SECTION P

ELECTRICAL AND INSTRUMENTS

MARK 2 MODELS

2·4, 3·4 and 3·8 litre

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Horns

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Starter Motor

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Instruments *(continued)*

BATTERY

Batteries having " GT " as their first two model letters are of the semi-linkless type, the short intercell connectors being partially exposed to enable testing of individual cells to be effected. The " BV " battery is of the " clean top " pattern, in which small holes are provided over each intercell connector to enable the prongs of a heavy discharge tester to be inserted for testing purposes.

DATA

	2.4 litre	3.4 litre	3.8 litre
Battery type	GTW.9A/3 GT.9A GTZ.9A	BV.11A	BV.11A
Voltage	12	12	12
Number of plates per cell ..	9	11	11
Capacity at 10 hour rate ..	51	60	60
Capacity at 20 hour rate ..	58	67	67

ROUTINE MAINTENANCE

Wipe away any foreign matter or moisture from the top of the battery, and ensure that the connections and the fixings are clean and tight.

About once a month, or more frequently in hot weather, examine the level of the electrolyte in the cells. If necessary add distilled water to bring the level up to the top of the separators.

The use of a Lucas battery filler will be found helpful in this topping-up process, as it ensures that the correct electrolyte level is obtained automatically and also prevents distilled water from being spilled over the battery top.

Distilled water should always be used for topping-up. In an emergency however, drinking water, clean rain water or melted snow may be used. Salt water, chlorinated water, chemically softened water or stagnant water must not be used.

NOTE : Never use a naked light when examining a battery, as the mixture of oxygen and hydrogen given off by the battery when on charge, and to a lesser extent when standing idle, can be dangerously explosive.

REMOVAL

Mark the positions of the bonnet hinges relative to the bonnet. Remove the four set-bolts securing the bonnet to the hinges.

Release the two spring clips and remove the battery cover.

Remove the two securing screws and detach the terminals from the lugs.

Unscrew the two battery securing bolts and detach the retaining band and rubber.

Lift out the battery from the tray.

REFITTING

Refitting is the reverse of the removal procedure. Before refitting the cables clean the terminals and coat with petroleum jelly.

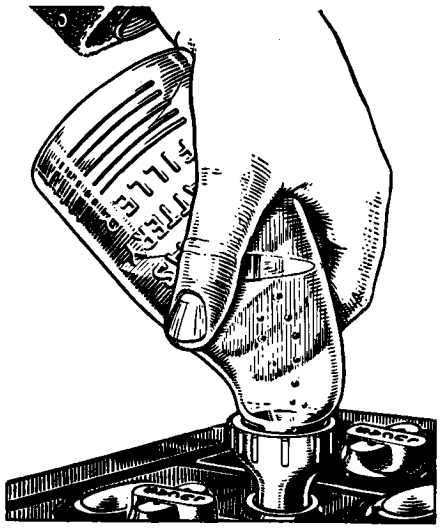


Fig. 1. Lucas battery filler

BATTERY PERSISTS IN LOW STATE OF CHARGE

First consider the conditions under which the battery is used. If the battery is subjected to long periods of discharge without suitable opportunities for recharging a low state of charge can be expected. A fault in the generator or regulator, or neglect of the battery during a period of low or zero mileage may also be responsible for the trouble.

Vent Plugs

See that the ventilating holes in each vent plug are clear.

Level of Electrolyte

The surface of the electrolyte should be level with the tops of the separators. If necessary, top up with distilled water. Any loss of acid from spilling or spraying (as opposed to the normal loss of **water** by evaporation) should be made good by dilute acid of the same specific gravity as that already in the cell.

Cleanliness

See that the top of the battery is free from dirt or moisture which might provide a discharge path. Ensure that the battery connections are clean and tight.

Hydrometer Tests

Measure the specific gravity of the acid in each cell in turn with a hydrometer. To avoid misleading readings, do not take hydrometer readings immediately after topping-up.

The readings given by each cell should be approximately the same. If one cell differs appreciably from the others, an internal fault in the cell is indicated.

The appearance of the electrolyte drawn into the hydrometer when taking a reading gives a useful indication of the state of the plates. If the electrolyte is very dirty, or contains small particles in suspension, it is possible that the plates are in a bad condition.

The specific gravity of the electrolyte varies with the temperature, therefore, for convenience in comparing specific gravities, this is always corrected to 60°F., which is adopted as a reference temperature. The method of correction is as follows :—

For every 5°F. **below** 60°F. **deduct** .002 from the observed reading to obtain the true specific gravity at 60°F.

For every 5°F. **above** 60°F. **add** .002 to the observed reading to obtain the true specific gravity at 60°F.

The temperature must be that indicated by a thermometer actually immersed in the electrolyte, and not in the air temperature.

Compare the specific gravity of the electrolyte with the values given in the table and so ascertain the state of charge of the battery.

If the battery is in a discharged state, it should be recharged, either on the vehicle by a period of daytime running or on the bench from an external supply, as described under " Recharging From An External Supply ".

Discharge Test

A heavy discharge tester consists of a voltmeter, 2 or 3 volts full scale, across which is connected a shunt resistance capable of carrying a current of several hundred amperes. Pointed prongs are provided for making contact with the inter-cell connectors.

Press the contact prongs against the exposed positive and negative terminals of each cell. A good cell will maintain a reading of 1.2—1.5 volts, depending on the state of charge, for at least 6 seconds. If, however, the reading rapidly falls off, the cell is probably faulty and a new plate assembly may have to be fitted.

State of Charge	Home and Climates Ordinarily Below 90°F. (32.2°C.) Specific Gravity of Electrolyte (Corrected to 60°F.)	Climates Frequently Over 90°F. (32.2°C.) Specific Gravity of Electrolyte (Corrected to 60°F.)
Fully charged	1.270—1.290	1.210—1.230
About half discharged	1.190—1.210	1.120—1.150
Completely discharged	1.110—1.130	1.050—1.070

RECHARGING FROM AN EXTERNAL SUPPLY

If the battery tests indicate that the battery is merely discharged, and is otherwise in a good condition, it should be recharged, either on the vehicle by a period of daytime running or on the bench from an external supply.

If the latter, the battery should be charged at the rate specified until the specific gravity and voltage show no increase over three successive hourly readings. During the charge the electrolyte must be kept level with the tops of the separators by the addition of distilled water.

Battery Model	Recharging Rate Amperes
GTW.9A/3	5
GT.9A	5
GTZ.9A	5
BV.11A	6

A battery that shows a general falling-off in efficiency, common to all cells, will often respond to the process known as " cycling ". This process consists of fully charging the battery as described above and then discharging it by connecting to a lamp board, or other load, taking a current of 5 amperes. The battery should be capable of providing this current for at least 7 hours before it is fully discharged, as indicated by the voltage of each cell falling to 1.8. If the battery discharges in a shorter time, repeat the " cycle " of charge and discharge.

PREPARING NEW UNFILLED, UNCHARGED BATTERIES (MODELS GTW.9A/3, GT.9A AND BV.11A) FOR SERVICE

Preparation of Electrolyte

Batteries should not be filled with acid until required for initial charging.

Electrolyte of the specific gravity required is prepared by mixing distilled water and concentrated sulphuric acid, usually of 1.835 specific gravity. The mixing must be carried out either in a lead-lined tank or in a suitable glass or earthenware vessel. Slowly add the acid to the water, stirring with a glass rod. **Never add the water to the acid,** as the resulting chemical reaction causes violent and dangerous spurting of the concentrated acid. The approximate proportions of acid and water are indicated in the following table :

	Specific Gravity of Acid Required When Filling	
Battery	Home and Climates Ordinarily Below 90°F (32.2°C.) Specific Gravity of Acid (Corrected to 60°F.)	Climates Frequently Over 90°F. (32.2°C.) Specific Gravity of Acid (Corrected to 60°F.)
GTW.9A	1.340	1.290
GT.9A	1.270	1.210

To obtain Specific Gravity (corrected to 60°F.) of :	Add 1 vol. of acid of 1.835 S.G. (corrected to 60°F.) to :
1.340	2.0 volumes of water
1.290	2.7 volumes of water
1.270	2.9 volumes of water
1.210	4.0 volumes of water

Heat is produced by the mixture of acid and water, and the electrolyte should be allowed to cool before taking hydrometer readings—unless a thermometer is used to measure the actual temperature, and a correction applied to the reading and before pouring the electrolyte into the battery.

Filling the Battery

The temperature of the acid, battery and filling-in room must not be below 32°F.

Carefully break the seals in the filling holes and **half-fill** each cell with electrolyte of the appropriate specific gravity. Allow the battery to stand for at least six hours, in order to dissipate the heat generated by the chemical action of the acid on the plates and separators. Completely fill the battery and allow to stand for a further two hours and then proceed with the initial charge.

Initial Charge Rate

Battery Model	Charging Rate (Amperes)
GTW.9A/3	3.5
GT.9A	3.5
BV.11A	4.0

Charge at this rate until the voltage and specific gravity readings show no increase over five successive hourly readings. This will take from 40 to 80 hours, depending on the length of time the battery has been stored before charging.

Keep the current constant by varying the series resistance of the circuit or the generator output.

This charge should not be broken by long rest periods. If, however, the temperature of any cell rises above the permissible maximum quoted in table, the charge must be interrupted until the temperature has fallen at least 10°F. below that figure. Throughout the charge, the electrolyte must be kept level with the top of the separators by the addition of acid solution of the same specific gravity as the original filling-in acid, until specific gravity and voltage readings have remained constant for five successive hourly readings. If the charge is continued beyond that point, top up with distilled water.

At the end of the charge carefully check the specific gravity in each cell to ensure that, when corrected to 60°F., it lies within the specified limits. If any cell requires adjustment, some of the electrolyte must be siphoned off and replaced either by distilled water or by acid of the strength originally used for filling-in, depending on whether the specific gravity is too high or too low. Continue the charge for an hour or so to ensure adequate mixing of the electrolyte and again check the specific gravity readings. If necessary, repeat the adjustment process until the desired reading is obtained in each cell. Finally, allow the battery to cool, and siphon off any electrolyte above the tops of the separators.

PREPARING NEW "DRY-CHARGED" BATTERIES, MODEL (GTZ9A) FOR SERVICE.

Filling the Cells.

Carefully break the seals in the filling holes and fill each cell with correct specific gravity acid to the top of the separators in one operation. The temperatures of the filling room, battery and acid should be maintained at between 60°F. and 100°F. If the battery has been stored in a cool place, it should be allowed to warm up to room temperature before filling.

Freshening Charge

Batteries filled in this way are up to 90% charged, and capable of giving a starting discharge one hour after filling. When time permits however, a short freshening charge will ensure that the battery is fully charged.

Such a freshening charge should be 5 amperes for not more than 4 hours.

During the charge the electrolyte must be kept level with the top of the separators by the addition of distilled water. Check the specific gravity of the electrolyte at the end of the charge ; if 1.270 acid was used to fill the battery, the specific gravity should now be between 1.270 and 1.290 ; if 1.210 acid, between 1.210 and 1.230.

Maintenance in Service

After filling, a dry-charged battery needs only the attention normally given to all lead-acid type batteries.

Maximum Permissible Electrolyte Temperature During Charge	
Home and Climates normally below 90°F. (32.2°C.)	Climates frequently over 90°F. (32.2°C.)
100°F. (37.7°C.)	120°F. (48.8°C.)

Specific Gravity of Acid Required When Filling Battery	
Home and Climates Ordinarily Below 90°F. (32.2°C.) Specific Gravity of Acid (Corrected to 60°F.)	Climates Frequently Over 90°F. (32.2°C.) Specific Gravity of Acid (Corrected to 60°F.)
1.270	1.210

DISTRIBUTOR (DMBZ.6A)

REMOVAL

Spring back the clips and remove the distributor cap.

Disconnect the low tension wire from the distributor terminal.

Disconnect the vacuum pipe by unscrewing the union nut at the vacuum advance unit.

Slacken the distributor plate pinch bolt and withdraw the distributor.

REFITTING

Refitting is the reverse of the removal procedure, but it will be necessary to reset the ignition timing as follows :—

Ignition Timing

Set the micrometer adjustment in the centre of the scale.

Connect the low tension wire to the terminal on the distributor body.

Enter the distributor into the cylinder block with the vacuum advance unit connection facing the cylinder block.

Rotate the rotor-arm until the driving dog engages with the distributor drive shaft.

Rotate the engine until the rotor-arm approaches the No. 6 (front) cylinder segment in the distributor cap.

Slowly rotate the engine until the ignition timing scale on the crankshaft damper is the appropriate number of degrees before the pointer on the sump. (See Data).

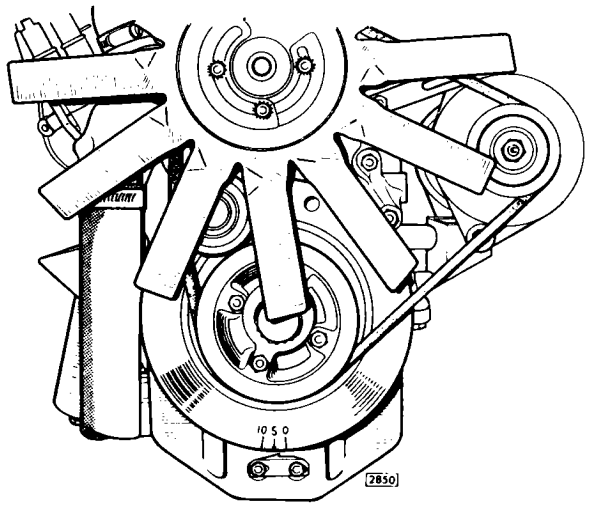


Fig. 2. Ignition timing scale on crankshaft damper.

Connect a 12 volt test lamp with one lead to the distributor terminal (or the CB terminal of the ignition coil) and the other to a good earth.

Slowly rotate the distributor body until the points are just breaking, that is, when the lamp lights up.

Tighten the distributor plate pinch bolt.

A maximum of six clicks on the vernier adjustment from this setting, to either advance or retard, is allowed.

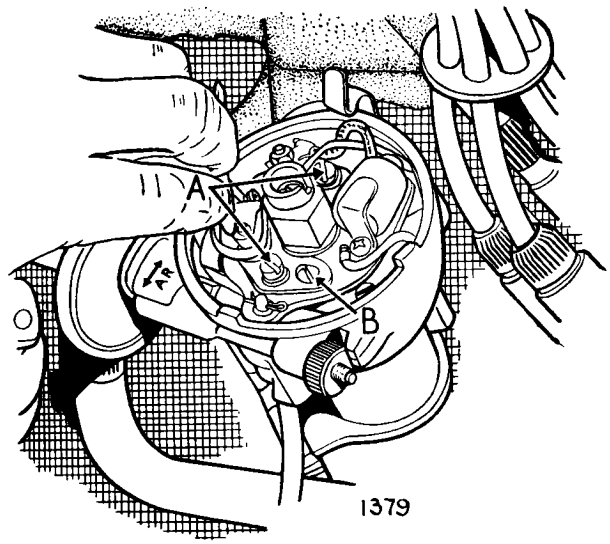
ROUTINE MAINTENANCE

Distributor Contact Breaker Points

Every 2,500 miles (500 miles with new contact set) check the gap between the contact points with feeler gauges when the points are fully opened by one of the cams on the distributor shaft. A combined screwdriver and feeler gauge is provided in the tool kit.

The correct gap is .014"—.016" (.36—.41 mm.).

If the gap is incorrect, slacken the two screws (A) securing the fixed contact plate and turn the eccentric-headed adjustment screw (B) in its slot until the required gap is obtained. Tighten the securing screws and recheck the gap.



A. Screws securing fixed contact plate.
B. Eccentric headed adjusting screw.

Fig. 3. Checking distributor point gap.

Lubrication—Every 2,500 miles

Remove the moulded cover and withdraw the rotor arm. A tight rotor arm can be withdrawn using a pair of suitable levers carefully applied at opposite points below the rotor moulding—never against the metal electrode.

Important : Do not allow oil or grease on or near the contacts when carrying out the following lubrication.

Cam Bearing

To lubricate the cam bearing, inject a few drops of thin machine oil into the rotor arm spindle (A, Fig. 4). Do not remove or slacken the screw located inside the spindle—a space is provided beneath the screwhead to allow the lubricant to reach the cam bearing.

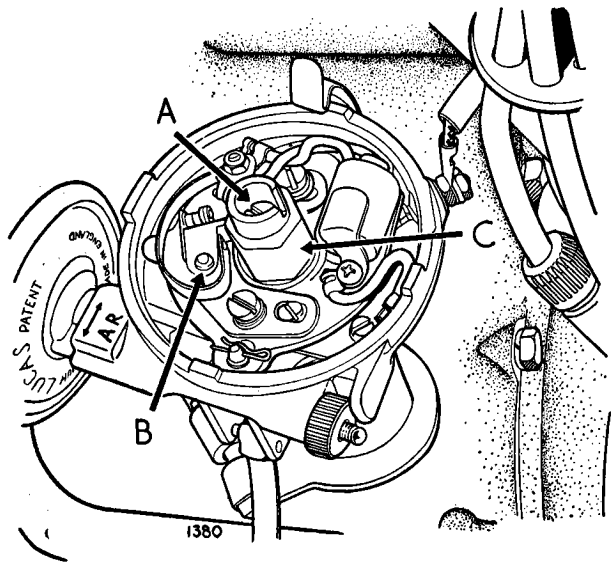


Fig. 4. Distributor lubrication points.

Cam

Lightly smear the faces of the cam (C, Fig. 4) with Mobilgrease No. 2 or with clean engine oil.

Centrifugal Timing Control

Inject a few drops of thin machine oil through a convenient aperture in the contact breaker base plate.

Cleaning

Clean the moulded cover inside and outside with a soft dry cloth. Pay particular attention to spaces between the terminals. Check that the small carbon brush inside the moulding can move freely in its holder.

Whilst the rotor arm is removed, examine the contact breaker. Rough, burned or blackened contacts can be cleaned with fine carborundum stone or emery cloth. After cleaning remove any grease or metallic dust with a petrol-moistened cloth.

Contact cleaning is facilitated by removing the lever to which the moving contact is attached. To do this, remove the nut, insulating piece and electrical connections from the post to which the contact breaker spring is anchored. The contact breaker lever can then be lifted off the pivot post and the spring from the anchor post.

After cleaning and trimming the contacts, smear the pivot post (B, Fig 4) with Ragosine Molybdenised Non-creep Oil or with Mobilgrease No. 2. Reassemble the contact breaker and check the setting.

Refit the rotor arm, carefully locating its moulded projection in the spindle keyway and pushing it on as far as it will go.

Refit the moulded cover and spring the two side clips into position.

DATA

	2.4 litre	3.4 litre		3.8 litre	
Ignition Distributor Type	DMBZ.6A	DMBZ.6A		DMBZ.6A	
Type of Carburetter Air Cleaner	Oil Bath	Oil Bath	Paper Element	Oil Bath	Paper Element
7 to 1 Compression Ratio	40557A	40578A	40640A	40640A	40640A
8 to 1 Compression Ratio	40528A	40576A	40640A	40640A	40640A
9 to 1 Compression Ratio	—	40617A	40665A	40665A	40665A
Cam dwell angle	35° ± 2°	35° ± 2°		35° ±2°	
Contact breaker gap	0.014″—0.016″ (0.36—0.41 mm.)	0.014″—0.016″ (0.36—0.41 mm.)		0.014″—0.016″ (0.36—0.41 mm.)	
Contact breaker spring tension (Measured at free contact)	18—24 ozs. (512—682 gms.)	18—24 ozs. (512—682 gms.)		18—24 ozs. (512—682 gms.)	

IGNITION TIMING

	2.4 litre	3.4 litre		3.8 litre	
Type of Carburetter Air Cleaner	Oil Bath	Oil Bath	Paper Element	Oil Bath	Paper Element
7 to 1 Compression Ratio	6° BTDC	TDC	TDC	TDC	TDC
8 to 1 Compression Ratio	8° BTDC	2° BTDC	7° BTDC	4° BTDC	7° BTDC
9 to 1 Compression Ratio	—	TDC	5° BTDC	10° BTDC	5° BTDC

IGNITION DISTRIBUTOR TEST DATA

			VACUUM TIMING ADVANCE TESTS The distributor must be run immediately below the speed at which the centrifugal advance begins to function to obviate the possibility of an incorrect reading being registered.				CENTRIFUGAL TIMING ADVANCE TESTS Mount distributor in centrifugal advance test rig and set to spark at zero degrees at 100 r.p.m.				
Distributor Type	Lucas Service Number	Lucas Vacuum Unit Number	Vacuum in inches of mercury and advance in degrees Inches	Degrees	No advance in timing below-ins. of mercury	Lucas Advance Springs Number	Accelerate to-RPM and note advance in degrees RPM	Degrees	Decelerate to-RPM and note advance in degrees RPM	Degrees	No advance in timing below-RPM
DMBZ 6A	40557A	424374	20 13 9½ 6½ 4	10—12 9½—11½ 6—8½ 1½—5 0—½	2½	424377	3,500	24—26	2,500 1,650 1,400 950 500	22—24 17—19 15—17 8—10 1—3	300
DMBZ 6A	40528A	423461	18 11½ 7½ 4 2½	11—13 10—12½ 5½—9 0—4 0—½	1	423750	3,200	20—23	2,500 1,700 1,100 800 450	18—20 14—16 11—13 8—11 ½—3½	300
DMBZ 6A	40578A	424374	20 13 9½ 6½ 4	10—12 9½—11½ 6—8½ 1½—5 0—½	2½	425183	3,500	16—18	2,400 1,300 1,100 650	14—16 10—12 7—10 ½—3½	400
DMBZ 6A	40576A	421027	20 12 8½ 6½	8—10 6—8 3—5 ½—3	5	424950	3,200	17—19	2,250 1,000 800 450	15—17 10—12 7½—10½ ½—3½	275
DMBZ 6A	40617A	54410415	20 13 9 7½ 6	7—9 6—8½ 2½—5½ 0—3 0—½	4½	54410416	2,000	12	850 450	7—9 0—2½	325
DMBZ 6A	40640A	54410709	25 14 10 6	6—8 4½—7½ 1—4½ 0—½	5	425183	3,400	19	3,000 2,300 1,300 1,000 500	17—19 14—16 10—12 8—10 1—3	250
DMBZ 6A	40665A	421189	15 12 6 4	7—9 6—9 0—3 0—½	2½	54411290	2,000	13	1,500 1,100 800 550 400	11—13 8—10 6—8 2½—4½ ½—2½	225

Auto advance weights Lucas number 410033/S. One inch of mercury = 0.0345 kg/cm²

SERVICING

Dismantling

When dismantling, note carefully the position in which the various components are fitted in order to simplify their re-assembly.

Bearing Replacement

The ball bearing at the upper end of the shank can be removed with a shouldered mandrel locating on the inner journal of the bearing.

When fitting a new ball bearing, the shouldered mandrel must locate on both inner and outer journals of the bearing.

The bearing bush at the lower end of the shank can be driven out with a suitable punch.

A bearing bush must be prepared for fitting by allowing it to stand completely immersed in medium viscosity (S.A.E. 30—40) engine oil for at least 24 hours. In cases of extreme urgency, this period of soaking may be shortened by heating the oil to 100°C. for 2 hours and then allowing to cool before removing the bush.

The bush is pressed into the shank with a shouldered mandrel. The mandrel should be hardened and polished and approximately 0.0005″ greater in diameter than the distributor shaft. To prevent subsequent withdrawal of the bush with the mandrel, a stripping washer should be fitted between the shoulder of the mandrel and the bush.

Under no circumstances should the bush be over-bored by reamering or by any other means, since this will impair the porosity and therefore the lubricating quality of the bush.

Re-assembly

When re-assembling, Ragosine molybdenised non-creep oil or (failing this) clean engine oil, should be smeared on the shaft and, more lightly, on the contact breaker bearing plate.

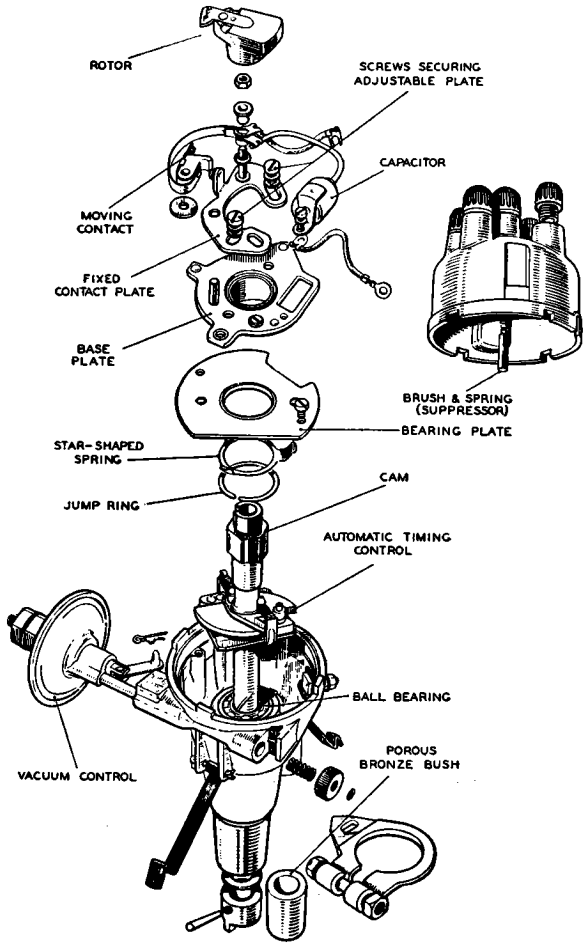


Fig. 5. Exploded view of distributor.

FLASHER UNITS

The flasher unit is housed in a small cylindrical container. Inside a switch is operated automatically by the alternate heating and cooling of an actuating wire. Also incorporated is a small relay to flash the switch warning light when the system is functioning correctly. Failure of this light to flash will indicate a fault. In the event of trouble occurring, the following procedure should be followed :—

(i) Check the bulbs for broken filaments.
(ii) Refer to the wiring diagram and check all flasher circuit connections.
(iii) Switch on the ignition.
(iv) Check with a voltmeter that flasher unit terminal 'B' is at 12 volts with respect to earth.
(v) Connect together flasher unit terminals 'B' and 'L' and operate the direction-indicator switch. If the flasher lamps now light, the flasher unit is defective and must be replaced.

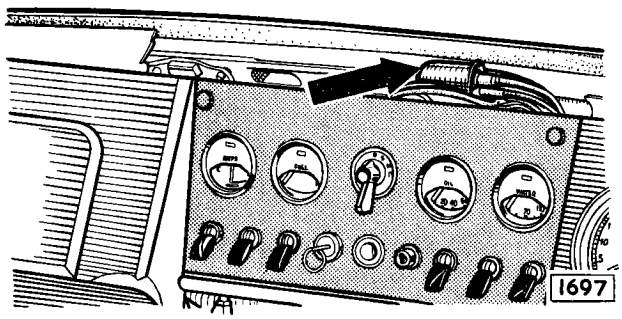


Fig. 6. Showing position of flasher unit behind instrument panel.

The direction-indicator switch is best checked by substitution. It is important that only bulbs of the correct wattage rating (i.e. 21 watts) are used in the flasher lamps.

The side/flasher and rear/stop/flasher lamps are fitted with a double filament bulb. This is the Lucas No. 380 12-volt 21/7-watt non-reversible small bayonet cap bulb.

Special contacts in the direction-indicator switch ensure that responses to the flasher unit take precedence over any simultaneous application of the brake switch.

The switch warning light is Lucas No. 280 12-volt 1.5-watt lilliput Edison screw cap.

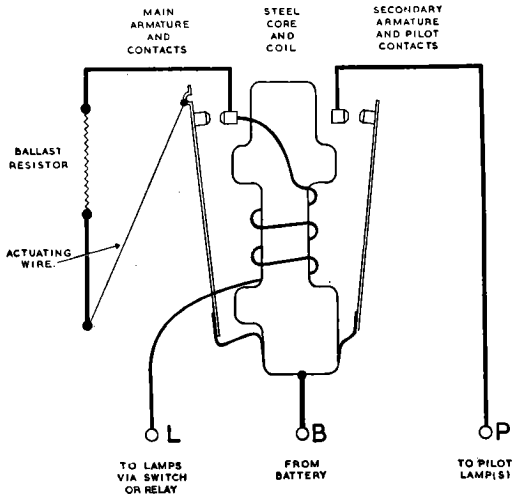


Fig. 7. Flasher unit wiring diagram.

FUSE UNIT

Model SF6 Fuse Unit carries two live glass cartridge type fuses and two spare fuses. Fuses are 35 and 50 ampere capacity.

Only one end of the spare fuses are visible and they are retained in position by a small spring clip.

AUXILIARY—this fuse is in circuit with the Interior Lights, Cigar Lighter and Headlamp Flasher and is 35 amperes capacity.

AUXILIARY IGNITION—this fuse is in circuit with the Heater Fan, Flashing Direction Indicators, Braking Lights, Petrol Gauge, Overdrive Solenoid, Reversing Light, Windscreen Wipers, Overdrive or Automatic Transmission Indicator Light, Oil Pressure Gauge, Water Temperature, Windscreen Washer and Horns ; this is 50 amperes capacity.

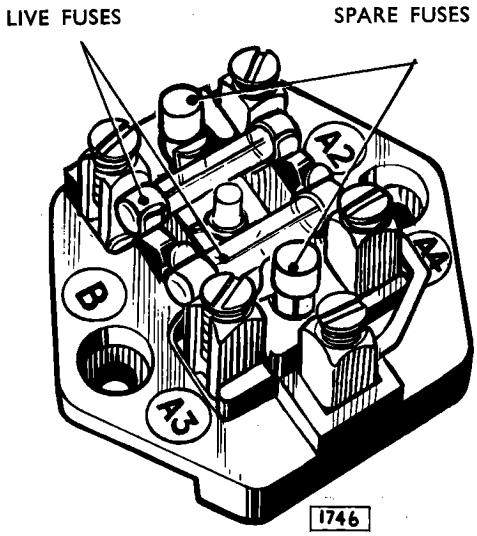


Fig. 8. Fuse unit.

GENERATOR — TYPE C.45. PV-6.

(Fitted to 2.4 litre Models.)

REMOVAL

Disconnect the cables from the two terminals at the rear of the dynamo noting that they are of different sizes.

Remove the nut and bolt securing the adjusting link to the dynamo.

Remove the two nuts and bolts securing the dynamo to the mounting bracket when the dynamo can be lifted out.

Remove the fan belt.

REFITTING

Refitting is the reverse of the removal procedure. When the fan belt has been refitted move the dynamo to a position where it is possible to depress the belt about ½" (12 mm.) midway between fan and dynamo pulleys.

1. GENERAL

The generator is a shunt-wound two-pole two-brush machine, arranged to work in conjunction with a Lucas regulator unit. A fan, integral with the driving pulley, draws cooling air through the generator, inlet and outlet holes being provided in the end brackets of the unit.

The output of the generator is controlled by the regulator unit and is dependent on the state of charge of the battery and the loading of the electrical equipment in use. When the battery is in a low state of charge, the generator gives a high output, whereas if the battery is fully charged, the generator gives only sufficient output to keep the battery in good condition without any possibility of over-charging. An increase in output is given to balance the current taken by lamps and other accessories when in use.

2. ROUTINE MAINTENANCE

(a) **Lubrication**
Every 10,000 miles, inject a few drops of high quality medium viscosity (S.A.E. 30) engine oil into the hole marked " OIL " at the end of the bearing housing.

(b) **Inspection of Brushgear**
Every 10,000 miles the brushgear should be checked as detailed in paragraph 4c.

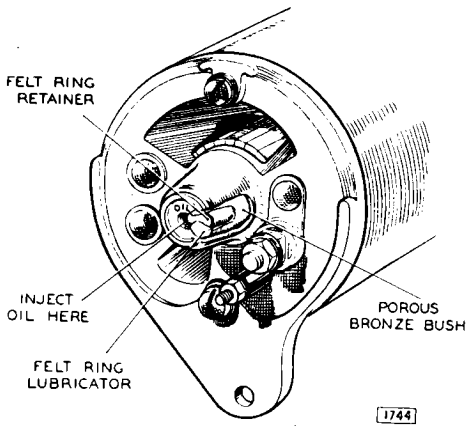


Fig. 9. Generator bush lubrication hole.

(c) **Belt Adjustment**
Occasionally inspect the generator driving belt, and, if necessary, adjust to take up any undue slackness by turning the generator on its mounting. Care should be taken to avoid overtightening the belt, the tension needed being just enough to drive without slipping. See that the machine is properly aligned, otherwise undue strain will be thrown on the generator bearings.

3. PERFORMANCE DATA

Cutting-in Speed	1,300 (max.) r.p.m. at 13.0 generator volts
Maximum Output	25 amperes at 2,050 (max.) r.p.m. at 13.5 generator volts and a resistance load of 0.54 ohm.
Field Resistance	6.0 ohms.

4. SERVICING

(a) **Testing in position to Locate Fault in Charging Circuit**
In the event of a fault in the charging circuit, adopt the following procedure to locate the cause of the trouble.

i. Inspect the driving belt and adjust if necessary (see Para. 2c).

ii. Check that the generator and control box are connected correctly. The larger generator terminal must be connected to control box terminal " D " and the smaller generator terminal to control box terminal " F ".

iii. Switch off all lights and accessories, disconnect the cables from the terminals of the generator and connect the two terminals with a short length of wire.

iv. Start the engine and set to run at normal idling speed.

v. Clip the negative lead of a moving coil type voltmeter, calibrated 0—20 volts, to one generator terminal and the positive lead to a good earthing point on the yoke.

vi. Gradually increase the engine speed, when the voltmeter reading should rise rapidly and without fluctuation. Do not allow the voltmeter reading to reach 20 volts and do not race the engine in an attempt to increase the voltage. It is sufficient to run the generator up to a speed of 1,000 r.p.m.

If the voltage does not rise rapidly and without fluctuation the unit must be dismantled (see Para. 4b) for internal examination.

Excessive sparking at the commutator in the above test indicates a defective armature which should be replaced.

NOTE: If a radio suppression capacitor is fitted between the output terminal and earth, disconnect this capacitor and re-test the generator before dismantling. If a reading is now given on the voltmeter, the capacitor is defective and must be replaced.

If the generator is in good order, remove the link from between the terminals and restore the original connections, taking care to connect the larger generator terminal to control box terminal " D " and the smaller generator terminal to control box terminal " F ".

(b) **To Dismantle**

i. Take off the driving pulley.

ii. Unscrew and withdraw the two through bolts.

iii. Withdraw the commutator end bracket from the yoke.

iv. Lift the driving end bracket and armature from the yoke. Take care not to lose the fibre thrust washer or collar.

v. The driving end bracket, which on removal from the yoke has withdrawn with it the armature and armature shaft ball-bearing, need not be separated from the shaft unless the bearing is suspected and requires examination, or the armature is to be replaced ; in this event the armature should be removed from the end bracket by means of a hand press.

(c) **Brushgear**

i. Lift the brushes up into the brush boxes and secure them in that position by positioning the brush spring at the side of the brush.

ii. Fit the commutator end bracket over the commutator and release the brushes.

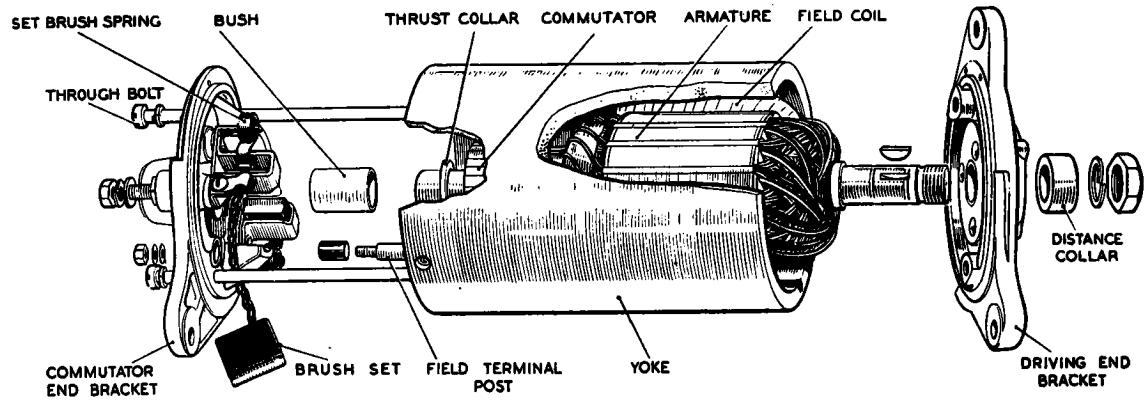


Fig. 10. Exploded view of generator.

iii. Hold back each of the brush springs and move the brush by pulling gently on its flexible connector. If the movement is sluggish, remove the brush from its holder and ease the sides by lightly polishing on a smooth file. Always refit brushes in their original positions. If the brushes are badly worn, new brushes must be fitted and bedded to the commutator. The minimum permissible length of brush is $\frac{11}{16}$".

iv. Test the brush spring tension utilizing a spring balance. The tension of a new spring and a new brush is 28 ozs. but with a brush worn to $\frac{11}{32}$" it may reduce to 20 ozs. Renew any brush spring when the tension falls below these values.

(d) **Commutator**

A commutator in good condition will be smooth and free from pits or burned spots.

Clean the commutator with a petrol-moistened cloth. If this is ineffective, carefully polish with a strip of fine glass paper while rotating the armature. To remedy a badly worn commutator, mount the armature, with or without drive end bracket, in a lathe, rotate at high speed and take a light cut with a very sharp tool.

Do not remove more metal than is necessary. Polish the commutator with a very fine glass paper. Emery cloth must not be used on the commutator. Undercut the insulators between the segments to a depth of $\frac{1}{32}$" with a hack saw blade ground to the thickness of the insulator.

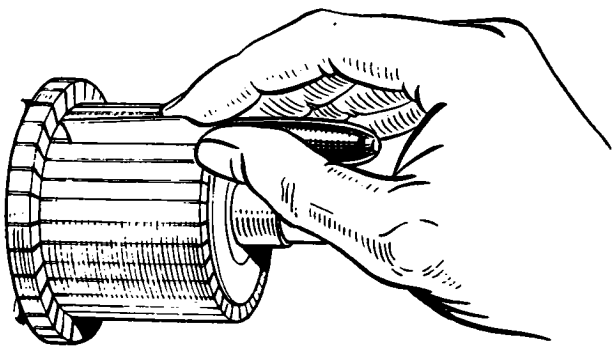


Fig. 11. Undercutting the commutator insulation.

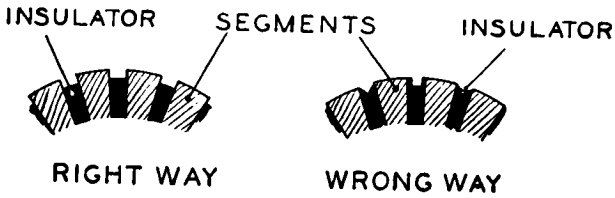


Fig. 12. Showing the correct and incorrect way of undercutting the commutator insulation.

(e) **Armature**

Indication of an open-circuited armature winding will be given by burnt commutator segments. If armature testing facilities are not available, an armature can be checked by substitution.

To remove the armature shaft from the drive end bracket and bearing, support the bearing retaining plate firmly and press the shaft out of the drive end bracket.

When fitting the new armature, support the inner journal of the ball bearing, using a mild steel tube of suitable diameter, whilst pressing the armature shaft firmly home (see also Para. 4h).

(f) **Field Coils**

Measure the resistance of the field coils, without removing them from the generator yoke, by means of an ohm meter connected between the field terminal and the yoke. Field resistance is 6.0 ohms.

If an ohm meter is not available, connect a 12-volt d.c. supply between the field terminal and generator yoke with an ammeter in series.

The ammeter reading in each case should be approximately 2 amperes. Zero reading on the ammeter or an " Infinity " ohm meter indicates an open circuit in the field winding.

If the current reading is much more than 2 amperes, or the ohm meter reading much below 6 ohms, it is an indication that the insulation of one of the field coils has broken down.

In either event, unless a substitute generator is available, the field coils must be replaced. To do this, carry out the procedure outlined below :—

i. Drill out the rivet securing the field coil terminal assembly to the yoke, and unsolder the field coil connections.

ii. Remove the insulation piece which is provided to prevent the junction of the field coils from contacting with the yoke.

iii. Mark the yoke and pole shoes so that the latter can be refitted in their original positions.

iv. Unscrew the two pole shoe retaining screws by means of a wheel-operated screwdriver.

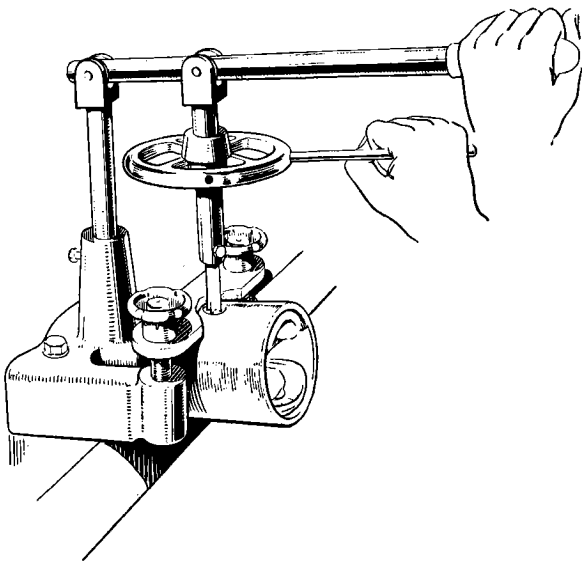


Fig. 13. Tightening the pole shoe retaining screws.

v. Draw the pole shoes and coils out of the yoke and lift off the coils.

vi. Fit the new field coils over the pole shoes and place them in position inside the yoke. Take care to ensure that the taping of the field coils is not trapped between the pole shoes and the yoke.

vii. Locate the pole shoes and field coils by lightly tightening the fixing screws.

viii. Fully tighten the screws by means of the wheel-operated screwdriver.

ix. Replace the insulation piece between the field coil terminal and re-rivet the terminal assembly to the yoke.

(g) **Bearings**

Bearings which are worn to such an extent that they will allow side movement of the armature shaft must be replaced.

To replace the bearing bush in a commutator end bracket, proceed as follows :—

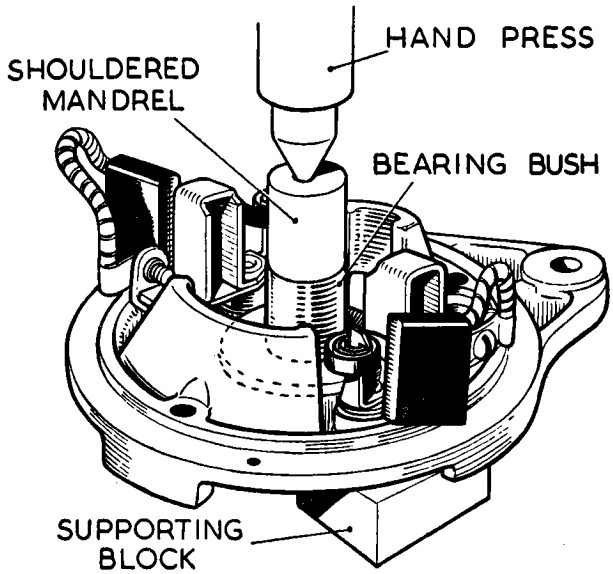


Fig. 14. Method of fitting the porous bronze bush.

i. Remove the old bearing bush from the end bracket. The bearing can be withdrawn with a suitable extractor or by screwing an $\frac{11}{16}$" tap into the bush for a few turns and pulling out the bush with the tap. Screw the tap squarely into the bush to avoid damage to the bracket.

ii. Insert the felt ring in the bearing housing, then press the new bearing bush into the end bracket, using a shouldered, highly polished mandrel of the same diameter as the shaft which is to fit in the bearing, until the visible end of the bearing is flush with the inner face of the bracket.
Porous bronze bushes must not be opened out after fitting, or the porosity of the bush may be impaired.

Note: Before fitting the new bearing bush, it should be allowed to stand for 24 hours completely immersed in a good grade thin engine oil ; this will allow the pores of the bush to be filled with lubricant.

The ball bearing at the driving end is replaced as follows :—

i. Drill out the rivets which secure the bearing retaining plate to the end bracket and remove the plate.

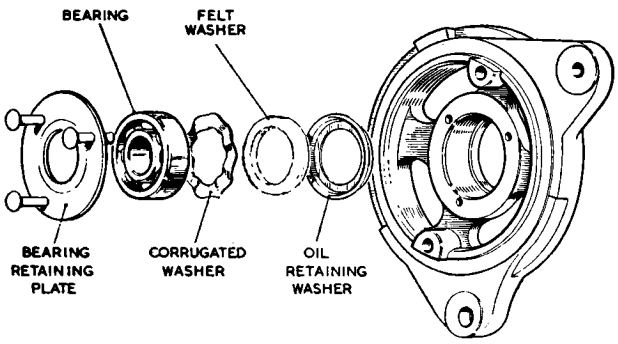


Fig. 15. Exploded view of drive end bearing.

ii. Press the bearing out of the end bracket and remove the corrugated washer, felt washer and retaining washer.

iii. Before fitting the replacement bearing, see that it is clean and pack it with high melting point grease.

iv. Place the oil retaining washer, felt washer and corrugated washer in the bearing housing in the end bracket.

v. Locate the bearing in the housing and press it home.

vi. Fit the bearing retaining plate. Insert the new rivets from the inside of the end bracket and open the rivets by means of a punch to secure the plate rigidly in position.

(h) **To Reassemble**

i. Fit the drive end bracket to the armature shaft. The inner journal of the bearing must be supported by a tube, approximately 4″ long $\frac{1}{8}$″ thick and internal diameter $\frac{11}{16}$″. Do not use the drive end bracket as a support for the bearing whilst fitting an armature.

ii. Fit the yoke to the drive end bracket.

iii. Lift the brushes up into the brush boxes and secure them in that position by positioning the brush spring at the side of the brush.

iv. Fit the commutator end bracket on the armature shaft until the brush boxes are partly over the commutator. Place a thin screwdriver on top of each brush in turn and press the brush down on the commutator.

The brush springs should then position themselves on top of the brushes.

v. Fit the commutator end bracket to the yoke so that the projection on the bracket locates in the yoke.

vi. Refit the two through bolts.

After reassembly lubricate the commutator end bearing (see Para. 2a).

GENERATOR — TYPE C.45. PVS-6.

(Fitted to 3.4 and 3.8 litre Models.)

REMOVAL

Remove the windscreen washer bottle and cage, noting the respective positions of the cables.

Disconnect the cables from the two terminals at the rear of the dynamo noting that they are of different sizes.

Remove the nut and bolt securing the adjusting link to the dynamo.

Remove the two nuts and bolts securing the dynamo to the mounting bracket when the dynamo can be lifted out.

Remove the fan belt.

REFITTING

Refitting is the reverse of the removal procedure. When the fan belt has been refitted move the dynamo to a position where it is possible to depress the belt about $\frac{1}{2}$" (12 mm.) midway between fan and dynamo pulleys.

Except for the differences described below, the instructions given for C.45.PV-6 generator fitted to the 2.4 litre model apply equally to C.45.PVS-6. The essential differences between the two generators concern :

(i) Brushgear inspection.

(ii) Commutator end bearings.

BRUSHGEAR INSPECTION

The yoke is provided with " windows " and a band cover. The instructions given for model C.45.PV-6 under Para. 4(c) (i-iii) need not, therefore, be followed in order to gain access to the brushes for inspection and spring testing—it being only necessary to slacken a single clamping screw and release the band cover.

COMMUTATOR END BEARING

A ball bearing is fitted at the commutator end of the armature shaft. Details are shown in the illustration. The bearing is secured to the shaft by a thrust screw and can be withdrawn with an extractor after the screw has been removed.

When replacing a defective bearing see that the new bearing is clean and packed with high melting point grease. It must be pressed home against the shoulder on the shaft and secured with the thrust screw.

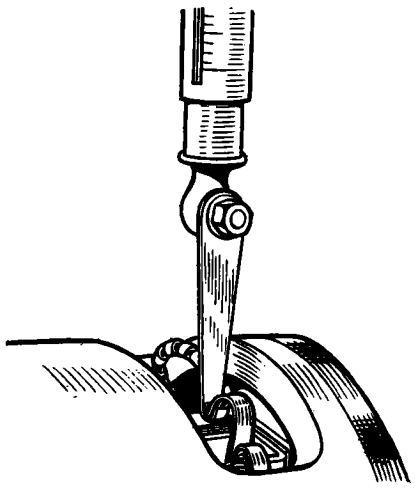


Fig. 16. Testing the brush spring tension.

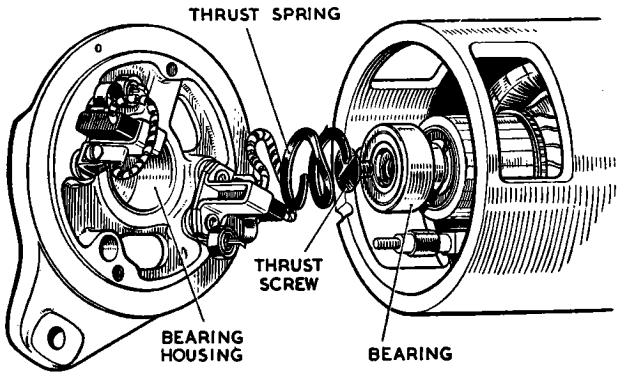


Fig. 17. Showing the commutator end plate removed.

POWER-ASSISTED STEERING GENERATOR

In the instance of generators fitted to cars having power-assisted steering, the pump which supplies the hydraulic pressure is mounted on the rear end of the generator by three studs fitted into the commutator end bracket and the commutator shaft is extended and slotted to accommodate the tongued drive of the pump. The " F " and " D " terminals normally at the rear of the generator are repositioned on the yoke.

When it is necessary to remove the generator the power-assisted steering hydraulic system must be drained, the pipes detached from the hydraulic pump and then the generator and dynamo detached as one unit.

HORNS

It is important to keep the horn mounting bolts tight and to maintain rigid the mountings of any units fitted near the horns. Electrical connections and cabling should be checked occasionally and rectified as required.

Adjustment

A horn in correct adjustment will pass 3.5—4.0 amperes at 12 volts. Adjustment does not alter the note but serves to take up wear of the moving parts which if not corrected will result in loss of power and roughness of tone.

When adjusting, use a first grade 0—10 moving coil ammeter and turn the horn adjustment screw clockwise to increase the current, or anti-clockwise to decrease the current.

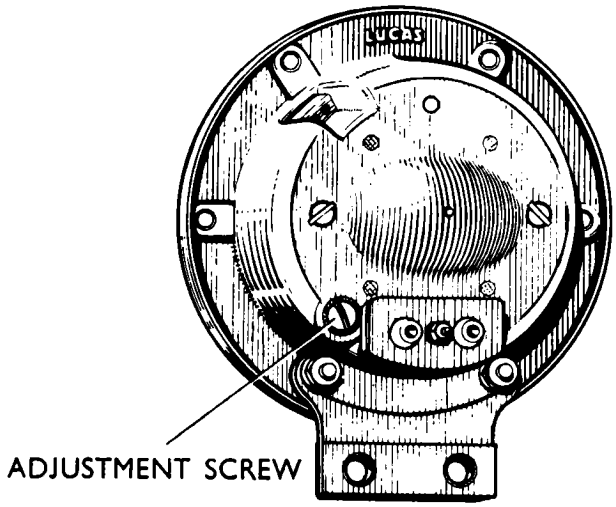


Fig. 18. Horn adjustment screw.

LAMPS

LIGHT BULBS

	Type of Cap	Watts.	Lucas Number	Remarks
Headlight				
Home and R.H. Drive Export	Double B.P.F.	60/36	404	Large globe
U.S.A. and Canada		Sealed beam units		
France	Three spade	45/40	411	Yellow
Germany and Italy	Three spade	45/40	410	
Norway and Sweden	Double B.P.F.	35/35	350	
Continental	Double B.P.F.	35/35	370	
L.H. Drive Export	Double B.P.F.	60/36	406	Large globe
Side Light Map Light Pillar Interior Light Number Plate Luggage Boot Light	M.C.C.	6	989	No. 222 can be used
Front and Rear Flashing Indicators Reversing Light	S.C.C.	21	382	
Rear/Brake Light	S.B.C. off set pin	21/6	380	
Fog Light	Single B.P.F.	48	323	
Rear Interior Light	38 mm. Festoon	6	254	
Instrument Illumination Headlamp Warning Light Ignition Warning Light Fuel Warning Light Handbrake/Brake Fluid Warning Light	M.E.S.	2.2	987	
Switch Indicator Strip Flashing Indicator Warning Light Overdrive Indicator Light Auto-Trans. Indicator Light	M.B.C.	1.6	281	Sub-miniature

HEADLAMPS

The headlamps comprise two Lucas light units with pre-focus double-filament bulbs (excepting U.S.A. export models, which are provided with an adaptor to accept American Sealed Beam Units) front rims and dust excluding rubber rings.

Since the spread of light and its position on the kerbside in the dipped position is a function of lensing and bulb design, special light units and bulbs are fitted to suit lighting regulations of the country in which a car is used. Special care should therefore be taken when replacing a bulb to see that the correct replacement is fitted.

Bulb Replacement

Slacken the single rim securing screw and withdraw the rim and dust excluding rubber ring.

Press the light unit inwards against the three spring-loaded adjustment screws and turn it anti-clockwise to disengage it through the keyhole slots.

Release the bayonet adaptor with a press-in anti-clockwise motion and withdraw the defective bulb.

Note that a notch in the flange of the bulb is arranged to locate with a ridge in the bulb-holder.

Fit the new bulb and refit the adaptor, light unit, dust excluder and front rim.

After fitting, the headlamp setting should be checked.

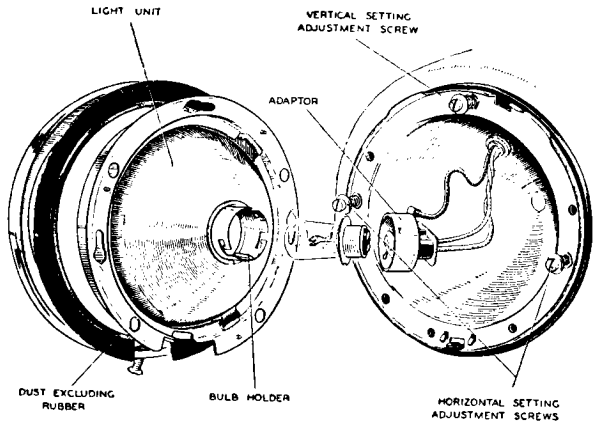


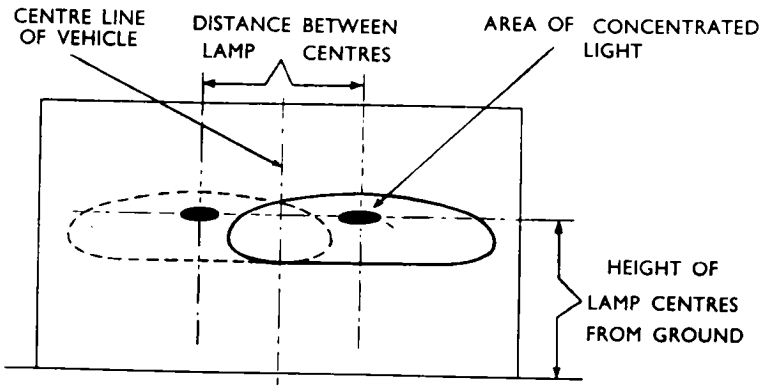
Fig. 19. Showing the headlamp adjustment screws and bulb location.

Headlamp Setting

The headlamps should be set so that when the car is carrying its normal load the driving beams are projected parallel with each other and parallel with the road (see Fig. 20).

When setting, remove the lamp rims and dust excluding rubber rings. Cover one lamp whilst adjusting the other.

Vertical trimming is effected by screwing in (or out) the top spring-loaded screw. Horizontal trimming is effected with the two side screws.



(A) FRONT OF VEHICLE TO BE SQUARE WITH SCREEN

(B) VEHICLE TO BE LOADED AND STANDING ON LEVEL GROUND

(C) RECOMMENDED DISTANCE FOR SETTING IS AT LEAST 25FT.

(D) FOR EASE OF SETTING ONE HEADLAMP SHOULD BE COVERED

1745

Fig. 20. Headlamp beam setting.

Sidelamp Bulb—Replacement

Remove the screw in the top of the sidelamp nacelle. Turn the rim clockwise a small amount and withdraw the lamp and bulb holder complete. To remove the bulb from the holder, press inwards and rotate anti-clockwise.

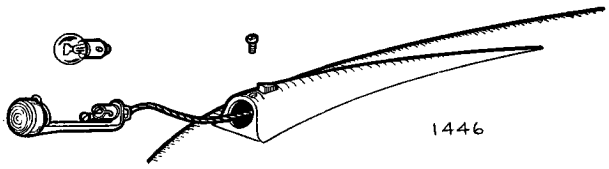


Fig. 21. Sidelamp bulb removal.

Front Flasher Bulb—Replacement

Remove the screw at the bottom of the rim and lift off the rim and glass. Remove the bulb by pressing in and rotating anti-clockwise.

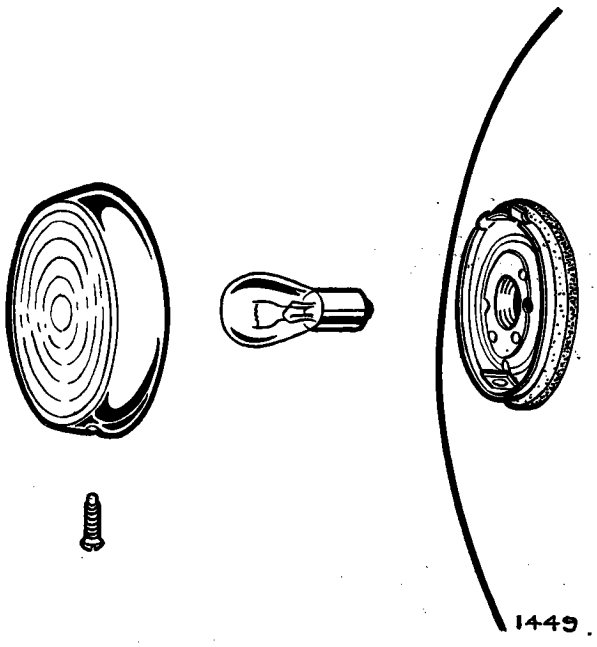


Fig. 22. Front flasher bulb removal.

Rear Flasher Bulb—Replacement

Remove the screw at the bottom of the lamp glass and lift out the glass from its attachment at the top. The flasher bulb is the uppermost of the two bulbs and is removed by pressing inwards and rotating anti-clockwise.

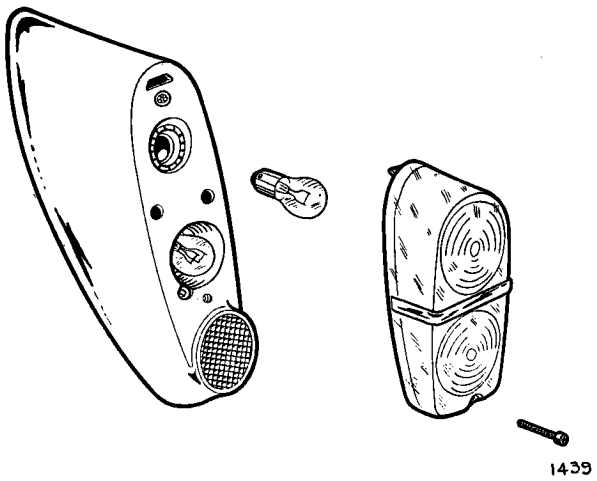


Fig. 23. Rear flasher bulb removal.

Rear/Brake Bulb—Replacement

Remove the screw at the bottom of the lamp glass and lift out the glass from its attachment at the top. The rear and braking light bulb is the lower of the two bulbs. To remove the bulb from its holder, press inwards and rotate anti-clockwise. When fitting a replacement bulb, note that the pins are offset.

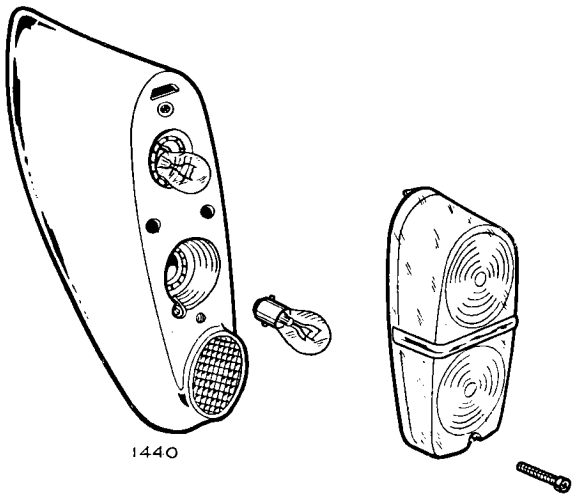


Fig. 24. Rear/Brake bulb removal.

Reverse, Number plate and Luggage Boot Bulbs—Replacement

The reverse light bulb, the two number plate bulbs and the boot light bulb are retained in a holder accessible from the underside of the luggage boot lid. To remove the holder unscrew the two cheese-headed screws when the holder can be withdrawn; all the bulbs are retained in the holder by bayonet fixings. The luggage boot light bulb is accessible without having to remove the holder.

Fog Lamp Bulb—Replacement

Unscrew the screw from the bottom of the lamp, disengage the rim at the top and withdraw the light unit from the back shell. Ease back the earth contact and withdraw the bulb. When replacing the bulb align the groove in the bulb plate with its register in the reflector. When refitting the light unit care must be taken to ensure that the contact blade coupled to the red and yellow cable registers with the centre contact on the bulb.

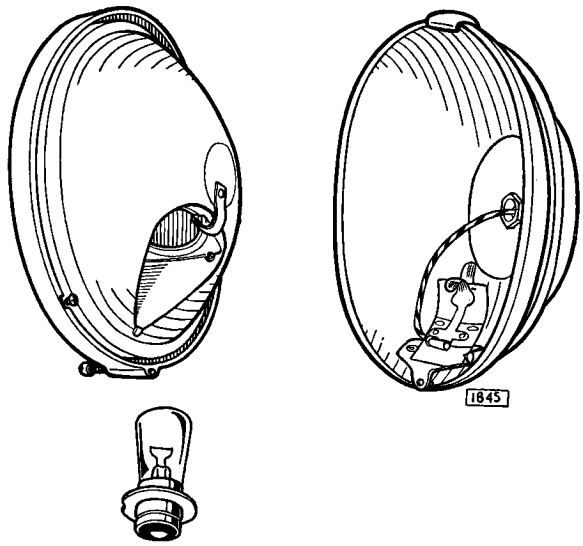


Fig. 25. Fog lamp bulb removal.

Adjusting Fog Lamp Beams

The beam of the fog lamp can be adjusted by slackening the nut of the attachment bolt, access to which is gained from beneath the car, and moving the lamp into the desired position. The nut is then tightened while a second person holds the lamp steady.

RB 310 VOLTAGE AND CURRENT REGULATOR

(a) CHECKING CONTINUITY BETWEEN BATTERY AND CONTROL BOX

If the generator and battery are in order, disconnect the cable from control box terminal " B " and connect it to the negative terminal of a good quality 0—20 moving coil voltmeter.

Connect the positive terminal of the voltmeter to an earthing point on the chassis. If the meter registers battery voltage, i.e., 12 volts, the wiring is in order and the control box settings should be checked.

If there is no reading, re-connect the cable to terminal " B " and examine the wiring between battery and control box for defective cables or loose connections.

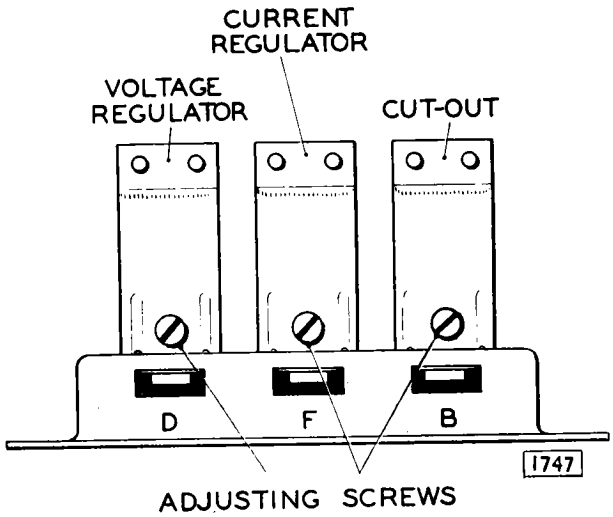


Fig. 26. The RB.310 control box showing the position of the three spring loaded adjusting screws.

(b) VOLTAGE REGULATOR ADJUSTMENT

The regulator is carefully set during manufacture and, in general, it should not be necessary to make further adjustment. However, if the battery fails to keep in a charged condition or if the generator output does not fall when the battery is fully charged, the setting should be checked and, if necessary, corrected.

It is important to check before altering the regulator setting that the low state of charge of the battery is not due to a defective battery or to slipping of the generator belt. Only a good quality MOVING COIL VOLTMETER (0—20 volts) must be used when checking the regulator. The open circuit setting can be checked without removing the cover from the control box.

Disconnect the cable from the control box terminal " B ".

Connect the voltmeter to control box terminal " D " and a good earthing point.

The regulator should be at ambient temperature, i.e., as measured in its immediate vicinity, and adjustment should be completed within thirty seconds, otherwise heating of the shunt coil by the energising current may cause false settings to be made.

Run the engine up until the generator speed reaches 3,000 r.p.m. (2,000 engine r.p.m.) when the open circuit voltage reading should lie within the following limits :—

Regulator Temperature	Voltage Setting
50°F. (10°C.)	15.1—15.7
68°F. (20°C.)	14.9—15.5
86°F. (30°C.)	14.7—15.3
104°F. (40°C.)	14.5—15.1

If the voltmeter reading is outside the specified limits rotate the voltage regulator adjusting screw, which is adjacent to the " D " terminal, clockwise to raise the setting or anti-clockwise to reduce the setting. Check the setting by switching off the engine, restarting and then raising the generator speed to 3,000 r.p.m. (2,000 engine r.p.m.) and make any final adjustment.

(c) CURRENT REGULATOR ADJUSTMENT

When setting the current regulator on the vehicle the generator must be made to develop its full rated output, regardless of the state of charge of the battery at the time of setting. The voltage regulator must therefore be rendered inoperative. To do this, the voltage regulator contacts should be short-circuited with a crocodile clip placed between the insulated fixed contact bracket and the voltage regulator frame

Disconnect the cable from terminal " B " and connect a 0—40 first grade moving coil ammeter between this cable and terminal " B ".

Start the engine and run the generator at about 4,000 r.p.m. (2,700 engine r.p.m.) when the ammeter should read 24-26 amperes. If the ammeter is outside the specified limit rotate the current adjusting screw, which is the centre of the three, clockwise to raise the setting or anti-clockwise to reduce the setting. Check the setting by switching off the engine, restarting and then raising the generator speed to 4,000 r.p.m. (2,700 engine r.p.m.) and make any final adjustment..

Restore the original connections.

(d) CLEANING REGULATOR CONTACTS

After long periods of service it may be found necessary to clean the contacts of the voltage and current regulators. These may be cleaned with fine carborundum stone or fine emery cloth. All traces of metal dust or other foreign matter must be removed with methylated spirits (de-natured alcohol).

(e) CUT-OUT ADJUSTMENT

If the regulator is correctly set but the battery is still not being charged, the cut-out may be out of adjustment. To check the voltage at which the cut-out operates, remove the control box cover and connect the voltmeter between terminals " D " and " E ". Start the engine and slowly increase its speed until the cut-out contacts are seen to close, noting the voltage at which this occurs. This should be 12.7—13.3 volts.

If the operation of the cut-out is outside the specified limit rotate the cut-out adjusting screw, which is adjacent to the " B " terminal, a fraction at a time clockwise to raise the setting or anti-clockwise to reduce the setting. Test after each adjustment by increasing the engine speed and note the voltmeter reading at the instant of contact closure. Electrical settings of the cut-out, like the voltage regulator, must be effected as quickly as possible because of temperature rise effects.

(f) CLEANING CUT-OUT CONTACTS

After long periods of service it may be found necessary to clean the cut-out contacts. These may be cleaned with fine glass paper. All traces of metal dust or other foreign matter must be removed with methylated spirits (de-natured alcohol).

STARTER MOTOR

REMOVAL

Disconnect one of the battery cables.

Disconnect the cable from the terminal at the end of the starter motor.

Slide the two seats rearward as far as possible and remove both seat cushions. Detach the gear lever knob by slackening the locknut. Remove the finisher panel assembly between the two seats by detaching a knob toward the rear end, lifting the end upward to disengage it from the stud, then rearward to disengage the front clips from beneath the finisher panel assembly. Remove the trim panel from the right-hand side of the gearbox cover by withdrawing two thumb screws on its top edge. Detach the right-hand heater hose from the air distributor box situated beneath the dash and remove the circular plate beneath.

Remove the two nuts from the rear ends of the starter motor securing bolts, access to the top nut is gained from inside the car through the circular aperture by removing two screws and a plate and the bottom nut from below the car.

Support the starter motor from below by hand and withdraw both bolts, the heads of which are connected by a curved metal rod, in a forward direction. The starter motor can then be withdrawn from position.

REFITTING

Refitting is the reverse of the removal procedure.

1. GENERAL

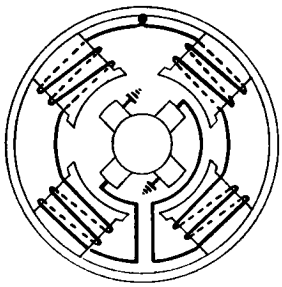
The electric starting motor is a series-wound four-pole four-brush machine having an extended shaft which carries the engine engagement gear, or starter drive as it is more usually named. The diameter of the yoke is $4\frac{1}{2}$".

The starting motor is of similar construction to the generator except that heavier copper wire is used in the construction of the armature and field coils. The field coils are parallel-connected between the field terminal and the insulated pair of brushes.

2. ROUTINE MAINTENANCE

The only maintenance normally required by the starting motor is the occasional checking of brush-gear and commutator. About every 10,000 miles, remove the metal band cover. Check that the brushes move freely in their holders by holding back the brush springs and pulling gently on the flexible connectors. If a brush is inclined to stick, remove it from its holder and clean its sides with a petrol-moistened cloth. Be careful to replace brushes in their original positions in order to retain " bedding ". Brushes which have worn so that they will not " bed " properly on the commutator or have worn less than $\frac{5}{16}$" in length must be renewed.

The commutator should be clean, free from oil or dirt and should have a polished appearance. If it is dirty, clean it by pressing a fine dry cloth against it while the starter is turned by hand by means of a spanner applied to the squared extension of the shaft. Access to the squared shaft is gained by removing the thimble-shaped metal cover. If the commutator is very dirty, moisten the cloth with petrol.



MODELS M45G & M41BG

Fig. 27. Showing the internal connections of the starter motor.

3. PERFORMANCE DATA

	2.4 litre	3.4 litre 3.8 litre
Type	M.418G	M.45G
Lock Torque	17 lb. ft. with 440-460 amperes at 7.4 -7.0 volts	22 lb. ft. with 430-450 amperes at 7.8 -7.4 volts.
Torque at 1,000 r.p.m.	8 lb. ft. with 250-270 amperes at 9.4 -9.0 volts	8.3 lb. ft. with 200-220 amperes at 10.2 -9.8 volts.
Light running current	45 amperes at 7,400-8,500 r.p.m.	45 amperes at 5,800-6,800 r.p.m.

4. SERVICING

(a) TESTING IN POSITION

(i) Switch on the lamps and operate the starter control. If the lights go dim, but the starter motor is not heard to operate, an indication is given that current is flowing through the starting motor windings but that the armature is not rotating for some reason ; possibly the pinion is meshing permanently with the geared ring on the flywheel. In this case the starting motor must be removed from the engine for examination.

(ii) Should the lamps retain their full brilliance when the starter switch is operated, check the circuit for continuity from battery to starting motor via the starter switch, and examine the connections at these units. If the supply voltage is found to be applied to the starting motor when the switch is operated, an internal fault in the motor is indicated and the unit must be removed from the engine for examination.

(iii) Sluggish or slow action of the starting motor is usually due to a loose connection causing a

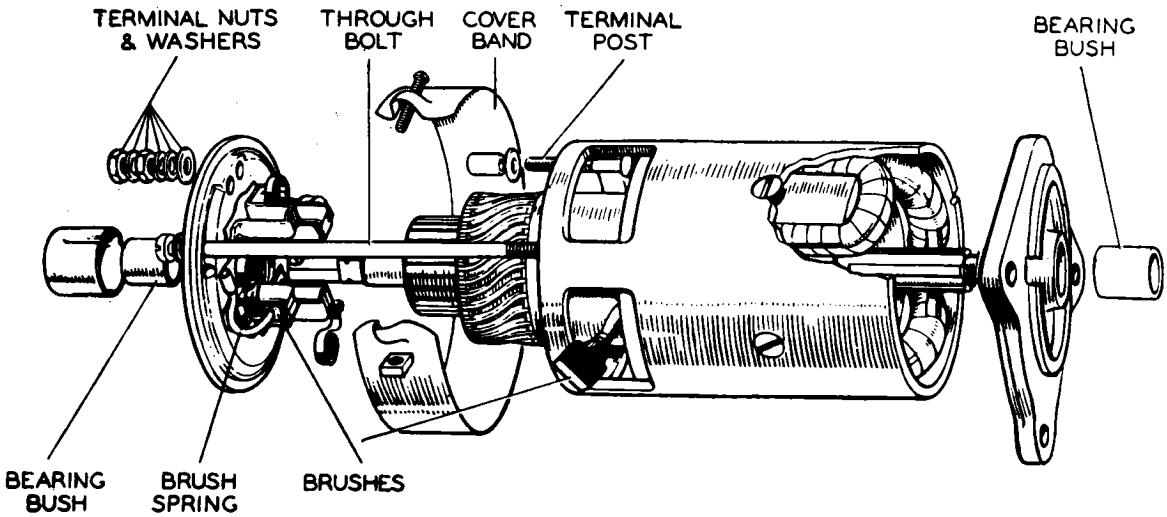


Fig. 28. Exploded view of starter motor.

high resistance in the motor circuit. Check as described above.

(iv) If the motor is heard to operate, but does not crank the engine, indication is given of damage to the drive.

(b) BENCH TESTING AND EXAMINATION OF BRUSHGEAR AND COMMUTATOR

(i) If it is necessary to remove the starting motor from the engine, proceed as follows :—
Disconnect one of the battery cables at the battery, to avoid any danger of causing short circuits.
Disconnect the cable from the starter motor.

(ii) After removing the starting motor from the engine secure the body in a vice and test by connecting it with heavy gauge cables to a battery of the appropriate voltage. One cable must be connected to the starter terminal and the other held against the body or end bracket. Under these light load conditions, the starter should run at a very high speed (see Para. 3) without excessive noise and without excessive sparking at the commutator

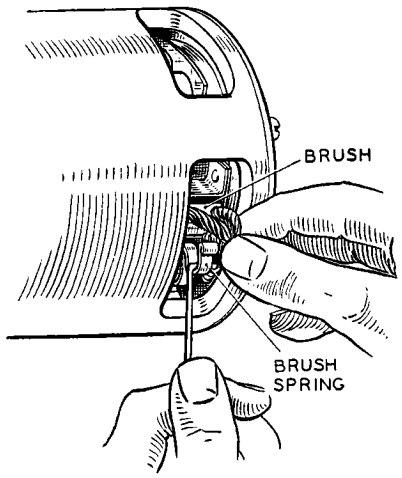


Fig. 29. Checking the brush gear.

(iii) If the operation of the starting motor is unsatisfactory, remove the cover band and examine the brushes and commutator. Hold back each of the brush springs and move the brush by pulling gently on its flexible connector. If the movement is sluggish, remove the brush from its holder and ease the sides by lightly polishing on a smooth file. Always replace brushes in their original positions. If the brushes are worn so that they will not bear on the commutator, or if the brush flexible is exposed on the running face, they must be replaced (see Para. 4D).
Check the tension of the brush springs with a spring scale. The correct tension is 30—40 ozs. New springs should be fitted if the tension is low.
If the commutator is blackened or dirty, clean it by holding a petrol-moistened cloth against it while the armature is rotated.

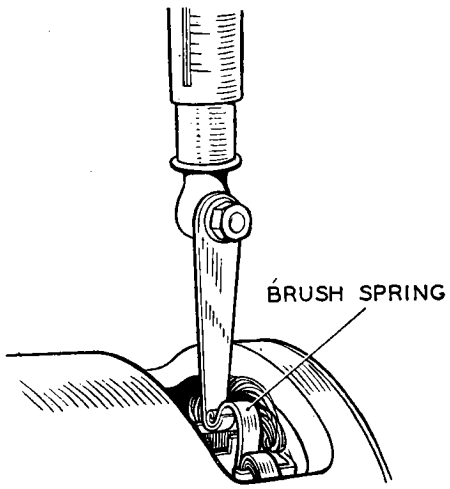


Fig. 30. Testing the brush gear tension.

(iv) Re-test the starter as described under (ii). If the operation is still unsatisfactory, the unit can be dismantled for detailed inspection and testing as follows :—

(c) TO DISMANTLE

(i) Remove the cover band, hold back the brush springs and lift the brushes from their holders.
(ii) Remove the nuts from the terminal post which protrudes from the commutator end bracket.
(iii) Unscrew the two through bolts from the commutator end bracket. Remove the commutator end bracket from the yoke.
(iv) Remove the driving end bracket complete with armature and drive from the starting motor yoke. If it is necessary to remove the armature from the driving end bracket, it can be done by means of a hand press after the drive has been dismantled.

(d) REPLACEMENT OF BRUSHES

If the brushes are worn to less than $\frac{5}{16}$" in length, they must be replaced.

Two of the brushes are connected to terminal eyelets attached to the brush boxes on the commutator end bracket and two are connected to the field coils.

The flexible connectors must be removed by unsoldering and the connectors of the new brushes secured in their place by soldering. The brushes are pre-formed so that bedding to the commutator is unnecessary.

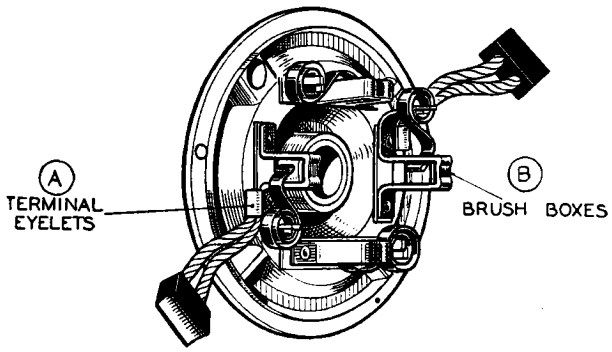


Fig. 31. Commutator end bracket brush connections.

(e) COMMUTATOR

A commutator in good condition will be smooth and free from pits and burned spots. Clean the commutator with a petrol-moistened cloth. If this is ineffective, carefully polish with a strip of fine glass paper, while rotating the armature. To remedy a badly worn commutator, dismantle the starter drive and remove the armature from the end bracket. Now mount the armature in a lathe, rotate at a high speed and take a light cut with a very sharp tool. Do not remove any more metal than is necessary. Finally polish with very fine glass paper.

The insulators between the commutator segments MUST NOT BE UNDERCUT.

(f) ARMATURE

Examination of the armature may reveal the cause of failure, e.g. conductors lifted from the commutator due to the starter motor being engaged while the engine is running and causing the armature to be rotated at an excessive speed. A damaged armature must always be replaced—no attempt should be made to machine the armature core or to true a distorted armature shaft.

(g) FIELD COILS

(i) Test the field coils for continuity by connecting a 12-volt test lamp between the starting motor terminal and to each field brush in turn.

(ii) Lighting of the lamp does not necessarily mean that the field coils are in order, as it is possible that one of them may be earthed to a pole-shoe or to the yoke. This may be checked with a 110-volt test lamp, the test leads being connected between the starting motor terminal and a clean part of the yoke. If the lamp lights, defective insulation of the field coils or of the terminal post is indicated. In this event, see that the insulating band is in position and examine the field coils and terminal connections for any obvious point of contact with the yoke. If from the above tests the coils are shown to be open-circuited or earthed and the point of contact cannot be readily located and rectified, either the complete starting motor or the field coils must be replaced. If the field coils are to be replaced, follow the procedure outlined below, using a wheel-operated screwdriver.

Remove the insulation piece which is provided to prevent the intercoil connectors from contacting with the yoke.

Mark the yoke and pole shoes so that the latter can be re-fitted in their original positions.

Unscrew the four pole shoe retaining screws with the wheel-operated screwdriver.

Draw the pole shoes and coils out of the yoke and lift off the coils.

Fit the new field coils over the pole shoes and place them in position inside the yoke.

Take care to ensure that the taping of the field coils is not trapped between the pole shoes and the yoke.

Locate the pole shoes and field coils by lightly tightening the fixing screw.

Fully tighten the screws with the wheel-operated screwdriver.

Replace the insulation piece between the field coil connections and the yoke.

(h) BEARINGS

Bearings which are worn to such an extent that they will allow excessive side-play of the armature shaft

must be replaced. To replace the bearing bushes proceed as follows :—

(i) Press the bearing bush out of the end bracket.

(ii) Press the new bearing bush into the end bracket using a shouldered, highly polished mandrel of the same diameter as the shaft which is to fit in the bearing. Porous bronze bushes must not be opened out after fitting, or the porosity of the bush may be impaired.

Note: Before fitting a new porous bronze bearing bush it must be completely immersed for 24 hours in clean thin engine oil.

(j) REASSEMBLY

The reassembly of the starting motor is a reversal of the dismantling procedure.

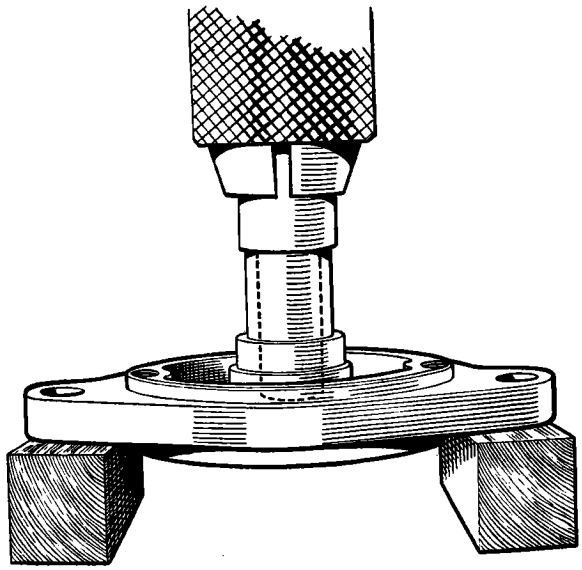


Fig. 32. Method of fitting bush.

STARTER DRIVE

1. GENERAL

The pinion is mounted on a threaded sleeve which is carried on splines on the armature shaft, the sleeve being arranged so that it can move along the shaft against a compression spring so as to reduce the shock loading at the moment engagement takes place.

When the starter switch is operated, the shaft and screwed sleeve rotate and, owing to the inertia of the pinion, the screwed sleeve turns inside the pinion causing the latter to move along the sleeve into engagement with the flywheel ring. The starter will then turn the engine.

As soon as the engine fires and commences to run under its own power, the flywheel will be driven faster by the engine than by the starter. This will cause the pinion to be screwed back along the sleeve and so thrown out of mesh with the flywheel teeth. In this manner the drive safeguards the starter against damage due to being driven at high speeds by the engine.

A pinion restraining spring is fitted over the starter shaft to prevent the pinion being vibrated into contact with the flywheel when the engine is running.

2. ROUTINE MAINTENANCE

If any difficulty is experienced with the starting motor not meshing correctly with the flywheel, it may be that the drive requires cleaning. The pinion should move freely on the screwed sleeve ; if there is any dirt or other foreign matter on the sleeve it must be washed off with paraffin.

In the event of the pinion becoming jammed in mesh with the flywheel, it can usually be freed by turning the starter motor armature by means of a spanner applied to the shaft extension at the commutator end.

This is accessible by removing the cap which is a push fit.

3. DISMANTLING AND REASSEMBLY

Having removed the armature as described in the section dealing with starting motors the drive can be dismantled as follows :—

Remove the split pin (A) from the shaft nut (B) at the end of the starter drive. Hold the squared starter shaft extension at the commutator end by means of a spanner and unscrew shaft nut (B). Lift off the main spring (C), washer (D), screwed sleeve with pinion (E), collar (F), pinion restraining spring (G) and restraining spring sleeve (H).

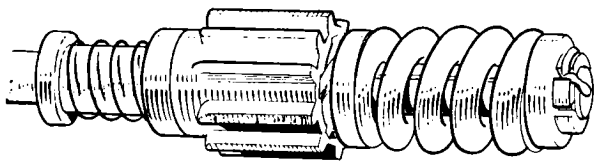


Fig. 33. Showing the starter drive assembled.

Note: If either the screwed sleeve or pinion are worn or damaged they must be replaced as a pair, not separately.

The reassembly of the drive is a reversal of the dismantling procedure.

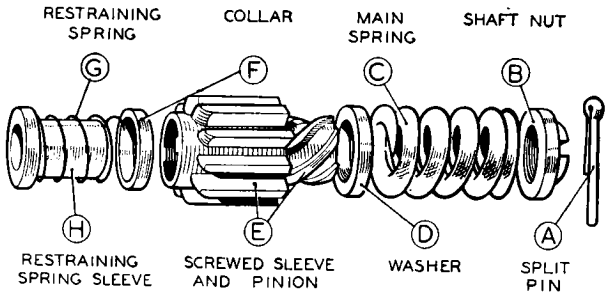


Fig. 34. Exploded view of the starter drive assembly.

WINDSCREEN WIPER

REMOVAL OF WIPER MOTOR AND CABLE

Withdraw the wiper arms from the spindles. Unscrew the large nut connecting cable guide to the wiper motor.

Remove the single screw securing the plate covering the electrical connections on the wiper motor. Withdraw the electrical cables from the wiper motor complete with the rubber retainer.

From the underneath of the right hand front wing remove the three screws securing the wiper motor to the wing valance.

The wiper motor cable can now be removed as an assembly by drawing the cable through the guide tube.

Disconnecting the Cable

Remove the four small set bolts from the gear cover.

Lift off the cover, remove the circlip from the post in the gear wheel.

Remove the washer, spring, shaped washer and connecting link from the post. Lift out the connecting link from the crosshead.

Lift out the cable ferrule from the gear casing.

REFITTING

Refitting is the reverse of the removal procedure.

REMOVAL OF WHEELBOXES

Remove the side facia panel as described on page 44.

Remove the glove box as described on page 45.

Withdraw both wiper arms from the spindles.

From outside the car unscrew the large nuts securing the wheelboxes to the scuttle.

Remove the chrome distance pieces and rubber seals.

Remove the backplates from the wheelboxes by removing the two screws.

Pull the cable away from the worm wheels and slide off the spacer tubing.

From inside the car withdraw the wheelboxes and spacers.

REFITTING

Refitting is the reverse of the removal procedure. When refitting ensure that the flared end of tube from motor to first wheelbox registers with outer narrow slot in cover plate.

DATA

Wiping Speed	
Normal :	45—50 cycles per minute
High :	60—70 cycles per minute
Light Running Current	
Normal Speed	2.7—3.4 amperes
High Speed :	2.6 (or less) amperes
Stall Current	10—11 amperes (DR3)
Control Switch	79.SA.
Pressure of Blades against Windscreen	
Arms with leaf type springs :	4.5—7.5 ounces
Arms with coil type springs :	5.5—7.5 ounces
Maximum permissible force to move cable rack in protective tubing with motor, arms and blades disconnected	6.0 lbs.

DESCRIPTION

The windscreen wiper is a two-speed, thermostatically protected, self-parking, cable rack unit.

The cable rack comprises a flexible inner core of steel wire wound with a wire helix. The rack passes through protective tubing from an underbonnet mounted motor to a pair of scuttle mounted wheelboxes. A reciprocating motion is imparted to the rack by a crank in the wiper gearbox and transmitted to the wiper arm spindles by engagement of the rack with a gear in each wheelbox.

The motor is controlled by a switch giving Park, Normal and High speed operation. The higher speed is intended to be used when driving fast through heavy rain or light snow. It should not be used in heavy snow or with a dry or drying windscreen. If overloaded, the motor windings will overheat and cause the thermostat to trip and isolate the motor from the supply. Provided the obstruction or other cause of excessive heating is removed, normal working resumes automatically when the temperature falls to a safe value.

MAINTENANCE

Efficient wiping is dependent upon having a clean windscreen and wiper blades in good condition.

Use methylated spirits (de-natured alcohol) to remove oil, tar spots and other stains from the windscreen. Silicone and wax polishes should not be used for this purpose.

Worn or perished wiper blades are readily removed for replacement.

When necessary, adjustments to the self-parking mechanism can be made by turning the knurled nut near the cable rack outlet. Turn the nut only one or two serrations at a time and test the effect of each setting before proceeding.

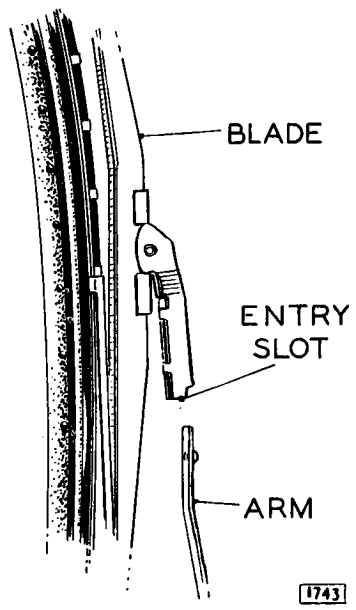


Fig. 35. Wiper blade to arm attachment.

FAULT DIAGNOSIS

Poor performance can be electrical or mechanical in origin and not necessarily due to a faulty motor, for example :—

Low voltage at the motor due to poor connections or to a discharged battery ;

Cable rack binding in protective tubing ;

Excessive loading on the wiper blades ;

Wheelboxes loose, out of alignment or spindles binding in the bearing housing.

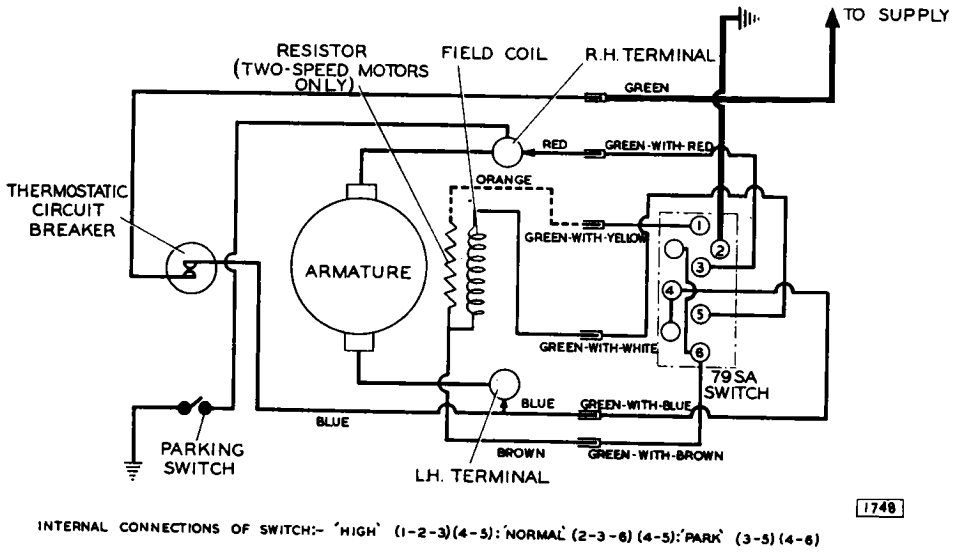


Fig. 36. Wiring connections switch to wiper.

TESTING

Unless the origin of the fault is apparent, proceed as follows to determine the cause of failure.

Measuring Supply Voltage

Using a first grade moving coil voltmeter, measure the voltage between the motor supply terminal (to which the green cable is connected) and a good earthing point. This should be 11.5 volts with wiper working normally. If the reading is low, check the battery, switch (by substitution), cabling and connections.

Measuring Light Running Current

If the normal running terminal voltage is correct, disconnect the cable rack at the wiper gearbox and measure the light running current with a first grade moving coil ammeter connected in the supply cable.

As this involves removing the gearbox cover, the opportunity can be taken to observe the speed of operation by counting the revolutions per minute of the final gear.

The light running current must not exceed 3.4 amperes at Normal speed (45—50 c.p.m.). If it does, fit a new windscreen wiper motor.

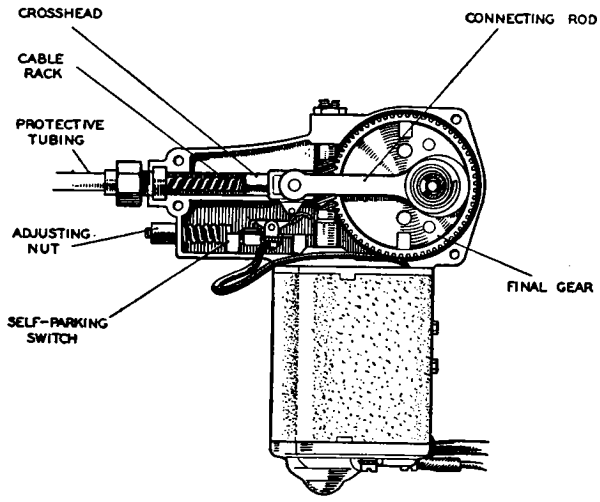


Fig. 37. Showing the DR3 wiper motor with cover plate removed.

Checking Cable Rack and Tubing

The maximum permissible force to move the cable rack in its protective tubing is 6 pounds with the wiper arms, blades and motor disconnected. The measurement can be made by hooking a spring balance in the hole in the cross-head (into which a pin on the connecting rod is normally located) and withdrawing the rack with the balance.

Binding of the rack can be due to kinked or flattened tubing or to faulty installation. Minor faults can be cleared with a suitable tested mandrel sold specifically for checking wiper installations. Badly kinked or flattened tubing must be renewed. Any bends of less than 9" radius must be reformed.

At the wheelboxes the flared ends of the intermediate tubing should be located in the inner wide slots of the wheelbox clamp plates but the end of the main tubing should be located in the outer narrow slot.

The cable rack should be well lubricated with Duckhams HBB grease.

Checking Wheelboxes

Check the wheelboxes for misalignment or looseness and rectify as required.

Renew seized wheelboxes.

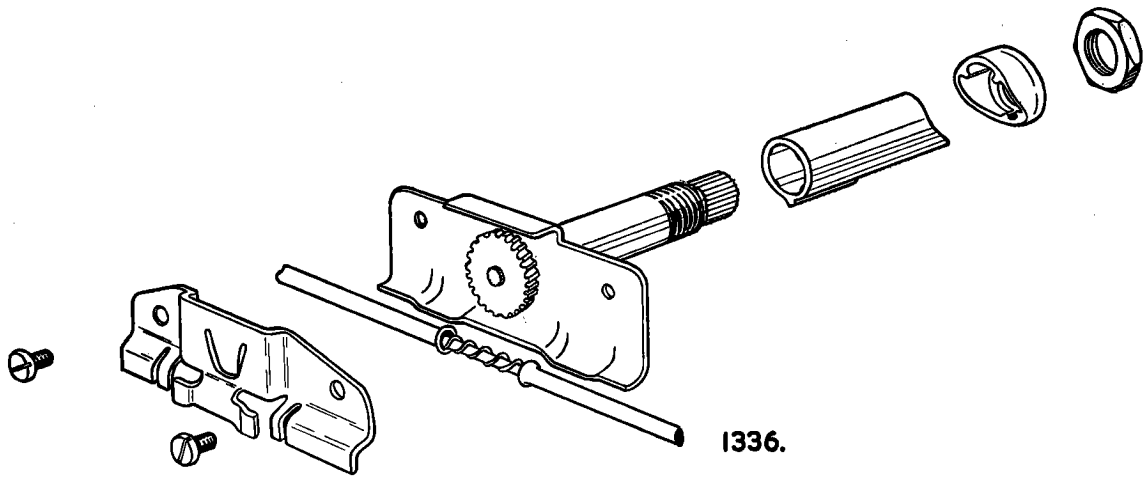


Fig. 38. Exploded view of wheelbox.

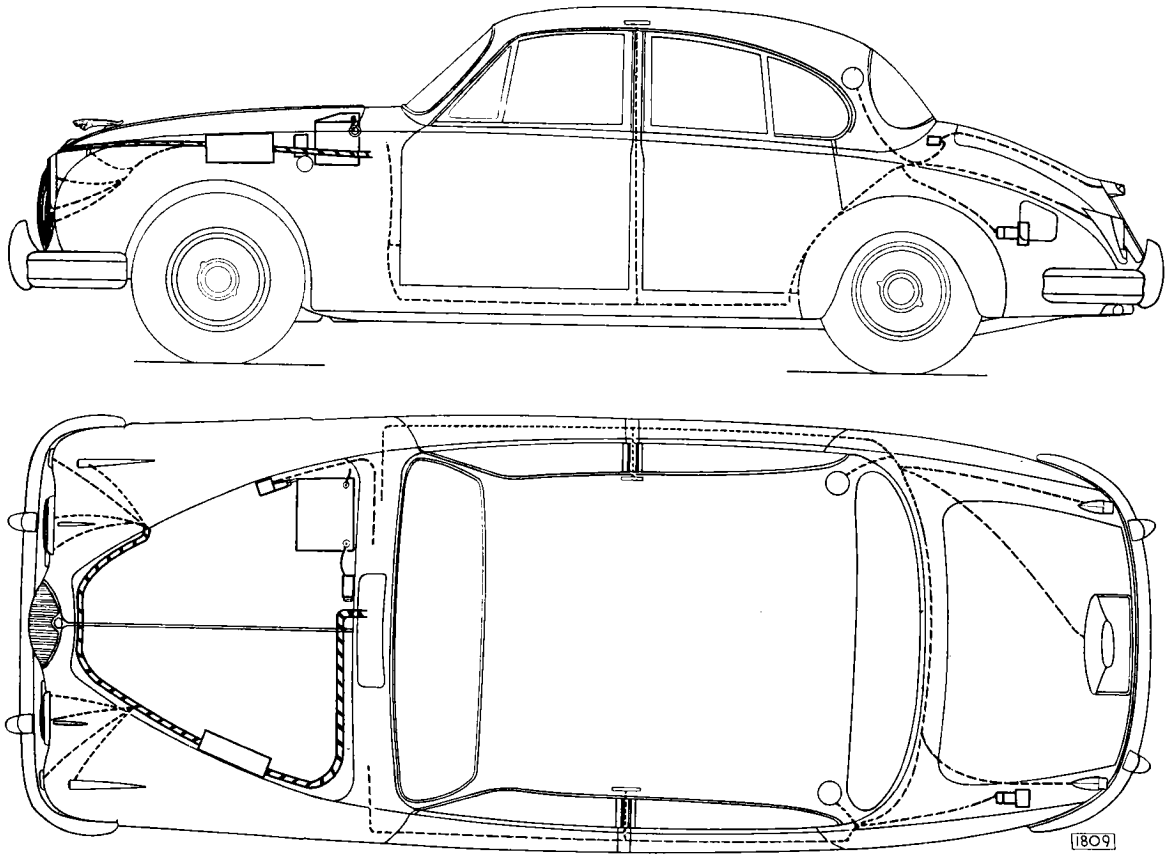


Fig. 39. Layout of wiring harnesses.

MISCELLANEOUS

ELECTRIC CLOCK

Removal

Detach the earthing lead from the battery. Remove both the speedometer and the revolution counter from the instrument panel as detailed under " Speedometer and Odometer, Removal " and " Revolution Counter and Clock, Removal ". Detach the clock from the hidden face of the revolution counter by removing two nuts. The flexible setting drive can be removed by slackening the knurled sleeve.

Adjustment

At the back of the time clock is a small screw surrounded by a semi-circular scale. If the clock is gaining, turn the screw towards the minus sign (—) : if the clock is losing, turn the screw towards the positive sign (+).

Note: The action of setting the hands automatically restarts the clock.

Refitting

Refitting is the reverse of the removal procedure.

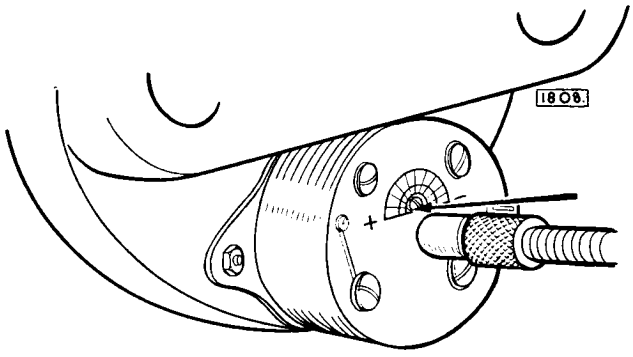


Fig. 40. Adjustment screw for clock.

BRAKE FLUID AND HANDBRAKE WARNING LIGHT

Renewing the Bulb

Unscrew the bezel of the lamp exercising care to control the run of the spring loaded bulb beneath. Feed the bulb into the spring loaded bulb holder, ensure the red transparent window is retained in the bezel by a small circlip, position the designation plate on the bulb holder and screw on the bezel.

The bulb holder can be removed from the hidden face of the side facia panel after the bezel and bulb have been removed but it will be necessary to remove the side facia panel first.

CARBURETTER MIXTURE CONTROL WARNING LIGHT (2.4 Litre Model)

Renewing the Bulb

Remove the dash casing from beneath the steering column by withdrawing four screws and the two screwed bezels from the flexible odometer and clock setting drives. Withdraw the bulb holder from the rear of the light unit above the lever quadrant and withdraw the bulb by rotating it anti-clockwise. Replace the bulb and the remaining components by reversing the removal sequence.

The lamp unit can be removed from the hidden face of the side facia panel after the bulb holder has been removed by unscrewing the body of the unit and withdrawing the red transparent window from the front face of the facia board, the chrome bezel can be prised out if necessary. The replacement of the lamp unit is the reverse of the removal sequence but the angled bracket must not be omitted.

SETTING THE CARBURETTER MIXTURE CONTROL WARNING LIGHT SWITCH

(2.4 Litre Model)

Remove the dash casing from beneath the steering column by withdrawing four screws and the two screwed bezels from the flexible odometer and clock setting drives. Set the lever of the carburetter mixture control $\frac{1}{4}$" (6.350 mm.) from the bottom limit of its travel when a click will be heard and utilizing the two nuts on the threaded shank of the switch position the switch so the warning light ceases to glow when the ignition is switched " on ". Actuate the lever up and down once or twice and make any final adjustments necessary. Replace the components by reversing the removal sequence.

OVERDRIVE AND INTERMEDIATE SPEED HOLD SWITCHES

Removal

Detach the earth lead from the battery. Remove the dash casing from beneath the steering column by withdrawing four screws and detaching the screwed bezels from the flexible odometer and clock setting drives.

Remove the overdrive or intermediate speed hold switches from the hidden face of the instrument facia by rotating the screwed ring anti-clockwise and collecting the escutcheon plate.

Refitting

Refitting is the reverse of the removal procedure.

FLASHING INDICATOR CONTROL

Removal

Detach the earth lead from the battery. Detach the upper and lower switch covers from around the steering column by withdrawing two sunken screws and three screws from below. Remove the dash casing from below the steering column by withdrawing four screws and detaching the screwed bezels from the flexible odometer and clock setting cable drives. Disconnect the seven cable harness at the snap connectors on the left-hand side of the steering column. Detach the flasher indicator control from the left-hand side of the steering column by withdrawing two horizontally positioned screws from the right-hand side.

Refitting

Refitting is the reverse of the removal procedure. Insert the wires into the multi-snap connector so that similar coloured wires are opposite each other.

FLASHING INDICATOR WARNING LIGHT BULB

Replacement

Detach the earth lead from the battery.

Detach the upper switch cover from above the steering column by withdrawing the two most sunken screws from below. Withdraw one or both flasher indicator warning lamp bulb holders from the outer sockets of the upper switch cover. Remove the bulb from the holder by applying inward pressure and rotating it 90° in either direction. The bulb is replaced by inserting the cap into the bulb holder and rotating it 90° until the notches inside the bulb holder are located. The bulb holder and upper switch are refitted by reversing the removal procedure.

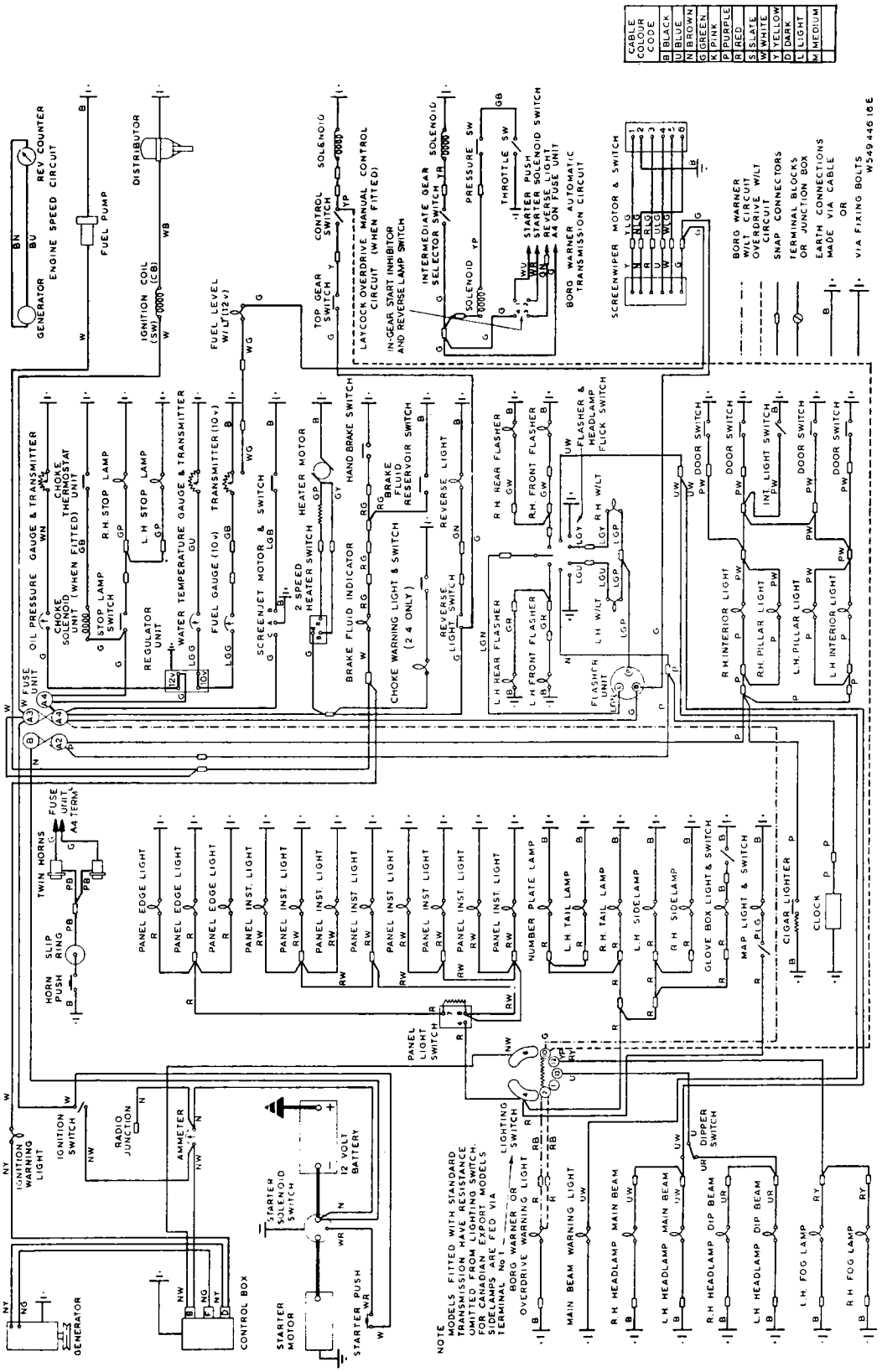


Fig. 41. Wiring diagram for Home and Right-hand drive Export models.

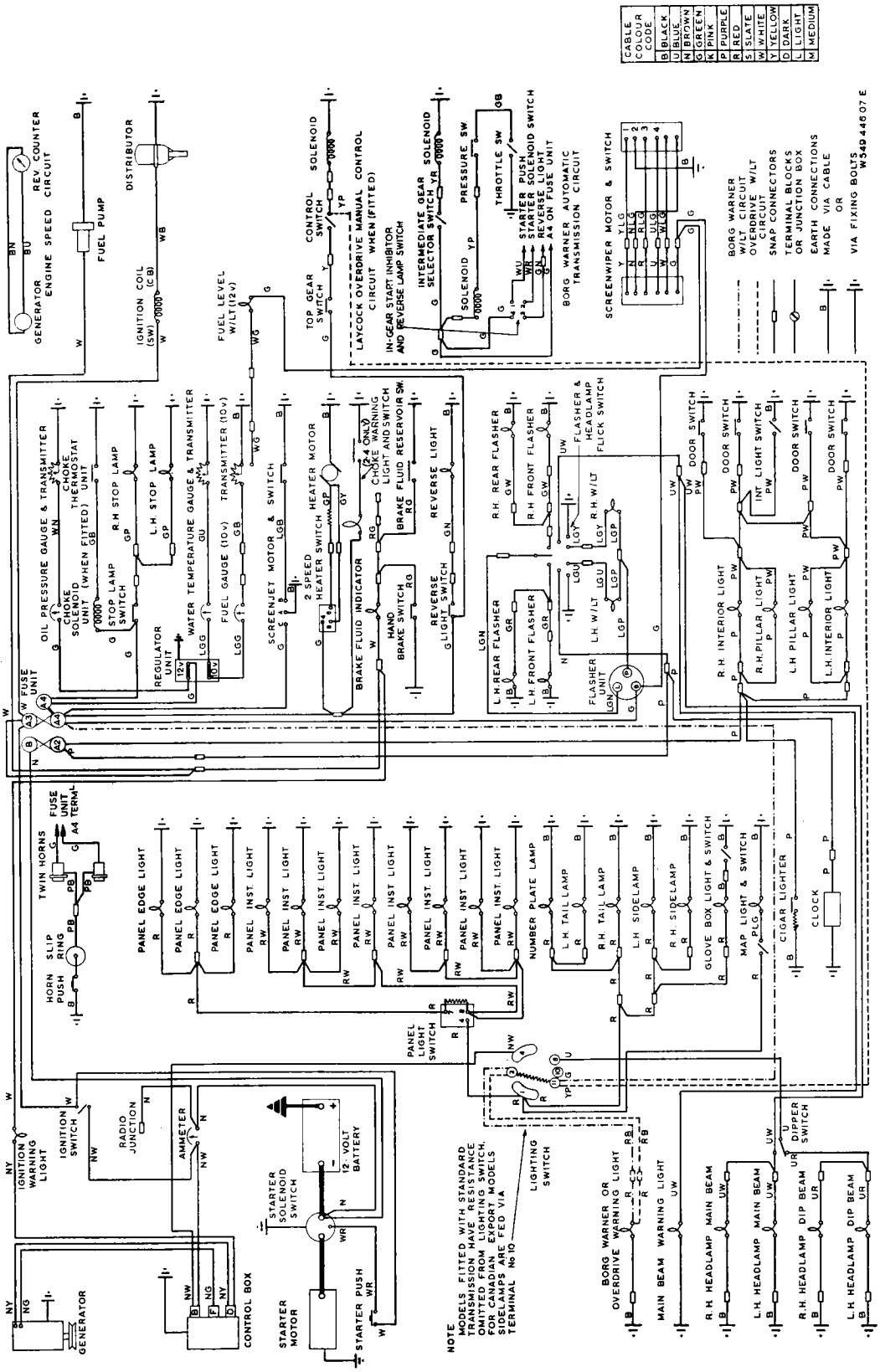


Fig. 42. Wiring diagram for Left-hand drive models

THE INSTRUMENTS

DASH CASINGS

Removal

Detach one or both dash casings situated beneath the glove box and side facia panel by withdrawing four screws each and in the instance of the dash casing on the steering column side, the screwed bezels of the flexible odometer and clock setting drives.

Refitting

The refitting is the reversal of the removal sequence but in the instance of the dash casing on the steering column side it will be necessary to attach the flexible odometer and clock setting drives to the casing before attaching the latter to the underside of the instrument panel.

THE INSTRUMENT PANEL

Opening

Detach the earth lead from the battery.

Remove the ignition key and cigar lighter for safe keeping. Hinge the centre instrument panel downward on its bottom edge after withdrawing two thumb screws situated in each top corner beneath the screen rail.

Removal

The instrument panel can be removed completely by detaching the earth lead from the battery, identifying and removing the leads from the hidden faces of the instruments, cigar lighter and switches. Removing the electrical harness and clips from the instrument panel posts by withdrawing one screw from each, then removing one harness clip and screw from each hinge inside the instrument panel aperture and two bolts from the extended portion of each hinge, access to which is gained through the newspaper tray beneath.

Refitting

Refitting is the reverse of the removal procedure but particular attention must be given to the following point.

That the leads are refitted in accordance with their colour coding, utilizing the wiring diagram as a reference.

Closing

Closing is the reverse of the opening procedure but particular attention must be given to the following points.

i. That the leads are replaced in accordance with their colour coding, utilizing the wiring diagram as a reference.

ii. That the clips securing the main harness to the body structure viewed through the instrument panel aperture will in no way foul the centre terminal of the cigar lighter otherwise a direct short will occur when the battery is connected.

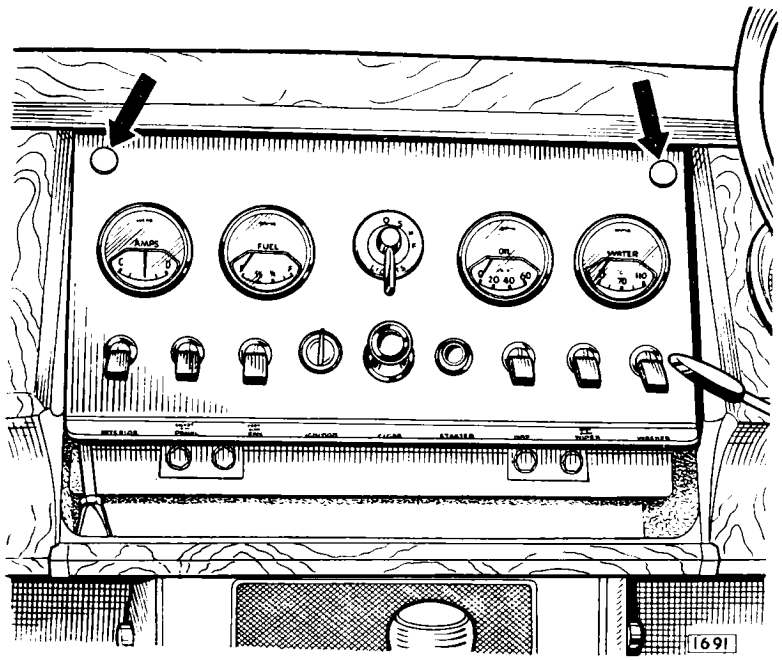


Fig. 43. The instrument panel, the two arrows indicate the securing screws.

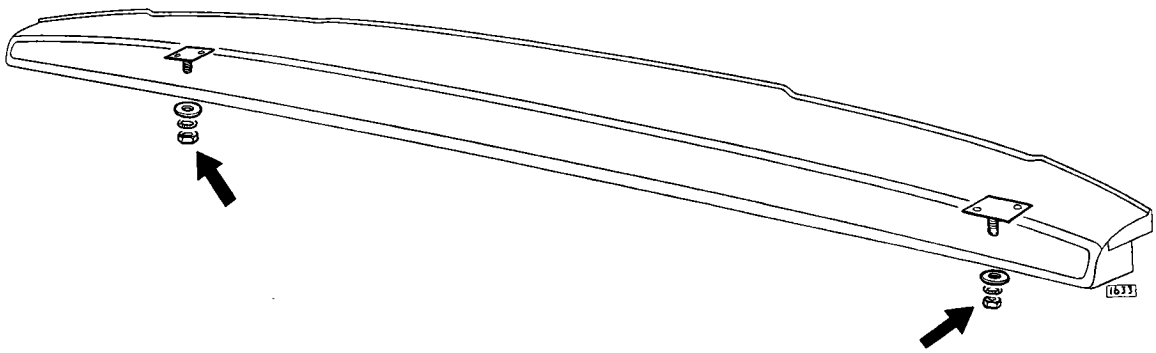


Fig. 44. The screen rail, the two arrows indicate the two sets of attachment details.

THE SCREEN RAIL AND MAP LIGHT

Renewing the Bulb

Remove the bulb from the map lamp unit by rotating its head in either direction until the bayonet cap becomes free and the bulb can be withdrawn outward.

Replace the bulb by offering it up to the lamp unit, rotating the head until the bayonet cap lugs sink into the holder, then while applying slight pressure give the head a 90° rotation in either direction.

Removal

Identify and withdraw the leads from the map lamp situated on the underside in the centre of the screen rail. Remove the screen rail from the base of the windscreen by detaching two nuts, one adjacent to each end. Detach the map lamp unit from beneath the centre of the screen rail by withdrawing two screws.

Refitting

Refitting is the reverse of the removal procedure but particular attention must be given to the following points.

i. That the map lamp unit is attached to the underside centre of the screen rail before it is offered up to the windscreen.

ii. That one snap connector has two black leads fitted.

THE SIDE FACIA PANEL

Removal

Detach the earthing lead from the battery. Remove the dash casing from beneath the steering column by withdrawing four screws and the two screwed bezels of the flexible odometer and clock setting drives ; detach the angles tie plate from the bottom hidden face of the facia board by removing two nuts. Fold the instrument panel downward by withdrawing the ignition key and cigar light unit and two thumb screws. In the instance of automatic transmission, remove the short control rod from the ball pin on the lever at the right-hand side of the steering column by unscrewing the end piece in one ball joint socket. Remove the upper switch cover from the top of the steering column by withdrawing the two most sunken screws from below. Identify and withdraw the trafficator warning light harness through the loop bracket attached to the hidden face of the facia board by disconnecting the six snap connectors.

Detach the steering column assembly from the body bracket beneath the side facia by removing two nuts and allow the rim of the steering wheel to lay on the driver's seat cushion. Detach the side facia panel from the front of the saloon by withdrawing one screw in the steady bracket beneath, by removing two nuts from a stud bracket situated behind the side facia panel adjacent to the outside of the saloon, withdrawing two screws, the heads of which are located in the instrument panel aperture. Detach the speedometer drive, all warning lights and electrical leads from the instruments and in the instance of the 2.4 litre cars, detach the flexible control cable from the carburetter mixture lever quadrant by slackening the trunnion screw.

Refitting

Refitting is the reverse of the removal procedure but particular attention must be given to the following points.

i. That the rubber seal beneath the angle bracket adjacent to the instrument panel is in good condition and has the straight edge outward.

ii. That the leads are refitted in accordance to their colour coding, utilizing the wiring diagram as a reference.

THE SPEEDOMETER

Removal

Detach the earth lead from the battery and raise the steering wheel to the highest position. Remove the dash casing from beneath the side facia panel by withdrawing four screws and the two screwed bezels from the flexible odometer and clock setting drives. Detach the speedometer from the facia board by removing two knurled nuts, earth lead and two retaining pieces, then withdraw the flexible drive from the centre of the instrument by slackening the knurled sleeve. Withdraw the speedometer from the facia board, identifying and removing the three warning lamps and two instrument illumination lamps from the hidden face of the instrument. Remove the flexible trip odometer setting drive from the hidden face of the speedometer by slackening the knurled sleeve.

Refitting

Refitting is the reverse of the removal procedure but particular attention must be given to the following points.

i. That the two warning lamps are inserted in the apertures at the side of the instrument.
ii. That the headlamp warning lamp is inserted in the aperture at the top of the instrument.
iii. That the fuel warning lamp is inserted in the right-hand bottom aperture.
iv. That the ignition warning lamp is inserted in the left-hand bottom aperture.

THE REVOLUTION COUNTER AND CLOCK

The revolution counter and clock are of the electrical type and the electrical leads to both are included in the car harness. The clock is mounted in the bottom of the revolution counter indicator head and to effect its removal it is necessary to remove both speedometer and revolution counter from the side facia panel. The revolution counter consists of an A.C. generator fitted to the rear end of the camshaft with an indicator head mounted in the side facia panel, both units have Lucar tags of equal size.

Removal

Remove the speedometer from the side facia panel as previously detailed, this will give the necessary working clearance. Detach the revolution counter from the facia board by removing two knurled nuts, earth lead and retaining pieces, then withdraw the revolution counter by removing the two centre leads and two instrument illumination lamps from the hidden face of the instrument and from the clock at the snap connector. Detach the flexible clock setting drive by slackening the knurled sleeve and the clock from the revolution counter by removing two nuts.

Refitting

Refitting is the reverse of the removal procedure but particular attention must be given to the following point:

That the leads are refitted in accordance to their colour coding, utilizing the wiring diagram as a reference.

TESTING OPERATION OF REVOLUTION COUNTER

Utilizing an A.C. voltmeter, check the current across the terminals of the generator at the rear of the right-hand camshaft while the engine is running ; as a rough guide it can be assumed that there is one volt output per 100 engine r.p.m. When electrical current is evident, check the continuity of the leads to the hidden face of the instrument, when electrical current is evident it can be assumed that the instrument is unserviceable and must be exchanged.

THE GLOVE BOX ASSEMBLY

Removal

Detach the earth lead from the battery. Remove the dash casing from beneath the glove box by withdrawing four screws. Detach the screen rail from the base of the windscreen by withdrawing the leads from the map lamp and removing two screws. Remove the chrome ended wooden finisher strip from the newspaper tray beneath the instrument panel by detaching two nuts situated beneath the finisher. Fold the instrument panel downward by withdrawing the ignition key, cigar lighter unit and the two thumb screws. Detach the glove box assembly from the front of the saloon by withdrawing a screw in the steady bracket beneath, by opening the glove box and detaching the false side wall adjacent to the light switch and removing the nuts from a stud bracket, access to which is gained through the revealed aperture in the glove box side wall and withdrawing the two screws, the heads of which are located in the instrument panel aperture, finally disconnect the glove box light harness at the snap connectors.

Dismantling

The glove box assembly can be dismantled by detaching the glove box lamp from inside the box by removing four nuts and bolts, the switch can be detached from its bracket by removing a nut and the harness fed through the top wall of the box thus allowing the lamp to be removed completely. The glove box can be detached from the hidden face of the facia board by withdrawing ten screws and a retainer. Remove the glove box lid from the facia board by withdrawing two screws each from the quadrant assembly and hinges. Remove the glove box lock from the lid by withdrawing three screws, the key number will be found stamped on the body of the lock.

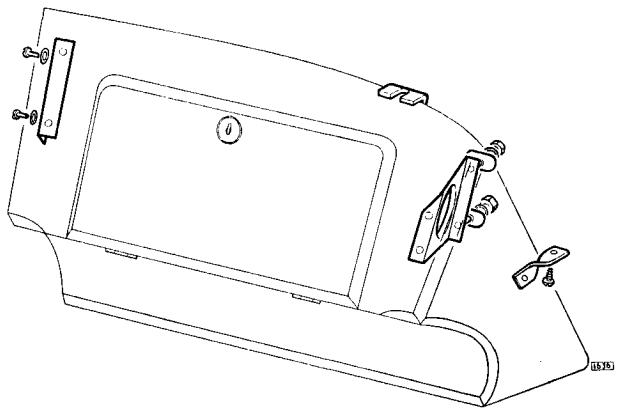


Fig. 45. The glove box, showing the three sets of attachment details, the forked bracket in the top edge secures one side of the screen rail.

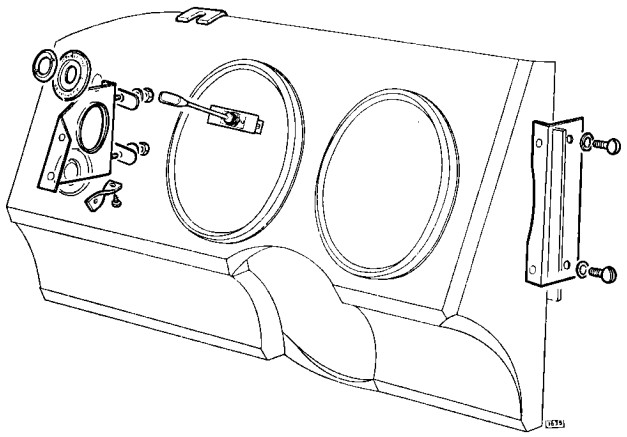


Fig. 46. The side facia panel, showing the three sets of attachment details, the forked bracket in the top edge secures one side of the screen rail.

Assembling and Refitting

Assembling and refitting is the reverse of the removal and dismantling procedures but ensure the rubber seal beneath the angle bracket adjacent to the instrument panel is in good condition and has the straight edges outward.

THE REMOVAL OF THE INSTRUMENT PANEL COMPONENTS

The Ignition Switch

Detach the earth lead from the battery and hinge the instrument panel downward. Identify and remove the leads from the ignition switch. Withdraw the ignition switch from the hidden face of the instrument panel after removing the chrome ring. The lock barrel can be withdrawn by inserting a thin rod through a hole in the body of the switch.

Refitting is the reverse of the removal procedure but particular attention should be given to the following points :

i. That the number of the ignition key is stamped on the lock barrel.

ii. That the flat on the thread is positioned toward the right-hand side of the panel.

iii. That the leads are refitted in accordance to their colour coding, utilizing the wiring diagram as a reference.

Renewing The Cigar Lighter Element

Withdraw the cigar lighter unit from the instrument panel and ensure that it is cold. Place the unit into the palm of the hand, knob first, and hold the sleeve downward against the pressure of the spring with the fingers and unscrew the lighter element and fit a replacement. It must be noted that the spring must not be omitted or tampered with for it ejects the lighter unit when it attains its correct temperature.

Cigar Lighter Unit—Removal

Withdraw the cigar lighter unit, detach the earth lead from the battery and hinge the instrument panel downward. Identify and remove the leads from the cigar lighter housing. Withdraw the cigar lighter housing through the face of the instrument panel by removing a nut and "U" piece from the centre terminal post. It is not wise to dismantle the cigar lighter housing any further, otherwise direct shorting may occur on assembly.

Refitting is the reverse of the removal procedure but particular attention may be given to the following points:

i. That the centre terminal post is firm and tight.

ii. That the insulated washer in the " U " piece is tight and in good condition, a sub-standard fit and/or condition of this washer could cause a direct short.

iii. That the black lead is attached by its Lucar connection to the tag at the top of the instrument panel and the purple lead from the main harness is attached to the centre terminal post.

The Starter Push Switch

Detach the earth lead from the battery and hinge the instrument panel downward. Identify and remove the leads from the starter push switch. Withdraw the starter push switch through the face of the instrument panel after removing the nut on the hidden face.

The Head, Side and Fog Light Switch

Remove the light switch control lever from the face of the instrument panel by depressing the plunger in the right-hand side. Detach the earth lead from the battery and hinge the instrument panel downward. Identify and remove the leads from the light switch and detach the light switch from the three posts on the hidden face of the instrument panel by removing three nuts. The designation plate can be removed from the face of the instrument panel by detaching the nut on the hidden face.

Refitting is the reverse of the removal procedure but particular attention must be given to the following points:

i. That the designation plate is mounted on the face of the instrument panel by allowing the " pip " on the hidden face to locate a drilling in the panel and the flat on the threaded barrel to locate a flat in the panel.

ii. That the control rod is rotated fully anti-clockwise so the control lever retaining plunger is on the right-hand side.

iii. That the control lever is pressed on the rod of the switch protruding through the face of instrument panel so the control rod plunger locates a drilling in the hub of the lever, a smear of vaseline on the plunger greatly facilitates this operation.

iv. That the leads are refitted in accordance to their colour coding, utilizing the wiring diagram as a reference.

The Tumbler Type Switches

Detach the earth lead from the battery and hinge the instrument panel downward. Identify and remove the leads from the Lucar tags on the body of the desired switches and withdraw the tumbler switch from the hidden face of the instrument panel by holding the switch lever in a horizontal position and removing the screwed chromium ring from the face of the instrument panel.

Refitting is the reverse of the removal procedure but particular attention must be given to the following points :

i. That the switch is fitted to the instrument panel so that flat face of the switch lever is downward.

ii. That the leads are refitted in accordance to their colour coding and utilizing the wiring diagram as a reference.

Renewing Illumination bulbs

Detach the earth lead from the battery and hinge the instrument panel downward. Remove the instrument illumination bulb holder from the hidden face of the instrument and withdraw the bulb by rotating it anti-clockwise. Fit a replacement bulb. Replace the bulb and holder into the hidden face of the instrument by reversing the removal procedure.

The Ammeter and Oil Pressure Gauge

Detach the earth lead from the battery and hinge the instrument panel downward. Identify and remove the instrument illumination lamps and leads from one or both instruments. Withdraw the instrument through the front face of the instrument panel by removing the two knurled nuts and a " U " piece from the hidden face of the instrument.

Refitting is the reverse of the removal procedure but particular attention must be given to the following points :

i. That the " U " piece is fitted so it will not foul any terminal or bulb holder, one side face is cut away for this purpose.

ii. That the leads are refitted in accordance to the colour coding, utilizing the wiring diagram as a reference.

The Fuel and Water Temperature Gauges

These instruments are removed and refitted in a similar manner to the ammeter and oil pressure gauges but in this instance only one knurled nut secures the " U " piece.

The removal and replacement of the fuel gauge tank unit and the water temperature transmitter unit are detailed in the Fuel System and Cooling System sections respectively.

The Voltage Regulator (Fuel and Water Temperature Gauges)

Detach the earth lead from the battery and hinge the instrument panel downward. Identify and remove the leads from the voltage regulator situated at the top right-hand side of the hidden face of the instrument panel. Detach the voltage regulator from the panel by removing one nut.

Refitting is the reverse of the removal procedure but particular attention must be given to the following points :

i. That a good earth is made between instrument and the panel.

ii. That the leads are refitted in accordance to the colour coding, utilizing the wiring diagram as a reference.

Renewing the Switch Indicator Strip Bulbs

Detach the earth lead from the battery and fold the instrument panel downward. Withdraw the switch indicator strip illumination bulb from any of the three lamps situated one in each bottom corner and a third in the centre. Remove the bulb from the holder by applying inward pressure and rotating it 90° in either direction. The bulb is replaced by inserting the cap into the bulb holder and rotating it 90° until the notches inside the bulb holder are located. The bulb holder and upper switch cover are refitted by reversing the removal procedure.

Remove the indicator strip, chrome finisher and light filter from the bottom edge of the instrument panel by withdrawing four screws.

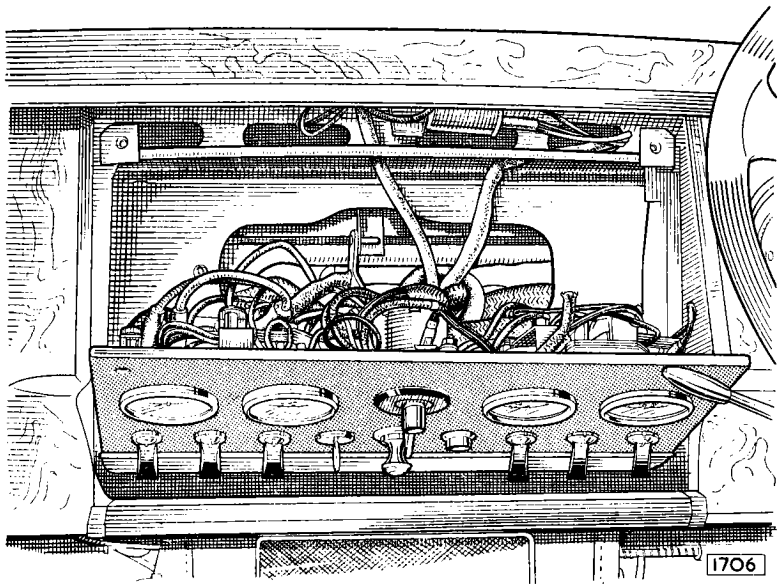


Fig. 47. The instrument panel in the hinged down position.

THE BIMETAL RESISTANCE INSTRUMENTATION

Engine Temperature, Fuel Tank contents and Oil Pressure Gauges

DESCRIPTION

The Bimetal Resistance Instrumentation for engine temperature, petrol tank contents and engine oil pressure consists of a gauge unit fitted in the instrument panel, a transmitter unit fitted in the engine unit or petrol tank and connected together to the battery, the oil pressure gauge being an exception, through a common voltage regulator. The purpose of the latter is to ensure a constant power supply at a predetermined voltage thus avoiding errors due to a low battery voltage; in the instance of the oil pressure gauge this is not quite so critical to supply voltage.

In all systems the gauge unit operates on the thermal principal utilizing a heater winding wound on a bimetal strip, while the transmitter units of the engine temperature and petrol tank contents gauge are of the resistance type but in both instances the system is voltage sensitive. The transmitter unit of the oil pressure gauge is of the thermal pressure principal utilizing a heater winding wound on a bimetal strip having a contact at one end with the second contact mounted on a diaphragm which is sensitive to engine oil pressure.

OPERATION OF THE ENGINE TEMPERATURE GAUGE

The transmitter unit of the engine temperature gauge is fitted in the water outlet pipe of the engine unit and is a variable resistance and consists of a temperature sensitive resistance element contained in a brass bulb. The resistance element is a semi-conductor which has a high negative temperature co-efficient of resistance and its electrical resistance decreases rapidly with an increase in its temperature. As the temperature of the engine unit rises the resistance of the semi-conductor decreases and increases the flow of current through the transmitter, similarly a decrease in engine temperature reduces the flow of current.

The gauge unit fitted in the instrument panel consists of a heater winding, connected at one end to the transmitter unit and at the second end to the " I " terminal of the voltage regulator, is wound on a bimetal strip which is linked to the indicator needle. The heater winding and bimetal strip assembly is sensitive to the changes in voltage received from the transmitter unit causing the heater winding to heat or cool the bimetal strip, resulting in the deflection of the indicator needle over the scale provided. The calibration of the scale is such that the movement of the indicator needle over it is relative to the temperature of the transmitter unit bulb and therefore the temperature of the engine unit.

OPERATION OF PETROL TANK CONTENTS GAUGE

The transmitter unit of the petrol gauge is fitted in the petrol tank and is a variable resistance actuated by a float, the arm of which carries a contact travelling across a resistance housed in the transmitter body. The float arm takes up a position relative to the level of petrol in the tank and thus varies the amount of current passing through the indicator unit.

The gauge unit in the instrument panel consists of a heater winding, connected at one end to the transmitter unit and at the other to the " I " (eye) terminal of the voltage regulator, is wound on a bimetal strip which is linked to the indicator needle. The heater winding and bimetal strip assembly is sensitive to the changes in voltage received from the position of the transmitter float, causing the heater winding to heat or cool the bimetal strip, resulting in the deflection of the indicator needle over the scale provided. The calibration of the scale is such that the movement of the indicator needle over it is relative to the position of the transmitter float actuated by the level of the contents in the petrol tank.

Exaggerated indicator needle movement due to petrol swirl in the tank is considerably reduced as there is a delay before current changes from the transmitter unit can heat or cool the bimetal and heater winding assembly in the indicator unit, which in fact causes the deflection of the needle. Similarly the indicator needle will take a few moments to register the contents of the petrol tank when the ignition is first switched on.

ANALYSIS OF ENGINE TEMPERATURE AND PETROL TANK CONTENTS GAUGES FAULTS

NOTE: THE INSTRUMENT PANEL GAUGES MUST NEVER BE CHECKED BY SHORT CIRCUITING THE TRANSMITTER UNITS TO EARTH

Symptom	Unit Possibly at Fault	Action
Instrument panel gauge showing a " zero " reading	Voltage regulator	Check output voltage at terminal I (eye) is 10 volts.
	Instrument panel gauge	Check for continuity between the gauge terminals with the leads disconnected.
	Transmitter unit in petrol tank or engine unit.	Check for continuity between the terminal and the case with lead disconnected.
	Wiring	Check for continuity between the gauge, the transmitter unit and the voltage regulator. Also that the transmitter unit and voltage regulator are earthed.
Instrument panel gauge showing a high low reading when ignition is switched on	Voltage regulator	Check output voltage at terminal I (eye) is 10 volts.
	Instrument panel gauge	Check by substituting another instrument panel gauge.
	Transmitter unit in petrol tank or engine unit	Check by substituting another transmitter unit in petrol tank or engine unit.
	Wiring	Check for leak to earth.
Instrument panel gauge showing a high reading and overheating	Voltage regulator	Check output voltage at terminal I (eye) is 10 volts.
	Wiring	Check for short circuits on wiring to each transmitter unit.
Instrument panel gauge showing an intermittent reading	Voltage regulator	Check by substituting another voltage regulator.
	Instrument panel gauge	Check by substituting another instrument panel gauge.
	Transmitter unit in petrol tank or engine unit	Check by substituting another transmitter unit in petrol tank or engine unit.
	Wiring	Check terminals for security, earthing and wiring continuity.

OPERATION OF THE OIL PRESSURE GAUGE

The transmitter unit of the oil pressure gauge, fitted in the head of the engine oil filter, is a voltage compensated thermal pressure unit and consists of a diaphragm, a bimetal strip with a heater winding wound thereon, a resistance and a pair of contacts. One contact is attached to the diaphragm while the second is mounted on one end of the bimetal strip, the second end of which is connected through the resistance and the gauge unit to the battery supply ; the heater winding is also connected to the battery supply but not through the resistance. Engine oil pressure will close the contacts causing current to flow through the gauge unit, bimetal strip and contacts to earth resulting in the heating of the heater winding which will, after a time, open the contacts.

The gauge unit fitted in the instrument panel consists of a heater winding, connected at one end to the battery supply and at the second to the transmitter unit, wound on to a bimetal strip which is linked to an indicating needle. The heater winding and bimetal strip assembly is sensitive to the continuity changes received from the thermal pressure unit, fitted in the engine oil filter, causing the heater winding to heat or cool the bimetal strip resulting in the deflection of the indicating needle over the scale provided.

The changes in continuity of current from the transmitter unit will vary according to the amount of oil pressure for, as the latter rises, the outward moving diaphragm contact limits the return travel of the bimetal strip contact thus allowing a longer continuity period. This results in a greater heating of the heater winding in the gauge unit and increased deflection of the indicating needle over the scale showing a greater oil pressure.

The opening and closing of the transmitter unit contacts is continuous thus the temperature of the heater winding in the gauge unit is kept within close limits and the calibration of the scale is such that the movement of the indicating needle over it is relative to the opening of the transmitter unit contacts and therefore the oil pressure of the engine unit is recorded.

ANALYSIS OF ENGINE OIL PRESSURE GAUGE FAULTS

NOTE : THE INSTRUMENT PANEL GAUGE MUST NEVER BE CHECKED BY SHORT CIRCUITING THE TRANSMITTER UNIT TO EARTH.

Symptom	Unit Possibly at Fault	Action
Instrument panel gauge showing a " zero " reading	Wiring	Check for continuity between the gauge and the transmitter unit and that the latter is earthed.
	Instrument panel gauge	Check for continuity between the gauge terminals with leads disconnected. If satisfactory replace the transmitter unit.
Instrument panel gauge showing a reading with ignition switched on but engine not running	Transmitter unit on oil filter head	Check by substituting another transmitter unit.
Instrument panel gauge showing a high reading and overheating	Transmitter unit on oil filter head	Check by substituting another transmitter unit.
Instrument panel gauge showing a below " zero " reading with ignition switched off	Instrument panel gauge	Check by substituting another instrument panel gauge.

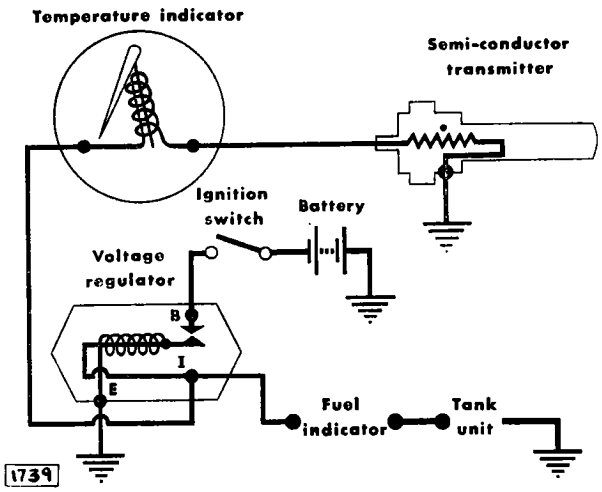


Fig. 48. The combined wiring diagram of the fuel tank contents a water temperature gauges with the voltage regulator.

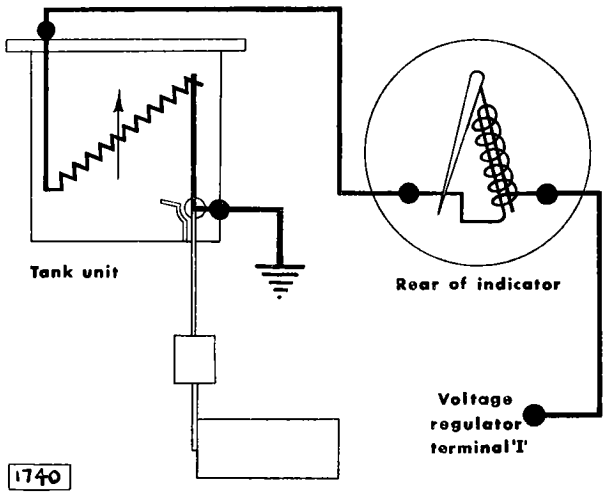


Fig. 49. The fuel tank contents gauge circuit.

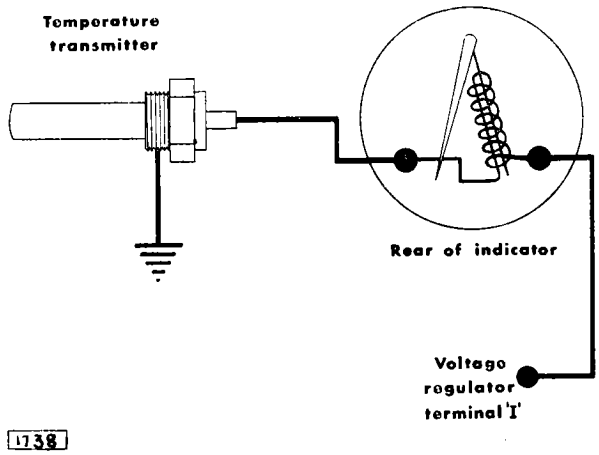


Fig. 50. The water temperature gauge circuit.

THE SPEEDOMETER DRIVE CABLE

Removal

Remove the speedometer from the side facia panel and remove the flexible drive cable as previously detailed. Detach the flexible drive cable from the gearbox, overdrive or automatic transmission and release it from the retaining clips. Push the flexible drive cable grommet through the rear engine bulkhead from inside the car and withdraw the flexible drive cable from the engine compartment.

Refitting

Refitting is the reverse of the removal procedure but particular attention must be given to the following points :

i. That the run of the flexible drive cable is without any sharp bends.

ii. That the flexible drive cable securing clips are so shaped that they only hold the cable in position without crushing it.

THE REVOLUTION COUNTER DRIVE

The revolution counter drive takes the form of a small A.C. electrical generator fitted at the rear R.H. end of the cylinder head where its tongued driving spindle engages a slotted adaptor screwed in the rear end of the inlet camshaft. Leads included in the electrical harness of the car connect with the Lucar tabs pointing upward in the body of the generator and with similar tabs at the rear of the instrument lead in the side facia panel. The Lucar tabs are of the same size and the leads can be fitted either way round.

Removal

Open the engine compartment and detach the earth lead from the battery. Remove the electrical harness from the two Lucar tabs on the A.C. generator on the rear R.H. end of the cylinder head. Detach the A.C. generator from the rear R.H. end of the cylinder head by withdrawing three allen screws and a plate washer, remove the generator in a rearward direction and note the position of the tongued driving spindle.

Refitting

Refitting is the reverse of the removal procedure but particular attention must be given to the following point :

That the tongued driving spindle is positioned in the same attitude as it was when it was removed ; whenever difficulty is experienced in engaging the tongued spindle do not apply any force but remove the generator, ascertain the position of the slot in the camshaft with a mirror and set the tongued drive in a similar position.

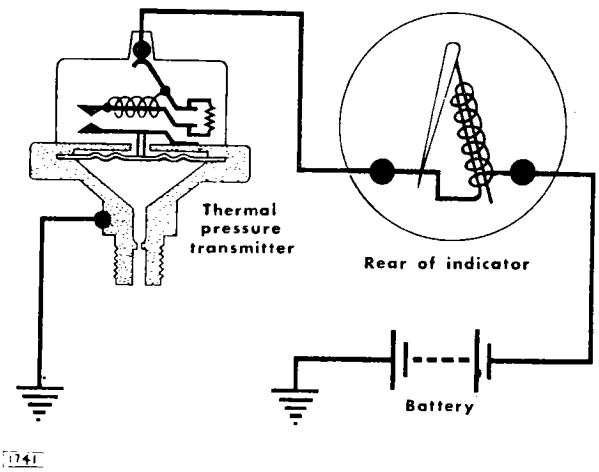


Fig. 51. The engine oil pressure gauge circuit.

SPEEDOMETER CABLE—GENERAL INSTRUCTIONS

Flexible cable condition to a great extent affects performance of speedometers. Poor installation or damage to the flexible drive will show up as apparent faults. It is most important that the flexible drive should be correctly fitted and maintained as illustrated in the following diagrams.

1. **Smooth Run**
   Run of flexible drive must be smooth. Minimum bend radius 6". No bend within 2" of connections.

2. **Securing**
   Avoid sharp bends at clips. If necessary change their position. Do not allow flexible drive to flap freely. Clip at suitable points.

3. **Securing**
   Avoid crushing flexible drive by over-tightening clip.

4. **Connection**
   Ensure tightness of outer flex connections. They should be finger tight only. It may be necessary to clean thoroughly the point of drive before the connection can be screwed completely home.

5. **Connection of Inner Flexible Shaft**

Where possible slightly withdraw inner flex and connect outer first. Then slide inner into engagement.

6. **Removal of Inner Shaft**

Most inner flexes can be removed by disconnecting instrument end and pulling out flex. Broken inner flex will have to be withdrawn from both ends.

7. **Examination of Inner Flexible Shaft**

Check for kinked inner flexible shaft by rolling on clean flat surface. Kinks will be seen and felt.

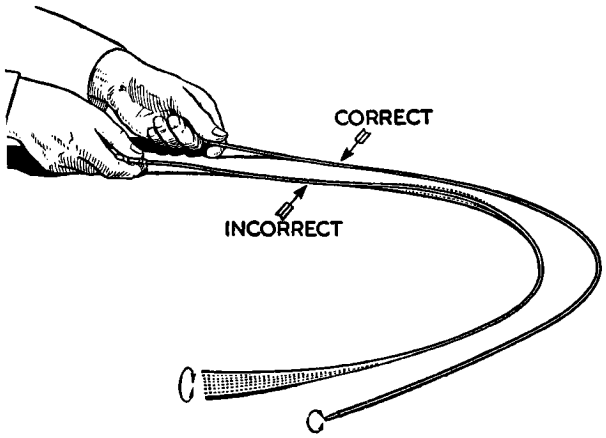


Fig. 52. Checking inner flex for kinks.

8. **Lubrication Every 10,000 Miles**

Withdraw inner flexible drive (see paragraph 6). Place blob of grease on end of outer cable and insert flex through it, carrying grease inside. Use Esso T.S.D.119 or equivalent. Do NOT use oil.

9. **Excessive Lubrication**

Avoid excessive lubrication. If oil appears in flexible drive, suspect faulty oil-seal at point of drive.

10. **Inner Shaft Projection**

Check $\frac{3}{8}$" projection of inner flex beyond outer casing at instrument end. This ensures correct engagement in instrument and point of drive.

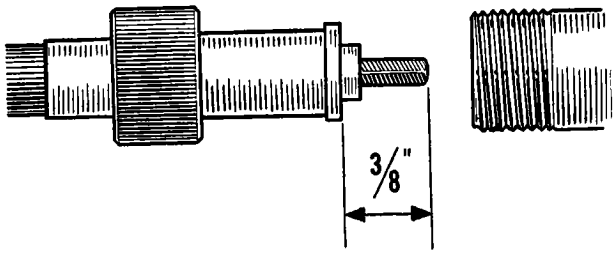


Fig. 53. Showing the amount the inner flex must protrude from outer cable.

11. **Concentric Rotation**

Check that inner flex rotates in centre of outer cable.

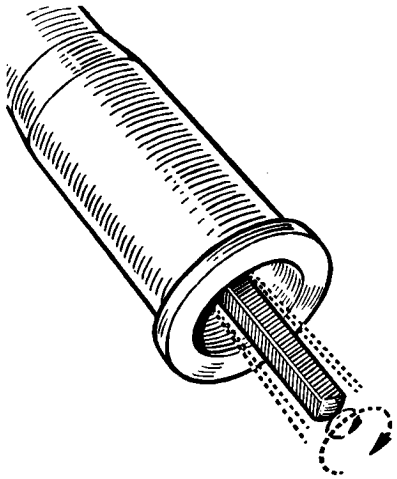


Fig. 54. Checking inner flex for "run out."

12. **Damaged Inner Shaft**

Examine inner flex ends for wear or other damage. Before fitting new flex, ensure instrument main spindle is free.

13. **Damaged Drive End Connections**

Examine point of drive for damage or slip on gears in gearbox.

14. **Ensuring Correct Drive Fitted**

When ordering, state Make, Year and Model of vehicle. State also length of drive required when alternatives are shown.

SPEEDOMETERS—GENERAL INSTRUCTIONS

Speedometer performance is dependent on the flexible drive, and apparent faults in the instrument may be due to some failure of the drive. Before returning a speedometer for service, the flexible drive should be checked, as described in the previous paragraphs. The following diagrams show you how to check the instrument performance.

15. Instrument Not Operating

Flexible drive not properly connected (see paragraph 5). Broken or damaged inner flexible shaft or fault at point of drive (see paragraphs 12 and 13), in which case remove and replace flex (see paragraphs 6 and 8) or rectify point of drive fault. Insufficient engagement of inner shaft (see paragraph 10). Defective instrument—return for service.

16. Instrument Inaccurate

Incorrect speedometer or revolution counter fitted. Check code number.

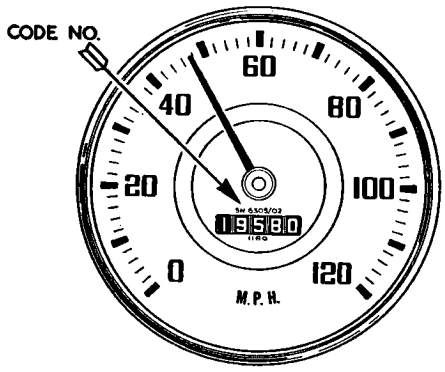


Fig. 55. Showing the code number on face of instrument.

17. Speedometer Inaccurate

Check tyre pressures. Inaccuracy can be caused by badly worn tyres. Non-standard tyres fitted. Apply to Smiths for specially calibrated instrument.

18. Speedometer Inaccurate

Rear-axle ratio non-standard. Drive ratio in vehicle gearbox non-standard. A rapid and simple check is obtained by entering in the formula the figures found in the test (see paragraph 19).

$$\frac{1680\ N}{R} = \text{T.P.M. No.}$$

Where N = Number of turns made by the inner shaft for 6 turns of rear wheel and R = Radius of rear wheel in inches measured from centre of hub to ground.

Example

Cardboard pointer on inner shaft (see 19) rotates $9\frac{1}{8}$ times as vehicle is pushed forward 6 turns of rear wheel. Rear wheel radius $12\frac{1}{4}$".

Flex turns per mile :

$$\frac{1680 \times 9\frac{1}{8}}{12\frac{1}{4}} = \frac{15330}{12\frac{1}{4}} = 1251 = \text{T.P.M. No.}$$

19. Gearing Test

Disconnect flexible drive from Speedometer. With the gears in neutral, count the number of turns of the inner shaft for six turns of the rear wheels when the vehicle is pushed forward in a straight line. Measure rolling radius of rear wheels —centre of hub to ground. Apply figures in formula (see paragraph 18).

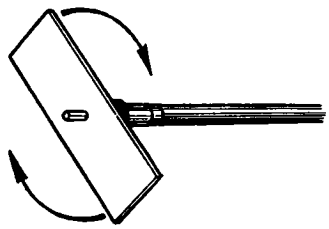


Fig. 56 Cardboard pointer on inner flex for checking the number of turns.

20. Correct Speedometer

Number illustrated should correspond within 25 either way with the number obtained from paragraphs 18 and 19. If it does not, apply to Smiths for specially calibrated instrument, giving details of test and vehicle.

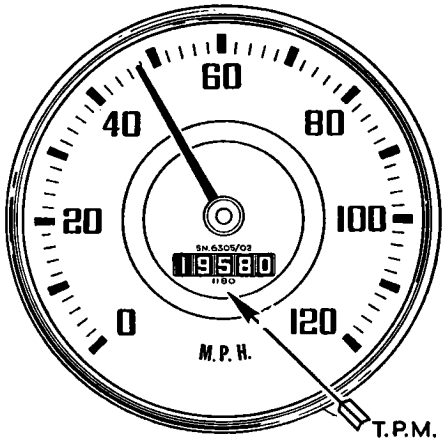


Fig. 57. Showing the turns per mile on face of instrument.

21. **Pointer Waver**

Oiled up instrument. Replace oil seal if necessary, clean and lubricate flexible drive (see paragraph 8). Return instrument for replacement.

22. **Pointer Waver**

Inner flexible shaft not engaging fully. Check 10, then try 4. Also check 12.

23. **Pointer Waver**

Kinked or crushed flexible drive. Check 7 and 3. For withdrawal of inner shaft see paragraph 6. Bends of too small radius in flexible drive, check 1.

24. **Pointer Waver**

If 21, 22 and 23 show no sign of trouble, instrument is probably defective. Return for replacement.

25. **Noisy Installation**

Tapping noises. Check 5 and 2. Flexible drive damaged. Check 7 and 12 (also see paragraph 6), check lubrication is sufficient. Check 10 and 11.

26. **Noisy Installation**

General high noise level. Withdraw inner shaft (see paragraph 6) and reconnect outer flex. If noise continues at lower level then source of noise is in vehicle point of drive. Fitting new P.V.C. covered flexible drive with nylon bush on inner shaft and instrument with rubber mounted movement should overcome this trouble.

27. **Noisy Installation**

Regular ticking in time with speedometer decimal distance counter. Return speedometer for replacement.

28. **Noisy Installation**

Loud screeching noise more prevalent in cold weather. Return instrument for replacement.

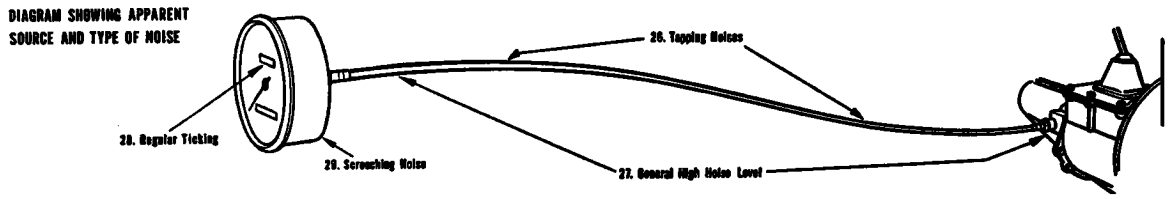


Fig. 58.

SUPPLEMENTARY INFORMATION TO SECTION P "ELECTRICAL AND INSTRUMENTS"

HORN MOUNTINGS AND ADJUSTMENTS

Reference Page : P.23

It is important to keep the horn mounting bolts tight and also the mountings of any units fitted near the horns. Electrical connections and cabling should be checked occasionally and rectified as required.

Ensure that the horn does not foul the body or chassis at any point. Do not bend the spring steel mounting bracket attached to the horn to maintain clearance.

ADJUSTMENT

On early cars Lucas HF.1748 horns were fitted as standard equipment and adjustment is by means of an adjuster screw located at the rear of the horn adjacent to the terminal cover.

A horn in correct adjustment will pass 3.5—4.0 amperes at 12 volts. Adjustment does not alter the tone but serves to adjust wear of the moving parts which if not corrected will result in loss of power and roughness of tone.

When adjusting, use a first grade 0—10 moving coil ammeter connected in series with the horn and turn the adjustment screw clockwise to increase the current or anti-clockwise to decrease the current.

On later cars Lucas WT618U horns are fitted. Adjustment is effected after removal of the domed cover by means of the fixed contact screw.

Connect a first grade 0—10 moving coil ammeter as mentioned in a previous paragraph.

Release the contact locknut and adjust contact until the horn will pass 13—15 amperes at 12 volts. Re-tighten the locknut and check.

Note : It is impossible to obtain a true adjustment and tone unless the horn is held firmly. Remove the horn from the car and clamp the mounting bracket in a vice before carrying out any adjustment. When replacing a horn always ensure that a correct replacement unit is fitted. The letters " H " or " L " on the horn denotes " high " or " low " notes.

DISTRIBUTOR (22 D 6)

Lucas 22D6 distributors, replacing the DMBZ6A distributors previously fitted, have the same Test Data figures as those stated on Page P.14.

The method of adjusting the contact breaker points however, is as follows :—

Remove the distributor cap and the water proof cover (if fitted).

Slacken (very slightly) the contact plate securing screw ("A" Fig. 59) and adjust the gap by turning a screwdriver in the nick in the counter plate and the slot in the base plate ("B" Fig. 59) clockwise to decrease the gap and anti-clockwise to increase the gap.

Tighten the screw and re-check the gap.

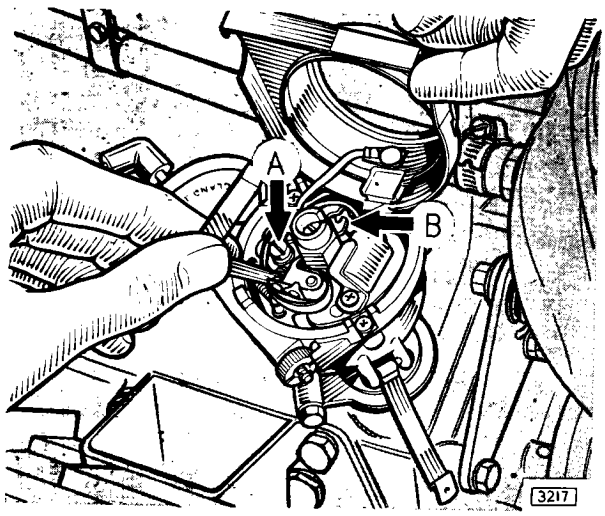


Fig. 59.

D.C. GENERATOR—TYPE C40L

Fitted to 2.4 Litre Models (From Engine No. BH9010)

The C40L D.C. Generator is similar in construction to the C.45 PV-6 unit detailed on Page P.17 with the exception of cable termination which is now "Lucar" replacing the terminal posts and nuts previously fitted.

The performance data figures for the C40L Generator are as shown in the table below :

PERFORMANCE DATA

Cutting-in Speed	1,250 (max.) r.p.m. at 13.0 generator volts
Maximum Output	25 Amperes at 2,400 max. r.p.m. at 13.5 generator volts and a resistance load of 0.54 ohm's.
Field Resistance	6 0 ohms.

SERVICING

The servicing details remain unaltered from those stated on Page P.17.

D.C. GENERATOR—TYPE C42

Fitted to

—3.4 Litre Models (From Engine No. KH8317)

—3.8 Litre Models (From Engine No. LC5345)

—2.4 Litre Models (From Engine No. BH.9010— Special Order only)

The C42 D.C. Generator is similar in construction to the C45-PV-6 unit detailed on Page P.17 with the exception of the cable termination which is now "Lucar" replacing the termination posts and nuts previously fitted.

The performance data figures for the C42 Generator are as shown in the following table :—

PERFORMANCE DATA

Cutting-in Speed	1,250 r.p.m. (max.) at 13.0 generator volts
Maximum Output	30 Amperes at 2,200 r.p.m. (max.) at 13.5 generator volts.
Field Resistance	6.0 ohms

SERVICING

The servicing details remain unaltered from those stated on page P.17.

D.C. GENERATOR—TYPE C48

Fitted to

—3.4 Litre Models (from Engine No. KH8957— Special order only)

—3.8 Litre Models (from Engine No. LC5787— Special order only)

Model C48 Generators fitted to engine prior to the above Serial Number (as special equipment) will have terminal posts and nuts: from the above numbers the termination is "Lucar". All other details remain the same for both units.

The C48 D.C. Generator is similar in construction to the C45-PVS-6 unit detailed on Page P.22.

The performance data figures for the C48 generator are as shown in the table below :—

PERFORMANCE DATA

Cutting-in Speed	850 Max. r.p.m. at 13 generator volts
Maximum Output	35 amperes at 1,650 (max.) r.p.m. at 13.5 generator volts (on resistance load of 0.385 ohms).
Field Resistance	6.0 ohms.

THE CURRENT VOLTAGE REGULATOR

(MODELS RB310 and RB340)

Dependent on the type of generator fitted, current and voltage regulation is by means of the Lucas RB310 or RB340 Control Boxes.

Units are readily identified by means of the cover. This is an aluminium pressing for the RB310 unit and a moulded black plastic cover for the RB.340 control box.

The Lucas serial number is stamped on the base plate of the unit.

The procedure for regulator adjustment of the RB340 control box is as stated below. The RB310 regulator adjustment remains as stated on Page P.28.

CURRENT VOLTAGE REGULATOR—MODEL RB 340

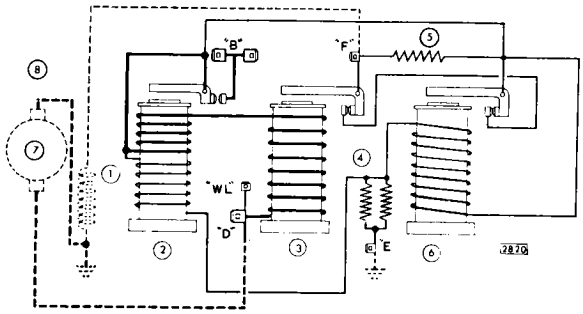


Fig. 60. Circuit diagram of the R.B.340 control box.

1. Field
2. Cut-out relay
3. Current regulator
4. Swamp resistor
5. Field resistor
6. Voltage regulator
7. Armature
8. Generator

GENERAL

Preliminary Checking of Charging Circuit

Before disturbing any electrical adjustments, examine as described below to ensure that the fault does not lie outside the control box :

(i) Check the battery by substitution or with an hydrometer and a heavy discharge (150—160A) tester.

(ii) Inspect the generator driving belt. This should just be taut enough to drive without slipping.

(iii) Check the generator by substitution or by withdrawing the cables from the generator terminals and, using a suitable "jumper lead", linking large generator terminal "D" to small terminal "F" and connecting a voltmeter between this link and earth and then running the generator up to about 1,000 r.p.m. (600 engine r.p.m.), when a rising voltage should be shown.

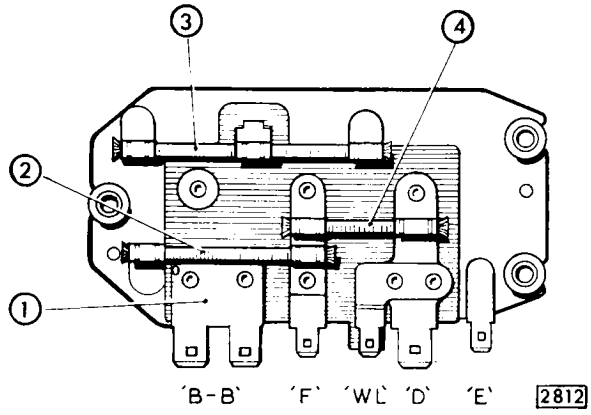
(iv) Inspect the wiring of the charging circuit and carry out continuity tests between the generator, control box and the ammeter.

(v) Check earth connections, particularly that of the control box.

(vi) In the event of reported undercharging, ascertain that this is not due to low mileage.

(vii) The control box terminals are protected with a plastic cover which is a sliding fit over the unit and must be removed before any adjustments can be made.
To ensure the impossibility of making incorrect connections the field cable terminal is insulated with a black plastic sleeve which differs in form and colour from all other terminal insula ors.

Note : Should the control box fail to respond correctly to any adjustment given in the following instructions, it should be examined at a Lucas Service Depot or by an official I uca A. nt



1. Battery main terminal
2. Swamp resistor
3. Ballast resistors
4. Field resistors

Fig. 61. View of underside of R.B.340 control box.

VOLTAGE REGULATOR

Open Circuit Settings

	Ambient Temperature	Voltage
C.40—C.42 Generator	10°C. (50°F.)	14.9—15.5
	20°C. (68°F.)	14.7—15.3
	30°C. (86°F.)	14.5—15.1
	40°C. (104°F.)	14.3—14.9
C.48 Generator	10°C. (50°F.)	15.0—15.6
	20°C. (68°F.)	14.8—15.4
	30°C. (86°F.)	14.6—15.2
	40°C. (104°F.)	14.4—15.0

Method of Adjustment

Checking and adjusting should be completed as rapidly as possible to avoid errors due to heating of the operating coil.

(i) Withdraw the cable from control box terminal blades "B".

(ii) Connect a first grade 0—20 moving coil voltmeter between control box terminal "D" and a good earthing point.

Note: A convenient method of making this connection is to withdraw the ignition warning light feed from control box terminal "WL" and to clip the voltmeter lead of appropriate polarity to the small terminal blade thus exposed—this terminal being electrically common with terminal "D".

(iii) Start the engine and run the generator at 3,000 r.p.m. (1,800 engine r.p.m.) C40L and C.48 generators, 4,500 r.p.m. (2,700 engine r.p.m.) C.42 generator.

(iv) Observe the voltmeter pointer.
The voltmeter reading should be steady and lie between the appropriate limits (see "Open Circuit Settings"), according to the temperature. An unsteady reading may be due to unclean contacts. If the reading is steady but occurs outside the appropriate limits, an adjustment must be made. In this event, continue as follows :

(v) Stop the engine and remove the control box cover.

(vi) Re-start the engine and run the generator at 3,000 r.p.m. (1,800 engine r.p.m.) C.40L and C.48 generators, 4,500 r.p.m. (2,700 engine r.p.m.) C.42 generator.

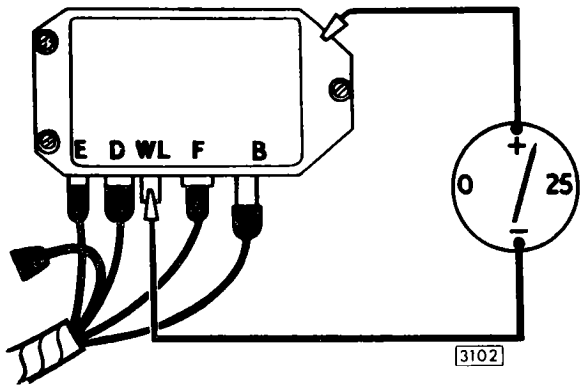


Fig. 62. Checking open circuit setting.

(vii) Using a suitable tool, turn the voltage adjustment cam until the correct setting is obtained—turning the tool clockwise to raise the setting or anti-clockwise to lower it.

(viii) Check the setting by stopping the engine and then again raising the generator speed to 3,000 r.p.m. (1,800 engine r.p.m.) or 4,500 r.p.m. (2,700 engine r.p.m.)

(ix) Restore the original connections and refit the cover.

CURRENT REGULATOR

On-Load Setting

The current regulator on-load setting is equal to the maximum rated output of the generator, which is 30 amperes (C.42), 35 amperes (C.48), 25 amperes (C.40L).

Method of Adjustment

The generator must be made to develop its maximum rated output, whatever the state of charge of the battery might be at the time of setting. The voltage regulator must therefore be rendered inoperative, and this is the function of the bulldog clip used in (ii) below in keeping the voltage regulator contacts together.

(i) Remove the control box cover.

(ii) Using a bulldog clip, short out the contacts of the voltage regulator. (See Fig. 64).

(iii) Withdraw the cable from control box terminal blades "B".

(iv) Using a suitable "jumper lead", connect the cables removed in (iii) to the load side of a first-grade 0-40A moving coil ammeter.

(v) Connect the other side of the ammeter to one of the control box terminal blades "B".

Note: It is important to ensure that terminal "B" carries only this one connection. All other load connections (including the ignition coil feed) must be made to the battery side of the ammeter.

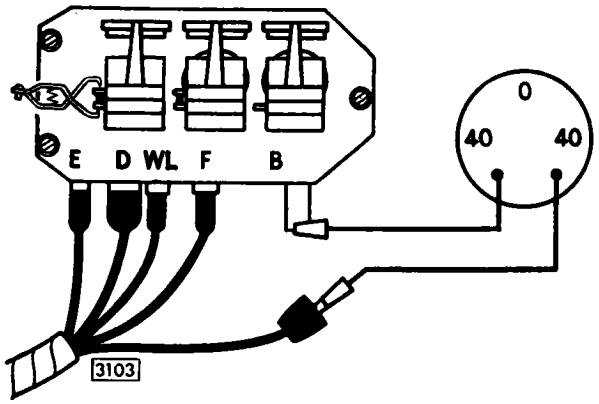
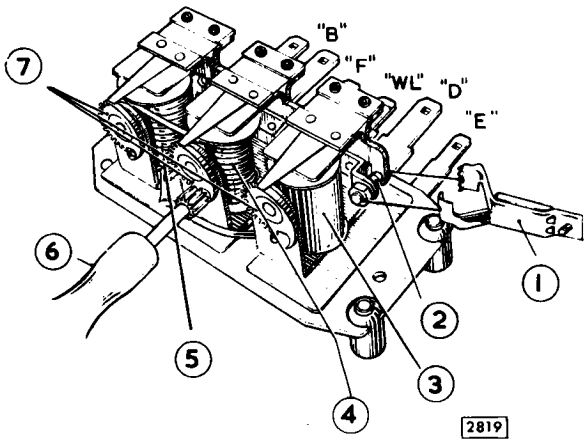


Fig. 63. Checking the current regulator on load setting.

(vi) Switch on all lights, to ensure that the generator develops its full rated output.

(vii) Start the engine and run the generator at 4,500 r.p.m. (2,700 engine r.p.m.), C.42 generator, 3,000 r.p.m. (1,800 engine r.p.m.), C.40L—C.48 generators.



1. "Bulldog clip
2. V.R. Contacts
3. Voltage regulator
4. Current regulator
5. Cut-out Relay
6. Setting tool
7. Adjustment cams

Fig. 64. The cam adjuster on the R.B.340 control box. Note the bulldog clip closing the voltage regulator contacts.

(viii) Observe the ammeter pointer.
The ammeter pointer should be steady and indicate a current equal to the maximum rated output of the generator. An unsteady reading (one fluctuating more than ± 1 ampere) may be due to unclean contacts. If the reading is too high or too low an adjustment must be made. In this event proceed as follows :

(ix) Using a suitable tool, turn the current adjustment cam until the correct setting is obtained—turning the tool clockwise to raise the setting or anti-clockwise to lower it.

(x) Switch off the engine and restore the original connections.

(xi) Refit the control box cover.

CUT-OUT RELAY

Electrical Settings

(i)	Cut-in Voltage	12.6—13.4
(ii)	Drop-off Voltage	9.3—11.2

Method of Cut-in Adjustment

Checking and adjusting should be completed as rapidly as possible to avoid errors due to heating of the operating coil.

(i) Connect a first-grade 0—20 moving-coil voltmeter between control box terminal "D" and a good earthing point, referring to the note in "Voltage Regulator—Method of Adjustment".

(ii) Switch on an electrical load, such as the headlamps.

(iii) Start the engine and slowly increase its speed.

(iv) Observe the voltmeter pointer.
The voltage should rise steadily and then drop slightly at the instant of contact closure. The

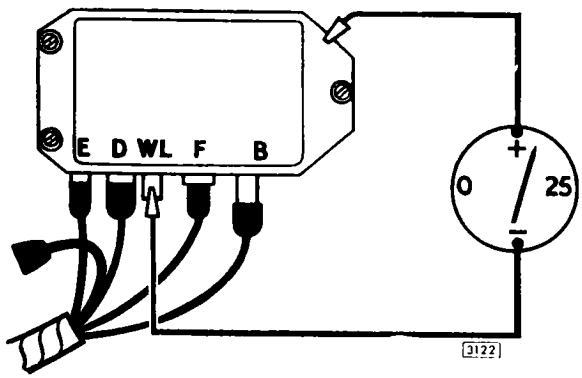


Fig. 65. Checking cut-in voltage.

cut-in voltage is that which is indicated immediately before the pointer drops back. It should occur between the limits given in "Electrical Settings" (i) above. If the cut-in occurs outside those limits, an adjustment must be made. In this event, reduce generator speed to below cut-in value and continue as follows:

(v) Remove the control box cover.

(vi) Using a suitable tool, turn the cut-out relay adjustment cam a small amount in the appropriate direction—turning the tool clockwise to raise the setting or anti-clockwise to lower it.

(vii) Repeat the above checking procedure until the correct setting is obtained.

(viii) Switch off the engine, restore the original connections and refit the cover.

Method of Drop-off Adjustment

(i) Withdraw the cables from control box terminal blades "B".

(ii) Connect a first-grade 0—20 moving-coil voltmeter between control box terminal "B" and earth.

(iii) Start the engine and run up to approximately 3,000 generator r.p.m. (1,800 engine r.p.m.).

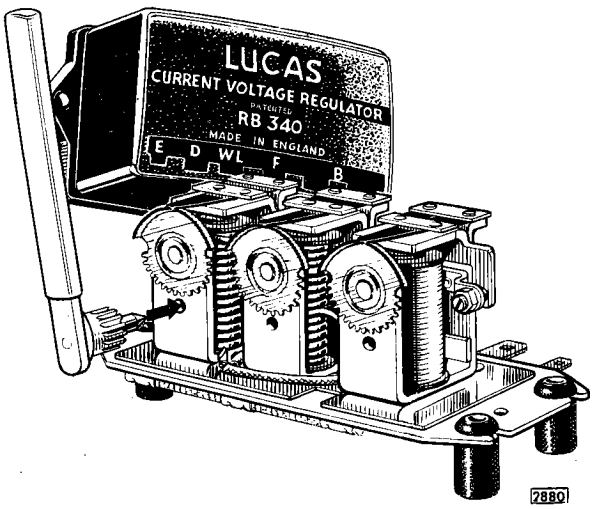


Fig. 66. Adjusting the cut-out.

(iv) Slowly decelerate and observe the voltmeter pointer.
Opening of the contacts, indicated by the voltmeter pointer dropping to zero, should occur between the limits given in "Electrical Settings". If the drop-off occurs outside these limits, an adjustment must be made. In this event, continue as follows :

(v) Stop the engine and remove the control box cover.

(vi) Adjust the drop-off voltage by carefully bending the fixed contact bracket. Reducing the contact gap will raise the drop-off voltage; increasing the gap will lower the drop-off voltage. Retest and if necessary, re-adjust until the correct drop of setting is obtained.

Note: This should result in a contact "follow through" or blade deflection of 0.010″—0.035″ (0.25—0.80 mm.).

Refit the connections and cover.

(vii) Retest and, if necessary, readjust until the correct drop-off setting is obtained.

Note: This should result in a contact "follow through" or blade deflection of 0.010″—0.020″ (.25—.5 mm.).

(viii) Restore the original connections and refit the cover.

ADJUSTMENT OF AIR GAP SETTINGS

Air gap settings are accurately adjusted during production of the control box and should require no further attention. If the original adjustments have been disturbed, it will be necessary to reset as described below.

Armature-to-Bobbin Core Gaps of Voltage and Current Regulators

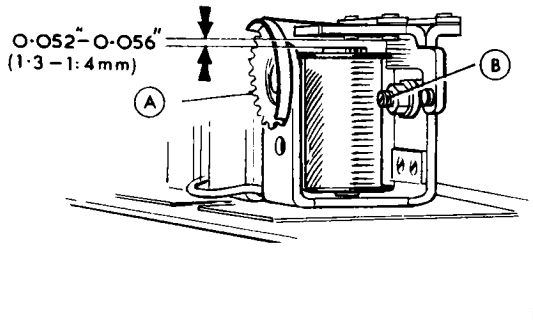
(i) Using a suitable tool, turn the adjustment cam to the point giving maximum lift to the armature tensioning spring, i.e. by turning the tool to the fullest extent anti-clockwise.

(ii) Slacken the adjustable contact locking nut and screw back the adjustment contact.

(iii) Insert a flat feeler gauge of 0.045″ (1.04 mm.) thickness between the armature and the copper separation on the core face, taking care not to turn up or damage the copper shim. The gauge should be inserted as far back as the two rivet heads on the underside of the armature.

(iv) Retaining the gauge in position and pressing squarely down on the armature, screw in the adjustable contact until it just touches the armature contact.

(v) Retighten the locking nut and withdraw the gauge.
(vi) Carry out the electrical setting procedure.

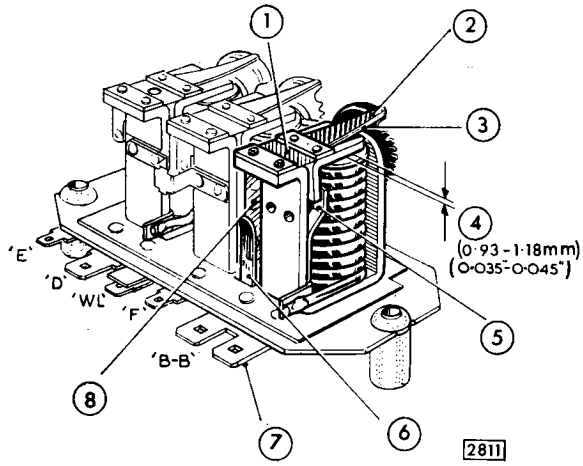


A. Turn cam to minimum lift. B. Slacken contact screw

Fig. 67. Voltage regulator gap setting.

Contact "follow-through" and Armature-to-Bobbon Core Gap of Cut-out Relay

(i) Press the armature squarely down against the copper separation on the core face.
(ii) Adjust the fixed contact bracket to give a "follow-through" or blade deflection of the moving contact of 0.010"—0.035" (0.25—0.89 mm.).
(iii) Release the armature.
(iv) Adjust the armature back stop to give a core gap of 0.035"—0.045" (.89—1.13 mm.).
(v) Check the cut-in and drop-off voltage settings.



1. Hinge spring
2. Armature
3. Bi-metal backing spring
4. Armature to bobbin core gap
5. Armature back stop
6. Fixed contact bracket
7. 'B-B' terminal plate
8. Moving contact blade

Fig. 68. Cut-out air gap setting.

CLEANING CONTACTS

Regulator Contacts

To clean the voltage or current regulator contacts, use fine carborundum stone or silicon carbide paper followed by methylated spirits (denatured alcohol).

Cut-out Relay Contacts

To clean the cut-out relay contacts, use a strip of fine glass paper—never carborundum stone or emery cloth.

HORNS

(MODEL WT 618U)

Fitted to	R.H.D. From Chassis Numbers	L.H.D. From Chassis Numbers
—2.4 Litre Models ..	104221	125798
—3.4 Litre Models ..	152649	176175
—3.8 Litre Models ..	202055	214549

The horns are situated at the front and on either side of the engine compartment immediately below the radiator.

Removal

Remove the battery earth terminal.

Pull off the two "Lucar" cable connections at the horn terminals.

Remove the two mounting bolts, nuts, washers and earth wire from each horn.

Withdraw the horns.

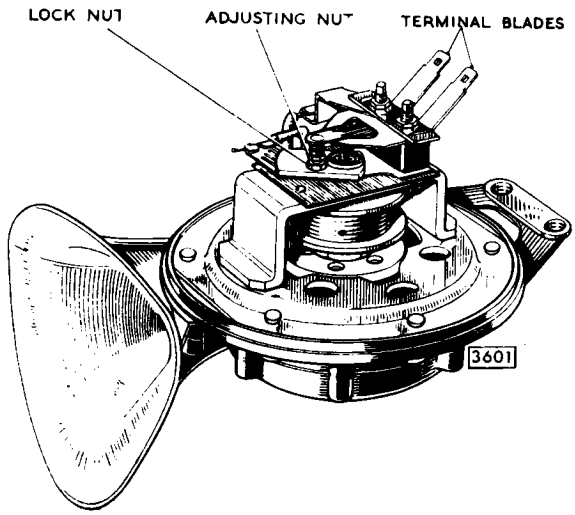


Fig. 69. W.T. 618U horn with the cover removed.

Adjustment

Adjustment is effected after removal of the domed cover by means of a fixed contact screw.

Connect an 0-20 first grade moving coil ammeter in series with a horn. Release the contact locknut and adjust the contact until the horn will pass 13½-15½ amperes at 12 volts. Retighten the locknut and check.

Refit the domed cover.

Refitting

Refitting is the reverse of the removal procedure. Care should be taken in ensuring a good contact between the earth strap and horn bracket on the left-hand horn.

Note: It is important to keep the horn mounting bolts tight and to maintain rigid the mountings of any units fitted near the horns. Electrical connections and cable should be checked occasionally and rectified as necessary.

HORNS—MODEL 9H

Fitted to	R.H.D. From Chassis Numbers	L.H.D. From Chassis Numbers
—2.4 Litre Models ..	119432	127886
—3.4 Litre Models ..	169762	180276
—3.8 Litre Models ..	234499	224234

Description

The Lucas 9H horns are mounted at the front end on either side of the engine compartment immediately below the radiator. The horn circuit operates through a Lucas 6 RA relay, the contacts C1 and C2 closing when the relay coil is energised by depressing the semi-circular ring attached to the steering wheel, or, by pressing the centre button.

Maintenance

In the event of the horn(s) failing to sound or performance becoming uncertain, check that the fault is not due to external causes before any adjustments are made.

Check as follows and rectify as necessary :

(i) Battery condition.

(ii) Loose or broken connections in the horn circuit. Test with voltmeter at cable terminals.

(iii) Loose fixing bolts. It is important to keep the horn mountings tight and to maintain rigid the mountings of any units fitted near the horns.

(iv) Faulty relay. Check by substitution after verifying that current is available at terminal C2 (cable colour—brown and blue) and terminal W (green).

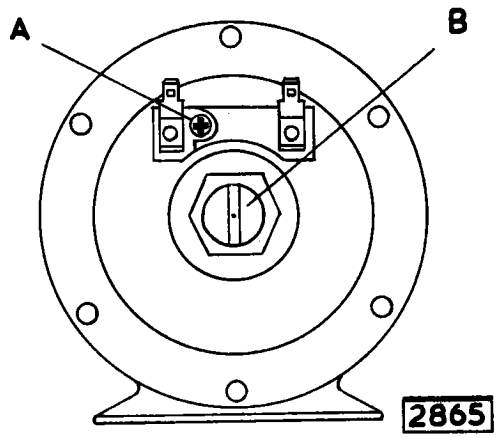
(v) Check that fuse 3 (35 amperes) and fuse 5 (50 amperes) have not blown.

Note: Horns will not operate until the ignition is switched on.

Adjustment

The horns cannot be conveniently adjusted in position. Remove and securely mount on the test fixture.

A small serrated adjusting screw is provided to take up wear of moving parts only in the horn and it is located adjacent to the horn terminals. Turning this screw does not alter the pitch of the note.



A. Contact breaker adjustment screw
B. Slotted centre core (do not disturb)

Fig. 70. The Lucas 9H horn.

Connect an 0—25 moving coil ammeter in series with the horn supply feed. The ammeter should be protected from overload by connecting an ON-OFF switch in parallel with its terminals.

Keep this switch ON except while taking readings, that is, when the horn is sounding.

Turn the adjustment screw anti-clockwise until the horn just fails to sound.

Turn the screw clockwise until the horn operates within the specified current limits of 6.5—7.0 amperes.

Service Replacements

When fitting replacement horns it is essential that the following procedure be carried out.

(i) Refit the lockwashers in their correct positions, one on each side of the mounting bracket centre fixing.

(ii) Ensure after positioning the horn, that the $\frac{5}{16}$" centre fixing bolt is secure but not over-tightened. Over-tightening of this bolt will damage the horn.

(iii) Ensure that, when a centre fixing bolt or washers other than the originals are used, the bolt is not screwed into the horn to a depth greater than $\frac{11}{16}$" (17.5 mm.).

Horn Relay—Checking

If the horn relay is suspected, check for the fault by substitution or by the following method :

(i) Check that fuses No. 3 and No. 5 have not blown. Replace if necessary.

(ii) Check with a test lamp that current is present at relay terminals W1 (green) and C2 (brown and purple). Switch on ignition before checking terminal W1.

(iii) Remove cable from terminal W2 (purple and black) and earth the terminal to a clean part of the frame. Relay coil should now operate and close contacts. Reconnect cable.

(iv) Remove cables from terminal C2 (brown and purple). Check for continuity by means of an earthed test lamp when horn button or ring is depressed with the ignition ON. Replace relay if faulty.

The horn relay is mounted on the left hand wing valance adjacent to the fuse block.

INTRODUCTION OF SEALED BEAM HEADLAMPS

		Commencing Chassis Numbers R H Drive
2.4 Litre Mark 2	..	112995
3.4 Litre Mark 2	..	160201
3.8 Litre Mark 2	..	208535

Commencing at the above chassis numbers, all R.H. drive Mark 2 models are fitted with a complete sealed beam unit. The unit consists of the reflector, glass and filament. If failure of the lamp is experienced, the complete unit must be changed.

The new headlamps are interchangeable, provided they are fitted in pairs, with those they replace.

Replacement

Remove the retaining screw at the bottom of the headlamp rim and carefully prise off the rim. Remove the three cross-headed screws and the headlight unit retaining rim. Withdraw the headlight and unplug the adaptor from the rear of the unit. The headlight can now be replaced with a sealed beam unit of the correct type.

Note: Do not turn the two slotted screws or the setting of the headlight will be upset.

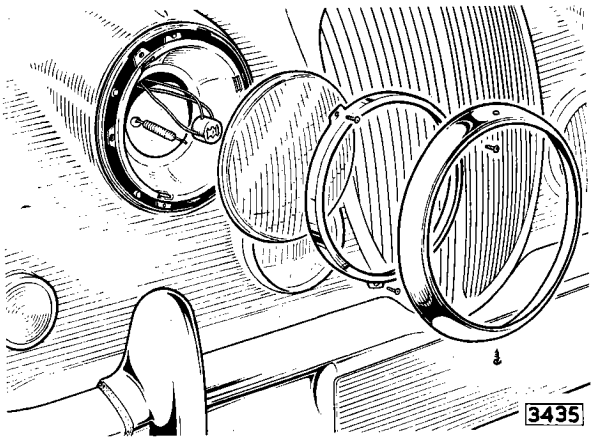


Fig. 78. Sealed beam unit removal.

Lamp	Lucas Bulb No	Volts	Watts	Application
HEAD	Sealed Beam Unit	12	75/45	Home and Export, Middle East, S. America
		12	50/40	
	410	12	45/40	Canada
	411	12	45/40 (Yellow)	Belgium, Holland, Sweden, Austria, Italy, France
Electrically Heated Backlight	987	12	2.2	
Traffic Warning device	987	12	2.2	(Optional Extra)

TRAFFIC HAZARD WARNING DEVICE

(Optional Extra)

This system operates in conjunction with the four flashing turn indicators on the car and the operation of a toggle switch on a sub-panel will cause these four lamps to flash simultaneously.

A red warning lamp is incorporated in the circuit to indicate that the hazard warning system is in operation. A 25 amp. in-line fuse (14 amp. American rating) is incorporated in the sub-panel circuit.

The flasher unit is located behind the instrument sub-panel and is of the plug-in type. The unit is similar in appearance to the one used for the flashing turn indicators but has a different internal circuit.

A correct replacement unit must be fitted in the event of failure.

The pilot lamp bulb is accessible after removing the chrome bezel and detaching the bulb holder.

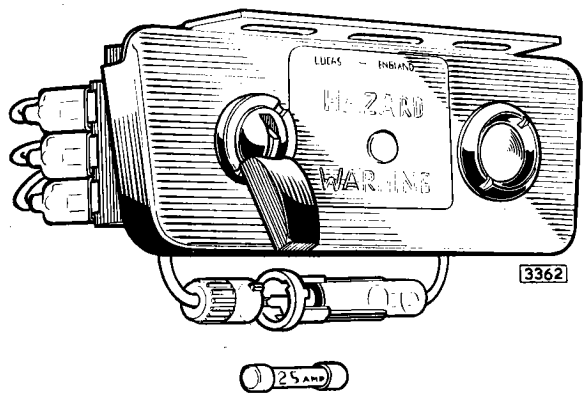
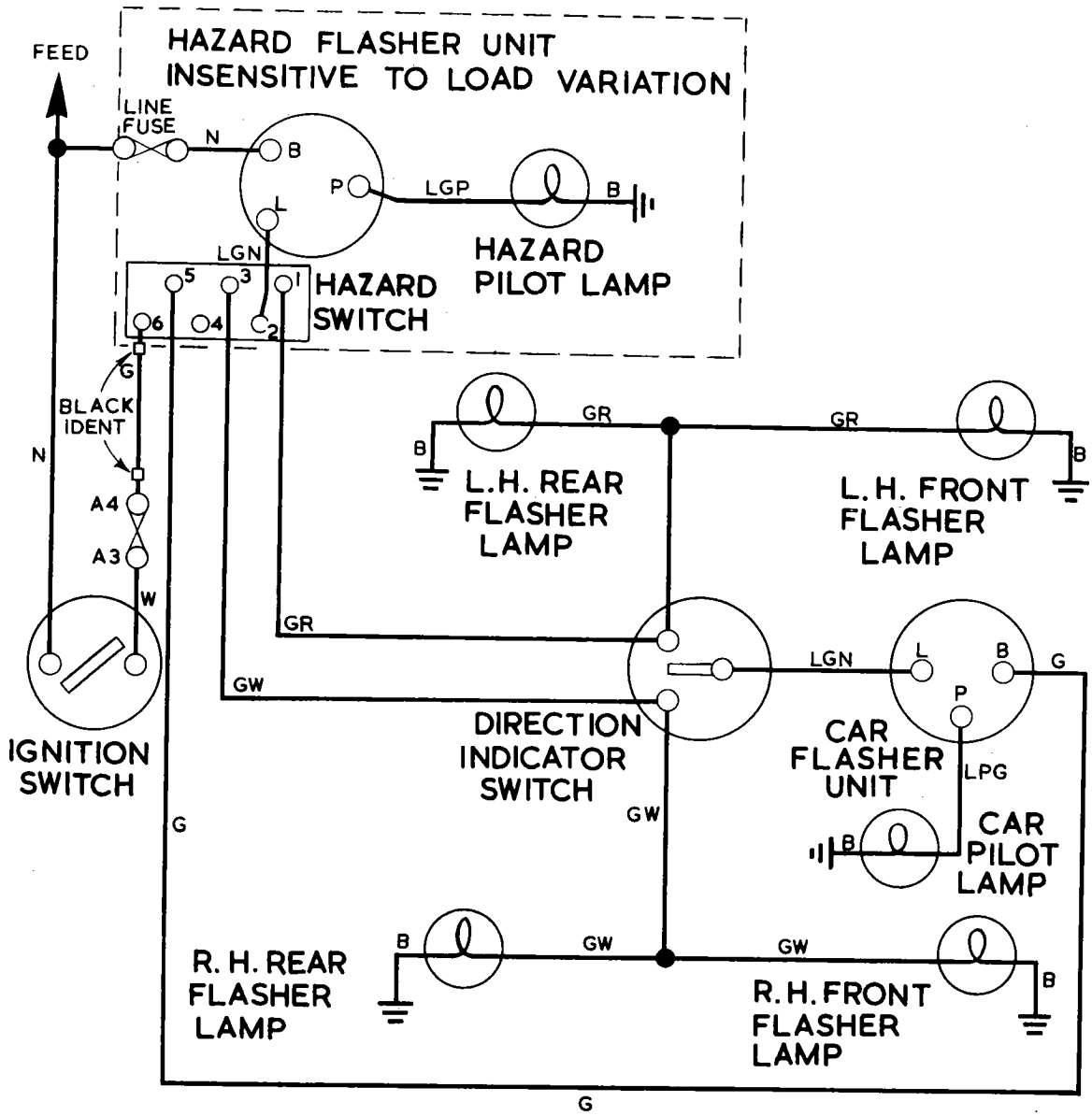


Fig. 79. Traffic hazard warning system sub-panel.



B	BLACK	LGN	LIGHT GREEN \ BROWN
G	GREEN	LGP	LIGHT GREEN \ PURPLE
GR	GREEN \ RED	N	BROWN
GW	GREEN \ WHITE	W	WHITE

3361

Fig. 80. Wiring diagram of the traffic hazard warning system.

ELECTRICALLY HEATED BACKLIGHT

An electrically heated backlight to provide demisting and defrosting of the rear window is fitted as an optional extra.

The heating element, consisting of a fine wire mesh between the laminations of glass, is connected to the main wiring harness and will come into operation when the ignition is switched on.

The current consumption is 5 amps. and a 15 amp. fuse, contained in a plastic holder, is located behind the instrument panel.

	Commencing Chassis Numbers	
	R.H. Drive	L.H. Drive
2.4 Litre Mark 2 ..	119902	127998
3.4 Litre Mark 2 ..	170565	180398
3.8 Litre Mark 2 ..	235046	224417

Commencing at the above chassis numbers the heated backlight has a control switch, warning light and relay with resistance included in the electrical circuit.

The warning light, operating through the resistance, is automatically dimmed when the side lights are switched on.

The circuit remains ignition controlled and there is no change in the fuse rating, fuse location and the current consumption.

The control switch is mounted on the facia panel and the relay is located on the back face of the panel above the switch terminals.

Fault Diagnosis

Check that the fuse has not blown. Replace if necessary by one of the correct value.

Check the rear light element by disconnecting the cable connectors in the luggage compartment and reconnecting the backlight cables to a 12 volt battery with a 0-20 moving coil ammeter in series.

If no reading is shown on the meter, replace the backlight glass as detailed on Page N.15.

If a reading is shown on the meter, check the feed cable connectors in the luggage compartment for continuity with a volt meter. Insert the fuse and switch on the ignition before checking.

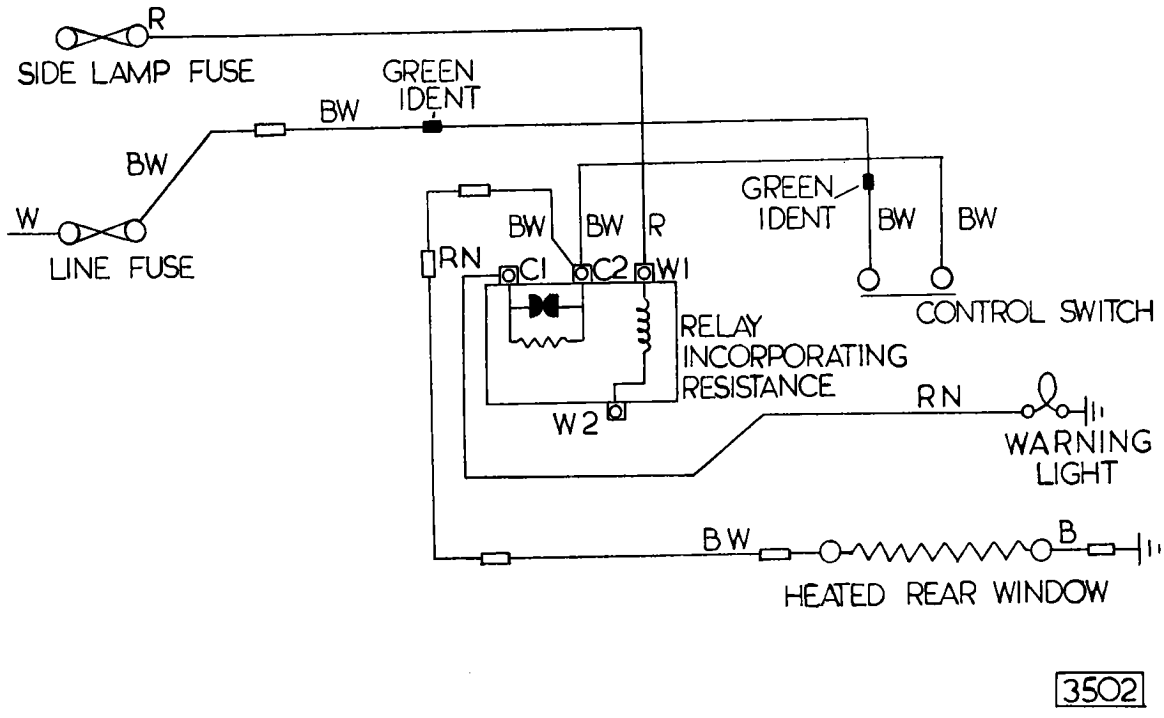


Fig. 81. Wiring diagram (Incorporating switch, relay and resistance).

ELECTRIC TIME CLOCK

	Commencing Chassis Numbers	
	R.H. Drive	**L.H Drive**
2.4 Litre Mark 2 ..	115205	127141
3.4 Litre Mark 2 ..	163007	179136
3.8 Litre Mark 2 ..	230516	222555

Commencing at the above chassis numbers, the electric time clock fitted to the revolution counter dial, incorporates a rectifier. This is to reduce fouling of the contact points in the clock.

If at any time the clock is removed for servicing and subsequent testing on the bench, IT IS MOST IMPORTANT that the feed terminal on the back of the clock is connected to the negative side of the battery and that the outer casing of the clock is positively earthed. Incorrect connection of a rectified clock to the battery will **instantly destroy the rectifier**