page

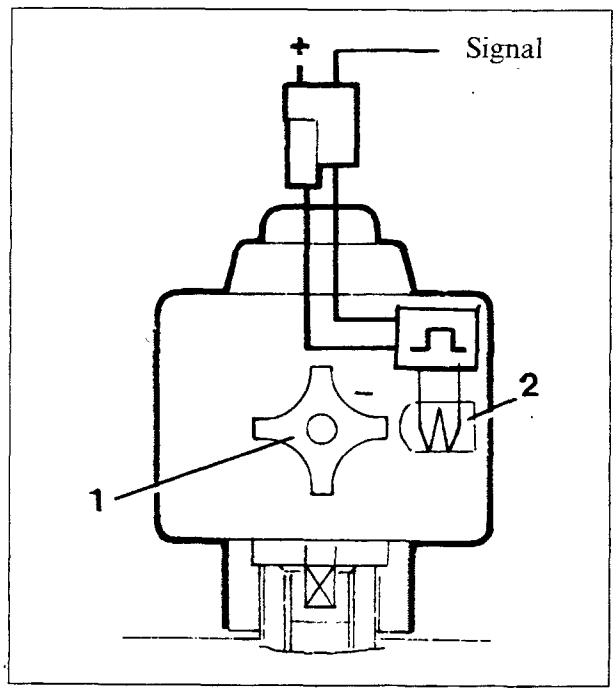
ELECTRONIC SPEEDOMETER

On all versions of this model, as for the previous one, an electronic speedometer is fitted. A description of its operation is given below as it has not yet been dealt with. The device is composed of:

a) an impulse generator, located in the front differential, for the direct pick of power.
b) an electric motor assisted by an electronic control unit, located in the instrument panel.

Wiring diagram showing impulse generator with connector connected to vehicle's electrical system

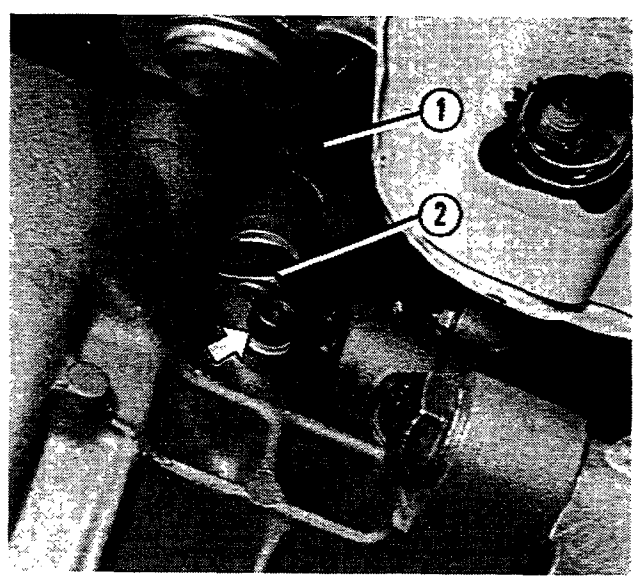
The impulse generator flywheel (1) is a rotating magnet with four polar expansions 90° apart. With the engine running, for each revolution, the flywheel sends 4 e.m.f. sinusoidal impulses which are varied by an oscillator (2), supplied with the battery voltage and controlled by the ignition key, from a cable coming from the instrument panel (terminal F, connector 1). The impulse generator oscillator in turn transforms the impulses into square signals to send to the control unit. The frequency of the signal emitted in this way by the impulse generator is proportional to the speed of the flywheel.



P1L01CL01

1. Impulse generator flywheel.
2. Impulse generator oscillator.

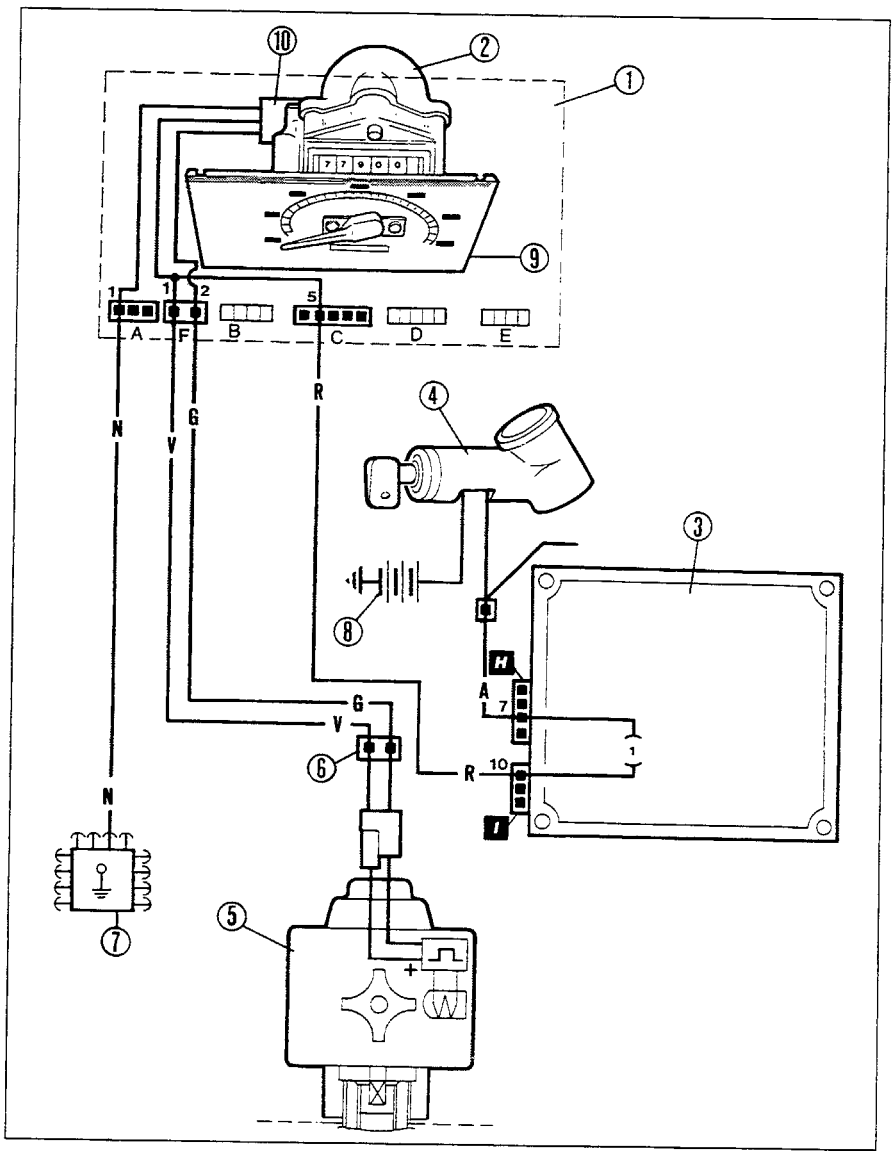
The flywheel is driven by the power pidck up located in the differential which, in normal vehicles, is used to connect the mechanical speedometer drive cable. The impulse generator is removed when necessary by working underneath the vehicle with a 22 mm open T spanner, which is widely available. To remove the impulse generator, the hexagonal bolt (shown by the arrows) MUST NOT be loosened.



P1L01CL02

Location of speedometer impulse generator on differential (view from beneath the vehicle)

1. Speedometer impulse generator.
2. Nut fixing impulse generator to front differential.



Wiring diagram showing electronic speedometer connections

1. Instrument panel
2. Electric motor which determines the rotation of the speed indicator magnet
3. Junction unit
4. Ignition switch
5. Impulse generator bolted onto differential casing
6. Connector
7. Right front earth cable loom
8. Battery
9. Speedometer
10. Speedometer motor electronic control unit

A-B-C-D-E-F Instrument panel connectors

H-I Junction unit connectors

Cable colour code

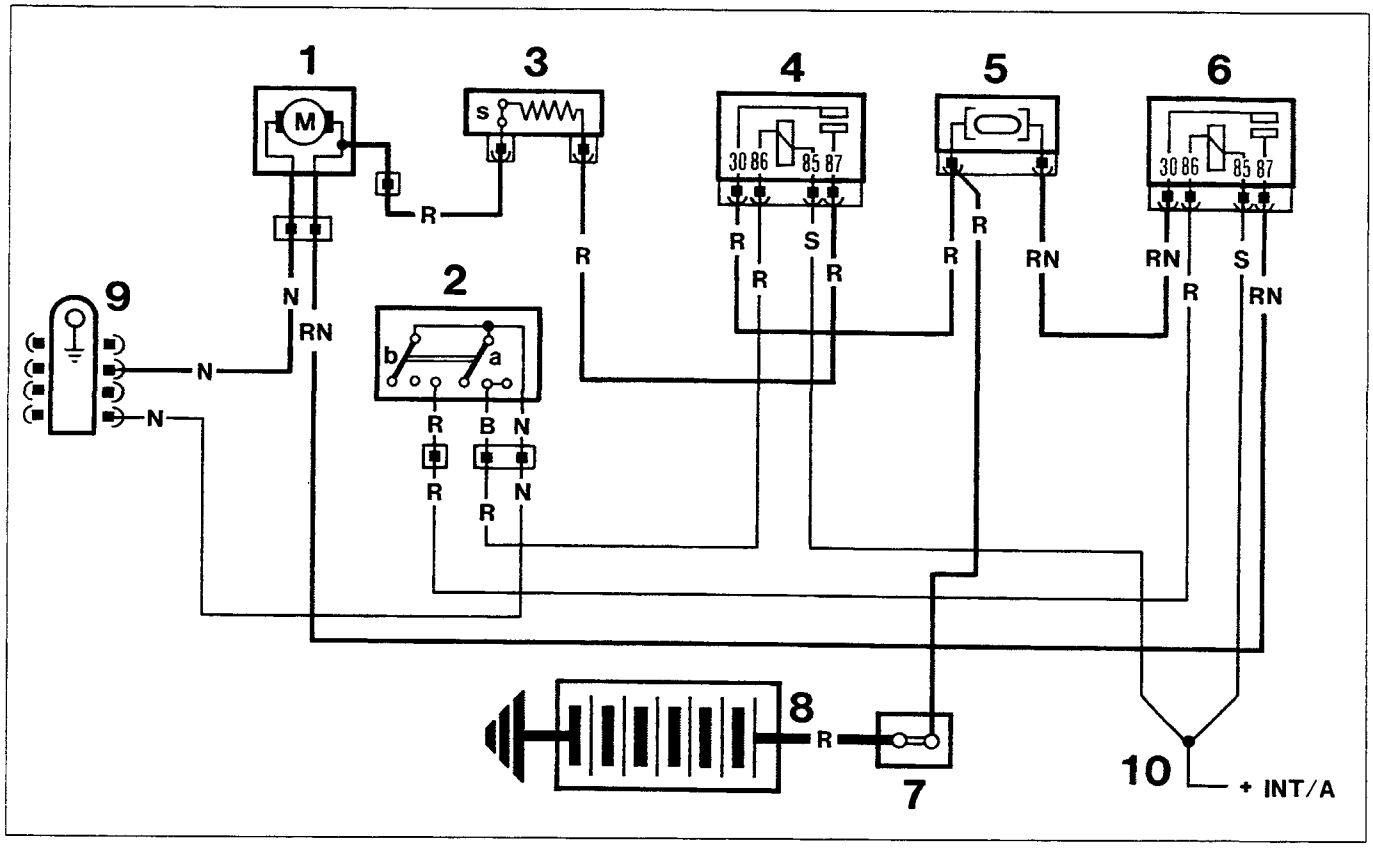
A Light blue
G Yellow
N Black
R Red
V Green

The speedometer drive motor is of the synchronous, direct current type and is controlled by an electronic control unit (10), located in the instrument panel, based on the frequency of the signals emitted by the impulse generator, so that the exact speed corresponds to that of the vehicle. The electronic control unit is supplied by terminal +15 of the ignition switch via blades 7 and 10, respectively for connectors A and I of the junction unit and blade 5 for connector C of the instrument panel. The speedometer electric motor carries out the following functions:
- it rotates a magnet which is fitted on its rotor which in turn, by means of the magnetic field linked to it, drives the needle of the conventional type speedometer indicator;
- it controls the total mileage recorder.

NOTE *The electronic supply unit processes the frequency signals transmitted by the impulse generator and carries out an adjustment in such a way that the speedometer motor rotation is definitely proporation to that of the impulse generator.*

DIAGNOSIS. It is possible to carry out a diagnosis, with the vehicle stationary, to establish whether the defect is in the impulse generator or in the control panel (electronic control unit or motor), it a square wave sender is available. The sender is connected to the yellow impulse generator cable: with the ignition switch in the ON position the speedometer pointer should show a certain speed (that generated by the square wave sender). It this is not the case, or if the speed is different from that generated by the sender, the fault lies in the control panel where the either the electronic control unit or the speedometer motor should be replaced.

TWO SPEED RADIATOR COOLING FAN



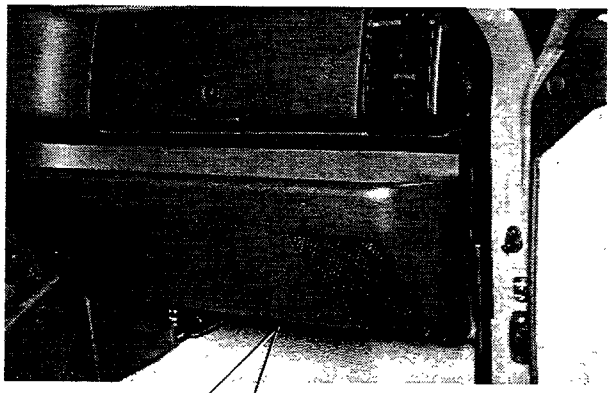
1. Radiator cooling fan
2. Two stage thermal switch
3. Additional resistor for 1st speed
4. 1st speed relay feed
5. Fan motor protective fuse
7. Connector block
8. Battery
9. Left front earth cable loom
10. Ignition switch controlled by key + INT/A

Operation

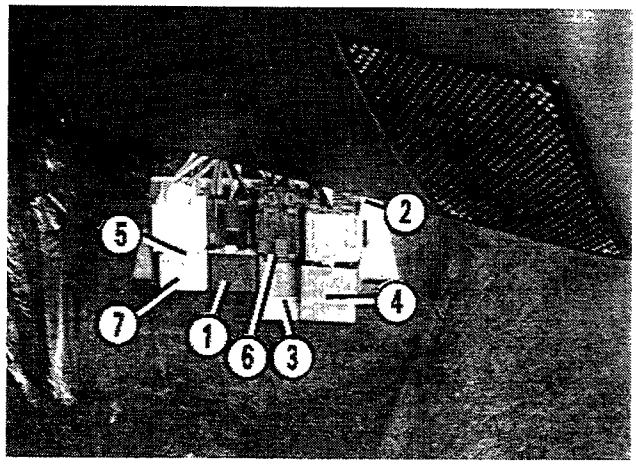
The fan (1) is controlled by the two stage thermal switch (2) which, as the first stage (a) closes when the temperature of the engine coolant reaches 86-90°C, allows the flow of current from the battery to the fan (1) via the resistor (3) thanks to the energizing of the relay (4) closed to earth, operating the 1st speed of the fan by closing its contacts.

The resistor (3) is protected internally by a thermal contact (s) which interrupts the electrical circuit when the temperature exceeds 130°C.

When the temperature of the engine coolant reaches 90°-94°C, the second stage (b) of the thermal contact (2) also closes putting the relay feed (6) energizing circuit to earth and the latter, by closing its contacts, sends current directly from the joint to the fan without passing through the resistor (3), thereby engaging the 2nd operating speed.



P1L04CL01



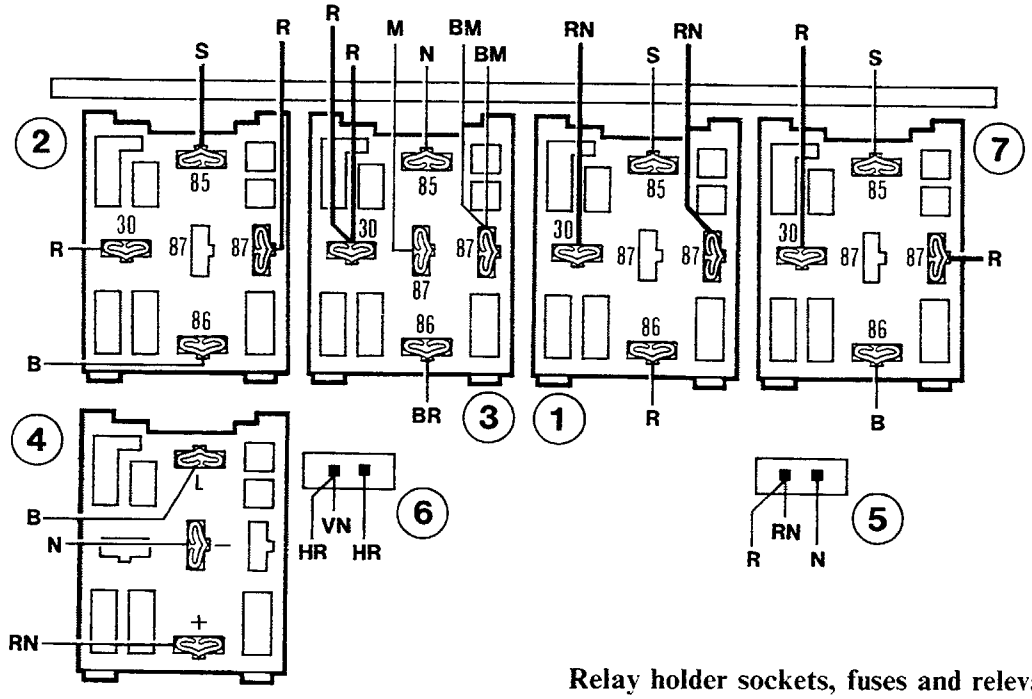
P1L04CL02

LOCATION ON VEHICLE OF AUXILIARY DEVICES FUSES AND RELAY FEEDS

1. Relay for radiator cooling fan 1st speed
2. Dipped headlamps remote control switch
3. Fog lamps relay
4. Direction indicators/hazard warning lights intermittent device
5. Radiator cooling fan 25 A protective fuse
6. Rear fog lamps 7.5 A protective fuse
7. Relay for radiator cooling fan 2nd speed

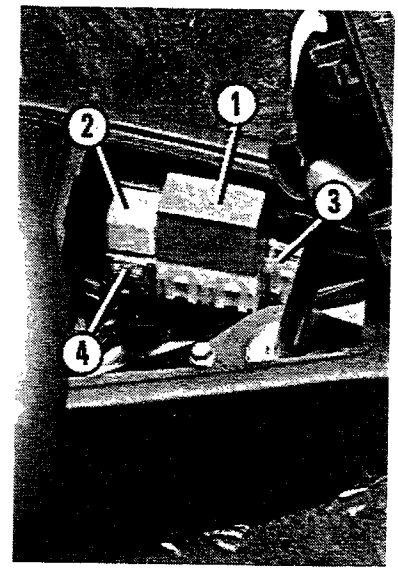
Colours of sockets and relays and fuse amperage

1 - Black and black
2 - White and yellow
3 - White and grey
4 - Grey and brown
5 - White and 25 A fuse
6 - Black and 7.5 A fuse
7 - White and yellow



Relay holder sockets, fuses and relevant cables

P1L04CL03



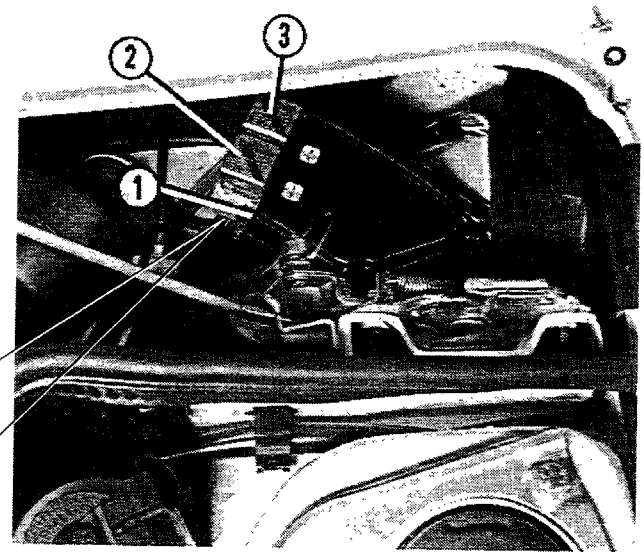
P1L05CL01

Devices located on gear lever housing central tunnel

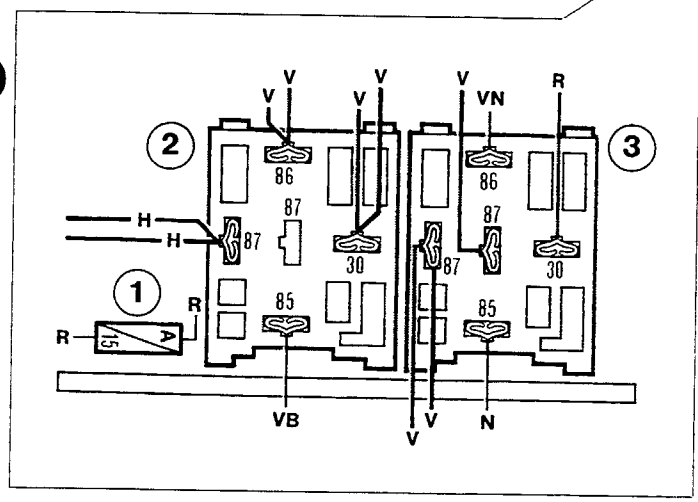
1. Centrl locking control unit - white sockets
2. Front electric windows relay feed - white socket
3. Electric front windows geared motors protective fuse - white socket, capacity 30 A
4. Central locking control unit protective fuse - black socket, capacity 15 A

Relays and fuses located in heater housing (with protective cover removed)

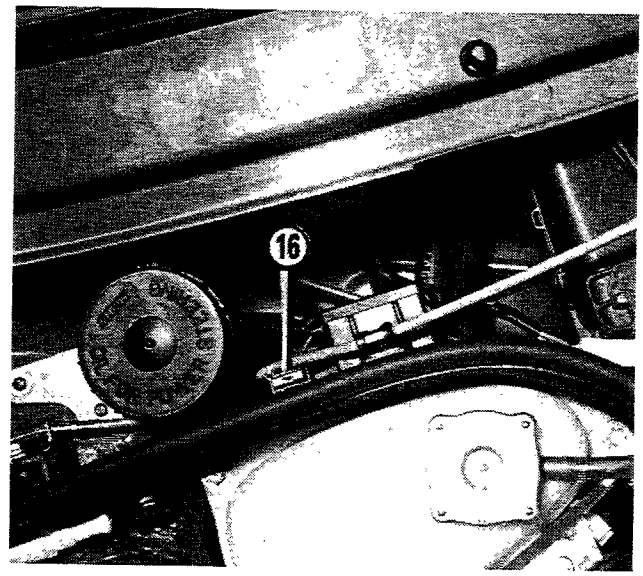
1. I.A.W. injection/ignition system protective fuse - black socket, capacity 15 A
2. Electric fuel pump relay feed - white socket
3. Injectors relay feed and electronic control unit - red socket



P1L05CL02



P1L05CL04



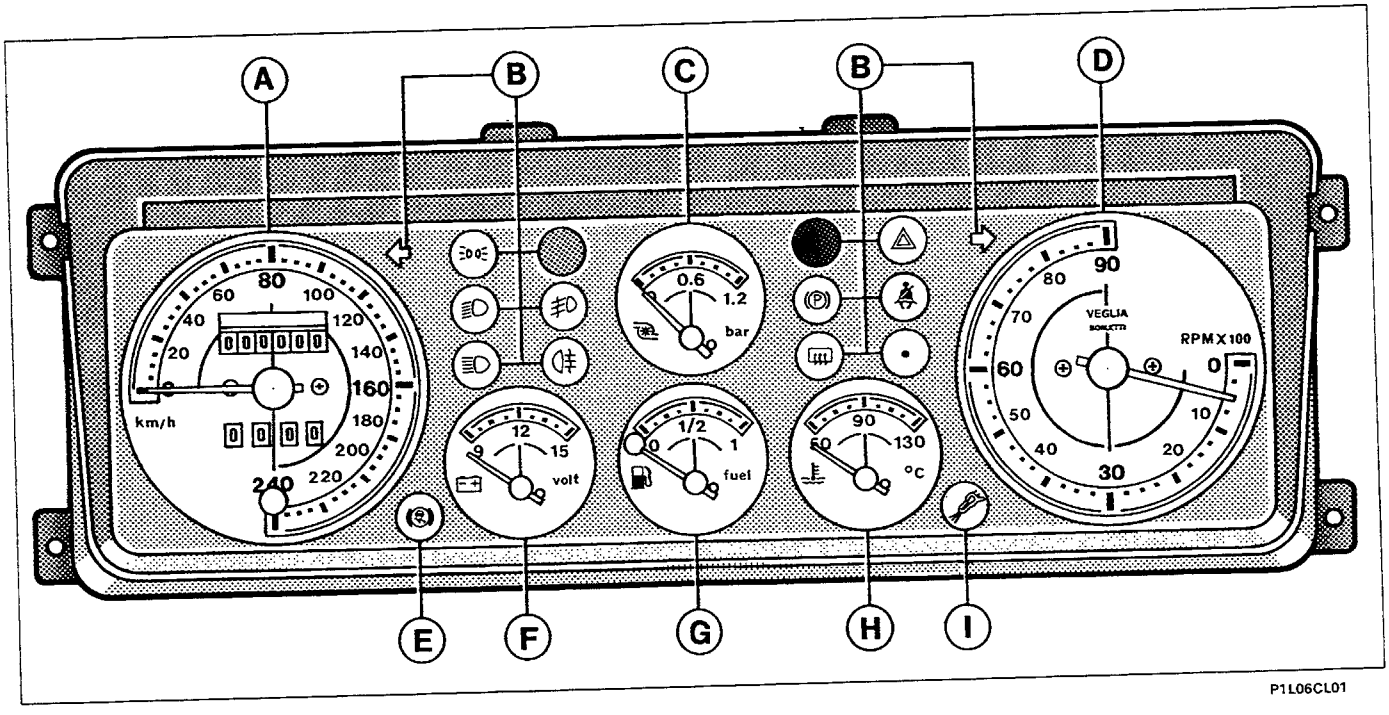
P1L05CL03

Location of A.B.S. anti-lock braking system protective fuse

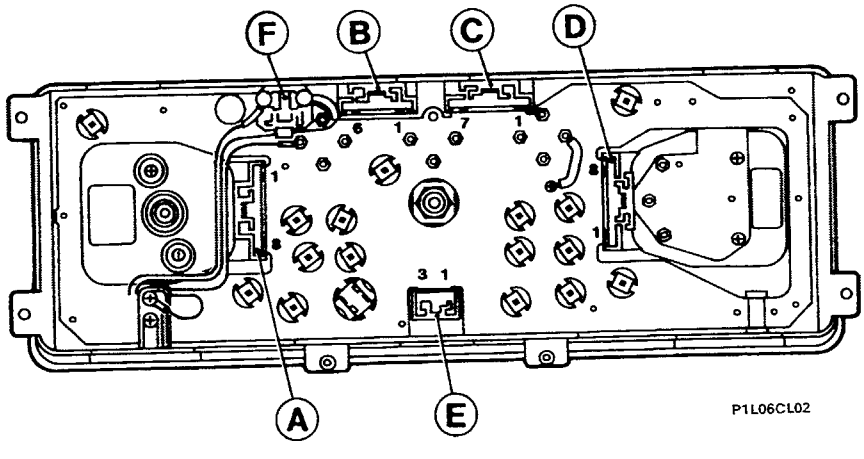
55.

INSTRUMENT PANEL Version with Control System

A. Speedometer and milometer.
B. Warning lights: (from left to right, from top to bottom)
left: left direction indicators, side lights, Control-System failure (RED), dipped beam headlamps, fog lights, main beam headlamps, rear fog lamps.
right: Control-System starter go ahead (GREEN), hazard warning lights, right direction indicators, handbrake applied, seat belt not fastened, heated rear windscreen, spare.



C. Supercharging pressure
D. Rev counter
E. Warning light signalling incorrect operation of anti-lock brakes (ABS)
F. Voltmeter.
G. Fuel level gauge.
H. Coolant temperature gauge
I. Warning light signalling "emergency" operation of injection/ignition system.



Terminals for connectors connected to electrical system at the rear of the instrument panel

NOTE *The letters identify the connectors for connection to the electrical system; the numbers for the terminals are identical to those in the Wiring diagrams.*

Connectors for terminals at the rear of the instrument panel with control system

CONNECTOR A		
Cable colour	N°	COMPONENT CONNECTED
N	1	Instrument general earth to the right front loom on the bodyshell
GN	2	Instrument panel lights: from terminal UT for the dimmer switch
HR	3	Rear fog lamps warning light: from terminal 1, connector H, junction unit
MB	4	Fog lights warning light: from terminal 87 of the relay feed
VB	5	Main beam headlamps warning lights: from terminal 7, connector I for the junction unit (fuse 7)
H	6	Dipped beam headlamps warning light: from terminal 2, connector C for the junction unit (fuse 5)
G	7	Side lights warning light: from terminal 2, connector M for the junction unit (fuse 4)
AN	8	Left direction indicators warning light: from connector A for the steering column switch unit

CONNECTOR B		
Cable colour	N°	COMPONENT CONNECTED
MB	1	Fuel reserve warning light: to terminal 1, connector E for the Control System control module
HR	2	Coolant overheating warning light: from terminal 2, connector E for the Control System control module
V	3	Green starter go ahead signal: from terminal 3, connector E Control System, via the diagnostic socket
RV	4	+ green and red Control System warning light: from terminal 4, connector E for the Control System control module via the diagnostic socket
RN	5	Control System red warning light: from terminal 5, connector E for the Control System control module via the diagnostic socket
G	6	Supply outlet for Control System display panel light

CONNECTOR E SPARE

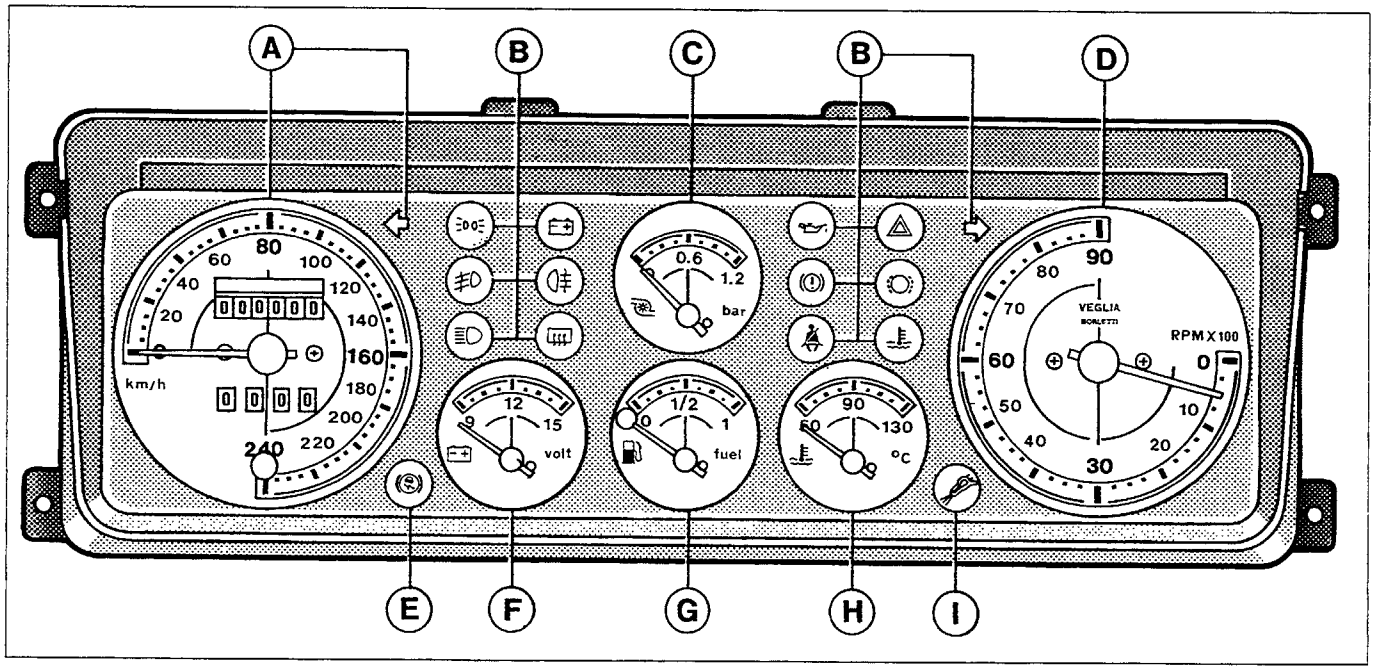
CONNECTOR C		
Cable colour	N°	COMPONENT CONNECTED
GR	1	Warning light signalling emergency operation of injection/ignition system: from terminal 12, IAW control unit
AR	2	Engine coolant temperature: from the sender unit on the engine
VB	3	+ for warning light signalling emergency operation of injection/ignition system: from terminal 20 for the IAW control unit
BN	4	Heated rear windscreen warning light: from terminal 9, connector D for the junction unit (fuse 11)
R	5	+ instrument supply: from terminal 10, connector I for the junction unit (fuse 1)
V	6	Fuel level gauge: from the sender unit via the junction unit (2I and 2L)
M	7	Fuel reserve warning light: from the sender unit via the junction unit (3I and 3L)

CONNECTOR D		
Cable colour	N°	COMPONENT CONNECTED
AB	1	Right direction indicators warning light: from the steering column switch unit via the junction unit (4C and 2B)
AR	2	Hazard warning lights warning light: from terminal L of the hazard warning lights switch
H	3	Seat belt warning light: from the micro-switch on the closure device.
-	4	Spare
HN	5	Engine coolant overheating warning light: from the sender unit on the engine
BR	6	Hnadbrake warning light: from terminal L for the intermittent device.
-	7	Spare
AN	8	Rev counter signal: from terminal 1 of the ignition coil power module.

CONNECTOR F		
Cable colour	N°	COMPONENT CONNECTED
V	1	Speedometer signal coming from the impulse generator located on the differential.
G	2	+ supply for the impulse generator: coming from the ignition controlled by a key via the junction unit (fuse no. 1) and terminal 5 for connector C of the instrument panel.

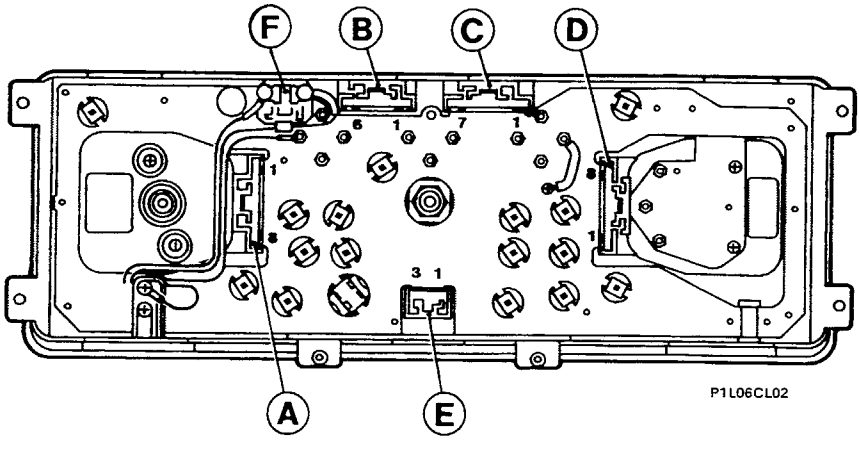
INSTRUMENT PANEL Version without Control System

A. Speedometer and milometer.
B. Warning lights: (from left to right, top to bottom)
left: left direction indicators, side lights, battery recharging, fog lights, rear fog lamps, main beam headlamps, heated rear windcreen.
right: insufficient engine oil pressure, hazard warning lights, right direction indicators, handbrake applied and insufficient brake fluid level, front brake pad wear, seat belts not fastened, engine coolant overheating.



P1L08CL01

C. Pressure gauge indicating engine supply pressure.
D. Rev counter.
E. ABS anti-lock brakes failure warning light
F. Voltmeter.
G. Fuel level gauge.
H. Engine coolant temperature gauge.
I. Warning light indicating "emergency" operation of injection/ignition system



P1L06CL02

Terminals for connectors connected to vehicle's electrical system at the rear of the instrument panel

NOTE *The letters denote the connectors connected to the electrical system; the numbers for the terminals are identical to those in the wiring diagrams.*

Connectors for terminals at the rear of the instrument panel without control system

CONNECTOR A		
Cable colour	N°	COMPONENT CONNECTED
N	1	Instrument general earth: to the right front loom on the bodyshell
GN	2	Instrument panel light: from terminal UT for the dimmer switch
HR	3	Heated rear windscreen warning light: from terminal 9, connector I for the junction unit (fuse 11)
MB	4	Rear fog lamps warning light: from terminal 1, connector H for the junction unit
VB	5	Main beam headlamps warning light: from terminal 7, connector I for the junction unit (fuse 7)
H	6	Fog lamps warning light: from terminal 87 for the relay feed
G	7	Side lights warning light: from terminal 2, connector M for the junction unit (fuse 4)
AN	8	Left direction indicators warning light: from connector A for the steering column switch unit

CONNECTOR B SPARE

CONNECTOR C		
Cable colour	N°	COMPONENT CONNECTED
GR	1	Warning light signalling emergency operation of injection/ignition system: from terminal 12, IAW control unit
AR	2	Engine coolant temperature gauge: from the sender unit on the engine
VB	3	+ for warning light signalling emergency operation of injection/ignition system: from terminal 20 for the IAW control unit
BN	4	Seat belt not fastened warning light: from the micro-switch on the closure device.
R	5	+ instrument supply: from terminal 10, connector I of the junction unit (fuse 1)
V	6	Fuel level gauge : from the sender unit via the junction unit (2I and 2L)
M	7	Fuel reserve warning light: from the sender unit via the junction unit (3I and 3L)

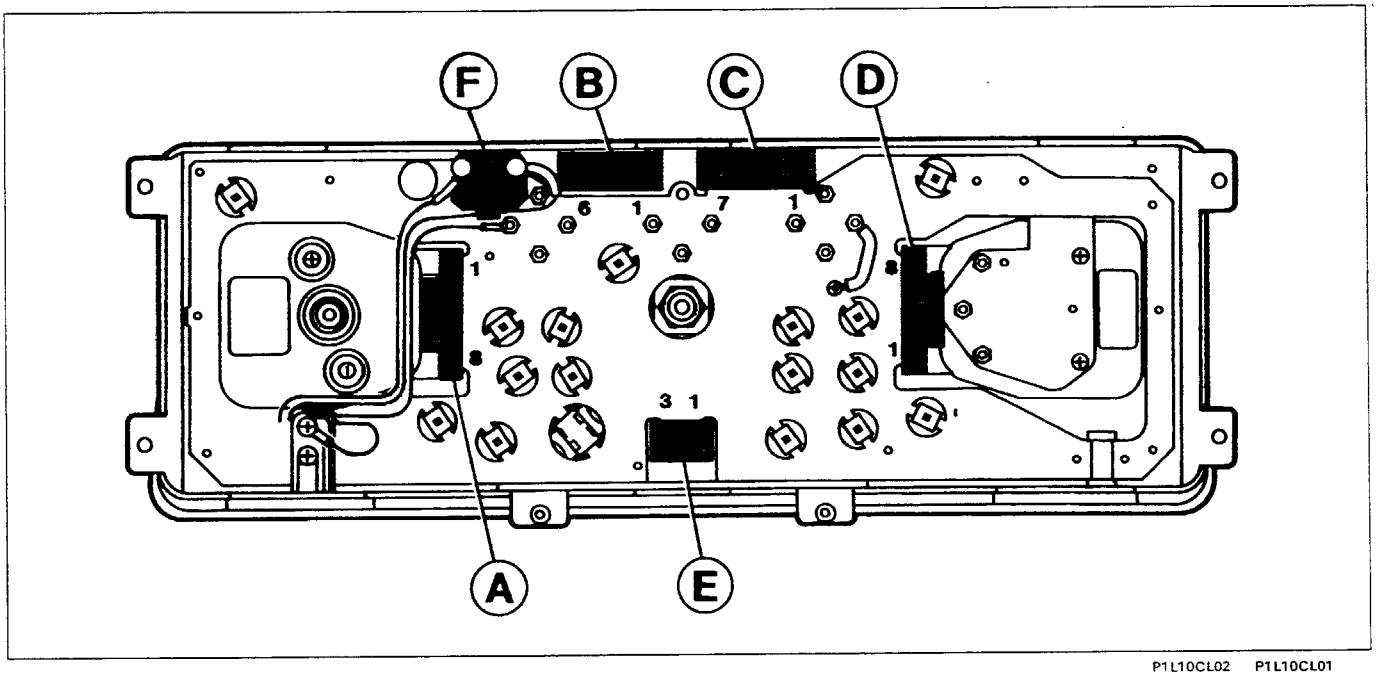
CONNECTOR D		
Cable colour	N°	COMPONENT CONNECTED
AB	1	Right direction indicators warning light: from the steering column switch unit via the junection unit (4C and 2B)
AR	2	Hazard warning lights warning light: from terminal L for the hazard warning lights switch
SN	3	Front brake pad wear warning light
-	4	Spare
HN	5	Coolant overheating warning light: from the sender unit located on the engine
BR	6	Handbrake applied and insufficient brake fluid level warning light
-	7	Spare
AN	8	Rev counter signal: from terminal 1 for the ignition coil power module

CONNECTOR E		
Cable colour	N°	COMPONENT CONNECTED
BN	1	Battery recharging warning light: from + D of alternator.
A	2	Battery recharging warning light: from INT of ignition switch controlled by key
HV	3	Insufficient engine oil pressure warning light: from switch located on engine.

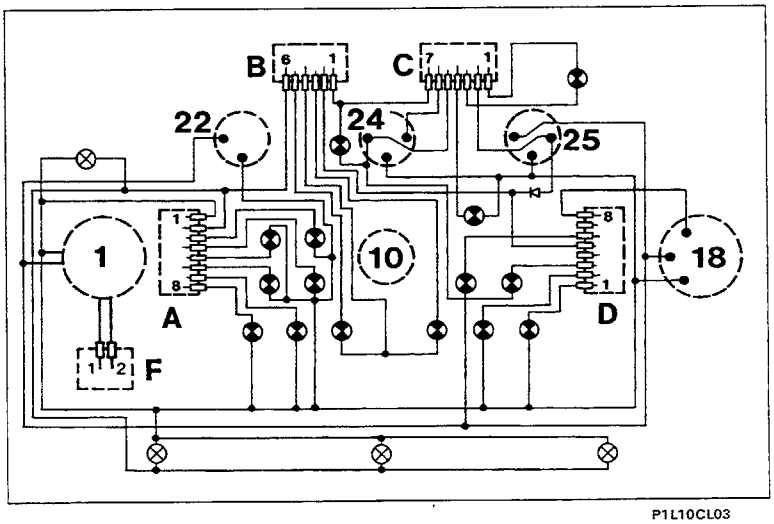
CONNECTOR F		
Cable colour	N°	COMPONENT CONNECTED
V	1	Speedometer signal coming from impulse generator located on differential.
G	2	+ supply for impulse generator: from ignition switch via junction unit, (fuse no. 1) and terminal 5, connector C for the instrument panel.

55.

Terminals at the rear of the instrument panel to be connected to vehicle electrical system connectors



P1L10CL02 P1L10CL01

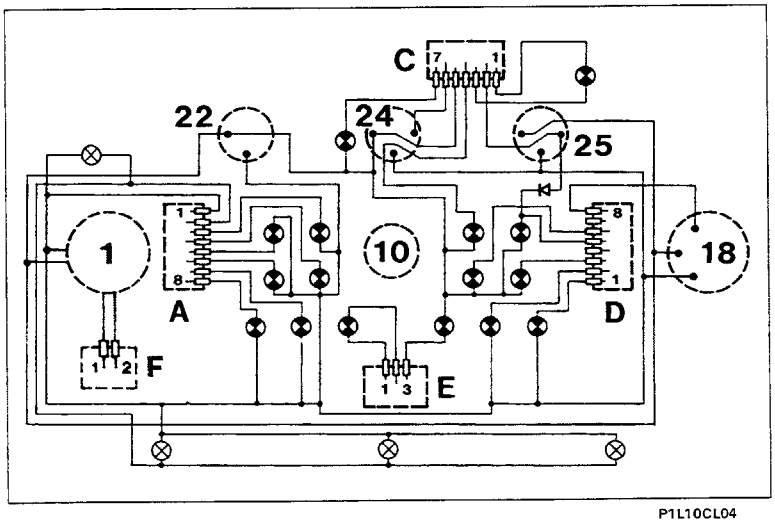


P1L10CL03

Wiring diagram showing instrument panel internal connections for versions with Control-System

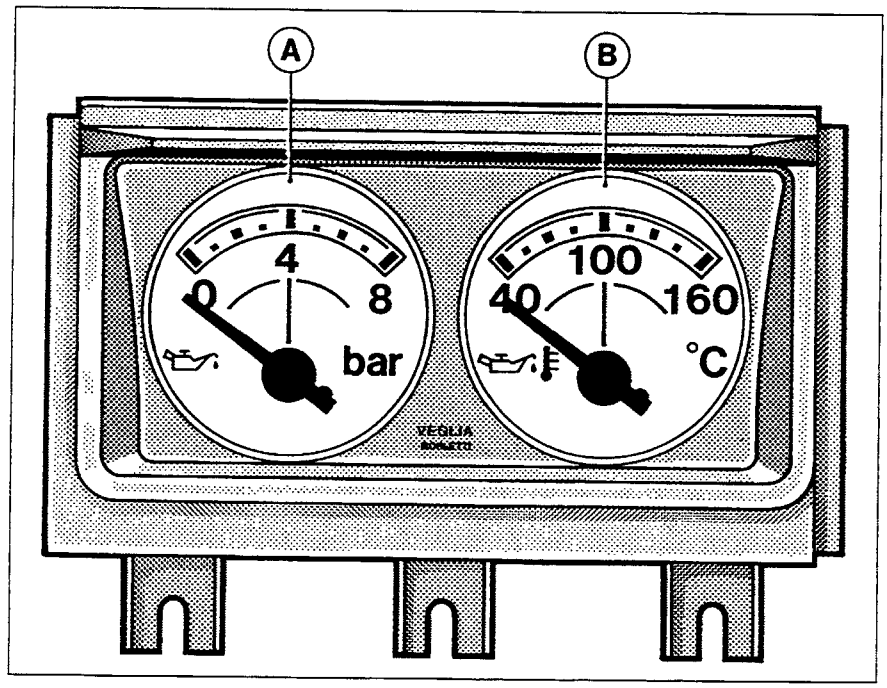
1. Electronic speedometer
10. Engine supply pressure gauge
18. Electronic rev counter
22. Voltmeter measuring electrical system voltage
24. Fuel level gauge
25. Engine coolant temperature gauge

A - B - C - D - E - F
Terminals for connection with vehicle electrical system.The small numbers denote the terminals



P1L10CL04

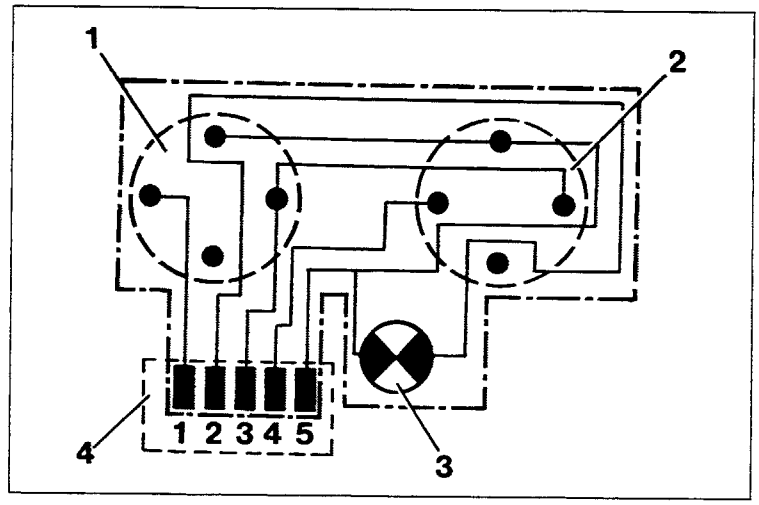
Wiring diagram showing internal connections for instrument panel on versions without Control System



P1L11CL01

Combined instrument for checking engine oil pressure and temperature

A. Engine oil pressure gauge.
B. Engine oil temperature gauge.



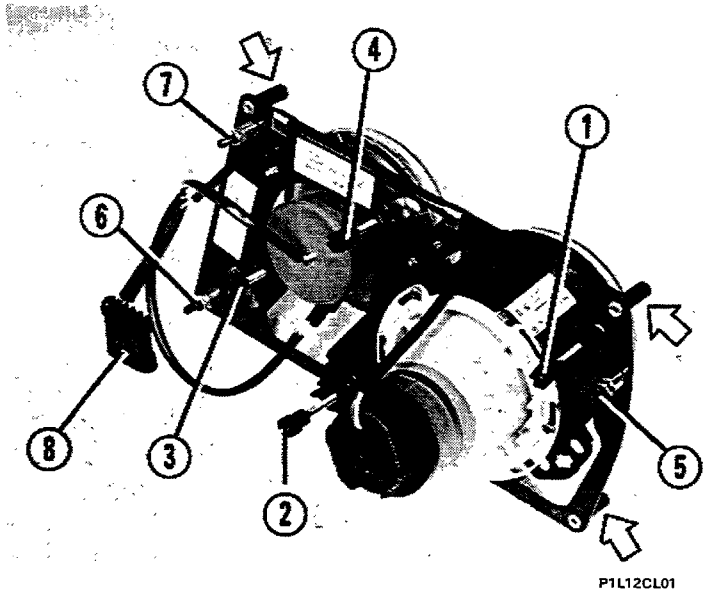
P1L11CL02

Combined instrument rear terminals for connection to vehicle electrical system connectors

1. Engine oil pressure gauge
2. Engine oil temperature gauge
3. Combined instrument light bulb.
4. Combined instrument connector for connection to electrical system.

CONNECTOR C		
cable colour	**N°**	**COMPONENTS CONNECTED**
A	1	Engine oil pressure gauge: from the sender unit on the engine.
GN	2	Instrument panel light cable.
H	3	+ Common instrument supply: from terminal 4, connector M of the junction unit (fuse no. 1).
B	4	Engine oil temperature gauge: from the sender unit on the engine.
N	5	Return to the left front earth cable loom.

NOTE *The terminals are identified by the same numbers and letters as used in the WIRING DIAGRAMS.*



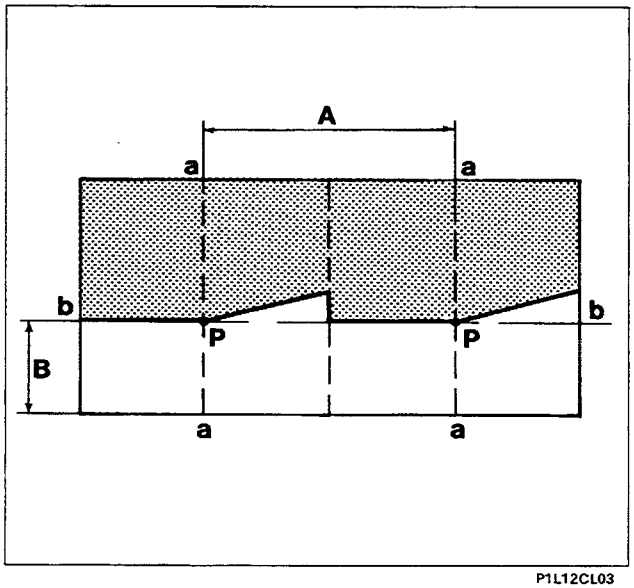
P1L12CL01

REAR LIGHT CLUSTER AND PLATE ANCHORING IT TO THE BODYSHELL

Key

1. Screw for adjusting dipped beam headlamp in a horizontal direction.
2. Screw for adjusting dipped beam headlamp in a vertical direction.
3. Screw for adjusting main beam headlamp in a vertical direction.
4. Screw for adjusting main beam headlamp in a horizontal direction.
5. 6. 7. Bolts fixing plate anchoring light cluster to bodyshell.
8. Electrical connector for side lights, dipped headlamps and main beam headlamps.

The arrows show the tabs for fixing the enigne compartment cooling grille to the anchorage plate.



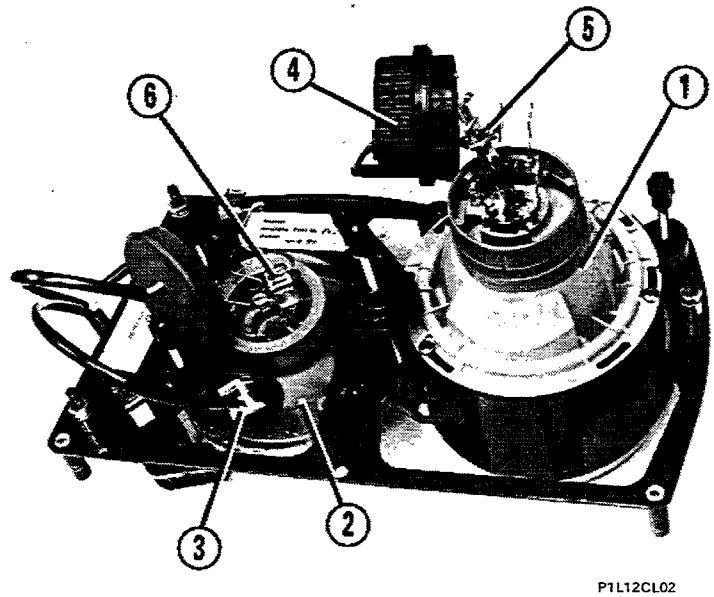
P1L12CL03

HEADLAMP ALIGNMENT

On a screen 10 m away, the demarcation line between the dark area and that lit up by the dipped beam headlamp (b-b) should be 12 cm lower than distance B for a new vehicle and 10 cm for a vehicle which has been run in.

Headlamp alignment diagram

A. Distance between centres of headlamp beams.
B. Height from the ground to the centre of the beams, measured during the alignment.



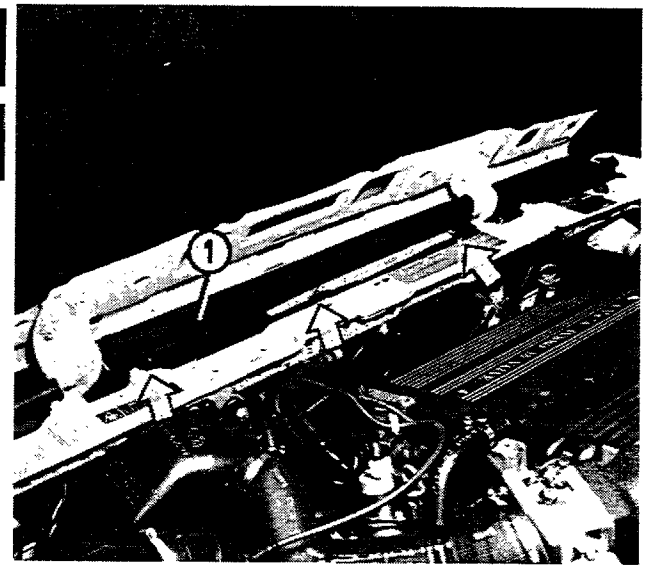
P1L12CL02

Key

1. Lamp with convex lens for dipped headlamp.
2. Lamp for main beam headlamp
3. Side lights bulb holder socket.
4. Dust cover for dipped beam headlamp.
5. Halogen bulb for dipped headlamp.
6. Halogen bulb for main beam headlamp.

The halogen bulbs should not be touched with ones hands because this could damage the glass and result in a rapid deterioration of the actual brightness of the bulb.

REMOVING-REFITTING LIGHT CLUSTER

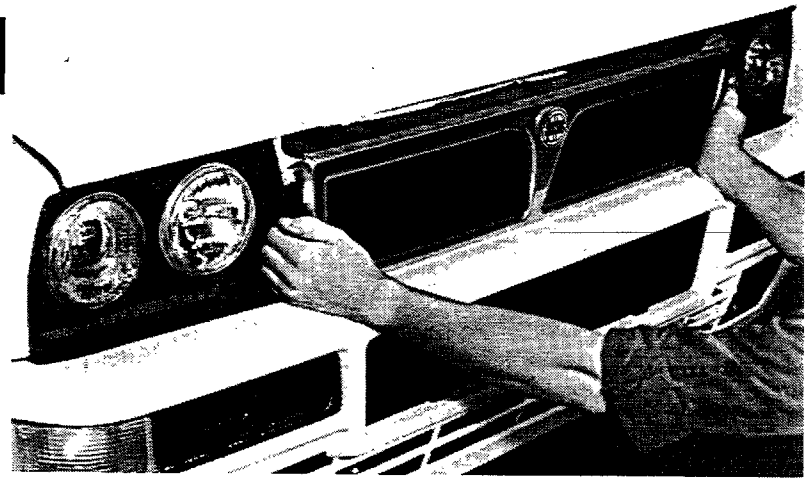


P1L13CL01

- unstick the rubber protection (1) on the engine compartment front cross member;
- removing upper bolts - shown by the arrows - fixing the grille to the above mentioned cross member;

Extracting radiator grille

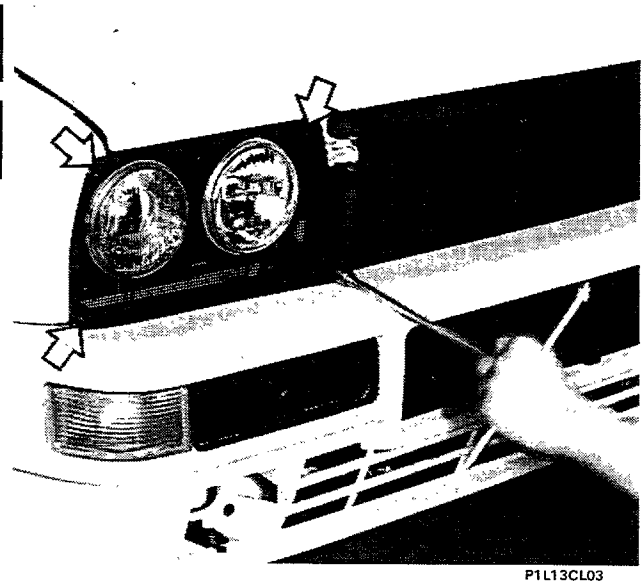
In order to facilitate this operation, firstly loosen the four hexagonal head bolts (shown by the arrows in the photo below) fixing the engine compartment radiator grille.



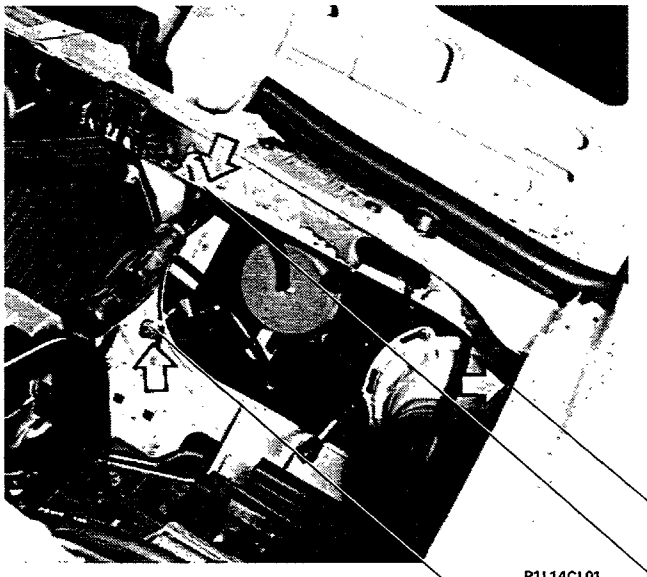
P1L13CL02

Completion of removal of engine compartment radiator grille

The grille is fixed to the light cluster anchorage plate by four bolts with hexagonal heads.



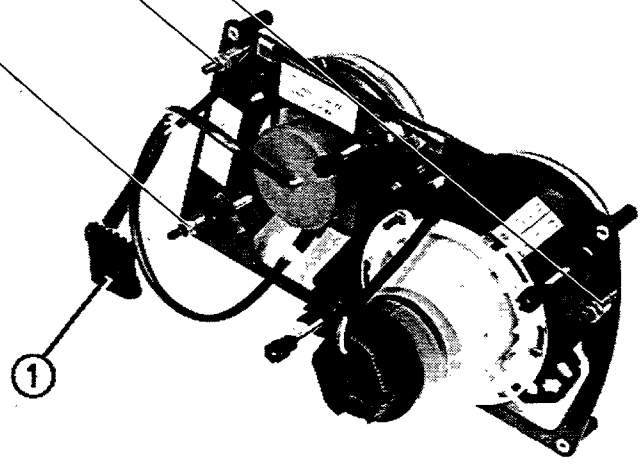
P1L13CL03



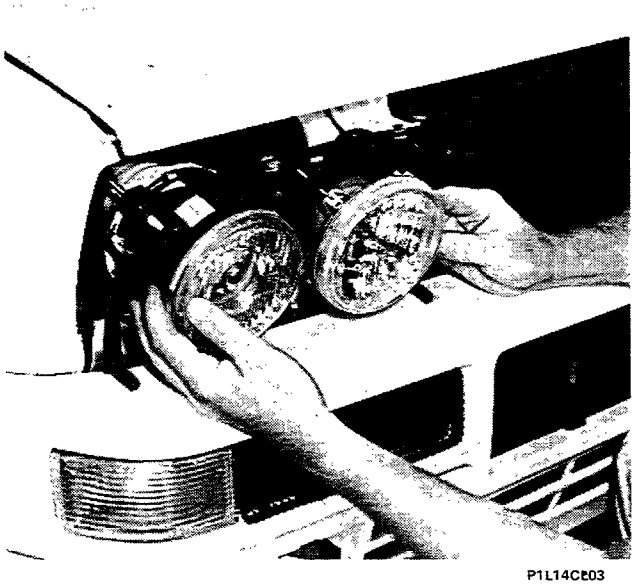
P1L14CL01

- disconnect the multiple connector for the side lights, dipped headlamps and main beam headlamps (1);

Removing bolts fixing light cluster anchorage plate to the bodyshell



P1L14CL02

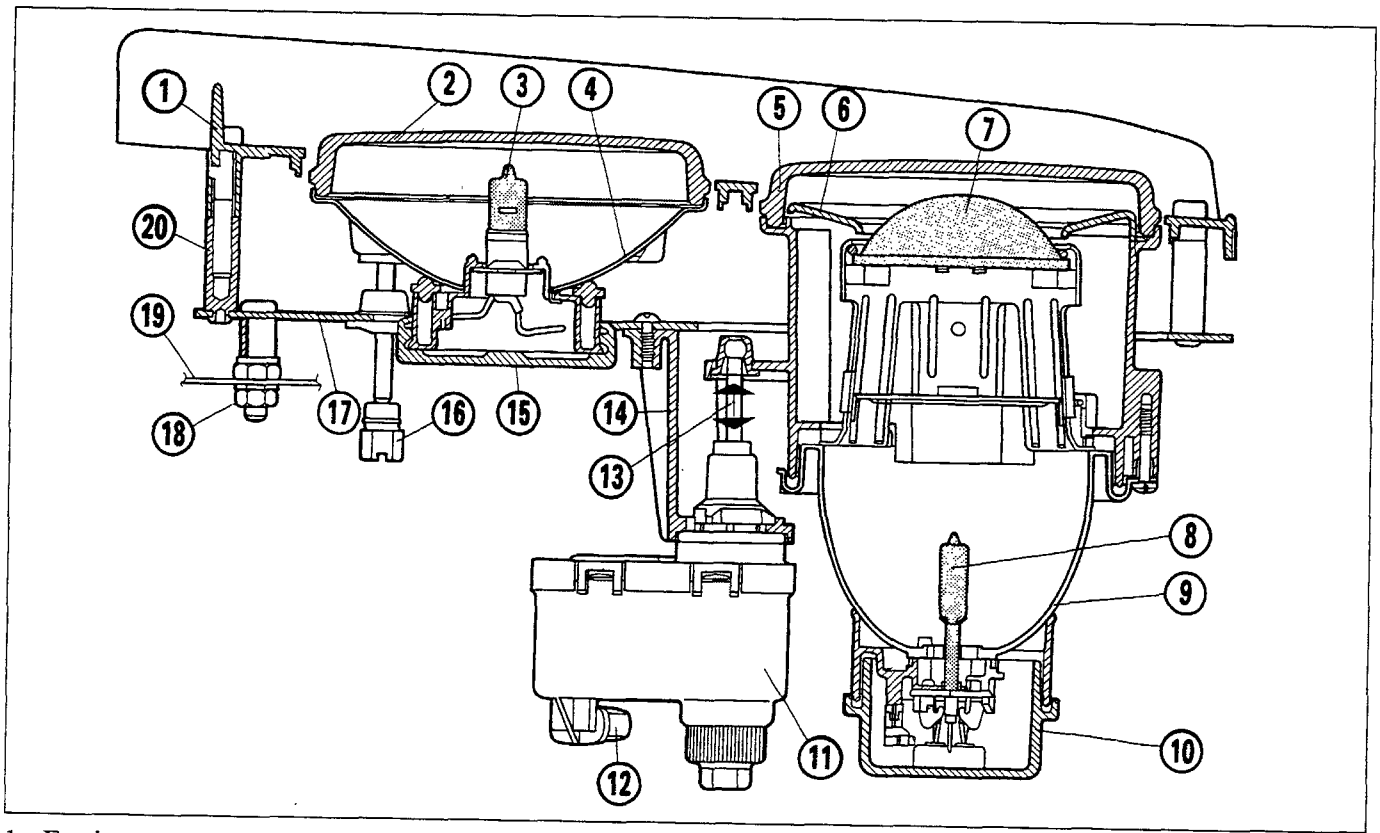


P1L14CE03

Removing anchorage plate complete with light cluster from its housing in the bodyshell

To replace an individual light, firstly remove the light cluster anchorage plate from the vehicle and then adjust the bolts fixing the light which requires replacing to the anchorage plate.

Section of front light cluster with convex lens for dipped beam headlamp, with view of actuator controlling electrical adjustment of dipped beam headlamp in vertical direction



1. Engine compartment radiator grille
2. Main beam headlamp glass
3. Main beam headlamp halogen bulb (it covers the side light bulb)
4. Main beam headlamp parabolic reflector
5. Dipped headlamp glass
6. Dipped headlamp outer reflector
7. Dipped headlamp convex lens
8. Dipped headlamp halogen bulb
9. Dipped headlamp semi-elliptical reflector
10. Dust cover
11. Stepping motor for electrical adjustment of dipped headlamp vertical alignment
12. Stepping motor electrical connector
13. Rod for electrically controlled vertical adjustment of dipped headlamp luminous beam
14. Stepping motor mounting bracket
15. Dust cover
16. Screw for initial vertical adjustment of main beam headlamp
17. Plate anchoring light cluster to bodyshell
18. Nut fixing anchorage plate to bodyshell
19. Bodyshell
20. Tabs fixing engine compartment radiator grille

Description

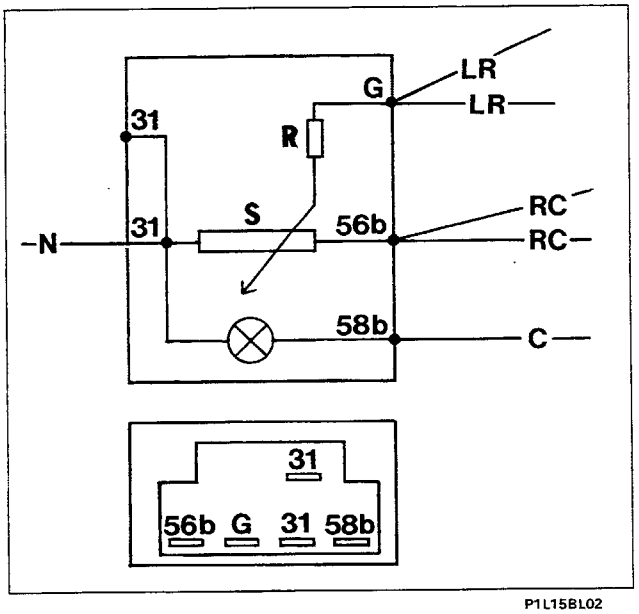
The front light cluster is available with either mechanical adjustment, described on page 12 or with the option (compulsory in certain Markets) of electrically operated vertical adjustment of the dipped beam headlamp alignment which can be carried out from the driver's seat by means of a 4 position control: 0, 1, 2, 3. This control varies the tension applied to an actuator composed of an electrical stepping motor (11) which is controlled by an electronic control unit in the actual motor which either lengthens or shortens the rod (13) which alters the angle of the headlamp axis.

The basic adjustment of the luminous beams should be carried out keeping the electrical control in position 0 and following the instructions given on page 12 concerning the vertical alignment of dipped beam headlamps.

To increase the brightness of the dipped beam headlamps there is a **convex lens in the second focus of the ellipse** (7) so that the semi-elliptical parabola (9) for this lamp can collect the greatest possible amount of light flux produced by the halogen bulb (8) with which it is equipped.

55.

DIAGRAM SHOWING ELECTRICALLY OPERATED VERTICAL ALIGNMENT OF DIPPED HEADLAMPS (LOCATED IN DASHBOARD) AND TERMINAL BOARD



Key

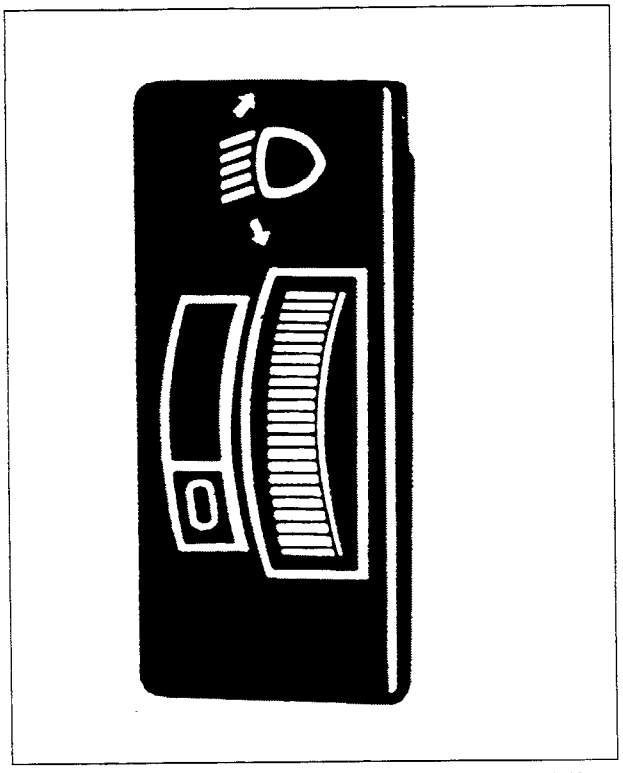
S. Potentiometer for adjusting supply voltage for stepping motor 4,7 KΩ - 0,5 W.
R. Resistor 390 Ω

Voltage measured between terminal G and 56b:

Position 0	4,6% of Vb
Position 1	8,8% of Vb
Position 2	14,4% of Vb
Position 3	39,4% of Vb
Final position	43,7 % of Vb

Tolerance ± 4%
Vb is the system voltage.

The electrically controlled vertical adjustment of the dipped headlamp beam is carried out from the driver's seat by regulating a potentiometer located in the centre tray which can assume the following positions: 0, 1, 2, 3. The control varies the voltage applied to the electrical stepping motor which is controlled by means of an electronic control unit contained in the actual motor.
The basic adjustment of the light beams should be carried out with the electrical control kept in position 0 and following the instructions given on page 12 concerning the vertical alignment of headlamps.



Electrically operated adjustment of headlamps from inside the vehicle according to the load transported optional

Control position	Load location
0	– driver only – driver and passenger in front seat
1	– 5 persons – driver and load in luggage compartment (max 75 kg)
2	– 5 persons and load in luggage compartment (max 75 kg) – driver and load in luggage compartment (max 200 kg)
3	– not to be used

For other load conditions, use intermediate positions.