

ELECTRICAL OPERATIONS

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ELECTRICAL EQUIPMENT

IMPORTANT

The electrical system is **NEGATIVE EARTH**, and it is most important to ensure correct polarity of the electrical connections at all times. Any incorrect connections made when reconnecting cables may cause irreparable damage to the semiconductor devices used in the alternator and regulator. Incorrect polarity would also seriously damage any transistorised equipment such as radio and tachometer etc.

Before carrying out any repairs or maintenance to an electrical component, always disconnect the battery.

The V-drive fan belt used with alternators is not the same as that used with d.c. machines. Only use the correct Rover replacement fan belt. Occasionally check that the engine and alternator pulleys are accurately aligned.

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.

Do not disconnect battery cables while the engine is running or damage to the semi-conductor 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.

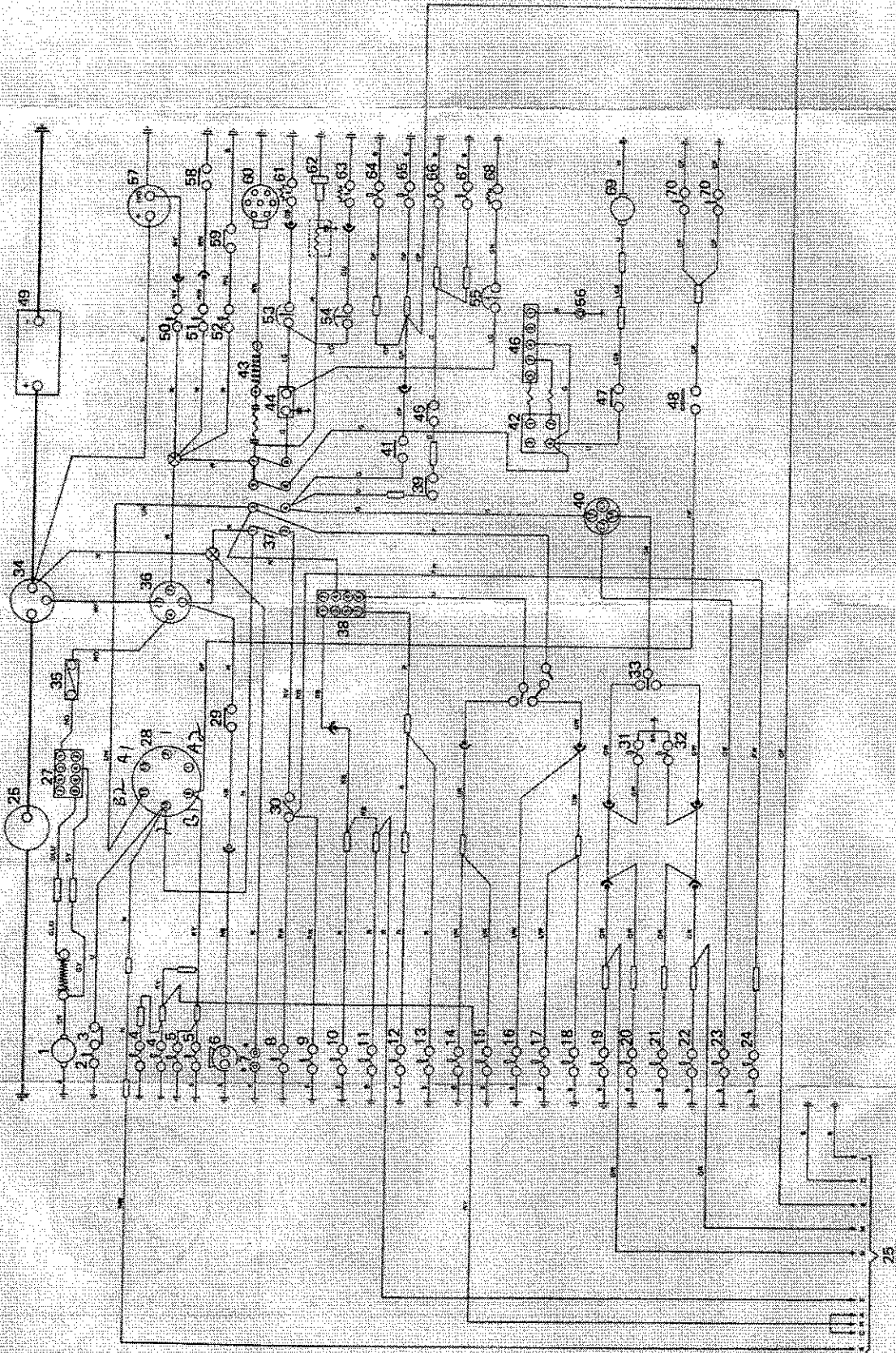
The electronic voltage regulator employs micro-circuit techniques resulting in improved performance under difficult service conditions. The whole assembly is encapsulated in silicone rubber and housed in an aluminium heat sink, ensuring complete protection against the adverse affects of temperature,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

The regulating voltage is set during manufacture to give the required regulating voltage range of 13.8 to 14.5 volts, and no adjustment is necessary. The only maintenance needed is the occasional check on terminal connections and wiping with a clean dry cloth.

The alternator system provides for direct connection of a charge (ignition) indicator warning light, and eliminates the need for a field switching relay or warning light control unit. As the warning lamp is connected in the charging circuit, lamp failure will cause loss of charge. Lamp should be checked regularly and a spare carried.

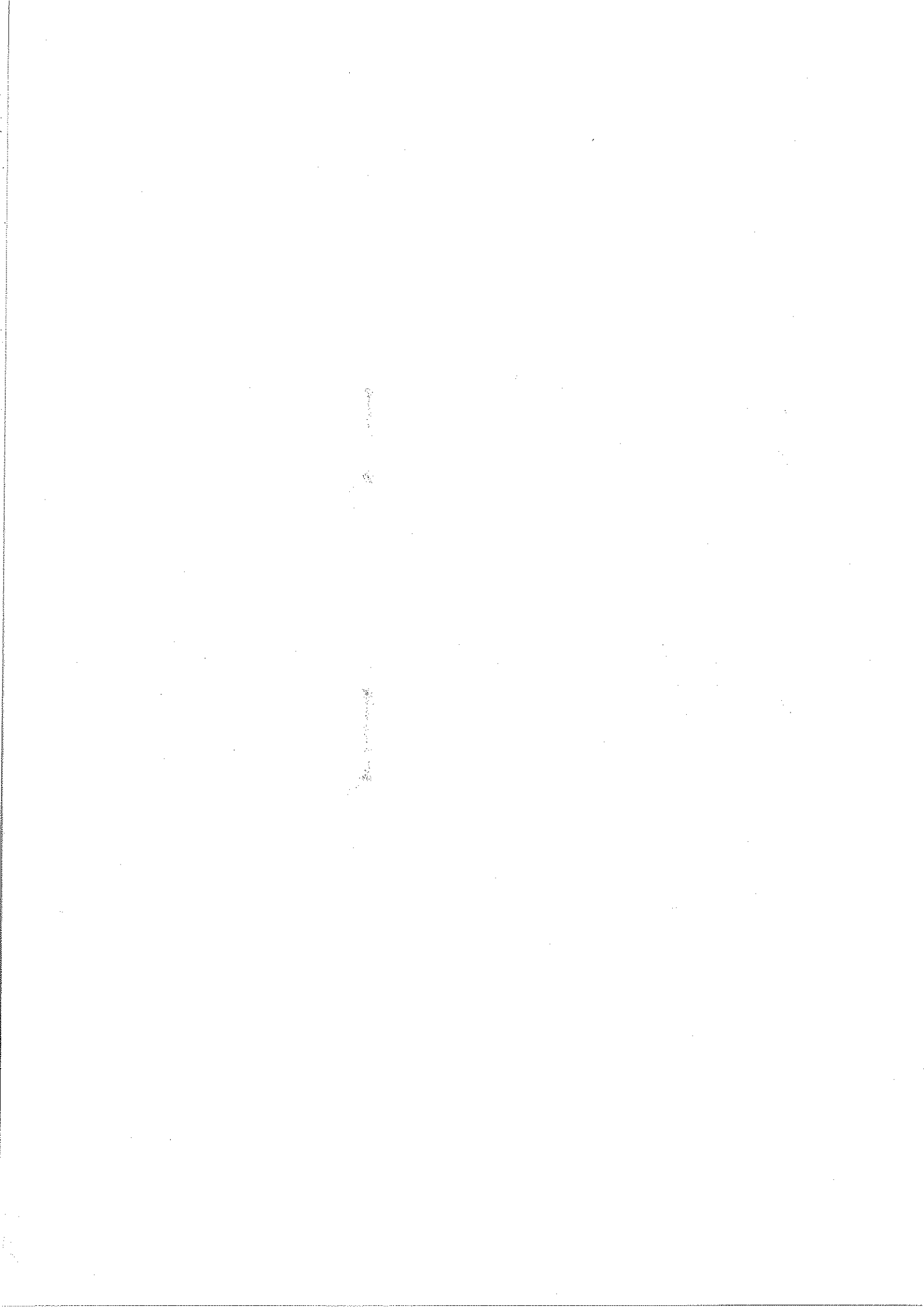
When using rapid charge equipment to re-charge the battery, the battery must be disconnected from the vehicle.





Circuit diagram



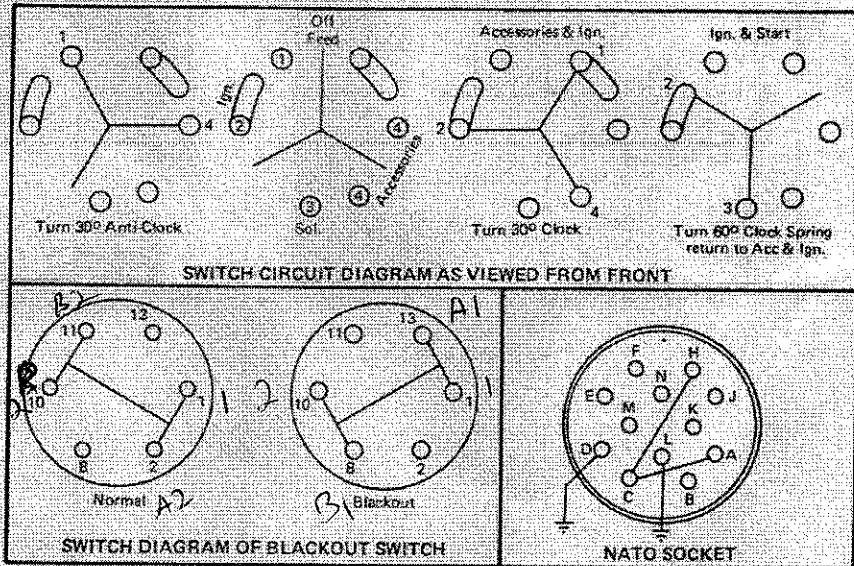
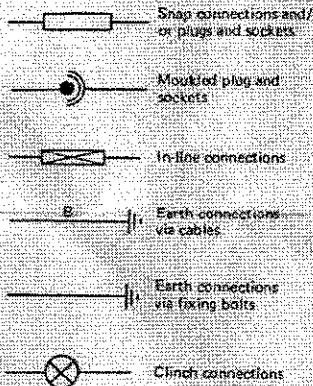


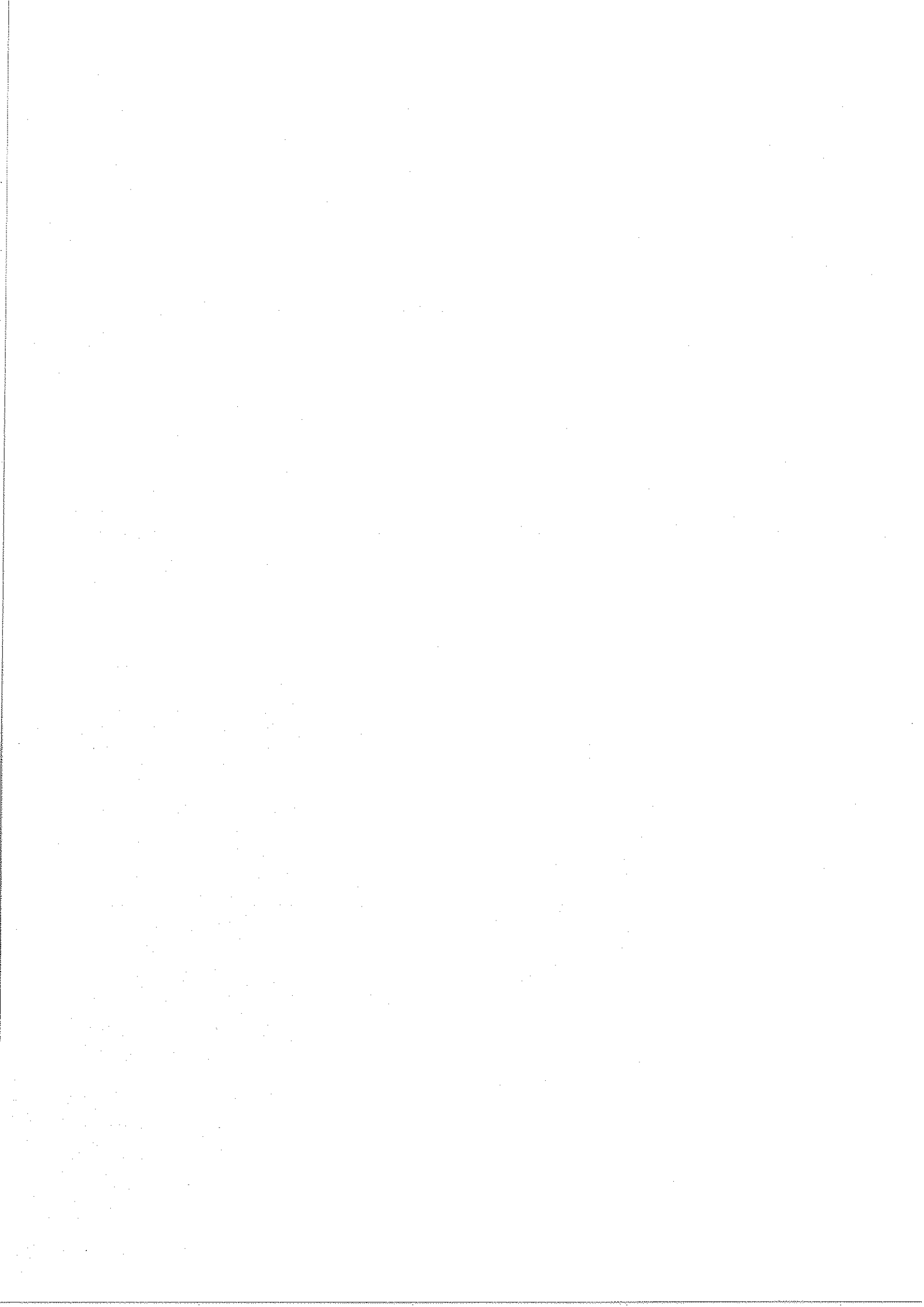
Key to circuit diagram

- | | | |
|--|----------------------------------|--|
| 1. Blower motor | 26. Starter motor, Lucas 2M100 | 51. Warning light, oil pressure |
| 2. Map reading lamp | 27. Blower switch | 52. Warning light, choke |
| 3. Switch, map reading | 28. Blackout switch | 53. Fuel gauge |
| 4. Convoy light, rear | 29. Horn push switch | 54. Water temperature gauge |
| 5. Blackout lamp, front | 30. Switch, panel light | 55. Oil temperature gauge |
| 6. Horn | 31. Warning light, indicator RH | 56. Socket, wiper inhibitor |
| 7. Inspection sockets | 32. Warning light, indicator LH | 57. Alternator, Lucas 15ACR-2D |
| 8. Speedo panel, light | 33. Switch, direction indicators | 58. Switch, oil pressure |
| 9. Instrument group, light | 34. Solenoid, starter motor | 59. Switch, choke |
| 10. Tail lamp, LH | 35. Fuse, in-line | 60. Distributor |
| 11. Tail lamp, RH | 36. Switch, ignition and starter | 61. Fuel tank unit |
| 12. Side lamp, LH | 37. Fuses, 1 to 8, 35 amp | 62. Fuel pump |
| 13. Side lamp, RH | 38. Switch, lights | 63. Water temperature transmitter unit |
| 14. Headlamp, LH dipped beam | 39. Switch, pressure | 64. Stop lamp, LH |
| 15. Headlamp, RH dipped beam | 40. Flasher unit, Hella No. 3036 | 65. Stop lamp, RH |
| 16. Warning light, headlamp main beam | 41. Switch, stop lamp | 66. Reversing lamp, RH |
| 17. Headlamp, LH main beam | 42. Switch, wiper | 67. Reversing lamp, LH |
| 18. Headlamp, RH main beam | 43. Coil, ignition | 68. Oil temperature transmitter |
| 19. Direction indicator lamp, rear RH | 44. Stabilizer unit, 19 volt | 69. Screenwasher motor |
| 20. Direction indicator lamp, front RH | 45. Switch, reverse | 70. Blackout stoplamps |
| 21. Direction indicator lamp, front LH | 46. Screenwiper motor | |
| 22. Direction indicator lamp, rear LH | 47. Switch, screenwasher | |
| 23. Trailer pilot light | 48. Switch, blackout stop | |
| 24. Oil temperature gauge, light | 49. Battery | |
| 25. Nato socket | 50. Warning light, ignition | |

B - Black D - Dark G - Green K - Pink L - Light N - Brown O - Orange
P - Purple R - Red S - Slate U - Blue W - White Y - Yellow

Key to terminations





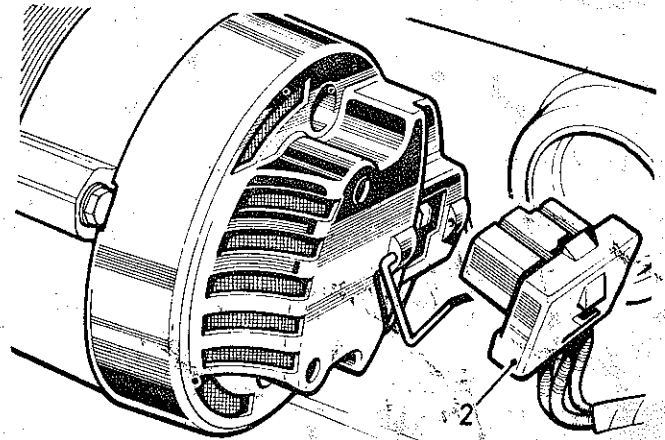
ALTERNATOR

—Remove and refit

86.10.02

Removing

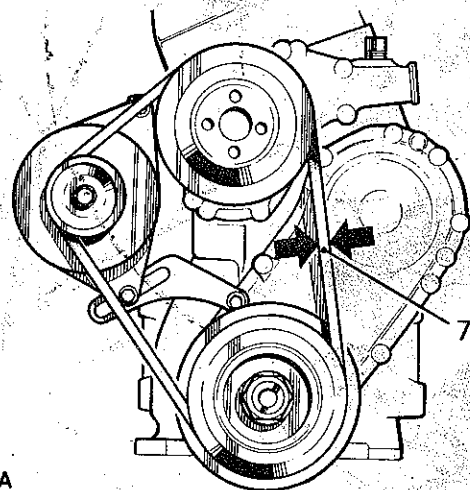
1. Disconnect the battery earth lead
2. Disconnect the electrical leads from the alternator.
3. Slacken the alternator fixings.
4. Pivot the alternator inwards and release the fan belt from the pulley
5. Remove the alternator



IRC 318A

Refitting

6. Fit the alternator, locating the fan belt over the pulley, but do not tighten the fixings at this stage.
7. Adjust the fan belt to give 8,0mm to 11,0mm (0.312 in. to 0.437 in.) free movement when checked midway between the fan and crankshaft pulleys.
8. Reverse 1 and 2.



IRC 843A

ELECTRICAL EQUIPMENT

ALTERNATOR**-Overhaul****86.10.08.****Note. Alternator charging circuit.**

The ignition warning light is connected in series with the alternator field circuit. Bulb failure would prevent the alternator charging, except at very high engine speeds, therefore, the bulb should be checked before suspecting an alternator fault.

Precautions

Battery polarity is **NEGATIVE EARTH**, which must be maintained at all times.

No separate control unit is fitted; instead a voltage regulator of micro-circuit construction is incorporated on the slip-ring end bracket, inside the alternator cover.

Battery voltage is applied to the alternator output cable even when the ignition is switched off, the battery must be disconnected before commencing any work on the alternator. The battery must also be disconnected when repairs to the body structure are being done by arc welding.

continued

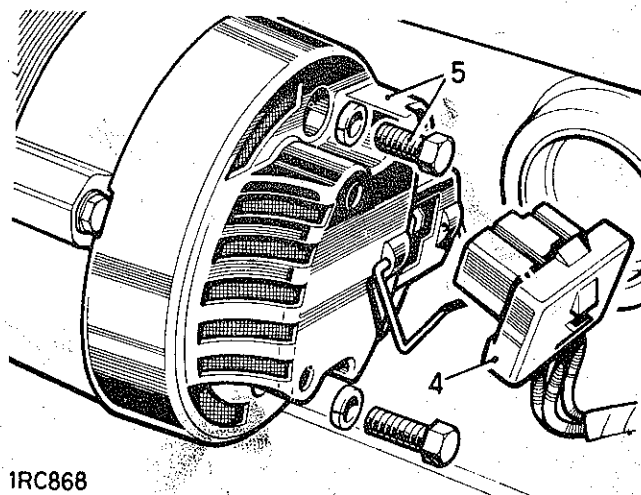


Testing in position**Diagnosis gauge**

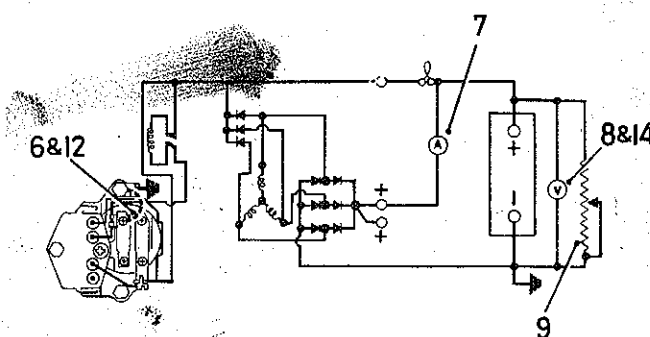
1. Undercharged battery
 - (a) Loose fan belt
 - (b) Faulty battery
 - (c) Faulty alternator
 - (d) Faulty regulator
 - (e) Loose or corroded connections
 - (f) Faulty circuit wiring
2. Overcharged battery
 - (a) Poor earth connections
 - (b) Faulty regulator
 - (c) Shorted cell in battery
3. Noisy alternator operation
 - (a) Loose fan belt
 - (b) Frayed or worn fan belt
 - (c) Worn or damaged fan belt pulley
 - (d) Worn alternator bearings
 - (e) Loose drive pulley nut
 - (f) Alternator mounting bracket loose or broken
 - (g) Badly discharged battery
 - (h) Open or shorted main diodes
 - (i) Open or shorted stator diodes.
4. Faulty indicator light operation (light does not glow)
 - (a) Blown globe
 - (b) Defective globe socket
 - (c) Defective wiring
 - (d) Open circuit in rotor winding
5. Faulty indicator light operation (light remains on)
 - (a) Loose fan belt
 - (b) Faulty alternator
 - (c) Faulty regulator
 - (d) Positive diode failure
 - (e) Open circuit in exciter diodes

Output test

1. Check that the fan belt is correctly tensioned and that all charging circuit connections are secure.
 2. Run the engine at fast idle until normal operating temperature is attained.
 3. Stop the engine.
 4. Withdraw the connector from the alternator.
 5. Remove the alternator rear cover.
 6. Link together regulator terminals 'F' and '—'
 7. Connect a 0–40-ammeter between the alternator and the battery.
 8. Connect a 0–20 voltmeter across the battery terminals
 9. Connect a 15 ohm 35 amp. variable resistor across the battery terminals.
- CAUTION** Do not leave the variable resistor connected across the battery terminals for longer than is necessary to carry out the following test, items 10 and 11.
10. Start the engine and run at 750 rev/min. The warning light bulb should be extinguished.
 11. Increase the engine speed to 3000 rev/min, and adjust the variable resistance until the voltmeter reads 14.0 volts. The ammeter reading should then be approximately 28 amps. Any appreciable deviation from this figure will necessitate removing and dismantling the alternator. If the output test is satisfactory, proceed with the regulator test.

continued

IRC868

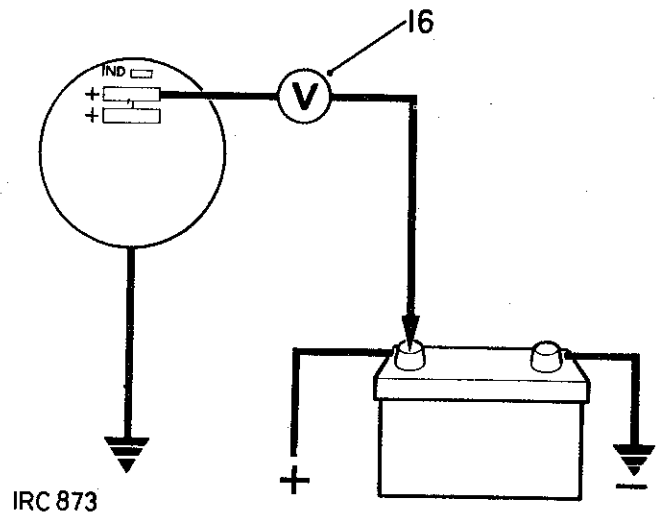


IRC 869

ELECTRICAL EQUIPMENT

Regulator test

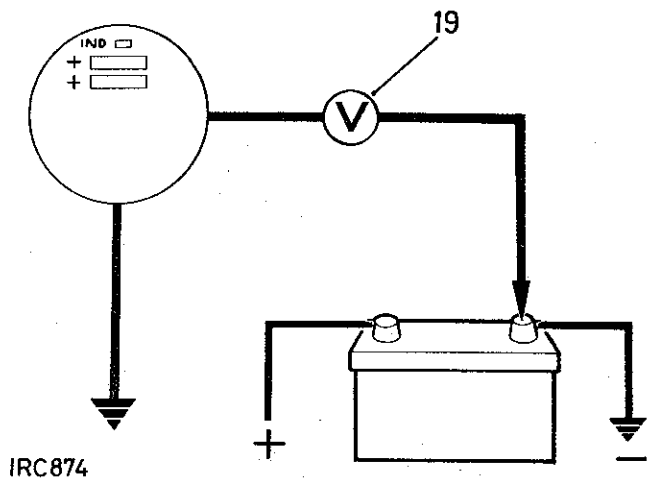
12. Disconnect the variable resistor and remove the link bridging regulator terminals 'F' and '-'.
13. With the remainder of the circuit connected as for the alternator output test, start the engine and run at 3,000 rev/min, until the ammeter shows an output current of less than 10 amperes.
14. The voltmeter should now give a reading of 13.8 to 14.5 volts. Any appreciable deviation from this (regulating) voltage indicates a faulty regulator.
NOTE: The regulator is a non-adjustable unit and if tested and found defective, must be serviced with a new unit.
15. If the foregoing output and regulator tests show the alternator and regulator to be performing satisfactorily, disconnect the test circuit, reconnect the alternator terminal connector and proceed with the charging circuit resistance test.



IRC 873

Charging circuit resistance test

16. Connect a low-range voltmeter between either of the alternator terminals marked + and the positive terminal of the battery.
17. Switch on the headlamps.
18. Start the engine and run at approximately 3,000 rev/min. Note the voltmeter reading.
19. Reduce engine speed and transfer the voltmeter connections to the frame of the alternator and the negative terminal of the battery, increase engine speed to approximately 3,000 rev/min and again note the voltmeter reading.
20. If the reading exceeds 0.5 volt on the positive side or 0.25 volt on the negative side, there is a high resistance in the charging circuit which must be traced and remedied.



IRC 874



Testing—alternator removed

21. Remove the alternator. 86.10.02.
22. Unscrew and withdraw the three through bolts and remove the rear cover.
23. Unsolder stator connections from rectifier pack, noting connection positions.

CAUTION When soldering or unsoldering connections to diodes take care not to over-heat the diodes or bend the pins. During soldering operations, diode pins should be gripped lightly with a pair of long nosed pliers which will act as a thermal shunt.

24. Unscrew brush moulding securing screws and if necessary, lower regulator pack securing screw.
25. Slacken rectifier pack retaining nuts and withdraw both brush moulding, with or without regulator pack, and rectifier pack.

Brushes

26. Check brushes for wear by measuring length of brush protruding beyond brush box moulding. If length is 5 mm (0.2 in.) or less, brush must be renewed.
27. Check that brushes move freely in holders. If brush is sticking, clean with petrol moistened cloth or polish sides of brush with fine file.
28. Check brush spring pressure using push-type spring gauge. Gauge should register 142 to 198 g (5 to 7 oz) when brush is pushed back until face is flush with housing. If reading is outside these limits, renew brush assembly.

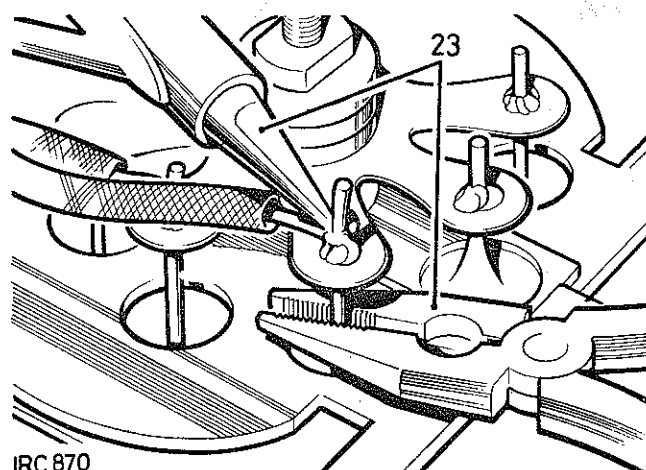
Slip rings

29. Clean surfaces of slip-rings using petrol moistened cloth.
30. Inspect slip-ring surfaces for signs of burning; remove burn marks using very fine sand-paper. On no account should emery-cloth or similar abrasives be used, or any attempt made to machine the slip-rings.

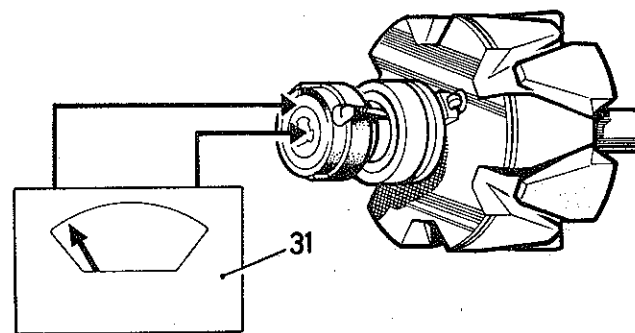
Rotor

31. Connect an ohmmeter or a 12-volt battery and an ammeter to the slip-rings. An ohmmeter reading of 3.5 ohms or an ammeter reading of 3 amps should be recorded.
32. Using a 110-volt a.c. supply and a 15-watt test lamp, test for insulation between one of the slip-rings and one of the rotor poles. If the test lamp lights, the rotor must be renewed.

continued



IRC 870



IRC 875

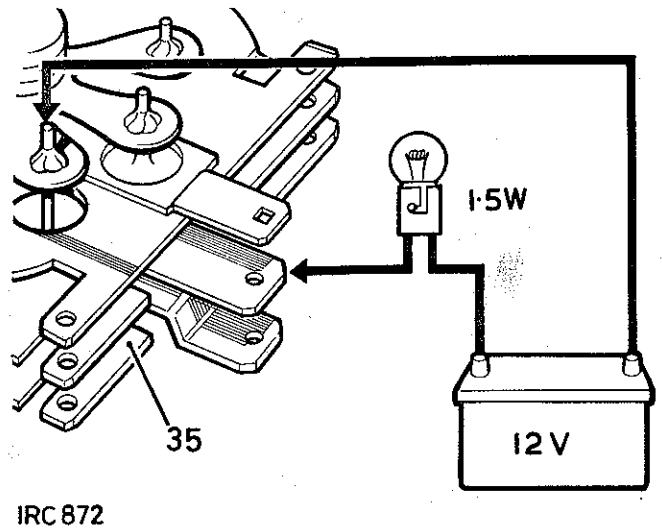
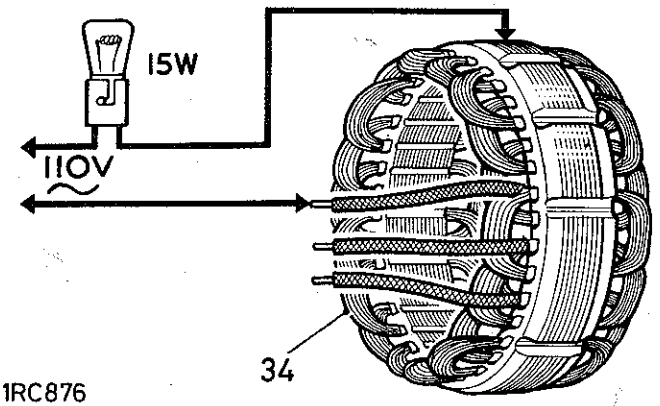
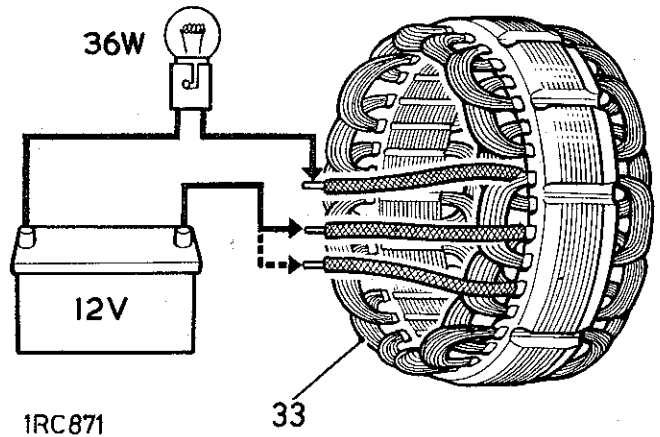
Stator

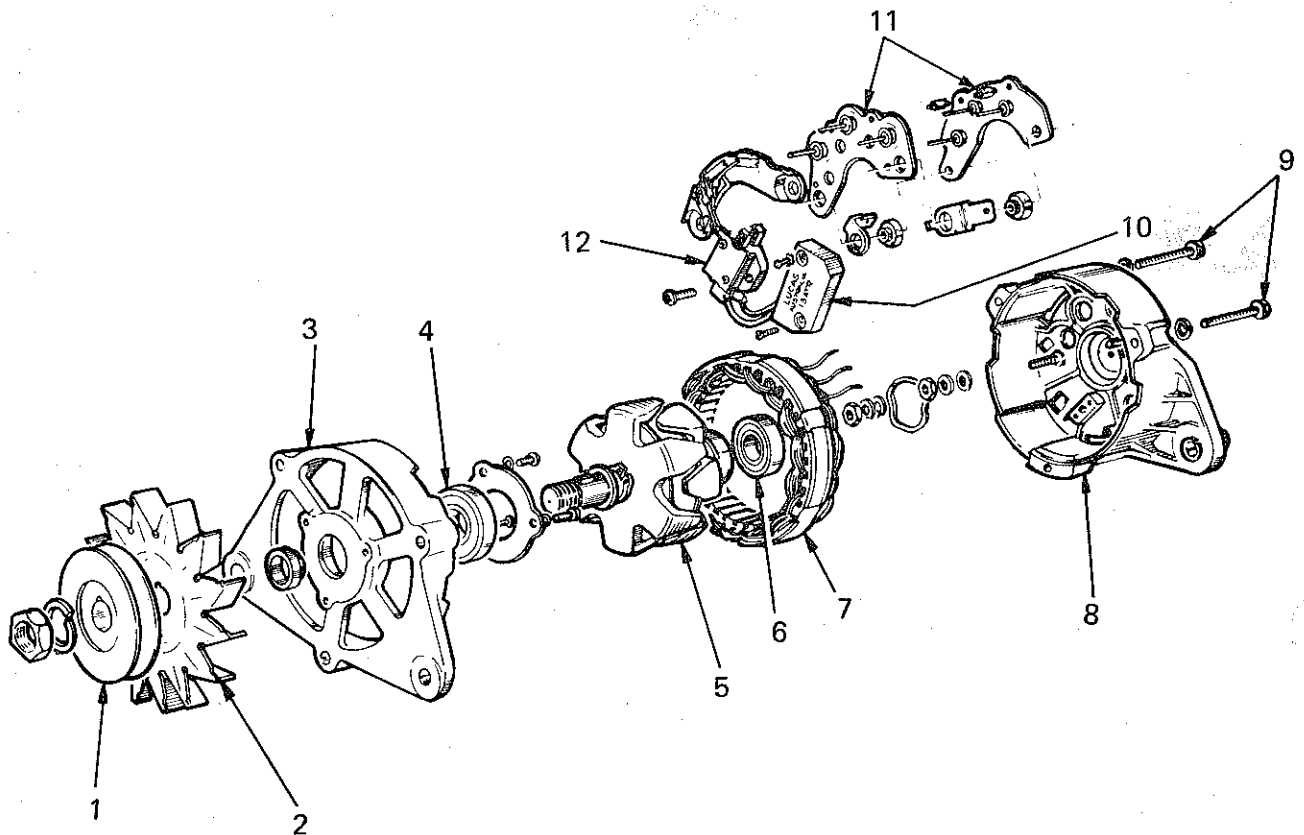
- 33. Connect a 12-volt battery and a 36-watt test lamp to two of the stator connections. Repeat the test replacing one of the two stator connections with the third. If test lamp fails to light in either test, stator must be renewed.
- 34. Using a 110-volt a.c. supply and a 15-watt test lamp, test for insulation between any one of the three stator connections and stator laminations. If test lamp lights, stator must be renewed.

Diodes

- 35. Connect a 12-volt battery and a 1.5-watt test lamp in turn to each of the nine diode pins and corresponding heat sink on the rectifier pack, then reverse the connections. Lamp should light with current flowing in one direction only. If lamp lights in both directions or fails to light in either, rectifier pack must be renewed.

continued





IRC867

ALTERNATOR

- 1— Pulley
- 2— Fan
- 3— Drive end bracket
- 4— Drive end bearing

- 5— Rotor
- 6— Slip ring end bearing
- 7— Stator
- 8— Slip ring end bracket

- 9— Through bolts
- 10— Regulator
- 11— Brush box
- 12— Diode assemblies

continued

Issue 1. Dec. 77



ELECTRICAL EQUIPMENT

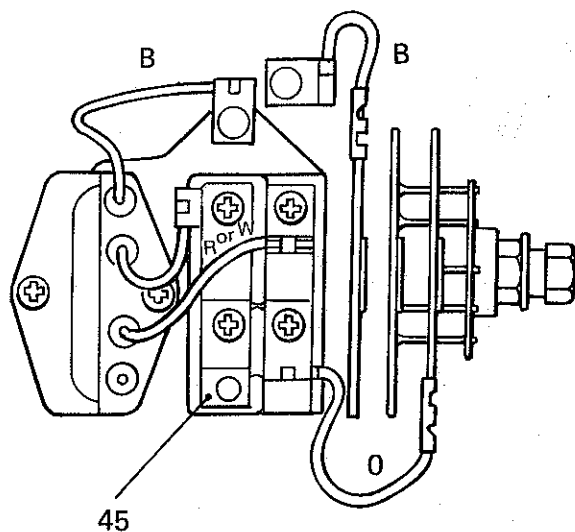
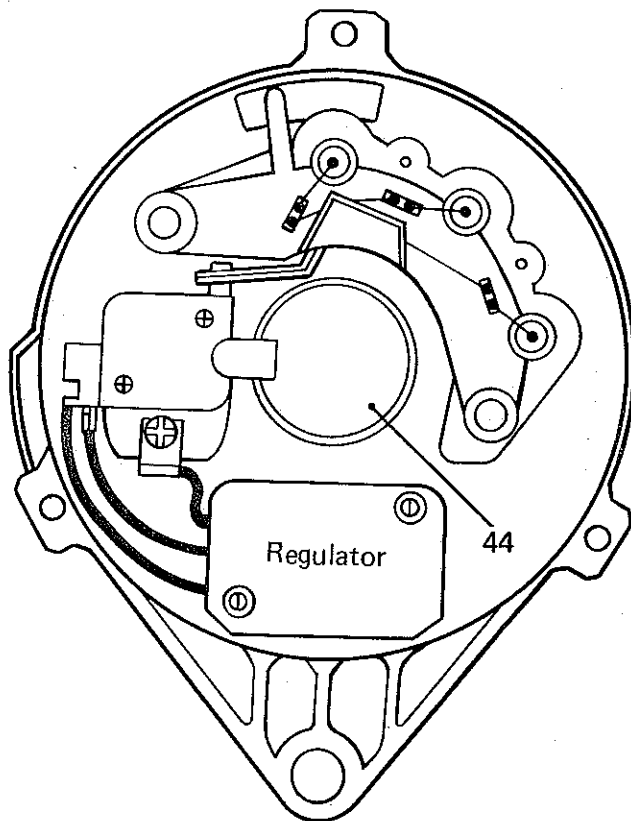
Dismantling

36. If not already completed, carry out items 21 to 25.
37. Remove the three through bolts.
38. Fit a tube over the slip-ring moulding so that it registers against outer track of slip-ring end bearing and carefully drive bearing from its housing.
39. Remove shaft nut, washer, pulley, fan and shaft key.
40. Press rotor from drive end bracket.
41. Remove circlip retaining drive end bearing and remove bearing.
42. Unsolder field connections from slip-ring assembly and withdraw assembly from rotor shaft.
43. Remove slip-ring end bearing.

Reassembling

44. Reverse the dismantling procedure, noting following points.
 - (a) Use Shell Alvania 'RA' to lubricate bearings.
 - (b) Before refitting slip-ring end bracket ensure that the wavy thrust washer is located in the bearing housing first.
 - (c) With brushes mounted in brush holder insert a steel pin, approximately 75 mm (3.0 in) by 2.4 mm (0.093 in) through the hole in the slip-ring end bracket to hold the brushes in a compressed position to assist assembly. Withdraw pin when assembling completed.
 - (d) When refitting bearings, ensure that they are fitted with shielded side facing rotor (advisable to use double shielded bearings, when available).
 - (e) Use Fry's H.T.3. solder on slip-ring field connections, taking care not to overheat diode wires.
 - (f) When refitting rotor to drive end bracket, support inner track of bearing. Do not use drive end bracket to support bearing when fitting rotor.
 - (g) Tighten through-bolts evenly to 50,0 kg cm (45 lb. in.) making sure that the end brackets are sitting evenly on the stator.
 - (h) Fit brushes into housings before fitting brush moulding.
 - (i) Tighten shaft nut to correct torque figure 7,0 kgf.m (50 lbf.ft.)
 - (j) Refit regulator pack to brush moulding.
45. Reconnect the leads between the regulator, brush box and rectifier, as illustrated.

Lead colours B — Black
 G — Green
 O — Orange
 W — White
 R — Red
46. Refit the alternator 86.10.02.



DATA

Alternator make/type	Lucas 15 ACR-2D, machine sensed
Part number	62921252A
Nominal output	28 amps at 6 000 alternator rev/min
Resistance of rotor winding	3.5 ohms \pm 5% at 20°C
Resistance of stator winding	0.198 ohms \pm 5% per phase at 20°C
Number of poles	12
Brush spring pressure	142 to 198g (5 to 7 oz)
Brush spring length new	13 mm (0.5 in)
Brush spring length minimum	5,0 mm (0.2 in) protrusion beyond brush box
Regulating voltage	13.8 to 14.5 volts (pre-set, non-adjustable)
Through-bolt torque	50,0 kg cm (45 lb. in.)



BATTERY

—Remove and refit 86.15.01

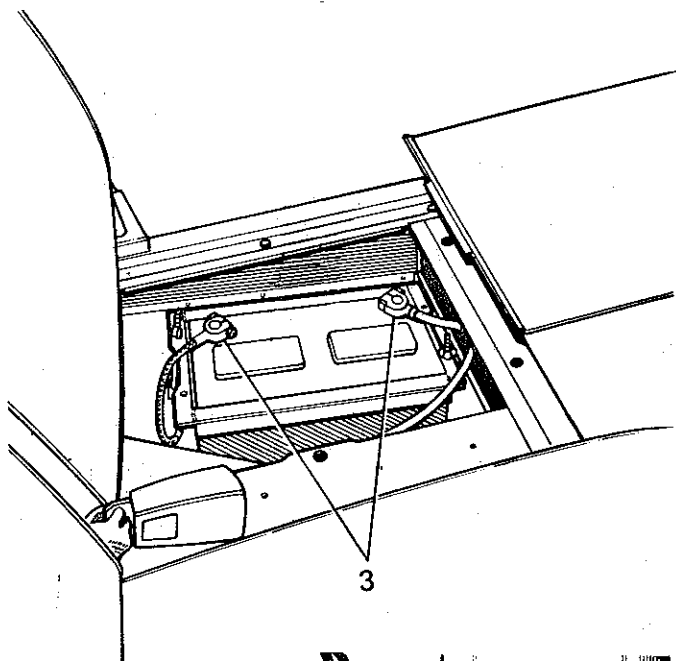
Removing

Located under left hand seat

1. Prop open left hand door.
2. Remove seat squab and panel lid.
3. Disconnect battery terminals.
4. Remove wing nuts and battery remaining frame.
5. Remove battery.

Refitting

6. Reverse 1 to 5. Ensure that the battery is connected **NEGATIVE EARTH.**



HORN

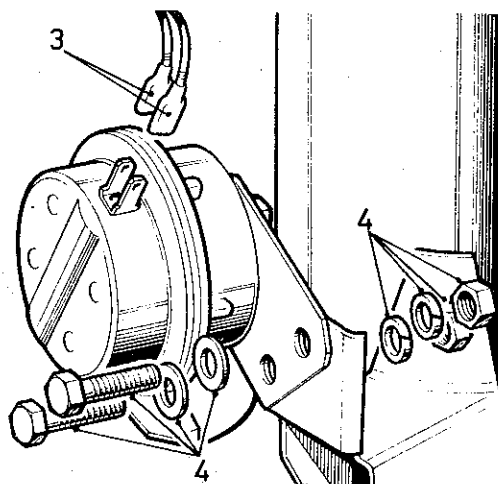
—Remove and refit 86.30.09

Removing

1. Disconnect the battery earth lead.
2. Remove the radiator grille.
3. Disconnect the leads from the horn.
4. Remove the horn.

Refitting

5. Reverse 1 to 4.



1RC889

DISTRIBUTOR

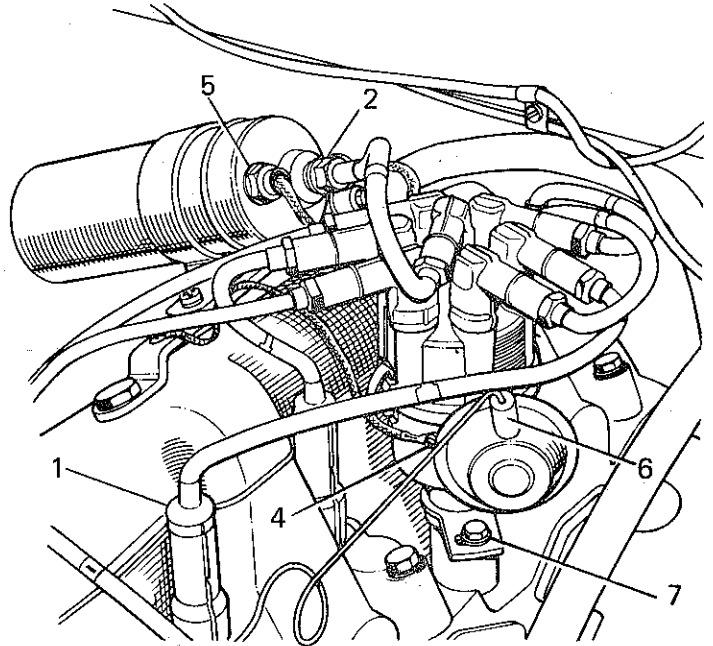
NOTE: The ignition system is radio suppressed. When carrying out repairs or maintenance, care should be taken not to disturb leads and connections unless absolutely necessary.

—Remove and refit

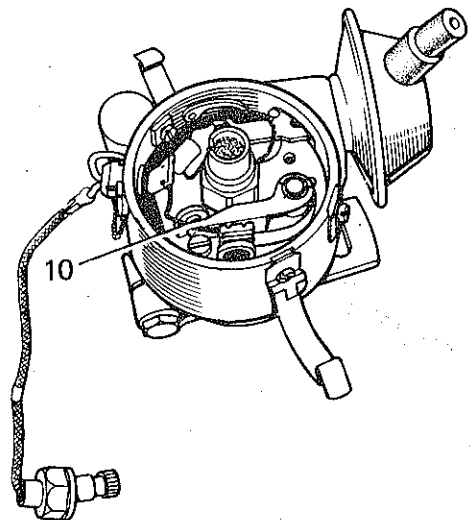
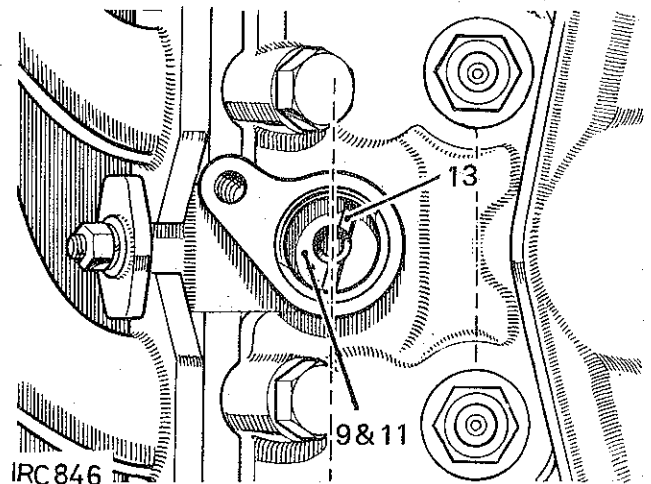
86.35.20

Removing

1. Disconnect high tension leads at spark plugs.
2. Unscrew distributor to coil high tension lead at coil.
3. Unclip distributor cap and remove as a unit.
4. Unscrew braided earth strap at distributor.
5. Unscrew low tension (shrouded) lead at coil.
6. Disconnect vacuum hose.
7. Remove fixing screw at base of distributor.
8. Withdraw distributor from housing.
9. If required, lift out the short drive shaft from the drive housing.

**Refitting**

10. Where a replacement distributor is to be fitted, check the contact breaker gap, 0,40 to 0,50 mm (0.016 to 0.020 in).
11. If removed, refit the short drive shaft to engage the offset drive.
12. Remove the side and top rocker covers.
13. Rotate the engine until the offset slot in the short drive shaft is positioned as illustrated and with both valves closed on No. 1 (front) cylinder, (that is, with No. 1 cylinder on firing stroke).

continued

Issue 1. Dec. 77

86.35.20
Sheet 1

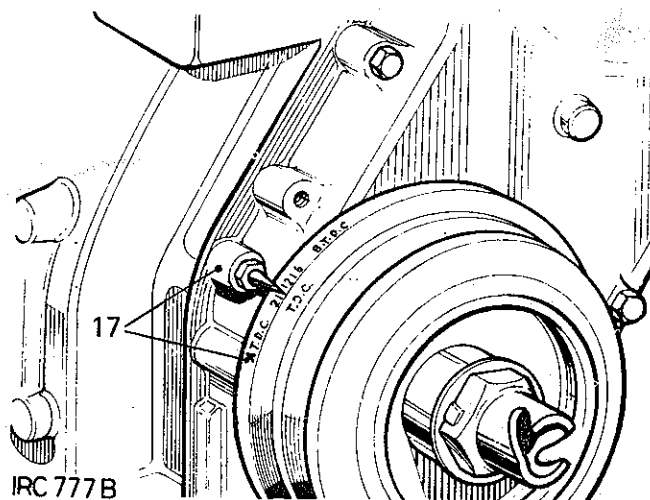
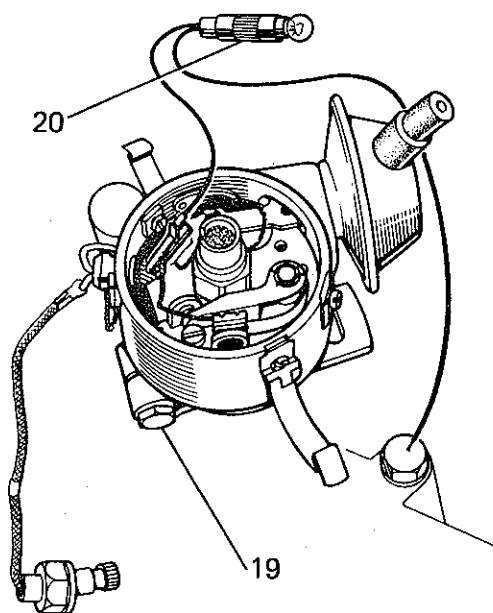
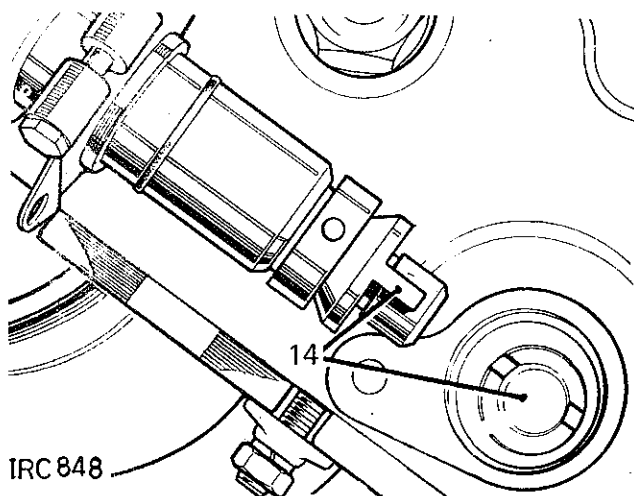
14. Align the drive dog on the distributor with the offset slot in the drive shaft and fit the distributor.
15. Remove the distributor cap; the distributor rotor arm should be in the No. 1 cylinder firing position and the distributor vacuum unit toward the front of the engine.
16. When refitting high tension lead to coil and leads to cap (if disturbed) the ends of the leads must be lightly smeared with silicone grease.

Ignition timing

The ignition setting is as follows:—

2° ATDC for engines using 90 octane fuel,

17. The timing marks are carried on the crankshaft pulley and the timing pointer is mounted on the timing gear cover.
18. Rotate the engine in direction of rotation until the appropriate timing mark is aligned with the pointer and the distributor rotor is at No. 1 cylinder firing position.
19. Slacken the pinch bolt in base of distributor body and rotate the distributor in opposite direction to arrow on rotor arm until the contact breaker points are just opening with the cam follower on the leading side of the cam. Re-tighten the pinch bolt.
20. Connect a 12 volt test lamp from the distributor low tension terminal to earth.
21. Switch 'on' the ignition.
22. Rotate the engine two revolutions in the direction of rotation. The test lamp bulb should light up as the timing pointer aligns with the appropriate mark on the crankshaft pulley.
23. Adjust as required by slackening the pinch bolt and turning the distributor bodily.
24. When satisfactory, remove the test lamp and leads and refit the distributor cap.
25. Reverse 12 and 1 to 6.
26. Final check with timing light to specifications, engine at idle, vacuum hose disconnected and plugged.



DATA

Distributor
Contact breaker gap
Bosch U-JFU6
0,40 mm to 0,50 mm (0.016 in. to 0.020 in.)

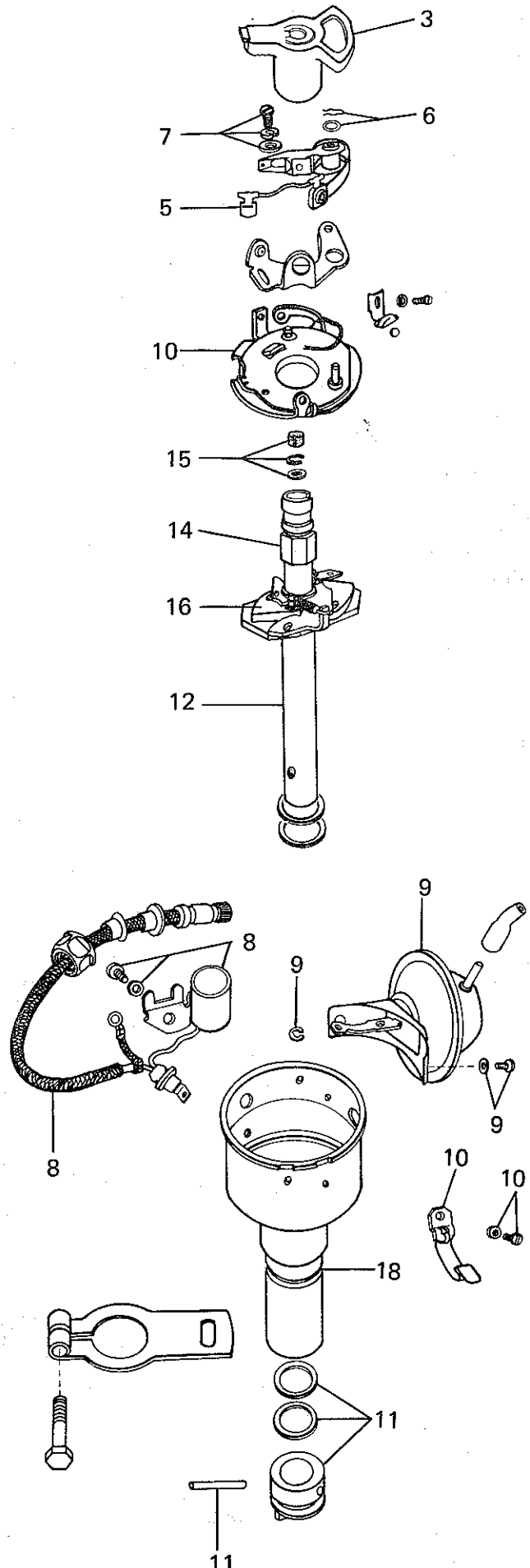


DISTRIBUTOR

—Overhaul

A86.35.26

1. Remove the distributor. 86.35.20.
 2. Remove the distributor cap.
 3. Withdraw the rotor arm.
 4. Disconnect the low tension (shrouded) and capacitor leads.
 5. Slide contact breaker low tension lead from terminal block.
 6. Remove circlip and washer from pivot post and remove contact half.
 7. Remove adjusting screw and remove base half of contact set.
- NOTE:** Some replacement contact sets may be a one-piece assembly.
8. Remove capacitor mounting screw and remove capacitor, lead and terminal (one-piece).
 9. Remove vacuum unit mounting screws and retaining circlip and remove vacuum unit.
 10. Remove cap retaining clip screws and withdraw base plate, exposing balance weights.
 11. Drive out pin securing driving dog and withdraw dog and thrust washer.
 12. Push shaft from housing by applying light force at the drive end.
 13. Mount the distributor shaft assembly in a vice equipped with copper jaws.
 14. Using two small screwdrivers under the base of the cam prise cam from shaft.
- NOTE:** As the cam is retained in position on the shaft by a circlip, it is advisable not to remove the felt wick before removing the cam from the shaft.
15. Remove felt wick, washer and circlip.
 16. Remove centrifugal weights and fibre washers from fulcrum pins.
 17. If required, press out the bush from the body end.
 18. Check 'O' ring on lower part of body for damage or wear and replace if necessary.
 19. Check all parts and replace as necessary.

Continued

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A86.35.26
Sheet

DISTRIBUTOR

Assembling

20. Reverse 5 to 18 noting the following.
21. If a new bush is required it must be completely immersed in engine oil for 24 hours prior to fitting.
22. When a new bush is fitted, redrill lubrication hole, using the hole in the distributor shank as a guide.
23. When assembling shaft to body, smear shaft with light grease.
24. Take care when fitting governor springs, so as not to stretch them.
25. Assemble spacer shims and fibre thrust washers in their respective positions and install driving dog with new lock pin to obtain 0,1 to 0,25 mm (0.004 to 0.010 in.) end float.
26. When fully assembled, adjust contact point gap to specifications.
27. Lubricate cam with a light smear of grease and lubricate contact point pivot and wick with a few drops of light oil.
28. Reverse 1 and 2.

DATA

Distributor	
Contact breaker gap	0,40 to 0,50 mm (0.016 to 0.020 in)
Dwell angle	30° to 35°
Contact spring tension	510 to 595 g (18 to 21 oz)
Shaft end float	0,1 to 0,25 mm (0.004 to 0.010 in)



IGNITION COIL

—Remove and refit

86.35.32

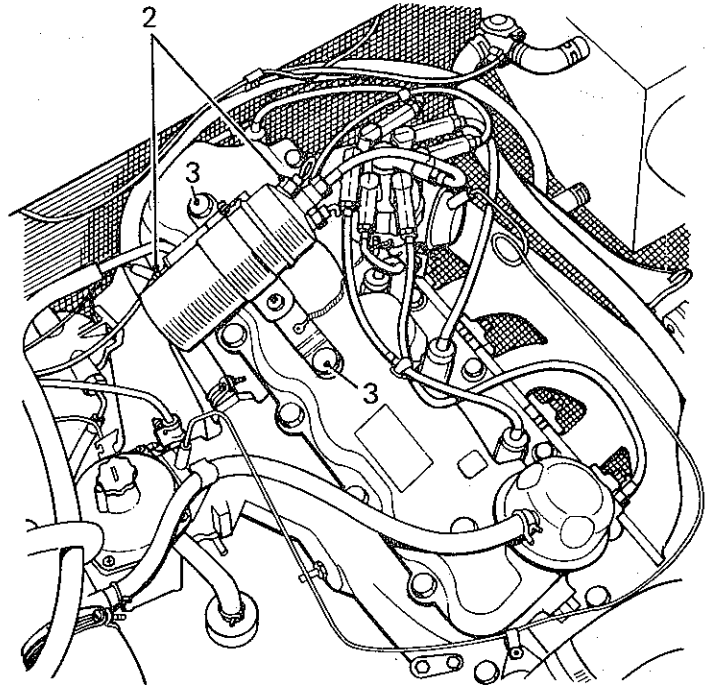
Removing

1. Disconnect the battery earth lead.
2. Disconnect the leads from the ignition coil.
3. Remove the ignition coil.

Refitting

4. Reverse 1 to 3.

NOTE: The electrical leads are of the radio suppressed type and when reassembling leads to coil a light smear of silicone grease is recommended.



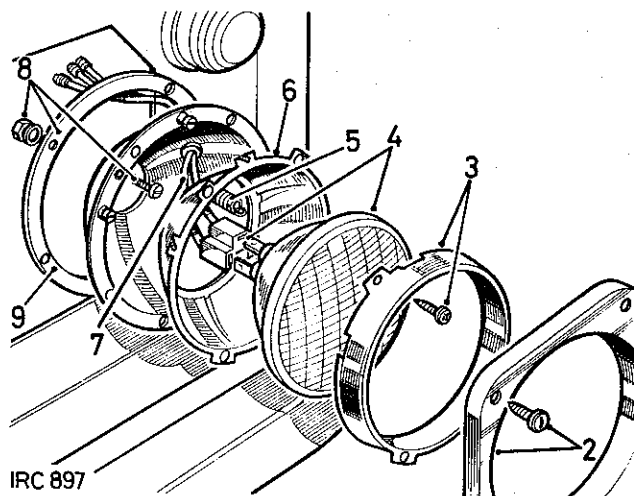
HEADLAMP ASSEMBLY

—Remove and refit

86.40.02

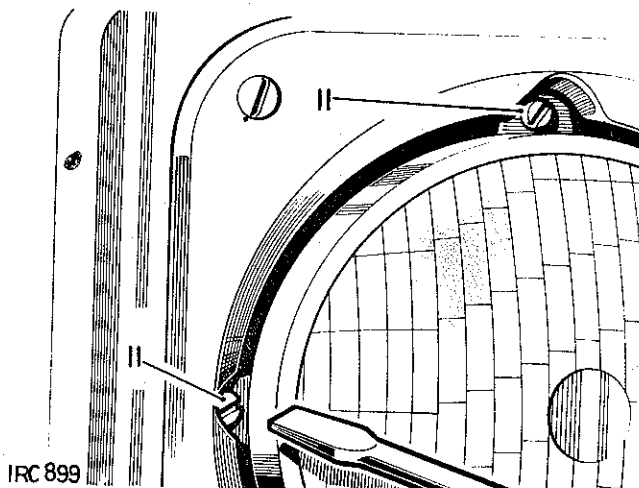
Removing

1. Disconnect the battery earth lead.
2. Remove the headlamp bezel.
3. Remove the headlamp rim.
4. Disconnect the headlamp leads at the plug connector and withdraw the light unit.
5. Disconnect the spring from the headlamp shell.
6. Withdraw the headlamp shell by rotating it clear of the slotted locations.
7. Disconnect the headlamp leads at the snap connectors behind the radiator grille.
8. Remove the headlamp mounting shell.
9. Withdraw the gasket.



Refitting

10. Reverse 1 to 9.
11. Check, and if necessary adjust, the headlamp, using suitable beam setting equipment.

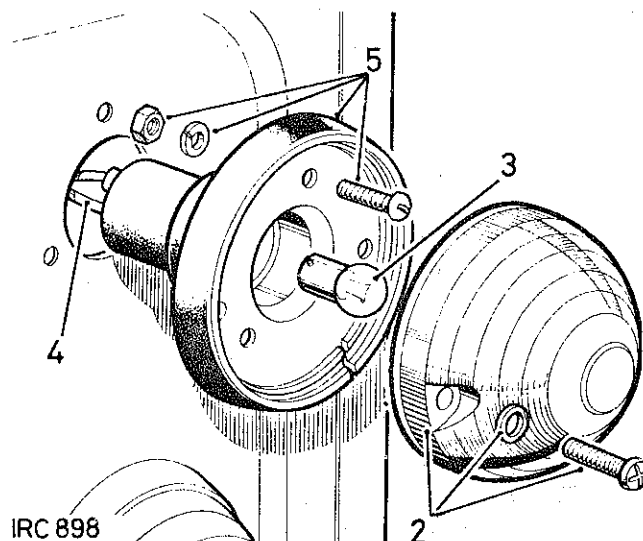


FRONT SIDE AND FLASHER LAMPS**—Remove and refit**

Front side lamp	86.40.34
Front flasher lamp	86.40.42

Removing

1. Disconnect the battery earth lead.
2. Remove the lamp lens.
3. If required, remove the bulb.
4. Disconnect the lamp leads at the snap connectors in the engine compartment.
5. Remove the lamp body.

**Refitting**

6. Reverse 1 to 5.

FRONT BLACKOUT LAMPS

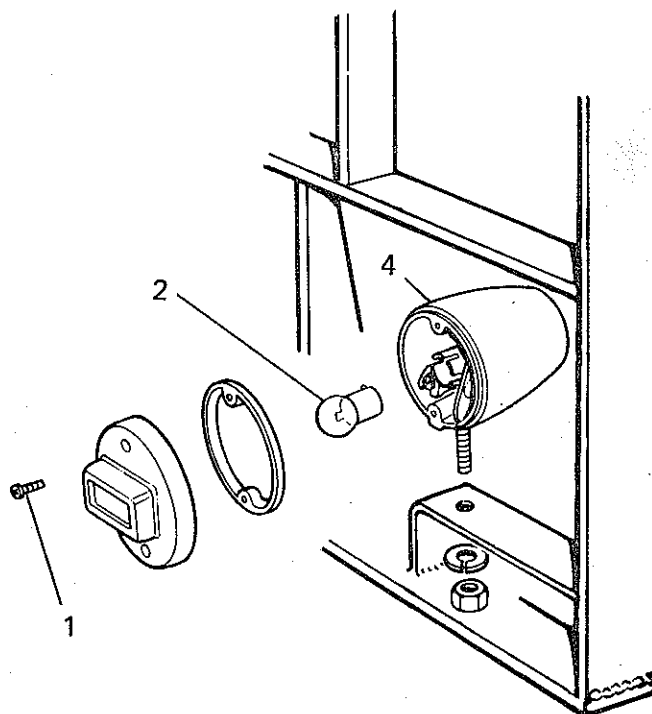
A86.40.43

—Remove and refit**Removing**

1. Remove the two screws holding lens in place.
2. If required, replace the bulb.
3. If unit to be removed, disconnect leads at snap connectors in engine compartment, forward of air cleaner.
4. Remove the lamp body.

Refitting

5. Reverse 1 to 4.



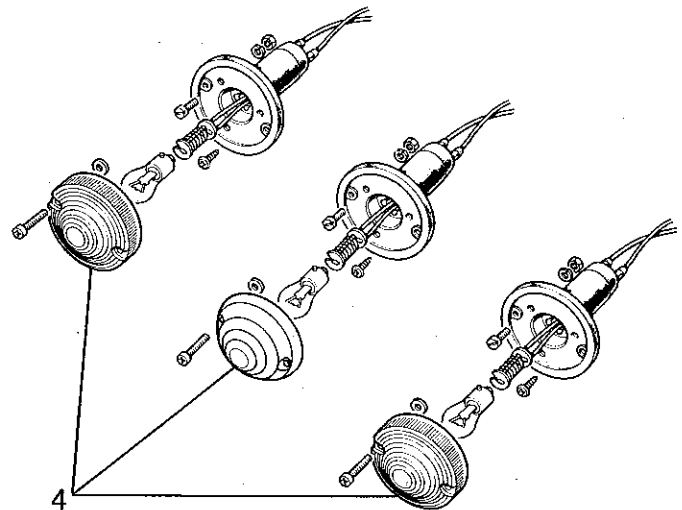
**REAR FLASHER, TAIL, REVERSING
AND NUMBER PLATE LAMPS**

-Remove and refit

Rear flasher lamp	86.40.45
Tail lamp	86.40.79
Reversing lamp	A86.40.80
Number plate lamp	A86.40.81

Removing

1. Disconnect the battery earth lead.
2. Remove the rear lamp cover plate from inside the vehicle.
3. Disconnect the lamp leads.
4. Remove the lamp lens.
5. If required, remove the bulb.
6. Remove the lamp body.
7. Withdraw the rubber mounting for the tail lamp.



Refitting

8. Reverse 1 to 7

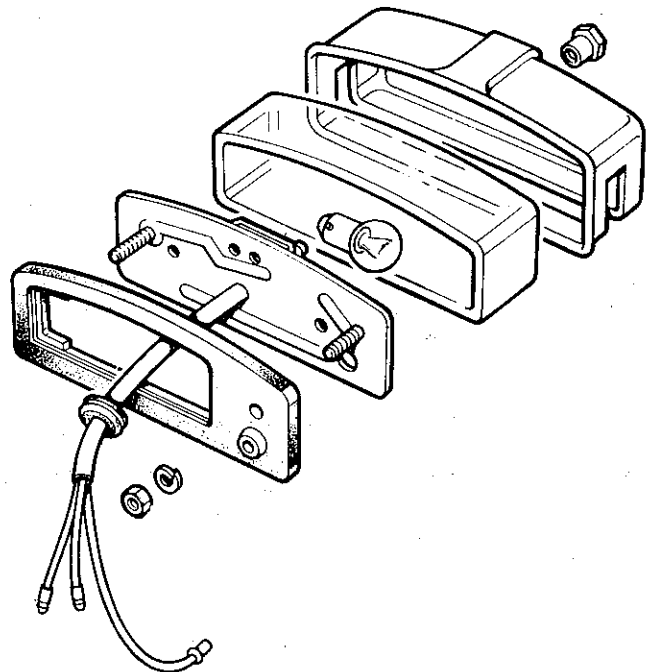
**REAR BLACKOUT LAMPS
(CONVOY)**

-Remove and refit

A86.40.44

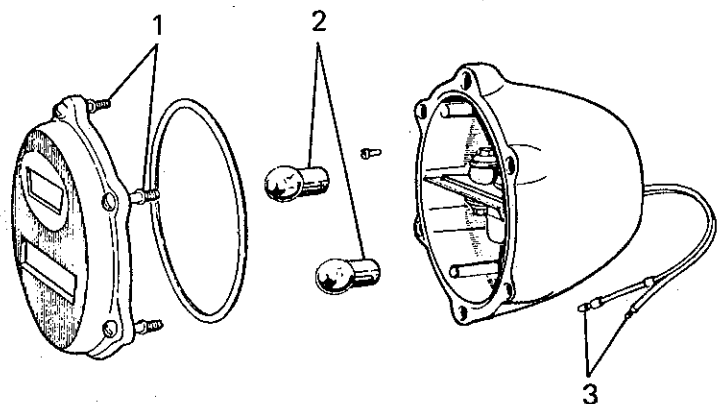
Removing

1. Remove six screws retaining lens in place.
2. If required, replace bulbs.
3. If unit to be removed, disconnect leads at connections, behind rear bumper frame.
4. Remove lamp fixings and lamp.



Refitting

5. Reverse 1 to 4.

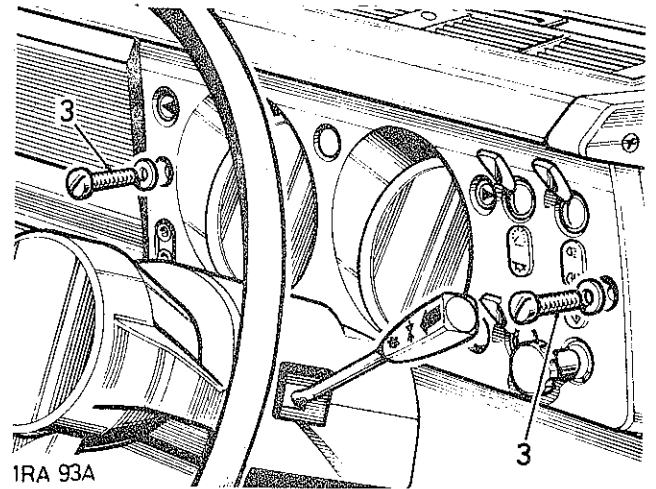


PANEL ILLUMINATION LAMP OR WARNING LAMP BULB

—Remove and refit **86.45.31**

Removing

1. Disconnect the battery earth lead.
2. Release the speedometer cable from the clip attached to the engine.
3. Remove the two screws retaining the instrument panel.
4. Withdraw the instrument panel clear of the dash.
5. Withdraw the bulb holder and change the bulb as necessary.



Refitting

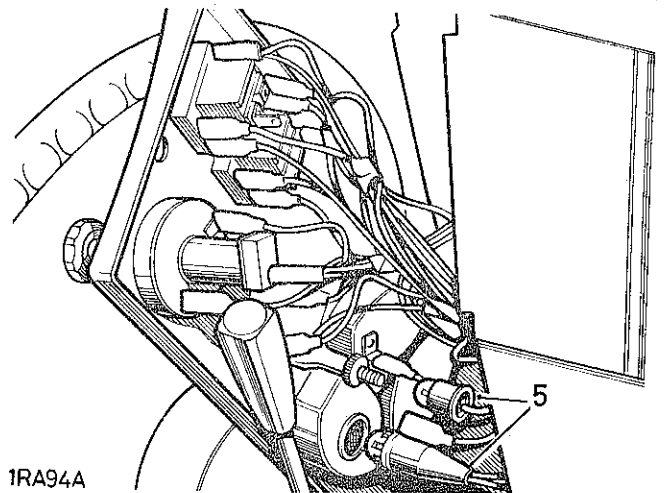
6. Reverse 1 to 5.

INSPECTION SOCKETS

—Remove and refit **86.45.33**

Removing

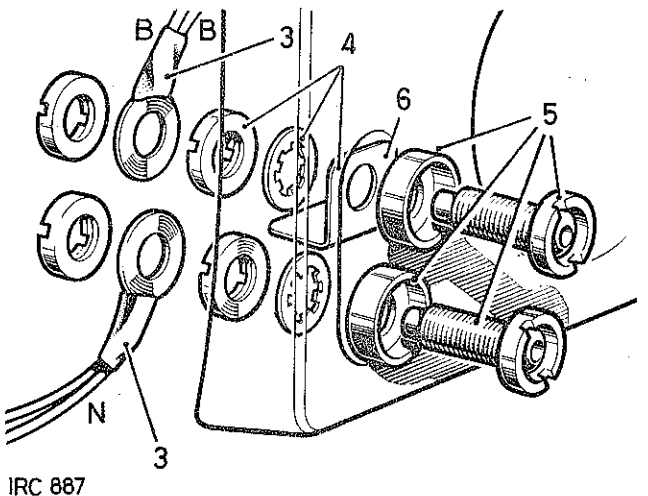
1. Disconnect the battery earth lead.
2. Withdraw the instrument panel clear of the dash. 88.20.01 (items 1 to 5).
3. Disconnect the electrical leads from the sockets.
4. Remove the screw lock rings, shakeproof washers and insulation tab.
5. Withdraw the sockets.



Refitting

6. Reverse 1 to 5, ensuring that the insulation tab is central between the two sockets.

Lead colours B — Black
N — Brown



MAPLIGHT

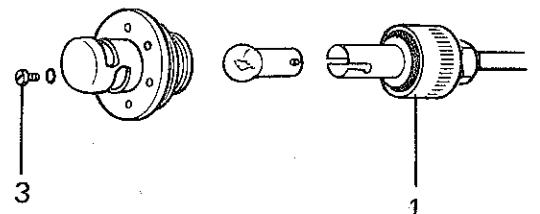
—Remove and refit **A86.45.34**

Removing

1. Unscrew large knurl section behind fascia panel.
2. Withdraw inner section away from lamp.
3. Unscrew three fixing screws from front section.
4. Remove lamp.

Refitting

5. Reverse 1 to 4.



FLASHER UNIT

—Remove and refit

86.55.11

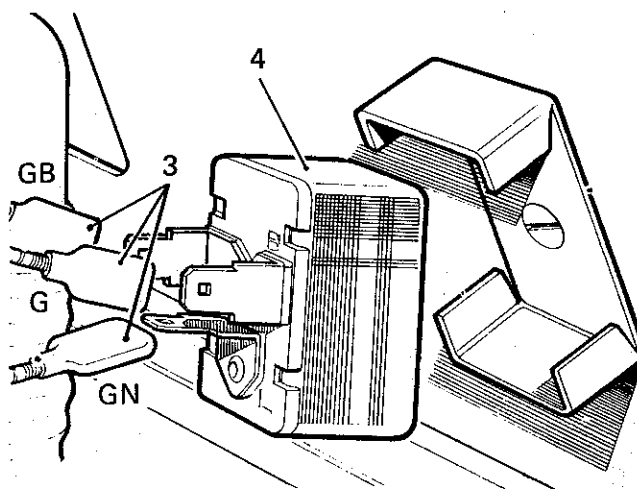
Removing

1. Disconnect the battery earth lead.
2. Withdraw the instrument panel clear of the dash.
88.20.01 (items 1 to 5).
3. Disconnect the leads from the flasher unit.
4. Remove the flasher unit.

Refitting

5. Reverse 1 to 4.

Lead colours
G — Green
GB — Green and Black
GN — Green and Brown



STARTER MOTOR

—Remove and refit

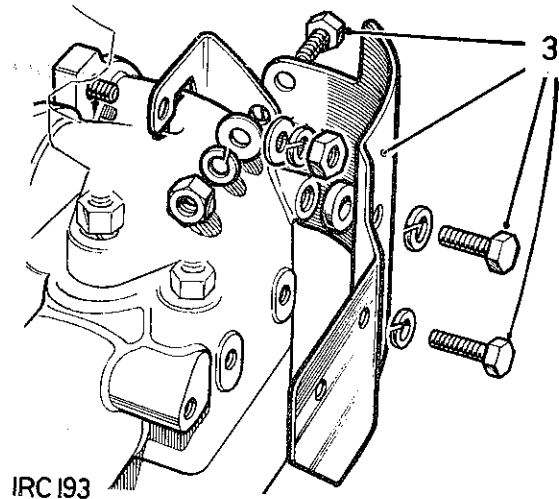
86.60.01

Removing

1. Remove the bonnet. 76.16.01.
2. Disconnect the battery earth lead.
3. Remove tunnel cover 76.10.12.
4. Remove the exhaust heat shield.
5. Disconnect the electrical leads from the starter motor.
6. Remove the starter motor.

Refitting

7. Reverse 1 to 6.

**STARTER SOLENOID**

—Remove and refit

86.60.08

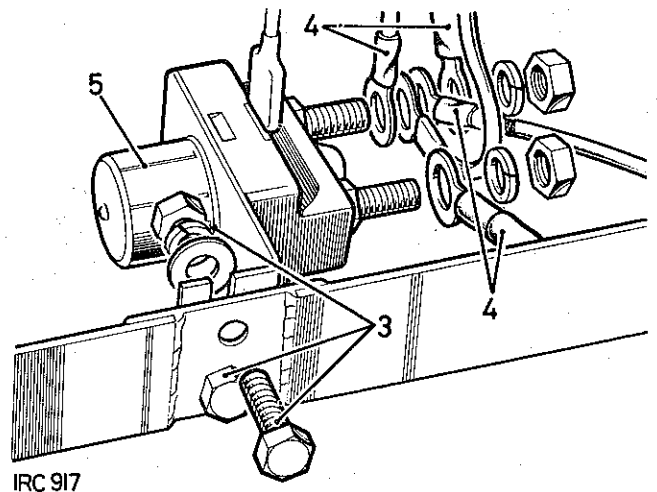
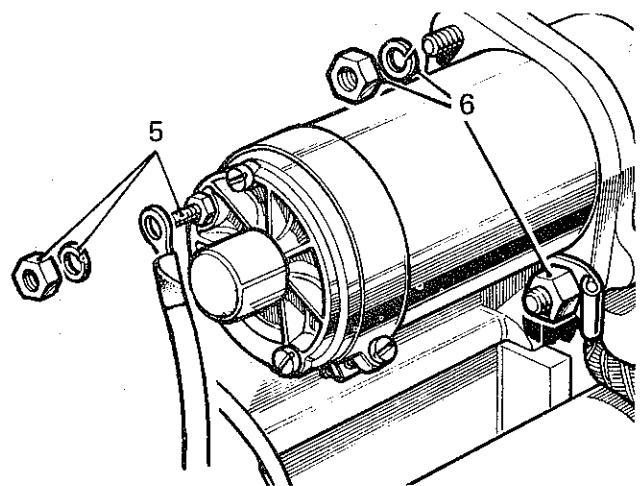
Located on R.H. inner guard panel behind air cleaner.

Removing

1. Disconnect the battery earth lead.
2. Remove one of the solenoid fixings and slacken the other.
3. Withdraw the solenoid from its mounting and disconnect the electrical leads.
4. Lift the solenoid clear.

Refitting

5. Reverse 1 to 4. Connect the electrical leads in accordance with the circuit diagram.



STARTER MOTOR

-Overall

A86.60.13

General Description

This starting motor is a four pole four brush 101,5 mm (4.0 in) diameter machine.

Main features are :—

1. Face type armature.
2. Fully insulated brush gear.
3. 29 slot armature.

The face type commutator works in conjunction with the fully insulated brush gear assembly which comprises two pairs of wedge shaped brushes and coil springs assembled into the brush box moulding.

The brushes are provided with a keyway to ensure correct fitting and the springs are held captive in the brush box moulding.

Routine Maintenance

Routine maintenance is not necessary, but the tightness of the terminal connections should be checked occasionally. The motor should be dismantled for detailed examination during major engine overhauls and the brushes and the bearing bushes should be renewed.

Servicing

Testing in position

Check that the battery is at least 70% charged and that there is excessive voltage drop in the wiring between the battery, starter and the operating switch.

Bench testing

With starter removed and clamped in a vice, and using a 12 volt battery and a moving coil ammeter (range 0-70A) check the light running current and the armature speed as follows:—

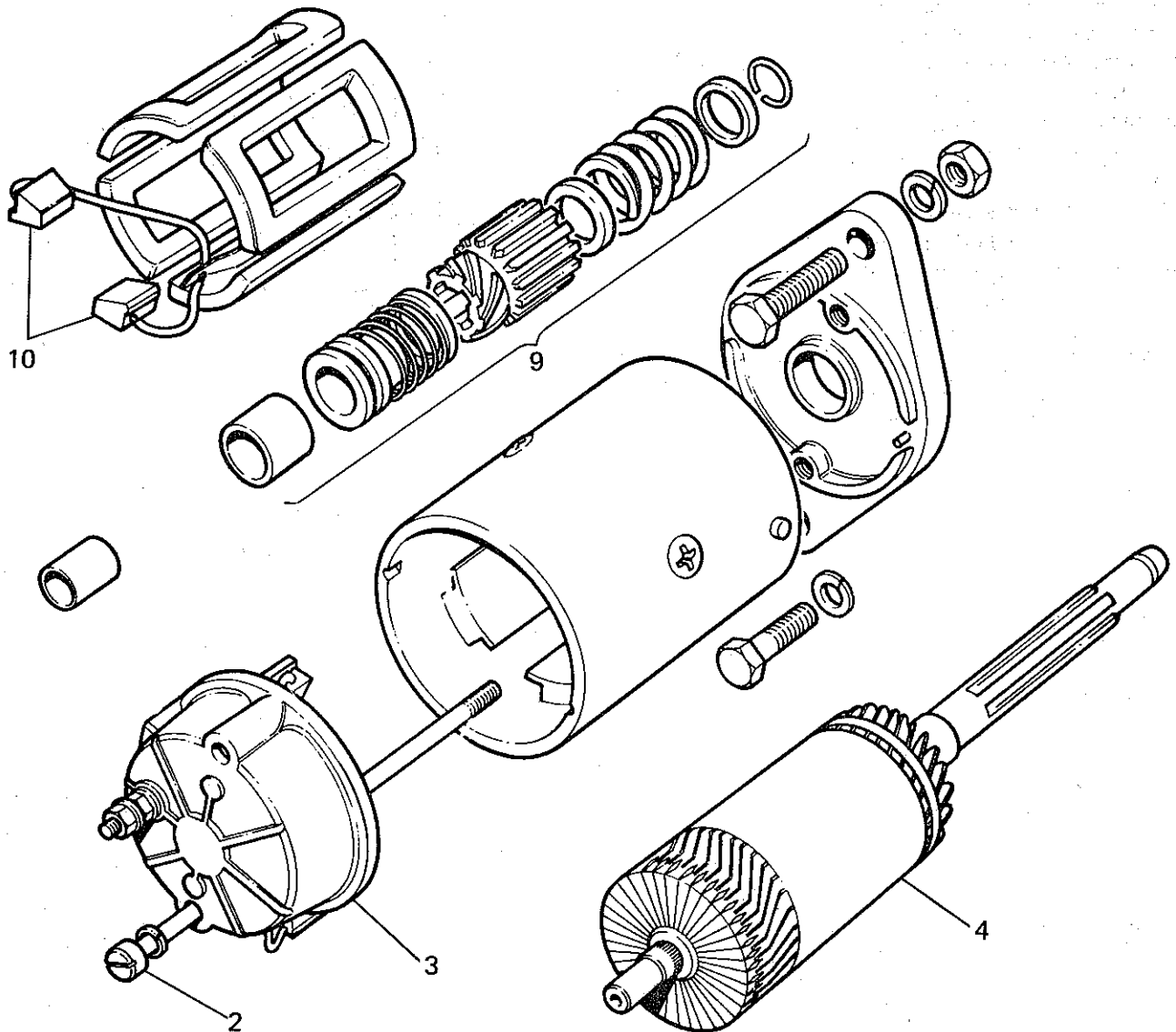
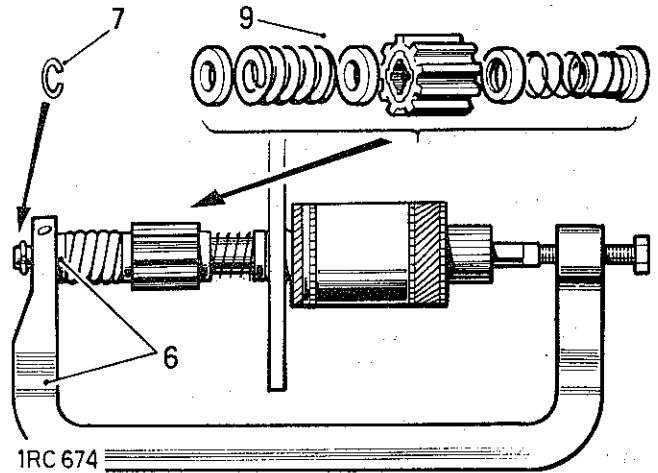
Using heavy duty cables connect one terminal to the end cover, via the ammeter. Connect the other battery terminal to a clean part of the yoke. If the motor runs, check the current and speed against the figure in the technical data. If the test figures are satisfactory, proceed to check the lock torque and current. If the figures are not satisfactory check brushgear and commutator.

Measuring lock torque and current, carry out a lock torque test. If readings vary considerably from those in the technical data, the motor probably has an internal fault and should be dismantled for detailed examination



Dismantling

1. Remove the starter motor. 86.60.01.
2. Remove the through bolts.
3. Withdraw the commutator end cover.
NOTE: Take care when disengaging the two field coil brushes from the brush box moulding.
4. Remove the armature complete with internal thrust washer and drive assembly.
5. Remove the thrust washer from the commutator end of the armature shaft.
6. Using a suitable clamp, clamp the end collar and compress the main spring.
7. Remove the circlip from the armature shaft.
8. Remove the clamp.
9. Withdraw the end collar, main spring, washer, screwed sleeve and pinion collar, pinion retaining spring and spring retaining sleeve.



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STARTER MOTOR

Inspection

Brushgear

10. Check that the brushes move freely in their respective guides in the brush box moulding.

NOTE: Sticky brushes can be cleaned with a petrol moistened cloth.

Brush minimum length 9,5 mm (0.375 in).

11. Check brush springs for correct tension by mean of a push-type spring balance.
12. If the spring pressure is not correct, position a new brush over the existing spring and with 1,6 mm (0.063 in) brush protruding retest spring tension which should read 10N (36 ozf.).

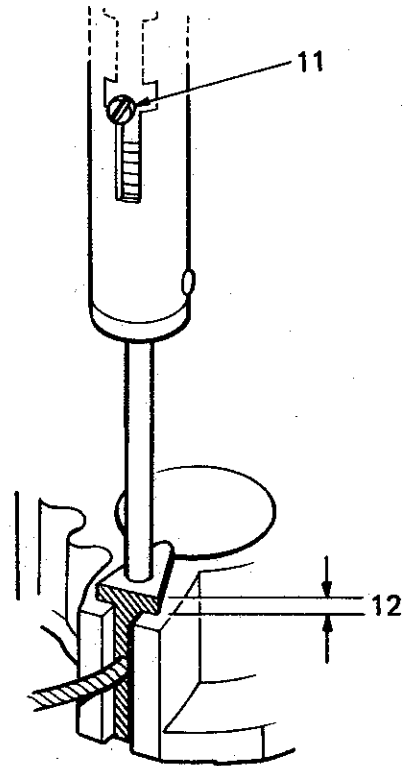
NOTE: Test all brush boxes in turn.

13. If springs need replacing:—
Tip existing spring over with long-nosed pliers and remove. Compress the new spring between thumb and finger and place horizontally in brushbox moulding, release, and finally locate in position.

14. Check the brush spring insulation by connecting a 110 volt AC 15 watt test lamp between a clean part of the commutator end cover and each of the springs in turn. The lamp should not light if the insulation is satisfactory.

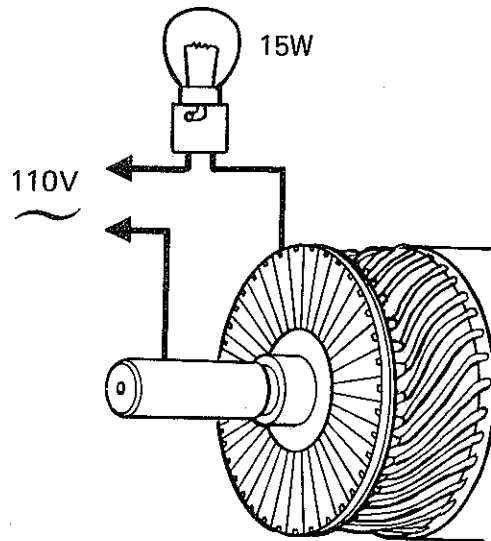
15. If brushes need replacing:—
Cut the worn brush flexible from the field coil leaving approximately 6 mm (0.25 in) of flexible each side of the coil end. Solder the new brushes to the remaining ends of the old flexibles to ensure a good connection.

NOTE: Use resin-covered type solder and avoid dry solder joints. Make sure connections are insulated. Check brush positions.



Commutator

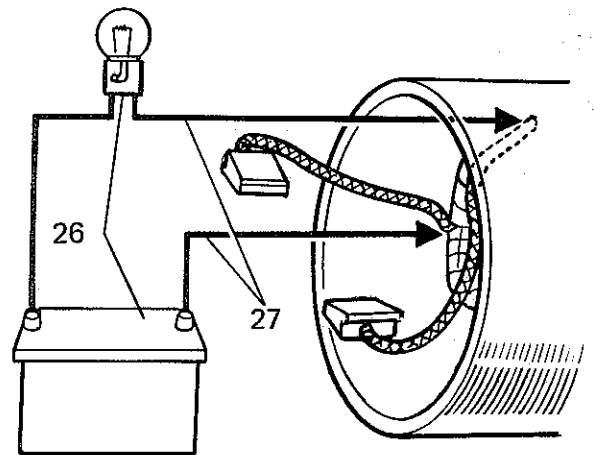
16. Clean commutator with a petrol-moistened cloth and examine.
 17. Remove all pits and burn spots.
 18. If the commutator surface requires skimming, first remove the drive assembly and drive bracket.
 19. Using a suitable lathe, and a very sharp tool, lightly skim the commutator.
- NOTE:** Minimum thickness of commutator copper 3,55 mm (0.140 in).
20. If commutator is still scored after the minimum thickness has been reached, a replacement armature is necessary.
 21. Finally polish the surface with very fine glass paper or emery cloth, and finally clean with petrol-moistened cloth.
 22. Do not undercut commutator segments.

**Armature**

23. If the armature is damaged, i.e. thrown solder or 'lifted' conductors, or distorted shaft a new replacement must be fitted.
- NOTE:** No attempt should be made to straighten or machine the armature core.
24. Test the armature insulation by means of a 110 volt AC 15 watt test lamp. Connect the lamp between one commutator segment and the armature shaft. The test lamp should not light. If it does, the insulation has broken down, replace armature.
 25. Check the armature for short-circuited windings using a 'growler', again replace armature, if a fault is indicated.

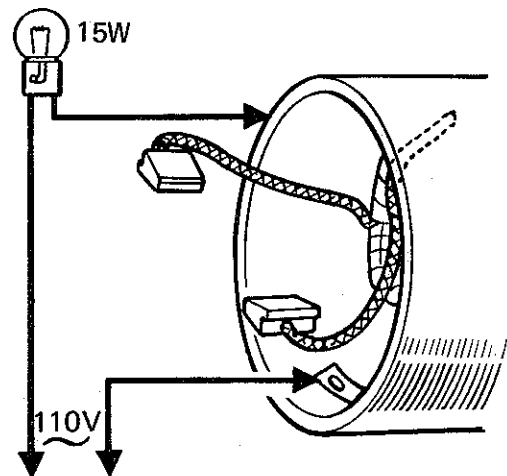
Field winding Continuity

26. Check the winding continuity by means of a 12 volt test lamp and battery.
27. Connect the test lamp between each of the brush tapings in turn and a clean part of the yoke.
28. If the test lamp does not light, an open circuit in the field winding is indicated and a replacement must be fitted.



Insulation

29. Make a positive check of the insulation between the field winding and the yoke.
NOTE: It will be necessary to disconnect the rivetted earth connection at the yoke.
30. To avoid disturbing this connection unnecessarily first inspect the inside of the yoke for obvious signs of insulation breakdown. If this is so, rectify or replace the field winding as necessary.
31. If there are no signs of a fault, consider the results of the light running current and lock torque tests carried out previously.
32. If the speed and torque are low and the current consumption high, faulty field winding insulation could be the cause. This would justify disconnecting the end of the field winding and carry out a positive check.
33. The field winding insulation can be checked, after disconnecting the end of the winding at the yoke, by connecting a 110 volt AC 15 watt test lamp between the disconnected end of the winding and a clean part of the yoke.
34. If the test lamp lights, it indicates an earth at some point on the yoke or pole shoes and a replacement field winding is necessary.
NOTE: Check that the earth connection, brush flexibles and brushes are not contacting the yoke before suspecting the field windings.



Replacing field windings

35. Disconnect the earthed end of the field windings at the yoke by drilling out the rivet.
36. Remove the four pole shoe retaining screws, and remove the field windings from the yoke.
NOTE: It may be required to use a wheel-operated or power-operated screwdriver to remove these screws.
37. Clean the inside of the yoke and the insulating piece and loosely fit the new field windings and the pole shoes into the yoke.
38. Ensure that the insulating piece is correctly fitted between the field coils and the yoke so that the through bolt loops are positioned 180° apart and 90° from the centre of the brush connection joints.
NOTE: The insulation piece does not pass under the brush connector joints. These are protected by an insulation extension in the end cover when the motor is assembled.
39. Tighten the pole shoes evenly, re-rivet and make a good earth joint between the winding connection and the yoke.



Bearings

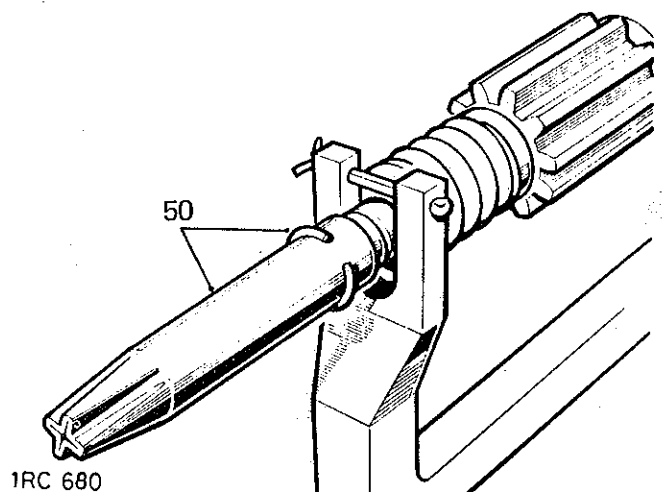
40. Both end brackets are fitted with porous bronze bearing bushes. Prior to replacing bushes, the bushes should be allowed to stand for 24 hours at room temperature, completely immersed in Shell Turbo T100 (previously T41), or if not available, clean light engine oil.

NOTE: Alternatively, the bushes may be immersed in the above lubricant at 100°C for two hours and allowed to cool before removal.

41. New bushes must not be reamed after fitting as the porosity of the new bush will be impaired.
42. Renew bushes when there is excessive side-play of the armature shaft, or fouling of the pole shoes by the armature is likely to occur.
43. To replace the bush in the drive end bracket use a wheel operated press or support the bearing housing and lightly tap the bush out with a mandrel.
44. To replace the bush in the commutator end cover, screw in a suitable thread tap a few turns and withdraw the bush.
45. New bushes should be pressed into position by means of a shouldered, polished mandrel with dimensions as follows:—
- Commutator end cover bush — 11,117 mm (0.4377 in).
- Drive end fixing bracket bush — 22,263 mm (0.8765 in).

Reassembly

46. Reverse 1 to 9 noting the following:—
47. Take care to position the brushes and flexibles correctly.
48. Take care to re-fit the internal thrust washer to the armature shaft at the commutator end.
49. When reassembling drive assembly lubricate all moving parts with Molybond GS10 or equivalent.
50. Using a suitable piece of steel tube with a tapered end, fit the new circlip to the armature shaft.



DATA

Starter motor make/type	Lucas 2M100
Part number	25668B
Number of slots	29
Through bolt torque	1,0 kgf.m (8.0 lbf.ft)
Brush spring pressure	10 N (36 ozf.)
Brush minimum length	9,53 mm (0.375 in)
Commutator minimum machining thickness	3,55 mm (0.140 in)
Lock torque	19,6 Nm (14.5 lbf.ft) with 445/480A
Torque at 1000 rev/min	9,5 Nm (7.0 lbf.ft) with 260/300A
Light running current	40A at 5200/7000 rev/min

The above test figures are obtained using a 12 volt, 60Ah (20h rate) battery in a 70% charged condition, at 20°C (68°F).



ELECTRICAL EQUIPMENT

PANEL LIGHT SWITCH

—Remove and refit

86.65.12

Removing

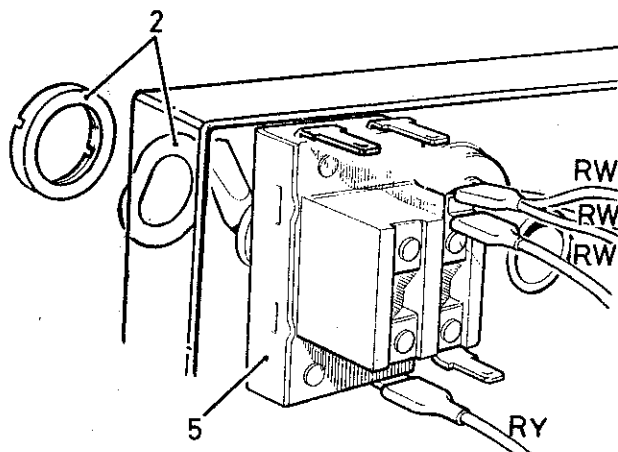
1. Disconnect the battery earth lead.
2. Unscrew the locking ring and wave washer from the switch knob.
3. Withdraw the instrument panel clear of the dash. 88.20.01 (items 1 to 5).
4. Disconnect the leads from the back of the switch.
5. Withdraw the panel light switch.

Refitting

6. Reverse 1 to 5.

Lead colours

- R — Red
- W — White
- Y — Yellow



WINDSCREEN WIPER SWITCH

—Remove and refit

86.65.38

Removing

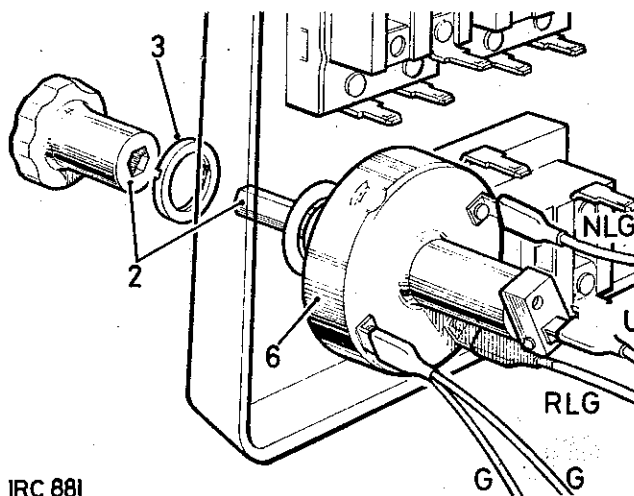
1. Disconnect the battery earth lead.
2. Withdraw the switch knob.
3. Unscrew the locking ring.
4. Withdraw the instrument panel clear of the dash. 88.20.01 (items 1 to 5).
5. Disconnect the leads from the back of the switch.
6. Withdraw the windscreen wiper switch.

Refitting

7. Reverse 1 to 6.

Lead colours

- G — Green
- R — Red
- N — Brown
- L — Light
- U — Blue



IRC 881

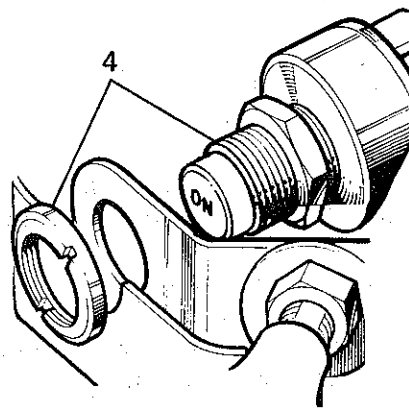


IGNITION STARTER SWITCH

—Remove and refit 86.65.02

Removing

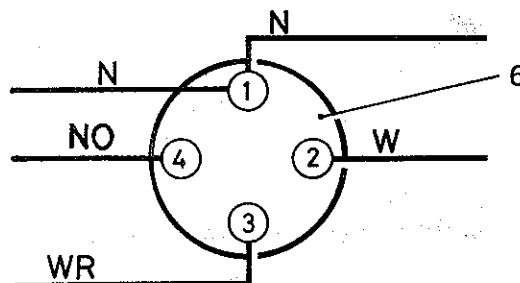
1. Disconnect the battery earth lead.
2. Remove the upper half of the switch shroud from the steering column.
3. Disconnect the leads from the ignition switch.
4. Unscrew the locking ring and withdraw the switch.

**Refitting**

5. Reverse 1 to 4, connecting the switch leads as follows.
6. Petrol engines as illustrated.

Lead colours

N	—	Brown
R	—	Red
W	—	White
O	—	Orange

**LIGHTING SWITCH**

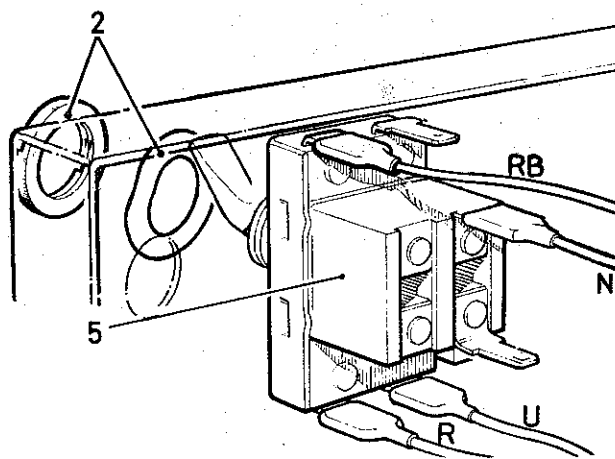
—Remove and refit 86.65.10

Removing

1. Disconnect the battery earth lead.
2. Unscrew the locking ring and wave washer from the switch knob.
3. Withdraw the instrument panel clear of the dash. 88.20.01. (items 1 to 5).
4. Disconnect the leads from the back of the switch.
5. Withdraw the lighting switch.

Refitting

6. Reverse 1 to 5
- Lead colours
- | | | |
|---|---|-------|
| R | — | Red |
| B | — | Black |
| N | — | Brown |
| U | — | Blue |



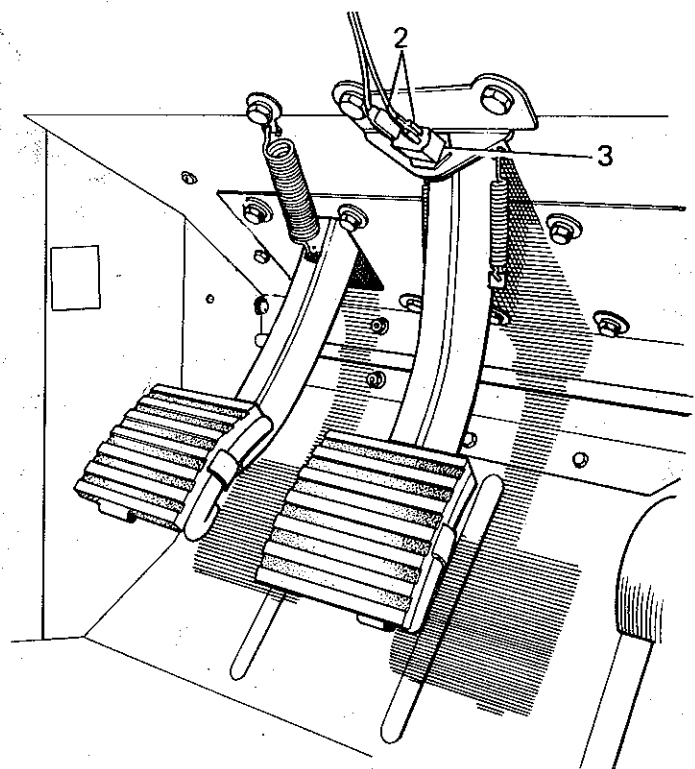
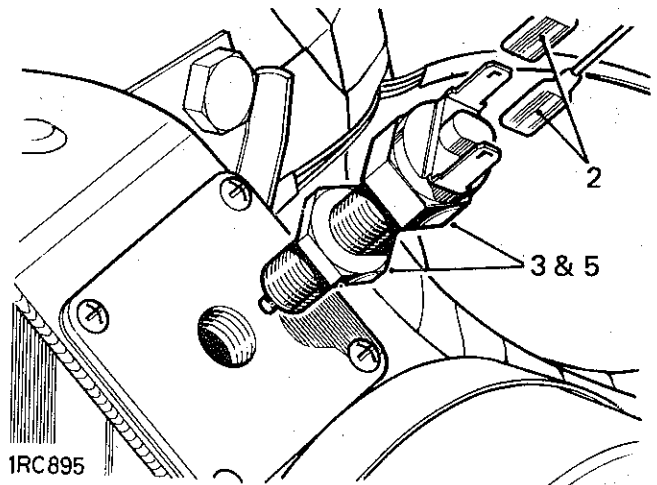
STOP LIGHT SWITCH**—Remove and refit****86.65.51****Removing**

1. Disconnect the battery earth lead.
2. Disconnect the leads from the stop lamp switch.
3. Release the locknut and unscrew the switch from the panel on the master cylinder mounting.

NOTE: Blackout stop light switch located inside cab on brake pedal bracket.

Refitting

4. Reverse 1 to 3.
5. Check, and if necessary adjust, the stop lamp switch to operate at 19 to 25 mm (0.750 to 1.000 in) of pedal movement.



CHOKE WARNING LIGHT SWITCH

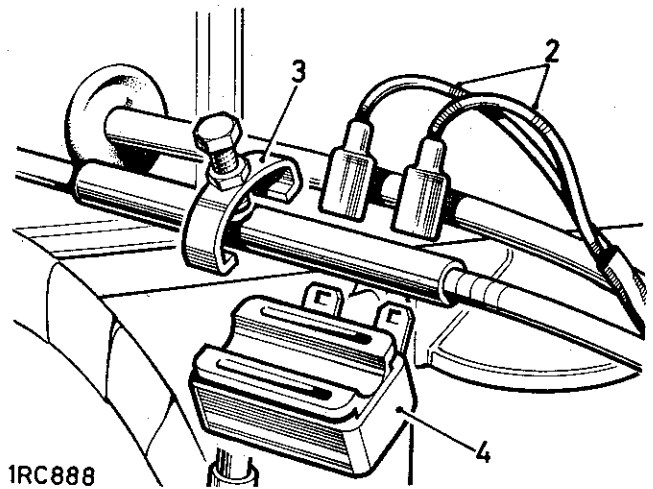
—Remove and refit 86.65.53

Removing

1. Disconnect the battery earth lead.
2. Disconnect the electrical leads from the switch.
3. Remove the clip securing the switch to the choke cable.
4. Remove the switch.

Refitting

5. Reverse 1 to 4.



COMBINED DIRECTION INDICATOR, HEADLIGHT AND HORN SWITCH

—Remove and refit 86.65.55

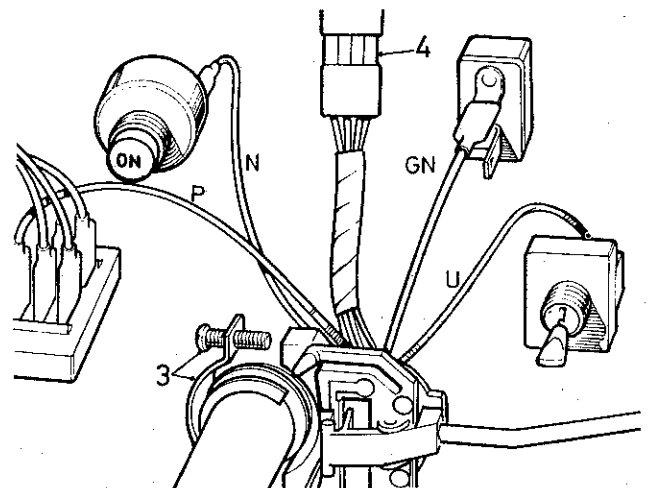
Removing

1. Disconnect the battery earth lead.
- 2.** Remove the both halves of the switch shroud from the steering column.**
3. Release the combined switch from the steering column.
4. Withdraw the combined switch sufficient to disconnect the main harness at the plug connector.
5. Withdraw the instrument panel clear of the dash. 88.20.01 (items 1 to 5).
6. Disconnect the switch leads from the flasher unit, lighting switch, fuse box and ignition switch.
7. Withdraw the combined switch.

Refitting

8. Reverse 1 to 7.

Lead colours
G—Green
N—Brown
P—Purple
U—Blue



NATO TRAILER SOCKET

Located left hand rear corner of vehicle.

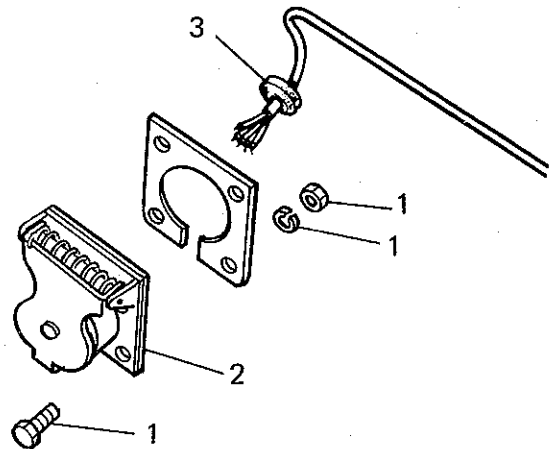
-Remove and refit**A86.67.01****Removing**

1. Remove fixing screws.
2. Remove socket.
3. Disconnect wiring.

Refitting

4. Connect wiring to socket, refer wiring diagram A86.4 and A86.5.
5. Secure socket and fixings to frame.

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FUSE BOX

Located lower half of steering column shroud.

—Remove and refit

86.70.01

Removing

1. Disconnect the battery earth lead.
2. Remove the upper half of the switch shroud from the steering column.
3. Disconnect the leads from the fuse box.
4. Remove the fuse box.

Refitting

5. Reverse 1 to 4 connecting the leads in accordance with the applicable circuit diagram.

NOTE: The fuses should all be 35 amp.

