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Chapter 12

CONTROL PANEL, TYPE 11A

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LEADING PARTICULARS

Control panel, Type 11A	*Stores Ref. 5UC/5213*
Incorporating—	
Voltage regulator, Type 26	*Stores Ref. 5UC/2491*
Magnetic relay switch, Type K3	*Stores Ref. 5CW/2472*
Magnetic relay switch, Type P2 (12V) ...	*Stores Ref. 5CW/3643*
A.C. output plug, Type W204 (2-pole) ...	*Stores Ref. 10H/397*
Voltmeter test plug, Type W198 (4-pole) ...	*Stores Ref. 10H/391*
Fuse, Type R, No. 1, 30 amp.	*Stores Ref. 5CZ/3445*
Fuse box, Type B	*Stores Ref. 5CZ/549*
Fuse, Type B, 10-amp.	*Stores Ref. 5CZ/463*
Fuse box, Type A	*Stores Ref. 5CZ/445*

Introduction

1. The control panel, Type 11A, is a modification of the Type 11 to provide for more accurate voltage adjustment, and is used in conjunction with the remote trimmer box, Type 5 (*Stores Ref.* 5UC/5191). Like the Type 11, it is used for the starting and voltage control of the inverter, Type MG4B, which is rated for a nominal 24-volt d.c. supply and an a.c. output of 25 amp. at 80 volts (R.M.S.).

2. The modification to the Type 11 panel consists mainly of adjusting the trimmer resistor in the base of the voltage regulator on the control panel to a position where it is virtually short-circuited, and adjusting the variable resistor on the front of the panel to the position of maximum resistance. The terminals of the latter resistor are then connected by a pair of suitable leads to pins 3 and 4 of the Type W plug on the panel.

3. With the Type 11A control panel, adjustment is made solely by means of the remote trimmer box, Type 5; the two variable resistors contained in it take the place of those fitted to the control panel.

DESCRIPTION

4. The control panel (*fig.* 1) consists of a right-angled sheet metal chassis, with a vertical plate forming the front of the panel, a base on which the components are mounted, and a ventilated cover secured by Dzus

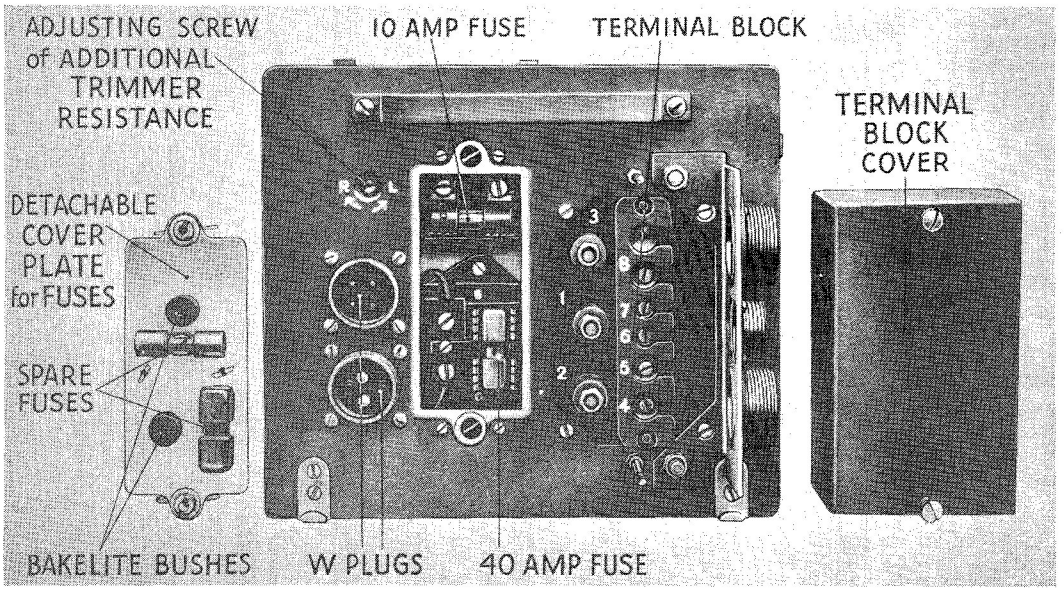

Fig. 1. Front of control panel

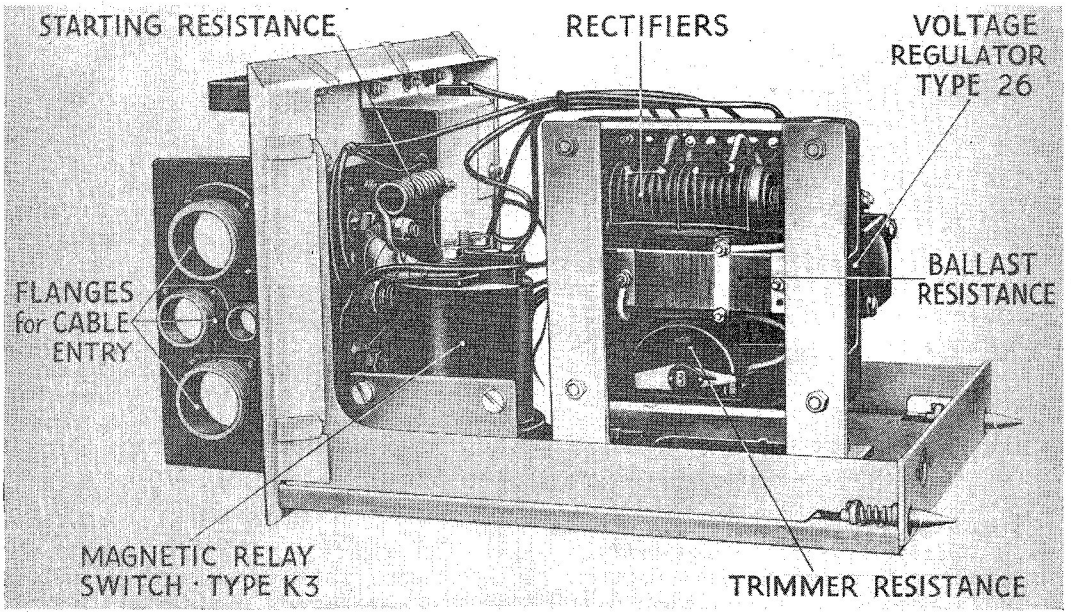

Fig. 2. Interior of control panel

fasteners enclosing the assembly. A general view of the interior of the panel is shown in fig. 2, and a circuit diagram in fig. 3.

5. A starting resistance of approximately 0·1 ohm is connected across the contacts of a magnetic relay switch, Type K3, and thus in series with the d.c. armature of the inverter when the relay contacts are open. The operating coil of a relay, Type P2, is connected across this resistance, with its contacts in the a.c. generator field circuit. The purpose of this relay is to relieve the inverter of load while running up to speed; it is for normal 12-volt operation, with normally-closed contacts, which are set to open at approximately 8 volts.

6. When a positive supply is connected to the control panel, the contacts of the relay, Type P2, open immediately, in consequence of the volt drop across the starting resistance due to the high starting current. The a.c. generator field therefore remains unexcited, and the inverter runs up on no load. The voltage between terminals 3 and 1 on the panel rises with the increasing speed of the machine, and when it reaches approximately 16 volts, the contacts of the starting relay, Type K3, close and the starting resistance is short-circuited. The a.c. generator field relay is also short-circuited and therefore closes, and the a.c. generator is excited. When the main supply is switched off, the a.c. generator field relay remains closed, and the starting relay, Type K3, should open shortly before the armature of the inverter comes to rest.

7. The output voltage is controlled by a voltage regulator, Type 26, which is described in Sect. 1 of this publication. As mentioned in para. 2, voltage adjustment is made solely by means of the remote trimmer box, Type 5; the trimmer on the regulator (if fitted) will be in the position of minimum resistance, and the variable resistor on the front of the panel at maximum resistance.

8. A 30-amp. fuse, Type R, No. 1, mounted in a fuse box, Type B, is inserted in the a.c. output line, and a 10-amp. fuse, Type B, in a fuse box, Type A, is inserted in series with the a.c. generator field and the carbon pile. The fuses are both of the glass cartridge type, and both are fitted with round end caps.

9. The fuses are mounted one above the other behind the front plate of the panel. A detachable cover, secured top and bottom by winged Dzus fasteners, is provided so that access to the fuses may be obtained from the front of the panel. Spare fuses are mounted on the back of this cover plate, together with two Bakelite bushes which prevent the fuses working out of their clips as a result of vibration.

10. The a.c. output is taken to a 2-pole plug, Type W204, on the front of the control panel on the left-hand side. Above this plug is mounted a 4-pole voltmeter test plug, Type W198, of which pins 1 and 2 are used. Other connections are taken to the terminal block on the right-hand side of the panel.

INSTALLATION

11. The control panel is mounted in a tray secured to the aircraft frame. It is held in the tray by two knurled nuts which bear on brass shoulders bolted to the front of the control panel, and by two spring-loaded, tapered plungers, which are attached to the rear of the control panel, and engage with corresponding holes in the tray.

SERVICING

12. The switch contacts and contact plates of the relays should be kept clean, and the efficiency of all electrical connections and screening arrangements maintained. The fuses should be examined periodically and renewed if the wire element shows signs of overheating or sagging.

13. The closing voltage of the magnetic relay switch, Type K3, should be measured by raising the coil voltage gradually until the relay closes, and noting the closing voltage. The relay should close with a snap and in no circumstances should the armature move slowly, or the closing voltage exceed 16 volts at 20 deg. C. approx. The voltage drop across the main terminals must not exceed 50 millivolts, with the coil excited at 16 volts, and a current of 100 amp. flowing in the main circuit. The coil resistance should be 90 ohms approx. at a temperature of 20 deg. C.

Testing

14. Owing to the high current consumption of the inverter, Type MG4B, it is essential that the source of supply used for testing should be of adequate capacity. The full load input to the machine is approximately 120 amp. at 26 volts.

(A.L.1, Aug. 57)

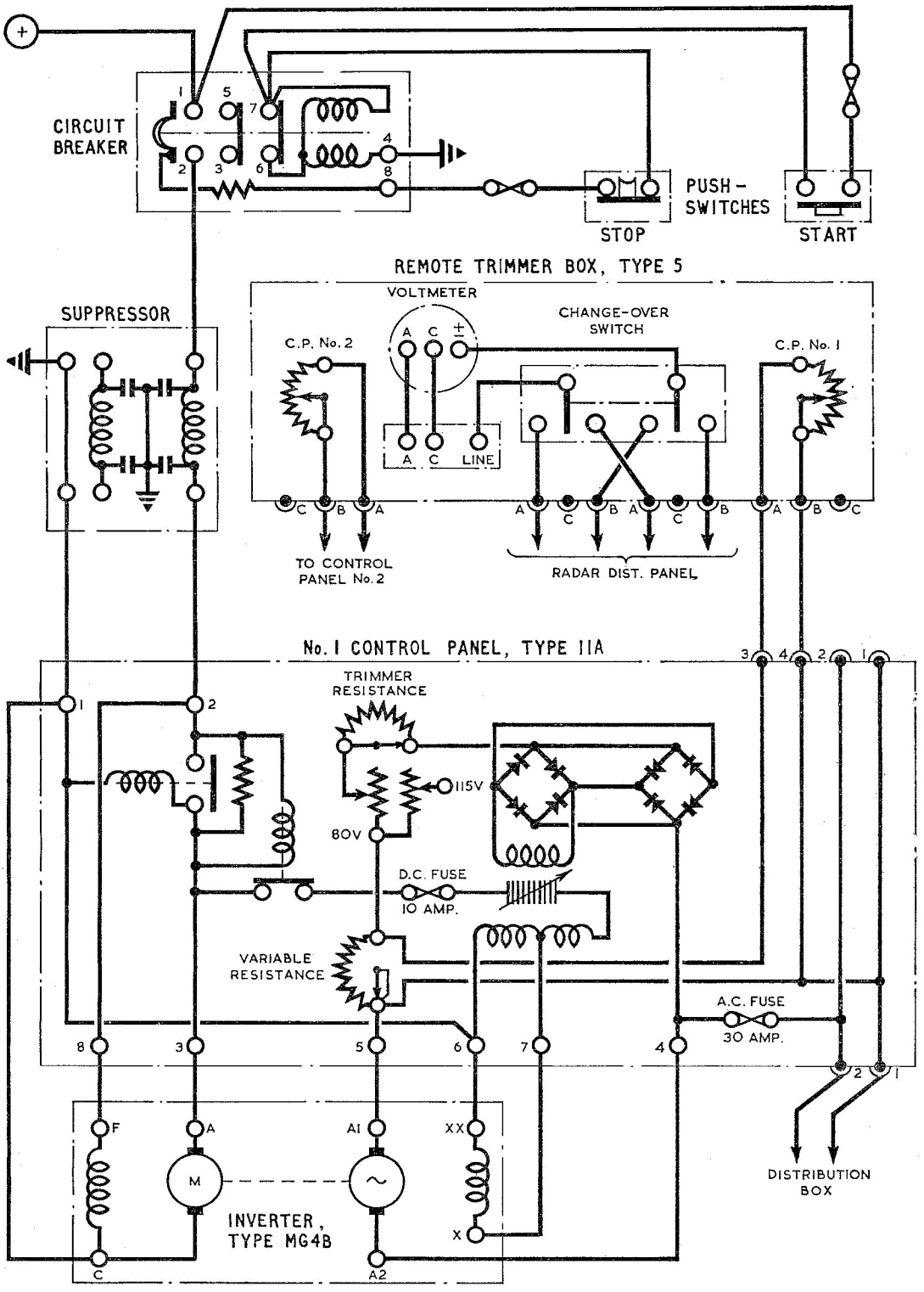

Fig. 3. Circuit diagram

15. Connect the panel to an inverter, Type MG4B, a d.c. supply having a voltage variable between 26 and 30 volts, a non-inductive load taking 25 amp. at 80 volts R.M.S., and an a.c. voltmeter. For test purposes a switch, Type B (*Stores Ref.* 5CW/1877) may be used as a main switch in place of the circuit breaker. The voltmeter used must be a thermal instrument of first grade accuracy, or a compensated moving iron instrument of first grade accuracy, and suitable for frequencies up to 2,500 cycles per second.

16. With the supply adjusted to 26 volts, the inverter should start without hesitation when the main switch is closed, and stop when it is opened. The starting relay in the panel, and the field relay should also be checked to see that they operate in accordance with the information given in para. 6 of this chapter. The inverter should be started from rest at least three times with full load connected.

17. With the inverter running, the d.c. input voltage, measured at the *machine* terminals, should be increased from 26 to 29 volts and then decreased to 26 volts under the two following conditions:—

(1) With full a.c. load of 80 volts, 25 amp. R.M.S.

(2) With no a.c. load.

Throughout this test the voltage should not vary by more than three volts, and should be between the limits 78 and 83 volts R.M.S. If necessary, the voltage may be adjusted initially by means of the remote trimmer box, Type 5, but should not be adjusted during the test. Test results will be more stable if the equipment is run on full load for 5–10 minutes before testing.

18. (1) With the supply voltage adjusted to 29V, switch the inverter on and off three times.

(2) With the inverter running, and the supply voltage adjusted to 29V, switch the full a.c. load on and off three times.

In each case the regulator must respond without tendency to hunt.

19. The insulation resistance should be measured with a standard insulation resistance tester and should be not less than 2 megohms between the following points:—

(1) d.c. circuits to a.c. circuits and frame (connect terminal No. 4 to frame and test between terminal No. 2 and frame).

(2) a.c. circuits to d.c. circuits and frame (connect terminal No. 2 to frame and test between terminal No. 4 and frame).

20. If the regulated voltage rises slightly owing to settling down of the carbon pile stack, minor adjustment to the voltage level may be made on the remote trimmer box, Type 5. If fitted, the trimmer resistor on the regulator itself and that on the control panel should be left undisturbed. Every effort should be made to obtain the correct voltage by this means. If, however, this proves impossible, the regulator is out of adjustment, and must be set again to the manufacturer's position. Instructions for the procedure to be adopted are given in Book 1, Sect. 1 of this publication.

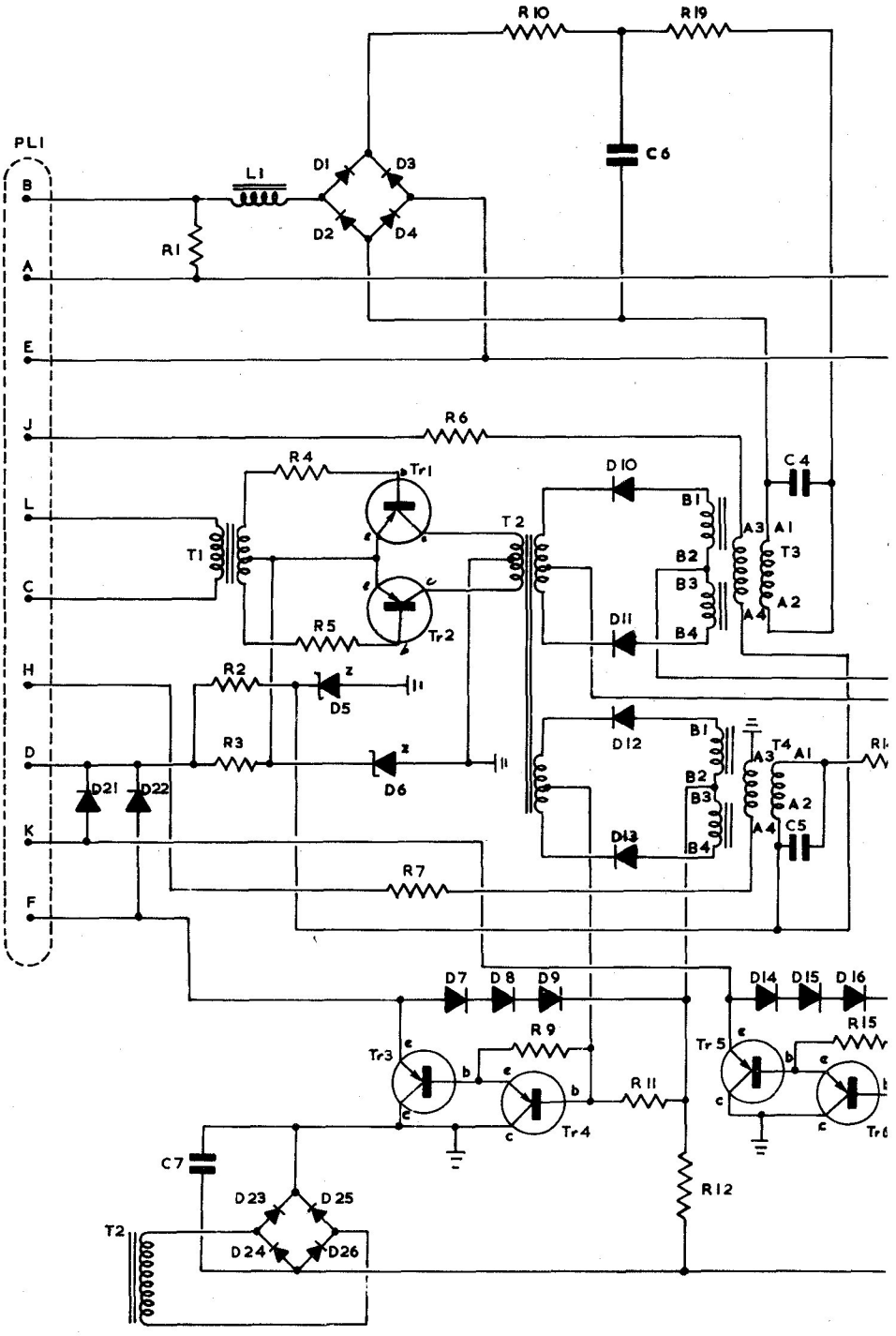

Fig. 10. Theoretical circuit diagram

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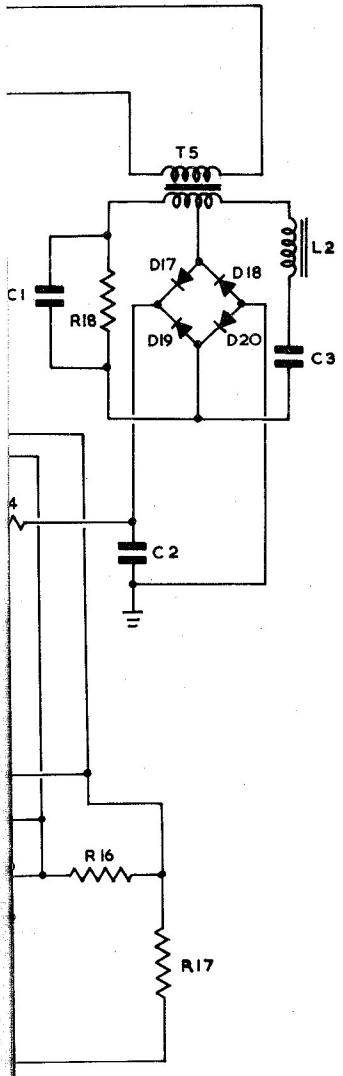

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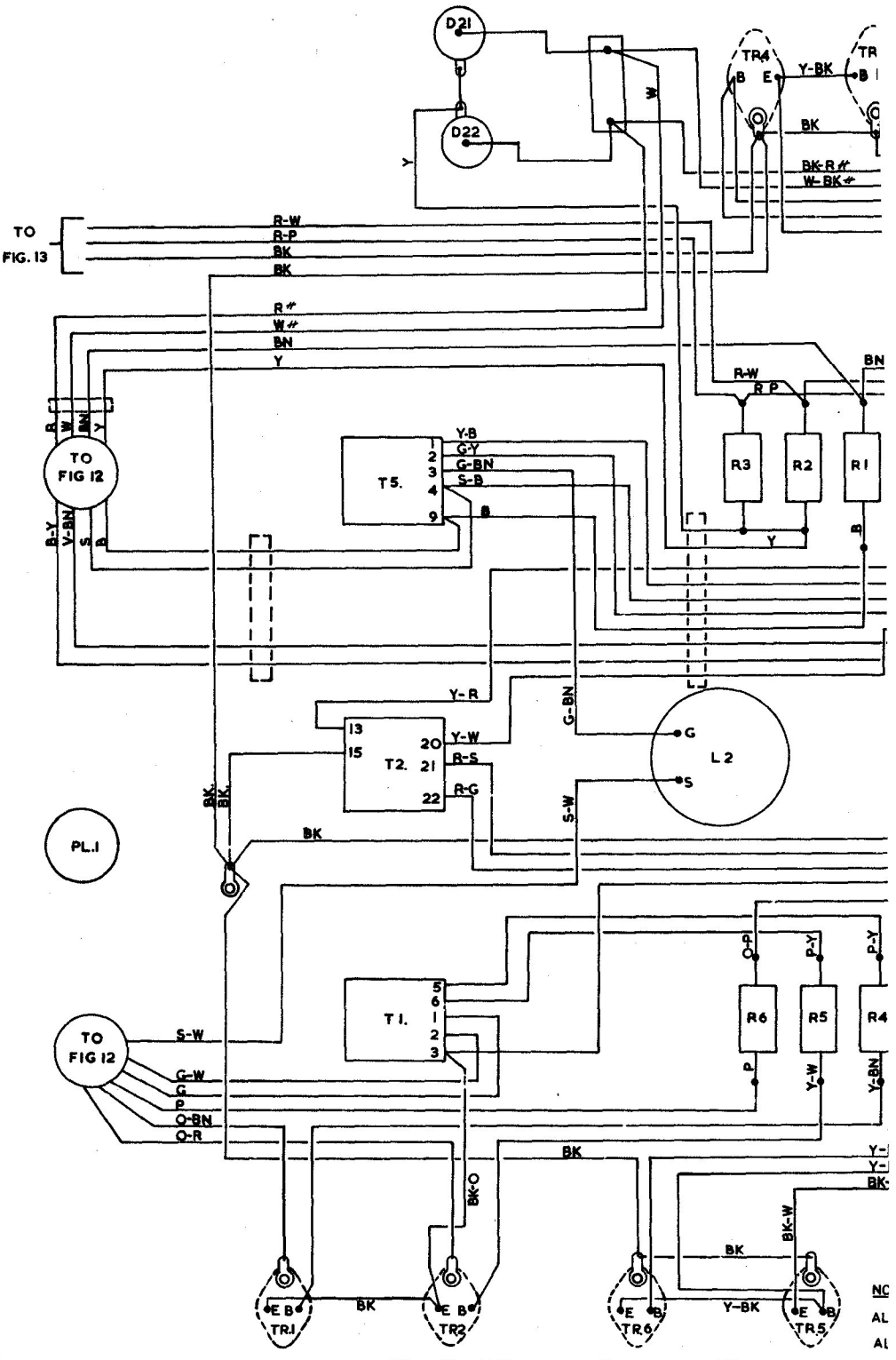

Fig.11. Wiring diagram – Top of cor

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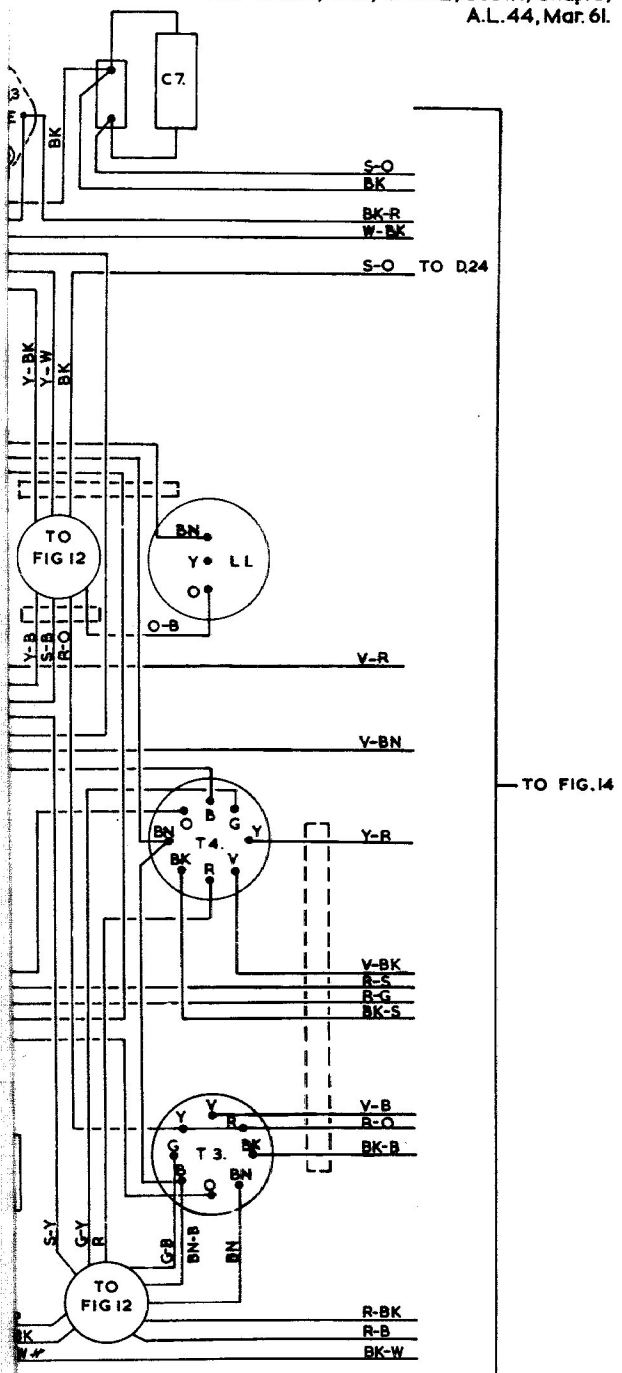

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REMAINING WIRES TO BE 23 s.w.g. SOLID CONDUCTOR.

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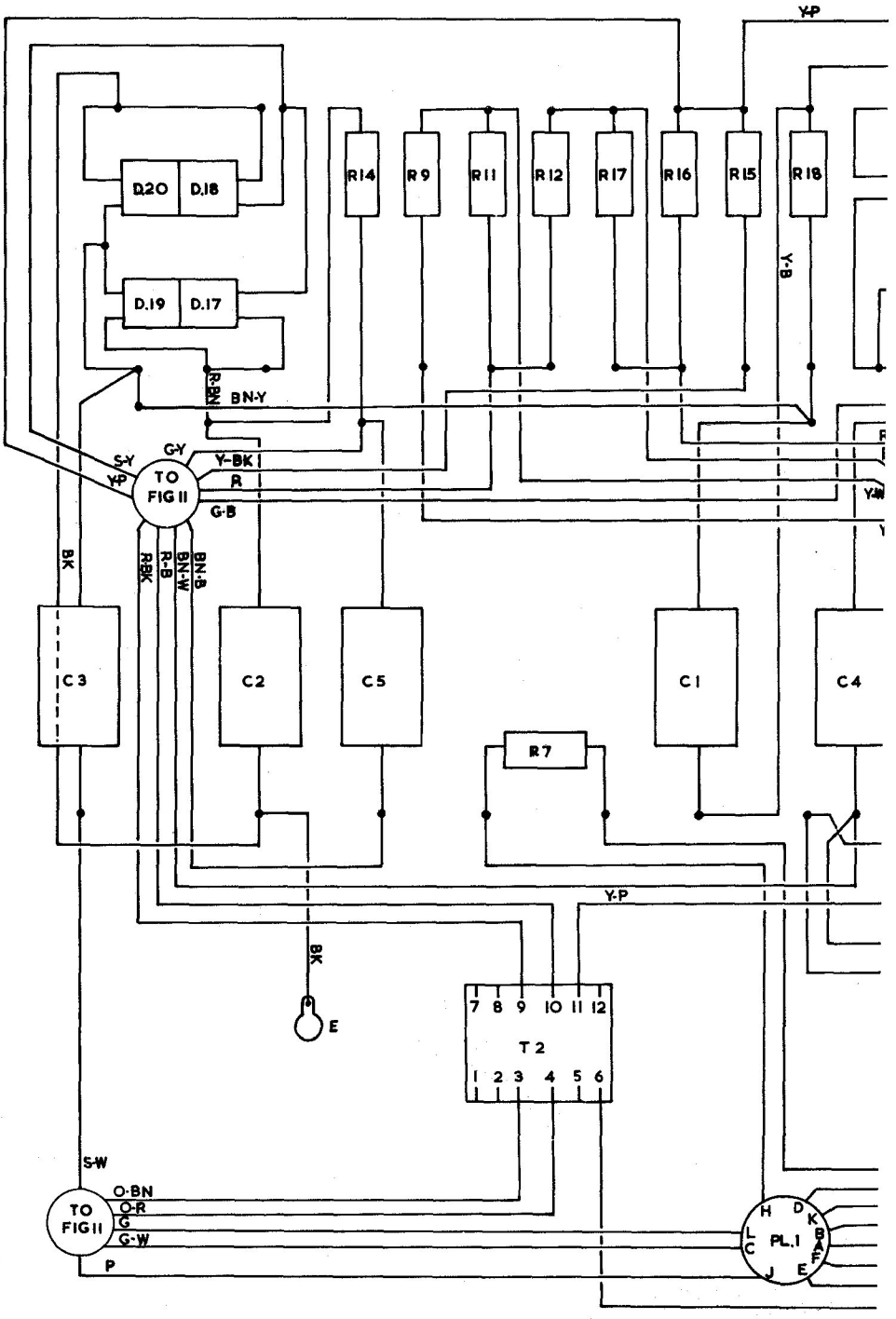

NOTE.

ALL WIRES MARKED THUS # T

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Fig.12. Wiring diagram – underside of control

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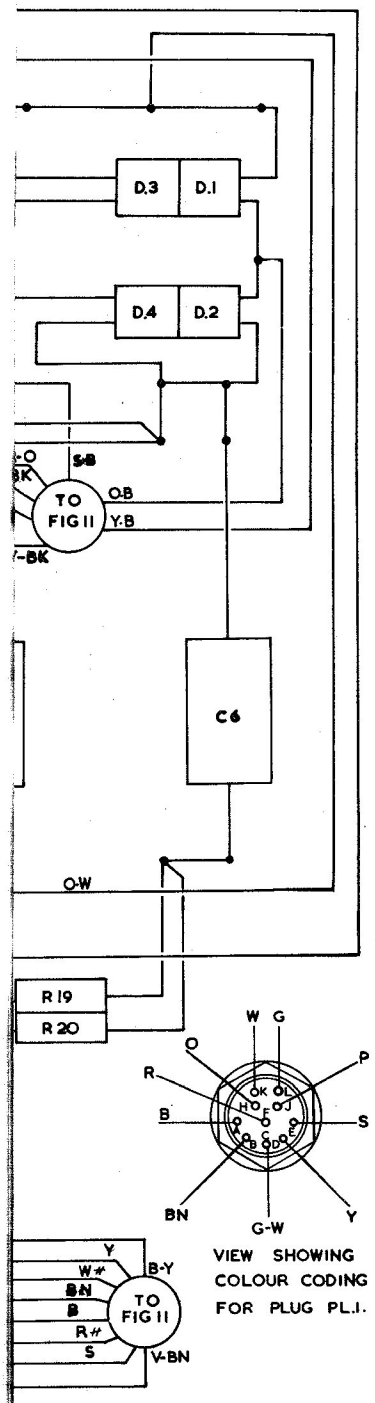

VIEW SHOWING COLOUR CODING FOR PLUG PL.I.

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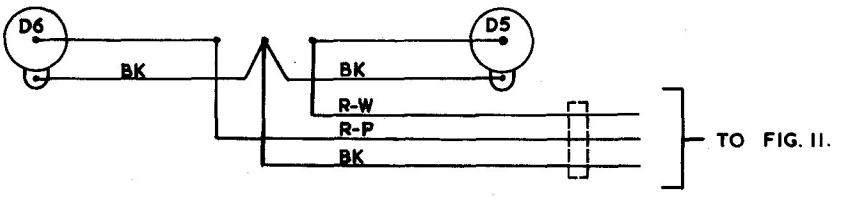
23 s.w.g. SOLID CONDUCTOR.

panel.



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ALL WIRES TO BE

Fig.13. Wiring diagram-Zener diode r

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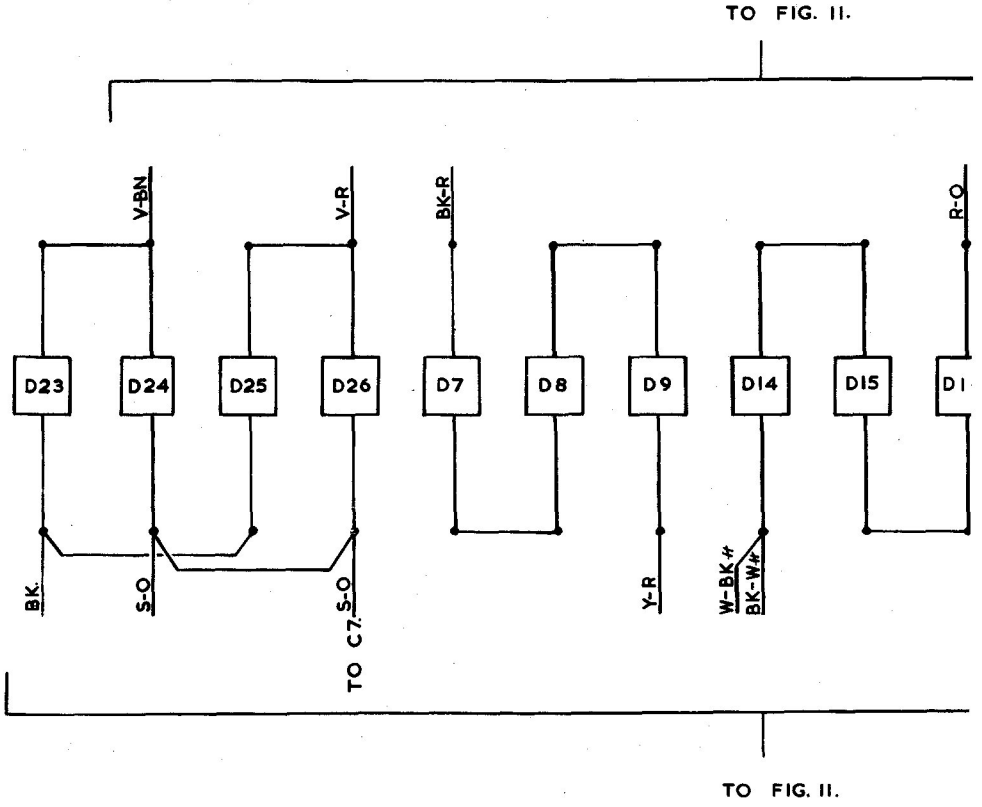

Fig.14. Wiring diagram-Diode mou

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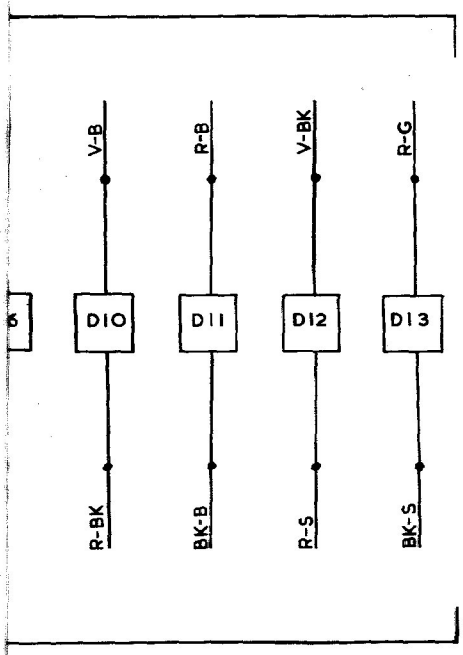
23 swg. SOLID CONDUCTOR.

nounting bracket.



NOTE.
ALL WIRES MARKED THUS # TO BE 23/-0076"
ALL REMAINING WIRES TO BE 23 s.w.g.
SOLID CONDUCTOR.

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