

Section P

ELECTRICAL EQUIPMENT — ALL MODELS

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Batteries

Note: Two batteries fitted to Diesel models—see Data section.

To remove Operation P/2

1. Remove the air cleaner, disconnect the leads, remove the securing frame and lift battery clear (when removing one battery only—Diesel models—always remove the interconnecting battery lead completely from both batteries).

To refit Operation P/4

1. Reverse removal procedure, taking care to smear the battery terminals with petroleum jelly.

Note: The drive screws securing the battery leads are manufactured from a special

non-corrosive metal and must never be replaced with ordinary drive screws, which may cause serious corrosion of the battery terminals.

Starter motor

To remove Operation P/6

1. Petrol models—disconnect the positive lead from the battery.
Diesel models—disconnect the negative L.H. battery lead from the battery and the leads from the starter solenoid.
2. Diesel models—remove the inlet and exhaust manifolds, and the dipstick and tube.

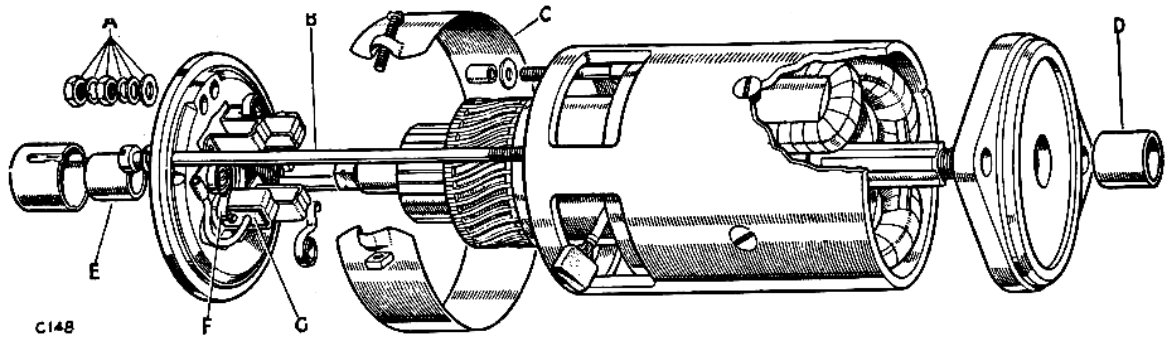


Fig. P-1—Exploded view of starter motor, Petrol models.

A—Terminal nuts and washer C—Cover band E—Bearing bush G—Brush
 B—Through bolt D—Bearing bush F—Brush spring

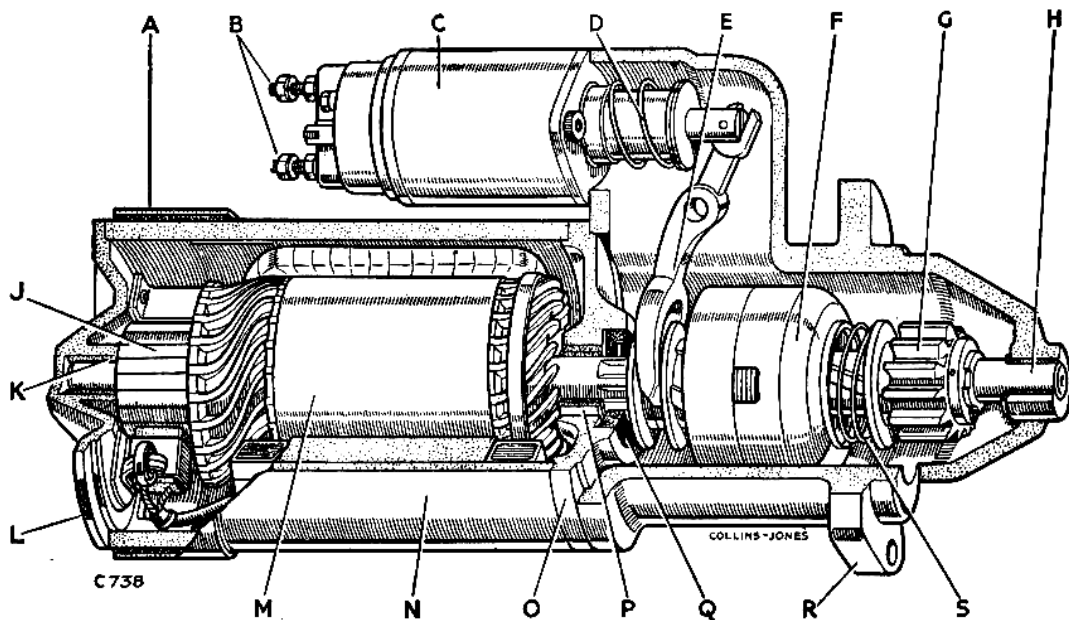


Fig. P-2—Sectioned view of starter motor, Diesel models.

A—Commutator cover band G—Driving pinion N—Yoke
 B—Solenoid terminals H—Porous bronze bush O—Intermediate bracket
 C—Solenoid J—Commutator P—Impregnated brass bush
 D—Solenoid return spring K—Porous bronze bush Q—Brake ring
 E—Engagement lever L—Commutator-end bracket R—Drive-end bracket
 F—Clutch assembly M—Armature S—Cushion spring

3. 1954 models. Remove the oil filter and brackets from the cylinder block. Section A.
4. 1954 models. Detach the filter outlet pipe from the cylinder block.
5. Petrol models—disconnect the cable from starter.

Early models

Detach the outlet pipe from the cylinder block. Disconnect the wire to the oil pressure switch. Remove the oil pressure switch and oil pipe to the cylinder head by withdrawing two union

bolts. Remove the three nuts and spring washers securing the starter housing to the flywheel housing and lift out the starter motor and housing. (If necessary, remove the large bolt locating the starter motor in the housing through the access hole in the dash panel.)

6. Remove the securing bolts and withdraw starter.

To refit

1. Reverse the removal procedure.
2. Check the operation of the starter motor.

Operation P/8

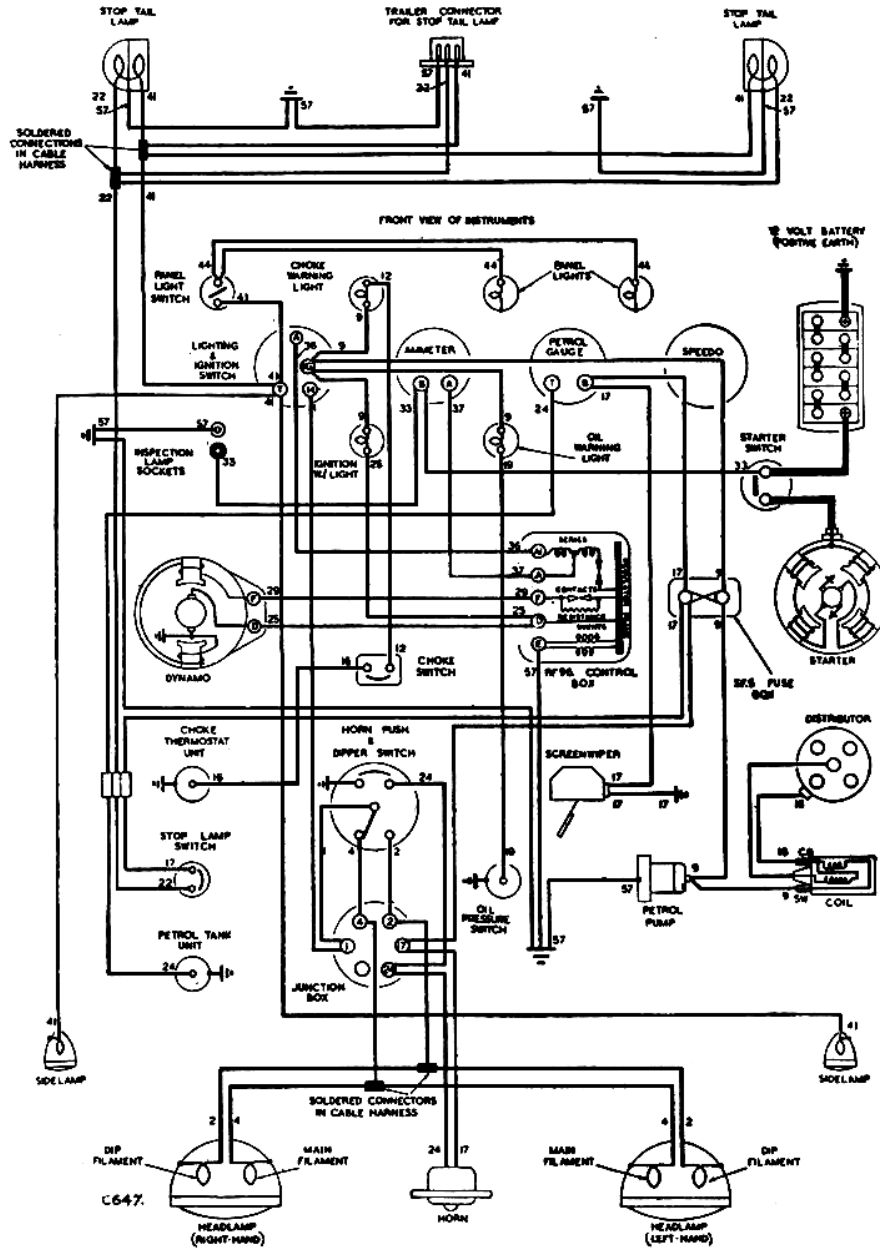


Fig. P-3—Wiring diagram, 1948-50 models

KEY TO CABLE COLOURS

1 BLUE	17 GREEN	33 BROWN	49 PURPLE
2 BLUE with RED	18 GREEN with RED	34 BROWN with RED	50 PURPLE with RED
3 BLUE with YELLOW	19 GREEN with YELLOW	35 BROWN with YELLOW	51 PURPLE with YELLOW
4 BLUE with WHITE	20 GREEN with BLUE	36 BROWN with BLUE	52 PURPLE with BLUE
5 BLUE with GREEN	21 GREEN with WHITE	37 BROWN with WHITE	53 PURPLE with WHITE
6 BLUE with PURPLE	22 GREEN with PURPLE	38 BROWN with GREEN	54 PURPLE with GREEN
7 BLUE with BROWN	23 GREEN with BROWN	39 BROWN with PURPLE	55 PURPLE with BROWN
8 BLUE with BLACK	24 GREEN with BLACK	40 BROWN with BLACK	56 PURPLE with BLACK
9 WHITE	25 YELLOW	41 RED	57 BLACK
10 WHITE with RED	26 YELLOW with RED	42 RED with YELLOW	58 BLACK with RED
11 WHITE with YELLOW	27 YELLOW with BLUE	43 RED with BLUE	59 BLACK with YELLOW
12 WHITE with BLUE	28 YELLOW with WHITE	44 RED with WHITE	60 BLACK with BLUE
13 WHITE with GREEN	29 YELLOW with GREEN	45 RED with GREEN	61 BLACK with WHITE
14 WHITE with PURPLE	30 YELLOW with PURPLE	46 RED with PURPLE	62 BLACK with GREEN
15 WHITE with BROWN	31 YELLOW with BROWN	47 RED with BROWN	63 BLACK with PURPLE
16 WHITE with BLACK	32 YELLOW with BLACK	48 RED with BLACK	64 BLACK with BROWN

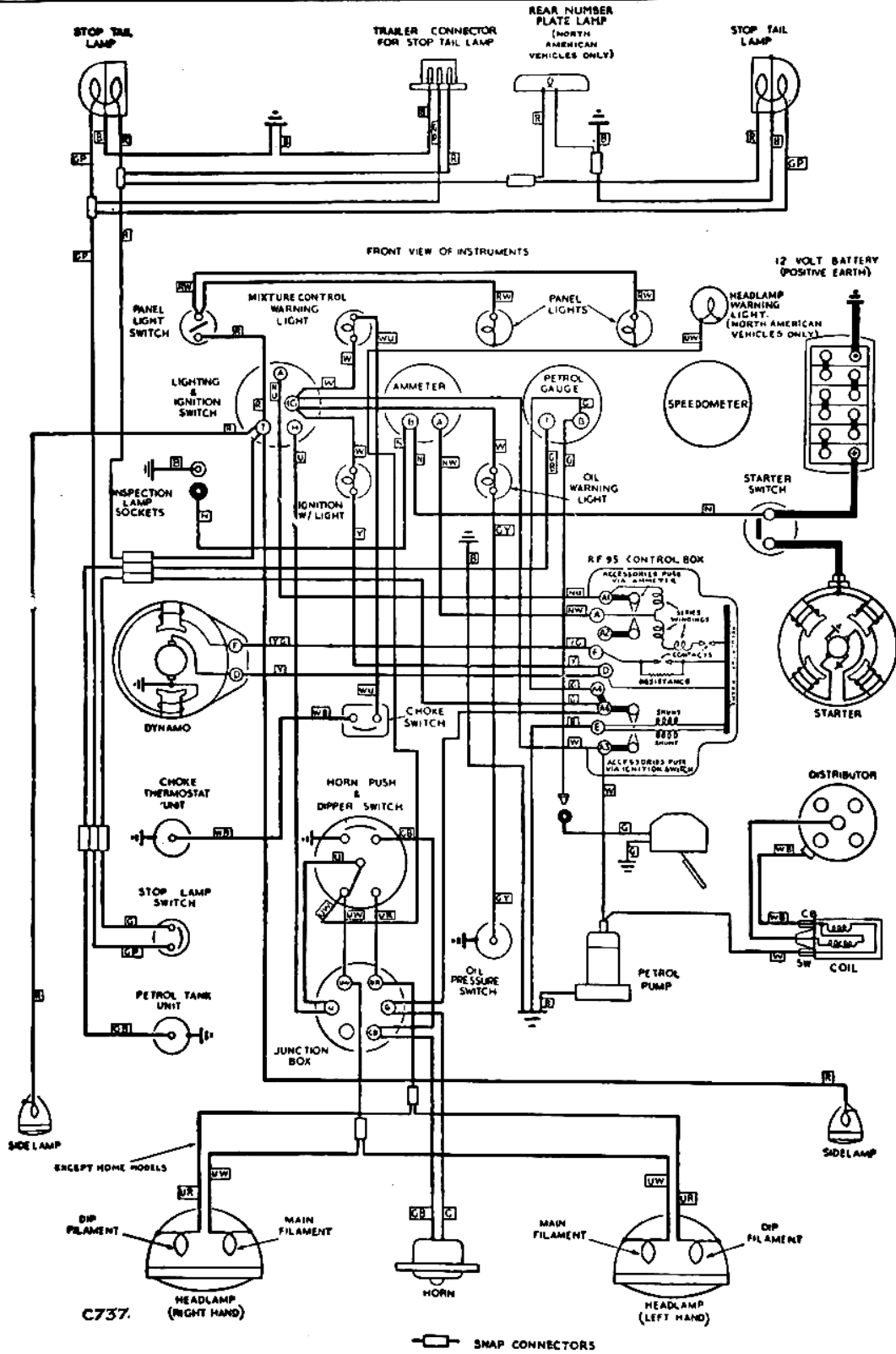


Fig. P-4—Wiring diagram, majority of 1951 models

KEY TO CABLE COLOURS

- | | | | |
|---------|-------------------------------|--------|----------|
| B—BLACK | N—BROWN | R—RED | W—WHITE |
| G—GREEN | P—PURPLE | U—BLUE | Y—YELLOW |
| | NU—BROWN with BLUE and so on. | | |

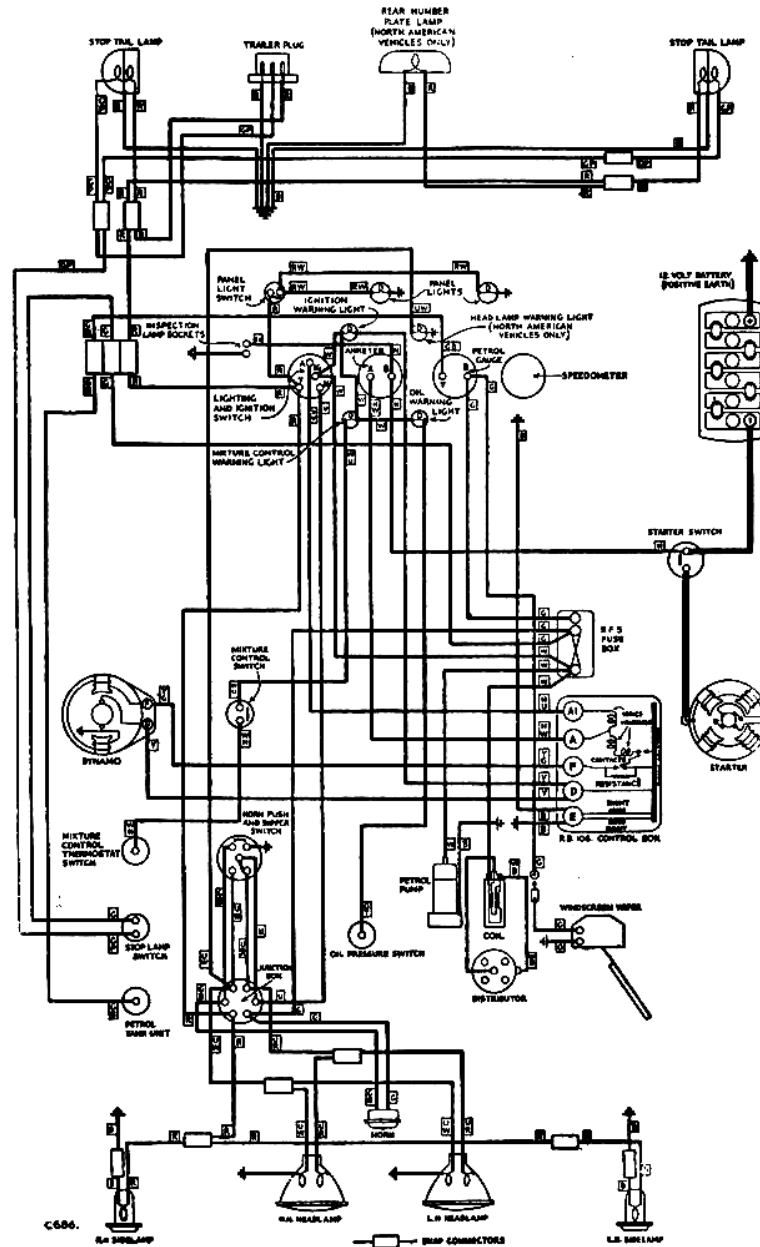


Fig. P-5—Wiring diagram, late 1951, 1952 and 1953 models

KEY TO CABLE COLOURS

B—BLACK
G—GREEN

N—BROWN
P—PURPLE

R—RED
U—BLUE

W—WHITE
Y—YELLOW

NU—BROWN with BLUE and so on.

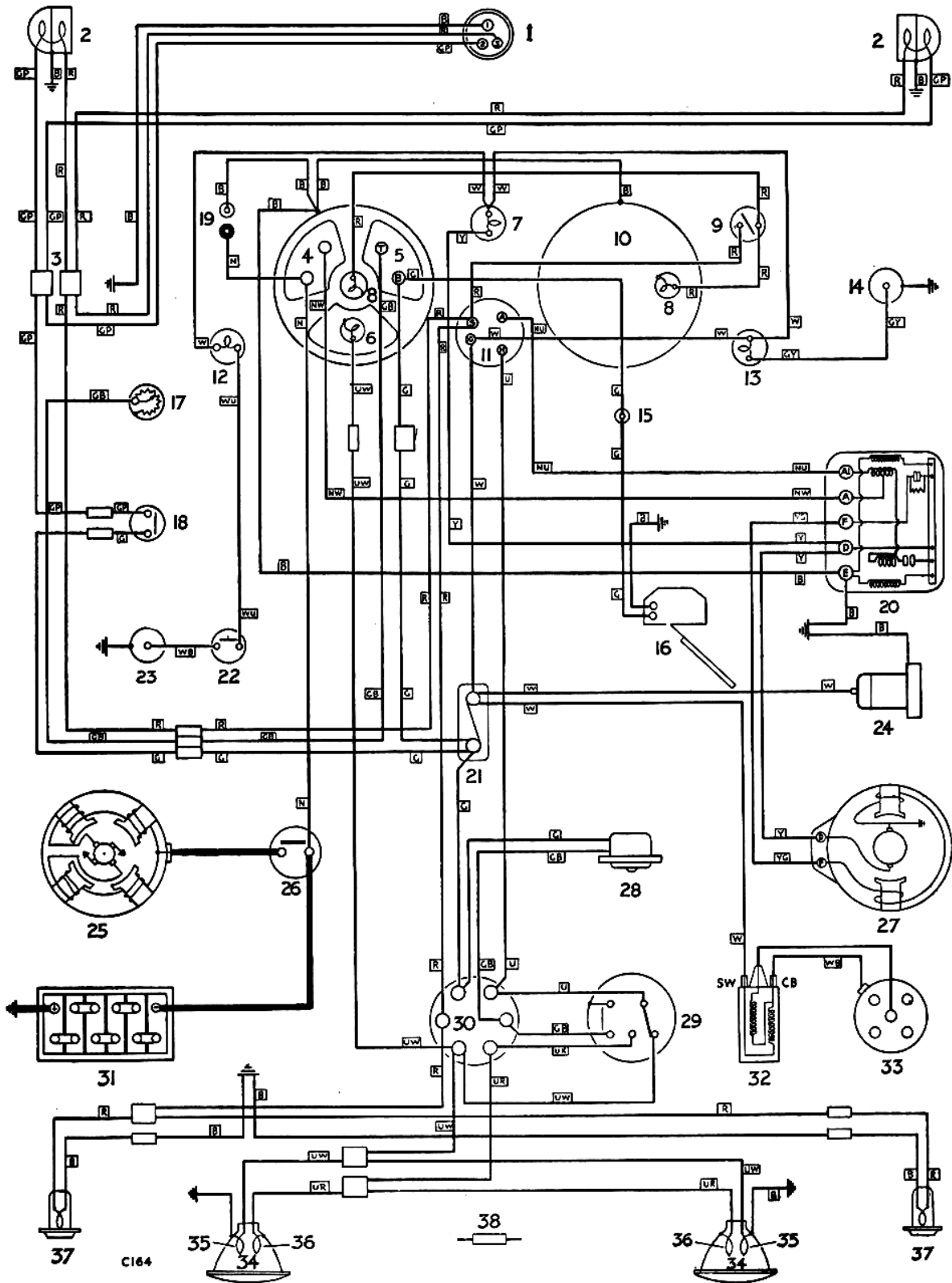


Fig. P-6—Wiring diagram 86 and 107—1956-58 models
See Page P-9 for key to wiring diagram

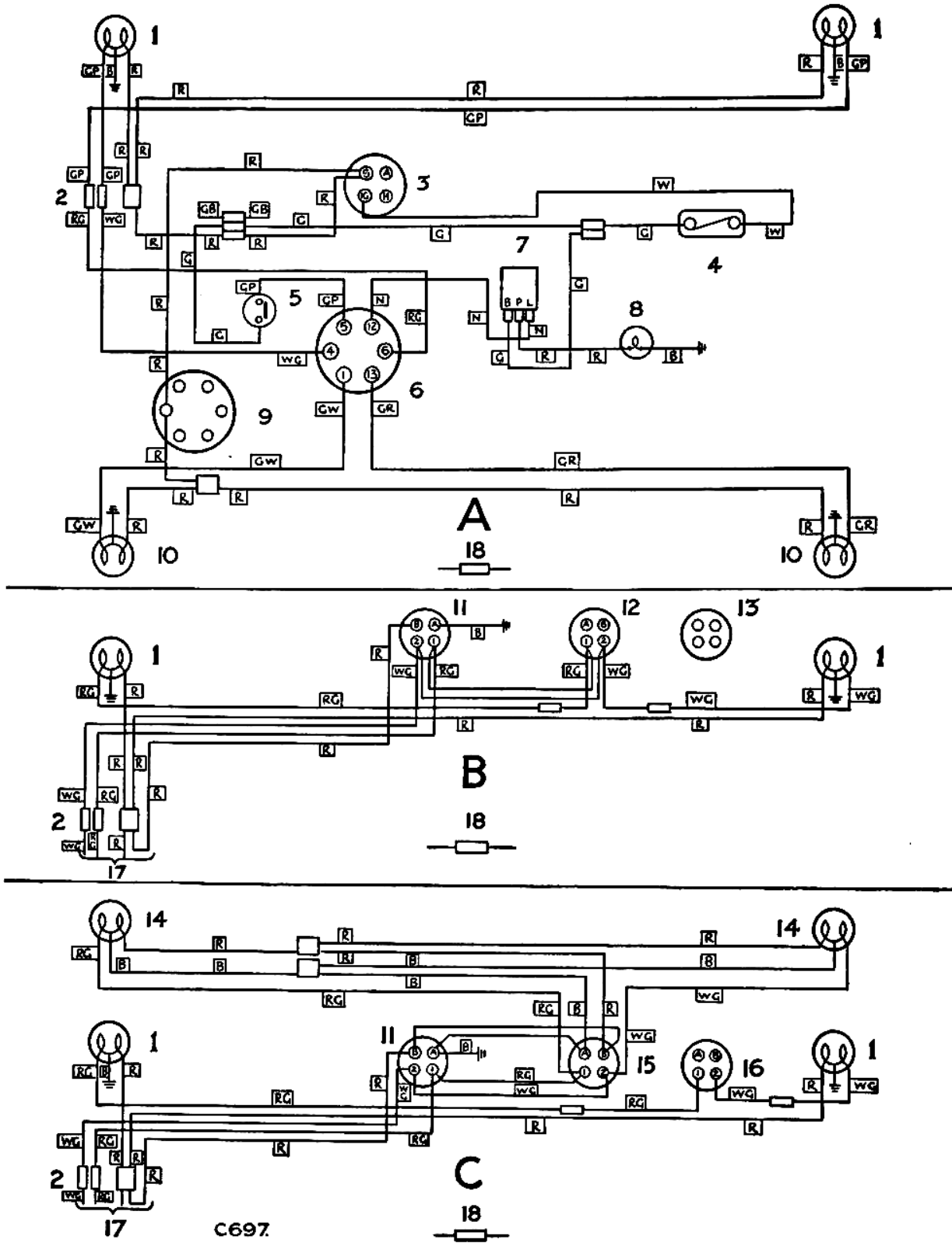


Fig. P-7—Flasher wiring diagram—1954-58 models
 See Page P-9 for key to wiring diagram

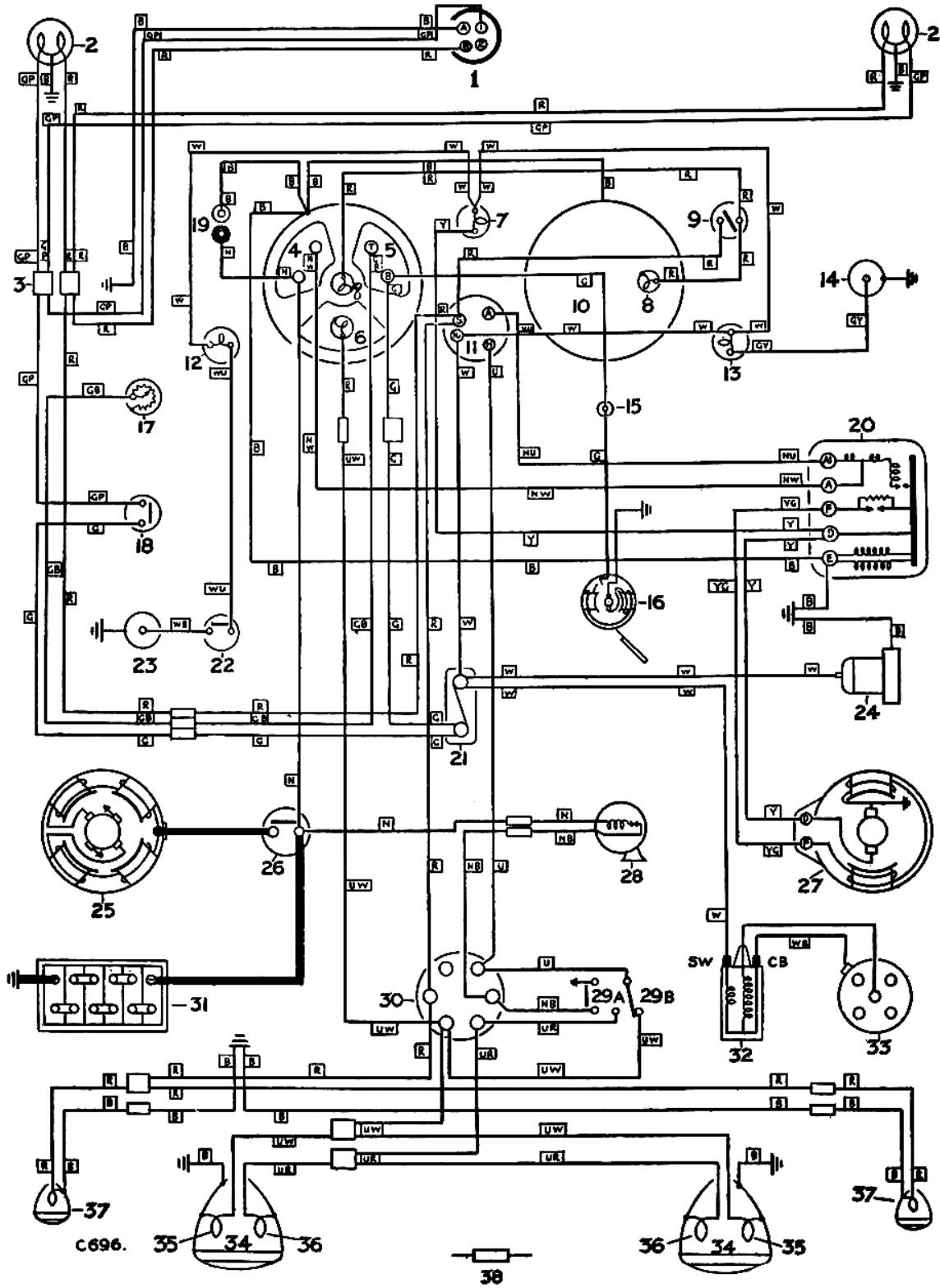



Fig. P-8—Wiring diagram 88 and 109—1954-58 models

See Page P-9 for key to wiring diagram

Key to main wiring diagrams, Figs. P-6 and P-8

1 Trailer light socket (extra equipment)	15 Windscreen wiper plug and socket	28 Horn
2 Stop, tail lamps	16 Windscreen wiper	29 Horn push and headlamp dipper switch, 86 and 107
3 Snap connectors for trailer light	17 Petrol tank level unit	29A Horn push
4 Ammeter	18 Stop lamp switch	29B Headlamp dipper switch
5 Petrol level gauge	19 Inspection lamp sockets	30 Junction box
6 Headlamp main beam warning light	20 R.B.106 voltage control box	31 12 volt battery (positive earth)
7 Ignition warning light	21 S.F.5 fuse box (35 amp. fuse)	32 Ignition coil
8 Panel lights	22 Mixture control switch (at control)	33 Distributor
9 Panel light switch	23 Mixture control thermostat switch (at cylinder head)	34 Headlamps
10 Speedometer	24 Petrol pump	35 Main beam
11 Ignition and lighting switch	25 Starter	36 Dip beam
12 Mixture control warning light	26 Starter solenoid switch	37 Side lamps
13 Oil pressure warning light	27 Dynamo	38 Snap connectors shown thus 
14 Oil pressure switch		

Note: On vehicles to the North American specification, the connections at the ignition and lighting switch are such that the sidelamps are extinguished when the headlamps are in use.


Key to flasher wiring diagram, Fig. P-7

To be used in conjunction with main wiring diagrams on Pages P-6 and P-8.

A—Wiring diagram for flashers only.

B—Wiring diagram using flashers and trailer socket. In this diagram the rear flashers are shown connected via the trailer socket and vehicle flasher plug; the plug must be in this position when trailer is not in use.

C—Wiring diagram using flashers and trailer. In this diagram vehicle flashers are disconnected and trailer plug in use, giving flashers on trailer.

1 Stop, tail lamp	7 Flasher unit	13 Dummy trailer socket
2 Snap connectors	8 Flasher warning light	14 Trailer stop, tail lamp
3 Ignition and light switch	9 Junction box	15 Trailer plug
4 Fuse box	10 Front flasher and side lamp	16 Vehicle flasher plug in dummy trailer socket
5 Stop lamp switch	11 Trailer socket	17 Wiring as diagram 'A' from this point
6 Flasher switch	12 Vehicle flasher plug	18 Snap connectors shown thus 

Key to cable colours

B—BLACK	N—BROWN	R—RED	W—WHITE
G—GREEN	P—PURPLE	U—BLUE	Y—YELLOW
RN—RED WITH BROWN, AND SO ON			

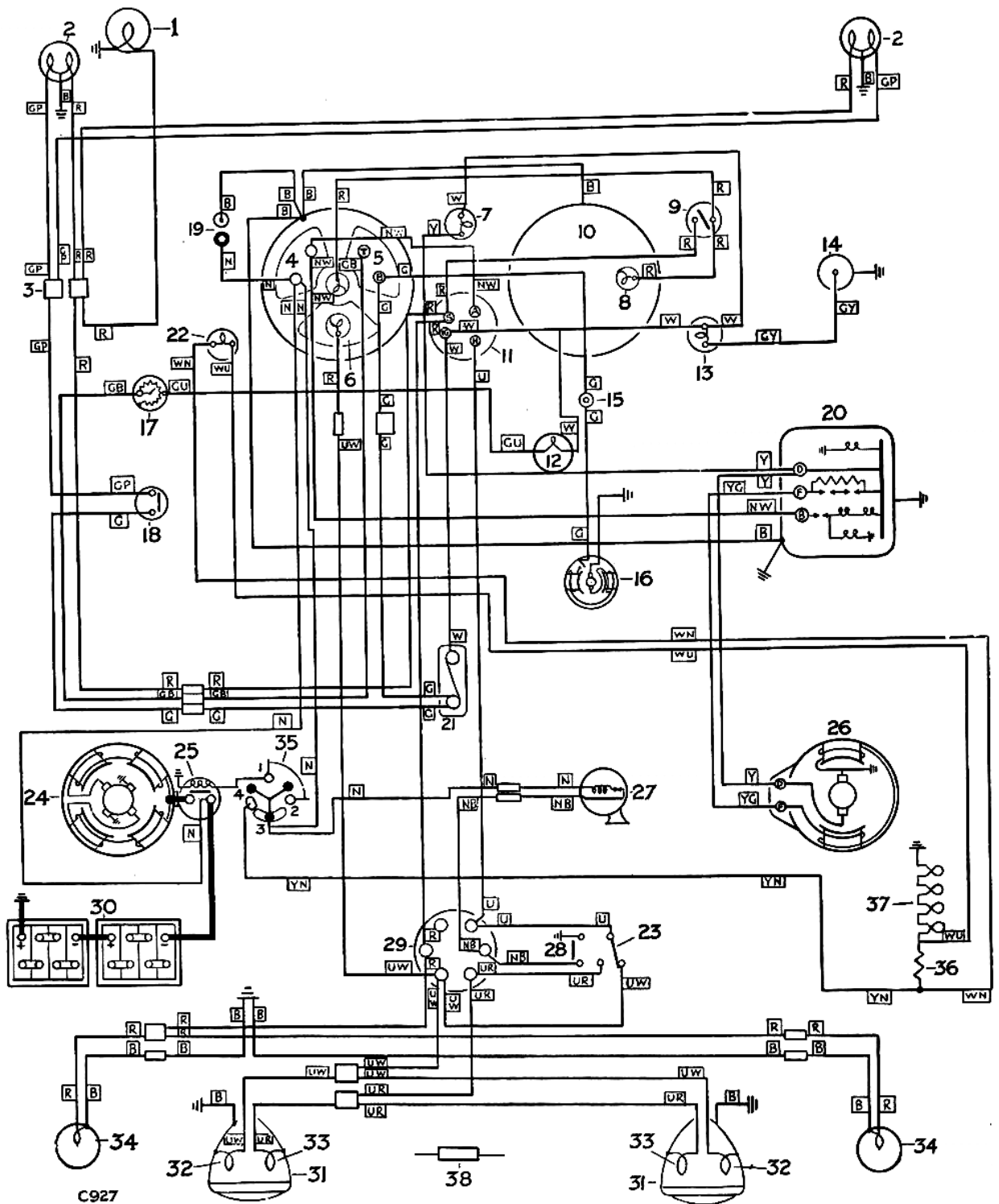


Fig. P-9—Wiring diagram, Diesel models.


Wiring diagrams

Note: On vehicles to the North American specification, the connections at the lighting switch are such that the sidelamps are extinguished when the headlamps are in use.

Key to cable colours

B—Black N—Brown R—Red W—White
 G—Green P—Purple U—Blue Y—Yellow
 RN—Red with brown and so on.

Key to Fig. P-9

- | | |
|--|---|
| 1 Rear number plate light | 20 Current control box |
| 2 Stop, tail lamps | 21 Fuse box (35 amp. fuse) |
| 3 Snap connectors for number plate light | 22 Heater plug warning light |
| 4 Ammeter | 23 Headlamp dipper switch |
| 5 Fuel level gauge | 24 Starter |
| 6 Headlamp main beam warning light | 25 Starter solenoid switch |
| 7 Dynamo warning light | 26 Dynamo |
| 8 Panel lights | 27 Horn |
| 9 Panel light switch | 28 Horn push |
| 10 Speedometer | 29 Junction box |
| 11 Electrical services and lighting switch | 30 6-volt batteries (positive earth) |
| 12 Fuel level warning light | 31 Headlamps |
| 13 Oil pressure warning light | 32 Main beam |
| 14 Oil pressure switch | 33 Dip beam |
| 15 Windscreen wiper plug and socket | 34 Side lamps |
| 16 Windscreen wiper | 35 Starter and heater plug switch |
| 17 Fuel tank level unit | 36 Resistance for heater plug |
| 18 Stop lamp switch | 37 Heater plugs |
| 19 Inspection lamp sockets | 38 Snap connectors shown thus  |

To dismantle**Operation P/10**

1. Remove the cover band, hold back the brush springs and lift the brushes from their holders.

Petrol models

2. Remove the starter drive, by withdrawing split pin from retaining nut on end of driving shaft and unscrewing the nut.
3. Remove the driving-end bracket, by unscrewing the two through bolts.
4. Withdraw the armature from the starter yoke.

Diesel models

5. Disconnect the copper link between the lower solenoid terminal and the starter motor casing.
6. Remove the solenoid securing bolts. Withdraw the solenoid from the drive-end bracket casting, carefully making sure that the solenoid plunger is free from the starter drive engagement lever.
7. Unscrew and withdraw the two through bolts from the commutator-end bracket, and remove bracket from the starter motor yoke.
8. Remove the rubber seal from the drive-end bracket.
9. Remove the nut securing the eccentric pin, on which the drive engagement lever pivots, and withdraw pin.
10. Split the armature and intermediate bracket assembly from the drive-end bracket.
11. Slide the drive assembly and engagement lever off the shaft, first removing the washer from the end of the armature shaft extension.
12. Slide the intermediate bracket and brake assembly off the shaft, first removing the retaining ring from the armature shaft extension.

To overhaul**Operation P/12****Brushes**

1. Check that the brushes move freely in their holders by holding back the brush spring and pulling gently on the flexible connectors. Any tendency to stick should be corrected by cleaning with a petrol-moistened cloth, or in extreme cases by the light use of a smooth file. If a brush is damaged or worn so that it does not make good contact on the commutator, all the brushes must be renewed.
2. Check the tension of the brush springs with a spring balance. The correct tension is 30 to 40 oz. (850 to 1134 grammes) and new springs must be fitted if the tension is low.
3. The flexible connectors are soldered to terminal tags; two are connected to brush boxes, and two are connected to the free ends of the field coils. These flexible connectors must be removed by unsoldering, and the flexible connectors of the new brushes secured in their places by soldering.

The new brushes being pre-formed, "bedding" to the commutator is unnecessary.

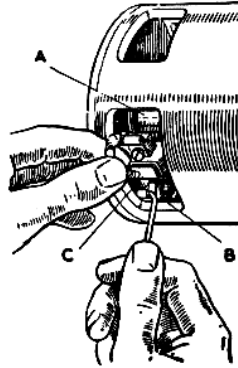


Fig. P-10—
Checking brushes.

A—Commutator.
B—Brush spring.
C—Brush.

Commutator

4. Clean the commutator with a petrol-moistened cloth. If necessary, rotate the armature and, using fine glass-cloth, remove pits and burned spots from commutator; remove abrasive dust with a dry air blast. If the commutator is badly worn, mount in a lathe, and, using a very sharp tool, take a light cut, taking care not to remove any more metal than necessary. The insulators between the commutator segments must not be undercut.

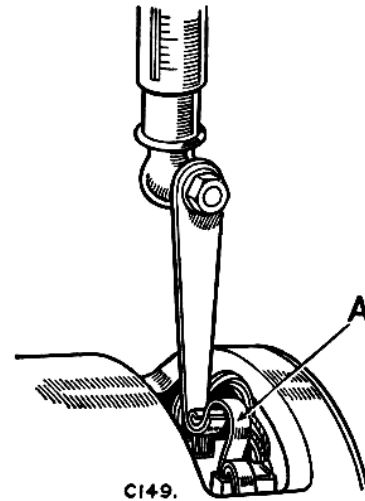


Fig. P-11—Testing brush spring tension.
A—Brush spring

Armature

5. If the armature is damaged, i.e. "lifted" conductors, or distorted shaft, it must be replaced. Never attempt to machine the armature core, or true a distorted armature shaft.

To assemble**Operation P/14**

1. Reverse the removal procedure.

Starter drive—1955-58 Petrol models

To strip **Operation P/20**

1. Withdraw split pin from nut on end of driving shaft and unscrew nut.
2. Remove main spring, washer, pinion and sleeve assembly, collar, push-off spring and spring restraining sleeve.

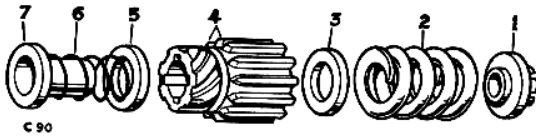


Fig. P-14—Layout of starter drive, 1955-58 Petrol models.

- | | |
|-------------------------------|-------------------------------|
| 1. Shaft nut. | 5. Collar. |
| 2. Main spring. | 6. Pinion restraining spring. |
| 3. Washer. | 7. Spring retaining sleeve. |
| 4. Screwed sleeve and pinion. | |

To assemble **Operation P/22**

1. Examine parts for excessive wear and replace as necessary. Assemble by reversing the removal procedure.

Starter drive—Diesel models

To strip **Operation P/24**

1. Remove the drive assembly from the armature shaft.
2. Remove the lock ring from the driving sleeve.
3. Lift the two halves of the engagement bush off the driving sleeve.
4. Using a suitable circlip extractor, remove the clutch retaining circlip from the barrel unit and withdraw the driving sleeve and clutch unit.
5. The clutch assembly can now be dismantled by removing all the parts from the driving sleeve—excepting the two pressure plates which are

held in position by the ring nut. To remove the ring nut, slide the driving sleeve on to the splined armature shaft and, using soft metal jaw plates, clamp the armature in a vice, file away the peened rims and remove ring nut. This locknut should only be removed if absolutely necessary. If removed, fit a new nut and peen the rim over the notch in the driving sleeve.

6. To remove the pinion from the helically splined sleeve, knock out the pinion retaining ring securing rivet. The retaining ring, pinion, cushion spring with cup washers and sleeve can now be separated.

To assemble **Operation P/26**

1. Reverse the stripping procedure.

Note: The correct cushion spring tension is 11 lb. (4,9 Kg.) measured with the spring compressed to $\frac{3}{8}$ in. (22,2 mm) length and 16 lb. (7,26 Kg.) with the spring compressed to $\frac{1}{2}$ in. (12,7 mm) length.

2. Check the slipping torque of the clutch as follows; fit the drive assembly on the splined armature shaft and clamp the armature between soft metal jaw plates in a vice.

Apply an anti-clockwise torque to the pinion with a suitable "torque wrench" fastened to the pinion teeth. The clutch should slip between 800-950 lb/in. (142,86 to 169,33 Kg/cm).

If the clutch slips at too low a torque figure, dismantle again, and add shims one at a time until the correct figure is obtained.

If the clutch does not slip between the torque limits given, again remove the circlip—dismantle and remove shims one at a time until the torque test gives correct figures.

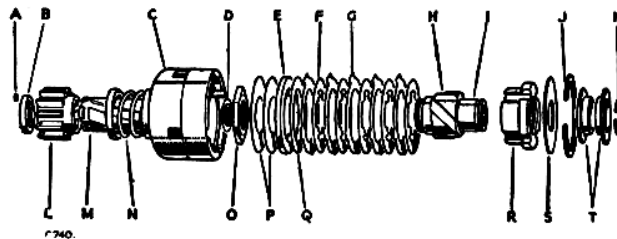


Fig. P-15—Exploded view of starter drive assembly, Diesel models.

- | | |
|---------------------------|--------------------------|
| A—Rivet | K—Lock ring |
| B—Pinion retaining spring | L—Pinion |
| C—Barrel unit | M—Helical splined sleeve |
| D—Thrust washer | N—Cushion spring |
| E—Backing ring | O—Ring nut |
| F—Clutch inner plate | P—Pressure plates |
| G—Clutch outer plate | Q—Shim |
| H—Helical splines | R—Moving member |
| I—Driving sleeve | S—Retaining washer |
| J—Circlip | T—Engagement bush |

3. The assembled clutch unit and lever mechanism must be capable of being pushed to the full extent of the set travel. The assembly must move along the armature shaft extension smoothly and freely, but without slackness.
4. Before fitting the drive assembly to the armature shaft, lightly smear the shaft and pack the space between the indented bearings inside the pinion sleeve, with a bentonite-based grease.

Solenoid (Diesel models)—to test

The solenoid is composed of two coils, namely, a closing coil, by-passed when the plunger is fully home, and a hold-on coil to retain the plunger in the fully home position.

To test individually, remove existing connections and with the use of a 4-volt DC supply (constant voltage), proceed as below:

Closing coil

Connect the supply between the solenoid terminal marked 'S T A' and the smaller centre terminal. This should cause a current of 14.8 amps. to 17.4 amps. to pass.

Hold-on coil

Connect the supply between the solenoid body and the small centre terminal. This should cause a current of 4.5-5.6 amps. to pass.

Note: These tests should not be carried out while the solenoid is hot. Do not attempt to repair a faulty solenoid, it should always be replaced.

Starter switch—Petrol models**To remove** **Operation P/28**

1. Disconnect the battery.
2. Disconnect the three leads from the switch.
3. Screw off the switch knob and the locking nut from the switch spindle.
4. Remove the switch from the dash panel.

To refit **Operation P/30**

Reverse the removal procedure, connecting the wires in accordance with the appropriate wiring diagram.

Starter switch—Diesel models

See Operation P/144.

Dynamo**To remove** **Operation P/32**

1. Disconnect the positive lead from the battery. Remove the air cleaner.
- Diesel only:** Completely detach the lead connecting both batteries, disconnect the negative lead from the L.H. battery and remove L.H. battery.

2. Disconnect the leads from dynamo.
3. Remove the bolts securing the dynamo to adjusting and anchor brackets.
4. Remove the belt from pulley and withdraw dynamo.

To refit **Operation P/34**

1. Reverse the removal procedure.
2. Adjust the driving belt tension: Petrol models, $\frac{1}{8}$ to $\frac{3}{8}$ in. (12-19 mm); and Diesel models, $\frac{3}{16}$ to $\frac{1}{4}$ in. (4-6 mm).

To strip **Operation P/36**

1. Take off the driving pulley.
2. Unscrew and withdraw the two through bolts.
3. The commutator-end bracket can now be withdrawn from the dynamo yoke. Do not lose the fibre thrust washer.
4. The driving-end bracket together with the armature can now be lifted out of the yoke.

To overhaul **Operation P/38****Brushes**

1. Lift the brushes up into the brush boxes and secure them there by positioning the brush spring at the side of the brush.
2. Fit the commutator-end bracket over the commutator and release the brushes.
3. Check that the brushes move freely in their holders by holding back the brush spring and pulling gently on the flexible connectors. Any tendency to stick should be corrected by cleaning with a petrol-moistened cloth, or in extreme cases by the light use of a smooth file. If a brush is damaged or worn so that it does not make good contact on the commutator, all the brushes must be renewed.
4. Check the tension of the brush springs with a spring balance. The correct tension is 22 to 25 oz. (624 to 709 grammes). In service it is permissible for this value to fall to 15 oz. (425 grammes). New springs must be fitted if the tension is low.
5. The new brushes being pre-formed, "bedding" to the commutator is unnecessary.

Commutator

6. Clean the commutator with a petrol-moistened cloth. If necessary, rotate the armature and, using fine glass-cloth, remove pits and burned spots from the commutator; remove abrasive dust with a dry air blast. If the commutator is badly worn, mount in a lathe, and, using a very sharp tool, take a light cut, taking care not to remove any more metal than necessary. Under-cut the insulators between the segments to a depth of $\frac{1}{32}$ in. (0.8 mm) with a hacksaw blade ground to the thickness of the insulator.

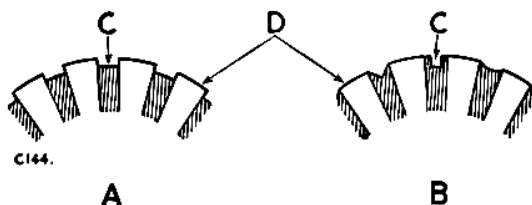


Fig. P-16—Undercutting commutator insulators.
A—Right. B—Wrong.

To assemble

Operation P/40

1. 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.
2. 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.
3. Fit the commutator-end bracket to the yoke so that the projection on the bracket locates in the yoke.
4. Refit the two through bolts.
5. Inject a few drops of any high quality medium viscosity (SAE 30) engine oil into the hole marked "Oil" at the end of the commutator bearing housing.

To check

Operation P/42

1. Check the driving belt tension, ensure that it is neither too tight nor too loose; Operation P/34. Adjust if necessary by slackening the pivot and adjusting link bolts, then move the dynamo outwards from the engine to tighten belt or inwards to loosen. Re-tighten the securing bolts.
2. Disconnect the cables from terminals of dynamo and connect the two terminals with a short length of wire.
3. Start the engine and run at normal idling speed. Clip the negative lead of a moving coil voltmeter, calibrated 0-20 volts, to one dynamo terminal and the other lead to a good earthing point on the yoke.
4. Gradually increase the engine speed; the voltmeter reading should rise rapidly and without fluctuation. Do not allow the voltmeter reading to reach 20 volts nor race the engine in an attempt to increase the voltage output. An engine speed of 1,000 r.p.m. should not be exceeded.
5. If there is no reading, check the brush gear as described in Operation P/38. A low reading of approximately $\frac{1}{2}$ -1 volt indicates a possible faulty field winding. Readings of 4 to 5 volts are probably attributable to faulty armature windings.

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

6. The dynamo being found serviceable, remove the link connecting the terminals and fit them to the respective connections. Ensure that the larger terminal is connected to control box terminal marked "D" and the smaller dynamo terminal to the control box terminal marked "F".

Voltage regulator—Petrol engines

To remove

Operation P/44

1. Disconnect the battery.
2. Disconnect all wires from the control box.
3. Remove the control box complete from the mounting plate.

To refit

Operation P/46

1. Reverse the removal procedure, connecting the wiring in accordance with the appropriate wiring diagram.

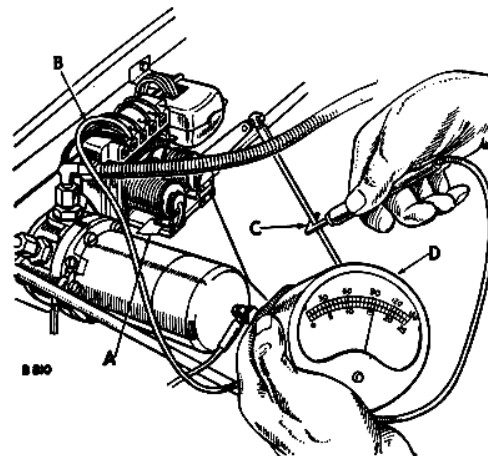


Fig. P-17— Checking voltage regulator, Petrol models.

A—Piece of paper. C—Earth.
B—D connection. D—Voltmeter.

To check

Operation P/48

1. Place a piece of paper between the cut-out contacts and connect a moving-coil voltmeter to the "D" terminal on the regulator and to a good earth (not the one on the regulator box). Start the engine and increase r.p.m. until the voltage remains constant, i.e., the regulator is controlling; the voltmeter reading should be 15.8 to 16.4 volts. If the regulating voltage is not correct, the vehicle should be examined by a qualified electrician. Should the regulator be reading correctly at the commencement of this test, the earth lead of the voltmeter should be transferred to the "E" connection on the

regulator box; the reading should be the same as that obtained with the previous earth. If there is any difference, i.e., the "E" connection on the regulator gives a lower reading, it will indicate a bad earth on the regulator box.

Current voltage regulator—Diesel models Locating faults on charging circuit

Ensure that the dynamo is functioning correctly and that the battery is in order, then proceed as follows:—

- Ensure that the wiring between battery and control box is in order by disconnecting the wire from control box terminal B and connecting the end of the wire removed to the negative terminal of a voltmeter. Connect the positive voltmeter terminal to an earthing point on the chassis. If a voltmeter reading is observed, the wiring is in order and the control box must be examined.
- If there is no reading, examine the wiring between battery and control box for defective cables or loose connections.
- Re-connect the wire to terminal B.

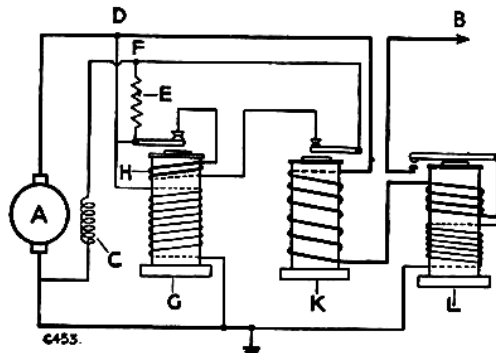


Fig. P-18—The charging circuit.

- | | |
|---|----------------------------|
| A—Armature. | F—Terminal on control box. |
| B—Terminal on control box—
to ammeter and battery. | G—Voltage regulator. |
| C—Field windings. | H—Bucking coil. |
| D—Terminal on control box. | K—Current regulator. |
| E—Resistor. | L—Cut-out relay. |

Regulator adjustments

The regulators are carefully set during manufacture to suit the normal requirements of standard equipment and, in general, further adjustments should not be necessary. However, if the battery does not keep in a charged condition, or if the dynamo output does not fall when the battery is fully charged, it may be advisable to check the settings and re-adjust if necessary.

Before disturbing any settings, it is important to check that a fault in the charging system is not due to a slipping dynamo belt or to a defective battery.

Electrical setting of voltage regulator

Operation P/50

- Disconnect control box terminal B. Connect a first-grade moving coil 0-20 voltmeter between terminal D and earth.

- Slowly increase the speed of the engine until the voltmeter needle flicks and steadies. This should occur at a reading between 14.2 and 14.8 volt. If it does not, stop the engine and remove the control box cover.
- Slacken the adjustment screw locking nut (see Fig. P-20) and turn the screw in a clockwise direction to raise the voltage setting, or anti-clockwise to lower the setting. Turn the screw a fraction of a turn only at a time and re-tighten the locknut.
- Repeat this open-circuit voltage test until the correct setting is obtained.

Re-make the original connections.

Note: When the dynamo is run at a high speed on open circuit, it builds up a high voltage. Therefore, when adjusting the regulator, do not run the engine up to more than half throttle or a false voltmeter reading will be obtained. The adjustment should be completed within 30 seconds, otherwise heating of the regulator winding may cause an inaccurate setting to be made.

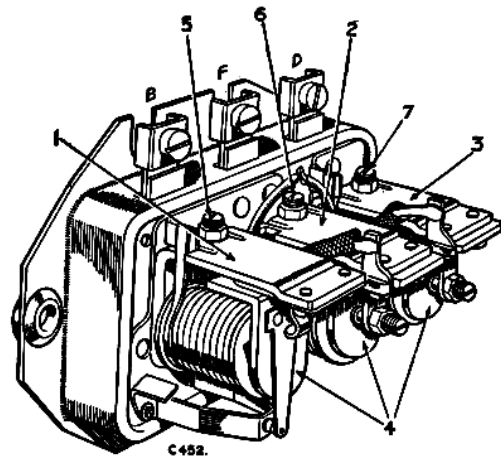


Fig. P-19—Current voltage regulator.

- | | |
|----------------------------|----------------------------|
| 1 Cut-out. | 6 Current adjusting screw. |
| 2 Current regulator. | 7 Voltage adjusting screw. |
| 3 Voltage regulator. | B—Terminal. |
| 4 Armature. | F—Terminal. |
| 5 Cut-out adjusting screw. | D—Terminal. |

Electrical setting of current regulator on vehicle

Operation P/52

- When setting the current regulator on the vehicle, the dynamo 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. To do this, the voltage regulator contacts should be short-circuited with a clip large enough to bridge the outer armature assembly securing screw and the insulated fixed contact bracket, as shown in Fig. P-20.

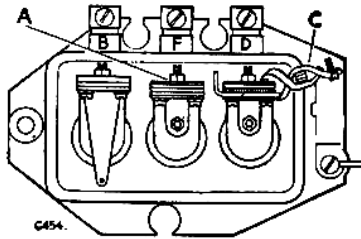


Fig. P-20—Short-circuiting voltage regulator contacts.

- A—Current regulator adjusting screw.
- B—Terminal.
- C—Clip—short-circuiting.
- D—Terminal.
- F—Terminal.

2. Disconnect the cable from control box terminal B and connect a first-grade moving coil 0-40 ammeter between this cable and terminal B. Switch on all lamps and accessories. This will prevent the voltage of the system rising when the engine is started.
3. With the dynamo running at approximately 4,000 r.p.m., the ammeter needle should be steady and indicate a current of 22 amp. If it does not, the unit must be adjusted in a manner similar to that described for the voltage regulator.

Re-make the original connections.

Electrical setting of cut-out relay

Operation P/54

1. Connect a first-grade moving coil 0-20 voltmeter between control box terminal D and earth. Switch on the headlamps and slowly increase the engine speed from zero. Closure of the contacts, indicated by a slight drop in the voltmeter reading, should occur between 12.7 and 13.3 volts. If it does not, the unit must be adjusted in a manner similar to that described for the voltage regulator.

Note: When setting the cut-in voltage at a test bench, a suitable load resistor passing about 6 amperes should be connected between control box terminal B and earth. This will cause the voltmeter needle to flicker at the instant of contact closure.

2. Disconnect the cable from control box terminal B. Connect a first-grade moving coil 0-20 voltmeter between this terminal and earth. Run the engine up to speed and then slowly decelerate, noting the instant when the voltmeter reading drops to zero. This should occur between 9.5 and 10.5 volts. If it does not, adjust by carefully bowing the legs of the fixed contact post. Repeat the test and, if necessary, re-adjust until the armature releases at the voltage specified.

Cleaning contacts

Operation P/56

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

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

Mechanical setting of air gaps—Voltage and current regulators

Operation P/58

All air-gap settings are accurately adjusted before the units leave the factory, and should require no further attention. If, however, an armature is removed for any reason, care must be taken to obtain the correct air-gap settings on re-assembly.

1. Slacken the two armature assembly securing screws so that the armature is loosely attached to the regulator frame.
2. Slacken the fixed contact locking nut and unscrew the fixed contact adjustment screw until it is well clear of the armature moving contact.
3. Slacken the voltage (or current) adjustment screw locking nut and unscrew the adjustment screw until it is well clear of the armature tension spring.
4. Using a 0.015 in. thick flat steel gauge, wide enough to cover completely the core face, insert the gauge between the underside of the armature and the copper disc. Take care not to turn up or damage the edge of this disc.
5. Press the armature squarely down against the gauge and re-tighten the two armature assembly securing screws.
6. With the gauge still in position, screw in the fixed contact adjustment screw until it just touches the armature moving contact. Re-tighten the locking nut.
7. Carry out the electrical settings, Operation P/52 or 54 as applicable.

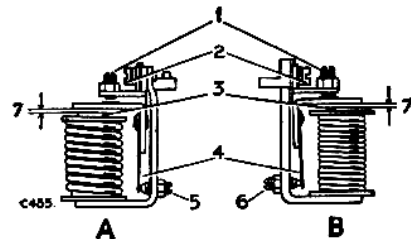


Fig. P-21—Voltage and current regulators.

- A—Voltage regulator.
- B—Current regulator.
- 1—Fixed contact adjustment screws.
- 2—Armature assembly securing screws.
- 3—Cores.
- 4—Armature tension springs.
- 5—Voltage adjustment screws.
- 6—Current adjustment screws.
- 7—.015 in. (0.381 mm).

Setting cut-out relay air gap **Operation P/60**

1. Slacken the two armature assembly securing screws so that the armature is loosely attached to the cut-out frame.
2. Slacken the adjustment screw locking nut and unscrew the adjustment screw until it is well clear of the armature tension spring.

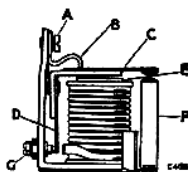


Fig. P-22—Cut-out relay.

A—Armature assembly securing screw.
 B—Armature back stop.
 C—Contact blade.
 D—Armature tension spring.
 E—Core.
 F—Fixed contact post.
 G—Adjustment screw.

3. Press the armature squarely down against the copper-sprayed core face and re-tighten the two armature assembly securing screws. No gauge is necessary.
4. Press the armature down against the core face and adjust the armature back stop so that a 0.018 in. (0,45 mm) gap is obtained between the tip of the back stop and the contact blade.
5. Insert a 0.010 in. (0,25 mm) thick flat steel gauge between the underside of the armature and the copper-sprayed core face. The gauge should be inserted from the side of the core nearest the fixed contact post. The leading edge of the gauge should not be inserted beyond the centre line of the core face. Press the armature down against the gauge and check the cut-out contacts. These should be just touching. If necessary adjust the height of the fixed contact by carefully bowing the legs of the fixed contact post.
6. Reset the cut-in voltage (Operation P/54) and lock the adjustment screw.

To remove **Operation P/62**

1. Disconnect the positive lead of R.H. battery and the leads to regulator box.
2. Remove the securing bolts and withdraw the regulator unit.

To refit **Operation P/64**

1. Reverse removal procedure, connecting wiring in accordance with the appropriate wiring diagram.

Headlamp, early models**To remove** **Operation P/66**

1. Remove the two bolts and clamps securing the radiator grille and lift out the grille from its sockets.
2. Slacken the fixing screw at the top of the lamp and swing it upwards. Remove the front from the top of the lamp first.
3. The reflector is secured to the lamp by means of a rubber bead and can now be withdrawn.

4. Withdraw the two screws securing the wiring and detach the wires.
5. Remove the large nut and shakeproof washer securing the headlamp to its bracket and remove the lamp.

Headlamp, late models**To remove** **Operation P/68**

1. Remove the securing screw from the lower side of rim and ease the rim off from the bottom.
2. Remove the dust-excluding rubber.

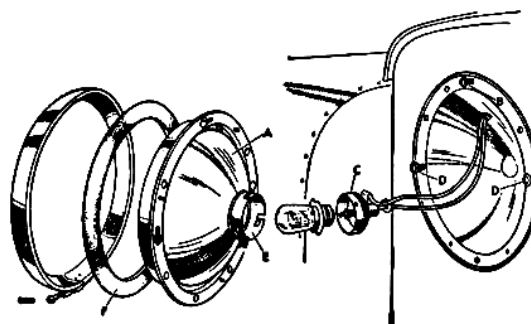


Fig. P-23—Headlamp.

A—Light unit.
 B—Vertical setting adjusting screw.
 C—Back shell.
 D—Horizontal setting adjusting screws.
 E—Bulb holder.
 F—Dust-excluding rubber.

3. Press in the light unit against the tension of the screw springs and turn in an anti-clockwise direction until the heads of the screws can be disengaged through the slotted holes in the light unit rim.
4. Disconnect the wiring from the bulb socket assembly.
5. Remove the headlamp body complete with grommet from the radiator grille panel.

NOTE:**Non-split type headlamp rim****To remove** **Operation P/70**

Where fitted, the non-split type rim is removed by removing the set screw, located at the bottom of the rim, and then springing the rim off. The unit is then removed as in Operation P/68.

To refit **Operation P/72**

Spring the rim back into position, having first replaced the dirt excluder rubber, and replace set screw and tighten.

Replacement bulbs, 1948-53

Position	Make and Type	Voltage	Wattage	
Headlamps R.H. (Home models)	Lucas No. 162	12	36 Single filament	} Vertical fluted glass in light unit
Headlamps L.H. (Home models)	Lucas No. 300	12	36/36 Double filament (dip to left)	
Headlamps (R.H.D. Export models)	Lucas No. 300	12	36/36 Double filament (dip to left)	} Block glass in light unit
Headlamps (L.H.D. Export models except North American vehicles)	Lucas No. 301	12	36/36 Double filament (dip to right)	
Headlamps (R.H.D. models)	Lucas No. 354	12	42/36 Double filament (dip to left)	} Block glass in light unit
Headlamps (L.H.D. models except Europe)	Lucas No. 355	12	42/36 Double filament (dip to right)	
Headlamps (Europe except France)	Lucas No. 360	12	45/35 Double filament (Duplo)	} Block glass in light unit
Sidelamps (dash fixing)	Lucas No. 207	12	6 Single pole	
Sidelamps (wing fixing)	Lucas No. 989	12	6 Single pole	
Stop/tail lamps (except North American vehicles)	Lucas No. 207	12	6 Single pole	
Stop/tail lamps (North American vehicles)	Lucas No. 361	12	18/6 Double filament	
Instrument panel lights	Lucas No. 207	12	6 Single pole	
Ignition and mixture control warning lights	Lucas No. 970	2.5	.5 M.E.S.	} Alternatives, check before ordering
	Lucas No. 987	12	2.2 M.E.S.	
	Lucas No. 987	12	2.2 M.E.S.	
Oil pressure and headlamp warning lights	Lucas No. 987	12	2.2 M.E.S.	
Rear number plate lamp	Lucas No. 989	12	6 Single pole	

Replacement bulbs, 1954

Position	Make and Type	Voltage	Wattage
Headlamps (R.H.D. models)	Lucas No. 354	12	42/36 Double filament (dip to left)
Headlamps (L.H.D. models except North America and Europe)	Lucas No. 301	12	36/36 Double filament (dip to right)
Headlamps (Europe except France)	Lucas No. 360	12	45/35 Double filament (Duplo) (vertical dip)
Headlamps (France and North America)	Special	12	—
Sidelamps	Lucas No. 222	12	4
Stop/tail lamps (except North American vehicles)	Lucas No. 207	12	6
Stop/tail lamps (North American vehicles)	Lucas No. 361	12	18/6 Double filament
Rear number plate lamp	Lucas No. 222	12	4
Instrument panel lights	Lucas No. 987	12	2.2 M.E.S.
Warning lights	Lucas No. 987	12	2.2 M.E.S.

Replacement bulbs, 1955-58

Position	Make and Type	Voltage	Wattage
Headlamps (R.H.D. models)	Lucas No. 354	12	42/36 Double filament (dip to left)
Headlamps (L.H.D. models except North America and Europe)	Lucas No. 355	12	42/36 Double filament (dip to right)
Headlamps (Europe except France)	Lucas No. 370	12	45/40 Double filament (Duplo) (vertical dip)
Headlamps (France and North America)	Special	12	—
Sidelamps	Lucas No. 222	12	4
Stop/tail lamps	Lucas No. 380	12	21/6 Double filament
Rear number plate lamps (North American vehicles)	Lucas No. 222	12	4
Instrument panel lights	Lucas No. 987	12	2.2 M.E.S.
Warning lights	Lucas No. 987	12	2.2 M.E.S.

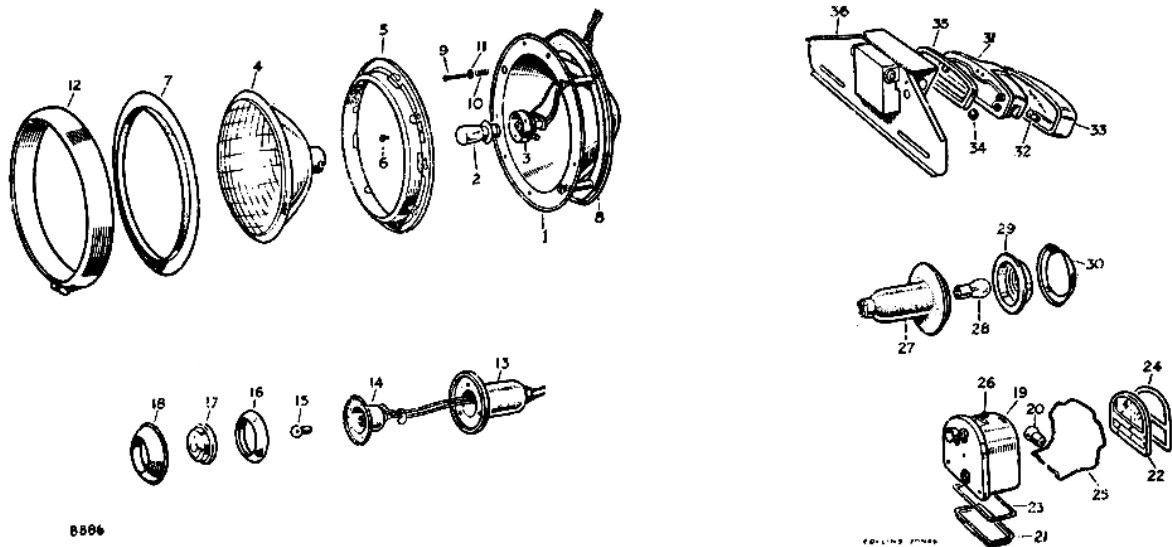


Fig. P-24—Layout of lamps.

- | | | | |
|----|----------------------------------|----|--|
| 1 | Body for headlamp | 19 | Stop tail lamp complete |
| 2 | Bulb for headlamp | 20 | Bulb (12v. 6w.) for stop tail lamp |
| 3 | Adaptor for bulb, double contact | 21 | Glass for number plate illumination, white |
| 4 | Light unit, "block-pattern" lens | 22 | Glass for stop and tail lights, red |
| 5 | Rim complete for light unit | 23 | Gasket for number plate illumination glass |
| 6 | Special screw for light unit rim | 24 | Gasket for stop tail glass |
| 7 | Rubber gasket for headlamp rim | 25 | Spring retaining glasses |
| 8 | Gasket for body | 26 | Screw fixing body |
| 9 | Special screw | 27 | Rubber body |
| 10 | Spring for screw | 28 | Bulb for stop tail lamp |
| 11 | Cup washer for screw | 29 | Glass |
| 12 | Rim for headlamp, vehicle colour | 30 | Rim for glass |
| 13 | Body | 31 | Number plate lamp |
| 14 | Bulb interior | 32 | Bulb for number plate lamp |
| 15 | Bulb for side lamp | 33 | Glass |
| 16 | Gasket for body | 34 | Rubber grommet for wire |
| 17 | Glass | 35 | Rubber gasket for lamp |
| 18 | Rim complete | 36 | Support for lamp |

To refit, adjust and re-focus, early models**Operation P/74**

1. Replace the headlamps by reversing the sequence of operations detailed for removal.
2. The setting of the headlamps should be checked by placing the vehicle in front of a blank wall at the greatest possible distance, taking care that the surface on which the vehicle is standing

is not sloping relative to the wall. The lamps are fitted with dual filament bulbs and must be set so that the main beams of light are parallel with the road and with each other.

3. Slacken the fixing nut at the top of the lamp and move the lamp on its adjustable mounting to the required position. Tighten the locking nut. The mounting is accessible when the bonnet top panel is raised.

- If Lucas Genuine Spare Bulbs are fitted it should be unnecessary to alter the setting of the lamp when a bulb is renewed. If, however, an ordinary bulb has to be fitted, it may be necessary to re-focus. If the lamp does not give a uniform long range beam without a dark centre, the bulb needs adjusting; when focusing it is an advantage to cover one lamp while testing the other.

To re-focus, slacken off the screw on the clip and move the bulb backwards and forwards until the best lighting is obtained.

Tighten the clamping clip after the best position for the bulb has been found.

To refit and adjust, late models

Operation P/76

- Reverse the removal procedure.
- Adjustment in a vertical plane is effected by turning the spring-loaded screw at the top of the lamp body.
- Adjustment in a horizontal plane is made by means of the screw at each side of the unit.

To adjust headlamps, using beam setting board

Operation P/78

- Mark on a board the dimensions given in Fig. P-25 and position the vehicle, unladen, on level ground.
- Place the board 12 ft. (365 cm) in front of the headlamps, ensuring that it is at right angles to the vehicle centre line and that the centre line on board is in the same plane as vehicle centre line.

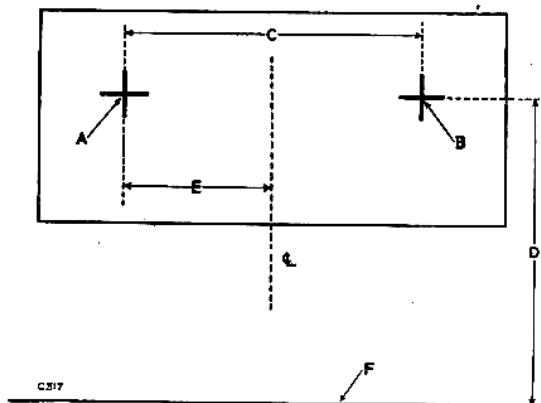


Fig. P-25—Headlamp beam setting board, 1954-58 models

- A—Concentrated area of light—L.H. headlamp.
- B—Concentrated area of light—R. H. headlamp.
- C—20 in. (508 mm).
- D—(86 and 88 models) 35½ in. (902 mm).
(107 and 109 models) 37¼ in. (946 mm).
- E—10 in. (254 mm).
- F—Ground level.

- Adjust the beam by turning the screws indicated in Fig. P-23 until the area of concentrated light corresponds with the marks on beam setting board.

Side lamp, dash fixing type

To remove Operation P/80

- Slacken the screw at the top of the lamp locating it in the dash panel.
- Turn the lamp in a clockwise direction until the tongue at the bottom is disengaged from the dash and withdraw the lamp front and reflector.
- Disconnect the feed wire and remove the side lamp complete.

To refit Operation P/82

- Reverse the removal procedure.

Side lamp, wing fixing type

To remove Operation P/84

- Disconnect the leads at the snap connectors, alongside the radiator cowl.
- Lever the rubber bead away from the lamp and remove the rim and glass from the bottom of the rim lamp.
- If required, remove the bulb.
- Remove the lamp and grommet from the wing.

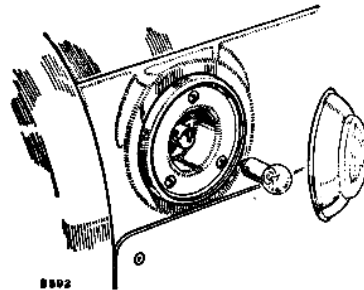


Fig. P-26—
Side lamp

To refit Operation P/86

Reverse the removal procedure.

Stop and tail lamp—1954 models

(Except North American vehicles)

To remove Operation P/88

- Slacken the securing screw and swing open the stop and tail lamp cover; disconnect the wiring from the connectors.
- Remove the lamp complete from the rear of the body.

To refit Operation P/90

Reverse the removal procedure, reconnecting the wiring in accordance with the wiring diagram.

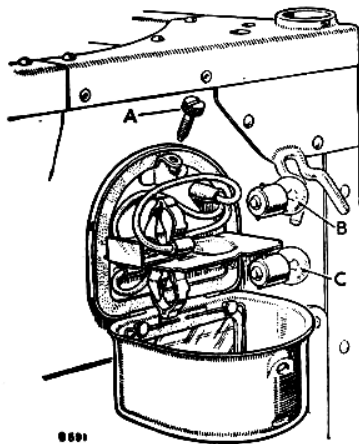


Fig. P-27—
Stop, tail lamp—
1954 models
A—Securing screw.
B—Stop bulb.
C—Tail lamp bulb.

Stop and tail lamp—1955-57 models

To remove Operation P/92

1. Disconnect the three snap connectors securing the tail lamp harness to the main wiring harness, beneath the wheel box, adjacent to the chassis frame side member.

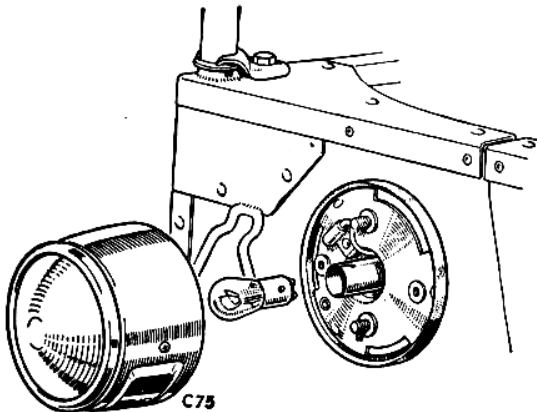


Fig. P-28—Stop, tail lamp—1955-58 models.
A—Securing bolt.
B—Double filament bulb.
C—Cover.

2. Withdraw the tail lamp harness through rubber grommet in wheel box.
3. Remove the two securing bolts and locking washers on the inside of body rear panel, then withdraw the lamp and harness complete.

To refit Operation P/94

1. Reverse the removal procedure. Reconnect harness in accordance with wiring diagram.

Stop and tail lamp—1954 models (North American vehicles)

To remove and refit Operation P/96

See Operations P/88 and P/90.

Rear number plate lamp (North American vehicles only)

To remove Operation P/98

1. Remove the small screw in the centre of the lamp and remove the cover.
2. Disconnect the wiring.
3. Remove the lamp from the rear number plate support.

To refit Operation P/100

1. Reverse the removal procedure.

Horn

The horn is adjusted on initial assembly and should not require attention for some considerable time.

Ascertain that horn failure or faulty note is not due to some outside source, such as a discharged battery, loose connections or loose horn mounting, before carrying out any adjustment.

Horn—80, 86 and 107 models

To remove Operation P/102

1. R.H.D. models. Remove the radiator grille.
2. With the ignition switched off, disconnect the wires from the horn.
3. Remove the horn complete from the front chassis cross-member.

To refit Operation P/104

Reverse the removal procedure.

Horn—88 and 109 models

To remove Operation P/106

1. Lift bonnet.
2. With the ignition switched off, disconnect the wires from the horn.
3. Remove horn from bonnet hinge position.

To refit Operation P/108

Reverse the removal procedure.

Adjustment of windtone horn

Operation P/110

Lucas

1. Disconnect the leads at the snap connectors adjacent to the horn, then remove the securing bolts and withdraw the unit.
2. Remove the dome and dome securing clip, clean the points and adjust them until they are almost touching, then turn the adjusting screw half a turn to increase the gap.

- If adjustment of the horn does not produce satisfactory results, the horn should be returned to the makers.

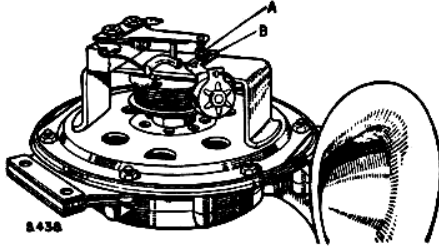


Fig. P-29—Horn adjustment. Lucas.
A—Adjustable contact. B—Locknut.

Clear Hooters

- Remove the horn—Operation P/106, then remove the dome and dome clip.
- Connect the horn leads to a 12-volt battery and adjust nut (A) until maximum volume is obtained, then lock in position with nut (B). See Fig. P-30.

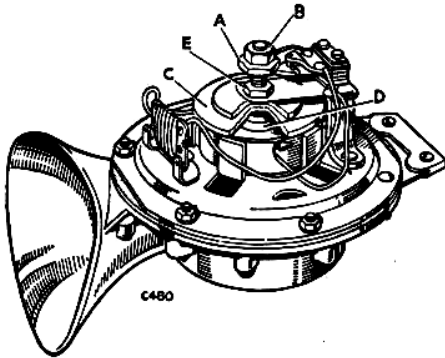


Fig. P-30—Horn adjustment. Clear Hooters.
A—Adjusting nut. C—Armature.
B—Locknut. D—Magnet core.
E—Locknut—armature.

- Adjust the air gap between armature (C) and the magnet core face (D) to .045-.050 in. (1,1-1,3 mm) by slackening nut (E) and turn the armature (C) clockwise or anti-clockwise until the recommended distance is obtained, then tighten nut (E). The current consumption with horn correctly adjusted is 9 amperes.

Dip switch and horn button

To remove (86 and 107 models)

Operation P/112

- Disconnect the wires protruding from the bottom of the steering column by withdrawing the wires from the junction box on the dash.
- Slacken the clamp bolt holding the stator tube at the bottom of the steering column.
- Withdraw the stator tube, horn button and dipper switch complete.

- Remove the horn button and dipper switch from the stator tube.

To refit (86 and 107 models) Operation P/114

Reverse the removal procedure, spacing the rubber and felt bushes on the stator tube before insertion in the control column, as these eliminate vibration noises.

Dip switch, to remove (88 and 109 models)

Operation P/116

- Disconnect the dip switch leads at junction box.
- Remove the securing screws and withdraw the switch from toe board.

Dip switch, to refit (88 and 109 models)

Operation P/118

- Reverse removal procedure and reconnect the leads in accordance with wiring diagram.

Horn button, to remove (88 and 109 models)

Operation P/120

- Remove the securing screws and withdraw the horn button and leads.
- Disconnect the leads if necessary.

Horn button, to refit (88 and 109 models)

Operation P/122

- Reverse removal procedure.

Ignition—Petrol models

Distributor

To remove.

Operation P/124

- Pull off the sparking plug covers and detach the plug leads; disconnect the vacuum pipe, L.T. and H.T. leads.
- Remove the set bolt securing the distributor clamp to the distributor mounting plate.
- Remove the distributor complete with clamp.

To refit

Operation P/126

- Reverse the removal procedure; set the contact breaker gap to .014 to .016 in. (0,35 to 0,40 mm). The driving spigot on the distributor drive shaft is offset, so eliminating any possibility of mistiming the engine on replacement.

Coil

To remove

Operation P/128

- With the ignition switched off, disconnect the high and low tension leads from the coil.
- Remove the coil from the dash panel.

To refit

Operation P/130

- Reverse the removal procedure.

Stop lamp switch**To remove** **Operation P/132**

1. With the ignition switched off, disconnect the two wires from the stop lamp switch.
2. Unhook the spring connecting the switch to the brake lever.
3. Remove the switch from the chassis bracket.

To refit **Operation P/134**

Reverse the removal procedure.

Heater plugs—Diesel models

The heater plugs do not require any maintenance. However, if at any time when the heater plugs are in use, the warning light glows very brightly, a short circuit in the system is indicated. No light will indicate an open circuit.

Note: Great care must be taken not to twist the centre terminal when removing heater plug leads.

Fault location on heater plug circuit**Operation P/136**

- (a) Examine the fuse at terminal A3 and replace if "blown".
- (b) Failure of the warning light bulb will not affect the heater plug circuit, but the bulb should be replaced when conveniently possible—Section Q.
- (c) Connect one lead of the test lamp to the earth lead terminal on No. 1 heater plug and the other lead to the L.H. battery negative terminal, whereon the bulb should light. If the bulb remains unlit, a corroded, loose, or disconnected heater plug earth lead is indicated.

Move the test lamp lead from the earth terminal on No. 1 heater plug, to the terminal also on No. 1 plug, to which the inter-connecting lead is attached. If the plug is serviceable the bulb will light but a broken heater plug filament will be indicated by the lamp remaining unlit.

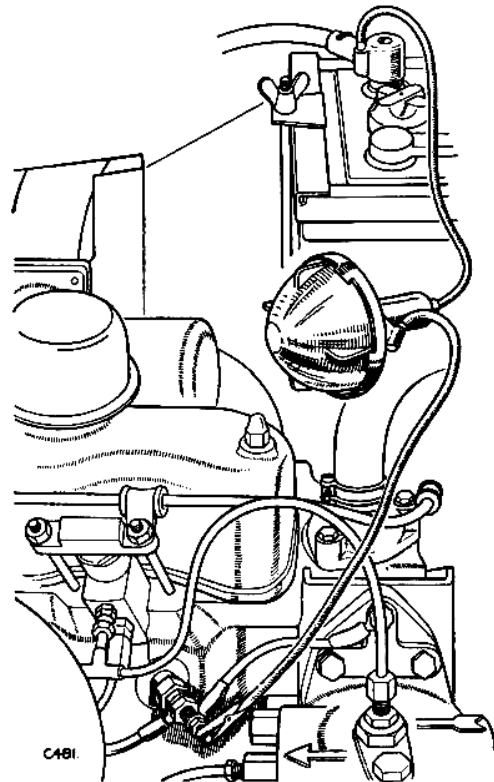
Check the remaining plugs in the same manner until the fault is located.

If the heater plugs are found serviceable check each terminal of the resistance unit in the same way.

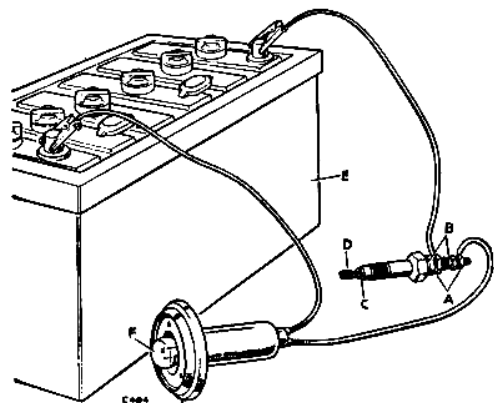
Removal, cleaning and inspection of heater plugs**Operation P/138**

The shape of the heater plug element and its position in relation to the plug body is important and care must therefore be taken when fitting, removing or cleaning the plug, to avoid distortion or damage to the element.

1. Disconnect the leads from plugs, using two spanners at each terminal to prevent the central rod or insulating tube twisting.

**Fig. P-31—Checking heater plug circuit.**

2. Remove carbon from base of heater plug to avoid possible short circuiting of the element. Do not sandblast.
3. Examine the element for signs of fracture or severe heat attack and the seating for scores. Plugs with fractured element must be replaced. Where scoring of the seating is sufficient to allow gas leakage or erosion of the element such that a fracture is likely to occur, then a replacement plug must be fitted.

**Fig. P-32—Testing heater plug circuit.**

- | | |
|------------------|--------------------|
| A—Terminal nuts. | D—Element. |
| B—Insulation. | E—12 volt battery. |
| C—Seating. | F—Bulb (12. v.) |

4. Test the plug internal circuit for continuity, by connecting it and a 12 volt side-lamp bulb in circuit, to a 12 volt battery.

The inclusion of a bulb in circuit is **essential**.

5. Ensure that the terminal nuts and threads are clean and that the thread at base of plug is free of carbon, then refit the plugs and tighten.

Note: Make sure the shakeproof washers are fitted under the terminal in order to maintain good electrical contact.

Replace the leads in accordance with the wiring diagram and tighten the terminals, using two spanners to each terminal.

Resistance--heater plugs

To remove **Operation P/140**

1. Disconnect the leads from resistance.
2. Remove the securing screws and withdraw the unit.

To refit **Operation P/142**

1. Reverse removal procedure.

Starter and heater plug switch—Diesel models

To remove **Operation P/144**

1. Disconnect the positive lead from the right-hand battery.
2. Disconnect the leads from the back of the starter switch.
3. Remove the large securing nut from fascia side of panel.
4. Withdraw switch.

To refit **Operation P/146**

1. Reverse removal procedure, connecting leads in accordance with the appropriate wiring diagram.

Fuel gauge tank unit

No adjustment or repair is permissible to the fuel contents gauge tank unit. If the gauge reads wrongly or—Diesel models—the fuel level warning light does not glow when two or less gallons only remain in the tank, the lead(s) at the tank unit should be checked for security. If the fault is not corrected by tightening the terminal(s), remove and test the warning light and check the tank unit by substitution.

To renew **Operation P/148**

1. Disconnect the battery.
Diesel—disconnect the positive lead from R.H. battery.
2. Drain off the fuel.
3. Remove the right-hand seat and raise the locker.
4. Disconnect the wire from the tank unit.
5. Remove the gauge unit from the fuel tank complete with joint washer.
6. Fit the new unit and cork washer; complete

the assembly by reversing the removal procedure, connecting lead(s) in accordance with the appropriate wiring diagram.

Fuse and junction boxes

To remove **Operation P/150**

1. Disconnect the battery.
Diesel—Disconnect the positive lead from the R.H. battery.
2. Remove the cover and disconnect the leads.
3. Remove the securing screws and withdraw the unit.

On certain early vehicles, the fuse is housed in a separate box mounted adjacent to the voltage control box. To remove, proceed as follows:—

1. Disconnect the battery.
2. Remove the fuse box cover, by springing aside the cover clip.
3. Disconnect all wires from the fuse box by loosening the grub screws.
4. Remove the two screws and nuts securing the fuse box to the mounting plate and remove the fuse box.

To refit **Operation P/152**

1. Reverse removal procedure and reconnect the leads in accordance with wiring diagram.

Windscreen wiper motor

To remove **Operation P/154**

1. Slacken the wiper arm fixing nut and tap sharply to release the clamp collet, then remove the wiper arm and blade.
2. With the key in lamp switch turned "off", disconnect the leads from wiper motor.
3. Remove the securing nuts, washers, grommets, wiper blade stop, rubber mounting block and brass brushes, then withdraw the motor.

To refit **Operation P/156**

1. Reverse removal procedure, but do not lock the wiper arm blade until the sweep is correctly adjusted.

Mixture control thermostat switch—Petrol engines

To renew **Operation P/158**

1. Disconnect the wire from the thermostat switch.
2. Remove the switch from the cylinder head rear end cover.
3. Check the switch: Contact is made at 51-54°C (124-129°F); contact is broken at 47-53°C (117-127°F).
4. Fit the new switch by reversing the removal procedure.

Note: Renewal of the second switch in the mixture control warning light circuit (at the manual control) is dealt with in Section Q.

DEFECT LOCATION

Symptom, Cause and Remedy

A—BATTERY DISCHARGED

1. Battery unserviceable—*Renew.*
2. Battery leads corroded or loose—*Clean and tighten.*
3. Voltage or current voltage regulator faulty—*Rectify or renew.*
4. Dynamo faulty—*Rectify.*

B—DYNAMO NOT CHARGING OR CHARGING AT REDUCED RATE

1. Slipping fan belt—*Tighten.*
2. Dynamo loose on mounting—*Tighten.*
3. Continuity of circuit broken—*See Page P-16.*
4. Brushes excessively worn—*Renew.*
5. Commutator burnt or worn unevenly—*Skim the surface in lathe.*
6. Commutator glazed—*Clean with fine glass paper.*
7. Voltage or current voltage regulator faulty—*Rectify or renew.*
8. Dynamo internal circuit faulty—*Dismantle and check.*

C—LAMPS DIM WHEN ENGINE REVOLUTIONS ARE LOW.

1. Faulty earth—*Check earthing points of lamps affected.*
2. Battery in a low state of charge—*See Symptom A.*

D—BULBS FAIL FREQUENTLY

1. Battery in a low state of charge—*See Symptom A.*
2. Voltage or current voltage regulator faulty—*Rectify or renew.*
3. Loose connections—*Tighten.*
4. Wrong type of bulb used—*See bulb chart.*

E—HORN FAILURE.

1. Loose connections—*Tighten.*
2. Burnt or loose contact points—*Clean and adjust. See Page P-23.*

F—INSTRUMENT PANEL LIGHTS FAIL—*See Section Q.*

Ga—STARTER FAILS TO OPERATE—PETROL MODELS.

1. Stiff engine, indicated by inability to turn by hand—*Locate and remedy.*
If the engine can be turned by hand, the trouble may be due to:—
2. Battery discharged—*Start by hand. Charging the battery either by a long period of daylight running, or from independent electrical supply.*
3. Broken or loose connection in starter circuit—*Check and tighten all battery, starter and starter switch connections and check the cables connecting these units for damage.*
4. Greasy, charred or glazed commutator—*Clean.*
5. Brushes worn, not fitted correctly or wrong type—*Renew.*
6. Brushes sticking in holders or incorrectly tensioned—*Rectify.*
7. Starter pinion jammed in mesh with flywheel—*Rotate the squared end of the starter shaft with a spanner to free the pinion.*

Gb—STARTER FAILS TO OPERATE—DIESEL MODELS

1. Battery discharged—*Re-charge.*
2. Starter/heater switch unserviceable—*Renew.*
3. Wiring at starter/heater switch loose—*Tighten.*
4. Solenoid unserviceable—*Renew.*
5. Wiring at solenoid loose—*Tighten.*
6. Brushes unduly worn—*Renew.*
7. Brush springs fatigued—*Renew.*
8. Commutator greasy or dirty—*Clean with petrol-moistened cloth.*
9. Commutator burnt or worn unevenly—*Remove armature, and skim.*
10. Fault in internal circuit—*Dismantle and check.*
11. Starter solenoid badly earthed—*Clean and tighten connections.*

H—STARTER OPERATES BUT ENGINE IS NOT CRANKED

1. Petrol models: Starter drive pinion not engaging with the flywheel, due to dirt on the screwed sleeve—*Clean.*
Diesel models: Plate clutch pinion faulty—*Remove starter and dismantle to ascertain cause.*

J—STARTER PINION WILL NOT DISENGAGE FROM FLYWHEEL.

1. Petrol models: Starter pinion jammed in mesh with the flywheel—*Rotate squared end of starter shaft with a spanner until pinion flies off. On no account run the engine or serious damage to the starter will result.*
Diesel models: Return spring in starter broken—*Dismantle starter and renew.*

K—ENGINE WILL NOT FIRE—PETROL MODELS.

1. The starter will not turn the engine due to a discharged battery—*Start the engine by hand. The battery should be recharged by running the car for a long period during daylight or from an independent electrical supply.*
2. Sparking plugs faulty, dirty or incorrect plug gaps—*Rectify or renew.*
3. Defective coil or distributor—*Remove the lead from the centre distributor terminal and hold it approximately $\frac{1}{4}$ in. from some metal part of the engine while the engine is being turned over. If the sparks jump the gap regularly, the coil and distributor are functioning correctly. Renew a defective coil or distributor.*
4. A fault in the low tension wiring is indicated by no ammeter reading when the engine is turned slowly with the ignition on, or no spark occurs between the contacts when separated quickly with the fingers with the ignition on—*Examine all the ignition cables and check that the battery terminals are secure and not corroded.*
5. Dirty or pitted contacts—*Clean.*
6. Contact breaker out of adjustment—*Adjust.*
7. Controls not set correctly or trouble other than ignition—*See Instruction Manual "STARTING PROCEDURE."*

M—ENGINE MISFIRES—PETROL MODELS.

1. See items (2), (5) and (6) under "Engine will not fire" and refer to Section A.

N—ENGINE FAILS TO START FROM COLD—DIESEL MODELS.

1. Heater plug circuit broken—*See Operation P/136.*

P—IGNITION AND MIXTURE DEFECTS—PETROL MODELS—DEFECTIVE DISTRIBUTOR.

1. Contact breaker gap incorrect or points burned and pitted—*Clean and adjust.*
2. Distributor cap cracked—*Renew.*
3. Condenser failure—*Renew.*
4. Weak or broken contact breaker spring—*Renew.*
5. Excessive wear in distributor shaft bushes, etc.—*Renew.*
6. Rotor arm pitted or burned—*Clean or renew.*

Q—MIXTURE CONTROL WARNING LIGHT FAILS TO APPEAR WHEN ENGINE REACHES RUNNING TEMPERATURE.

1. Mixture control already pushed in—*In the hands of the operator.*

2. Broken connection in warning light circuit—*Rectify.*
3. Faulty thermostat switch (at cylinder head)—*Renew.*
4. Faulty manual switch (at mixture control)—*Renew Section Q.*
5. Broken operating mechanism at manual switch—*Rectify.*

R—MIXTURE CONTROL WARNING LIGHT REMAINS ON WITH ENGINE AT RUNNING TEMPERATURE.

1. Mixture control out—*Push control right in.*
2. Faulty manual switch—*Renew. Section Q.*
3. Broken operating mechanism at manual switch—*Rectify.*

DATA**Batteries**

Petrol models Single 12 volt, positive earth
Capacity 51 A.H.

Diesel models Two 6 volt, series connected, positive earth
Capacity 120 A.H.

Starter Motor

Petrol models
Nominal voltage 12
Starting shaft end-float Zero

Diesel models
Nominal voltage 12
Starting shaft end-float Zero
Lock torque 32.5 lb./ft. (4,49 Kg/m)
Torque at 1,000 r.p.m. 15 lb./ft. (2,14 Kg/m)

Starter motor drive

Petrol models Spring-loaded pinion and sleeve

Diesel models Multi-plate clutch
Slip load 800 to 950 lb./in. (142,86 to 169,5 Kg/cm)

Dynamo

Petrol models
Maximum output 19 amps

Diesel models
Maximum output 22 amps

Control box

Petrol models Compensated voltage control

Diesel models Compensated current/voltage control

Voltage regulator—
open circuit setting
20°C (68°F) at
2,000 r.p.m. 14.2 to 14.8 volts

Current regulator—
Contact opening
amperage 19

Cut-in voltage 12.7 to 13.3 volts

Distributor

Contact breaker gap014 to .016 in. (0,35 to 0,40 mm)

Distributor rotation Clockwise, at drive end

Advance mechanism Centrifugal/vacuum

Fuse

.... Protects the horn, wind-screen wiper, and on early models also fuel tank level unit and stop lights.

Amperage 35

Heater plugs

Type K.L.G. B.R.Q.1 coil element—1.7 volts 36/40 amps.

Stop lamp switch

Type Mechanical

Mixture control thermostat switch

Contact made at 51-54°C (124-129°F)
Contact broken at 47-53°C (117-127°F)