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SECTION O

ELECTRICAL SYSTEM

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CAUTION

Before working on the electrical system read the cautionary notes at the beginning of Sub-section O1, Chapter 1.

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SUB-SECTION 01

DESCRIPTION AND SPECIFICATIONS

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1	DESCRIPTION OF THE ELECTRICAL SYSTEM	01.3
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SUB-SECTION 01

CHAPTER 1

DESCRIPTION OF THE ELECTRICAL SYSTEM

CAUTIONS

1. *Before carrying out any repairs or maintenance to an electrical component, always disconnect the battery.*
2. *The V-drive fan belt used with alternators is not the same as that used with d.c. machines. Use only the correct replacement fan belt. Occasionally check that the engine and alternator pulleys are accurately aligned.*
3. *It is essential that good electrical connections are maintained at all times. Of particular importance are those in the charging circuit (including those at the battery) which should be occasionally inspected to see that they are clean and tight. In this way any significant increase in circuit resistance can be prevented.*
4. *Do not disconnect battery cables while the engine is running or damage to the semiconductor devices may occur. It is also inadvisable to break or make any connections in the alternator charging and control circuits while the engine is running.*
5. *When using rapid charge equipment to recharge the battery, the battery must be disconnected from the vehicle.*
6. *When using electric arc welding equipment in the vicinity of the engine take the following precautions to avoid damage to the semiconductor devices used in the alternator and control unit and also to the ignition system:*
 - (1) *Disconnect battery earthed lead.*
 - (2) *Disconnect alternator output cables.*
7. *Alternator testing and repairs must only be undertaken by a qualified auto electrician or the local agents.*

INTRODUCTION

1. The main components of the electrical system are a 12 V battery charged by an engine-driven alternator. The battery drives the fuel pump, road and cab lights via switches, the ignition system, the starter motor and solenoid, and various warning and indicator lamps in the cab. Four fuses, rated at 17A continuous and 35A blow, are fitted to protect the battery from overloads in the low current circuits.
2. The electrical system is negative earth and it is most important to ensure correct polarity of all electrical connections. Incorrect connections made when reconnecting cables may cause irreparable damage to the semiconductor devices used in the alternator and regulator.

3. The electronic voltage regulator employs micro-circuit techniques resulting in improved performance under difficult service conditions. The whole assembly is encapsulated in silicone rubber and housed in an aluminium heat sink, ensuring complete protection against the adverse affects of temperature, dust, moisture, etc.

ALTERNATOR

4. The Lucas alternator type 21 ACR fitted to the vehicle is a high output three-phase machine which produces current at idling speed.
5. The heatsink-rectifier, terminal block assembly can be removed complete. There are six silicone diodes connected to form a full wave rectifier bridge circuit, and three silicone diodes which supply current to the rotor winding. Individual diodes cannot be removed from the heatsink assemblies. Regulation is by a Lucas type 8TRD control unit mounted in the slip-ring end bracket. There is no provision for adjustment in service.
6. Individual connectors are used to connect external wiring to the alternator. The alternator's main negative terminals are connected internally to the body of the machine. Provision is made for the connection of external negative wiring if required.

SURGE PROTECTION DEVICE

7. The surge protection device is a special avalanche-diode, fitted to the outer face of the slip-ring end bracket (not to be confused with a suppression capacitor, similarly fitted in the end bracket). The avalanche-diode is connected between terminal 'IND' and frame and its purpose is to protect the regulator from damage by absorbing high transient voltages which occur in the charging system due to faulty cable connections, or if the cables are temporarily disconnected at the battery whilst the engine is running. The surge protection device is intended to provide limited protection for the regulator under normal working conditions and therefore the service precaution not to disconnect any of the charging system cables, particularly those at the battery, whilst the engine is running, should still be observed.

STARTER MOTOR

General

8. The 2M100 pre-engaged starter motor is a four pole, four brush machine, 100 mm in diameter, with a series connected field, an armature with a face type commutator and a solenoid operated roller clutch drive.

Commutator

9. The face type commutator on the end face of the armature works in conjunction with a fully insulated brush-gear assembly comprising two pairs of wedge shaped brushes and coil type springs assembled into a brushbox moulding. The moulding is riveted to the inside of the commutator end cover. The brushes are provided with a keyway to ensure correct fitting and the springs are held captive in the brushbox moulding.

Coil Connections

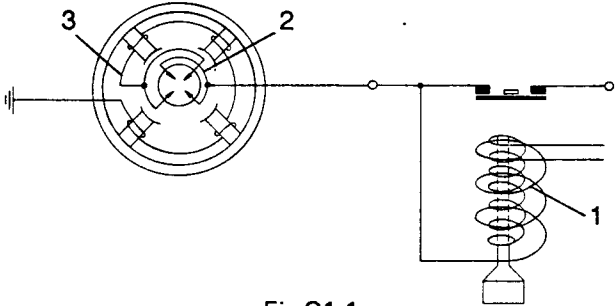


Fig O1.1

10. Refer to Fig O1.1. The field coils are of conventional design but the method of connection is different to that usually employed. The supply voltage to the starter motor is applied via the solenoid (1) direct to one pair of brushes (2). The start of the field winding (3) is connected to the other pair of brushes and the winding terminates at earth (the frame of the starter motor) via a riveted connection to the yoke.

Armature Movement

11. End float and axial movement of the armature is determined by the position in which a special type of 'Spire' retaining ring is fixed to the armature shaft, where it extends through the commutator end bracket.

Drive Engagement Lever

12. There is no need to set the drive pinion and therefore the operating position of the drive engagement lever is non-adjustable. The plain type pivot pin on which the lever swivels is retained in the fixing bracket by a small special type of 'Spire' retaining ring.

Roller Clutch

13. The roller clutch prevents the armature from rotating excessively if the drive remains in mesh after the engine has started.

SUB-SECTION 01

CHAPTER 2

SPECIFICATIONS

INTRODUCTION

- The specifications for the electrical system are given in the following Tables:

TABLE O1.1 - GENERAL DATA
TABLE O1.2 - TORQUE SPECIFICATIONS

TABLE O1.1 - GENERAL DATA

ITEM	DESCRIPTION
ALTERNATOR	
Type	Lucas 21 ACR battery sensed with transistorised current-voltage regulator
Nominal voltage	12 volts
Regulating voltage	13,6 to 14,4 volts
Cut-in voltage	13,5 volts at 2100 rev/min
Polarity	Negative earth
Maximum output current	55 amperes at 6000 alternator rev/min
Maximum output speed	12400 rev/min
Rotor winding resistance	3,2 ohms at 20°C (68°F)
Brush spring pressure	225 to 368 gf (9 to 13 ozf)
Minimum brush length	8 mm (0,312 in)
BATTERY	
Type	Lucas C9
Capacity	58 Ah at 20 hour rate
STARTER MOTOR	
Type	Lucas 2M100 pre-engaged
* Lock torque	19,52 N.m with 463 A
* Torque at 1 000 r/min	9,9 N.m with 300 A
* Light running current	40 A at 6 000 r/min (approx)
BULB AND SEALED BEAM	
Headlamps with bulbs	Lucas 411, 12 V, 45/50 W, clear
Headlamps with sealed beam units	Lucas 54521872, 60/45 W
Sidelamps	Lucas 207, 12 V, 4 W
Stop/Tail lamps	Lucas 380, 12 V, 21/5 W
Flasher lamps	Lucas 382, 12 V, 21 W
Rear number plate lamp	Lucas 233, 12 V, 4 W
Instrument panel lights	Lucas 987, 12 V, 2,2 W MES
Warning lights	Lucas 987, 12 V, 2,2 W MES
Warning light, brakes	Lucas 280, 12 V, 1,5 W
Warning light, flashers	Lucas 281, 12 V, 2 W
Interior light	Lucas 382, 12 V, 21 W
Hazard switch (on dash)	Lucas 12 V, 2 W
All blackout lights	Lucas 12 V, 5 W
*Typical performance figures obtained with a 12 V, 60 Ah battery in a 70% charged condition at 20° C.	

TABLE O1.2 - TORQUE SPECIFICATIONS

ITEM	TORQUE (N.m)
Alternator shaft nut	35 to 42

SUB-SECTION 02

FAULT DIAGNOSIS AND CORRECTIVE ACTION

INTRODUCTION

1. This Sub-section deals with fault diagnosis and the corrective action required for the electrical system. In the Table below a list of symptoms, the probable cause and the suggested remedies are shown. The Table is not exhaustive and does not indicate faulty bulbs. Should a fault occur in a circuit containing a bulb the first action should be to check the bulb by replacement. If the fault is still present, check wiring and connections between the lamp and the switch or battery.
2. Each of the four fuses protects several circuits, thus if more than one bulb fails, the fuses should be checked first.

TABLE 02.1 - ELECTRICAL SYSTEM FAULT DIAGNOSIS CHART

SYMPTOM	POSSIBLE CAUSE	REMEDY
Battery in low state of charge	Broken or loose connection in alternator circuit. Current voltage regulator not functioning correctly. Slip rings greasy or dirty. Brushes worn not fitted correctly or wrong type.	Examine the charging and field circuit wiring. Tighten any loose connections and renew any broken leads. Examine the battery connection. Adjust or renew. Clean. Renew.
Battery over-charging, leading to burnt-out bulbs and frequent need for topping-up	Current voltage regulator not functioning correctly.	Renew.
Lamps giving insufficient lamination	Battery discharged. Bulbs discoloured through prolonged use.	Charge the battery from an independent supply or by a long period of daylight running. Renew.
Lamps light when switched on but gradually fade out	Battery discharged.	Charge the battery from an independent supply or by a long period of daylight runnings.
Lights flicker	Loose connection.	Tighten.
Failure of lights	Battery discharged. Loose or broken connection.	Charge the battery from an independent supply or by a long period of daylight running. Locate and rectify.
Starter motor lacks power or fails to turn engine	Stiff engine. Battery discharged.	Locate cause and rectify. Charge the battery either by a long period of daytime running or from independent electrical supply.

TABLE O2.1 - ELECTRICAL SYSTEM FAULT DIAGNOSIS - Continued

SYMPTOM	POSSIBLE CAUSE	REMEDY
	<p>Broken or loose connection in starter circuit.</p> <p>Greasy or dirty slip rings. Brushes worn, not fitted correctly or wrong type. Brushes sticking in holders or incorrectly tensioned. Starter pinion jammed in mesh with flywheel.</p>	<p>Check and tighten all battery, starter and switch connections and check the cables connecting these units for damage. Clean. Renew.</p> <p>Rectify.</p> <p>Remove starter motor and investigate.</p>
Starter noisy	<p>Starter pinion or flywheel teeth chipped or damaged. Starter motor loose on engine.</p> <p>Armature shaft bearing.</p>	<p>Renew.</p> <p>Rectify, checking pinion and the flywheel for damage. Renew.</p>
Starter operates but does not crank the engine	Pinion of starter does not engage with the flywheel.	Check operation of starter solenoid. If correct, remove starter motor and investigate.
Starter pinion will not disengage from the flywheel when the engine is running	Starter pinion jammed in mesh with the flywheel.	Remove starter motor and investigate.
Engine will not fire	<p>The starter will not turn the engine due to a discharged battery.</p> <p>Sparking plugs faulty, dirty or incorrect plug gaps. Defective coil or distributor.</p> <p>A fault in the low tension wiring is indicated when no spark occurs between the contacts when separated quickly with an insulated screwdriver with the ignition on. Dirty or pitted contacts. Contact breaker out of adjustment. Controls not set correctly or trouble other than ignition.</p>	<p>The battery should be recharged by running the car for a long period during daylight or from an independent electrical supply. Rectify or renew.</p> <p>Remove the lead from the centre distributor terminal and hold it approximately 6 mm from some metal part of the engine while the engine is being turned over. If the sparks jump the gap regularly, the coil and distributor are functioning correctly. Renew a defective coil or distributor. Examine all the ignition cables and check that the bottom terminals are secure and not corroded.</p> <p>Clean or renew. Adjust. See Starting Procedure in the OMM.</p>
Engine misfires	<p>Distributor points incorrectly set. Faulty coil or condenser. Faulty sparking plugs. Faulty carburetter.</p>	<p>Adjust. Renew. Rectify. Check and rectify.</p>

TABLE O2.1 - ELECTRICAL SYSTEM FAULT DIAGNOSIS - Continued

SYMPTOM	POSSIBLE CAUSE	REMEDY
Frequent recharging of the battery necessary	Alternator inoperative. Loose or corroded connections. Slipping fan belt. Voltage control out of adjustment. Excessive use of the starter motor. Vehicle operation confined largely to night driving. Abnormal accessory load. Internal discharge of the battery.	Check the brushes, cables and connections or renew the alternator. Examine all connections, especially the battery terminals and earthing straps. Adjust. Renew. In the hands of the operator. In the hands of the operator. Superfluous electrical fittings such as extra lamps etc. Renew.
Alternator not charging correctly	Slipping fan belt. Voltage control not operating correctly. Greasy, charred or glazed slip rings. Brushes worn, sticking or oily. Shorted, open or burnt-out field coils.	Adjust. Rectify or renew. Clean. Rectify or renew. Renew.
Alternator noisy	Worn, damaged or defective bearings. Cracked or damaged pulley. Alternator out of alignment. Alternator loose in mounting. Excessive brush noise.	Renew. Renew. Rectify. Rectify. Check for rough or dirty slip rings, badly seating brushes, incorrect brush tension, loose brushes and loose field magnets. Rectify or renew.
Defective distributor	Contact breaker gap incorrect or points burned and pitted. Distributor cap cracked. Weak or broken contact breaker spring. Excessive wear in distributor shaft brushes, etc. Rotor arm pitted or burned. If the engine lacks power, or misfires, it may be due to a faulty condenser.	Clean and adjust. Renew. Renew. Renew. Clean or renew. Renew the condenser.
Poor performance of horns	Low voltage due to discharged battery. Bad connections in wiring. Loose fixing bolt. A faulty horn.	Recharge. Carefully inspect all connection and horn push. Rectify. Adjust or renew.

SUB-SECTION O3

TESTING THE ALTERNATOR IN SITU

EQUIPMENT REQUIRED

1. The following test metres will be required for the tests:
 - a. A moving coil ammeter or multimeter with a range of 0-75 amps.
 - b. A moving coil voltmeter or multimeter with a range of 0-30 volts.

OUTPUT TEST

2. This test should be carried out with the alternator at normal temperatures. Run a cold engine at 3000 rev/min for three to four minutes before testing.

(1) Disconnect the battery earth lead.

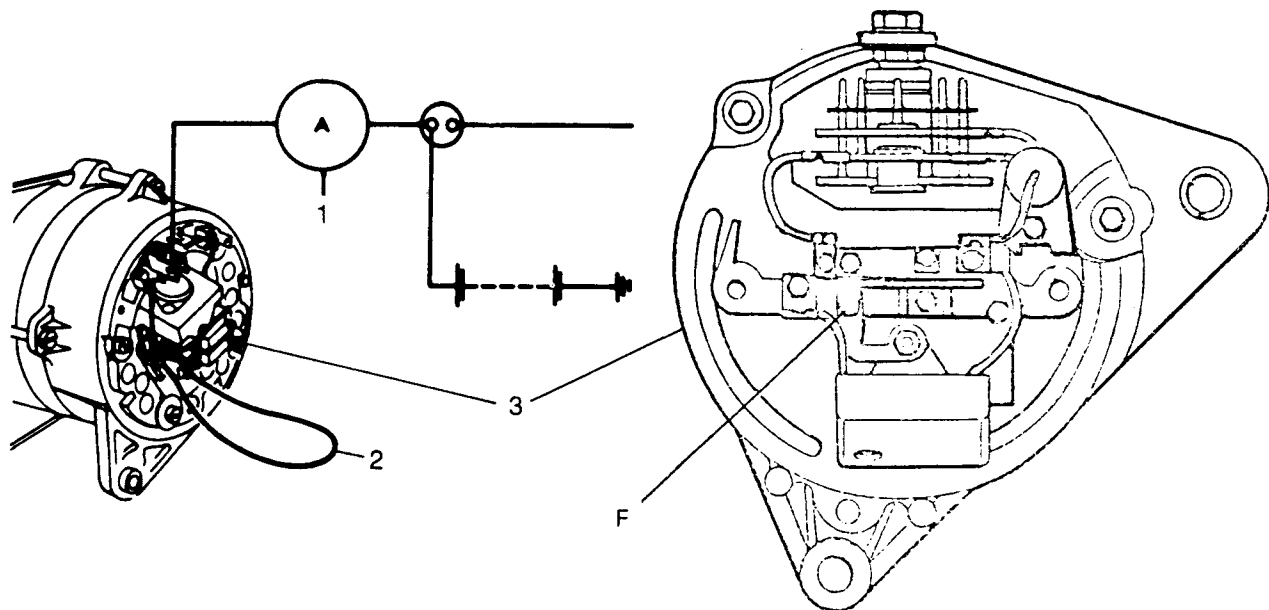


Fig O3.1

- (2) Refer to Fig O3.1. Connect ammeter (1) in series with alternator (3) main output cable and starter solenoid.
- (3) Remove connectors from alternator. Remove moulded end cover and re-make connectors.
- (4) Connect jumper lead (2) to short out the 'F' terminal to earth. (This makes regulator inoperative by effectively linking 'F' green lead to alternator frame).
- (5) Reconnect battery earth lead.

(6) Switch on all vehicle lighting, headlights on main beam. Switch on ignition and check warning light is on.

(7) Start engine, slowly increase speed to 3000 rev/min. Ammeter reading should equal maximum output of 55 amperes.

VOLTAGE DROP TEST

3. This test checks for an unwanted high resistance in the charging circuit.

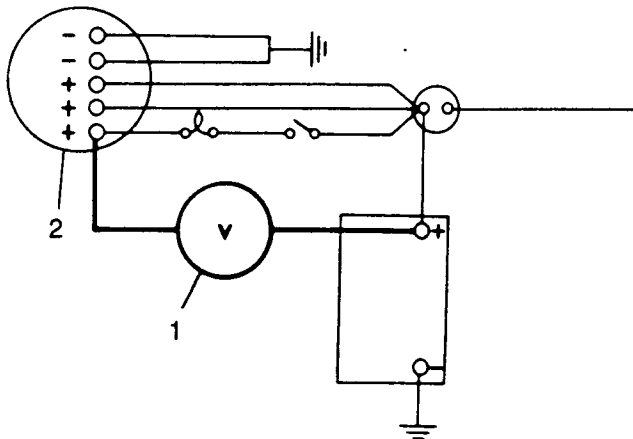


Fig O3.2

(1) Refer to Fig O3.2. Connect voltmeter (1) between battery +ve terminal and alternator main output terminal (2).

(2) Switch on all vehicle lighting, headlights on main beam.

(3) Start engine and run at 3000 rev/min. Note voltmeter reading. Stop engine and switch off the lights.

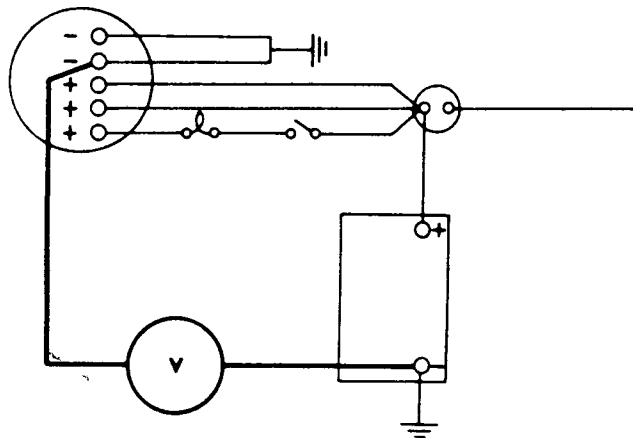


Fig O3.3

(4) Refer to Fig O3.3. Transfer voltmeter connections to battery earth and alternator negative terminal.

(5) Switch on all vehicle lighting, headlights on main beam.

(6) Start the engine and run at 3000 rev/min. Note the voltmeter reading. Stop the engine.

(7) The voltmeter readings in steps (3) and (6) should not be greater than 0,5 volts. Higher readings indicate an unwanted high resistance in the circuit.

CONTROL UNIT TEST

4. Circuit wiring must be in good condition and all connections clean and secure. The battery must be in a well charged condition or be temporarily replaced by a charged unit. Test the control unit as follows:

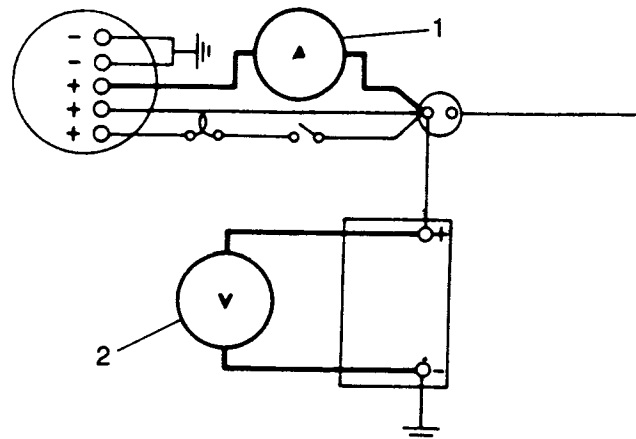


Fig O3.4

(1) Refer to Fig O3.4. Connect ammeter (1) in series with starter solenoid and alternator main output cable.

(2) Connect voltmeter (2) between battery terminals.

(3) Start engine and run at 3000 rev/min until the ammeter reads less than 10 amperes. Voltmeter reading should be between 13,6 volts and 14,4 volts.

(4) An unstable reading or a reading outside the specified limits indicates a faulty control unit.

SUB-SECTION O4

ALTERNATOR DRIVE BELT - ADJUSTING

CHECKING BELT TENSION

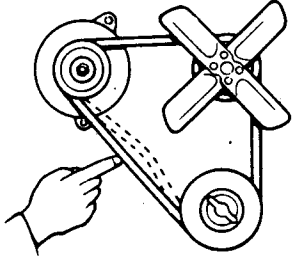


Fig O4.1

- (1) Refer to Fig O4.1. To check belt tension depress the belt at the midway point of its longest run with moderate finger pressure. Deflection is to be 12 mm. If it is more or less than this, retension the belt.

TENSIONING THE BELT

CAUTION

Do not use leverage across the alternator body when tensioning the belt.

2. To tension the belt:

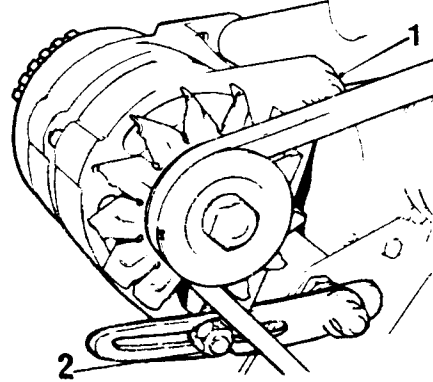


Fig O4.2

- (1) Refer to Fig O4.2. Slacken the nuts (1) securing the alternator to the mounting bracket.
- (2) Slacken the fixings (2) at the adjustment link.
- (3) Pivot the alternator inwards or outwards as necessary and adjust until the correct tension is obtained. Tighten the bolt on the top of the adjustment link.
- (4) Tighten the remaining fixings.
- (5) Recheck tension and readjust if necessary.

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SUB-SECTION 05

REMOVAL AND REPLACEMENT

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SUB-SECTION O5

CHAPTER 1

ALTERNATOR - REMOVAL AND REPLACEMENT

REMOVAL

1. To remove the alternator:
 - (1) Disconnect the battery earth lead.

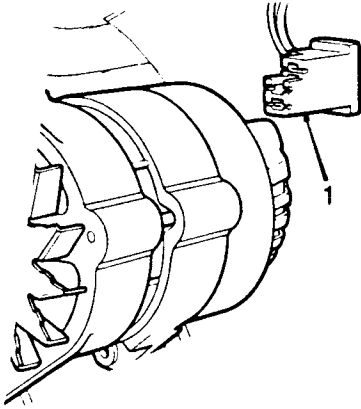


Fig O5.1

- (2) Refer to Fig O5.1. Disconnect the leads from the alternator.

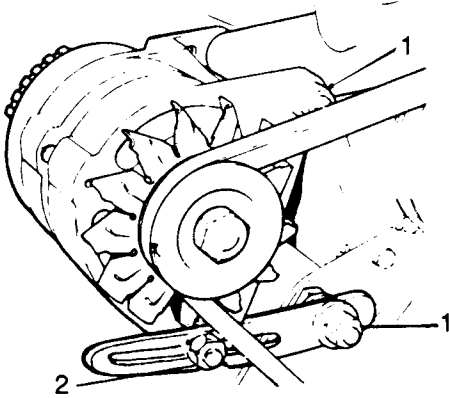


Fig O5.2

- (3) Refer to Fig O5.2. Slacken the alternator fixings (1) and (2). Pivot the alternator inwards towards the engine and remove the drive belt.
 - (4) Remove all fixings and lift out the alternator.

REPLACEMENT

2. To replace the alternator:
 - (1) Refer to Fig O5.2. Fit the alternator into position and secure with finger tight fixings (1) and (2).
 - (2) Fit the drive belt and adjust belt tension (see Sub-section O4, Chapter 3).
 - (3) Refer to Fig O5.1. Connect the leads (1) to the alternator.
 - (4) Reconnect the battery.

SUB-SECTION O5

CHAPTER 2

CONTROL UNIT - REMOVAL AND REPLACEMENT

REMOVAL

1. To remove the control unit:
 - (1) Disconnect the battery.
 - (2) Remove the alternator (see Sub-sub-section O5, Chapter 1).

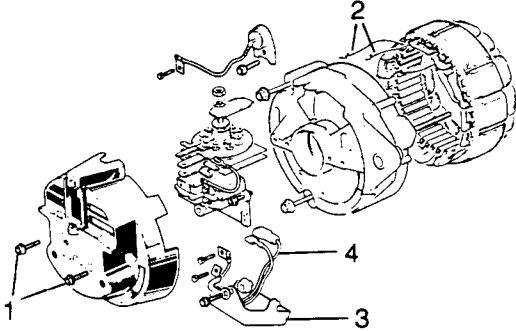


Fig O5.3

- (3) Refer to Fig O5.3. Remove alternator end cover by withdrawing two retaining screws (1).
- (4) Unsolder stator winding connections (2) at rectifier diodes.

CAUTION

It is essential to use a thermal shunt and a light-weight soldering iron.

- (5) Note position of cables (4) at rectifier plates and disconnect.

- (6) Remove three hexagon headed screws securing brush moulding and regulator (3) to slip-ring end bracket.

- (7) Remove brush gear and regulator from alternator.

REPLACEMENT

2. Replace the control unit as follows:
 - (1) Refer to Fig O5.3. Replace the brush gear and regulator (3) and secure with the three screws.
 - (2) Reconnect the cables (4) to the rectifier plate.
 - (3) Solder the stator winding connections (2) to the rectifier diodes.
 - (4) Replace the end cover (1) and secure with the two retaining screws.

SUB-SECTION O5

CHAPTER 3

BATTERY - REMOVAL AND REPLACEMENT

REMOVAL

1. The battery is in the cab, under the driver's seat.
To remove:

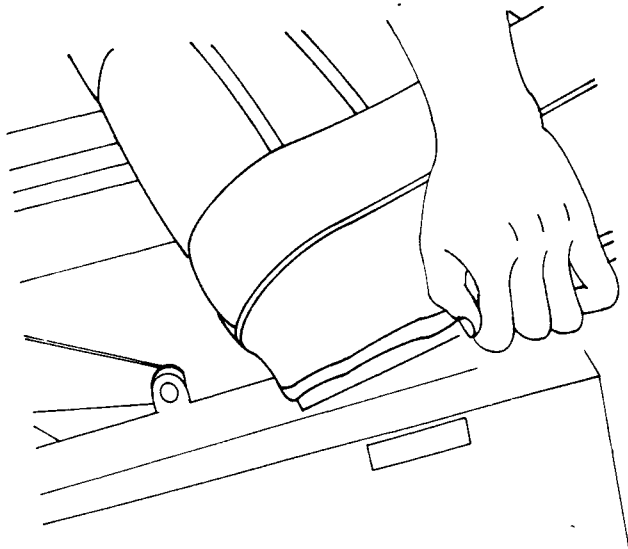


Fig O5.4

- (1) Refer to Fig O5.4. Lift off the seat.

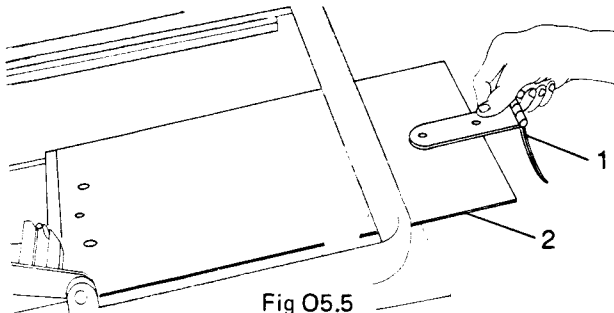


Fig O5.5

- (2) Refer to Fig O5.5. Undo the antiluce fastener (1) in front of the seat frame, lift the plate (2) slightly and pull forward to remove.

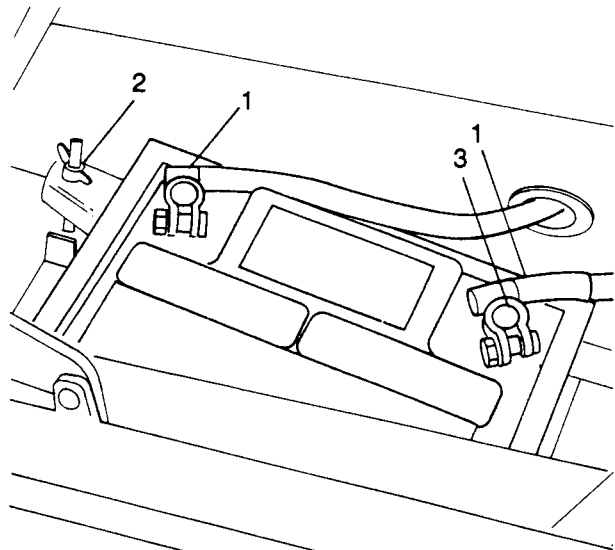


Fig O5.6

- (3) Refer to Fig O5.6. Disconnect the two battery leads (1).
- (4) Remove the two wing nuts (2) and lift off the battery retaining frame.
- (5) Lift out the battery.

REPLACEMENT

2. To replace the battery:

- (1) Fig O5.6 still applies. Place the battery into the box with the positive terminal (3) adjacent to the positive (red) lead.
- (2) Refit the battery frame, carefully avoiding contact with the terminals, and secure with the wing nuts (2).
- (3) Remove any oxydization from the leads and terminals with a clean cloth. Fit the leads and secure. Apply a smear of acid resistant grease around the terminals.
- (4) Fig O5.5 still applies. Replace the plate over the battery box and clip the antiluce device into position.
- (5) Replace the seat.

SUB-SECTION O5

CHAPTER 4

HORN - REMOVAL AND REPLACEMENT

REMOVAL

1. To remove the horn:
 - (1) Disconnect the battery earth lead.

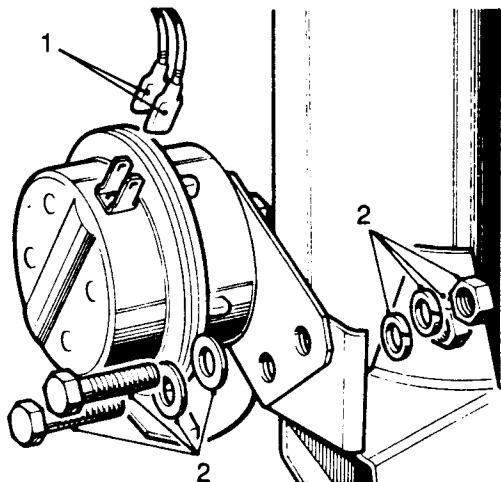


Fig O5.7

- (2) Refer to Fig O5.7. Disconnect the leads (1) from the horn.
 - (3) Remove the fixings (2) and lift the horn out.

REPLACEMENT

2. Replace the horn as follows:
 - (1) Offer up the horn to the bracket.
 - (2) Secure with the fixings (2).
 - (3) Replace the horn leads (1). It is immaterial which lead fits to each terminal.

SUB-SECTION O5

CHAPTER 5

STARTER MOTOR - REMOVAL AND REPLACEMENT

REMOVAL

1. To remove the starter motor:
 - (1) Drive the vehicle onto a ramp.
 - (2) Disconnect both battery leads.

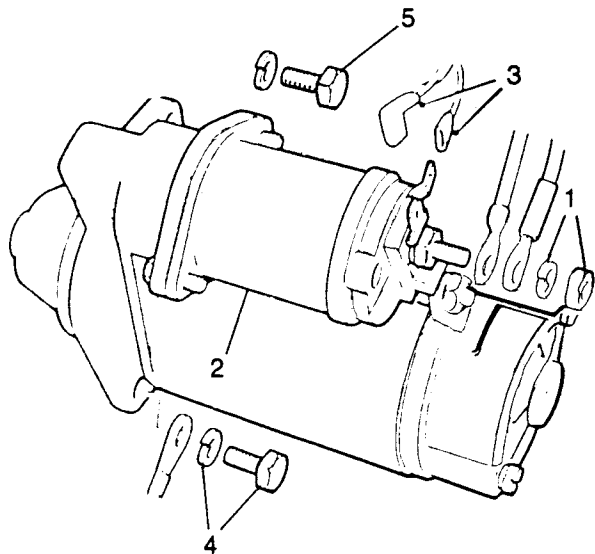


Fig O5.8

- (3) Refer to Fig O5.8. Remove the nut and spring washer (1) and remove the battery lead from the solenoid (2).
- (4) Disconnect the brown and the brown/red leads from their respective connections (3).

- (5) Remove the lower mounting bolt (4), nut and spring washer.
- (6) Remove the upper mounting bolt (5), nut and spring washer, and manoeuvre the starter motor downwards from the vehicle.

REPLACEMENT

2. Replace the starter motor as detailed below:
 - (1) Manoeuvre the starter motor upwards into the vehicle and secure with the upper mounting bolt (5) nut and spring washer.
 - (2) Refit the lower mounting bolt (4) nut and spring washer.
 - (3) Reconnect the brown and brown/red leads (3) to their respective connections.
 - (4) Reconnect the battery lead to the solenoid (2) and secure with the nut (1) and spring washer.
 - (5) Reconnect the battery leads.

SUB-SECTION O5

CHAPTER 6

HEADLAMP ASSEMBLY - REMOVAL AND REPLACEMENT

REMOVAL

1. To remove the headlamp assembly:

(1) Disconnect the battery earth lead.

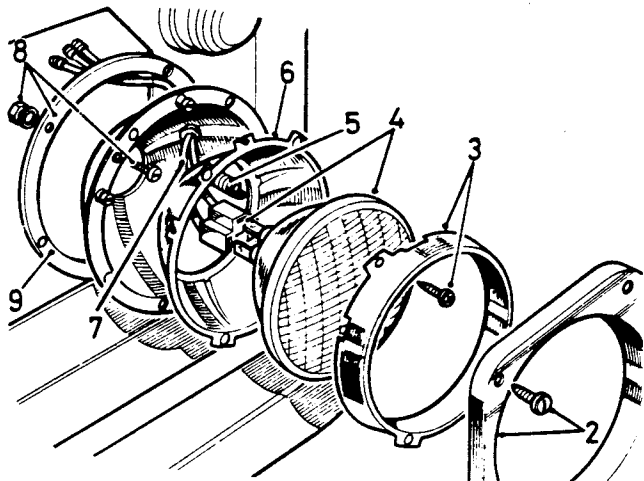


Fig O5.9

- (2) Refer to Fig O5.9. Remove the headlamp Bezel (2).
- (3) Remove the headlamp rim (3).
- (4) Disconnect the headlamp leads at the plug connector and withdraw the light unit (4).
- (5) Disconnect the spring from the headlamp shell (5).
- (6) Withdraw the headlamp shell (6) by rotating it clear of the slotted locations.
- (7) Disconnect the headlamp leads (7) at the snap connectors behind the radiator grille.
- (8) Remove the headlamp mounting shell (8).
- (9) Withdraw the gasket (9).

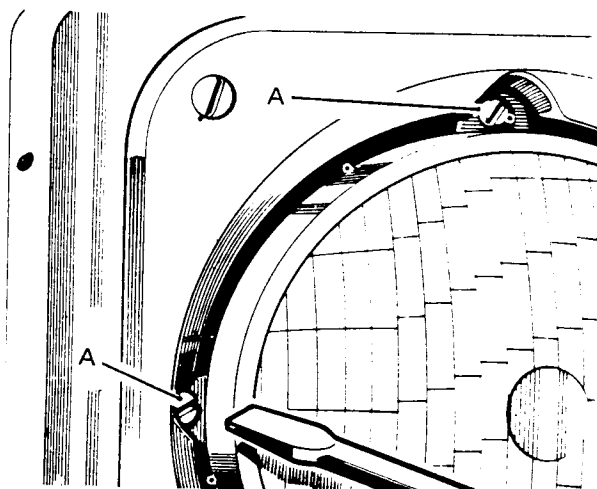
REPLACEMENT

2. Replace the headlamp assembly as follows:

- (1) Replace the gasket (9).
- (2) Replace the headlamp mounting shell (8) and secure with the bolts, nuts and washers.
- (3) Reconnect the headlamp leads to the snap connectors behind the radiator grille. The connections are:

Blue/Red - dip beam positive.
Blue/White - main beam positive.
Black - earth.

- (4) Refit the headlamp shell (6) by rotating it into the slotted locations.
- (5) Reconnect the spring to the headlamp shell (5).
- (6) Refit the light unit (4) and connect the leads to the plug connector.
- (7) Replace the headlamp rim (3) and secure with the self tapping screws.
- (8) Refit the headlamp bezel (2) and secure with the fixing screws.
- (9) Reconnect the battery earth lead.
- (10) Check and if necessary adjust the headlamp using suitable beam setting equipment. The beam setting screws and beam position diagram are given in Fig O5.10 below:



BEAM SETTING SCREWS (A)

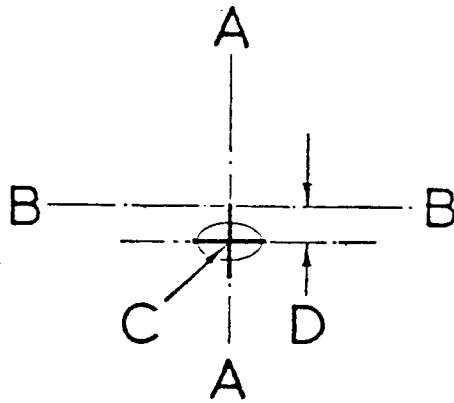


Fig O5.10

BEAM SETTING MARKS

- AA = Vertical centre line of headlamp
- BB = Horizontal centre line of headlamp
measured from level floor
- C = Centre of concentrated area of light
- D = 50 mm \pm 25 mm

SUB-SECTION O5

CHAPTER 7

FRONT FLASHER LAMP - REMOVAL AND REPLACEMENT

REMOVAL

1. To remove either the flasher or side lamp assembly:

(1) Disconnect the battery earth lead.

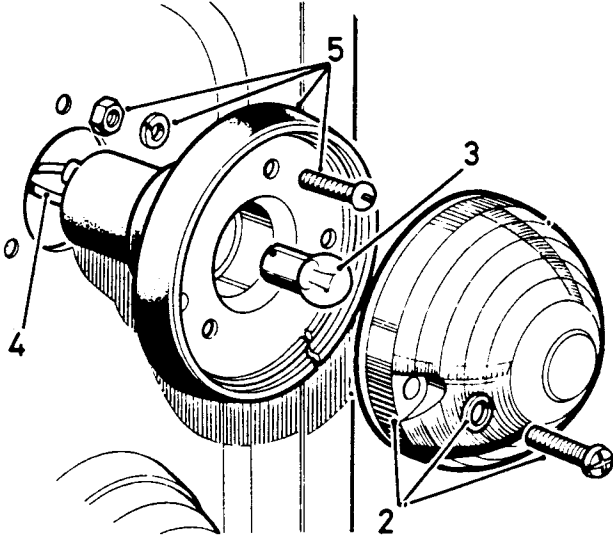


Fig O5.11

(2) Refer to Fig O5.11. Remove the lamp lens (2) after removing the two cross-head bolts and washers.

(3) If required, remove the bulb (3).

(4) Disconnect the lamp leads at the snap connectors (4) in the engine compartment.

(5) Remove the fixings (5) and pull out the lamp body.

REPLACEMENT

2. Replace the assembly as follows:

(1) Fit the lamp body into position and secure with the bolts, nuts and washers (5).

(2) Connect the lamp leads at the snap connectors in the engine compartment: Red lead - positive; Black lead - earth.

(3) Replace the bulb (3).

(4) Refit the lamp lens (2) and secure with the cross head bolts and washers.

(5) Reconnect the battery earth lead.

SUB-SECTION O5

CHAPTER 8

COMBINED REAR, FLASHER, STOP AND BLACKOUT LAMPS - REMOVAL AND REPLACEMENT

REMOVAL

1. To remove the lamp:

(1) Disconnect the battery earth lead.

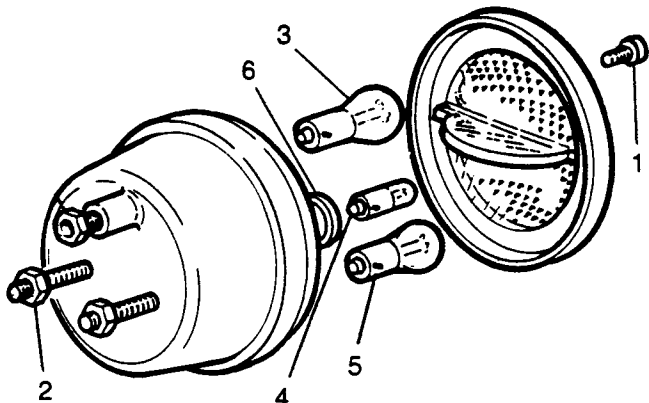


Fig O5.12

(2) Refer to Fig O5.12. Remove the lens fixings (two screws) (1) and pull off the lens.

(3) Remove the bulbs if required.

(4) Remove the fixings for the cover in the rear of the load area behind the lamp (two self tapping screws and one nut) and lift the cover away.

(5) Disconnect the lamp leads at the snap connectors, making a note of the socket each connector comes from.

(6) Remove the two bolts (2) holding the lamp to the wall and pull the lamp body away.

REPLACEMENT

2. Replace the:

(1) Position secure washers.

(2) Reconnect the connectors.

(3) Replace the bulbs:

18 W at the top (3).
4 W in the centre (4).
21/5 W at the bottom (5).

(4) Replace the red tube (6) over the centre bulb.

(5) Refit the lens with amber at the top and secure with the fixings.

(6) Reconnect the battery earth lead and check that the bulbs operate correctly:

In the amber sector - flasher.
In the red sector - normal tail light.
- normal stop light.
- blackout tail light.

(7) Replace the cover in the load area and secure with the two self tapping screws and the screw, two washers and nut.

INSPECTION SOCKETS - REMOVAL AND REPLACEMENT

REMOVAL

1. To remove the inspection sockets:

- (1) Disconnect the battery earth lead.
- (2) Withdraw the instrument panel clear of the dash (see Sub-section O5, Chapter 27).

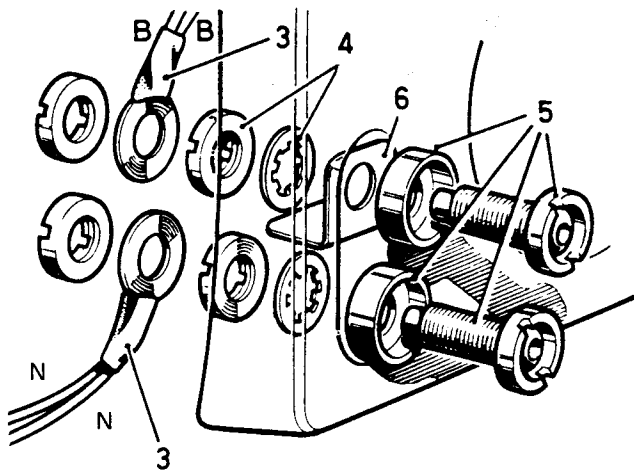


Fig O5.13

- (3) Refer to Fig O5.13. Disconnect the electrical leads (3) from the sockets.

- (4) Remove the screw lock rings, shakeproof washers (4) and insulation tab (6).

- (5) Withdraw the sockets (5).

REPLACEMENT

2. Replace the sockets as follows:

- (1) Fit the sockets into the holes (red on top) with the insulation tab (6) central between the two sockets. Secure with the shakeproof washers and lock rings (4).

- (2) Connect the leads to the sockets, black leads to the black socket and the remaining leads to the red socket, and secure with the screws.

- (3) Reconnect the battery earth lead.

SUB-SECTION O5

CHAPTER 10

PANEL ILLUMINATION OR WARNING LAMP BULB - REMOVAL AND REPLACEMENT

REMOVAL

1. To remove a lamp bulb:
 - (1) Disconnect the battery earth lead.
 - (2) Withdraw the instrument panel clear of the dash (see Sub-section O5, Chapter 27).

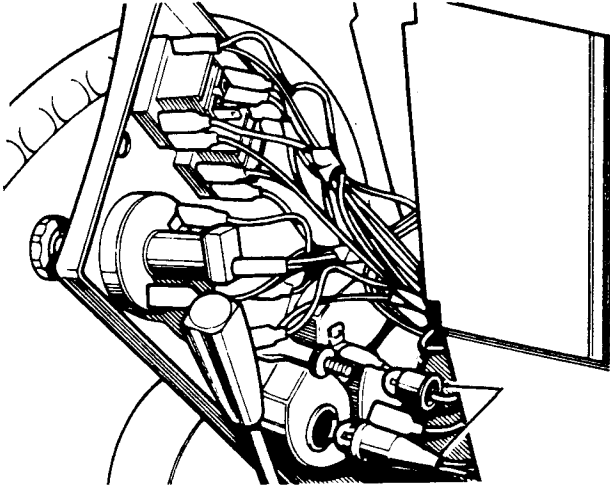


Fig O5.14

- (3) Refer to Fig O5.14. Withdraw the bulb holder and change the bulb as necessary.

REPLACEMENT

2. Replace the instrument panel as detailed in Sub-section O5, Chapter 27.

SUB-SECTION O5

CHAPTER 11

FLASHER UNIT - REMOVAL AND REPLACEMENT

REMOVAL

1. The flasher unit is located on the bulkhead behind the instrument panel. To remove the unit:
 - (1) Disconnect the battery earth lead.
 - (2) Withdraw the instrument panel clear of the dash (see Sub-section O5, Chapter 27).

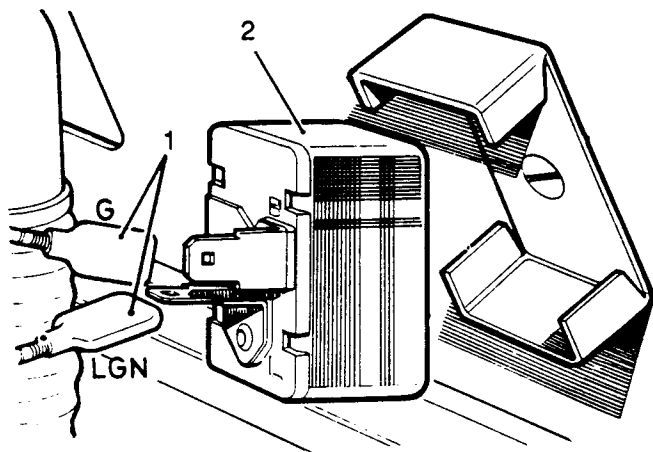


Fig O5.15

- (3) Refer to Fig O5.15. Disconnect the two leads (1) from the flasher unit.
 - (4) Pull the flasher unit (2) forward out of its clip.

REPLACEMENT

2. To replace the flasher unit:
 - (1) Fit the flasher unit into the clip.
 - (2) Connect the leads to the flasher unit terminals:

Green lead to the vertical terminal.
Light green/brown lead to the horizontal terminal.
 - (3) Replace the instrument panel (see Sub-section O5, Chapter 27).

Lead colours:

G - Green
L - Light
N - Brown

SUB-SECTION O5

CHAPTER 12

LIGHTING SWITCH - REMOVAL AND REPLACEMENT

REMOVAL

1. To remove the switch:
 - (1) Disconnect the battery earth lead.
 - (2) Withdraw the instrument panel clear of the dash (see Sub-section O5, Chapter 27).

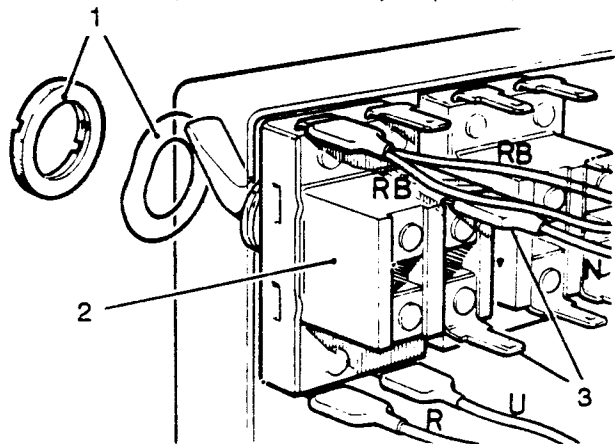


Fig O5.16

- (3) Refer to Fig O5.16. Unscrew the lock ring and wave washer (1) from the switch knob.
- (4) Disconnect the leads from the back of the switch.
- (5) Withdraw the switch (2).

REPLACEMENT

2. Replace the switch as follows:
 - (1) Orientate the switch by looking at the back and keeping the two inner terminals (3) to the right.
 - (2) Fit the switch this way up into its mounting hole and secure with the wave washer and lock ring.
 - (3) Connect the leads to the back of the switch in the positions shown on illustration above.
 - (4) Replace the instrument panel.
 - (5) Reconnect the battery earth lead.

Lead colours:

R - Red
B - Black
N - Brown
U - Blue

SUB-SECTION O5

CHAPTER 13

PANEL LIGHT SWITCH - REMOVAL AND REPLACEMENT

REMOVAL

1. The following instructions apply to the panel light switch and to a combined panel and interior light switch. The latter has more leads to the back of the switch. To remove:

- (1) Disconnect the battery earth lead.
- (2) Withdraw the instrument panel clear of the dash (see Sub-section O5, Chapter 27).

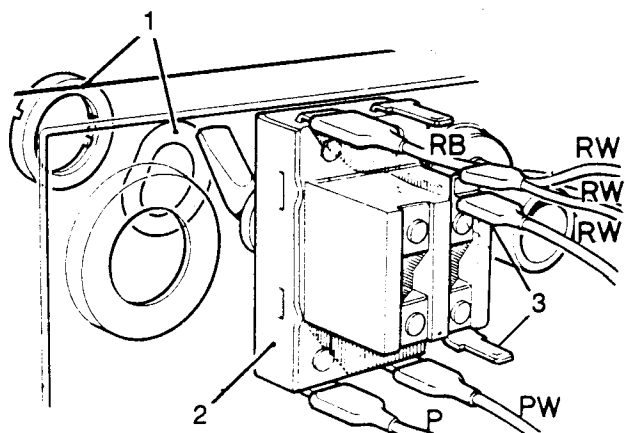


Fig O5.17

- (3) Refer to Fig O5.17. Unscrew the lock ring (1) and remove it and the wave washer (1) from the switch knob.

(4) Disconnect the leads from the back of the switch.

(5) Withdraw the switch (2).

REPLACEMENT

2. Replace the switch as follows:

- (1) Orientate the switch by looking at the back and keeping the two inner terminals (3) on the right.
- (2) Fit the switch this way up into the instrument panel mounting hole and secure with the wave washer and lock ring.
- (3) Connect the leads to the back of the switch as shown in the illustration above.
- (4) Replace the instrument panel.
- (5) Reconnect the battery earth lead.

Lead colours:

R - Red
B - Black
W - White
P - Purple

SUB-SECTION O5

CHAPTER 14

WINDSCREEN WIPER/WASHER SWITCH - REMOVAL AND REPLACEMENT

REMOVAL

1. To remove the switch:

(1) Disconnect the battery earth lead.

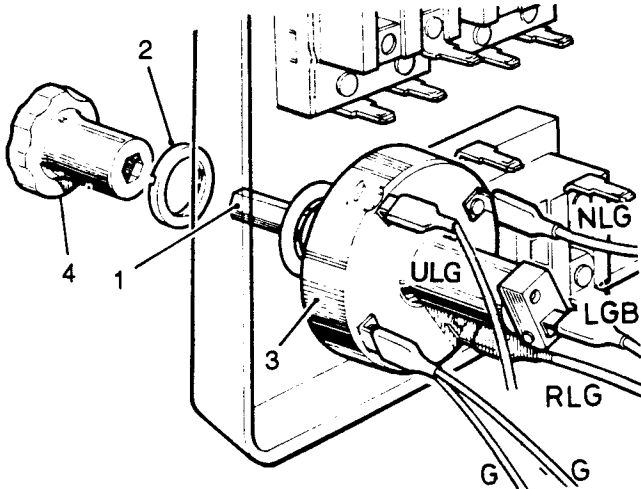


Fig O5.18

(2) Refer to Fig O5.18. Depress the plunger (use a matchstick or similar pointed instrument) and withdraw the switch knob (4).

(3) Unscrew the lock ring (2).

(4) Withdraw the instrument panel clear of the dash (see Sub-section O5, Chapter 27).

(5) Disconnect the leads from the back of the switch and withdraw the switch (3).

REPLACEMENT

2. Replace the switch as follows:

(1) Fit the switch through the mounting hole with the centre terminal at the bottom of the block and secure with the lock ring.

(2) Connect the leads to the terminals on the back of the switch as shown in the above Figure.

(3) Refit the instrument panel to the dash.

(4) Push in the plunger and push the switch knob onto the hex rod (1).

(5) Reconnect the battery earth lead.

Lead colours:

N - Brown
G - Green
R - Red
B - Black
U - Blue
L - Light

SUB-SECTION O5

CHAPTER 15

STOP LIGHT SWITCH - REMOVAL AND REPLACEMENT

REMOVAL

1. The stop light switch is mounted on a panel behind the servo unit. To remove the switch:

- (1) Disconnect the battery earth lead.
- (2) Raise the bonnet.

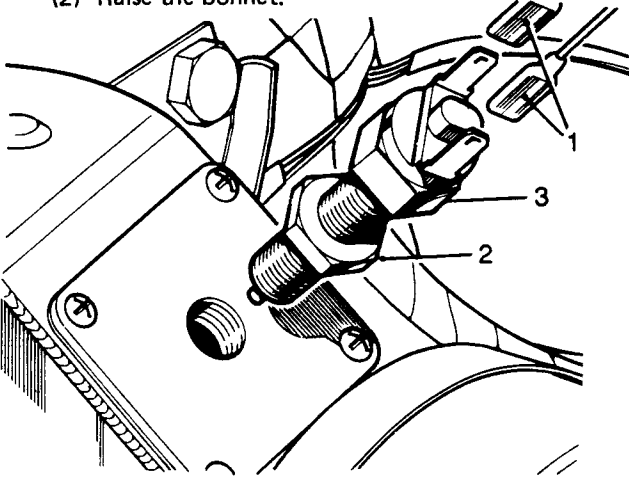


Fig O5.19

- (3) Refer to Fig O5.19. Disconnect the leads (1) from the stop switch.
- (4) Release the lock nut (2) and unscrew the switch (3) from the brake pedal bracket.

REPLACEMENT

2. To replace the stop switch:

- (1) Screw the switch into the brake pedal bracket but do not tighten the lock nut at this stage.
- (2) Connect the leads to the switch terminals. It is immaterial which lead goes to which terminal.
- (3) With the ignition on, check that the stop lamp lights at 19 to 25 mm brake pedal travel. If necessary, disconnect the leads and screw the stop switch into or out of the bracket. Reconnect the leads and recheck.
- (4) Carry out step (3) until the correct pedal travel is established.
- (5) Tighten the lock nut without moving the switch.
- (6) Lower the bonnet and reconnect the battery earth lead.

SUB-SECTION O5

CHAPTER 16

CHOKE WARNING LIGHT SWITCH - REMOVAL AND REPLACEMENT

REMOVAL

1. The choke warning light switch is clamped to the choke cable at the rear of the engine compartment. To remove the switch:

- (1) Disconnect the battery earth lead.

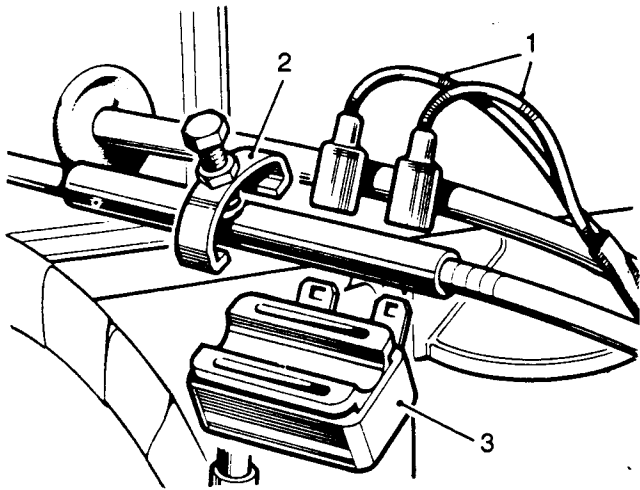


Fig O5.20.

- (2) Refer to Fig O5.20. Disconnect the leads (1) from the switch.
- (3) Remove the clip (2) securing the switch to the choke cable.
- (4) Remove the switch.

REPLACEMENT

2. Replace the switch as follows:

- (1) Offer up the switch to the choke cable.
- (2) Fit the clip and tighten the bolt and lock nut holding it to the choke cable.
- (3) Replace the leads. It is immaterial which lead goes to which terminal.
- (4) Reconnect the battery earth lead.