DAILY
TURBODAILY
TURBODAILY 4x4

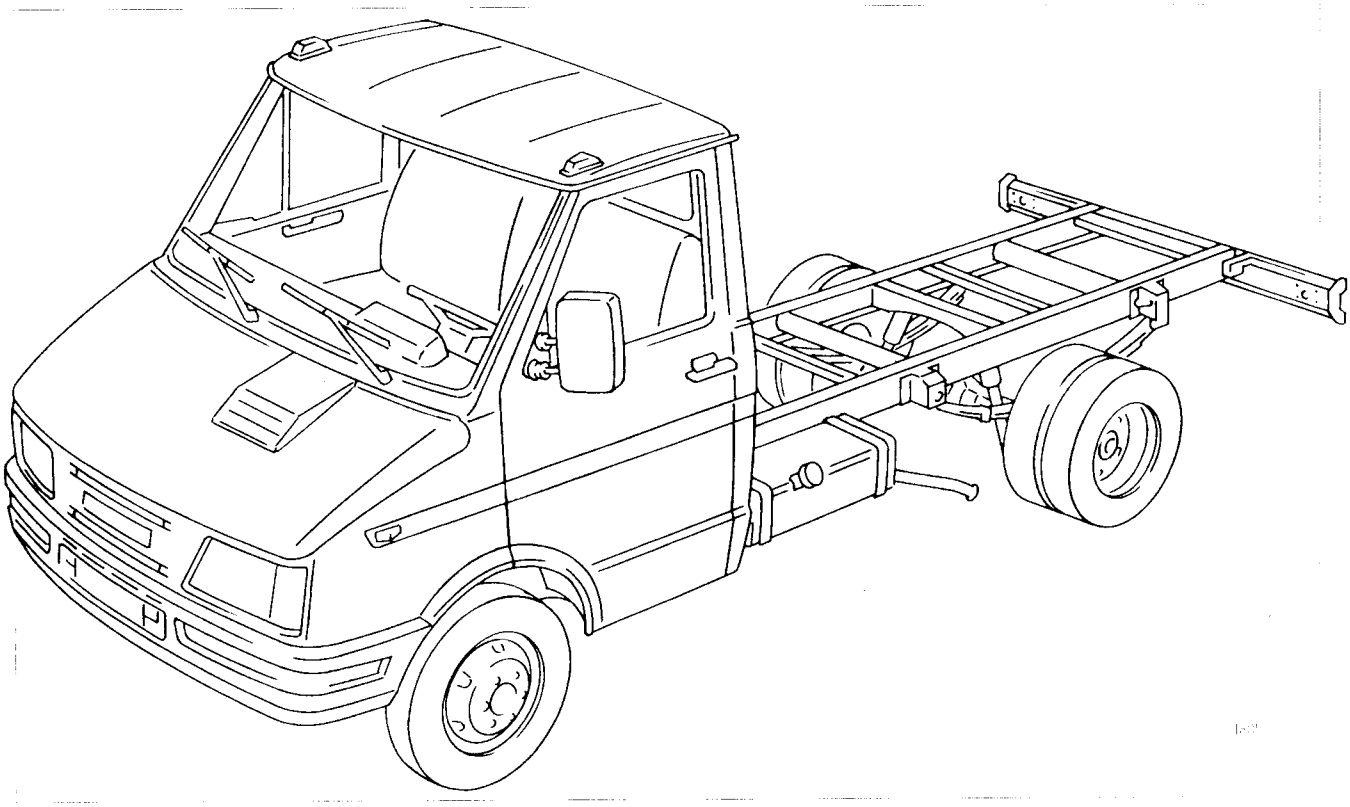
30.8	30.10	
35.8	35.10	35.12
	35.10 EDC	
	35.10 W	
40.8	40.10	40.12
	40.10 W	
	A 40.10	A 40.12
	45.10	A 45.12
	A 45.10	
	49.10	49.12
	A 49.10	
		59.12

Repair Manual
Electrical/electronic system

Update for manual
Print n°. 603.42.961

Print n°. 603.42.961/A

INTRODUCTION



This manual is produced by our Technical Publications Department for use by Technicians to assist in carrying out repairs or maintenance work and provide a better knowledge of IVECO products.

With the introduction of the new Daily/Turbodaily/Turbodaily 4x4 range our efforts have been devoted at improving the electrical system litterature as a whole. It now includes this present manual entitled "ELECTRICAL/ELECTRONIC COMPONENTS" and a further manual entitled "ELECTRICAL/ELECTRONIC EQUIPMENT".

This manual provides comprehensive written and graphic information which is the result of thorough research work. It is not nor does it set out to be an exhaustive survey of electrical equipment, since the experts in this field are already familiar with the complex and specific nature of such products, but it is limited to the essential, relevant documentation that a motor vehicle electrical repair workshop must have available for information on electrical equipment, so that it can carry out its work properly.

The "ELECTRICAL/ELECTRONIC COMPONENT" manual is therefore a valuable source of information for electrical components, covering such areas as removal and refitting, inspection, bench testing, numerical codes, cable colour codes, etc. It is specifically intended for use by qualified electrical engineers.

The other manual, "ELECTRICAL/ELECTRONIC EQUIPMENT", which complements this manual, covers each individual model of the vehicle range in question and contains full circuit diagrams and descriptions of the respective electrical systems.

TABLE OF CONTENTS

GENERAL

GENERAL

Composition of the manual

This manual consists of the section "GENERAL" plus nine chapters identified by Roman numerals, as follows:

Chapter I – POWER NETWORK

Chapter II – STARTING

Chapter III – CHARGING

Chapter IV – INSTRUMENTS

Chapter V – LIGHTS

Chapter VI SIGNALS

Chapter VII – SERVICES

Chapter IX – SPECIAL CIRCUITS

Chapter X – INDEX

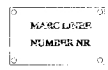
All subjects covered in this manual are correct at the time of its preparation. This practically corresponds to the date of printing.

Each chapter has its own progressive page numbering system to make future updatings easier. Pictures have a double numbering system: the first figure refers to the chapter number while the second one is a progressive number; this way, pictures can be easily traced in case a cross reference is needed.

In the following pages you will find the key that will help you read the information contained in this manual.

On reading through this manual you will find a special information entitled "Simplified diagnosis" (above the component diagram, see page II.28 as an example). This information is meant to facilitate circuit diagnosis as described on page I.52. The electrical network to which the component under examination belongs is to be looked for in the "Electric/electronic System" manual, print no. 603.42.961.
Unless otherwise specified, simplified diagnosis tests should be carried out on a vehicle in the following condition: engine switched off, parking brake engaged and transmission in neutral.

Graphic symbols and abbreviations used in this manual

	Warning		Component identification numbers/letters	NA	Normally open
	Warning relating to electronic equipment	52502	Component code	N.B.	Note
	Chassis and/or body earth connection	A	Ampere	NC	Normally closed
	Refer to	ABS	Wheel antilock system	SU	Ultrasound welding point
	Analogue check	EDC	Electronic injection control device	TGC	General current relay
	Digital check	ET	Engine Tester	V	Volts
	Component supplier/ manufacturer	ISO K/L	Programming and diagnosis serial line	0Ω	Zero Ohm (circuit continuity)
	Identification of a component and electronic control units	IT	Iveco Tester	– 7777 –	Cable colour code
	Symbol identifying an electric function	MI	Earth point: M = Earth I = Identification number		
	Vehicle model	MO	Workshop Manual		

N.B. Technical data and component specification given in this manual are supplied by way of example and must be checked on the test bench.

General instructions

NEVER DISCONNECT THE BATTERIES FROM THE SYSTEM OR OPEN THE ISOLATING SWITCH WITH THE ENGINE RUNNING.
ALWAYS CONNECT THE BATTERIES IN A PERMANENT WAY PRIOR TO STARTING THE ENGINE.

Before carrying out any servicing operation on the vehicle, chock the wheels securely to prevent the truck from moving on its own.

Do not use quick charging devices to start the engine. Enginestarting should be performed only by means of separate batteries or a suitable trolley.

Ensure correct polarity of battery terminals when starting the engine by means of an auxiliary trolley.

Incorrect polarity of electronic control unit input voltage (i.e. incorrect polarity of battery terminals) can lead to electronic module breakage.

When disconnecting the batteries from the system, always disconnect the chassis earth cable from battery negative terminal first of all.

Before connecting the batteries, make sure the system is properly isolated.

When tracing the cause of a circuit failure, place a spare fuse between the battery negative terminal and the chassis earth cable (main current breaker on).

Before removing electrical/electronic components, disconnect the earth cable from the battery negative terminal.

When tracing the cause of circuit failure, place a spare fuse between the battery negative terminal and the chassis earth cable (main current breaker on).

Before removing electrical/electronic components, disconnect the earth cable from the battery negative terminal.

Disconnect the battery from the system when recharging it fron an external source.

Disconnect external battery charger from mains supply before disconnecting it from the battery terminals.

Never connect/disconnect the electronic module jack when the input line is alive.

Dismantle electronic control units when working with temperatures over 80°C (drying oven).

While performing electrical welding on the chassis, disconnect connectors from electronic control modules.

Always use the specified tightening torque data in connector nuts (temperature, pressure sensors, etc.).

Measurements on electronic modules controlling plugs, plug connections and electrical connections to components must be taken using exclusively the specified testing lines and plugs. Under no circumstances should metal wires, screwdrivers, clips or other similar devices be used. In addition to short circuit risks, this could cause damage to plug connections with consequent contact problems.

General information on electronic components

- Before disconnecting the electronic module jack make sure the system is properly isolated (ref. A fig. on this page).

  Do not generate sparks when testing voltage presence in a circuit.

  Do not touch connector plugs of electronic modules with your hands.

  Do not use a test lamp to check circuit continuity. Use exclusively the specified testing equipment (ref. B).

  Do not supply electronic unit assisted components with the vehicle nominal voltage.

- Do not plug meter terminals into electronic module sockets. Measurements should be taken using the UNITESTER equipment only. (ref. C).

  Make sure the harness pertaining to electronic devices (length, cable type, label band position, braided wire connection, earthing, etc.) is in compliance with the IVECO system and is properly restored after any servicing operation has been carried out. To avoid damage to electronics on board the vehicle, ensure the wiring pertaining to additional equipment follows a different route.

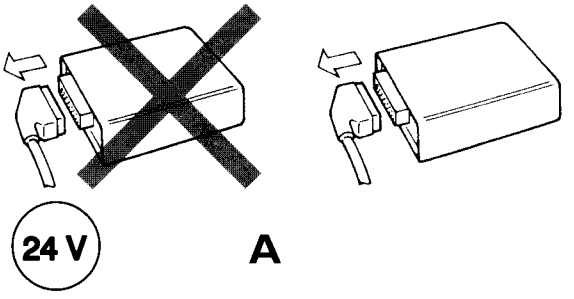
  Use IVECO original spare parts only.

  Do not install electrical/electronical equipment not approved by IVECO or not authorized by the local legislation.

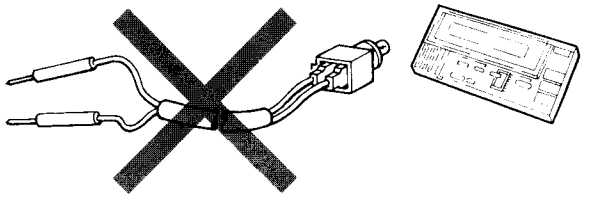
  Do not connect negative poles of additional equipment to negative poles of electronic modules.

- While performing electrical welding on the vehicle, disconnect all electronic modules and/or the battery positive terminal power cable and connect it to the chassis earth (ref. D).

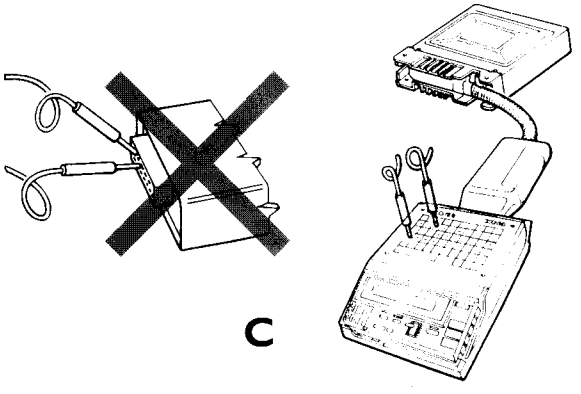
- Remove all electronic modules and components when drying paints in a furnace.



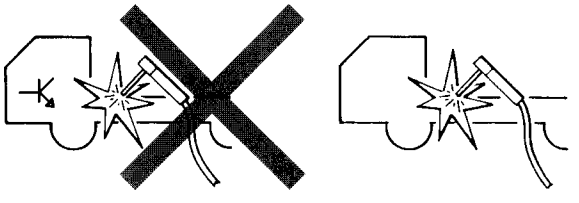
A



B



C



D

Earth concept and electromagnetic compatibility

The standard system is traditionally a single–pole system. The body, chassis, metal container of electromechanical components act as equipotential return conductor to the generator; since any point of the metal structure or any unisolated negative terminal is at the same potential or EARTH. This is why the earth has been chosen as the reference for the entire system, conventionally giving it a rating of 0.

For obvious constructive reasons, different earth points scattered over the vehicle according to the location of the components,influence the system in the negative network.

Ideally, all the equipment should be connected to **only one** earth point to warrant a clearly defined earth reference, especially for the electronic devices.

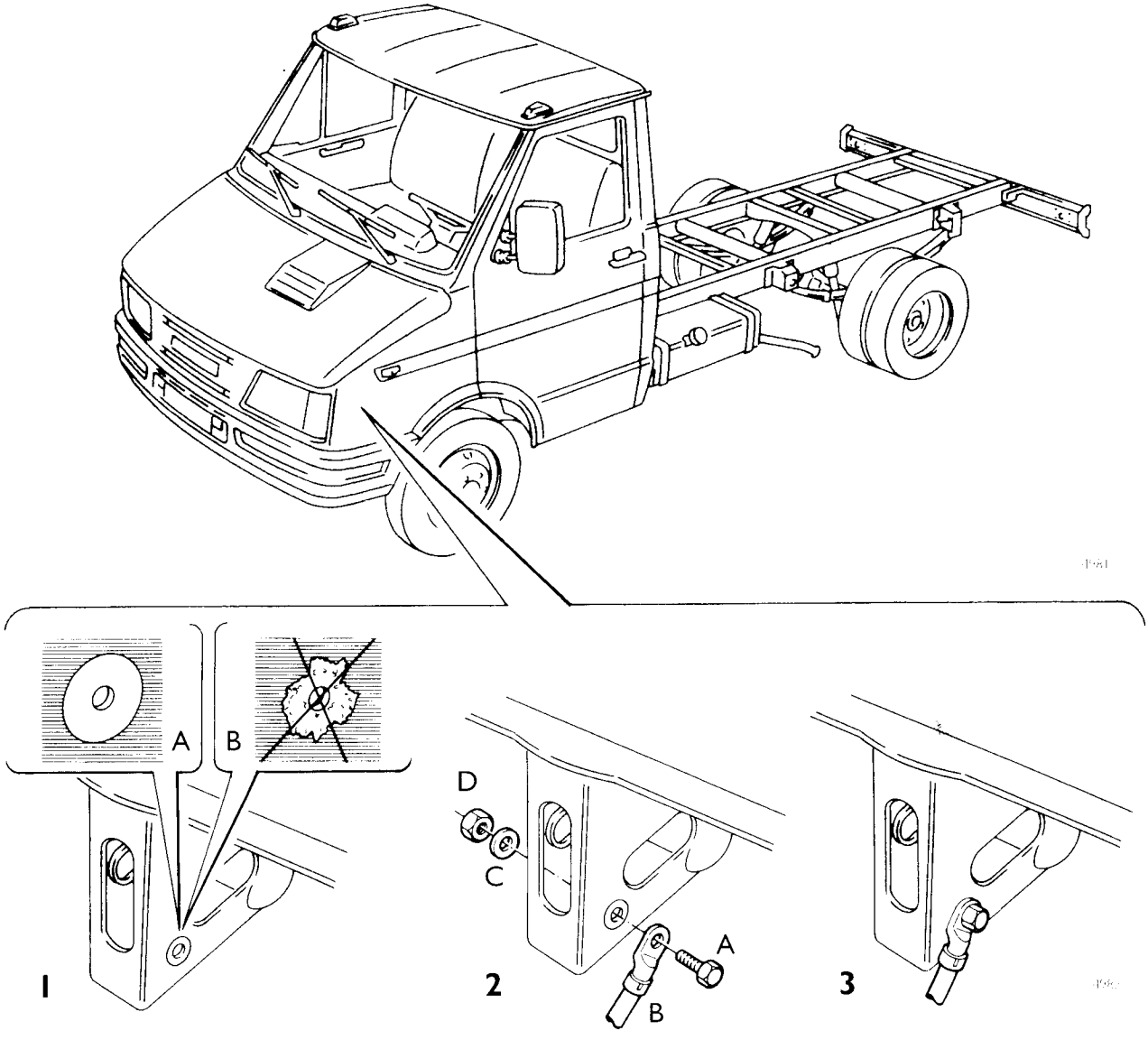
Due to the above mentioned reasons, the **supply earth** or system earth characterised by strong direct current intensity (> 1 A for electromechanical components) must be distinguished from the **analogue earth** characterised by wave shapes at determinate frequencies and with very small current intensities (mA,μA) of the electronic/numerical systems.

The definition of signal earth or analogue earth depends on the sensitivity of the electronic systems to EMC (electromagnetic compatibility) since parasite signals induce malfunctioning and/or deterioration of the actual systems (as they are emitted by systems on board and/or outside the vehicle).

In order to minimise continuous or transient disturbances or interferences caused by parasite radiations, it is of the **utmost importance** to bear in mind all the time that the soundness of the reference plan or system earth depends on the excellent conduction features (contact resistance tending to zero) in each of its connecting points.

To sum up we can say that earth intended as equipotential electric conductor, i.e. as potential reference of all the electric/electronic components on board, is subdivided into system earth and analogue earth.

Earth points (M1, M2, M3 etc) are established by the manufacturer and must obviously be free from paint, oxidation, grease, dust etc.



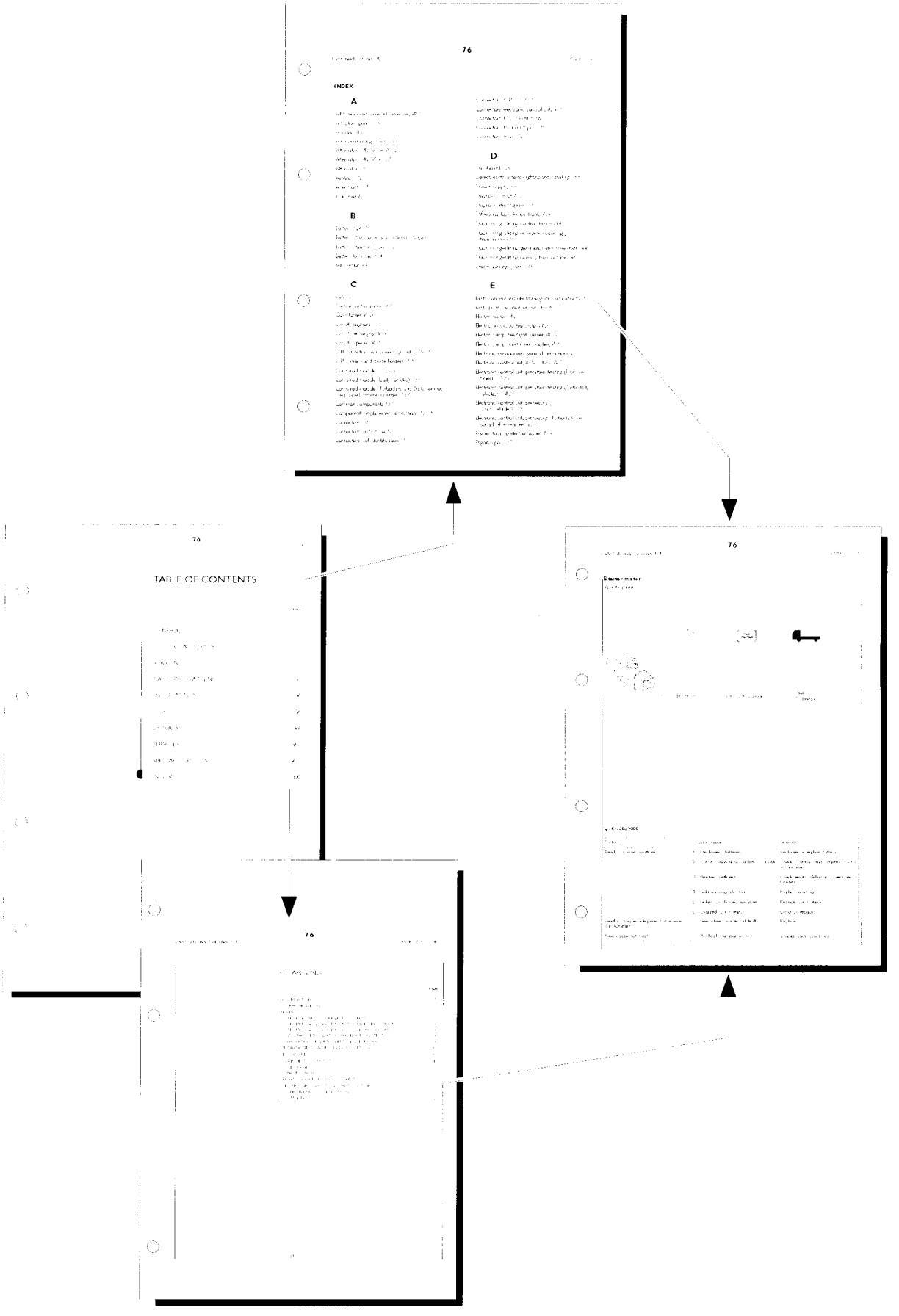
1 EARTH CONNECTIONS: A. EFFICIENT EARTH POINT B. INEFFICIENT EARTH POINT
2 - FASTENING SEQUENCE: A. SCREW B. WIRE TERMINAL C. WASHER D. NUT
3 EARTH CONNECTION

When refitting the earth wires to the chassis, thoroughly remove the old conductive paint and apply a new even coat of BH44D or Kontaktolon paint, proceeding as described below:

1. Chemically or mechanically remove the paint on both chassis and terminal.
2. Apply the paint with a brush or a sprayer.
3. Connect earth wires within 5 minutes from paint application.
4. If mounting a new earthing contact, file the chassis anaphoresis paint around the terminal clamp fixing hole and prepare a smooth supporting surface.

READING KEYS

Key to manual reading



Reading key

COMPONENT UNDER EXAMINATION - FAULT DIAGNOSIS PROCEDURE	12VIS THE VEHICLE'S NOMINAL VOLTAGE (OPERATING VOLTAGE IS 14V APPROX.)	COMPONENT UNDER EXAMINATION - WIRING SYSTEM - CONNECTIONS	COMPONENT UNDER EXAMINATION - INNER WIRING SYSTEM	GRAPHIC REPRESENTATION OF MULTIMETER	COMPONENT UNDER EXAMINATION CODE NUMBER

Electronic rev Counter Sender unit

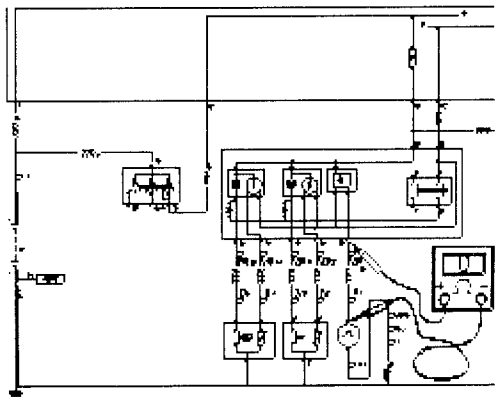
SIMPLIFIED DIAGNOSIS

Disconnect connector A from component under examination.

Set multimeter to OHM.

- Check for 0 Ω by setting one multimeter prod to terminal 1 of connector A and the otherone to terminal 3 of combined module connector A (page M3).
- Check for 0 Ω by setting one multimeter prod to terminal 2 of connector A and otherone to earth.

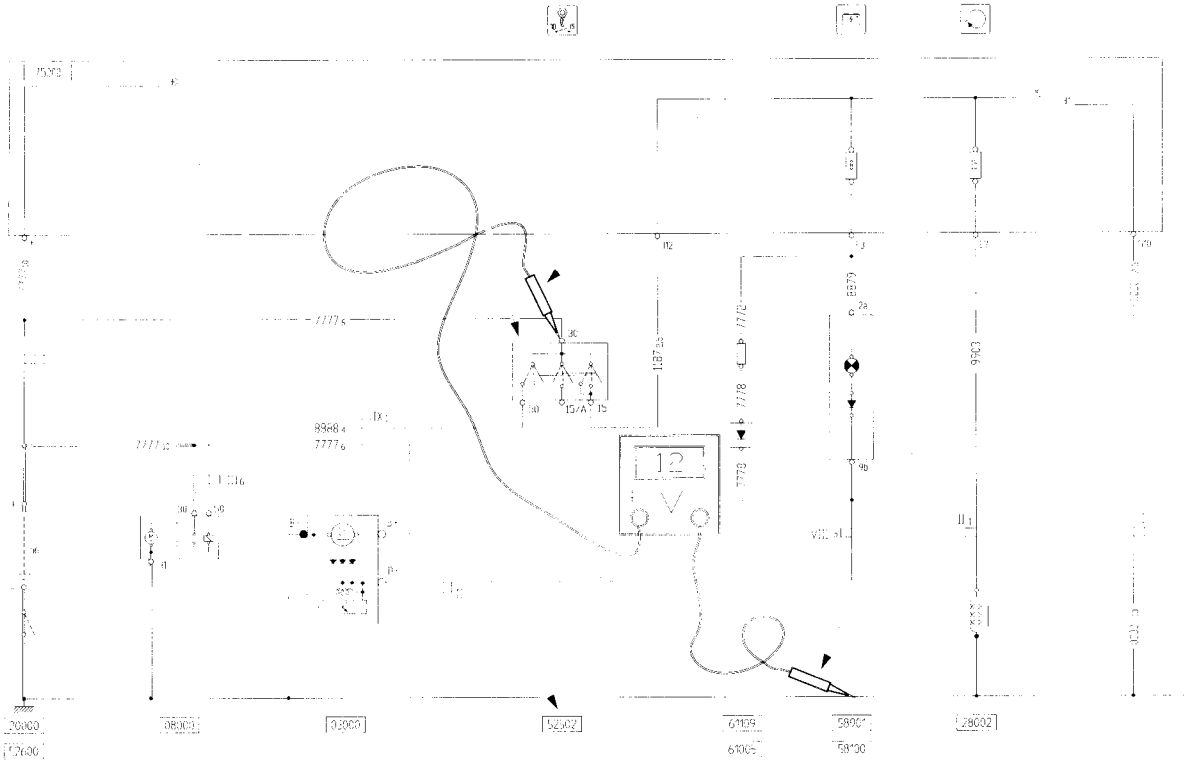
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



Print no 603.42961 Diagram no 3

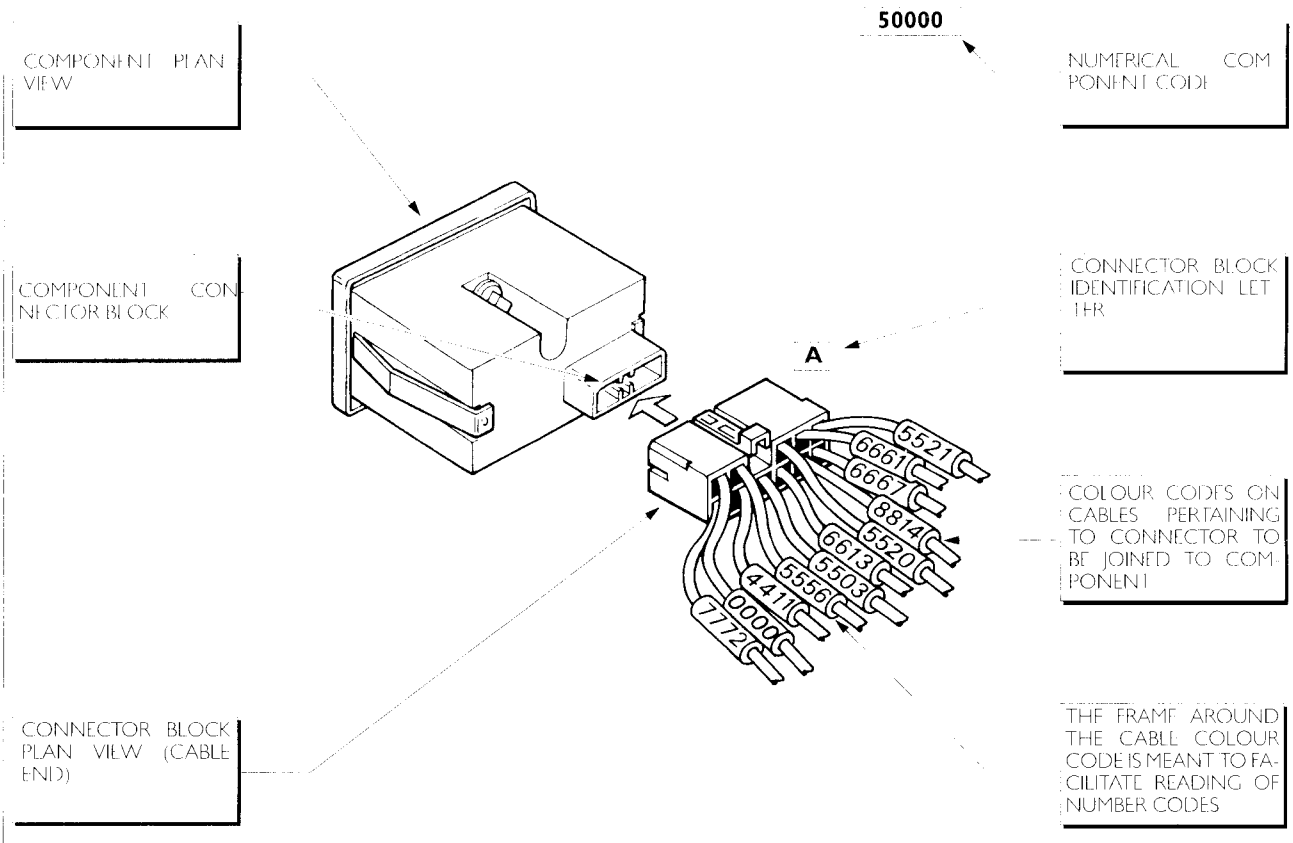
48030

NUMERICAL CODE OF COMPONENT UNDER EXAMINATION	COMPONENT UNDER EXAMINATION - LOCATION ON WIRING DIAGRAM	MULTIMETER POSITIVE PROD	MULTIMETER NEGATIVE PROD



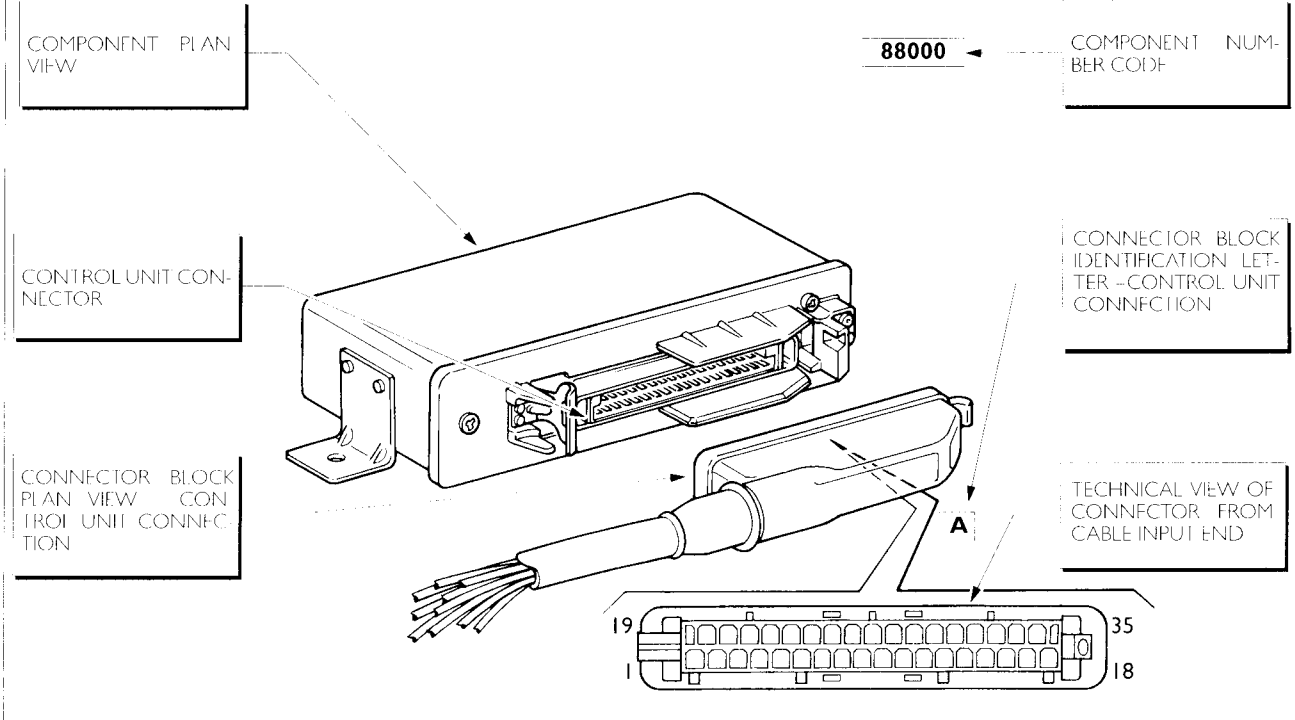
FUNCTION CONNECTED TO COMPONENT UNDER EXAMINATION - COMPLETE WIRING SYSTEM

Key to components described in chapters II – III – IV – V – VI – VII – VIII



LAYOUT WITH ELECTRICAL CONNECTIONS

Key to components described in chapter VIII (ABS/ASR, EDC etc. electronic control units)



LAYOUT WITH ELECTRICAL CONNECTIONS

Key to component characteristics and possible faults

COMPONENT TRADE MARK (MANUFACTURER/SUPPLIER)

COMPONENT IDENTIFICATION LETTERS/NUMBERS

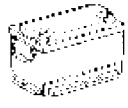
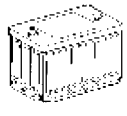
76

Daily/Turbodaily/Turbodaily 4x4 STARTING 11.5

Batteries

Specifications

MODEL TYPE

	5100	MARELLI	12V–88Ah–395A	Daily
	5101	MARELLI	12V–95Ah–450A	Turbodaily
	5102	DELCO	12V–102Ah–RC310A	Turbodaily (either right–hand drive or fitted with air–conditioning system)
	5103	MARELLI	12V–110Ah–450A	Turbodaily (either bus version or fitted with optional extras)

POSSIBLE FAILURES AND REMEDIES

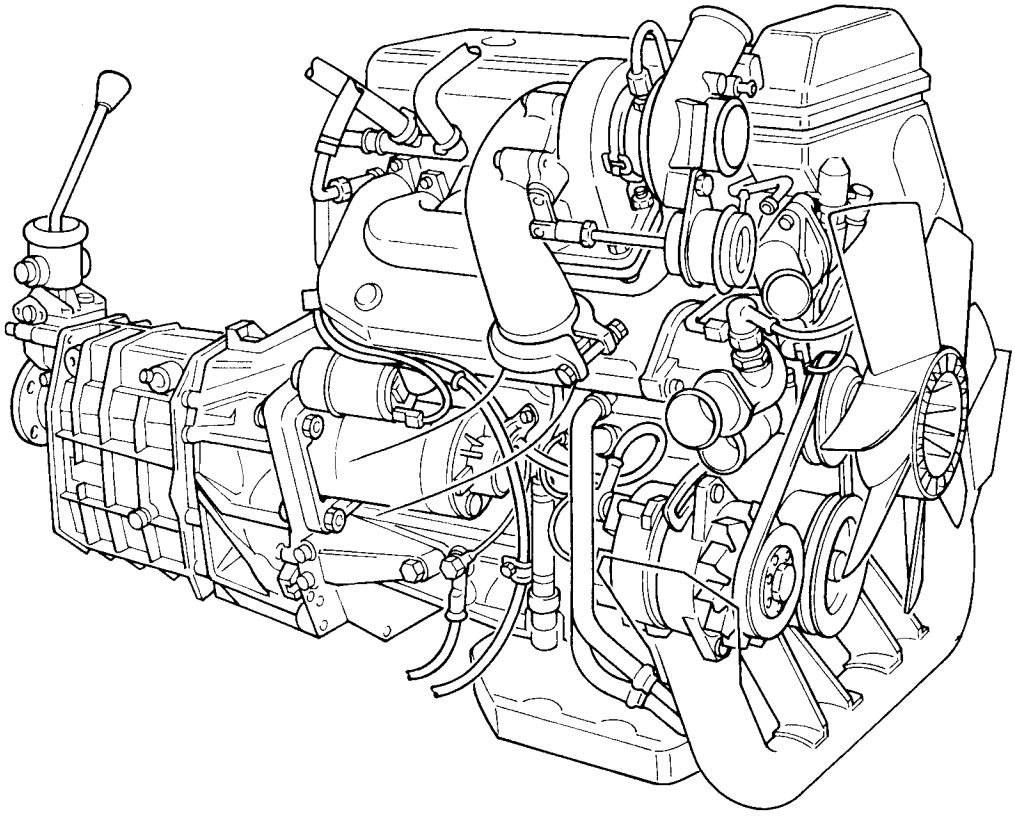
Quick diagnosis

Defect	Possible cause	Remedy
Starting defect	1. Discharged battery	Check battery charge. If correct, check recharging circuit
	2. Terminals loose or oxidized or burnt	Restore terminal efficiency, as required
	3. Faulty starting circuit	See "Starting" section
Electrolyte level often low	1. Excessive voltage	Check recharging circuit and/or check if terminals are loose
	2. Oxidized terminals	Clean or replace
Electrolyte level often low	1. Excessive voltage	Check recharging circuit and/or check if terminal are loose

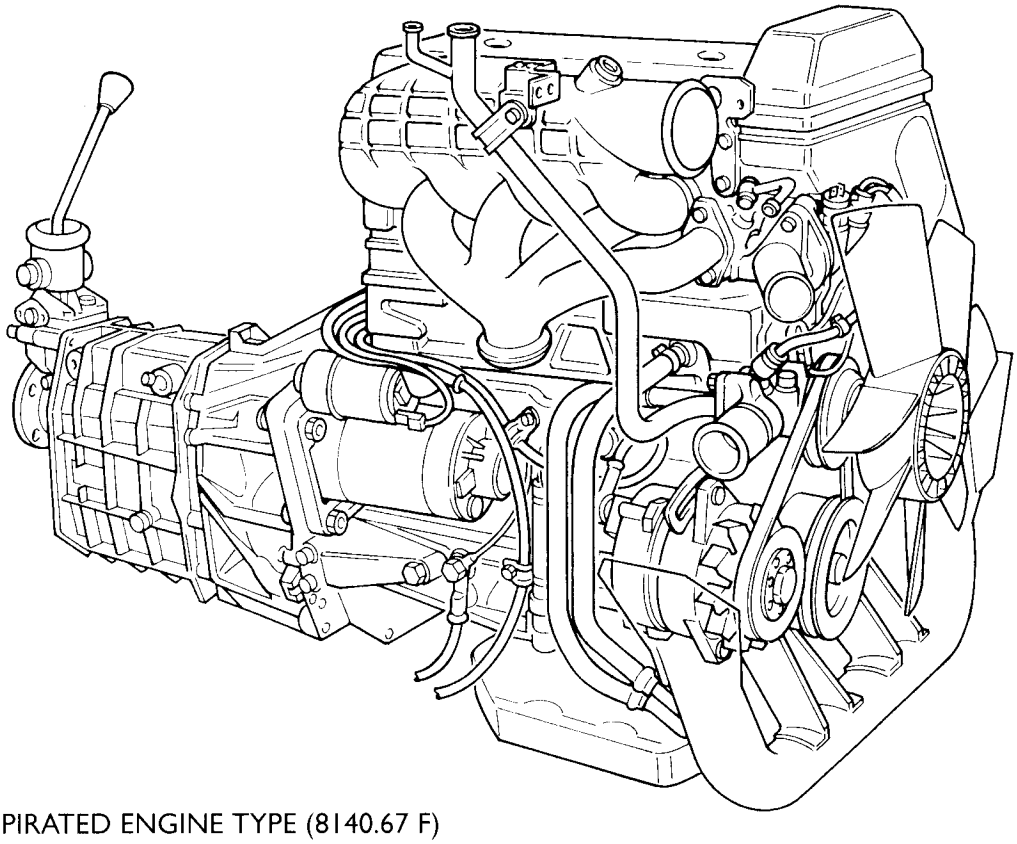
ELECTRICAL SYSTEM

ELECTRICAL SYSTEM

Engine types



SUPERCHARGED ENGINE TYPE (8140.23 – 8140.43 – 8140.47



ASPIRATED ENGINE TYPE (8140.67 F)

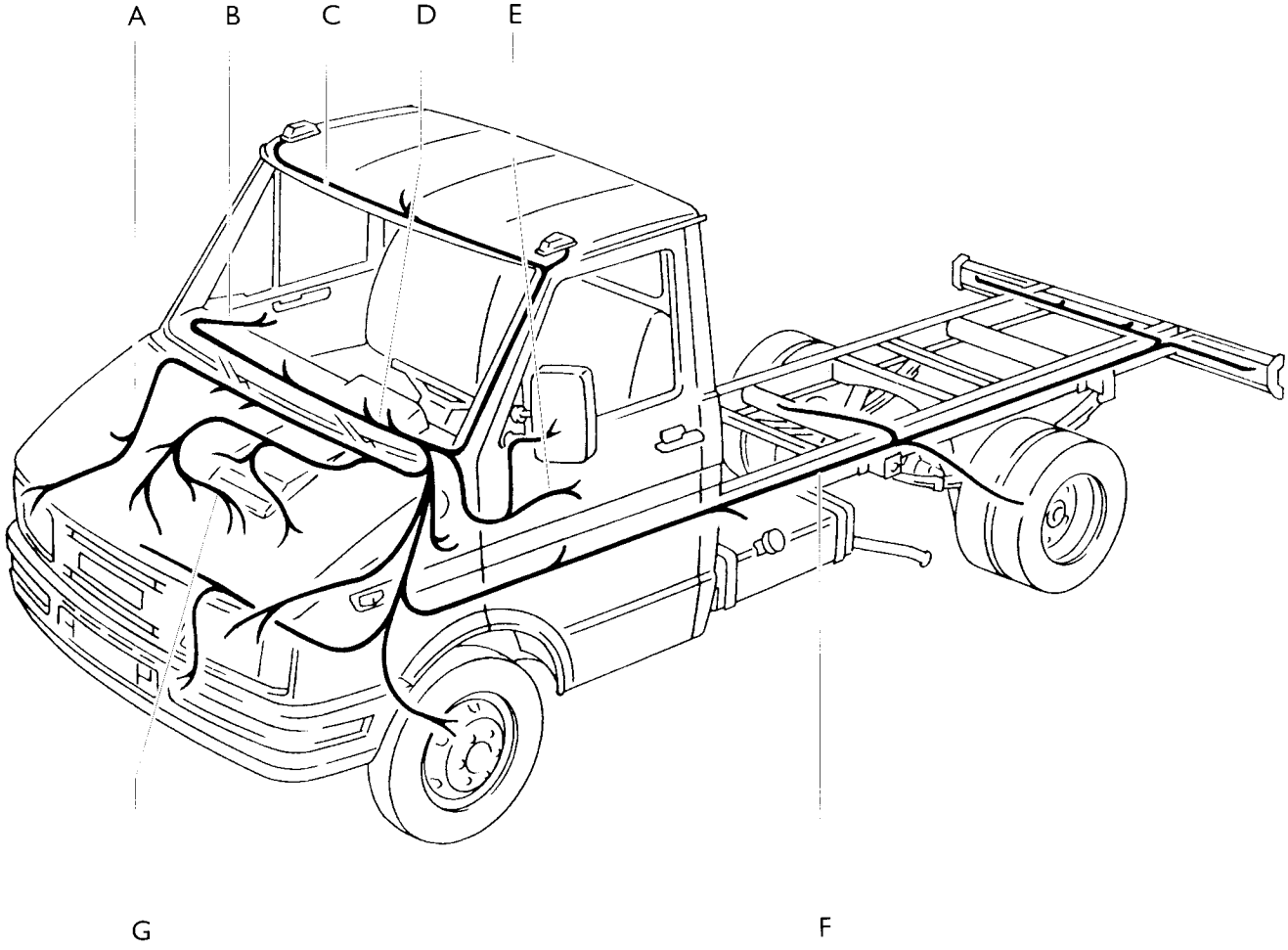
1.1 IFFERENTENGINETYPES ASSEMBLEDON DAILY/TURBODAILY/TURBODAILY 4X4 VEHICLES

SYSTEM SPECIFICATIONS

Daily/Turbodaily vehicles (truck version) – Main electrical data

The wiring system installed on the various Daily and Turbodaily models is basically the same, with the exception of the following data:

Nominal voltage	12V
Operating voltage	~ 14V
Battery capacity (depending on vehicle model)	88 Ah
	95 Ah
	102 Ah
Alternator rating (depending on vehicle model)	55 A
	90 A
Starter motor rating	2.2 kW



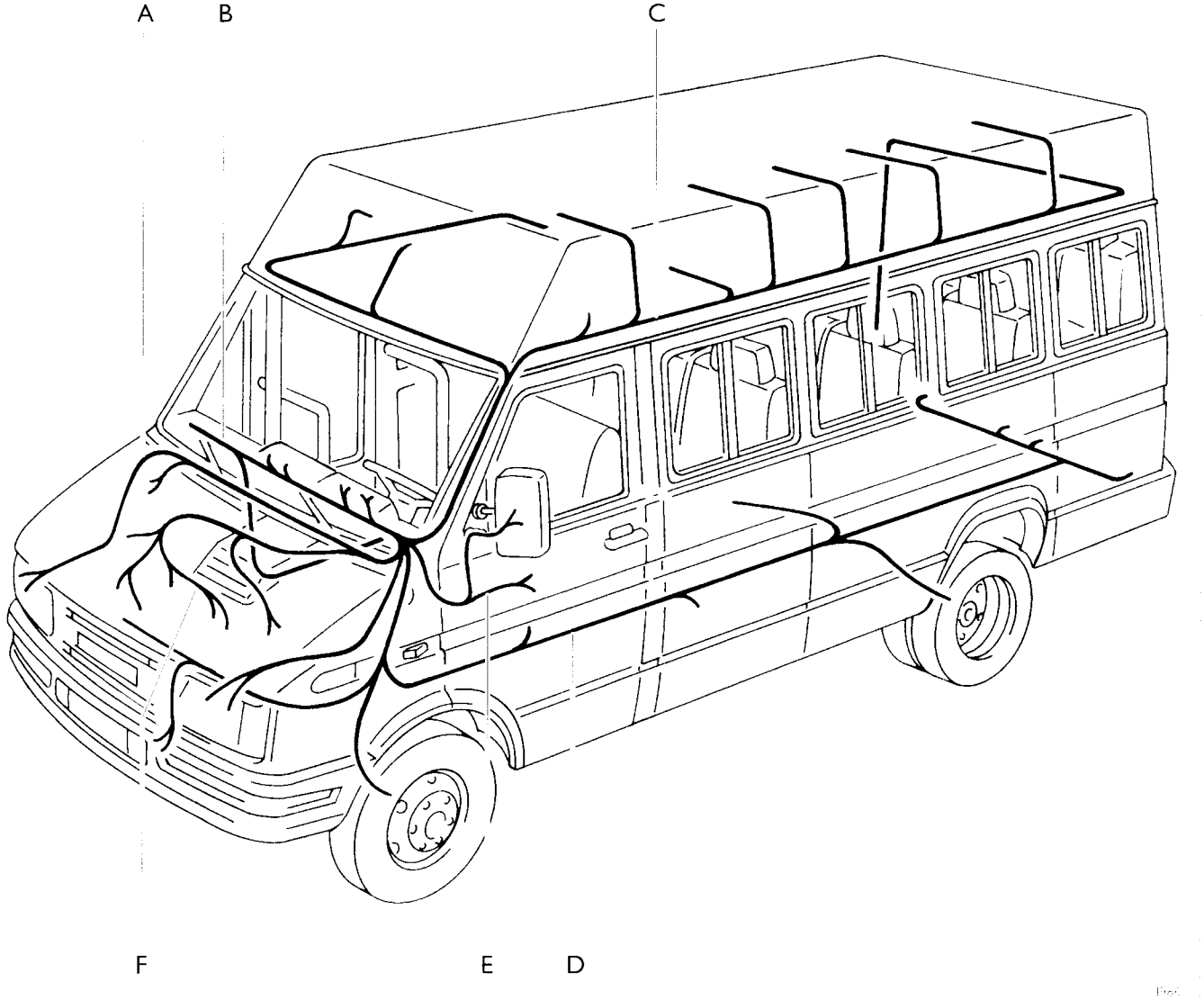
1.2 LOOM LOCATION
A. HOOD LOOM – B. RH DOOR LOOM – C. ROOF LOOM – D. CAB LOOM – E. LH DOOR LOOM – F. CHASSIS LOOM – G. ENGINE LOOM

Daily/Turbodaily vehicles (Bus version) – Main electrical data

Regardless of optional extras and variants requested by the different countries, the standard wiring system installed on the bus version includes the following components:

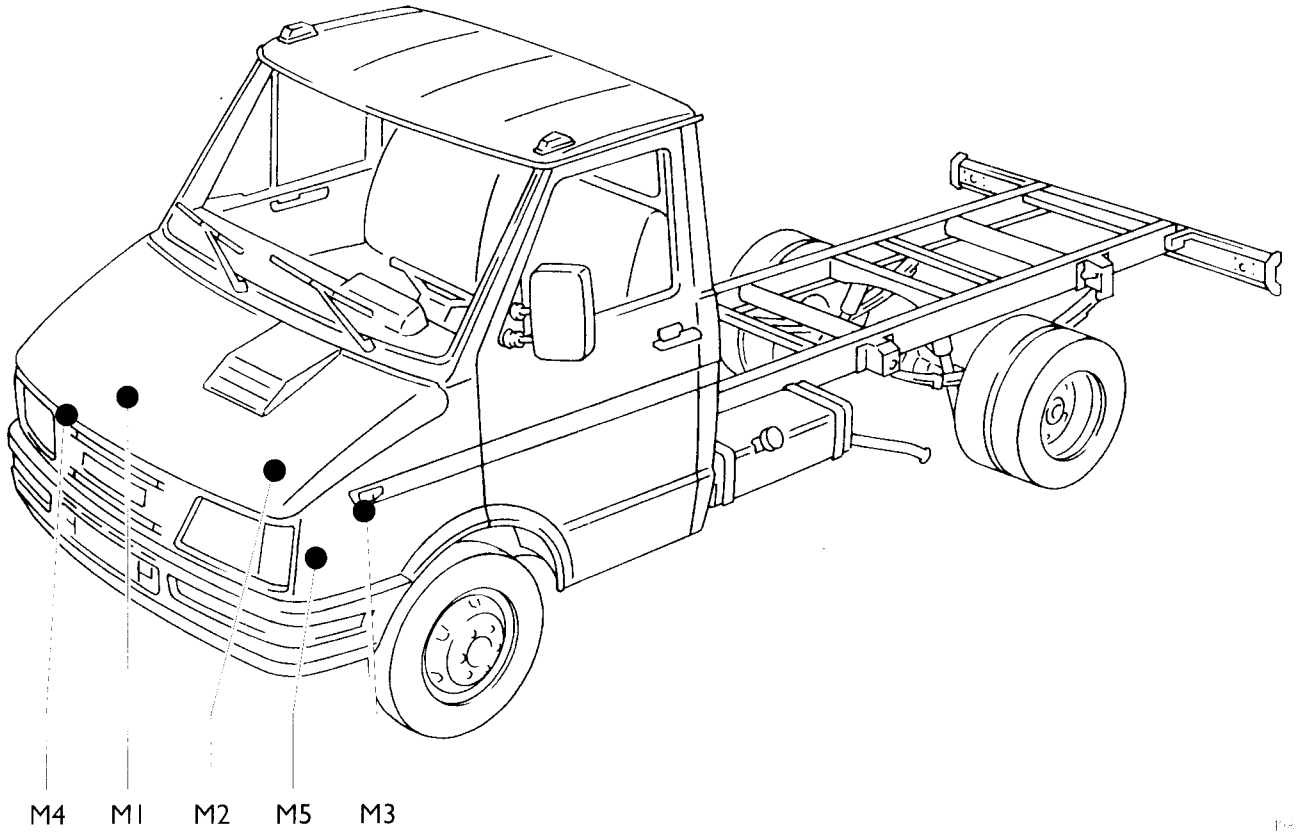
General Current Relay
Emergency circuit
Swing sliding door
Internal lighting

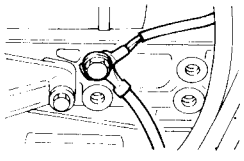
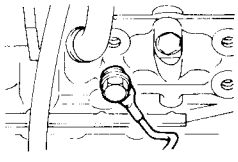
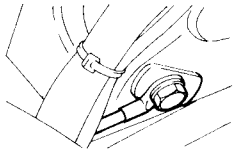
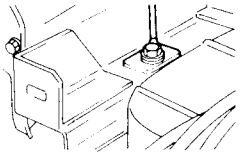
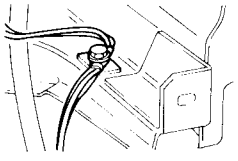
Nominal voltage	12V
Operating voltage	~ 14V
Battery capacity	110 Ah
Alternator rating	90 A
Starter motor rating	2,2 kW



1.3 LOOM LOCATION
A. HOOD LOOM – B. CAB LOOM C. ROOF LOOM D. CHASSIS LOOM E. LH DOOR LOOM F. ENGINE LOOM

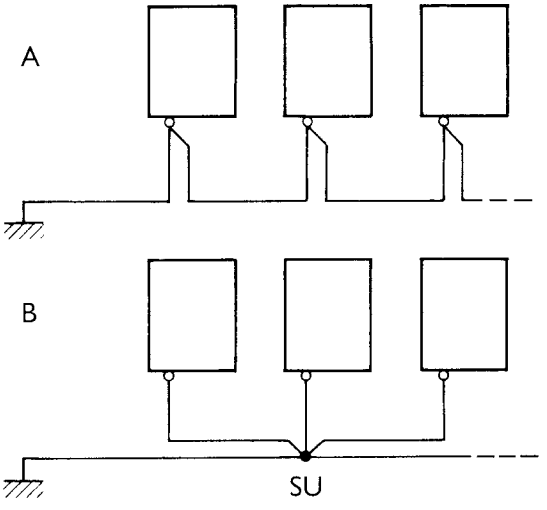
Location of earth points on the vehicle



Earth connection	Location	Components concerned
M1 	Engine block rh side	Battery negative terminal – Windscreen wipers – Roof components Cab interior components – Engine cooling electromagnetic joint
M2 	Engine block lh side	Earth connection between engine and chassis
M3 	Lh side member	Power steering fluid level indicator control device –Horns – Fuel level sender unit – Side marker lights – Brake fluid level indicator control device – Tail external lighting – Telma –
M4 	Hood (close to rh headlight cluster)	High/low beam light with rh parking light – Rh front turn signal light – Air cleaner restriction indicator switch – Windscreen washer pump – Engine coolant level indicator
M5 	Hood (close to lh headlight cluster)	High/low beam light with lh parking light – Lh turn signal light – Fog lamps

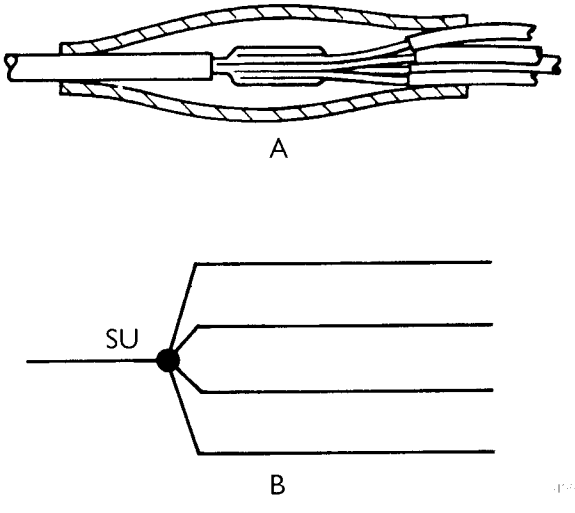
Cable ultrasound welding

This is the first time that ultrasound welding is used on a commercial vehicle with the purpose of eliminating the considerable number of power and earth jumpers included with other components in its electrical system (fig. 1.4).



1.4 COMPONENT EARTH CONNECTION
A. CONNECTION VIA JUMPERS B. CONNECTION VIA ULTRASOUND WELDING

Welding points are fitted inside the cable loom and are isolated from other cables by means of heat–shrinking sheaths or insulating plastic material. All component lines meet on one side of the point while on the other side a single wire supplies earth or power connection for all of them (fig. 1.5).



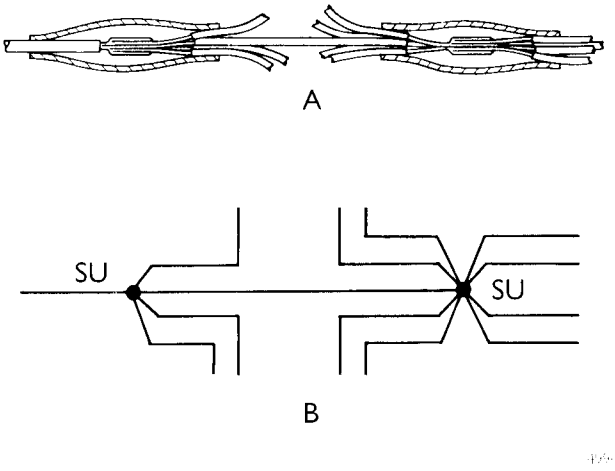
1.5 1.5 ULTRASOUND WELDING
A. TECHNICAL DIAGRAM B. WIRING DIAGRAM

Several welding points can be connected to one another and therefore a number of lines will meet on each side of them.

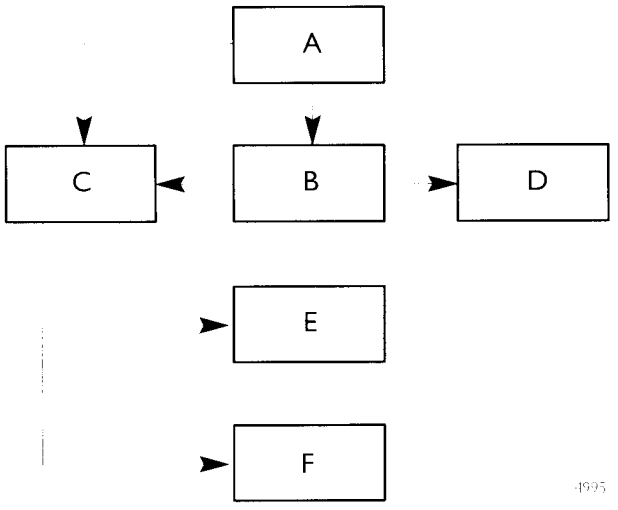
In this case, the wire assigned the power or earth function will be connected to the last serially connected weldiUltrasound welding enables the following advantagesing point (fig. 1.6).

Ultrasound welding enables the following advantages:

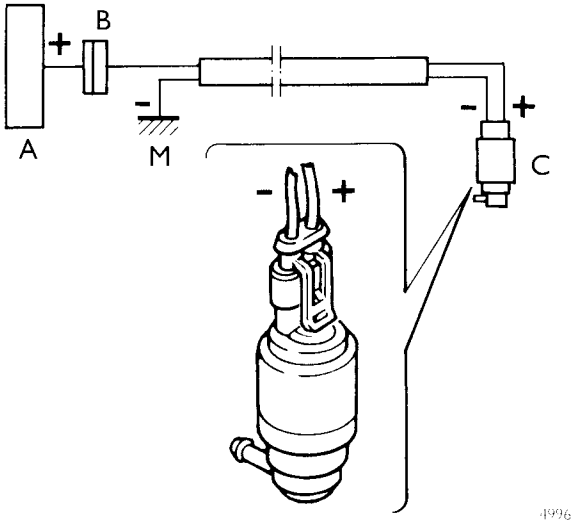
- considerable reduction of electromagnetic disturbances from outside the vehicle
- improved reliability of electrical system operation due to the elimination of jumpers and consequent possible system malfunction.



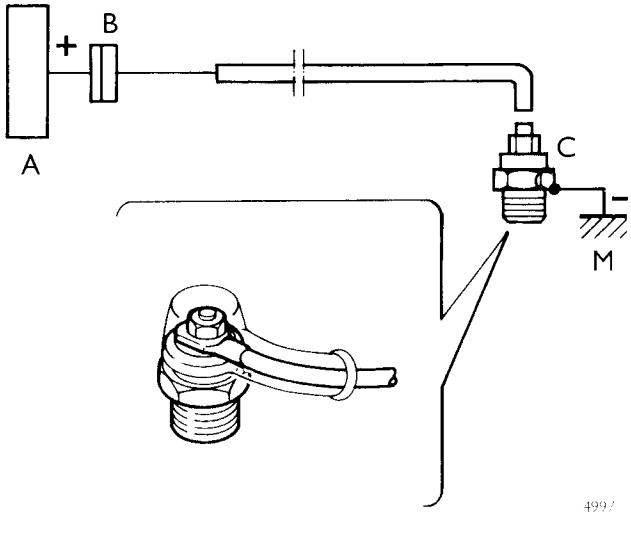
1.6 CONNECTION BETWEEN ULTRASOUND WELDING POINTS
A. TECHNICAL DIAGRAM B. WIRING DIAGRAM



I.7 CIRCUIT MODULARITY DIAGRAM
A. C.I.U. - B. CAB - C. HOOD - D. ROOF - E. ENGINE
F. CHASSIS



I.8 BIPOLAR COMPONENT
A. C.I.U. B. JUNCTION BLOCK C. COMPONENT
M. EARTH



I.9 SINGLE POLE COMPONENT
A. C.I.U. - B. JUNCTION BLOCK - C. COMPONENT -
M. EARTH

Components

The new electrical system for the Daily/Turboadaily range is designed to guarantee a high level of operational efficiency over a period of time and make the different cables which comprise the vehicle electrical network independent from one another.

The new connections which are sealed against external agents (humidity, water, dust, acid, temperature changes, etc.) considerably reduce both oxidation at electrical component terminals and the possibility of contact to earth due to wire exposure.

Circuit modularity or, better still, the separation of electric cable looms (cab, hood, roof, engine and chassis looms) enable the replacement of one single cable loom without having to remove them all in the event of a circuit fault.

To ensure circuit continuity, the network is connected to the power source on–board the vehicle (batteries) via positive conductors for supply of the various components and negative conductors for current return.

Negative cables are connected to the hood or engine earth points and to the chassis earth depending on component location.Furthermore, a cable connects the engine to the chassis earth to ensure vehicle equipotentiality.
Earth point potential as to on–board voltage is the reference potential, that is to say 0 Volt.

N.B. The negative cable of several components is insulated from the chassis earth as this wire is connected to the battery negative terminal.

Figure I.8 shows circuit making to earth for a bipolar component whose terminals are isolated from the component body.

Figure I.9 shows circuit making to earth for a single–pole component whose negative terminal is not isolated from the component body.

The following components feature the above–described property:

- temperature sender unit and engine coolant indicator switch
- variable resistance for ignition timer control
- thermostarter
- engine stopping solenoid
- solenoid valve for connection of fuel tank to atmosphere (thermostarter)
- engine oil pressure indicator switch
- preheating system operation switch

Connector blocks

Cable junction blocks

Figure I.10 shows various connectors with relevant conductors.

Type A connectors are used as junction blocks between the following cable looms:

- hood/engine
- hood/chassis.

The multi cell female junction block (which forms part of the hood cable loom) is fitted with locking tabs designed to secure it to special mountings positioned close to the windscreen wiper motor.

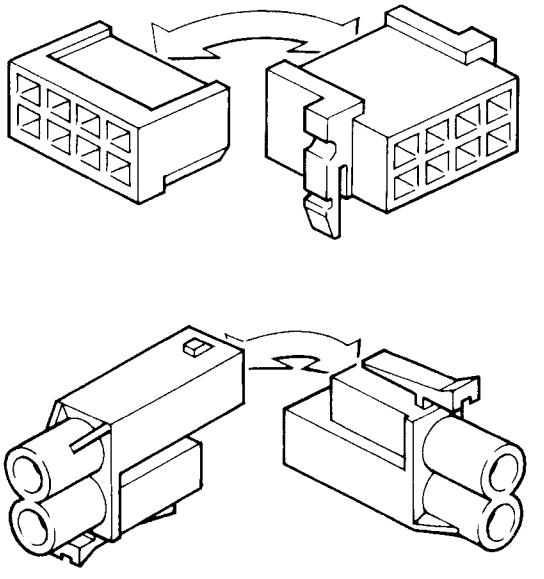
Type B connectors are used as junction blocks between the following cables:

- cab/hood
- cab/doors
- cab/roof
- cab/headlight washer unit
- cab/power windows and adjustable mirrors
- cab/ABS
- ABS/ABS sensors

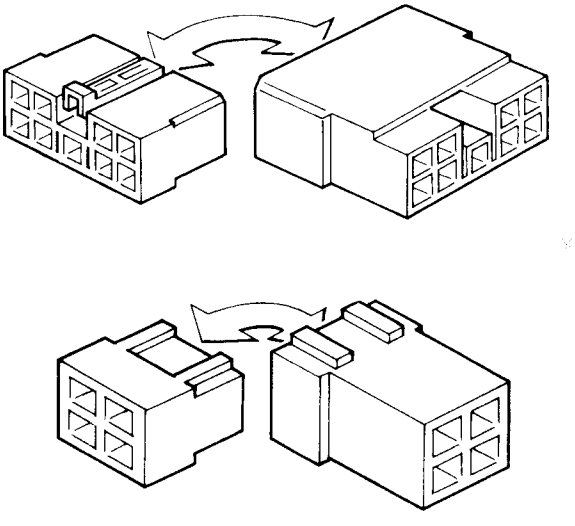
Type C connectors are used as junction blocks between the following cables:

- hood/electronic tachometer sender unit
- hood/windscreen water and engine oil level indicator switch
- hood/fog lamps
- chassis/heated fuel filter

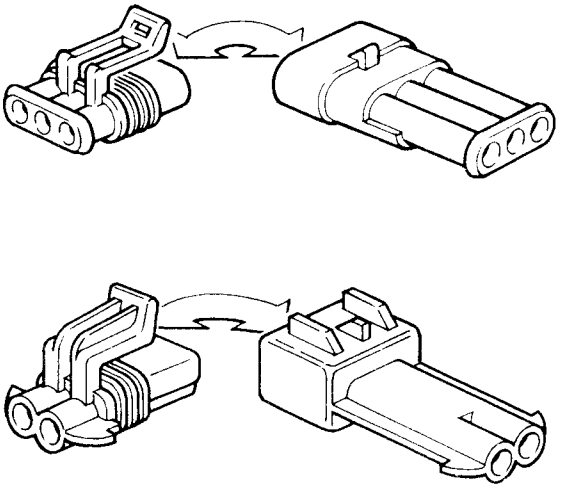
A



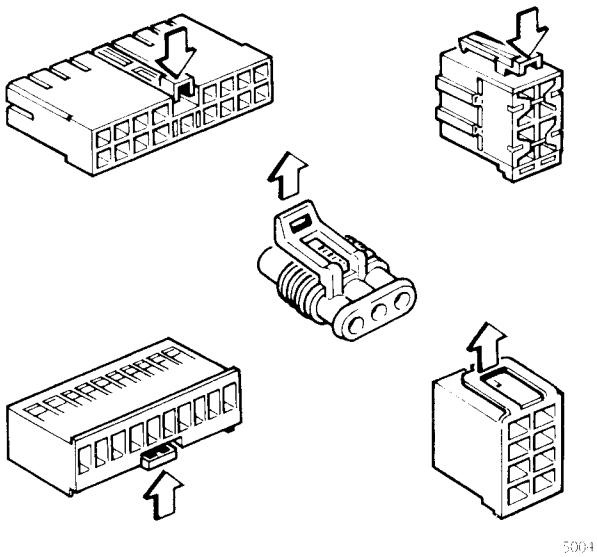
B



C



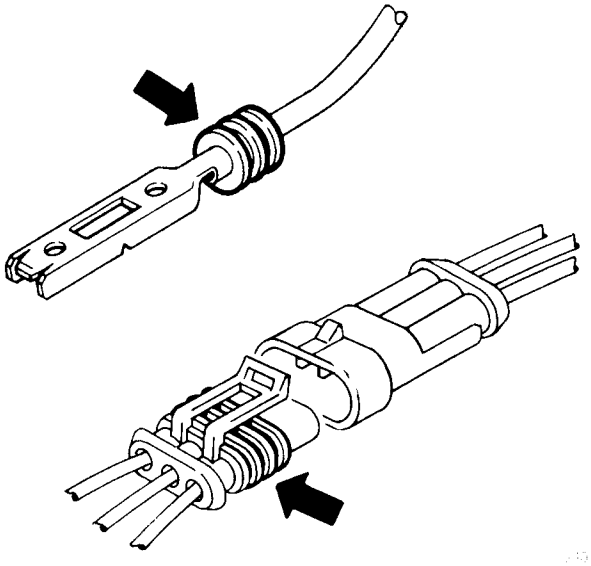
I.10 JUNCTION BLOCKS



I.11 CONNECTORS FITTED WITH LOCKING TABS

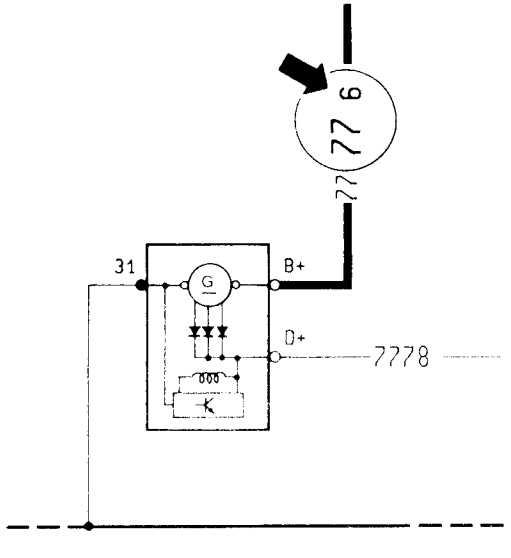
Connector types and cable section identification

Connectors shown in figure I.11 are fitted with a locking tab to prevent them from loosening due to vibrations. To remove a connector it is therefore necessary to either press or lift the relevant tab.



I.12 PACKARD CONNECTORS - PLASTIC SEALS

Packard type connectors are fitted with a plastic seal to ensure protection from external agents (dust, water, etc.). Conductor ends are fitted with seals fastened to the wire terminal (fig. I.12).



I.13 CABLE SECTION IDENTIFICATION

Single cables or conductors (with 0.5 mm^2 copper plait core for signals and 1 mm^2 or more for supply lines) are insulated with heat and dust/waterproof polyvinyl material.

Polyvinyl insulation also proves very efficient in the prevention of corona and galvanic effects produced by direct current. Such effects cause contact oxidation resulting in voltage drops atthe electrical component terminals.

By way of example, we can say that maximum carrying capacity (this may vary from one country to another) in continuous duty is 6A for 0.5 mm^2 conductors and 11A for 1 mm2 conductors.

The heavy type number at the side of the cable colour code identifies, on circuit diagrams, cable sections above 1 mm^2.

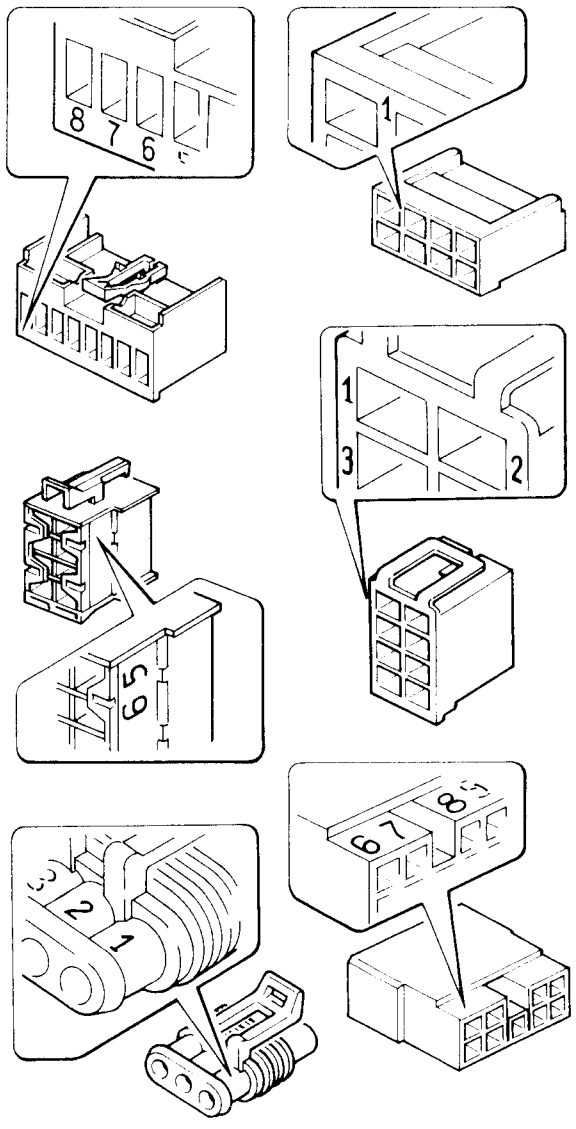
For instance, figure I.13 shows that section of cable 7777 is 6 mm^2.

Connector cell identification

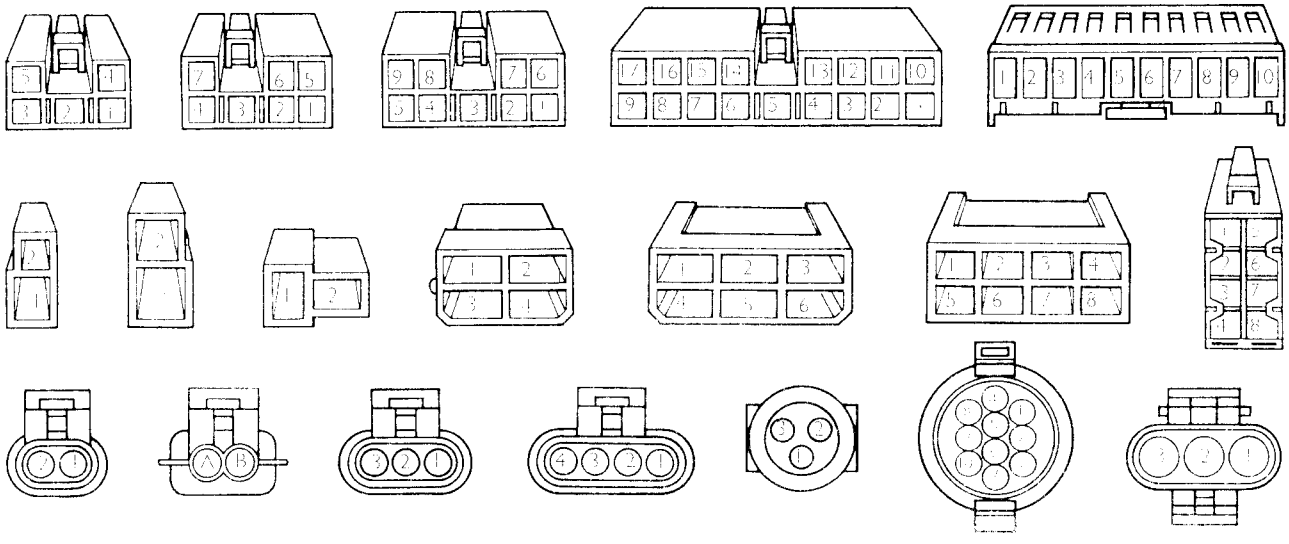
Figure I.14 shows several examples of cell numbering on different connector types.

Raised stamped numbers are always on the connector cable side.

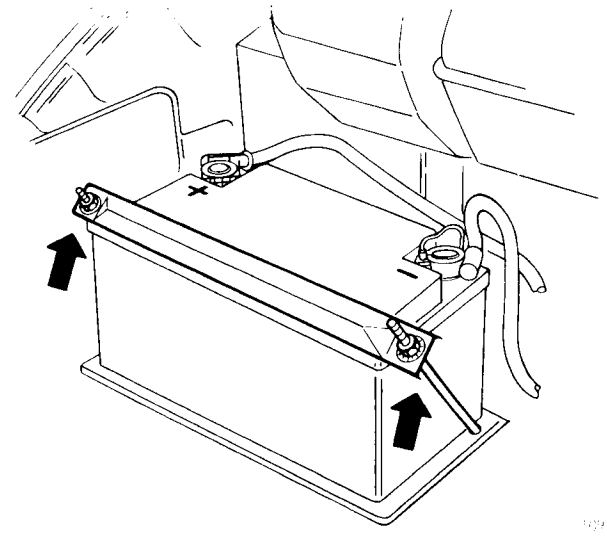
Figure I.15 shows cell identification relative to connector types most frequently used on the Daily/Turbodaily/Turbodaily 4x4 range.



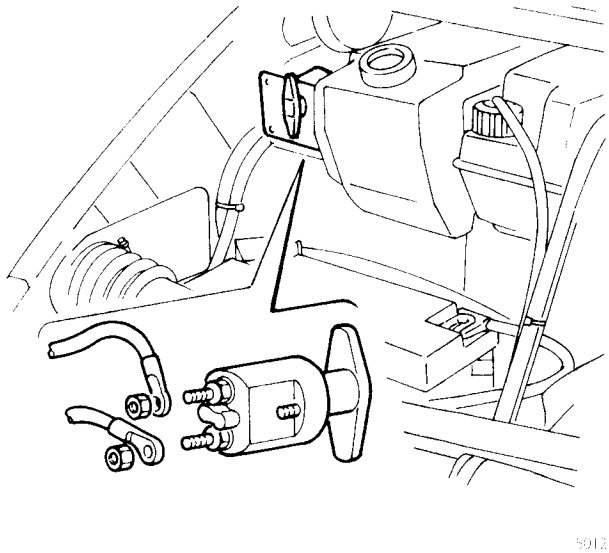
I.14 HIGHLIGHTING CELL IDENTIFICATION NUMBERS ON DIFFERENT CONNECTOR TYPES



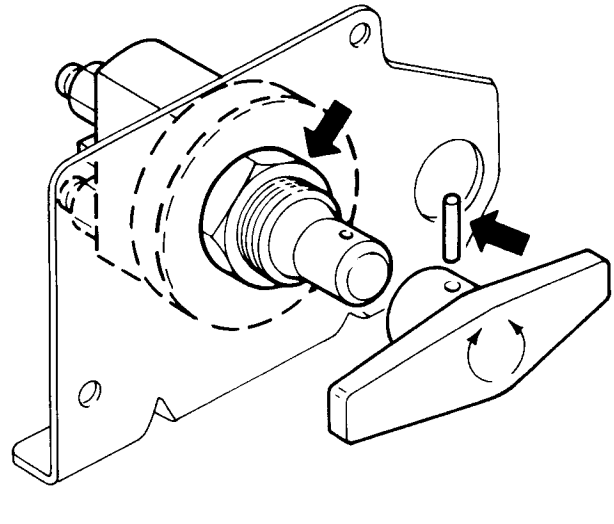
I.15 CELL IDENTIFICATION (CABLE END MALE CONNECTORS)



I.58 REMOVING BATTERY



I.59 REMOVING MAIN SWITCH



I.60 REMOVING PIN AND FIXING NUT

Component replacement instructions

Battery

⚠ Never disconnect the batteries with the engine running.

Cut the battery off the electrical system during the recharging operation.

Before reconnecting the battery ensure the system is properly isolated.

To replace the battery follow the operating sequence indicated below. Remember to cut the battery off the electrical system by means of the main current switch (if fitted). Then:

- Loosen terminal clamps.
- Disconnect power network supply cables. If an isolator switch is not fitted, disconnect the earth cable first and then the positive cable.
- Unscrew both battery clamp nuts from the bracket securing battery to hood (fig. I.58).

When reinstalling the battery, connect power cables in accordance to polarity to avoid serious damage to on board mains and electronic components.

Main current switch (where fitted)

To replace the main switch comply with the following operation sequence. Remember that the first step to be carried out is to break the circuit. Then:

- Disconnect the cable from the battery negative pole.
- Remove nuts securing cables to the main switch (fig. I.59).
- Remove handle fixing pin and take the handle out (fig. I.60).
- Loosen nut fixing main switch to its mounting bracket (fig. I.60).
- Remove the main current switch and carry out repairing or replacing operations.

Starter motor

Proceed as follows to remove the starter motor from the engine:

Disconnect power cables from battery.

Undo nuts to disconnect wire terminals from starter motor clamps.

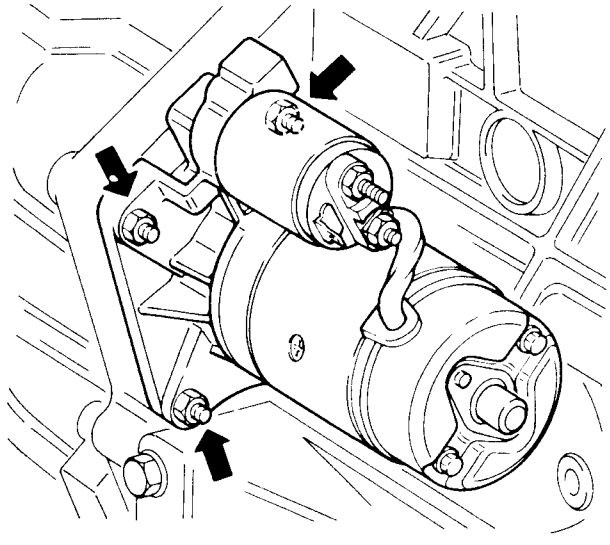
Remove the three fixing nuts fastening the starter motor to the engine (fig. 1.61).

Remove the starter motor.

Visually check the ring gear for wear.

Clean starter motor mounting surface.

Reassemble the unit by reversing the above steps.



1.61 REMOVING THE STARTER MOTOR

14V 50–90A Alternator

Carry out the following operations to remove the 14V 50 90A alternator:

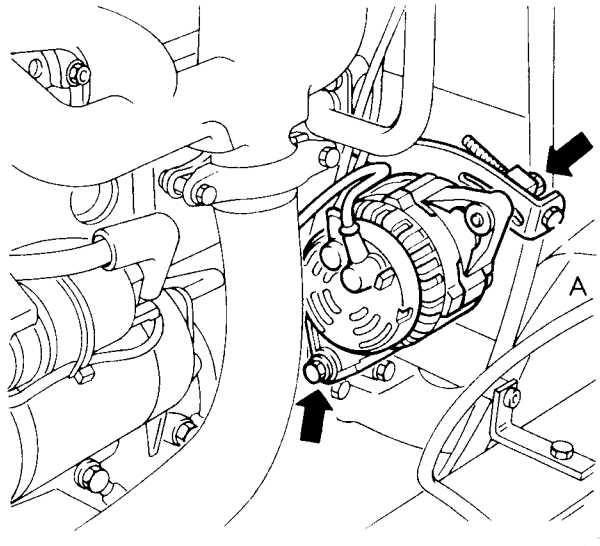
Disconnect power cables from battery.

Disconnect alternator electrical cables.

Remove bolts from belt tension adjustment bracket and from alternator mounting (fig. 1.62).

Remove the alternator.

Reassemble the unit by reversing the above steps and tension the alternator belt by means of the adjusting screw (fig. 1.62 ref. A).



1.62 REMOVING THE 14V 50 90A ALTERNATOR

14V 55A Alternator

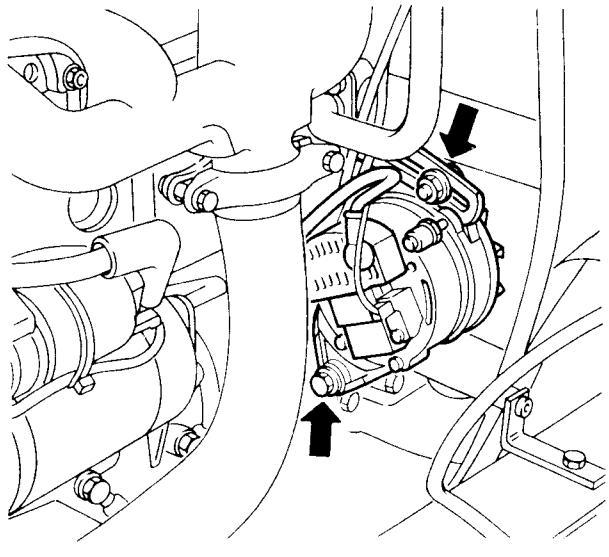
Disocnnect power cables from battery.

Disconnect alternator electrical cables.

Remove bolts from belt tension adjustment bracket and from alternator mounting (fig. 1.63).

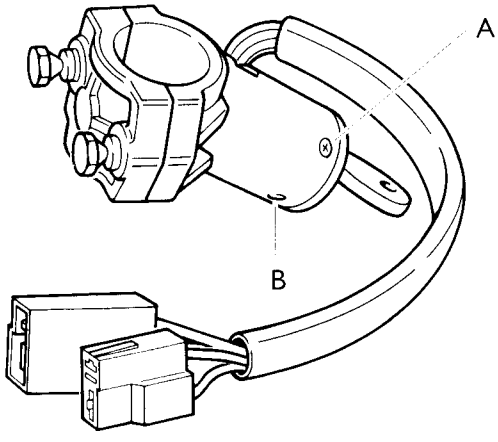
Remove the alternator.

Reassemble the unit by reversing the above steps and ensure belttension is correct.

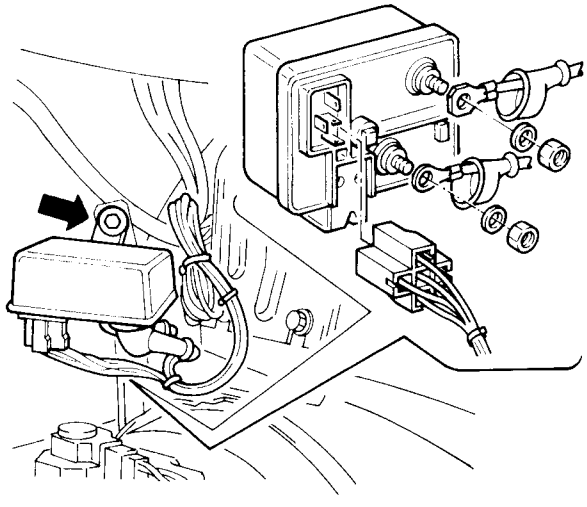


1.63 REMOVING THE 14V 55A ALTERNATOR

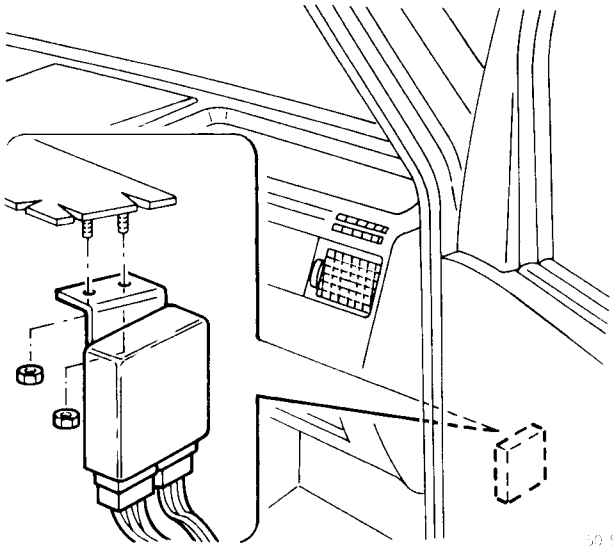
Precautions to be strictly observed.
Before working on electrical components disconnect earth cable from battery negative terminal.



I.64 REMOVING THE IGNITION SWITCH BARREL
A. SCREW B. PIN



I.65 REMOVING THE PREHEATING ELECTRONIC CONTROL UNIT (DAILY VEHICLES)



I.66 REMOVING THE PREHEATING ELECTRONIC CONTROL UNIT (TURBODAILY VEHICLES)

Ignition switch

The steering lock device is included in the ignition switch.

Proceed as follows to replace the internal barrel:

– Loosen screw A and push pin B inwards (fig. I.64).

This operation can only be performed with ignition switch in position P (parking) or key removed from the lock.

Daily vehicles – Preheating electronic control unit

To replace this control unit located close to the windscreen wiper unit proceed as follows:

– Undo the screw securing the control unit to the mounting bracket (fig. I.65).
– Disconnect the connector block and separate wire terminals from control unit clamps by loosening the two fixing nuts.

Reassemble the unit by reversing the above steps.

Turbodaily/Turbodaily 4x4 vehicles – Preheating electronic control unit

To replace this control unit located in the cab right bottom side proceed as follows:

– Disconnect the two control unit connector blocks.
– Unscrew the two nuts fixing the control unit to the cab (fig. I.66).

Reassemble the unit by reversing the above steps.

Thermostarter

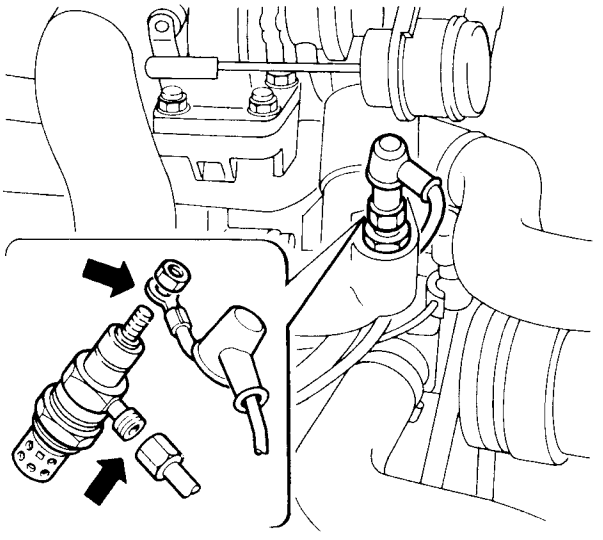
Proceed as follows to remove the thermostarter:

Lift the protection cap and disconnect electrical lines.

Disconnect the pipe from thermostarter to fuel delivery solenoid valve.

Unscrew the thermostarter and remove it.

To reassemble the unit reverse the removal operation sequence and tighten the thermostarter locking nut to a moderate torque.



I.67 REMOVING THE THERMOSTARTER

Preheating plugs (aspirated engine)

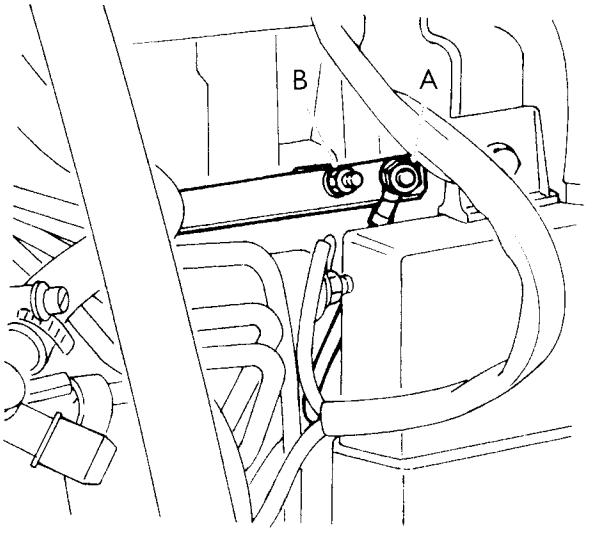
Proceed as follows to remove preheating plugs:

Disconnect the wire terminal from the connection bar (fig. I.68 ref. A).

Loosen the four nuts fastening preheating plugs to the connection bar.

Loosen the plug to be removed.

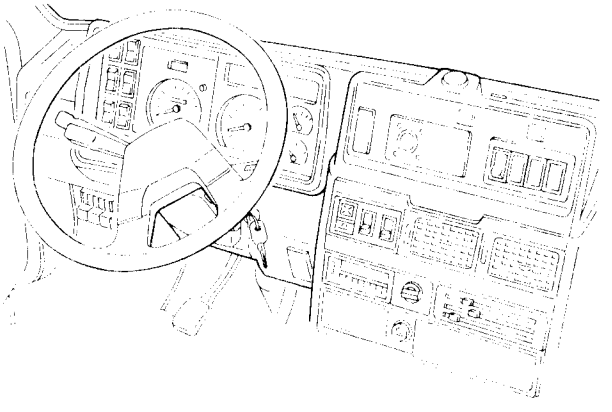
To reassemble the unit reverse the removal operation sequence and tighten the preheating plug you have just replaced to a moderate torque.



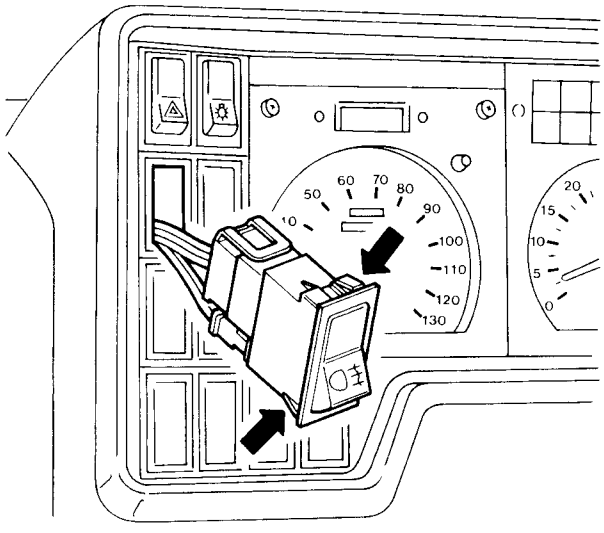
I.68 PREHEATING PLUGS
A. WIRE TERMINAL FIXING NUT B. PREHEATING PLUGS FIXING NUT

Dashboard

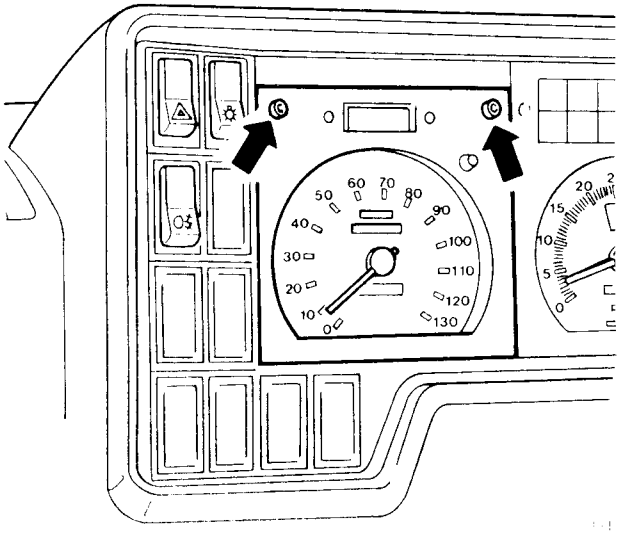
The dashboard consists of two separate areas: one is located in front of the driver. It includes all on board instruments and the majority of control switches. The other one (central control panel) contains control devices relative to the bus version, power window switches, external mirror switches (optional extra), IVECO Control display panel (optional extra) and electric heater.



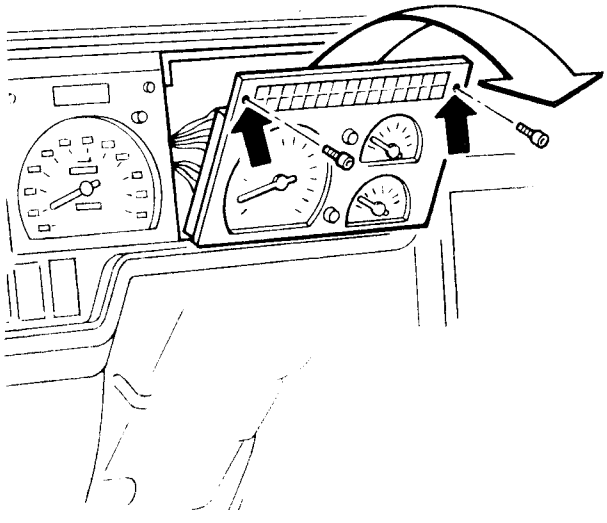
I.69 CITY BUS VERSION DASHBOARD



I.70 REMOVING THE SWITCH FROM ITS HOUSING



I.71 REMOVING THE ELECTRONIC SPEEDOMETER



I.72 REMOVING THE COMBINED MODULE

Key switches

To gain access to the junction block of a key switch prize the switch off the fixing tabs on its top and bottom sides by means of a screwdriver (fig.I.70).

Proceed with care to avoid disconnecting cables and damaging switches and relevant seats.

Switches are fitted with an internal test lamp of the all glass 12V 2W type.

Electronic tachometer

Proceed as follows to replace the tachometer:

- Undo both screws fastening the instrument to the dashboard (fig. I.71).
- Disconnect the junction block.

Reassemble the unit by reversing the above steps.

NOTE. We suggest that you remove the steering wheel from its seat to facilitate access to the electronic tachometer and the combined module.

Combined module

The combined module forms part of the instrument panel.

Two types of module are available. One of them includes the following components:

- electronic rev counter
- engine coolant temperature gauge
- fuel level indicator
- warning lights

The other module type contains the same instruments with the exception of the electronic rev counter arranged in a different way.

The combined module is also fitted with a lamp test switch and and instrument light dimming rheostat for checking lamp efficiency and reduce instrument light intensity.

Proceed as follows to remove the combined module:

- Undo both screws securing the module to the dashboard (Fig. I.72).
- Carefully turn the module outwards.
- Disconnect instrument junction blocks.

Reassemble the unit by reversing the above steps.

Instruments

Proceed as follows to remove instruments from the combined module:

Remove the combined module as described in the preceding page.

Remove knobs for lamp test switch and light dimmer rheostat switch.

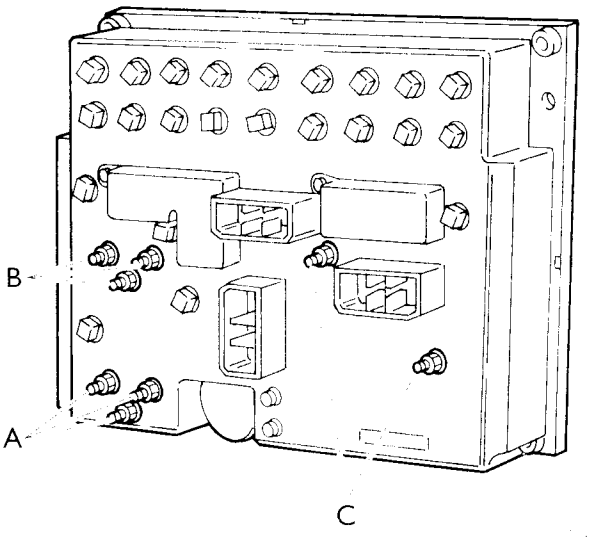
Remove protection plates and antireflection glasses.

Unscrew fixing nuts with vibration–damping metal washers and separate them from the rest of the module.

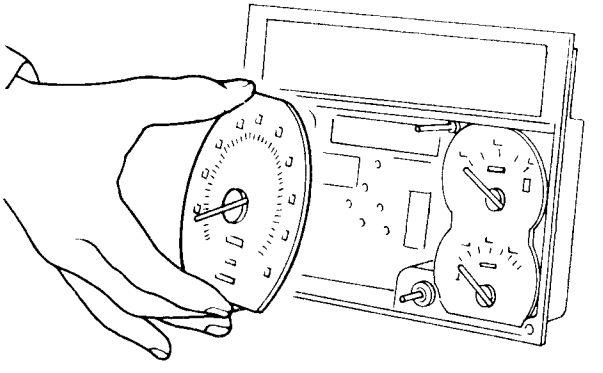
Work from the component end to remove instruments from the module (figs. I.74/I.75).

Reassemble the unit by reversing the above steps.

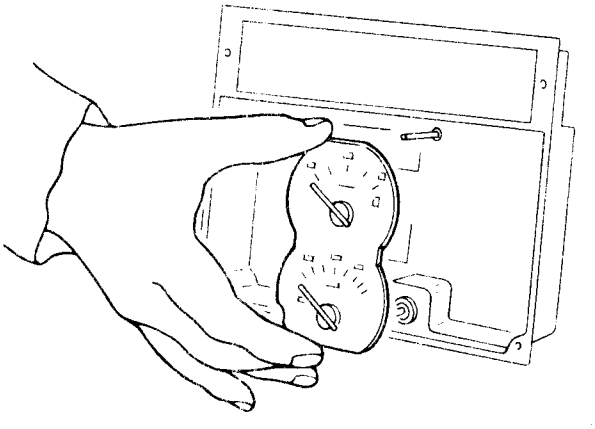
NOTE. Gently pull instruments off their seats to avoid damaging their printed circuits.



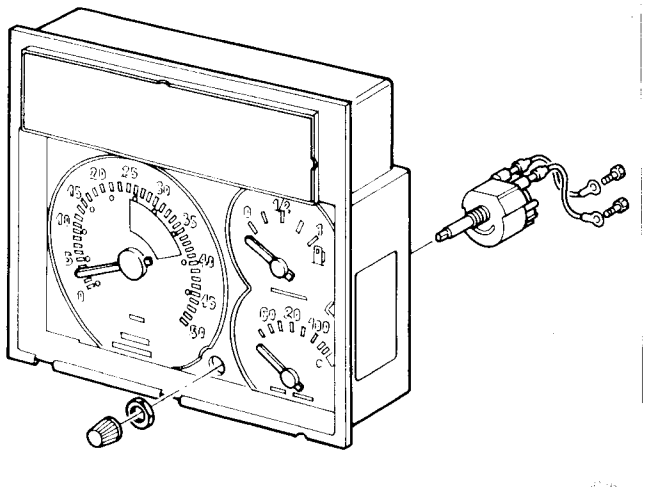
I.73 INSTRUMENT FIXING PROCEDURE
A. ENGINE COOLANT GAUGE B. FUEL LEVEL INDICATOR
C. ELECTRONIC REV COUNTER



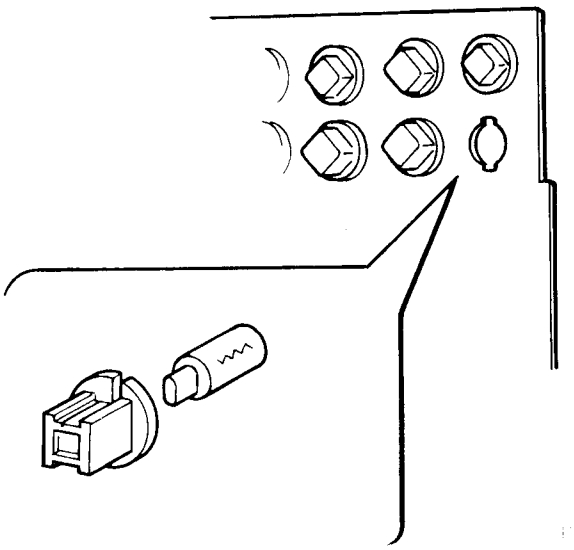
I.74 REMOVING ELECTRONIC REV COUNTER



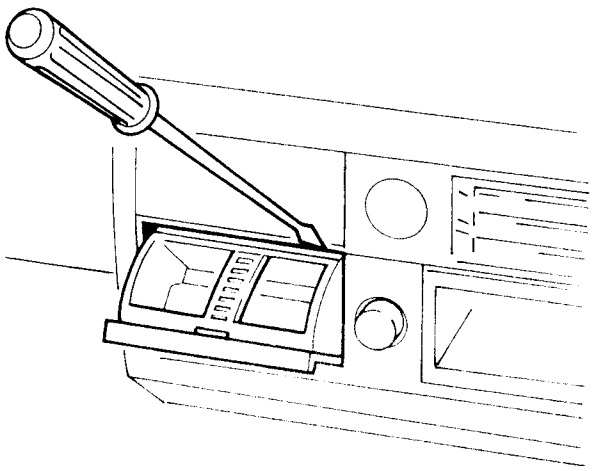
I.75 REMOVING ENGINE COOLANT GAUGE AND FUEL LEVEL INDICATOR



I.76 REMOVING INSTRUMENT LIGHT RHEOSTAT



I.77 REPLACING WARNING LAMP BULBS



I.78 REMOVING ASHTRAY ASSEMBLY

Instrument light rheostat

Proceed as follows to replace the intrument light rheostat (fig. I.76):

- Remove the combined module.
  Remove the rheostat knob.
  Remove instrument protection plates.
- Unscrew rheostat ring nut.
- Working from the module's rear end, disconnect electrical connection lines and withdraw the rheostat.

Reassemble the unit by reversing the above steps.

Warning lamps

Warning lamps are of the all-glass 12V 2W type.

Proceed as follows to replace them:

- Remove the combined module.
- Working from the module's rear end, turn the bayonet-coupling warning lamp connector until it is possible to remove it (fig. I.77).

The block is electrically connected to the system via a tinned seat included in its printed circuit.

Reassemble the unit by reversing the above steps.

Ashtray assembly

Proceed as follows to replace the ashtray (fig. I.78):

  Use a screwdriver to work on both tabs (not visible from the ashtray outside).
- Gently prize the ashtray off its seat taking care not to break its light pipe.

Steering column switch

To remove the steering column switch perform the following operations:

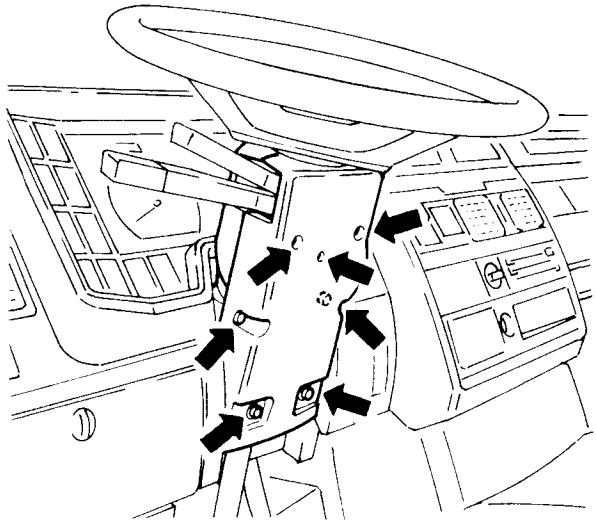
Remove the steering wheel.

Undo the seven screws fixing steering column shrouds (fig. I.79);

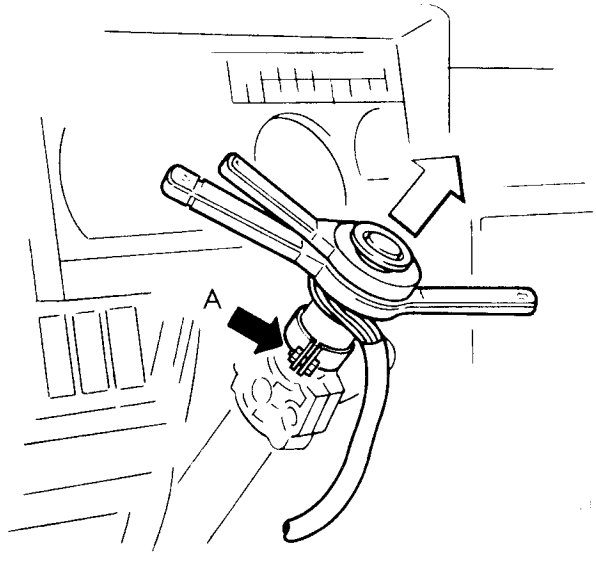
Disconnect junction blocks connecting steering column switch to C.I.U.

Unscrew the clamp fixing nut and remove the clamp (fig. I.80).

Reassemble the unit by reversing the above steps.



I.79 REMOVING STEERING COLUMN SHROUDS



I.80 REMOVING STEERING COLUMN SWITCH
A. CLAMP

Power window motor

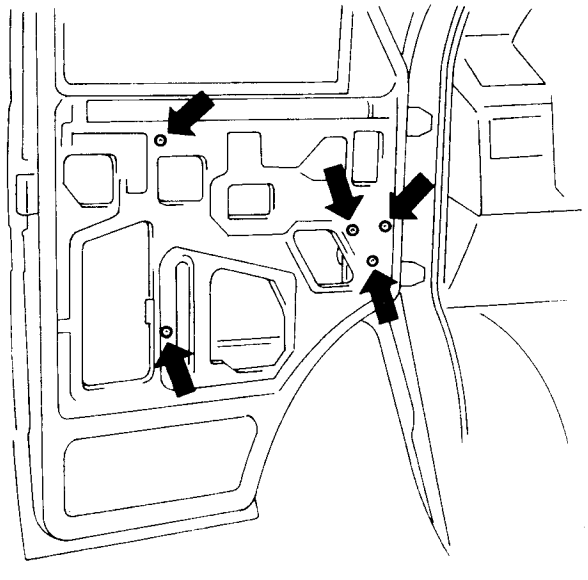
To remove the power window motor perform the following operations:

Remove the door lining panel.

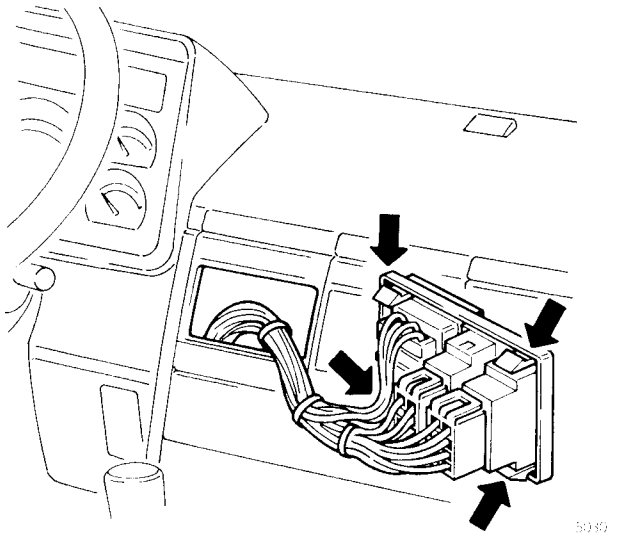
Disconnect junction block from power window motor.

Undo the five screws shown in fig. I.81.

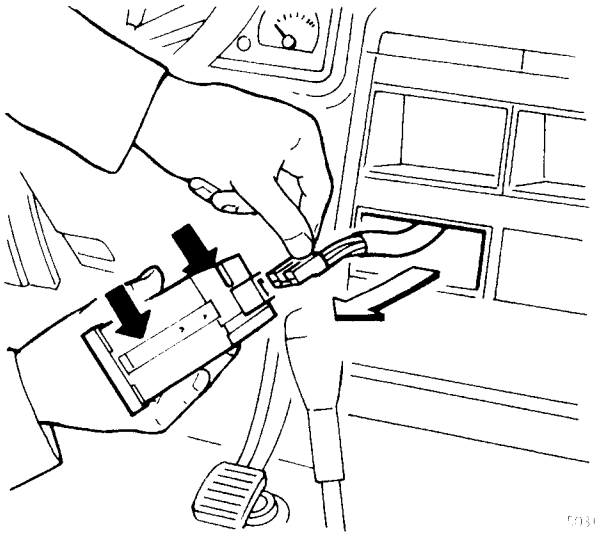
Reassemble the unit by reversing the above steps.



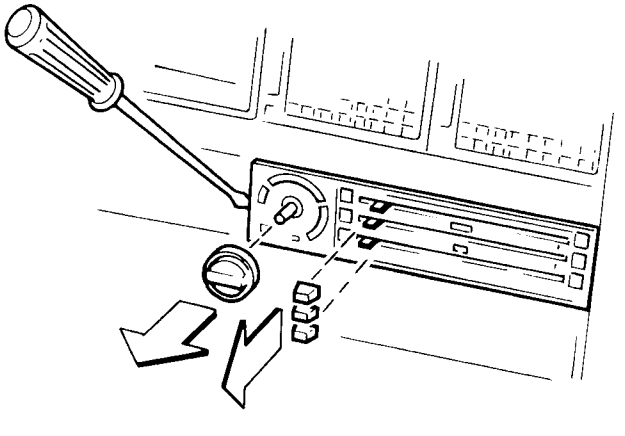
I.81 REMOVING LEFT POWER WINDOW MOTOR



I.82 REMOVING POWER WINDOW AND EXTERNAL MIRROR SWITCH PROTECTION PLATES



I.83 REMOVING IVECO CONTROL DISPLAY PANEL. ARROWS SHOW THE TWO SPRINGS SECURING THE COMPONENT TO THE DASHBOARD



I.84 REMOVING THE ELECTRIC HEATER CONTROL UNIT ESCUTCHEON PLATE

Power window and external adjustable mirror switches

You may follow either one of the procedures described below to remove these switches:

- 1) Use the tip of a screwdriver to remove the plug covering one of the empty compartments (designed to house an optional extra not yet installed) and push the desired component off its seat through this opening.

  2) Use a screwdriver to remove the protection plate onto which switches are assembled. To do so, prize the plate off the four tabs securing it to the central instrument panel (fig. I.82).

Reassemble the unit by reversing the above steps.

IVECO Control

Perform the following operations to remove the IVECO Control panel:

- Remove the protection plate onto which power window and adjustable mirror switches are assembled.
- Press the IVECO Control display panel off its seat through this opening (fig. I.83)

Reassemble the unit by reversing the above steps.

Electric heater control unit

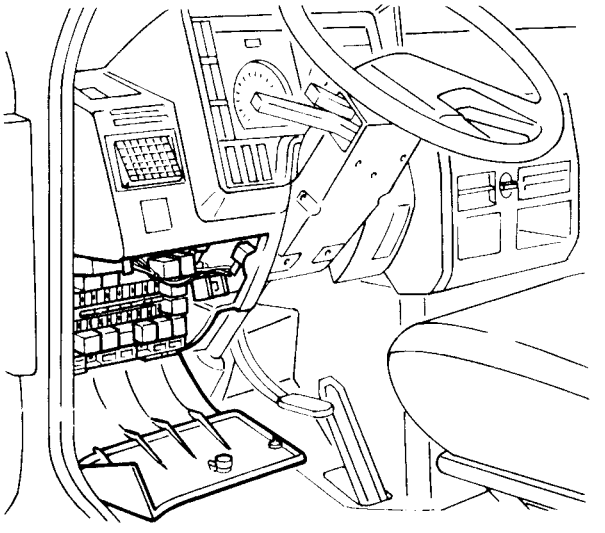
Perform the following operations to gain access to electric heater microswitch:

- Withdraw the speed selection knob and the three air control lever buttons. Then remove the central panel escutcheon plate (fig. I.84).
- Unscrew the four electric heater fixing screws.

Reassemble the unit by reversing the above steps.

Central Interconecting Unit (C.I.U.)

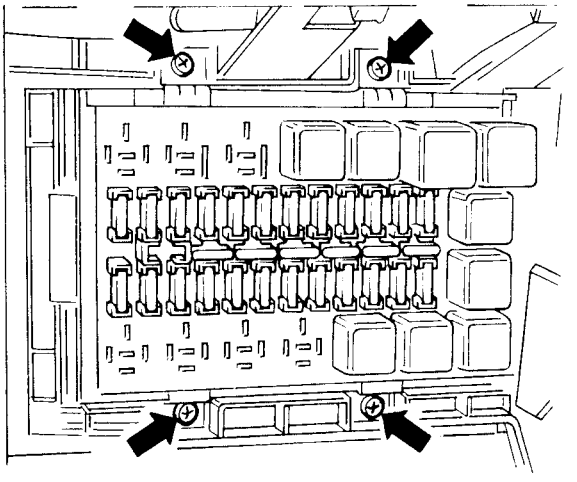
To gain access to the C.I.U. compartment open the door located to the dashboard left bottom side (fig. I.85).



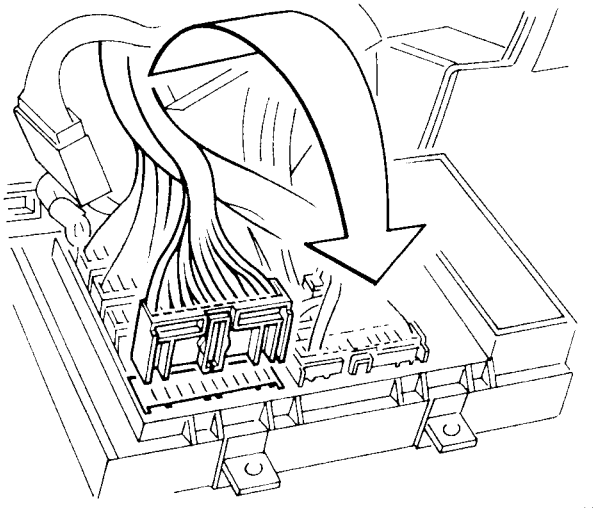
I.85 C.I.U. LOCATION

Access to junction blocks connecting C.I.U. to cab, engine,steering column switch, ABS (optional extra) cable looms is gained by loosening the four fixing screws (fig. I.86) and turning the C.I.U. outwards.

NOTE. Turn the C.I.U. on its mounting pin gently to avoid disconnecting cables from junction blocks.



I.86 C.I.U. FIXING SCREWS



I.87 CONNECTION BETWEEN C.I.U. AND ONE OF THE HOOD LOOM JUNCTION BLOCKS

Internal lighting

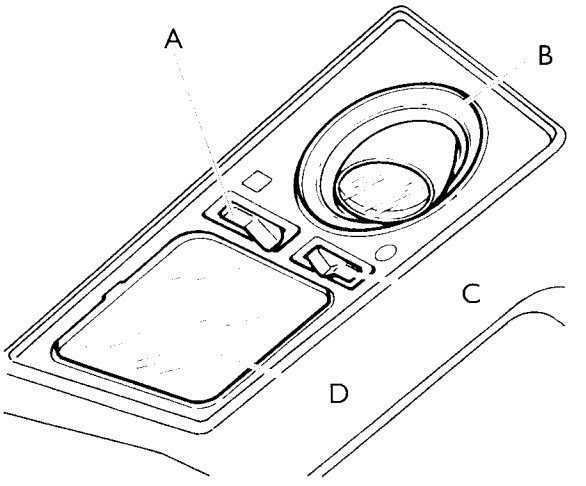
Internal lighting is provided by a central ceiling lamp. The lamp is either turned on whenever doors are opened via appropriate switches installed on door posts or through a switch assembled on the same ceiling lamp (I.91 ref. A).

The ceiling lamp is fitted with two 12V 10W cylindrical bulbs. To replace the bulb, use a screwdriver to remove the lens (fig. I.91 ref D).

A swivel spotlight fitted with a 4W bulb is also available. It can be turned on/off via another switch fitted to the ceiling lamp unit (fig. I.91 ref. C). To gain access to the bulb presslightly on the ring locking the swivel spotlight and then turn it counterclockwise (fig. I.91 ref. B).

The ceiling lamp and swivel spotlight unit is secured to the roof by means of two screws. Remove the lens to gain access to these screws.

For more information on interior lighting refer to page I.47 (bus version) and page I.50 (van version).



I.91 CEILING LAMP AND SWIVEL SPOTLIGHT UNIT
A. CEILING LAMP SWITCH B. SPOTLIGHT LOCKING RING
C. SPOTLIGHT SWITCH D. LENS

Headlight aiming control switch

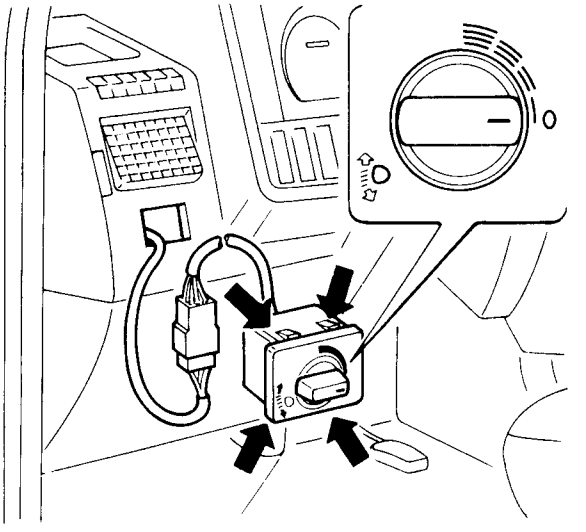
Headlights can be fitted with a light beam control system that adjusts the light beam in the vertical direction. The system is enabled via an appropriate switch.

The system is designed to adjust the light beam to the vehicle's load.

The switch is located between the air outlet and the C.I.U. compartment door. It can be removed as follows:

- Use a screwdriver to press lightly on each of the four latches securing the switch to the dashboard (fig. I.92).
- Pull out the switch and disconnect the junction block.

Reassemble the unit by reversing the above steps.



I.92 REMOVING HEADLIGHT AIMING CONTROL SWITCH

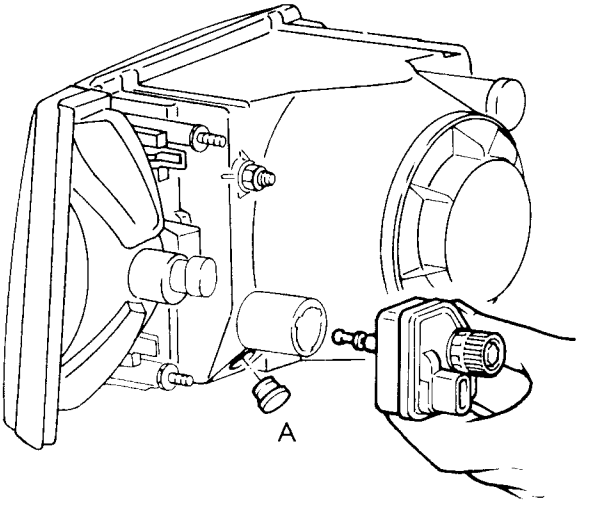
Headlight aiming control actuator

Carry out the following operations to remove this device:

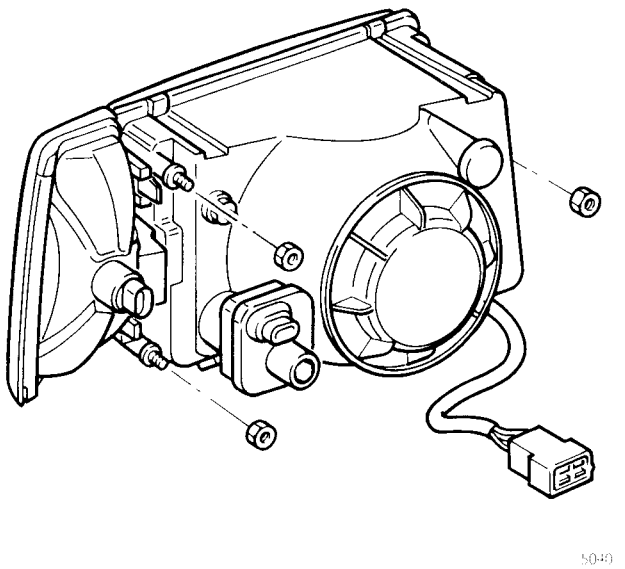
- Disconnect the the junction block.
- Turn the actuator counterclockwise (lh headlight) or clockwise (rh headlight).
- Turn the actuator counterclockwise until it is fully removed from its seat (complete protrusion of its pin from the headlight should be observed).

Perform the following reassembling operations:

- Remove the headlight rubber plug (fig. I.93 ref. A) and fit a screwdriver through this opening to stop the actuator pin seat.
- Fit the actuator into the appropriate headlight opening and push the actuator pin into its seat.
- Turn the actuator clockwise (lh headlight) or counterclockwise (rh headlight) until it engages with the headlight.
- Refit the rubber plug.



I.93 REMOVING HEADLIGHT AIMING CONTROL ACTUATOR



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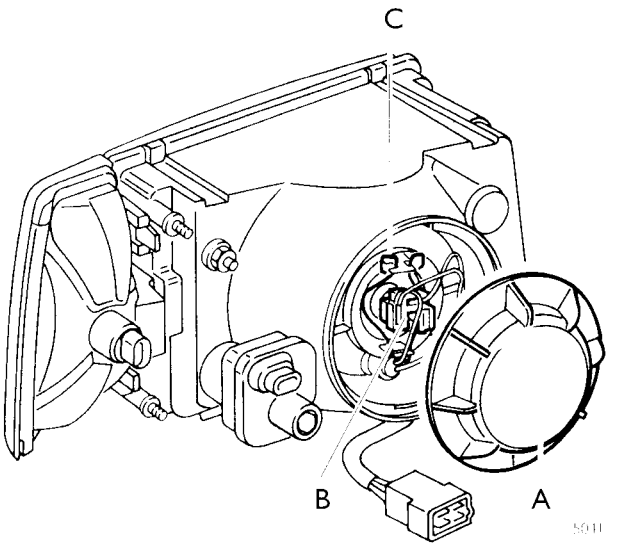
I.94 REMOVING LEFT HAND HEADLIGHT



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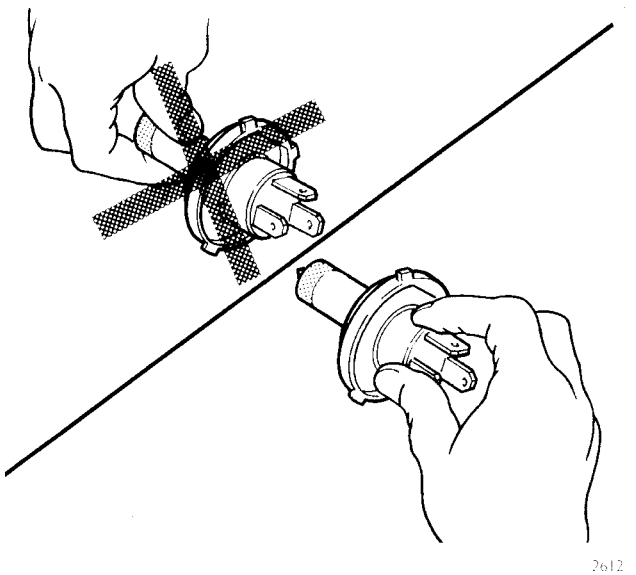
I.95 LAMP REPLACEMENT
A. COVER B. CONNECTOR C. RETAINING SPRING



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I.96 REPLACING H4 HALOGEN LAMP

External lighting

The external lighting system consists of the the following components:

- high/low beam lights with built-in parking lights
  fog lamps (optional extra)
  front turn signal lights
- turn signal side repeaters
- front and side marker lights (the van version has prearrangement for side marker lights)
  number plate lights
- tail headlight cluster (parking, turn signal, stop, reverse, rear fog lights)

Chapter V : External lighting
Chapter VI: Signals

High/low beam light with built–in parking light

To remove the headlight disconnect electrical lines to the front headlight cluster and unscrew the three nuts fastening the unit to the vehicle front (fig. I.94).

To gain access to bulbs turn headlight cover counterclokwise (fig. I.95 ref. A). To replace high/low beam lamps disconnect the junction block (fig. I.95 ref. B) and remove the retaining clip (fig. I.95 ref. C).

Reassemble the unit by reversing the above steps.

Halogen lamps should be handled with care and the quartz should not be touched as this could endanger the efficiency of the lamp (fig. I.96).

Front turn signal light

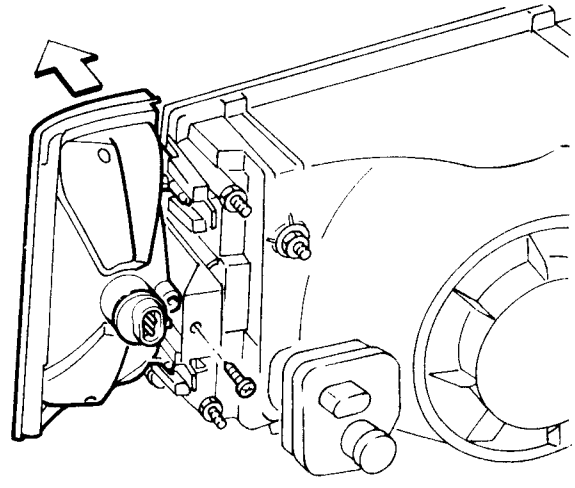
Proceed as follows to remove the headlight:

Disconnect the junction block.

Undo the fixing screw and detach the lamp from the headlight cluster (fig. I.97).

To gain access to the bulb undo the two screws fastening the lens to the headlight body.

Reassemble the unit by reversing the above steps.



I.97 REMOVING FRONT TURN SIGNAL LIGHT

Turn signal side repeater

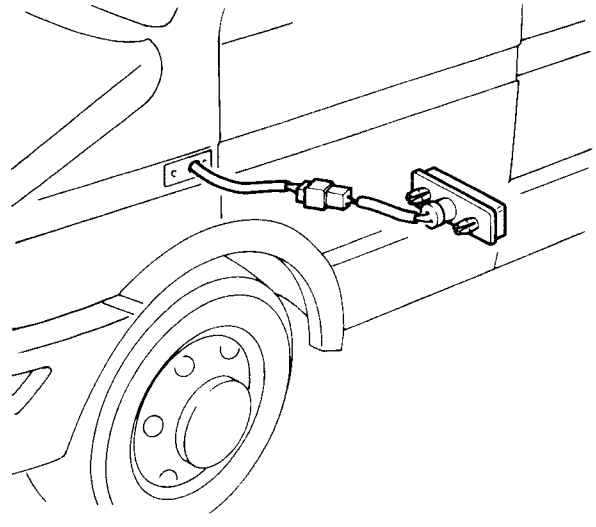
Proceed as follows to remove the headlamp (fig. I.98):

Disconnect the junction block.

Prize the headlight off the pressure clutches fastening it to the vehicle body.

Separate the lamp socket from the headlight unit to gain access to the bulb.

Reassemble the unit by reversing the above steps.



I.98 REMOVING TURN SIGNAL SIDE REPEATER

Fog lamp

Proceed as follows to remove the fog lamp:

Disconnect the junction block.

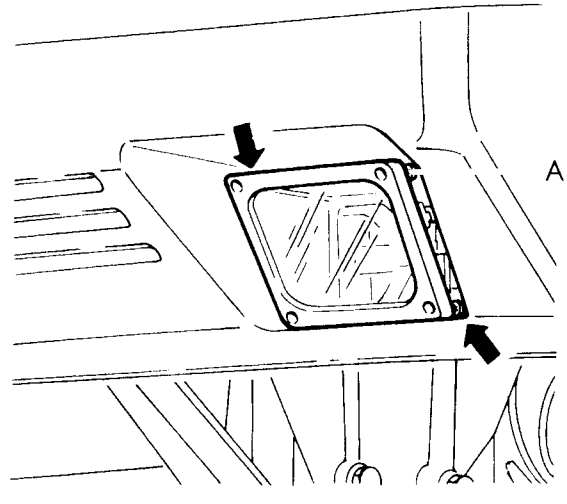
Undo the two fixing screws (arrows fig. I.99).

To gain access to the lamp undo the four screws fastening the cover fitted with a connector block to the headlight body and withdraw the retaining spring.

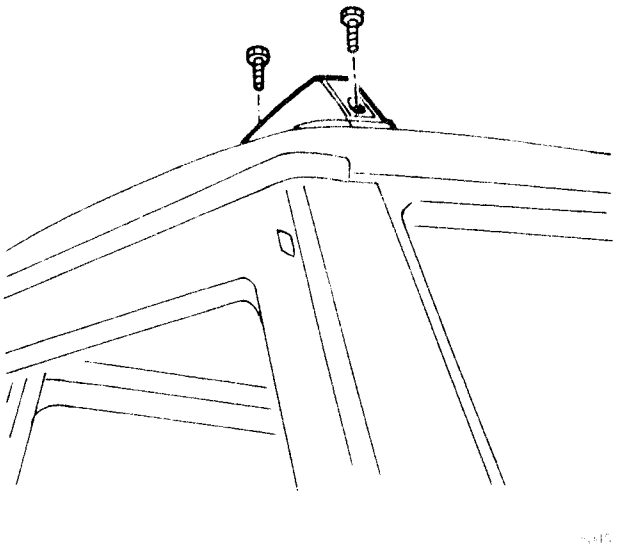
Reassemble the unit by reversing the above steps.

While reassembling the new lamp avoid touching its quartz bulb as this could endanger the efficiency of the lamp.

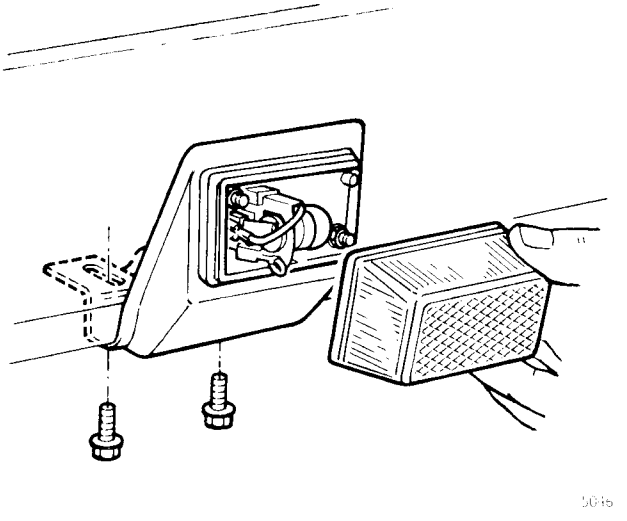
Turn in or out screw A (fig. I.99) as required to aim the light beam correctly.



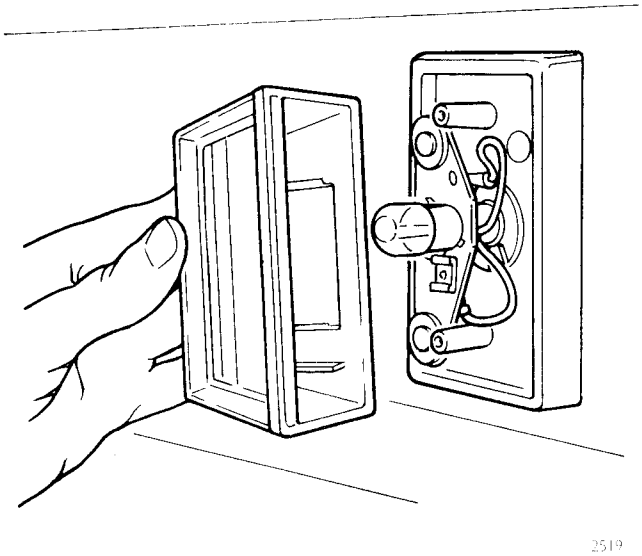
I.99 REMOVING FOG LAMP
A. LIGHT BEAM AIMING SCREW



I.100 REMOVING FRONT MARKER LIGHT



I.101 REMOVING SIDE MARKER LIGHT



I.102 NUMBER PLATE LIGHT

Front marker light

Proceed as follows to remove the front marker light:

- Loosen both screws securing the headlight to the vehicle body (fig. I.100).
- Remove the lens to gain access to the bulb.

Reassemble the unit by reversing the above steps.

Side marker light

Side marker lights are assembled on the van version. They are located on the bottom side of the vehicle's side panels and are fitted onto suitable mounting brackets.

To remove the side marker light perform the following operations:

- Disconnect the junction block.
- Undo both mounting bracket fixing bolts (fig. I.101).

Remove the lens to gain access to the bulb.

Reassemble the unit by reversing the above steps.

Number plate light

Truck version: proceed as follows to remove the lamp.

- Disconnect the junction block.
- Loosen both nuts fastening the headlight to the antitelescoping device.

Proceed as follows to gain access to the headlight bulb (fig. I.102):

- Loosen both screws securing the lens to the headlight body.
- Replace the bulb.

Ressemble the unit by reversing the above steps.

Refer to page I.50 for information on number plate lights relative to van and bus versions.

Tail headlight cluster

Proceed as follows to remove this component:

- Disconnect junction blocks.
- Undo the four nuts fixing the headlight to its mounting frame. Remove the headlight.

To gain access to the headlight cluster lamps:

- undo screws fastening the lens to the headlight body (fig. I.103).

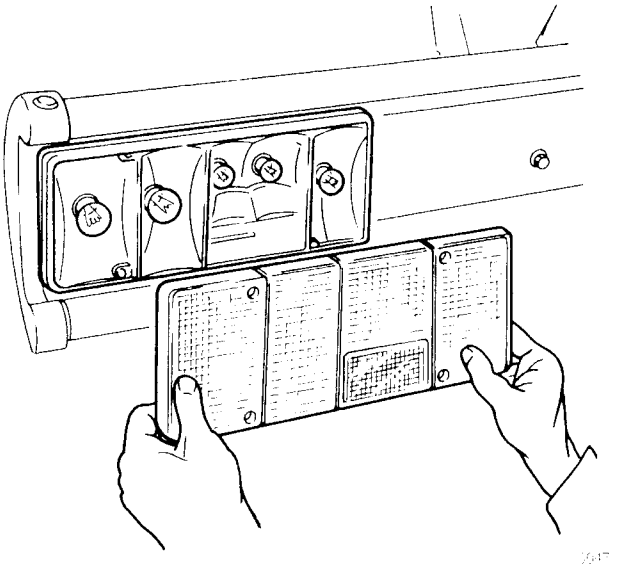
Reassemble the unit by reversing the above steps.

All lamps are fitted with a standard bayonet coupling device.

Lamps are arranged in the following way:
(left headlight: from left to right – right headlight: from right to left)

- turn signal lamp
- stop lamp
- parking lamp
- rear fog, lh headlight lamp
- reversing, rh headlight lamp

Refer to page I.50 for information on tail headlight cluster installed on van/bus versions.



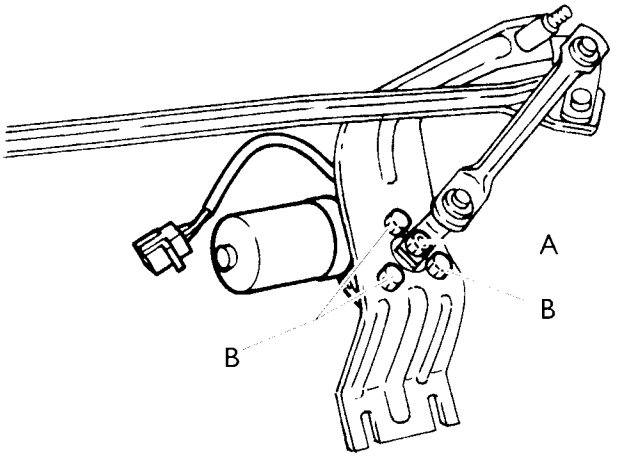
I.103 REMOVING TAIL HEADLIGHT CLUSTER LENS

Windscreen wiper motor

Proceed as follows to replace windscreen wiper motor:

- Disconnect motor junction block.
- Unscrew the nut fastening motor to linkage (fig. I.104 ref. A).
- Unscrew the three three motor fixing bolts. Remove the motor (fig. I.104 ref. B).

Reassemble the unit by reversing the above steps.



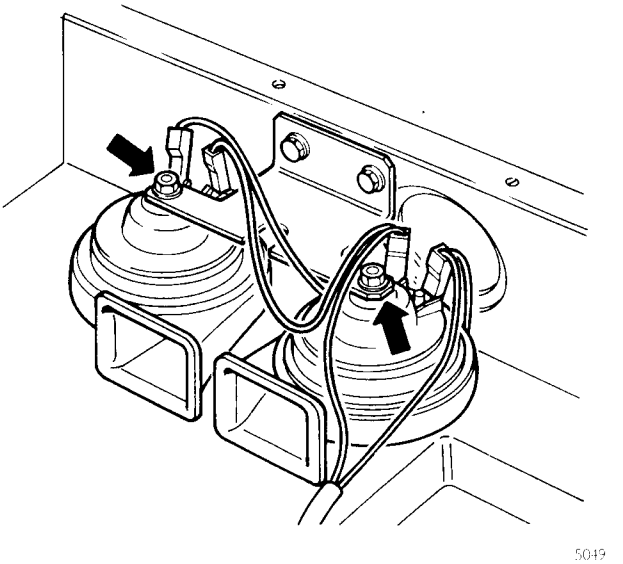
I.104 REMOVING WINDSCREEN WIPER MOTOR

Horns

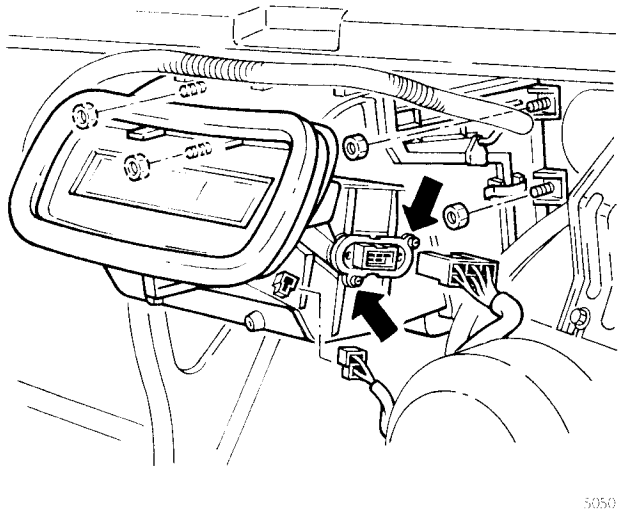
Horns are assembled on the chassis frame under the power steering fluid reservoir. Proceed as follows to remove horn(s):

- Disconnect junction block(s).
- Undo the nut securing the horn to its mounting bracket (fig. I.105).

Reassemble the unit by reversing the above steps.



I.105 REMOVING HORNS



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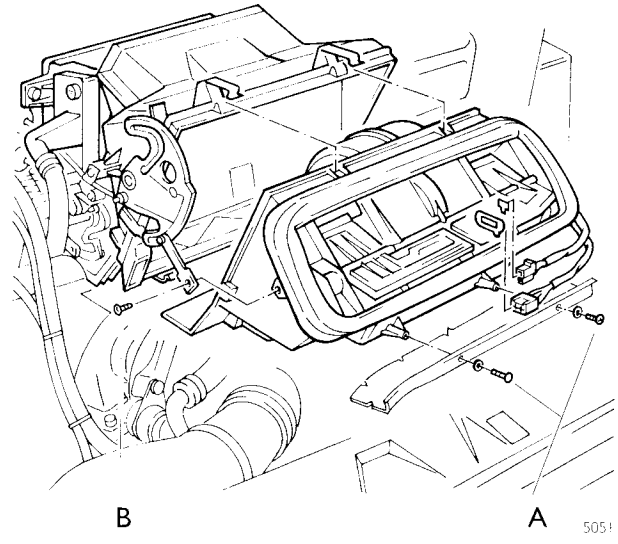
I.106 REMOVING ELECTRIC HEATER AND RESISTOR UNIT



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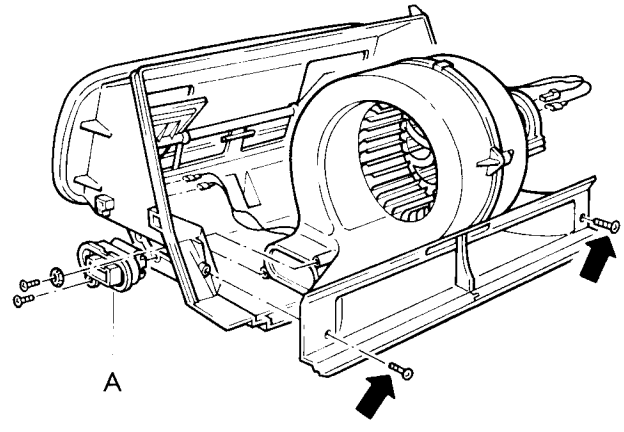
I.107 REMOVING ELECTROFAN SUPPORT



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I.108 REMOVING ELECTROFAN

Electric heater

Carry out the following operations to remove the electric heater (fig. I.106):

- Drain the engine cooling system.
- Loosen clamps and disconnect engine coolant delivery pipes.
- Disconnect air flow drive rods. To do so, press springs and undo screws fastening rods to electric heater.
- Disconnect electric heater junction blocks.
- Undo both screws fastening heat shield to electric heater (fig. I.107 ref. A).
- Remove the four nuts fastening electric heater to vehicle body.

The resistor unit controls the speed of the electric heater motor. To gain access to the restor unit, disconnect the junction block and remove both screws shown in fig. I.106.

Reassemble the unit by reversing the above steps.

Carry out the following operations to gain access to the electric heater inner wiring system:

- Disconnect electric heater junction blocks.
- Loosen the screw fixing the air flow outlet door control lever to the electric heater section housing the fan (fig. I.107 ref. B).
- Remove retaining spring securing electrofan unit to electric heater.
- Remove the resistor unit (fig. I.108 ref. A).
- Loosen both screws (arrows fig. I.108) and remove the fan. Avoid damaging internal wiring.
- Disconnect electrofan junction blocks.

Reassemble the unit by reversing the above steps.

Bus version

The bus version described in this manual also applies to school buses and City Daily/Turbodaily vehicles. The latter vehicle type is equipped with smaller rear tyres compared to other bus versions to enable thorough use of the loading platform. Contrary to buses and school buses, City Daily/Turbodaily vehicles are used exclusively for goods freight.

The bus version is equipped with the following components and relevant wiring (not assembled on the truck version):

- general current relay (bus/school bus)
- emergency circuit (bus/school bus)
- swing–sliding door
- interior lighting

GCR (General Current Relay) – Operation

Energizing of the GCR (terminal 86 of its coil) is through connection of unsteady switch 53023 (fig. I.109 ref. B) assembled on the dashboard central panel. Terminals 30 and 85 of the GCR are connected to one another and are directly powerd by the battery positive cable. Terminal 87 supplies battery positive, ignition switch and the entire wiring system.

To disconnect the GCR turn the ignition switch to STOP position and either operate the safety unit switch 52029 (fig. I.109 ref. A) on the centre instrument panel or the GCR opening switch 53009 (close to the GCR). This way, no energizing order reaches relay 25202 whose purpose is to supply earth for terminal 86 of the GCR coil.

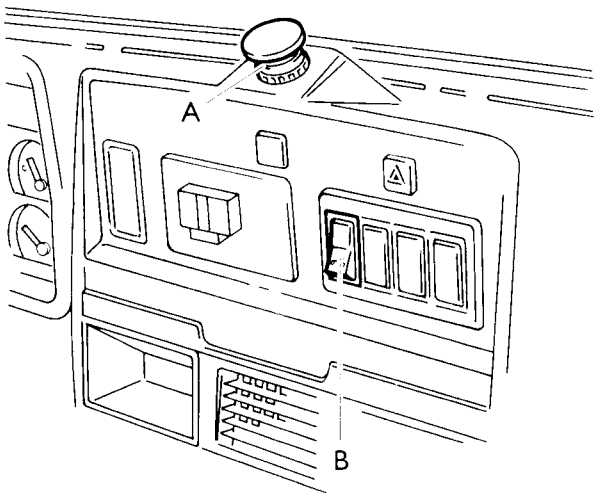
Removing GCR and GCR opening switch

The GCR (fig. I.111 ref. A) is positioned close to the windscreen wiper fluid tank. To remove the GCR carry out the following operations:

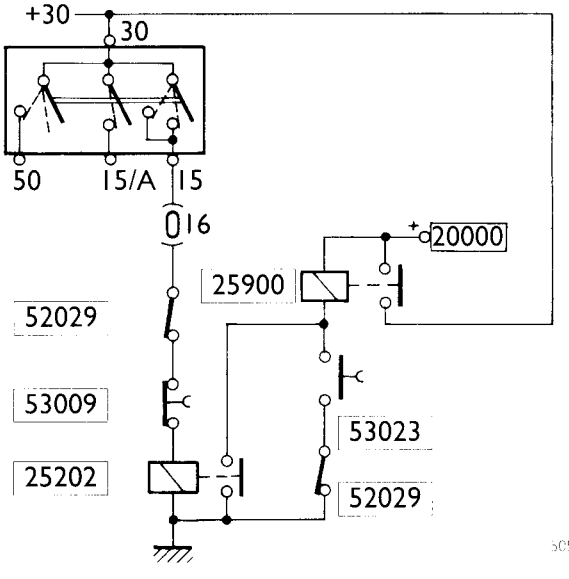
- Disconnect battery power cables.
- Disconnect coil–to–relay junction blocks. Loosen both power cable wire terminal fixing nuts.
- Loosen the four nuts fastening GCR to its mounting bracket.

To remove the GCR opening switch (fig. I.111 ref. B) disconnect the switch junction block and unscrew the ring nut from the GCR mounting bracket (fig. I.111 ref. C).

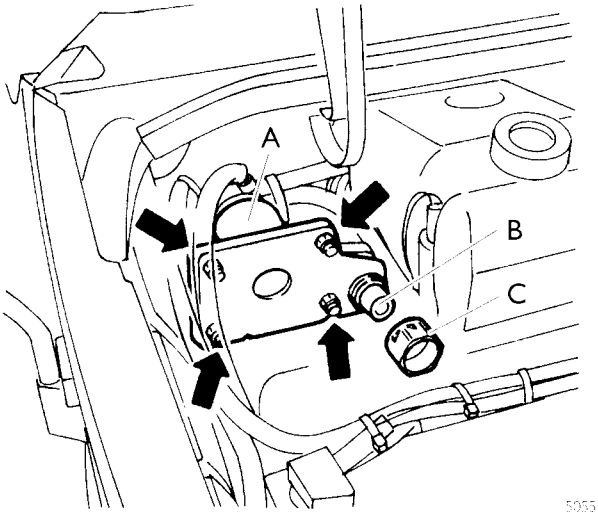
Reassemble the unit by reversing the above steps.



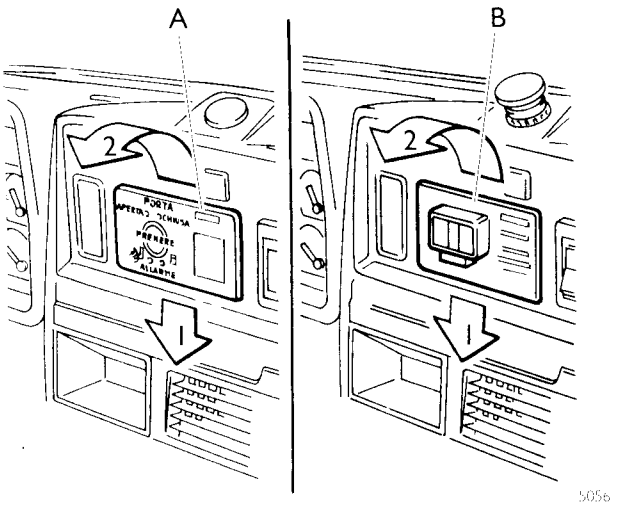
I.109 LOCATION OF SAFETY UNIT SWITCH AND GCR CLOSING SWITCH



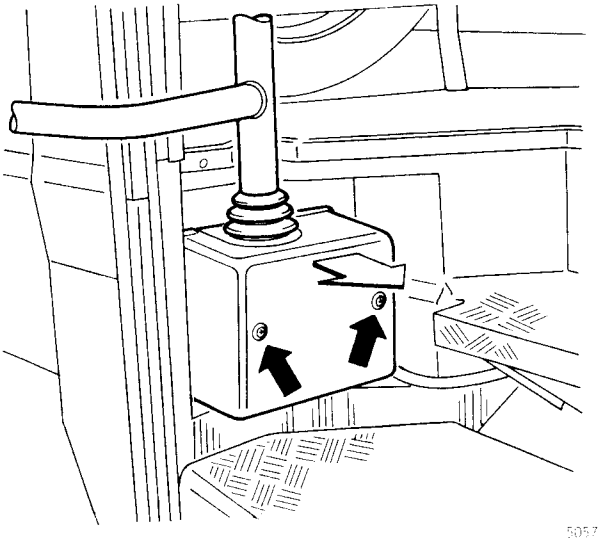
I.110 GCR STANDARD OPENING/CLOSING DIAGRAM



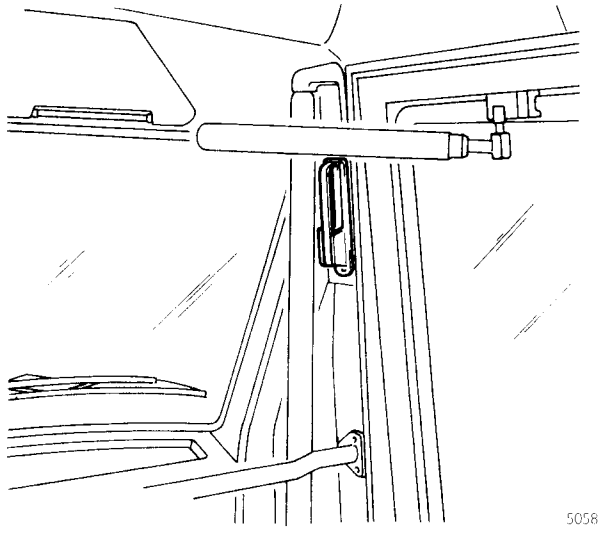
I.111 A. GCR (GENERAL CURRENT RELAY)
B. GCR OPENING SWITCH
C. SWITCH RING NUT



I.112 SWING SLIDING DOOR PUSHBUTTON STRIPS REMOVING SEQUENCE



I.113 REMOVING GEARMOTOR UNIT GUARD



I.114 EMERGENCY DOOR OPENING HANDLE (OPERABLE FROM THE INSIDE)

Swing–sliding door control device

The device consists of the following components:

- Pushbutton control strip
- Motor unit
- Swing sliding door drive shaft

Pushbutton control strip

On City Daily/Turbodaily and bus vehicles the pushbutton strip (fig. I.112 ref. A) is fitted with a control pushbutton, four leds and a sound warning signal.

The red led illuminates whenever the door opens and remains so until the door is perfectly closed.

The green led only illuminates when the door is thoroughly closed.

The yellow led illuminates whwnever the manual opening door handle is operated.

The orange led illuminates when the antitheft device is in operation (optional extra). The latter two functions are also signalled via the sound warningsignal.

As regards the school bus version, the button strip (fig. I.112 ref. B) is equipped with two control pushbuttons: a red one for opening the door, a green one for closing it and a red warning lamp that illuminates when door opening is in progress. The lamp goes out as soon as the door is thoroughly closed. Furthermore, the pushbutton strip is fitted with a 20A fuse for protecting the swing sliding door circuit.

Motor unit and swing–sliding door drive shaft

The motor unit is made up of a plastic frame (plate on the school bus version) housing the gearmotor with the relevant wiring. To gain access to the motor loosen both screws shown in fig. I.113 and remove the frame.

The door drive shaft is positioned next to the door. The mechanism enabling the change of the motor's rotary motion into vertical motion is housed inside the shaft.

Such motion occurs during the door opening/closing stageswhenever the door windstrip meets with an obstacle or the door abuts against its housing.

In the first case, the shaft's vertical motion operates a microswitch that will reverse the door movement. In the second case, it enables correct fitting of the door in its seat thus ensuring perfect closing.

Swing–sliding door – Emergency opening from the inside

An emergency door unlocking system can be put into action in the event of a gearmotor or power failure. In this case the door can be opened via a red handle (fig. 1.114) located close to the door compartment on bus and City Daily/Turbodaily versions (close to the motor unit on school bus version).

Proceed as follows: operate the black lever positioned beside the motor unit while rotating the door supporting shaft until motor gears are again in mesh.

Swing–sliding door – Emergency opening from the outside

Bus and City Daily/Turbodaily vehicles are equipped with a red handle (fig. 1.115) that is positioned close to the wheelhouse.
During an emergency this handle can be pulled to open the vehicle door from the outside.

To restore normal operation of the system, follow direction given above concerning emergency door opening from the inside.

The red handle is also meant to prevent the door being opened from the outside, via a suitable key, while the vehicle is stationary. However, regardless of the fact the door is locked, it can still be unlocked from the inside.

If steps for unlocking the door using the appropriate key are not taken, this inconvenience will be signalled via the orange led and the sound signal as soon as the ignition switch is turned on.

Door locking device

City Daily/Turbodaily vehicles are fitted with a system for locking doors through a remote control device consisting essentially of a sender unit and an infrared receiver.

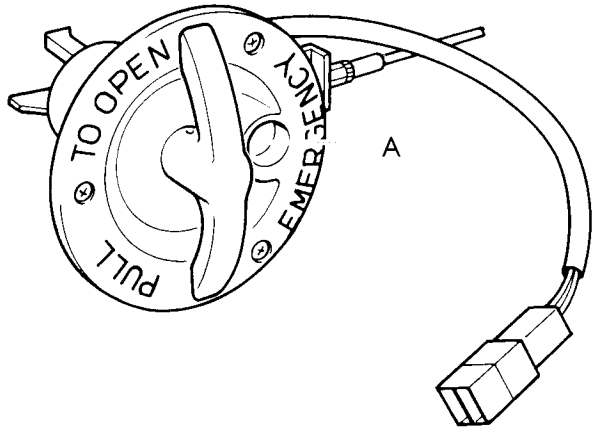
The sender unit includes (fig. 1.116):

- a control pushbutton
- a led for visulizing the signal delivered by the sender unit

The receiver includes (fig. 1.117):

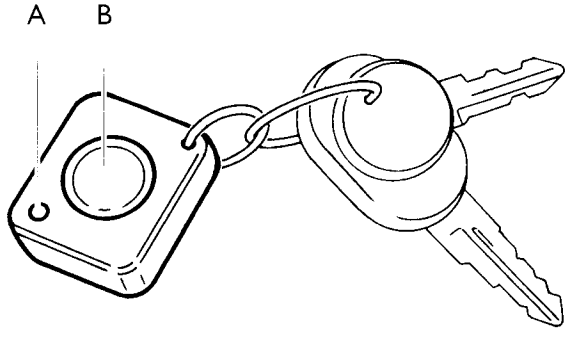
- a pushbutton for storing the code of the signal delivered by the sender unit
- a led for signalling reception of the signal
- a sensor for receiving the signal

To enable the door locking function operate the sender unit control button and aim the sender unit towards the infrared receiver located in the middle of the roof.



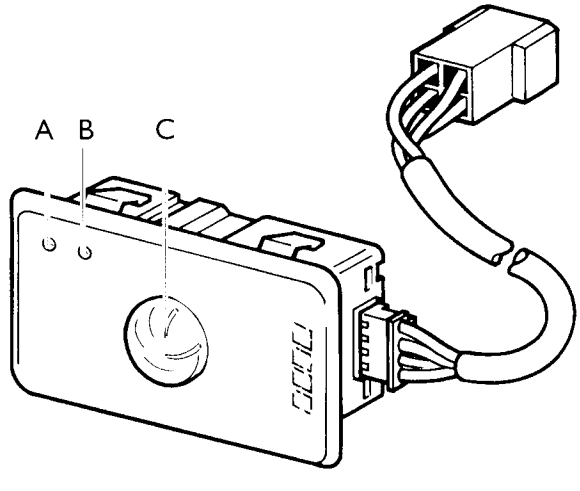
5059

1.115 HANDLE FOR EMERGENCY OPENING OF THE DOOR FROM THE OUTSIDE A. SWING-SLIDING DOOR KEY LOCK



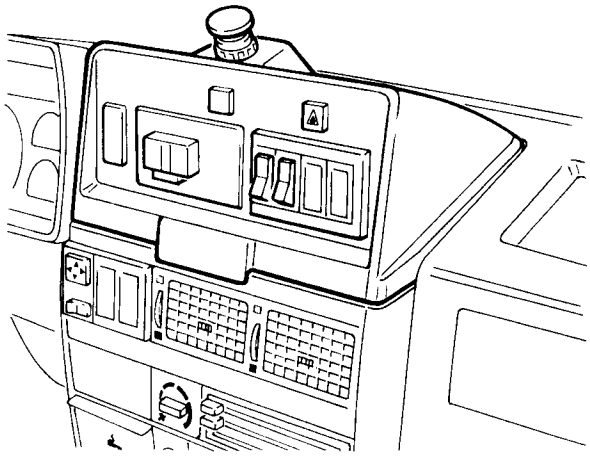
5060

1.116 SENDER UNIT A. LED B. CONTROL PUSHBUTTON



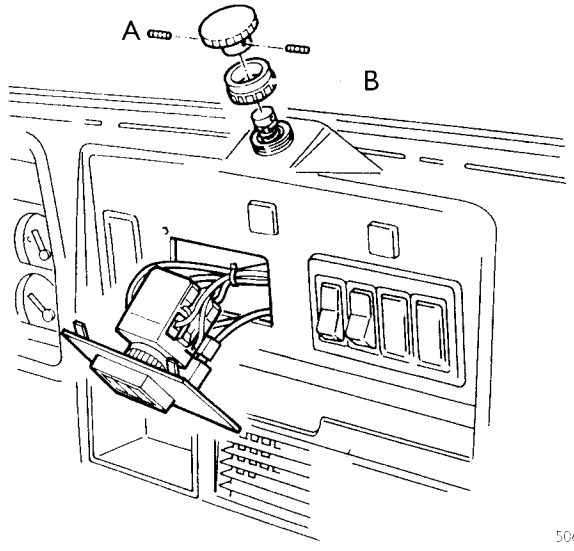
5061

1.117 INFRARED RECEIVER A. LED – B. PUSHBUTTON – C. SENSOR



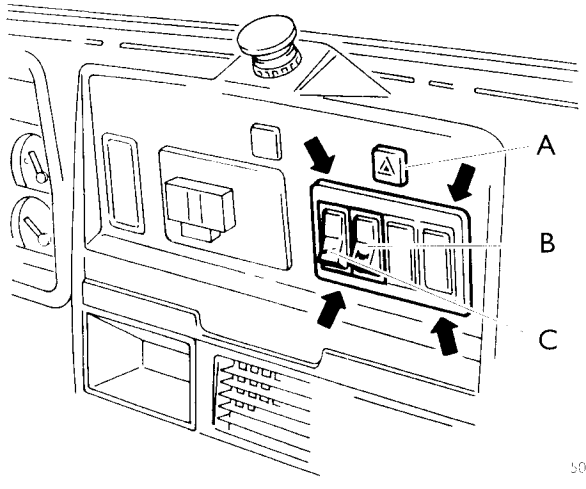
5062

I.118 CENTRAL INSTRUMENT PANEL - TOP CONSOLE (SCHOOL BUS VERSION)



5063

I.119 REMOVING SAFETY UNIT CONTROL SWITCH
A. THREADED DOWEL – B. RING NUT



5064

I.120 REMOVING WARNING LAMP AND SWITCHES
A. HAZARD LIGHTS ON WARNING LAMP
B. ELECTRIC/AIR HORN SWITCH
C. GCR CLOSING SWITCH

Top console

A console fitted on top of the centre instrument panel houses the following components:

- safety unit switch (bus/school bus)
- Telma retarder control device and associated warning lamp (optional extra)
- swing–sliding door pusbutton strip
- GCR closing switch (bus/school bus)
- electric/air horn switch
- hazard light warning lamp with built -in safety unit control switch (bus/school bus)

Safety unit control switch

Operation of this switch produces the following effects:

- engine stopping
- turning on of hazard lights
- turning on interior lighting
- GCR opening
- turning on of warning lamp for hazard lights on (fig.I.120 ref. A).

Perform the following operation to remove the safety unit switch:

- Remove the swing–sliding door pushbutton strip
- Unscrew both knob threaded dowels and ring nut securing the switch to the top console (fig. I.119 ref. A/B)
- Withdraw the switch through the button strip seat
- Disconnect both switch junction blocks.

Reassemble the unit by reversing the above steps.

Hazard lights on warning lamp and switches assembled on the top console

You may follow either one of the procedures described below to remove these components:

- 1) Use the tip of a screwdriver to remove the plug covering one of the empty compartments (designed to house an optional extra not yet installed) and push the desired component off its seat through this opening.
- 2) Use a screwdriver to remove the protection plate onto which switches are assembled. To do so, prize the plate off the four tabs securing it to the top console (fig. I.120).

Reassemble the unit by reversing the above steps.

Interior lighting

Interior lighting for the bus/school bus version includes the following components:

- driver's place ceiling lamp
- step light
- passengers door ceiling lamp
- normal/blue light interior ceiling lamp
- loading lamp

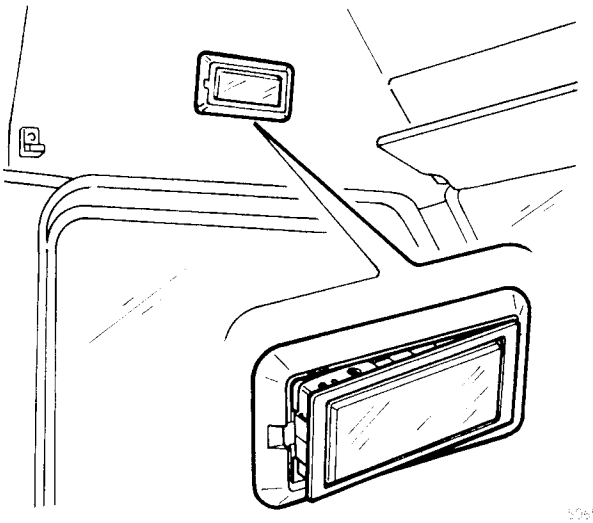
Driver's place ceiling lamp

Either opening of the driver's door or pressure applied to the lens sides enable ceiling lamp operation.

Perform the following operation to remove the ceiling lamp (fig. 1.121) and gain access to its bulb:

- Remove the lens by means of a screwdriver and replace the all–glass 10W 12V bulb.
- Loosen both screws fixing the ceiling lamp to the roof
- Disconnect ceiling lamp junction blocks

Reassemble the unit by reversing the above steps.



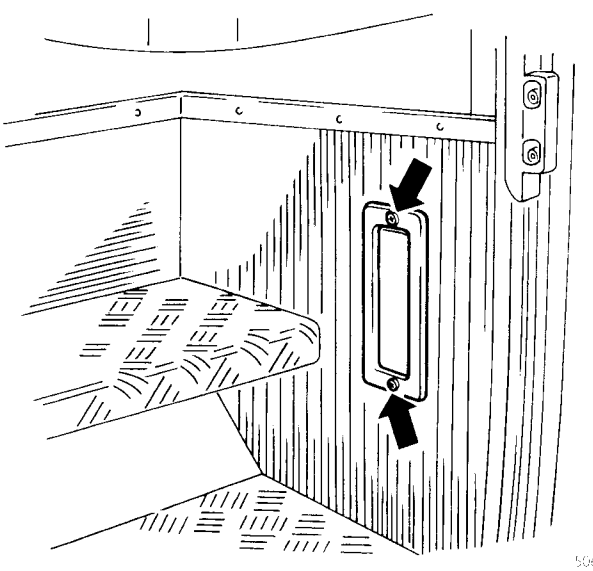
1.121 REMOVING LENS FROM DRIVER'S PLACE CEILING LAMP

Step light

The step light (fig. 1.122) is enabled through operation of the swing–sliding door.
Perform the following operations to remove it:

- Loosen both screws fixing the lamp to the vehicle body.
- Remove the lens and the lamp.
- Remove both screws positioned on the lamp rear and disconnect lamp cables.

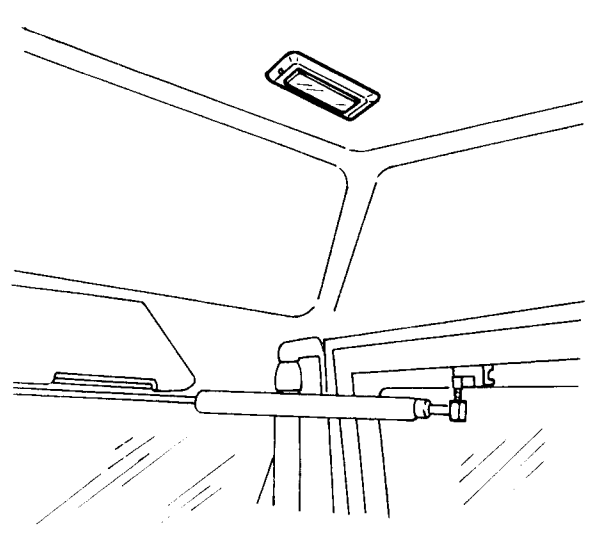
Reassemble the unit by reversing the above steps.



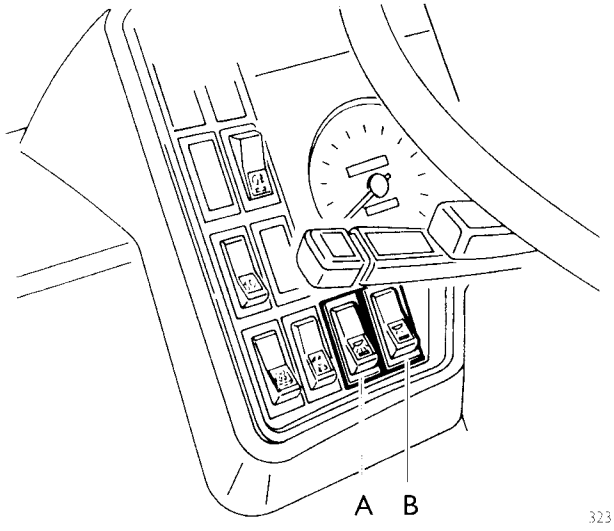
1.122 STEP LIGHT

Passengers door ceiling lamp

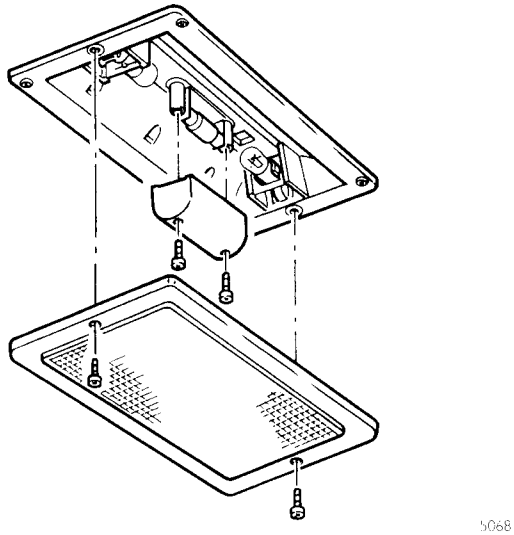
This ceiling lamp (fig. 1.123) is also enabled through operation of the swing sliding door. Follow directions given for driver's place light to remove the lamp and gain access to its bulb.



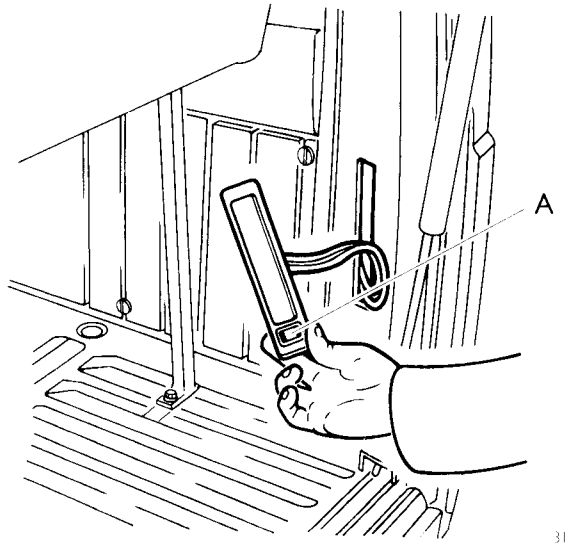
1.123 PASSENGERS DOOR CEILING LAMP



I.124 INTERIOR LIGHTING SWITCHES
A. NORMAL LIGHTS SWITCH - B. BLUE LIGHTS SWITCH



I.125 NORMAL/BLUE LIGHT CEILING LAMP



I.126 LOADING LAMP
A. SWITCH

Normal/blue light interior ceiling lamps (bus)

Lights are operated via two key switches (fig. I.124) located on the dashboard. Normal lights can also be switched on by operating the safety unit control switch.

Perform the following operations to remove the ceiling lamp (fig. I.125) and gain access to the bulbs:

- Loosen both screws fastening the lens to the ceiling lamp.
- Loosen both screws fastening the blue light lens to the ceiling lamp.
- Loosen the four screws fastening the ceiling lamp to the roof.
- Disconnect junction blocks.

Reassemble the unit by reversing the above steps.

Loading lamp (bus)

With reference to the vehicle running direction, the loading lamp is assembled in the bottom rh luggage compartment. It is fitted with a special switch.

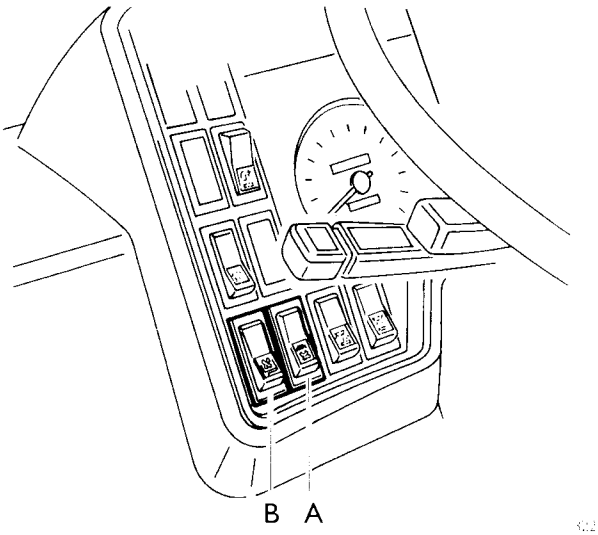
To replace the loading lamp (fig. I.126):

- Use a screwdriver inserted between the lamp rim and the vehicle body to prize the lamp off its seat gently.
- Disconnect junction blocks.

Reassemble the unit by reversing the above steps.

Air–conditioning system

In addition to the electric heater, bus/school bus vehicles are equipped with a further heating system and a foul air intake or ventilation system.
Such systems are enabled via two key switches (fig. I.127) assembled on the dashboard.
An auxiliary electric heater behind the driver's seat and an aerator located in the roof centre area are controlled by the key switches.



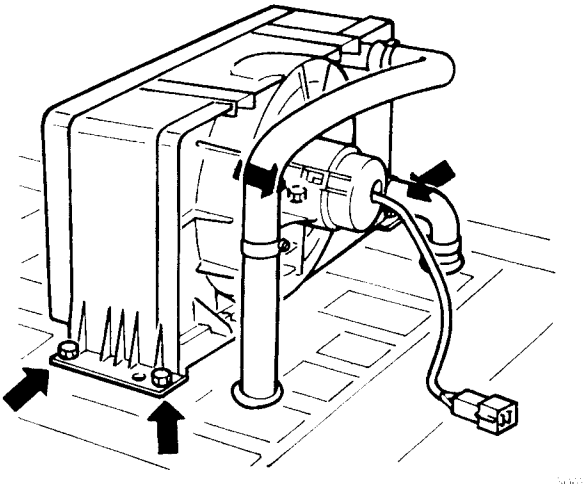
I.127 AIR–CONDITIONING SYSTEM SWITCHES
A. AERATOR SWITCH – B. INTERIOR HEATING SWITCH

Interior heating motor

Perform the following operations to remove the interior heating motor:

- Drain the engine cooling system.
- Disconnect motor junction block.
- Loosen clamps and disconnect engine coolant pipes.
- Unscrew the four bolts (fig. I.128) (two on each side) securing the motor to the vehicle floor.

Reassemble the unit by reversing the above steps.



I.128 INTERIOR HEATING MOTOR

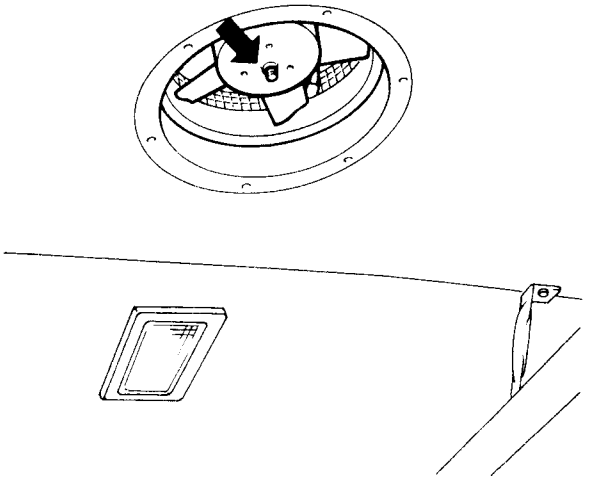
Aerator

The aerator is designed to expel the foul air and intake fresh air from the outside.

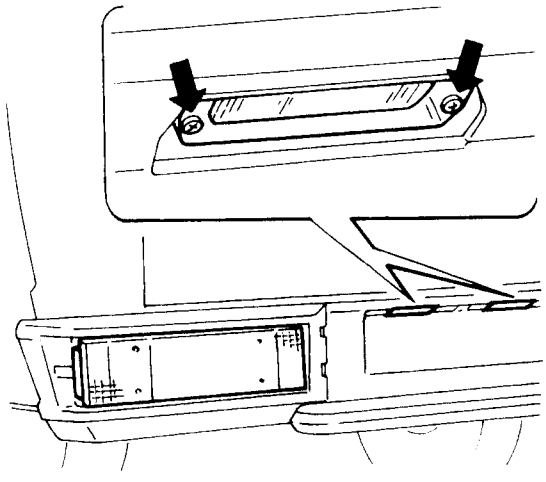
Proceed as follows to remove the aerator:

- Loosen the six screws fastening the air outlet to the roof.
- Loosen the fan fixing nut and remove the fan (fig. I.129).
- Disconnect aerator motor junction block.
- Remove screws fixing motor to aerator.

Reassemble the unit by reversing the above steps.



I.129 AERATOR



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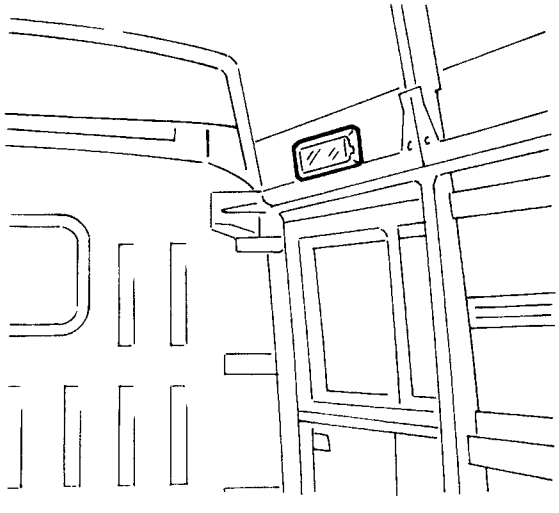
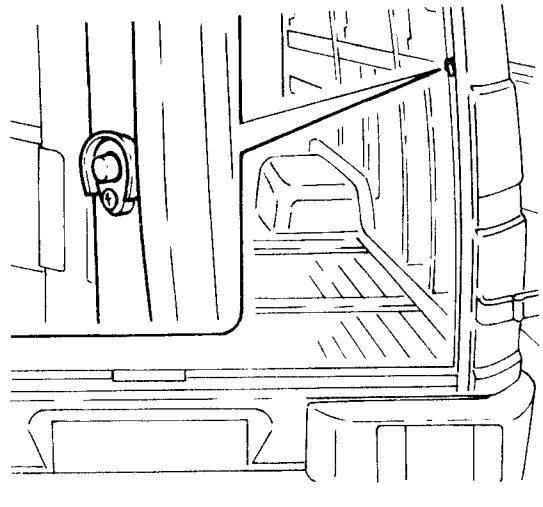
I.130 TAIL HEADLIGHT CLUSTER AND NUMBER PLATE LIGHT



5072

I.131 SIDE DOOR CEILING LAMP



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I.132 REAR DOOR CEILING LAMP PUSHBUTTON

Tail headlight cluster and number plate light

To gain access to tail headlight cluster lamps loosen the four screws fixing the lens to the headlight frame. The headlight is also fitted with a side lens that operates tail side marker lights whenever parking lights are switched on.

Lamps are arranged as follows:
(lh headlight: from left to right) – (rh headlight: from right to left)

- tail side marker light
- turn signal light
- stop light
- parking light
- rear fog light
- reversing light

Undo both screws fixing headlight to bumper to gain accees to the reversing light bulb (fig. I.130).

Above lights are also assembled on the van version.

Interior lighting (van)

In addition the centre ceiling lamp (page I.37) the interior lighting system of the van version also includes a ceiling lamp located on the side sliding door (fig. I.131) and another light fitted to the top of the rear double–door.

Both lights are either operated via a pushbutton (fig. I.132) assembled on the rear door post or by pressure applied to the ceiling lamp sides.

Access to the bulb is gained by removing the lens by means of a screwdriver.

4x4 Vehicles – Special functions and switch location

Front axle

Figure 1.134 shows location of the differential lock switch on the front axle.

Instead of the standard lever system, the alternative installation of a red switch (positioned on the instrument panel rh bottom side) for operating the front differential lock can be requested. The switch is designed to control the front differential lock unit assembled on the front section of the left longitudinal member.

Transfer case

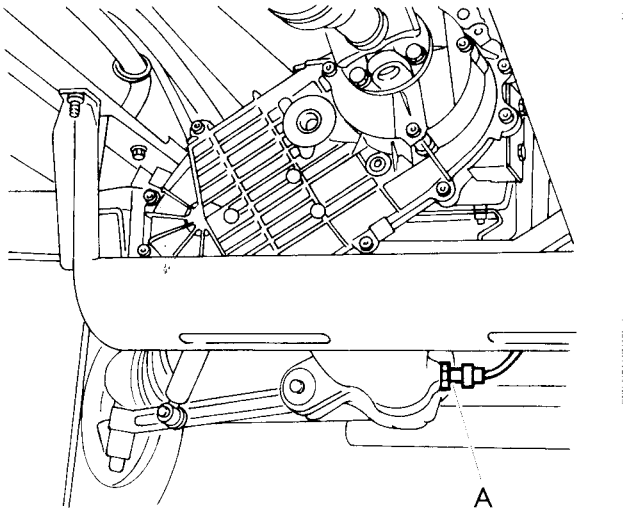
Figure 1.135 shows the location of the all–wheel drive switch.

Rear axle

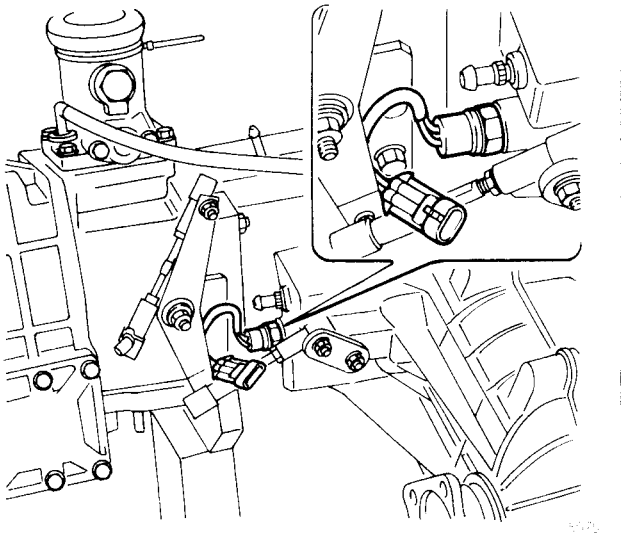
Figure 1.136 shows the rear axle. The detail highlights the position of the rear differential lock switch.

Cab

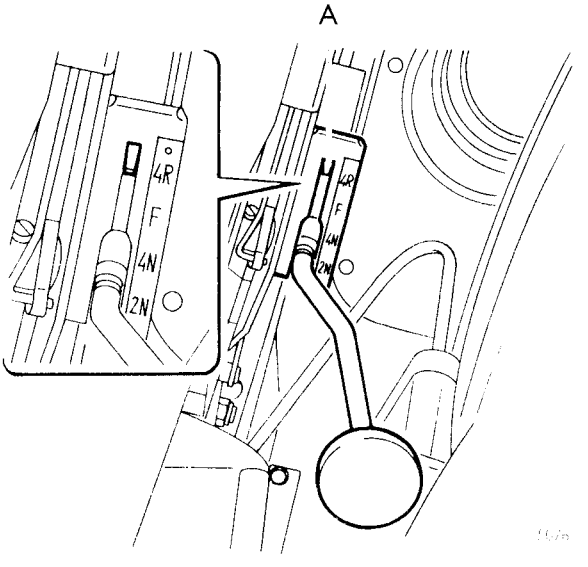
Figure 1.133 shows the splitter gear engagement lever. The detail highlights the position of splitter gears on signalling switch.



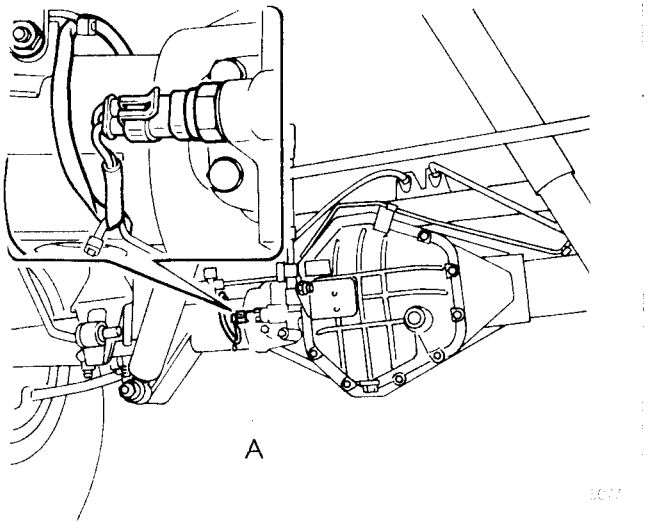
1.134 FRONT AXLE
A. FRONT DIFFERENTIAL LOCK SWITCH



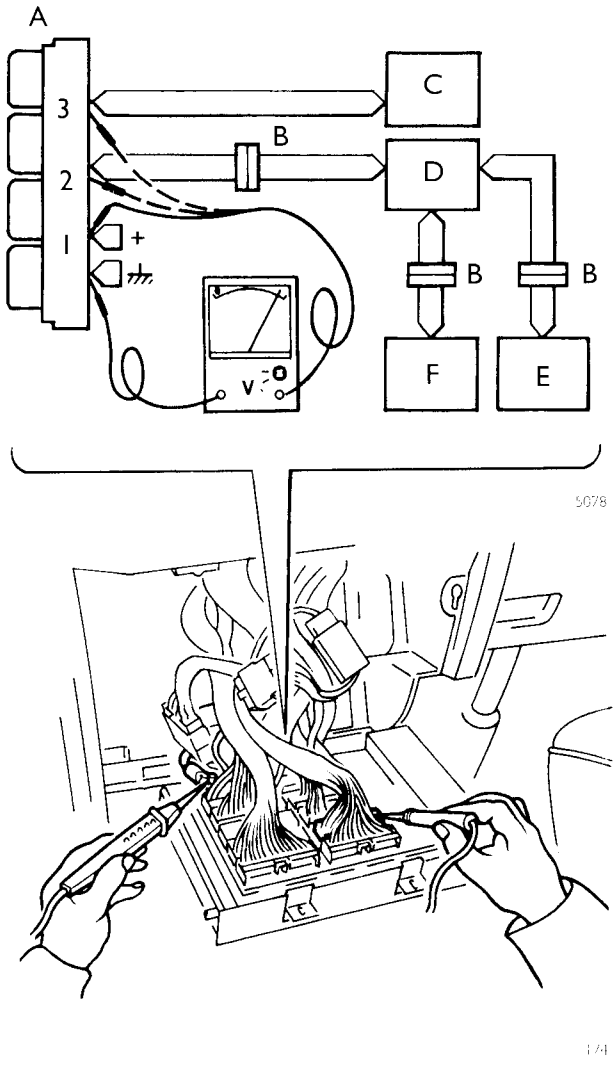
1.135 TRANSFER CASE
A. ALL WHEEL DRIVE SIGNALLING SWITCH



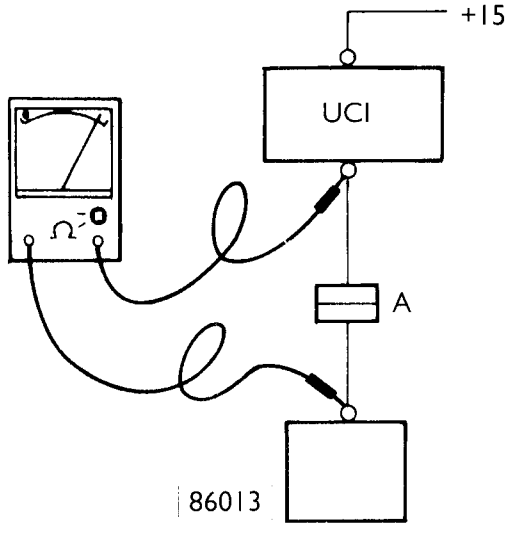
1.133 CAB
A. SPLITTER GEARS ON SIGNALLING SWITCH



1.136 REAR AXLE
A. REAR DIFFERENTIAL LOCK SIGNALLING SWITCH



I.137 TESTING THE PRESENCE OF OUTPUT VOLTAGE ON C.I.U. CONNECTORS OF FAULTY CIRCUIT
A. C.I.U. – B. JUNCTION BLOCKS FOR CABLE LOOMS C/D/E/F ELECTRICAL COMPONENTS: CAB (**C**) HOOD (**D**) ENGINE (**E**) CHASSIS (**F**)



I.138 TESTING CIRCUIT CONTINUITY
A. JUNCTION BLOCK

Circuit fault diagnosis

The convergence of the different modules at the C.I.U. (Central Interconnecting Unit) facilitates diagnosis in the circuit because voltage readings can be carried out directly on C.I.U. junction blocks.

NOTE. Voltage readings on connectors should be performed on the lead wire side with the connector plugged into the C.I.U. or the electrical component.

To carry out a circuit fault diagnosis, a circuit diagram should be obtained of the defective circuit and a suitable measuring instrument should be used in order to confirm the presence (or otherwise) of an electrical signal.

The measuring instrument indicates the presence of a voltage.

If a voltage value is detected by setting the negative prod of the measuring instrument to earth (connector G cell 10) and the otherone on the C.I.U. positive terminal (fig. I.137 ref. 1), this indicates that the power network is effective before the switch.
Therefore the fault will have to be sought after the C.I.U. positive terminal (fig. I.137 ref. 2/3).

The measuring instrument does not indicate the presence of a voltage.

If a voltage value is not detected by setting the negative prod of the measuring instrument to earth (connector G cell 10) and the otherone on the C.I.U. positive terminal (fig. I.137 ref. 1), this indicates that the power network is not effective before the switch.
Therefore the fault will have to be sought before the C.I.U. positive terminal.

It should be noted that this fault finding method can be used to trace faults throughout the electrical system.

Circuit continuity test

Electrical continuity of the various circuits (fig. I.138) can be tested by insulating the battery from the mains and setting the measuring instrument to the ohmetric function.

If a resistance reading equal to ý is obtained with the instrument prods set to either end of the cable to be tested, the wiring point where circuit continuity is failing can be traced by testing all cable/component and cable/connector junction blocks.

Particular disadvantages

The following section describes a number of particular recurring disadvantages with an anlysis of their probable causes and remedies.

- The batteries are quickly discharged when the vehicle is not in use and junction blocks are not connected.

In general, this problem is caused either by sulphation of the battery itself, or more probably by a partially short circuiting component.

A defective circuit can be easily identified by connecting an analogue voltmeter in SERIES to the chassis earth cable and to the negative terminal of the battery.

Note. Before doing this, make sure that the different circuits that are permanently under voltage, such as tachograph, interior lights etc., are disconnected.

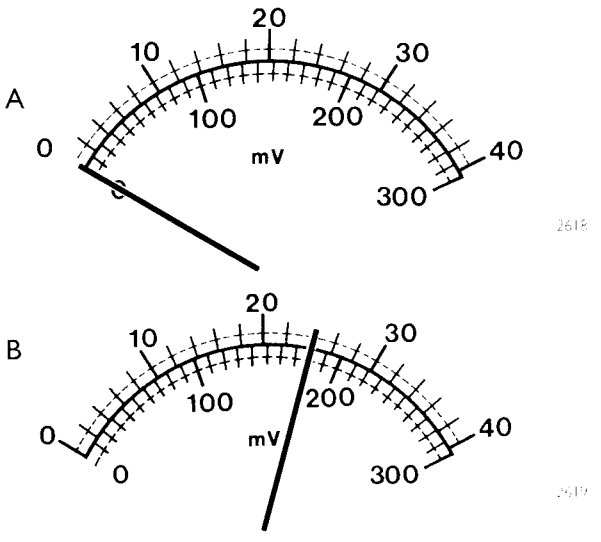
The test will reveal either:

- That the instrument pointer does not deviate from its position at rest.
  The system is functioning normally (A fig. I.139).
  It can be concluded from this test that the discharging of the battery is due to the formation of sulphur salts between the terminals and the mounting brackets of the battery housing, or possibly because the batteries themselves do not hold the charge (because their active components have fallen to the bottom of the container or because the separators have crystallized).
  In this case the batteries must be renewed.

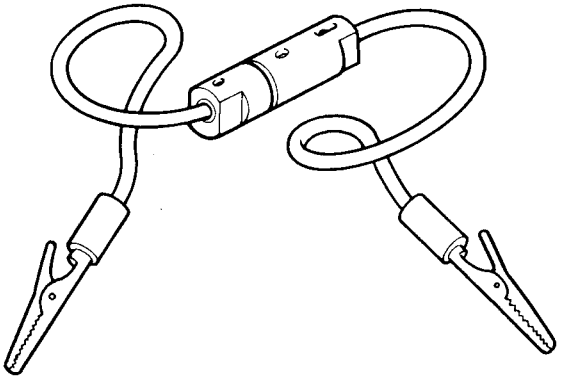
  Or, that the instrument pointer does deviate from its position at rest.
  This indicates a passage of current (mA) through the measuring instrument and thus a current leak throughout the system (B fig. I.139).
  All that remains to be done is to identify the defective circuit or component. Remove each fuse or junction block from the C.I.U. until the instrument pointer returns to zero.
  The return of the pointer to zero is an indication of a defective circuit or component.

Renewal of components

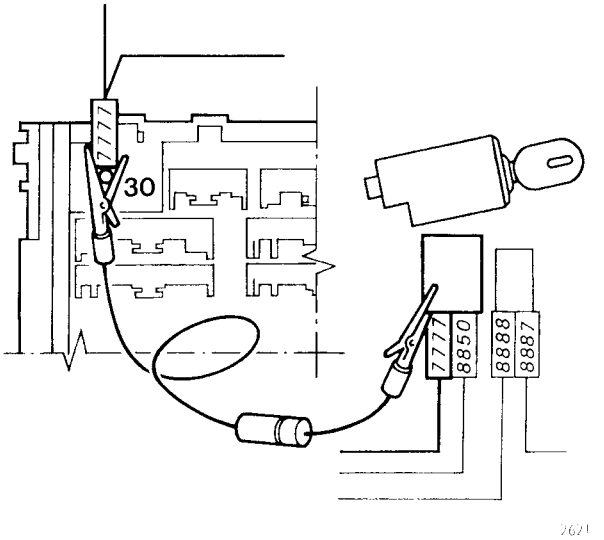
Before any component is renewed, the electrical connections – and the earth connection in particular – must be carefully inspected.



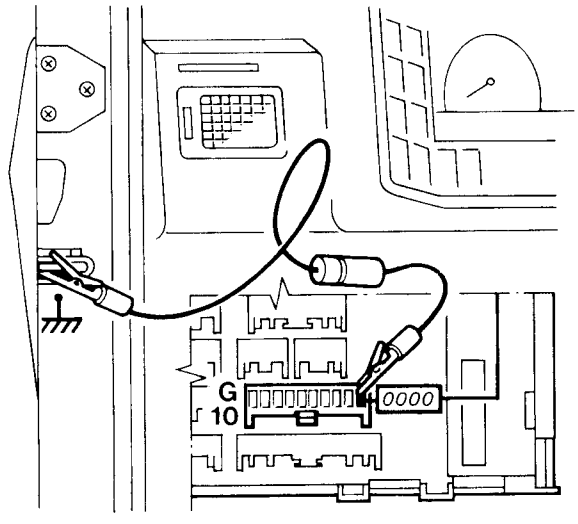
I.139 MEASURING VOLTAGE
A. RELIABLE SYSTEM – B. SYSTEM INCLUDING A FAULTY CIRCUIT OR COMPONENT



I.140 SHUNT WITH A FUSE



I.141 EXAMPLE OF POWER SUPPLY TO A COMPONENT VIA A SHUNT



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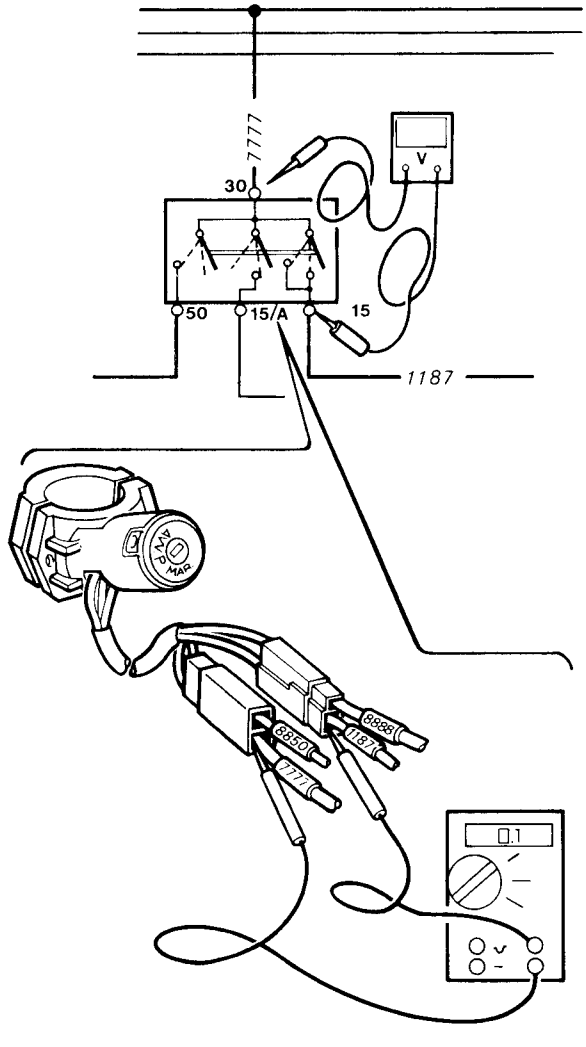
1.142 USE OF A SHUNT TO CHECK THE EFFICIENCY OF A COMPONENT NEGATIVE NETWORK



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1.143 MEASURING VOLTAGE DROP DUE TO A CONTACT

Use a shunt equipped with a fuse to supply the component in question bypassing the on–board network and thereby checking the correct operation (fig. 1.141). This shunt is also used to check the efficiency of the component earth network (fig. 1.142).

NOTE. The maximum capacity of the fuse inserted in the shunt is 3 A. In the majority of cases of circuit problems, even if intermittent, the fault is due to the actual network (defective earth, drops in voltage due to electrical contacts, faulty terminal clamping or oxidation, junction block or earth points loose).

Drops in voltage

Among the most frequent causes of circuit problems are the different drops in voltage which adversely affect the reliability of the electrical system.

These drops, which occur in the electrical contacts for switches, remote control switches and relays are due either to the poor connection of the wire terminals or to the wear of the contacts or oxidation.

The method for detecting the fault in these cases consists of checking the drop in input and output voltage of the component, using a digital voltmeter and starting upstream of the defective circuit (having checked that the leads are properly connected to the battery).

The drop in voltage should not exceed 0.1 V. If this is not the case, renew the contact or replace the component (fig. 1.143).

Shortcircuit

A simple method for locating a shortcircuit consists of bridging the burnt fuse using the two prods of a multimeter set to the Volt function (fig. 1.144 page 1.55).

During the search for the cause of a shortcircuit the use of a spare fuse between the battery negative terminal and the earth cable (main current switch off, if fitted) is more than ever justified (fig. 1.145 page 1.55).

Obviously the spare fuse will be inserted after having bridged the shortcircuited line using the multimeter. The maximum capacity for the fuse is 8 A.

When connected, the multimeter display should indicate 12 V.

As the wires for the circuits protected by the fuse under examination are detached, the defective circuit will be signalled by the return to zero of the multimeter display.

Once the faulty circuit is identified, disconnect junction blocks and components after the fuse.

As junction blocks are reconnected, the 12 V shown on the multimeter display will indicate which section of the cable is shorted or which is the component to be replaced.

Once circuit continuiuty is restored, replace the fuse observing capacity data specified by the manufacturer.

Excessive voltage

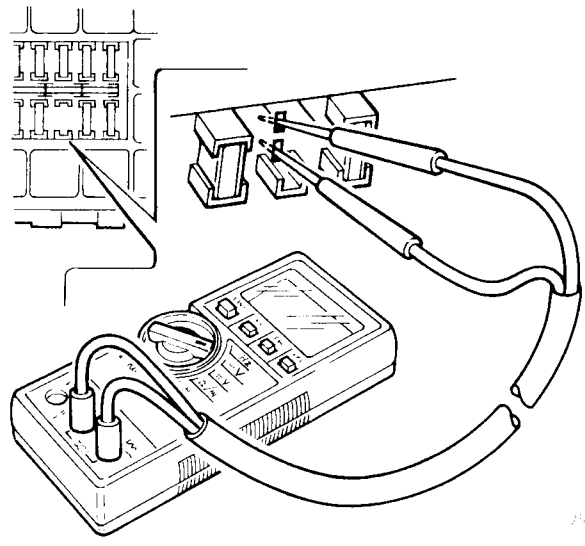
Boiling electrolyte (electrolyte has been topped up too often), silvered or blackened glass of lamps are also symptoms of a defect.

Excessive voltage may be due to a recharge circuit fault (voltage regulator, shorted diodes) as well as to a general circuit failure caused by a loosened supply cable in the vehicle power network (alternator terminals B+, 30 of starter motor, 30 of C.I.U. and battery terminal clips).

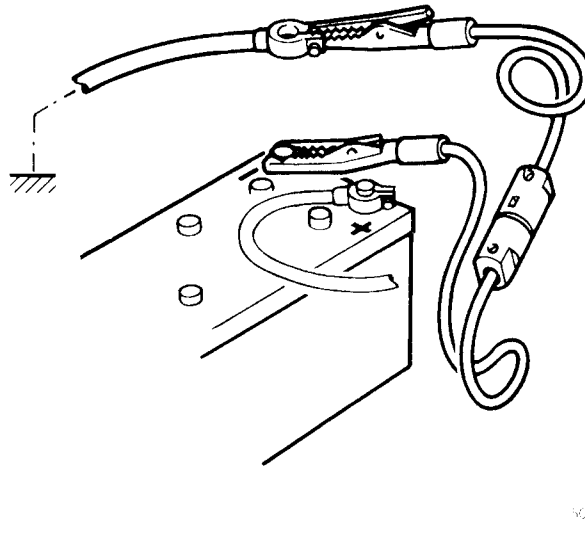
NOTE. The voltage value at alternator terminals, with engine running, is limited by the battery counter-elelectromotive force as batteries are connected in parallel (buffer battery) with the alternator.

If the battery is disconnected from the system, the voltage at alternator terminals may damage the electrical network and the electric/electronic components assembled on the vehicle.

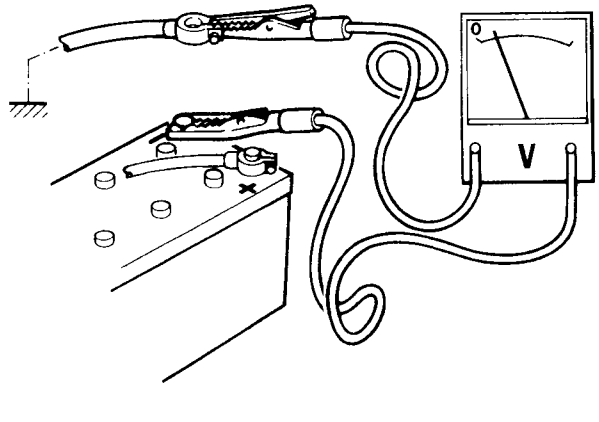
Should it be necessary to leave the engine running for short periods - at an Authorized Workshop – with batteries disconnected from the system, connect terminal D+ of alternator to hood earth by means of a jumper after disconnection of excitation cable (7778).



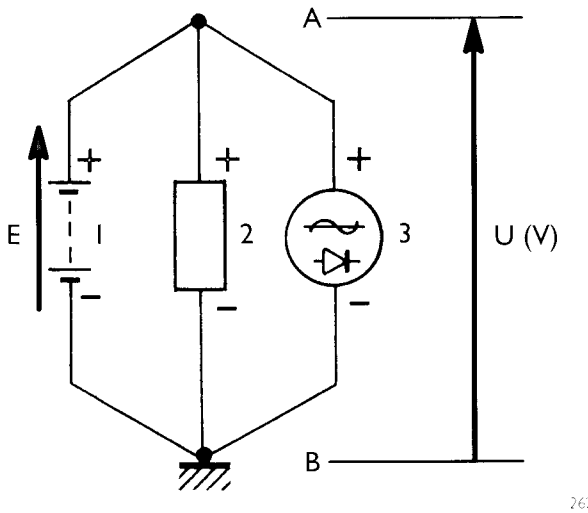
1.144 LOCATING A FAULT USING THE MULTIMETER



1.145 SHUNT INSERTED BETWEEN BATTERY NEGATIVE TERMINAL AND BATTERY EARTH NEGATIVE TERMINAL

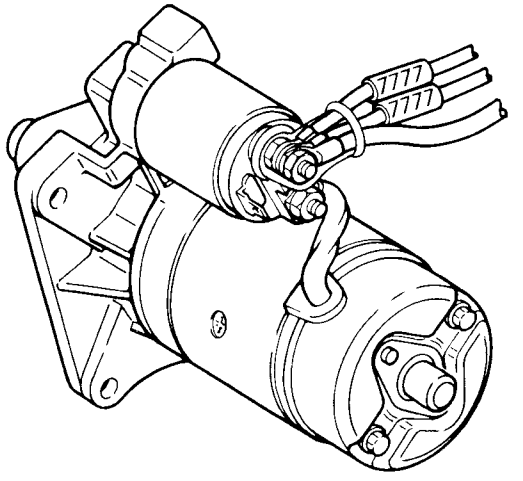


1.146 VOLTMETER INSERTED BETWEEN BATTERY NEGATIVE TERMINAL AND BATTERY EARTH CABLE



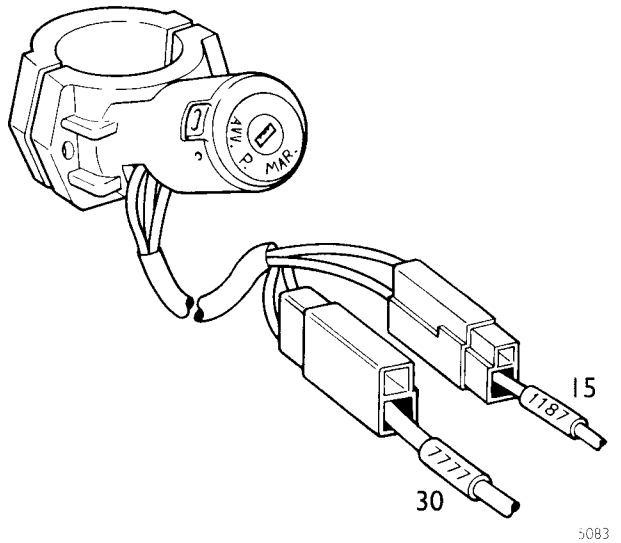
2673

I.147 A. POSITIVE CONNECTION B. EARTH CONNECTION – 1. BATTERY – 2. COMPONENTS – 3. ALTERNATOR – U. VOLTAGE – E. ELECTROMOTIVE FORCE (VOLTS)



5087

I.148 TERMINAL 30 STARTER MOTOR



5083

I.149 IDENTIFICATION OF TERMINALS 15 AND 30 OF IGNITION SWITCH

Supply defect

There are many possible voltage supply defects as the number of components which make up the network is large and consequently also the junction blocks.

The wiring system of Daily/Turbodaily/Turbodaily 4x4 vehicles can be divided into three sections from the point of view of on–board electrical voltage (fig. I.147): battery, components and alternator. These sections converge both in terms of positive voltage and reference voltage, that is to say earth.

If there is a supply problem, firstly ensure the efficiency of the connection to the negative terminal of the battery as well as the efficiency of the general current relay (if fitted) and the earth points.

Also ensure the efficiency of:

- connection to battery positive terminal
- connection to terminal 30 of starter motor
- connection to positive terminal of C.I.U.
- connection to terminals 30 and 15 of ignition switch.

Earth defect in exterior lighting and signalling circuits

In this case the defect can be located in as far as, for example, when the stop lights are activated, the other lights not directly involved with the circuit in question come on with decreased power.

The earth defect for the circuits in question may occur either at the connector or the actual component.

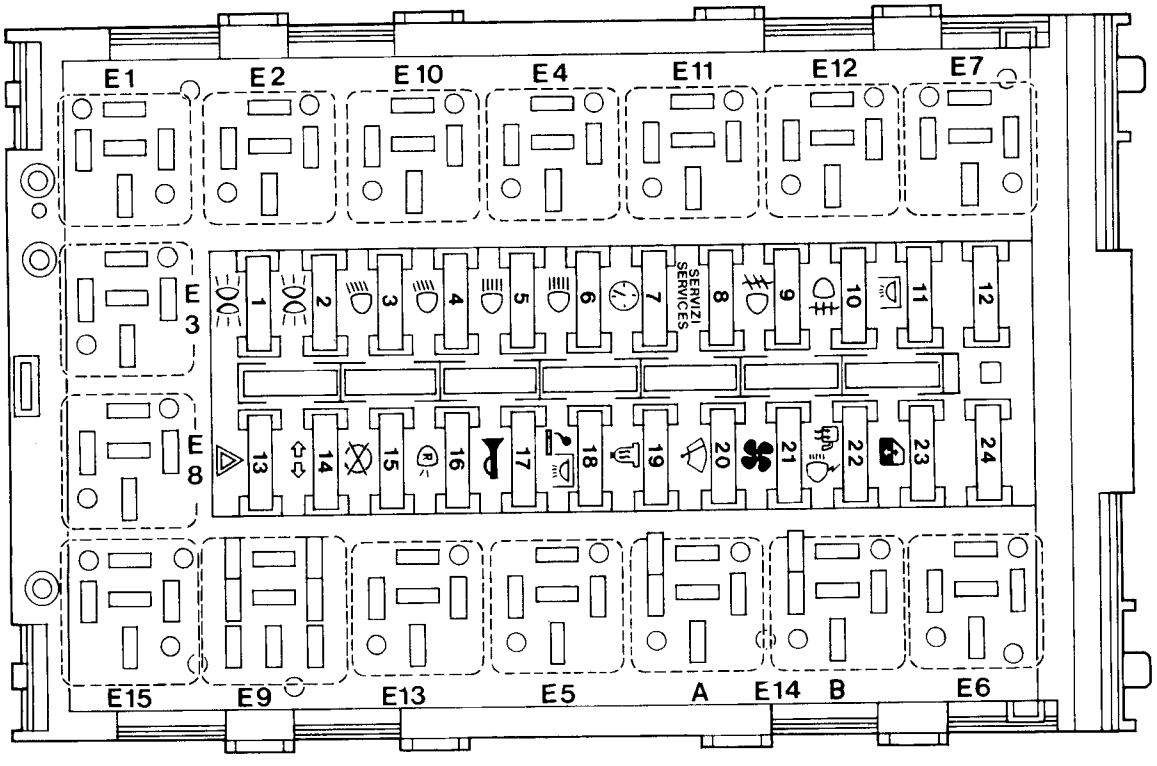
A spare shunt, connected to the chassis earth to ensure the reliability if the component before replacing it, should be used.

Common components

Central Interconnecting Unit

Supplier CAVIS
Nominal voltage 12V

75000



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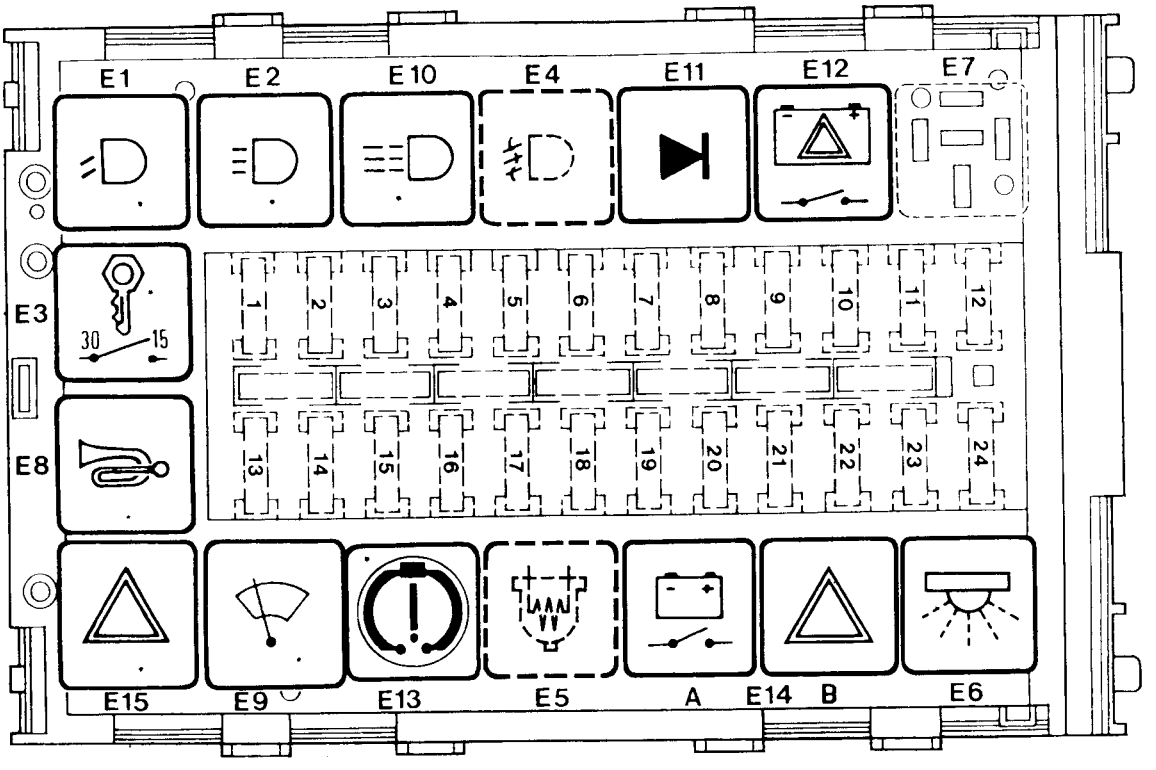
FUSE ASSEMBLY

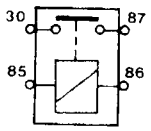
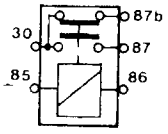
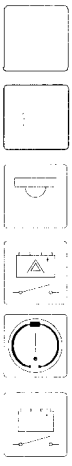
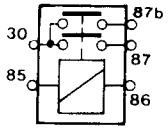
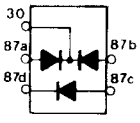
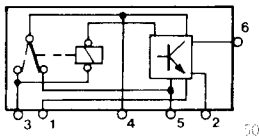
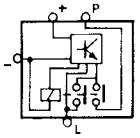
No.	Capacity (A)	Function
1	5	Lh front parking light, lh number plate light, rh rear parking light, rh front marker light, dashboard light
2	5	Rh front parking light, rh number plate light, lh rear parking light, lh marker light
3	7,5	Rh low beam light
4	7,5	Lh low beam light
5	7,5	Rh high beam light
6	7,5	Lh high beam light
7	3	Electronic speedometer
8	5	Lamp test, warning lamps, instruments
9	10	Fog lamps (optional extras)
10	3	Rear fog lamps
11	5	Not used
12	7,5	Not used
13	10	Hazard lights
14	5	Turn signal lights
15	3	Engine stopping
16	7,5	Stop lights, reversing light
17	10	Horns
18	7,5	Interior lighting, cigar lighter, radio receiver set
19	15	Fuel filter heating (optional extra)
20	10	Windscreen wiper unit, windscreen washer pump
21	15	Electric heater
22	7,5	Key switch lighting, flasher light
23	25	Power windows (optional extra), engine cooling system
24	10	Not used

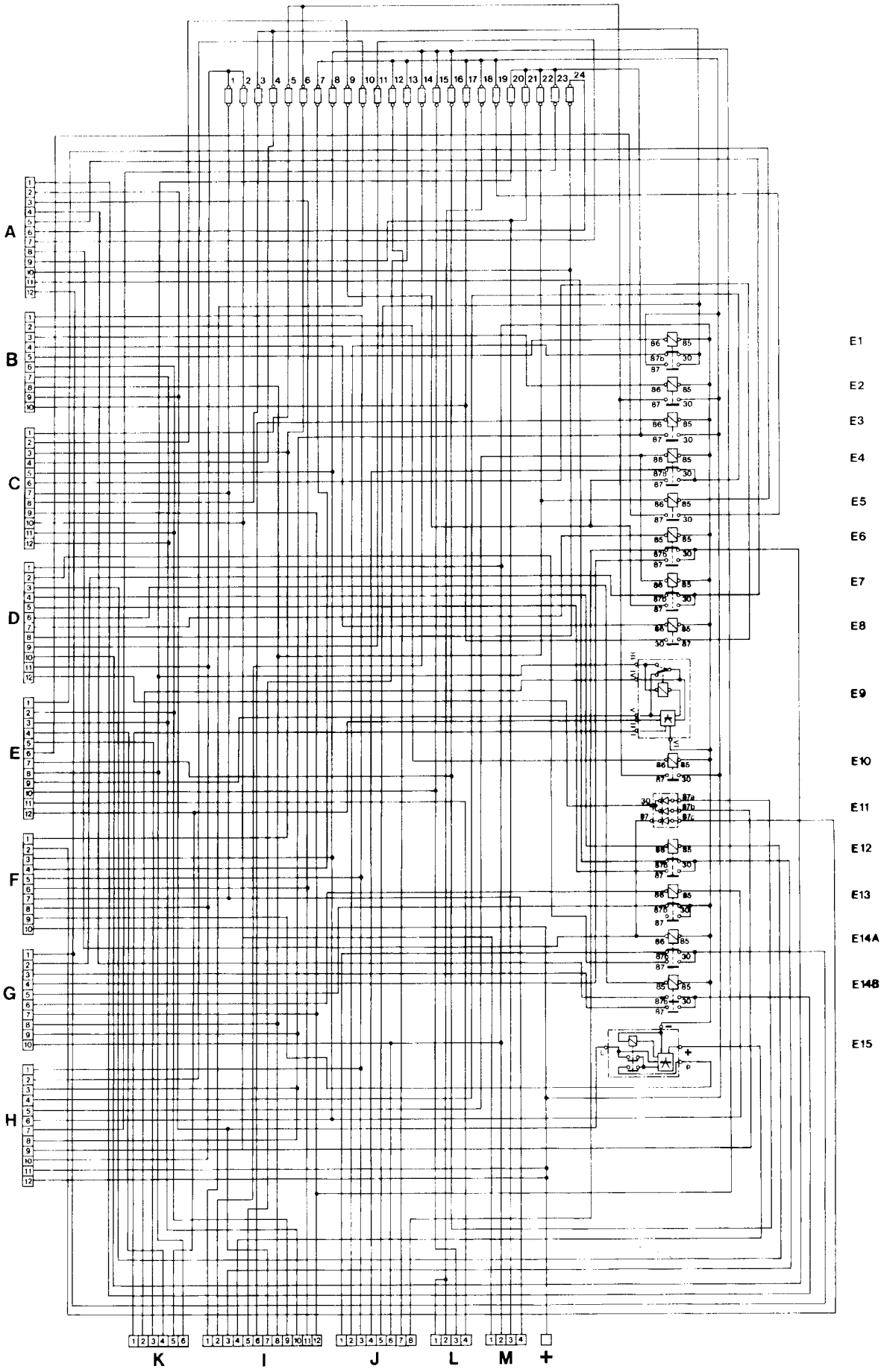
C.I.U. relays and diode holders



RELAY AND DIODE HOLDER ASSEMBLY

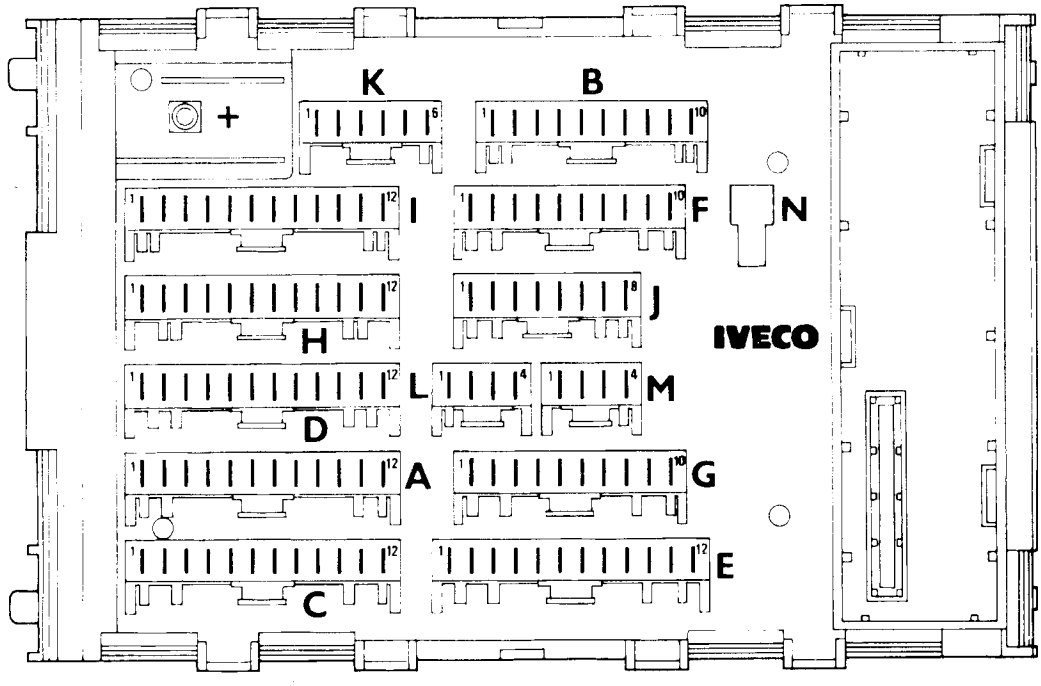
Relay	Description
E1	Relay for switching on low beam lights
E2	Relay for switching on high beam lights
E3	Relay for user cutoff during starting stage
E4	Relay for switching on fog lamps (optional extra)
E5	Fuel heating circuit relay (optional extra)
E6	Relay for switching on interior lighting with safety unit on (bus)
E7	Available for daylights with fog lamps (variant)
E8	Horn relay
E9	Windscreen wiper unit intermittent operation
E10	Flasher light relay
E11	1A 3–diode holder container/2 with common cathode (bus and day lights variant)
E12	Relay for switching on hazard lights with safety unit on (bus)
E13	Relay for switching on brake failure warning lamp (vehicles not fitted with IVECO Control device)
E14A	Relay for excitation of general current relay (bus)
E14B	Hazard lights relay (bus)
E15	Turn signal/emergency electronic flasher light

Wiring diagram	Function symbol	Control unit identification no.	Component code
 5084		E 2	25009
		E 3	25209
		E 5	25810
		E 8	25805
		E 10	25004
 5085		E 1	25008
		E 4	25003
		E 6	25804
		E 12	25401
		E 13	25103
		E 14 A	25202
 5086		E 14B	25400
 5087		E 11	61000
 5088		E 9	59100
 5089		E 15	59000


1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
A
B
C
D
E
F
G
H
E1
E2
E3
E4
E5
E6
E7
E8
E9
E10
E11
E12
E13
E14A
E14B
E15
K
I
J
L
M
+

C.I.U. connectors

75000



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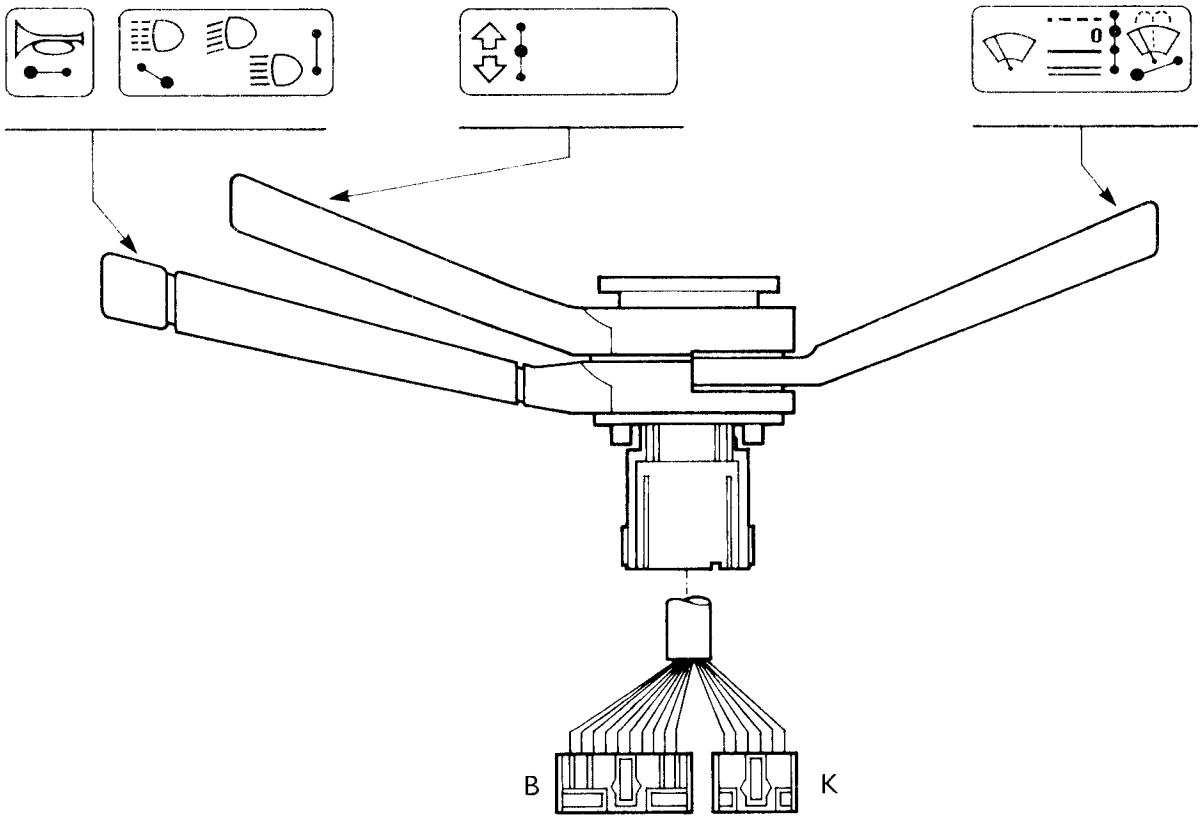
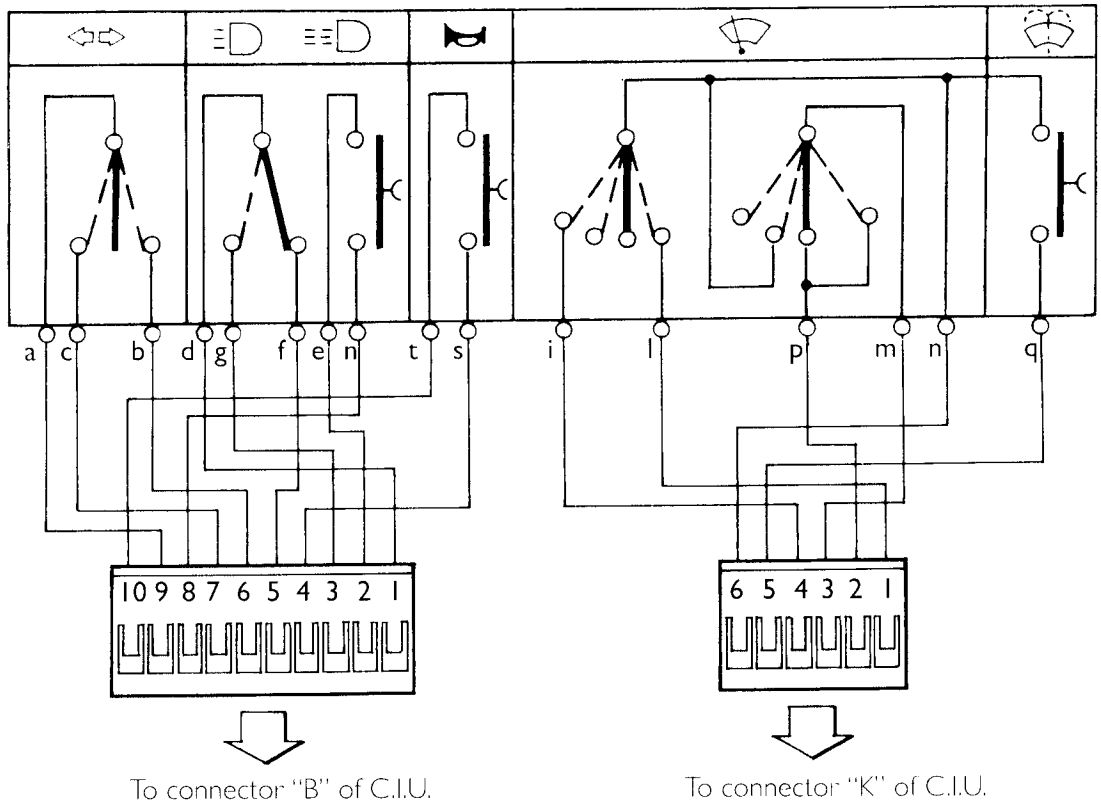
CONNECTOR ASSEMBLY

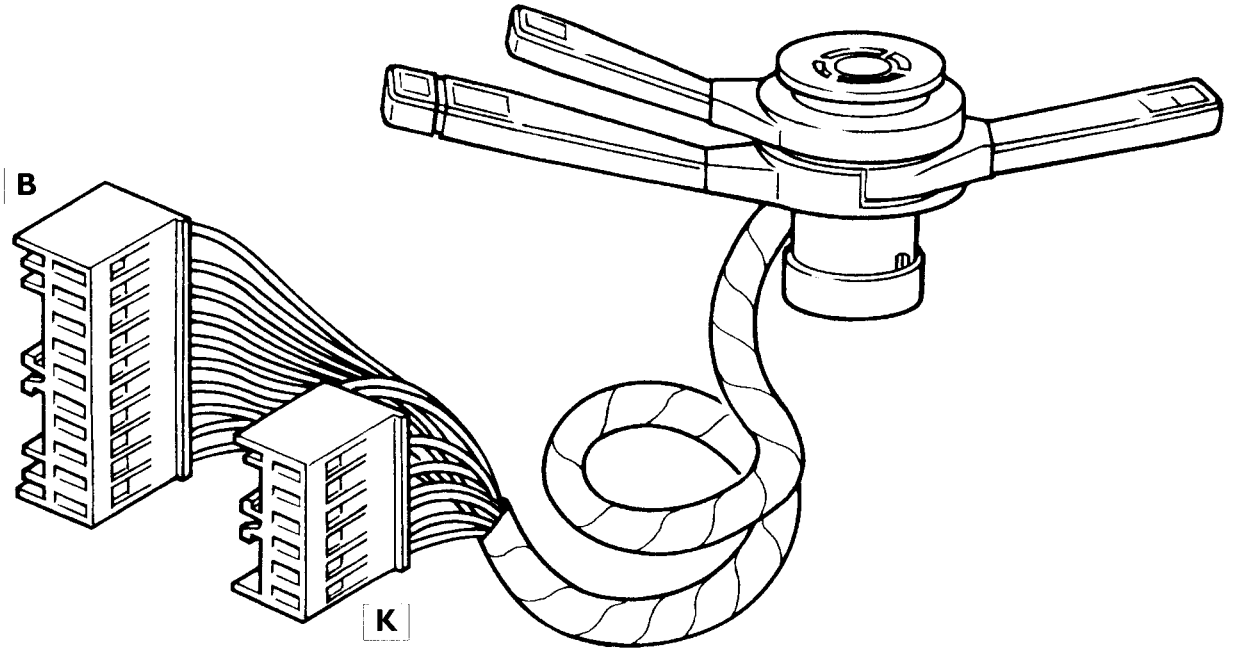
Connector	Type (cell no.)	Interlocking circuit
A	12	Cab (bus)
B	10	Cab (steering column switch)
C	12	Hood (standard type)
D	12	Cab (bus)
E	12	Hood (standard type)
F	10	Cab (standard type)
G	10	Hood (standard type and variants)
H	12	Cab (standard type)
I	12	Cab (standard type)
J	8	Cab (variants)
K	6	Cab (steering column switch)
L	4	Cab (standard type)
M	4	Cab (standard type)
N	–	–
+	1	Cab/hood/engine (standard type)

Steering column switch



STEERING COLUMN SWITCH ASSEMBLY - FRONT VIEW

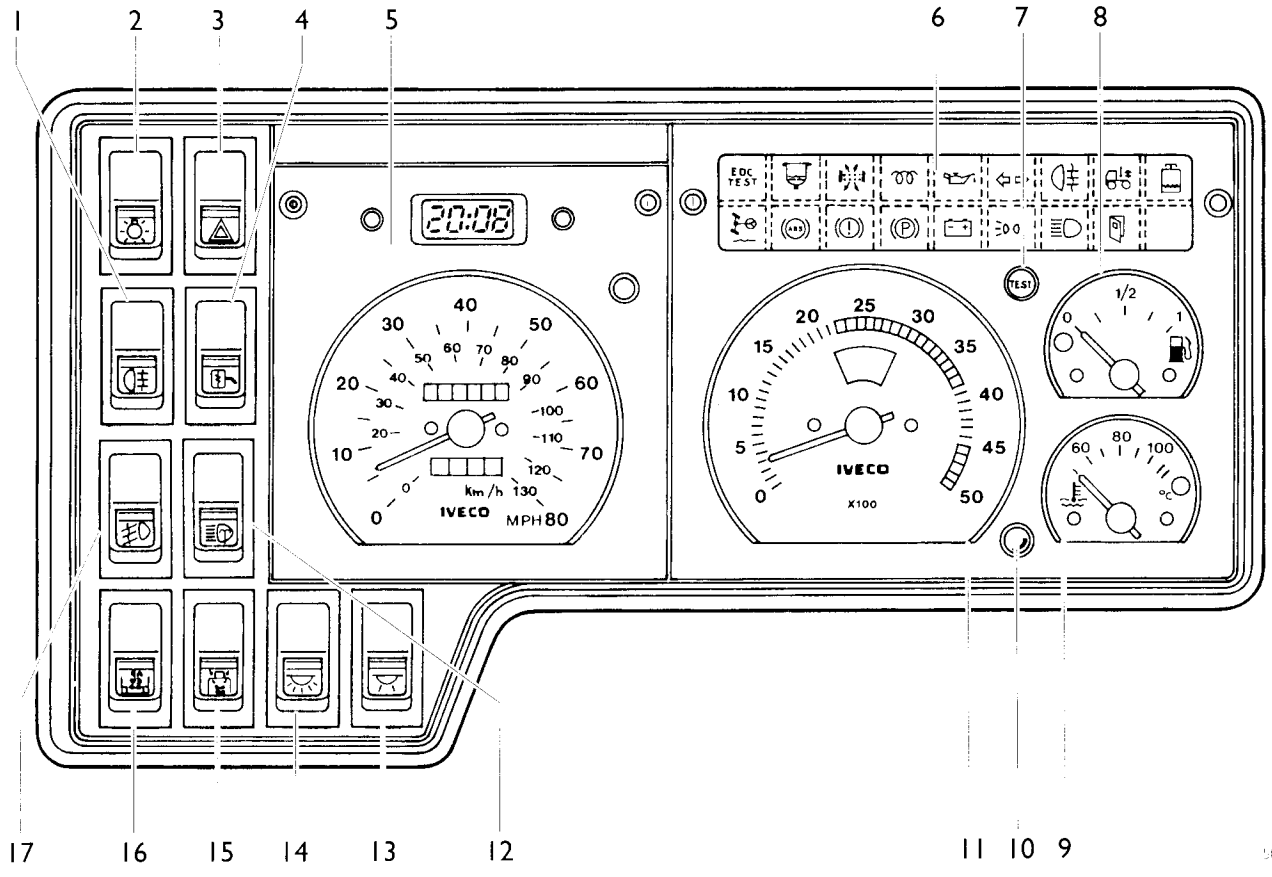




LAYOUT WITH CONNECTIONS

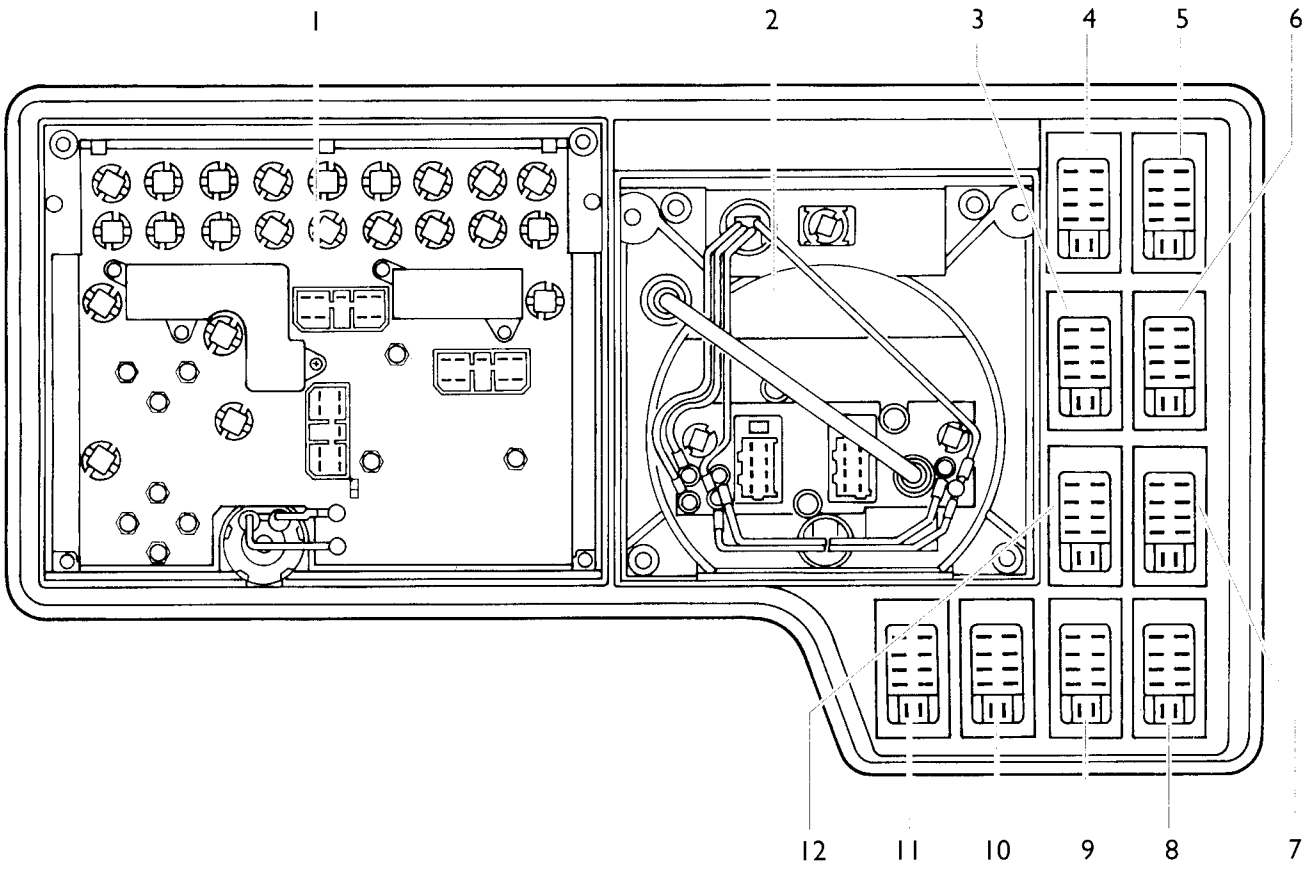
	Ref. no.	Cable colour	Function
B	1 (d)	green	Supply of high/low beam lights
	2 (e)	brown	Flasher light
	3 (g)	blue	High beam lights
	4 (s)	black	Horns
	5 (f)	grey/black	Low beam lights
	6 (b)	blue/black	Lh turn signal light
	7 (c)	light blue	Rh turn signal light
	8 (n)	brown	Flasher light supply
	9 (a)	violet	Turn signal flasher light
	10 (t)	black	Horn supply
K	1 (l)	yellow	Windscreen wipers (intermittent operation)
	2 (p)	light blue/white	Windscreen wipers (reset)
	3 (m)	light blue/yellow	Windscreen wipers (low speed)
	4 (i)	grey	Windscreen wipers (high speed)
	5 (q)	green/black	Windscreen washer pump
	6 (h)	pink/black	Supply of windscreen wiper and washer pump unit

Dashboard



FRONT VIEW

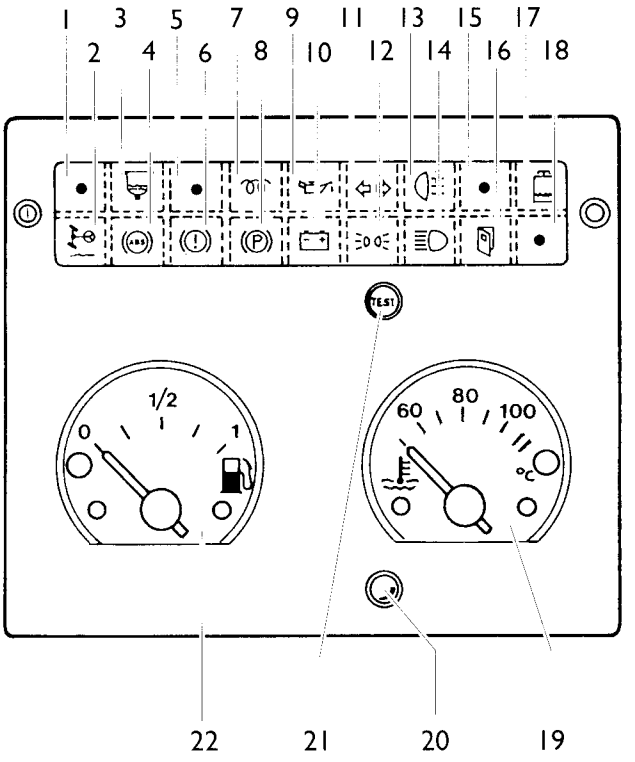
Ref. no.	Component code	Description
1	52006	Tail fog lamp switch
2	52307	Exterior lighting switch
3	52302	Hazard light switch with built–in warning lamp
4	52005	Heated rearview mirror switch with built–in warning lamp (optional extra)
5	40002	Electronic tachometer with digital clock
6	58901	18–optical indicator panel
7	53000	Lamp test switch
8	44001	Fuel level indicator with built -in warning lamp
9	47011	Engine coolant temperature gauge with built–in warning lamp
10	61203	Instrument light rheostat
11	48001	Electronic rev counter
12	53004	Headlamp washer switch (optional extra)
13	52017	Blue interior light switch (bus)
14	52021	Interior lighting switch (bus)
15	52311	Aerator switch with built–in warning lamp
16	52030	Interior heating switch (bus)
17	52304	Fog lamp/rear fog lamp interlock switch (optional extra)



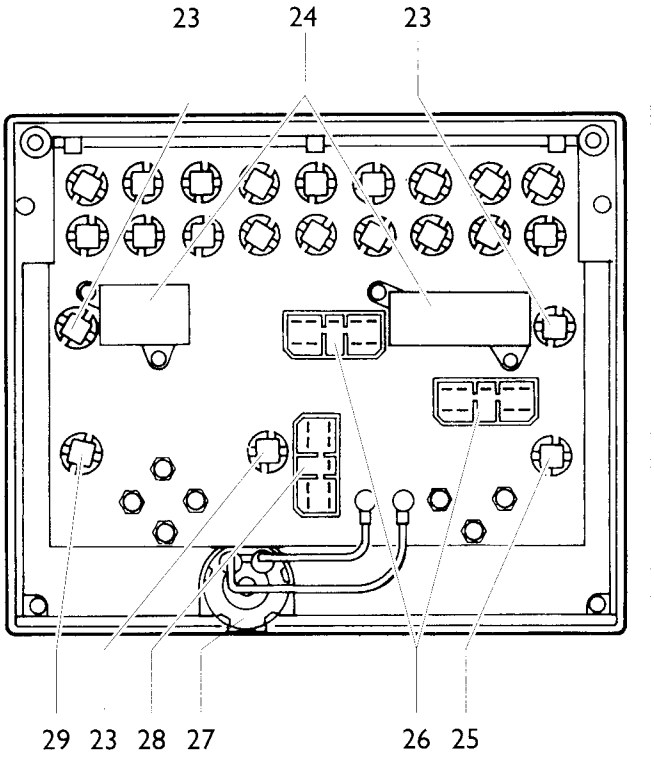
CONNECTOR END VIEW

Ref. no.	Description
1	Combined module (optical indicators, lamp test switch, instruments, instrument light dimmer rheostat)
2	Electronic tachometer with digital clock
3	Heated rearview mirror switch with built–in warning lamp (optional extra)
4	Hazard light switch with built–in warning lamp
5	Exterior lighting switch
6	Tail fog lamp switch
7	Fog lamp/tail fog lamp interlock switch (optional extra)
8	Interior heating switch (bus)
9	Aerator switch with built–in warning lamp (bus)
10	Interior lighting switch (bus)
11	Interior blue light switch (bus)
12	Headlight washer unit switch (optional extra)

Combined module (Daily vehicles)



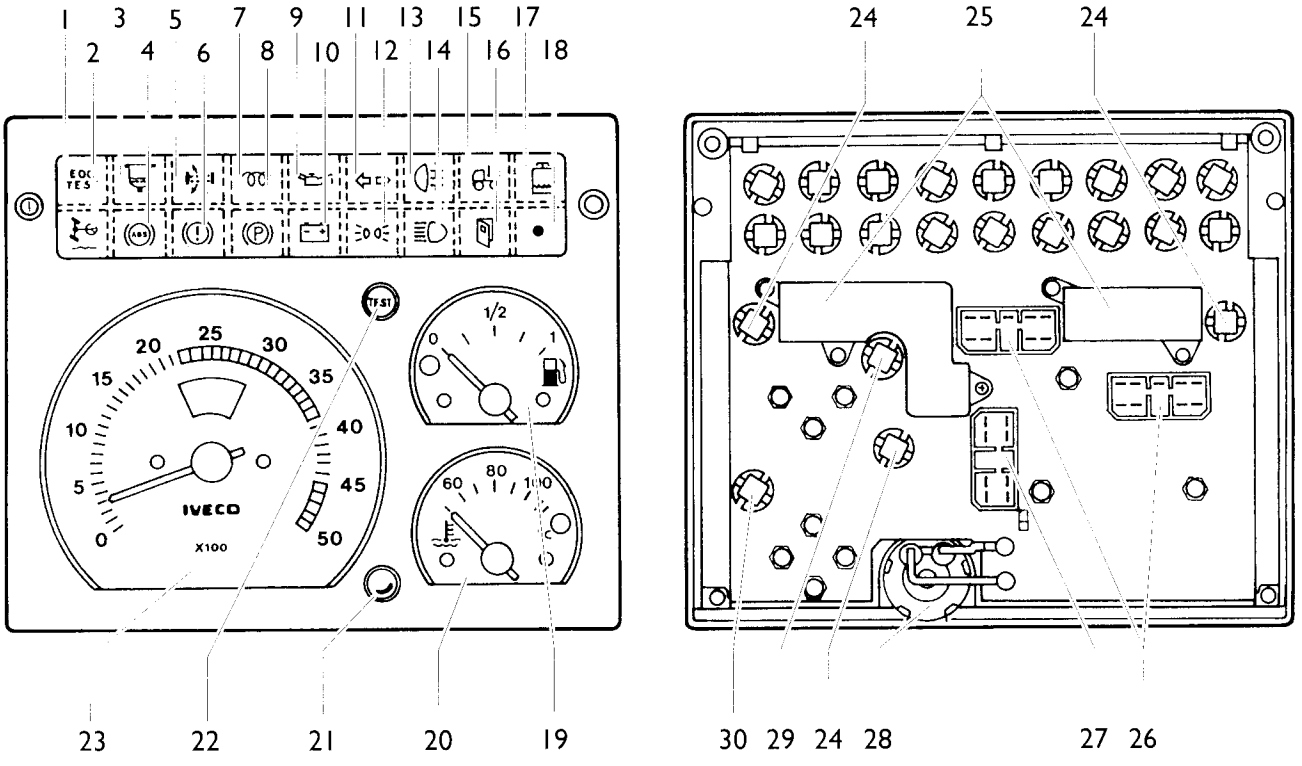
FRONT VIEW



CONNECTOR END VIEW

Ref. no.	Description
1	Available for optional extra warning lamp
2	Power steering fluid level warning lamp
3	Water in fuel filter warning lamp
4	ABS system failure warning lamp (optional extra)
5	Available for optional extra warning lamp
6	Brake system failure warning lamp
7	Interior heating on warning lamp
8	Parking brake on warning lamp
9	Engine oil pressure warning lamp
10	Battery charging failure warning lamp
11	Turn signal lights on warning lamp
12	Parking lights on warning lamp
13	Tail fog lamp on warning lamp
14	High beam lights on warning lamp
15	Available for optional extra warning lamp
16	Rear door open warning lamp
17	Engine coolant level warning lamp
18	Available for optional extra warning lamp
19	Engine coolant temperature gauge with built–in warning lamp
20	Instrument light rheostat
21	Lamp test rheostat
22	Fuel level indicator with built–in warning lamp
23	Instrument light
24	Warning lamp protection diodes
25	Fuel reserve warning lamp
26	Warning lamp connectors
27	Instrument light rheostat
28	Instrument connector block
29	Engine coolant temperature warning lamp

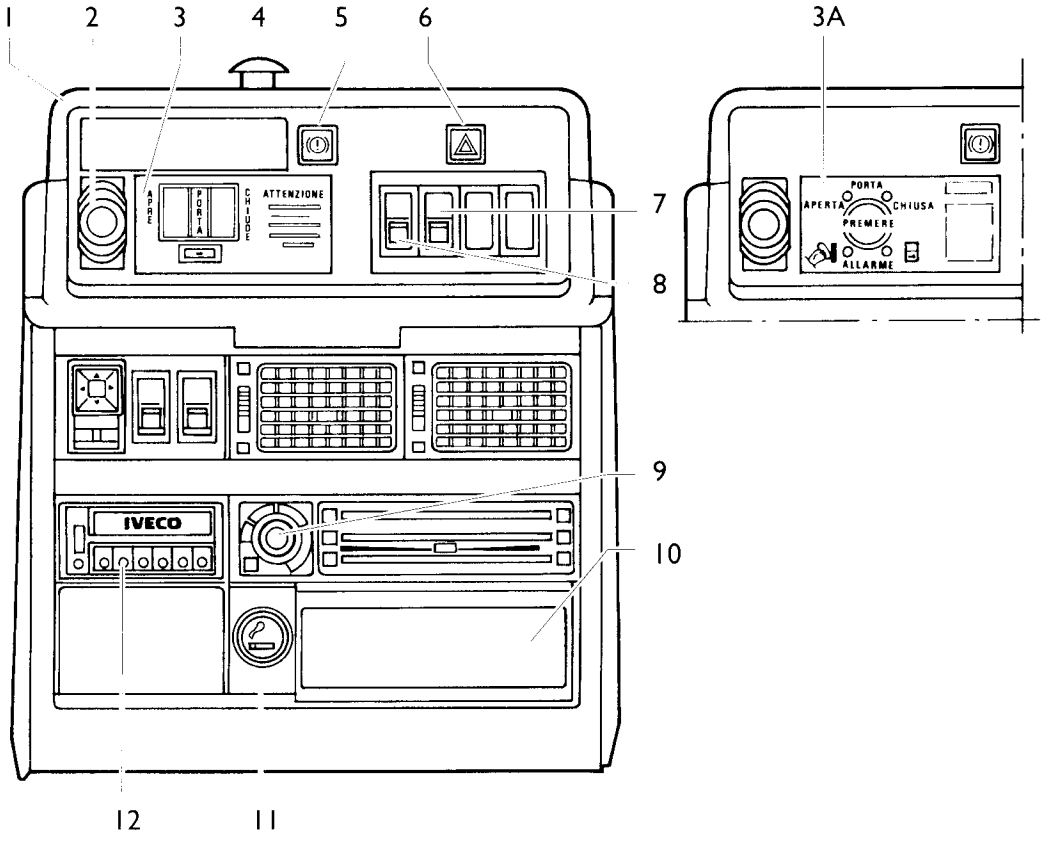
Combined module (Turbodaily vehicles and Daily vehicles equipped with rev counter unit)



FRONT VIEW CONNECTOR END VIEW

Ref. no.	Description
1	EDC system failure warning lamp (Turbodaily.10 vehicles)
2	Power steering fluid level warning lamp
3	Water in fuel filter warning lamp
4	ABS system failure warning lamp (optional extra)
5	Air cleaner restriction warning lamp (Turbodaily)
6	Brake system failure warning lamp
7	Preheating system on warning lamp
8	Parking brake on warning lamp
9	Engine oil pressure warning lamp
10	Brattery charging failure warning lamp
11	Turn signal lights on warning lamp
12	Parking lights on warning lamp
13	Tail fog lamp on warning lamp
14	High beam lights on warning lamp
15	Air suspension system failure warning lamp (optional extra on Turbodaily vehicles)
16	Rear door open warning lamp
17	Engine coolant fluid level warning lamp
18	Available for optional extra warning lamp
19	Fuel level indicator with built in warning lamp
20	Engine coolant temperature gauge with built–in warning lamp
21	Rheostat
22	Lamp test switch
23	Rev counter
24	Instrument light
25	Warning lamp protection diodes
26	Warning lamp connector blocks
27	Instrument connector blocks
28	Rheostat
29	Fuel reserve warning lamp
30	Engine coolant temperature warning lamp

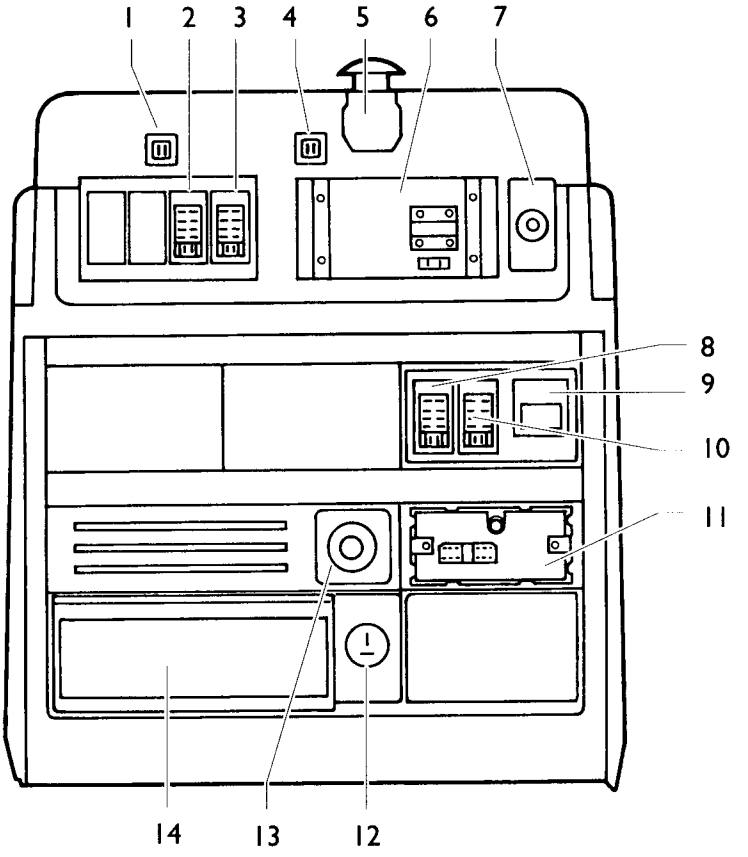
Central control panel



5096

FRONT VIEW

Ref. no.	Description
1	Central control panel top console (City Daily/Turbodaily vehicles)
2	Telma retarder control device (optional extra)
3	Swing–sliding door opening device button strip (school bus)
3A	Swing–sliding door control device (bus/City Daily/Turbodaily vehicles)
4	Safety unit switch (bus)
5	Telma retarder warning lamp (optional extra)
6	Hazard lights on warning lamp (bus)
7	Air/electric horn switch (bus)
8	General Current Relay (GCR) closing switch (bus)
9	Windscreen defrosting electric heater
10	Radioreceiver set compartment
11	Cigar lighter
12	IVECO Control display panel (optional extra)
13	Passenger's door power window switch (optional extra)
14	Adjustable mirror switch (optional)
15	Driver's door power window switch (optional extra)



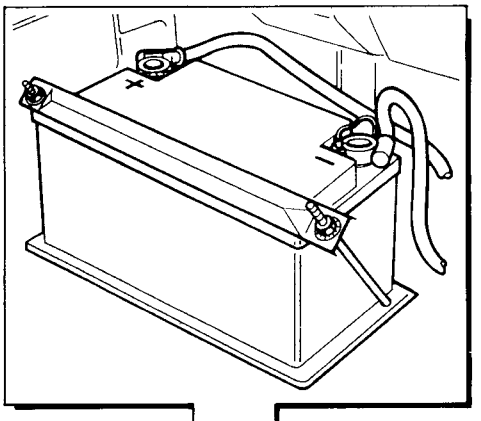
CONNECTOR END VIEW

Ref. no.	Description
1	Hazard lights on warning lamp (bus)
2	Air/electric horn switch (bus)
3	General current relay (GCR) closing switch (bus)
4	Telma retarder warning lamp (optional extra)
5	Safety unit control switch (bus)
6	Swing–sliding door opening device button strip (school bus)
7	Telma retarder control device (optional extra)
8	Passenger's door power window switch (optional extra)
9	Adjustable mirror switch (optional extra)
10	Driver's door power window switch (optional extra)
11	IVECO Control display panel (optional extra)
12	Cigar lighter
13	Windscreen defrosting electric heater
14	Radioreceiver set compartment

STARTING

STARTING

Turbodaily vehicles – Simplified network



20000 Page II.5

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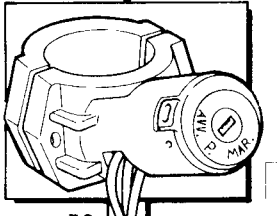

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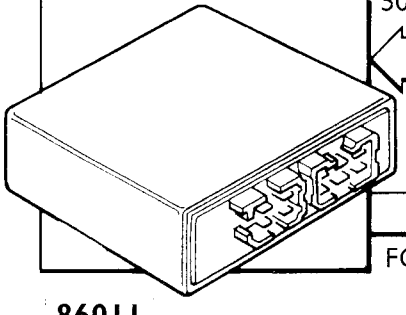

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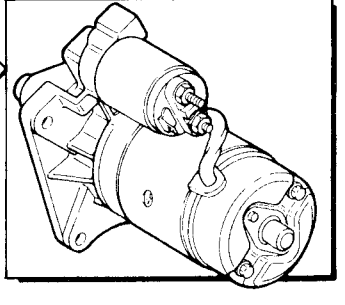
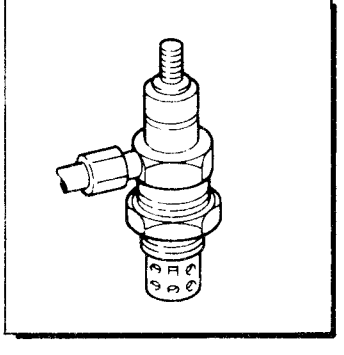
86011 Page II.31



08000 Page II.15



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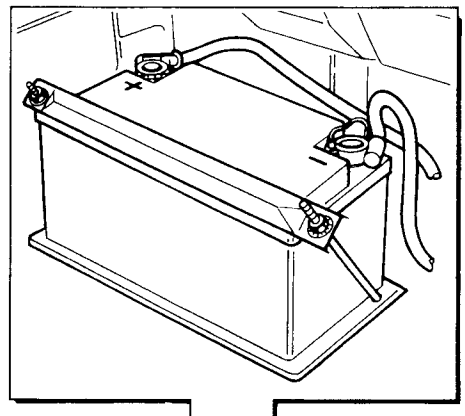
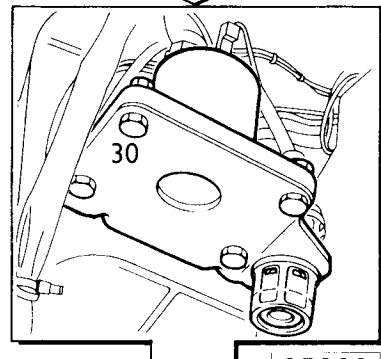
Turbodaily vehicles (School bus version) – Simplified network



20000 Page II.5



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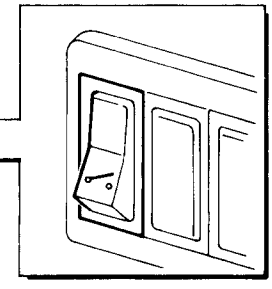

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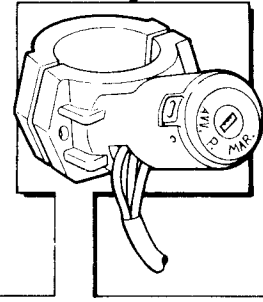

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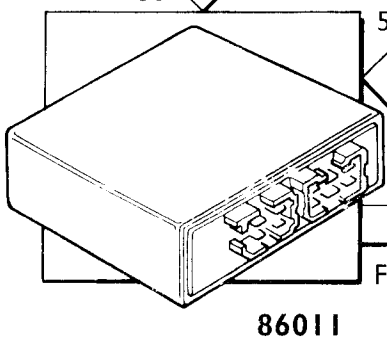

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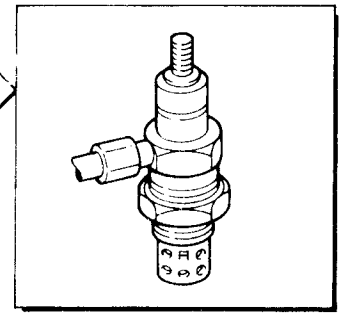

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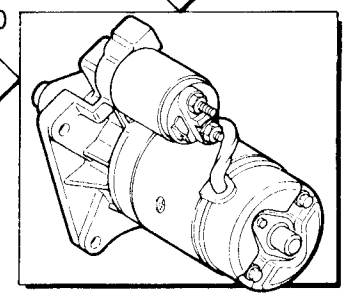

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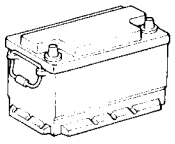
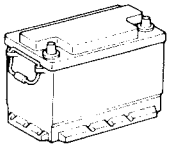
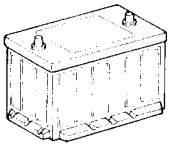
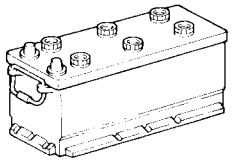
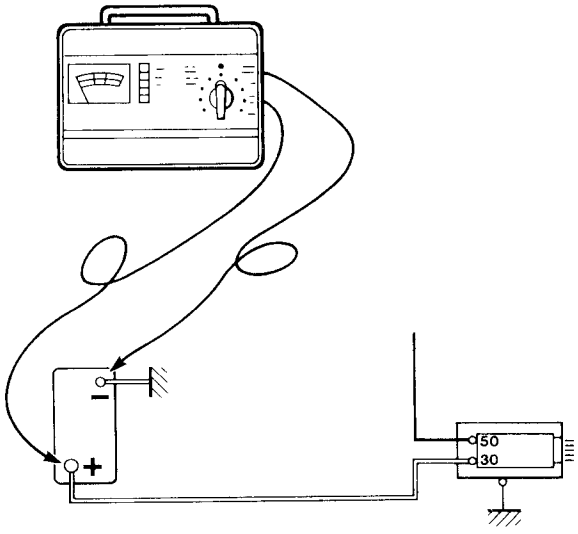
Batteries

Specifications

 5100	MARELLI	12V–88Ah–395A	Daily
 5101	MARELLI	12V–95Ah–450A	Turbodaily
 5102	DELCO	12V–102Ah–RC 310A	Turbodaily (either right–hand drive or fitted with air–conditioning system)
 5103	MARELLI	12V–110Ah–450A	Turbodaily (either bus version or fitted with optional extras)

Quick diagnosis

Defect	Possible cause	Remedy
Starting defect	1. Discharged battery	Check battery charge. If correct, check recharging circuit
	2. Terminals loose or oxidized or burnt	Restore terminal efficiency, as required
	3. Faulty starting circuit	See "Starting" section
Electrolyte level often low	1. Excessive voltage	Check recharging circuit and/or check if terminals are loose
	2. Oxidized terminals	Clean or replace
Electrolyte level often low	1. Excessive voltage	Check recharging circuit and/or check if terminal are loose



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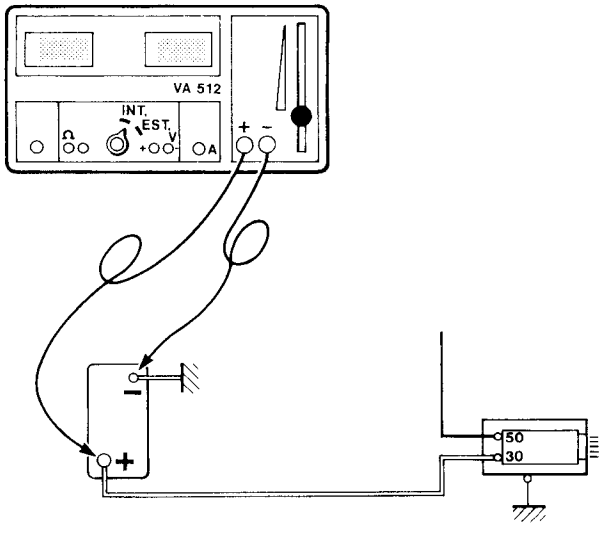
II.3 CAPACITY TEST WITH EQUIPMENT 9933002



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II.4 CAPACITY TEST WITH EQUIPMENT 99309003

On–board testing

⚠ Avoid connecting/disconnecting cables with charging rheostat on. Clips connected to terminals might blaze up.

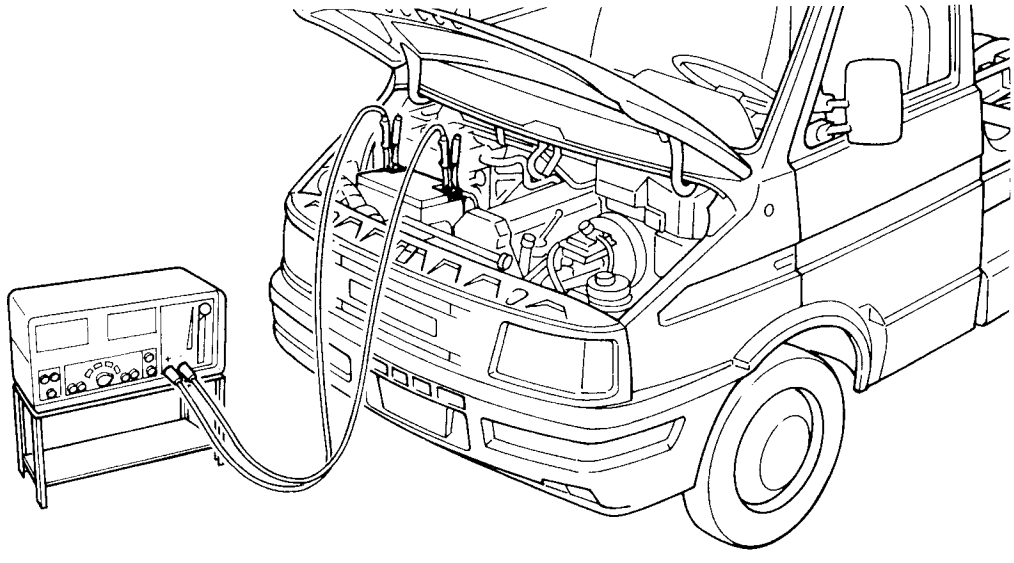
Capacity test

- Connect "Electric system test" equipment clips to battery terminals observing polarity.
- Position test selector knob on "INT" (interior).
- Work on charge rheostat lever until reading on amperometer is about three times the A/h nominal capacity.
- Hold rheostat charge for 15 seconds.
- Read voltage value attained by the battery.
- Release the rheostat.
- If voltage does not drop below 9.6 V the battery is working properly.

General information

The efficiency of the electric system is mainly dependent on the charging state and regular maintenance of accumulators, generally called batteries.

Perfect efficiency of the electric system is a prerequisite for the active and passive safety of the vehicle.



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II.5 BATTERY CAPACITY TEST WITH EQUIPMENT 99309003

Basic data

The battery is a reversible device. This means that it stores and supplies the energy necessary to operate electrical and electronic components fitted on the vehicle.

The battery consists of a group of elements (cells) connected in series which generate energy via chemical reactions occurring when the electric current passes through the composing substances (fig. II.6).

The property or reversibility is due to the fact that its composing elements can return to their initial state during the charging stage.

The active substance applied to plates contained in each cell is lead dioxide (Pb02) for positive plates and spongy lead (Pb) for negative plates (fig. II.7).

The lead has a spongy consistency to facilitate chemical reaction with the acid (electrolyte) in which plates are immersed.

The electrolyte consists of a solution of sulphuric acid (H2SO4) diluted in distilled or demineralized water.

Density of the electrolyte varies from charging state (1270 g/l) to discharging state (1150 g/l).

During discharging, active substances (lead dioxide and lead) are transformed in lead sulphate (PbSO4).

When the current flows in the opposite direction (that is to say when the battery receives the energy) active substances are restored to their initial state.

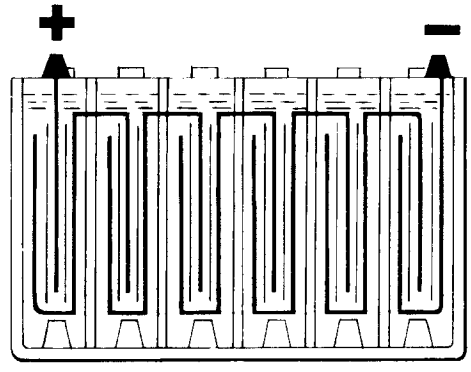
At the ends of each single cell, an electromotive force is formed (2.05 V approx.)

Technical hints

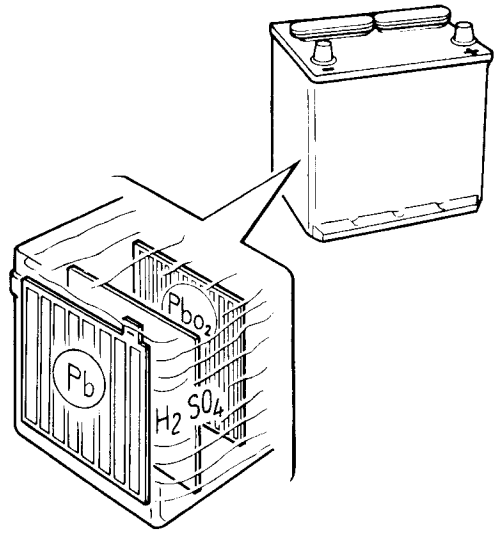
Self-discharge. A discharge resulting from internal reactions of the battery. Normally self-discharge value may amount to 1% of the daily rated capacity of the battery for each stoppage day. This percentage value should always be remembered when batteries are stored. If a battery is not recharged for more that 30 days it is irreparably damaged. Recharging of stored batteries or of sulphated batteries – provided their condition is still recoverable – is performed as permanent charge and at minimum current intensity.

Capacity. The quantity of electricity measured in a/h which can be drawn from a battery.

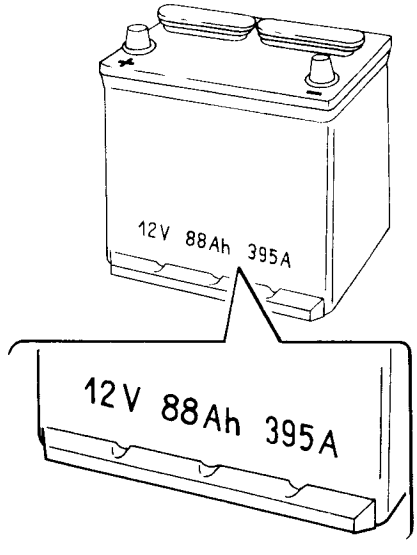
Rated capacity. The capacity that a battery can supply during 10 or 20 hour discharging (according to standards). This value is generally shown on battery holders (fig. II.8).



II.6 SIX-CELL BATTERY (SCHEMATIC DIAGRAM)



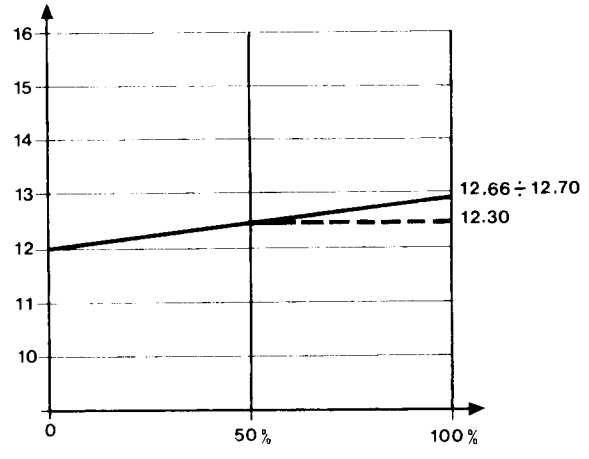
II.7 SECTIONAL VIEW OF A BATTERY CELL



II.8 NOMINAL FEATURES: 12 V. RATED VOLTAGE – 88 Ah. RATED CAPACITY – 395 A. QUICK DISCHARGE

Recharging current rate	
Capacity in Ah	A
50 ÷ 65	4
65 ÷ 75	5
75 ÷ 85	6
85 ÷ 110	8
110 ÷ 130	10
130 ÷ 155	11
155 ÷ 170	13
170 ÷ 200	15
220 ÷ 260	19

II.9 CURRENT INTENSITY SUGGESTED FOR RECHARGING THE BATTERY



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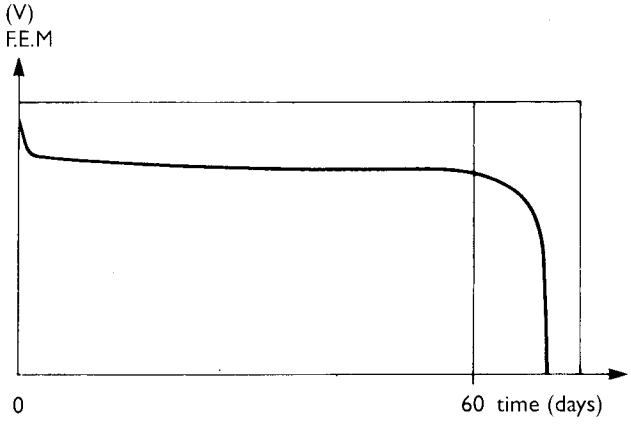
II.10 CHARGING STATE AND RELEVANT VOLTAGE VALUES. WITH A VALUE OF 12.30 V THE BATTERY DOES NOT GUARANTEE ENGINE STARTING



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II.11 DISCHARGING PERFORMANCE CURVE RELATIVE TO TIME

Normal charging current. The current intensity used for recharging through an external source. As a rule, the charging intensity amounts to a tenth of the battery rated capacity.

Potential difference. The voltage measured at battery terminals.

Electrolyte. Ionic conductor consisting of a sulphuric acid water solution (density: 1200 g/l at 25° C).

Plates. Consisting of lead alloy–antimony grids on which active substance is pressed: lead dioxide on positive plates, spongy lead on negative plates.

Internal resistance. Resistance opposing the current flow inside the battery. It is formed by various partial resistances. In lead batteries internal resistance ranges from a few thousandths to a few hundredths ohms.

Quick discharge. Battery discharge for three minutes in the most unfavourable outdoor temperature conditions (–10° C). This value is normally shown on batteries.

Sulphuric salts. They form close to battery terminals owing either to capillary effect of electrolyte splashes or gassing. This process continues relentlessly unless parts in contact with salts are cleaned. Sulphuric salts accelerate battery self–discharge via its fixing elements.

Separators. Microporous synthetic substances allowing the flow of ionic current yet preventing contact between opposite polarity plates.

Sulphation. Lead suplphate crystals (insoluble in water) inhibiting ionic current flow inside the battery whenever the latter has been poorly serviced.

Buffer battery. This is a parallel connection between battery (or batteries) and generator (alternator).
In other words, the generator positive terminal and the battery negative terminal are connected to the generator negative terminal. Buffer connection enables battery (or batteries) to act as a voltage regulator for the entire system.

Charging voltage. Voltage detected at battery terminals once the battery is recharged. This value is normally 2.4 V for each cell.

Rated voltage. Conventional value obtained by multiplying the product of a single cell by the number of battery cells.

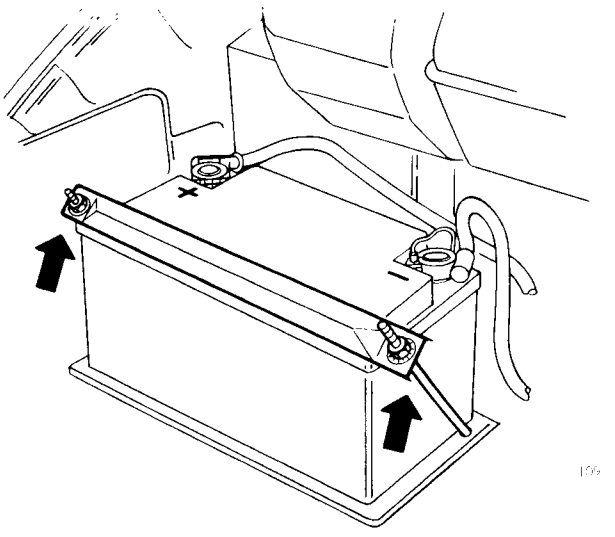
Discharging voltage. On reaching a given voltage value (which as a rule is 10.5 V for a 12 V battery), it is advisable to stop battery discharging.

Maintenance

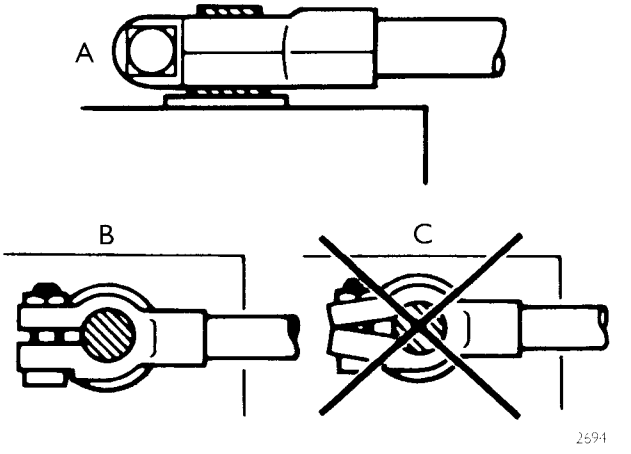
- When electrically welding parts on the vehicle, disconnect power cable from the battery positive terminal and connect it to chassis earth.

  To prevent serious damage to the electrical system caused by extreme current intensity produced by battery, in case of a short circuit it is of the utmost importance to disconnect the chassis earth cable from the battery negative terminal before disconnecting any other terminal and before working on electrical or electronic components.
- Disconnect cable from battery terminals when recharging by means of an external battery charger.

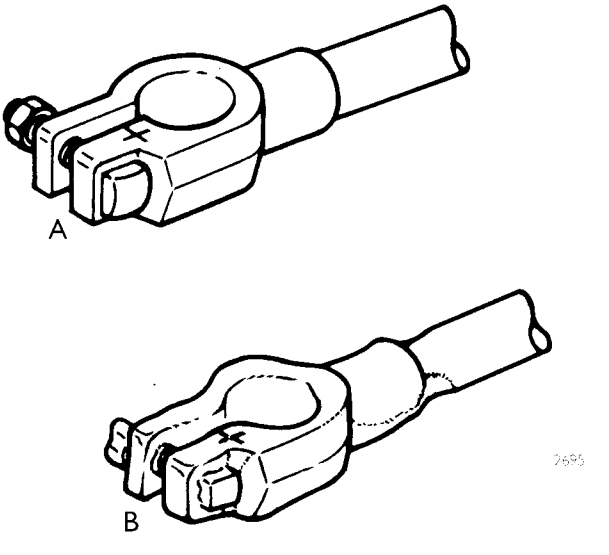
  Discharged batteries (electrolyte density 1.150 g/l at 25° C) should be immediately recharged to prevent the irreversible process of plate sulphation.
- When testing with a hydrometer, if one or more cells are found with milky white or brick red electrolyte, the battery must be replaced.
- Never top up with sulphuric acid.
- Recharge batteries if they do not supply the necessary engine starting power. In cold weather (outdoor temperature below 0° C) wait 3 minutes before repeating the starting operation.
- Quick emergency recharging should be performed only when a battery is in good condition.



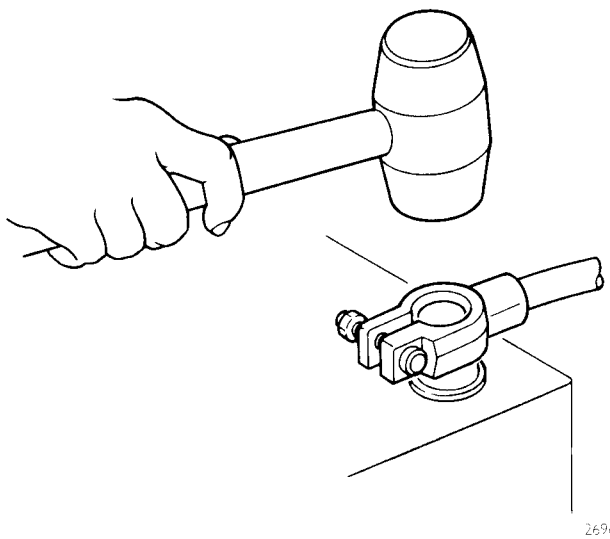
II.12 TIGHTENING STAY BOLTS



II.13 A. CORRECT CLIP POSITIONING ON BATTERY TERMINALTIGHTENING CLIP ON BATTERY TERMINAL – B. CORRECT – C. INCORRECT



II.14 A. EFFICIENT CLIP B. INEFFICIENT CLIP



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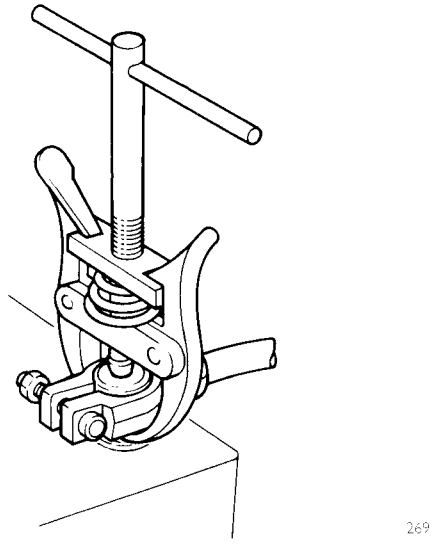
II.15 POSITIONING A BATTERY CLIP WITH A RUBBER MALLET



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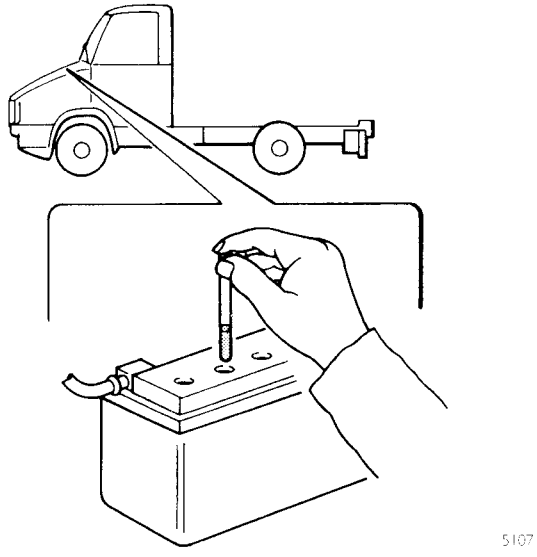
II.16 REMOVING A BATTERY CLIP WITH A SUITABLE EXTRACTOR



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II.17 CHECKING ELECTROLYTE LEVEL WITH A GLASS TUBE

- Never bring a flame (matches, cigar lighter etc.) close to batteries especially when they are being charged with an external charger.
- Ensure system isolation before carrying out battery replacement.
- Never rest tools or objects on battery covers. Never step on batteries.

As mentioned before, good functioning of the electric system depends on correct use of the battery which should undergo continuous and efficient maintenance.

Connections

Perfect electrical contact of the battery clips to battery terminals is of the utmost importance. Battery terminal clips should be in perfect condition, free from corrosion, from galvanic oxidation and electrolyte salts. They should be tightened to a moderate torque to prevent warping (fig. II.12 and II.13).

Clips are marked + (positive) and – (negative) and are of different diameters to avoid connection errors. Finally, cable length should be adequate.

Fixing

Correct fixing of the battery in the mounting tray ensures its long life. Tightening through L bracket or frame, torque should be moderate to prevent warping or cracking of battery caps (fig. II.11).

Electrolyte level

Periodically check electrolyte level in each single battery cell. Topping up, if necessary, should be carried out after resting the battery (i.e. with no current input for 5 or 6 hours). Use only distilled or purified water and a plastic funnel. Depending on battery type, plates should be immersed by 10 to 15 mm.

For ebonite batteries – therefore with non translucent case – use a glass tube to check the level (fig. II.17).

Cleaning

Periodically wash batteries with a jet of water. Then blow dry with compressed air and use woollen cloths. Smear clips with anti–acid neutral grease (do not use lubricants).

Checking the state of charge of the battery

Make sure you respect polarity when connecting an external charger to battery terminals. To avoid explosions, disconnect the recharging equipment from the mains BEFORE disconnecting clips from battery terminals. For the same reason, electrolyte level check should only be carried out by means of an electric torch.

If the vehicle is expected to remain stationary for more than eight days, battery terminals must be disconnected. Check the state of charge at regular intervals and recharge if necessary. Checking the state of charge is a basic step in the maintenance operation sequence.

The efficiency of the battery can be checked through electrolyte density to which it is strictly connected. This measurement is carried out by means of a suitably calibrated hydrometer (fig. II.19). Compare the reading on its scale with that shown on figure II.20 to obtain the exact state of efficiency of the battery (percentage reading).

To avoid obtaining an unreliable reading, do not take this measurement in the following cases:

- When electrolyte level is not as specified: in this case top up with distilled water and wait 1 – 2 hours before carying out a quick 10/15 minute recharging.
- When battery temperature is different from ambient temperature (25° C): in this case wait for the battery to reach the correct temperature.
- When the electrolyte is boiling: in this case wait until all bubbles in the hydrometer reach the surface.

To obtain a correct electrolyte level reading position the hydrometer vertically and take the reading at the emerging point.

If the vehicle is expected to remain stationary over a long period of time, store batteries in a dry and ventilated place and recharge them each time electrolyte density is below 1200 g/l.

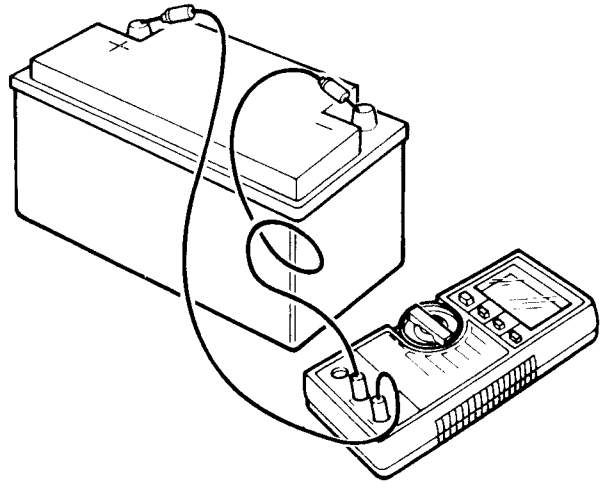
Visual inspection

Check efficiency of clips, fastening brackets etc. at regular intervals ensuring batteries are perfectly clean.

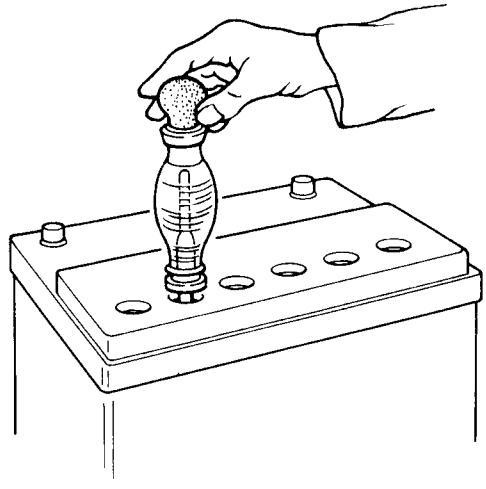
Measuring electrlyte density

The electromotive force of the batteries depends on electrolyte density and increases accordingly.

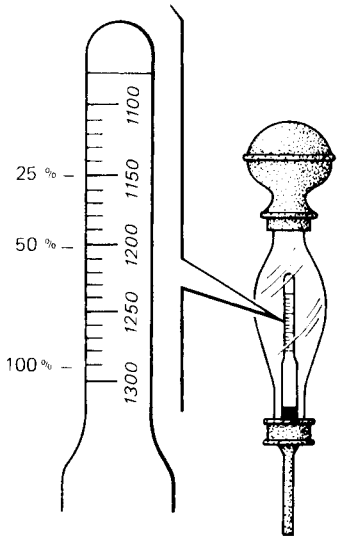
Remember that daily self–discharge of a battery requiring standard servicing is 1% of its rated capacity.



II.18 CHECKING STATE OF CHARGE OF SEALED BATTERIES



II.19 CHECKING ELECTROLYTE DENSITY

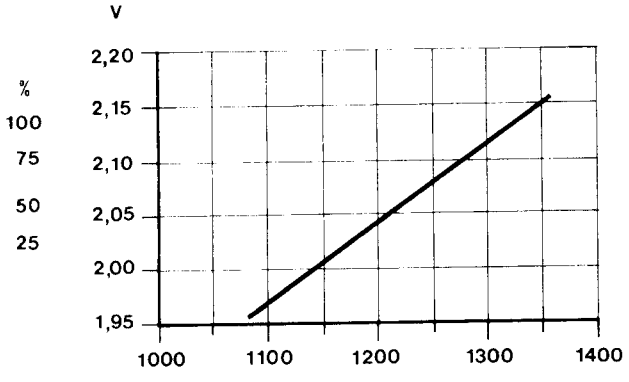


II.20 HYDROMETER. THE PERCENTAGE SCALE INDICATES THE STATE OF CHARGE

Voltage	Specific weight 25°C	Charging percentage	Guaranteed starting	
				❄
13.2	1.300	100%	YES	YES
12	1.190	50 %	YES	NO
11.6	1.146	25 %	NO	NO

2702

II.21 TABLE OF ELECTROLYTE DENSITIES (SPECIFIC WEIGHT) OR ELECTROMOTIVE FORCE VALUES IN VOLTS AND RECHARGING PERCENTAGE



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II.22 PERFORMANCE CURVE OF OPEN CIRCUIT ELECTROMOTIVE FORCE VARIATION DEPENDING ON ELECTROLYTE DENSITY AT 25° C. PERCENTAGE SCALE REPRESENTS THE CHARGING STATE

Electrolyte	Batteries	
	Normal climates (below 32°C)	Tropical climates (over 32°C)
Filling density	1270	1270
Density at end of charge	1270 ÷ 1280	1220 ÷ 1230
Max. temp. per single cell during charging	1270	60 °C

2704

II.23 TABLE OF ELECTROLYTE DENSITIES DEPENDING ON CLIMATES

Standard batteries

Before recharging the battery top up the electrolyte level in each single cell with distilled or purified water (use plastic funnels).

Disconnect the earth and positive leads from their respective terminals, then proceed as follows:

- Connect the clips to the battery terminals observing polarity.
- Select the recharging voltage on the external charger.
- Connect the charger to the mains and switch it on.
- Regulate the charging current according to table in figure II.9.

During recharging the temperature of the electrolyte should not exceed 50° C.

End of charge is indicated by boiling electrolyte. Voltage on battery terminals is then 15 to 16.2 V (for a 12 V battery).

Dry charge battery

Top up with the electrolyte supplied with the battery kit.

Before use, this type of battery must be rested 2 hours to allow the plates to absorb the acid. Top up level again after resting for 2 hours, if necessary.

If after operation the electrolyte density is lower than 1220 g/l at a temperature of 25° C, recharge the battery with an external device.

The recharge current value should not exceed 20% of battery rated capacity.

Maintenance free batteries

Use an open circuit digital voltmeter to check the state of charge of this type of battery.

Recharging of batteries requiring no maintenance is carried out at constant voltage and current intensity is one tenth of rated capacity.

If the voltage value exceeds 16V, the recharging current should be decreased.

End of charge

End of charge is automatically ensured by external devices equipped with a special probe. If the external device is not fitted with a probe, end of charge is indicated by boiling electrolyte. Switch off the battery charger through the proper switch (MAR/AR) before disconnecting extension leads from battery terminals.

⚠ Wait for electrolyte temperature to reach ambient temperature and then check the charge percentage using a digital voltmeter or an appropriate hydrometer (fig. II.20). Discharged battery electrlyte freezes at –55 C.

Recharging batteries by means of an external charger

Perform connections as indicated in figures II.24 and II.25.

A. External charger
B. Battery on-board the vehicle
1. Amperometer
2. Timer
3. Selector
4. Voltmeter
5. Positive power cable disconnected from battery terminal
6. Negative power cable disconnected from battery terminal
7. Main current switch (if fitted)
8. Earth

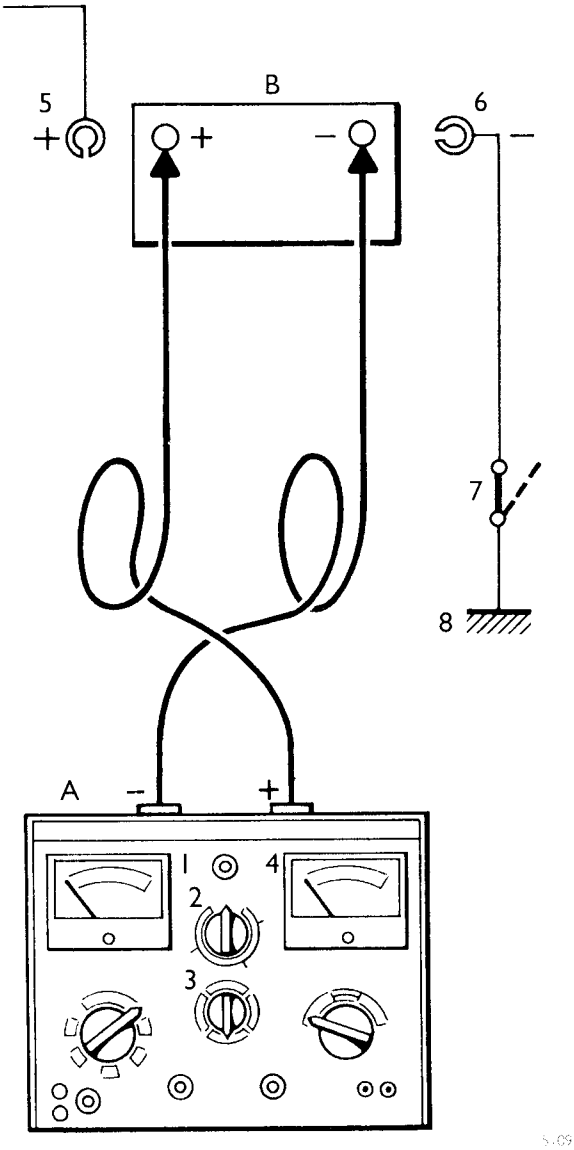
Table figure II.9 page II.8.

For maintenance free batteries recharging current values must be halved.

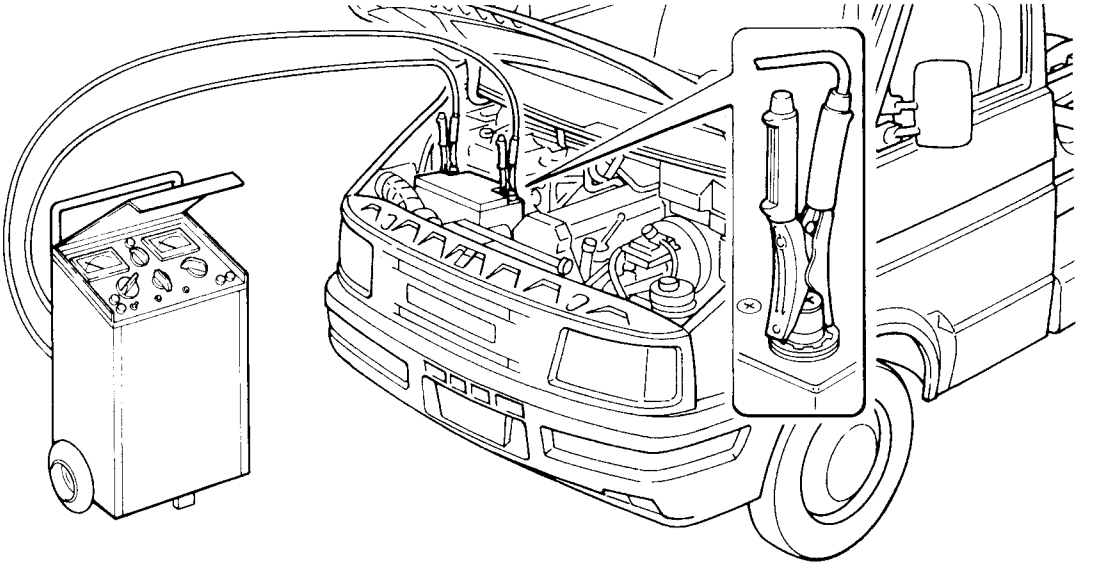
Battery end of charge is indicated by boiling electrolyte (45ɔ–50ɔ C) and emission of explosive gases.

To avoid damaging the battery inside and prevent battery explosions, strictly adhere to the following directions:

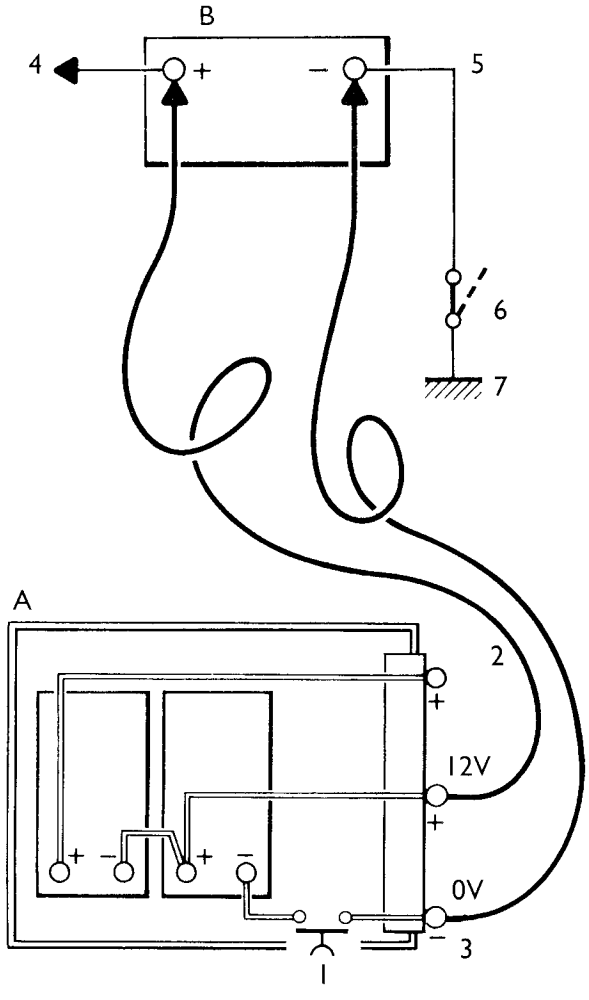
- top up the electrolyte to the correct level;
- charger voltage characteristics must meet vehicle system specifications;
- battery must be disconnected from vehicle mains;
- the intensity of the charging current must be proportional to the battery's rated capacity .



II.24 EXTERNAL CHARGER TO VEHICLE BATTERY CONNECTION DIAGRAM



II.25 CONNECTING EXTERNAL CHARGER TO BATTERY ON-BOARD THE VEHICLE



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II.26 EXTERNAL TROLLEY TO VEHICLE BATTERY CONNECTION DIAGRAM

Starting from external trolley

Owing to the large quantity of delivered energy (several hundrendths of ampere), voltage and rated capacity of batteries assembled on the external trolley should meet vehicle system specifications.

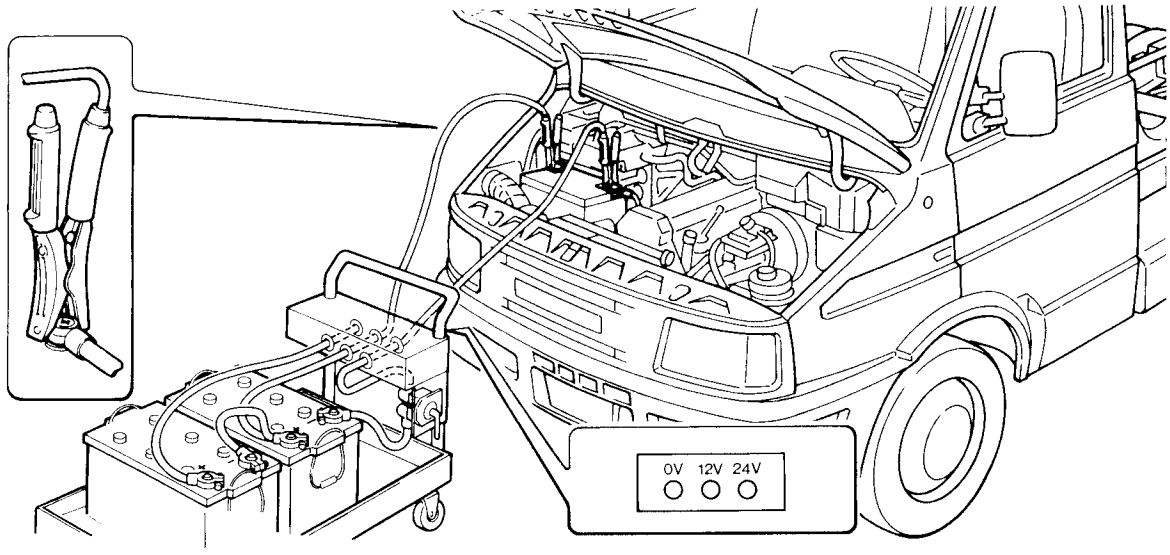
Ensure the external trolley knife switch is open. First connect the trolley positive extension cable to battery power cable positive terminal (RED). Then connect the trolley negative extension cable to power cable negative terminal (BROWN).

Close the vehicle's knife switch, then close the external trolley's knife switch, once the preheating stage is over, start the engine. When the engine is running open the external trolley's knife switch. Disconnect the clip for the negative extension cable first, then disconnect the positive one.

Above connections are shown in fig. II.26, as follows:

A. Trolley with batteries for starting vehicle from the outside
B. Battery on vehicle
1. External trolley knife switch
2. Positive extension cable to be connected to positive clip (+) of vehicle battery
3. Negative extension cable to be connected to negative clip (–) of vehicle battery
4. Positive power cable for supply of vehicle components
5. Negative power cable connected to engine earth (M1)
6. Main current switch (if fitted)
7. Vehicle's metal frame (earth)

Observe vehicle system polarity.
Take great care when positioning external trolley power clips: they should cover maximum possible terminal surface area without however touching the battery fixing brackets.



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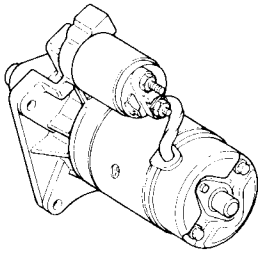
II.27 CONNECTING VEHICLE BATTERIES TO EXTERNAL TROLLEY FOR REMOTE STARTING OPERATION

Starter motor

Specifications

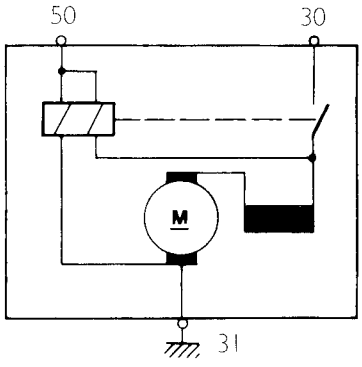


	BOSCH	EV–12V–2,2kW	Daily Turbodaily

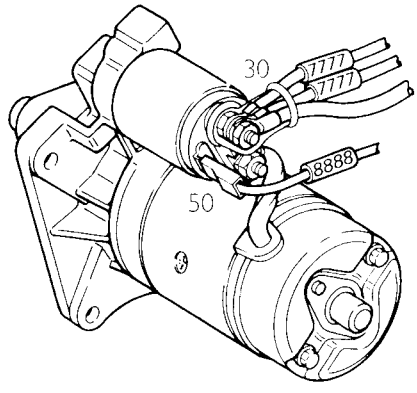
Quick diagnosis

Defect	Possible cause	Remedy
Lead in torque insufficient	1. Discharged batteries	Recharge or replace battery
	2. Circuit connections oxidized or loose	Check battery and starter motor connections
	3. Brushes inefficient	Check length, sliding and pressure of brushes
	4. Field windings shorted	Replace windings
	5. Broken or shorted armature	Replace commutator
	6. Ovalized commutator	Grind or replace
Lead in torque adequate but engine will not start	1. Free wheel or solenoid faulty	Replace
Pinion does not mesh	1. Flywheel ring gear worn	Change parts concerned

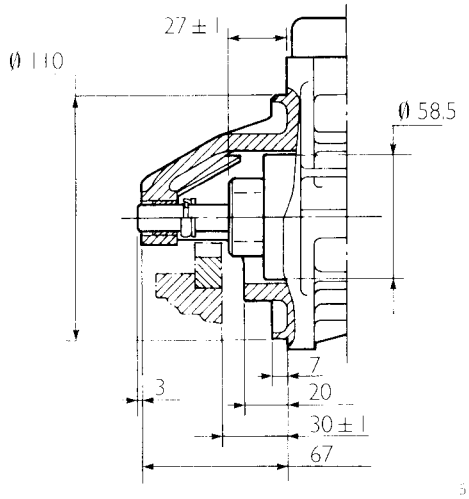
Supplier	BOSCH KB 24V 5,4kW
Model	EV 12V 2,2 kW
Type:	4 poles, series excitation, mesh by solenoid driven fork
Direction of rotation	clockwise
Rated voltage	12 V
Rated output	2,2 kW



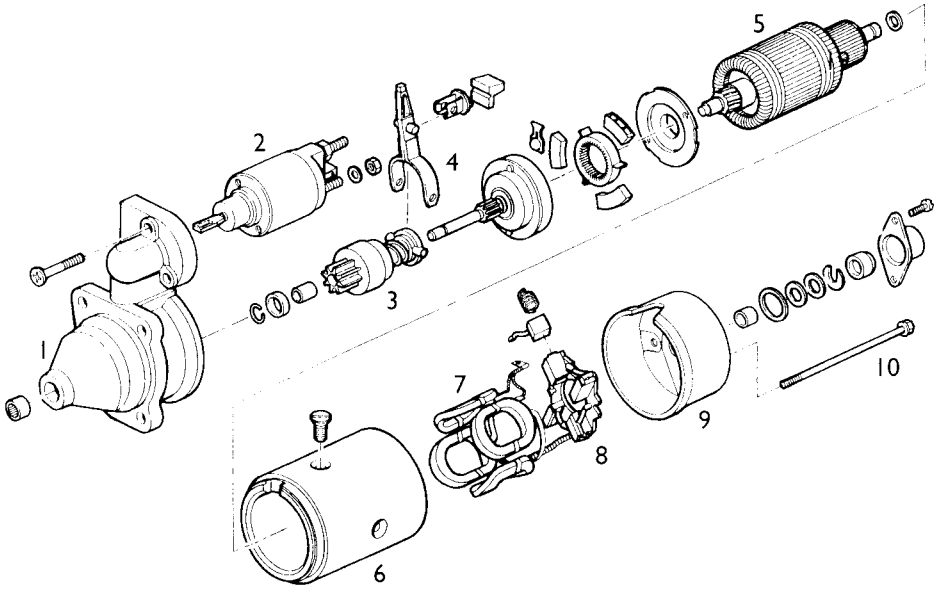
WIRING DIAGRAM



LAYOUT WITH CONNECTIONS



PINION ADJUSTMENT



EXPLODED VIEW

1. SUPPORT
2. PINION MESH DRIVE SOLENOID
3. PINION
4. PINION MESH FORK
5. ARMATURE
6. FRAME
7. INDUCTANCE WINDINGS
8. BRUSH HOLDER
9. COVER
10. SCREW

On–board testing

Current absorption test

- Connect main lead clips of equipment to battery terminals observing polarity (fig. II.28).

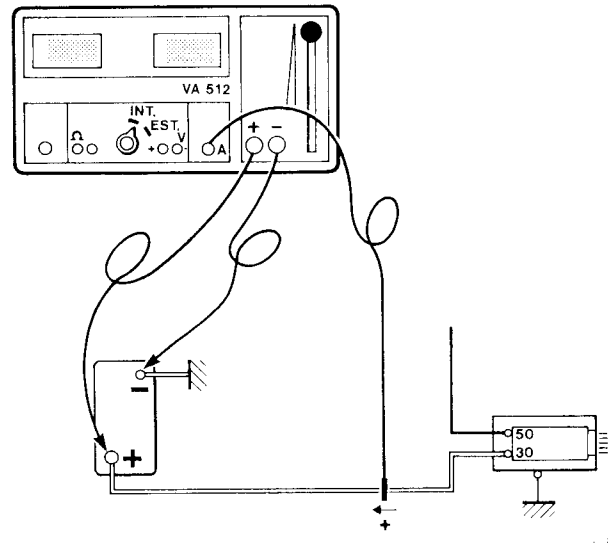
  Connect inductive clip to positive cable observing polarity and direction of arrow marked on same clip.

  Turn test selector to "INT" (internal) position.

- Prevent engine starting and actuate starter motor for 15 seconds.

Observe voltage and current values.

- Voltage should not drop below 19.5 V if two 12V series-connected batteries are used.
- The value of current absorbed by the starter motor should not exceed battery capacity in Ah by about three times.
- If the above two conditions are met, the starter motor is working properly.



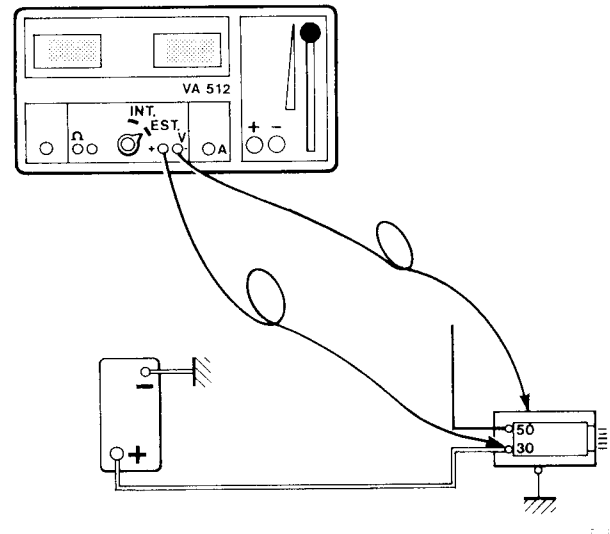
II.28 CURRENT ABSORPTION TEST

Testing circuit voltage drop

Connect positive clip to terminal 30 of starter motor and negative clip to starter motor frame (fig.II.29).

- Turn test selector on "EST" (external) position.
- Prevent engine starting and actuate starter motor.

Voltage reading on digital voltmeter during starting stage may vary by about 0.5 V compared to readings obtained during the previous test (current absorption test). If this is so, conditions of circuit and connections are satisfactory.



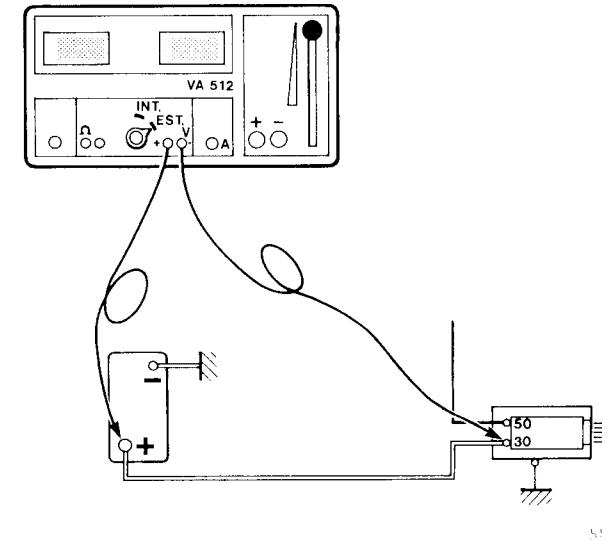
II.29 VOLTAGE DROP TEST ON CIRCUIT AND CONNECTIONS

Excessive voltage drop test

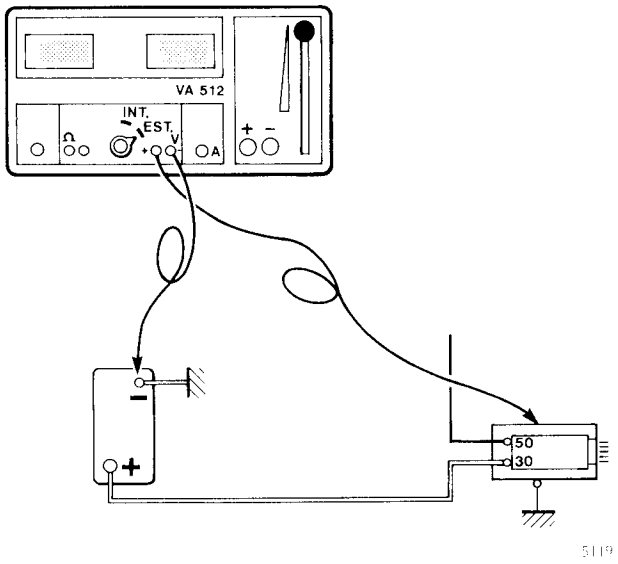
Connect positive clip of external voltmeter to battery positive terminal and negative clip to terminal 30 of starter motor (fig. II.30).

- Turn test selector to "EST" (external) position.
- Prevent engine starting and actuate starter motor.

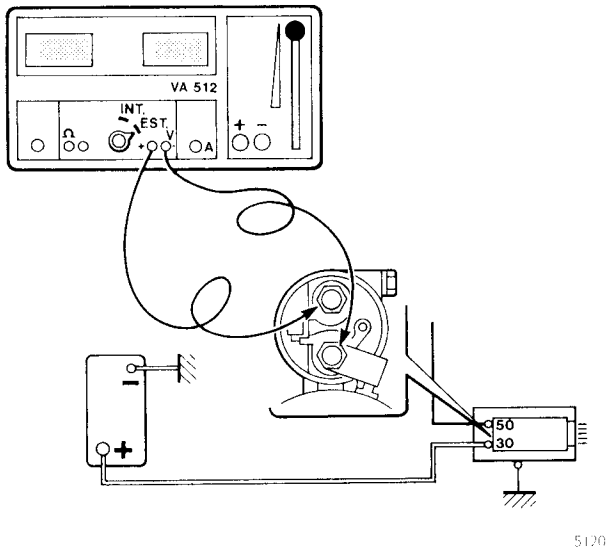
Voltage reading on digital voltmeter should not exceed 0.5 V if the circuit is efficient.



II.30 CIRCUIT VOLTAGE DROP TEST



II.31 TESTING STARTER MOTOR EARTH



II.32 TESTING VOLTAGE DROP ON SOLENOID CONTACTS

Testing starter motor earth

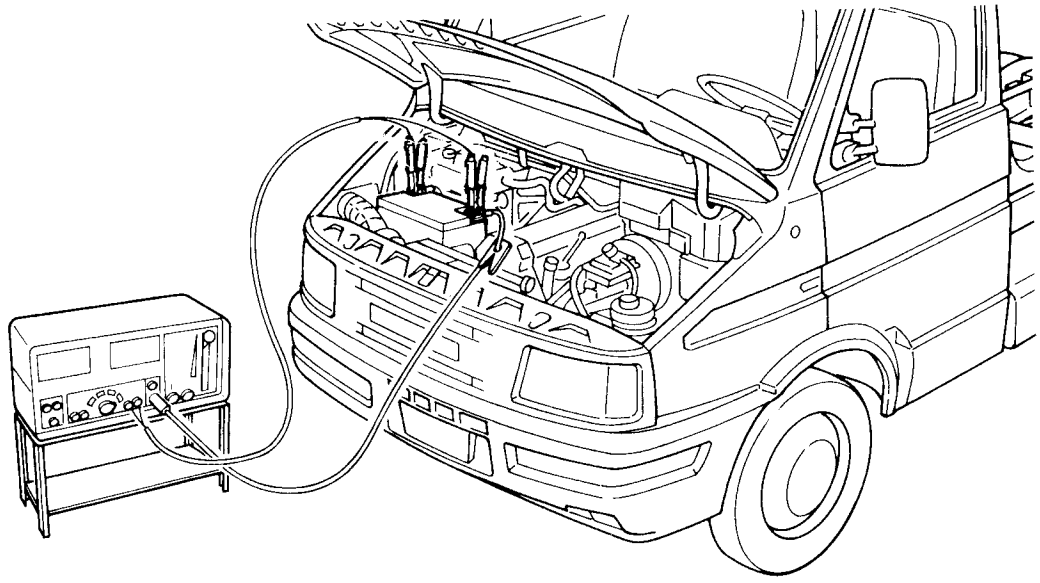
- Connect the external voltmeter negative cable to battery negative terminal and voltmeter positive cable to starter motor body (fig. II.30).
- Turn test selector to "EST" (external) position.
- Prevent engine starting and actuate starter motor.

Voltage reading on digital voltmeter should not exceed 0.25 V if solenoid contacts are efficient.

Testing voltage drop on solenoid contacts

- Position external voltmeter cables on solenoid contacts observing polarity.
- Turn test selector to "EST" (external) position.
- Prevent engine starting and actuate starter motor.

Voltage reading on digital voltmeter should not exceed 0.25 V if contacts are efficient.



II.33 TESTING STARTING CIRCUIT WITH EQUIPMENT 99309003

In addition to previously mentioned tests, troubleshooting on a starter motor can be carried out at the test bench using the appropriate equipment and facilities.

Readings resulting from these tests should be compared with data supplied by the manufacturer.

Disassembly

Lock the starter motor in a vice provided with lead caps. Dismantle the starter motor according to instructions.

NOTE. To facilitate dismantling operations use only a plastic hammer.

Remove the control relay and take out the compensating plate.

Remove the brush holder support, be careful not to damage winding terminals.

After disassembly wash all components quickly. Use only detergents for electrical components: petrol, solvent or trichlorethylene.

Given their volatility, strict compliance with safety standards concerning inflammable liquids is recommended, as well as the use of protective glasses and gloves.

Accurately blow dry washed parts with compressed air (4 bar approx.) and use clean cloths.

Check all parts for wear or defects. Damaged, shorted or worn parts should be replaced.

NOTE. Regular replacement is also recommended for brushes, seals, washers, Grower washers and for the pinion fixing nut on armature shaft.

Should the armature commutator need remachining (eccentricity) use a hard steel turning tool to turn commutator until all eccentricity is eliminated.

If it is necessary to remove the windings proceed as follows: mark pole pieces, then slightly heat new windings and refit pole pieces observing marks made during disassembly.

When using the tester, rest the polar body on a working plane insulated from the test bench earth and from the earth.

Change relays with corroded contacts.

Extreme care is required during the armature insulation test.

Possible vibrations of the steel segment located on the armature body mean that armature levers are shorted or that mica removal is incorrect. Correct mica removal should be in the shape of a clear-cut U.

Reassembly

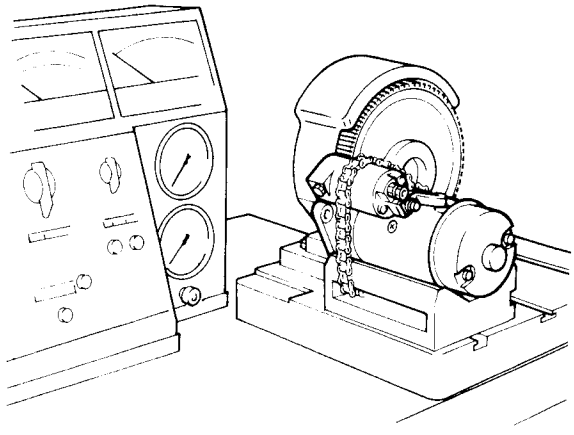
During reassembly make sure that the armature (without brushes) turns freely.

Also check that brushes slide easily in their seat, check spring pressure on brushes (1.2 kg), and spring pressure on coupling rod.

Lubricate bright sections with corrosion proof oils and slightly smear the pinion with specific grease.

NOTE. Do not put oil or grease on the commutator.

When reassembling the brush holder support make sure not to damage winding terminals.



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II.34 BENCH TEST

On completion of assembly check that the pinion slides freely by working on coupling relay and make sure of armature free rotation.

Special attention should be paid to the position of brush polarity jumpers as well as to winding terminals both with regard to brushes and control and starting relays.

Make sure there is no short circuit (owing to vibrations) between winding terminals and polar body or brush holder support. Also make sure there is no contact or risk of contact between winding terminals and armature.

Bench test

Fix the starter motor firmly to the bench by means of fastening chains. Starter motor cover on commutator side should be removed.

Connect power leads to starter motor terminals observing polarity.

Should values read during test be other than those of performance curves shown on figure, dismantle the motor again and repeat the checking sequence for each single component.

NOTE. Bench test values mainly depend on the state of charging and capacity of batteries and on test duration which should be as short as possible.

Power curves

Power depends on two factors: torque and rotation speed.

Power is nil when the starter motor is idling (no load) and when it is in stall (locked).

Power is maximum at curve vertex.

Rated power is normally read at 2/3rds of the curve.

Torque curve

Torque is nil when the starter motor is idling and maximum when it is in stall.

Speed curve

Rotation speed curve is maximum when the starter motor is idling and is nil when it is in stall.

Voltage curve

It depends on the state of bench batteries and on current absorbed by the starter motor.

Should values read during bench test vary significantly from testing values, the starter motor is faulty.

Repeat the disassembling and checking sequence for each single component.

General information

The purpose of the starter motor is to convert the electric power produced by the battery (or batteries) into mechanical power that causes the engine to turn.

Basic data

Direct current starter motor operation is based on the magnetic induction principle.

"A conductor placed in a magnetic field and through which current is flowing is subject to a force which is proportional to magnetic field and current intensity. Such force reaches its peak value when magnetic field and conductor are at right angles."

In the starter motor the magnetic field is generated by the stator or fixed windings. The armature houses inductive windings which are immersed in the inductive magnetic field and crossed by current thereby developing a motive torque on the armature shaft.

Technical and practical hints

Excitation winding. It generates the electromagnetic field between the polar pieces into which the armature turns.

Field windings. This is the starter motor static system where the electromagnetic field is generated.

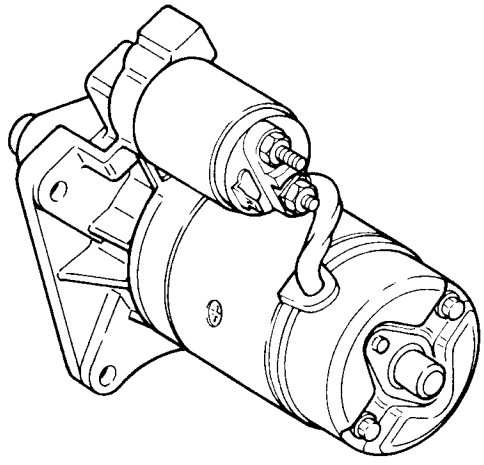
Field windings are series connected to the armature through the brushes and produce the starter motor lead in torque.

They are secured to the frame by means of polar pieces.

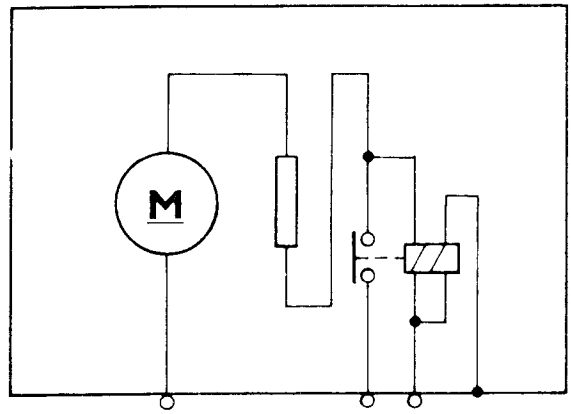
Medium and high power windings consist of copper straps; insulation between each strap is ensured by a layer of paint. Ohmic winding resistance is less than 1 ohm.

Besides series connected field windings, high power starter motors are also provided with parallel connected winding enabling slow rotation and pinion feed in the flywheel coupling stage.

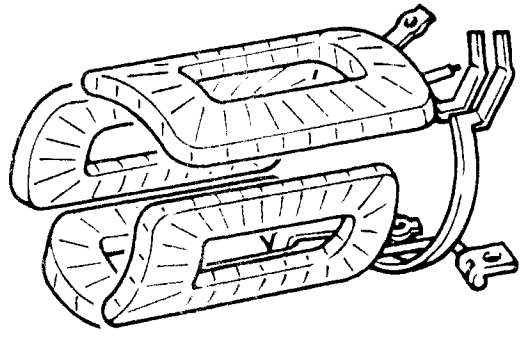
As soon as the best position is attained, an adequately located electrical contact enables the current to flow to field windings thus supplying the maximum armature lead in torque.



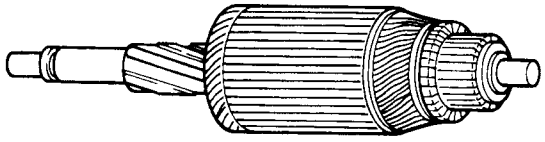
II.35 PERSPECTIVE VIEW OF STARTER MOTOR



II.36 STARTER MOTOR WIRING DIAGRAM



II.37 FIELD WINDING



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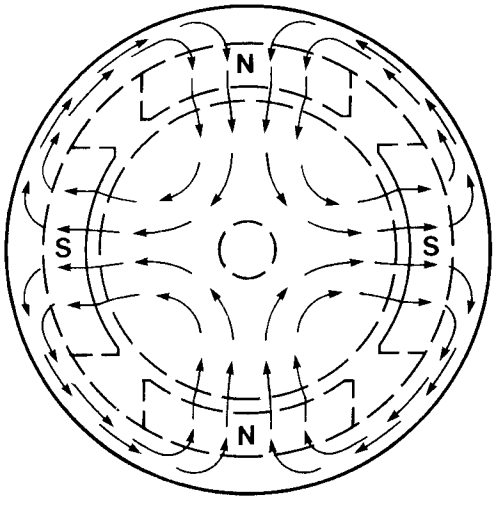
II.38 ARMATURE WINDINGS



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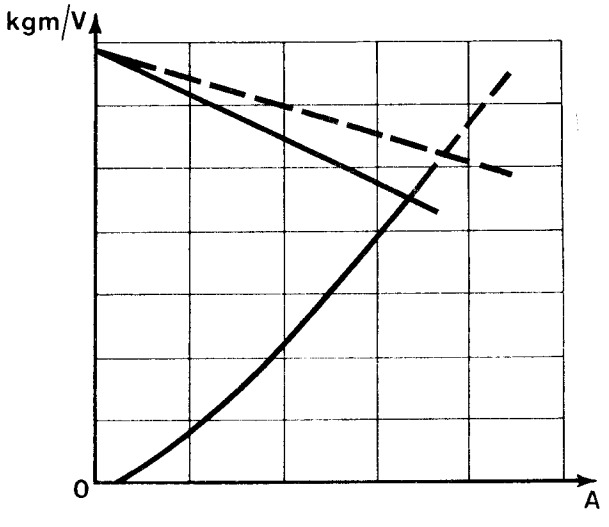
II.39 POLAR FRAME



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II.40 TORQUE PERFORMANCE DEPENDING ON VOLTAGE

Armature winding. This winding is made up of several windings connected between each other by commutator segments.

The current flowing through windings via negative and positive brushes generates the starter motor driving torque.

Braking winding (starter motor with pinion translation). When the starter motor is cut off, this winding is short-circuited at the armature winding via a control relay contact; this way the starter motor is rapidly brought to rest position.

Clutch winding. This type of winding is present in relays provided with a retaining winding. It is short-circuited after contacts are closed.

Polar frame. Field windings are fastened to the frame by means of polar pieces. Its property is to increase the excitation field magnetic flux through its metal agglomerate.

Commutator. The commutator feeds direct current to the different armature winding sections via the brushes.

All ends of windings forming the armature winding lead to the commutator which is made up of copper blades insulated from each other by insulated segments.

Torque. This is the turning power that the starter motor transmits to the engine during the initial starting stage. Voltage at battery terminals affects the starting torque in a substantial way.

NOTE. Torque is zero when the starter motor is idling and is at its peak value when the starter motor is in stall.

Duration of the starting stage. Starter motor operation must be brief as its current absorption (about 450 A) affects the battery as a short circuit. Duration of the starting stage should not exceed 30 seconds.

Should the starting operation be repeated owing to particular conditions (e.g. low temperatures), leave batteries at rest for about 3 minutes.

Electromagnet (solenoid). Purpose of this electromagnet is to close the starter motor power circuit via the excitation current of its own coil and with a current absorption of several hundred amperes.

It consists of two windings:

- clutch winding
- retaining winding.

The first winding enables pinion fork and flywheel coupling.

The second one prevents pinion fork from getting detached from flywheel during the entire starting stage.

Armature. This is the rotating section of the starter motor housing the armature winding. It also includes the blade collector and the clutch pinion. Lead–in torque is generated inside the armature.

For correct operation of the armature the following conditions should be met:

- electrical insulation of armature winding from the sheet pack
- commutator insulation
- perfect seal of bushings at armature terminals.

Polar pieces. They increase the magnetic flux of the excitation field.

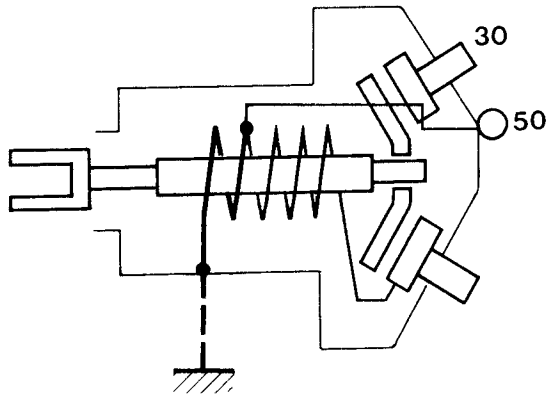
Pinion. This is a toothed wheel that engages with the flywheel ring gear during the starting stage thus conveying the torque generated by the armature to the crankshaft.

The flywheel ring gear is fitted with different types of clutches according to the required power value:

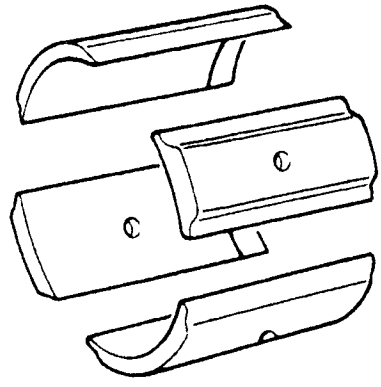
- translation and screwing of the armature spindle on the helical groove by means of a fork
- armature translation
- pinion translation.

Rated power. Starter motor rated power mainly depends on two factors: torque and rotation speed.

Rated power is generally read at 2/3rds of the curve and is calculated on the basis of a given temperature and a given battery capacity.



II.41 ELECTROMAGNET (SOLENOID)



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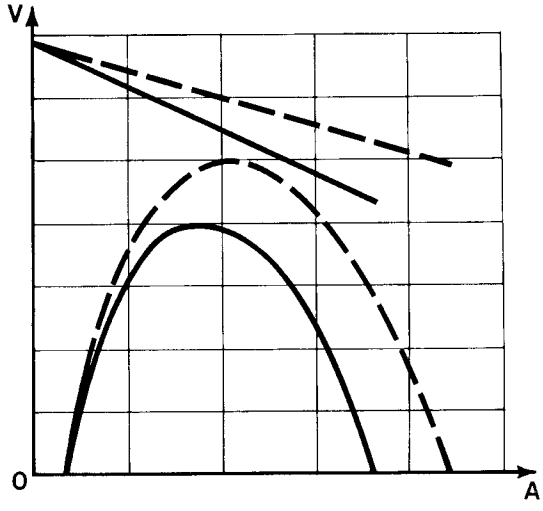
II.42 POLAR PIECES



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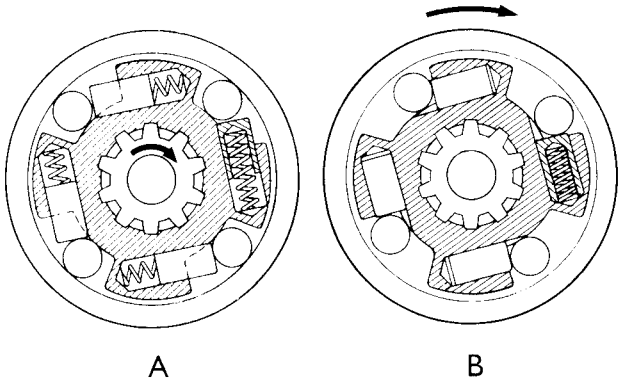
II.43 POWER PERFORMANCE DEPENDING ON VOLTAGE



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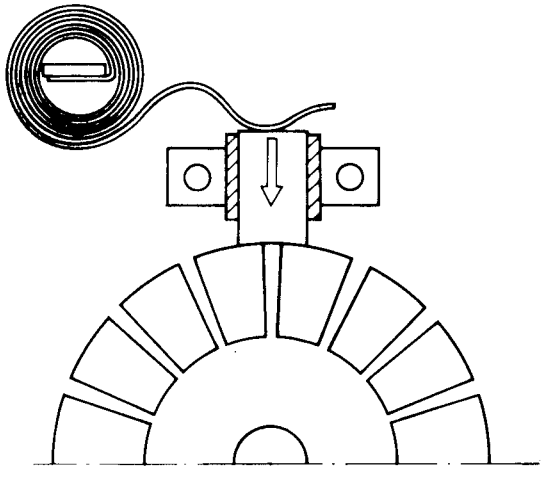
II.44 ROLLER WHEEL
A. COUPLING STAGE – B. FREE STAGE



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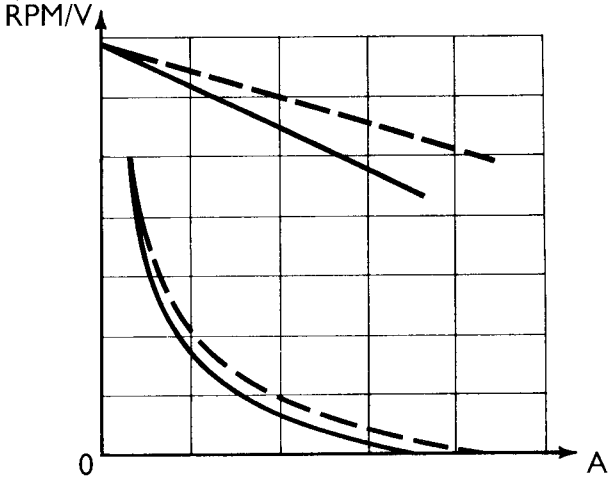
II.45 BRUSH HOLDER - BRUSH PRESSURE ON COMMUTATOR IS THROUGH SPIRAL SPRING



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II.46 RPM PERFORMANCE DEPENDING ON VOTLAGE

Roller free wheel. When the engine is running and pinion rpm increase (speed is higher than normal idling starter motor speed), the roller free wheel cuts in with the purpose of inhibiting transmission of torque supplied by armature to pinion.

Roller movement enables pinion/armature engagement and disengagement.

This is possible, during the starting stage, as pinion and armature move in the narrow section of a curved race.

In this condition the cylindrical section of the pinion becomes integral with the armature (torque transmission to engine flywheel) thus obstructing the free wheel guide.

As soon as the engine is started pinion rpm increase. Overcoming the force of the springs, the pinion moves the rollers to the larger section of the curved race thus separating pinion from armature.

Now the starter motor does not convey torque to the pinion. However, the pinion will remain in mesh with the engine flywheel until the ignition switch is turned off.

During the second part of the starting stage, springs return rollers to rest position – i.e. the narrow section of the free wheel guide – so that the pinion may be coupled securely to the armature.

Brushes. Purpose of the brushes is to connect the induced circuit and convey the electric current to the armature winding.

Reliability of the starter motor is based on brush length, quality and pressure on the commutator as well as on perfect sliding of the brush holder.

Furthermore, brushes must rest completely on the commutator and their entire surface must adhere to it.

Voltage. Voltage drop during the starting stage depends on starter motor current absorption and on battery capacity.

Minimum speed during starting stage. Starter motor rotation speed increases according to voltage present at battery terminals.

However, minimum speed – below which Diesel engine starting is not ensured – depends on ambient temperature.

Pre-engaged starter motors

Starter motors of this type are operated through electromagnet (solenoid) coupling.

The protruding end of the electromagnet is provided with a slit housing the coupling lever pin.

On pinion end the armature spindle has a helical groove with a driving nut which is in mesh with the pinion through the roller free wheel.

Helical groove enables pinion and flywheel coupling.

The driving nut is fitted with a guide ring connected to the above-mentioned coupling lever.

The spring is positioned between the guide ring and the driving nut.

Purpose of the spring is to enable the lever to complete its stroke thus closing both jumper and contact.

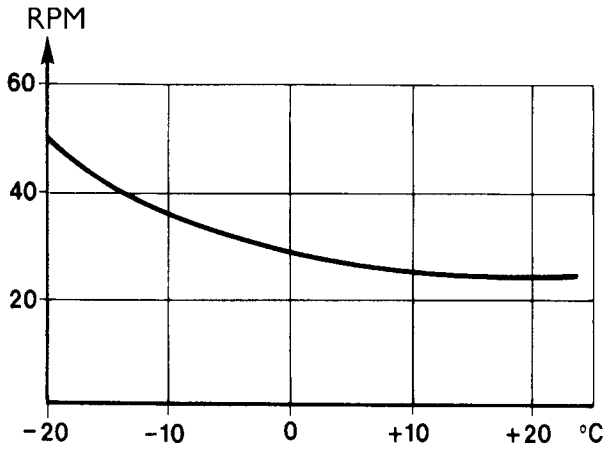
During the starting stage the lever pushes driving pin and pinion against the toothed wheel.

Owing to the helical groove, the pinion rotates and engages with the flywheel. The lever reaches its end of stroke and closes the power contact thereby transmitting the driving torque to the flywheel.

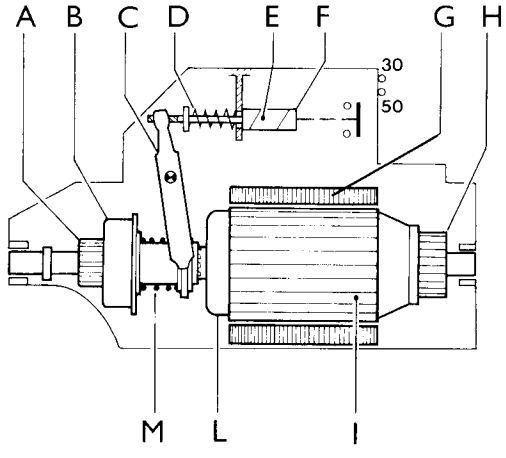
NOTE. Starting current stays on even if the pinion hits one of the ring gear teeth.

When the starting stage is over, the roller free wheel previously integral with the armature – separates the armature from the pinion, in case engine rpm exceed starter motor rpm.

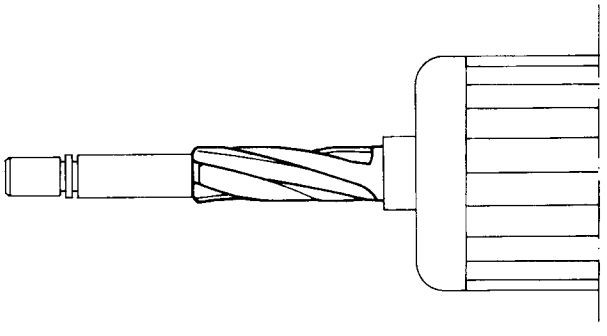
The coupling process consists of two stages: translation and engagement. However, starter motor coupling occurs in one stage only.



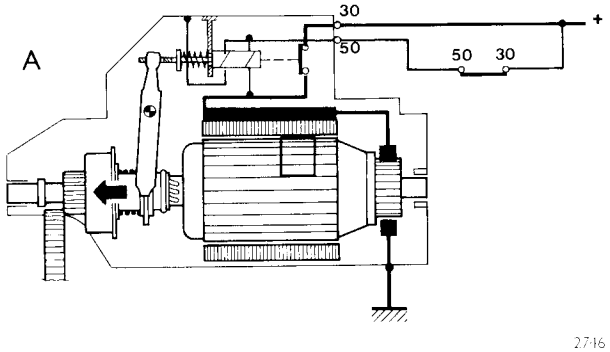
II.47 MINIMUM STARTING SPEED



II.48 STARTER MOTOR ASSEMBLY
A. PINION – B. FREE WHEEL – C. COUPLING LEVER – D. COUNTER SPRING – E. RETAINING WINDING – F. CLUTCH WINDING – G. FIELD WINDING – H. COMMUTATOR – I. ARMATURE – L. POLAR PIECE – M. COUPLING SPRING



II.49 HELICAL GROOVE



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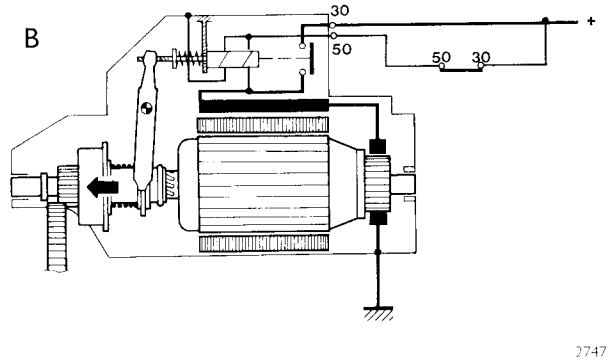
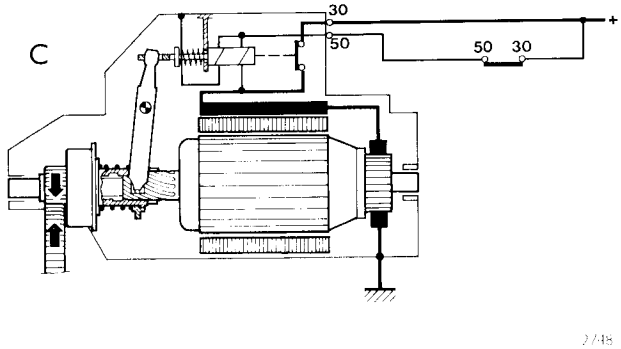


2747



2748

II.50 STARTER MOTOR COUPLING SEQUENCE

Pinion engagement. As soon as terminal 50 of ignition switch is energized the coupling lever moves against the spring thereby inhibiting closing of armature and winding connection contacts.

As previously mentioned, the lever pushes the driving nut and the pinion against the ring gear; owing to the helical groove, driving nut and pinion rotate.

Translation. If the pinion finds a space between the flywheel teeth, it meshes with the ring gear as deeply as the coupling lever permits, that is until the jumper presses against the solenoid contacts. In this condition, pinion translation is completed (ref. B).

Should the pinion not engage with the ring gear (tooth against tooth), the coupling lever compresses the spring until it reaches the jumper contact stop: the starter motor starts to turn (rif. A).

The pinion slides on the tooth head and engages owing to the preloaded spring and to pressure produced by the helical groove screwing effect.

As solenoid contacts are closed when translation is completed, the armature – now rotating – pushes the toothed wheel pinion – owing to the helical groove – in contact with the armature spindle.

In this condition the pinion is integral with the armature spindle via the roller free wheel and enables the starter motor to operate the engine.

It should be remembered that the torque supplied by the starter motor is zero when the armature turns but its spindle slides on the flywheel tooth. Rotation speed in this case is only sufficient to carry out the coupling operation.

As soon as the pinion is in the coupling position – and is not therefore free to turn – the starter motor is opposed by the counter effect of the flywheel inertia and supplies the maximum torque required to start the engine.

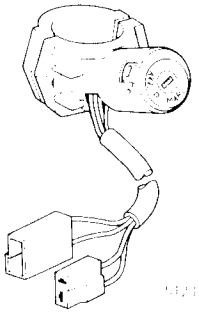
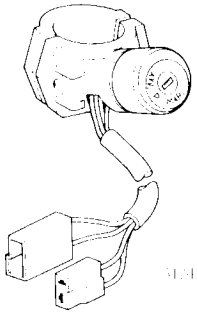
Disengagement. The pinion remains in mesh until the coupling lever is held in connection position.

After the engine is started flywheel rpm are higher than pinion rpm; as this condition could impair starter motor efficiency, the free wheel cuts in to release the armature spindle from the pinion.

As soon as the ignition switch is disconnected driving nut and pinion return to their rest position under action of the counter spring.

Ignition switch with starter–assisted services

Specifications

	SIPEA	1775	Daily–Turbodaily Turbodaily 4x4
	MARELLI	Q 213C	Daily–Turbodaily Turbodaily 4x4

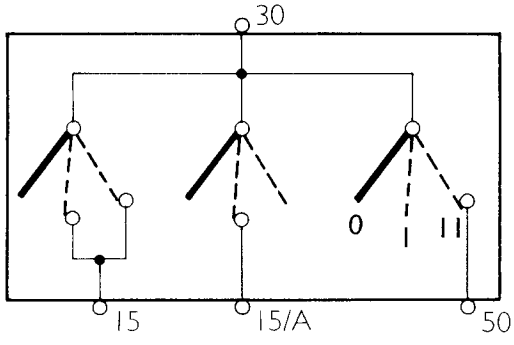
General directions

Supplier's name, manufacturing date, IVECO trademark must be stamped on the key switch.

The switch is supplied with two two–edged keys and manufacturer's code lock.

The steering lock cannot function unless the key has been set to position "0" (Stop) and removed from its seat.

The switch must be fitted with an antistarting repeater device.



WIRING DIAGRAM

Switching sequence

Position					Function	
		0				
30	15		15A	50	STOP	Key can be removed
		I				
30	15		15A	50	RUNNING	Key cannot be removed
		II				
30	15		15A	50	STARTING	Key cannot be removed and will return automatically to position I

Ignition switch for starter–assisted services

SIMPLIFIED DIAGNOSIS

Disconnect ignition switch connector blocks [A] and B:

Set multimeter to VOLT:

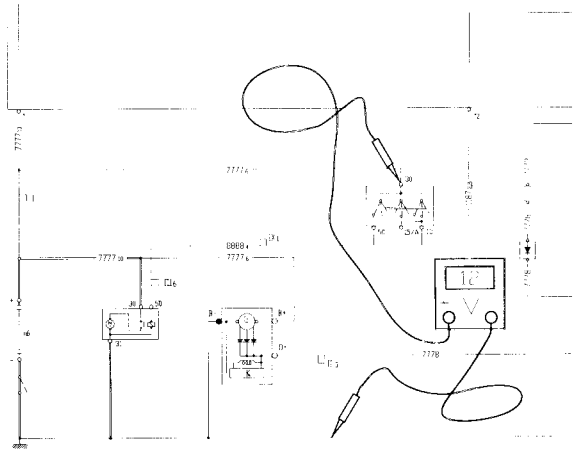
Ensure 12 Volts are available by setting one multimeter prod to terminal +30 of connector block [B] and the otherone to earth.

Set multimeter to OHM.

Turn the key to position 15 and ensure the presence of 0 Ω by setting multimeter prods to terminals +30 and 15 of switch connector blocks.

Turn the key to position 50 and ensure the presence of 0 Ω by setting multimeter prods to terminals +30 and 50 of switch connector blocks.

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



Electrical System" workshop manual Print no. 603.42.961
Diagram no. 1

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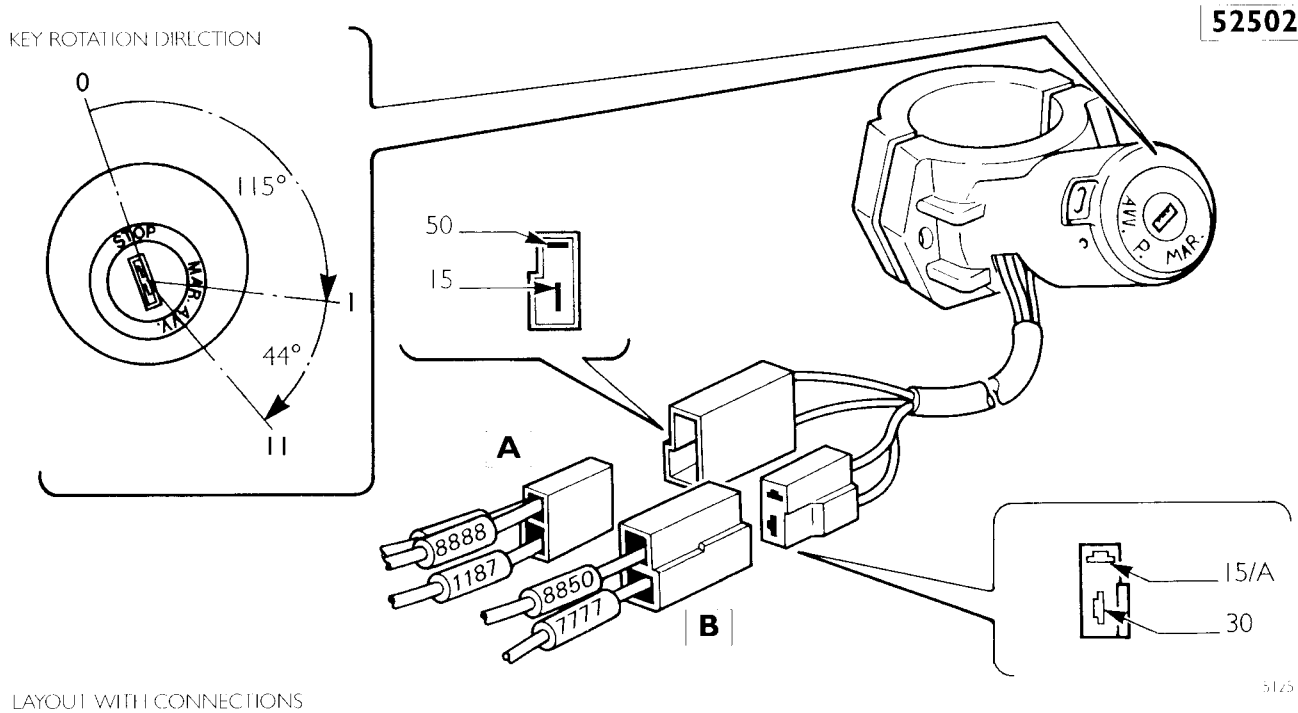


LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1 (15)	Services	1187
	2 (50)	Starting	8888
B	1 (30)	Supply	7777
	2 (15/A)	Connection of relay for user cutoff during starting stage	8850

Pre/after-heating electronic control unit (Daily vehicles)

SIMPLIFIED DIAGNOSIS

Engage parking brake and set transmission in neutral.
Disconnect connectors A and C from preheating control unit.
Set multimeter to VOLT.

Leave ignition switch in rest position. Ensure 12 Volts are available by setting one multimeter prod to connector A and the otherone to earth.

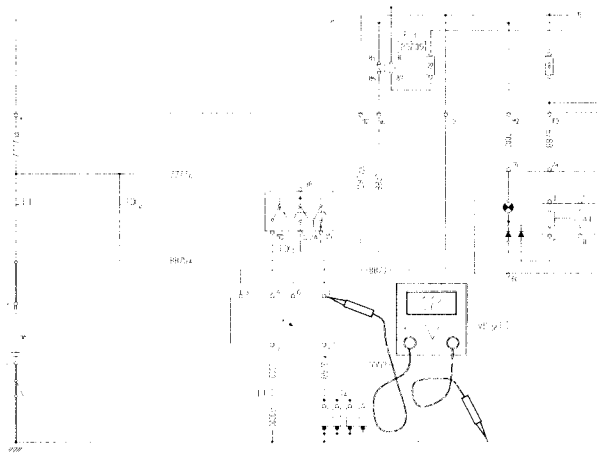
Turn the key to position 15 and ensure the presence of 12 Volts by setting one multimeter prod to terminal 3 of connector C and the other one to earth.

Turn the key to position 50 and ensure the presence of 12 Voltsby setting one multimeter prod to terminal 4 of connector C and the otherone to earth.

Set multimeter to OHM.

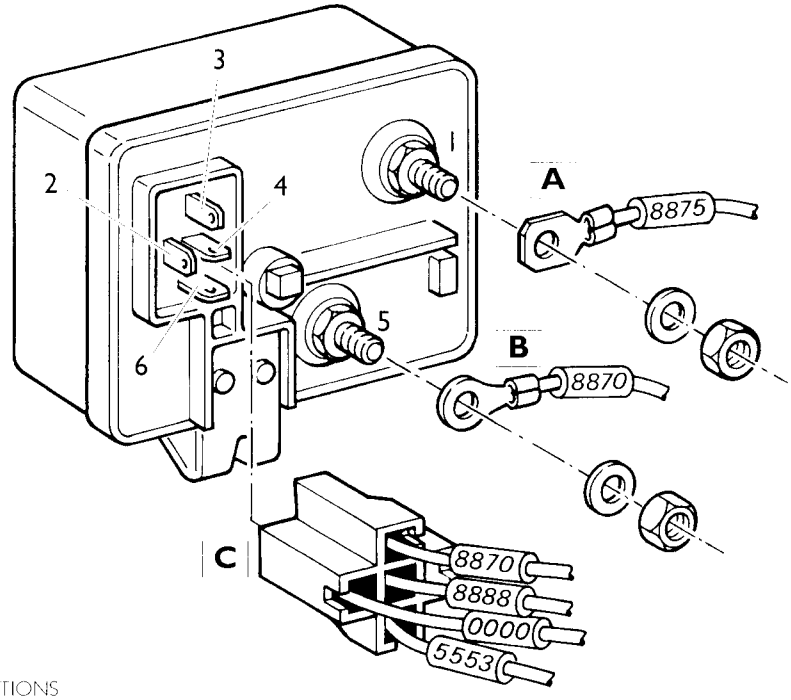
Set ignition switch to rest position. Ensure the presence of 0 Ω by setting one multimeter prod to terminal 2 of connector C and the otherone to earth.

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



Print no. 603.42.961 Diagram no. 2

86011

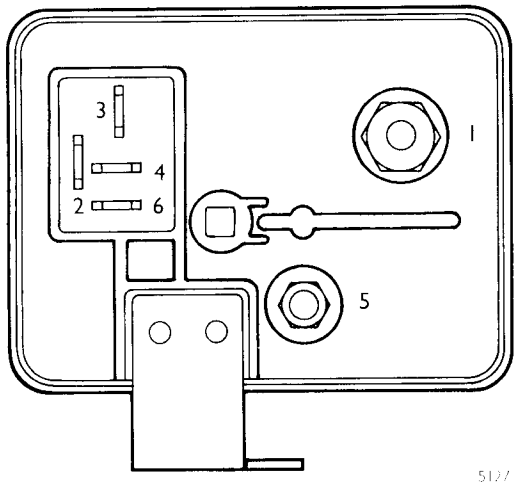


LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	Supply (+30)	8875
B	5	To thermostarter	8870
C	2	Earth	0000
	3	Positive after ignition switch (+15)	8870
	4	Positive after ignition switch (+50)	8888
	6	To preheating warning lamp	5553

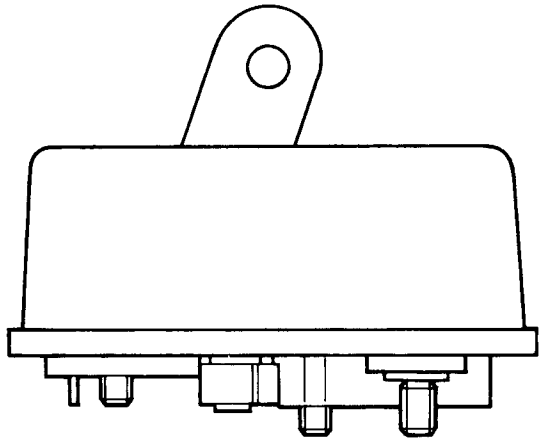
Pre/after–heating electronic control unit (Daily vehicles)

86011



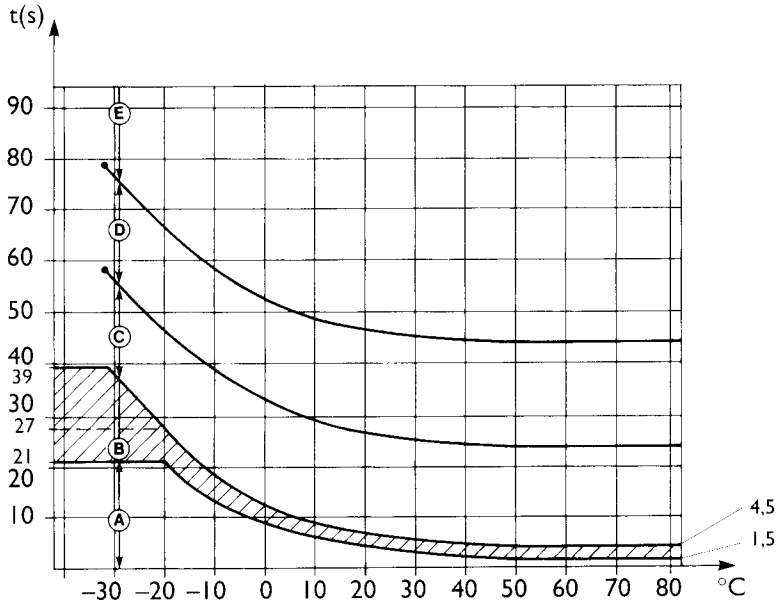
5127

CONNECTOR END VIEW



5128

FRONT VIEW



5129

PREHEATING TIME PERFORMANCE CURVE

Preheating curve area	Description
(A)	Period during which both warning lamp and preheating system are in operation
(B)	Tolerance field during which the warning lamp goes out while preheating remains on
(C)	Period during which the warning lamp is off and preheating is on. This 15 to 20 secs. steadily operative stage is calculated from the moment the warning lamp is switched off
(D)	After heatingperiod with plugs on and warning lamp off. This 15 to 20 secs. steadily operative is calculated from the moment the starting stage is over (with engine running)
(E)	Period during which both warning lamp and preheating are off

Pre/after–heating electronic control unit (Turbodaily vehicles)

SIMPLIFIED DIAGNOSIS

Engage parking brake and set transmission in neutral.
Disconnect connectors [A] and [B] from preheating control unit and hood/engine loom junction block.
Set multimeter to VOLT.

Leave ignition switch in rest position. Ensure 12 Volts are available by setting one multimeter prod to terminal 1 of connector [A] (+30) and the otherone to earth.

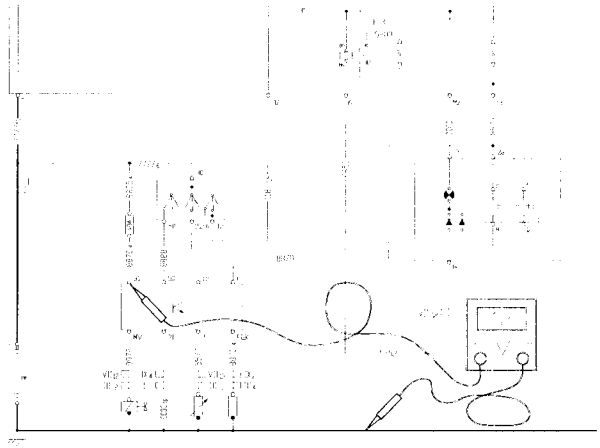
Turn the key to position 15 and ensure the presence of 12 Volts by setting one multimeter prod to terminal 2 of connector [B] (15) and the otherone to earth.

Turn the key to position 50 and ensure the presence of 12 Volts by setting one multimeter prod to terminal 3 of connector [B] (50) and the otherone to earth.

Set multimeter to OHM.

Set ignition switch to rest position. Ensure the presence of 0 Ω by setting one multimeter prod to terminal 4 of connector [A] and the otherone to earth.

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



Print no. 603.42.961 Diagram no. 2

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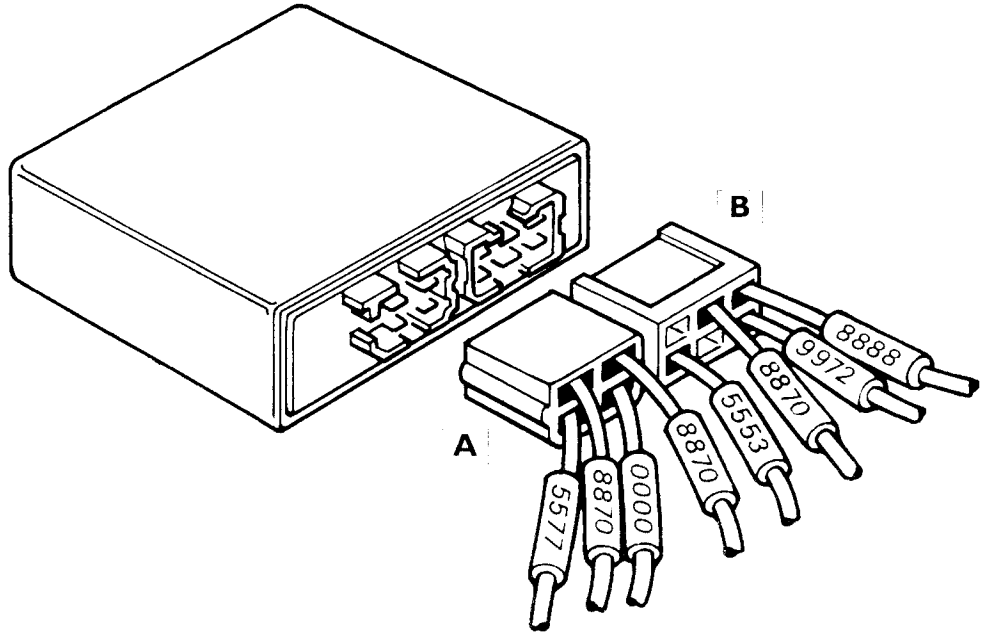
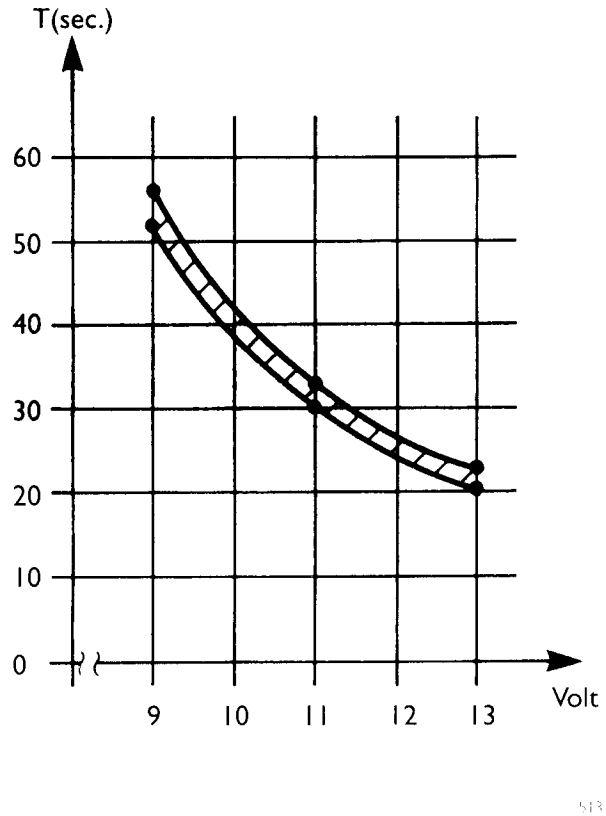
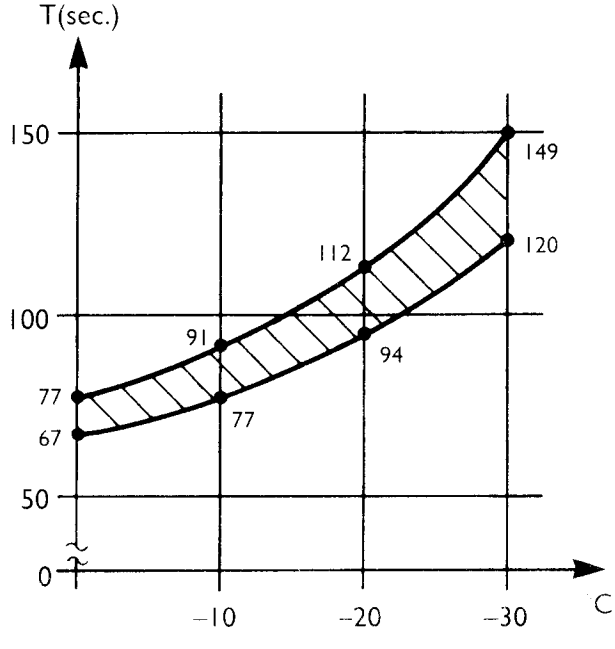


LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1 (30)	Supply (+30)	8870
	2 (FGK)	To thermostarter	8870
	3 (T)	To radiator motor water temperature sender unit	5577
	4 (31)	Earth	0000
B	1 –	Not used	–
	2 (15)	Positive after the ignition switch (15)	8870
	3 (50)	Positive after the ignition switch (50)	8888
	4 (L)	To preheating on warning lamp	5553
	5 –	Not used	–
	6 (MV)	To fuel delivery solenoid valve	9972



II.51 PREHEATING TIME AS A FUNCTION OF VOLTAGE AT EGK TERMINAL



II.52 AFTER-HEATING TIME RESULTING FROM THE SUM OF CONTROL UNIT AND TEMPERATURE SENSOR TOLERANCES

Operation and specifications

The electronic control unit is protected against the following external faults:

- inverted polarity
- thermostarter shortcircuit
- temperature sensor shortcircuit
- warning lamp shortcircuit
- supply voltage value higher than rated voltage (24 instead of 12V).

Both thermostarter and solenoid valve are always supplied with direct voltage (intermittent supply is not available).

The control unit cuts in automatically when sensor resistance is >2150 –4%+2% Ω (2064 – 2173 Ω).

Automatic cut–in temperature resulting from the sum of control unit and temperature sensor tolerances ranges from zero to +4 °C.

After–heating time depends on sensor resistance:

Resistance	After–heating
2390 Ω	72 ± 3,6 s
3790 Ω	84 ± 4,2 s
6200 Ω	104 ± 5,2 s
∞	~ 250 s (WEHRLE)
	~ 300 s (ITALAMEC)

Characteristic values of the thermostarter electronic control unit change with reference to resistance and the type of engine coolant temperature sender unit (see figure II.52).

1° Automatic thermostarter cut–in stage with ignition switch in position +15 (services)

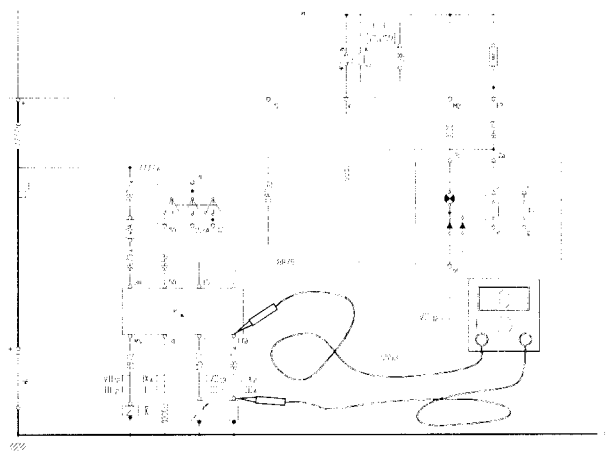
With coolant temperature exceeding the present operation value, the system is off (the warning lamp only turns on for about 2 seconds for initial checking purposes).

The system is anable when the engine coolant temperature is lower than the preset value (the warning lamp remains on throughout the preheating time)

Thermostarter

SIMPLIFIED DIAGNOSIS

Disconnect connector A from thermostarter.
Set multimeter to OHM.
Set ignition switch to rest position. Check for 0 Ω by setting one multimeter prod to connector A (+30) and the otherone to terminal 2 of connector A of pre/after heating electronic control unit (page II.31).
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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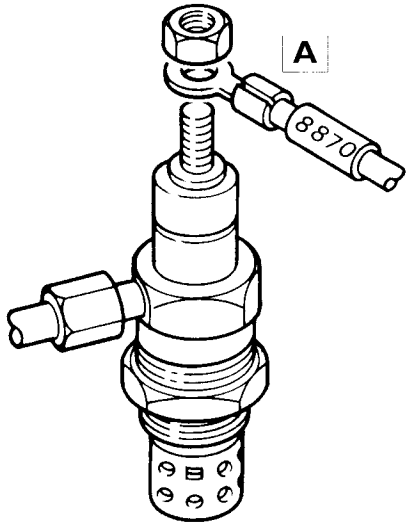
19010



LAYOUT WITH CONNECTIONS

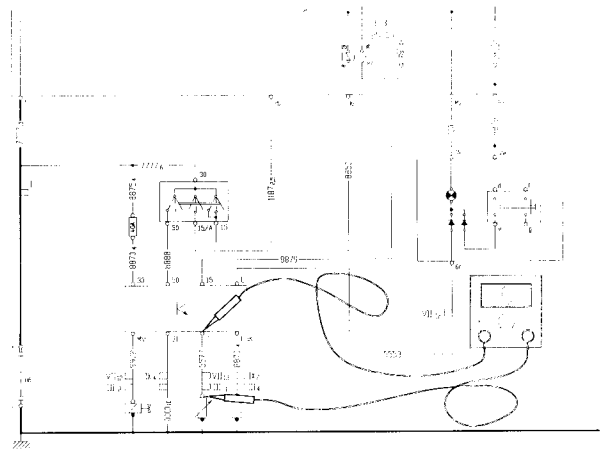
Connector	Function	Cable colour
A	Thermostarter supply	8870

Preheating system operation switch (Turbodaily vehicles)

SIMPLIFIED DIAGNOSIS

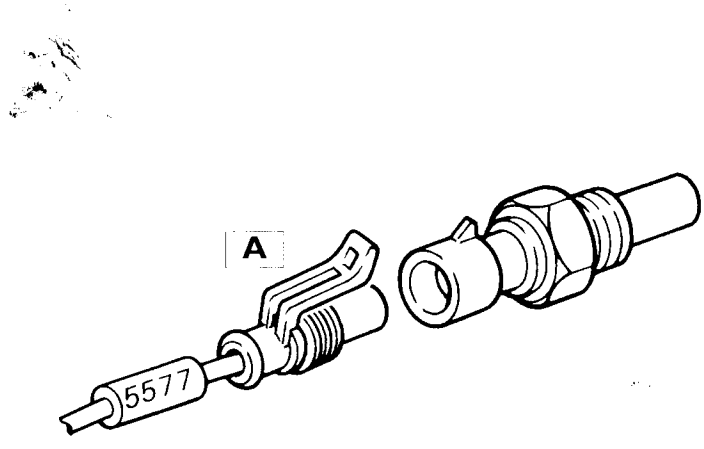
Disconnect connector A from switch.
Set multimeter to OHM.
Set ignition switch to rest position. Check for 0 Ω by setting one multimeter prod to connector A and the otherone to terminal 3 of connector A of pre/after-heating electronic control unit (page II.31).

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



Print no. 603.42.961 Diagram no. 7

47105



3558

LAYOUT WITH CONNECTIONS

Connector	Function	Cable colour
A	Temperature signal	5577

2 Thermostarter preheating stage

Thermostarter is supplied with direct voltage.

Fuel delivery solenoid valve is not energized.

Preheating warning lamp is on (when it goes off preheating is completed and the engine can be started).

Duration of preheating time (in seconds) depends on voltage value at FGK terminal of the electronic control unit (diagram infigure II.51 page II.32).

3 Automatic cut–off time

When the preheating warning lamp goes off, the thermostarter is still supplied for 30+8 seconds after which, if engine starting has not occurred, the thermostarter is turned off by the electronic control unit.

Warning lamp operation sequence

Engine coolant temperature	Operation/function	W/lamp on		Thermostarter on		Solenoid valve on	
		YES	NO	YES	NO	YES	NO
Higher than preset value for preheating cut in	Turn ignition key, starting switch in running position (voltage at terminal "15")	● ✳ ▲			●		●
	After 2±0.2 seconds		●		●		●
	Turn ignition key, starting switch in running position (voltage at terminal "15")	●		●			●
	After 2 seconds	●		●			●
	Preheating stage (duration according to diagram)	●		●			●
Lower than preset value for preheating cut in	Starter motor is actuated before preheating stage is completed (warning lamp on). This incorrect operation is inhibited:the control unit is reset		●		●		●
	End of preheating stage		●	●			●
	If starting is not performed within 30±1.5 secs. from end of preheating stage (waiting time)		●		●		●
	Engine starting stage (lasting throughout starter motor turning time)	●		●		●	
	Air heating in inlet manifold, engine started (after heating)	●		●		●	
	End of after heating stage		●		●		●

✳ Warning lamp goes out when test is carried out but does not supplied (WITHRLE).

▲ Warning lamp remains on throughout test cycle even if 15 is not supplied (ITALAMEC).

4 Engine starting stage

Thermostarter, fuel delivery solenoid valve and warning lamp remain on throughout the engine starting stage.

5° Air heating in the intake manifold iwth engine started (after–heating stage)

When starter motor is turned off, thermostarter, fuel delivery solenoid valve and warning lamp remain on for the time shown on the table below. This depends on engine coolant temperature.

If engine starting is performed before preheating is completed (warning lamp on) the electronic control unit returns to zero and the warning lamp is turned off.

The control unit does not signal thermostarter and/or fuel delivery solenoid valve failure.

The following table refers to the failure code (blink code) that is to say to warning lamp operation sequence.

Failure Code (Blink Code)

Circuit under examination	System and/or component	Defect	Fault diagnosis from warning lamp						Diagnosis duration		
			Type of signal			Operation					
			W/lamp off	W/lamp blinking		Key position "15"	Starting	After–heating end	60 secs	Until key switch is cut off "15"	Until control unit is cut off
				1 Hz	4 Hz						
	Inverted polarity		●								
	Supply voltage higher than rated voltage (24V instead of 12V)		●								
	Supply failure "30"			●		●			●		
	Supply failure "15"		●								
Defects outside control unit circuit	Thermo-starters	Break		●		●			●		
		Shortcircuit		●		●			●		
	Solenoid valve	Break		●		●			●		
		Shortcircuit	●				●				
	Temperature sensor	Break		●				●	●		
	Warning lamp	Break	●								
		Shortcircuit	●								
Defect inside control unit circuit	Thermostart or relay	Contacts not closed			●	●			●		
		Contacts stuck			●			●			●
	Solenoid valve relay	Contacts not [illegible]			●		●		●		
		Contacts stuck			●			●		●	

Thermostarter – Solenoid valve for connection to atmosphere from fuel tank (Turbodaily vehicles)

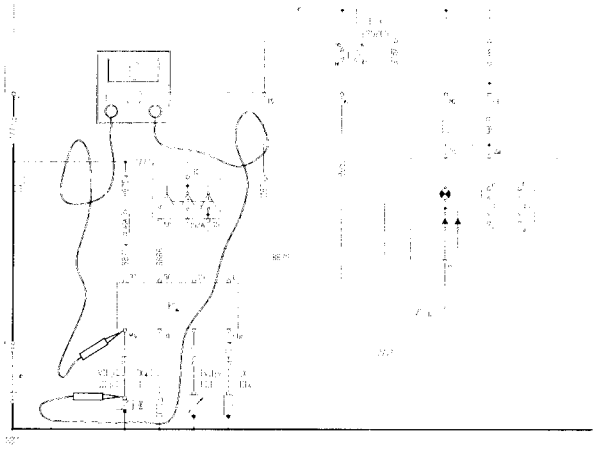
SIMPLIFIED DIAGNOSIS

Disconnect connector A from solenoid valve.

Set multimeter to OHM.

Set ignition switch to rest position. Check for 0 Ω by setting one multimeter prod to connector A and the otherone to terminal 6 of connector A of pre/after heating electronic control unit (page II.31).

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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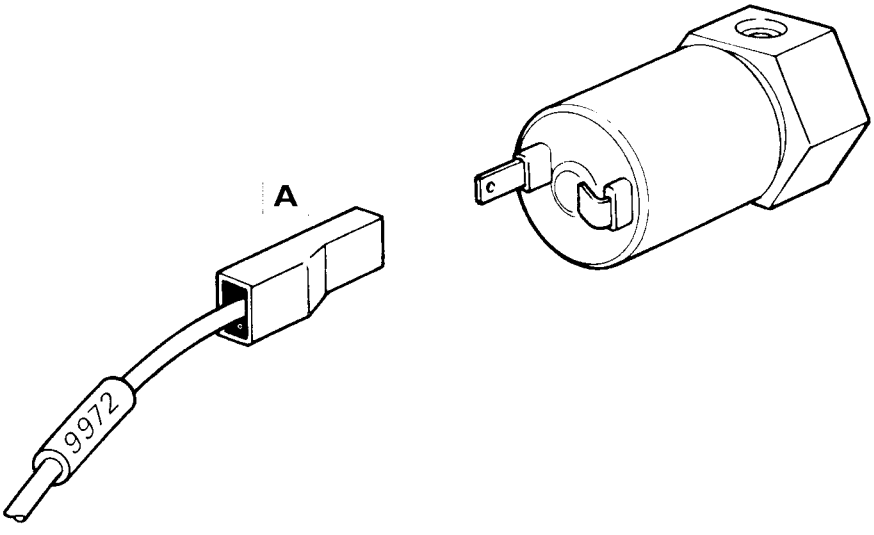
78000



LAYOUT WITH CONNECTIONS

Connector	Function	Cable colour
A	Supply of fuel delivery solenoid valve	9972

Engine stopping solenoid valve

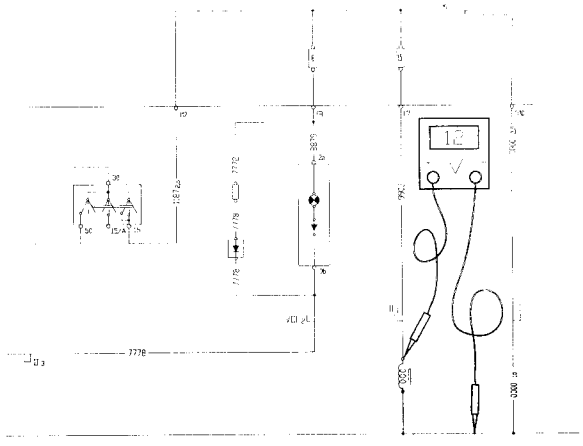
SIMPLIFIED DIAGNOSIS

Disconnect connector A from solenoid valve.

Set multimeter to VOLT.

Set ignition switch to position 15. Check for 12 V by setting one multimeter prod to connector A and the otherone to earth.

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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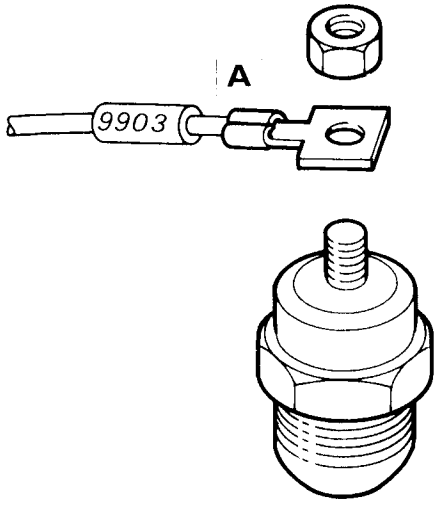
28002



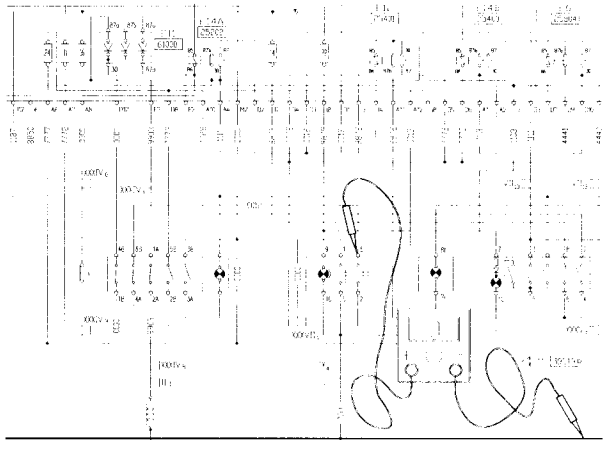
LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	–	Supply of engine stopping solenoid	9903

GCR (General Current Relay) closing switch (bus)

SIMPLIFIED DIAGNOSIS

Disconnect connector A from switch.
Set multimeter to OHM.
Check for 0 Ω by setting one multimeter prod to terminal 6 of connector A, and the otherone to earth.
Check for 0 Ω by setting one multimeter prod to terminal 5 of connector A and the otherone to earth.
Press switch key and check for 0 Ω by settingone multimeter prod to terminals 1/5 and the otherone to terminals 2/6.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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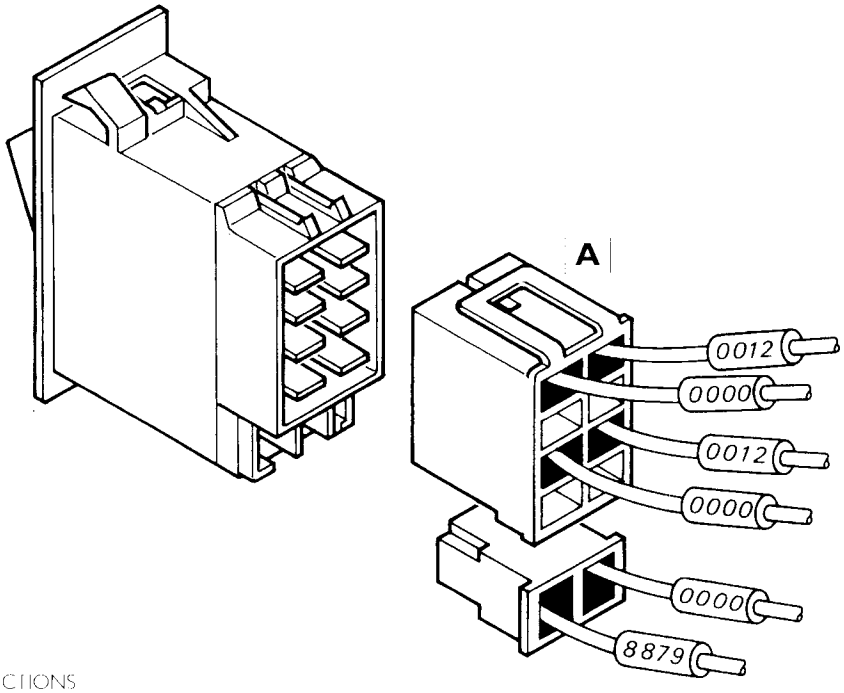
53023



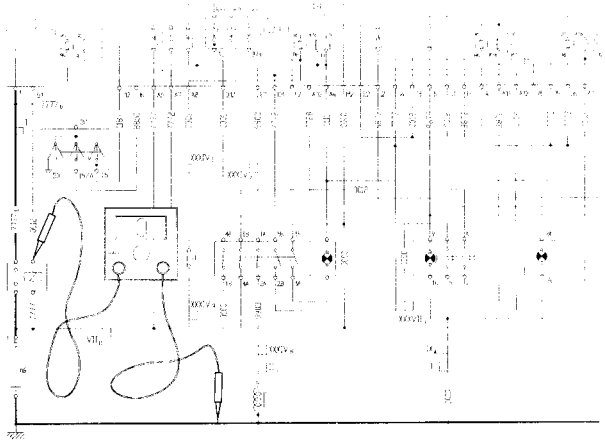
LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
	1	To swing sliding door control device	0000
	2	GCR operation control device	0012
	3	--	–
	4		–
A	5	Earth	0000
	6	Earth for GCR operation control device	0012
	7		–
	8	--	–
	9	Supply (+15/A) of switch lighting	8879
	10	Earth	0000

General Current Relay (GCR) (bus)

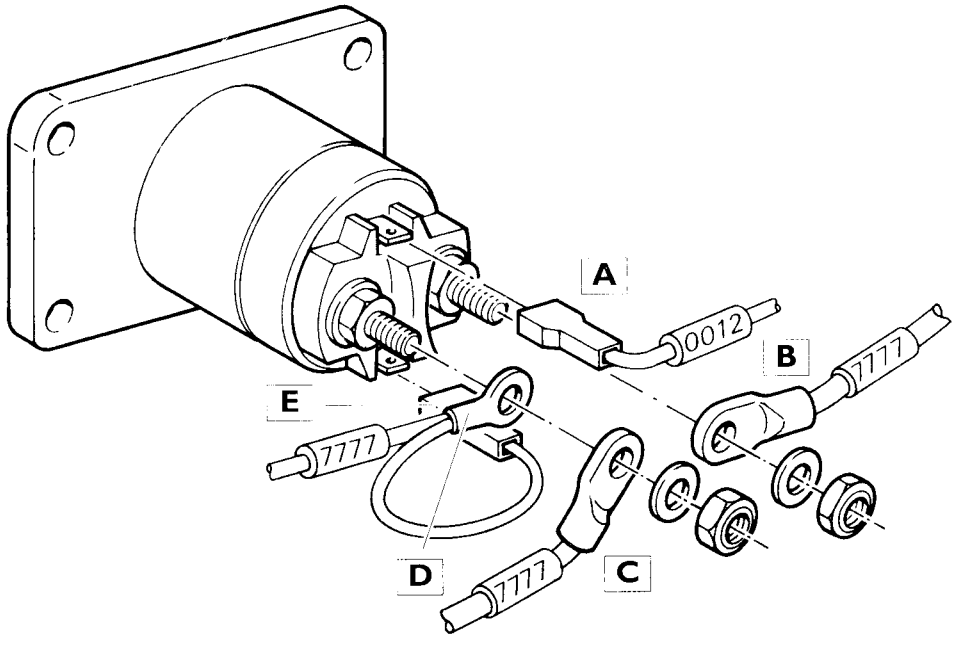
SIMPLIFIED DIAGNOSIS

Transmission in neutral, parking brake engaged.
Disconnect connector 'A' from GCR.
Set multimeter to OHM.
Operate GCR closing switch. Check for 0 Ω by setting one multimeter prod to terminal of conector 'A' and the otherone to earth.
Disconnect connector 'B' from GCR and reconnect connector 'A' to GCR.
Set multimeter to Volts.
Operate GCR closing switch. Check for 12V by setting one multimeter prod to the GCR terminal (from which connector 'B' has just been removed) and the otherone to earth.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component.
Then repeat the test.



Print no. 603.42.961 Diagram no. 1

25900



5136

LAYOUT WITH CONNECTIONS

Connector	Function	Cable colour
A	GCR connector block	0012
B	Supply of starter motor, ignition switch and C.I.U.	7777
C	To battery positive terminal	7777
D	Supply (battery +) for safety unit switch and tachometer	7777
E	Positive for GCR coil	7777

GCR opening switch (bus)

SIMPLIFIED DIAGNOSIS

Disconnect connector A from switch.

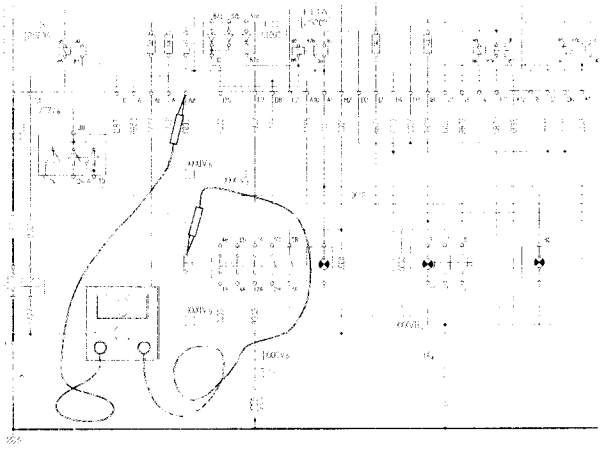
Set multimeter to OHM.

Check for 0 Ω by setting one multimeter prod to terminal 6 of C.I.U. connector A and the otherone to terminal 1 of connector A.

If reading is other than specified, repeat the test by setting multimeter prod to terminal 2 of connector A.

Check for 0 Ω by setting multimeter prods directly to terminals 1 and 2 of the switch.

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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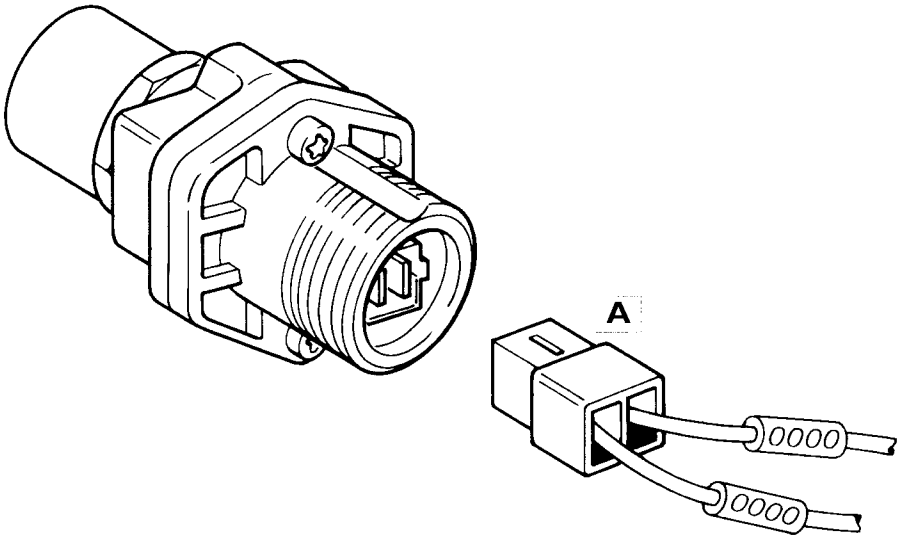
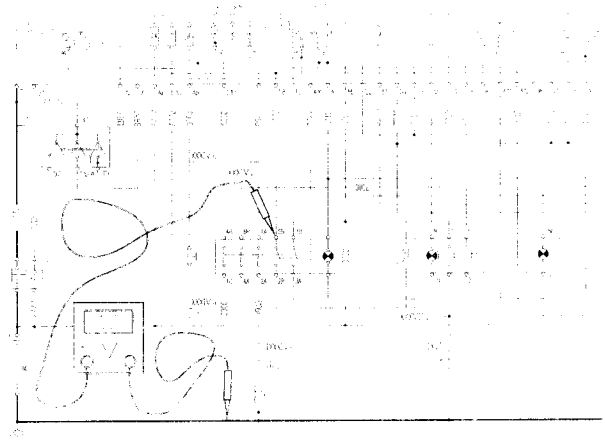


LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	To safety unit switch	0000
	2	Control device for opening GCR energizing relay	0000

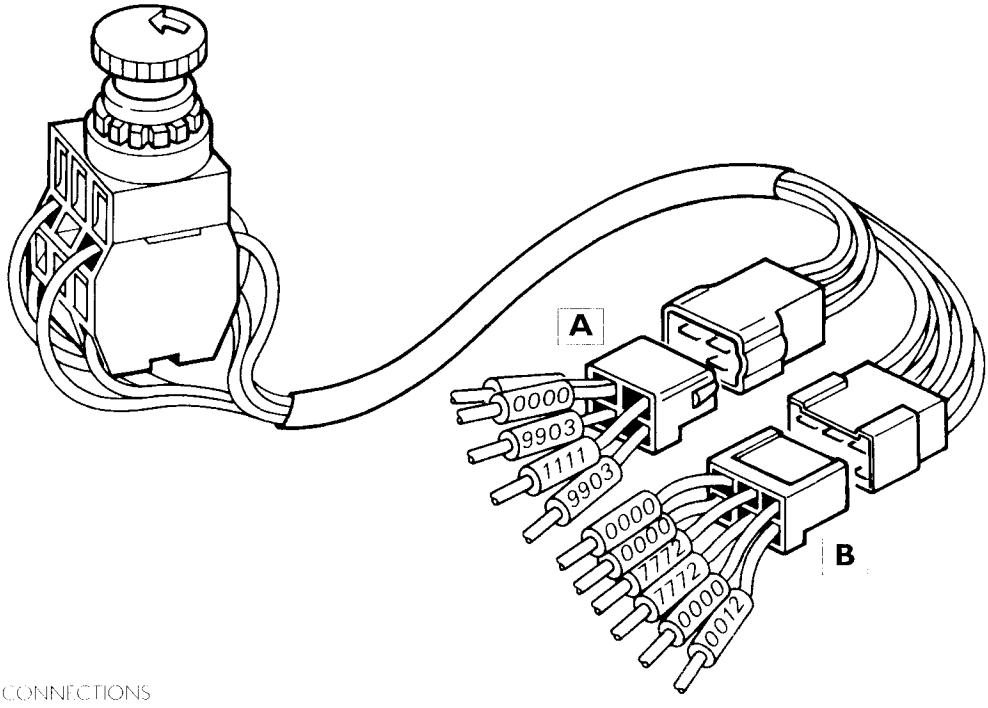
Safety unit control switch (bus)

Disconnect connectors A and B from switch.
Set multimeter to Volts.
Check for 12 V by setting one multimeter prod to terminal 5 of connector B, and the other one to earth.
Operate the GCR closing switch and turn the ignition switch in position 15.
Check for 12 V by setting one multimeter prod to terminal 1 of connector A, and the other one to earth.
Repeat the same test with terminal 4 of connector B.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



Print no. 603.42.961 Diagram no. 1

52029



LAYOUT WITH CONNECTIONS

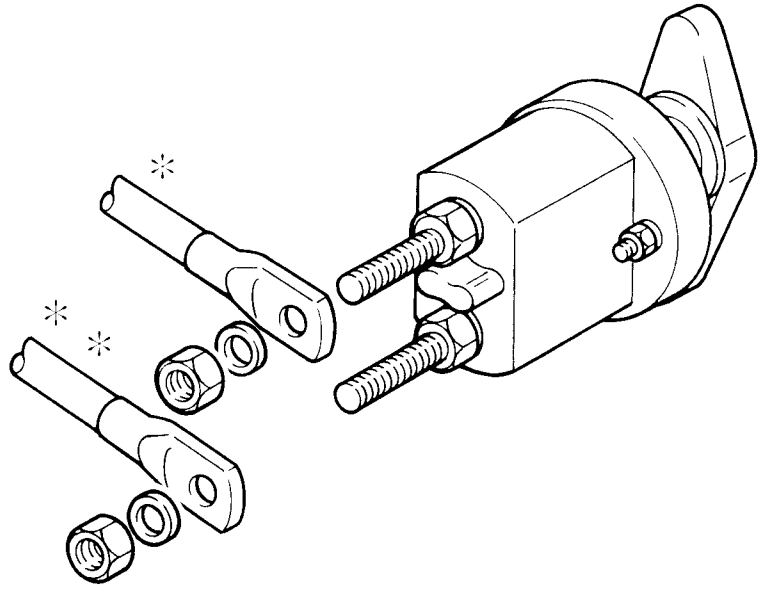
Connector		Function	Cable colour
A	1	Supply (+15) of engine stopping solenoid	9903
	2	To engine stopping solenoid	9903
	3	Hazard lights on indicator	1111
	4	Earth	0000
B	1	To GCR opening switch	0000
	2	Control device for connection of hazard and interior lighting with safety unit switch on	7772
	3	earth	0000
	4	To terminal 12 of C.I.U. connector D	0000
	5	Supply (battery +)	7772
	6	To GCR closing switch	0012

Main current switch

SIMPLIFIED DIAGNOSIS

Turn main current switch (MCS) handle in circuit opening position.
Set multimeter to OHM.
Ensure infinite resistance is available by setting multimeter prods to MCS terminals.
Turn handle by 90°. Check for 0 Ω (zero ohm) by setting multimeter prods to MCS terminals.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.

Print no. 603.42.961 Diagram no. 52600



* TO BATTERY NEGATIVE TERMINAL

** TO CRANKCASE EARTH POINT

LAYOUT WITH CONNECTIONS

Description

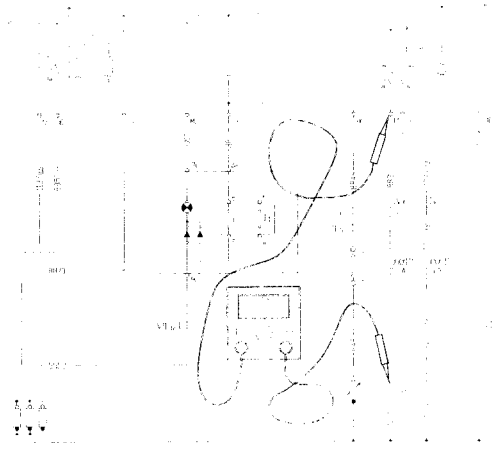
Supplier's name and identification letters/numbers, device serial no. and production date according to IVECO STD. 10-0812 (N.P.0.00013) should be stamped on the switch.

Handle operating torque	1.5 ÷ 2 Nm
Max locking thickness	12 mm

TO CLOSE CONTACTS TURN HANDLE 90° CLOCKWISE

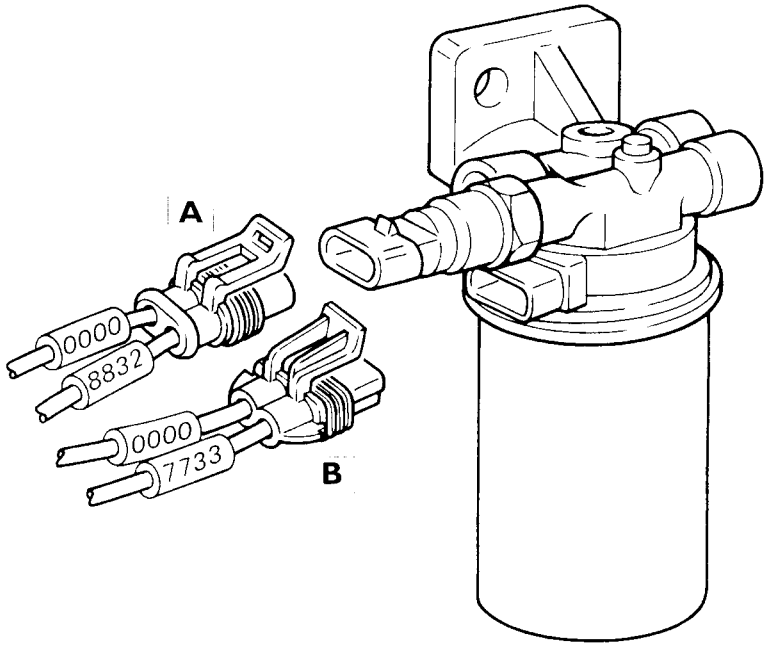
Heated fuel filter

Disconnect connector A from fuel filter.
Set multimeter to OHM.
Check for 0 Ω by setting one multimeter prod to terminal 1 of connector A and the otherone to C.I.U. connector E terminal 1.
Disconnect connector B from fuel filter.
Check for 0 Ω by setting one multimeter prod to terminal B of connector B and the otherone to C.I.U. connector F terminal 6.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



Print no. 603.42.961 Diagram no. 2

47106 **61101**



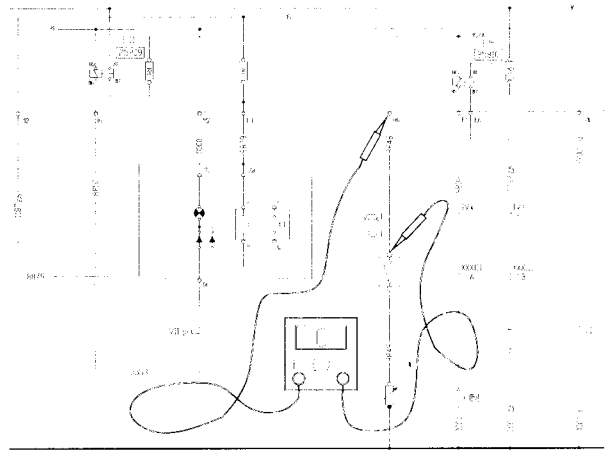
LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	Fuel heating relay control device	8832
	2	Earth of fuel heating switch	0000
B	A	Earth of fuel heating resistance	0000
	B	Supply of fuel heating resistance	7733

Ignition timer operation switch

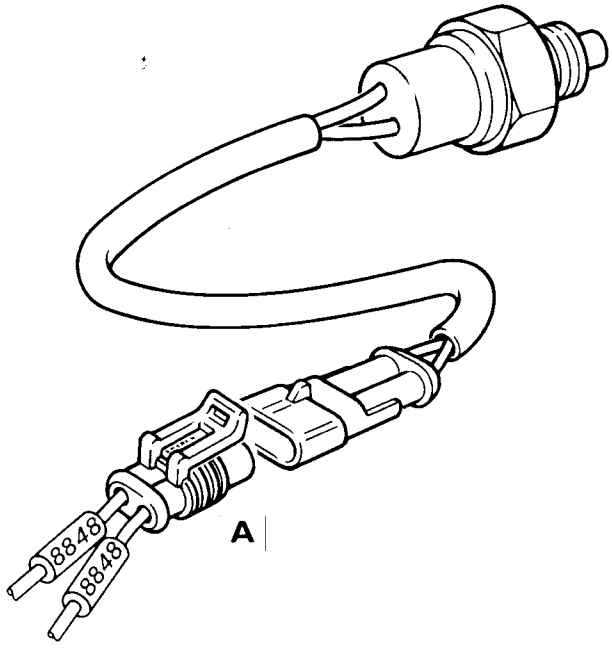
SIMPLIFIED DIAGNOSIS

Disconnect connector A from switch.
Set multimeter to OHM.
Check for 0 Ω by setting one multimeter prod to terminal 2 of connector A and the otherone to C.I.U. connector terminal 6.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



Print no. 603.42.961 Diagram no. 2

47109



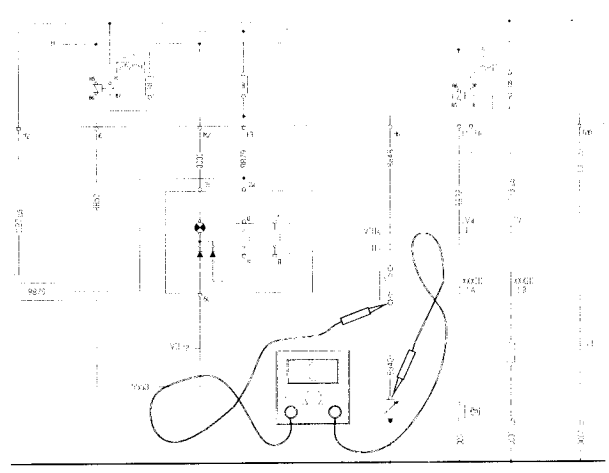
LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	To ignition timer variable resistance	8848
	2	Supply (+15)	8848

Ignition timer variable resistance

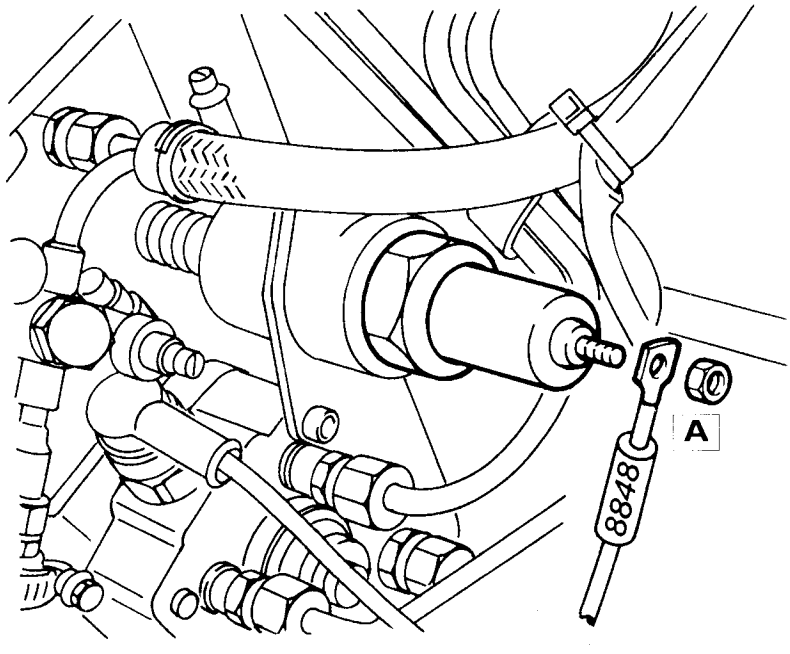
SIMPLIFIED DIAGNOSIS

Disconnect connector A from resistor.
Set multimeter to OHM.
Check for 0 Ω by setting one multimeter prod to terminal 1 of ignition timer switch connector and the otherone to connector A.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



Print no. 603.42.961 Diagram no. 2

61103



5141

LAYOUT WITH CONNECTIONS

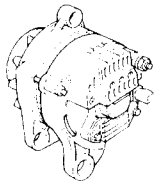
Connector		Function	Cable colour
A	1	Supply (+15) of variable resistor with ignition timer switch	8848

CHARGING

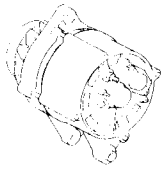
CHARGING

Alternators

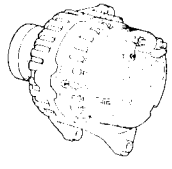
Specifications



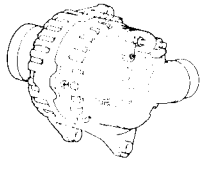
MARELLI AA125R 14V-55A



BOSCH K1→14V 23/55A



BOSCH K1→14V 50-90A



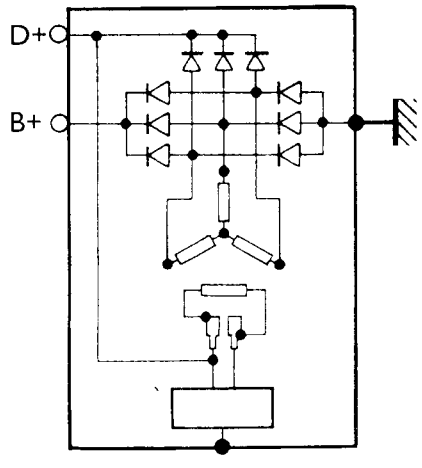
BOSCH K1→14V 50–90A

Quick diagnosis

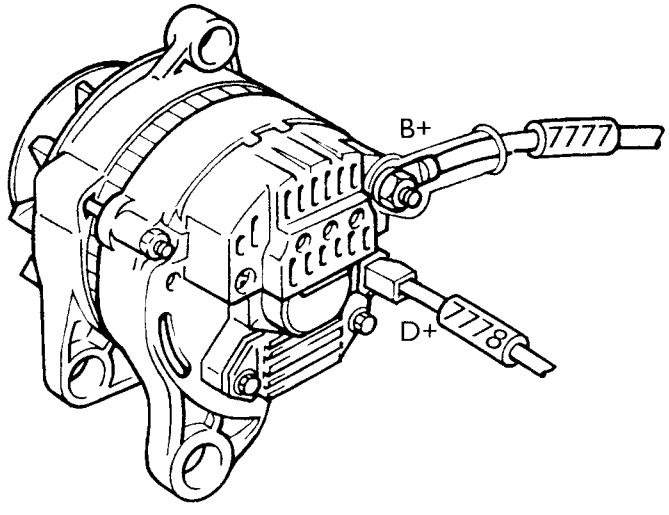
Defect	Possible cause	Remedy
No charging	1. Break in charging circuit (warning light, thermoswitch, connector, ecc.)	Check charging circuit connection, clean and tighten terminals at alternator and battery (or batteries).
	2. Voltage regulator not working properly	Replace the component
	3. Rotor winding broken	Replace the component
	5. Brushes worn	Replace the component
Low charging	1. Belt loose	Reset correct tension
	2. Voltage regulator defective	Replace the component
	3. Excess wear of rotor rings or brushes	Replace the component
	4. Diodes shortcircuited	Replace the component
	5. Stator windings or rotor windings shortcircuited	Replace the component
Excessive charging	1. Circuit connections loose	Check connections to terminals and wire terminals for battery, starter motor and alternator
	2. Voltage regulator not working properly	Replace the component
	3. Earth defect	Check earth connections

Supplier	MARELLI
Model	AA125R 14V 55A
Type	star three-phase, claw type rotor, 9-diode rectifier and built-in voltage regulator
Direction of rotation (drive side)	clockwise
Rated voltage	14 V

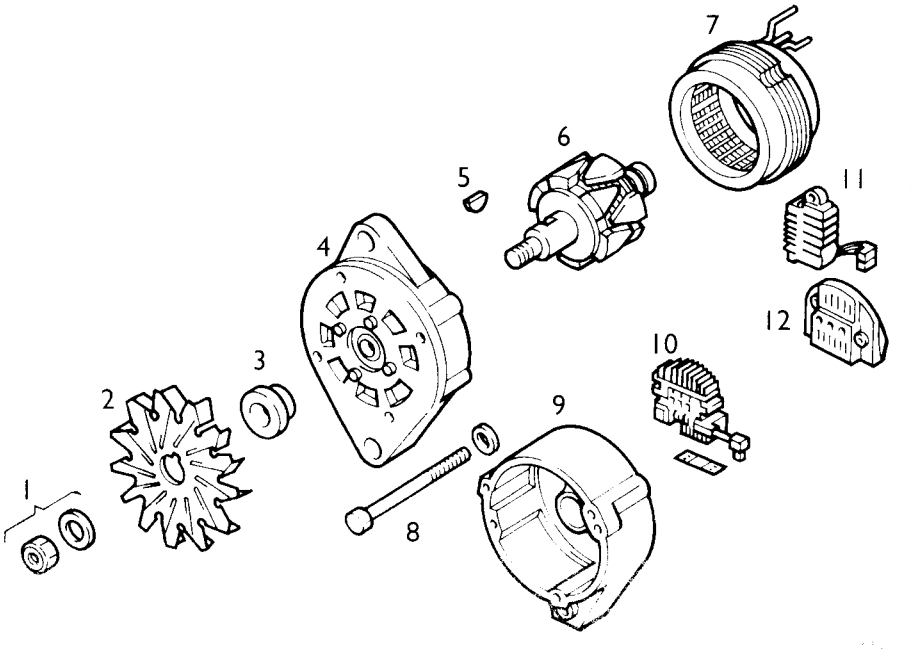
03000



WIRING DIAGRAM



LAYOUT WITH CONNECTIONS

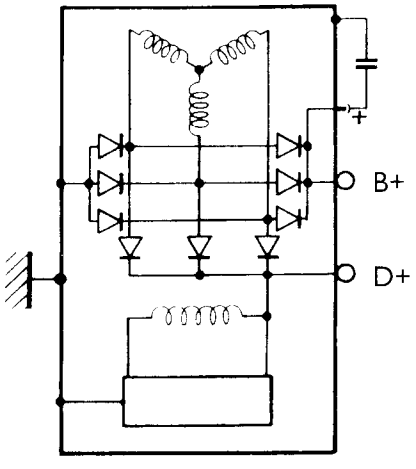


EXPLODED VIEW

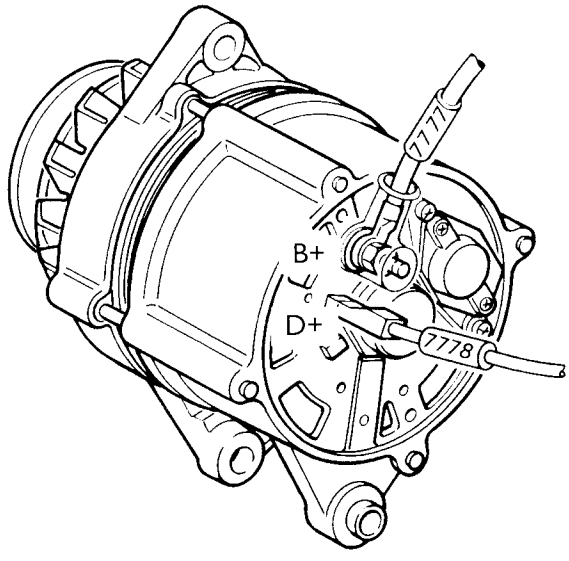
1. NUT AND WASHERS
2. FAN
3. SPACER
4. SUPPORT
5. KEY
6. ROTOR
7. STATOR
8. STAY ROD
9. SUPPORT
10. RECTIFIER BRIDGE
11. VOLTAGE REGULATOR
12. COVER

Supplier	BOSCH
Model	K1 14V - 23/55A
Type	threephase, claw type rotor, 9-diode rectifier and built in electronic voltage regulator
Direction of rotation (drive side)	clockwise
Rated voltage	14V

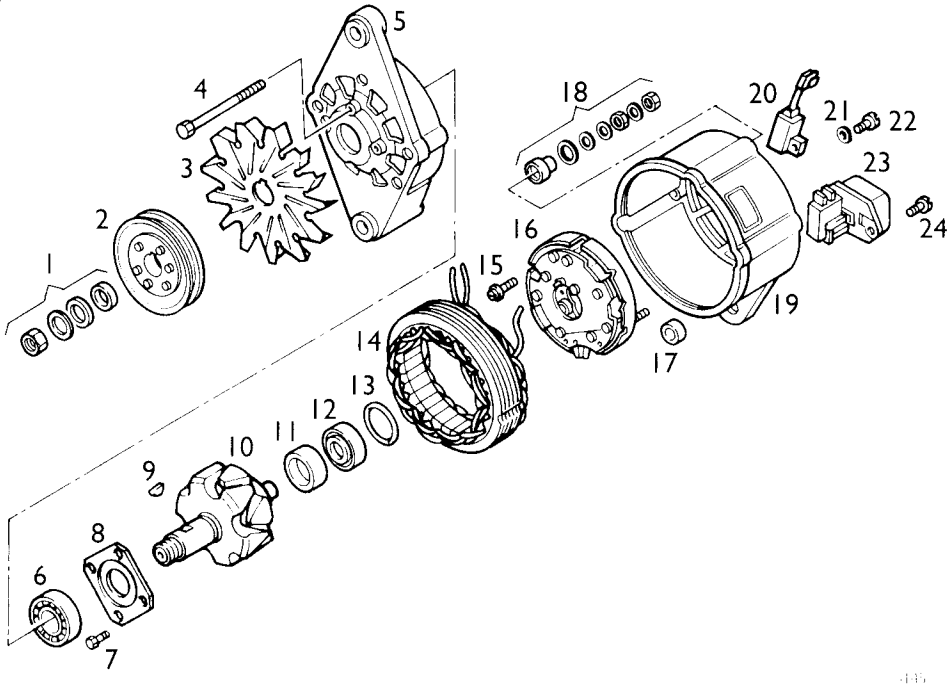
03000



WIRING DIAGRAM



LAYOUT WITH CONNECTIONS

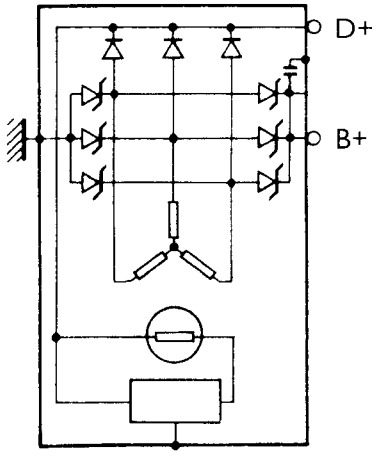


EXPLODED VIEW

1. NUT AND WASHERS
2. PULLEY
3. FAN
4. SCREW
5. SUPPORT
6. BALL BEARING
7. SCREW
8. PLATE
9. KEY
10. ROTOR
11. RING
12. BEARING
13. O RING
14. STATOR
15. SCREW
16. RECTIFIER BRIDGE
17. BUSH
18. INSULATING BUSHES
19. SUPPORT
20. CAPACITOR
21. WASHER
22. SCREW
23. VOLTAGE REGULATOR
24. SCREW

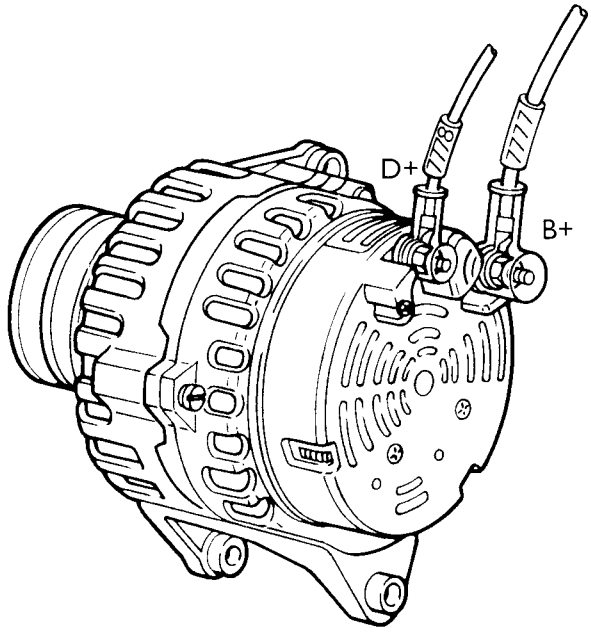
Supplier	BOSCH
Model	KC - 14V 50-90A
Type	threephase, claw type rotor, 9 diode rectifier and built-in electronic voltage regulator
Direction of rotation (drive side)	clockwise
Rated voltage	14V

03000



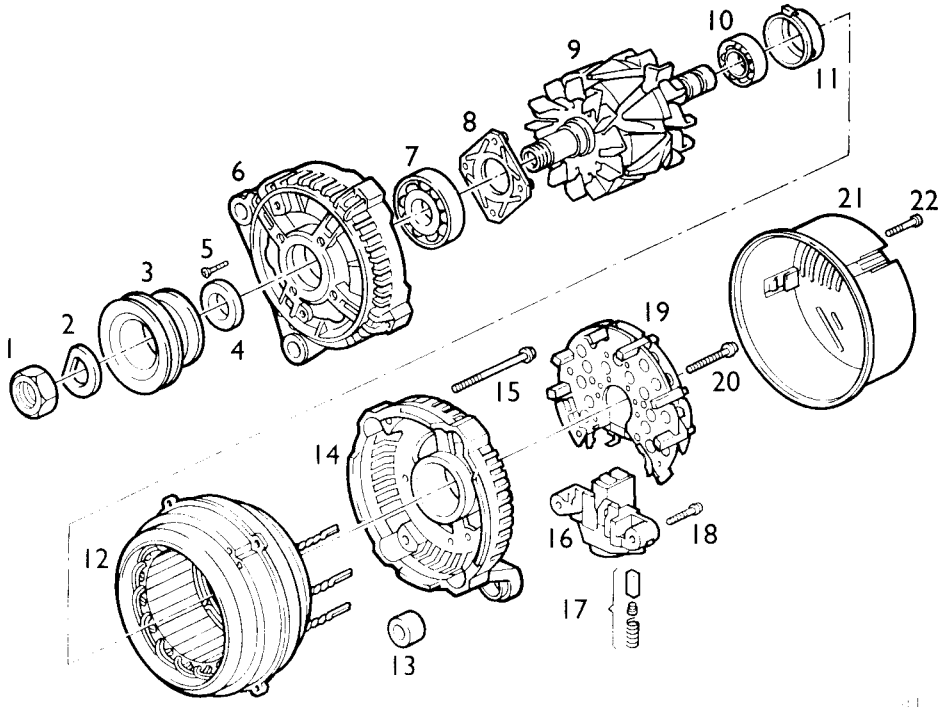
5148

WIRING DIAGRAM



5146

LAYOUT WITH CONNECTIONS

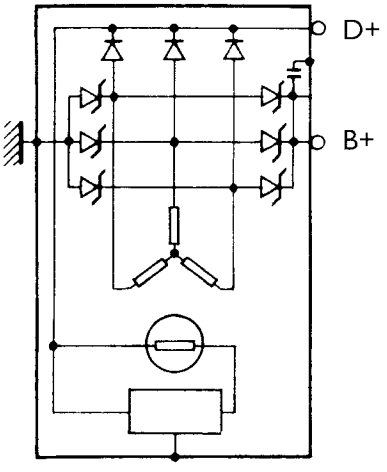


EXPLODED VIEW

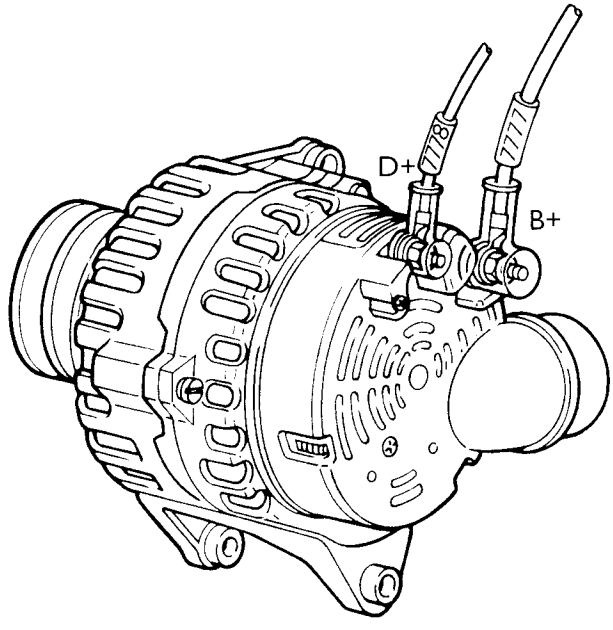
1. NUT
2. SPRING WASHER
3. PULLEY
4. SPACER
5. SCREW
6. SUPPORT
7. BALL BEARING
8. PLATE
9. ROTOR
10. BALL BEARING
11. RING
12. STATOR
13. BUSH
14. SUPPORT
15. SCREW
16. VOLTAGE REGULATOR
17. BRUSH ASSDEMBLY
18. SCREW
19. RECTIHER BRIDGE
20. SCREW
21. SUPPORT
22. SCREW

Supplier	BOSCH
Model	KC – 14V – 90A
Type	threephase, claw type rotor, 9 - diode rectifier and built- in electronic voltage regulator
Direction of rotation (drive side)	clockwise
Rated voltage	

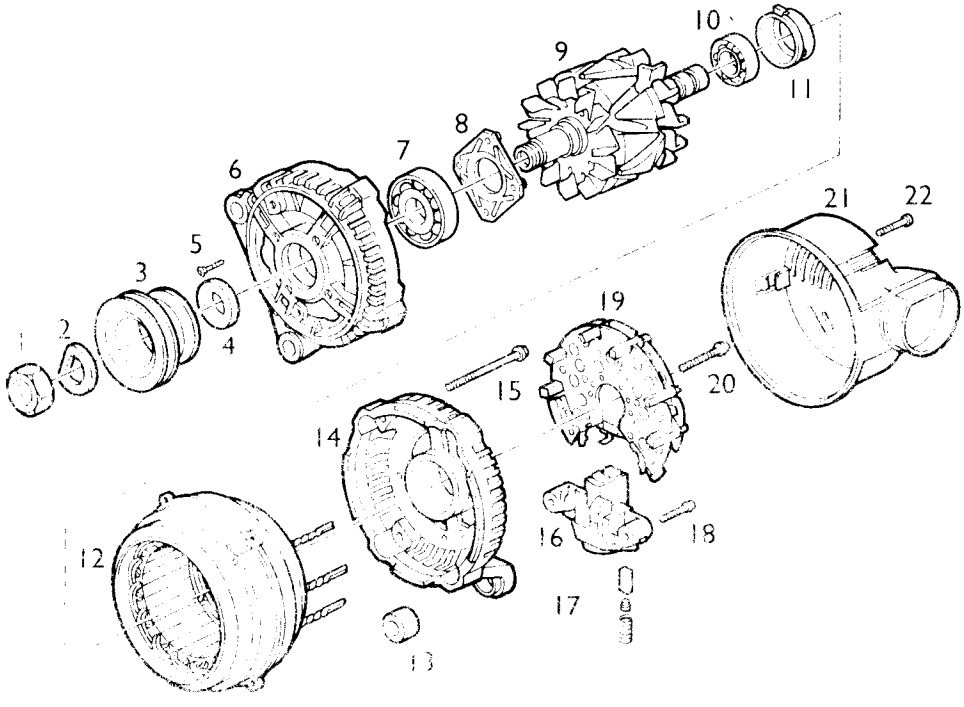
03000



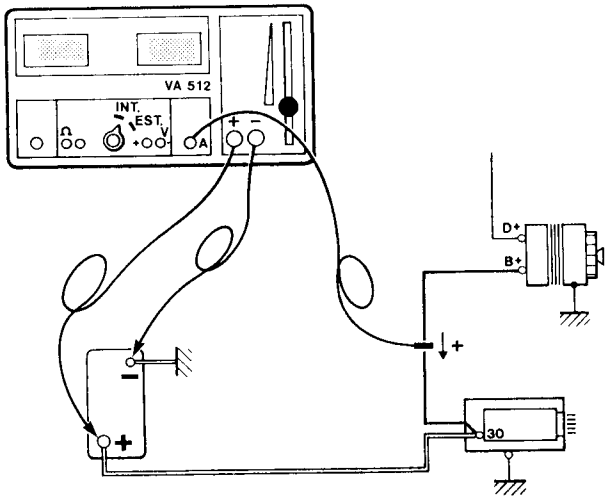
WIRING DIAGRAM



LAYOUT WITH CONNECTIONS

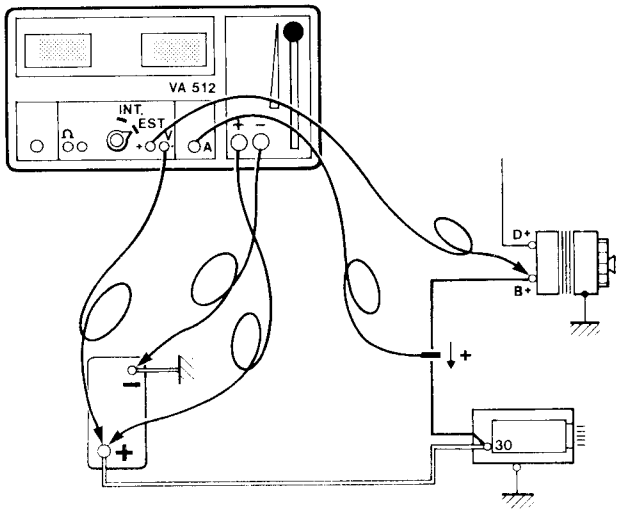


1. NUT
2. SPRING WASHER
3. PULLEY
4. SPACER
5. SCREW
6. SUPPORT
7. REAR BEARING
8. REAR
9. ROTOR
10. FRONT BEARING
11. FAN
12. STATOR
13. FRONT
14. SUPPORT
15. SCREW
16. VOLTAGE REGULATOR
17. BRUSH ASSEMBLY
18. SCREW
19. RECTIFIER BRIDGE
20. SCREW
21. SUPPORT
22. SCREW

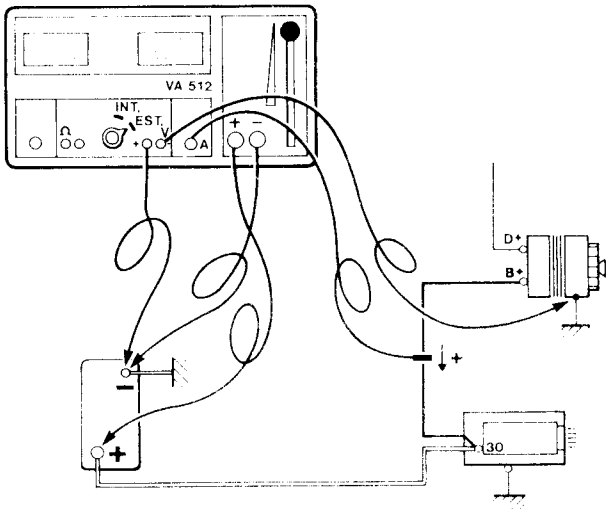


5150

III.1 MAXIMUM OUTPUT TEST



III.2 TESTING VOLTAGE DROP ON CHARGING CIRCUIT



III.3 TESTING VOLTAGE DROP ON "ARTEC" CIRCUIT

TESTS

Testing maximum output on vehicle

Never let the engine run with the electrical connections for the charging circuit disconnected or slack at the battery terminals.

Proceed as follows:

- Connect clamps for cables of the "Electrical System Test" equipment 99309003 to battery terminals observing polarity (fig. III.1).
- Position the test selector in INT (internal).
- Fit the inductive clamp to the main alternator cable, observing polarity and direction of the arrow (stamped on the clamp).
- Start up the engine and rev it up.
- Actuate the load rheostat lever until the reading on the ammeter is equal to the maximum alternator output value.
- Press the ammeter operation switch using the inductive clamp.

Check the battery voltage and the alternator current. These values should be the same, within 10%, as far as charging current is concerned.

The voltage reading should correspnd to calibration figures recommended by the Manufacturer.

If alternator output values are low and the warning light signalling a defective diode (DEFECT) located between the two digital indicators comes on, the cause may be due to a defective diode or a broken alternator field.

Testing voltage drop in the circuit

Proceed as follows:

- Connect the main equipment cables to the batteries observing polarity (fig. III.2).
- Connect the outer voltmeter with the negative clamp to the battery POSITIVE terminal and the positive clamp to 30 or B+ of alternator.
- Position the test selector on EST (external).
- Connect the inductive clamp to the alternator cable observing polarity and arrow direction.
- Rev up the engine until current output is 10 A.

Check the reading on the voltmeter: it should not exceed 0.6 V if circuit and connections are in good working order.

Voltage drop test on earth circuit

Proceed as follows:

Connect main equipment cables to batteries observing polarity (fig. III.3).

Connect the outer voltmeter with the negative clamp to the alternator body and the positive clamp to the battery negative terminal.

Position the selector on EST (external).

Connect the inductive clamp to the alternator cable observing polarity and arrow direction.

Rev up until current output is 10A.

Check that the reading on the voltmeter is zero, if connections are satisfactory.

Voltage regulator calibration test

Proceed as follows:

Connect outer voltmeter leads to battery terminals observing polarity (fig. III.4).

Position selector on EST (external).

Connect the inductive clamp to the alternator cable observing polarity and arrow direction.

Start the engine and rev it up slightly until the ammeter reading is a little less than 8 A.

Ensure the reading on the voltmeter corresponds to the figure recommended by the Manufacturer.

Tensioning alternator belt

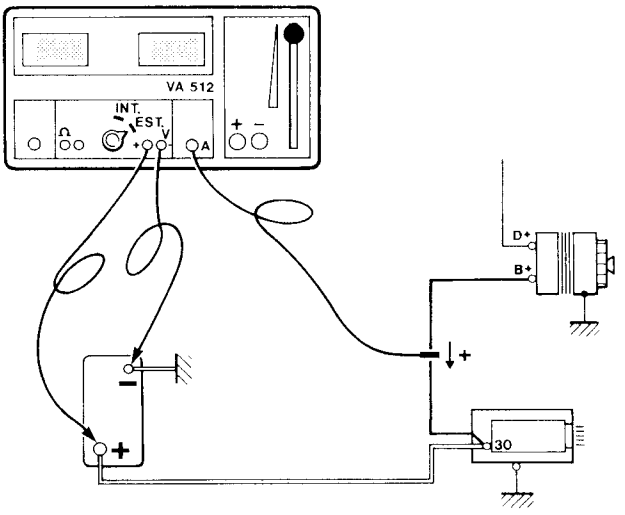
Proceed as follows:

Slacken nuts fixing alternator support and tensioning bracket (fig. III.5).

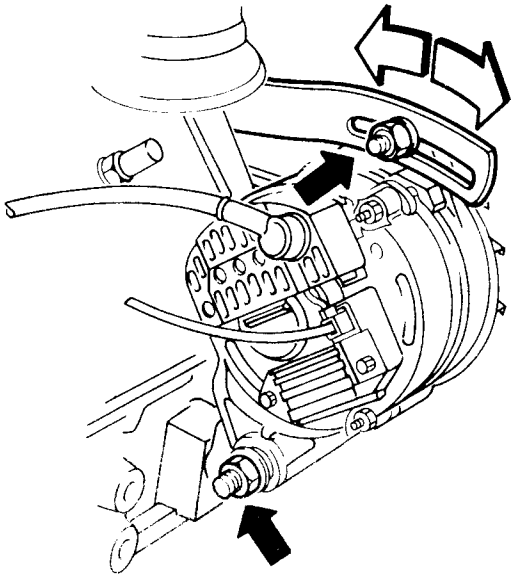
Introduce a lever between the alternator and the engine in order to suitably tension the drive belt.

Tighten both alternator fixing nuts, starting with the one in the adjustment slot.

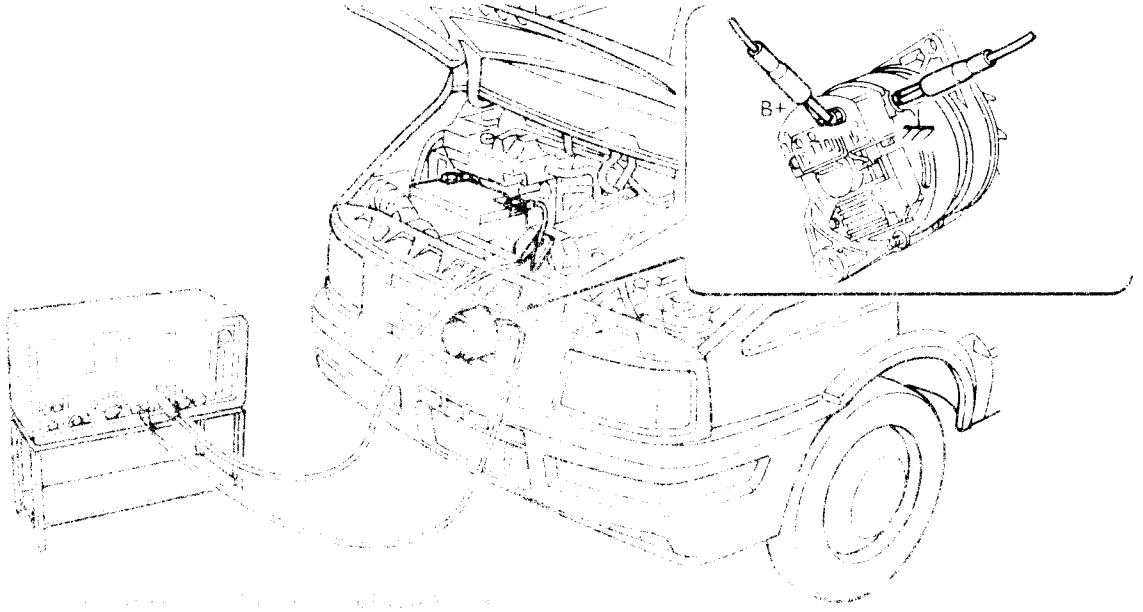
Check that the belt sags by 10 mm. approx. if pressure is applied to its centre area.

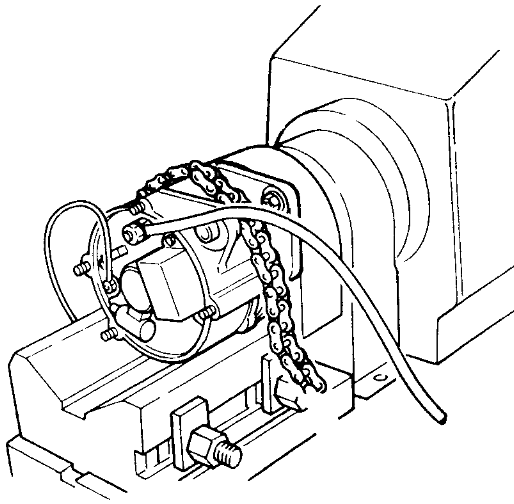


III.4 - VOLTAGE REGULATOR CALIBRATION TEST



III.5 - TENSIONING ALTERNATOR DRIVE BELT





2829

III.7 BENCH TEST

If faults are detected in a generator (alternator) during the previous diagnostic checks on the vehicle, then it must be bench tested.

This involves removing the alternator from the vehicle or the engine in order to eliminate the problem(s) with the aid of suitable tools or equipment and following the Manufacturer's instructions.

Dismantling and bench testing

Lock the alternator pulley in a vice with lead caps. Dismantle the alternator following the instruction given on the pages which follow.

NOTE. In order to facilitate certain dismantling operations, simply use a plastic hammer.

When the pulley has been removed, withdraw the washer, the fan, the key and the spacer.

Remove the brush holder taking care not to break or damage it.

Remove the rods and washers and remove the rectifier side support, tapping the rotor shaft lightly with the plastic hammer.

Remove the rotor by tapping lightly with the plastic hammer on the edge of the rectifier end mounting.

Carefully unsolder the three phases with the aid of pliers, in order to dissipate part of the heat and prevent overheating.

When dismantling [illegible] quickly wash the parts using liquid for electrical components, petrol [illegible]

⚠ On account of their volatility observe the safety regulations for inflammable liquids and wear the special goggles and protective gloves.

Carefully dry the parts which have been washed using compressed air (about 4 bar) and dry rags.

Make sure the parts do not show signs of wear or damage. The parts which are damaged, short–circuited or worn, should be replaced like the brushes, seals and washers.

Continue the checks using the multimeter with the parts resting on a work surface which is insulated by the bench earth.

Particular attention should be paid during the insulation tests for the stator and the rotor. If the insulation of the rotor between the slip rings and the poles is insufficient, replace the rotor.

The insulation between any of the phases and the stator assembly should be perfect: if this is not the case, replace it.

The power diodes should be checked, one by one, for direct and reverse polarity.

If the values are incorrect, the rectifier should be replaced.

The exciter winding should also be checked using an ohmmeter: if the values are abnormal, the rotor should be replaced.

If the bearings need replacing, this should be carried out using new bearings which are hermetically sealed with grease.

If during the visual inspection the rotor slip rings show signs of grooves or excess wear the rotor should be replaced.

Reassembly

When refitting, after having carefully welded the phases, make sure that terminal 30 or B+ is properly insulated. Also check the seal of the O-ring in the rectifier end mounting housing.

Lubricate the rotor shaft moderately and assemble the control end mounting fixing the alternator with the rods.

After refitting, check that the rotor rotates freely and insulation of terminal 30 or B+.

If, during the test, the values differ considerably from the typical curve, dismantle it once again and repeat the checks.

NOTE. The bench test values depend greatly on the battery charge conditions and capacity and the length of the test, which should be as short as possible. The curve shows that at low speeds, the current output is nil whilst it reaches the [illegible] value at around [illegible] rpm. Starting from this [illegible] value irrespective of the rotor speed (self-adjustment).

The nominal current output is usually measured at 2/3 of the graph.

Charging circuit

General

The efficiency of the electrical system depends on the state of charge of the batteries and on the voltage regulator (alternator).

The alternator takes mechanical energy from the engine and transforms it into electric energy.

Basic data

The principle on which the alternator operates is the application of the law of electromagnetic induction:

"In a fixed conductor immersed in a variable magnetic field an electromotive force (EMF) is generated for the lines of force of the field and the speed".

The variable magnetic field in a threephase alternator is composed of the number of NS magnetic poles arranged in alternating order and of an exciter winding: the rotor.

The system continuous voltage starts at the exciter winding and includes:

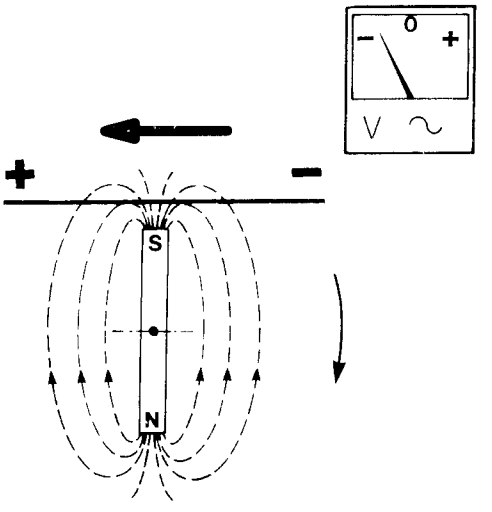
- the ignition switch
- the control panel protective thermoswitch
- the charging warning light
- a possible insulation diode
- the alternator D+ terminal
- the voltage regulator.

When the ignition is switched on, the energizing current from the batteries circulates in the winding, generating an electromagnetic field in which it reinforces the residual force lines for the magnetic poles.

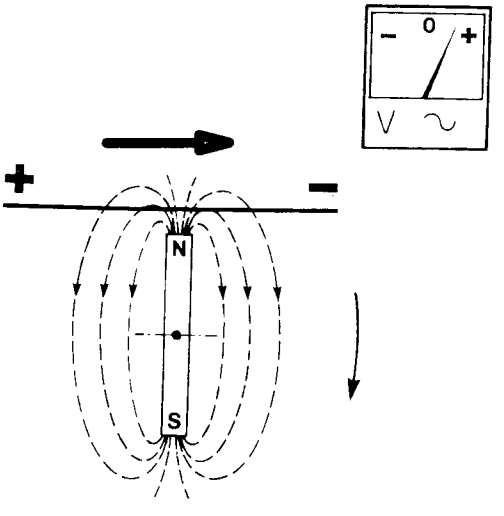
If the rotor turns, the field generates an alternating, sinusoidal voltage in the alternator fixed windings.

The density of the electromagnetic field which is generated in the exciter winding depends on the intensity of the current flowing through it.

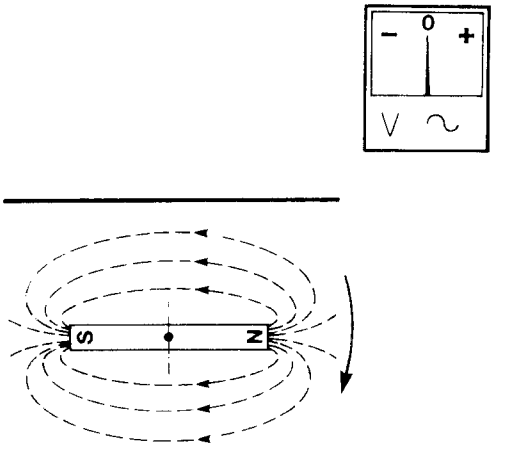
This current is limited by means of an adjustment device, dealt with later in this chapter.



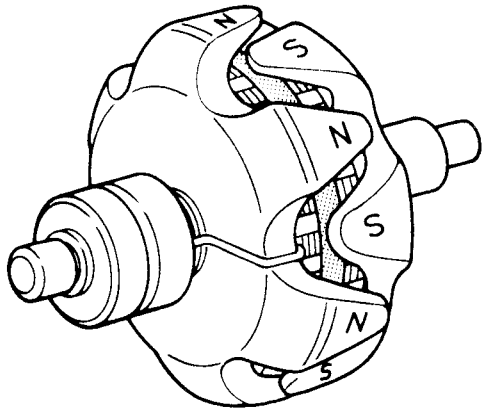
III.8 EMF GENERATOR IN A FIXED CONDUCTOR IMMERSED IN A VARIABLE MAGNETIC FIELD



III.9 EMF GENERATOR IN A FIXED CONDUCTOR IMMERSED IN A VARIABLE MAGNETIC FIELD



III.10 NO EMF (AS THE LINES OF FORCE ARE PARALLEL TO THE FIXED CONDUCTOR)



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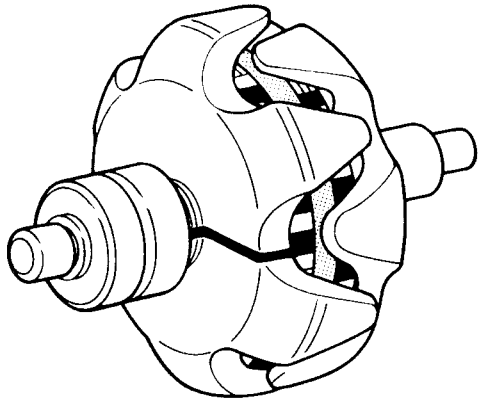
III.11 CLAW TYPE ROTOR: N-S POLAR EXPANSIONS



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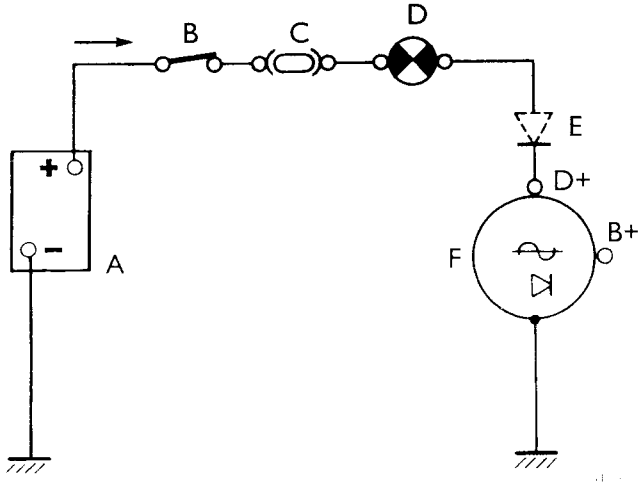
III.12 CLAW–TYPE ROTOR: EXCITER WINDING MARKED IN BLACK



III.13 CHARGING CIRCUIT DIAGRAM
A. BATTERY – B. IGNITION SWITCH – C. FUSE – D. WARNING LIGHT – E. DIODE – F. ALTERNATOR

The alternator stator (or fixed) windings (fig. III.13 page III.14), where the EMF is generated, are equal to andindependent of one another.

The windings are arranged with an angular opening of 120° in such a way as to give rise to three alternating voltages, offset by 120°, with the same intensity and frequency (fig. III.14).

The stator winding coils are arranged in a preset manner in a special support known as the stator.

The current, generated by the three stator windings, is completely unsuitable for recharging the battery and for operating the electronic components on board the vehicle.

For this reason, the three phases are suitably converted, by means of a diode bridge, into direct current.

In reality, the wave form of the continuous voltage measured at the generator terminals, is pulsating (fig. III.15).

Instant variations of induced voltages depend on the state of charge of on board batteries and on changes in engine speed values.

Charge variations at the generator, due to the state of charge of the batteries and the connectors engaged, as well as variations in engine speed, cause the induced voltage values in the stator windings to change moment by moment.

In order to keep these variations within pre–established limits, there is a device which regulates the rotor winding energizing current.

Regulation of the maximum intensity of the current generated in the stator windings is virtually automatic in as far as their apparent resistance increases proprotionally with the rotor rotation speed.

This very effectively limits the generator output curve.

This phenomenon is shown by the typical curve usually found in service manuals.

It should be noted that the current intensity curve, though based on the rev number, starting from a certain speed remains practically parallel to the rpm axis (fig. III.16).

Technical/practical hints

Self-excitation. The alternator supplying a direct current (with the aid of its diodes) is capable of self excitation.

For this reason, disconnected from the battery, the alternator supplies a very high continuous voltage which is dangerous for both the system and the vehicle's electrical and electronic components.

Therefore, NEVER disconnect the batteries with the engine running.

Exciter or rotor winding. The exciter winding is the alternator's dynamic system where the direct current passes through and generates the lines of electromagnetic forces.

The ohmic resistance of the rotor winding varies according to rotor type and output characteristics.

The exciter winding is insulated from the rotor casing.

Armature or field (stator) windings. This is the alternator static system where the induced electromotive forces are generated.

Connections between field windings may be of the star or delta type.

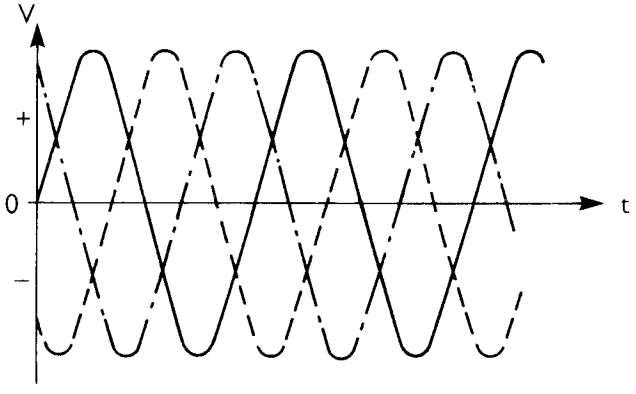
Star type connection. The alternator line voltage is obtained from the product of the voltage of one of the three field windings multiplied by 1.732 (fig. III.21 page III.15).

The resulting current is equal to the current circulating in one of the three windings.

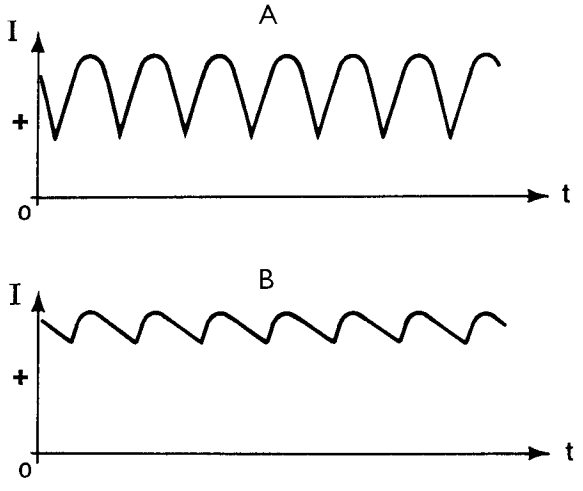
Delta type connection. The alternator line voltage is equal to the voltage of one of the three field windings (fig. III.21 page III.15).

The current value is obtained from the product of the current circulating in one of the three windings multiplied by 1.732.

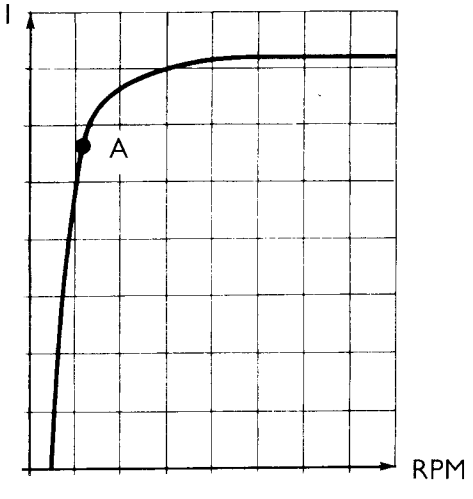
Alternators with Delta type connections should be installed on vehicles featuring high current consumption.



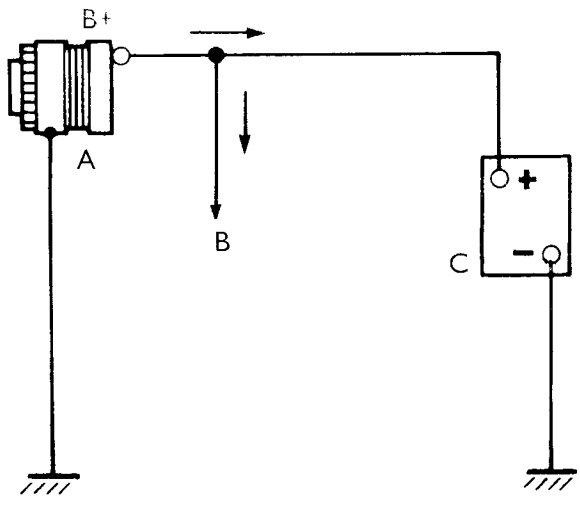
III.14 THREEPHASE SINUSOIDAL VOLTAGE OFFSET 120°



III.15 CONTINUOUS PULSATING VOLTAGE DOWNSTREAM OF A DIODE BRIDGE. A. NO LOAD B. CHARGE



III.16 TYPICAL OUTPUT CURVE
A. WORKING CURRENT (2/3 OF MAXIMUM CURRENT)



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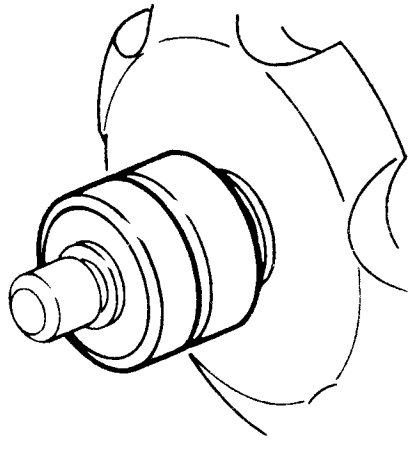
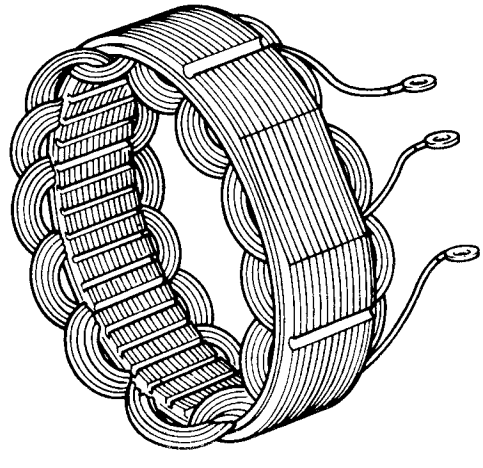
ILL.17 CHARGING CIRCUIT
A. ALTERNATOR - B. SYSTEM - C. BATTERIES



ILL.18 SLIP RINGS



ILL.19 STATOR FOR THREEPHASE ALTERNATOR

Belt. The belt [illegible] transmission of the [illegible] to the alternator.

The condition of the belt and its correct tension are vital to the efficiency of the alternator.

Make sure the belt does not yield by more than 10 mm when the relevant force (varying from type to type) is applied to it.

Capacitor. The capacitor is of the electrolytic type and its value usually ranges between 2.2 and 3 μF. It is connected between terminal B+ and the alternator casing if the latter is not of the insulated type.

If, however, the characteristic whistling noise of the current output from the radio persists, a suitable size lowpass coil should be connected in series to the radio equipment supply cable.

Also make sure that the reception aerial is duly earthed.

Energizing current. This is the direct current which flows through the exciter or rotor winding.

Its values may vary from a minimum of 200 mA (current limited by the resistance of the charging warning light) to a maximum of 2A (current limited by the voltage regulator) according to the state of the battery charge.

Maximum current. This is the maximum current which the alternator can supply. This information is usually given on the alternator casing and on the typical curve.

The nominal power of the alternator in Watts (W) is obtained from the product of the maximum current and the nominal voltage of the system.

Working current. The working current (at which the alternator chooses to operate) is obtained from 2/3 of the typical output curve.

Typical curve. The typical curve graphically reproduces the trend of the current output based on the alternator speed.

The curve shown in figure III.16 page III.13 shows that at minimum speed the current output is nil as the alternator is connected to the batteries via terminal B+ and is therefore connected with the nominal voltage. As the rpm number increases, the output curve reaches its maximum level at around 4500 rpm.

The working current is usually fixed at 2/3 of the typicalcurve; this value should always be higher than the overall current consumption figure of all on-board connectors with the exception of the starter motor.

A typical curve diagram should always be available while a bench test of the alternator is performed.

Exciter diodes. Exciter diodes have very little power (1 to 3 A).They lead to the field windings and are aimed at rectifying the current required for correct operation of the voltage regulator.

Exciter diodes are usually located on an insulated plate inside the alternator; heat dissipation is not required in view of the very slight current absorption.

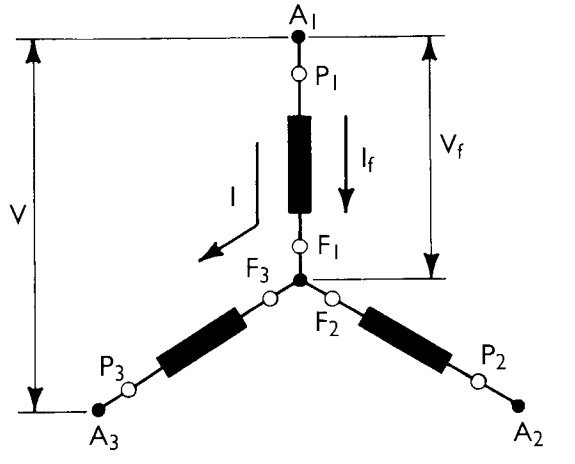
A break or short circuit in any one of the diodes implies that the charging current is not working properly; they should be checked with the alternator dismantled, using an ohmmeter set on a scale of ohm x 1.

Power diodes. The power diodes are used to convert the alternating current into direct current; thery are usually made from silicon as are resistant to high temperatures (175° C).

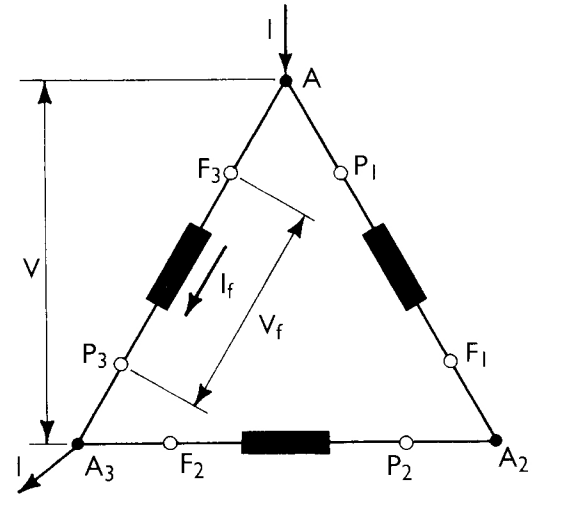
Power diodes are press fitted onto supports which act as heat dissipators; the positive diode is insulated by the alternator earth.

When an alternator with terminal B– insulated from the chassis earth is used (generally on buses or vehicles carrying dangerous materials), then both diode supports are insulated from the alternator body.

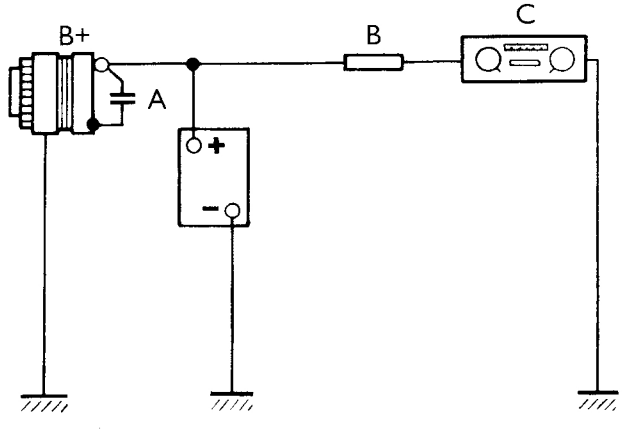
A break or short circuit in one or more of the power diodes implies that the charging circuit is not working properly; they should be checked, with the alternator dismantled, using an ohmmeter set on a scale of ohm x 1.



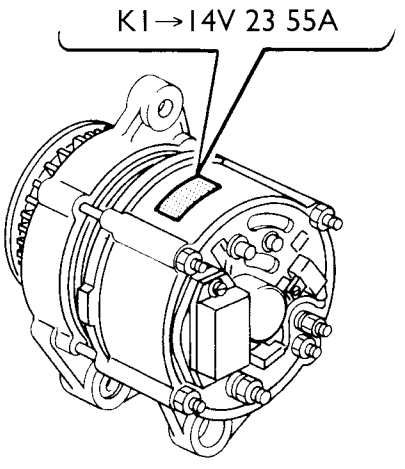
III.20 STAR CONNECTION
A_1 A_2 A_3 BRANCH POINTS – P_1 P_2 P_3 WINDING TERMINALS
V = V_f x 1.732 I = I_f



III.21 DELTA CONNECTION
A_1 A_2 A_3 BRANCH POINTS – P_1 P_2 P_3 WINDING TERMINALS
I = I_f x 1.732 V = V_f



III.22 ANTIJAMMING NETWORK
A. CAPACITOR – B. FILTER – C. RADIO



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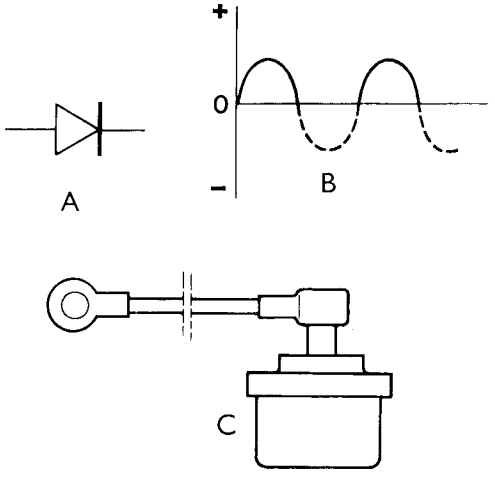
III.23 ALTERNATOR NOMINAL CHARACTERISTICS
K1. TYPE → CLOCKWISE ROTATION – **14V.** NOMINAL VOLTAGE – **23.** WORKING CURRENT RPM (23x100=G/M) – **55A.** NOMINAL CURRENT



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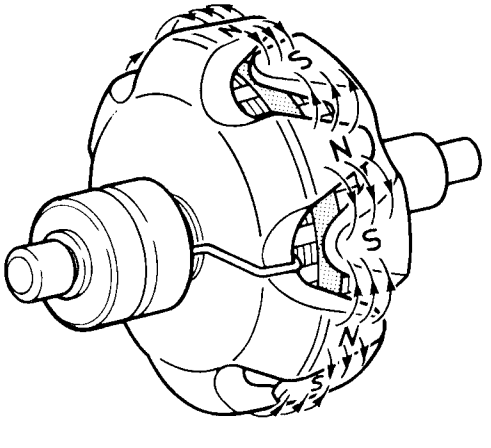
III.24 OWER DIODE
A. SYMBOL – **B.** HALF-WAVE RECTIFIER
C. TECHNICAL DIAGRAM



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III.25 CLAW-TYPE ROTOR AND RELEVANT LINES OF FORCE

Electromotive force (EMF). This is a physical phenomenon throughwhich it is possible to maintain a difference in electrical potential between two points in an open electrical circuit or to allow a current to flow through a closed circuit.
Its physical size is a voltage expressed in volts (V).

Frequency. The frequency is the number of cycles which are reproduced in a second. It is expressed in Hertz (Hz).

The frequency is inversely proportional to the period T.

The period T is the length of time during which a wave form passes through the same values.

The link between time and frequency is: $f = 1/T$.

A sinusoidal signal, at a given frequency, can give rise to interference with the radio equipment.

In order to minimize this interference, an electrolytic capacitor is fitted on terminal B+ of the alternator.

Lines of force. The lines of force are imaginary lines which indicate the direction of the force. The different lines of force in a space make up the field of force or magnetic field.

They are further increased if the magnet is immersed in a coil in which a direct current is flowing.

Terminal W. Bosch alternators types GI, KI, NI and TI have a terminal marked with the letter W where there is an alternating voltage whose frequency depends on the rotor coupling and the alternator revs conforming to the equation:

$$f = \frac{P \cdot n}{60}$$

where **f** is the frequency, **P** is the polar coupling and n the alternator rpm.

Terminal W is usually used for the indirect measurement of the speed in diesel engines.

Residual magnetism. This is the magnetism which remains in a magnetic iron casing after the magnetic force has been removed.

Brush holders. The two brushes make the connection between terminal D+, exciter diodes and voltage regulator with the exciter winding via the slip rings.

The minimum length for the brushes is usually 7 mm.

The brush holder may be assembled on the voltage regulator.

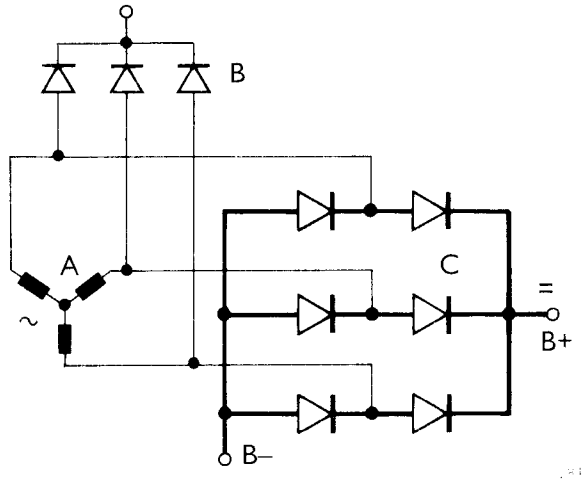
Pulley. In order to have a current output at low engine speeds, the ratio between the alternator pulley and crankshaft pulley should be between 1 ÷ 1.8 and 1 ÷ 2.1. In this way the alternator rotation speed almost doubles that of the engine.

The pulley race should be free from cracks or grease.

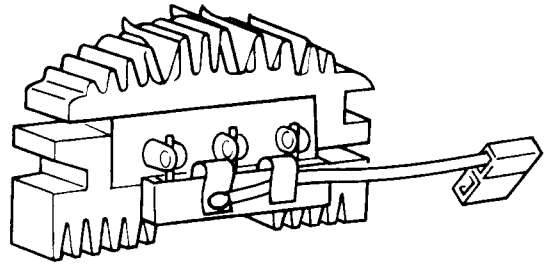
Bridge rectifier. This is a static device which converts the field winding alternating voltage into continuous voltage by means of a 6 or 12 diode bridge.

Positive half waves pass through positive diodes which lead to terminal B+ of the alternator, whilst negative half waves pass through negative diodes which are connected by means of their support to the system earth.

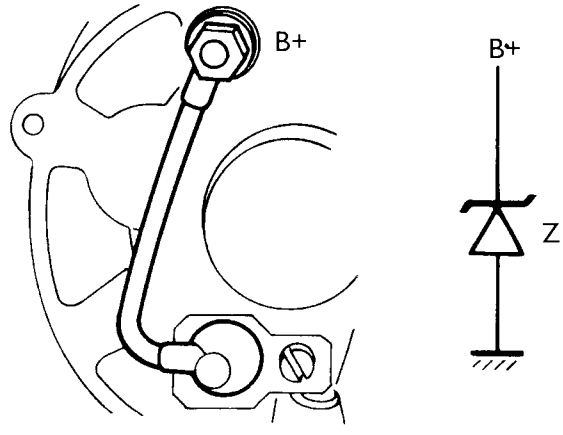
The rectifier bridge prevents a return of current to the field windings from the battery.



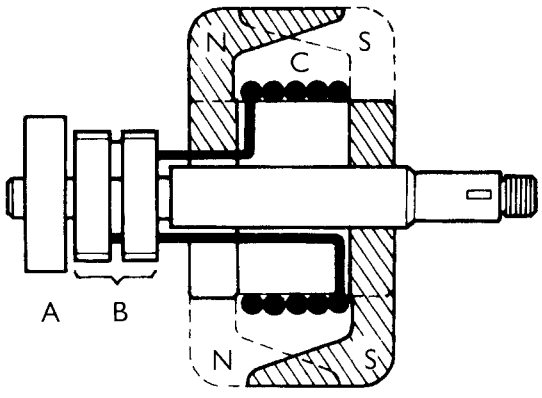
III.26 RECTIFIER BRIDGE DIAGRAM
A. ROTOR WINDINGS – B. EXCITER DIODES
C. POWER DIODES



III.27 RECTIFIER BRIDGE (MARELLI)



III.28 PROTECTION AGAINST EXCESS VOLTAGE
Z. ZENER DIODE SYMBOL



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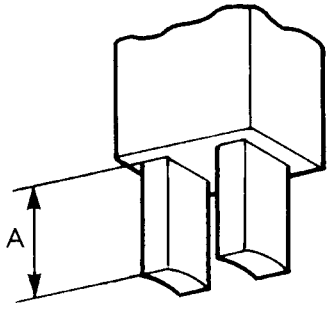
III.29 CLAW TYPE ROTOR
A. BEARING – B. RINGS – C. EXCITER WINDINGS – N.S. POLAR EXPANSIONS



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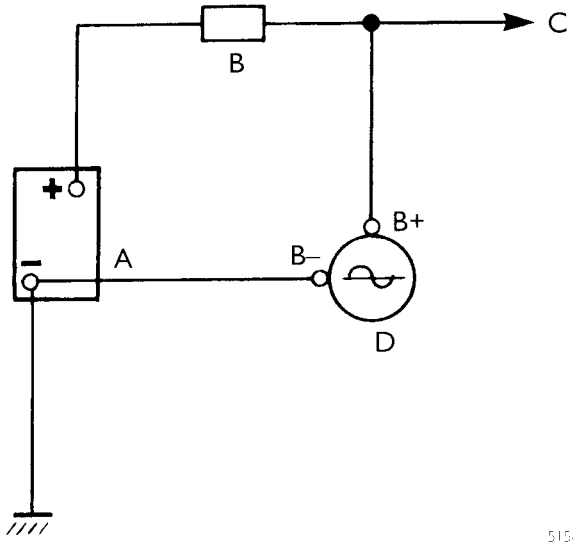
III.30 BRUSHES A. MINIMUM LENGTH 7 mm



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III.31 ALTERNATOR WITH INSULATED B– TERMINAL
A. BATTERY – B. G.C.R. – C. WIRING SYSTEM – D. ALTERNATOR

Rotor. The rotor comprises alternating magnetic poles and exciter windings also known as rotor windings (fig. III.29).

The rotor is very compact and the slip rings and ball bearings are fitted to the end of the shaft.

The rotor is designed in such a way as to support the centrifugal force produced by its rotation; this rotation speed may vary between 12000 and 14000 rpm.

Battery charging warning light. When the ignition switch is turned to position 15 (services) this warning light makes it possible for the current to flow from the battery to the voltage regulator and consequently to the exciter winding.

This is in order to ensure that the alternator provides a current even at low engine speeds.

As soon as the alternator produces an EMF which is opposed to that produced by the battery, the warning light goes out (this takes place when the EMF electromotive forces between points D+ and B+ are nil).

If the warning light remains on, this means that there is a fault though not necessarily a lack of current.

Check the tension of the belt, the length of the brushes (fig. III.30) and the insulation of the rotor winding.

When the warning light flashes there may be a defect in the voltage regulator, the exciter diodes or one of the battery components or a decrease in pressure in the brushes at the slip rings.

It should be remembered that in systems where the alternator is not equipped with exciter diodes, the battery recharging circuit warning light is controlled by a special relay.

Stator. The stator is a hollow cylinder made up of laminations 0.5 mm thick. Open slots in the stator inside have the purpose of housing induced or stator windings.

The number of slots depends on the number of rotor poles multiplied by the number of phases.

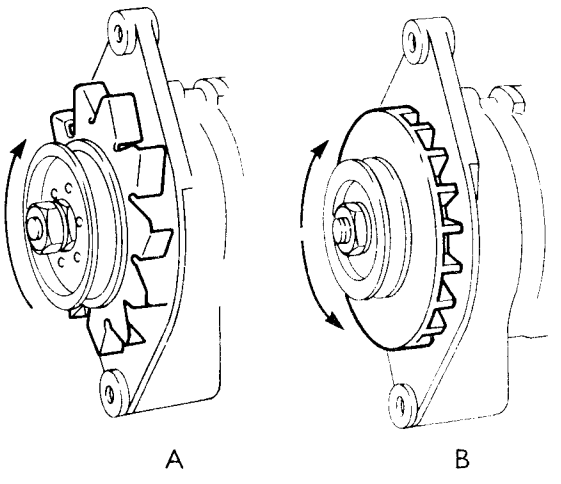
Example: a threephase alternator with a 12–pole rotor is fitted with 36 slots ($12 \times 3 = 36$).

The power of a generator depends on the number of its slots.

Nominal voltage. This is the alternator operating voltage; it is stamped on the alternator casing.

Threephase voltage. The induced voltages in a threephase alternator are offset 120°.

They are linked by means of a star or delta type connection; the flow is of the sinusoidal type with equal amplitude and frequency.

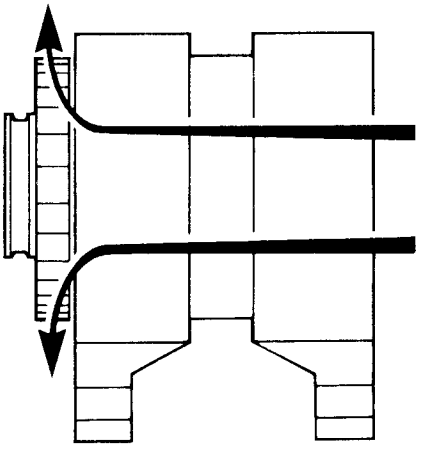


III.32 FANS A. CLOCKWISE ROTATION - B. CLOCKWISE OR COUNTERCLOCKWISE ROTATION

Fan. The ventilation of the rectifier bridge is achieved by means of a centrifugal fan connected to the pulley.

When assembling the fan, bear in mind the alternator direction of rotation.

For large capacity alternators, the cold air is taken from outside with a sleeve assembled in the engine compartment for this purpose.



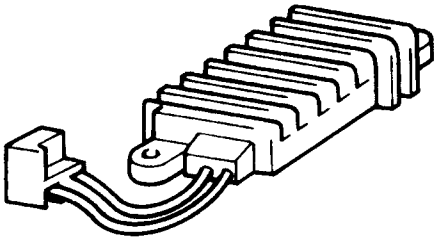
III.33 AIR FLOW GENERATED BY A MEDIUM SIZED ALTERNATOR

Electronic voltage regulator

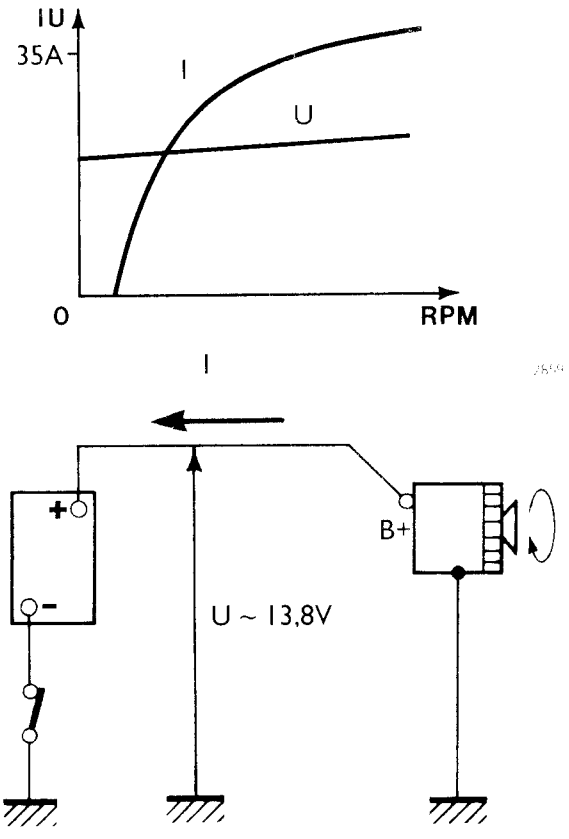
The integrated circuit voltage regulator is subordinate to terminal D+, to the three exciter diodes and to the alternator rotor winding.

No adjustments or maintenance can be carried out on this type of voltage regulator.

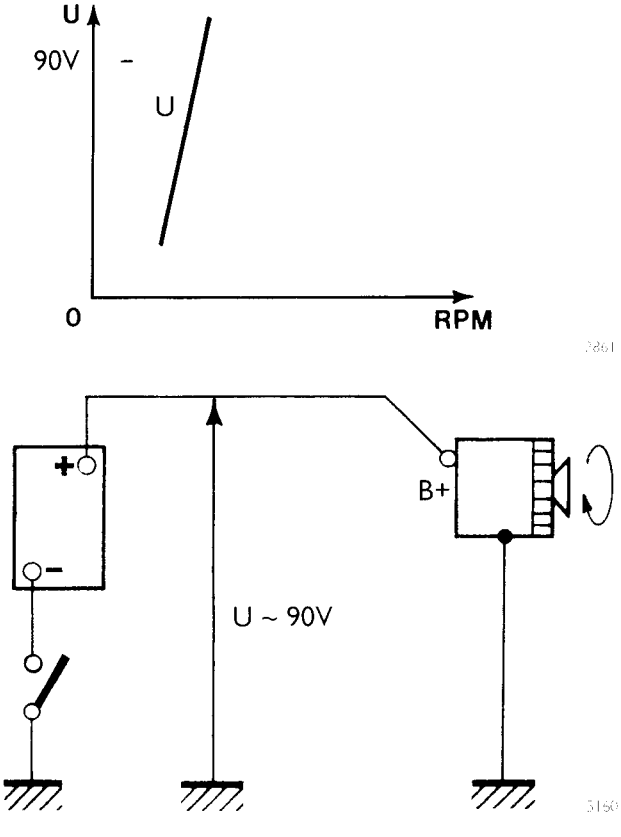
Check that it is correctly fixed to the alternator casing. If it is connected to earth by means of a cable, this check is of vital importance.



III.34 ELECTRONIC VOLTAGE REGULATOR (MARELLI)



III.35 "BUFFER" CONNECTION FOR A BATTERY TO AN ALTERNATOR AND RELEVANT VOLTAGE AND CURRENT CURVES



III.36 ALTERNATOR OPERATION AND RELEVANT VOLTAGE CURVE

As it is known, voltage at battery terminals depends on the AMOUNT of current passing through it.

In order to avoid excessive voltage (16V approximately for a 12V battery), the amount of current supplied by the alternator should be adjusted to the battery's ACTUAL requirements.

Electronic voltage regulators presently in use work, via a specific preset voltage detector, on the necessary amount of energizing current (and consequently for the amount of current supplied by the alternator) based on battery requirements as well as on the requirements of all electrical components on board the vehicle.

In practice, in the charging circuit, where the alternator is connected in parallel, or as a "buffer" to the battery, themaximum voltage value is linked to the power P and the current I in the formula:

$P = U.I$

where

P is the nominal alternator power

U is the voltage

I is the current intensity.

If the alternator is disconnected from the batterys (and therefore not forming a "buffer" connection) then the latter behaves like a "no load" generator.

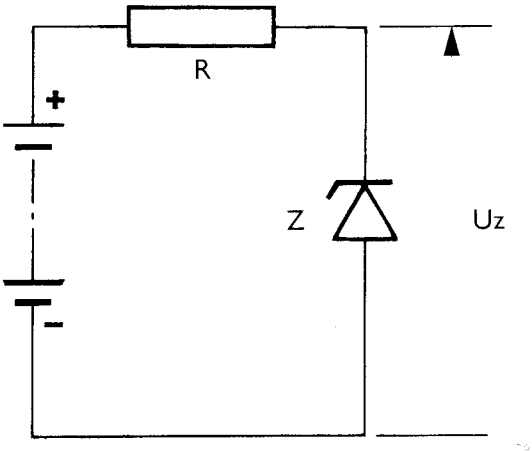
As a result, the voltage at the terminals exceeds the nominal voltage of the system, several times over.

Theoretical operation

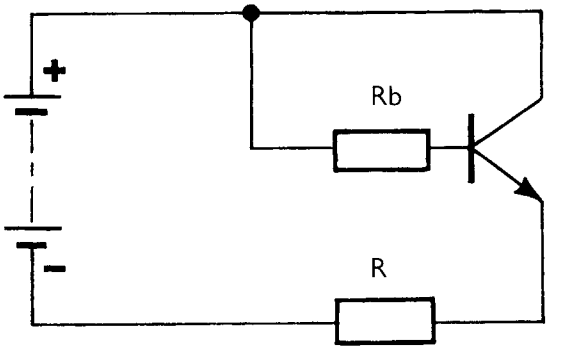
The voltage regulator controls the exciter current, that is to say the field influenced by the alternator rotor winding,and consequently the current supplied by the alternator (provided the latter is connected to the batteries).

The current output of a generator (alternator) over a load (battery) should be regulated on the basis of the voltage at battery terminals (according to electrolyte density). Regulation of the current output is worked out with the assistance of an electronic device which uses the characteristics of zener diode and transistors for this purpose.

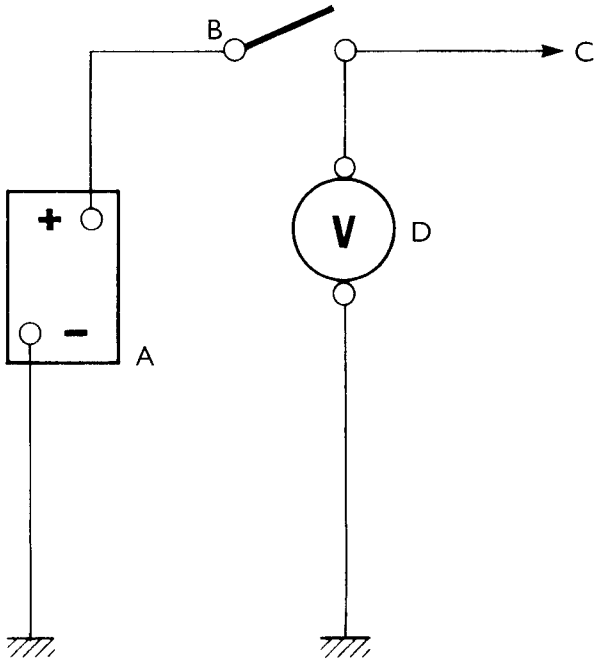
Zener diodes perform a stabilizing action as they either conduct or block at preset voltage values according to voltage variations.



III.37 ZENER DIODE IN A DIRECT CURRENT CIRCUIT
R. RESISTANCE – Uz. ZENER VOLTAGE

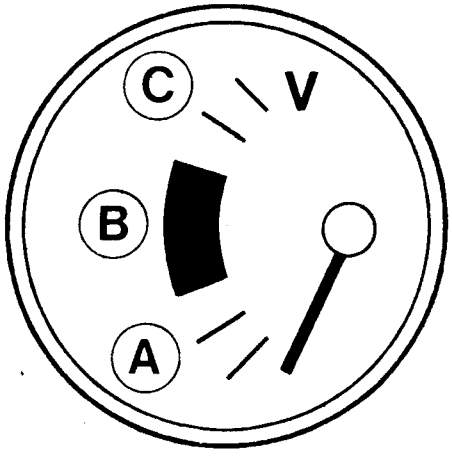


III.38 TRANSISTOR IN A DIRECT CURRENT CIRCUIT
R. LOAD – Rb. POLARITY RESISTANCE



5161

III.39 VOLTMETER CONNECTION
A. BATTERIES – B. IGNITION SWITCH – C. WIRING SYSTEM – D. VOLTMETER



2858

III.40 VOLTMETER A. RECHARGING CIRCUIT NOT WORKING PROPERLY – B. RECHARGING CIRCUIT WORKING PROPERLY – C. OVERVOLTAGE

Voltmeter

The voltmeter is connected after the ignition switch. Its purpose is to provide useful information as soon as the engine is switched on.

Engine switched off. If after a few seconds the instrument pointer stops below the green sector, the battery is discharged.

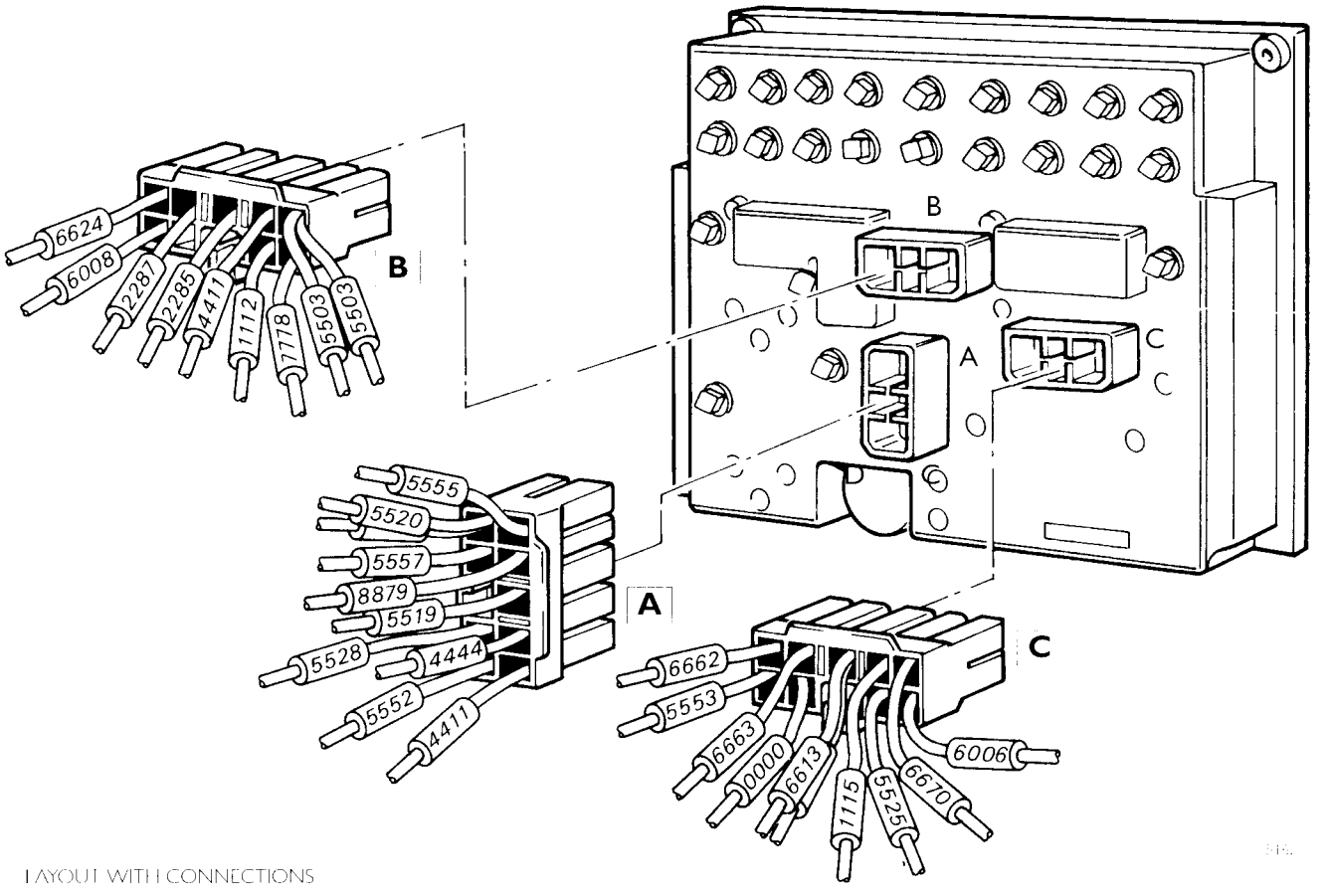
Engine running. If the instrument pointer stops in the area below the green sector, the charging circuit is faulty.

If the instrument pointer stops outside the green sector, the circuit is charged with excessive voltage.

INSTRUMENTS

INSTRUMENTS
Combined module

58901



LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A (black)	1	Fuel reserve w/lamp	5555
	2	Supply (+15) of combined module	8879
	3	Electronic rev counter	5519
	4	Positive of tachometer light and combined module after the rheostat	4444
	5	Positive with exterior lighting switch	4411
	6	Engine coolant level w/lamp	5520
	7	Fuel level indicator	5557
	8	Engine coolant temperature w/lamp	5528
	9	Engine coolant temperature gauge control device	5552
B (white)	1	Rear door w/lamp	6624
	2	Rear fog lamp w/lamp	2287
	3	High beam lights w/lamp	2285
	4	Parking lights w/lamp	4411
	5	Engine oil pressure w/lamp	5503
	6	Available for optional extra w/lamp	6008
	7	Available for optional extra w/lamp	
	8	Turn signal lights w/lamp	1112
	9	Battery charging failure w/lamp	7778
C (green)	1	Parking brake w/lamp	6662
	2	Air cleaner restriction w/lamp	6663
	3	Brake system failure w/lamp	6613
	4	Water in fuel filter w/lamp	1115
	5	ABS system failure w/lamp	6670
	6	Preheating w/lamp	5553
	7	Earth	0000
	8	Power steering fluid level w/lamp	5525
	9	Available for optional extra w/lamp	6006

Electronic rev counter

SIMPLIFIED DIAGNOSIS

Disconnect connector blocks [A] and [C] from combined module.

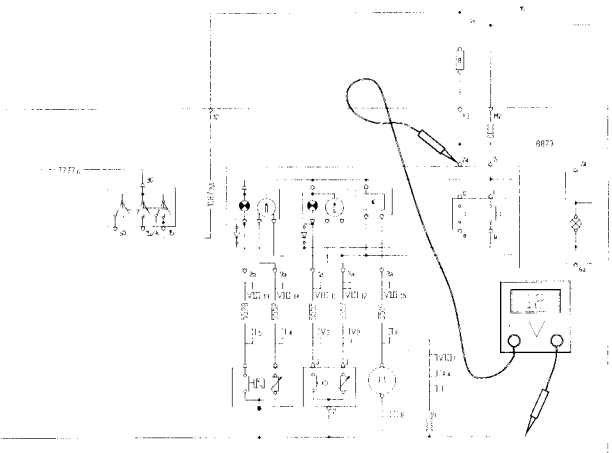
Set multimeter to VOLT:

Turn ignition switch key to position 15. Ensure 12 Volts are available by setting one multimeter prod to terminal 2 of connector block [A] and the otherone to earth.

Set multimeter to OHM.

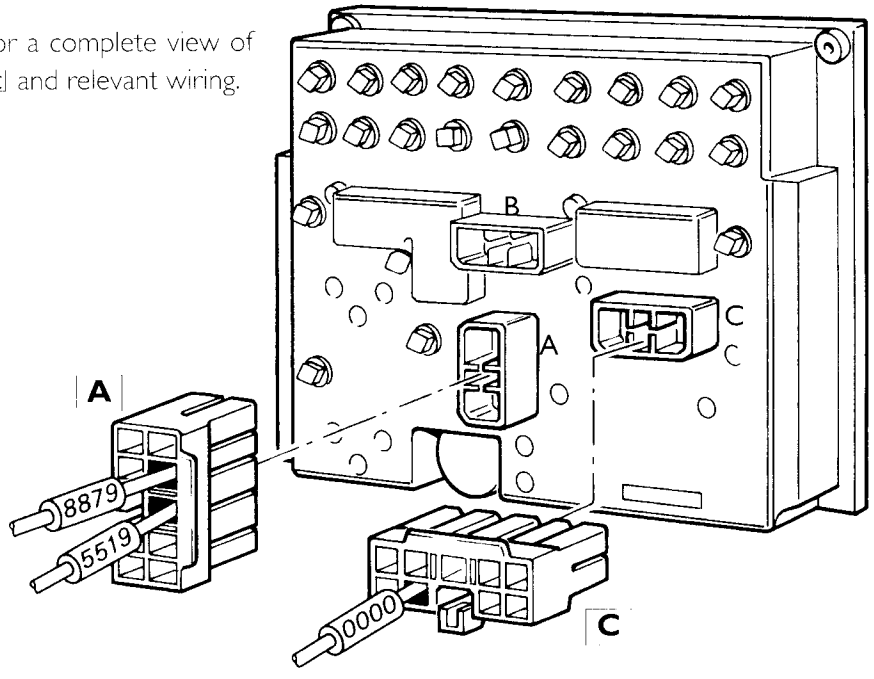
Turn the key to rest position and ensure the presence of 0 Ω (zero ohm) by setting one multimeter prod to terminal 7 of connector [C] and the otherone to earth.

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



Print no. 603.42.961 Diagram no. 3

NOTE. Refer to page IV.3 for a complete view of connectors [A] and [C] and relevant wiring.



LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	Not used	
	2	Supply (+15)	8879
	3	Signal from electronic rev counter sender unit	5519
	4 ÷ 9	Not used	
C	1 ÷ 6	Not used	–
	7	Earth	0000
	8	Not used	–
	9	Not used	

Electronic rev counter sender unit

SIMPLIFIED DIAGNOSIS

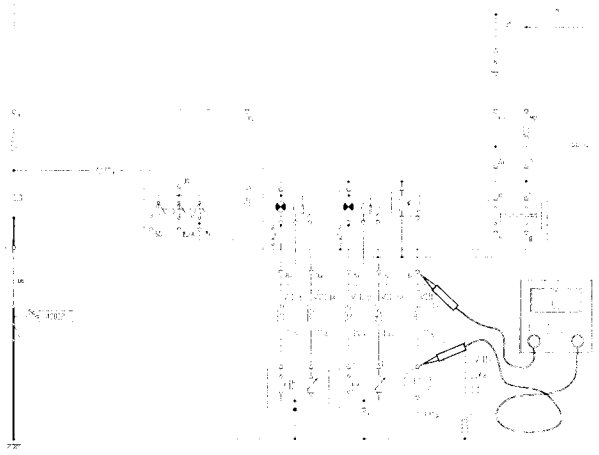
Disconnect connector **A** from component under examination.

Set multimeter to OHM.

Check for 0 Ω by setting one multimeter prod to terminal 1 of connector **A** and the otherone to terminal 3 of combined module connector A (page IV.3).

Check for 0 Ω by setting one multimeter prod to terminal 2 of connector **A** and otherone to earth.

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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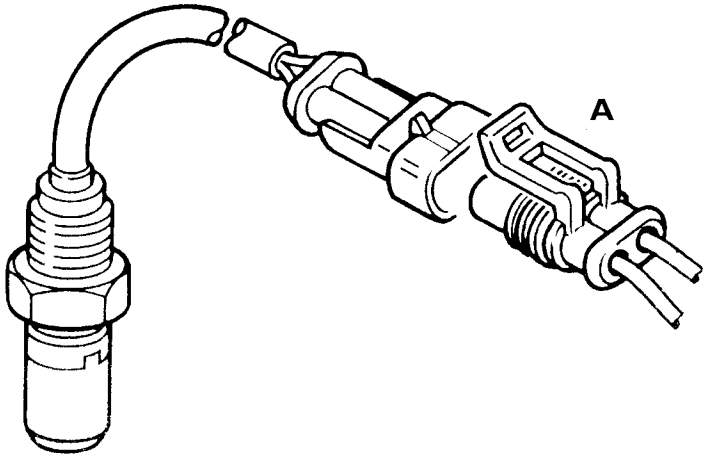


CONNECTIONS

Connector		Function	Cable colour
A	1	to electronic rev counter	Light blue
	2	Earth	Brown

Engine coolant temperature gauge with built–in warning lamp

SIMPLIFIED DIAGNOSIS

Disconnect connector blocks [A] and [C] from combined module.

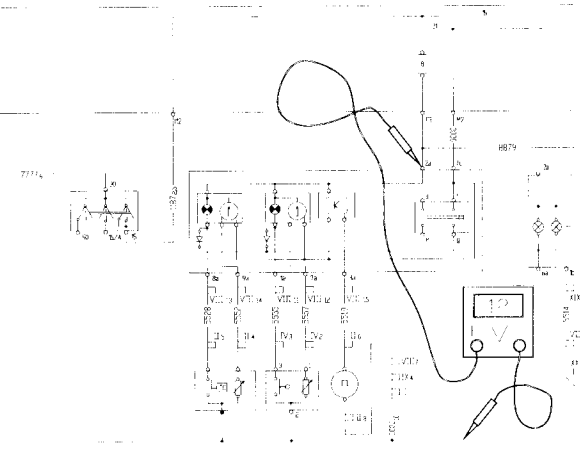
Set multimeter to VOLT:

Turn ignition switch key to position 15. Ensure 12 Volts are available by setting one multimeter prod to terminal 2 of connector block [A] and the otherone to earth.

Set multimeter to OHM.

Turn the key to rest position and ensure the presence of 0 Ω by setting one multimeter prod to terminal 7 of connector [C] and the otherone to earth.

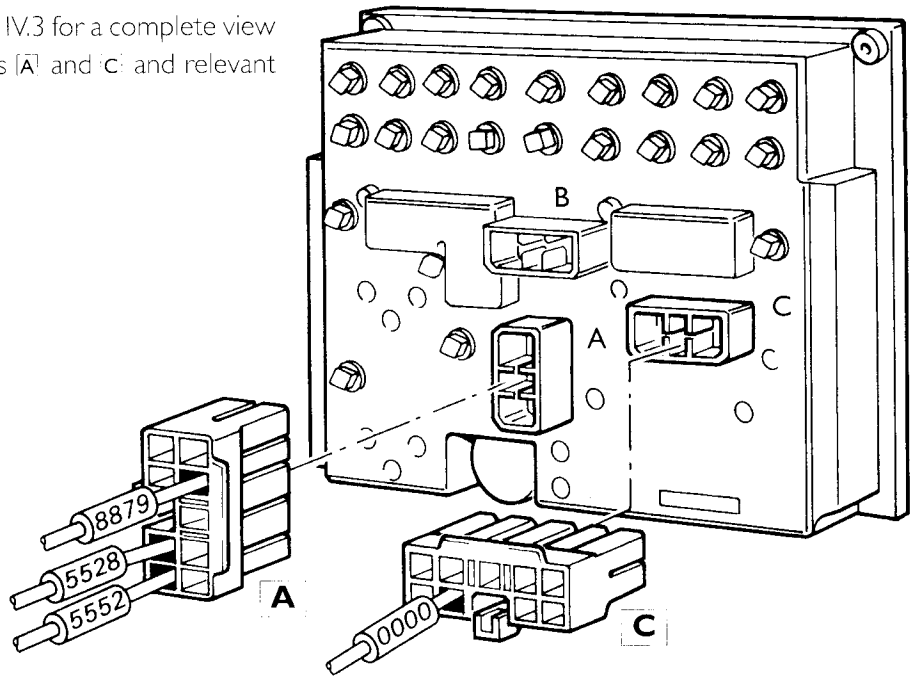
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



Print no. 603.42.961 Diagram no. 3

NOTE. Refer to page IV.3 for a complete view of connectors [A] and [C] and relevant wiring.

47011



5165

LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	Not used	–
	2	Supply (+15)	8879
	3 ÷ 7	Not used	–
	8	To engine coolant temperature w/lamp	5528
	9	Signal to engine coolant gauge	5552
C	1 ÷ 6	Not used	–
	7	Earth	0000
	8	Not used	–
	9	Not used	–

Engine coolant temperature switch and gauge sender unit

SIMPLIFIED DIAGNOSIS

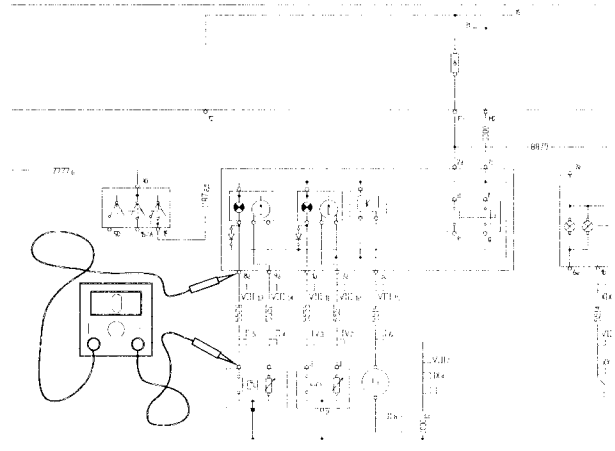
Disconnect connector A from component under examination.

Set multimeter to OHM.

Check for 0 Ω by setting one multimeter prod to terminal 1 of connector A and the otherone to terminal 8 of combined module connector A (page IV.3).

Check for 0 Ω by setting one multimeter prod to terminal 2 of connector A and otherone to terminal 9 of combined module connector A.

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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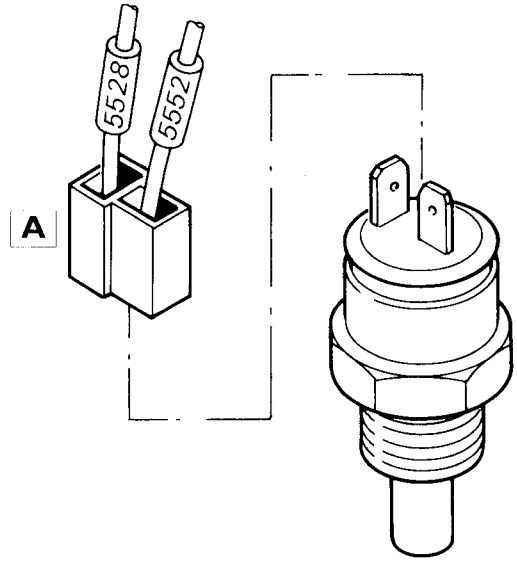
47030 **47100**



5166

LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	To engine coolant temperature w/lamp	5528
	2	Signal to engine coolant gauge	5552

Fuel level indicator with built–in warning lamp

SIMPLIFIED DIAGNOSIS

Disconnect connector blocks A and C from combined module.

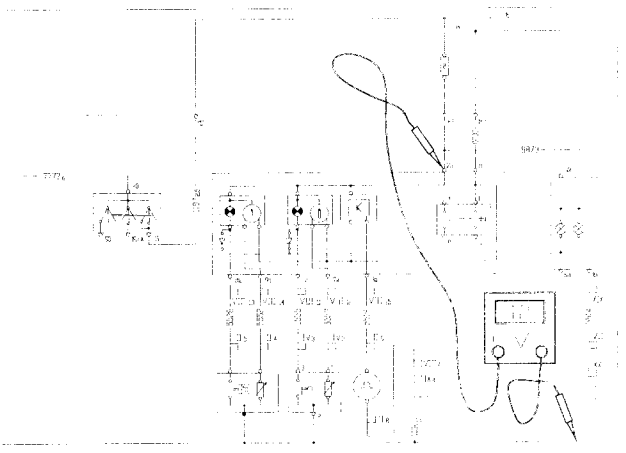
Set multimeter to VOLT:

Turn ignition switch key to position 15. Ensure 12 Volts are available by setting one multimeter prod to terminal 2 of connector block A and the otherone to earth.

Set multimeter to OHM.

Turn the key to rest position and ensure the presence of 0 Ω by setting one multimeter prod to terminal 7 of connector C and the otherone to earth.

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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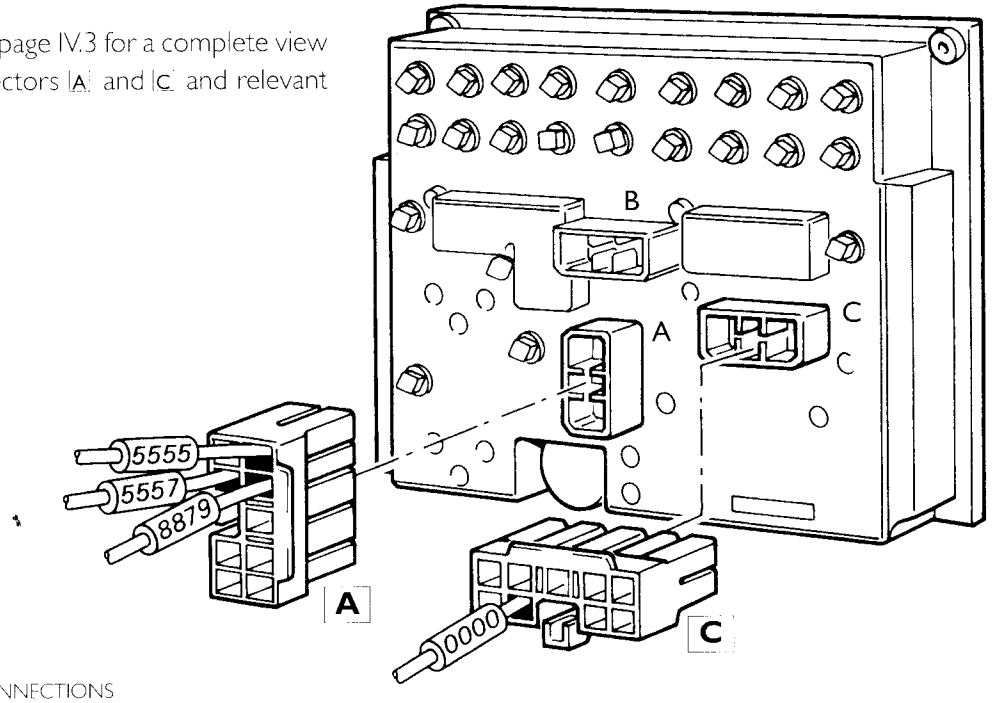
44001

NOTE. Refer to page IV.3 for a complete view of connectors A and C and relevant wiring.



5167

LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	To fuel reserve w/lamp	5555
	2	Supply (+15)	8879
	3 ÷ 6	Not used	
	7	Fuel level indicator control device	5557
	8	Not used	
	9	Not used	–
C	1 ÷ 6	Not used	
	7	Earth	0000
	8	Not used	–
	9	Not used	–

Fuel level indicator control device with reserve warning lamp contact

SIMPLIFIED DIAGNOSIS

Disconnect connector [A] from component under examination.

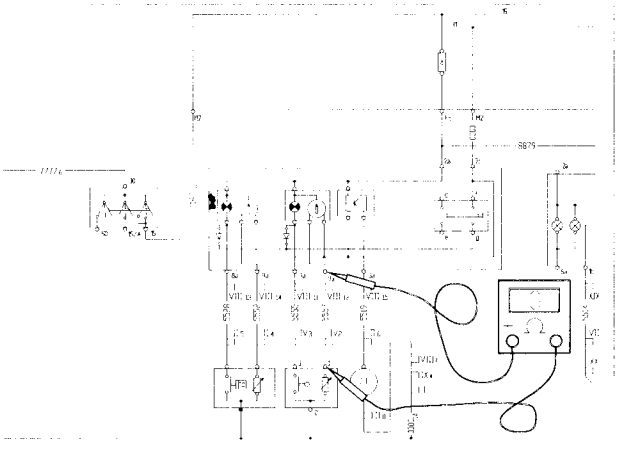
Set multimeter to OHM.

Check for 0 Ω by setting one multimeter prod to terminal 1 of connector [A] and the otherone to terminal 7 of combined module connector [A] (page IV.3).

Check for 0 Ω by setting one multimeter prod to terminal 3 of connector [A] and otherone to terminal 1 of combined module connector A.

Check for 0 Ω by setting one multimeter prod to terminal 2 of connector [A] and the otherone to earth.

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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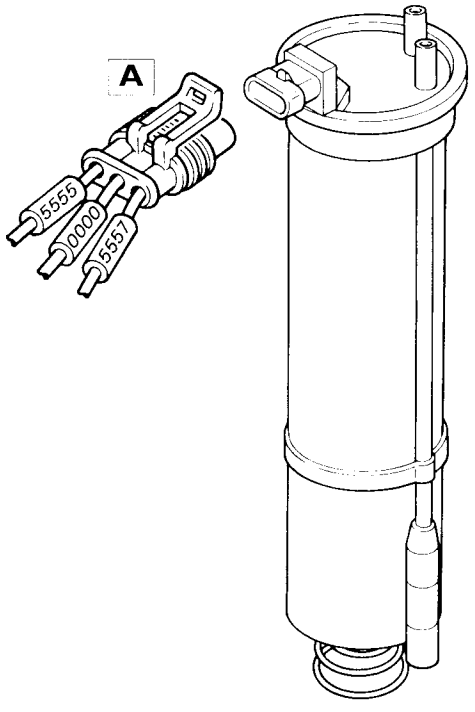
44031



5168

LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	Signal to fuel level indicator	5557
	2	Earth	0000
	3	To fuel reserve w/lamp	5555

Electronic tachometer with clock

SIMPLIFIED DIAGNOSIS

Disconnect connector block [A] from component under examination.

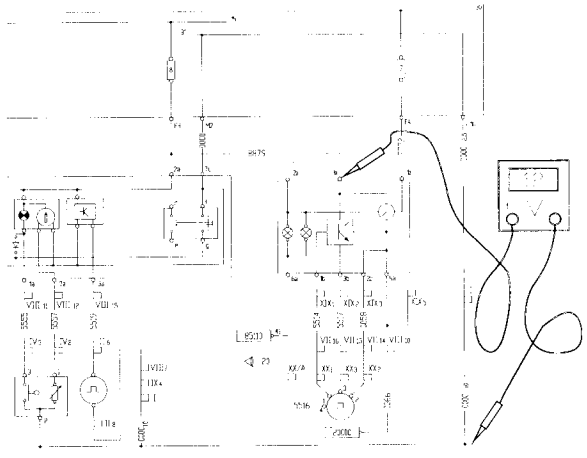
Set multimeter to VOLT:

Turn ignition switch key to position 15. Ensure 12 Volts are available by setting one multimeter prod to terminal 3 of connector block [A] and the otherone to earth.

Set multimeter to OHM.

Turn the key to rest position and ensure the presence of 0 Ω by setting one multimeter prod to terminal 5 of connector [A] and the otherone to earth.

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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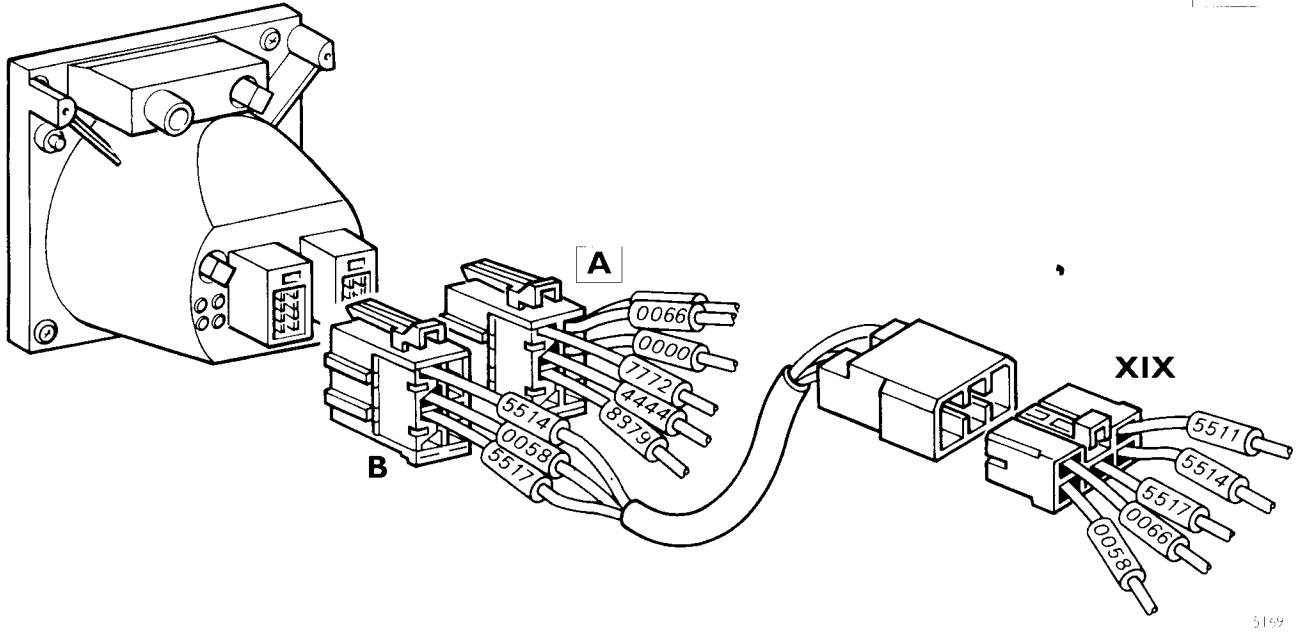


5169

LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
[A]	1	Supply (+15)	7772
	2	Positive for instrument lighting	4444
	3	Supply (+15)	8879
	4	Not used	–
	5	Insulated earth	0066
	6	Earth	0000
	7	Not used	–
	8	Not used	–
[XIX]	1	To electronic tachometer sender unit	5514
	2	To electronic tachometer sender unit	5517
	3	To electronic tachometer sender unit	0058
	4	Supply (+15)	5511
	5	Insulated earth	0066

Electronic tachograph/tachometer sender unit

SIMPLIFIED DIAGNOSIS

Disconnect connector |A| from component under examination.

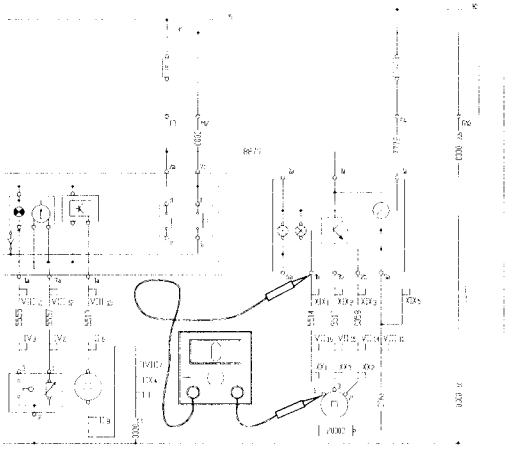
Set multimeter to OHM.

Check for 0 Ω by setting one multimeter prod to terminal 1 of connector |A| and the otherone to terminal 1 of tachometer connector B (page IV.10).

Check for 0 Ω by setting one multimeter prod to terminal 3 of connector |A| and otherone to terminal 3 of tachometer connector B.

Check for 0 Ω by setting one multimeter prod to terminal 2 of connector |A| and the otherone to terminal 2 of tachometerconnector B.

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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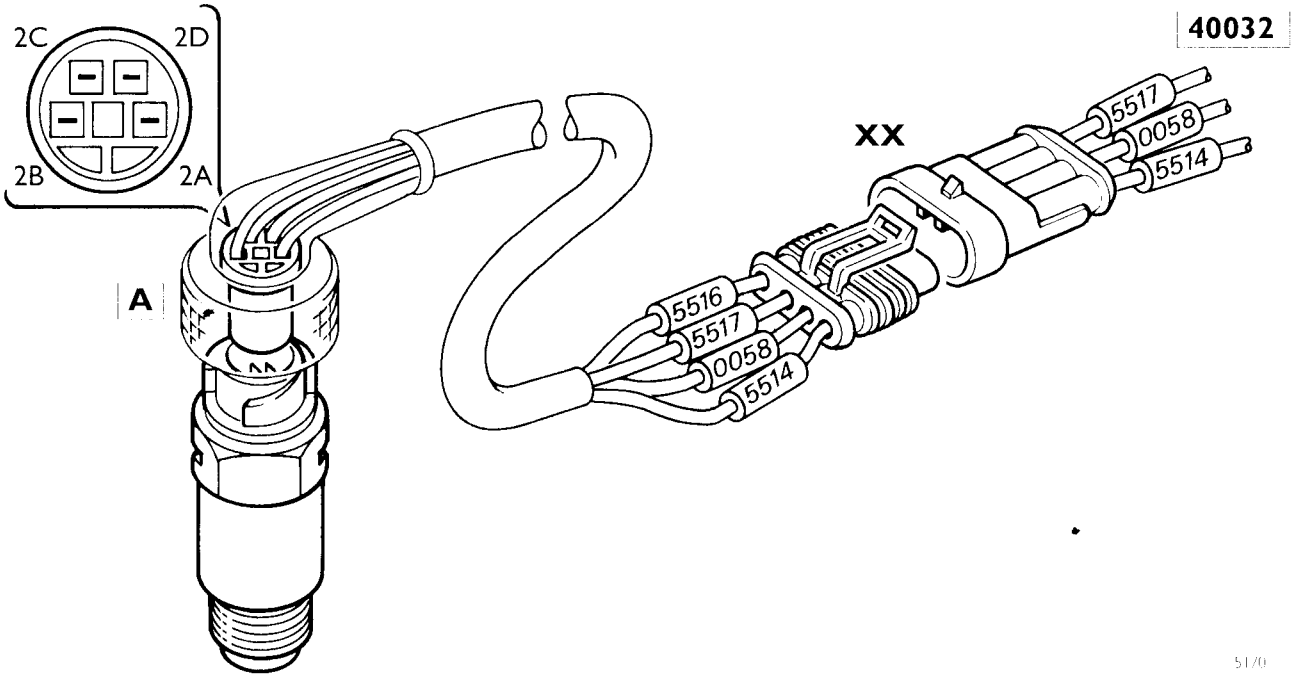


5170

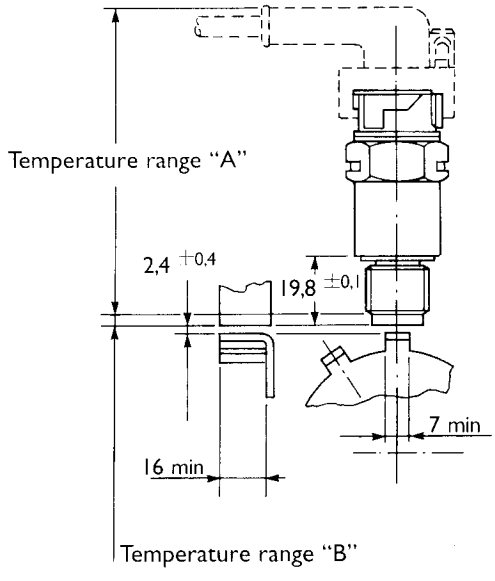
LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	2A	Positive for sender unit	5514
	2B	Negative for sender unit	0058
	2C	Speed signal	5517
	2D	Inverse speed signal	5516
XX	1	To tachometer/tachograph	5514
	2	To tachometer/tachograph	0058
	3	To tachometer/tachograph	5517
	4	Tachometer/tachograph sender unit	

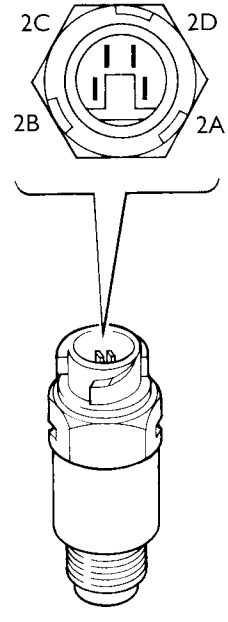
Tachograph/tachometer sender unit

Terminal	Function	Symbol
2A	8V supply	+
2B	Earth	–
2C	Speed signal	A1 [1]
2D	Inverse speed signal	A2 [1] [2]

40032



2897



2898

ELECTRICAL CONNECTIONS

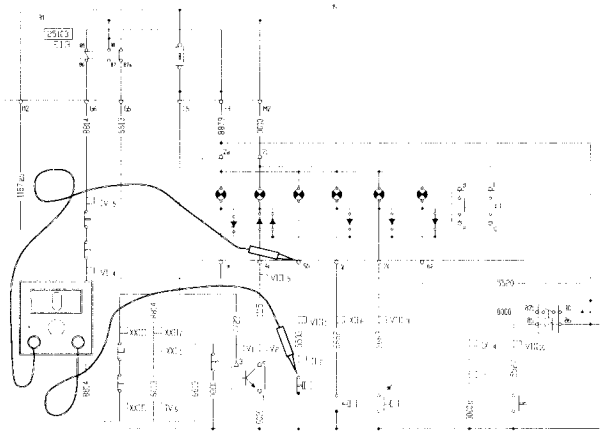
Technical data

Overvoltage protection device	± 150V (0,5 ms – 0,2 Hz)	Hermetic	0.5 bar in oil, 120°C, 100h
"VE" operating voltage	6 ÷ 15V	Signal	A2 = inversion of A1
Current absorption	MAX 12 mA	Operating temperature "A"	-30 ÷ +135
Connection type	no earth	Operating temperature "B"	-30 ÷ +145
Internal resistance	1,5 KΩ	Storage temperature "C"	-40 ÷ +140
Wave form	square	Storage temperature "D"	-40 ÷ +150
Initial signal A1	L ≦ 50mV:H=VE–2V (13V max)	Type of protection	DIN 40050 – IP 66
		Tightening torque	50 Nm max

Engine oil pressure warning lamp switch

SIMPLIFIED DIAGNOSIS

Disconnect connector A from component under examination.
Set multimeter to OHM.
Check for 0 Ω by setting one multimeter prod to connector A and the otherone to terminal 5 of combined module connector B (page IV.3).
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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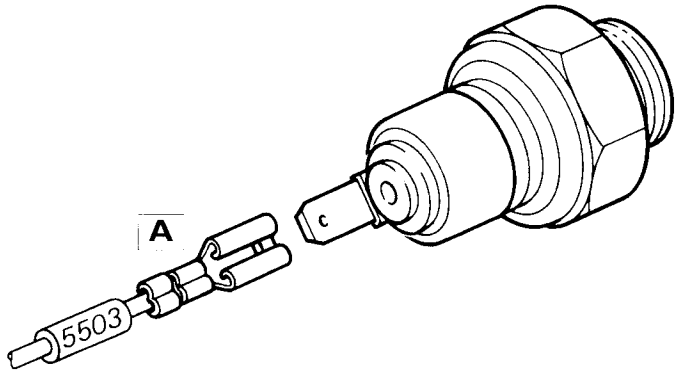
42550



5171

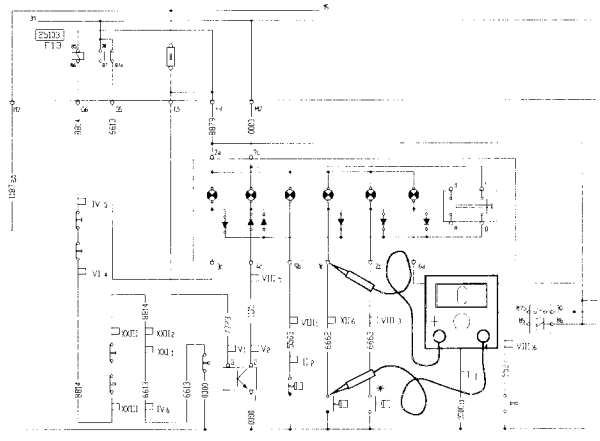
LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	–	To engine oil pressure warning lamp	5503

Parking brake warning lamp switch

SIMPLIFIED DIAGNOSIS

Disconnect connector A from component under examination.
Set multimeter to OHM.
Check for 0 Ω by setting one multimeter prod to connector A and the otherone to terminal 1 of combined module connector C (page IV.3).
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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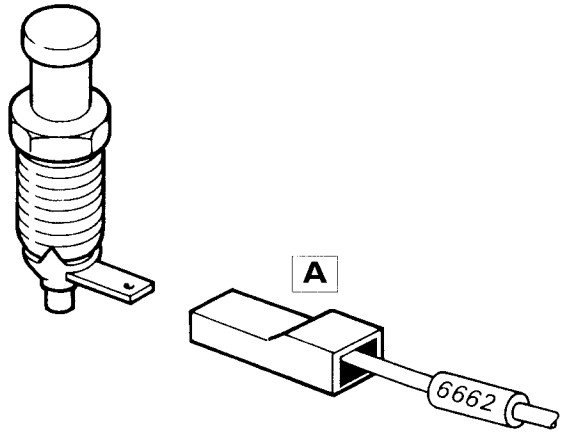
42102



51/2

LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	–	To parking brake warning lamp	6662

IVECO Control display panel

SIMPLIFIED DIAGNOSIS

Disconnect connector block [A] from component under examination.

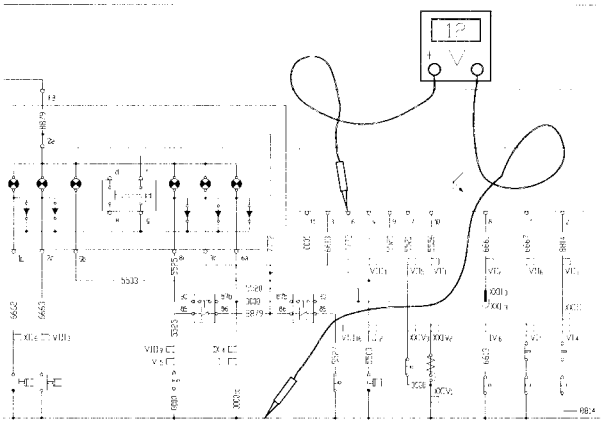
Set multimeter to VOLT:

Turn ignition switch key to position 15. Ensure 12 Volts are available by setting one multimeter prod to terminal 6 of connector block [A] and the otherone to earth.

Set multimeter to OHM.

Turn the key to rest position and ensure the presence of 0 Ω by setting one multimeter prod to terminal 11 of connector [A] and the otherone to earth.

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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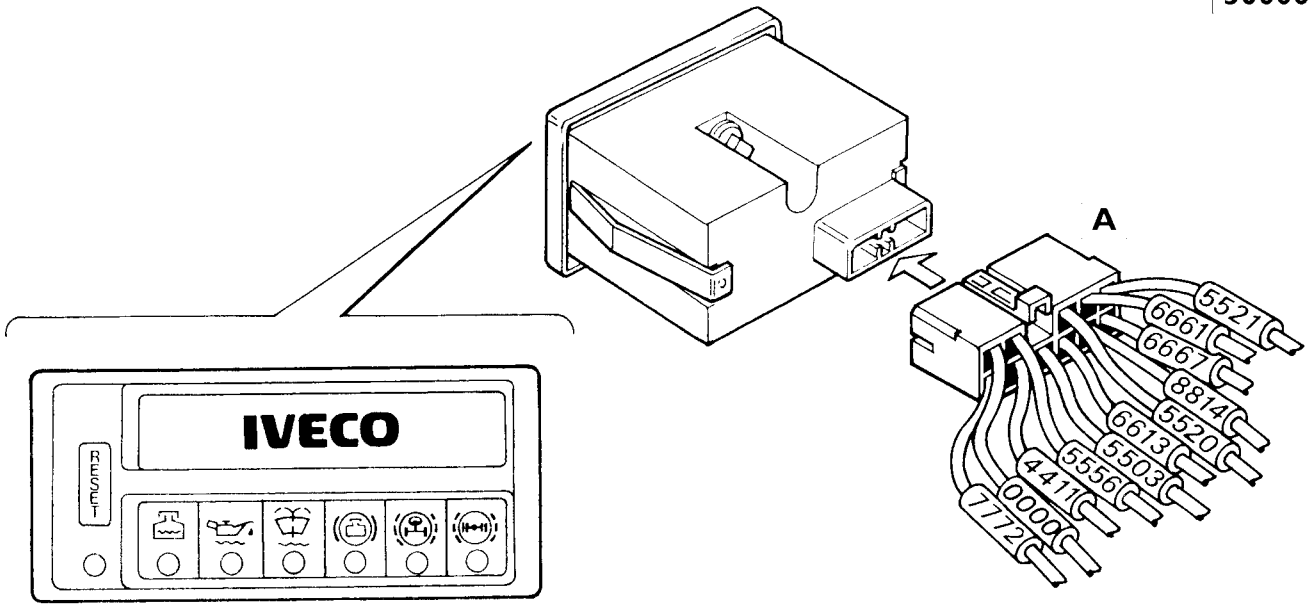
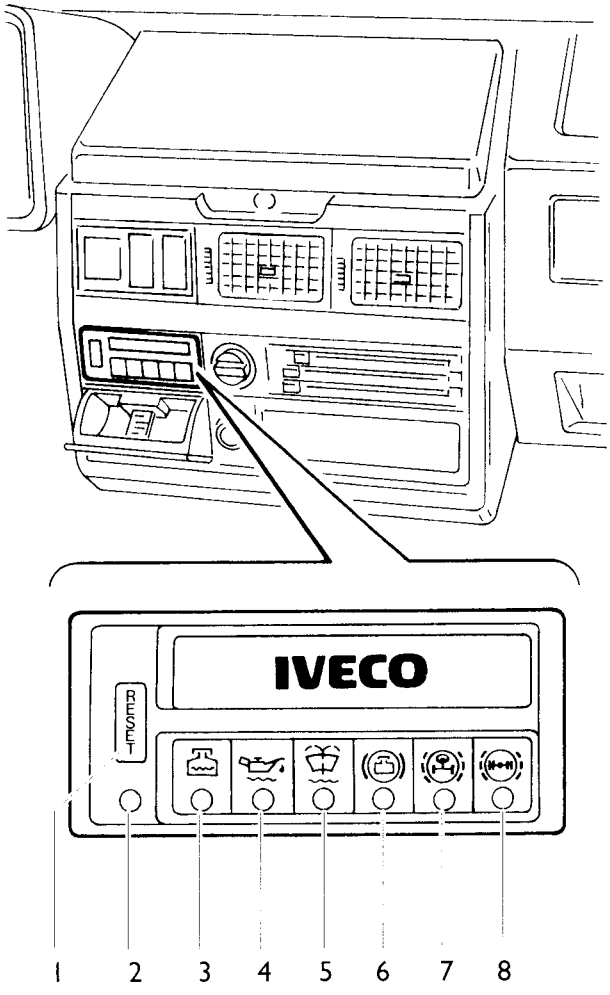
50000



LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	Rear axle brake failure w/lamp	6667
	2	Front axle brake failure w/lamp	8814
	3	Brake system failure w/lamp	6613
	4	Engine oil pressure failure w/lamp	5503
	5	Positive for display panel lighting	4411
	6	Supply (+15)	7772
	7	Windscreen washer fluid level w/lamp	5521
	8	Brake fluid level w/lamp	6661
	9	Engine coolant level w/lamp	5520
	10	Engine oil level w/lamp	5556
	11	Earth	0000



1556

IV.41 IVECO CONTROL DISPLAY PANEL

IVECO Control display panel

This device indicates low fluid levels and/or brake wear by lighting up warning lights (LEDs).

Description

The functions being checked are the following:

- engine coolant level
- engine oil level
- windshield washer fluid level
- brake fluid level
- front axle brake wear
- rear axle brake wear

Operation

When the ignition switch is turned to services (+15) it is possible to visually inspect the efficiency of all the warning lights (LEDs). They come on for a period of about 5 seconds.

Then, if the system is working properly, the LEDs go out and only the general green LED remains on.

IVECO CONTROL DISPLAY PANEL

Engine and brake system operation check

1. Reset button
2. Device on (general green led)
3. Engine coolant level (red)
4. Engine oil level (red)
5. Windshield washer fluid level (red)
6. Brake fluid level (red)
7. Front axle brake wear (red)
8. Rear axle brake wear (red)

Engine coolant level indicator control device

SIMPLIFIED DIAGNOSIS

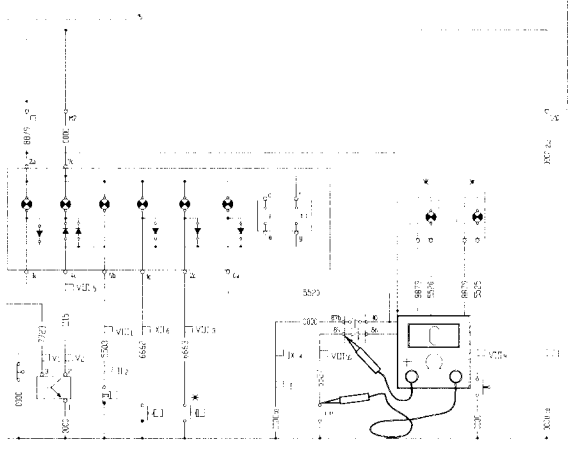
Disconnect connector A from component under examination.

Set multimeter to OHM.

Check for 0 Ω by setting one multimeter prod to terminal 2 of connector A and the otherone to terminal 85 of engine coolant level indicator relay

Check for 0 Ω by setting one multimeter prod to terminal 3 of connector A and otherone to earth.

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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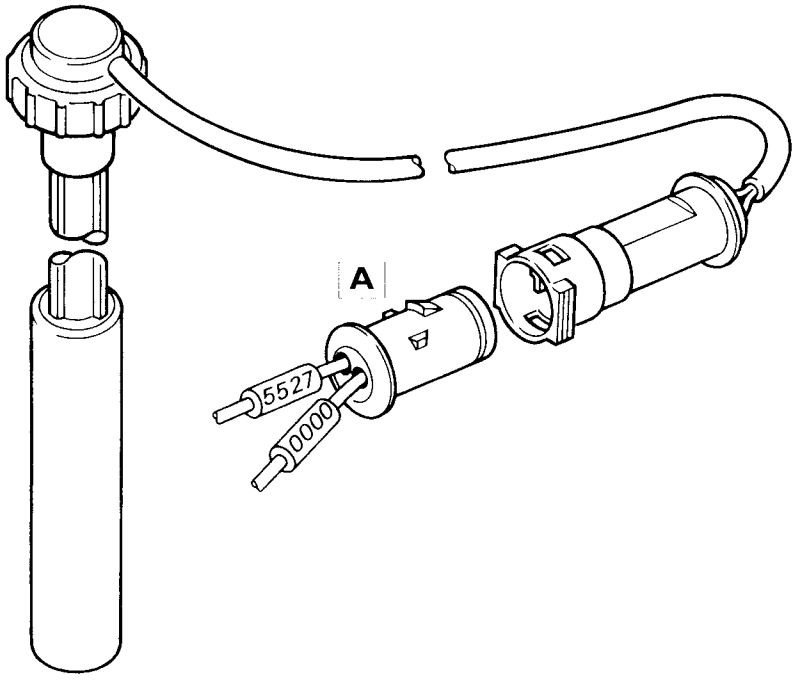
44036



LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	Not used	
	2	Relay for engine coolant level w/lamp	5527
	3	Earth	0000

Engine oil level indicator control device

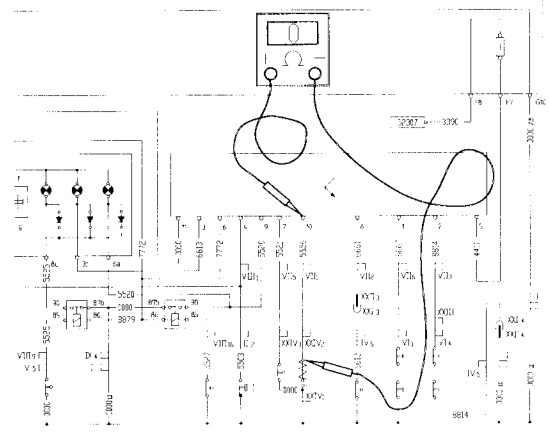
SIMPLIFIED DIAGNOSIS

Disconnect connector A from component under examination.

Set multimeter to OHM.

- Check for 0 Ω by setting one multimeter prod to terminal 1 of connector A and the otherone to terminal 10 of IVECO Control display panel connector A (page IV.15).
- Check for 0 Ω by setting one multimeter prod to terminal 2 of connector A and otherone to earth.

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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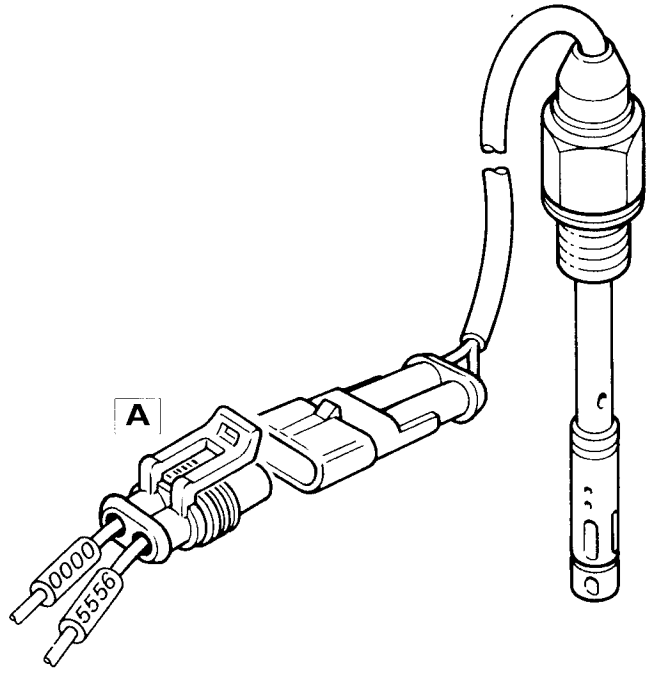
44032



LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	To IVECO Control display panel (engine oil level w/lamp)	5556
	2	Earth	0000

Brake fluid level indicator control device

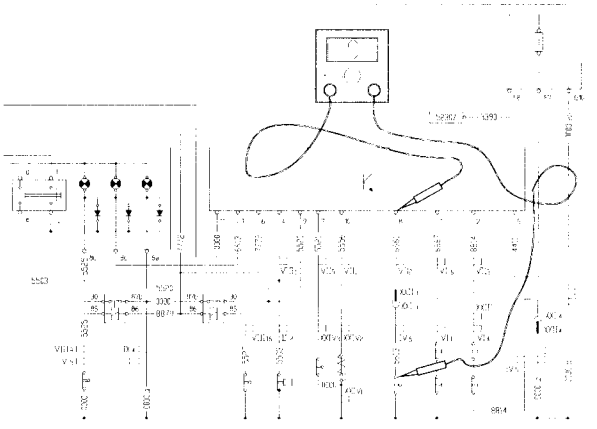
SIMPLIFIED DIAGNOSIS

Disconnect connector [A] from component under examination.
Set multimeter to OHM.

Check for 0 Ω by setting one multimeter prod to terminal 2 of connector [A] and the otherone to terminal 8 of IVECO Control display panel connector [A] (page IV.15).

Check for 0 Ω by setting one multimeter prod to terminal 1 of connector [A] and otherone to earth.

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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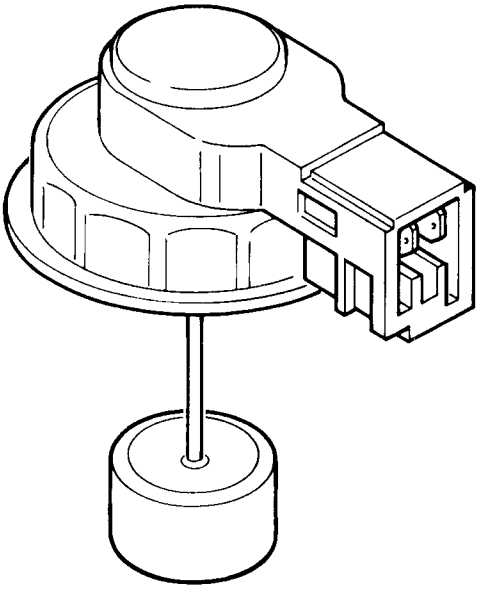
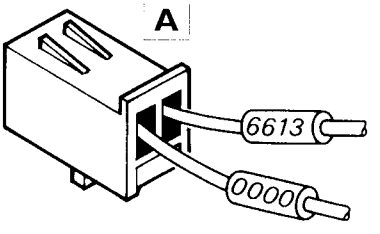
44033





LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	Earth	0000
	2	To IVECO Control display panel (brake fluid level indicator)	6613

Front rh wheel brake lining wear sensor

SIMPLIFIED DIAGNOSIS

Disconnect connector [A] from component under examination.

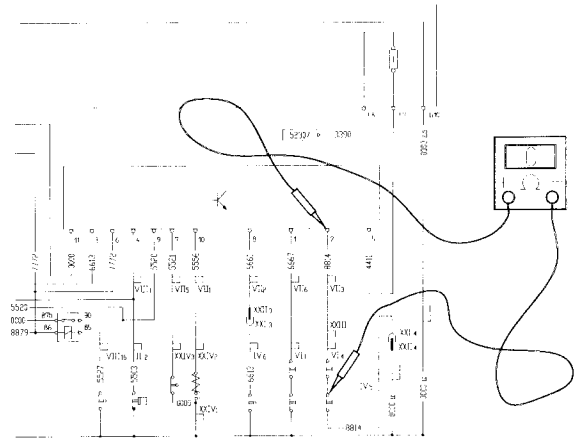
Set multimeter to OHM.

Check for 0 Ω by setting one multimeter prod to terminal 2 of connector [A] and the otherone to terminal 2 of IVECO Control display panel connector A (page IV.15).

Check for 0 Ω by setting multimeter prods to terminals 1 and 2 of sensor connector.

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.

Repeat the same test with the front lh wheel sensor. Use the wiring diagram on the side as a reference guide.



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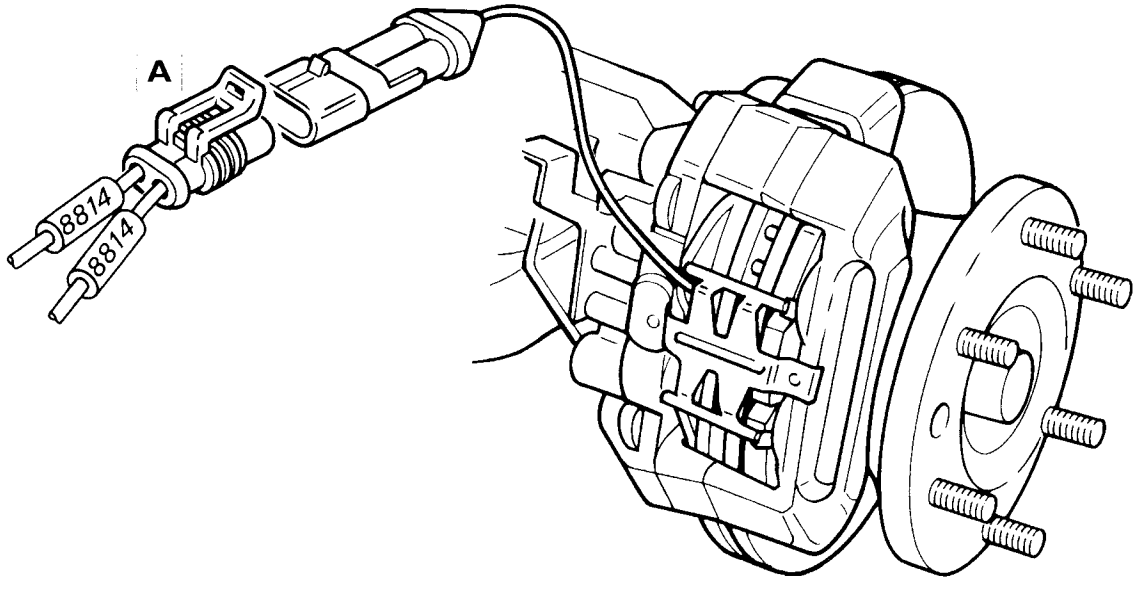
86002



5177

LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	Earth	8814
	2	To front lh wheel brake lining wear sensor	8814

Rear rh wheel brake lining wear sensor

SIMPLIFIED DIAGNOSIS

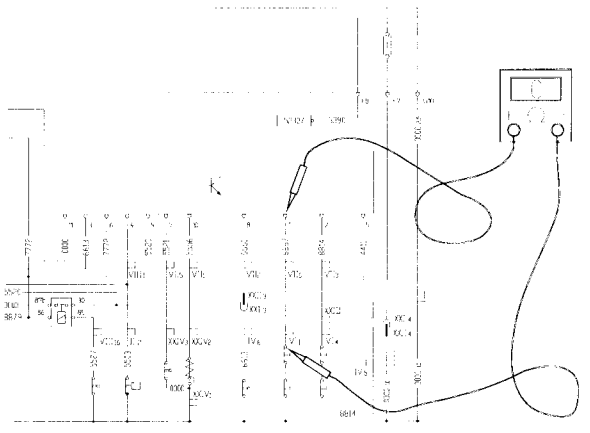
Disconnect connector A from component under examination.
Set multimeter to OHM.

Check for 0 Ω by setting one multimeter prod to terminal 2 of connector A and the otherone to terminal 1 of IVECO Control display panel connector A (page IV.15).

Check for 0 Ω by setting multimeter prods to terminals 1 and 2 of sensor connector.

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.

Repeat the same test with the rear lh wheel sensor. Use the wiring diagram on the side as a reference guide.



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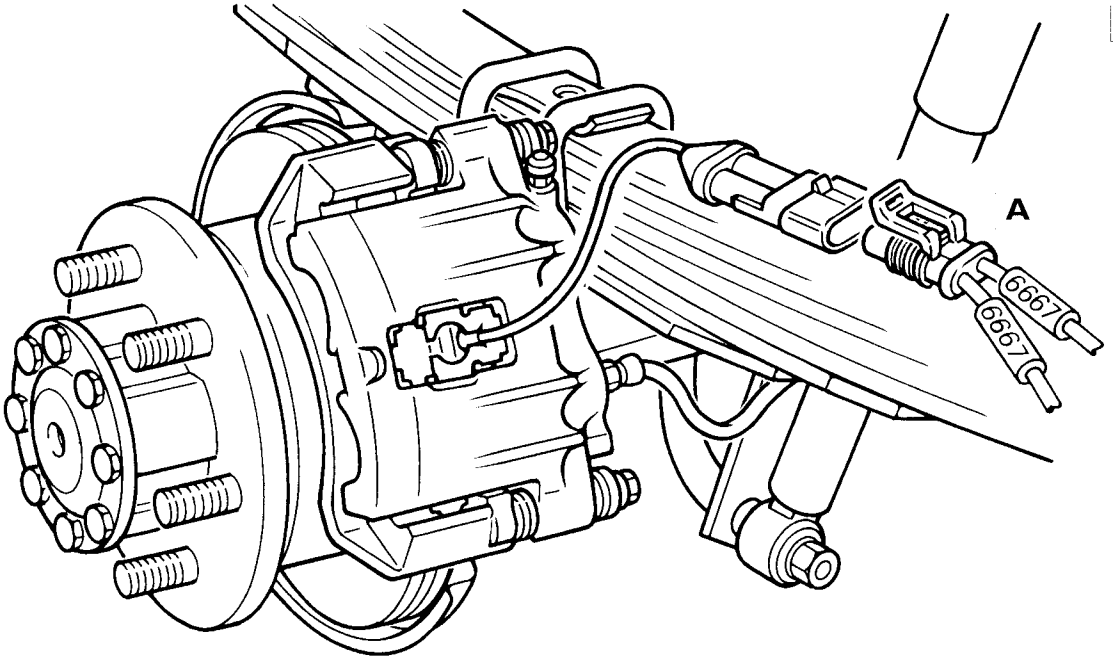
86003



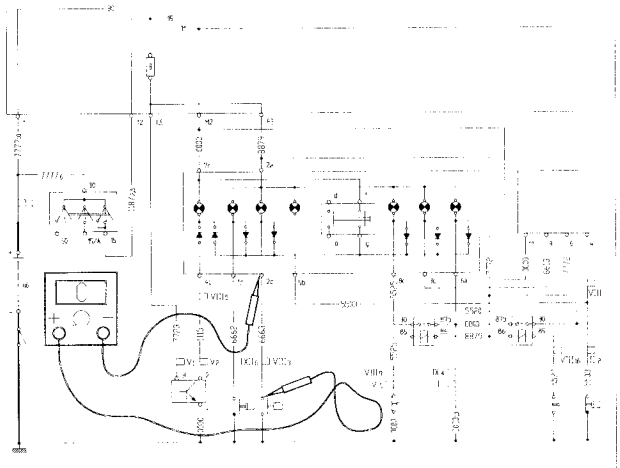
LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	To rear lh wheel brake lining wear sensor	6667
	2	To IVECO Control display panel (rear axle brake wear w/lamp)	6667

Air cleaner restriction switch

SIMPLIFIED DIAGNOSIS

Disconnect connector A from component under examination.
Set multimeter to OHM.
Disconnect connector A from component under examination.
Set multimeter to OHM.
Check for 0 Ω by setting one multimeter prod to terminal 2 of connector A and the otherone to terminal 2 of combined module connector C (page IV.3).
Check for 0 Ω by setting one multimeter prod to terminal 1 of connector A and the otherone to earth.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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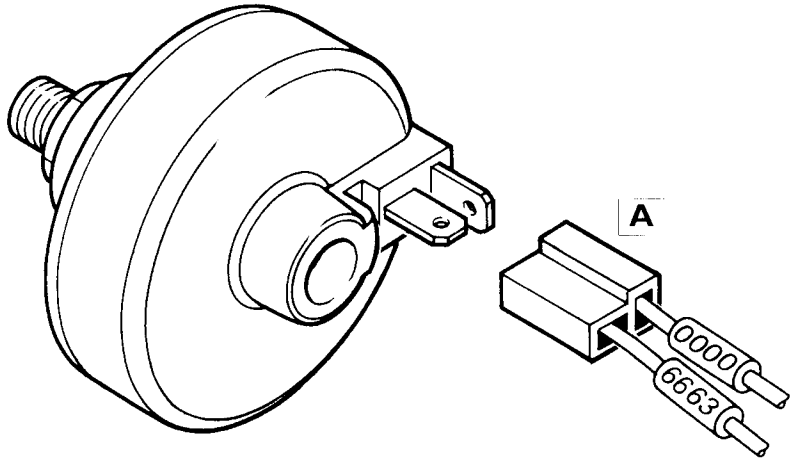
42351



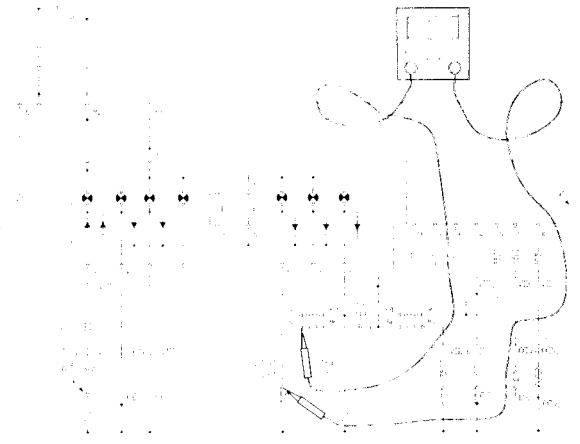
LAYOUT WITH CONNECTIONS

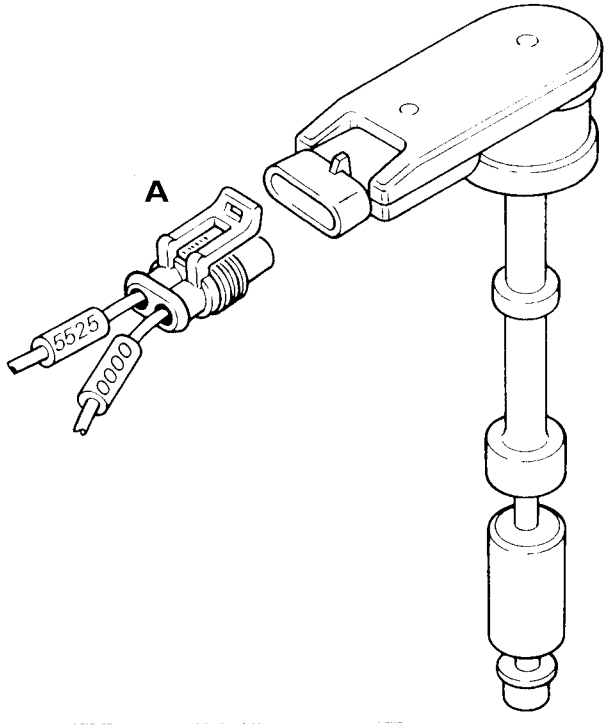
Connector		Function	Cable colour
A	1	Earth	0000
	2	To air cleaner restriction w/lamp	6663

Power steering fluid level indicator control device

SIMPLIFIED DIAGNOSIS

Disconnect connector "A" from component under examination.
Set multimeter to OHM.
Check for 0 Ω by setting one multimeter prod to terminal 2 of connector A and the other one to terminal 85 of power steering fluid level indicator relay.
Check for 0 Ω by setting one multimeter prod to terminal 1 of connector A and the other one to earth.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.





44037

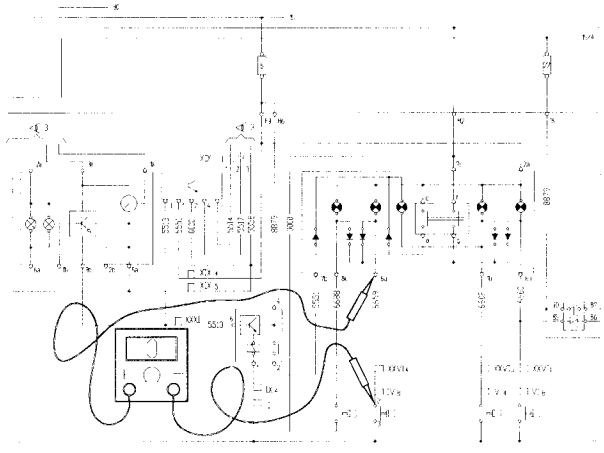
LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	Earth	0000
	2	To power steering fluid level indicator relay	5525

Front differential lock warning lamp switch

SIMPLIFIED DIAGNOSIS

Disconnect connector [A] from component under examination.
Set multimeter to OHM.
Check for 0 Ω by setting one multimeter prod to terminal 1 of connector [A] and the otherone to terminal 6 of combined module connector A (page IV.3).
Check for 0 Ω by setting one multimeter prod to terminal 2 of connector [A] and the otherone to earth.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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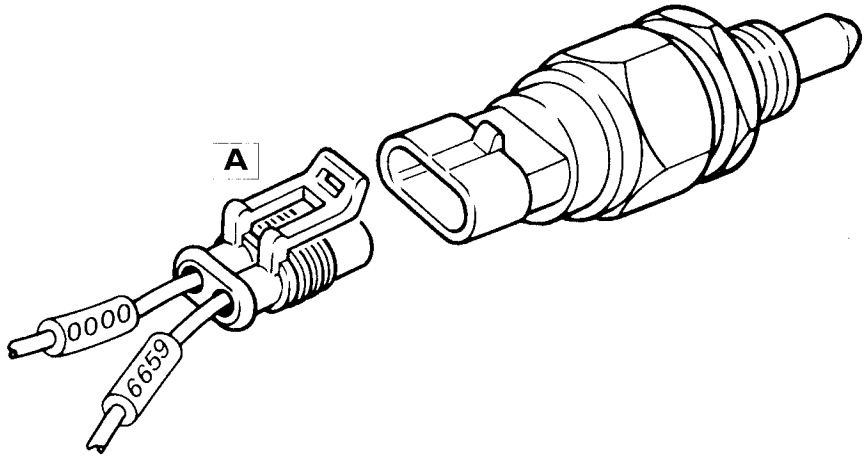
53504



51R

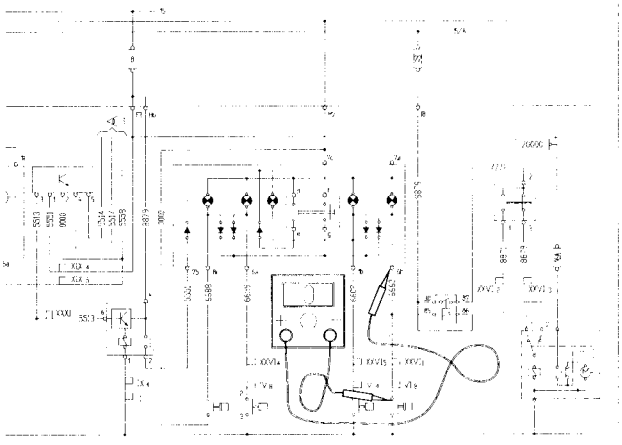
LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
[A]	1	To front differential lock w/lamp	6659
	2	Earth	0000

Rear differential lock warning lamp switch

SIMPLIFIED DIAGNOSIS

Disconnect connector A from component under examination.
Set multimeter to OHM.
Check for 0 Ω by setting one multimeter prod to terminal 1 of connector A and the otherone to terminal 6 of combined module connector A (page IV.3).
Check for 0 Ω by setting one multimeter prod to terminal 2 of connector A and the otherone to earth.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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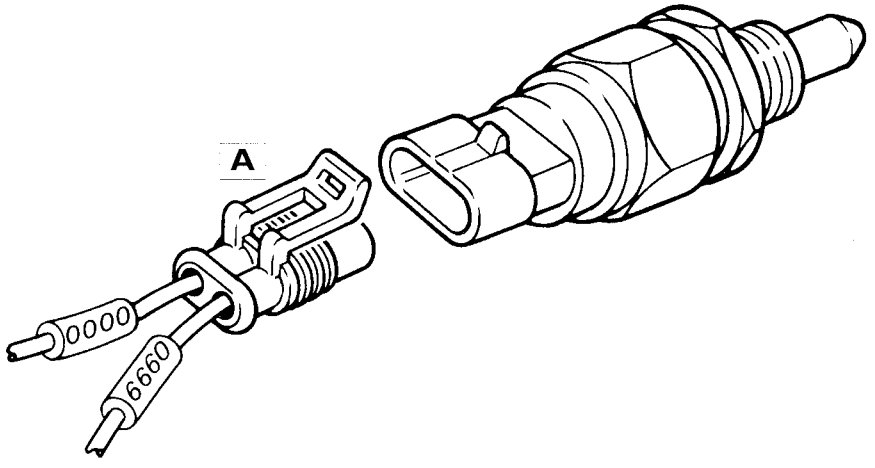


5182

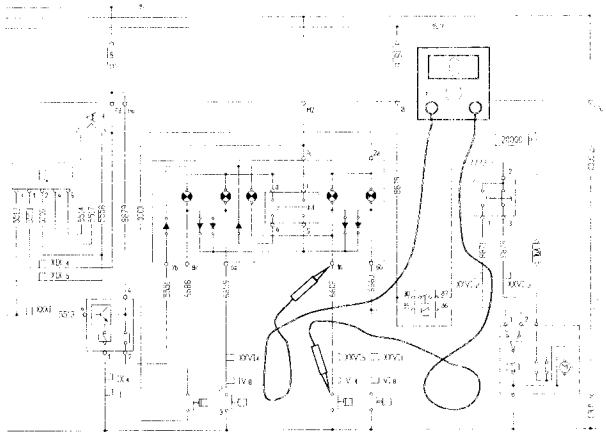
LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	To rear differential lock w/lamp switch	6660
	2	Earth	0000

All–wheel drive warning lamp switch

SIMPLIFIED DIAGNOSIS

Disconnect connector [A] from component under examination.
Set multimeter to OHM.
Check for 0 Ω by setting one multimeter prod to terminal 2 of connector [A] and the otherone to terminal 1 of combined module connector B (page IV.3).
Check for 0 Ω by setting one multimeter prod to terminal 1 of connector [A] and the otherone to earth.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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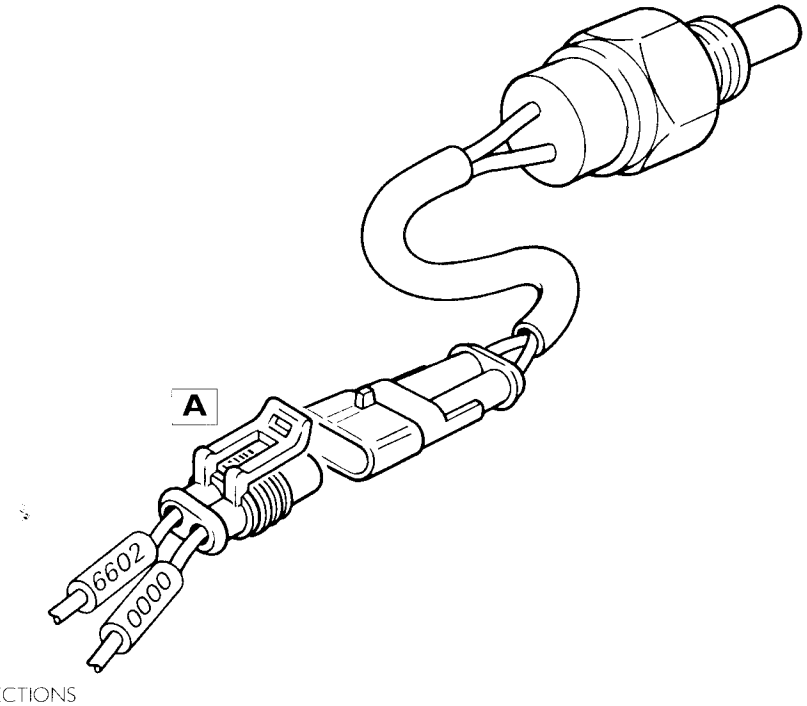


5183

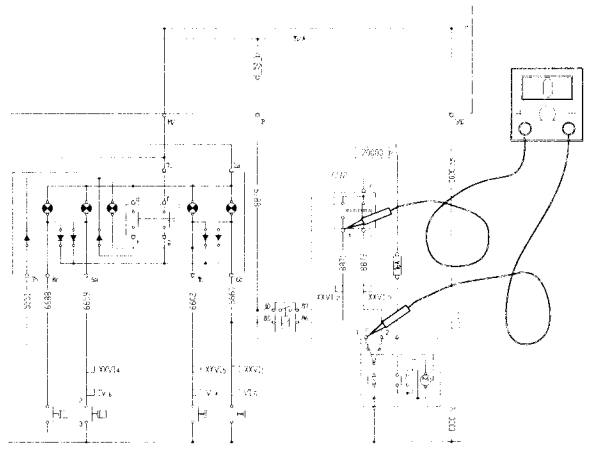
LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
[A]	1	Earth	0000
	2	To all–wheel drive warning lamp	6602

Front differential lock control switch

SIMPLIFIED DIAGNOSIS

Disconnect connector A from component under examination.
Set multimeter to OHM.
Check for 0 Ω by setting one multimeter prod to terminal 1 of connector A and the otherone to terminal 1 of front differential lock device connector (page IV.29).
Check for 0 Ω by setting one multimeter prod to terminal 3 of connector A and otherone to terminal 2 of front differential lock connector.
Check for 0 Ω by setting one multimeter prod to terminal 2 of connector and the otherone to terminal 87 of front differential lock interlock relay.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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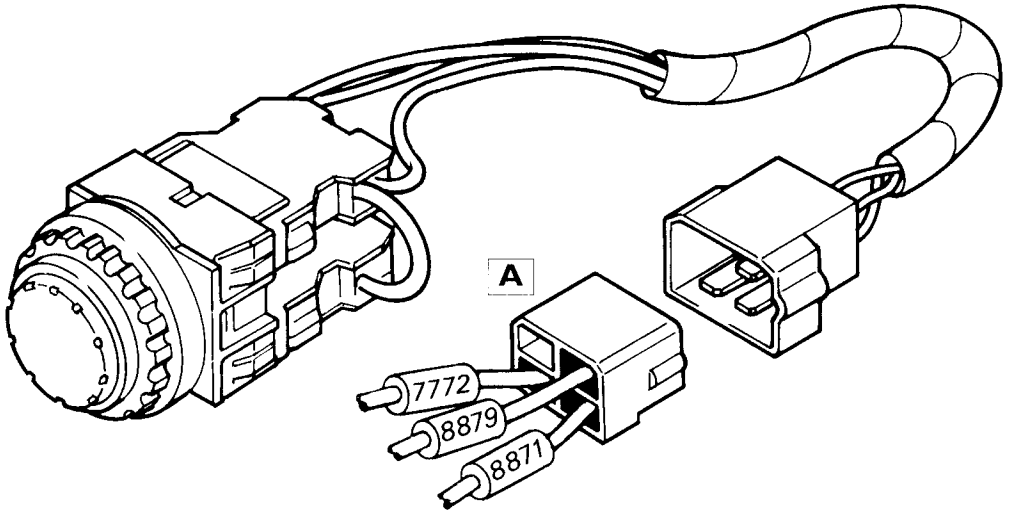


4658

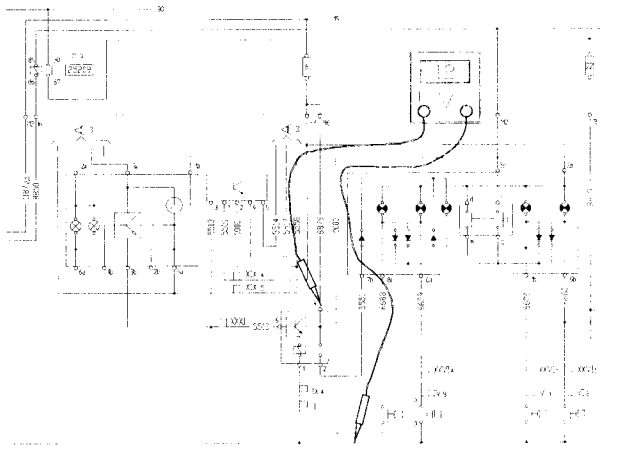
LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	To rear differential lock device	8871
	2	Supply (+15/A) with front differential lock interlock relay	7772
	3	To front differential lock device	8879

Speed switch for max speed with all–wheel drive on

SIMPLIFIED DIAGNOSIS

Disconnect connector block [A] from component under examination.
Set multimeter to VOLT:
Move ignition switch key to position 15. Ensure 12 Volts are available by setting one multimeter prod to terminal 4 of connector block [A], and the otherone to earth.
Set multimeter to OHM.
Turn the key to rest position and ensure the presence of 0 Ω by setting one multimeter prod to terminal 1 of connector a and the otherone to earth.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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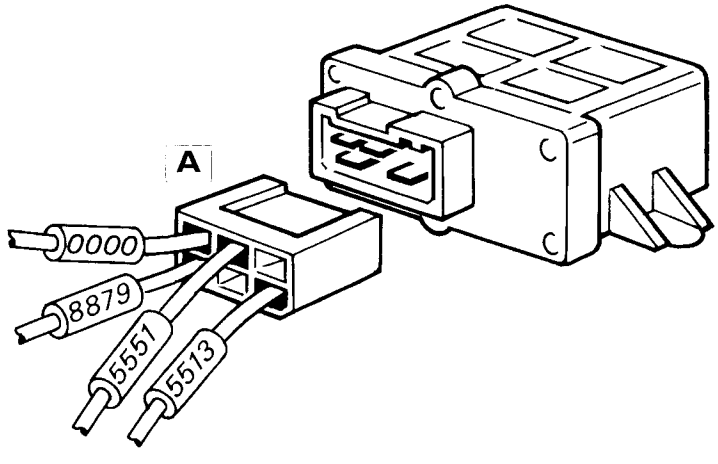
55002



153

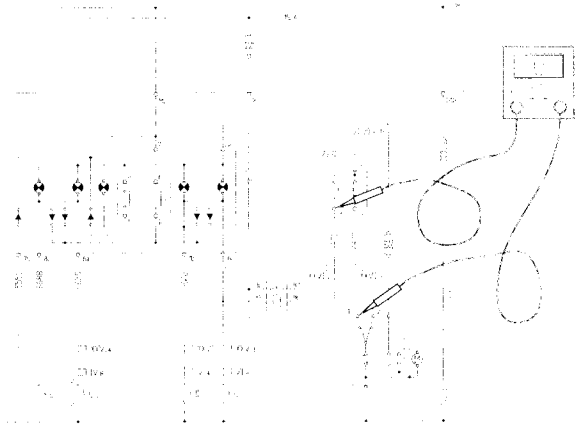
LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
	1	Earth	0000
	2	To max speed warning lamp with all–wheel drive on	5551
A	3	Not used	–
	4	Supply (+15)	8879
	5	Not used	–
	6	Vehicle speed signal	5513

Front differential lock device

SIMPLIFIED DIAGNOSIS

Disconnect connector **C** from component under examination.
Set multimeter to OHM.
Check for 0 Ω by setting one multimeter prod to terminal 1 of connector **C** and the otherone to terminal 1 of front differential lock control switch.
Check for 0 Ω by setting one multimeter prod to terminal 2 of connector **C** and the otherone to terminal 3 of front differential lock switch connector.
Ensure efficiency of 16A fuse.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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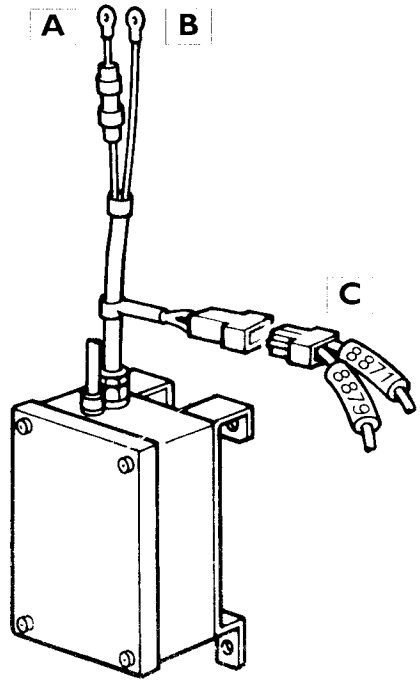


85025

ABOUT WIRE CONNECTIONS

Connector		Function	Cable colour
A		Supply (battery +)	7777
B		Earth	0000
C	1	Front differential lock operation	8871
	2	Front differential lock cutoff	8879

EXTERIOR LIGHTING

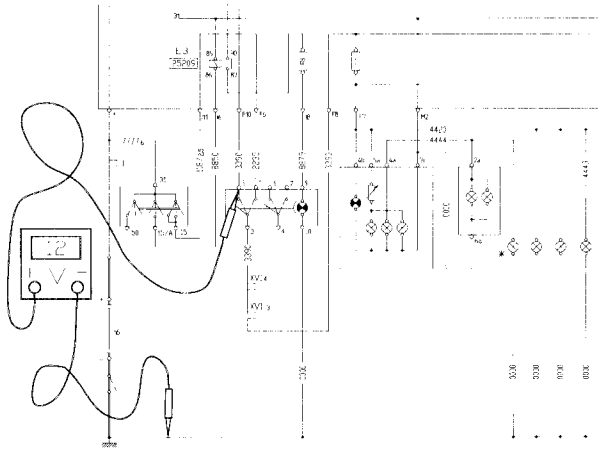
EXTERIOR LIGHTING
Exterior lighting switch

SIMPLIFIED DIAGNOSIS

Disconnect connector [A] from component under examination:
Set multimeter to VOLT:
- Ensure 12 Volts are available by setting one multimeter prod to terminal 5 of connector [A] and the otherone to earth.
- Put ignition switch key in position 15. Check for 12 V by setting one multimeter prod to terminal 1 of connector [A] and the otherone to earth.

Set multimeter to OHM.
- Set the key to rest position.
- Press switch to 1st release and check for 0 Ω by setting multimeter prods to terminals 3 and 5 of switch connector block.
- Repeat the same test with terminals 3–1 and 2–4 but pressing the switch to the 2nd release.

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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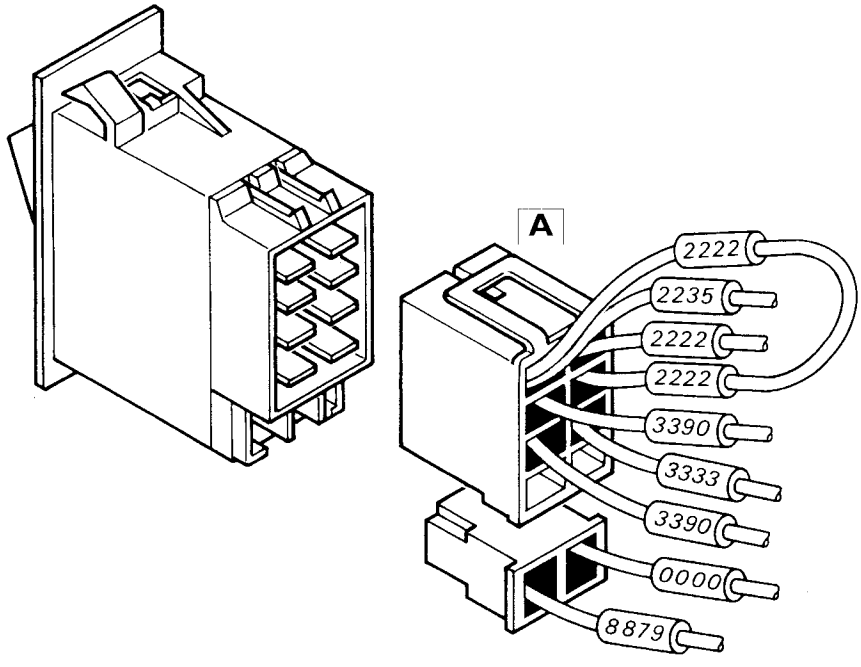
52307



5185

LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
	1	Supply (+15)	2235
		Jumper to cell no. 4 of high/low beam lights operation switch	2222
	2	High/low beam lights	2222
	3	Parking lights, instrument lighting	3390
	4	Positive for high/low beam lights	2222
A	5	Supply (+30)	3390
	6	To day lights variant prearrangement	3333
	7	Not used	–
	8	Not used	–
	9	Supply (+15/A) for switch lighting	8879
	10	Earth	0000

Steering column switch (high/low beam lights/flasher light)

SIMPLIFIED DIAGNOSIS

Disconnect connector [B] from the C.I.U.

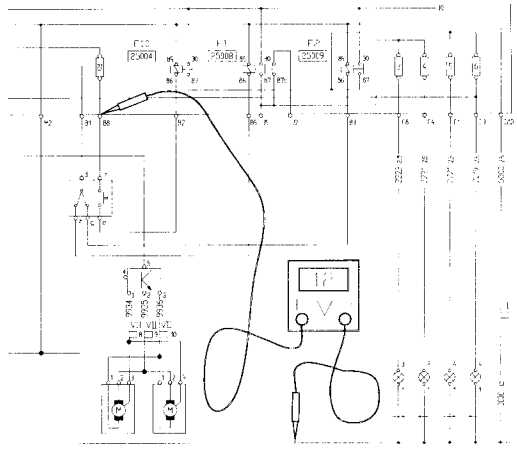
Set multimeter to VOLT:

- Put ignition switch key in position 15.
  Ensure 12 Volts are available by setting one multimeter prod to terminal 8 of C.I.U. connector [B] and the otherone to earth.
  Check for 12 V by setting one multimeter prod to terminal 1 of C.I.U. connector [B] (having pressed the exterior lighting switch twice) and the otherone to earth.

Set multimeter to OHM.

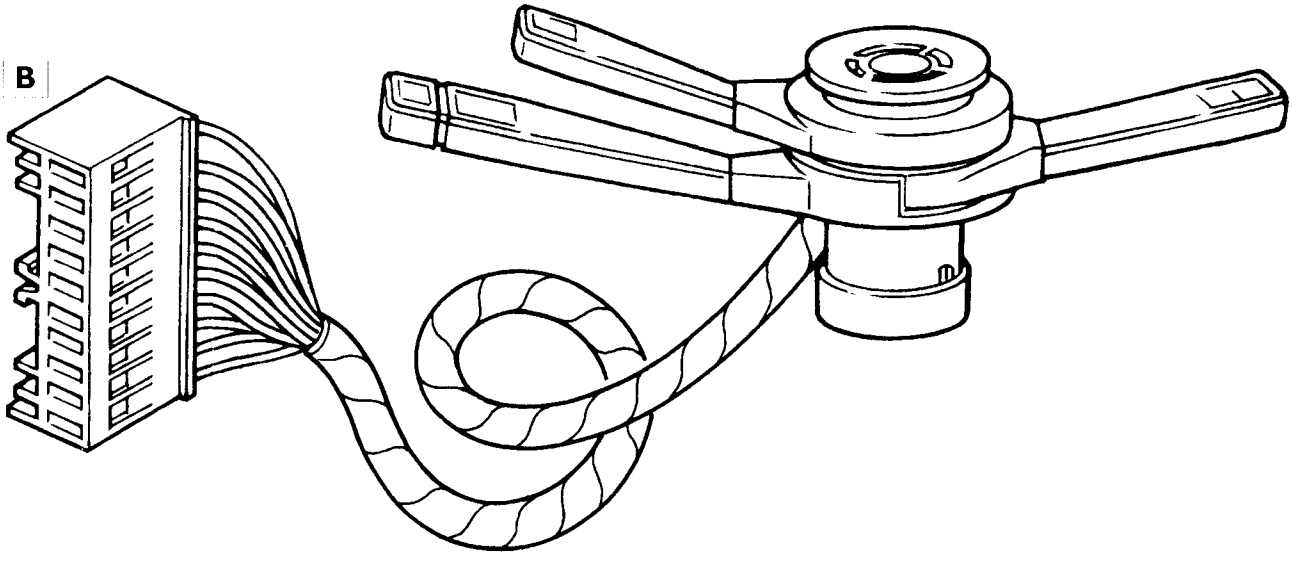
- Set the key in rest position. Set the steering colun switch in low beam lights position. Check for 0 Ω by setting multimeter prods to terminals 1 and 5 of steering column switch connector [B].
  Now set the switch in high beam lights position. Repeat the same test by setting multimeter prods to terminals 1 and 3 of steering column switch connector [B].
  Position the switch in the flasher light position. Repeat the same test by setting multimeter prods on terminals 2 and 8.

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



Print no. 603.42.961 Diagram no. 6

NOTE. Refer to page 1.64 for a complete view of steering column switch and relevant wiring. **54033 A–C**



5186

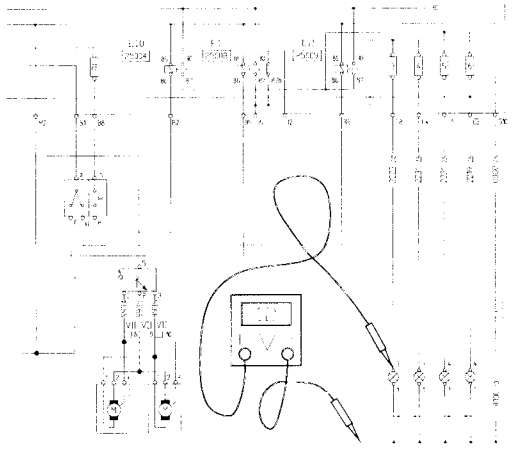
LAYOUT WITH CONNECTIONS

Connector	Function	Cable colour
1 (d)	Supply of high/low beam lights	green
2 (e)	Flasher light	brown
3 (g)	High beam lights	blue
4 (s)	Not used	–
B 5 (f)	Low beam lights	grey/black
6 (b)	Not used	–
7 (c)	Not used	–
8 (n)	Flasher light supply	brown
9 (a)	Not used	–
10 (t)	Not used	–

High/low beam headlight with parking light

SIMPLIFIED DIAGNOSIS

Disconnect connector [A] from component under examination.
Set multimeter to VOLT.
Press the exterior lighting switch (page V.3) to 1st release. Check for 12 V by setting one multimeter prod to terminal 2 of connector [A] and the otherone to earth (parking lights).
Put the ignition switch key in position 15 and press the exterior lighting switchto 2nd release. Check for 12 V by setting one multimeter prod to terminal 3 of connector [A] and the otherone to earth (low beam lights).
Set the steering column switch in high beam light position. Check for 12 V by setting one multimeter prod to terminal 4 of connector [A] and the otherone to earth.
Set multimeter to OHM.
Put the ignition switch key in rest position.
Check for 0 Ω by setting one multimeter prod to terminal 1 of connector [A] and the otherone to earth.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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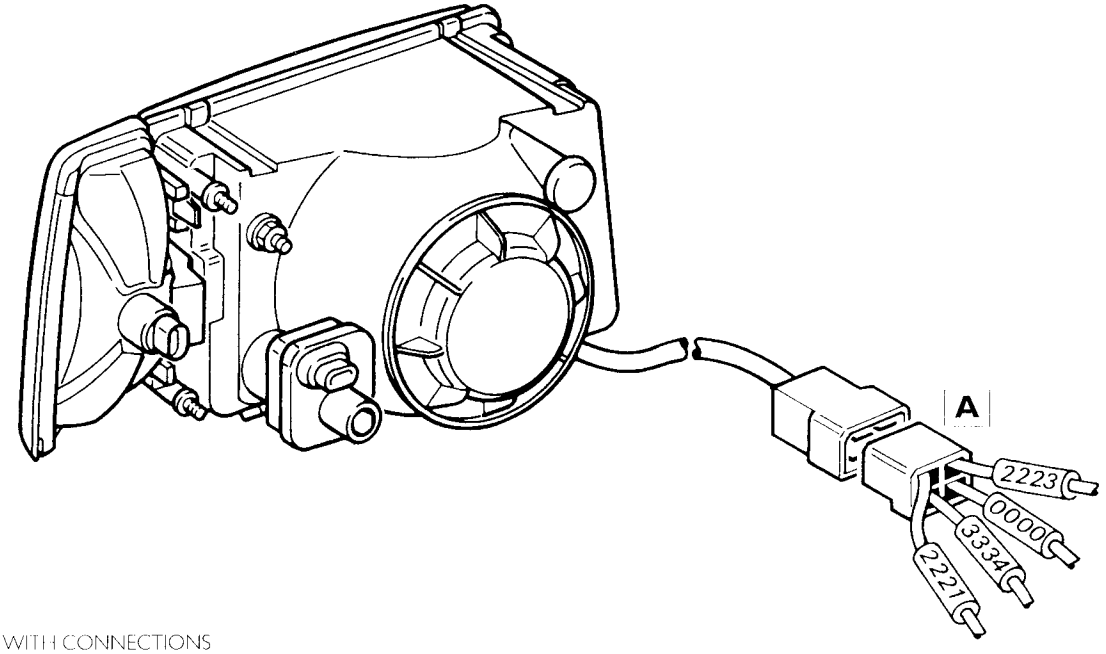
30001



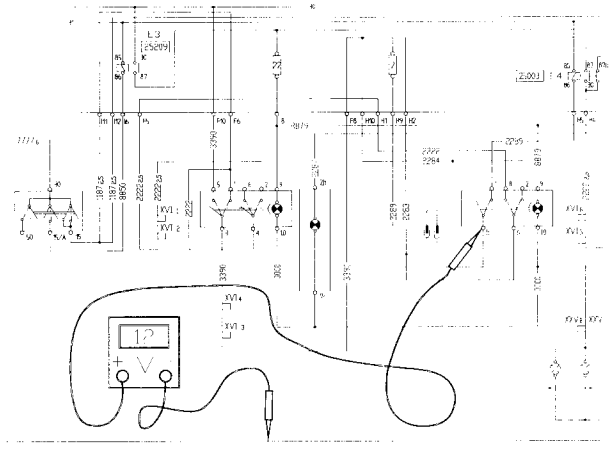
LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	Earth	0000
	2	Supply of parking light lamp	3334
	3	Supply of low beam light lamp	2223
	4	Supply of high beam light lamp	2221

Fog light switch with rear fog light interlock device

SIMPLIFIED DIAGNOSIS

Disconnect connector [A] from component under examination.
Set multimeter to VOLT.
Put the ignition switch key in position 15.
Press the exterior lighting switch (page V.3) once.
Check for 12 V by setting one multimeter prod first to terminal 2 and then to terminal 5 of connector [A] and the otherone to earth.
Press the exterior lighting switch twice.
Check for 12 V by setting one multimeter prod to terminal 8 of connector [A] and the otherone to earth.
Set multimeter to OHM.
Put the ignition switch key in rest position. Check for 0 Ω by setting multimeter prods to terminals 6 and 8 fog lights switch.
Press the fog lights switch. Check for 0 Ω by setting multimeter prods to terminals 1 5 and 2 6 of same switch.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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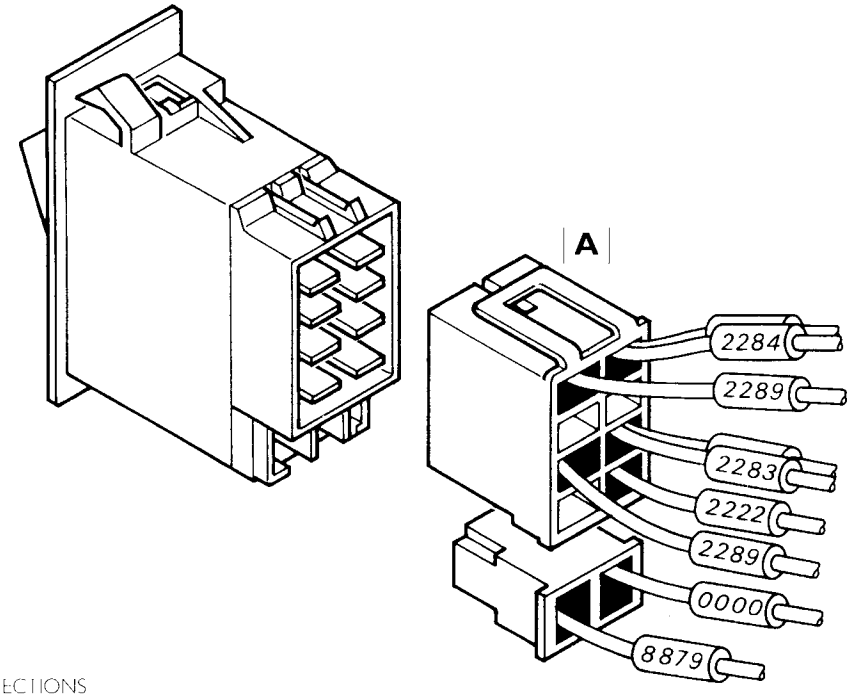


5188

LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	Fog light relay control device	2289
	2	Supply from exterior lighting switch	2284
	3	Not used	–
	4	Not used	–
	5	Supply from exterior lighting switch	2289
	6	Rear fog light interlock switch	2283
	7	Not used	–
	8	Supply from exterior lighting switch	2222
	9	Supply (15/A) for switch lighting	8879
	10	Earth	0000

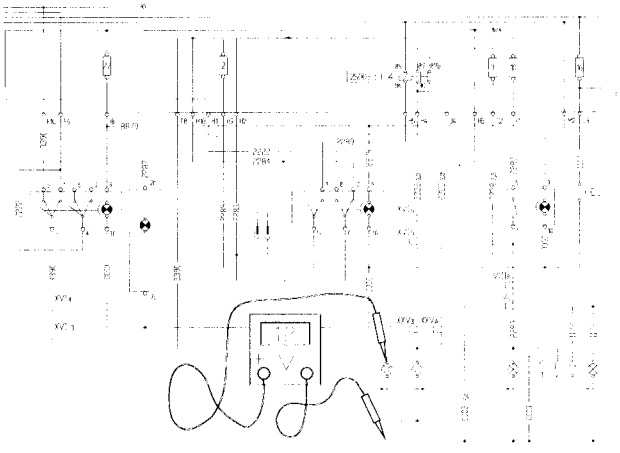
Fog headlight

SIMPLIFIED DIAGNOSIS

Disconnect connector [A] from component under examination.
Set multimeter to VOLT.
- Put the ignition switch key in position 15.
- Press the exterior lighting switch (page V.3) (either 1st or 2nd release).
- Press the fog light switch (page V.6).
- Check for 12 V by setting one multimeter prod to terminal [B] of connector [A] and the otherone to earth.

Set multimeter to OHM.
- Put the ignition switch key in rest position.
- Check for 0 Ω by setting one multimeter prod to terminal A of connector [A] and the otherone to earth.

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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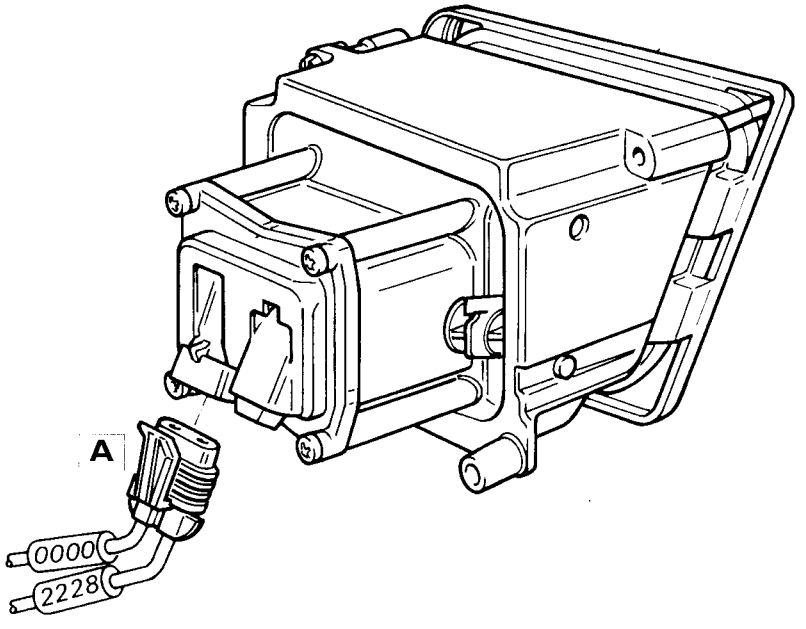
30011



5189

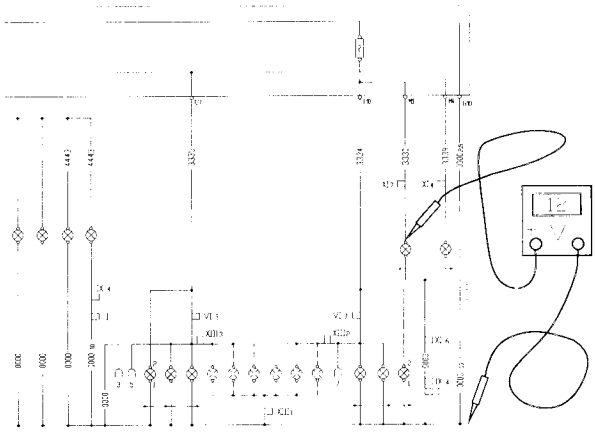
LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	A	Earth	0000
	B	Supply of fog headlight lamp	2228

Front marker light

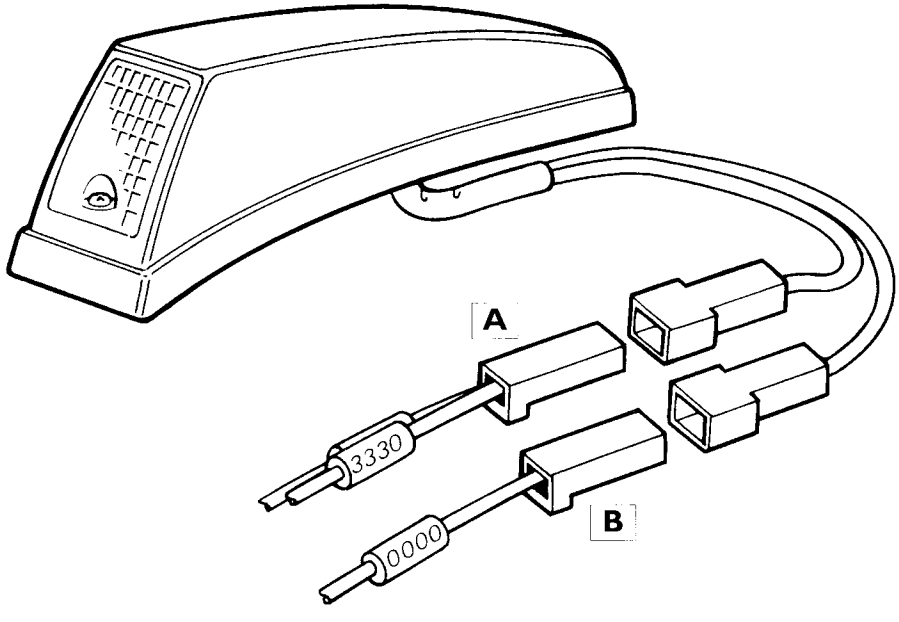
SIMPLIFIED DIAGNOSIS

Disconnect connectors A and B from component under examination.
Set multimeter to VOLT.
Press exterior lighting switch (page V.3) to 1st release.
Check for 12 V by setting one multimeter prod to terminal of connector A and the otherone to earth.
Set multimeter to OHM.
Return exterior lighting switch in rest position.
Check for 0 Ω by setting one multimeter prod to terminal of connector B and the otherone to earth.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



Print no. 603.42.961 Diagram no. 5

37001



5190

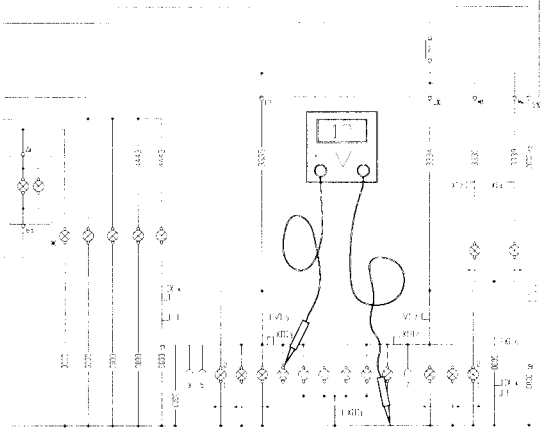
LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	Supply of marker light bulb	3330
B	2	Earth	0000

Side marker light

SIMPLIFIED DIAGNOSIS

Disconnect connector [A] from component under examination.
Set multimeter to VOLT.
Press exterior lighting switch (page V.3) to 1st release.
Check for 12 V by setting one multimeter prod to terminal 2 of connector [A] and the otherone to earth.
Set multimeter to OHM.
Return exterior lighting switch in rest position.
Check for 0 Ω by setting one multimeter prod to terminal 1 ofconnector [A] and the otherone to earth.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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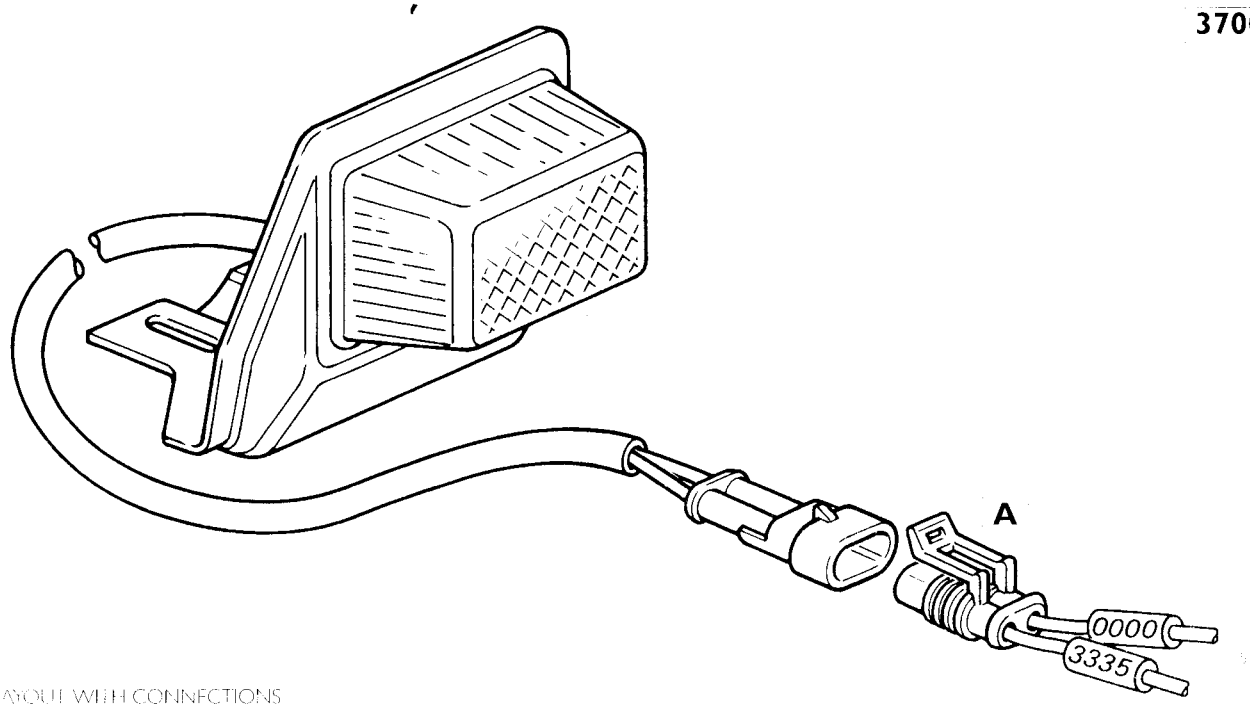
37005



LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	Earth	0000
	2	Supply of marker light bulb	3335

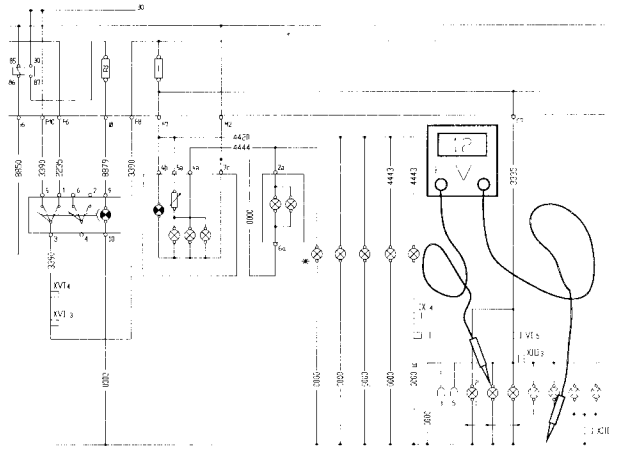
Number plate headlight

SIMPLIFIED DIAGNOSIS

Disconnect connector [A] from component under examination.
Set multimeter to VOLT.
- Press exterior lighting switch (page V.3) to 1st release.
- Check for 12 V by setting one multimeter prod to terminal 1 of connector [A] and the otherone to earth.

Set multimeter to OHM.
- Return exterior lighting switch in rest position.
- Check for 0 Ω by setting one multimeter prod to terminal 2 ofconnector [A] and the otherone to earth.

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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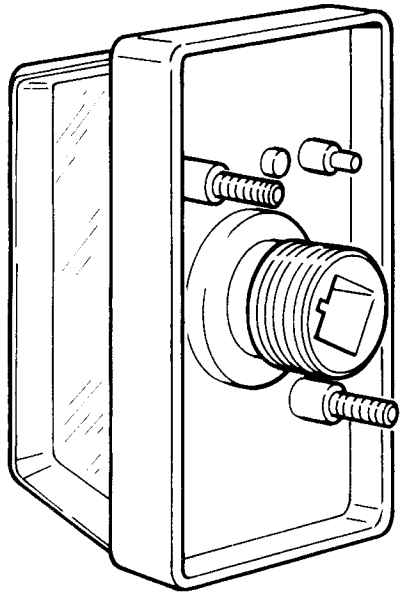
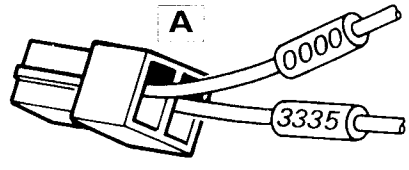




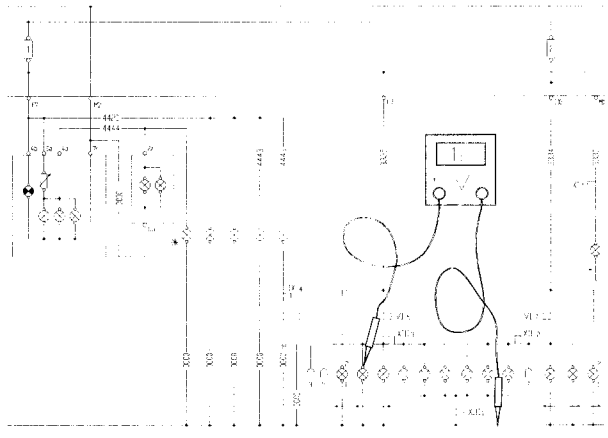
LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	Supply of number plate headlight bulb	3335
	2	Earth	0000

Number plate headlight (vans and buses)

SIMPLIFIED DIAGNOSIS

Disconnect connector A and B from component under examination.
Set multimeter to VOLT.
Press exterior lighting switch (page V.3) to 1st release.
Check for 12 V by setting one multimeter prod to terminal of connector B and the otherone to earth.
Set multimeter to OHM.
Return exterior lighting switch in rest position.
Check for 0 Ω by setting one multimeter prod to terminal ofconnector B and the otherone to earth.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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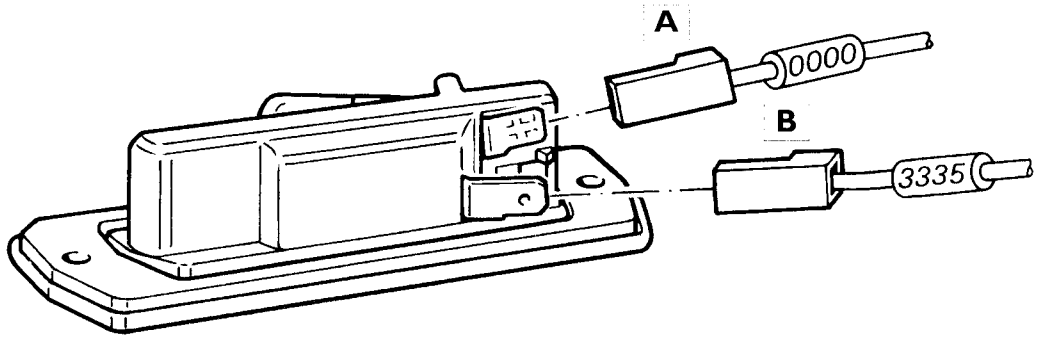


LAYOUT WITH CONNECTIONS

Connector	Function	Cable colour
A	Earth	0000
B	Supply of number plate headlight bulb	3335

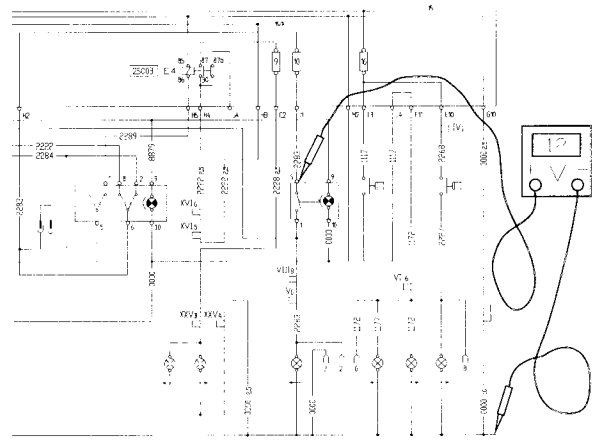
Rear fog light switch

SIMPLIFIED DIAGNOSIS

Disconnect connector [A] from component under examination.
Set multimeter to VOLT.
- Put the ignition switch key in position 15.
- Press exterior lighting switch (page V.3) to 1st release and check for 12 V by setting one multimeter prod to terminal 5 of connector [A] and the otherone to earth.
- Press exterior lighting switch to 2nd release and repeat the test.

Set multimeter to OHM.
- Return exterior lighting switch in rest position.
- Press the rear fog lamp key switch.
- Checkfor 0 Ω by setting multimeter prods to terminals 1 and 5 of rear fog lamp switch.

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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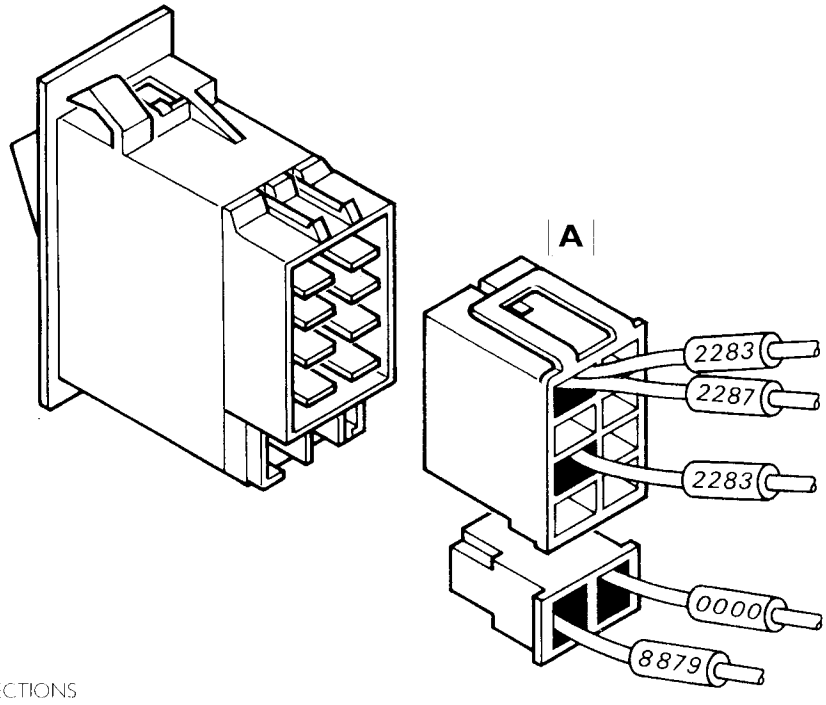
52006



LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
	1	Supply of rear fog lamp bulb	2283
		Supply of rear fog lamp w/lamp	2287
	2	Not used	–
	3	Not used	–
	4	Not used	–
A	5	Supply of rear fog lamp switch	2283
	6	Not used	–
	7	Not used	–
	8	Not used	–
	9	Supply (15/A) of switch lighting	8879
	10	Earth	0000

Tail headlight cluster

SIMPLIFIED DIAGNOSIS

Disconnect connectors A and B and C from component under examination.

Set multimeter to VOLT.

Put the ignition switch key in position 15 and press the exterior lighting switch (page V.3) to 1st release.

Check for 12 v by setting one multimeter prod to terminal 1 of connector A and the otherone to earth.

While keeping exterior lighting switch pressed (to 1st release and then to 2nd release) press the rear fog lamp key switch. Check for 12 V by setting one multimeter prod to terminal of connector B and the otherone to earth.

Set transmission in reverse gear. Check for 12 V by setting one multimeter prod to connector C and the otherone to earth.

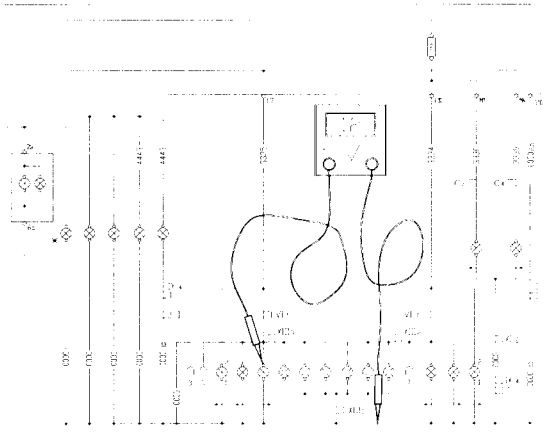
Set the steering column switch lever in turn signal light position. Check for 12 V by setting one multimeter prod to terminal 2 of connector A and otherone to earth.

Depress the brake pedal. Check for 12 V by setting one multimeter prod to terminal 3 of connector A and the otherone to earth.

Set multimeter to OHM.

Put the ignition switch key in rest position. Check for 0 Ω by setting one multimeter prod to terminal 4 of connector A and the otherone to earth.

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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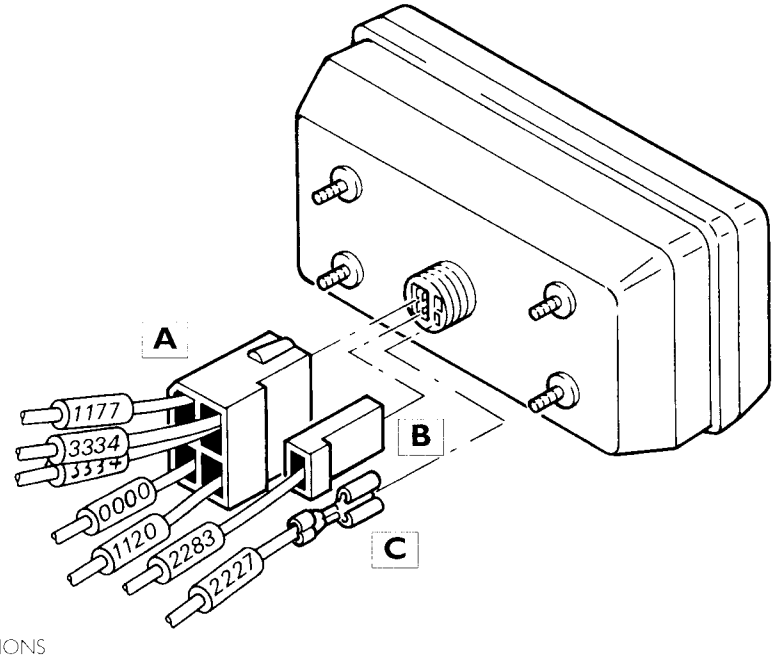


5195

LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	Supply of parking light bulb	3334
	2	Supply of hazard/turn signal light bulb	1120
	3	Supply of stop light bulb	1177
	4	Earth	0000
B	–	Supply of rear fog light bulb	2283
C	–	Supply of reversing light bulb	2227

Tail headlight cluster (vans and buses)

SIMPLIFIED DIAGNOSIS

Disconnect connector [A] from component under examination.

Set multimeter to VOLT.

Put the ignition switch key in position 15 and press the exterior lighting switch (page V.3) to 1st release.

Check for 12 v by setting one multimeter prod to terminal 10 of connector [A] and the otherone to earth.

While keeping exterior lighting switch pressed (1st release and then 2nd release) press the rear fog lamp key switch. Check for 12 V by setting one multimeter prod to terminal 9of connector [A] and the otherone to earth.

Set transmission in reverse gear. Check for 12 V by setting one multimeter prod to terminal 4 of connector [A] and the otherone to earth.

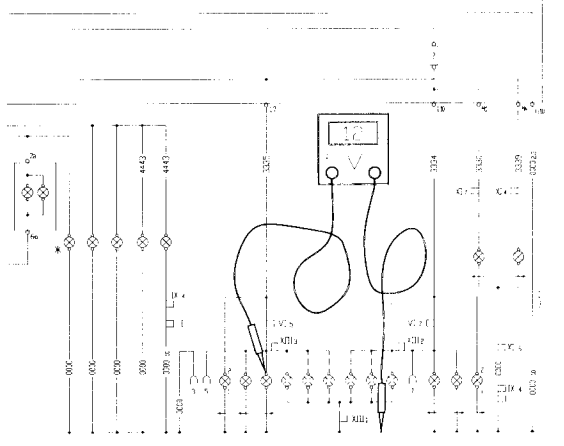
Set the steering column switch lever in turn signal light position. Check for 12 V by setting one multimeter prod to terminal 2 of connector [A] and otherone to earth.

Depress the brake pedal. Check for 12 V by setting one multimeter prod to terminal 3 of connector [A] and the otherone to earth.

Set multimeter to OHM.

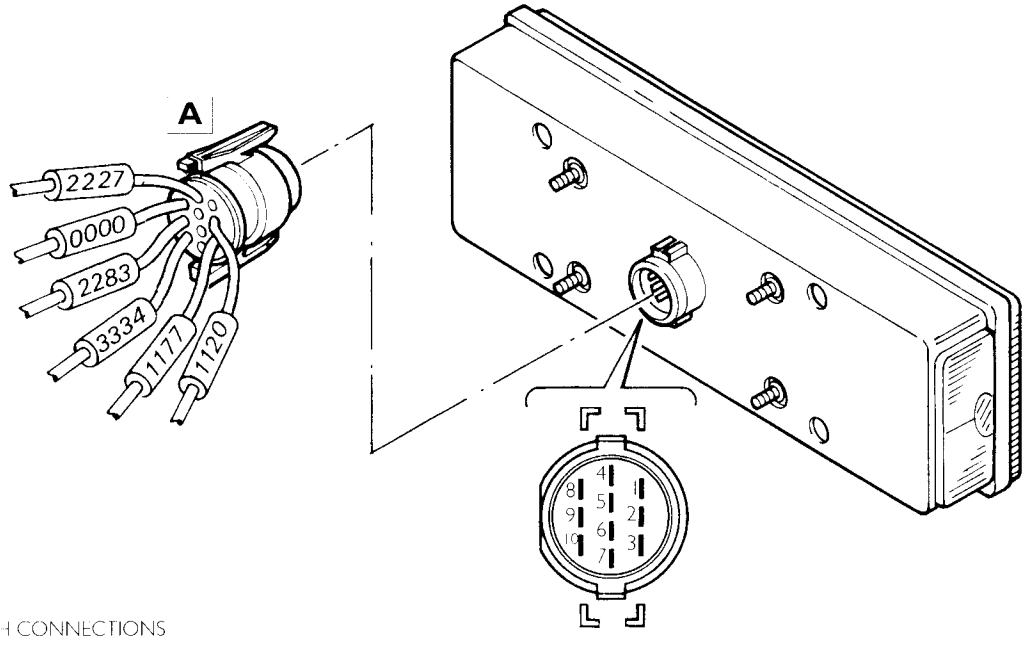
Put the ignition switch key in rest position. Check for 0 Ω by setting one multimeter prod to terminal 8 of connector [A] and the otherone to earth.

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



Print no. 603.42.961. School bus Basic Wiring Diagram

34000



5196

LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	Not used	–
	2	Supply of hazard/turn signal light bulb	1120
	3	Supply of stop light bulb	1177
	4	Supply of reversing light bulb	2227
	5	Not used	–
	6	Not used	–
	7	Not used	–
	8	Earth	0000
	9	Supply of rear fog light bulb	2283
	10	Supply of parking light bulb	3334

LAMPS

General

The lamps, whether of the incandescent or the halogen type, are directly connected to the vehicle's active (exterior lighting) or passive (interior lighting and optical indicators) safety devices.

The efficiency of the exterior signalling system is of basic importance and in particular the correct functioning and alignment of dipped and driving headlights.

External and internal lighting is regulated by precise rules both in terms of lighting efficiency, voltage and power, and its layout on the vehicle.

Incandescent lamps

Replacement of headlight bulbs, of external optical units and dashboard lamps is not difficult.

However adhesion to procedures supplied by the manufacturer is extremely important.

When assembling a new bulb pay attention to the positioning marks on the metal base of the high/low beam lamps to obtain perfect headlight aiming (fig. V.1).

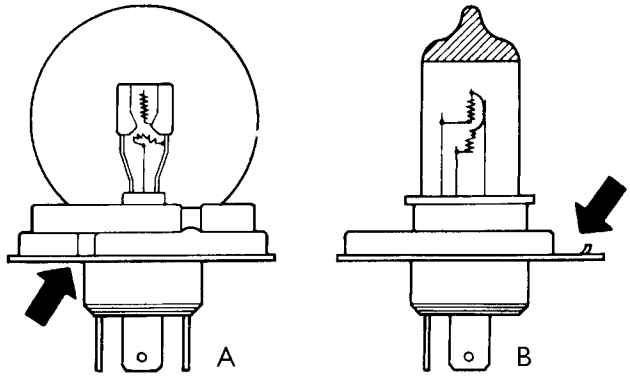
Replacement of bulbs of side and tail optical units is quite simple. However, make sure that lamp housings and connectors leading to system cables are free from oxidation and dust.

Blackened bulbs should be renewed as vibrations can affect their operation.

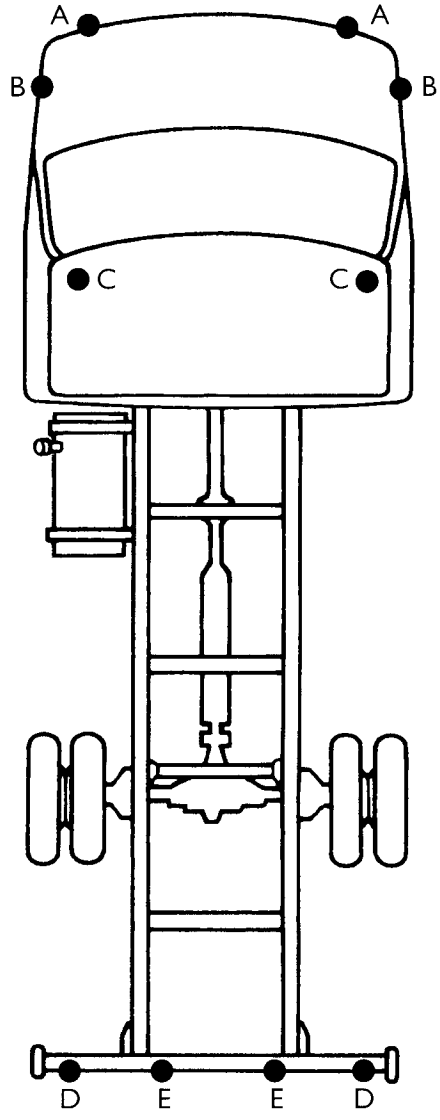
When bulbs have a silver colouring either the charging system is faulty or one of the connections is loose (overvoltage).

Also check lenses for signs of cracks and efficiency of silentblocks in rear optical units.

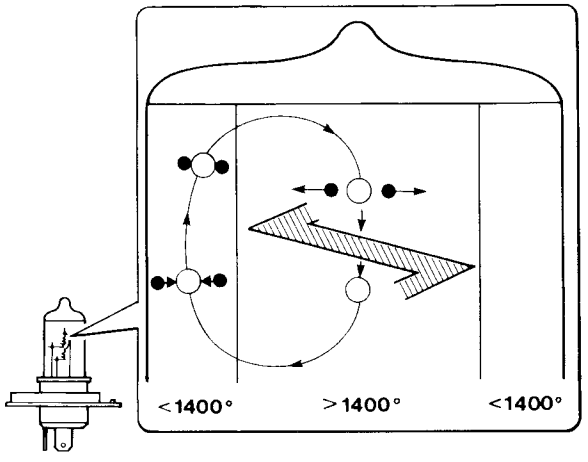
Tighten lens fixing screws to a moderate torque.



V.1 DOUBLE-FILAMENT LAMPS
A. INCANDESCENT BULB
B. HALOGEN BULB
ARROWS INDICATE POSITIONING MARKS

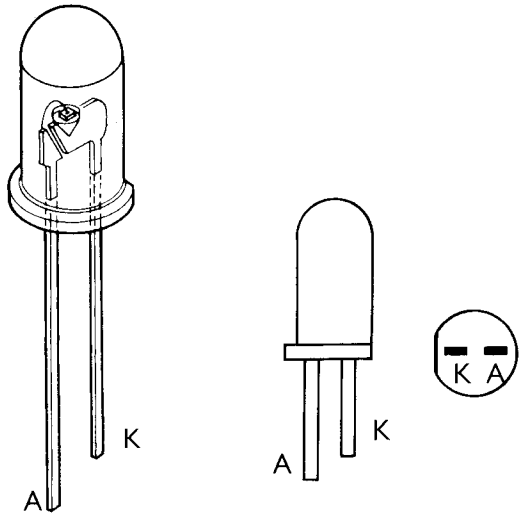


V.2 A. TURN SIGNAL, HIGH/LOW BEAM LIGHTS WITH PARKING LIGHTS – B. SIDE MARKER LIGHTS – C. FRONT MARKER LIGHTS – D. TAIL HEADLIGHT CLUSTER (TURN SIGNAL, PARKING, STOP, REAR FOG, REVERSING LIGHTS) – E. NUMBER PLATE LIGHTS



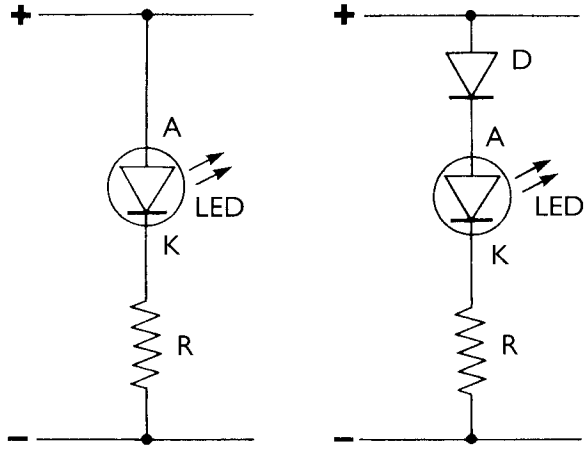
3019

V.3 HALOGEN LAMP (REGENERATION PRINCIPLE)



3020

V.4 PERSPECTIVE AND SCHEMATIC VIEWS OF A LED
A. ANODE – K. CATHODE



3021

V.5 CIRCUITS WITH LED DIODES – **A.** ANODE – **K.** CATHODE – **R.** CURRENT LIMITING PROTECTION RESISTANCE – **D.** DIODE FOR PROTECTION AGAINST INVERSE CURRENTS

Halogen lamps

Though incandescent, lamps of the H1, H2, H3 and H4 type are based on the regeneration of tungsten particles emitted from the bulb filament via an halogen element (fig. V.3).

Under the effect of temperature, the halide particles (composed of halogen and tungsten) circulate inside the bulb.

When close to the filament, where the temperature rises to over 1400°C, tungsten separates from halogen and once more combines itself with the original material.

The high operating temperature and the use of quartz as an external wrapper of this type of lamps means that their replacement calls for absolute care in handling them (they should only be held by their metal base).

The presence of grease marks on the bulb (left by fingers) at high temperatures can in fact develp a "devetrification" process which impairs the operation of the lamp and reduces its illumination power.

NOTE. In order to protect the steering wheel switch assembly and the key switches from the considerablle absorption of initial current, on their switching on halogen lamps are generally operated by relays of suitable power.

LEDs (Light Emitting Diodes)

LEDs are used as optical indicators as they illuminate by supplying a suitable polarisation current (fig. V.4).

They function as a connection diode and should therefore be inserted in circuits observing correct polarity (anode connected to circuit positive, cathode connected to circuit negative).

LEDs operate with an intensity of direct current within the range of 20 and 50 mA, which means that they are protected by an adequate limiting resistance (fig. V.5).

NOTE. In practical applications, the limiting resistance can be inserted either before or after the LED (obviously in both cases the value of the current flowing through the LED is the same).

Fluorescent lamps

Fluorescent lamps are generally of a tubular shape and contain low pressure gas with a small quantity of mercury (fig. V.6).

The electrodes ensuring electrical contact are connected at both ends. The inner surface is lined with a layer of fluorescent substances.

When the current flows, the mercury vapour develops ultra violet radiations which energise the fluorescent material electrons in turn producing photons (luminous emission).

As the emitted light is not as harsh as the light emitted by incandescent lamps, it does not cause glare and eye problems.

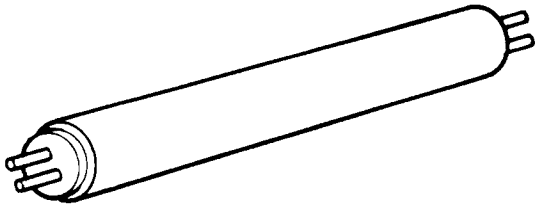
Owing to such advantages, the use of fluorescent lamps is suggested for the internal lighting of buses where driver and passengers need an ideal level of comfort without endangering the passive safety of the vehicle.

Figures V.7 and V.8 show the operating diagram of a fluorescent lamp consisting of:

- starter, which generates the pulse necessary to start the spark;
- reactor, which is connected in series and limits the current flowing to the lamp when spark starting has occurred;
- capacitor, which is connected in parallel and suppresses radio noises.

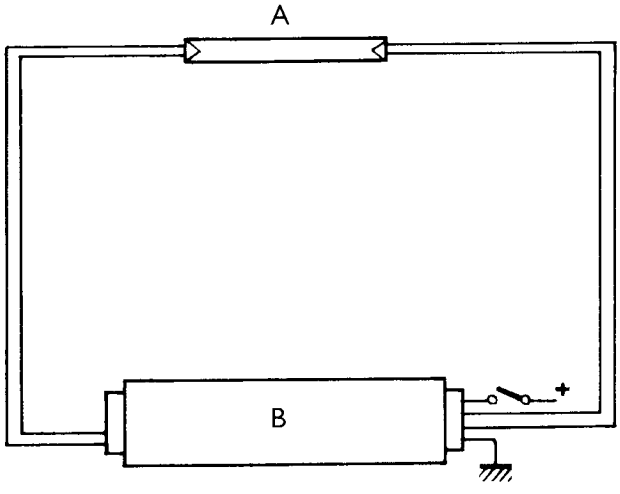
NOTE. The voltage necessary to switch on a fluorescent lamp is higher than the voltage normally operating in an electrical system served by a battery.

It is therefore necessary to insert an inverter - to be used as output voltage and as required power - in the lamp supply circuit.



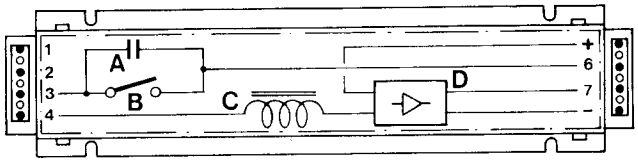
4695

V.6 FLUORESCENT LAMP



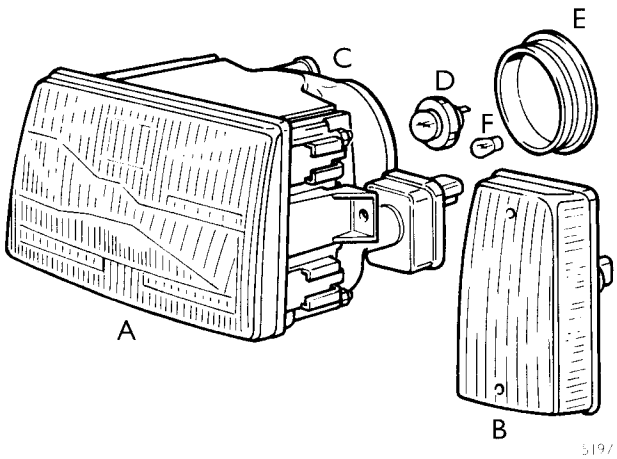
4696

V.7 ELECTRICAL CONNECTION OF A FLUORESCENT LAMP – A. LAMP – B. INVERTER



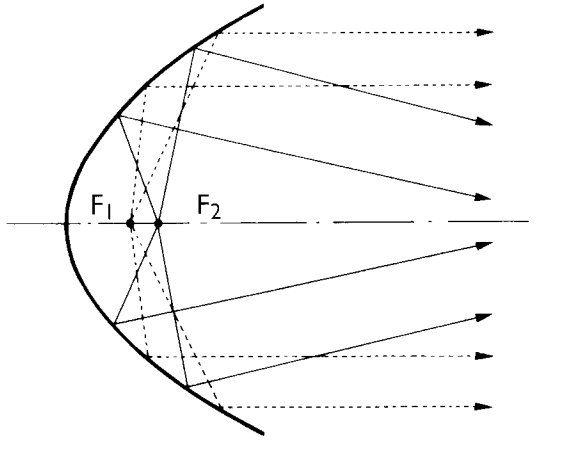
4697

V.8 INVERTER (INTERNAL WIRING SYSTEM)
A. CAPACITOR – B. STARTER – C. REACTOR (SOFT IRON CORE) – D. STATIC INVERTER



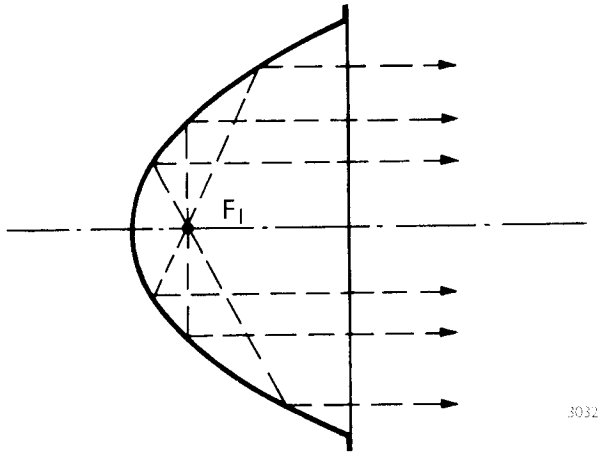
5197

V.9 HIGH/LOW BEAM HEADLIGHT
A. LENS – B. TURN SIGNAL UNIT – C. BODY – D. HALOGEN LAMP (HIGH/LOW BEAM LIGHT) – E. GAITER – F. PARKING LIGHT BULB



3031

V.10 PARABOLA F_1 FOCUSING POINT – F_2 POINT IN FRONT OF THE FOCUSING POINT
– – – PARALLEL RAYS
——— CONVERGENT RAYS



3032

V.11 HIGH BEAM LIGHT – F_1 FOCUSING POINT

Headlights

The headlight consists of (fig. V.9):

- lamp holder and bulb
- diffusor or refractor glass
- a lens seal positioned against the parabola
- abodywhich, together with lens and parabola, makes up the optical unit
- a parabola or reflecting telescope
- gaiter or plug
- adjusting screws.

Diffusor or refractor glass

The diffusor glass determines the distribution of the light beam over the roadway. The type of light difffusion is obtained by means of prisms engraved on the glass or, in case of small headlights, by lenses.

Parabola

The parabola is the basic component of the headlight as it reflects and sheds the light emitted by the bulb.

If the light source (filament) is aligned with the focusing point the light rays are projected outwards in parallel lines. On the contrary, if the light source is in front of the focusing point the light rays are projected outwards in a convergent pattern (fig. V.10).

It is possible to obtain different types of light beams by using different types of prabolas or lamps.

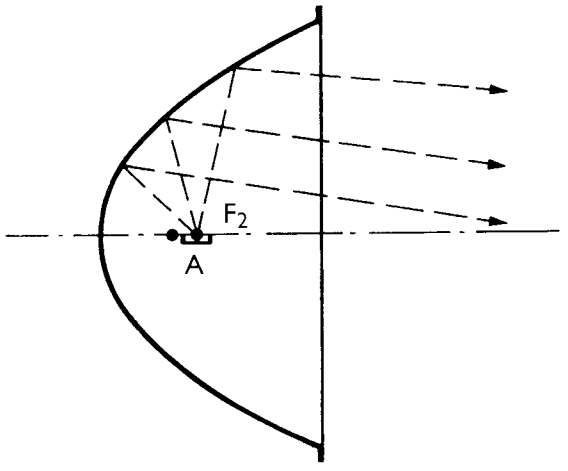
High beam light

The high beam light, whose rays are shown in a parallel line pattern, is obtained by supplying the lamp filament (either of the traditional or the halogen type) which is positioned on the parabola's focusing point (fig. V.11).

Low beam (dipped) lights

The low beam (or dipped) light (convergent rays) is obtained by supplying the filament of the bulb (either of the traditional or halogen type) positioned in front of the parabola's focusing point (figure V.12 ref. F2). As a rule,this filamente is located before the high beam filament.

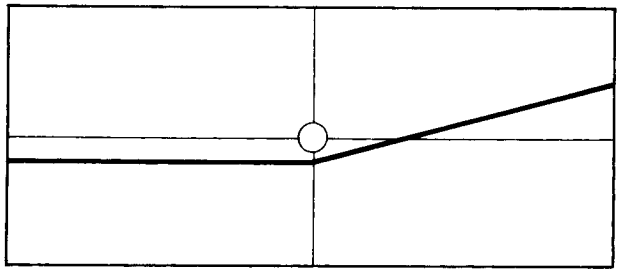
Contrary to the high beam, where the light rays are shed from the whole of the parabolic surface by means of a suitable filament screening (figure V.12 ref. A), the low beam (or dipped light) is only shed by the upper section of the parabola.



V.12 LOW BEAM (DIPPED LIGHTS)
F_2 POINT IN FRONT OF THE FOCUSING POINT
A. SCREENING

European asymmetrical low beam (dipped) lights

The asymmetrical low beam light in conformity with European standards (fig. V.13), concerning right–hand drive vehicles, follows a horizontal trend along its left hand side while it shows a 15° angle on its right–hand side. This way, a larger light range is made possible on the right- hand side of the road and the glaring of vehicles coming from the opposite direction is prevented (fig. V.14).



V.13 VIEW OF THE ASYMMETRICAL LOW BEAM LIGHT

Fog lights

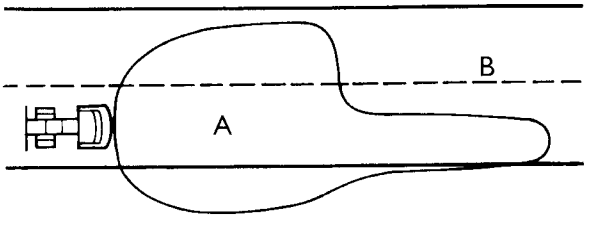
The fog light beam can be compared to the dipped beam as rays conveyed by its parabola have a vertical minimum angle (4°) thus avoiding illumination of the higher section of the roadway and protecting the driver from annoying reflections.

Furthermore, the light beam has a horizontal range of 160° (this is obtained by means of the prism pattern on the glass or by suitable lenses).

Fog lamps are usually fitted with H3 halogen lamps.

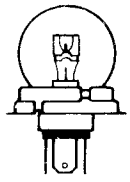
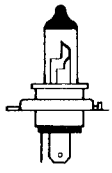
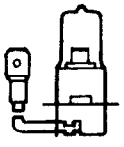
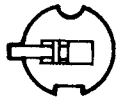
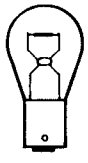
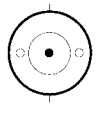
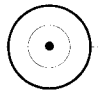
Auxiliary high beam (driving) lights

Auxiliary high beam (driving) lights, used in addition to main headlights, are concentrated and convey an intense light beam over a maximum range. They are usually fitted with H4 halogen bulbs.



V.14 TREND OF THE EUROPEAN ASYMMETRICAL LIGHT BEAM
A. LIGHT BEAM – B. ROADWAY

List of lamp types assembled on the vehicle

Type	Connection	Voltage (V)	Power (W)	Use
 R2		12	40/45	Low beam lights High beam lights
 H4		12	55/60	Low beam lights High beam lights
 H3		12	55	Fog lights
 P21W		12	21	Turn signal lights Stop lights Rear fog lights Reversing lights
 C5W		12	5	Blue lights
 C10W		12	10	Interior lighting ceiling lamps
 R5W		12	5	Number plate lights Tail parking lights Marker lights
 T4W		12	4	Front marker lights Swivel spotlight
 2W		12	2	Instrument and warning lamp lights
 LED		1,2 ÷ 1,5	10 ÷ 50 mW	IVECO Control warning lamps

SIGNALS

SIGNALS
Steering column switch (Turn signal lights)

SIMPLIFIED DIAGNOSIS

Disconnect connector [B] from C.I.U.

Set multimeter to VOLT:

Move ignition switch key to position 15.

Ensure 12 Volts are available by setting one multimeter prod to terminal 9 of C.I.U. connector [B] and the otherone to earth.

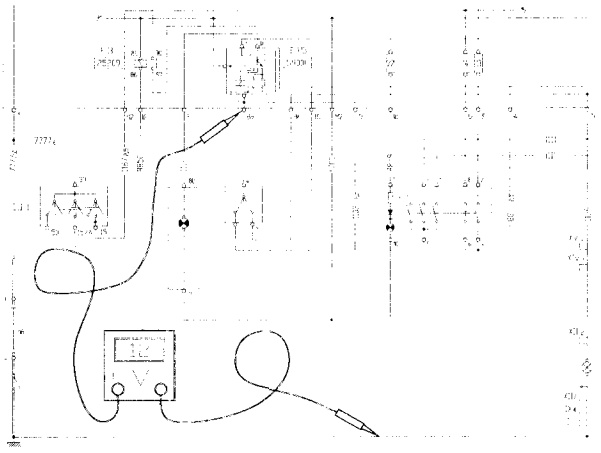
Set multimeter to OHM.

Putthe key in rest position.

Set the steering column switch to lh turn signal light. Check for 0 Ω by setting multimeter prods to terminals 9 and 6 of steering wheel switch connector B . Set the steering wheel switch to rh turn signal light position.

Check for 0 Ω by setting multimeter prods to terminals 9 and 7 of steering wheel switch connector [B]

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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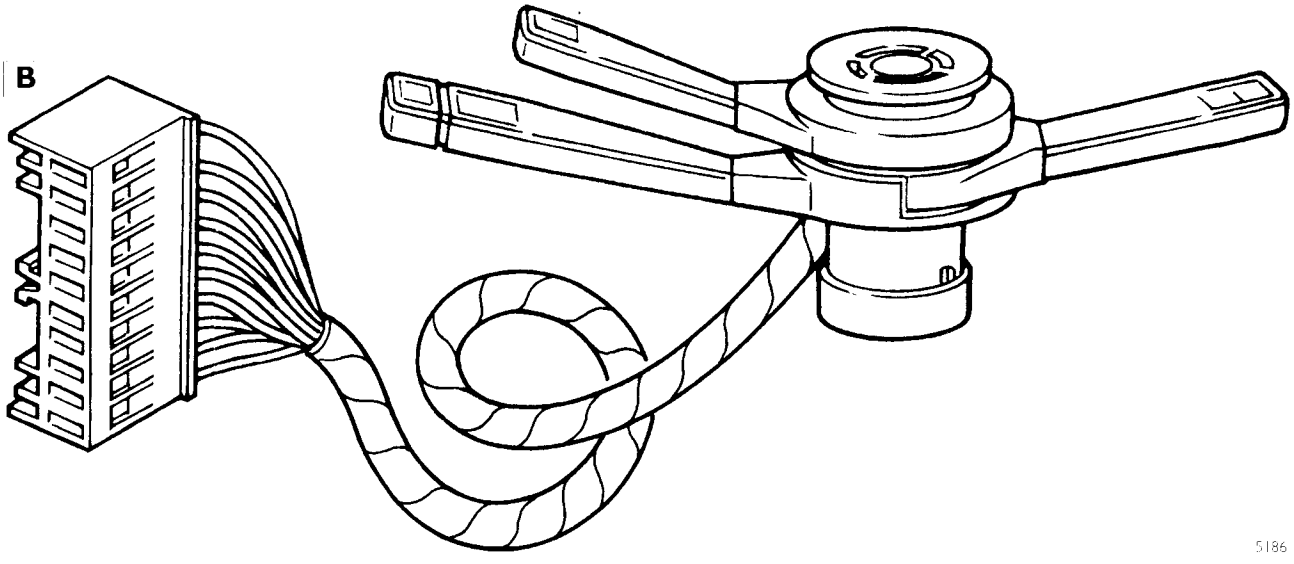
NOTE. Refer to page 1.64 for a complete view of steering wheel switch and relevant wiring. **54033 B**

B



5186

LAYOUT WITH I CONNECTIONS

	Connector	Function	Cable colour
	1 (d)	Not used	–
	2 (e)	Not used	–
	3 (g)	Not used	–
	4 (s)	Not used	–
B	5 (f)	Not used	–
	6 (b)	Lh turn signal light	light blue/black
	7 (c)	Rh turn signal light	light blue
	8 (n)	Not used	–
	9 (a)	Turn signal flashing light	violet
	10 (t)	Not used	–

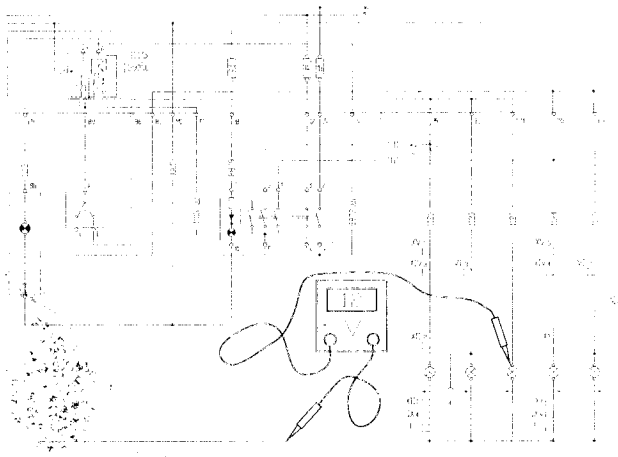
Front turn signal light

SIMPLIFIED DIAGNOSIS

Disconnect connector [A] from component under examination.
Set multimeter to VOLT:
- Put the ignition switch key in position 15.
- Set steering wheel switch (page VI.3) to turn signal light position.
- Ensure 12 Volts are available by setting one multimeter prod to terminal 1 of connector [A] and the otherone to earth.

Set multimeter to OHM.
- Put the key in rest position. Check for 0 Ω by setting one multimeter prod to terminal 2 of connector "A" and the otherone to earth.

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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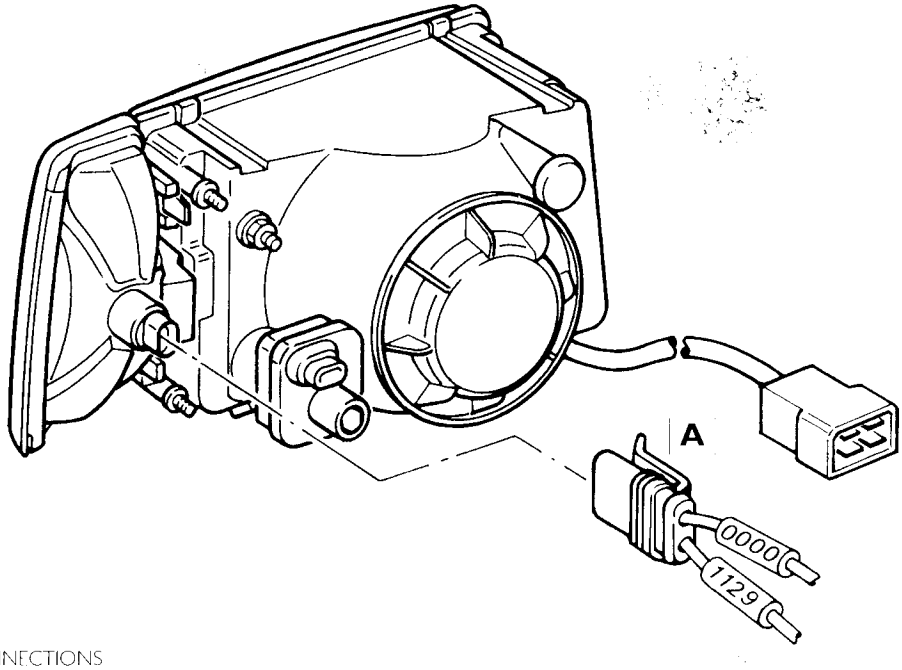
32002



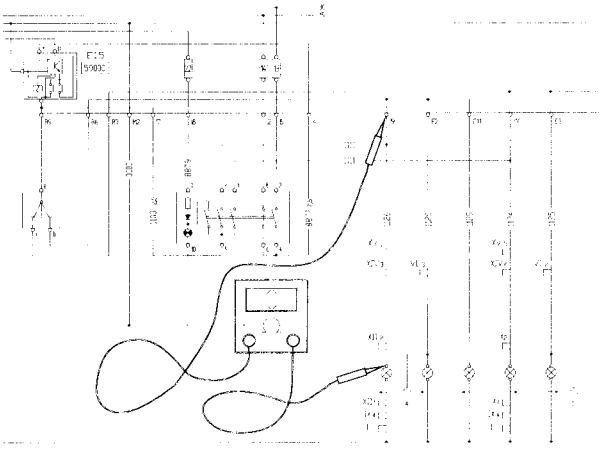
LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	Supply of hazard/turn signal headlight bulb	1129
	2	Earth	0000

Turn signal side repeater

SIMPLIFIED DIAGNOSIS

Disconnect connector A from component under examination.
Set multimeter to OHM.
Check for 0 Ω by setting one multimeter prod to terminal 2 of connector A and the otherone to terminal 9 of C.I.U. connector 1.
Check for 0 Ω by setting one multimeter prod to terminal 1 of connector A and the otherone to earth.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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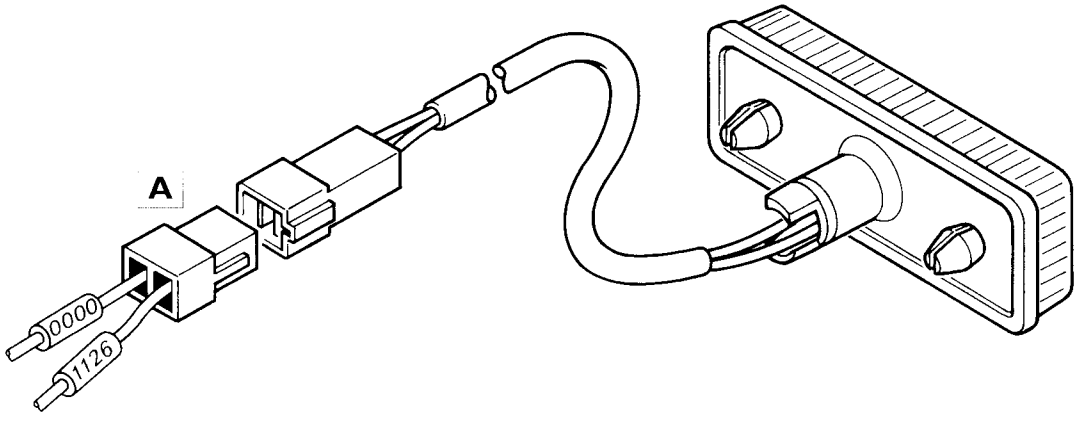
33001



5202

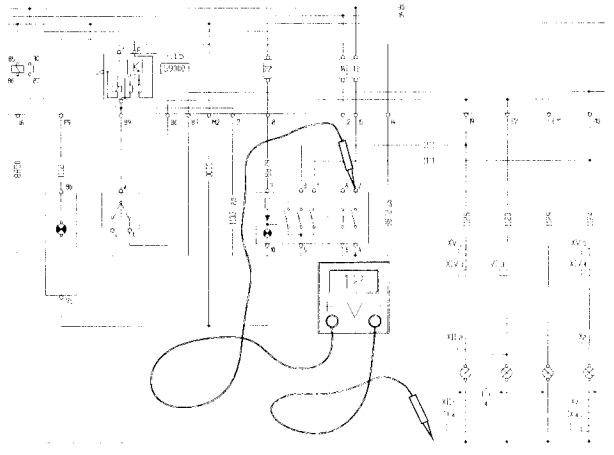
LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	Earth	0000
	2	Supply of hazard/turn signal side repeater bulb	1126

Hazard light switch with built–in warning lamp

SIMPLIFIED DIAGNOSIS

Disconnect connector [A] from component under examination.
Set multimeter to VOLT:
Check for 12 V by setting one multimeter prod to terminal 2 of connector [A] and the otherone to earth.
Put ignition switch key to position 15.
Ensure 12 Volts are available by setting one multimeter prod to terminal 8 of connector [A] and the otherone to earth.
Set multimeter to OHM.
Put the key in rest position.
Press the hazard light switch. Check for 0 Ω by setting multimeter prods to switch terminals 4 and 2.
Check for 0 Ω by setting multimeter prods to switch terminals 7 and 1 first and then to terminals 7 and 3.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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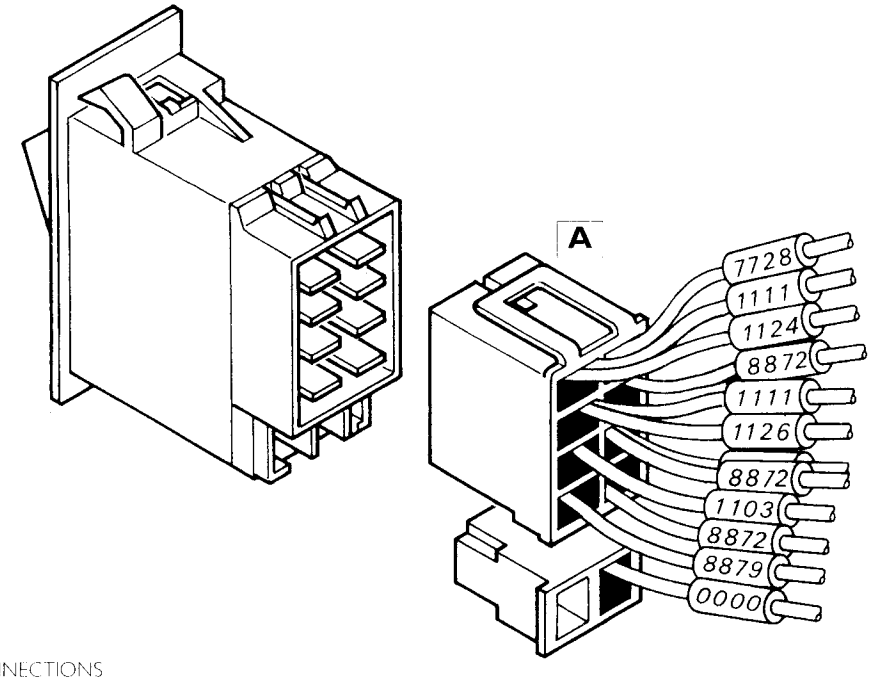


5203

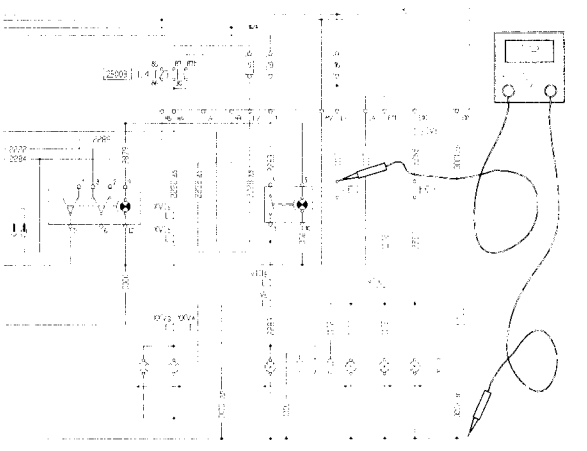
LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
	1	Supply of steering wheel switch (side rh turn signal light bulb)	1111
		To side rh turn signal light bulb	1124
	2	Supply (+30)	7728
	3	Supply of steering wheel switch (side lh turn signal light bulb)	1111
		To side lh turn signal light bulb	1126
	4	Supply of electronic flasher light (hazard/turn signal light with hazard light switch)	8872
A	5	Supply of turn signal light bulbs with hazard light switch on	1103
	6	Supply (+15) of electronic flasher light (hazard/turn signal light and jumper to switch cell no. 4)	8872
	7	Supply of switch lighting bulb	8879
	8	Supply (+15)	8872
	9	Not used	–
	10	Earth	0000

Stop signal switch

SIMPLIFIED DIAGNOSIS

Disconnect connector A from component under examination.
Set multimeter to VOLT:
Put switch key in position 15. Ensure 12 Volts are available by setting one multimeter prod to terminal 1 of connector A and the otherone to earth.
Set multimeter to OHM.
Put the key in rest position and operate the switch.
Check for 0 Ω by setting multimeter prods to terminals 1 and 2 of connector A.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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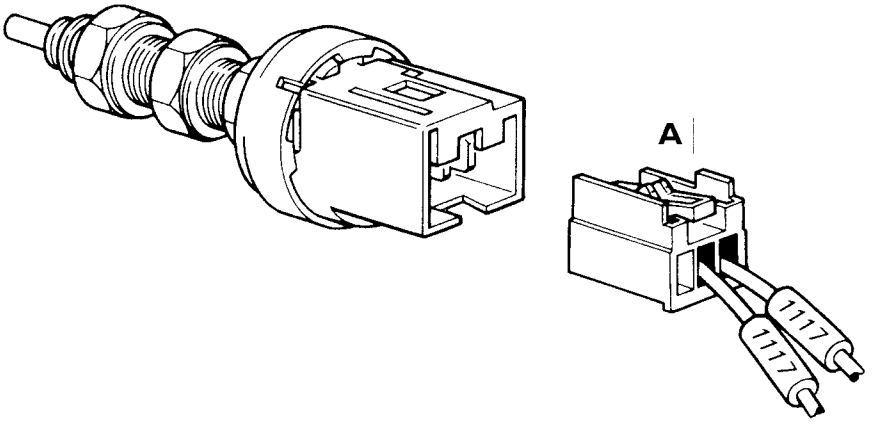
53501



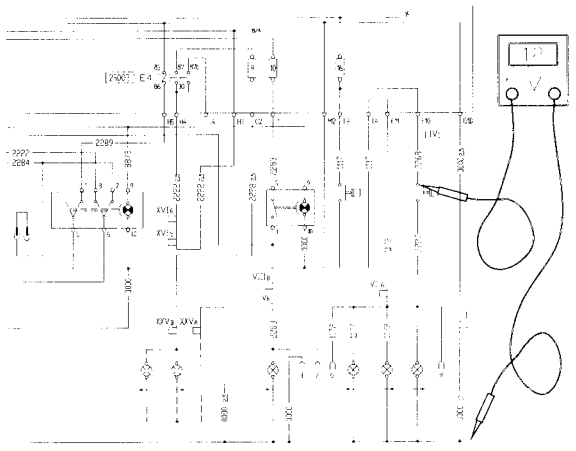
LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
	1	Supply (+15)	1117
A	2	Stop light bulb switch on device	1117
	3	Not used	–

Reversing light switch

SIMPLIFIED DIAGNOSIS

Disconnect connector [A] from component under examination.
Set multimeter to VOLT:
Put switch key in position 15.
Ensure 12 Volts are available by setting one multimeter prod to terminal 1 of connector [A] and the otherone to earth.
Set multimeter to OHM.
Put the key in rest position and operate the switch.
Check for 0 Ω by setting one multimeter prod to terminal ofconnector [A] and otherone to either connector C or terminal 4 of tail headlight connector [A] (pages V.13/V.14).
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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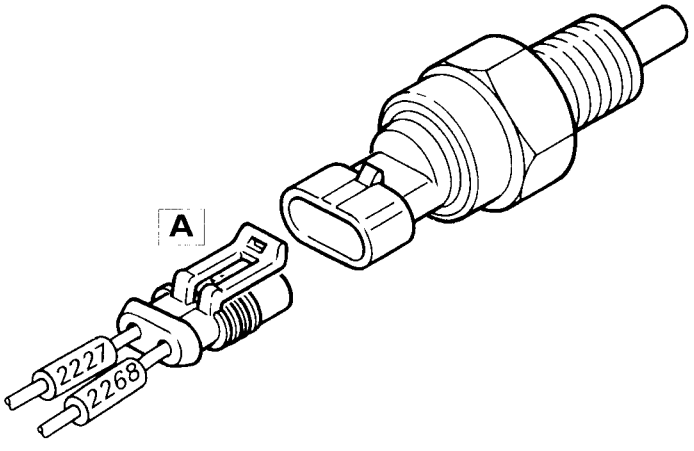
53503



5295

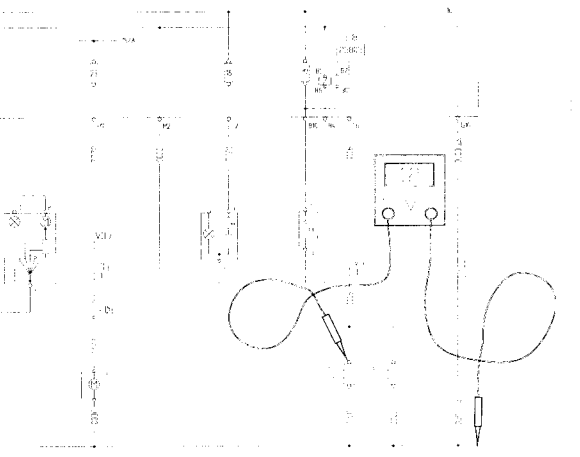
LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	Supply (+15)	2268
	2	Reversing light bulb switch on device	2227

Horn

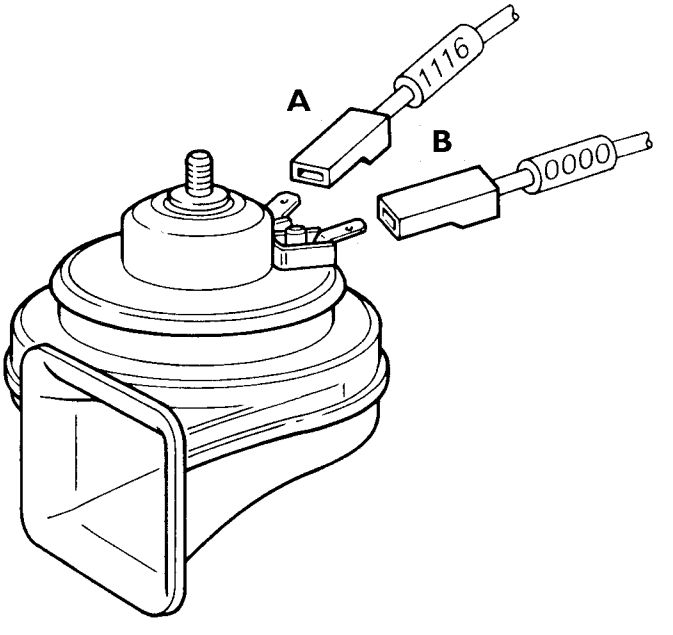
SIMPLIFIED DIAGNOSIS

Disconnect connectors A and B from component under examination.
Set multimeter to VOLT.
While keeping the steering wheel pushbutton pressed check for 12 V by setting one multimeter prod to terminal of connector A and the otherone to earth.
Set multimeter to OHM.
Return the steering wheel pushbutton to rest position. Check for 0 Ω by setting one multimeter prod to terminal of connector B and the otherone to earth.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



Print no. 603.42.961 Diagram no. 10

2200!



LAYOUT WITH CONNECTIONS

Connector	Function	Cable colour
A	Horn supply	1116
B	Earth	0000

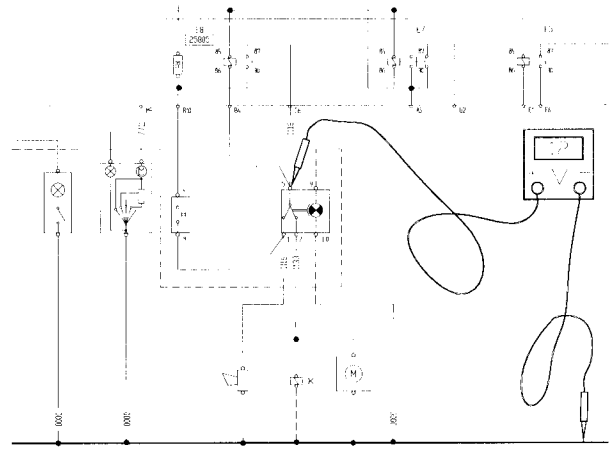
Electric/air horn switch (bus)

SIMPLIFIED DIAGNOSIS

Disconnect connector [A] from component under examination.
Set multimeter to VOLT.
- While keeping the relevant steering wheel pushbutton pressed check for 12 V by setting one multimeter prod toterminal 5 of connector [A] and the otherone to earth.

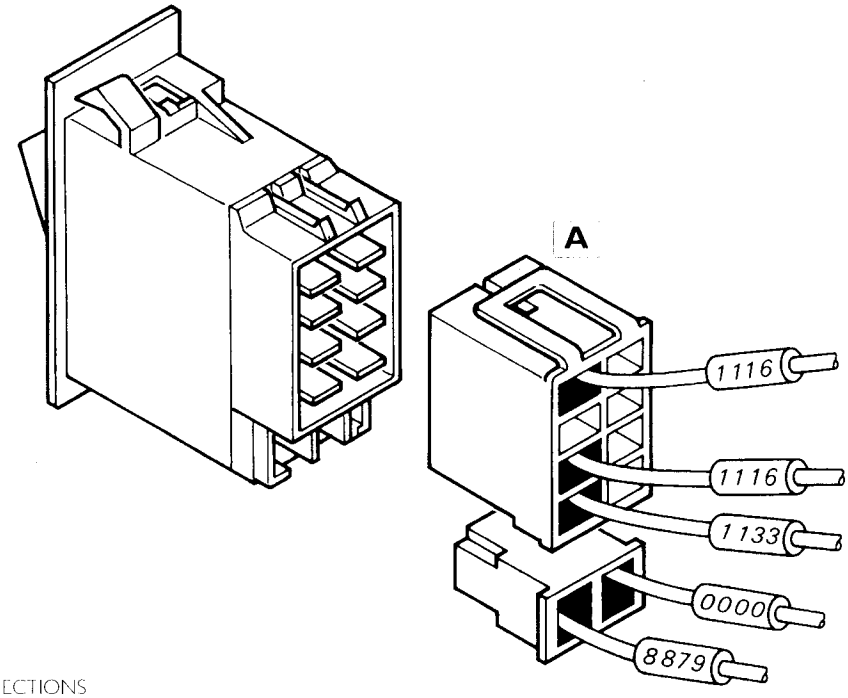
Set multimeter to OHM.
- Check for 0 Ω by setting multimeter prods to terminals 5 and 1 of horn switch.
- Press the switch key and repeat the test.

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



Print no. 603.42.961. School bus Basic Wiring Diagram

52200



5207

LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
	1	Horn switch on device	1116
	2	Not used	–
	3	Not used	–
	4	Not used	–
A	5	Supply of electric/air horn swithc on device	1116
	6	Not used	–
	7	Air horn switch on device	1133
	8	Not used	–
	9	Supply (15/A) for switch lighting	8879
	10	Earth	0000

Hazard lights on warning lamp (bus)

SIMPLIFIED DIAGNOSIS

Disconnect connector A from warning lamp and operate safety unit switch.

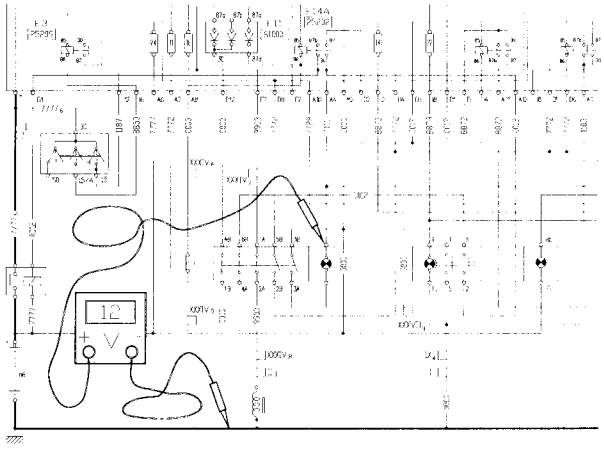
Set multimeter to VOLT.

Check for 12 V by setting one multimeter prod toterminal 1 of connector A and the otherone to earth. If reading is other than specified set one multimeter prod to terminal 2 of connector A and repeat the test.

Set multimeter to OHM.

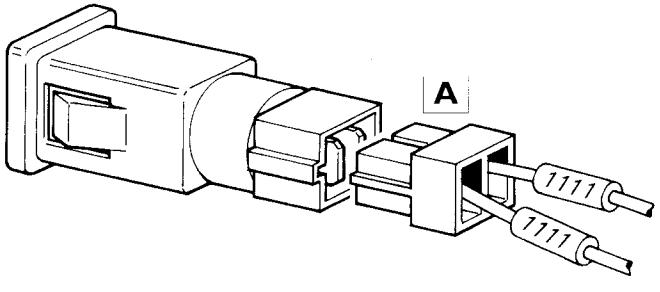
Check for 0 Ω by setting one multimeter prod to terminal 1 of connector A and the otherone to earth. Press the switch key and repeat the test. If reading is other than specified set one multimeter prod to terminal 2 of connector A and repeat the test.

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



Print no. 603.42.961 Diagram no. 18

58202



LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	–	Supply of hazard lights on warning lamp bulb	1111
	–	Earth of warning lamp bulb with safety unit switch on	1111

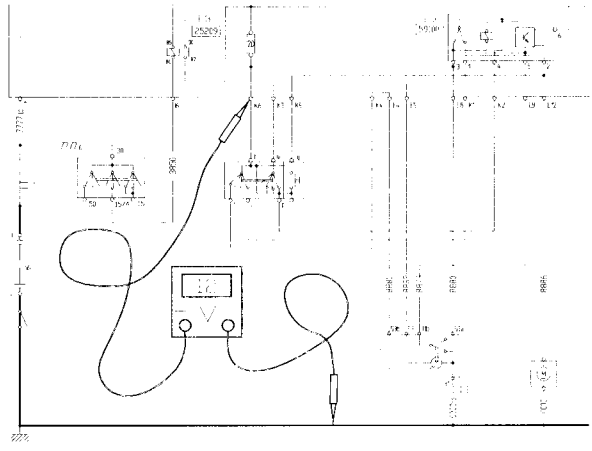
SERVICES

Page

SERVICES
Steering column switch (Windscreen wipers – Electric washer pump)

SIMPLIFIED DIAGNOSIS

Disconnect connector [K] from C.I.U.
Set multimeter to VOLT.
Put the ignition key in position 15.
Check for 24 V by setting one multimeter prod to terminal 6 of connector [K] and the otherone to earth.
Set multimeter to OHM and take the following measurements on steering column switch terminals.
Turn the ignition key to OFF position.
Move the steering column switch lever to "intermittent operation". Check for 0 Ω by setting multimeter prods to terminals 2 3 and 1 6.
Put the steering wheel switch in "low speed" position. Check for 0 Ω by setting multimeter prods to terminals 5 and 6
Put the steering column switch lever in "high speed" position. Check for 0 Ω by setting multimeter prods to terminals 4 and 6
Put the lever in "windshield washing" position. Check for 0 Ω by setting multimeter prods to terminals 5 and 6.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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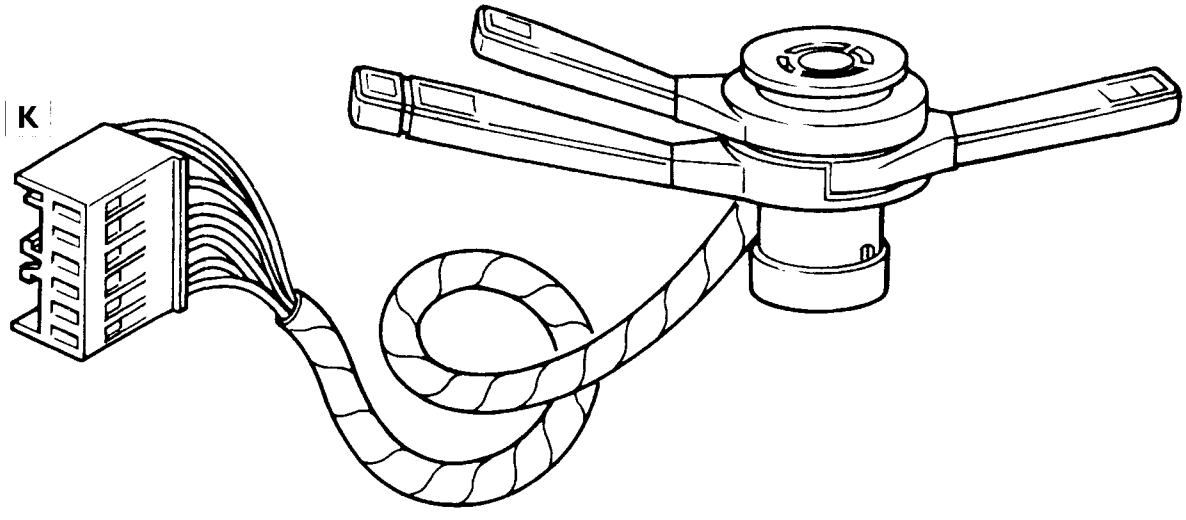
54033 E–F



5706

LAYOUT WITH I CONNECTIONS

Connector		Function	Cable colour
K	1 (l)	Windscreen wipers (intermittent operation)	yellow
	2 (p)	Windscreen wipers (resetting)	light blue/white
	3 (m)	Windscreen wipers (low speed)	light blue/yellow
	4 (i)	Windscreen wipers (high speed)	grey
	5 (q)	Windscreen washer electric pump	green/black
	6 (h)	Supply of windscreen wiper unit and washer electric pump	pink/black

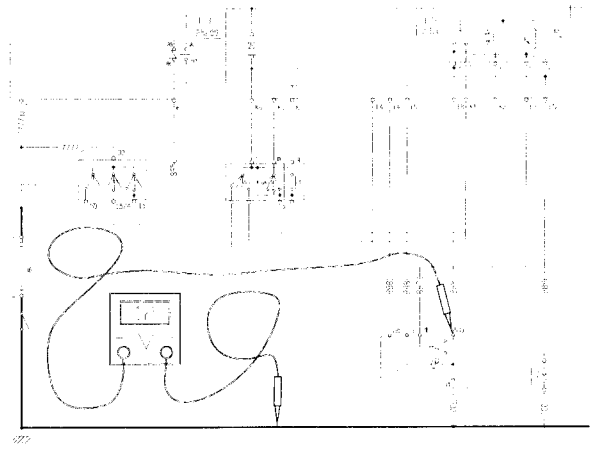
Windscreen wiper unit (Gear motor)

SIMPLIFIED DIAGNOSIS

Disconnect connector A from component under examination.
Set multimeter to VOLT:
- Turn ignition switch key to position 15.
- Ensure 12 Volts are available by setting one multimeter prod to terminal 3 of connector A and the otherone to earth.

Set multimeter to OHM.
- Set the key to rest position.
- Ensure the presence of 0 Ω by setting one multimeter prod to terminal 6 of connector C and the otherone to earth.

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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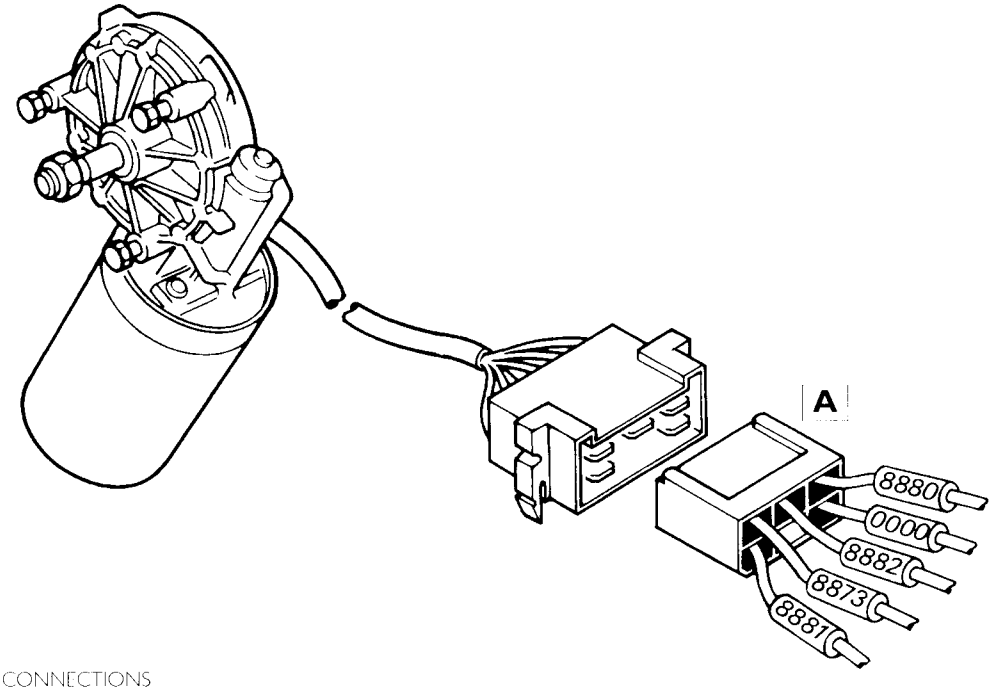


2219

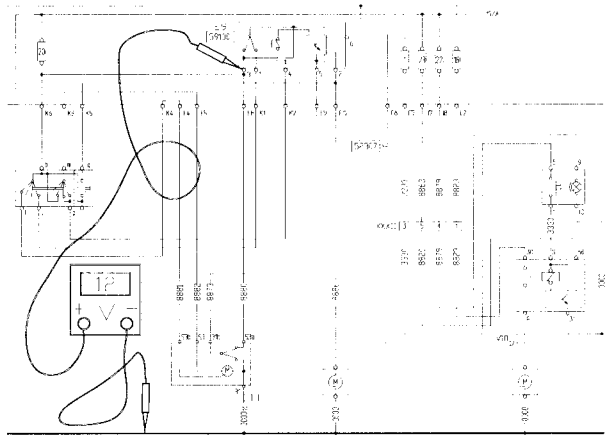
LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1 (31b)	Windscreen wipers resetting	8873
	2 (53)	Low speed	8882
	3 (53a)	Gearmotor supply	8880
	4 (53b)	High speed	8881
	5	Not used	–
	6 (31)	Earth	0000

Windscreen wiper unit intermittent operation

SIMPLIFIED DIAGNOSIS

Remove component under examination from the C.I.U.
Set multimeter to VOLT:
Turn ignition switch key to position 15.
Ensure 12 Volts are available by setting one multimeter prod to terminal 3 of connector E9 (page I.54) and the otherone to earth.
Set multimeter to OHM.
Set the key to rest position.
Ensure the presence of 0 Ω by setting one multimeter prod to terminal 6 of C.I.U. connector E9 and the otherone to earth.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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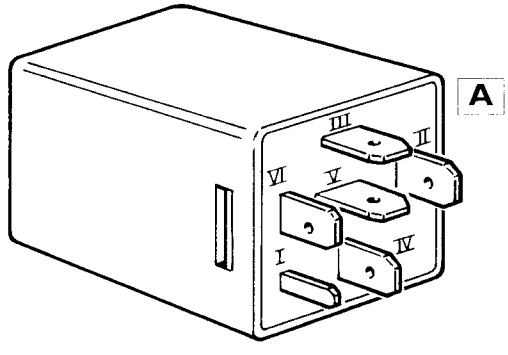
59100



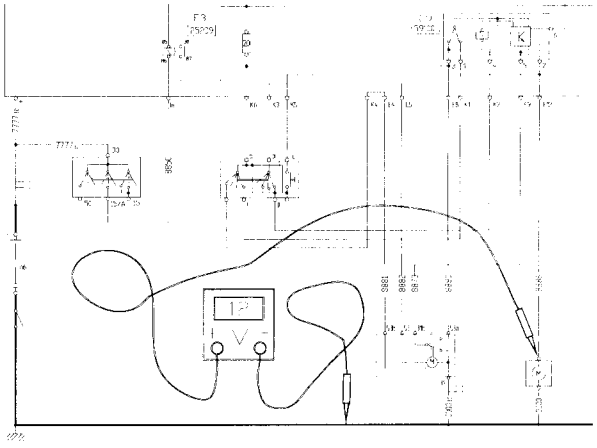
LAYOUT WITH I CONNECTIONS

Connector		Function	Cable colour
A	I	Windscreen wiper unit low speed timing	–
	II	Windscreen wiper unit control after activation of windscreen washer electric pump	–
	III	Supply	–
	IV	Windscreen wiper unit low speed	–
	V	Windscreen wiper unit resetting	–
	VI	Earth	–

Windscreen washer electric pump

SIMPLIFIED DIAGNOSIS

Disconnect connector [A] from component under examination.
Set multimeter to VOLT.
Turn ignition switch key to position 15.
Put steering column switch in windscreen washing position. Ensure 12 Volts are available by setting one multimeter prod to terminal 2 of connector [A] and the otherone to earth.
Set multimeter to OHM.
Set the key to rest position.
Ensure the presence of 0 Ω by setting one multimeter prod to terminal 1 of connector [A] and the otherone to earth.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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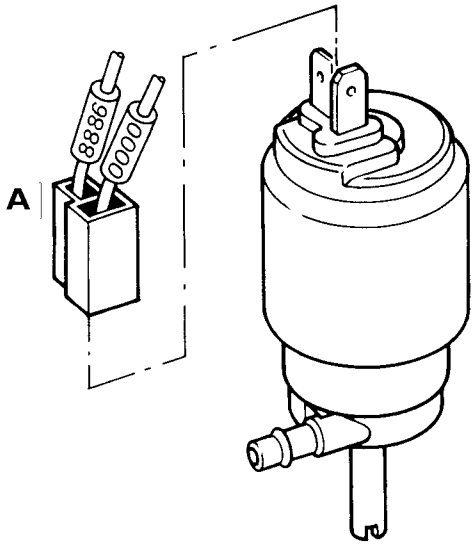


5212

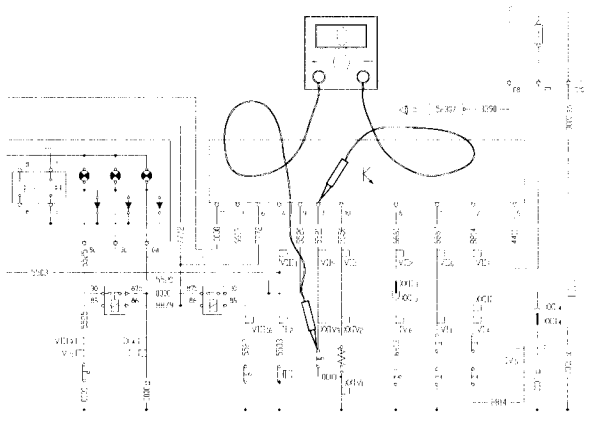
LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	Earth	0000
	2	Electric pump enablement	8886

Windscreen washer electric pump

SIMPLIFIED DIAGNOSIS

Disconnect connector [A] from component under examination.
Set multimeter to OHM.
Check for 0 Ω by setting one multimeter prod to terminal 2 of connector [A] and the otherone to terminal 7 of IVECO Control display panel connector (page IV.15).
Check for 0 Ω by setting one multimeter prod to terminal 3 of connector [A] and the otherone to earth.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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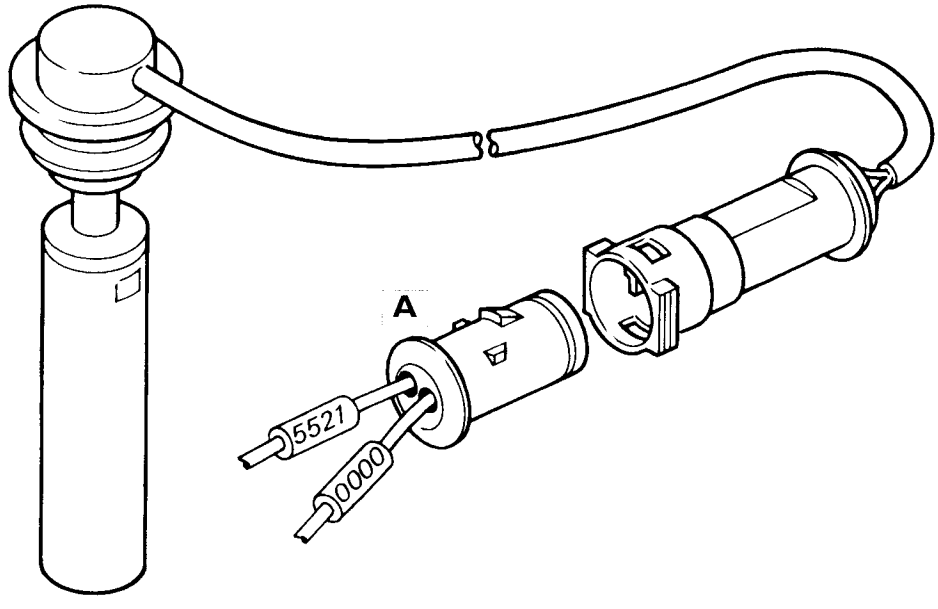


5213

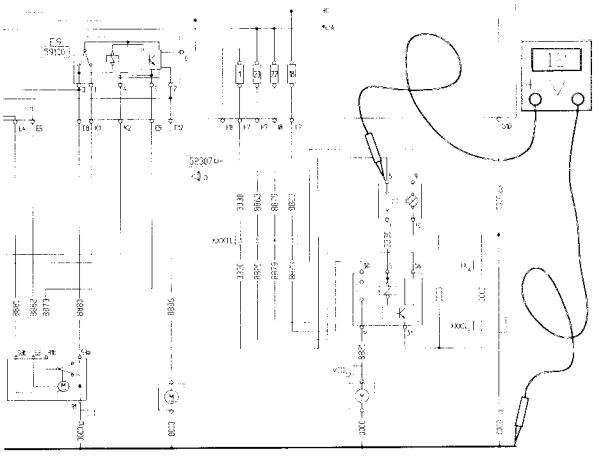
LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	Not used	–
	2	To IVECO Control display panel (windscreen washer fluid level)	5521
	3	Earth	0000

Headlamp washer unit switch

SIMPLIFIED DIAGNOSIS

Disconnect connector (A) from component under examination.
Set multimeter to VOLT.
Press the exterior lighting switch (page V.3) to 1st release.
Check for 12 V by setting one multimeter prod to terminal 5 of connector A and the otherone to earth.
Set multimeter to OHM.
Check for 0 Ω by setting one multimeter prod to terminal 1 of connector A and the otherone to terminal 5 of headlamp washer unit timer connector (page VII.9).
Press the switch and check for 0 Ω by setting multimeter prods to terminals 1 and 5 of same switch.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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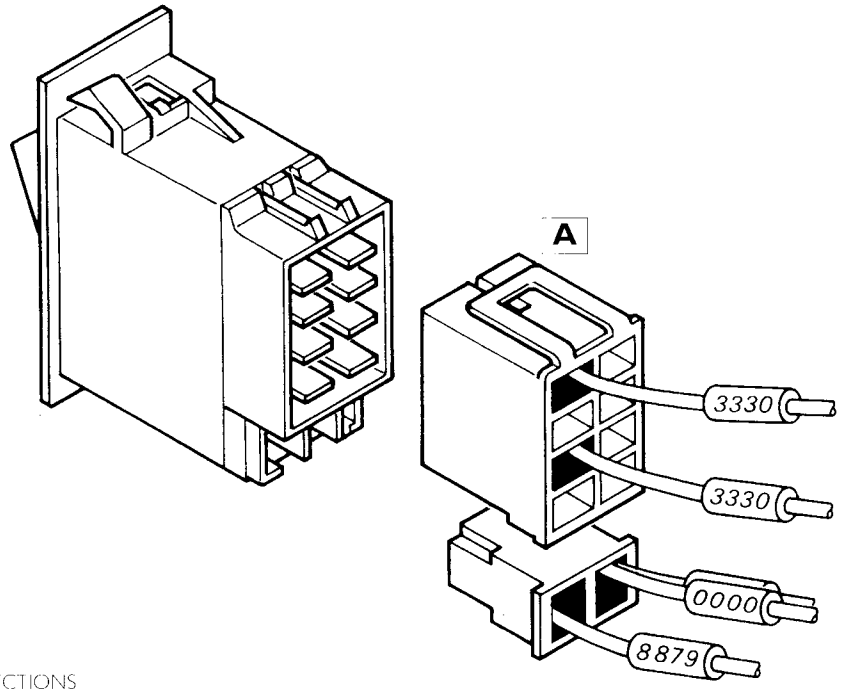
53004



LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	Supply from exterior lighting switch	3330
	2	Not used	–
	3	Not used	–
	4	Not used	–
	5	To headlamp washer unit timer	3330
	6	Not used	–
	7	Not used	–
	8	Not used	–
	9	Supply (+15/A) for switch lighting	8879
	10	Earth	0000

Headlamp washer unit timer

SIMPLIFIED DIAGNOSIS

Disconnect connector A from component under examination.

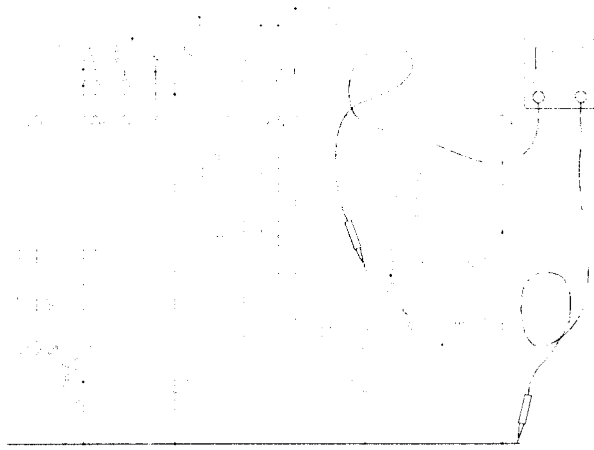
Set multimeter to VOLT.

- Check for 12 V by setting one multimeter prod to terminal 30 of connector A and the other one to earth.
- Set the ignition key to position 15 and check for 12 V by setting one multimeter prod to terminal 56 of connector A and the other one to earth.

Set multimeter to OHM.

- Return the key to rest position. Check for 0 Ω by setting one multimeter prod to terminal 31 of connector A and the other one to earth.

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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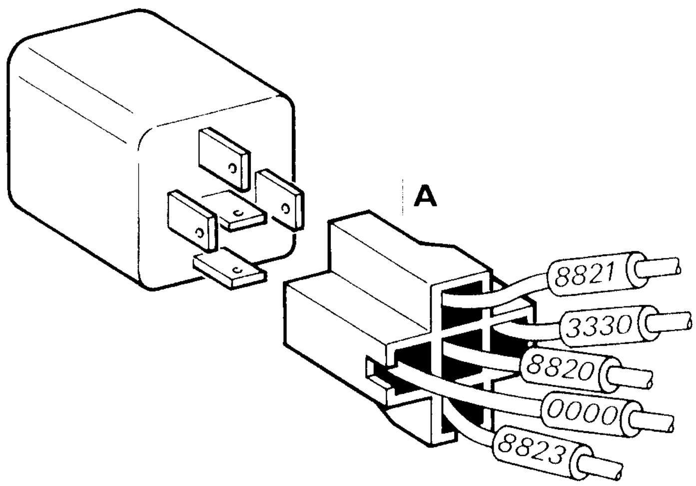


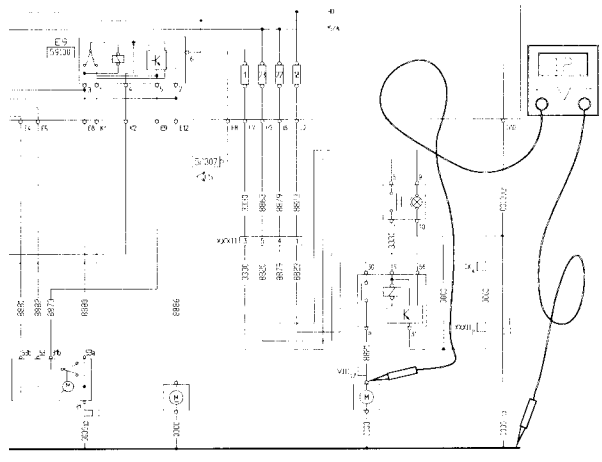
LAYOUT WITH CONNECTIONS

	Connector	Function	Cable colour
A	30	Supply (+15)	8823
	31	Earth	0000
	P	Headlamp washer pump enablement	8821
	S	Headlamp washer pump switch on device	3330
	56	Supply (+15/A)	8820

Headlamp washer electric pump

SIMPLIFIED DIAGNOSIS

Disconnect connector [A] from component under examination.
Set multimeter to VOLT.
Press the exterior lighting switch (page V.3) to 1st release and operate the headlamp washer unit switch (page VII.8).
Check for 12 V by setting one multimeter prod to terminal 1 of connector [A] and the otherone to earth.
Set multimeter to OHM.
Check for 0 Ω by setting one multimeter prod to terminal 2 of connector [A] and the otherone to earth.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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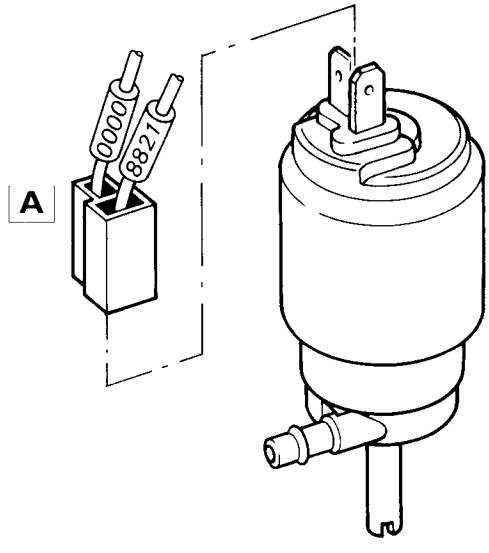


5216

LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
[A]	1	Electric pump operation	8821
	2	Earth	0000

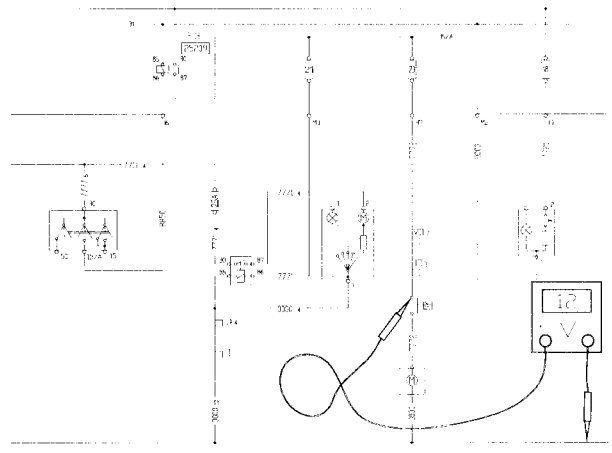
Engine cooling electromagnetic coupling switch

SIMPLIFIED DIAGNOSIS

Disconnect connector A from component under examination.
Set multimeter to VOLT.
- Put the ignition key in position 15.
- Check for 12 V by setting one multimeter prod to terminal 1 of connector A and the otherone to earth.

Set multimeter to OHM.
- Return the ignition key to rest position.
- Ensure resistance value is = ∞ by setting multimeter prods to connector terminals 1 and 2.

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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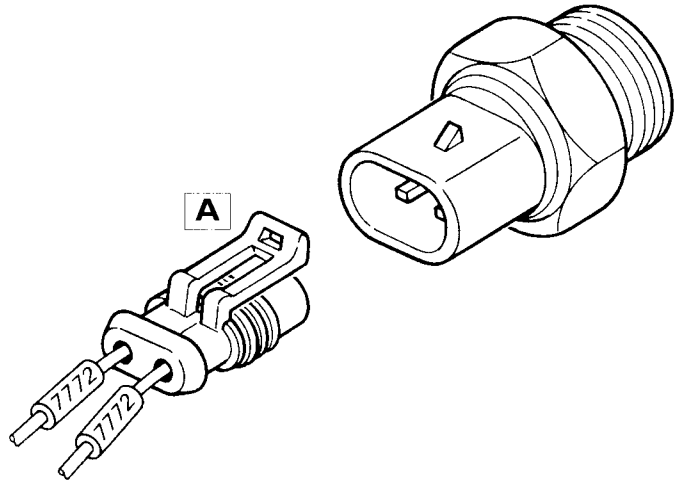


LAYOUT WITH CONNECTIONS

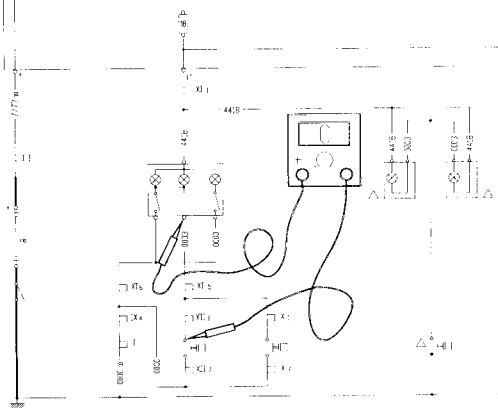
Connector		Function	Cable colour
A	1	Engine cooling electromagnetic coupling operation	7772
	2	Supply (+15/A)	7772

Interior lighting switch

SIMPLIFIED DIAGNOSIS

Disconnect connectors A and B from component under examination.
Set multimeter to OHM.
- Check for 0 Ω by setting one multimeter prod to terminal of connector B and the otherone to connector D of cab interior ceiling lamp (page VII.13)
- Check for 0 Ω by setting one multimeter prod to terminal of connector A and the otherone to earth.

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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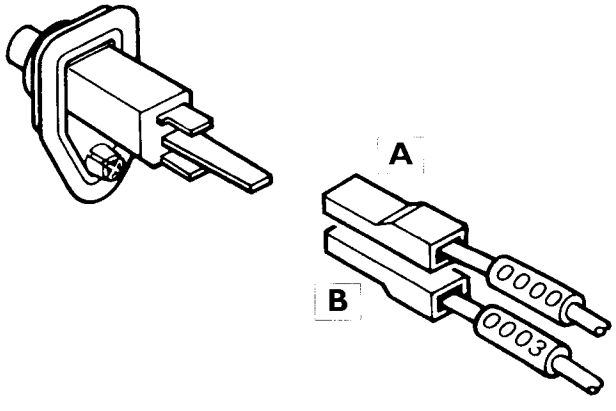


LAYOUT WITH CONNECTIONS

Connector	Function	Cable colour
A	Earth	0000
B	To cab interior ceiling lamp with swivel spotlight	0003

Cab interior ceiling lamp with swivel spotlight

SIMPLIFIED DIAGNOSIS

Disconnect connectors A, B, C and D from component under examination.

Set multimeter to VOLT.

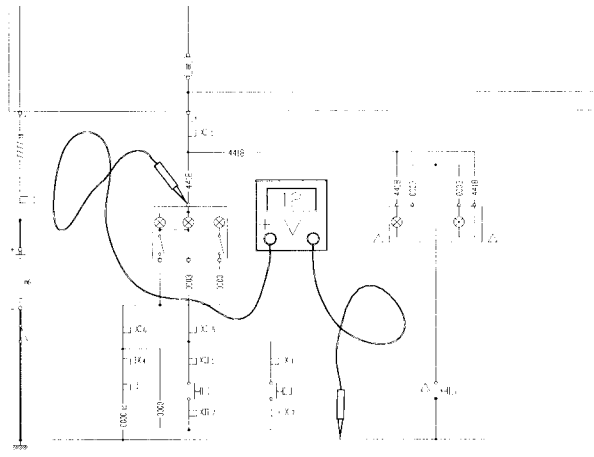
Check for 12 V by setting one multimeter prod to terminal 1 of connector A and the otherone to earth.

Set multimeter to OHM.

Check for 0 Ω by setting one multimeter prod to connector C and the otherone to earth.

Open the door and check for 0 Ω by setting one multimeter prod to connector D and the otherone to earth.

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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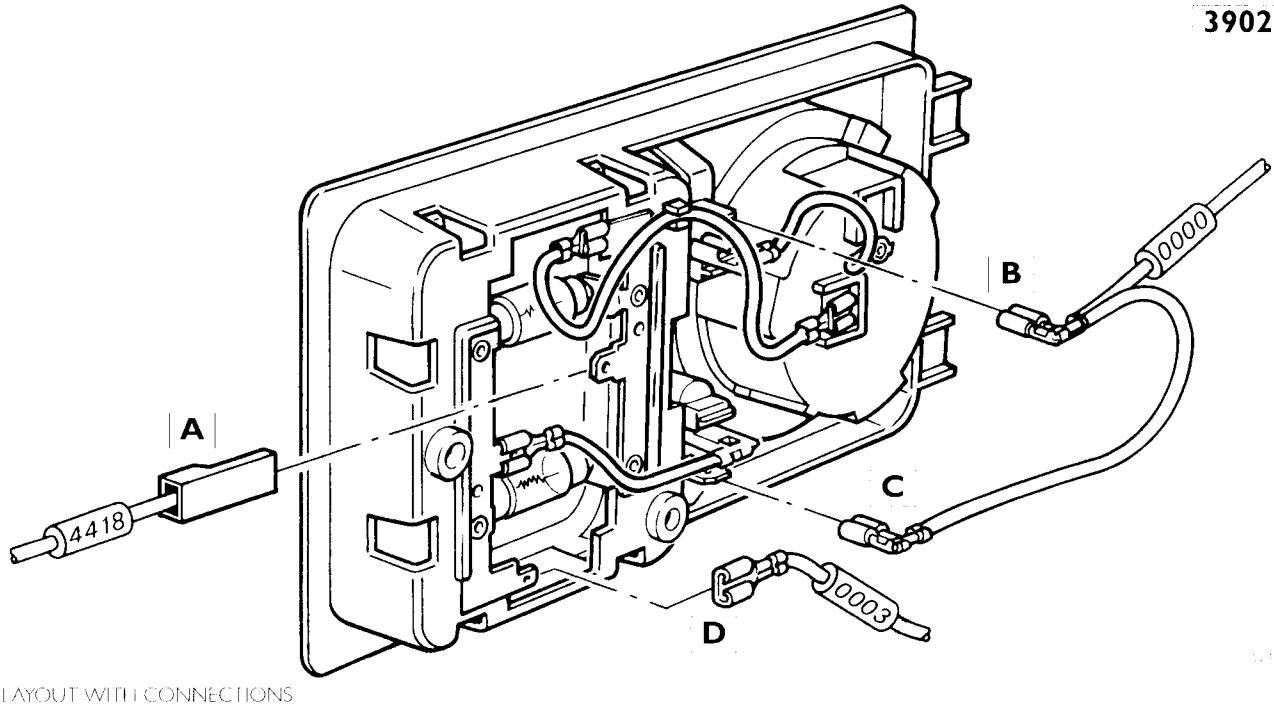


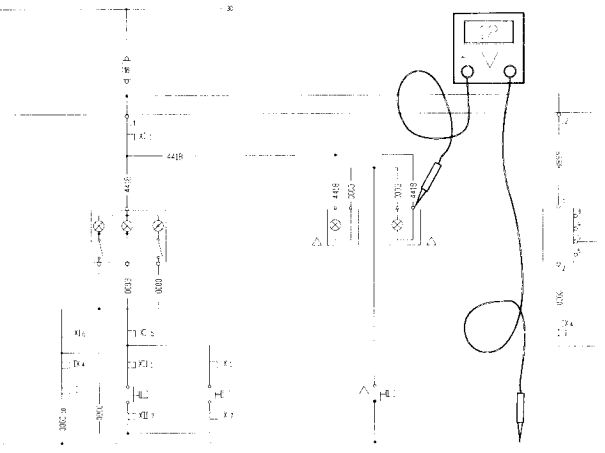
LAYOUT WITH CONNECTIONS

Connector	Function	Cable colour
A	Lamp supply (+30)	4418
B	Earth	0000
C	Earth	0000
D	Ceiling lamp illumination via door opening system	0003

Ceiling lamp for front/rear door step lighting (vans)

SIMPLIFIED DIAGNOSIS

Disconnect connectors A and B from component under examination.
Set multimeter to VOLT.
Check for 12 V by setting one multimeter prod to terminal of connector A and the otherone to earth.
Set multimeter to OHM.
Open the rear door and check for 0 Ω by setting one multimeter prod to connector B and the otherone to earth.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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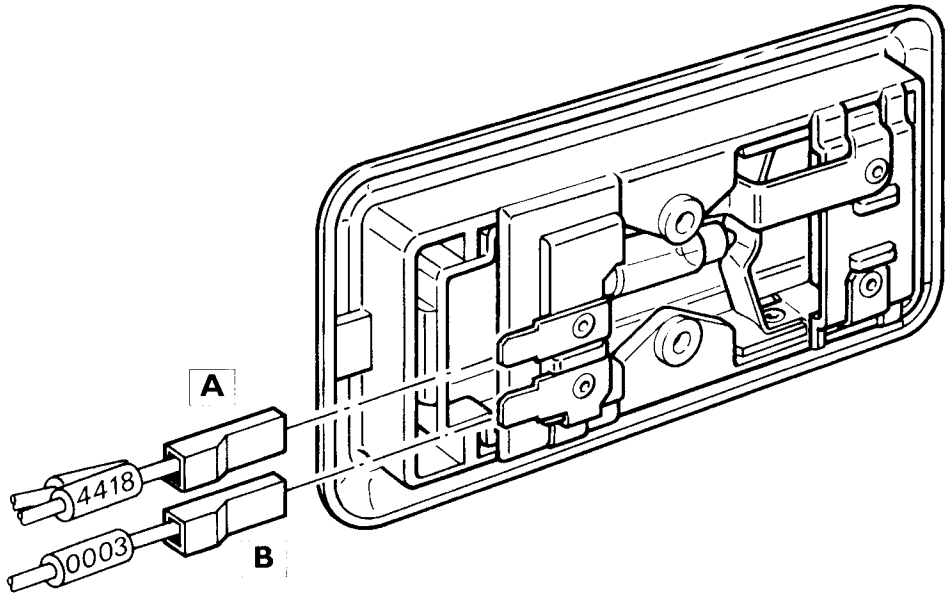
39014 **39016**



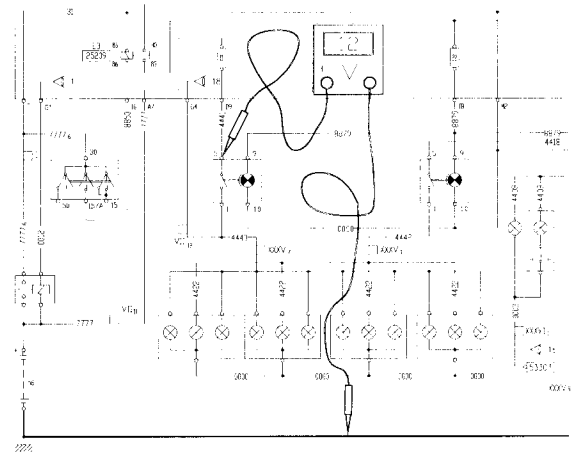
LAYOUT WITH CONNECTIONS

Connector	Function	Cable colour
A	Lamp supply (+30)	4418
B	Lamp supply (+30)	4418

Interior lighting switch (bus)

SIMPLIFIED DIAGNOSIS

Disconnect connectors |A| from component under examination.
Set multimeter to VOLT.
Check for 12 V by setting one multimeter prod to terminal 5 of connector |A| and the otherone to earth.
Set multimeter to OHM.
Press the switch key and check for 0 Ω by setting multimeter prods to terminals 1 and 5 of same switch.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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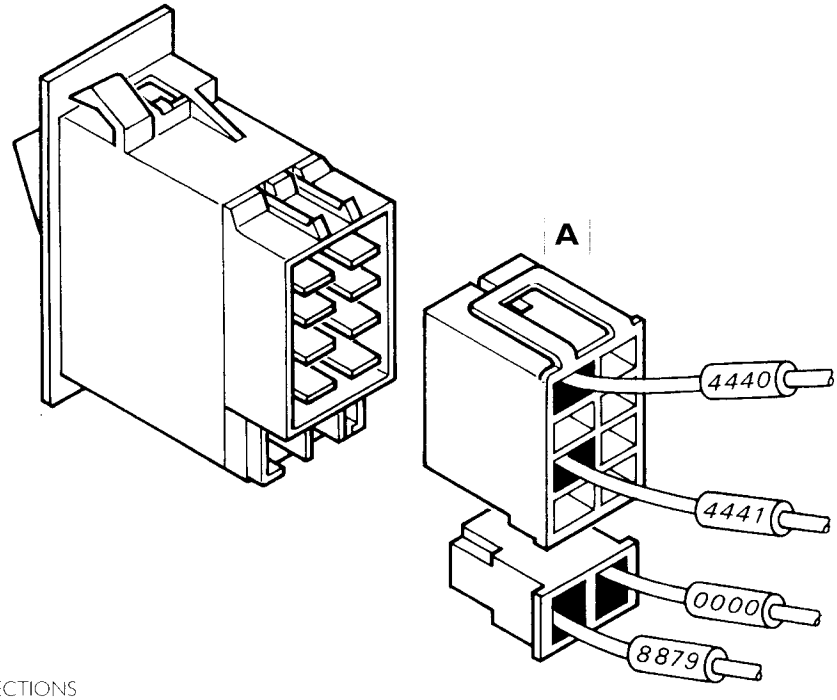


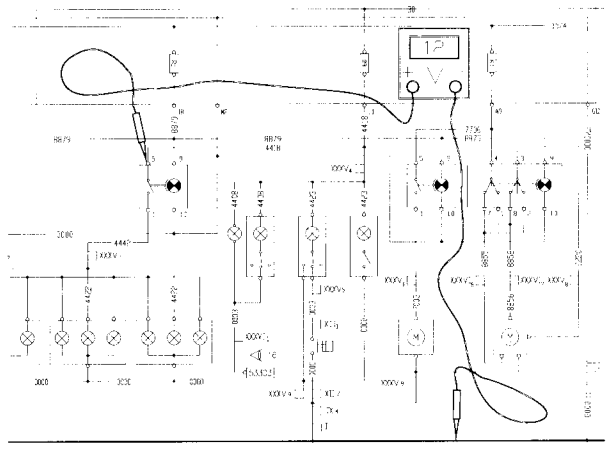
LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	Supply for interior lighting	4440
	2	Not used	–
	3	Not used	–
	4	Not used	–
	5	Supply (+30)	4441
	6	Not used	–
	7	Not used	–
	8	Not used	–
	9	Supply (+15/A) for switch lighting	8879
	10	Earth	0000

Interior lighting – Blue lights switch (Bus)

SIMPLIFIED DIAGNOSIS

Disconnect connector [A] from component under examination.
Set multimeter to VOLT.
Check for 12 V by setting one multimeter prod to terminal 5 of connector [A] and the otherone to earth.
Set multimeter to OHM.
Press the switch key and check for 0 Ω by setting multimeterprods to terminals 1 and 5 of same switch.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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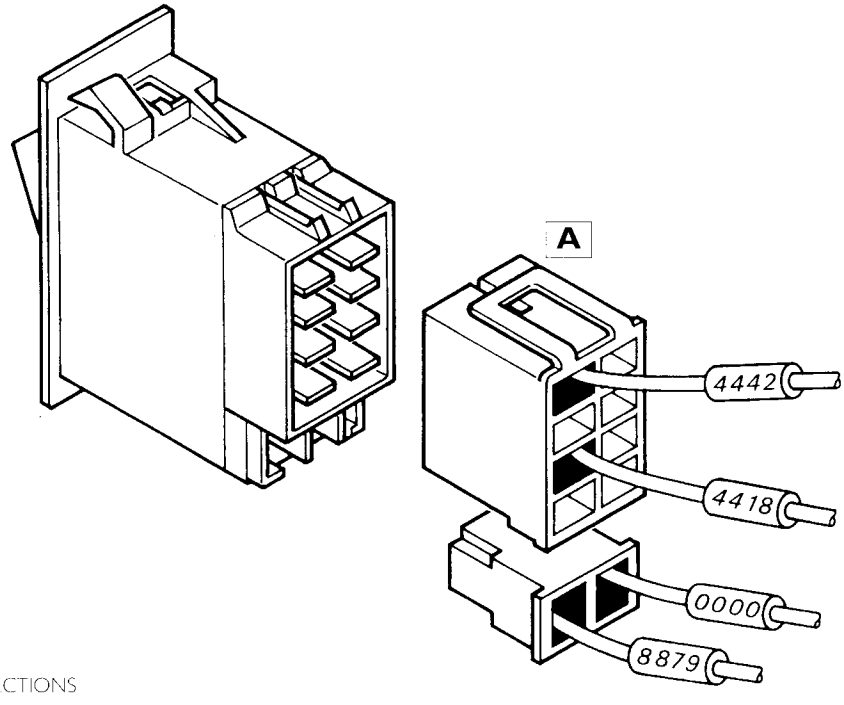


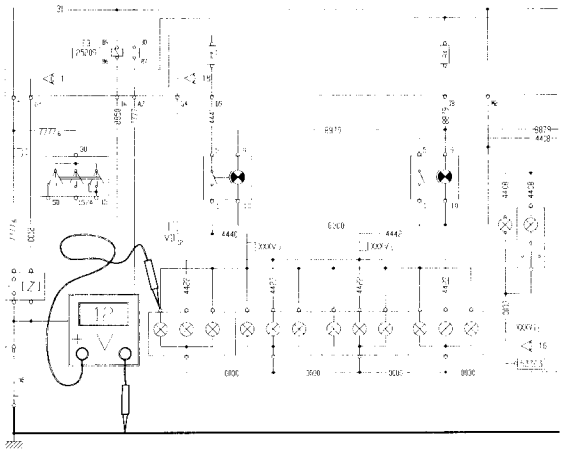
LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	Supply of blue interior lamps	4442
	2	Not used	–
	3	Not used	–
	4	Not used	–
	5	Supply (+30)	4418
	6	Not used	–
	7	Not used	–
	8	Not used	–
	9	Supply (+15/A) for switch lighting	8879
	10	Earth	0000

Blue and normal interior lighting ceiling lamp (bus)

SIMPLIFIED DIAGNOSIS

Disconnect connectors [A] [B] [C] [D] from component under examination.
Set multimeter to VOLT.
Press the interior lighting switch (page VII.15) and check for 12 V by setting one multimeter prod to terminal of connector [A] and the otherone to earth.
Press the interior blue lighting switch (page VII.16) and check for 12 V by setting one multimeter prod to connector [B] and the otherone to earth.
Set multimeter to OHM.
Check for 0 Ω by setting one multimeter prod to connector [D] and the otherone to earth.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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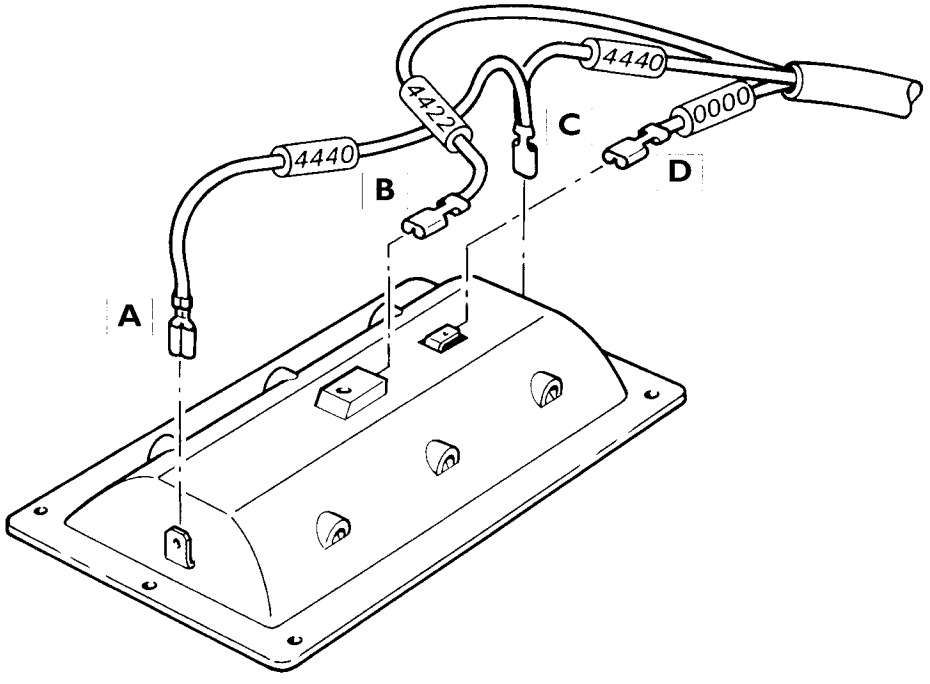


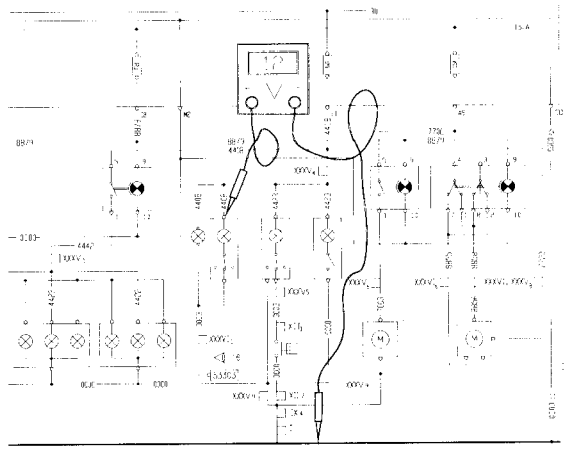
LAYOUT WITH CONNECTIONS

Connector	Function	Cable colour
A	Supply of normal lights	4440
B	Supply of blue lights	4422
C	Supply of normal lights	4440
D	Earth	0000

Step lighting ceiling lamp (bus)

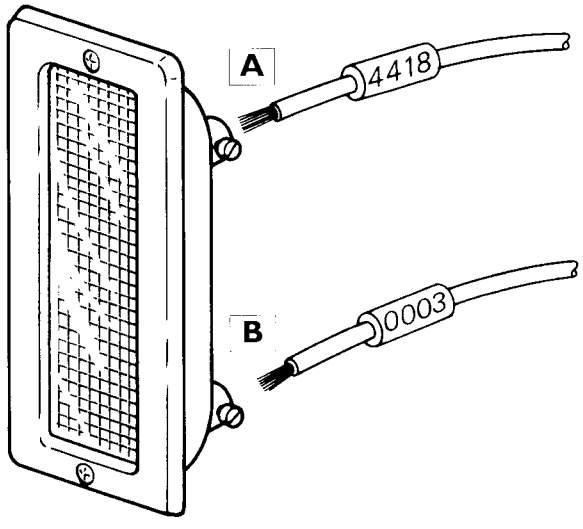
SIMPLIFIED DIAGNOSIS

Disconnect connectors [A] and [B] from component under examination.
Set multimeter to VOLT.
Check for 12 V by setting one multimeter prod to end of cable Aand the otherone to earth.
Set multimeter to OHM.
Check for 0 Ω by setting one multimeter prod to end of cable [B] and the otherone to terminal 1 of connector C2 (Worksho p Manual chart 16).
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



Print no. 603.42.961 Diagram no. 11

39003



5771

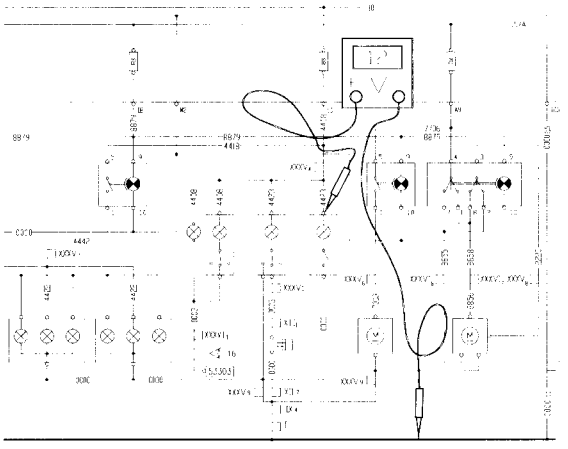
LAYOUT WITH I CONNECTIONS

Connector	Function	Cable colour
A	Lamp supply (+30)	4418
B	Ceiling lamp illumination via swing–sliding door opening system	0003

Luggage compartment ceiling lamp (bus)

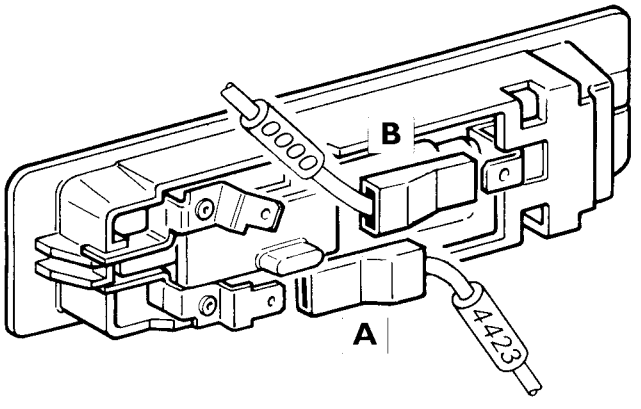
SIMPLIFIED DIAGNOSIS

Disconnect connectors [A] and [B] from component under examination.
Set multimeter to VOLT.
Check for 12 V by setting one multimeter prod to terminal of connector [A] and the otherone to earth.
Set multimeter to OHM.
Check for 0 Ω by setting one multimeter prod to terminal ofconnector [B] and the otherone to earth.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



Print no. 603.42.961 Diagram no. 11

39005



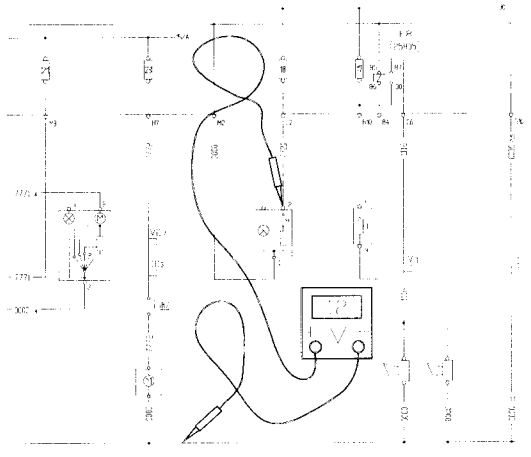
LAYOUT WITH I CONNECTIONS

Connector	Function	Cable colour
A	Lamp supply (+30)	4423
B	Ceiling lamp supply via luggage compartment door opening system	0000

Cigar lighter

SIMPLIFIED DIAGNOSIS

Disconnect connector [A] from component under examination.
Set multimeter to VOLT.
Check for 12 V by setting one multimeter prod to terminal 2 of connector [A], and the otherone to earth.
Set multimeter to OHM.
Check for 0 Ω by setting one multimeter prod to terminal 1 ofconnector [B] and the otherone to earth.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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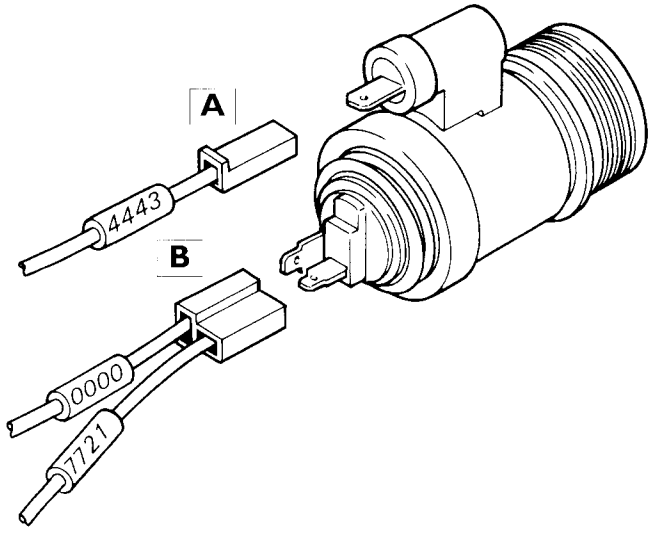
85000



5226

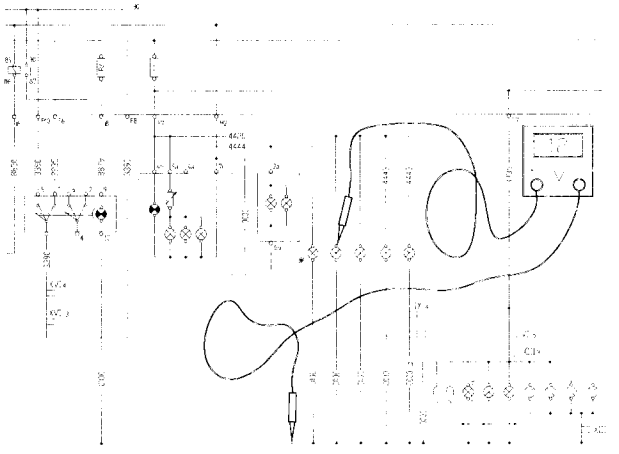
LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A		Parking light positive for cigar lighter	4443
B	1	Earth	0000
	2	Cigar lighter supply (+30)	7721

Ashtray light

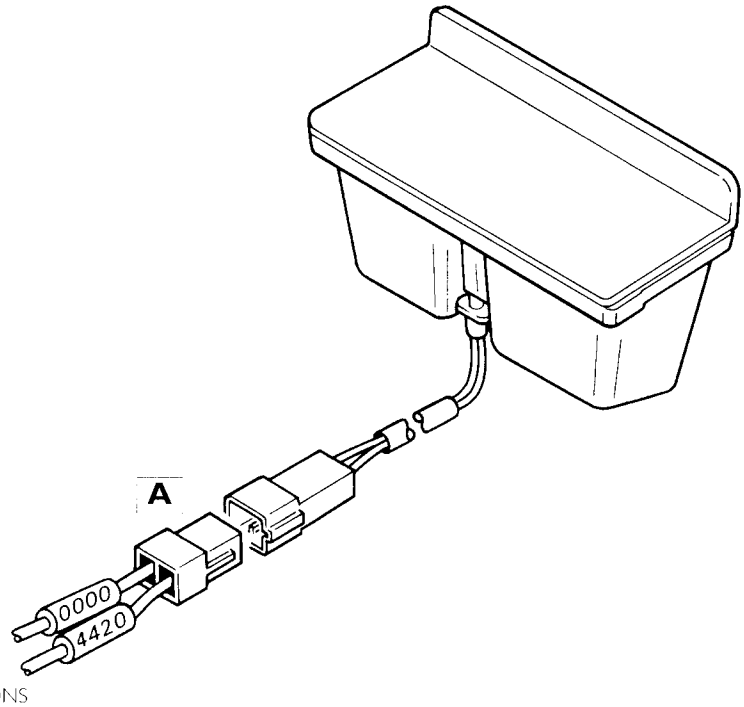
SIMPLIFIED DIAGNOSIS

Disconnect connector [A] from component under examination.
Set multimeter to VOLT.
Press the exterior lighting switch (page V.3) once.
Check for 12 V by setting one multimeter prod to terminal 2 of connector [A] and the otherone to earth.
Set multimeter to OHM.
Check for 0 Ω by setting one multimeter prod to terminal 1 of connector [A] and the otherone to earth.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



Print no. 603.42.961 Diagram no. 5

39020



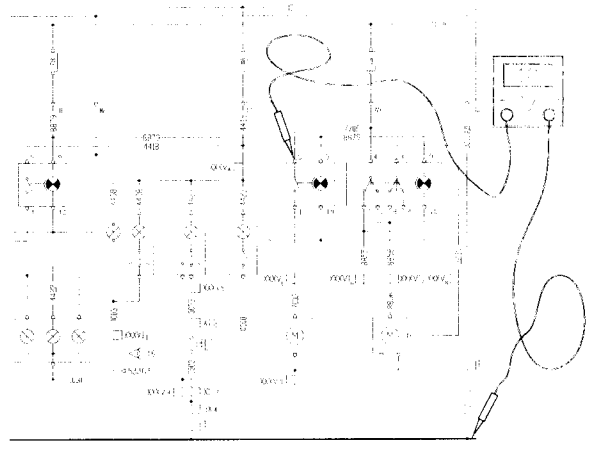
LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	Earth	0000
	2	Parking light positive for ashtray light	4420

Interior lighting switch (bus)

SIMPLIFIED DIAGNOSIS

Disconnect connector [A] from component under examination.
Set multimeter to VOLT.
Put the ignition switch key in position 15.
Check for 12 V by setting one multimeter prod to terminal 5 of connector [A] and the otherone to earth.
Set multimeter to OHM.
Return the key to rest position.
Press the switch key and check for 0 Ω by setting multimeter prods to terminals 1 and 5 of same switch.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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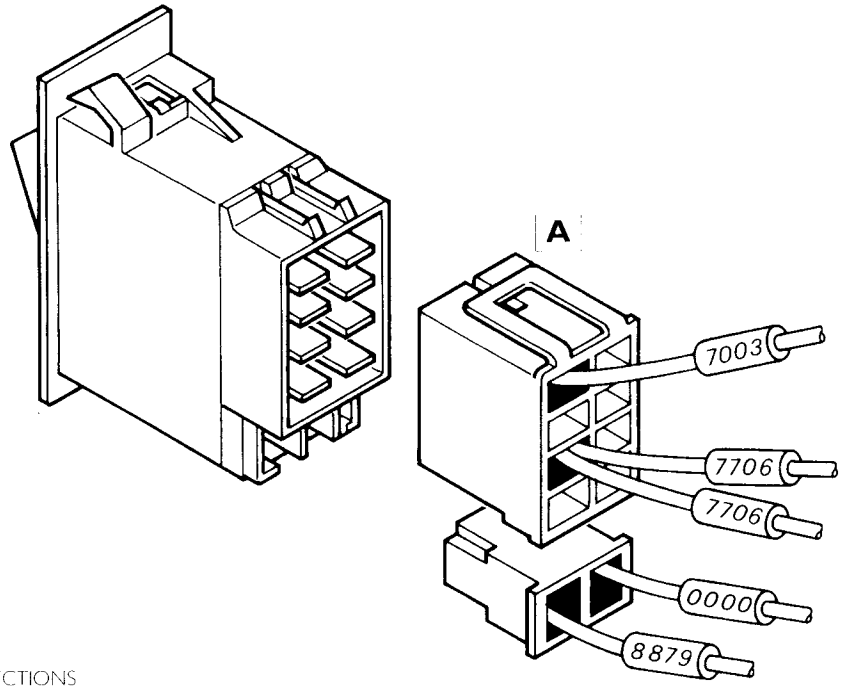
52030



5228

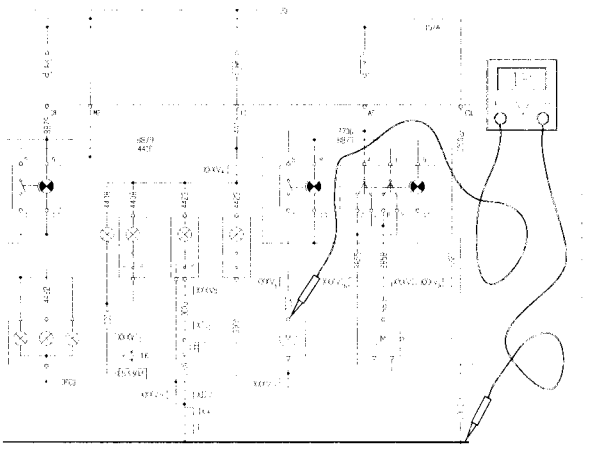
LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	Interior heating motor operation	7003
	2	Not used	–
	3	Not used	–
	4	Not used	–
	5	Supply (+15/A)	7706
	6	Not used	–
	7	Not used	–
	8	Not used	–
	9	Supply (+15/A) for switch lighting	8879
	10	Earth	0000

Interior heating motor (bus)

SIMPLIFIED DIAGNOSIS

Disconnect connector [A] from component under examination.
Set multimeter to VOLT.
Put the ignition switch key in position 15.
While keeping the interior heating switch key pressed (page VII.22) check for 12 V by setting one multimeter prod to terminal 2 of connector [A] and the otherone to earth.
Set multimeter to OHM.
Return the key to rest position.
Check for 0 Ω by setting one multimeter prod to terminal 1 of connector [A] and the otherone to earth.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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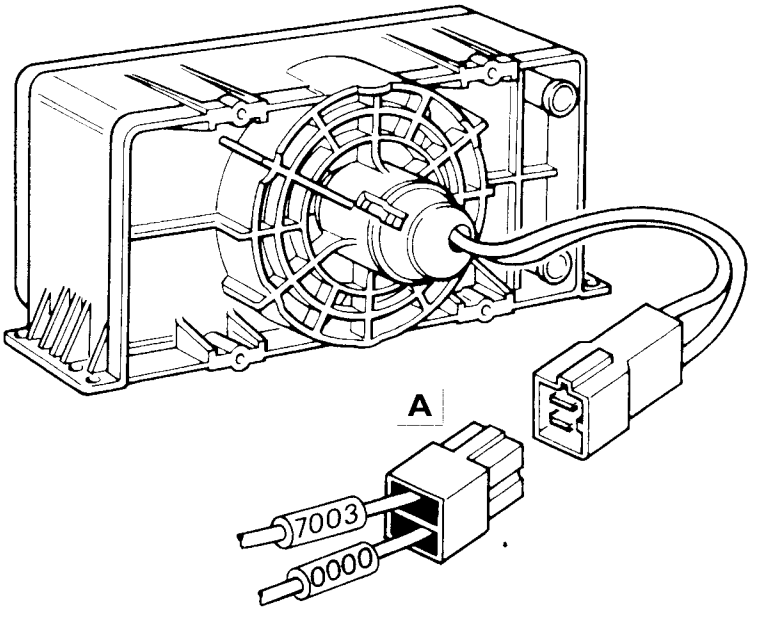
12009



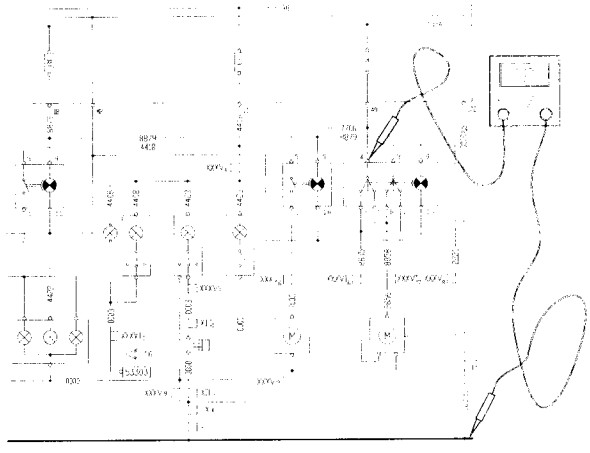
LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	Earth	0000
	2	Interior heating motor	7003

Internal aerator switch with built–in warning lamp

SIMPLIFIED DIAGNOSIS

Disconnect connector A from component under examination.
Set multimeter to VOLT.
Put the ignition switch key in position 15.
Check for 12 V by setting one multimeter prod to terminal 4of connector A and the otherone to earth.
Set multimeter to OHM.
Return the key to rest position.
Set the switch to either one of the two available positions and check for 0 Ω by setting multimeter prods to terminals 4- 7 and 3 8 of same switch.
Put the switch in the other position and check for 0 Ω by setting multimeter prods to terminals 4 1 and 3 2 of same switch.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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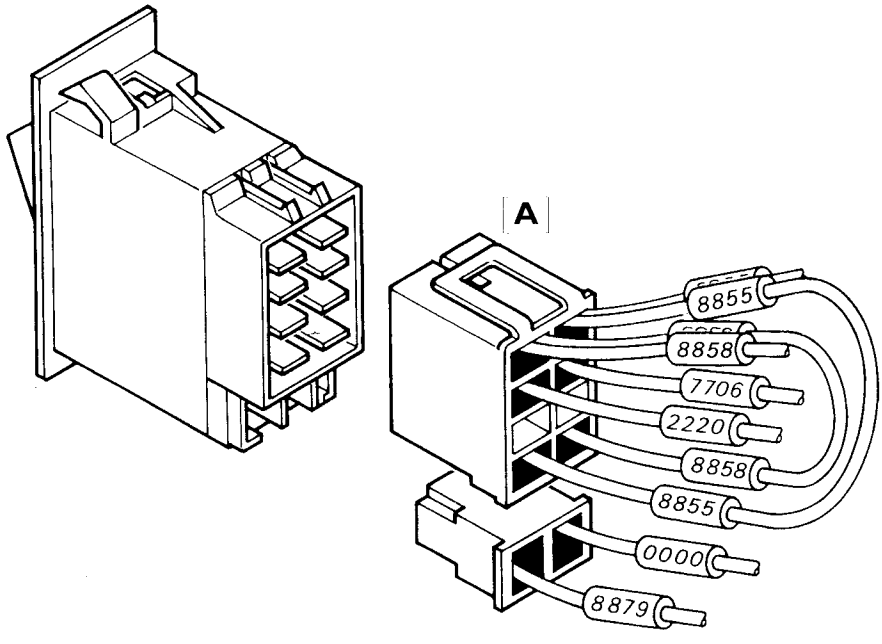
52311



5230

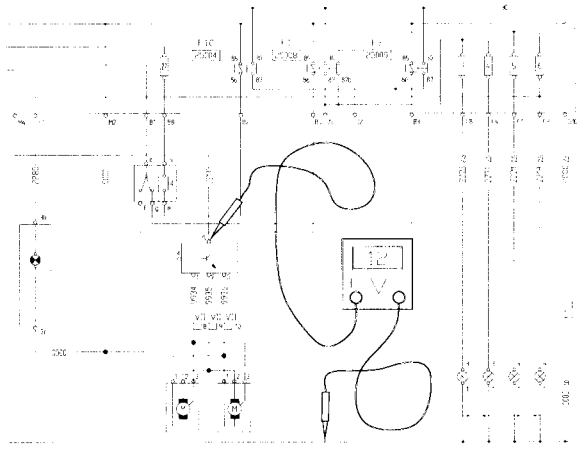
LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	To internal aerator motor	8858
	2	To internal aerator motor	8855
	3	To internal aerator motor	2220
	4	Supply (+15/A)	7706
	5	Not used	–
	6	Not used	–
	7	To switch cell no. 2	8855
	8	To switch cell no. 1	8858
	9	Supply (+15/A) for switch lighting	8879
	10	Earth	0000

Headlamp alignment control switch

SIMPLIFIED DIAGNOSIS

Disconnect connector [A] from component under examination.
Set multimeter to VOLT.
Press the exterior lighting switch (page V.3) once.
Check for 12 V by setting one multimeter prod to terminal 5 of connector [A] and the other one to earth.
Set multimeter to OHM.
Check for 0 Ω by setting one multimeter prod to terminal 4 of connector [A] and the other one to earth.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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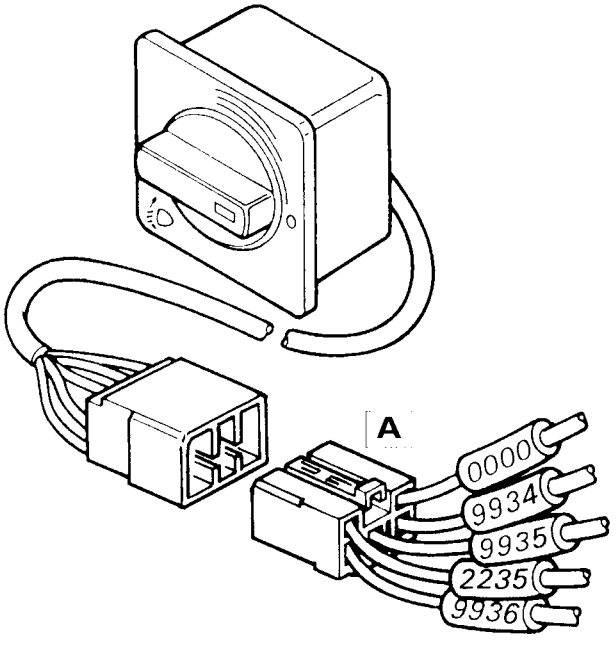
52312



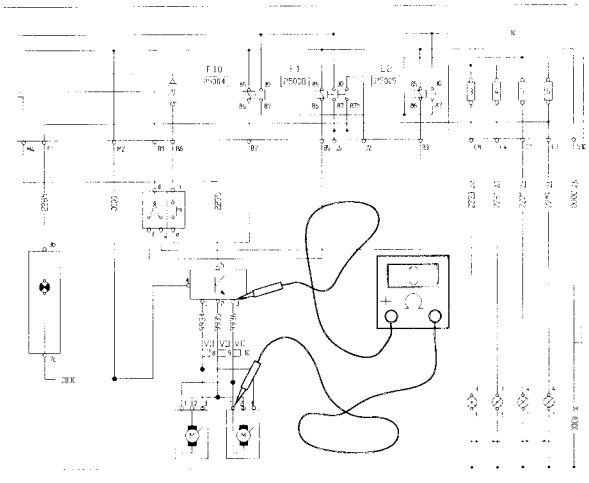
LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	To headlamp alignment unit actuator	9934
	2	To headlamp alignment unit actuator	9935
	3	To headlamp alignment unit actuator	9936
	4	Earth	0000
	5	Supply from exterior lighting switch	2235

Headlamp alignment unit actuator

SIMPLIFIED DIAGNOSIS

Disconnect connector [A] from component under examination.
Set multimeter to OHM.
Check for 0 Ω by setting one multimeter prod to terminal 1 of connector [A] and the otherone to terminal 3 of headlamp alignment unit actuator switch (page VII.25).
Repeat the test with multimter prods set to terminal 2 of connector [A] and terminal 2 of the switch and terminal 3 of connector [A] and terminal 1 of the switch.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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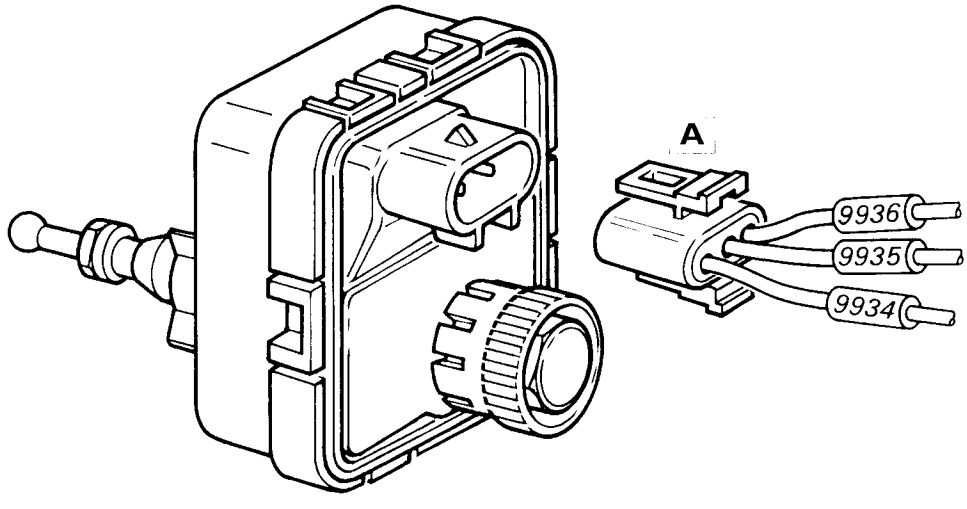
30100



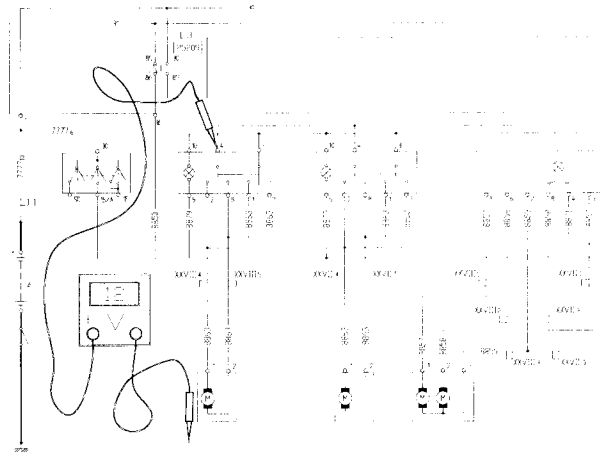
LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	To headlamp alignment unit control switch	9936
	2	To headlamp alignment unit control switch	9935
	3	To headlamp alignment unit control switch	9934

Power window switch

SIMPLIFIED DIAGNOSIS

Disconnect connector A from component under examination.
Set multimeter to VOLT.
Put the ignition switch key in position 15.
Check for 12 V by setting one multimeter prod to terminal 4 of connector A and the otherone to earth.
Set multimeter to OHM.
Return the key to rest position.
Check for 0 Ω by setting one multimeter prod to terminal 3 of connector A and the otherone to earth.
While keeping the switch pressed in either one of the two available positions check for 0 Ω by setting multimeter prods to terminals 4 2 and 3 1 of same switch.
With the switch pressed in the other position check for 0 Ω by setting multimeter prods to terminals 4-8 and 3 7 of same switch.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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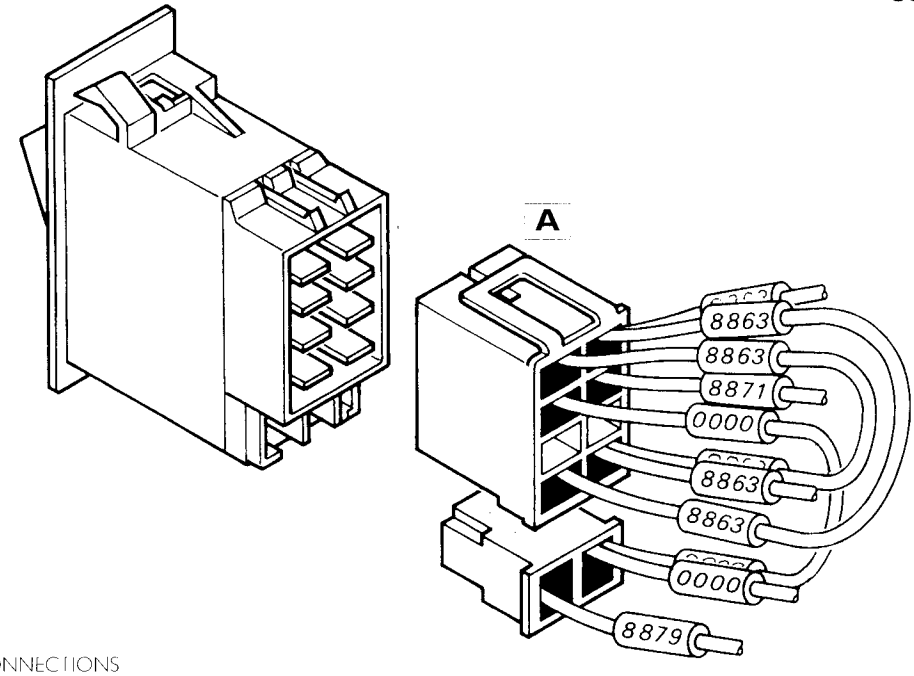
53300 **53302**



LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	Jumper to switch cell no. 8	8863
	2	To power window motor	8863
	3	Jumper to switch cell no. 10	0000
	4	Supply (+15/A)	8871
	5	Not used	–
	6	Not used	–
	7	Jumper to switch cell no. 2	8863
	8	To power window motor	8863
	9	Supply (+15/A) for switch lighting	8879
	10	Earth	0000

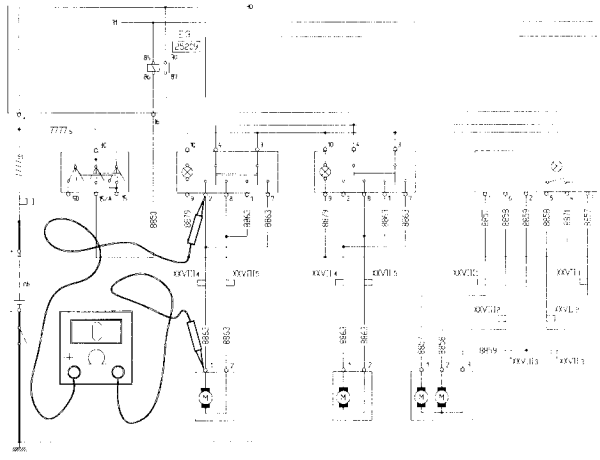
Power window motor

SIMPLIFIED DIAGNOSIS

Disconnect connector [A] from component under examination.
Set multimeter to OHM.

- Check for 0 Ω by setting one multimeter prod to terminal 1 of connector "A" and the otherone to terminal 2 of power window switch(page VII.27).
- Check for 0 Ω by setting one multimeter prod to terminal 2 of connector "A" and the otherone to terminal 8 of power window switch connector.

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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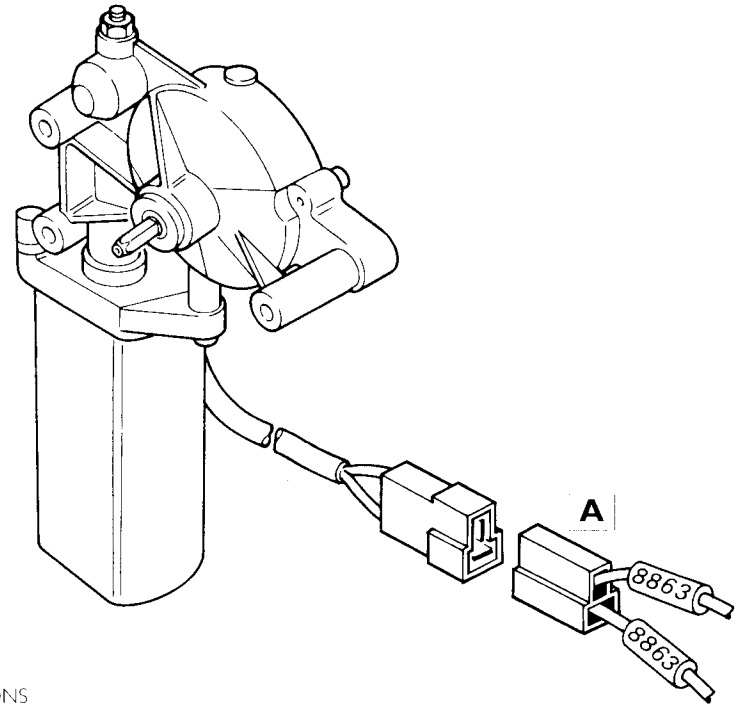
80000 | 80001



5235

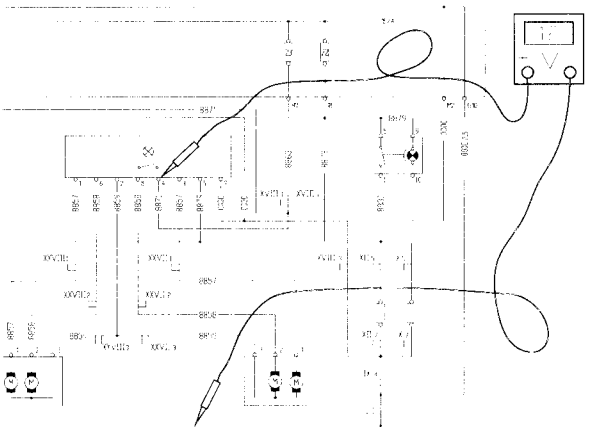
LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	To power window switch	8863
	2	To power window switch	8863

Adjustable rearview mirror switch

SIMPLIFIED DIAGNOSIS

Disconnect connector A from component under examination.
Set multimeter to VOLT.
Put the key in position 15.
Check for 12 V by setting one multimeter prod to terminal 4 of connector A and the otherone to earth.
Repeat the same test on terminal 5.
Set multimeter to OHM.
Return the key to rest position.
Check for 0 Ω by setting one multimeter prod to terminal 7 of connector A and the otherone to earth.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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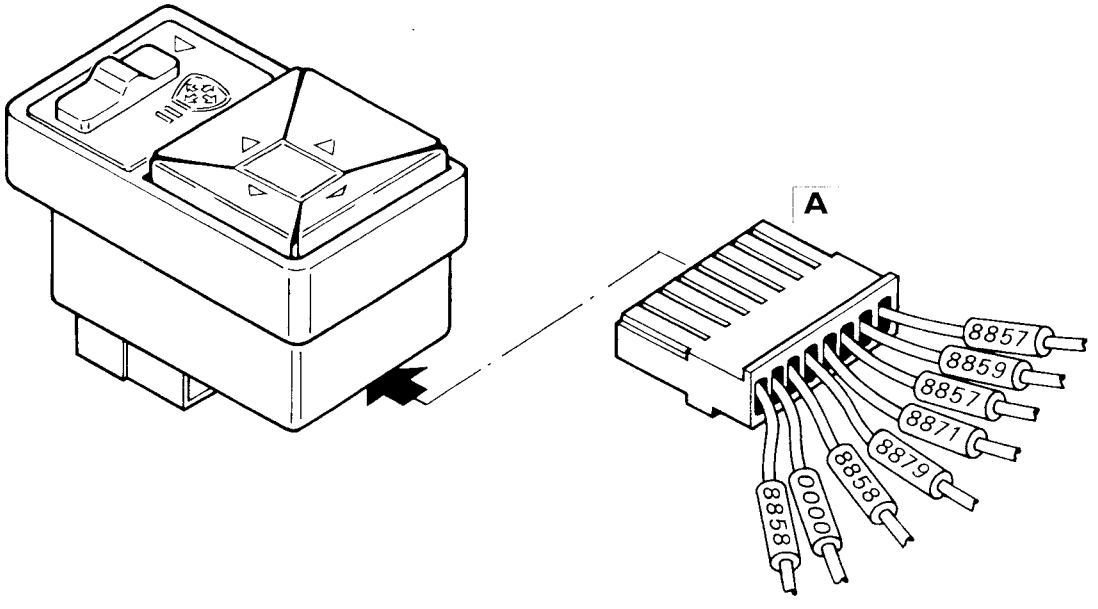
52310



LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	To lh rearview mirror adjustment motor	8857
	2	To common terminal for rearview mirror adjustment	8859
	3	To rh rearview mirror adjustment motor	8857
	4	Supply (+15/A)	8871
	5	Supply (+15/A) for switch lighting	8879
	6	To lh rearview mirror adjustment motor	8858
	7	Earth	0000
	8	To rh rearview mirror adjustment motor	8858

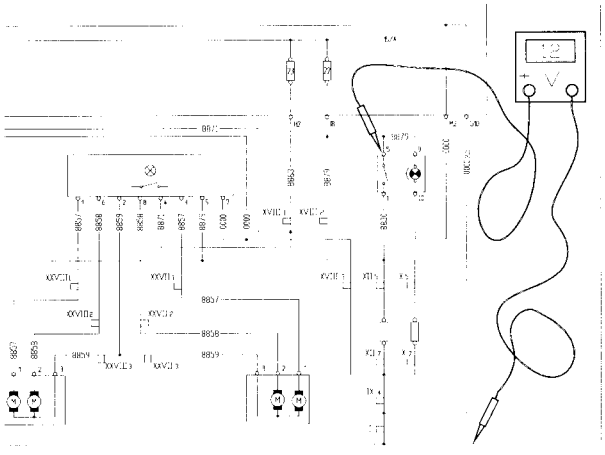
Heated rearview mirror switch with built–in warning lamp

SIMPLIFIED DIAGNOSIS

Disconnect connector [A] from component under examination.
Set multimeter to VOLT.
- Put the key in position 15.
- Check for 12 V by setting multimeter prod to terminal 5 of connector [A] and the otherone to earth.

Set multimeter to OHM.
- Return the key to rest position.
- While keeping the switch key pressed check for 0 Ω by setting multimeter prods to terminals 1 and 5 of same switch.

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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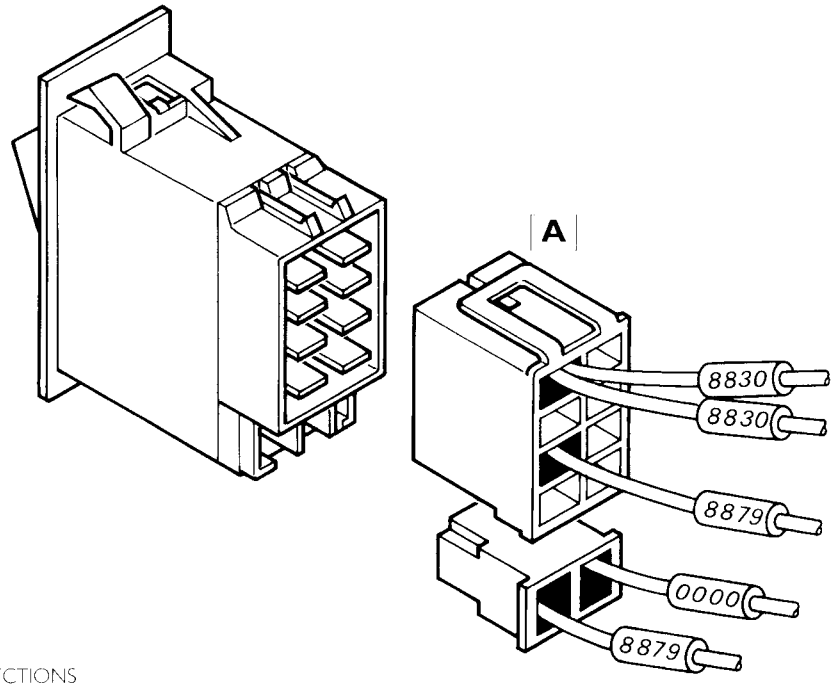


523/

LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	To heated rearview mirror resistors	8830
	2	Not used	–
	3	Not used	–
	4	Not used	–
	5	Supply (+15/A)	8879
	6	Not used	–
	7	Not used	–
	8	Not used	–
	9	Supply (+15/A) for switch lighting	8879
	10	Earth	0000

Electrically–operated heated rearview mirror

SIMPLIFIED DIAGNOSIS

Disconnect connectors [A] [B] and [C] from component under examination.

Set multimeter to OHM.

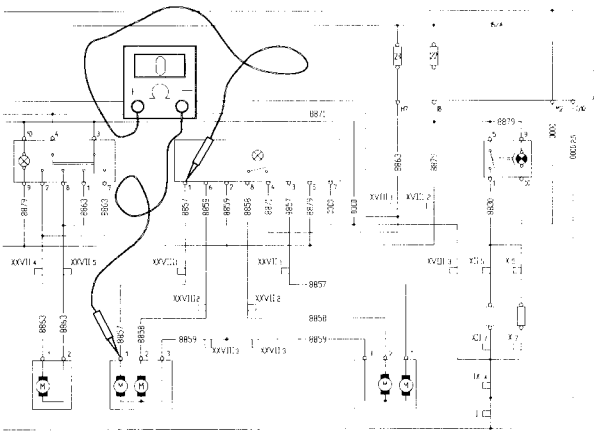
Check for 0 Ω by setting one multimeter prod to terminal 1 of connector [A] and the otherone to terminal 1 of adjustable rearview mirror switch (page VII.29).

Check for 0 Ω by setting one multimeter prod to terminal 2 of connector [A] and the otherone to terminal 6 of the switch. Repeat the test with multimeter prods set to terminal 3 of connector [A] and terminal 2 of the switch.

Check for 0 Ω by setting one multimeter prod to terminal of connector, [C] and the otherone to terminal 1 of heated rearview mirror connector (page VII.30).

Check for 0 Ω by setting one multimeter prod to terminal of connector [B] and the otherone to earth.

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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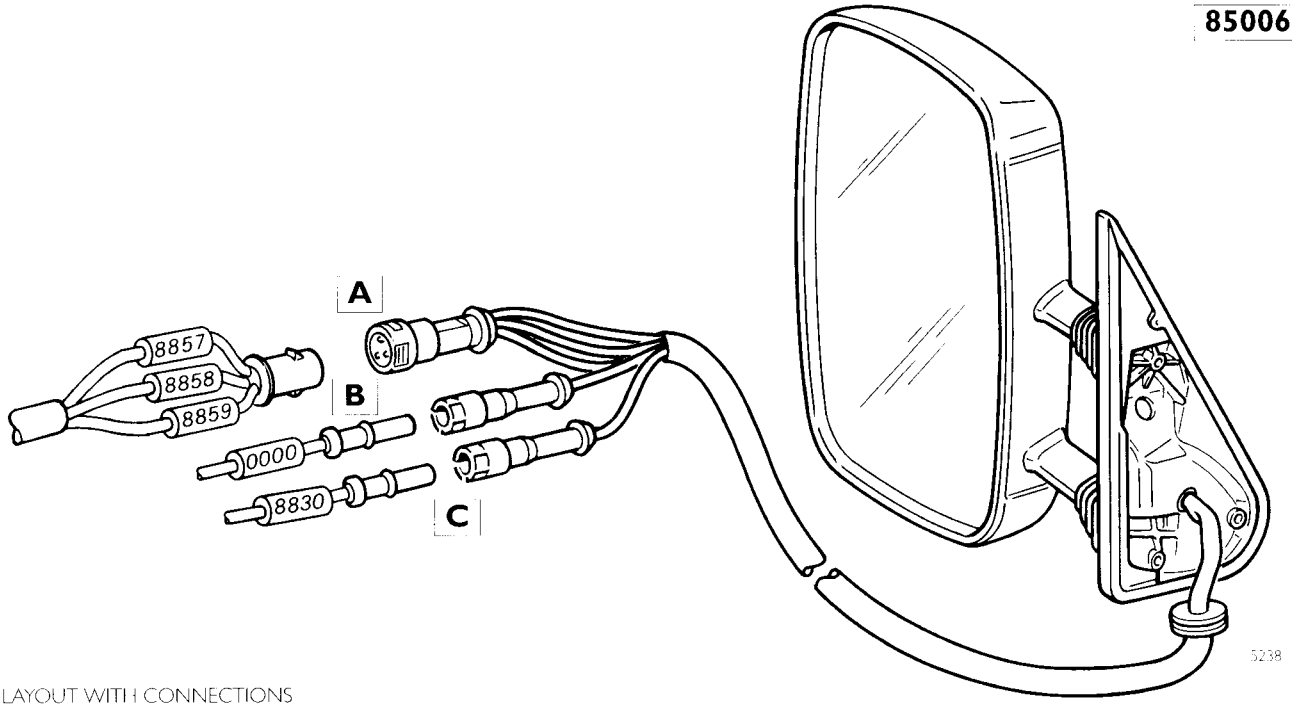
85006



LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	To adjustable rearview mirror switch	8857
	2	To adjustable rearview mirror switch	8858
	3	To adjustable rearview mirror switch	8859
B	–	Earth	0000
C	–	Supply of heated rearview mirror resistor	8830

SPECIAL CIRCUITS

SPECIAL CIRCUITS
ABS system solenoid valve and relay unit

SIMPLIFIED DIAGNOSIS

Disconnect connector blocks A and B from component under examination.

Set multimeter to VOLT:

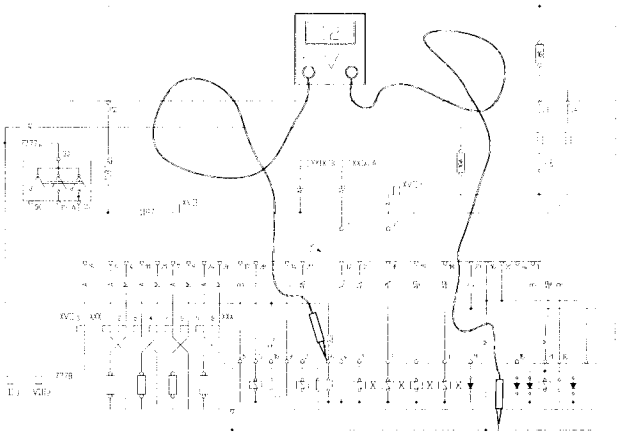
Check for 12 V by setting one multimeter prod to terminal 6 of connector A and the otherone to earth.

Check for 12 V by setting one multimeter prod to terminal 10 of connector A and the otherone to earth.

Set multimeter to OHM.

Check for 0 Ω by setting one multimeter prod to terminal of connector B and the otherone to earth.

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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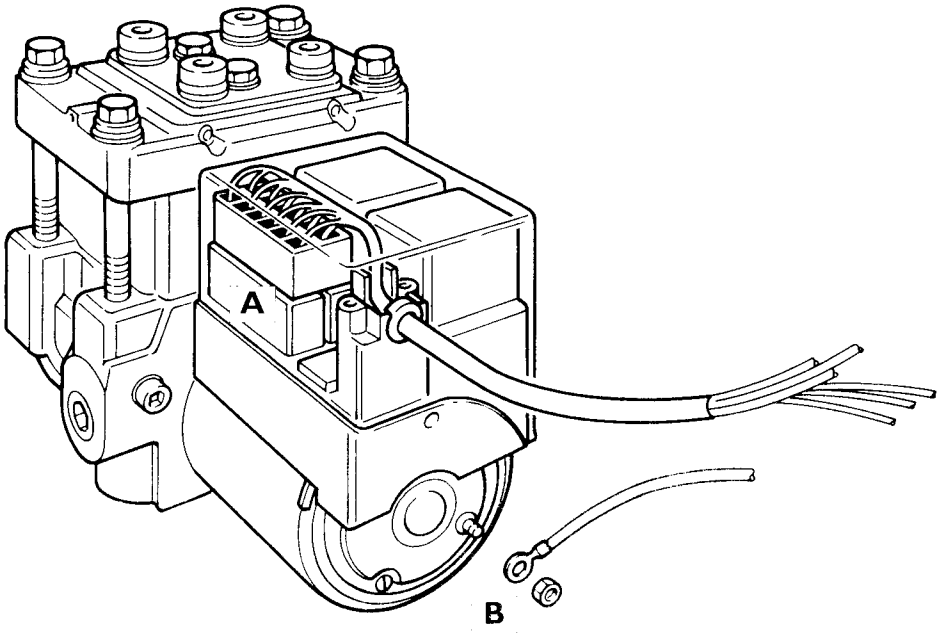
88003



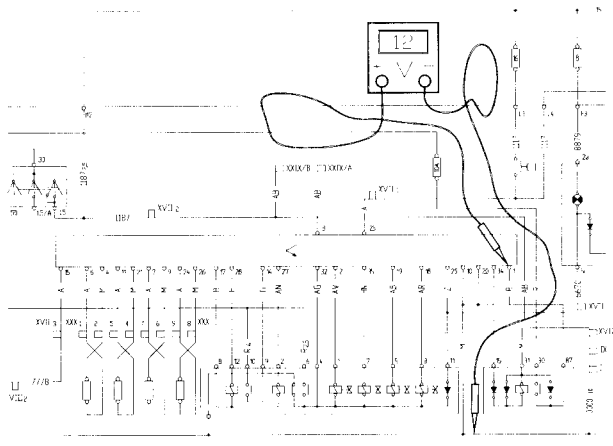
LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
	1	To terminal 2 of ABS control unit	light blue/green
	2	To terminal 27 of ABS control unit	light blue/black
	3	To terminal 18 of ABS control unit	light blue/red
	4	To terminal 32 of ABS control unit	light blue/yellow
	5	To terminal 19 of ABS control unit	light blue/white
A	6	Supply (+30)	red
	7	To terminal 35 of ABS control unit	grey/black
	8	To terminal 17 of ABS control unit	white
	9	To terminal 14 of ABS control unit	yellow
	10	Supply (+30)	red
	11	To cab loom junction block (cell no. 4)	violet
	12	To terminal 28 of ABS control unit	grey

ABS system electronic control unit

SIMPLIFIED DIAGNOSIS

Disconnect connector |A| from component under examination.
Set multimeter to VOLT.
Put the ignition switch key in position 15.
Check for 12 V by setting one multimeter prod to terminal 1 of connector |A| and the otherone to earth.
Set multimeter to OHM.
Return the key to OFF position.
Check for 0 Ω by setting one multimeter prod to terminal 10 of connector |A| and the otherone to earth. Repeat the test with multimeter prods set to terminals 20 and 34.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



Print no. 603.42.961 Diagram no. 14

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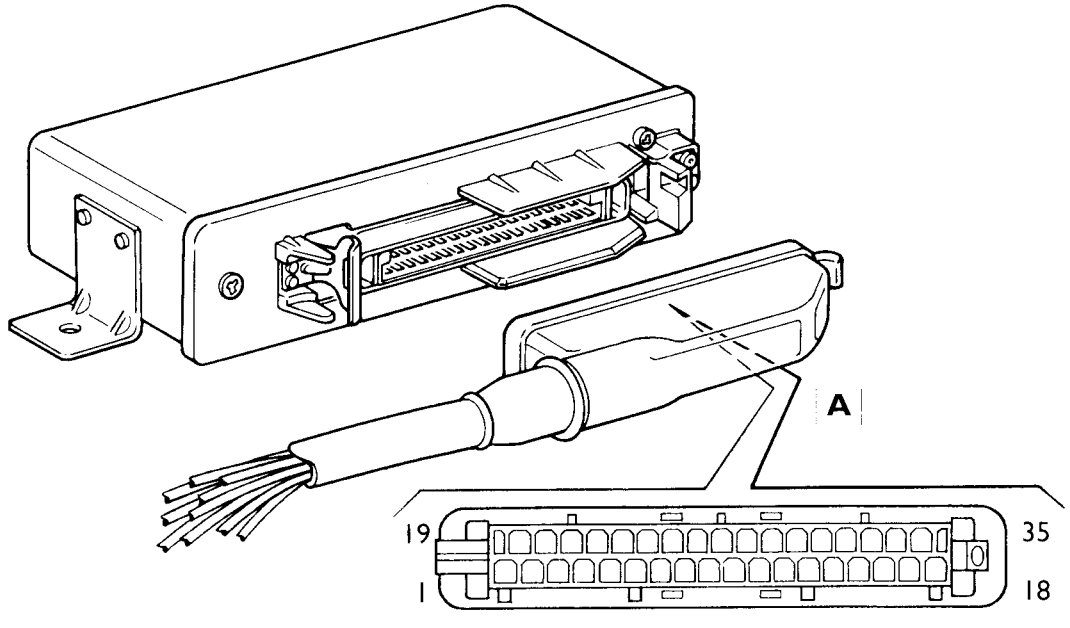


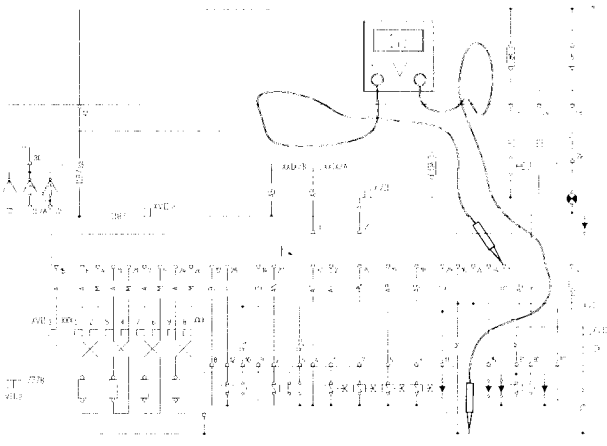
LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	Supply (+30) with overvoltage protection relay on	white
	2	To ABS solenoid valve and relay unit (solenoid valve)	light blue/green
	3	To Telma retarder prearrangement	light blue/white
	4	To ABS front lh sensor	Brown
	5	Not used	–
	6	To ABS front lh sensor	Light blue
	7	To ABS rear lh sensor	Light blue
	8	Not used	–
	9	To ABS rear lh sensor	Brown
	10	Earth	Brown
	11	To ABS front rh sensor	Light blue
	12–13	Not used	–
	14	To ABSS solenoid valve relay unit (relay)	Yellow
	15	Alternator positive (D+)	Light blue
	16	Not used	–
	17	To ABS solenoid valve and relay unit (common for both relay coils)	White

ABS system electronic control unit

SIMPLIFIED DIAGNOSIS

Disconnect connector [A] from component under examination.
Set multimeter to VOLT.
Put the ignition switch key in position 15.
Check for 12 V by setting one multimeter prod to terminal 1 of connector [A] and the otherone to earth.
Set multimeter to OHM.
Return the key to OFF position.
Check for 0 Ω by setting one multimeter prod to terminal 10 of connector [A] and the otherone to earth. Repeat the test with multimeter prods set to terminals 20 and 34.
If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



Print no. 603.42.961 Diagram no. 14

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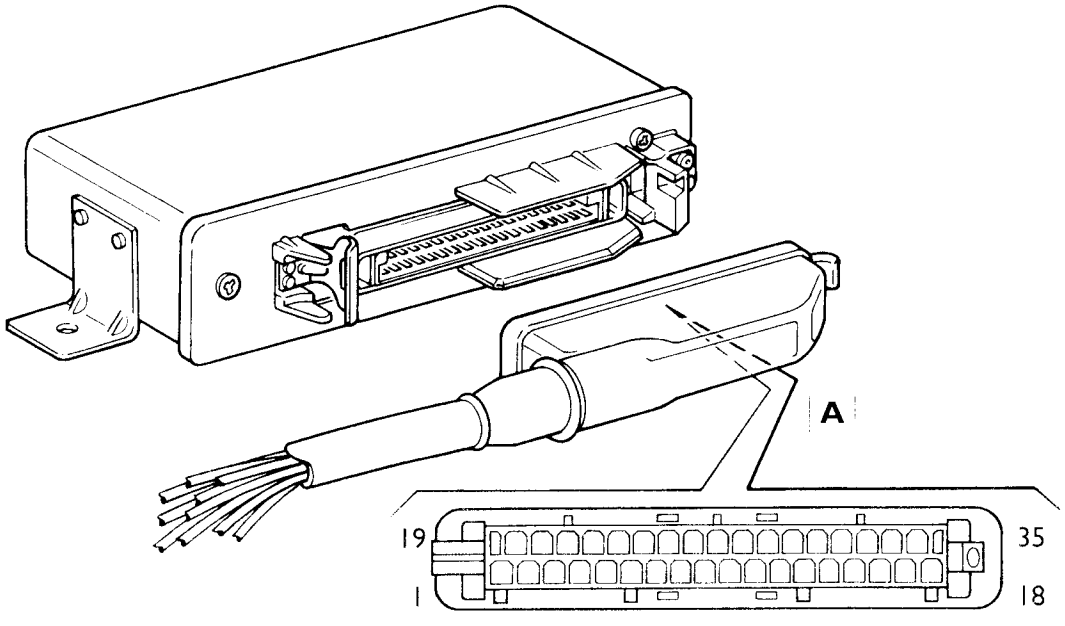


LAYOUT WITH CONNECTIONS

Connector	Function	Cable colour
18	To ABS solenoid valve and relay unit (solenoid valve)	light blue/red
19	To ABS solenoid valve and relay unit (solenoid valve)	light blue/white
20	Earth	brown
21	To ABS front rh sensor	brown
22–23	Not used	–
24	To ABS rear rh senosr	light blue
25	Supply (+15) with stop signal switch on	light blue
A 26	To ABS rear rh senosr	brown
27	To ABS solenoid valve and relay unit (relay)	light blue/black
28	To ABS solenoid valve and relay unit (relay)	grey
29	ABS system failure indicator	violet
30–31	Not used	–
32	To ABS solenoid valve and relay unit	light blue/yellow
33	Not used	–
34	Earth	brown
35	To ABS solenoid valve and relay unit (solenoid valve)	grey/black

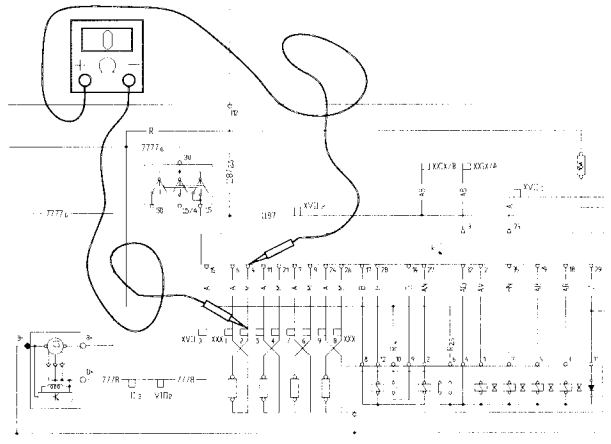
ABS system front wheel sensors

SIMPLIFIED DIAGNOSIS

Disconnect connector [A] from ABS sensors.
Set multimeter to OHM.

Check for 0 Ω by setting one multimeter prod to terminal 2 of connector [A] and the otherone to terminal 4 of ABS control unit connector.
Check for 0 Ω by setting one multimeter prod to terminal 1 of connector [A] and the otherone to terminal 6 of ABS control unit connector.
Repeat the test with multimeter prods set to terminal 5 of connector [A] and terminal 11 of control unit, terminal 4 of connector [A] and terminal 21 of control unit.

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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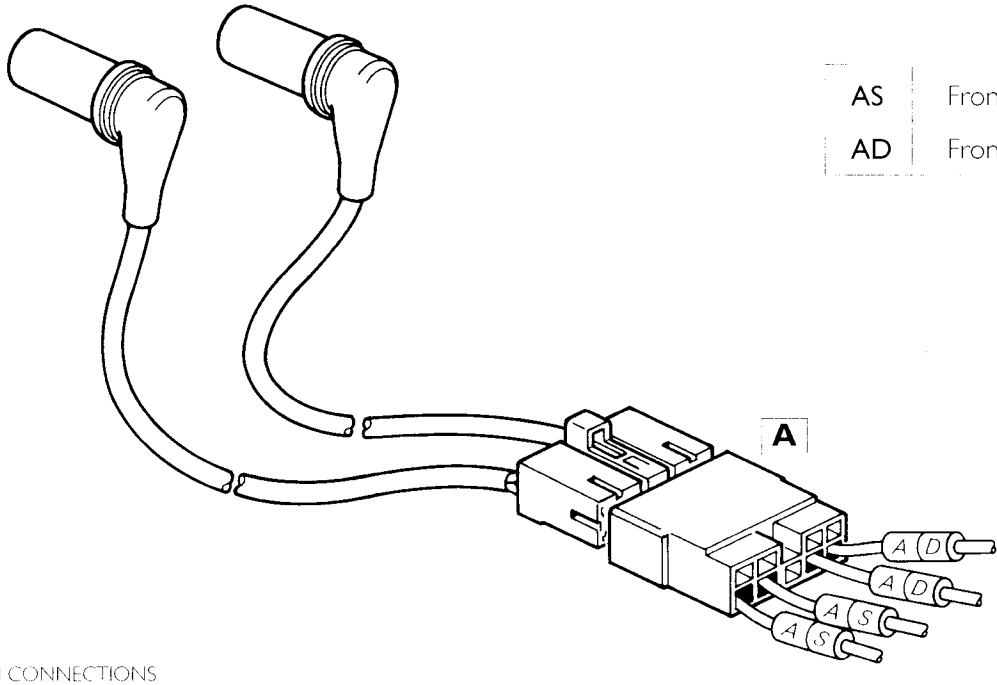
AS	Front left
AD	Front right



LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	To terminal 6 of ABS control unit	light blue
	2	To terminal 4 of ABS control unit	brown
	3	Not used	–
	4	To terminal 21 of ABS control unit	brown
	5	To terminal 11 of ABS control unit	light blue
	6	Not used	–
	7	Not used	–
	8	Not used	–
	9	Not used	–

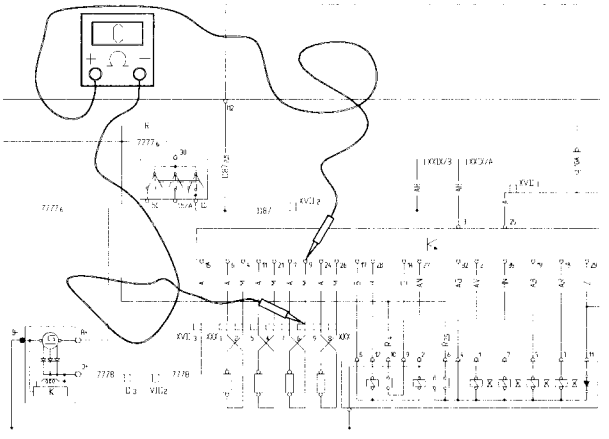
ABS system rear axle wheel sensors

SIMPLIFIED DIAGNOSIS

Disconnect connector [A] from ABS sensors.
Set multimeter to OHM.

Check for 0 Ω by setting one multimeter prod to terminal 6 of connector [A] and the otherone to terminal 9 of ABS control unit connector.
Check for 0 Ω by setting one multimter prod to terminal 7 of connector [A] and the otherone to terminal 7 of ABS control unit connector. Repeat the test with multimeter prods set to terminal 8 of connector [A] and terminal 26 of control unit, terminal 9 of connector [A] and terminal 24 of control unit.

If readings are other than specified, remedy as required by either repairing the circuit or replacing the component. Then repeat the test.



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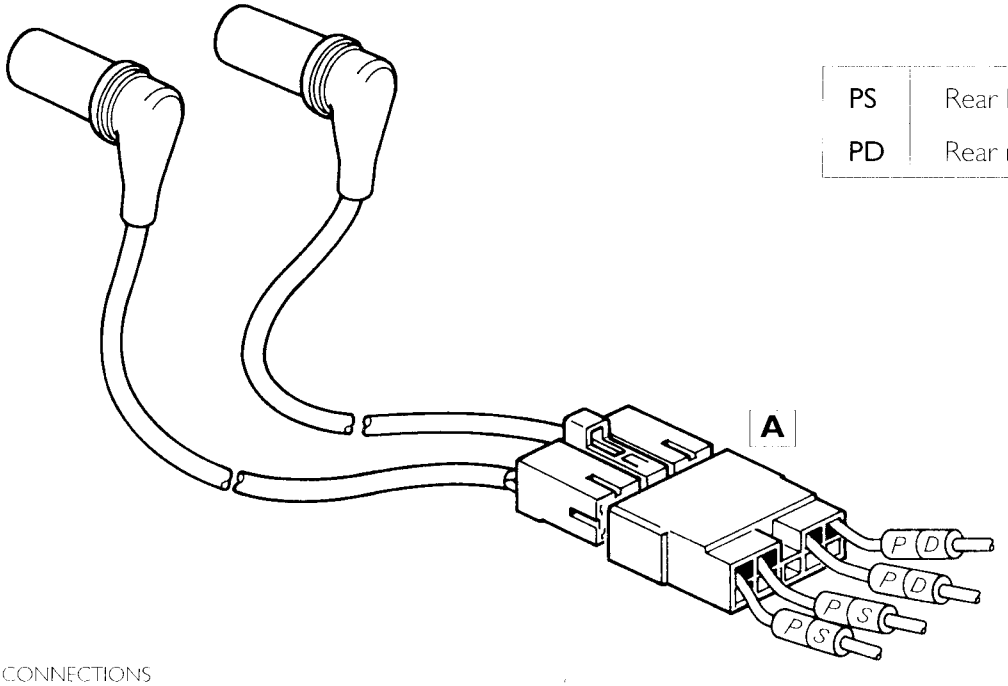
PS	Rear left
PD	Rear right



LAYOUT WITH CONNECTIONS

Connector		Function	Cable colour
A	1	Not used	–
	2	Not used	–
	3	Not used	–
	4	Not used	–
	5	Not used	–
	6	To terminal 9 of ABS control unit	brown
	7	To terminal 7 of ABS control unit	light blue
	8	To terminal 26 of ABS control unit	brown
	9	To terminal 24 of ABS control unit	light blue

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GENERAL LIST OF CONTENTS

INTRODUCTION

Warnings

The symbols listed below are often used in the following pages. For your personal safety and the safety of the vehicle, it is imperative to follow carefully all the instructions and warnings given below.

Shows that failure to comply with the instructions may result in physical injuries.

Shows that failure to comply with the instructions may result in damages to the electrical equipment and/or the systems and/or instruments.

Shows a warning of a general nature.

General conditions for the preparation of the wiring diagrams

- i.c. engine off
- key–operated switch off
- Hand–brake engaged
- Gearbox in neutral
- Liquid level is normal

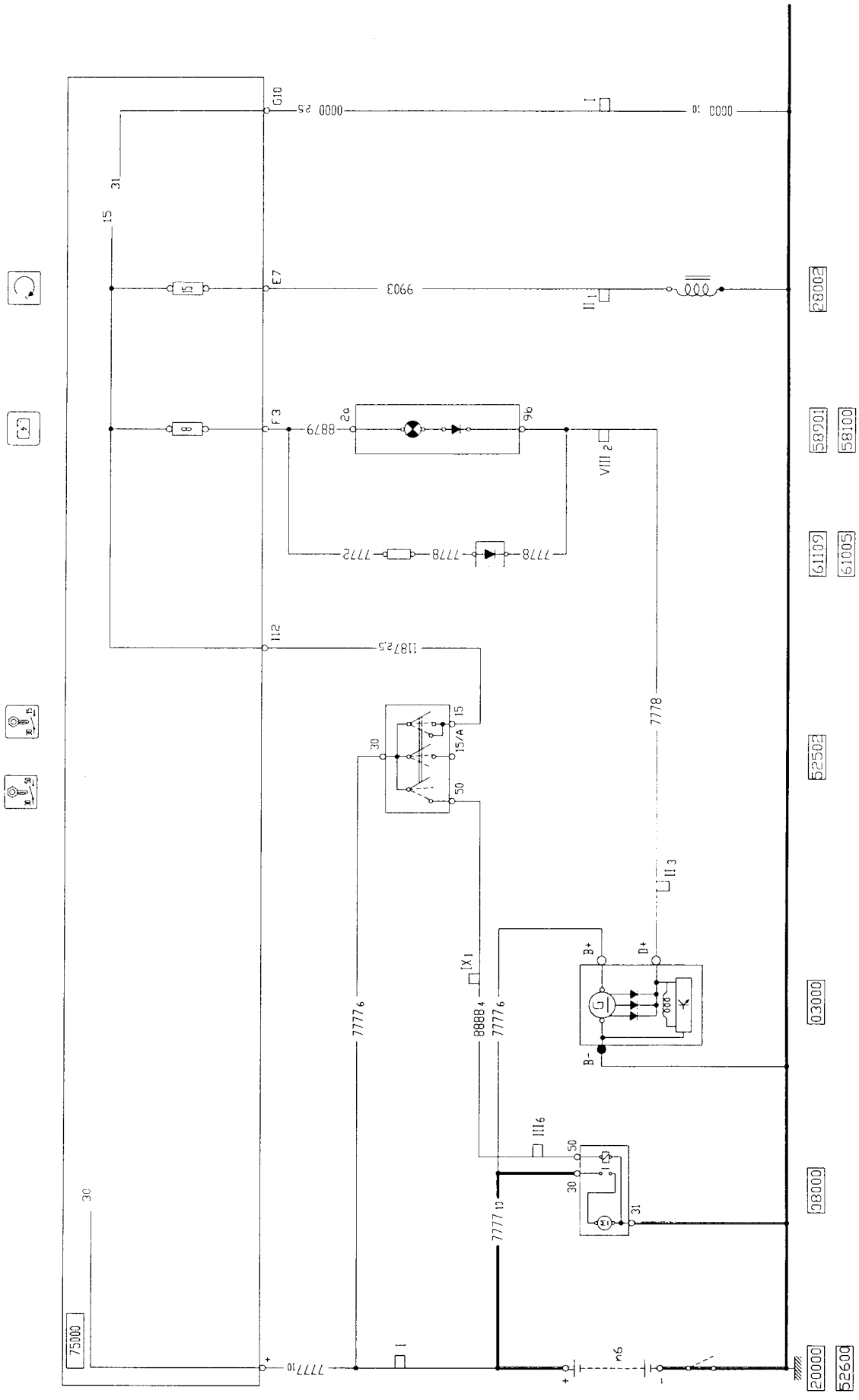
For more detailed information on the components adopted for the Daily/TurboDaily/TurboDaily 4X4 range, see the manual "Electrical/electronic components", publication n°. 603.42.971.
The technical codes (component codes and cable colour codes) can be found in manual "Warnings and Technical codes" publication n° . 603.42.936.

Abbreviations and graphic symbols used in tents.

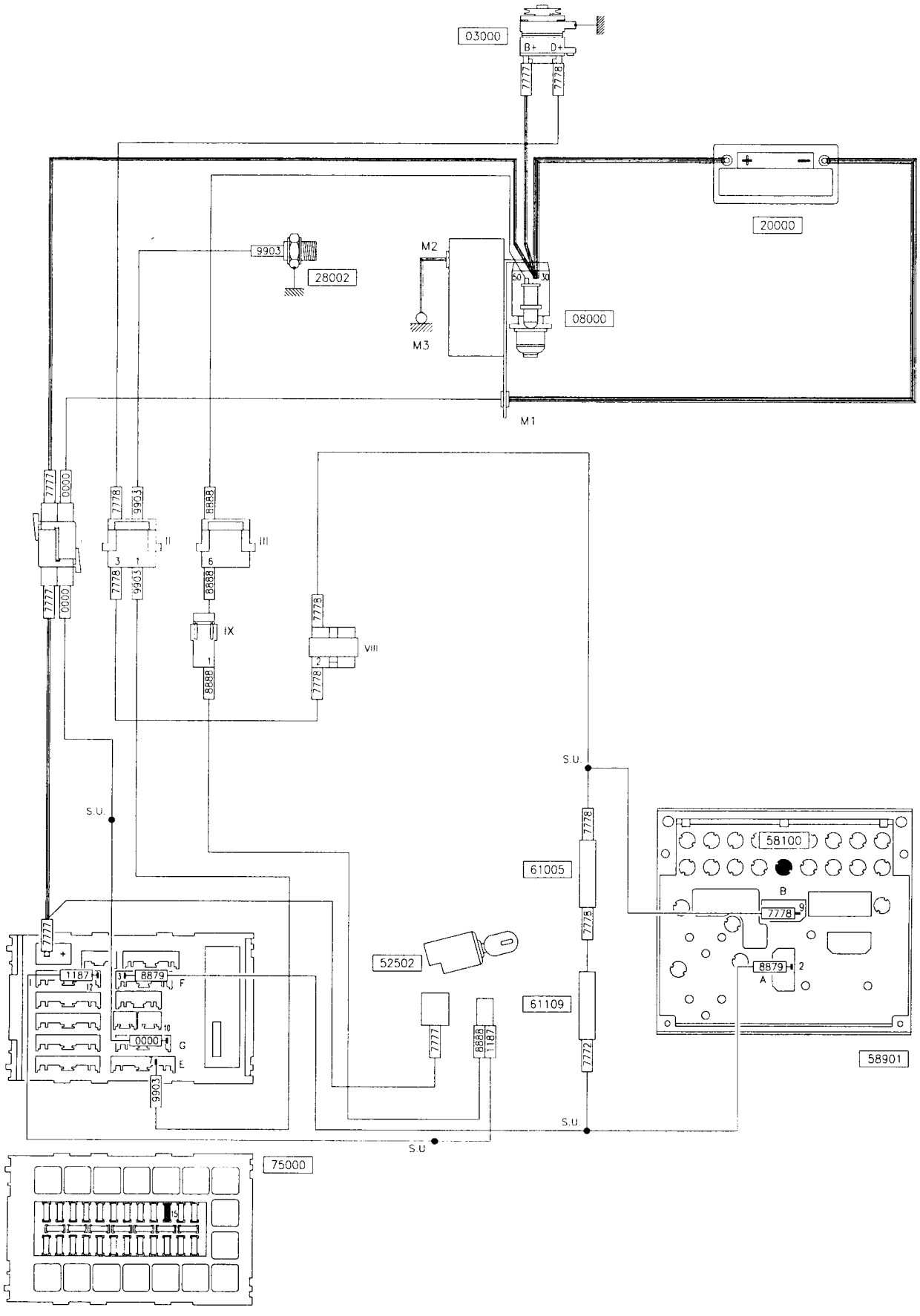
B	Connector on UCI B = identification letter
ABS	Antilocking braking system
ACS	Automatic clutch
EDC	Electronic injection control
EI	Housing for remote control switch or diode–holder on UCI
M	Identification of a grounding point
SU	Ultrasonic welding
TGC	Main switch
UCI	Central Interconnection Unit
–7777–	Cable colour code
52307	Component code
	Look up
	Grounding connection to the frame and/or bodywork

1	Laminar fuse on UCI 1 = identification number
IX2	Connector between two cables IX = identification number 2 = cell number
	Connection to the ground via a component
	Connection to the ground via cable
	Optional electrical connection
	Connection present in Daily vehicles
	Connection present in TurboDaily vehicles
	Component present in Truck version
*	Connection or component present in 4x4 version
△	Connection or component present in van version

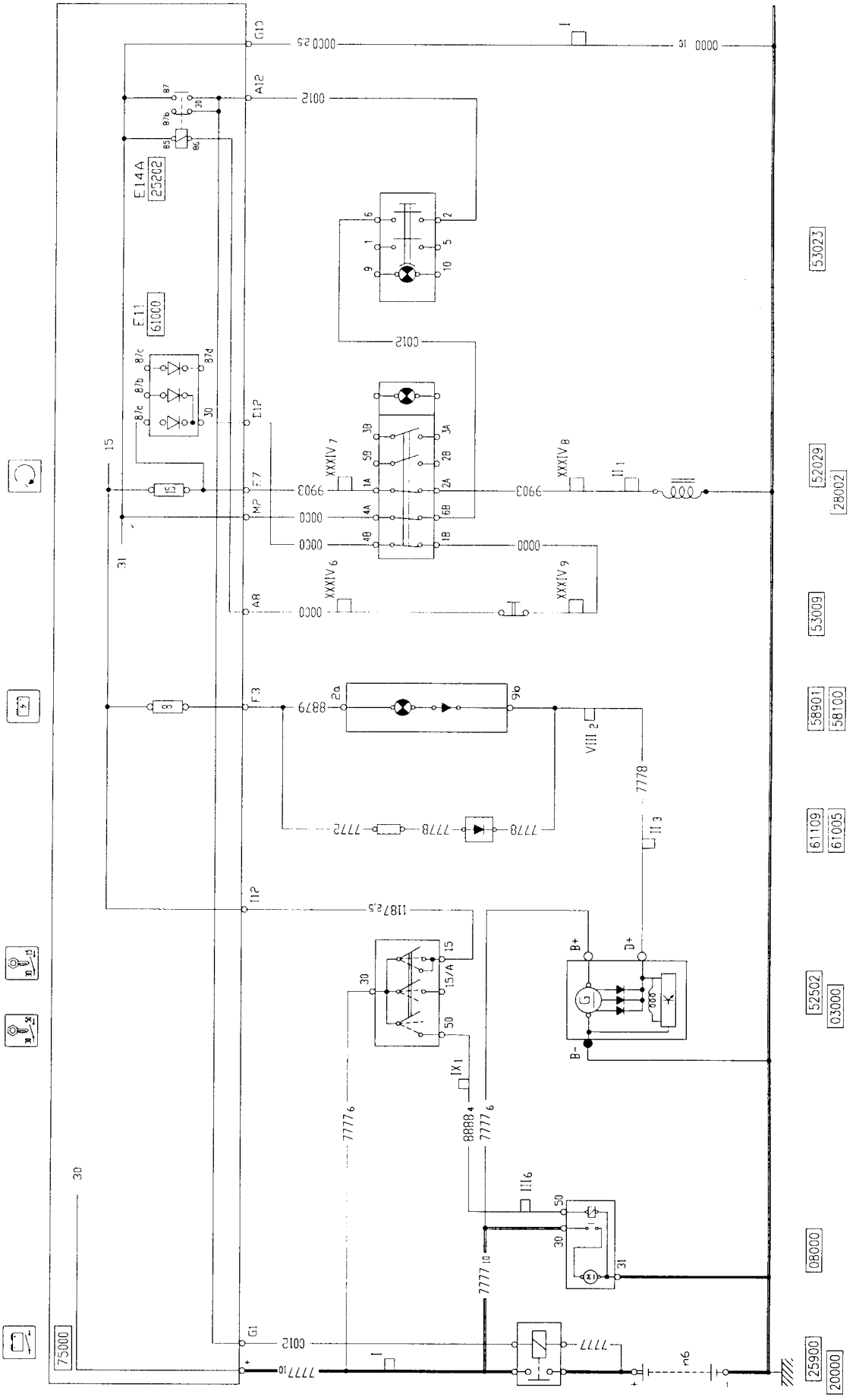
DATA SHEET 1: STARTING / RECHARGE



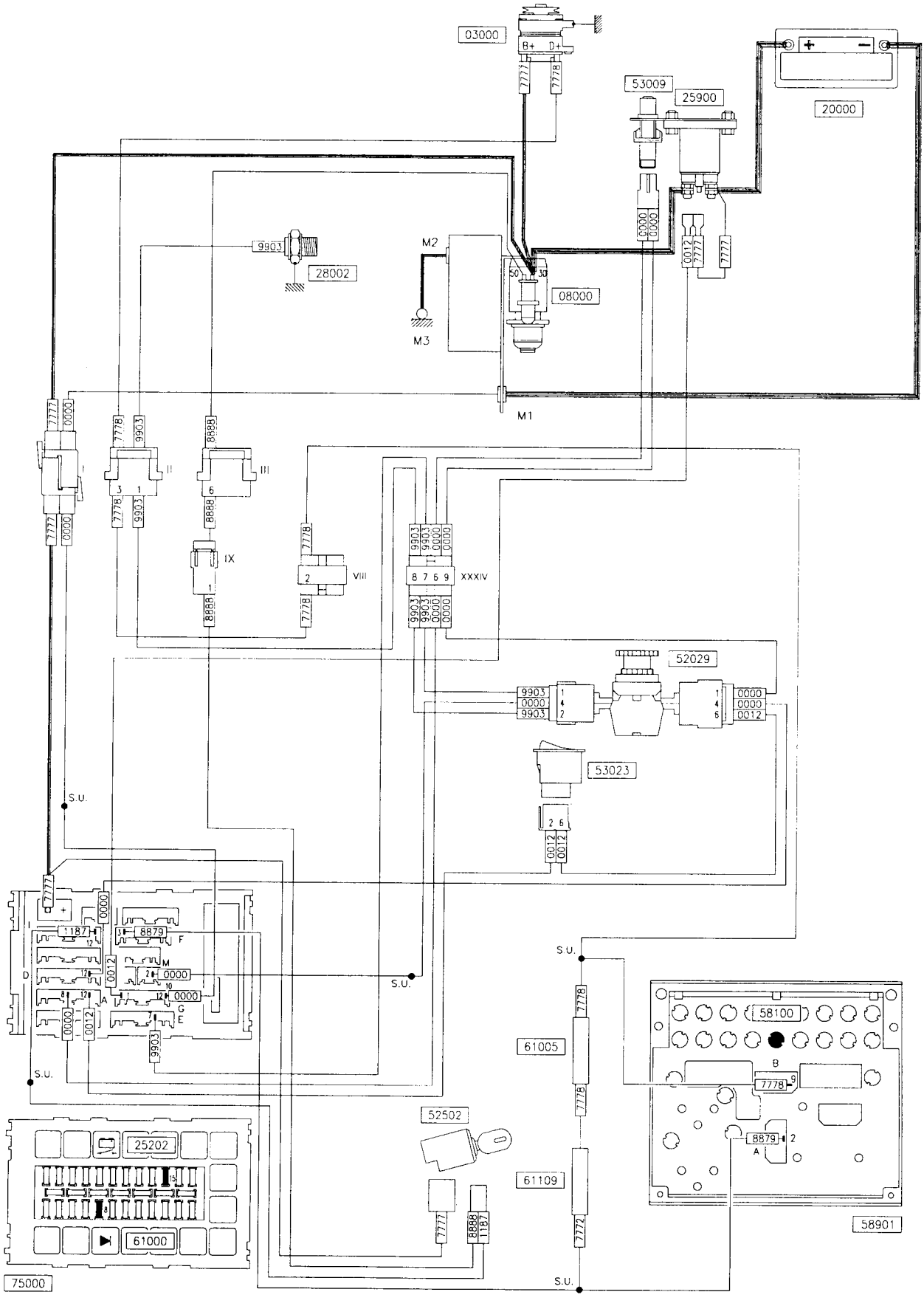
DATA SHEET 1: STARTING / RECHARGE



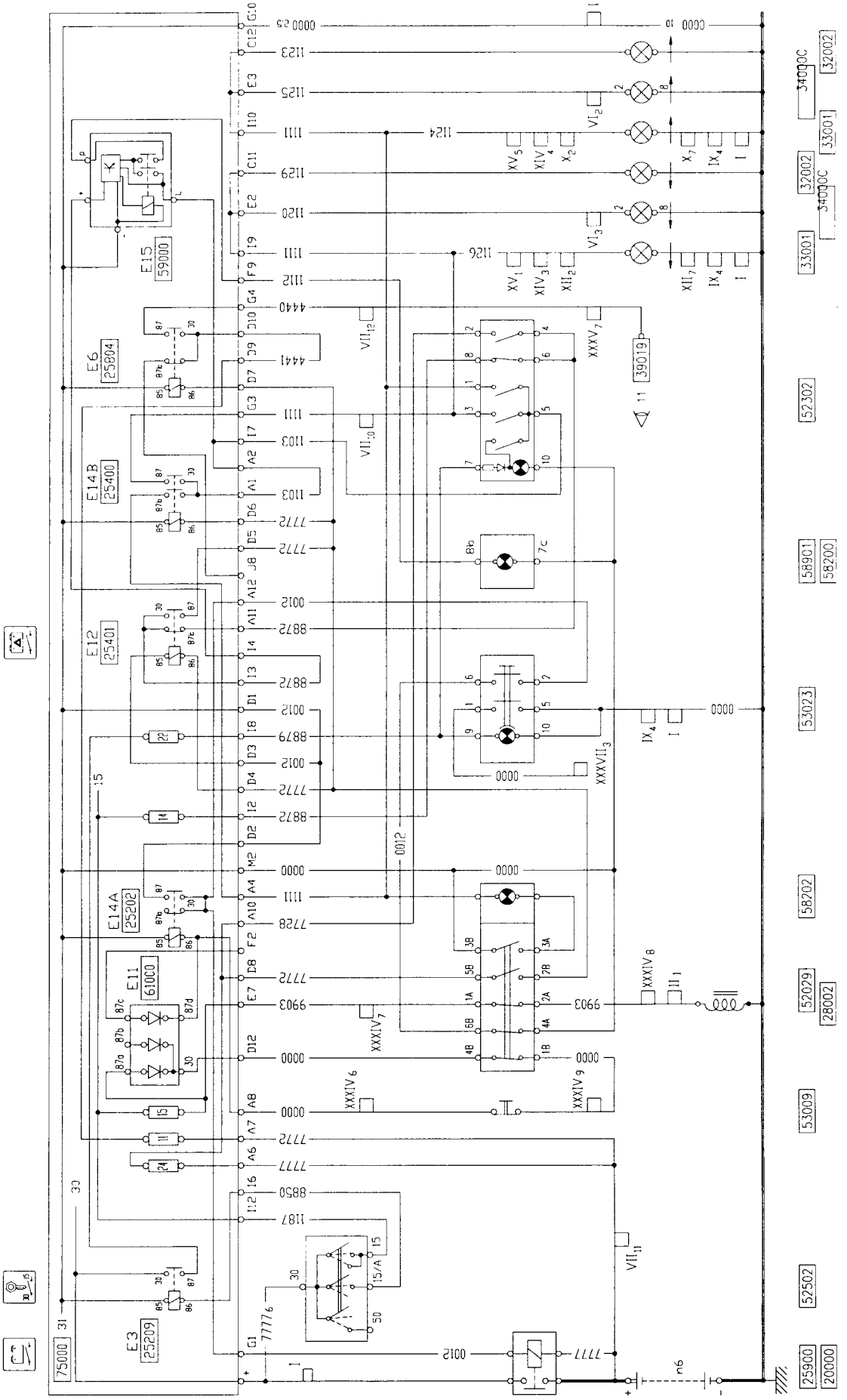
DATA SHEET 1: STARTING / RECHARGE (BUS)



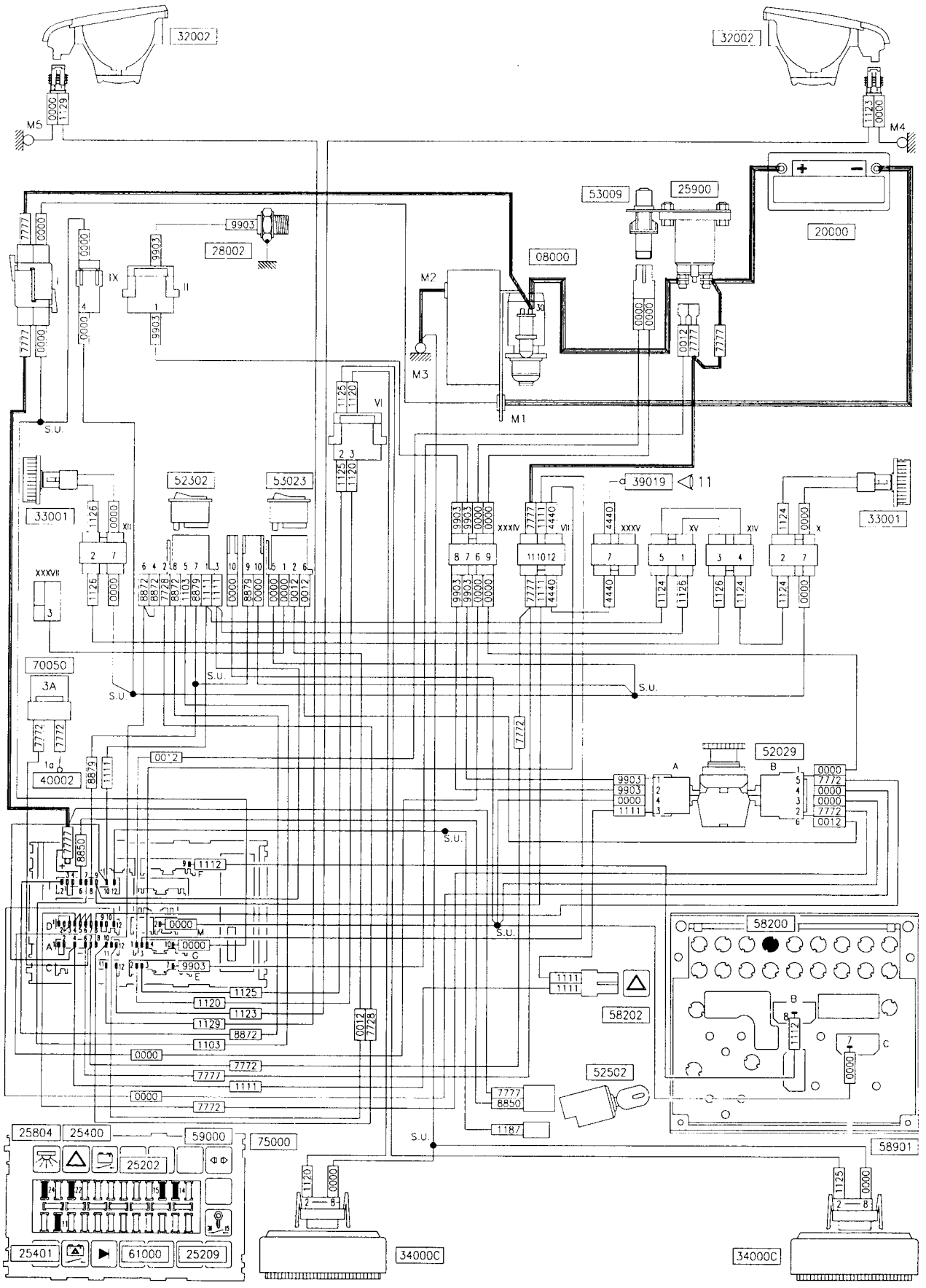
DATA SHEET 1: STARTING / RECHARGE (BUS)



DATA SHEET 18: SAFETY SYSTEM (BUS)

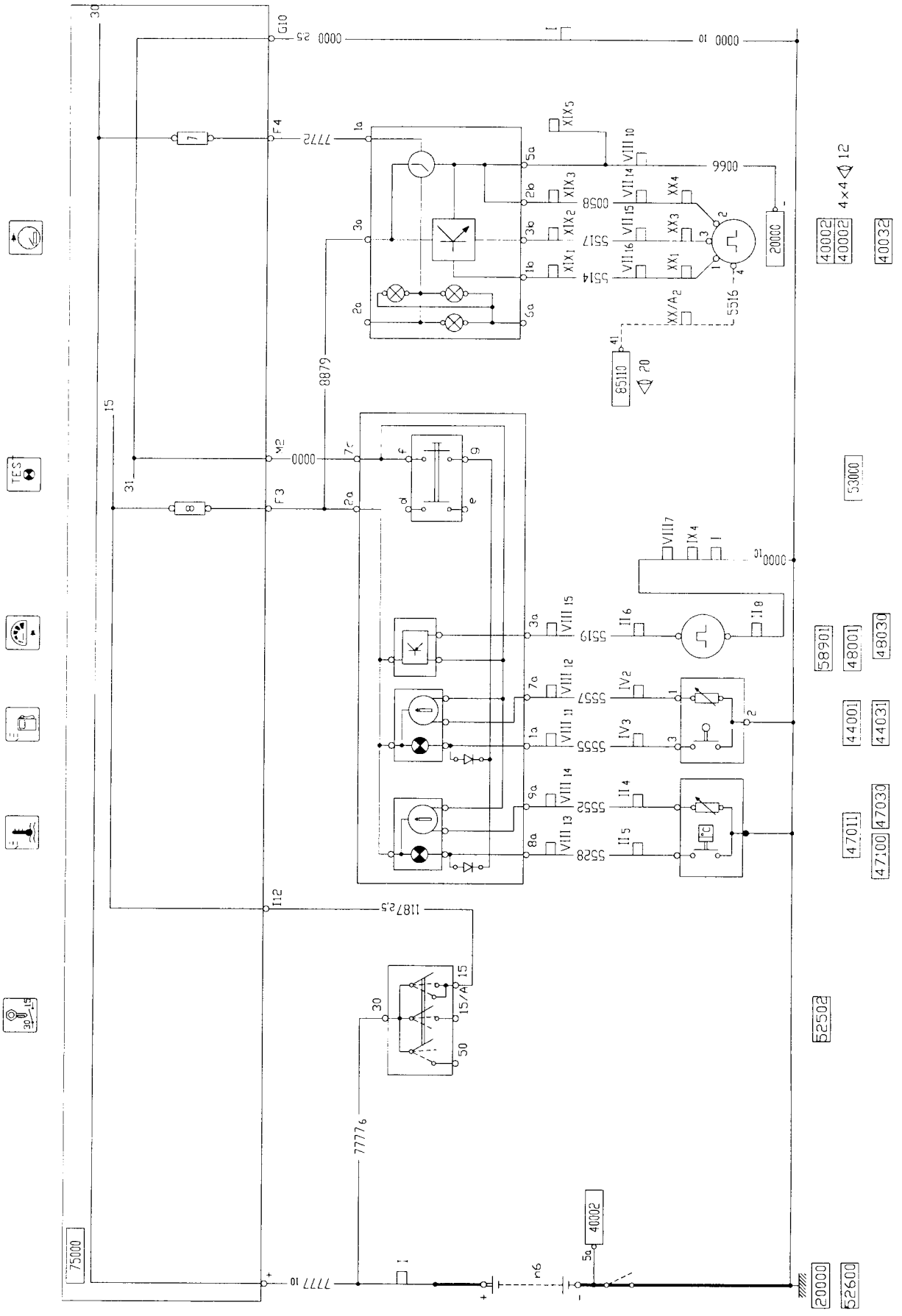


DATA SHEET 18: SAFETY SYSTEM (BUS)



MODEL YEAR '98 CIRCUITRY DATA SHEETS

DATA SHEET 3: INSTRUMENTS



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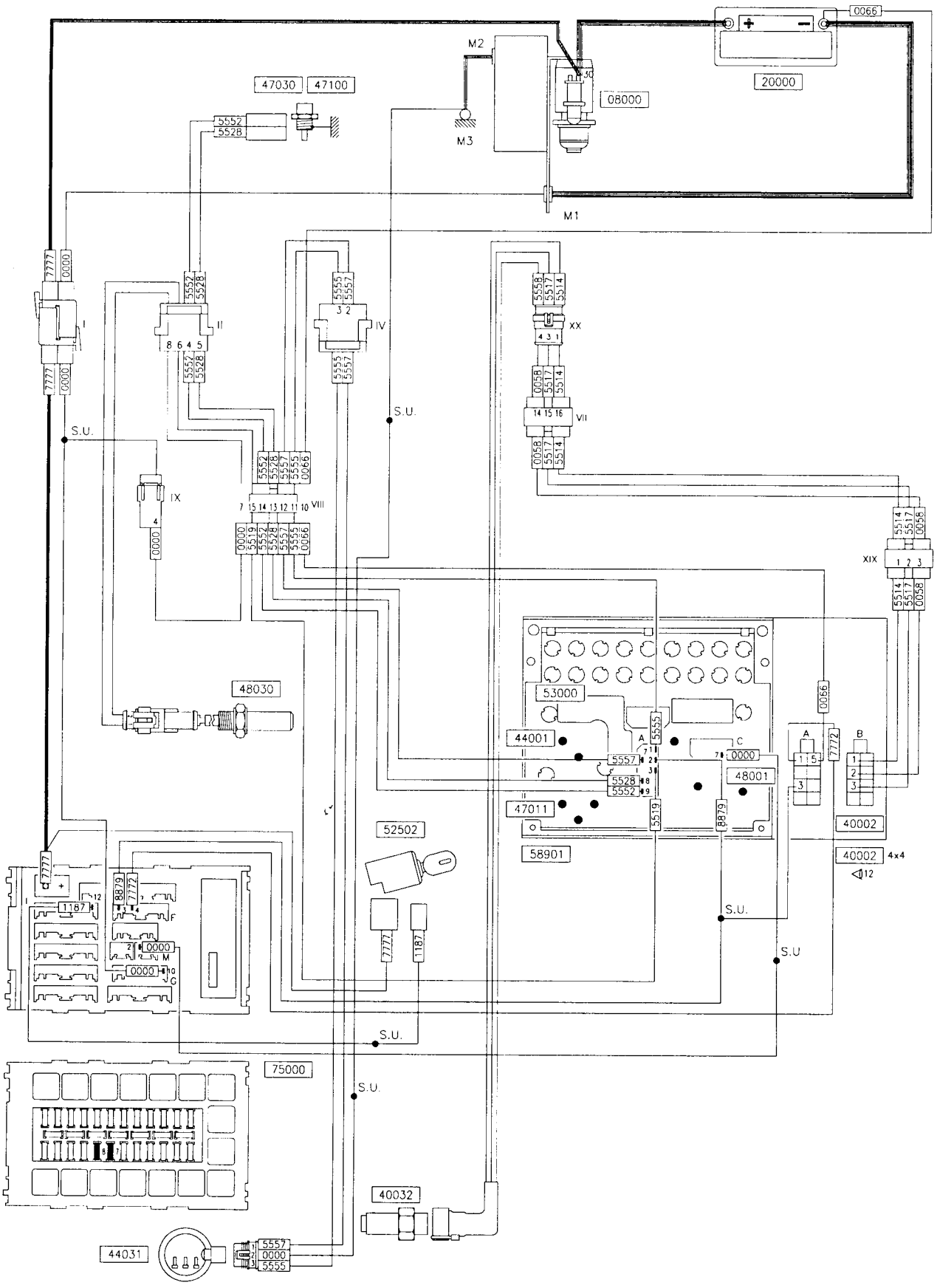
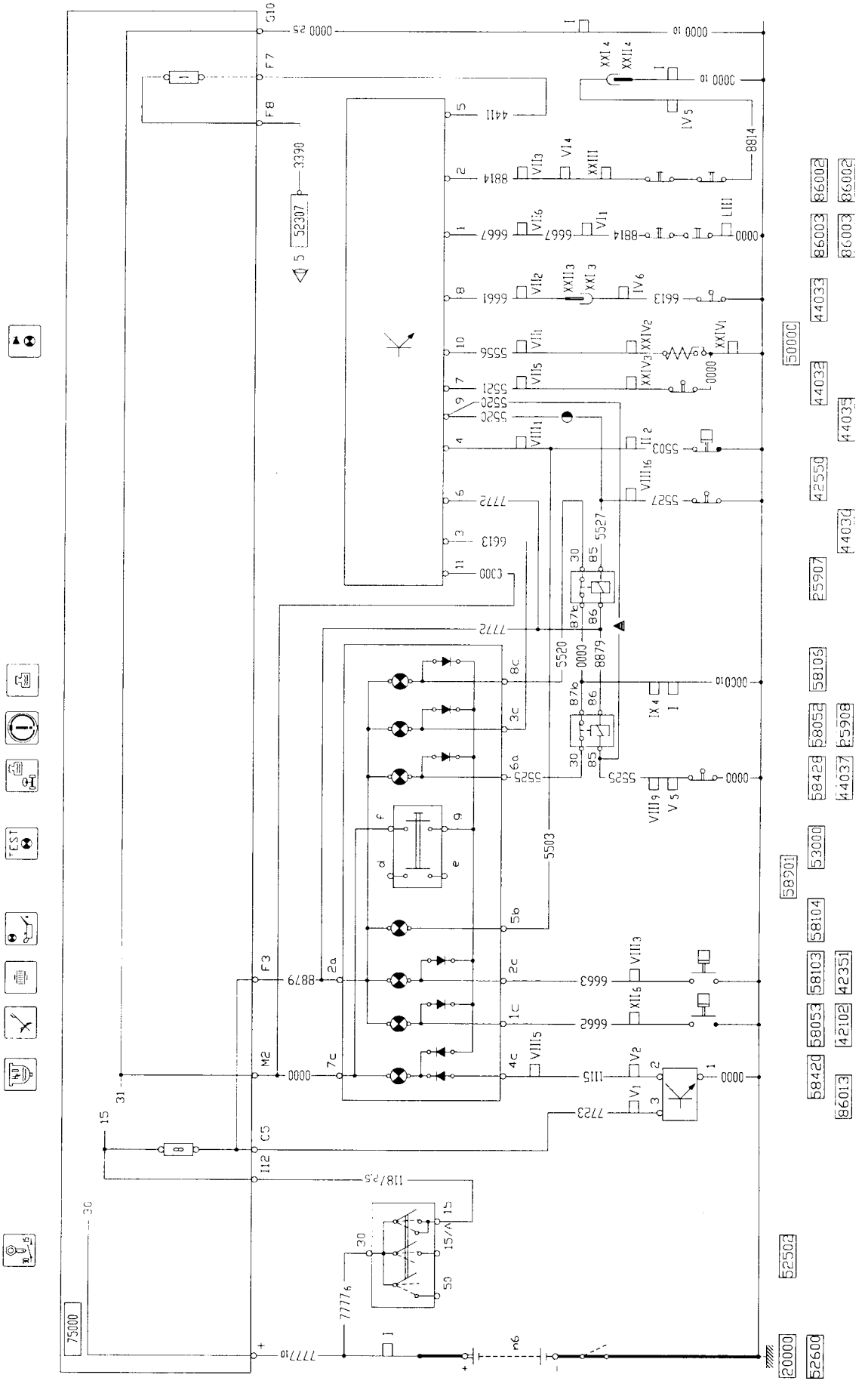
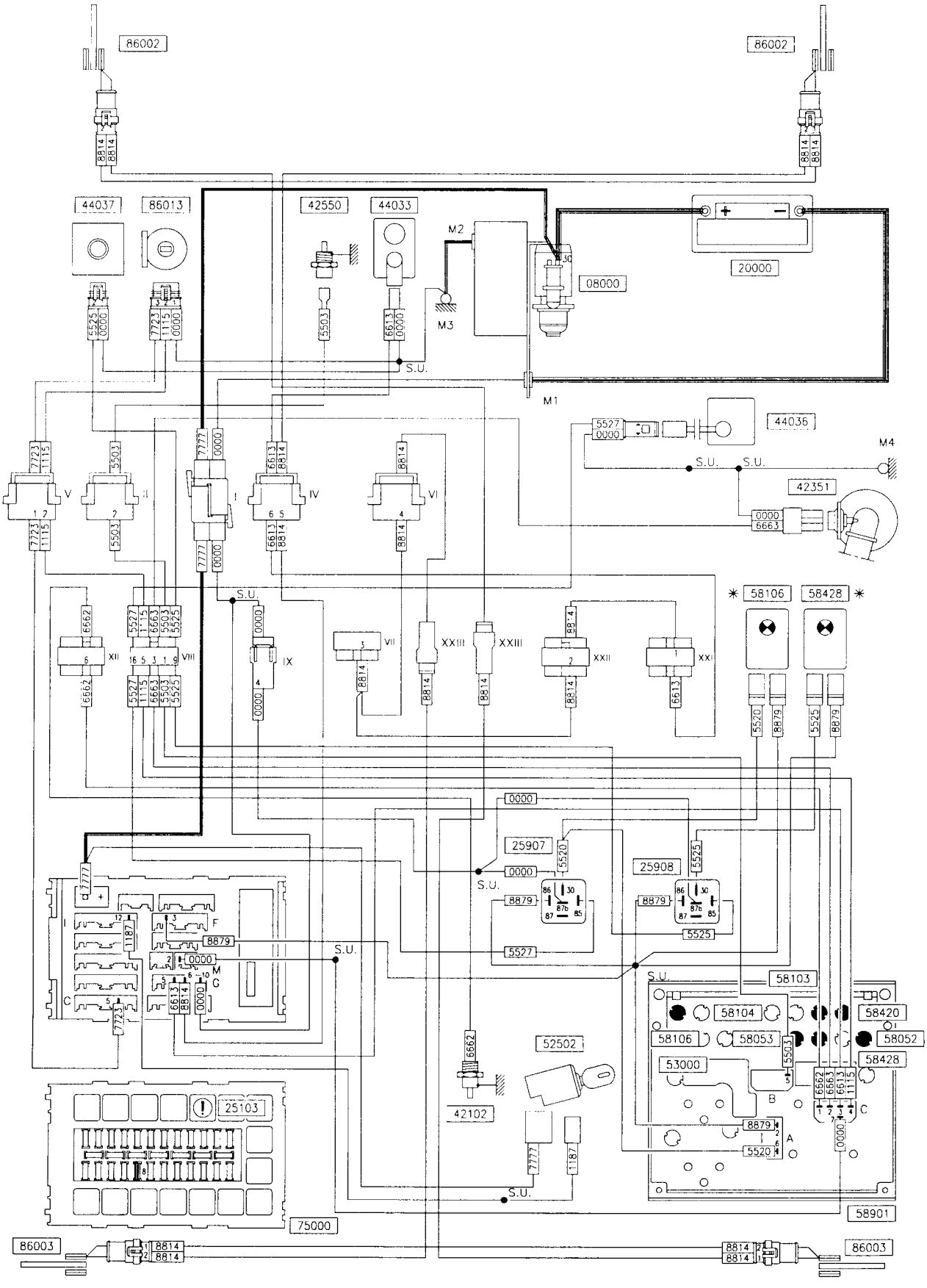


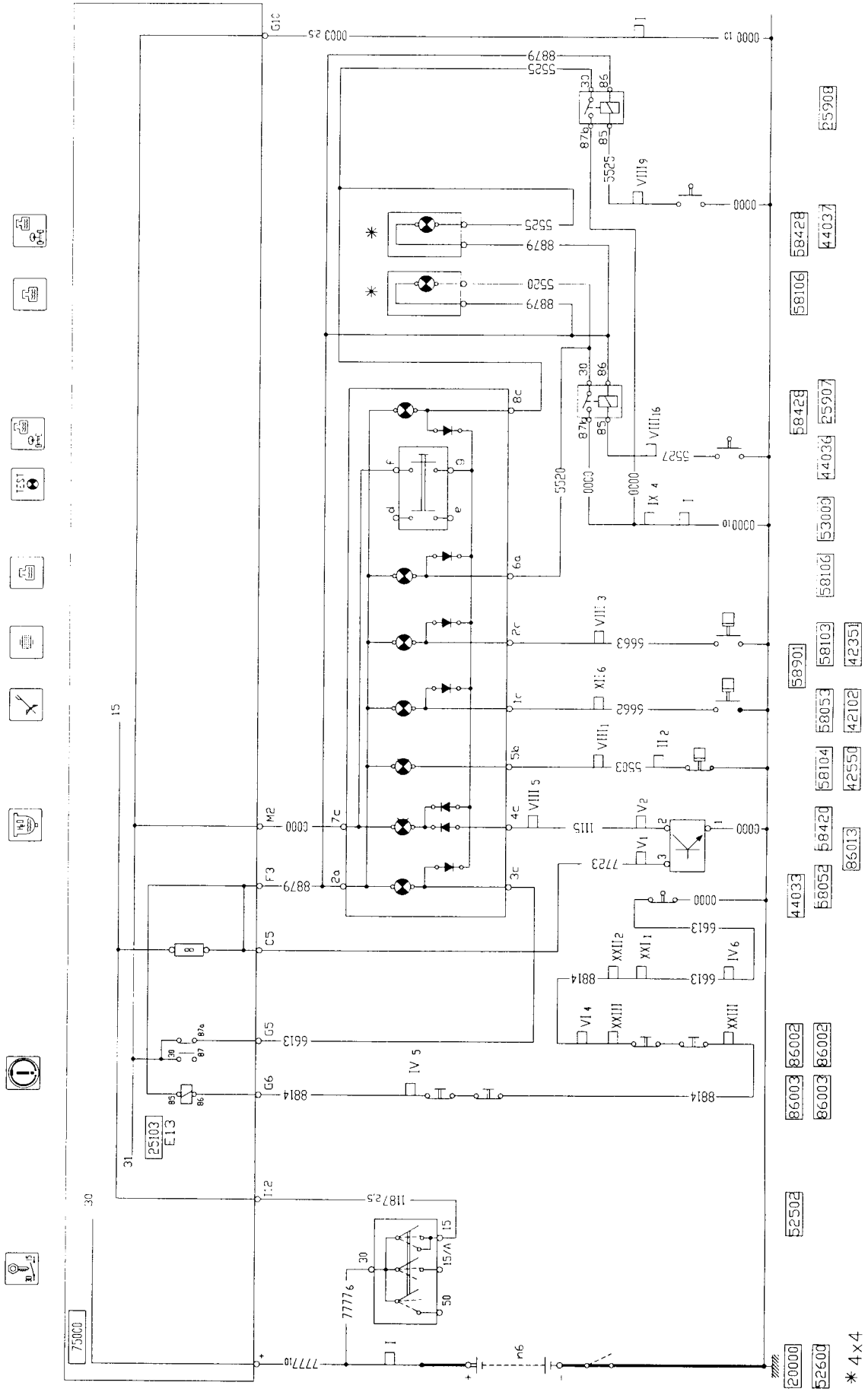
DATA SHEET 4: VISUAL INDICATORS



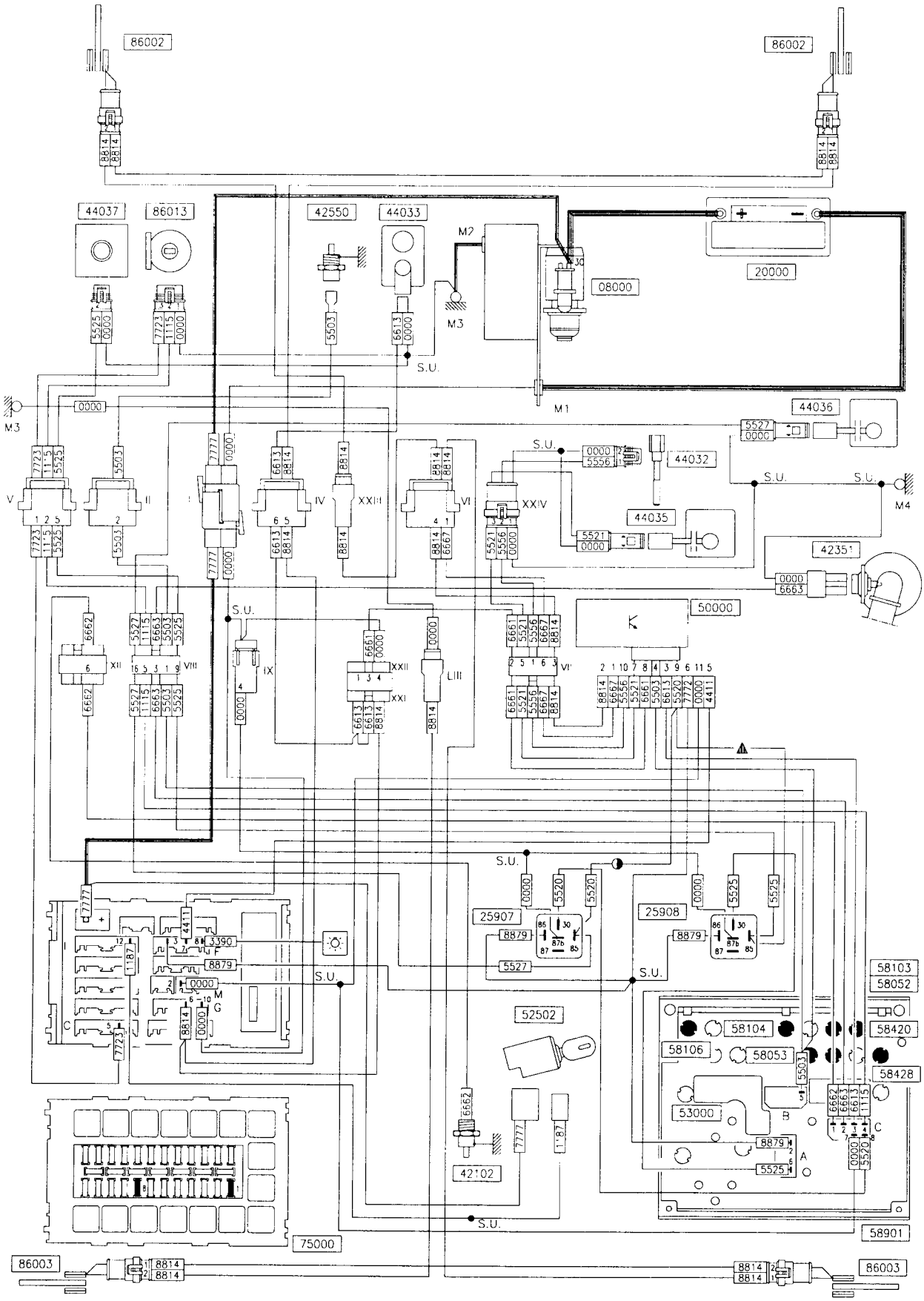
DATA SHEET 4: VISUAL INDICATORS



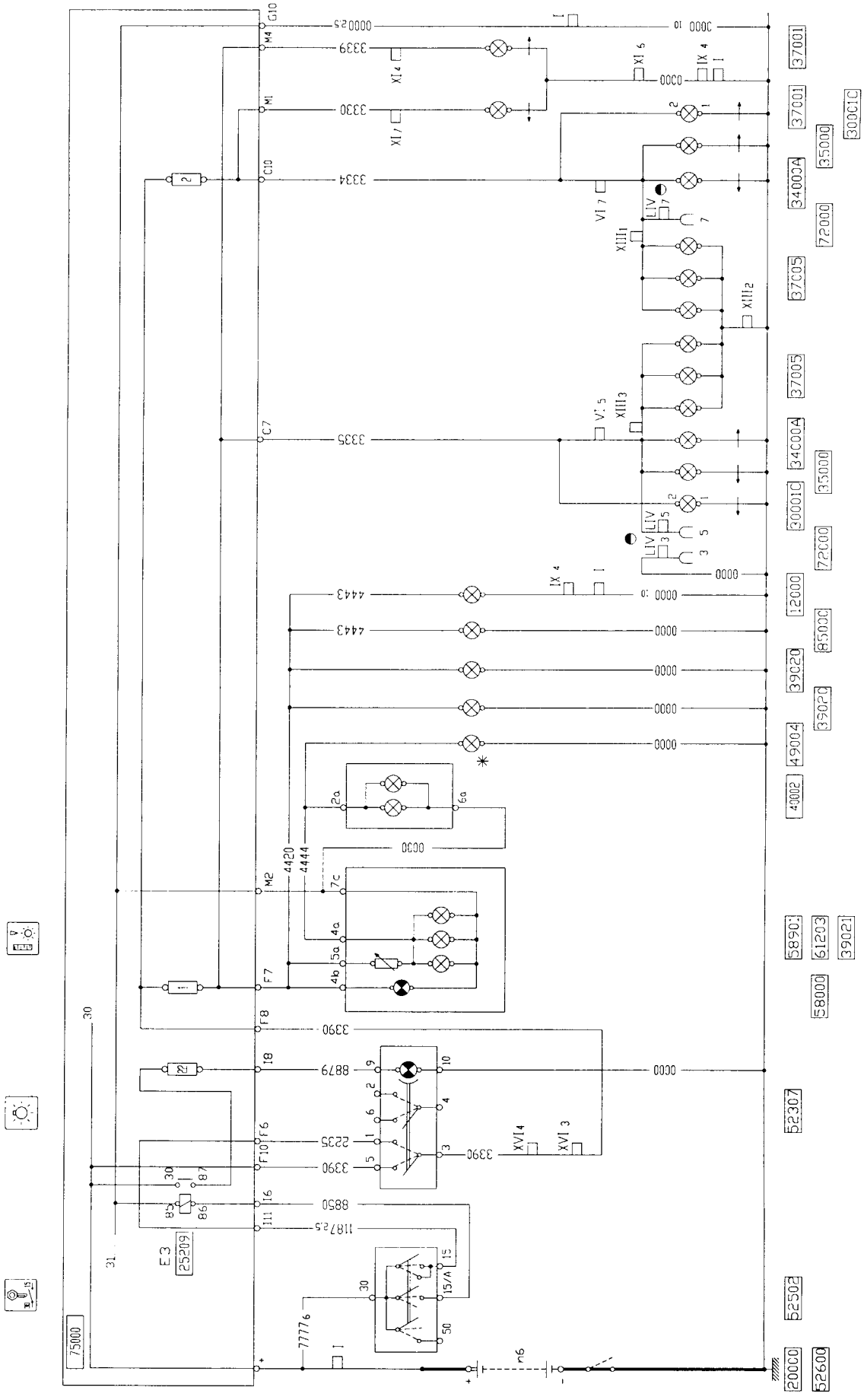
DATA SHEET 4: VISUAL INDICATORS – IVECO CONTROL



DATA SHEET 4: VISUAL INDICATORS – IVECO CONTROL



DATA SHEET 5: EXTERIOR LIGHTING (Tail and side lights, cab instrumentation)



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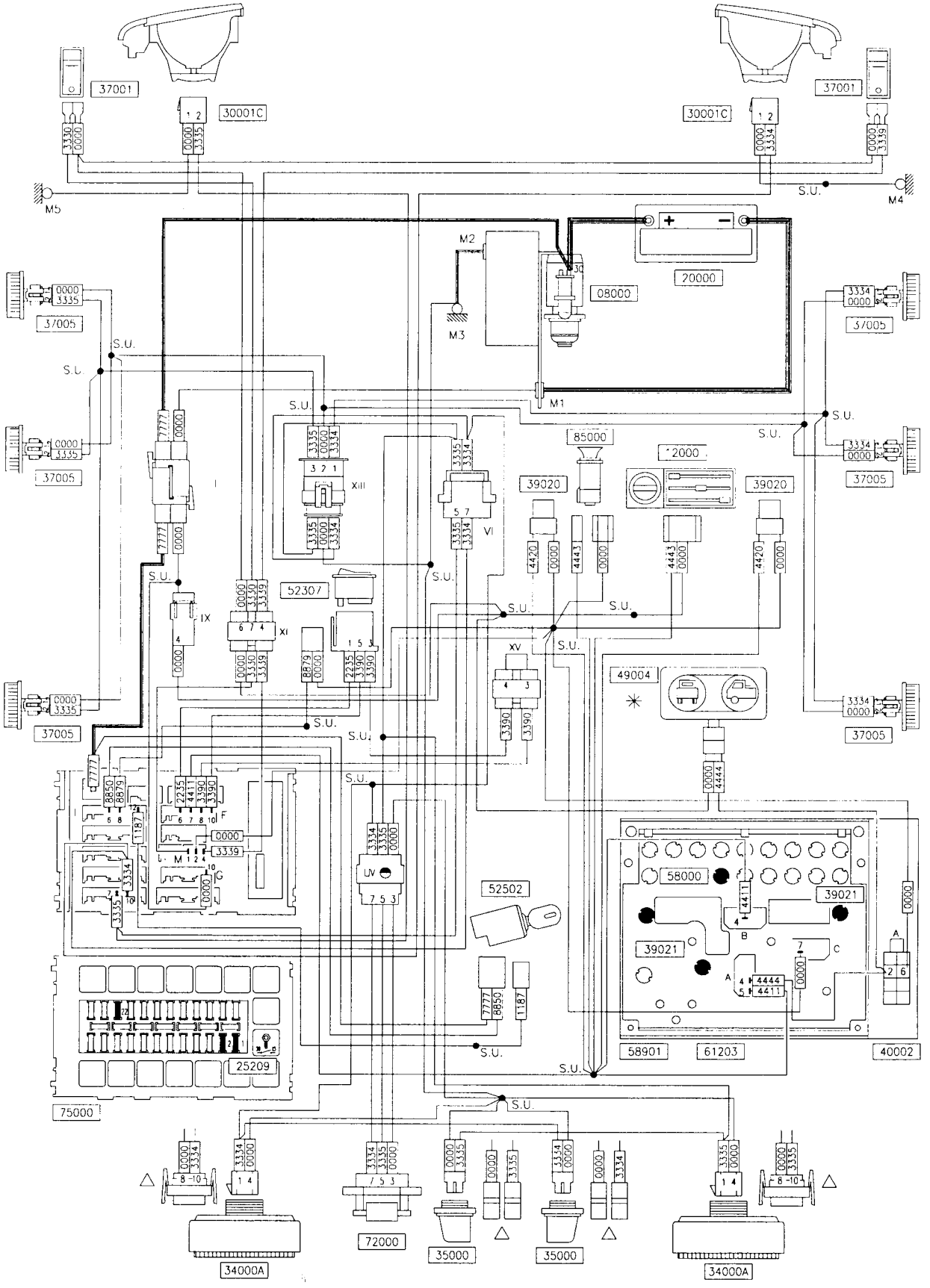
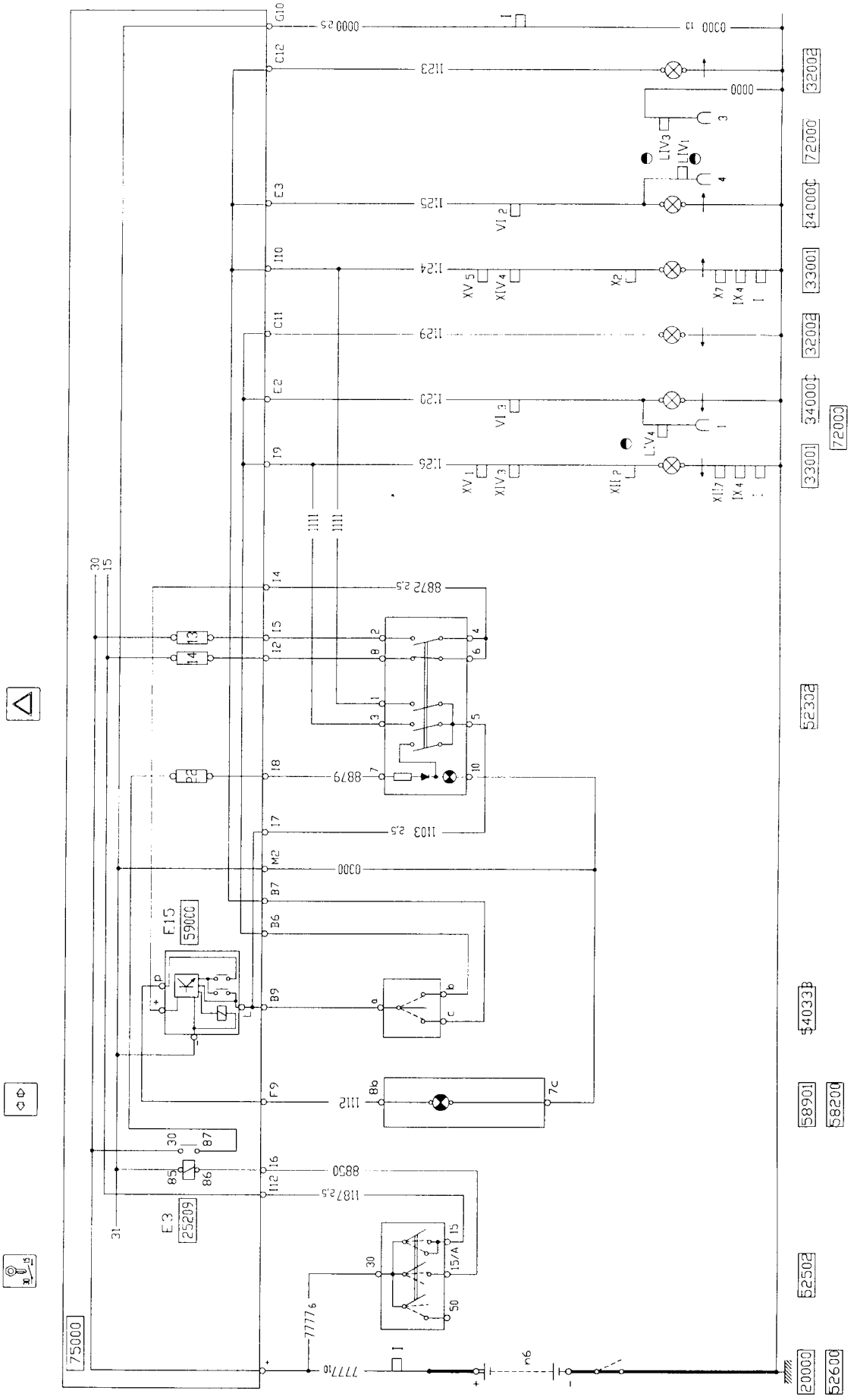
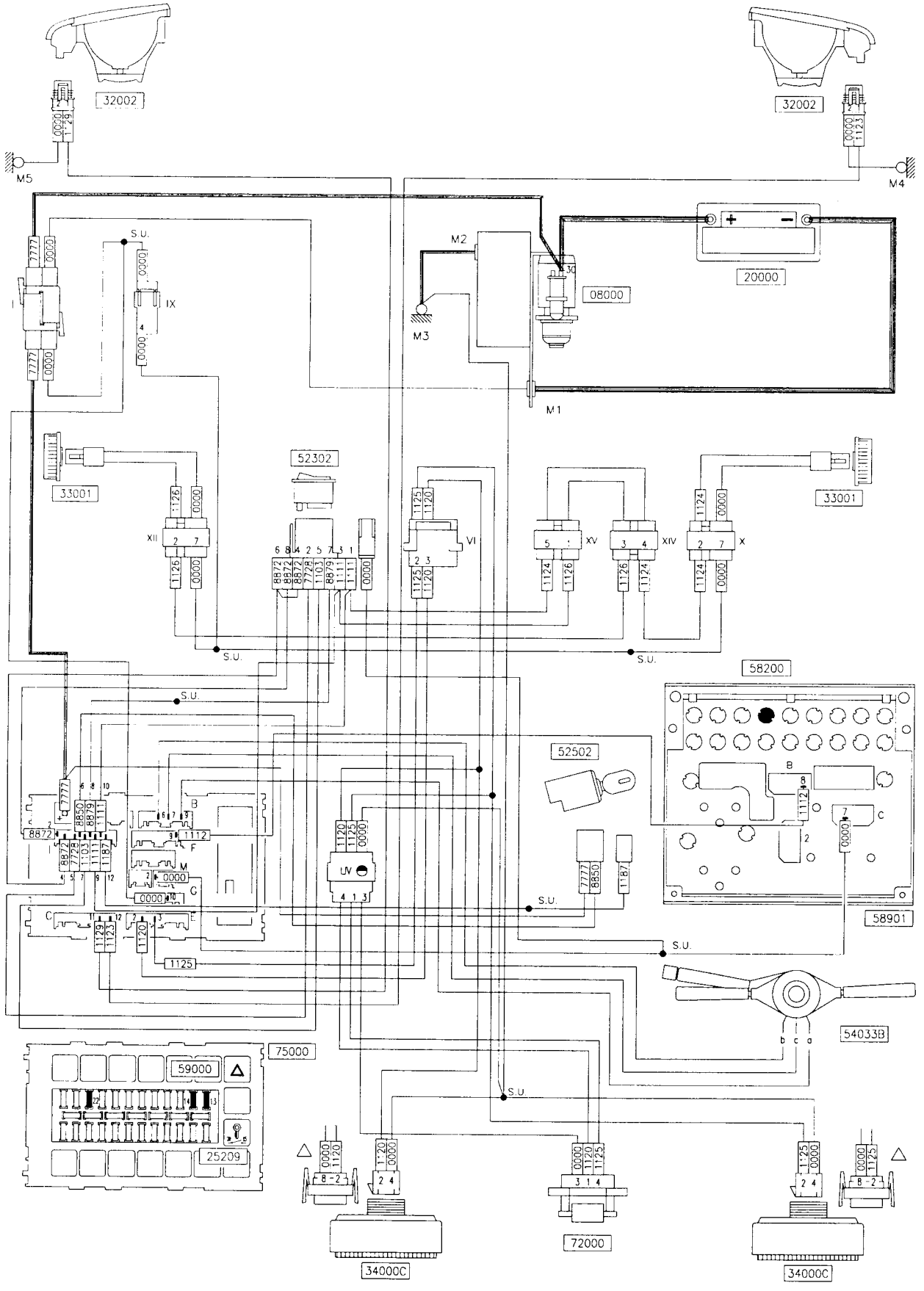


✳ 4x4

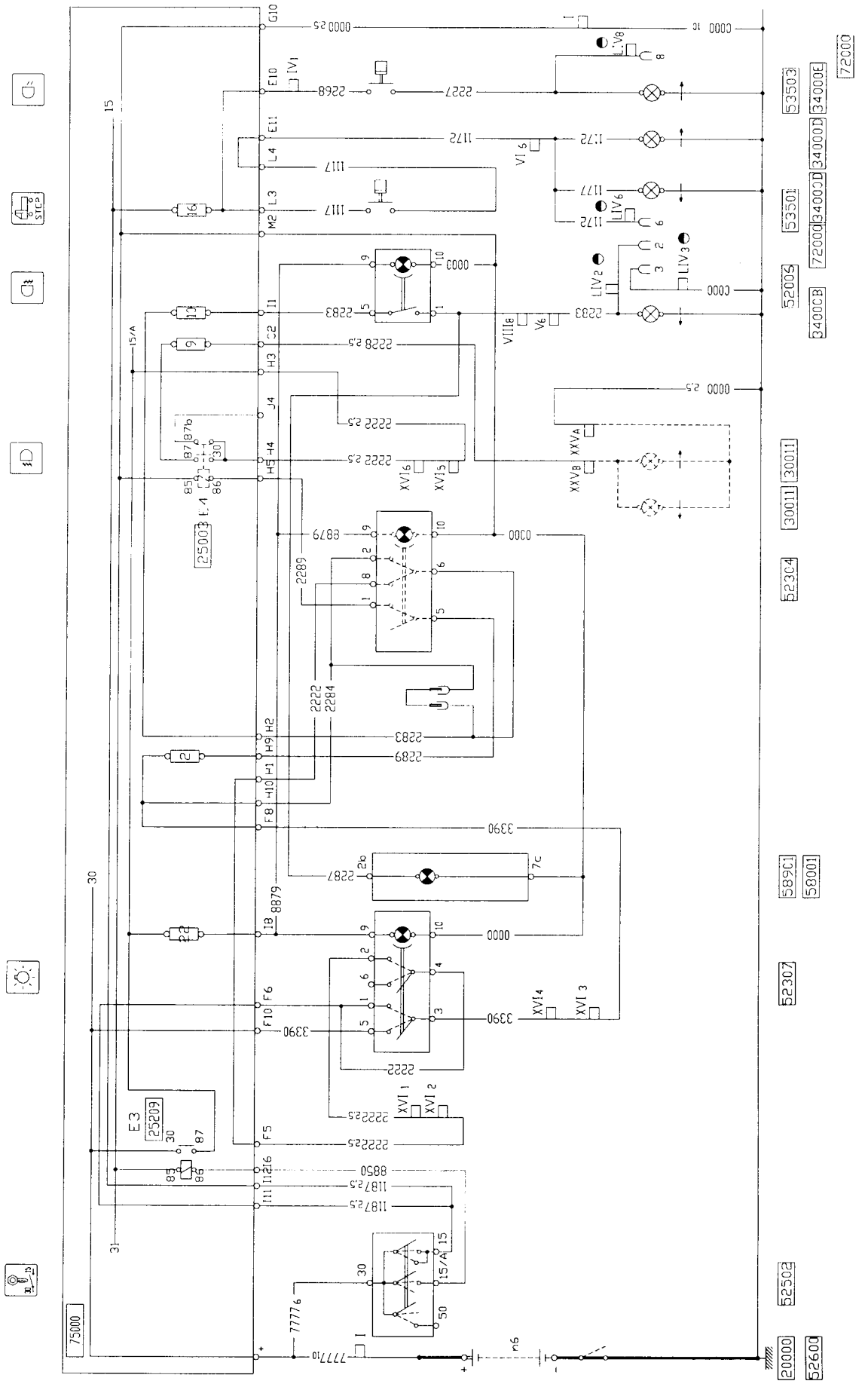
DATA SHEET 7: DIRECTION INDICATORS AND EMERGENCY LIGHTS



DATA SHEET 7: DIRECTION INDICATORS AND EMERGENCY LIGHTS



DATA SHEET 8: STOP, REVERSING AND REAR FOG LIGHTS



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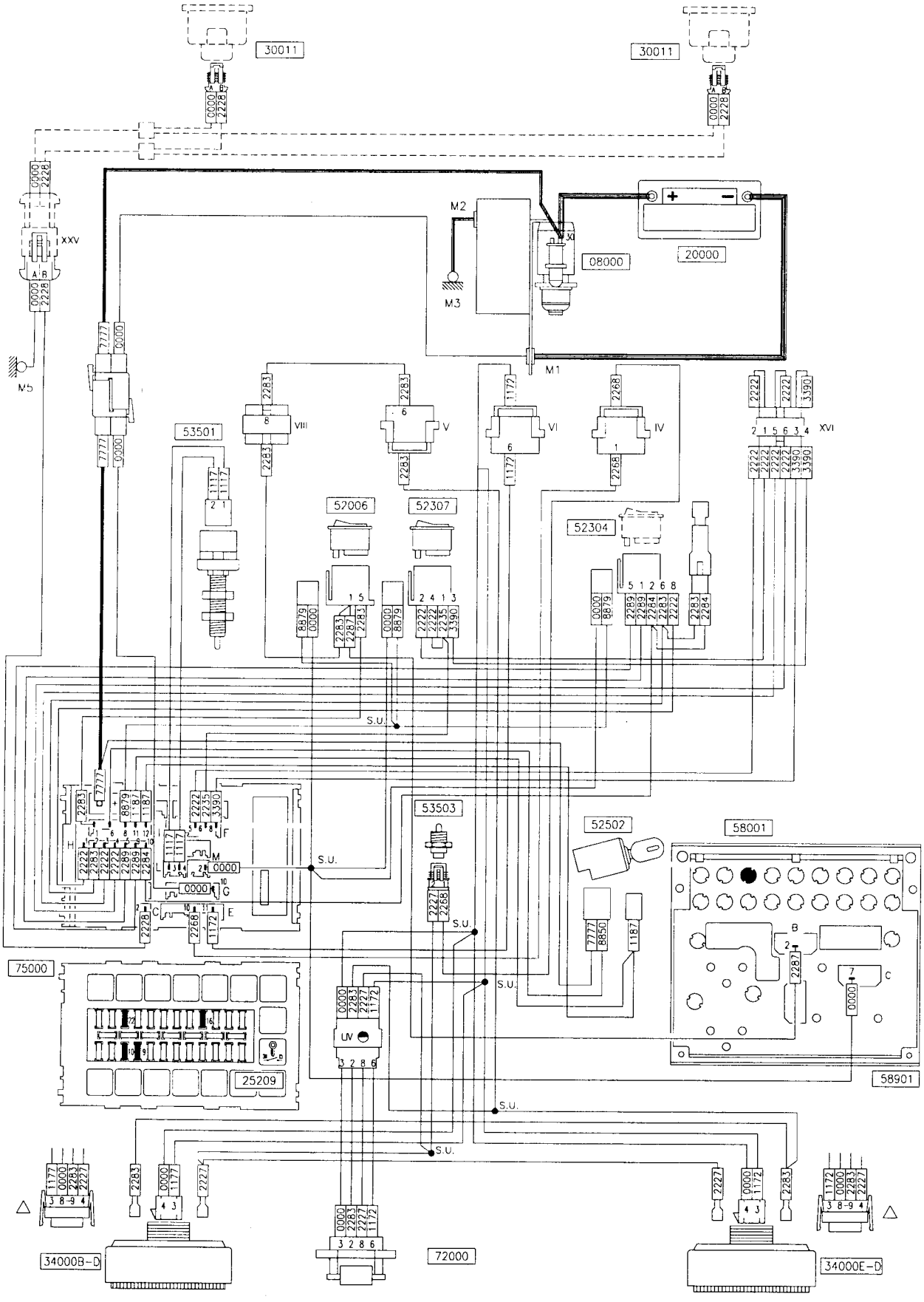
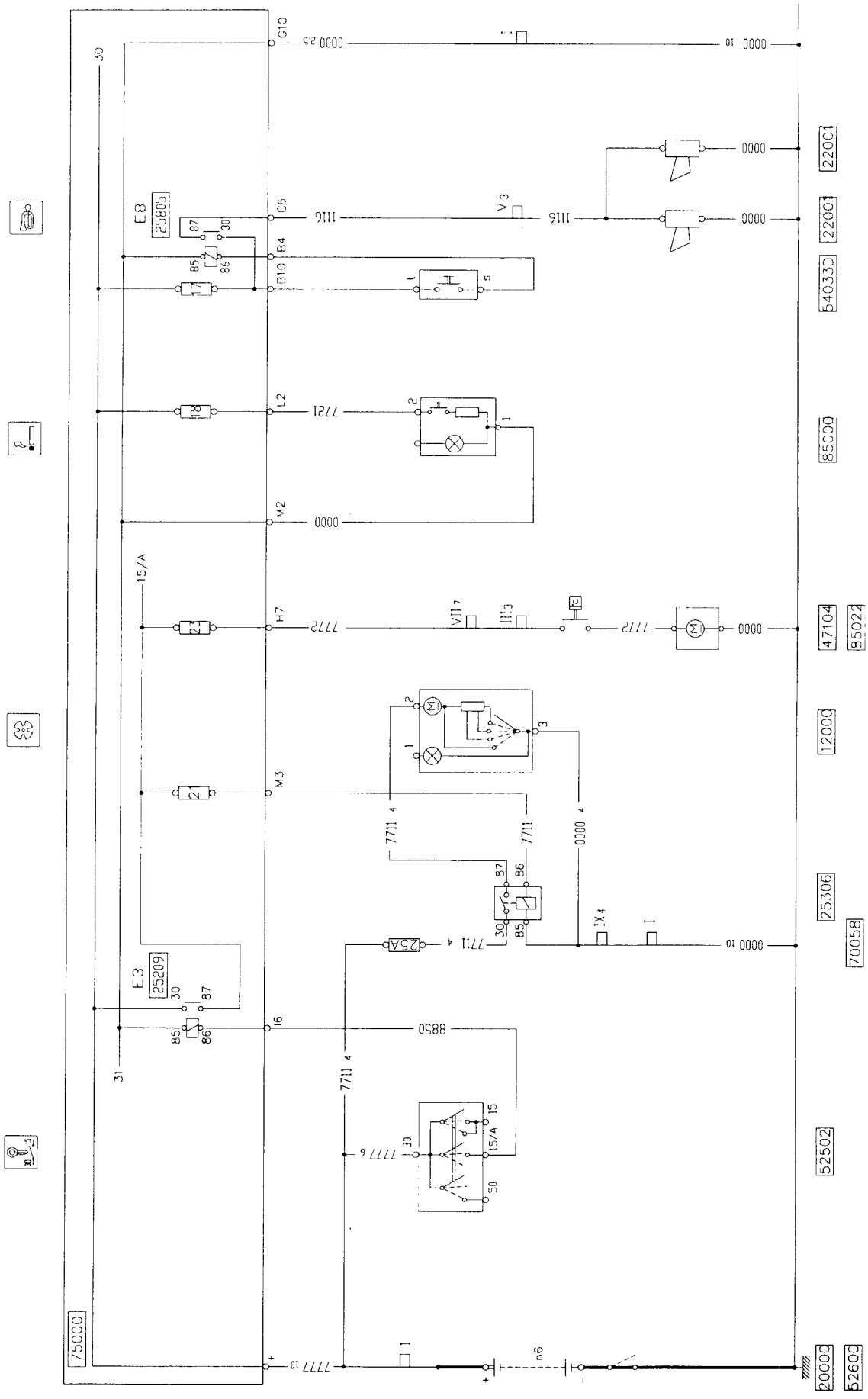
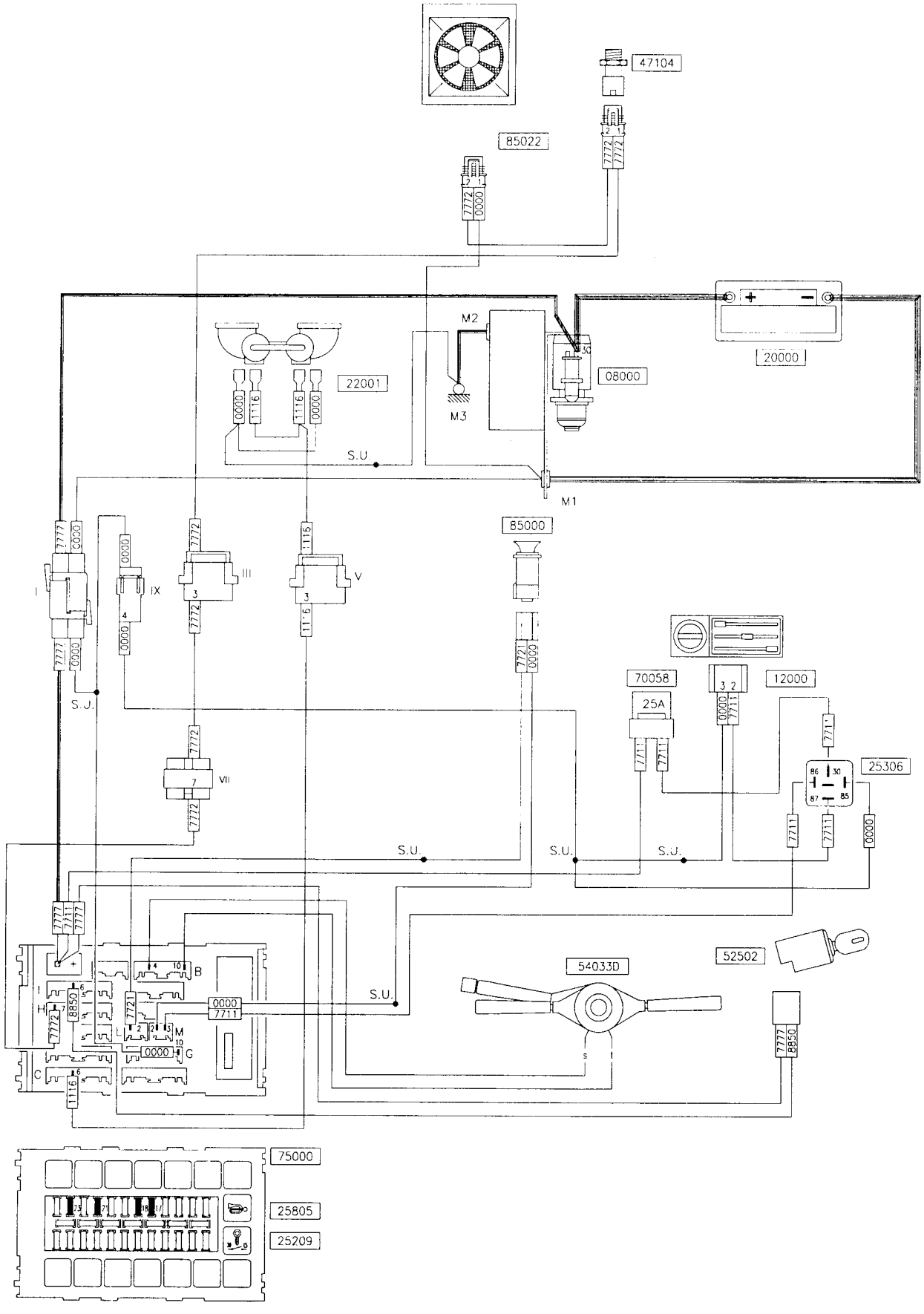


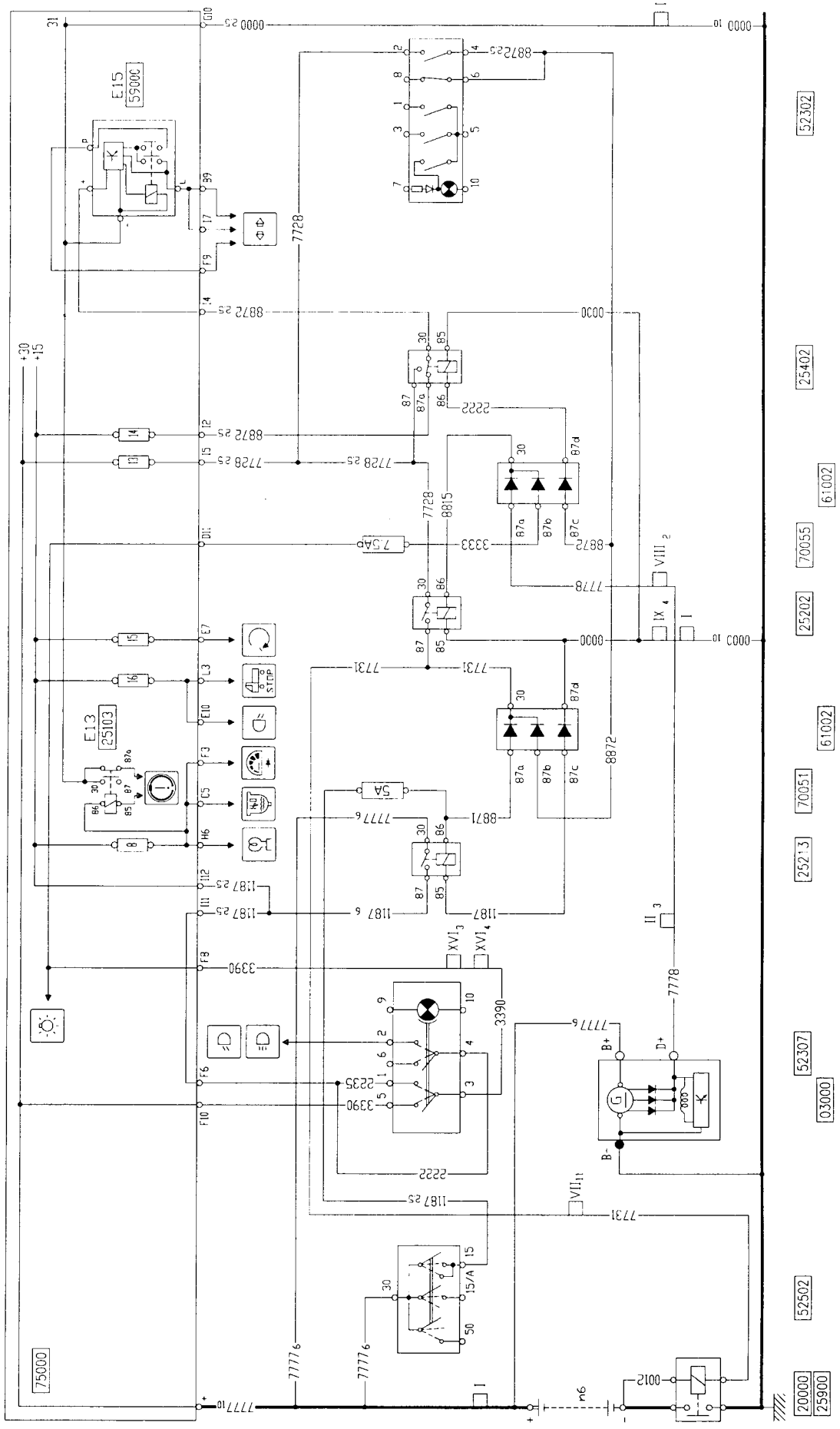
DATA SHEET 10: ELECTRICAL WINDSHIELD DEMISTER/HORNS



DATA SHEET 10: ELECTRICAL WINDSHIELD DEMISTER/HORNS



DATA SHEET 22: CONNECTION VARIANT FOR BO-FROST VEHICLES



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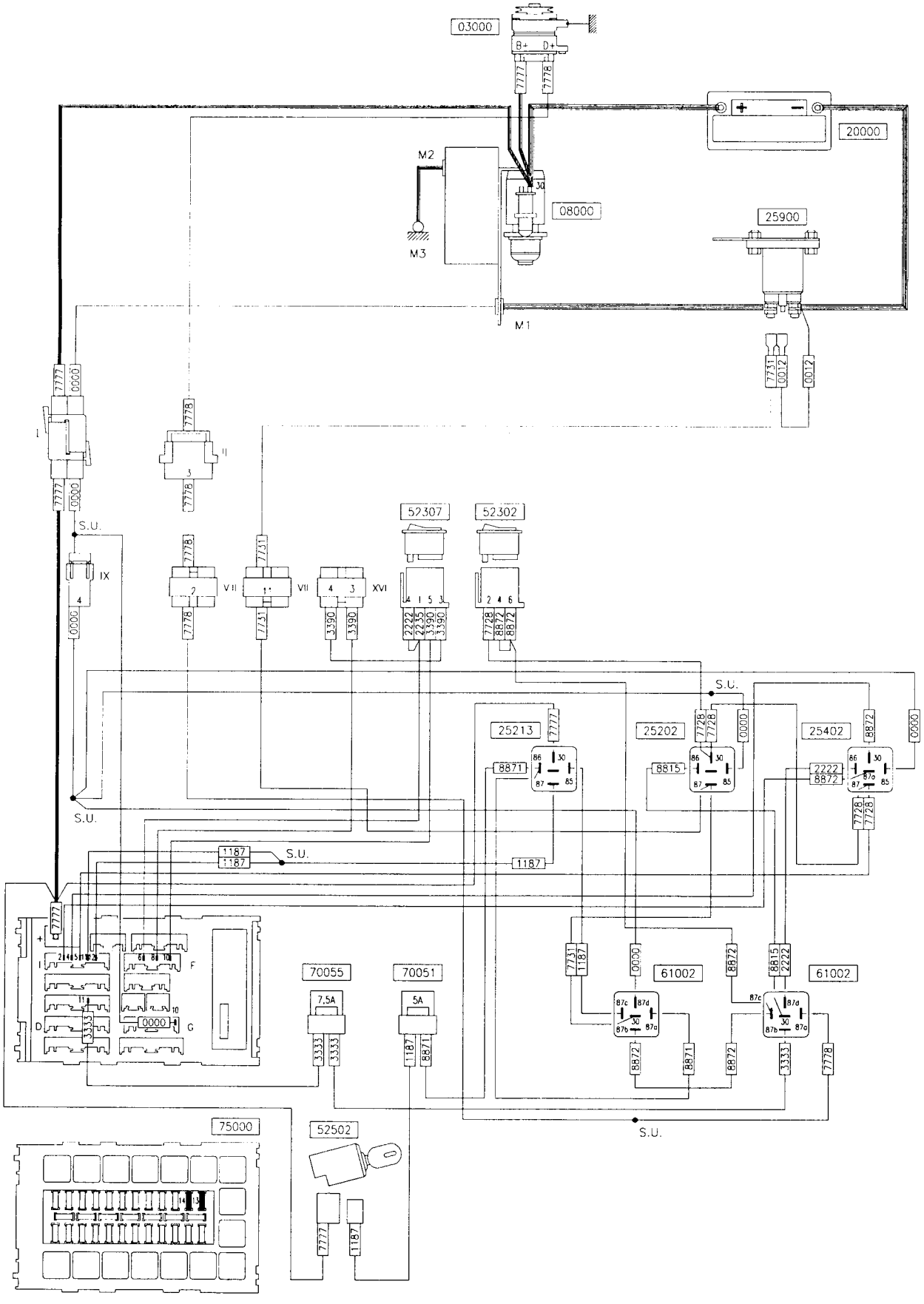

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