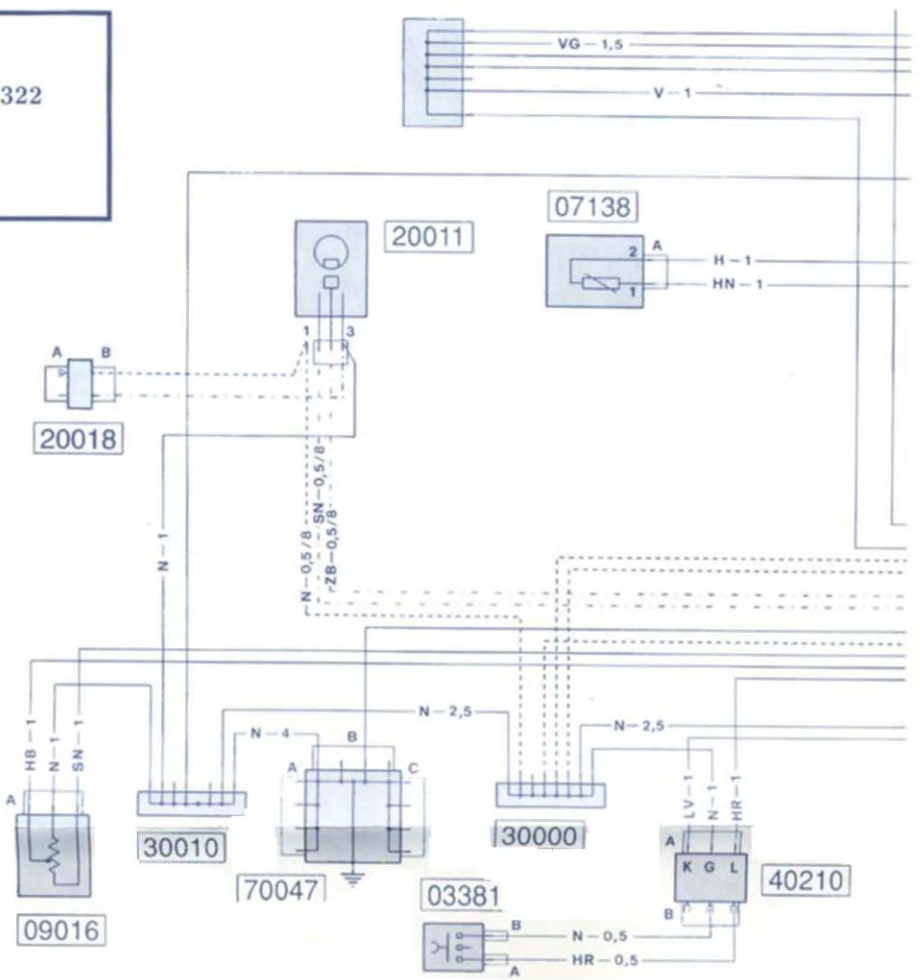
COLORS OF CABLES				
A		*Light blue*		
B		*Withe*		
C		*Orange*		
G		*Yellow*		
H		*Grey*		
L		*Blue*		
M		*Brown*		
N		*Black*		
P		*Beige*		
R		*Red*		
S		*Pink*		
V		*Green*		
Z		*Violet*		

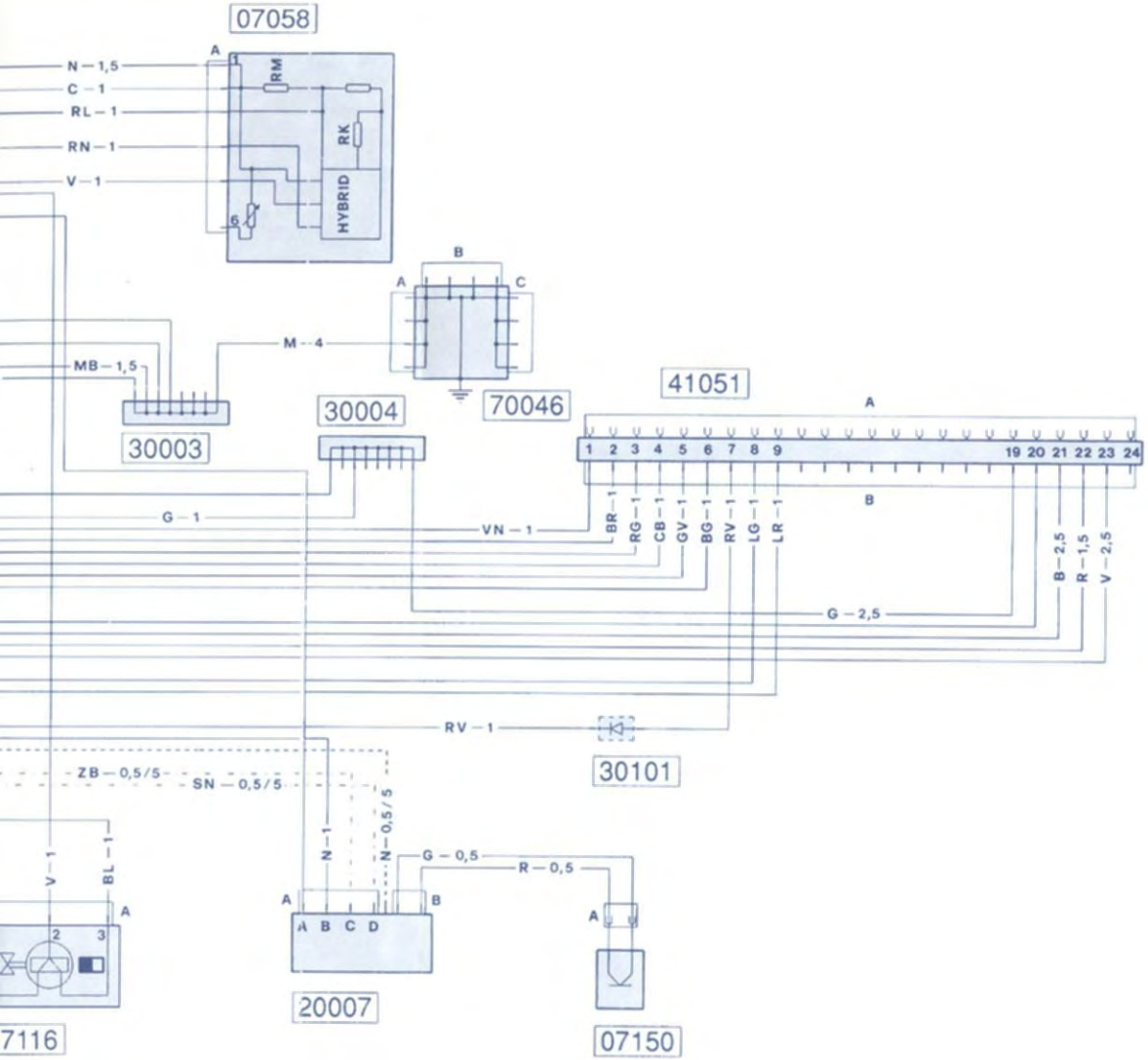
The not indicated section of the wires is 0,5 mm²



TOP R/H 1994 F355

Variant valid from engine no. **38322**





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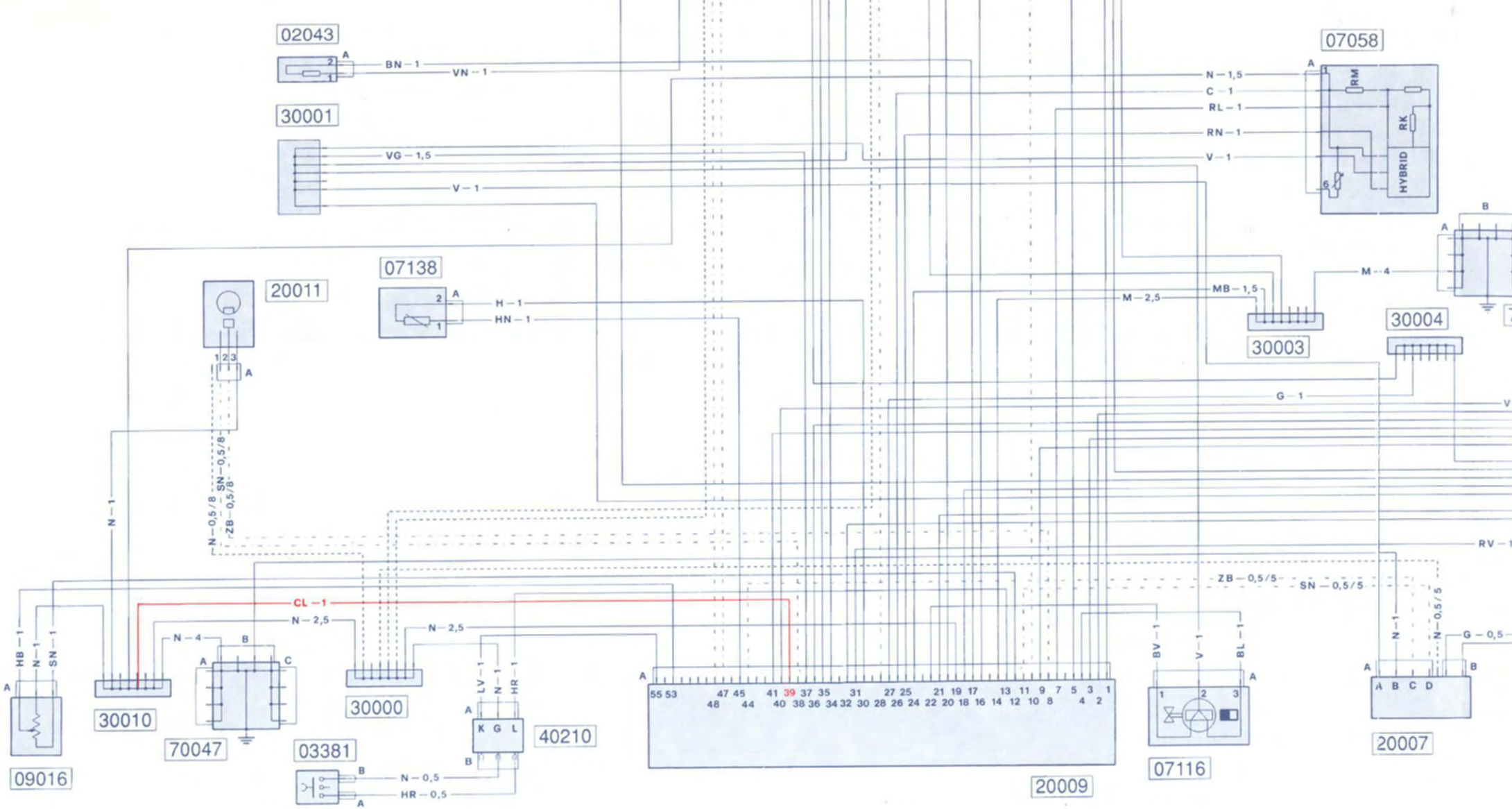


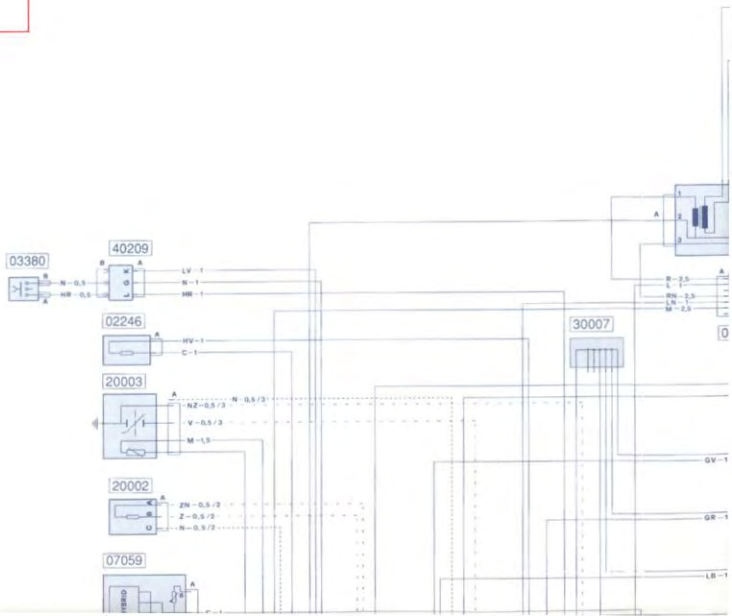
BOTTOM L/H 1994 F355

TOP L/H 1994 F355

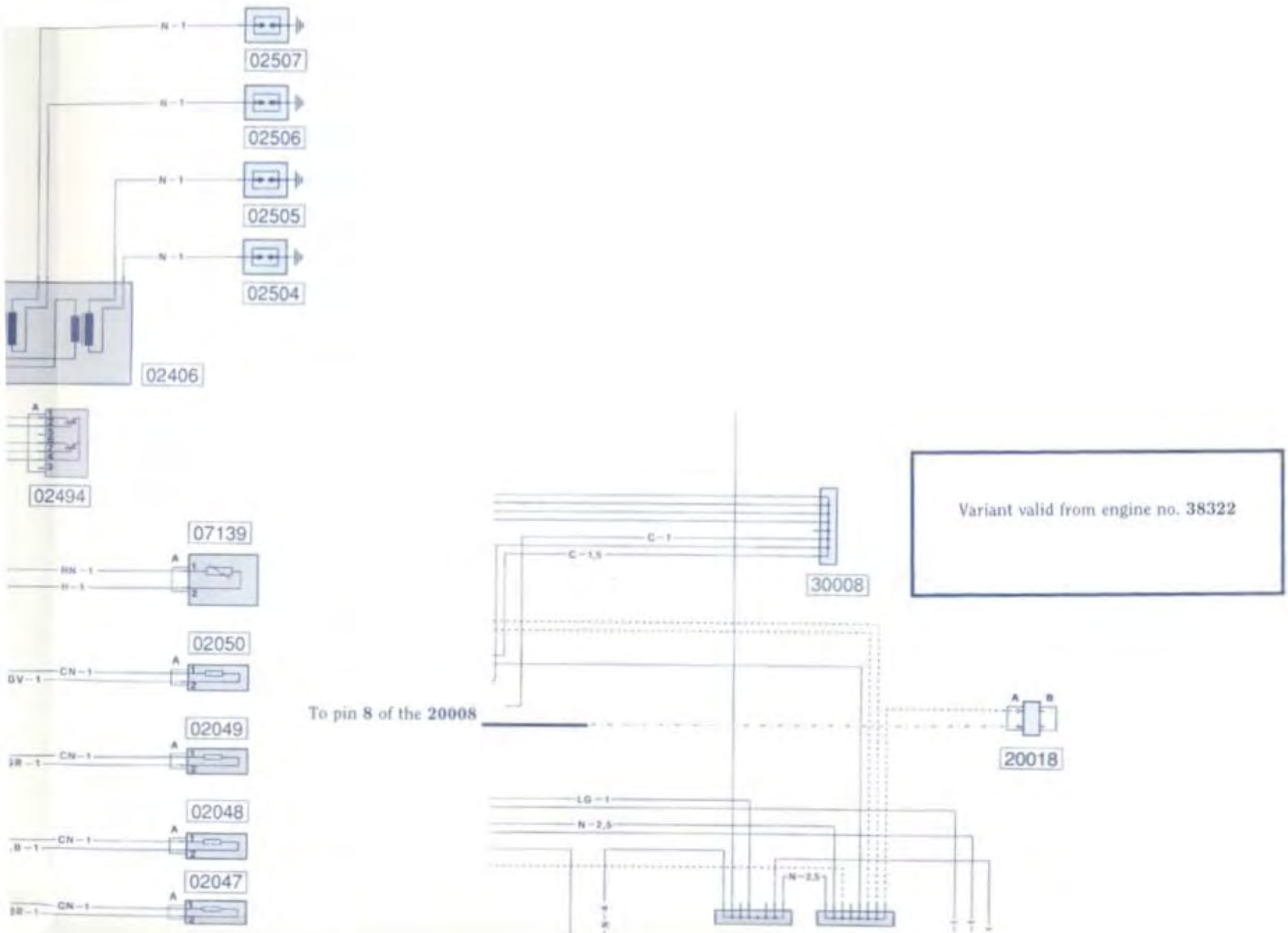
Variants for USA Version

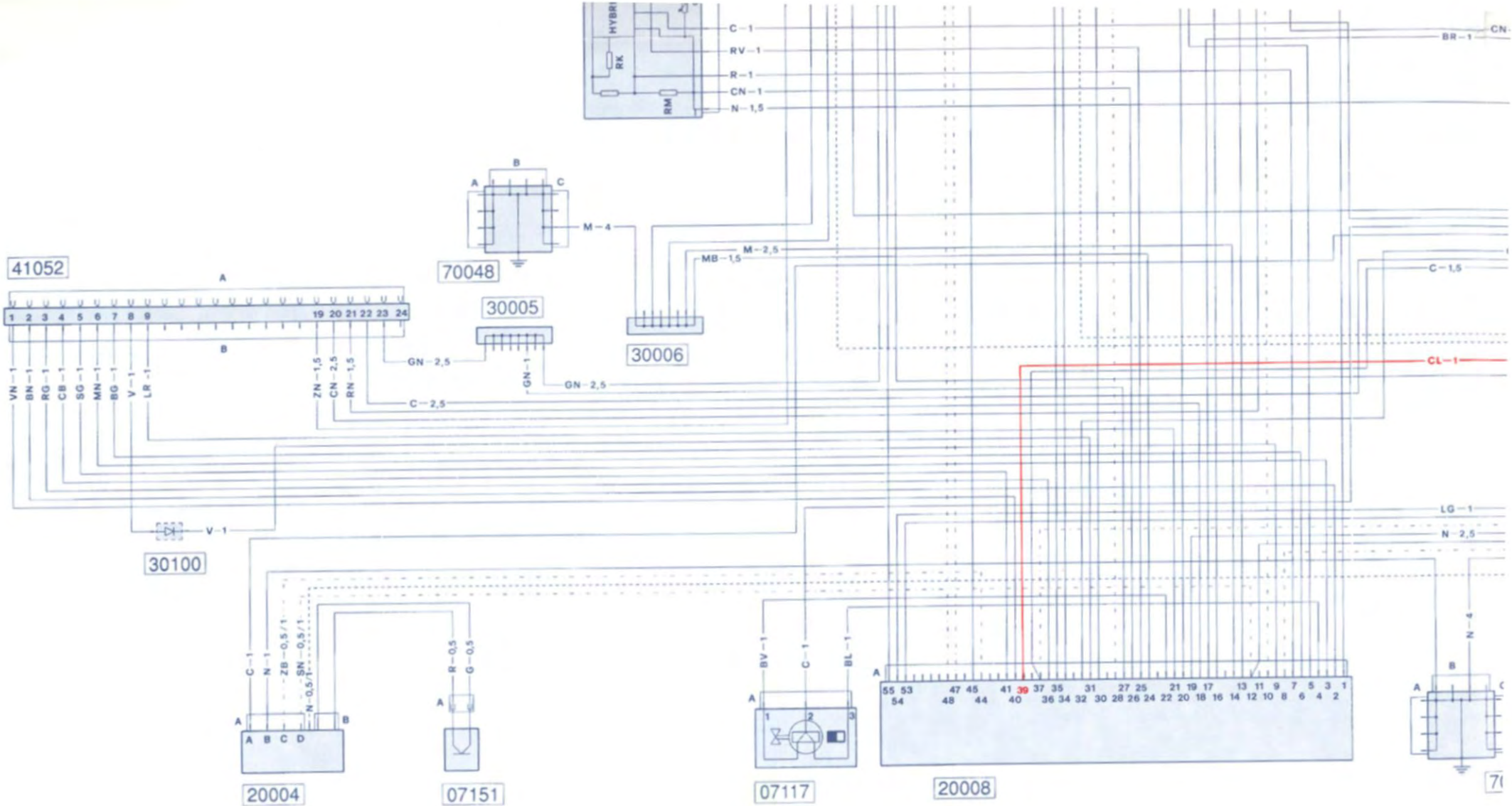
COLORS OF CABLES				
A	Light blue			
B	Withe			
C	Orange			
G	Yellow			
H	Grey			
L	Blue			
M	Brown			
N	Black			
P	Beige			
R	Red			
S	Pink			
V	Green			
Z	Violet			

The not indicated section of the wires is 0,5 mm²



TOP R/H 1994 F355





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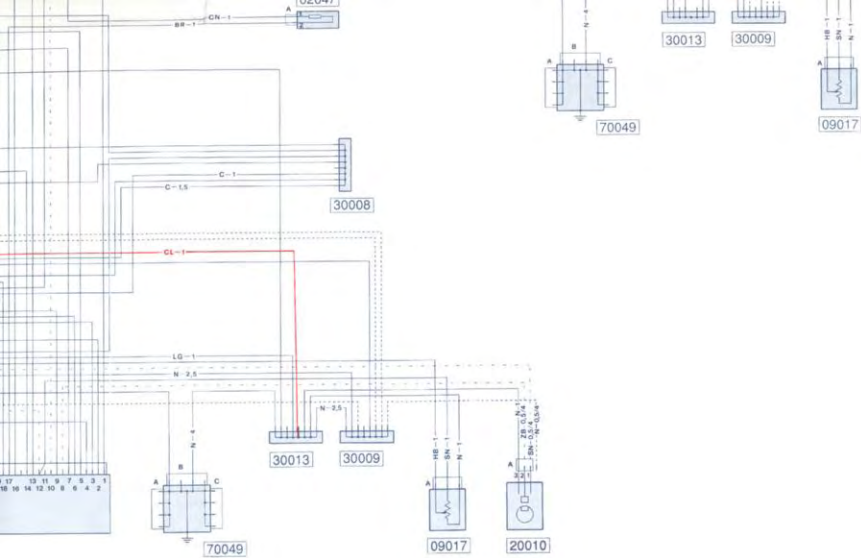

BOTTOM R/H 1994 F355

TOP L/H 1994 F355

COLORS OF CABLES				
A		Light blue		
B		Withe		
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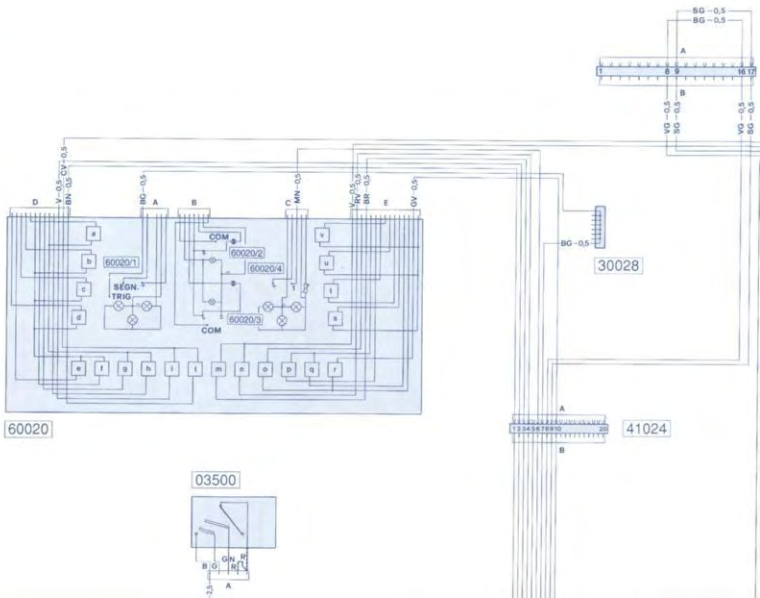
R		Red		
S		Pink		
V		Green		
Z		Violet		

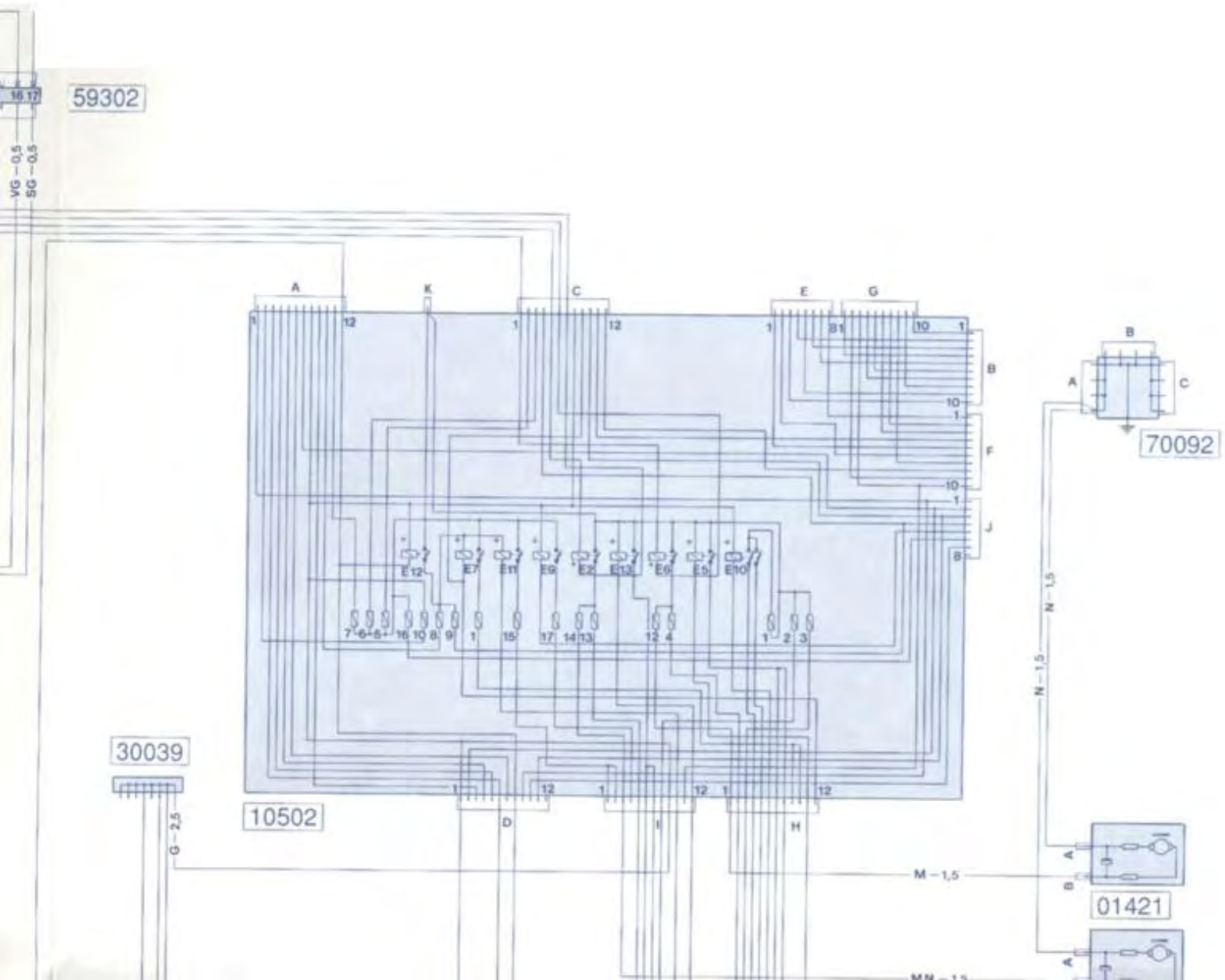
The not indicated section of the wires is 0,5 mm²

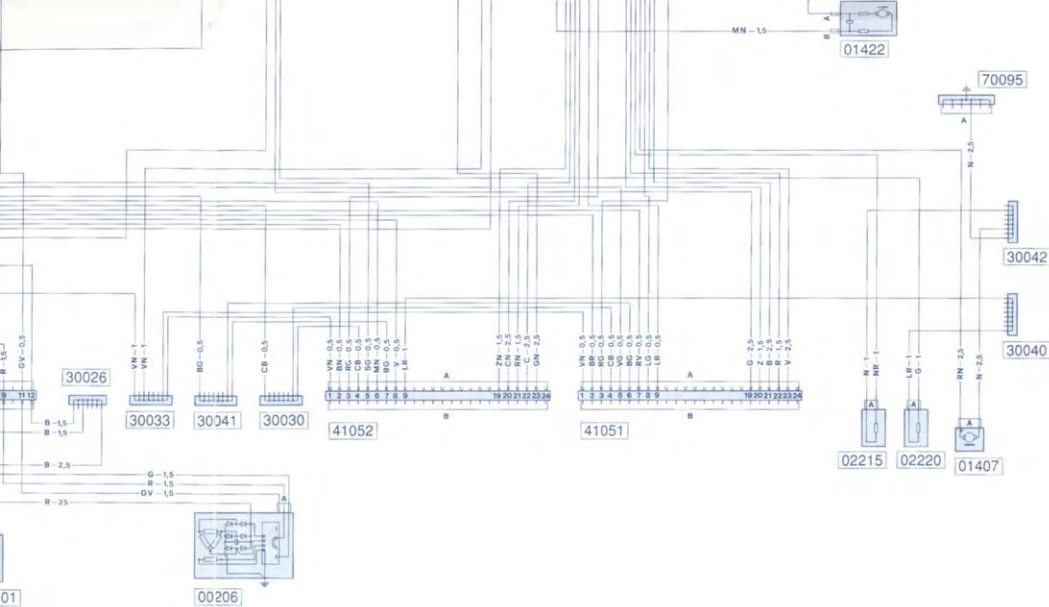


Note

For cars with single-pump supply system, the part **01421** - left fuel pump - is eliminated.

TOP R/H 1994 F355





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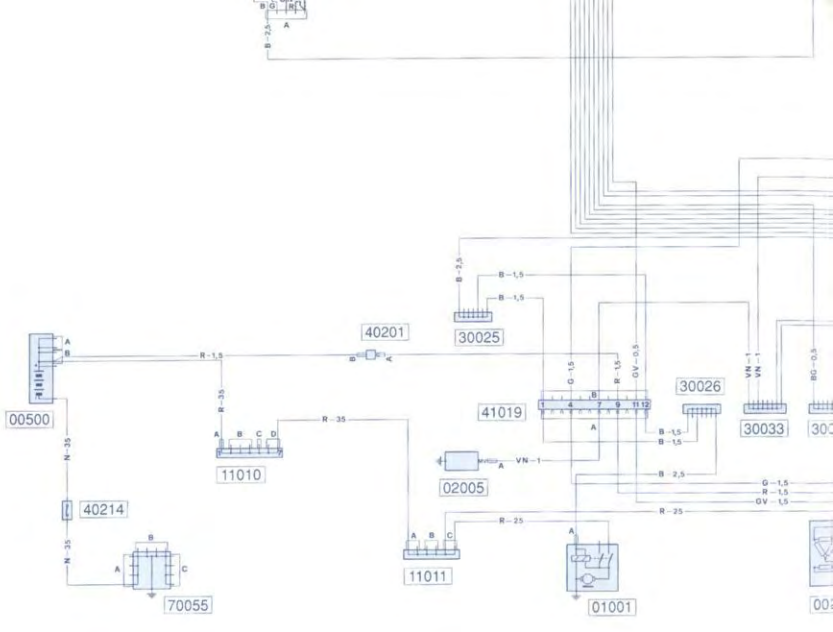

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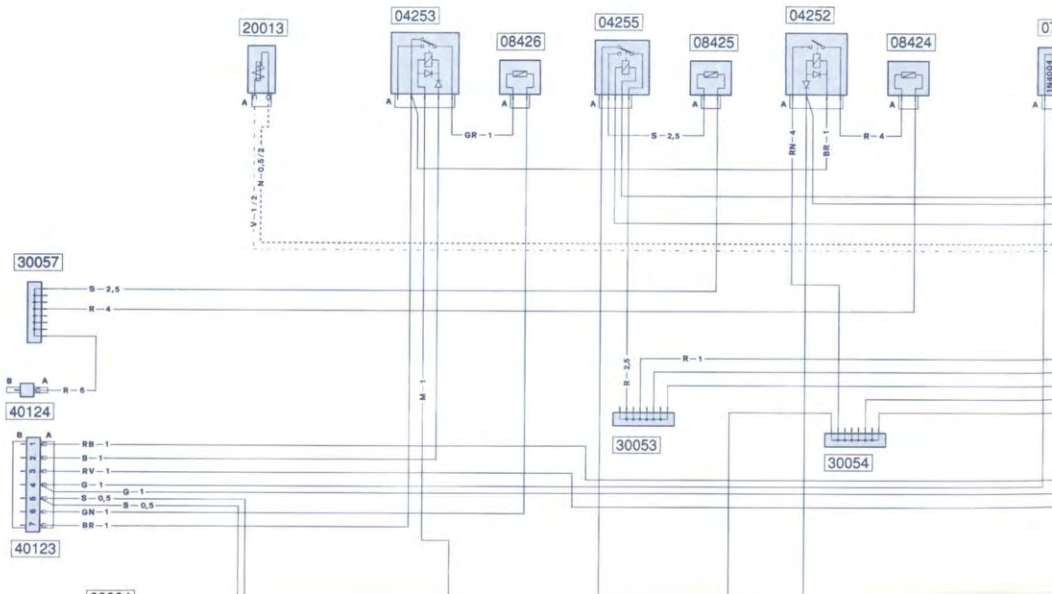

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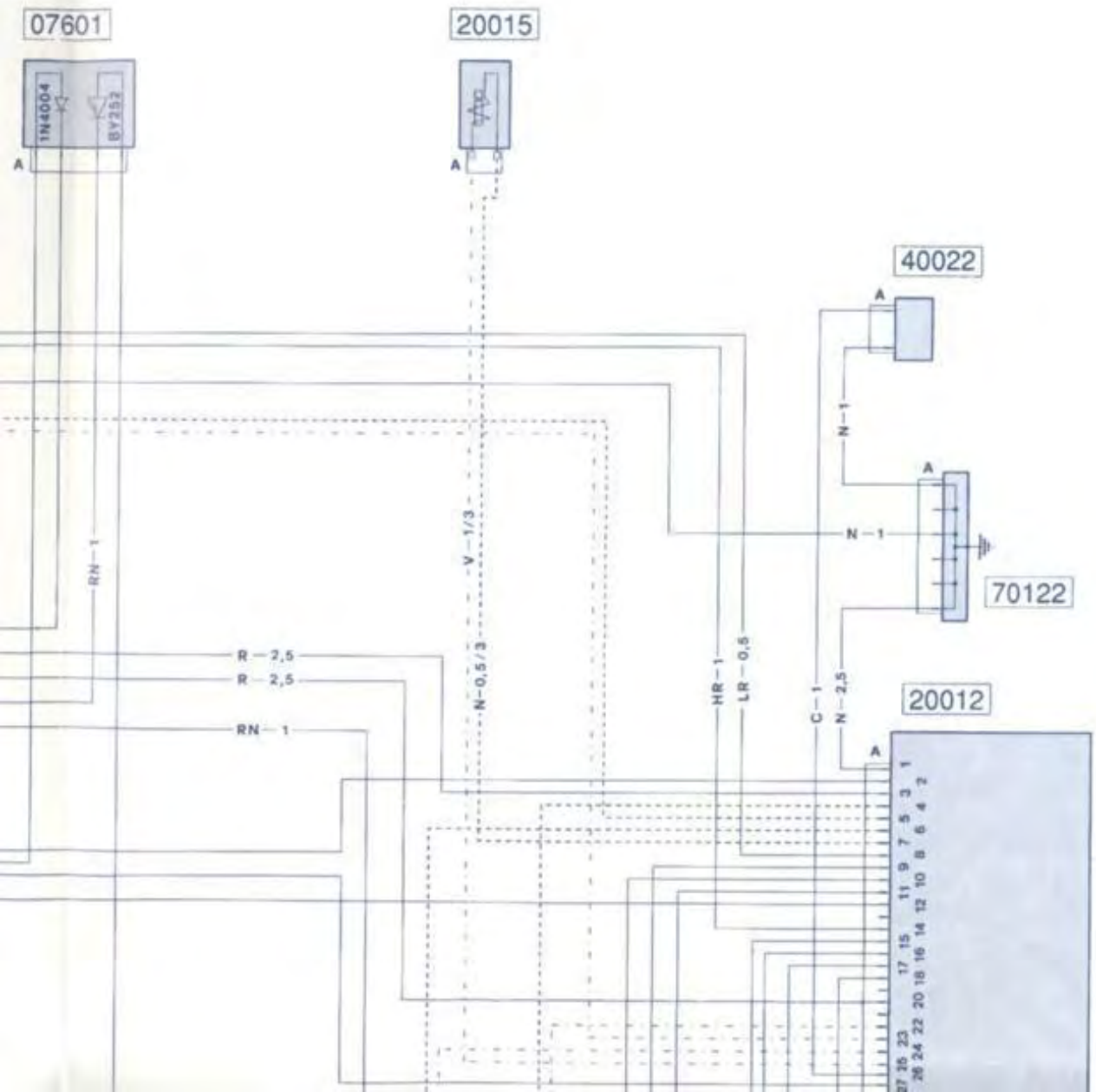

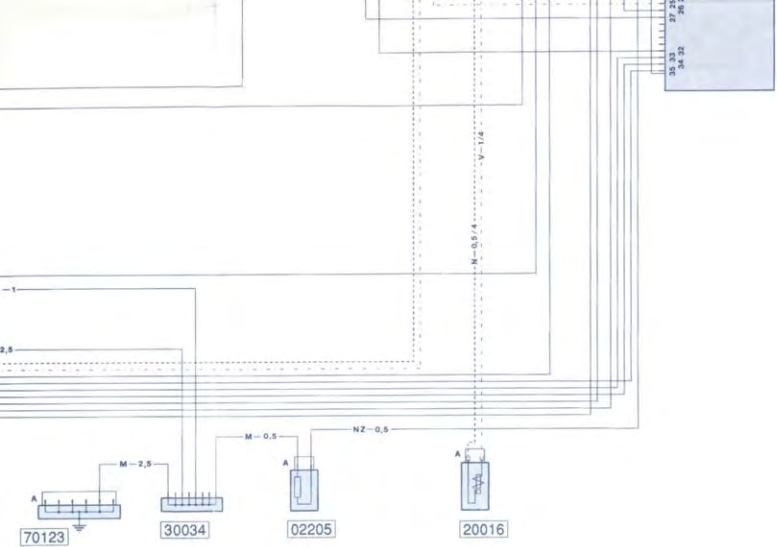

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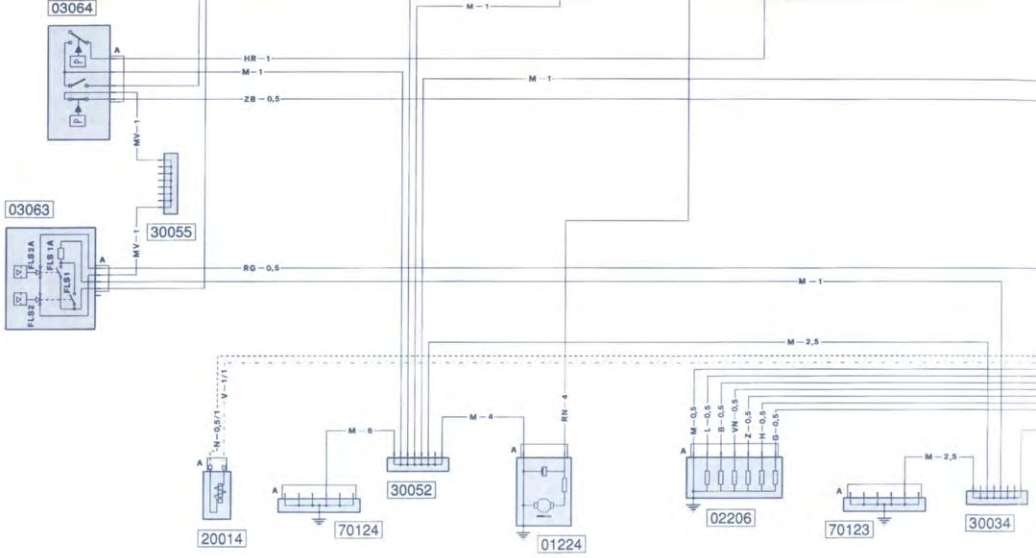

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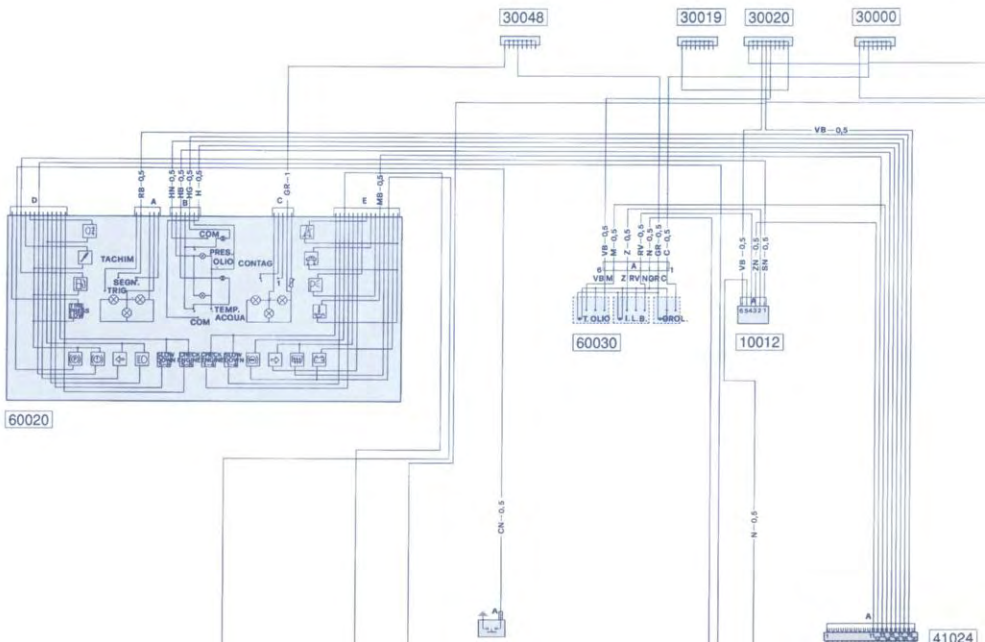

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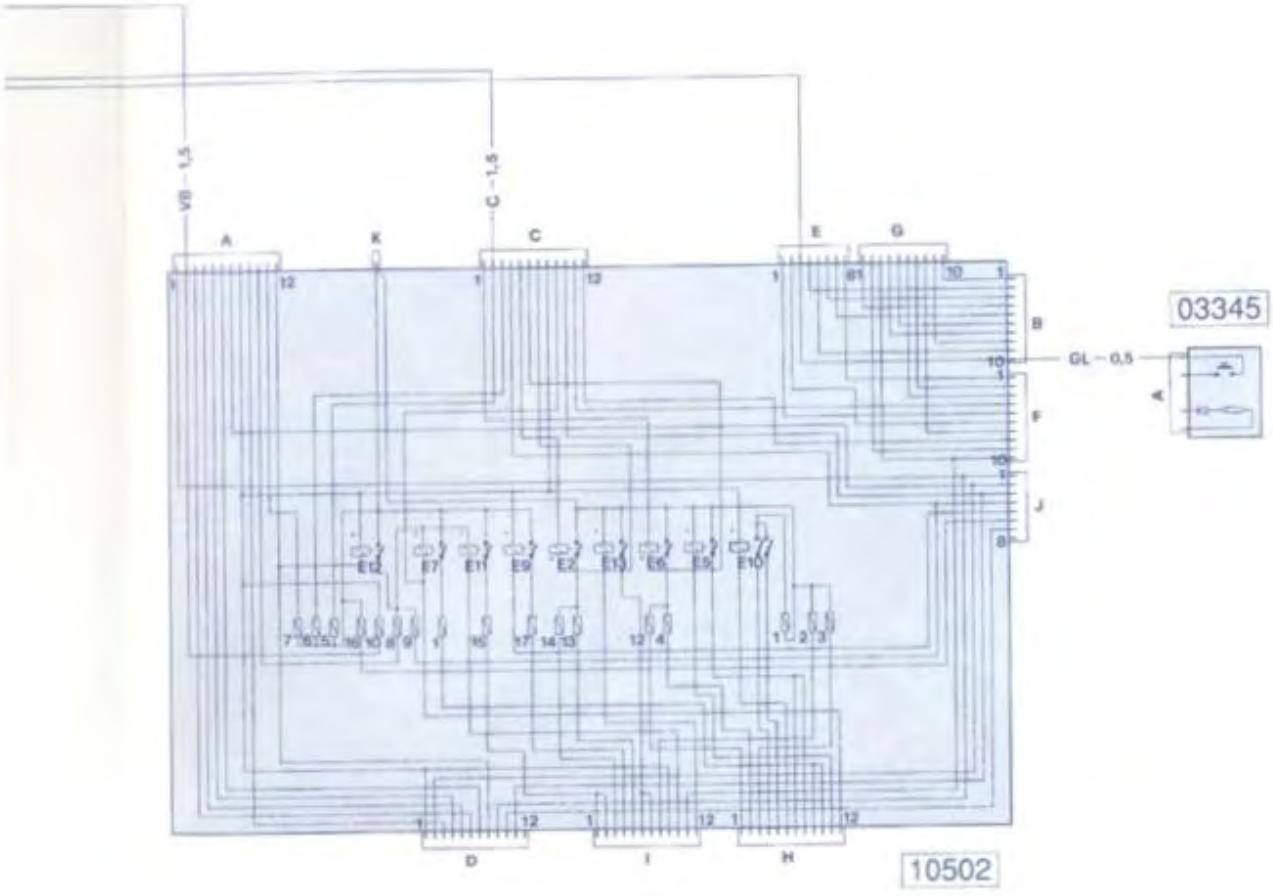

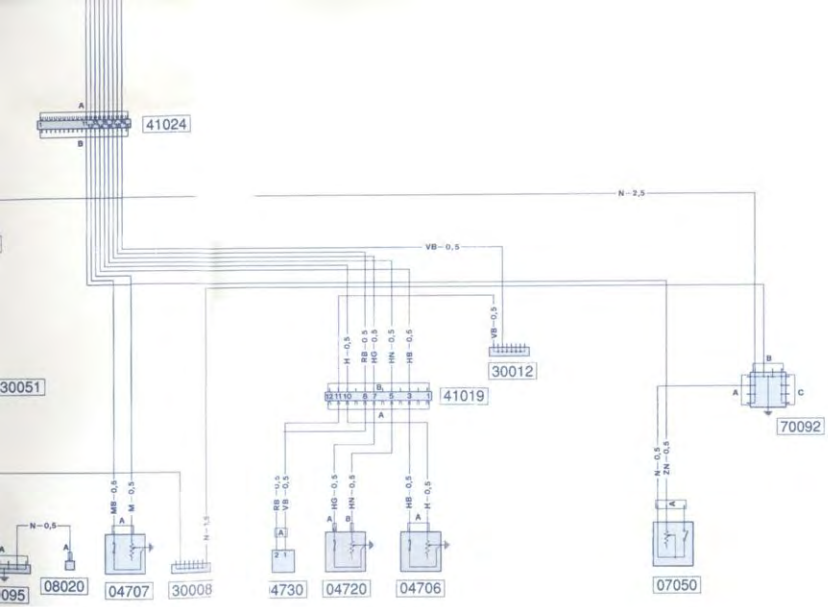

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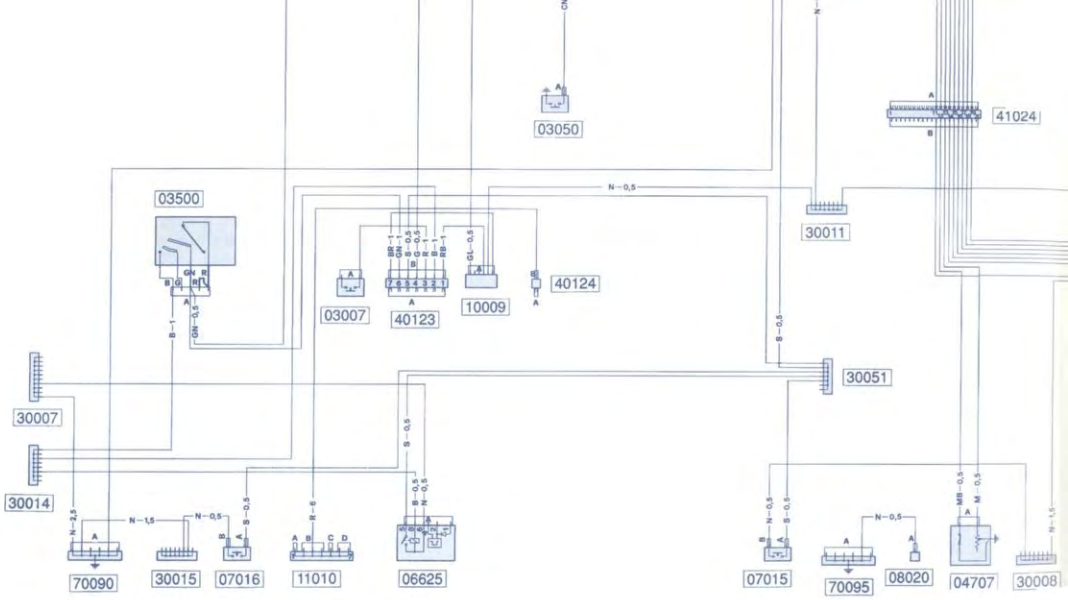

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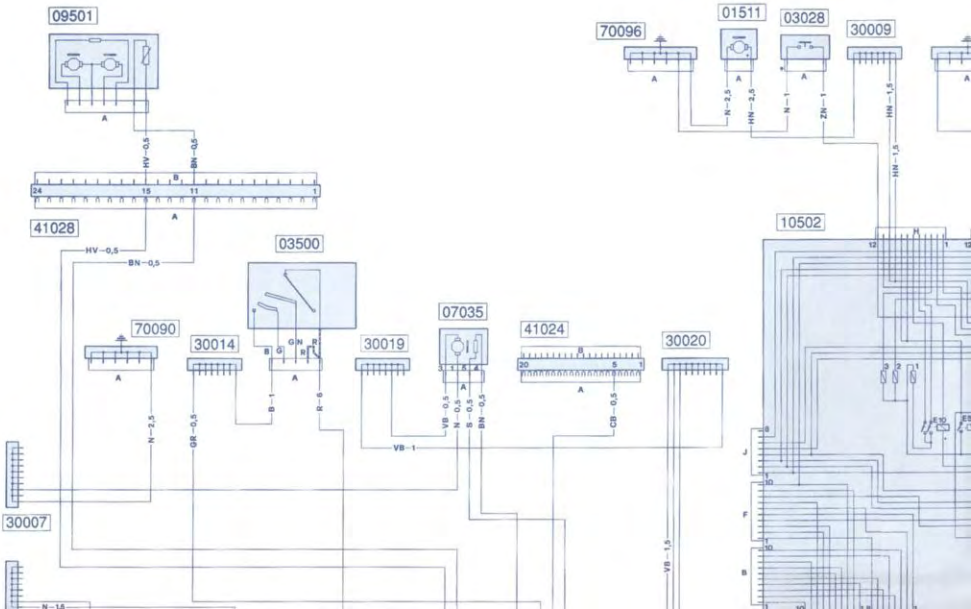

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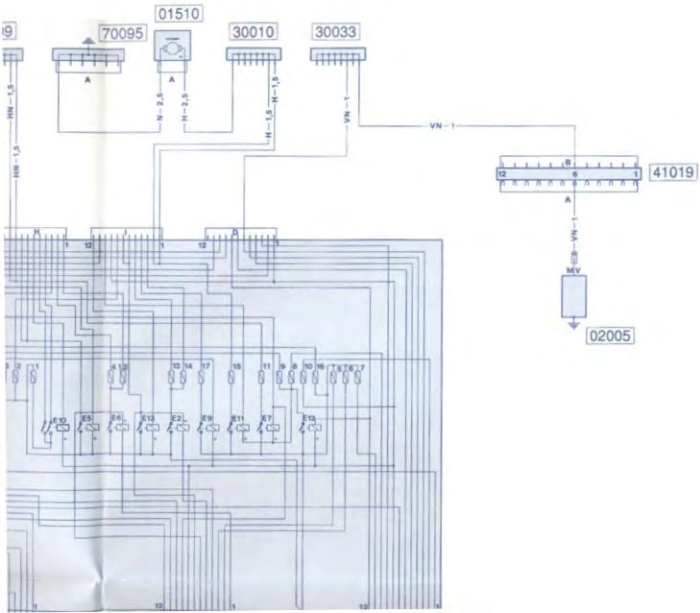

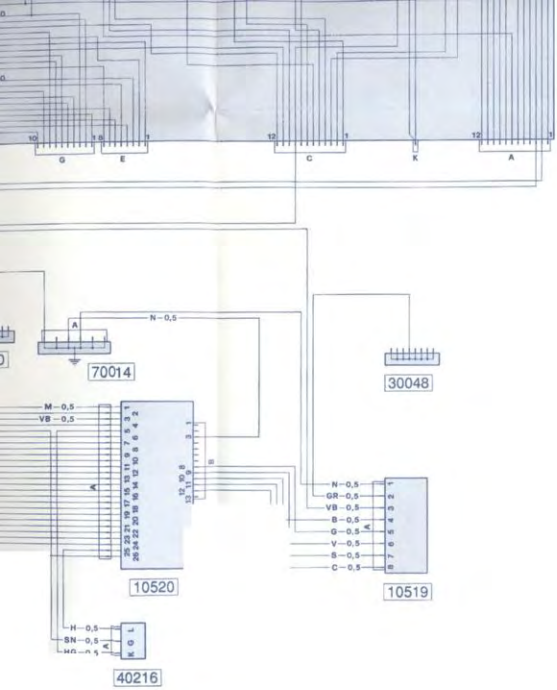

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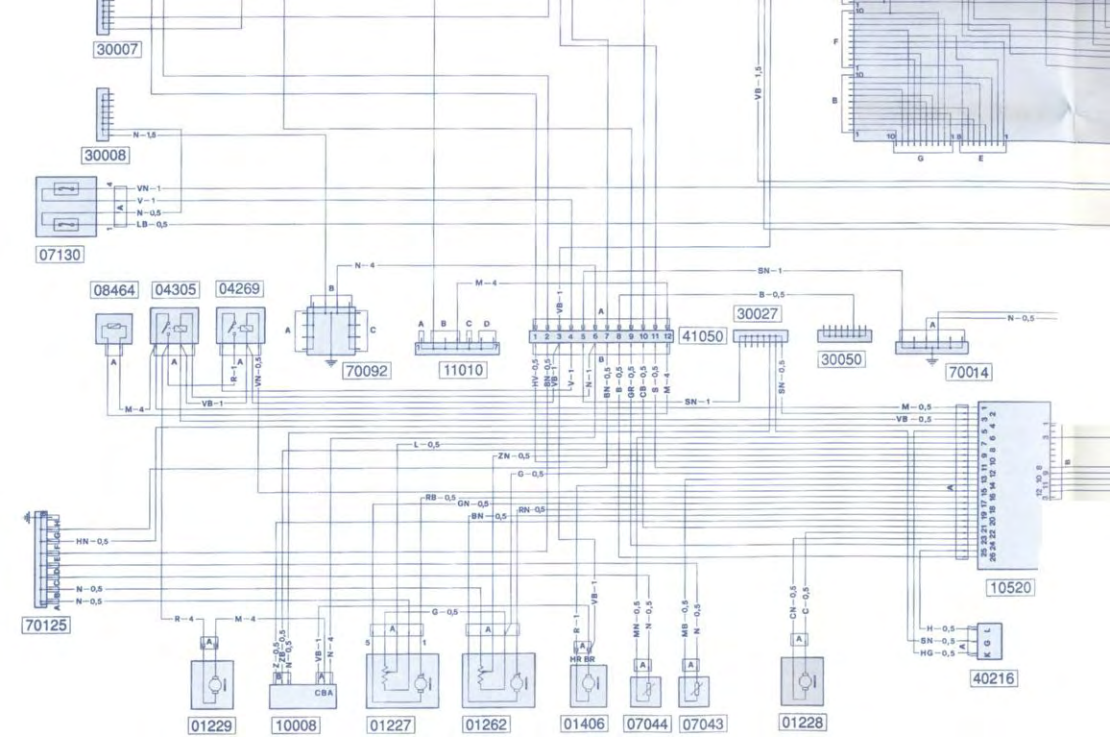

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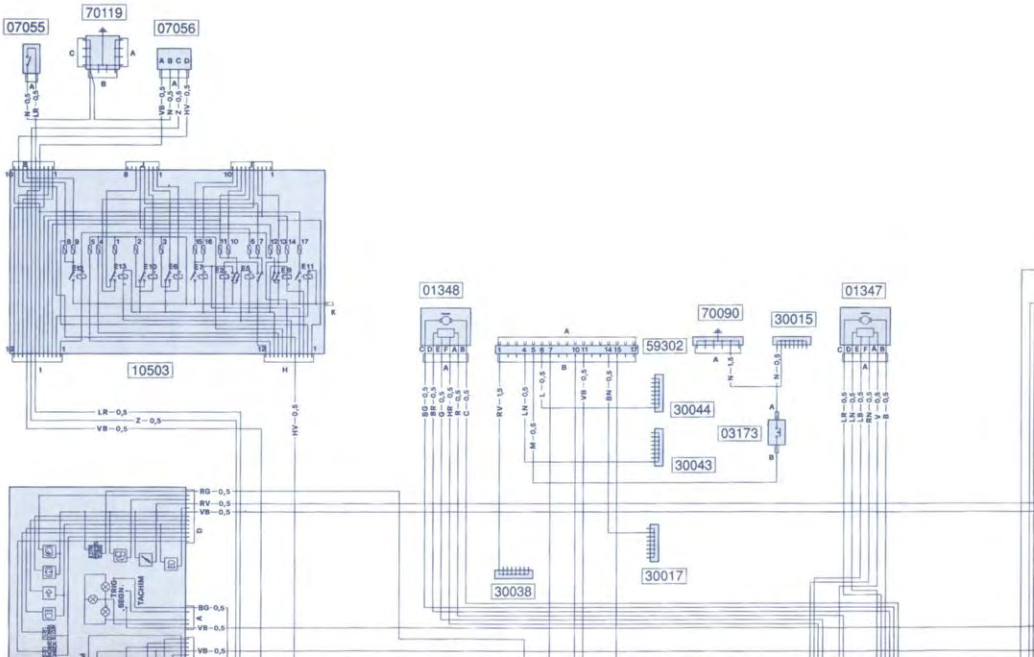

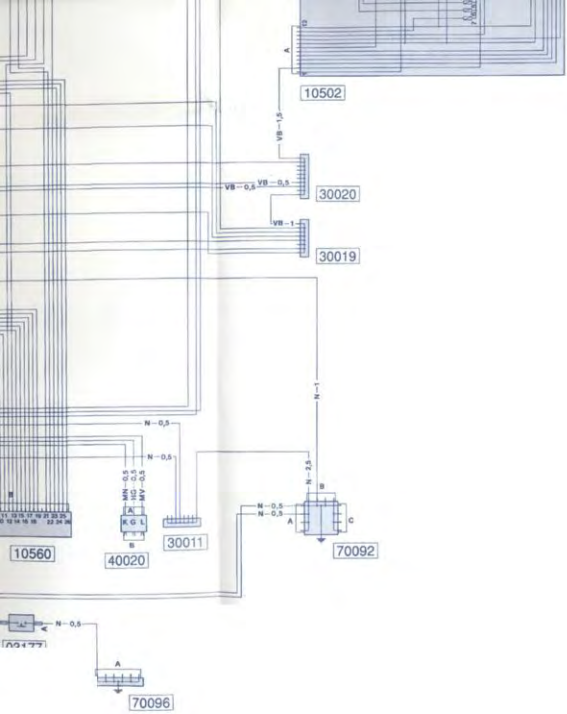

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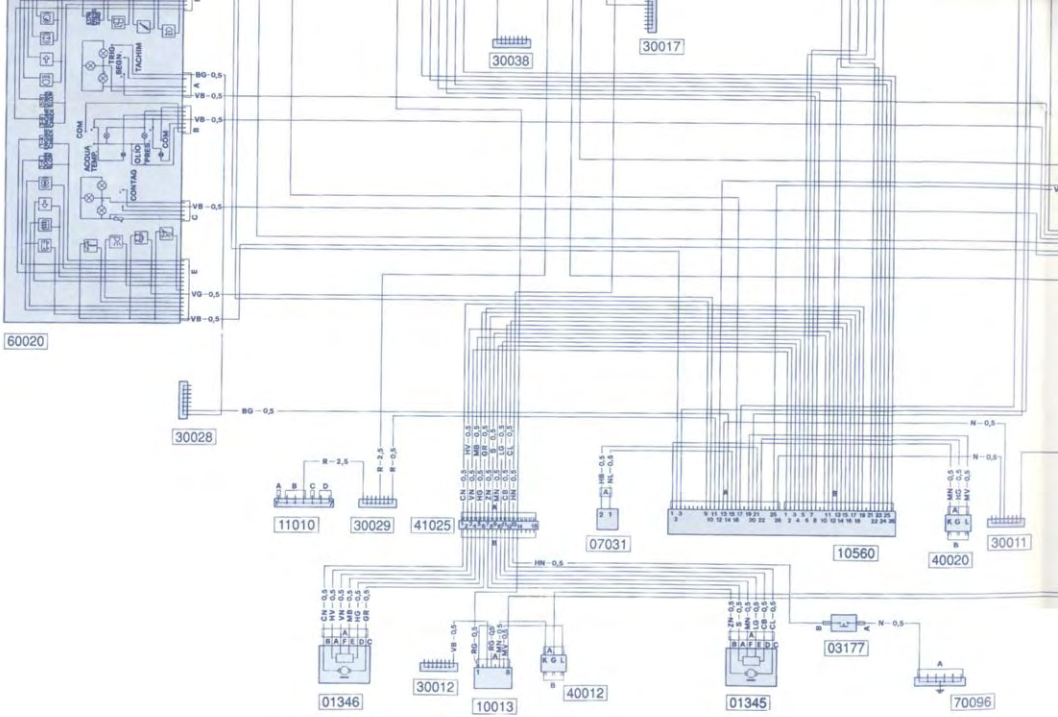

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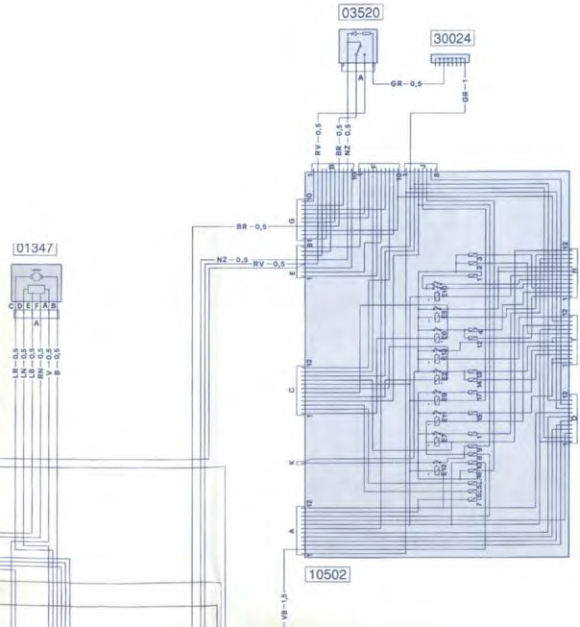

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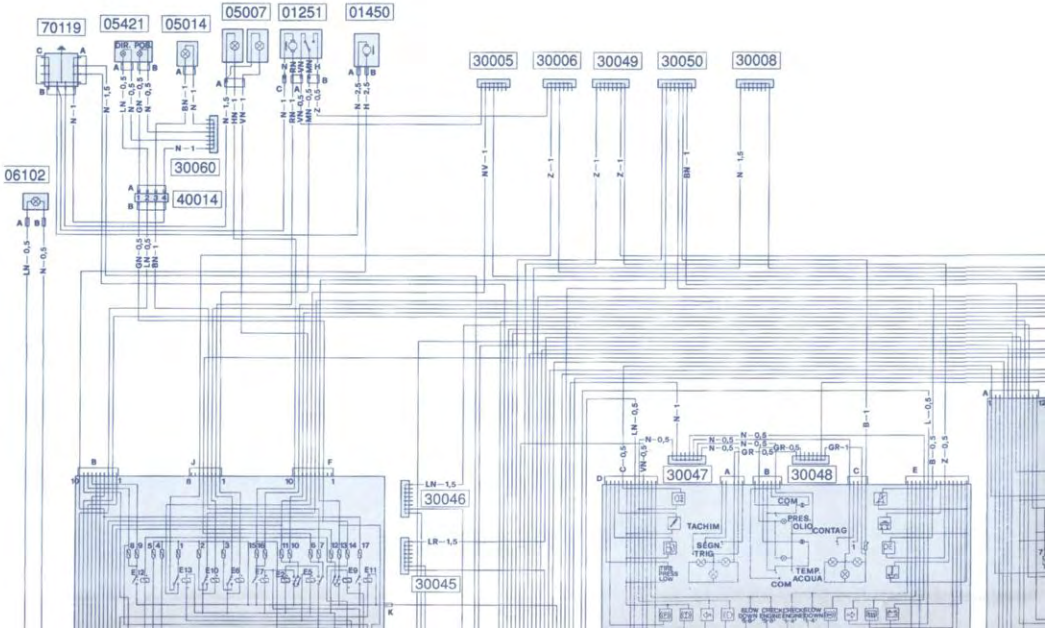

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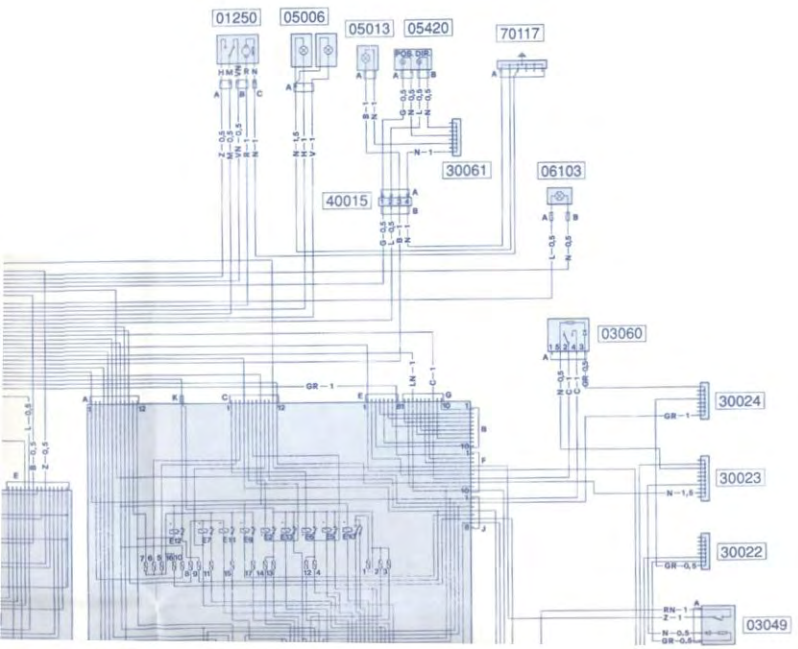

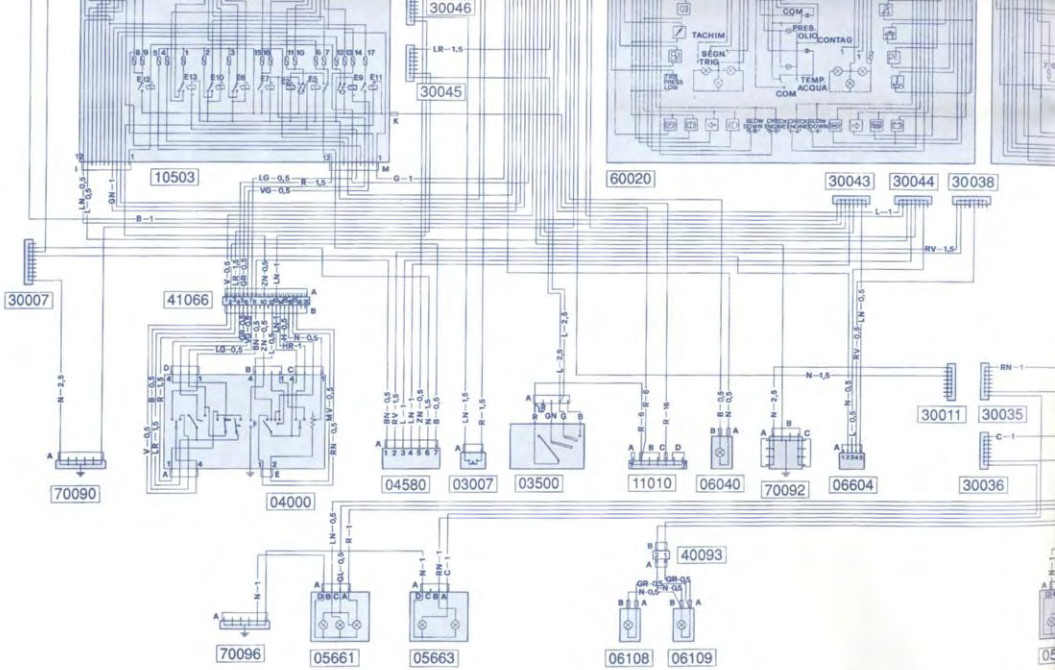

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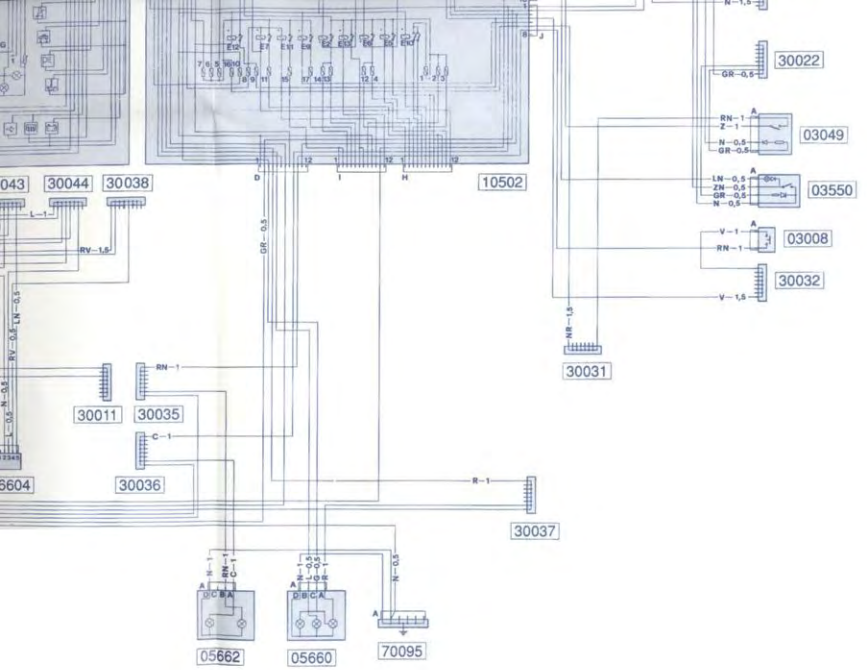

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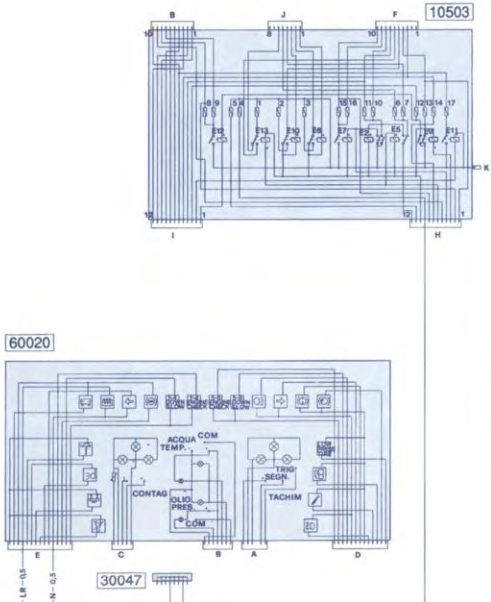

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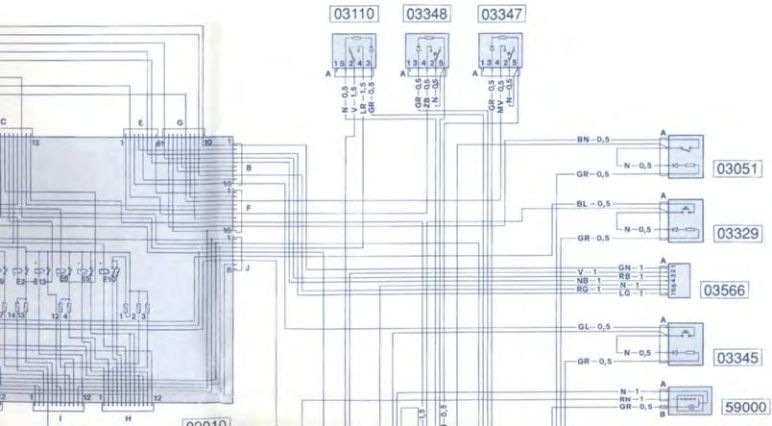

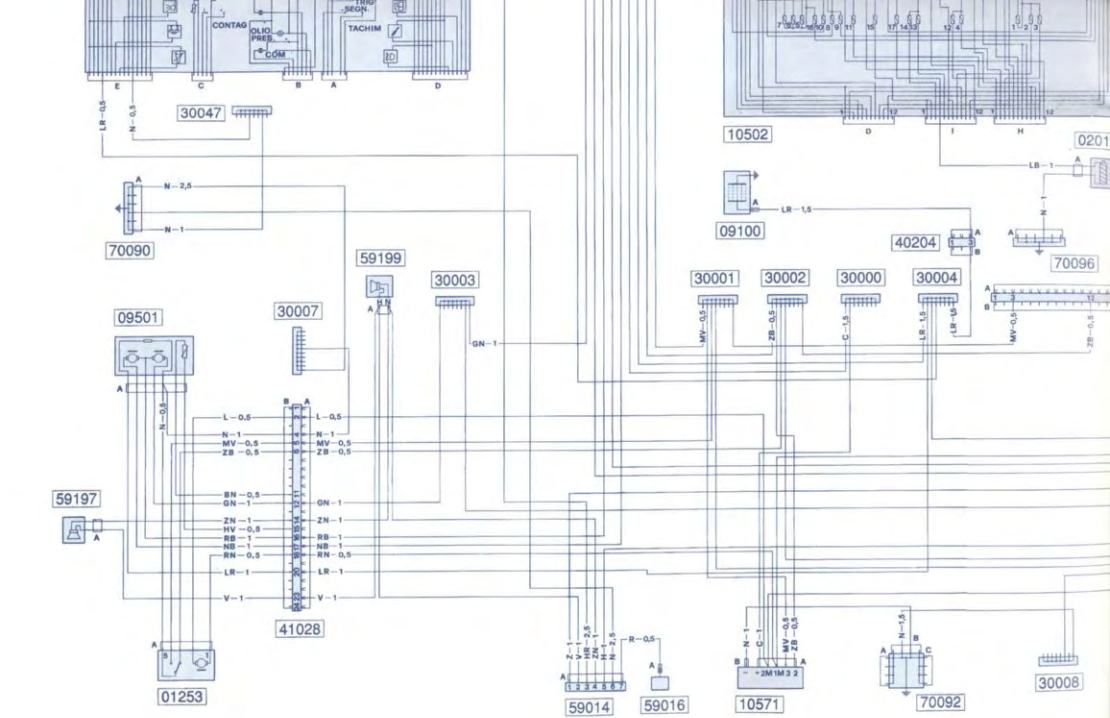

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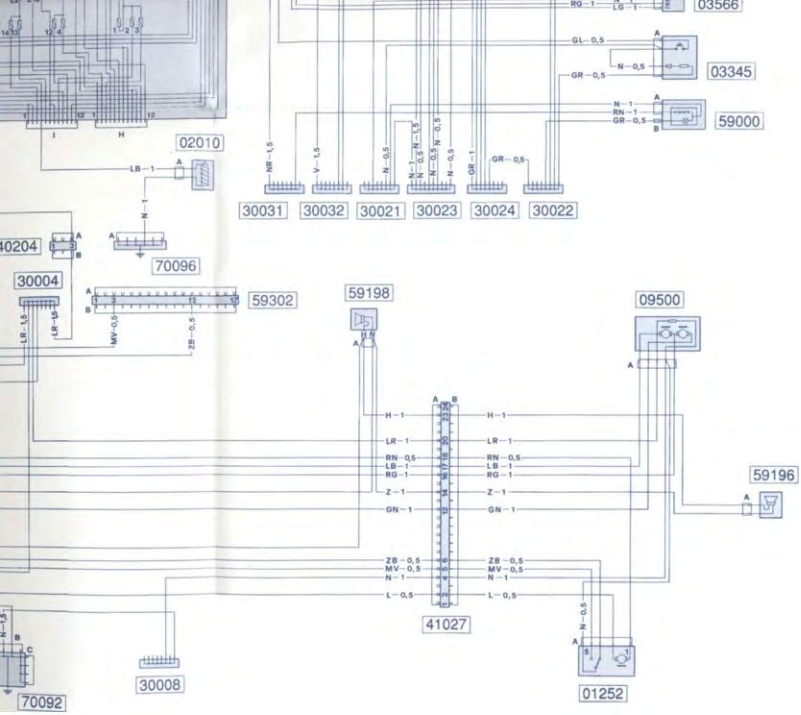

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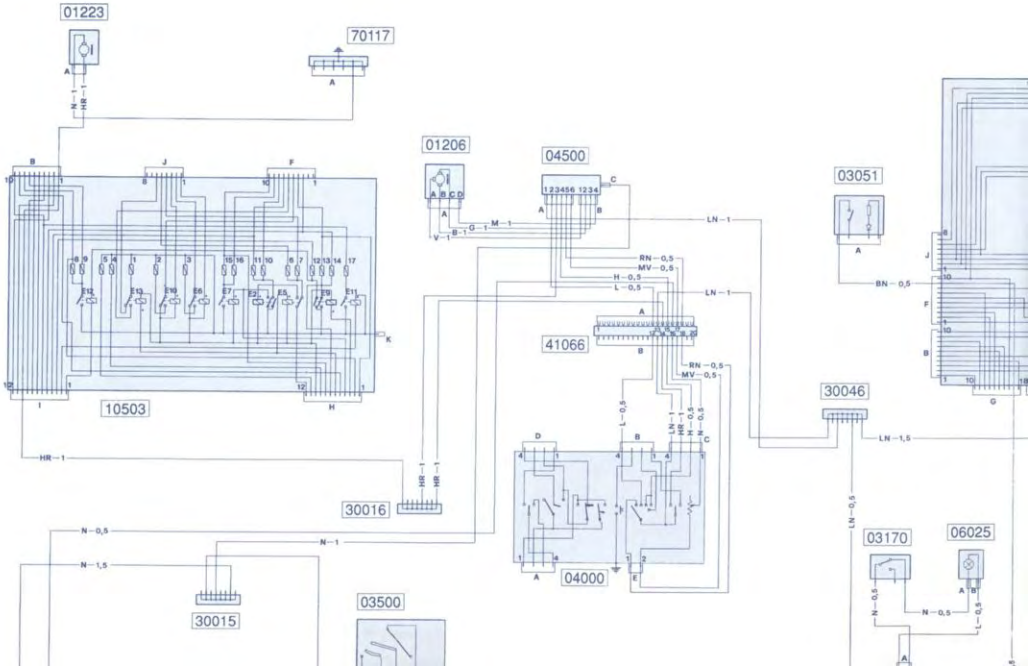

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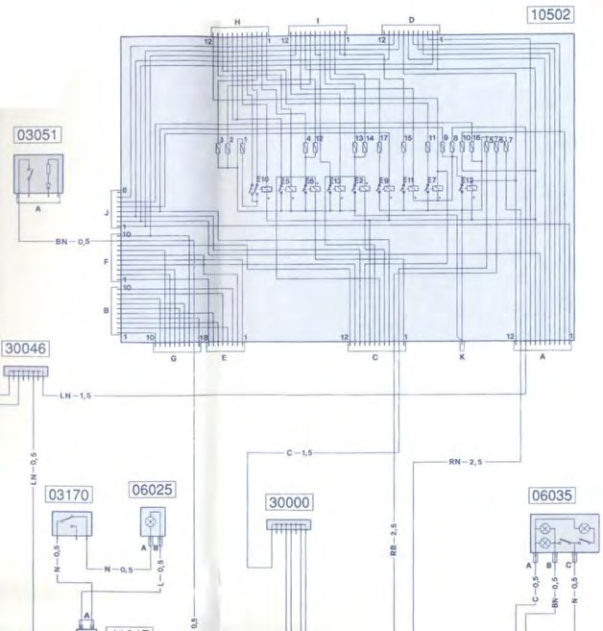

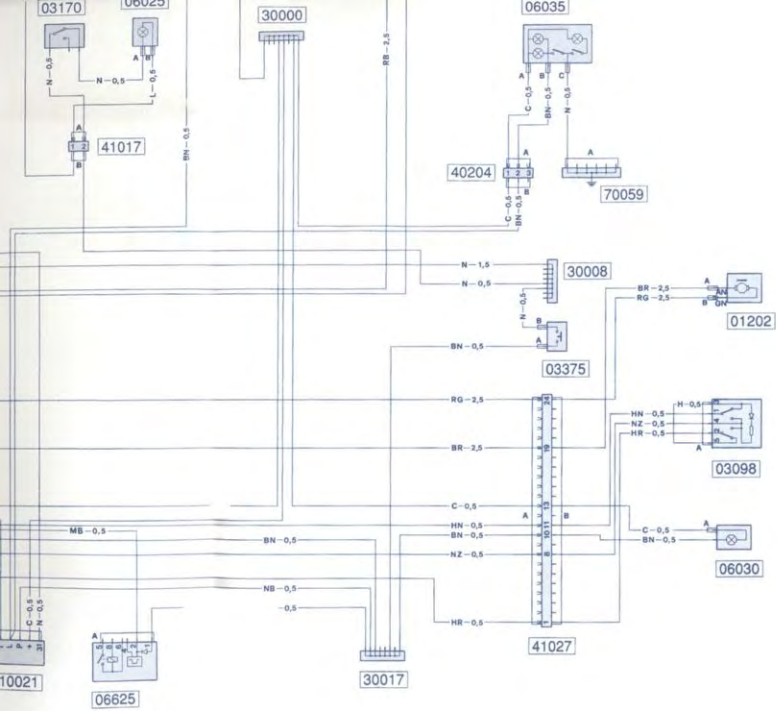

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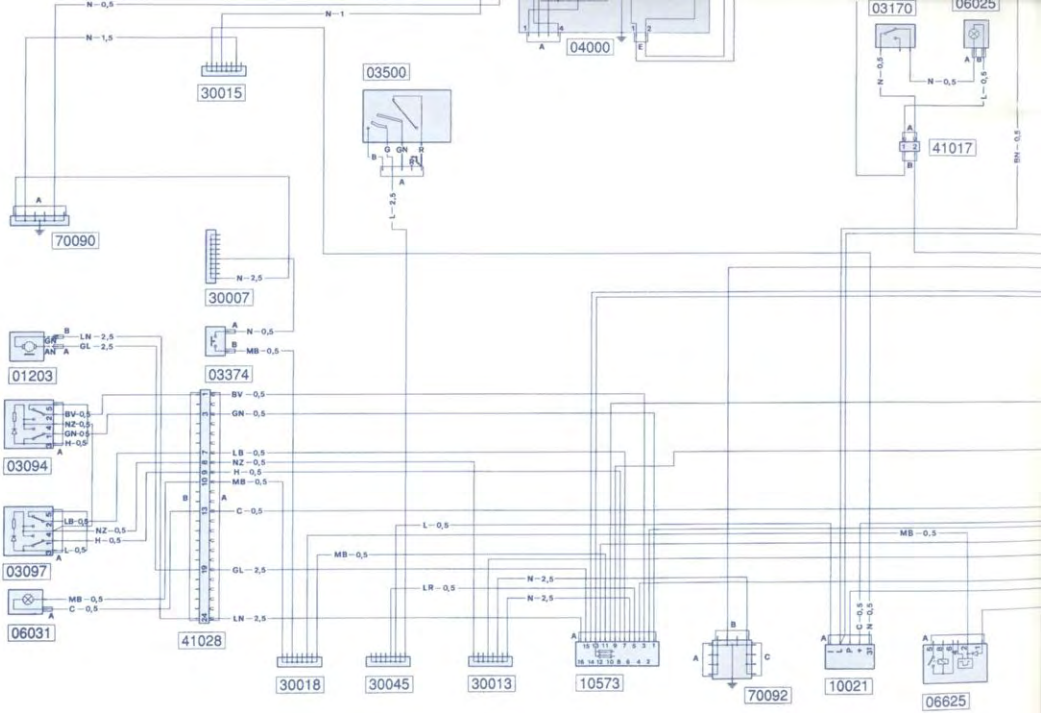

BOTTOM L/H 1994 F355

LIST OF COMPONENTS

00206 - Alternator with in-built regulator
00500 - 12 V battery
01001 - 12 V starter
01202 - Passenger side front window control motor
01203 - Driver side front window control motor
01206 - Windscreen wiper motor
01223 - Motor located on windscreen washer motor
01224 - Brake fluid pump drive motor
01227 - Water cock motor
01228 - Recirculation system motor
01229 - Fan motor
01250 - RH headlight motor
01251 - LH headlight motor
01252 - RH front door lock gearmotor
01253 - LH front door lock gearmotor
01262 - Air distribution moto-actuator
01345 - Motor-actuator for RH rear shock absorber
01346 - Motor-actuator for LH rear shock absorber
01347 - Motor-actuator for RH front shock absorber
01348 - Motor-actuator for LH front shock absorber
01367 - Belt retractor for LH safety belt
01368 - Belt retractor for RH safety belt
01406 - Water recirculation pump at idle
01407 - Air pump
01421 - RH petrol pump
01422 - LH petrol pump
01450 - Compressor for warning horn
01510 - Electric fan for RH radiator
01511 - Electric radiator auxiliary fan
02005 - Electromagnet for air conditioner compressor
02010 - Solenoid for fuel filler flap opening
02043 - Electrically powered injector for cyl. no. 1
02044 - Electrically powered injector for cyl. no. 2
02045 - Electrically powered injector for cyl. no. 3
02046 - Electrically powered injector for cyl. no. 4
02047 - Electrically powered injector for cyl. no. 5
02048 - Electrically powered injector for cyl. no. 6
02049 - Electrically powered injector for cyl. no. 7
02050 - Electrically powered injector for cyl. no. 8
02205 - Main ABS system solenoid valve
02206 - ABS system adjusting solenoid valve
02215 - Solenoid valve for RH cylinder bank secondary air
02220 - Exhaust manifold compensating solenoid valve
02245 - Anti-evaporation solenoid valve for RH cylinder bank
02246 - Anti-evaporation solenoid valve for LH cylinder bank
02406 - LH ignition coil
02407 - RH ignition coil
04707 - Oil temperature control indicator and high temperature warning light
04720 - Oil temperature transmitter
04730 - Pulse generator
05006 - RH headlight
05007 - LH headlight
05013 - Right flashing light
05014 - Left flashing light
05015 - Right fog light
05016 - Left fog light
05420 - Right front parking and direction light
05421 - Left front parking and direction light
05615 - LH front Side Marker
05616 - RH front Side Marker
05617 - LH rear Side Marker
05618 - RH rear Side Marker
05622 - Supplementary stop light
05660 - Right parking, direction and stop light
05661 - Left parking, direction and stop light
05662 - Right rear fog and reverse lights
05663 - Left rear fog and reverse lights
05664 - Right rear reverse and stop lights
05665 - Left rear reverse and stop lights
05666 - Right rear parking and direction lights
05667 - Left rear parking and direction lights
06025 - Glove box lamp
06030 - RH front open door light
06031 - LH front open door light
06035 - Front dome lamp
06040 - Luggage compartment ligh
06102 - Left front direction light bulb
06103 - Right front direction light bulb
06108 - LH number plate lamp
06109 - RH number plate lamp
06604 - Direction light buzzer
06625 - Inserted key alarm connected with brake warning light working control
07015 - Sensor for RH brake pads wear warning
07016 - Sensor for LH brake pads wear warning
07031 - Brake oil pressure sensor
07035 - Sensor for inside air temperature
07043 - Treated air temperature sensor
07044 - Defroster sensor
07050 - Fuel level sensor
07055 - Sensor for horizontal acceleration
07056 - Acceleration sensor
07058 - Hot-wire air flow sensor for RH cyl. bank
07059 - Hot-wire air flow sensor for LH cyl. bank
07116 - Idle speed regulator for RH cyl. bank
20007 - RH cylinder bank catalyst electronic control unit
20008 - Ignition control unit-LH cyl. bank Motronic injectio
20009 - Ignition control unit-RH cyl. bank Motronic injectio
20010 - Sensor for engine revolutions - LH cyl. bank
20011 - Sensor for engine revolutions - RH cyl. bank
20012 - ABS ECU
20013 - ABS sensor for left front toothed wheel
20014 - ABS sensor for right front toothed wheel
20015 - ABS sensor for left rear toothed wheel
20016 - ABS sensor for right rear toothed wheel
20018 - Connection between right and left bank
30000 ... 30066 - Cable multiplication
30100 - Diode
30101 - Diode
40012 - Joint for tyre pressure ECU diagnosis
40014 - Front connection with left front lights
40015 - Front connection with right front lights
40020 - Diagnosis block for Bilstein control unit
40022 - Block for ABS ECU diagnosis
40093 - Rear cable connection with number plate light cable
40123 - Connection for ABS circuit
40124 - Connection for ABS circuit
40172 - Connection for cable multiplication
40173 - Connection for cable multiplication
40201 - Connection for battery plus cable and alternator
40202 - Connection for main beam and dipped beam LH headlight
40203 - Connection for main beam and dipped beam RH headligl
40204 - Connection for dashboard and roof dome lamp
40209 - Block LH cyl. bank Motronic control unit diagnosis
40210 - Block RH cyl. bank Motronic control unit diagnosis
40214 - Starter release switch
40216 - Block for A/C ECU diagnosis
41017 - Connector between dashboard and gloves bo
41019 - Engine connection - rear connector
41024 - Dashboard connection - rear connector (A)
41025 - Dashboard connection - rear connector (B)
41027 - Dashboard connection - RH door connector
41028 - Dashboard connection - LH door connector
41050 - Dashboard connection to A.C. system
41051 - Connection rear system- right injection system
41052 - Connection rear system- left injection system
41065 - Instrument panel - light switch connector joint
41066 - Instrument panel - light switch connector joint
41077- Connection instrument panel - air bag system
59000 - Cigarette lighter
59014 - Presetting for radio receiver
59016 - Pre-amplifier for aerial and rear heated window
59196 - RH loudspeaker for low tones *(Woofer)*
59197 - LH loudspeaker for low tones *(Woofer)*

02050 - Electrically powered injector for cyl. no. 8
02205 - Main ABS system solenoid valve
02206 - ABS system adjusting solenoid valve
02215 - Solenoid valve for RH cylinder bank secondary air
02220 - Exhaust manifold compensating solenoid valve
02245 - Anti-evaporation solenoid valve for RH cylinder bank
02246 - Anti-evaporation solenoid valve for LH cylinder bank
02406 - LH ignition coil
02407 - RH ignition coil
02493 - RH power module
02494 - LH power module
02500 ... 02507 - Spark plug
03007 - Flasher light switch
03008 - Reverse gear warning switch
03028 - Thermometric switch radiator
03049 - Parking switch
03050 - Hand brake switc
03051 - Inner light switch
03059 - Fog lights switch
03060 - Rear fog light switch
03063 - Brake fluid level control switches
03064 - Brake fluid pressure control switches
03094 - Driver side RH window control switch
03097 - LH window control switch
03098 - RH window control switch
03110 - Heated rear window control switch
03165 - Left safety belt warning light switch
03170 - Dashboard box lighting microswitch
03173 - Switch on front compartment lock
03177 - Switch on rear bonnet lock
03329 - Pushbutton for fuel filler flap opening
03334 - Pushbutton on the LH door beam
03335 - Pushbutton on the RH door beam
03345 - ABS push-button
03347 - Door locking control switch
03348 - Door unlocking control switch
03374 - Driver side roof light switch
03375 - Passenger side roof light switch
03380 - Pushbutton for LH cylinder bank self-diagnosis
03381 - Pushbutton for RH cylinder bank self-diagnosis
03500 - Ignition commutator
03520 - Selection switch for shock absorber calibration
03550 - Emergency lights switch
03566 - Electric rear view mirrors control
04000 - Combination switch
04252 - ABS pump motor remote control switch
04253 - Auxiliary ABS remote control switch
04255 - Main remote control switch and control for ABS
04269 - Remote control switch for A/C compressor
04305 - Relay for A/C fan motor
04500 - Windscreen wiper intermittence device
04580 - Emergency flasher direction indicator light
04702 - Oil temperature transmitter
04706 - Water temperature control indicator and high temperature warning light
07035 - Sensor for inside air temperature
07043 - Treated air temperature sensor
07044 - Defroster sensor
07050 - Fuel level sensor
07055 - Sensor for horizontal acceleration
07056 - Acceleration sensor
07058 - Hot-wire air flow sensor for RH cyl. bank
07059 - Hot-wire air flow sensor for LH cyl. bank
07116 - Idle speed regulator for RH cyl. bank
07117 - Idle speed regulator for LH cyl. bank
07130 - Max. and min. pressure switch for freon in the A.C. system
07138 - Sensor for RH water temperature
07139 - Sensor for LH water temperature
07150 - RH cylinder bank catalyst temperature sensor
07151 - LH cylinder bank catalyst temperature sensor
07601 - Two-diode box
08020 - Ground connection for oil tank
08424 - 30A fuse for ABS pump motor
08425 - 30A fuse for ABS ECU
08426 - 3A fuse on auxiliary ABS relay
08464 - Protecting fuse for A/C system
09016 - Throttle potentiometer for RH cyl. bank
09017 - Throttle potentiometer for LH cyl. bank
09100 - Heated rear window
09500 - RH side rear view mirror with electric adjustment
09501 - LH side rear view mirror with electric adjustment
10008 - Power unit
10009 - Electronics for ABS system cut-off
10012 - Damper for fuel level indicator
10021 - Courtesy lamps time-lack relay
10502 - Dashboard shunt control unit
A - Front system connecting block
B - Front system connecting block
C - Front system connecting block
D - Rear system connecting block
E - Rear system connecting block
F - Rear system connecting block
G - Dashboard system connecting block
H - Dashboard system connecting block
I - Dashboard system connecting block
J - Dashboard system connecting block
10503 - Front shunt ECU
10519 - A/C system ECUs
10520 - A/C ECU
10560 - Bilstein control unit
10571 - Door locking ECU
10573 - Control unit for window control switch
11010 - Terminal board for plus front cables
11011 - Terminal board for plus rear cables
20002 - Sensor for LH cyl. bank revolutions
20003 - Oxygen sensor and sensor heater for LH cyl. bank
20004 - LH cylinder bank catalyst electronic control unit
20005 - Sensor for RH cyl. bank revolutions
20006 - Oxygen sensor and sensor heater for RH cyl. bank
41065 - Instrument panel - light switch connector joint
41066 - Instrument panel - light switch connector joint
41077- Connection instrument panel - air bag system
59000 - Cigarette lighter
59014 - Presetting for radio receiver
59016 - Pre-amplifier for aerial and rear heated window
59196 - RH loudspeaker for low tones *(Woofer)*
59197 - LH loudspeaker for low tones *(Woofer)*
59198 - LH loudspeaker for high-pitched *(Tweeter)*
59199 - RH loudspeaker for high-pitched *(Tweeter)*
59302 - Antitheft-systemprearrangement
60020 - Main instrument board
/1 - Speedometer
/2 - Oil pressure sender
/3 - Water temperature sender
/4 - Revolution counter
a - Rear fog light indicator (green)
b - Comfort suspension setting indicator (amber)
c - Fuel reserve warning light (amber)
d - Free
e - 5/8 cylinder bank "Slow Down" warning light (red)
f - Brake malfunction warning light (red)
g - Left turn direction indicator light (green)
h - High beam indicator (blue)
i - Parking brake warning light (red)
l - 5/8 cylin. bank "Check Engine" warning light (amber)
m - 1/4 cylin. bank "Check Engine" warning light (red)
n - Heated exterior mirror indicator (amber)
o - ABS warning light (amber)
p - Right turn direction indicator light (green)
q - Alternator warning light (red)
r - 1/4 cylinder bank "Slow Down" warning light (red)
s - Airbag warning light (red)
t - Parking light indicator (green)
u - Suspension malfunction warning light (amber)
v - Seat belt warning light (red)
60030 - Complete device
70000 - Earth
70014 - Earth
70046 - Earth 2 for RH cylinder bank Motronic
70047 - Earth 1 for RH cylinder bank Motronic
70048 - Earth 2 for LH cylinder bank Motronic
70049 - Earth 1 for LH cylinder bank Motronic
70055 - Battery earth
70059 - Earth for roof dome lamps
70090 ... 70096 - General earth
70117 - RH front earth point
70119 - LH front earth point
70122 - Earth for ABS ECU
70123 - Mass on hydraulic ECU body
70124 - ABS earth
70125 - Sensor earth