SECTION I-5
ISSUE 1, APRIL 1956

LUCAS

Quality

EQUIPMENT

VOLUME 2

WORKSHOP INSTRUCTIONS

FLASHING-LAMP DIRECTION-INDICATORS

INCORPORATING
FLASHER UNIT MODEL FL5

JOSEPH LUCAS LTD · BIRMINGHAM 19 · ENGLAND

Printed in England

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1. GENERAL

In general, flashing-lamp direction-indicators can be classified as four-lamp or two-lamp systems. With four-lamp systems two amber (or white) forward-showing lamps are located adjacent to or in combination with the sidelamps, and two amber (or red) rearward-showing lamps are located adjacent to or in combination with the tail or stop-tail lamps. The lamps of the nearside or offside pair are arranged to flash in unison, according to the intended direction of turn. With a two-lamp system, one amber lamp is mounted in a conspicuous position on each side of the vehicle. In addition, both systems utilise a small interior warning lamp mounted in a prominent position before the driver and which flashes in unison with the external signal.

Similarity in the appearance of flasher units having different Service Numbers should not be confused with interchangeability. Apart from the physical differences between plug-in and screw-type teminal mountings, and the usual requirement of voltage, separate non-interchangeable units are necessary for two-lamp or four-lamp operation. For guidance, the Service Number, Voltage and Wattage rating is clearly marked on every unit—the wattage figure referring either to a single main bulb of a two-lamp system or to the combined wattage of two bulbs in a four-lamp system.

In the United Kingdom, the positioning on the vehicle of flashing signal lamps must conform with the requirements of the Motor Vehicles (Construction and Use) (Amendment) Regulations, 1953.

THE FLASHER UNIT

Model FL5 flasher unit is contained in a small cylindrical metal container, one end of which is rolled over on to an insulated plate carrying the mechanism and three terminals. The unit depends for its operation on

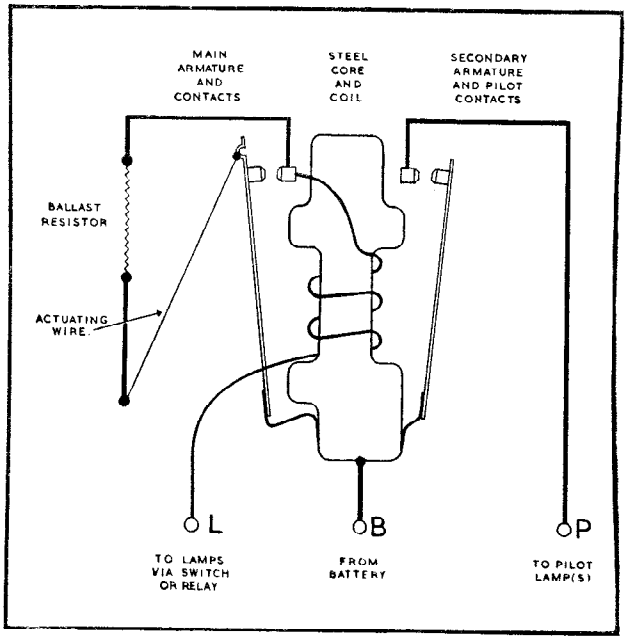

Fig. 1
Symbolic representation of flasher unit, model FL5

the linear expansion of a length of wire which becomes heated by an electric current flowing through it. This actuating wire controls the movement of a spring-loaded armature attached to a central steel core and carrying a moving contact—the sequence of operation being as follows:

When the direction-indicator switch is turned either to left or right, current flows through the actuating wire, ballast resistor and a coil wound on the central core and thence to earth via the flasher lamp filaments. This current is limited by the ballast resistor to a value which will ensure that the flasher lamp filaments do not light at this stage. The actuating wire grows in length under the heating influence of the current and allows the armature to move inwards to its alternative position, thereby closing a pair of contacts in the supply circuit to the flasher lamps and, at the same time, short-circuiting the actuating wire. The increased electromagnetic attraction of the armature to the core, due to

the full lamp current now flowing through the coil, serves to hold the closed contacts firmly together. At the same time a secondary spring-loaded armature is attracted to the core and closes a pilot warning lamp circuit so that now both flasher lamps and warning lamp are illuminated.

Since, however, heating current no longer flows through the short-circuited wire, the latter cools down and consequently contracts in length. The main armature is therefore pulled away from the core, the contacts opened and the light signals extinguished. The consequent reduction of electro-magnetism in the core allows the secondary armature to return to its original position and so extinguish the pilot warning light. The above sequence of operations continues to be repeated until the indicator switch is returned to the off position. A symbolic representation of the flasher unit is shown in Fig. 1.

FUNCTIONS OF WARNING LAMP

The warning lamp not only serves to indicate that the flasher unit is functioning correctly but also gives warning of any bulb failure occurring in the external direction-indicator lamps—since a reduction in bulb current flowing through the coil reduces the electro-magnetic effect acting on the secondary armature and so prevents closure of the pilot light contacts.

The pilot lamp is usually located either in a prominent position on the facia or incorporated in the indicator switch.

TWO WARNING LAMPS

As shown in Fig. 2, two pilot warning lamps can be connected to flasher unit terminal 'P'—one to flash in unison with offside signals and the other with nearside signals—the circuit to earth of each warning lamp being through the filament or filaments of the opposite flasher lamp or lamps. With a four-lamp system, both warning lamps illuminate simultaneously to indicate bulb failure and, due to the reduced core magnetism, flash at an increased frequency. Also, until the defective bulb is replaced and terminal 'P' again receives voltage pulses, the two warning lamps are effectively in series-connection and thus flash at reduced brilliance. With a two-lamp system, the effect of a bulb failure is to prevent either warning lamp from lighting until the defective bulb is replaced.

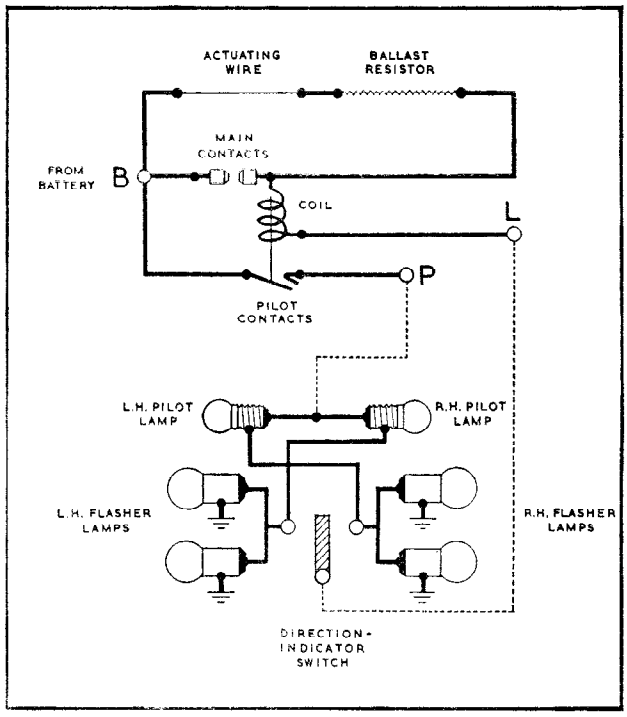

Fig. 2
Flasher unit, model FL5, internal connections and external circuit to four-lamp system utilising two pilot warning lamps

THE BRAKE SWITCH OVERRIDING RELAY

When stop-light filaments are used also as direction lights, it is essential that responses to the flasher unit should override simultaneous applications of the brake switch. In the event of simultaneous applications being made, the relay shown in Fig. 3 allows the appropriate stop-light filament to flash and the other to remain steadily illuminated as long as the brake pedal is depressed.

Operation of the direction-indicator switch to right or left first energises the appropriate relay operating coil which effects movement of its associated armature in the direction shown by the arrow (Fig. 3, inset). By this means, flasher unit terminal 'L' is connected to relay terminals '2' and '3' (or '6' and '7') and, thus, to the indicating lamps. As long as the relay coil remains energised, connection to the brake switch on the corresponding side is interrupted.

SWITCHES WITH STOP-LIGHT CONTACTS

The function of the brake switch overriding relay can also be effected within the direction-indicator switch,

thus obviating the need for a relay. Switches designed for this purpose incorporate additional contacts connected in the stop-light circuits. The connections of such a switch are shown diagrammatically in Fig. 4. In addition to the connections shown, some switches include connections in the warning light, horn push or horn ring circuits.

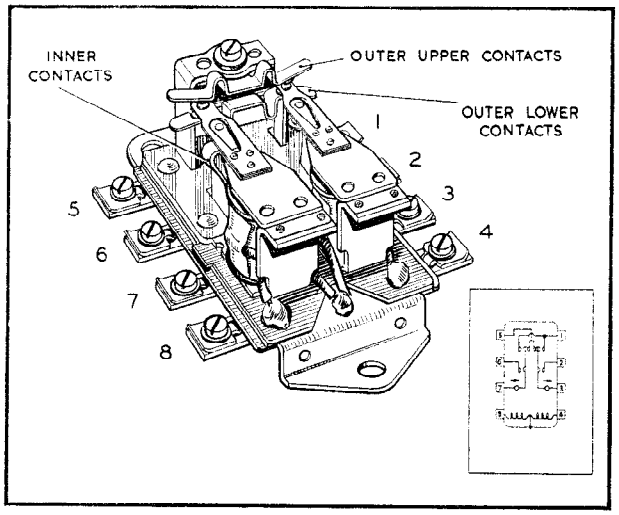

Fig. 3
Brake switch overriding relay, model DB10, with cover removed and (inset) internal connections

It should be noted that the practice of combining flasher and stop-light circuits is obsolescent in new vehicles and should not in future be followed when installing flashing-light direction-indicators in older vehicles.

2. MAINTENANCE

(a) BULB REPLACEMENT

The following bulbs should be used as required:

(i) Single-filament front or rear earth return flasher lamps:	Lucas No. 317 6-volt 18-watt S.C.C. cap. Lucas No. 382 12-volt 21-watt S.C.C. cap. Lucas No. 339 24-volt 24-watt S.C.C. cap
(ii) Single-filament front or rear insulated return flasher lamps:	Lucas No. 319 6-volt 18-watt S.B.C. Lucas No. 335 12-volt 21-watt S.B.C. Lucas No. 333 24-volt 24-watt S.B.C.
(iii) Double-filament front or rear flasher lamps:	Lucas No. 384 6-volt 6/18-watt S.B.C. (non-reversible). Lucas No. 380 12-volt 6/21-watt S.B.C. (non-reversible). Lucas No. 334 24-volt 6/24-watt S.B.C. (non-reversible).

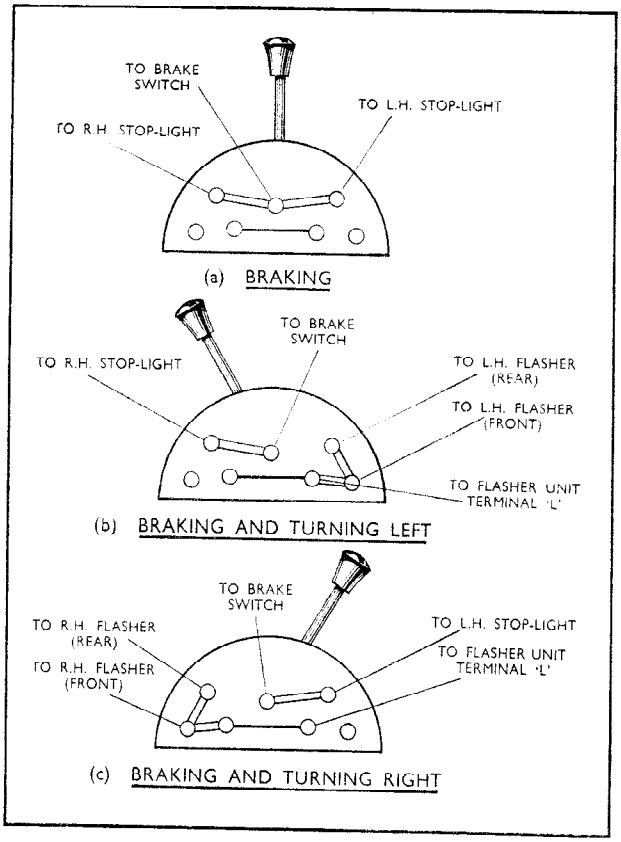

Fig. 4
Direction-indicator switch with brake switch overriding contacts

(iv) Pilot warning lamp in facia or switch body:	Lucas No. 990 6-volt 3-watt M.E.S. cap. Lucas No. 987 12-volt 2.2-watt M.E.S. cap. Lucas No. 650 24-volt 2.8-watt M.E.S. cap.
(v) Pilot warning lamp in switch lever:	Lucas No. 280 12-volt 1.5-watt L.E.S. cap.

(b) CHECKING FAULTY OPERATION

In the event of trouble occurring with a flashing light direction-indicator system, the following procedure should be followed:

(i) Check the bulbs for broken filaments.

(ii) Refer to the vehicle 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 battery voltage with respect to earth.

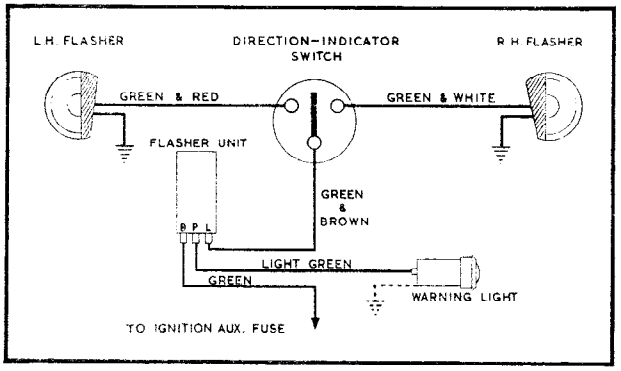

Fig. 5
Wiring of two-lamp indicator set

(v) Connect together flasher unit terminals 'B' (or 'X') and 'L' and operate the direction-indicator switch. If the flasher lamps now light, the flasher unit is defective and must be replaced.

(vi) If, in a system incorporating model DB10 brake switch overriding relay, the lamps do not light in test (v), check the relay as follows:

Temporarily link relay terminal '1' to terminals '2' and '3'.

The left-hand lamps should now flash.

Temporarily link relay terminal '1' to terminals '6' and '7'

The right-hand lamps should now flash.

If the lamps do flash in test (vi), the relay is defective and requires either re-setting, see para. 4 (b), or replacing.

Direction-indicator switches are best checked by substitution.

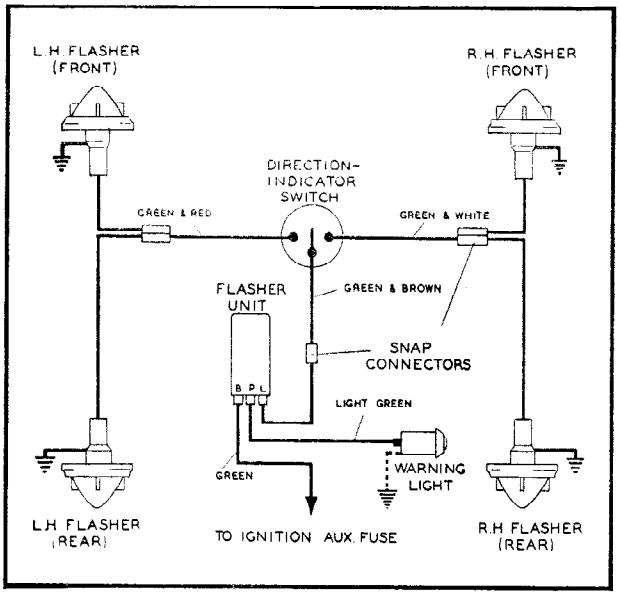

Fig. 6
Wiring of four-lamp indicator set

3. DESIGN DATA

(a) FL5 FLASHER UNIT

	6-volt units	12-volt units	24-volt units
(i) Rating of main bulbs:	18-watt	21-watt	24-watt
(ii) Rating of pilot bulbs:	3-watt	2.2 or 1.5-watt	2.8-watt
(iii) Flashes/Minute:	70–100 @ 6.4±0.5 v.	70–100 @ 12.8±0.1 v.	70–100 @ 25.6±0.2 v.
(iv) Light/Dark ratio:	50/50±15%	50/50±15%	50/50±15%
(v) Resistance (measured by ohm meter) between terminals 'B' (or 'X') and 'L'	4.8±0.25 ohms	9.75±0.5 ohms	32.5±1.75 ohms

(b) DB10 RELAY

	6-volt units	12-volt units	24-volt units
(i) Cut in voltage	3.25–4.5	6.0–9.0	12.0–18.0
(ii) Drop-out voltage	1.0–2.0	3.0–6.0	6.0–12.0
(iii) Resistance of coils measured between terminal '4' and base or terminal '8' and base.	2.75–3.25 ohms	17.75–20.25 ohms	70.0–80.0 ohms

4. SERVICING

Flasher units cannot be dismantled for subsequent reassembly. A defective unit must therefore be replaced, care being taken to reconnect as the original.

The cover of model DB10 brake switch overriding relays can be withdrawn for checking air-gap settings. No further dismantling is possible. In the event of defective coils or contacts occurring, relays must be replaced as complete units, care being taken to reconnect as the original.

Similarly, defective direction-indicator switches are normally replaceable only as complete units.

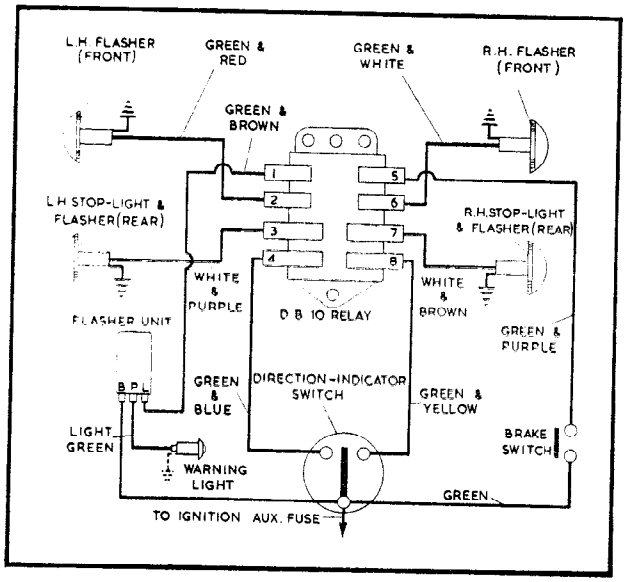

Fig. 7
Wiring of four-lamp indicator set with brake switch overriding relay

(a) REPLACEMENT OR INSTALLATION OF FLASHER UNIT—PRECAUTIONARY NOTE.

When replacing a flasher unit or installing a flashing light system, it is advisable to test the circuits before connections to flasher terminals 'L', 'B' and 'P' are made. When testing, join the cables normally connected to these terminals together and operate the direction-indicator switch. In the event of a wrong connection having been made, the ignition auxiliaries fuse will blow but no damage will be done to the flasher unit.

Flasher units must be handled with care. Factory-made settings, though good for conditions of normal automobile duty, can be thrown off balance by rough handling.

(b) CHECKING AND RE-SETTING RELAY AIR-GAPS

Prise off the relay cover, noting the non-reversible locating slot between terminals '6' and '7'.

Each armature controls three pairs of contacts, two pairs being normally open and one pair normally closed. For setting purposes these contacts can be identified as follows:

Inner pairs, adjacent to bobbins, normally open.

Outer lower pairs, normally open.

Outer upper pairs, normally closed.

When an inner pair of contacts is just touching, a relay in correct adjustment will have an armature-to-bobbin core gap of 0.010″–0.015″. In addition, when these contacts are separated by a 0.007″–0.013″ gap, the outer lower contacts must be separated by 0.012″–0.018″ gap. If the gaps are not within these limits, the relay must be re-set.

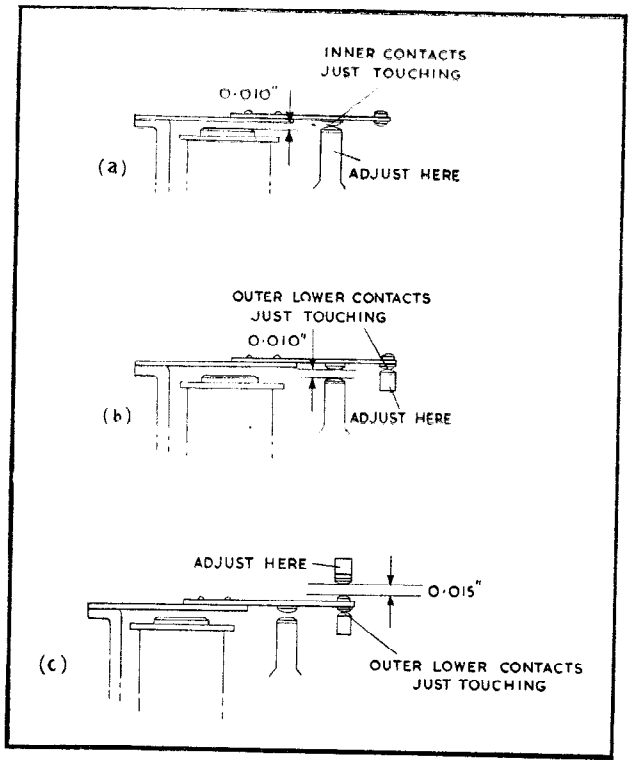

Fig. 8
Air-gap settings of model DB10 relay, showing order of adjustment

Adjustments are made by bending the fixed contact carriers with a suitably slotted bending tool. Setting is effected in three stages, as follows:

(i) Insert a 0.010" gauge between one of the armatures and its bobbin core.

Press down the armature.

Adjust the height of the inner contact carrier until the inner pair of contacts is just touching.

Remove the gauge.

(ii) Insert the 0.010" gauge between the inner pair of contacts and lightly press down the armature.

Adjust the outer lower contact carrier until the outer lower contacts are just touching.

Remove the gauge.

(iii) With the outer lower contacts just touching, adjust the upper contact carrier until a 0.015" gauge is a sliding fit between the outer upper contacts.

Remove the gauge and refit the cover.