

- Removing-refitting power unit

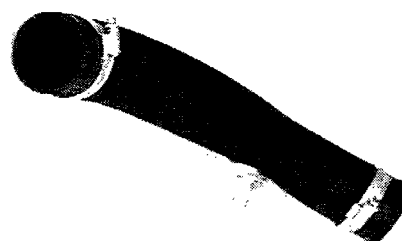
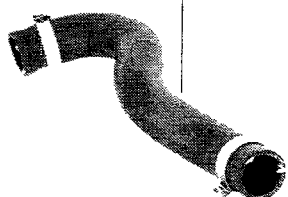
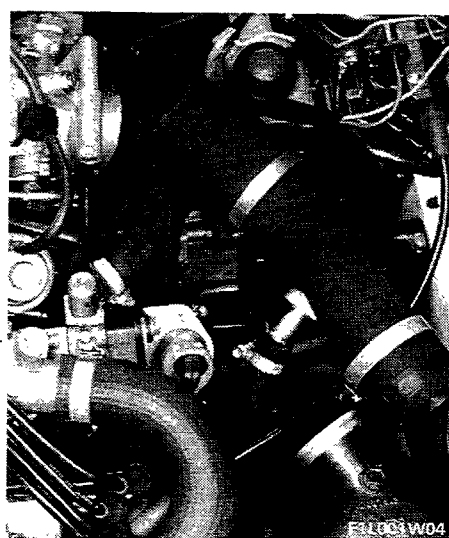
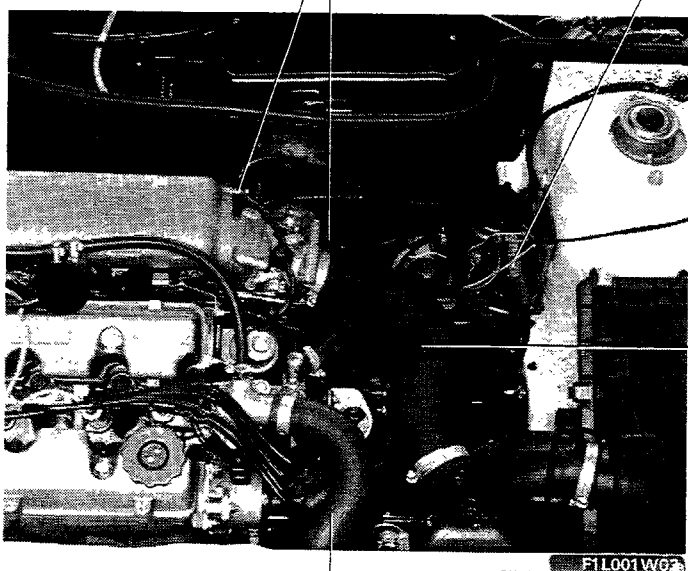
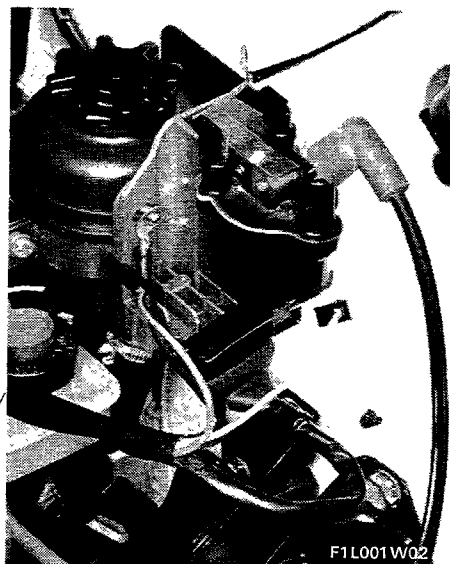
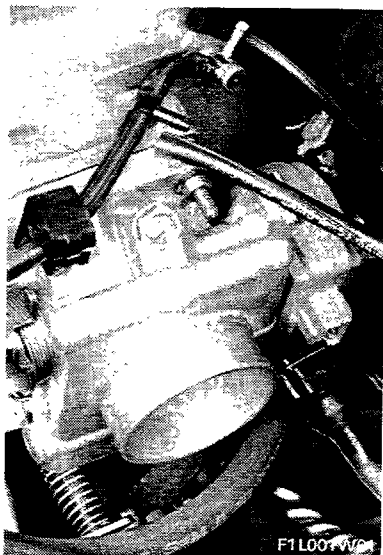
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Position the car on the lift.

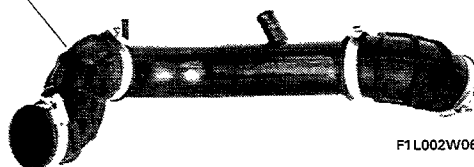
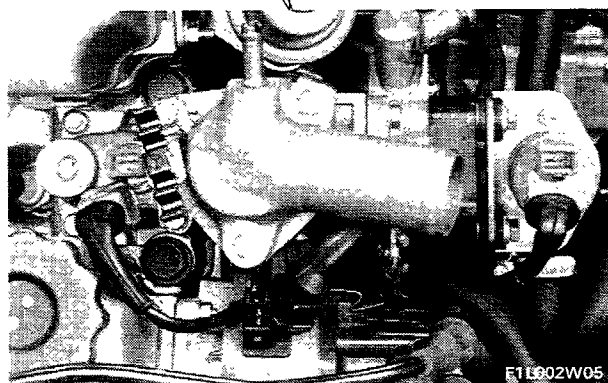
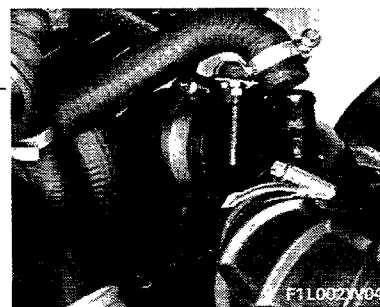
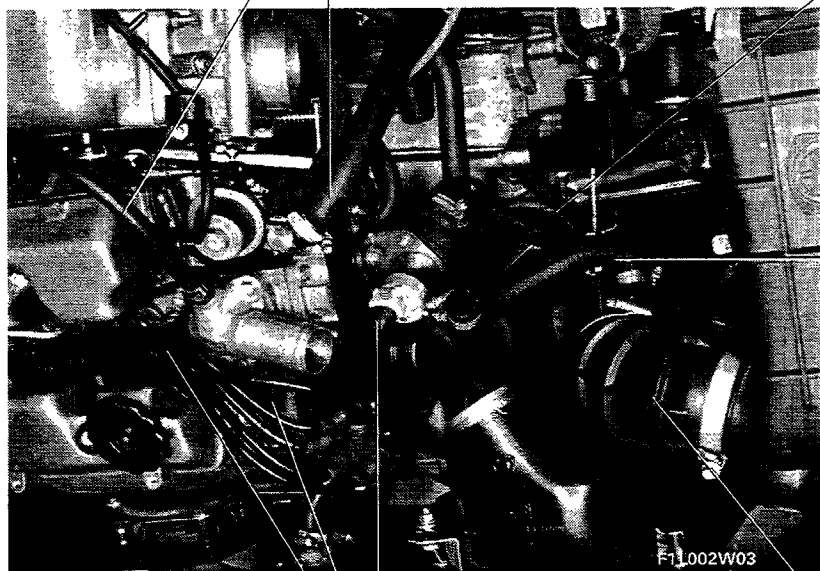
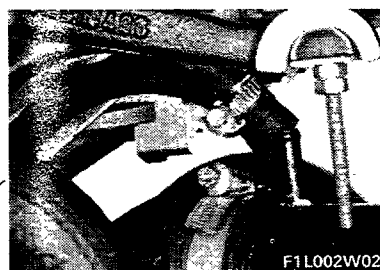
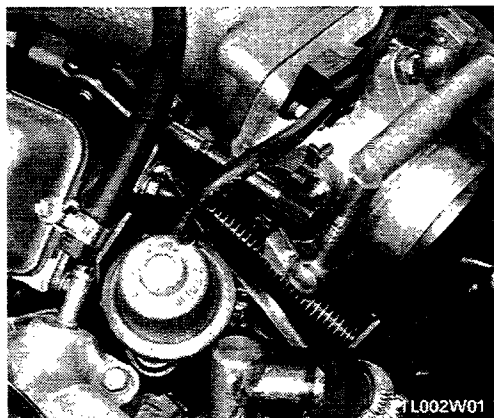
Proceed as follows:

- drain off the coolant;
- remove the bonnet;
- disconnect the negative lead from the battery;
- carry out the following operations:

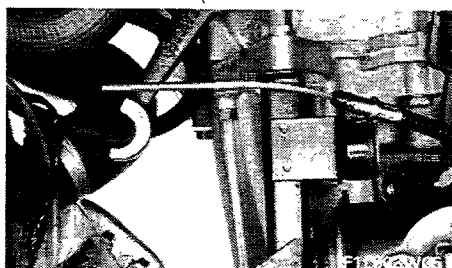
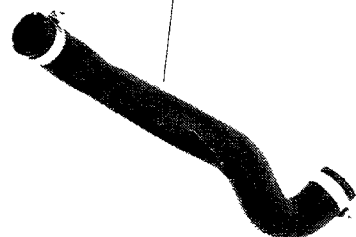
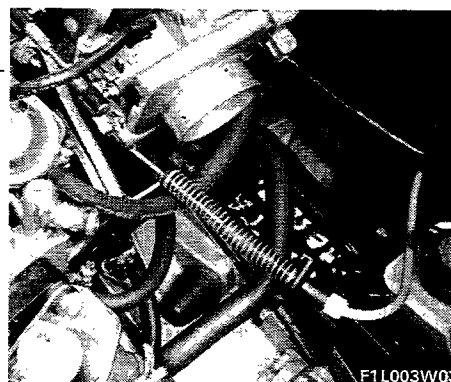
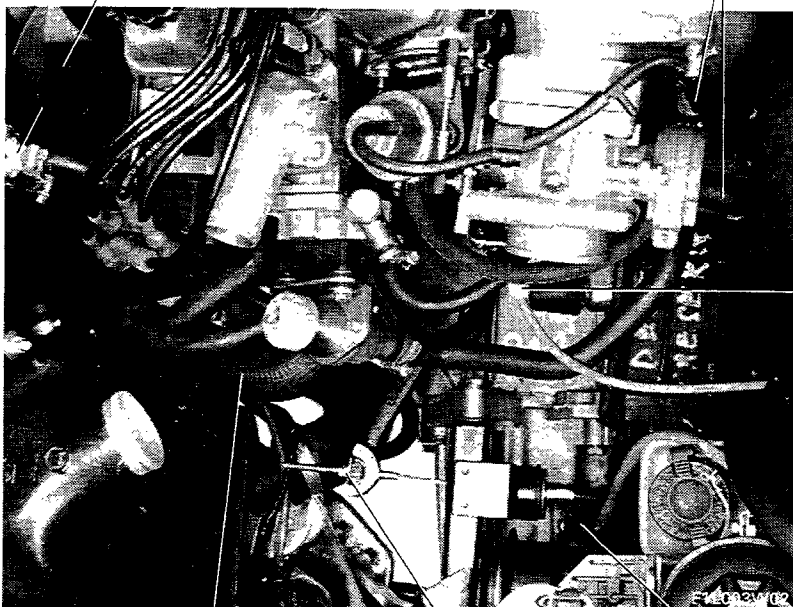
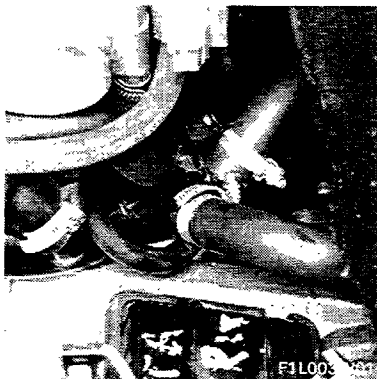
2000 i.e. turbo ENGINE



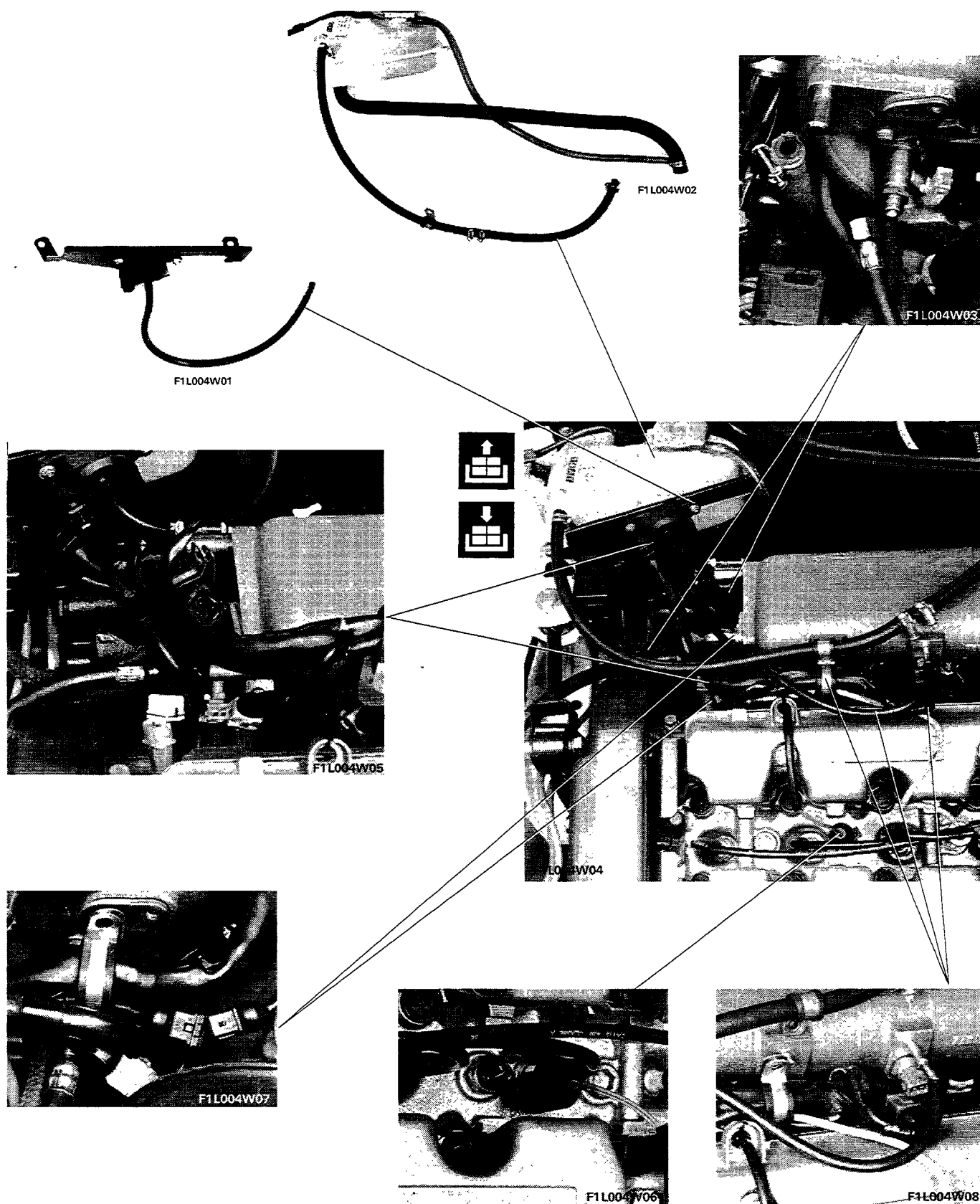
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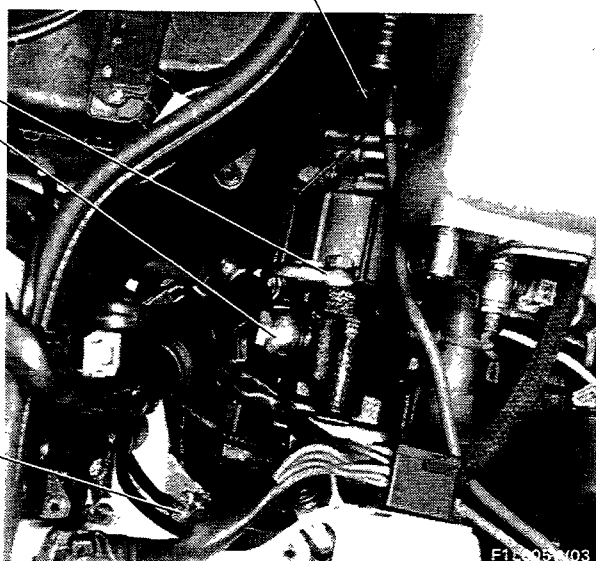
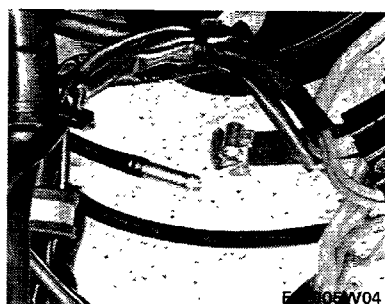
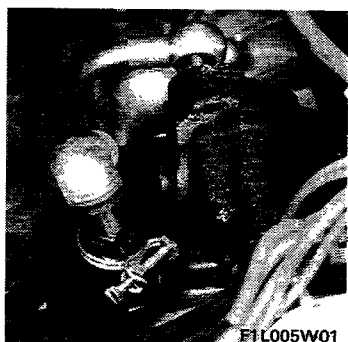


- Disconnect electrical connections from over-boost control solenoid;

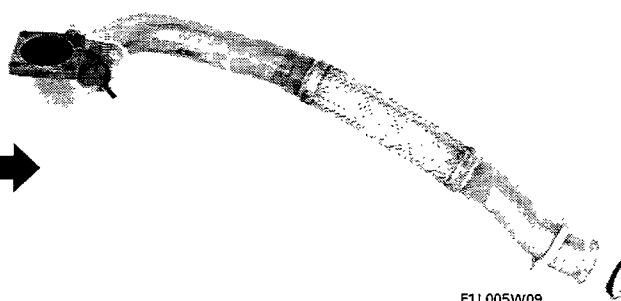
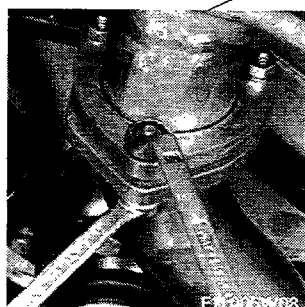
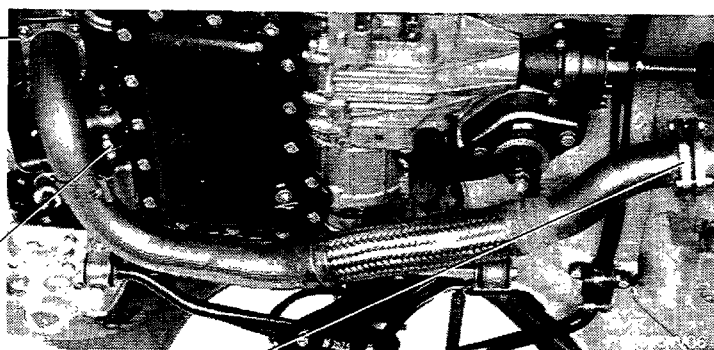


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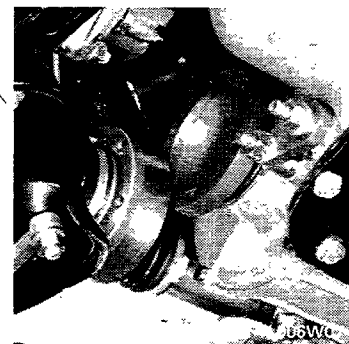
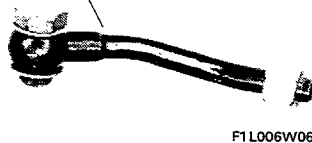
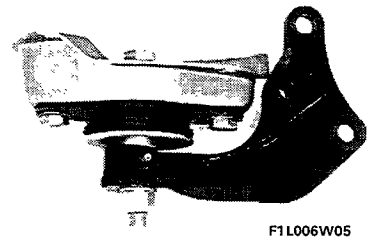
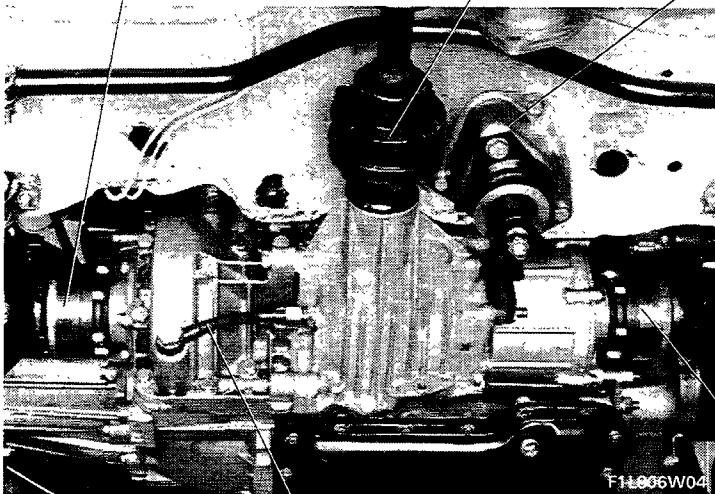
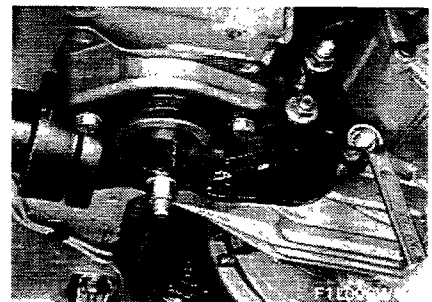
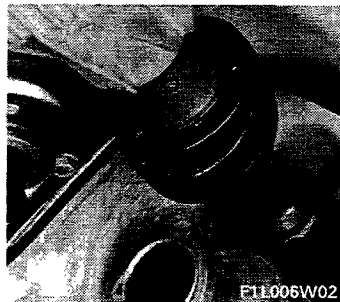
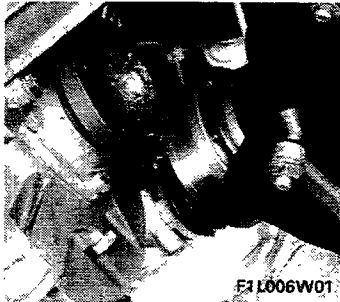


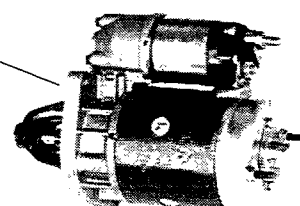
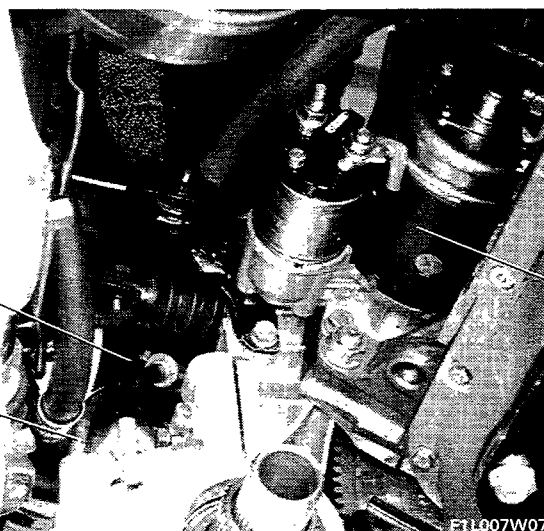
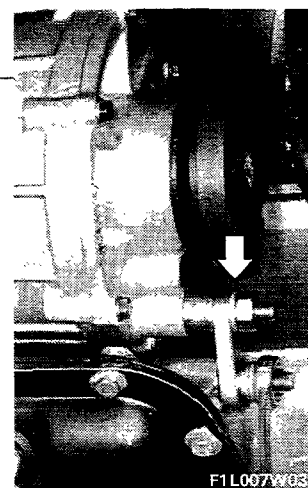
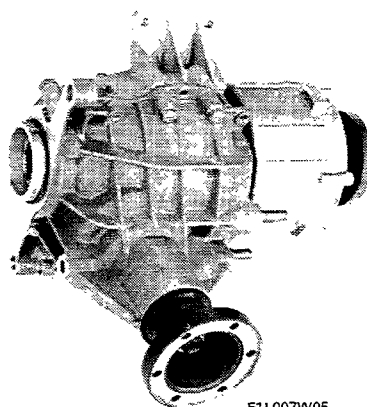
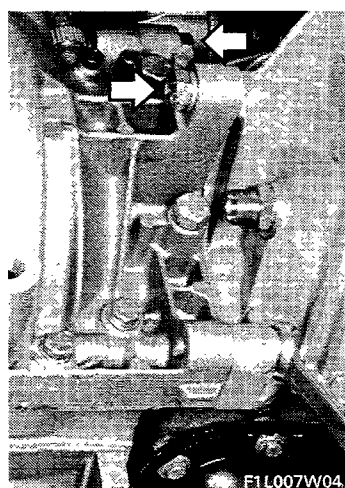
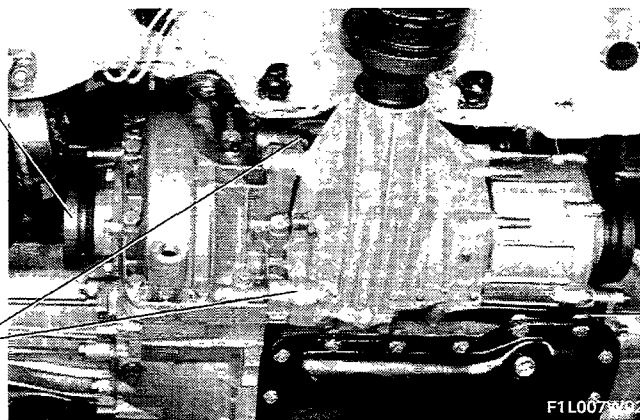
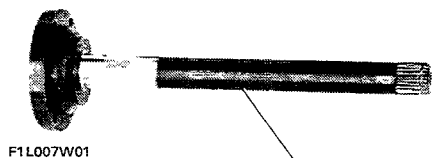


- remove the front wheels;
- raise the car and, working from underneath, drain the gearbox oil; then proceed as follows:

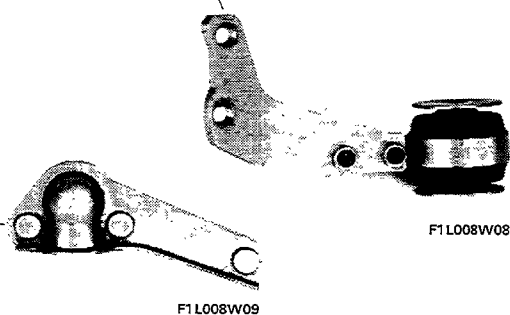
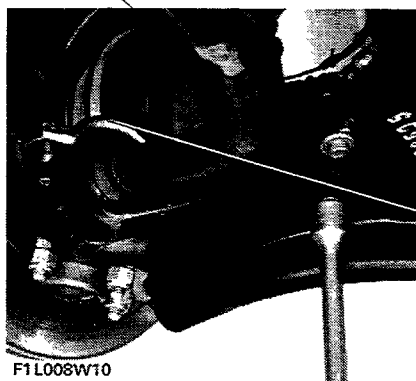
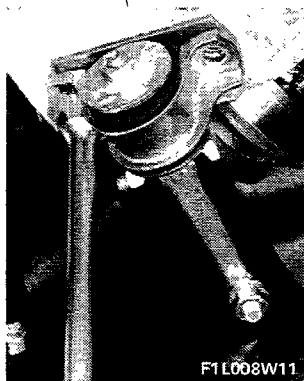
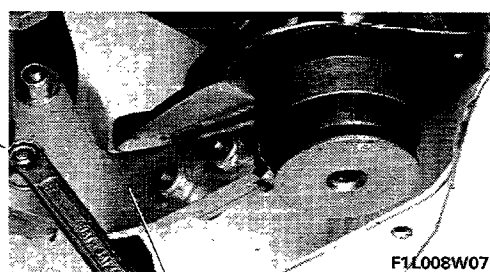
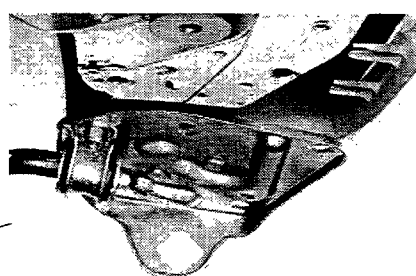
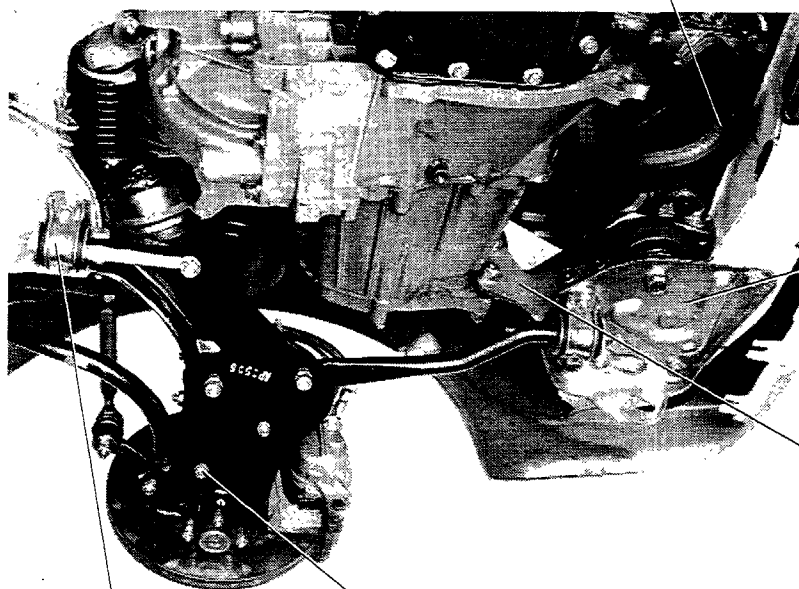
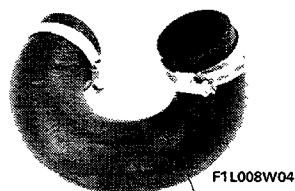
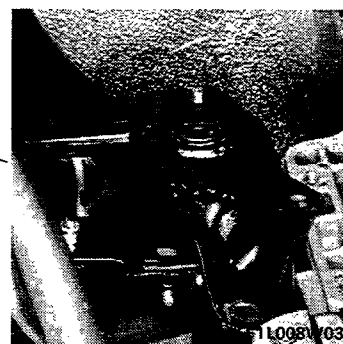
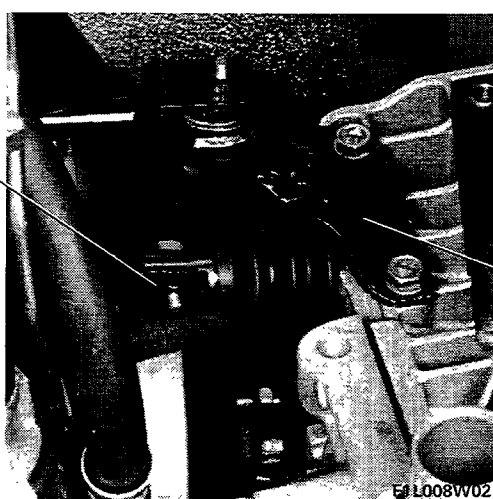


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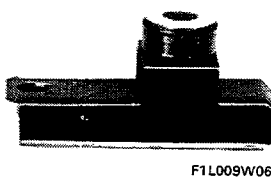
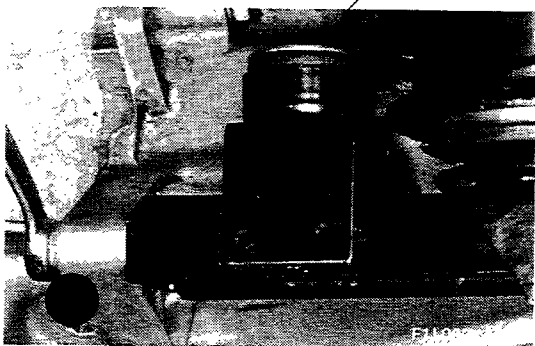
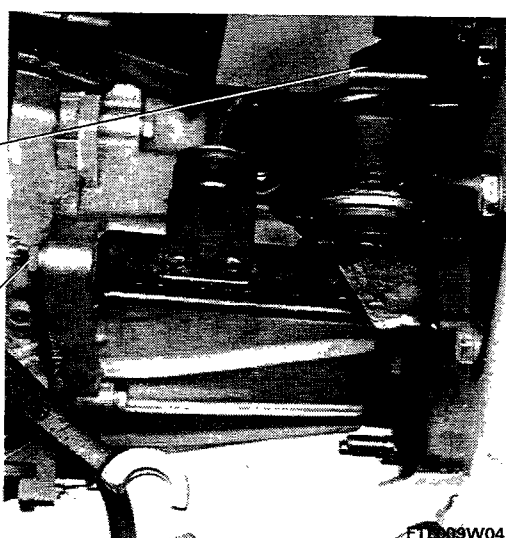
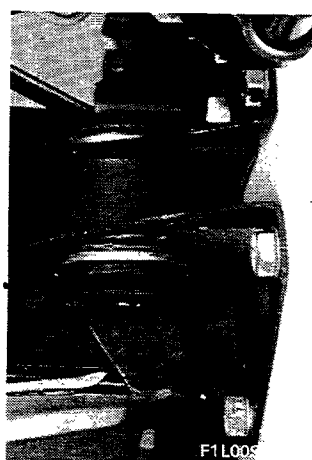
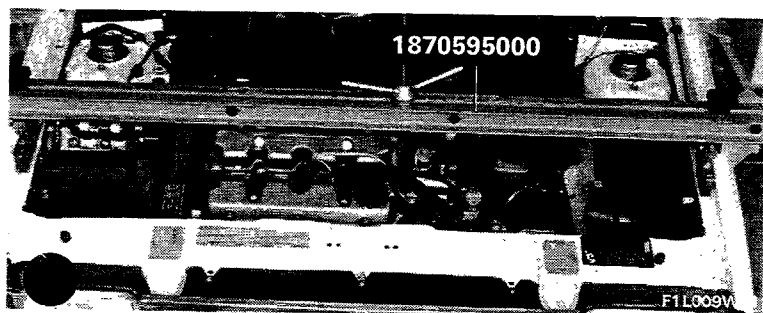


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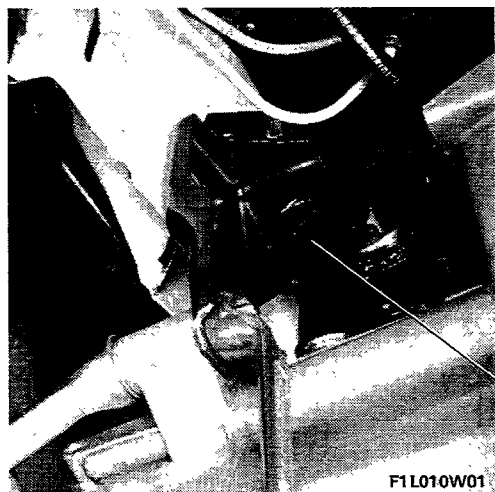
- disconnect electrical connections from alternator;
- lower lift, position crossbeam 1870595000 in engine compartment and support the engine using special hook;



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10.

- raise the lift and, working from beneath, proceed as follows:



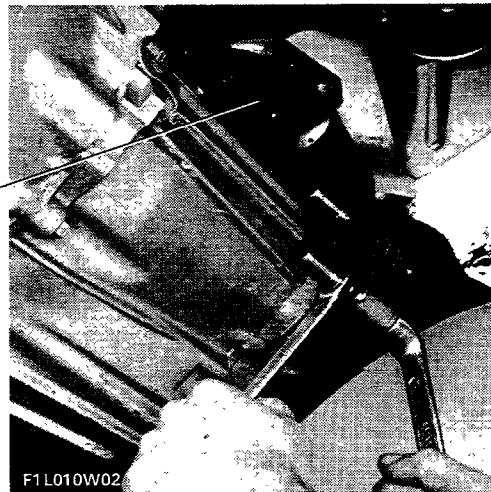
Removing-refitting rear gearbox support bracket



F1L010W02

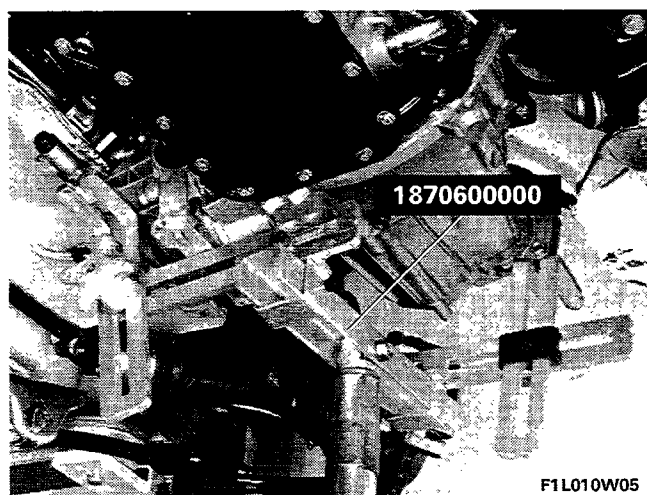


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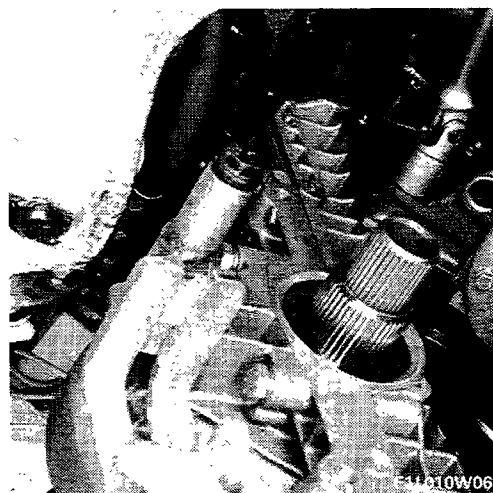
Removing-refitting front gearbox support bracket



F1L010W05



- remove flywheel cover retaining bolts, arrange gearbox-differential support 1870600000 as shown in the diagram and position the hydraulic jack;
- remove bolts retaining gearbox-differential unit to engine;

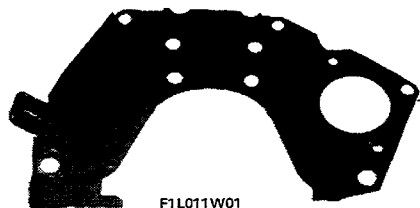


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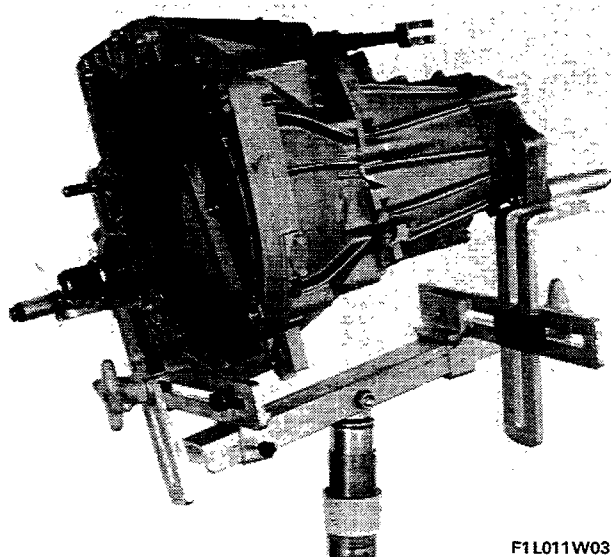


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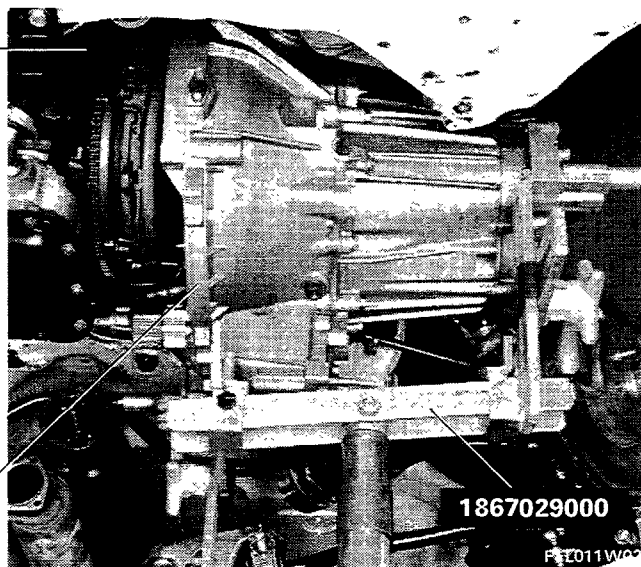




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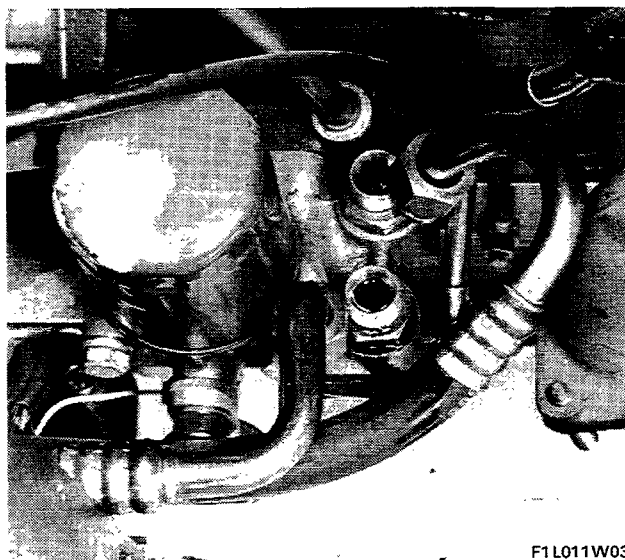


F1L011W03



- move the gearbox-differential unit until it is free of the centring pins on the engine and the clutch shaft slides out of the driven plate;

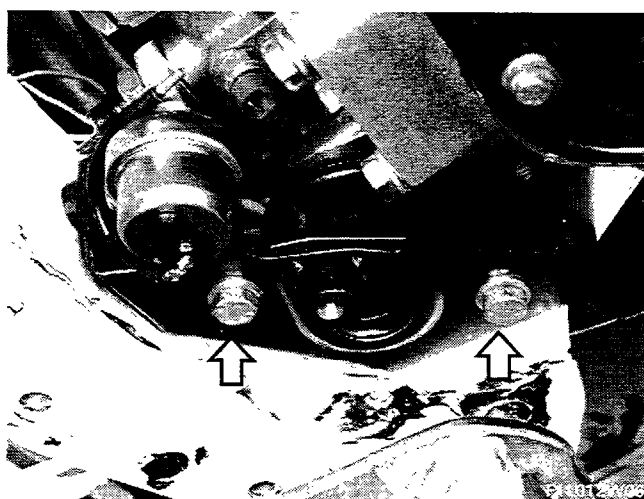
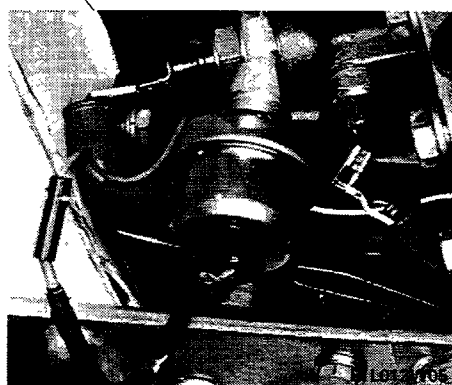
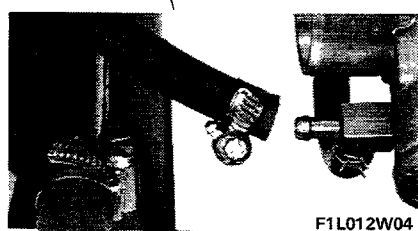
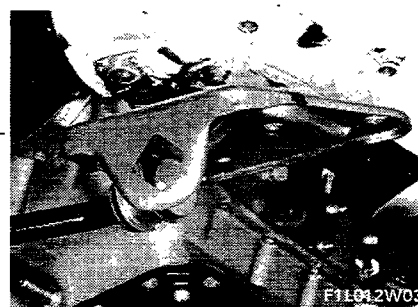
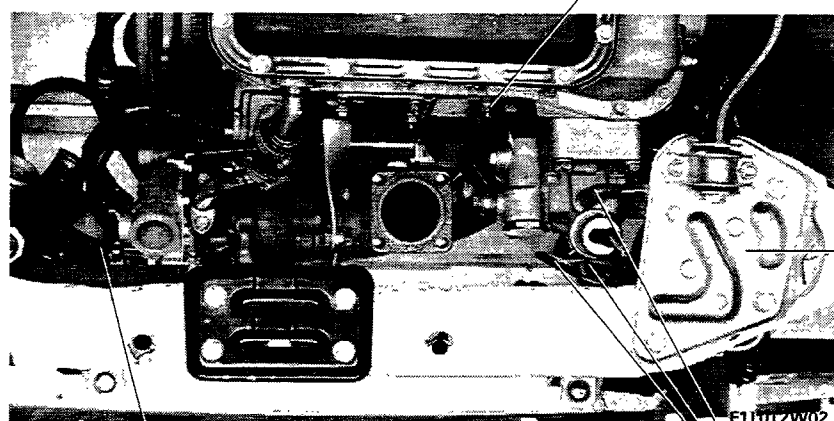
- lower the lift, remove the radiator grille and the hose connecting the radiator to the turbocharger and then withdraw the radiator together with the fan. Now proceed as follows:



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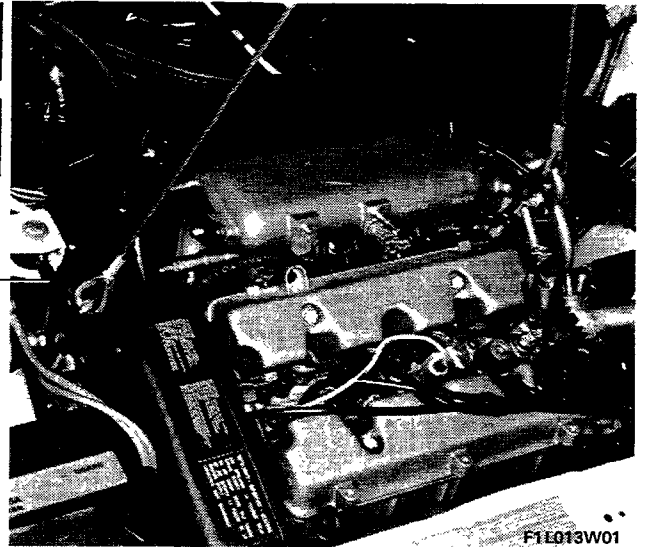
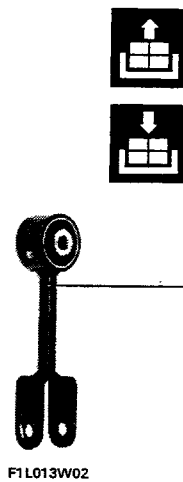
Removing-refitting oil lines from thermostatic valve on oil filter support

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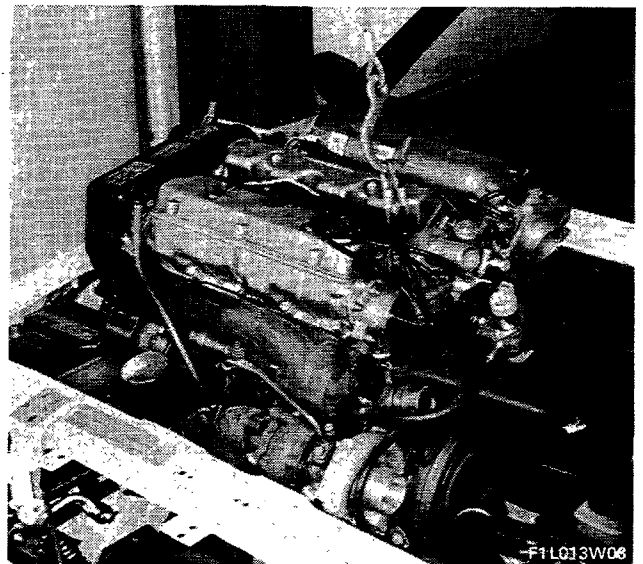


- disconnect the camshaft end front engine supports via bolts shown in diagram;

- lower the lift, position universal hook 1860592000 in attachment brackets on engine then take up the slack on power unit using the hoist;
- disconnect support beam 1870595000;



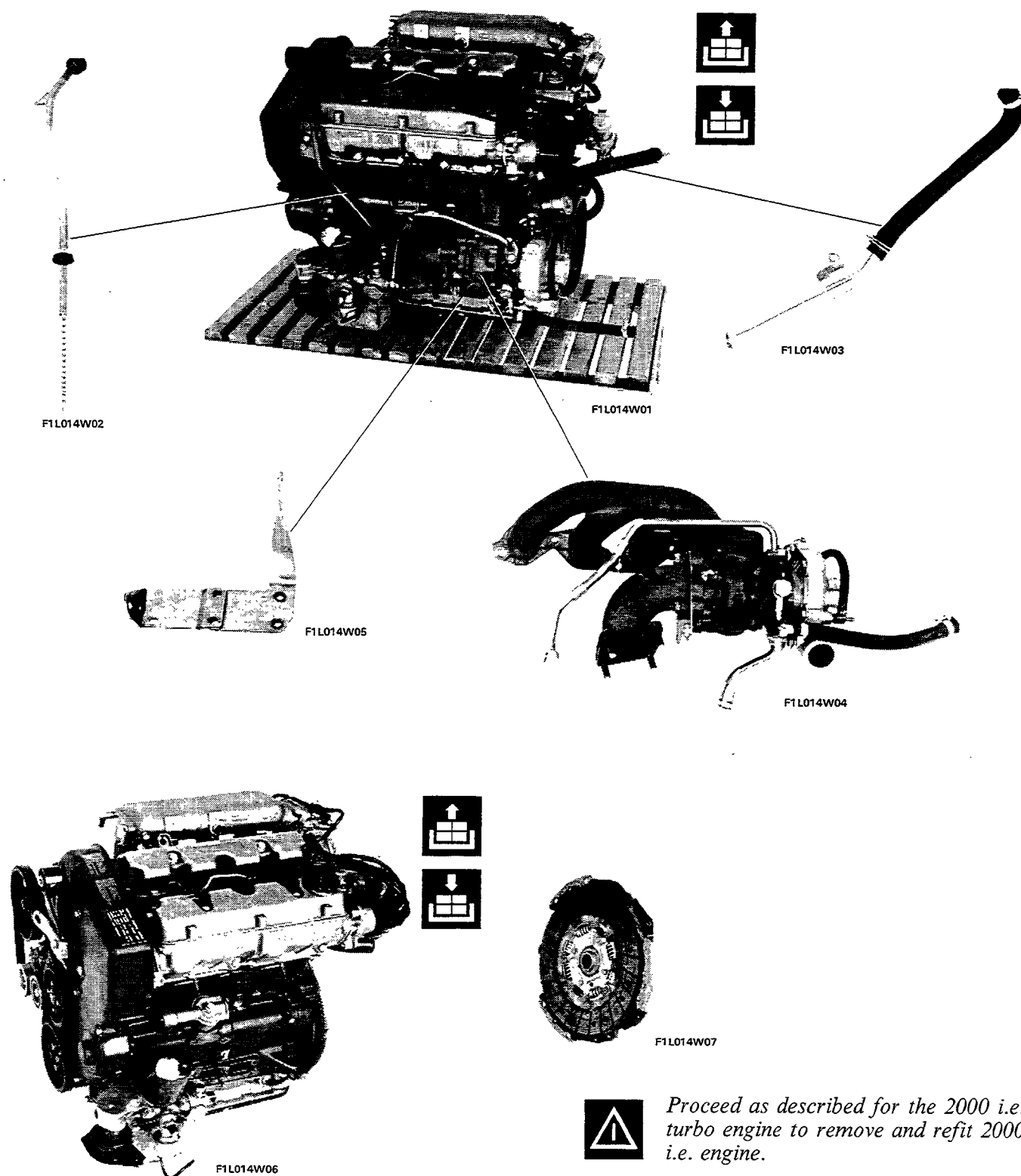
- remove the link fastening engine to body shell;



- raise engine with hoist;

10.

- rest engine on platform and then proceed as follows:



NOTE To re-install power unit carry out removal instructions in reverse order.

| PART | Thread | Tightening torques |
|------|--------|--------------------|
| | | daNm |

ENGINE

| | | |
|--|-----------------|------------------|
| Bolt retaining central cap to engine block | M 12 x 1.25 | 2 + 130° |
| Self-locking bolts retaining caps to engine block | M 12 x 1.25 | 2 + 90° |
| Nut retaining link to aluminium sump and torque distributor | M 8 | 2.3 |
| Bolt retaining vent housing to engine block | M 8 | 2.3 |
| Bolt retaining reaction bracket to torque distributor | M 10 x 1.25 | 5.9 |
| Bolt retaining cylinder head to engine block | M 10 x 1.25 | 4 + 90° + 90° |
| Bolt retaining top end of cylinder head | M 8 | 2.2 |
| Bolt retaining intake manifold to cylinder head | M 8 | 2.5 |
| Nut retaining intake manifold to cylinder head | M 8 | 2.5 |
| Nut retaining reaction bracket to intake manifold | M 8 | 2.3 |
| Bolt retaining reaction bracket to intake manifold | M 8 | 2.3 |
| Self-locking bolt retaining exhaust manifold | M 8 | 2.9 |
| Connecting rod cap retaining bolt | M 10 x 1 | 2.5 + 50° |
| Bolt retaining flywheel to crankshaft | M 12 x 1.25 | 14.2 |
| Bolt retaining auxiliary pulley to timing gear | M 8 | 2.5 |
| Bolt retaining timing gear to crankshaft ▲ | M 14 x 1.5 Left | 19 |
| Bolt retaining belt tensioner bearing to support | M 10 x 1.25 | 4.4 |
| Bolt retaining belt tensioner support to alternator and power steering support | M 8 | 2.3 |
| Poly-V belt tensioner adjustment screw locknut | M 10 x 1 | 4.4 |
| Timing gear retaining bolt | M 12 x 1.25 | 11.8 |
| Belt tensioner retaining bolt | M 10 x 1.25 | 4.4 |

▲ Do not lubricate the bolt

10.

| PART | Thread | Tightening torque |
|------|--------|-------------------|
| | | daNm |

| | | |
|---|-------------|------|
| Counter-rotating shaft gear retaining bolt | M 12 x 1.25 | 11.8 |
| Counter-rotating shaft cover retaining bolt | M 8 | 2.3 |
| Counter-rotating shaft belt tensioner retaining nut | M 8 | 2.3 |
| Self-locking nut retaining turbocharger to exhaust manifold | M 10 x 1.5 | 5.9 |
| Self-locking nut retaining flange to turbocharger | M 8 | 2.9 |
| Bolt retaining turbocharger support bracket to engine block | M 8 | 2.9 |
| Nut retaining turbocharger support bracket and exhaust pipe support bracket to engine block | M 8 | 2.9 |
| Bolt retaining oil delivery lines to turbocharger | M 8 | 2.3 |
| Union for adjustable fitting retaining oil delivery lines to oil filter support | M 14 x 1.5 | 5 |
| Bolt retaining oil delivery line support bracket to exhaust manifold | M 10 x 1.25 | 4.3 |
| Bolt retaining oil return line from turbocharger to sump | M 8 | 2.3 |
| Union for adjustable fitting retaining turbocharger coolant delivery and return hoses | M 16 x 1.5 | 3.2 |
| Bolt retaining oil filter and engine suspension support to engine block | M 10 x 1.25 | 4.3 |
| Plug for thermostatic valve on oil filter support | M 35 x 1.5 | 11.8 |
| Bolt retaining water pump to engine block | M 8 x 1 | 2.5 |
| Bolts retaining water pump and power unit suspension bracket to engine block | M 8 x 1 | 2.5 |
| Bolt retaining water pump hose to pump | M 8 | 2.5 |
| Bolt retaining coolant return lines to cylinder head | M 10 x 1.25 | 4.3 |
| Nut retaining power steering pump alternator support to engine block | M 10 x 1.25 | 4.3 |
| Bolts retaining power steering pump alternator support to engine block | M 10 x 1.25 | 4.3 |
| | M 8 | 2.5 |

| PART | Thread | Tightening torque |
|------|--------|-------------------|
| | | daNm |

| | | |
|---|------------------|-----|
| Bolt retaining alternator bracket to support | M 10 x 1.25 | 4.3 |
| Alternator bracket retaining nut | M 10 x 1.25 | 4.3 |
| Alternator retaining nut | M 12 x 1.25 | 6.9 |
| Bolt retaining support brackets to power steering pump | M 8 | 2 |
| Bolt retaining power steering support brackets to support | M 10 x 1.25 | 4.3 |
| Nut retaining power steering pump driven pulley | M 14 x 1.5 | 9.5 |
| Spark plugs | M 14 x 1.25 | 3.7 |
| Oil temperature sending unit | M 14 x 1.5 | 3.7 |
| Coolant temperature sending unit | M 16 x 1.5 bevel | 4.9 |
| Oil pressure switch | M 14 x 1.5 | 3.2 |
| Oil sump plug | M 22 x 1.5 bevel | 5 |

EXHAUST

| | | |
|--|-------------|-----|
| Nut for stud fastening exhaust pipe to turbocharger | M 10 x 1.5 | 3.7 |
| Bolt retaining silencer flange on exhaust pipe | M 8 x 1.25 | 1.5 |
| Bolt securing bracket retaining exhaust pipe to collar | M 10 x 1.25 | 5 |
| Nut retaining collar on exhaust pipe to bracket | M 8 x 1.25 | 2.5 |
| Nut retaining exhaust pipe to rubber bush | M 8 x 1.25 | 1 |

POWER UNIT MOUNTING

| | | |
|--|-------------|-----|
| Bolt retaining support for crankshaft end rubber engine mounting block | M 8 x 1.25 | 1.7 |
| Bolt retaining rubber block, crankshaft end, to engine | M 12 x 1.25 | 5 |
| Bolt retaining engine block to crankshaft end support | M 10 x 1.25 | 3.1 |

10.

| PART | Thread | Tightening torques |
|------|--------|--------------------|
| | | daNm |

| | | |
|--|-------------|-----|
| Bolt retaining crankshaft end power unit fastening link | M 10 x 1.25 | 4.2 |
| Bolt retaining body shell end power unit fastening link | M 10 x 1.25 | 4.2 |
| Bolt retaining gearbox end rubber block bracket | M 8 x 1.25 | 1.6 |
| Bolt retaining rubber block to gearbox end bracket | M 12 x 1.25 | 8.5 |
| Bolt retaining support for rubber block to body shell, gearbox end | M 10 x 1.25 | 3.1 |
| Bolt joining gearbox end rubber block brackets | M 10 x 1.25 | 6 |
| Bolt joining rubber block to gearbox end support | M 10 x 1.25 | 6 |
| Self-locking nut for retaining rubber block to gearbox | M 10 x 1.25 | 6 |
| Bolt retaining gearbox end rubber block | M 12 x 1.25 | 8.5 |
| Self-locking nut retaining middle rubber block bracket | M 12 x 1.25 | 5 |
| Bolt retaining middle rubber block bracket to differential | M 10 x 1.25 | 5 |
| Bolt joining middle rubber block to supports | M 12 x 1.25 | 8.5 |
| Bolt retaining middle block to body shell support | M 10 x 1.25 | 3.1 |
| Bolt retaining middle block support to body shell | M 8 x 1.25 | 1.8 |

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| - Operating principles of the system | 1 |
| - Delta HF 4WD turbo: wiring diagram | |
| - Anti-detonation and overboost devices | 2 bis |
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WEBER INJECTION/IGNITION SYSTEM

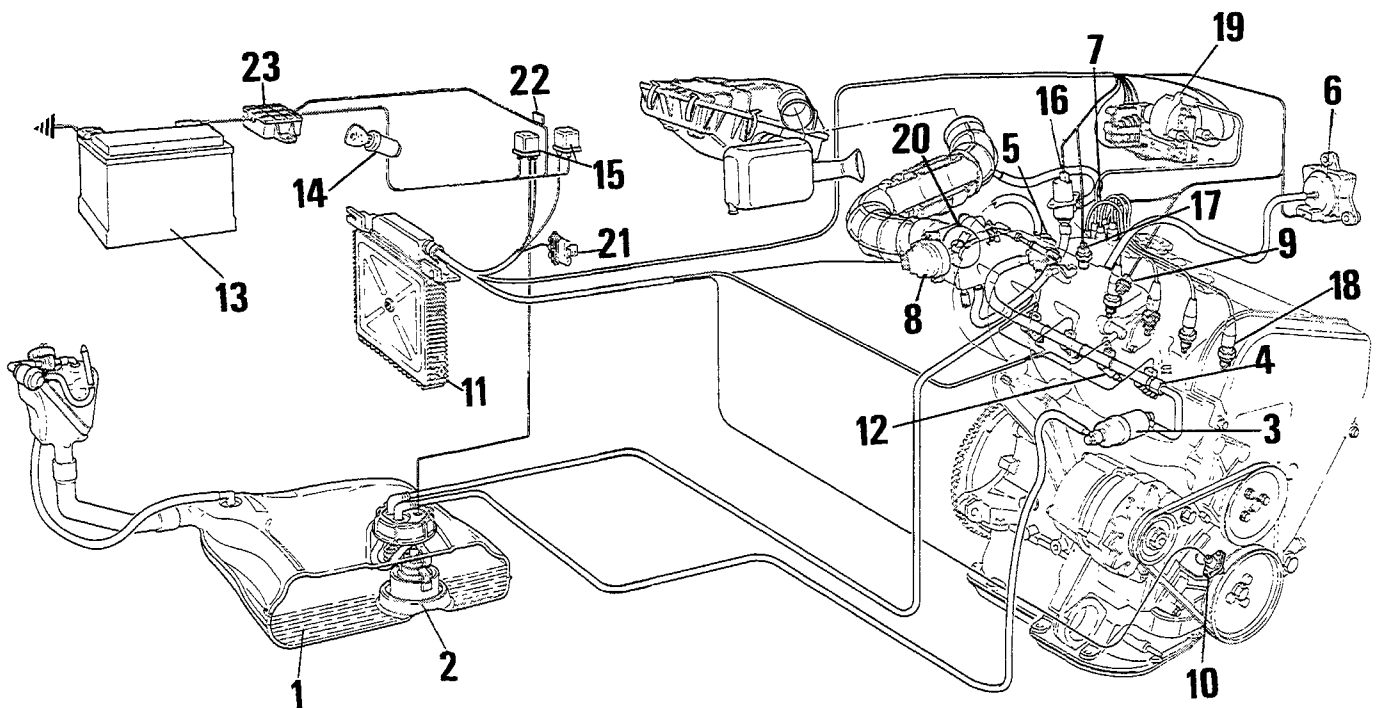
The IAW (Weber injection/ignition) system integrates the static advance digital electronic ignition system with an intermittent type, multipoint, low pressure electronic fuel injection system developed by Weber S.p.A. in conjunction with Marelli Autronica.

This device reduces the number of elements which currently make up the ignition and injection systems by utilizing a single electronic control unit; it also has one set of cables and a single set of common sensors.

Ignition system operating principle

The electronic control unit memorizes a map containing the entire range of optimum advance values which the engine can use in its operating range according to the engine speed and load (= instant vacuum value in the manifold) developed.

These values have been obtained experimentally, using an exhaustive series of practical tests carried out on prototypes at the test bench, until it was possible to determine the advances which give the best compromise between the contrasting requirements of maximum power and minimum fuel consumption and harmful exhaust emissions.



Wiring diagram for Prisma 4WD injection/ignition system

- | | |
|--|---|
| 1. Fuel tank | 14. Ignition switch |
| 2. Electric fuel pump | 15. Injection/ignition relays |
| 3. Fuel filter | 16. Supplementray air soleonid valve for automatic engine idle adjustment |
| 4. Fuel manifold | 17. Coolant temperature sensor |
| 5. Fuel pressure regulator | 18. Spark plugs |
| 6. Intake air absolute pressure sensor | 19. Ignition unit |
| 7. HT distributor with injection timing sensor | 20. Butterfly valve |
| 8. Butterfly valve position sensor | 21. Diagnostic socket (located near the injection control unit connector) |
| 9. Intake air temperature sensor | 22. IAW system protective fuse |
| 10. Rpm and TDC sensor | 23. Vehicle electrical system connector block |
| 11. Electronic control unit | |
| 12. Injectors | |
| 13. Battery | |

10.

The optimum advances are then memorized in the system control unit. Whilst the engine is operating the central control unit (11) is constantly supplied information concerning the following conditions **speed** (= engine speed) and **load** (= vacuum in the inlet manifold of the engine and on the basis of this information it **selects from its memory the advance value required** by the engine to control the ignition unit power module so that the spark reaches the spark plug in the cylinder during the explosion stroke with the optimum advance. Following the command from the control unit (11), the unit ignition module (19) causes a current to pass through the ignition coil primary circuit until it is completely energized and consequently cuts off the passage of this current and through self-induction there is an extremely high voltage in the secondary winding and the spark reaches the spark plug.

This information which the control unit (11) needs is transmitted by means of electrical signals emitted by the following two sensors:

- a) **Rpm and TDC sensor (10)** which produces a **single-phase alternating** signal whose frequency indicates the engine speed and together with the timing sensor helps to determine the TDC position for the pairs of pistons in cylinders 1-4 and 3-2.
- b) **Absolute pressure sensor (6)** which produces a **continuous current** signal whose voltage value is proportional to the absolute pressure value in the inlet manifold to which the sensor is connected by means of a pipe.

Injection system operating principle

This consists of calculating **the exact weight of the air drawn in by the engine at each phase** of its operation by means of an indirect measuring system (*) known as : **engine speed - density** of the air drawn in. This injection system uses a **micro computer** to calculate the exact weight of the air drawn in by the engine during the various operating stages in order to control the correct length of the injection period for the cylinder which is pre-set according to the instant read out of the engine operating conditions supplied by the following sensors:

1. Rpm and TDC sensor
2. Timing sensor located in the H.T. distributor
3. Absolute pressure sensor
4. Coolant temperature sensor and air intake temperature sensor
5. Butterfly valve position sensor

In addition, the solenoid valve for the automatic adjustment of the idle speed is also connected to the control unit. It causes the flow of supplementary air:

- a) to sustain the "idling" with the engine warm (operating temperature) even when the external engine load varies suddenly when one of the accessories is switched on;
- b) to determine a "fast idle" speed capable of sustaining the engine during cold starting and when testing its efficiency.

(*) The engine speed-intake air density method is based on the following calculation of the weight (mass) of the air drawn in and the weight of petrol to be injected to obtain the correct mixture strength (= air/petrol weight ratio):

Theoretical volume (V_T) of air drawn in per cycle

$$V_T = \frac{\text{engine idle speed}}{2} \times \text{capacity}$$

Actual volume (V_R) of air drawn in per cycle

$$V_R = V_T \cdot \mu_v$$

where μ_v = engine volumetric output at various speeds

Actual volume (M_R) (mass) of air drawn in by engine per cycle

$$M_R = V_R \cdot \frac{P}{T}$$

where:

P = absolute pressure in engine inlet manifold

T = absolute temperature of intake air.

The amount (Q_B) of petrol to be injected depends on the stoichiometric ratio α desired and also on the injector flow constancy characteristic K

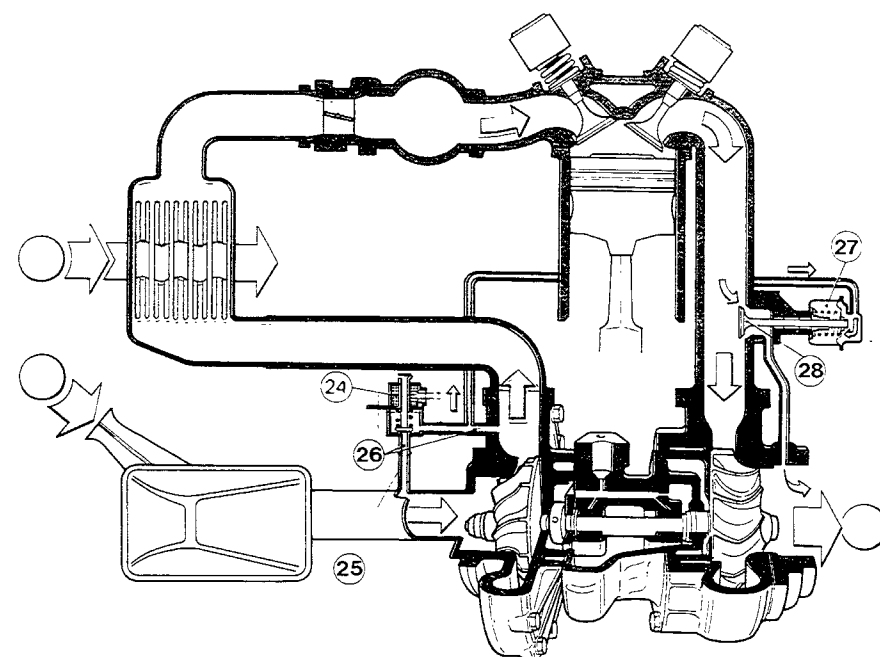
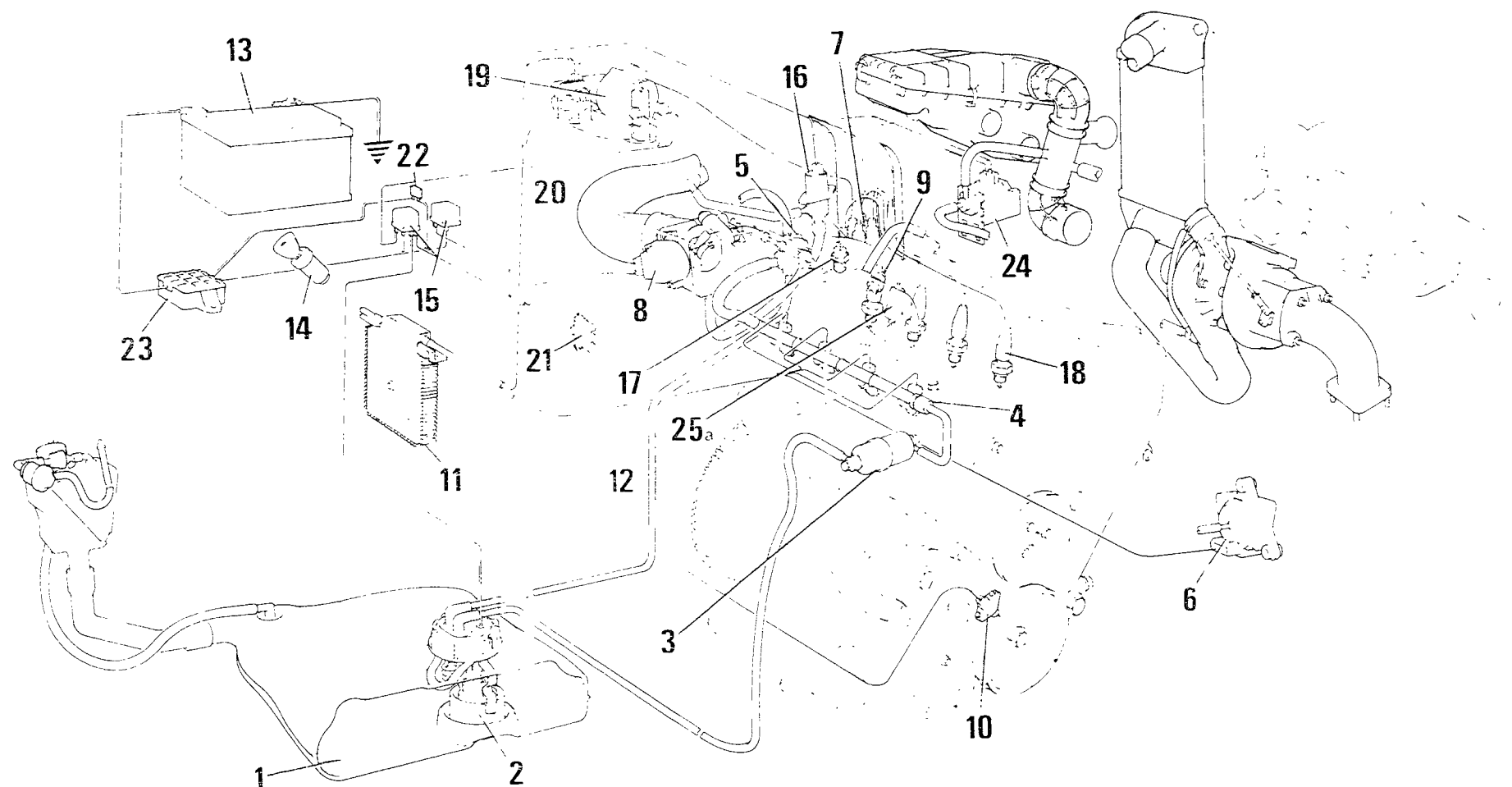
$$Q_B = \frac{1}{\alpha} \cdot K \cdot V_R.$$

Since during normal operation the injector injects fuel for each half revolution of the crankshaft, it makes a note of the engine speed and the amount of fuel to be injected to each open injector.

To sum up:

$$Q_B = K \cdot \frac{\mu_v}{\alpha} \text{ rpm} \cdot \frac{\text{capacity}}{2} \cdot \frac{P}{T}$$

DELTA HF 4WD TURBO IAW INJECTION/IGNITION SYSTEM WIRING DIAGRAM



Key

- | | |
|--|---|
| 1. Fuel tank | 16. Additional air solenoid valve for automatic adjustment of the engine idle speed |
| 2. Electric fuel pump | 17. Coolant temperature sensor |
| 3. Fuel filter | 18. Spark plugs |
| 4. Fuel manifold | 19. Ignition unit |
| 5. Fuel pressure regulator | 20. Butterfly valve |
| 6. Intake air absolute pressure sensor | 21. Diagnostic socket |
| 7. HT distributor with injection timing sensor | 22. Fuse |
| 8. Butterfly valve position sensor | 23. Connector |
| 9. Intake air temperature sensor | 24. Over-boost solenoid valve |
| 10. Rpm and TDC sensor | 25. Air intake duct from the filter |
| 11. Electronic control unit | 25a. Detonation sensor |
| 12. Injector | 26. Compressed air ducts from the turbocharger |
| 13. Battery | 27. Supercharging adjustment actuator |
| 14. Ignition switch | 28. Wastegate valve |
| 15. Injection/ignition relays | |

ANTI-DETONATION AND OVER-BOOST DEVICES

The IAW system fitted on the Delta 4WD differs from the one on the Prisma 4WD through the addition of anti-detonation and over-boost devices.

Anti-detonation device: this comprises a sensor (25a) bolted onto the cylinder head and connected to terminals 6 and 22 of the ignition injection control unit (11) in order to adjust the intensity of the vibrations (knocking) caused by the detonation in the combustion chamber whilst the engine is running. If this is the case, the sensor (25a) informs the ignition injection control unit (11) so that it can quickly reduce the engine ignition advance values. The reduction of the advance values takes place when the system recognizes "engine knock" due to detonation as distinct from normal combustion. The advance curve for a given engine load is reduced by around 5°.

If the detonation should still persist, the advance is further reduced by 5° at a time up to a maximum of 15°. After a certain number of operating cycles without knocking the advance is then gradually reinstated to its original value. The advance curve cannot be reduced by more than 15° in relation to the original curve according to the engine load conditions, supercharging pressure and engine speed.

This device is essential in safeguarding the life of the engine as detonation can very easily occur whilst the engine is being supercharged.

Over-boost device: this closes the wastegate valve (28) so that all the exhaust gases blow into the turbine increasing the revs so that the speed of the compressor, connected to it, increases and causes an increase in the engine supercharging pressure (with a consequent increase in torque and or engine power). When the device is activated the ignition injection control unit operates the solenoid valve (24), through terminal 16, which, on opening, places the wastegate valve actuator diaphragm (27) at atmospheric pressure via sleeves (25) and (26). The decrease in pressure at the wastegate actuator (27) obtained in this way causes the closure of the valve (28) and as a result prevents a substantial amount of exhaust gases from by-passing (i.e. avoiding) the turbine.

This device operates in two ways: it can increase the torque by 10% for a short period if the accelerator pedal is fully depressed when the engine speed is between 2000 rpm and 5300 rpm (it operates for a maximum of 30 secs to a minimum of secs). Or it can increase the maximum power of the engine for a limited length of time if the accelerator pedal is fully depressed starting at a speed of ≥ 5000 rpm. The information concerning the engine speed is transmitted to the injection/ignition control unit by means of the rpm and TDC sensor (10).

COMPOSITION OF IAW SYSTEM

The Weber electronic injection/ignition system comprises three independent circuits, namely:

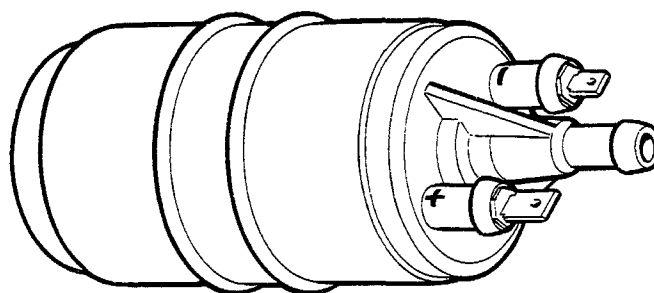
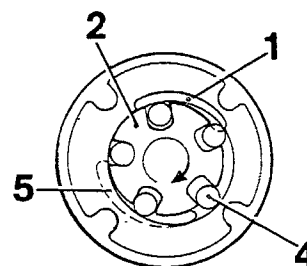
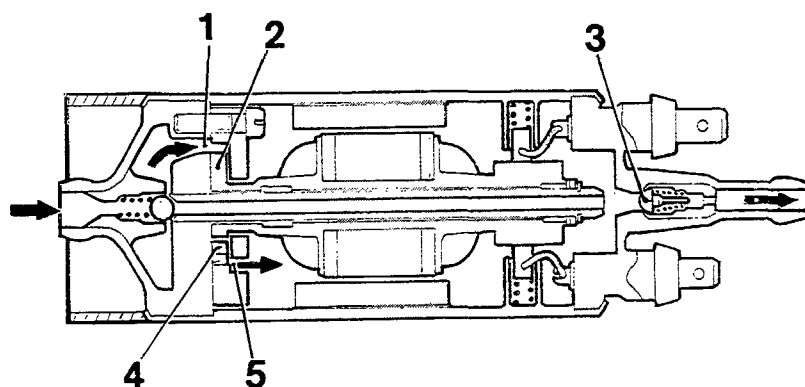
A. FUEL SUPPLY CIRCUIT

It comprises the following components: (see key on page 1)

- a tank (1)
- an electric pump (2)
- a filter (3)
- a fuel pressure regulator (5)
- four injectors (12)

Electric fuel pump

The electric pump (2) is located in the tank where it draws in the fuel and sends it through the filter (3) to a distribution manifold (4) which shares it out equally amongst the injectors (12). The pressure of the fuel in the circuit is kept constant by means of a pressure regulator (5) which keeps the excess fuel in check by making it flow back to the tank (1).



Electric fuel pump assembly and cross sections

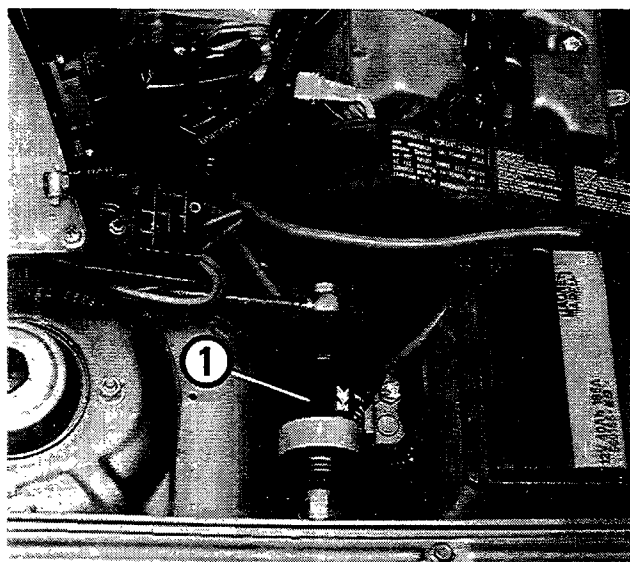
1. Inlet opening
2. Impeller
3. Non-return valve
4. Rollers
5. Delivery opening
6. Excess pressure valve

The electric pump is of the volumetric roller type with a motor energized by permanent magnets immersed in the fuel (2).

The impeller rotates, driven by the motor, creating volumes which move from the inlet opening (1) to the delivery opening (5). These volumes are defined by the rollers (4) which adhere to the outer race whilst the motor rotates.

The pump has two valves: one non-return valve to prevent the fuel circuit emptying when the pump is not operating and an excess pressure valve which short circuits the delivery with the inlet when the pressure exceeds 5 bar to prevent the electric motor from overheating.

10.



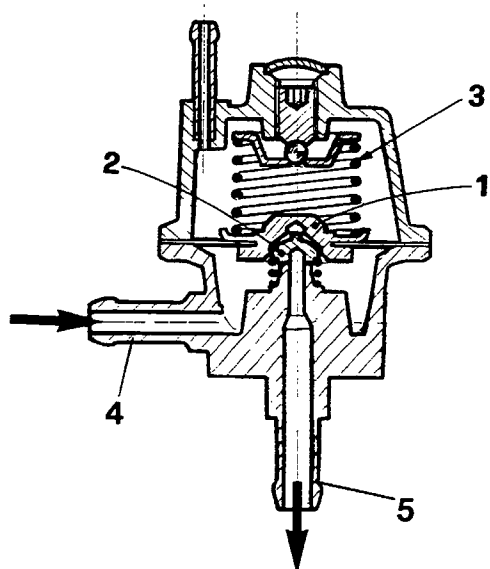
Fuel filter (1)

It has the task of trapping any impurities which may be present in the fuel as the injectors are extremely sensitive to foreign bodies.

It comprises a paper filter element with a surface area of around 1200 cm² and a filtering capacity of 10 µm.

The filter is fitted in the engine compartment between the pump and the fuel manifold.

NOTE *An arrow stamped on the filter casing shows the direction of the fuel. The filter should be replaced every 20,000 km or if it has been incorrectly fitted and worked like that even for a short length of time.*



Fuel pressure regulator

1. Diaphragm plate
2. Valve
3. Opposing spring
4. Fuel arriving under pressure from the injector manifold
5. Excess fuel outlet returning to the tank

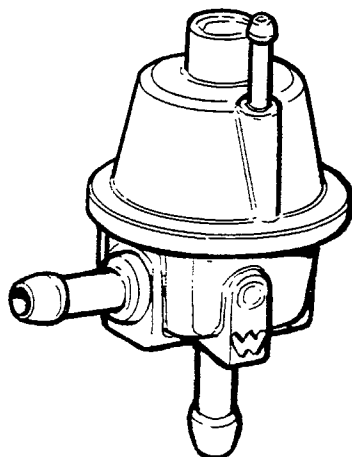
The regulator is a device which maintains the pressure rise at the injectors constant.

It is of the differential diaphragm type and is adjusted during assembly at a pressure of 2.5 bar.

The fuel coming from the pump at a given pressure causes a thrust which is opposed by the calibrated spring (3) on the diaphragm plate (1) and the valve (2) below.

When the pressure exceeds the pre-set value (2.5 bar) the valve (2) moves and consequently the excess fuel flows back into the tank.

In order to maintain the rise in pressure at the injectors constant the difference between the pressure of the fuel and the absolute pressure of the air in the inlet manifold should be constant; this has been achieved by connecting the chamber housing the calibrated spring (3) with the inlet manifold by means of a pipe.



NOTE *The pressure regulator has been pre-adjusted and if it is faulty it must be replaced.*

Injectors

The injectors control the amount of fuel which enters the engine.

An injector is a device which can only assume two positions: open or closed.

It comprises a casing (1) and a needle (2) which are fixed to the magnetic armature (3).

The needle (2) is thrust against the seat by a helical spring (4) whose loading is determined by an adjustable pusher.

In the rear section of the injector casing there is a winding (5) whilst in the front part there are the needle seats.

The electrical impulses coming from the electronic control unit create a magnetic field in the winding which attracts the armature (3) and causes the injector to open.

Taking the physical characteristics of the fuel (viscosity, density) and the rise in pressure (due to the pressure regulator) as constant, the amount of fuel injected depends solely on the length of time the injector is open (injection time) which is established by the electronic control unit according to the engine operating conditions.

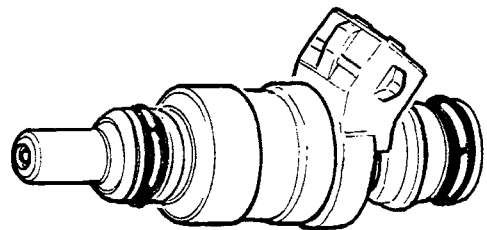
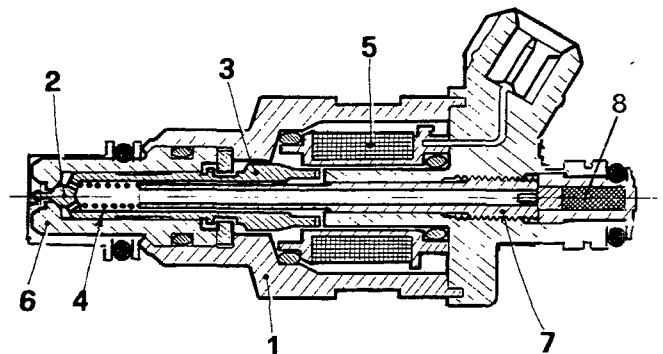
The jet of fuel at the differential pressure of 3 bar which comes out of the injector nozzle is instantly atomized forming a cone of around 30°.

The fuel is injected into the inlet manifold for each cylinder upstream of the inlet valve.

The control of the injectors is of the "sequential phased" type, in other words, the four injectors are controlled according to the intake order of the engine cylinders whilst the supply can already start for each cylinder during the expansion stroke until the intake stage has already begun.

Injector assembly and longitudinal section

1. Injector casing
2. Needle
3. Magnetic armature
4. helical spring
5. Winding
6. Front section of injector
7. Adjustable pusher
8. Fuel filter



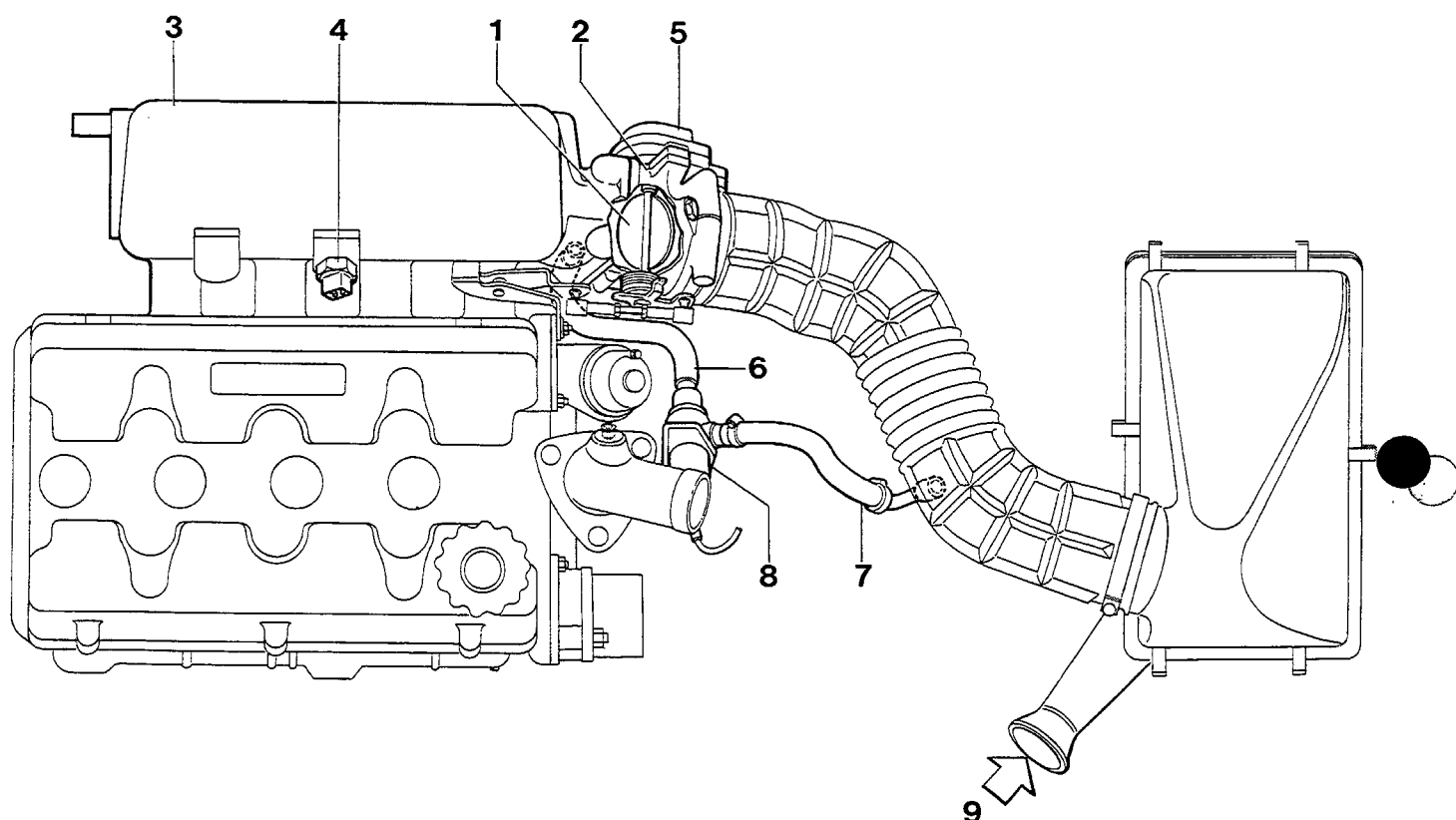
B. AIR INTAKE CIRCUIT

It basically comprises the following components:

- air filter
- air inlet manifold
- butterfly casing
- intake air temperature sensor
- intake air absolute pressure sensor
- idle speed automatic adjustment additional air solenoid valve.

10.

Inlet manifold and butterfly casing



1. Butterfly valve
2. Butterfly casing
3. Inlet manifold
4. Intake air temperature sensor
5. Butterfly valve position sensor
6. Supplementary air sleeve solenoid valve
7. Supplementary air intake solenoid valve
8. Supplementary air solenoid valve for automatic adjustment of idle speed and checking efficiency of engine when cold
9. Air filter

The manifold contains the air temperature sensor (4) and the vacuum pick ups for the absolute pressure sensor, the fuel pressure regulator and the servo brake.

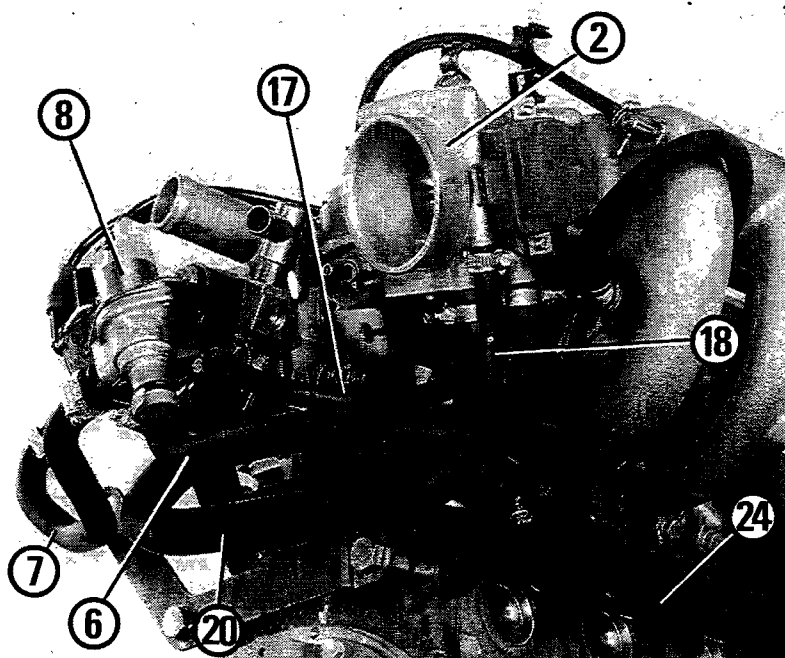
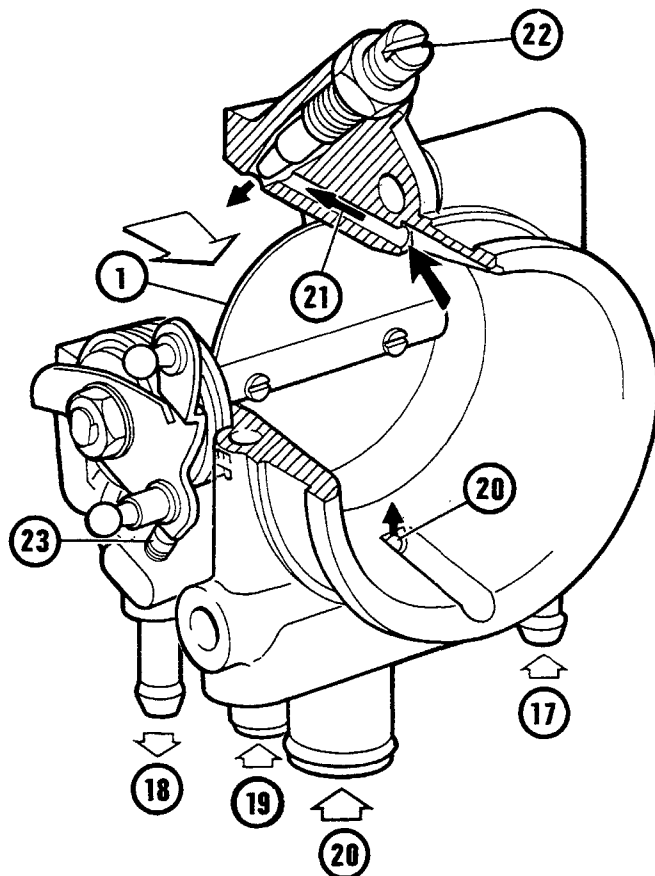
In addition, it also houses the sets for fixing the injectors.

The amount of air drawn in during idling depends on the adjustment of the butterfly valve closing position. **The butterfly stop adjustment screw in the butterfly casing (23) (see overleaf) should not be tampered with; it is checked by "fluxing" the butterfly casing during assembly at the factory.**

It is possible to alter the opening of the by-pass channel (21) by means of the idle pre-adjustment screw (22) to ensure that when the engine is warm the idle speed is 50 rpm below the normal idle speed (compared with when it is adjusted by the idle speed adjustment solenoid valve).

Lastly, the butterfly casing is heated by the coolant to prevent the engine being supplied with cold air since this could cause condensation of the fuel and consequently poor carburation.

- 17. Coolant arriving from the engine to heat the butterfly casing
- 18. Coolant returning from the butterfly casing to the engine
- 19. Air arriving from the idle speed adjustment solenoid valve
- 20. Gas arriving for ventilation of the crankcase
- 21. By-pass channel
- 22. Idle speed pre-adjustment screw
- 23. Butterfly valve stop screw
- 24. Coolant return sleeve to the pump

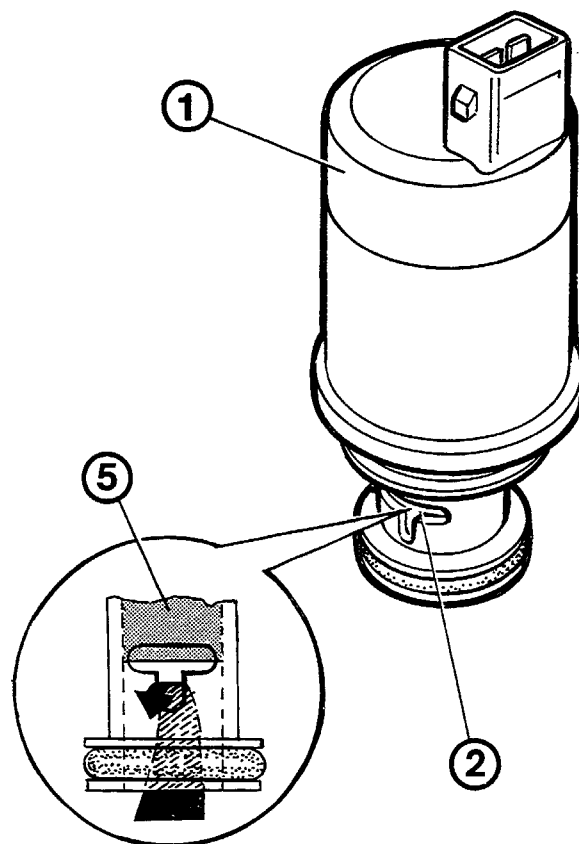


Engine components:
butterfly casing and connecting pipes

10.

Idle speed supplementary air solenoid valve

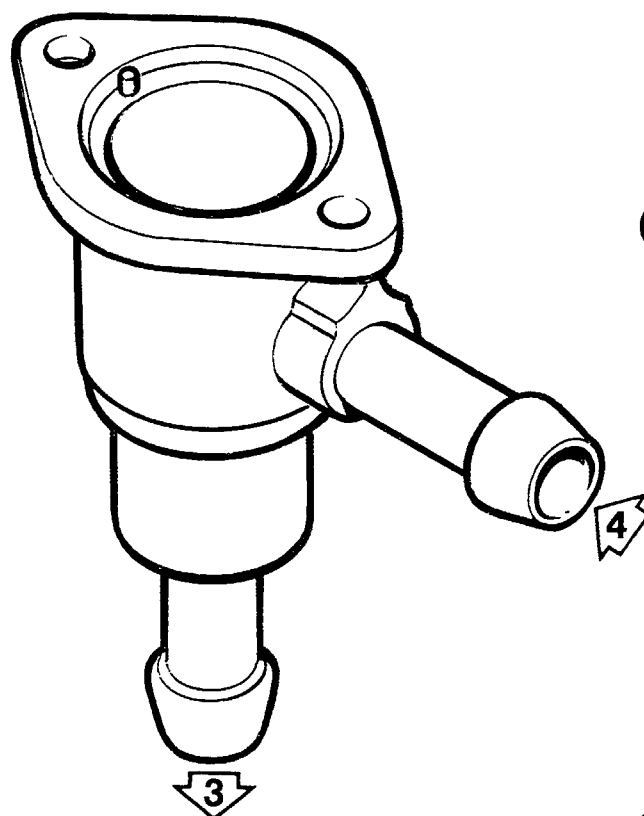
1. Solenoid
2. Flow of supplementary air for automatic adjustment of idle speed and checking efficiency of engine when cold
3. Air outlet towards the butterfly casing downstream of the butterfly valve
4. Arrival of air from the filter
5. Piston adjusting air flow quantity. It is moved by the variation in magnetic flux developed in the solenoid (1).



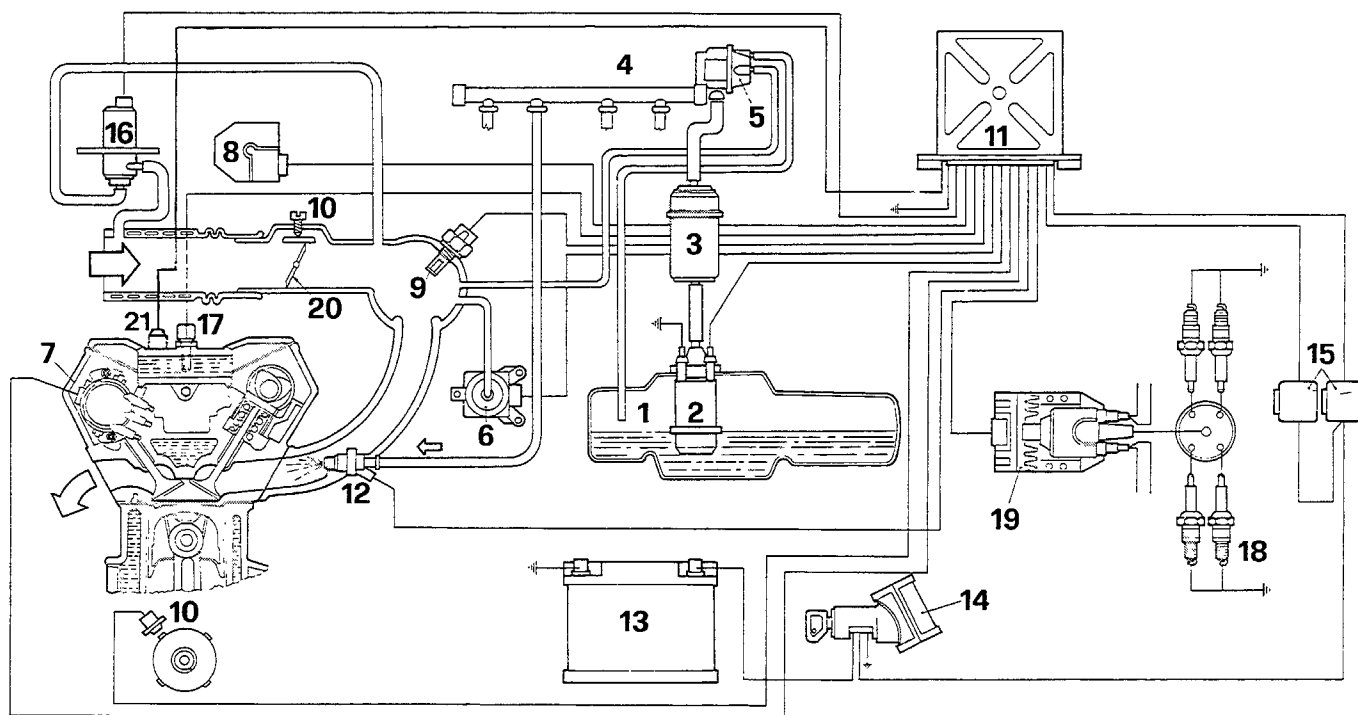
This involves a proportional type solenoid valve with a variable size air flow.

A variable duty cycle electronic device with a frequency of 90 Hertz controls the supply to the winding of the above mentioned valve. If the engine speed frequency decreases during idling the effective current which supplies the solenoid valve winding (1) increases creating the maximum air flow opening (2). If the engine speed increase during idling the effective current absorbed by the solenoid winding decreases to a few tenths of an Ampere. consequently, the opening (1) of the additional air flow is restricted and the engine speed decreases.

This device makes it possible to (automatically) maintain the engine speed constant during idling even when the external load conditions vary slightly because the automatic gearbox is engaged or the power assisted steering is at the end of its travel or the alternator is operating a maximum output. When the engine is running cold or when it is warming up this valve allows the engine to operate at the fast idle speed. **In these conditions the coolant temperature sensor signals the need for enrichment of the mixture strength to the control unit.**



WIRING DIAGRAM



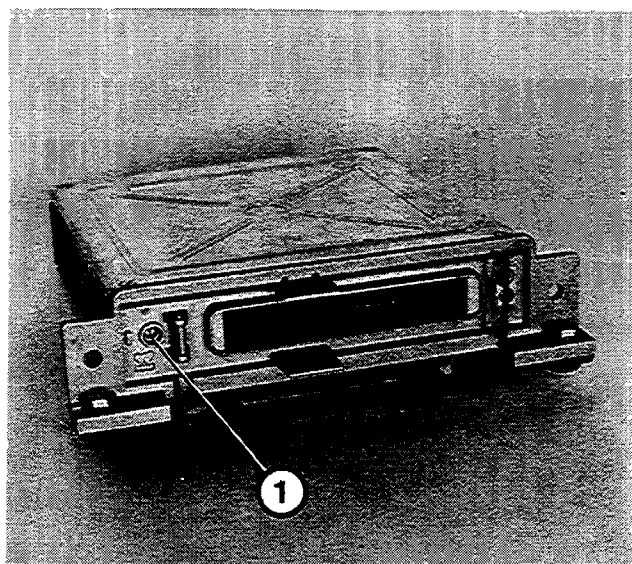
- | | |
|--|---|
| 1. Fuel tank | 12. Injector |
| 2. Electric fuel pump | 13. Battery |
| 3. Fuel filter | 14. Ignition switch |
| 4. Fuel manifold | 15. IAW injection/ignition system relays |
| 5. Fuel pressure regulator | 16. Engine idle speed automatic adjustment supplementary air solenoid valve |
| 6. Intake air absolute pressure sensor | 17. Coolant temperature sensor |
| 7. High tension distributor with injection timing sensor | 18. Spark plug |
| 8. Butterfly valve position sensor | 19. Ignition unit |
| 9. Intake air temperature sensor | 20. Butterfly valve |
| 10. Rpm and TDC sensor | 21. Anti-detonation sensor (for Delta HF 4WD turbo only). |
| 11. W.I.I. electronic control unit | |

C) ELECTRICAL CIRCUIT

It basically comprises an electronic control unit (11) to which the following components are connected:

- Butterfly valve position sensor (8)
- Air temperature sensor (9)
- Four injectors (12)
- Absolute pressure sensor (6)
- Electric fuel pump (2)
- Rpm and TDC sensor
- Injection timing sensor (7) in the H.T. distributor
- Coolant temperature sensor
- Ignition coil with power module (19)
- Two relays (15)
- Ignition switch with key (14)
- Battery (13)

10.



Electronic control unit

The Weber electronic injection/ignition system control unit is of the digital type with a micro computer which controls the parameters concerning the supply and ignition of the engine, namely:

- the amount of fuel supplied to each cylinder in sequence (1-3-4-2- in a single delivery;
- the start of the fuel supply (injection timing) in relation to the intake for each cylinder;
- the ignition advance.

In order to calculate the above parameters the control unit makes use of the following input signals:

- absolute pressure inside the inlet manifold;
- air intake temperature;
- coolant temperature;
- engine speed;
- position of each pair of cylinders in relation to TDC and engine timing;
- opening (or closure) position of the butterfly valve.

The control unit governs the operation of the ignition unit and the length of the sequence opening and timing of the individual injectors.

In addition to the above mentioned parameters it makes use of the following:

- a) **Cut-off:** this device cuts off the flow of fuel into the engine each time the accelerator pedal is released when the vehicle is slowing down. It has a fixed cut-off operating range whilst the speed at which the injection is renewed is variable and takes place when the engine is warm at speeds above 1100 rpm and when the engine is cold at speeds above 1800 rpm with the butterfly valve closed. At lower speeds the injection is renewed.
- b) When the butterfly opening is $> 30^\circ$, in other words during maximum power conditions, in order to exploit the maximum flame speed propagation during combustion, the mixture strength is suitably **enriched**.
- c) During acceleration the amount of fuel injected must be considerably higher than the stoichiometric ratio for when the engine is operating at a normal speed.
The condition of acceleration is recognized by the control unit by a rapid variation in the opening angle of the butterfly valve which the appropriate sensor undergoes when the accelerator is opened rapidly.
- d) During cold starting the mixture strength is enriched in a manner which is inversely proportional to the temperature of the coolant.
In addition, under these conditions the engine speed is increased (**fast idle**) given that the control unit activates the automatic idle speed adjustment supplementary air solenoid valve.

NOTE *There is a special screw protected by an anti-tamper plug (1) in the electronic control unit to adjust the percentage of CO in the exhaust gases.
This screw should be adjusted very carefully making sure not to force it or break the adjustment trimmer which would mean that the complete control unit would have to be replaced.*

Butterfly valve position sensor (3)

This comprises a potentiometer (1) the moveable part (2) of which is directly operated by the butterfly valve shaft.

During operation, the control unit supplies the potentiometer with a voltage of 5 Volts at terminals (a) and (c).

At terminal (b) the voltage is inversely proportional to the butterfly valve opening position. According to the voltage sent by the terminal (b) the control unit recognizes the opening condition of the butterfly valve and corrects the mixture strength accordingly.

When the butterfly is closed an electrical voltage signal of ~ 0.5 V reaches the control unit: from this the latter recognizes the idle and cut-off condition (which is differentiated on the basis of the engine speed).

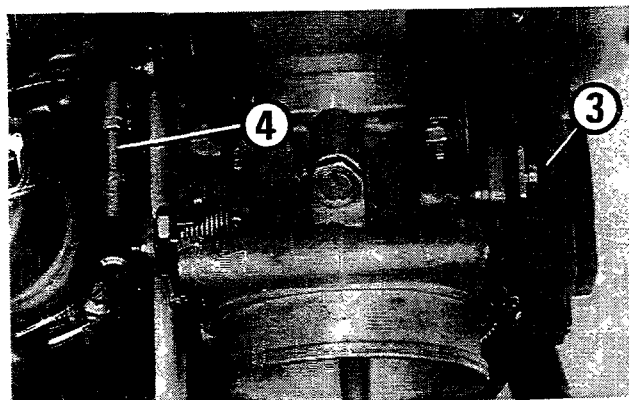
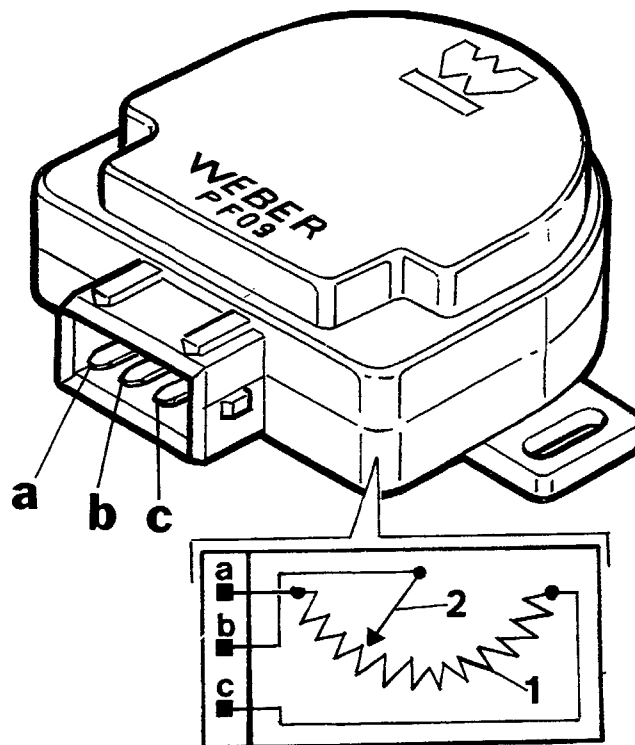
For butterfly valve openings greater than $\sim 30^\circ$ a voltage signal of around 3.3 V returns to the control unit and increases progressively until it reaches a voltage value of around 5 Volts when the butterfly valve reaches the maximum opening of 80° .

NOTE When the butterfly valve reaches openings greater than 30° the control unit activates progressive enrichment by operating the injectors for a greater length of time than is necessary to achieve the fuel/air stoichiometric ratio. This strategy is also decided on the basis of the engine vacuum signal.



Each type of injection control unit works with its own type of butterfly valve position sensor.

Butterfly valve position sensor wiring diagram



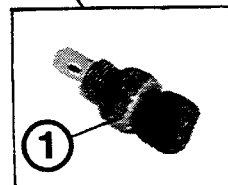
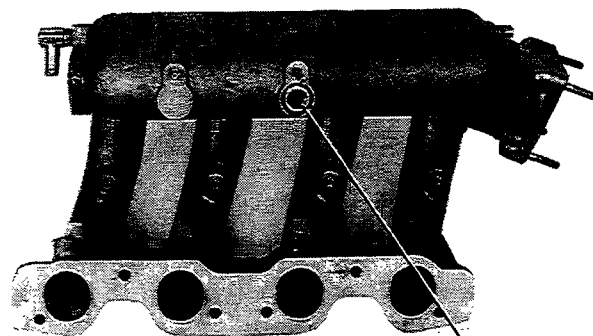
Butterfly valve sensor (3) with control rod (4)

Air temperature sensor (1)

This sensor measures the temperature of the air in the inlet manifold (2) by means of an NTC thermistor.

The electrical signal obtained reaches the electronic control unit where, together with the manifold pressure signal, it is used to calculate the density of the air.

NOTE NTC means that the resistance of the thermistor decreases as the temperature increases.



10.

Rpm and TDC sensor (1)

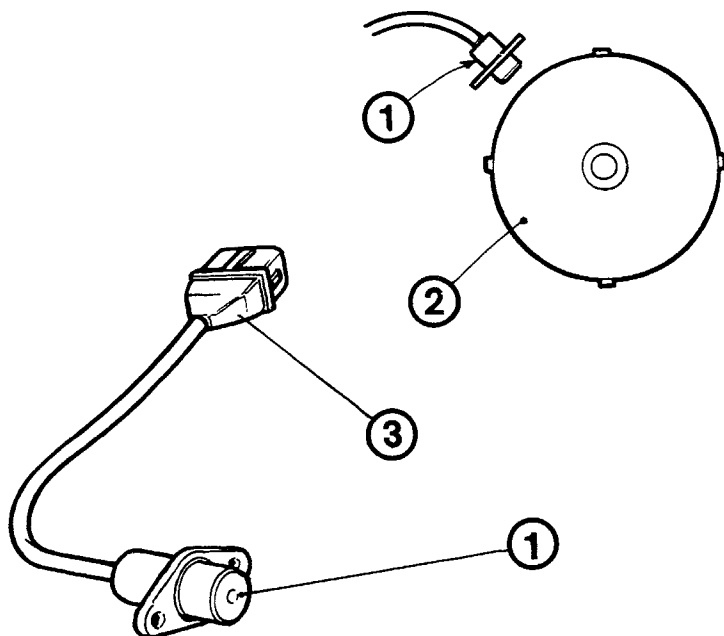
1. Sensor or magnetic impulse generator
2. Crankshaft pulley with 4 projections
3. Connector for connection with electronic control unit

The sensor used is of the variable reluctance type and is facing the pulley (2) fitted on the crankshaft.

The latter has 4 projecting teeth 90° from one another and as each of these pass under the sensor they cause a variation in the flux and consequently an alternating electrical signal.

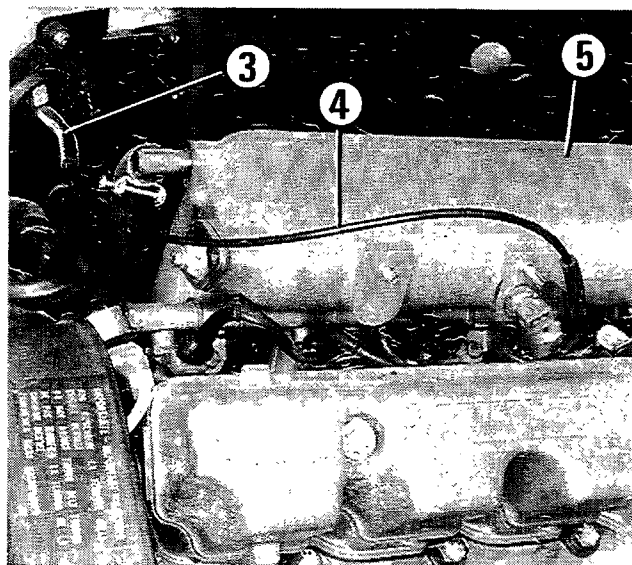
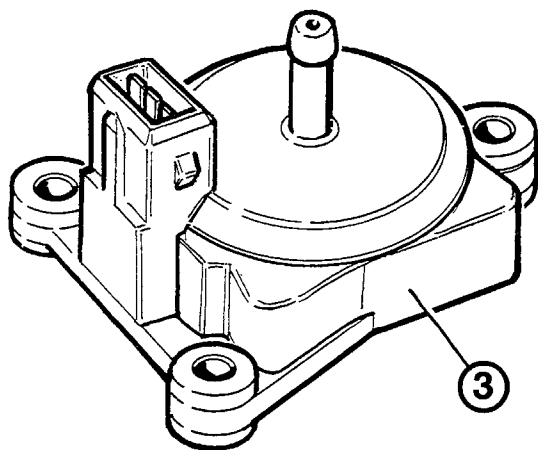
From the frequency of this signal the electronic control unit is able to obtain information on the engine speed and the TDC position of the pair of cylinders nos. 1 and 4 or 2 and 3 through the 2 projections which are 180° apart.

NOTE *Each TDC measurement for the pulley is facing the sensor exactly at TDC for each pair of cylinders.*



Absolute pressure sensor

Location of absolute pressure sensor in the engine compartment



The pressure sensor (3) is a transducer connected by a rubber pipe (4) to the inlet manifold (5) which supplies a voltage signal proportional to the absolute pressure of the air.

The sensor is supplied by the electronic control unit and provides information concerning the absolute pressure of the air in the inlet manifold.

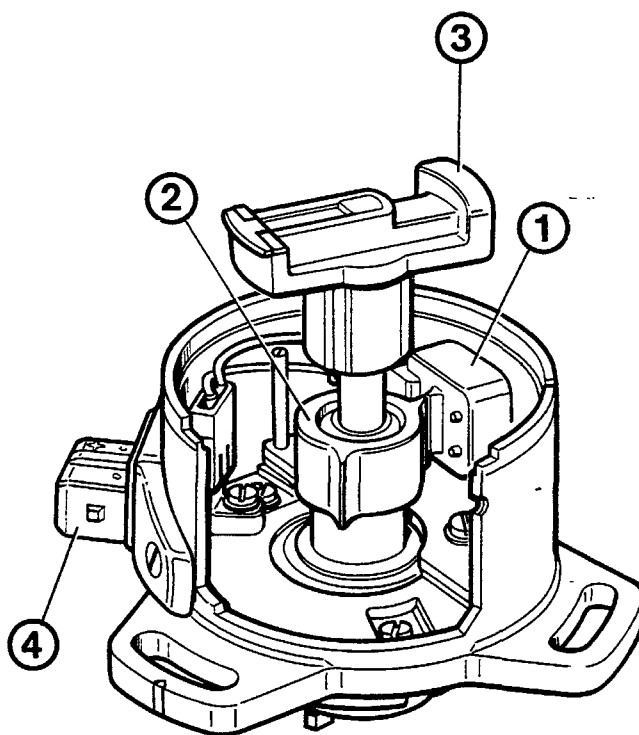
This information, together with the measurement of the temperature of the air and volumetric output corresponding to the engine operating speed, is used to calculate the density of the air.

H.T. distributor with injection timing sensor

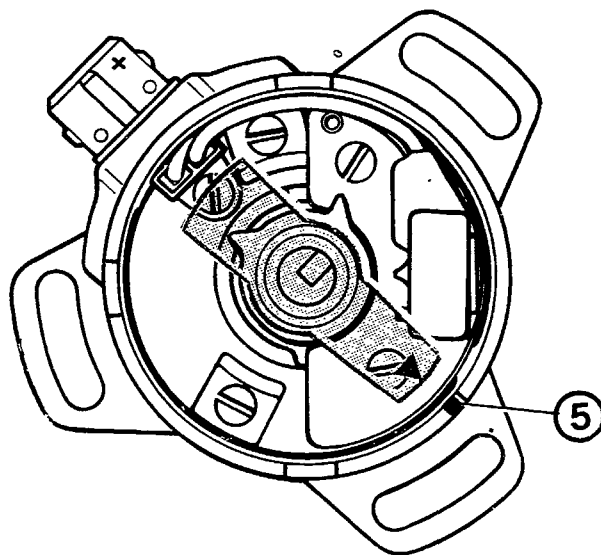
The sensor (1) used is of the variable reluctance type and it is opposite a cam (2) with two teeth (90° apart) fitted on the distributor control shaft.

As each tooth passes in front of the sensor an alternating electrical signal is produced in the sensor winding which is sent to the control unit. The superimposing of the timing sensor and rpm sensor signals on a single map, memorized in the control unit, makes it possible for the latter to identify the operating stage for each cylinder to control the injection adhering to the following sequence (cylinders 1,3,4,2).

A rotor arm (3) with a built in resistance of **1000Ω** distributes the sparks to the 4 spark plugs. This is the only part of the distributor (together with the cap) belonging to the ignition system.



If the distributor (and consequently the timing sensor) is not fitted correctly in relation to the correct timing, the control unit will no longer be able to control the injection because it will no longer recognize the engine timing in its memory.

**Distributor with rotor arm and casing optioned for correct timing with engine in TDC position**

1. Timing sensor or magnetic impulse generator
2. 2 tooth cam or timer
3. H.T. rotor arm
4. Control unit connector terminal
5. Rereference mark with H.T. rotor arm centre line for distributor timing.

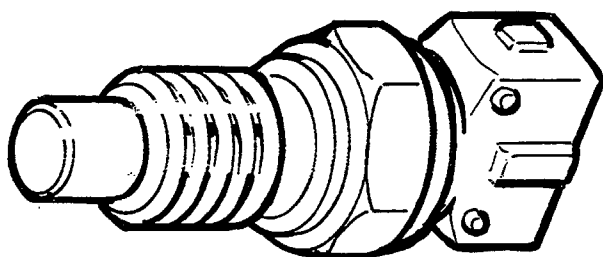
10.

Coolant temperature sensor

The sensor comprises an NTC thermistor which measures the temperature of the coolant near the thermostat.

The electrical signal obtained reaches the electronic control unit and is used to correct the mixture strength.

NOTE *N.T.C. means that the resistance of the thermistor decreases as the temperature increases.*



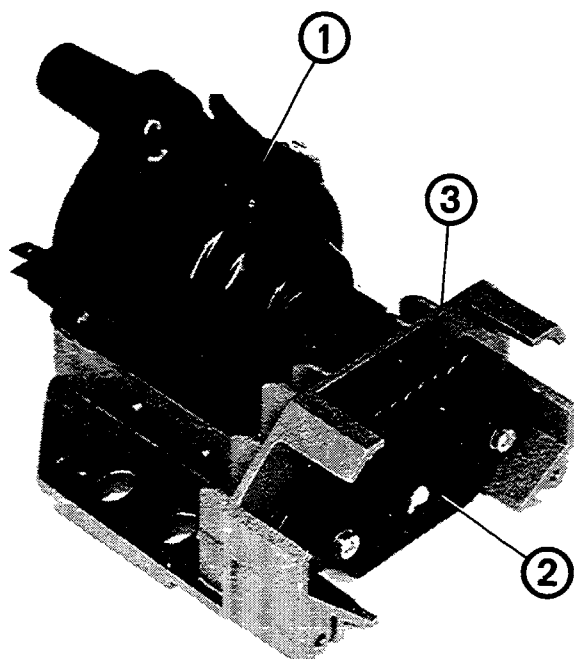
Ignition unit (coil and power module)

1. Ignition coil
2. Power module or ignition control
3. Heat dissipation plate

The ignition system used is of the inductive discharge type.

The ignition unit is composed of a coil and a power module. The latter receives the order to cut off the current from the electronic control unit, which processes the desired ignition advance.

The power module ensures a charge for the constant energy coil whatever the battery charge conditions.



Relays

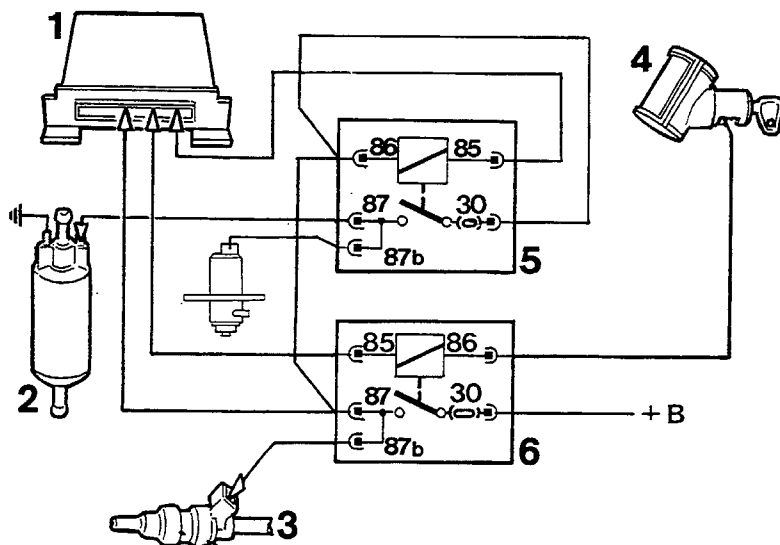
1. Electronic control unit
2. Electric fuel pump
3. Injector
4. Ignition switch with key
- 5.6. Relays

The post-modification relays are no longer protected by a fault in fuse.

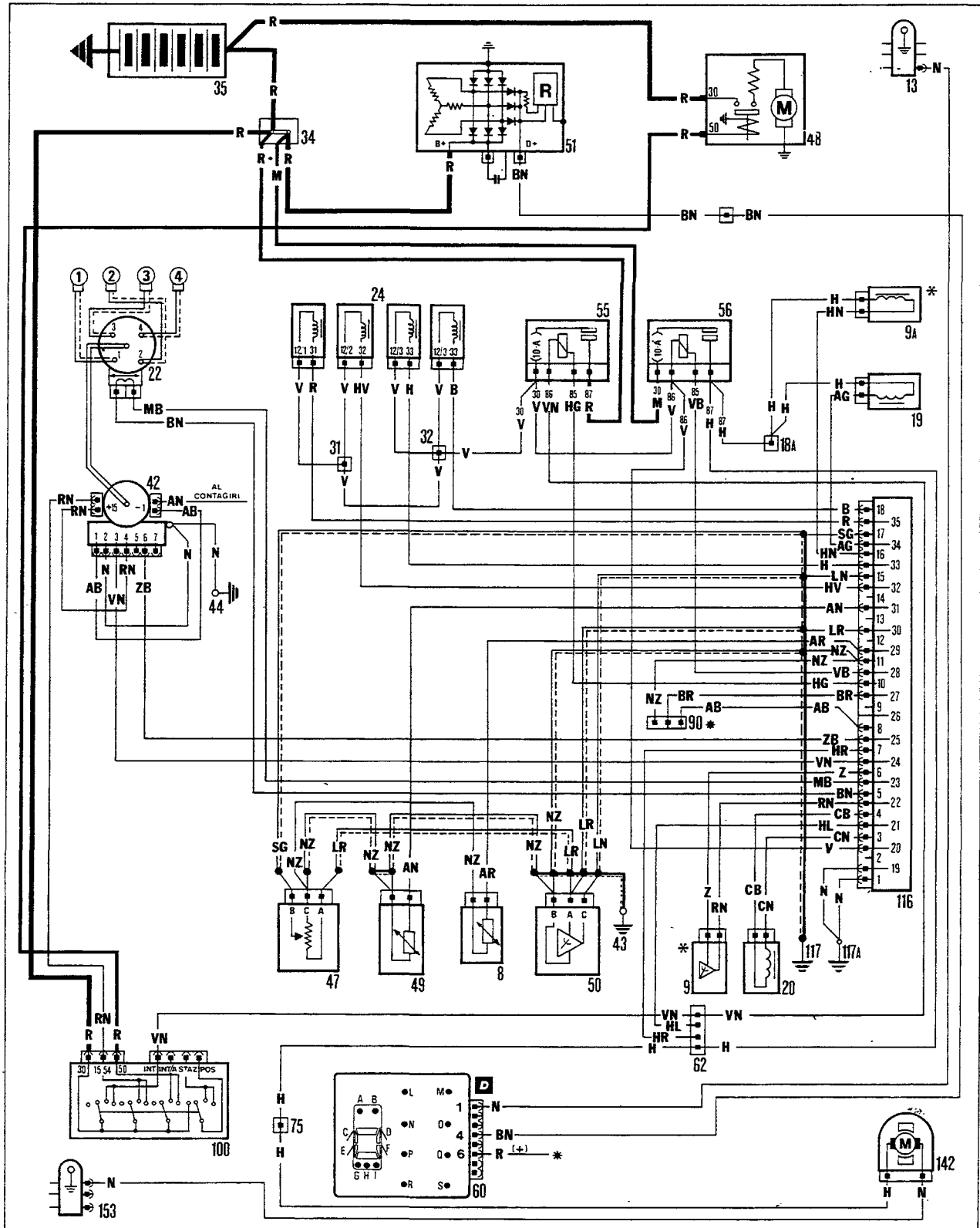
Two relays are used in the WEBER injection/ignition system.

The connection to earth of the relay energizing circuits is carried out by the electronic control unit and is protected against pole reversal.

A relay (5) supplies the electric fuel pump and the automatic idle adjustment valve; whilst a second relay (6) supplies the injectors, control unit and electric pump relay feed.



WEBER INJECTION/IGNITION SYSTEM (ante-modification) (see page 17 for key and cable colour code)



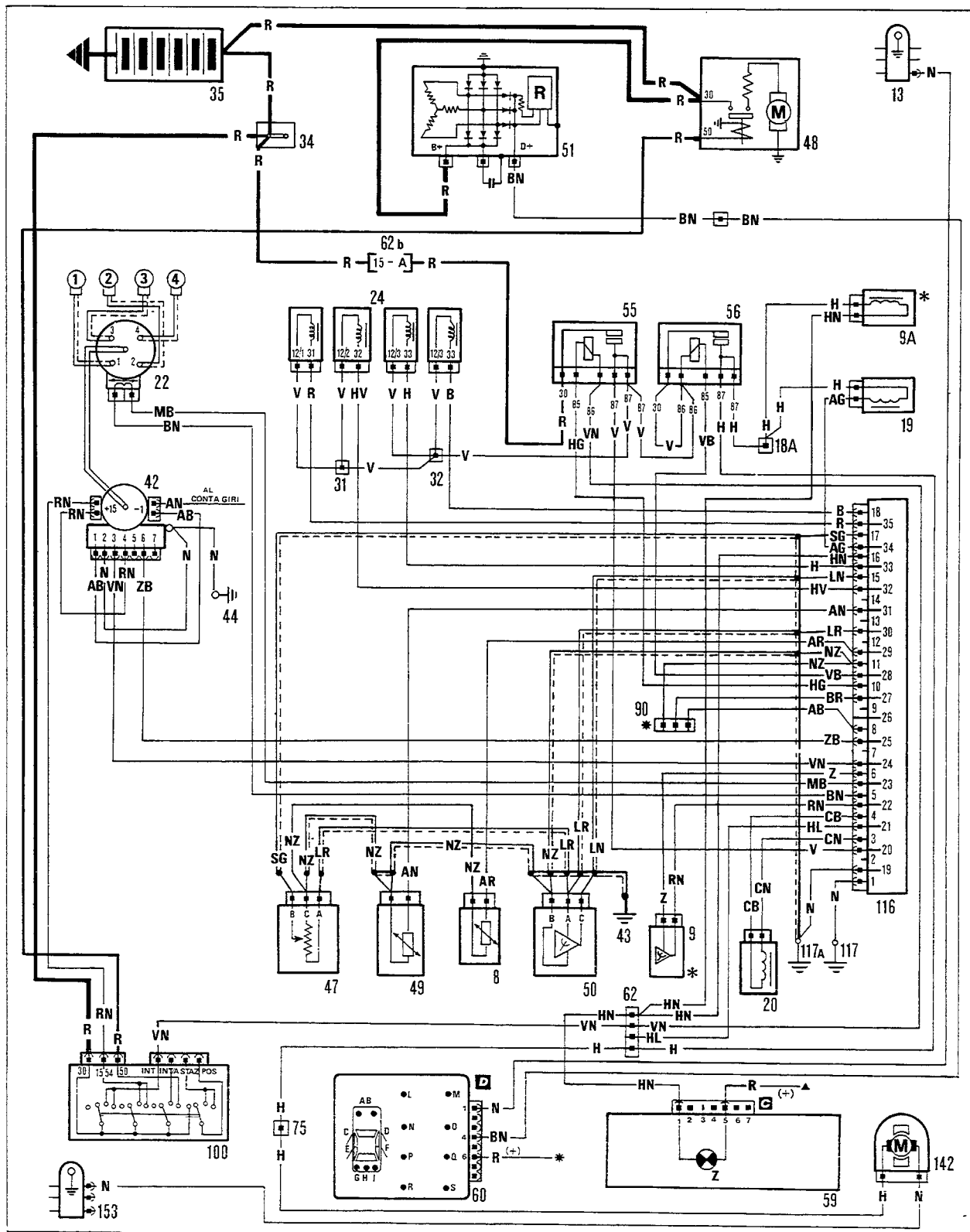
- * TO CONNECTOR 6F OF THE CONTROL BOX FUSE BOX
- * FOR THE DELTA 4WD TURBO

FOR THE PRISMA 4WD

10.

WEBER INJECTION/IGNITION SYSTEM (post-modification)

(see page 17 for key and cable colour code)



* TO CONNECTOR 61 OF THE CONTROL BOX FUSE BOX
* FOR DELTA 4WD TURBO

FOR PRISMA 4WD

IAW injection/ignition system wiring diagram key for pages 15 and 16

- | | |
|--|---|
| 8. Coolant temperature sensor | 49. Intake air temperature sensor |
| 9. Detonation sensor | 50. Absolute pressure sensor |
| 9A. OVER-BOOST solenoid valve (power increase) | 51. Alternator with built in regulator |
| 13. Right front earth cable loom | 55. Injector control relay |
| 18A. Connector | 56. Electric fuel pump control relay |
| 19. Automatic idle adjustment solenoid air valve | 60. Control-system |
| 20. Rpm and TDC sensor | 62. Connector block (located in tunnel near the IAW electronic control unit) |
| 22. Ignition distributor with built in timing sensor | 62b. 15 A protective fuse located between relays (55) and (56) |
| 24. Fuel injectors | 75. Connector block |
| 31. Connector | 90. Diagnostic socket for Fiat-Lancia tester (located in tunnel near IAW electronic control unit) |
| 32. Connector | 100. Ignition switch with key |
| 34. Connector | 116. IAW injection/ignition electronic control unit |
| 35. Battery | 117. Connector |
| 42. Ignition coil with power module | 117A. Connector |
| 43. Earth connector | 142. Electric fuel pump |
| 44. Earth | 153. Left rear earth cable loom |
| 47. Butterfly valve position sensor | |
| 48. Starter motor | |

Cable colour code

| | | | | | |
|---|------------|----|-------------------|----|--------------|
| A | Light Blue | AB | Light Blue-White | HN | Grey-Black |
| B | White | AG | Light Blue-Yellow | HR | Grey-Red |
| C | Orange | AN | Light Blue-Black | LB | Blue-White |
| G | Yellow | AR | Light Blue-Red | LG | Blue-Yellow |
| H | Grey | AV | Light Blue-Green | LN | Blue-Black |
| L | Blue | BG | White-Yellow | LR | Blue-Red |
| M | Brown | BL | White-Blue | LV | Blue-Green |
| N | Black | BN | White-Black | MB | Brown-White |
| R | Red | BR | White-Red | MN | Brown-Black |
| S | Pink | BV | White-Green | NZ | Black-Violet |
| V | Green | BZ | White-Violet | RB | Red-White |
| Z | Violet | CA | Orange-Light Blue | RG | Red-Yellow |
| | | CB | Orange-White | RN | Red-Black |
| | | CN | Orange-Black | RV | Red-Green |
| | | GN | Yellow-Black | SN | Pink-Black |
| | | GL | Yellow-Blue | VB | Green-White |
| | | GR | Yellow-Red | VN | Green-Black |
| | | GV | Yellow-Green | VR | Green-Red |
| | | HG | Grey-Yellow | | |

10.

HT distributor with
built in timing sensor

coolant temperature
sensor

anti-detonation
sensor (*)

air temperature
sensor
(in manifold)

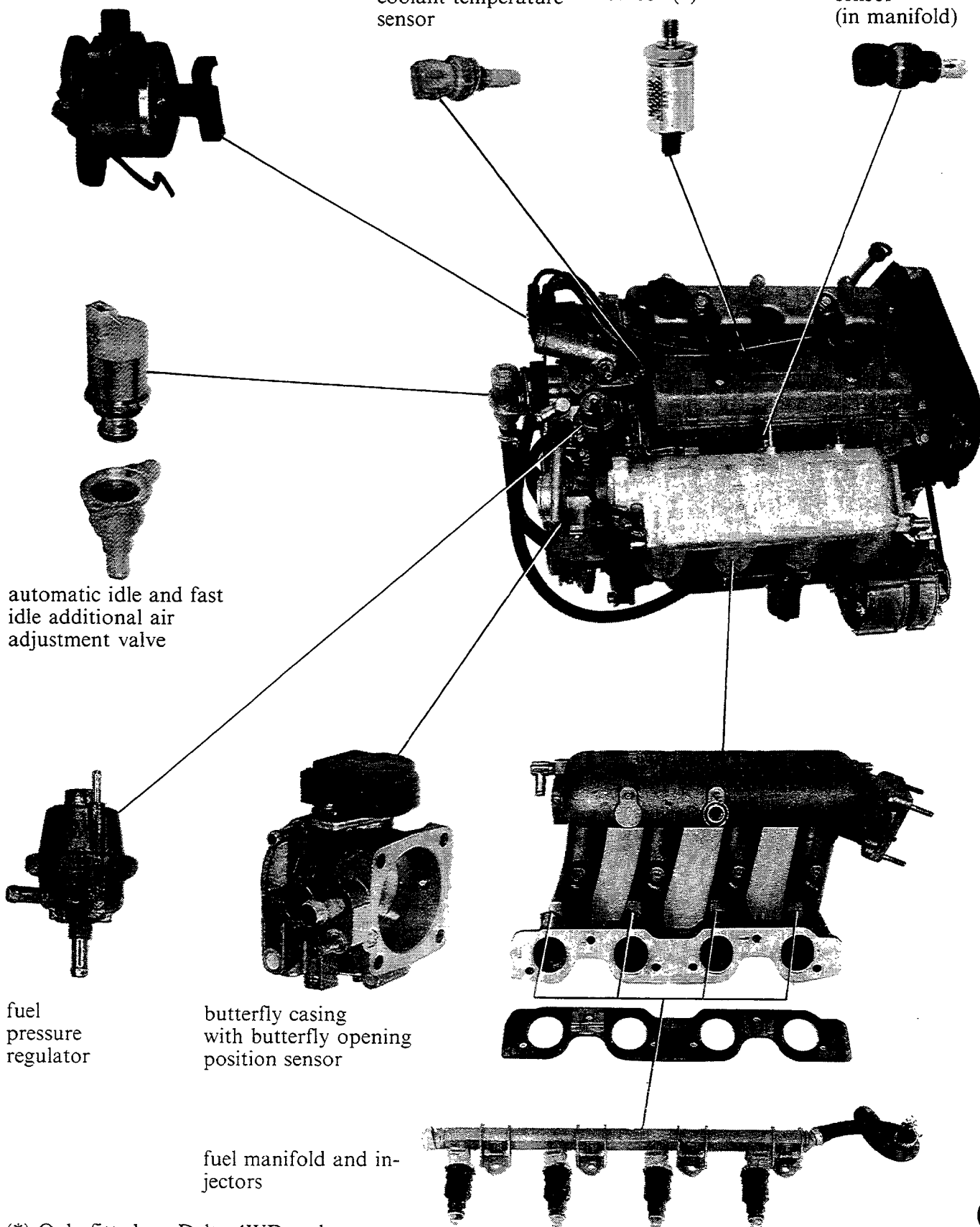
automatic idle and fast
idle additional air
adjustment valve

fuel
pressure
regulator

butterfly casing
with butterfly opening
position sensor

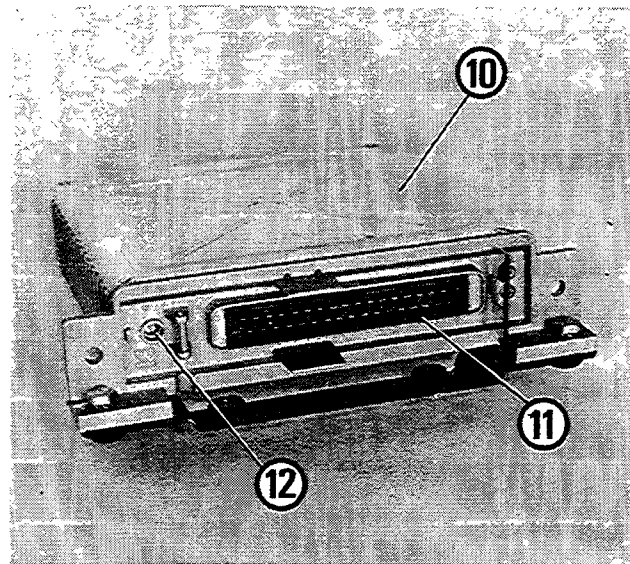
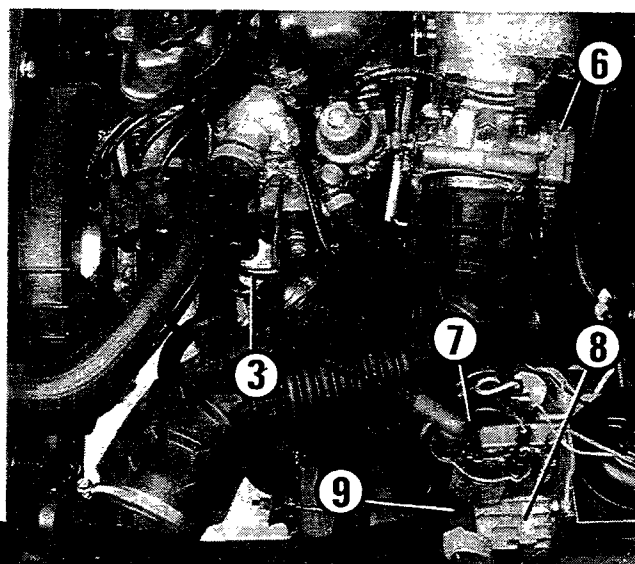
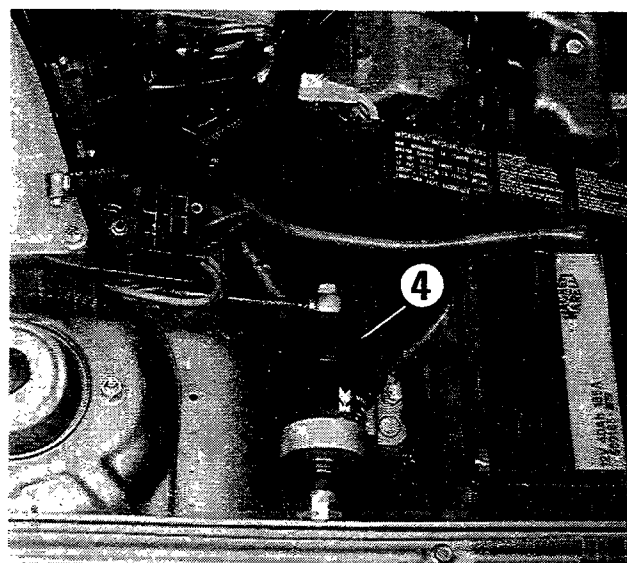
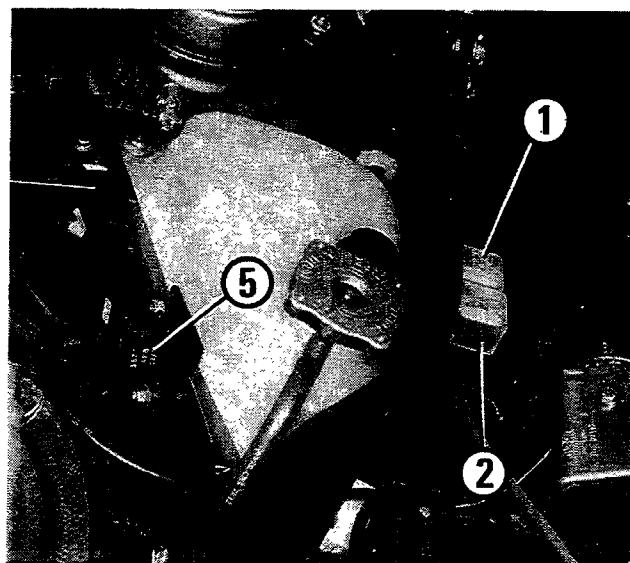
fuel manifold and in-
jectors

(*) Only fitted on Delta 4WD turbo



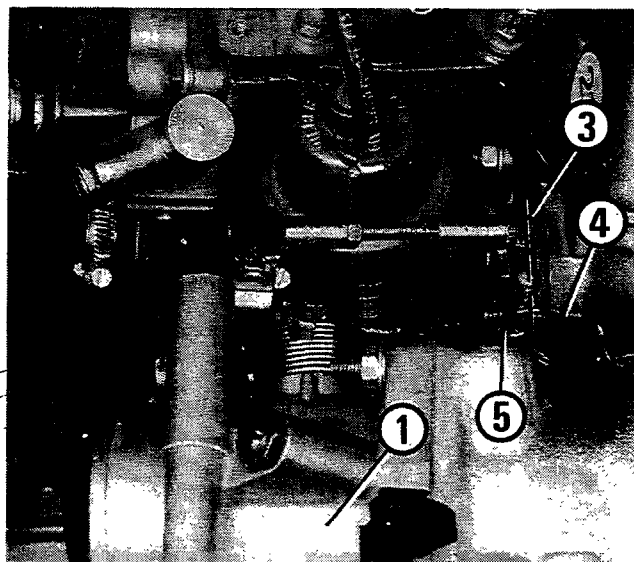
Location of IAW system components

1. Electric fuel supply pump relay (with or without fuse)
2. Injector control and control unit supply relay (with or without fuse)
3. Automatic idle adjustment supplementary air solenoid valve
4. Fuel filter
5. Absolute pressure sensor
6. Butterfly valve position sensor
7. Ignition coil
8. Ignition unit heat dissipator plate
9. Ignition module connector
10. Injection/ignition electronic control unit (located on the right side of the tunnel, under the dashboard)
11. Injection/ignition control unit terminals for connection to the system
12. CO adjustment screw (protected by an anti-tamper plug).



10.

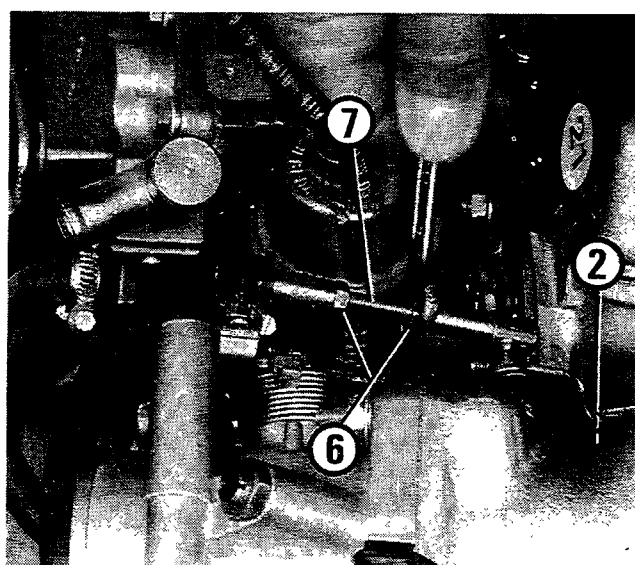
IAW SYSTEM CHECKS AND ADJUSTMENTS



ADJUSTING BUTTERFLY VALVE CONTROL ROD

NOTE *The butterfly valve stop screw (5) is adjusted in the factory and should never be tampered with because it is adjusted in such a way that a specific amount of air enters the engine with the butterfly closed.*

View of accelerator



- 1. Butterfly casing
- 2. Butterfly valve control cable
- 3. Butterfly valve control rod
- 4. Control lever
- 5. Butterfly valve stop screw
- 6. Rod lock nuts
- 7. Rod length adjustment screw

Adjustment of butterfly valve control rod

In order to check whether the valve control rod is properly adjusted (in terms of length) simply start up the engine, let it warm up until it reaches the operating temperature and let it idle.

At this point disconnect the end of the rod from the control lever: the engine should continue to idle without any alternation in speed. If the engine speed does change it is necessary to adjust the length of the rod by regulating the adjustment screw (7) after having undone the lock nuts (6).

The length of the control rod is correct when the engine idle speed is 800 - 850 rpm without any alternations when the end of the rod (3) is refitted to the butterfly valve control lever (4).

ADJUSTING IDLE SPEED AND CARBON MONOXIDE (CO)

Firstly check the condition of the connecting pipes between: the inlet manifold and the absolute pressure sensor, the fuel pressure regulator and the inlet manifold; the servo brake vacuum pipe; the air pipes for the automatic idle adjustment solenoid valve.

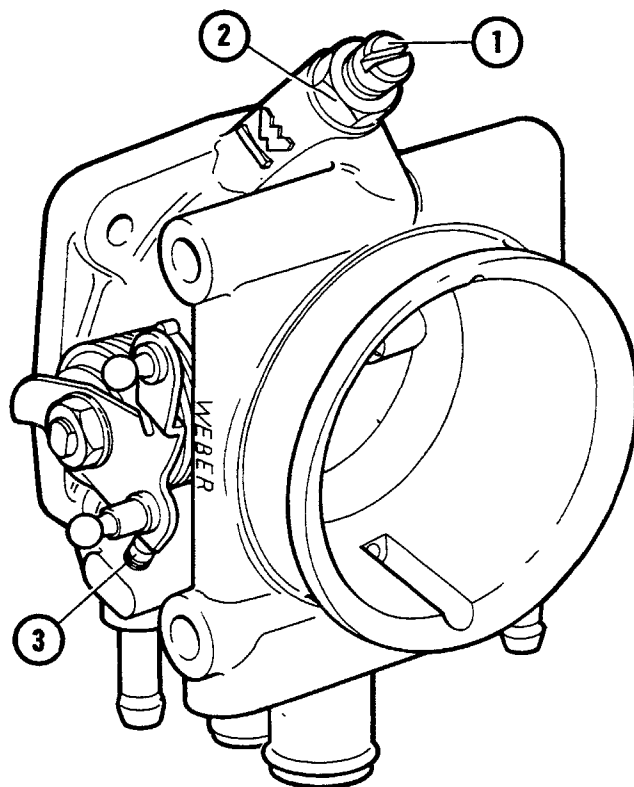


The idle speed is adjusted with the engine at the operating temperature, in other words when the cooling circuit fan has come on at least twice.

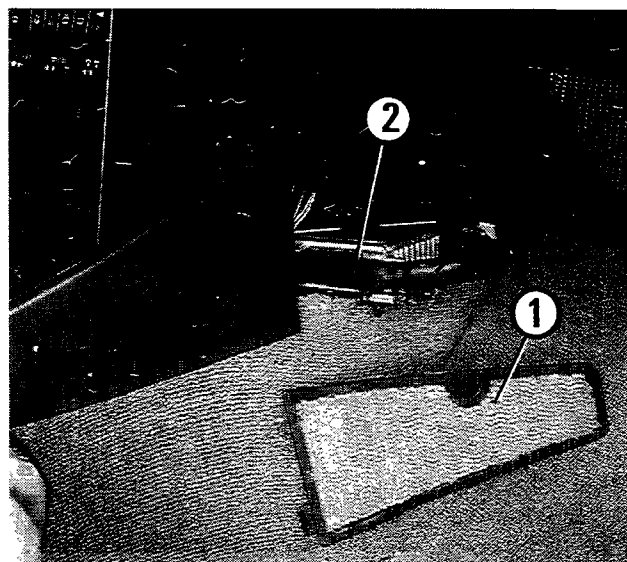
The adjustment of the idle speed is carried out with the fan switched off and without any other connectors engaged (heated rear windscreen, air conditioning, headlamps, etc.).

If the electric fan comes on during the adjustment, do not operate until it is completely still.

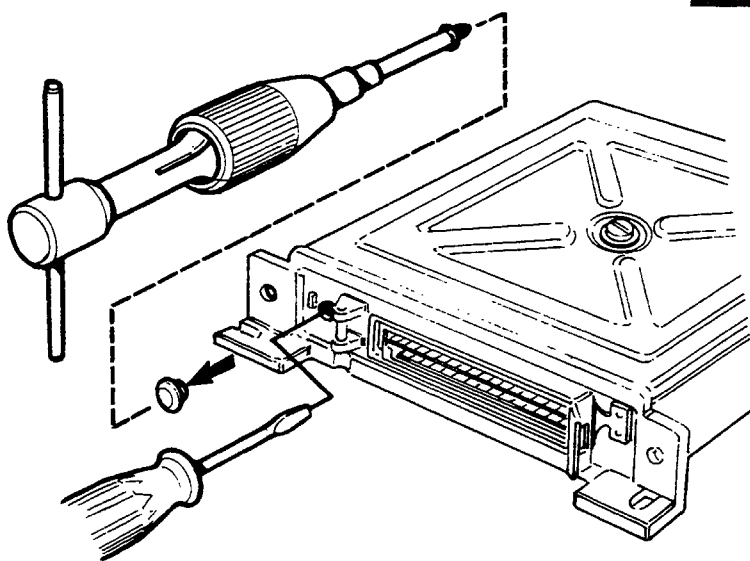
In order to adjust the exhaust CO correctly, the engine should operate with the correct ignition advance. ($15^\circ \pm 2^\circ$ for the Delta and $18^\circ \pm 2^\circ$ for the Prisma).



- Connect a rev counter to the engine
- Insert the exhaust gas analyzer sensor probe into the silencer
- Disconnect the solenoid air valve connector and check that the idle speed is between 750 and 800 rpm for both vehicles with a manual gearbox or automatic transmission and that the CO percentage is between 1% and 2%.
- If the idle speed is not correct, loosen the by-pass screw (2) lock nut (1) and adjust it until the speed is between 750 and 800 rpm
- Reconnect the automatic idle adjustment solenoid valve connector: the engine operating speed should increase sharply (up to 1500 - 2000 rpm) but should then adjust itself straight afterwards to 800 - 850 rpm without any oscillations in speed.

**Removing-refitting injection control unit**

If the CO percentage measured is outside the permissible tolerance of 1.5 ± 0.5 it is necessary to remove the control unit plastic shield (1) on the right side of the tunnel and then free the control unit (2) by loosening the two bolts fixing it to the bodyshell



Adjusting CO content in control unit

Using tool 1848007000, remove the CO anti-tamper plug from the control unit and proceed to adjust the CO percentage with the engine at the operating temperature and correct idle speed, using a 4 mm maximum broad screwdriver, by tightening or loosening the adjustment screw until the correct CO percentage is obtained. The CO adjustment screw has a rotation field of around 270°.

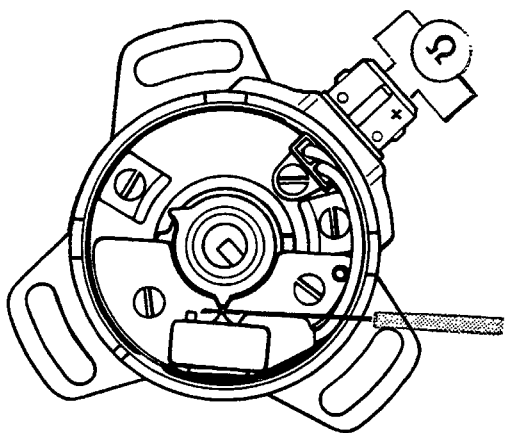
Never force this screw under any circumstances or this will damage the control unit.

Check that the rotation speed does not vary during this operation; if this is not the case, reset the speed at the nominal value by adjusting the butterfly casing by-pass screw and check that the CO percentage has not altered. Fit the new anti-tamper plug (black).



If the idle speed is irregular or cannot be adjusted, the problem may lie in the automatic idle adjustment solenoid valve (short circuit or break) or in the electronic control unit idle adjustment supply valve control.

In addition, the fault may be due to an overflow of air in the valve supply ducts or the seals inside the actual valve.



Checking HT distributor timing sensor gap

Rotate the distributor control shaft until each timer tooth is facing the sensor. Using a feeler gauge, measure the distance between the two, i.e. the gap, which should be between 0.3 and 0.4 mm.

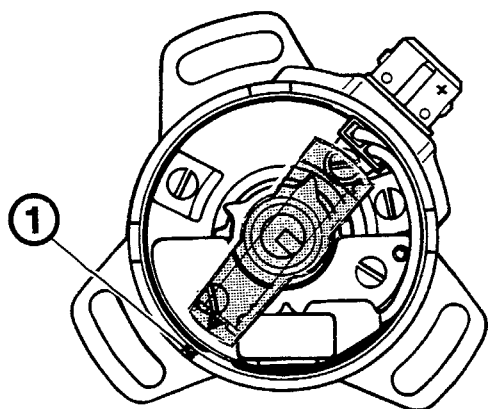
Checking timing sensor winding resistance

Using an ohmmeter, measure the resistance value between the 2 connector terminals as shown in the diagram: the reading should be between 758Ω and 872Ω at 20°C.

HT distributor timing on engine



Position pistons 1 and 4 at TDC and the distributor rotor arm centre line facing the reference mark (1) on the distributor casing. Then fit the distributor and fix it, in this position, to the cylinder head.



In order to position the distributor correctly, fit tool 1895896000 on the distributor, after having removed the cap, in such a way that the centering pin inside the tool fits into the reference mark (1) in the distributor casing. This tool eliminates the parallax error in checking the reference marks.

When the engine is operating at the correct idle speed the ignition advance (memorized in the IAW control unit) should be $15^{\circ} \pm 2^{\circ}$ for the Delta and $18^{\circ} \pm 2^{\circ}$ for the Prisma. If this is not the case, the rpm and TDC sensor is incorrectly positioned or the control unit memory is faulty.



In order to check the resistance values for the various WII injection/ignition system sensors it is necessary to use precision digital testers for the temperature of the sensors being checked. It is advisable therefore, when the sensors are not short circuited or broken, to try and replace them with a test sensor before discarding them as faulty.

Method for determining TDC for piston no. 1

Checking rpm and TDC sensor position

Rotate the crankshaft to the TDC position; remove spark plug no. 1 and insert tool 1895879000 complete with dial gauge 1895881000 in its place; zero the dial gauge when piston no. 1 is exactly at TDC (i.e. the highest point reached during its stroke). Position tool 1895895000 in place of the sensor: the projection on the pulley should fit perfectly in the groove in the tool.

If this is not the case, loosen the sensor carrier plate and fix it with the above mentioned tool inserted in the pulley indentation.

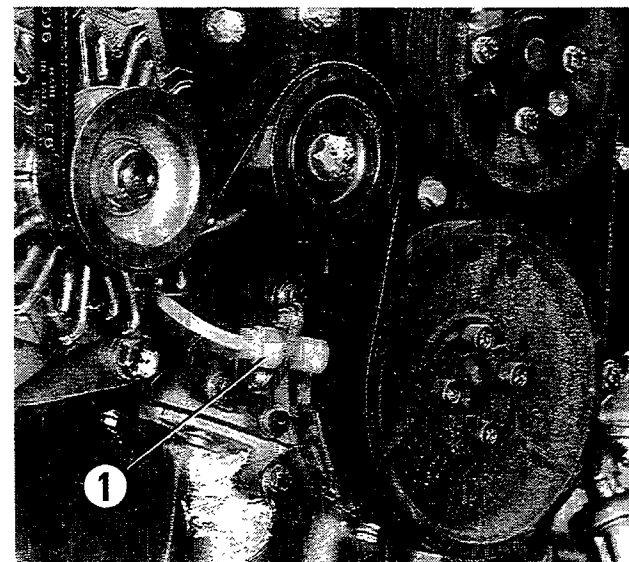
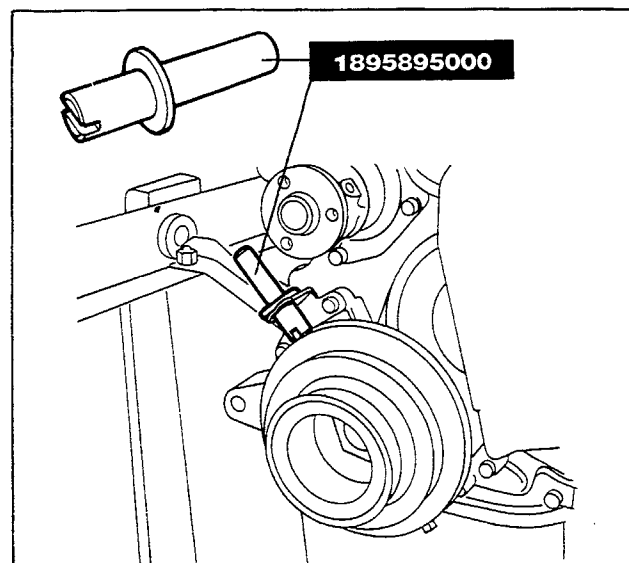
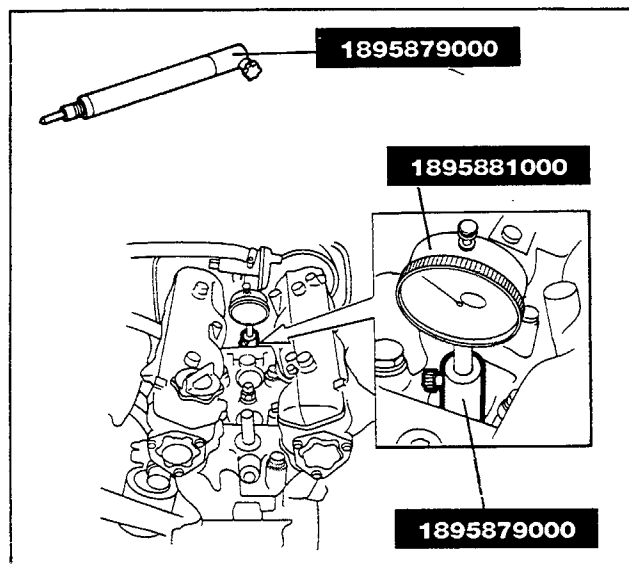
Checking correct positioning of rpm and TDC sensor

Checking rpm and TDC sensor (1) winding resistance

Disconnect the sensor connector and using an ohmmeter measure: the value between the 2 connector terminals which should be between 618Ω and 748Ω at 20°C .

Checking rpm and TDC sensor gap

Using a feeler gauge (1) check that the distance between each of the 4 notches in the crankshaft pulley and the sensor core, when they are facing, is between 0.6 and 1.2 mm.



10.

Checking butterfly valve position sensor potentiometer

Insert an ohmmeter between contacts b and c of the sensor terminal, then gradually open the butterfly valve: the resistance value should vary without any sudden changes from $\sim 450\Omega$ up to $\sim 80\Omega$ with the butterfly valve completely open (approximate figures)

Checking efficiency of temperature sensors

Disconnect the sensor connectors; using an ohmmeter connected between the 2 contacts of the sensor being checked, check the resistance values.

They should be within the following limits:

1. Coolant sensor for engine temperatures at

- 10°C from $\sim 15,27\text{ k}\Omega \div 17,93\text{ k}\Omega$
- + 20°C from $\sim 3,56\text{ k}\Omega \div 3,93\text{ k}\Omega$
- + 80°C from $\sim 0,34\text{ k}\Omega \div 0,41\text{ k}\Omega$

2. Intake air temperature sensor for air temperatures

- 10°C from $\sim 15,27\text{ k}\Omega \div 17,93\text{ k}\Omega$
- + 20°C from $\sim 3,56\text{ k}\Omega \div 3,93\text{ k}\Omega$
- + 80°C from $\sim 0,68\text{ k}\Omega \div 0,82\text{ k}\Omega$

CHECKING FUEL PRESSURE, PRESSURE REGULATOR AND ELECTRIC PUMP

- Make sure that the ignition switch is in the OFF position.
- Remove the union fixing the fuel inlet pipe to the fuel injector manifold and insert the pressure gauge complete with unions no. 1895890030 in its place.

NOTE *The pressure gauge should be between the pressure regulator and the pressure gauge tap. The operation of fitting the pressure gauge should be carried out taking special care as regards cleanliness in order not to introduce any foreign bodies into the injectors which would obstruct them.*

- Open the pressure gauge tap (lever in line with tap axis).
- Turn the ignition switch to the ON position without starting up the engine (this energizes the fuel pump for a moment). Repeat this several times.

The reading on the pressure gauge should be 2.5 ± 0.2 bar whilst the electric pump is operating.

NOTE *In order to reach the regulation pressure more quickly: remove the electric pump control relay (the outermost one) and connect terminals 30 and 87 to one another using a bridge incorporating a 20A fuse.*

The electric fuel pump should be supplied directly from the connection.

When the fuel pressure test is carried out the following may occur:

a) The pressure shown on the pressure gauge is greater than $2,5 \pm 0,2$ bar

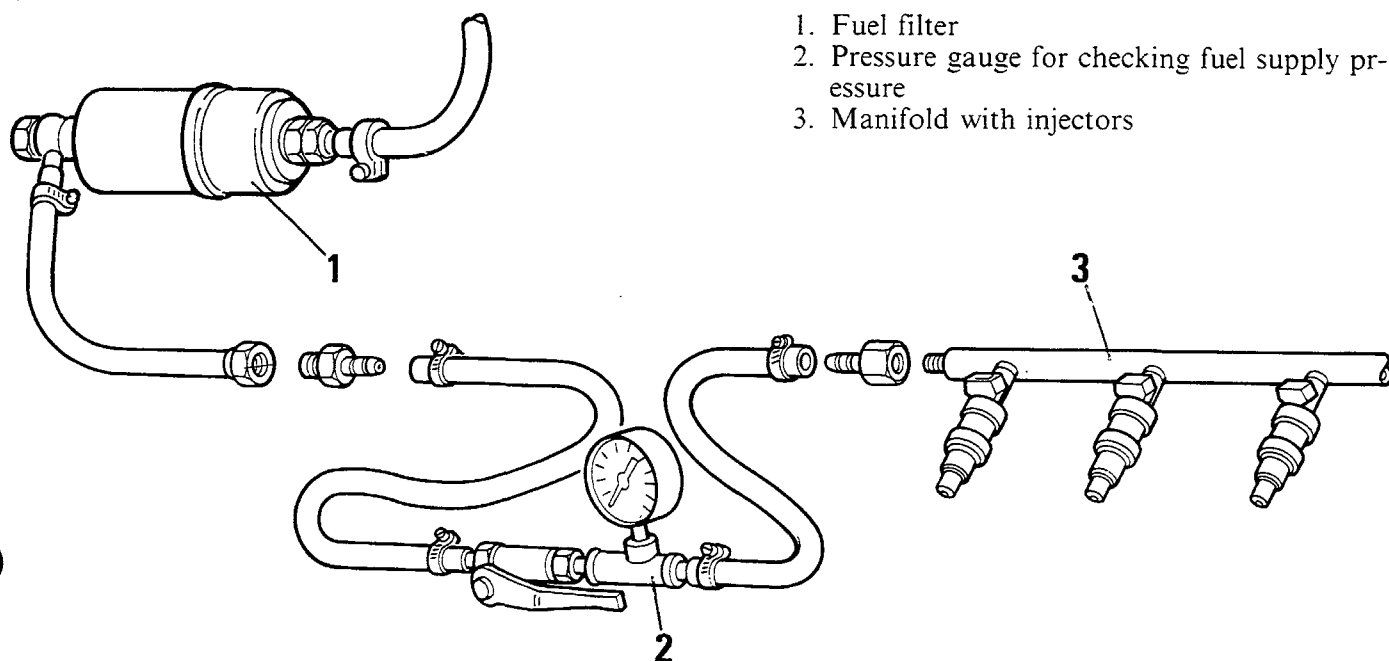
If this is the case, proceed as follows:

disconnect the return pipe from the pressure regulator and fit a temporary pipe in its place from the regulator to a petrol collection tray. Repeat the test turning the ignition switch to the ON position. If the pressure is now 2.5 ± 0.2 bar, the defect should be sought in a blockage of the vehicle return pip; if the pressure is still above 2.5 ± 0.2 bar, replace the pressure regulator.

b) The pressure reading on the gauge is less than 2.5 ± 0.2 bar, or reaches this value very slowly: this may be caused by the filter being blocked (the filter should be replaced every 20,000 km), or by an obstruction in the pump inlet.

If neither of the above anomalies is encountered:

- using special pliers, close the regulator return pipe whilst the ignition switch is turned to the ON position. If the pressure goes above 5 bar, replace the pressure regulator as it is faulty; if the pressure remains at a value below 2.5 ± 0.2 bar, replace the pump because it is worn or defective.



1. Fuel filter
2. Pressure gauge for checking fuel supply pressure
3. Manifold with injectors

c) The pressure shown in the gauge falls rapidly even after being stabilized.

NOTE The stabilization pressure varies according to the elasticity and length of the pressure gauge pipes. It may settle at 2.0 - 1.5 bar after a short time.

If this condition occurs, turn the ignition switch to the ON position and whilst the pump is turning shut the pressure gauge tap.

The pressure reading on the gauge once it stabilizes should not vary.

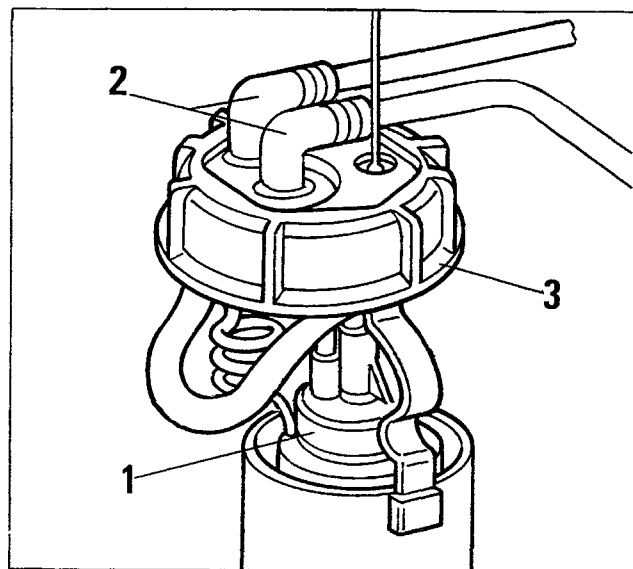
If this is not the case, the fall in pressure is caused by the imperfect seal of the pressure regulator valve or one of the injector valves.

In order to locate the fault, open the pressure gauge tap once again: turn the ignition switch to the ON position; close the return pipe using pliers and keep it tightly closed throughout the duration of the test; shut the pressure gauge tap again and observe whether the pressure falls rapidly. If this is the case, one or more injectors is dripping and they should be found and replaced. If this is not the case, the pressure regulator should be replaced because the internal valve is not properly sealed (observe whether or not there are leaks between the regulator ring seal and the injector manifold seat).

When the above tests have been completed, remove the pressure gauge and restore the fuel supply connections, making sure that there are no leaks.

Removing-refitting electric fuel pump (1)

The electric fuel pump is the immersion type and is located in the fuel tank. Remove the rear seat, disconnect the two petrol pipes (2) (removing the retaining springs) and loosen the securing ring nut (3) using tool A. 1854033000



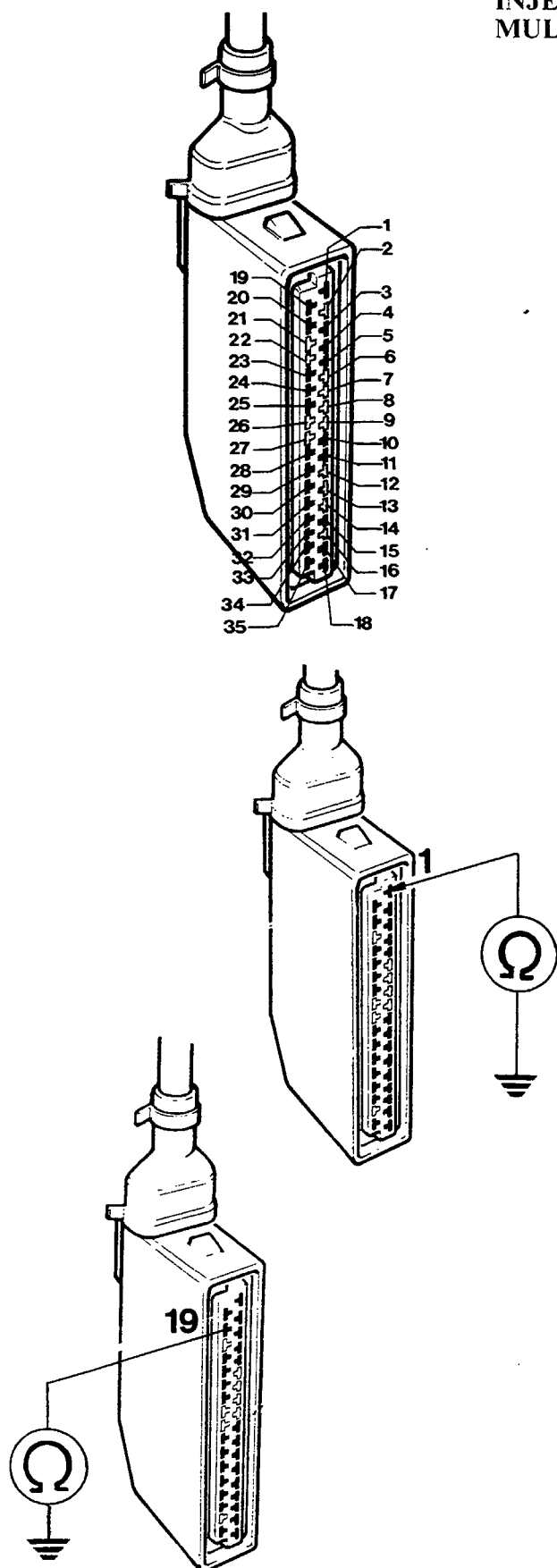
10.

**INJECTION/IGNITION ELECTRONIC CONTROL UNIT
MULTIPLE CONNECTOR**

Checking continuity of connection cables and sensor resistance

Remove the control unit protective cover on the right hand side of the tunnel, under the dashboard, then loosen the 2 bolts fixing the latter to the bodyshell and extract it. Make sure that the ignition switch is in the OFF position. Disconnect the multiple connector and, using an ohmmeter, check the continuity or the resistance of the following:

1. Negative supply (-)
2. Not used
3. Rpm and TDC sensor negative
4. Rpm and TDC sensor positive
5. Distributor timing sensor negative
6. To the over-boost solenoid valve (*)
7. Not used
8. To the Fiat-Lancia tester diagnostic socket
9. Not used
10. Negative at terminal 85 of the injector control relay
11. Absolute pressure, butterfly valve position and air intake temperature sensor negative
12. Not used
13. Not used
14. Not used
15. Absolute pressure sensor signal intake
17. Butterfly valve position sensor signal intake
18. Cylinder no. 4 injector
19. Negative supply (-)
20. Control unit supply (+) from injector control relay
21. Signal for idle adjustment solenoid valve for switching on air conditioning
23. Distributor timing sensor positive
24. Ignition period control
25. Ignition period control
26. Not used
27. To the diagnostic socket
28. To terminal 85 of the electric fuel pump relay feed
29. Coolant temperature sensor supply
30. Absolute pressure sensor and butterfly valve position sensor supply
31. Air intake temperature sensor supply
32. Cylinder no. 2 injector
33. Cylinder no. 3 injector
34. Supply intake from engine idle speed adjustment solenoid valve



(*) Only used on the Delta 4WD



Before carrying out the checks illustrated below it is absolutely vital to make sure that the ignition switch is in the OFF position (switched off).

Disconnect the multiple connector from the control unit, then carry out the following checks.

Checking continuity of multiple connector earth cables

There should not be any breaks but continuity between terminal 1 and an earth point and between terminal 19 and an earth point.

Renew any possible broken connections, ensuring that the earths are working properly.

Checking control unit supply cables continuity

Connect an ohmmeter between terminal 20 and terminal 87 of the injector relay carrier socket (disconnect the relay).

Checking rpm and TDC sensor resistance

Connect an ohmmeter between terminals 3 and 4. The reading should be around 612 - 748 Ω at 20°C.

Checking timing sensor resistance (located in the distributor)

Connect an ohmmeter between terminals 5 and 23. The reading should be about 750 - 880 Ω at 20°C.

Checking injector winding resistance

Connect an ohmmeter between terminal 20 and terminals 18 (cylinder no. 4); 33 (cylinder no. 3); 32 (cylinder no. 2) and 35 (cylinder no. 1), respectively. The reading should be between 2 - 3 Ω at 20°C.

Checking coolant sensor resistance

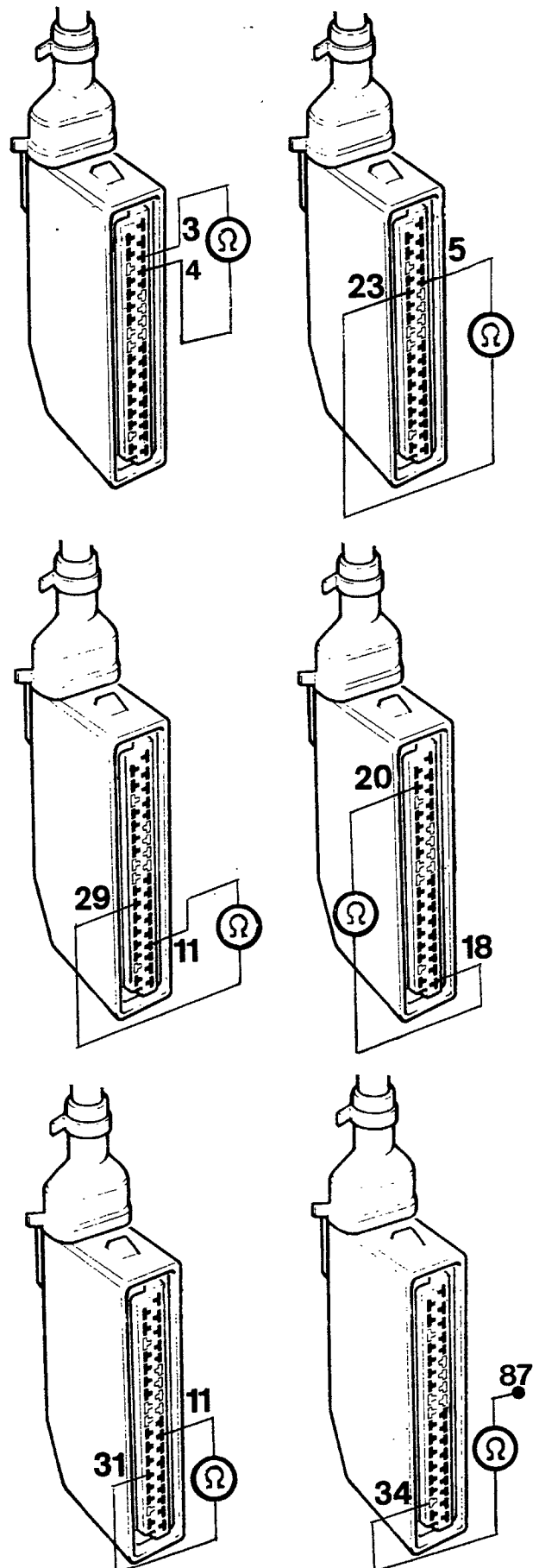
Connect an ohmmeter between terminals 29 and 11 (during the check disconnect the connector for the intake air temperature sensor, the butterfly valve position sensor and the absolute pressure sensor). The reading should be 15.2 - 17.9 k Ω at - 10°C, 3.5 - 3.9 k Ω at + 20°C, 0.3 - 0.4 k Ω at + 80°C.

Checking air temperature sensor resistance

Connect an ohmmeter between terminals 11 and 31 (during this check disconnect the connectors for the butterfly valve position sensor, absolute pressure sensor, coolant temperature sensor). The reading should be 15.2 - 17.9 k Ω at - 10°C, 3.5 - 3.9 k Ω at + 20°C, 0.6 - 0.8 k Ω at 80°C.

Checking automatic idle adjustment valve winding

Connect an ohmmeter between terminal 34 of the multiple connector and terminal 87 (relay disconnected) of the electric fuel pump relay carrier socket. The reading should be 7 $\Omega \pm 0.4$ at 20°C.



10.**Operation of control relays (refer to wiring diagram on page 16)**

When the ignition switch is turned to the ON position the injector control relay winding (55) is energized; in actual fact, the current arrives from terminal 15/54 and goes to earth through terminal 10 of the electronic control unit.

The relay (55) contacts close and the battery voltage is available to supply the control unit (terminal 20), the injectors (but their earth is inhibited with the engine not running) and the electric pump relay (56) winding. Since the relay (56) winding is closed to earth, through terminal 28 of the control unit, the current passes through it and closes the contacts: therefore both the electric pump and the idle air adjustment valve (19) are supplied.

If the engine is not started up, the electric fuel pump cuts out almost immediately (given that the control unit disconnects the relay earth by means of a timer).

Checking efficiency of relays

First of all check that the injection system protective fuse 62b located between the 2 relays is working properly.

If one of the relays does not click, replace it with a test relay. Remember that if the injector control relay (55) is not working then neither can the electric pump control relay (56).

If, after replacing the relays, they are still not working, check the continuity of the supply circuits - post-modification system - **relay (55)**: between terminal 85 and earth terminal 10 of the injection control unit connector; between terminal 86 and terminal 15/54 of the ignition switch; **relay (56)**: between terminal 85 and terminal 28 of the injector control unit connector; between terminal 86 and terminal 87 of the relay (55).

IAW ELECTRONIC INJECTION/IGNITION SYSTEM COMPONENTS

| DESCRIPTION | QUANTITY | PRISMA 4WD | DELTA 4WD |
|---|----------|----------------|----------------|
| ELECTRONIC CONTROL UNIT | 1 | WH2G.03/HAI-B8 | WH4E.03/085-F6 |
| BUTTERFLY CASING | 1 | 56 CFL 18 | 52 CFL 15 |
| INJECTOR | 4 | IW 023/03 | IW 025/01 |
| AUTOMATIC IDLE ADJUSTMEN AND ENGINE TIMING SOLENOID VALVE | 1 | VAE 02 | VAE 02 |
| PRESSURE REGULATOR | 1 | RP 1/3 bar | RP 1/3 bar |
| AIR TEMPERATURE SENSOR | 1 | ATS 04 | ATS 04 |
| WATER TEMPERATURE SENSOR | 1 | WTS 05 | WTS 05 |
| ABSOLUTE PRESSURE SENSOR | 1 | APS 03/01 | APS 02/07 |
| BUTTERFLY VALVE POSITION SENSOR | 1 | PF 09/01 | PF 09/01 |
| FUEL FILTER | 1 | FI 02/01 | FI 02/01 |
| ELECTRIC FUEL SUPPLY PUMP | 1 | PI 022/2 | PI 022/2 |

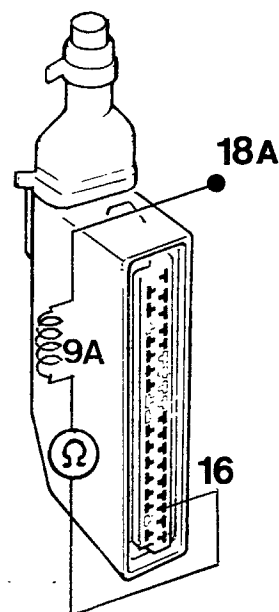
SYSTEM VARIANTS FOR DELTA 4WD HF TURBO

This model is equipped with two additional devices: **anti-detonation** and **over-boost** devices which have been described previously (see page 2 bis).

Below is a description of the check on the anti-detonation sensor and the over-boost solenoid valve wiring.

Checking continuity of connection cables and over-boost solenoid valve resistance

Before carrying out the checks described below it is absolutely vital to make sure that the ignition switch is in the OFF position (switched off)



Disconnect the multiple connector from the injection/ignition control unit, then carry out the following checks:

connect an ohmmeter between terminal 16 of the connector for the injection/ignition control unit and terminal 9A for the solenoid valve (after having disconnected the latter from connector 18A). The resistance value measured should be $\sim 40 \Omega$ at 20°C .

If this is not the case, replace the solenoid valve as it is faulty.

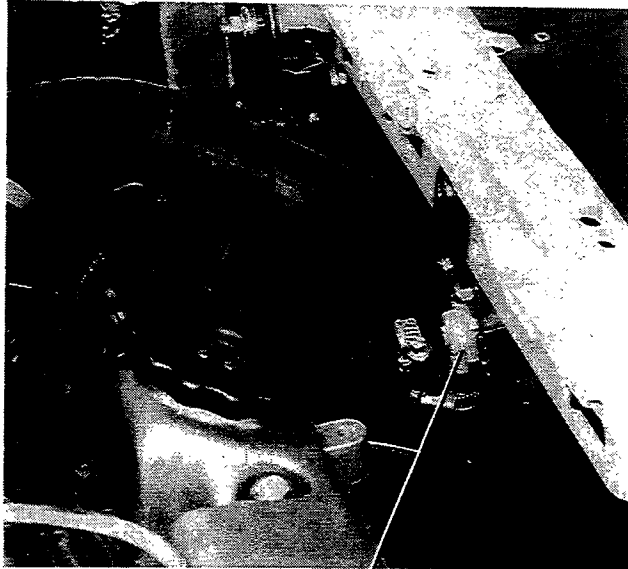
If the solenoid valve is not defective, but the device does not work, check the mechanical operation of the valve supplying it with 12 Volts. Also make sure that the rubber pipes are securely connected to the inlet manifold and the turbocharger (see diagram on page 2 BIS)

Checking detonation sensor

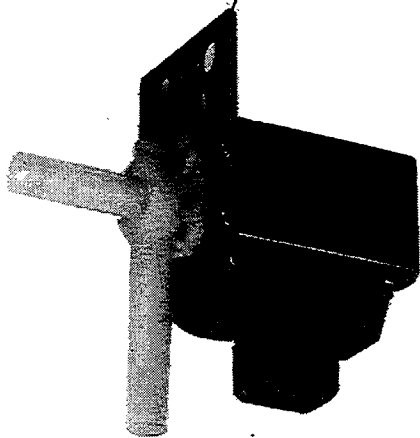
This check can only be carried out by replacing and road testing the sensor having previously replaced the sensor with a test sensor.

In order to check the continuity of the connection cables, disconnect the sensor connector and, using an ohmmeter, check that the resistance is virtually nil between the respective connector terminals and terminals 6 and 22 of the injection/ignition control unit. If this is not the case, locate and renew the broken connection.

10.



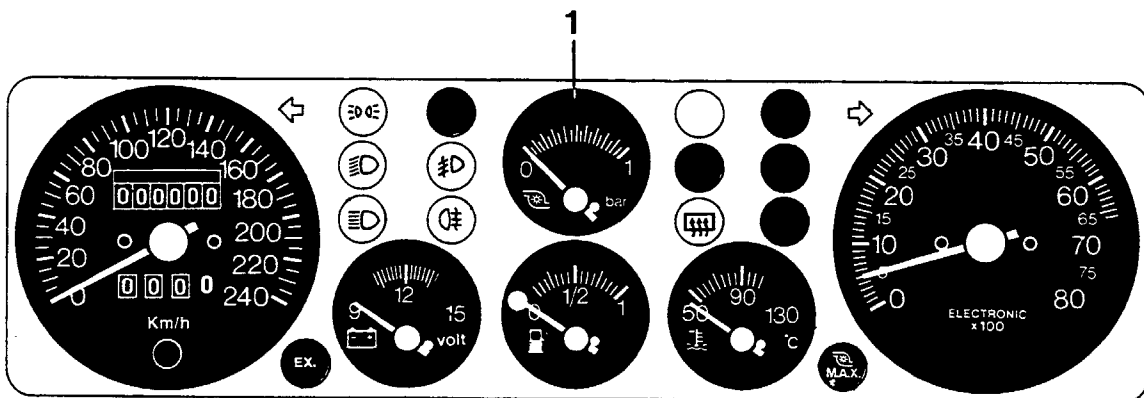
Location of over-boost solenoid valve device in engine compartment



Over-boost solenoid valve control device

Magnetic winding resistance: around 40 Ω at 20°C.
Supply: 12 Volts.

Delta 4WD instrument panel



The test lamp (2) should remain on (in the instrument panel) for the entire length of time that the over-boost valve is working. The supercharging pressure can be read off the pressure gauge (1).

IAW IGNITION SYSTEM CHECKS

As the fuel system is inter-connected with the ignition system it is difficult, in the case of a problem, to determine in which of the 2 systems (or possibly in both) the fault lies.

IN ORDER TO CHECK THE IAW ELECTRONIC INJECTION SYSTEM MORE EASILY AND QUICKLY USE THE FIAT-LANCIA AUTOMATED DIAGNOSTIC EQUIPMENT AND THE APPROPRIATE MEMORY WHICH CAN BE ORDERED FROM THE PARTS DEPARTMENT AT VOLVERA BY QUOTING PART NOS. 1806039000 AND 1806040000, RESPECTIVELY

1. Checking efficiency of ignition control unit (or power) module and IAW control unit module control.

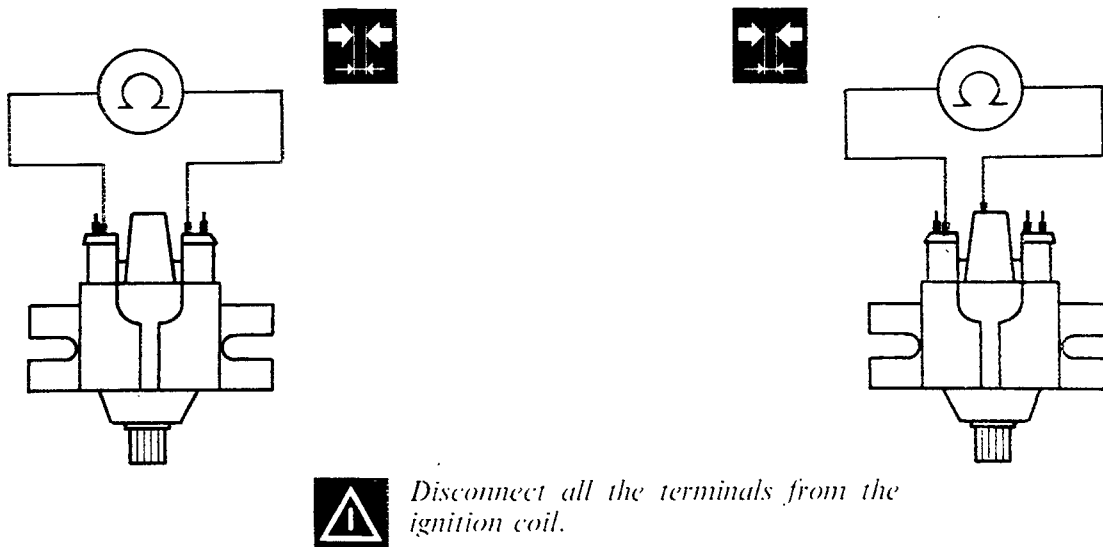
Open the bonnet lid.

Turn the ignition switch to the ON position: if the spark can clearly be heard in the distributor cap this means that the ignition module and the control unit are working properly. If this is not the case (as one or the other or both may be defective) firstly replace the power module and, only if the fault still persists afterwards, replace the injection ignition control unit

NOTE Before replacing the ignition unit power module, it is necessary to *carefully* check the ignition coil (especially the resistance of the primary winding) because a short circuited coil can quickly damage even a new replacement module.

If the check described above has a positive result, the following components must be checked:

1. Ignition coil

**Primary winding resistance check**

Check the resistance using an ohmmeter inserted between the two low voltage terminals: the reading should be 0.415 - 0.495 Ω at 20°C.

Secondary winding resistance check

Check the resistance using an ohmmeter inserted between the centre high tension terminal and one of the low voltage terminals: the reading should be between 4320 and 5280 Ω at 20°C.

The resistance of the rotor arm should be about 1000 Ω .

10.

2. Rpm and TDC sensor

Carry out the checking procedures illustrated on page 23.



Disconnect all the terminals for the cables whose continuity is being checked.

3. IAW control unit connection circuits - power module - ignition coil supply

there should be continuity (= almost nil resistance) between terminals 24 and 25 of the IAW control unit multiple connector and terminals 3 and 6 of the ignition unit power module.

In addition, there should be continuity (= almost nil resistance):

- between terminal 15/54 of the ignition and terminal +15 of the coil;
- between terminal -1 of the coil and terminal 1 of the ignition unit power module.

4. Distributor cap - HT leads and spark plugs

Check, in the same way as for conventional ignition, that the distributor cap is not cracked, the rotor arm is not broken (resistance 1000 Ω), that the HT leads are not oxidized or broken and that the spark plugs are working properly.

NOTE *A fault in the coolant temperature sensor, intake air temperature sensor, butterfly valve position sensor, relays or IAW control unit ignition advance curve control sector would adversely affect the operation of the ignition system.*

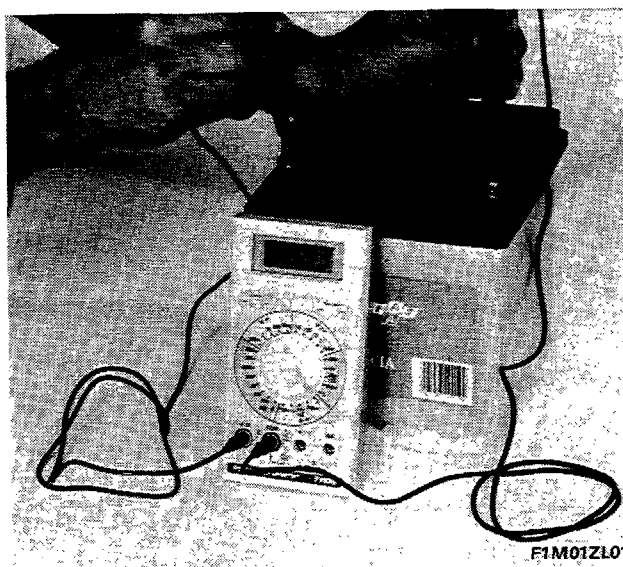
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BATTERY

All batteries fitted to Prisma versions are ES (Energy Sealed) and do not require maintenance.

This type of battery offers the following advantages over conventional batteries:

- negligible consumption of electrolyte due to the use of a new type of alloy for grille and plate construction;
- negligible standing charge loss that allows efficient starting for a period of 7 months and is thus suitable for extended storage (at temperatures below 28°C);
- reduction in the volume of gas produced during charging that is normally responsible for corrosion and consequent bad contact of terminal poles.



F1M01ZL01

If the battery appears to be flat, **leave the battery disconnected for at least two hours**, measure the no-load voltage by connecting a digital voltmeter over its terminals: if this is less than 12.3 V it holds 50% charge, if it reaches 12.48 V it is 75% charged and if it reaches 12.66 V it is 100% charged.



If the electrolyte level drops below the minimum level marked on the plastic container in one or more cells, open the cover sealing the plugs and add distilled, deionised water (as used to top up ordinary batteries).

NOTE Do not subject the battery to rapid recharging at voltages over 15.5 V or at high currents and recharging ampere.

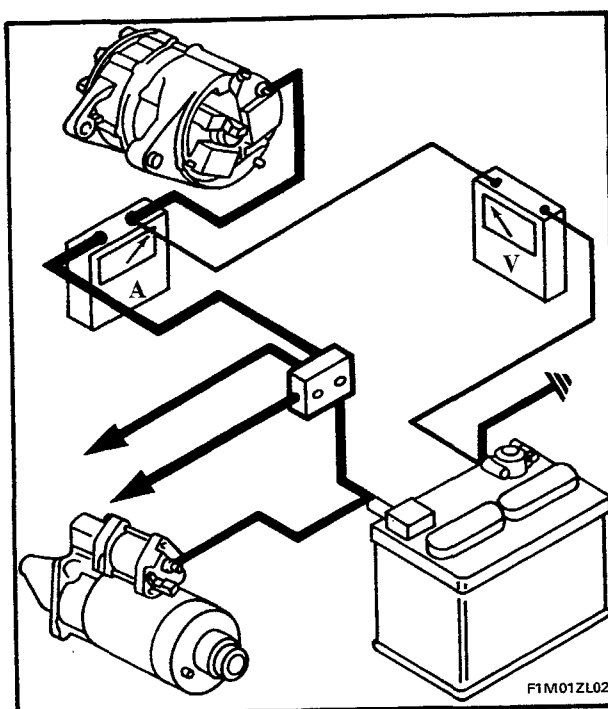
ALTERNATOR

Checking maximum charge rate on car produced by alternator with built-in electronic regulator:

Carry out the following operations:

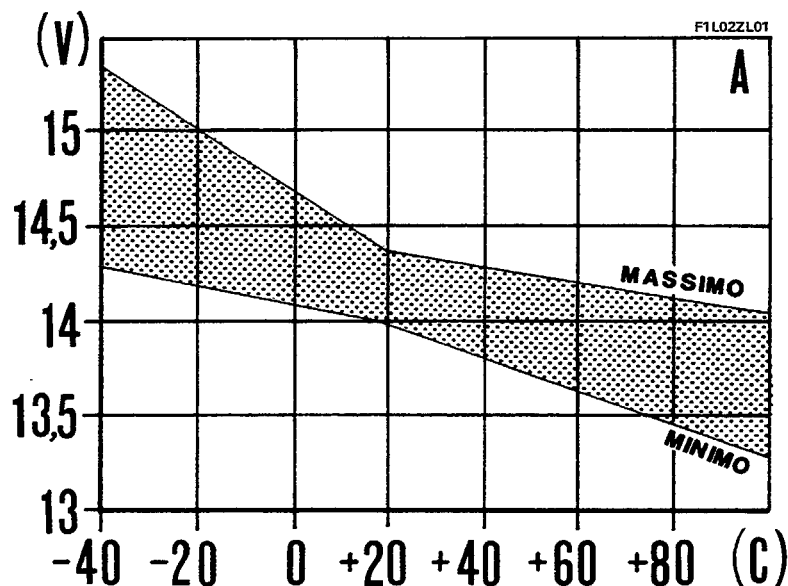
- release the cable connected to the alternator from the junction box;
- connect an ammeter across the above cable and the junction or the battery positive terminal;
- connect a voltmeter across the negative pole of the battery and the cable connected to the alternator and ammeter (see diagram);
- start the engine and run it at a speed of 3000 - 4000 rpm;
- connect all available connections one by one;
- measure the maximum current when the voltage read off the voltmeter falls below 13.5 V.

If the current reading is over 5A below specified levels, overhaul the alternator.



F1M01ZL02

55.



Graph of regulated voltages -regulator ambient temperature

Checking voltage regulator on car

Maintain previous connections and engine speed and then disconnect some connectors until an absorption of about **half maximum load** is reached.

Under these conditions the voltage should fall between the maximum and minimum values given in the diagram alongside, depending on the ambient temperature of the electronic regulator (alternator).

Diagram A refers to electronic regulator RTT 119 A incorporated in Marelli alternators

Checking stability of electronic regulator

Maintaining the same electrical contacts and engine speed, connect a few connectors until the current load is about 2/3 of the alternator current rating.

Under these conditions the voltage should drop by over 0.4 V.

Then disconnect connections to obtain a current load of about 5A. The voltage previously recorded for about half load should not alter by more than ± 0.2 V.

If the voltage change does not fall within specified limits, the electronic voltage regulator must be replaced since it is faulty.

ADJUSTING TENSION OF ALTERNATOR, WATER PUMP AND POWER STEERING DRIVE BELT

Fit the new belt (Poli-V) type, ensuring that it slides through the grooves in the pulleys. Adjust belt tensioner screw to obtain a load of 50-100 daN as measured with tool 1895760000.

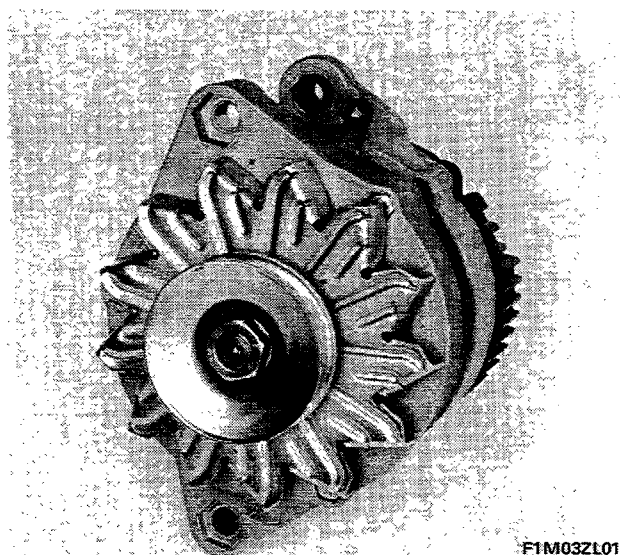
Belt tension need not be readjusted for this belt type

NOTE *Always adjust belt tension when the engine is cold.*

OVERHAULING M. MARELLI ALTERNATOR



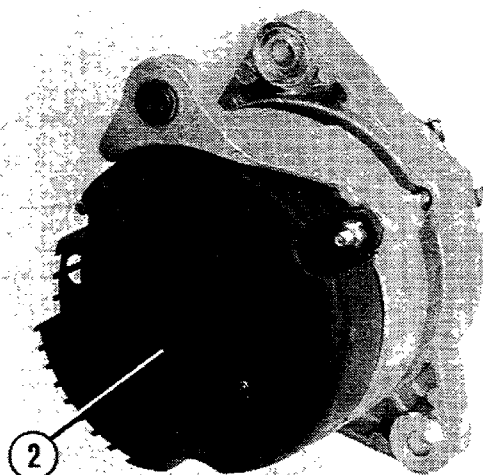
Never run the engine with temporary or slack recharging circuit electrical connections since this could damage the alternator diodes. Never carry out diagnostic checks on the electronic regulator using test lights since this could cause damage.



F1M03ZL01

M. Marelli AA125R-14V-65A alternator

NOTE *All M. Marelli alternators are manufactured to practically identical specification. Follow the instructions and illustrations in the following pages for all models.*

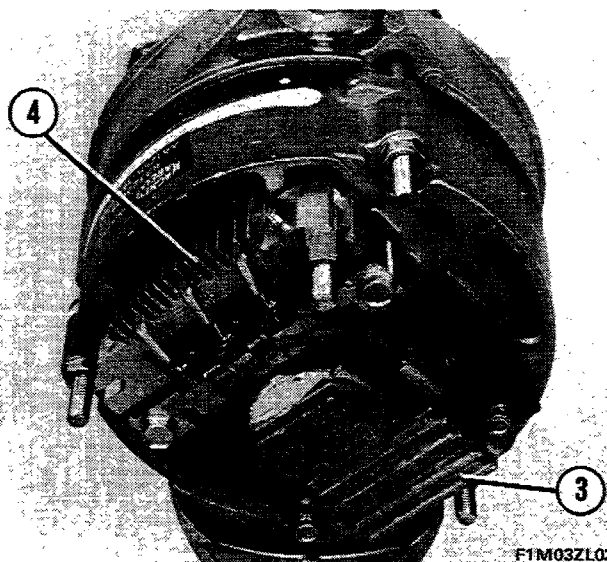


F1M03ZL02

Rear view of alternator

Remove guard (2) after removing nuts retaining it to the alternator.

Before completely disassembling the alternator, carry out the operations and checks described in the following pages.

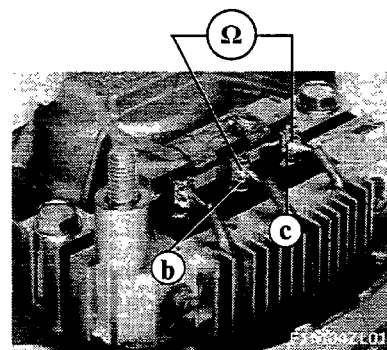
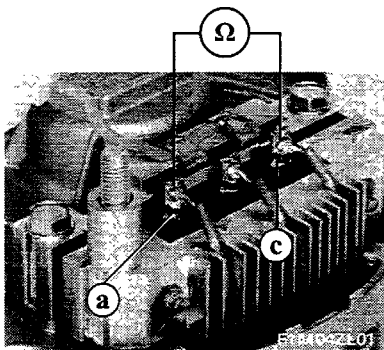
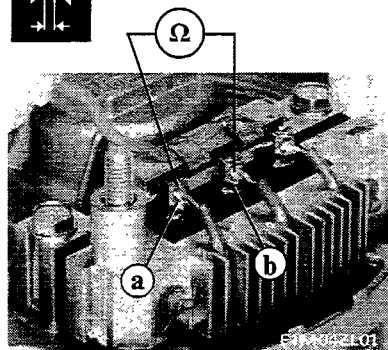


F1M03ZL03

Rear view of alternator without guard

- 3. RTT 119A electronic voltage regulator.
- 4. 9 diode rectifier bridge.

55.



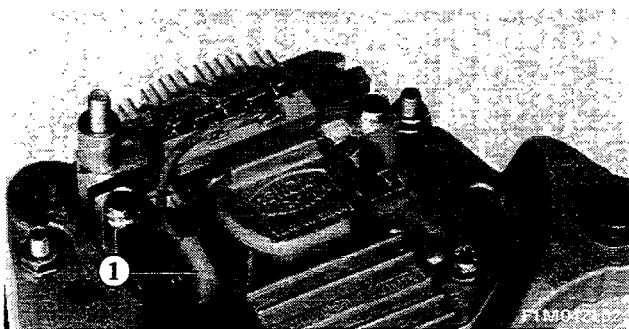
Checking continuity of 3 stator windings

Connect the terminals of an ohmmeter (adjusted to a scale of $\times 1$) to the ends of the stator windings (a-b-c) in the three possible ways as shown.

For each measurement, the instrument should show a certain resistance value that is equal for all measurements.

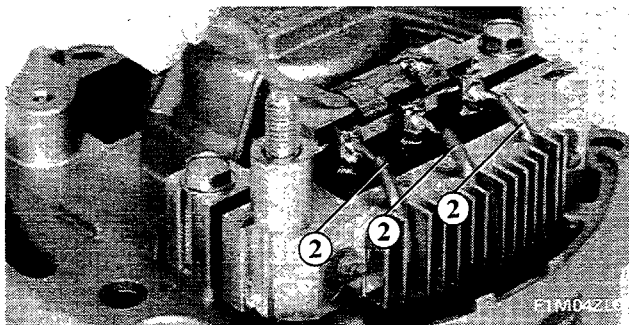


If the instrument needle does not move (infinite resistance) or fully deflects (resistance nil), the winding in question is broken or short-circuited and the stator must be replaced.

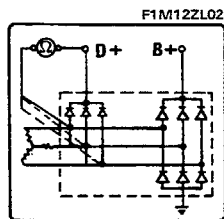
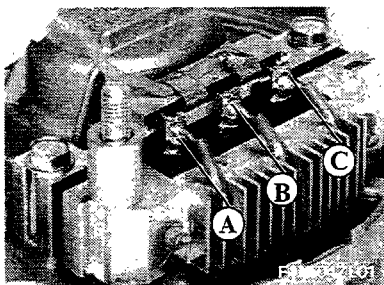


CHECKING DIODES

Disconnect connector (1) of the terminal lead of the flat pin exciter diodes connected to the positive brush.



Disconnect terminals (2) of the stator windings from the rectifier bridge.



Checking excitation diodes

Insert the terminal of an ohmmeter in connector (1) above.

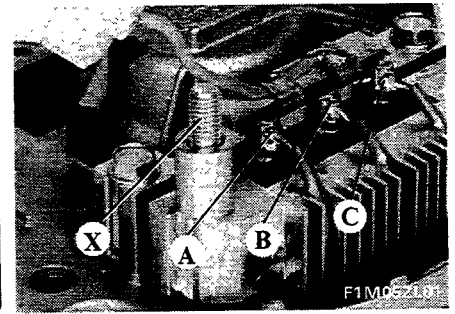
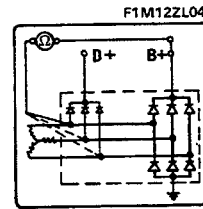
The second instrument terminal must be placed into contact with each of the three terminals (A-B-C) in turn.

Repeat the three measurements after reversing the terminal connection on the instrument.

Checking positive diodes

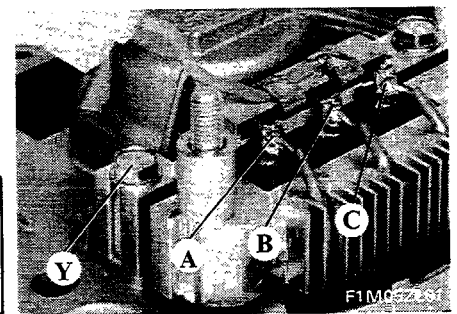
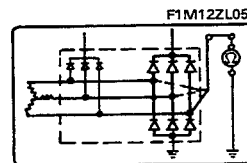
Connect one ohmmeter probe to the alternator positive terminal (X) and the other to each of the three terminals (A-B-C) in turn.

Repeat the three measurements after reversing the connections of the probes on the instrument.

**Checking negative diodes**

Connect one ohmmeter probe to the negative diode plate (Y) and the other probe with each of the three terminals (A-B-C) in turn.

Repeat the three measurements after reversing the probe connection order.



For each of the three checks described previously, a resistance value should be measured for each instrument terminal (A-B-C).

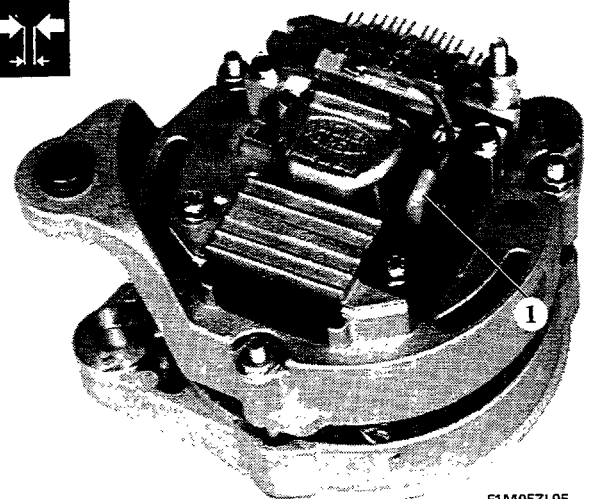
When the connection of the two probes on the instrument is reversed, the needle should not move. If the needle moves for both connections (diode short-circuited), or never moves (diode interrupted) the rectifier bridge assembly must be replaced.

ROTOR**Check rotor winding resistance measured across the brush connectors**

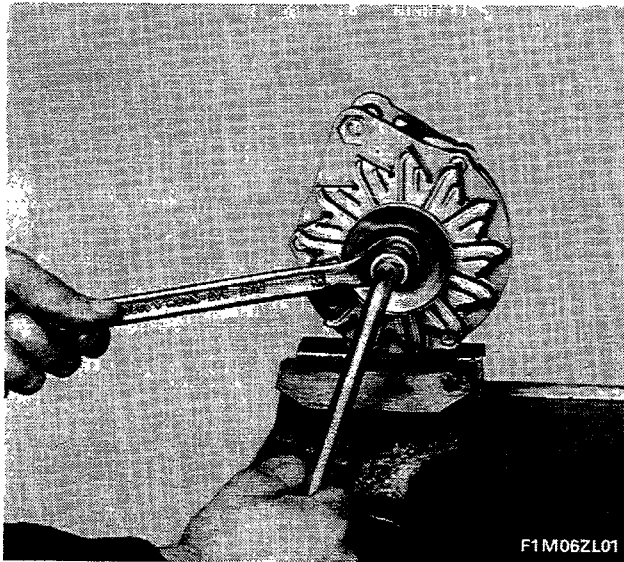
Disconnect connector (1) of exciter diode terminal cable from the blade connected to the positive brush.

Connect the ohmmeter probes (set to a scale of $\Omega \times 1$) with the two blades of the brush carrier - voltage regulator support.

If the resistance reading is not as specified or infinite (interrupted circuit), the rotor must be checked and replaced if necessary.

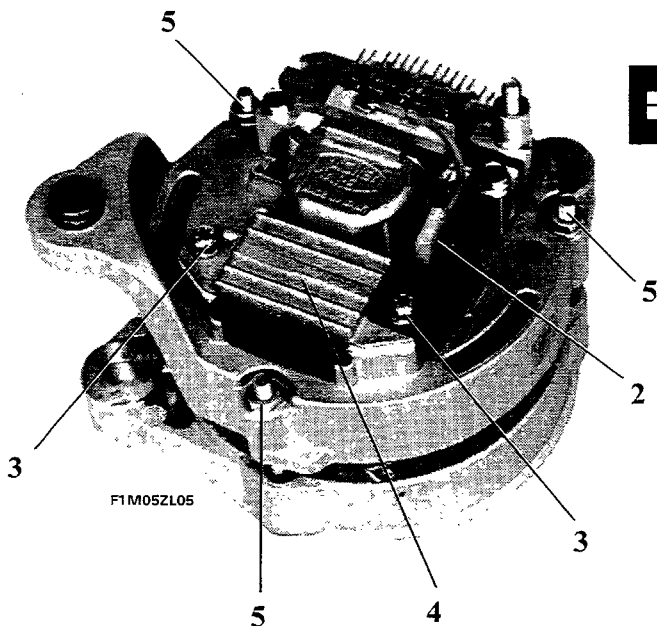


55.



Disassembly

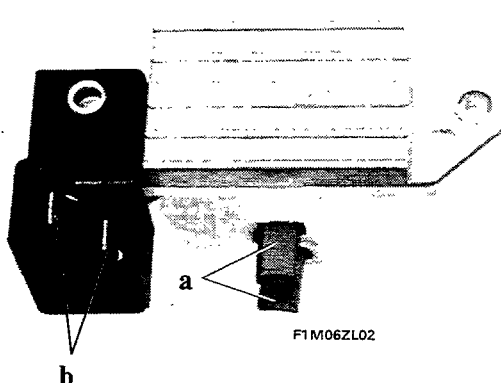
Insert a socket wrench in the hexagonal hole on the alternator shaft to hold the alternator shaft still and use another wrench to back off the nut retaining the fan and pulley to the rotor. Withdraw the above components with their spacers and washers from the alternator shaft.



Disconnect connector (2) of the exciter diode terminal cable from the blade connected to the positive brush.

Back off bolts (3) retaining the electronic voltage regulator (4) complete with brushes to the rear alternator support plate.

Back off bolts (5) and withdraw bolts that join the main outer parts of the alternator.

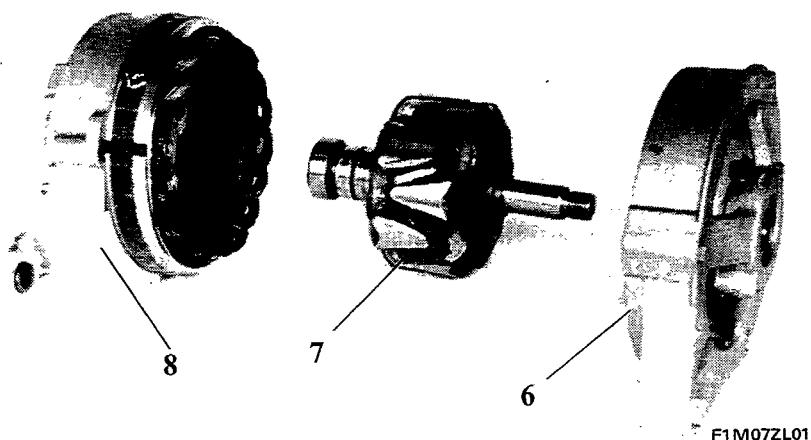


Electronic voltage regulator

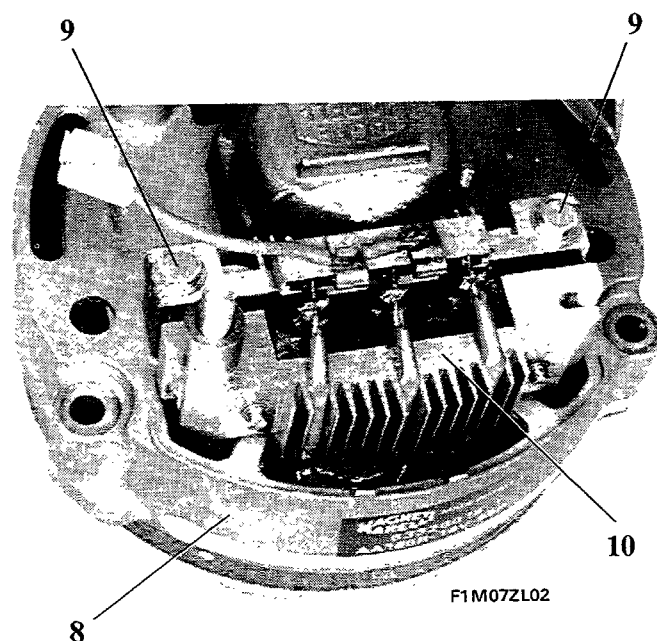
- a. Brushes
- b. Blades

Disassemble the various components (as shown), remembering that pressure must be exerted on the rotor shaft in order to release it from the support plate.

NOTE *If a press is not available, use a brass driver to avoid damaging the thread.*



F1M07ZL01

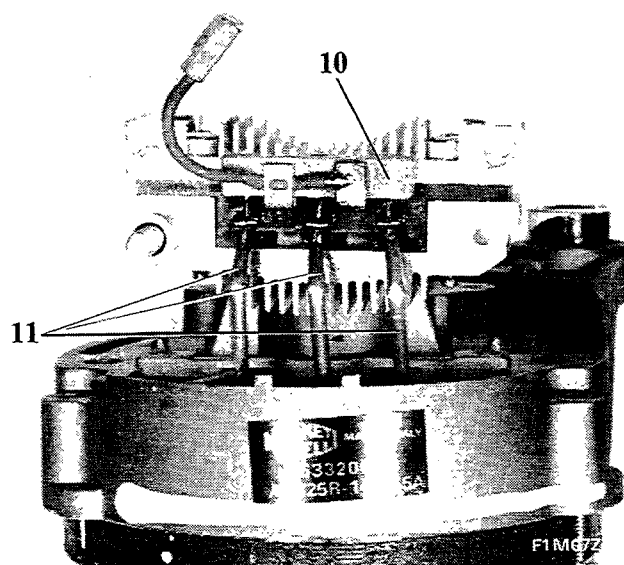


F1M07ZL02

Back off bolts (9) retaining rectifier bridge (10) to the rear support plate (8).



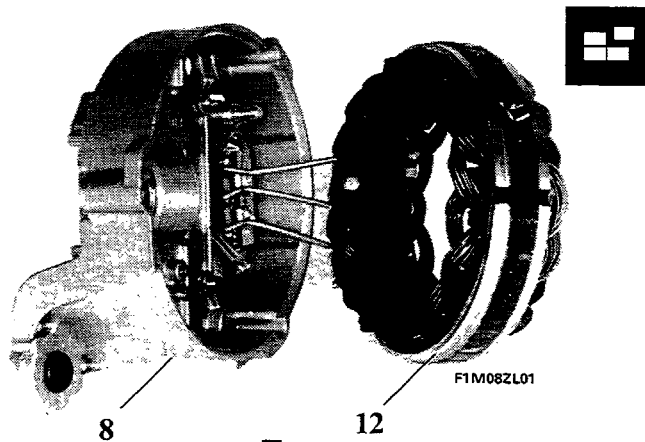
The rectifier bridge should not be disassembled; this is supplied as a complete spare.



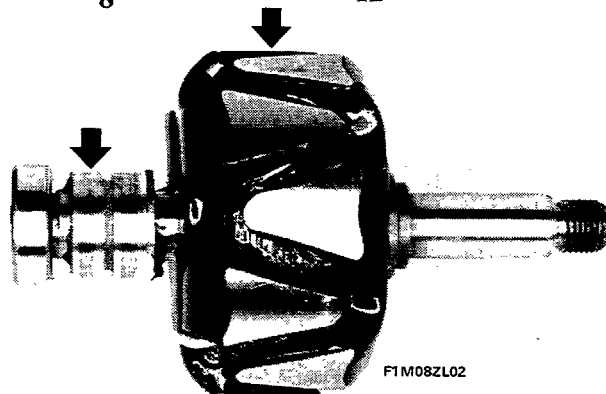
F1M07Z

Move rectifier bridge (10) away from the support plate and unsolder terminals (11) of the stator winding.

55.



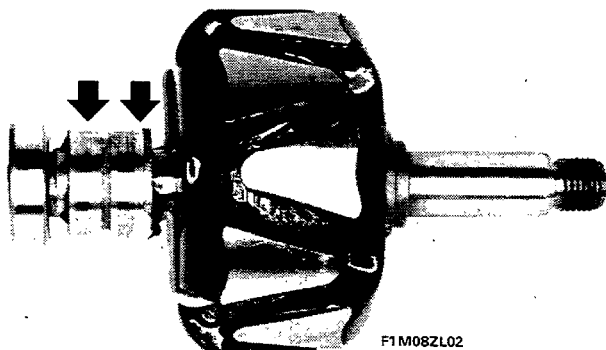
Remove stator (12) with its terminals (11) from rear support plate (8).



Check inductor winding insulation

Connect the two probes of an ohmmeter (set to a scale of $\Omega \times 1$) to a slip ring and the rotor case (see arrows).

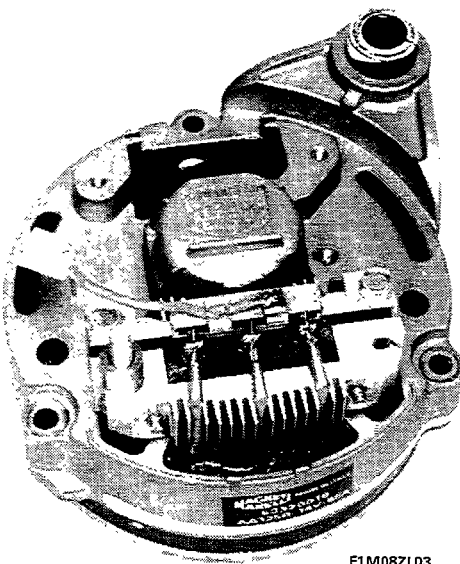
The instrument should give an infinite resistance reading, otherwise replace the rotor.



Checking resistance of inductor winding (rotor) on slip rings

Connect the two probes of an ohmmeter (set to a scale of $\Omega \times 1$) to the rotor slip rings (see arrows): the instrument should show a certain resistance reading.

If the resistance reading is not as specified or infinite (circuit interrupted), the rotor must be replaced.



Check that the bearing turns freely without binding or noise.

Check that the slip rings have not been grooved by the brushes, otherwise replace the rotor assembly.

Reassembly

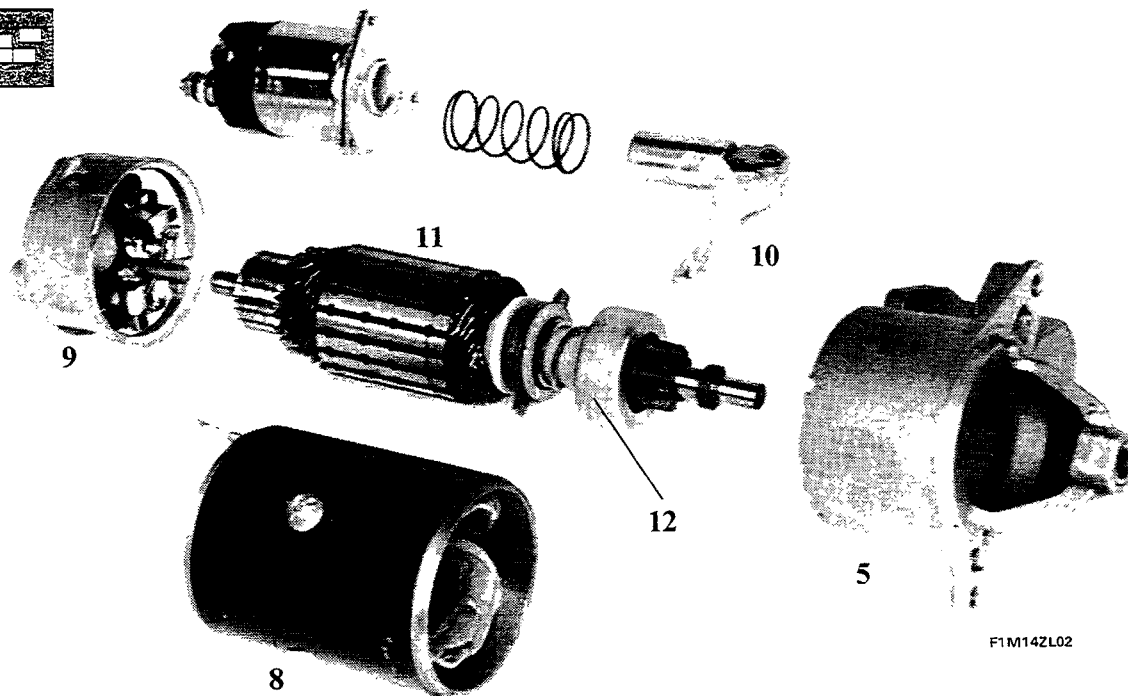
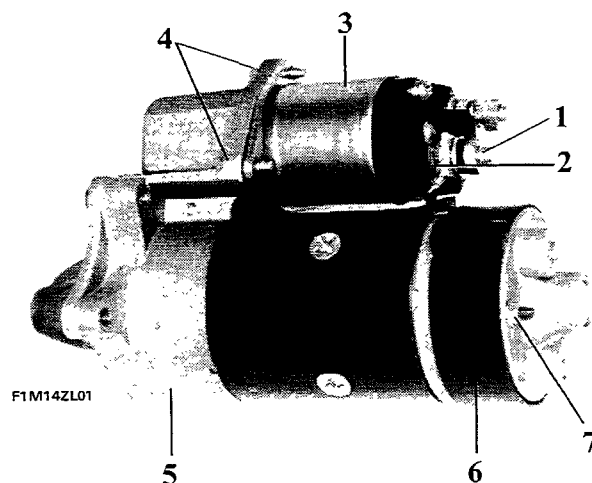
Carry out disassembly instructions in reverse order for assembly.

OVERHAULING M. MARELLI
STARTER MOTOR

Before overhauling the starter motor, check that the cause of the insufficient starting torque is not due to a flat battery.

Removal

To remove the starter motor first disconnect the supply leads and then back off the bolts retaining the unit to the gearbox.



Disassembly

Proceed as follows to disassemble the starter motor:

- back off nut (1) and release cable (2) from solenoid (3);
- back off bolts (4) retaining solenoid (3) to front support (5);
- remove brush protective band (6);
- back off nuts (7) and withdraw bolts that join front support (5) to the central part (8) and brush carrier support (9);
- disassemble the parts and release fork (10) from front support (5) and rotor (11).

Checks

Carry out the following checks on motor components:

rotor: check continuity, short-circuit and earth insulation

stator: check continuity and earth insulation

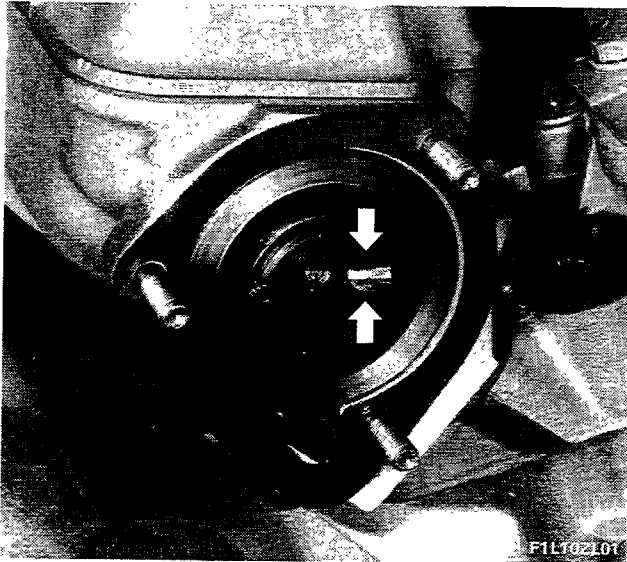
brush carrier: earth insulation

solenoid: check continuity and earth insulation



Free wheel (12) must be replaced whenever the starter motor makes a noise upon starting.

55.

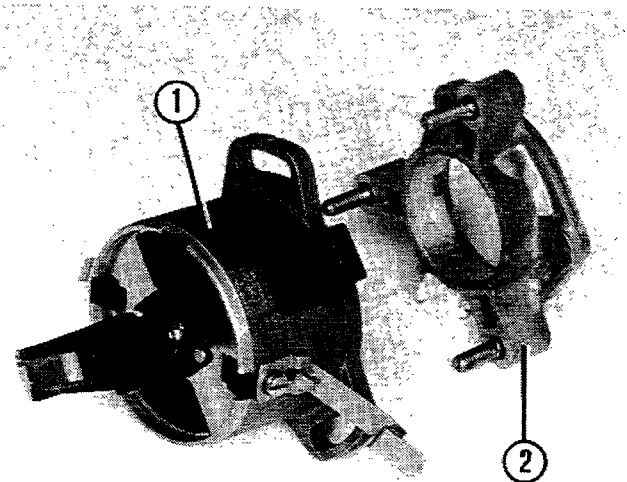


I.A.W. IGNITION-INJECTION SYSTEM



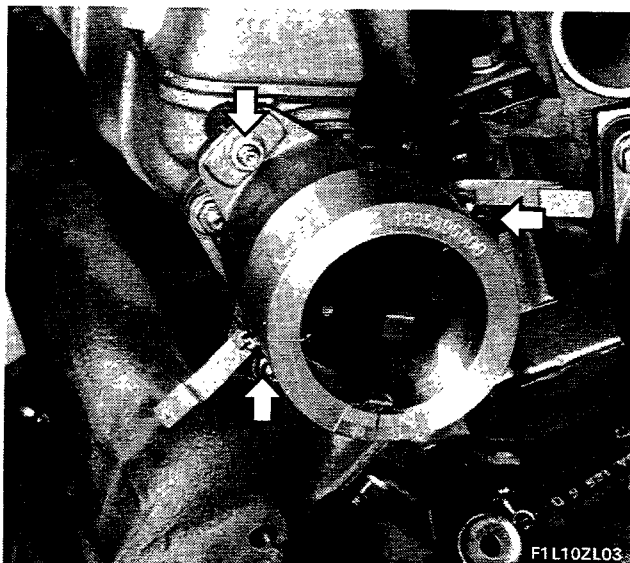
The WEBER-MARELLI integrated electronic intermittent, multipoint, low pressure ignition-injection system adopted on the DELTA HF 4WD and PRISMA HF 4WD is described in detail on section 10 in the Fuel System section.

Asymmetrically milled end (→) of timing shaft



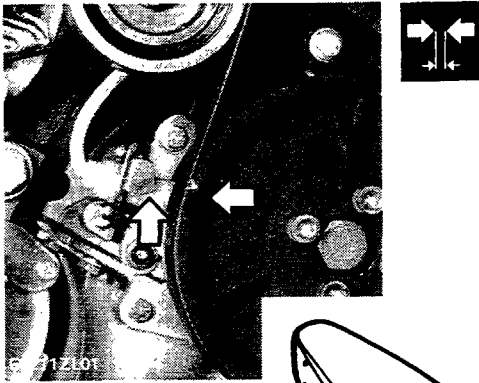
F1L10ZL02

High tension distributor (1) with incorporated phase sensor and support (2) for attachment to cylinder head



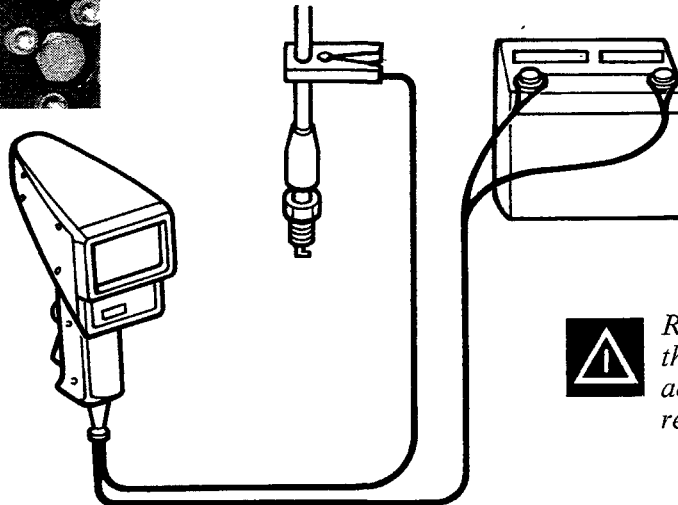
Timing adjustment

- Pistons 1 and 4 at T.D.C.
- Tool 1895896000 fitted to distributor: the rotary brush centre line must align with the central zero on the gauge. Otherwise turn the distributor in its seat until the reading is zero, then fully tighten the retaining bolts (→).



Checking ignition advance angles using stroboscopic lamp

| | |
|----------------|-------------------------------------|
| PRISMA 4WD - | Idle speed: 8080-850 rpm |
| | Advance: $18^{\circ} \pm 2^{\circ}$ |
| DELTA HF 4WD - | Idle speed: 800 - 850 rpm |
| | Advance: $15^{\circ} \pm 2^{\circ}$ |



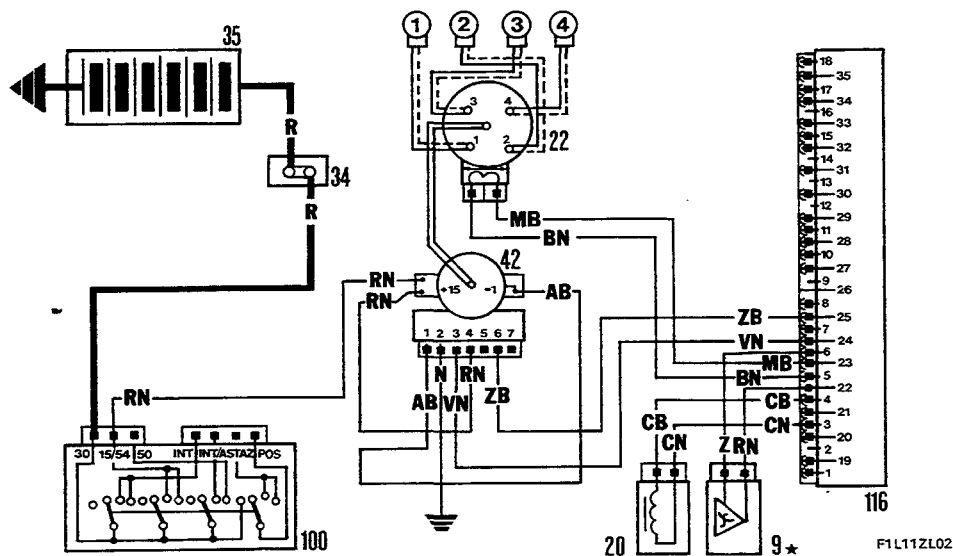
F1M19ZL03



Remove the plastic guard under the right front wheel arch to gain access to the engine advance reference marks.

NOTE The first cars manufactured had fixed references on the timing belt cover that cannot be seen through the relevant opening. On these cars it is therefore necessary to remove the bulkhead separating the engine compartment from the front right wheel arch in order to check the ignition advance.

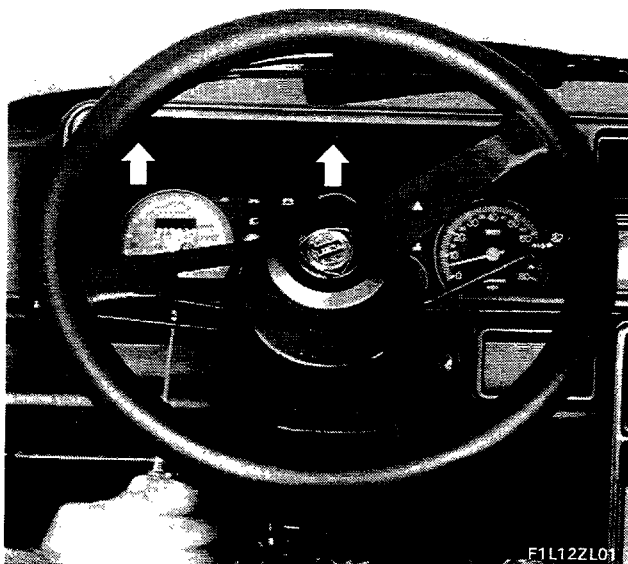
DIAGRAM SHOWING I.A.W. IGNITION SYSTEM COMPONENTS



- 9. Anti-knock sensor (only on DELTA HF 4WD)
- 20. Rpm and T.D.C. sensor
- 22. Ignition distributor with built-in phase sensor
- 34. Joint

- 35. Battery
- 42. Ignition coil
- 100. Ignition commutator
- 116. Electronic ignition injection control unit

55.



REMOVAL-REFITTING (DELTA HF 4WD)

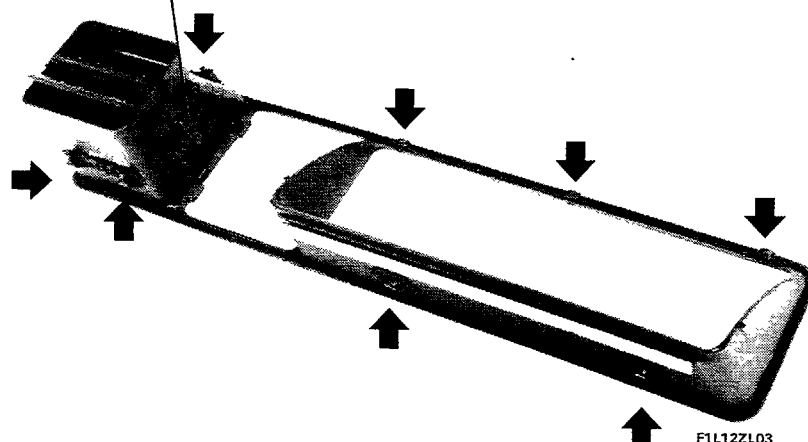
Removing-refitting control panel frame

- Bolts retaining (→) frame to facia.

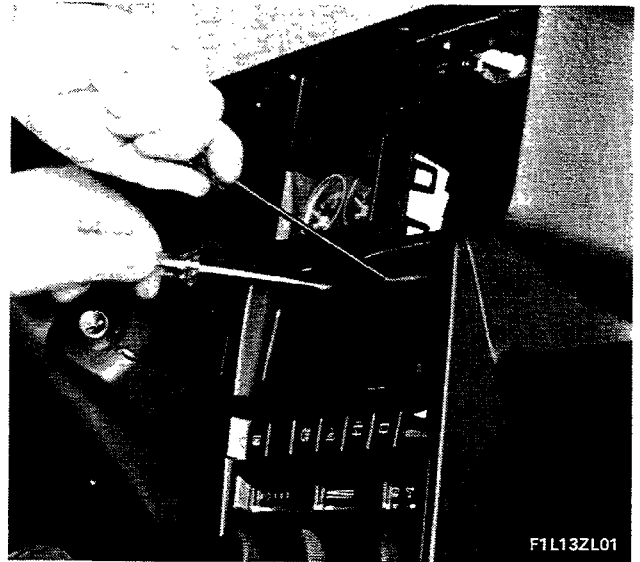


Removing frame from facia

- The frame is secured by flexible tabs (→), see photo below, to the facia.

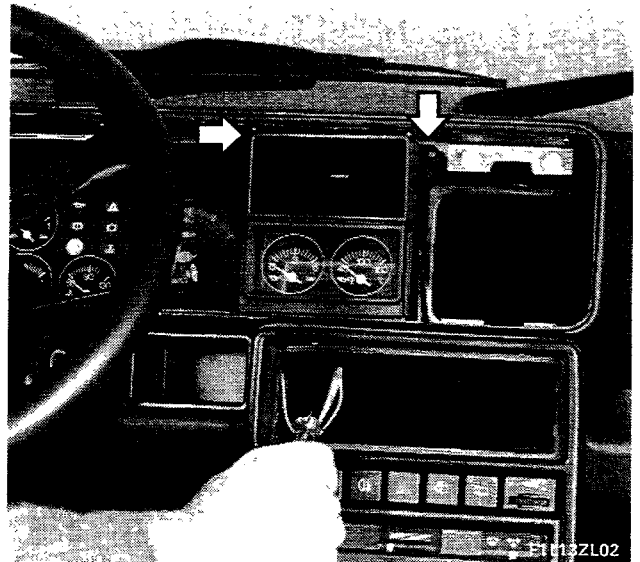


Rear of protective control panel frame



F1L13ZL01

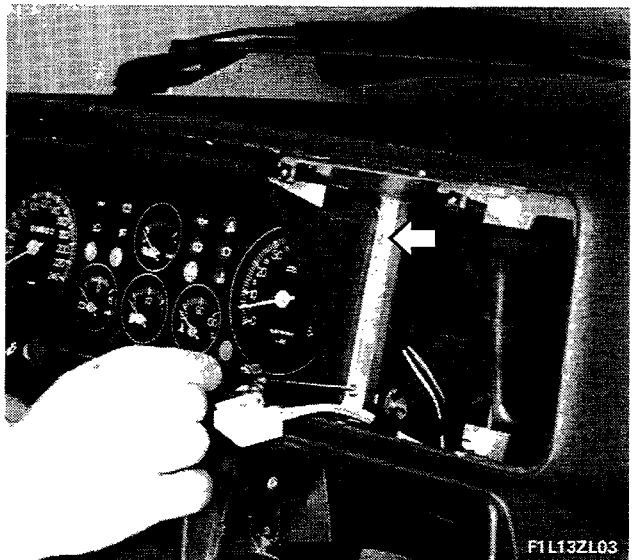
Removing radio compartment grille



Removing-refitting auxiliary control panel

(→) Bolts retaining auxiliary panel to fascia.

- Disconnect electrical connections and extract panel from its compartment.

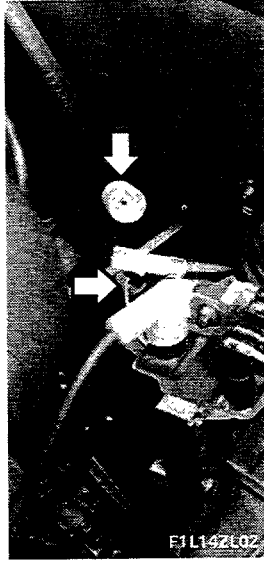
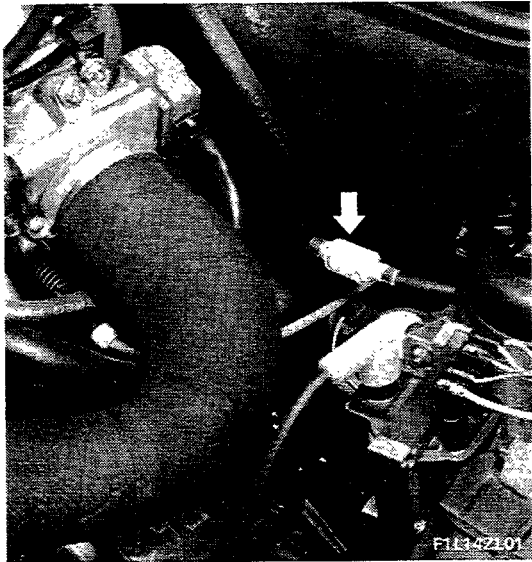


Removing-refitting control panel from fascia

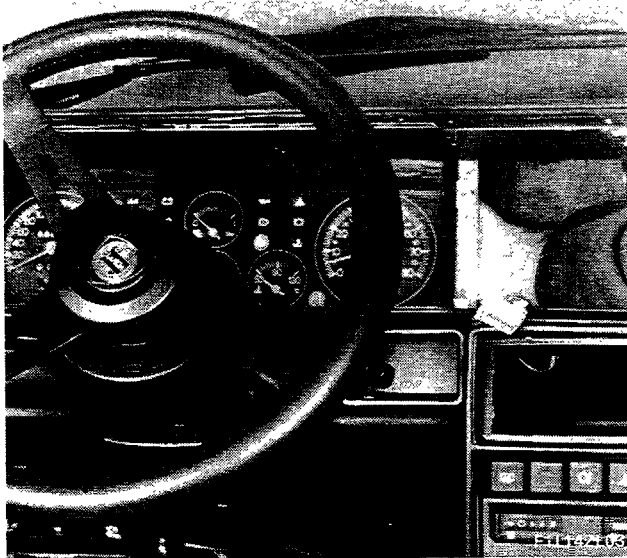
(→) Bolts retaining auxiliary panel to bodyshell

F1L13ZL03

55.

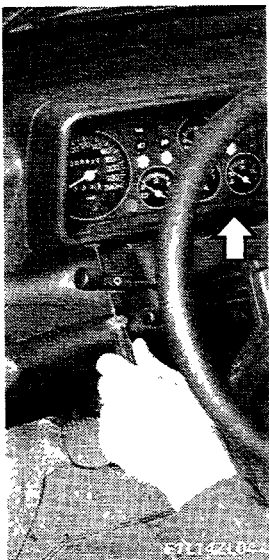


Disconnecting milometer cable in engine compartment (to facilitate removal of control panel from facia compartment)



Removing control panel from facia

- Disconnect milometer control cable (press-fit) from panel.
- Disconnect all electrical connections from panel.



REMOVAL-REFITTING (PRISMA 4WD)

Removing frame from facia

- Back off bolts retaining (→ Φ bottom end of frame to facia).

NOTE *The top side of the frame is secured with flexible tabs.*

Removing-refitting control module - Check system display and rear differential lock

(→) Bolts retaining panel to fascia.

- Disconnect electrical connectors from module.

NOTE *Connectors can only be fitted one way round.*

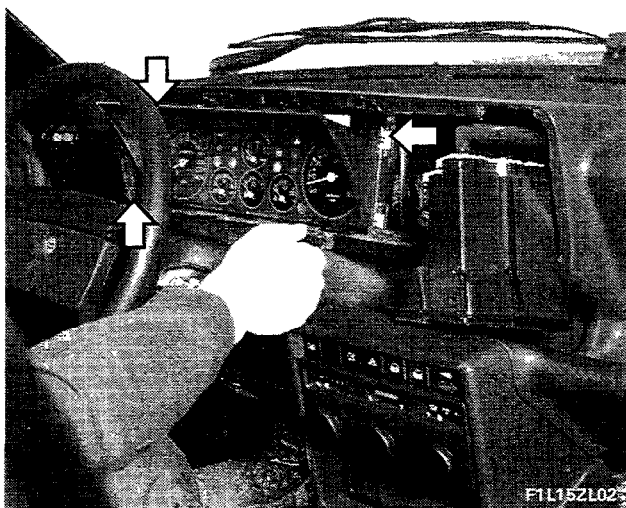
- Disconnect milometer control cable in engine compartment (see previous page, top illustration).

Removing-refitting control panel from fascia

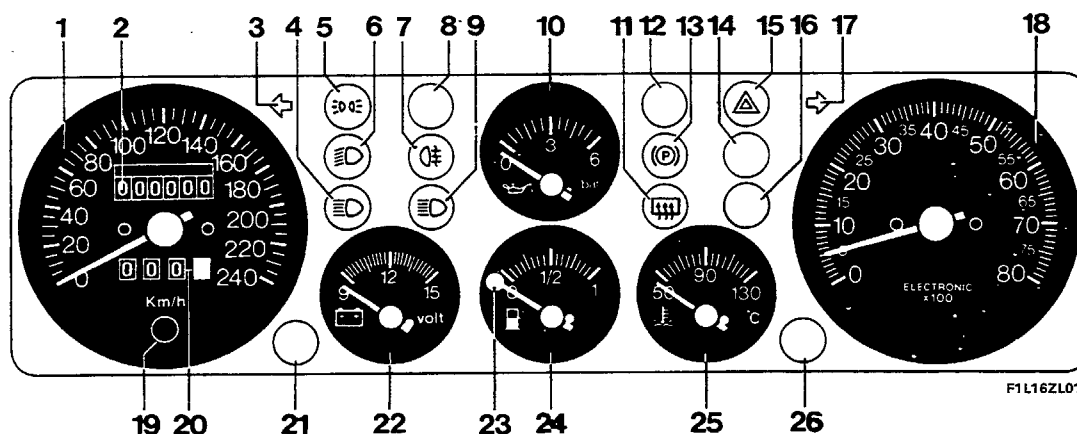
(→) Bolts retaining panel to fascia.

- Disconnect press-fit milometer control cable and electrical connectors from control panel.

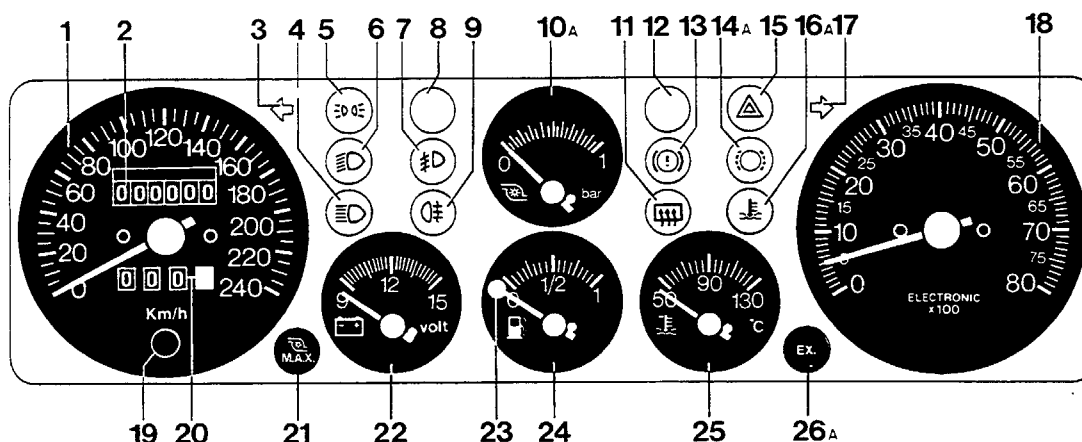
Removing control panel from fascia compartment



Control panel PRISMA 4WD



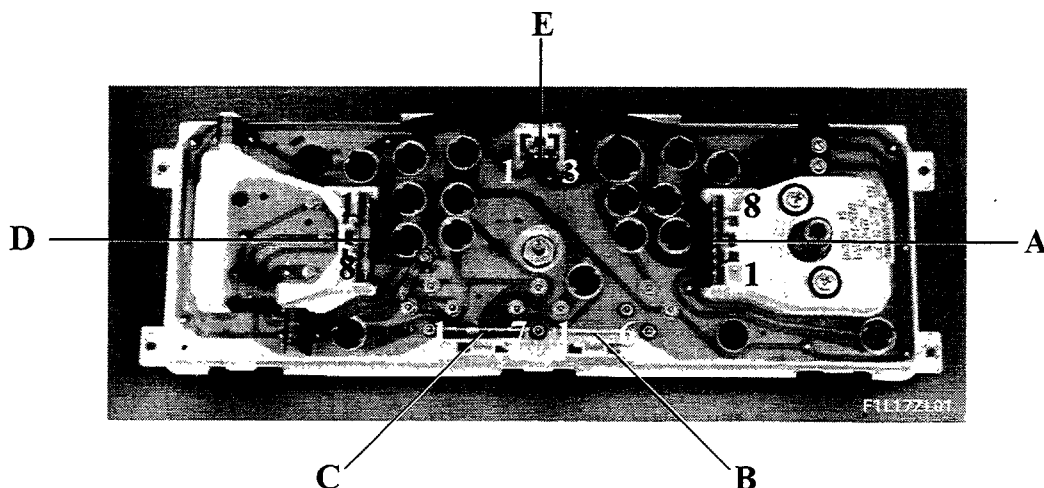
Control panel DELTA HF 4WD



Key

- | | |
|--|---|
| 1. Speedometer | 15. Hazard warning flasher warning light |
| 2. Milometer | 16. Spare (PRISMA 4WD) |
| 3. Left turn signal | 16A. Excessive coolant temperature warning light (DELTA HF 4WD) |
| 4. Main beam warning light | 17. Right turn signal |
| 5. Lights on warning light | 18. Rev counter |
| 6. Dipped beam warning light | 19. Trip counter reset button |
| 7. Fog lamp warning light | 20. Trip counter |
| 8. Check panel monitor light upon car start-up | 21. Maximum catalytic converter temperature warning light (certain markets) |
| 9. Rear fog lamp warning light | 22. Voltmeter |
| 10. Oil pressure gauge (PRISMA 4WD) | 23. Low fuel level warning light |
| 10A. Turbo boost gauge (DELTA HF 4WD) | 24. Fuel level gauge |
| 11. Heated rear window warning light | 25. Coolant temperature gauge |
| 12. Main Check Panel warning light | 26. Spare (PRISMA 4WD) |
| 13. Parking brake warning light | 26A. Overboost warning light (DELTA HF 4WD) |
| 14. Spare (PRISMA 4WD) | |
| 14A. Brake pad wear warning light (DELTA HF 4WD) | |

Rear control panel terminals for connection of car electrical system connectors



NOTE The blades and terminals are identified using the same numbers and letters adopted in the **WIRING DIAGRAMS**.

| CONNECTOR A | | |
|--------------|----|--|
| cable colour | N° | PARTS CONNECTED |
| N | 1 | General instrument earth to FRONT RIGHT body shell section |
| GN | 2 | Control panel lighting from UT terminal of dimmer |
| HR | 3 | Rear fog lamp warning light from blade 1 H of control box |
| MB | 4 | Fog lamp warning light from terminal 87 of control relay |
| VB | 5 | Main beam warning light from blade 7 I of control box (fuse 7) |
| HN | 6 | Dipped beam warning light from blade 2 C of control box (fuse 5) |
| G | 7 | Side light warning light from blade 2 of control box connector M (fuse 4) |
| AN | 8 | Right turn signal warning lights from connector A on steering column switch unit |

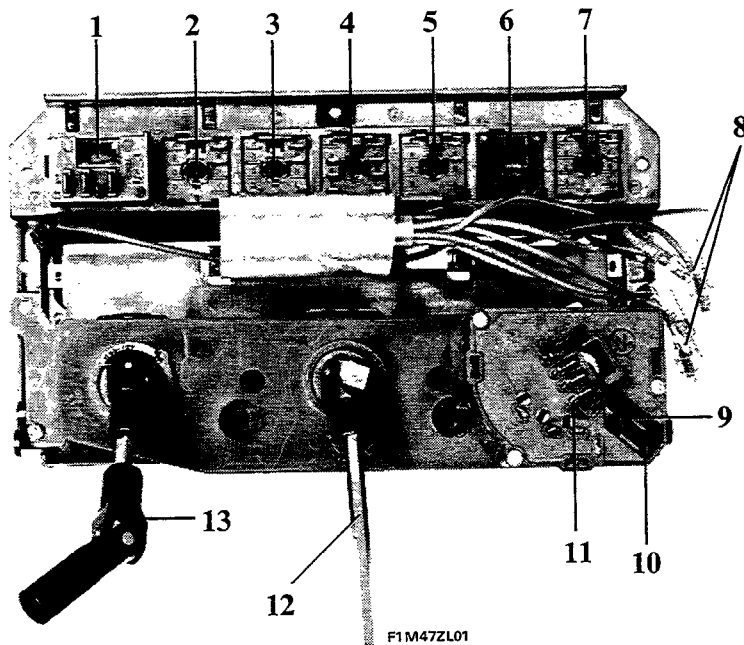
| CONNECTOR B | | |
|--------------|----|---|
| cable colour | N° | PARTS CONNECTED |
| MB | 1 | Low fuel level warning light to terminal 1 connector E of Check panel control module |
| HR | 2 | Maximum coolant temperature warning light from terminal 2 of Check Panel control module connector E |
| V | 3 | Green start-up monitor warning light from terminal 3 of Check Panel connector E through check socket |
| RV | 4 | + green and red Check Panel warning lights from terminal 4 connector E of Check Panel control module through the check socket |
| RN | 5 | Red Check Panel warning light from terminal 5 connector E of Check Panel control module through the check socket |
| G | 6 | Check panel lighting supply outlet (to terminal 6, connector E of Check Panel module) |

| CONNECTOR C | | |
|---------------|----|--|
| cable colours | N° | PARTS CONNECTED |
| HN | 1 | Spare (PRISMA 4WD) Over-boost warning light: from block no. 62 (over-boost solenoid) (DELTA HF 4WD) |
| AR | 2 | From coolant temperature sending unit |
| | 3 | Spare |
| BN | 4 | Heated rear window warning light from blade 9 connector I of control box (fuse 11) |
| R | 5 | + instrument supply from blade 10 connector I of control box (fuse 1) |
| V | 6 | Fuel level warning light from sending unit via control box (2I and 2L) |
| M | 7 | Low fuel level warning light from sending unit via control box (3I and 3L) |

| CONNECTOR D | | |
|--------------|-----|--|
| cable colour | No. | PARTS CONNECTED |
| AB | 1 | Right turn signal warning light from blade 4 of connector C of control box |
| AR | 2 | Hazard warning flasher warning light from terminal L of hazard warning switch unit |
| | 3 | Spare |
| | 4 | Spare |
| HN | 5 | Excessive coolant temperature warning light from sending unit on engine |
| BR | 6 | Handbrake warning light from terminal L of control flasher |
| | 7 | Spare |
| AN | 8 | Rev counter signal from terminal 1 of ignition coil |

CONNECTOR E: ALL THREE SPARE

55.



Rear view of auxiliary control console (PRISMA 4WD)

- 1-7. Auxiliary device control buttons.
- 8. Button symbol lighting bulbs.
- 9-10. Vacuum connection pipes to external air flap control.
- 11. Motor speed variation connector for fan and outside air intake flap opening actuator cam.
- 12. Shaft with two universal joints for control of blender flaps and coolant intake cock
- 13. Shaft with two universal joints for control of distribution flaps.

Removing-refitting pushbutton

Remove the pushbutton by inserting a screwdriver between the button and its seat on the console.

Connectors for connection between central console pushbuttons and devices (terminals are indicated from left to right and top to bottom)

1. Instrument light dimmer (white connector)

- Yellow-black cable to control panel (terminal 2 connector A)
- Yellow cable to a box lamp:
yellow cable from control box (terminal 6 connector I)
- Supply from INT terminal of ignition commutator (under fuse 4)
- Black cable from earth carrier, under right side of facia
black cable from door release control

2. Door release control (green connector)

- Black cable, to earth loom, under right side of facia via instrument light dimmer
- white-dark blue cable to terminal 2 of door lock control unit through a multiple connector and branch of the door lock system

3. Door lock control button (dark blue connector)

- Black cable to box light switch
- Dark blue-white cable to terminal 3 of door lock control unit passing through a multiple connector and a branch of the door lock system

5. Rear fog lamp switch (red connector)

- Grey-red cable to control box: enters (1-C); exits (1-I) for warning light of control panel (3-A) and (9-D) for Check Panel module. Goes from inside the module to the lights via the control unit
- Grey-black cable from control box (2-C). Supply under fuse no. 5

4. Hazard warning light switch (white connector)

- Spare
- B. Red cable from control box (terminal 7 connector M). Direct emergency supply (fuse 13)
- C. Red-black cable to + terminal of flasher unit (hazard warning)
- D. red-green cable from control box (3-M). Turn signal supply (fuse 1) below key
- E. Light blue-white cable to turn signal via control box: input (4-C); output (7-A), (2-A). Hazard warning light on control panel (1a-d) also comes from 4-C.
- F. White cable to steering column switch unit connector (turn signal stalk)
- H. Light blue-black cable to turn signal via control box: enters (3-C); exits (3-F), (6-A). Turn signal warning light of control panel (8-A) also comes from 3-C

6. Provision for fog lamps

- Black cable for connection to earth loom under right side of facia (via turn signal - hazard warning flasher terminal)
- White-red cable to terminal 86 of fog lamp relay for relay activation

7. Heated rear screen pushbutton

- Black cable to earth loom under right side of facia
- Black-purple cable to control box (6-H). Activation of control unit heated rear screen relay

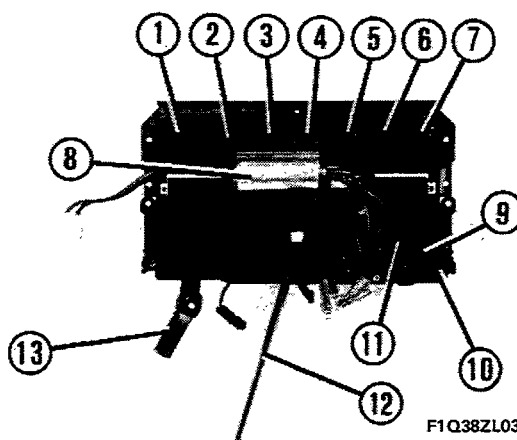
11. Interior fan speed control switch

- Black cable to earth loom under right side of facia
- Grey cable from fan resistor (1st speed)
- Red cable from fan resistor (2nd speed)
- Brown cable from fan resistor

NOTE Behind the console there is a 3-way connector for checking Check Panel efficiency at the end of the production line (not used during service).

MODEL DELTA HF 4WD VARIANTS

1. Instrument light dimmer
2. Rear wiper switch
3. Rear wash/wipe intermittent switch
- 4.....13 As for mod. PRISMA 4WD



1. Instrument light dimmer

- Black cable to earth loom under facia on right hand side
- Yellow supply cable from ignition cable INT across steering column side light control (protected by fuse 4) and blade 6 of connector I of control box: supply to box lamp (yellow cable)
- Yellow-black supply cable regulated in intensity at control panel from terminal 2, connector A of control box

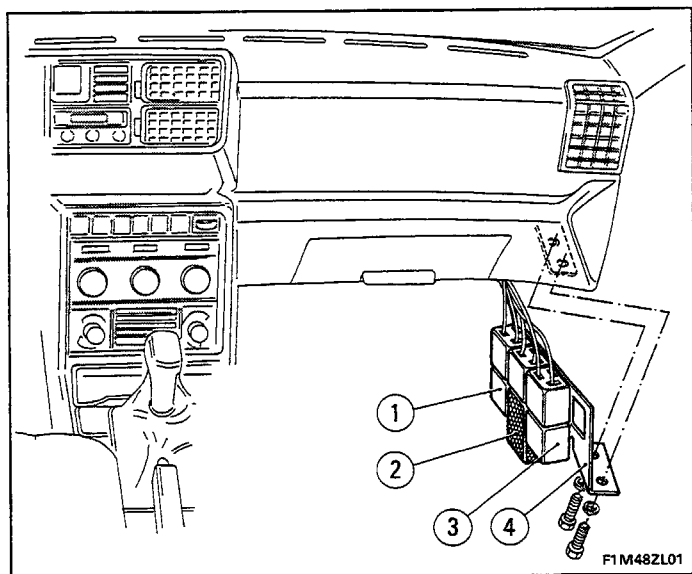
2. Rear wiper switch

- Yellow-black cable supply from fuse no. 2 under INT/A key from blade 2, connector G of control box
- Connection (green cable) to windscreen wiper motor for normal operation via multiple connector
- To rear wash/wipe intermittent switch via a red-green cable

3. Rear window wash/wipe intermittent switch

- E - Red cable: to rear wiper motor via a multiple connector
- F - Red-green cable: to rear washer pump motor via multiple connector
- B - Red cable for supply of electric motors from control box (5.H) protected by fuse no. 2 (under key)
- C - Red-green cable: to rear wiper switch (switch supply)
- D - Grey-black cable: to rear wiper motor via multiple connector

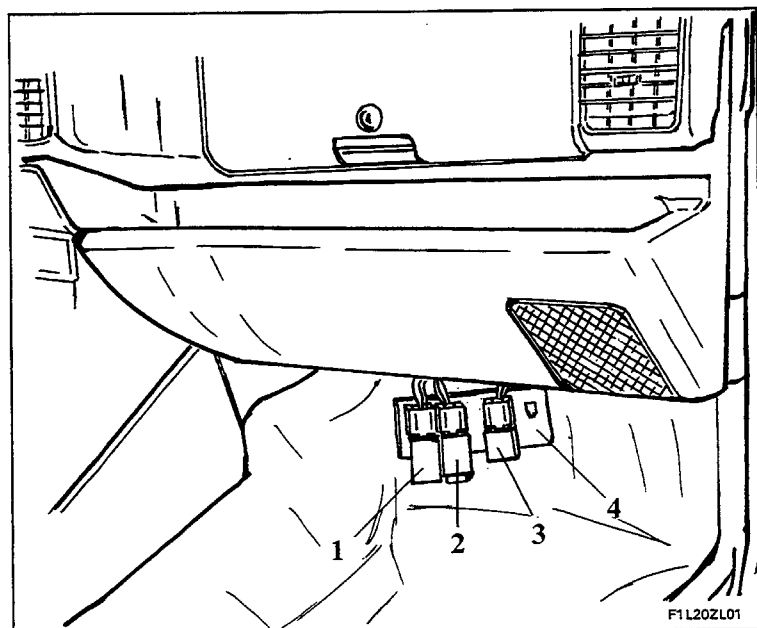
55.



LOCATION OF AUXILIARY DEVICES
(PRISMA 4WD)

Key

- | | |
|---|----------------------------------|
| 1. Hot wire device for ignition switch slot light delay | 3. Supplementary high beam relay |
| 2. Turn signal-hazard warning light flasher unit | 4. Bracket |



LOCATION OF AUXILIARY DEVICES
(DELTA HF 4WD)

Key

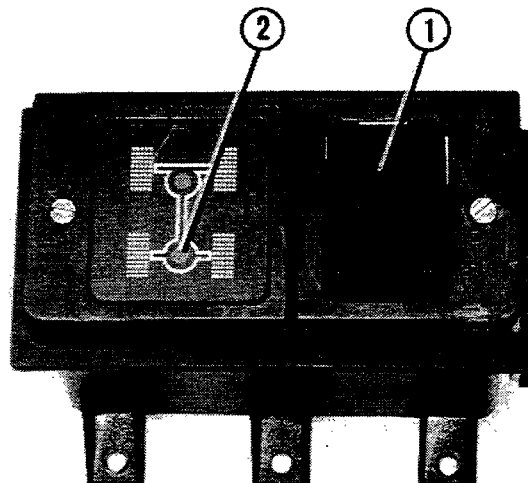
- | | |
|--|-------------------------|
| 1. Turn signal-hazard warning flasher unit | 3. Main beam relay |
| 2. Fog lamp relay | 4. Device carrier plate |

REAR DIFFERENTIAL VACUUM LOCK

NOTE *This device cuts out the rear differential so that the two rear wheels are integral. This is used only in certain critical driving conditions when the ground is very slippery or bumpy.*

Front view of differential lock controls and warning light

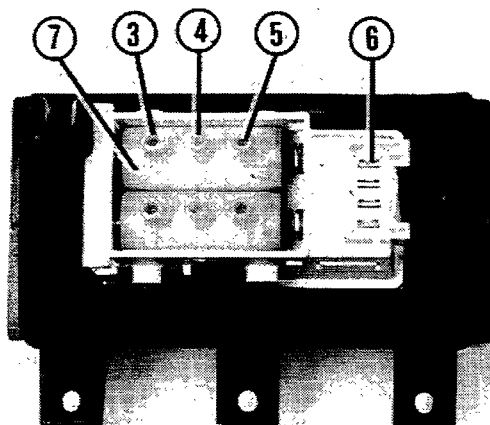
1. Rear differential lock control button
2. Rear differential lock sleeve engagement warning light



F1 L21ZL01

Rear view of rear differential lock control and warning light

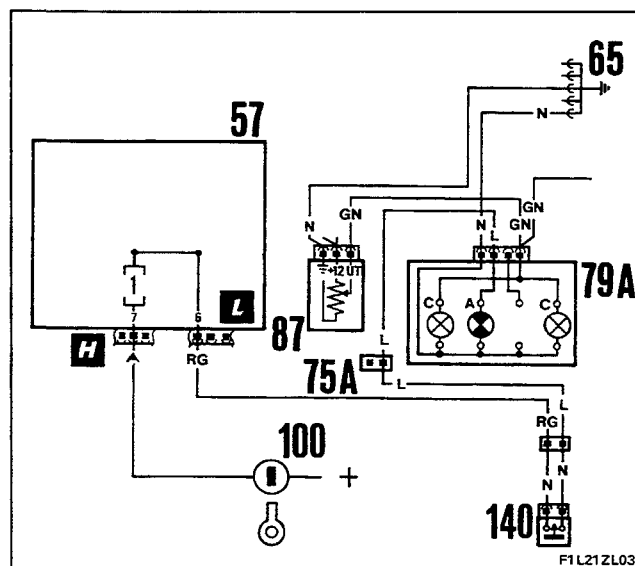
3. Piping (yellow) connected to one end of pneumatic differential lock actuator
4. Piping (red) connected to vacuum tank
5. Piping (yellow) connected to other side of actuator
6. Warning light and symbol illumination connection
7. Distributor casing (atmospheric pressure and vacuum)



F1 L21ZL02

Rear differential lock symbol and warning light electrical lighting circuit

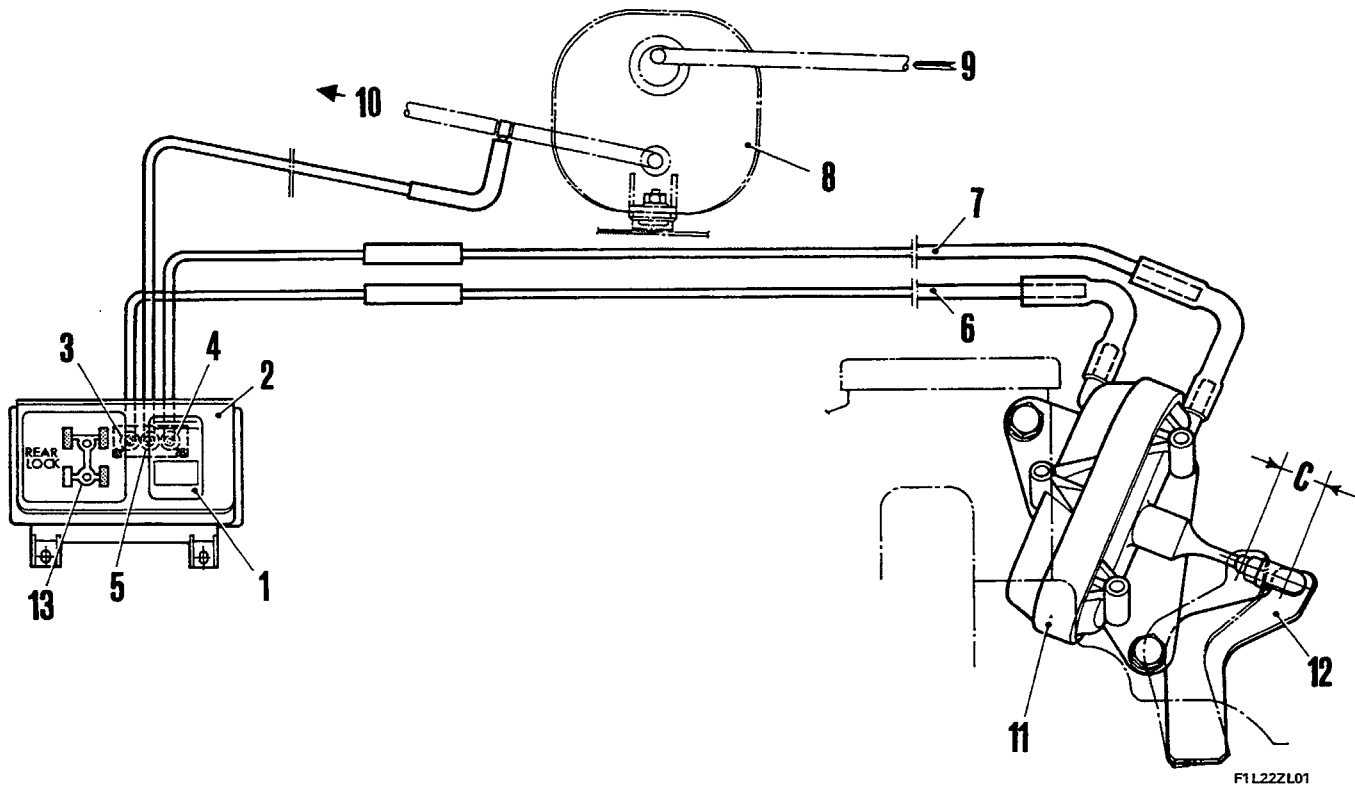
57. Control box and fuse holder
65. Earth loom under facia on right hand side
- 75A. Connection
- 79A. Control instruments and rear differential engaged warning light
87. Control panel lighting warning light
100. Ignition control switch
140. Rear differential lock switch (on rear differential)



F1 L21ZL03

55.

REAR DIFFERENTIAL LOCK CONTROL AND WARNING LIGHT



- | | |
|---|--|
| 1. Control button | 7. Actuator connection pipe |
| 2. Instrument | 8. Vacuum tank |
| 3. Socket for connection of distributor to actuator | 9. From inlet manifold |
| 4. Socket for connection of distributor to actuator | 10. To interior air intake flap |
| 5. Socket for connection of distributor to inlet manifold | 11. Actuator and rear differential lock engagement diaphragm |
| 6. Actuator connection pipe | 12. Rear differential lock sleeve control lever |

OPERATION

When device button (1) is pressed, a distribution system within the instrument (2) moves to open up communication with passage (5) - connected permanently to engine intake manifold vacuum - alternatively passages (3) or (4) and, at the same time, to bring the passage cut off by the connection into contact with the atmosphere.

Two connection pipes (6) and (7) between passages (3) and (4) of the distributor and the two opposite sides of a diaphragm actuator - located in the rear differential - are used to transmit the vacuum to one side of the diaphragm and atmospheric pressure to the other. The force set up due to the different pressures acting on the diaphragm pushes the diaphragm, lever and toothed differential lock engagement sleeve (12) until engagement takes place.

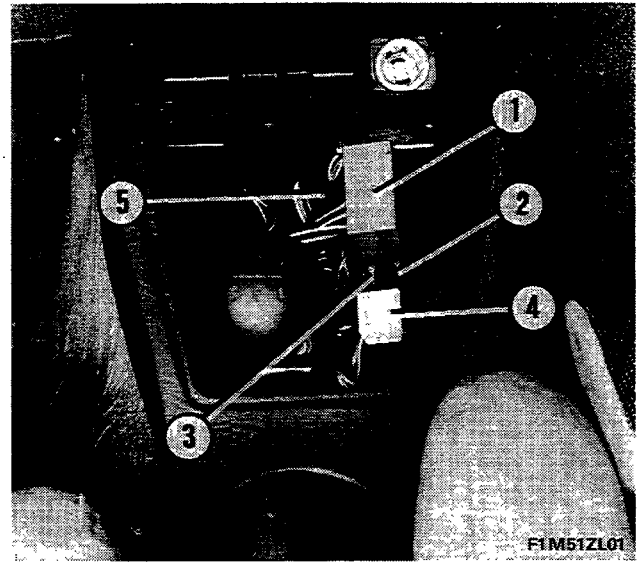
When the differential is engaged, a switch on the differential closes. This causes the differential lock warning light (13) to come on.



The differential lock should never be engaged on tarmac roads or at high speed because it does not allow the car to corner.

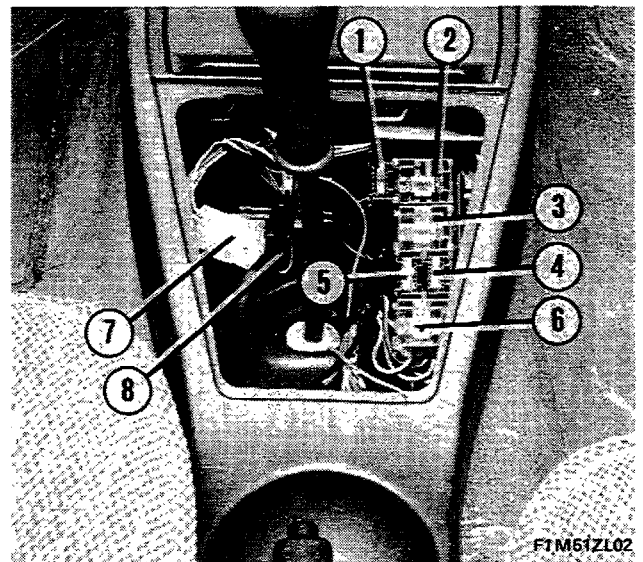
LOCATION OF POWER WINDOW AND DOOR LOCK CONTROL AND FUSES (PRISMA 4WD)

1. Door lock control unit
2. Rear power window reduction unit fuse
3. Front power window reduction unit fuse
4. Power window motor relay
5. Connector



The **unlocked power supply** reaches the + terminal of the door lock control unit (3) directly from the battery through the junction and fuse (1).

Locked power reaches the relay of power windows (6), terminal 86 pink lead, from INT/A terminal of ignition switch.



Location of control unit mount, relay and fuses

Key (last photo)

1. Electric door lock control unit fuse
2. Green mount for door lock control unit
3. Red mount for door lock control unit
4. Rear power window reduction unit fuse
5. Front power window reduction unit fuse
6. Red mount for power window motor relay
- 7-8. Multiple connectors

55.

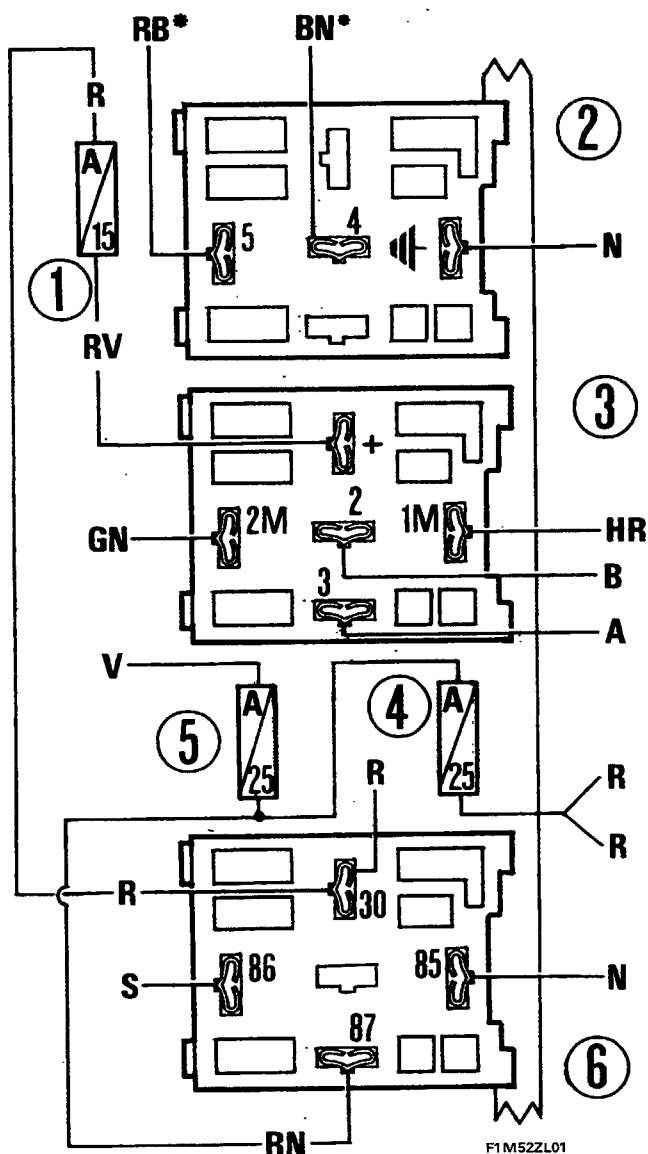
Vehicle electrical system socket cable connection

Key - see bottom photo on previous page
(PRISMA 4WD)

| Socket n° 2 - (green) - for central locking control unit | | |
|--|-------------|--|
| N° | Cable color | CABLE CONNECTION |
| 5 | RB | Wiring for boot lid geosed motor |
| 4 | BN | Wiring for fuel filler flap geosed motor |
| | N | To the right side under dashboard earth cable loom |

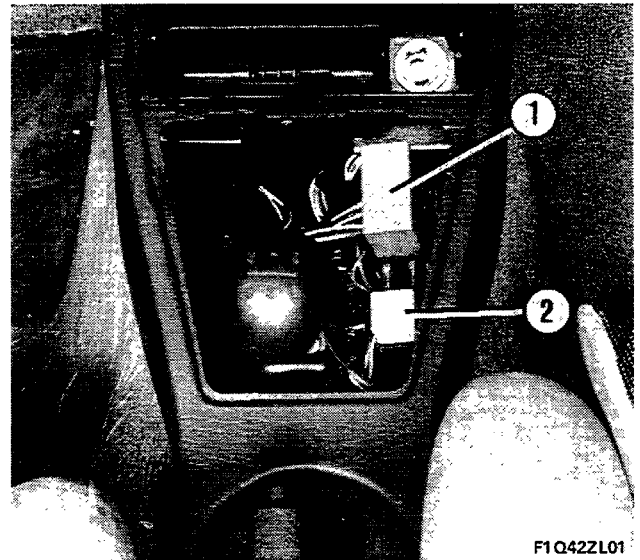
| Socket n° 2 - (green) - for central locking control unit | | |
|--|-------------|---|
| N° | Cable color | CABLE CONNECTION |
| + | RV | Central locking supply (via connector block) through socket (6) and fase (1) |
| 1M | HR | To the front and rear door geared motors for rotation in clockwise direction (through a multiple fastening for the various terminals located nearby. |
| 2M | GN | To the front and rear door geared motor for rotation in an anti-clockwise direction (via a multiple fastening for the various terminals located nearby. |
| 2 | B | To the end of travel microswitches for the electric front window geared motors for maintenance without rotating the motors |
| 3 | A | To the end of travel microswitches for the electric front windows for reversal without rotating the motors |

| Socket n° 6 - (red) - for electric windows relay | | |
|--|-------------|---|
| N° | Cable color | CABLE CONNECTION |
| 30 | R | Supply from electrical system connector block |
| | R | Central locking control unit direct supply via fuse (1) |
| 87 | RN | Supply for electric front window motor, via protective fuse (5) and for rear windows via fuse (4) |
| 85 | N | To earth |
| 86 | S | INT/A terminal of ignition switch, supply. Coming from |



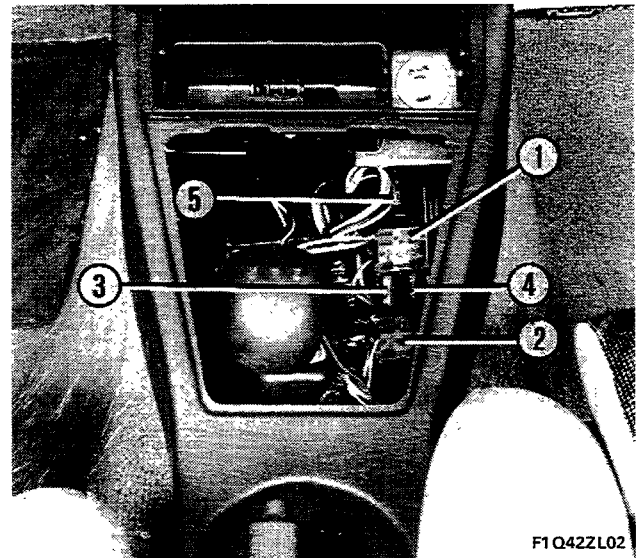
LOCATION OF POWER WINDOW AND DOOR LOCK CONTROL UNIT AND FUSES (DELTA HF 4WD)

1. Door lock control unit
2. Front power window supply relay

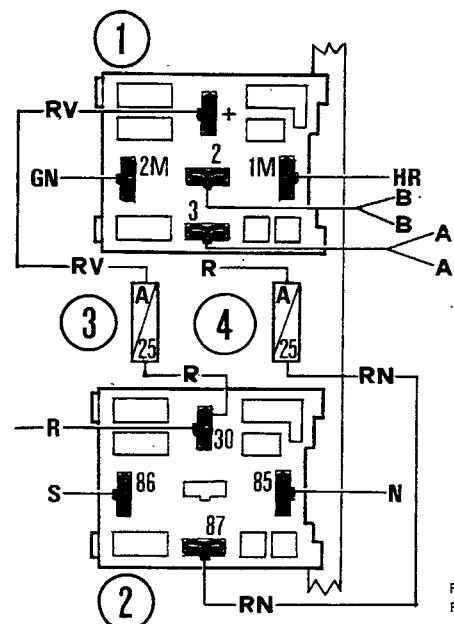


F1Q42ZL01

1. Door lock control unit mount
2. Front power window relay mount
3. Door lock control unit supply fuse
4. Front power window reduction unit fuse
5. Door lock control unit earth lead



F1Q42ZL02



F1Q42ZL03
F1Q42ZL04

Relay and door lock control unit mounts with fuses

55.

Connection of mount cables to car electrical system (DELTA HF 4WD)

| Mount no. 1 for door lock control unit | | |
|--|--------------|--|
| Terminal no. | Cable colour | DESCRIPTION |
| + | RV | Door lock control unit supply from fuse (3) through terminal 30 of power window supply relay |
| 1M | HR | To front and rear door lock reduction units by clockwise rotation (via multiple clips) |
| 2M | GN | To front and rear door lock reduction units by anticlockwise rotation (via multiple clips) |
| 2 | B | To front door reduction unit end stop microswitches to maintain motor rotation direction |
| 3 | A | To front door reduction unit end stop microswitches to reverse motor rotation direction |

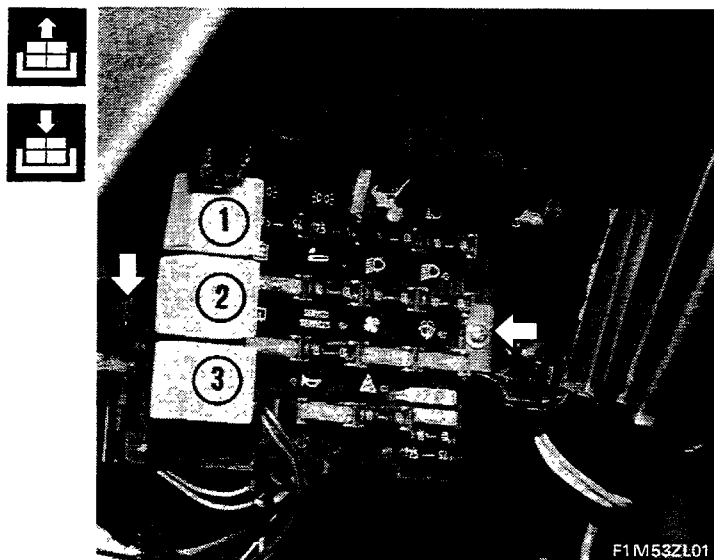
| Mount no. 2 for front power window relay | | |
|--|--------------|---|
| Terminal no. | Cable colour | DESCRIPTION |
| 30 | R | Direct supply cable from battery junction |
| | R | Door lock control unit supply |
| 87 | RN | Supply for front power window motors via fuse (4) and power window switches |
| 85 | N | Earth cable |
| 86 | S | Power window relay excitation supply from INT/A terminal of ignition switch |

CONTROL BOX

1. Horn control relay
2. Heated rear window relay
3. Car interior fan relay

Removing-refitting control box from facia

- Back off bolts retaining (→) unit to facia.



Rear view of control unit with shape of terminals for connection to car electrical system

The control box contains all electrical system fuses, with symbols showing main function protected.

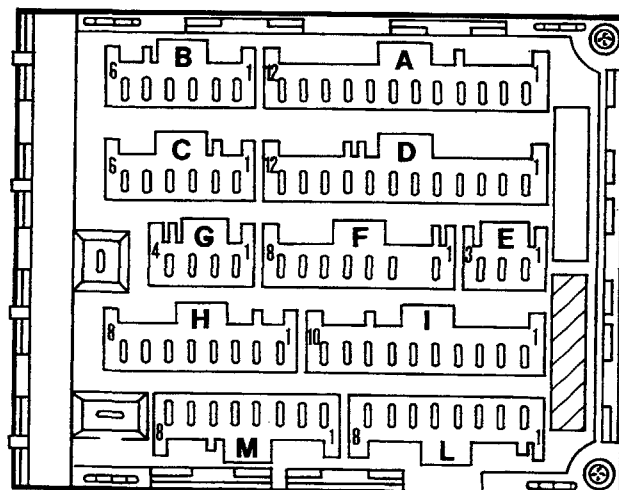
It is also equipped with connections for insertion of some relays.

Internally it consists of a flexible support for connection of the various wires.



It is impossible to mistake one connector for another as they all have their own special shape.

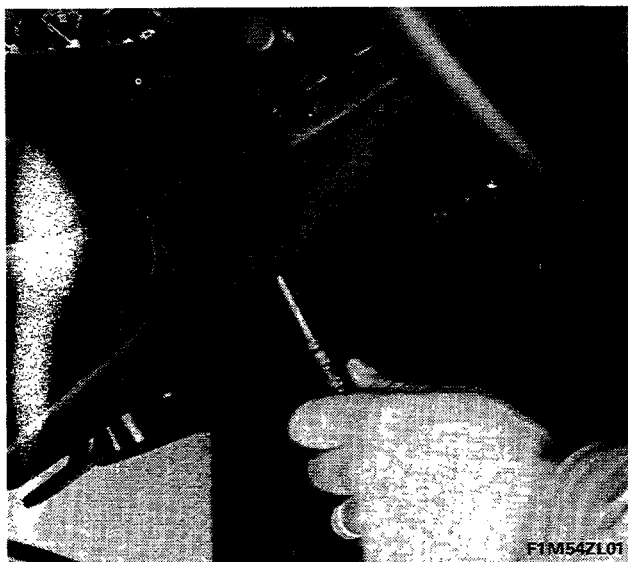
Connector identification letters are as adopted in the wiring diagrams.



Classification of connection unit connectors with cable colours

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|----|-------|-------|-------|-----|-----|----|----|----|-----|----|----|
| A | GV | HR | VN | GR | RV | AN | AB | RN | GN | SN | MB | G |
| B | H | AB | Z | A | - | V | | | | | | |
| C | HR | HN-HN | AN-AN | AB-AB | G | BN | | | | | | |
| D | RV | RN | V | - | A | - | HR | MB | H | HG | VG | - |
| E | BR | GR | GR | | | | | | | | | |
| F | GN | - | AN-AN | - | HN | R | - | VN | | | | |
| G | - | GN-GN | V | H | | | | | | | | |
| H | RA | M | RV | - | R-S | NZ | A | C | | | | |
| I | HR | V | M | R | - | G-G | VB | RN | BN | R-R | | |
| L | - | V | M | R | - | - | SN | N | | | | |
| M | - | G | RN | H-H | - | GN | R | S | | | | |
| Q | R | | | | | | | | | | | |

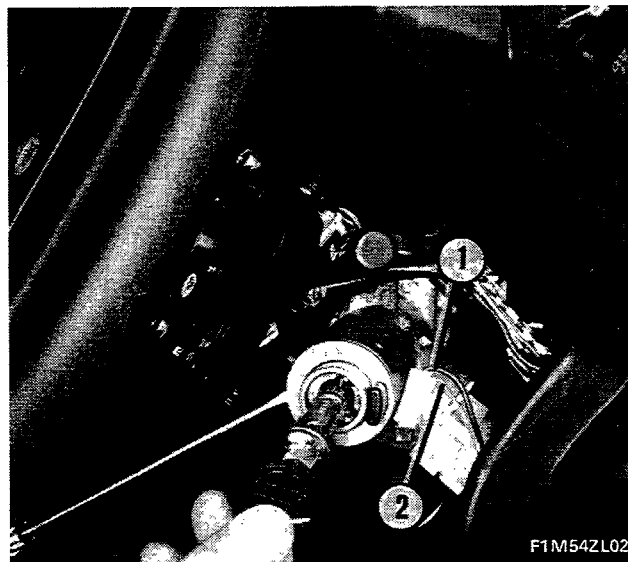
55.



IGNITION SWITCH

Removing-refitting top steering control shaft guards

Back off the five bolts fastening the bottom of the guard to the steering column.

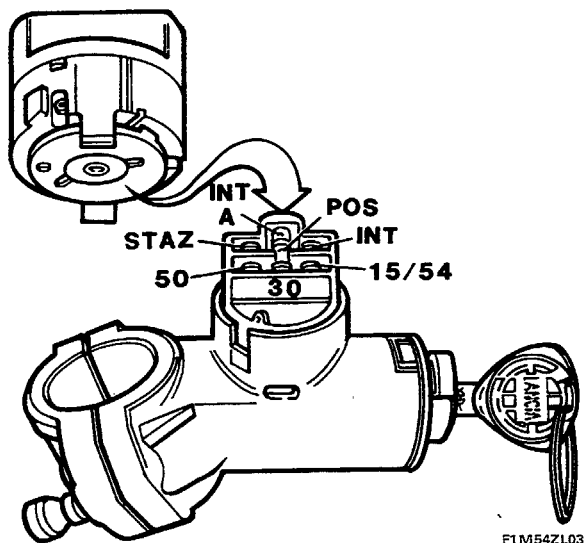


Ignition switch bulb supply cable

1. Black cable to earth loom under facia on right side, via radio connector
2. Red-green supply cable to ignition switch light from ignition switch light delay

Replacement of block with ignition key

Turn key to running position. Press relevant groove with screwdriver and simultaneously extract key and block.



Replacement of ignition switch electrical contacts

With key in "STOP" position, withdraw the two switch connectors.

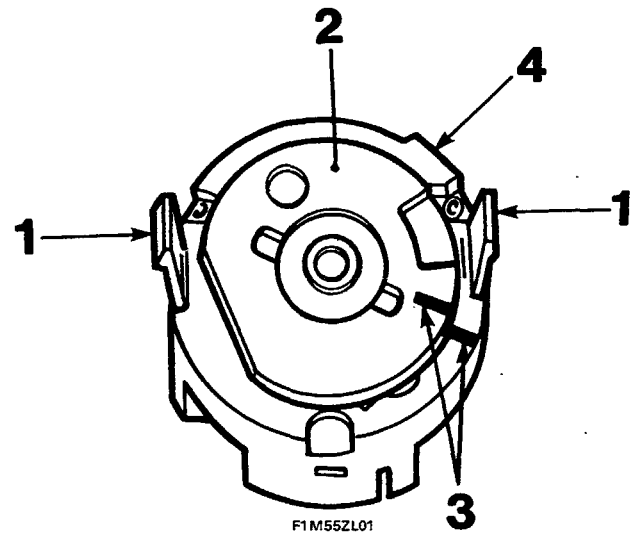
Turn the key to "MAR" position.

Using a screwdriver, push fins (1) inward and simultaneously withdraw switch from housing (see following illustration).

Position cam (2) of new switch so that reference notches (3) are aligned.

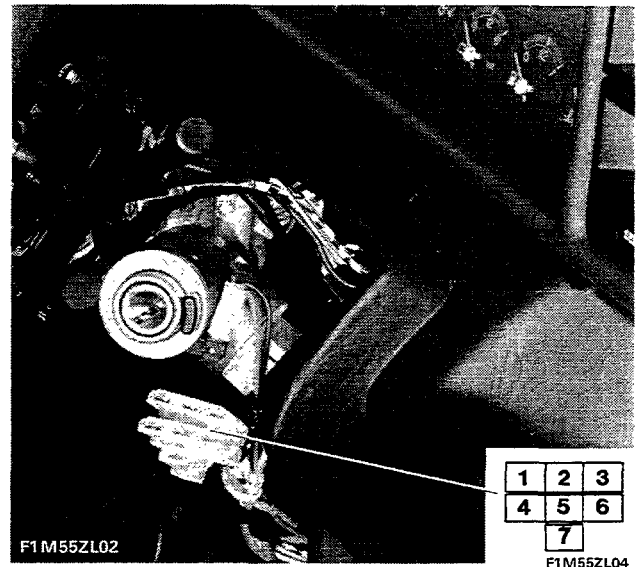
Insert switch into seat on steering lock until fins lock in grooves. Reference tooth (4) will ensure correct positioning.

Turn key to "STOP" position and connect the two connectors previously removed.



Cables connecting ignition switch to car electrical system

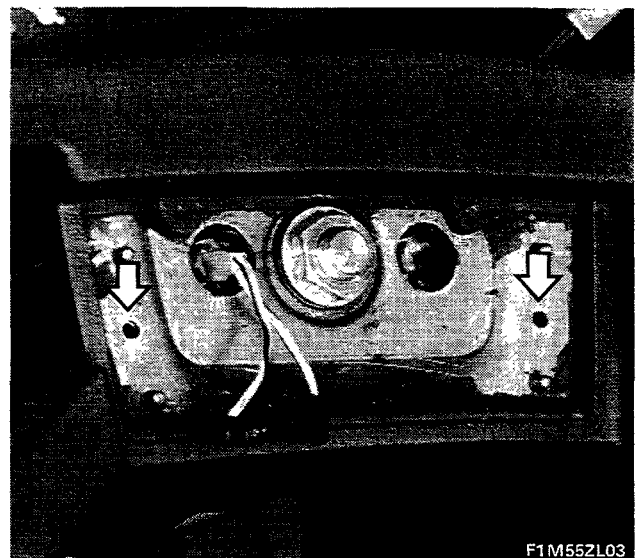
| Term. | No. | Cable colour | CABLE CONNECTION |
|-------|-----|--------------|---|
| 15/54 | 1 | RN | To terminal +15 of ignition coil |
| 30 | 2 | RN | To cut-off control module (1300) |
| | | R | To terminal 50 of starter motor |
| INT | 4 | A | To steering column connector for main-dipped beam switch |
| POS | 5 | GN | To control box (terminal 6 - connector M) supplying fuses nos. 3-4 |
| STAZ | 6 | G | To side light switch steering column connector |
| INT/A | 7 | S | To control box (connector M - terminal 8) for car interior fan relay, screen wipers, headlamp wipers, heated rear screen (switch discharge) |
| | | SN | To amendment 04 device fuse |
| | | S | To connector for power windows, door lock and air conditioner |



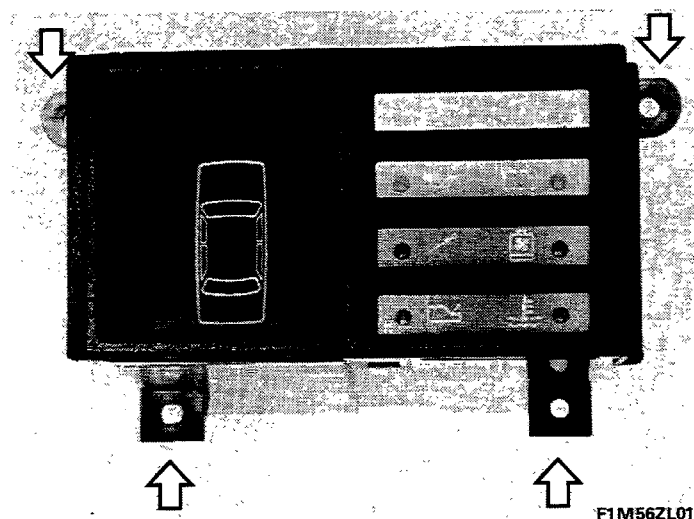
Removing-refitting steering wheel

Back off the 2 steering wheel cover retaining bolts from below (→).

Back off the steering wheel retaining nut and pull this off the steering column.



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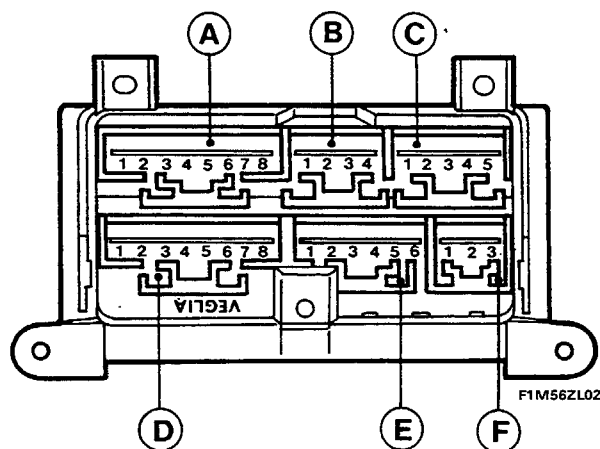
F1M56ZL01

CAR OPERATION MONITORING DEVICE (CHECK PANEL)

Car operation monitoring check and display unit (Check Panel)

See page 41 for removal-refitting operations.

(→) Bolts retaining Check Panel module to fascia



F1M56ZL02

A-B-C-D-E-F. Terminals for connection to various functions monitored.

Back of Check Panel with connection terminals

| TERMINAL BLOCK A | | |
|------------------|-----|---|
| Cable colour | No. | CABLE CONNECTION |
| HR | 1 | To left fog lamp bulb via control box 7D-2A |
| MB | 2 | To right fog lamp bulb via control box 8D-11A |
| RN | 3 | To left stop light bulb via control box 2D-8A |
| RV | 4 | To right stop light bulb via control box 1D-5A (may be exchanged for 3) |
| AR | 5 | From stop light switch working contacts |
| H | 6 | To rear fog lamp light switch and control panel warning light via control box 9D-1C-1I |
| VG | 7 | Supply of side lights from fuse no. 3 (under POS ignition switch) from 11-D on control box (also number plate and cigarette lighter light) |
| HG | 8 | Supply of side lights from fuse no. 4 (under POS) from 10-D of control box (also digital clock display, dimmer, luggage compartment light and control panel lighting) |

| TERMINAL BLOCK B | | |
|------------------|-----|---|
| Cable colour | No. | CABLE CONNECTION |
| BR | 1 | To right front side light |
| V | 2 | To left rear side light via control unit 3D-4A (may be exchanged with no. 4) |
| GN | 3 | To left front side light |
| A | 4 | To right rear side light via control unit 5D-9A (may be exchanged with no. 2) |

| TERMINAL BLOCK C | | |
|------------------|-----|---|
| Cable colour | No. | CABLE CONNECTION |
| R | 1 | From switch resting contacts |
| BN | 2 | To right front door button (via front door transverse cable connectors) |
| BR | 3 | To left rear door button (via door lock connector) |
| VB | 4 | To left front door button (via front door transverse cable connector) |
| CB | 5 | To right rear door button (via power window connector, door lock) |

| TERMINAL BLOCK D Various devices | | |
|----------------------------------|-----|---|
| Cable colour | No. | CABLE CONNECTION |
| N | 1 | To right front earth loom |
| | 2 | Spare |
| VN | 3 | To coolant level sensor located in expansion tank |
| BN | 4 | Battery charge warning light from +D generator |
| HV | 5 | Low oil pressure warning light from associated switch |
| R | 6 | + from INT terminal of ignition switch via fuse no. 1 of control box &h-6F for battery charging warning light |
| HG | 7 | To engine oil level sensor |
| HR | 8 | To engine oil level sensor |

| TERMINAL BLOCK E | | |
|------------------|-----|--|
| Cable colour | No. | CABLE CONNECTION |
| MB | 1 | Low fuel level warning light from blade 1. terminal B of control panel |
| HR | 2 | Maximum coolant temperature warning light from blade 2, terminal B of control panel |
| V | 3 | To check socket, then to blade 3, terminal B of panel for general Check Panel start-up signal |
| RV | 4 | To Check Panel check socket, then to blade 4, terminal B of panel for supply of GREEN and RED Check Panel warning lights |
| RN | 5 | To Check Panel check socket, then to blade 5, terminal B of Check Panel general FAILURE warning light |
| G | 2 | To blade 6, terminal D of panel for lighting |

| TERMINAL BLOCK F To sensors | | |
|-----------------------------|-----|---|
| Cable colour | No. | CABLE CONNECTION |
| S | 1 | To brake fluid level sensor |
| SN | 2 | To left front brake lining wear sensor |
| VG | 3 | To right front brake lining wear sensor |

| MULTIPLE SUPPLY CABLES | | |
|------------------------|-----|--|
| Cable colour | No. | CABLE CONNECTION |
| RN | 1 | Supply from fuse 12, not locked, via blade 8, of connector I of control box and courtesy light transverse cable bundle connector |
| G | 2 | Supply from fuse 4 (locked, POS terminal) from blade 6, of connector I of control box |
| N | 3 | General earth to left front earth loom |
| | 4 | Supply from fuse 1 (locked, INT terminal) via blade 4, of connector M of control box |

Composition

This system for checking the operation of several important electrical circuits and various car functions (oil level, brake fluid etc.) comprises:

- An electronic CONTROL UNIT incorporating a light circuit check module and a check monitor that memorises and displays faults;
- A general GREEN warning light and a RED light located in a prominent position on the control panel;
- a system of connecting cables joining car circuits to be checked and the control unit;
- some N.C. sensors i.e. with contacts normally closed during correct operation of monitored service and other N.O. sensors, i.e. normally open, with contacts normally open during correct operation of monitored service.

Characteristics of check panel

This multifunctional electronic device checks the functions listed below as follows:

Checks with engine off (ignition key in MARCIA position)

- low oil level. If the level is too low, the fault is memorised so that it can be displayed when the engine is started up;
- low coolant level. If the level is too low, the fault is memorised so that it can be displayed when the engine is started up.

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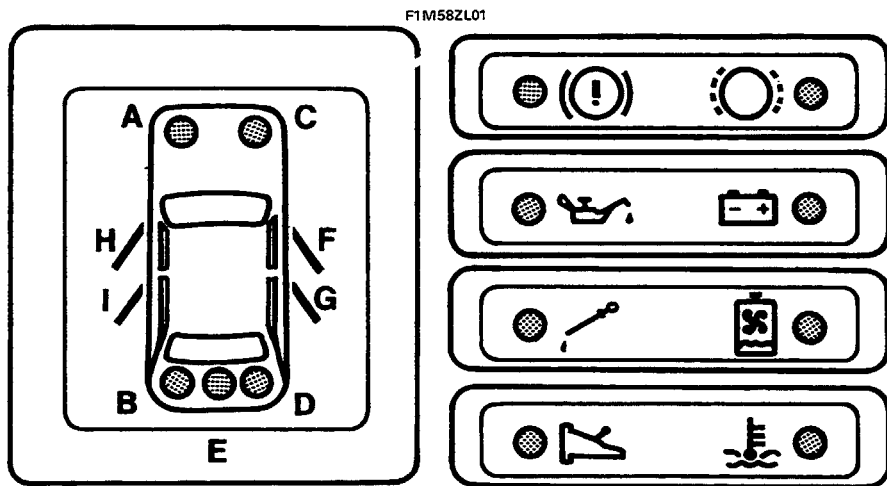
- low oil pressure;
- alternator is not providing sufficient current (failure).

Checks run with engine off and running:

- brake fluid level;
- excessive coolant temperature;
- excessive automatic transmission fluid temperature (for cars with this feature);
- wear (maximum) of front brake linings.

The device also checks the following services if activated (with ignition key in MARCIA position or with engine running):

- side lights (side light switch on);
- rear fog lamps (dipped beam and fog lamp switches on);
- stop lights (brake pedal depressed);
- brake lining wear signal (initial) (brake pedal depressed).



Check Panel display

- A-C. Front side lights
- B-D. Rear side lights
- E. Rear fog lamps

- H-F. Incomplete front door closure
- I-G. Incomplete rear door closure

Symbols (from left to right - from top to bottom)

Low brake fluid level, front brake linings excessively worn, low oil pressure, alternator defective, low oil level, low coolant level, excessive automatic transmission fluid level, excessive oil temperature.

All device functions are first monitored as described, then DISPLAYED. Display only takes place a few seconds after the engine has been started up however. At this point any defects (or open doors) are identified by the lighting of the corresponding LED and the general RED Check Panel warning light on the control panel.

NOTE If oil or coolant levels drop below specified limits, this information is memorised. Once the engine has been started up, the red LED corresponding to the fault and the general RED warning light will both come on for the time that the ignition key is in MARCIA position.
To turn the lights off you must not only top up the levels but also turn the ignition key to STOP position in order to delete the previously memorised information.

In order to be sure that one of the leds (light emitting diodes), the low fuel level warning light or the general failure warning light (RED) have not failed and have not therefore indicated a fault, all red LEDs and above warning lights should come until the general signal (GREEN) lights up to indicate the car is ready to start when the ignition key is turned to MARCIA position.

NOTE *The low oil pressure and battery charge checks are carried out only when the engine is running.*

Operation

With engine OFF

When the ignition key is turned to MARCIA position, the following warning lights come on: all red LEDs on the display, the low fuel level warning light, excessive coolant temperature warning light and the general RED warning light on the control panel.

After about 2 seconds, the oil level check will be over. If this is satisfactory the general signal (GREEN) will come on. Otherwise this will go off and the general failure warning light (RED) will come on. If the GREEN warning light comes on all the components and services monitored are working properly and the engine may be turned on. If the engine is not started, the general GREEN signal will start to flash.

With engine RUNNING

As soon as the engine has been running for a sufficient length of time for the oil pressure and battery charge lights to go off, a time switch comes into operation that causes the general GREEN signal to go off after a few seconds if all services monitored are working properly.

When the car is running or the engine is on, the electronic device monitors the following services continually:

- generator and circuit;
- engine oil pressure;
- brake fluid level;
- excessive coolant temperature;
- external lighting;
- excessive transmission fluid temperature;
- front brake lining wear;
- incomplete door closure.

When one or more of the above services fails, the relevant red LED comes on immediately together with the red general warning light.

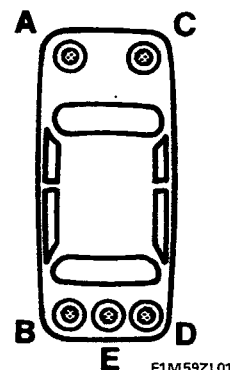
LIGHT CIRCUITS MONITORED

Side lights and number plate lights

One or more LEDs on the display come on to indicate:

- individual or simultaneous failure of two bulbs in a diagonal (ignition of corresponding LED: A-C-B-D);
- Fuse failure brings about ignition of the LEDs situated diagonally (A + D come on for fuse 3 or C + B for fuse 4).

NOTE *Simultaneous failure of the two fuses 3 and 4 is not indicated on the DISPLAY.*



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Rear fog lamps

The display indicates:

- Individual or simultaneous failure of the two bulbs (LED E comes on).
- Fuse failure is not indicated.

NOTE The rear fog lamp must be turned on in order to carry out this check.

Stop lights

The display indicates:

- failure of a single bulb (LED B or D comes on);
- interruption of working contacts of switch below brake pedal (LEDs B and D come on);

NOTE Operate the brake pedal in order to carry out these checks.

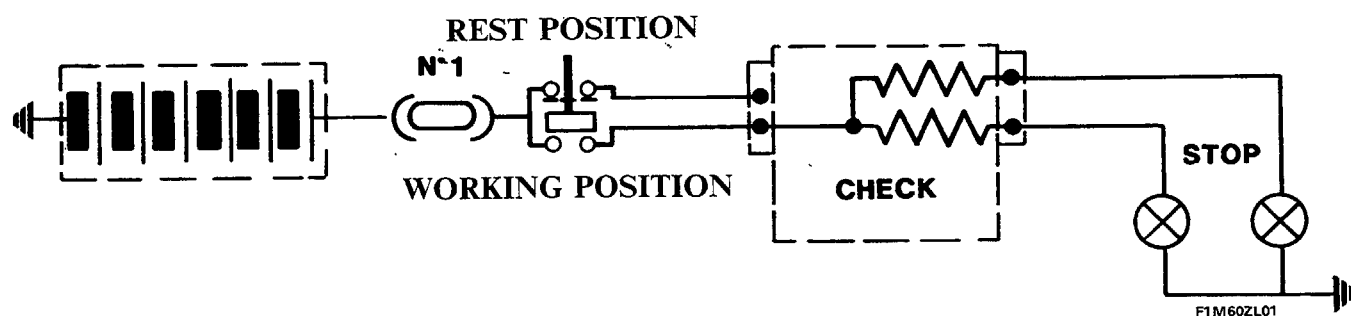
- simultaneous failure of both bulbs (LEDs B and D come on);
- failure of fuse 1 (LEDs B and D come on);
- inefficiency of resting contacts of switch under brake pedal (LEDs B and D come on).

NOTE These defects are also indicated even if the service is not on.

To conclude, note how the two following services are checked:

Stop lights

The circuit fuse (no. 1) and resting contacts of switch under brake pedal are checked even when the brake pedal is not depressed. The two bulbs or working contacts of the switch under the brake pedal are monitored only WHEN THE BRAKE PEDAL IS OPERATED.

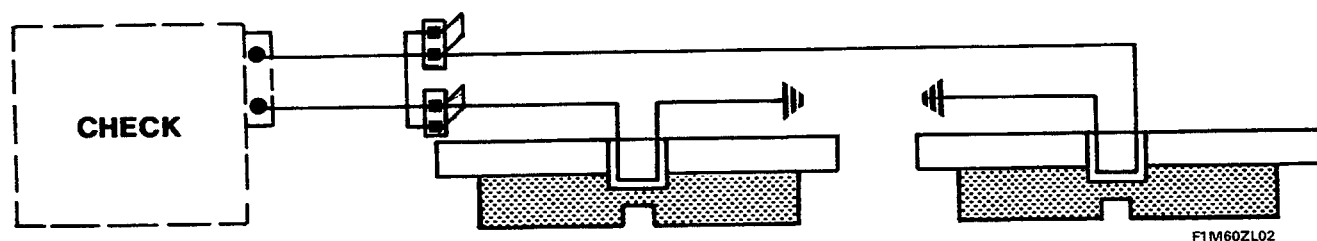


Front brake lining wear

When the brake lining insert wire is earthed due to being brought into contact with the brake disc while braking the check system indicates the defect.

When the pedal is released, the defect is no longer displayed.

When linings become so worn that the insert wire is cut, the defect is indicated CONTINUALLY and not only at the time of braking.



CONSTITUTION AND OPERATION OF MAIN SENSORS



Check system sensors include normal switches adopted on cars not fitted with Check Panels, such as an excessive coolant temperature switch, excessive brake pad wear inserts etc.

Coolant level sensor

This consists of a pair of electrical contacts (Reed) enclosed in a glass bulb located in the coolant expansion tank and a control magnet located on the end of a float immersed in the tank fluid. When the hydrostatic thrust exercised by the fluid (at normal level) against the float moves the magnet closer to the contacts, the strong magnetic flux generated in the bulb closes them.

When fluid is lost from the coolant circuit and the level drops excessively, the contacts open because the magnet moves away, thus depriving them of the magnetic flux necessary to stay open. The warning light therefore comes on.

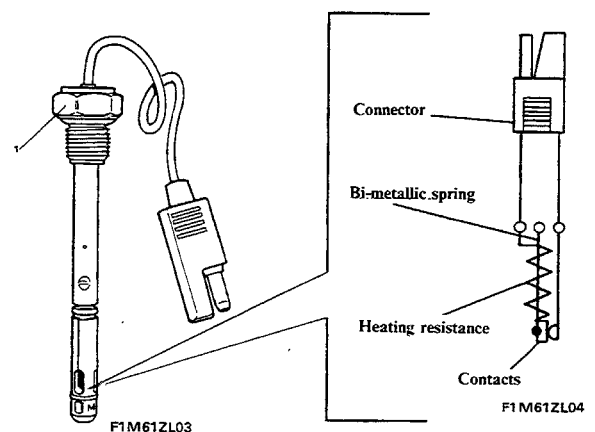
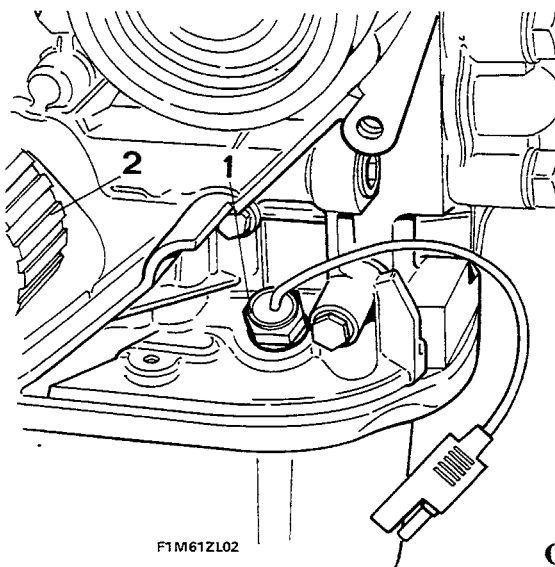
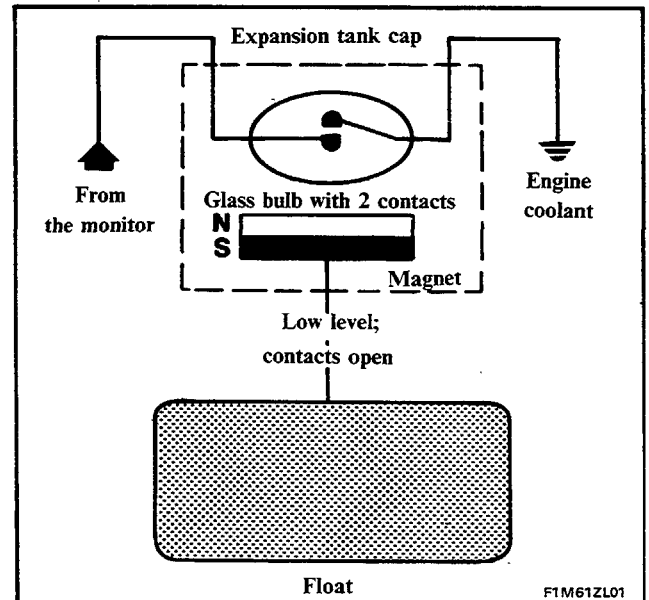
NOTE If the cable is disconnected, the warning light comes on.

Engine oil level sensor

This is located on the end of a rod immersed in the sump oil. It consists of a pair of electrical contacts located at the end of a bimetallic strip heated by an electrical resistance.

Part of the heat produced by the current passing through the sensor resistance is dissipated by the engine oil (even if this is hotter than 100°C). The bimetallic strip therefore fails to bend sufficiently and the sensor contacts stay closed.

When the oil level drops below a certain limit, heat dissipation no longer takes place with the same intensity. The contacts therefore open as a result of the curving of the bimetallic strip and the warning light on the monitor display comes on.

**Oil level sensor location**

1. Sensor socket screw
2. Crankshaft pulley

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CHECKS IN CASE OF DEFECTIVE DEVICE OPERATION

If the DISPLAY indicates faults that do not exist in the circuit monitored, proceed as follows:

Check the connections to the various sensors, light circuits and electronic control unit

If a conductor is broken or a connector disconnected (or its terminals oxidised) this is indicated by the device as a DEFECT in the relevant service if the sensor is N.C. type.

On the other hand **failure or disconnection of a connector fitted with a N.O. connector would prevent indication of a defect.**

CHECKING SENSORS

If the previous check does not reveal any defects, check the sensors associated with the defective service as follows:

Brake fluid level sensor

- Check that level is correct;
- turn ignition switch to "MARCIA" position;
- press brake reservoir cap where sensor is located in order to close the contacts: if the warning light does not go off on the display **the sensor is working properly.** Otherwise it is defective and must be replaced.

Coolant level sensor (N.C. type)

- Check that expansion tank level is correct.
If so, remove the sensor from its seat and use an ordinary ohmmeter to check electrical continuity between the two pins of the connector by putting the float in completely raised and completely lowered positions. If continuity or lack of continuity is noted in both cases, replace the sensor since it is defective.

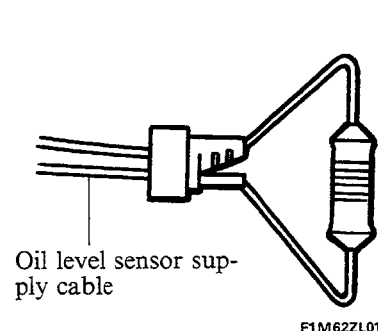
Incomplete door closure sensor

- Check that sensor contacts are not oxidised.

Oil level sensor (N.C.)

- Check oil level when car is on a flat surface. Check that oil level in sump is at least 2 mm above minimum mark.
- Disconnect and connect the oil level sensor supply cable several times in order to remove any oxidation on the contacts.
- Start engine **after leaving engine off for at least 10 mins.** (to allow the oil pumped through the engine ducts to fall back into the oil sump).

If the check panel level warning light goes out after the waiting time, the sensor is working properly and need not be replaced.



Otherwise, detach the sensor and fit a 12Ω resistance in its place, as shown in the diagram, then turn the ignition key to MARCIA position: if the check panel warning light does not go off after the waiting period, the check panel module is defective and must be replaced.

NOTE *Inform customers that the low oil level warning light may come on if the engine is restarted immediately after stalling. In this case the level is recorded when the oil ducts have not completely emptied and the oil has not all returned to the sump.*



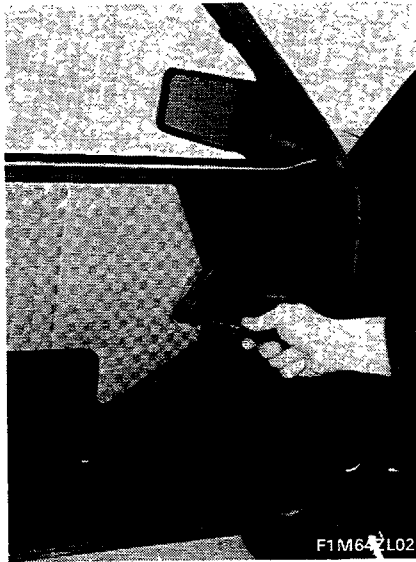
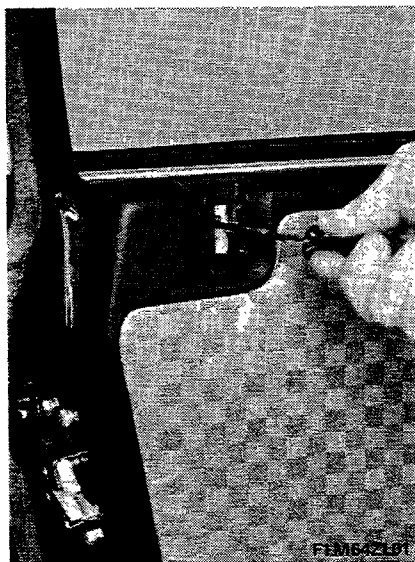
Never short-circuit the supply cables of this sensor since this would irreparably damage the control unit. If the defect is due to low oil level, top up and then turn the ignition switch to STOP position to delete the previous MEMORY before reading the display again.

SUMMARY TABLE OF OPERATION AND DIAGNOSIS

| Services | Conditions for carrying out check | Possible check system defects | Repair | Notes |
|--|---|--|---|---|
| Side lights and fuses 3 and 4 | Engine on or off Side light switch on | Conductor joining lights to control unit broken or with oxidised terminals Power module of defective control unit | Reset, connect or clean Replace the electronic control unit | |
| Car stop lights and fuse no. 1 Car stop light switch resting contacts (under brake pedal) * | Engine on or off Brake pedal activated Engine on or off | Control unit defective Conductor connecting lights to control unit broken or with oxidised terminal Cable connecting switch or control unit broken or disconnected Control unit defective | Replace, connect, clean or reset Connect or reset Replace electronic control unit | |
| Rear fog lamps | Engine on or off, but with dipped beams and fog lamp on | Conductor connecting light to control unit broken or failed Control unit power module defective | Connect or reset Replace electronic control unit | |
| Engine coolant level | Only with engine off (signal MEMORISED) | Sensor defective Cable connecting disconnected or broken sensor Defective control unit | Replace, connect or reset Replace electronic control unit | |
| Engine oil level | Only with engine off (signal MEMORISED) | Sensor defective Control unit sensor cable disconnected or interrupted Defective control unit | Replace, connect or reset Replace electronic control unit | If a sensor connection cable is earthed, the electronic control unit would be irreparably damaged |
| Low engine oil pressure | Only with engine on | Sensor defective Control unit defective | Replace Replace | If a sensor connection cable is disconnected, any fault will not be indicated |
| Low battery charge | Only with engine on | Generator cable disconnected Control unit cables broken | Connect Connect | |
| Initial front brake lining wear Maximum front brake lining wear | Engine running or off, operating brake Engine running or off | Control unit connection cables broken, disconnected or terminals oxidised Control unit sensor connection cables interrupted, disconnected or terminals oxidised | Connect, reset or clean Connect, reset or clean | If a cable is disconnected, the display indicates a DEFECT |

NOTE Defects are displayed only if the engine is running.

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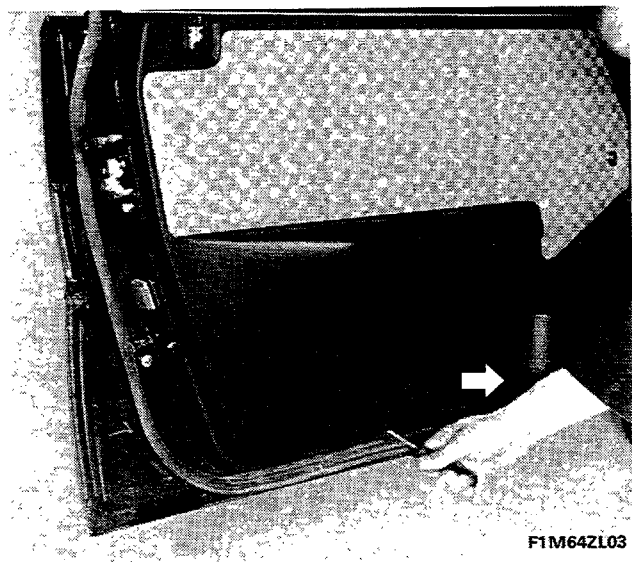


POWER WINDOWS

The power windows are controlled by a switch in door. The driver side door has a dual switch to control both windows.

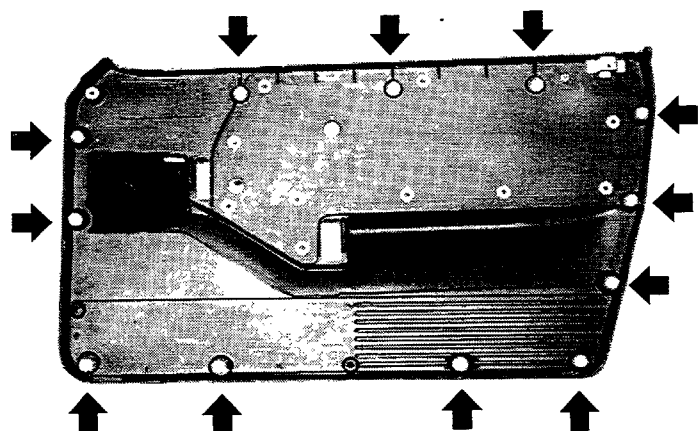
- Back off the two bolts retaining the arm rest.

Remove inner safety catch and door opening handles



- Disconnect the power window electric switches from the door panel by pressing in the retaining tabs with a screwdriver;
- back off bolts retaining the panel to the door frame;
- insert a screwdriver near each flexible panel retaining button.

Removing door panel from door frame (levering flexible retaining buttons)



Rear view of door panel

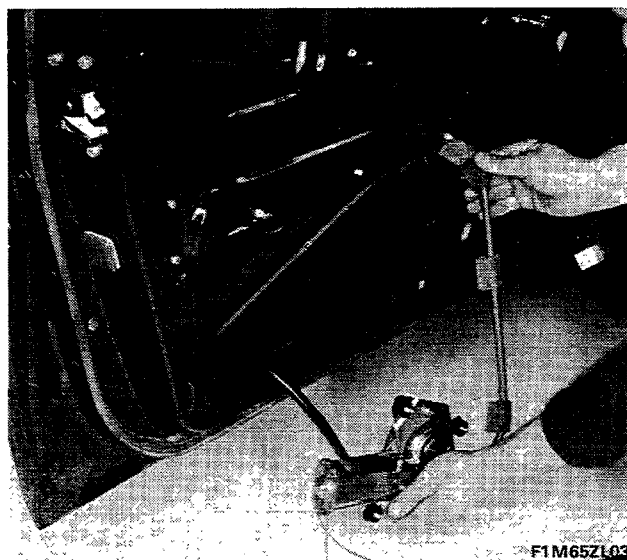
All flexible buttons retaining panel to door frame can be seen.



Removing window support retaining bolts (→) and bolts retaining power window assembly to door frame (→)



- Turn power window assembly to extract from door frame, as shown in diagram.



Removing power window assembly from door

NOTE After fitting the assembly, adjust the window support in the lift support slots (3) after applying tension to the system to ensure that the window slides smoothly.

Constitution and operation

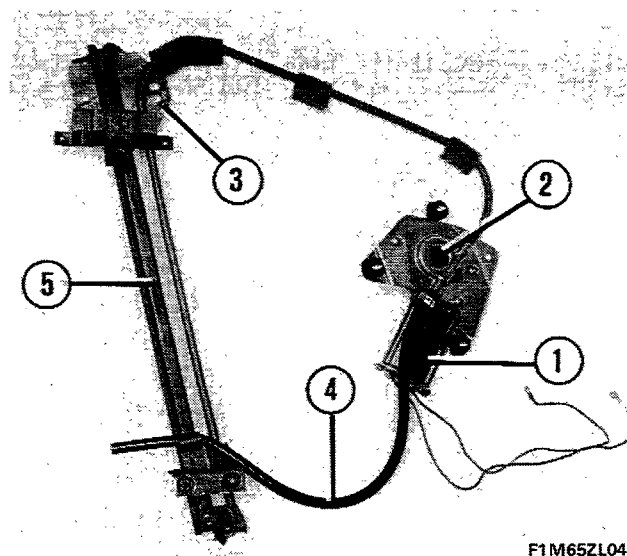
Motor (1) operates a worm screw and wheel mechanism (2).

This controls a coaxial pinion that engages the control cable coils.

The coil is fixed to power window support (3), which slides in a vertical guide (5).

The door window is secured to the support with a special bracket.

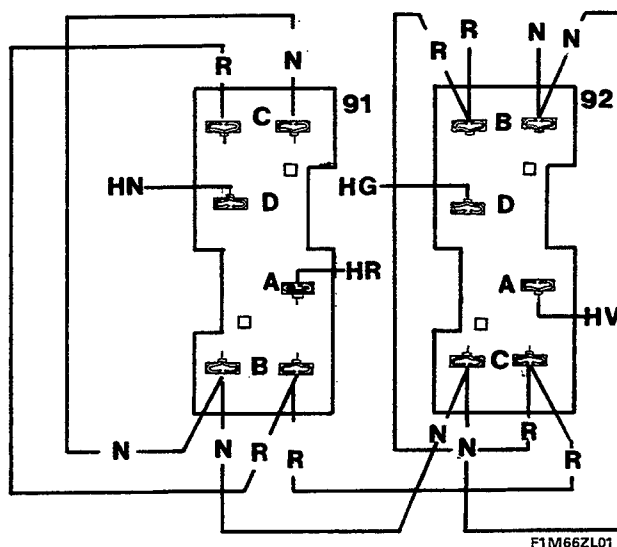
A plastic pipe (4) houses the free section of the control cable that slides within a moulded tube. The motor may turn clockwise or anticlockwise to move the control cable in rack-like fashion. The motor is fitted with a circuit breaker that consists of 2 contacts and a bimetallic strip.



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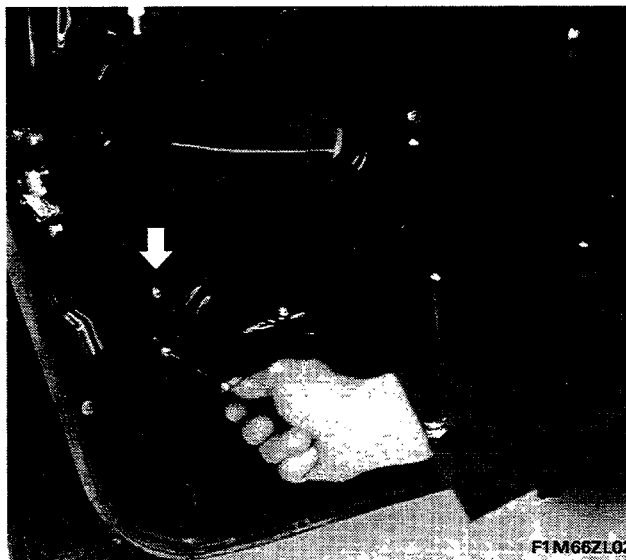
Power window switch mount (driver side window)

- 91. White left door power window switch mounting
- 92. Red right door power window switch mounting
- A-D. Connection cables to the two front power window motors (clockwise and anticlockwise)
- C-D. Connection cables to the two front power window motors: black cable to earth, red cable to auxiliary fuses (25 Amps).



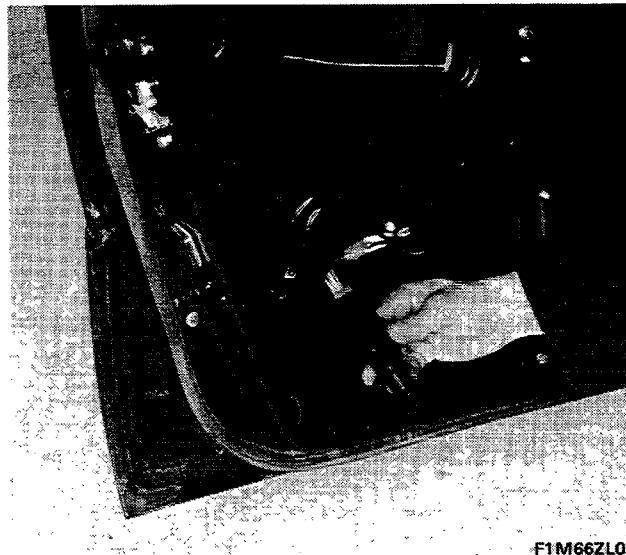
ELECTRIC DOOR LOCK

- Remove the door panel and inside safety catch handle as described on the previous pages.



Removing-refitting reduction unit and door lock from door frame

The reduction unit consists of an electric motor that operates a rack via a pinion. The front reduction unit is also fitted with an end stop microswitch.



Extracting door lock reduction unit from door frame

- Disconnect electrical connector.

REPAIR OPERATION IN CASE OF POWER WINDOW FAILURE

If power windows fail, follow the following instructions

1. - Turn the ignition switch to "MARCIA" position.
2. - Check that the fuses 113 (only PRISMA 4WD) - 114 located near power window control switch have not blown.

For front power window failure (Mod. DELTA-PRISMA 4WD)

3. - Remove power window control button/s and disconnect from mounting/s
 - Check positive and negative power supply to button mounting (using check light or multimeter);
 - **red supply cables**
 - **negative supply cables (continuity for return to earth): black (only driver door)**
- (*) If positive supply is lacking, the failure should be sought in the following components:
 - Ignition switch failed (INT/A terminal no voltage)
 - Power window relay failed or with excitation circuit inoperative due to defective earth
 - Driver or passenger side under facia connection blocks, defective.

NOTE *If there is no connection to earth (negative supply) check the earth loom contact under the facia.*

If positive and negative supply are present, refit the power window control button and move on to point 6.

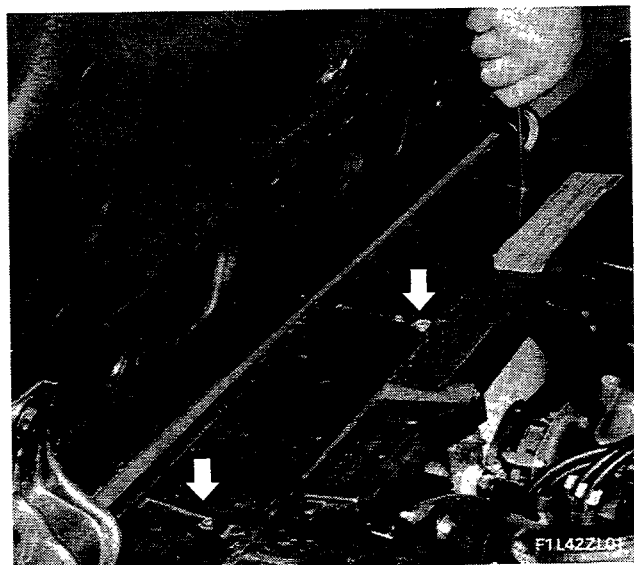
For failed rear power windows (only for PRISMA 4WD)

4. - Remove the rear power window inhibition button located on the drive side tunnel and defective rear button/s located at end of tunnel and disconnect from mounts.
 - Check positive power supply to rear power window operation inhibition switch (green cable) on tunnel.
 - Refit this switch and check operation, making sure that the power supply reaches the red cable.
If no power reaches the green cable, the causes are the same described at point (*) previously
If power does not reach the red cable, replace the inhibitor switch since it is defective.
 - Refit the control buttons to tunnel.
5. - Check positive and negative power supplies to rear power window button mountings located in the rear of the tunnel:
 - **positive power supply: red cable**
 - **negative power supply: black cable**
 - If no voltage is present, the defect lies in the following:
 - 2 way connector block defective or earth contact loose
 - red cable from rear window inhibition switch to control switches broken
 - Refit control buttons.
6. - Disconnect the defective window door panel, disconnect the 2-way window motor supply connector and check that this is supplied by both cables when the control button on the tunnel is pressed (both ways).
If no voltage is obtained, replace the control button since it is defective. If voltage is obtained, replace the window motor since this is defective.

NOTE *Also search for faults or binding of mechanical glass guide assembly by supplying the window motor directly (with 25A fuse) with buffers at top and bottom.*

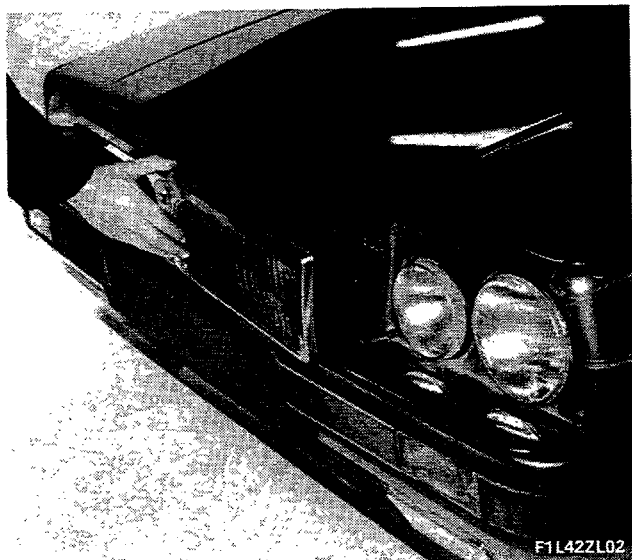
*Repeat the test without the glass.
Ensure that the ducts do not slow down the glass.*

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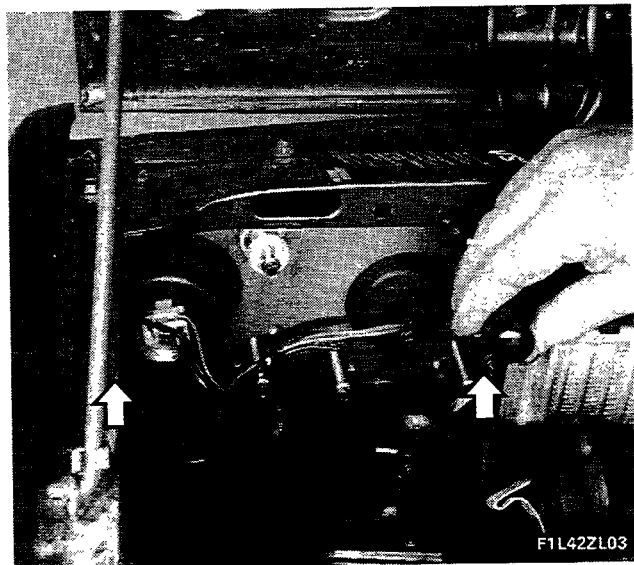


REMOVING-REFITTING FRONT LIGHT CLUSTER

Removing-refitting radiator grille assembly

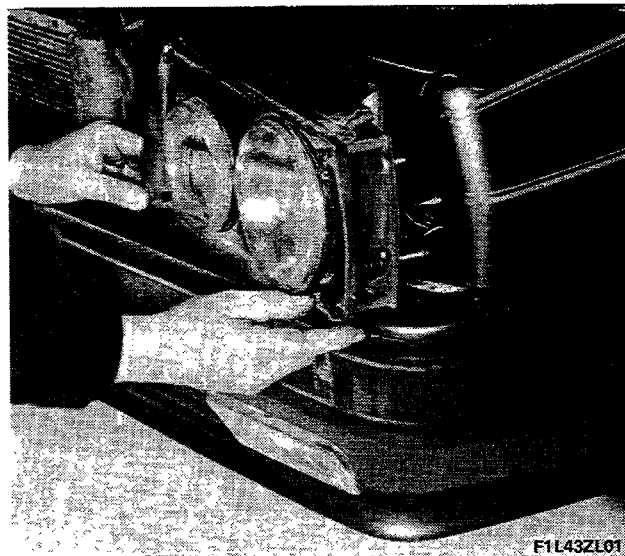


Removing radiator grille assembly from housing



Removing-refitting bolts retaining light cluster to body

- Disconnect bulb connectors

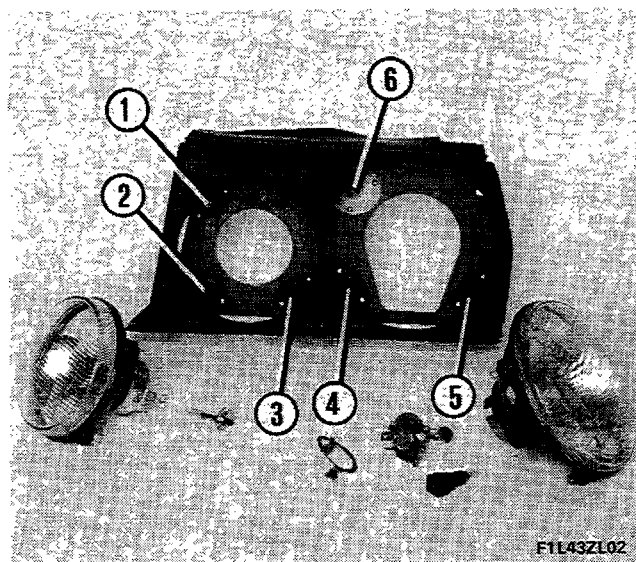


F1L43ZL01

Removing light cluster from seat

Components of front light cluster

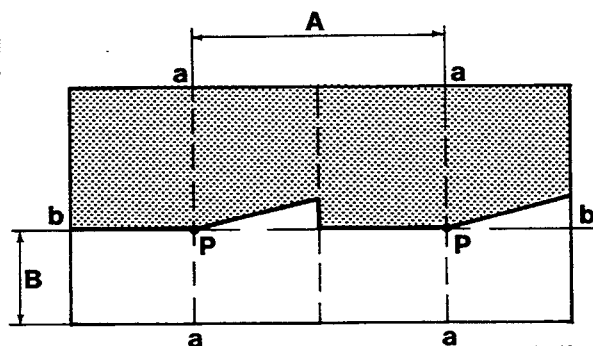
1. Vertical supplementary beam adjustment screw
- 2-3. Horizontal supplementary beam adjustment screw
- 4-5. Horizontal main-dipped beam adjustment screw
6. Vertical main-dipped beam adjustment screw



F1L43ZL02

HEADLAMP ALIGNMENT

On a screen located 10 m away, the demarcation line between the dark area and area lit by the dipped beam (b-b) must be 12 cm lower than height B when the car is new, 10cm when the car has been run in.

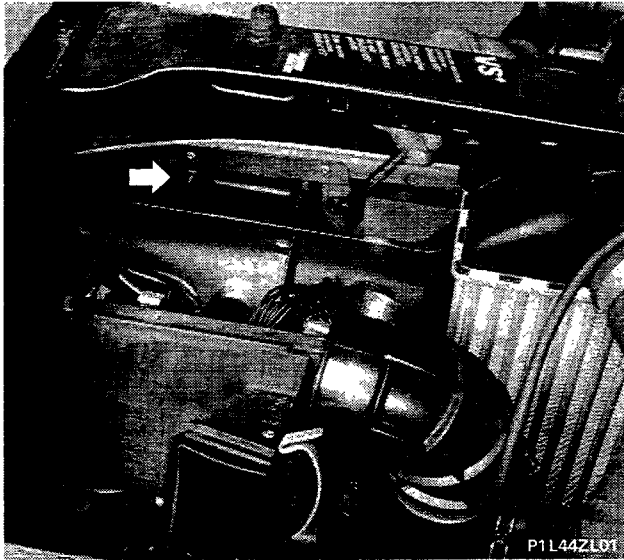


F1M67ZL02

Headlamp alignment diagram

- A. Line connecting headlamp centre lines
- B. Height of headlamp centre from ground during alignment

55.



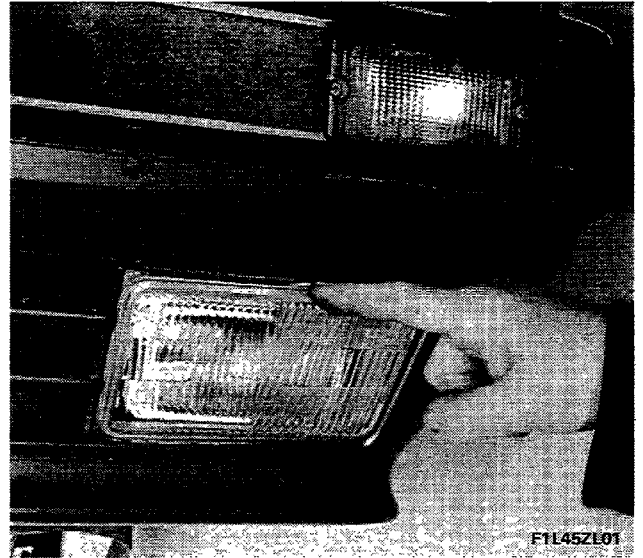
Removing-refitting bolts retaining side lights to body shell (with car raised)



Removing side lights from body shell

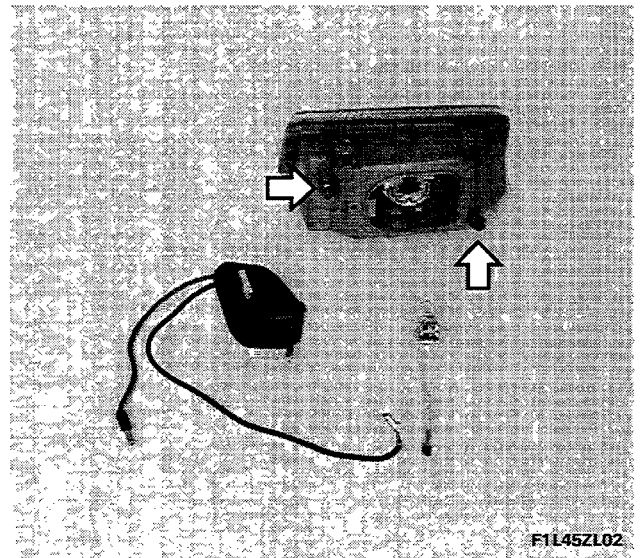


Removing-refitting bolts retaining fog lamps to body shell (with car raised)



F1L45ZL01

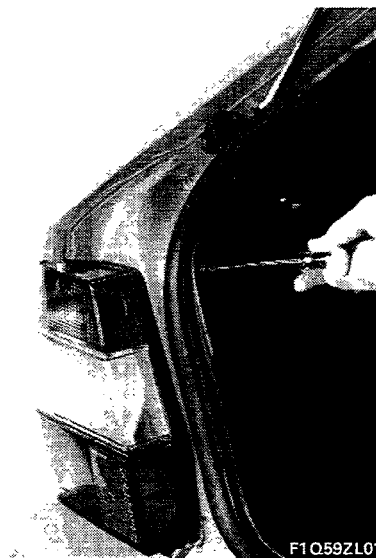
Operation of fog lamp locking device in order to remove device from the body shell



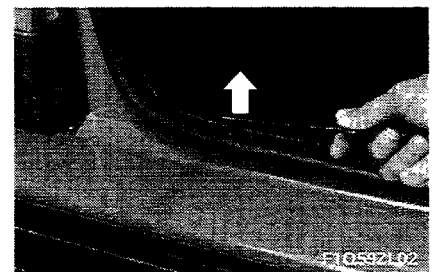
F1L45ZL02

Components of fog lamp

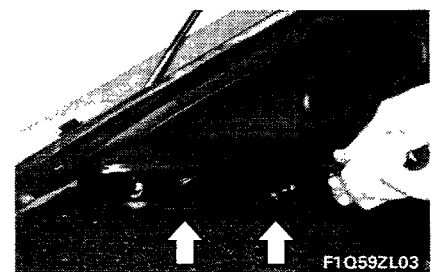
(→) Bolts retaining lamp to body shell.



F1Q59ZL01



F1Q59ZL02

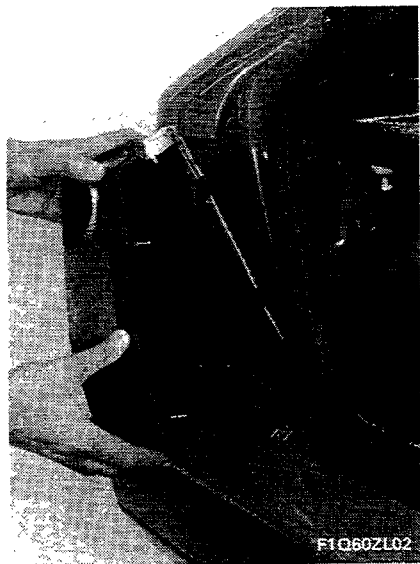
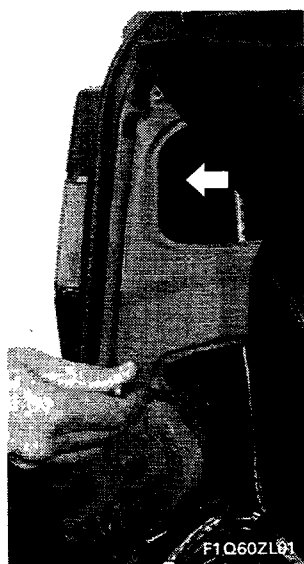


F1Q59ZL03

Removing-refitting rear light from body shell

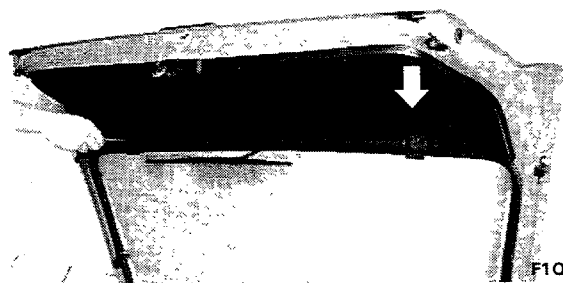
- Remove cover to gain access to the bolts.

55.



Removing rear light

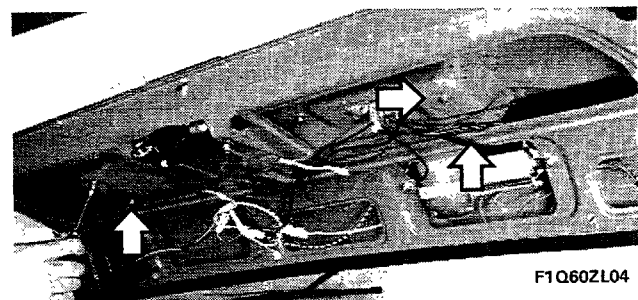
- Back off nuts retaining light to body shell.



F1Q60ZL03



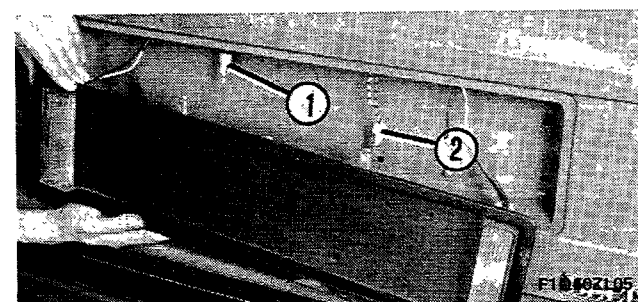
REMOVING-REFITTING NUMBER PLATE HOLDER WITH ASSOCIATED BULB HOLDERS AND REVERSING LIGHTS



F1Q60ZL04



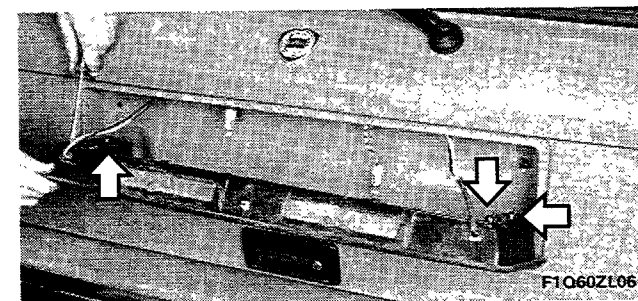
Removing tailgate interior trim



F1Q60ZL05



Removing nuts retaining plate holder to tailgate



F1Q60ZL06



Removing plate holder from seat

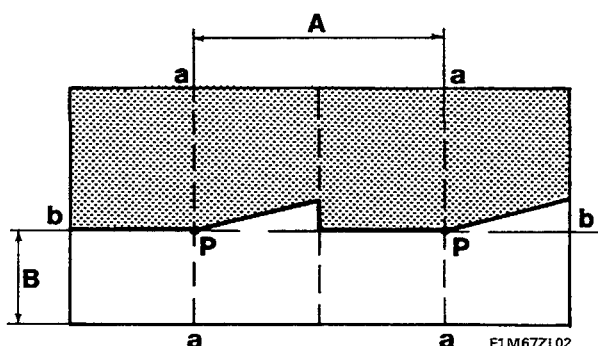
1-2. Number plate light bulb

Removing reversing lights

1. Horizontal headlamp adjustment screw
2. Vertical headlamp adjustment screw
3. Manual dipped-main beam alignment correction device

HEADLAMP ALIGNMENT

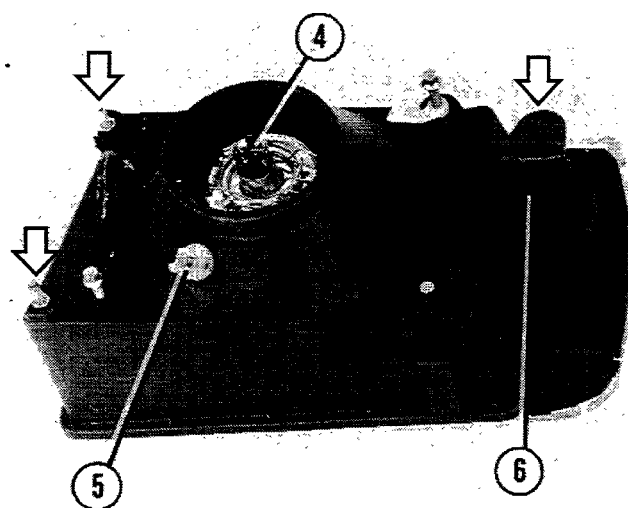
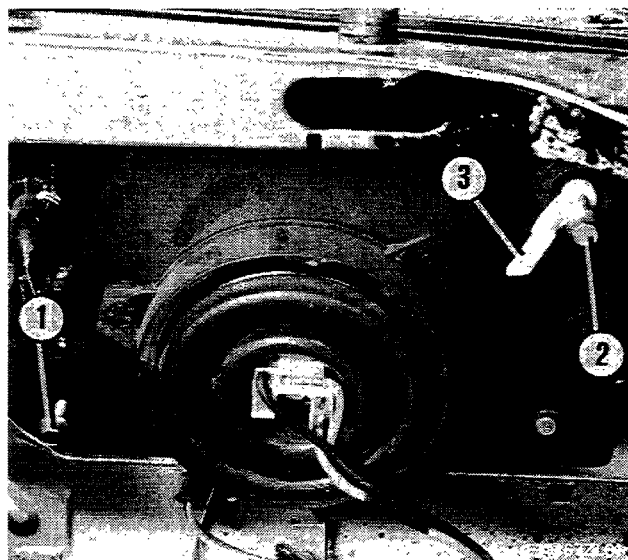
On a screen located 10m away the demarcation line between the dark area and the area lit by the main beam (b-b) should be 12cm lower than height B when the car is new, 10cm when the car has been run in.



Headlamp alignment diagram

- A. Line joining headlamp centre lines
- B. Height of headlamp centre from ground, measured upon alignment

4. Headlamp bulb connection plug
5. Side light bulb connection plug
6. Side turn signal connector housing (→) pins retaining lights to body shell.



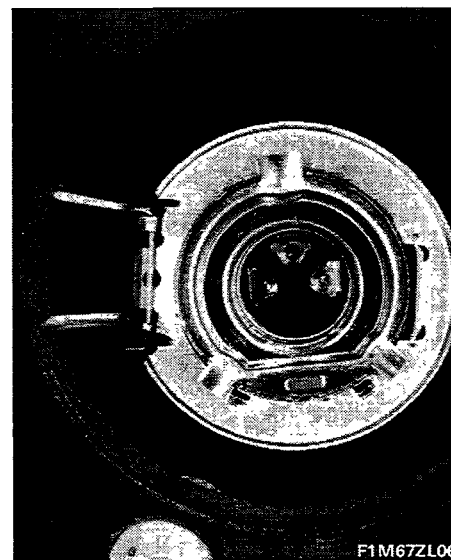
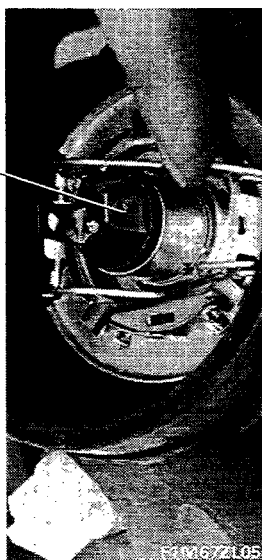
F1M67ZL03



- withdraw the rubber protective boot;
- extract connection plug;
- press and turn the spring to release from the light cluster cup and remove the bulb.

Replacing dipped-main beam bulb

NOTE Since the bulb is halogen type its brightness will be lost if it is touched with the hands.



55.



REMOVING-REFITTING
CLUSTERS

LIGHT



Removing-refitting bolts retaining lights to body
shell



Removing front light assembly (including turn
signal)

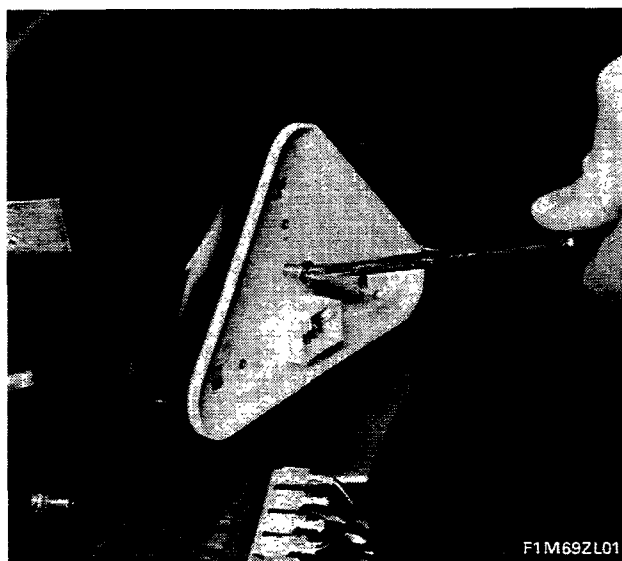


REMOVING-REFITTING REAR LIGHTS
AND BULBS

Removing rear light connector

NOTE Remove locking device using a screwdriver.

Removing-refitting rear side light, turn signal and stop light bulb holders



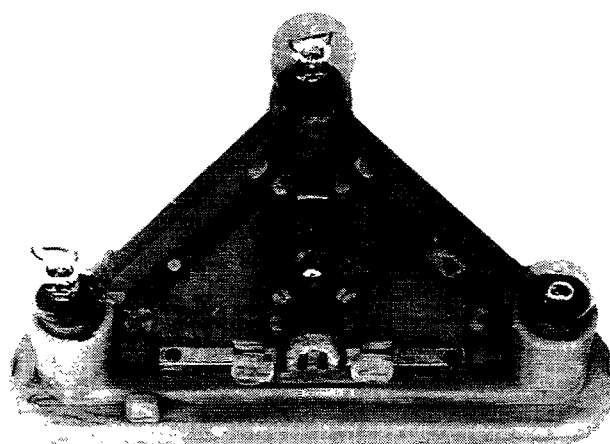
F1M69ZL01

Removing-refitting rear side light, turn signal and stop light cluster (→) from body shell



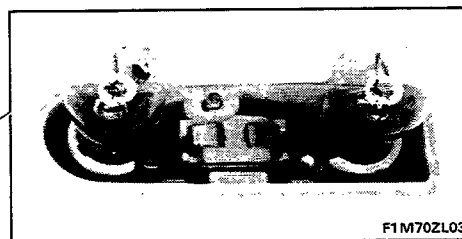
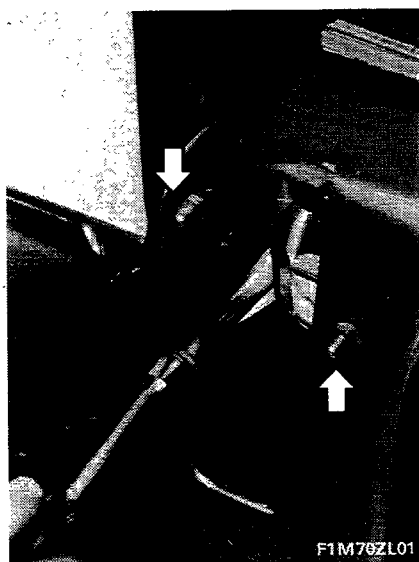
F1M69ZL02

Rear bulb holder for side lights, turn signal and stop light



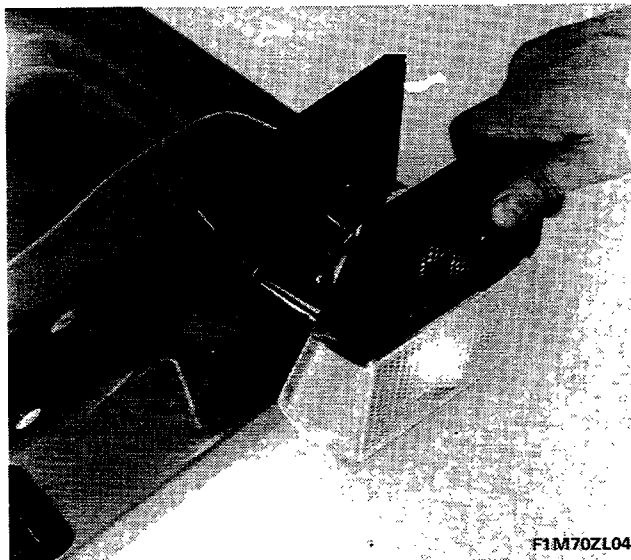
F1M69ZL03

55.



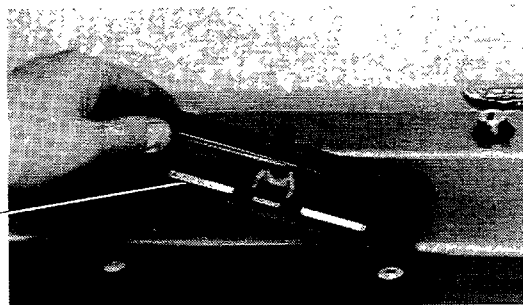
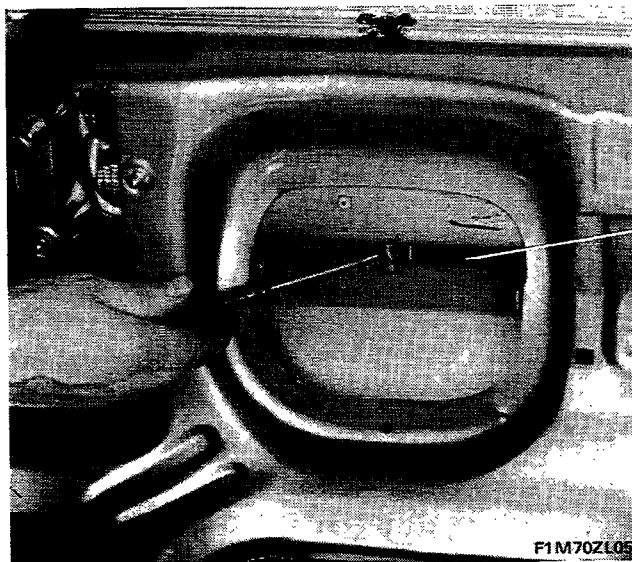
- Remove electrical connector

Removing-refitting reverse-rear fog lamp lights and bulb holder



To remove light from boot back off retaining bolts (→) (top photo).

Removing rear reversing light and fog lamp



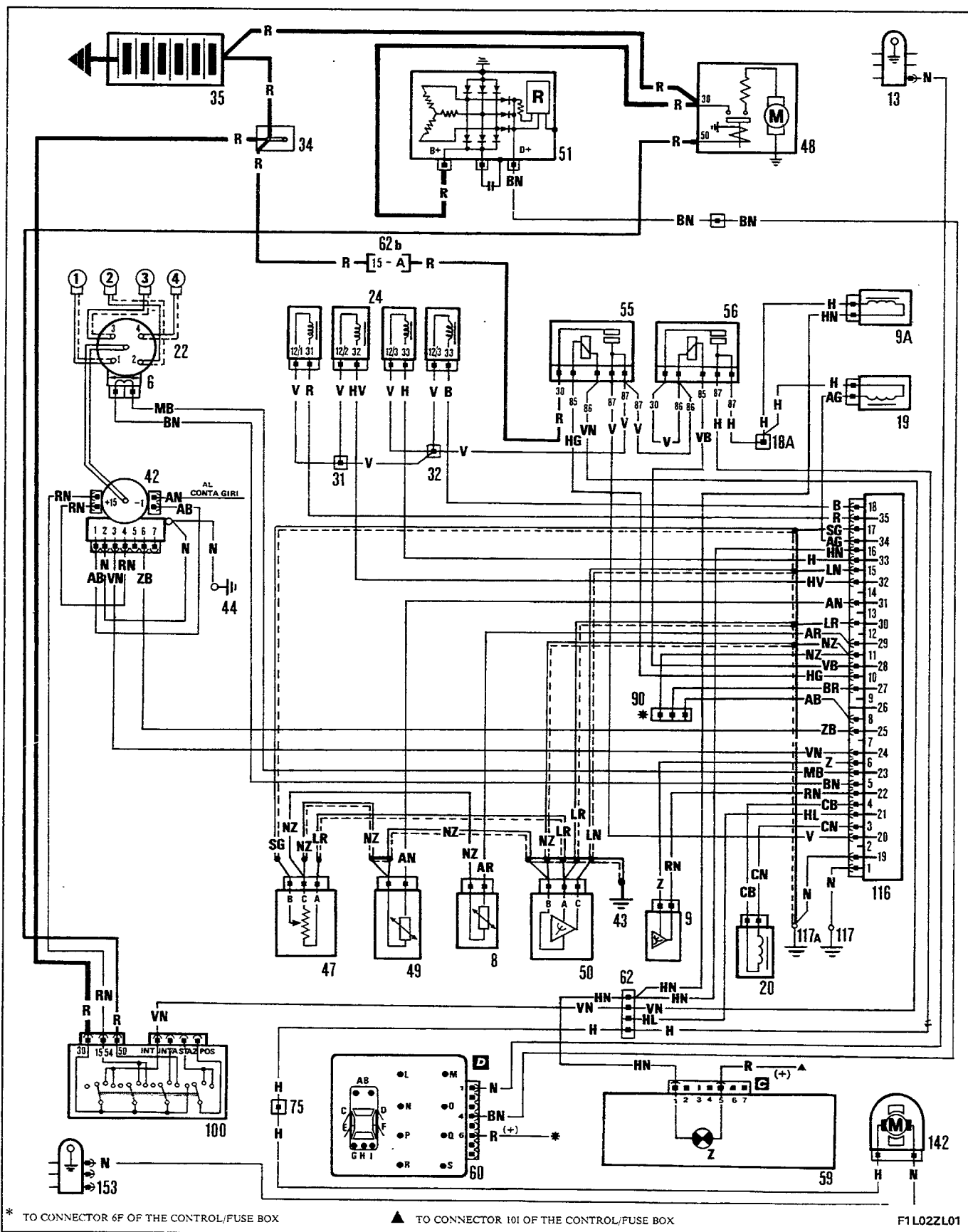
Cutting out rear number plate locking and fitting device

| | |
|-------------------|----|
| – Wiring diagrams | 1 |
| – Key | 13 |

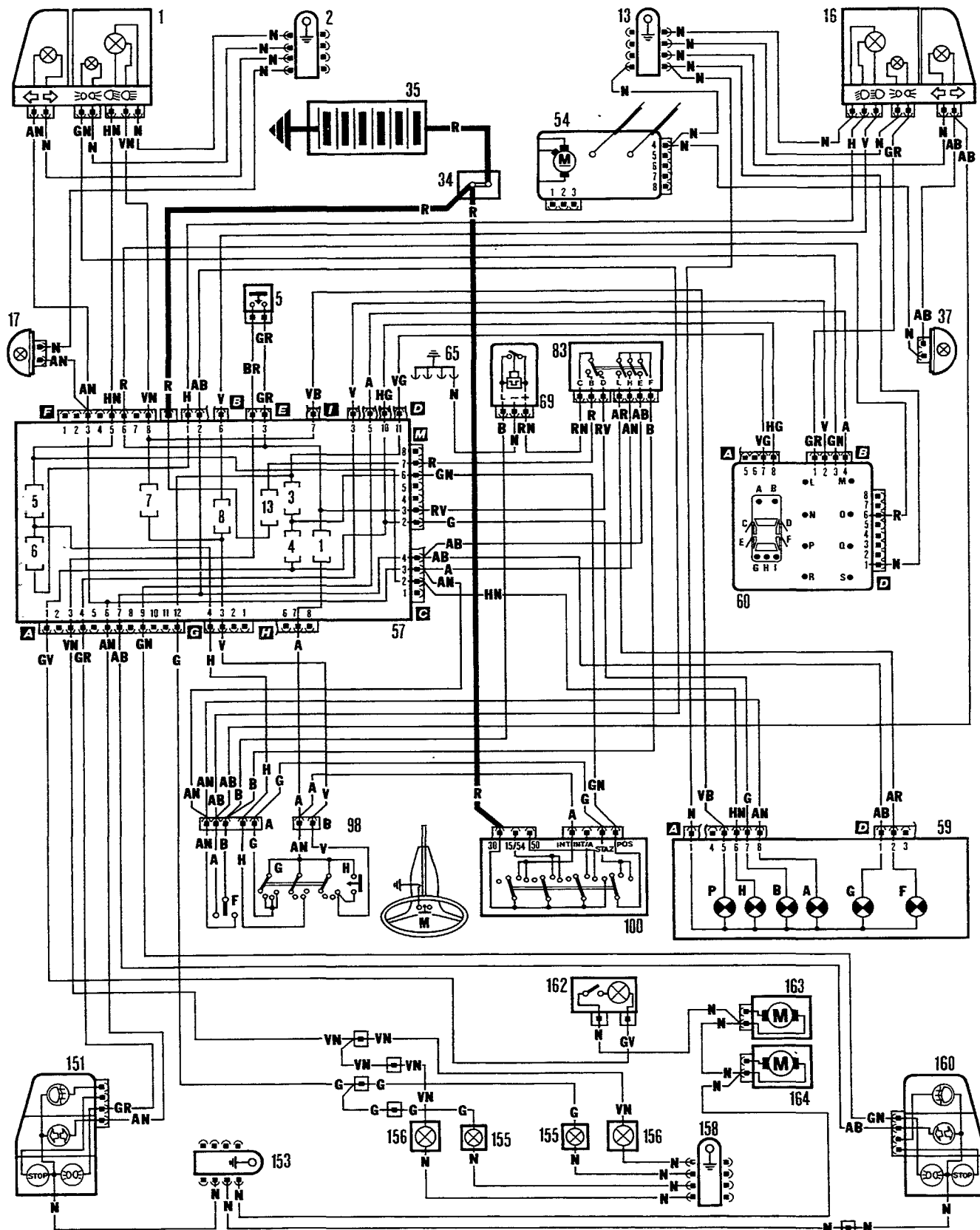
F1L01ZL01

55.

Starting - Recharging - WEBER Ignition/Injection (post-modification I.A.W.) - Electric fuel pump (see page 13 for key).

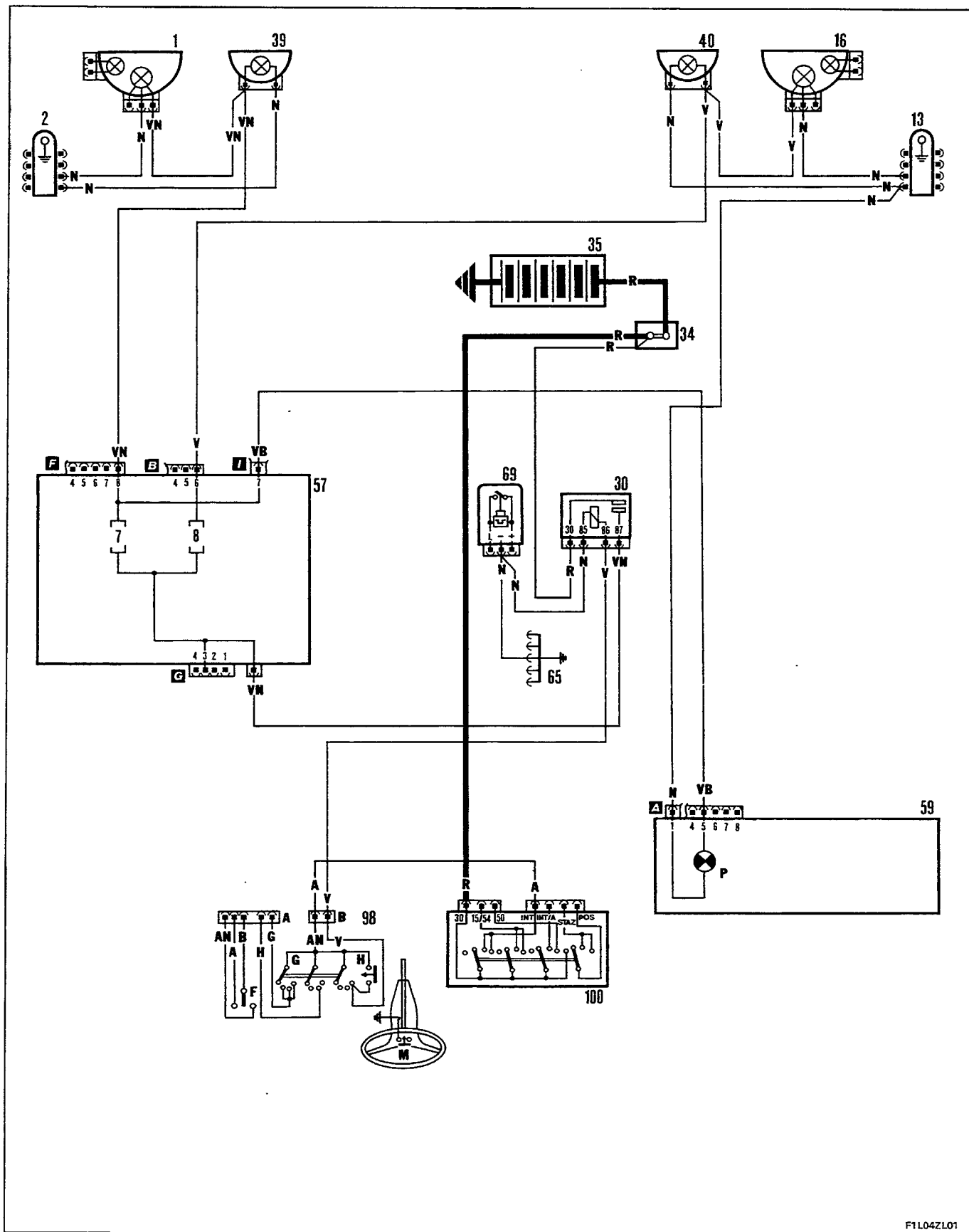


Side lights and warning light - Dipped headlamps - Main beam headlamps and warning light (additional driving lights - see wiring diagram on page 4) - Flashers - Direction indicators and warning light - Hazard warning lights and warning lights - Reversing lights - No. plate lights - Luggage compartment light (see page 13 for key).



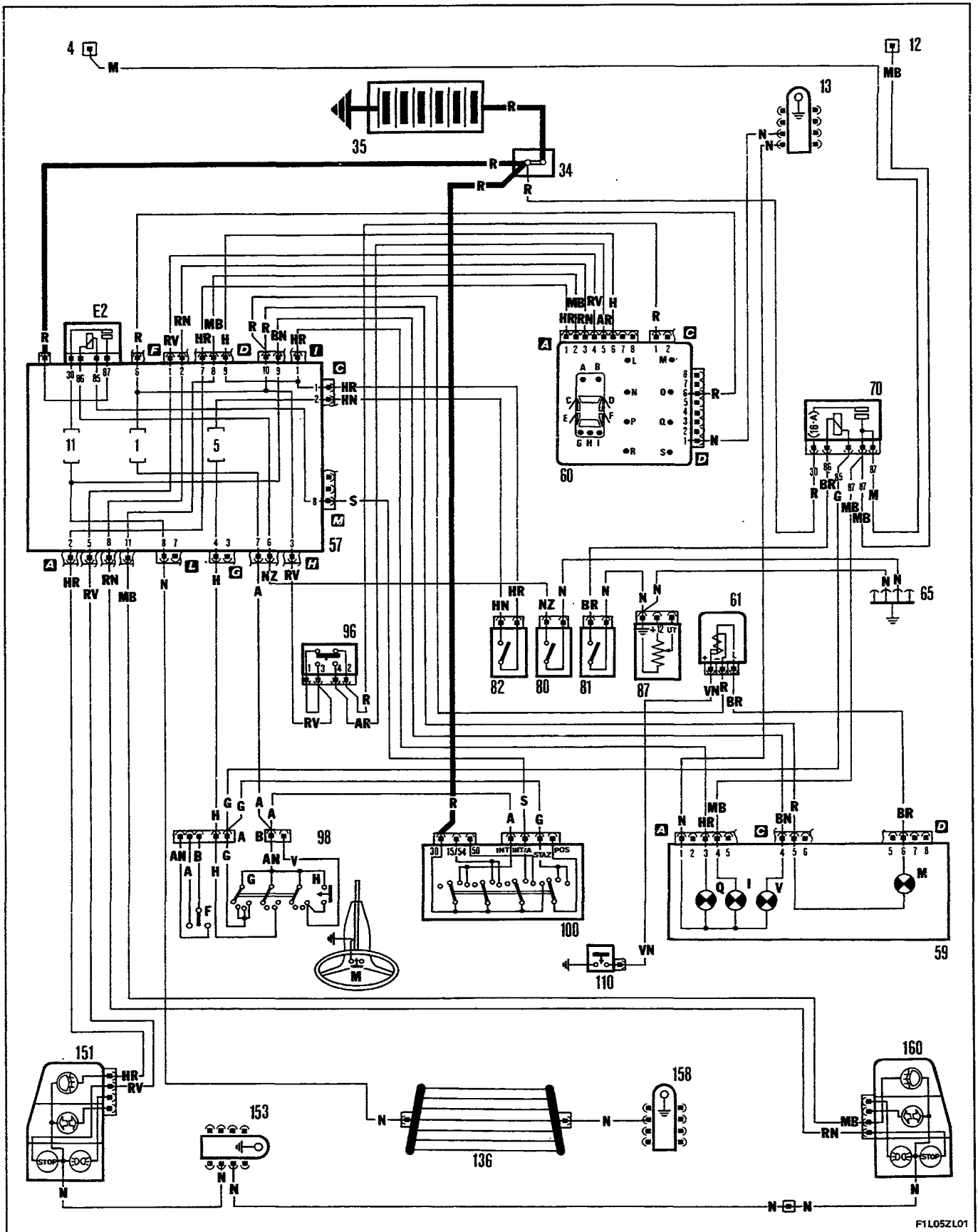
55.

Additional driving lights (see page 13 for key).

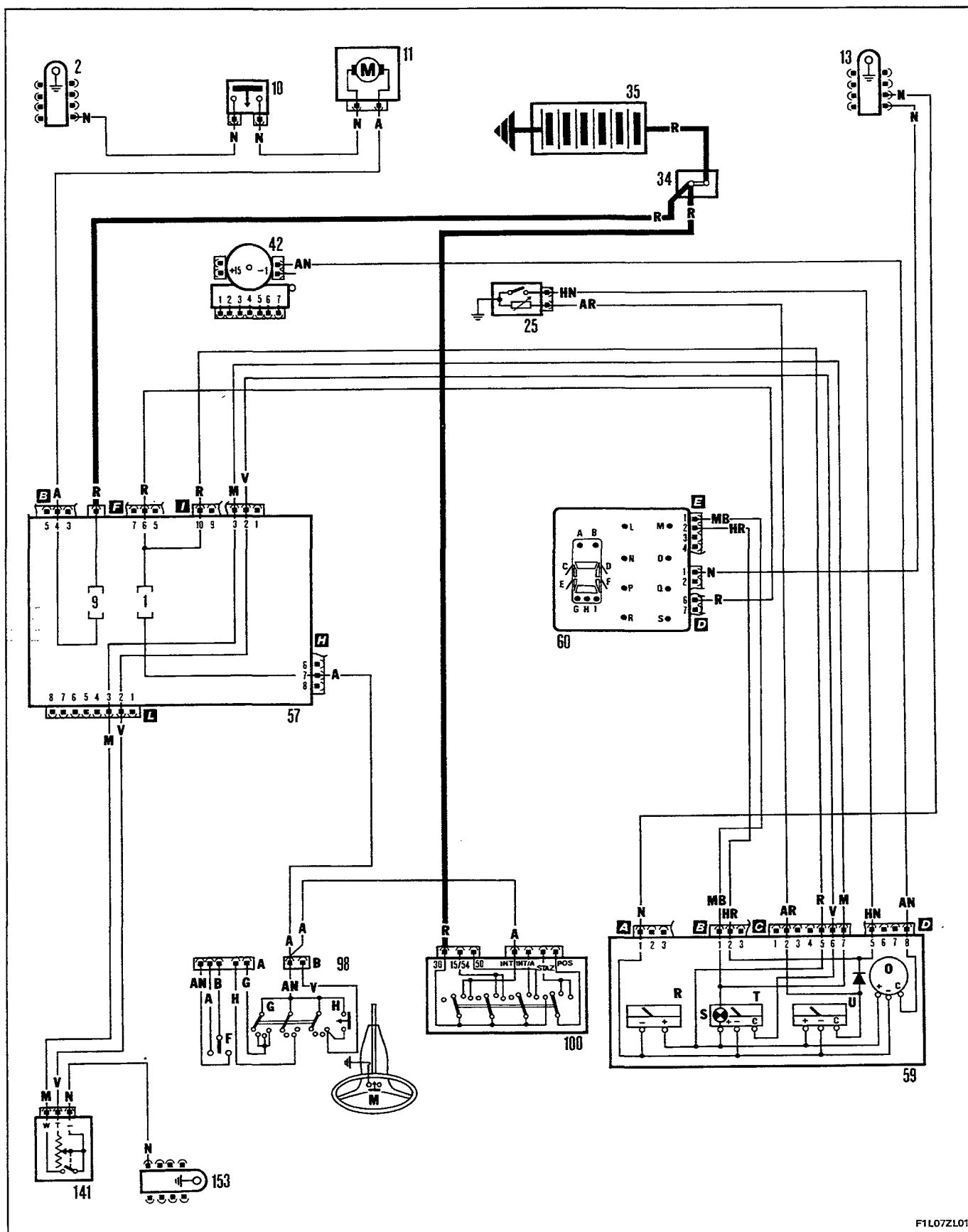


F1L04ZL01

Heated rear windscreen and warning light - Wiring for fog lamp and warning light - Rear fog lamps and warning light - Brake lights - Handbrake warning light (see page 13 for key).

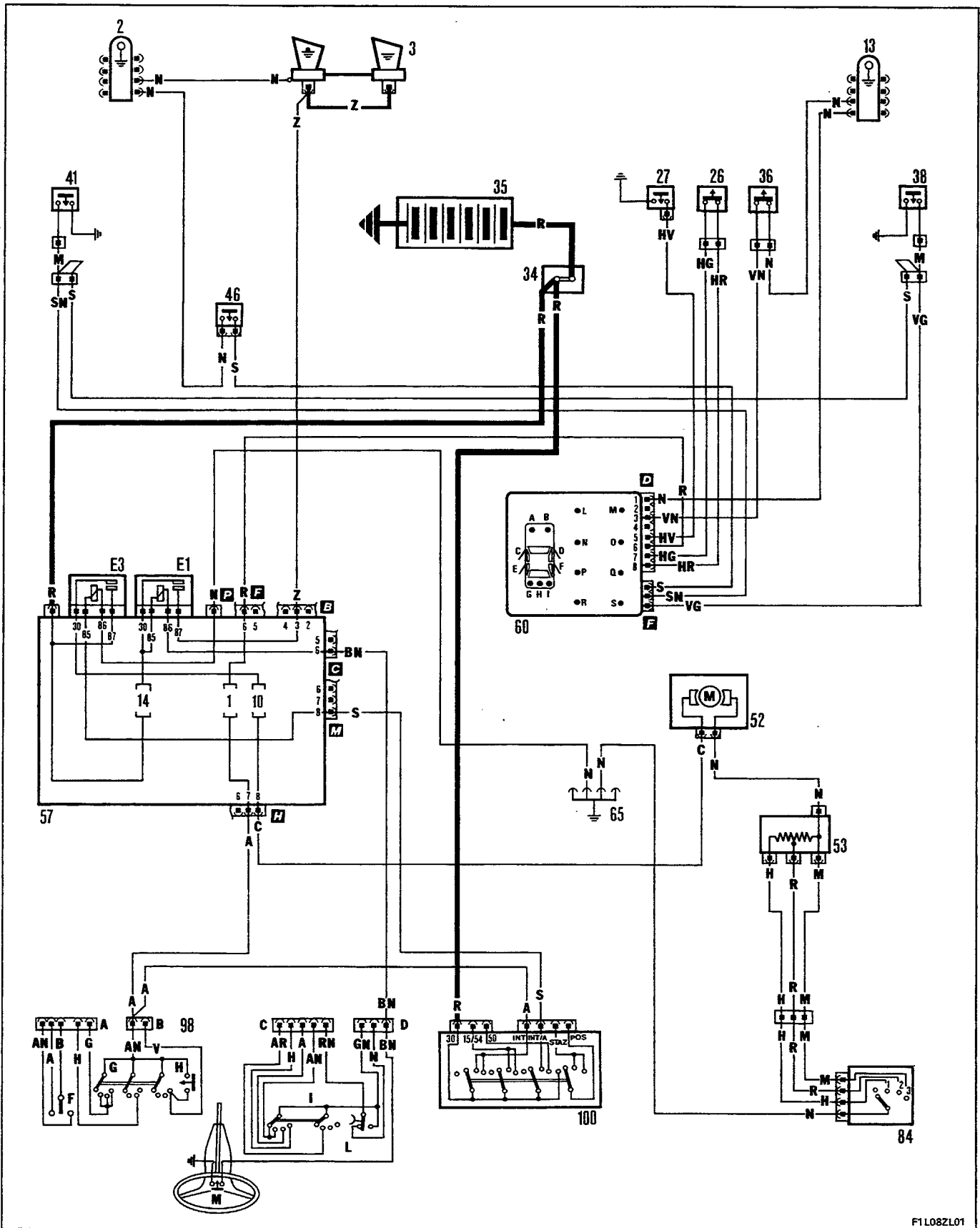


Engine radiator - Fuel gauge and reserve warning light - Rev counter - Voltmeter - Coolant temperature gauge and overheating warning light (see page 13 for key).



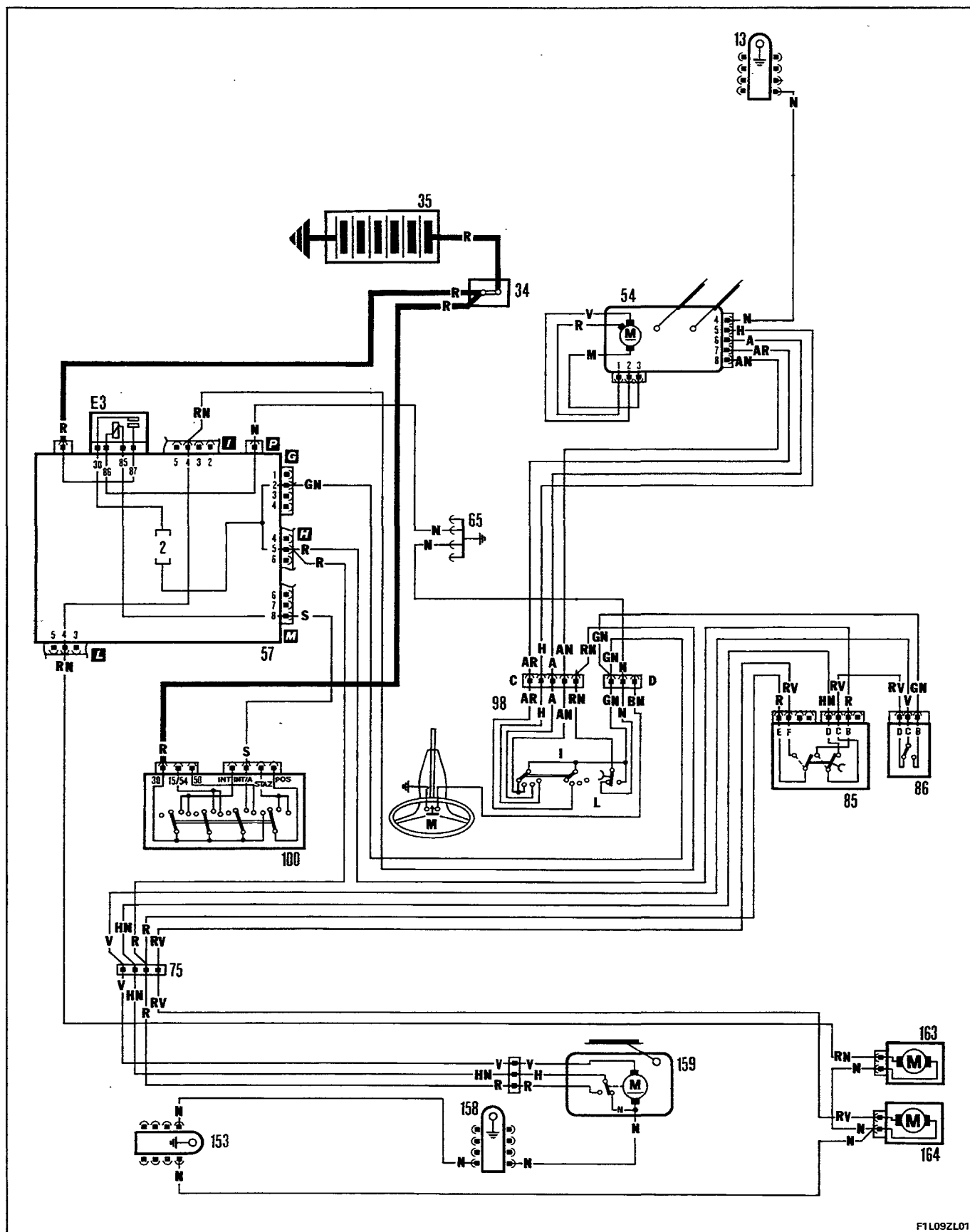
55.

Electric horns - Car interior ventilation - Front brake pad wear - Insufficient brake fluid level - Insufficient engine oil pressure - Insufficient engine oil level - Insufficient coolant level (see page 13 for key).



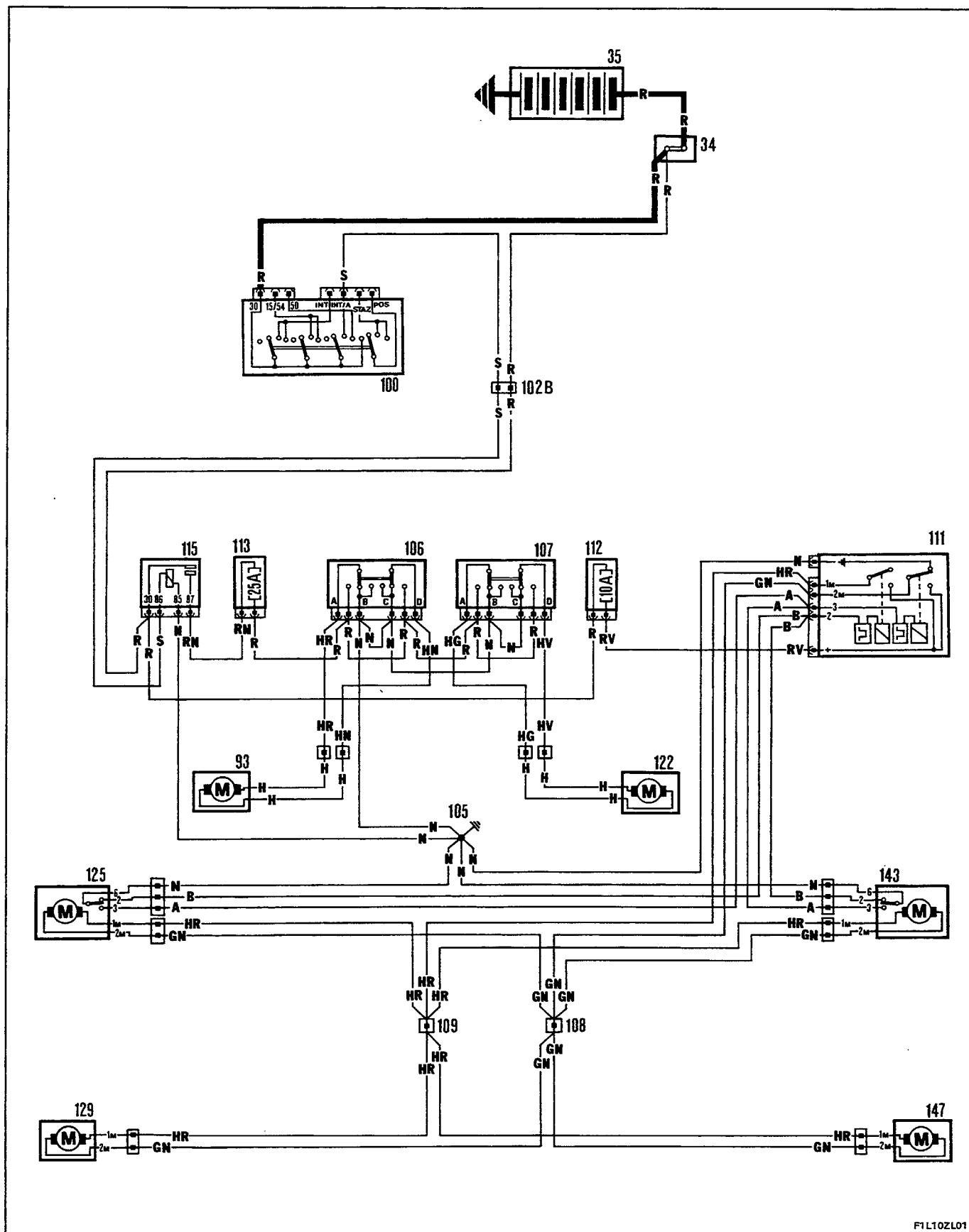
F1L08ZL01

Windscreen wiper - Electric windscreen washer pump - Rearscreen wiper - Electric rearscreen washer pump (see page 13 for key).



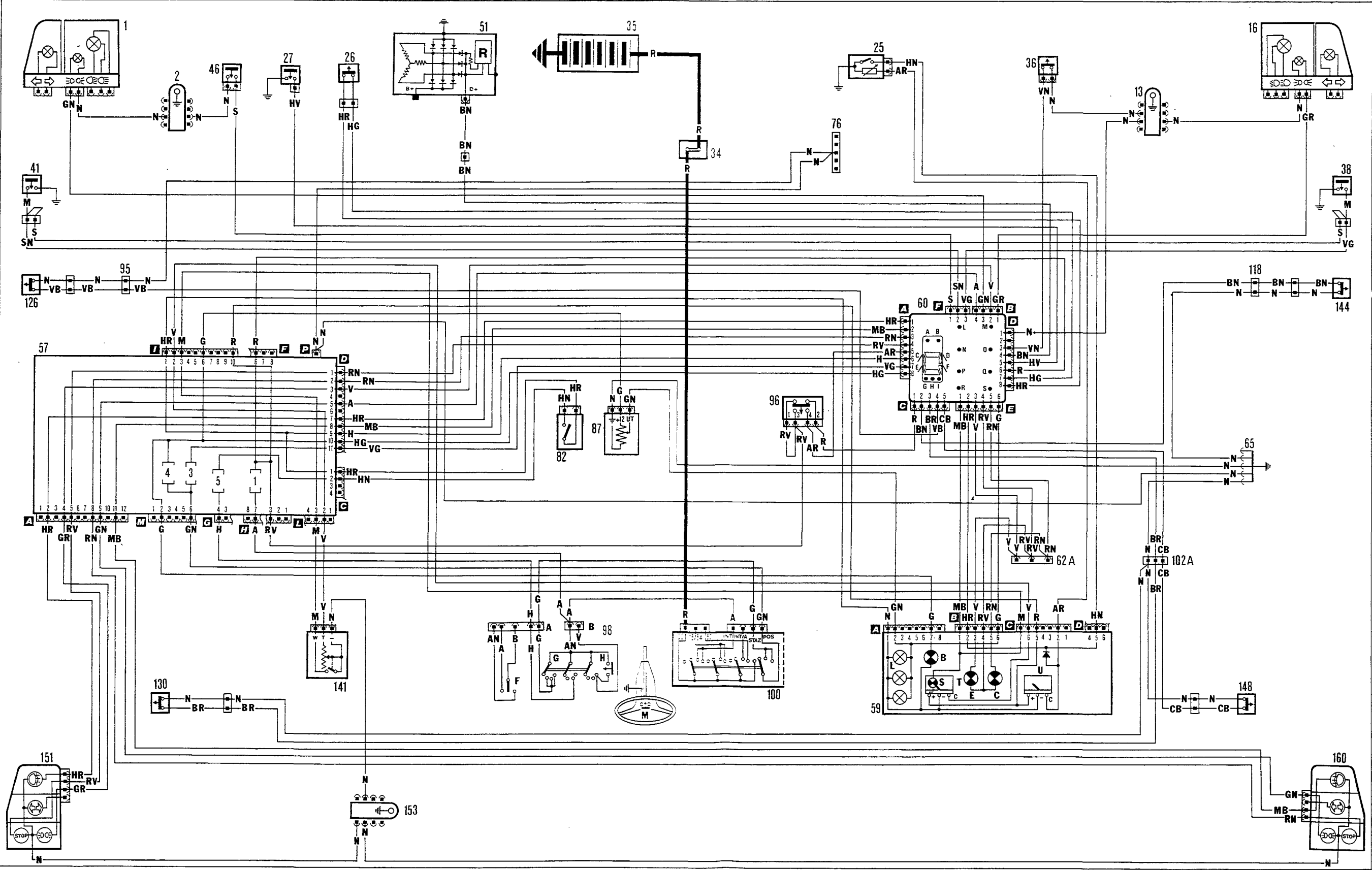
55.

Electric front windows - Central door locking (see page 13 for key).



F1L10ZL01

Control-System



1. Left front light cluster
2. Left front earth cable loom
3. Electric horns
4. Wiring for left fog lamp
5. Reversing lights switch
6. Timing sensor (located in distributor)
7. Left headlamp wiper
- 7A. Starter inhibitor switch on automatic gearbox
- 7B. Automatic gearbox oil temperature sender unit
8. Coolant temperature sensor (I.A.W.)
9. Detonation sensor
- 9A. Over-boost valve
10. Thermostatic switch for radiator cooling fan
- 10A. Thermostatic switch for radiator cooling fan
11. Electric radiator cooling fan
- 11A. Additional radiator cooling fan
12. Wiring for right fog lamp
13. Right front earth cable loom
15. Right headlamp wiper
16. Right front light cluster
17. Left side direction indicator
- 18A. Connector block
19. Automatic idle adjustment solenoid air valve (I.A.W.)
20. Engine rpm and TDC sensor (I.A.W.)
21. Earth points
22. Distributor
23. Spark plugs
- 23B. Heater plugs
24. Fuel injectors
25. Coolant temperature sender unit
26. Engine oil level sensor
27. Insufficient engine oil pressure switch
28. Engine oil pressure sender unit
29. Engine oil temperature sender unit
30. Additional driving lights relay
31. Connector block
32. Connector block
33. Resistor for radiator cooling fan 1st speed
34. Connector block
35. Battery
36. Engine coolant level sensor
37. Right side direction indicator
38. Right front brake pad wear sensor
39. Left additional driving light
40. Right additional driving light
41. Left front brake pad wear sensor
42. Ignition coil
43. Earth on bodywork
44. Earth on engine
45. Electric headlamp washer pump
46. Brake fluid level sensor
47. Butterfly valve position sensor (I.A.W.)
48. Starter motor
49. Air temperature sensor (I.A.W.)
50. Absolute pressure sensor (I.A.W.)
51. Alternator
52. Heater fan
53. Resistor for adjusting heater fan speed
54. Windscreen wiper with built in intermittent device
55. Fuel injector relay
56. Fuel pump relay
57. Control box for fuses and relays
- E1. Electric horn relay
- E2. Heated rear windscreen relay
- E3. Relay for heater fan - windscreen wiper - rearscreen wiper - headlamp wiper
58. Connector block
59. Instrument panel
 - A. Left direction indicator warning light
 - B. Side lights warning light
 - C. Control System general warning light (red)
 - E. Go-ahead signal (green)
 - F. Hazard warning lights warning light
 - G. Right direction indicators warning light
 - H. Dipped headlamps warning light
 - I. Fog lamps warning light
 - L. Instrument panel light bulbs
 - M. Handbrake warning light
 - O. Rev counter
 - P. Main beam headlamps warning light
 - Q. Rear fog lamps warning light
 - R. Voltmeter
 - S. Fuel reserve warning light
 - T. Fuel level gauge
 - U. Coolant temperature gauge
 - V. Heated rear windscreen warning light
 - X. Heater plugs warning light
 - Y. Water in fuel warning light
 - Z. Over-boost warning light
 - W. Engine oil pressure gauge
 - K. Speedometer switch for trip computer
- 59A. Instrument panel (version without Control-System)
 - C. Battery recharging warning light
 - E. Insufficient engine oil pressure warning light
 - M. Handbrake and insufficient brake fluid level warning light
 - N. Front brake pad wear warning light
 - Z. Coolant overheating warning light
60. Control-System
 - A. Left front side light failure warning light
 - B. Right front side light failure warning light
 - C. Right front door open warning light
 - D. Left front door open warning light
 - E. Right rear door open warning light
 - F. Left rear door open warning light
 - G. Failure in left rear side lights, brake lights warning light

H. Rear fog lamps failure warning light
 I. Right rear side lights, brake lights failure warning light
 L. Insufficient brake fluid level warning light
 M. Front brake pad wear warning light
 N. Insufficient engine oil pressure warning light
 O. Battery recharging warning light
 P. Insufficient engine oil level warning light
 Q. Insufficient coolant level warning light
 R. Automatic gearbox oil overheating warning light
 S. Coolant overheating warning light
 61. Intermittent device for handbrake warning light
 62. Connector block
 62A. Diagnostic socket for Control System
 62B. Fuel injector and electric fuel pump protective fuse
 63. Glove compartment light
 64. Glove compartment light push button
 65. Earth cable loom under dashboard
 66. Radiator cooling fan relay
 67. Fuse
 68. Heater plugs control unit
 69. Intermittent device for direction indicators and hazard warning lights
 70. Rear fog lamps relay
 71. Sensor for water in fuel filter warning light
 73. Wiring for left front speaker
 74. Front courtesy light push button on left front pillar
 75. Connector
 76. Connector for courtesy light
 77. Combined instrument
 A. Oil pressure gauge
 B. Oil temperature gauge
 77A. Digital clock
 78. Front courtesy light
 78A. Trip computer
 78B. Front courtesy light with digital clock
 79. Engine cut out solenoid on injection pump
 80. Heated rear windscreen switch
 81. Fog lamps switch
 82. Reversing lights switch
 83. Hazard warning lights switch
 84. Heater fan switch
 85. Rearscreen wash/wipe switch
 86. Rearscreen wiper switch
 87. Instrument panel and Control System light dimmer

 88. Rev counter signal electro-magnetic sensor
 89. Fibre optic light for switches
 90. Diagnostic socket
 91. Fuse
 92A. Thermal switch on automatic choke (P.T.C.)
 92B. Thermal switch on idle duct (P.T.C.)
 92C. Thermal switch for accelerator pump outlet opening cut out valve
 92D. Plate
 93. Left front electric window motor
 94. Accelerator pump outlet opening cut out valve
 95. Connector
 96. Brake lights switch
 96A. Brake lights switch
 98. Steering column switch unit

A. Connector
 B. Connector
 C. Connector
 D. Connector
 F. Direction indicators control
 G. Side lights, dipped headlamps, main beam headlamps control
 H. Main beam flasher control
 I. Windscreen wiper control
 L. Windscreen washer and headlamp wash/wipe control
 M. Electric horn control
 100. Ignition switch
 102A. Wiring for Control-System
 102B. Wiring for electric windows - central locking
 103. Cigar lighter
 104. Wiring for radio
 105. Earth stud
 106. Left front electric window switch
 107. Right front electric window switch
 108. Connector block
 109. Connector block
 110. Handbrake warning light push button
 111. Central locking control unit
 112. Central locking control unit protective fuse
 113. Electric front windows protective fuse
 115. Electric windows relay
 116. Injection/ignition control unit (I.A.W.)
 117. Connector block
 117A. Connector block
 118. Connector
 119. Wiring for right front speaker
 120. Front courtesy light push button on right front pillar

 122. Right front electric window motor
 123A. Resistor (P.T.C.) on automatic choke
 123B. Resistor (P.T.C.) on idle duct
 124. Cut-off device electronic control unit
 125. Left front door locking motor
 126. Left front door open warning light push button
 127. Rear courtesy light push button on left centre pillar
 128. Idle cut out device (cut-off)
 129. Left rear door locking motor
 130. Left rear door open warning light push button
 131. Butterfly valve position switch on carburettor (cut-off)
 132. Digiplex electronic ignition control unit
 133. Diagnostic socket for Digiplex control unit
 134. Left rear courtesy light

135. TDC and rpm sensor on pulley (2nd generation Digiplex)
 136. Heated rear windscreen
 137. Stater inhibitor with gear engaged relay (automatic transmission)
 138. Fast idle valve relay (for automatic transmission)
 139. Gear selector ideogram light
 140. Fuel flow meter
 141. Fuel level gauge and reserve warning light
 142. Electric fuel pump
 143. Right front door locking motor
 144. Right front door open push button
 145. Rear courtesy light push button on right centre pillar

 146. External temperature sensor
 147. Right rear door locking motor
 148. Right rear door open push button
 151. Left rear light cluster
 153. Rear earth cable loom
 155. No. plate lights
 156. Reversing lights
 158. Earth cable loom on tailgate
 159. Rearscreen wiper
 160. Right rear light cluster
 161. Right rear courtesy light
 162. Luggage compartment light
 163. Electric windscreen washer pump
 164. Electric rearscreen washer pump
 165. Fast idle valve
 166. Air conditioning system compressor pulley electro-magnet coupling
 167. Electro-magnet coupling protective fuse
 168. Air conditioning system electro-magnet coupling relay
 169. Radiator cooling fan protective fuse
 170. Radiator cooling fan relay
 171. Air conditioning system switch
 172. Thermal switch for air conditioning radiator and condenser fan
 173. Thermal switch for air conditioning system safety device
 174. Idle pressure switch
 175. Anti-frost thermostat

Cable colour code

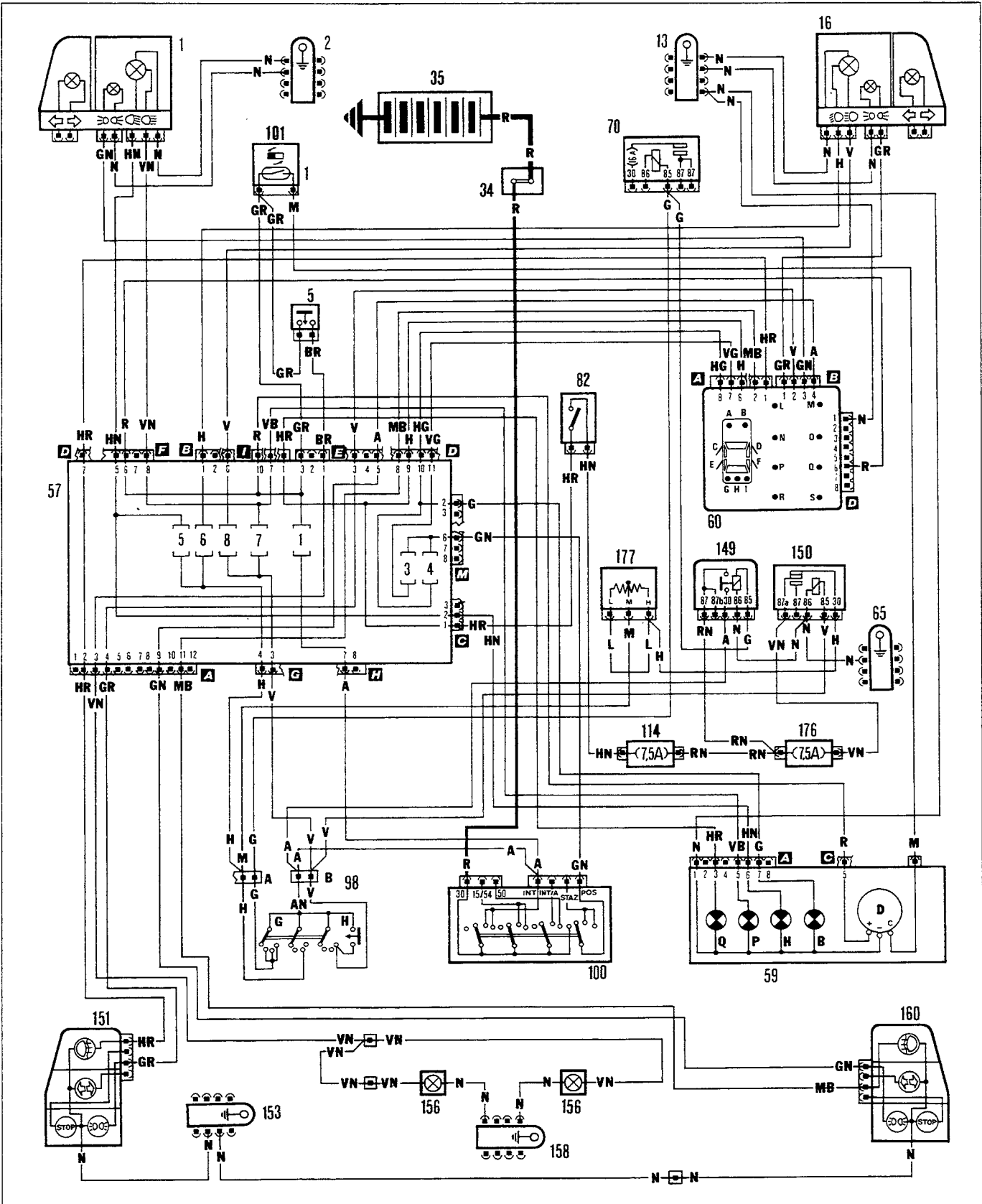
| | |
|-----------|-------------------|
| A | Light Blue |
| B | White |
| C | Orange |
| G | Yellow |
| H | Grey |
| L | Blue |
| M | Brown |
| N | Black |
| R | Red |
| S | Pink |
| V | Green |
| Z | Violet |
| AB | Light Blue-White |
| AG | Light Blue-Yellow |
| AN | Light Blue-Black |
| AR | Light Blue-Red |
| AV | Light Blue-Green |
| BG | White-Yellow |
| BL | White-Blue |
| BN | White-Black |
| BR | White-Red |
| BV | White-Green |
| BZ | White-Violet |
| CA | Orange-Light Blue |
| CB | Orange-White |
| CN | Orange-Black |
| GN | Yellow-Black |
| GL | Yellow-Blue |
| GR | Yellow-Red |
| GV | Yellow-Green |
| HG | Grey-Yellow |
| HN | Grey-Black |
| HR | Grey-Red |
| LB | Blue-White |
| LG | Blue-Yellow |
| LN | Blue-Black |
| LR | Blue-Red |
| LV | Blue-Green |
| MB | Brown-White |
| MN | Brown-Black |
| NZ | Black-Violet |
| RB | Red-White |
| RG | Red-Yellow |
| RN | Red-Black |
| RV | Red-Green |
| SN | Pink-Black |
| VB | Green-White |
| VN | Green-Black |
| VR | Green-Red |

Version: RIGHT HAND DRIVE

Side lights and warning light - Dipped beam dimmed with DIM-DIP device - Main beam and warning light - Flasher - Number plate light - Electronic speedometer (see key on page 19)

Key

- 1. L. front light cluster
- 2. L. front earth loom
- 5. Reversing light switch
- 13. R. front earth loom
- 16. R. front light cluster
- 34. Shunt node
- 35. Battery
- 57. Fuse and relay control box
- 59. Control panel
 - B. Side light warning light
 - H. Dipped beam warning light
 - P. Main beam warning light
 - Q. Rear fog lamp warning light
- 60. Check Panel
- 65. Under facia earth loom
- 70. Supplementary beam control relay
- 82. Rear fog lamp switch
- 98. Steering column switch
- 100. Ignition switch
- 101. Pulse generator
- 114. Rear fog lamp fuse
- 149. DIM-DIP cut-out relay
- 150. DIM-DIP cut-out remote control switch
- 151. L. rear light
- 153. Rear earth loom
- 156. Reversing lights
- 158. Rear earth loom
- 160. R. rear light
- 176. DIM-DIP circuit fuse
- 177. Additional DIM-DIP circuit fuse



P1Q19ZL01

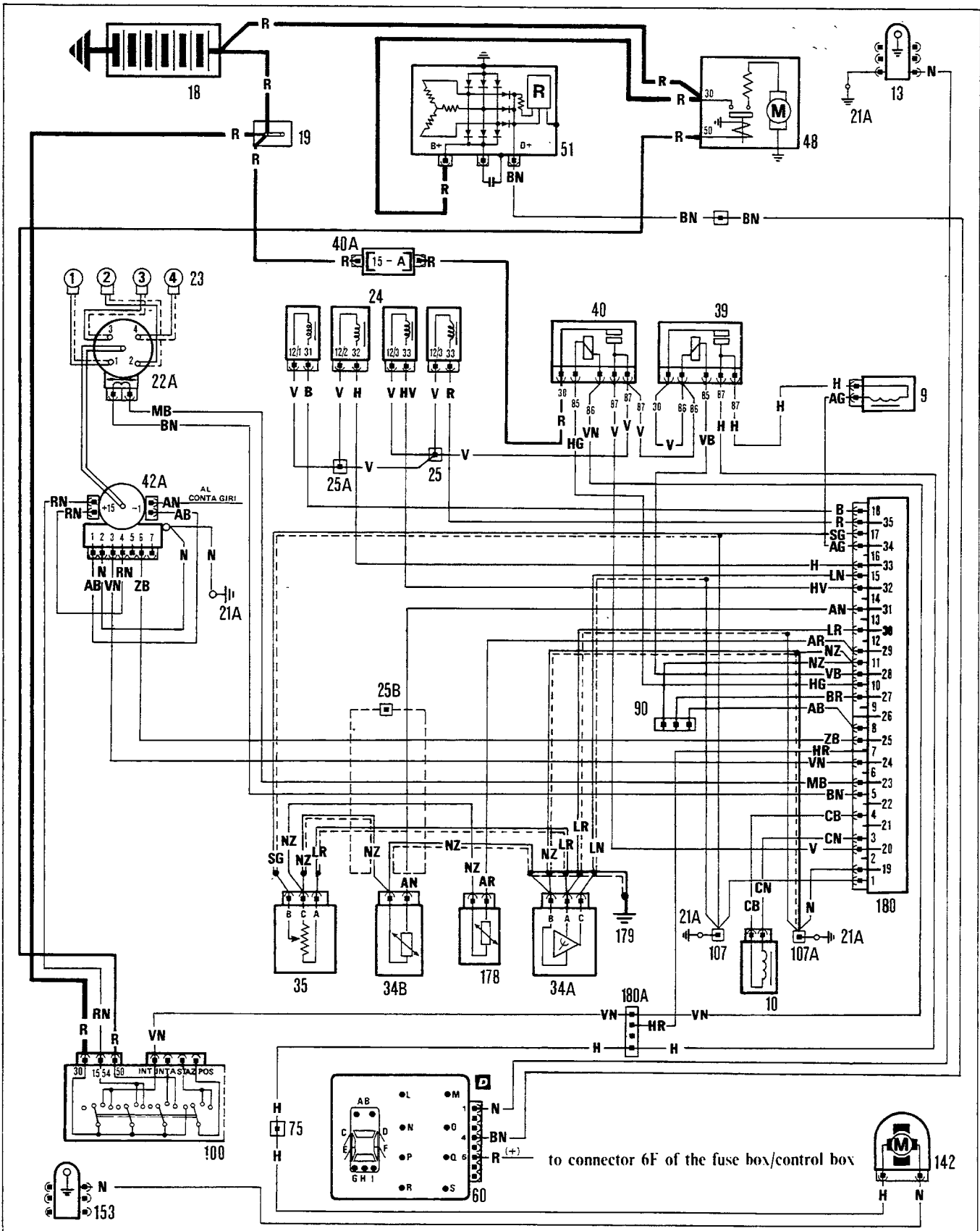
page

| | |
|---------------------|----|
| Wiring diagrams | 1 |
| Wiring diagrams key | 13 |

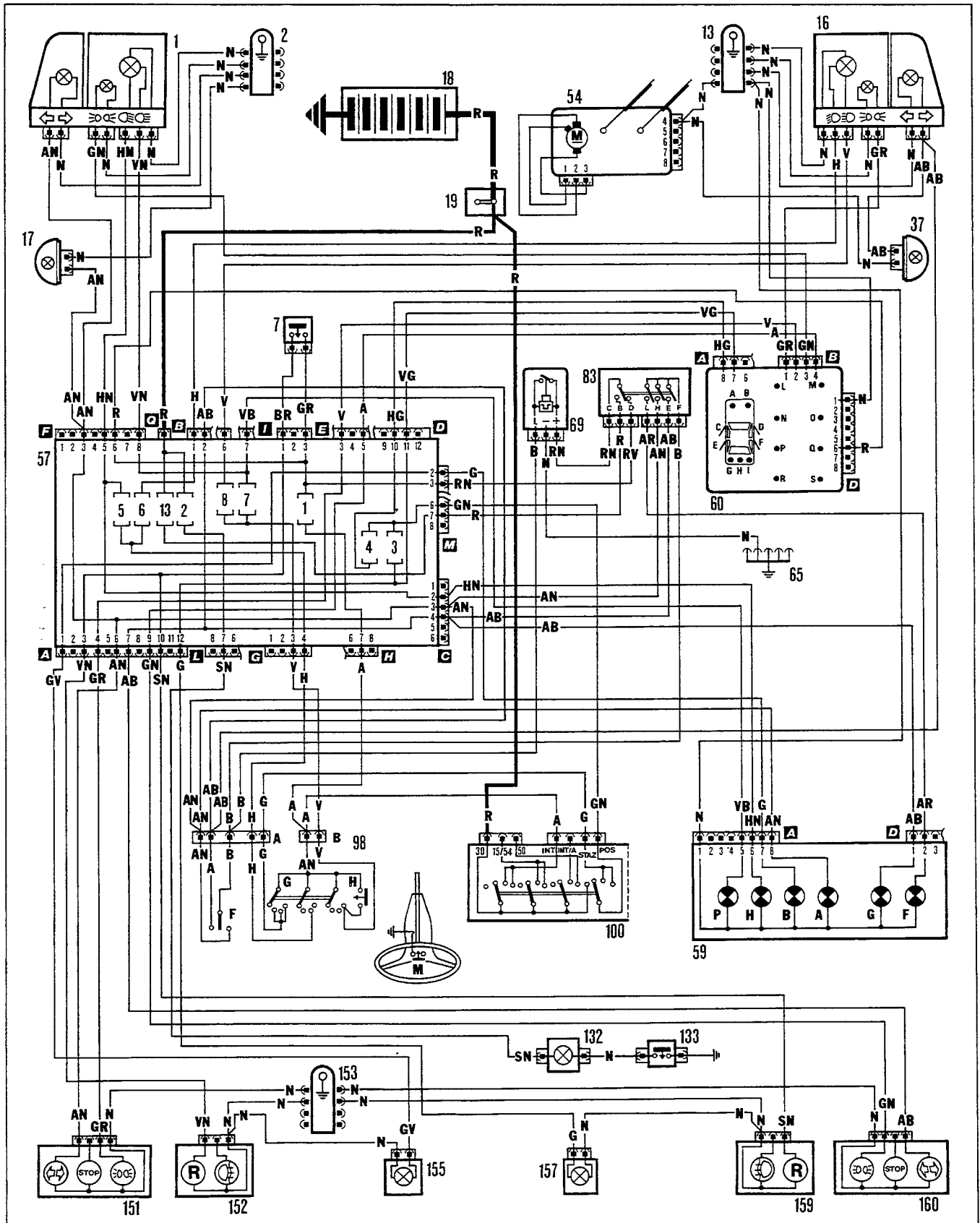
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55.

Starting - Recharging - Weber injection/ignition (IAW post-modification) - Fuel pump (see page 13 for key)

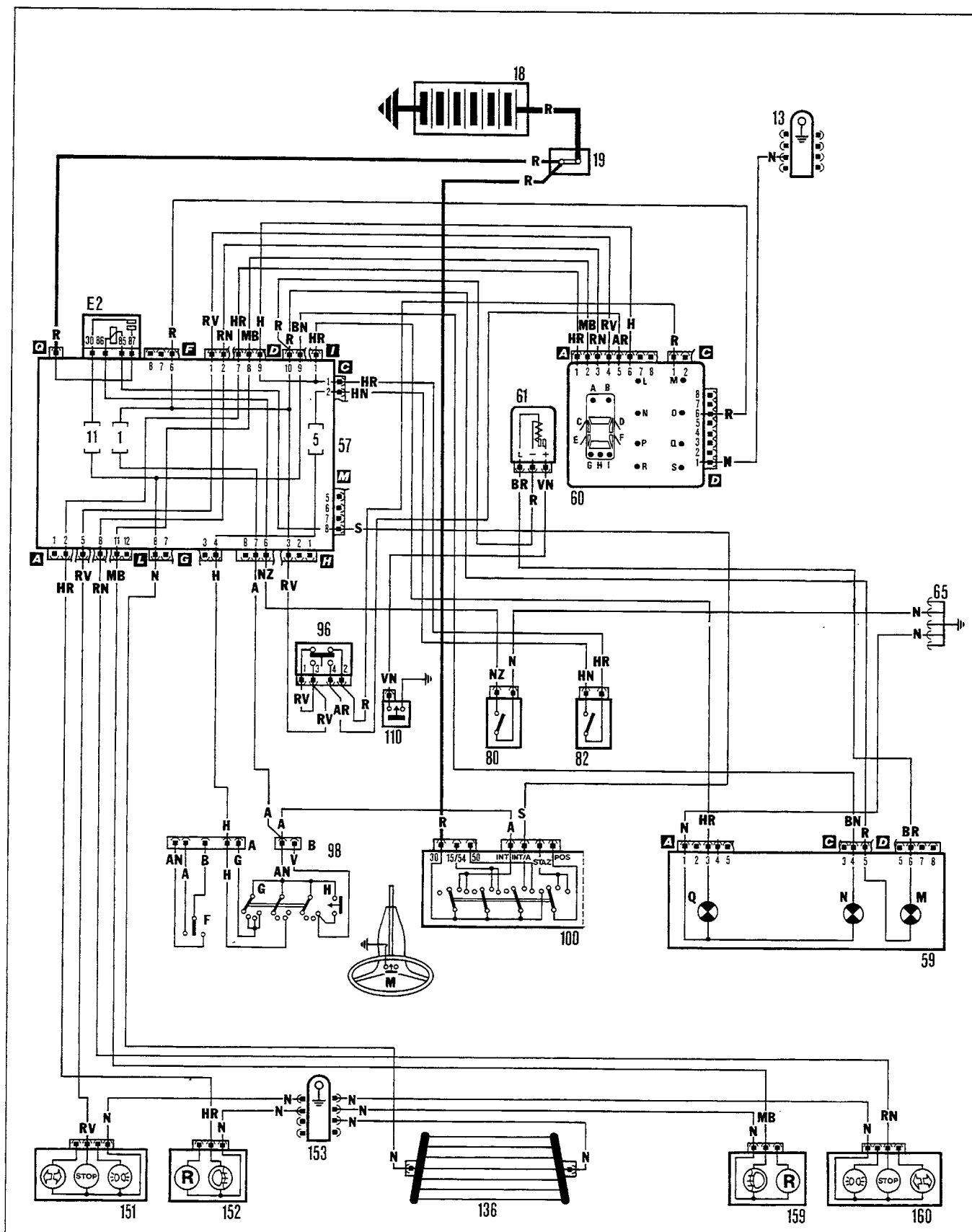


Side lights and warning light - Dipped headlamps - Main beam headlamps and warning light - Driving lights - Direction indicators and warning light - Hazard warning lights and warning light - No. plate light - Luggage compartment light (see page 13 for key)



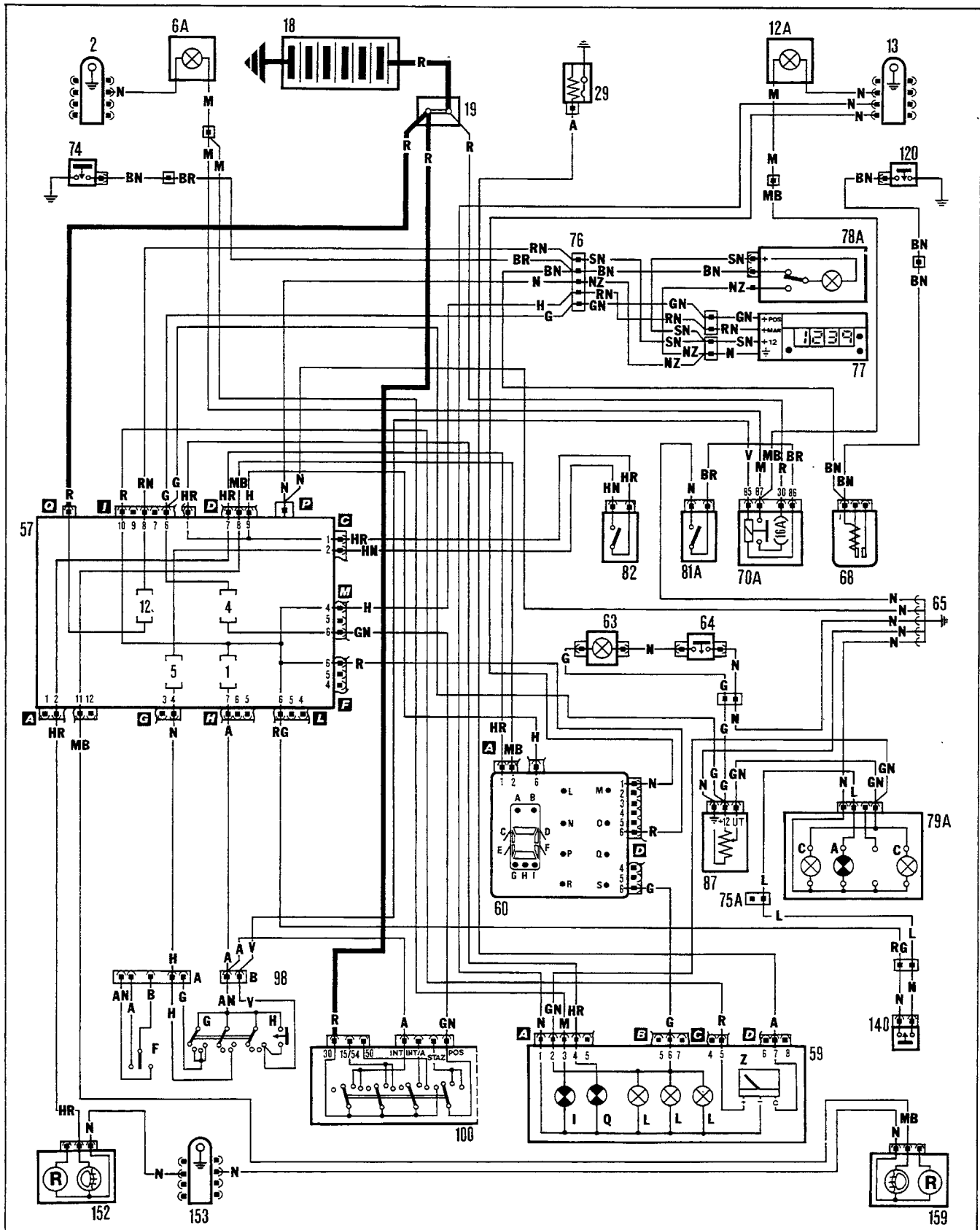
55.

Heated rear windscreen and warning light - Rear fog lamps and warning light - Brake lights - Handbrake warning light (see page 13 for key)

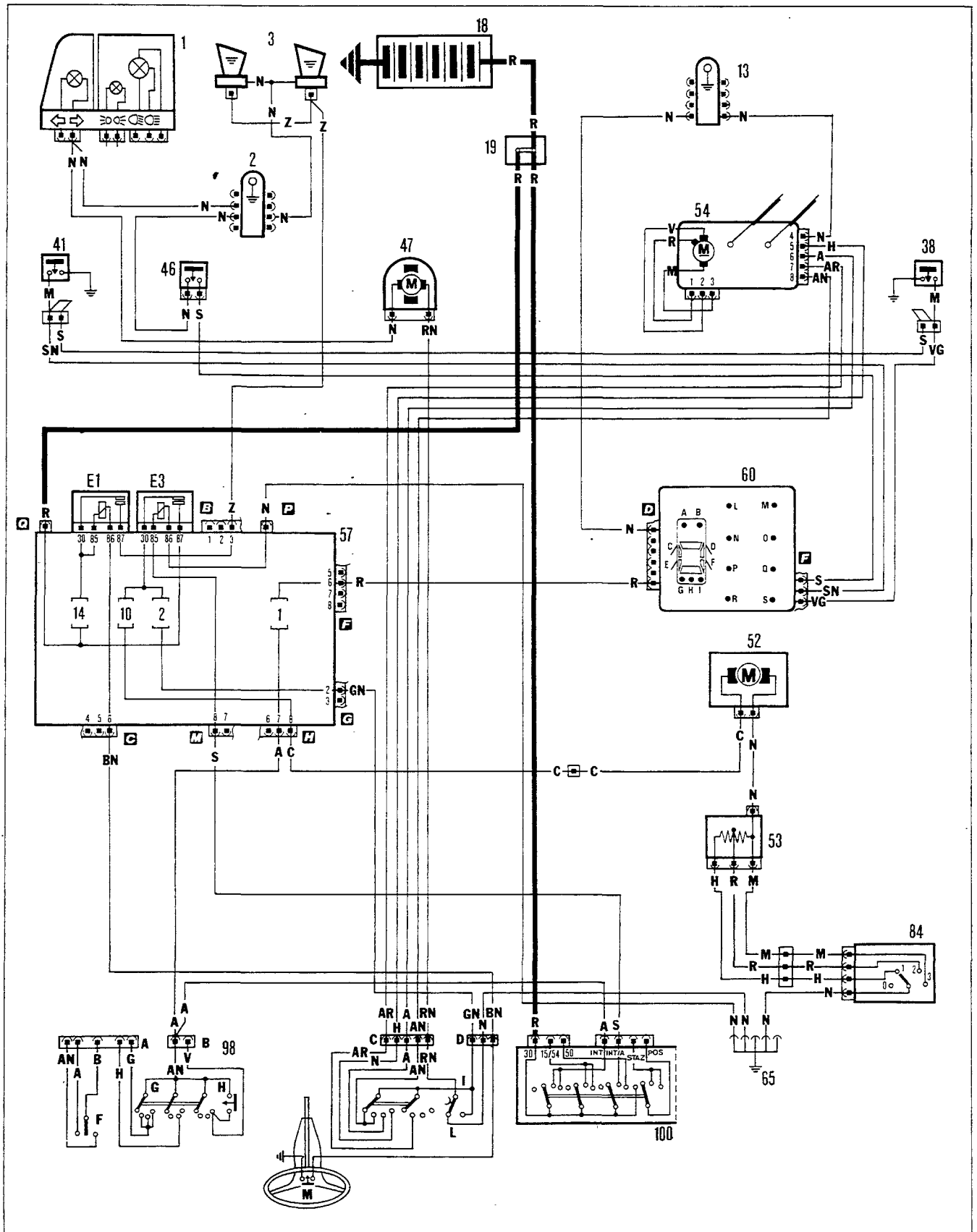


55.

Rear differential engaged warning light - Additional driving light and warning light - Rear fog lamps and warning light - Front courtesy light - Digital clock - Engine oil pressure gauge (see page 13 for key)

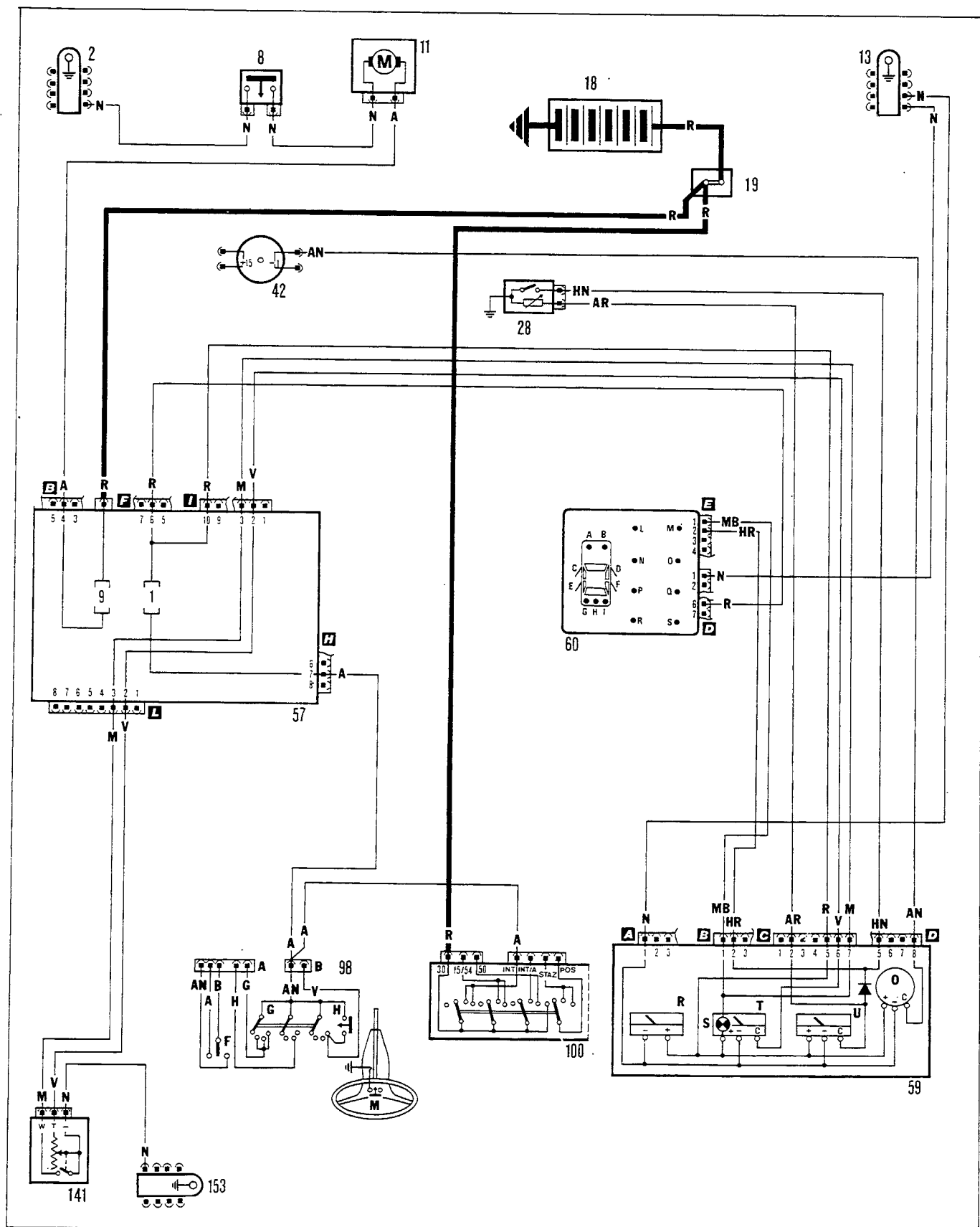


Windscreen wiper - Electric windscreen washer pump - Electric horns - Car interior ventilation - Insufficient brake fluid level - Front brake pad wear (see page 13 for key)

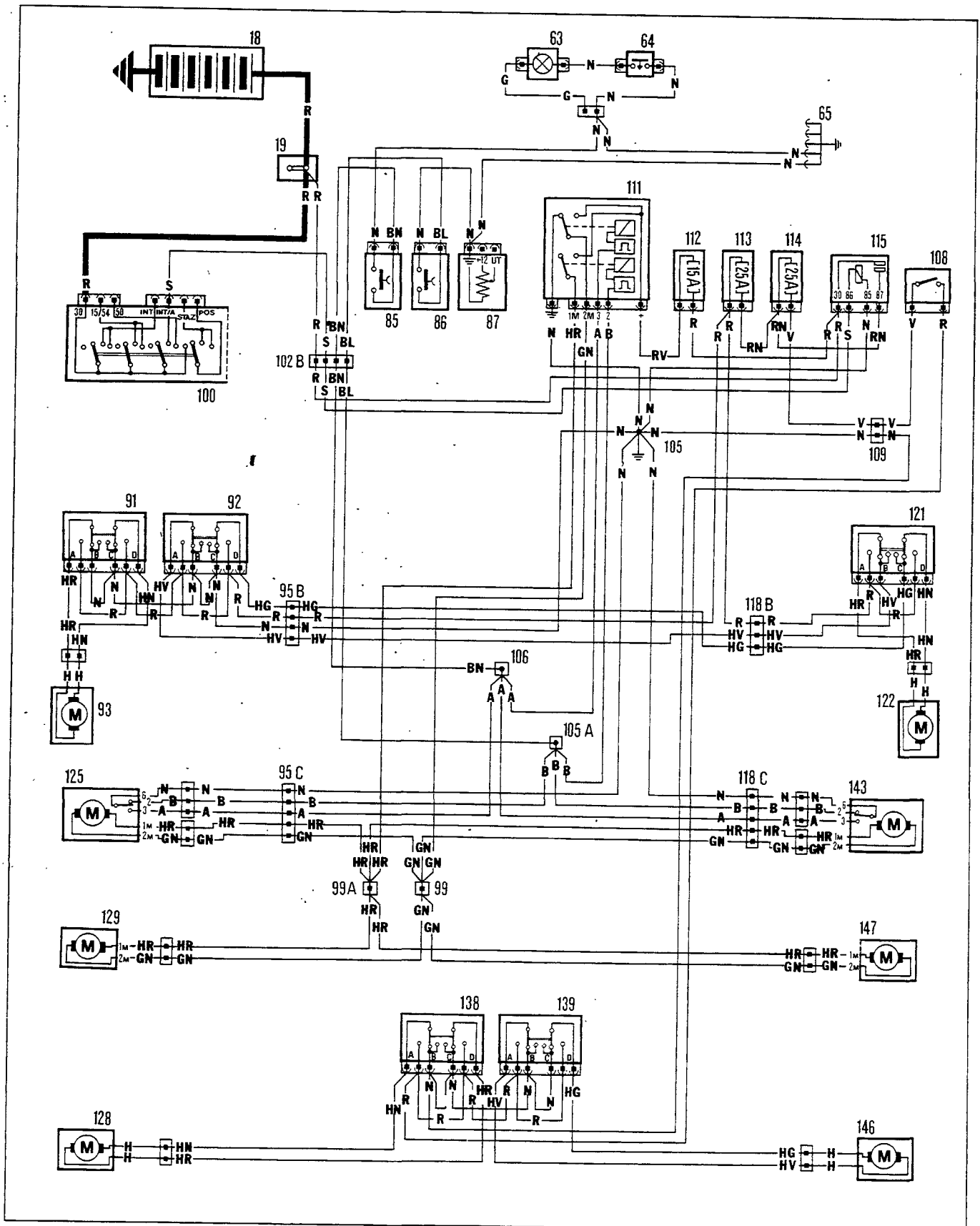


55.

Fuel gauge and reserve warning light - Engine coolant temperature and overheating warning light - Voltmeter - Radiator cooling fan - Rev counter (see page 13 for key)

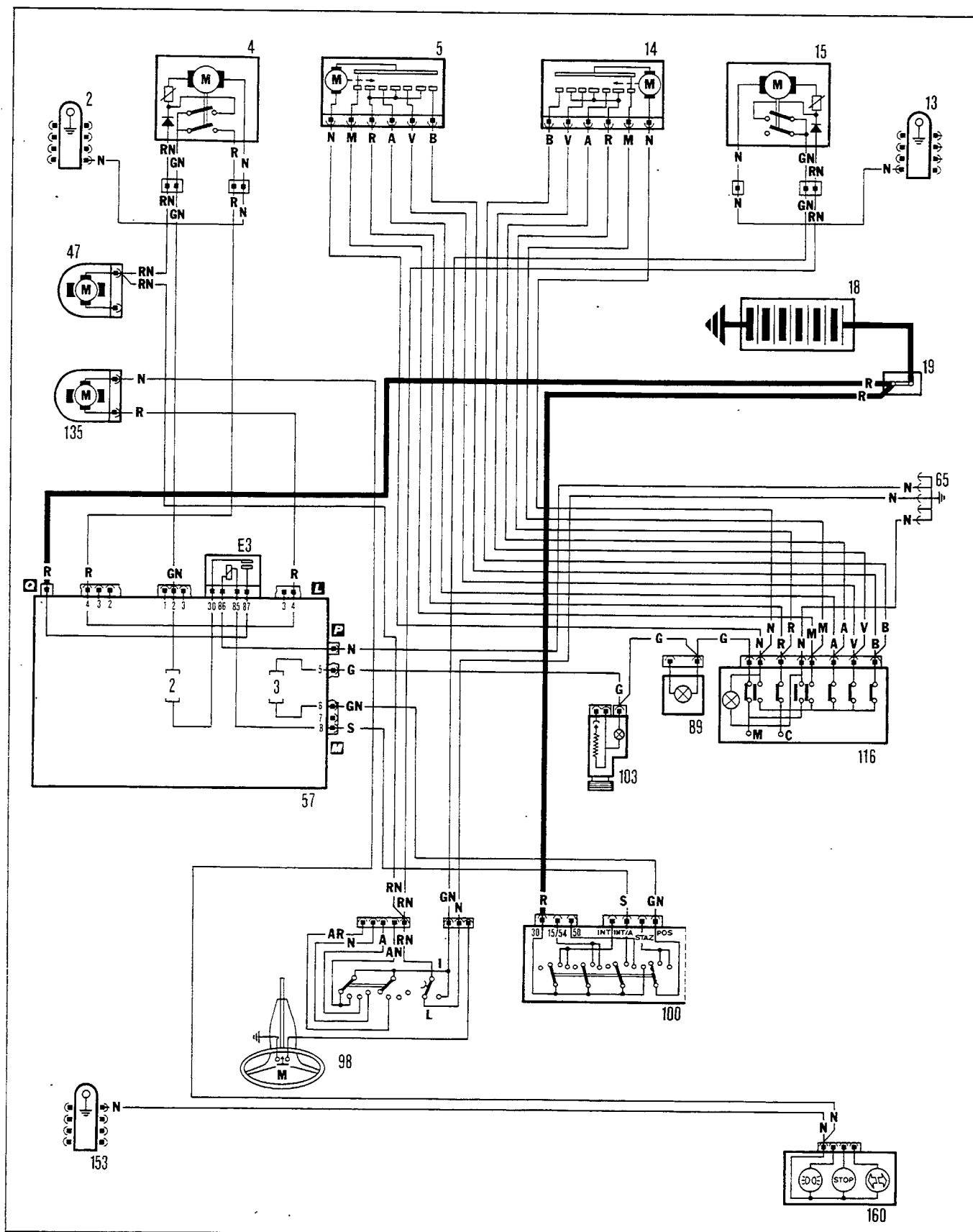


Electric front windows - Electric rear windows - Central locking system (see page 13 for key)

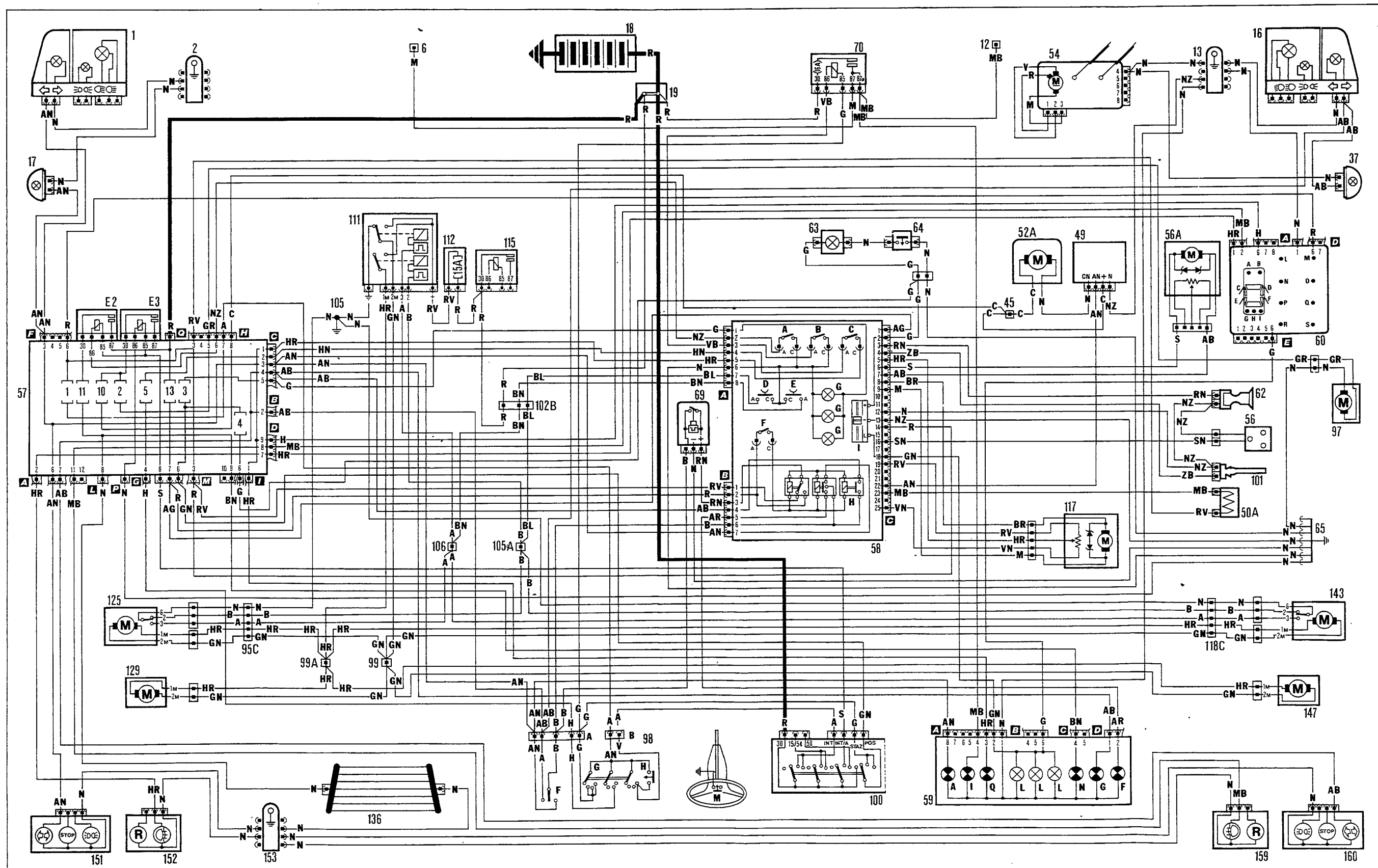


55.

Headlamp alignment - Headlamp wipers - Electric headlamp washer pump (see page 13 for key)



Version with automatic heater (see page 13 for key)



Control System (see page 13 for key)



- 1. Left front light cluster
- 2. Left front earth cable loom
- 3. Electric horns
- 4. Left headlamp wiper motor
- 5. Left headlamp alignment corrector
- 6. Left fog lamp wiring
- 6A. Left front additional driving light
- 7. Reversing lights switch
- 7A. Starter inhibitor switch on automatic transmission
- 7B. Automatic gearbox oil maximum temperature thermostatic switch
- 8. Radiator fan thermostatic switch
- 9. Automatic idle adjustment solenoid valve (IAW)
- 9A. Fuel flow meter
- 10. Rpm and TDC sensor (IAW)
- 11. Radiator cooling fan
- 11A. Additional radiator cooling fan
- 12. Right fog lamp wiring
- 12A. Right front additional driving light
- 13. Right front earth cable loom
- 14. Right headlamp alignment corrector
- 15. Right headlamp wiper
- 16. Right front light cluster
- 17. Left side direction indicator
- 17A. External temperature sensor
- 18. Battery
- 19. Connector
- 20. Diagnostic socket
- 21. Digiplex electronic ignition control unit
- 21A. Earths on engine
- 22. Ignition distributor
- 22A. Ignition distributor
- 23. Spark plugs
- 24. Fuel injectors
- 24A. Cut-off device electronic control unit
- 25. Connector
- 25A. Connector
- 25B. Connection
- 26. Engine oil level sensor
- 27. Insufficient engine oil pressure sensor
- 28. Coolant temperature sender unit and overheating warning light
- 29. Engine oil pressure sender unit
- 30. Butterfly valve position switch on carburettor
- 30A. Thermal switch for P.T.C. on automatic choke
- 31. Dipped headlamp resistor
- 32. Diode carrier plate
- 33. Sensor on TDC pulley (rpm and TDC sensor for 2nd generation Digiplex)
- 34. Idle cut out device
- 34A. Absolute pressure sensor (IAW)
- 34B. Air temperature sensor (IAW)
- 35. Butterfly valve position sensor (IAW)
- 35A. Rpm sensor on flywheel
- 36. Coolant level sensor
- 37. Right side direction indicator
- 38. Right front brake pad wear sensor
- 39. Electric fuel pump relay
- 40. Injector supply relay
- 40A. Injector and electric fuel pump supply fuse
- 41. Left front brake pad wear sensor
- 42. Ignition coil
- 42A. Ignition coil with power module
- 43. Heated seat protective fuse
- 44. Heated seat supply relay
- 45. Connection
- 46. Brake fluid level sensor
- 47. Electric windscreen washer pump
- 47A. Thermal switch for P.T.C. on automatic choke
- 47B. Thermal switch for P.T.C. on idle manifold
- 47C. Thermal switch for accelerator pump outlet opening idle cut out solenoid valve
- 47D. Plate
- 48. Starter motor
- 49. Electronic speed regulator for heater fan
- 49A. P.T.C. on idle manifold
- 49B. P.T.C. on automatic choke
- 50. Accelerator pump outlet opening idle cut out solenoid valve
- 50A. Outside air intake flap control valve
- 51. Alternator
- 52. Heater fan
- 52A. Ventilation fan
- 53. Resistor for adjusting heater fan speed
- 54. Windscreen wiper with built in intermittent device
- 55. P.T.C. supply fuse
- 56. Outside air temperature sensor
- 56A. Air mixture motor
- 57. Fuse and relay control box
 - E1. Electric horn relay
 - E2. Heated rear windscreen relay
 - E3. Heater fan - windscreen wiper - headlamp wiper relay
- 58. Automatic heater and dashboard controls control unit
 - A. Heated rear windscreen switch
 - B. Fog lamps switch (additional headlamps for 4WD)
 - C. Rear fog lamps switch
 - D. Central locking switch
 - E. Central unlocking switch
 - F. Hazard warning lights switch
 - G. Control unit light bulbs
 - H. Relay for hazard warning lights
 - I. Instrument panel and Control System light dimmer
- 59. Instrument panel
 - A. Left direction indicators warning light
 - B. Side lights warning light
 - C. Control System (red) general warning light
 - E. (Green) go ahead signal

F. Hazard warning lights warning light
G. Right direction indicators warning light
H. Dipped headlamps warning light
I. Fog lamps warning light (additional headlamps on 4WD)
L. Instrument panel light
M. Handbrake warning light
N. Heated rear windscreen warning light
O. Rev counter
P. Main beam headlamps warning light
Q. Rear fog lamps warning light
R. Volt meter
S. Fuel reserve warning light
T. Fuel gauge
U. Coolant temperature gauge
V. Speedometer switch for trip computer
X. Heater plugs warning light
Y. Water in fuel warning light
Z. Engine oil pressure gauge
59A. Instrument panel (version without Control-System)
C. Battery recharging warning light
E. Insufficient engine oil pressure warning light
M. Handbrake and insufficient brake fluid level warning light
N. Front brake pad wear warning light
V. Heated rear windscreen warning light
Z. Coolant overheating warning light
60. Control-System
A. Left front side light failure warning light
B. Right front side light failure warning light
C. Right front door not properly shut warning light
D. Left front door not properly shut warning light
E. Right rear door not properly shut warning light
F. Left rear door not properly shut warning light
G. Left rear side lights and brake lights failure warning light
H. Rear fog lamps failure warning light
I. Right rear side lights and brake lights failure warning light
L. Insufficient brake fluid level warning light
M. Front brake pads wear warning light
N. Insufficient engine oil pressure warning light
O. Battery recharging warning light
P. Insufficient engine oil level warning light
Q. Insufficient coolant level warning light
R. Automatic gearbox oil overheating warning light
S. Coolant overheating warning light
61. Intermittent device for handbrake warning light
62. Car interior air temperature sensor
62A. Diagnostic socket for Control-System
63. Glove compartment light bulb
64. Push button for glove compartment light
64B. Switch signalling low engine oil pressure
64C. Relay for P.T.C. supply
65. Earth cable loom under dashboard
66. Supply fuse for P.T.C.
67A. Relay for starter inhibitor with gear engaged
68. Delay device for ignition switch light
69. Intermittent device for direction indicators and hazard warning lights
70. Fog lamps relay
70A. Additional headlamps relay

71. Dipped headlamps relay
71A. Main beam headlamps relay
73. Left front speaker wiring
74. Push button for front courtesy light on left front pillar
75. Connection
75A. Connection
76. Connection for courtesy light
76A. Connection for courtesy light with digital clock
77. Digital clock
78. Front courtesy light
78A. Front courtesy light with digital clock
79. Trip computer
79A. Panel for warning light showing rear differential engaged
A. Warning light signalling rear differential engaged
C. Panel lights
80. Heated rear windscreen switch
81. Fog lamps switch
81A. Additional headlamps switch
82. Rear fog lamps switch
83. Hazard warning lights switch
84. Heater fan switch
85. Central locking switch
86. Central unlocking switch
87. Instrument panel and Control System light dimmer switch
88. Driver's seat heated pad
89. Switch fibre optic light
90. Diagnostic socket
91. Left front electric window switch
92. Right front electric window switch
93. Left front electric window motor
95A. Connection
95B. Connection
95C. Connection
96. Brake lights switch
96A. Brake lights switch
97. Car interior temperature sensor fan
98. Steering column switch unit
F. Direction indicators control
G. Side light, dipped and main beam headlamps control
H. Driving lights control
I. Windscreen wiper control
L. Windscreen washer and headlamp wash/wipe control
M. Electric horn control

99. Connector
99A. Connector
100. Ignition switch
101. Air mixture temperature sensor
102A. Wiring for Control-System
102B. Wiring for electric front windows and central locking
103. Cigar lighter
103A. Gear selector ideogram fibre optic light
104. Wiring for radio
105. Earth stud
105A. Connector
106. Connector
107. Connector
107A. Connector
108. Electric rear windows cut out switch
109. Wiring for electric rear windows
110. Push button for handbrake warning light
111. Central locking control unit
112. Central locking control unit supply fuse
113. Electric front windows supply fuse
114. Electric rear windows supply fuse
115. Electric windows relay feed
116. Headlamp alignment controls
117. Car interior air mixture and distribution motor
118A. Connection
118B. Connection
118C. Connection
119. Right front speaker wiring
120. Push button for front courtesy light on right front pillar
121. Switch for right front electric window
122. Motor for right front electric window
125. Left front door locking motor
126. Push button signalling left front door open
127. Push button for rear courtesy light on left centre pillar
128. Left rear electric window motor
129. Left rear door locking motor
130. Push button signalling left rear door open
132. Luggage compartment courtesy light
133. Luggage compartment courtesy light switch
134. Rear courtesy light
135. Electric headlamp washer pump
136. Heated rear windscreen
138. Left rear electric window switch
139. Right rear electric window switch
140. Rear differential engaged warning light
141. Fuel gauge and reserve warning light
142. Electric fuel pump
143. Right front door locking motor
144. Push button signalling right front door open
145. Push button for rear courtesy light on right centre pillar
146. Right rear electric window motor
147. Right rear door locking motor
148. Push button signalling right rear door open
151. Left rear light
152. Left rear light on tailgate
153. Rear earth cable loom
155. Left no. plate light
157. Right no. plate light
159. Right rear light on tailgate

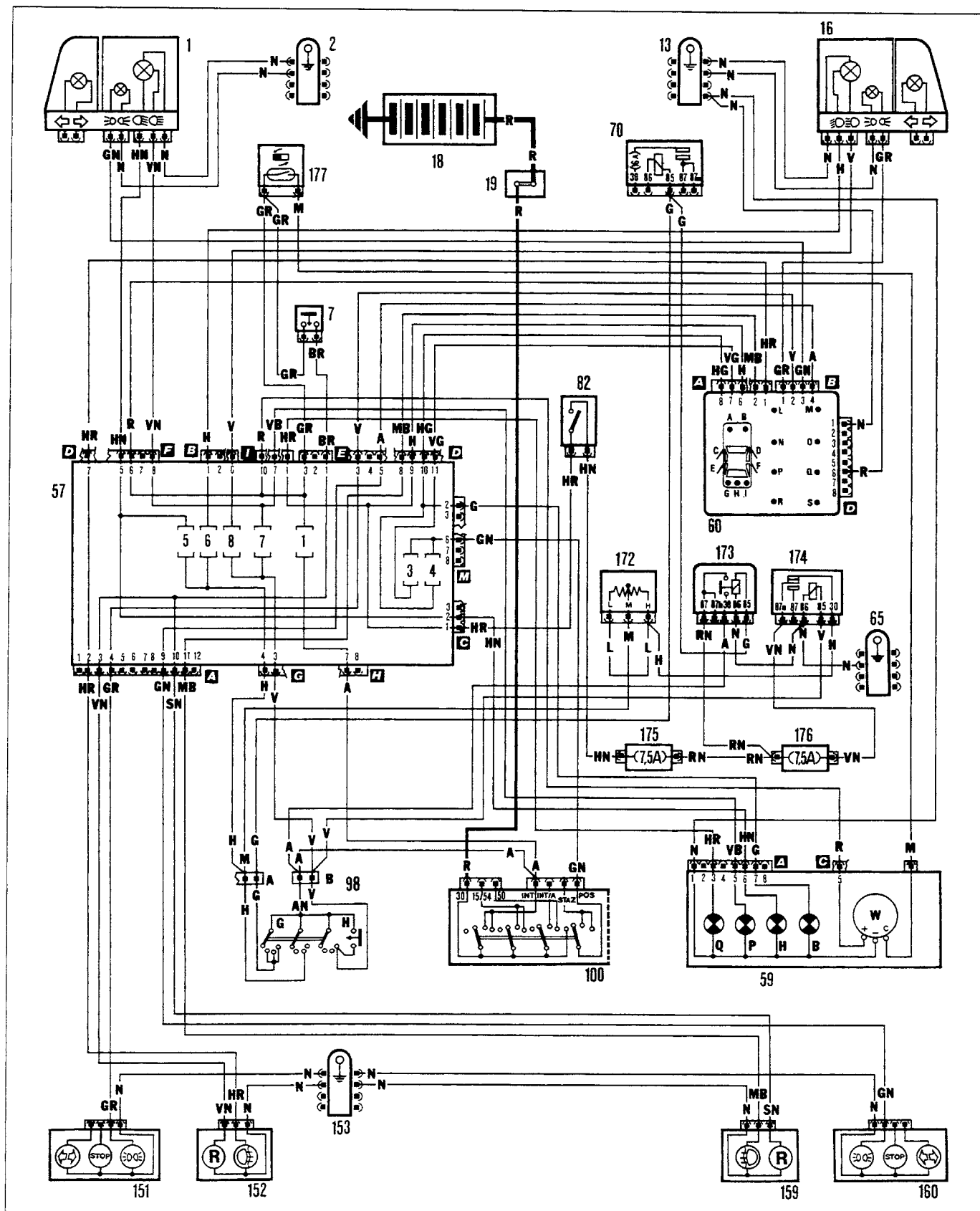
160. Right rear light
161. Thermal switch for air conditioning system radiator and condenser fan
162. Thermal switch for air conditioning system safety device
363. Idle pressure switch
164. Anti-frost thermostat
165. Fast idle solenoid valve
166. Air conditioning system compressor pulley electro-magnet coupling
167. Electro-magnet coupling protective fuse
168. Fast idle solenoid valve and electro-magnet coupling relay feed
169. Radiator cooling fan protective fuse
170. Radiator cooling fan relay feed
171. Air conditioning system switch
178. Coolant temperature sensor (IAW)
179. Earth on bodywork
180. Injection/ignition system electronic control unit (IAW)
180A. Connection
181. Resistor for radiator cooling fan 1st speed
183. Thermal switch for dual operating range radiator fan
185. Heater plugs control unit
186. Heater plugs
187. Sensor for water in fuel filter warning light
188. Engine cut out solenoid valve on injection pump
191. Thermal switch for air conditioning system compressor electro-magnet coupling

Cable colour code

| | |
|----|-------------------|
| A | Light Blue |
| B | White |
| C | Orange |
| G | Yellow |
| H | Grey |
| L | Blue |
| M | Brown |
| N | Black |
| R | Red |
| S | Pink |
| V | Green |
| Z | Violet |
| AB | Light Blue-White |
| AG | Light Blue-Yellow |
| AN | Light Blue-Black |
| AR | Light Blue-Red |
| AV | Light Blue-Green |
| BG | White-Yellow |
| BL | White-Blue |
| BN | White-Black |
| BR | White-Red |
| BV | White-Green |
| BZ | White-Violet |
| CA | Orange-Light Blue |
| CB | Orange-White |
| CN | Orange-Black |
| GN | Yellow-Black |
| GL | Yellow-Blue |
| +R | Yellow-Red |
| GV | Yellow-Green |
| HG | Grey-Yellow |
| HN | Grey-Black |
| HR | Grey-Red |
| LB | Blue-White |
| LG | Blue-Yellow |
| LN | Blue-Black |
| LR | Blue-Red |
| LV | Blue-Green |
| MB | Brown-White |
| MN | Brown-Black |
| NZ | Black-Violet |
| RB | Red-White |
| RG | Red-Yellow |
| RN | Red-Black |
| RV | Red-Green |
| SN | Pink-Black |
| VB | Green-White |
| VN | Green-Black |
| VR | Green-Red |

Version: RIGHT HAND DRIVE

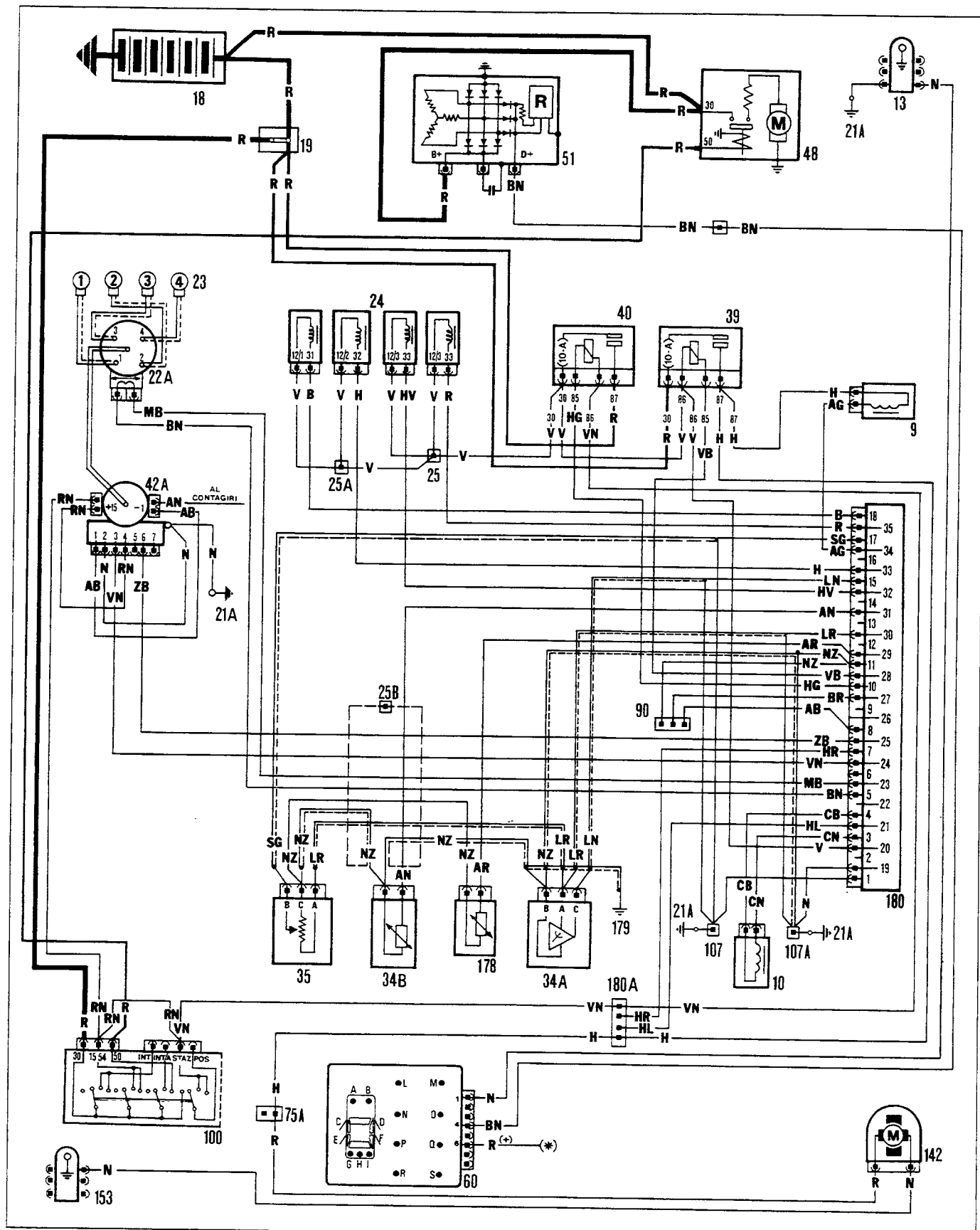
Side lights and warning light - Dipped beam dimmed with DIM-DIP device - Main beam and warning light - Flasher (see key on page 19)



55.

Version: SCANDINAVIA

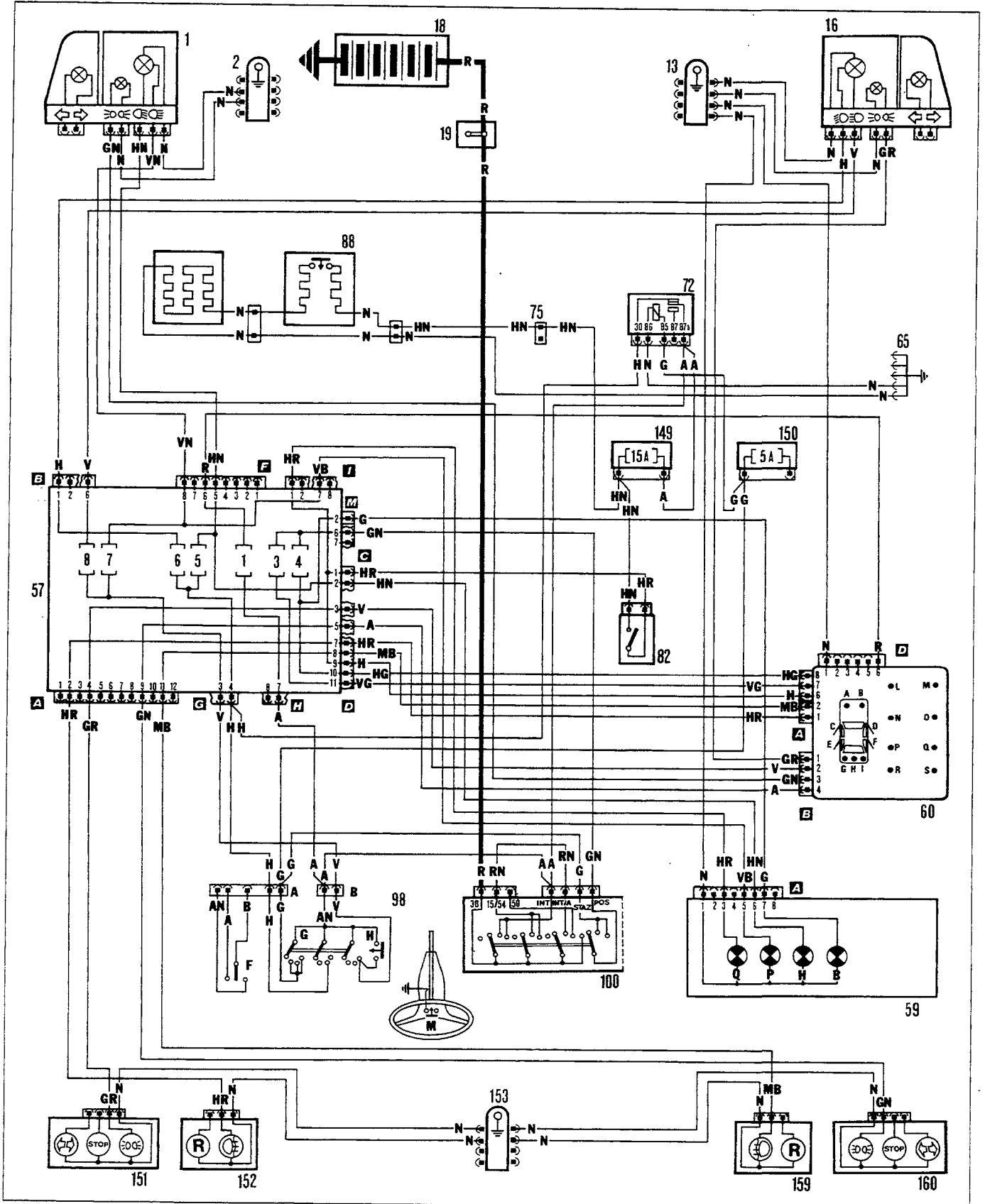
Starting- Recharging-Weber ignition injection (I.A.W.) - Fuel feed pump (see key on page 19)



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Version: RIGHT HAND DRIVE

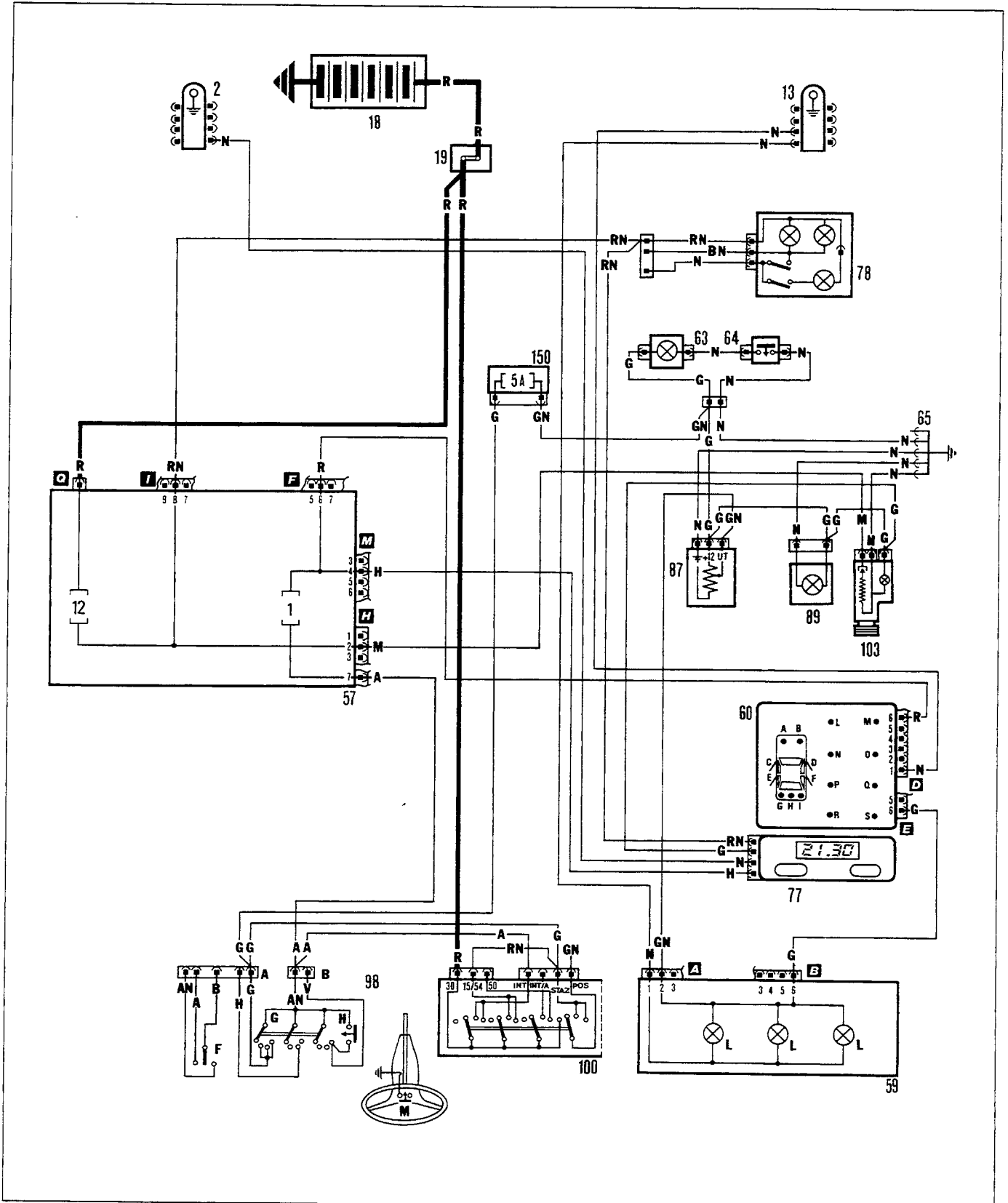
Side lights and warning light - Dipped beam and warning light - Main beam and warning light - Flasher - Rear fog lamp and warning light - Heated seats (see key on page 19)



55.

Version: SCANDINAVIA

Digital clock - Control panel and Check Panel lighting - Glove compartment lighting - Switch symbol lighting fibre-optic bulb - Cigarette lighter (see key on page 19)



Key

- 1. L. front light cluster
- 2. L. front earth loom
- 7. Reversing light switch
- 9. Solenoid
- 10. Rpm and TDC sensor
- 13. R. front earth loom
- 16. R. front light cluster
- 18. Battery
- 19. Shunt node
- 21A. Engine earth
- 22A. Ignition distributor
- 24. Electric fuel injector
- 25. Shunt node
- 25A. Shunt node
- 25B. Connection
- 34A. Absolute pressure sensor
- 34B. Air temperature sensor
- 35. Throttle position sensor
- 39. Electric fuel pump relay
- 40. Electric injector supply relay
- 42A. Ignition coil with power module
- 48. Starter motor
- 48. Starter motor
- 51. Alternator
- 57. Fuse and relay control box
- 59. Control panel
- B. Side light warning light
- H. Dipped beam warning light
- L. Control panel lighting bulbs
- P. Main beam warning light
- Q. Rear fog lamp warning light
- W. Electronic speedometer
- 60. Check Panel
- 63. Glove compartment light bulb
- 64. Glove compartment light control button
- 65. Under facia earth loom
- 72. Daytime light relay
- 75. Connection
- 75A. Connection
- 77. Digital clock
- 78. Front courtesy light
- 82. Rear fog lamp switch
- 87. Check Panel and control panel light dimmer
- 88. Heated seat
- 89. Fibre-optic switch lighting bulb
- 90. Check socket
- 98. Steering column switch unit
- 100. Ignition switch
- 103. Cigarette lighter
- 107. Shunt node
- 107A. Shunt node
- 142. Electric fuel pump
- 149. Rear fog lamp and heated seat fuse
- 150. Instrument lights. Check Panel and clock fuse
- 151. L. rear light
- 152. L. rear light on tailgate
- 153. Rear earth loom
- 159. R. rear light on tailgate
- 160. R. rear light
- 172. DIM-DIP circuit resistance
- 173. DIM-DIP circuit relay
- 174. DIM-DIP circuit cut-out remote control switch
- 175. Rear fog lamp circuit fuse
- 176. DIM-DIP circuit fuse
- 177. Tachymetric generator
- 178. Coolant temperature sending unit
- 179. Body earth
- 180. Weber electronic injection control unit
- 180A. Connection